ABSTRACT

DELL'OLIO, LAURA ASHLEY. Retention of Phosphorus and Refining the Phosphorus Loss Assessment Tool for the Organic Soils of North Carolina. (Under the direction of Rory Maguire and Deanna Osmond.)

Phosphorus (P) runoff and leaching from agricultural fields have been identified as major environmental concerns for the health of aquatic ecosystems. North Carolina has responded by implementing the Phosphorus Loss Assessment Tool (PLAT). The goal of the PLAT is to determine relative P losses from agricultural fields based on several site factors and characteristics, including Mehlich-3 P (M3P) soil test values. Based on previous research, the current version of PLAT is programmed to predict greater soluble P losses from organic soils than from mineral soils with the same M3P values. However, recent research specific to North Carolina's organic soils has indicated decreased water-soluble P (WSP) in the presence of high Al concentrations. Our objectives were to determine (i) the concentrations of Al, Fe, and OM in Typic Haplosaprists and Terric Haplosaprists of North Carolina's Lower Coastal Plain, (ii) how the concentrations of Al, Fe, and OM in these soils affects P retention, and (iii) how the algorithms in the PLAT software should be refined to accurately predict P losses based on the results of the study. We sampled four organic soil series and determined M3P, Mehlich-3 Al (M3Al), Mehlich-3 Fe (M3Fe), WSP, total P, pH, particle size distribution, and the organic matter content (OM). Water-soluble P and M3P were also measured in a 21-d incubation study in which P was added at a rate equivalent to 150 kg P ha^{-1}. Inorganic chemical P fractions and $CuCl_2$ extractable Al were identified in an Al and inorganic P fractionation study, respectively. According to the results of the incubation, multiple regression, and fractionation studies, Al was the main cation responsible for P retention; the mean topsoil M3Al concentrations (1926 mg kg^{-1}) in these organic soils were close to three times higher than those observed in another study of mostly mineral NC soils. The concentration of M3Fe was low in every series and was not correlated to any P characteristics. Mehlich-3 P was not consistently related to P retention and WSP; however, OM content, M3Al, and $CuCl_2$ extractable Al were associated with P retention. In the incubation study, the proportion of applied P that was adsorbed was greater in soils with lower OM and/or higher M3Al. Increased OM was associated with increased WSP and lower total P, as well as decreased P retention. The opposite effect was observed with increasing M3Al concentrations. The regression coefficient for the relationship of the ratio of OM to M3Al between WSP and P retention was greater than when the variables OM and Al were used alone. Furthermore, as more Al bound P was extracted by M3P (causing higher M3P/Al-P), WSP increased, and coincided with decreased $CuCl_2$ extractable Al. The results from this study indicate that in high OM soils, the concentration of extractable Al controlled the solubility of P. It is recommended for the "shallow organics" that the M3P threshold should be raised to 155 mg kg^{-1} and that the "deep organics" remain at 50 mg kg^{-1} to more accurately predict P losses in the organic soils of the lower Coastal Plain.

RETENTION OF PHOSPHORUS AND

REFINING THE PHOSPHORUS LOSS ASSESSMENT TOOL

FOR THE ORGANIC SOILS OF NORTH CAROLINA

by

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BIOGRAPHY

The author was born and raised in Los Angeles, California. Her life long interests in agriculture and environmental issues as a child turned into a passion for conservation and protection, as she attended the University of California at Santa Barbara in 2000. Her studies in Geography and Environmental sciences fostered a deep interest and appreciation for soil science. Upon graduation in 2004, Laura continued her education at North Carolina State University where she enrolled in a Masters program in Soil Science and was exposed to nutrient management issues, specifically those related to P losses from agricultural fields fertilized with animal manure. Laura’s work has introduced her to the challenges of working with field experiments and scientists, while enjoying the personal satisfaction and intellectual rewards of discovering scientific patterns and processes.

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LITERATURE REVIEW

Introduction

Research into the management of phosphorus (P) has accelerated over the past decade in response to the observed environmental repercussions of poor P management. Where animals are raised, manure is created and consequently used as a fertilizer source in agriculture. In general, most manures have a lower nitrogen (N):P ratio than plants require for optimum growth, and traditionally manures have been applied to meet crop N demands (Barker et al., 1994; Sims and Maguire, 2004). Nitrogen based manure application, however, often results in excess P relative to crop demand, causing an increase in soil test P (STP) (Barker et al., 1994; Beauchemin et al. 1996; Sims and Maguire; 2004). Traditionally, this imbalance of N:P in manure compared to crop demand had not been of great environmental concern because crop production in most soils was P limited. In recent decades, however, the total number of animal units in the United States has increased, while the total number of animal operations has decreased, resulting in greater density of animals at fewer facilities (Kellogg et al., 2000; Sims and Maguire, 2004).

The adverse environmental effects of large confined animal feeding operations (CAFO) are often associated with the application of manure P in excess of crop requirements. Land application of manure is also employed as a waste disposal technique, where transportation of manure over far distances is highly uneconomical (Sims et al., 2000; Sims and Maguire, 2004). Continued application in this manner has been shown to increase STP well above levels needed for optimum crop growth (Breeuwsma et. al, 1996; Lookman et al, 1996; Maguire et al., 2000). In 2001 the NC Department of Agriculture ranked NC as having the second highest swine population in the US and furthermore, producing the highest excess P of all other states studied (Novak and Chan, 2002). As the size of CAFO continues to grow, the amount and geographical concentration of P in manure has created the need for proper environmental P management (Sims and Maguire, 2004).

Currently, in most circumstances the only economically viable option for manure waste disposal in CAFOs is application to local crops (Sims and Maguire, 2004). The use of N based manure fertilization regimes can create saturated soil P conditions over time because more manure must be applied to meet crop N demand than crop P demand (Maguire et al., 2000). In addition, some of the high STP comes from over fertilization of tobacco and vegetable crops. After many years of improper P management, P saturated soil conditions may continue to exist even after a more efficient P based fertilization regime is adopted. Soil P levels approaching or exceeding saturation have been shown to increase the likelihood of excess P being transported off site by leaching (Maguire and Sims, 2002b), erosion, and runoff (Sharpley et al, 1996; Hooda et al., 2000; Schroeder et al., 2004).

There are growing environmental concerns for the health of aquatic ecosystems receiving excessive P from agricultural operations. According to the Environmental Protection Agency (USEPA, 2006), 60% of surveyed rivers and streams have been adversely affected by agricultural operations. Phosphorus is the limiting nutrient in most fresh water resources and as P concentrations increase, water quality may be diminished. An increase in P concentration allows algae that were once nutrient limited, the ability to flourish. As algae continue to bloom and die, decomposition depletes the aquatic ecosystem of oxygen, often creating hypoxic conditions under which aquatic species diversity may decline.

Historically, agricultural P management has been geared towards fertilization of P limited soils for the purpose of economic gain via increased yields. The use of inorganic commercial fertilizers in combination with soil testing, has allowed farmers the ability to match crop P demand with specifically formulated inorganic P fertilizers. Since it is not economical for farmers to apply more commercial P fertilizer than is needed, generally this P fertilization approach is profitable and decreases the likelihood of P nutrient application in excess of crop P demand. When P crop demand is linked directly with proper P fertilization, the opportunity for P nutrient losses into the environment is highly reduced (Allen, 1984).

Phosphorus Loss Assessment Tool

In 1999, the USDA's Natural Resource Conservation Service (NRCS) responded to the declining health of waterways by revising its policy on nutrient management. Previous nutrient management guidelines were focused on N crop demands. The NRCS's 590 standard, however, shifts the focus primarily to P plant demands for animal waste applications. The 590 standard offers three options for P management based on (1) agronomic STP, (2) environmental STP, or (3) P Index approach. In accordance with the new nutrient management (590) standard, North Carolina implemented a P Index called the Phosphorus Loss Assessment Tool (PLAT). Members from NC Department of Agriculture and Consumer Services, NC Division of Soil and Water Conservation, NRCS, and 11 faculty members from NC State University made up the PLAT committee.

The need for a comprehensive tool that would account for all the major P loss pathways, agricultural practices, and the specific geography of NC was identified. The committee realized the need for a site-specific tool specialized for NC, rather than adopting a P index from another state. Four P loss pathways were identified; 1) Runoff carrying soil-bound P, 2) Runoff carrying dissolved P, 3) Subsurface dissolved P losses, and 4) Runoff carrying P from nutrient sources applied to the surface (Havlin et al., 2001; The NC PLAT Committee, 2005).

Examples of the major parameters used in the PLAT are erosion rate, P application rate, and STP values. The Mehlich-3 P (M3P) soil test is used as the state's official agronomic soil test and was therefore adopted for use in the PLAT (Mehlich, 1984). The overall PLAT assessment is calculated by addition of the four PLAT loss pathways and then transformed to an index value, which is associated with a of rating low, medium, high, or very high P loss assessment (Table 1).

Table 1. The PLAT ratings.

Rating	Index Value	Consequence of Rating
Low	0-25	Use of N based manure application rate
Medium	26-50	Use of N based manure application rate
High	51-100	Manure application rate is limited to P removal from the site in the harvested crop
Very High	>101	No additional P application is allowed (except starter fertilizer P)

The PLAT ratings were based on the EPA standard for the maximum allowable amount of dissolved P (1 mg P L^{-1}) discharged from wastewater treatment plants. Soils were segregated into textural classes and assigned a P threshold in the PLAT software, which is the M3P value associated with 1 mg P L^{-1}. The PLAT sampling protocol calls for a subsoil sample to be taken at ~30 in (76 cm) when a surface sample exceeds the P threshold for the soil type (Table 2).

Table 2. Phosphorus threshold groups and associated P thresholds.

P Threshold Group	**Location**	**P Threshold (mg kg^{-1})**
Organic	Coastal Plain	50
Sand	Coastal Plain and alluvial areas of the Piedmont and Mountains	100
Loam	Piedmont and Coastal Plain	200
Clay	Piedmont and Mountains	500

Currently at a M3P value of 50 mg P kg^{-1} soil, organic soils are predicted to release 1 mg P L^{-1} in runoff, whereas mineral soils are predicted to release less than 1 mg P L^{-1} runoff at the same M3P value (Fig. 1). However, Johnson et al. (2005) found that it would take greater M3P values to raise the degree of P saturation in organic soils, compared to all other PLAT threshold groups which suggests that the P retention capacity of these soils was larger than the other groups examined. It was also observed that the organic soils studied had more than three times more Al_{ox} than the clay threshold group, which has traditionally been thought to have the highest P sorption capacity based on its ability to retain cations responsible for P retention (Wild, 1950; Cox and Hendricks, 2000; Johnson et al., 2005). Therefore, it was brought to the committee's attention that further research was needed to accurately predict P losses for the organic soils of NC's Coastal Plain.

It is important that the organic soils of NC's Coastal Plain are appropriately represented in PLAT because they may impact agricultural management decisions by shifting

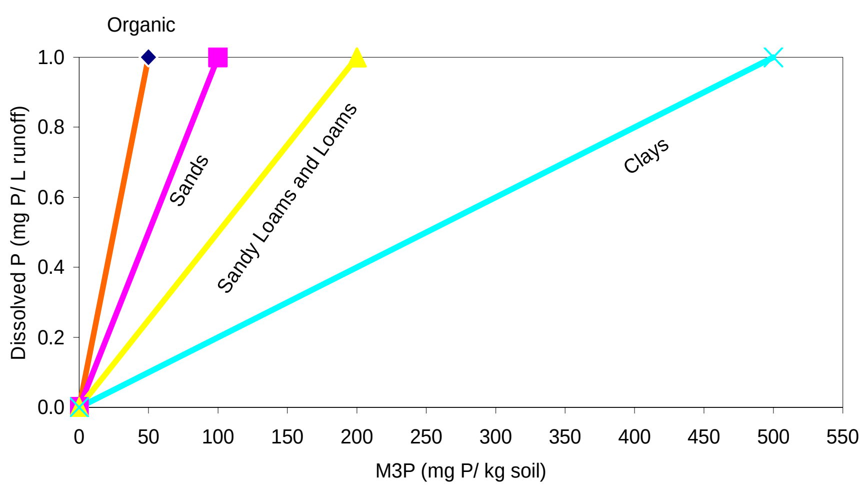

Figure 1. Relationship between dissolved P in runoff and M3P for different soil textures in the PLAT (Havlin et al., 2001).

N based fertilization regimes to P based or vice versa. In addition, organic soils have dramatically lower bulk densities than mineral soils creating a greater risk for sediment transport with wind and water (Lilly, 1981). Furthermore, these soils are in a known fragile, wetland ecosystem of high diversity where over application of P fertilizers, coupled with soils that are traditionally thought to be low in P retention capacity, pose a risk of increased P in runoff and leaching.

Characteristics of the Organic Soils of North Carolina's Coastal Plain

The organic soils of NC Coastal Plain began developing 9,000 years ago during the Wisconsin glacial period (Dolman and Buol, 1967) (Fig. 2). High rainfall, flat landscapes, large distances between streams, and shallow depths to impermeable layers are the main factors believed to be responsible for the formation of organic soils in this region (Lilly, 1981). As water accumulated in the Coastal Plain and dissolved oxygen was depleted, the availability of electron acceptors responsible for decomposition decreased. As the state of saturation and decreased decomposition persisted, organic material continued to accumulate

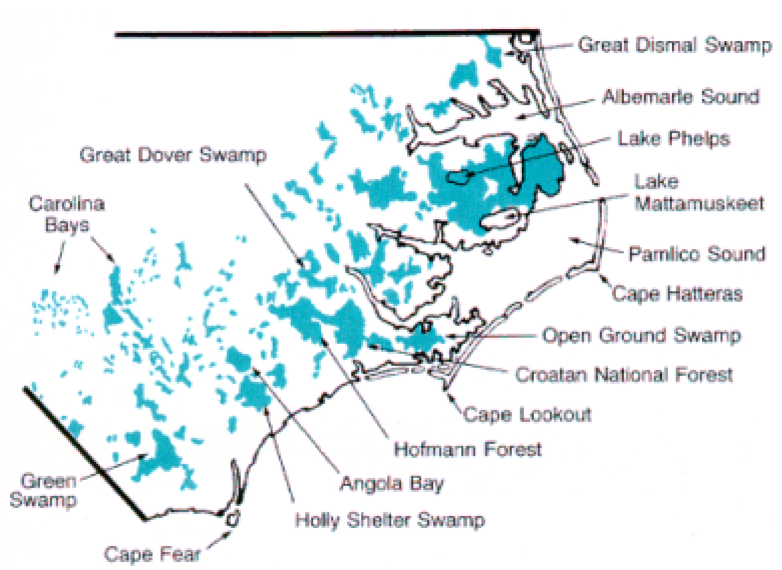

Figure 2. North Carolina's Coastal Plain; Presence of organic soils.

and the pH became very acidic, eventually forming inches to feet of organic matter atop original soil mineral layers. The original organic matter thickness has been altered as a result of natural and controlled fire and decomposition induced by agricultural drainage, causing subsidence (Dolman and Buol, 1968). Furthermore, mixing of the soil profile is common in this region due to uprooting trees (Buol and Dolman, 1968)

Although most of the soils of the Coastal Plain have experienced a reduction in organic matter thickness, they are still classified as organic soils. The proper soil classification of an organic soil is a “Histosol”. The different types of Histosols are classified based on formation, state, and/or type of organic matter. Most of the organic soils of NC’s Coastal Plain are Saprists, which by definition means they are composed of the highest form of decomposed organic matter (sapric). In particular, the two types of organic soils encountered in this research are “Typic Haplosaprists” and “Terric Haplosaprists”, which will be referred to as “shallow” and “deep” organics, respectively, from this point on.

Farmers have developed unique management strategies for the organic soils of NC’s Coastal Plain. To prepare forested organic soils for cultivation, the area is first drained by installing lateral canals one-half mile apart that empty into a header field canal. Perpendicular field drains connected to the lateral canals are placed 330 feet apart (Lilly, 1984). Once the land is drained, it can then be cleared and uprooted for logs using subsoilers. Tupelo-cypress (*Nyssa Taxodium*) and mixed hardwoods are the common type of trees encountered in forested areas growing in organic soils (Dolman and Buol, 1967). Preserved trees are commonly found buried within the soil profile and must be removed if the soil is to come into agricultural production. Furthermore, in order to promote runoff toward the ditches and to avoid standing water, fields are typically crowned from the center to the ditches by moving soil from the edges to the center between the drains to form a 0.5 % slope (Lilly, 1981).

Factors Affecting P Retention

Depending on the soil pH, P is present in soil solution as either $H_2PO_4^-$ or HPO_4^{2-}. These labile, orthophosphate P species are oxyanions and therefore are bound in soil by positively-charged particle surfaces, cationic surface functional groups, precipitation as phosphate minerals, immobilization, or by incorporation into OM as organic P. The main cations responsible for P retention in soil are Ca^{2+}, Al^{3+}, and Fe^{3+}, though at low pH's Al and Fe dominate (Wild, 1950; Larsen et. al., 1959). The main retention mechanisms occur with clay and organic matter surfaces and through precipitation reactions with Al, Ca, and Fe species (Wild, 1950; Bloom, 1981). Moreover, particle size and the crystallinity of Al and Fe-oxide minerals can also affect the P retention capacity of a soil.

The chemical reactivity of soil organic matter is influenced by phenolic and carboxylic functional groups that typically impart negative surface charges. There are, however, limited positive organic sites on organic matter available for direct OM-P binding (Wild, 1950). The main mechanisms thought to be responsible for P retention via organic matter occur through cation bridging reactions (PO_4^--Al-OM, PO_4^--Ca-OM, PO_4^--Fe-OM) (Violante et al., 1991; Gerke and Hermann, 1992; Bhatti et al., 1998). However, it should be noted that Ca concentrations are usually minimal due to high calcite solubility and Ca losses through cation exchange at low pHs. Also, Al^{3+} has been shown to out compete Ca for carboxyl groups associated with organic matter and therefore, it should be expected that in acid organic soils, little PO_4^- will be associated with Ca (Bloom, 1981).

Wild (1950) observed that P retention increased as particle size decreased with the clay sized fractions having the greatest retaining capacity, as clay is associated with increased surface area and therefore increased P retention capacity (Cox and Hendricks, 2000). Similarly, it has been noted that as the ratio of SiO_2 / (Fe_2O_3 + Al_2O_3) increases, P sorption decreases as there is decreased surface area for P sorption accompanied with decreased concentration of cations associated with retention (Wild, 1950). Similar P retention mechanisms seen in organic matter such as cation bridging have been proposed for P associated clay retention (PO_4^--Al-clay, PO_4^--Ca-clay, PO_4^--Fe-clay) (Violante et al., 1991; Gerke and Hermann, 1992; Bhatti et al., 1998).

Non- crystalline and poorly crystalline forms of Al- and Fe-oxides have been shown to retain more P than crystalline forms (Elliot et. al., 2002). The P retaining capacity of a soil has been linked to the crystallinity of Al and Fe, where non-crystalline and poorly crystalline species have been shown to have higher surface area and thus more surface sites for adsorption of PO_4^- than crystalline species (Schwertmann et al., 1986). Elliot et al. (2002) found that crystalline forms of Al- and Fe-oxides in water treatment residuals did not retain as much P as their non-crystalline counterparts when examined in a P sorption study. Additionally, in similar flooding studies, it was observed that Al- and Fe-oxide crystallinity decreased (as observed with an increase in oxalate extractable Al (Al_{ox}) and Fe (Fe_{ox})) as flooded-drained and periodically flooded treatments increased (Darke et al., 1997; Young and Ross, 2001).

In a similar study, high correlation was observed between soil OM content and Al_{Ox} and Fe_{Ox} (Darke and Walbridge, 2000). With experimental flooding, a decrease in Al crystallinity was also observed as well as association between Al_{Ox} and P sorption capacity

(Darke and Walbridge, 2000). It has been proposed that oxide mineral crystallization is inhibited in soils containing high organic carbon contents (Schwertmann et al, 1986). The results from these studies suggest that flooded-drained and carbon rich soils may have more non-crystalline or poorly crystalline Al- and Fe-oxides, which has been shown to increase a soil's P retention capacity. It could be expected then that cultivated organic soils might have greater amounts of poorly crystalline than crystalline Al-/Fe-oxides.

Differences between the Capacity of P Retention in Organic and Mineral Soils

Without the presence of Ca^{2+}, Al^{3+}, and/or Fe^{3+} as described above, organic soils have historically been thought to have little or no P retaining ability (Wild, 1950). Soil mineralogy, mixing of soil, and subsidence can all influence the amount of Al, Ca, and Fe present in an organic soil (Dolman and Buol, 1968). Acid organic soils of the Coastal Southeastern United States have been shown to contain tremendous amounts of Al and a much higher P sorption capacity than other organic soils without significant Al contents (Richardson, 1985). In fact, Bloom (1981) found similar P sorption in a peat with high Al content and a mineral volcanic soil; where volcanic soils (Andisols) have been thought to have the highest P fixing capacity of all soils. Furthermore, the peat adsorbed greater amounts of PO_4^- per quantity of organic matter than the Andisol, reinforcing the importance of organic matter associated P retention in organic soils.

Organic soils were formed because of extended saturated and reduced conditions. Aluminum is not affected by changes in redox, however Fe^{3+} reduces to soluble Fe^{2+} under reducing conditions and, consequently, is rarely associated with P retention in reduced soils (Darke and Walbridge, 2000; Liikanen et al., 2004). Iron has been shown to be lost from wetland ecosystems, whereas Al persists and is more likely to form Al-OM complexes than

Fe (Darke and Walbridge, 2000). In accordance, Cuttle (1983) found poor relationships between Fe and P sorption and attributed these results to reduction and redistribution of Fe in high Al organic soils studied in Scotland.

In a study comparing P sorption capacities of wetland soils and upland soils, it was observed that differences in soil chemistry between the two landscapes, accounted for the relationships seen in soil parameters associated with P retention (Axt and Walbridge, 1999). Positive relationships between clay and silt content, and P sorption capacities were reported in the upland soils, but not in the organic soils (Axt and Walbridge, 1999). Conversely, in the wetland organic soils examined, Al_{ox} and soil organic matter were highly related to P sorption capacity and each other. These results indicate the importance of OM-Al associations in the organic soils studied (Axt and Walbridge, 1999).

While higher concentrations of Fe^{3+} in proportion to Al^{3+} are not typically found in organic soils, organically associated Al^{3+} and Fe^{3+} have been shown to a higher P sorption capacity than non-crystalline Al and Fe oxides and crystalline surfaces not associated with organic matter (Gerke and Hermann, 1992). Therefore, as the amount of organic carbon increases, it is expected that total P retention will increase in the presence of Al and Fe (Gerke and Hermann, 1992). The results of these studies suggest that projecting the traditional factors thought to influence P retention in mineral soils onto organic soils, may lead to an under representation of the potential P sorption capacity in some organic soils (Bloom, 1981).

Research Specific to the Organic Soils of North Carolina's Coastal Plain

Several extracts have historically been used to aid in the estimation of easily exchangeable and organically bound Al in soils. In the extractant, 1N $CuCl_2$, Cu is used as a complexing agent to displace Al from organic matter in addition to extracting easily exchangeable Al (Juo and Kamprath, 1979). The extractant $CaCl_2$ is typically used to estimate the amount of easily exchangeable Al, while organically bound Al is calculated as the difference between $CuCl_2$ and $CaCl_2$ extracts (Mengel and Kamprath, 1978).

Juo and Kamprath (1979) identified the different pools of Al in a variety of soils from Africa, South America, and North Carolina by using a 1N $CuCl_2$ extract. Ponzer soils, a Histosol in NC, had almost 5 times more $CuCl_2$ extractable Al compared to all the Alfisols, Oxisols, and Ultisols also extracted in their study. In a similar study, Mengel (1975) found that the amount of $CuCl_2$ extractable Al was far greater for a NC Histosol than for a NC Ultisol. The difference was attributed to the presence of large amounts of organic-bound Al in the Histosol, where an increase in organic matter yielded an increase in organically bound Al. Hargrove and Thomas (1981) observed similar relationships between increasing organic matter and the formation of stable Al-organic complexes.

There is evidence that most of the organic soils of NC Coastal Plain contain large amounts of M3Al (compared to mineral soils) and that the levels of M3Al should be expected to increase as subsidence and tillage persists (Johnson, 2005). Fox and Kamprath (1971) identified that NC soils dominated by organic colloids, without the presence of inorganic colloids, readily leached applied P. However, with the addition of $AlCl_3$, the same soils retained almost all of the P applied. Likewise, Mengel and Kamprath (1978) tested the potential for Al toxicity with soybeans on organic and inorganic soils. $CuCl_2$ extractable Al was determined by extracting the soil with $CuCl_2$; more than half of the organic soils sampled had high enough Al contents to cause Al toxicity in soybeans. Similarly, Johnson (2005) found significantly higher oxalate and Mehlich-3 extractable Al levels in a small number of organic samples compared to all other texture groups sampled. These studies indicate that the high Al levels observed in these organic soils may cause higher levels of P retention than in other organic soils with lower Al contents.

Typical agronomic soil tests such as Mehlich-3 do not indicate how strongly Al is retained; only the total Mehlich extractable amount is quantified. The question remains: what is the effect of the level of organic matter on the bonded nature of Al and how does this affect P retention? Do soils with high organic matter contents bind Al so strongly with organic matter that each Al is occupied by organic functional groups causing decreased P retention by disallowing ligand exchange on Al for P binding? Or are organic functional groups not bound to Al as strongly in soils with lower organic matter, which allows P retention to occur more readily with ligand exchange reactions?

Using Agronomic Soil Tests to predict Environmental P Losses

The PLAT uses M3P as one of the most important parameters in predicting the potential for P losses through different pathways (Johnson et al., 2005). Mehlich-3 P is used as an agronomic STP because it has been related to plant available P; however, it has also been related with environmental soil tests such as oxalate extractable P (P_{ox}) and WSP (Hooda et. al, 2000; Maguire and Sims, 2002a). The oxalate solution extracts organically bound Al and Fe as well as non-crystalline Al and Fe oxides (van der Zee and van Riemsdijk, 1988).

Mehlich-3 P values are used in PLAT because they are inexpensive compared to environmental STPs and because the infrastructure for testing is already established with North Carolina Department of Agriculture & Consumer Services agronomic soil testing. Good relationships between environmental and agronomic STPs, and in turn soluble P losses in runoff (Pote et al, 1996, Sharpley et al., 1996), have given researchers the ability to estimate and predict P losses based on readily available agronomic STP (Maguire et al., 2005).

Not only are M3P and P_{ox} highly related, but so is M3Al and Al_{ox} and to a lesser degree, M3Fe and Fe_{ox} (Paulter and Sims, 2000; Maguire and Sims, 2002b; Sims et. al, 2000). It has been proposed that the Mehlich-3 solution extracts Al better than Fe because it was developed mainly for use in high Al acid soils. Johnson (2004) attributed the decreased ability of the Mehlich-3 solution to extract Fe over Al to the neutralization of the extracting solution. It is proposed that the Al and Fe chelating agent (EDTA) used in the Mehlich-3 solution may extract less Fe than Al because as the solution approaches a neutral pH, Fe becomes less soluble. Furthermore, Fe-oxide minerals are far less soluble than Al-oxides even at the same pH: therefore, regardless of pH of Mehlich-3 solution Fe will still be less extractable than Al (Kerndorff and Schnitzer, 1980).

A good relationship between the degree of P saturation (M3PSR) and P losses by leaching have been established for the Mehlich-3 extraction. The M3PSR is defined as:

$$\mathrm{M3PSR} = [\mathrm{M3P} / (\mathrm{M3Al} + \mathrm{M3Fe})] \times 100.$$

Johnson (2004) found the greatest relationship between oxalate PSR (PSR_{ox}) and M3P with the organic soils of NC Coastal Plain, than with all other texture groups studied. Furthermore, PSR_{ox} and Mehlich-3 PSR (PSR_{M3}) values have been related to each other and with the potential for P loss (Khiari et al., 2000; Maguire and Sims, 2002a; Sims et al., 2000). With this relationship, it is assumed that the amount of P a soil can retain is based on the amount of P already present and the amount Al and Fe available for P sorption. Based on this notion, if a soil contains low concentrations of M3Al and M3Fe, the application of a large amount of P would most likely result in little retention causing P leaching because a high M3PSR was achieved. Furthermore, some authors have proposed critical M3PSR levels where P leaching rapidly increases as M3PSR levels reach a defined level (Schoumans and Groenendijk, 2000; Maguire and Sims, 2002b). The results from these studies show that P losses are exacerbated as a soil nears saturated P levels.

Statement of Research Objectives

The main objective of the PLAT is to identify sites with a high potential for P losses and improve P management at these sites to minimize such losses. In order to properly predict P losses from the organic soils, the accuracy of the algorithms in the PLAT must be verified. Research is needed then, to identify the main soil properties affecting P retention; specifically studies that relate agronomic STPs used in the tool to environmental losses of P.

Our objectives were to determine (i) the concentrations of Al, Fe, and OM in Typic Haplosaprists and Terric Haplosaprists of North Carolina's Lower Coastal Plain, (ii) how the concentrations of Al, Fe, and OM in these soils affects P retention, and (iii) how the algorithms in the PLAT software should be refined to accurately predict P losses based on the results of the study.

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Chapter 2

Introduction

In general, most manures have a lower N:P ratio than plants require for optimum growth and traditionally, manures have been applied to meet crop N demands, resulting in excess P relative to crop demand (Barker et al., 1994; Sims and Maguire, 2004). Initially, this imbalance of N:P in manure had not been of great environmental concern because most soils were P limited. In recent decades, however, the total number of animal units in the United States has increased, while the total number of animal operations has decreased, resulting in greater concentrations of animals at fewer facilities (Kellogg et al., 2000; Sims and Maguire, 2004). The application of manure in excess of crop demand has resulted in soil P levels approaching or exceeding soil P saturation, which have been shown to increase the likelihood of excess P being transported off site by leaching (Maguire and Sims, 2002b; Johnson, 2004), erosion, and runoff (Sharpley et al, 1996; Hooda et al., 2000; Schroeder et al., 2004).

In response to the declining health of waterways, the USDA's Natural Resource Conservation Service new nutrient management (590) standard motivated North Carolina (NC) to implement a P Index called the Phosphorus Loss Assessment Tool (PLAT). Four P loss pathways were identified; 1) Runoff carrying soil-bound P, 2) Runoff carrying soluble P, 3) Subsurface soluble P losses, and 4) Runoff carrying P from nutrient sources applied to the surface (Havlin et al., 2001; The NC PLAT Committee, 2005). The overall PLAT assessment rating is calculated by addition of the four PLAT loss pathways and is then transformed into an index value that is associated with a low, medium, high, or very high P loss assessment. For subsurface P losses, soils were segregated into texture classes and assigned a M3P threshold, above which P leaching had to be further investigated with deep soil sampling.

The committee temporarily set the organic soil texture class as releasing more P (lower threshold set at 50 mg kg^{-1}) at the same M3P value as the sands (100 mg kg^{-1}), sandy loams and loams (200 mg kg^{-1}), and clay (500 mg kg^{-1}) textures based on limited past studies with NC organic soils (Fox and Kamprath, 1970; Cox and Hendricks, 2000; Tarkalson, 2001).

The main mechanisms thought to be responsible for P retention via organic matter occur through cation bridging reactions (P-Al-OM, P-Ca-OM, P-Fe-OM) (Violante et al., 1991; Gerke and Hermann, 1992; Bhatti et al., 1998). With little presence of clay, organic soils have historically been thought to have little or no P sorption capacity (Wild, 1950). On the other hand, acid organic soils of the Coastal Southeastern United States have been shown to contain tremendous amounts of Al and a much higher P sorption capacity than other organic soils without significant Al contents (Richardson, 1985). Flooded-drained and organic carbon rich soils may have higher concentrations of poorly crystalline or non-crystalline Al and Fe that have been shown to have a higher P sorption capacity than crystalline Al and Fe oxides (Schwertmann et al, 1986). Organically complexed Al and Fe may also have higher P sorption capacities than both amorphous Al and Fe oxides and crystalline surfaces not associated with organic matter (Gerke and Hermann, 1992; Darke and Walbridge, 2000).

The main objective of the PLAT is to identify sites with a high potential for P losses and improve P management at these sites to minimize such losses. In order to properly predict P losses from the organic soils, the accuracy of the algorithms in the PLAT must be verified. Research is needed then, to identify the main soil properties affecting P retention; specifically studies that relate agronomic STPs used in the tool to environmental losses of P. Our objectives were to determine (i) the concentrations of Al, Fe, and OM in Typic

Haplosaprists and Terric Haplosaprists of North Carolina's Lower Coastal Plain, (ii) how the concentrations of Al, Fe, and OM in these soils affects P retention, and (iii) how the algorithms in the PLAT software should be refined to accurately predict P losses based on the results of the study.

METHODS AND MATERIALS

Site Selection and Sampling

Soils that have similar morphological and agronomic characteristics were grouped together in the same soil management group (SMG) in the state of NC. Out of the seven soil series in the Coastal Plain, four organic soil series (Belhaven, Ponzer, Pungo, and Scuppernong) were chosen to represent the three different SMGs that make up the organic soils (Appendix 1). The Nitrogen Loss Estimation Software (Aggregated Version 5.02) was used to approximate the total amount of acres farmed in each SMG (Appendix 2). Soil Management Group 1 (the "deep organics"- Typic Haplosaprists) comprised less than 5% of the total acreage farmed on organic soils and therefore only one soil series (Pungo) was sampled in this SMG instead of all three. In contrast, SMG 2 and 3 (the "shallow organics"- Terric Haplosaprists) equally made up the remaining portion of total organic acreage farmed in North Carolina and, therefore, a higher proportion of samples were taken from these SMGs.

Hyde County was selected as the location for soil sampling because of its diversity amongst soil series represented in the organic SMG. Fields were selected based on soil series as identified by USDA soil survey maps and a known history of conventional tillage. Twenty fields were sampled per series, except for the Pungo soil. Most of the Pungo agricultural acreage has been abandoned, thus only 10 fields could be found.

Soils were sampled with a 2.5 cm diameter automatic Giddings probe where field conditions permitted. Where fields were too wet to allow vehicular access, samples were obtained with a hand auger. Four increments (1-4) were determined and recorded in the field by depth and a textural and or color change (Appendices 3 and 4). The first (1) increment was always 0-8 in (0-20 cm), which approximately represented the typical plow layer found in this region. Increment 2 always started at 8 inches (20 cm) and stopped at the first observable textural and/ or color change. Similarly, increment 3 started at the bottom of the 2nd increment down to the next observable textural and/or color change. Finally, increment 4 started where the third ended, and was always completed at 32 in (81.3 cm). Average increment length was close to 8 inches (20 cm) at every depth sampled. Where the water table was at the surface or wetness did not permit automatic probe sampling, 8-inch (20 cm) increments were assumed by sampling with a hand auger.

Soil samples were taken across the field at (A) 25 ft (7.6 m), (B) 95 ft (29.0 m), and (C) 165 ft (50.3 m) from the ditch to account for lateral field effects (Appendices 5 and 6). Three sampling locations per field (A, B, C), four increments per sample location (1, 2, 3, 4), and 20 fields per series (except Pungo, where only 10 fields were sampled) yielded a total of 840 soil samples.

Soil Preparation and Analysis

Samples were air-dried and ground to pass through a 2 mm sieve. Organic matter content was determined using the loss on ignition method (Nelson and Sommers, 1996). Samples were placed in a muffle furnace at 550 F (260°C) for at least 48 hours or until all observable organic material was combusted (dark color had disappeared). Particle size analysis was measured by dispersal with Na–hexametaphosphate and a modification of the

Klute (1986) hydrometer procedure where organic matter was removed prior to analysis. Total P was determined by 0.1 M sulfuric acid extraction of ignited samples in a muffle furnace at 1022 F (550°C) overnight (Bowman, 1988). Total inorganic P was similarly determined by 0.1 M Sulfuric acid extraction of unignited samples and total organic P was calculated as the difference in total inorganic P measured in the ignited and unignited samples (Bowman, 1988).

Mehlich-3 P (M3P), Mehlich-3 Al (M3Al), and Mehlich-3 Fe (M3Fe) were measured by extraction (1:10, soil:0.2 M CH_3COOH + 0.25 M NH_4NO_3 + 0.015 M NH_4F + 0.13 M HNO_3 + 0.001 M EDTA) with Mehlich-3 extractant and analyzed by inductively coupled plasma atomic emission spectroscopy (ICP) (Mehlich, 1984). The Mehlich-3 P saturation ratio (M3PSR), where each variable is expressed in mmol kg^{-1}, was calculated for all samples (Khiari et al., 2000; Maguire and Sims, 2002a; Sims et al., 2002). The M3PSR is defined as:

$$(M3PSR = M3P/ [M3Al + M3Fe] *100) \quad [1]$$

Inorganic water-soluble P (WSP) was determined on a 3 g: 30 mL, soil: water extraction and analyzed by the Murphy- Riley Molybdate Blue Method (Murphy and Riley, 1962; Luscombe et al., 1979). Total dissolved P was quantified by persulfate digest of the water extracts (Pote and Daniel, 2000). The difference between total dissolved P and WSP was assumed to be water soluble organic P. Total dissolved P and WSP were measured in the water extracts by the Murphy- Riley Molybdate Blue Method (Murphy and Riley, 1962). Water soluble P, which when measured with the Murphy-Riley Method, represents dissolved reactive P in the water extract.

Soil pH (1:1, soil: deionized water) was measured by standard methods of the North Carolina Department of Agriculture.

Incubation of Soils with Added Phosphorus

Five soil samples from each organic soil series with similar M3P and a wide range in M3Al were incubated with or without P fertilizer in triplicate (5 soil samples x 2 fertilized and unfertilized x 3 triplicate x 4 soil series), yielding 120 total samples in the incubation study (Appendix 7). The source of P added was inorganic triple super phosphate (TSP), which was finely crushed with a mortar and pestle and dissolved into water before application. Phosphorus rates of 0 and 150 kg P ha^{-1} soil fertilization rates were applied to 50 g of soil, as 0 mL and 6.69 mL TSP solution, respectively (Appendix 8). Soil container capacity (CC; a rough measure of field capacity) was determined for each soil by saturating 50 g of soil with deionized water and allowing free drainage for 48 hours. Soil CC was calculated by:

$$CC = \text{Dionized water held by soil (kg water)} / \text{Mass of soil (kg soil)} \qquad [2]$$

Soil moisture was kept at 70% of soil CC throughout the incubation by maintaining at constant weight (Klute, 1986; Bond et al. 2006) (Appendix 9). Holes were drilled at the top of the containers to allow air exchange. Samples were taken at 1, 7, and 21 days for WSP analysis and on samples taken on day 21, M3P was also measured. The percentage of applied P that was retained was calculated by

$$\text{Percentage of Applied P Retained} = [\text{Fertilizer added (mg kg}^{-1}) – (\text{Fertilized 21 day WSP (mg kg}^{-1}) - \text{Unfertilized 21 day WSP (mg kg}^{-1})] / \text{Fertilizer added (mg kg}^{-1}) * 100 \qquad [3]$$

Fractionation of Soil Phosphorus and Aluminum

A P fractionation using an amended Chang and Jackson method was performed in triplicate using the incubation samples (20), plus 36 other samples that were chosen because they represented a range of M3Al values, organic soil series, and depths to yield 56 total samples (Kuo, 1996) (Appendix 10). A sequential fractionation aimed at extracting loosely bound P (NH_4Cl extractable P), Al-associated P (NH_4F extractable P), Fe-associated P (NaOH extractable P), reductant extractable P ($Na_3C_6H_5O_7$ + $NaHCO_3$) and Ca associated P (H_2SO_4 extractable P) was carried out and all fractions were analyzed using ICP (except loosely bound P, analyzed by the Murphy Riley Molybdate Blue Method).

An Al fractionation was performed using 199 samples, which were comprised of the fractionation samples (56), plus 143 other samples that were chosen because they covered a wide range of M3Al values, soil series, and depths. Organically complexed Al was measured with a 0.01 M $CaCl_2$ extraction (Kuo, 1996) and total extractable Al was measured by a 0.5 M $CuCl_2$ extraction (Juo and Kamprath, 1979). Organically complexed Al (OM-Al) was calculated by:

$$\text{OM-Al} = CuCl_2 \text{ extractable Al} - CaCl_2 \text{ extractable Al} \qquad [4]$$

Statistical Analyses

'Topsoil' indicates samples taken from 0-8 in (0-20 cm) and 'subsoil' indicates samples taken from 8-32 in (20-81 cm). Two farms were sampled that had Belhaven soils (Farm A and Farm C). Belhaven Farm A and Farm C samples were analyzed independently because it was noticed that, although these soils are within the same soil series, they had different soil characteristics as discussed below. Statistical analyses were performed using the GLM procedure in v. 8.02 of the SAS system for Windows, to determine if significant differences existed between sampling locations on the field (SAS Institute, 2001) (Appendices 4 and 6). All other statistical analyses were carried out with the Data Analysis tool pack in Microsoft Excel 2002 (Microsoft, Seattle, WA).

RESULTS AND DISCUSSION

General Soil Characteristics

The target pH for soybeans and corn grown in NC is 6.0 for mineral soils and 5.0 for organic soils (Crozier and Hardy, 2003). The pH values of the soils in this study were acidic with a mean pH of 4.9 for all topsoils, which was slightly higher than the range (3.2 - 4.4) reported by Dolman and Buol (1967) for the organic soils of NC's Coastal Plain (Table 1). Greater soil OM decreases Al toxicity to crops, therefore acid organic soils do not typically require as high of a pH, as mineral soils (Pierzynski et al., 2000).

Traditionally clay was thought to have a high P retaining ability and thus, organic soils containing minimal clay have been thought to have lower P retention capacity (Wild, 1950; Cox and Hendricks, 2000). The amount of clay present across all soils sampled were 2.3 ± 1.0 % in the topsoils and subsoils, which is very low compared to most mineral soils (Table 1).

Table 1. Means (standard deviation) of soil characteristics for all the soils collected.

Series	pH	%Clay	OM	M3Al	M3Fe	WSP	M3P	M3PSR	Total P
Topsoils			g kg^{-1}	------------------------------mg kg^{-1}------------------------------					mg kg^{-1}
All Series	4.9 (0.5)†	2.3 (1.0)	601 (170)	1926 (588)	226 (8)	9.2 (8.2)	86 (52)	0.04 (0.03)	381 (169)
Belhaven A	5.2 (0.5)	NA‡	610 (50)	1028 (334)	193 (40)	22.6 (8.7)	75 (36)	0.06 (0.04)	338 (56)
Belhaven C	4.9 (0.2)	3.0 (2.0)	400 (150)	2852 (266)	368 (43)	0.6 (0.2)	80 (24)	0.02 (0.01)	672 (74)
Ponzer	4.7 (0.6)	1.7 (0.4)	500 (140)	1869 (358)	156 (39)	4.9 (0.5)	71 (33)	0.03 (0.01)	419 (127)
Pungo	5.0 (0.4)	1.8 (0.9)	720 (80)	2328 (356)	291 (64)	9.1 (0.8)	49 (18)	0.02 (0.01)	279 (93)
Scuppernong	4.7 (0.5)	2.6 (0.6)	630 (170)	2093 (267)	244 (54)	8.8 (0.7)	133 (63)	0.05 (0.04)	321 (165)
Subsoils									
All Series	4.6 (0.4)	2 (1.7)	260 (240)	1892 (684)	115 (89)	2.4 (2.6)	31 (30)	0.02 (0.02)	189 (118)
Belhaven A	4.3 (0.3)	NA	190 (190)	1702 (513)	68 (59)	6.9 (5.0)	59 (39)	0.03 (0.02)	95 (51)
Belhaven C	5.2 (0.3)	1.94 (3.44)	190 (180)	1118 (713)	220 (147)	0.8 (0.4)	23 (24)	0.02 (0.01)	202 (152)
Ponzer	4.6 (0.3)	2.3 (0.9)	170 (130)	1744 (609)	100 (62)	1.2 (1.2)	23 (28)	0.01 (0.01)	275 (123)
Pungo	4.2 (0.3)	1.6 (0.9)	370 (300)	2458 (547)	128 (101)	2.5 (2.3)	26 (15)	0.01 (0.01)	187 (95)
Scuppernong	4.4 (0.2)	2.2 (2.0)	260 (230)	2124 (486)	126 (69)	0.7 (0.9)	26 (24)	0.01 (0.01)	123 (55)

†Values in parentheses are standard errors.

‡ Data not available, not enough soil available for particle size analysis (NA).

The Pungo soil was the only "deep organic" soil sampled and as expected it had the largest mean topsoil (720 ± 80 g OM kg^{-1}) and subsoil (370 ± 300 g OM kg^{-1}) OM of all the series sampled (Appendix 11; Table 1). The topsoils of the "shallow organics" had a mean OM range of 400 to 630 g OM kg^{-1} and the subsoil range was 170 to 260 g OM kg^{-1}. In this study the highest OM observed was 900 g kg^{-1} which is the same as the highest OM contents (900 g kg^{-1}) recorded by Dolman and Buol (1968).

The mean M3Al concentration was not significantly different between the topsoils (1926 ± 588 mg Al kg^{-1}) and subsoils (1892 ± 684 mg Al kg^{-1}) (Table 1). Belhaven Farm C had the highest topsoil and lowest subsoil M3Al contents, whereas the Belhaven Farm A had the lowest topsoil and subsoil M3Al and the Pungo had the highest subsoil M3Al (Appendix 12, Table 1). Johnson (2004) sampled 685 soils that included 38 mostly mineral soil series and six soil orders in NC and found a mean M3Al value of 778 mg Al kg^{-1} for the topsoils and 924 mg Al kg^{-1} for the subsoils. Compared to the wide range of NC soils sampled by Johnson (2004), the organic soils in this study had on average more than twice the M3Al content. Schroder et al. (2004) evaluated how the inclusion of other soil properties assisted in predicting P losses. It was determined that Al and Fe (both Mehlich-3 and oxalate extractable) significantly improved the relationship between STP and P losses, which has also been observed in a number of other studies (Beauchemin and Simard, 1999; Maguire and Sims, 2002a).

The mean M3Fe concentration across all the series' topsoils was 226 ± 8 mg Fe kg^{-1} and subsoils was 115 ± 89 mg Fe kg^{-1} (Table 1). For all soils, M3Fe decreased from the first sampling depth to the second except in Belhaven Farm C soil (Appendix 13). The high topsoil Fe content encountered was consistent with Dolman and Buol's (1968) observation of a mixed organic-mineral layer rich in Fe, which was termed a "mull" surface layer. Another explanation given by Dolman and Buol (1967) was that new mineral-organic compounds (composed of both mineral and organic counterparts) are formed as well as increased reactivity of existing Fe oxides and organically bound Fe, which often occurs when soil becomes aerated from a saturated state (Darke and Walbridge, 2000; Young and Ross, 2001).

Johnson (2004) observed four times more Fe_{ox} than M3Fe in organic soils and Maguire and Sims (2002b) found 3.4 times more Fe_{ox} than M3Fe in the highest OM soil sampled (60 g OM kg^{-1}), indicating that soils with higher OM content may contain non-crystalline Fe-oxides that were not extracted by the Mehlich-3 solution. When the mean topsoil and subsoil M3Fe values were multiplied by four (the conversion factor between M3Fe and Fe_{ox} in the study by Johnson, 2004) and converted to a molar basis, there was still seven times more M3Al than M3Fe in the topsoils and 11 times more in the subsoils. As the M3Al concentration was much grater than that of M3Fe, Al most likely has a greater influence on P retention than Fe in these organic soils. Although no relationship was observed between OM and M3Al for the topsoils, a relationship was evident in the subsoils (r^2= 0.41***) (Appendix 14). A poor relationship between OM and M3Fe in the subsoils (r^2=0.28***) and no relationship in the topsoils was observed (Appendix 15).

Soil Phosphorus Characteristics

Water-soluble P decreased with depth in soils from every series (Table 1) (Appendix 16). The Belhaven Farm A and Pungo soils had the highest mean WSP values at every sampling depth. The Belhaven Farm A soil had the greatest mean WSP concentrations of all topsoils (22.6 ± 8.7 mg P kg^{-1}), as well as subsoils (2.4 ± 2.6 mg P kg^{-1}), while the Belhaven Farm C topsoil (0.6 ± .02 mg P kg^{-1}) and Scuppernong C subsoil (0.7 ± .09 mg P kg^{-1}) had the lowest mean WSP concentrations (Table 1). Studies have revealed that WSP is a better predictor for P losses in runoff and leaching than M3P (Maguire and Sims, 2002a). The trends observed for WSP with depth, suggest that accumulated P in the subsurface occurred from the surface through downward movement (Appendix 16; Table 1).

On average, all soils studied were above the PLAT M3P threshold for organic soils (50 mg P kg^{-1}) at the soil surface, so deep soil sampling would be required, except for the Pungo series (Table 1). Although the mean M3P concentration of the Pungo soil remained relatively constant with depth, it never exceeded the P threshold for the organic soil group, so PLAT would have missed identifying this as a soil likely to leach P. Mehlich-3 P concentrations above 53 mg kg^{-1} are considered adequate for most crops in NC. For all depths, 31% of samples had a M3P concentration above 53 mg kg^{-1}, while 72 % of all topsoils exceeded this value. Calculation of the mean M3P ratio of topsoil to the subsoil (deepest sampling increment), showed that M3P in the Belhaven Farm A and Pungo soils did not decrease M3P with depth as markedly as the other soils examined (Figure 1). The decrease in M3P between topsoil relative to subsoil followed the trend; Belhaven Farm A (1.6) <Pungo (2.1) <Ponzer (5.5) <Belhaven Farm C (10.5) <Scuppernong (10.7). The small decrease in M3P with depth exhibited for the Belhaven Farm A and Pungo soils may suggest decreased P retention at the soil surface and increased P leaching.

Total P was measured to assess the current levels of P and to identify the ability of M3P to extract total P in the organic soils, as M3P is dependent on a soil’s total P and the P affinity against extraction with the Mehilch-3 solution. The amount of total P extracted with the Mehlich-3 solution varied widely in these soils. In this study, M3P extracted, on average, 18% of total P across the 840 samples, with a range of total P from 15-42% (topsoils) and 8-31% (subsoils) (Appendix 17).

All soils sampled had, on average, accumulated total P at the soil surface, which is consistent with the results from agricultural fields examined by Schroder et al. (2004) and Buol and Stokes (1997) (Figure 1; Appendix 18). Total P decreased with depth in all series, although the degree of total P build up in the topsoil relative to the subsoil varied by soil series (Figure 1). Assuming parent material and plant redistribution and uptake of P were consistent across all series, total P mobility with depth appears to be greatest in the Ponzer and Pungo soils. While native soil data could not be found for Histosols in this region, Buol and Stokes (1997) observed an average native total P concentration of 125 mg kg^{-1} for the top 75 cm in Norfolk mineral soils; however, managed fields had consistently lower total P at depths below 75 cm, indicating that plant uptake and or redistribution of P most likely occurred. In the current study, total P concentrations in the topsoils were well above 125 mg kg^{-}, although slightly higher in the subsoils suggesting that the total P concentrations observed are most likely a result of fertilization and perhaps subsequent leaching of P in some soils.

A positive relationship in the topsoils was seen when M3P was plotted against total P, indicating that the lack of buildup of M3P in these soils is not due to P being held in unextractable forms (Appendix 19). Most of the soil series had significant positive relationships between M3P and total P; however, there were differences between regression coefficients amongst the soil series (Appendix 19). The Belhaven Farm A soil had the highest regression coefficient (r^2=0.84*) which suggests that each level of increase in M3P was followed very closely with a similar increase in total P. The trends observed in

Appendices 17-19 suggest that P was not held as tenaciously in soils that had a high percentage of total P extracted with the Mehlich-3 solution. Differences between M3P and total P with depth, such as the ones described, suggest that total P should also be measured.

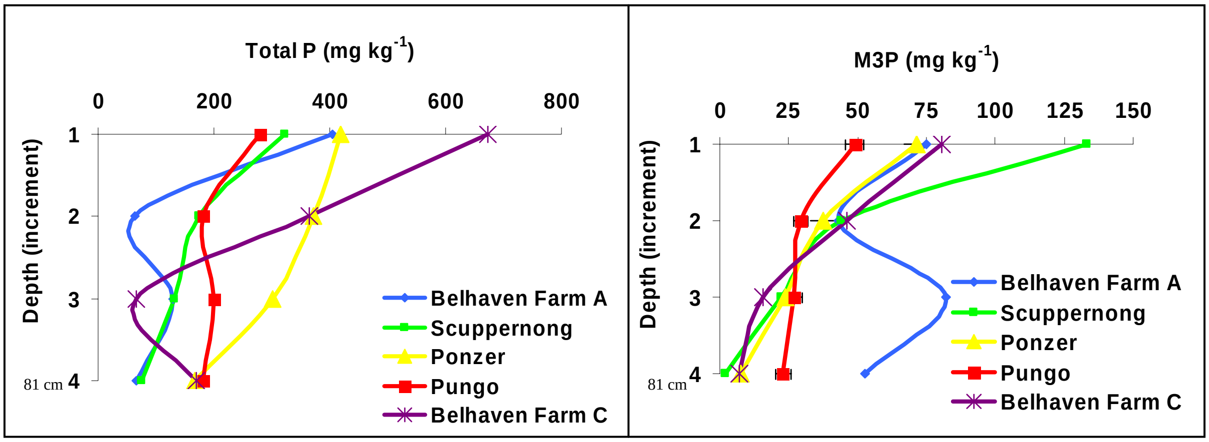

Figure 1. Comparison of Total P and Mehlich-3 P with Depth.

The Belhaven Farm A had the highest mean topsoil M3PSR (0.06 ± 0.04) and also the highest mean subsoil M3PSR (0.03 ± 0.02) (Table 1) (Appendix 20). A mean M3PSR value of 0.15 was observed in 465 top and subsoils used by Sims et al. (2002). Also, Maguire and Sims (2002a) found an average M3PSR value of 0.17 across 5 mineral soil series. The average topsoil M3PSR across all soils in this study was 0.04 ± 0.3 and the subsoil mean was 0.02 ± 0.02, which were considerably lower than those found in other studies with mineral soils heavily fertilized with animal waste (Maguire and Sims 2002a; Sims et al., 2002) (Table 1). The mean M3PSR values in this study were low because of a combination of high M3Al contents and low M3P values. The traditionally calculated M3PSR and M3PSR (calculated with M3Fe omitted in the equation) were significantly related, indicating that the low M3Fe concentrations may not have been contributing to the potential for saturated P conditions, which was also seen by Maguire and Sims (2002a) (Appendix 21).The M3PSR has been correlated to P losses via leaching (Pote et al., 1996; Beauchemin and Simard, 1999; Hooda, et al., 2000) and runoff (Shroeder et al., 2004) better than STP alone. Despite the absence of a relationship between PSR and WSP, low M3PSR values may suggest that on average, saturated P conditions have possibly not been met in these organic soils and P loss via leaching and runoff, on average, may not be of critical concern (Hooda, et al., 2000; Shroeder et al., 2004).

Relationship between Mehlich-3 Phosphorus and Water-soluble Phosphorus

Agronomic STPs, such as Mehlich-3, are relatively easy to perform on soils and much data already exists for analyses. However, the relationship between M3P and the risk of P loss to the environment is not fully understood in these organic soils so WSP was measured to give a clear measure of P loss potential. In this study, no relationship was observed between M3P and WSP in the topsoils and subsoils (Appendix 22), however, when the Belhaven Farm A and Pungo soils were eliminated, a significant relationship was observed in the topsoils (r^2= 0.56***), but not in the subsoils (Figure 2). Higher M3P concentrations were associated with higher WSP values, as observed in a number of other studies (Sims et al., 2002; Maguire and Sims, 2002a).

Relationship between Soil Phosphorus and Phosphorus-Retention Variables in the Field Samples

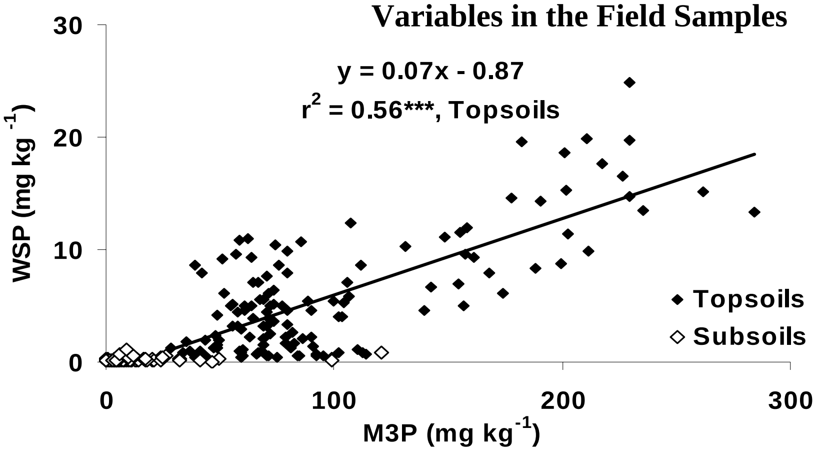

Figure 2. Water-soluble P vs. Mehlich-3 P, segregated by topsoils and subsoils.

Higher OM was associated with increased WSP in both the topsoils (r^2= 0.50***) and subsoils (r^2=0.56***) (Fig. 3). In contrast, a negative relationship was observed between WSP and M3Al for the topsoil samples (r^2= 0.36***), but no relationship was evident for subsoils (Fig. 4). Unlike M3Al, M3Fe was not associated with WSP (data not shown.). Iron has been shown to be lost from wetland ecosystems, whereas Al persists over time and has been shown to be more likely to form Al-OM complexes than Fe (Darke and Walbridge, 2000).

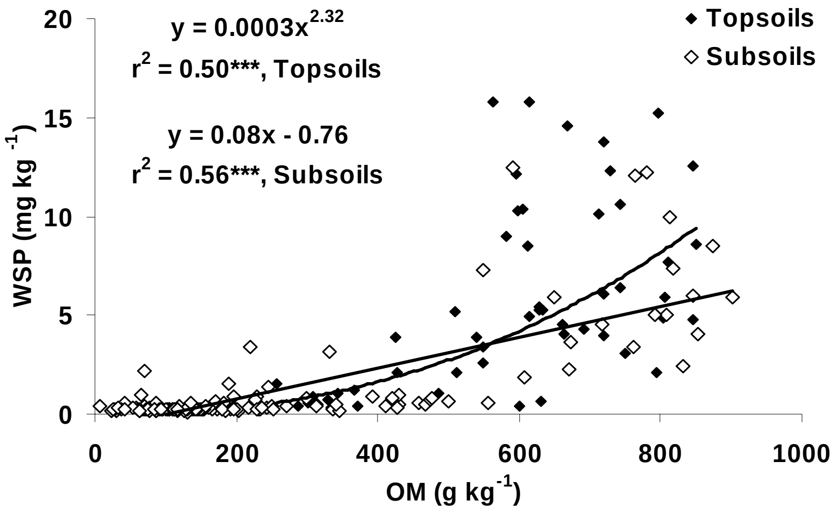

Figure 3. Water-soluble P vs. OM, segregated by topsoils and subsoils.

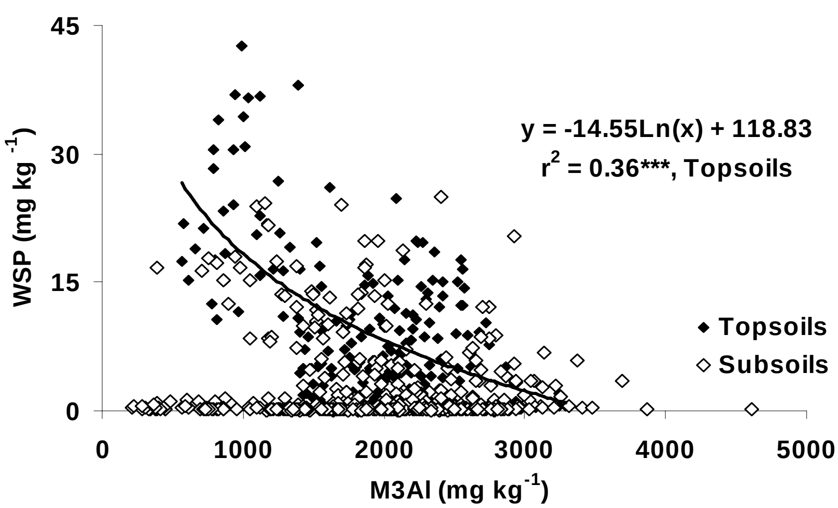

Figure 4. Water-soluble P vs. Mehlich-3Al, segregated by topsoils and subsoils.

It has been assumed that organic soils have a lower capacity to absorb P than mineral soils because the presence of high concentrations of organic acids is thought to prevent effective sorption of P (Larsen et al. 1959; Daly et al. 2001). Larsen et al. (1959) observed no sorption of applied P in organic soils when humic acid (which is assumed to be positively associated with OM content) was added and the opposite when Fe and Al were added, which is similar to the results of this study. Humic acid sorption by Al-OM and Fe-OM may have blocked potentially vacant sites for P sorption. In their samples, where Fe and Al concentrations were the highest, the effect of the Fe and Al concentrations outweighed those of the added humic acid content as P sorption sites were still available because of the high Fe and Al concentrations.

In this study, no relationship was observed between M3Al and OM in the topsoils; however OM and M3Al were both independently associated with WSP. A significant relationship was observed between WSP and OM/M3Al and an increase in r^2 was observed, compared to when OM and M3Al were used alone (Figs. 3, 4 and 5). This relationship was highly significant for both topsoils and subsoils. Figure 4 shows that when more OM in proportion to M3Al (producing a high OM/M3Al) were found, WSP increased in both the topsoils (r^2=0.62***) and subsoils (r^2=0.52***). These results are most likely due to the ligand competition between humates and organic acids, and phosphates for Al adsorption sites in high OM soils (Stevenson and Vance, 1989).

No relationship was observed between clay content and the P retention variables and soil P characteristics analyzed in this study. (Appendices 23-27). Axt and Walbridge (1999) observed positive relationships between clay and silt content, and P sorption capacities in upland soils, but not in lowland organic soils. Since clay is one of the major P retaining

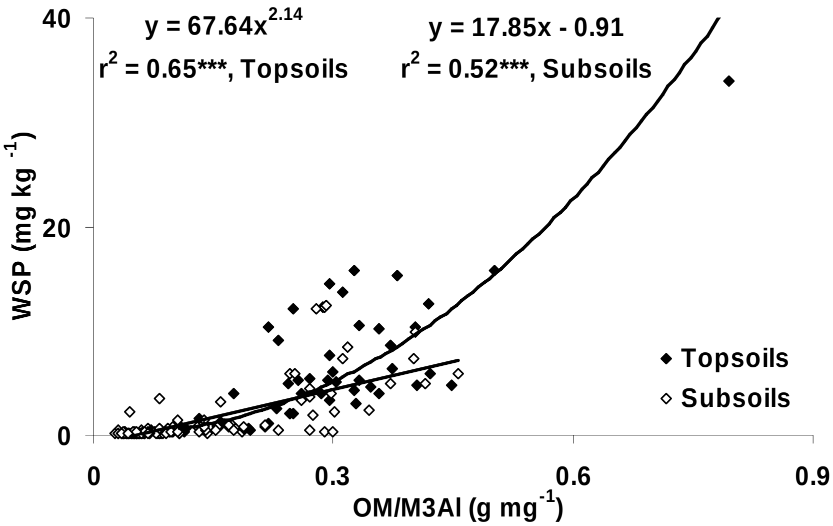

Figure 5. Water-soluble P vs. OM/M3Al, segregated by topsoils and subsoils.

agents, it was expected that P retention would increase with increasing clay content (Wild, 1950). Johnson (2005) also observed no relationship between clay content and M3Al, M3Fe, and M3P in the 685 NC soils sampled. Several explanations for the lack of relationship between clay and the soil P characteristics examined exist: (i) the mean amount of clay determined across all samples (2.1%) may have been too small to be accurately measured with the hydrometer method; (ii) the range of mean clay values (1.7% – 2.3%) may have been too narrow to differentiate the effect of clay levels amongst all series; (iii) the amount of clay was to small to be significantly associated with P retention, (v) OM-Al complexes may be more important for P sorption than clay in the organic soils of the NC Coastal Plain.

Predicting Water-soluble P with Multiple Regressions

A multiple regression statistical analysis was completed using topsoil and subsoil samples (n=76) with the variables OM, M3Al, M3Fe, and M3P. The regression equation produced with the model was y = (0.13*OM) + (-0.001*M3Al) + 1.59. A high coefficient of regression (r^2=0.78***) was observed between predicted WSP and actual WSP, with OM and M3Al contents being the only significantly related variables, while M3Fe and M3P were not related with WSP (Appendices 28 and 29). The calculated multiple regression trends for OM content and M3Al (Appendices 28 and 29) agreed with the relationships previously observed between WSP with OM and with M3Al in the field samples (Figs. 3 and 4). Organic matter content was positively associated with WSP, while M3Al content was negatively associated. It was expected that M3Al would be negatively associated with WSP, as Al has been one of the main agents positively associated with increased P retention in these organic soils (Fox and Kamprath, 1971; Mengel and Kamprath, 1978; Juo and Kamprath, 1979; Johnson et. al, 2005). Mehlich-3 P and M3Fe were not significantly associated with WSP in either the multiple regression or the field sample analyses.

A multiple regression analysis was also performed using topsoil samples only and yielded a multiple regression equation of y = (0.16*OM) + (-0.003*M3Al) + 4.62 (n=42). The results were in accordance with the outcome when both topsoil and subsoil samples were combined (Appendices 30 and 31). The coefficient of determination for the model regression, although highly significant, was lower for topsoil samples (r^2=0.65***), than when topsoil and subsoils samples were combined (r^2=0.78***), which was most likely a result of the fewer number of samples used in the analysis for the topsoil. Both multiple regressions produced a curved relationship, where predicted WSP values were closer to actual WSP values between 0 and 2 mg kg^{-1}. Between 2 and 4 mg kg^{-1}, predicted WSP values became noticeably dissimilar to actual WSP, indicating that the specified variables in the model were only able to predict reliably at low WSP values.

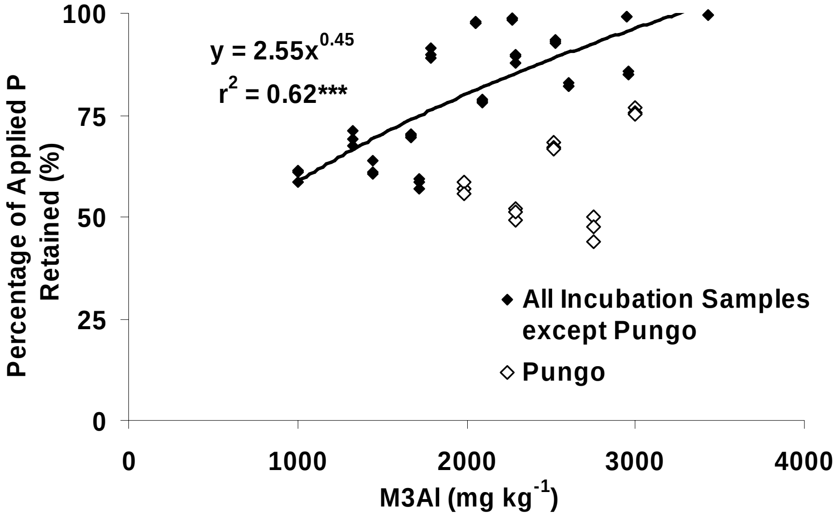

Figure 6. Percentage of Applied P Retained vs. Mehlich-3 Al.

Relating Phosphorus Retention to Soil Characteristics

Results from the Incubation Study

Most of the change in WSP during the incubation occurred during the first 7 days; with little change in WSP between 7 and 21 d, indicating that WSP had approached steady state in these soils after 7 days (data not shown). When the relationship between the amount of applied P that was retained and M3Al was segregated by soil series, it became evident that the deep organic soil (Pungo series) was dissimilar from the general trend observed (Figure 6). The Pungo samples were removed and a significant relationship was observed (r^2= 0.62***) suggesting that increased P retention was a product of increased M3Al (Fig. 6). Soils with M3Al concentrations below 730 mg kg^{-1} retained less than 50% of the applied P; however, as M3Al values exceeded 1850 mg kg^{-1}, more than 75% of the applied P was retained. While analysis of the field samples demonstrated this relationship, the results of the incubation study verified the hypothesis that increased M3Al was associated with decreased

P dissolution in water. An opposite relationship was observed between the percentage of applied retained and OM, where increased OM cause decreased P retention (Figure. 7).

No relationship was observed between P retention and M3Fe even when the Pungo soil was eliminated (data not shown). The lack of a significant relationship between P retention and M3Fe may not surprising as there was 7 times more M3Al in the topsoils and 11 times more in the subsoils than M3Fe, even when M3Fe values were adjusted to meet Fe_{ox} values (using Johnson et al. (2005) conversion factor of 4). Iron is held more strongly to OM than Al (as evident with the larger solubility constants for Fe with organic ligands than Al) (Kerndorff and Schnitzer, 1980; Stevenson and Vance, 1989) and thus the low extractable M3Fe may be due to the decreased accessibility of the Mehlich-3 solution to extract Fe. However, results from other studies indicate that Fe has rarely been associated with P retention in frequently reduced soils (Cuttle, 1983; Darke and Walbridge, 2000; Liikanen et al., 2004). While the results of these studies indicate that Fe was not related to P retention, it is unclear whether there was indeed little Fe present or that the inability of the Mehlich-3 solution to extract Fe accounted for the lack of observed relationship.

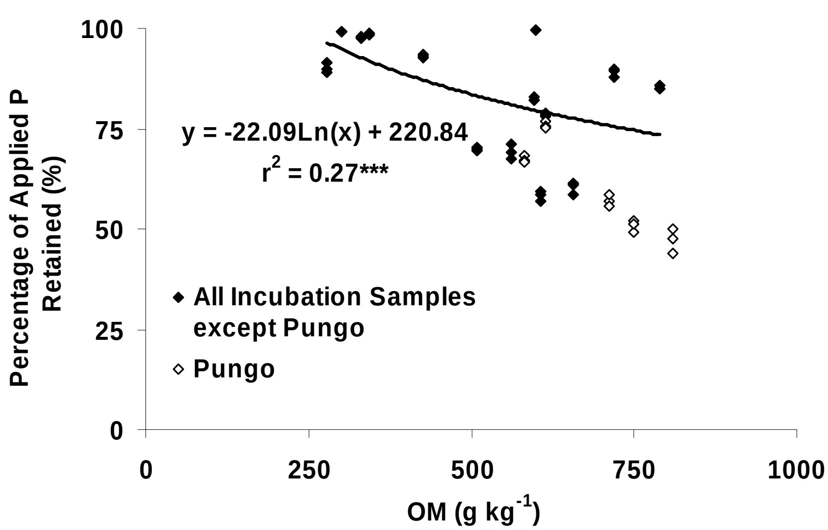

Figure 7. The percentage of applied P retained vs. OM.

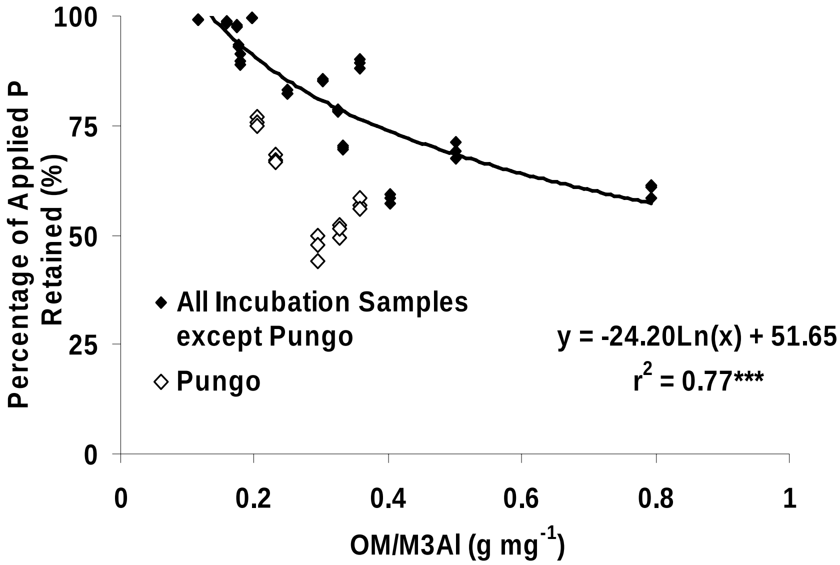

Figure 8. The percentage of applied P retained vs. OM/M3Al, segregated by samples containing the Pungo soil and those without.

In the incubation samples it was evident that OM negatively affected P retention, whereas M3Al positively affected P retention (Figs. 6 and 7). In accordance, Daly et al (2001) observed that high OM soils exhibited decreased P sorption and attributed the decrease in P sorption of soil to organic acid inhibiting PO_4^- binding. Other studies have produced similar results and have attributed the decrease in P sorption with increasing OM to competition between P and organic anions (Stevenson and Vance, 1989; Giesler et al., 2005). In both the field and incubation samples, P retention appeared to be a product of both OM and M3Al contents, so the ratio of OM to M3Al was calculated and a higher coefficient of regression was observed between P retention and OM/M3Al (r^2=0.77***) (Fig. 8). A higher coefficient of regression was discerned in predicting WSP when the OM/Al ratio was used in the field samples, solidifying that the observed retention and WSP was not solely a function of OM or Al, but a combination of both.

In a study with two high OM soils (>300g kg^{-1}), Giesler et al. (2005) observed higher P sorption in the soil that had higher Al_{ox}, which supports Figure 6. Similar results have also been shown by Cuttle (1983), Richardson (1985), and Haynes and Swift (1989) in peat soils. Furthermore, higher OM has been shown to inhibit crystallization of Al hydroxides and hence increase its capacity for P sorption, indicating that the P sorption capacity of these soils may not only be due to high Al concentrations, but also to the non-crystalline nature of the Al (Reedy et al., 1998; Maguire et al., 2000; Elliot et al., 2002). Furthermore, organically associated Al^{3+} and Fe^{3+} have been shown with a higher P sorption capacity than non-crystalline Al and Fe oxides and crystalline surfaces not associated with organic matter (Gerke and Hermann, 1992). The results of this study however indicate that when OM/M3Al is high, the effect of a high concentration of OM appears to outweigh the potential benefit of increased reactivity of non-crystalline and poorly-crystalline Al for P sorption.

Predicting Percentage of Applied Phosphorus Retained from Soil Properties with Multiple Regressions for the Incubation Study

A prediction of the percentage of applied P that was retained was assessed by using OM content, M3Al, M3Fe, and M3P. The results of this multiple regression were similar to those observed with the field samples: y = (-0.50*OM) + (0.01*M3Al) + (0.20*M3P) + 69.98 (Appendices 32 and 33). Organic matter content, M3Al, and M3P were the variables found to significantly predict the percentage of applied P retained in the incubation samples. Mehlich-3 Al and P were positively correlated to P retention, while OM content was negatively correlated.

The results of the multiple regression for OM and M3Al variables were as expected. It was expected that M3P would be negatively associated with P retention, however it was positively associated. As more P was retained, it was expected that degree of P saturation would increase, decreasing the ability for further P retention, however, that was not observed. The results of the multiple regression demonstrate that in some cases an organic soil's M3P value may be indicative of the soils ability to retain P, where in the incubation samples a low value suggested that P was not being retained. The positive association between M3P and P retention may explain the low mean M3P value in the Pungo soil, which also had the second highest WSP (Table 1). Mehlich-3 extractable Fe was not significantly related in either the incubation or field samples.

Identification of Soil Aluminum Fractions

An aluminum fractionation was performed on the inorganic P fractionation samples (56), plus 143 other samples that covered a wide range of M3Al values, soil series, and depths. The difference between total $CuCl_2$ extractable and organically bound Al ($CuCl_2$ – $CaCl_2$) was small due to the negligible concentrations of $CaCl_2$ extractable Al (easily exchangeable Al) (Equation [3]). Across all series and depths ~97 % of the $CuCl_2$ extractable Al was calculated as organically bound (complexed OM-Al) and regardless of OM/M3Al, easily exchangeable Al content was small (Appendix 34). The low concentration and the lack of difference in easily exchangeable Al levels between series resulted in no observed relationship between easily exchangeable Al and P retention, as well as OM/M3Al content (data not shown).

On the other hand, $CuCl_2$ extractable Al was negatively associated with OM in the topsoils (r^2= 0.30***) and positively in the subsoils (r^2=0.60***) (Fig. 9). A similar negative relationship was observed between $CuCl_2$ extractable Al and OM in the topsoils of several Histosols analyzed by Mengel and Kamprath (1978). In order to identify if the decrease in $CuCl_2$ extractable Al was in fact due to the level of OM in these samples, the effect of particle size fractions were examined. No relationship between sand, silt, and clay and the observed decrease in $CuCl_2$ extractable Al was identified for the topsoils (data not shown).

In the current study, no relationship was observed between M3Al and OM in the topsoils, however a positive relationship was observed in the subsoils (Appendix 14). Similarly, a positive relationship was observed between $CuCl_2$ extractable Al and OM content in the subsoil samples (r^2=0.60***) (Fig. 9). Between the OM concentration of 0-200 g kg^{-1}, a positive relationship between $CuCl_2$ extractable Al and OM was established in the subsoils, however, beyond 200 g kg^{-1} OM content, the relationship became more scattered

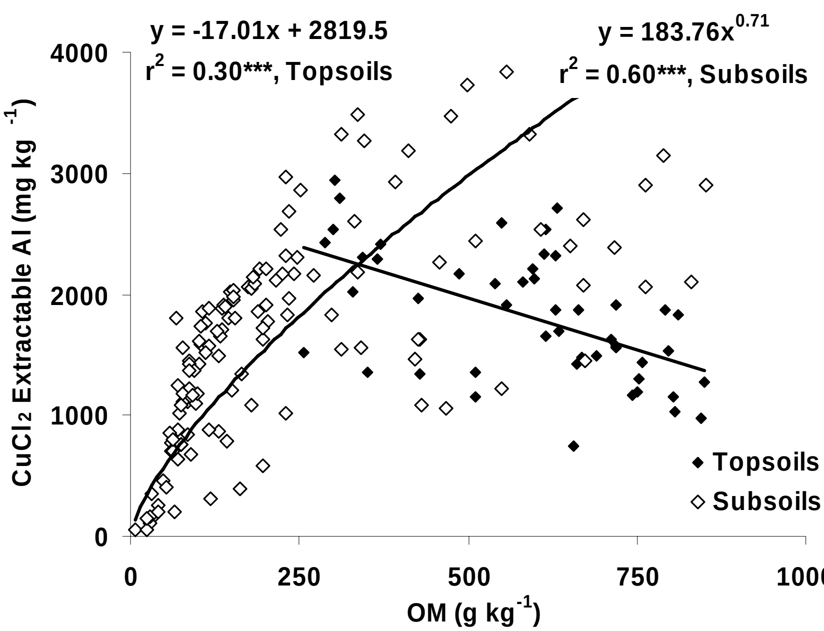

Figure 9. $CuCl_2$ extractable Al vs. OM, segregated by topsoils and subsoils.

(Fig. 9). When just the samples containing 0-200 g kg^{-1} OM were analyzed, a positive relationship between silt (r^2=0.57***) and to a lesser extent, clay (r^2=0.36***) and $CuCl_2$ extractable Al was observed (Appendix 35). Conversely, sand content was negatively associated with $CuCl_2$ extractable Al in these samples (r^2=0.71***) (Appendix 36).

When both the OM and $CuCl_2$ extractable Al concentrations were close to zero, clay and silt contents were minimal (Appendices 35 and 36) as the soil texture was dominated by sand. Sand has a low CEC, hence the low observed $CuCl_2$ extractable Al when the subsoil texture was sand dominated. As the OM, silt, and clay contents in the soils increased, $CuCl_2$ extractable Al increased (Appendices 35 and 36; Fig. 9). Above 200 g kg^{-1} OM, no relationship between OM, sand, silt, or clay was observed in the subsoils. Similarly, Axt and Walbridge (1999) found positive relationships between clay and silt and P sorption capacities in the upland mineral soils, but not in the lowland organic soils studied. Conversely, in the wetland organic soils examined, Al_{ox} and soil OM were highly correlated to P sorption capacity and each other, as observed in this study (as $CuCl_2$ extractable Al).

Mengel (1975) also recognized that higher OM contents were associated with lower $CuCl_2$ extractable Al, which is consistent with the results of this study. These results are in agreement with the results of the field samples in which lower OM contents were associated with increased WSP and lower total P, which when coupled with the results of the Al fractionation indicate that higher OM contents were associated with decreased $CuCl_2$ extractable Al, ultimately resulting in decreased P retention. The opposite was observed between total P and $CuCl_2$ extractable Al in both the topsoils and subsoils indicating that higher $CuCl_2$ extractable Al was associated with increased P retention (Fig. 10). This notion is further demonstrated in Figure 10, where $CuCl_2$ extractable Al affected WSP negatively and total P positively. Mengel (1975) observed comparable results, where P retention (measured as M1P) increased as $CuCl_2$ extractable Al increased. In this study, however, P retention (measured as total P) was positively correlated with $CuCl_2$ extractable Al, but not with M3P.

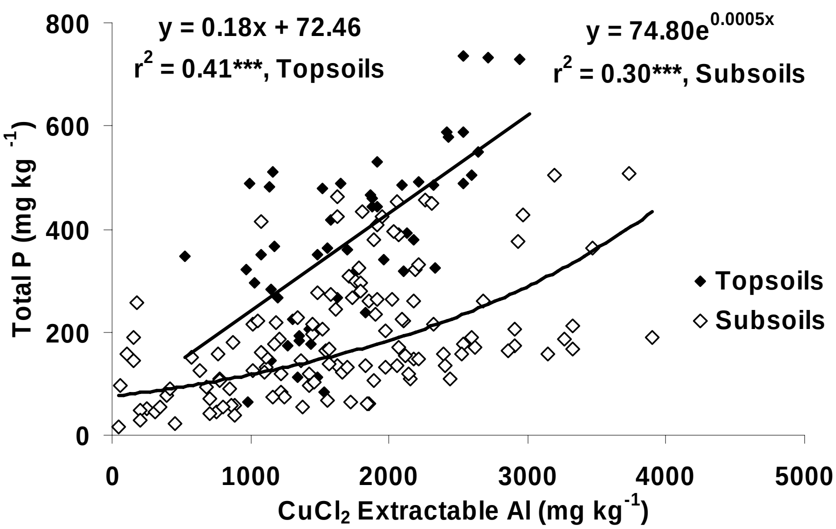

Figure 10. Total P vs. $CuCl_2$ extractable Al, segregated by topsoils and subsoils.

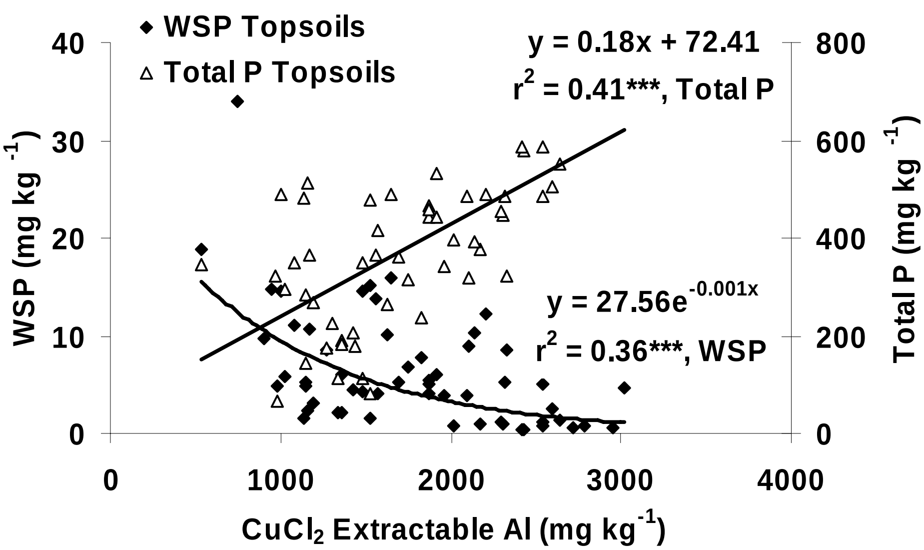

Figure 11. Topsoil Water soluble-P and total P vs. $CuCl_2$ extractable Al.

It was expected that as OM increased, organically bound Al would increase and easily exchangeable Al would decrease, resulting in overall decreased P retention. As OM increased, it was also expected that organic functional groups (mainly carboxyl, but also phenolic, alcoholic, and enolic groups to a lesser extent) would consume sites that would have potentially been available for P sorption (Hargrove and Thomas, 1981). As these sites are consumed and the Al is bound strongly by organic functional groups, the potential for ligand exchange resulting in P sorption would likely diminish. On the other hand, as OM decreased and Al was plentiful, it was expected that the lower concentration of OM would result in decreased concentrations of strongly complexed Al-OM, producing an increase in $CaCl_2$ extractable Al (easily exchangeable Al) concentrations. Ultimately, an increase in P retention would be expected, as Al would be available for ligand exchange with P, causing decreased WSP.

The results of this study show that although ~97 % of the $CuCl_2$ extractable Al was organically bound on average, P retention still occurred (Appendix 34). An explanation for the lack of significant difference between organically complexed Al and $CuCl_2$ extractable Al may be that the $CaCl_2$ extractant may not have been able to effectively differentiate and extract between different levels of bound Al in the high OM soil samples. This may have resulted in the improper identification of Al that may have been associated with OM (but not complexed) and available for P retention.

The results from the Al fractionation have confirmed that high $CuCl_2$ extractable Al existed in the organic soils of NC's Coastal Plain, which is in agreement with the high M3Al values measured in the incubation and field samples. Furthermore, $CuCl_2$ extractable Al was significantly associated with P retention (as observed with decreased WSP and increased total P), which is consistent with the results from the incubation and multiple regression results. The $CuCl_2$ solution extracted more Al than the Mehlich-3 extract and the result of using $CuCl_2$ Al was that some relationships were stronger in this study than with the Mehlich-3 data, however there is no strong evidence that the M3Al extract should be replace by the $CuCl_2$ extract to quantify Al.

Identification of Inorganic Soil P Fractions

A P fractionation using an amended Chang and Jackson method was performed in triplicate using the incubation samples (20), plus 36 other samples that were chosen to represent a range of M3Al values, soil series, and depths for 56 total samples. It is understood that while these chemical fractionation methods were designed to target extraction of particular forms of soil P, often they extract other forms too. Across all series and depths, the average percentage of NH_4Cl extractable P (loosely bound P) in a soluble form was less than 2% of the calculated total P and was the smallest inorganic P fraction identified (Table 2). The Belhaven Farm C and Pungo soils had the largest NH_4Cl extractable P fractions, which is consistent with WSP in the field sample analyses (Table 2).

The next smallest fraction was H_2SO_4 extractable P (Ca-P) (Table 2). It is not uncommon to observe some Ca-PO_4^- in acidic soils, although it is expected that Ca usually predominates in calcareous soils, so it was expected that P associated with Ca would considerable lower than Al-P and Fe-P in these acid soils. Beauchemin et al. (2003) observed Ca-phosphates at all pHs and in all soils studied, however, in this study no consistent trend or difference between series was observed for NH_4Cl H_2SO_4 extractable P (Ca-P) even though Ca-P made up ~5% of total P in these soils. Furthermore, there were no observed significant correlations of l NH_4Cl extractable P (loosely bound P) and H_2SO_4 extractable P (Ca-P) with any other variables measured in this study, which may be largely due to the small percentage of total P that these fractions accounted for.

The dominant soil P fraction observed in most the organic soil series was NH_4F extractable P (Al-P) confirming that Al was the major cation responsible for P retention, which is consistent with the results seen in the Al fractionation and field samples (Table 2). In addition since most of the Al was associated with OM (as observed in the Al fractionation study), P retention was most likely due to an OM-Al-P complex. The results from both of the fractionation studies confirm that Al was in high concentrations and that P retention was in fact mainly due to Al-P association in the topsoils. The mechanism proposed for P retention is these soils is most likely due to organic metal ternary complexation, which is analogous to cation bridging in mineral soils (Kerndorff and Schnitzer, 1980).

The average concentration of NH_4F extractable P (Al-P) for each series ranged from 93 - 368 mg P kg^{-1} in the topsoils, which is consistent with the average range observed in a number of setback sites in a biosolid study conducted by Maguire et al. (2000). In order to

Table 2. Inorganic P fractions.

Series	NH_4Cl extractable P (Soluble P)	NH_4F extractable P (Al-P)	NaOH extractable P (Fe-P)	$Na_3C_6H_5O_7$ + $NaHCO_3$ extractable P (Reductant Soluble P)	H_2SO_4 extractable P (Ca-P)	Total P (calculated)
	mg P kg^{-1}					
Topsoils						
Belhaven Farm A	16 (5%)†	98 (29%)	108 (32%)	93 (28%)	19 (6%)	334
Belhaven Farm C	7 (<1%)	773 (57%)	463 (34%)	87 (6%)	28 (2%)	1357
Scuppernong	9 (2%)	321 (52%)	165 (27%)	100 (16%)	20 (3%)	616
Ponzer	8 (2%)	178 (50%)	114 (31%)	45 (12%)	19 (5%)	364
Pungo	10 (4%)	93 (34%)	103 (37%)	59 (21%)	12 (4%)	277
Subsoils						
Belhaven Farm A	6 (2%)	126 (47%)	40 (15%)	80 (30%)	16 (6%)	268
Belhaven Farm C	7 (2%)	111 (31%)	103 (29%)	110 (31%)	24 (7%)	354
Scuppernong	7 (2%)	130 (43%)	71 (23%)	78 (26%)	18 (6%)	304
Ponzer	7 (2%)	196 (52%)	74 (20%)	80 (21%)	17 (5%)	375
Pungo	8 (3%)	93 (39%)	50 (21%)	77 (32%)	13 (5%)	242

† Values in parenthesis are the percent of total P.

determine if Al was in abundance and available for P sorption, the amount of Al associated with P (Al-P) was compared to the total average $CuCl_2$ extractable Al. Based on the results from the Al fractionation study, the average $CuCl_2$ extractable Al (on a molar basis) in the topsoils was 64100 mmol kg^{-1}, whereas the amount of Al associated with P (observed in the inorganic Al-P fraction) was only 9.0 mmol kg^{-1}. There was 7111 times more $CuCl_2$ extractable Al measured than Al associated with P (Al-P) because of the very low P concentrations. Similarly, M3Al concentrations were far greater than Al-P for every series (Tables 1 and 2). These trends indicate that there is most likely a tremendous amount of Al not associated with P and hence available for potential P sorption (Table 2). The large population of Al unassociated with P is also consistent with the low M3PSR values observed in the field samples.

The next largest fraction identified was NaOH extractable P (Fe-P), which ranged from 103-250 mg Fe kg^{-1} in the topsoils. These results are consistent with other research in acidic soils, where Al-P and Fe-P were the dominant soil P fractions associated with P retention. However, no relationship between M3Fe or Fe-P and P retention was observed in this study and others (Mozaffari and Sims, 1996). $Na_3C_6H_5O_7$ + $NaHCO_3$ extractable P (reductant P) was not associated with any variables in this study and no consistent trend or difference was observed between organic soil series.

Relationship between Mehlich-3 P and Al-P

As the concentration of P that was extracted by the Mehlich-3 solution increased in proportion to that of Al-P quantified by the fractionation, WSP increased (Fig. 12). This relationship suggests that as more Al bound P was extracted by M3P (causing higher M3P/Al-P %), more WSP occurred as a result. As M3P/Al-P % increased, P was held less strongly by Al-P and there was less $CuCl_2$ extractable Al (Figs. 12 and 13). Conversely, less Al bound P was extracted by M3P (causing lower M3P/Al-P %) when $CuCl_2$ extractable Al was high (Fig. 12).

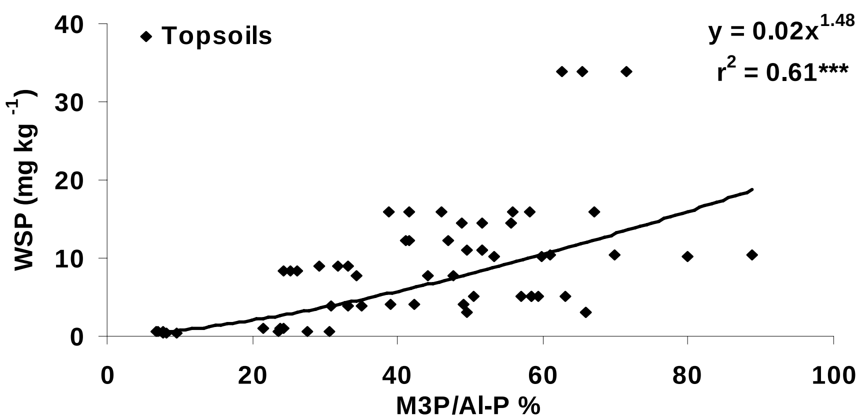

Figure 12. Topsoil Water Soluble P vs. M3P/Al-P.

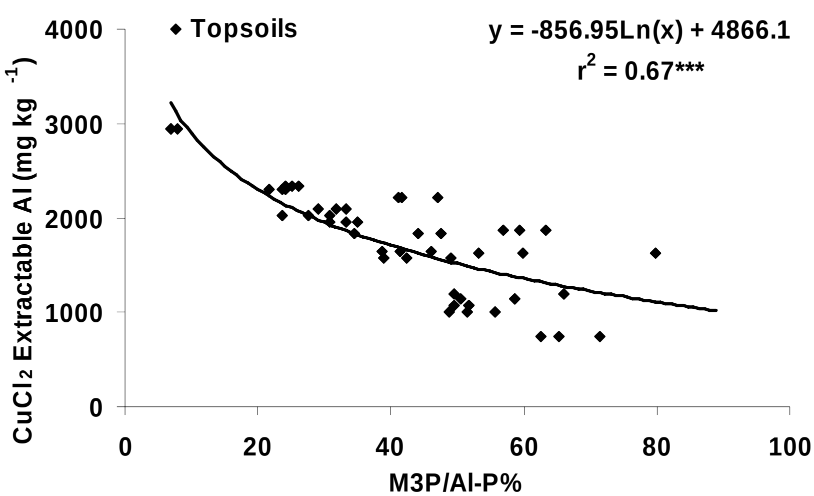

Figure 13. Topsoil $CuCl_2$ Extractable Al vs. M3P/Al-P.

These relationships indicate that Al bound P was more soluble (causing higher M3P and WSP values) when $CuCl_2$ extractable Al was lower as Al may have been held less strongly by OM and thus more easily extracted by the Mehlich-3 solution. These observations suggest that $CuCl_2$ extractable Al was controlling the solubility of P. This hypothesis is supported by Figure 10, in which total P increased with increasing $CuCl_2$ extractable Al and decreasing WSP. The results of the fractionation studies indicate that in most soils, Al was the main cation responsible for P retention and that most of the Al was probably associated with OM. As the amount of $CuCl_2$ extractable Al increased there was a decrease in the percentage of Al-P extracted with the M3 solution and there was a decrease in WSP.

Implications for the Phosphorus Loss Assessment Tool

It should be noted that while SMGs are used by PLAT to aid in the prediction of P losses, soils in fields are identified by the predominant soil map units. Soil mapping units are delineated at approximately a 2.5 acre scale, thus multiple soil inclusions may occur within a mapped unit. A source of error in this study may be due to the variability in mapped soil units in the sampled fields.

Currently in the PLAT software a M3P value of 50 mg P kg^{-1} corresponds to 1 mg L^{-1} predicted P in soil runoff for the organic soils of NC's Coastal Plain. In order to determine how the M3P threshold for the organic soils used in PLAT compares to the results of this study, the relationship between WSP and M3P were examined. Water-soluble P was converted to mg L^{-1} by setting the equation of the line in Figure 2 to 10, to account for the 10 fold dilution factor used to go from a solution basis to a soil basis. The equation was solved and the corresponding M3P value for 1 mg L^{-1} (or 10 mg kg^{-1}) was found to be 155 mg kg^{-1}. The M3P threshold value of 155 mg kg^{-1} calculated from the relationship between WSP and M3P observed in this study is far greater than the current threshold used in PLAT.

For the "deep organic' soils the PLAT rating of 50 does not appear to be too conservative in predicting P losses. High WSP and low P retention in the field, incubation, and inorganic P fractionation samples warrants caution in continued N- based fertilization, where more P is added than is removed by crops. In contrast, the "shallow organics", on average, did not have high WSP, but instead, high P retention as observed in the inorganic P fractionation, field, and incubation samples. The current PLAT rating of 50 mg P kg^{-1} (associated with 1 mg P L^{-1} runoff) is most likely too conservative of an estimate for these "shallow organics". It is recommended that the M3P threshold for the "shallow organics" in SMG 2 and 3 be raised to 155 mg kg^{-1} and that the "deep organics" in SMG 1 remain at 50 mg kg^{-1} (Figure 14).

The results of the Al fractionation study indicated that $CuCl_2$ extractable Al was associated with increased P retention (as measured by total P) and decreased P losses (as

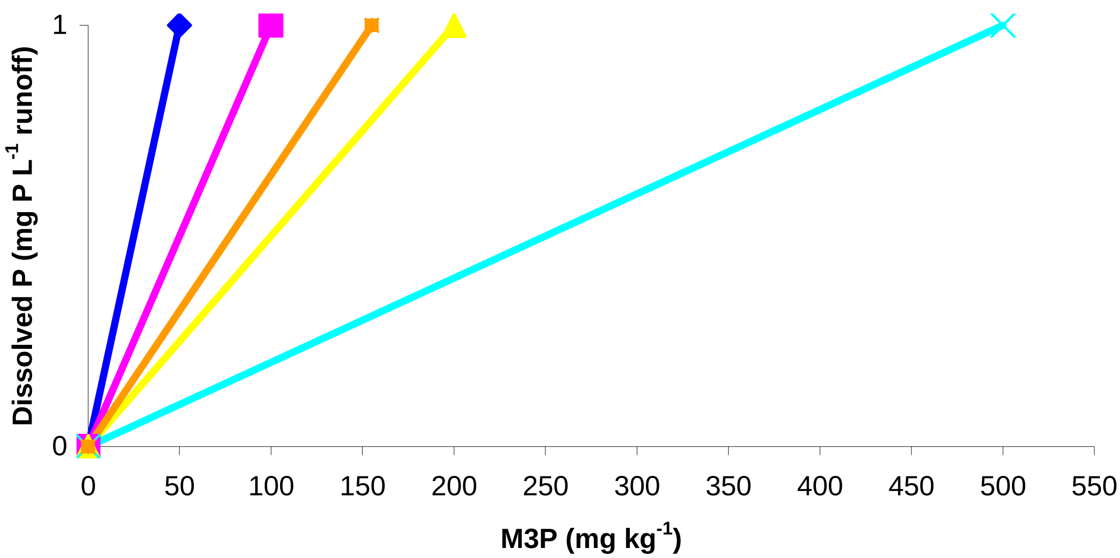

Figure 14. Recommendations for the relationship between dissolved P in runoff and M3P for different soil textures in the PLAT.

measured with WSP). The PLAT software does not have Al or OM parameters, only M3P can be input with SMG. Soils submitted to the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) for analysis could routinely be analyzed for M3Al and these values could be entered into PLAT to more accurately predict P losses in the organic soils. The infrastructure for the Mehlich-3 extract is already established at NCDA&CS, so adding this extra analysis to agronomic samples is not an unreasonable suggestion. According the incubation results, M3Al contents above 1850 mg kg^{-1} produced P retention rates >75%. Also, NCDA&CS routinely measures humic matter and a relationship exists between humic matter and OM for all the soils types sampled (Figure 15, Appendix 37). Since M3Al is already measured and if OM can be approximated with humic matter, then OM/M3Al could also be used to predict WSP. However, when humic matter is used in place of OM (Figure 16), the relationship between WSP and humic matter/M3Al is weaker than that observed in Figure 5. Further research is needed to determine more accurately the relationship between humic matter and OM, as well as how these relationships would be used in the PLAT software to predict P losses.

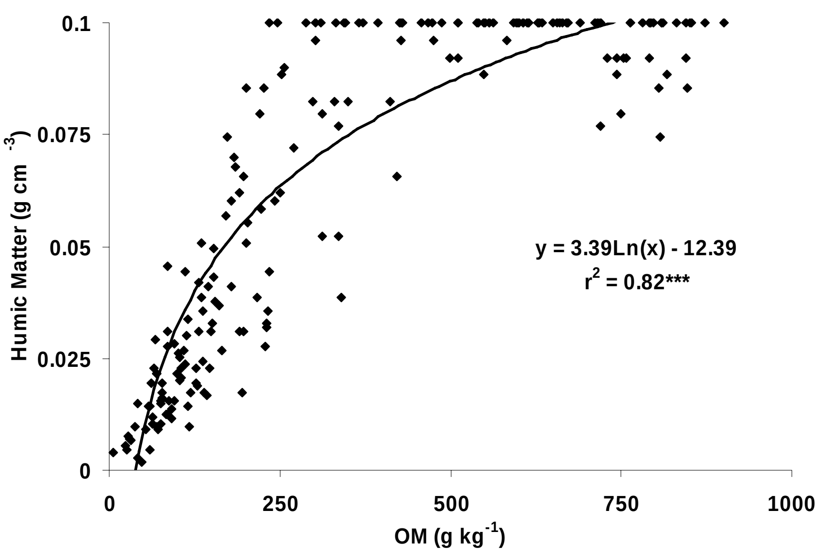

Figure 15. Humic matter vs. Organic matter for all series and depths.

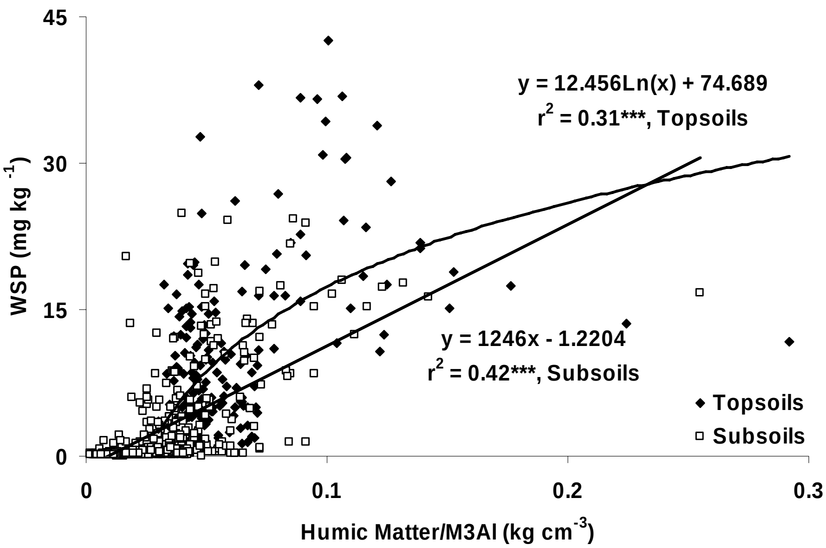

Figure 16. Water Soluble P vs. Humic matter/M3Al, segregated by topsoils and subsoils.

CONCLUSIONS

Mehlich-3 Al concentrations were much higher than those observed in other studies of NC mineral soils (Johnson, 2004). Mean topsoil M3Al concentrations were 7 times greater than M3Fe even when adjustments were made by using Johnson's (2004) factor of 4 to account for the inability of the Mehlich extract to accurately quantify Fe.

While M3P was not consistently associated with P retention and WSP, OM content, M3Al, and $CuCl_2$ extractable Al were related to P retention. According to the results of the incubation, multiple regression, and fractionation studies, Al was the main cation responsible for P retention. The concentration of M3Fe was low in every series and the results of these studies indicate that M3Fe was not related to P retention, except in the fractionation study where a substantial amount of P was associated with Fe. It is unclear whether there was indeed little Fe present or that the inability of the Mehlich-3 solution to extract Fe accounted for the lack of observed relationships.

Increased OM was associated with increased WSP and lower total P, as well as decreased P retention in the incubation. On the other hand, increased M3Al concentration was associated with decreased WSP and increased P retention in the incubation study and field samples. Clay, sand and silt contents were not positively related with P retention, except in the subsoils that measured less than 200 g kg^{-1} OM content. Conversely, in the high OM topsoils, $CuCl_2$ extractable Al was not associated with sand, silt, or clay contents, but was negatively related to P retention (measured as total P and WSP).

Both OM and Al were shown to affect the retention of P in both the incubation study and field samples, but the ratio of OM to M3Al showed a stronger relationship to P retention and WSP than when OM and Al were used as independent variables. These results indicate that soils with higher OM and lower Al did not retain P as well as soils with lower OM and higher Al contents. North Carolina’s PLAT could be modified to include M3Al and OM concentrations to more accurately predict P losses in the organic soils of the lower Coastal Plain.

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APPENDIX

Appendix 1. Explanation of organic soil management groups (SMGs).

SMG 1: Typic Medisaprists *Series: Dare, Dorovan, Pungo*
Very poorly drained, deep (>51 in), organic soils of the lower coastal plain.
SMG 2: Terric Medisaprists *Series: Belhaven, Scuppernong*
Very poorly drained, shallow (16-51 in), organic soils of the lower coastal plains, colloidal organic materials in Oa2, overlying loamy and sandy materials, lower yield potentials.
SMG 3:Terric Medisaprists *Series: Croatan, Ponzer*
Very poorly drained, shallow (16-51 in), organic soils of the lower coastal plain, overlying loamy or silty mineral layers, higher yield potentials.

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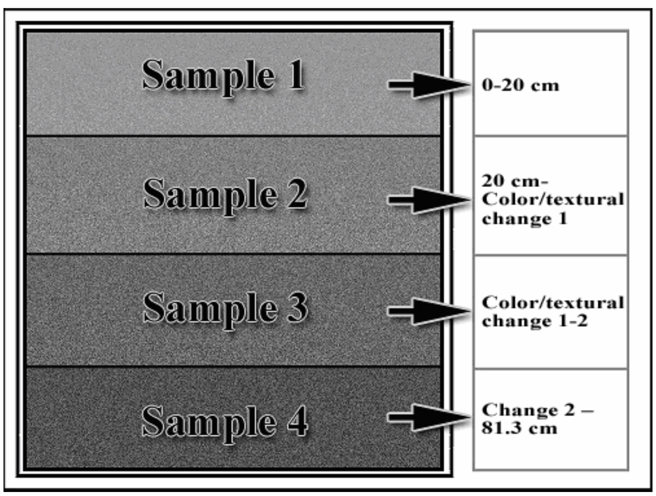
SMG 3:Terric Medisaprists *Series: Croatan, Ponzer*
Very poorly drained, shallow (16-51 in), organic soils of the lower coastal plain, overlying loamy or silty mineral layers, higher yield potentials.

Appendix 2. Acres farmed under SMG 1, 2, and 3.
(Estimated Using Nitrogen Loss Estimation Software Aggregated Version 5.02)

	SMG 1	SMG 2	SMG 3	Total Organic Soils Farmed	Total Acres Farmed in Hyde County to Total Acres Farmed within Neuse/Tarpam River Basin
	---------------------	-acres-	----------------------		
Hyde County	**1332**	**14179**	**8389**	**23900**	**55.3 %**
	Total SMG 1	Total SMG 2	Total SMG 3	Total Acres Farmed on Organic Soils	
Neuse/ Tar-Pamlico River Basins	**1836**	**20683**	**20720**	**43239**	



Appendix 3. Determination of sampling depths at each field site.

Appendix 4. Effect of sampling depth.

M3Al ($mg\ kg^{-1}$)

Increment	Belhaven Farm A	Belhaven Farm C	Ponzer	Pungo	Scuppernong
1	1044 C†	2852 A	2017 AB	2328 AB	2093 B
2	1271 B	2259 B	2308 A	2606 A	2512 A
3	1926 A	715 C	2168 A	2474 AB	2163 B
4	1909 A	382 C	1599 B	2293 B	1697 C

M3Fe ($mg\ kg^{-1}$)

Increment	Belhaven Farm A	Belhaven Farm C	Ponzer	Pungo	Scuppernong
1	193 A	368 A	163 A	291 A	244 A
2	118 B	396 A	138 A	207 B	128 C
3	47 C	132 B	66 AB	108 C	91 D
4	40 C	132 B	59 B	68 D	160 B

M3P ($mg\ kg^{-1}$)

Increment	Belhaven Farm A	Belhaven Farm C	Ponzer	Pungo	Scuppernong
1	75 A	76 A	74 A	49 A	133 A
2	43 B	46 B	35 B	29 B	44 B
3	81 A	16 C	19 C	27 B	22 C
4	53 B	7 C	7 C	23 B	13 C

WSP ($mg\ kg^{-1}$)

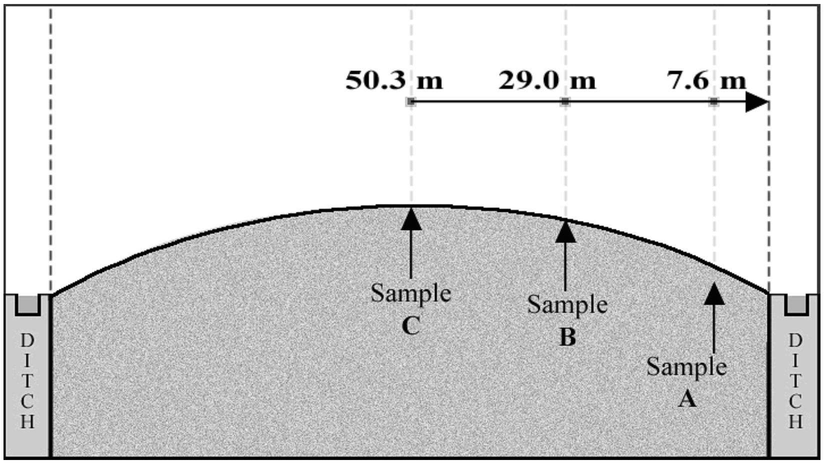
Increment	Belhaven Farm A	Belhaven Farm C	Ponzer	Pungo	Scuppernong
1	23 A	.6 BC	4 A	9 A	9‡
2	14 B	1 A	3 A	5 B	2‡
3	8 C	.8 B	1 AB	2 C	.2‡
4	5 D	.4 C	.7 B	.5 D	.2‡

OM ($g\ kg^{-1}$)

Increment	Belhaven Farm A	Belhaven Farm C	Ponzer	Pungo	Scuppernong
1	58‡	40‡	51‡	74 A	65‡
2	37‡	41‡	31‡	67 A	49‡
3	15‡	10‡	13‡	41 B	18‡
4	6‡	3‡	10‡	14 C	10‡

† Means followed by the same letter in a column are not significantly different ($p<0.05$).
‡ Appropriate amount of data was not available for SAS to determine significant differences.

Significant differences between the increments sampled and the variables measured were expected, as these soils go from an organic rich topsoil to an increased mineral matter subsoil. Mehlich 3 extractable Al was the only variable examined that did not have a significantly consistent trend of decreasing content with depth. On average, M3Fe, M3P, and WSP decreased with depth. In the Pungo and Belhaven Farm A soils, M3P content in depths 1, 2, 3, and/or 4 were not significantly different from each other indicating that no apparent significant decrease of M3P with depth in these soils was observed. These results are in agreement with the results of the field samples in which these two soils did not appear to retain P as well as the other soils studied. Finally, as a result of a lack of data, SAS was unable to determine significant differences between OM content and depth.



Appendix 5. Within Field Sampling.

Appendix 6. Effect of sampling location on field.

Location on Field	M3Al (mg kg^{-1}) A†	B	C
Belhaven Farm A	1613 A‡	1463 B	1536 AB
Belhaven Farm C	1603 A	1485 A	1568 A
Ponzer	1970 A	1969 A	2130 A
Pungo	2353 AB	2613 A	2310 B
Scuppernong	1905 B	2172 A	2272 A

Location on Field	M3Fe (mg kg^{-1}) A	B	C
Belhaven Farm A	89 A	107 A	101 A
Belhaven Farm C	247 A	253 A	271 A
Ponzer	112 A	107 A	101 A
Pungo	124 B	195 A	187 A
Scuppernong	150 A	155 A	161 A

Location on Field	M3P (mg kg^{-1}) A	B	C
Belhaven Farm A	59 AB	55 B	74 A
Belhaven Farm C	36 A	34 A	38 A
Ponzer	26 A	32 A	42 A
Pungo	32 A	36 A	28 A
Scuppernong	45 B	55 A	61 A

Location on Field	WSP (mg kg^{-1}) A	B	C
Belhaven Farm A	9 B	13 AB	15 A
Belhaven Farm C	.7 A	.7 A	.8 A
Ponzer	2 A	2 A	3 A
Pungo	2 B	5 A	5 A
Scuppernong	2§	2§	4§

Location on Field	OM (g kg^{-1}) A	B	C
Belhaven Farm A	292§	NA¶	NA¶
Belhaven Farm C	267 A	221 A	258 A
Ponzer	201§	281§	298§
Pungo	349 B	511 A	609 A
Scuppernong	222§	447§	433§

† Location A, B, C were sampled 25, 95, and 165 feet from the ditch, respectively.
‡ Means followed by the same letter in a row are not significantly different ($p<0.05$).
§ Appropriate amount of data was not available for SAS to determine significant differences.
¶ Samples not taken, data not available (NA).

No consistent trend was observed between sampling location on the field and M3Al, M3P, and WSP contents for each soil series examined. Mehlich 3 Fe contents, however, were not significantly different at each sampling location, expect in the Pungo soil. The M3Fe contents were significantly lower as samples approached the ditch (location A) where the water table was higher and saturation most likely existed for longer periods of time. Iron becomes soluble under reduced conditions, which may explain the lower M3Fe contents with samples closer to the ditch in the Pungo soil. As a result of a lack of data, SAS was unable to determine significant differences between OM content and sampling location on fields.

Appendix 7. Incubation selection process.

Soil samples were selected by comparing M3P, M3Al, and M3PSR values on all topsoil increments (0-20 cm) within each soil series. Sample selection was done by data inspection, first by sorting M3P values in ascending order and eliminating the high and low values as to minimize a large range in M3P values. Then samples were chosen by sorting M3Al in ascending order and choosing the broadest range of values. Furthermore, samples were chosen equally from different sampling locations and distances from ditch (A, B, C) as to represent the sampling diversity amongst samples.

Yellow= High and low M3P are eliminated
Red= Selected Samples, have a range of Al values

Sample ID pneumonic:
Pg=Pungo
S=Scuppernong
Pz= Ponzer
B=Belhaven

First # (1-20) refers to the field number. Last # refers to sampling depth (see Appendix 3).
First letter refers to location on field that sample was taken (see Appendix 4).

Sample ID	M3P (mg kg-1)	M3Al (mg kg-1)	DPS (mg kg-1)
Pg4C1	44	1795	0.02
Pg2C1	34	1916	0.01
Pg9C1	31	1919	0.01
Pg6B1	44	1973	0.02
Pg3C1	31	1976	0.01
Pg1A1	39	1986	0.02
Pg6C1	48	1990	0.02
Pg8C1	32	2012	0.01
Pg5C1	29	2095	0.01
Pg6A1	42	2105	0.02
Pg10C1	39	2110	0.01
Pg2A1	65	2124	0.03
Pg4A1	74	2157	0.03
Pg2B1	75	2230	0.03
Pg5B1	71	2267	0.03
Pg1C1	40	2286	0.01
Pg3B1	71	2305	0.03
Pg4B1	69	2315	0.02
Pg10A1	35	2377	0.01
Pg7B1	36	2512	0.01
Pg10B1	29	2522	0.01
Pg1B1	77	2539	0.02
Pg9B1	36	2542	0.01
Pg8B1	54	2542	0.02
Pg3A1	78	2679	0.02
Pg5A1	84	2722	0.03
Pg7C1	31	2753	0.01
Pg7A1	50	2865	0.01
Pg9A1	33	2993	0.01
Pg8A1	49	3240	0.01
B14A1	154	255	0.35
B14C1	93	411	0.15
B14B1	123	567	0.15
B12C1	113	575	0.15
B11B1	102	611	0.12
B6A1	58	655	0.07
B2B1	64	722	0.07
B12B1	59	775	0.06
B5A1	51	791	0.05
B11C1	189	795	0.19
B7B1	68	802	0.07
B13C1	40	819	0.04
B2C1	75	826	0.07
B6B1	48	861	0.05
B1B1	44	869	0.04
B7A1	66	874	0.06

B5C1	49	926	0.04
B5B1	50	934	0.05
B2A1	153	940	0.13
B13B1	47	963	0.04
B3B1	52	994	0.04
B4A1	57	1004	0.05
B7C1	67	1019	0.05
B4B1	45	1039	0.04
B6C1	41	1095	0.03
B13A1	67	1123	0.05
B3C1	60	1124	0.04
B1C1	61	1124	0.04
B3A1	62	1173	0.04
B8C1	41	1210	0.03
B8A1	65	1250	0.05
B10C1	118	1264	0.08
B10B1	60	1285	0.04
B8B1	81	1337	0.05
B1A1	53	1397	0.03
B9A1	53	1398	0.03
B12A1	49	1505	0.03
B9B1	46	1508	0.03
B9C1	70	1519	0.04
B11A1	97	1539	0.05
B10A1	100	1621	0.06
B4C1	158	1678	0.09
B20A1	43	2265	0.02
B17A1	93	2443	0.03
B16A1	39	2534	0.01
B16C1	60	2612	0.02
B16B1	75	2762	0.02
B15C1	113	2785	0.04
B18B1	85	2786	0.03
B15B1	102	2845	0.03
B18C1	114	2855	0.04
B17B1	71	2858	0.02
B19B1	70	2928	0.02
B19A1	110	2933	0.03
B20B1	95	3004	0.03
B19C1	84	3044	0.02
B18A1	59	3060	0.02
B17C1	99	3077	0.03
B15A1	93	3248	0.03
B20C1	44	3294	0.01

S1A1	79	1514	0.04
S9A1	68	1540	0.04
s11A1	178	1559	0.09
s4A1	79	1589	0.04
s3A1	86	1747	0.04

s8A1	79	1751	0.04
s11B1	174	1752	0.08
s6A1	59	1761	0.03
s7A1	63	1777	0.03
s5B1	78	1835	0.03
sz8C1	112	1844	0.05
s2A1	79	1855	0.03
s12A1	230	1868	0.1
s18C1	149	1888	0.07
s18B1	157	1896	0.07
s9C1	72	1899	0.03
s3B1	61	1900	0.03
s1C1	90	1953	0.04
s10A1	42	1987	0.02
s4B1	73	1988	0.03
s13A1	212	2008	0.09
s1B1	123	2019	0.05
s10C1	70	2023	0.03
s9B1	71	2033	0.03
s5A1	69	2047	0.03
s14A1	155	2053	0.06
s16A1	158	2071	0.06
s2B1	108	2086	0.04
s12C1	230	2090	0.09
s8B1	106	2094	0.04
s17A1	161	2114	0.06
s15A1	142	2127	0.06
s14C1	217	2146	0.08
s15B1	202	2157	0.08
s6C1	42	2159	0.02
s20B1	168	2164	0.06
s10B1	72	2184	0.03
s6B1	71	2188	0.03
s18A1	139	2198	0.05
s19B1	188	2198	0.07
s11C1	149	2202	0.06
s7B1	57	2209	0.02
s17C1	211	2225	0.08
s13C1	182	2238	0.07
s20A1	103	2268	0.04
s20C1	230	2276	0.08
s4C1	76	2291	0.03
s19A1	131	2319	0.05
s3C1	99	2321	0.04
s5C1	70	2344	0.02
s16C1	202	2350	0.07
s19C1	201	2360	0.07
s17B1	162	2394	0.06
s12B1	262	2417	0.09
s14B1	284	2417	0.1

s7C1	107	2560	0.03
s16B1	226	2560	0.07
s15C1	191	2571	0.06
s13B1	200	2596	0.06
s2C1	145	2616	0.05
pz4B1	62	1280	0.04
pz3A1	58	1392	0.03
pz4A1	51	1405	0.03
pz3B1	58	1405	0.03
pz13C1	64	1422	0.04
pz7B1	35	1424	0.02
pz1C1	65	1434	0.04
pz12A1	43	1451	0.03
pz1A1	39	1458	0.02
pZ2A1	55	1490	0.03
pz13B1	49	1492	0.03
pz2B1	58	1494	0.03
pz5A1	56	1532	0.03
pz13A1	29	1541	0.02
pz15B1	69	1546	0.04
pz7A1	52	1551	0.03
pz2C1	64	1559	0.03
pz5B1	68	1562	0.04
pz12C1	59	1564	0.03
pz4C1	106	1603	0.05
pz16A1	61	1622	0.03
z1B1	48	1631	0.02
pz15A1	74	1661	0.04
pz12B1	48	1672	0.02
pz15C1	67	1716	0.03
pz16B1	80	1735	0.04
pz16C1	85	1752	0.04
pz11A1	89	1761	0.04
pz6A1	80	1774	0.04
pz3C1	155	1782	0.07
pz11C1	74	1799	0.03
pz11B1	50	1826	0.02
pz17A1	66	1903	0.03
pz18A1	69	1931	0.03
pz6B1	79	1931	0.03
pz14C1	74	2002	0.03
pz8A1	55	2004	0.02
pz5C1	235	2033	0.1
pz10A1	47	2046	0.02
pz14A1	90	2046	0.04
pz18B1	72	2075	0.03
pz14B1	69	2098	0.03
pz6C1	157	2135	0.06
pz7C1	58	2161	0.02

pz9C1	67	2176	0.03
pz17B1	115	2195	0.04
pz9B1	41	2198	0.02
pz20A1	60	2220	0.02
pz9A1	83	2279	0.03
pz10C1	81	2305	0.03
pz8B1	37	2310	0.01
pz19A1	49	2319	0.02
pz19C1	102	2338	0.04
pz19B1	81	2398	0.03
pz20B1	71	2410	0.02
pz20C1	65	2414	0.02
pz10B1	90	2437	0.03
pz18C1	104	2445	0.04
pz8C1	34	2486	0.01
pz17C1	77	2519	0.03

Appendix 8. Preparing triple super phosphate solution.

TSP solution: 4 g TSP dissolved into + 1 L DI water

TSP = 0-46-0 = 46% P_20_5

46% * 62/142 = **20% P in TSP**

Concentration of P in TSP stock solution =4000 mg/ L TSP solution * 20 % P = 800 mg P/L=

0.8 mg P/ ml

Average Bulk Density across all series = 0.7 g cm^{-3} = 0.7 Mgm^{-3}

Volume of soil to a depth of 8 in = 2,000 m^3 * 0.7 Mgm^{-3} = 1400 Mg soil = 1,400,000 kg soil

Application rate of 150kg P/ ha * 1 ha/1,400,000 kg soil = 0.107g P/kg soil

.107g P/kg soil * 50 g soil = 5.35 mg P to 50 g soil

5.35 mg P / 0.8 mg P /ml = **<u>6.6875 ml TSP solution to add to each 50 g soil sample</u>**

Appendix 9. Determination of container capacity.

Determination of container capacity (CC) was used to bring incubation samples to 70% CC. At 70% container capacity it is assumed that soil samples have sufficient water and aeration for chemical reactions to proceed. Container capacity was determined by saturating 50 grams of soil in a Dixie cup with several small holes at the bottom. After saturation was achieved, cups were allowed to drain for 48 hours, covered with Saran wrap to minimize evaporation.

CC = Dionized water held by soil (kg water)/ Mass of soil (kg soil)

Sample ID	70% CC (grams of water/ 50g soil)	Amount of TSP solution added (mL)	Amount of Water added (mL)
Pg1C1	32.31	6.7	25.61
Pg1C2	32.31	6.7	25.61
Pg1C3	32.31	6.7	25.61
Control Pg1C1	32.31	0	32.31
Control Pg1C2	32.31	0	32.31
Control Pg1C3	32.31	0	32.31
Pg6C1	32.31	6.7	25.61
Pg6C2	32.31	6.7	25.61
Pg6C3	32.31	6.7	25.61
Control Pg6C1	32.31	0	32.31
Control Pg6C2	32.31	0	32.31
Control Pg6C3	32.31	0	32.31
Pg7B1	32.31	6.7	25.61
Pg7B2	32.31	6.7	25.61
Pg7B3	32.31	6.7	25.61
Control Pg7B1	32.31	0	32.31
Control Pg7B2	32.31	0	32.31
Control Pg7B3	32.31	0	32.31
Pg7C1	32.31	6.7	25.61
Pg7C2	32.31	6.7	25.61
Pg7C3	32.31	6.7	25.61
Control Pg7C1	32.31	0	32.31
Control Pg7C2	32.31	0	32.31
Control Pg7C3	32.31	0	32.31
Pg9A1	32.31	6.7	25.61

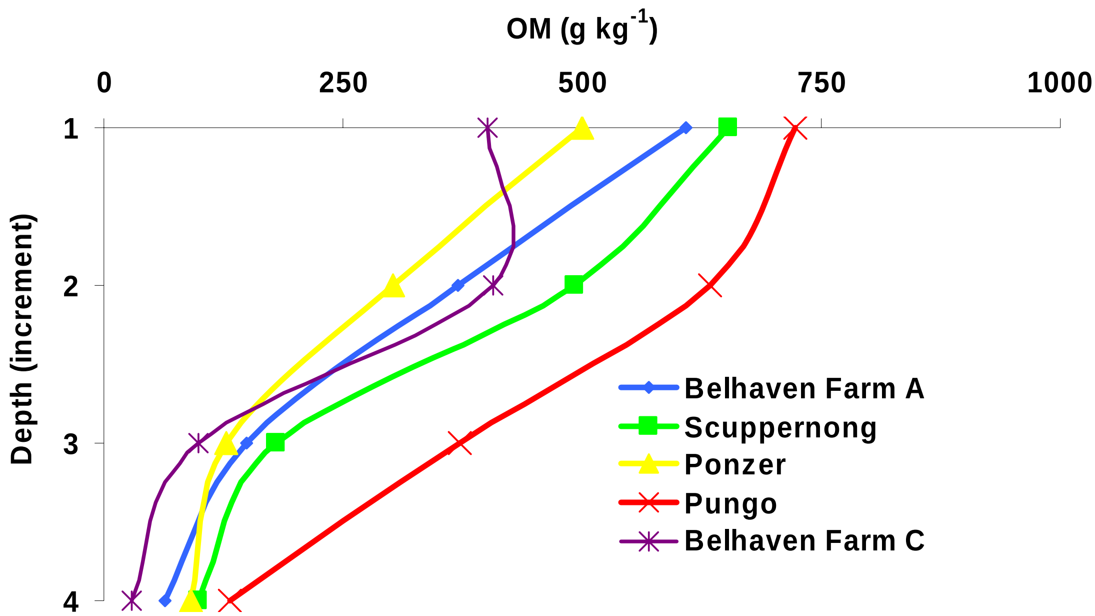
Pg9A2	32.31	6.7	25.61
Pg9A3	32.31	6.7	25.61
Control Pg9A1	32.31	0	32.31
Control Pg9A2	32.31	0	32.31
Control Pg9A3	32.31	0	32.31
B2C1	40	6.7	33.3
B2C2	40	6.7	33.3
B2C3	40	6.7	33.3
Control B2C1	40	0	40
Control B2C2	40	0	40
Control B2C3	40	0	40
B12A1	40	6.7	33.3
B12A2	40	6.7	33.3
B12A3	40	6.7	33.3
Control B12A1	40	0	40
Control B12A2	40	0	40
Control B12A3	40	0	40
B13A1	40	6.7	33.3
B13A2	40	6.7	33.3
B13A3	40	6.7	33.3
Control B13A1	40	0	40
Control B13A2	40	0	40
Control B13A3	40	0	40
B16C1	40	6.7	33.3
B16C2	40	6.7	33.3
B16C3	40	6.7	33.3
Control B16C1	40	0	40
Control B16C2	40	0	40
Control B16C3	40	0	40
B18A1	40	6.7	33.3
B18A2	40	6.7	33.3
B18A3	40	6.7	33.3
Control B18A1	40	0	40
Control B18A2	40	0	40
Control B18A3	40	0	40
S1B1	23.8	6.7	17.1
S1B2	23.8	6.7	17.1
S1B3	23.8	6.7	17.1
Control S1B1	23.8	0	23.8
Control S1B2	23.8	0	23.8
Control S1B3	23.8	0	23.8
S2C1	23.8	6.7	17.1
S2C2	23.8	6.7	17.1

S2C3	23.8	6.7	17.1
Control S2C1	23.8	0	23.8
Control S2C2	23.8	0	23.8
Control S2C3	23.8	0	23.8
S11A1	23.8	6.7	17.1
S11A2	23.8	6.7	17.1
S11A3	23.8	6.7	17.1
Control S11A1	23.8	0	23.8
Control S11A2	23.8	0	23.8
Control S11A3	23.8	0	23.8
S17B1	23.8	6.7	17.1
S17B2	23.8	6.7	17.1
S17B3	23.8	6.7	17.1
Control S17B1	23.8	0	23.8
Control S17B2	23.8	0	23.8
Control S17B3	23.8	0	23.8
S18C1	23.8	6.7	17.1
S18C2	23.8	6.7	17.1
S18C3	23.8	6.7	17.1
Control S18C1	23.8	0	23.8
Control S18C2	23.8	0	23.8
Control S18C3	23.8	0	23.8
PZ4B1	22.5	6.7	15.8
PZ4B2	22.5	6.7	15.8
PZ4B3	22.5	6.7	15.8
Control PZ4B1	22.5	0	22.5
Control PZ4B2	22.5	0	22.5
Control PZ4B3	22.5	0	22.5
PZ5A1	22.5	6.7	15.8
PZ5A2	22.5	6.7	15.8
PZ5A3	22.5	6.7	15.8
Control PZ5A1	22.5	0	22.5
Control PZ5A2	22.5	0	22.5
Control PZ5A3	22.5	0	22.5
PZ7C1	22.5	6.7	15.8
PZ7C2	22.5	6.7	15.8
PZ7C3	22.5	6.7	15.8
Control PZ7C1	22.5	0	22.5
Control PZ7C2	22.5	0	22.5
Control PZ7C3	22.5	0	22.5
PZ17A1	22.5	6.7	15.8
PZ17A2	22.5	6.7	15.8
PZ17A3	22.5	6.7	15.8

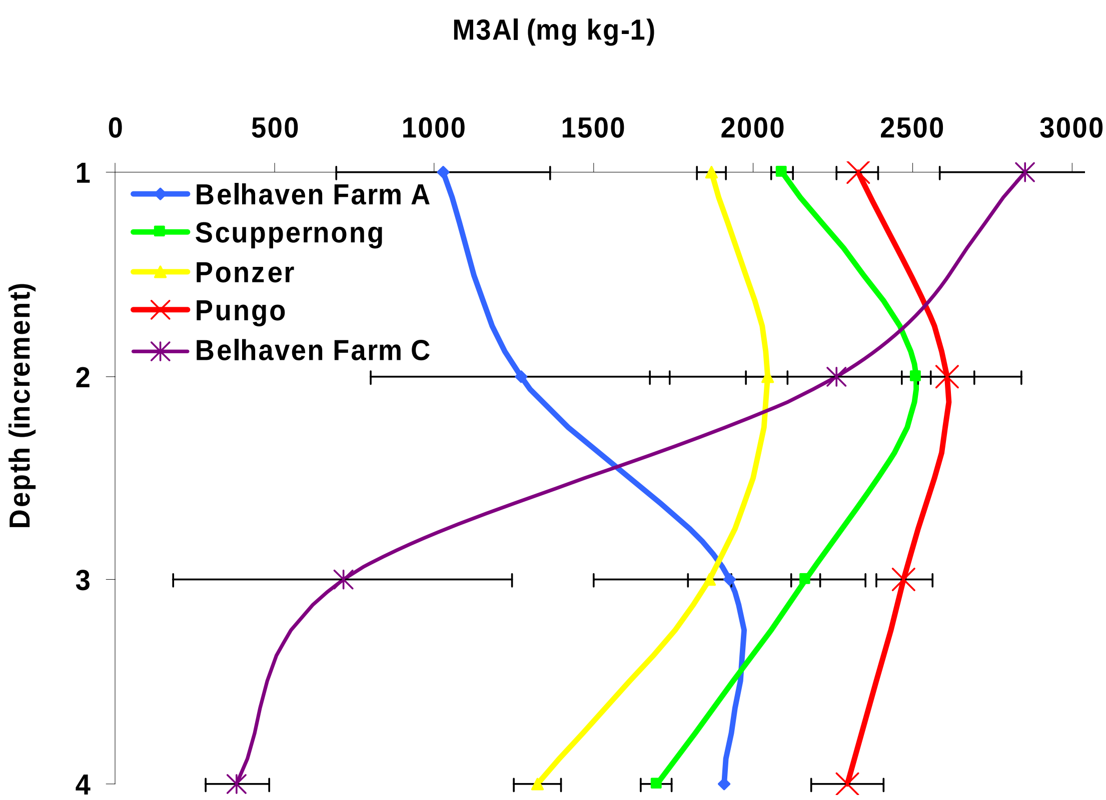
Control PZ17A1	22.5	0	22.5
Control PZ17A2	22.5	0	22.5
Control PZ17A3	22.5	0	22.5
PZ20C1	22.5	6.7	15.8
PZ20C2	22.5	6.7	15.8
PZ20C3	22.5	6.7	15.8
Control PZ20C1	22.5	0	22.5
Control PZ20C2	22.5	0	22.5
Control PZ20C3	22.5	0	22.5

Appendix 10. Amended method of Jackson and Chang: Fractionation for noncalcareous soils.

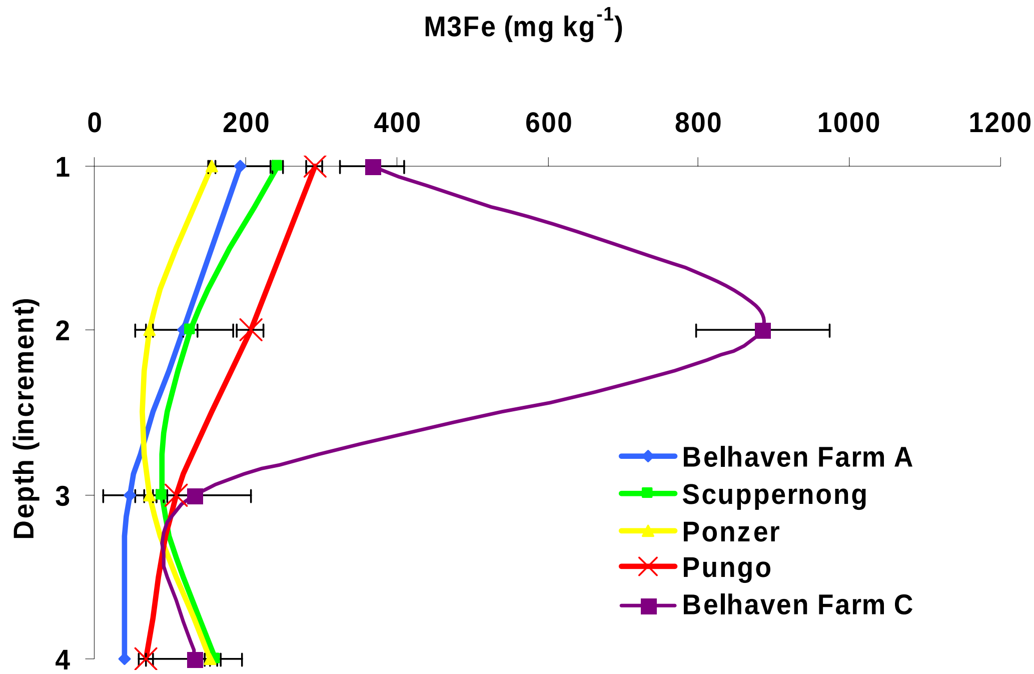
Soils were not washed with saturated NaCl between sequential fractionation extractions. In addition, the washings were not combined with extracted sample, as protocol calls for, and were not brought to volume. Though this method may allow some transfer of extractant into the next sequential fraction because washing is eliminated, it also provides a more accurate reading of fractions. Extractant concentration is not manipulated by bringing extractant to volume with additional NaCl, so that unnecessary dilution is avoided. Furthermore, the accuracy of ICP analysis benefits from the lack of saturated NaCl in the extractant.



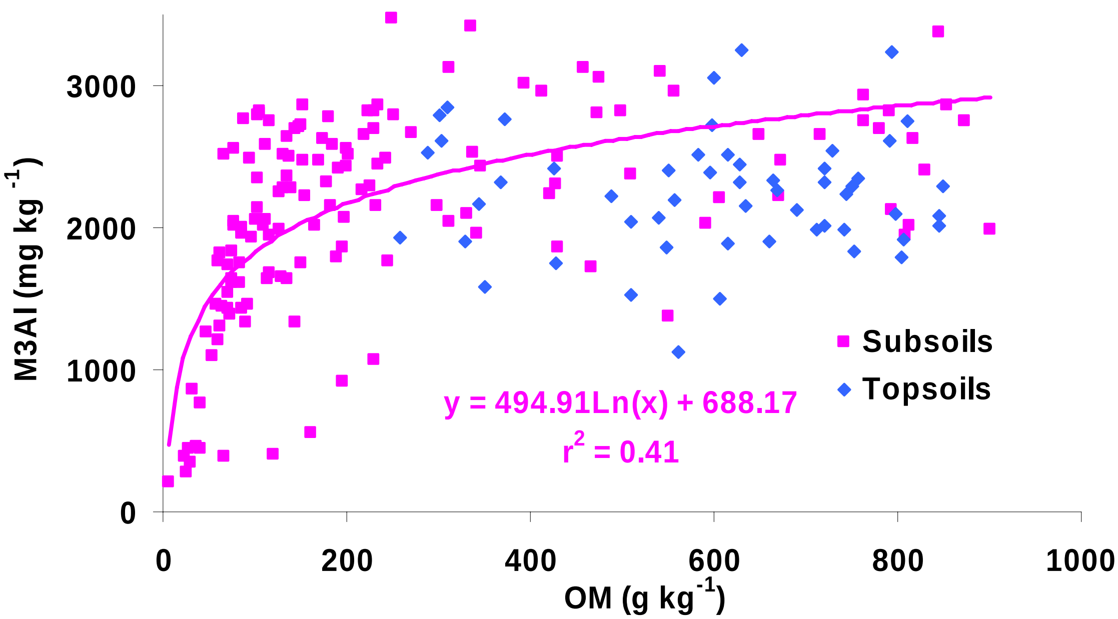
Appendix 11. Organic matter content with Depth.



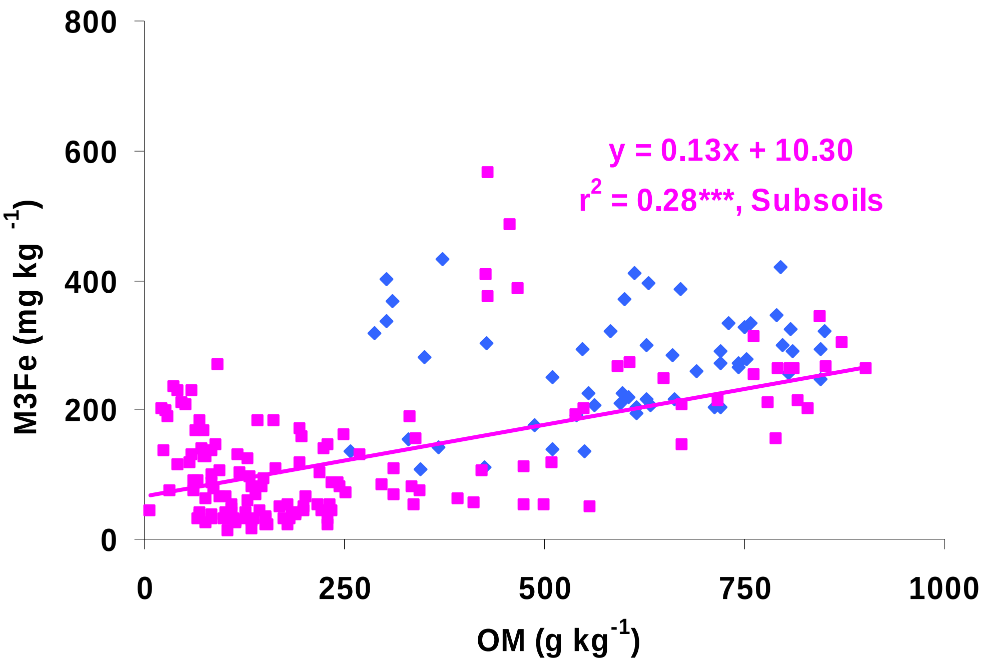
Appendix 12. Mehlich-3 Al with Depth.



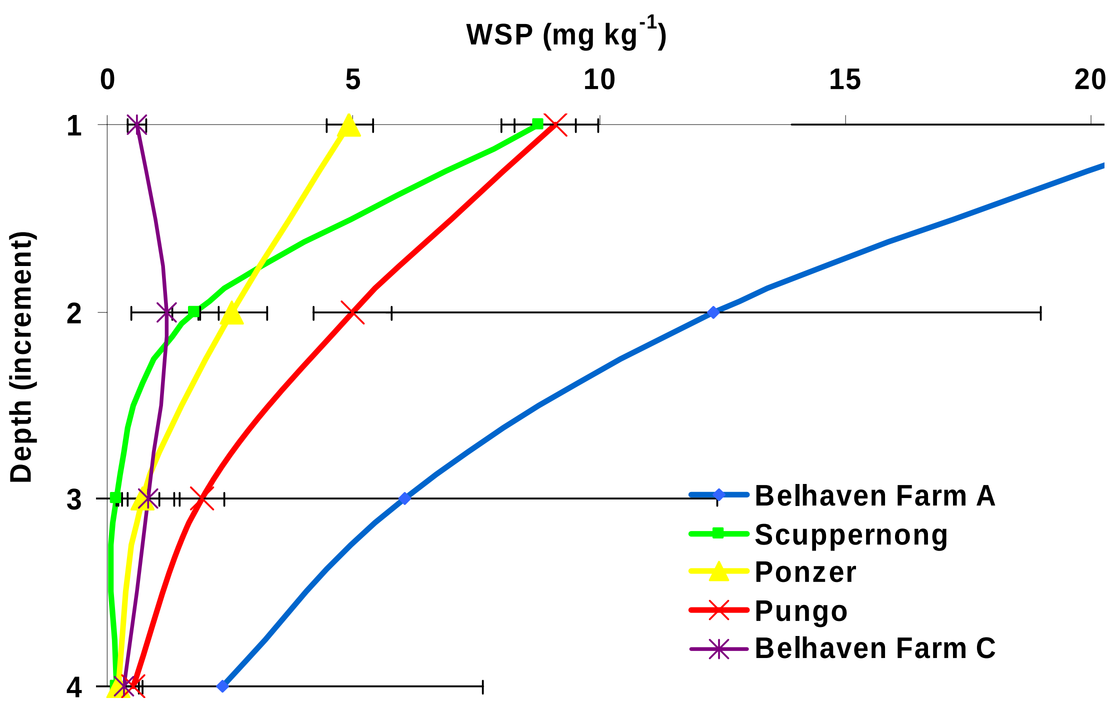
Appendix 13. Mehlich-3 Fe with Depth.



Appendix 14. Mehlich-3 Al vs. Organic matter content, segregated by topsoils and subsoils.



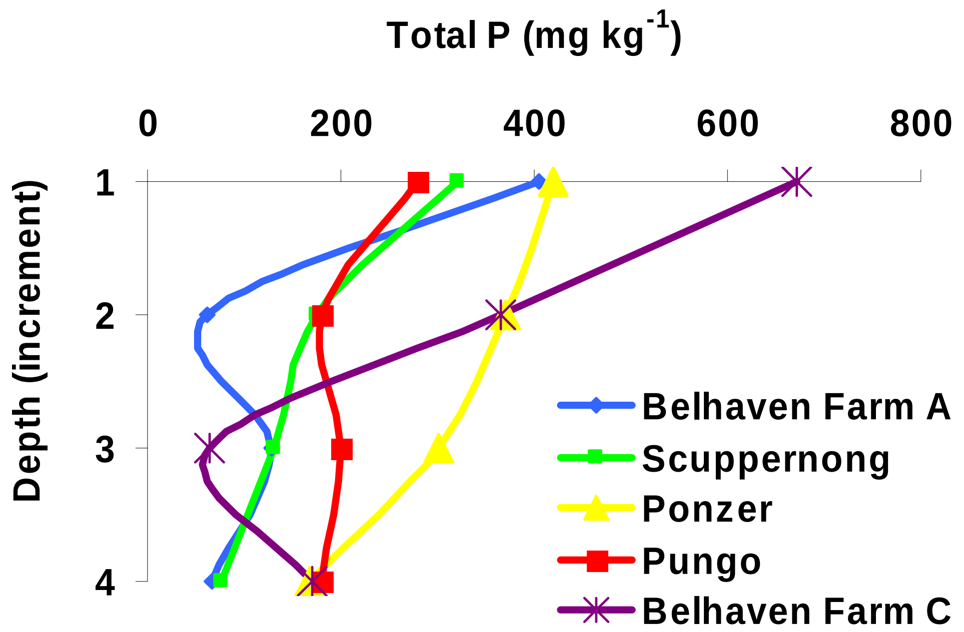
Appendix 15. Mehlich-3 Fe vs. Organic matter content, segregated by topsoils and subsoils.



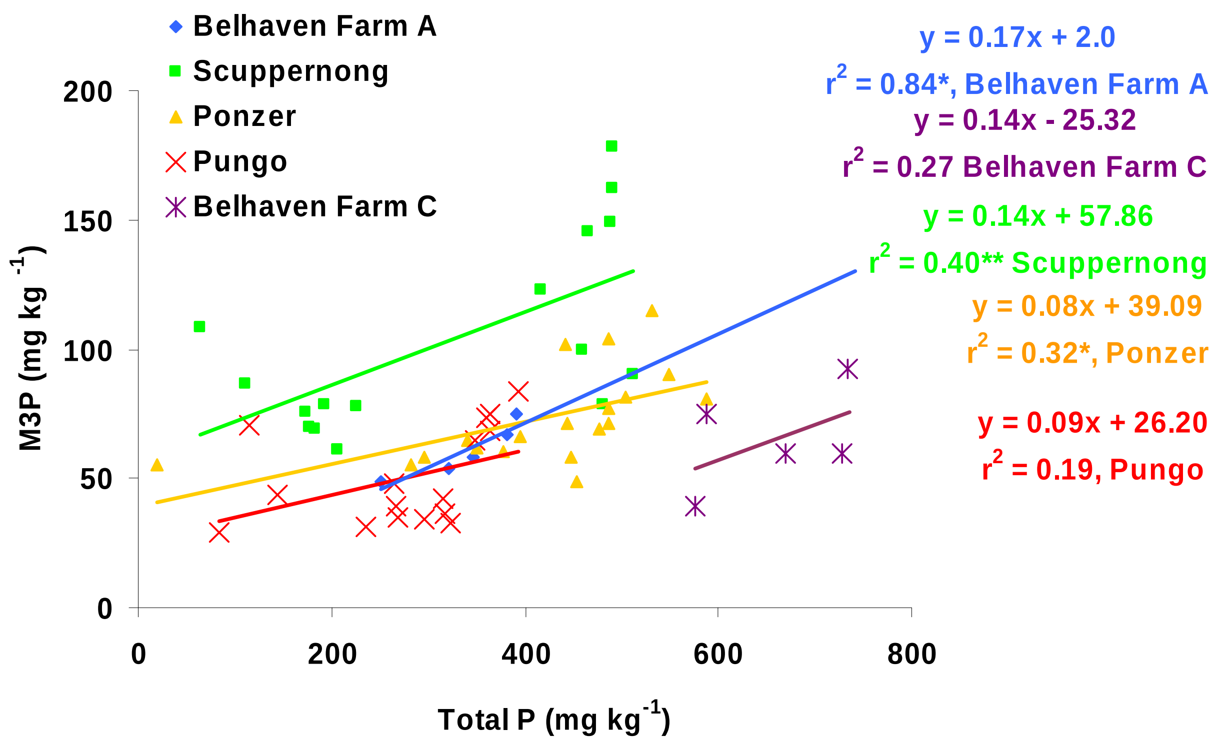
Appendix 16. Water Soluble P with Depth.

Appendix 17. Comparison of Phosphorus Extractions.

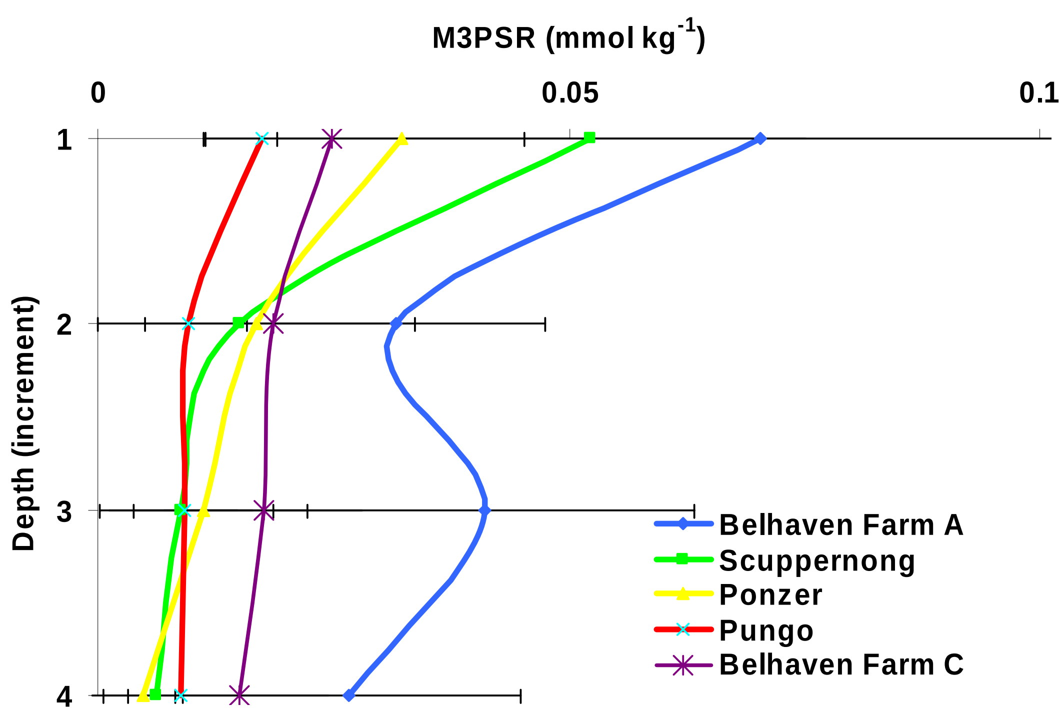
Series	% of Total P extracted by M3P	% of M3P extracted by WSP	% of Total P extracted by WSP	OM:M3Al	M3P	WSP	Total P
Topsoils				g mg^{-1}	--------mg kg^{-1}	--------	
All Series	22.5	11.4	2.6	.31	86	10	381
Belhaven A	22.2	30.7	6.8	.59	75	23	338
Belhaven C	11.9	1.3	0.1	.04	80	1	672
Ponzer	17.0	6.6	1.1	.27	71	5	419
Pungo	17.5	18.7	3.3	.31	49	9	279
Scuppernong	41.5	6.6	2.7	.30	133	9	321
Subsoils							
All Series	16.6	7.4	1.2	.14	31	2	189
Belhaven A	62.1	30.7	7.4	.11	59	7	95
Belhaven C	11.4	4.3	0.5	.17	23	1	202
Ponzer	8.4	5.0	0.4	.10	23	1	275
Pungo	14.1	9.3	1.3	.15	26	3	187
Scuppernong	21.6	2.7	0.6	.12	26	1	123



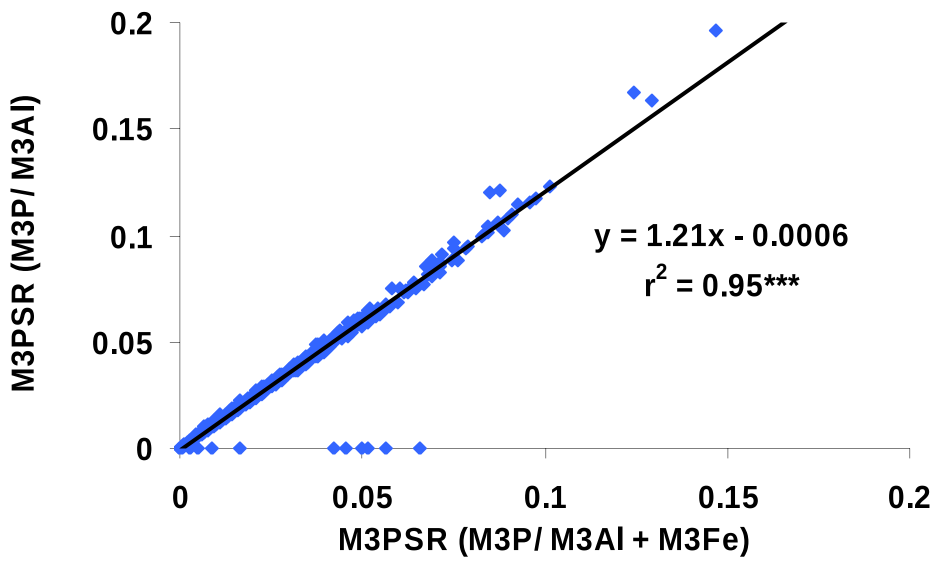
Appendix 18. Total P with depth, segregated by soil series.



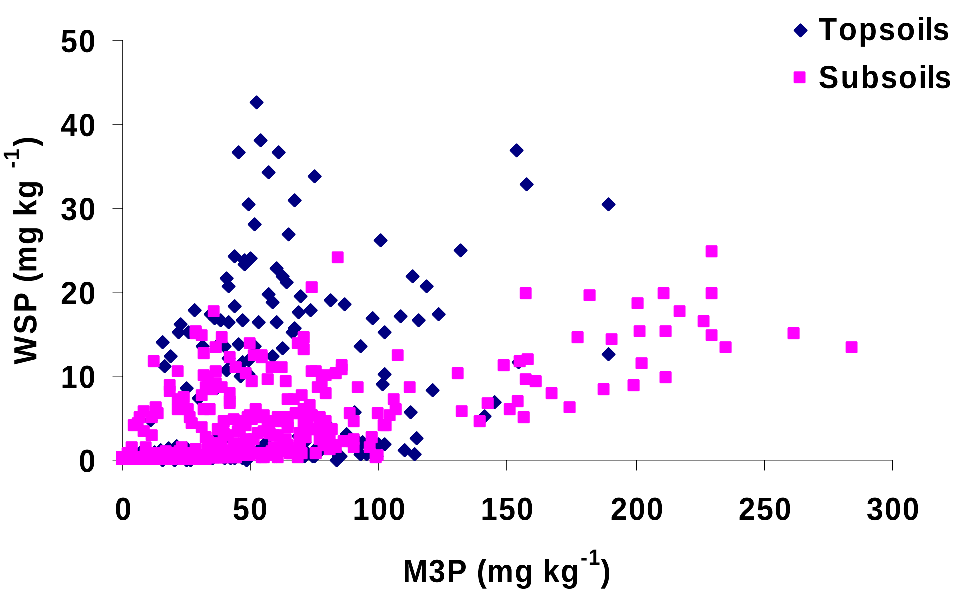
Appendix 19. Topsoil Mehlich-3 P vs. Total P, segregated by soil series.



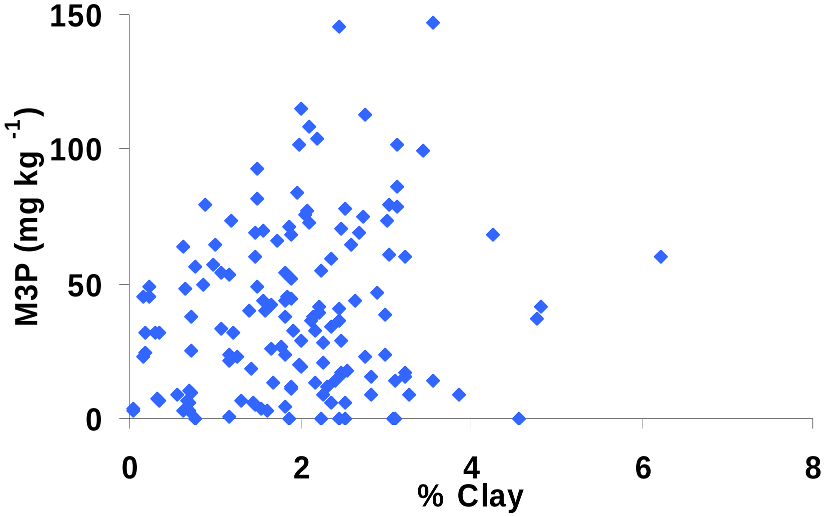
Appendix 20. Phosphorus saturation ratio with Depth.



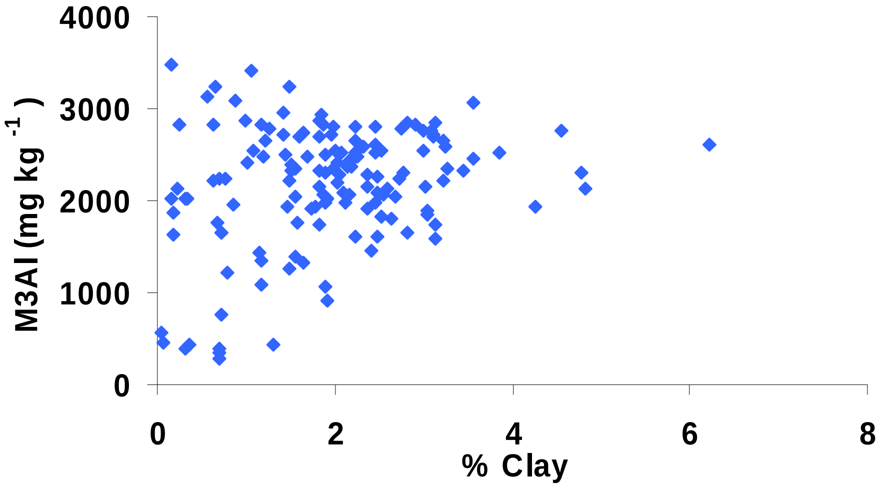
Appendix 21. Phosphorus saturation ratio calculated without Fe vs. Phosphorus saturation capacity calculated traditionally.



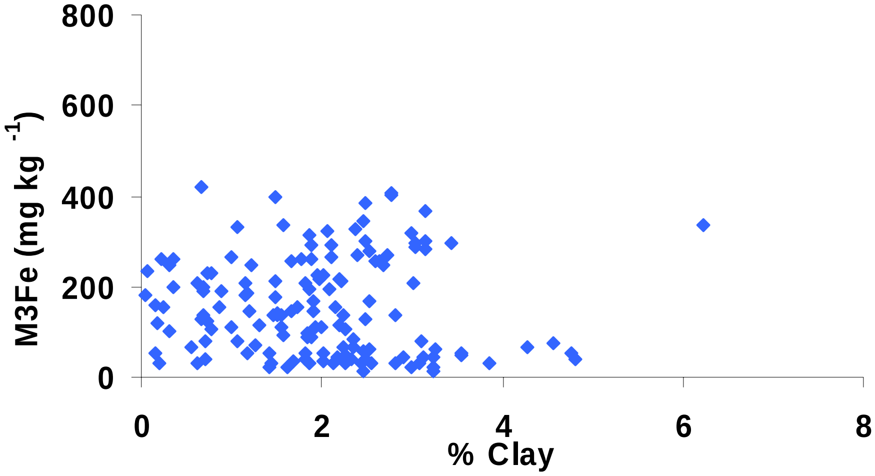
Appendix 22. Water Soluble P vs. Mehlich-3 P, segregated by topsoils and subsoils.



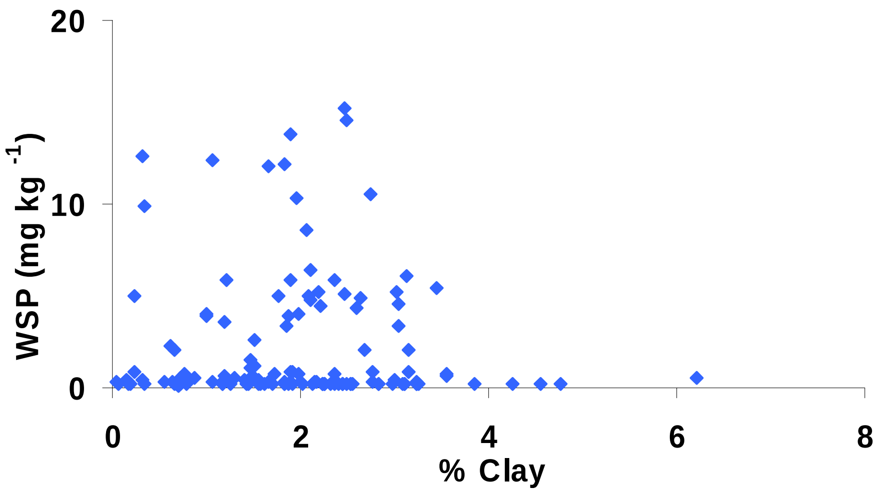
Appendix 23. Mehlich-3 P vs. % Clay.



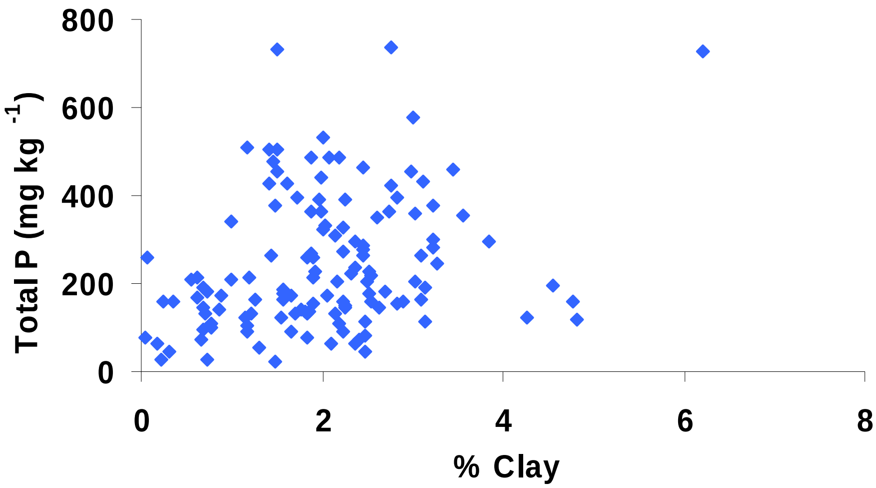
Appendix 24. Mehlich-3 Al vs. % Clay.



Appenidx 25. Mehlich-3 Fe vs. % Clay.



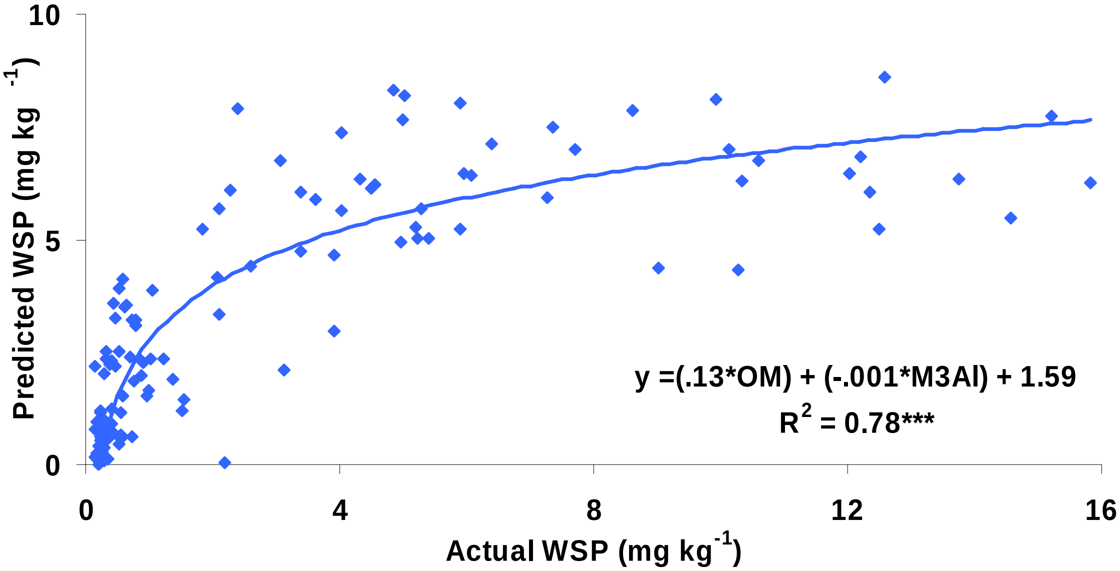
Appendix 26. Water Soluble P vs. % Clay.



Appendix 27. Total P vs. % Clay.

Appendix 28. Multiple Regression Analysis (topsoils and subsoils combined).

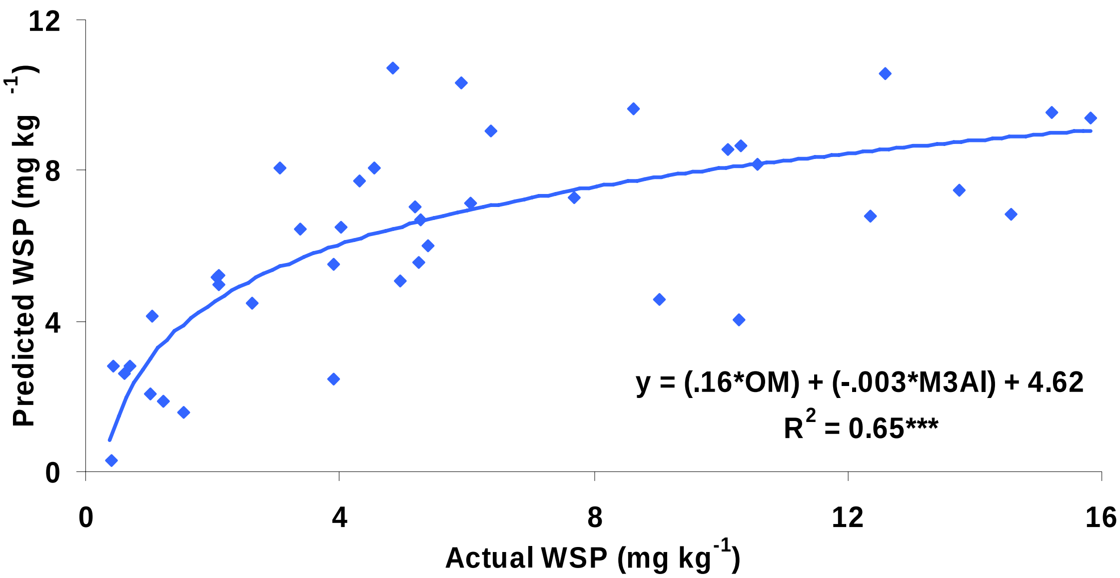
Explanatory Variable	Slope	P-value
Intercept	1.59	-
OM Content	0.13	***
M3Al (mg kg^{-1})	-0.001	***
M3Fe (mg kg^{-1})	-0.003	NS
M3P (mg kg^{-1})	-0.004	NS
Predicted WSP = y = (.13*OM) + (-.001*M3Al) + 1.59 Model R^2 = .78***		



Appendix 29. Predicted Water soluble P vs. Actual Water soluble P for topsoils and subsoils.

Appendix 30. Multiple Regression Analysis (topsoils only).

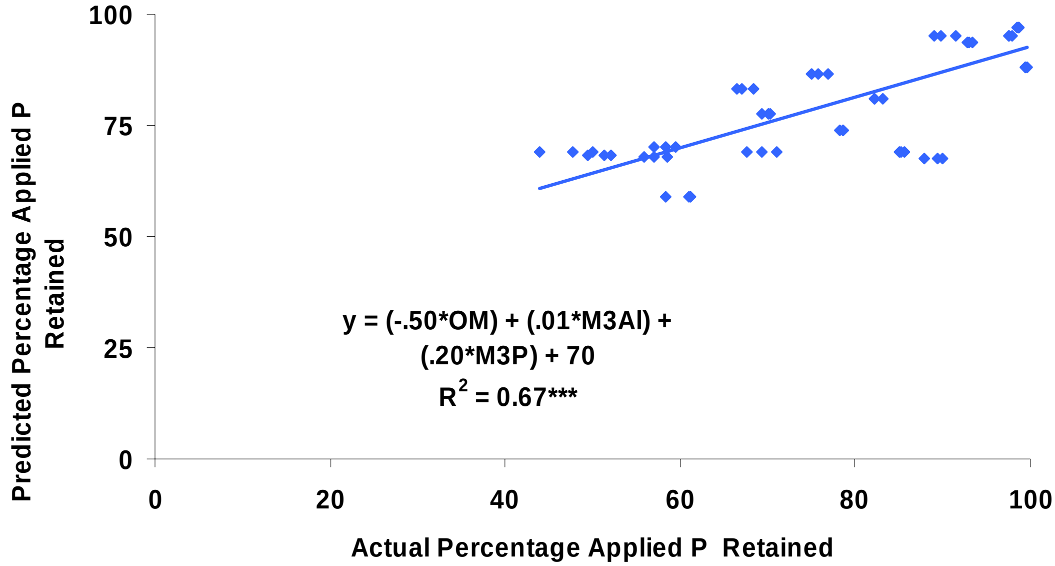
Explanatory Variable	Slope	P-value
Intercept	4.62	-
OM Content	.16	***
M3Al (mg kg^{-1})	-.003	**
M3Fe (mg kg^{-1})	.002	NS
M3P (mg kg^{-1})	-.01	NS
Predicted WSP = y = (.16*OM) + (-.003*M3Al) + 4.62 Model R^2 = .65***		



Appendix 31. Predicted Water soluble P vs. Actual Water soluble P for topsoils only.

Appendix 32. Multiple Regression Analysis Results for the Fertilized Incubation Samples.

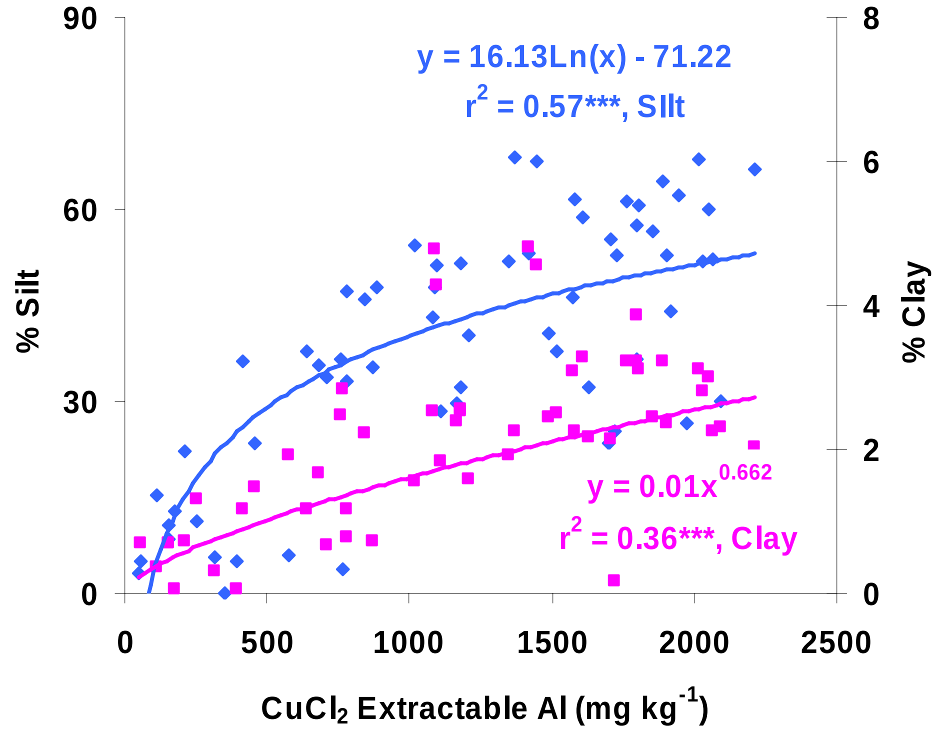
Explanatory Variable	Slope	P-value
Intercept	69.98	-
OM Content	-0.5	***
M3Al (mg kg^{-1})	0.01	***
M3P (mg kg^{-1})	0.2	***
M3Fe (mg kg^{-1})	-0.03	NS
Predicted % Applied P that was retained = y = (-.50*OM) + (.01*M3Al) + (.20*M3P)+ 69.98 Model R^2 = .67***		



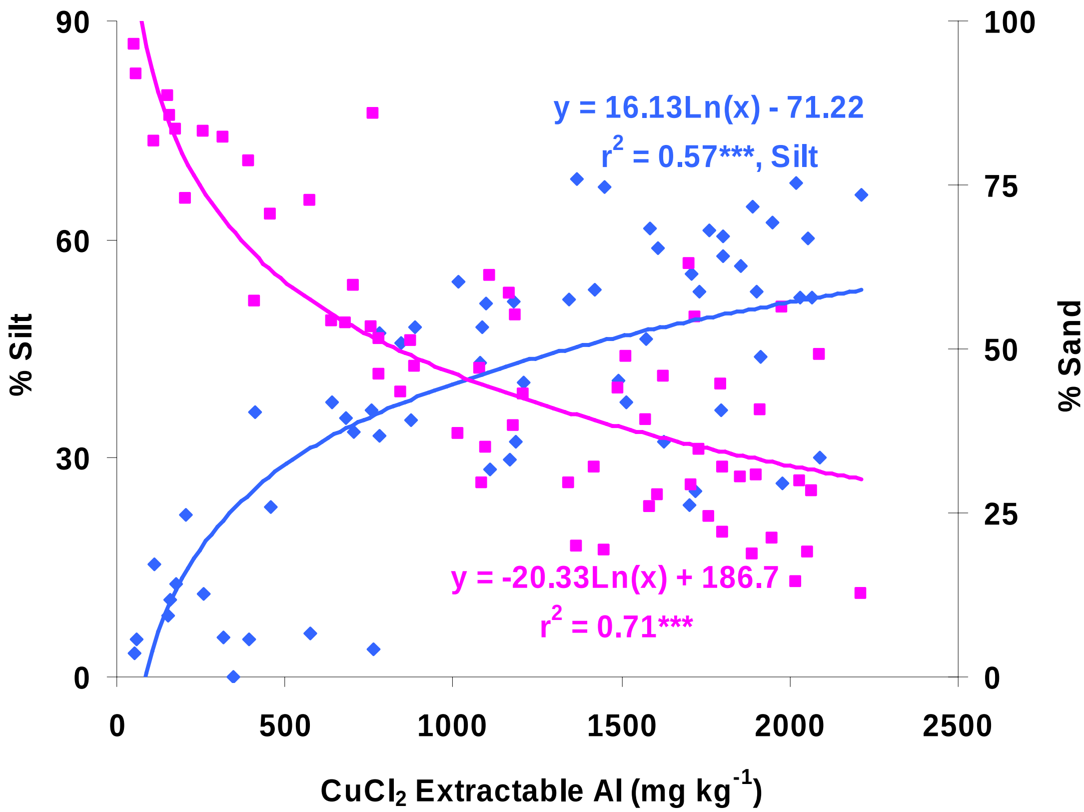
Appendix 33. Predicted percentage of applied P retained vs. Actual percentage of applied P retained.

Appendix 34. Aluminum Fractions.

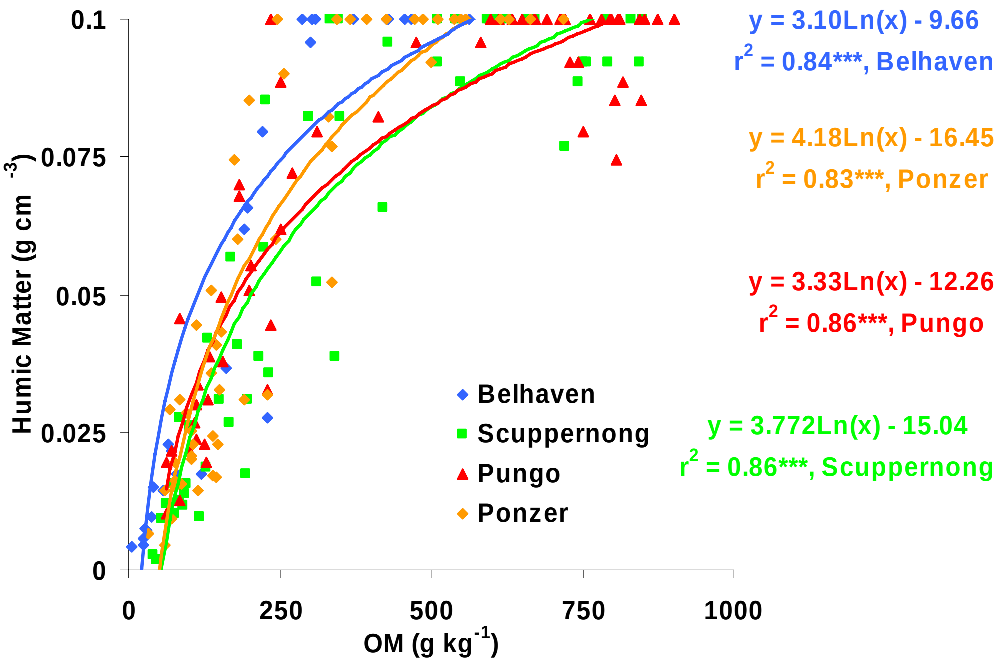
Series	**Exchangeable Al ($CaCl_2$)**	**OM-Al ($CuCl_2$ - $CaCl_2$)**	**$CuCl_2$ extractable Al ($CuCl_2$)**	**OM/M3Al**
	-------------------------mg Al kg^{-1}		------------------------	g mg^{-1}
Topsoils				
Belhaven Farm A	12	984	996	.59
Belhaven Farm C	13	2626	2639	.04
Ponzer	19	1973	1992	.27
Pungo	17	1451	1468	.31
Scuppernong	10	1469	1479	.30
Subsoils				
Belhaven Farm A	51	1607	1659	.11
Belhaven Farm C	13	616	628	.17
Ponzer	52	1838	1889	.10
Pungo	86	1907	1994	.15
Scuppernong	32	1556	1589	.12



Appendix 35. % Silt and % Clay vs. $CuCl_2$ extractable Al.



Appendix 36. % Sand and % Silt vs. $CuCl_2$ extractable Al.



Appendix 37. Humic matter vs. Organic matter, segregated by series.

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PGIAI	27.3	0.1	6.3	4.1	0.3	0.7	4.8	5.7	16.1	65	1.9	0.1	10+
PGIA2	21.6	0.1	1.3	0.7	0.2	0.9	4.5	4.1	6.1	33	0.4	0.1	4.32
PGIA3	22.7	0.1	1.0	0.5	0.2	1.0	4.7	2.9	4.5	36	0.3	0	2.15
PGIA4	17.7	0.1	1.8	1.0	0.2	0.5	4.8	2.7	5.5	51	0.4	0.1	3.37
PGIBI	35.2	0.1	9.1	6.3	0.3	0.5	5	6	21.5	72	4.1	0.4	7.7
PGIB2	16.1	0.1	2.7	1.8	0.2	0.6	4.5	6.1	10.7	43	0.9	0.1	5.23
PGIB3	29.5	0.1	1.7	0.9	0.3	0.6	4.4	6.7	9.3	28	0.4	0.1	4.56
PG1B4	10.7	0.0	1.5	0.9	0.2	0.4	4.3	7	9.5	26	0.5	0	5.09
PG1C1	17	0.2	9.1	7.7	0.4	0.4	4.6	8.3	25.3	67	4.9	0.3	7.96
PG1C2	22.9	0.2	4.1	4.5	0.4	0.7	4.2	9.6	18.3	48	2.1	0.1	10+
PG1C3	33.7	0.1	0.9	0.8	0.2	0.8	4.2	6.7	8.5	21	0.4	0.1	6.99
PG1C4	21	0.1	0.7	0.4	0.2	1.0	4.5	4.4	5.6	21	0.3	0.1	3.37
PG2A1	32.4	0.1	10.7	8.2	0.3	0.5	5	6.7	25.8	74	4.1	0.4	10.0
PG2A2	15.4	0.1	5.5	4.6	0.4	0.4	4.3	9	19.1	53	1.2	0.1	10+
PG2A3	24.1	0.1	1.8	1.2	0.3	0.6	4.2	7.6	10.7	29	0.6	0.2	8.24
PG2A4	38.5	0.1	0.9	0.5	0.2	0.9	4.5	3.8	5.2	27	0.3	0.3	2.29
PG2B1	33.1	0.1	12.3	9.3	0.4	0.4	5.2	6.4	28.2	77	7	1	9.21
PG2B2	25.6	0.1	4.9	3.7	0.5	0.5	4.1	9.2	17.9	49	2.2	0.3	10+
PG2B3	38	0.1	1.5	0.8	0.3	0.7	4.2	4.9	7.3	33	0.8	0.1	5.53
PG2B4	28.2	0.1	0.8	0.3	0.2	0.8	4.4	3.2	4.4	27	0.3	0.2	3.1
PG2C1	14.1	0.1	12.6	8.9	0.5	0.4	5	7.6	29.3	74	7.9	0.3	7.45
PG2C2	21.7	0.2	3.7	3.0	0.6	0.4	3.9	11	17.8	38	2.1	0	10+
PG2C3	4.7	0.2	4.0	4.3	0.8	0.4	3.8	11.5	20	43	2.9	0.2	10+
PG2C4	47.4	0.1	1.0	0.6	0.2	0.8	4.3	5	6.6	24	0.6	0	3.77
PG3A1	37.5	0.1	7.0	4.9	0.4	0.5	4.5	9	21.1	57	2.1	0.3	10+
PG3A2	27.9	0.1	2.0	1.1	0.3	0.7	4.4	6.3	9.5	34	0.6	0.1	5.69
PG3A3	24.5	0.1	0.8	0.3	0.2	0.9	4.6	2.6	3.7	30	0.3	0.2	2.22
PG3A4	3.3	0.1	1.0	0.4	0.2	0.9	4.8	2.4	3.9	38	0.4	0.3	1.74
PG3B1	29.9	0.3	9.9	5.9	0.4	0.4	4.8	7.5	23.6	68	7	0.8	10.0

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PG3B2	18.1	0.1	4.7	2.8	0.6	0.4	4.1	10.2	17.9	43	1.5	0.1	10+
PG3B3	13.1	0.1	1.7	0.7	0.3	0.7	4.2	7	9.5	26	0.6	0.2	9.21
PG3B4	13	0.1	1.6	0.8	0.2	0.8	4.6	4	6.5	38	0.7	0.2	4.44
PG3C1	13.4	0.3	11.2	9.9	0.4	0.4	5.1	7.2	28.5	75	6.5	0.4	10+
PG3C2	17.3	0.2	4.4	4.8	0.6	0.4	4.1	9.9	19.3	49	2.2	0.2	10+
PG3C3	15.4	0.1	1.0	0.7	0.2	0.7	4.3	6.6	8.5	22	0.4	0.2	5.11
PG3C4	15.8	0.1	1.5	0.8	0.2	0.8	4.6	4.6	7	34	0.6	0.2	3.67
PG4A1	39.8	0.2	9.9	6.5	0.4	0.5	5.1	6.6	23.3	72	4.6	0.4	10+
PG4A2	14.1	0.1	3.2	2.1	0.4	0.6	4.4	7.6	13	42	0.8	0	10+
PG4A3	4.3	0.1	1.1	0.5	0.2	1.0	4.8	3.6	5.4	33	0.2	0.3	1.25
PG4A4	15.1	0.1	1.6	0.8	0.2	0.9	4.7	4.3	6.8	37	0.4	0.1	2.37
PG4B1	32.2	0.2	9.3	6.5	0.3	0.5	4.8	7.4	23.4	68	3.8	0.2	10.0
PG4B2	16.7	0.2	4.8	3.7	0.4	0.4	4.1	10.2	18.9	46	1.4	0	10+
PG4B3	8.3	0.1	1.2	0.7	0.2	0.7	4.1	6.9	8.9	22	0.3	0	6.78
PG4B4	16	0.1	1.2	0.6	0.2	0.9	4.6	4.2	6	30	0.3	0.1	2.15
PG4C1	17	0.3	9.0	7.6	0.3	0.4	5	6.6	23.4	72	6.5	1	8.54
PG4C2	12.2	0.3	6.1	6.6	0.5	0.5	4.2	9.6	22.6	58	3.9	0.2	10+
PG4C3	41.9	0.2	3.5	3.0	0.3	0.6	4.2	9.1	15.7	42	1.9	0	10+
PG4C4	10.1	0.1	1.2	0.7	0.2	0.8	4.3	6.6	8.6	23	0.5	0.1	4.44
PG5A1	41	0.2	5.6	2.7	0.3	0.5	4.4	8.2	16.7	51	2.4	0	10+
PG5A2	8.8	0.1	1.9	0.8	0.3	0.6	4.3	7.8	10.7	27	0.5	0	9.59
PG5A3	10	0.1	1.5	0.7	0.2	0.8	4.3	6.7	9	26	0.4	0	4.95
PG5A4	8.7	0.1	1.4	0.6	0.2	0.9	4.6	5.1	7.2	29	0.3	0.3	1.94
PG5B1	32.5	0.2	10.4	5.1	0.4	0.5	4.8	7.3	22.9	68	6.8	0.7	10+
PG5B2	17.3	0.2	4.4	2.2	0.6	0.4	4.2	9.8	16.6	41	2.4	0.2	10+
PG5B3	5.4	0.1	2.1	0.8	0.4	0.6	4.3	7.6	10.6	28	0.9	0.2	7.96
PG5B4	2.1	0.1	1.0	0.4	0.2	0.7	4.5	5.1	6.6	23	0.3	0.4	3.28
PG5C1	13.7	0.4	6.3	4.1	0.4	0.5	4.3	10.3	21.1	51	4.1	0.1	10+
PG5C2	14.6	0.3	3.3	2.8	0.6	0.5	4	11	17.4	37	2.1	0	10+
PG5C3	14.1	0.1	1.4	0.9	0.3	0.6	4	8.4	10.8	22	0.7	0.1	8.86

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PG5C4	6.7	0.1	1.6	0.7	0.2	0.7	4.3	6.5	8.9	27	0.5	0.2	5.09
PG6A1	24.6	0.2	6.6	2.7	0.3	0.6	4.3	8	17.4	54	2.6	0	10+
PG6A2	16.5	0.1	1.6	0.7	0.2	0.7	4.1	7.4	9.8	24	0.4	0.1	8.54
PG6A3	22.1	0.1	0.7	0.3	0.2	0.9	4.4	3.8	4.8	21	0.2	0.2	2.01
PG6A4	10.3	0.1	0.9	0.3	0.2	1.0	4.7	3.1	4.4	30	0.3	0.2	0.97
PG6B1	21.3	0.2	9.1	4.7	0.5	0.5	4.7	7.5	21.4	65	4.1	0.3	10+
PG6B2	15.8	0.2	6.8	4.2	0.6	0.4	4.2	9	20.2	55	2.6	0.1	10+
PG6B3	19.1	0.1	1.9	1.1	0.3	0.4	4.1	8.4	11.5	27	0.6	0	10.0
PG6B4	15.8	0.1	1.5	0.7	0.2	0.8	4.3	6.2	8.5	27	0.4	0.1	5.23
PG6C1	27.8	0.2	5.0	2.9	0.3	0.6	4.2	9.2	17.2	47	4.1	0.5	10+
PG6C2	8.4	0.2	2.3	2.2	0.4	0.4	4	10.6	15.2	30	1.5	0.2	10+
PG6C3	17	0.1	1.7	1.4	0.5	0.4	4	8.8	12.1	27	1	0.2	9.21
PG6C4	9.4	0.1	0.9	0.5	0.2	1.0	4.4	4.2	5.7	26	0.3	0.3	4.56
PG7A1	23	0.2	3.3	1.3	0.3	0.5	4	9.5	14.3	34	1.8	0.1	10+
PG7A2	16.6	0.1	2.0	0.8	0.3	0.7	4	7.9	10.8	27	0.7	0	10.0
PG7A3	20.2	0.1	0.7	0.3	0.2	0.9	4.5	2.9	4	28	0.2	0.3	1.94
PG7A4	19	0.1	0.8	0.3	0.2	1.0	4.8	2.6	3.8	32	0.3	0.3	1.19
PG7B1	18.6	0.2	4.0	1.8	0.4	0.5	4	9.2	15.2	39	3.1	0	9.59
PG7B2	7.7	0.1	3.5	2.5	0.7	0.4	3.9	10.8	16.9	36	1.3	0	10+
PG7B3	23.2	0.1	1.3	0.7	0.4	0.6	3.9	8.7	10.7	19	0.5	0	7.45
PG7B4	12.8	0.1	1.1	0.4	0.3	0.9	4.4	5.1	6.6	23	0.6	0	3.77
PG7C1	13.3	0.4	2.5	2.4	0.6	0.4	3.9	10.2	15.5	34	2.4	0	10+
PG7C2	1.4	0.3	1.1	1.9	0.6	0.3	3.6	11.2	14.5	23	0.7	0	10+
PG7C3	18	0.3	1.1	1.3	0.4	0.4	3.7	9.8	12.4	21	0.8	0	6.78
PG7C4	20.2	0.2	0.9	0.5	0.2	0.9	4.3	5	6.6	24	0.3	0.2	3.67
PG8A1	19.4	0.1	4.0	1.5	0.5	0.4	4	9.1	14.7	38	1.3	0	10+
PG8A2	20.4	0.1	1.4	0.6	0.3	0.5	4.1	8.6	10.7	20	0.5	0.1	6.2
PG8A3	20.1	0.1	0.7	0.2	0.2	0.9	4.5	4	5	20	0.3	0.1	2.68
PG8A4	13.7	0.1	0.8	0.2	0.2	1.0	5.1	2	3.1	35	0.3	0.2	1.02
PG8B1	23.3	0.2	5.6	1.9	0.4	0.4	4.1	9.1	16.7	46	3	0	9.21

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PG8B2	13.4	0.1	4.3	2.2	0.4	0.4	3.9	9.3	15.9	42	1.3	0	10+
PG8B3	5.7	0.1	2.4	1.6	0.4	0.3	3.9	8.6	12.7	32	0.6	0	8.54
PG8B4	23	0.1	1.2	0.4	0.2	0.9	4.5	4.4	6.1	28	0.4	0	3.01
PG8C1	14.6	0.2	3.1	2.1	0.4	0.5	3.7	10.8	16.1	33	3.2	0	10.0
PG8C2	3.5	0.1	1.2	2.3	0.5	0.4	3.7	11.7	15.3	24	0.7	0	10+
PG8C3	8.2	0.1	1.9	1.8	0.5	0.3	3.7	9.9	13.7	28	1.2	0	8.86
PG8C4	23.7	0.1	1.0	0.6	0.2	0.9	4.4	6.2	8	23	0.5	0.1	3.87
PG9A1	13.4	0.1	1.6	1.1	0.4	0.4	3.7	10.9	13.7	20	1.5	0	10.0
PG9A2	25.5	0.1	0.9	0.5	0.3	0.6	3.9	8.4	9.9	15	0.4	0	7.21
PG9A3	32.9	0.1	0.9	0.3	0.2	1.0	4.6	3.9	5.2	25	0.4	0	2.15
PG9A4	20.6	0.1	0.8	0.3	0.2	1.1	4.6	2.8	3.9	28	0.3	0	1.94
PG9B1	13.7	0.2	2.1	1.5	0.5	0.4	3.7	10.9	14.7	26	2.3	0	8.24
PG9B2	2.4	0.1	1.4	1.1	0.6	0.3	3.8	9.4	12	22	0.8	0	7.45
PG9B3	4.5	0.1	1.7	1.4	0.6	0.4	3.6	11.4	14.6	22	1	0	9.59
PG9B4	29	0.1	1.5	0.6	0.4	0.5	4.2	7.1	9.2	23	1.2	0.1	6.99
PG9C1	12.1	0.1	2.9	1.8	0.4	0.4	3.5	11.7	16.5	29	4.3	0	7.64
PG9C2	4.5	0.1	2.1	1.8	0.6	0.4	3.7	12	16	25	2.5	0	7.96
PG9C3	2.8	0.1	1.7	1.5	0.6	0.3	3.6	9.8	13.1	25	1.2	0	9.21
PG9C4	4.4	0.1	1.7	1.3	0.7	0.3	3.9	9.6	12.7	24	0.8	0.1	6.58
PG10A1	16.5	0.2	1.7	1.2	0.4	0.5	3.8	9.1	12.1	25	2.5	0.2	9.59
PG10A2	3.3	0.1	1.0	1.1	0.5	0.3	3.8	10	12.2	18	0.7	0	8.24
PG10A3	9.6	0.0	0.8	0.7	0.5	0.3	3.7	8.4	9.9	15	0.3	0.1	3.77
PG10A4	31.3	0.0	0.6	0.3	0.2	0.8	4.1	6.2	7.2	14	0.3	0.3	4.2
PG10B1	11.8	0.1	1.6	1.1	0.4	0.4	3.8	10.3	13	21	2	0.1	8.54
PG10B2	4.3	0.1	1.1	1.0	0.5	0.4	3.6	9.6	11.8	19	0.9	0	7.21
PG10B3	2.5	0.1	1.2	1.0	0.6	0.3	3.7	10.4	12.7	18	0.5	0	7.45
PG10B4	31.7	0.1	1.7	0.7	0.4	0.6	4	8	10.4	23	0.6	0.4	6.78
PG10C1	19.3	0.1	2.3	1.1	0.3	0.5	3.6	9.2	12.7	28	3.4	0.1	7.96
PG10C2	8.3	0.1	1.8	1.5	0.5	0.3	3.6	9.1	12.5	27	2.3	0.1	8.86
PG10C3	2.5	0.1	1.2	1.2	0.5	0.4	3.7	10.2	12.7	20	1	0	9.59

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PG10C4	2.6	0.1	1.1	0.8	0.4	0.3	3.7	10.9	12.8	15	0.6	0	3.77
PZ1A1	23.2	0.2	11.2	1.0	0.2	0.6	4.4	8.3	20.7	60	2.2	0.6	10+
PZ1A2	28.3	0.1	5.7	0.5	0.2	0.6	3.9	8.7	15	42	0.5	0.1	10+
PZ1A3	79	0.1	2.0	0.3	0.2	1.0	4.2	5.8	8.3	30	0.3	0.2	4.09
PZ1A4	16.9	0.2	2.8	1.1	0.1	1.1	4.6	3.5	7.6	54	0.4	0.4	2.84
PZ1B1	30	0.2	12.4	2.4	0.2	0.6	4.8	7.1	22	68	3.6	0.5	10+
PZ1B2	20.2	0.1	5.5	0.8	0.2	0.6	4.1	8.6	15	43	0.7	0.1	10+
PZ1B3	65	0.1	1.6	0.3	0.2	1.0	4.2	5.2	7.2	28	0.2	0.2	2.52
PZ1B4	8.1	0.2	1.8	0.5	0.1	1.1	4.6	2.4	4.9	51	0.2	0.3	0.81
PZ1C1	40.2	0.3	14.3	2.0	0.2	0.6	4.8	7.2	23.7	70	3.6	1.2	10+
PZ1C2	12.8	0.2	5.8	0.5	0.2	0.6	4.2	8.6	15.1	43	0.6	0.1	10+
PZ1C3	65.1	0.1	2.7	0.3	0.2	0.8	4	7.4	10.5	30	0.3	0	9.21
PZ1C4	21.2	0.2	2.1	0.5	0.1	1.2	4.5	3.8	6.6	42	0.4	0.4	0.81
PZ2A1	35	0.4	13.9	1.7	0.2	0.6	4.9	5.6	21.6	74	2.1	1.2	10+
PZ2A2	75.9	0.1	3.9	0.5	0.2	0.8	4.1	6.7	11.2	40	0.4	0.2	6.38
PZ2A3	27.8	0.1	1.5	0.3	0.1	0.9	4.4	4.6	6.5	29	0.2	0.3	2.6
PZ2A4	11.2	0.1	2.0	0.4	0.1	0.9	4.6	5.1	7.6	33	0.5	0.4	3.1
PZ2B1	35.9	0.2	14.1	1.8	0.2	0.6	4.8	7	23.1	70	3.3	1.1	10+
PZ2B2	12.2	0.1	5.0	0.6	0.1	0.6	3.9	7.9	13.5	41	0.6	0.1	10+
PZ2B3	80.8	0.1	1.7	0.3	0.2	0.9	4.2	6.2	8.2	24	0.4	0.4	4.56
PZ2B4	8.4	0.2	2.0	0.7	0.1	1.2	4.7	3.6	6.5	45	0.4	0.7	0.94
PZ2C1	39.4	0.3	13.6	1.2	0.2	0.6	4.8	7.6	22.7	67	2.6	0.6	10+
PZ2C2	14.9	0.2	6.1	0.4	0.2	0.5	3.8	9.7	16.3	40	0.8	0.1	10+
PZ2C3	45	0.1	1.9	0.3	0.1	0.9	4.1	6.2	8.5	27	0.5	0.4	5.38
PZ2C4	7	0.2	2.0	0.5	0.1	1.0	4.6	4.8	7.6	37	0.5	0.8	1.94
PZ3A1	36.2	0.3	14.3	1.5	0.2	0.6	4.9	7.5	23.6	68	2.4	1.5	10+
PZ3A2	95.9	0.1	4.0	0.5	0.2	0.8	4.3	7.3	11.8	38	0.7	0.3	5.38
PZ3A3	35.9	0.1	1.5	0.3	0.2	1.0	4.5	4.2	6.1	31	0.4	0.2	1.94
PZ3A4	5.1	0.2	3.3	1.0	0.1	1.2	4.7	6.2	10.7	42	0.5	0.9	0.71
PZ3B1	35.4	0.3	15.4	1.1	0.2	0.6	4.9	7.6	24.4	69	2.7	0.7	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ3B2	82.4	0.1	3.0	0.3	0.2	0.9	4.1	7.6	11	31	0.5	0.1	7.21
PZ3B3	24	0.1	1.5	0.4	0.1	1.1	4.5	5	7	29	0.4	0.3	1.37
PZ3B4	8.8	0.2	3.2	1.3	0.1	1.2	4.8	2.4	7.1	66	1	0.8	0.51
PZ3C1	103.8	0.2	13.0	1.0	0.2	0.7	5	6.4	20.5	69	3.7	1.4	10+
PZ3C2	30.1	0.1	6.7	0.5	0.2	0.5	3.9	9.4	16.7	44	1.1	0.3	10+
PZ3C3	48.3	0.1	1.4	0.3	0.1	0.8	4.1	7.4	9.1	19	0.4	0.1	4.44
PZ3C4	21.7	0.2	1.8	0.7	0.1	1.0	4.5	4.6	7.2	36	0.4	0.4	1.31
PZ4A1	33.5	0.2	13.2	1.2	0.2	0.7	4.9	7.7	22.2	65	2.1	1.5	10+
PZ4A2	40.3	0.1	4.0	0.4	0.3	0.8	4.2	8.4	12.8	34	0.7	0.2	8.86
PZ4A3	29.5	0.1	1.6	0.3	0.2	1.1	4.6	4.8	6.9	30	0.4	0.3	1.43
PZ4A4	2.3	0.2	3.8	1.3	0.2	1.2	4.9	2	7.2	72	0.8	1.1	0.22
PZ4B1	40.3	0.4	15.0	1.8	0.3	0.7	5.1	7.3	24.5	70	2.9	1.2	10+
PZ4B2	19	0.1	6.2	0.5	0.3	0.8	4.3	7.9	14.7	46	0.7	0.2	10+
PZ4B3	23	0.1	1.5	0.2	0.2	1.0	4.5	6	7.8	23	0.3	0.1	2.01
PZ4B4	2.9	0.2	2.7	0.7	0.2	1.2	4.8	2.8	6.4	56	0.5	0.4	0.92
PZ4C1	71.8	0.2	16.9	1.2	0.3	0.7	5.5	5.2	23.5	78	3.4	2.4	10+
PZ4C2	121	0.1	4.7	0.3	0.3	0.8	4	8	13.1	39	1.1	0.2	10+
PZ4C3	59.7	0.0	1.3	0.2	0.2	1.0	4.3	4.8	6.4	25	0.4	0.1	2.37
PZ4C4	19.7	0.1	1.5	0.4	0.2	1.2	4.8	2.5	4.5	44	0.4	0.4	0.76
PZ5A1	32.8	0.2	14.4	2.1	0.2	0.6	5.1	6.9	23.5	71	2.7	1	10+
PZ5A2	25.6	0.1	3.8	0.4	0.2	0.7	4.4	7.8	12.1	36	0.5	0.1	5.85
PZ5A3	24.9	0.2	2.8	0.6	0.3	0.8	4.6	6	9.5	37	0.5	0.3	3.47
PZ5A4	3	0.2	5.8	1.9	0.2	1.1	5	5.7	13.5	58	0.5	0.1	0.6
PZ5B1	41.4	0.2	16.9	2.5	0.3	0.6	5.2	6.9	26.5	74	3.6	1.3	10+
PZ5B2	11.3	0.1	5.3	0.6	0.3	0.7	4	8.9	14.9	40	0.5	0.1	10+
PZ5B3	41	0.1	1.4	0.3	0.2	0.9	4.3	6.2	7.9	22	0.3	0.2	2.52
PZ5B4	19.7	0.2	4.7	1.3	0.2	1.1	4.9	4	10.3	61	0.6	0.6	1.49
PZ5C1	150.6	0.4	17.8	1.0	0.2	0.6	5.5	4.4	23.6	81	5.8	1.1	10+
PZ5C2	150.6	0.1	6.0	0.3	0.2	0.7	4.2	7.8	14.2	45	1.2	0.2	10+
PZ5C3	50.3	0.1	2.6	0.4	0.2	0.8	4.2	8	11	27	0.3	0.1	8.54

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ5C4	26.5	0.1	3.0	0.7	0.2	1.1	4.8	3.6	7.4	51	0.4	0.4	1.61
PZ6A1	48.6	0.2	13.4	1.6	0.2	0.6	4.7	7.4	22.6	67	3	1.2	10+
PZ6A2	59.2	0.1	3.4	0.3	0.2	0.8	4.2	7.5	11.3	34	0.3	0.1	7.96
PZ6A3	27.8	0.1	1.4	0.3	0.2	1.0	4.6	4.7	6.5	28	0.1	0.4	1.49
PZ6A4	5.3	0.2	3.4	0.8	0.2	1.1	4.7	4.3	8.7	51	0.3	0.4	0.97
PZ6B1	46.1	0.2	15.2	1.9	0.3	0.6	5	7.4	24.7	70	2.7	1.3	10+
PZ6B2	14.8	0.1	7.0	0.4	0.3	0.6	4.2	8.6	16	46	0.4	0.1	10+
PZ6B3	43.8	0.1	2.3	0.4	0.2	1.0	4.6	5.1	7.9	35	0.2	0.3	3.19
PZ6B4	9.1	0.2	3.4	1.1	0.2	1.2	4.9	3.6	8.3	57	0.4	0.6	0.51
PZ6C1	117.4	0.3	9.0	0.9	0.2	0.8	5.2	5.3	15.4	66	2.9	0.7	10+
PZ6C2	15.5	0.1	4.0	0.3	0.3	0.6	3.8	9.4	13.8	32	0.5	0	10+
PZ6C3	39.9	0.1	1.0	0.2	0.2	1.0	4.1	6.6	7.9	16	0.2	0	3.47
PZ6C4	14	0.2	1.6	0.4	0.2	1.0	4.5	4.6	6.7	31	0.2	0.3	1.43
PZ7A1	39.5	0.2	9.9	1.5	0.2	0.8	4.9	7	18.6	62	2	0.9	10+
PZ7A2	25.6	0.1	6.6	0.7	0.2	0.8	4.4	7.6	15	49	0.9	0.4	10+
PZ7A3	18.8	0.1	1.9	0.2	0.1	1.1	4.4	5.7	7.9	28	0.2	0.1	3.87
PZ7A4	5.5	0.2	3.6	1.0	0.2	1.2	4.8	3.6	8.4	57	0.3	0.1	0.56
PZ7B1	28.8	0.2	12.2	2.0	0.2	0.8	5.4	5.5	19.9	72	4.4	1.1	10+
PZ7B2	13.1	0.1	3.3	0.3	0.2	0.9	4.2	7.5	11.1	32	0.4	0	10+
PZ7B3	12.7	0.1	2.8	0.6	0.2	1.2	5	2.4	5.9	59	0.6	0.5	1.14
PZ7B4	21.4	0.1	1.9	0.2	0.1	1.0	4.6	5.2	7.4	30	0.3	0.1	4.81
PZ7C1	41.9	0.4	9.2	0.7	0.2	0.7	5.3	5.5	15.8	65	3.9	1.6	10+
PZ7C2	17.1	0.1	5.3	0.3	0.2	0.7	4.3	8.2	13.9	41	0.6	0.1	10+
PZ7C3	30.3	0.1	1.7	0.2	0.1	1.0	4.3	5.3	7.2	26	0.2	0	3.1
PZ7C4	13	0.1	1.9	0.4	0.1	1.2	4.7	3	5.4	44	0.2	0	0.66
PZ8A1	37.1	0.2	11.8	0.7	0.2	0.7	5	7	19.7	64	4.7	0.9	10+
PZ8A2	19.2	0.1	4.7	0.3	0.2	0.8	4.3	7.4	12.4	40	0.6	0.1	10+
PZ8A3	6.4	0.2	3.1	0.5	0.2	1.2	4.5	5.3	9.1	42	0.2	0.3	0.71
PZ8A4	6	0.2	4.4	1.0	0.1	1.2	4.8	2.7	8.3	67	0.2	0.5	0.32
PZ8B1	23.3	0.2	11.9	1.3	0.2	0.6	5.1	6.4	19.8	68	5.5	1.2	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ8B2	6	0.1	3.9	0.4	0.3	0.5	4.3	8.6	13	34	0.4	0	10+
PZ8B3	7.6	0.1	2.3	0.3	0.1	0.9	4.4	6.3	8.9	29	0.2	0.1	9.59
PZ8B4	2.6	0.2	4.3	1.3	0.2	1.2	4.8	2.4	8.2	71	0.4	0.3	0.81
PZ8C1	22	0.2	4.2	0.3	0.2	0.7	4.6	7.8	12.4	37	1.9	1.1	10+
PZ8C2	16.8	0.1	1.9	0.2	0.2	0.7	4.1	8.3	10.4	20	0.6	0.1	10+
PZ8C3	8.5	0.1	1.6	0.2	0.2	0.9	4.5	5.4	7.3	26	0.3	0	3.87
PZ8C4	2	0.2	5.1	1.6	0.2	1.2	4.9	3	9.9	70	0.5	0.1	0.71
PZ9A1	52.2	0.3	9.9	1.3	0.2	0.6	4.9	6.8	18.4	63	5.5	1.2	10+
PZ9A2	21	0.1	4.1	0.3	0.2	0.6	4.3	7.9	12.4	36	0.7	0.2	9.59
PZ9A3	23.8	0.1	2.8	0.6	0.1	1.1	4.6	4.4	7.9	44	0.2	0.1	1.43
PZ9A4	7.6	0.2	5.8	1.6	0.2	1.2	5.1	2.3	9.9	77	0.2	0.7	0.41
PZ9B1	25.8	0.3	11.6	0.7	0.2	0.6	5.2	6.5	19.1	66	1.9	0.5	10+
PZ9B2	9.1	0.1	3.7	0.2	0.2	0.6	4.5	8.3	12.3	33	0.3	0.1	10+
PZ9B3	10.7	0.1	1.8	0.3	0.2	1.1	4.6	4.6	6.7	31	0.2	0.1	1.8
PZ9B4	0.8	0.2	4.2	1.2	0.1	1.2	4.8	3.2	8.7	63	0.2	0.5	0.56
PZ9C1	44.7	0.2	9.3	0.8	0.2	0.7	5	5.9	16.2	64	2.6	0.7	10+
PZ9C2	13.1	0.1	2.6	0.2	0.2	0.8	4.2	8.4	11.3	26	0.3	0.1	10+
PZ9C3	27.3	0.1	1.0	0.1	0.1	1.0	4.5	4.6	5.7	19	0.1	0	3.19
PZ9C4	4.3	0.1	2.2	0.7	0.1	1.2	4.8	3.2	6.2	48	0.2	0.1	0.56
PZ10A1	28.6	0.2	11.8	1.2	0.3	0.6	5.2	6	19.2	69	4.4	0.9	10+
PZ10A2	10.9	0.1	3.3	0.3	0.2	0.7	4.6	6.2	9.9	37	0.5	0.1	10+
PZ10A3	6.6	0.1	2.4	0.5	0.2	1.1	4.8	3.4	6.4	47	0.1	0	1.87
PZ10A4	0.3	0.2	5.4	1.6	0.2	1.2	4.9	2.7	9.9	73	0.3	0.1	0.51
PZ10B1	47	0.3	14.7	2.0	0.2	0.5	5.3	5.5	22.5	76	3	0.6	10+
PZ10B2	22	0.1	4.7	0.6	0.2	0.7	4.9	5.9	11.2	47	0.4	0.2	8.86
PZ10B3	10.7	0.1	2.8	0.7	0.2	1.1	5	2.8	6.4	56	0.2	0.1	1.8
PZ10B4	0.8	0.2	6.2	2.3	0.2	1.2	5	2.4	11.1	78	0.2	0.3	0.41
PZ10C1	45.4	0.2	16.4	1.4	0.2	0.6	5.5	4.7	22.7	79	2.6	1	10+
PZ10C2	8.9	0.1	4.5	0.4	0.2	0.6	4.6	6.4	11.3	43	0.3	0.1	10+
PZ10C3	9	0.1	2.2	0.4	0.1	1.0	4.8	3.3	6	45	0.1	0	3.1

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ10C4	0.3	0.2	5.7	1.9	0.2	1.2	5	2.6	10.3	75	0.3	0.1	0.76
PZ11A1	61.3	0.2	11.4	1.3	0.3	0.7	5	6.2	19.1	68	4.8	0.9	10+
PZ11A2	14.1	0.1	3.0	0.3	0.2	0.8	4.5	5.4	8.8	39	0.5	0.1	7.96
PZ11A3	5.2	0.1	1.2	0.2	0.2	1.2	4.8	2.4	4	40	0.2	0	0.6
PZ11A4	14.6	0.2	2.0	0.5	0.2	1.1	4.9	2.7	5.3	49	0.3	0.2	0.92
PZ11B1	33.8	0.2	11.4	0.8	0.2	0.7	4.9	6.3	18.7	66	1.3	0.7	10+
PZ11B2	0	0.1	2.2	0.2	0.2	1.0	4.9	4.2	6.6	36	0.4	0.1	2.52
PZ11B3	0	0.1	1.2	0.2	0.2	1.3	5.1	1.5	3	50	0.6	0.1	0.46
PZ11B4	14	0.2	1.7	0.4	0.2	1.2	5	2.2	4.4	50	0.4	0.3	0.36
PZ11C1	50.1	0.2	11.4	1.3	0.2	0.7	5	6.9	19.8	65	3.3	1.1	10+
PZ11C2	41.5	0.1	3.0	0.4	0.2	0.7	4	8.4	11.9	29	1.1	0.1	10+
PZ11C3	3.1	0.1	1.1	0.2	0.2	1.1	4.5	4.7	6.1	23	0.4	0.1	2.44
PZ11C4	0	0.1	1.1	0.3	0.2	1.2	4.9	2.2	3.7	41	0.3	0.2	0.56
PZ2A1	32.1	0.1	13.7	1.3	0.2	0.7	5.1	5.6	20.7	73	7.1	3.1	10+
PZ2A2	8.2	0.1	2.8	0.3	0.2	1.0	4.4	5.6	8.8	36	0.8	0.4	6.78
PZ12A3	2	0.1	1.1	0.2	0.2	1.1	4.8	3.5	4.9	29	0.3	0.1	1.49
PZ12A4	1.9	0.1	1.5	0.4	0.1	1.0	4.8	3.5	5.6	38	0.4	0.2	2.84
PZ12B1	30.8	0.1	12.3	1.0	0.2	0.6	5.1	6.2	19.7	69	2	1.5	10+
PZ12B2	6.8	0.1	3.2	0.3	0.2	0.9	4.6	5.5	9	39	0.4	0.2	6.99
PZ12B3	7.7	0.1	1.3	0.3	0.1	1.1	4.9	3.4	5.2	35	0.3	0.3	1.8
PZ12B4	3.8	0.2	1.2	0.4	0.2	1.1	5.1	2.6	4.3	40	0.3	0.3	0.76
PZ12C1	40.7	0.6	17.0	1.4	0.2	0.7	5.6	4.6	23.5	80	2.4	1.5	10+
PZ12C2	18.5	0.1	4.1	0.5	0.2	0.8	4.1	8.2	12.9	36	0.5	0.2	10+
PZ12C3	9.3	0.1	1.5	0.4	0.2	1.1	4.6	4.7	6.7	30	0.4	0.2	4.56
PZ12C4	11.8	0.2	1.3	0.6	0.2	1.2	4.8	2.3	4.3	47	0.4	0.4	0.36
PZ13A1	24.3	0.1	8.3	0.5	0.2	0.9	4.8	6.4	15.4	58	1.3	1.2	10+
PZ13A2	0	0.1	1.7	0.3	0.1	1.1	4.7	4.3	6.4	33	0.3	0.2	1.31
PZ13A3	0	0.1	1.0	0.2	0.2	1.1	5	3	4.3	30	0.3	0.2	0.46
PZ13A4	3.2	0.1	1.1	0.3	0.1	1.1	5	2.2	3.7	41	0.3	0.3	0.66
PZ13B1	35.6	0.2	16.3	2.6	0.2	0.7	5.8	3.5	22.6	85	4.3	1.3	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ13B2	19.2	0.1	4.9	0.5	0.2	0.8	4.4	7.2	12.7	43	0.6	0.2	10+
PZ13B3	1.2	0.1	1.5	0.3	0.2	1.0	4.4	5.5	7.4	26	0.3	0.3	2.6
PZ13B4	12.3	0.1	1.5	0.4	0.2	1.0	4.7	4.3	6.3	32	0.3	0.4	3.28
PZ13B1	42.9	0.3	16.8	1.5	0.3	0.7	5.4	4.8	23.3	79	2.2	0.7	10+
PZ13B2	18.9	0.1	3.6	0.4	0.3	0.7	4.2	7.6	11.7	35	0.4	0.1	10+
PZ13B3	16	0.1	2.0	0.3	0.2	0.8	4.2	7.5	9.9	24	0.4	0.1	9.21
PZ13B4	15.7	0.1	1.5	0.5	0.2	1.2	4.7	3.8	5.9	36	0.4	0.5	1.55
PZ14A1	53.2	0.3	12.6	1.8	0.2	0.6	5	6.9	21.6	68	5.3	1.1	10+
PZ14A2	10.6	0.1	4.0	0.5	0.2	0.7	4.6	7.1	11.7	39	0.6	0.2	10+
PZ14A3	0	0.2	4.4	1.1	0.2	1.1	4.9	2.9	8.6	66	0.4	0.2	1.08
PZ14A4	0	0.2	8.7	3.0	0.2	1.2	5.1	1.9	13.7	86	0.3	0.1	0.51
PZ14B1	36.6	0.2	15.4	1.4	0.3	0.5	4.8	7.8	24.8	69	1.7	1.4	10+
PZ14B2	6.7	0.1	4.2	0.5	0.2	0.9	4.8	5	9.7	48	0.4	0.3	7.21
PZ14B3	0	0.1	3.8	1.0	0.2	1.3	5	1.7	6.6	74	0.3	0.2	0.76
PZ14B4	0	0.2	8.0	2.6	0.2	1.2	5.2	1.2	12	90	0.4	0.4	0.36
PZ14C1	40.5	0.2	16.9	2.3	0.3	0.6	5.1	6.8	26.2	74	5.9	2.4	10+
PZ14C2	28.7	0.1	4.9	0.6	0.4	0.5	4.2	9.9	15.5	36	0.6	0.3	10+
PZ14C3	5.3	0.1	2.0	0.4	0.2	1.0	4.8	4.5	7	36	0.3	0.1	3.28
PZ14C4	0	0.2	5.2	1.7	0.2	1.2	5.1	1.5	8.6	83	0.3	0.2	0.27
PZ15A1	49.8	0.4	12.4	1.7	0.2	0.7	4.8	8.1	22.5	64	2.8	1.8	10+
PZ15A2	26.1	0.1	3.5	0.5	0.3	0.7	4.2	9.2	13.3	31	0.4	0.2	10+
PZ15A3	25.3	0.2	2.1	0.7	0.2	1.1	4.5	5.2	8.1	36	0.4	0.6	2.22
PZ15A4	2.8	0.2	2.0	0.9	0.2	1.2	4.7	1.9	5.1	63	0.4	1.1	0.41
PZ15B1	44.2	0.2	16.5	1.0	0.3	0.6	5.1	6.7	24.4	73	4.3	1.6	10+
PZ15B2	31.1	0.1	5.4	0.5	0.3	0.7	4.2	9.1	15.1	40	0.6	0.2	10+
PZ15B3	21.5	0.1	1.4	0.3	0.2	1.1	4.5	4.7	6.5	28	0.4	0.2	2.08
PZ15B4	10.5	0.2	1.4	0.6	0.2	1.2	4.7	2.7	5	46	0.3	0.7	0.71
PZ15C1	40.9	0.3	14.1	0.9	0.3	0.6	4.7	8	23.2	66	4.6	0.9	10+
PZ15C2	17.1	0.1	3.9	0.8	0.3	0.6	4	9.8	14.6	33	0.6	0.1	10+
PZ15C3	24.6	0.1	0.9	0.3	0.2	1.1	4.3	5.5	6.8	19	0.3	0.1	2.44

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ15C4	18.2	0.1	1.0	0.4	0.1	1.2	4.7	4	5.5	27	0.1	0.3	1.55
B1A1	27.8	0.4	10.0	2.0	0.3	0.5	3.9	11	23.4	53	6.2	0.9	10+
B1A2	68.3	0.1	3.7	1.2	0.3	0.6	3.9	10.4	15.4	32	0.9	0.2	10+
B1A3	108.7	0.1	1.5	0.5	0.2	0.8	4.2	7.2	9.2	22	0.4	0.1	5.23
B1A4	30.1	0.1	1.3	0.6	0.1	1.0	4.5	4.6	6.6	30	0.6	0.3	3.47
B1B1	22.4	0.2	19.6	6.8	0.3	0.5	5.2	6.3	32.9	81	11.3	0.7	10+
B1B2	9.3	0.2	15.9	3.6	0.3	0.5	4.6	9	28.6	69	8.3	0.6	10+
B1B3	30.1	0.1	4.4	1.8	0.4	0.4	4.1	9.6	15.8	39	1.2	0.1	10+
B1B4	37.2	0.1	1.4	0.7	0.2	0.8	4.5	6.2	8.3	25	0.4	0.2	6.2
B1C1	34	0.5	17.5	3.6	0.3	0.6	4.5	8.7	30.3	71	8.9	0.4	10+
B1C2	25.2	0.2	7.5	2.6	0.3	0.5	4.2	9.6	19.9	52	2.2	0.2	10+
B1C3	98.8	0.1	2.0	0.9	0.2	0.9	4.4	6	8.9	33	0.5	0.1	4.44
B1C4	28.9	0.1	1.1	0.5	0.1	0.9	4.7	4.8	6.5	26	0.3	0.2	3.77
B2A1	78.1	0.7	21.7	9.2	0.3	0.5	5.7	4.8	36.4	87	10.5	1	10+
B2A2	18.5	0.2	8.2	2.9	0.4	0.5	4.2	9.8	21	53	2.2	0.4	10+
B2A3	108.7	0.1	1.2	0.6	0.1	0.9	4.2	7	8.8	20	0.3	0.2	4.51
B2A4	69.1	0.1	1.1	0.5	0.1	1.0	4.6	5.1	6.8	25	0.5	0.1	5.23
B2B1	29.4	0.4	15.4	5.1	0.3	0.5	5.3	5.8	26.7	78	8.3	0.6	10+
B2B2	11.4	0.1	6.5	2.9	0.4	0.6	4.4	8.6	18.1	52	1.5	0.1	10+
B2B3	78.1	0.0	1.4	0.8	0.2	0.8	4.2	6.6	8.9	26	0.4	0	5.53
B2B4	43.6	0.0	0.9	0.4	0.2	1.0	4.6	4.7	6	22	0.4	0	3.98
B2C1	36.8	0.2	16.7	6.2	0.3	0.5	5.5	5.4	28.4	81	7.3	0.8	10.0
B2C2	13	0.2	3.4	2.3	0.3	0.5	3.9	9.4	15.2	38	0.8	0.1	10+
B2C3	98.4	0.1	1.1	0.7	0.2	0.8	4	7.8	9.6	19	0.3	0	8.54
B2C4	74	0.1	0.8	0.3	0.1	1.0	4.3	5.4	6.6	18	0.4	0	4.32
B3A1	37.8	0.4	16.0	5.0	0.3	0.6	4.8	7.8	29.1	73	6.2	1.2	10+
B3A2	14.8	0.2	5.2	2.4	0.3	0.5	4.1	10.2	17.9	43	0.8	0.1	10+
B3A3	65.7	0.1	1.5	0.8	0.2	0.9	4.3	7	9.3	25	0.4	0.1	8.24
B3A4	22	0.1	0.8	0.4	0.1	0.9	4.5	5.1	6.4	20	0.3	0.1	3.28
B3B1	28.3	0.3	15.5	4.4	0.2	0.5	4.8	7.8	27.9	72	7.4	1.5	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B3B2	15	0.2	5.1	3.5	0.3	0.4	4.1	10.2	18.9	46	1.5	0.2	10+
B3B3	106	0.1	2.0	1.9	0.3	0.6	4.2	9.8	13.8	29	0.5	0	10+
B3B4	47.6	0.1	0.7	0.5	0.1	0.8	4.3	6	7.3	18	0.3	0.1	6.02
B3C1	32.5	0.3	16.1	4.4	0.2	0.5	4.9	6.8	27.5	75	6.1	1.1	10+
B3C2	12.1	0.2	6.1	2.4	0.3	0.4	3.9	10.8	19.5	45	1.3	0.1	10+
B3C3	37.2	0.1	1.7	1.8	0.3	0.5	3.7	10	13.7	27	0.5	0	10+
B3C4	72.2	0.1	0.7	0.4	0.2	0.8	4.2	6.6	7.8	15	0.3	0.1	5.23
B4A1	35.1	0.3	16.6	5.4	0.3	0.6	5.1	6.7	28.9	77	7.5	1.9	10+
B4A2	11.9	0.2	4.8	2.8	0.3	0.6	4.1	9.5	17.2	45	1.1	0.1	10+
B4A3	76.9	0.1	1.4	1.0	0.2	0.9	4.2	7.8	10.3	24	0.5	0	7.96
B4A4	18.9	0.1	0.9	0.4	0.2	1.1	4.6	4.8	6.2	23	0.4	0.1	3.28
B4B1	21.1	0.3	13.7	4.1	0.3	0.5	5.1	5.6	23.6	76	3.9	0.6	10+
B4B2	35	0.4	18.4	5.3	0.3	0.5	5.5	6.7	30.8	78	7.7	1.2	10+
B4B3	15.7	0.1	11.2	2.7	0.4	0.6	5.1	8.7	22.7	62	3.7	0.8	10+
B4B4	49.5	0.1	1.8	0.5	0.2	1.0	4.4	5.1	7.4	31	0.7	0.1	4.56
B4C1	107.2	0.1	1.5	0.9	0.2	0.7	4.4	8.3	10.8	23	0.5	0	7.96
B4C2	22.3	0.2	7.7	1.7	0.4	0.4	4.2	9.6	19.2	50	1.1	0.1	10+
B4C3	99.3	0.1	2.6	1.0	0.3	0.6	4.3	9	12.6	29	0.5	0	10+
B4C4	94.4	0.1	1.0	0.3	0.2	0.9	4.3	6.3	7.7	18	0.3	0	6.99
B5A1	28.7	0.3	18.2	3.3	0.3	0.6	5.1	6.4	28.3	77	6.2	1.2	10+
B5A2	10.1	0.1	5.2	2.0	0.4	0.4	4.4	9.2	16.5	44	0.8	0.1	10+
B5A3	63.7	0.0	1.0	0.4	0.1	0.9	4.2	6.8	8.3	18	0.4	0.2	5.23
B5A4	38	0.1	0.9	0.3	0.1	0.9	4.5	5.6	6.9	19	0.3	0.1	4.09
B5B1	26.6	0.1	19.8	3.3	0.3	0.5	5.2	6.3	29.5	79	7.9	1.6	10+
B5B2	12.4	0.1	5.9	2.3	0.3	0.4	4	9.2	17.5	47	1	0.1	10+
B5B3	60	0.1	1.7	1.0	0.4	0.5	4.1	8.8	11.5	23	0.2	0	9.21
B5B4	38.5	0.1	1.1	0.4	0.2	0.9	4.3	6.3	7.8	19	0.3	0.1	8.24
B5C1	24	0.3	15.1	2.5	0.4	0.5	4.9	7.4	25.2	71	5.5	0.6	10+
B5C2	15.1	0.2	7.9	2.2	0.4	0.5	4	10.2	20.4	50	1.7	0.3	10+
B5C3	72	0.1	1.7	0.7	0.2	0.7	4.1	7.8	10.3	24	0.4	0	7.7

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B5C4	32.5	0.1	1.0	0.3	0.1	0.9	4.4	5.4	6.7	19	0.3	0	4.69
B6A1	30.2	0.4	19.4	3.8	0.3	0.5	5.4	5.8	29.3	80	4.7	1.5	10+
B6A2	31.8	0.1	6.0	1.0	0.3	0.6	4.4	8.6	15.7	45	0.7	0.2	8.86
B6A3	92.9	0.1	1.9	0.4	0.2	0.9	4.5	5.8	8.2	29	0.3	0	4.2
B6A4	62.5	0.1	1.5	0.5	0.1	1.1	4.6	5	7.1	30	0.3	0	2.29
B6B1	24.3	0.3	18.1	2.8	0.3	0.5	5	7.1	28.2	75	5.2	1.3	10+
B6B2	10.5	0.1	7.3	1.9	0.3	0.5	4.3	9.4	18.8	50	0.9	0.2	10+
B6B3	57.1	0.1	2.0	0.7	0.2	0.7	4.3	7.6	10.4	27	0.8	0.3	7.45
B6B4	23.2	0.1	1.1	0.4	0.2	0.9	4.6	5.1	6.7	24	0.2	0	3.01
B6C1	20.3	0.2	15.4	2.3	0.3	0.5	4.8	8	26	69	5.6	0.6	10+
B6C2	11.2	0.2	7.1	2.5	0.4	0.5	4.1	10.6	20.4	48	1.3	0.1	10+
B6C3	51.3	0.1	2.5	1.2	0.4	0.4	4.1	9.5	13.2	28	0.5	0.1	9.59
B6C4	67.9	0.1	1.1	0.3	0.2	0.9	4.3	6	7.5	20	0.4	0	6.02
B7A1	32.3	0.3	21.6	4.2	0.3	0.5	5.5	5	31	84	8.3	1.5	9.59
B7A2	18.7	0.1	10.0	1.7	0.4	0.3	4.7	8.2	20	59	1.3	0.2	7.7
B7A3	79.8	0.1	2.9	0.6	0.2	0.9	4.5	6.3	9.9	36	0.4	0.1	6.78
B7A4	21	0.1	1.6	0.4	0.2	0.9	4.6	5.1	7.2	29	0.4	0.1	4.56
B7B1	36.3	0.3	20.9	2.8	0.3	0.5	5.3	5.9	29.9	80	9.5	3.6	10+
B7B2	10.8	0.1	7.0	1.6	0.4	0.4	4.2	9.1	17.8	49	1	0.3	10+
B7B3	76.7	0.0	2.0	0.6	0.2	0.8	4.1	8	10.6	25	0.3	0	6.99
B7B4	33.7	0.1	1.0	0.3	0.1	0.9	4.5	5.6	7	20	0.2	0	3.37
B7C1	33.6	0.4	18.3	3.0	0.4	0.5	5.2	6.7	28.4	76	8.1	1.5	10+
B7C2	20.4	0.2	17.5	3.4	0.3	0.5	4.8	8.4	29.5	72	4.8	1	10+
B7C3	52	0.1	2.6	0.9	0.2	0.7	4.2	8.3	11.9	30	0.7	0.1	7.45
B7C4	54.9	0.1	1.3	0.4	0.2	0.7	4.4	7.1	8.9	20	0.3	0	8.24
B8A1	32.5	0.2	13.9	2.4	0.2	0.5	4.7	7.9	24.4	68	3.6	1.6	10+
B8A2	39.9	0.1	3.3	0.7	0.3	0.6	4.2	8.9	12.9	31	0.4	0.1	9.59
B8A3	43.8	0.1	1.6	0.4	0.2	0.9	4.5	5.1	7.2	29	0.3	0.1	5.53
B8A4	18.1	0.1	1.4	0.4	0.2	0.9	4.6	4.4	6.3	30	0.3	0.3	4.56
B8B1	39	0.3	22.1	4.8	0.3	0.5	5.4	5.3	32.5	84	7.4	1	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B8B2	23	0.1	15.7	2.7	0.4	0.5	4.6	8.6	27.1	68	2.1	0.5	10+
B8B3	71.1	0.1	3.2	0.7	0.2	0.9	4.3	6.3	10.3	39	0.4	0.1	6.99
B8B4	23.5	0.1	1.6	0.4	0.1	0.9	4.6	4.6	6.7	31	0.3	0.3	5.53
B8C1	21.7	0.2	20.1	2.7	0.4	0.5	5	7	30.1	77	5.4	0.9	10+
B8C2	19.1	0.2	6.7	1.8	0.6	0.5	3.9	9.9	18.5	46	0.9	0.1	10+
B8C3	71.1	0.1	2.2	0.7	0.3	0.5	4.1	9.1	12.1	25	0.4	0.1	7.96
B8C4	22.8	0.1	1.2	0.3	0.3	0.9	4.4	5.6	7.2	22	0.6	0.3	5.69
B9A1	26.5	0.3	16.4	3.6	0.2	0.5	4.6	8	28.3	72	6.3	1.7	10+
B9A2	47.1	0.1	5.5	1.1	0.2	0.7	4.3	8	14.8	46	1.1	0.3	10+
B9A3	18	0.1	1.5	0.4	0.2	0.9	4.5	5.6	7.6	26	0.3	0.3	3.37
B9A4	24.9	0.2	2.3	0.7	0.2	1.1	4.7	3.7	6.9	46	0.4	0.3	1.61
B9B1	22.3	0.3	16.3	4.0	0.3	0.5	4.6	7.8	28.4	73	8.5	1.9	10+
B9B2	37.7	0.1	4.8	1.4	0.3	0.6	4.1	8.4	14.8	43	1.2	0.3	9.59
B9B3	35.9	0.1	1.4	0.5	0.2	0.8	4.3	6.8	8.8	23	0.4	0.1	4.32
B9B4	15	0.1	1.1	0.4	0.1	1.0	4.5	5.1	6.7	24	0.1	0.3	2.37
B9C1	36.2	0.3	18.3	3.0	0.3	0.5	4.9	7.2	28.8	75	12.7	4.3	10+
B9C2	20.8	0.2	11.6	3.5	0.3	0.5	4.3	9.6	24.8	61	2.5	0.6	10+
B9C3	42.2	0.1	4.0	2.3	0.4	0.5	4.1	9.2	15.6	41	0.9	0.1	10+
B9C4	121.8	0.1	1.5	0.7	0.2	0.9	4.3	6.6	8.8	25	0.4	0.1	5.53
B10A1	60.2	0.4	11.6	2.2	0.2	0.6	4.4	8.4	22.7	63	5.1	0.9	10+
B10A2	51.7	0.1	4.5	1.0	0.2	0.9	4.3	6.8	12.3	45	1.1	0.2	6.58
B10A3	15.1	0.1	1.3	0.4	0.2	1.0	4.5	4.6	6.4	28	0.3	0.1	2.29
B10A4	9.3	0.1	1.1	0.4	0.2	1.1	4.7	3.1	4.7	34	0.3	0.2	1.74
B10B1	30	0.4	16.1	4.5	0.4	0.5	5.2	6.3	27.2	77	6.3	1.2	10.0
B10B2	15.5	0.1	11.2	3.8	0.4	0.4	4.6	7.9	23	66	1.8	0.5	10+
B10B3	54.4	0.1	2.7	1.0	0.3	0.8	4.3	6.7	10.5	36	0.4	0.1	6.02
B10B4	24.1	0.1	1.3	0.5	0.2	1.1	4.6	4	5.9	32	0.5	0.3	2.52
B10C1	73.4	0.4	21.4	4.4	0.3	0.6	5.2	5.6	31.8	82	11.2	2.1	10+
B10C2	24.1	0.2	5.4	2.3	0.4	0.6	4	8.7	16.6	48	1.2	0.4	9.59
B10C3	47	0.1	1.2	0.7	0.2	0.8	4.1	7.9	9.9	20	0.7	0.1	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B10C4	20.9	0.1	0.6	0.3	0.1	0.9	4.3	4.9	5.9	17	0.4	0.4	5.06
B11A1	53.5	0.4	20.4	3.3	0.3	0.6	5.1	6.3	30.4	79	10.5	2.3	10+
B11A2	66	0.1	8.6	1.6	0.2	0.7	4.5	7.4	17.7	58	1.5	0.6	10+
B11A3	40.5	0.1	1.9	0.5	0.1	1.0	4.5	5	7.5	33	0.3	0.2	3.1
B11A4	10.8	0.1	1.1	0.5	0.1	1.3	4.7	2.6	4.3	40	0.2	0.2	0.76
B11B1	56.3	0.3	31.9	3.8	0.2	0.6	5.8	3	39	92	5.4	1.4	9.21
B11B2	41.8	0.2	27.7	3.6	0.4	0.6	5.4	5.3	36.8	86	2.5	1.1	10+
B11B3	73.5	0.1	4.4	0.9	0.2	0.8	4.3	7.1	12.4	43	0.4	0.1	6.02
B11B4	55.8	0.1	2.5	0.6	0.1	0.8	4.6	6.8	10	32	0.3	0.1	4.95
B11C1	121	0.5	33.1	4.6	0.2	0.6	5.9	3.2	41.4	92	6.9	2.4	8.54
B11C2	27.8	0.3	8.3	3.6	0.4	0.5	4.1	9	21.1	57	1.8	0.3	10+
B11C3	149.6	0.1	1.8	1.1	0.2	0.8	4.3	6.6	9.6	31	0.3	0	6.78
B11C4	93.5	0.2	1.0	0.5	0.1	1.0	4.4	5.1	6.8	25	0.2	0.4	2.52
B12A1	25.9	0.4	15.0	1.9	0.2	0.5	4.7	8.6	25.9	67	5.5	2.3	10+
B12A2	30.3	0.1	4.4	0.7	0.2	0.8	4.3	7.1	12.3	42	0.6	0.2	6.2
B12A3	19.3	0.1	1.1	0.3	0.1	1.1	4.5	5.2	6.7	22	0.1	0.1	1.74
B12A4	58.2	0.1	1.0	0.3	0.1	1.1	4.6	3.9	5.2	25	0.2	0.2	2.15
B12B1	33.4	0.2	24.6	4.2	0.4	0.6	5.7	4.7	33.7	86	6.4	2.2	9.59
B12B2	24.2	0.1	22.1	3.6	0.3	0.6	4.8	7.5	33.3	77	2.1	0.7	10+
B12B3	6.3	0.1	5.2	1.4	0.3	0.6	4.2	9.5	16.3	42	0.4	0.1	10+
B12B4	41.2	0.1	1.3	0.4	0.2	0.9	4.3	6	7.7	22	0.2	0	3.28
B12C1	64.2	0.3	29.4	5.4	0.3	0.6	6.2	2.6	37.7	93	6.3	2.1	7.96
B12C2	21.5	0.3	16.1	4.5	0.4	0.5	4.4	8.8	29.7	70	1.1	0.6	10+
B12C3	8.4	0.2	3.2	2.5	0.4	0.5	3.9	10.4	16.3	36	0.3	0	10+
B12C4	100.9	0.1	1.8	1.0	0.2	0.6	3.9	9.2	12.2	25	0.2	0.2	8.54
B13A1	39.5	0.3	18.1	2.2	0.3	0.6	5	6.8	27.4	75	5.9	1.7	10+
B13A2	18	0.1	15.8	1.8	0.3	0.6	4.6	8.7	26.5	67	2.1	0.8	10+
B13A3	87	0.1	3.5	0.7	0.2	0.7	4.3	7.8	12.1	36	0.3	0.1	7.96
B13A4	52.2	0.1	1.5	0.5	0.1	1.2	4.7	3.8	6	37	0.2	0.2	1.43
B13B1	23.4	0.4	17.8	4.2	0.2	0.5	5.1	6.2	28.6	78	10.2	2.2	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B13B2	21	0.2	16.8	3.8	0.3	0.6	4.7	8	28.7	72	4.3	1.2	10+
B13B3	28.4	0.1	2.8	1.4	0.4	0.7	4.1	7.8	12.1	36	0.5	0.1	10+
B13B4	70.6	0.1	0.8	0.4	0.1	1.2	4.4	4.1	5.3	23	0.3	0	2.15
B13C1	22.6	0.2	19.8	3.6	0.3	0.6	5.2	5.8	29.4	80	6.9	1.8	10+
B13C2	13.3	0.2	6.3	3.1	0.3	0.5	3.9	8.4	18	53	1.1	0.2	10+
B13C3	8.3	0.2	2.0	1.6	0.5	0.5	3.8	10	13.7	27	0.3	0	10+
B13C4	152.5	0.1	2.7	0.5	0.2	1.0	4.5	4.2	7.4	43	0.7	0.3	3.47
B14A1	88	0.4	38.1	3.5	0.3	0.6	6.5	1.4	43.4	97	6.2	1.3	7.45
B14A2	24.5	0.2	20.6	2.0	0.3	0.5	4.9	7	29.8	77	2.2	0.7	10+
B14A3	81.4	0.1	4.9	0.8	0.2	0.7	4.2	7.2	13	45	0.4	0.6	9.21
B14A4	58.8	0.1	2.9	0.5	0.2	0.8	4.7	5	8.6	42	0.3	0.8	4.69
B14B1	60.3	0.3	32.0	3.0	0.3	0.5	5.9	3.4	38.7	91	6.2	1.5	10.0
B14B2	14.2	0.1	10.5	1.8	0.3	0.5	4.2	8.7	21.1	59	0.8	0.2	10+
B14B3	29.6	0.1	1.8	0.4	0.2	0.9	4.4	4.9	7.1	31	0.2	0.2	3.77
B14B4	47.3	0.1	1.8	0.6	0.2	0.7	4	8.2	10.7	23	0.2	0.1	7.96
B14C1	50	0.2	30.8	3.0	0.3	0.5	5.9	3	36.9	92	8.3	1.6	9.21
B14C2	15.3	0.2	12.3	2.4	0.3	0.4	4.1	9.7	24.5	60	1	0.2	10+
B14C3	26	0.1	3.1	1.4	0.2	0.5	3.9	8.7	13.3	35	0.3	0.1	10+
B14C4	27.1	0.1	1.2	0.4	0.1	0.9	4.2	5.5	7.2	24	0.2	0.1	4.09
B15A1	46.3	0.3	8.7	2.3	1	0.5	5.2	4.7	16	71	2.5	0.4	10+
B15A2	57.5	0.1	5.8	1.2	0.4	1.1	5.7	2.5	9.5	74	0.4	0.2	2.76
B15A3	9.8	0.1	1.6	0.4	0.2	1.4	5.7	0.4	2.4	83	0.2	0	0.41
B15A4	3.9	0.2	4.8	1.6	0.4	1.3	5.4	0.8	7.3	89	2.1	1.2	0.97
B15B1	59.1	0.3	7.6	2.1	0.8	0.6	5.1	5.4	15.5	65	2.2	0.7	10+
B15B2	11.2	0.1	12.3	2.4	1	0.4	5.2	5.8	20.6	72	1.1	0.3	10+
B15B3	8.4	0.1	4.5	0.9	0.4	1.3	5.6	1.4	6.8	79	0.4	0.1	1.49
B15B4	8.7	0.1	4.8	1.3	0.4	1.3	5.5	1.1	7.3	85	1.7	1.8	0.76
B15C1	59.8	0.4	8.7	2.4	0.8	0.5	5.2	5	16.5	70	2.1	0.6	9.59
B15C2	13.4	0.2	15.0	2.9	1	0.6	5.3	5.2	23.2	78	0.7	0.3	10+
B15C3	9.1	0.1	4.8	0.9	0.3	1.2	5.6	1.3	7	81	0.3	0.1	1.74

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B15C4	4.6	0.1	3.5	1.0	0.3	1.4	5.4	0.9	5.4	83	1.8	1.7	0.71
B16A1	25.3	0.3	6.5	1.6	0.5	0.7	4.8	4.7	13	64	1.6	0.5	10+
B16A2	11.9	0.1	14.3	2.5	0.6	0.5	5.1	5.9	22.8	74	0.7	0.2	10+
B16A3	4.5	0.1	7.6	1.3	0.4	1.1	5.6	2.8	11.8	76	0.3	0	3.67
B16A4	4.3	0.1	2.7	0.7	0.2	1.4	5.5	0.7	4.2	83	1	1.5	0.46
B16B1	35.2	0.3	8.9	1.8	0.7	0.5	5	5.6	16.5	66	1.1	0.5	10+
B16B2	12.4	0.1	14.5	2.7	0.8	0.5	5.2	5.4	22.6	76	0.5	0.1	10+
B16B3	29.3	0.1	3.5	0.7	0.2	1.3	5.6	1.8	6.1	70	0.4	0.1	2.29
B16B4	8.3	0.1	4.2	1.2	0.3	1.3	5.4	1.2	6.6	82	1.3	2.3	0.56
B16C1	34.2	0.3	9.3	2.1	0.7	0.6	5.2	5	16.6	70	1.5	0.6	10+
B16C2	32.2	0.1	16.9	3.0	0.9	0.5	5.3	5	25	80	0.9	0.1	10+
B16C3	11	0.1	8.4	1.4	0.5	0.9	5.5	3.8	13.6	72	0.4	0	6.58
B16C4	10.6	0.1	4.8	0.9	0.3	1.4	5.7	1.6	7.4	78	0.5	0.3	1.37
B17A1	60.2	0.4	6.7	1.7	0.6	0.7	4.9	5.1	13.9	63	2.4	0.7	10+
B17A2	28.8	0.1	10.4	2.2	0.7	0.6	5.1	5.1	17.8	71	5.2	0.2	10+
B17A3	7.7	0.1	2.3	0.6	0.2	1.4	5.6	0.8	3.8	79	0.9	0.4	0.66
B17A4	12.8	0.0	4.1	0.9	0.3	1.2	5.4	2	7.1	72	7.5	0.1	2.84
B17B1	39.1	0.3	7.5	2.1	0.8	0.6	5.1	5.2	15	65	6.5	0.5	10+
B17B2	15	0.1	12.7	2.9	1	0.5	5	6.2	21.9	72	10.2	0.1	10+
B17B3	6.1	0.0	5.2	1.2	0.4	1.2	5.2	3.2	9.6	67	1.2	0.1	3.77
B17B4	5.3	0.1	3.1	1.0	0.2	1.4	4.9	1.1	5.3	79	2.3	2	0.46
B17C1	51.4	0.3	8.1	2.1	0.7	0.5	4.9	5.6	16.1	65	1.7	0.6	10+
B17C2	24.7	0.1	10.5	2.6	0.9	0.5	4.7	6.8	20	66	0.6	0.2	10+
B17C3	4.8	0.1	5.7	1.4	0.5	1.0	5.2	3.2	10.4	69	0.3	0.1	4.56
B17C4	6.5	0.1	3.2	0.9	0.3	1.3	5.3	1.4	5.6	75	0.9	1.7	0.97
B18A1	32.7	0.3	5.5	1.6	0.7	0.6	4.8	5.4	12.8	58	1.3	0.5	10+
B18A2	25	0.1	8.6	2.2	0.8	0.5	4.8	5.6	16.5	66	0.6	0.2	10+
B18A3	11.1	0.1	3.9	1.0	0.4	1.2	5	3.1	8.1	62	0.3	0.1	3.19
B18A4	6.3	0.1	2.3	0.8	0.2	1.4	4.9	1.4	4.5	69	1	1.4	0.66
B18B1	50.1	0.3	6.1	2.0	0.7	0.6	5	4.7	13.1	64	1.6	0.6	10.0

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B18B2	43.5	0.2	8.6	2.4	0.9	0.6	4.9	6.1	17.3	65	0.8	0.3	10+
B18B3	9.8	0.1	4.1	1.1	0.4	1.2	5.2	2.8	8	65	0.3	0.1	2.68
B18B4	6.9	0.1	3.7	1.3	0.3	1.3	5.6	1.1	6.3	83	1.2	2.5	0.51
B18C1	66.1	0.5	7.3	2.2	0.8	0.6	4.9	5.2	15.1	66	1.8	0.5	10+
B18C2	55	0.2	10.1	2.6	0.9	0.5	4.9	6.2	19.1	68	1.3	0.3	10+
B18C3	8.9	0.1	3.5	0.9	0.3	1.3	5.2	2.4	6.8	65	0.2	0.1	1.8
B18C4	5.6	0.1	2.9	0.9	0.2	1.3	5.7	1.2	5.1	76	0.9	1.7	0.86
B19A1	66	0.3	4.6	1.3	0.5	0.6	4.7	6	12.2	51	1.7	0.6	10+
B19A2	26.7	0.1	10.2	2.5	0.9	0.5	4.6	7	19.7	64	0.5	0.1	10+
B19A3	8.6	0.0	4.2	1.0	0.4	0.9	5	3.5	8.8	60	0.2	0.1	6.2
B19A4	14.1	0.0	1.6	0.4	0.2	1.4	5.3	1.6	3.6	56	0.3	0.1	0.92
B19B1	37.2	0.3	6.4	1.6	0.7	0.5	4.7	5.9	14.1	58	1	0.4	10+
B19B2	9.6	0.1	8.8	2.1	0.8	0.5	4.7	7.1	18.1	61	0.4	0.1	10+
B19B3	18.5	0.0	3.4	0.8	0.3	1.2	5.1	2.8	7	60	0.1	0.1	2.08
B19B4	13.6	0.0	1.4	0.4	0.2	1.4	5.3	1.1	2.9	62	0.3	0.1	0.76
B19C1	47.9	0.3	5.1	1.3	0.5	0.6	4.6	5.9	12.6	53	1.4	0.5	10+
B19C2	17.4	0.1	10.6	2.7	1	0.4	4.8	7.1	20.6	66	0.6	0.2	10+
B19C3	20.8	0.1	8.0	2.1	0.8	0.8	4.9	4.8	15	68	0.5	0.2	10+
B19C4	7.8	0.1	2.7	0.8	0.3	1.3	5.3	1.8	5.4	67	0.6	0.5	1.43
B20A1	32	0.4	4.7	1.2	0.4	0.8	5	5.1	11.4	55	2.3	0.8	9.59
B20A2	6.9	0.3	5.1	1.2	0.4	0.5	4.6	6.5	13	50	1	0.3	10+
B20A3	52.5	0.3	9.5	2.2	0.6	0.6	4.8	6.4	18.4	65	1.8	0.4	10+
B20A4	19.8	0.1	4.1	1.0	0.3	1.1	5.2	2.8	7.9	65	0.3	0.1	4.09
B20B1	53.3	0.4	5.9	1.8	0.7	0.6	4.9	5.9	14	58	1.8	0.5	10+
B20B2	30.8	0.2	9.4	2.4	1	0.6	4.9	6.7	18.7	64	0.7	0.2	10+
B20B3	25.7	0.1	3.7	0.9	0.4	1.1	5.3	3.2	7.9	59	0.3	0	3.77
B20B4	12.2	0.0	1.7	0.4	0.1	1.4	5.5	1.4	3.6	61	0.2	0	0.76
B20C1	23.1	0.2	5.7	1.7	0.7	0.5	4.9	5	12.6	60	1.3	0.4	10+
B20C2	29.1	0.1	9.4	2.6	0.9	0.5	4.7	6.8	18.9	64	0.7	0.1	10+
B20C3	17.9	0.1	5.5	1.5	0.5	1.0	4.9	4.8	11.8	59	0.4	0.1	7.96

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
B20C4	15.8	0.0	2.1	0.6	0.2	1.4	5.3	2	4.7	57	0.3	0	1.31
S1A1	55	0.3	14.8	4.6	0.3	0.7	5.7	3.8	23.5	84	6	0.9	7.21
S1A2	15.1	0.1	3.0	1.1	0.3	0.7	4.3	6.3	10.4	39	0.9	0.2	4.95
S1A3	18.2	0.1	0.9	0.5	0.1	1.0	4.6	3.1	4.6	33	0.2	0.2	1.19
S1A4	4.6	0.1	0.9	0.6	0.1	1.2	4.7	2	3.6	44	0.2	0.6	0.22
S1B1	56.5	0.3	17.2	6.8	0.3	0.5	5.5	5	29.2	83	9.4	1.4	7.7
S1B2	19.2	0.1	3.5	1.8	0.3	0.6	4.2	7.8	13.2	41	1.2	0.2	10+
S1B3	15.5	0.1	1.0	0.5	0.2	0.9	4.4	4.3	5.9	27	0.3	0.2	1.87
S1B4	0	0.2	0.9	0.6	0.2	1.1	4.6	2.8	4.4	36	0.2	0.4	0.27
S1C1	46	0.1	20.6	10.1	0.4	0.5	5.8	4	34.9	89	14.8	1.9	8.24
S1C2	15	0.1	5.9	4.4	0.4	0.4	4.3	9.6	20.1	52	2.5	0.3	10+
S1C3	13.7	0.1	1.5	0.9	0.2	0.8	4.4	5.6	8	30	0.4	0.3	3.87
S1C4	10.5	0.1	1.4	0.6	0.2	1.0	4.7	3.4	5.5	38	0.9	0.3	1.08
S2A1	47.6	0.3	15.3	5.2	0.3	0.6	5.5	4.7	25.5	82	6.5	0.9	8.86
S2A2	34.9	0.1	4.5	1.6	0.2	0.8	4.6	5.5	11.7	53	1.3	0.2	5.23
S2A3	37.9	0.1	2.2	0.7	0.2	1.0	4.8	3.7	6.7	45	0.6	0.2	1.87
S2A4	27.1	0.1	2.0	0.8	0.2	1.1	5	2.4	5.3	55	0.6	0.2	0.92
S2B1	54.1	0.3	16.5	6.6	0.4	0.5	5.3	6.5	29.9	78	11.7	1.5	9.21
S2B2	24.6	0.1	3.4	1.7	0.3	0.5	4.1	8.2	13.4	39	1.5	0.1	10.0
S2B3	36.6	0.1	1.7	0.7	0.2	0.9	4.5	4.6	7	34	0.5	0.1	3.1
S2B4	28.7	0.1	1.4	0.6	0.2	1.1	4.8	3.2	5.3	40	0.4	0.1	1.16
S2C1	65.4	0.3	15.1	7.5	0.3	0.5	5.4	5.5	28.4	81	9.9	0.9	9.21
S2C2	25	0.3	5.7	4.3	0.5	0.5	4.1	8.4	18.7	55	2.6	0.2	10+
S2C3	40.8	0.1	2.6	1.6	0.3	0.7	4.2	5.8	10.1	43	1	0.1	8.24
S2C4	40.3	0.1	2.6	1.4	0.3	0.8	4.3	5.2	9.3	44	0.9	0.2	3.87
S3A1	55.2	0.3	12.6	3.9	0.3	0.6	5.2	4.1	20.9	80	5.2	1	9.59
S3A2	28.3	0.1	3.4	1.1	0.3	0.9	4.7	3.2	7.7	58	0.9	0.3	2.68
S3A3	22.1	0.1	1.5	0.6	0.2	1.0	4.9	1.8	4	55	0.3	0.4	0.97
S3A4	11.7	0.1	1.8	0.8	0.2	1.2	4.8	1.3	4.1	68	0.3	0.6	0.27
S3B1	31.6	0.2	13.1	4.4	0.4	0.5	5	5.8	23.5	75	6.2	0.6	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S3B2	17.2	0.2	6.7	3.5	0.5	0.5	4.2	8.3	18.6	55	2	0.1	10+
S3B3	31.9	0.1	1.2	0.6	0.2	0.9	4.3	4	5.8	31	0.3	0	3.57
S3B4	41.4	0.1	1.1	0.6	0.2	1.0	4.6	2.2	4	45	0.2	0.2	1.25
S3C1	47.7	0.3	12.2	5.3	0.3	0.5	5.3	4.8	22.5	79	6	0.4	10.0
S3C2	40.1	0.2	4.4	2.8	0.4	0.6	4.1	7.1	14.4	51	1.5	0.2	10+
S3C3	31.5	0.1	1.6	1.0	0.2	0.8	4.2	4.6	7.2	36	0.5	0.1	3.1
S3C4	13.8	0.2	1.5	0.9	0.2	1.0	4.5	3.2	5.7	44	0.4	0.2	1.37
S4A1	57.4	0.2	8.1	3.2	0.3	0.7	4.8	5.2	16.7	69	7.8	0.9	8.24
S4A2	23.3	0.2	5.7	4.0	0.4	0.5	4.1	9	18.9	52	2.7	0.2	10+
S4A3	30.2	0.1	1.6	1.0	0.2	0.8	4.4	3.9	6.6	41	0.5	0.3	3.87
S4A4	4.7	0.2	1.2	0.8	0.2	1.1	4.7	2.6	4.7	45	0.5	0.4	0.97
S4B1	35.1	0.2	12.7	5.4	0.4	0.5	4.9	6.9	25.3	73	14.6	1	8.86
S4B2	23.5	0.1	5.4	3.1	0.5	0.5	4.1	9.5	18.1	48	3.7	0.2	10+
S4B3	30	0.1	1.2	0.6	0.3	0.8	4.3	4.4	6.2	29	0.5	0.3	4.09
S4B4	16	0.1	1.2	0.6	0.2	1.0	4.6	2.2	4.1	46	0.5	0.5	1.55
S4C1	34.2	0.5	9.6	6.4	0.5	0.5	4.5	8.5	25	66	6.7	0.3	10+
S4C2	16.2	0.4	2.9	2.7	0.5	0.3	3.9	9.5	15.5	39	1.4	0	10+
S4C3	39.1	0.1	0.8	0.7	0.2	0.7	3.9	5.5	7.2	24	0.3	0.1	6.58
S4C4	30.5	0.2	0.8	0.5	0.2	1.0	4.6	2.7	4.3	37	0.3	0.1	1.74
S5A1	41.6	0.2	8.6	4.0	0.3	0.6	4.8	5.8	18.6	69	5.4	0.7	9.21
S5A2	119.3	0.1	1.8	0.9	0.2	0.8	4.4	4.5	7.3	38	0.8	0.5	5.69
S5A3	64.8	0.1	0.9	0.4	0.2	1.0	4.6	2.4	3.8	37	0.3	0.6	1.55
S5A4	5.6	0.2	1.0	0.9	0.1	1.1	4.6	2.6	4.6	43	0.2	0.6	0.18
S5B1	34.4	0.2	15.1	6.1	0.4	0.4	5.1	5.8	27.2	79	12.7	1.1	9.21
S5B2	20.8	0.1	5.6	2.3	0.3	0.6	4.4	6.7	14.8	55	3.6	0.4	10+
S5B3	35.2	0.1	0.9	0.3	0.2	0.9	4.4	3.8	5.1	25	0.4	0.2	2.62
S5B4	16.9	0.1	0.8	0.4	0.1	1.1	4.6	3.7	5	26	0.4	0.6	1.02
S5C1	30	0.5	11.2	5.8	0.5	0.4	4.8	7.9	25.3	69	10	0.9	9.21
S5C2	34.9	0.3	2.9	2.9	0.4	0.4	4	9.5	15.6	39	1.8	0.2	10+
S5C3	33.5	0.1	1.3	0.8	0.2	0.7	4.1	6.3	8.4	25	0.4	0	5.85

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S5C4	38.3	0.1	1.2	0.6	0.2	0.9	4.4	4.7	6.6	29	0.5	0.2	2.6
S6A1	42.1	0.2	11.5	4.0	0.4	0.7	5.2	4.8	20.5	77	6.6	0.8	9.59
S6A2	35.4	0.1	1.9	0.8	0.2	0.9	4.5	4.8	7.6	37	0.8	0.3	2.37
S6A3	4.6	0.2	1.1	0.7	0.2	1.1	4.7	2.8	4.7	40	0.2	0.4	0.76
S6A4	0	0.2	1.6	1.1	0.2	1.1	4.7	3.5	6.4	45	0.4	0.6	0.6
S6B1	29	0.3	13.7	6.7	0.4	0.4	5	6.2	26.9	77	11.2	0.8	9.21
S6B2	41.5	0.2	3.0	1.9	0.2	0.6	4.2	7.5	12.5	40	1.4	0.2	9.21
S6B3	34.8	0.1	0.9	0.5	0.2	0.9	4.4	3.9	5.4	28	0.3	0.3	2.29
S6B4	9.2	0.2	0.8	0.5	0.2	1.0	4.5	2.6	4.1	37	0.3	0.6	0.92
S6C1	16.4	0.4	4.6	4.0	0.5	0.4	4.2	8.8	17.8	51	2.4	0.2	9.59
S6C2	48.9	0.2	1.6	1.4	0.3	0.6	4	7.8	10.9	28	0.7	0	10.0
S6C3	44.9	0.1	0.7	0.5	0.2	0.8	4.2	5.2	6.5	20	0.2	0.1	3.67
S6C4	2.6	0.2	1.1	0.7	0.2	1.0	4.7	2.8	4.8	42	0.3	0.2	0.66
S7A1	49.1	0.2	10.8	3.0	0.3	0.8	5.3	4.2	18.2	77	6.1	1.3	8.24
S7A2	10.3	0.2	1.9	0.6	0.2	1.0	4.7	3.6	6.3	43	0.7	0.3	2.37
S7A3	0	0.2	1.5	0.7	0.2	1.1	4.7	2.7	5.2	48	0.3	0.3	0.81
S7A4	0	0.2	1.2	0.7	0.1	1.1	4.5	3	5.2	42	0.3	0.5	0.36
S7B1	26.2	0.3	10.2	4.7	0.4	0.5	4.6	7.9	23.1	66	8.2	0.7	10+
S7B2	15.7	0.2	7.3	2.8	0.4	0.4	4.4	8.2	18.6	56	8	0.8	10+
S7B3	0	0.2	1.6	0.7	0.2	1.0	4.5	4.7	7.2	35	0.9	0.3	3.57
S7B4	0	0.2	1.5	0.8	0.2	1.1	4.5	4.3	6.8	37	0.7	0.7	1.08
S7C1	48.3	0.4	10.3	6.0	0.5	0.5	4.5	7.8	24.5	68	6.8	0.5	10+
S7C2	15.5	0.3	2.7	2.6	0.5	0.3	3.9	10.2	15.7	35	1.2	0.1	10+
S7C3	8.8	0.1	1.5	0.7	0.3	0.7	4.1	6.7	9	26	0.4	0.3	7.45
S7C4	3.3	0.3	1.3	0.6	0.2	1.0	4.6	3.6	5.8	38	0.4	0.6	1.94
S8A1	59.1	0.3	11.9	4.8	0.4	0.8	5.5	3	19.9	85	6.7	1	7.96
S8A2	9.8	0.2	2.7	1.3	0.2	1.0	4.9	3.1	7.3	58	0.9	0.4	2.08
S8A3	3.4	0.2	1.2	0.6	0.2	1.0	4.7	3.5	5.5	36	0.3	0.4	0.97
S8A4	8.4	0.2	2.3	1.0	0.2	1.0	4.8	2.8	6.3	56	0.9	0.7	1.08
S8B1	54.3	0.3	15.1	7.4	0.5	0.5	5.4	5.6	28.4	80	13.7	1.1	10.0

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S8B2	21.9	0.2	6.6	4.0	0.4	0.5	4.5	8	18.7	57	4.1	0.3	10+
S8B3	11.7	0.1	1.4	0.8	0.2	0.9	4.3	5.5	7.8	29	0.7	0.5	4.32
S8B4	4.5	0.2	1.3	0.7	0.2	1.1	4.6	3.2	5.3	40	0.6	0.5	1.49
S8C1	59.3	0.5	14.7	8.2	0.5	0.5	5.2	5	28.4	82	11.4	0.9	10.0
S8C2	36.1	0.4	8.3	5.6	0.6	0.4	4.5	8	22.3	64	4.4	0.4	10+
S8C3	10.5	0.2	2.8	1.6	0.3	0.8	4.3	5.9	10.5	44	1.4	0.5	7.45
S8C4	19	0.2	2.3	1.1	0.3	0.9	4.6	3.9	7.5	48	0.9	0.6	3.37
S9A1	56.8	0.3	11.0	3.7	0.3	0.8	5.4	3.5	18.5	81	6.6	1.2	9.21
S9A2	10.3	0.2	2.9	1.1	0.3	0.9	4.8	4.3	8.5	49	1	0.5	5.09
S9A3	0.5	0.1	1.4	0.6	0.2	1.0	4.8	2.8	4.9	43	0.4	0.5	1.37
S9A4	0	0.2	1.5	0.8	0.2	1.1	4.7	2.8	5.4	48	0.4	0.7	0.56
S9B1	32.5	0.2	13.1	5.5	0.3	0.5	5.1	6.2	25	75	8.3	0.7	10+
S9B2	24.2	0.2	7.4	4.0	0.5	0.5	4.3	8.5	20.1	58	3.9	0.3	10+
S9B3	8.7	0.1	3.0	1.3	0.3	0.9	4.5	4.8	9.2	48	1.4	0.3	5.69
S9B4	2.8	0.2	1.2	0.6	0.3	1.1	4.6	2.7	4.6	41	0.4	0.8	1.08
S9C1	32.5	0.3	13.3	6.1	0.5	0.5	5	6.7	26.4	75	8	0.7	10+
S9C2	31.6	0.2	4.3	2.6	0.5	0.5	4.1	8.4	15.4	45	2.4	0.2	10+
S9C3	23	0.1	1.7	1.1	0.4	0.6	4.1	6.7	9.6	30	0.7	0.3	8.24
S9C4	7.5	0.2	1.1	0.4	0.2	0.8	4.5	3.5	5.2	33	0.4	0.4	2.76
S10A1	32.4	0.2	7.6	2.2	0.3	0.8	4.9	5.1	15	66	2.5	1	9.59
S10A2	11.2	0.1	2.6	0.9	0.2	0.9	4.6	3.9	7.5	48	0.7	0.5	4.2
S10A3	3.4	0.2	1.6	0.7	0.3	1.0	4.6	3.4	5.8	41	0.4	0.5	0.97
S10A4	0	0.2	1.2	0.7	0.2	1.1	4.6	2.4	4.5	47	0.7	0.7	0.51
S10B1	35.9	0.2	9.9	3.5	0.3	0.5	4.8	6.4	19.9	68	5.2	0.9	10+
S10B2	10.1	0.1	2.7	1.1	0.3	0.8	4.3	5.5	9.4	41	1	0.4	6.99
S10B3	8.9	0.1	1.6	0.7	0.2	1.0	4.6	3.6	6	40	0.6	0.4	2.52
S10B4	0	0.2	1.3	0.7	0.2	1.0	4.5	3.2	5.4	41	0.4	0.7	1.02
S10C1	33	0.4	9.4	5.2	0.4	0.5	4.7	7.7	22.7	66	3.9	0.4	10+
S10C2	21	0.2	2.7	1.8	0.3	0.5	4	8.1	12.8	37	1	0.2	10+
S10C3	5.2	0.2	1.0	0.6	0.2	0.9	4.3	4	5.7	30	0.4	0.4	3.67

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S10C4	5.1	0.2	1.1	0.6	0.2	1.0	4.6	2.8	4.6	39	0.4	0.6	1.25
S11A1	140.6	0.3	13.5	4.1	0.3	0.8	5.4	3.7	21.6	83	6.4	2.1	7.96
S11A2	38	0.2	6.0	1.8	0.2	0.8	4.5	5.5	13.5	59	1.8	0.6	8.54
S11A3	19	0.2	2.2	0.7	0.2	1.0	4.5	3.7	6.8	46	0.6	0.3	2.76
S11A4	12.5	0.2	2.3	1.0	0.2	1.0	4.6	2.5	5.9	58	0.7	1.3	1.19
S11B1	94.1	0.3	14.3	6.2	0.3	0.5	5.2	5	25.7	81	7.4	1.4	10+
S11B2	19.5	0.1	2.8	1.1	0.2	0.7	4.3	5.3	9.3	43	0.7	0.2	7.7
S11B3	12.2	0.2	2.0	0.8	0.2	1.0	4.5	4	6.9	42	0.5	0.3	2.68
S11B4	4.6	0.2	1.2	0.6	0.1	1.1	4.4	2.5	4.5	44	0.3	0.7	0.81
S11C1	83.3	0.3	8.7	4.4	0.4	0.6	4.5	8	21.4	63	4.6	0.7	10+
S11C2	23.3	0.1	2.3	1.2	0.3	0.7	4.1	6.9	10.5	34	1.4	0.3	8.86
S11C3	17.8	0.1	0.9	0.5	0.2	0.9	4.3	3.4	4.9	31	0.3	0.4	2.01
S11C4	6.1	0.2	0.9	0.6	0.2	1.0	4.4	2.7	4.3	37	0.5	1	1.14
S12A1	142.4	0.4	12.4	4.4	0.4	0.6	5.1	5.3	22.5	76	5.2	1	10.0
S12A2	37.7	0.2	4.6	1.5	0.3	0.8	4.3	6.6	12.8	48	1.2	0.3	10+
S12A3	34.4	0.2	2.3	0.8	0.3	1.0	4.3	4.5	7.8	42	0.4	0.5	3.28
S12A4	29.5	0.2	2.0	0.8	0.2	0.9	4.4	4.1	7	41	0.3	0.8	4.09
S12B1	123	0.3	13.6	5.0	0.4	0.5	5.1	6	24.9	76	7.1	1.2	10+
S12B2	29.5	0.1	4.4	1.6	0.3	0.7	4.3	7	13.1	47	1.4	0.4	9.59
S12B3	20.8	0.1	2.0	0.8	0.2	0.9	4.3	4.6	7.4	38	0.5	0.4	3.37
S12B4	15.7	0.2	2.5	1.2	0.2	1.0	4.6	3.4	7.3	53	0.6	1.3	2.68
S12C1	117.2	0.3	11.1	5.4	0.3	0.5	4.8	6.9	23.7	71	6.4	1	10+
S12C2	44.6	0.1	3.7	1.9	0.3	0.6	4.1	7.2	12.9	44	1.4	0.2	6.99
S12C3	10.1	0.2	1.4	0.9	0.2	0.9	4.2	4.8	7.3	34	0.4	0.4	3.1
S12C4	9.3	0.2	1.7	1.0	0.2	1.0	4.4	3.3	6.2	47	0.5	0.7	2.37
S13A1	133.4	0.4	12.7	4.3	0.4	0.6	5.2	5	22.4	78	5.8	0.9	10+
S13A2	37.3	0.2	4.9	1.6	0.4	0.7	4.5	5.9	12.6	53	1.3	0.4	10+
S13A3	10.7	0.2	1.6	0.7	0.2	1.1	4.5	2.5	5	50	0.4	0.8	1.43
S13A4	18.4	0.2	1.5	0.8	0.2	1.1	4.5	1.9	4.4	57	0.2	1.4	0.46
S13B1	95.8	0.3	10.7	3.8	0.4	0.5	4.9	6.2	20.9	70	4.7	1	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S13B2	23.6	0.1	3.4	1.2	0.3	0.7	4.3	6.4	11.1	42	1	0.3	8.86
S13B3	6.1	0.2	1.7	0.7	0.3	0.9	4.4	4.1	6.7	39	0.6	0.5	4.2
S13B4	20.7	0.2	1.7	0.7	0.2	0.9	4.6	2.6	5.2	50	0.4	0.9	2.68
S13C1	96.6	0.4	10.0	5.0	0.6	0.5	4.6	7.3	22.7	68	5.6	0.8	10+
S13C2	22.1	0.1	2.3	1.3	0.3	0.6	4	7	10.7	35	0.9	0.2	9.21
S13C3	18.4	0.1	1.4	0.7	0.3	0.9	4.2	5.1	7.3	30	0.4	0.5	4.44
S13C4	39.4	0.2	2.5	1.1	0.3	0.9	4.4	4.8	8.6	44	0.9	0.9	6.38
S14A1	89.7	0.2	8.9	3.1	0.5	0.6	4.7	6.4	18.7	66	3.2	0.6	10+
S14A2	32.1	0.1	2.0	0.7	0.4	0.8	4.2	4.5	7.2	38	0.7	0.5	5.85
S14A3	26.3	0.1	1.0	0.5	0.3	1.0	4.4	3	4.6	35	0.3	0.6	1.55
S14A4	25.7	0.2	1.7	0.7	0.4	1.0	4.5	2.7	5.3	49	0.3	0.8	1.46
S14B1	133.7	0.4	14.8	5.0	0.6	0.5	5	7	27.2	74	6.6	1.1	10+
S14B2	20.6	0.1	4.2	1.4	0.6	0.5	4.1	7.7	13.5	43	1.2	0.2	8.24
S14B3	92.9	0.2	1.7	0.6	0.3	0.9	4.4	4.8	7.3	34	0.5	0.8	2.37
S14B4	92.2	0.2	2.1	0.7	0.3	0.9	4.7	3.5	6.6	47	0.6	1.2	1.61
S14C1	121.7	0.5	11.7	5.2	0.6	0.6	4.7	6.7	24.1	72	7.1	0.9	10+
S13C2	28.5	0.1	2.3	1.2	0.4	0.7	4	8	11.6	31	1.1	0.5	10+
S14C3	23.7	0.2	0.9	0.4	0.3	0.8	4.3	4.2	5.7	26	0.4	0.8	2.84
S14C4	8.4	0.3	1.3	0.7	0.2	1.0	4.5	2.8	5	44	0.4	1	1.67
S15A1	93.9	0.3	10.1	3.1	0.4	0.7	4.9	5.6	19.2	71	3.6	0.9	10+
S15A2	31.9	0.2	3.1	0.9	0.4	0.8	4.5	5	9.1	45	0.9	0.4	6.02
S15A3	7	0.2	1.6	0.6	0.2	0.9	4.7	3	5.3	43	0.6	0.7	2.6
S15A4	4.2	0.2	2.0	0.7	0.2	1.1	4.7	2.4	5.3	55	0.4	1	2.15
S15B1	121.4	0.3	13.4	4.5	0.5	0.6	5	6	24.3	75	6	1.3	10+
S15B2	20.9	0.1	3.2	1.1	0.4	0.7	4.2	7.5	11.8	36	0.9	0.3	9.21
S15B3	9.3	0.1	1.7	0.5	0.2	0.9	4.4	4.3	6.7	36	0.4	0.4	3.67
S15B4	5.5	0.1	1.2	0.4	0.2	1.0	4.5	3.1	4.8	35	0.3	0.7	1.67
S15C1	104.8	0.4	9.3	4.0	0.5	0.6	4.5	7.5	21.1	64	4.7	0.8	10+
S15C2	38.9	0.1	4.0	1.9	0.4	0.7	4.1	8.1	14.1	43	1.4	0.3	10+
S15C3	19.5	0.2	2.3	1.1	0.3	0.8	4.3	6.1	9.6	36	0.6	0.6	6.2

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S15C4	11.3	0.3	1.6	0.9	0.2	1.0	4.3	4.7	7.4	36	0.5	1	2.22
S16A1	109.1	0.3	10.3	3.6	0.4	0.7	4.8	6.2	20.3	69	4.2	0.8	10+
S16A2	29.5	0.1	2.8	1.0	0.2	0.8	4.2	6.3	10.2	38	0.6	0.4	7.96
S16A3	7.9	0.2	1.4	0.6	0.1	1.1	4.4	3.2	5.5	42	0.4	1	0.92
S16A4	4	0.2	1.3	0.4	0.3	1.1	4.4	2.2	4.1	46	0.4	0.6	0.46
S16B1	129.1	0.4	11.8	4.3	0.3	0.6	4.9	5.8	22.2	74	5.7	1.1	9.59
S16B2	24.1	0.1	3.2	1.3	0.3	0.8	4.3	6.7	11.3	41	1.1	0.3	7.45
S16B3	24.2	0.2	1.6	0.6	0.2	1.0	4.3	4.2	6.6	36	0.5	0.5	2.44
S16B4	5.2	0.2	1.6	0.9	0.2	1.1	4.5	3	5.7	47	0.6	1.1	1.08
S16C1	125.3	0.4	10.1	3.9	0.5	0.6	4.6	7.5	21.9	66	6.1	1	10+
S16C2	27.4	0.2	3.1	1.7	0.6	0.4	3.9	9	14	36	1.2	0.3	10.0
S16C3	20.4	0.1	1.2	0.6	0.3	0.7	4.1	6.3	8.2	23	0.9	0.3	5.53
S16C4	15.2	0.2	1.4	0.8	0.2	1.1	4.4	2.8	5.1	45	0.6	1.4	1.61
S17A1	103.3	0.2	11.9	3.7	0.3	0.6	4.8	6.3	22.1	71	4.1	1.1	10+
S17A2	21.6	0.1	3.0	1.0	0.2	0.8	4.2	6.1	10.2	40	0.6	0.4	5.09
S17A3	12.5	0.2	2.0	1.2	0.3	1.0	4.4	3.2	6.6	52	0.4	1.1	1.8
S17A4	0.1	0.2	1.5	0.7	0.2	1.2	4.3	4.5	7	36	0.4	0.9	0.51
S17B1	87.7	0.3	9.7	3.3	0.4	0.5	4.6	6.8	20.1	66	3.9	1.1	10+
S17B2	17.8	0.1	2.2	0.8	0.2	0.9	4.2	5.4	8.4	36	0.6	0.3	6.99
S17B3	15.6	0.2	1.2	0.5	0.2	1.0	4.3	4	5.8	31	0.3	0.4	2.01
S17B4	3.4	0.2	1.5	0.7	0.2	1.0	4.4	4.5	7	36	0.2	0.8	1.37
S17C1	128.7	0.5	9.4	4.4	0.3	0.6	4.6	7.4	21.6	66	5.4	0.8	10+
S17C2	52.3	0.1	2.9	1.4	0.3	0.8	4.1	7.5	11.9	37	1.3	0.3	10+
S17C3	5.3	0.3	1.5	1.0	0.2	1.0	4.3	5.4	8.2	34	0.4	0.7	2.08
S17C4	0	0.3	1.4	0.9	0.2	1.1	4.3	3.9	6.5	40	0.3	0.8	0.97
S18A1	83.5	0.3	9.1	2.4	0.4	0.6	4.7	6.6	18.3	64	3.8	0.7	10+
S18A2	18.8	0.1	1.7	0.5	0.2	0.9	4.3	5.8	8.1	28	0.4	0.3	5.69
S18A3	0	0.1	0.7	0.2	0.1	1.0	4.6	2.8	3.9	28	0.2	0.5	1.31
S18A4	9.9	0.1	0.7	0.3	0.1	1.0	4.6	2.3	3.4	32	0.1	1	0.81
S18B1	83.4	0.2	11.9	4.3	0.4	0.5	5.2	5	21.3	77	4.3	0.9	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S18B2	37.5	0.1	6.7	2.6	0.5	0.6	4.4	7	16.3	57	1.3	0.3	10+
S18B3	15	0.1	3.2	1.3	0.4	0.6	4	7.6	12.2	38	0.4	0.1	10+
S18B4	17.9	0.2	1.5	0.7	0.3	1.0	4.4	4.5	6.9	35	0.2	0.9	2.29
S18C1	88.1	0.3	9.4	3.2	0.5	0.6	4.7	7	19.9	65	4.2	0.5	10+
S18C2	23.5	0.1	2.4	1.1	0.5	0.7	3.9	8.6	12.2	30	0.8	0	10+
S18C3	14.6	0.1	1.2	0.5	0.3	0.8	4.1	4.4	6.3	30	0.4	0.2	4.2
S18C4	19.5	0.2	0.9	0.5	0.2	1.0	4.4	3.5	5	30	0.3	0.6	1.37
S19A1	87.8	0.2	9.8	2.5	0.4	0.7	4.6	7.2	19.7	63	3.6	0.5	10+
S19A2	12.4	0.1	2.5	0.7	0.2	0.7	4.1	7	10.3	32	0.5	0.2	10+
S19A3	35.1	0.1	0.8	0.3	0.1	1.1	4.5	2.3	3.5	34	0.2	0.4	1.74
S19A4	4.1	0.2	1.4	0.7	0.2	1.1	4.4	2.3	4.6	50	0.4	1.2	0.6
S19B1	114.7	0.3	11.4	3.2	0.4	0.6	4.9	5.5	20.4	73	5.6	0.8	10+
S19B2	15	0.1	2.5	0.8	0.2	0.8	4.2	5.5	8.9	38	0.7	0.1	6.99
S19B3	4.7	0.1	1.2	0.4	0.2	0.9	4.5	3.1	4.8	35	0.3	0.3	2.01
S19B4	6.9	0.2	2.0	0.6	0.2	1.0	4.7	3.4	6.2	45	0.6	0.5	2.68
S19C1	106.6	0.3	9.4	3.2	0.4	0.5	4.6	6.7	19.6	66	5.2	0.6	10+
S19C2	25.6	0.1	2.4	1.2	0.4	0.6	3.9	7.7	11.3	32	0.8	0.1	7.96
S19C3	11.5	0.2	0.9	0.5	0.2	0.9	4	5.1	6.6	23	0.3	0.2	3.1
S19C4	16.4	0.2	1.4	0.6	0.2	1.0	4.3	4	6.3	37	0.5	0.4	1.74
S20A1	71.2	0.2	7.8	1.8	0.2	0.7	4.5	5.6	15.4	64	2.6	0.4	10+
S20A2	17.5	0.1	2.9	0.8	0.2	0.8	4.2	5.8	9.6	40	0.6	0.2	7.99
S20A3	3.3	0.2	1.6	0.6	0.2	1.1	4.4	3.3	5.8	43	0.4	0.5	1.37
S20A4	1.9	0.2	1.9	0.8	0.2	1.1	4.4	2.3	5.2	56	0.5	0.9	1.14
S20B1	97.3	0.2	12.1	3.5	0.4	0.6	4.7	6.4	22.3	71	5.9	0.8	10+
S20B2	23.1	0.1	3.3	1.1	0.3	0.8	4.1	6.5	11	41	1.2	0.3	8.86
S20B3	0.8	0.2	1.3	0.6	0.2	1.1	4.3	3.8	5.8	34	0.4	0.6	0.97
S20B4	0	0.2	1.5	0.7	0.2	1.2	4.4	3.2	5.6	43	0.4	0.9	0.97
S20C1	112.5	0.5	10.0	3.3	0.4	0.5	4.7	6.8	20.6	67	5.7	0.8	9.59
S20C2	43.3	0.2	6.2	2.4	0.5	0.5	4.1	8.4	17.1	51	2.5	0.3	10.0
S20C3	12.7	0.1	1.8	0.8	0.2	0.8	4.1	6.2	8.9	30	0.6	0.5	7.21

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
S20C4	6.3	0.2	1.6	0.7	0.2	1.1	4.3	4.1	6.7	39	0.4	0.7	2.15
PZ16A1	41.8	0.2	14.0	1.5	0.3	0.7	4.8	6.7	22.4	70	7.4	2.9	10+
PZ16A2	24.4	0.1	4.3	0.4	0.2	0.8	4.1	7.3	12	39	0.6	0.2	10+
PZ16A3	28.3	0.1	1.8	0.3	0.2	1.0	4.3	5	7.2	31	0.3	0.3	4.2
PZ16A4	2.2	0.2	2.2	1.2	0.1	1.3	4.5	3	6.6	55	1.7	1.1	0.46
PZ16B1	47.9	0.3	16.5	1.2	0.2	0.6	4.8	7.4	25.3	71	2	1.1	10+
PZ16B2	30.2	0.1	7.0	0.6	0.3	0.6	4.1	9	16.7	46	0.6	0.3	10+
PZ16B3	32.3	0.1	1.8	0.3	0.2	0.9	4.1	4.7	6.9	32	0.2	0.2	3.37
PZ16B4	28.4	0.1	1.6	0.4	0.2	1.2	4.5	2.8	4.9	43	0.1	0.7	1.55
PZ16C1	51.2	0.2	16.4	0.9	0.3	0.6	4.9	7	24.4	71	2.6	1.2	10+
PZ16C2	30.3	0.1	5.5	0.7	0.3	0.6	4	9.1	15.4	41	0.4	0.1	10+
PZ16C3	68.5	0.1	1.7	0.5	0.2	0.9	4.2	5.8	8.1	28	0.3	0.2	5.23
PZ16C4	13.8	0.2	1.5	0.9	0.1	1.2	4.6	2.5	5.1	51	0.3	0.8	0.92
PZ17A1	49.5	0.2	9.0	3.4	0.3	0.8	5.4	3.7	16.3	77	4.1	1.1	8.24
PZ17A2	21.3	0.1	2.3	1.1	0.3	0.7	4.5	4.7	8.2	43	0.6	0.3	5.23
PZ17A3	0	0.2	1.6	0.9	0.2	0.9	4.8	3.4	6	43	0.4	0.3	2.29
PZ17A4	4	0.2	1.4	0.8	0.2	1.1	4.8	1.8	4.2	57	0.4	0.6	0.92
PZ17B1	66.6	0.3	11.7	6.6	0.5	0.6	5.2	5.4	23.9	77	10.5	1.5	10+
PZ17B2	33.5	0.1	3.3	1.8	0.4	0.6	4.2	6.2	11.4	46	1.9	0.5	9.21
PZ17B3	12.5	0.1	1.0	0.5	0.2	0.8	4.4	4.5	6.2	27	0.3	0.4	3.57
PZ17B4	8	0.1	1.2	0.6	0.2	0.9	4.8	1.9	3.9	51	0.4	0.5	2.52
PZ17C1	40.2	0.2	7.8	5.3	0.6	0.5	4.8	7.2	20.5	65	5.4	0.5	10+
PZ17C2	26.4	0.1	1.4	1.0	0.3	0.6	4	7.3	9.7	25	0.6	0.1	10+
PZ17C3	17.3	0.1	0.9	0.5	0.3	0.7	4.3	4.6	6.1	25	0.3	0.3	6.02
PZ17C4	11.5	0.1	0.9	0.5	0.2	0.8	4.8	3	4.5	33	0.3	0.5	4.09
PZ18A1	55.4	0.3	9.3	4.8	0.3	0.8	5.6	3.2	17.6	82	5.1	1.2	9.0
PZ18A2	0	0.1	1.1	0.5	0.2	0.9	5	2.8	4.5	38	0.3	0.3	2.01
PZ18A3	0	0.1	1.0	0.5	0.2	0.9	5.1	1.9	3.6	47	0.3	0.3	1.55
PZ18A4	0	0.2	1.1	1.2	0.2	1.1	4.8	1.9	4.4	57	0.4	0.9	0.46
PZ18B1	45.1	0.2	10.2	6.6	0.4	0.6	5.2	5.5	22.5	76	11	1	10+

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ18B2	25.9	0.1	2.1	1.4	0.3	0.7	4.6	4.8	8.4	43	1.5	0.3	8.54
PZ18B3	13.4	0.1	2.6	1.3	0.4	0.8	5	3.1	7.1	56	1.5	0.5	4.44
PZ18B4	2	0.1	1.1	0.7	0.2	1.0	5	2	3.9	49	0.7	0.4	1.61
PZ18C1	57.3	0.4	10.8	7.9	0.3	0.6	5.3	6.2	25.3	75	9.9	0.7	10+
PZ18C2	22.6	0.1	1.9	1.9	0.3	0.6	4.3	6.8	10.7	36	1.2	0.1	10+
PZ18C3	16.3	0.2	1.2	1.2	0.2	0.9	4.7	4	6.5	38	0.4	0.2	3.1
PZ18C4	18.5	0.2	1.4	1.4	0.3	0.9	4.9	3.5	6.5	46	0.4	0.4	2.84
PZ19A1	33.2	0.2	7.5	3.6	0.3	0.7	5.1	5.1	16.5	69	5.8	0.9	10+
PZ19A2	2.5	0.1	1.5	0.7	0.2	0.9	5	2.8	5.1	45	0.9	0.4	3.19
PZ19A3	0	0.1	0.8	0.4	0.2	0.9	4.9	2.7	4	33	0.6	0.3	2.08
PZ19A4	0	0.1	0.9	0.4	0.1	1.0	5.1	2.2	3.6	39	0.4	0.4	1.94
PZ19B1	47.2	0.3	10.8	5.7	0.4	0.6	5.3	5.1	21.8	77	10	1.2	10+
PZ19B2	20.4	0.1	2.8	1.6	0.3	0.7	4.8	5.1	9.6	47	1.5	0.4	7.45
PZ19B3	7.7	0.1	1.3	0.7	0.2	0.9	4.8	3.5	5.5	36	0.6	0.4	2.92
PZ19B4	6.3	0.2	1.1	0.9	0.2	1.0	4.8	2.3	4.4	48	0.4	0.9	1.49
PZ19C1	48.9	0.3	11.3	9.0	0.4	0.5	5.5	4.3	24.8	83	9.3	1	10+
PZ19C2	27.1	0.1	2.8	2.2	0.3	0.8	4.7	4.9	10	51	1.7	0.3	5.09
PZ19C3	0	0.1	0.9	0.6	0.2	0.8	4.7	3.2	4.9	35	1.1	0.2	2.29
PZ19C4	0	0.2	1.0	0.6	0.1	0.9	4.8	2.8	4.5	38	0.4	0.4	1.43
PZ20A1	39.2	0.2	6.9	3.3	0.3	0.7	4.7	6	16.4	63	5.5	1	10+
PZ20A2	17.2	0.1	2.1	1.2	0.3	0.5	4.4	7.2	10.6	32	1	0.5	7.7
PZ20A3	15.2	0.1	0.8	0.4	0.2	0.8	4.6	3.1	4.4	30	0.3	0.5	3.28
PZ20A3	1	0.2	1.1	0.9	0.2	1.1	4.7	2.3	4.5	49	0.7	0.9	1.67
PZ20B1	34.8	0.1	10.8	5.6	0.5	0.5	4.9	6.7	23.2	71	13.5	1.6	10+
PZ20B2	11.6	0.1	4.7	2.4	0.4	0.6	4.4	7.2	14.4	50	5.6	0.9	10+
PZ20B3	6.7	0.1	1.1	0.6	0.3	0.7	4.5	3.9	5.6	30	0.6	0.7	4.32
PZ20B4	7	0.1	1.0	0.7	0.2	1.0	4.8	5.8	7.6	24	0.4	0.7	1.43
PZ20C1	40.8	0.2	7.3	5.1	0.4	0.6	4.9	5.9	18.4	68	5.7	0.5	10+
PZ20C2	29	0.1	2.6	2.0	0.3	0.7	4.4	5.9	10.5	44	1.2	0.2	6.02
PZ20C3	5.1	0.1	1.1	0.9	0.2	0.8	4.5	4.5	6.6	32	0.4	0.6	2.44

General Data from NCDA

Sample ID	P	K	Ca	Mg	Na	Wt/Vol	pH	Buf AC	CEC pH 6.6	Base Cations	Sat.	Zn	Cu
	mg dm^{-3}	-------meq 100 cm^{-3}-------				g cm^{-3}		meq 100 cm^{-3}		%	mg dm^{-3}	----- g 100 cm^{-3}------	
PZ20C4	5.9	0.2	0.6	0.4	0.2	1.0	4.7	2.6	3.8	32	0.3	1	1.72

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	A	1	A	1	38.0	45.1	321	53
Belhaven	A	1	B	1	18.4	22.8		44
Belhaven	A	1	C	1	36.8	42.8		61
Belhaven	A	2	A	1	36.9	42.1		153
Belhaven	A	2	B	1	21.3	25.1		64
Belhaven	A	2	C	1	33.9	39.6	391	75
Belhaven	A	3	A	1	21.9	27.4		62
Belhaven	A	3	B	1	42.6	49.1		52
Belhaven	A	3	C	1	22.8	28.0		60
Belhaven	A	4	A	1	34.3	39.9		57
Belhaven	A	4	B	1	36.6	41.2		45
Belhaven	A	4	C	1	32.8	38.3		158
Belhaven	A	5	A	1	28.2	32.5		51
Belhaven	A	5	B	1	24.1	23.6		50
Belhaven	A	5	C	1	30.5	35.7		49
Belhaven	A	6	A	1	18.8	22.8	346	58
Belhaven	A	6	B	1	23.4	27.3		48
Belhaven	A	6	C	1	20.6	24.5		41
Belhaven	A	7	A	1	15.2	19.3		66
Belhaven	A	7	B	1	17.5	35.4		68
Belhaven	A	7	C	1	30.8	32.5		67
Belhaven	A	8	A	1	26.9	22.4		65
Belhaven	A	8	B	1	19.1	23.8		81
Belhaven	A	8	C	1	16.4	19.8		41
Belhaven	A	9	A	1	16.5	18.7		53
Belhaven	A	9	B	1	13.7	19.7		46
Belhaven	A	9	C	1	19.6	25.3		70
Belhaven	A	10	A	1	26.1	32.2		100
Belhaven	A	10	B	1	16.4	20.5		60

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	A	10	C	1	20.7	25.1		118
Belhaven	A	11	A	1	16.9	21.6		97
Belhaven	A	11	B	1	15.2	19.2		102
Belhaven	A	11	C	1	30.4	33.6		189
Belhaven	A	12	A	1	10.3	15.4	252	49
Belhaven	A	12	B	1	12.5	16.7		59
Belhaven	A	12	C	1	21.9	26.5		113
Belhaven	A	13	A	1	15.8	19.0	382	67
Belhaven	A	13	B	1	11.6	16.2		47
Belhaven	A	13	C	1	10.7	14.8		40
Belhaven	A	14	A	1	11.7	14.9		154
Belhaven	A	14	B	1	17.4	21.3		123
Belhaven	A	14	C	1	13.5	17.5		93
Belhaven	C	15	A	1	0.6	4.2	734	93
Belhaven	C	15	B	1	0.9	3.8		102
Belhaven	C	15	C	1	0.8	3.7	735	113
Belhaven	C	16	A	1	0.4	3.2	577	39
Belhaven	C	16	B	1	0.4	3.3	587	75
Belhaven	C	16	C	1	0.6	3.8	729	60
Belhaven	C	17	A	1	0.7	3.8		93
Belhaven	C	17	B	1	0.6	3.5		71
Belhaven	C	17	C	1	0.5	3.5		99
Belhaven	C	18	A	1	0.4	3.5	670	59
Belhaven	C	18	B	1	0.6	4.0		85
Belhaven	C	18	C	1	0.7	3.7		114
Belhaven	C	19	A	1	1.1	4.7		110
Belhaven	C	19	B	1	0.5	3.6		70
Belhaven	C	19	C	1	0.5	3.8		84
Belhaven	C	20	A	1	0.6	3.8		43

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	C	20	B	1	0.6	3.8		95
Belhaven	C	20	C	1	0.5	3.6		44
Belhaven	A	1	A	2	17.1	17.1		108
Belhaven	A	1	B	2	12.4	17.5		19
Belhaven	A	1	C	2	23.8	28.5		48
Belhaven	A	2	A	2	16.8	18.6		36
Belhaven	A	2	B	2				18
Belhaven	A	2	C	2				24
Belhaven	A	3	A	2				29
Belhaven	A	3	B	2				38
Belhaven	A	3	C	2				33
Belhaven	A	4	A	2				19
Belhaven	A	4	B	2				65
Belhaven	A	4	C	2				51
Belhaven	A	5	A	2				27
Belhaven	A	5	B	2	17.4	20.8		34
Belhaven	A	5	C	2	17.9	20.2		28
Belhaven	A	6	A	2	13.5	14.3		51
Belhaven	A	6	B	2	16.3	19.1		23
Belhaven	A	6	C	2	15.2	18.0		22
Belhaven	A	7	A	2	13.2	19.2		62
Belhaven	A	7	B	2	8.5	9.7		25
Belhaven	A	7	C	2	16.6	12.8		38
Belhaven	A	8	A	2	2.8	4.1		69
Belhaven	A	8	B	2	10.0	11.8		46
Belhaven	A	8	C	2	3.0	10.1		37
Belhaven	A	9	A	2	2.1	3.8		70
Belhaven	A	9	B	2	4.7	5.4		61
Belhaven	A	9	C	2	24.3	29.5		43

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	A	10	A	2	1.3	2.4		61
Belhaven	A	10	B	2	8.5	10.4		37
Belhaven	A	10	C	2	3.8	5.0		38
Belhaven	A	11	A	2	5.7	6.8		90
Belhaven	A	11	B	2	17.8	19.1		73
Belhaven	A	11	C	2	19.8	21.7		57
Belhaven	A	12	A	2	1.5	2.2	62	37
Belhaven	A	12	B	2	12.2	14.7		41
Belhaven	A	12	C	2	21.7	23.7		41
Belhaven	A	13	A	2	7.3	9.0	118	30
Belhaven	A	13	B	2	8.7	12.3		34
Belhaven	A	13	C	2	15.3	15.8		26
Belhaven	A	14	A	2	16.8	19.3		47
Belhaven	A	14	B	2	13.5	15.4		32
Belhaven	A	14	C	2	17.4	18.3		35
Belhaven	C	15	A	2	0.9	3.8	216	52
Belhaven	C	15	B	2	0.6	3.6	457	25
Belhaven	C	15	C	2	0.5	3.5	462	23
Belhaven	C	16	A	2	0.3	3.1	423	23
Belhaven	C	16	B	2	0.5	3.2	221	25
Belhaven	C	16	C	2	1.0	3.5	413	72
Belhaven	C	17	A	2		2.2		51
Belhaven	C	17	B	2		3.0		31
Belhaven	C	17	C	2	1.4	2.8		54
Belhaven	C	18	A	2	1.9	3.6		56
Belhaven	C	18	B	2	1.2	2.2		75
Belhaven	C	18	C	2	2.0	3.2		102
Belhaven	C	19	A	2	1.7	3.0		57
Belhaven	C	19	B	2	1.8	4.4		21

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	C	19	C	2	2.5	3.3		40
Belhaven	C	20	A	2	0.2			14
Belhaven	C	20	B	2	0.9	3.4		54
Belhaven	C	20	C	2	1.8	4.0		56
Belhaven	A	1	A	3	5.3	5.9		141
Belhaven	A	1	B	3	0.0	0.0		84
Belhaven	A	1	C	3	5.7	5.9		112
Belhaven	A	2	A	3	8.4	8.8		121
Belhaven	A	2	B	3				98
Belhaven	A	2	C	3				125
Belhaven	A	3	A	3				77
Belhaven	A	3	B	3				168
Belhaven	A	3	C	3				72
Belhaven	A	4	A	3				88
Belhaven	A	4	B	3				29
Belhaven	A	4	C	3				163
Belhaven	A	5	A	3	2.2	2.6		71
Belhaven	A	5	B	3	16.6	16.7		115
Belhaven	A	5	C	3	9.2	9.5		101
Belhaven	A	6	A	3	1.9	2.2		100
Belhaven	A	6	B	3	1.9	3.2		77
Belhaven	A	6	C	3	24.9	18.0		132
Belhaven	A	7	A	3	2.2	2.0		92
Belhaven	A	7	B	3	10.1	10.4		102
Belhaven	A	7	C	3	4.0	4.5		80
Belhaven	A	8	A	3	0.1	0.6		49
Belhaven	A	8	B	3	1.1	2.1		83
Belhaven	A	8	C	3	6.8	8.2		145
Belhaven	A	9	A	3	0.4	1.0		20

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	A	9	B	3	0.2	1.6		47
Belhaven	A	9	C	3	18.7	20.7		86
Belhaven	A	10	A	3	0.1	0.6		16
Belhaven	A	10	B	3	0.8	1.8		69
Belhaven	A	10	C	3	1.1	1.7		59
Belhaven	A	11	A	3	0.2	1.3		40
Belhaven	A	11	B	3	3.2	3.8		88
Belhaven	A	11	C	3	12.5	12.2		189
Belhaven	A	12	A	3	0.3	0.7	68	18
Belhaven	A	12	B	3	4.8	6.0		11
Belhaven	A	12	C	3	14.0	14.8		16
Belhaven	A	13	A	3	3.4	3.8	190	119
Belhaven	A	13	B	3	13.5	13.8		39
Belhaven	A	13	C	3	11.3	12.6		17
Belhaven	A	14	A	3	2.6	3.3		115
Belhaven	A	14	B	3	0.2	0.7		34
Belhaven	A	14	C	3	11.9	1.8		49
Belhaven	C	15	A	3	0.4	3.8	15	7
Belhaven	C	15	B	3	0.6	3.3	53	7
Belhaven	C	15	C	3	0.4	3.2	45	7
Belhaven	C	16	A	3	0.3	3.0	76	4
Belhaven	C	16	B	3	1.0	3.8	49	23
Belhaven	C	16	C	3	0.9	3.5	152	12
Belhaven	C	17	A	3		1.1		6
Belhaven	C	17	B	3		0.8		5
Belhaven	C	17	C	3	0.3	0.6		5
Belhaven	C	18	A	3	0.4	0.8		9
Belhaven	C	18	B	3	1.1	0.9		8
Belhaven	C	18	C	3	0.4	0.8		7

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	C	19	A	3	0.3	0.7		9
Belhaven	C	19	B	3	1.3	1.6		15
Belhaven	C	19	C	3	1.4	1.8		25
Belhaven	C	20	A	3	2.1			94
Belhaven	C	20	B	3	1.1	2.3		23
Belhaven	C	20	C	3	1.4	2.7		18
Belhaven	A	1	A	4	0.2	1.1		30
Belhaven	A	1	B	4	0.8	1.6		48
Belhaven	A	1	C	4	0.2	0.6		31
Belhaven	A	2	A	4				66
Belhaven	A	2	B	4				44
Belhaven	A	2	C	4				77
Belhaven	A	3	A	4				26
Belhaven	A	3	B	4				63
Belhaven	A	3	C	4				87
Belhaven	A	4	A	4				18
Belhaven	A	4	B	4				51
Belhaven	A	4	C	4				107
Belhaven	A	5	A	4	0.3	0.6		42
Belhaven	A	5	B	4	0.4	0.5		42
Belhaven	A	5	C	4	0.2	0.5		35
Belhaven	A	6	A	4	0.7	1.2		57
Belhaven	A	6	B	4	0.1	0.6		25
Belhaven	A	6	C	4	1.0	0.8		76
Belhaven	A	7	A	4	0.2	0.6		23
Belhaven	A	7	B	4	13.5	0.6		37
Belhaven	A	7	C	4	0.6	1.4		74
Belhaven	A	8	A	4	0.1	0.7		20
Belhaven	A	8	B	4	0.1	0.6		26

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	A	8	C	4	0.1	0.8		26
Belhaven	A	9	A	4	0.2	0.7		23
Belhaven	A	9	B	4	0.2	0.6		16
Belhaven	A	9	C	4	5.8	6.1		132
Belhaven	A	10	A	4	0.1	0.7		9
Belhaven	A	10	B	4	0.8	0.7		22
Belhaven	A	10	C	4	0.3	0.6		24
Belhaven	A	11	A	4	0.1	0.7		9
Belhaven	A	11	B	4	20.4	1.3		74
Belhaven	A	11	C	4	1.3	1.8		96
Belhaven	A	12	A	4	0.4	0.8	73	54
Belhaven	A	12	B	4	0.4	0.9		44
Belhaven	A	12	C	4	19.8	19.5		158
Belhaven	A	13	A	4	0.4	0.8	58	44
Belhaven	A	13	B	4	1.5	1.9		61
Belhaven	A	13	C	4	6.1	6.0		151
Belhaven	A	14	A	4	0.7	1.3		70
Belhaven	A	14	B	4	0.7	1.6		67
Belhaven	A	14	C	4	0.3	1.7		32
Belhaven	C	15	A	4	0.2	3.0	257	3
Belhaven	C	15	B	4	0.2	0.0	159	7
Belhaven	C	15	C	4	0.2	3.1	191	3
Belhaven	C	16	A	4	0.2	3.1	96	3
Belhaven	C	16	B	4	0.2	3.1	144	6
Belhaven	C	16	C	4	0.3	3.2		8
Belhaven	C	17	A	4		1.1		11
Belhaven	C	17	B	4		0.5		4
Belhaven	C	17	C	4	0.1	0.5		5
Belhaven	C	18	A	4	0.1	0.6		5

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Belhaven	C	18	B	4	0.1	0.5		5
Belhaven	C	18	C	4	0.2	0.6		4
Belhaven	C	19	A	4	0.4	0.7		10
Belhaven	C	19	B	4	0.6	1.3		9
Belhaven	C	19	C	4	0.3	0.6		6
Belhaven	C	20	A	4	1.1			18
Belhaven	C	20	B	4	0.5	1.7		9
Belhaven	C	20	C	4	0.8	0.0		12
Scuppernong	B	1	A	1	1.6	2.0	481	79
Scuppernong	B	1	B	1	4.0	4.2	417	123
Scuppernong	B	1	C	1	2.3	2.3	512	90
Scuppernong	B	2	A	1	3.4	3.7		79
Scuppernong	B	2	B	1	4.8	4.8	64	108
Scuppernong	B	2	C	1	5.1	5.5	465	145
Scuppernong	B	3	A	1	2.1	2.7	112	86
Scuppernong	B	3	B	1	4.5	5.8	206	61
Scuppernong	B	3	C	1	5.4	8.3	459	99
Scuppernong	B	4	A	1	6.1	7.3	192	79
Scuppernong	B	4	B	1	6.4	6.8		73
Scuppernong	B	4	C	1	8.6	9.0	174	76
Scuppernong	B	5	A	1	2.1	2.4	184	69
Scuppernong	B	5	B	1		6.9	226	78
Scuppernong	B	5	C	1		9.7	177	70
Scuppernong	B	6	A	1	0.9	1.2		59
Scuppernong	B	6	B	1	4.4	4.8		71
Scuppernong	B	6	C	1	7.9	8.5		42
Scuppernong	B	7	A	1	2.2	2.9		63
Scuppernong	B	7	B	1	9.6	10.0		57
Scuppernong	B	7	C	1	12.4	12.9		107

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	8	A	1	2.2	3.1		79
Scuppernong	B	8	B	1	5.8	6.3		106
Scuppernong	B	8	C	1	8.6	9.6		112
Scuppernong	B	9	A	1	1.0	1.3		68
Scuppernong	B	9	B	1	3.1	3.5		71
Scuppernong	B	9	C	1	4.9	5.2		72
Scuppernong	B	10	A	1	0.7	0.9		42
Scuppernong	B	10	B	1	2.5	2.8		72
Scuppernong	B	10	C	1	7.6	7.8		70
Scuppernong	B	11	A	1	14.6	28.9	490	178
Scuppernong	B	11	B	1	6.2	6.3		174
Scuppernong	B	11	C	1	11.1	11.6		149
Scuppernong	B	12	A	1	14.7	15.5		230
Scuppernong	B	12	B	1	15.1	15.0		262
Scuppernong	B	12	C	1	24.8	18.8		230
Scuppernong	B	13	A	1	9.8	10.9		212
Scuppernong	B	13	B	1	8.7			200
Scuppernong	B	13	C	1	19.6	21.0		182
Scuppernong	B	14	A	1	6.9	8.0		155
Scuppernong	B	14	B	1	13.3	14.4		284
Scuppernong	B	14	C	1	17.6	22.6		217
Scuppernong	B	15	A	1	6.7	7.9		142
Scuppernong	B	15	B	1	11.4	14.9		202
Scuppernong	B	15	C	1	14.3	15.4		191
Scuppernong	B	16	A	1	12.0	23.5		158
Scuppernong	B	16	B	1	16.5	0.0		226
Scuppernong	B	16	C	1	15.3	16.7		202
Scuppernong	B	17	A	1	9.3	10.8		161
Scuppernong	B	17	B	1	12.2	13.4	491	162

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	17	C	1	19.8	20.8		211
Scuppernong	B	18	A	1	4.6	6.1		139
Scuppernong	B	18	B	1	9.6	11.0		157
Scuppernong	B	18	C	1	15.8	15.5	489	149
Scuppernong	B	19	A	1	10.3	12.4		131
Scuppernong	B	19	B	1	8.3	9.3		188
Scuppernong	B	19	C	1	18.6	21.8		201
Scuppernong	B	20	A	1	4.1	5.9		103
Scuppernong	B	20	B	1	7.9	10.6		168
Scuppernong	B	20	C	1	19.7	20.6		230
Scuppernong	B	1	A	2	0.2	1.9		21
Scuppernong	B	1	B	2	0.4	2.3		33
Scuppernong	B	1	C	2	3.5	4.6		38
Scuppernong	B	2	A	2	0.5	1.8	164	44
Scuppernong	B	2	B	2	0.8	2.1	158	46
Scuppernong	B	2	C	2	3.1	4.2	190	53
Scuppernong	B	3	A	2	0.2	2.1	229	33
Scuppernong	B	3	B	2	1.8	2.9	177	37
Scuppernong	B	3	C	2	2.3	3.1	170	64
Scuppernong	B	4	A	2	12.5	14.6	169	52
Scuppernong	B	4	B	2	2.4	3.3	220	51
Scuppernong	B	4	C	2	5.0	6.2		49
Scuppernong	B	5	A	2	0.7	2.7		147
Scuppernong	B	5	B	2		2.1	110	33
Scuppernong	B	5	C	2		7.4	174	79
Scuppernong	B	6	A	2	0.1	1.6		39
Scuppernong	B	6	B	2	1.4	2.7		65
Scuppernong	B	6	C	2	3.5	4.4		82
Scuppernong	B	7	A	2	0.1	1.6		10

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	7	B	2	3.5	6.0		37
Scuppernong	B	7	C	2	3.5	5.1		46
Scuppernong	B	8	A	2	0.1	2.0		10
Scuppernong	B	8	B	2	1.9	4.7		48
Scuppernong	B	8	C	2	24.1	26.3		84
Scuppernong	B	9	A	2	0.2	2.2		12
Scuppernong	B	9	B	2	4.8	7.9		50
Scuppernong	B	9	C	2	2.9	5.0		61
Scuppernong	B	10	A	2	0.2	2.1		13
Scuppernong	B	10	B	2	0.2	1.7		12
Scuppernong	B	10	C	2	0.8	3.2		43
Scuppernong	B	11	A	2	0.7	2.7	149	51
Scuppernong	B	11	B	2	0.3	1.7		26
Scuppernong	B	11	C	2	0.3	1.8		32
Scuppernong	B	12	A	2	1.2	2.6		47
Scuppernong	B	12	B	2	0.5	1.8		40
Scuppernong	B	12	C	2	0.8	2.6		76
Scuppernong	B	13	A	2	0.6	2.1		57
Scuppernong	B	13	B	2	0.3	2.5		35
Scuppernong	B	13	C	2	0.3	2.3		35
Scuppernong	B	14	A	2	0.2	2.0		43
Scuppernong	B	14	B	2	0.4	3.1		40
Scuppernong	B	14	C	2	0.6	2.7		42
Scuppernong	B	15	A	2	0.1	2.2		38
Scuppernong	B	15	B	2	0.2	2.1		32
Scuppernong	B	15	C	2	1.3	3.3		59
Scuppernong	B	16	A	2	0.4	2.2		36
Scuppernong	B	16	B	2	0.4	1.8		32
Scuppernong	B	16	C	2	1.2	4.7		62

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	17	A	2	0.1	2.0		26
Scuppernong	B	17	B	2	0.2	23.7		21
Scuppernong	B	17	C	2	1.8	3.5		65
Scuppernong	B	18	A	2	0.2	2.1		22
Scuppernong	B	18	B	2	0.8	5.3		66
Scuppernong	B	18	C	2	0.2	2.6	187	35
Scuppernong	B	19	A	2	0.2	2.4		17
Scuppernong	B	19	B	2	0.1	1.1		19
Scuppernong	B	19	C	2	0.6	2.3		44
Scuppernong	B	20	A	2	0.2	2.2		22
Scuppernong	B	20	B	2	0.5	2.2		31
Scuppernong	B	20	C	2	8.6	13.3		92
Scuppernong	B	1	A	3	0.1	1.6		19
Scuppernong	B	1	B	3	0.1	1.4		17
Scuppernong	B	1	C	3	0.1	2.1		17
Scuppernong	B	2	A	3	0.2	1.4	180	38
Scuppernong	B	2	B	3	0.3	1.5	188	40
Scuppernong	B	2	C	3	0.8	2.3	62	59
Scuppernong	B	3	A	3	0.2	1.5	124	21
Scuppernong	B	3	B	3	0.2	1.2	136	38
Scuppernong	B	3	C	3	0.4	1.4	134	38
Scuppernong	B	4	A	3	0.4	1.9	155	37
Scuppernong	B	4	B	3	0.2	1.8	158	37
Scuppernong	B	4	C	3	0.8	7.5	102	57
Scuppernong	B	5	A	3	0.3	1.9	121	68
Scuppernong	B	5	B	3		1.9	118	41
Scuppernong	B	5	C	3		2.0	157	47
Scuppernong	B	6	A	3	0.1	1.4		4
Scuppernong	B	6	B	3	0.1	1.4		39

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	6	C	3	0.2	1.9		55
Scuppernong	B	7	A	3	0.1	1.4		0
Scuppernong	B	7	B	3	0.1	1.2		0
Scuppernong	B	7	C	3	0.1	2.2		13
Scuppernong	B	8	A	3	0.1	1.9		3
Scuppernong	B	8	B	3	0.1	2.4		13
Scuppernong	B	8	C	3	0.3	2.8		14
Scuppernong	B	9	A	3	0.1	2.0		1
Scuppernong	B	9	B	3	0.2			10
Scuppernong	B	9	C	3	0.2	2.0		36
Scuppernong	B	10	A	3	0.1	1.9		3
Scuppernong	B	10	B	3	0.1	1.6		9
Scuppernong	B	10	C	3	0.1	1.5		6
Scuppernong	B	11	A	3	0.1	1.5	84	20
Scuppernong	B	11	B	3	0.1	1.5		12
Scuppernong	B	11	C	3	0.2	1.4		19
Scuppernong	B	12	A	3	0.2	1.7		35
Scuppernong	B	12	B	3	0.3	1.5		23
Scuppernong	B	12	C	3	0.1	1.5		11
Scuppernong	B	13	A	3	0.1	2.0		10
Scuppernong	B	13	B	3	0.1	1.9		7
Scuppernong	B	13	C	3	0.1	1.9		21
Scuppernong	B	14	A	3	0.1	1.7		27
Scuppernong	B	14	B	3	0.4	2.1		100
Scuppernong	B	14	C	3	0.2	2.0		28
Scuppernong	B	15	A	3	0.3	1.9		8
Scuppernong	B	15	B	3	0.1	2.0		10
Scuppernong	B	15	C	3	0.3	2.1		24
Scuppernong	B	16	A	3	0.1	1.5		7

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	16	B	3	0.2	1.7		24
Scuppernong	B	16	C	3	0.2	1.8		28
Scuppernong	B	17	A	3	0.1	1.9		13
Scuppernong	B	17	B	3	0.1	1.9		16
Scuppernong	B	17	C	3	0.1	2.0		5
Scuppernong	B	18	A	3	0.1	1.9		0
Scuppernong	B	18	B	3	0.3	2.4		23
Scuppernong	B	18	C	3	0.1	2.2	121	17
Scuppernong	B	19	A	3	0.1	0.8		33
Scuppernong	B	19	B	3	0.1	0.8		5
Scuppernong	B	19	C	3	0.1	1.9		13
Scuppernong	B	20	A	3	0.1	1.8		3
Scuppernong	B	20	B	3	0.1	2.0		1
Scuppernong	B	20	C	3	0.3	2.3		16
Scuppernong	B	1	A	4	0.1	1.6		4
Scuppernong	B	1	B	4	0.2	0.0		0
Scuppernong	B	1	C	4	0.1	1.4		10
Scuppernong	B	2	A	4	0.3	1.5	89	24
Scuppernong	B	2	B	4	0.3	1.4	92	26
Scuppernong	B	2	C	4	0.5	1.9	139	50
Scuppernong	B	3	A	4	0.3	1.4	28	10
Scuppernong	B	3	B	4	0.3	1.2	91	41
Scuppernong	B	3	C	4	0.3	1.2	73	14
Scuppernong	B	4	A	4	0.2	1.2	37	4
Scuppernong	B	4	B	4	0.2	1.2	156	16
Scuppernong	B	4	C	4	0.3	1.9	64	32
Scuppernong	B	5	A	4		1.8	24	5
Scuppernong	B	5	B	4		1.7	44	16
Scuppernong	B	5	C	4		1.8	79	44

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	6	A	4	0.1	1.6		0
Scuppernong	B	6	B	4	0.1	1.4		9
Scuppernong	B	6	C	4	0.1	1.6		3
Scuppernong	B	7	A	4	0.1	1.2		0
Scuppernong	B	7	B	4	0.1	1.4		0
Scuppernong	B	7	C	4	0.1	1.9		3
Scuppernong	B	8	A	4	0.1	2.1		8
Scuppernong	B	8	B	4	0.1	2.0		4
Scuppernong	B	8	C	4	0.1	2.3		21
Scuppernong	B	9	A	4	0.1	1.9		0
Scuppernong	B	9	B	4	0.7	1.9		3
Scuppernong	B	9	C	4	0.1	1.9		9
Scuppernong	B	10	A	4	0.1	1.9		0
Scuppernong	B	10	B	4	0.1	1.4		0
Scuppernong	B	10	C	4	0.1	1.5		5
Scuppernong	B	11	A	4	0.1	1.5	55	12
Scuppernong	B	11	B	4	0.1	1.5		4
Scuppernong	B	11	C	4	0.1	1.4		6
Scuppernong	B	12	A	4	0.3	1.6		32
Scuppernong	B	12	B	4	0.3	1.6		16
Scuppernong	B	12	C	4	0.1	1.6		9
Scuppernong	B	13	A	4	0.1	1.8		17
Scuppernong	B	13	B	4	0.1	1.9		24
Scuppernong	B	13	C	4	0.4	2.3		46
Scuppernong	B	14	A	4	0.1	2.0		25
Scuppernong	B	14	B	4	0.3	2.0		99
Scuppernong	B	14	C	4	0.2	2.2		8
Scuppernong	B	15	A	4	0.1	1.8		4
Scuppernong	B	15	B	4	0.1	1.8		6

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Scuppernong	B	15	C	4	0.2	1.7		11
Scuppernong	B	16	A	4	0.1	1.5		4
Scuppernong	B	16	B	4	0.2	1.5		5
Scuppernong	B	16	C	4	0.2	1.6		14
Scuppernong	B	17	A	4	0.1	24.6		0
Scuppernong	B	17	B	4	0.1	1.9		3
Scuppernong	B	17	C	4	0.1			0
Scuppernong	B	18	A	4	0.1	1.6		10
Scuppernong	B	18	B	4	0.1	2.1		18
Scuppernong	B	18	C	4	0.1	2.2	91	20
Scuppernong	B	19	A	4	0.1	1.0		4
Scuppernong	B	19	B	4	0.3	0.9		7
Scuppernong	B	19	C	4	0.1	2.0		16
Scuppernong	B	20	A	4	0.2	2.0		2
Scuppernong	B	20	B	4	0.1	1.9		0
Scuppernong	B	20	C	4	0.1	2.0		6
Ponzer	A	1	A	1	8.6	11.4		39
Ponzer	A	1	B	1	4.1			48
Ponzer	A	1	C	1	7.1	7.5		65
Ponzer	A	2	A	1	5.0	5.3		55
Ponzer	A	2	B	1	3.2	3.5	296	58
Ponzer	A	2	C	1	9.4	12.6		64
Ponzer	A	3	A	1	10.9	11.6		58
Ponzer	A	3	B	1	4.4	4.7		58
Ponzer	A	3	C	1	11.6	12.0		155
Ponzer	A	4	A	1	9.2	10.7		51
Ponzer	A	4	B	1	11.0	11.9	350	62
Ponzer	A	4	C	1	7.0	9.1		106
Ponzer	A	5	A	1	5.2	6.1	282	56

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	5	B	1	5.6	6.8		68
Ponzer	A	5	C	1	13.4	14.8		235
Ponzer	A	6	A	1	7.9	8.2		80
Ponzer	A	6	B	1	4.6	4.9		79
Ponzer	A	6	C	1	5.0	6.3		157
Ponzer	A	7	A	1	6.1	7.0		52
Ponzer	A	7	B	1	1.9	3.2		35
Ponzer	A	7	C	1	1.0	2.4	448	58
Ponzer	A	8	A	1	3.2	4.3	19	55
Ponzer	A	8	B	1	1.0	1.7		37
Ponzer	A	8	C	1	0.8	1.8		34
Ponzer	A	9	A	1	1.6	2.5		83
Ponzer	A	9	B	1	1.0	1.1		41
Ponzer	A	9	C	1	0.9	2.1		67
Ponzer	A	10	A	1	1.3	1.9		47
Ponzer	A	10	B	1	1.5	1.8	550	90
Ponzer	A	10	C	1	1.2	14.3	587	81
Ponzer	A	11	A	1	5.5	9.5		89
Ponzer	A	11	B	1	1.9	5.3		50
Ponzer	A	11	C	1	5.2	9.6		74
Ponzer	A	12	A	1	2.0	5.8		43
Ponzer	A	12	B	1	2.4	6.4		48
Ponzer	A	12	C	1	2.9	7.8		59
Ponzer	A	13	A	1	1.3	4.3		29
Ponzer	A	13	B	1	1.5	5.2		49
Ponzer	A	13	C	1	5.0	5.8		64
Ponzer	A	14	A	1	4.6	5.9		90
Ponzer	A	14	B	1	3.2	3.8		69
Ponzer	A	14	C	1	3.7	7.5		74

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	15	A	1	10.5	15.0		74
Ponzer	A	15	B	1	5.5	10.0		69
Ponzer	A	15	C	1	7.1	10.4		67
Ponzer	A	16	A	1	5.0	8.2		61
Ponzer	A	16	B	1	9.9	14.5		80
Ponzer	A	16	C	1	10.7	14.0		85
Ponzer	B	17	A	1	0.7	4.0	396	66
Ponzer	B	17	B	1		4.6	531	115
Ponzer	B	17	C	1	5.0	8.5	487	77
Ponzer	B	18	A	1	1.5	5.2	477	69
Ponzer	B	18	B	1	3.9	7.7	486	72
Ponzer	B	18	C	1	5.2	8.5	486	104
Ponzer	B	19	A	1	1.2	5.1	454	49
Ponzer	B	19	B	1	2.6	5.8	505	81
Ponzer	B	19	C	1	4.0	7.5	443	102
Ponzer	B	20	A	1	1.1	4.2	378	60
Ponzer	B	20	B	1	6.1	9.1	443	71
Ponzer	B	20	C	1	3.9	3.4	341	65
Ponzer	A	1	A	2	13.7	16.4		50
Ponzer	A	1	B	2	10.5	10.6		37
Ponzer	A	1	C	2	10.5	13.2		22
Ponzer	A	2	A	2	2.7	3.3		97
Ponzer	A	2	B	2	8.2	9.1		19
Ponzer	A	2	C	2				30
Ponzer	A	3	A	2				117
Ponzer	A	3	B	2				92
Ponzer	A	3	C	2				60
Ponzer	A	4	A	2				50
Ponzer	A	4	B	2				25

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	4	C	2				155
Ponzer	A	5	A	2				35
Ponzer	A	5	B	2				17
Ponzer	A	5	C	2	15.2	16.6		212
Ponzer	A	6	A	2	2.3	4.5		77
Ponzer	A	6	B	2	6.0	9.6		26
Ponzer	A	6	C	2	4.2	5.3		27
Ponzer	A	7	A	2	2.6	4.0		33
Ponzer	A	7	B	2	0.7	1.6		15
Ponzer	A	7	C	2	1.4	2.5	448	23
Ponzer	A	8	A	2	0.8	2.7		25
Ponzer	A	8	B	2	0.6	1.9		13
Ponzer	A	8	C	2	0.6	1.4		25
Ponzer	A	9	A	2	0.5	3.6		33
Ponzer	A	9	B	2	0.4	0.6		15
Ponzer	A	9	C	2	0.5	2.0		17
Ponzer	A	10	A	2	0.1	1.2		16
Ponzer	A	10	B	2	0.1	2.3		30
Ponzer	A	10	C	2	0.1	1.6		14
Ponzer	A	11	A	2	0.2	1.9		17
Ponzer	A	11	B	2				0
Ponzer	A	11	C	2				60
Ponzer	A	12	A	2				9
Ponzer	A	12	B	2				8
Ponzer	A	12	C	2				23
Ponzer	A	13	A	2				0
Ponzer	A	13	B	2				25
Ponzer	A	13	C	2				27
Ponzer	A	14	A	2				15

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	14	B	2				8
Ponzer	A	14	C	2				57
Ponzer	A	15	A	2				38
Ponzer	A	15	B	2				42
Ponzer	A	15	C	2				29
Ponzer	A	16	A	2				33
Ponzer	A	16	B	2				49
Ponzer	A	16	C	2				47
Ponzer	B	17	A	2	0.3		321	29
Ponzer	B	17	B	2	0.7	3.2	508	53
Ponzer	B	17	C	2	0.6	1.0		46
Ponzer	B	18	A	2	0.2	0.4	272	0
Ponzer	B	18	B	2	0.2	0.5	407	37
Ponzer	B	18	C	2	0.9	1.5	375	37
Ponzer	B	19	A	2	0.2	0.6	427	3
Ponzer	B	19	B	2	0.2	1.0	390	28
Ponzer	B	19	C	2	0.2	3.2	310	36
Ponzer	B	20	A	2	0.3	0.5		34
Ponzer	B	20	B	2	0.7	1.8	363	20
Ponzer	B	20	C	2	0.3	0.6	261	45
Ponzer	A	1	A	3	1.5	0.9		83
Ponzer	A	1	B	3	1.0	2.0		63
Ponzer	A	1	C	3	11.3	13.1		86
Ponzer	A	2	A	3	0.2	0.5		31
Ponzer	A	2	B	3	2.2	2.7		90
Ponzer	A	2	C	3				53
Ponzer	A	3	A	3				36
Ponzer	A	3	B	3				21
Ponzer	A	3	C	3				58

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	4	A	3				28
Ponzer	A	4	B	3				24
Ponzer	A	4	C	3				60
Ponzer	A	5	A	3				30
Ponzer	A	5	B	3				45
Ponzer	A	5	C	3	1.8	2.5		63
Ponzer	A	6	A	3	0.2	0.6		27
Ponzer	A	6	B	3	0.4	1.0		44
Ponzer	A	6	C	3	0.4	0.8		42
Ponzer	A	7	A	3	0.4	1.0		18
Ponzer	A	7	B	3	0.6	1.1		10
Ponzer	A	7	C	3	0.5	1.0	95	31
Ponzer	A	8	A	3	0.2	0.5		6
Ponzer	A	8	B	3	0.3	1.1		8
Ponzer	A	8	C	3	0.2	0.7		9
Ponzer	A	9	A	3	0.4	0.7		22
Ponzer	A	9	B	3	0.2	0.5		9
Ponzer	A	9	C	3	0.2	1.5		28
Ponzer	A	10	A	3	0.1	1.6		6
Ponzer	A	10	B	3	0.1	1.6		10
Ponzer	A	10	C	3	0.1	1.4		9
Ponzer	A	11	A	3	0.1	0.5		4
Ponzer	A	11	B	3				0
Ponzer	A	11	C	3				3
Ponzer	A	12	A	3				2
Ponzer	A	12	B	3				7
Ponzer	A	12	C	3				9
Ponzer	A	13	A	3				0
Ponzer	A	13	B	3				1

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	13	C	3				21
Ponzer	A	14	A	3				0
Ponzer	A	14	B	3				0
Ponzer	A	14	C	3				6
Ponzer	A	15	A	3				23
Ponzer	A	15	B	3				20
Ponzer	A	15	C	3				23
Ponzer	A	16	A	3				29
Ponzer	A	16	B	3				35
Ponzer	A	16	C	3				79
Ponzer	B	17	A	3	0.2	3.2	264	0
Ponzer	B	17	B	3	0.2	3.1	378	15
Ponzer	B	17	C	3	0.2	0.5	452	24
Ponzer	B	18	A	3	0.2	0.4	197	0
Ponzer	B	18	B	3	0.2	0.4	300	17
Ponzer	B	18	C	3	0.3	0.5	331	19
Ponzer	B	19	A	3	0.2	0.5	268	0
Ponzer	B	19	B	3	0.2	0.5	297	9
Ponzer	B	19	C	3	0.2	3.1	261	0
Ponzer	B	20	A	3	0.2	0.4	425	19
Ponzer	B	20	B	3	0.2	0.5	395	9
Ponzer	B	20	C	3	0.2	0.5	262	6
Ponzer	A	1	A	4	0.2	0.5		16
Ponzer	A	1	B	4	0.1	0.5		7
Ponzer	A	1	C	4	0.1	0.8		18
Ponzer	A	2	A	4	0.3	0.7		13
Ponzer	A	2	B	4	0.1	1.6		7
Ponzer	A	2	C	4				7
Ponzer	A	3	A	4				4

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	3	B	4				7
Ponzer	A	3	C	4				21
Ponzer	A	4	A	4				2
Ponzer	A	4	B	4				2
Ponzer	A	4	C	4				16
Ponzer	A	5	A	4				3
Ponzer	A	5	B	4	0.4	0.5		18
Ponzer	A	5	C	4	0.3	1.4		24
Ponzer	A	6	A	4	0.2	0.7		5
Ponzer	A	6	B	4	0.2	0.5		8
Ponzer	A	6	C	4	0.2	0.8		13
Ponzer	A	7	A	4	0.2	0.7		4
Ponzer	A	7	B	4	0.2	0.6		21
Ponzer	A	7	C	4	0.3	0.6	54	11
Ponzer	A	8	A	4	0.2			5
Ponzer	A	8	B	4	0.2	0.5		2
Ponzer	A	8	C	4	0.2	0.7		2
Ponzer	A	9	A	4	0.2	0.6		6
Ponzer	A	9	B	4	0.1	5.9		1
Ponzer	A	9	C	4	0.2	1.2		4
Ponzer	A	10	A	4	0.1	1.4		0
Ponzer	A	10	B	4	0.3	1.3		1
Ponzer	A	10	C	4	0.1	1.4		0
Ponzer	A	11	A	4	0.2	0.5		13
Ponzer	A	11	B	4				11
Ponzer	A	11	C	4				0
Ponzer	A	12	A	4				2
Ponzer	A	12	B	4				3
Ponzer	A	12	C	4				10

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Ponzer	A	13	A	4				3
Ponzer	A	13	B	4				12
Ponzer	A	13	C	4				14
Ponzer	A	14	A	4				0
Ponzer	A	14	B	4				0
Ponzer	A	14	C	4				0
Ponzer	A	15	A	4				2
Ponzer	A	15	B	4				9
Ponzer	A	15	C	4				15
Ponzer	A	16	A	4				2
Ponzer	A	16	B	4				24
Ponzer	A	16	C	4				12
Ponzer	B	17	A	4	0.2	3.1	124	4
Ponzer	B	17	B	4	0.2	3.1	244	9
Ponzer	B	17	C	4	0.2	0.4	433	14
Ponzer	B	18	A	4	0.2	0.5	111	0
Ponzer	B	18	B	4	0.2	0.4	151	2
Ponzer	B	18	C	4	0.2	0.4	143	21
Ponzer	B	19	A	4	0.2	0.4	178	0
Ponzer	B	19	B	4	0.2		159	6
Ponzer	B	19	C	4	0.2	3.0	166	0
Ponzer	B	20	A	4	0.2	0.6	106	1
Ponzer	B	20	B	4	0.2	0.5	72	7
Ponzer	B	20	C	4	0.2	0.5	234	6
Pungo	B	1	A	1	0.8	4.0		39
Pungo	B	1	B	1	3.5	6.6		77
Pungo	B	1	C	1	3.1	5.9	266	40
Pungo	B	2	A	1	4.3	7.3	349	65
Pungo	B	2	B	1	10.6	13.8	365	75

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Pungo	B	2	C	1	5.9	9.5	296	34
Pungo	B	3	A	1	9.2	12.8		78
Pungo	B	3	B	1	13.1	17.6		71
Pungo	B	3	C	1	3.7	6.9		31
Pungo	B	4	A	1	5.3	8.3	360	74
Pungo	B	4	B	1	13.8	19.3	364	69
Pungo	B	4	C	1	4.8	8.5	145	44
Pungo	B	5	A	1	10.3	12.7	393	84
Pungo	B	5	B	1	14.6		114	71
Pungo	B	5	C	1	15.2	17.6	83	29
Pungo	B	6	A	1	6.8	7.8	316	42
Pungo	B	6	B	1	10.9	11.8		44
Pungo	B	6	C	1	10.1	10.7	265	48
Pungo	B	7	A	1	5.2	6.3		50
Pungo	B	7	B	1	9.0	10.4	317	36
Pungo	B	7	C	1	7.7		236	31
Pungo	B	8	A	1	2.1	2.2		49
Pungo	B	8	B	1	12.3	8.1		54
Pungo	B	8	C	1	12.6	13.5		32
Pungo	B	9	A	1	8.5	9.8	323	33
Pungo	B	9	B	1	17.6	19.0		36
Pungo	B	9	C	1	14.8	15.2		31
Pungo	B	10	A	1	8.4	8.9	269	35
Pungo	B	10	B	1	15.1	17.1		29
Pungo	B	10	C	1				39
Pungo	B	1	A	2	0.2	0.9		23
Pungo	B	1	B	2	0.2	1.0		27
Pungo	B	1	C	2	9.7	11.5	130	33
Pungo	B	2	A	2	4.5	7.8	157	39

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Pungo	B	2	B	2	4.0	6.8	207	57
Pungo	B	2	C	2	12.2	14.9		54
Pungo	B	3	A	2	0.3	0.9		40
Pungo	B	3	B	2	2.8	4.2		41
Pungo	B	3	C	2	6.7			42
Pungo	B	4	A	2	0.3	3.2	259	24
Pungo	B	4	B	2	3.4	6.2	136	45
Pungo	B	4	C	2	5.0	8.1	142	27
Pungo	B	5	A	2	0.8	4.1	355	14
Pungo	B	5	B	2	12.0	15.8	173	42
Pungo	B	5	C	2	5.9	9.0	133	32
Pungo	B	6	A	2	0.2	0.7		25
Pungo	B	6	B	2	13.4	15.0		37
Pungo	B	6	C	2	7.1	25.6		22
Pungo	B	7	A	2	0.7	3.0		25
Pungo	B	7	B	2	8.7	25.8		18
Pungo	B	7	C	2	4.0	6.3		5
Pungo	B	8	A	2	0.4	3.6		45
Pungo	B	8	B	2	9.9	12.3		32
Pungo	B	8	C	2	8.5	12.1		9
Pungo	B	9	A	2	0.4	0.9	108	45
Pungo	B	9	B	2	3.4	3.6		8
Pungo	B	9	C	2	11.7	14.5		13
Pungo	B	10	A	2	2.8	3.8		12
Pungo	B	10	B	2	5.0	6.3		12
Pungo	B	10	C	2				31
Pungo	B	1	A	3	0.2	0.5		23
Pungo	B	1	B	3	0.4	0.8		46
Pungo	B	1	C	3	0.5	0.9	119	41

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Pungo	B	2	A	3	0.4	3.5	506	40
Pungo	B	2	B	3	0.2	3.1	325	55
Pungo	B	2	C	3	5.9	9.4		11
Pungo	B	3	A	3	0.2	0.6		28
Pungo	B	3	B	3	0.2	0.9		20
Pungo	B	3	C	3	0.2	8.1		24
Pungo	B	4	A	3	0.2	3.0	132	4
Pungo	B	4	B	3	0.2	3.1	224	12
Pungo	B	4	C	3	3.6	6.1	215	74
Pungo	B	5	A	3	0.3	3.2	133	13
Pungo	B	5	B	3	0.4	3.2	211	9
Pungo	B	5	C	3	0.3	3.2	163	23
Pungo	B	6	A	3	0.1	0.5		24
Pungo	B	6	B	3	0.6	0.8		43
Pungo	B	6	C	3	1.7	3.6	118	39
Pungo	B	7	A	3	0.2	2.1		22
Pungo	B	7	B	3	0.6	2.6		37
Pungo	B	7	C	3	4.5	6.0		46
Pungo	B	8	A	3	0.2	3.1		23
Pungo	B	8	B	3	6.0	9.9		22
Pungo	B	8	C	3	7.4	11.5		24
Pungo	B	9	A	3	2.2	0.6	56	33
Pungo	B	9	B	3	6.2	7.7		13
Pungo	B	9	C	3	5.8	6.0		9
Pungo	B	10	A	3	0.2	0.9		32
Pungo	B	10	B	3	5.0	2.4		7
Pungo	B	10	C	3	4.2	6.3		7
Pungo	B	1	A	4	0.2	0.7		34
Pungo	B	1	B	4	0.3	0.8		27

P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	WSP	Total dissolved P	Total P	M3P
					mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$	mg kg $^{-1}$
Pungo	B	1	C	4	0.2	0.5	105	20
Pungo	B	2	A	4	0.2	3.1	284	41
Pungo	B	2	B	4	0.2	3.1	276	36
Pungo	B	2	C	4	0.4	3.3	280	60
Pungo	B	3	A	4	1.5	0.5		4
Pungo	B	3	B	4	0.1	0.7		17
Pungo	B	3	C	4	0.2	0.6		20
Pungo	B	4	A	4	0.2	3.1	204	17
Pungo	B	4	B	4	0.2	3.1	217	18
Pungo	B	4	C	4	0.3	3.2	203	13
Pungo	B	5	A	4	0.2	3.0	131	10
Pungo	B	5	B	4	0.3	3.1	215	3
Pungo	B	5	C	4	0.2	3.0	148	9
Pungo	B	6	A	4	0.3	0.6		10
Pungo	B	6	B	4	0.2	0.7		21
Pungo	B	6	C	4	0.2	1.9	54	10
Pungo	B	7	A	4	0.1	1.9		18
Pungo	B	7	B	4	0.2	2.0		14
Pungo	B	7	C	4	0.3	24.1		24
Pungo	B	8	A	4	0.2	3.1		14
Pungo	B	8	B	4	0.2	3.1		24
Pungo	B	8	C	4	0.6	3.5		25
Pungo	B	9	A	4	0.2	0.6	42	20
Pungo	B	9	B	4	0.3	7.7		60
Pungo	B	9	C	4	5.4	5.9		14
Pungo	B	10	A	4	1.2	2.0		39
Pungo	B	10	B	4	0.6	2.1		54
Pungo	B	10	C	4	1.5	3.1		9

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	A	1	A	1	205	1397	0.03				3.9			1000
Belhaven	A	1	B	1	207	869	0.04				5.2			1000
Belhaven	A	1	C	1	189	1124	0.04				4.5			1000
Belhaven	A	2	A	1	193	940	0.13				5.7			1000
Belhaven	A	2	B	1	171	722	0.07				5.3			1000
Belhaven	A	2	C	1	174	826	0.07				5.5	656	0.79	1000
Belhaven	A	3	A	1	157	1173	0.04				4.8			1000
Belhaven	A	3	B	1	156	994	0.04				4.8			1000
Belhaven	A	3	C	1	172	1124	0.04				4.9			1000
Belhaven	A	4	A	1	152	1004	0.05				5.1			1000
Belhaven	A	4	B	1	175	1039	0.03				5.1			1000
Belhaven	A	4	C	1	17	1678	0.08				4.4			796
Belhaven	A	5	A	1	155	791	0.05				5.1			1000
Belhaven	A	5	B	1	168	934	0.04				5.2			1000
Belhaven	A	5	C	1	180	926	0.04				4.9			1000
Belhaven	A	6	A	1	163	655	0.07				5.4			1000
Belhaven	A	6	B	1	166	861	0.04				5			1000
Belhaven	A	6	C	1	188	1095	0.03				4.8			1000
Belhaven	A	7	A	1	168	874	0.06				5.5			959
Belhaven	A	7	B	1	168	802	0.07				5.3			1000
Belhaven	A	7	C	1	230	1019	0.05				5.2			1000
Belhaven	A	8	A	1	189	1250	0.04				4.7			1000
Belhaven	A	8	B	1	251	1337	0.05				5.4			1000
Belhaven	A	8	C	1	226	1210	0.03				5			1000
Belhaven	A	9	A	1	222	1398	0.03				4.6			1000
Belhaven	A	9	B	1	233	1508	0.02				4.6			1000
Belhaven	A	9	C	1	229	1519	0.04				4.9			1000
Belhaven	A	10	A	1	175	1621	0.05				4.4			1000
Belhaven	A	10	B	1	195	1285	0.04				5.2			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	A	10	C	1	219	1264	0.08				5.2			1000
Belhaven	A	11	A	1	238	1539	0.05				5.1			1000
Belhaven	A	11	B	1	217	611	0.12				5.8			921
Belhaven	A	11	C	1	203	795	0.18				5.9			854
Belhaven	A	12	A	1	218	1505	0.03				4.7	606	0.40	1000
Belhaven	A	12	B	1	208	775	0.06				5.7			959
Belhaven	A	12	C	1	193	575	0.15				6.2			796
Belhaven	A	13	A	1	208	1123	0.05				5	562	0.50	1000
Belhaven	A	13	B	1	267	963	0.04				5.1			1000
Belhaven	A	13	C	1	227	819	0.04				5.2			1000
Belhaven	A	14	A	1	186	255					6.5			745
Belhaven	A	14	B	1	232	567	0.16				5.9			1000
Belhaven	A	14	C	1	199	411	0.16				5.9			921
Belhaven	C	15	A	1	396	3248	0.02	1.5	16.7	18.7	5.2	631	0.19	1000
Belhaven	C	15	B	1	369	2845	0.03	3.1	25.6	40.3	5.1	309	0.11	1000
Belhaven	C	15	C	1	400	2785	0.03	2.8	30.7	36.4	5.2	301	0.11	959
Belhaven	C	16	A	1	319	2534	0.01	3.0	45.8	22.4	4.8	288	0.11	1000
Belhaven	C	16	B	1	433	2762	0.02				5	371	0.13	1000
Belhaven	C	16	C	1	336	2612	0.02	6.2	30.2	33.3	5.2	302	0.12	1000
Belhaven	C	17	A	1	364	2443	0.03				4.9			1000
Belhaven	C	17	B	1	383	2858	0.02				5.1			1000
Belhaven	C	17	C	1	444	3077	0.03				4.9			1000
Belhaven	C	18	A	1	370	3060	0.02				4.8	600	0.20	1000
Belhaven	C	18	B	1	362	2786	0.02				5			1000
Belhaven	C	18	C	1	396	2855	0.03				4.9			1000
Belhaven	C	19	A	1	330	2933	0.03				4.7			1000
Belhaven	C	19	B	1	392	2928	0.02				4.7			1000
Belhaven	C	19	C	1	381	3044	0.02				4.6			1000
Belhaven	C	20	A	1	275	2265	0.02				5			959

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	C	20	B	1	362	3004	0.03				4.9			1000
Belhaven	C	20	C	1	308	3294	0.01				4.9			1000
Belhaven	A	1	A	2	34	1878	0.05				3.9			1000
Belhaven	A	1	B	2	172	896	0.02				4.6			1000
Belhaven	A	1	C	2	68	1092	0.04				4.2			1000
Belhaven	A	2	A	2	100	1385	0.02				4.2			1000
Belhaven	A	2	B	2	55	762	0.02				4.4			1000
Belhaven	A	2	C	2	50	1092	0.02				3.9			1000
Belhaven	A	3	A	2	70	1045	0.02				4.1			1000
Belhaven	A	3	B	2	105	973	0.03				4.1			1000
Belhaven	A	3	C	2	84	1081	0.03				3.9			1000
Belhaven	A	4	A	2	40	629	0.03				4.1			1000
Belhaven	A	4	B	2	223	535	0.09				5.5			1000
Belhaven	A	4	C	2	107	1152	0.04				4.2			1000
Belhaven	A	5	A	2	84	1590	0.01				4.4			1000
Belhaven	A	5	B	2	73	813	0.04				4			1000
Belhaven	A	5	C	2	100	939	0.02				4			1000
Belhaven	A	6	A	2	34	1278	0.03				4.4			886
Belhaven	A	6	B	2	59	704	0.03				4.3			1000
Belhaven	A	6	C	2	83	855	0.02				4.1			1000
Belhaven	A	7	A	2	114	1611	0.03				4.7			770
Belhaven	A	7	B	2	53	1054	0.02				4.2			1000
Belhaven	A	7	C	2	209	977	0.03				4.8			1000
Belhaven	A	8	A	2	42	2236	0.03				4.2			959
Belhaven	A	8	B	2	217	1426	0.03				4.6			1000
Belhaven	A	8	C	2	121	1430	0.02				3.9			1000
Belhaven	A	9	A	2	71	2318	0.03				4.3			1000
Belhaven	A	9	B	2	83	2213	0.02				4.1			959
Belhaven	A	9	C	2	207	1160	0.03				4.3			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	A	10	A	2	46	2008	0.03				4.3			658
Belhaven	A	10	B	2	168	1179	0.03				4.6			1000
Belhaven	A	10	C	2	102	1580	0.02				4			959
Belhaven	A	11	A	2	80	1937	0.04				4.5			1000
Belhaven	A	11	B	2	185	760	0.08				5.4			1000
Belhaven	A	11	C	2	204	1863	0.03				4.1			1000
Belhaven	A	12	A	2	40	1795	0.02				4.3	190	0.11	620
Belhaven	A	12	B	2	237	1384	0.02				4.8			1000
Belhaven	A	12	C	2	227	1180	0.03				4.4			1000
Belhaven	A	13	A	2	200	1376	0.02				4.6	550	0.40	1000
Belhaven	A	13	B	2	209	1200	0.02				4.7			1000
Belhaven	A	13	C	2	131	1052	0.02				3.9			1000
Belhaven	A	14	A	2	191	392	0.08				4.9			1000
Belhaven	A	14	B	2	121	1292	0.02				4.2			1000
Belhaven	A	14	C	2	162	1239	0.02				4.1			1000
Belhaven	C	15	A	2	144	1071	0.04	1.9	69.1	6.1	5.7	229	0.21	276
Belhaven	C	15	B	2	485	3118	0.01				5.2	457	0.15	1000
Belhaven	C	15	C	2	375	1862	0.01				5.3	429	0.23	1000
Belhaven	C	16	A	2	407	2308	0.01	2.8	39.5	15.0	5.1	427	0.19	1000
Belhaven	C	16	B	2	387	1725	0.01				5.2	468	0.27	1000
Belhaven	C	16	C	2	566	2493	0.02				5.3	430	0.17	1000
Belhaven	C	17	A	2	425	1884	0.02				5.1			1000
Belhaven	C	17	B	2	451	1953	0.01				5			1000
Belhaven	C	17	C	2	485	2274	0.02				4.7			1000
Belhaven	C	18	A	2	421	2476	0.02				4.8			1000
Belhaven	C	18	B	2	350	1984	0.03				4.9			1000
Belhaven	C	18	C	2	416	2259	0.04				4.9			1000
Belhaven	C	19	A	2	456	2632	0.02				4.6			1000
Belhaven	C	19	B	2	345	2252	0.01				4.7			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	C	19	C	2	403	2128	0.01				4.8			1000
Belhaven	C	20	A	2	344	3873	0.00				4.6			1000
Belhaven	C	20	B	2	314	2104	0.02				4.9			1000
Belhaven	C	20	C	2	350	2260	0.02				4.7			1000
Belhaven	A	1	A	3	17	2055	0.06				4.2			523
Belhaven	A	1	B	3	41	2096	0.03				4.1			1000
Belhaven	A	1	C	3	14	1718	0.06				4.4			444
Belhaven	A	2	A	3	13	1564	0.07				4.2			451
Belhaven	A	2	B	3	17	1518	0.06				4.2			553
Belhaven	A	2	C	3	15	1666	0.06				4			854
Belhaven	A	3	A	3	11	1980	0.03				4.3			824
Belhaven	A	3	B	3	28	1906	0.08				4.2			1000
Belhaven	A	3	C	3	34	1158	0.05				3.7			1000
Belhaven	A	4	A	3	9	1395	0.06				4.2			796
Belhaven	A	4	B	3	125	989	0.02				5.1			1000
Belhaven	A	4	C	3	21	1591	0.09				4.3			1000
Belhaven	A	5	A	3	9	1729	0.04				4.2			523
Belhaven	A	5	B	3	26	1859	0.05				4.1			921
Belhaven	A	5	C	3	17	1704	0.05				4.1			770
Belhaven	A	6	A	3	21	1677	0.05				4.5			420
Belhaven	A	6	B	3	20	2084	0.03				4.3			745
Belhaven	A	6	C	3	80	2405	0.05				4.1			959
Belhaven	A	7	A	3	16	1738	0.05				4.5			678
Belhaven	A	7	B	3	17	1603	0.06				4.1			699
Belhaven	A	7	C	3	40	1857	0.04				4.2			745
Belhaven	A	8	A	3	55	2210	0.02				4.5			553
Belhaven	A	8	B	3	64	2084	0.03				4.3			699
Belhaven	A	8	C	3	91	3133	0.04				4.1			796
Belhaven	A	9	A	3	52	2582	0.01				4.5			337

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	A	9	B	3	60	2847	0.01				4.3			432
Belhaven	A	9	C	3	84	2129	0.03				4.1			1000
Belhaven	A	10	A	3	40	2115	0.01				4.5			229
Belhaven	A	10	B	3	55	2218	0.03				4.3			602
Belhaven	A	10	C	3	30	2095	0.02				4.1			1000
Belhaven	A	11	A	3	36	2031	0.02				4.5			310
Belhaven	A	11	B	3	37	1980	0.04				4.3			602
Belhaven	A	11	C	3	37	2301	0.07				4.3			678
Belhaven	A	12	A	3	25	2017	0.01				4.5	78	0.04	174
Belhaven	A	12	B	3	115	1472	0.01				4.2			1000
Belhaven	A	12	C	3	96	1486	0.01				3.9			1000
Belhaven	A	13	A	3	102	2655	0.04				4.3	220	0.08	796
Belhaven	A	13	B	3	70	1501	0.02				4.1			1000
Belhaven	A	13	C	3	156	1537	0.01				3.8			1000
Belhaven	A	14	A	3	71	2211	0.04				4.2			921
Belhaven	A	14	B	3	28	2184	0.01				4.4			377
Belhaven	A	14	C	3	72	1812	0.02				3.9			1000
Belhaven	C	15	A	3	42	211	0.03		96.4	3.3	5.7	7	0.03	41
Belhaven	C	15	B	3	113	444	0.01	1.3	83.2	11.4	5.6	42	0.09	149
Belhaven	C	15	C	3	100	400	0.01	0.3	82.2	5.5	5.6	120	0.30	174
Belhaven	C	16	A	3	183	562	0.01	0.1	78.6	5.2	5.6	162	0.29	367
Belhaven	C	16	B	3	90	392	0.05	12.5	78.7	2.1	5.6	66	0.17	229
Belhaven	C	16	C	3	169	911	0.01	1.9	72.6	5.9	5.5	196	0.22	658
Belhaven	C	17	A	3	90	245	0.02				5.6			66
Belhaven	C	17	B	3	115	479	0.01				5.2			377
Belhaven	C	17	C	3	181	737	0.00				5.2			456
Belhaven	C	18	A	3	98	609	0.01				5			319
Belhaven	C	18	B	3	93	483	0.01				5.2			268
Belhaven	C	18	C	3	87	354	0.02				5.2			180

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	C	19	A	3	108	1034	0.01				5			620
Belhaven	C	19	B	3	80	598	0.02				5.1			208
Belhaven	C	19	C	3	177	1182	0.02				4.9			1000
Belhaven	C	20	A	3	396	2552	0.03				4.8			1000
Belhaven	C	20	B	3	103	799	0.02				5.3			377
Belhaven	C	20	C	3	142	872	0.02				4.9			796
Belhaven	A	1	A	4	18	1637	0.02				4.5			347
Belhaven	A	1	B	4	9	2065	0.02				4.5			620
Belhaven	A	1	C	4	6	1885	0.01				4.7			377
Belhaven	A	2	A	4	15	1651	0.03				4.6			523
Belhaven	A	2	B	4	17	1617	0.02				4.6			398
Belhaven	A	2	C	4	11	1764	0.04				4.3			432
Belhaven	A	3	A	4	9	1994	0.01				4.5			328
Belhaven	A	3	B	4	7	2368	0.02				4.3			602
Belhaven	A	3	C	4	9	1920	0.04				4.2			523
Belhaven	A	4	A	4	6	1720	0.01				4.6			328
Belhaven	A	4	B	4	13	1577	0.03				4.4			456
Belhaven	A	4	C	4	9	2091	0.04				4.3			699
Belhaven	A	5	A	4	9	2001	0.02				4.5			409
Belhaven	A	5	B	4	14	1928	0.02				4.3			824
Belhaven	A	5	C	4	15	1870	0.02				4.4			469
Belhaven	A	6	A	4	40	1516	0.03				4.6			229
Belhaven	A	6	B	4	23	1815	0.01				4.6			301
Belhaven	A	6	C	4	21	1749	0.04				4.3			602
Belhaven	A	7	A	4	15	1923	0.01				4.6			456
Belhaven	A	7	B	4	19	1812	0.02				4.5			337
Belhaven	A	7	C	4	26	2450	0.03				4.4			824
Belhaven	A	8	A	4	76	2276	0.01				4.6			456
Belhaven	A	8	B	4	86	2082	0.01				4.6			553

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	A	8	C	4	39	2317	0.01				4.4			569
Belhaven	A	9	A	4	171	1683	0.01				4.7			161
Belhaven	A	9	B	4	101	1996	0.01				4.5			237
Belhaven	A	9	C	4	58	1816	0.06				4.3			553
Belhaven	A	10	A	4	54	1779	0.00				4.7			174
Belhaven	A	10	B	4	86	1669	0.01				4.6			252
Belhaven	A	10	C	4	37	2348	0.01				4.3			506
Belhaven	A	11	A	4	114	957	0.01				4.7			76
Belhaven	A	11	B	4	81	2921	0.02				4.6			495
Belhaven	A	11	C	4	37	2208	0.04				4.4			252
Belhaven	A	12	A	4	40	1741	0.03				4.6	70	0.04	215
Belhaven	A	12	B	4	24	1888	0.02				4.3			328
Belhaven	A	12	C	4	53	1959	0.07				3.9			854
Belhaven	A	13	A	4	117	1453	0.03				4.7	58	0.04	143
Belhaven	A	13	B	4	36	1297	0.04				4.4			215
Belhaven	A	13	C	4	33	1831	0.07				4.5			347
Belhaven	A	14	A	4	52	2273	0.03				4.7			469
Belhaven	A	14	B	4	36	2113	0.03				4			796
Belhaven	A	14	C	4	39	2228	0.01				4.2			409
Belhaven	C	15	A	4	235	454	0.00	0.1	83.5	12.7	5.4	37	0.08	97
Belhaven	C	15	B	4	198	445	0.01	0.3	81.5	15.3	5.5	28	0.06	76
Belhaven	C	15	C	4	189	341	0.01	0.7	85.6	10.7	5.4	30	0.09	71
Belhaven	C	16	A	4	136	279	0.01	0.7	91.7	5.0	5.5	25	0.09	46
Belhaven	C	16	B	4	200	384	0.01	0.7	88.6	8.4	5.4	23	0.06	56
Belhaven	C	16	C	4	120	437	0.01				5.7			137
Belhaven	C	17	A	4	113	478	0.02				5.4			284
Belhaven	C	17	B	4	212	365	0.01				4.9			46
Belhaven	C	17	C	4	180	373	0.01				5.3			97
Belhaven	C	18	A	4	159	336	0.01				4.9			66

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Belhaven	C	18	B	4	155	411	0.01				5.6			51
Belhaven	C	18	C	4	145	332	0.01				5.7			86
Belhaven	C	19	A	4	39	302	0.03				5.3			92
Belhaven	C	19	B	4	43	222	0.03				5.3			76
Belhaven	C	19	C	4	76	376	0.01				5.3			143
Belhaven	C	20	A	4	75	683	0.02				5.2			409
Belhaven	C	20	B	4	39	288	0.03				5.5			76
Belhaven	C	20	C	4	63	371	0.03				5.3			131
Scuppernong	B	1	A	1	218	1514	0.04				5.7			721
Scuppernong	B	1	B	1	270	2019	0.05				5.5	720	0.36	770
Scuppernong	B	1	C	1	268	1953	0.04				5.8			824
Scuppernong	B	2	A	1	294	1855	0.03	3.0	20.0	22.2	5.5	548	0.30	886
Scuppernong	B	2	B	1	293	2086	0.04	2.1	5.3	8.1	5.3	845	0.41	921
Scuppernong	B	2	C	1	344	2616	0.05	2.5	7.7	10.7	5.4	791	0.30	921
Scuppernong	B	3	A	1	302	1747	0.04	3.1	25.2	28.9	5.2	428	0.24	959
Scuppernong	B	3	B	1	286	1900	0.03	3.0	13.6	17.3	5	660	0.35	1000
Scuppernong	B	3	C	1	298	2321	0.04	3.4	15.4	18.3	5.3	629	0.27	1000
Scuppernong	B	4	A	1	282	1589	0.04	3.1	31.4	30.4	4.8	351	0.22	824
Scuppernong	B	4	B	1	265	1988	0.03	2.1	8.9	14.7	4.9	743	0.37	886
Scuppernong	B	4	C	1	322	2291	0.03	2.1	4.6	8.3	4.5	850	0.37	1000
Scuppernong	B	5	A	1	249	2047	0.03	2.7	22.1	24.2	4.8	511	0.25	921
Scuppernong	B	5	B	1	278	1835	0.03	2.5	7.9	14.4	5.1	753	0.41	921
Scuppernong	B	5	C	1	335	2344	0.02	1.6	8.9	13.8	4.8	757	0.32	921
Scuppernong	B	6	A	1	252	1761	0.03				5.2			959
Scuppernong	B	6	B	1	330	2188	0.03				5			921
Scuppernong	B	6	C	1	322	2159	0.02				4.2			959
Scuppernong	B	7	A	1	214	1777	0.03				5.3			824
Scuppernong	B	7	B	1	342	2209	0.02				4.6			1000
Scuppernong	B	7	C	1	382	2560	0.03				4.5			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	8	A	1	195	1751	0.04				5.5			796
Scuppernong	B	8	B	1	307	2094	0.04				5.4			1000
Scuppernong	B	8	C	1	296	1844	0.05				5.2			1000
Scuppernong	B	9	A	1	194	1540	0.04				5.4			921
Scuppernong	B	9	B	1	267	2033	0.03				5.1			1000
Scuppernong	B	9	C	1	272	1899	0.03				5			1000
Scuppernong	B	10	A	1	203	1987	0.02				4.9			959
Scuppernong	B	10	B	1	218	2184	0.03				4.8			1000
Scuppernong	B	10	C	1	313	2023	0.03				4.7			1000
Scuppernong	B	11	A	1	230	1559	0.09				5.4			796
Scuppernong	B	11	B	1	183	1752	0.08				5.2			1000
Scuppernong	B	11	C	1	207	2202	0.06				4.5			1000
Scuppernong	B	12	A	1	218	1868	0.10				5.1			1000
Scuppernong	B	12	B	1	255	2417	0.09				5.1			1000
Scuppernong	B	12	C	1	222	2090	0.09				4.8			1000
Scuppernong	B	13	A	1	216	2008	0.09				5.2			1000
Scuppernong	B	13	B	1	233	2596	0.06				4.9			1000
Scuppernong	B	13	C	1	200	2238	0.07				4.6			1000
Scuppernong	B	14	A	1	177	2053	0.06				4.7			1000
Scuppernong	B	14	B	1	259	2417	0.10				5			1000
Scuppernong	B	14	C	1	215	2146	0.08				4.7			1000
Scuppernong	B	15	A	1	149	2127	0.06				4.9			1000
Scuppernong	B	15	B	1	191	2157	0.08				5			1000
Scuppernong	B	15	C	1	208	2571	0.06				4.5			1000
Scuppernong	B	16	A	1	188	2071	0.06				4.8			1000
Scuppernong	B	16	B	1	197	2560	0.07				4.9			959
Scuppernong	B	16	C	1	237	2350	0.07				4.6			1000
Scuppernong	B	17	A	1	207	2114	0.06				4.8			1000
Scuppernong	B	17	B	1	210	2394	0.06				4.6	596	0.25	1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	17	C	1	210	2225	0.08				4.6			1000
Scuppernong	B	18	A	1	184	2198	0.05				4.7			1000
Scuppernong	B	18	B	1	179	1896	0.07				5.2			1000
Scuppernong	B	18	C	1	204	1888	0.07				4.7	614	0.33	1000
Scuppernong	B	19	A	1	146	2319	0.05				4.6			1000
Scuppernong	B	19	B	1	205	2198	0.07				4.9			1000
Scuppernong	B	19	C	1	223	2360	0.07				4.6			1000
Scuppernong	B	20	A	1	174	2268	0.04				4.5			1000
Scuppernong	B	20	B	1	232	2164	0.06				4.7			1000
Scuppernong	B	20	C	1	258	2276	0.08				4.7			959
Scuppernong	B	1	A	2	91	2400	0.01				4.3			495
Scuppernong	B	1	B	2	97	2714	0.01				4.2			1000
Scuppernong	B	1	C	2	192	3072	0.01				4.3			1000
Scuppernong	B	2	A	2	109	2048	0.02	1.6	35.7	31.4	4.6	313	0.15	523
Scuppernong	B	2	B	2	155	2819	0.01	0.2	11.0	9.7	4.1	791	0.28	1000
Scuppernong	B	2	C	2	188	2097	0.02				4.1	332	0.16	1000
Scuppernong	B	3	A	2	109	2014	0.01	1.9	29.6	51.9	4.7	166	0.08	268
Scuppernong	B	3	B	2	271	2204	0.01				4.2	607	0.28	1000
Scuppernong	B	3	C	2	207	2227	0.02	0.6	13.6	18.6	4.1	672	0.30	1000
Scuppernong	B	4	A	2	267	2034	0.02				4.1	592	0.29	1000
Scuppernong	B	4	B	2	201	2407	0.02				4.1	831	0.35	1000
Scuppernong	B	4	C	2	262	2127	0.02	0.2	8.9	11.7	3.9	793	0.37	1000
Scuppernong	B	5	A	2	50	2465	0.05	3.6	31.4	48.1	4.4	170	0.07	569
Scuppernong	B	5	B	2	117	2378	0.01	2.2	16.3	30.5	4.4	511	0.21	1000
Scuppernong	B	5	C	2	190	3091	0.02	0.9	16.2	28.8	4	541	0.18	1000
Scuppernong	B	6	A	2	67	2129	0.02				4.5			237
Scuppernong	B	6	B	2	107	3028	0.02				4.2			921
Scuppernong	B	6	C	2	93	2673	0.03				4			1000
Scuppernong	B	7	A	2	70	1820	0.00				4.7			237

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	7	B	2	384	3038	0.01				4.4			1000
Scuppernong	B	7	C	2	329	3694	0.01				3.9			1000
Scuppernong	B	8	A	2	69	2044	0.00				4.9			208
Scuppernong	B	8	B	2	239	2998	0.01				4.5			1000
Scuppernong	B	8	C	2	233	1702	0.04				4.5			1000
Scuppernong	B	9	A	2	79	2298	0.00				4.8			509
Scuppernong	B	9	B	2	294	2692	0.02				4.3			1000
Scuppernong	B	9	C	2	178	2758	0.02				4.1			1000
Scuppernong	B	10	A	2	84	2160	0.01				4.6			420
Scuppernong	B	10	B	2	70	2207	0.00				4.3			699
Scuppernong	B	10	C	2	144	2829	0.01				4			1000
Scuppernong	B	11	A	2	138	2291	0.02				4.5	226	0.10	854
Scuppernong	B	11	B	2	74	2657	0.01				4.3			770
Scuppernong	B	11	C	2	82	2559	0.01				4.1			886
Scuppernong	B	12	A	2	88	2302	0.02				4.3			1000
Scuppernong	B	12	B	2	91	2478	0.01				4.3			959
Scuppernong	B	12	C	2	88	2690	0.02				4.1			699
Scuppernong	B	13	A	2	162	2744	0.02				4.5			1000
Scuppernong	B	13	B	2	79	2613	0.01				4.3			886
Scuppernong	B	13	C	2	68	2889	0.01				4			921
Scuppernong	B	14	A	2	47	2583	0.01				4.2			585
Scuppernong	B	14	B	2	139	2967	0.01				4.1			824
Scuppernong	B	14	C	2	70	2768	0.01				4			1000
Scuppernong	B	15	A	2	43	2467	0.01				4.5			602
Scuppernong	B	15	B	2	78	2714	0.01				4.2			921
Scuppernong	B	15	C	2	125	2785	0.02				4.1			1000
Scuppernong	B	16	A	2	51	2440	0.01				4.2			796
Scuppernong	B	16	B	2	71	2456	0.01				4.3			745
Scuppernong	B	16	C	2	143	2852	0.02				3.9			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	17	A	2	89	2337	0.01				4.2			509
Scuppernong	B	17	B	2	52	2328	0.01				4.2			699
Scuppernong	B	17	C	2	91	2017	0.03				4.1			1000
Scuppernong	B	18	A	2	23	2473	0.01				4.3			569
Scuppernong	B	18	B	2	108	2363	0.02				4.4			1000
Scuppernong	B	18	C	2	74	2433	0.01				3.9	346	0.14	1000
Scuppernong	B	19	A	2	36	2697	0.01				4.1			1000
Scuppernong	B	19	B	2	72	2453	0.01				4.2			699
Scuppernong	B	19	C	2	63	2795	0.01				3.9			796
Scuppernong	B	20	A	2	131	2272	0.01				4.2			799
Scuppernong	B	20	B	2	131	2472	0.01				4.1			886
Scuppernong	B	20	C	2	213	2685	0.03				4.1			1000
Scuppernong	B	1	A	3	91	1858	0.01				4.6			119
Scuppernong	B	1	B	3	52	2026	0.01				4.4			187
Scuppernong	B	1	C	3	43	2380	0.01				4.4			387
Scuppernong	B	2	A	3	122	1648	0.02	0.7	51.1	35.2	4.8	130	0.08	187
Scuppernong	B	2	B	3	93	1752	0.02	1.6	43.0	40.5	4.5	150	0.09	310
Scuppernong	B	2	C	3	83	2159	0.02	2.4	26.6	41.2	4.2	299	0.14	824
Scuppernong	B	3	A	3	182	1427	0.01	1.2	54.1	37.7	4.9	71	0.05	97
Scuppernong	B	3	B	3	53	2159	0.01	1.8	28.0	47.0	4.3	233	0.11	357
Scuppernong	B	3	C	3	156	2073	0.02	2.2	45.9	32.2	4.2	197	0.09	310
Scuppernong	B	4	A	3	51	2268	0.01	10.9	6.2	61.2	4.4	216	0.10	387
Scuppernong	B	4	B	3	52	2315	0.01	4.8	29.4	47.9	4.3	179	0.08	409
Scuppernong	B	4	C	3	105	2236	0.02	0.8	27.2	29.9	3.9	422	0.19	658
Scuppernong	B	5	A	3	66	1929	0.03	4.3	34.9	51.2	4.6	96	0.05	155
Scuppernong	B	5	B	3	39	2140	0.02	4.8	31.8	53.2	4.4	102	0.05	262
Scuppernong	B	5	C	3	43	2821	0.01	2.9	26.1	48.8	4.1	223	0.08	585
Scuppernong	B	6	A	3	146	1661	0.00				4.7			76
Scuppernong	B	6	B	3	101	2388	0.01				4.4			229

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	6	C	3	47	2294	0.02				4.2			367
Scuppernong	B	7	A	3	224	1569	0.00				4.7			81
Scuppernong	B	7	B	3	164	2048	0.00				4.5			357
Scuppernong	B	7	C	3	117	2826	0.00				4.1			745
Scuppernong	B	8	A	3	115	1978	0.00				4.7			97
Scuppernong	B	8	B	3	57	2068	0.01				4.3			432
Scuppernong	B	8	C	3	74	2456	0.00				4.3			745
Scuppernong	B	9	A	3	74	2232	0.00				4.8			137
Scuppernong	B	9	B	3	71	2141	0.00				4.5			569
Scuppernong	B	9	C	3	113	2502	0.01				4.1			824
Scuppernong	B	10	A	3	132	2094	0.00				4.6			97
Scuppernong	B	10	B	3	79	2141	0.00				4.6			252
Scuppernong	B	10	C	3	75	2250	0.00				4.3			367
Scuppernong	B	11	A	3	85	2006	0.01				4.5	86	0.04	276
Scuppernong	B	11	B	3	73	2091	0.01				4.5			268
Scuppernong	B	11	C	3	59	2265	0.01				4.3			201
Scuppernong	B	12	A	3	77	2063	0.01				4.3			328
Scuppernong	B	12	B	3	55	2304	0.01				4.3			337
Scuppernong	B	12	C	3	62	2221	0.00				4.2			310
Scuppernong	B	13	A	3	174	1469	0.01				4.5			143
Scuppernong	B	13	B	3	95	2218	0.00				4.4			420
Scuppernong	B	13	C	3	89	2361	0.01				4.2			444
Scuppernong	B	14	A	3	63	2101	0.01				4.4			155
Scuppernong	B	14	B	3	66	2454	0.04				4.4			237
Scuppernong	B	14	C	3	31	2531	0.01				4.3			284
Scuppernong	B	15	A	3	39	3029	0.00				4.7			260
Scuppernong	B	15	B	3	52	2439	0.00				4.4			367
Scuppernong	B	15	C	3	116	2637	0.01				4.3			620
Scuppernong	B	16	A	3	108	1757	0.00				4.4			92

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	16	B	3	62	1998	0.01				4.3			244
Scuppernong	B	16	C	3	58	2544	0.01				4.1			553
Scuppernong	B	17	A	3	178	2075	0.01				4.4			180
Scuppernong	B	17	B	3	72	2049	0.01				4.3			201
Scuppernong	B	17	C	3	197	1755	0.00				4.3			208
Scuppernong	B	18	A	3	19	2458	0.00				4.6			131
Scuppernong	B	18	B	3	89	2658	0.01				4			1000
Scuppernong	B	18	C	3	95	2271	0.01				4.1	132	0.06	420
Scuppernong	B	19	A	3	20	1400	0.02				4.5			174
Scuppernong	B	19	B	3	76	2415	0.00				4.5			201
Scuppernong	B	19	C	3	20	2471	0.00				4			310
Scuppernong	B	20	A	3	220	1614	0.00				4.4			137
Scuppernong	B	20	B	3	145	1814	0.00				4.3			97
Scuppernong	B	20	C	3	68	2486	0.01				4.1			721
Scuppernong	B	1	A	4	158	732	0.00				4.7			22
Scuppernong	B	1	B	4	198	1376	0.00				4.6			27
Scuppernong	B	1	C	4	92	1751	0.00				4.7			108
Scuppernong	B	2	A	4	207	1091	0.02	1.2	57.1	36.4	5	53	0.05	92
Scuppernong	B	2	B	4	145	1330	0.02	1.7	53.8	35.5	4.8	91	0.07	116
Scuppernong	B	2	C	4	154	1953	0.02	0.9	31.3	33.8	4.3	341	0.17	387
Scuppernong	B	3	A	4	229	760	0.01	0.7	73.0	22.1	4.8	41	0.05	27
Scuppernong	B	3	B	4	135	1614	0.02	2.2	43.4	45.9	4.6	84	0.05	125
Scuppernong	B	3	C	4	268	1464	0.01	2.4	58.5	29.8	4.5	92	0.06	137
Scuppernong	B	4	A	4	131	1686	0.00		47.2	47.8	4.7	116	0.07	97
Scuppernong	B	4	B	4	136	1643	0.01	2.8	85.8	3.9	4.6	75	0.05	155
Scuppernong	B	4	C	4	118	1863	0.01	0.2	54.9	25.4	4.6	195	0.10	174
Scuppernong	B	5	A	4	211	1263	0.00	1.5	70.3	23.4	4.6	48	0.04	18
Scuppernong	B	5	B	4	128	1606	0.01	2.5	53.4	36.6	4.6	76	0.05	102
Scuppernong	B	5	C	4	39	2320	0.02	1.8	63.0	35.2	4.4			260

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					$mg\ kg^{-1}$	$mg\ kg^{-1}$		%	%	%		$g\ kg^{-1}$	$g\ mg^{-1}$	$g\ cm^{-3}$
Scuppernong	B	6	A	4	241	1552	0.00				4.7			60
Scuppernong	B	6	B	4	213	1657	0.00				4.5			92
Scuppernong	B	6	C	4	288	1361	0.00				4.7			66
Scuppernong	B	7	A	4	256	1340	0.00				4.5			36
Scuppernong	B	7	B	4	213	1596	0.00				4.5			108
Scuppernong	B	7	C	4	174	1902	0.00				4.6			194
Scuppernong	B	8	A	4	152	1601	0.00				4.8			108
Scuppernong	B	8	B	4	92	1644	0.00				4.6			149
Scuppernong	B	8	C	4	72	1973	0.01				4.6			337
Scuppernong	B	9	A	4	215	1633	0.00				4.7			56
Scuppernong	B	9	B	4	119	1794	0.00				4.6			108
Scuppernong	B	9	C	4	56	2499	0.00				4.5			276
Scuppernong	B	10	A	4	206	1604	0.00				4.6			51
Scuppernong	B	10	B	4	233	1694	0.00				4.5			102
Scuppernong	B	10	C	4	136	1964	0.00				4.6			125
Scuppernong	B	11	A	4	167	1446	0.01				4.6	64	0.04	119
Scuppernong	B	11	B	4	147	1643	0.00				4.4			81
Scuppernong	B	11	C	4	132	1672	0.00				4.4			114
Scuppernong	B	12	A	4	151	2085	0.01				4.4			409
Scuppernong	B	12	B	4	101	1622	0.01				4.6			268
Scuppernong	B	12	C	4	137	1801	0.00				4.4			237
Scuppernong	B	13	A	4	240	1196	0.01				4.5			46
Scuppernong	B	13	B	4	156	2113	0.01				4.6			268
Scuppernong	B	13	C	4	186	2101	0.02				4.4			638
Scuppernong	B	14	A	4	172	1578	0.01				4.5			146
Scuppernong	B	14	B	4	130	2331	0.04				4.7			161
Scuppernong	B	14	C	4	117	1851	0.00				4.5			167
Scuppernong	B	15	A	4	117	1845	0.00				4.7			215
Scuppernong	B	15	B	4	91	2298	0.00				4.5			167

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Scuppernong	B	15	C	4	187	1831	0.01				4.3			222
Scuppernong	B	16	A	4	34	2333	0.00				4.4			46
Scuppernong	B	16	B	4	193	1659	0.00				4.5			108
Scuppernong	B	16	C	4	98	1680	0.01				4.4			161
Scuppernong	B	17	A	4	252	1209	0.00				4.3			51
Scuppernong	B	17	B	4	181	1778	0.00				4.4			137
Scuppernong	B	17	C	4	258	1439	0.00				4.3			97
Scuppernong	B	18	A	4	95	2030	0.00				4.6			81
Scuppernong	B	18	B	4	143	1842	0.01				4.4			229
Scuppernong	B	18	C	4	137	1876	0.01				4.4			137
Scuppernong	B	19	A	4	204	1361	0.00				4.4			60
Scuppernong	B	19	B	4	124	2253	0.00				4.7			268
Scuppernong	B	19	C	4	68	1977	0.01				4.3			174
Scuppernong	B	20	A	4	258	1232	0.00				4.4			114
Scuppernong	B	20	B	4	177	1586	0.00				4.4			97
Scuppernong	B	20	C	4	128	1870	0.00				4.3			215
Ponzer	A	1	A	1	118	1458	0.02				4.4			1000
Ponzer	A	1	B	1	178	1631	0.02				4.8			1000
Ponzer	A	1	C	1	137	1434	0.04				4.8			1000
Ponzer	A	2	A	1	130	1490	0.03				4.9			1000
Ponzer	A	2	B	1	135	1494	0.03				4.8			1000
Ponzer	A	2	C	1	165	1559	0.03				4.8			1000
Ponzer	A	3	A	1	141	1392	0.03				4.9			1000
Ponzer	A	3	B	1	166	1405	0.03				4.9			1000
Ponzer	A	3	C	1	247	1782	0.07				5			1000
Ponzer	A	4	A	1	156	1405	0.03				4.9			1000
Ponzer	A	4	B	1	161	1280	0.04				5.1			1000
Ponzer	A	4	C	1	208	1603	0.05				5.5			1000
Ponzer	A	5	A	1	138	1532	0.03				5.1	510	0.33	1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	5	B	1	180	1562	0.04				5.2			1000
Ponzer	A	5	C	1	213	2033	0.10				5.5			1000
Ponzer	A	6	A	1	166	1774	0.04				4.7			1000
Ponzer	A	6	B	1	219	1931	0.03				5			1000
Ponzer	A	6	C	1	193	2135	0.06				5.2			1000
Ponzer	A	7	A	1	118	1551	0.03				4.9			1000
Ponzer	A	7	B	1	123	1424	0.02				5.4			1000
Ponzer	A	7	C	1	108	2161	0.02				5.3	344	0.16	1000
Ponzer	A	8	A	1	100	2004	0.02				5			1000
Ponzer	A	8	B	1	101	2310	0.01				5.1			1000
Ponzer	A	8	C	1	130	2486	0.01				4.6			1000
Ponzer	A	9	A	1	112	2279	0.03				4.9			1000
Ponzer	A	9	B	1	100	2198	0.02				5.2			1000
Ponzer	A	9	C	1	125	2176	0.03				5			1000
Ponzer	A	10	A	1	130	2046	0.02				5.2			1000
Ponzer	A	10	B	1	143	2437	0.03				5.3			1000
Ponzer	A	10	C	1	169	2305	0.03				5.5			1000
Ponzer	A	11	A	1	133	1761	0.04				5			1000
Ponzer	A	11	B	1	96	1826	0.02				4.9			1000
Ponzer	A	11	C	1	180	1799	0.03				5			1000
Ponzer	A	12	A	1	115	1451	0.03				5.1			1000
Ponzer	A	12	B	1	133	1672	0.02				5.1			1000
Ponzer	A	12	C	1	149	1564	0.03				5.6			1000
Ponzer	A	13	A	1	87	1541	0.02				4.8			1000
Ponzer	A	13	B	1	111	1492	0.03				5.8			1000
Ponzer	A	13	C	1	134	1422	0.04				5.4			1000
Ponzer	A	14	A	1	159	2046	0.04				5			1000
Ponzer	A	14	B	1	161	2098	0.03				4.8			1000
Ponzer	A	14	C	1	210	2002	0.03				5.1			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	15	A	1	141	1661	0.04				4.8			1000
Ponzer	A	15	B	1	159	1546	0.04				5.1			1000
Ponzer	A	15	C	1	208	1716	0.03				4.7			1000
Ponzer	A	16	A	1	154	1622	0.03				4.8			1000
Ponzer	A	16	B	1	201	1735	0.04				4.8			1000
Ponzer	A	16	C	1	225	1752	0.04				4.9			1000
Ponzer	B	17	A	1	154	1903	0.03	1.7	21.8	43.5	5.4	330	0.17	824
Ponzer	B	17	B	1	226	2195	0.04	2.0	11.5	30.9	5.2	556	0.25	1000
Ponzer	B	17	C	1	194	2519	0.03	2.1	9.7	26.7	4.8	615	0.24	1000
Ponzer	B	18	A	1	136	1931	0.03	1.5	23.0	49.8	5.6	257	0.13	900
Ponzer	B	18	B	1	193	2075	0.03	1.9	13.6	30.7	5.2	539	0.26	1000
Ponzer	B	18	C	1	216	2445	0.04	2.2	8.1	26.9	5.3	628	0.26	1000
Ponzer	B	19	A	1	142	2319	0.02	1.5	14.4	47.4	5.1	367	0.16	1000
Ponzer	B	19	B	1	137	2398	0.03	1.5	9.3	34.2	5.3	550	0.23	1000
Ponzer	B	19	C	1	216	2338	0.04	2.0	5.5	26.1	5.5	664	0.28	1000
Ponzer	B	20	A	1	176	2220	0.02	1.5	13.9	35.9	4.7	487	0.22	1000
Ponzer	B	20	B	1	204	2410	0.02				4.9	720	0.30	1000
Ponzer	B	20	C	1	111	2414	0.02	1.0	19.7	36.7	4.9	426	0.18	1000
Ponzer	A	1	A	2	124	1840	0.02				3.9			1000
Ponzer	A	1	B	2	81	1731	0.02				4.1			1000
Ponzer	A	1	C	2	74	1523	0.01				4.2			1000
Ponzer	A	2	A	2	35	2042	0.04				4.1			638
Ponzer	A	2	B	2	61	1193	0.01				3.9			1000
Ponzer	A	2	C	2	83	1863	0.01				3.8			1000
Ponzer	A	3	A	2	35	1751	0.06				4.3			538
Ponzer	A	3	B	2	59	1638	0.05				4.1			721
Ponzer	A	3	C	2	105	1877	0.03				3.9			1000
Ponzer	A	4	A	2	74	1586	0.03				4.2			886
Ponzer	A	4	B	2	61	1062	0.02				4.3			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	4	C	2	227	1494	0.08				4			1000
Ponzer	A	5	A	2	60	2370	0.01				4.4			585
Ponzer	A	5	B	2	61	1349	0.01				4			1000
Ponzer	A	5	C	2	227	2007	0.09				4.2			1000
Ponzer	A	6	A	2	70	2103	0.03				4.2			796
Ponzer	A	6	B	2	103	1560	0.01				4.2			1000
Ponzer	A	6	C	2	89	1705	0.01				3.8			1000
Ponzer	A	7	A	2	112	1658	0.02				4.4			1000
Ponzer	A	7	B	2	40	1389	0.01				4.2			1000
Ponzer	A	7	C	2	81	1768	0.01				4.3	246	0.14	1000
Ponzer	A	8	A	2	81	1817	0.01				4.3			1000
Ponzer	A	8	B	2	74	2830	0.00				4.3			1000
Ponzer	A	8	C	2	84	2500	0.01				4.1			1000
Ponzer	A	9	A	2	61	2071	0.01				4.3			959
Ponzer	A	9	B	2	101	2332	0.01				4.5			1000
Ponzer	A	9	C	2	59	1768	0.01				4.2			1000
Ponzer	A	10	A	2	59	2389	0.01				4.6			1000
Ponzer	A	10	B	2	79	2104	0.01				4.9			886
Ponzer	A	10	C	2	70	2779	0.00				4.6			1000
Ponzer	A	11	A	2	85	2027	0.01				4.5			796
Ponzer	A	11	B	2	15	2159	0.00				4.9			252
Ponzer	A	11	C	2	112	1841	0.03				4			1000
Ponzer	A	12	A	2	58	1708	0.00				4.4			678
Ponzer	A	12	B	2	42	1906	0.00				4.6			699
Ponzer	A	12	C	2	49	1576	0.01				4.1			1000
Ponzer	A	13	A	2	28	1749	0.00				4.7			131
Ponzer	A	13	B	2	39	1812	0.01				4.4			1000
Ponzer	A	13	C	2	28	1721	0.01				4.2			1000
Ponzer	A	14	A	2	72	2281	0.01				4.6			1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	14	B	2	70	1880	0.00				4.8			721
Ponzer	A	14	C	2	149	2656	0.02				4.2			1000
Ponzer	A	15	A	2	104	2032	0.02				4.2			1000
Ponzer	A	15	B	2	65	1588	0.02				4.2			1000
Ponzer	A	15	C	2	49	1431	0.02				4			1000
Ponzer	A	16	A	2	46	1825	0.02				4.1			1000
Ponzer	A	16	B	2	102	1827	0.02				4.1			1000
Ponzer	A	16	C	2	72	1614	0.03				4			1000
Ponzer	B	17	A	2	52	2534	0.01	2.0	16.7	47.6	4.5	337	0.13	523
Ponzer	B	17	B	2	51	2819	0.02	1.2	15.2	33.7	4.2	500	0.18	921
Ponzer	B	17	C	2	51	2953	0.01		14.2	30.1	4	557	0.19	1000
Ponzer	B	18	A	2	39	2798	0.00	2.2	25.8	61.6	5	104	0.04	201
Ponzer	B	18	B	2	43	2434	0.01				4.6	200	0.08	854
Ponzer	B	18	C	2	62	3020	0.01				4.3	393	0.13	1000
Ponzer	B	19	A	2	21	2699	0.00	1.6	29.9	45.4	5	231	0.09	319
Ponzer	B	19	B	2	32	2631	0.01	2.3	28.2	52.2	4.8	174	0.07	745
Ponzer	B	19	C	2	29	2364	0.01	2.1	29.1	55.2	4.7	136	0.06	509
Ponzer	B	20	A	2	79	3412	0.01	1.1	13.7	51.6	4.4	336	0.10	770
Ponzer	B	20	B	2	110	2807	0.01	2.0	13.3	37.3	4.4	474	0.17	1000
Ponzer	B	20	C	2	87	2491	0.02	1.9	18.2	55.6	4.4	243	0.10	602
Ponzer	A	1	A	3	99	1819	0.04				4.2			409
Ponzer	A	1	B	3	22	1643	0.03				4.2			252
Ponzer	A	1	C	3	68	1737	0.04				4			921
Ponzer	A	2	A	3	19	2308	0.01				4.4			260
Ponzer	A	2	B	3	46	1876	0.04				4.2			456
Ponzer	A	2	C	3	42	2053	0.02				4.1			538
Ponzer	A	3	A	3	57	1910	0.02				4.5			194
Ponzer	A	3	B	3	104	1460	0.01				4.5			137
Ponzer	A	3	C	3	55	2176	0.02				4.1			444

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	4	A	3	89	1537	0.02				4.6			143
Ponzer	A	4	B	3	32	1923	0.01				4.5			201
Ponzer	A	4	C	3	36	1623	0.03				4.3			237
Ponzer	A	5	A	3	146	2486	0.01				4.6			347
Ponzer	A	5	B	3	25	2063	0.02				4.3			252
Ponzer	A	5	C	3	85	2163	0.02				4.2			854
Ponzer	A	6	A	3	66	1887	0.01				4.6			149
Ponzer	A	6	B	3	105	1757	0.02				4.6			319
Ponzer	A	6	C	3	27	1836	0.02				4.1			347
Ponzer	A	7	A	3	62	1579	0.01				4.4			387
Ponzer	A	7	B	3	182	592	0.01				5			114
Ponzer	A	7	C	3	32	1427	0.02				4.3	86	0.06	310
Ponzer	A	8	A	3	105	1284	0.00				4.5			71
Ponzer	A	8	B	3	102	1555	0.00				4.4			959
Ponzer	A	8	C	3	106	1706	0.00				4.5			387
Ponzer	A	9	A	3	110	1441	0.01				4.6			143
Ponzer	A	9	B	3	70	1315	0.01				4.6			180
Ponzer	A	9	C	3	37	1539	0.02				4.5			319
Ponzer	A	10	A	3	155	1251	0.00				4.8			187
Ponzer	A	10	B	3	138	1164	0.01				5			180
Ponzer	A	10	C	3	115	1666	0.00				4.8			310
Ponzer	A	11	A	3	94	1267	0.00				4.8			60
Ponzer	A	11	B	3	63	1338	0.00				5.1			46
Ponzer	A	11	C	3	104	1743	0.00				4.5			244
Ponzer	A	12	A	3	86	1732	0.00				4.8			149
Ponzer	A	12	B	3	155	1689	0.00				4.9			180
Ponzer	A	12	C	3	110	1420	0.01				4.6			456
Ponzer	A	13	A	3	66	1839	0.00				5			46
Ponzer	A	13	B	3	32	1806	0.00				4.4			260

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	13	C	3	98	1683	0.01				4.2			921
Ponzer	A	14	A	3	187	1039	0.00				4.9			108
Ponzer	A	14	B	3	160	943	0.00				5			76
Ponzer	A	14	C	3	112	1748	0.00				4.8			328
Ponzer	A	15	A	3	124	1661	0.01				4.5			222
Ponzer	A	15	B	3	21	1653	0.01				4.5			208
Ponzer	A	15	C	3	15	1638	0.01				4.3			244
Ponzer	A	16	A	3	73	1883	0.01				4.3			420
Ponzer	A	16	B	3	33	1909	0.02				4.1			337
Ponzer	A	16	C	3	56	1923	0.04				4.2			523
Ponzer	B	17	A	3	81	2711	0.00	3.1	14.4	67.8	4.8	148	0.05	229
Ponzer	B	17	B	3	15	2643	0.01	3.2	18.8	64.4	4.4	136	0.05	357
Ponzer	B	17	C	3	21	2771	0.01	3.0	18.9	60.2	4.3	180	0.06	602
Ponzer	B	18	A	3	76	2764	0.00	4.6	19.3	67.3	5.1	87	0.03	155
Ponzer	B	18	B	3	45	2579	0.01	3.2	24.3	61.3	5	111	0.04	444
Ponzer	B	18	C	3	37	2413	0.01	2.0	12.6	66.2	4.7	191	0.08	310
Ponzer	B	19	A	3	32	2826	0.00	1.9	34.7	52.9	4.9	105	0.04	208
Ponzer	B	19	B	3	32	2516	0.00	3.9	31.8	57.6	4.8	67	0.03	292
Ponzer	B	19	C	3	13	2807	0.00	2.4	30.5	56.4	4.7	106	0.04	229
Ponzer	B	20	A	3	20	2727	0.01	1.4	21.1	62.3	4.6	152	0.06	328
Ponzer	B	20	B	3	30	2858	0.00	2.8	29.9	51.9	4.5	153	0.05	432
Ponzer	B	20	C	3	29	2504	0.00	1.4	40.7	44.0	4.5	138	0.06	244
Ponzer	A	1	A	4	234	1297	0.01				4.6			284
Ponzer	A	1	B	4	107	1246	0.00				4.6			81
Ponzer	A	1	C	4	115	1249	0.01				4.5			81
Ponzer	A	2	A	4	60	2292	0.00				4.6			310
Ponzer	A	2	B	4	147	1261	0.00				4.7			94
Ponzer	A	2	C	4	123	1966	0.00				4.6			194
Ponzer	A	3	A	4	225	919	0.00				4.7			71

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	3	B	4	248	745	0.01				4.8			51
Ponzer	A	3	C	4	169	1585	0.01				4.5			131
Ponzer	A	4	A	4	203	663	0.00				4.9			22
Ponzer	A	4	B	4	172	1095	0.00				4.8			92
Ponzer	A	4	C	4	83	1105	0.01				4.8			76
Ponzer	A	5	A	4	262	949	0.00				5			60
Ponzer	A	5	B	4	240	1115	0.01				4.9			149
Ponzer	A	5	C	4	109	1449	0.01				4.8			161
Ponzer	A	6	A	4	211	1254	0.00				4.7			97
Ponzer	A	6	B	4	197	1049	0.01				4.9			51
Ponzer	A	6	C	4	84	1727	0.01				4.5			143
Ponzer	A	7	A	4	217	810	0.00				4.8			56
Ponzer	A	7	B	4	77	1188	0.01				4.6			481
Ponzer	A	7	C	4	75	857	0.01				4.7	32	0.04	66
Ponzer	A	8	A	4	158	860	0.00				4.8			32
Ponzer	A	8	B	4	179	743	0.00				4.8			81
Ponzer	A	8	C	4	185	789	0.00				4.9			71
Ponzer	A	9	A	4	159	692	0.01				5.1			41
Ponzer	A	9	B	4	212	828	0.00				4.8			56
Ponzer	A	9	C	4	180	857	0.00				4.8			56
Ponzer	A	10	A	4	217	701	0.00				4.9			51
Ponzer	A	10	B	4	218	725	0.00				5			41
Ponzer	A	10	C	4	206	784	0.00				5			76
Ponzer	A	11	A	4	169	1362	0.01				4.9			92
Ponzer	A	11	B	4	154	1197	0.01				5			36
Ponzer	A	11	C	4	162	1631	0.00				4.9			56
Ponzer	A	12	A	4	213	1652	0.00				4.8			284
Ponzer	A	12	B	4	155	1733	0.00				5.1			76
Ponzer	A	12	C	4	159	1272	0.01				4.8			36

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Ponzer	A	13	A	4	118	1854	0.00				5			66
Ponzer	A	13	B	4	78	1626	0.01				4.7			328
Ponzer	A	13	C	4	135	1055	0.01				4.7			155
Ponzer	A	14	A	4	260	653	0.00				5.1			51
Ponzer	A	14	B	4	208	595	0.00				5.2			36
Ponzer	A	14	C	4	187	745	0.00				5.1			27
Ponzer	A	15	A	4	150	804	0.00				4.7			41
Ponzer	A	15	B	4	119	1040	0.01				4.7			71
Ponzer	A	15	C	4	64	1308	0.01				4.7			155
Ponzer	A	16	A	4	219	861	0.00				4.5			46
Ponzer	A	16	B	4	109	1409	0.01				4.5			155
Ponzer	A	16	C	4	153	1108	0.01				4.6			92
Ponzer	B	17	A	4	139	1393	0.00	1.5	37.0	54.3	4.8	72	0.05	92
Ponzer	B	17	B	4	64	2353	0.00	3.3	27.6	58.9	4.8	103	0.04	252
Ponzer	B	17	C	4	43	2696	0.00	3.1	21.9	60.6	4.8	145	0.05	409
Ponzer	B	18	A	4	230	1212	0.00	0.8	46.1	47.1	4.8	60	0.05	46
Ponzer	B	18	B	4	126	2042	0.00				5	77	0.04	161
Ponzer	B	18	C	4	105	2480	0.01	2.3	20.0	68.2	4.9	95	0.04	284
Ponzer	B	19	A	4	63	2553	0.00	2.5	38.2	51.6	5.1	77	0.03	194
Ponzer	B	19	B	4	167	1829	0.00	2.5	47.0	43.0	4.8	75	0.04	149
Ponzer	B	19	C	4	29	2754	0.00	3.1	39.0	46.3	4.8	116	0.04	143
Ponzer	B	20	A	4	184	1338	0.00	1.2	51.4	33.1	4.7	144	0.11	167
Ponzer	B	20	B	4	130	1761	0.00	0.7	59.6	33.7	4.8	61	0.03	143
Ponzer	B	20	C	4	67	2280	0.00	2.4	30.7	53.0	4.7	140	0.06	172
Pungo	B	1	A	1	171	1986	0.02				4.8			1000
Pungo	B	1	B	1	344	2539	0.02				5			770
Pungo	B	1	C	1	327	2286	0.01				4.6	750	0.33	796
Pungo	B	2	A	1	258	2124	0.03	2.6	13.2	15.1	5	691	0.33	1000
Pungo	B	2	B	1	272	2230	0.03	2.7	10.4	12.6	5.2	743	0.33	921

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Pungo	B	2	C	1	325	1916	0.01	2.4	6.9	10.1	5	806	0.42	745
Pungo	B	3	A	1	161	2679	0.02				4.5			1000
Pungo	B	3	B	1	285	2305	0.03				4.8			1000
Pungo	B	3	C	1	316	1976	0.01				5.1			1000
Pungo	B	4	A	1	208	2157	0.03	3.0	17.6	16.1	5.1	634	0.29	1000
Pungo	B	4	B	1	292	2315	0.02	1.9	11.5	14.6	4.8	720	0.31	1000
Pungo	B	4	C	1	257	1795	0.02	2.6	6.7	10.3	5	804	0.45	854
Pungo	B	5	A	1	226	2722	0.03	2.0	19.1	19.1	4.4	598	0.22	1000
Pungo	B	5	B	1	385	2267	0.03	2.5	16.3	14.4	4.8	669	0.30	1000
Pungo	B	5	C	1	300	2095	0.01	2.5	8.1	9.7	4.3	798	0.38	1000
Pungo	B	6	A	1	220	2105	0.02				4.3			1000
Pungo	B	6	B	1	326	1973	0.02				4.7			1000
Pungo	B	6	C	1	203	1990	0.02				4.2	712		1000
Pungo	B	7	A	1	268	2865	0.01				4			1000
Pungo	B	7	B	1	320	2512	0.01				4	582	0.23	959
Pungo	B	7	C	1	290	2753	0.01				3.9	810	0.29	1000
Pungo	B	8	A	1	419	3240	0.01	0.7	11.2	8.7	4	794	0.25	1000
Pungo	B	8	B	1	332	2542	0.02	1.1	16.1	10.0	4.1	729	0.29	921
Pungo	B	8	C	1	248	2012	0.01	0.3	8.7	6.5	3.7	845	0.42	1000
Pungo	B	9	A	1	412	2993	0.01				3.7	613	0.20	1000
Pungo	B	9	B	1	360	2542	0.01				3.7			824
Pungo	B	9	C	1	319	1919	0.01				3.5			764
Pungo	B	10	A	1	250	2377	0.01				3.8			959
Pungo	B	10	B	1	342	2522	0.01				3.8			854
Pungo	B	10	C	1	299	2110	0.01				3.6			796
Pungo	B	1	A	2	58	1934	0.01				4.5			432
Pungo	B	1	B	2	74	2890	0.01				4.5			523
Pungo	B	1	C	2	140	1513	0.02				4.2			1000
Pungo	B	2	A	2	213	2659	0.01	2.2	12.0	14.1	4.3	717	0.27	1000

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Pungo	B	2	B	2	265	2862	0.02	1.0	5.8	7.8	4.1	854	0.30	1000
Pungo	B	2	C	2	210	2700	0.02	1.8	3.3	16.8	3.9	781	0.29	1000
Pungo	B	3	A	2	29	2627	0.01				4.4			569
Pungo	B	3	B	2	170	3225	0.01				4.1			1000
Pungo	B	3	C	2	210	2610	0.01				4.1			1000
Pungo	B	4	A	2	87	2867	0.01	1.8	47.5	27.2	4.4	234	0.08	1000
Pungo	B	4	B	2	313	2932	0.01	1.9	0.4	21.5	4.1	763	0.26	1000
Pungo	B	4	C	2	263	1945	0.01	1.8	8.6	8.8	4.2	808	0.42	1000
Pungo	B	5	A	2	52	3057	0.00	3.6	19.6	29.3	4.3	476	0.16	959
Pungo	B	5	B	2	254	2746	0.01	1.7	-2.2	24.3	4.2	763	0.28	1000
Pungo	B	5	C	2	248	2650	0.01	1.2	17.2	16.6	4	650	0.25	1000
Pungo	B	6	A	2	64	2554	0.01				4.1			854
Pungo	B	6	B	2	342	1930	0.02				4.2			1000
Pungo	B	6	C	2	198	2158	0.01				4			1000
Pungo	B	7	A	2	117	2545	0.01				4			1000
Pungo	B	7	B	2	315	2790	0.01				3.9			1000
Pungo	B	7	C	2	274	2866	0.00				3.6			1000
Pungo	B	8	A	2	161	3473	0.01	0.2	54.5	20.4	4.1	250	0.07	620
Pungo	B	8	B	2	263	2020	0.01	0.3	6.0	12.5	3.9	812	0.40	1000
Pungo	B	8	C	2	301	2749	0.00		6.2	6.8	3.7	873	0.32	1000
Pungo	B	9	A	2	128	2672	0.01				3.9	270	0.10	721
Pungo	B	9	B	2	375	2941	0.00				3.8			745
Pungo	B	9	C	2	261	1526	0.01				3.7			796
Pungo	B	10	A	2	202	3122	0.00				3.8			824
Pungo	B	10	B	2	274	2453	0.00				3.6			721
Pungo	B	10	C	2	356	3149	0.01				3.6			886
Pungo	B	1	A	3	58	1857	0.01				4.7			215
Pungo	B	1	B	3	40	2888	0.01				4.4			456
Pungo	B	1	C	3	30	2151	0.02				4.2	182	0.08	699

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Pungo	B	2	A	3	55	2955	0.01	1.4	32.6	24.7	4.2	412	0.14	824
Pungo	B	2	B	3	66	2517	0.02	2.2	41.9	35.5	4.2	203	0.08	553
Pungo	B	2	C	3	261	1980	0.00	1.9	4.6	3.3	3.8	902	0.46	1000
Pungo	B	3	A	3	15	2276	0.01				4.6			222
Pungo	B	3	B	3	40	2932	0.01				4.2			921
Pungo	B	3	C	3	32	2872	0.01				4.3			511
Pungo	B	4	A	3	98	1745	0.00	1.8	61.2	28.5	4.8	85	0.05	125
Pungo	B	4	B	3	41	2590	0.00	2.3	49.1	30.1	4.1	184	0.07	678
Pungo	B	4	C	3	147	2479	0.03	1.2	17.7	13.8	4.2	673	0.27	1000
Pungo	B	5	A	3	33	2474	0.00	1.7	56.4	26.7	4.3	153	0.06	495
Pungo	B	5	B	3	69	3127	0.00	0.6	49.3	18.9	4.3	312	0.10	796
Pungo	B	5	C	3	72	2787	0.01	1.3	45.4	28.1	4	252	0.09	886
Pungo	B	6	A	3	35	1887	0.01				4.4			201
Pungo	B	6	B	3	109	3311	0.01				4.1			1000
Pungo	B	6	C	3	150	3255	0.01				4			921
Pungo	B	7	A	3	30	2042	0.01				4.5			194
Pungo	B	7	B	3	75	2454	0.01				3.9			745
Pungo	B	7	C	3	134	2836	0.01				3.7			678
Pungo	B	8	A	3	53	2020	0.01	0.2	66.7	22.1	4.5	110	0.05	268
Pungo	B	8	B	3	343	3369	0.01				3.9	846	0.25	854
Pungo	B	8	C	3	212	2628	0.01		9.0	9.7	3.7	817	0.31	886
Pungo	B	9	A	3	38	1548	0.02				4.6	70	0.05	215
Pungo	B	9	B	3	323	2445	0.00				3.6			959
Pungo	B	9	C	3	211	2116	0.00				3.6			921
Pungo	B	10	A	3	106	2661	0.01				3.7			377
Pungo	B	10	B	3	208	2098	0.00				3.7			745
Pungo	B	10	C	3	147	1929	0.00				3.7			959
Pungo	B	1	A	4	218	2810	0.01				4.8			337
Pungo	B	1	B	4	63	4610	0.01				4.3			509

Non-P Characteristics Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	M3Fe	M3Al	M3PSR	Clay	Sand	Silt	pH	OM	OM/M3Al	Humic Matter
					mg kg^{-1}	mg kg^{-1}		%	%	%		g kg^{-1}	g mg^{-1}	g cm^{-3}
Pungo	B	1	C	4	24	1950	0.01				4.5	116	0.06	337
Pungo	B	2	A	4	30	1988	0.02	2.4	49.1	35.8	4.5	127	0.06	229
Pungo	B	2	B	4	57	2517	0.01	2.5	43.8	40.7	4.4	130	0.05	310
Pungo	B	2	C	4	21	2218	0.02	3.2	44.6	36.6	4.3	156	0.07	377
Pungo	B	3	A	4	51	2404	0.00				4.8			174
Pungo	B	3	B	4	40	2661	0.01				4.6			444
Pungo	B	3	C	4	43	2382	0.01				4.6			367
Pungo	B	4	A	4	39	2061	0.01	2.5	48.8	37.7	4.7	111	0.05	237
Pungo	B	4	B	4	32	2058	0.01	2.5	55.1	32.3	4.6	100	0.05	215
Pungo	B	4	C	4	44	2445	0.00	2.2	45.6	28.7	4.3	235	0.10	444
Pungo	B	5	A	4	39	2248	0.00	0.7	63.0	23.6	4.6	127	0.06	194
Pungo	B	5	B	4	32	2826	0.00	0.6	53.3	23.1	4.5	230	0.08	328
Pungo	B	5	C	4	49	2551	0.00	2.3	51.1	26.5	4.3	201	0.08	509
Pungo	B	6	A	4	90	1545	0.01				4.7			97
Pungo	B	6	B	4	44	2245	0.01				4.3			523
Pungo	B	6	C	4	38	1952	0.00				4.4	86	0.04	456
Pungo	B	7	A	4	49	1707	0.01				4.8			119
Pungo	B	7	B	4	36	2004	0.01				4.4			377
Pungo	B	7	C	4	44	1954	0.01				4.3			367
Pungo	B	8	A	4	91	1825	0.01		70.2	23.9	5.1	63	0.03	102
Pungo	B	8	B	4	31	1634	0.01	0.2	60.0	28.5	4.5	113	0.07	301
Pungo	B	8	C	4	81	1641	0.01	0.7	54.4	31.4	4.4	135	0.08	387
Pungo	B	9	A	4	74	1310	0.01				4.6	62	0.05	194
Pungo	B	9	B	4	146	3213	0.02				4.2			699
Pungo	B	9	C	4	240	2928	0.00				3.9			658
Pungo	B	10	A	4	35	2015	0.02				4.1			420
Pungo	B	10	B	4	87	2469	0.02				4			678
Pungo	B	10	C	4	169	2630	0.00				3.7			377

Fertilized Incubation Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day	pH day 21	Applied P that was retained
				g kg^{-1}	--------------------mg kg^{-1}--------------------								%
Pungo	6	C	1	712	1990	203	0.36	79	57	53	61	3.9	56.9
Pungo	6	C	1	712	1990	203	0.36	79	55	51	66	3.9	58.5
Pungo	6	C	1	712	1990	203	0.36	75	57	54	73	4.0	55.8
Pungo	1	C	1	750	2286	327	0.33	78	61	57	86	4.3	49.4
Pungo	1	C	1	750	2286	327	0.33	79	59	54	81	4.3	52.2
Pungo	1	C	1	750	2286	327	0.33	80	58	55	80	4.2	51.4
Pungo	7	B	1	582	2512	320	0.23	69	46	42	74	3.7	68.3
Pungo	7	B	1	582	2512	320	0.23	66	47	44	82	3.7	67.0
Pungo	7	B	1	582	2512	320	0.23	66	48	44	76	3.7	66.5
Pungo	7	C	1	810	2753	290	0.29	91	65	61	71	3.7	50.0
Pungo	7	C	1	810	2753	290	0.29	84	72	67	61	3.5	44.0
Pungo	7	C	1	810	2753	290	0.29	8	35	63	66	3.4	47.7
Pungo	9	A	1	613	2993	412	0.20	51	68	35	62	3.6	77.0
Pungo	9	A	1	613	2993	412	0.20	52	68	36	63	3.7	75.7
Pungo	9	A	1	613	2993	412	0.20	11	65	37	64	3.8	75.0
Belhaven	2	C	1	656	828	174	0.79	98	69	68	112	4.8	60.9
Belhaven	2	C	1	656	828	174	0.79	98	60	69	118	4.8	58.4
Belhaven	2	C	1	656	828	174	0.79	30	62	67	126	4.8	61.2
Belhaven	13	A	1	562	1123	208	0.50	91	53	44	84	4.5	71.1
Belhaven	13	A	1	562	1123	208	0.50	95	58	46	113	4.5	69.3
Belhaven	13	A	1	562	1123	208	0.50	17	59	49	125	4.4	67.6
Belhaven	12	A	1	606	1505	218	0.40	98	57	55	81	4.1	58.4
Belhaven	12	A	1	606	1505	218	0.40	106	60	53	87	4.1	59.4
Belhaven	12	A	1	606	1505	218	0.40	11	63	56	95	4.0	57.1
Belhaven	16	C	1	300	2612	336	0.11	3	2	1	87	4.5	99.3
Belhaven	16	C	1	300	2612	336	0.11	3	2	1	126	4.7	99.3
Belhaven	16	C	1	300	2612	336	0.11	1	2	1	76	4.6	99.3
Belhaven	18	A	1	600	3060	370	0.20	3	1	1	97	4.1	99.6
Belhaven	18	A	1	600	3060	370	0.20	2	1	1	74	4.4	99.5

Fertilized Incubation Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day	pH day 21	Applied P that was retained
				g kg^{-1}	--mg kg^{-1}--								%
Belhaven	18	A	1	600	3060	370	0.20	1	1	1	64	4.3	99.4
Scuppernong	11	A	1	278	1559	230	0.18	33	22	21	228	5.0	89.8
Scuppernong	11	A	1	278	1559	230	0.18	35	22	19	229	5.0	91.5
Scuppernong	11	A	1	278	1559	230	0.18	14	24	22	229	5.0	89.0
Scuppernong	18	C	1	614	1888	204	0.33	55	42	39	121	4.3	78.1
Scuppernong	18	C	1	614	1888	204	0.33	53	42	38	111	4.3	78.6
Scuppernong	18	C	1	614	1888	204	0.33	16	41	38	125	4.3	78.7
Scuppernong	1	B	1	720	2019	270	0.36	28	16	14	126	5.1	90.0
Scuppernong	1	B	1	720	2019	270	0.36	28	17	15	128	5.1	89.4
Scuppernong	1	B	1	720	2019	270	0.36	3	17	16	122	5.1	87.9
Scuppernong	17	B	1	596	2394	210	0.25	46	34	31	161	4.3	82.2
Scuppernong	17	B	1	596	2394	210	0.25	51	33	30	161	4.3	82.3
Scuppernong	17	B	1	596	2394	210	0.25	13	32	30	163	4.3	83.1
Scuppernong	2	C	1	790	2616	344	0.30	37	24	20	124	4.7	85.6
Scuppernong	2	C	1	790	2616	344	0.30	36	23	21	118	4.7	85.0
Scuppernong	2	C	1	790	2616	344	0.30	6	24	21	124	4.7	85.1
Ponzer	4	B	1		1280	161		12	60	50	107	4.3	63.7
Ponzer	4	B	1		1280	161		11	59	54	108	4.3	60.4
Ponzer	4	B	1		1280	161		13	60	53	76	4.3	61.0
Ponzer	5	A	1	510	1532	138	0.33	63	43	37	77	4.4	70.2
Ponzer	5	A	1	510	1532	138	0.33	60	43	38	74	4.4	69.4
Ponzer	5	A	1	510	1532	138	0.33	7	45	37	58	4.5	70.1
Ponzer	17	A	1	330	1903	154	0.17	9	4	3	98	4.6	97.9
Ponzer	17	A	1	330	1903	154	0.17	9	4	3	85	4.6	97.6
Ponzer	17	A	1	330	1903	154	0.17	0	5	3	62	4.7	97.5
Ponzer	7	C	1	344	2161	108	0.16	9	3	2	75	4.6	98.5
Ponzer	7	C	1	344	2161	108	0.16	8	3	2	102	4.6	98.7
Ponzer	7	C	1	344	2161	108	0.16	1	3	2	111	4.6	98.6
Ponzer	20	C	1	426	2414	111	0.18	19	12	9	64	4.4	92.8

Fertilized Incubation Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day	pH day 21	Applied P that was retained
				g kg^{-1}	---------------mg kg^{-1}---------------								%
Ponzer	20	C	1	426	2414	111	0.18	19	11	8	91	4.4	93.0
Ponzer	20	C	1	426	2414	111	0.18	1	10	8	88	4.4	93.4

Unfertilized P Incubation Study Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day
				$g\ kg^{-1}$	----------------------	----------------------	----------------------	$mg\ kg^{-1}$	----------------------	----------------------	----------------------
Pungo	6	C	1	712	1990	203	0.36	8.3	6.8	7.2	48
Pungo	6	C	1	712	1990	203	0.36	7.8	6.6	6.7	48
Pungo	6	C	1	712	1990	203	0.36	7.9	6.6	6.7	48
Pungo	1	C	1	750	2286	327	0.33	2.5	2.3	2.6	40
Pungo	1	C	1	750	2286	327	0.33	2.7	2.4	2.6	40
Pungo	1	C	1	750	2286	327	0.33	2.7	2.4	2.5	40
Pungo	7	B	1	582	2512	320	0.23	9.8	8.4	8.3	36
Pungo	7	B	1	582	2512	320	0.23	9.9	8.3	8.3	36
Pungo	7	B	1	582	2512	320	0.23	10.0	8.5	8.4	36
Pungo	7	C	1	810	2753	290	0.29	8.2	9.7	7.0	31
Pungo	7	C	1	810	2753	290	0.29	8.2	9.8	7.0	31
Pungo	7	C	1	810	2753	290	0.29	48.3	9.9	7.1	31
Pungo	9	A	1	613	2993	412	0.20	11.2	25.0	10.1	33
Pungo	9	A	1	613	2993	412	0.20	11.0	24.9	10.1	33
Pungo	9	A	1	613	2993	412	0.20	100.5	24.9	10.1	33
Belhaven	2	C	1	656	828	174	0.79	29.1	10.2	25.8	75
Belhaven	2	C	1	656	828	174	0.79	29.5	10.0	24.9	75
Belhaven	2	C	1	656	828	174	0.79	97.8	10.3	25.0	75
Belhaven	13	A	1	562	1123	208	0.50	17.4	13.6	13.3	67
Belhaven	13	A	1	562	1123	208	0.50	17.3	13.7	13.4	67
Belhaven	13	A	1	562	1123	208	0.50	17.3	13.7	13.9	67
Belhaven	12	A	1	606	1505	218	0.40	11.1	10.2	10.3	49
Belhaven	12	A	1	606	1505	218	0.40	11.0	11.2	9.8	49
Belhaven	12	A	1	606	1505	218	0.40	79.6	11.7	9.9	49
Belhaven	16	C	1	300	2612	336	0.11	0.6	0.6	0.5	30
Belhaven	16	C	1	300	2612	336	0.11	0.6	0.7	0.5	30
Belhaven	16	C	1	300	2612	336	0.11	2.1	0.6	0.5	30
Belhaven	18	A	1	600	3060	370	0.20	0.5	0.5	0.4	59
Belhaven	18	A	1	600	3060	370	0.20	0.5	0.5	0.4	59

Unfertilized P Incubation Study Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day
				g kg^{-1}	----------mg kg^{-1}----------						
Belhaven	18	A	1	600	3060	370	0.20	26.8	0.6	0.4	59
Scuppernong	11	A	1	278	1559	230	0.18	14.4	10.5	10.2	178
Scuppernong	11	A	1	278	1559	230	0.18	14.8	10.5	10.1	178
Scuppernong	11	A	1	278	1559	230	0.18	50.0	10.5	9.8	178
Scuppernong	18	C	1	614	1888	204	0.33	16.9	15.0	15.4	149
Scuppernong	18	C	1	614	1888	204	0.33	10.7	14.9	15.1	149
Scuppernong	18	C	1	614	1888	204	0.33	77.2	14.7	14.9	149
Scuppernong	1	B	1	720	2019	270	0.36	3.6	3.3	3.3	123
Scuppernong	1	B	1	720	2019	270	0.36	3.5	3.2	3.2	123
Scuppernong	1	B	1	720	2019	270	0.36	36.0	3.3	3.2	123
Scuppernong	17	B	1	596	2394	210	0.25	12.8	11.6	11.7	162
Scuppernong	17	B	1	596	2394	210	0.25	13.8	11.3	11.3	162
Scuppernong	17	B	1	596	2394	210	0.25	55.1	11.4	11.7	162
Scuppernong	2	C	1	790	2616	344	0.30	5.6	5.0	4.8	145
Scuppernong	2	C	1	790	2616	344	0.30	5.4	4.9	4.8	145
Scuppernong	2	C	1	790	2616	344	0.30	34.1	5.0	4.8	145
Ponzer	4	B	1		1280	161		14.1	11.3	11.2	62
Ponzer	4	B	1		1280	161		13.6	11.6	11.2	62
Ponzer	4	B	1		1280	161		64.5	11.3	11.0	62
Ponzer	5	A	1	510	1532	138	0.33	6.9	5.9	5.4	56
Ponzer	5	A	1	510	1532	138	0.33	7.1	5.3	5.1	56
Ponzer	5	A	1	510	1532	138	0.33	9.6	5.5	5.1	56
Ponzer	17	A	1	330	1903	154	0.17	0.5	0.6	0.3	66
Ponzer	17	A	1	330	1903	154	0.17	0.4	0.5	0.3	66
Ponzer	17	A	1	330	1903	154	0.17	19.3	0.5	0.4	66
Ponzer	7	C	1	344	2161	108	0.16	3.4	0.8	0.5	58
Ponzer	7	C	1	344	2161	108	0.16	1.1	0.8	0.5	58
Ponzer	7	C	1	344	2161	108	0.16	8.5	0.8	0.5	58
Ponzer	20	C	1	426	2414	111	0.18	1.1	1.2	0.9	65

Unfertilized P Incubation Study Data

Series	Field Number	Location on Field A, B, or C	Depth	OM	M3Al	M3Fe	OM/M3Al	1 day Wsp	7 day Wsp	21 day Wsp	M3-P 21 day
				g kg^{-1}	---			mg kg^{-1}	---		
Ponzer	20	C	1	426	2414	111	0.18	1.3	1.2	0.9	65
Ponzer	20	C	1	426	2414	111	0.18	0.0	1.2	0.9	65

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Belhaven	A	2	C	1	Loosely Bound P	22.6
Belhaven	C	16	C	1	Loosely Bound P	7.1
Belhaven	A	12	A	1	Loosely Bound P	6.4
Belhaven	A	13	A	1	Loosely Bound P	10.4
Belhaven	C	18	A	1	Loosely Bound P	6.8
Belhaven	A	12	A	2	Loosely Bound P	6.0
Belhaven	A	12	A	3	Loosely Bound P	7.0
Belhaven	A	12	A	4	Loosely Bound P	6.9
Belhaven	C	16	C	2	Loosely Bound P	6.6
Belhaven	C	16	C	3	Loosely Bound P	6.8
Belhaven	C	16	C	4	Loosely Bound P	
Belhaven	A	13	A	2	Loosely Bound P	4.6
Belhaven	A	13	A	3	Loosely Bound P	4.0
Belhaven	A	13	A	4	Loosely Bound P	6.8
Belhaven	A	2	C	1	Loosely Bound P	29.1
Belhaven	C	16	C	1	Loosely Bound P	7.3
Belhaven	A	12	A	1	Loosely Bound P	7.8
Belhaven	A	13	A	1	Loosely Bound P	11.4
Belhaven	C	18	A	1	Loosely Bound P	6.9
Belhaven	A	12	A	2	Loosely Bound P	5.5
Belhaven	A	12	A	3	Loosely Bound P	6.9
Belhaven	A	12	A	4	Loosely Bound P	6.5
Belhaven	C	16	C	2	Loosely Bound P	6.6
Belhaven	C	16	C	3	Loosely Bound P	6.9
Belhaven	C	16	C	4	Loosely Bound P	
Belhaven	A	13	A	2	Loosely Bound P	4.1
Belhaven	A	13	A	3	Loosely Bound P	5.2
Belhaven	A	13	A	4	Loosely Bound P	6.7
Belhaven	A	2	C	1	Loosely Bound P	28.3
Belhaven	C	16	C	1	Loosely Bound P	6.8
Belhaven	A	12	A	1	Loosely Bound P	9.7
Belhaven	A	13	A	1	Loosely Bound P	16.0
Belhaven	C	18	A	1	Loosely Bound P	6.6
Belhaven	A	12	A	2	Loosely Bound P	5.5
Belhaven	A	12	A	3	Loosely Bound P	6.8
Belhaven	A	12	A	4	Loosely Bound P	6.5
Belhaven	C	16	C	2	Loosely Bound P	6.4
Belhaven	C	16	C	3	Loosely Bound P	6.6
Belhaven	C	16	C	4	Loosely Bound P	
Belhaven	A	13	A	2	Loosely Bound P	4.4
Belhaven	A	13	A	3	Loosely Bound P	5.3
Belhaven	A	13	A	4	Loosely Bound P	6.6
Ponzer	A	4	B	1	Loosely Bound P	10.6
Ponzer	A	5	A	1	Loosely Bound P	5.6
Ponzer	A	7	C	1	Loosely Bound P	7.1

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Ponzer	B	17	A	1	Loosely Bound P	7.0
Ponzer	B	20	C	1	Loosely Bound P	6.5
Ponzer	B	20	A	2	Loosely Bound P	6.5
Ponzer	B	20	A	3	Loosely Bound P	7.2
Ponzer	B	20	A	4	Loosely Bound P	7.3
Ponzer	B	17	C	2	Loosely Bound P	4.8
Ponzer	B	17	C	3	Loosely Bound P	7.1
Ponzer	B	17	C	4	Loosely Bound P	7.2
Ponzer	A	7	C	2	Loosely Bound P	9.8
Ponzer	A	7	C	3	Loosely Bound P	6.9
Ponzer	A	7	C	4	Loosely Bound P	6.9
Ponzer	A	4	B	1	Loosely Bound P	11.7
Ponzer	A	5	A	1	Loosely Bound P	5.9
Ponzer	A	7	C	1	Loosely Bound P	6.9
Ponzer	B	17	A	1	Loosely Bound P	6.9
Ponzer	B	20	C	1	Loosely Bound P	6.5
Ponzer	B	20	A	2	Loosely Bound P	6.3
Ponzer	B	20	A	3	Loosely Bound P	7.1
Ponzer	B	20	A	4	Loosely Bound P	7.1
Ponzer	B	17	C	2	Loosely Bound P	4.3
Ponzer	B	17	C	3	Loosely Bound P	4.4
Ponzer	B	17	C	4	Loosely Bound P	7.1
Ponzer	A	7	C	2	Loosely Bound P	6.7
Ponzer	A	7	C	3	Loosely Bound P	6.5
Ponzer	A	7	C	4	Loosely Bound P	6.9
Ponzer	A	4	B	1	Loosely Bound P	13.8
Ponzer	A	5	A	1	Loosely Bound P	6.0
Ponzer	A	7	C	1	Loosely Bound P	6.7
Ponzer	B	17	A	1	Loosely Bound P	6.6
Ponzer	B	20	C	1	Loosely Bound P	6.2
Ponzer	B	20	A	2	Loosely Bound P	6.2
Ponzer	B	20	A	3	Loosely Bound P	6.4
Ponzer	B	20	A	4	Loosely Bound P	7.1
Ponzer	B	17	C	2	Loosely Bound P	4.5
Ponzer	B	17	C	3	Loosely Bound P	7.1
Ponzer	B	17	C	4	Loosely Bound P	7.0
Ponzer	A	7	C	2	Loosely Bound P	6.5
Ponzer	A	7	C	3	Loosely Bound P	6.3
Ponzer	A	7	C	4	Loosely Bound P	6.5
Pungo	B	1	C	1	Loosely Bound P	4.3
Pungo	B	6	C	1	Loosely Bound P	8.7
Pungo	B	7	B	1	Loosely Bound P	10.7
Pungo	B	7	C	1	Loosely Bound P	12.1
Pungo	B	9	A	1	Loosely Bound P	8.7
Pungo	B	1	C	2	Loosely Bound P	6.6

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Pungo	B	1	C	3	Loosely Bound P	6.7
Pungo	B	1	C	4	Loosely Bound P	7.1
Pungo	B	6	C	2	Loosely Bound P	4.2
Pungo	B	6	C	3	Loosely Bound P	5.6
Pungo	B	6	C	4	Loosely Bound P	7.1
Pungo	B	9	A	2	Loosely Bound P	8.0
Pungo	B	9	A	3	Loosely Bound P	7.1
Pungo	B	9	A	4	Loosely Bound P	7.1
Pungo	B	1	C	1	Loosely Bound P	4.3
Pungo	B	6	C	1	Loosely Bound P	9.5
Pungo	B	7	B	1	Loosely Bound P	11.7
Pungo	B	7	C	1	Loosely Bound P	10.6
Pungo	B	9	A	1	Loosely Bound P	9.4
Pungo	B	1	C	2	Loosely Bound P	7.2
Pungo	B	1	C	3	Loosely Bound P	6.4
Pungo	B	1	C	4	Loosely Bound P	7.0
Pungo	B	6	C	2	Loosely Bound P	7.3
Pungo	B	6	C	3	Loosely Bound P	4.9
Pungo	B	6	C	4	Loosely Bound P	7.2
Pungo	B	9	A	2	Loosely Bound P	6.7
Pungo	B	9	A	3	Loosely Bound P	6.9
Pungo	B	9	A	4	Loosely Bound P	6.9
Pungo	B	1	C	1	Loosely Bound P	4.4
Pungo	B	6	C	1	Loosely Bound P	9.3
Pungo	B	7	B	1	Loosely Bound P	14.9
Pungo	B	7	C	1	Loosely Bound P	12.8
Pungo	B	9	A	1	Loosely Bound P	12.2
Pungo	B	1	C	2	Loosely Bound P	7.9
Pungo	B	1	C	3	Loosely Bound P	6.2
Pungo	B	1	C	4	Loosely Bound P	6.9
Pungo	B	6	C	2	Loosely Bound P	50.5
Pungo	B	6	C	3	Loosely Bound P	5.0
Pungo	B	6	C	4	Loosely Bound P	7.1
Pungo	B	9	A	2	Loosely Bound P	6.5
Pungo	B	9	A	3	Loosely Bound P	6.8
Pungo	B	9	A	4	Loosely Bound P	6.8
Scuppernong	B	1	B	1	Loosely Bound P	5.6
Scuppernong	B	2	C	1	Loosely Bound P	4.9
Scuppernong	B	11	A	1	Loosely Bound P	7.6
Scuppernong	B	17	B	1	Loosely Bound P	8.2
Scuppernong	B	18	C	1	Loosely Bound P	9.8
Scuppernong	B	2	C	2	Loosely Bound P	7.1
Scuppernong	B	2	C	3	Loosely Bound P	6.5
Scuppernong	B	2	C	4	Loosely Bound P	6.7
Scuppernong	B	11	A	2	Loosely Bound P	6.8

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Scuppernong	B	11	A	3	Loosely Bound P	7.1
Scuppernong	B	11	A	4	Loosely Bound P	7.2
Scuppernong	B	18	C	2	Loosely Bound P	6.8
Scuppernong	B	18	C	3	Loosely Bound P	7.1
Scuppernong	B	18	C	4	Loosely Bound P	7.1
Scuppernong	B	1	B	1	Loosely Bound P	4.7
Scuppernong	B	2	C	1	Loosely Bound P	5.5
Scuppernong	B	11	A	1	Loosely Bound P	8.0
Scuppernong	B	17	B	1	Loosely Bound P	11.8
Scuppernong	B	18	C	1	Loosely Bound P	15.1
Scuppernong	B	2	C	2	Loosely Bound P	7.6
Scuppernong	B	2	C	3	Loosely Bound P	6.2
Scuppernong	B	2	C	4	Loosely Bound P	6.6
Scuppernong	B	11	A	2	Loosely Bound P	6.5
Scuppernong	B	11	A	3	Loosely Bound P	7.0
Scuppernong	B	11	A	4	Loosely Bound P	7.1
Scuppernong	B	18	C	2	Loosely Bound P	6.5
Scuppernong	B	18	C	3	Loosely Bound P	7.0
Scuppernong	B	18	C	4	Loosely Bound P	7.0
Scuppernong	B	1	B	1	Loosely Bound P	4.0
Scuppernong	B	2	C	1	Loosely Bound P	5.8
Scuppernong	B	11	A	1	Loosely Bound P	10.8
Scuppernong	B	17	B	1	Loosely Bound P	13.9
Scuppernong	B	18	C	1	Loosely Bound P	18.7
Scuppernong	B	2	C	2	Loosely Bound P	9.8
Scuppernong	B	2	C	3	Loosely Bound P	6.0
Scuppernong	B	2	C	4	Loosely Bound P	6.4
Scuppernong	B	11	A	2	Loosely Bound P	6.4
Scuppernong	B	11	A	3	Loosely Bound P	6.9
Scuppernong	B	11	A	4	Loosely Bound P	7.0
Scuppernong	B	18	C	2	Loosely Bound P	6.4
Scuppernong	B	18	C	3	Loosely Bound P	6.9
Scuppernong	B	18	C	4	Loosely Bound P	6.9
Belhaven	A	2	C	1	Al-P	120.0
Belhaven	C	16	C	1	Al-P	885.0
Belhaven	A	12	A	1	Al-P	55.0
Belhaven	A	13	A	1	Al-P	100.0
Belhaven	C	18	A	1	Al-P	775.0
Belhaven	A	12	A	2	Al-P	90.0
Belhaven	A	12	A	3	Al-P	95.0
Belhaven	A	12	A	4	Al-P	110.0
Belhaven	C	16	C	2	Al-P	185.0
Belhaven	C	16	C	3	Al-P	75.0
Belhaven	C	16	C	4	Al-P	
Belhaven	A	13	A	2	Al-P	65.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Belhaven	A	13	A	3	Al-P	310.0
Belhaven	A	13	A	4	Al-P	65.0
Belhaven	A	2	C	1	Al-P	105.0
Belhaven	C	16	C	1	Al-P	770.0
Belhaven	A	12	A	1	Al-P	70.0
Belhaven	A	13	A	1	Al-P	120.0
Belhaven	C	18	A	1	Al-P	620.0
Belhaven	A	12	A	2	Al-P	95.0
Belhaven	A	12	A	3	Al-P	100.0
Belhaven	A	12	A	4	Al-P	115.0
Belhaven	C	16	C	2	Al-P	175.0
Belhaven	C	16	C	3	Al-P	75.0
Belhaven	C	16	C	4	Al-P	
Belhaven	A	13	A	2	Al-P	65.0
Belhaven	A	13	A	3	Al-P	290.0
Belhaven	A	13	A	4	Al-P	75.0
Belhaven	A	2	C	1	Al-P	115.0
Belhaven	C	16	C	1	Al-P	855.0
Belhaven	A	12	A	1	Al-P	80.0
Belhaven	A	13	A	1	Al-P	115.0
Belhaven	C	18	A	1	Al-P	730.0
Belhaven	A	12	A	2	Al-P	90.0
Belhaven	A	12	A	3	Al-P	95.0
Belhaven	A	12	A	4	Al-P	130.0
Belhaven	C	16	C	2	Al-P	155.0
Belhaven	C	16	C	3	Al-P	75.0
Belhaven	C	16	C	4	Al-P	
Belhaven	A	13	A	2	Al-P	60.0
Belhaven	A	13	A	3	Al-P	340.0
Belhaven	A	13	A	4	Al-P	70.0
Ponzer	A	4	B	1	Al-P	125.0
Ponzer	A	5	A	1	Al-P	110.0
Ponzer	A	7	C	1	Al-P	270.0
Ponzer	B	17	A	1	Al-P	280.0
Ponzer	B	20	C	1	Al-P	210.0
Ponzer	B	20	A	2	Al-P	205.0
Ponzer	B	20	A	3	Al-P	320.0
Ponzer	B	20	A	4	Al-P	38.5
Ponzer	B	17	C	2	Al-P	325.0
Ponzer	B	17	C	3	Al-P	365.0
Ponzer	B	17	C	4	Al-P	345.0
Ponzer	A	7	C	2	Al-P	75.0
Ponzer	A	7	C	3	Al-P	60.0
Ponzer	A	7	C	4	Al-P	10.5
Ponzer	A	4	B	1	Al-P	120.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Ponzer	A	5	A	1	Al-P	95.0
Ponzer	A	7	C	1	Al-P	245.0
Ponzer	B	17	A	1	Al-P	240.0
Ponzer	B	20	C	1	Al-P	185.0
Ponzer	B	20	A	2	Al-P	205.0
Ponzer	B	20	A	3	Al-P	350.0
Ponzer	B	20	A	4	Al-P	41.5
Ponzer	B	17	C	2	Al-P	305.0
Ponzer	B	17	C	3	Al-P	345.0
Ponzer	B	17	C	4	Al-P	340.0
Ponzer	A	7	C	2	Al-P	70.0
Ponzer	A	7	C	3	Al-P	60.0
Ponzer	A	7	C	4	Al-P	11.5
Ponzer	A	4	B	1	Al-P	120.0
Ponzer	A	5	A	1	Al-P	95.0
Ponzer	A	7	C	1	Al-P	240.0
Ponzer	B	17	A	1	Al-P	215.0
Ponzer	B	20	C	1	Al-P	195.0
Ponzer	B	20	A	2	Al-P	230.0
Ponzer	B	20	A	3	Al-P	350.0
Ponzer	B	20	A	4	Al-P	45.0
Ponzer	B	17	C	2	Al-P	320.0
Ponzer	B	17	C	3	Al-P	365.0
Ponzer	B	17	C	4	Al-P	360.0
Ponzer	A	7	C	2	Al-P	85.0
Ponzer	A	7	C	3	Al-P	65.0
Ponzer	A	7	C	4	Al-P	12.0
Pungo	B	1	C	1	Al-P	80.0
Pungo	B	6	C	1	Al-P	90.0
Pungo	B	7	B	1	Al-P	125.0
Pungo	B	7	C	1	Al-P	90.0
Pungo	B	9	A	1	Al-P	135.0
Pungo	B	1	C	2	Al-P	100.0
Pungo	B	1	C	3	Al-P	160.0
Pungo	B	1	C	4	Al-P	130.0
Pungo	B	6	C	2	Al-P	60.0
Pungo	B	6	C	3	Al-P	115.0
Pungo	B	6	C	4	Al-P	65.0
Pungo	B	9	A	2	Al-P	105.0
Pungo	B	9	A	3	Al-P	55.0
Pungo	B	9	A	4	Al-P	35.5
Pungo	B	1	C	1	Al-P	60.0
Pungo	B	6	C	1	Al-P	80.0
Pungo	B	7	B	1	Al-P	115.0
Pungo	B	7	C	1	Al-P	70.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Pungo	B	9	A	1	Al-P	130.0
Pungo	B	1	C	2	Al-P	100.0
Pungo	B	1	C	3	Al-P	155.0
Pungo	B	1	C	4	Al-P	145.0
Pungo	B	6	C	2	Al-P	2.5
Pungo	B	6	C	3	Al-P	95.0
Pungo	B	6	C	4	Al-P	60.0
Pungo	B	9	A	2	Al-P	100.0
Pungo	B	9	A	3	Al-P	60.0
Pungo	B	9	A	4	Al-P	35.5
Pungo	B	1	C	1	Al-P	60.0
Pungo	B	6	C	1	Al-P	60.0
Pungo	B	7	B	1	Al-P	110.0
Pungo	B	7	C	1	Al-P	65.0
Pungo	B	9	A	1	Al-P	125.0
Pungo	B	1	C	2	Al-P	100.0
Pungo	B	1	C	3	Al-P	180.0
Pungo	B	1	C	4	Al-P	160.0
Pungo	B	6	C	2	Al-P	
Pungo	B	6	C	3	Al-P	105.0
Pungo	B	6	C	4	Al-P	65.0
Pungo	B	9	A	2	Al-P	120.0
Pungo	B	9	A	3	Al-P	65.0
Pungo	B	9	A	4	Al-P	42.5
Scuppernong	B	1	B	1	Al-P	315.0
Scuppernong	B	2	C	1	Al-P	255.0
Scuppernong	B	11	A	1	Al-P	345.0
Scuppernong	B	17	B	1	Al-P	395.0
Scuppernong	B	18	C	1	Al-P	385.0
Scuppernong	B	2	C	2	Al-P	130.0
Scuppernong	B	2	C	3	Al-P	160.0
Scuppernong	B	2	C	4	Al-P	90.0
Scuppernong	B	11	A	2	Al-P	145.0
Scuppernong	B	11	A	3	Al-P	95.0
Scuppernong	B	11	A	4	Al-P	32.5
Scuppernong	B	18	C	2	Al-P	225.0
Scuppernong	B	18	C	3	Al-P	125.0
Scuppernong	B	18	C	4	Al-P	90.0
Scuppernong	B	1	B	1	Al-P	250.0
Scuppernong	B	2	C	1	Al-P	230.0
Scuppernong	B	11	A	1	Al-P	320.0
Scuppernong	B	17	B	1	Al-P	345.0
Scuppernong	B	18	C	1	Al-P	325.0
Scuppernong	B	2	C	2	Al-P	120.0
Scuppernong	B	2	C	3	Al-P	160.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Scuppernong	B	2	C	4	Al-P	110.0
Scuppernong	B	11	A	2	Al-P	190.0
Scuppernong	B	11	A	3	Al-P	100.0
Scuppernong	B	11	A	4	Al-P	33.0
Scuppernong	B	18	C	2	Al-P	230.0
Scuppernong	B	18	C	3	Al-P	135.0
Scuppernong	B	18	C	4	Al-P	85.0
Scuppernong	B	1	B	1	Al-P	290.0
Scuppernong	B	2	C	1	Al-P	245.0
Scuppernong	B	11	A	1	Al-P	365.0
Scuppernong	B	17	B	1	Al-P	390.0
Scuppernong	B	18	C	1	Al-P	360.0
Scuppernong	B	2	C	2	Al-P	120.0
Scuppernong	B	2	C	3	Al-P	170.0
Scuppernong	B	2	C	4	Al-P	115.0
Scuppernong	B	11	A	2	Al-P	200.0
Scuppernong	B	11	A	3	Al-P	105.0
Scuppernong	B	11	A	4	Al-P	32.5
Scuppernong	B	18	C	2	Al-P	255.0
Scuppernong	B	18	C	3	Al-P	165.0
Scuppernong	B	18	C	4	Al-P	100.0
Belhaven	A	2	C	1	Fe-P	115.0
Belhaven	C	16	C	1	Fe-P	530.0
Belhaven	A	12	A	1	Fe-P	90.0
Belhaven	A	13	A	1	Fe-P	120.0
Belhaven	C	18	A	1	Fe-P	435.0
Belhaven	A	12	A	2	Fe-P	34.0
Belhaven	A	12	A	3	Fe-P	23.5
Belhaven	A	12	A	4	Fe-P	20.5
Belhaven	C	16	C	2	Fe-P	150.0
Belhaven	C	16	C	3	Fe-P	38.0
Belhaven	C	16	C	4	Fe-P	
Belhaven	A	13	A	2	Fe-P	85.0
Belhaven	A	13	A	3	Fe-P	55.0
Belhaven	A	13	A	4	Fe-P	25.0
Belhaven	A	2	C	1	Fe-P	115.0
Belhaven	C	16	C	1	Fe-P	490.0
Belhaven	A	12	A	1	Fe-P	85.0
Belhaven	A	13	A	1	Fe-P	120.0
Belhaven	C	18	A	1	Fe-P	425.0
Belhaven	A	12	A	2	Fe-P	38.0
Belhaven	A	12	A	3	Fe-P	27.0
Belhaven	A	12	A	4	Fe-P	21.5
Belhaven	C	16	C	2	Fe-P	145.0
Belhaven	C	16	C	3	Fe-P	42.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Belhaven	C	16	C	4	Fe-P	
Belhaven	A	13	A	2	Fe-P	75.0
Belhaven	A	13	A	3	Fe-P	44.0
Belhaven	A	13	A	4	Fe-P	22.5
Belhaven	A	2	C	1	Fe-P	115.0
Belhaven	C	16	C	1	Fe-P	485.0
Belhaven	A	12	A	1	Fe-P	95.0
Belhaven	A	13	A	1	Fe-P	115.0
Belhaven	C	18	A	1	Fe-P	415.0
Belhaven	A	12	A	2	Fe-P	34.5
Belhaven	A	12	A	3	Fe-P	23.0
Belhaven	A	12	A	4	Fe-P	22.5
Belhaven	C	16	C	2	Fe-P	185.0
Belhaven	C	16	C	3	Fe-P	55.0
Belhaven	C	16	C	4	Fe-P	
Belhaven	A	13	A	2	Fe-P	85.0
Belhaven	A	13	A	3	Fe-P	55.0
Belhaven	A	13	A	4	Fe-P	24.0
Ponzer	A	4	B	1	Fe-P	110.0
Ponzer	A	5	A	1	Fe-P	100.0
Ponzer	A	7	C	1	Fe-P	155.0
Ponzer	B	17	A	1	Fe-P	110.0
Ponzer	B	20	C	1	Fe-P	90.0
Ponzer	B	20	A	2	Fe-P	120.0
Ponzer	B	20	A	3	Fe-P	75.0
Ponzer	B	20	A	4	Fe-P	36.5
Ponzer	B	17	C	2	Fe-P	175.0
Ponzer	B	17	C	3	Fe-P	80.0
Ponzer	B	17	C	4	Fe-P	75.0
Ponzer	A	7	C	2	Fe-P	50.0
Ponzer	A	7	C	3	Fe-P	24.0
Ponzer	A	7	C	4	Fe-P	16.0
Ponzer	A	4	B	1	Fe-P	110.0
Ponzer	A	5	A	1	Fe-P	95.0
Ponzer	A	7	C	1	Fe-P	150.0
Ponzer	B	17	A	1	Fe-P	110.0
Ponzer	B	20	C	1	Fe-P	90.0
Ponzer	B	20	A	2	Fe-P	110.0
Ponzer	B	20	A	3	Fe-P	75.0
Ponzer	B	20	A	4	Fe-P	43.5
Ponzer	B	17	C	2	Fe-P	170.0
Ponzer	B	17	C	3	Fe-P	80.0
Ponzer	B	17	C	4	Fe-P	90.0
Ponzer	A	7	C	2	Fe-P	55.0
Ponzer	A	7	C	3	Fe-P	20.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Ponzer	A	7	C	4	Fe-P	14.5
Ponzer	A	4	B	1	Fe-P	110.0
Ponzer	A	5	A	1	Fe-P	95.0
Ponzer	A	7	C	1	Fe-P	155.0
Ponzer	B	17	A	1	Fe-P	130.0
Ponzer	B	20	C	1	Fe-P	105.0
Ponzer	B	20	A	2	Fe-P	120.0
Ponzer	B	20	A	3	Fe-P	75.0
Ponzer	B	20	A	4	Fe-P	43.5
Ponzer	B	17	C	2	Fe-P	175.0
Ponzer	B	17	C	3	Fe-P	90.0
Ponzer	B	17	C	4	Fe-P	95.0
Ponzer	A	7	C	2	Fe-P	65.0
Ponzer	A	7	C	3	Fe-P	21.0
Ponzer	A	7	C	4	Fe-P	12.5
Pungo	B	1	C	1	Fe-P	90.0
Pungo	B	6	C	1	Fe-P	100.0
Pungo	B	7	B	1	Fe-P	115.0
Pungo	B	7	C	1	Fe-P	100.0
Pungo	B	9	A	1	Fe-P	105.0
Pungo	B	1	C	2	Fe-P	90.0
Pungo	B	1	C	3	Fe-P	42.0
Pungo	B	1	C	4	Fe-P	35.0
Pungo	B	6	C	2	Fe-P	80.0
Pungo	B	6	C	3	Fe-P	90.0
Pungo	B	6	C	4	Fe-P	30.5
Pungo	B	9	A	2	Fe-P	55.0
Pungo	B	9	A	3	Fe-P	28.0
Pungo	B	9	A	4	Fe-P	26.0
Pungo	B	1	C	1	Fe-P	110.0
Pungo	B	6	C	1	Fe-P	105.0
Pungo	B	7	B	1	Fe-P	120.0
Pungo	B	7	C	1	Fe-P	90.0
Pungo	B	9	A	1	Fe-P	120.0
Pungo	B	1	C	2	Fe-P	95.0
Pungo	B	1	C	3	Fe-P	41.5
Pungo	B	1	C	4	Fe-P	35.0
Pungo	B	6	C	2	Fe-P	
Pungo	B	6	C	3	Fe-P	80.0
Pungo	B	6	C	4	Fe-P	27.0
Pungo	B	9	A	2	Fe-P	48.0
Pungo	B	9	A	3	Fe-P	24.5
Pungo	B	9	A	4	Fe-P	23.0
Pungo	B	1	C	1	Fe-P	105.0
Pungo	B	6	C	1	Fe-P	80.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Pungo	B	7	B	1	Fe-P	115.0
Pungo	B	7	C	1	Fe-P	85.0
Pungo	B	9	A	1	Fe-P	110.0
Pungo	B	1	C	2	Fe-P	90.0
Pungo	B	1	C	3	Fe-P	46.5
Pungo	B	1	C	4	Fe-P	43.5
Pungo	B	6	C	2	Fe-P	
Pungo	B	6	C	3	Fe-P	80.0
Pungo	B	6	C	4	Fe-P	29.0
Pungo	B	9	A	2	Fe-P	60.0
Pungo	B	9	A	3	Fe-P	28.5
Pungo	B	9	A	4	Fe-P	29.0
Scuppernong	B	1	B	1	Fe-P	205.0
Scuppernong	B	2	C	1	Fe-P	180.0
Scuppernong	B	11	A	1	Fe-P	160.0
Scuppernong	B	17	B	1	Fe-P	150.0
Scuppernong	B	18	C	1	Fe-P	155.0
Scuppernong	B	2	C	2	Fe-P	125.0
Scuppernong	B	2	C	3	Fe-P	65.0
Scuppernong	B	2	C	4	Fe-P	65.0
Scuppernong	B	11	A	2	Fe-P	70.0
Scuppernong	B	11	A	3	Fe-P	43.0
Scuppernong	B	11	A	4	Fe-P	47.5
Scuppernong	B	18	C	2	Fe-P	85.0
Scuppernong	B	18	C	3	Fe-P	70.0
Scuppernong	B	18	C	4	Fe-P	65.0
Scuppernong	B	1	B	1	Fe-P	195.0
Scuppernong	B	2	C	1	Fe-P	160.0
Scuppernong	B	11	A	1	Fe-P	160.0
Scuppernong	B	17	B	1	Fe-P	145.0
Scuppernong	B	18	C	1	Fe-P	135.0
Scuppernong	B	2	C	2	Fe-P	130.0
Scuppernong	B	2	C	3	Fe-P	60.0
Scuppernong	B	2	C	4	Fe-P	60.0
Scuppernong	B	11	A	2	Fe-P	80.0
Scuppernong	B	11	A	3	Fe-P	42.0
Scuppernong	B	11	A	4	Fe-P	43.5
Scuppernong	B	18	C	2	Fe-P	85.0
Scuppernong	B	18	C	3	Fe-P	60.0
Scuppernong	B	18	C	4	Fe-P	70.0
Scuppernong	B	1	B	1	Fe-P	205.0
Scuppernong	B	2	C	1	Fe-P	180.0
Scuppernong	B	11	A	1	Fe-P	165.0
Scuppernong	B	17	B	1	Fe-P	145.0
Scuppernong	B	18	C	1	Fe-P	140.0

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Scuppernong	B	2	C	2	Fe-P	130.0
Scuppernong	B	2	C	3	Fe-P	65.0
Scuppernong	B	2	C	4	Fe-P	60.0
Scuppernong	B	11	A	2	Fe-P	75.0
Scuppernong	B	11	A	3	Fe-P	46.5
Scuppernong	B	11	A	4	Fe-P	38.0
Scuppernong	B	18	C	2	Fe-P	90.0
Scuppernong	B	18	C	3	Fe-P	70.0
Scuppernong	B	18	C	4	Fe-P	65.0
Belhaven	A	2	C	1	Reductant P	165.9
Belhaven	C	16	C	1	Reductant P	133.6
Belhaven	A	12	A	1	Reductant P	64.5
Belhaven	A	13	A	1	Reductant P	78.3
Belhaven	C	18	A	1	Reductant P	78.3
Belhaven	A	12	A	2	Reductant P	73.7
Belhaven	A	12	A	3	Reductant P	41.0
Belhaven	A	12	A	4	Reductant P	64.5
Belhaven	C	16	C	2	Reductant P	147.5
Belhaven	C	16	C	3	Reductant P	96.8
Belhaven	C	16	C	4	Reductant P	
Belhaven	A	13	A	2	Reductant P	73.7
Belhaven	A	13	A	3	Reductant P	96.8
Belhaven	A	13	A	4	Reductant P	82.9
Belhaven	A	2	C	1	Reductant P	82.9
Belhaven	C	16	C	1	Reductant P	64.5
Belhaven	A	12	A	1	Reductant P	87.6
Belhaven	A	13	A	1	Reductant P	110.6
Belhaven	C	18	A	1	Reductant P	78.3
Belhaven	A	12	A	2	Reductant P	78.3
Belhaven	A	12	A	3	Reductant P	119.8
Belhaven	A	12	A	4	Reductant P	110.6
Belhaven	C	16	C	2	Reductant P	50.7
Belhaven	C	16	C	3	Reductant P	82.9
Belhaven	C	16	C	4	Reductant P	
Belhaven	A	13	A	2	Reductant P	10.1
Belhaven	A	13	A	3	Reductant P	5.1
Belhaven	A	13	A	4	Reductant P	5.1
Belhaven	A	2	C	1	Reductant P	82.9
Belhaven	C	16	C	1	Reductant P	69.1
Belhaven	A	12	A	1	Reductant P	64.5
Belhaven	A	13	A	1	Reductant P	101.4
Belhaven	C	18	A	1	Reductant P	96.8
Belhaven	A	12	A	2	Reductant P	73.7
Belhaven	A	12	A	3	Reductant P	142.9
Belhaven	A	12	A	4	Reductant P	147.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Belhaven	C	16	C	2	Reductant P	221.2
Belhaven	C	16	C	3	Reductant P	59.9
Belhaven	C	16	C	4	Reductant P	
Belhaven	A	13	A	2	Reductant P	55.3
Belhaven	A	13	A	3	Reductant P	184.3
Belhaven	A	13	A	4	Reductant P	73.7
Ponzer	A	4	B	1	Reductant P	119.8
Ponzer	A	5	A	1	Reductant P	110.6
Ponzer	A	7	C	1	Reductant P	188.9
Ponzer	B	17	A	1	Reductant P	202.8
Ponzer	B	20	C	1	Reductant P	64.5
Ponzer	B	20	A	2	Reductant P	124.4
Ponzer	B	20	A	3	Reductant P	64.5
Ponzer	B	20	A	4	Reductant P	46.1
Ponzer	B	17	C	2	Reductant P	133.6
Ponzer	B	17	C	3	Reductant P	50.7
Ponzer	B	17	C	4	Reductant P	78.3
Ponzer	A	7	C	2	Reductant P	78.3
Ponzer	A	7	C	3	Reductant P	110.6
Ponzer	A	7	C	4	Reductant P	64.5
Ponzer	A	4	B	1	Reductant P	69.1
Ponzer	A	5	A	1	Reductant P	69.1
Ponzer	A	7	C	1	Reductant P	133.6
Ponzer	B	17	A	1	Reductant P	133.6
Ponzer	B	20	C	1	Reductant P	82.9
Ponzer	B	20	A	2	Reductant P	101.4
Ponzer	B	20	A	3	Reductant P	55.3
Ponzer	B	20	A	4	Reductant P	101.4
Ponzer	B	17	C	2	Reductant P	110.6
Ponzer	B	17	C	3	Reductant P	87.6
Ponzer	B	17	C	4	Reductant P	55.3
Ponzer	A	7	C	2	Reductant P	50.7
Ponzer	A	7	C	3	Reductant P	64.5
Ponzer	A	7	C	4	Reductant P	106.0
Ponzer	A	4	B	1	Reductant P	4.6
Ponzer	A	5	A	1	Reductant P	6.0
Ponzer	A	7	C	1	Reductant P	4.6
Ponzer	B	17	A	1	Reductant P	92.2
Ponzer	B	20	C	1	Reductant P	82.9
Ponzer	B	20	A	2	Reductant P	78.3
Ponzer	B	20	A	3	Reductant P	50.7
Ponzer	B	20	A	4	Reductant P	73.7
Ponzer	B	17	C	2	Reductant P	96.8
Ponzer	B	17	C	3	Reductant P	55.3
Ponzer	B	17	C	4	Reductant P	50.7

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Ponzer	A	7	C	2	Reductant P	73.7
Ponzer	A	7	C	3	Reductant P	101.4
Ponzer	A	7	C	4	Reductant P	101.4
Pungo	B	1	C	1	Reductant P	124.4
Pungo	B	6	C	1	Reductant P	101.4
Pungo	B	7	B	1	Reductant P	179.7
Pungo	B	7	C	1	Reductant P	124.4
Pungo	B	9	A	1	Reductant P	115.2
Pungo	B	1	C	2	Reductant P	92.2
Pungo	B	1	C	3	Reductant P	101.4
Pungo	B	1	C	4	Reductant P	101.4
Pungo	B	6	C	2	Reductant P	119.8
Pungo	B	6	C	3	Reductant P	78.3
Pungo	B	6	C	4	Reductant P	46.1
Pungo	B	9	A	2	Reductant P	82.9
Pungo	B	9	A	3	Reductant P	82.9
Pungo	B	9	A	4	Reductant P	87.6
Pungo	B	1	C	1	Reductant P	87.6
Pungo	B	6	C	1	Reductant P	5.5
Pungo	B	7	B	1	Reductant P	4.6
Pungo	B	7	C	1	Reductant P	3.7
Pungo	B	9	A	1	Reductant P	115.2
Pungo	B	1	C	2	Reductant P	96.8
Pungo	B	1	C	3	Reductant P	73.7
Pungo	B	1	C	4	Reductant P	73.7
Pungo	B	6	C	2	Reductant P	
Pungo	B	6	C	3	Reductant P	87.6
Pungo	B	6	C	4	Reductant P	59.9
Pungo	B	9	A	2	Reductant P	6.9
Pungo	B	9	A	3	Reductant P	5.5
Pungo	B	9	A	4	Reductant P	4.1
Pungo	B	1	C	1	Reductant P	7.8
Pungo	B	6	C	1	Reductant P	10.6
Pungo	B	7	B	1	Reductant P	3.2
Pungo	B	7	C	1	Reductant P	4.1
Pungo	B	9	A	1	Reductant P	3.2
Pungo	B	1	C	2	Reductant P	165.9
Pungo	B	1	C	3	Reductant P	96.8
Pungo	B	1	C	4	Reductant P	50.7
Pungo	B	6	C	2	Reductant P	
Pungo	B	6	C	3	Reductant P	82.9
Pungo	B	6	C	4	Reductant P	87.6
Pungo	B	9	A	2	Reductant P	82.9
Pungo	B	9	A	3	Reductant P	50.7
Pungo	B	9	A	4	Reductant P	110.6

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Scuppernong	B	1	B	1	Reductant P	225.8
Scuppernong	B	2	C	1	Reductant P	87.6
Scuppernong	B	11	A	1	Reductant P	92.2
Scuppernong	B	17	B	1	Reductant P	78.3
Scuppernong	B	18	C	1	Reductant P	73.7
Scuppernong	B	2	C	2	Reductant P	64.5
Scuppernong	B	2	C	3	Reductant P	96.8
Scuppernong	B	2	C	4	Reductant P	92.2
Scuppernong	B	11	A	2	Reductant P	64.5
Scuppernong	B	11	A	3	Reductant P	92.2
Scuppernong	B	11	A	4	Reductant P	106.0
Scuppernong	B	18	C	2	Reductant P	82.9
Scuppernong	B	18	C	3	Reductant P	152.1
Scuppernong	B	18	C	4	Reductant P	69.1
Scuppernong	B	1	B	1	Reductant P	106.0
Scuppernong	B	2	C	1	Reductant P	59.9
Scuppernong	B	11	A	1	Reductant P	50.7
Scuppernong	B	17	B	1	Reductant P	46.1
Scuppernong	B	18	C	1	Reductant P	161.3
Scuppernong	B	2	C	2	Reductant P	106.0
Scuppernong	B	2	C	3	Reductant P	78.3
Scuppernong	B	2	C	4	Reductant P	73.7
Scuppernong	B	11	A	2	Reductant P	78.3
Scuppernong	B	11	A	3	Reductant P	59.9
Scuppernong	B	11	A	4	Reductant P	55.3
Scuppernong	B	18	C	2	Reductant P	6.5
Scuppernong	B	18	C	3	Reductant P	8.8
Scuppernong	B	18	C	4	Reductant P	12.0
Scuppernong	B	1	B	1	Reductant P	115.2
Scuppernong	B	2	C	1	Reductant P	170.5
Scuppernong	B	11	A	1	Reductant P	115.2
Scuppernong	B	17	B	1	Reductant P	59.9
Scuppernong	B	18	C	1	Reductant P	59.9
Scuppernong	B	2	C	2	Reductant P	96.8
Scuppernong	B	2	C	3	Reductant P	64.5
Scuppernong	B	2	C	4	Reductant P	78.3
Scuppernong	B	11	A	2	Reductant P	106.0
Scuppernong	B	11	A	3	Reductant P	55.3
Scuppernong	B	11	A	4	Reductant P	82.9
Scuppernong	B	18	C	2	Reductant P	106.0
Scuppernong	B	18	C	3	Reductant P	124.4
Scuppernong	B	18	C	4	Reductant P	101.4
Belhaven	A	2	C	1	Ca-P	34.5
Belhaven	C	16	C	1	Ca-P	25.5
Belhaven	A	12	A	1	Ca-P	4.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Belhaven	A	13	A	1	Ca-P	9.0
Belhaven	C	18	A	1	Ca-P	26.0
Belhaven	A	12	A	2	Ca-P	10.5
Belhaven	A	12	A	3	Ca-P	21.5
Belhaven	A	12	A	4	Ca-P	6.5
Belhaven	C	16	C	2	Ca-P	29.0
Belhaven	C	16	C	3	Ca-P	8.0
Belhaven	C	16	C	4	Ca-P	
Belhaven	A	13	A	2	Ca-P	5.5
Belhaven	A	13	A	3	Ca-P	8.0
Belhaven	A	13	A	4	Ca-P	11.0
Belhaven	A	2	C	1	Ca-P	36.0
Belhaven	C	16	C	1	Ca-P	27.5
Belhaven	A	12	A	1	Ca-P	17.0
Belhaven	A	13	A	1	Ca-P	19.0
Belhaven	C	18	A	1	Ca-P	21.5
Belhaven	A	12	A	2	Ca-P	39.5
Belhaven	A	12	A	3	Ca-P	23.0
Belhaven	A	12	A	4	Ca-P	35.5
Belhaven	C	16	C	2	Ca-P	38.5
Belhaven	C	16	C	3	Ca-P	17.5
Belhaven	C	16	C	4	Ca-P	
Belhaven	A	13	A	2	Ca-P	15.5
Belhaven	A	13	A	3	Ca-P	18.0
Belhaven	A	13	A	4	Ca-P	14.0
Belhaven	A	2	C	1	Ca-P	25.5
Belhaven	C	16	C	1	Ca-P	37.5
Belhaven	A	12	A	1	Ca-P	11.5
Belhaven	A	13	A	1	Ca-P	16.0
Belhaven	C	18	A	1	Ca-P	28.0
Belhaven	A	12	A	2	Ca-P	13.5
Belhaven	A	12	A	3	Ca-P	19.5
Belhaven	A	12	A	4	Ca-P	19.5
Belhaven	C	16	C	2	Ca-P	35.0
Belhaven	C	16	C	3	Ca-P	13.5
Belhaven	C	16	C	4	Ca-P	
Belhaven	A	13	A	2	Ca-P	9.0
Belhaven	A	13	A	3	Ca-P	13.5
Belhaven	A	13	A	4	Ca-P	13.0
Ponzer	A	4	B	1	Ca-P	12.5
Ponzer	A	5	A	1	Ca-P	9.0
Ponzer	A	7	C	1	Ca-P	21.5
Ponzer	B	17	A	1	Ca-P	28.0
Ponzer	B	20	C	1	Ca-P	12.0
Ponzer	B	20	A	2	Ca-P	13.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Ponzer	B	20	A	3	Ca-P	10.5
Ponzer	B	20	A	4	Ca-P	9.0
Ponzer	B	17	C	2	Ca-P	11.0
Ponzer	B	17	C	3	Ca-P	7.5
Ponzer	B	17	C	4	Ca-P	11.5
Ponzer	A	7	C	2	Ca-P	4.0
Ponzer	A	7	C	3	Ca-P	8.0
Ponzer	A	7	C	4	Ca-P	8.5
Ponzer	A	4	B	1	Ca-P	22.0
Ponzer	A	5	A	1	Ca-P	22.5
Ponzer	A	7	C	1	Ca-P	23.0
Ponzer	B	17	A	1	Ca-P	26.0
Ponzer	B	20	C	1	Ca-P	20.0
Ponzer	B	20	A	2	Ca-P	17.5
Ponzer	B	20	A	3	Ca-P	23.0
Ponzer	B	20	A	4	Ca-P	26.5
Ponzer	B	17	C	2	Ca-P	15.0
Ponzer	B	17	C	3	Ca-P	16.5
Ponzer	B	17	C	4	Ca-P	21.0
Ponzer	A	7	C	2	Ca-P	12.5
Ponzer	A	7	C	3	Ca-P	16.5
Ponzer	A	7	C	4	Ca-P	18.0
Ponzer	A	4	B	1	Ca-P	11.0
Ponzer	A	5	A	1	Ca-P	11.0
Ponzer	A	7	C	1	Ca-P	19.0
Ponzer	B	17	A	1	Ca-P	20.0
Ponzer	B	20	C	1	Ca-P	29.5
Ponzer	B	20	A	2	Ca-P	15.5
Ponzer	B	20	A	3	Ca-P	14.0
Ponzer	B	20	A	4	Ca-P	17.5
Ponzer	B	17	C	2	Ca-P	12.5
Ponzer	B	17	C	3	Ca-P	12.5
Ponzer	B	17	C	4	Ca-P	13.5
Ponzer	A	7	C	2	Ca-P	8.0
Ponzer	A	7	C	3	Ca-P	11.0
Ponzer	A	7	C	4	Ca-P	14.5
Pungo	B	1	C	1	Ca-P	9.5
Pungo	B	6	C	1	Ca-P	7.5
Pungo	B	7	B	1	Ca-P	12.0
Pungo	B	7	C	1	Ca-P	6.5
Pungo	B	9	A	1	Ca-P	11.5
Pungo	B	1	C	2	Ca-P	6.0
Pungo	B	1	C	3	Ca-P	
Pungo	B	1	C	4	Ca-P	10.0
Pungo	B	6	C	2	Ca-P	11.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Pungo	B	6	C	3	Ca-P	8.0
Pungo	B	6	C	4	Ca-P	
Pungo	B	9	A	2	Ca-P	7.0
Pungo	B	9	A	3	Ca-P	7.5
Pungo	B	9	A	4	Ca-P	9.0
Pungo	B	1	C	1	Ca-P	7.5
Pungo	B	6	C	1	Ca-P	
Pungo	B	7	B	1	Ca-P	
Pungo	B	7	C	1	Ca-P	
Pungo	B	9	A	1	Ca-P	20.0
Pungo	B	1	C	2	Ca-P	16.0
Pungo	B	1	C	3	Ca-P	17.5
Pungo	B	1	C	4	Ca-P	19.0
Pungo	B	6	C	2	Ca-P	
Pungo	B	6	C	3	Ca-P	19.5
Pungo	B	6	C	4	Ca-P	20.5
Pungo	B	9	A	2	Ca-P	15.5
Pungo	B	9	A	3	Ca-P	17.5
Pungo	B	9	A	4	Ca-P	21.5
Pungo	B	1	C	1	Ca-P	11.0
Pungo	B	6	C	1	Ca-P	11.0
Pungo	B	7	B	1	Ca-P	13.0
Pungo	B	7	C	1	Ca-P	14.0
Pungo	B	9	A	1	Ca-P	17.5
Pungo	B	1	C	2	Ca-P	18.0
Pungo	B	1	C	3	Ca-P	15.5
Pungo	B	1	C	4	Ca-P	14.0
Pungo	B	6	C	2	Ca-P	
Pungo	B	6	C	3	Ca-P	18.0
Pungo	B	6	C	4	Ca-P	19.5
Pungo	B	9	A	2	Ca-P	13.5
Pungo	B	9	A	3	Ca-P	12.0
Pungo	B	9	A	4	Ca-P	13.0
Scuppernong	B	1	B	1	Ca-P	31.0
Scuppernong	B	2	C	1	Ca-P	6.5
Scuppernong	B	11	A	1	Ca-P	35.0
Scuppernong	B	17	B	1	Ca-P	7.0
Scuppernong	B	18	C	1	Ca-P	6.0
Scuppernong	B	2	C	2	Ca-P	3.5
Scuppernong	B	2	C	3	Ca-P	9.0
Scuppernong	B	2	C	4	Ca-P	20.5
Scuppernong	B	11	A	2	Ca-P	8.5
Scuppernong	B	11	A	3	Ca-P	9.5
Scuppernong	B	11	A	4	Ca-P	7.5
Scuppernong	B	18	C	2	Ca-P	9.5

Inorganic P Fractions Data

Series	Farm	Field Number	Location on Field A, B, or C	Depth	Fraction Identified	Concentration of Fraction
						mg kg^{-1}
Scuppernong	B	18	C	3	Ca-P	25.0
Scuppernong	B	18	C	4	Ca-P	10.0
Scuppernong	B	1	B	1	Ca-P	21.0
Scuppernong	B	2	C	1	Ca-P	20.5
Scuppernong	B	11	A	1	Ca-P	31.0
Scuppernong	B	17	B	1	Ca-P	15.0
Scuppernong	B	18	C	1	Ca-P	16.0
Scuppernong	B	2	C	2	Ca-P	13.0
Scuppernong	B	2	C	3	Ca-P	22.0
Scuppernong	B	2	C	4	Ca-P	19.0
Scuppernong	B	11	A	2	Ca-P	22.0
Scuppernong	B	11	A	3	Ca-P	21.0
Scuppernong	B	11	A	4	Ca-P	28.0
Scuppernong	B	18	C	2	Ca-P	14.5
Scuppernong	B	18	C	3	Ca-P	20.0
Scuppernong	B	18	C	4	Ca-P	28.5
Scuppernong	B	1	B	1	Ca-P	32.0
Scuppernong	B	2	C	1	Ca-P	18.0
Scuppernong	B	11	A	1	Ca-P	37.5
Scuppernong	B	17	B	1	Ca-P	12.5
Scuppernong	B	18	C	1	Ca-P	12.0
Scuppernong	B	2	C	2	Ca-P	12.5
Scuppernong	B	2	C	3	Ca-P	12.5
Scuppernong	B	2	C	4	Ca-P	15.0
Scuppernong	B	11	A	2	Ca-P	24.0
Scuppernong	B	11	A	3	Ca-P	18.0
Scuppernong	B	11	A	4	Ca-P	19.5
Scuppernong	B	18	C	2	Ca-P	13.0
Scuppernong	B	18	C	3	Ca-P	23.0
Scuppernong	B	18	C	4	Ca-P	22.0

Aluminum Fractionation Data

Series	Farm	Field Number	Location on Field A, B, or C	Increment	Organically Bound Al	$CuCl_2$ Al	$CaCl_2$ Al
					mg kg^{-1}	mg kg^{-1}	mg kg^{-1}
Belhaven	A	1	A	1	941	965	24
Belhaven	A	2	C	1	740	742	2
Belhaven	A	6	A	1	529	531	2
Belhaven	C	16	C	1	2940	2948	8
Belhaven	C	15	A	1	2705	2718	13
Belhaven	C	15	A	2	1006	1021	15
Belhaven	C	15	A	3	50	51	1
Belhaven	C	15	A	4	139	177	38
Belhaven	C	15	B	1	2775	2789	14
Belhaven	C	15	B	2	2255	2264	9
Belhaven	C	15	B	3	253	256	3
Belhaven	C	15	B	4	104	109	6
Belhaven	C	15	C	1	2527	2540	13
Belhaven	C	15	C	2	1627	1632	5
Belhaven	C	15	C	3	313	315	2
Belhaven	C	15	C	4	132	156	24
Belhaven	C	16	A	1	2406	2424	18
Belhaven	C	16	A	2	1611	1632	21
Belhaven	C	16	A	3	391	393	2
Belhaven	C	16	A	4	55	58	3
Belhaven	C	16	B	1	2403	2414	11
Belhaven	C	16	B	2	1050	1054	4
Belhaven	C	16	B	3	177	205	28
Belhaven	C	16	B	4	151	153	2
Belhaven	C	16	C	2	1075	1079	4
Belhaven	C	16	C	3	574	578	4
Belhaven	C	16	C	4	121	177	56
Belhaven	A	13	A	2	1170	1223	53
Belhaven	A	13	A	3	3836	3902	66
Belhaven	A	13	A	4	814	861	47
Belhaven	A	12	A	2	1803	1854	51
Belhaven	A	12	A	3	1479	1556	77
Belhaven	A	12	A	4	1190	1249	59
Belhaven	B	5	A	4	454	457	3
Belhaven	B	5	B	1	1279	1303	24
Belhaven	B	5	B	2	2390	2435	45
Belhaven	B	5	B	3	1370	1422	52
Belhaven	B	5	B	4	708	757	49
Belhaven	B	5	C	1	1434	1440	6
Belhaven	B	5	C	3	2465	2529	64
Belhaven	B	5	C	4			
Ponzer	A	2	B	1			
Ponzer	A	4	B	1	1072	1076	5
Ponzer	A	5	A	1	1145	1148	3
Ponzer	A	7	C	1	2302	2309	7

Aluminum Fractionation Data

Series	Farm	Field Number	Location on Field A, B, or C	Increment	Organically Bound Al mg kg^{-1}	$CuCl_2$ Al mg kg^{-1}	$CaCl_2$ Al mg kg^{-1}
Ponzer	A	10	B	1	2638	2642	4
Ponzer	A	10	C	1	2532	2537	5
Ponzer	B	17	A	1	1990	2018	28
Ponzer	B	20	C	1	1954	1965	11
Ponzer	B	17	A	2	2143	2188	45
Ponzer	B	17	A	3	1966	2018	52
Ponzer	B	17	A	4	969	1017	48
Ponzer	B	17	B	1	1906	1912	6
Ponzer	B	17	B	2	3668	3730	62
Ponzer	B	17	B	3	1809	1891	82
Ponzer	B	17	B	4	1553	1610	57
Ponzer	B	17	C	1	2526	2541	15
Ponzer	B	17	C	3	1942	2054	112
Ponzer	B	17	C	4	1742	1802	60
Ponzer	B	18	A	1	1519	1524	5
Ponzer	B	18	A	2	1543	1582	39
Ponzer	B	18	A	3	1414	1450	36
Ponzer	B	18	A	4	749	778	29
Ponzer	B	18	B	1	2083	2092	9
Ponzer	B	18	B	2	1838	1914	76
Ponzer	B	18	B	3	1704	1762	58
Ponzer	B	18	B	4	1063	1107	44
Ponzer	B	18	C	1	2315	2322	8
Ponzer	B	18	C	2	2878	2930	52
Ponzer	B	18	C	3	2141	2210	69
Ponzer	B	18	C	4	1330	1369	39
Ponzer	B	19	A	1	2283	2295	12
Ponzer	B	19	A	2	2913	2969	56
Ponzer	B	19	A	3	1685	1729	44
Ponzer	B	19	A	4	1150	1178	28
Ponzer	B	19	B	1	2583	2594	11
Ponzer	B	19	B	2	2012	2064	52
Ponzer	B	19	B	3	1734	1799	65
Ponzer	B	19	B	4	1033	1079	46
Ponzer	B	19	C	1	1863	1873	10
Ponzer	B	19	C	2	1650	1706	56
Ponzer	B	19	C	3	1798	1855	57
Ponzer	B	19	C	4	1532	1571	39
Ponzer	B	20	A	1	2162	2176	14
Ponzer	B	20	A	3	1891	1947	56
Ponzer	B	20	A	4	729	781	52
Ponzer	B	20	B	1	1902	1912	10
Ponzer	B	20	B	2	3445	3472	27
Ponzer	B	20	B	3	1967	2028	61
Ponzer	B	20	B	4	647	707	60

Aluminum Fractionation Data

Series	Farm	Field Number	Location on Field A, B, or C	Increment	Organically Bound Al	$CuCl_2$ Al	$CaCl_2$ Al
					mg kg^{-1}	mg kg^{-1}	mg kg^{-1}
Ponzer	B	20	C	2	2107	2172	65
Ponzer	B	20	C	3	1851	1914	63
Ponzer	B	20	C	4	1839	1903	64
Ponzer	B	17	C	2	3835	3844	9
Ponzer	B	20	A	2	3403	3479	76
Ponzer	A	7	C	2	2260	2305	45
Ponzer	A	7	C	3	1392	1421	29
Ponzer	A	7	C	4	338	349	11
Pungo	B	1	C	1	1189	1195	6
Pungo	B	5	A	1	2103	2135	32
Pungo	B	6	A	1	1718	1745	27
Pungo	B	6	C	1	1602	1625	23
Pungo	B	7	B	1	2040	2102	62
Pungo	B	7	C	1	1774	1827	53
Pungo	B	9	A	1	2226	2333	107
Pungo	B	10	A	1			
Pungo	B	2	A	1	1483	1487	5
Pungo	B	2	A	3	3112	3188	76
Pungo	B	1	A	4	1273	1368	95
Pungo	B	2	B	1	1156	1167	11
Pungo	B	2	B	3	1668	1780	112
Pungo	B	2	B	4	1398	1488	90
Pungo	B	2	C	1	1019	1028	9
Pungo	B	2	C	4	1683	1797	114
Pungo	B	4	A	1	1687	1694	8
Pungo	B	4	A	2	2600	2678	78
Pungo	B	4	A	3	1023	1107	84
Pungo	B	4	A	4	1431	1515	84
Pungo	B	4	B	1	1542	1556	14
Pungo	B	4	B	3	1935	2092	157
Pungo	B	4	B	4	1111	1183	72
Pungo	B	4	C	1	1143	1148	5
Pungo	B	4	C	3	1405	1449	44
Pungo	B	4	C	4	1861	1968	107
Pungo	B	5	A	2			
Pungo	B	5	A	3	1848	1975	127
Pungo	B	5	A	4	1571	1699	128
Pungo	B	5	B	1	1466	1483	17
Pungo	B	5	C	1	1501	1532	31
Pungo	B	5	C	3	2661	2862	201
Pungo	B	5	C	4	2068	2216	148
Pungo	B	2	A	2	2330	2388	58
Pungo	B	2	B	2	2891	2907	16
Pungo	B	4	B	2	1943	2058	115
Pungo	B	4	C	2			62

Aluminum Fractionation Data

Series	Farm	Field Number	Location on Field A, B, or C	Increment	Organically Bound Al	$CuCl_2$ Al	$CaCl_2$ Al
					mg kg^{-1}	mg kg^{-1}	mg kg^{-1}
Pungo	B	5	B	2	2896	2901	5
Pungo	B	5	B	3	3282	3324	42
Pungo	B	5	B	4	2287	2325	38
Pungo	B	5	C	2	2376	2406	30
Pungo	B	9	A	2	2146	2156	10
Pungo	B	9	A	3	803	881	78
Pungo	B	9	A	4	620	703	83
Pungo	B	1	C	2			
Pungo	B	1	C	3	2019	2146	127
Pungo	B	1	C	4	1810	1887	77
Pungo	B	6	C	3			
Pungo	B	6	C	4	1263	1374	111
Scuppernong	B	1	A	1	1119	1132	13
Scuppernong	B	1	B	1	1566	1573	7
Scuppernong	B	1	C	1	1143	1155	12
Scuppernong	B	2	C	1	1859	1868	9
Scuppernong	B	3	C	1	1866	1873	8
Scuppernong	B	11	A	1	994	998	4
Scuppernong	B	17	B	1	2199	2208	10
Scuppernong	B	18	C	1	1644	1652	8
Scuppernong	B	12	A	1	937	946	9
Scuppernong	B	13	A	1	903	906	3
Scuppernong	B	18	A	1	2993	3019	26
Scuppernong	B	2	A	2	1517	1543	26
Scuppernong	B	2	A	3	868	874	6
Scuppernong	B	2	A	4	381	413	32
Scuppernong	B	2	B	1	954	981	27
Scuppernong	B	2	B	3	1183	1206	23
Scuppernong	B	2	B	4	616	678	62
Scuppernong	B	2	C	3	1783	1837	54
Scuppernong	B	2	C	4	1453	1562	109
Scuppernong	B	3	A	1	1335	1340	5
Scuppernong	B	3	A	2	1342	1345	3
Scuppernong	B	3	A	3	632	639	7
Scuppernong	B	3	A	4	204	208	4
Scuppernong	B	3	B	1	1420	1425	5
Scuppernong	B	3	B	3	1797	1825	28
Scuppernong	B	3	B	4	835	845	10
Scuppernong	B	3	C	2	2050	2074	24
Scuppernong	B	3	C	3	1625	1627	2
Scuppernong	B	3	C	4	1163	1165	2
Scuppernong	B	4	A	1	1346	1354	8
Scuppernong	B	4	A	3	2101	2114	13
Scuppernong	B	4	A	4	880	887	8
Scuppernong	B	4	B	3	1075	1088	13

Aluminum Fractionation Data

Series	Farm	Field Number	Location on Field A, B, or C	Increment	Organically Bound Al	$CuCl_2$ Al	$CaCl_2$ Al
					mg kg^{-1}	mg kg^{-1}	mg kg^{-1}
Scuppernong	B	4	B	4	756	765	10
Scuppernong	B	4	C	1	1266	1273	7
Scuppernong	B	4	C	3	1462	1465	3
Scuppernong	B	4	C	4	1712	1722	10
Scuppernong	B	5	A	1	1346	1354	8
Scuppernong	B	5	A	3	1089	1098	9
Scuppernong	B	4	A	2	3265	3326	61
Scuppernong	B	4	B	2	2063	2108	45
Scuppernong	B	4	C	2			8
Scuppernong	B	2	B	2	3093	3141	48
Scuppernong	B	2	C	2	2530	2598	68
Scuppernong	B	3	B	2	2496	2534	38
Scuppernong	B	3	C	2	2609	2621	12
Scuppernong	B	18	C	2	3158	3271	113
Scuppernong	B	18	C	3	1560	1659	99
Scuppernong	B	18	C	4			
Scuppernong	B	11	A	2	2147	2175	28
Scuppernong	B	11	A	3	1170	1226	56
Scuppernong	B	11	A	4	749	796	47