SL248

UF UNIVERSITY of FLORIDA
IFAS Extension

Soil Fertility Management for Wildlife Food Plots[1]

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Introduction

A good seed bed is the foundation for a successful wildlife food plot. Soil fertility is an important component of seed bed preparation. At a minimum, growers should be familiar with their soil characteristics. Deep sands typically do not hold many nutrients. The heavier, red soils such as those found in the Florida Panhandle, will likely have more nutrients and will hold nutrients when fertilized. Your local county extension or NRCS office should have a soil survey book or CD available that will help you determine your soil type. The soils map and descriptions of your property will guide you in choosing a plot location and avoiding marginal soils. Additionally, you can go on-line and use the NRCS Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/.

Soil Sampling

Your next step is to sample the soil for pH and plant-available nutrients. You want to be certain that the small package of soil you send to the lab represents the soil you intend to manage for your food plots. This is best accomplished by gathering a composite soil sample.

A composite soil sample is comprised of several representative subsamples taken throughout the food plot that are combined into a single sample, using a 5 gallon bucket or a clean, non-metal container. Metal containers may contaminate your soil sample with iron, zinc or other metals which may affect the lab results for those metals. Ten to 20 subsamples taken from the upper 6-8 inches of topsoil are used to create a composite sample. If you are unsure, take additional subsamples.

A shovel, soil probe or soil auger can be used to remove soil. To further prevent contamination, be sure the equipment is rust-free, particularly if micronutrient analysis will be conducted (Figure 1). Soil probes are fairly inexpensive and provide much more uniform core removal than do shovels. Prices range from about $25 to over $200.

The most thorough method for gathering samples is systematic subsampling at either grid centers or intersections (Figure 2). However, this approach, used in precision agriculture, may not be necessary for wildlife food plots. Instead, both random and zig zag sampling patterns are acceptable. The zig zag method has the preferable advantage of removing some unintentional bias in selecting subsampling points (Figure 2).

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Figure 1. Examples of soil sampling equipment. From left, soil probe, spade, sharpshooter and soil auger.

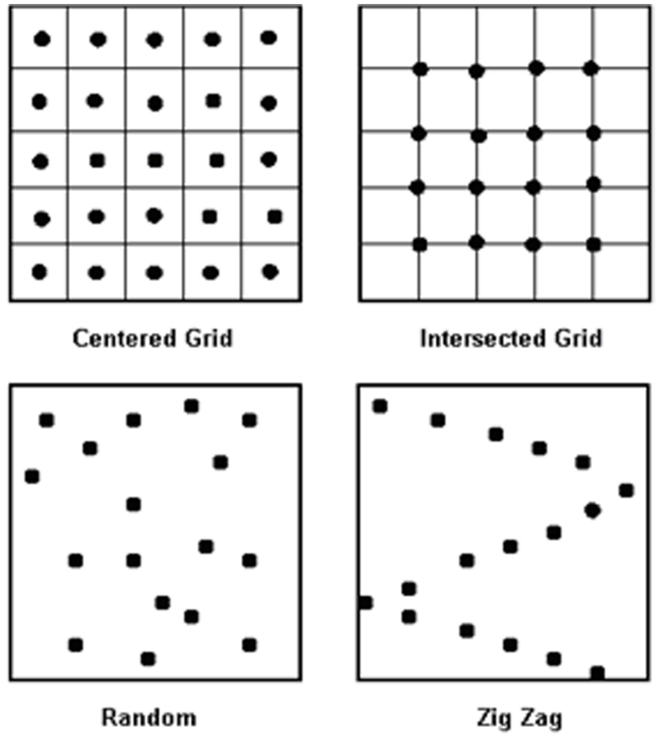

Figure 2. Each example represents a 10 acre field. Each point represents a subsample.

If soil pH and fertility are in good standing, sampling every 3 years is adequate. Annual sampling may be required if fertility is sub-optimal or the food plot is located on deep sands.

Approximately two cups of a soil composite are required by an analytic laboratory. Allow your soil sample to air-dry (e.g., spread sample on a cookie sheet) before packaging it for delivery. Soils are analyzed for plant-available nutrients, not total nutrients. Moist soil samples kept in air-tight bags may undergo changes in their available nutrient content, which would produce an inaccurate representation of nutrient availability in the original soil. You may send your samples to a trusted commercial lab or contact your local extension agent for instructions on sending them to the University of Florida (UF) Extension Soils Testing Lab (ESTL), which is located on UF's campus in Gainesville, FL.

Soil Analyses

Laboratory analytic parameters may include soil pH, buffer pH, available NO_3-N, P_2O_5 (phosphate), K_2O (potash), Ca, Mg, Fe, Mn, Zn, Cu, B, cation exchange capacity (CEC), and percent base saturation. At a minimum, the soil should be tested for pH, buffer pH (lime requirement), P_2O_5, and K_2O. Nitrate-N soil values change rapidly over time, therefore, soil testing for NO_3-N may not be warranted, nor is it recommended by IFAS.

Percent base saturation, buffer pH, Ca and Mg values provide information relative to soil acidity and liming status. Cation exchange capacity provides an estimate of nutrient storage and release from soil particles whereby the higher the CEC value, the more fertile the soil may be. Because clays tend to hold more nutrients, the CEC provides an approximation of soil texture and vice versa. Sandy soils typically have a CEC below 12 and loamy soils typically have a CEC above 20. Soils high in $CaCO_3$ (calcium carbonate) may have a higher CEC than their soil texture would infer. This is typically true of soils overlying marl or karst topography (i.e., limestone).

Micro or minor elements (Fe, Mn, Zn, Cu, B, Mo) are required in much lower doses than N, P, and K and they are not measured as often. However, some Florida soils are deficient in one or more minor elements and, therefore, trace elements should be analyzed every few years, more often in very sandy soils. It is important to take caution when applying trace nutrients because excessive application can harm plant productivity for many years.

Soil pH/Liming

If your soil pH is above 6.0, then liming is probably not required. Without a proper soil pH, some fertilizer nutrients become less available (Figure 3), resulting in lower yields. Additionally, a low pH (<5.0) increases the risk of plant aluminum (Al) and manganese (Mn) toxicity.

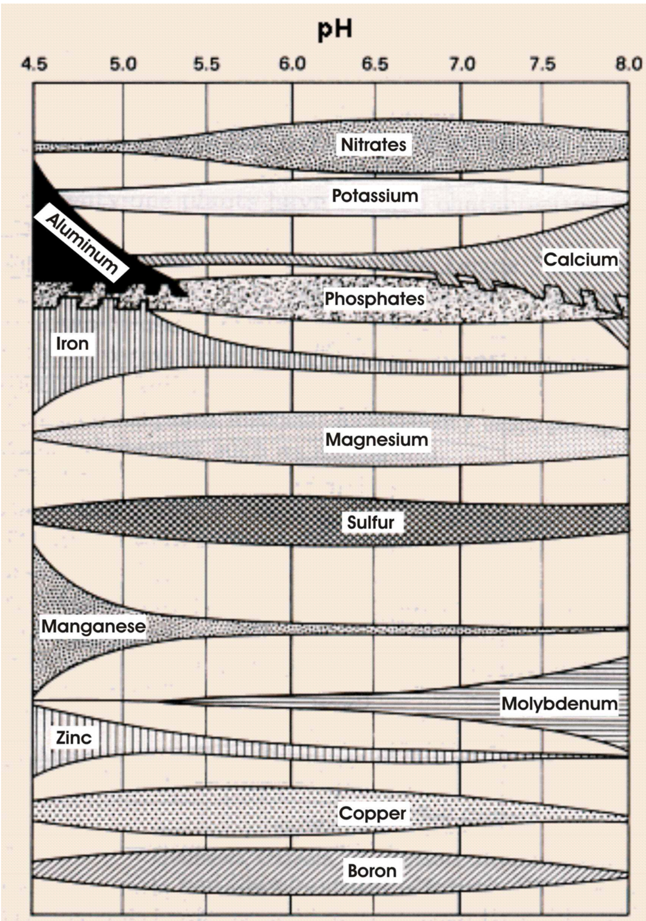

Figure 3. Relationship between soil pH and relative plant nutrient availability (a widening bar equates to greater availability). Where nutrients are shown interlocking, they combine at that pH to form insoluble compounds which reduce phosphate solubility. Credits: Taken from R.W. Miller and D.T. Gardiner. Soils in Our Environment. Prentice Hall, 2001.

It is best to incorporate the lime several months before planting your food plot. This provides time for the lime to neutralize soil acidity. Applying lime to the surface without incorporating it into the soil may limit liming effects to the upper inch or two of soil.

Not all liming materials are the same! Pure calcite is used as the standard to rank all other liming materials. Calcium carbonate equivalent (CCE) is a term used to describe relative effectiveness. If you have a material with a CCE of 70 then it will take 1.3 tons of your product to receive the same benefit as 1.0 ton of pure calcite. Additionally, some fertilizers have either a liming or acidifying effect (negative CCE) (Table 1). Lime particle (mesh) size determines liming effectiveness or the effective neutralizing value, but this does not pertain to granular fertilizers since they are much more soluble than lime. Rule of thumb: large lime particles (less than 20 mesh) will have minimal neutralizing value so choose smaller particle (higher mesh) sizes. More information may be found at http://edis.ifas.ufl.edu/pdffiles/SS/SS16100.pdf.

Table 1. Typical CCE of some liming materials.

Liming Materials	Typical CCE (%)
Calcite (pure)	100
Calcitic limestone	75 - 100
Dolomitic limestone	75 - 108
Aragonite	95 - 100
Hydrated lime ($Ca(OH_2)$)	120 - 136
Marl	50 - 90
Burned lime (CaO)	178
Flue dust	60 - 80
Wood ash	30 - 70
Basic slag	50 - 70
Other Materials	
Calcium nitrate	20
Potassium nitrate	23
Rock phosphate	10
Gypsum (land plaster)	0
Urea	-83*
Ammonium sulfate	-110*
Diammonium phosphate	-70*
Humus	9
Milorganite	10
Sludges	20 - 80

*Negative values represent acidifying.

Often food plot fertility is accomplished at fall planting. Since agricultural lime requires some time to affect soil pH, pelletized lime may be desirable for more rapid liming. The pellet form is as easy to broadcast as granular fertilizer and the pellets are comprised of finely ground lime, thereby providing effective liming in a relatively short time. The ESTL will provide liming recommendations with your soil analysis report.

Fertilizer Recommendations

Fertilizer recommendations may be provided in either parts per million (ppm) or lbs per acre. If the analytic results are in ppm, they can be converted to lbs per acre by multiplying the values by 2. A good guide to follow for fertilization requirements of specific forages common to food plots is UF/IFAS standardized fertilization recommendations for agronomic crops http://edis.ifas.ufl.edu/pdffiles/SS/SS16300.pdf.

In addition to the IFAS forage recommendations, legumes (clovers, peanut, peas) tend to have a higher pH requirement (6.5) in temperate soils, but this has not always been observed in Florida's subtropical soils. Therefore liming may only be needed when the soil pH is below 6.0. Additionally, legumes rarely need N fertilizer since their associated microorganisms fix N which benefits the microorganisms, the host plant, and sometimes the neighboring plants.

There is plenty of anecdotal information suggesting that intermixing legumes with other forage species may reduce the need for fertilizer N. Legumes, in particular, tend to have higher S, Ca, Mg, and B requirements and therefore may benefit from additional fertilization with one or more of these nutrients.

You can benefit by following the best management practice (BMP) of splitting the recommended fertilizer rate into two or more applications. This improves the likelihood that the plants will capture more of the fertilizer to meet their nutrient requirements. Additionally, splitting applications will lessen the economic loss from leached fertilizer and reduce the potential for surface and groundwater nutrient loading.

Organic Fertilizers

Organic fertilizers, such as manures, litters and composts, may be considered for wildlife food plots. The organic matter in composts and manures is good for improving soil quality, such as water holding capacity and nutrient retention. The readily available nutrient concentration of composts is low. Therefore, application rates can approach 20 ton/acre to meet plant nutrient requirements. Manures and litters tend to contain more nutrients so application rates are typically 5 tons/acre or less.

Biosolids (AA-rated municipal sludge) are also good sources of plant nutrients. Wildlife (deer in particular) may have an aversion to the material until it degrades and becomes incorporated into the soil. Thus, biosolids may work to protect against browsing pressure for a time, allowing for better forage establishment. It might be advantageous to test biosolids on a small area for one or more seasons to evaluate their effectiveness as a temporary deer repellent prior to using them on larger acreage.

To learn more about specific wildlife food plot forages, link to the following:

A walk on the wild side: 2006-2007 cool-season forage recommendations for wildlife food plots in North Florida

http://edis.ifas.ufl.edu/pdffiles/AG/AG13900.pdf.

2006 fall forage update

http://edis.ifas.ufl.edu/pdffiles/AA/AA26600.pdf.