LOWA LILs Guide to a Nutrient Management Plan

This guide is written for the University of Missouri Extension (MU Ext) Soil Test Report received after submitting a soil sample to a MU Extension office for a soil test, and is designed to be used by the average home owner, either on their own or in coordination with trained volunteers from Lake of the Ozarks Watershed Alliance (LOWA). If you would like some help in using this Guide to a Nutrient Management Plan, or if you would like to discuss landscaping your property with a healthy watershed in mind, LOWA LILs or erosion control issues at your property, please contact LOWA online at LOWA's website, www.soslowa.org, lowasec@soslowa.org, or call 573-374-1331 and set up a time.

To Begin:

With a Soil Test Report (STR) in hand, work through the following steps in order. A simple calculator may help with some of the short calculations. In this guide, the term "**nutrient**" means a plant food and one of several essential needs for a plant. The most common plant nutrients are nitrogen (N), phosphorus (P), and potassium (K). These three form the basis of most fertilizers. Other plant nutrients include calcium (Ca), magnesium (Mg), and some trace minerals such as boron (B), and copper (Cu), to name but a few.

In the STR, under a section called either "Nutrient Requirements/Fertilizer Recommendations" or "Fertilizer & Limestone Recommendations", you will see N = ( ); P_2O_5 = ( ); and K_2O = ( ), with a value inside the parentheses. P_2O_5 is the phosphorus (P) part, and K_2O is the potassium (K) part.

Step 1: Decide if applying fertilizer is necessary for you.

If, under Nutrient Requirements/Fertilizer Recommendations in the STR, you see a zero, your soil does not need that nutrient. Soils rated "high" for a nutrient generally have less than a 10% probability that the plants will show a response to being fertilized and soils

rated “medium” have a 30-60% probability of having plants show a response to fertilization. This means the more nutrients a soil has, the less likely fertilizing for that nutrient will make a noticeable difference for the plants.

For example, the STR might have a ‘medium’ rating for phosphorus (P) and a ‘very high’ rating for potassium (K). Under Nutrient Requirements/Fertilizer Recommendations, N = 0.0; P_2O_5 = 1.0; and K_2O = 0.0. This individual might decide to save some money and to wait a year before applying P because of the fairly low probability of seeing any results in the plants.

Step 2: Choose the fertilizer grade.

Most fertilizers available in most stores come with 3 numbers on the bag that refer to the 3 nutrients, nitrogen (N), phosphorus (P), and potassium (K), in that order and are called the NPK for that fertilizer.

For example: 10-20-10. These 3 numbers are the percentages of the 3 nutrients, NPK, or nitrogen, phosphorus, and potassium, in that order. So this fertilizer is 10% N (nitrogen), 20% P (phosphorus), and 10% K (potassium). These numbers are also a ratio, so we also know that this fertilizer has twice as much P as it does N and twice as much P as it does K. We also know this fertilizer has the same amount of potassium (K) relative to nitrogen (N).

Look at the Soil Test Report (STR) – how much of one nutrient compared to the others does it recommend under the Nutrient Requirements/Fertilizer Recommendations portion? Look at the fertilizers available in your store. You might want to make a list or go to www.sosLOWA.org for a listing of local stores and the fertilizers they offer.

For example: Nutrient Requirements/Fertilizer Recommendations on the STR might have N = 2.0, P_2O_5 = 0.5; and K_2O = 0.5. ‘2.0 to 0.5’ is like ‘4 to 1’, so this person would look for a fertilizer with 4 times the N compared to P and K, like a 12-3-3 mix. But what if you can’t find a mix to fit your needs exactly? Sometimes close is the best you can do, so don’t worry if the ratios don’t match exactly. Focus on matching the nutrients you need the most of. For example, a 15-4-4 might be as close as you can get, or a 13-4-3.

What if your soil only needs one of the nutrients? Some soil supplements are rated with simply one of the three. For example, a high yield bone meal mix is rated at 0-12-0 (all P), dried blood meal is 12-0-0 (all N), and greensand is 0-1-7 (mostly potassium (K) (with 30+ trace minerals, as well!)).

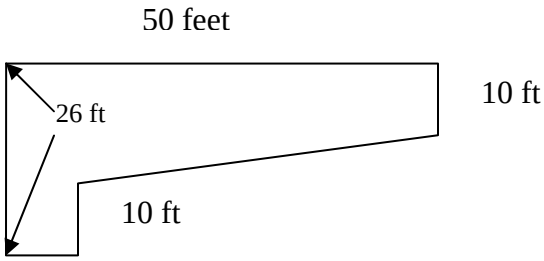
Step 3: Figuring how much fertilizer to apply.

Once you've chosen the fertilizer to use, you first need to determine how much of that fertilizer is needed for a 1000 square foot (sq ft) area. Note: lb = pound.

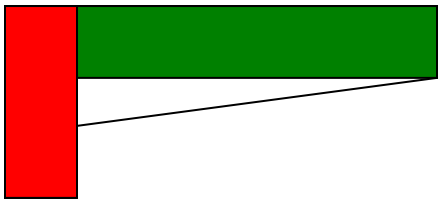
For example: You've chosen 10-20-10 fertilizer to match your Nutrient Requirements/ Fertilizer Recommendations of N = 2.5, P_2O_5 = 5.0; and K_2O = 2.5. We'll calculate using the nutrient with the largest requirement, which in this case is P = 5.0 lbs/1000 sq ft. Divide 5 lb of P by the %P in the fertilizer over 100.

$$\frac{\text{lb nutrient/1000 sq ft}}{\text{\% nutrient in fertilizer/100}} = \text{lb fertilizer/1000 sq ft} \qquad \frac{\text{5 lb/1000 sq ft}}{\text{20/100}} = \textbf{25 lb/1000 sq ft}$$

Second, you need to know how many square feet of lawn or garden area you want to apply the fertilizer to. So, you'll need to sketch out the area and measure its different sides. If you have an oddly shaped area, you might need to break the area up into a bunch of rectangles and triangles and then add them all together.
Here is an example. Suppose your area includes some side yard and back yard, like this:



Break the area up into rectangles and maybe even a couple of triangles, like this:



Remember, the square foot area of a rectangle is length times width to equal number of square feet (sq ft). In this example, we have 2 rectangles. The red one is about 10 ft by 26 ft, so its area is 10 ft times 26 ft = 260 sq ft. The green rectangle is about 40 ft by 10 ft, so its area is 40 ft times 10 ft or 400 sq ft.

The square foot area of a triangle (white in our example above) is ½ times the base of the triangle times the height of the triangle. In our example, the triangle has a base of about 40 ft and a height of about 6 ft. So the area of the triangle is ½ times 40 ft times 6 ft = 120 sq ft.

Adding the two rectangles and the triangle together, we get 260 sq ft plus 400 sq ft plus 120 sq ft = 780 sq ft.

Multiply your square feet by the fertilizer rate calculated above.

'Your area sq ft' times 'lb fertilizer/1000 sq ft' = lb fertilizer needed for your size area

780 sq ft times 25 lb/1000 sq ft = **19.5 lb of fertilizer needed for your size area**
So, almost 20 lbs of that type of fertilizer for that size area are needed.

Step 4: Lime or no lime?

Lime is calcium and is most often applied in the form of crushed limestone (calcium carbonate) or dolomite (dolomite is like limestone but has magnesium with the calcium). Lime is used to adjust the pH of soil (pH is how acidic or basic a soil is, which affects how available nutrients are to the plants; some plants prefer more acidity and some prefer a more basic soil). Most plants do fine in soils with a pH of 6.0-7.2. Lime will raise the pH of a soil. To lower pH, finely ground sulfur is used.

Step 5: What about nitrogen?

There are no reliable soil tests for nitrogen availability to plants, so for the Soil Test Report, nitrogen recommendations are based on the % organic matter (OM) and the CEC (cation exchange capacity, a measure of how readily the soil lets plants take up nutrients). When soil organic matter levels are too low, then fertilizer nitrogen is recommended in amounts based on type of plants being grown and the soil's CEC. Nitrogen recommendations are found in the Nutrient Requirements/Fertilizer Recommendations portion of the STR. For lawns, nitrogen requirements are based on the type of grass, the %OM, and the level of turf management being pursued. Be sure to read product labels and instructions carefully and thoroughly and include the proper timing of applications in your maintenance plan.

Step 6: Calcium

Calcium levels are often linked to adequate soil pH. But, when pH levels are good yet the soil still needs calcium, gypsum may be added without affecting pH very much. When recommended, lbs of the fertilizer to apply may be calculated similarly to nutrients by knowing how many sq ft of area the fertilizer is to be applied on and how many lbs/1000 sq ft are needed.

Step 7: Calibrating your fertilizer spreader

First set up a calibration plot by marking off a measured rectangle in the area to be fertilized. For lawns, a 20 ft by 25 ft rectangle (20ft x 25ft = 500 sq ft) works well. For smaller areas, a smaller sized plot would be better, keeping the square feet something easily divisible by 1000, for example, 10ft x 10ft (=100 sq ft) or 25ft x 10ft (=250 sq ft).

Put a measured amount of fertilizer based on the number of pounds of fertilizer per 1000 sq ft calculated in step 3 and the size of the calibration plot.

For example, if 20 lbs/1000 sq ft was calculated and the calibration plot size is 250 sq ft, since 250 is ¼ of 1000, then ¼ of the 20 lbs/1000 sq ft, or 5 lbs of fertilizer, should be placed in the spreader.

Spread the measured amount of fertilizer over the calibration plot. If there is too much fertilizer left in the spreader, the spreader setting needs to be opened up a bit. If there wasn't enough fertilizer to cover the calibration plot, then too much fertilizer was coming out and the spreader needs to be closed down a bit.

Spreading fertilizer in two directions minimizes streaking, but also means the area will be covered twice by the spreader. In that case, only half the amount of fertilizer should be put in the spreader per direction.

Once the proper calibration setting for the spreader has been determined, write the number down so it can be used again the next time that fertilizer is used.

Please remember, avoid applying fertilizer to impervious surfaces such as sidewalks, driveways, and streets. When finished applying the fertilizer, sweep any fertilizer that has landed on an impervious surface back onto the application surface like the lawn or garden area. And please, keep an eye on the weather. Fertilizer washed off the applied surfaces not only is a waste of money and energy, but those nutrients usually end up in our streams and lakes where they can become excessive and cause problems.

Need more? Need help?

These 7 steps are a start to setting up your own Nutrient Management Plan. Timing of fertilizer applications is important and when during the year to fertilize will vary depending on the plant type. Your own Nutrient Management Plan (NMP) will depend on recommendations from your soil test and on what you want to do with your property. Any of the MU Extension publications referred to in your Soil Test Report or in this guide can be found at http://muextension.missouri.edu. Other references are also listed at the end of this guide.

If you would like to meet with someone from LOWA (Lake of the Ozarks Watershed Alliance) to go over your STR and help you develop your own Nutrient Management Plan and/or discuss ideas and options for your site, please contact LOWA by phone at 573-374-1331 extension 16, or at 573-347-2543; by email at lowasec@soslowa.org ; or online at www.sosLOWA.org to set up a time and place.

Or, if you would like to discuss the LOWA LIL Program and how you can receive discounts on establishing rain gardens, beautiful vegetated buffer strips, and other beautiful landscaping ideas designed to reduce the amount of runoff reaching the Lake or any other nearby body of water, please contact LOWA by phone at 573-374-1331 extension 16, or at 573-347-2543; by email at lowasec@soslowa.org; or online at www.sosLOWA.org .

In developing this *Guide to a Nutrient Management Plan*, the following MU Extension publication was used:
MU Extension publication: MP 733
Revised Jan 2000, Reviewed April 2003.
"Lawn and Garden Soil Test Interpretations and Fertilizer Recommendations Guide" by Stecker, Nathan, Ervin, Jett, and Starbuck.

This and the following University of Missouri Extension (MU Ext) publications can be found at http://muextension.missouri.edu. These and other documents and sources can be used for more information and explanations. A few suggestions are listed below:

MU Extension Publication #	Title
G9112	"Interpreting Missouri Soil Test Reports"
G6705	"Cool-Season Grasses Lawn Maintenance Calendar"
G6749	"Natural Lawn Care"
G6954	"Soil Testing for Lawns"
G6950	"Steps in Fertilizing Garden Soil: Vegetables and Annual Flowers"
G6706	"Establishment and Care of Zoysia grass Lawns"
G6955	"Improving Lawn and Landscape Soils"
G6956	"Making and Using Compost"
G9221	"Nutrients and Water Quality for Lakes and Streams"

Other Publications:

"Cool-Season Grasses Lawn Care and Maintenance Calendar". Show-Me Yards and Neighborhoods in Springfield, MO. This includes information on organic practices also.

Source for alternate fertilizers and organic fertilizers:

Morgan County Seeds. Phone 573-378-2655 (Call for a catalog or directions to their store at 18761 Kelsay Rd. in Barnett, MO 65011-3009)

Other sources for related information:

www.sosLOWA.org
www.grownative.org
http://healthyyards.missouri.edu/
www.springfieldmo.gov/showmeyards
http://www.jamesriverbasin.com/ (Thanks to James River Basin Partnership and their soil testing calibration sheet.)

Lake of the Ozarks Watershed Alliance, Inc.

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Lake of the Ozarks Chapter

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