FRIDAY, 2 MARCH 2018

MLSN MATH Step by Step

I've done a lot of talks recently all over the world about the MLSN guidelines and a common issue I come across is people getting hung up on the math. One of the biggest advantages of MLSN is giving the power to determine how much fertilizer to apply back to the superintendent, but if you can't figure out the math you are no better off than when you started.

If it wasn't already obvious, I love math. I see the world as numbers and use them to help me better understand what I see. This is one of the reasons the MLSN instantly made sense to me back in 2012. The numbers just didn't add up for me with fertilizer recommendations coming from things like BCSR or SLAN. It was almost like these recommendations were being pulled out of thin air.... The fact that the math behind the MLSN is freely available and quite simple to do should say a lot about the benefits of this system.

Before I start I would suggest checking out PACE Turf's Climate Appraisal form and Micah's MLSN Cheat Sheet. These tools can do the work for you and explain how to do this math for yourself. For you stubborn SOB out there I will now go through the math step by step with an example from one of my soil tests.

Now you can do this without testing your soil and simply just apply any fertilizer in the ratio found in the plant. This will ensure that you supply all the nutrients that the plant can use but will invariably lead to some waste because with this method you are ignoring the nutrients in the soil. If we account for the nutrients in the soil we can use them and save from having to apply that nutrient as fertilizer until we use up the soil reserves.

Element	Tissue ppm	Ratio:N
N	40000	1
K	20000	0.5
P	5000	0.13
Ca	4000	0.08
Mg	2500	0.05
S	3000	0.06
Fe	200	0.004
Mn	75	0.0015

Apply fertilizer in this ratio and forget about it

But this isn't why you are here, you want to fine tune your fertilizer applications and have recently tested you soils. You want to use up your soil reserves and save some money!

Element	ppm
K	37
P	21
Ca	331
Mg	47
S	6

MLSN Guidelines

Here's a soil test that I did a few years back.

Area	pH	K	P M3	P Bray 2	P Olsen	Ca	Mg	S	TOT-N	EC
G1	5.9	37	64	81	15	367	59	19	5.5	0.7
G689	5.8	33	60	67	16	360	57	12	4.9	0.6
T15689	5.6	43	49	57	14	380	62	13	8.1	0.6

Let's use the G1 sample for this example.

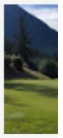
As you can see I have 37ppm of K in my soil and the MLSN guideline is also 37 ppm. Great I have enough, right?

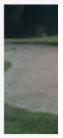
WRONG

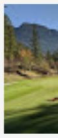
I have enough for today but as the plant grows it will use some of that K and my soil test will dip below the MLSN guidelines. In the short term this is ok because there is a built in safety factor in the guidelines but after a while I will be in trouble.

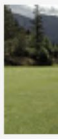
So how much K will I use?

This is super easy to determine because as we know, K use is directly related to N use. It's a ratio. We can expect to use half as much K as N for any given time. How you determine how much N you apply is up to you. I like to use PACE Turf's climate appraisal because it takes my specific climate into account and allows me to fine tune rates over the course of a season.







For this example let's say I use 10g of nitrogen per square meter per year. That means that the plant will use 5g of potassium because half of 10 is 5 as determined by the above ratios.

Easy peasy.

But the MLSN guidelines are in ppm and we have g/m^2. To convert our 5g K/m^2 into ppm we need to multiply it by 6.7 to determine ppm in the top 10cm of soil. This will give us 33.5 ppm. This is the amount of potassium in ppm that we will expect our plant to use over the course of the season or whatever the time frame was that I used to determine my nitrogen rates for.

I'll use Micah's *a*+*b*-*c* formula to determine how much fertilizer is required.

We just determined what *a* is. That is how much K the plant will use and that is 33.5ppm

b is the MLSN guidelines which is 37ppm.

c is our soil test which was 37ppm as well.

So 33.5 + 37 - 37 = 33.5ppm

This makes sense because my soil test was exactly what the MLSN guidelines is so I essentially have to supply all of the K that the plant will use to stay above the MLSN guideline.

Ok so now I have the amount of K to add in ppm but we don't apply fertilizer in ppm. We need to convert back to g/m^2. To do this we divide ppm by 6.7 to get g/m^2 in the top 10cm. For our example this gives us 5 g/m^2. Ok so we just apply that much over the course of the year and we are good.

NO

That is the amount of K to apply but we apply fertilizer K in the form of K2O. To convert from K to K2O multiply it by 1.2. This gives us 6g K/m^2 per year to apply.

For phosphorus this conversion factor is 2.29.

For the other nutrients there is no conversion factor!

So I need to apply 6g K/m^2. Personally I like to use 0-0-50 for my potassium source because it's cheap. Remember, the plant doesn't know the cost. So I divide 6g by 50% (that's what the numbers on the bag signify) and get 12g of 0-0-50/m^2 fertilizer per year. I have 4000m^2 of greens so that will require 48,000g of 0-0-50 fertilizer or 48kg or 2 bags or about $60 worth of fertilizer.

If you are using pre-blended fertilizer you need to multiply the quantity in liters by the density or mass per liter.

The fertilizer costs on my greens is an insignificant part of my budget. We literally spend more on toilet paper.

For phosphorus I can expect to use 1.3g/m^2 per year. Multiply that by 6.7 to get ppm and we get;

8.71ppm used per year for *a*

The MLSN is 21 ppm for *b*

I have 64ppm in my soils for *c*

So we do the math.

8.71 + 21 - 64 = - 34.29

What does a negative number mean?

It means you have more than enough nutrient already contained in your soil for the time frame you used to determine nutrient use compared to nitrogen. In this case it is a year.

I essentially have 34ppm extra in the soil above and beyond what I will likely use. If we divide this excess by the annual use rate of 8.71 we can get the number of years worth of phosphorus we have in the soil. In this example we get 3.93 years worth of P.

On my greens this isn't a huge deal because we don't use much P and the greens are small. If this was K and on my fairways I could expect to find huge savings.

If this number wasn't a negative, I would divide it by 6.7 then multiply it by 2.29 to determine how much P

to apply as fertilizer.

For Calcium

I expect to use 0.08 x 10 = 0.8g Ca

0.8*6.7 = 5.36 ppm Ca for *a*

The MLSN for Ca is 331ppm for *b*

My soil has 367ppm for *c*

So 5.36 + 331 - 367 = -30.64 ppm

Another negative number! 30.67 divided by the annual Ca use rate of 5.36 gives me 5.7 years worth of Ca in my soils. I don't need to apply it as a fertilizer. There is no conversion factor for Ca but don't forget to divide it by 6.7 to get it in g/m^2.

Magnesium!

10 (nitrogen use) x 0.05 (magnesium ratio to nitrogen) = 0.5 grams of magnesium multiplied by 6.7 is 3.35ppm for *a*

The MLSN for Mg is 47 ppm for *b*

And we have 59 ppm in the soil for *c*

The Math;

3.35 + 47 - 59 = -8.65

ANOTHER NEGATIVE! I have more then enough Mg in my soil to sustain by grass for at least 2.6 years (8.65/3.35 = 2.6). There is no conversion factor for Mg but don't forget to divide it by 6.7 to get it in g/m^2.

Sulfur!

10 x 0.06 = 0.6 grams of sulfur x 6.7 = 4.02 ppm of sulfur for *a*

MLSN is 6 ppm for *b*

I have 19ppm in my soil for *c*

4.2 + 6 - 19 = -8.8

There is no conversion factor for S but don't forget to divide it by 6.7 to get it in g/m^2.

It looks like the only things my greens need are nitrogen and potassium. Great!

To make applying the custom amount of potassium determined with the MLSN guidelines I divide the amount needed by the amount of nitrogen I expect to apply for the year.

primo
puttir
puttir
R. ce
robot
rollin
salan
sand
sand
Seed
Shad
silica
silver
Smar
socia
soil n
STIM
Suns
supe
Susta
techr
Turf
UAV
urea
VMC
Wate
weed
wetti
white
winte
wood
yello
FOLL
Ema

6 (amount of K to apply)/10 (amount of N I expect to apply.

This gives me a ratio of 66% potassium to nitrogen. I can use this number when making custom blends of soluble fertilizer to apply in my sprayer for next to no money, or I can use this to select pre-blended fertilizers that I will spend a lot of money on to apply to my greens. Easy.

The soil test used in this example was done in 2015 which was 3 years after I had adopted the MLSN guidelines on my course. Nutrients like K that are used in larger quantities will quickly end up close to the MLSN guidelines using this strategy. If you think about it that's the entire point of calculating fertilizer requirements in this manner. It is to use what the soil can provide and apply what the soil can't provide as fertilizer. After a while, you will end up with soil test figures that are close to the MLSN guidelines. How long it will take to get to this point will be determined by how much your grass grows, if you remove clippings or not, how much you have in your soil, and what ratio that nutrient is used each year.

Potassium went to the MLSN guidelines on my low CEC soils in 1 year. As you can see I still had a few years to go for the other nutrients to get them to the MLSN levels.

From there I can continue to test my soils to ensure that my math is good, make adjustments because this is just math, not reality, and apply all the nutrients as required by the plant use.

So how does this method compare to the one I first described where we apply the nutrients found in the ratios in the plant?

Well with that method I would slightly underapply potassium but the safety factor in the MLSN would keep me safe. Eventually I would need to supplement the K in my soil.

I would also over-apply all the other nutrients but even then, they are so cheap this would only cost me maybe $20 per year over what I currently do on my greens ($130 annual fertilizer cost for 0.4ha in 2017).

If you are struggling through the math I hope this helps you figure it out. Once you figure this out, you will see that the MLSN, and fertilizing grass is actually quite boring. But this will help you focus your efforts to make meaningful improvements elsewhere.

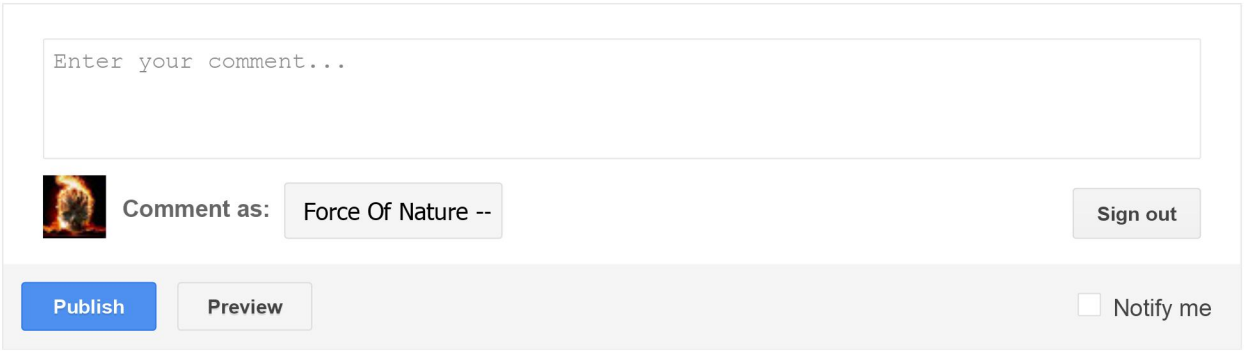
If you like my blog and want to support what I do you can support me on Patreon or paypal. Thanks!

Posted by Jason Haines

Labels: fertilizer, MLSN

No comments:

Post a Comment



Newer Post Home Older Post

Subscribe to: Post Comments (Atom)

Google Sheets

Sorry, unable to open the file at this time.

Please check the address and try again.

Get stuff done with Google Drive

Apps in Google Drive make it easy to create, store and share online documents, spreadsheets, presentations and more.

Learn more at drive.google.com/start/apps.