Jerry Faulring

Perfecting Landscape Soils

My last article described how landscape soils can be improved through the addition of compost as a top dressing agent of change over a long time frame. The article generated inquires related to how to build landscape soils before planting. Further, when landscape contractors visit us to select plant material, the conversation almost always goes to our growing system when they see the compost production area. This leads to conversation related to how they can achieve the benefits. It is not altogether a simple, one size fits all answer. The information can be acquired through soil testing, compost testing and an assessment of the site related to soil type and drainage. Three important factors need to be recognized;

1. What is the analysis of the proposed organic matter to be incorporated?
2. What is the general soil type and is it well drained?
3. How will the compost be incorporated?

I find that many contractors are using organic soil amendments as part of a planting program but do not necessarily understand why from a technical perspective and how they can make the program better with minor changes in practice.

The production of high quality compost is not routinely practiced in this country as compared to Europe where it has long been a major source of agricultural crop nutrient supply and soil improvement. Having said that, one should not be afraid to engage compost utilization out of fear of compost quality issues. The goal is to be an informed buyer, use organics with an eye toward gaining insight into the benefits, and developing practical/salable growing systems in the landscape. Landscape contractors are growers just like nursery operators but move the growing operation into someone's yard.

Quick review from previous articles – Benefits of Compost

1. Increase soil water holding capacity.
2. Decrease bulk density – simply stated bulk density measures compaction.
3. Increase Cation Exchange Capacity (CEC) – soils ability to hold and release nutrients.
4. Makes trace elements available over a wider pH range.
5. Increase drainage.
6. Decrease potential for erosion.
7. Provides nutrition over long periods of time.
8. Increase humic and fulvic acid – the catalyst for top-

soil production and movement of nutrients to the root zone plus increased root branching.
9. Introduces beneficial fungi including mycorrhizae to the soil system.

Composts vary widely in many ways.

Composts vary depending on the feedstocks that are used. In recent years some have promoted the notion that composts can be either fungal or bacterial dominated as a function of feedstock sources and that different plant types have a preference for one over the other. While this may have merit, I will discuss compost generically with the understanding that plants are very resourceful in their ability find and utilize nutrients.

If you choose to research and experiment with the above concept, it is believed that fungal dominated soils favor the growth of woody plants and perennials while bacterial dominated soils favor the growth of food bearing plants, annuals and grasses.

An example of how decaying organic matter produces nutrients is seen in lawns as a 'fairy ring' (shown below). Deep shades of green and sometimes fugal bodies in the form of 'mushrooms' are seen in a circle. This is the result of decaying wood under the surface, often decaying tree stumps or construction debris releasing nitrogen.

Typical 'Fairy Rings' found in turfgrass.

The critical variation in compost you need to be aware of is its maturity or stability. The compost vendor should have lab tests available for buyers and the tests should be current within a couple weeks of the sale – but this is not common practice. I use A&L Labs in Richmond, Virginia who provides a very quick turnaround, usually just 3 days. It is smart to have a full test but the determining factor as to compost readiness is the carbon to nitrogen ratio (C/N ratio). The C/N ratio should 20:1 or less and the pile temperature should be in the range of ambient air temperature. When mature compost is disturbed, there should be little water vapor seen.

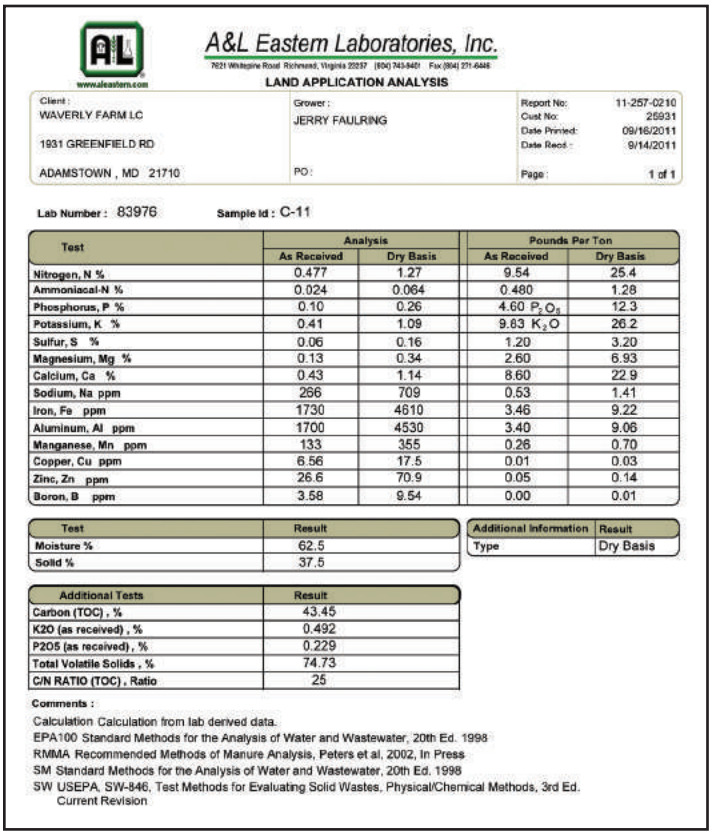
Compost produced from garbage dominated feedstocks will be low in nutrient value and one would either not choose such a material or be prepared to blend it with higher nutrient value compost.

The test results seen below are an actual test of compost produced here at the farm. I focus on the nutrient values and the C/N ratio which in the sample is 25:1.

This test shows the compost has 25.4 pounds of nitrogen, 12.3 pounds of phosphorus, and 26.2 pounds of potassium as well as many micronutrients (pounds per ton, dry basis) and 1.3 pounds of ammoniacal N. Thinking about the nutrient quantities as a typical synthetic fertilizer these numbers may seem high. However, the nutrients are organically bound and will release at the rate of 8-10% per year and constantly feed plants for 10 to 12 years.

From the test results shown on page 34, the C/N ratio being 25:1, the compost is not fully stabilized which I can confirm because when the sample was taken the pile temperature was 135 degrees F.

One should also look at the compost lab test to see the moisture content and calculate tons per cubic yard although I think one's focus should be on yardage. 50% moisture content generally converts to 2 cubic yards per ton. In the test shown above, the moisture content was 64% which means that one ton equaled about 1.4 cubic yards. Moisture content will vary by location in the compost pile. The surface will be drier and the interior will be wetter. From the start of my work with compost I have been confused over recommendations that relate only to tonnage. Immediately recognizing the moisture content variability I have, for the most part, used the cubic yardage measurement when calculating application rates knowing that wetter material will have the impact of increasing yardage a bit over drier, fluffier material.



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LAND APPLICATION ANALYSIS

Client : WAVERLY FARM LC 1931 GREENFIELD RD ADAMSTOWN , MD 21710	Grower : JERRY FAULRING PO :	Report No: 11-257-0210 Cust No: 25931 Date Printed: 09/16/2011 Date Recd : 9/14/2011 Page : 1 of 1	

Lab Number : 83976 Sample Id : C-11

Test	Analysis		Pounds Per Ton	
	As Received	Dry Basis	As Received	Dry Basis
Nitrogen, N %	0.477	1.27	9.54	25.4
Ammoniacal-N %	0.024	0.064	0.480	1.28
Phosphorus, P %	0.10	0.26	4.60 P_2O_5	12.3
Potassium, K %	0.41	1.09	9.83 K_2O	26.2
Sulfur, S %	0.06	0.16	1.20	3.20
Magnesium, Mg %	0.13	0.34	2.60	6.93
Calcium, Ca %	0.43	1.14	8.60	22.9
Sodium, Na ppm	266	709	0.53	1.41
Iron, Fe ppm	1730	4610	3.46	9.22
Aluminum, Al ppm	1700	4530	3.40	9.06
Manganese, Mn ppm	133	355	0.26	0.70
Copper, Cu ppm	6.56	17.5	0.01	0.03
Zinc, Zn ppm	26.6	70.9	0.05	0.14
Boron, B ppm	3.58	9.54	0.00	0.01

Test	Result
Moisture %	62.5
Solid %	37.5

Additional Information	Result
Type	Dry Basis

Additional Tests	Result
Carbon (TOC) , %	43.45
K2O (as received) , %	0.492
P2O5 (as received) , %	0.229
Total Volatile Solids , %	74.73
C/N RATIO (TOC) , Ratio	25

Comments :

Calculation Calculation from lab derived data.

EPA100 Standard Methods for the Analysis of Water and Wastewater, 20th Ed. 1998

RMMA Recommended Methods of Manure Analysis, Peters et al, 2002, In Press

SM Standard Methods for the Analysis of Water and Wastewater, 20th Ed. 1998

SW USEPA, SW-846, Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, 3rd Ed. Current Revision

Know the soil type and drainage issues in advance.

Soil type and drainage does matter. If the soil is generally well drained and of silt loam composition, it is perfect for compost amendment in quantities up to 4 cubic yards per 1000 sq. ft.

You are thinking, that's a lot of compost and on the order of $120-$150 per 1000 sq. ft. What is the value of plant material in 1000 sq. ft.? The cost of compost is not a huge per cent of the project.

How much is too much compost for deep amendment? In 2006 I purchased a new home devoid of a landscape. The first project was to build a berm 8 foot high by 40 feet wide at the base. Foolishly I agreed to buy 'topsoil' from a reliable source without inspecting the material. It turned out to be mostly red clay that could become shale in a million years when under high pressure although a soil test showed it was not as bad as it looked. The area to be initially planted was about 15,000 square feet. In total ignorance, I secured about 400 cubic yards of compost thinking, what the heck, the more the better! The compost was spread to a depth of 8 inches and aggressively spade plowed in to a depth of 20 inches. With hindsight, it was a ridiculous amount of compost and I should be wondering about the all the bad things that could have happened. The plants absolutely flourished with minimal drip irrigation in the first year only. Subsequently, I have made additional plantings and as an experiment, did not irrigate – ever. No dead plants! It's unlikely anyone could win a bid proposing that much compost but it does sort of answer the lead question to this paragraph – the real answer is I don't know and it likely depends on the soil and drainage.

If the site is dominated by clay loam or heavy clay soils and does not drain well the amount of compost should be reduced to 2 cubic yards per 1000 sq. ft. This sounds counter intuitive because this soil would seem to need more improvement with organic matter. Such is true but too much compost in a wet environment could cause anaerobic conditions which may cause toxic compounds to be produced. In this situation, the soil should be amended with both good soil and compost to achieve a desirable long term result.

If the soil type is dominated by sand, the higher rate of compost cited above should be used. However, even sandy soils can be poorly drained due to a compacted layer below the surface. This can be remedied with deep tillage.

Incorporation of compost should not be looked at casually.

I have seen small amounts of compost literally sprinkled on a planting area – with great expectation. A little is better than none but the real benefits come from getting the volume right. The key is to incorporate the material uniformly and to a depth that matches up with where the majority of the roots will flourish. This is usually within the upper twelve inches or less. Tools for uniform incorporation are limited. Although the roto tiller is the most soil punishing device ever invented, it is the easiest method. The downside of roto tillers is they tend to grind the soil too finely, sometimes to a powder, which destroys any existing desirable soil granulation. However, the end result of amending what is likely a less than perfect soil with a one-time beating is better than not amending it at all.

Here at the farm we incorporate compost with a rotary spading machine that reaches down into the profile about 20 inches. This is a large device operated with a 65hp tractor. If the landscape site to be amended is large enough to accommodate larger machines, this is the perfect method. The company that manufactures the machine we use also produces a walk-behind machine and small tractor units. I am told the walk-behind machine requires rock free soil as hitting one will do a lot of potential damage to the operator. A smaller tractor model is seen below and works to a depth of 14 inches.

Sell a growing system to your customers – not just plants.

Amending soils in the landscape will add cost to the project. Set yourself apart from the competition by selling the need for soil amendment (if needed). It's all about the 'green' movement. Residential property owners in our region almost always complain about their soil even if they have no clue about soil science. Use this to your advantage by communicating a fix. The benefits of amending soils could include the following:

1. Every 1% of organic matter in the soil retains almost 7 inches of rainfall to be released for the plants use when needed – reduced water use and related expense. 200 cubic yards per acre equals 1%. Soil water holding capacity is increased while drainage is improved at the same time.
2. Reduced disease incidence of susceptible plants is a known.
3. Plant nutrition can be 100% sourced from organic matter released precisely when the plant needs it; not in excess soluble forms.
4. Plants will require less pruning because they grow more naturally.
5. Compost amendment sequesters carbon!
6. Protect the Chesapeake Bay by preventing degraded water runoff quality containing soluble nutrients.
7. The new landscape will stand out from the neighbors for decades as the benefits can be very long term.

I am greatly indebted to Dr. Frank Gouin for reviewing this article, supporting me in my quest to improve our growing system here at Waverly Farm and helping me to share what we have learned with others.

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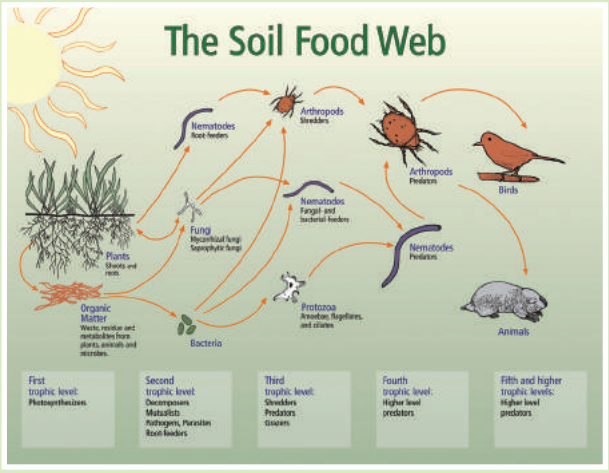
Upcoming Topics

My next few articles will focus on the science of great soils. It will include in-depth discussions of how microbes make what has become known as the 'soil food web' and the long term benefits of focusing on the build up of humic acid. You may be amazed to find that good soil is a happy living organism.



We'll also visit some local landscape contractors who produce and use their own compost in landscape installations.

Finally, we'll delve into the magical, mystical and often misunderstood world of mycorrhizae.