## TOTAL SYSTEM RESEARCH

■ John Edmonds' "Total System Organic Management" focuses on turf care in the urban/suburban environment by using "specific management strategies and products to create ecologically healthy environments at relatively low costs."

One part of the company's research is taking place on turf plots established on the grounds of "The Oaks" at St. Mary's University in May of 1992. Laboratory, greenhouse, growth chamber and outdoor lysimeter experiments are also being conducted at Dalhousie University. The Oaks plots were established on two soil types, one a newly-imported topsoil and others on severely degraded soil.

Locally available waste products are being compared with synthetic NPK fertilizer treatments and control plots using no soil amendments. The waste products tested include:

- an agricultural compost;
- unprocessed brewery waste;
- SeaGreen fish byproducts;
- three grass mixes, including a custom "Ecomix"; an off-the-shelf mix; and a mix of two tall fescues, one with clover, and one without clover;
- rock-phosphate in the "no-clover" mixes.

Greenness was assessed visually, and by chlorophyll measurements using a Minolta chlorophyll meter.

Greenness was found to be roughly proportional to the total nutrient applications. In July and August, the control plots were darkest green on the better field, and the brewery waste and Seagreen plots were darkest on the field of degraded soil.

According to the Edmonds report, results showed that it is possible to achieve sustained high quality of turfs with organic management, and that it is important not to over- or under-fertilize, and to select mixes for organic use.

*Similar intensive tests have been conducted for chinch bug control and weed control. To obtain a copy of the company's Greenfacts Special Research Edition, contact Edmonds Landscape and Construction Services, 2675 Clifton St., Halifax, N.S. B3K 4V4; or fax your request to (902) 455-9956.*

"Some of our high-profile properties haven't had any chemicals applied on them for two years," says Edmonds, "and chinch bugs are not a problem. That's not the case for chemically-treated lawns." A $5 million company, Edmonds Landscape and Construction Services was awarded the Canada Award for Business Excellence in 1991 for what was viewed as a valuable, death-defying—and apparently successful—business feat.

A composting program began last year. Backyard composters are given free to regular landscape maintenance clients.

*—Terry McIver*

# Healthy soil the key to turf care science

**Biological soil management may be the 'missing link' in making IPM programs work.**

by Joel Simmons, EarthWorks, Inc.

■ Man's survival has always depended on his ability to work the land.

As man became more civilized, so did his skills at agriculture and horticulture and his understanding of the importance of proper soil management. Today, many farmers, fruit growers and turf managers are re-evaluating the importance of the soil and gaining an understanding for the concepts of biological soil management.

**Rediscover the basics**—Biological soil management is based on solid agronomic principles that date back decades, if not centuries. Dr. William Albrecht, the former head of agronomy at the University of Missouri, wrote in the late 50s and early 60s of the importance of maintaining a healthy soil. Today, the agriculture industry is making major changes in its outlook toward the importance of soils, as farmers continue to lose topsoil at alarming rates.

The practice of eco-agriculture is being led by government and universities in the U.S. and the world over.

Many in the turf industry are starting to realize the advantages of natural programming. An effective program depends on an understanding of the agronomic principles behind biological soil management.

For years now, we have been focusing on plant growth, and have ignored the soil. We must build a healthy soil first, which allows for ample nutrition, and a healthier plant.

**The principles**—There are four basic agronomic principles that have to be considered to build a healthy soil. Those are, in descending order of importance:

- air management;
- water management;
- decay management; and
- nutrient management.

**Simmons: use synthetics after soil biology problems are solved.**

The relationship between these four principles is significant. Without good air management, the other three cannot produce healthy soil. If water management is not up to par, proper air, decay and nutrient management is difficult. Most of us in the business of growing plants have overemphasized the focus of nutrient management (i.e. fertilization) without considering the interdependence that exists among air, moisture, decay and fertility.

A program that keeps all four of these principles in mind assures you of good results; lessens plant stress; and reduces the need for pesticides. This may sound simplistic, but it works.

Unfortunately, our industry is focused on products that are designed to manage nutrients, often at the expense of air, water and decay management.

**The breathing soil**—Air management insures that there is ample oxygen in the soil. Soil compaction strangles air movement and depletes oxygen availability. A well-balanced turf program must first address compaction. Too often, this is done by aeration or top-dressing, short term treatments which ignore the fundamental causes of the problem.

Usually, the soil needs to be physically changed by adding composts, natural /organic fertilizers or other organic materials.

These can be worked in over time, or in combination with aeration. Managing oxygen in the soil also requires the proper ratios of cations (positively-charged nutrients) and anions (negatively-charged nutrients).

Measurable imbalances, due to either excesses or deficits of particular plant foods, will cause the soil to take on adhesive characteristics.

**Water: easy to waste**—Water management addresses the problems of too much or too little water availability. Too much water creates an anaerobic environment, which depletes oxygen from the soil, and affects microbial activity and nutrient release. Too little water can produce the same results: poor microbial viability and limited nutrient uptake. Again, soil structure will have a significant effect on water mobility. A richly organic soil will provide both the pore space to allow water to drain through, and the sponging properties that will hold water.

**From decay comes life**—Decay management is a concept that few of us understand, but it is here that more of our focus should be placed, because it is here that biological soil management has its greatest impact.

The soil's micro-organisms decompose the organic compounds which release plant available nutrients. Humus is the final phase of decomposition that includes the use of organic matter, synthetic and natural plant foods and the remains of soil organisms themselves. It provides a significant buffering effect for excess moisture, temperature, acidity, alkalinity and salts. This reduces plant stress and increases insect, disease and weed tolerance.

Air and water mobility must be available for sustainable microbial activity. Soil micro-organisms need very much the same kind of environment that we need: air, water and nourishment. Nourishment for soil microbes is supplied by organic matter: carbohydrates, sugars, proteins, vitamins and minerals, just to name a few.

**Build up a healthy soil to allow for ample nutrition and a healthier plant.**

**Plant foods vary**—Without proper microbial activity, synthetic nutrients are not mobilized and assimilated to plants. As one example of microbial involvement in plant food availability, the urea molecule is transformed to nitrate, one of the forms that plants can utilize, due to the urease enzymes that are produced by these organisms. To generate these enzymes, energy from soil-available carbohydrates is necessary (humus).

Lime—which is simply calcium and/or magnesium carbonates—is often ignored as an important element.

Adjusting pH is critical because most soil organisms thrive in a limited range of acidity or alkalinity. Perhaps even more important is the need to provide calcium—and a smaller percentage of magnesium—as primary plant foods for soil microbes and landscape material. Calcium/magnesium content and ratios in the soil are also essential for building soil structure because of the valence or electrical attraction that exists between soil colloids and these two nutrients.

The over-use of synthetic fertilizers eventually destroys soil aggregates due to excessive salt accumulation. Simple and complex carbohydrates found in humus are oxidized or broken down, and used as an energy source in order to accommodate overloads of non-protein nitrogen. As the soils die, air space or granulation is reduced, creating compaction.

Compacted, low oxygen soil no longer retain moisture or support adequate life forms to stimulate digestion. The interdependent cycle has been ruptured, plant stress leading to insect and disease pressure has begun and subsequent "rescue chemistry," in the form of pesticides, is needed. The soil and the plants become dependent on chemicals, like plant in a hydroponic medium.

**Formula for success—**"Biologically friendly," turf care programs improve the soil structure with organic matter: compost, natural organic fertilizers or even grass clippings.

When synthetic products are used, proper IPM practices should be followed. Biological soil management will greatly enhance IPM and may be the "missing link" in truly making IPM work. Use those synthetic fertilizers that have the least harmful effect on the soil.

For example,

- use fertilizers with lower salt indexes. Chlorine, found in some plant foods, is very detrimental to microbial life;
- increase the amount of organic matter allows for a reduction in total nitrogen for the year;
- consider natural organic-based bridge products;
- use less reactive sources of phosphorus such as colloidal/rock phosphates.

With these four agronomic principles in mind, you'll get the most out of the soil. There will be more available nutrients, less plant stress and less dependence on pesticides.

*—Joel Simmons is president of Earth Works Natural Lawn & Garden Care, Inc., Martins Creek, Pa.*