MGG Lawn & Land Forum Webinar - May 3rd, 2019

Benefits of Natural Lawn Care

Executive Summary

Mission of Forum: To document, summarize, and improve the state of Integrated Pest Management (IPM) and Natural Lawn Care (NLC) policies and practices locally, regionally, and nationally.

Working definition of IPM used by forum: An environmentally sensitive and cost-effective approach to pest and weed management that consolidates all available necessary techniques into a sequential program to keep pest populations at acceptable levels and to avoid adverse effects. An IPM program will utilize physical, cultural, mechanical, structural, and biological controls before resorting to chemical controls.

Session topic: This session covered some of the benefits of natural lawn care, such as reducing exposure to toxic chemicals, controlling plant pathogens, and cycling nutrients.

Panelists:

1. *Vytas Pabedinskas* – Pabedinskas received his Masters degree in soil science from the University of Arizona. His research looked at the effects of compost and compost tea application on turf. His past work includes being a consultant for soil health related issues to farmers, turf managers, and organics recyclers. Currently he is working with a number of school districts that want to institute composting/waste diversion programs, as well as giving presentations on the latest science surrounding composting and compost use. He is a member of the Soil Science Society of America and participates on the Education committee. He is also a member of the Illinois Food Scrap Coalition promoting composting and compost use in Illinois.

2. *Jack Higgins* – Higgins has a passion for green keeping and that drew him to get his BS in Turfgrass Sciences from Penn State, graduating in 2007. His green keeping experience in sports fields started while working summers in baseball and school years on the Penn State Athletic Field Grounds Crew. He also has years of experience green keeping on golf courses in New Jersey, Pennsylvania and 6 months at St. Andrews in Scotland. For 10 years he has been an Agronomist with EarthWorks working with turf managers and growers on agronomic programs, soil tests, and site evaluations. Higgins live in NJ with his generous wife and 3 wonderful young kids.

3. *Kevin Mercer* – Mercer graduated from the University of Georgia in turfgrass and sports turf management. He has over twenty years of experience working in golf course and ground management operations. Mercer has given lectures for grounds and sports fields maintenance programs nationally. He also volunteers as a Board member for the local Sports Turf Managers Association chapters, Mid-Atlantic, New Jersey SFMA and currently the Ohio chapter OSTMA and Cincinnati PGMS branch.

Summary of panelist presentations and discussions:

Healthy soil drives productive agriculture, clean air and water and the microorganisms that support all ecosystems.

All three of the panelists for this forum recognize the importance of healthy soil and shared how natural lawn care practices, tools and products can achieve favorable soil quality. Vytas Pabedinskas began the session by covering the evolution of scientific understanding of soil health and its importance to agriculture and landscapes. After Pabedinskas briefly covered the characteristics of healthy soil, Jack Higgins elaborated on the three most important soil characteristics to monitor and address in soil of pore space, soil microbiology and soil nutrients. Finally, Kevin Mercer compared the advantages and disadvantages of synthetic turf versus natural grass and how Denison University manages their grounds to achieve the maximum benefit for the campus socially, economically and environmentally.

The question and answer session primarily looked at strategies to mitigate the higher upfront costs of natural lawn care programs. Market costs for organic fertilizers and compost continue to decrease. Mercer has capitalized on the cost-effectiveness of these organic products by making a small investment in the infrastructure to make and apply these products on his grounds. For example, Mercer invested in infrastructure to allow for inexpensive conversion of food waste into compost. In addition to infrastructure, Higgins recommended soil tests to evaluate nutrient levels and guarantee the best allocation of resources towards lawn care. Overall, all panelists stressed that the holistic nature and systemic benefits achieved by organic products of improved water retention, biologically diverse soil ecosystems and spongy, uncompacted soils offset the low initial costs of synthetic products.

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Topics of Discussion by Panelists

Overview of the Importance of Soil Health:

Pabedinskas:

- Achieving healthy soil requires a broad, systemic focus as opposed to a narrowed scope for optimizing a single aspect of soil-
    - A farmer's narrow focus led to a chemical/fertilizer spill in Beach Park IL that resulted in severe consequences (roads closed, schools closed, 37 people hospitalized)
- Soil health has been an issue for humans since the dawn of agriculture
    - Early on, people added Biochar to soils in the Amazon by "accident"
        - Dark, rich, organic matter-laden soils = healthy plants

- John Morley started to explain the science behind the success of biochar, compost and organic matter.
    - Without soil bacteria, there is no decay, and without decay, there is no life.
    - Morley started the National Superintendents Organization, which encouraged professionals in the field to work collectively. This organization is now the Golf Course Superintendents Association of America (GCSAA).
- In the 1930's, managers discovered that the rules for soil health changed at a regional scale during migration to the plains.
    - East Coast practices like tilling exposed organic matter in the semi-arid plains resulting in the Dust Bowl
    - Government passed the Soil Conservation Act, April 27, 1935 and started the National Resource Conservation Services

- After the Dust Bowl, the federal government & NRCS understood the importance of soil health and established a formal definition for the concept as "continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans"
    - This definition has a limited scope, because it mainly focused on agricultural soils and only messaged to a select amount of people in the country.
- To increase the scope, scientists developed the concept of Soil Ecosystem Services that monetarily quantifies everything that soil provides:
    - Products = antibiotics, building materials, food
    - Resources = carbon sequestration, water storage
    - Culture = gardens, recreation
    - Environment = water quality, erosion protection, flood protection
        - The overall estimate for these benefits exceed 1.5 quadrillion USD
- Soil Renaissance – Soil health experts from industry, academia, government agencies, agriculture and research gathered to develop a mission statement that "reawakens public to soil health to enhance healthy, profitable, sustainable and natural systems.
    - If conducting a project on land, the project manager should first consider how the action will affect soil health.
    - The initiative developed a Strategic Plan that identifies four target areas of soil health:
        - Measurement: Getting data to understand what's going on
        - Economics: To measure the impacts of decisions
        - Education: Ensuring all stakeholders receive proper information to make decisions
        - Research: Keeping information up-to-date and accurate.

Higgins

- Healthy soil can sequester carbon by providing a suitable environment for mycorrhizal fungi in plant roots. Mycorrhizae produce glomalin proteins that have carbon capturing qualities.

Mercer:

- Mercer covered the pros and cons of natural grass fields to synthetic fields socially, economically and environmentally.
    - Socially, the public views both natural grass fields and synthetic fields negatively due mainly to the chemicals applied on both (natural- pesticides, synthetic- toxic chemicals of arsenic, cadmium and chromium.

- Natural grass managed well with IPM or NLC can limit exposure to toxic inputs and add to biodiversity.
- Managers will help themselves by monitoring social media and community issues to craft messages that educate individuals about the benefits of natural grass fields.

- Economically, synthetic turf requires significantly more costs than natural grass fields.
  - Ten-year synthetic turf lifecycle cost per year: $700,000-$1.5 million
    - Yearly maintenance = $7,000 - $25,000
  - Ten-year natural grass lifecycle cost: $55,000-$250,000
    - Yearly maintenance = $12,000
- Environmentally, synthetic fields produce greenhouse gases and stormwater pollutants, while not adding to carbon sequestration or reducing the heat island effect.
  - Natural grass meanwhile promotes wellness, stress reduction, better air quality, and stormwater quality.

Characteristics of Healthy Soil:

Pabedinskas

- The main take-away from Pabedinskas thesis was that Organic matter seems to be the driving factor for healthy soil
  - One gram of soil has one billion bacteria cells
  - Diverse organic matter contributes to good texture, good aeration, good moisture, good cycling of nutrients

Higgins:

- Biological soil management basics represented by two main concepts: GO food (carbon) and GROW food (nitrogen)
  - Maintaining good C to N ratio in soil = biological soil management
- Healthy soil provides three benefits: Pore space, biology, soil nutrients.
  - Pore space - Physical space for water to move and gases to be exchanged, e.g., carbon dioxide
  - Biology – Monitoring the C to N ratio that provides a good environment and feeds the microbiology
    - The optimal C:N ratio varies depending on the purpose of the soil. For example, the ideal C:N ratio for compost is 30:1 whereas the ideal ratio for crop soil is 24:1. The best results are achieved by staying close to the proper ratio.
  - Soil Nutrients- Either providing nutrients directly to the plant or indirectly through the soil.

Tools/Assessments Available to Improve Soil Quality:

Pabedinskas:

- Pabedinskas appreciates Soil Renaissance because they simplify soil health into data that practitioners outside of soil scientists or agronomists can use. The Cornell comprehensive assessment tool, also, does a great job a facilitating systemic soil qualitative assessments for nonscientists.
  - The assessment tool enables practitioners to determine soil health through tangible, apparent soil characteristics such as density of earthworms or soil color.
    - Also, instructs on best times to take soil samples/surveys

Higgins:

- EarthWorks stresses soil testing to measure the soil chemistry that can alter the soil physics/porosity.
    - The largest limiting factor for soil porosity is the Ca : MG ratio (specifically soils with high clay content). Ideal range is 68% : 12%, 7 : 1
        - High Mg concentrations reduce the porosity of soil. Results in clay soils having a "sticky" texture.
        - Increasing Ca, by lime, creates space between clay colloids/particles. This enables the soil to "crumble" and makes it softer/easier for aeration.
- EarthWorks recommends a minimum of one sample per year of data
    - Each sampling period takes about six to eight cores and then mails the cores to Logan Labs for data processing.
    - EarthWorks then holds a conversation with the customer to develop a fertilization program that highlights priorities or at lease addresses the limiting factors.
    - A soil test costs about $25.

Mercer

- Mercer receives both a mechanics test and nutrients test from Logan Labs for testing
    - Mercer values the mechanics test, because he manages 50-60% silt soils
    - The tests may call for a lot of compost initially, but Mercer can reduce the amount applied after a while when he gets the soil to an ideal condition.

Products Available to Improve Soil Quality:

Higgins:

- EarthWorks fertilizer products have two primary components of carbon and diversity. These two characteristics of the products works in line with the soil superorganism.
    - EarthWorks prefers to bring many different constituents into one product, as opposed to a single linear source.
        - I.e. Their BioVantage Rhizobacteria product contains eight different strains of rhizobacteria and the foundation uses many different sources of fish, worm tea, kelp etc.
        - The company offers a completely organic product (3-4-3), but, also, mixes organic with synthetic bases for some products.
- EarthWorks composts chicken manure for most of their products, since it tends to work best for turfgrass.
    - The chickens receive a lot of minerals to increase the calcium in the manure. End result is a 1:1 nitrogen to calcium ratio.
        - Plants demand calcium primarily for rooting.
    - EarthWorks avoids sludge and meals. Sludge provides limited benefits to the microbiology. Meanwhile, meals avoid the added microbiology that results from the digestion of the bird.

Improving Soil Quality in Practice:

Mercer:

- When Mercer worked for St. Mary's College of Maryland, they set an initial, primary goal to protect the watersheds. This required actions outside of reducing pesticides for their golf course and other green space. These actions included:

  - Reducing herbicide applications to once per year (product was Revolver)
  - Planting native plants and trees for shading and to benefit the natural ecosystem.
  - Buffering watersheds with wildflowers to slow runoff.
  - Collecting stormwater runoff with a retention pond and used that water for irrigation.
  - Selecting a high quality turfgrass cultivar for the course to reduce inputs needed.
- Mercer works with the campus marketing department to showcase each sustainable action to the community through signage, demonstrations and more.
- For a period of time, Mercer's team tested the water near the sports fields after every application to see if his actions had a positive effect.
  - Phosphorus levels did increase during the testing, Mercer attributes this increase to soil erosion as opposed to the fertilization, since the fertilizers they used did not contain much phosphorus.
  - These P levels did decrease, however, after using the retention ponds for irrigation of fields.
- Mercer uses a number of organic fertilizers and amendments for his fields and advertises those inputs
  - Mercer puts down 1-2 lbs of granular compost per 1000 sq ft. at least once a month.
  - Mercer's team experiments with different composts and compost tea formulas to help the grass
    - I.e. One study found that cucumbers in compost helped keep down powdery mildew.
    - Environmental

Question and Answer Session

What are the greatest threats and opportunities to soil microbiology? How do pesticides affect soil microbiology?

Pabedinskas:

- From an agricultural standpoint, the roots of plants release exudates that feed microbes in the soil. Thus, bare and fallow fields threaten microbiology by taking away habitat.
- From a turf standpoint overuse, compaction and loss of porosity starve the soil, plants and microbes of oxygen.
- Greatest opportunity = modern research has uncovered new microbes and unique functions of those microbes.
  - As Jack Higgins covered, soils are not homogenous and can serve many functions if healthy.
  - Mercer exemplified these different functions by planting different ecosystems on his properties (bioswales, native plants, impervious services, etc.). In a way, all these ecosystems harness microbiology to improve the environment.
- Though research does not find specific correlations that show a specific pesticide will decimate a specific microbe, the science has generally acknowledged that pesticides mess with the overall community.
  - I.e Using an herbicide to kill a plant eliminates something that fed or helped microbes.
  - In the short-term, this might not evidently impact the soil ecosystem. However, these impacts on the overall community can interrupt the equilibrium and create a feedback loop of negative impacts.

How do you justify the needs for quality organic products for districts that may not have the available funds?

Mercer:

- Denison University can turn large quantities of food waste into landscape compost at relatively minimal costs.

- Around a $2,000 to $5,000 investment for the composting infrastructure of a 800 gallon vermicompost bin and an air pump for compost tea.

Is there a "market" or source for organic topsoil or a way to make sure soils brought in are suitably organic?

Higgins:

- Soil tests are key to determine proper nutrient levels and organic matter content for the top soil that you hope to source from.

Mercer:

- Coco blocks and matting is a good retention product

Can you provide examples of districts that have increased their return on investment by using natural, organic products as opposed to synthetic products?

Higgins:

- Organic fertilizer products often use less nitrogen and application rates are generally half that of synthetic products.
  - Seasonally the need for applications become less and less.
- Need for water reduces immediately with organic fertilizer applications.

Pabedinskas:

- Pound for pound synthetic product may be cheaper, but these products often specialize in focus (i.e. more N to the system). This specialization can accumulate costs by requiring a special tank, operator, etc.
- Meanwhile, organic products and NLC takes a systems approach that achieves multiple benefits (increased nutrients, reduced soil compaction, etc.)

How can the public engage in natural lawn care and soil health advocacy?

Pabedinskas:

- Don't necessarily rely on experts. When talking with these experts, have a lot of questions about whether or not they follow natural lawn care and soil health practices.
  - Pabedinskas' research resulted from managers finding success with natural lawn care and then asking the researchers to determine why these programs were successful.
  - It is important for managers to be vocal when they have success with these practices.

Mercer:

- Showcase how everything on your landscapes are sustainable, not just the lawns.