The Impact of Golf Courses on Soil Quality

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Objectives:

1. Develop a method for evaluating soil quality on golf course landscapes that utilizes science-based inputs and superintendent-useable outputs.
2. Select and quantify indicators of soil quality and follow their change during construction, grow-in, and operation stages of a golf course.
3. Evaluate soil quality indicators and integrate with other observations to gauge ecosystem quality on a golf course.
4. Link soil quality indicators to soil management options.

Start Date: 1998
Project Duration: 5 years
Total Funding: $50,000

Environmental quality is a composite evaluation of the many subsystems comprising the entire ecosystem. Soil, water, flora, and fauna represent but a few of these subsystems. This study focused on soil quality in recognition of its essential role in turf and water relations and, ultimately, the success of golf course operations.

The study site is a grassland ecosystem on which Colbert Hills Golf Course was built in Manhattan, Kansas. A multi-disciplinary research team studied the site before construction began and continued their study during course construction and operation.

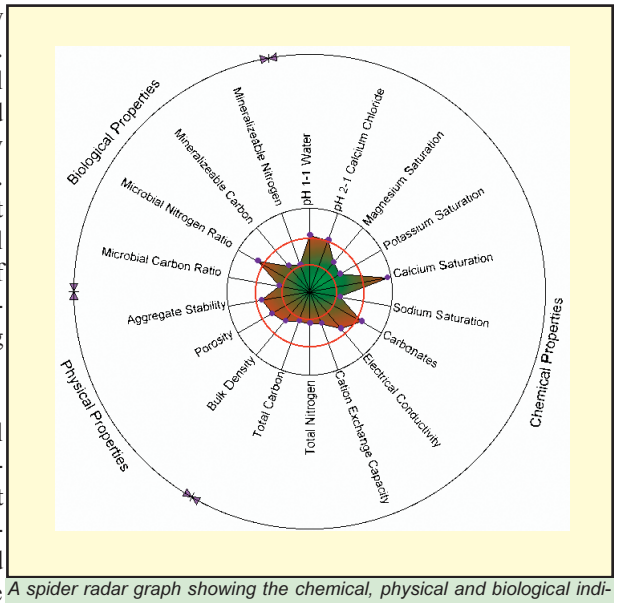
First, critical functions of soil in this turf ecosystem were identified. They were plant growth, soil tilth, environmental buffering, soil life, and natural cycles involving water, carbon, nutrients, and energy. Next, appropriate indicators were selected that would allow assessment of each function. As might be expected, several indicators were necessary and some found assessment utility for more than one function. Indicators were selected that were useful in assessing soil quality, but also ones that turf managers could routinely evaluate on-site or by using testing laboratory services.

Periodic testing of critical soil indicators and comparison to acceptable ranges allows soil quality to be evaluated.

A critical step in evaluating soil quality lies in setting appropriate and acceptable target boundaries for the various indicators. These limits, called control boundaries, can be established for small regions or even individual courses. Lack of sufficient research data for setting control boundaries is the most limiting information for this method.

A soil quality indicator's value is then compared to its control boundaries and any number of indices can be normalized and rated on a "spider radar" graph. This format produces an easy-to-understand, visual representation of environmental quality by showing whether indicators fall inside or outside their acceptable control boundaries.

Sequential production of these quality graphs allow managers to identify soil properties in need of remediation and can show changes that occur in response to management inputs. Long-term monitoring of essential indicators will illustrate how environmental quality responds to natural disruptive events or management programs.



A spider radar graph showing the chemical, physical and biological indicators used to asses soil quality. Red lines form the upper and lower acceptable boundaries for each indicator.

Seven Step Soil Quality Evaluation Program:

1. Identify critical functions of soil on a golf course.
2. Select indicators that relate to these functions.
3. Sample and analyze indicators over time.
4. Establish acceptable ranges for indicators.
5. Plot multiple indices on evaluation graphs.
6. Select and apply remedial management for degraded indicators.
7. Monitor indicators over time to identify changes.

Summary Points

- Critical functions of the soil of Colbert Hills Golf Course, Manhattan, KS, are being monitored to assess the long-term effects of golf course construction on soil quality.