



# AGRONOMY OF SCALE

Precision Turf Management (PTM) offers unprecedented control of turf.

***But will the investment pay off?***

By Kyle Brown

**W**hen Brian Hicks was superintendent at Eagle Point Country Golf Club in Wilmington, N.C., he had his work cut out for him with a three-year-old course built mostly on sand.

"There were lots of areas that I'd call bad areas," says Hicks. "We had trouble keeping grass in a lot of places because the sand was so very random. There was no pattern at all."

He was applying nitrogen where he could across the course, just trying to cover problem areas. But the cost was adding up faster than he saw a return in the turf. His application needed to be specific, or he was just wasting the nitrogen.

That's when he started working with Marcus Thigpen, owner of NuTec Soil. Using an

intensive soil sampling program tied to GPS locations, he was able to narrow down the problem areas into more manageable sections.

"That way all our bad areas were good, and our good areas were even better," he says. "It just kept on until we got everything evened out."

Mapping out a fairway or green isn't uncommon, but using the information to build a GPS-accurate map with multiple soil samples is part of a new set of tools for superintendents, including more efficient chemical application. More accurately, precision turf management (PTM) has been in the agriculture industry for about a few decades, and it's finally making its way to the golf course.

"We're 20 years behind the agriculture mar-



ket,” says Emil Miller, marketing manager for Smithco. “It’s a well-established paradigm for a farmer, but it’s gaining traction on the turf side.”

**SMART SAMPLES.** Most superintendents take soil samples to send in to a lab for testing, but not as many do it like Hicks and his crew at his current post at Carolina Shores Country Club in Calabash, N.C. Since his first days of working with Thigpen, he’s used the soil sampling service to get an in-depth look at his course. The process starts off like taking a regular soil sample, but on a grand scale.

“We took five of my crew and everybody had a bucket, a soil probe and a lot of boxes,” he says. “We’d start in an area, put the bucket down and walk out about eight or 10 feet away. Then we’d start sampling in a circle around the bucket, and that went into the bucket, which went into the box.

“We’d continue moving around, probably 30 paces away from that bucket in a different direction, and we’d keep doing these random patterns from the tee to the green and then also the green in the same fashion.”

Once all the samples are collected, another crew member comes along and marks each of the boxes with its GPS point. The

samples are sent to a lab for testing, and the GPS information is correlated with a host of results, creating a map of the spread of nutrients in the soil.

“Numbers don’t lie,” says Thigpen, who worked in agriculture before starting to use the intensive soil testing in the golf industry. “If we’re taking soil samples, when you analyze that, what you’re able to do is see what your pH is, your phosphorus, your potassium. Then it becomes very easy to understand. For example, if I have a pH of 4.3, I know I’ve got to take it up.”

Tom Bailey, superintendent at Wade Hampton Golf Club in Cashiers, N.C., had seen the whole process in action in his agriculture classes, so he didn’t need much of a push to try it out, he says. He’s been using it since 2007, building up a record of his soil’s health over time with a much more narrow focus than what he could do with traditional soil samples.

“Historically, you would take several samples from a fairway and you’d designate a common theme on that fairway,” says Bailey. “You’re at a 2.5 acre range for that, depending on the size of your fairway. With this kind of sample, you’re taking that accuracy down to a 3-4,000 square foot range. It’s not only knowing what you need to put down, but knowing where you need

Hicks and his crew took soil samples across the fairway, starting from a central point marked by GPS and working outward to create a full soil profile of the fairway.

## SHOW AND TELL

**B**eyond having specific data on how the turf is doing, PTM means having a way to prove what’s been done on the course, says Bailey.

“You can really show the members what’s happening on the course,” he says. “It’s color-coded, and it shows where your deficiencies are. You can load this onto a PowerPoint slide and show it in a meeting, to say, ‘Here’s how we’ve changed over the last two to five years. Based on our applications, here’s my justification on what we’re spending on this.’”

But all that data can show even more about what he’s been able to do with a more specific vision of the fairway and accurate application: It’s part of continuing to show that golf can be environmentally friendly, he says.

“There are counties saying point-blank, ‘You can’t put phosphorus down anywhere, there’s nowhere it’s safe,’” says Bailey. “I think it’s a great thing to have in my back pocket and be ahead of the curve as far as legislation goes. I can say, ‘I’ve been making precision applications and where 10 years ago I would’ve gone out with 3-5 tons, today I’m going with 1,000 pounds, and I’m putting it exactly here because the soil test says I need it here. I won’t be polluting, because I’m doing this exactly.’”

to put it down.

"Instead of just a broadcast that may overdo a third of the fairway and underdo two thirds, you're more accurate now because you know what you're putting down, what you need and where you need it."

Having all the information from around the fairway would be useful on its own, but having it mapped out via GPS location takes the information and makes it into something a superintendent can actually use to make decisions, says Thigpen.

Hicks uses the information to keep track of problem areas on his course from year to year, revisiting points from the previous year's tests that raised concern and trying to bring them to the same level as the rest of the course.

"We're looking at soil sampling from a different point of view now," he says. "Instead of just sampling the whole course,



With GPS coordinates and many more samples to work with, PTM draws a bead on trouble areas on the course for specific treatment.

the next year we'll go out and sample all of those areas that we know are bad."

Armed with the map from the previous year's data, he can take the GPS unit to that particular point and sample the same places again to see what change he was able to

make in the soil. Tracking that information is a brand new way for him to micromanage his soil, and by extension, his fertilizer inputs, he says. Overall, his inputs are down between 30 to 35 percent, and he's able to do it without sacrificing turf quality.

PHOTOS COURTESY NUTEC SOIL



Bailey even uses the information like a shopping list when planning his fertilization program for the next year, and the cost of the testing fits inside what he's saved by being more efficient in his orders.

"It leaves me controlling what I want to put down and where," he says. "I know my phosphorus is taken care of. I know my potash is taken care of. I know I've calcium and all those other factors. You can take what you want from the data and know you're working toward the right goal. You don't have to guess."

**SPECIFIC SPRAYING.** Using an intensive soil sample is one way to determine what exactly the soil needs to support healthy turf, but actually putting that down accurately is one of the more challenging jobs on the golf course due to the sheer number of variables.

“It's not only knowing what you need to put down, but knowing where you need to put it down.”

– Tom Bailey, Wade Hampton Golf Club

"There's always been a locked relationship between speed, pressure pattern and the tips when spraying," says Miller. "At the end of the day, the tip is the biggest limiting factor that end-users face. You go too slow, it doesn't form a pattern. You go too fast, you create a lot of small droplets that are subject to drift."

Using GPS technology boosted by other mapping services like the Wide Area Augmentation System with cell tower triangulation

or the Real Time Kinematic systems, sprayers can be smarter about application, eliminating overspray by recognizing turf that's already been covered.

"It's assisting the sprayer driving from swath to swath, like lines on a tile floor," says Thigpen. "A human can't judge that and keep it within an inch from one end to the other. When it turns and comes back, it's giving you the exact swath as if it was on a metal bar."

The equipment doesn't drive itself in that straight line — a spray tech still has to push it along. But if he drifts a little bit over an area that's already been covered, "the computer will recognize I've been here and it cuts off," says Thigpen. "It'll even cut off the individual tips as it needs to. The machine takes over that job so it allows him to be more accurate."

The location systems deal with ele-

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PTM gives superintendents a closer look at what goes into the makeup of a hole, with data mapped out geographically.

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— Marcus Thigpen, NuTec Soil

ments around the course, running along boundaries set up prior to the application using the GPS maps built from intensive soil testing. The equipment is “remarkable, in that once you load that specific hole with that specific element into the GPS, the truck will recalibrate itself as it goes so it’ll put the chemical down where it needs to be and vary the rate as it goes down,” says Bailey.

Hicks is working on getting his own sprayer, since he worked out he would save between 10 to 20 percent on his chemicals just by putting the application exactly where it needs to be.

“You don’t really have to worry about skips, and you don’t worry about overapplying because the machine just won’t let you,” he says.

“When you think about golf courses, there’s a lot of hard areas, a lot of contours and undulations that make it difficult to spray evenly,” says Miller. “When we define a boundary, the sprayer will automatically not spray outside the boundary we’ve created.”

**SENSING STRENGTH.** One of the newer technologies to make the jump from agriculture to the golf course has everything to do with light. Using sensors bouncing different wavelengths of light onto turf and picking up the response, the equipment can tell the relative strength of the plant, says Gary Roberson, associate professor and extension specialist at North Carolina State University.

“Turf that’s lush and green and growing well and not stressed by lack of nutrients or water, it’s going to have a deep green signature. Turf that is stressed is going to have a different signature.

“You can collect data on the health or vigor of the turf as you’re driving across it,” he says. “A lot of the sensors are Normalized Difference Vegetation Index, and what that means is that depending on what the plant bounces back, we can correlate that to health or stress of the growing plant.” The NDVI comes out as a number rating between 0 and 1, with findings closer to 1 showing more healthy turf.

He worked on a project several years

ago tracking down spring dead spot in turf and was able to pinpoint the location of the disease by reading the relative health of the turf, marking it on a map using GPS. “Now we’ve got a map of where those affected areas are and we can go right back to it later in the fall when it’s time to treat for it, knowing right down to the inch where these dead spots are,” he says.

The sensors give another way to read the health of the turf, which a superintendent can use to map and pinpoint damage on the course at a level closer than a human eye can notice, says Thigpen.

“We can measure exactly where the grass is going off, and we can see a correlation between good fertility and good irrigation that makes everything optimal,” he says. “You can set a guideline on your computer, and as soon as it’s below that threshold, you can see where that’s happening. Your own eye can’t see it, but the sensor can track and analyze that.”

But whether a superintendent is building a groundwork of data through intensive soil sampling or reading the specific health of the turf with reflected light waves, PTM is just more effectively using what superintendents have always known, says Hicks.

“It just goes back to basic agronomy,” he says. “There’s no gimmick to it. It’s just getting back to the way things used to be done, and keeping it simple and doing it right.” **GCI**