time where the mixture is applied. Complete coverage of the treated plant is essential. There should be no cross-resistance between the toxins. In effect, both compounds should each be able to kill the target pest, which is called "**redundant killing**." As turfgrass managers, we are not chemists, and we don't know if only one of the compounds in the mix is doing all the heavy lifting or if there is really a benefit to having both compounds in the mix.

Whether or not mixtures are useful in pesticide resistance management is controversial among applicators, researchers and regulators. Some say that the use of mixtures in resistance management is not supported by either computer models or field experiments, although lab tests can make mixtures appear to work. It is possible that a mixture could incompletely kill multiple life stages of a pest, instead of killing everything it was intended to kill. That means that some bugs still survive, lay eggs and pass on their resistance genes to the next generation.

I asked someone at that meeting if they thought it might be possible to restore the use of a product when resistance levels were really high (like bifenthrin and chinch bugs in parts of Florida), and they pessimistically said that it was too late. I hope that's not true. They also said that resistance management should start **before** field failures occur. So the time is NOW to determine how to delay resistance development in the neonicotinoids like Arena (clothianidin), Meridian (thiamethoxam) and Merit (imidacloprid).

RESISTANCE MANAGEMENT STRATEGY

Okay, so I also had the question of what a resistance management strategy should look like. Should each pest generation only be exposed to one active ingredient? Should all of a species' populations be treated with the same compound at the same time, or should each infested site be treated differently? In lawn care, that is what we do—each lawn is treated differently often by different companies, thereby creating a "mosaic" effect, unless a whole neighborhood is under the management of one pest management company. If property 1 is treated with bifenthrin (Talstar) and neighboring property 2 is treated with clothianidin (Arena), then what happens next? Any surviving insects on either property may find each other, mate and have offspring that can better survive an application of either compound applied alone or mixed together. Almost sounds like a cliff-hanger; we can't predict how fast resistance will develop to another compound in this common type of scenario.

So, what does this all mean? Be good product stewards and help us develop a functional resistance management plan for turf. Implement integrated pest management or IPM. Avoid treating turfgrass unless you absolutely have to, which admittedly challenging for a route-based business. Just because you treat green grass and it stays green after an application does not mean that a product worked—it may mean that no pests were present and causing damage at the time of application. Overuse of products like this is one route to developing product failures down the road. ■

Dr. Eileen Buss is an associate professor, Entomology & Nematology Dept., University of Florida. This article first appeared in the Florida Turf Digest's July/August 2012 issue.

Getting faster turf recovery coming out of winter

Editor's note: *We asked some top-of-their-game STMA members about strategies they employ to help their fields recover from winter more quickly. Here are the questions:*

1. What's your experience with fertility strategies coming out of winter?
2. What's your experience in controlling any winter diseases you've seen?
3. What topdressing materials do you use? Why those particular materials?
4. If you overseed, what's your advice on removing the overseeded grasses?

GRANT SPEAR, CSFM

Athletic Fields Supervisor
University of Nevada, Las Vegas

Winter in Las Vegas typically means dormant bermudagrass fields for 3-4 months. If a field is not overseeded, the bermudagrass will start to slowly grow in March. Fertilizing with a 3/4 to 1 pound N per thousand square feet and 4% Fe in late March or early April following topdressing with sand or better yet, sand with 20 to 30% peat helps to speed things along (the darker the topdressing, the better). Of course longer days and 80+ degree highs and 60+ lows help much more. I have yet to see any disease issues other than physical damage from excessive use of a dormant field when it's wet in the winter.

Overseeded fields behave and are treated differently here. Typically, ryegrass remains green but grows very little for us after mid-November until the end of January. Topdressing with a dark sand helps a little but most fertilizer seems to have very little effect until the days get longer in early February. Late January, I start fertilizing overseeded turf at about 3/4 pound of N per thousand square feet with about 4% Fe every 3-4 weeks until about a month before I want to transition the turf back to bermudagrass.

The bermudagrass base turf is much slower coming back when competing with perennial ryegrass, but by late May it's usually coming back. Depending on field use in May through the end of June we spur the bermudagrass along by controlling the water to stress the ryegrass and lowering the mowing height from 1" to 3/4" or from 5/8" to 5/16" on infield turf. Heavier applications of urea (1-1.5 lbs N per thousand square feet) add to the stress on the rye and speed the encroaching bermudagrass.

If more complete, quick removal of the rye is optimal and adequate time is available for the bermudagrass to grow, transitioning herbicides like Monument and Revolver are the way to go. One week after treatment, I start to hit it with fertilizer again.

JEFF HAAG

Sports Turf Specialist
John Carroll University, University Heights, OH

Currently I try to avoid making any fertilization application in this region until late April so that I don't deplete the carbohydrate reserves I have built up heading into winter for our cool-season grass. If there would be a need to apply any I would try to limit it strictly to recovery areas and not as a blanket application for an entire field.

I do apply a dormant fertilization application to continue to store carbohydrates for the following spring and summer the last week of November. Last year it was applied on November 26.

In this part of the country (outside Cleveland) the main concern is pink snow mold; however, here at John Carroll we do not apply any fungicides to any of the athletic fields. But when I was the golf course superintendent/sports turf manager at Bowling Green State University, I applied a tank mixture of iprodione (Chipco 26GT) and Daconil (chlorothalonil) as a preventive for pink snow mold with great success.

I topdress using a coarse USGA spec sand because the coarser grade allows for better drainage.

Since we have cool-season grasses here at John Carroll we do not have to overseed. When I was at the University of Louisville we overseeded the bermuda fields with perennial rye, and found that the product Katana removed the rye the quickest and with minimal turf discoloration.

CHRIS "BUTTER" BALL

Sports Turf Manager
Gwinnett Braves (GA)

Typically we load up our bermuda with potassium for the winter. We usually apply 1-1.5 lbs of N all winter, typically done with one granular app, supplemented by foliars. In the Southeast it has been rare the last few years that the bermuda has gone totally dormant, in my opinion, which really helps as the weather starts to turn. We start the spring by lowering the mowing heights on our ryegrass, and applying small but frequent amounts of N as soon as the air temp breaks 65-70 and our bermuda starts to show signs of life.

Most of the winter diseases we see in the Southeast are on our ryegrass. Preventative apps of broad spectrum fungicides made starting in late January and early February, usually do the trick. We also are on a phosphate program that has been a large piece of our puzzle the past few years. I also believe it is a must that getting your potassium built up in late summer and all fall is a vital to a healthy transition.

We typically use a sand for topdressing that is very similar to our rootzone base. We are 100% sand and have found a source that matches our rootzone very, very closely. We also topdress with green sand in thin and wear areas as needed. Kiln-dried green sand is a must in our program.

We do overseed, (unfortunately) due to some of the February and March games we play. My philosophy the past 10 years or so has been to go out late and very light with our ryegrass seed. Last year (2011) we were close to 5lbs/M and this year (2102) we are at 4-4.5lbs/M.

We do not take the rye out chemically for transition. We start to drop the mowing heights as soon as possible (late March-early April) typically from 5/8" to 1/2". When our team is on the road for an extended period of time we will often take our turf down to 3/8". We will apply a poly-coated N-P-K granular and really start to pour our foliar program to our turf by spraying small amounts of N every 7-10 days. We also use green pigments as much as possible to draw heat into the plant and start to aerify with small solid tines as much as possible early during transition, while large core aerification is done in June, July, August, and September. Frequent light topdressings also help us push our transition.

TODD TRIBBLE
Athletic Field Superintendent
Oklahoma State University

Like most athletic fields in the transition zone we are forced to overseed our bermuda stand with perennial ryegrass. We have to stay fairly lean on our nitrogen inputs on our baseball field in mid-September and October when the overseed is somewhat weak and hasn't yet begun to tiller and mature. During this time we supplement once a week with a light foliar application until November. As soon as fall practice is over the first of November we push out a starter application of 18-24-12 at 0.75lbsN/1000.

Our other go-to product when the soil temps begin to drop to the upper 50's at a 4" level has always been an IBDU product at 1.5 lbsN/1000. This is a can't-miss product for us here. It is perfect for cool season grasses such as rye as it is slowly soluble and the release is based on moisture availability, not temperature or the activity of microorganisms. Usually we will come back 8 weeks later at 1lbN/1000 of the same product to get us through the end of February when our soil temps are warm enough to use more conventional fertilizer methods such as ammonium sulfate.

If I see a 4 or 5 day window of warmish weather for Stillwater during January or February (mid-upper 60's) we will usually go out at light rates (.25-.33lbsN/1000) of a soluble product to give our rye a quick kick of growth and allow for some recovery from the daily practices and games. Unfortunately, after this winter draws to an end we will be forced to find a different slow release source that mimics IBDU as it is more or less unavailable to us now. Beyond the end of February, we use a 13-2-13 at 0.75lb rates to help with repair and color maintenance until early June when the season comes to an end. We know that with fairly low nitrogen rates for that 7-month time frame our team is playing on rye we can keep growth where we need it[DASH HERE]not too lush but still be able mow each day and remove some tissue.

We have been fairly fortunate here in Stillwater to not have great winter disease pressure. We do get snowfall each year but in all years but one it has burned off within 4 days or so. In the winter of 2010 we did get 9" of snow and in our right field corner at baseball snow drifts piled up 3+ feet of snow. It took about 2 weeks of good temperatures for this to burn off and we did see some light instances of snow mold. Consequently, I will only spray preventatively for snow mold if we have a storm coming that will blanket us fairly heavily with snow and the 10-day forecast does not allow for melting. In such cases I will use a chemical with a combination of the active ingredients chlorothalonil, propicanozole and fludioxonil before the storm arrives.

The practice of topdressing is important for many reasons, including quicker recovery from turf injury/damage, enhanced overseed, thatch decomposition, and smoothing out our playing surfaces. We are always sure that the material we use is of a similar or slightly coarser particle size than our overall rootzone. If you really want to take a sci-

On our other fields I also consider how aeration will mix the existing soil and topdressing material as not to upset the rule of thumb; coarse materials over fine equal positive drainage.

entific approach to it, test the percolation rates of your field as is, then test your proposed sand. If the sand from the supplier drains at a faster pace than what your current perc rates are, that might be a good option for a topdressing material; just make sure it isn't too course so that it can't be worked into the turf canopy with a mat.

A particle size that is finer than what was used at the time the fields were built can lock up pore space, decreasing air, water and gas movement, impacting the availability of nutrients due to roots hitting a "physical barrier" in the rootzone, and create compaction issues over time. Obviously for us, it is important to find a USGA spec type sand that fits our needs and is not much more expensive per ton than a local, "dirtier" type of masonry sand. We recently built a new 4-acre football complex and are lucky enough to get our sand from the same plant as the one who provided the rootzone mix at time of initial construction.

Certainly we overseed in Stillwater with our being in the transition zone. Each year we use perennial ryegrass to keep our softball, soccer, and baseball fields green for the late fall/winter/spring months. As soon as the season ends for each sport we immediately (day after) eliminate the stand of rye chemically with the active ingredient foramsulfuron. We are fortunate in the fact that our coaches understand our urgent approach to ryegrass removal. Our camp schedules in the summer are usually played on a weaker stand of bermuda as it recovers from the smothering of the overseed. Like most turf scientists have included in their presentations, the importance of having as close to a 100-day time frame of having a healthy stand of pure bermuda cannot be overstated.

For our baseball field specifically this can be a difficult thing to accomplish with the season extending into June. The past two seasons we have regularly maintained our rye at 0.75" but dropped to 0.625" when the team is out of town. This imparts some stress on the rye for that time period and we hope that our permanent stand of bermuda can jump in and slowly overtake the rye in May. During this same time we begin to up our nitrogen inputs to further encourage the bermuda to take off. These two practices certainly do not lead to a 100% stand of bermuda and probably never will but it does allow us to cheat a little before June 5 spray out time. Rye that isn't removed simply hangs on all summer in clumps and alters the uniformity of the bermuda.

AMY J. FOUTY, CSFM
Athletic Turf Manager
Michigan State University

The fall and winter in Michigan can be very different from year to year. Over the years I have changed my fertility strategies to best match the changing environment. I have gone away from late fall applications of fertilizer and typically wait to fertilize in the spring time until the soil temperatures averages 50 degrees. Fifty degree soil temperatures signify that the ground will most likely not freeze again and that the turfgrass plant is beginning to actively grow. We often get periods of rains and warm spells during the winter months that unthaw the ground; by waiting I feel that we do not waste our fertilizer or money. As far as the type of fertilizer we use in that first application I like a quick to medium release to quickly green up the turf and start the rejuvenation process for the plant.

We use a combination of cultural practices and chemical applications to control winter diseases. We typically do not push the bluegrass with a lot of N in the fall. I believe that the plant can better store carbohydrates using this fertility method and prepare the plant naturally to defend against the winter if I am not pushing shoot growth. Second, we try to solid deep tine aerate the fields that we need to get out on the earliest in the spring so that the soil and plants have the healthiest environment possible through the winter months.

Diseased areas are often low light areas or compacted soils that do not drain well, so we try to alleviate these issues as best we can by opening them up in the late fall. Finally, at the end of our fall season we typically make preventative snow mold application. I like to wrap these applications up the last week of November.

The type of topdressing materials that we use is based on the existing soil structure in each of our facilities. For example, we have an engineered sand system in Spartan Stadium that we have matched sod and soil to, and then in 2010 engineered topdressing material for as well. It is all based on the distribution of the particle size of our soil test to maintain positive drainage and air movement through the soil structure.

Finding the proper balance of fines, medium, and course particles is critical for stability and drainage. Basically it equates to 95% well graded sand and 5% silt and clay in the stadium. On our other fields I also consider how aeration will mix the existing soil and topdressing material as not to upset the rule of thumb; coarse materials over fine equal positive drainage.

In our northern climate we typically overseed year round with Kentucky bluegrass seed mixes on the fields just before events, camps, and rentals for the athletes to work in the seed. We have had great success over the years just sticking with the Kentucky bluegrass. The only fields that receive any rye/Kentucky bluegrass blends of seed are our practice fields in the fall. The winter weather typically desiccates the rye for us so there is no need to chemically remove it. We start again in the spring with straight Kentucky bluegrass.

JOHN WATT, CSFM
Athletic Field Manager
North Kansas City Schools

My best results of turf quality coming out of the winter come from applying a pound of nitrogen that is quick release in the late fall. Then in late winter months, end of February, we apply ½ pound of nitrogen to kick start the bluegrass. Three weeks later, when soil temperatures warm up, apply the ½ pound of nitrogen to continue growth and recovery from spring sports. At the K-12 level, spring sports season is very short, so we need to start as early as possible to get the grass growing for quick recovery.

My budget doesn't allow for a preventative fungicide program, so I try to stick to cultural practices going into the winter months. My crew and I use growth blankets as much as possible. We focus in areas that can be prone to winter disease or where there is a low threshold for thin turf

when spring season starts up, for example soccer goal mouths.

I usually use a 90/10 sand:peat mixture. I choose this for ease of application and addition of organic material into the native soil.

We don't overseed.

VINCE HENDERSON, Park Services Manager
JASON MELTON, Sports Turf Manager
Henrico (VA) County Parks & Rec

We are 100% warm season turf and since we are in the transition zone we try to be patient with our nitrogen fertility on overseeded and non overseeded fields. We overseed mostly for color on our baseball fields and for early season tournaments on soccer fields. We start fertilizing these fields when we begin mowing and typically use a water soluble fertilizer such as ammonium sulphate or urea with a urease inhibitor at .25 -.50/ lb per 1000 rate. We are even more patient with non overseeded fields due to the possibility of a late freeze. Very mild winters usually lead to early green-up of these fields, but a late heavy frost or freeze can really hurt these fields if they are too lush. We really take a wait and see approach to these fields. Sometimes we may get into April and need to push them a little, but more often we try to wait until the grass wants to grow.

The only major problem we have with disease has been spring dead spot on our baseball stadium field. We have had mostly good results in using fenarimol (Rubigan) at split 4 oz/1000 rates. The best timing for the applications has been late August or early September and then again 4 weeks later. Going forward, Rubigan will not be available, so we will have to use an alternative fungicide if we decide to continue with fungicide applications.

Another way we have tried to combat this problem is the use of nitrogen sources. Calcium nitrate seems to help, but we cannot be sure if it is the fertilizer source or the fungicide applications or a combination of both that has helped. We have tried to use information from Dave McCall at Virginia Tech and research done by Dr. Lane Tredway at North Carolina State to combat this problem.

Over the years we have mostly used sand to topdress our fields, but we have moved more to using compost on all of our fields except our sand-based stadium field. The sand-based field is topdressed with a matching sand when we core aerate. We do not use compost on this field so that we keep from creating a layer that will inhibit drainage.

On our native soil fields we try to incorporate .25" of compost with some type of cultivation process, whether it is core or solid time aeration. We have seen a great response with using compost in early spring to promote growth and enhance color and believe that over a period of time we will create a better soil structure. We have also found that topdressing compost in conjunction with sprigging has really helped our grow-in process.

We started using compost due to a recommendation by Dr. Andy McNitt at Penn State when we renovated a native soil field to improve soil structure and drainage. This particular renovation required 2" of compost be tilled into the top 8" of soil. The results were excellent, so we have since incorporated this into our cultural practices.

It is important to note that we have found an excellent source for compost that is clean of sticks and debris and is easy to spread and also free of weed seeds due to their composting process. The cost of compost has also been cheaper than sand. The truth is that with the number of fields we maintain (81 irrigated fields) we don't have enough time to topdress as much as we would like.

This question really depends on the type of weather we have. Our perfect scenario would be to scalp the rye and turn off our irrigation systems for a week or so and let Mother Nature take care of the rest. This also works well with some type of cultivation process such as slicing. If it is a cooler-than-normal spring and the ryegrass is thriving and the bermuda is lagging a little we may wait a short time, but then use a chemical application to reduce the competition between the two grasses.

Another factor to consider is if we will need to sprig or repair worn areas of a field that has been overseeded. In this case, we must be careful to plan the chemical application accordingly in case a window of time is needed. We have typically used trifloxysulfuron-sodium (Monument), because we are also able to control sedges and some broadleaf weeds if needed. We try to use as few chemical applications as possible.

SHANE YOUNG, CSFM
Grounds Supervisor
Prince William County (VA) Park Authority

I don't fertilize warm or cold season turf until my pre-emergent app in early April.

Since being in my current position for past 12 years, I have only seen spring dead spot on bermuda. It usually it grows right out of it.

I don't topdress my bermuda soccer fields anymore because the reward wasn't worth the cost.

I overseed my bermuda and let it transition out naturally. I use transitional rye though. ■

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Use earthworm castings tea for better turf

HOW CAN EARTHWORMS BE BENEFICIAL TO US AS TURF MANAGERS? We know of the natural aerification that takes place from earthworm activity in the soil, ultimately opening up pore space for root growth and improving water and oxygen movement, but is there any other way that we can benefit from these slimy creatures? It turns out that through a process called vermicomposting we can potentially reap countless advantages in making turfgrass more stress tolerant while improving soil structure while reducing dependence on chemical and pesticide use.

Vermicomposting is an organic process used to convert agricultural and other waste into valuable living soil amendments. The end result of the vermicomposting process is the production of earthworm excrement, referred to as castings. These castings are packed with beneficial nematodes, protozoa, fungi, organic matter, plant growth regulators (humates and fulvates), plant growth hormones (IAA and gibberellins), and soluble nutrients (N, P, K, Ca, and Mg).

Organic matter serves as a storehouse for nutrients in the soil.

SOIL NEEDS ORGANIC MATTER AND MICROBES

To fully understand the benefits of worm castings, it is best to first comprehend the need for sufficient organic matter and healthy microbial activity in the soil. Organic matter serves as a storehouse for nutrients in the soil. Unlike soluble synthetic fertilizers, the nutrients stored in organic matter and microbial bodies do not easily leach out. The organic matter forms aggregates with fungus and other beneficial bacteria making it difficult for nutrient leaching from heavy water movement through the soil profile.

The diverse addition of microbial life to the plant's leaf surface and rootzone has many benefits, but perhaps the greatest and most direct benefit comes as a population addition to the soil food web. This addition helps to maximize a continual cycle of breaking down and releasing nutrients into plant-available forms accessible to the roots. As bacteria and fungi feed on organic matter in the soil, they store nutrients within their body while releasing others. Then as nematodes and protozoa in turn prey on them, nutrients are released from the bacterial and fungal bodies into the soil in a plant available-form ready for

Worm image ©istockphoto.com/knorre

>> **THE BEGINNING** of the brewing process—the straining bag of worm castings is placed in water.

root uptake. When organic matter is fed to the soil, the microbial life then feeds nutrients to the plant.

BENEFITS OF WORM CASTINGS

Nutrient Cycling and Retention: As mentioned earlier, aggregates formed from microorganisms within the soil greatly reduce nutrient loss, ultimately reducing groundwater contamination. Less nutrient leaching, coupled with a healthy microbial population unlocking nutrients already in the soil, leads to a lessened need for the quantity of fertilizer output.

Microbial Diversity: The addition of an incredibly diverse population of microorganisms from the worm castings helps maximize the productivity of the soil food web.

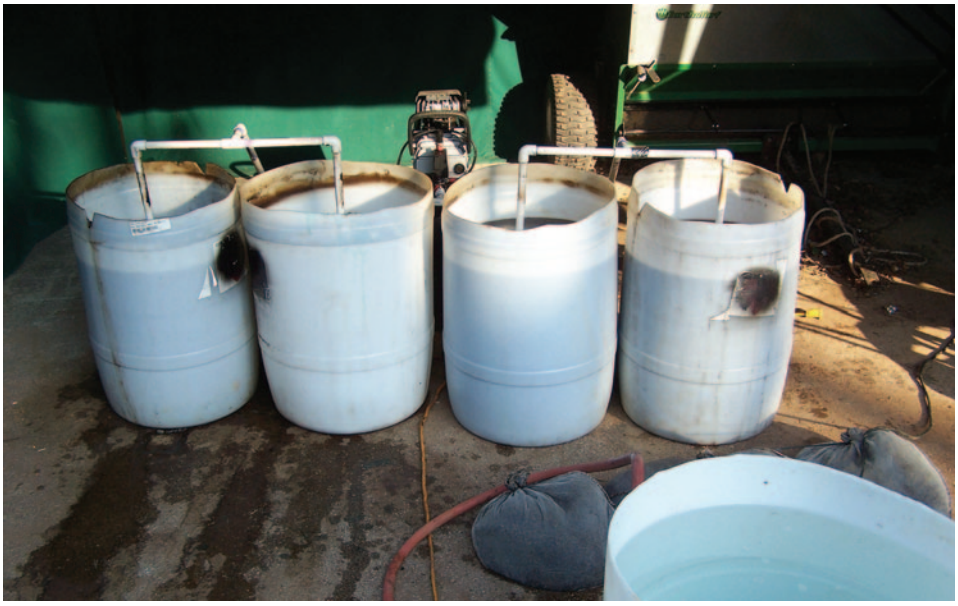
Water Retention: As the amount of organic matter within the soil increases, so too does the water holding capacity of that soil.

Disease Suppression: Spraying worm castings tea populates the soil and leaf surface with an exorbitant amount of microbes all searching for a food source to survive.

» **LEFT:** The middle of the brewing process. The foam indicates good microbial activity in the tea.
» **RIGHT:** This is the finished solution with a tea bag in the foreground.

This diversity ensures that all of the organisms have a predator in the soil; because of this, no one organism can easily reach populations high enough to cause damage of any significance. Working symbiotically with the plant's roots system in this way helps to eliminate harmful molds and fungi from inoculating the plant's surface.

Worm castings don't do miracles against all plant disease; however, research completed by Dr. Norman Arancon and Dr. Clive Edwards at Ohio State has shown that worm castings suppress *Pythium ultimum* and *Rhizoctonia solani* diseases. Further research conducted by the Plant Sciences Department at Cornell University shows that the beneficial microbes colonize seed surfaces masking the chemical signaling needed for the pathogen to locate the host material.



» **THIS IS OUR BREWING SET-UP** with the air compressor in the middle of the four containers and PVC piping branching off of that.

Insect Control: Worm castings are rich in chitinase, a chemical that decomposes the exoskeleton of insects. Many researchers believe that its presence in the castings prove inhibitory to many damage-causing insects.

Plant Available Nutrients: Worm castings provide soluble nutrients to the plant. The nutritional analysis can vary depending on the food source during the vermicomposting process, but generally the castings have around 1-3% N, .5-1% P, and 1-2% K. These levels are low, but they are immediately ready for plant uptake.

» **CLOSE-UP** view of the dry worm castings.

APPLICATION PROCESS

Worm castings can be applied a couple of different ways. Like any compost, the castings can be spread in a finely ground, dry formulation. Dry application would be more useful in a situation when it could be added directly to the soil profile during a renovation or construction.

When applied to the plant, the best and most cost effective application method is by making a tea from the castings. Much like making a pot of tea at home, the concept of this tea is to simply use water to extract all of the "good stuff" from the worm castings into a liquid solution that can easily be applied. This process can be done two different ways: extracted or aerobically brewed. Aerobically brewed teas require more time to produce, but the end product is a solution with exponentially higher microbial populations than that of extracted teas.

This aerobic tea brewing process is fairly simple, but it does require some time, attention, and know how. A variety of brewing containers and methods are available and can be used; however, a key point to keep in mind when producing the castings tea is that because the tea is a living solution, oxygen and a food source must be continually available to the microorganisms in the tea for survival and maximum population growth.

During the STMA Conference last year in Long Beach, CA I sat in on an educational program presented by Leif Dickinson about his practices with growth regulators on his bermudagrass at Del Mar Thoroughbred Club. During the presentation he mentioned his use of worm castings tea brewed with alfalfa to jump start his turf out of large patch symptoms in the spring time. Our field had experienced large patch the previous fall, so this concept caught my attention. I began looking for any additional information or research anywhere about the benefits or drawbacks from the usage of worm castings tea on turfgrass. What I found was a wealth of success stories from gardeners, crop producers, and the greenhouse production industry, but nothing more documenting real success on turfgrass. After reading all of the different uses and benefits, I came to the realization that once you strip everything down, growing quality turfgrass isn't really that much different from growing other crops, so I decided to give brewing an aerobic castings tea a try.

For the brewing system I retrofitted an air bubbling system off of a 10-gallon air compressor we had sitting around. We began spraying in mid-March as our bermudagrass had begun coming out of dormancy. My intention was to make three applications on 2-week intervals with my last application coming in mid-April; instead I got hooked on the results we were having and continued spraying on the bi-monthly interval schedule for the remainder of the growing season.

OBSERVATIONS FROM TRIAL AND ERROR APPROACH

• Because our field displayed the visual symptoms of large patch in the fall, I naturally anticipated those same areas to appear as the field broke dormancy in the spring. When the turf woke up from the winter, the infected areas from the previous fall where nowhere to be found.

• I was amazed how well the "usual suspect" wear areas handled traffic throughout the year. Even before the bermudagrass season really kicks into gear, the turf dealt with our 18 high school game, pre-Lookouts season slate with ease. From my observation, this improved wear tolerance continued throughout the 2012 season.

• Even though we had a substantially drier summer, two different observations I made this year can speak to improved water retention in our soil. First, we did not have an occurrence of fairy ring, which the field had experienced the previous six seasons.