

years. Course B and C are both several decades old and have been able to maintain this very low resistant proportion for years, while courses opened within the past decade already have levels of resistance far surpassing those at B and C. One fungicide application per year is clearly not a practical solution for managing fungicide resistance in most instances.

So how can we limit the development of fungicide resistance on our golf courses? While this study cannot give clear answers to that question, this study has shown that the issue of fungicide resistance may actually be even more complex than thought just recently and may have raised more questions than it answered. But it is clear that every golf course, no matter how old or how young, should have a plan in place to manage fungicide resistance. This plan should include implementing traditional strategies for managing fungicide resistance such as fungicide class rotation, inclusion of contact fungicides, adhering to the recommended spray interval, and applying at the correct label rate as recommended by the fungicide label. These traditional strategies do not appear to have the ability to completely stop the development of fungicide resistance, but should slow down the rate of resistance buildup significantly enough to maintain our most effective fungicides years into the future. New resistance management strategies without sufficient scientific data to

support their validity should be looked at skeptically, though not completely discarded.

Fewer new fungicide chemistries are being produced by chemical companies due to the incredible cost, and many of our current fungicides are facing increasing regulation from federal and state governments. This leaves turfgrass managers with fewer options for controlling disease, and if we're not careful could lead to a reduction in efficacy due to resistance development in fungal populations. Much more research is needed to determine what strategies actually work to limit resistance development to keep our most successful disease control products effective years into the future.

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Step-by-Step Instructions for Getting Maps and Soil Information for NR 151

By **Doug Soldat**, Department of Soil Science, University of Wisconsin-Madison

In an earlier article, I wrote that soil test results make up the backbone of a nutrient management plan (NMP). The other components of the NMP include soil maps, hydrologic soil ratings, topography and slope maps, and information about the depth to bedrock and water table. This is a lot of information to assemble, but the good news is it can all be found at one place on the world wide web. Below are step-by-step instructions that will get you the site-specific information that you need for your NMP. Amazingly, you can obtain this information in less than an hour, and it is not much more difficult than navigating Google Earth. If you haven't used Google Earth and don't consider yourself good with computers then it's probably a good idea to have someone nearby who is. Alternatively, this task can be completed in about ten minutes by someone who has a MySpace page or is constantly "texting" people on his or her mobile phone. Chances are you know someone like this at work or at home.

What you'll need:

1. A computer with a fast connection to the internet, as dial-up connection might be too slow.
2. Internet Explorer 6 or 7 (some other web browsers will work too) with pop-up blockers disabled. This is very important; if pop-ups are blocked you won't be able to generate maps.
3. Adobe Acrobat Reader.
4. A color printer.

Step 1: Visit the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>)

Find this site by typing the address above into your web browser, or by typing "web soil survey" into Google. Once you've arrived at the web soil survey site, click on the big green button near the top of the page that reads "Start WSS".

Step 2: Zoom in on Your Property

Find your property by entering in the address in the "Navigate By..." section or by zooming in on the map with the zoom tool, a magnifying glass with a plus sign.

Step 3: Select the "Area of Interest" or AOI

You'll need to use one of two virtual tools to do this. They can be found in the toolbar above the map. They both have the letters AOI and a red rectangle of polygon. To use the AOI rectangle, click and hold the cursor on the upper left hand corner of your property and drag the cursor down to the lower right hand corner and release the mouse button.



Figure 1. Click on the green button to begin the Web Soil Survey application



Figure 2. To find your property, enter the street address, or zoom in using the zoom tool.

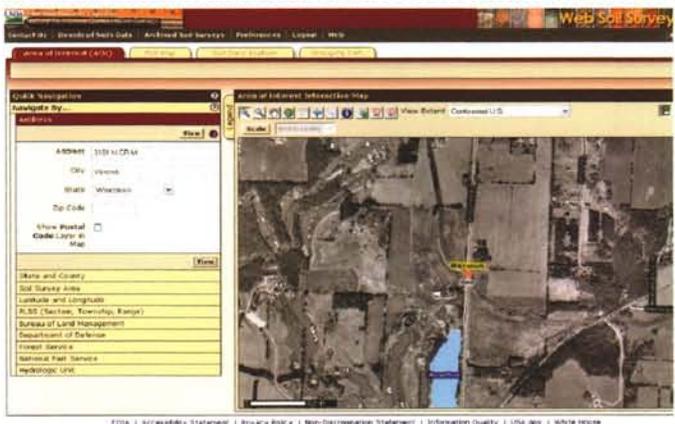


Figure 3. After entering the address of the O.J. Noer Facility, an aerial photograph of the research center and surrounding areas appears.

I find the polygon tool to be the more useful, as most properties are not perfectly rectangular. However, it may take a little longer to learn how the polygon tool works. Click once on any part of the property border; drag the mouse along the border until you reach a corner. Then click the mouse once and drag in a new direction. After you have encircled your property with the polygon tool, double click the mouse to finalize the selection. If you are unhappy with the area you selected, just click the "clear AOI" button located to the left of the map.

Step 4: Find and Print Maps

1. Soil Map and Topography Map
 - a. Click on the tab near the top of the page that reads "Soil Map."
 - b. Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.
 - c. Close the print version and return to the web version of the soil map and click on the "Legend" tab on the upper left side of the map
 - d. Scroll down to the bottom of the legend and click on "Topographic Map". This will be the second to last item on the legend. Click on the "X" in the upper right hand corner of the legend, and the soils map should be shown with a topographic map.
 - e. Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.
 - f. Click on the legend tab again and select the "Aerial Photograph" option near the bottom of the legend. This will remove the topographic map and replace it with the aerial photograph.
2. Soil Slope Map
 - a. Click on the tab that reads "Soil Data Explorer."
 - b. Click on the tab that reads below and to the right of "Soil Data Explorer" that reads "Soil Properties and Qualities."
 - c. To the left of the map, click on the yellow bar that reads "Soil Qualities and Features."
 - d. Then click on the yellow bar that reads "Representative Slope."
 - e. Then click "View Rating."
 - f. Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute

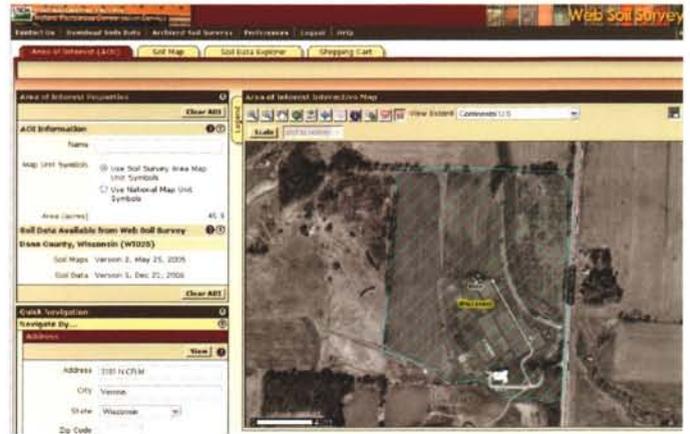


Figure 4. Use the polygon AOI or rectangle AOI to select the "Area of Interest". After selecting the area, it will be highlighted by blue lines.



Figure 5. After selecting the AOI, clicking on the "Soil Map" tab will create an overlay showing the soil types within the AOI. A printable map is generated after clicking on the "printable version" button in the upper right hand corner.



Figure 6. Most of the maps for NR151 can be generated by selecting an AOI, clicking on the "Soil Data Explorer" tab, and then clicking on the "Soil Properties and Qualities" tab



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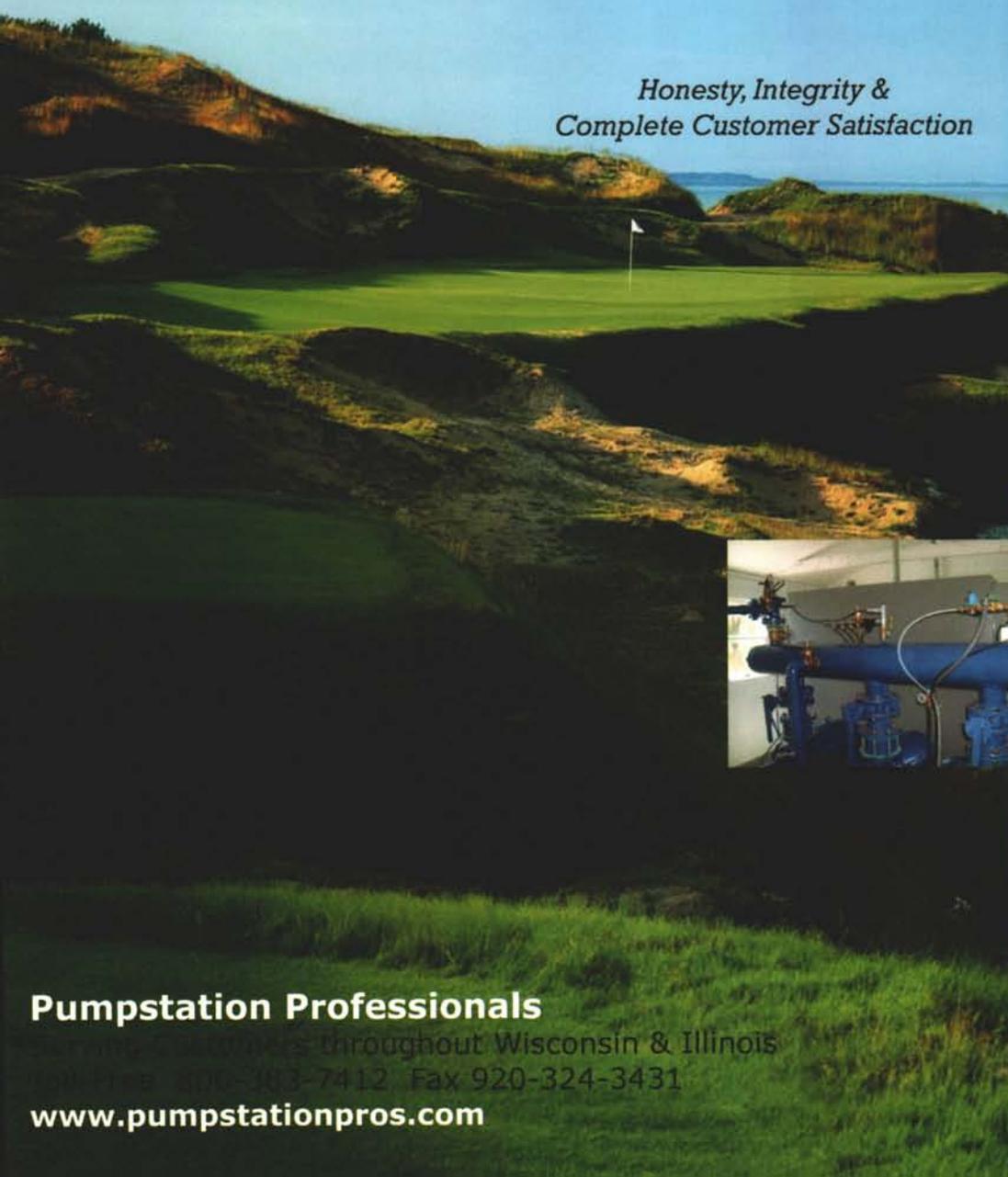
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or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.

3. Hydrologic Soil Group

- Click on the yellow bar that reads "Hydrologic Soil Group."
- Then click "View Rating."
- Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.

4. Depth to Bedrock Map

- Click on the yellow bar that reads "Depth to a selected soil restrictive layer". If this is not available click on the yellow bar below that reads "Depth to any soil restrictive layer."
- Then click "View Rating."
- Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.

5. Water Table Map

- Click on the yellow bar that reads "Water Features."
- Then click on the yellow bar that reads "Depth to Water Table."
- In the advanced options, set the beginning and ending months to coincide with when you typically begin and end applying fertilizer. For example, at the O.J. Noer Facility the first fertilization is typically occurs in May and ends in October.
- Then click "View Rating."
- Click "Printable Version" in the upper right hand corner of the screen and click "view" when the popup screen appears. After a minute or so, another window will open with a map that you can print. If you have a browser with a pop-up blocker, this window will not appear unless you disable the pop-up blocker.

Potential Problems and Solutions

Problem 1: Technical issues like the web soil survey doesn't run properly on my computer, the maps won't print, or I can't disable the pop-up blocker. There are an infinite amount of potential technical problems that can occur. These can be extremely frustrating. A good solution is to visit the local library,

which will likely have computers which are very capable of running the web soil survey and generating printable maps. Also, computer savvy people are fairly good at finding fast solutions to these common technical problems.

Problem 2: Golf course was built after aerial photographs were taken. Unfortunately, there is no easy solution to this issue. For now, you'll need to approximate the property borders and possibly draw in by hand the locations of the golf holes and other fertilized areas. Hopefully, the aerial photographs will be updated in the near future.

Problem 3: Site grading and soil modification has changed soil properties, so the maps are not accurate. The solution to this problem is to document the scope of the changes and indicate the new properties. For example, the web soil survey indicates a steep slope in an area that was graded to be nearly flat for our research plots. The NMP for the O.J. Noer Facility will include a note that the slopes shown in the map no longer exist due to grading. Alternatively, it is possible that new slopes were built on a previously flat area. These areas should also be identified.

This article only addressed how to collect all the maps and soil information you'll need for a NMP. The next step in the process is interpreting the information on the maps in order to identify areas which fertilization restrictions exist. We will help you interpret the maps at our NR151 Workshops so you can develop a fertilization program for your golf course that conforms to the new regulation. Registration forms are available online at www.turf.wisc.edu. 



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EXPO GOES GREEN

By Tom Schwab, O.J. Noer Turfgrass Research and Education Facility, University of Wisconsin-Madison

The Wisconsin Turfgrass and Greenscape EXPO is going green in 2008. Our industry has always been on the forefront of the environmental movement but often doesn't get credit for it. Next year's EXPO will explore how the turf industry performs when it comes to going green. This common theme will be touched on throughout all the presentations, round tables, and panel discussions. The vendors in the trade show will likewise exhibit all the tools you need to make your business more environmentally green.

EXPO is held annually at the Madison Marriott West, and the Marriott has made major renovations to make your visit even more enjoyable this year. The conference is on January 8, 9, and 10, 2008. The first day, Tuesday, January 8th, includes two afternoon workshops. One is about developing an NR 151 Nutrient Management Plan, and the other is about troubleshooting electrical and hydraulic equipment problems. The main part of the conference starts on Wednesday, January 9th.

Over 30 educational sessions are scheduled on the 9th and 10th, and will be of interest to anyone who manages turf whether it be for lawn care and landscaping, sports turf, sod production, or golf turf management. Leading researchers, business managers, and other experts in their fields will inform you with everything you need to go greener in your position. Speakers will explore organic lawn care, human health effects in turf management, new environmentally friendly landscape management techniques, and so much more. Examples of what you will learn are listed here:

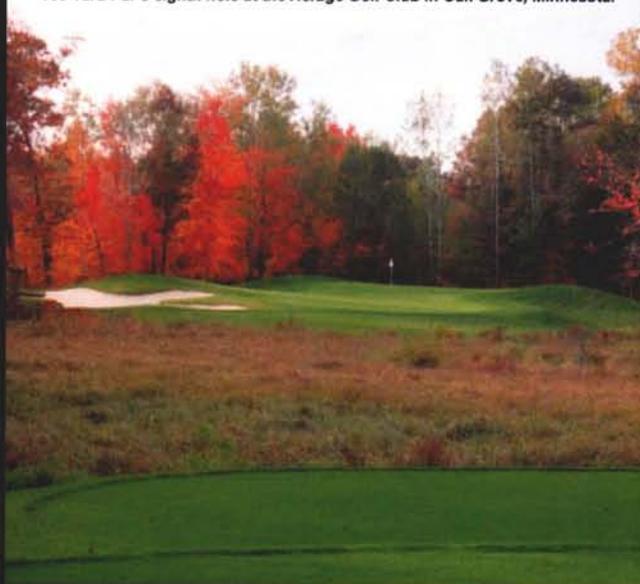
- Dr. Mike Hurdzan (Hurdzan/Fry Golf Course Architects) - Environmental Impact of Golf Course Design.
- Dr. Jennifer Grant from Cornell University - 1.) The Bethpage Experiment, Reduced Risk Putting Green Management, 2.) Lawn Care IPM: Doing It and Marketing It Successfully
- Dr. Bruce Branham from the University of Illinois - 1.) Environmentally Sound Nitrogen Fertilization Programming 2.) Why PGRs Work
- Dr. Marshall Clark from the University of Massachusetts - Pesticide Exposure in Turf Management
- Andy Kurth from Weedman Lawn Care - Dealing With Public Perception

This is only a short description of the education available. Other highlights include research reports from our UW-Madison turfgrass researchers and several round-

table discussions. One panel involves two golf course designers and two superintendents in a discussion of the environmental impacts from renovations and new construction. Another roundtable looks at different views of what defines a healthy home lawn from the perspective of a traditional and an organic lawn care provider, to a no-pesticide lawn activist, and a university turf researcher. One other main highlight is the trade show which has all the latest technologies and innovations to help you go green and make more green.

The full program and registration form will be mailed out in early November. It will also be posted on wisconsinturfgrassassociation.org at that time. You may contact Audra if you need more information at 608-845-6536 or ajander2@wisc.edu. This is going to be one of the best conferences you attend and it will be here before you know it! I hope to see you all there. 🌱

163 Yard Par 3 eighth hole at the Refuge Golf Club in Oak Grove, Minnesota.



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 - Pesticide Exposure in Turfgrass Areas
- **Dr. Jennifer Grant from Cornell University**
 - Using and Marketing IPM programs in lawn care
- **NR 151 Workshop: Nutrient Management Plans for Turfgrass Areas**
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Questions from the Floor

By Dr. R. Chris Williamson, Department of Entomology, University of Wisconsin-Madison

How do you explain the sporadic distribution/occurrence of Japanese beetle activity and damage this year? Waukesha County

Although Japanese beetles are widespread in Wisconsin, their distribution or occurrence is readily influenced by soil moisture. If you recall, the majority of Wisconsin was deficient in rainfall from the early spring through late July. Due to their strategic behavior, Japanese beetle females typically seek out areas of turf or ground cover that have sufficient soil moisture to lay their eggs. Consequently, irrigated turf areas such as golf courses are often the most vulnerable turf areas when dry conditions exist. This is likely the reason that you observed such a sporadic distribution of Japanese beetles this year.

Considering the substantial rainfall (>18 inches in less than three weeks) that occurred in August, what impact will it have on my preventative white grub (Japanese beetle) insecticide treatment that I made in late June? Dane County

Three of the four commercially available, preventative white grub insecticides are from the nicotinoid insecticide class. Some nicotinoids have physical characteristics that are more favorable for movement with water. Consequently, such products may be more susceptible or likely to move via excessive rainfall. Unfortunately, I am not aware of any published data that addresses this question. Thus, it important to closely monitor or inspect the areas of turf that were treated with a nicotinoid insecticide such as clothianidin (Arena), imidacloprid (Merit), or thiamethoxam (Meridian). I have not observed any problems or issues associated with excessive moisture on nicotinoid performance in any of my research studies this year.

Ants were particularly bad this year compared to most, especially prior the ample rains in August; why were they so bad this year? Sheboygan County

The ant species most commonly associated with turf is *Lasius neoniger*, a.k.a. the "turfgrass ant." The turfgrass ant is most common in drier, well-drained sandy soils that have low water holding capacity. Again, much of Wisconsin was deficient in rainfall from the early spring through late July. As a result, conducive conditions resulted in increased ant activity.

Emerald ash borer (EAB) was discovered less than 40 miles from the southern Wisconsin border; when do you expect EAB to be found in Wisconsin?

Kenosha County

The greatest potential threat for movement of EAB into Wisconsin is via EAB infested firewood. This is not to say that EAB infested nursery stock or other ash materials are not important, but many of the EAB infestations discovered in Indiana and Illinois have been linked to EAB infested firewood. The Wisconsin Department of Agriculture, Trade and Consumer Protection and Department of Natural Resources have been actively communicating the strong message of NOT bringing firewood (all hardwood species) into Wisconsin from out-of-state. Hopefully, people will take this request seriously so that we can keep EAB out of Wisconsin! 🌱

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