# Hole Notes

The official publication of the MGCSA

# The Scramble!

Vol. 46, No. 4 May 2013

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## *Upcoming Events*

***June 3rd***
***The Scramble***
***Medina Golf and Country Club***
***Host Erin McManus***

***August 13***
***The Championship***
***Prestwick Golf Club***
***Host Dave Kazmierczak, CGCS***

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**Hen House Habitat at Brackett's Crossing**

## June 1st Scholarship Deadline

**Cutural Practices to Limit Pesticide Runoff Research you can use by Dr. Brian Horgan on pages**

## ...Even More Content...



**Hole Notes** (ISSN 108-27994) is digitally published monthly except bimonthly in November/December and January/February by the Minnesota Golf Course Superintendents' Association, 10050 204th Street North, Forest Lake, MN 55025. Jack MacKenzie CGCS publisher. Please send any address changes, articles for publication, advertising and concerns to jack@mgcsa.org.

# Presidential Perspective

by Scottie Hines, CGCS

Here we are at the end of May. I feel like the season has just started and I cannot believe how far behind I seem to be. How does this happen so fast? We just can't seem to catch a break with the weather. If it isn't raining sideways, it's 90 and blowing. If it isn't 90 and blowing, it's 63 and ugly out. It really seems we are trending to have a year of extremes. Not exactly what we need as many of us are trying to get some recovery of fine turf and just get caught up. I am anxious to see what all this does to the drought monitor.

It is times like this it is easy to forget about the important things in life. I do not know who wrote the following or if it really happened. I have it printed and look at it from time to time to remind myself of the important stuff. Enjoy:

***A professor stood before his philosophy class and had some items in front of him. When the class began, he wordlessly picked up a very large and empty mayonnaise jar and proceeded to fill it with golf balls.***

***He then asked the students if the jar was full. They agreed that it was.***

***The professor then picked up a box of pebbles, poured them into the jar and shook the jar lightly. The pebbles rolled into the open areas between the golf balls.***

***He then asked the students again if the jar was full. They agreed it was.***

***The professor next picked up a box of sand and poured it into the jar. Of course, the sand filled up everything else.***

***He asked once more if the jar was full. The students responded with a unanimous 'yes.'***

***The professor then produced two bottles of beer from under the table and poured the entire contents into the jar effectively filling the empty space between the sand.***

***The students laughed.***

***'Now,' said the professor as the laughter subsided, 'I want you to recognize that this jar represents your life.***

***The golf balls are the important things - your family, your children, your health, your friends and your favorite passions - and if everything else was lost and only they remained, your life would still be full.***

***The pebbles are the other things that matter like your job, your house and your car.***

***The sand is everything else - the small stuff.***

***'If you put the sand into the jar first,' he continued, 'there is no room for the pebbles or the golf balls.***

***The same goes for life.***

***If you spend all your time and energy on the small stuff you will never have room for the things that are important to you.***

***Pay attention to the things that are critical to your happiness.***

***Spend time with your children.***
***Spend time with your parents.***
***Take your partner out to dinner.***
***Play another 18 holes of golf.***
***There will always be time to clean the house and fix the disposal.***
***Take care of the golf balls first---the things that really matter.***
***Set your priorities. The rest is just sand.***

***One of the students raised her hand and inquired what the beers represented.***

***The professor smiled and said, 'I'm glad you asked.'***
***The beers just show you that no matter how full your life may seem, there's always room for a couple of beers with a friend.***

I think that about sums it up. In fact, I think I will put a mayonnaise jar filled with golf balls on my desk, maybe on the book shelf at home to keep me a bit more grounded when I feel like I do right now.

Best of luck in 2013



*The Legends at Giants Ridge*

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# In Bounds

by Jack MacKenzie, CGCS

***Water fees dropped from environment budget bill***

***Posted at 1:26 PM on May 18, 2013 by Tom Scheck, Minnesota.publicradio.org***

***A plan that would have increased water fees to pay for increased monitoring of the state's groundwater is off the table. The conference committee on the environment and ag budget bill scrapped the water fees, but the monitoring will be done with money from the state's general fund.***

Fine turf managers, environmentalists to their core, across our region have been expecting an increase in pressure to conserve water for quite some time as the awareness and appreciation for the quality and quantity of this finite resource grows among state agencies and in the legislature. The economist within feels spared. However the greater problem still remains. *How does the golf industry respond to long term water management challenges?*

In general our state, "land of 10,000 lakes", currently has issues with the quantity of water available at any given time. Surface water, which is visible and measurable and can be recycled within the surface system, provides the majority of water to users in the state, the greatest of which is power generation that utilizes 65 % of both surface and aquifer sources. The bulk of water consumed for municipal use, agriculture, mining and yes, golf course irrigation, is from aquifers deep in the ground.

These storage systems are a mystery as they are only *estimated* in size and perhaps more importantly it isn't completely known as to *how they* are recharged.

Simply put, surface water seeps into the aquifers over time. As the population in our state grows, more impermeable surfaces are created, agricultural properties expanded with increased drainage and wetlands are filled in to accommodate the growth. Rather than 'seeping' into below ground aquifers, the surface water is redirected…eventually out of our state and either north to Hudson Bay, east to the

Atlantic Ocean, or south to the Gulf of Mexico.

The bulk of the water pulled from 'our' aquifers is used once and then drained away to a creek or a stream and finally into a river.

*How does the golf industry fit into the equation?* Golf is always positioned low on the water allocation totem pole.

Perceived as a game for the wealthy (even though over 90% of rounds are at public golf facilities), golf courses are considered recreational and non-productive (although a 2.3 billion dollar state industry) natural disaster zones (yet the benefits of open space are well documented) and also significant water wasters. This mind set is almost institutional in nature.

The only way to change these perceptions is to promote the reality of the greater good of golf courses through education and demonstrate stewardship through water conservation and realistic crisis management plans. This is especially true when water, our most critical resource, becomes seasonally scarce. Steps toward this end have already begun through the creation of the Golf Industry Environmental Stewardship Committee, a coalition of representatives from the MGCSA, MGA, MPGA, CMAA and MWGCOA.

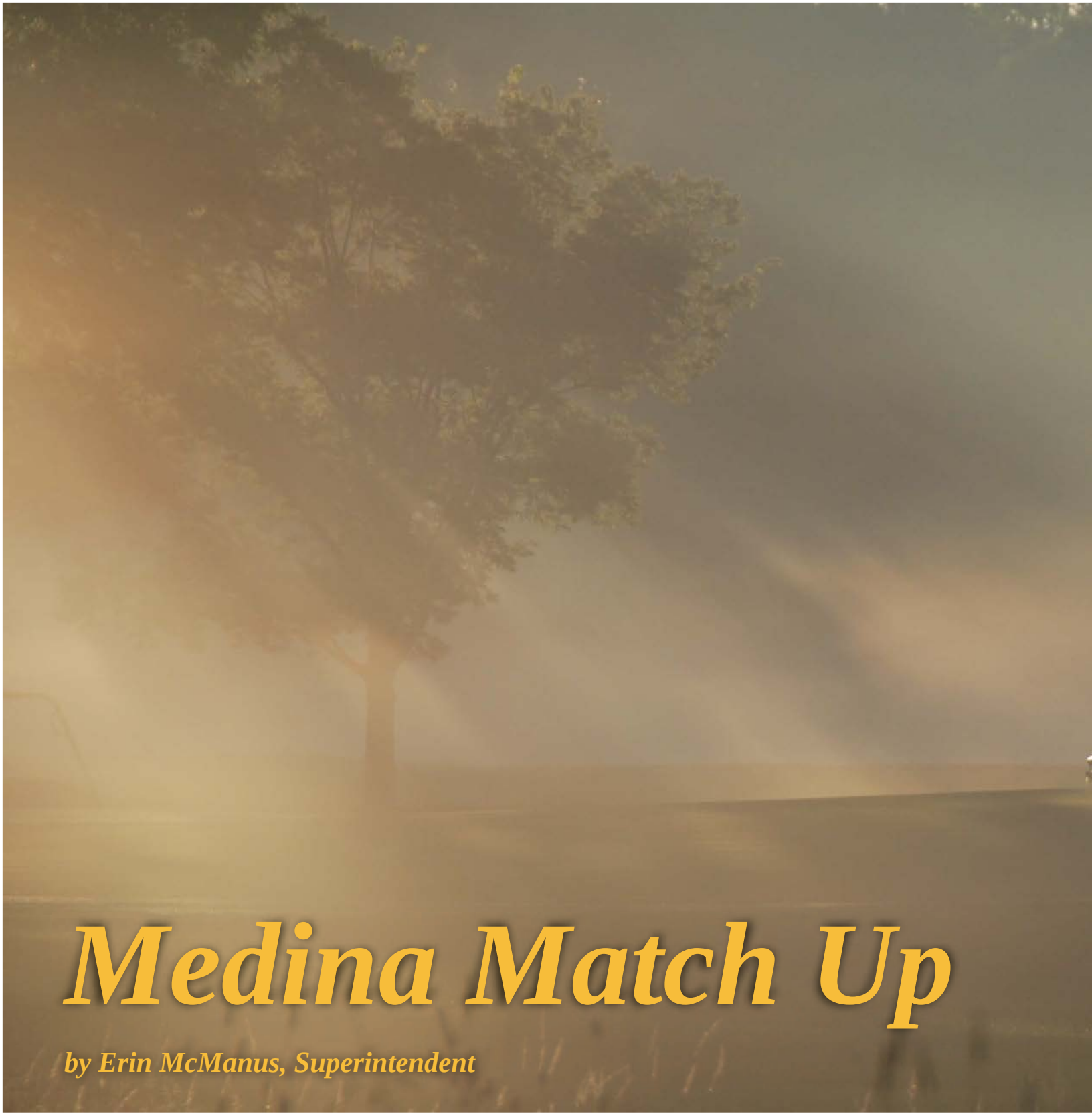
Unfortunately these groups do not represent all of the courses in the state, all those employed in the golf industry or all players of the game. Our allied partners can/will be responsible for their sectors in the industry, however, we, the MGCSA, must be dedicated to enlisting 100% support of conservation initiatives by 100% of the members in the MGCSA.

Our efforts, which will be tested in the next legislative session, will be for naught if we can only claim or demonstrate a 65% participation or support rate. Who in their right mind would think 65% is "good enough"? Especially when dealing with a commodity such as water or the environment.

Your Board of Directors and the active Committees are just as busy as you are and yet have made time to support the golf industry. Think about what you can do to prepare for political action, recruit a new member or develop a water crisis management plan. The fate of golf course management, as you know it, truly is in your hands.

Proper planning will make a positive for the golf industry. The MGCSA, appreciates your support in the upcoming initiatives for the good of the game.

***Figures in this column came from the 2006 MGA Golf EIS and DNR publications.***



# Medina Match Up

*by Erin McManus, Superintendent*

"Rolling Green Country Club" was built in 1968 by Architect Charles Maddox. The Championship course has gone through several renovation projects starting with a new Clubhouse in 1999 and a drainage and bunker renovation in 2003-2004. Hartman Companies completed the bunker and drainage renovation in 2004 and in 2006 the membership voted to change

the name of the club to Medina Golf and Country Club.

Medina Golf & Country Club is a first rate country club with all the golf components. Our Championship 18 hole course features larger than normal, undulating greens that challenge golfers of all abilities. We are able to set up a very challenging course extending the length to over 7300 yards but will

probably play the “Scramble” at closer to 6500 yards. The golf course is pretty straight forward off the tee with the front being a little more open than the back nine. The large undulating greens can be a challenge if you are left with a putt of over 100 feet. There are several greens that are 40 yards deep and they can present some double breaking difficult putts. The bunkers are flat bottomed and generally guard both the front right and front left of the green complex. Playing you approach shot to the middle of the green, can help you avoid some of the sloping areas of the greens.

I have been at the club since the spring of 2004 and took over as Superintendent in 2009. Troy Tschida, my assistant, worked at the club for several years before moving over to Woodhill Country Club. Troy came back to work for me at Medina in 2010 and has been a great asset to the club. Shaun Hill, Equipment Technician, came to Medina in 2010 to take over for longtime mechanic Doug Swift. We have a moderate staff of 12-15 employees that are seasonal full time and seasonal part time.

***Right: #10 at Medina Golf and Country Club is a slightly downhill par 4. It is the 6th handicap hole with water off the tee to the right. The green is undulating and is very receptive to shots into the middle of the green. It plays 394 from the Blue tees.***

# Benefits of Membership in the MGCSA

**MGCSA.org:** The MGCSA provides its membership an electronic destination. The site offers a broad range of services including latest news, meeting information, important links, local association contacts and meeting schedules, as well as a market place for used equipment or student internships. Links are provided to the Affiliate Members who advertise on the web site.

**Education:** The MGCSA provides a range of high quality discounted professional education with more than 100 hours of relevant classes at the Northern Green Expo in January each year, supplemented by an extensive program at the Mega Seminar, as well as the annual MGA Spring Turf Forum.

**Research:** The MGCSA coordinates with researchers at the University of Minnesota's TROE Center to make sure you get the information you need. The association also directs Turfgrass Research Benefit Week, the annual sale of donated tee-times, to raise money for golf turfgrass research. And the association also contributes to The Turf Endowment fund to ensure a continuing program at the University of Minnesota.

**Government Relations:** The MGCSA provides access to the State Capitol through a continued relationship with the Minnesota Golf Association and other Green Industry Allies. This service keeps your association aware of issues likely to affect golf as they emerge rather than after the fact. This proactive presence also helps us educate legislators and regulators by providing solid information and research findings as they strive to make sound decisions for the good of the whole community. The MGCSA has representation at the Minnesota Nursery and Landscape's 'Day on the Hill' event.

**Hole Notes Magazine:** The MGCSA provides an award winning professional golf course superintendent association journal. Published ten times each year in a digital format, Hole Notes strives to provide relevant, interesting information that reflects the personality and professionalism of the membership. Links are provided to the Affiliate members who advertise in the magazine.

**Membership Directory:** At the Member's Only section the MGCSA provides an annually updated listing of names and contact details for every member of the association. This electronic directory puts each within fingertip reach of around 700 allied professionals across the region.

**Employment Referral Service:** The MGCSA provides a link between the people with jobs and those who want them. The employment referral service is available on-line at MGCSA.org as well as electronically delivered weekly through 'e-updates'.

**Email Alerts:** The MGCSA uses the internet to provide updates and alerts on urgent matters as they arise so we remain current with issues that may effect you, the industry and the Association.

**Scholarships:** The MGCSA extends its support to the next generation through an annual scholarship program to assist children and grandchildren of superintendents who have achieved academic excellence.

**Wee One Support:** The MGCSA annually hosts a Wee One fund raising golf outing with the proceeds going to support this outstanding program that serves those in the goof course turf management industry.

# Get ‘er Done!

**From the Team at Brackett’s Crossing**

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HENHOUSE!!!

MINNESOTA GOLF COURSE SUPERINTENDENTS' ASSOCIATION

# Presents "*The SCRAMBLE*"

# AT MEDINA Golf and Country Club

## MONDAY, June **3**, 201**3**

**Medina**, Minnesota

HOST SUPERINTENDENT: **Erin McManus**

This is a combined scholarship/research fundraising event. Proper golf attire required. $120 entry fee (per person) includes lunch, research donation, range balls, cart fee, and heavy appetizers. The format is a scramble and open to all members with emphasis placed upon inviting your club officials to join in the fun. Prizes from the Pro Shop will be based upon participation.
A 50/50 skins game for $50 per team. 50 percent of which goes to the Reseach and Scholarship funding.
Join the fun, it won't be the same without you!!!

FORMAT: FOUR-PERSON SCRAMBLE

| | |
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| 11:30 - 12:45 p.m. | Registration – Driving Range available, lunch |
| 1:00 p.m. | GOLF - Shotgun |
| 5:30-7:00 p.m. | Reception and heavy appetizers<br>(Dinner tickets available for $60 ea. -- includes donation.) |

---------- REGISTRATION FORM ----------

PLEASE FILL OUT COMPLETELY. THE DINNER COUNTS ARE IMPORTANT.

| NAME | CLASS | GOLF COURSE / COMPANY | GOLF - $120 ea. | DINNER ONLY - $60 |
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REGISTER: ___ GOLFERS @ $1**2**0 ea (Golf, dinner, donation, range balls, cart) ___ NON-GOLFERS @ $**6**0 ea. (Dinner, donation)

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REGISTRATION DEADLINE: **May 2**7, 201**3**

# Minimizing Tree Risks in Public Spaces

Gary Johnson
Professor, Urban and Community Forestry
University of Minnesota Extension, Department of Forest Resources

In the two previous parts of this three-part series on managing tree risks in public spaces, the principles of tree defect detection, identifying and ranking hazardous situations that involve tree defects, and developing a logical and professional approach to monitoring trees in public spaces were promoted as critical elements of a risk management program. Now, the final part: minimizing the risks to an acceptable level. Minimizing risks is a combination of instituting some maintenance practices and avoiding others that can create harmful situations.

***Large tree size only produces unacceptable risks in small spaces.***

**One: Zero Risk Management is not Possible.**

I know what you're thinking. "Sure it is…cut down all of the trees!" That's as logical as removing all streets and paths to control traffic risks, all electrical services to eliminate risk of electrocution, and draining all lakes and ponds to create a landscape with no risk of drowning. Every single service, every part of open space infrastructure presents some level of risk. The smart

***Whether the area around the tree trunk is mulched or kept clean with an herbicide, it removes the necessity of mowing or line trimming near the tree and therefore the chance of unintentional wounding.***

and effective manager is the one who minimizes the critical risks to a level that is acceptable to the users of the park, campus or golf course.

**Two: Profile and be Proactive.**

***Profile 1: Decay*** is the number one, pre-existing condition that leads to predictable and unpredictable failures during loading events (wind, ice, snow) or "silent weather." Since it's so common and unforgiving, avoiding or minimizing decay should be part of the management plan. Decay begins with wounding a plant: roots, trunks, branches…all are vulnerable to wounding and decay. Decay reduces the static and dynamic strength of woody tissue and the heavier the woody tissue, the greater the likelihood of failure and resulting damage or injury.

In managed landscapes, the most common causes of wounding can be traced back to maintenance practices that result in unintentional damage to trees. Repeated wounding from lawn mowers and line trimmers ranks as the most common wounding. However, this wounding has the simplest solution: remove the reason for mowing or line trimming close to tree trunks. A mulch ring around the tree trunk works well. If the landscape manager cannot tolerate mulches interrupting the turf, then a band of barren soil around the tree trunk works well using glyphosate or a similar and safe herbicide.

***Good grief! Look at the size of those pruning wounds!!! If those branches had been removed 10 years ago, the wounds would have been minimal.***

**Keep it small and not too close.** Oddly enough, the second most common cause of tree wounding is *intentional:* Pruning! Pruning, like anything else can be helpful or harmful. To minimize the wounds left by pruning, prune when the trees are young and/or the branches are small. Branches that are less than four inches in diameter leave relatively small wounds and smaller opportunities for decay to become a problem. Aim for the smallest wounds possible while still removing undesirable branches.

Never wound tree trunks or main branches. If the pruning wound can be restricted to only wounding the removed branch, the chance of decay spreading into the tree trunk is minimized.

***Profile 2: Weak branch attachments*** can result in nasty headaches, holes in roofs and lost trees. Remove any branches that develop attachments with *included bark,* the true signal that the attachment is weak. Included bark attachments lack the full tissue attachment that a normal branch

attachment has because bark is squeezed down into the union between the branch and the stem. The earlier the offending branch is removed, the smaller the wound and the less likely any damage will result from a split out tree in a wind storm.

Weak attachments and multiple leaders are even more dangerous and more prone to cause grave damage when the tree matures. No large tree should have multiple leaders (well-attached or not) lower than 15-20 feet above the ground. Removing all but one leader when the tree is young and malleable prevents future damage to the landscape and the tree.

***Above, small branches leave small wounds.***

***On the right, note the small wound made to the branch only on this pruning cut. Removing branches "flush" with the tree trunk leads to decay in the heaviest and most dangerous part of a tree.***

*Strong Crotch*

*Weak Crotch*

***Split Crotch!!!*** ***If this tree would have been trained to a single leader, had the branches with included bark attachments removed when it was young, it would now be healthy, large, relatively safe and useful instead of …removed.***

*A littleleaf linden with stem girdling roots forming below the surface of the lawn. More than 14 inches of the tree trunk was below ground.*

*In a thunderstorm, this littleleaf linden snapped off at a SGR several inches below ground. Photo credit: Dave Hanson.*

***Profile 3: Dysfunctional root systems*** cause most of the tree failures in public spaces. Stem girdling roots (SGRs) are literally roots that fully or partially girdle (aka, squeeze/compress) tree stems and create weak points. Most SGRs occur below ground so the simple corrective action is to avoid something…don't bury stems. If stems aren't buried, SGRs won't be a problem.

The second-most common cause of dysfunctional root systems in trees is due to the partial loss of a root system. With rare exception, this partial loss is due to some type of construction activity: trenching, excavation, sidewalk and curb repair. A tree's overall stability relies on a balanced root system, one that radiates out extensively. If part of that system is removed for any reason, the tree becomes unstable. The larger the tree, the more unstable it becomes with root loss.

To prevent this damage, minimize or avoid any activity that cuts roots from a depth of 12 inches to 3 feet within the drip line of the tree. If this cannot be avoided and the trenching, excavation or root cutting will be on two or more sides of a large tree, remove the tree before the construction or trenching is done to avoid harm to the landscape or people.

***This tree will not stay vertical as it gets larger or if a wind storm hits this town…and it doesn't take a degree in physics to phygure this one out!***

***If this type of damage cannot be avoided, a risk management plan would call for the removal of these unstable trees.***

**Three: A summary of Do's and Do Not's.**

**Do:** Keep grass away from tree trunks, either with mulch or herbicides.
Prune trees when they are young.
Make the smallest pruning wounds possible.
Prune and wound only branch tissue.
Remove all leaders but one on trees that will become large.
Remove all branch attachments with included bark.
Keep trees healthy. Healthy trees always are more tolerant and recover much better.

**Do Not:** Wound tree trunks with mowers, line trimmers, nails, chains
Wait until trees are large to prune them.
Prune branches flush to the tree trunk (aka, flush-cut).
Bury tree stems, either at planting time or during grading operations.
Remove support roots within the drip line of a large tree.
Keep large trees that have had their support roots severely

***The MGCSA wishes to acknowledge and thank Gary Johnson for his three part series on proper tree maintenance and risk management. Trees, while beautiful and great contributions to the golf course environment, can pose serious threats if not maintained properly.***

Wee One Foundation

A tribute to Wayne Otto, CGCS

# *The Wee One*

## October 7th, 2013 at Brackett's Crossing

## Making life easier for a peer in need

# Got Green?

# Steps to Maintaining Algae-Free Po

**By Mark Koepsell, Healthy Ponds from Bioverse.**

Here's the scenario; initially in the spring an inspection of your ponds finds them crystal clear and looking good. But just around the corner a beast is growing and that beast is algae. It starts out around the edges of the pond and as the season continues and the weather warms the beast just continues to grow. Algae is caused by a nutrient overload present in your pond. Grass clipping, leaf debris, animal and fish waste fill into your pond and become decaying organic matter. The algae feeds on this matter and reproduces to a noticeable green scum that takes away from the natural beauty of the pond. Now what do you do?

The solution to this problem is to reduce the nutrient level in your pond.

photo credit Andy Keyes, Assistant Superintendent at The Meadows at Mystic Lake

An effective way to accomplish this is to treat your pond with Healthy Ponds AquaSpherePro, or a similar product, containing beneficial bacteria and enzymes that break down the organic waste and reduces the excess nutrients in the water.

The following is an example of a typical treatment plan for a typical pond:

1. Determine the type of algae that is present.

   Filamentous Algae – appears to be green clumps collecting around the water's edge. When pulled from the water it appears and feels hair-like.

   Planktonic Algae – appears like pea soup in the water.

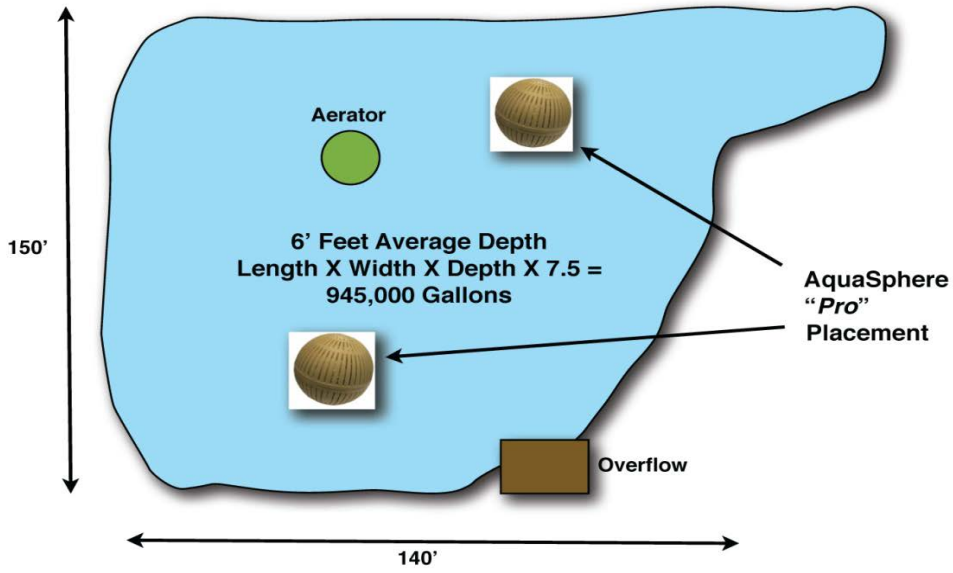
2. Determine the correct amount of water in the pond to be treated. While

over treating a pond will have no adverse effect, under-estimating, and thus under-treating, will not achieve the desired results. To determine the correct amount of water use the following formula: Length x Width x Average Depth x 7.5

3. Treat with appropriate size and number of spheres. It is important to apply the proper amount of beneficial micro-organisms. For that reason Healthy Ponds has a variety of sized AquaSpherePro products to treat your pond.

**Typical Lake Treatment**

**150' x 140' Lake Treatment**
Total Gallons: **945,000 Gallons**
Treat for: **1,000,000 Gallons**
First Treatment: Vista 4 packs (each water soluble packs treat 250,000 gallons)
First Treatment: Aquaspheres 2
Treatment Additional Months: 2 AquaSpheres per month.
Typical Treatment for North Texas is February through October.




Typical Pond Treatment Plan

Factors Affecting Performance:

- Ponds using aeration systems will see an even greater impact when using an all natural product with beneficial bacteria and enzymes.
- Large ponds can be quite irregular in shape. You will get better results if the beneficial bacteria and enzymes are distributed throughout the pond.

- Ponds subject to periodic loading of nutrient rich runoff through turf fertilization, frequent rainstorms may require additional treatment requiring a stronger dose of bacteria.
- Very shallow ponds may require additional treatments.
- Irrigation ponds require additional treatment to compensate for the turnover of water.

Ponds are like people, they are all different. Not every pond responds to the same treatment program. It is important to keep as much debris out of the pond as possible and to monitor the pond on an ongoing basis. Each pond has its own issues that need to be addressed to determine the most effective treatment plan.

"Got Duckweed?" Look for my next article later this season on Aquatic Weed control.


# Evaluation of Core Cultivation Practices to Reduce Ecological Risk of Pesticides in Runoff from Turf

***Runoff studies were carried out to identify which core cultivation practice, solid tine or hollow tine, maximized pesticide retention at the site of application. Measured quantities of pesticides in the edge-of-turf runoff and characteristics of a local golf course were used to calculate pesticide concentrations in a surface water receiving turf runoff. Surface water concentrations of pesticides were compared to published toxicity data. Identifying management practices that reduce pesticide loss with runoff will improve disease and pest control in turf while minimizing undesirable environmental effects associated with the off-site transport of pesticides.***

Contributed by:

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**Summary**

Pesticides associated with the turfgrass industry have been detected in storm runoff and surface waters of urban watersheds; raising concern of their potential environmental effects and a desire to reduce their transport to non-target locations. Runoff studies were conducted to compare the effectiveness of solid tine versus hollow tine core cultivation to reduce the quantity of pesticides transported with runoff from creeping bentgrass (*Agrostis palustris*) turf managed as a golf course fairway. The concentration of pesticides anticipated in a surface water receiving the runoff were calculated using data from this study and runoff volumes and pond dimensions recorded from a local golf course. Surface water concentrations were compared with levels known to be harmful to aquatic organisms. Key observations of the study were:

- Runoff volumes were less from turf managed with hollow tine compared to solid tine core cultivation.
- Greater quantities of pesticides were transported off-site with runoff from turf managed with solid tines.
- Concentrations of pesticides in a pond receiving runoff from turf managed with solid tines exceeded levels harmful to eight of nineteen aquatic organisms evaluated.
- Replacing solid tine with hollow tine core cultivation reduced surface water pesticide concentrations to levels below harmful concentrations for most of these organisms.

***Figure 1. Creeping bentgrass turf managed with solid tine (A) or hollow tine (B) core cultivation. Cores removed with the hollow tines were air dried and worked back into the turf prior to pesticide application and simulated precipitation.***

## Text

Pesticides are applied to highly managed biotic systems such as golf courses, commercial landscapes and agricultural crops. Golf course turf often requires multiple applications of pesticides at rates that exceed those typically found in agricultural or home environments (1,2). Pesticides associated with the turfgrass industry have been detected in surface waters of urban watersheds; leading to increased suspect of contaminant contributions from residential, urban, and recreational sources (3-7).

Fairways comprise approximately one-third of a typcial golf course (8), which may border surface waters such as ponds, streams, and lakes. Golf course fairways and greens may be managed with core cultivation during the spring or fall to control thatch, alleviate surface compaction, enhance water infiltration, and stimulate root and shoot growth (9-14). Cultivation with hollow tines typically involves removing cores from the turf, which are air-dried and brushed back into the open holes. Solid tine core cultivation requires a reduced amount of labor and is less disruptive to the surface of the turf but is believed to cause localized compaction (15).

Management practices have been shown to reduce runoff and pesticides transported with runoff from agricultural crops (16-18). Research on turfgrass has also shown the influence of cultural and irrigation practices on nutrient and pesticide transport with runoff and leachate (19-26). The goal of the present study was to identify which core cultivation practice, solid tine or hollow tine, maximizes pesticide retention at the site of application; thus improving desired results of disease and pest control in turf while minimizing undesirable environmental effects associated with the off-site transport of pesticides.

## Runoff Study Site

Experiments were conducted on turf plots managed as a golf course fairway at the University of Minnesota, Saint Paul, MN, USA. The site (Waukegan silt loam) was divided into 6 plots (24.4 m x 6.1 m, length x width) and sodded with L-93 creeping bentgrass (*Agrostis palustris* Huds.) sod 14 months prior to initiation of the reported studies. The turf was managed as a fairway with 1.25 cm height of cut (three times weekly, clippings removed), topdressed with sand (weekly, 1.6 mm depth) and maintained with sprinkler irrigation.

***Figure 2. A commercially available insecticide, fungicide, and herbicide were tank mixed and applied at label rates to all plots perpendicular to runoff flow; 63 d and 2 d following core cultivation and 26 ± 13 h prior to initiation of simulated precipitation and runoff.***

Runoff collection systems were constructed at the western end of each plot, modified from the design of Cole et al. (21). Water traveled from the runoff gutter to a stainless steel flume equipped with an automated sampler and flow meter. Gutter covers and flume shields prevented dilution of runoff with precipitation. Plots were hydrologically isolated with removable berms.

**Management Practices**

Plots were aerated twice (June 21$^{st}$, Sept 28$^{th}$) with either solid tines (ST: 0.95 cm diameter x 11.43 cm length with 5 cm x 5 cm spacing) or hollow tines (HT: 0.95 cm internal diameter x 11.43 cm length with 5 cm x 5 cm spacing) and top dressed weekly with sand (Figure 1). Cores removed with the hollow tines were allowed to dry, broken into smaller pieces, and worked back into the turf. A back-pack blower and leaf rake removed the turf and thatch from the plot surface. Sand top dressing was not performed immediately after core cultivation or within a week of simulated precipitation and generation of runoff.

## Pesticide Application and Simulated Precipitation

A rainfall simulator was constructed to deliver precipitation similar to natural rain (27) (Figure 2). Measured rainfall rates were similar to storm intensities recorded in Minnesota, USA, during July through October. Prior to initiation of simulated precipitation (48 h), each plot was pre-wet with the maintenance irrigation beyond soil saturation to allow for collection of background samples and to ensure uniform water distribution. Irrigation water samples and resulting background runoff were collected for analysis. Petri dishes were distributed across the plots to verify pesticide application rates and rain gauges were distributed throughout each plot to quantify simulated precipitation. A commercially available insecticide, fungicide, and herbicide containing chlorpyrifos, flutolanil, mecoprop-p, dicamba and 2,4-D were tank mixed and applied at label rates to all plots perpendicular to runoff flow (Figure 3). Simulated precipitation was initiated 26 ± 13 h after pesticide application. Soil moistures were 46 ± 7% water holding capacity within 3 h prior to initiation of the simulated precipitation.

## Runoff Collection and Pesticide Analysis

Runoff water samples were collected using automated samplers equipped with a flow meter to recorded water level in the flume, calculated flow rates, reported total runoff volume and collected time-paced samples from each plot. Water samples were removed from the automated samplers and stored frozen until laboratory analysis. Concentrations of chlorpyrifos, dicamba, flutolanil, MCPP and 2,4-D were measured by direct injection of filtered samples onto a high performance liquid chromatograph with a photodiode array detector and quantified by direct comparison with external standard calibration curves of the analytical standards.

## Calculating Pesticide Concentrations in a Pond Receiving Turf Runoff

Pesticide loads (mg $m^{-2}$) in the edge-of-plot runoff were calculated from recorded runoff volumes (L $m^{-2}$) and measured concentrations (mg $L^{-1}$) of pesticides in the runoff. Pesticide concentrations in a body of water receiving the runoff was determined using characteristics of a golf course located less than 20 miles from our study site; including the volume (L) of a pond receiving runoff from a known area of the golf course ($m^2$); considering the percentage

***Figure 3. A rainfall simulator deliver precipitation resembling storm intensities recorded in Minnesota, USA. Runoff collection gutters guided runoff from the turf to flumes equipped with automated samplers and flow meters. Gutter covers and flume shields prevented dilution of runoff with precipitation.***

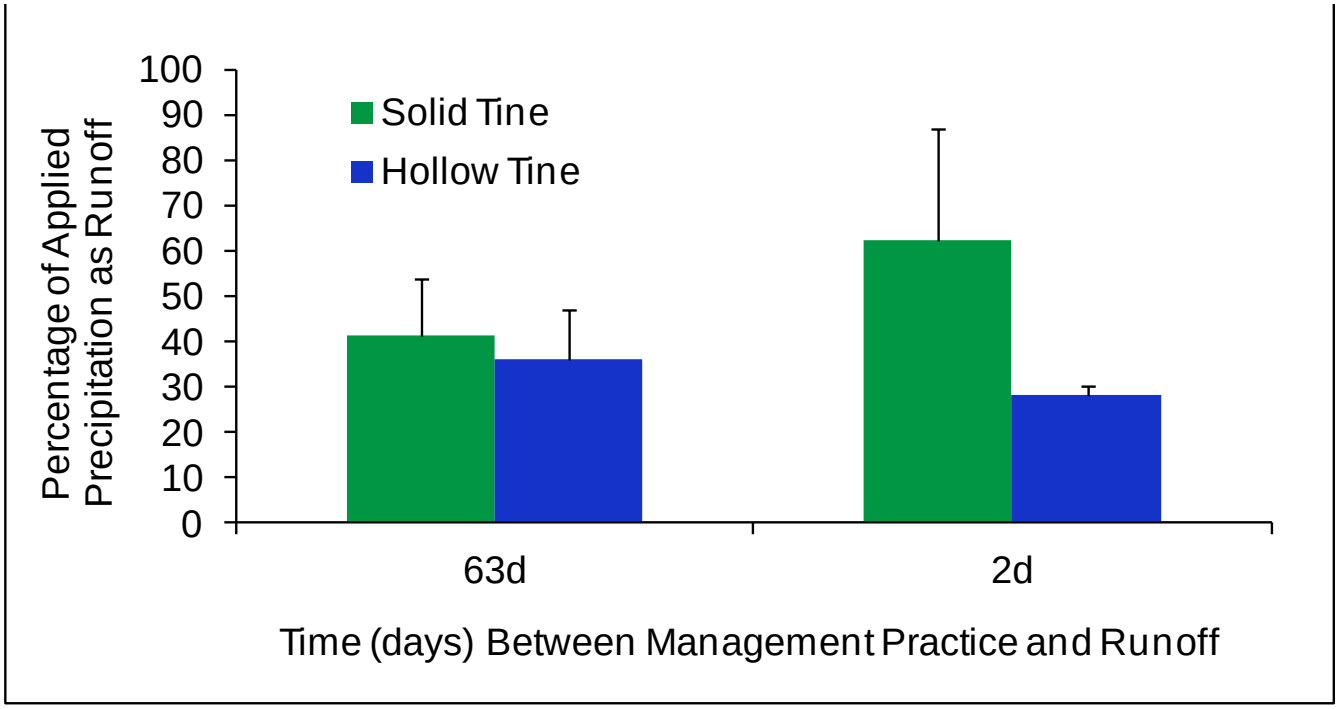
of that area represented by fairway turf. Estimated pesticide concentrations in a pond receiving runoff from fairway turf managed with solid tine or hollow tine core cultivation were compared to published toxicity data to evaluate which core cultivation practice would be the most efficient at reducing environmental impacts. A detailed description of the calculations, toxicity data and statistical analysis are provided elsewhere (28).

**Reduced Runoff Volume with Hollow Tine Core Cultivation**

Runoff volumes were reduced in fairway turf plots aerated with hollow tine compared to solid tine core cultivation. Although the period of time between core cultivation and simulated precipitation was greater for the first runoff event (63 d) than the second runoff event (2 d), due to a delay in the construction of the rainfall simulator, the overall trends observed between solid tine and hollow tine core cultivation remained the same; showing reduced runoff volumes with hollow tines for more than 80% of the samples (63 d = 81%, 2 d = 87%). Calculation of cumulative runoff volumes from

plots receiving core cultivation 63d prior to rainfall simulation demonstrated a 10% reduction in cumulative runoff volume with hollow tine (HT) relative to solid tine (ST) (HT = 3,149 ± 932 L; ST = 3,490 ± 1,107 L). A 55% reduction in cumulative runoff volume with hollow tine compared to solid tine core cultivation was observed when plot received core cultivation 2d prior to rainfall simulation (HT = 1,856 ± 139 L; ST = 4,164 ± 1,698 L). The percentage of precipitation resulting as runoff from plots aerated with hollow tines was less than quantities observed from the solid tine plots; suggesting greater infiltration with hollow tine core cultivation (Figure 4). Other researchers have measured enhanced water infiltration in turf managed with hollow tine core cultivation compare to untreated turf (29, 30) and greater saturated water conductivity and air porosity in turf managed with hollow tines compared to solid tines (15). The greatest difference in soil physical properties between plots was most prominent shortly after cultivation and diminishes with time as roots grow, compaction dissipates and holes are covered or filled; resulting in the greater distinction in runoff volumes between treatments at 2 d following cultivation compared to 63 d.

***Figure 4. Mean percentage of applied precipitation measured as runoff from turf plots managed with solid tine core cultivation or hollow tine core cultivation 63 d and 2 d prior to simulated precipitation and runoff. Error bars represent the standard deviation of the mean.***



## Reduced Pesticide Transport in Runoff with Hollow Tine Core Cultivation

The quantity of pesticides transported with runoff from solid tine plots exceeded that of the hollow tine plots. Plots receiving hollow tine core cultivation to manage thatch 63 d prior to runoff showed a 17, 15, 24 and 23% reduction in cumulative dicamba, flutolanil, MCPP and 2,4-D loads, respectively. Cumulative loads of chlorpyrifos were similar. Following the second core cultivation (2 d), hollow tine plots displayed an even greater reduction in cumulative pesticide loads relative to the solid tine plots with 46, 55, 37, 35 and 57% decline in cumulative loads of dicamba, flultolanil, MCPP, 2,4-D and chlorpyrifos (Figure 5). Correlation analysis of pesticide loads with runoff volumes and pesticide concentrations revealed pesticide loads were attributed to runoff volume more than chemical concentrations for both management practices (volume $r$ = 0.78 to 0.90, concentration $r$ = 0.05 to 0.22). This greater correlation of pesticide load with runoff volume explains in part the increased pesticide transport associated with the solid tine plots compared to hollow tine plots and the increased difference in pesticide loads between cultivation practices at 2 d compared to 63 d.

Hollow tine core cultivation removed the cores and returned the soil back to the turf while solid tine core cultivation pushed the soil aside to create the channels. As a result one would anticipate greater soil compaction with the solid tine cultivation and increased accessibility of soil adsorptive sites with the hollow tine cultivation. This would influence hydraulic conductivity and infiltration as previously reported (15, 29, 30) as well as pesticide availability for transport (25, 31, 32). The percentage of applied pesticides observed in the runoff is also influenced by the physical and chemical properties of the active ingredient. Chemical degradation was not influential in the present study as the time from chemical application to runoff (30 ± 8 h) was much less than the reported half lives of the compounds of interest (5 to 320 d).

## Reduced Risk of Pesticides in Receiving Surface Waters with Hollow Tine Core Cultivation

Calculated concentrations of pesticides in a pond receiving runoff from fairway turf managed with hollow tines or solid tines were compared with published toxicological endpoints for 19 aquatic organisms including fish, amphibians, mollusks, crustaceans, aquatic plants and algae (28). Toxicological endpoints included the median lethal concentration (LC50) and

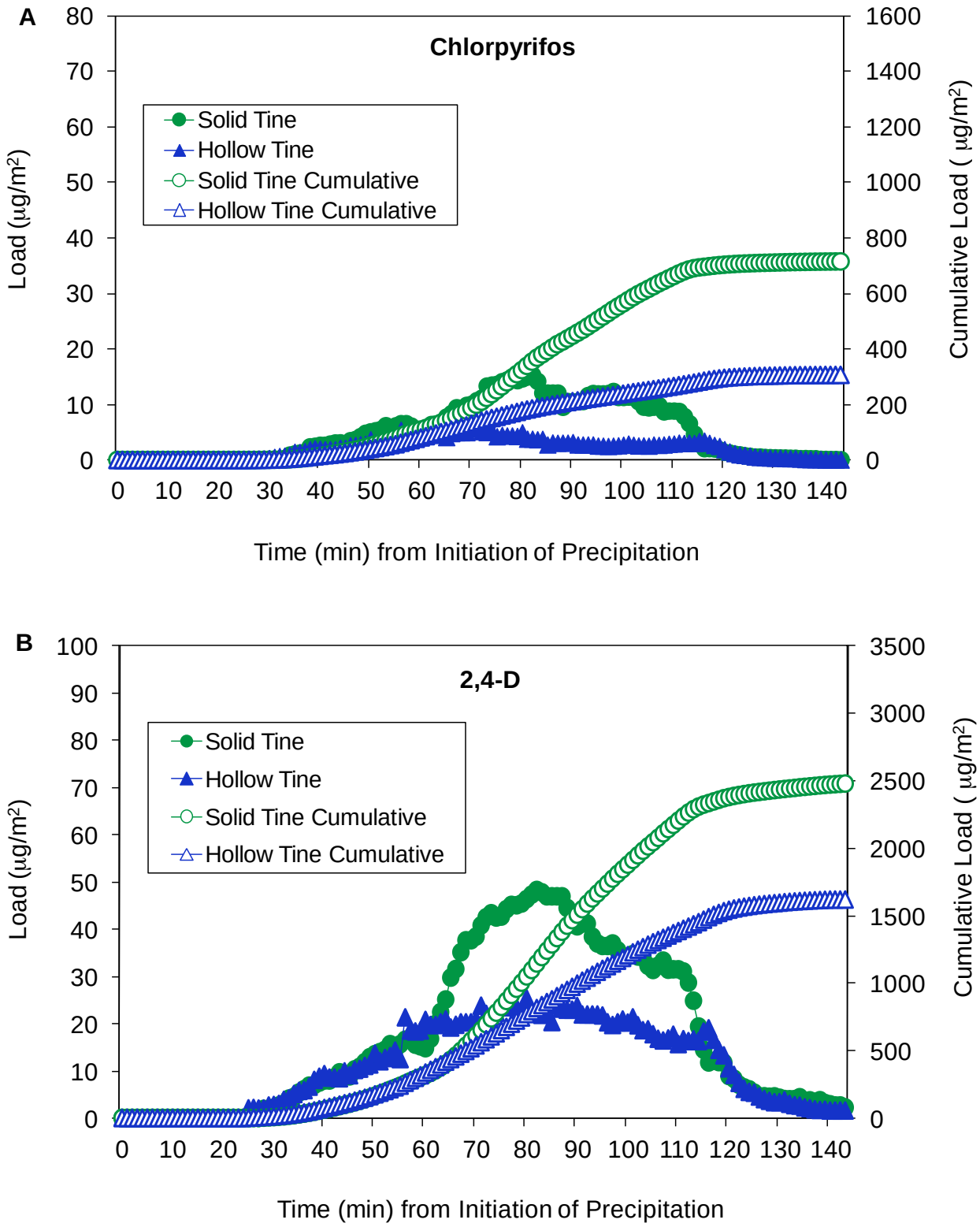



***Figure 5. Chemographs and cumulative loads of chlorpyrifos (A) and 2,4-dichlorophenoxyacetic acid (2,4-D) (B) and measured in runoff from turf plots managed with solid tines or hollow tines 2 d prior to simulated precipitation and runoff. Data for dicamba, flutolanil, and mecoprop-p (MCPP) at 2 d and all pesticides at 63 d are provided elsewhere (28).***

median effective concentration (EC50); or the concentration of a compound that results in the measured effect in 50% of the organisms during a defined exposure period. Pesticide levels in a surface water receiving runoff from turf managed with solid tines exceeded the LC50s or EC50s for eight of the 19 evaluated aquatic organisms. With a few exceptions at 63 d, replacing solid tine core cultivation with hollow tine core cultivation reduced surface water concentrations of chlorpyrifos to levels below the LC50 or EC50 for three fish (Figure 6A), MCPP to levels below the EC50 of a diatom (not shown), and 2,4-D to levels below the EC50 of an aquatic plant (Figure 6B). The sensitivity of rainbow trout, opossum shrimp and water fleas to chlorpyrifos and water fleas to 2,4-D was great enough that surface water levels exceeded the LC50s or EC50s regardless of the turf cultivation practice (ST, HT) (Figure 6A&B). Likewise, changes in management practice did not significantly influence the risk of pesticides to non-sensitive organisms (e.g. organisms who's LC50 is well above the maximum concentration estimated in the diluted surface water) (data not shown). Results of the present research provide quantitative information that will allow for informed decisions on cultural practices that can maximize pesticide retention at the site of application; improving pest control in turf while minimizing environmental contamination and adverse effects associated with the off-site tranpsort of pesticides. Using cultural practices that enhance infiltration and reduce runoff volume will effectively reduce pesticide runoff as demonstrated through the use of HT aerification.

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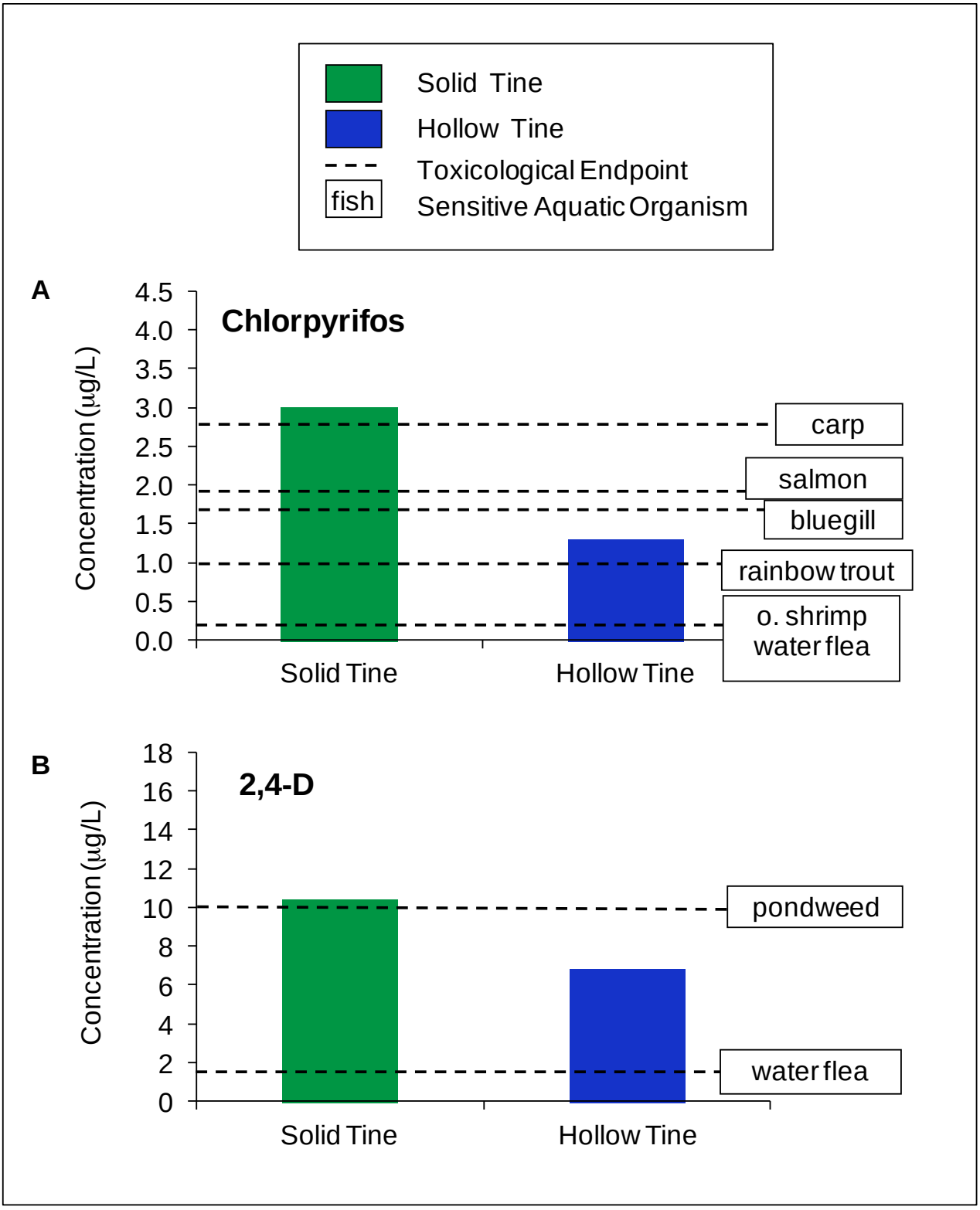


***Figure 6. Comparing concentrations of chlorpyrifos (A) and 2,4-dichlorophenoxyacetic acid (2,4-D) (B) in a surface water receiving runoff from fairway turf managed with solid tines or hollow tines 2-d prior to runoff with toxicological end points (median lethal concentrations or median effective concentrations) of sensitive aquatic organisms. Toxicity data available at http://cfpub.epa.gov/ecotox/ecotox_home.cfm.***

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**Selection of Recipients: Scholarship recipients are selected on the basis of academic record, potential to succeed, leadership and participation in school and community activities, honors, work experience, a statement of education and career goals and an outside appraisal. Selection of recipients is made by Scholarship Management Services. In no instance does any member of the MGCSA play a part in the selection. Applicants will be notified by the end of July whether they have been awarded or denied a scholarship.**

**Eligibility: Applicants for the MGCSA Legacy Scholarships must be: children/ grandchildren of Class AA, A, SM, C, D, Associate or Affiliate members who have been members of the MGCSA at least five years; High school seniors or graduates who plan to enroll or students who are already enrolled in a full-time undergraduate course of study at an accredited two- or four-year college, university or vocational-technical school, and under 23 years of age.**

**Awards: Three awards will be given to children and grandchildren of Class AA, A, SM and C members. One award of $1,500 in the name of Joseph S. Garske will be given to the highest evaluated applicant. That award will be renewable for one year contingent upon full- time enrollment and satisfactory academic performance. One other $1,000 award will be given to other qualified applicants from this group. One $1,000 award will be available to children and grandchildren of Class D, Associate and Affiliate members. These awards are not renewable. However, students may reapply to the program each year they meet eligibility requirements. Awards are for undergraduate study only.**

**Obligations: Recipients have no obligation to the MGCSA or its members. They are, however, required to supply Scholarship Management Services with current transcripts and to notify Scholarship Management Services of any changes of address, school enrollment or other relevant information. Except as described in this brochure, no obligation is assumed by the MGCSA.**

**Application Deadline: June 1, 2013. For more information go to mgcsa.org**

# Within the Leather

by David Kazmierczak, CGCS

I am a procrastinator. It is a character flaw that I have fought all of my life. Somewhere along the line, the piece of paper proclaiming never put off until tomorrow what can be done today never made it in my initial trapper keeper.

The flaw seems to accentuate itself to some exponential degree when it is something that I do not particularly care to do, or do not seem to have the time for. Just ask my wife of 22 years. She could probably fill an entire magazine full of instances of my procrastination, and those would only be the ones that brought her total consternation. Or is it constipation? I don't know, I think it's one of the two. Anyway, I believe at this point in life, she has accepted and come to terms with the garden variety procrastination. I she hadn't, I would be living at the shop out of necessity.

So, it with this admission/revelation, that I bring you this months' editorial column. Honestly? I have nothing. I always have wanted to be that guy who writes on hard-hitting topics with deep meaning, or exposing a new idea or shine light on a person who has done something brilliant or heroic or admirable. I am sure there are some of those stories out there, but I got none of them.

I have great excuses. Procrastinators are never short of excuses. Most of them currently center around the fact that we are trying to stuff two months worth of work into two weeks before Memorial Day weekend, the unofficial official start of summer. This is the time when a golf course in Minnesota should be rounding into peak condition. We are not even close. We are getting there at Prestwick, and we were pretty much spared the ravages of the awful winter savagery bestowed upon so many area courses (sorry, guys and gals), but we are not there yet.

Mix in a family matters, funerals, birthdays, a few more light excuses and I got no column ideas, content, nothing and I'm pretty sure Jack MacKenzie, the Publisher of this fine turf rag, needed my column yesterday. So I'm going to wing it with random thoughts on this silly business we love so much: Andy Rooney style….

Ever wonder why an irrigation head sticks on overnight in the wettest spot on the golf course. It never sticks on over that troublesome dry hump. And the probability of it sticking on is proportional to the importance of the day. Member-guest tournament- you bet; random Tuesday in April, 40 degrees, not a chance.

And while we are on the subject of irrigation, why is it the most likely irrigation box not to run overnight is the one that operates the first hole? And why is it usually on a Saturday? If it's the box on 18, I have time to run the dang thing before play starts. First hole? Pack a lunch.

And why is the irrigation head always pointing at my cart when I turn the thing on to check it? You would think with a 360 degree radius I'd have a pretty good

chance of not getting soaked, but I usually do. If I had the same results at the casino I have with the head saturating me, I'd be able to retire to Vegas. And even if I don't get it the first time, it seems the head turns off just after gracing my carryall with its liquid bounty.

Why is it golfers can't read? I know they can write and count to at least ten. I see their names written out, and numbers jotted on the scorecards I constantly pick up off the golf course. If Ted can write 8, 10, 6 why can't he read the sign that says carts on path only? I don't even think they understand arrows. They must think that means run me over, near as I have been able to ascertain.

Why are mechanics allergic to the beach? The mere mention of sand has made every single one I have ever worked with start to cough and wheeze. It must have something to do with the salt air.

Why is it geese instinctively know when it's men's day?

Why is the only day in the spring with low winds and zero percent chance of rain so that you can wreck havoc on that bumper crop of volunteer spring mums happen to be ladies day?

Explain to me why the pro shop insists on letting a single, two twosomes and another single out first thing in the morning when they know you are trying to verti-cut and topdress. Can't they all just play along together?

Is there really a reason why high school educated people cannot figure out how to load a towel dispenser in the employee bathroom? Or the toilet paper dispenser? I'm certain if left to their own devices, many a golf course crew would be paperless in a bad way. Mind you, these are the same people who are sent to operate equipment worth tens of thousands of dollars.

When did trees establish status akin to the Holy Grail? You would think by the reaction of some members that the old oak hanging over the 14th fairway obstructing half the whole was planted by God himself. To even consider the removing of such a treasure borders on a kind of blasphemy that violates the very essence of all things country club. I guess the next superintendent had better walk on water.

I am starting to be convinced that rocks now have to power to spontaneously leap in front of freshly sharpened mower blades, and that Fridays are their favorite day to do so, with any weekend or holiday a close second.

I am further convinced no matter how hard you try or what you do, the range tee will look like hell, and some golfer will always be there to let you know about it. And give you tips on what to do about it.

But in the end, at the start of every day, I can honestly think of no better job to have. There are always things that aggravate, always things that irritate but the reward of a well maintained golf course produced by a group of people pulling together for a common goal cannot be beat. As we all march into the summer season, be thankful of your course, your people and the opportunity to be a golf course superintendent. Have a great summer!