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Editor: Susan Barton, Extension Specialist, University of Delaware
The DNLA Newsletter is produced with the assistance of University of Delaware Cooperative Extension.
ASSOCIATION NEWS
Valann Budischak
Executive Director, D.N.L.A.

Seasons Greetings! The green industry never grinds to a halt. For some, this time of year may be a welcome break from the frenzy of spring and fall. However, for others it may be the calm before the trade show storm. January and February are “show time.” Suppliers and growers are bustling from trade show to trade show – exhibiting and meeting with customers. Many of our landscapers and garden center members attend the trade shows to place orders, and to catch a glimpse of “what’s new” to the industry. I hope you are planning to make the Delaware Horticulture Industry Expo & Annual Pesticide Conference one of your trade show/conference stops. The event will be held January 28th & 29th at the Modern Maturity Center in Dover. We’ve got a great line-up of speakers and topics you won’t want to miss. Pesticide, Nutrient Management and ISA recertification credits will be awarded both days. Event information is posted on our website or you can click here. A hardcopy will also be mailed.

On November 19th, the DNLA decided to step out of our comfort zone and offer a full day workshop with no pesticide recertification credits. In direct response to member requests for assistance with business skills such as technology, social media and finances, the DNLA commissioned Charles Vander Kooi of Vander Kooi & Associates of Littleton, CO to lead an Estimating & Bidding Workshop. The event was capped at 30 to allow a more intimate gathering where attendees could feel free to ask company-specific questions. To say it was success was an understatement. The DNLA strives to meet the educational needs of its members. If you have an idea for a class or workshop, please contact me.

Landscape Awards
The DNLA is a statewide program and our 2014 Landscape Award entries were representative of that. Judges traveled the length of Delaware in mid September to visit the entries while still in their prime. Congratulations to our winners! They will be honored at the Horticulture Industry Expo in January. The winning entries were submitted by the following:

Chris Cordrey of RSC Landscaping located in Millsboro – Large Residential
Delaware Center for Horticulture located in Wilmington – Commercial

Plant of the Year
The 2015 Delaware Plants of the Year have been selected. Committee members nominate plants based upon the following criteria: hardy in Delaware; few diseases and insect problems; non-invasive; adapts for a variety of landscape uses; possesses horticultural assets such as flower, fruit, leaf, habit, structure, attractiveness to wildlife, etc.; currently under-used in Delaware landscapes; readily available from Delaware growers, nurseries, and garden center outlets. Based upon their input, the board on directors voted to select the following for 2015:

Woody selection: *Carpinus caroliniana*

Herbaceous selection: *Aster divaricatus*

Informational sheets will be available at the Horticulture Industry Expo.
Congratulations to our Newest CNP:

Taylor Fehmel
RSC Landscaping
Landscape Design Specialist
Landscape Specialist

Welcome New Members:

Aspen Eco Green, LLC
Tom Buck
18766 John J. Williams Highway, Unit 4
Rehoboth Beach, DE  19971
(302) 745-5155
tom@aspenecogreen.com

Harbeson Groundskeeping Co.
Carl Anderson
17247 Harbeson Road
Milton, DE  19968
(302) 745-1766
hgc@dmv.com

Jacobs Yardworks
Randy Parsons
31008 Olde Fruitland Road
Salisbury, MD  21804
(410) 749-0180
jacobsyardworks@comcast.net

NewLeaf LandDesign, LLC
PJ Philiposian
1166 Smithbridge Road
Chadds Ford, PA  19317
(610) 662-9021
pjlanddesign@gmail.com

Meetings between DNLA, Delaware Cooperative Extension and the Department of Agriculture about invasive plant species have resulted in a plan to continue our focus on education to address the invasive plant problem in Delaware. This education campaign might focus on the following:

1. Link replacing invasive plants with native species to the charismatic fauna people care about, such as birds, honeybees and butterflies. Take advantage of the popular press focusing on the dramatic reduction in populations of Monarch butterflies. Link specific butterflies with native plants that provide larval food.

2. Develop demonstration sites in which invasive plants are removed, native species are planted and signage is installed to explain why the site supports more ecosystem services with its new plant palette. Ideas for demonstration site locations include:
   - Government buildings
   - Hospitals
   - Corporate headquarters
   - Large businesses
   - Schools
   - Public parks
   - Housing developments
   - Public spaces

3. Create a signage program to identify invasive plant-free facilities. Garden centers could post a standard sign that indicates their operation is invasive plant-free.

4. Department of Agriculture letters could be sent to all nursery and landscape businesses in Delaware requesting they not sell the invasive plants currently on the DISC list (Norway

U of D NEWS
Susan Barton, Extension Specialist

Delaware Nursery & Landscape Association
maple, privet, Japanese barberry, burning bush, callery pear and purple loosestrife. This strategy worked well with purple loosestrife in the past. It would simply be a request and would not require enforcement.

This educational campaign should be a unified effort involving all the agencies and organizations interested in the control of invasive plants including:

- Delaware Department of Agriculture
- Delaware Department of Environmental Control
- Forestry Service
- Natural Resources Conservation Service
- Delaware Nursery and Landscape Association
- Delaware Nature Society
- Center of Inland Bays
- University of Delaware Cooperative Extension
- Delaware Center for Horticulture

The Applecross demonstration project ended with a bang this fall as 75+ people toured the site on Saturday, October 25. We are currently conducting a survey of tour participants throughout the past 3 years to see how interested they are in installing components in their own home landscapes. This could be a big boon for the landscape industry as people seek professionals who can install and maintain meadows, reforestation areas and rain gardens. Think about developing your expertise in preparation for meeting a new demand.

NEW FROM UD COOPERATIVE EXTENSION THIS SPRING.

Landscape 101 intensives- one hour, short and to-the-point providing basic information on a variety of topics in a hands-on format. Wednesdays, 4:30-5:30 pm. $10/session or sign up for the entire series for only $85.

**SPRING 2015**
- Plant ID-Evergreens
- Planting/Transplanting Shrubs and Trees
- Pruning
- Plant ID- Flowering Trees

**FALL 2015**
- Turf Maintenance
- Weed Identification/Maintenance
- Plant ID- Herbaceous Plants
- Soils
- Plant ID- Woody Plants
- Plant ID- Shade Trees

Look for the complete schedule soon.

Contact your County Extension Agent for more information: Tracy Wootten in Sussex, and Carrie Murphy, New Castle County.
SOILS HAVE A NASTY HABIT OF MOVING
Jerry Faulring, Waverly Farm

2014 has been a wet year for much of the MidAtlantic. Soils have been at the field capacity and actually oozing water in places. Every little rain causes run off and ponding in low areas. Soils are on the move. Most growers include grassed perimeters and aisles to stem soil loss from the site, but when the soil moves from planting areas to grassed areas, long term growing soil quality is diminished. Exposed root flares result in eroded areas and buried root flares where soil is deposited.

Erosion occurs under these conditions:
1. rate of rainfall exceeds a soil's ability to absorb the water.
2. the water is high.
3. the ground slopes.
4. there is a lack of vegetation.
5. soils are compacted and or poorly drained limiting infiltration.

We cannot control the rate of rainfall, but we can control the other variables. Install a drainage tile to improve a high water table. Manage the slope by planting perpendicular to the slope with grassed isles installed between rows or blocks. Use cover crops to provide vegetation. Finally, improve compacted soils through improved tillage systems and by using equipment only during ideal soil moisture periods.

Compacted Soils
Compacted or poorly drained soils become apparent during periods of high and persistent rainfall. This is a great year to find those areas and work to resolve them. A soil penetrometer is an inexpensive but very important tool for studying soil compaction. Some labs perform bulk density testing, but you can learn how to do the test yourself by searching 'calculating bulk density of soils' in Google. Bulk density is the weight of soil in a given volume. Soils with a bulk density higher than 1.6 g/cm3 tend to restrict root growth.

Symptoms of Compacted Soils in Nursery Production
1. Surface water remains for long periods (greater than 24 hours) after rainfall or overhead irrigation.
2. Equipment tracks hold water.
3. Premature foliage drop in any season, but excessive in the fall.
4. Variable plant productivity in the same row or block. Inconsistent plant development such as bushy growth when not the norm, a range of leader development, the wrong foliage color, and smaller than normal leaves can all be symptoms of compaction, but may also be signs of high or low nutrient values or pH problems.
5. Increased wind- and water-caused soil erosion.
6. Perception that the tractor is losing horsepower when in fact compacted soils require more horsepower to work.
7. New weeds start showing up and old favorites disappear.
8. Irrigation water runs off prematurely instead of infiltrating to the roots where needed.
9. More mosquitoes than in previous years.
10. Increased sucker production on many different trees.
11. Plants show stress more readily in dry periods.
12. Pests such as Ambrosia Beetle are attracted to plants that are growing in high moisture areas.
13. Increased denitification in the anaerobic environment leading to the loss of nutrients.

This may be difficult to detect as other symptoms may cause confusing results but lack of plant vigor is occurring due to the lack of available nitrogen and oxygen. The take away message is that roots grow between the soil particles. If the particles become compressed, water, oxygen and pore spaces are squeezed out.

Productive silt loam soils will contain 45-50% soil particles, 20-25% air space and 25-30% water. The roots consume oxygen. When oxygen is absent because the pore space was compacted, plants will not flourish. Many plants will start to decline within 48 hours of having their roots flooded with water but the decline may not become obvious for months or years. The most important factor for maintaining a desirable ratio between air space and water is to avoid soil compaction by implementing every tool and practice available that still fits into an economically viable production system.

Research on soil compaction and its effect on corn production showed that heavy compaction of silt loam soil reduced corn yield from 200 bushels per acre to 85. Is it possible to see a 50% decline in the productivity of horticultural crops due to soil compaction? Most definitely.

At Waverly Farms, in 2004, we began modifying our soils through the use of a spading machine and compost amendment For most plants we have seen about 40% increased growth rates as a result of increasing the level of oxygen and increased deep pore space from the tillage system leading to improved drainage.

Roots maximize their productivity and efficiency at an optimum soil temperature of 68 degrees F. Not surprisingly, that is the same temperature preferred by soil microorganisms. Encouraging and protecting this vital resource is critical to production success.

**Cover Crops**

Cover crops have been around forever but are often not used within an existing planting by nursery managers. I have avoided the use of cover crops due to equipment investment requirements. One way to partially solve the problem is to grow only single rows with grass isles on either side and to plant perpendicular to the slope. A common practice for many growers seeking better land utilization, including us, is to plant several rows in a block with the blocks separated by grass isles. This exposes a significant amount of bare soil, assuming no weeds, to erosion and causes the soil to heat up which reduces microbial activity. A solution is to use cover crops until the plants are large enough to dampen the effect of heavy rains and soil heating.

Another option is apply mechanically stable mulch. This is cost prohibitive except in small
areas where very high value crops are grown over a period of many years. We did this for three blocks about ten years ago. The soil organic matter increased from 2.5% to 7% over several years. There was no soil erosion at all and zero requirement for irrigation. The plants thrived. However, it was cost prohibitive … I think. Sometimes what we think is expensive is really a bargain long term.

The wrong cover crop could impact growing conditions by robbing the soil of nutrients and water at the expense of the desirable crop. Some cover crops put nitrogen into the soil and some attract predator insects. A cover crop like forage radish will bore deep holes in the soil, die with the first frost and deliver nutrition back into the desirable plants.

Much work has been done for nursery cover crops. Dr. Paula Shrewsbury, et. al. conducted a three year research program with a SARE grant. There is much useful information at: http://mysare.sare.org/mySARE/ProjectReport.aspx?do=viewProj&pn=LNEOS-274.

My dream cover crop would:
1. Control soil erosion,
2. Be 12 inches tall, or less, so as to not take away from visual marketing of the saleable plants,
3. Attract predator insects,
4. Be perennial to avoid annual seeding,
5. Be effective in cooling the soil while not robbing nutrients and water, and
6. Finally, I would like it to have a very pretty flower; I can dream!


TOP FIVE REASONS TO KEEP YOUR RECORDS UP TO DATE
Bill Schrodel, Loan Officer, Mid Atlantic Farm Credit (wschrodel@mafc.com)

As a business owner, you don't have a lot of extra time. Most days you probably feel good if you get a chance to sit down and clear your head between projects, right? Since I know how busy you are, I hate to add another priority to your already long list, but I'm going to because it is critical that you take the time to keep your business records up-to-date. What kind of records am I talking about? Maintaining documents, updating minutes, and properly documenting changes in business entity ownership, are all part of the recordkeeping process. It is important to keep accurate and complete records because these accounts:

1. Help you monitor and manage the progress of your business and help it grow.
2. Help your tax agent or accountant do your books more quickly, which saves you money.
3. Make filling in your tax returns easier and quicker.
4. Help you to avoid pitfalls down the road,
5. Make it easier to get a loan in the future.

I have seen many excellent businesses get into trouble because they haven't properly documented something significant, such as change to their ownership or officers. It is important to keep up-to-date records and maintain accurate standings for your entities. For example, as a Limited Liability Company, you should maintain and keep the following in a safe but accessible place:

1. Article of Organization
2. Operating Agreement
3. Schedule of Ownership
4. Changes to members, managing members and rights to act
5. Filing of Personal Property Tax Return to the state.

When you make a change to any of the above items, you should update your record immediately. If you have additional documentation, such as correspondence or legal bills related to the changes, keep them all together so that you can find them quickly if necessary. It is true that it takes time and energy to ensure accurate records, but doing so will help future generations get the right answers (or even a loan) when they need them. This will also help save you money and worry in the long run, for there is nothing worse than trying to find an important document when you're under timeline pressure!


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**FROM ASIA: SUSTAINABLE INSIGHTS INTO STINK BUGS**

A collection of articles originally published in China, Japan, and Korea and translated with American Farm Bill funds has yielded a bounty of insights into sustainable agriculture practices used in Asia against the brown marmorated stink bug (BMSB), a serious agricultural pest.

The stink bug, *Halyomorpha halys* (Stal), is a voracious eater that damages fruit, vegetable, and ornamental crops in North America. The insect uses over 170 plants for food and reproduction, and threatens an estimated $21 billion worth of crops in the United States alone. Researchers in the BMSB Working Group and the BMSB Specialty Crop Research Initiative (SCRI) Coordinated Agricultural Project have tapped into the collection of articles. The BMSB Working Group is funded by the Northeastern IPM Center, which also directs outreach for the national BMSB SCRI research project.

One tactic against the pest used in Asia: cover each fruit on the tree with a paper bag. (American trade publications such as *Fruit Grower News* have discussed this approach.) According to USDA Agricultural Research Service (ARS) scientist Tracy Leskey, in Korea...
some fruit is grown to a huge size, perhaps three pounds, and the entire fruit is served as a dessert. Therefore, it makes economic sense to protect the fruit from BMSB and the fruit-piercing moth (“that huge moth is like a vampire because it flies at night and sucks the juices out of ripe fruit,” Leskey commented.) Bagging represents a behavioral control that can be implemented and prevents insects from making contact with the growing fruit. Leskey mentioned that it makes sense in smaller orchards where laborers can easily administer the bagging. The technique may be more challenging but still could be useful in larger settings.

In August of 2013 a team of researchers, including Leskey, led by Doo-Hyung Lee of USDA ARS, published a review paper on the biology, ecology, and management of BMSB in China, Japan, and Korea. The paper cites 100 articles, a significant selection of the 216 publications on BMSB known to exist from Asia.

According to the translation, one researcher from Japan wrote, "Stink bugs that migrate to apple orchards are often difficult to detect because they often hide in gaps between leaves and fruit in trees. Therefore, branches and the trunk need to be shaken just forcefully enough so that fruit does not fall from the tree in order to check for the presence of pests."

Chinese researchers wrote about their experiments with light traps for monitoring and management. They mention tactics such as removing egg masses, capturing stink bugs physically, using a buffer zone plant around cash crops, bagging fruit, and creating an encouraging environment for parasitic wasps such as the Trissolcus species.

Other researchers, also from China, wrote that the stick-beating method causes bugs to drop, then pesticides can be applied on the ground under the tree. They believe that bagging fruit is not productive; they say it impedes growth of good quality fruit and does little to stop BMSB. They also mention that spraying equipment disturbs BMSB and causes them to fly away. The bugs return after spraying is done.

Scientists in Japan wrote that they trapped more bugs facing the river where cool breezes circulated than on the mountainside. They also said that spraying insecticide at entry points in dwellings helped stop stink bugs. Spraying DEET repellant at entry points also worked well.

The male-produced aggregation pheromone (methyl (E,E,Z)-2,4,6-decatrienoate) of the brownwinged green bug, Plautia stali Scott is commonly used to attract H. halys to traps in the late season.

"The translated Asian literature has taught us much about natural enemies and physical methods we can consider for managing BMSB," Leskey said. "We've learned a lot about the bug's biology and what types of crops it attacks. Not every tactic used in Asian systems will be effective in ours, but the research points us toward where we should be heading and away from tactics we can rule out."

Excerpted from Insights, Fall 2014, a publication of the Northeastern IPM center.
JAPANESE BEETLES: ON THEIR WAY BACK IN
Stanton Gill, Extension Specialist in Nursery and Greenhouse IPM, University of Maryland

We have been pretty much Japanese beetle free for the past six years and it has been great. But, something happened in 2013 that is changing this blissful period. It started raining on a regular basis during the egg laying period for adult Japanese beetles and as a result we saw a higher survival rate of Japanese beetle grubs in the soil. Ultimately this means there were more Japanese beetles in 2014 than in previous years.

The cold temperatures of -7 F in January for several days did nothing to reduce this grub population. They moved deep into the soil to overwinter and did just fine.

Meanwhile, people have been planting ideal food in landscapes for the adult beetle. The bush-type roses, such as Knockout and Double Knockout, have made a big hit in commercial planting sites and have been used extensively in landscapes over the last couple of years. These roses just add to the food sources for Japanese beetles in 2014. Many plants grown by local nurseries including little leaf linden trees, crabapples, rose of sharon, hibiscus, and cherry trees are all favored hosts for Japanese beetle adults. If you grow fruit bearing sweet and sour cherry, blueberry plants, or apple trees expect a visit from Japanese beetles.

We Learn From Our Past Experiences
The drought periods in the summers of 2007 - 2013 kept the Japanese beetle populations suppressed and we saw only isolated cases of Japanese beetle damage. Back in 2005, we saw a brutal onslaught of Japanese beetles that left a path of devastation in the Washington/Baltimore corridor. The beetle population had been building over the previous four years, but in 2005 we received reports of record setting level amounts of damage in the landscape. One landscape manager reported that within five days after they first saw the Japanese beetle emerge on June 24th they were finding 14 -16 foot tall little leaf lindens completely defoliated. Nurseries visited in Frederick and Carroll Counties on June 30 had so many adult beetles on susceptible trees species that when we shook the branches the sky was clouded by swarms of escaping beetles. Similar population levels occurred in 2014.

The population levels of Japanese beetles were at epidemic proportions on the East Coast in the 1940-1960s before settling into generally low levels for many years. This pest activity fell into a persistent but almost "low incidence" pest status in many communities. We are still seeing low populations in the oldest, established communities, but also plague levels in the newly developed neighborhoods. In the south and mid-west of the United States, however, the Japanese beetle is still a relatively recent pest, where expanding populations are wreaking havoc in many landscapes.

This beetle was one of the early invasive species, but we did not call them that back then. Native to Japan, the Japanese beetle was first discovered in the United States in New Jersey in 1916 by two Canadian entomologists who described them as a "curious southern species of beetle." Little did these two Canadian entomologists realize how wide-spread the Japanese beetle would become over the next century. The Japanese beetle population is deeply entrenched in the U.S., and damages plant material from Iowa, Illinois, Kentucky, Alabama, and northern Georgia, all the way to South Carolina. The range of the beetles continues to expand with localized infestations in many other states including Colorado, which
now has thousands of beetles feeding on many of the remaining trees and shrub species growing in that arid land. You thought you had it tough, try growing anything other than rocks in Colorado.

Aggressive programs to eliminate this pest in these isolated outcroppings have been effective but expensive. Constant vigilance and early interdiction will be a continuing process to keep Japanese beetle from spreading to new areas in the United States.

Nursery and Landscape Plants that Attract Japanese Beetles

Japanese beetle adults begin their annual activity by mid-June (approximately), with peak activity in mid-July. Adults prefer ornamental plants in full sun, and typically feed in groups. Certain plants in the landscape are magnets for Japanese adults. For example, if a little leaf linden, a horse chestnut, Japanese flowering plum, rose or crepe myrtle are in the landscape, expect Japanese beetle adults will to be frequent visitors and will consume generous amounts of foliage. The following list includes the top 10 favorite plant foods of Japanese beetles (source: APHIS):

1) American linden
2) Crabapple
3) Apple
4) Japanese maple
5) Norway maple
6) Rose
7) Crape myrtle
8) Pin oak
9) Birch and
10) Prunus spp (Plum, Apricot, Cherry, Peach).

Secondary preferred host plants include Black Walnut, Willow, Grape, Horsechestnut, Hibiscus, Blueberry, Sassafras, Virginia Creeper and Summersweet (Clethra). Notice that the list of secondary preferred plants includes some wild plants that might be found in nearby hedgerows. The top 5 preferred herbaceous plants include:

1) Hollyhock (Alcea rosea),
2) Dahlia (Dahlia spp.),
3) Hibiscus (Hibiscus spp.),
4) Common Mallow (Malva rotundiflora) and
5) Evening-primrose (Oenothera biennis).

Adulls also feed on annual flowers, including zinnia (Zinnia elegans), common four-o'clock (Mirabilis jalapa) and French marigold (Tagetes patula).

Controlling Adult Beetles

The key with controlling adult Japanese beetles is to use a material that either repels the adult beetles from feeding or kills them quickly before they can inflict much damage to the foliage. One additional challenge is how to reduce damage to plants with materials that have the least impact on pollinators and beneficial organisms.

Once Japanese beetle adults start damaging foliage, the wounded plant tissue releases a volatile "scent" that additional beetles will detect, attracting other adults to feed on the plant. If a slow killing pesticide is used, adults can cause a fair amount of damage and increase the feeding aggregation of other adult beetle on the plant.

Read labels on pesticide containers to see if they impact pollinators. Do not spray plants that are in bloom with materials that have on the label "do not spray when a plant is in bloom." EPA is requiring all of the neonicotinoids to have a bee box with a warning precaution on the label. Presently, there will be no precaution listed for soil drench application of neonicotinoids since there is not adequate information available on
whether soil applications are carried into pollen or if so, at what level. Registered products that give very good control of adult Japanese beetle include Sevin (carbaryl), Astro (permethrin), DeltaGard (deltamethrin), Talstar (bifenthrin) and/or Tempo (cyfluthrin). All these materials should not be applied when plants are in bloom. If spraying large trees or shrubs make sure there are not flowering plants in the area where drift from an application may carry onto the bloom.

A newer insecticide, Acelepryn (chorantraniliprole) is a systemic insecticide that is a FRAC group28 insecticide that controls adult Japanese beetles. The present label lists that the insecticide controls the larval stage of the Japanese beetle, although it does not list adult Japanese beetle on the label. Syngenta company submitted a 2ee (emergency exemption) for Acelepryn that allows use as both a foliar and oil application to trees and herbaceous plants in the landscape. The label rate for foliar applications for Japanese beetles ranges from 1 - 8 oz/100 gallon of water. The soil rate is 0.125 fl oz to 0.25 fl oz per inch of trunk diameter (measure at 4 ft height). If you choose to use Acelepryn then visit the website CDMS.net and go to the Acelepryn label. You must download the Acelepryn 2ee and have it on file at your shop if you intend to use Acelepryn for adult Japanese beetle control. The label on the Acelepryn has no precautions concerning bee or other pollinators. Syngenta has submitted the paperwork to EPA to have adult Japanese beetle listed on the label but this will not occur until the next EPA review process occurs. Once the approval transpires, then the new labels will list adult Japanese beetles and you will not need to download the copy of the 2ee from the web.

The impact of neonicotinoid class of insecticides on pollinating insects such as honey bees and native bees may be a concern. None of the neonicotinoid class of chemicals can be applied as sprays when a plant is in flower. To be on the cautious side, soil applications of neonicotinoids should be made after flowering of the plant to which the drench or injection is applied. It is not known presently if soil applications are carried into pollen of all plant material. Imidacloprid (Merit, Mallet and many other brand names) has a label for Japanese beetle control. If you are applying this as foliar spray after a plant has bloomed it should kill Japanese beetles for two to three weeks. Applying as a foliar spray after bloom time reduces the chance that pollinators will contact the insecticide. Foliar applications of the material do not result in long term persistence in the plant. When imidacloprid is applied as a soil drench it acts differently and remains in a plant for longer periods of time. The problem is if applied as soil drench, imidacloprid has to be applied two to three months before an insect that you are trying to control is present. The chemical is very slow on uptake into woody plant material. The chemical could be present in flower bloom, thus impacting pollinators. Additional research is needed to determine the potential uptake into tree flowers and what this means to pollinators. Also, soil applications of imidacloprid that are absorbed through roots result in the plant metabolizing the compounds. Some of the resulting breakdown product could be equally toxic or even more toxic to pollinators than the original compound but this is presently unknown. Also, the imidacloprid when absorbed through roots of a plant remains in the plant for two to three years. So, to control Japanese beetles, if you choose to use imidacloprid, a foliar spray is used after the plant is finished blooming. Make sure the spray does not drift onto other plants that are in bloom. This works for single-season flowering tree, shrub and herbaceous plants. For plants that continue to flower over a longer time, such as roses, hibiscus or zinnias, this would not be
an appropriate material to use as a spray since the material would be found in the flower when pollinators would pick up the chemical. Soil applications before the plant bloom are not restricted by EPA labels.

Dinotefuran (Safari, Transtect), is also a neonicotinoid. It is more water soluble and is taken up by plants faster. It can be applied as basal trunk spray and be taken up into foliage in a couple of weeks. When the dinotefuran is taken up into the plant, it also forms metabolites that break down rapidly, compared to imidacloprid, and are non-detectable by the end of the season.

If you wanted to use dinotefuran to control Japanese beetle adults, apply it as soil drench or basal trunk spray just after bloom-time to avoid any chance of impacting pollinators. The soil or bark application should last the rest of the growing season. If you choose to apply dinotefuran as a foliar spray, do this after bloom time. Residual control over the Japanese beetle is two to three weeks.

Acetamiprid is another neonicotinoid that is highly water soluble. It is labeled for foliar applications only. This material will supply control of adult Japanese beetles and should only be applied to plant after they have finished blooming.

Reduced Risk Pesticides for Controlling Adult Japanese Beetles

The federal EPA classifies certain chemicals as reduced risk, if they have minimal impact on human health and the environment. Some of the reduced risk pesticides that can be used for Japanese beetle adult control are Azadirachtin, Spinosad and Pyrethrin.

Azadirachtin, sold under several names including Azatin XL, eemazad, Aza-Direct and Ornazin, is a botanical insecticide that is derived from the seed of neem tree. Applications of Azadirachitin act as a feeding deterrent and we have obtained three to four days of repellency with foliar applications on Japanese beetle-susceptible plants.

Pyrethrin is also sold under the names Pyreth-It and Pyganic. The pyrethrins are a pair of natural organic compounds normally derived from Chrysanthemum cinerariifolium that have potent insecticidal activity. Pyrethrins are neurotoxin that attack the nervous systems of all insects. When present in amounts not fatal to insects, they still appear to have an insect repellent effect. They are non-persistent, being biodegradable, and break down on exposure to light or oxygen. This material works as direct contact to the Japanese beetle, so spray has to be directed onto the beetle. This is best done in morning hours when beetles are stationary. If pyrethrins hit pollinators directly, they will kill them. Since it has no-residual effect, once it is dry it has no impact on pollinators.

Pyola, a combination of pyrethrins and canola oil (from Gardens Alive and other suppliers) was effective in research conducted by Dan Potter and Rebecca Baumler Willis at Kentucky University.

Coming in 2014

Mainspring (cyanoantraniliprole) is in the same family (FRAC 28) as Acelpryn and will be labeled by EPA for use in greenhouses, interiorscapes and production nurseries for controlling several insects, including adult Japanese beetles. The proposed label has no precaution concerning bees or other pollinators. This product is presently in the process of being reviewed by EPA and is not on the market.

The ideal spray timing targets adults when they first appear and before damage occurs. Repeat
applications are often desirable weekly on high value plants, particularly if this ideal spray window was missed. Since larvae develop in turf, treatment of turf areas is also recommended as a dual control.

Japanese beetle traps containing floral and sex attractant draw adult beetles and are used as a monitoring tool. Traps have been misused by the public who mistakenly believe they control beetles, but beetles have been shown to often land and feed on plants close to traps.

**How About Japanese-Resistant Plants?**
Many littleleaf lindens (*Tilia cordata*) and American lindens (*Tilia americana*) were completely defoliated in mid-Atlantic landscapes in 2004. By late July, only brown skeleton-like veins remained from the leaf petioles of numerous street trees, including the linden cultivars ‘Greenspire’, ‘Olympic’, ‘Redmond’ and ‘Prestige’. However, Silverleaf lindens (*Tilia tomentosa*) growing in the same landscape had little, if any, Japanese beetle feeding injury. The foliage of silverleaf linden (and cultivars) is just a little thicker with small hairs on the foliage that apparently makes it unattractive to adult beetles.

Another resistant tree to try is the Japanese tree lilac, *Syringa recticulata*. The tree lilac is well adapted to urban soils and blooms in mid-summer. The late lilac, *Syringa villosa*, grown as a shrub or trained as a small tree is also a good choice. Both species of Syringa are very resistant to Japanese beetle feeding.

Using species that are seldom attacked by the Japanese beetle can reduce damage to nursery plants. The top 10 least preferred plants are:

1. Magnolia
2. Redbud
3. Dogwood
4. Red maple
5. Northern red oak
6. Burning bush
7. Holly
8. Boxwood
9. Hemlock
10. Lilac,
(Source: APHIS).

Other least preferred landscape plants include false cypress, yew, juniper, forsythia, clematis, red maple, euonymus, tuliptree, ornamental pears and most oaks (white, scarlet, red, and black).

BECOME MORE PRODUCTIVE IMMEDIATELY – 10 TIPS FOR TIME MANAGEMENT
Jeffrey Scott

No one is ever as efficient as they want to be, however, most leaders don’t know what to do about that. I have researched the best ideas for time management, tested them out myself, and collated this list. The techniques in this article will double your effectiveness and allow you to accomplish more than you ever thought possible.

1. “Give me two alternatives”
Teach your direct reports and employees to answer their own questions, by asking them to come to you with two alternative solutions when they want to ask you a question. Tell them you will coach them on which is the best— and the happy truth is they will solve most of their questions by the time they develop two alternatives. Teach them to fish, and you will all eat more fish.

2. Carve out alone time.
If you are bombarded with interruptions and can’t seem to get any work done, carve out alone time each day (up to 2 hours), or a half day each week, where you either close the door, pull down the shades, put a do-not-disturb sign on your door, turn off your email ping and phone buzz, and let your employees know not to interrupt. You may choose to go off site to get the quiet you need. Train your staff when they can reach out to you, and when they shouldn’t.

3. Use a weekly meeting.
Set up a recurring weekly time to meet with certain staff and ask them to save up their issues for that meeting, and not to ask you throughout the week, unless urgent or critical to a project or client’s satisfaction (in which case, see tip #1)—many will end up getting solved and not be relevant by the time your meeting happens.

4. Don’t sell to shoppers.
Qualify out 60% +/- of the shoppers on the phone, and the other 40% on the first appointment. Use consultation fees and direct questions to make sure they are a good fit for you. Use your time on your higher value leads: close more good leads at a higher value.

5. Delegate low-profit tasks.
Delegate any task you could pay someone $20 to $25/hr or less to do. Brainstorm a list of 5-10 things you do that someone else could. And for your key managers lower on the pecking order, have them choose a lower cut off ($10 to $15/hr). You will make more money and have happier clients if you (and they) stay focused to your high value, high profit tasks.

6. Build the habit of planning ahead.
If you do everything last minute, you will make more mistakes, have less chance for support from others, cause more chaos, be more stressed, and waste everyone’s time. On Friday (or weekend) plan ahead for the next week. At 4pm or in the evening plan ahead for the next day. Taking time for quiet reflection improves your thinking process.

   FOREMEN: Have your foremen report back to you at noon and at 4pm. Have them answer: will they finish on time, have they run into anything that have set them back, do they need another kind of tool tomorrow.

7. Make one business-building improvement a day.
Improve one thing each working day, and in 20 weeks you will have improved 100 things in your company and doubled the effectiveness of your corporation. Keep this up and within a year you will be 250% better off.
People over estimate what they can get done in a month, and under estimate what they can accomplish in a year.

9. **Have people clean up their own mess.**
   When you clean up after others, you train them to keep making mistakes. When clients complain about workmanship, have the employees’ responsible go talk to the client and fix the problem themselves—your employees will train themselves to do better next time.

10. **Outsource non-core tasks.**
    You don’t need to be your own website guy or social media gal. You don’t need to be an expert in a side service (irrigation, fertilization). Understand what your core business really is, and focus your energies on building that aspect of the business. Outsource or delegate everything else.

   Treat your business as a profession, and you will attract professionals.

**ACTIONS**

- Take the top 3 ideas, and implement one a week, or faster if they are simple to execute.
- Share with someone in your company to be your accountability partner.
- Ask your employees which of these ideas make sense to implement right away.

*Excerpted from VNLA Newsletter, July/August/September 2014.*

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**NOBODY SAID NETWORKING WAS EASY**

**Jim Paluch**

You’ve just completed a hectic day complete with piles of paperwork, interoffice conflicts, a heated phone conversation with a client, and whatever junk food you could grab for lunch. There is nothing you would enjoy more than a quiet, relaxing evening at home, and you’re headed in the opposite direction to invest a few hours with a professional organization and reap the benefits of a “power networking” session.

Yes. It’s true, regardless of the benefits of mingling with people, making contacts and putting yourself in the right place at the right time, it is sometimes the last thing you would choose to do.

For a privileged few, meeting people is a fun, natural, easy going process. For most of us, however, stepping into a room full of people that we’ve never met and striking up several intelligent, interesting conversations is at best a challenge and sometimes just plain work.

When I was designing and selling landscape services years ago, much of my success came from the relationships formed in network settings. I not only developed incredible business leads, but I also became friends with individuals I’m still in contact with today.

I remember many evenings standing next to the shrimp bowl trying to gather enough courage to approach a developer I was dying to do business with, while contemplating the drawing I had yet to do when I arrived at home that night.

There was something in me, however, that knew the effort made in meeting and enjoying people was going to be the secret to my success. So the fear remained, but I inched away from the
shrimp, put on a confident smile and began talking to people.

Years later, as I began speaking to groups around the country, I found myself in more “networking” situations than ever. After one such gathering with my wife by my side, we both collapsed in the car and took a deep breath before driving home.

“I know that’s easy for you,” she said with a sigh, “but I’m exhausted!”

“What makes you think it’s easy for me?” I laughed. “That’s work!”

“Well, you make it look so easy and fun I thought it just came naturally” she concluded.

As I told her that night and we remind each other of even today, networking takes enthusiasm, energy, and effort, and even if you don’t make a life-changing connection, you’ll usually learn something about people or yourself in each experience.

If you enjoy the challenge, you will reap the benefits of networking – Jim Paluch

Networking Steps you Can Take

- **Appreciate yourself.** You have one chance to make a first impression, so be aware of your appearance. Remember, when you feel good about the way you look, confidence and poise will follow.

- **Sincerely appreciate people.** The greatest single factor in determining your success in networking is your sincere appreciation of the other people in the room. If you are looking for the good in others and approaching every conversation with interest and care, you’ll be amazed at the people you’ll meet.

- **Truly listen.** Ask open-ended questions that will encourage the other person to talk, and then carefully listen and retain the information. Be alert to recognize likes, dislikes, areas of interest, details about their family, etc., which will give you more to talk about now and in your follow-up conversations.

- **Follow up and keep in touch.** The most important step in developing a working network of names to continually draw from is the follow up.

Dos and Don’ts of Networking

- **DO remember networking isn’t selling—it’s building relationships that are mutually beneficial.**

- **DO understand personality styles-treat people the way they want to be treated.**

- **DO begin every conversation with a question-listen and learn from what you hear.**

- **DO carry business cards-be sure you always have enough.**

- **DO write on the back of any card you receive where you met and what you want to remember.**

- **DO realize that networking improves with practice.**
• DON’T be late to a meeting-get there early.
• DON’T sit by someone you know-sit by strangers.
• DON’T sit by an aisle, empty seat, or in the back row-surround yourself with people.
• DON’T do all the talking-the best conversationalists say the least.
• DON’T wait to be approached-take the responsibility to introduce yourself.
• DON’T use inappropriate humor.
• DON’T become comfortable and monopolize one person’s evening-after 5 to 10 minutes, move on.

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WORKERS’ COMPENSATION MITIGATION STRATEGIES

Take a look around your company. Chances are your workplace has changed in the past 10 years. Your workforce has changed as well. Regardless of industry, the U.S. workforce is aging. The U.S. Bureau of Labor Statistics has estimated that 25 percent of the workforce will be age 55 or older by 2020. This aging workforce brings with it the potential for escalating workers’ compensation costs, particularly since older employees typically experience more severe workplace injuries and illnesses than younger ones.

One of the most effective ways to reduce these costs is through a commitment to workplace safety. A commitment to safety is the key to a successful workers’ compensation process and cost containment. A successful process creates a better work environment and improves productivity. A commitment to workplace safety makes your company an attractive place to work, helping you retain employees and reduce employee turnover.

Below are some workers’ compensation mitigation strategies that you should keep top of mind during the time of hire, during day to day operations and when an injury occurs in the workplace.

TIME OF HIRE

Make every effort to ascertain that new or potential hires are physically capable of handling the requirements of the job, employee’s safety commitment; including a section on your company’s safety policies and procedures in employee orientation reinforces your safety culture from day one.

A new or potential hire should be mentally capable of understanding and consistently
applying safety training, procedures and protocols.

Companies with safety in their DNA want to make sure they hire employees with the same mindset.

Understand that age, obesity and co-morbidities will generally create more time and treatment for injured workers to return to full duty after an accident. A more extensive transitional duty program may be necessary to mitigate off duty status.

**DAY-TO-DAY**

**Build a safety culture.**
A safety-focused work culture attracts safety-minded employees. With a strong safety culture, both management and employees are engaged in the process and share responsibility for accident prevention and effective injury management.

Encourage collaboration and communication to promote safety as their priority. Employees feel comfortable voicing their suggestions and concerns and may be involved in developing and revising safety procedures. If an accident happens everyone knows what to do and how to report the incident.

**Treat “near misses” as accidents.**
Defect check processes and root causes and develop the best safety solutions for operational activities.

**Knowledge share.**
In states where it is permitted, post medical panels to inform injured workers and managers as to which occupational medical providers in the area are available to treat work-related injuries.

**WHEN AN INJURY OCCURS**
Contact the insurance company as soon as possible after an occurrence.

Prompt reporting assures that the necessary medical attention is provided and a return-to-work process is put into place. Claims reported to the carrier within 3 days of injury cost up to 20% less than claims reported outside that time frame.

Conduct a thorough investigation to determine what caused the accident and make workplace adjustments to prevent similar accidents.

*Excerpted from VNLA Newsletter, July/August/September, 2014.*
NUTRIENT RUNOFF FROM URBAN LAWNS

John Steir, Associate Dean, College of Agriculture and Natural Resources,
Tom Samples, Professor, Dept. of Plant Sciences,
University of Tennessee
John Sorochan, Associate Professor, Dept. of Plant Sciences
Douglas Soldat, Assistant Professor, Dept. of Soil Science, University of Wisconsin

The protection of groundwater and surface waters from nutrient contamination is an environmental issue and public concern. Specifically, nitrate (NO₃) and phosphates (HPO₄ –H₂PO₄) continue to receive much attention. Urbanization results in more and connected, impervious surfaces (roads, parking lots, rooftops), fewer pervious groundcovers (forests and fields), less water infiltration and greater runoff. As the volume of runoff increases, the potential for pollution of surface waters with nutrients, sediments and other compounds also increases.

In 2005, based on satellite imagery, total turf area in the U.S. was estimated to be 40.3 million + 9.6 million acres (Milesi et al. 2005). Lawns and roadsides account for the greatest and second-greatest amounts of managed turf, respectively. There are an estimated 70 million detached single-family homes nationwide (U.S. Census Bureau 2010). If the average home lawn size ranges from ¼ to 1/3 acre, this represents about 17.5 to 23 million acres.

Lawns are a highly visible and very important component of an urban environment. When properly sited, designed, installed and managed, they form a dense, perennial and erosion-resistant vegetative cover capable of absorbing carbon dioxide and water at low mowing heights. They also generate oxygen, cool the air in summer, trap dust and organic compounds (which are then degraded by soil microorganisms) and contribute organic matter to the soil.

The need for fertilizer
Soils in which turfgrasses are maintained seldom provide enough nitrogen (N) and may lack adequate phosphorus (P) or potassium (K) to support healthy lawns. As a result, supplemental granular or foliar applications of fertilizer containing N, P and/or K are often recommended. These three essential mineral nutrients vary in ionic, plant-available form and movement within soils. A basic soil test performed in a soil-testing laboratory will determine soil phosphorus, potassium and pH levels. Fertilization and liming guidelines based on soil-test results most often accompany the soil test results.

Many people believe that lawn fertilization contributes substantially to nutrient runoff in urban areas. This perception has led to proposals to limit inputs and reduce the size of lawns. In an effort to reduce the amounts of suspended solids and nutrients in urban runoff and to comply with the U.S. Clean Water Act, some states and municipalities have enacted legislation restricting lawn fertilization. For example, in 2005, Minnesota became the first state to ban most turf applications of P-containing fertilizers. Michigan, North Carolina, Virginia, Washington and Wisconsin have, or are considering, enacting similar bans. In January 2011, New Jersey passed the most restrictive law (The New Jersey Fertilizer Law, A2290) to date, limiting applications of both N and P to lawns.

According to research conducted within the last 20 years, stormwater run-off from a healthy, dense lawn growing on soils of even moderate compaction and slope rarely occurs. In all but
very intense rainfall occurrences, stormwater runoff from a healthy, dense lawn is at or near zero. Most notable exceptions include 1) very steep slopes, 2) saturated or 3) frozen soils and 4) severe soil compaction.

A Research Summary
This summary is based on a much more comprehensive article by Drs. Stier and Soldat, titled “Lawns as a Source of Nutrient Runoff in Urban Environments,” published in the Fall 2011 issue of the Watershed Science Bulletin, journal of the Association of Watershed and Stormwater Professionals.

- According to a three-year study conducted in the area of Baltimore, Maryland, N deposits from the atmosphere averaged 10 lbs. per acre, compared to 12.8 lbs. per acre from fertilizers, as potential inputs to the watershed (Groffman et al. 2004).

- Kentucky bluegrass and perennial ryegrass are able to absorb 70% to 80% of an application of 50 lbs. soluble N per acre within 24 hours and almost all of the applied N within 48 hours following application (Bowman et al. 1989).

- According to sales data, Scotts Miracle-Gro estimates that about 50% of U.S. homeowners fertilize the lawn (Augustin 2007). On average, the number of annual fertilizer applications of about 50 lbs. N per acre per application was 1.8, including an estimated 10 million lawns receiving professional lawncare treatments. This frequency of application of N is much lower than that usually recommended by most University Extension turf professionals.

- In 1999, it was estimated that the atmosphere deposits 0.36 lbs. P per acre per year (UN Environment Programme 1999).

- In Wisconsin, a conventionally recommended lawn fertilization program of 130 lbs. N per acre per year, using a 27:1.3 N:P fertilizer, would supply 6.2 lbs P per acre per year. Researchers at the University of Wisconsin (Soldat and Petrovic 2008) found a range of 0 to 17 lbs. P per acre per year reported in turf field-plot research projects, with typical losses from established turf of about 0.4 lbs. P per acre per year. This compares to annual P losses from native prairies of about 0.18 lbs. P per acre, from conventionally tilled agricultural systems of about 1.69 lbs P per acre and from construction sites of more than 11.5 lbs P per acre (Daniel et al. 1979; Sharpley 1995).

- In many cases, runoff is reduced as the stand density of a lawn increases. The contiguous mass or matrix of aerial shoots of turfgrass plants creates a “tortuous pathway,” slowing the flow of water and allowing greater infiltration (Linde et al. 1995; Kussow 2008). In one investigation conducted on a mixture of cool-season turfgrasses, runoff was reduced threefold when infiltration increased in response to fertilization (Easton and Petrovic 2004).

- Returning clippings to the lawn as it is mowed does not appear to contribute to P runoff (Bierman et al. 2010).

- Surface roughness coefficients are commonly used by civil engineers to predict the potential of surfaces to contribute to overload water flow. High coefficient values reflect a potential for less runoff. In a simulated rainfall experiment, pavement had a low roughness coefficient (about 0.01); Short grass prairie, a value of 0.15; and both bluegrass and bermudagrass sod, a value of about 0.4 (Engman 1986).
Most or all of the runoff from lawns can occur when soils are frozen or saturated (Kussow 2008; Steinke et al. 2007). A study evaluating the effect of prairie and turf buffer strips on runoff from concrete slopes revealed that a vegetative buffer twice the size of the sloped (5%) concrete area reduced annual run-off by more than 60%, compared to a 1:1 concrete-to-buffer design (Steinke et al. 2007). However, the 1:1 concrete-to-buffer design was effective, allowing less than 1.5% of precipitation to run off during non-frozen conditions. Most of the runoff from both prairie and turf plots occurred when soils were frozen, at which time runoff totals for both types of vegetation were similar.

Many naturalized areas in a home landscape have rough texture and are capable of retaining precipitation. A properly designed and sized, bermed rain garden (flat-bottomed depression planted with trees, shrubs and native vegetation) or turf swale can intercept flowing water before it reaches an impervious surface (Asleson et al. 2007; Schneider 2007).

Soil compaction may contribute to runoff. A study of 15 lawns in central Pennsylvania revealed that a soil’s condition, structure and history may be more likely to affect water infiltration rates in lawns than the texture (percent stand, silt and clay) of the soil (Hamilton and Waddington 1999). The researchers noted that the condition, structure and history of a soil are largely a function of construction practices before planting.

Recent research in an upper Mid-west lawn demonstrated that, in some cases and over time, the effect of pre-plant soil compaction on the rate of water infiltration may be less of a problem than perceived (Kussow 2008). A silt loam soil with a 5% slope was intentionally compacted using a vibratory roller before an additional 3 inches of silt loam topsoil was placed on top of the compacted area and either tilled or left in a layer before seeding Kentucky bluegrass. By year two of the study, runoff amounts from both compacted and non-compacted plots were similar (e.g., 1.2 to 1.5 inches of runoff annually from 25.2 total inches of annual precipitation).

Core aerification of established turfgrasses growing in compacted soils can improve the speed at which water moves into soil (Partsch et al. 1993; Stier 2000). The growth of turfgrass roots, freezing and thawing of soil and the activity of soil macro-organisms, including earthworms, can also improve infiltration (Easton et al. 2005).

The loss of sediment from healthy lawns is often very low (Soldat and Petrovic 2008) and is unrelated to the level of P in soil unless it is unusually high (Soldat et al. 2009). The small but consistent level of soluble P in runoff waters from turf probably originates from plant tissue (Soldat et al. 2009).

When reactive P loss from unfrozen turf fertilized for three years with a high P:N (1:2) fertilizer was compared to reactive P loss from unfrozen turf receiving a low P:N (1:27) fertilizer, a K:N fertilizer and no fertilizer annually, a significantly greater reactive P loss (0.1 lb P per acre) from turf receiving the high P:N fertilizer occurred in the first year only (Bierman et al. 2010). In the second and third years of the study, reactive P losses from non-fertilized turf were greater than those from any of the fertilized turfs. The researchers attributed
this increase to limited density and higher runoff volumes compared to fertilized turfs.

Final Thoughts
Runoff from lawns is typically 5% or less of precipitation if the soil is not saturated or frozen and the lawns are not maintained on severe slopes. Nutrient loads in runoff from urban areas are directly related to runoff volume, which can be reduced by maintaining a dense lawn, and possibly, by creating swales of turf and/or bermed rain gardens between vegetated sites and paved areas designed to concentrate and funnel runoff into storm sewers or surface waters.

Nitrogen and P should not be applied to turfs when soils are saturated or frozen, or when turfgrasses are not actively growing or are dormant. Phosphorus should be applied in accordance with soil-test recommendations.

If turf is irrigated, water should not be allowed to “pool” on the lawn surface for long periods of time or to move onto impervious surfaces such as driveways, sidewalks and roads. Similarly, fertilizer granules lying on impervious surfaces after fertilizing should be brushed or blown back into the lawn.

Editor’s Note: So, what does this mean for Delaware’s Livable Lawn program or Livable Ecosystems push? It means that small, well-managed, dense lawns are not contributing to nutrient runoff. But, how many lawns in Delaware are compacted? What other ecosystem services are not provided by lawns. There is no question; lawns are an important component of the suburban landscape. Let’s design them to be functional spaces and allow the rest of suburbia to be planted as meadows, forests and landscape beds.


ECOLOGICAL HARDSCAPE CHOICES FOR TODAY’S LANDSCAPE
Jesse Harris, PLA

Today’s landscape professionals have many choices when it comes to choosing ecological hardscapes for their designs. Proper design, installation, and maintenance are critical to their effectiveness. The pavement choices are typically grouped into three categories: rigid, flexible, and unit pavements.

Rigid Pavements
Rigid pavements are surfaces made up of poured slabs of Portland cement and remain rigid or fixed when placed under stress. Rigid pavement requires less base material and has a longer life span than flexible pavements. Concrete is one of the most widely used pavements in construction today. For the designer, concrete is very versatile because it can be integrally colored, stained, stamped, and formed into intricate shapes and patterns. It often utilizes industrial by-products, such as fly ash and slag cement in its production.

Demonstration of the porosity of a porous concrete test sample.
Concrete surfaces also readily reflect light; a property generally referred to as albedo. This characteristic helps to mitigate the Urban Heat Island Effect. Porous concrete pavements are comprised of specially graded coarse aggregates, cementation materials, admixtures, water, and little or no fines. Mixing these products in a carefully controlled process creates a paste that forms a thick coating around the aggregate particles, thus creating a pavement with interconnected voids which allow water to percolate. Similar to all other porous pavements, porous concrete requires a stone bed layer to infiltrate stormwater into.

**Flexible Pavements**
Flexible pavements are surfaces that rely on the strength of the individual component layers and will deform when placed under stress. Hot mix asphalt is the most common flexible pavement, and typically is the least expensive pavement type available. You may not think of asphalt pavement as being sustainable, but it is one of the few pavements that is regularly recycled and reused in new applications, reducing the need for additional natural resources. When trying to mitigate the Urban Heat Island Effect, designers typically have two options with asphalt pavement. Either they can apply a coating that will reflect the sun’s rays back into the atmosphere, or apply a chip sealing to the surface of the pavement. Chip sealing typically consists of two layers: a lighter color aggregate that is bound to the pavement below with a tack coat of liquid bitumen.

Traditional asphalt pavement (left) and porous asphalt pavement (right).

Porous asphalt has been around since the 1970s and it has grown in popularity in recent years, largely due to more rigorous stormwater regulations that require increased infiltration. These pavements, typically used in parking lots, allow stormwater to infiltrate through voids in the asphalt surface into a stone bed below. This pavement type promotes infiltration, improves water quality, and often reduces the need for more traditional stormwater infrastructure. However, owner maintenance is required to keep the pores clean and free from debris. Here in the Northeast, maintenance can be complicated due to leaf drop in the fall and the application of sand for snow and ice during the winter. Nevertheless, with the proper design, installation, and maintenance, porous asphalt can provide a cost-effective and attractive pavement surface.
University of Connecticut, Porous Asphalt parking stalls alongside traditional asphalt drive aisle

**Unit Paving**

Unit paving offers the designer an almost unlimited array of options. There are products made from concrete, asphalt, stone, and even products that incorporate recycled materials such as glass. Color and texture can vary widely amongst manufacturers and product types. Unit pavers can either be placed on a compacted gravel base or a solid material such as concrete or asphalt.

Concrete interlocking pavers are one of the most common types of paver used today. They come in many sizes, colors, and textures. They are typically set on a sand setting bed over a prepared base and compacted. The joints are typically filled with fine sand and compacted again to create an interlocking effect. Concrete pavers afford the designer lower initial and life cycle costs, lower maintenance, and a high end look.

Unit paver with recycled glass.

Concrete interlocking pavers are one of the most common types of paver used today. They come in many sizes, colors, and textures. They are typically set on a sand setting bed over a prepared base and compacted. The joints are typically filled with fine sand and compacted again to create an interlocking effect. Concrete pavers afford the designer lower initial and life cycle costs, lower maintenance, and a high end look.

**Typical cross section for pervious unit pavers.**

The use of pavers with recycled material content can account towards sustainability credits, and may also create visual interest or a splash of color to your project. There is an increase in cost to using this type of unit pavement compared to other types of unit pavers. Pervious pavers can be a great choice for the designer when challenged to meet state or local stormwater requirements. Typically made of concrete, these pavers are designed with an integral tab which creates a predetermined joint space that is filled with a larger aggregate, such as a No. 9 crushed stone. The challenge for the designer is to have the appropriate layers of open graded stone below the pavers to allow for both adequate infiltration and support for the given application.
Design Considerations
The selection of pavement types can be a formidable task for the designer. Designers are often asked to provide the best product that meets the project’s goals, while also meeting the project budget. There are many things that should be considered before arriving at a final product choice. The designer should consider such questions as “What are the goals for the project?” “Does the project have certain ‘Low Impact Development’ (LID) requirements?” “How long will the pavement last?” and “What is the desired aesthetic?” Cost can also be a major determining factor in the selection of the final product, with porous concrete and asphalt often being the highest priced. Ecological hardscapes, where feasible, can significantly enhance the appearance and performance of today’s landscapes.


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Research Briefs

CONTAINER PRODUCTION

Controlled release fertilizer placement affects leaching pattern of nutrients from containers during irrigation. Incorporated and topdressed CRF produced their highest effluent nutrient concentrations in the first 50mL volume of effluent collected before steadily diminishing with increasing effluent volume. Dibbled CRF peaked after 150mL of effluent had been collected. Incorporated and dibbled CRF placement methods have the potential to produce the greatest quantity of leachable nutrients as compared with the topdressed methods. However, a benefit of the dibbled over the incorporated method is that less of the leachable nutrients may leave the container when effluent volumes are kept low, leaving more residual nutrients in the substrate that are available for plant growth. So, when growers are able to maintain a low leaching fraction, the dibble method may be a viable CRF placement method in terms of reducing nutrient leaching and the subsequent environmental impact. (Tyler C. Hoskins, J.S. Owen Jr. and A.X. Niemiera)


Controlled-release fertilizer rates for container nursery production. Nutritional requirements for container-grown crops are known to vary widely among species and even between cultivars. This was observed in this study. To produce high-quality plants while limiting overfertilization, growers should apply CRF rates within the optimal range for each species or cultivar. Overall, the highest acceptable CRF rates within the optimal range were 1.25 kg/m³ N for Spiraea, 1.7 kg/m³ N for Hydrangea, 2.1 kg/m³ N for Cornus, 2.5 kg/m³
N for *Weigelia, Salix and Hibiscus*. The lowest acceptable CRF res within the optimal range were 0.35 kg/m³ N for *Hibiscus*, 0.65 kg/m³ N for *Cornus, Weigelia, Salix* and *Spiraea*; and 0.80 kg/m³ N *Hydrangea*. The undesirable and substantial leaching losses associated with overfertilization require further attention in the nursery industry as well as a n adjustment to the CRF recommended rates for container-grown crops. The cumulative nutrient leaching losses calculated within this study indicate that significant amounts of N and P can be lost under normal production practices. (E. Agro and Y. Zheng)


**GREENHOUSE PRODUCTION**

**Three commonly planted narcissus cultivars show salinity tolerance.** ‘Tete-a-Tete’, ‘Dutch Master’ and ‘Ice Follies’ demonstrate salinity tolerance, which further increases their desirability for cut flower production and landscape planting. The authors recommend cut flower production in pots with irrigation water with an NaCL induced EC of up to 12.81 dS/m. Although they did not test how salinity affects bulb viability in the next season, the salinity tolerance displayed by the plants under controlled conditions indicate that these three cultivars may be good candidates for growth in salinized landscapes. (M.E. Veatch-Blohm, D. Sawch, N. Elia and D. Pinciotti)

*Excerpted from* HortScience 49(9):1158-1164, September 2014.

**Carrier water pH, bicarbonate concentration and plant growth regulators affect final solution pH.** There is little information available on reaction of PGRs commonly used in bedding plant production to carrier water pH and bicarbonate concentration. Most of the 11 PGRs evaluated affected solution pH when mixed with carrier water varying widely in pH and bicarbonate concentration. Establishment of a range of recommended carrier water pH and bicarbonate levels for these PGRs through efficacy studies on bedding plants is necessary to provide applicators and consultants with accurate information on which to base recommendations for efficient and effective PGR use. (D.M. Camberto, J.J. Camberato, R.G. Lopez)

*Excerpted from* HortScience 49(9):1176-1182, September 2014.

**Ultraviolet radiation affects intumescence development in ornamental sweet potato.** Intumescences are a physiological disorder that develops sporadically on the leaf tissue of many plant species. Results from this study show that UVB light plays a significant role in the prevention of intumescence development on ornamental sweet potato. ‘Ace of Spades’ is highly susceptible to intumescences and ‘Sidekick Black’ is much less susceptible, suggesting a genetic component to susceptibility. The best recommendation for control at this point is cultivar or variety selection. (J.K. Craver, C.T. Miller, K. A. Williams and N.M. Bello)


**Pulsing with gibberellin plus benzyladenine or commercial floral preservatives affects postharvest longevity of cut lilies and gladiolas.** Cut stems of lilies and gladioli should be pulsed with 5.0—10.0 mg/L GA₄₋₇ + BA or 2 mL/L GA₄₋₇ + BA + preservative at 3 +/- 1°C in the dark for 20 h before shipping for longest vase life and to prevent leaf yellowing. However, floral bulb preservative was not
effective as an overnight pulse for vase life extension or preventing leaf yellowing. (I. Ahmad, J.M. Dole and B.T. Favero)


TURF

Biosolids improve Kentucky bluegrass growth, especially in drought conditions.
Application of biosolids to the soil improved turf quality, delayed leaf wilting, and increased proline and total amino acids and IAA content, especially under drought stress conditions. Biosolids may improve drought tolerance by promoting N and hormone metabolism and root growth. Proper application of biosolids may be a practical approach to improve plant fitness under drought stress environments. This growth chamber study used calcined clay as the growth media. This media may have much lower microbial activity than native soil, so the effect of biosolids may not be as pronounced in native soils. (Z. Chang, L. Zhuo, F. Yu and Z. Zhang)

Excerpted from HortScience 49(9):1205-1211, September 2014.

Growth responses of Zoysia sp. in shade.
Zoysiagrass use throughout the transition zone has been limited by adaptation to cold temperatures and shade tolerance. The cold-tolerant genotypes, ‘Meyer’ and Chinese Common, both exhibited declining turfgrass quality and density during the course of the study. The shade-tolerant southern adapted cultivars, Emerald and Zorro, both performed well but exhibited injury after the cold winter of 2010-11. The experimental progeny in this study (Z. japonica x Z. pacifica) x Z. japonica) had improved shade tolerance compared with ‘Meyer’ and along with their equivalent cold tolerance to ‘Meyer’ could provide transition zone turf managers improved zoysiagrass cultivars in the future. (K.W. Peterson, J.D. Fry and D. J. Bremer)


NEW PLANTS

Three new Cornus kousa cultivars. ‘Empire’ is a brilliant, white-bracted kousa dogwood that has a columnar form and exfoliating bark. ‘Pam’s Mountain Bouquet (patent pending) is a kousa dogwood with a spreading form that features a prolific fused bract display. ‘Red Steeple’ is a cultivar with a columnar-shaped canopy with red foliage that fades to green with high temperature and white bracts that have a red tint along the margins. Dogwood anthracnose and powdery mildew were not observed on any of these trees. A limited quantity of budwood has been distributed to selected wholesale nurseries in Tennessee and Japan. Additional bulking of these cultivars through budding by selected nurseries under confidentiality and propagation agreements has been accomplished. Contact R.N. Trigiano (rtrigian@utk.edu) for additional details. (P.A. Wadl, M.T. Windham, R. Evans, R.N. Trigiano)

Excerpted from HortScience 49(9):1230-1233, September 2014.

New Chinese hibiscus cultivars. Chinese hibiscus (Hibiscus rosa-sinensis) is planted as a flowering pot plant world-wide and as a flowering shrub in tropical regions. ‘USS Alabama’, ‘USS Mississippi’, ‘USS Missouri’, ‘USS Tennessee’ and ‘USS Texas’ were selected for the shrub market with characteristics such as rapid growth to fill bigger pots, environmental tolerance, and extended bloom cycles. All five new clones develop rapidly in containers. Old flowers abscise freely
with no production of seed under normal culture. Ultimate plant size is dependent on container size and environmental conditions.

‘USS Alabama’ – dense lime green foliage, an upright growth habit and prolific flowering. Flowers are yellow.

‘USS Mississippi’ – clean foliage, a compact growth habit, beautiful blooms, and ease of production. Flowers are yellow-orange with a white eye.

‘USS Missouri’ – dark green foliage, a uniform upright growth habit, attractive foliage and abundant large red flowers. This clone is suited to production as a container plant with its attractive form and intermediate-sized red flowers.

‘USS Tennessee’ – adapted to southern conditions, with multicolored flowers and a vigorous, upright growth habit.

‘USS Texas’ - olive green foliage, a uniform upright growth habit and attractive, abundant large flowers. Flowers are hunter orange with light orange streaks.

These five clones are ideal plants for summer decoration on patios, around pools, or other outside areas. Information on a list of nurseries propagating these clones is available on written request to Cecil Pounders (Cecil.Pounders@ars.usda.gov) (C.T. Pounders and H. F. Sakhanokho)


**Publications**

**Research Report 2014 – Heuchera for the Mid-Atlantic Region.** Mt. Cuba Center's Trial Garden evaluates native plants and their related cultivars for their horticultural and ecological value. The goal of this research is to provide gardeners and the horticulture industry with information about superior plants for the mid-Atlantic region as well as highlight the important ecosystem services native plants provide. To download a copy of the report visit: [http://www.mtcubacenter.org/horticultural-research/trial-garden-research/?utm_source=Heuchera++email+blast&utm_campaign=Education+Email+Blast_June+&utm_medium=email](http://www.mtcubacenter.org/horticultural-research/trial-garden-research/?utm_source=Heuchera++email+blast&utm_campaign=Education+Email+Blast_June+&utm_medium=email)

**Landscape Irrigation Best Management Practices.** Recently released from the Irrigation Association and the American Society of Irrigation Consultants, this update reflects sound engineering practices, emerging technologies and recommended techniques for efficient water use. For more information, contact Carol Colein (carolc@asic.org) or 308-763-8340.
Calendar


**January 7, 14, and 21, 6:30-8:30 PM and January 17 9:00-11:00 AM** - Summer Flowering Shrubs, Mini-Series lectures & Lab by Dr. John Frett; UDBG Friends: $75; Nonmembers: $105; Location: Room 132 Townsend Hall. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.

**January 8** - Turfgrass Conference; Location: College Park, MD; Contact: University of Maryland Extension, Avis Koeiman, 301-405-3913; [http://entomology.umd.edu/extension/extensiontrainingforprofessionals](http://entomology.umd.edu/extension/extensiontrainingforprofessionals)

**January 8-9** - 26th Annual Landscape Design Symposium; Location: Science Center Auditorium; Montgomery County Community College, Blue Bell, PA; Contact: 215.247.5777, info@morrisarboretum.org

**January 14-16** – MANTS Trade Show, Baltimore Convention Center, [www.MANTS.com](http://www.MANTS.com).


**January 28-29** – Delaware Horticulture Industry Expo and 25th Annual Delaware Pesticide Conference; Modern Maturity Center, Dover, DE. Contact Valann Budischak, 888-448-1203

**January 28-29** - Maryland Arborist Winter Conference; Location: Turf Valley, Ellicott City, MD; Contact: MAA, 410-321-8082, [www.mdarborist.com](http://www.mdarborist.com)

**February 4** - Eastern Shore Pest Management Conference; Location: Salisbury, MD; Contact: University of Maryland Extension, 410-856-1850

**February 5** – Aquarius Supply Sustainable Solutions Open House.8AM-3PM, 852 East Main Street, Norristown, PA 19401; for more info, call Nathan Bish @ 610-342-7688

**February 12** - LCA Winter Conference; Location: University of Maryland, Shady Grove Branch, Gaithersburg, MD Contact: LCA, 301-948-0810; [www.lcamddcv.org](http://www.lcamddcv.org)

**February 19-20** - 2015 Chesapeake Green; Location: Maritime Institute, Baltimore, MD; Contact: MNLA, 410-823-8684, [www.mnlaonline.com](http://www.mnlaonline.com)

**March 11** - Pruning 101, 4:00 – 6:00 PM Lecture and Workshop by Dr. John Frett, UDBG Friends members: $30; Nonmembers: $40; Location: 103 Fischer Greenhouse. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.

**March 24** - Mythology of Plants, Lecture by Annette Geisecke; 7:00 PM; UDBG Friends: $15; Nonmembers: $20; Location: The Commons, Townsend Hall. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.

**March 28-29** - Mt. Cuba Enhancing Life in the Soil, Mt. Cuba Center 3120 Barley Mill Road Hockessin, DE 19707, 8:45AM – 5 PM, For more information visit the Mt. Cuba website at mtcubacenter.org or call 302-239-4244

**April 7** - 2015 Annual Plant Sale Preview; Lecture by Drs. Frett and Lyons; 7 - 9 PM; UDBG Friends members: $5; Nonmembers: $10; Location: The Commons, Townsend Hall. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.

**April 15** - Guided Walk of 2015 Plant Sale Highlights, 4-5:30 PM, UDBG Friends members: $5; Nonmembers: $10; Location: Meet at Fischer Greenhouse Entrance on Roger Martin Lane. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.

**May 5** - Designing Resilient Plantings; Lecture by Travis Beck, 7:00 PM, UDBG Friends members: FREE; Nonmembers: $10. Location: The Commons, Townsend Hall. Please register by emailing [botanicgardens@udel.edu](mailto:botanicgardens@udel.edu) or contact Sue Biddle at 302-831-2531.