CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

Winter 2002 • Volume 12 • Number 4

Weed Suppressive Groundcovers

A More Attractive and Effective Way to Manage Weeds

Recent meetings of the New York State Landscape Horticulture Program Committee have led to the development of focus areas for future research and extension emphasis in turfgrass and landscape settings in New York. The statewide program committee has both landscape and turf divisions with representation from academics at Cornell University, key stakeholders and county-based extension personnel. The development of alternative pest management strategies for weed, insect and pathogen pests of turfgrass and landscape plants, as well as environmental preservation of greenspace across New York were identified as key priorities in 2001. Greater understanding of the plant's interaction with its environment, including soil rhizosphere ecology, and the impact of stress on plant growth were also identified as important research priorities. Given this increased emphasis on alternative pest management and environmental preservation, our research and extension programs have expanded to address this need.

Increased Greenscapes

In the past 10 years the landscape industry has seen a rapid increase in spending by the homeowner and commercial landscaper on plant material selections, installation and maintenance. The green industry as a whole has nearly doubled in some areas of New York and the U.S., with recent expansion in numbers of acres in greenscape, and the completion of new golf courses, parks, athletic fields, and private landscape projects. In terms of turfgrass, the U.S. maintains over 25 million acres of turf, with over 2 million acres in New York alone.

Weed management in turf and landscapes has been identified as one of the most critical pest control issues in turf and landscape settings. This issue recognizes the time and amount of herbicide applied to these areas for control of annual and perennial weeds and the strong emphasis on aesthetic appeal. Complicating this issue is the fact that herbicide application in residential and public areas has become more and more controversial. Exposure of adults, children and animals to pesticides is of key concern, as well as runoff due to excessive rainfall or misapplication, or residual activity in local or municipal mulches. Most recently,

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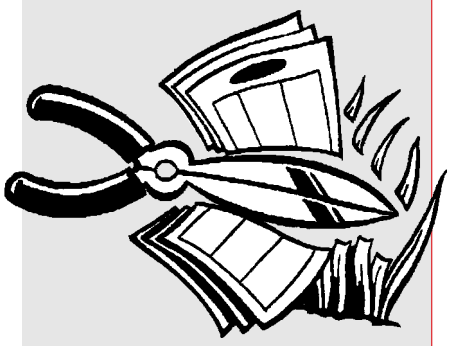
Clippings

A leader is one who inspires, who makes decisions that affect the organization in a positive way, and who can pull together a diverse team to work toward a common goal. Clearly, this characterizes Beth Seme.

NYSTA has begun a unique partnership with the State University of New York College at Delhi to provide college credit towards a Certificate degree based on one's life work.



Beth Seme Recognized Leader!

The Executive Director of the New York State Turfgrass Association (NYSTA), Elizabeth (Beth) Seme has been recognized by *Lawn and Landscape* magazine for a 2001 Leadership Award. The awards, sponsored by Chipco Professional Products, are presented to professionals who are committed to improving the green industry. In discussing leadership, Liz O'Leary, author of the *Ten Minute Guide to Leadership*, says, "A leader is one who inspires, who makes decisions that affect the organization in a positive way, and who can pull together a diverse team to work toward a common goal." Clearly, this characterizes Beth.

A native of Warren, NJ, where by her own admission, "her family grew a little bit of everything," Beth developed an interest in horticulture. After an initial effort studying to become a German teacher, Beth found her interest in plants pulling her into the plant sciences and eventually into occupational education. This wealth of expertise was put to work by Cornell Cooperative Extension in Albany County. Finally, NYSTA, in need of new executive leadership found Beth to be the perfect fit.

Beth has provided important leadership in the legislative arena for NYSTA, as well as for the entire green industry. "When you are working with people," Beth stated, "you want to do positive things." She continues, "More and more people are understanding the importance of being connected, understanding what they are doing, and being educated. They have to understand that they must do an excellent job, or else they will be very susceptible to criticism."

Photo by Bruce McDonough, courtesy Lawn & Landscape.

Leadership, Beth says, does not mean "you have to work miracles. It happens when you become dedicated to what you're doing." On behalf of the entire green industry in New York State, we are glad Beth is dedicated to us and is most deserving of this Leadership Award!

Credit for Life

The New York State Turfgrass Association (NYSTA) has entered into a unique partnership with the State University of New York College at Delhi. President Candace Vancko announced the program, which will provide college credit towards a Certificate degree, at the 2001 NYSTA Conference in Syracuse.

Progress toward a Certificate degree begins with the development of a portfolio that summarizes professional work and educational experiences, awarding credit for life work. The portfolio will provide up to half the credits required for a Certificate as a Landscape/Turf Technician. The remaining credits can come from courses offered on the internet or through NYSTA programs.

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Scanning the Journals

Environmental Cancer Distraction

There are few issues more actively debated among green industry professionals, legislators and advocacy organizations than the environment. A constant stream of criticism from environmentalists or persons concerned about the impact of pesticide use on human health, often places industry leaders and legislators into a defensive posture. In many cases, the easiest solution—especially for legislators—is to promulgate new regulations. The question remains, is this the *best* solution?

Professor Bruce Ames, an internationally recognized toxicologist from the University of California at Berkeley, is a regular contributor to this discussion. His most recent work, published in the *Journal of Mutation Research,* challenges the notion that chemicals in the environment cause cancer. In summarizing a decade of research, Ames and his colleague Professor Lois Gold attempt to make four points.

First, high doses of *all* chemicals—natural or synthetic—will cause cancer in laboratory rodents. Therefore, these doses are not likely relevant to the low doses of human exposure. Second, human exposure to naturally occurring pesticides in plants, half of which will cause cancer in rodents, is 10,000 times their exposure to synthetic pesticides. Third, the major causes of cancer—other than smoking—involve diet, hormonal factors, infection, inflammation, and genetic factors, not synthetic chemicals. Finally, Ames and Gold express concern that putting huge amounts of money into minuscule hypothetical risks damages public health by diverting resources and distracting the public from major risks.

Ames makes a compelling argument when he cites more than 200 studies that report an association between low consumption of fruits and vegetables and high incidence of cancer. It is important to note that recent studies have suggested that synthetic pesticides mimic certain hormones and trigger cancer, however, the scientific community remains undecided.

In the end it becomes a debate in which environmental and human health advocacy groups accuse the industry of bias from having a vested interest. This article is important reading for people looking for some moderation to the debate. One cannot discount the importance of a robust discussion and it is always best to err on the side of caution, but not at the expense of science and public health.

From: Ames, B.N. and L.S. Gold. 2000. Paracelsus to parascience: the environmental cancer distraction. Mutation Research 447:3-13.

Understanding Annual Bluegrass Winterkill

Each year throughout the Northern U.S. a significant amount of golf course turf dies from a complex of factors, loosely termed winterkill. There are a myriad of causes of this complex including diseases, ice encasement and freezing stress. Of these causes, the most elusive to understand has been freezing stress.

With few exceptions, annual bluegrass is a major species on golf courses more than 20 years old in northern climates. A prolific reproductive ability enables annual bluegrass to continually colonize areas that have low turf density. Still, a limitation of annual bluegrass has been the inability to survive winter conditions, especially where persistent ice cover is common.

Canadian researchers, led by Julie Dionne, now on the faculty at the University of Guelph, have been exploring the physiology of annual bluegrass freezing stress resistance.

Populations of annual bluegrass from Professor Dave Huff's collection at Penn State University faced a battery of freezing regimes in a growth chamber in an effort to determine carbohydrate status. The populations differed substantially in response to freezing, as some were killed at 18˚F and some were hardy to -6˚F. It was hoped that this variability would be correlated to the amount of stored carbohydrates; unfortunately, this was not case.

This research did suggest that the ability to hydrolyze stored energy (fructans) to available energy (sucrose) may partially explain the difference in freezing stress. From a practical standpoint any measure a manager can implement to enhance energy reserves, including late season fertilization and increased mowing height, could maximize the chances of survival. With annual bluegrass, nothing is ever absolute as each community of plants represents populations in various stages of evolution.

From: Dionne, J., et al. 2001. Freezing tolerance and carbohydrate changes during cold acclimation of green-type annual bluegrass ecotypes. Crop Sci. 41:443-451.

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Weed Suppressive Groundcovers

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the American Lymphoma Society has reported that higher incidence of usage of 2,4 D was associated with increased incidence of lymphoma in humans. Undoubtedly, further studies and restrictions in use of 2,4 D, the major broadleaf weed control herbicide in turf, are likely as a result of these findings.

State DOT Activities

Besides private and public agencies and stakeholders who maintain turf and landscapes, the New York State Department of Transportation (DOT) currently manages vegetation growth along rights-of-way (ROW) in order to provide adequate sight distances, visibility of signs and guiderails, and prevention of deadly fixed objects along highways. DOT has adopted an integrated vegetation management program which includes prevention, monitoring and control methods as key elements for vegetation management. The establishment of an appropriate vegetation cover which can be maintained with periodic mowing is the preferred technique currently used within the ROW where mowing can be performed. For vegetation under the guiderail and around signs and on slopes where mowing cannot be performed, periodic herbicide treatments have been traditionally used for management of vegetation.

As formally stated in DOT's Environmental Initiative, the DOT has an obligation and responsibility to the people of New York to enhance, protect and improve the environment. Declining resources and an increased interest in management strategies for vegetation with limited environmental impact have also reinforced the need for this agency to examine alternative strategies for vegetation management along New York's highway system. DOT has initiated a program to investigate alternatives to herbicides for vegetation management. Effective alternative strategies could result in significant reductions in herbicide application and less environmental impact in the long term.

Alternative Strategies

To address these needs, recent studies in managed turf settings and along roadsides have investigated the use of alternatives to herbicides for vegetation and weed management. Demonstration projects were designed along roadsides by DOT to evaluate the use of mulch mats made from recycled tires, wildflower mixes to provide low-growing ground covers, and weed fabric mulches. In addition, organic herbicide products including BurnOut—a mixture of acetic acid and lemon juice—clove oil derivatives and corn gluten meal based products were evaluated by extension personnel and the DOT for turf weed and vegetation control. Standard application rates were tested with comparisons to standard herbicide treatments, including Round Up and selected preemergent products.

Studies have also evaluated the use of Alamo and Polecat mowers for vegetation management under guiderails. The general findings of the first two studies indicated that mulch materials in the landscape and along roadsides for weed suppression were expensive, not necessarily effective in suppressing weeds over the long term, and were labor intensive with respect to installation. The herbicide alternative product BurnOut, and the clove oil derivatives suppressed weeds initially to some extent, but regrowth was soon evident after application. Corn gluten meal was found to be expensive to apply given its limited weed suppression, which was similar to that provided by application of less expensive synthetic fertilizers containing nitrogen. The use of alternative mowing strategies and more frequent mowing offered some promise for weed management in turf and under guiderails but involved expensive equipment purchase and additional labor expenses.

So what other non-chemical alternatives might we suggest for use in landscapes and along roadsides? Let's consider the plant material we establish in landscape, turf and roadside settings. Besides turf, the diversity of new ornamental plant materials now available, including groundcovers, is enormous. Given this diversity, the fact that turfgrass may not be the best plant material selection in shady, moist or droughty locations, and the interest in minimizing inputs for pest management, the investigation of new groundcover selections for the landscape has attracted our attention.

In collaboration with Dr. Andy Senesac at Long Island Horticulture Research and Extension Center in Riverhead NY, we have established extensive field trials in Ithaca and Riverhead to evaluate a diverse collection of herbaceous ornamental groundcovers, turfgrasses and native species. Our goals were to select materials which were easily established, required low maintenance and were able

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to overwinter in the Northeast. In addition, the selection of materials which were weed suppressive and resistant to insects, disease and mammalian pests was of critical importance for long-term maintenance ease.

Certain plant selections may offer strong potential for vegetation suppression along NY roadsides, especially if one considers those groundcovers which are easily maintained and stress tolerant. Many groundcover selections have dense low-growing foliage which prevents light penetration at the soil surface and provides for increased competition with weed seedlings for space, light, fertility, and water. Certain ground covers also inhibit weed growth by releasing natural herbicides or allelochemicals from foliage or living root systems, similar to the suppressive effects of the black walnut, for example. We are currently selecting for materials that are both highly competitive and possibly allelopathic, in an attempt to develop recommendations and an interactive website for stakeholders who want aesthetically pleasing, pest resistant selections for landscapes, golf courses, roadsides or other uses.

Suppressive Groundcovers

Weed suppressive groundcovers have been shown to be effective for annual weed suppression in orchards, vineyards, nurseries, and vegetable fields. Plants which produce large quantities of biologically active secondary products called allelochemicals are likely to exhibit resistance to insects, diseases, weeds, or other predators because of their presence within the plant. These allelochemicals are secondary products that are chemically diverse and appear to play a strong role in plant protection from an evolutionary standpoint.

Groundcovers represent an exceptionally diverse collection of higher plants that possess larger quantities of secondary products than many cultivated edible plants, where selective breeding for palatability has resulted in lesser quantities or the total absence of these compounds. Groundcovers such as *Vinca*, *Pachysandra* and *Arctostaphyllus* spp. are highly weed suppressive, due to their dense canopy that may prevent light from reaching the soil surface and stimulating weed seed germination. However, these species also contain secondary products of unique structure and activity. For example, vinca, or periwinkle, produces large amounts of vincristeine, a potent inhibitor of leukemia in children. Vinca is raised commercially for extraction and collection of vincristeine. Pachysandra contains a group of saponins that were used for making soap, but are also potent plant growth and germination inhibitors. Arctostaphyllus, the common bearberry, contains a group of complex terpenoids that exhibit inhibitory activity against weeds and insects.

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According to Paul Curtis of the Department of Natural Resources at Cornell University, relatively few studies have been performed with common groundcovers to evaluate their ability to repel mammalian pests. Recent studies with vinca and pachysandra, however, have shown that bioassays testing the feeding activity of these pests can be effectively designed and are highly correlated with their palatability to deer.

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Weed Suppressive Groundcovers

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Three successive years of field studies at the Turfgrass Research Center in Ithaca NY have shown that certain cultivars of fine fescue are more weed suppressive than others. How exactly do they suppressive weeds? This is the subject of our current research. Some cultivars show strong suppression by their dense growth habit and also through the production of bioactive root exudates from living roots of fine fescues.

Our studies in 2000 and 2001 with herbaceous ornamental-type groundcovers have shown that there are certain groundcovers which exhibit strong aesthetic appeal, resistance to droughty conditions, ability to overwinter well in several climatic regions and also strong weed suppressive abilities.

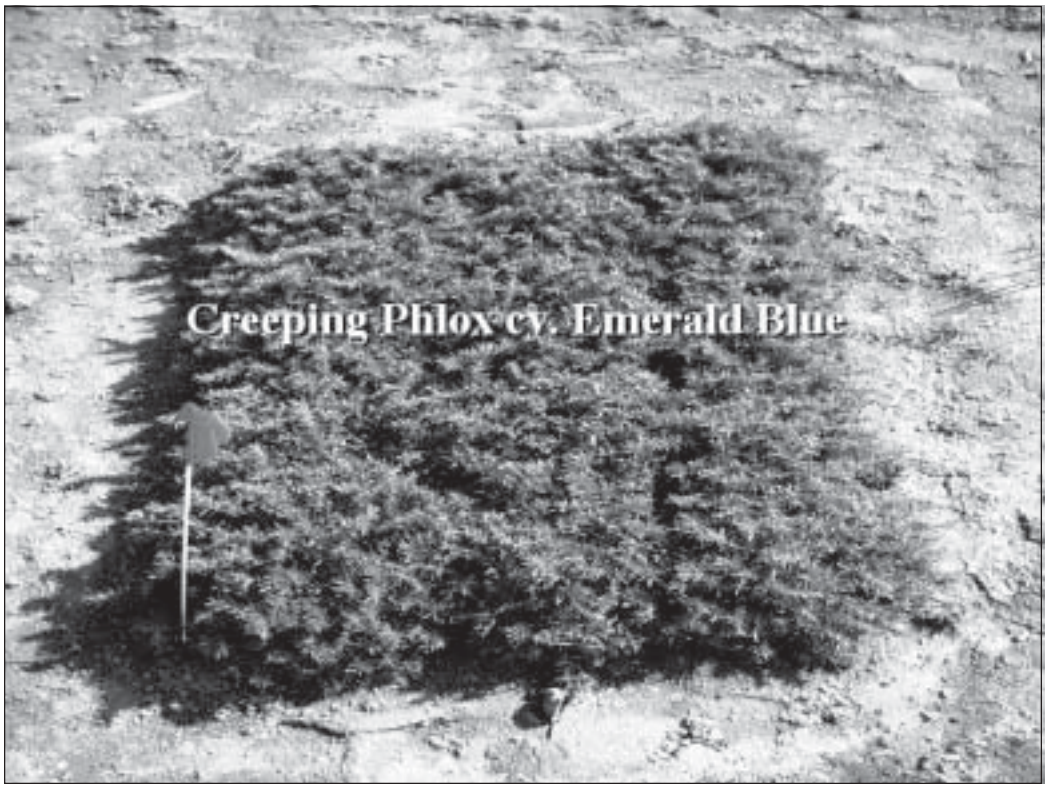
In addition, there are numerous cultivated and native grass species which also have weed suppressive characteristics and may offer appeal in turf and landscape plantings. Certain selections or cultivars of perennial ryegrass, buffalograss and fine or coarse fescues appear to be most promising as low maintenance turfs which offer weed suppressive characteristics. These species and many others offer interesting opportunities for aesthetic appeal in the landscape along with resistance to key pests.

In the landscape as well as naturalized areas, groundcovers serve a variety of functions. They have been recognized to serve as a potential means of protection against soil erosion; their foliage and flowers may add to the aesthetic value, function and form of the landscape; and they may also serve to suppress weeds that grow in the same spatial area as the groundcover itself. As mentioned previously, many of these groundcovers, grasses or native species have never been investigated for their ability to suppress weeds, or the presence of secondary products associated with resistance to insects, diseases or mammalian species.

If one establishes a group of groundcovers in the Northeastern U.S. either in the landscape or along roadsides for weed suppression, it will be imperative that these materials do not attract mammalian pests including voles, mice and especially deer. According to Paul Curtis of the Department of Natural Resources at Cornell University, relatively few studies have been performed with common groundcovers to evaluate their ability to repel mammalian pests. Recent studies with vinca and pachysandra, however, have shown that bioassays testing the feeding activity of these pests can be effectively designed and are highly correlated with their palatability to deer. The presence of unique chemicals in their foliage contributes strongly to the groundcover's ability to repel these mammals or be utilized as a food source.

Suppressive Fescues

Recently, our own studies have shown that creeping or fine fescues (*Festuca rubra* or *Festuca ovina* spp.) for use as turfgrasses in lawns, athletic fields or even golf courses can also be exceptionally weed suppressive. Three successive years of field studies at the Turfgrass Research Center in Ithaca NY have shown that certain cultivars of fine fescue are more weed suppressive than others. How exactly do they suppressive weeds? This is the subject of our current research. Some cultivars show strong suppression by their dense growth habit and also through the production of bioactive root exudates from living roots of fine fescues. Root inhibitors are exuded into the rhizosphere from



the actively growing living roots. We can collect this exudate from fescue growing in agar or sand growth media in laboratory bioassays. The exudate contains about 20 diverse chemicals which are now being structurally characterized. The purified exudate shows potent activity as a seed germination inhibitor of a variety of weed and crop species. Past studies have shown that other coarse fescues are also allelopathic and inhibit the growth of weeds and woody species. Many are used as weed suppressive groundcovers in orchards or vineyards in the western U.S.

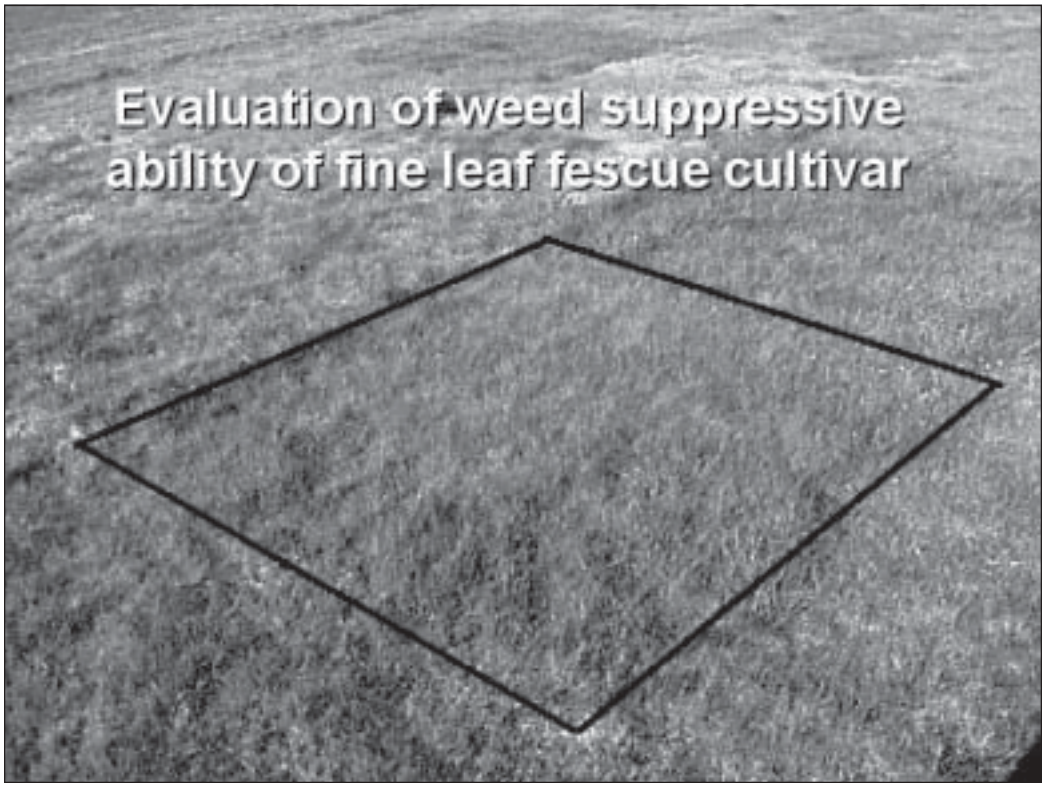
Our studies in 2000 and 2001 with herbaceous ornamental-type groundcovers have shown that there are certain groundcovers which exhibit strong aesthetic appeal, resistance to droughty conditions, ability to overwinter well in several climatic regions and also strong weed suppressive abilities. We plan to conduct these studies over at least the next 5 years to focus upon a diverse collection of attractive species which would be useful in both landscape and roadside settings for weed suppression.

Several species that have shown great promise in our first year of trials in both Ithaca and Riverhead include several species of sedum, creeping phlox, blue lymegrass, ladies mantle, solidago or ornamental goldenrod, and creeping thyme. Other species have proven less tolerant of the New York climate, and less able to suppress weeds. Species that performed poorly for a variety of reasons included several species of creeping hydrangea, phuopsis, fragaria (ornamental strawberry), and houstonia.

Other less well-known materials are now under evaluation for use in a variety of settings across the state. Eventually, we will be conducting on-site highway trials in several settings across the state to predict their ability to suppress weeds along New York roadsides. We have also established a collection of hardy native species that may offer the same interesting characteristics. While ornamentals are generally established by either cuttings or direct seeding, native species are generally established only by direct seeding. One challenge we will face is to develop methodology to enhance seed germination and establishment of these small-seeded natives in less than favorable planting locations.

Within 2 years, we plan to establish an attractive website containing color pictures of each groundcover evaluated with recommendations on establishment and maintenance. Ratings on their individual ability to suppress weeds and resist pest infestation will also be featured. Based on your own landscaping experience, any suggestions you may have for interesting materials to include in our continuing studies would be appreciated. Don't forget that it will be possible to see our field trials in Ithaca and Riverhead locations at Cornell's turfgrass and ornamental Field Day.

Leslie Weston



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Golf Turf Management With Reduced Chemical Pesticides

Program Spotlight

This project is providing information on the feasibility and performance of golf course turf managed with few or no chemical pesticides. Using all 18 greens on Bethpage's Green Course, we are comparing three ways to manage pests:

1) Unrestricted Practices: includes the safe use of legal chemical pesticides.

2) IPM (Integrated Pest Management): reduced, judicious use of pesticides.

3) Non-chemical: biological controls and cultural practices.

Bethpage State Park on Long Island is hosting groundbreaking research on reduced-chemical and non-chemical management of golf course greens. The project is a partnership between Bethpage State Park, Cornell University and the USGA.

Why This Project?

Golf courses throughout the United States are being challenged to reduce or eliminate the use of chemical pesticides. In New York State, many public golf courses have been affected by legislation that phases out or eliminates chemical pesticide use. Those advocating this type of legislation are often unaware of the impact of implementing the policies and the resulting impacts on golf turf performance. In addition, golf course superintendents faced with operating their facilities under constraints on the use of chemical technology need better information on how to maintain acceptable, playable golf course turf with few or no chemical pesticides.

What Are We Doing?

This project is providing information on the feasibility and performance of golf course turf managed with few or no chemical pesticides. Using all 18 greens on Bethpage's Green Course, we are comparing three ways to manage pests:

1) Unrestricted Practices: includes the safe use of legal chemical pesticides.
2) IPM (Integrated Pest Management): reduced, judicious use of pesticides.
3) Non-chemical: biological controls and cultural practices.

An important addition to this project is the comparison of standard and alternative cultural

Kathe Wegman scouting for pests while the intense play on the Green Course continues.

Kathe Wegman, Andrew Wilson (Green Course supervisor) and Frank Rossi view significant damage from fungal diusease.

practices. Cultural practices include mowing, core cultivation, irrigation, topdressing, and numerous other practices to maintain turfgrass at the high level of performance required for the game of golf. The alternative cultural practices in this project were selected to reduce stress on the plants, while keeping the same level of performance quality and playability of the turf. We believe that if golf courses are to be maintained with very few or no chemical pesticides, the use of cultural practices to prevent and minimize problems will be essential.

What Have We Learned?

In 2001, the first year of a three-year project, we learned many things including:

- IPM greens could be maintained with almost a third fewer pesticides than the unrestricted greens that simulate normal maintenance practices—while keeping acceptable quality. However, these greens require a great deal more labor and attention than greens managed in a standard fashion.
- Alternative cultural practices improved green quality slightly. Next year, these practices will need to be more aggressive to get better results.
- We were unable to maintain acceptable playing quality on the non-chemical greens, under the high traffic conditions on the Green Course. Next season, we will be making substantial changes to alleviate these problems to the best of our abilities, within the confines of a non-chemical system.
- Old problems didn't go away. Small and shaded greens still take a beating, and these problems are often worse without chemicals to treat resulting stress symptoms such as diseases and weeds.

Plans For 2002

Most notably, we are installing velvet bentgrass on three of the non-chemical greens. This grass has been under development for many years. It is not susceptible to most of the turfgrass diseases that plague creeping bentgrass greens. You can be among the first golfers in the Northeast to putt on this new grass. We will be making other changes in the cultural and pest management practices on the Green Course that will not be as obvious as the velvet surfaces, but should work together to improve the overall quality of many of the greens.

The Bottom Line

The project is a systems-based approach to putting greens management that integrates both cultural and pest management practices. Bethpage is leading the way nationally to show how golf courses can best be managed with minimal impact on the environment.

Jennifer Grant

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¿Cómo Usted Dice "Golf"?

Managing A Multicultural Workforce

The Human Dimension

Over half of the golf course superintendents surveyed indicated that they had employed immigrant workers for six years or less. The primary reason that the majority of golf course superintendents cited for hiring immigrant workers was availability; most employers had difficulty attracting dependable golf course workers.

In February 2001 a group of golf course superintendents attended a seminar in Dallas, TX entitled "Managing a Multicultural Workforce". Prior to the seminar superintendents were asked to complete a survey regarding their experiences managing Hispanic workers. A total of 30 superintendents completed the survey, which included a variety of questions relating to culture, language and supervisory issues. The superintendents reported on their successes and challenges in dealing with this growing segment of the workforce.

Over half of the golf course superintendents surveyed indicated that they had employed immigrant workers for six years or less. The primary reason that the majority of golf course superintendents cited for hiring immigrant workers was availability; most employers had difficulty attracting dependable golf course workers. In addition, superintendents indicated that the work ethic of immigrant workers was superior to that of many local workers. Superintendents also reported that the overwhelming majority of their immigrant employees came from Mexico. Most of the other countries mentioned were either Central American or Caribbean countries. When asked about the residency status of their immigrant employees the superintendents were split in their responses. Half said that their employees were long term residents of the local area, the other half indicated that they were seasonal employees who returned to their home country in the off season. Only two of the employers surveyed provided housing for their Hispanic workers.

When superintendents were asked to discuss the challenges of dealing with an immigrant workforce the majority indicated that language was clearly the biggest challenge. They used a variety of strategies to overcome the language barrier. Over half indicated that they and their supervisors were making a concerted effort to learn Spanish and have taken Spanish classes. Approximately one third of the respondents indicated that their non-English speaking employees had taken English classes. At one time or another approximately one third of the respondents had hired an interpreter to help with translation in the work place. In addition, many superintendents have a bilingual employee interpret for the rest of the employees. Most employers indicated that overcoming the language barrier was a gradual process, which involved a variety of strategies at the same time.

Cultural Issues

The superintendents surveyed also reported on the issue of cross-cultural understanding. Some indicated that their workers were motivated primarily by money and did not take a longer term view of their job. One employer indicated that older Hispanic workers did not like younger Hispanic supervisors telling them how to perform a job. Similarly, women super-

Keys to Successful Multicultural Management

Turf managers who are successful in managing Hispanic employees generally possess the following characteristics:

- They work aggressively to overcome the language barrier, including learning to speak Spanish themselves.
- They make a considerable effort to learn about the culture of their employees. This enables employers to better understand their employees as people, and to understand the supervisory techniques that are acceptable and unacceptable to employees from another culture.
- They develop an organizational culture that accepts and appreciates the differences that individual employees bring to the workplace. They build an organization based on respect and trust for all employees.
- They establish employment policies and carefully communicate them so all employees understand employer expectations for proper conduct on the job. Once established, employment policies are uniformly enforced with all employees.
- They continually work at building a multicultural team. They encourage their employees to work and problem solve together.
- They help orient their employees to United States laws and customs.

intendents reported that Hispanic men often did not readily accept or respect their management role. All of these examples relate to Hispanic cultural values and traditions.

Some superintendents noted the need to help employees understand the customs and policies of their new country. For example, when superintendents were asked if their immigrant employees had any problems with law enforcement authorities the most common difficulty cited was motor vehicle violations. This indicates a need for employers to work with their employees to understand local laws and customs.

Superintendents discussed openly their feelings about their most challenging aspects of employing immigrant workers. Communication and language issues were very common. Another challenge some superintendents raised was motivating Hispanic workers to take pride in work and to make a long-range commitment to the job. They felt that their ability to motivate was tied to understanding of the culture of their workers. Training was also raised as an issue that is linked to the language and communication problem. By far the consensus of superintendents regarding challenges came down to several key issues, motivation, training, language, and cultural understanding.

Regardless of the challenges, golf course superintendents are impressed with the work ethic and personal qualities that their Hispanic employees bring to the job and they are committed to creating a work environment where people will stay and be satisfied with their jobs.

Thomas R. Maloney

When superintendents were asked if their immigrant employees had any problems with law enforcement authorities the most common difficulty cited was motor vehicle violations. This indicates a need for employers to work with their employees to understand local laws and customs.

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Know More, Do Less

The Lawn Reader

Historically, reducing maintenance inputs often leads to reduction in turfgrass quality. It is unlikely that the American public will be willing to accept reductions in quality. There are few turf books dedicated to the principle of reduced turfgrass maintenance—until now.

Fuel prices in 2001 reached almost $2.00 per gallon in the United States. The rapid price increases prompted discussion about fuel consumption in turfgrass management. Few resources are as critical to the management of turf as fossil fuel. This ranges anywhere from the obvious fuel needed to run a mower, and the fuel used to manufacture fertilizers and pesticides, to fuel consumed in the manufacture of irrigation pipe. Turf is extremely reliant on petroleum.

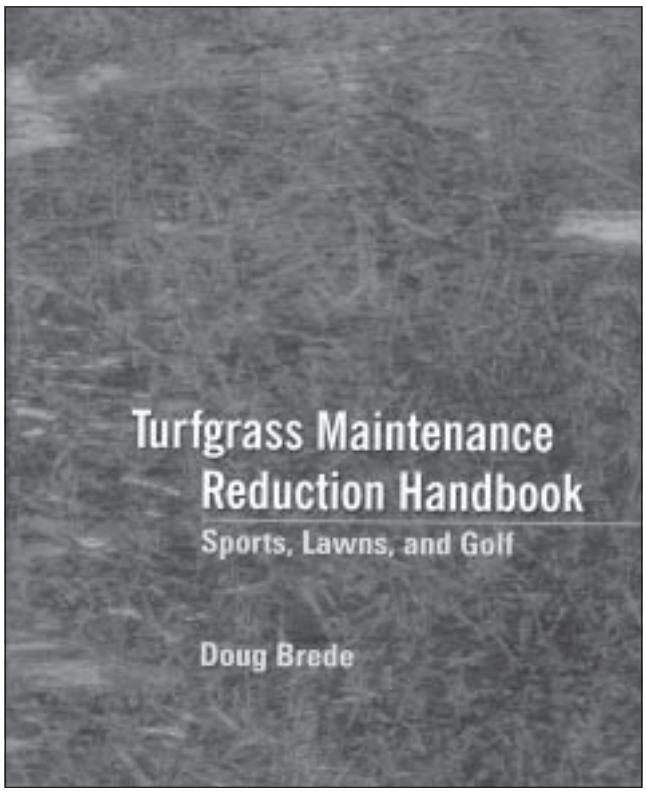
Clearly, the need to question fuel use in turf is here, however, what is the best way to go about it? Historically, reducing maintenance inputs often leads to reduction in turfgrass quality. It is unlikely that the American public will be willing to accept reductions in quality. There are few turf books dedicated to the principle of reduced turfgrass maintenance. In fact, Danneberger's *Turfgrass Ecology and Management*, published by GIE Publications, Cleveland, OH is one of the few that dedicates any space to lower inputs, that is until now.

Turfgrass Maintenance Reduction Handbook:
Sports, Lawns, and Golf
Doug Brede
Ann Arbor Press, Chelsea, MI
ISBN: 1-57504-106-5

Doug Brede has spent his entire professional life in the turfgrass industry. In fact, he has spent most of his life either at the handle of a mower, poking around seed fields, or at the end of a microscope. He is a credible source of information on a variety of turfgrass issues, specifically, turfgrass development, breeding, selection, and establishment. It appears that only one thing continues to plague Doug and that is Mrs. Fernstead and the pro-fertilizer establishment.

Turfgrass Maintenance Reduction Handbook is a one-of-a-kind textbook. This book combines useful maintenance tips with scientific principles in a readable style. It challenges existing thought on energy and water use and offers new ways of thinking about turf maintenance.

The book begins by outlining the issue of low maintenance turf, recognizing the opportunities and pitfalls that lie ahead for those who



embrace the idea of reducing maintenance. Brede is quick to add that the key ingredient in reducing maintenance is not a biological control agent, nor a native grass, rather it is **you**, the manager.

Nevertheless, a significant amount of the text (almost 50%) is dedicated to improving our understanding of turfgrasses. Brede reviews each major cool and warm season species, as well as a collection of "unconventional" grass and grasslike plants. I especially enjoyed the mixing turfgrass chapter. While the charts require a little study to fully grasp, they are good additions and some of the key principles of mixing turf seed are substantiated with research.

The unconventional grass chapter is the only treatise of the subject of which I am aware. In fact, this chapter would really be a book in and of itself. The catalog of these grasses in the Appendix section would be very useful for architects and others who specify grasses for sites.

The remaining chapters are filled with ideas about how to reduce maintenance in a thoughtful way. Of course, more deliberate reductions in maintenance may allow for less drastic reductions in quality.

The major drawback of this text are the black and white images. They rarely add anything to the topic and should have been eliminated.

The book concludes with an interesting discussion on how to trim your pesticide budget. It begins with a little conversation with former *CUTT* editor, Norm Hummel, that highlights the importance of having the right grass. The tables for biocontrols and how to prevent and solve pest problems are handy quick reference guides, although the former may date the text.

The handbook title befits the ease of getting information from this book. Despite its larger format, it is a great book to refer to regularly when making turf management choices. Brede has brought together information, though not necessarily new, in a way that allows the reader to develop reduced maintenance programs based on information, not on products. A must for any thoughtful turfgrass manager.

Frank S. Rossi

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CUTT

continued from page 2

Additional information on the Credit for Life Program is available by contacting SUNY Delhi's Division of Applied Sciences and Recreation, or Dean Dominic Morales at (607) 746-4410.

Weston Joins Cobleskill Faculty

David Weston joined the faculty at the State University of New York College at Cobleskill in 2001 as an instructor in the Turfgrass Management Program. Dave received his BS degree at Cornell University, and was recently awarded an MS degree from Cornell. Dave conducted his Master's research in the area of photobiology, exploring the response of turf growing in shaded conditions.

A regular speaker at Cornell's Turf Field Day and at NYSTA programs, Dave is a gifted teacher. Bob Emmons, the longtime leader of the Golf Turf Program at Cobleskill said, "Dave is the most intelligent and articulate young man I have ever met. He has the ability to sustain and expand the Golf Turf Program at Cobleskill."

Not only is Dave an excellent teacher, he is an experienced scientist able to conduct sophisticated research. Currently, Weston received a grant to evaluate the response of annual bluegrass to drought stress and expects to develop an important sports turf education and research program. Keep a lookout for Dave's infectious smile and welcome him to the turf industry in New York.

Dave Weston at work researching the effect of light levels on turf areas.

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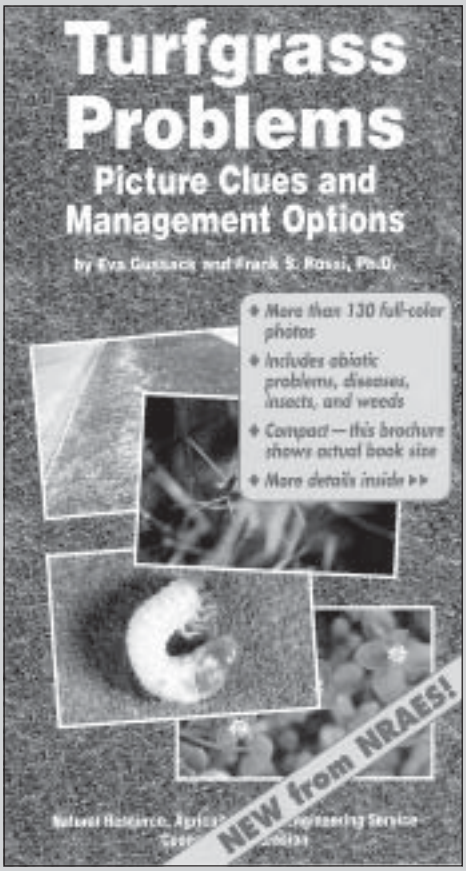
For more information, contact Joann Gruttadaurio, Director of Turfgrass Education: (607) 255-1792 or jg17@cornell.edu. Visit the Cornell Turfgrass Short Course Website: http://www.hort.cornell.edu/instruction/short/turf.html.



*Note: photo does **not** show book at actual size.*

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NYSTA members can order the Picture Clues guide for $18, a 30% savings off the retail price. Contact NYSTA at (800) 873-8873.

Nonmembers contact NRAES at (607) 255-7654, nraes@cornell.edu, or www.nraes.org.

The Horticulture Elemental/Nutrient Analytical Laboratory is one of a small number of university laboratories nationwide dedicated to assisting growers and homeowners in evaluating the nutritional and environmental status of their plants, water and soil.

The lab has been performing plant nutrient analyses for growers and researchers since the 1950s. Cornell faculty work closely with lab personnel to provide fertilizer recommendations and consultations on growers' specific problems. Soil or plant samples may also be submitted for total carbon/nitrogen ratios.

In the last decade, lab services have expanded to include environmental testing of water, plants, amended soil, and sewage sludge. This provides homeowners, turf managers and municipalities with levels of potentially toxic heavy metals so that they can evaluate the safety of their environment. State-of-the-art plasma emission technology is used to provide simultaneous elemental analysis of 30 elements.

The Horticulture Elemental/Nutrient Analytical Laboratory is committed to quality data, and the operation is tested quarterly through the North American Proficiency Testing Service. Please contact the lab for more information on sample preparation, available services and prices. The Horticulture Elemental/Nutrient Analytical Laboratory, 20 Plant Science, Cornell University, Ithaca, NY 14853-5908; (607) 255-1785; www.hort.cornell.edu/department/facilities/icp/index.html.

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the biocontrol agent out-competes the disease-causing organism for a particular resource. Interestingly, there is no definitive evidence that resource competition is an important aspect of biological control.

Several other mechanisms of biological activity that afford disease control include one organism attacking another, an organism inducing plant defenses to a disease, and finally how competently an organism can colonize the root zone.

Much of the activity expected from microbial inoculants stems from the population levels supplied and sustained. For example, *Trichoderma harzianum*, sold as Turf Shield and developed by Cornell University microbiologist Gary Harman, must be present in the soil between 100,000 and 1,000,000 colonies (groups of organisms) per gram of soil. If levels drop below 100,000 then control efficacy is lost.

Much of the activity expected from microbial inoculants stems from the population levels supplied and sustained.

Sustaining these populations depends on conditions at application, such as ultraviolet light and temperature. While most turf managers rarely consider application variables for pesticides, knowledge of these subtle effects will be essential for maximizing performance of microbial inoculants.

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Your Daily Microbe?

A system was developed (BioJect System, Ecosoil, Inc.) to deliver an biological control organism (TX-1), proven in the laboratory to control dollar spot, brown patch and *pythium* diseases of turf. This system is currently being used on several golf courses in the U.S., however, actual performance data has not been available. The Bioject System injects organisms that produce an antibiotic substance into the irrigation system.

Researchers Bresnahan and Drohen at the University of Massachusetts, in cooperation with three golf courses, conducted evaluations of the BioJect Systems at their facilities. The objectives of the study were: 1) evaluate the ability of the BioJect to suppress dollar spot on fairways, 2) evaluate the ability to suppress nematodes on greens, and 3) evaluate the ability to distribute the biocontrol organism through the system.

For the dollar spot trial, daily application of the biocontrol organism was made following a 12-hour fermentation cycle. The organism was applied with a watering can between the hours of 9 pm and 12 am, to simulate nightly irrigation, not through the BioJect System.

Dollar spot levels in the untreated plots were significantly greater than the action threshold that would require treatment (5 spots per 18 square foot plot). Dollar spot levels did not reach the action threshold in BioJect treated plots on the Orchards Golf Course with mostly bentgrass, and Twin Hills Golf Course with low-maintenance Kentucky bluegrass blend. In fact, BioJect treatments were similar to Daconil and Banner fungicide programs.

Under more severe disease pressure, the BioJect treatments provided 86% control but did not maintain acceptable quality turf, as dollar spot levels were well above threshold. Still, the BioJect treated plots that only received Daconil or Banner when threshold levels were reached, reduced fungicide use approximately 70 to 80% as compared to fungicide treated plots without BioJect treatment.

Nematode treatments were applied to a 75-year-old annual bluegrass/bentgrass putting green with high populations of certain parasitic nematodes. Application methods were similar to those made to fairways in the dollar spot experiments, relative to fermentation and watering can. Except for two dates, for one species (*Tylenchorhyncus* spp.), neither the BioJect, nor Nemacur treatments significantly suppressed nematode populations.

The experiment to evaluate distribution was conducted on three golf courses in eastern Massachusetts. Population counts were taken after the fermentation cycle and at various distances from the irrigation pump house. In the cases where the system performed adequately, counts were at or above what is required to achieve acceptable activity. However, in every case where irrigation water was sampled from the sprinkler heads, populations were often 1000 times less than at the pump. The lack of disease incidence on the courses at the time of the study limited the researcher's ability to determine the actual impact of reduced population amounts on control.

The TX-1 organism developed by Dr. Joe Vargas at Michigan State University, when applied in the correct amount, is capable of eliminating or reducing the need for some fungicides. Yet, the inadequacies of the BioJect System to deliver the populations needed for control leaves many questions unanswered.

Shift in Thinking

While biological control will be held to the same performance standards as chemical control, a disparity exists in our willingness to understand the differences inherent with each system. When a turf manager applies chlorothalonil at the recommended rate for 10 to 14 days of dollar spot control, then notices a severe infestation in 5 days, the immediate response is to blame it on intense disease pressure. Regardless of conditions, in most cases a follow up application will be made with little thought given to product failure. Yet, when a biological control fails to provide acceptable protection, the entire technology is criticized.

Chemical pesticide technology has alleviated the burden of understanding the dynamic ecological and biological processes in turf systems. One has no need to understand why dollar spot invades a putting green, only what is needed to control the problem. In fact, there is little motivation for determining ways of preventing the problem, when such simple curative measures are available. How long can we avoid conducting the research to understand these problems? How long will we allow expectations to be the driving force for technological advances?

Clearly, regulation will drive the shift from chemical pesticide use to biological-based management. Until there is a mainstream shift in thinking by the turf industry—whether user motivated or community advocated—the subtleties that inhibit our understanding of biological control will persist. Turf users must be included in this discussion to ensure their support.

We have evidence now that certain cultivars of bentgrass respond differently to biological control. This may explain the well-documented inconsistencies with certain biological control programs. It also means that companies may have to develop cultivar specific microbes and golf course superintendents will need to know the cultivar to utilize the technology.

The days of being able to toss a water-soluble packet into a spray tank on any day a problem is noted and expect 100% control may be numbered. Our commitment to continued research and education on biological control will determine the success of the transition from chemical pesticides to a biologically based system of management.

Frank S. Rossi

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CORNELL Turfgrass
Your Weekly Link to Turfgrass Information!
Short CUTT

April 5, 2001
Week 2

Weather Highlights

- **Temperatures:** Cold this past week. Temps were 4° to 5.5° ↓for most of the region, 6° to 7° ↓ to the south and warmest to the west, 2° to 4° ↓.
- **GDD:** None accumulated this past week. This time of year NYC south would see 30 to 40 and points north should have accumulated ~ 10 to 20.
- **Precipitation:** Abundant across the region. 1" to 2" for most of us. Driest to the west < 0.25", 0.5" across central PA and the highest amounts NYC area with 3".
- **ET:** 0.25" for the region. ET at this time of year can be critical when annual bluegrass suffers winter injury and lower plant crown damage that inhibits early spring rooting.
- **Soil Temperatures:** 36° at 2" in Geneva, 40° at 2" Philly and mid 40°'s as you move west.
- **Forecast for the Coming Week:** Expect a change in the weather pattern bringing ↑ normal temps. (2° to 5°). Weekend will bring a warm front to the northeast. South of the front temps will be in the 60°'s and north of the front 50°'s. Rainfall expected Friday thru Monday particularly to the north of NY and drier to the south. Precip will be ~ 0.5" to 0.75".

Around the Region

- **LI:** Wet with 3" of rainfall. Grass is starting too green-up.
- **Hudson Valley:** Snow molds and salt damage along roadways.
- **Western NY:** Snow molds
- **Jennifer Grant:** Right of Way conference update: Dept. of Transportation is doing some interesting work on alternative weed control including mowers and mats. Demo plots are located around the state. Contact Jennifer for more info.

Grazing in the Grass with Frank Rossi

Turf Covers: In the last decade a few studies have investigated the use of covers to prevent winter injury, with the most comprehensive being conducted in Canada. Several types of covers were used that included completely impermeable blankets, curled wood shavings mat, straw mulch covered with impermeable material, felt material, and a wood frame that created a 2 inch air space above the green and covered with an impermeable material. An uncovered treatment was included to determine the influence of snow or ice cover on winter injury.

Deep prolonged snow cover at the Quebec City location on the uncovered plots afforded the warmest soil temperature and provided best protection from winter injury. However, there were some problems noted from severe snow mold damage. These snow mold scars on putting greens with the new generation bentgrasses can persist for months into the growing season. Results from the Montreal site demonstrated substantial differences in soil temperatures, explanations of how plants are injured and variable survival depending on the type of cover. Temperatures as low as -10° F were recorded under the felt material, and consequently considerable winter damage was observed. In fact, a subsequent study suggested that anoxic conditions, where oxygen levels decrease and carbon dioxide levels increase, might be responsible for severe winter injury to annual bluegrass if experienced for more than 40 days. The researchers went on to suggest that anoxic conditions are exacerbated when soil respiration is high, a condition noted with high organic matter soils.

Uncovered plots reached as low as -17° F. Insulating covers like straw, curled wood mat and the 2 inch air space reduced temperature fluctuations at the soil surface and the annual bluegrass overwintered successfully. Spring removal of covers should be dictated by temperature and leaving them on longer may lead to more rapid green-up. This green-up could result in increased injury, so moving covers on and off in the spring may be required to avoid freezing the succulent tissue. There are some anecdotal reports that indicate that while covered greens do grow sooner, if they are not protected in the early spring from frost, the greens will get set back and be delayed in their performance.

Fungicide Injury: Pentochloronitrobenzene (PCNB) is a uniquely persistent soil active fungicide that affords the winter long disease protection. However, there have been an increasing number of reports regarding turf injury relate to PCNB. Researchers at Penn State University led by Peter Landschoot investigated two formulations (liquid and granular) of PCNB, applied at half, full and double rate (to simulate application overlap) and three timings (late fall, winter and spring). The most objectionable injury was noted after the late and spring applications of the liquid product. The spring application is not available to the superintendent based on label restrictions. Injury from applications of the granular formulation did not appear until after three years of treatments, especially in the final year of the study with follow-up spring applications. The persistence of PCNB was noted with enhanced dollar spot control. Winter and spring applications of PCNB provided up to five months of dollar spot control, regardless of formulation. Finally, Dr. Landschoot and his colleagues observed significant annual bluegrass encroachment in some of the PCNB treated plots in the final years of the study. It was suggested that PCNB reduces the competitiveness of bentgrass or possible enhances annual bluegrass.

Preemergence Herbicides and Rooting: Preemergence herbicides do not inhibit germination, in fact they require weed germination to be effective. Following germination the seedling absorbs the herbicide which is resident in the top 2" of soil. The majority of preemergence herbicides (pendimethalin, benefin, trifluralin, oryzalin, bensulide, prodiamine, DCPA, napropamide, dithiopyr) act by inhibiting cell division which eventually exhausts the seed reserves before the weed can emerge and begin photosynthesizing. The effect of preemergence herbicides on rooting has focused on establishing Kentucky bluegrass sod. In general, preemergence herbicides are thought to be less injurious to established turf, though, the ability to detect subtle differences in rooting remains a critical void in turfgrass research. Grass root tips are regions of active cell division (meristems). The root meristems could be affected if it contacts a preemergence herbicide that inhibits cell division. Ecologically, turfgrass rooting will be most active in the early spring when the soil is cool and top growth is yet to be initiated. This root development aids the turf's ability to withstand summer stress periods where evaporative demand is high and

emergence
during a
application
active stage
would avoid injuring the new roots. Yet, if crabgrass has already emerged most preemergence products will not provide postemergence control, hence, proper timing remains critical.

Our Guest: Dr. Gail Schumann, Dept. of Plant Pathology, U. Mass.

- **Grey Snow Mold:** The prolonged snow cover has made this a good year for snow molds. Under long snow cover we tend to see more Grey snow mold (*Typhula incarnata*) but the good news is that for the most part Grey snow mold eats the leaf blades and does not damage the crown. Once the snow melts the *T. incarnata* activity ceases. Best option is to rake off the matted surface and let the turf recover. Avoid excess nitrogen.
- **Pink Snow Mold:** Pink snow mold (*Michrodochium nivale*) will persist as long as the weather is cool and wet. It does not require snow cover. This fungus will get into the crown, unlike the Grey snow mold, and can appear greasy like Pythium and be difficult to distinguish. This pathogen can be problematic when you start to mow and walk on diseased areas spreading the spores. If this is an issue rope off area to avoiding spreading. This is the time to avoid excess nitrogen and divert water that will move the spores. Pink snow mold is primarily a problem for GC's that need to get out and get going early in the season. Usually homelawns and athletic fields aren't seriously effected. Spring treatments are not recommended. Occasionally a fall treatment may be necessary for a newly established lawn or field (fall) that will have weak reserves to come out of winter.
- **Anthracnose:** Early sightings of Anthracnose (*Colletotrichum graminicola*) on Poa and Bent may be the resting structures from last fall. There was a lot of crown rot last year from the wet, cool summer and stressed poa. It is hard to believe the pathogen is actively growing in these soil and air temps. Anthracnose is typically associated with summer temps (>70°) and stress. Now is not the time to treat the turf. Once you see the blackened crown its too late for fungicides. Granular materials are not effective for crown rots.
- **Leaf Spots:** Reports of Red Leaf Spot (hot weather disease) this time of year are usually a result of winter stress and nutrient issues not the pathogen (Ophiosphacrella). We can expect Drechslera and Bipolaris as soon as it turns warm and wet especially areas that were fertilized. Fungi grow when the grass grows with the exception of snow molds.

Take Home

- **Avoid making applications when the turf is dormant**. If you're going to treat…make sure the grass is growing and you are mowing. Fungi grow when the grass grows.

CUTT

Turfgrass ShortCUTT:
Easy to Use Timely Information

The Cornell Turfgrass Team has a long tradition of conducting important fundamental scientific research focused on turfgrass management. Our scientists are recognized as *the* experts in their field, including biological control, soil insect management, turfgrass ecology, and environmental quality. Still, much of this information doesn't effectively reach you, the end-user.

In the last few years we have seriously addressed this information transfer need. Specifically, in 1998 we initiated the Turfgrass Hotline, now known as *Turfgrass ShortCUTT* (CUTT=Cornell University Turfgrass Times). *ShortCUTT* is a brief, concise, weekly newsletter delivered by noon each Monday during the growing season via electronic mail or FAX.

ShortCUTT includes comprehensive regional weather information, including a weekly forecast; regional pest observations available from turf educators throughout the northeast, including USGA NE Regional Agronomists; cultural and pest management recommendations based not only on current weather patterns, but also on the latest research available from around the world; and finally, each week a national expert is interviewed on a relevant topic such as nematodes, cutworms, bentgrass deadspot, annual bluegrass decline.

As an added bonus, we compile and index all 32 to 35 weeks of *ShortCUTT* for easy reference into an Almanac that becomes a diary of the growing season. It also includes a complete set of weather charts and graphs to compare current conditions with historical information. It is useful during the growing season to refer to such information to compare management strategies. The Almanac has a $50 value.

To get this research-based information into your hands quickly and easily, we use email or FAX and a two or three page format. Annual subscriptions for a year of emailed *ShortCUTT* are $75 ($100 for FAX). Add the Almanac a year of emails is $100 ($125 for FAX)—a 50% savings on the price of the Almanac. NYSTA members receive a 10% discount.

So, now is the time to take advantage of this exciting and innovative approach to having the latest research-based information at your fingertips during the growing season. Act now, send in the subscription form with your payment to secure the Almanac and begin receiving the weekly *ShortCUTT*.

ShortCUTT is a weekly newsletter delivered each Monday during the growing season via email or fax. ShortCUTT includes comprehensive weather information, a weekly forecast, pest observations from turf educators throughout the Northeast, and cultural and pest management recommendations based on the latest research.

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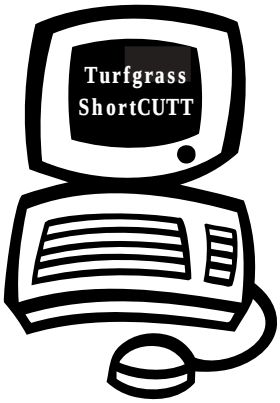

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CUTT

Subtle Aspects of Microbes Determine Performance

A Healthy Ecosystem

In every case, the cry from the public to implement IPM or eliminate pesticides includes an emphasis on the use of biological control.

The recent ruling in Hudson, Ontario, Canada that bans all pesticide use in the community is currently under discussion in Toronto. Several counties in New York State have phased out the use of pesticides on municipal property. Other government bodies are legislating the use of Integrated Pest Management (IPM) in schools as a means of eliminating pesticide use.

In every case, the cry from the public to implement IPM or eliminate pesticides includes an emphasis on the use of biological control. A scientifically illiterate public falls prey to a variety of advocacy groups touting the successes of biological control of plant pests. Unfortunately, the industry as a whole has little understanding of the processes, opportunities and limitations of biological control of turf pests.

Turfgrass managers are regularly inundated with sales material that touts a myriad of benefits from using a particular product. In some cases, actual research data is available, however, many times the data is from controlled laboratory studies or with plant material other than turf. While this should not always disqualify the data, studies under field conditions that generate consistent measurable responses are clearly lacking. A working understanding of the dynamic relationship among plants, soils and biological control agents such as microorganisms is vital for increasing success.

Microbes for Disease Control

"The most common approaches for implementing biological control strategies for plant diseases have involved the use of microbial inoculants or organic amendments," states Eric Nelson, Turfgrass Microbiologist at Cornell University. "In either case, the goal is to increase populations and activity of disease-suppressive microbes in association with turfgrass plants and treated soils."

Microbial inoculants have been used for a variety of purposes in turfgrass management. Researchers have investigated the use of nematodes to control insects, bacteria for annual bluegrass control, and even as means of reducing thatch. Still, the lion's share of the research has focused on the use of microbes for disease control. Unfortunately, the disease research has focused on control efficacy, with little emphasis on the relationships among the plants, microbes, and the soil.

Microbes have specific traits that influence biological control activity such as the production of toxic compounds that influence the growth of a disease organism. This mechanism is similar to how a pesticide would work. A second trait is the competition among the inoculant and the disease-causing organism, where

continued on page 16

CORNELL Turfgrass

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