New York State Integrated Pest Management Program

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Reducing the Risks of Golf Course Management: The Bethpage Project

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*A previous version of this article was published in the BCERF Newsletter, The Ribbon, vol. 12 (4), pp. 6-7, 2007, http://envirocancer.cornell.edu/Newsletter/articles/v12GolfRisk.cfm

About this page

This page describes a systems-based research and demonstration project that compares Conventional, IPM and Biologically Based Reduced Risk management of golf course putting greens. The project is being conducted on the Green Course at Bethpage State Park in Farmingdale (Long Island), NY, and began in 2001.

Background

Golf course superintendents, owners and staff are motivated to reduce pesticide use due to pending regulation, economic factors, and their own environmental consciousness. However, golf turf managers faced with operating facilities with fewer pesticides need the best information on course conditioning that is less reliant on chemical pesticides and also meets golf client expectations. At the same time, those advocating pesticide restrictions need to be aware of the costs of implementing the policies and the resulting impacts on revenues in the case of widespread turf loss. In an effort to address the environmental, economic and practical aspects of pesticide restriction we are exploring golf turf management with little to no chemical pesticides.

Our approach has been to compare traditional putting green management to a strict IPM[1] approach and to biologically-based reduced-risk management. We chose putting greens because they are the most intensively managed golf course areas, have the highest quality expectations, and will therefore be the most difficult to manage without chemical pesticides.

A primary focus of our work is to reduce the plant stress associated with putting green management that often leads to pest problems. These stress-reducing strategies include altered mowing, watering and feeding practices. They result in turfgrass that is sometimes poor in visual quality, but meets the playability standards of the game.

Our project is unique for many reasons. We look at the full suite of management practices performed on a golf course—not just one aspect, and our research site is an operational golf course. The Green Course at Bethpage State Park on Long Island is a high-use public course, with approximately 50,000 rounds of play each year.

The project is long term—we're coming into our ninth year. It's an experiment using full putting greens as experimental units, and it also serves as a demonstration to the many thousands of golfers who play the course each year.

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[1]IPM is "integrated pest management"—using a broad base of practices to prevent and manage pest problems while minimizing negative effects on human health and the environment. In this study, cultural and biological approaches to prevent and minimize pest problems were emphasized in the IPM treatment, but any legal practice or pesticide could be used.

What have we learned?

Diseases, caused by fungi similar to organisms that cause athlete's foot, are the main pest problems on putting greens. These organisms attack weakened, stressed grass more easily and severely than healthy, non-stressed plants. In the early years, we managed six greens without pesticides (no EPA-classified I, II, or III chemical pesticides). The greens, composed of creeping bentgrass and annual bluegrass (*Poa annua*), eventually became unplayable and died each year from the intense heat and humidity of increasingly warmer Northeastern summers. Three of the greens were converted to a more disease-resistant grass species, velvet bentgrass, but have also proven to be difficult to manage without chemical pesticides.

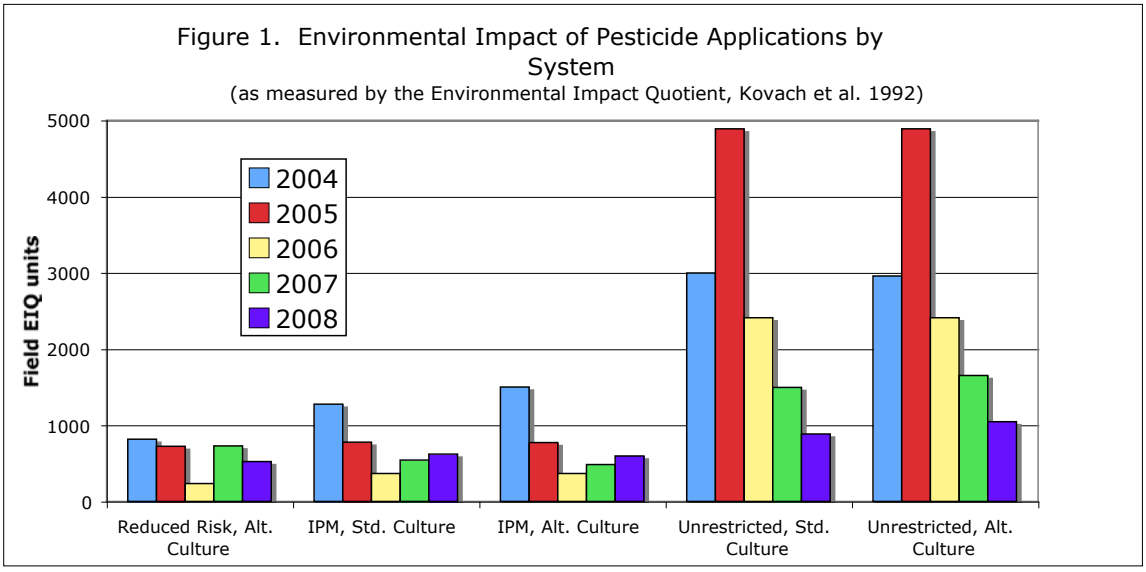
A Conventionally managed green in August, 2008. July and August are the most stressful time for turfgrass in the Northeast.

We conceded that for these older surfaces, that had been treated with chemical pesticides for more than 30 years, nonchemical management was not sustainable given the current technology and negative impact on revenue from reduced golfer play. Consequently, we modified the management of these greens to "reduced risk"—incorporating low-risk chemical pesticides. Reduced risk pesticides have characteristics such as very low toxicity to humans and non-target organisms including fish and birds, low risk of groundwater contamination or runoff, low potential for pesticide resistance, and demonstrated efficacy and compatibility with IPM. This treatment is also "Biologically-based", as biological products and organisms that have shown efficacy in promoting turfgrass health and/or reducing pest problems have been incorporated.

Throughout the project, we have been able to apply fewer chemical pesticides on the IPM and reduced-risk (or nonchemical) greens as compared to traditionally managed greens. The IPM greens have consistently received 30-60% fewer applications of traditional chemical pesticides, while almost always maintaining equal quality. However, numbers of applications do not tell the full story. Numbers of pesticide applications are easily compared, but they reveal nothing about the qualitative effect of these pesticides. As traditional chemical pesticide applications have decreased, reduced-risk and biological product use has increased. So how can we tell which products are "better" to use, and when we are improving?

To address this predicament, we incorporated the "Environmental Impact Quotient" (EIQ) (Kovach et al. 1992), to both select low-impact pest management products and to evaluate the relative effect of our various management regimes. The EIQ model provides information on pesticide effects on non-target organisms, applicators and golfers. The superintendent chooses the lowest risk product amongst the legal products expected to be effective under the specific circumstances encountered. In comparing management strategies, we use the EIQ to evaluate the effect of each approach. From 2004 to 2008, the environmental impact of the IPM and reduced-risk treatments have been up to 96% less than that of the conventionally managed greens (Fig. 1).

Figure 1. Environmental Impact of Pesticide Applications by System
(as measured by the Environmental Impact Quotient, Kovach et al. 1992)



The quality of the IPM greens has equaled that of the conventionally managed greens, almost without exception throughout the eight years of our study. Quality of the reduced-risk greens has been acceptable, if not equal to conventional, through most seasons, with the common exception of approximately one month during the hottest weather each year. Improvement in the biologically-based reduced-risk treatments is documented by the fact that there have been no green closures since 2006. Golfer surveys have further attested to the quality, with all treatments rated as good to very good, with few exceptions from 2003-2008 (excluding the unpopular velvet bentgrass greens). It appears, to date, as though we are getting closer to meeting our environmental and economic goals.

An IPM green in August 2008. July and August are the most stressful time for turfgrass in the Northeast.

Where will we go from here?

Perhaps most important in this project is that we have developed a suite of reduced-risk practices that is feasible for use on public golf courses in New York. We have seen our "experimental" practices begin to be implemented on the other courses at Bethpage and we look forward to more widespread implementation. We are producing an operations manual that can be used as a guide throughout the northeast by other courses interested in reducing their dependence on chemical pesticides. We have also begun examining practices on tees and fairways. We will also continue testing new products and practices for environmentally compatible golf course management.

Further reading

A more detailed discussion of methodology and results from 2001 through 2003 can be found at Turfgrass and Environmental Research Online, http://usgatero.msu.edu and the 2004-2006 reports at New York State Integrated Pest Management Reports, http://nysipm.cornell.edu/grantspgm/projects/default.asp

A Biologically-Based Reduced Risk green in August, 2008. July and August are the most stressful time for turfgrass in the Northeast. If they can make it then, they can make it anytime!

Acknowledgements

We thank the New York State Office of Parks, Recreation and Historic Preservation for our current funding, and NE IPM (USDA) and the USGA for past support.

The project would not be possible without the cooperation and participation of Bethpage State Park, we specifically recognize Andrew Wilson, Kathleen Wegman, Craig Currier and David Catalano.

Reference

Kovach, J., C. Petzoldt, J. Degni, and J. Tette. 1992. A Method to Measure the Environmental Impact of Pesticides. New York Agricultural Experiment Station Bulletin #139. Cornell University, Ithaca, NY, 8pp. Updated version available online., http://www.nysipm.cornell.edu/publications/EIQ