

Project Title:

Producing an integrated pest management (IPM) template to assist golf course superintendents in developing written IPM plans for golf courses.

Executive Summary:

The production of a set of templates will guide golf course superintendents in developing, documenting, implementing, assessing the effectiveness and periodically improving IPM plans. By learning and knowing the identity and lifecycles of weed, disease, and insect pests, and by integrating this information with site-specific agronomic (soil, water and weather data) and financial data, superintendents can generate proactive IPM plans that document progress towards goals, and that aid in communication with co-workers and management. The adoption of IPM-based decision making will enhance not only turf performance, but also superintendent professionalism. In addition, it will reduce the potential for harm to human health, wildlife, and the environment by optimizing and/or reducing unnecessary pesticide applications.

Rationale for research / Description of problem:

Effective pest management plans are comprehensive in scope, integrating agronomic and biological principles as well as cultural, biological and chemical pest control practices. They provide proven, science-driven and reliable methods for resolving the sometimes conflicting goals that golf course superintendents face – producing consistently high quality, high playability turf while at the same time reducing environmental impacts and keeping within budget constraints. While most golf courses have embraced some, or all of the general principles of IPM, development, implementation and optimization of IPM plans can be hampered by several barriers:

- There is a large gap between the general IPM principles found in textbooks and the development of site-specific strategies that address issues of climate and weather, turf varieties, soil and water quality, specific pest complexes, golfer expectations and budgets that vary from course to course. There are currently few tools available to superintendents that bridge this gap, and as a result, IPM programs are rarely realized to their full potential.
- The ability to identify, understand the biology and stay abreast of control strategies for golf course pests – including weeds, diseases, insects and other arthropods and nematodes – is essential for development and implementation of IPM plans. Although a great deal of information is available in the scientific literature, trade journals, text books and extension publications, it has not been synthesized in a way that makes it accessible to golf course superintendents, regardless of their location.
- Once IPM plans are developed, they cannot remain static. Shifts in pest populations, changes in golf course expectations and budgets and the introduction of new products, technologies and scientific information require methods of evaluating new advances as well as procedures for periodic updating of IPM plans.
- Monitoring (for pests, weather, equipment operation/calibration and for the quality of water, soil and turf) and record keeping are the backbone of any successful IPM program.

Information on monitoring and record keeping tools and procedures needs to be centralized and presented in a form that is easily accessible to golf course superintendents.

- One of the most oft-discussed yet least implemented practices is that of objective evaluation of the success (or failure) of newly introduced practices in meeting turf maintenance goals. Without tools for assessing the effectiveness of new techniques, the superintendent's ability to justify and promote their management decisions can be compromised.
- Superintendents vary widely in their technical backgrounds, computer literacy access to information. And golf courses vary widely in their interest in IPM principles and the budgets available to implement them. Yet the ability to incorporate IPM into turf management programs should be feasible for all interested superintendents and golf courses, despite these differences. Rather than assuming a "one size fits all" approach to IPM, successful plans need to be flexible enough to take these differences into account and to make it possible for superintendents at levels to participate.

This proposal seeks to remove these barriers by providing a centralized source of easily accessible information, clear procedures for incorporating this information into IPM plans, and tools for documenting, record keeping and planning that will facilitate IPM planning.

Benefits of research to golf course superintendents:

Proactive approaches: Development and implementation of a comprehensive IPM plan can help superintendents to decrease the incidence of unanticipated turf quality problems (due to pests, fertility, water management or weather related problems) and can improve their ability to respond to unanticipated problems caused by weather, equipment or product failures. In addition, successful implementation of IPM plans is the clearest way to illustrate superintendent's and the golf industry's proactive philosophy with regards to environmental protection.

More effective decision making: By providing a synthesized, centralized and accessible source of key turfgrass management information, superintendents will have easier access to the tools they need to promote turf quality and playability, as well as for making science-based decisions that also take budgetary and site-specific issues (see below) into account.

Site-specific planning: Each superintendent deals with a unique combination of soil types, water qualities, turf types, pest complexes and weather/climate issues – not to mention different budgetary constraints. The procedures and models proposed here will allow the superintendent to customize their IPM plans to address the unique nature of each of these factors at their golf course.

Improved communication: The transparent procedures, record keeping forms and planning calendars proposed in this document will facilitate communication with co-workers, managers and golfers regarding the agronomic rationale for turf management strategies, the timing and planning of management practices and progress towards goals.

Environmental compatibility and human safety: Achieving turf management goals while minimizing hazardous inputs not only contributes to environmental compatibility and awareness, but also to the health and safety of superintendents, their co-workers and golfers.

Enhanced professionalism: Involvement in the implementation of IPM programs as described in this proposal will provide superintendents with new information, skills and tools that will stand them in good stead in current and future jobs. These include: access to comprehensive technical information; methods for objective evaluation of practices, products and progress towards goals; the ability to integrate agronomic and biological information; the discipline involved in monitoring and record keeping; and the tools for communicating complex management principles to a lay audience

Objectives:

1. Produce a set of templates (written procedures, pest identification guides, agronomic guidelines and other reference materials, spreadsheets, record keeping forms and planning calendars) that will guide golf course superintendents towards development and implementation of IPM plans that meet environmental, agronomic and budgetary goals.
2. Ensure that templates are flexible enough to accommodate site-specific conditions, as well as varying levels of superintendent technical expertise and golf course budget constraints.
3. Evaluate the feasibility of these templates through periodic review and testing by superintendents, and make necessary changes based on their input.
4. Recommend methods for dispersing the templates to the superintendent community.

Materials and Methods:

Objective 1: Produce a set of templates that will guide golf course superintendents towards development and implementation of IPM plans that meet environmental, agronomic and budgetary goals:

- Produce a reference resource of clearly written turf guidelines for insect, weed, disease and nematode management. Guidelines will include information on pest identification, biology and control, monitoring tools and procedures, research resources, and pertinent agronomic information such as soil physical and chemical performance, water quality, and turf type performance.
- Produce a series of written procedures that instruct superintendents on the steps and resources required for documentation of current practices and development of an optimized IPM plan.
- Produce spreadsheets, record keeping forms and planning calendars that will assist in planning, documentation and periodic evaluation/update of IPM plans.
- Develop simple models to be incorporated into electronic spreadsheets that will assist superintendents in integrating financial planning into their IPM plans.
- Templates will be designed so that they can be made available electronically or through distribution of hard paper copies. Cost constraints and superintendent preference will dictate the choice of media for dispersal of the information.

Objective 2: Ensure that templates are flexible enough to accommodate site-specific conditions, as well as varying levels of superintendent technical expertise and golf course budget constraints.

- Site-specific historical climate data will be provided to each superintendent to aid in integrating management practices with weather-driven phenomena such as pest development, turf growth and stress and water demand.
- Develop simple models to be incorporated into electronic spreadsheets that will assist superintendents in integrating financial planning into their IPM plans.
- Templates will assist superintendents in establishing short, mid and long term goals for IPM implementation, as well as the tools for evaluating success at each stage of the process.
- Superintendents will be able to implement IPM strategies and develop competence and confidence at their own pace. Documenting current practices and pest infestations will comprise the initial phase of adoption. Secondary level of practice will include implementing new IPM tactics based on the templates provided by this project. A third level of competence includes integration of climate, financial and agronomic factors into the plan and documentation of progress towards IPM goals.

Objective 3: Evaluate the feasibility of these templates through periodic review and testing by superintendents, and make necessary changes based on their input.

- A panel of superintendents selected jointly by the principle investigators and GCSAA will periodically review and test the templates.

Objective 4: Recommend methods for dispersing the templates to the superintendent community.

- The most appropriate method(s) for disseminating each template will be evaluated and recommendations made. Possible methods include GCSAA sponsored seminars, articles in *Golf Course Management*, on-line GCSAA courses, on-line GCSAA references and resources, hard copies of IPM procedures and planning documents made available for sale to cover printing and shipping expenses.

Expected results / outcomes:

- Increased adoption of IPM principles at U.S. golf courses, including documentation, development, implementation and critical evaluation and refinement of IPM plans.
- Enhanced communication with co-workers, golfers and golf course management regarding agronomic and pest management practices
- Ability to progress towards environmental, economic and turf quality goals.
- Improved ability to select products and practices based on IPM principles.
- Easy access to essential information on pest biology and control, agronomic guidelines and monitoring tools and references.

Budget:

A two-year budget request is for a total of \$40,000.

	Year 1 - 2006	Year 2 - 2007	Grand Total
PACE	6,667.00	6,667.00	13,334.00
Wages + ERE for partial salary of computer programmer NCSU	6,667.00	6,667.00	13,334.00
Wages + ERE for partial salary of research specialist UA	6,666.00	6,666.00	13,332.00
Total	20,000.00	20,000.00	\$40,000.00

Principal Investigators:

Dr. Rick Brandenburg, Extension Entomology Specialist, North Carolina State University, Raleigh NC will provide entomological expertise.

Dr. Wendy Gelernter, Principal PACE Turf Research Institute, San Diego, CA will provide entomological and biological control expertise.

Dr. David Kopec, Extension Turfgrass Specialist, Plant Sciences Department, University of Arizona, Tucson, AZ will provide general turfgrass agronomy and management expertise.

Dr. Larry Stowell, Principal PACE Turf Research Institute, San Diego, CA will provide plant pathology and agronomic expertise.

Kai Umeda, Area Extension Agent, Turfgrass Science, University of Arizona Cooperative Extension, Phoenix, AZ will provide weed science and pest management expertise and coordinate the project.

Dr. Fred Yelverton, Extension Weed Specialist, North Carolina State University, Raleigh, NC will provide weed science expertise.

Drs. Brandenburg, Gelernter, Kopec, Stowell and Yelverton are all long-time GCSAA instructors whose seminars address many aspects of the development of comprehensive IPM plans for golf course turf. The combined information in their seminar manuals and references will provide the initial basis for much of the proposed work.