



specific field study was done in the Palatka area to test for aldicarb (Temik) in potable wells. The initial data shows no significant aldicarb in the wells in this area of the state. Dr. Howard mentioned the groundwater study done in Dade County looking for synthetic pesticides used by the golf course industry. Arsenic was found at elevated levels in the soils and shallow groundwater in wells situated at the water table, but concentrations approached background levels in deeper wells. The final reports from DACS and DERM should be available in the near future.

#### Lake Wales Ridge Monitoring Network

The focus of this project is to evaluate the occurrence of pesticides and nitrates in the vicinity of the water table in the unconfined surficial aquifer system throughout the Lake Wales Ridge and Polk and Highlands counties. This area was selected for the low organic matter content in the very clean, well-drained sands that exist in this area and for the potential for contamination from the agricultural use of the land.

#### Surface Water Projects in South Dade and St. Lucie Estuary

Seven detections of endosulfan in excess of water quality criteria for fishable, swimmable waters prompted an inter-agency meeting to determine an integrated approach to the problem. The method will be non-regulatory and includes an education and outreach component, an advisory committee made up of representatives of the industry and regulatory communities and incentive projects to encourage changes in agricultural practices which will protect surface water. The areas of concern were the C-111 and C-111E canals which drain bean and tomato fields. SFWMD has continued to monitor these canals and no further exceedances of water quality criteria have occurred. Furthermore, concentrations of endosulfan and endosulfan sulfate detected below WQC have been reduced significantly. (Ed Note: BMP's do work!)

#### Pesticide Usage Survey

Florida is required by Section 487.16, Florida Statutes to conduct a Pesticide Usage Survey every three years. The new

report in tabular format supersedes the old practice of Random Sample Surveys and is based on the number of pesticides applied, number of applications, rates, and total pounds of active ingredient.

The survey was used for the top 29 major crops in Florida. The reports are based on questionnaires sent to the growers by the USDA. A nationwide uniform procedure along with statistical validity is

used by the USDA to estimate pesticide use information. Comparisons can be made with other states because of a uniform methodology by USDA. This format appears to have more value than the old Random Sample Surveys.

#### Department of Health

DOH officials were caught unaware when the U.S. Fish and Wildlife Service

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released a press release citing that the cause of death of the pelicans dying around Lake Apopka was exposure to chlorinated pesticides. The federal agency issued health advisories in their press release. However, they have not released any of the data that their advisory is based upon.

**Editor's Note:** *These issues have potential to spill over into all commodity groups using pesticides. It is essential that you maintain proper records and comply with all safety rules and regulations so that worst-case scenarios will not dictate how the golf industry will be regulated.*

### SWFWMD Working Group Targets Nitrate Pollution

The Nitrate Remediation Working Group of the SWFWMD held a public forum called "Seeking Solutions for Springs and River Pollution" at St. Leo College in May.

The group contends that homeowners,

agriculture and the green industry, including golf, is contributing a significant amount of nitrates to the springs and river systems from the Suwanee River south to Tampa.

Compelling presentations were made documenting the rise in nitrate concentrations in water samples and the interconnection of sinkholes, underground rivers, and the springs, although it must be noted that the nitrate levels were not yet above health warning levels. However the graph of the nitrate levels is on an upward trend which is growing steeper over time. The working group wanted to tackle the problem before it became more severe and invited all interested parties to the meeting.

Erica Santella, vice president of the FTGA and one of her territory managers from TruGreen-Chemlawn represented the lawn care industry. Paul Illgen of the Glen Lakes G&CC in Weeki Wachee and I represented the golf industry. Tim Hiers from Colliers Reserve in Naples made a

presentation on IPM and good stewardship in general.

Kyle Champion of the SWFWMD summed up the concerns of the Nitrate Remediation Working Group with his study of the origins of the nitrates in springs discharge. Champion stated that between 1991 and 1998, 14 sources of nitrate were investigated (see sidebar).

Champion claims that using a nitrogen isotope test, they have determined that the dominant form of nitrogen present is from inorganic sources. IFAS sources I queried were not aware of such an isotope test that could make that distinction. Champion went on to state that of the seven major spring groups, four were affected by residential/golf course fertilization, two are affected by historical grove fertilization, and one by pasture fertilization.

While those statements may seem pointed, the tenor of the meeting was inclusive and not accusatory. The SWFWMD was seeking cooperation to solve a problem, not pointing fingers to castigate.



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One interesting presentation which illustrated the complexity of the problem on a regional basis was made by Jim

### Nitrate Sources

- 1) organic decay
- 2) rainfall
- 3) residential turf/landscaping fertilization
- 4) golf course turf fertilization
- 5) sewage effluent disposal via WWTP's (?)
- 6) land disposal of sewage sludge
- 7) effluent from septic tanks
- 8) land disposal of septage sludge
- 9) row crops
- 10) citrus grove fertilization
- 11) pasture fertilization
- 12) poultry
- 13) dairies (feedlots)
- 14) open range cattle and horses

Stevenson of the Florida Department of Environmental Protection. Stevenson's focus was on the famed Ichetucknee Springs northwest of Gainesville. Mysterious periods of turbidity made scientists wonder about the underground connections of springs to other bodies of water.

Stevenson's research showed an ancient river course that once flowed from Alligator Lake in Lake City to the present Ichetucknee springs and river. Remnants of the old river course are now fed by a few local creeks and sinkholes which indeed are still connected to the Ichetucknee Springs. Stevenson placed dye in Rose Sink six miles north of the springs and several hours later the dye showed up in the springs. The problem – the creeks and sinkholes in the area receive stormwater runoff from urban and agricultural areas in the basin.

### The Solution

The SWFWMD is seeking collaboration among concerned citizen groups, local governments, IFAS and industry to

address the problem before it gets out of hand. Some ways to reduce and prevent nitrate contamination: better engineering and design of residential stormwater retention systems; good stewardship in agriculture and pasture management to prevent organic wastes from moving into the creeks and sink holes; implementation of best management practices for lawn and golf course fertilization including the use of slow release and liquid fertilizers.

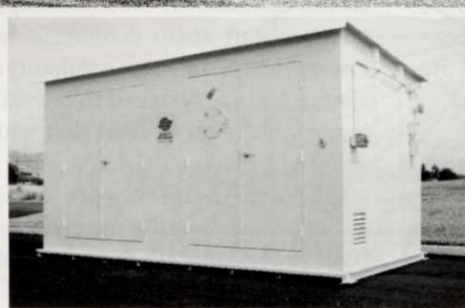
Santella and Illgen have volunteered to serve on the Nitrate Remediation Working Group to represent the turf and golf industries in future discussions.

Water quality is and will be a growing concern as development pushes farther into the pristine wilderness. You can reasonably expect this kind of emphasis to spread to other water management districts. Be prepared to offer your time and expertise in dealing with these issues in your area.

JOEL JACKSON

Director of Communications

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# Building a Consensus on Golf, Environment

**T**he Environmental Principles grew out of the Golf and the Environment conference, held in Pebble Beach in 1995. Attended by influential members of the golf industry and environmental advocacy groups, the attendees waded through tense and tentative exchanges of views, but ended up with an overwhelming consensus that the shared interests and values could be a basis for future collaborative work.

At that meeting, it was determined that an important priority of the collaboration must be the development of a set of national principles to provide guidance on matters relating to environmental considerations in golf course planning and siting, construction, operation and maintenance.

A committee of 25 golf, environmental and government representatives worked together over the next year to prepare a set of principles acceptable to all concerned.

At the next meeting of the Golf and the Environment consortium in 1996 at Pinehurst, the principles were introduced and official endorsements were sought from the organizations that worked on the document and other interested groups.

The environmental principles devel-



*Golf courses are part of our environment. By following the Environmental Principles for Golf Courses, you can make sure they remain a positive influence in communities. Photo by Tom Stone.*

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Management, 1104 East  
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210, Salt Lake City, UT  
84106 or call (801) 466-  
3600 or fax (801) 466-  
6800 for a copy of the  
Environmental  
Principles booklet from  
which this information  
was excerpted.***

oped and approved by the endorsing organizations above will be presented here in a two- or three-part series of articles.

You may also contact The Center for Resource Management, 1104 East Ashton Avenue, Suite 210, Salt Lake City, UT 84106 for call (801) 466-3600 or fax (801) 466-6800 for a copy of the Environmental Principles booklet from which the following information was excerpted.

What are the Principles?

## **Part I. The Preamble**

The principles are envisioned as a tool of universal value, for national use under a variety of circumstances. However, it should be up to the local communities, based on local values, and others involved in the regulatory process, to assess the environmental compatibility of golf courses.

These principles are meant to provide a framework for environmental responsibility in developing goals for existing

courses and for considering issues associated with new courses. They are designed to educate and inform the public and relevant decision makers about environmental responsibility, and to help set goals for environmental performance.

These principles are voluntary. They are not intended for use in making judgments about socio-economic issues. These principles assume regulatory compliance and are designed to provide opportunities to go beyond that which is required by law.

These principles were designed through a collaborative research and dialogue process, but do not resolve all environmental issues related to golf. The dialogue and process is on-going as is the implementation of these principles.

### **How Should They Be Used?**

Good environmental practice and design is the result of a multitude of factors and a thorough understanding of how these factors interrelate on a specific site in a specific locale. The principles are

meant to be used as a guide to making good decisions relative to the planning and siting, design, construction, maintenance and operation of a golf course. They are voluntary and should be interpreted as representing a whole philosophy of good environmental design and management rather than specific dictates, each of which must be met in all cases. It is hoped that the principles will be widely adopted and used to improve the level of environmental awareness, practice, dialogue, and quality achieved within the game of golf.

#### Part II. The Precepts

The participating organizations are committed to the following basic precepts which provide a foundation for the environmental principles:

- To enhance local communities ecologically and economically.
- To develop environmentally responsible golf courses that are economically viable.

## Endorsing the Principles

Organizations endorsing the environmental principles include:

- American Society of Golf Course Architects
- Arizona Golf Association
- Audubon International
- Club Managers Association of America
- Friends of the Earth
- Golf Course Builders Association of America
- Golf Course Superintendents Association of America
- Ladies Professional Golf Association
- National Association of Counties
- National Club Association
- National Coalition Against the Misuse of Pesticides
- National Golf Course Owners Association
- National Golf Foundation
- National Wildlife Federation
- North Carolina Coastal Federation
- Pamlico-Tar River Foundation
- Physicians for Social Responsibility
- Save the Bay
- Shivas Irons Society
- Southern Environmental Law Center
- United States Environmental Protection Agency
- United States Golf Association

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*These principles are voluntary. They are not intended for use in making judgments about socio-economic issues. These principles assume regulatory compliance and are designed to provide opportunities to go beyond that which is required by law.*

- To offer and protect habitat for wild-life and plant species.
- To recognize that every golf course must be developed and managed with consideration for the unique conditions and ecosystem of which it is a part.
- To provide important greenspace benefits.
- To use natural resources efficiently.
- To respect all adjacent land use when planning, constructing, maintaining and operating golf courses.
- To create desirable playing condi-

- tions through practices that preserve environmental quality.
- To support ongoing research to scientifically establish new and better ways to develop and manage golf courses in harmony with the environment.
- To document outstanding development and management practices to promote more widespread implementation of environmentally sound golf.
- To educate golfers and potential developers about the principles of environmental responsibility and to promote

the understanding that environmentally sound golf courses are quality golf courses.

In the next issue we will begin coverage of Part III, Voluntary Principles which will give some practical considerations in the planning and siting, design, construction, maintenance, facility operations and what golfers can do to help.

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## KEY POINTS

- No single alternative is available for methyl bromide as the government prepares to ban it.
- As a fumigant, methyl bromide kills tough perennial weeds, pathogens, insects and nematodes before turfgrass is established.
- With more time, the industry might be able to find an alternative to methyl bromide.



Drs. Barry Brecke, left, and Bryan Unruh check a newly sprigged plot of bermudagrass at the West Florida Research and Education Center in Jay. The plot is being evaluated for emerging weeds and undesirable bermudagrass contaminants. Photo by Milt Putnam. Credit: IMPACT

# Methyl Bromide Ban Will Have Huge Impact on Turfgrass Industry

By J. BRYAN UNRUH, PH.D.

**B**ecause of environmental concerns, a ban on methyl bromide will begin Jan. 1, 2001. The turfgrass industry is not prepared.

Replacements for methyl bromide appear to be less effective, more expensive or environmentally unacceptable.

New turfgrass varieties planted on greens, tees, fairways and sod fields require a clean planting bed to ensure top-quality turf, and methyl bromide provides such a planting surface by killing roots, stems and seeds of unwanted plants, as well as insects, nematodes and disease organisms.

## Application

Methyl bromide is used in the production of more than 100 crops. An estimated 46.5 million pounds were used in the United States in 1996<sup>2</sup>.

Reports lump turf use of methyl bromide under "nursery" or "ornamental" categories. In 1996, the U.S. EPA pegged "nursery" use at 12 percent, or 5.4 million pounds, of U.S. methyl bromide use<sup>2</sup>. Meanwhile, the National Center for Food and Agricultural Policy estimated that 31.3 percent, or 6.26 million pounds, of methyl bromide sold in Florida was used for nursery and sod (turf)<sup>4</sup>.

In turf, two methods of fumigation are employed. In solid-tarp application, liquid methyl bromide is injected (before planting) into the soil at a depth of 8 to 12 inches as a polyethylene tarp is laid over the soil. The chemical rapidly becomes a gas and permeates soil pores. Alternatively, in "hot gas" applications, heated liquid methyl bromide produces a gas that diffuses through a plastic drip tape under a tarp and into the soil.

After a minimum of 48 hours, the

*There is no single alternative to methyl bromide in turfgrass management... the future of preplant fumigation in turfgrass does not look promising.*

tarp is removed, and the soil is allowed to air out for at least three days before planting.

## The ozone layer

Ozone is an unstable, pale-blue gas that forms a layer in the stratosphere 9 to 18 miles above the Earth's surface. It absorbs solar ultraviolet radiation (which damages human skin). Chlorine and bromine destroy ozone. The refrigerant Freon and fire-retardant halons were among the first substances banned to protect the ozone layer.

Worldwide regulation and control of ozone-depleting substances falls under the Montreal Protocol, signed by more than 160 countries. In 1997, the signers agreed to a 25 percent reduction in methyl bromide consumption in 1999, a 50 percent reduction in 2001, a 70 percent consumption reduction in 2003 and a 100 percent reduction by 2005.

But under the U.S. Clean Air Act, the EPA has prohibited production and importation of methyl bromide starting Jan. 1, 2001. Meanwhile, the EPA has frozen U.S. production and importation at 1991 levels.

The EPA says any substance with an



ozone-depletion potential (ODP) of 0.2 or greater must be phased out in seven years. Originally estimated at 0.7, methyl bromide's ODP has been repeatedly revised<sup>6</sup>.

Since 1992, however, new information indicates the original estimate should be reconsidered. Global methyl bromide places of accumulation, called "sinks," include the atmosphere, oceans, soil, as well as plants. Factoring only the oceanic sink into the original estimates results in a lowered ODP estimate of between 0.45 and 0.4<sup>6</sup>.

### Replacements

Many methyl bromide alternatives are under consideration.

Soil solarization occurs when clear plastic is stretched over moistened soil. Over a six- to eight-week period, the heat of solar energy kills many pathogenic fungi and nematodes. Although research indicates that solarization may be a viable alternative for fall vegetable crops<sup>5</sup>, its efficacy hasn't been determined for

turfgrass. This option is probably too time-consuming for golf courses, but may be viable in sod production.

Soil amendments including composts such as yard waste, municipal solid wastes and organic materials such as blood meal, meat and bone meal, and feather meal, suppress soil-borne pathogens<sup>7,13</sup>. The large quantities of compost or amendments needed (20,000 pounds per acre

or more) make this alternative economically unrealistic.

Hot water technology has recently come under consideration for nematode control<sup>10,14</sup>. A Florida company's diesel-fired mobile boiler can heat between 250 and 300 gallons of water per minute to 200-230 F, which is both injected into and sprayed on the soil. Nematode control requires 25,000 to 50,000 gallons of water per acre,

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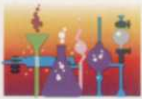
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Chuck Jones, left, manager of St. Augustine sod production at South Florida Sod, Inc., Punta Gorda, and Joan Dusky discuss the sprigging of bermudagrass in fumigation plots located south of Arcadia. The plots are being used to determine the effectiveness of various methyl-bromide alternatives. Photo by Thomas Wright. Credit: IMPACT.

plus 300 gallons of diesel fuel per acre to heat the water. This method may not be environmentally sound, nor is it effective for disease or weed control.

Telone II, developed in 1943, was the first effective and inexpensive nematicide for general field use<sup>11</sup>. It has little activity against pathogens or weeds<sup>9</sup>, so it's frequently used with other fumigants such as chloropicrin and metham sodium.

Areas treated with Telone must be closed to reentry for five days — impractical for operational golf courses, but not for sod farms or closed golf courses. Telone has been targeted by environmental groups.

Chloropicrin (tear gas) is a very effective soil fungicide, but it offers little control of weeds<sup>15</sup>, so it's often used with methyl bromide. Environmentally, it's quite benign: soil microorganisms metabolize it into carbon dioxide, sunlight degrades it rapidly and it's only slightly soluble in water, so it will not move rapidly in aquatic environments.

Metham sodium is a water-soluble pre-plant soil fumigant used to control fungi, nematodes, soil insects and weeds. Its performance varies because it must decompose after application to its active form — methyl isothio cyanate (MITC)<sup>4</sup>. In warmer, drier soils, conversion to MITC is rapid, and the chemical may diffuse out of the soil too quickly to allow control. In cool, wet soils, decomposition to MITC diminishes, and lethal concentrations of the chemical are never achieved.

Dazomet (Basamid) also reacts with soil moisture to produce MITC. As with metham sodium, results are affected by many factors. Dazomet's physical form (ultra-fine powder) imposes serious application limitations. Its label states that 24 days are needed for effective fumigation, which might be acceptable for sod production, but not for most golf courses. A Texas company has developed recommendations for blending dazomet into putting green mixes<sup>3</sup>.

Methyl iodide is in initial stages of evaluation. Limited research indicates it's as good as or better than methyl bromide for control of weeds, nematodes and soil-borne pathogenic fungi<sup>12,16</sup>. It is 1.5 times more effective than methyl bromide in controlling purple nutsedge<sup>16</sup>. Methyl iodide decomposes in light, resulting in a very short lifespan in the atmosphere. Methyl iodide is considered ozone safe with an ODP estimated at less than 0.016<sup>1,12</sup>. It's not a registered pesticide, and virtually no research history is available to allow prompt registration.

Oxidiazon (Ronstar) is the only herbicide deemed safe for newly sprigged bermudagrass in sod production. Oxidiazon is a pre-emergence herbicide

## A Political Alternative

**T**he Clean Air Act is rigid and allows no avenue of recourse for a pesticide that has been targeted.

For this reason, 73 U.S. lawmakers have joined U.S. Rep. Dan Miller (R-Fla.) as co-sponsors of HR 2609 in Congress (8) to bring U.S. regulations into compatibility with the obligations of the Montreal Protocol rather than the stricter obligations of the Clean Air Act.

The bill notes that agricultural use of methyl bromide accounts for less than 3 percent of the threat to the ozone layer, and a report in 1994 stated the Earth's ozone layer will return to normal by the middle of the next century even if methyl bromide remains available.

Alternatives to methyl bromide have many shortcomings, and detailed management schemes are not likely to be devised before the ban occurs. Likewise, too little time remains to identify, research and register new chemical alternatives. HR 2609 would buy the turfgrass industry time to replace methyl bromide by ratifying a slower ban on the fumigant.