

Pesticides on Golf Courses: Mixing Toxins with Play?

By Caroline Cox

Is "an oasis of burbling creeks, swaying trees, and rolling seas of shimmering green"¹ an appropriate description of a golf course? Or would "a toxic waste dump, a destroyer of wetlands, and a misuse of farmland and water"¹ be more correct? What does pesticide use on golf courses mean for golfers, nearby residents, wildlife, and the environment in general? Consider the following stories:

Miami, Florida: "One year, in a tournament near Miami, I had to withdraw after thirty-six holes. The course had been heavily sprayed, and there was weed killer in the lake. When I got to the course for the third round, I couldn't hit a wedge shot thirty yards—I didn't have enough strength. My eyes were bloodshot, my complexion was very ruddy, and my right hand was swollen from taking balls from the caddy. My doctor said it was acute pesticide poisoning." —*Billy Casper*²

(Billy Casper was one of the top professional golfers in the U.S. during the 1960s. He won 51 major tournaments during his career and is in the golf Hall of Fame.)

Hempstead, New York: Following an application of the organophosphate insecticide diazinon to several fairways of the Seawane Harbor Golf Club, a flock of Brant geese came to feed in the treated area. That evening, several hundred of the birds were dead on the golf course and in the nearby harbor. During the next few days, a total of 546 dead geese were collected, and many more birds died in the harbor. Tests showed that diazinon residues in the birds were high, and the acetylcholinesterase (the enzyme inhibited by diazinon) activity in the Brants' brains was depressed by over 80 percent.³

Shizuoka, Japan: "For the first time in Japan, something other than liberal dosings of agricultural chemicals will

be used to keep pests from ruining pristine greens and fairways on a golf course. Japan's first chemical free golf course, to be built near Lake Hamana in Hamamatsu, Shizuoka-ken, will be protected by heat-treating the soil using organic farming technology, it was reported Friday.

"Environmental pollution caused by agricultural chemicals used on golf courses has become a serious problem...."⁴

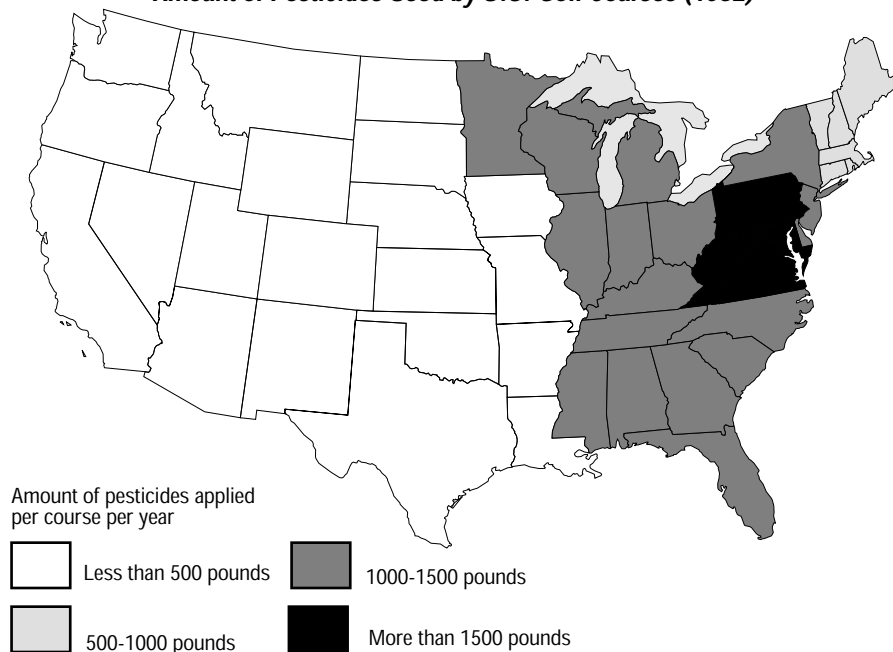
What Are the Problems Associated with Golf Course Pesticide Use?

The pesticides used on golf courses have the potential to cause problems for several reasons. Pesticides are applied at a high rate on golf courses, and the courses are repeatedly used by many people. Pesticides used on golf courses, as is true with most pesticides, are often acutely and chronically toxic to humans and wildlife, have not yet been completely evaluated by U.S. Environmental Protection Agency (EPA), and are used in combination with so-called "inert" (secret)

ingredients whose identity is protected by trade secrets. Finally, pesticide contamination can move beyond golf courses themselves. Perhaps the best studied examples are those in which golf course pesticides have contaminated groundwater.

High Usage: EPA's most recent survey of national golf course pesticide usage, conducted by the American Association of Retired Persons in 1982, showed that golf courses applied an average of over three and a half pounds of herbicides per acre per year, a similar amount of fungicides, and about two and a half pounds of insecticides per acre per year. Total pesticide use was over nine pounds per acre. In some regions of the country, an average golf course uses over 1500 pounds of pesticides per year.⁵ (See Figure 1.) This is much more intensive pesticide use than typical agricultural applications of pesticides, which average less than a pound per acre per year.⁶ A recent survey of golf courses on Long Island, New York, found similar pesticide use rates,

Figure 1
Amount of Pesticides Used by U.S. Golf Courses (1982)⁵



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seven pounds per acre per year.⁷

The 1982 EPA survey also identified the 20 most commonly used golf course pesticides.⁵ (See Figure 2.)

Incomplete and Inadequate Regulation: None of the compounds identified in the EPA survey has been registered, meaning that toxicity testing or evaluation of the pesticides' active ingredient is incomplete.⁸

Because no chronic toxicity testing is required of complete pesticide formulations (the active plus the "inert" ingredients), complete toxicological information is not available about the pesticides used on golf courses.⁹ For example, Daconil 2787, a formulation of the most commonly used golf course pesticide chlorothalonil, is 59.6 percent "inert" ingredients.¹⁰ Neither the identity nor the toxicity of the "inerts" is known.

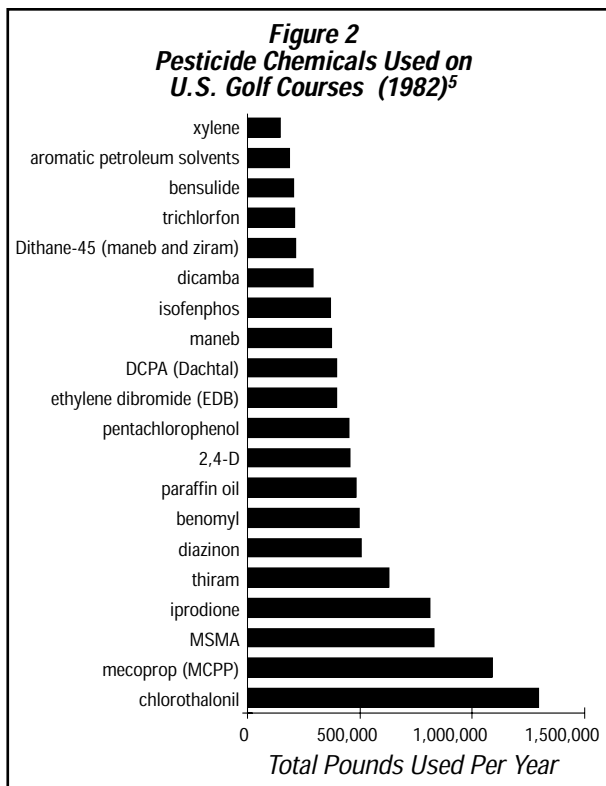
Even some of the active ingredients will never be tested for chronic toxicity. For example, the chlorinated phenoxy herbicide MCPP (mecoprop) is the second most heavily used pesticide on golf courses.⁵ It is also registered for use on lawns, ornamental and sports turf, drainage ditches, and in forestry. Because these are all nonfood uses, EPA is not requiring any chronic toxicity testing of MCPP.¹¹

Regarding chronic toxicity, of the five most commonly used golf course pesticides, two (thiram and MSMA) are neurotoxins,^{7,12} two (iprodione and MCPP) are mutagenic (causing damage to genetic material),^{11,13} and one (chlorothalonil) causes reproductive effects and may have "oncogenic [cancer-causing] potential"¹⁴

Exposure to Golfers: An estimated 23.5 million people play golf in the United States, and thus are directly exposed to the pesticides used on golf courses. This exposure is repeated as the average golfer plays over twenty rounds of golf per year.¹⁵ In most states, golf courses do not notify golfers about pesticide applications, or post the areas that have been treated. The consequences can be tragic, as is

illustrated by the story of Navy Lieutenant George Prior.

Prior, a thirty year old flight officer and frequent golfer, died after twenty days of painful and difficult illness.¹⁶ He had been in perfect health until a short golfing vacation. Extensive investigation by Navy pathologists showed that his death was caused by exposure to the fungicide chlorothalonil. During his hospitalization, his wife learned from the golf course that it had been sprayed twice with chlorothalonil during the week that Prior played there, although such in-



formation was not routinely made available to patrons.

Effects on Wildlife: Pesticide-related bird kills have been one of the best documented problems associated with pesticide use on golf course. The New York State Department of Conservation has records of 25 cases of bird deaths caused by pesticide applications on golf courses going back as far as 1971.^{3,17} The reports summarize deaths of hundreds of birds following exposure to the organophosphate insecticides diazinon, chlorpyrifos, and isofenphos. Blackbirds, blue jays, Brant and Canada geese, coots, grackles, gulls, mallards, robins, starlings, and widgeons have all been killed on golf courses.^{3,17}

These 25 documented cases prob-

ably represent only a small fraction of actual bird kills, as there are only a handful of scientists who can document a pesticide-caused bird death. Also, dead birds are easily overlooked, crushed by automobiles, eaten by scavengers, destroyed by insects and bacterial decay, or washed away.³

Groundwater Contamination: The most careful study of groundwater contamination associated with golf course pesticide use found that groundwater under four Cape Cod golf courses was contaminated with seven pesticides (or their metabolites): chlordane, DCPA (Dacthal), chlorothalonil, isofenphos, chlorpyrifos, dicamba, and 2,4-D. Chlordane, an insecticide whose use on golf courses is no longer permitted, was found at levels over 200 times greater than the calculated health guidance level.¹⁸

Possible contamination of Cape Cod groundwater was of particular concern because of the Cape's large number of golf courses, its shallow groundwater aquifer that provides most of the residents' drinking water, and its sandy soils. Samples were analyzed for 14 pesticides and 3 pesticide metabolites, mostly chemicals used on the courses between 1984 and 1987.¹⁸

Residues of pesticides in water in other areas resulting from golf course use are mostly unstudied. A recent survey in New York found that the two most commonly used pesticides on golf courses on Long Island, chlorothalonil and DCPA, have also been found in Long Island's groundwater.⁷

Pesticides as Part of a Bigger Picture: Environmental Impacts of Golf Courses

Environmental concerns about golf courses focus on a number of issues in addition to pesticide use. At over 100 acres per golf course,⁵ and the "fastest growing sport in North America"¹⁹ golf courses can use up otherwise open space quickly. Construction of a golf course can involve significant alterations to the natural landscape and make the land unsuitable for other uses.

Examples are abundant. Around Palm Springs, California, construction of many golf courses has changed a desert ecosystem inhabited by lizards, snakes, and desert rodents into what a golf course architect called a tropical environment. The arrival of egrets, who had never been seen in the area

before and made the golf course their permanent home, was an obvious sign of the change.²

Near Astoria, Oregon, two golf courses applied for permits and zoning changes to build resorts that included golf courses. Environmental concerns centered around two issues: the developers asked to build closer to the sand dunes that paralleled the ocean beach than was permitted by county ordinances and part of the land proposed for the resorts was home to the silverspot butterfly (*Speyeria zerene hippolyta*), a threatened species. Developers of one resort cancelled their plans after more butterfly habitat was found; developers of the second resort plan to build a course with habitat set aside for the butterfly.^{20,21}

In Ontario, Canada, a golf course was built with four holes on a Class I (provincially protected) wetland that was home to wild rice, pied-billed grebe, river otter, and blue-spotted salamander.²² In a rather convoluted administrative process, the Ontario Municipal Board ruled that plans for the golf course should be rejected on environmental grounds. However, the course had already been constructed, and the Board found it had no jurisdiction to order restoration.²³

Water use is another significant concern, especially in arid areas, areas with a dry season, or where water supplies are being used for people and industry. Bermuda grasses on golf courses in Arizona, for example, use over 30 inches of water per year.²⁴ A proposal for a Canadian golf course would use 10 percent of an adjacent creek's summer water flow for irrigation. Given that the creek is already nearly dry in August, residents are concerned about the wetlands that depend on the creek's water.¹⁹

Whatever the larger environmental issues, it appears that pesticide use on golf courses has the potential to magnify environmental impacts. If a golf course develops a conservation plan to protect an endangered butterfly, for example, how will use of insecticides on the course conflict with those plans? If a course is designed to preserve wetlands, how will pesticide use affect the plants and animals that live in the wetlands?

Moving Towards Solutions

How do we reduce the potential

problems associated with pesticide use on golf courses? While this question has not yet been completely answered, the solution should include the following:

- Make sure that existing courses are being used at their full capacity before constructing new ones.
- Design golf courses to minimize potential pest problems and other environmental damage.
- Reduce golfer's expectations about how golf courses should look. "No longer can we afford the costs of manipulating the environment to allow us to push our turf beyond its genetic limitations," said Dennis Lyon, president of the Golf Course Superintendents Association of America. "The costs to produce the perfect golf course may be, if not financially too high, ecologically too high."²⁵ Greens that are not completely green, or fairways with an occasional weed, need to be a part of a golfer's game.
- Research and implement alternative pest management techniques. Biological control, breeding of disease-resistant turf varieties, and new cultural practices all show promise for golf course management.¹⁵
- Increase the number of well-designed integrated pest management (IPM) programs on golf courses. The next articles in this issue of the *Journal of Pesticide Reform* are introductions to some of the pioneers in golf course IPM. Their programs have made a good start; significant reductions in pesticide use and an increase in the number of courses using IPM programs are needed now. ■

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