

Mark Maloy, 7803 Hamilton Circle, past city council member the city of Jersey Village, Texas, citizen's comments for the 05/15/2017 city council meeting. Please make my comments and documents given to the city secretary a permanent record of this meeting.

I am here tonight to talk about the continued wasteful spending of tax payer money on the city purchased still being paid off by the tax payers Jersey Meadows golf course. I am going to make statements and ask questions that I want an accurate accounting answer to by the current city government and city manager. I have documented and proposed positive repurposing of the golf course land into a very effective storm water detention basin area that can also be designed into low maintenance park space for all Jersey Village citizens to utilize and enjoy that is very much needed at this time and will be very much needed in the future for the Jersey Village community due to the city's plans to develop an estimated 704 acres of Extraterrestrial jurisdiction land on the south side of US290 that drains through the city via two channels that run along the South and North sides of the Jersey Meadows golf course. The large increase of nonpermeable concrete roadway surfaces of the now ongoing major expansion of US290 through the city and further West will be another huge increase in storm water runoff that will come through the aforementioned drainage channels. My proposed repurposing of the golf course land area would significantly reduce or could eliminate flooding to large numbers of homes which has now happened at least four times in the past years starting in the late 1990's.

Question, is the city of Jersey Village Texas applying any fertilizer, pesticides or herbicides on the est. 126 acre fenced in extremely taxpayer subsidized Jersey Meadows golf course? If so what are all the names of these chemicals? And how much of each is being applied and what is the annual cost of the chemicals and the cost of the application including equipment and city employee time? During a recent past council meeting councilman Gary Wubbenhorst asked the parks director about the sub par course conditions. The parks director replied we cannot treat the problem because we reached the maximum usage of specific chemicals at this time.

When the community endures a major storm system such as the one on April 18th 2016 what environmental hazards are inflicted on the property owners due to the runoff of water and chemicals that come off the golf course and end up in their homes and all over their personal property?

Question, How many full time and part time city employees are required to operate and maintain the est. 126 acre fenced in extremely taxpayer subsidized Jersey Meadows golf course? What is the total amount of money of any kind required to employ those individuals?

How much money was spent by the city on well water pumping fees by the city to irrigate the extremely taxpayer subsidized est. 126 acre fenced in Jersey Meadows golf course for the fiscal year 2015-2016? I'm of the understanding it was an estimated two hundred thousand dollars. A past city employee that would know average daily gallon usage numbers est. it to be over one hundred thousand gallons per day. This is the est. amount of water used by 315 homes in Jersey Village TX per day. (determined by 3.5 persons per household each using 90 gallons per day.)

Two private nontaxpayer subsidized golf course facilities close to the Jersey Village area have closed down within the last year. Does this tell you the truth about the economic viability of golf courses?

OVER

What I have said and tried to emphasize as a citizen of Jersey Village TX for many years now is that the only reason the Jersey Meadows golf course continues to exist is because the city of Jersey village government since their nontaxpayer/voter allowed decision (use of certificates of obligation) to purchase the golf course was made continue apparently to be perfectly fine with wasting the taxpayers hard earned money on something named Jersey meadows golf course that the taxpayers should not be paying for. I have read articles about recent large residential planned developments and few if any that are being built will have golf courses as part of their development due to the extreme costs involved in maintaining them which is very apparent if you look at the Jersey Meadows financial requirements.

Average principle and interest payments over the 25 year payment cycle $\$500,724.56 \times 25 \text{ years} = 12,793,114.00$. (From what is printed at the bottom left page of the city provided golf course analysis since inception based on CAFR (Audited numbers) analysis information this money is coming from the general fund).

The most current 2015-2016 golf course ending fund balance since purchased by the city is a negative deficit ending fund balance of \$3,639,235.00. Who is paying this debt? (Could it be the citizens of Jersey Village Texas?)

Every penny of money that is being spent on the Jersey Meadows golf course should be counted as an expense on the golf courses financial profit and loss statement. Is this what is happening or is there some creative although I'm sure legal ways by the city to lessen the amount counted as expense. An example is will the proposed Castlebridge waste treatment plant treated sewer water supplemental irrigation project to water the golf course that is estimated to be \$760,000.00 dollars but I'm pretty sure will be more than this number going to be counted as an expense on the golf courses profit and loss statement?

I look forward to hearing your answers to the above mentioned questions.

Thank you.

✓ Please add this as a record of the 05/15/2017 Council meeting

Mark Maloy, 7803 Hamilton Circle, past city council member of the city of Jersey Village, Texas citizen's comments and questions for the 03/23/2017 city of Jersey Village long-term flood recovery plan phase 2 public meeting. Please make my comments and documents given to the city secretary and Dannenbaum Engineering a permanent record of this meeting.

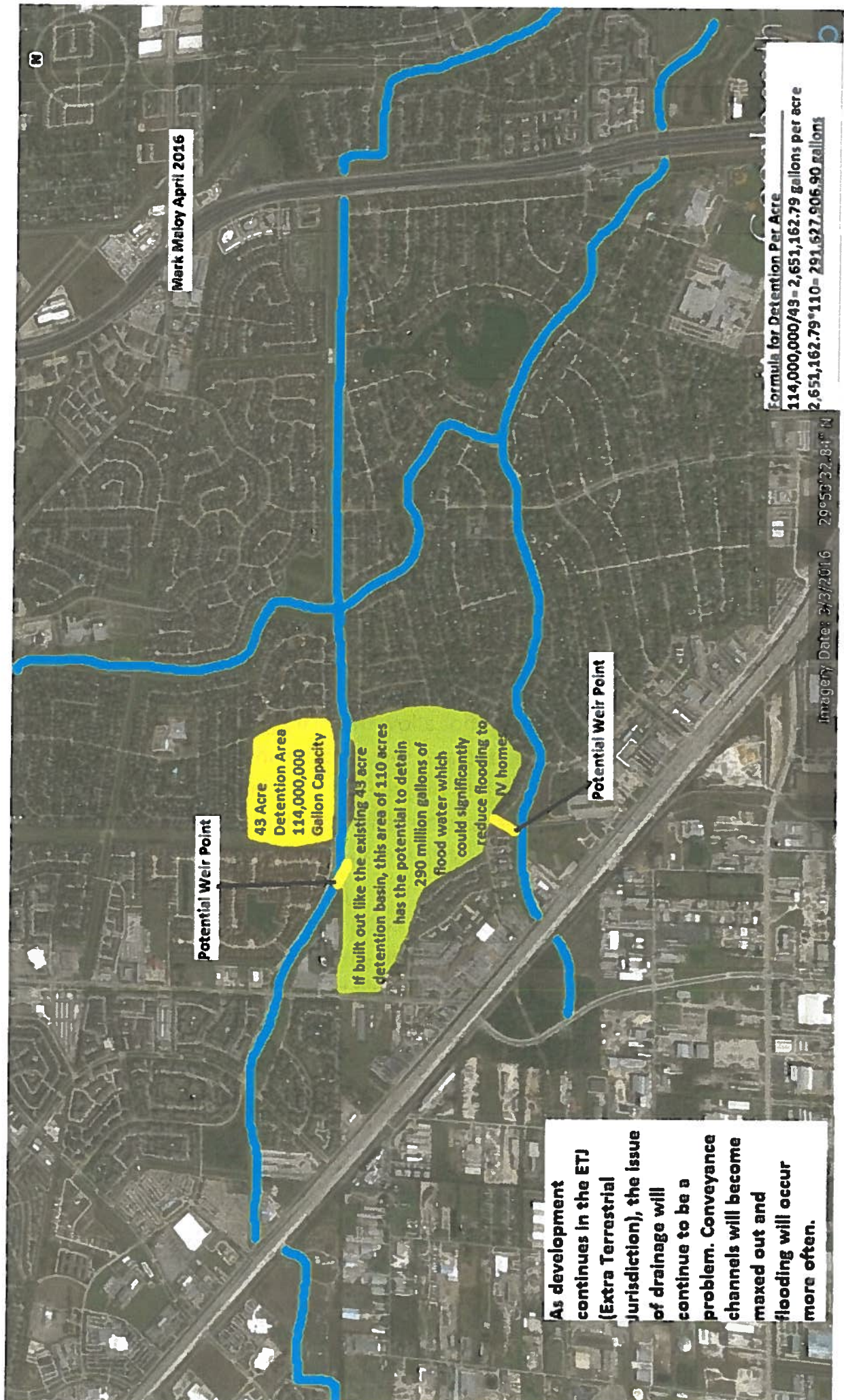
I'm here tonight to express my concerns about the results and findings that are incorporated into the phase 2 handout which I believe many other property owners share. I do not believe that the information saying that future development of the city's extraterritorial jurisdiction on the south side of US290 and the ongoing major expansion of US290 are not going to increase the flooding to already existing homes and properties in Jersey Village. Here are some of the questions and comments I would like answered.

How many more thousands of gallons of storm water are going to be directed into the tributaries and conveyance channels that run along the North and South sides of the Jersey Meadows golf course during a 10, 50 and 100 year flood events from the near future completion of the major expansion of US290?

What factual/guaranteed requirements are in force by the city government to not allow any additional storm water runoff to come through the city that will flood already existing homes and properties due to the development of the estimated 704 acres of the city's extraterritorial jurisdiction (ETJ) on the south side of US290?

The citizens of Jersey Village Texas should not allow their city government to scam them into the belief that they will do the truly needed and required digging out and removal of soil on the Jersey Meadows golf course land area to provide real flood relief to the home owners that live in Jersey Village. The golf course needs to be repurposed into a very effective flood water detention area that can also be designed into low maintenance park space for all the city residents to enjoy. All of the Jersey Village citizens are paying for the golf course. It does not come close to paying for its existence if all actual costs are included in its operation. From past history I believe the city government will most likely do some minor, minimally effective changes and then say we have to keep the golf course because it is now, per them, a dual use area and you, the taxpayers, will be hung with the debt again. City documents attached to show financials.

The engineering study is proposing digging out the soil underneath the bridges located at Tahoe St, Lakeview St and Equador St to allow more storm water to pass through. I think this is a good idea but I am concerned that this is going to cause more flooding to the properties and homes east of the Lakeview/Elwood St bridge. There is nowhere for the additional water to go because there is only one exit point on White Oak Bayou at the TXDOT beltway 8 and HCTRA dam. The bridge openings at the previously mentioned dam are too small to allow the volume of flood water to leave the east side Jersey Village area in a timely manner.



Mark Maloy April 2016

43 Acre
Detention Area
114,000,000
Gallon Capacity

If built out like the existing 43 acre
detention basin, this area of 110 acres
has the potential to detain
290 million gallons of
flood water which
could significantly
reduce flooding to
IV homes

Potential Weir Point

Potential Weir Point

As development continues in the ETJ (Extra Terrestrial Jurisdiction), the issue of drainage will continue to be a problem. Conveyance channels will become maxed out and flooding will occur more often.

Formula for Detention Per Acre
114,000,000/43 = 2,651,162.79 gallons per acre
2,651,162.79*110 = 291,627,906.90 gallons

Imagery Date: 3/3/2016 29°53'32.81" N

Additional questions

How much larger has the flood plain grown in size in the incorporated land area of the city of Jersey Village Texas in the last 30 years?

How many additional homes/properties that were in existence 30 years ago that weren't in the flood zone at that time are now in the current Harris County flood zone mapping in the incorporated city of Jersey Village Texas?

City of Jersey Village, Texas
Certificates of Obligation, Series 2000

	Original Series 2000 C/O Debt Service Requirements	2000 C/O Refunded by Series 2012	Series 2012 Requirements from Series 2000	Total Series 2000 C/O Debt Service Requirements	Debt Service Savings on Series 2000 C/O
9/30/2001	\$405,688			\$405,688	
9/30/2002	405,688			405,688	
9/30/2003	405,688			405,688	
9/30/2004	405,688			405,688	
9/30/2005	569,738			569,738	
9/30/2006	567,488			567,488	
9/30/2007	564,538			564,538	
9/30/2008	565,713			565,713	
9/30/2009	561,013			561,013	
9/30/2010	560,438			560,438	
9/30/2011	558,813			558,813	
9/30/2012	556,138	(\$112,719)	\$111,082	554,500	\$1,637
9/30/2013	552,413	(225,438)	188,329	515,304	37,109
9/30/2014	552,463	(225,438)	201,081	528,106	24,357
9/30/2015	546,288	(225,438)	201,350	522,200	24,088
9/30/2016	544,094	(544,094)	502,411	502,411	41,683
9/30/2017	544,000	(544,000)	504,863	504,863	39,137
9/30/2018	546,000	(546,000)	505,873	505,873	40,127
9/30/2019	551,875	(551,875)	511,803	511,803	40,072
9/30/2020	556,500	(556,500)	514,901	514,901	41,599
9/30/2021	559,875	(559,875)	520,416	520,416	39,459
9/30/2022	566,875	(566,875)	527,460	527,460	39,415
9/30/2023	567,500	(567,500)	520,614	520,614	46,886
9/30/2024	576,625	(576,625)	496,825	496,825	79,800
9/30/2025	579,125	(579,125)	497,350	497,350	81,775
	\$13,370,256	(\$6,381,500)	\$5,804,358	\$12,793,114	\$577,142

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 caddie. 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,

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

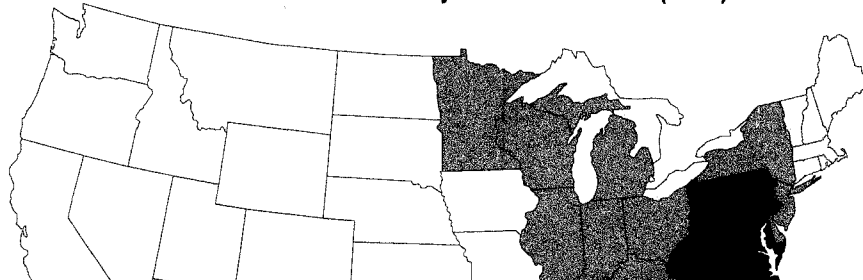
What Are the Problems Associated with Golf Course Pesticide Use?

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



Please make this a permanent record of the 05/15/17 Council Meeting

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 re-registered, meaning that toxicity testing or evaluation of the pesticides' active ingredient is incomplete.⁸

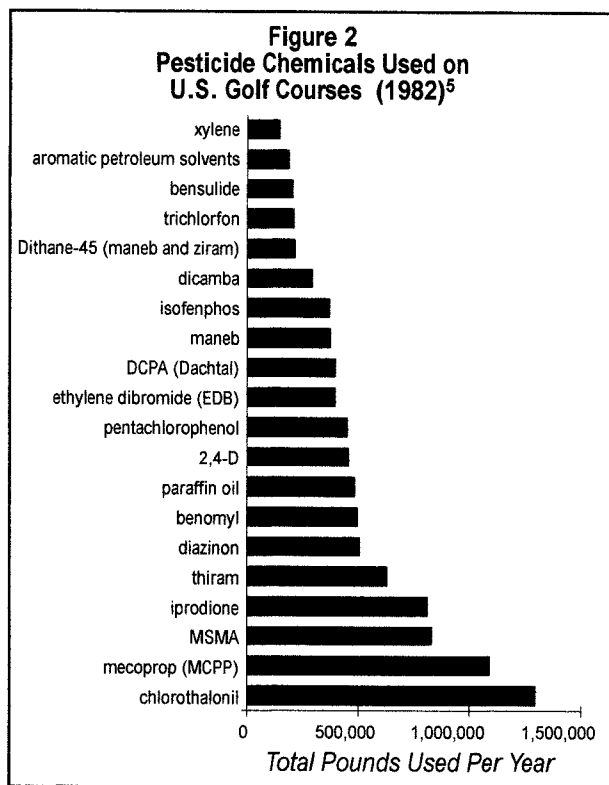
Because no chronic toxicity testing is required of complete pesticide formulations (the active plus the "inert" ingredients), complete toxicological information is not available about the pesticides used on golf courses.⁹ For example, Daconil 2787, a formulation of the most commonly used golf course 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

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 Con-

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

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

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. ■

References

1. O'Connor, T. 1990. Golf and the environment: A deadly serious debate. *Score* (August):25,26,28,30.
2. Edmondson, J. 1987. Hazards of the game. *Audubon* (November):25-37.
3. Stone, W.B. 1987. In the matter of CIBA-GEIGY CORP. et al. FIFRA docket Nos. 562, et al. Testimony. Washington, D.C. U.S. Environmental Protection Agency.
4. *Congressional Record*. 1990. 136(45):S4794.

groundwater contamination from pesticides on Long Island golf courses. State of New York Department of Law. Environmental Protection Bureau.

8. U.S. Environmental Protection Agency. Pesticides and Toxic Substances. 1991. Pesticide reregistration progress report. Washington, D.C. (May.)
9. U.S. Environmental Protection Agency. 1987. Inert ingredients in policy statements; Policy statement. *Federal Register* 52(77):13305. (April 22.) and "Corrections to EPA proposed data requirements for registration of pesticides." *Chemical Regulation Reporter* January 21, 1983.
10. Diamond Shamrock Corporation. Agricultural Chemicals Division. 1982. Material Safety Data Sheet Daconil 2787 Flowable Fungicide. Cleveland, OH.
11. U.S. Environmental Protection Agency. Office of Pesticides and Toxic Substances. Office of Pesticide Programs. 1988. Pesticide factsheet 192. Washington, D.C. (December).
12. Weiss, L. 1989. *Keep off the grass. Part I. A review of the health effects of pesticides most commonly used by the lawn care industry.* Washington, D.C.: Public Citizen's Congress Watch.
13. Mott, L. and K. Snyder. 1987. *Pesticide alert: A guide to pesticides in fruits and vegetables.* San Francisco CA: Sierra Club Books and Natural Resources Defense Council.
14. U.S. Environmental Protection Agency. Office of Pesticides and Toxic Substances. Office of Pesticide Programs. 1988. Pesticide factsheet 36 (chlorothalnil). Washington, D.C. (December).
15. U.S. Environmental Protection Agency. Office of Pesticide Programs. 1989. *Integrated pest management for turfgrass and ornamentals.* (A. R. Leslie and R. L. Metcalf, eds). Lawrence, KS: Golf Course Superintendents Association of America.
16. Prior, L.R. 1985. With full military honors. *The Amicus Journal* (Fall):8-9.)
17. Stone, W.B. 1990. Wildlife mortality related to the use of diazinon, chlorpyrifos, isofenphos, and bendiocarb 1987-1989. Unpublished report. New York State Department of Environmental Conservation.
18. Cohen, S.Z. et al. 1990. A ground water monitoring study for pesticides and nitrates associated with golf courses on Cape Cod. Lawrence, KS: Golf Course Superintendents Association of America.
19. Tiner, Tim. 1991. Green space or green waste. *Seasons* (Summer):16-19,36-37. Federation of Ontario Naturalists.
20. Fletcher, Jan. 1991. Tiny, rare butterfly puts developer of resort to flight. *Oregonian*. p.

Cosmetic Standards on Golf Courses

By Tom Cook

When we apply the word cosmetic to golf course maintenance standards, the implication is that we are doing things to the course that make it more attractive but don't necessarily improve playability. I guess obvious cosmetic touches might involve planting annual flowers around tees, mowing fairways in stripes, or contour mowing fairways to create the illusion of curves and to define landing areas. Another cosmetic touch might involve reshaping bunkers or changing sand from gray to white or tan.

Cosmetic standards change much like fashions. Currently flowers and elaborate landscape plantings are in vogue. Depending on the year a given club may mandate a wall to wall green policy; that is, there will be no brown grass anywhere on the golf course, even in out of play areas. The same club might later switch and irrigate only tees, greens, and landing areas to create contrast between rough areas and groomed areas. With the increasing popularity of wildflowers some golf courses are converting out-of-play grassy areas into wildflower meadows. Some simply quit maintaining these areas and allow nature to take over.

Apart from its utilitarian value, water is a popular cosmetic touch at many golf courses. From simple ponds to elaborate artificial waterfalls and fountains, water features can have a profound impact on the appearance and character of the course. It's not fair to say water features on golf courses are purely cosmetic because many are strategically placed to create challenging golf shots or are part

all of the azaleas are in bloom. In the Pacific Northwest many of our finest country clubs have a park-like or private garden atmosphere complete with rustic shelters, flowering vines,

“High cosmetic standards could cause managers to use more pesticides”

seasonal color, and bearing fruit trees.

It would be foolish to conclude that all wealthy private clubs fit the image I've just described. Some of the truly great private clubs in America are as rough, rugged, and spartan as you can possibly imagine. Resort golf courses run the gamut from elaborate ornamental embellishments to sites carefully situated in surrounding undisturbed vegetation with no significant cosmetic touches. Municipal and privately owned daily fee courses tend to have few cosmetic touches although there are many notable exceptions.

How Do Cosmetic Standards for Turf Quality Affect Pesticide Use?

Do these cosmetic touches have an influence on pesticide use on golf courses? In my opinion this question can't really be answered in general terms. Obviously high cosmetic standards could cause managers to use more pesticides than if standards were lower, but it's highly site dependent. For example, a club with extensive

holes or other multiples of nine holes. Each hole is composed of several distinct areas. Tees are where play starts on each hole. Tees range in size from eight foot by eight foot rubber mats to several thousand square feet. Each hole will have from one to five distinct tees so players of varying abilities can play the hole at different lengths. An average eighteen hole golf course has about two acres devoted to tees. Fairways are relatively large short cut areas where tee shots are supposed to land on par four and five holes. An average eighteen hole golf course will have from 20 to 40 acres of fairways. Greens are the targets for all shots. Greens are cut very short so the golf balls will roll smoothly when golfers putt. While green sizes vary, the average eighteen hole golf course will have about two acres of putting turf. The other major area on a golf course is the rough. Rough is all the area not taken up by tees, greens, fairways and water features. On a 120 acre golf course there will generally be 80-90 acres of rough.

Maintenance intensity is inversely proportional to the size of the area. Greens and tees are maintained more intensively than fairways, which receive more care than roughs. It's difficult to discuss cosmetic standards for turf care because there are no absolute standards to judge against. The best I can do is to explain what the general goals of maintenance are for each area on a golf course. From there I will try to describe the extremes for which people might shoot and how that might influence use of pesticides.

Pesticide Use in Rough Areas

Rough areas are normally main-

for weeds in rough areas is high. In other parts of the U.S. where weed, disease, and insect pressures are much higher, roughs may be treated with pre-emergent crabgrass herbicides, insecticides for grub control, and possibly (though rarely), with fungicides for disease control. The extremes range from no treatments with any pesticides to annual sprays for weed control plus other pesticides when need arises. Private clubs with high standards for appearance and high end resort golf courses are most likely to treat rough areas cosmetically. Public golf courses are least likely to treat roughs cosmetically.

Pesticide Use in Fairways

Fairways are maintained with the goal of producing tight, dense, erect growing turf that will support golf balls. Typical mowing heights on fairways range from 3/4 to 3/8 of an inch. Short turf is desirable to facilitate proper shot making. The principle cultural practices used to achieve top quality turf include frequent mowing, periodic fertilization, and regular irrigation during dry periods.

On mature golf courses in the Pacific Northwest broadleaf weed control is done on a target basis. I estimate that about 20 percent of the fairway acreage is sprayed annually. Golf courses that have been well maintained have relatively few weed problems on fairways because of competition from turf. Insect problems are not consistent in

keep the turf alive through the playing season. In general, areas with hot humid summers and/or long growing seasons and significant summer rainfall face a real struggle to keep turf free from warm season weedy annual grasses, summer insect damage, and warm weather diseases. The combination of severe summers and cold winters creates a "transition zone" which is perhaps the most challenging area in North America to grow healthy turf.

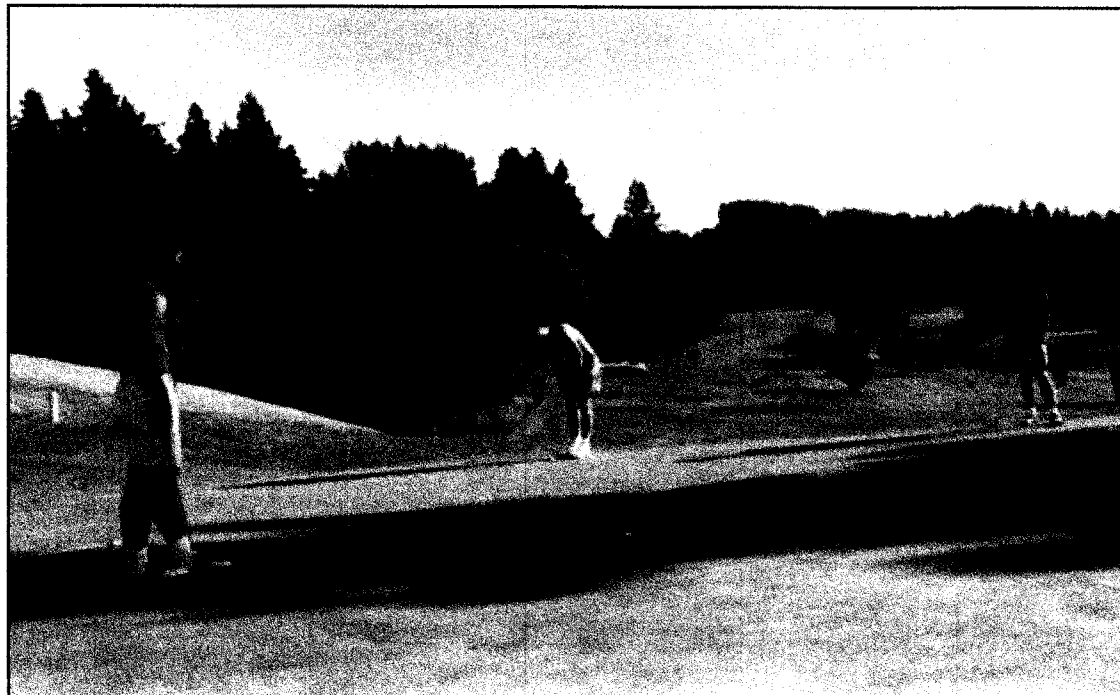
Pesticide applications on golf course fairways range from none to annual pre-emergent herbicide applications, annual insecticide sprays, and repeated fungicide treatments during the growing season. The primary factor determining pesticide use intensity is climate, not cosmetic standards. Se-

vere climates might be treated the same as putting greens.

Pesticide Use on Putting Greens

Putting greens generally receive the highest level of maintenance. Putting requires smooth firm surfaces which are achieved generally by daily mowing, seasonal coring, light frequent topdressing, regular fertilization, consistent frequent irrigation, and insect and disease control as needed to maintain near perfect turf. Because mowing heights range as low as one tenth of an inch, turf on greens exists right on the edge of life and death. Add in the difficulties of severe climates and it's easy to see the need for use of fungicides and to a lesser extent insecticides.

Actual pesticide use on greens var-



Annette Gurdian

vere climates will require more pesticide treatments than mild climates in nearly every case.

ies drastically from region to region. In Portland, Oregon, four to twelve fungicide applications may be needed depending on the year. In more severe

of grass is being grown.

For example, in the Pacific Northwest greens are normally planted with creeping bentgrass, *Agrostis palustris*. Over a period of five to twenty years annual bluegrass, *Poa annua* invades and normally dominates the turf. People in this region generally accept annual bluegrass as the climax grass and no attempt is made to control it because it grows well most of the year, produces an excellent putting surface, and has no more pest problems than bentgrass.

In other northern areas annual blue-



Annette Gurdian

grass also invades bentgrass but is prone to many pest problems and periodically dies out in summer and/or winter. Many view it as a weed in these areas and herbicides may be applied annually to control it.

The picture gets more complicated in the south where bermudagrass, *Cynodon sp.* is the logical choice for putting greens. Because bermudagrass goes dormant in winter and winter is

tion under very difficult summer conditions. Insect and disease problems can be severe resulting in the potential need for more fungicides and insecticides. Current research is aimed at producing better bermudagrasses and more stress tolerant bentgrasses. In the meantime there is no best approach for maintaining putting greens in southern regions.

The Influence of Geography

Of all the factors that affect pesticide use on golf courses the most important is geographic location. Mild climate areas generally have fewer disease and insect problems than climates featuring extended periods of heat and humidity. The relatively low stress environments of Northern Europe and the Pacific Northwest of the U.S. and Canada have lower pest pressures than southern Europe, Southeast Asia, and the southern parts of North America. In-between areas often have the greatest stresses of all because they have extreme weather conditions in winter and summer.

Grass species adaptation is an important factor affecting pesticide use. Attempting to grow cool season grasses in warm season areas will ultimately require more disease and insect control efforts than growing grasses where they are best adapted.

Golfer's Expectations

Finally, golfer expectations affect pesticide use to some degree. In particular golfer demands for faster, shorter putting surfaces and shorter fairways means grass is cultured in a more stressful environment. Smaller plants with less well developed root and shoot systems tend to be less tolerant of wear, heat, cold, drought, or excess moisture. This, in my opinion, predisposes grass to more disease problems than it would get if mowed taller. These somewhat unrealistic ex-

nance intensity, golf course superintendents are forced to rely more on pesticides to keep grass healthy than they would otherwise.

Conclusions

I'm not sure I can draw all of this together but I will try to leave you with some thoughts to ponder.

- Cosmetic standards have less impact on pesticide use than geographic location, turfgrass adaptation, or golfer expectations.

- In the U.S., the Pacific Northwest and the arid west have the lowest pest pressure while the southern half of the nation probably has the highest. The north central region and New England fall somewhere between these extremes.

- Areas most likely to receive frequent pesticide applications such as greens and tees make up only about 5 percent of the total acreage of the golf course.

- Generalizations about pesticide use on golf courses can't be made. Even within a small geographic area pesticide use may vary dramatically between private courses, public and municipal courses, and resorts. Concerns about pesticide use can only be addressed on a case by case basis.

There are many excellent texts for technical information on golf course maintenance and pest management. Below are several that I use regularly. If you want to have a better understanding of golf courses and golf course maintenance practices these sources are a good place to start. ■

Suggested References

- Beard, James B. 1973. *Turfgrass: Science and Culture*. Englewood Cliffs, N.J.: Prentice-Hall, Inc.
- Beard, James B. 1982. *Turf Management for Golf Courses*. Minneapolis, MN: Burgess Publishing Co.
- Larson, P.O. and B.G. Joyner (ed.). 1980. *Advances in Turfgrass Pathology*. Duluth, MN: Harcourt Brace Jovanovich, Inc.

Please make this a permanent record of the 05/15/17 Council meeting

CHEM-TOX COMMENT:

The following report on lawn pesticides was written by Nathan Diegelman of the S.T.A.T.E Foundation. This report should be used by any person or organization wishing to make changes in pesticide use policies in schools, government buildings, or even neighborhood spray policies. It is well written and clearly documents how conventional pesticide applications can cause significant illnesses over time. All pesticide health effects statements have been clearly documented, making this a reputable tool for policy change and protection of public health. We highly recommend concerned citizens write "Letters to the Editor" to their local newspapers quoting important points from this report as a "first-step" in generating public concern and understanding.

Poison In The Grass:**The Hazards And Consequences Of Lawn Pesticides**

Nathan Diegelman
The S.T.A.T.E. Foundation
bl891@FreeNet.Buffalo.EDU

As the use of lawn chemicals and pesticides has grown, questions have arisen regarding safety hazards and environmental consequences. This report gives factual findings to help answer many of these concerns. Some of them may seem shocking, since the chemical pesticide industry has made every effort to keep this information from the public. Everything that follows in this report is documented and supported by the U.S.Federal Government, private agencies, and other experts.

Contrary to what lawn "care" companies would like people to believe, herbicides (weed killers) and other pesticides are not "magic bullets". They are broad spectrum biocides, and by their very nature can harm organisms other than targeted species. This includes homeowners and their families, neighbors, pets, and all other forms of life. The pesticide industry downplays this by claiming their chemicals are heavily diluted, but doesn't mention the toxins are still extremely dangerous in small amounts. They also are unwilling to mention all of what is in their mixtures. Many components are classified as "inert", which allows them to be kept hidden from the public and not listed on product labels. These are more than just fillers or solvents. "Inert" does not mean "inactive" - some, such as benzene and xylene, are more toxic than listed chemicals.(1,2)

Listed chemicals can be just as dangerous. They include components of war-time defoliants like Agent Orange, nerve-gas type insecticides, and artificial hormones. Some the Federal Government has even prohibited from

use on its own property. Many pesticides are not safe when dry. Water evaporates, but most pesticides remain and continue to release often odorless and invisible toxic vapors. In areas where lawn spraying is common, they accumulate in a toxic smog throughout the entire season.

Some

pesticides remain active for years after application. DDT is still showing up in higher rates in women's breast milk than the government permits in cow's milk.(4) Fat soluble pesticides accumulate over time in our bodies, then are released at potentially toxic levels when illness or stress results in our fat reserves being metabolised. A large portion of a woman's lifetime exposure to such pesticides is released in the breast milk for her firstborn child.(37)

It is a violation of U.S. Federal law to claim pesticides are "safe when used as directed" since nothing can assure safety.(2,3,5) (However, Agriculture Canada, the federal agency responsible until recently for licensing pesticides in Canada, routinely used this statement, adding for good measure that "most pesticides are safer than table salt". Fortunately, pesticides in Canada are now licensed by Health Canada.) Some pesticides labeled "bio-degradable" degrade into compounds more dangerous than the original. Examples include Mancozeb, which degrades into a substance that is an EPA-classified probable carcinogen.(6) The pesticide industry also implies that "organic" means safe and natural (for example, "Nature's Lawn"), knowing that the term legally may be applied to any compound containing carbon and hydrogen. ChemLawn and other lawn "care" companies

and manufacturers have often been sued for fictitious claims.(5-14) Many applicators are just as conniving and deceitful, using statements like "absolutely cannot harm children or pets" and "perfectly safe for the environment" to mislead the public. The New York State Attorney General's Office sued Dow Elanco chemical company when they claimed that Dursban

shows "no evidence of significant risk to the environment" when right on the label is stated "this pesticide is toxic to birds and extremely toxic to fish and aquatic organisms".(15) A few years later on May 2, 1995, the EPA fined Dow Elanco for "failing to report to the Agency information on adverse health effects (to humans) over the past decade involving a number of pesticides, including chlorpyrifos (brand name Dursban)". Most of the information came from personal injury claims against Dow Elanco which the

company had hidden from the EPA. Now it is even being found that chlorpyrifos causes multiple sclerosis.(38)

Some companies have even made claims that their products better the environment. "Funk" lawn care of New York has coined the phrase "Growing A

Better Environment" in order to fool consumers into believing lawn chemicals pose no ecological harm. Another states "a 50-by-50 foot lawn produces enough oxygen to sustain a family of four." But this is only true with a plot of land that has tall grass and no lawn care. Pesticides, lawnmower fumes and common lawn care practices actually create a net destruction of oxygen.(16)

The United States General Accounting Office, the investigative arm of Congress, has also tried to alert the public to lawn chemical dangers. GAO's undercover team noted many fictitious claims by many in the lawn "care" industry.(35) Many included illegal claims of product safety. Others were just deceiving, such as the ChemLawn claim that a child would have to ingest ten cups of treated grass clippings to equal the toxicity of one baby aspirin. In fact, the real danger is not that people will be grazing the lawn but that most poisonings come from inhaling pesticide residues or absorbing them through the skin.(6,7,10)

Most do-it-yourselfers are just as ignorant when it comes to proper protection and safety precautions. Studies show most don't even look at the warnings on their toxins. They don't wear gloves, goggles, or protective clothing to decrease exposure. Worse, many don't keep people off the contaminated area after chemicals are applied. Homeowners commonly use up to ten times as much pesticides per acre as farmers.(7,17) A Virginia Tech study for the state legislature found that most homeowners have no idea how much nitrogen they use when fertilizing and that they apply chemicals in ways that damage water supplies.(18)

Pesticides drift and settle during application. In the Antarctic ice pack alone there are 2.4 million pounds of DDT and its metabolites from years past.(26) Pesticides engulf the home and are easily tracked inside, readily inhaled and absorbed through the skin. They do harm by attacking the central nervous system and other essential organs. Symptoms of pesticide poisoning are often deceptively simple, commonly mis-diagnosed as flu or allergies. They include, but are not limited to, headaches, nausea, fever, breathing difficulties, seizures, eye pains, vomiting, cramps, diarrhea, sore nose, tongue, or throat; burning skin, rashes, coughing, muscle pain, tissue swelling, blurred vision, numbness and tingling in hands or feet, incontinence, anxiety, irritability, sleep disorders, hyperactivity, fatigue, dizziness, irregular heartbeat, high blood pressure, spontaneous bleeding, and temporary paralysis. Long-term consequences include lowered fertility, birth defects, miscarriages, blindness, liver and kidney dysfunction, neurological damage, heart trouble, stroke, immune system disorders, menstrual problems, memory loss, suicidal depression, cancer, and death. The National Academy of Sciences reports that at least one out

of seven people are significantly harmed by pesticide exposure each year.(3) Increasingly, reports from many people around the country are "beginning to link feeling terrible with the fact the neighbors had the lawn sprayed the day before", notes Catherine Karr, a toxicologist for the National Coalition Against The Misuse Of Pesticides.(7) Unfortunately, except for industrial accidents, tests for pesticide poisoning are rarely performed, partially because they are expensive. Doctors also attribute them to stress, allergies, influenza, or an overactive imagination.(3)

Many Americans are developing Multiple Chemical Sensitivity (MCS), a bizarre and extremely disabling condition. In 1979, the Surgeon General issued a report stating "There is virtually no major chronic disease to which environmental factors do not contribute, directly or indirectly." Indeed, people today are exposed to synthetic chemicals at levels unmatched at any time throughout human history. Washington Post staff writer Michael Weiskopf noted in a February 10, 1990 article that "hypersensitivity to low levels of toxic chemicals (MCS) is a serious and growing medical problem, threatening to cause significant economic consequences by disabling large numbers of otherwise healthy people." MCS is a result of the destruction of the body's ability to tolerate and synthesize chemicals after exposure to toxic substances. Victims develop extreme reactions now not only to lawn pesticides but also hair sprays, perfumes, soaps, formaldehyde, and many other common household products.(5,36) Many victims include former lawn pesticide applicators and users, their families, and children.

Sharon Malhorta, a registered nurse from Pittsburgh, would get so sick from lawn and tree spraying that she had to leave her home every spring. Otherwise she would suffer headaches, paralysis in her hands and feet, and muscle seizures. Repeated exposure caused blurred vision, speech difficulties, and severe stomach cramps. Her husband, a doctor, suspected early on her symptoms were the result of nerve damage from organophosphates, which are widely used nerve-gas type insecticides, like Diazinon. After questioning lawn companies about their products he was told they were "practically nontoxic", registered by the EPA, and not harmful to people or pets. He later discovered that the chemicals his wife was exposed to were in fact neurotoxins, and was shocked to discover there were surprisingly few EPA studies on their health effects.(19)

Karen James, a Michigan postal worker, successfully sued ChemLawn in 1988.

While walking past one of their trucks, a hose ruptured and she was drenched with chemicals. The employee told her not to worry, that only fertilizers were in the spray. But soon after she became seriously ill, and her eyes and skin burned. When her symptoms of fatigue, vomiting, diarrhea,

and reduced vision didn't clear up, her doctor called ChemLawn to find out what chemicals she had been exposed to. He was told no pesticides had been involved, but after tests on Karen's body tissue detected high levels of Dursban, ChemLawn admitted the truck contained pesticides. Many other suits against lawn companies are settled out of court. Frequently the settlement restrains the victim from talking about the incident, so the public is not informed.(19)

For the price of green lawns, children are also being poisoned. In 1985 a married couple in Sarasota, Florida, felt pressured by their neighbors to get their lawn treated. They hired a company, never thinking their 2-year-old daughter would be jeopardized. The company declared the yard would be safe about an hour after the chemicals were applied. However, soon after playing barefoot on the grass, the couple's daughter developed a rash all over her body, her urine turned dark brown, and she ran a high fever. Her doctor prescribed antibiotics, but her condition grew steadily worse. Her hands and feet swelled to twice normal size, blistered, and peeled. Her lips turned black and bled. Years later she is still permanently prone to headaches and has 40% hearing loss in her right ear.(19)

Barry and Jackie Veysey believe lawn chemicals were responsible for the death of their baby son. Barry was a professional turf master, and the chemicals he worked with may have mutated his sperm or poisoned the infant in utero. Every time Jackie washed her husband's uniforms, the chemicals may have been absorbed through her skin and permeated the placenta. The child was born with a severe and fatal type of dwarfism. Jackie held her son only once before he died due to massive failure of his underdeveloped organs.(19)

Kevin Ryan from Arlington Heights, Illinois, feels like a prisoner in his home. "I can't even play in my own yard because the neighbors spray their lawns and trees", he says. Kevin suffered routine chemical exposure as a toddler from lawn spraying, and now suffers nausea, irritability, fatigue, and loss of memory whenever pesticides are nearby. His family moves to Colorado every spring and fall, the peak spraying times of the year, to keep him safe.(19,20)

In 1986, Robin Dudek of Hamburg, New York pulled the garden hose off her lawn and used it to fill a wading pool for her daughters Amanda, 3, and Kristen, 2. Earlier her lawn had been sprayed with chemicals. When Amanda started drinking from the hose, she began to scream that the water was

burning her. Then Kristen began crying and screaming as well. Robin took the children inside and noticed burn marks on both of them, as well as the smell of chemicals on Amanda's breath. The girls later suffered from fevers, swollen eyes, and blisters the size of grape clusters around their necks.(19)

Christina Locek was a professional ice skater and pianist before her health was destroyed in 1985, when her neighbor's lawn was sprayed with pesticides. Her cat and dog died that same day, and she suffers headaches, partial paralysis, vision loss, and blood disorders.(21) Former Navy Lieutenant George Prior developed a fever, headache, and nausea after playing on a golf course treated with Daconil. It was later discovered he was suffering from toxic epidermal necrolysis, which causes skin to fall off in sheets and massive organ failure. Prior died soon after.(6,8)

According to the EPA, 95% of the pesticides used on residential lawns are possible or probable carcinogens.(3,22) In 1989 the National Cancer Institute reported children develop leukemia six times more often when pesticides are used around their homes.(3,22) The American Journal of Epidemiology found that more children with brain tumors and other cancers had been exposed to insecticides than children without.(3) Studies by the National Cancer Society and other medical researchers have discovered a definite link between fatal non-Hodgkins Lymphoma (NHL) and exposure to

triazine herbicides (like Atrazine), phenoxyacetic herbicides (2,4-D), organophosphate insecticides (Diazinon), fungicides, and fumigants; all of which have uses as lawn chemicals. This may be an important contributing factor to the 50% rise in NHL over the past ten years in the American population. Studies of farmers who once used these pesticides found alarmingly high numbers of NHL, especially in those who didn't wear protective clothing. This latest finding also proves the theory that most danger from pesticides comes through dermal absorption, not ingestion.(23) A University of Iowa study of golf course superintendents found abnormally high rates of death due to cancer of the brain, large intestine, and prostate.(4) Other experts are beginning to link golfers, and non-golfers who live near fairways, with these same problems.(8,24)

Documented cases of pesticides in groundwater wells are suspect for cancer clusters showing in many towns. In 1989, drinking water in at least 38 states was known to be contaminated.(3) After the herbicide Dacthal was applied to Long Island golf courses, it was detected in drinking water wells at levels twenty times the State's safety limits. The water also contained a dioxin that is a highly toxic by-product of Dacthal(8,19). The New York State Attorney General sued the manufacturer in 1989 to investigate the contamination and develop a treatment program, since ground

water is the main source of drinking water for Long Island. Twenty-two other pesticides have been found in the water so far. However, there is still no requirement or systematic program designed to test for drinking water contamination.(3,25) As Michael Sorgan, Ph.D., Chief Environmental Scientist for the New York State Attorney General, and an advocate for responsible pesticide use, puts it, "If you buy the notion that we have to accept a certain amount of risk from pesticides to safeguard the food supply, that's one thing, he notes. But with lawns, people are applying carcinogens simply for the sake of aesthetics. That's got to change".(4)

Pesticides and chemical fertilizers are becoming some of the worst water pollutants in America. Discharges into San Francisco Bay from the central valley of California are estimated at almost two tons per year.(26)

Phosphorous levels in some Maryland streams have doubled since 1986.

And an

EPA study found potentially harmful levels of nitrate from chemical fertilizers in drinking water wells nationwide. This can cause blue-baby syndrome , an oxygen-depriving condition in infants that can be fatal.(18)

Environmental impacts are also devastating. Ward Stone, a DEC wildlife pathologist, has long studied bird kills from pesticides that were used according to regulation. Documented cases of owls, mourning doves, sparrows, blue birds, and many other songbirds killed by lawn chemicals are on the rise. Waterfowl like Canadian geese, mallards, wood ducks, and others have suffered even worse. In 1984 there were 700 brant found dead on

a Long Island country club after it was sprayed with Diazinon.(8,27)

Pesticide exposure causes shivering, excessive salivating, grand mal seizures, wild flapping, and sometimes screaming according to U.S. Fish and

Wildlife Service volunteer Diana Conger. Ward Stone likens these birds to miners' canaries, foreshadowing serious harm to humans from chemical build-up in the environment.(28)

Most people seriously overestimate the amount of protection given them by governments regarding pesticide safety. Congress found that 90% of the pesticides on the market lack even minimal required safety screening.(3) Of the 34 most used lawn pesticides, 33 have not been fully tested for human health hazards.(4) If any tests are done, they are performed by the chemical manufacturers, not the EPA. "If a chemical company wanted to, they

could start with a desired conclusion, and skew the data, and the EPA would never know", notes David Welch, an entomologist with the EPA's Office of Pesticide Programs. Welch did a random sampling of 15 pesticide files and found 13 without proper reviews.(19) One third of the most commonly used lawn pesticides were illegally registered for use. Despite the fact executives of Industrial Bio- Test labs were given jail terms for faking

pesticides tests, the chemicals are still on the market.(3) Shortages in funding, personnel, and interference from business has slowed re-evaluation of these chemicals.(25) Even when the EPA does refuse a pesticide registration, the manufacturer often files a lawsuit, which keeps the chemical on the market.(19) Jay Feldman, coordinator of the National Coalition Against the Misuse of Pesticides, is well aware of this. "The EPA should be called the IPA- the Industry Protection Agency", he charges. The chemical industry is extremely powerful, and wraps the EPA in red tape. It is also essential to understand that by law pesticide registration in the U.S.A. is not a consumer safety program.(9) According to Congress, the EPA

does not have testing and assessment guidelines specifically for lawn use.(25) EPA has admitted in court that pesticide registration does not ensure product safety. Rather, it is a balancing act of costs and risks.(1-5,7-9,15,22) Most lawn pesticides were registered before 1972, when more stringent restrictions took effect under the revised Federal Rodenticide and Fungicide Act. They were never tested for many human health

hazards like carcinogenicity, neurotoxicity, and environmental dangers. Most, as previously stated, have yet to be re-evaluated, yet remain on the market.

Read the labels on many lawn pesticide products, sprayed by lawn companies

or sold in stores, and you will find one or more of the following: 2,4-D, Captan, Diazinon, Dursban, Dacthal, Dicamba, and Mecocrop. Each was registered without full safety screening. 2,4-D is an artificial hormone that has become a synonym for "dangerous pesticide", but dermal absorption

of mecoprop is far more dangerous, and dicamba is much more persistent in the environment - a mixture of these three is usually used, not 2,4-D alone. Diazinon has been banned for use on golf courses and sod farms due to massive waterfowl deaths but is still widely used on lawns and gardens. It is an organophosphate which disables the nervous system by blocking enzymes essential for nerve impulse transmission.

People can protect themselves and their families by knowing the facts. If having grass that looks more like Astroturf than living plants still seems essential, it doesn't have to come with pesticides but is possible with products or programs that are organic and natural. This list of alternatives continues to grow, and they are safer, cheaper, and often work better than pesticides.(3,5) Ringer Corporation vice president Fred Hunt markets natural fertilizers and microbes that kill pests. "We just don't think a lot of these chemicals are necessary for aesthetic use on homeowners' lawns", he reveals.(7) Chemicals add salt to the soil and kill beneficial nitrogen-fixing microorganisms that provide necessary nutrients

for grass, turning a lawn into a junkie.(29) Each quick fix of green creates a dependence for the next. Synthetic fertilizers kill earthworms and other organisms that aerate soil, causing it to compact and kill grass plants. Inorganic nitrogen-based fertilizers also promote the sprouting of weeds.(30) Compounds in chemical fertilizers also acidify the soil and aid in breeding of some insects. Lawns need a soil pH between 5.6 and 7 or else they turn pale and thin out. Additional doses of chemicals will only make matters worse.(31,32) Recycling grass clippings saves money, reduces waste, and according to Lawn Institute Director Eliot C. Roberts is equivalent to three applications of fertilizer a year without unhealthy chemicals and their side-effects. Natural fertilizers are also better because they are time released, allowing grass to grow slower and tougher, requiring much less care.

Insects have been best controlled by other insects for millions of years, and the lawn is no exception. Insecticides often kill more beneficial insects than problem ones. Once the natural balance is destroyed, continued reliance on insecticides will occur. This is also true of weed killers. When a crabgrass stand is killed with an herbicide, there will still be thousands of seeds ready to start anew.(31) In the long run, pesticides can actually help the very pests they target by also killing their predators, and their use becomes self-perpetuating. Until a natural balance is restored, more and more will have to be spent each year on chemicals, and resistant pests may also invade. Using alternative strategies will bring better results and be kinder to the environment. Integrated Pest Management gives simple, long-lasting solutions which require no chemicals, much less money, and much less time and effort. Many alternatives not explored here can be found in the books and articles listed at the end of this report.

What makes a plant a "weed" is often only a matter of opinion. For instance, it was once a sign of prestige to have clover in a lawn. Their flowers and silky green leaves were once prized by homeowners, as was their

natural production of nitrogen fertiliser, and clover seed was sold by the bushels, alone or mixed with grass seed. It wasn't until a chemical company discovered a pesticide that killed clover but not always grass and launched an enormous advertising campaign that clover became no longer fashionable.

As a result, people today ignore its fine qualities, even though throughout the 1950s it was "common as bluegrass".(33)

A growing list of over 9,000 Americans are participating in the National Wildlife Federation Backyard Wildlife Habitat program. By growing tall grasses, they attract a dazzling array of wildflowers, butterflies, and birds, creating habitats that are the aesthetic match of any manicured

lawn. Suggestions on what to plant to best attract wildlife can be obtained from the Fish & Game Department of any state in the country.(34)

The lawn pesticide industry is a very recent creation by chemical firms to expand the market for aging farm chemicals. These products are not necessary for use on lawns and pose serious ecological and human health risks that outweigh any benefits they offer. Integrated Pest Management strategies offer alternatives that work better and have less harmful effects. Proper legislation to protect the public regarding pesticide use is still seriously insufficient.(35) Therefore, the responsibility rests on the public to be the ultimate judge of what the acceptable levels of risk will be for their families and environment.(4)

References:

- 1.New York State Attorney General's Office. "The Secret Hazards Of Lawn Pesticides: Inert Ingredients." New York State Department Of Law, 1994.
- 2.New York State Attorney General's Office. "Pesticides In The Schools: Reducing The Risks." New York State Department Of Law, 1994.
- 3."Lawn Chemical Dangers." American Defender Network, 1989.
- 4.Davidson, Osha Gray. "Pesticides: The Killing Fields." Woman s Day 20 September 1994.
- 5.The S.T.A.T.E. Foundation (Sensitive To A Toxic Environment), 4 Hazel Court, West Seneca, NY 14224.
- 6.Begley, Sharon & Hager, Mary. "Please Don't Eat The Daisies." Newsweek 16 May 1988.
- 7.Stevens, William K. "Public Said To Disregard Dangers Of Manicuring The Greensward." The New York Times 17 September 1990.
- 8.New York State Attorney General's Office. "Toxic Fairways: Risking Groundwater Contamination From Long Island Golf Courses." New York State Department Of Law, 1990.
- 9.New York State Attorney General's Office. "Lawn Care Pesticides And Safety: What You Should Know". New York State Department Of Law, 1994.
- 10.Meier, Barry. "Lawn Care Concern Says It Will Limit Safety Claims." The New York Times 30 June 1990.
- 11.United States Environmental Protection Agency Pesticide Information Network.
- 12.gopher@earth1. The United States Environmental Protection Agency Internet Server. EPA WAIS Gateway.
- 13.fedworld.gov. The United States Government Internet Database.
- 14.www.whitehouse.gov. The White House WWW Server. Executive Branch.
- 15.Raver, Anne. "Fertilizing Your Lawn? Look Before You Leap." The New

York Times 24 April 1994.

16.Fischer, Aldeheid. "Grass Is Not Always Greener: Reasons Not To Love Lawns." Utne Reader September/October 1990.

17.New York State Department Of Environmental Conservation, Pest Control.

18.Cohn, D Vera. "The Chemical Quest For The Perfect Lawn: Pesticide, Fertilizer Runoff Ending Up In Area's Water Supply." The Washington Post 28 April 1991.

19.Sayan, Kathyrne. "The Pesticide Scandal." Family Circle 2 April 1991.

20.Associated Press. "Lawn Care Chemicals Raise Health Concerns: GAO Faults EPA On Commercial Regulation." The Washington Post 31 May 1990.

21.Skow, John. "Can Lawns Be Justified?" TIME Magazine 3 June 1991.

22."Warning: The Use Of Pesticides May Be Hazardous To Your Health". American Cancer Society, Erie County Branch.

23.Zahm, Sheila and Aaron Blair. "Pesticides and Non-Hodgkin's Lymphoma." Cancer Research 1 October 1992.

24.Associated Press. "Lawn Herbicide Called Cancer Risk For Dogs." The New York Times 4 September, 1991.

25.United States Congress General Accounting Office. "Lawn Care Pesticides: Reregistration Falls Further Behind and Exposure Effects Are Uncertain." GAO/RCED-93-80, Washington, DC: April 1993.

26.Rudd, Robert C. "Pesticides." Encyclopedia Americana 1990.

27.Hershenson, Roberta. "Study Finds Use of Some 'Safe' Pesticides Harmful." The New York Times 14 April, 1985.

28.Levy, Claudia. "Pretty Lawns May Be Lethal For Songbirds: Pesticides Blamed For Toll On Wildlife." The Washington Post 28 April 1991.

29.Polk, Nancy. "The Perfect Lawn Isn't Always Green." The New York Times 17 October 1990.

30.Findlay, Steven & Terry Thompson. "Watch That Weed Killer." US News & World Report 16 September 1991.

31.Henkenius, Merle & Eugene Thompson. "Natural Lawn Care." Popular Mechanics July 1993.

32."The Green Way To A Green Lawn." Consumer Reports June 1990.

33.Schultz, W. "The Chemical Free Lawn." Emmaus, PA: Rodale Press, 1989.

34.Glastris, Kukula. "Letting The Lawn Run Wild." US News & World Report 27 August 1990.

35.United States General Accounting Office. "Lawn Care Pesticides: Risks Remain Uncertain While Prohibited Safety Claims Continue." GAO/RCED-90-134. Washington, DC: March 1990.

36.Bartle, Hazel. "Quiet Sufferers of the Silent Spring". New Scientist 18 May 1991.

37.International Joint Commission on the Great Lakes. "Selected Persistent Toxic Substances in Human Breast Milk in the Great Lakes Basin". March

1990.

38.Arch.Env.Health, 48:89 (1993)

Joyce Shepard, CSW

Citizens' Action Committee for Change

E-Mail: CactionC@jps.net

Telephone: 718-279-2069

Facsimile: 718-279-3281

Please make this a permanent record of the 05/15/17 Council meeting

destroy such weeds after a few years of herbicide application.^[20]

Weed-wiping may also be used, where a wick wetted with herbicide is suspended from a boom and dragged or rolled across the tops of the taller weed plants. This allows treatment of taller grassland weeds by direct contact without affecting related but desirable shorter plants in the grassland sward beneath. The method has the benefit of avoiding spray drift. In Wales, a scheme offering free weed-wiper hire was launched in 2015 in an effort to reduce the levels of MCPA in water courses.^[21]

Misuse and misapplication

Herbicide volatilisation or spray drift may result in herbicide affecting neighboring fields or plants, particularly in windy conditions. Sometimes, the wrong field or plants may be sprayed due to error.

Use politically, militarily, and in conflict

Health and environmental effects

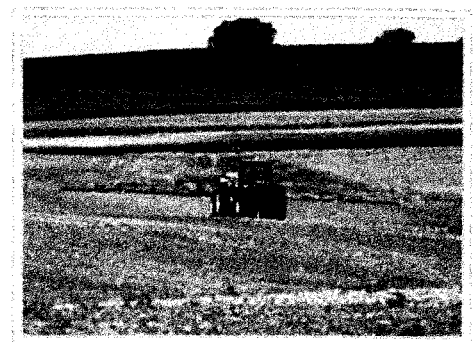
Herbicides have widely variable toxicity in addition to acute toxicity from occupational exposure levels.

Some herbicides cause a range of health effects ranging from skin rashes to death. The pathway of attack can arise from intentional or unintentional direct consumption, improper application resulting in the herbicide coming into direct contact with people or wildlife, inhalation of aerial sprays, or food consumption prior to the labeled preharvest interval. Under some conditions, certain herbicides can be transported via leaching or surface runoff to contaminate groundwater or distant surface water sources. Generally, the conditions that promote herbicide transport include intense storm events (particularly shortly after application) and soils with limited capacity to adsorb or retain the herbicides. Herbicide properties that increase likelihood of transport include persistence (resistance to degradation) and high water solubility.^[22]

Phenoxy herbicides are often contaminated with dioxins such as TCDD^[23]; research has suggested such contamination results in a small rise in cancer risk after occupational exposure to these herbicides.^[24] Triazine exposure has been implicated in a likely relationship to increased risk of breast cancer, although a causal relationship remains unclear.^[25]

Herbicide manufacturers have at times made false or misleading claims about the safety of their products. Chemical manufacturer Monsanto Company agreed to change its advertising after pressure from New York attorney general Dennis Vacco; Vacco complained about misleading claims that its spray-on glyphosate-based herbicides, including Roundup, were safer than table salt and "practically non-toxic" to mammals, birds, and fish (though proof that this was ever said is hard to find).^[26] Roundup is toxic and has resulted in death after being ingested in quantities ranging from 85 to 200 ml, although it has also been ingested in quantities as large as 500 ml with only mild or moderate symptoms.^[27] The manufacturer of Tordon 101 (Dow AgroSciences, owned by the Dow Chemical Company) has claimed Tordon 101 has no effects on animals and insects,^[28] in spite of evidence of strong carcinogenic activity of the active ingredient^[29] Picloram in studies on rats.^[30]

The risk of Parkinson's disease has been shown to increase with occupational exposure to herbicides and



Herbicides being sprayed from the spray arms of a tractor in North Dakota.

pesticides.^[31] The herbicide paraquat is suspected to be one such factor.^[32]

All commercially sold, organic and nonorganic herbicides must be extensively tested prior to approval for sale and labeling by the Environmental Protection Agency. However, because of the large number of herbicides in use, concern regarding health effects is significant. In addition to health effects caused by herbicides themselves, commercial herbicide mixtures often contain other chemicals, including inactive ingredients, which have negative impacts on human health.

Ecological effects

Commercial herbicide use generally has negative impacts on bird populations, although the impacts are highly variable and often require field studies to predict accurately. Laboratory studies have at times overestimated negative impacts on birds due to toxicity, predicting serious problems that were not observed in the field.^[33] Most observed effects are due not to toxicity, but to habitat changes and the decreases in abundance of species on which birds rely for food or shelter. Herbicide use in silviculture, used to favor certain types of growth following clearcutting, can cause significant drops in bird populations. Even when herbicides which have low toxicity to birds are used, they decrease the abundance of many types of vegetation on which the birds rely.^[34] Herbicide use in agriculture in Britain has been linked to a decline in seed-eating bird species which rely on the weeds killed by the herbicides.^[35] Heavy use of herbicides in neotropical agricultural areas has been one of many factors implicated in limiting the usefulness of such agricultural land for wintering migratory birds.^[36]

Frog populations may be affected negatively by the use of herbicides as well. While some studies have shown that atrazine may be a teratogen, causing demasculinization in male frogs,^[37] the U.S. Environmental Protection Agency (EPA) and its independent Scientific Advisory Panel (SAP) examined all available studies on this topic and concluded that "atrazine does not adversely affect amphibian gonadal development based on a review of laboratory and field studies."^[38]

Scientific uncertainty of full extent of herbicide effects


The health and environmental effects of many herbicides is unknown, and even the scientific community often disagrees on the risk. For example, a 1995 panel of 13 scientists reviewing studies on the carcinogenicity of 2,4-D had divided opinions on the likelihood 2,4-D causes cancer in humans.^[39] As of 1992, studies on phenoxy herbicides were too few to accurately assess the risk of many types of cancer from these herbicides, even though evidence was stronger that exposure to these herbicides is associated with increased risk of soft tissue sarcoma and non-Hodgkin lymphoma.^[40] Furthermore, there is some suggestion that herbicides can play a role in sex reversal of certain organisms that experience temperature-dependent sex determination, which could theoretically alter sex ratios.^[41]

Resistance

Weed resistance to herbicides has become a major concern in crop production worldwide.^[18] Resistance to herbicides is often attributed to lack of rotational programmes of herbicides and to continuous applications of herbicides with the same sites of action.^[19] Thus, a true understanding of the sites of action of herbicides is essential for strategic planning of herbicide-based weed control.^[18]

Plants have developed resistance to atrazine and to ALS-inhibitors, and more recently, to glyphosate herbicides.

Please make this a permanent record of the 05/15/17 Council meeting

 CNN Environment News

IT'S NEW
AND IT'S NIFTY.
CLICK HERE TO
SEE IT IN A JIFFY.




Turf battle rages over golf course chemicals


April 11, 1996

Web posted at: 5:45 p.m. EDT

From Correspondent David Mattingly

GRIFFIN, Georgia (CNN) -- As the world's best golfers walk down the lush green fairways of Augusta National Golf Club this weekend, they are not likely to be wondering if there is an environmental cost linked to the beautiful fairways they hope to conquer.

 greener green graphic

 Augusta National

Many people, however, have been looking into just that question since the issue rose to prominence in the late 1980s. Golf associations, agricultural researchers, grass roots environmental groups, and the U.S. government are all investigating the effect of fertilizer and pesticide use on environments surrounding golf courses.

In the past it was believed by golf course superintendents that high concentrations of fertilizers, herbicides, and insecticides were necessary to keep a course glowing green, according to Stuart Cohen of Environmental and Turf Services, a turf maintenance company. ([77K AIFF sound](#) or [77K WAV sound](#))


 Cohen

Concerns arose, though, that runoff and seepage from chemicals used for course maintenance may get into public water sources, damaging the environment.

Golfing groups, led by the United States Golfing Association (USGA), say that runoff and seepage from golf courses is really not much of a problem, and that they are addressing the concern in a responsible manner.

They have some support from researchers. Preliminary findings from studies (partially funded by the golfing industry) at the University of Georgia show that most chemicals applied to golf courses


tend to stay there. The Georgia researchers say that golf course chemicals, if used properly, pose little threat to the environment or public health.

 fertilizer

Some environmental groups, however, feel that the industry and government are minimizing a situation that is faced by nearly every community from coast to coast. They point out that a single course averages about a half ton of chemical pesticides a year, and there are approximately 12,000 golf courses in the United States.

"The fact of the matter is the regulatory process does not protect the public. The golf course industry knows that," said Jay Feldman of the National Association Against the Misuse of Pesticides. "The vast majority of pesticides have not been fully tested under the law, and risk-benefit standard under the federal law is simply not protecting human health and the environment."

The golf industry says it is responding to those concerns with efforts to make course maintenance a "greener" practice. Last month, 16 golf and environmental organizations endorsed a set of environmental principles at the second Conference on Golf and the Environment.

 golfer

In addition, the USGA maintains a staff of about 15 people to develop new methods of tending golf courses and new strains of grass requiring less maintenance. They also seek alternatives to pesticides and herbicides, such as using beneficial organisms to control pests. The USGA team's findings are used nationwide, on park land and other areas as well as golf courses.

While they applaud research into alternatives, environmental activists still want stricter government regulation.

And course superintendents, meanwhile, have to use what is available to keep their courses in shape for events such as the Masters, for which the beauty of the course has become a trademark.

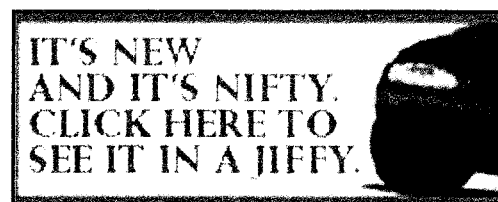
Related Sites

- [CNN Interactive Sports](#)
- [U.S. Golf Association Green Section](#) -- information on turf management
- [National Coalition against the Misuse of Pesticides](#)
- [Turfgrass Links](#)

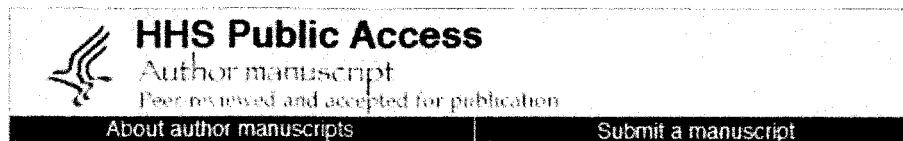
Feedback

Send us your comments.

Selected responses are posted daily.



Please make this a permanent record of the 05/15/17 Council meeting



Am J Ind Med. Author manuscript; available in PMC 2012 Jun 1.

PMCID: PMC3092004

Published in final edited form as:

NIHMSID: NIHMS274628

Am J Ind Med. 2011 Jun; 54(6): 474–485.

Published online 2011 Feb 28. doi: 10.1002/ajim.20942

Hazardous materials on golf courses: Experience and knowledge of golf course superintendents and grounds maintenance workers from seven states

Alice E. Arcury-Quandt,^{1,*} Amanda L. Gentry, MPH,² and Antonio J. Marín, MA²

¹Division of Public Health Sciences, Department of Epidemiology and Prevention, Wake Forest University School of Medicine, Winston-Salem, North Carolina

²Department of Family and Community Medicine, Wake Forest University School of Medicine, Winston-Salem, North Carolina

Alice E. Arcury-Quandt: aaarcuryq@wfubmc.edu

*Correspondence: Alice E. Arcury-Quandt, Department of Epidemiology and Prevention, Division of Public Health Sciences, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27175-1084

[Copyright notice](#) and [Disclaimer](#)

The publisher's final edited version of this article is available at [Am J Ind Med](#)

Abstract

Go to:

Background

The golf course industry has a growing Latino work force. Little occupational health research has addressed this work force. This paper examines golf course superintendents' and Latino grounds maintenance workers' pesticide knowledge, beliefs, and safety training. In particular, it focuses on knowledge of and adherence to OSHA Right-to-Know regulations.

Methods

In person, in-depth interviews were conducted with ten golf course superintendents in five states and with sixteen Latino grounds maintenance workers in four states.

Results

Few superintendents were in compliance with Right-to-Know regulations or did pesticide safety training with all of their workers. Few workers had any pesticide safety knowledge. Most safety training on golf courses was rudimentary and focused on machine safety, and was usually conducted in the off-season or on rainy days, not before workers were assigned tasks.

Conclusions

More Right-to-Know training is necessary for superintendents and grounds maintenance workers. Culturally and linguistically appropriate Spanish language materials need to be developed or made more

I do all the jobs which are done on the golf courses – except for spraying because you have to know English in order to read the brochures which come with the fertilizers [FLW1].

Some workers said that they would not necessarily be able to read labels in Spanish since they had so little education.

Any outside safety information was difficult to access:

Fortunately, I have the information [about pesticides], but a lot of people don't have it because they don't know how to read and write, or they simply don't have the information about how to apply those chemicals on hand [NCW4].

Though many organizations produce pesticide safety information, workers do not know how to get that information. When they do, they cannot necessarily use the information because they are not able to read it.

Besides problems with English, workers had trouble with golf course terminology in Spanish. Most words associated with golf course and golf course maintenance do not have a translation to Spanish. Certain activities could be approximated, but the words used depended on the native dialect of the speaker. Other words were said in English or in Spanglish. Terminology differed between golf courses. Some of the workers who were not Mexican differentiated between what they would call something and what the Mexicans called it. One said it was sometimes hard to communicate with other workers:

But the thing is that in each country, people use different terms. And sometimes, I have to ask someone from Mexico who works with me because I don't know and I have to repeat it because a lot of them don't understand my Spanish. Sometimes, we can't understand each other because we all talk differently [FLW2].

Discussion

Go to:

This study collected data from superintendents and workers across a range of states and types of golf courses. Workers and superintendents generally had differing beliefs about training and views on practices, though there were some commonalities (Table I). Few superintendents were knowledgeable about or in compliance with federal pesticide safety regulation. Superintendents thought that most workers used safety equipment, though it was not required because there had been few injuries reported. They believed the training provided was adequate or the best they could provide due to the communication barrier between them and their workers.

Item	Worker	Superintendent
1. Do you use pesticides on your golf course?	10	10
2. Do you use fertilizers on your golf course?	10	10
3. Do you use herbicides on your golf course?	10	10
4. Do you use fungicides on your golf course?	10	10
5. Do you use insecticides on your golf course?	10	10
6. Do you use any other chemicals on your golf course?	10	10
7. Do you have a written safety plan for your golf course?	10	10
8. Do you have a written training plan for your workers?	10	10
9. Do you have a written maintenance plan for your golf course?	10	10
10. Do you have a written emergency plan for your golf course?	10	10

Table I
Summary of findings (beliefs and practices) by interviewee status.

Workers wanted more information about chemicals they identified as dangerous, but superintendents did not want to give them that information, did not have the means by which to communicate that information, or did not think those chemicals dangerous. Workers received very little training in other areas of golf course work. Most training was on the job, though many workers reported being shown instructional videos that came with the equipment. These videos were sometimes in Spanish. Workers identified occupational health hazards based on word of mouth and sensory information rather than by

training. They judged the strength of a chemical by its smell. Many workers did not use safety equipment, even it was provided.

Agriculture poses similar occupational health hazards to golf courses. More data are available about farmworker and grower knowledge, beliefs, and training than about golf course workers and their supervisors. In both industries workers are exposed to hazardous chemicals, motorized equipment, and sharp tools; and there are often substantial communication barriers between workers and supervisors. Golf course workers who had worked in agriculture said that they were better at their job and needed less training because they had worked in agriculture. Farmworkers and golf course workers share similar countries of origin, language skills, and educational attainment.

In agriculture, growers, like golf course superintendents, are responsible for training their workers; and training is based largely on regulations and growers' beliefs about workers' health risks. Rao and colleagues [2004] reported that North Carolina growers and extension agents, like golf course superintendents, do not believe their employees to be in a great deal of danger from pesticides. Both growers and golf course superintendents think that pesticides are not as dangerous as the general public believes. Both groups also think that those who do not apply chemicals are not exposed to them. Both growers and superintendents face the same training difficulties, and both say that PPE use is common sense.

Farmworkers rely on the same word-of-mouth and cultural knowledge base as golf course workers. For both groups, a chemical's smell is indicative of its toxicity [Quandt et al., 1998; Rao et al., 2007]. Both use milk as a folk remedy to treat acute symptoms of exposure [Rao et al., 2002]. Residual symptoms may be attributed to folk illnesses, like *susto*, which may indicate a more severe exposure [Baer & Penzell, 1993]. Like golf course workers, farmworkers often do not have access to information about pesticides [Flocks et al., 2007].

Because workers in both groups have little access to pesticide information, few workers know anything about pesticides beyond the fact that they are dangerous [Quandt et al., 1998; Flocks et al., 2007]. They trust that their supervisors keep them safe and know that they are not allowed to apply pesticides, so golf course workers thought that any chemical they worked with was not a pesticide and relatively safe. Therefore, they did not know to take post-exposure measures (i.e., showering immediately after work, changing out of work clothes before they went in the house). Because they thought that chemicals they handled were safe, they did not take precautions to prevent exposure (i.e., using a facemask, wearing a long-sleeved shirt).

Latino workers may take greater risks than some non-Latino workers. A common belief among farmworkers is that a person's strength and size are protective when the person is exposed to pesticides [Quandt et al., 1998; Rao et al., 2007]. Cultural expectations are that men, particularly strong men, can tolerate a certain amount of symptoms and illness, so many farmworkers do not follow all safety regulations, placing themselves at additional risk for injury [Hunt et al., 1999]. Many golf course workers said that younger men would not use provided safety equipment.

Federal regulations require compliance with OSHA Right-to-Know requirements as part of the Hazard Communication Standard (HCS). Each workplace must have a written plan for training that describes how requirements for labels and other forms of warning, MSDSs, and employee information and training will be addressed. Supervisors must provide any information about a chemical that an employee requests. Each employee who may be exposed to hazardous chemicals when working must be provided information and trained prior to initial assignment to work with a hazardous chemical and

whenever the hazard changes. Information and training may be done either by the individual chemical or by categories of hazard. Workers should learn to read and understand such information, determine how it can be obtained and used in their own workplaces, and understand the risks of exposure to the chemicals in their workplace as well as how to protect themselves. The training program should ensure comprehension [OSHA, 1996].

These results show that Right-to-Know regulations are not being followed by golf courses. All workers on golf courses are exposed to hazardous chemicals, so all workers should receive thorough pesticide training. All superintendents had an MSDS, but no workers mentioned anything like one when asked about pesticides. Only superintendents in California specifically did Right-to-Know training. Right-to-Know was the only federal regulation that most supervisors knew existed. Most thought they were in compliance with the regulations. However, few seemed to know much about what the regulations required or who was responsible for enforcing the regulations.

Golf course superintendents need better training in Right-to-Know procedures and pesticide safety. Because they do not have this training, they do not know the mechanics of pesticide exposure. Workers do not receive training about pesticides or PPE because their superintendents do not know that they should be trained, so workers do not have the knowledge or equipment to protect themselves from pesticide exposure. Superintendents need to understand the risks posed by pesticides and other hazardous chemicals. Current training focuses primarily on equipment safety because the danger from equipment is more apparent. Most effects from pesticides are long term, and acute symptoms rarely occur while on the job [Baer & Penzell, 1993], so supervisors are not as aware of the danger posed by pesticides as they are of that posed by equipment.

Barriers to training must also be taken into account. Considerable communication barriers were demonstrated in this study and were part of the reason why Latino workers received as little training as they did. Appropriate Spanish language training materials must be developed or made more widely available. Superintendents should be made aware of these materials and other services to train their Spanish-speaking workers.

Coupled with better training is better enforcement. Superintendents must train workers before they are assigned work. Most who were interviewed relegated training to rainy days or to the off-season, and many workers said they started work during the summer. Training should be equal for Latino and non-Latino workers. All workers should receive the same information in a manner in which they understand, and training materials should include information on pesticides and hazardous chemicals. Many supervisors said that training their Spanish-speaking workers would be too difficult or expensive and that these workers now receive training that is different from their English-speaking workers. Enforcement should be great enough that supervisors are forced to find a way to train these workers.

An alternative to better pesticide safety training is pesticide elimination or using less toxic chemicals. In the case of elimination, no workers would be routinely exposed to pesticides as they are now. However, this is unlikely to happen in the near future, so better training should be adopted in the interim. Using less toxic chemicals, though seemingly beneficial, may not hold the promise that seems likely. When the city of San Francisco, California, switched to less hazardous chemicals for its public courses, it had to use a larger volume of chemical to have the same effect. So the benefits of using a less dangerous material may be nullified by increased exposure [Hawkes, 2010].

This research must be considered in light of the limitations common to qualitative research. Participants were not selected randomly, so caution must be taken in generalizing results. Each in-depth interview is

somewhat different, and not all questions are asked of all participants in the same way. However, participants were recruited from several different states and many different golf courses. Interviewers were trained, and their interviews were reviewed for quality. This study focused on Latino workers, and so our conclusions and recommendations focus on this group of workers. This is not to suggest that non-Latino golf course workers are less at risk for pesticide exposure and other occupational health hazards. However, it is likely that different factors affect training and hazard exposure other workers (e.g., English-speaking workers), so our findings should be interpreted in light of this.

More research is needed. Though this study revealed general attitudes of golf course workers and superintendents, more specific information is needed on which to base educational materials for superintendents and workers. Culturally, linguistically, and educationally appropriate pesticide safety training programs need to be developed for golf course maintenance workers. Efforts are needed to inform golf course superintendence about the exposure risks of all of their employees and of the need for training all of their employees. Both further research and training need to be tailored to state-specific extensions of the federal Right-to-Know regulations.

Notes

Go to:

This paper was supported by the following grant(s):

National Institute of Environmental Health Sciences : NIEHS R01 ES008739-14 || ES.

References

Go to:

1. Latino farmworker perceptions of the risk factors for occupational skin disease. 2006. author. [PubMed]
2. Arcury TA, Grzywacz JG, Isom S, Whalley LE, Vallejos QM, Chen H, Galván L, Barr DB, Quandt SA. Seasonal variation in the measurement of urinary pesticide metabolites among Latino farmworkers in eastern North Carolina. *Int J Occup Environ Health*. 2009a;15:339–350. [PMC free article] [PubMed]
3. Arcury TA, Grzywacz JG, Chen H, Vallejos QM, Galván L, Whalley LE, Isom S, Barr DB, Quandt SA. Variation across the agricultural season in organophosphorus pesticide urinary metabolite levels for Latino farmworkers in eastern North Carolina: project design and descriptive results. *Am J Ind Med*. 2009b;539–550. [PMC free article] [PubMed]
4. Arcury TA, Grzywacz JG, Talton JW, Chen H, Vallejos QM, Galván L, Barr DB, Quandt SA. Repeated pesticide exposure among North Carolina migrant and seasonal farmworkers. *Am J Ind Med*. 2010;53:802–813. [PMC free article] [PubMed]
5. Baer RD, Penzell D. Susto and pesticide poisoning among Florida farmworkers. *Cult Med Psychiatry*. 1993;17:321–327. [PubMed]
6. Centers for Disease Control and Prevention (CDC) Work-related injury deaths among Hispanics – United States, 1992–2006. *Morb Mortal Wkly Rep*. 2008;57:597–600. [PubMed]
7. Duvall K. Parks and golf course workers. *Occup Med*. 2001;16:135–142. [PubMed]
8. Flocks J, Monaghan P, Albrecht S, Bahena A. Florida farmworkers' perceptions and lay knowledge of occupational pesticides. *J Community Health*. 2007;32:181–194. [PubMed]
9. Golf Course Superintendents Association of America (GCSAA) Compensation and benefits survey and report. Lawrence, KS: 2009.
10. Hawkes A. SF's golf courses are pesticide central. *The Bay Citizen*. 2010 October 12;
11. Hunt LM, Tinoco Ojanguren R, Schwartz N, Halperin D. Balancing risks and resources:

- Applying pesticides without using protective equipment in southern Mexico. In: Hahn RA, editor. *Anthropology in public health: Bridging differences in culture and society*. New York: Oxford University Press; 1999. pp. 235–254.
12. Kross BC, Burmeister LF, Ogilvie LK, Fuortes LJ, Fu CM. Proportionate mortality study of golf course superintendents. *Am J Ind Med*. 1996;29:501–506. [PubMed]
 13. Knopper LD, Lean DRS. Carcinogenic and genotoxic potential of turf pesticides commonly used on golf courses. *J Toxicol Environ Health B*. 2004;7:267–279. [PubMed]
 14. Murphy RA, Haith DA. Inhalation health risk to golfers from turfgrass pesticides at three northeastern U.S. sites. *Environ Sci Technol*. 2007;41:1038–1043. [PubMed]
 15. National Golf Foundation. Information and trends in courses and facility operations: frequently asked questions. [accessed 18 October 2010];2010 Available at: <http://secure.ngf.org/cgi/faq.asp#3>.
 16. OSHA. Occupational safety and health standards: Toxic and hazardous substances. [accessed 19 August 2010];Guidelines for Employer Compliance (Advisory)-1910.1200 App E. 1996 Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10104.
 17. Pew Hispanic Center. Statistical Portrait of the foreign-born populations in the United States, 2006. [accessed 11 August 2010];2008 Available at: <http://pewhispanic.org/factsheets/factsheet.php?FactsheetID=36>.
 18. Pew Hispanic Center. Statistical portrait of the foreign-born populations in the United States, 2007. [accessed 11 August 2010];2009 Available at: <http://pewhispanic.org/factsheets/factsheet.php?FactsheetID=45>.
 19. Pew Hispanic Center. Statistical portrait of the foreign-born populations in the United States, 2009. [accessed 11 August 2010];2010 Available at: <http://pewhispanic.org/factsheets/factsheet.php?FactsheetID=58>.
 20. Putnam RA, Doherty JJ, Clark JM. Golfer exposure to chlorpyrifos and carbaryl following application to turfgrass. *J Agric Food Chem*. 2008;56:6616–6622. [PubMed]
 21. Quandt SA, Arcury TA. Qualitative methods in arthritis research. Overview and data collection. *Arthritis Care Res*. 1997;10:273–281. [PubMed]
 22. Quandt SA, Arcury TA, Austin CK, Saavedra RM. Farmworker and farmer perceptions of farmworker agricultural chemical exposure in North Carolina. *Hum Organ*. 1998;57:359–368.
 23. Rao P, Quandt SA, Arcury TA. Hispanic farmworker interpretations of green. *J Rural Health*. 2002;18:503–511. [PubMed]
 24. Rao P, Arcury TA, Quandt SA, Doran A. North Carolina growers' and extension agents' perceptions of Latino farmworker pesticide exposure. *Hum Organ*. 2004;63:151–161.
 25. Rao P, Quandt SA, Doran AM, Snively BM, Arcury TA. Pesticides in the homes of farmworkers: Latino mothers' perceptions of risk to their children's health. *Health Educ Behav*. 2007;34:335–353. [PubMed]
 26. Reigart JR, Roberts JR. Recognition and management of pesticide poisonings. 5th ed. United States Environmental Protection Agency; 1999. pp. 2–10.
 27. Snipes SA, Thompson B, O'Connor K, Shell-Duncan B, King D, Herrera AP, Navarro B. "Pesticides protect the fruit, but not the people": Using community-based ethnography to understand farmworker pesticide-exposure risks. *Am J Pub Health*. 2009;99:616–621. [PMC free article] [PubMed]
 28. Weichenthal S, Moase C, Chan P. A review of pesticide exposure and cancer incidence in the Agricultural Health Study cohort. *Environ Health Perspect*. 2010;118:1117–1125.

[\[PMC free article\]](#) [\[PubMed\]](#)

Texas – Houston to Use Old Golf Course for Flood Mitigation

9 MARCH, 2017 BY [RICHARD DAVIES](#) IN [FLOOD PROTECTION, USA](#)

The City of Houston, Texas, is getting creative with flood control, with new plans to use an old golf course to store as much as 350 million gallons of storm water.

The City announced on Tuesday, 07 March, that it intends to convert the Inwood Forest Golf Course, a 223-acre site closed since 2007, into a series of 10 connected detention basins. It is hoped that plan will mitigate flooding within the White Oak Bayou watershed.

Once complete the new detention basins will be able to hold 350 million gallons of storm water, almost 530 Olympic size pools worth of water, which is more water than the Houston Astrodome could hold.

The City purchased the 227-acre course in March 2011 for \$9.3 million and spent \$2.5 million building the first two detention basins. With recent Council approval of an interlocal agreement, the City and Harris County Flood Control District are now free to invest about \$20 million to design and develop the remaining basins, with the first phase slated to begin construction in 2018.

"After the design phase and masterplan study, we will have a better understanding of the basin layouts, depths, and potential green space available for the community," said Paresh Lad, Acting Deputy Assistant Director for the Department of Public Works and Engineering's Infrastructure Planning.

Harris County Flood Control District will oversee the construction and maintenance of the project. The Inwood Storm Water Detention Basins will be located in the vicinity of Antoine Drive between Victory Drive and West Gulf Bank Road.

This is the latest in a series of announcements regarding the city's plans for addressing flooding and drainage. In January, the Mayor Sylvester Turner formed the Storm Water Action Team to expand maintenance capabilities and improve the movement of water from day-to-day storm events through rehabilitation and upgrade of existing drainage infrastructure. Also in January, the mayor announced the City of Houston would be stepping in to provide the funds needed to help expedite long-awaited flood relief projects along Brays, Hunting and White Oak Bayous.

Houston was ravaged by floods in April 2016 after 12 inches (300 mm) of rain fell in 24 hours. Around 7,000 homes were damaged and 8 people died in what became known as the "Tax Day Flood".



ADVERTISEMENT

Emriver Stream Tables

Hands-on Educational Tools for Studying How Rivers Work

LITTLE RIVER RESEARCH & DESIGN

ADVERTISEMENT

STOPFLOOD
flood defence systems

[learn more](#)

FLOODLIST DIRECTORY

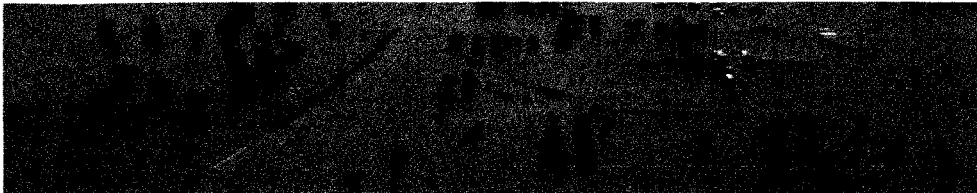
- Damage Restoration
- Elevation Certificates
- Flood Risk Assessment
- Pumps and Pumping
- Sandbags and Alternatives
- More...

COPERNICUS



FloodList is funded by Copernicus, the European system for Earth monitoring.

FOLLOW US



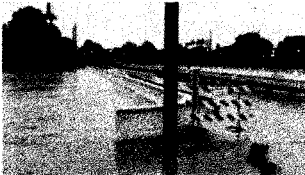
Houston floods 22 April 2016. Photo: Sandra Arnold, USACE Galveston District



Related



UK - River Ouseburn Diverted as Part of £7 Million Newcastle Flood Scheme
11 May, 2016



Texas - Flood Deaths Reported in Houston, State of Disaster Declared for 9 Texas Counties
19 April, 2016



SMART Tunnel, Kuala Lumpur, Malaysia
21 January, 2014

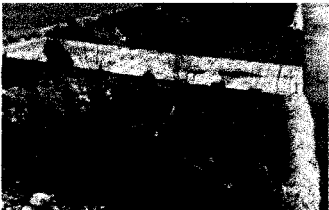
Texas

Richard Davies

Richard Davies is the founder of floodlist.com and reports on flooding news, flood insurance, protection and defence issues.

- < UK – Scotland’s Biggest Flood Alleviation Scheme Opened in Elgin
- Philippines – Floods in Sarangani Province Leave 1 Dead, 100s Evacuated >

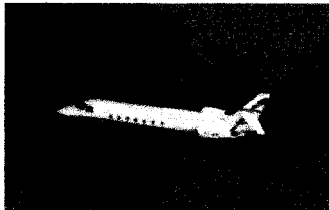
EDITOR'S PICKS



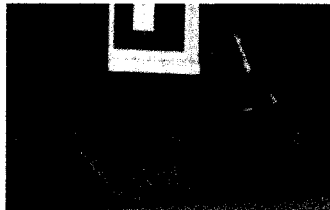
Depave – The Community-Based Approach to Storm Water Management



Using Drones For Flood Disaster Risk Reduction, Assessment and Recovery



Flood Protection Options For Airports



Flood and High Water Marks

 FloodList - Reporting floods and flooding news since 2008	NORTH AMERICA	SOUTH AMERICA	EUROPE	ASIA	AFRICA	OCEANIA
	Canada	Argentina	France	China	Kenya	Australia
	Mexico	Bolivia	Germany	India	Mozambique	Fiji
	USA	Brazil	Italy	Indonesia	Nigeria	Marshall Islands
	Florida	Colombia	Netherlands	Malaysia	South Africa	New Zealand
	New York	Paraguay	Russia	Nepal	Sudan	Solomon Islands
	Texas	Peru	UK	Thailand	Tanzania	Tonga
	More...	More...	More...	More...	More...	More...