THE PESTICIDE PIPELINE

A glimpse at the products chemical manufacturers have released recently and plan to bring to market during the next three years

With the economy in a full-blown recession, rounds down and budgets flat, golf course superintendents are under as much pressure as ever to keep spending in check. Their chemical budgets are no exception, and when expenses are a concern, it behooves a buyer to have as much information as possible about what products are coming down the pike.

The *Golf Course Industry* staff contacted the market's major manufacturers of basic and generic pesticides to find out what they're bringing to market the next several years. Though some of them were tight-lipped about specifics, here's what they would share about recently released products and what's to come. – *Marisa Palmieri*

Editor's note: The following manufacturers were contacted for the article but declined to participate or didn't respond to requests for information: Advan, AgraQuest, Amvac Environmental Products, Bell Labs, Biosafe Systems, Cheminova, FMC, Gowan, Regal Chemical, Petro Canada and SePro.

Pesticide type	Manufacturer	Product name	Active Ingredient	Targeted pests	Released/expected release
HERBICIDES	Arysta LifeScience	TBA	Amicarbazone	*Poa annua* on bentgrass greens	Q4 2009 or Q1 2010
HERBICIDES	Arysta LifeScience	TBA	Flucarbazone	Broadleaf weeds	Q4 2009 or Q1 2010
HERBICIDES	Bayer Environmental Science	TBA	TBA	TBA	2010
HERBICIDES	DuPont Professional Products	TBA	TBA	TBA - broad spectrum	TBA
HERBICIDES	PBI/Gordon	TBA	TBA	Sedges	TBA by 2012
HERBICIDES, AQUATIC	Phoenix Environmental Care	Avocet PLX	Glyphosate	Various emergent and floating aquatic plants, terrestrial and ditchbank woody brush, grasses and weeds on shorelines, landscapes and in turf or noncrop areas	Q1 2009
HERBICIDES, AQUATIC	Valent	Clipper	Flumioxazin	Aquatic weeds including watermeal, cabomba, duckweed, water lettuce and others.	Q2 2010
HERBICIDES, AQUATIC	Valent	Tradewind	Bispyribac	Aquatic weeds including hydrilla, milfoil, water hyacinth and water lettuce and others	Q3 2010
HERBICIDES, POSTEMERGENT	BASF Turf & Ornamentals	TBA	TBA	TBA	TBA
HERBICIDES, POSTEMERGENT	Dow AgroScience	LockUp	Penoxsulam	Broadleaf weeds, including dollar weed, white clover, kyllinga and English lawn daisy	2009
HERBICIDES, POSTEMERGENT	Dow AgroScience	Sapphire	Penoxsulam	English lawn daisy in California, Washington and Oregon	Q4 2008
HERBICIDES, POSTEMERGENT	Monsanto	Roundup ProMax	Glyphosate, N-(phosphonomethyl)glycine, in the form of its potassium salt	Annual and perennial weeds, woody brush and trees	Q4 2008 (exept California)
HERBICIDES, POSTEMERGENT	Quali-Pro	TBA	TBA (proprietary)	Postemergent weeds	TBA – approximately 2012
HERBICIDES, POSTEMERGENT	Valent	TBA	Imazosulfuron	Sedges (annual and perennial) and some broadleaf weeds	1st Quarter 2010

TBA – to be announced

Pesticide type	Manufacturer	Product name	Active ingredient	Targeted pests	Released/expected release
HERBICIDES, PREEMERGENT	BASF Turf & Ornamentals	Tower	Dimethenamid-P	More than 50 weeds, including yellow nutsedge, annual sedges, carpetweed, bittercress, purslane, crabgrass, goosegrass, barnyardgrass, doveweed and others.	TBA
	Cleary Chemical	Agule 65 WDG	Prodiamine	Preemergent grass and selected broadleaf weeds	Q3 2010
	Phoenix Environmental Care	StarFighter	Oxidiazon	Most grasses and some broadleaf weeds	Q1 2009
FUNGICIDES	BASF Turf & Ornamentals	TBA	TBA (class of chemistry not widely used in the golf market)	Dollar spot, brown patch and others	TBA
	Bayer Environmental Science	TBA	TBA	TBA	2009
	Bayer Environmental Science	TBA	TBA	TBA	2009
	Cleary Chemical	3336 70 EG	Thiophanate-methyl	Anthracnose, dollar spot, brown patch and others	Q2 2009
	DuPont Professional Products	TBA	TBA	TBA	TBA
	PBI/Gordon	TBA	TBA	TBA	TBA by 2012
	Phoenix Environmental Care	Pegasus HPX	Chlorothalonil	Dollar spot, brown patch, anthracnose, red thread, gray snow mold and leaf spots	Q1 2009
	Phoenix Environmental Care	Verio	Metalaxyl	Pythium and other root diseases	Q2 2009
	Syngenta Professional Products	TBA	TBA (class of chemistry: strobulurin)	TBA	TBA – registration pending
INSECTICIDES	Agrisel	ImidaPro 2F; Imida Pro 5	Imidacloprid	Aphids, grubs, beetles, borers, lacebugs, psyllids, thrips, scales, pine tip moths, black vine weevils, adelgids, billbugs, northern masked chafer, mole crickets and chinchbugs	Q4 2008
	DuPont Professional Products	DuPont Acelepryn granular	DuPont Calteryx	White grub species, annual bluegrass weevil, billbugs, caterpillars and others	Q4 2008
	DuPont Professional Products	TBA	TBA (class of chemistry: anthranilic diamide)	TBA	TBA
	PBI/Gordon	TBA	TBA	TBA	TBA by 2012
NEMATACIDES	Quali-Pro	TBA	TBA (proprietary)	Nematodes	TBA – approximately late 2011

TBA – to be announced

COMBINATION PRODUCTS

Pesticide type	Manufacturer	Product name	Active ingredient	Targeted pests	Released/ expected release
FUNGICIDE COMBINATIONS/ PREMIXES	Arysta LifeScience	Disarm T; Disarm M Premix Fungicides	Fluoxastrobin + tebuconozole; fluoxastrobin + myclobutanil	All major patch, spot and snow mold diseases	Anticipated Q4 2009 or Q1 2010
	Cleary Chemical	Spectro 90 EG	Chlorothalonil + thiophanate-methyl	Anthracnose, bentgrass dead spot, bluegrass stem rust, brown patch, dichondra leaf spot, dollar spot, downy mildew, fusarium blight, fusarium patch, gray leaf spot, gray snow mold, pink snow mold, red thread, algae and others	Q1 2010
	Syngenta Professional Products	TBA	Azoxystrobin + chlorothalonil	Brown patch, gray leaf spot, dollar spot, large patch, leaf spot and anthracnose	TBA
HERBICIDE COMBINATIONS	Bayer Environmental Science	TBA	TBA	TBA	Late 2009
	Dow AgroScience	TBA, LockUp combinations	Penoxsulam + 2,4-D + dicamba	Broadleaf weeds	2009 or 2010
	Nufarm	4-Speed; 4-Speed XT	2,4-D 2EHE + MCPP + dicamba + pyraflufen; 2,4-D 2EHE + triclopyr + dicamba + pyraflufen	Broadleaf weeds, including white clover, buckhorn plantain and dandelion	Anticipated registration Q1 2009
	PBI/Gordon	TBA	TBA	Broadleaf weeds, including wild violet	TBA by 2012
INSECTICIDE COMBINATIONS	DuPont Professional Products	Fertilizer with DuPont Acelepryn	DuPont Calteryx	White grub species, annual bluegrass weevil, billbugs, caterpillars and others	Q2 2009

TBA – to be announced

BY J. MARSHALL CLARK, PH.D.

Pesticide and nutrient removal

Study optimizes vegetative filter strips for treating turfgrass runoff waters

A joint greenhouse and field project is underway at the University of Massachusetts-Amherst to evaluate plant species for their effectiveness in removing pesticides and nutrients from turfgrass runoff waters that enter the rhizospheres of plants in vegetated filter strips acting as buffer zones. Initially, a greenhouse study screened plant species for their ability to remove pesticides from soil. The best arrangement of selected plants within vegetated filter strips to optimize their ability to remove pesticides is being evaluated.

Vegetated filter strips will be compared to turfgrass buffer strips to determine the relative effectiveness of each and will consider how these two systems would work in conjunction with each other. The fate of contaminants entering the vegetated filter strips will be evaluated by analyzing soil, plant tissue, soil water and runoff for parent pesticides and their major breakdown products.

GREENHOUSE STUDY

A greenhouse study was carried out to identify the most effective plant species for placement in a field run-on plot. A silt loam was amended with six pesticides (Table 1, below) at 5 percent of their application rates. While this is an overestimation of the amount of pesticides likely being lost, it will provide sufficient residues for screening plants for their ability to remove pesticides from soil at an amount that exceeds the detection limits for these pesticides.

The study objective was to screen 10 aesthetically acceptable plant species for their ability to remove four commonly used and degradable pesticides: chlorpyrifos, chlorothalonil, pendimethalin and propiconazole from soil in a greenhouse setting, thus providing invaluable information about the species composition that would be most effective for use in vegetated filter strips. Plant treatments examined were:

- Big blue stem (*Andropogon gerardii*);
- Black willow (*Salix nigra*);
- Blue flag iris (*Iris versicolor*);
- Eastern gama grass (*Tripsacum dactyloides*);
- Perennial rye (*Lolium perenne*);
- Prairie cord grass (*Spartina pectinata*);
- Rice cutgrass (*Leersia oryzoides*);
- Tall fescue (*Festuca arundinacea*);
- Tufted sedge (*Carex stricta*);
- Woolgrass (*Scirpus cyperinus*); and
- an unvegetated control.

Many of these plant species have been effective in previous buffer strip studies or have some other quality (salt tolerance, dense growth, increase soil infiltration) that makes them good candidates.

Blue flag iris, big blue stem, eastern gama grass, prairie cord grass and woolgrass enhanced the loss of one or more pesticides from the greenhouse soil. Blue flag iris (76 percent chlorpyrifos, 94 percent chlorothalonil, 48 percent pendime-

Table 1. Characterization and use of pesticides of interest

Pesticide class	Pesticide name	Pesticide mode	Maximum application rate (23.5%)	Active ingredient lost from 60 ft^2 at 5% loss	Concentration in soil if all lost in first square foot on VFS*
Insecticides	Chlorpyrifos	Nonsystemic	1 lb/acre	0.03 grams	0.2 mg/kg
	Imidacloprid	Systemic	8.6 oz/acre (75% ai)	0.01 grams	0.15 mg/kg
Herbicides	Pendimethalin	Nonsystemic	3.6 oz/1,000 ft^2 (37.4%) or 5lbs/acre (60%)	0.11 grams	0.81 mg/kg
	2,4-D	Systemic	1.1 oz/1,000 ft^2 (48.99%)	0.05 grams	0.37 mg/kg
Fungicides	Chlorothalonil	Nonsystemic	20 lbs/acre (82.5%) or 16 $^2/_3$ pints/acre (54%)	0.52 grams	3.85 mg/kg
	Propiconazole	Systemic	176 oz/acre (14.3%)	0.05 grams	0.37 mg/kg

* Calculation based on a bulk density of 1.6 g/cm^3.

thalin and 33 percent propiconazole were lost from soil after three months of plant growth), eastern gama grass (47 percent chlorpyrifos, 95 percent chlorothalonil, 17 percent pendimethalin and 22 percent propiconazole were lost from soil after three months of plant growth) and big blue stem (52 percent chlorpyrifos, 91 percent chlorothalonil, 19 percent pendimethalin, and 30 percent propiconazole were lost from soil after three months of plant growth) were excellent candidates for the optimization of vegetated filter strips (Figure 1 on page 77). Blue flag iris was most effective in removing selected pesticides from soil and had the highest aesthetic value of the plants.

These five species were selected for use in the establishment of one of the two plant treatments. In the mixture treatment, each species will be mixed evenly throughout the plot. In the succession treatment, species will be arranged in order of increasing height from the front of the vegetated filter strips (blue flag iris, woolgrass, prairie cord grass, big blue stem, and eastern gama grass).

FIELD STUDY

Twelve vegetated filter strips in a run-on plot will be used to evaluate the ability of four planting treatments (unvegetated, mixture of selected plant species, succession of selected plant species and succession of different heights of turfgrass, with each treatment replicated three times) to remove pesticides and nutrients from runoff water generated in two simulated rain events (one year and five year). The first year of the study was primarily for site establishment; the second year was for plant establishment. The third year of the study and any subsequent years will have application of one of the pesticide groups in June with the other group applied in July.

CONSTRUCTING THE STRIPS

A run-on plot for the field study was constructed at the University of Massachusetts Turfgrass Research Center in Deerfield during the summer of 2006. Native sandy loam was used as the subsoil, and a silt loam was brought in from another location to be used for the surface horizon (0 to 6 inches). The 12 vegetated filter strips in the run-on plot were 3 feet by 15 feet by 6 feet each, lined with an impermeable 36-mil polypropylene liner and graded to a 5-percent slope.

At the end (bottom) of each strip, an aluminum sheet was placed under 3 inches of soil for the last 12 inches of the strip to collect runoff. Beneath the lip of the collector, a 5-gallon bucket was inserted to hold a 1-gallon brown bottle used during the collection of runoff water from each vegetated filter strip in the run-on plot. On the front (top) end of each filter strip, an aluminum manifold with holes drilled at 2-inch intervals was placed to ensure water would flow evenly onto the strips.

Stainless steel lysimeters were placed 5 feet below the soil surface and about 14 feet from the top of the vegetated filter strips to sample the subsurface water flow at the bottom of each filter strip (Figure 2 on page 76).

STORM/RUN-ON SCENARIOS

Several storm/run-on scenarios on the bare (preplanted) vegetated filter strips were evaluated. The volume of runoff water applied as run-on to each filter strips was based on a one-year rain event. The runoff water generated during a one-year rain event was calculated to be 25.4 gallons during 24 hours from a turfgrass area 3 feet by 20 feet with a 5 percent slope (obtained by calculating the amount of water loss with these rain events using the SCS Curve Number Method, Climate System Research Center, University of Massachusetts-Amherst).

This water volume is applied to the top of the filter strips as run-on water. A storm scenario was selected, which produced runoff that was measurable and manageable. Early storm event trials were spread over a 24-hour period. It was clear from these early trials the one-year rain event had to be condensed to six hours and the soil needed to be presaturated to produce measurable runoff.

Soil presaturation was achieved by adding artificial rain for 10 hours (0.4 inches per hour), followed by a 12-hour drying period (6 p.m. to 6 a.m.) before the initiation of the storm event. The storm scenario selected for the one-year rain event and the initial bromide tracer studies were as follows: Artificial rain for six hours total (6 a.m. to noon, for 2 inches total rainfall) and run-on for two hours (11 a.m. to 1 p.m. at 12.7 gallons an hour).

BROMIDE TRACER STUDY

A bromide tracer study was conducted to determine hydraulic characteristics and runoff flows on the 12 vegetated filter strips before planting. This allowed us to evaluate the effects the plants have on the flow of water through each filter strip, and it will allow us to know any differences observed in runoff of the pesticides because of the plant treatments not the differences in the hydrology between the plots.

Artificial run-on containing the bromide tracer was applied to each vegetated filter strip by using a scaled-down version of previous run-on studies. A holding tank was used to mix the water and bromide together, and then run-on water was pumped to the manifold as previously described for a one-year rain event. Runoff water volume from the run-on event was measured by collecting in 1-gallon amber bottles at the bottom of the filter strips.

Grab samples were collected every two minutes in 2-ounce amber bottles for bromide analysis. Run-on was started at 11 a.m., and the first bromide grab sample was collected at 11 a.m. Grab samples were collected until the 2-ounce bottle was full so collection duration varied depending on the runoff flow rate. Between grab samples, the runoff was collected into the 1-gallon amber bottles to ensure the entire runoff volume was collected.

The results of the initial preplanting bromide tracer study are shown in Table 2 (below). Only the first six minutes of bromide tracer data is shown because the bromide tracer had reached the end of the vegetated filter strips by the six-minute grab sample for all 12 vegetated filter strips.

PLANT ESTABLISHMENT

Individual vegetated filter strips were planted in replicates of three (unvegetated, random mixture of plant species, succession of plant species and turfgrass rough mix). Greenhouse-reared plugs of blue flag iris, eastern gamma grass, prairie cord grass and woolgrass were planted at a density of 25 plants per 9 square feet. Big blue stem was seeded at a similar rate and was thinned in spring 2008. Three filter strips were planted with a golf course rough mixture (80 percent Kentucky bluegrass, 20 percent chewings fescue) at a rate of 4 pounds per 1,000 square feet. The rough mixture was maintained at three different heights (1, 1.5, and 2.0 inches, top to bottom) during the growing season.

The results of the bromide tracer study were used to block the plant-

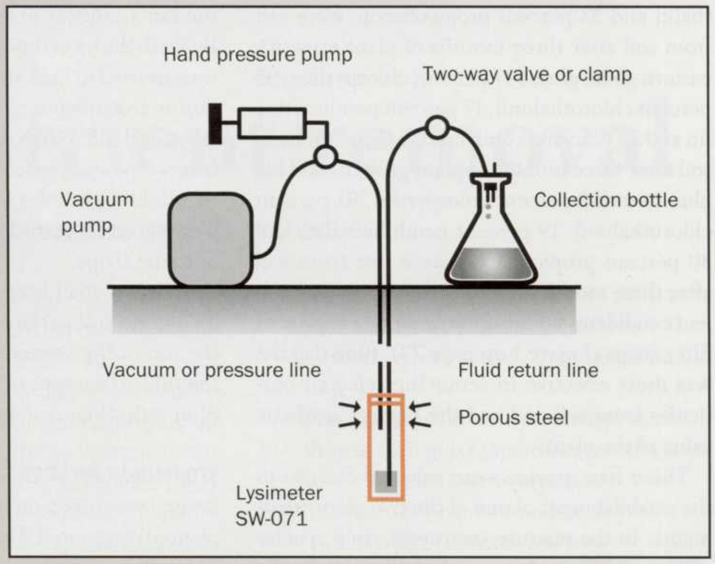

Figure 2. Lysimeters placed 5 feet below the soil surface and 14 feet from the top of the VFS allows subsurface water to be collected.

Table 2. Runoff rate, volume and bromide tracer concentrations

Strip	Runoff rate prerun-on	Runoff rate with run-on	Rainfall	Total volume	Run-on stop*	Runoff stop	Bromide				Planting
	(gal/hr)	(gal/hr)	(inches)	(liters)			(mg/L)** at				
							0 min	2 min	4 min	6 min	
1	2.5	11.2	1.9 ± 0.60	58.4	1:16	1:25	0.27	600	2,060	1,900	Turf
2	0.9	7.6	2 ± 0.13	47.1	1:14	1:20	1.02	0.23	2,690	1,910	Succession
3	1	9.2	1.9 ± 0.19	49.2	1:18	1:42	0.7	95.1	1,450	1,890	Bare
4	1	9.2	2.2 ± 0.16	43.8	1:15	1:19	BDL	169	150	1,920	Random
5	3.8	10	2.5 ± 0.13	50	1:06	1:51	BDL	480	1,560	1,610	Bare
6	0.4	4.4	2.2 ± 0.10	22	1:09	1:31	BDL	660	1,820	1,620	Random
7	0.4	4.3	1.9 ± 0.10	19.7	1:14	1:21	BDL	BDL	BDL	3	Turf
8	1.7	8.7	1.9 ± 0.10	40.5	1:11	1:49	0.75	70	1,500	1,680	Succession
9	2.5	13	2 ± 0	77.3	1:09	1:33	2	1,360	2,230	2,430	Succession
10	1.9	9	2.2 ± 0	42.4	1:06	1:29	BDL	230	1,560	1,620	Turf
11	2.3	10.5	2.3 ± 0.11	54.5	1:05	1:37	BDL	140	1,170	1,360	Random
12	1	6.2	2.2 ± 0.22	26.5	1:05	1:36	0.12	0.11	0.1	470	Bare

*Time run-on delivery tank was empty. ** Bromide added at 4,000 mg/l. BDL = below detection limit ings in groups of three vegetated filter strips (fast, intermediate and slow flow rates). The individual vegetated filter strips were planted as shown in Table 2.

FUTURE RESEARCH PLANS

The six pesticides used in the greenhouse study, plus cyfluthrin, will be used in the vegetated filter strip run-on field trials. Pesticides will be applied with a water volume that would be generated for a one-year and five-year rain event. Bromide also will be added to the pesticide containing water at 4 grams per liter as a tracer.

Before applying the pesticide-containing water, the vegetated filter strips will receive a water volume that would occur in a one-year or five-year rain event (see storm scenario mentioned earlier). In the case of the five-year rain event, this would involve adding 3.8 inches of water as rain over 24 hours and 62.1 gallons of water as runoff over 24 hours. The expected runoff water coming from a vegetated filter strip is about 31 ounces for the one-year rain event and 36 gallons for the five-year rain event.

The mass of pesticide lost will be evaluated using the concentration of the pesticide and the volume of water collected during runoff. In addition to pesticides, runoff water will be monitored for losses of nitrogen and phosphorus from fertilizer inputs. Soil, soil water and plants within the vegetated filter strips also will be analyzed to determine if the pesticides lost from the runoff water are sorbing to the soil, being degraded in the soil, taken up by the plants or potentially lost to leaching or subsurface flow. These values will be compared against the bromide tracer, which will move freely with the run-on water.

Soil sampling will be conducted at three different depths at three locations within the vegetated filter strips (1 foot, 6 feet, and 11 feet from the top of each strip). The reason for sampling at multiple locations is half the pesticides of interest are water soluble. Also, many investigators have shown that even chemicals that sorb tightly to the soil can be found deeper in the soil profile than would be expected based on the physical and chemical properties of those chemicals because of preferential flow pathways established by earthworms and old root channels. Analysis will be conducted for parent compounds and expected metabolites based on existing literature.

Soil water will be collected with lysimeters and should include water that has passed through all the rhizospheres and soil in the upstream part

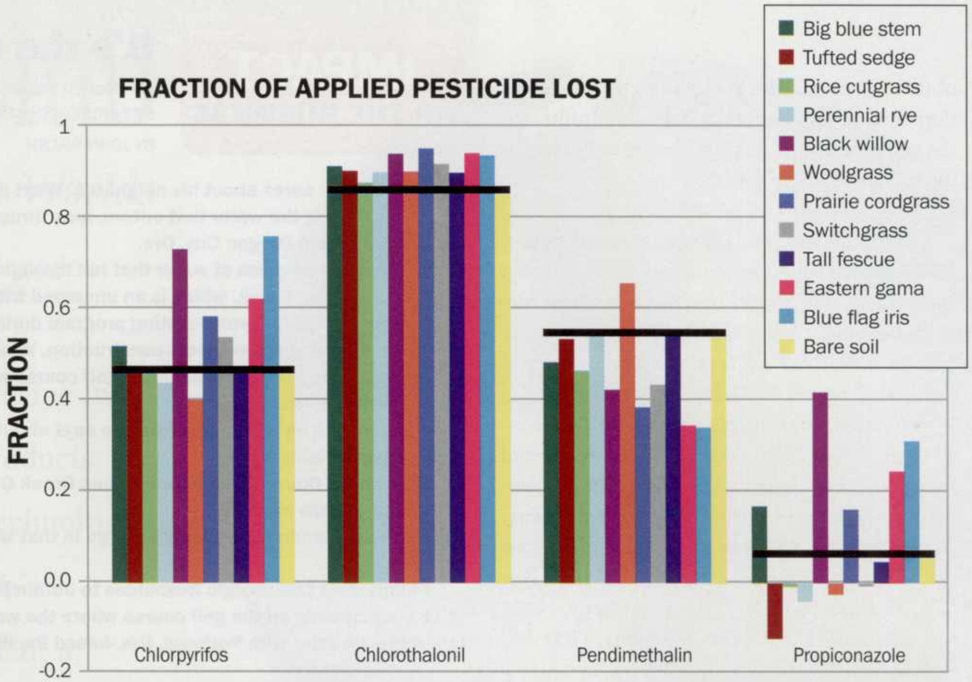

Figure 1. Fraction of applied pesticide lost from greenhouse soil for chlorpyrifos, chlorothalonil, pendimethalin and propiconazole. Horizontal lines represent unvegetated controls (bare soil).

of the vegetated filter strips and give an indication of whether or not pesticides that infiltrated the vegetated filter strips are being lost to leaching or subsurface flow. GCI

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Credit: USGA Turfgrass and Environmental Research Online 7(19): 1-8.

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IMPACT ON THE BUSINESS

It's the neighborly thing to do

An Oregon superintendent regularly tests streams for pesticide contaminants

BY JOHN WALSH

David Phipps cares about his neighbors. Want proof? He's spent $65,000 throughout the past eight years testing the water that enters, runs through and exits the golf course he maintains – Stone Creek Golf Club in Oregon City, Ore.

There are two bodies of water that run through the golf course. Beaver Creek runs below the course, and Stone Creek, which is an unnamed tributary, runs through it.

Phipps started the water-testing program during the golf course's infancy, as soon as the grass was planted during the course's construction. When the golf course was being built, he knew some people in the area thought building a golf course was harmful to the environment. Phipps wanted to show them otherwise.

"I wanted all my ducks in a row," he says about backing up the fact that a golf course is beneficial to the environment.

Clackamas County, which owns Stone Creek Golf Club, bought into the water testing from the beginning, Phipps says.

"We're protecting the county's image in that we're looking to protect the neighboring properties," he says.

Phipps uses EnviroLogic Resources to obtain the water samples. The samples are gathered at strategic points on the golf course where the water enters and exits the property. Steve Thun, laboratory director with Portland, Ore.-based Pacific Agriculture Laboratory, performs the actual water

(continued on page 88)

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BY JOHN WALSH

It's in their hands

The maintenance staff at Great River Golf Club meets golfer expectations one piece of handheld equipment at a time

"You get what you pay for" is an all too familiar saying, especially in the golf world. Golfers at Great River Golf Club in Milford, Conn., can attest to that. According to golf course superintendent Sean Flynn, the semiprivate club, which opened in 2000, charges more per round than all but about two daily-fee courses in the state. Golfers' high expectations go hand in hand with green fees, and because of that, the detail work done on Great River's course using handheld equipment is important to meet them.

"When members come to play here, they expect perfect conditions," Flynn says.

Flynn, who has been a superintendent for five years and at Great River that entire time, works with a $980,000 maintenance budget, which has remained relatively flat for the past eight years. The capital expenditure budget is as needed, but the club is averaging $30,000 annually on golf course projects. Equipment purchases, which have been tied in with the operating budget, average about $70,000 annually.

On a scale of one to 10, Flynn, who works with a staff of 18 to 20 in season and six during the winter, considers handheld equipment a 10 regarding its importance to maintain the course, which features tree-lined fairways on the front nine and a links style with water on all holes on the back nine. His fleet of handheld equipment, which he added to once he arrived at Great River, includes:

- RedMax backpack blowers
- A Stihl handheld blower
- Stihl backpack blowers
- RedMax string trimmers
- Echo string trimmers
- A RedMax reciprocating edger
- A RedMax power broom
- An Echo extended-reach hedge trimmer
- A RedMax hedge trimmer
- A Stihl extended-reach pole chain saw
- A Stihl 036 chain saw
- A Stihl 029 chain saw
- A small RedMax chain saw
- HoverMowers
- Lawn-Boy push mowers

On the Tommy Fazio-designed course, which is ranked No. 5 in the state by Golf Digest, the staff uses HoverMowers to cut grass around the 101 bunkers, string trimmers to edge them and backpack blowers to clean them out – all done once a week. When mowing greens, tees, collars and approaches, the staff takes blowers with them each time they go out. They also edge along cart-path curbing once a week.

"It's required to bring a blower on just about every task, even mowing greens," Flynn says.

The breakdown of man-hours needed for each task using the handheld pieces of equipment is:

- Blowing debris on greens, tees, approaches – five minutes per area daily
- HoverMowers – five operators, eight hours weekly
- Bunker edging – two operators, eight hours weekly
- Blowing debris in bunkers – two operators, three hours weekly
- Cart path edging – four operators, four hours weekly
- Blowing cart paths – four operators, four hours weekly
- Clubhouse grounds – three operators, four hours weekly
- Miscellaneous string trimming – two operators, six hours weekly
- Hedge trimming shrubs – four hours monthly
- Hedge trimming phragmites – 160 hours annually
- Chain saws – 80 to 100 hours annually.

Fortunately, Flynn doesn't have to abide by any noise ordinances. Sometimes Flynn buys new replacement handheld equipment; other times it's repaired.

"Our equipment manager will typically give me the repair scenario, and I will decide at that time," he says. "The rule of thumb is if the repair is more than half of the replacement cost, we'll just purchase a new one. The age of the piece of equipment also will determine how much we're willing to spend on repair."

Flynn spends $3,000 to $5,000 annually for handheld equipment, which is a line item in the operating budget. He uses certain brands and models (listed previously) because of ease of use, comfort and durability. On average the equipment lasts four to seven years:

- String trimmers – two to four years
- Backpack blowers – four to seven years
- Chain saws – five to 10 years
- HoverMowers – four to seven years
- Hedge trimmers – four to seven years.

Before making a purchase, Flynn gathers the input from everyone on the staff, including the equipment tech, who must work on the equipment and have the ability to get parts quickly, and the operators, who must be comfortable with the piece of equipment in their hands.

"If they're not happy with a piece of equipment, or frustrated with it, it will reflect the quality of their work," he says.

Several factors go into Flynn's purchases.