

Since much golf turf, especially putting greens, essentially “lives on the edge,” it is important to minimize the potential negative impacts of effluent water. Effluent containing low to medium total suspended solids (TSS) can physically clog macropores over time and greatly reduce drainage. Thus, only tertiary effluent should be used; avoid secondary effluent (often illegal—primary effluent won’t be available due to legal restrictions because of human pathogen concerns). Greens irrigated with effluent may require regular aeration, spiking and/or slicing to minimize crusting and algal growth.

Potential problems with effluent water can be minimized by diluting the effluent with high-quality (potable) water. This will, of course, require two water sources and two irrigation lines to “feed” the potable water into the effluent line. In Wisconsin, sufficient rainfall will usually leach excess salts below the root zone. During extended drought or in areas of the country where rainfall is minimal, the salts will need to occasionally

be leached below the root zone with potable water before salts accumulate sufficiently to cause a problem (see part II in the April issue for more information). Sand-based root zones and good internal drainage (tiling) allow more rapid leaching of salts than do native soils. In certain cases, replacement of salt-affected grasses with salt-tolerant grasses may be warranted.

Logistical Considerations

There are logistical considerations when effluent water is used for irrigation. Metal irrigation components may corrode; chlorine can affect brass and galvanized pipes and fittings, while ammonia (NH₃) can corrode copper pipe even when only 1.5 ppm N. Solids in the effluent water can clog nozzles, so large nozzles may have to be used and the water should be filtered before it reaches the nozzles.

Human health concerns dictate a special design for irrigation heads and pipes. In many states, heads from

(continued on page 22)

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effluent water sources have to be spaced a minimum of 75 feet from irrigated or public areas or wells. A vegetative buffer (typically 50-100 feet) is usually required between the edge of the irrigation pattern and dwellings. These unwatered spaces in between may be subject to drought. All pipes, fittings, spigots and quick-couple connections must be belowground.

Pipes carrying effluent water must be noticeably distinguishable from lines carrying potable water. Generally, pipe carrying effluent water is colored purple. Most states that have laws regulating effluent irrigation require 10 feet horizontal and 1 foot vertical spacing between domestic and effluent pipes. Backflow prevention is required and leakage of pipes/fittings is regulated.

Supply can be one of the biggest logistical concerns. Typically, users of effluent water are required to accept a minimum amount of effluent every day, whether it is needed for irrigation or not. This forces many courses to add special holding ponds to accept the effluent until it can be used. Individual states typically have special requirements for such ponds, including an impermeable liner, specific slopes and other criteria.

In many locations, golf courses must post signs such as the following to notify staff and the public that effluent water is being used: "Warning: Course irrigated with reclaimed water." Such a sign can send a negative impact and reduce play unless the superintendent and course management properly explain the situation to players. Often, irrigation must be restricted to daylight hours and the surface must be dry before entry. The potential for disruption of play is obvious.

Financial Considerations

Dealing with the many agroeconomic and logistical considerations of effluent irrigation will certainly increase costs. Occasionally, these costs will be offset by the lower cost of the water (typically <80%) compared to potable water from municipal sources. Some additional costs include:

- Permits for effluent water use.
- Monitoring.
- Filters for pumps.
- Retention pond construction and maintenance.
- Corrosion to golf course vehicles.

Wisconsin's regulations for the use of effluent water are not well spelled out. Currently, there are only a handful of courses that use or have even inquired about using effluent water. The Department of Natural Resources' water quality division evaluates each request on a case-by-case

basis and establishes guidelines as appropriate. As public demand for potable water increases and potable water becomes more valuable, it is likely a matter of time before the DNR is forced to outline specific requirements across the board for use of effluent irrigation.

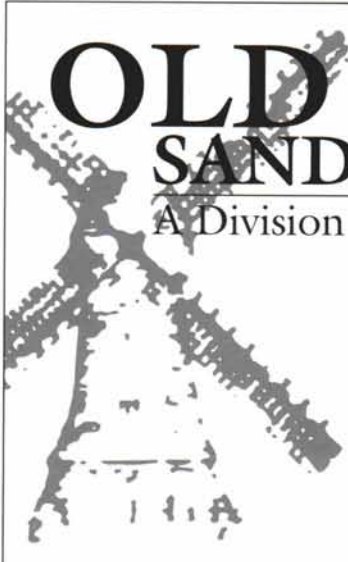
Sampling for Water Quality

If you are concerned about water quality, whether or not you use effluent irrigation, then follow these simple steps to have your water tested:

- Collect a water sample (at least 8 oz.) in a clean, triple-rinsed plastic container with a plastic cap. Be sure not to leave ANY soap residue in the container as it will destroy the integrity of the sample and provide false results.
- Seal the container immediately after collection to prevent exposure to the air. Prolonged exposure to the air may affect the water pH, bicarbonate and carbonate levels.
- Label each bottle with a permanent marker, indicating time, date and location of where the sample was collected.
- Deliver to a state-approved water-quality-testing lab within 24 hours of collection. If situations prevent rapid delivery, refrigerate the sample (in the dark) and get it to the lab as soon as possible.



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West Nile Virus: What Superintendents MUST Know

Randy Wahler knows firsthand how serious a mosquito-borne illness can be. Years ago, Wahler's daughter contracted encephalitis from a mosquito bite and was hospitalized. Today, the threat of West Nile Virus has a very human face for him.

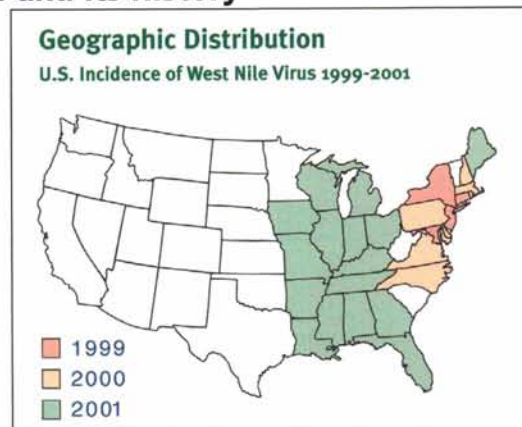


Among his other duties as superintendent of Lake Forest's Knollwood Country Club, Wahler is responsible for mosquito control for the course. While in the past superintendents were more concerned with the nuisance aspect of mosquitoes, West Nile Virus has become a significant health threat to employees and golfers alike.

"We're going to stay on top of West Nile in 2002 . . . we don't want something enjoyable like golf to become something life-threatening because of mosquitoes," says Wahler.

In 2001, birds carrying the West Nile Virus were found in DuPage, Kane, Lake, Crawford, Will, Cook and Winnebago counties in Illinois.

The Disease and Its History



West Nile Virus originally debuted in the United States in New York City in the late summer of 1999. Transmission is ongoing between mosquitoes and birds throughout the spring and summer months. Humans are the unintended victims of the disease and can contract West Nile Virus via a mosquito's bite. The resulting disease can cause encephalitis, a swelling of the brain. For those with compromised immune systems—including the elderly—West Nile Virus can be deadly.

(continued on page 24)

Since its introduction to the U.S. three years ago, it has steadily spread westward, reaching across the Mississippi in 2001. Experts agree that West Nile Virus is here to stay, and according to those who track bird migratory patterns, it's within the realm of probability that the virus will reach at least the Rockies in 2002.

Nearly two dozen mosquito species have been identified as carriers or "vectors" of West Nile Virus, including the *Culex* mosquito, which is prevalent in the Midwest. The *Culex* mosquito breeds in small or large amounts of stagnant standing-water areas. In 2001, birds carrying the West Nile Virus were found in DuPage, Kane, Lake, Crawford, Will, Cook and Winnebago counties in Illinois. These bird sightings are a critical part of the surveillance effort that municipalities and private citizens conduct in tandem with public health to monitor the spread of West Nile.

Golf course superintendents can be key in the regional battle against West Nile Virus. With an expanse of well-maintained acreage and a wide range of mosquito and bird habitats, golf courses can serve as an early warning system to identify the spread of this disease.

Surveillance: The First Line of Defense

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Critical in the battle against West Nile Virus is monitoring and surveillance, which includes identifying dead birds, and testing the various mosquito populations for West Nile.



Dead Birds: Birds chirping merrily on a summer morning is one of the true joys of the golfing experience. Finding a dead bird on the fourteenth green is not. But that bird may be your first sign that West Nile Virus is in your area in 2002. Birds—especially crows, blue jays and hawks—are especially susceptible to West Nile Virus, and have a much higher risk of death. Over 80 species of birds have been identified as affected by WNV, including songbirds, domestic birds and predatory birds. Just as miners used to bring canaries into the mines to determine if the air was too poor to breathe, birds can act as a sentinel for health risks of mosquito-borne disease.

Instruct your grounds staff to be on the lookout for either dead birds or birds acting strangely: hopping, not flying, when approached, walking off-balance or in circles on the ground. If a dead bird is found, contact the county health department immediately to determine if the bird is a candidate for testing for West Nile Virus.

From Sand Traps to Mosquito Traps: A number of golf courses work in partnership with local mos-

quito control agencies and Clarke Mosquito Control to trap mosquitoes. Mosquito trapping allows experts to identify the population of mosquitoes, any changes in population, and whether the populations are potential carriers of West Nile Virus. Knowing the "enemy" helps to identify the best control methods to employ.

Larviciding and Source Reduction: The First Attack

Standing water can be a day at the beach for mosquitoes. Undisturbed water is the breeding place of choice for mosquitoes, and such areas of standing water should be treated with effective larvicides. Birdbaths, reflecting ponds and water traps without an active fountain can be conducive to a mosquito population explosion.



Larvicides, including Abate, Altosid and Vectolex, have been proven quite effective against the strains of mosquitoes that carry West Nile Virus. Treatment programs for standing water can begin in May to cut down on adult mosquitoes later in the season.

Mosquitofish are growing in popularity as an option to reduce mosquito larvae in ponds and water traps. By stocking 500 mosquitofish per acre, you can reduce mosquito larvae by 80 percent, as the two-inch fish consume about 100 mosquito larvae an hour.

Removing standing water can prevent rampant mosquito breeding. By instructing staff to tip water from buckets, ashtrays, planters, basins and other small water-holding areas, you can reduce mosquito populations with little effort. "We try to keep standing water areas to a minimum," notes Tim Davis, golf course superintendent for Shoreacres in Lake Bluff.

Adulticiding – The SWAT Team

While your golfers are snug in their beds dreaming of the elusive hole-in-one, they may be lulled by the quiet hum of all-terrain vehicles applying a mist of adulticide in the quiet hours after midnight. Covering all areas of the course from tees to greens and rough to fairways, these evening applications can knock down huge numbers of mosquitoes in minutes, making sure that twilight golfers are only swinging for birdies, not swatting biters.



Adulticiding provides golf courses with an immediate response to a biting problem. Applied aurally or via ATVs, an ultra-low-volume

spray of an adulticiding agent like Anvil attacks the nervous system of adult mosquitoes and knocks down more than 90 percent of mosquitoes on the course.

At Knollwood and other area courses during prime mosquito season, helicopters apply an adulticide in the predawn hours. In eight short minutes, the helicopters are gone, having applied Anvil, the adulticide used to fight West Nile Virus when it first appeared in New York City in 1999.



“The aerial spraying has been very beneficial for us,” remarks Knollwood’s Wahler. “Our golfers noticed there didn’t seem to be many mosqui-

(continued on page 26)

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toes out, and when they heard later in the day that we'd sprayed, they said how much they appreciated it."

Special Events

After the most determined golfer can no longer find his ball in the darkness, the course may be quiet, but other revenue-generating special events are just heating up during those prime mosquito-biting hours. Wedding receptions, charity events and other group activities held at a clubhouse or tent on the grounds can be a veritable feast for hungry mosquitoes looking for a blood meal. A number of factors serve to attract mosquitoes: the high output of carbon dioxide from chatting guests, presence of floral perfumes, and bare shoulders, legs and arms.

"We provide special-event adult-iciding as a courtesy to our guests, to make sure the people who use our facility have a pleasant experience and don't get eaten alive," says Shore-acres' Davis.



Other courses offer their guests the option to spray adult mosquitoes in advance of their event for an additional cost. Now that West Nile Virus has its foothold in the Midwest, event organizers may be more inclined to purchase this self-liquidating (and often profitable) service to ensure a mosquito-free event.

Education and Community Relations

By educating your employees and guests, these individuals can take steps to protect themselves against any mosquitoes that remain after your mosquito-control efforts. Early in the

season, provide your grounds, sales and administrative staff with information on West Nile Virus and the efforts the facility is taking to minimize the risks. For guests and golfers, provide fact sheets on the disease. Encourage staff to wear long sleeves and pants and a DEET-based repellent during prime mosquito hours.

Balancing Conservation and Control

Many of the award-winning golf courses in the Midwest are as beautiful as they are challenging. Natural wetlands, prairie grasses or other natural habitats are often areas for wildlife conservation, and mosquito control and environmental stewardship aren't mutually exclusive. The need for mosquito control must be balanced with the need to keep these areas pristine. It is important to note that a properly executed mosquito control program is unobtrusive and will have absolutely no negative impact on any area of your course.

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The Centers for Disease Control and Prevention¹ have said, "Prevention and control of arboviral diseases is accomplished most effectively through a comprehensive, integrated mosquito management program." When your course's community is threatened by the West Nile Virus, a mosquito-control program is necessary and appropriate.

With the advent of West Nile Virus in the Midwest, far too many courses have ineffective mosquito-control programs in place—if they have any at all. While some courses have implemented the recommendations of old wives' tales and highly ineffective programs including bat sanctuaries, purple martins, electronic repellents or other gadgetry, only an integrated program can and will make a difference. Consequently, it's critical that golf course superintendents establish programs or review their current efforts to determine if they are sufficient. As a superintendent, you can be the driving force that keeps West Nile Virus from being an issue on your

grounds, to the benefit of your employees and golfers. Reappraising your mosquito-control resources and implementation now can mean far fewer headaches—and mosquito bites—this season.



REFERENCES

¹"Epidemic/Epizootic West Nile Virus in the United States." Centers for Disease Control. April 2001. p. 26

George Balis is an entomologist for Roselle, IL-based Clarke Mosquito Control. He implemented Clarke's West Nile control efforts in coordination with the Centers for Disease Control and Prevention in New York City, during the country's first outbreak of the virus in 1999.

For fact sheets on West Nile Virus, call Clarke at 630-894-2000, or e-mail George at georgebalis@clarke-mosquito.com.

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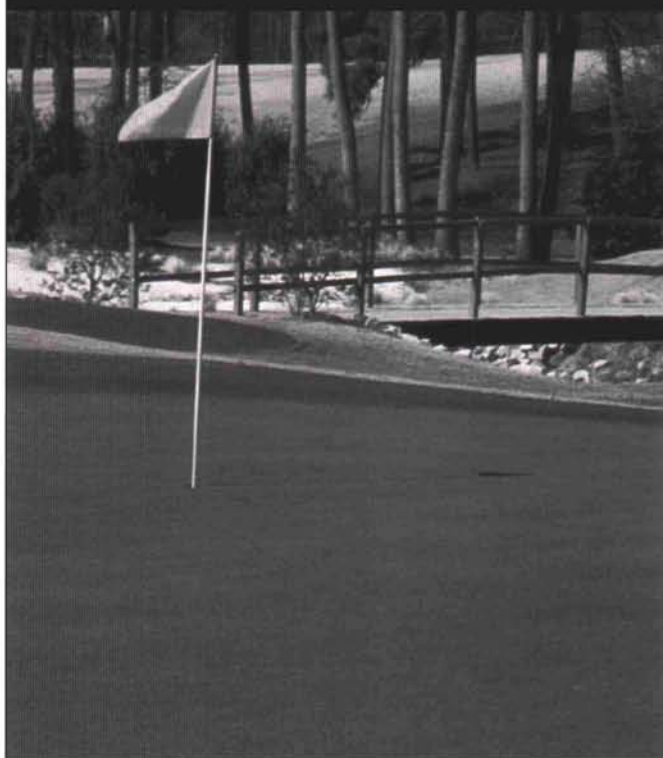


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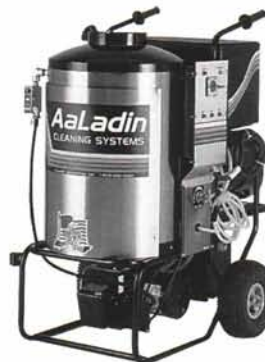


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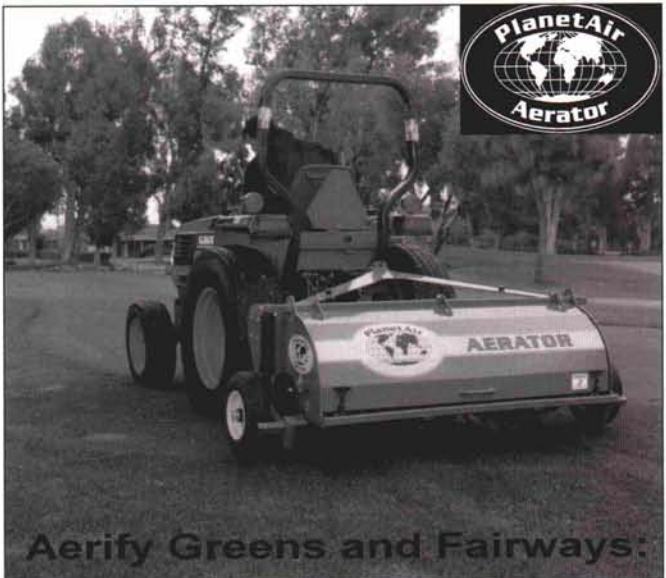
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