

Turfgrass management after the millennium

by Christopher Sann

The day is Monday, June 14, 2019. The place is a well-known private country club on Long Island at day break. All of the grounds maintenance employees have started on their day's work assignments. The superintendent and his three assistants have reviewed the events of the weekend and have finished their discussion about how to deal with the current hot issues. After the meeting has ended, assistant number three straps on her mobile communications and global positioning locator gear and head set and sets out to check the progress of the 10 grounds employees she supervises. Six employees are mowing greens and tees, two are collecting trash, and the two others are replacing the 40 feet of fencing that a member's car mowed down Saturday night. Before assistant number three can activate her locator system, she gets three calls on her communications headset. The first call is from the senior equipment operator. He has found three dead birds near the 15th tee. She transfers this call to the number one assistant and there ensues a brief four way conversation between the superintendent, the number one assistant, herself and the operator. They decide that the senior operator will stay there to guard the site until the number one assistant arrives.

The second call is from a recently hired equipment operator who has been sent to hand-mow the turf around the club house. The operator has flooded the mower engine and can't get it restarted. After "walking" the employee through the restart procedures, the number three assistant transfers the call to the head mechanic and listens long enough to make sure that the head mechanic has the situation well in hand. The third call is from the senior maintenance employee, who has a materials estimate to fix the damaged fence, but has been unable to contact the number two assistant to get a purchase order number to give to the materials supplier. The number three assistant tries to call the number two assistant, but the central communications computer reports that the number two assistant is not yet on line. Giving the verbal code to activate the locator system, she finds that he has not yet activated his locator transponder, so she is unable to locate him on her portable display. First she and the number two assistant review and modify the purchase order as seen on their displays. Then she activates the number three assistant's beeper and receives and transfers the materials authorization code to the senior maintenance employee. After the three calls are taken care of, she activates the locator display and heads out to supervise her employees.

The second assistant's day

The number two assistant, after having authorized the purchase of the fencing materials, turns on his display to find the location of the seven irrigation moisture sensors that have been giving erratic soil moisture readings for the past 36 hours.

When the number two assistant logged on that morning, the maintenance computer had already flagged the seven sensors along with three sprinkler heads and a digital weather station that had been showing reduced water flow data and erratic temperature readings. Additionally, the maintenance computer had already downloaded and prioritized the six scheduled preventive maintenance jobs on the irrigation system that it was tracking. The display had highlighted the best route to the "old" prioritized list, but the number two assistant's impromptu trip to the fence replacement site had forced the maintenance computer to make new priorities of the list and reroute his work pattern.

The first assistant's day

The number one assistant is talking to the state's area pesticide compliance officer, at the site where the three dead birds are, and the superintendent is monitoring the call. As required by pesticide regulations, the number one assistant informed the officer about the possibility of a pesticide poisoning at the golf course. Before calling the compliance officer, the assistant logged onto the integrated pest management computer and searched the global information database and a display history of the site. He confirmed that the bio-rational insecticide had been spot-applied to that and the other two areas of the club to control Frit fly activity last week. He also confirmed that it was not toxic to birds.

During the conversation the compliance officer instructs the number one assistant to bag the dead birds in bio-sampling bags and to notify the certified testing facility to have the samples picked up by a driver that afternoon. Under the regulations, the compliance officer has the authority to issue a quit work order over the phone without seeing the site, but he opts to review the global positioning records at the club's offices that afternoon and to wait for testing results before taking any further action. Having notified the integrated pest management computer of the situation regarding the dead birds, the number one assistant then issues a set of verbal commands to the integrated pest management computer to reroute his regular Monday morning inte-

grated pest management scouting activities. The computer reroutes him past the business office to drop off the bio-samples and then on to the 11th fairway to check it and the next three holes for signs of Dollar Spot activity that had been reported over the weekend. In addition to checking for Dollar Spot, the computer then schedules the number one assistant to take core samples from the tees and greens on 10th, 13th, and 17th holes to check for early signs of Pythium blight. The computer finishes the scouting session by scheduling a second sweep net sampling of the shrubbery in the rough areas on 12th, 14th, and 15th holes, for over-wintering sod webworm adults. Once the bio-samples are delivered, the number one assistant activates the computer display screen that mounted on the dash of his cart and proceeds down the fairway on the 11th hole. He follows the tight zigzag pattern that the integrated pest management computer recommends to look for Dollar Spot infestation. He does not finish the scouting run on the back nine holes before noon, but there is enough time to do a preliminary microscopic scan of all the samples that he has taken that day to confirm the probable field diagnoses.

The superintendent's day

After dealing with the two conference calls from his three assistants, the superintendent turns his attention to the demonstration and installation of the computer upgrade to the liquid application equipment that had been scheduled for earlier that morning. He calls the club's outside computer consultant to check that the specialist has reviewed the new hardware requirements for the upgrade and to make sure that the specialist would be at the meeting. The specialist responds that he is en route and that he was faxing the club's central office computer the certification that the club's computer system could meet the requirements of the new equipment. While the superintendent waits for the computer specialist and the equipment salesperson to arrive, he reviews the club's maintenance labor requirements for the week, month, and year to date and has the computer do a "what if" run to see what effect the recent and predicted weather of the next few days would have on his labor allocations for the next two weeks. After the computer predicts the new labor requirements for the next two weeks, the superintendent has the computer compare the stored scouting data and information concerning previously recommended and already taken corrective actions with the recent past and predicted weather for the next month. He feeds this into the new disease forecasting model to see if it will predict any disease infections that may require the use of chemical controls. If the new model forecasts any above threshold disease outbreaks, then he will want to notify the pesticide compliance office that he may request written permission for the use of prescription status pesticides to

control the infection. The superintendent learned an expensive lesson the previous year when the old disease forecasting model required he wait for site confirmation of the disease infection before notifying the pesticide compliance office. By the time the pesticide compliance office had processed and issued the required written authorization for the application of the prescription status pesticide, the disease had done so much damage that the superintendent had been forced to do extensive reseeding in the fall. This caused the club's material and labor costs to go over budget. Luckily for the superintendent, the greens committee chairman could access the stored data covering all of the recorded actions of that two week period and had correctly concluded that the fault was not the superintendent's but that of old disease modeling software. Later, the superintendent canvasses his three assistants in a conference call to check if every thing is going as planned. Then he checks with the business office to make sure that the previous week's employee payroll data that had been retrieved over night was being processed.

Computer upgrades

He then greets the computer specialist and they go over the work order authorizations that are required for the upgrade's installation as the equipment salesperson unloads the computer upgrade from the trunk of her car. The \$2,000 sprayer computer upgrade is about the size of a large sandwich but the installation requires more than just plugging in like the last upgrade. As the sales person and the specialist go over the new requirements, the superintendent brings the sprayer from its storage location. The hardware installation takes about an hour and the computer specialist takes about thirty minutes to make sure that the systems are completely compatible. Next the senior application specialist returns from trash pick-up duty and all four spend the next hour getting the wrinkles out of the system. Getting the global positioning database systems working correctly requires they test-spray several locations with rinsette solution on several designated pesticide mitigation sites that the club operates with the pesticide compliance officer's approval. Once the new upgrade is fully operational and the system is zeroed into the club's global positioning system, the newly upgraded sprayer will provide application accuracy down to less than one inch at running speeds of five to six miles per hour while operating wireless communications directly with the club's integrated pest management computer. No longer will the spraying system operators have to download the data before starting. Now all of that happens in real time. Unlike the old system, the data about spraying activity can be available as it is generated. This increases the superintendent's direct control of applications as they are made. Also the upgrade automatically notifies the

pesticide compliance office that an authorized application is being made. Additionally, the new upgrade has an on-site environmental condition monitoring system that eliminates the need for an operator to guess whether the current site conditions meet the requirements of the pesticide to be applied. The new system is so advanced that it can change the spray droplet size and application pressure on the run by using variable diameter spray nozzles that change to meet changing site conditions.

Clocking in

As the mowing operators come back to the storage garage, they plug their machines into the maintenance computer to down-load the performance data for that day. If the computer gives them a storage clearance, they park the equipment and check the preventive maintenance worksheet for their machines. Once they have performed the required maintenance and logged that information into the maintenance computer, they can clock out for the day using their employee identification cards in a card reader. If the computer does not give them the required storage clearance, they drive the mowers over to one of the maintenance bays and consult with the lone mechanic on duty. If the computer has detected a major problem, then the mower is left for the mechanic to repair and a backup unit is issued and parked back at the equipment storage building. If the problem is minor and the mechanic or the operator, with mechanic's supervision, can fix it, then that problem is taken care of at that time. Any overtime authorizations for operators must be cleared with the superintendent's computer. If no overtime authorizations are given, then the equipment is left in the maintenance bays over-night and the problem is corrected in the morning.

The assistants finish their days

Once the equipment operators have left for the day, number three assistant checks the maintenance computer to see if there are any problems with the equipment. If one or more of the mowers will be delayed in starting the next day or if the weather will not allow mowing, she asks the computer to put together a new jobs list for those employees and posts it. She then checks with the number two assistant to see if his maintenance work will require more than the two employees normally assigned to help with systems maintenance. Once that has been determined her employee work allocations are forwarded to the superintendent. They discuss the allocations and modify a few. Once that task is completed, she leaves for the day. The number two assistant enters his work progress on the maintenance computer and has the computer develop a prioritized list for tomorrow's work. Since the fence repair went well, tomorrow he will have his normal two-person crew back and they will be able to

get back on schedule repairing and maintaining the club's infrastructure and operating systems. The number one assistant has been back at his diagnostic lab since just after lunch. He and the two members of his integrated pest management crew have finished the microscopic examination of the collected samples. Their analysis of the 11th fairway samples has found that the suspected Dollar spot is actually the beginnings of a *Nigrospora* disease outbreak. A check of the data base has found that they can either increase irrigation in the infected area and apply an organic product or make an application to the pesticide compliance office for written authorization to use a high-rate application of a known ground water contaminating fungicide. After clearing his actions with the superintendent, he programs the irrigation sprinkler heads in the infection area to run for 30 minutes more per watering cycle. He then schedules three, monthly applications of compost for the infected area and he changes the fertility schedule for the site to account for the added nutrient input. The number one assistant's microscopic examination of the core samples taken from the greens and tees has proven negative for *Pythium* blight. And his sweep net sampling for sod webworm adults has captured some moths but not enough to reach the control action threshold required by integrated pest management. The integrated pest management software will have the number one assistant run the same two checks for sod webworms and *Pythium* when he again scouts the back nine holes in two weeks. The number one assistant reports his findings of his scouting activities to the superintendent's computer and he then runs the integrated pest management program to see what planned action, fertilization, pesticide application or cultural activity is scheduled for the next day.

Tomorrow

Tomorrow, the number one assistant will be scouting the front nine holes, while the senior application specialist makes a series of scheduled liquid applications with the upgraded sprayer and the junior application specialist samples the fairways on the back nine to test for soil nitrate concentrations. These will be used to determine the timing of the next fertilizer application. This schedule for the next day is also downloaded to the superintendent's computer. Because of outside obligations late in the day, the superintendent is not able to get the number one and number two assistants' progress reports. So later that night he accesses the various club computers using a computer terminal at home. From there, the superintendent can review all the day's activities and either approve or modify each assistant's plans for the next day. The work day having ended, the superintendent turns in knowing that it all starts again at 4:30 am, Tuesday, June 15, 2019. ■