When Leaves Turn Into Litter

By THOMAS A. NIKOLAI,
Michigan State University

Autumn. It's a word that conjures up vivid images of brilliant colored hillsides and city streets due to the maturing of deciduous tree growth. However, the brilliance quickly declines, giving autumn the appropriate nickname of "fall."

There was a time in most of our lives when the leaf litter produced from this annual event was more a joy than a problem. As young children, many of us volunteered to rake the leaves to our suburban curbsides where the annual event of leaf burning took place. The passage of the Clean Air Act in 1970 ended this form of disposal in my hometown, but it continued in smaller towns and grounds managers were able to burn leaves for several more decades, in some instances only with a permit from the local fire chief.

With the burn-ban in effect, many turned to landfills as a source of disposal. I suspect volunteer leaf raking declined dramatically when the end result was to put the leaves into a garbage bag. Others, such as the community of Scarsdale, N.Y., initiated municipal collection of leaf litter that was turned into compost for residents and sold to nurseries for a profit. However, when the Federal Solid Waste Management Act became effective in 1995, the disposal of yard waste in landfills was eliminated and the Clean Air Act simultaneously became more stringent regarding burning of tree leaves. As for collection and mulching, what was once a profitable enterprise for Scarsdale is now estimated to cost the taxpayers there approximately $600,000 annually for collection and disposal of autumn leaves.

A newer alternative for the disposal of leaf litter includes the direct application of leaf litter from municipal shade trees to agricultural land. New Jersey adopted this practice in 1988 after legislation banned leaves from landfills in that state in 1987. New Jersey regulations mandate that the application rate must not be greater than a layer six inches deep. According to farmer surveys, the most significant advantages of this practice included increased soil organic

(Continued on Page 12)

Leaves–

(Continued from Page 11)

matter, helping the community dispose of leaves, improved soil moisture holding, soil tilth, structure and fertility. Disadvantages were trash (plastic, bottles, engine parts and, in one case, a bowling ball) in the leaves and logistical problems such as weather and spreading-equipment malfunction. In 1998, 10 years after the inception of this practice, 8.4 percent of the leaves collected annually in New Jersey were disposed of in this fashion. Cleary, there is a need for other alternatives.

Turfgrass Deciduous Leaf-Litter Experiments

Beginning in 1990, three studies have been conducted at Michigan State University's Hancock Turfgrass Research Center to examine the feasibility of mulching tree leaves into existing turfgrass canopies. The first study examined different deciduous leaf rates (50 and 100 pounds of dry leaves per 1,000 sq. ft.) and the timing of nitrogen fertility applications. The objectives were to determine if there were any negative effects of mulching tree leaves into the existing canopy with a lawn mower and if the nitrogen fertility would enhance leaf-litter decomposition. The study ended in 1996, concluding that there were no negative effects of mulching the leaves into the turf at the rates applied and that the nitrogen treatments did not aid in the degradation of the leaf litter.

The second study was initiated in October 1991 to examine the effects of mulching different leaf types (oak and maple) at the rate of 100 pounds of dry leaves per 1,000 sq. ft. into Midnight Kentucky bluegrass turf using a rotary push mower. The study was concluded in the fall of 1998. Objectives were to determine if different leaf types would have an effect on soil pH or turfgrass quality. Turfgrass quality increased on plots that had maple leave treatments due to the fact that less broadleaf weed growth was observed in those plots. No differences were observed regarding soil pH for the duration of the field experiment. Soil cores taken in the fall of 1998 concluded that there was an increase in the amount of organic matter in plots that had oak and maple leaves mulched into them compared to the check plot. Tissue analyses of clippings collected in October of 1998 also revealed that grass plants grown in plots having leaves mulched into them also had greater percentages of carbon and nitrogen. However, the carbon nitrogen (C/N) ratio was not affected.

These studies led to the conclusion that there were more benefits than negatives for turf managers and homeowners

(Continued on Page 14)

Leaves–

(Continued from Page 12)

who mulch tree leaves into existing sites. The question then became, "Could there be an expanded roll for turfgrass in the leaf-litter collection process?" As previously cited, decreasing landfill space led many states to dispose of leaf litter in farm fields. Truckloads of leaves were taken to farms and tilled into the soil. However, it was found that this activity had the potential to increase the C/N ratio above 30/1, which immobilizes the nitrogen (makes it unavailable to the plant). It was also determined that, while within EPA standards, some loading of heavy metals was taking place due to the collection process of leaf litter. On several occasions, leaf samples that were analyzed revealed high concentrations of lead as a result of urban soil that contained high levels of the heavy metal. To minimize this, it is suggested that municipalities strive to eliminate picking up urban soil during the collection process to cut down on the lead contamination of the leaf-litter. However, since many municipalities direct homeowners to rake the leaves to the curbside, where they are picked – up with a vacuum, it stands to reason that debris and petroleum products that rest in the gutter are also sucked-up with the leaves.

With these facts in mind, the third leaf-mulching study was initiated in October of 1995. The objective was to determine if low-maintenance turfgrass sites could take heavy loads of deciduous leaves and maintain their usefulness. The study consisted of mulching a mix of deciduous leaves into an existing sunny mixed-turf area (Kentucky bluegrass, perennial rye, and fine fescue). Excessive leaf rates of 150, 300 and 450 pounds per 1,000 sq. ft. (approximately 6-, 12- and 18-inch layers) were mulched in with the aid of a mulching mower. Two mower deck heights (1.5 and 3 inches) were included in the study to determine if deck height had a significant impact on the degradation of the leaf litter. The area was mowed at 2.5 inches for the remainder of the year. Furthermore, because the plots represented low-input turfgrass areas, they never received fertilization for the three years in which the experiment ran.

Mulching at such excessive rates resulted in visible leaf liter still being present in the spring. As anticipated, as the rate of leaves mulched increased, the percentage of visible leaf litter increased. However, at the higher mower-deck leaf-mulching height of 3 inches, there was reduced visibility of leaf litter the following spring. This is most apparent at the dry leaf rate of 300 pounds per 1,000 sq. ft. It is noteworthy that all visible leaf litter soon dissipated as the grass growth increased in the spring, and these plots also tended to green-up quicker.

Because the plots represented turfgrass areas of low input, it follows that the areas receiving leaf litter for mulching would be home lawns, municipal parks, low-maintenance ball fields and golf course roughs. This means that the areas would potentially be utilized for numerous outdoor activities that would result in persons coming into contact with the turf. With that in mind, plots were tested for surface hardness in 1998. Results indicated that all three rates of leaf mulching provided a softer surface the following summer providing a cushion that would be more forgiving for persons engaging in physical activity in the area.

As previously mentioned, the C/N ratio was a potential problem when applying leaf litter to agricultural fields. Samples were obtained from the turfgrass plots to analyze the C/N ratio in September of 1999. No differences were anticipated regarding the C/N ratio because no apparent color differences were recorded on the plots, which would indicate that the plots required nitrogen fertilization in comparison with the check plots. Results of the sampling indicated that, as the amount of leaf-litter increased, the percentage of carbon and nitrogen increased in the soil thatch layer. However, the increases were such that the C/N ratio did not significantly increase and was maintained well below the 30/1 ratio.

Technological Void?

Ron Foote, golf course superintendent at Forest Akers Golf Course in East Lansing, Mich., has been mulching deciduous leaf litter into his golf course turf since 1961. However, he has a technological advantage that most superintendents and ground managers do not have. Ron owns two "Good Roads Leaf Mulchers." These machines look like a vacuum. "The leaves go through a series of flat fans and are blown through a series of knifes (like rotary mower blades) that are welded onto a bushing," he says. "The leaves blow right through and they come out pulverized. After you've gone over a pile, you look back and you can't even tell where the leaves were."

With the aid of these machines, Foote mulches his leaves into his fairway turf. Unfortunately, this type of machine disappeared from the market sometime around 1960, when most of us were burning leaves. Most other golf course superintendents use blowers to get the leaves off the fairways or out from under trees (where turfgrass does not grow as dense) prior to mulching by using out-front and pull-type rotary mowers.

Mulching is Fine, For Now

While the practice of disposing of deciduous leaf-litter to agricultural land has merit, it is not feasible to dispose of all leaves in this manner. Rotary mowers cut leaves into small pieces, allowing them to fall into and beneath the turfgrass canopy instead of resting upon it. This process results in increased surface area, which in turn makes it easier for insects and microbes to consume.

Undoubtedly, the use of blowers for placement and rotary mowers for mulchers is adequate. Research clearly indicates that the practice of mulching leaf litter into existing turfgrass canopies provides benefits for the soil and the

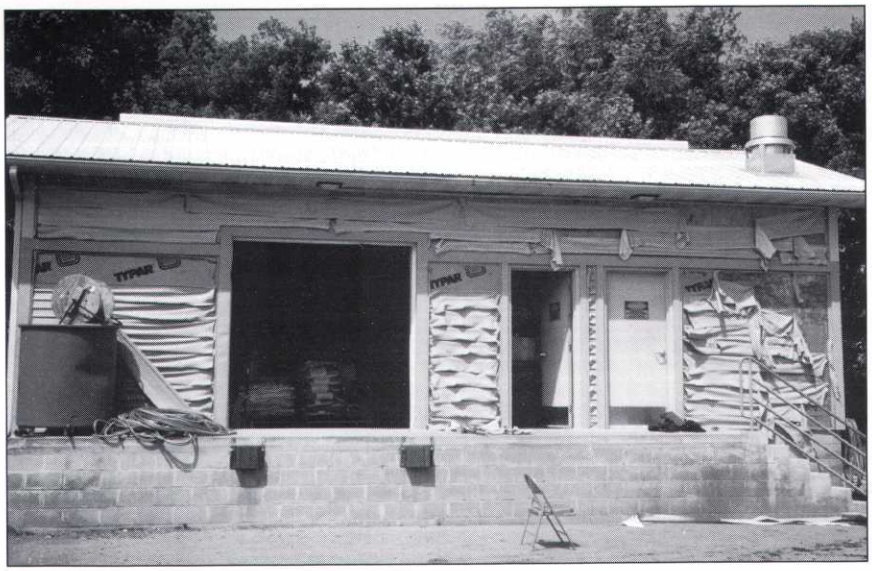
(Continued on Page 16)

Chaska Town Course Fire–

(Continued from Page 15)

where the door was mounted, the fire damaged the door prior to releasing the fusible links.

Early the next morning, a meeting took place between the city administrator, the city's insurance coordinator, the city engineer and myself. At this time we received confirmation from the city's insurance provider that everything damaged or destroyed was covered at replacement cost. We also decided we needed a temporary office because the offices could not be occupied, due to the smoke and water damage. Some sort of covered enclosure for equipment storage, and some type of building to perform routine equipment maintenance. We rented a construction trailer to house our offices and employee break room, a 40' by 60' tent structure for equipment storage and we also were given the go ahead by the insurance company to construct a 24' by 28' garage for repair work. Because the tent company couldn't come for more than a week, the Chaska Public Works Dept. installed a chain link fence compound in our parking lot to secure the equipment. The next step was finding equipment to use until new equipment could be purchased. With help from Hazeltine, Chaska's Park Dept., the Chaska Par 30, MTI Distributing, Inc., Minnesota Golf Cars and offers from many area golf courses and distributors we were able to obtain enough equipment to get us through the next couple of days.



THE CHEMICAL BUILDING AT THE CHASKA TOWN COURSE was spared of any interior damage but the radiant heat from the maintenance building fire caused some exterior damage.

With the patience and determination of the seasonal grounds staff and the passion and dedication of Steve Dellwo, Jim Holden, Dave Reif and Bill Teich, we met and exceeded that goal. to them I say "it is an honor and pleasure to work with you."

At the July council meeting, the council declared teh fire an emergency situation which gives the City the option of not bidding the construction out. This will speed up the building process with the exception of being done rebuilding by mid-October. The building will be the same as the original one, only the rebuilt one will have fire protection installed. There was some debate on the office portion of the building, such s should it come down and start over or restore it. The insurance company decided that it should be restored, so that is what is taking place now. Demolition of the burned out building started on July 22nd and was completed July 31st. The equipment repair garage was started July 15th and finished August 1st. We were in the temporary office trailer on July 16th, and as of August 10th, we had 95% of our new equipment on site.

Our goal after the fire was not to let the fire affect the condition of the golf course. With the patience and determination of the seasonal grounds staff and the passion and dedication of Steve Dellwo, Jim Holden, Dave Reif and Bill Teich we met and exceeded that goal. to them I say "it is an honor and pleasure to work with you." I also would like to say thanks to everyone that called and offered the use of equipment or your services – it is greatly appreciated.

Leaves–

(Continued from Page 14)

turfgrass plant. Also, turfgrass can take up to three times the legal load limit that agricultural fields can have applied. However, it is apparent that technology could improve (or devolve, in this case) to give the turfgrass manager a specialized machine for this annual chore.

It is also time that municipalities (and possibly homeowners) follow the lead of golf course superintendents and ground managers by mulching leaf litter into existing turfgrass sites with rotary-mowers. With a little education, literally millions of dollars could be saved annually in the United States.

(Editor's Note: Thomas A. Nikolai is the turfgrass academic specialist at Michigan State University in East Lansing, Michigan. This article was reprinted with permission from the October 1, 2001 issue of Grounds Maintenance magazine.)