Polyethylene tubing, emitter and "spaghetti" tubing in trench before burying.

Drip Irrigation for Establishing and Maintaining Trees

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IN JUNE of 1974, I attended an irrigation meeting at the University of California where one of the topics of discussion was drip irrigation in vineyards and avocado and citrus groves. Our course is in the sagebrush belt, so I felt the talk would be of little value to me, but as I listened, I began to realize more and more that the principles of drip irrigation could be very useful to our club.

Olive Glenn is located on the eastern slope of the Rocky Mountains in the Big Horn basin in northwestern Wyoming. We grow combination Kentucky bluegrass-fescue fairways and Penncross bentgrass greens under nearly continuous irrigation. The golf course is 5,100 feet in elevation; we annually receive six to nine inches of rainfall and lots of wind.

Over 1,000 trees were planted in 1970, when the course was new. Basically

they are of three species: Russian olive *(Eleagnus angustifolia)*, green ash *(Fraxinus pennsylvanica 'lanceolata')* and Colorado spruce *(Picea pungens)*.

About 700 of the trees were planted outside the reach of our fairway sprinkler irrigation pattern. During the establishment phase the trees were hand watered by hose from quick-coupling valves in the summer, and water was hauled by tank wagon during the early winter and early spring to attempt to keep them alive. With wind (40 mph is not uncommon) and low humidity, tree survival was difficult to ensure. Hand watering produced a shallow root system and also contributed to salt accumulation on the soil surface.

Another problem was the unreliability of the workers who watered the trees. After several days of hand watering, it seemed very easy for them to simply skip a tree here and there to hurry up the job. The problem was that I didn't know that trees were being skipped until the following spring when I found that some had died.

In the spring of 1975, with little information available, we embarked on a project to provide drip irrigation to 700 trees. Our initial purchase included 30,000 feet of ¾" polyethylene (80 psi) pipe which came in 400-foot coils and 700 emitters. The ¾" poly was buried three or four inches deep using three techniques — vibratory plow, irrigation ditch plow, and a narrow trench. The emitters were buried along with the pipe. The trickle tube from the emitters to the trees was buried by slitting the ground with a spade; thus the entire system was buried except the very end of the trickle tube. This minimized possible vandalism damage and allowed motorized equipment to drive over the system without doing any damage.

By 1976 it was obvious that our system was working well. Tree loss was nearly eliminated. The growth rate of some trees doubled, and in some cases it was tripled. The labor required to water all the trees on the course was reduced from days per watering to just the few minutes required to open the valves controlling the water flow to the ¾" polyethylene pipe.

During the summer of 1976, we had a shortage of water due to a lack of snowfall in the mountains the previous winter. It was necessary for us to water our roughs only enough to keep them alive — but not green. We had recently planted 300 more trees that were located within the irrigation pattern of sprinklers, but because of the water cutoff, the trees began to wilt. To resolve the problem, we installed drip irrigation to these trees as well.

WE HAVE NOW operated our drip irrigation system for six seasons. During that time fewer than 1 percent of the emitters have required service. Each spring we activate the system, and after two or three days we check each plant to make certain the emitter is functioning. The system is then shut down for two or three weeks, until the trees require more water, after which they are watered according to need throughout the season. As fall approaches we again check each emitter to be certain that every tree goes into the winter well watered.

During 1980, we planted more than 500 landscape plants around a new clubhouse-tennis court complex. Every plant is individually drip irrigated. Drip irrigation lends itself particularly well to foundation plantings around buildings and in parking lot islands. It is also practically invisible and to my knowledge is less prone to damage by vandals than other types of irrigation systems.

I am confident that the drip irrigation system works; the plants benefit from deep watering, salt accumulation is no longer a problem, and the cost of labor involved in watering all our plants is far less than with any other option available under these conditions.

End of "spaghetti" tubing at base of tree. The only part of drip system above ground.