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GREENBELT SURROUNDS HUGE CANADIAN STEELMAKING PLANT

By Robert Dyment, Dunkirk, NY

The most significant new development in the history of Canada's steel industry was officially completed on September 16, 1980, with the opening of one of the world's most advanced integrated steelmaking facilities. But this event occurred after years of site studies and tests on how to protect the environment were first made by Stelco Inc. for its new Lake Erie Works at Nanticoke, Ontario.

Stelco's Lake Erie Works is a "greenfield" steelmaking plant—one started from scratch—on the north shore of the lake, and also the largest single venture ever undertaken by a Canadian steelmaker. Total cost of the first stage alone was $829 million which included $94 million for environmental projects when construction started at the 6,600-acre site in 1974.

At Stelco, which is headquartered in Toronto, company officials used more than instinct to ensure that they were right with their Lake Erie development. As far back as 1962, they knew the projected demand pattern for steel to the year 2000. They also knew what production facilities they would require to fill the demand.

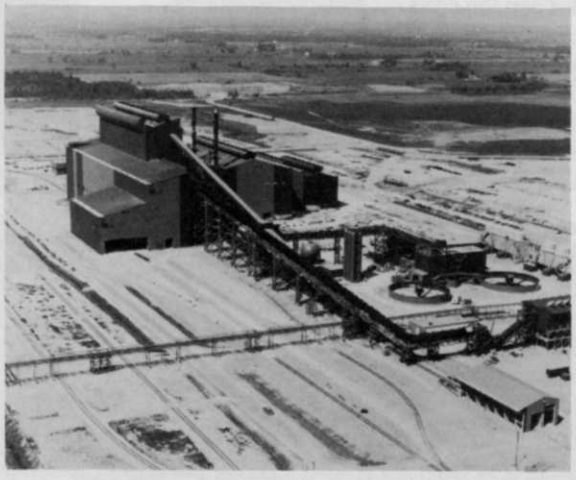
They analyzed the projected output of steel-using industries and where in Canada the greatest demand for steel was likely to be. This data determined the location for such a massive industrial complex, which has a projected annual capacity of 6 million tons.

And, even though at the outset they planned Stelco's Lake Erie Works as a greenfield project, they commissioned a further 45 studies prior to the start up of construction in order to ensure the minimum disturbance to the environment.

They studied Nanticoke's historical background, the atmospheric inventory, erosion, fisheries, historical ecology, land-use, wildlife resources, social needs, and the Lake Erie shoreline.

They planted 100,000 trees and created artificial hills and ponds. They undertook extended research in order that Stelco designers would build the most technologically advanced, cost-efficient, and cleanest steelmaking operation in the world.

Site studies prior to construction and plans to build a greenbelt around the facility played important roles in developing Canada's newest steel plant. This building is the basic oxygen furnace and slab caster complex at the Lake Erie Works.



A "greenfield" project means a company starts from scratch on a plot of land. In the United States, nearly all of the major steel plant expansions have been "brownfield," that is, expanding on site. A greenfield project is more expensive because the company has to put in the sewers, roads, utilities, and other basic structures before even constructing the plant.

But it has the advantage in that a project can be laid out for greater efficiency. Stelco, realizing it was entering a rural area, tried to make the plant less offensive to nearby residents by surrounding the complex with a greenbelt of trees, ponds, and hills. This greenbelt obstructs much of the facility's view from the roads.

Once the decision in favor of the Nanticoke site was taken, the process of land acquisition began and by 1968 Stelco had assembled 6,600 acres. Almost at once, work began on layouts for a fully integrated steel plant. This resulted in 3,600 acres of the property being set aside for steel mill development, approximately 2,400 acres being set aside for an industrial park, and the balance of the acreage being allotted to recreational and environmental purposes.

It was decided to develop a broad greenbelt to surround the steelmaking operation, separating it from the neighboring countryside. The first excavations helped to provide the material for developing a series of berms, or man-made hills, virtually concealing the plant from adjacent roads and minimizing the windborne spread of dust from raw materials.

Employees drive directly to their place of work—first, because the plant is so spread out that walking is totally impractical, and second, because acres of ugly parking lots at the plant entrance were never built.

From the very beginning, Stelco has taken a "total ecological approach" to the building of its Lake Erie Works. This concern for the environment goes far beyond the mere consideration of the effect of emissions from the plant.

Virtually every aspect of the development of the site has been undertaken with a view to its impact on the environment. In addition to the development and preservation of a landscaped greenbelt around the perimeter of the steelmaking site and the planting of thousands of trees and bushes at various locations, many existing woodlots and natural open space and watercourse areas were preserved and the latest in air and water quality control technology in the major operating plants were included.

But some of these activities were not so noticeable, and related to some of the unique features of the property. For instance, throughout the industrial park site along the north side of Stelco's property are several former farm woodlots that have been preserved in their natural state. In the midst of these, particular concern has been paid to ensure that the meeting grounds for a flock of great blue heron would not be disturbed.

Plans for a rail route through the north section of the

property took into account the preservation of a location frequented by a colony of Hungarian partridge. Extensive changes were made to the raw materials receiving dock, so that the existing sandy shoreline of Lake Erie would be maintained and fish swimming patterns along the shore could continue. The dock had originally been designed as a solid causeway, but was changed to allow a bridge section out from the shore.

All of these considerations, large and small, add up to the essence of this total ecological approach. This massive industrial development attempts, as much as possible, to blend into and co-exist with the surrounding topography. It has meant spending about $94 million on environmental projects and equipment at the Lake Erie Works—more than 10 percent of the total construction cost for Stage One.

In addition to the 45 studies undertaken to assess the environmental impact of the impending development, there were separate studies of such matters as Lake

This century-old house is located in the middle of the greenbelt area along the east side of the steelmaking property at the Lake Erie Works. Stelco restored it as part of its environmental program.

Erie water temperatures and movement, its quality and chemistry, weed bed locations, fish migration and growth, plankton and bottom fauna, and observation of ice cover.

The greenbelt project affects a half-mile-wide slice of land along the east side of the property, plus a wide section between the lake and the steel site. The contoured mounds were formed by earthmovers and then planted with grasses, bushes, and trees to form a visual screen as well as a noise buffer and a barrier to reduce the effect of winds. On the east side, the greenbelt was interspersed with small settling ponds to capture surface run-off water before it reaches Nanticoke Creek.

An elegant and stately, century-old, country house is the crowning jewel in Stelco's showpiece greenbelt. The 15-room home, the original portion of which was built in 1870, is located immediately east of the steelmaking site, smack in the middle of the greenbelt along the west side of Nanticoke Creek.

As part of the company's overall environmental policy of preserving much of the scenic landscape at the site, the old house was refurbished to its 19th Century style and the surrounding grounds were groomed and preserved to enhance the property.

The property was part of the 6,600 acres of land purchased by Stelco for its industrial development. The restoration of the home was undertaken with the guid-

Continues on page 65

Viburnums, Part II

NON-NATIVE VIBURNUMS THRIVE IN WELL-DRAINED, SANDY LOAMS

By Douglas Chapman, Horticulturist, Dow Gardens, Midland, MI

Non-native Viburnums also thrive in our landscapes. In fact, several of these non-native Viburnums are used more than our natives. The most important and exciting of the imported Viburnums include *Viburnum carlesii, V.* X *burkwoodii, V. opulus, V. plicatum tomentosum, V. rhytidophyllum,* and *V. sargentii.* All of these imports essentially thrive in fertile, well-drained soil. In fact, the key to growing many Viburnums is a well-drained, sandy loam soil. They will all adapt to a wide range of pH, but the optimal pH is 6.0.

Koreanspice Viburnum *(V. carlesii)* is a native of Korea. It is a rounded shrub, reaching 4 to 5 feet in height and width. The habit is somewhat stiff, upward spreading, and it has a rather coarse texture. Its rate of growth is slow. Koreanspice Viburnum should be considered a small specimen shrub. It is one of the earliest to flower, flowering in late April or early May in central Michigan. The buds are good, dark pink, opening to a 2 to 3 inch diameter white flower. The flowers reach their peak when the leaves are about one-half expanded or about a week after *V.* X *burkwoodii* flowers. Koreanspice is extremely fragrant and a tremendous understory specimen or specimen plant in intimate landscapes. The fruit matures during August and September. It grows into small, fine drupes two-fifths of an inch in diameter, with the red color changing to black at maturity. The foliage is a dull pubescent green throughout the summer, becoming red to maroon in the fall. Often, single branches will develop fall color and not the entire plant. Further, fall foliage color development is not dependable in Central Michigan. *V. carlesii* does have problems with borers and should be considered either a short-lived plant or grown only under optimal conditions.

Burkwood Viburnum *(V.* X *burkwoodii)* is an exciting small- to medium-sized shrub. Its shrubby habit is upright oval and multi-stemmed, reaching 8 to 9 feet in height and 5 to 7 feet in width. It grows much faster than *V. carlesii* and shows little or no borer problems. The leaves are narrow and pointed, about 1½ to 2 inches long. The summer color is a lustrous dark green with fall color remaining essentially the same. In fact, as far north as Central Michigan, *V.* X *burkwoodii* is semi-evergreen and, therefore, fall color is little or non-existent. When considering flowers, Burkwood Viburnum is the first of the Viburnums to flower in the spring, either in late April or early May just prior to *V. carlesii.* The bud is pink and becomes a slight pink cast when the flower is in full bloom. Burkwood Viburnum is an annual flower; the entire plant is covered with these terminally borne fragrant flowers. The fruit matures in late August, turning from red to black, with little or no ornamental value. Although diseases—crown gall, leaf spot, powdery mildew, and shoot blight—can be a problem, only the latter is a significant concern. *V.* X *burkwoodii* is exciting as an understory screen or mass planting for large areas or as a specimen in intimate landscapes. Its semi-evergreen characteristics give a unique texture and exciting green color throughout much of the fall—a truly outstanding plant.

European Cranberrybush Viburnum *(V. opulus)* is native to Europe and Northern Asia. The leaves are

Koreanspice Viburnum (top) is one of the earliest to flower but has problems with borers.

European Cranberrybush Viburnum (bottom) is one of the most dependable viburnums regarding fall color.

simple-toothed, 3 to 4 inches long and wide, and similar to *V. trilobum*. The summer color is a good glossy green with a dull red developing often in the fall. It must be stressed that *V. trilobum* is considerably more dependable and spectacular when judging fall color. *V. opulus*'s habit of growth is a multiple-stemmed shrub, reaching 8 to 12 feet in height and 10 to 12 feet in width with a somewhat arching, rounded habit, where as *V. trilobum* is considerably more upright. European Cranberrybush has a medium rate of growth. It is used extensively in large and small area landscapes for shrub borders, as individual specimens, or screens. The flowers are an exciting white flower in the spring, similar to *V. trilobum*, with the sterile flowers surrounding the small fertile flowers. The druping red fruit develop in September and persist throughout much of the winter. One truly outstanding cultivar is the yellow fruiting form *V. opulus* 'Xanthocarpum'.

Doublefile Viburnum *(V. plicatum tomentosum)* is a truly outstanding import, native to China and Japan. It has almost horizontal branches that surround a central stem, giving one a layered feeling, similar to the habit of *Cornus florida*. At maturity it often reaches 8 to 12 feet in height and width with the shrub being a little wider than tall. Leaves are serrated-lobed oval, 2 to 4 inches, medium in texture, and dark green throughout the summer with consistent maroon to purplish-red fall color. Fall color is so outstanding that Doublefile Viburnum should be considered the showiest of all non-native Viburnum. The flowers grow 2 to 4 inches in diameter with large white, sterile flowers surrounding small yellow fertile inner flowers. Fruit of Doublefile Viburnum matures earlier than all the Viburnum, usually during late July or early August. It ranges in color from red at bloom to black at full maturity. *V. plicatum tomentosum* prefers fertile, well-drained soil. It is outstanding as a specimen plant for large area or home landscapes. Doublefile is a good understory plant or companion with Chokecherry or deep-rooted trees. This truly regal import should be used more extensively in the landscape.

Leatherleaf Viburnum *(V. rhytidophyllum)* is a multiple-stemmed shrub 10 to 15 feet in height and 8 to 10 feet in width. The simple, opposite oval leaves reach 3 to 7 inches in length and are dark green in the summer, giving a somewhat coarse texture. Leatherleaf Viburnum is a semi-evergreen; therefore, fall color rarely develops. The yellow-white flowers which develop in mid-May reach 4 to 8 inches in diameter. The red to black ⅓-inch long fruit is not effective in the general landscape situation. Leatherleaf Viburnum is an aggressive multiple-stemmed shrub. Often in northern areas, which include northern Ohio or Michigan, it will be killed to the ground but dependably comes back from the roots. This outstanding plant is good in mass plantings, and as screens or border shrubs. It thrives in shady, protected areas and is compatible with ericaceous plantings, e.g., Rhododendrons.

Sargent Viburnum *(V. sargentii)* is native to northern Asia. This rounded, multiple-stemmed shrub reaches 12 to 15 feet in height and width and has a somewhat coarse texture. The white flowers differ from *V. opulus* in that the anthers are purple as opposed to yellow for *V. opulus*. The two-fifths-inch scarlet fruit is effective in early August. The leaf is similar to *V. opulus* yet thicker and somewhat coarser. Sargent Viburnum is certainly a specimen or works well as a screen or mass planting.

When planning to use deciduous shrubs in the landscape, Viburnums should be considered. Although the imported Viburnums are used more often, in general, any of our native Viburnums have less insect and disease problems while integrating into natural landscapes as an understory shrub or small tree. *V. trilobum* with less insect and disease problems; *V. prunifolium* with its outstanding fall color and fruit; and *V. lentago* with its exceptional summer leaf and fall color should be considered in almost any landscape. Of the non-natives, certainly Doublefile Viburnum *(V. plicatum tomentosum)* is the outstanding individual. It has a unique sympodial habit of growth, showy flowers, and outstanding fall color. Of the smaller shrubs, *V.* X *burkwoodii* should be considered, since it's a semi-evergreen and multiple-stemmed with extremely showy flowers. Viburnums are a must in almost any landscape from industrial to home. They are low maintenance, have few insect and disease problems, and are tolerant of many pollutants. **WTT**

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THE EFFECT OF LOW PHOSPHORUS ON POA-ANNUA PUTTING GREENS

By Paul Voykin, Superintendent, Briarwood Country Club, Deerfield, IL

In the course of my education I have found out that nutrients may enter plants through the leaves, stems, or roots. The most natural and major way is through the roots. The soil is a storehouse for water and nutrient needs by plants. Therefore, we know that good soil management should make a constant and adequate supply of required and necessary nutrients available for growing plants. While doing my studying and my research I became very interested in one particular element — phosphorus. I found out that adequate P levels in the soil would promote fast, vigorous root growth during the seedling stages. And also if some roots were destroyed new roots would be produced so fast that little injury would be evident. Perhaps that's why the North American Indian advised the pilgrims to place a fish below each hill of corn — not on top but below where it would do the new plants the most good. The flesh gave the plant some calcium (Ca) and K, and the fish bones provided lots of P. We still use fish fertilizer but we bottle it and use it for house plants.

I also read that young plants have a high nutrient requirement relative to their size. Their nutrient content is from two to several times greater than in mature plants. Furthermore, nutrients accumulated in young plants may redistribute as the plant matures. To back these discoveries, I then read in farm magazines that P uptake was greatest for the first growth stage and decreased with plant age. This is generally true for turf, but this can be at lower rates because turf grasses need less P than high yielding grain crops and vegetables. Farmers long ago found out that sugar beets, corn, wheat, alfalfa, barley, etc., do much better when P is band applied at proper depths. If fertilizer is broadcast randomly over the soil surface it will be diluted with soil and little will be available for uptake by early developing roots. It has long been recognized that banded P application is more important than for other nutrients.

A greenkeeper puts P in the root zone when he seeds a nursery or other turf areas. How deep to apply a starter P fertilizer has never been critically determined for turf. From my experience, I think it would be just beneath the surface. P is subject to little leaching. Therefore, after the initial application, very little P may be needed to maintain adequate levels. Most superintendents for some reason do not adhere to this theory. Keep in mind that fertilizer applications were started as a supplement to that available under natural soil conditions. Therefore, I think there is a tendency to maintain too high amounts of P in mixed fertilizer goods. K, on the other hand, is leached by waterings or rainfall. Thus with heavy water, especially on sandy soils, the K moves from the root zone. Also, clipping removal causes a steady drain on nutrients, particularly N and K. So from this, and other less relevant factors, I conclude that P needs should be based on soil test. Adding more to a mature crop is wastful and does nothing more than encourage notorious shallow-rooted weeds such as chickweed, crabgrass, and poa-annua, whose seed as you know is available in large quantities at the soil surface. Maybe the whole key to this is this: where putting-green root penetration is deep, lower rates of soil P can be maintained than where roots are shallow, such as with the above-mentioned weeds whose swift germination and health is based on higher levels of phosphorus. However, if soil tests show that a green desperately needs P, which in our midwest area is not common, then the phosphorus should not be broadcast over the turf randomly, but be put down closer to the roots through slicing, spiking, and, perhaps best of all, laid down after aereating the greens. We know P will not move far from its point of placement; however, on high sand greens P may move well through the profile. Just throwing it over mature turf by broadcast methods doesn't do much to get it down into the root zone. My observation has been that most greenkeepers don't allow enough time for granular phosphorus to dissolve and it is usually picked up by the greensmower.

When I came to Briarwood twenty years ago, I found that a recent soil test indicated that phosphorus levels in my greens were extremely high and that K levels were extremely low. Twenty years later, by not using P at all except on special occasions and by using K and N only as required, I have reduced the P levels by half or more. Which is still too high. However, I have brought up the K to desirable levels. In the process I have found out that by not overfertilizing with P in concert with other good maintenance procedures, my poa population has not increased in recent years. In fact, I believe it has diminished. So now after twenty years I can boast that I have as much or more Washington creeping bent as when I first started. At that time the greens, despite high phosphorus content in the soil, were almost all bent. This was due mostly to the fact that the course was public before the Briarwood people took it over. Being a public course the greens were mowed extremely high and watered very infrequently. However, I know of three private courses in my area which, twenty years ago, had beautiful creeping bent; but the "new" supts. who took charge of them overwatered their fine turf, overloaded them with P on poorly drained soil that wasn't exactly good sandy loam and now are devastated with poa-annua on their greens. In fact, one of them is seriously thinking of resodding all the green surfaces with fresh creeping bent and hauling the poa-annua away. But what is the use of this enormous expense if his practices are going to remain the same? He comes to my place and says, "Boy you sure have lots of bent. You're lucky!"

Recently Roy Goss, extension agronomist at the Western Washington Research Extension Center, wrote: "Phosphorus applications significantly increased poa-annua in all our plots in our tests, which suggests that rates of phosphorus possibly as high as those used (4 pounds per 1,000 square feet P_2O_5) or higher may be required for normal bluegrass development. It should be pointed out, however, that most golf course superintendents and other turfgrass managers have in my view consistently overapplied phosphorus. In nearly all cases in the Pacific Northwest, putting green soil tests reveal extremely high phosphorus levels.

Thomas W. Cook, now at Oregon State University,

wrote: "As you have undoubtedly heard before, one of the most commonly abused management tools is the fertilizer program. In attempting to control poa-annua it is important to keep phosphorus and nitrogen levels moderate. Excessive nitrogen and phosphorus and disregard to proper balance of nutrients has helped to make the poa-annua a problem much worse than it should be."

In 1978, Dr. Al Turgeon showed at the U. of Ill. field day that fertilizer containing phosphorus resulted in better poa-annua turf plots than where straight N was used. He also pointed out that P deficiencies rarely are observed in established turf unless the P level in the soil is extremely low.

A research report compiled by the team of Drs. Beard, Turgeon, Riehe, and Vargas prescribed a cultural program for annual bluegrass greens, under the heading "Fertilization Phosphorus." They stated the application rate should be based on soil test using a program that maintains a moderately high level of soil phosphorous. Applications are best made in the spring or fall. Well, how much proof do you need that we are throwing away good money and good creeping bent greens by using phosphorous? I would like to see the fertilizer manufacturers put a big skull and crossbones on each bag of fertilizer containing phosphorus "poison" in the same manner the druggist once did with medicine bottles.

But let me say again to you that just putting down less or no phosphorus is not going to keep the poa out entirely. It's just one of the more important tools in the overall maintenance program that a good supt. works into the picture. I carry out other cultural practices that I believe diminish the encroachment and germination of poa-annua. They are as follows:

1. If I have to use a little fertilizer containing P (such as activated sewerage sludge), I do it only in the hot temperatures when poa isn't germinating well. I am talking about the latter part of June until the second week in August. I believe that in hot weather P applied on mostly organic sandy soils is utilized or tied up by the time climate conditions are again beneficial for poa-annua germination.
2. I aerify and topdress only in the fall. The popular statement by some experts that poa-annua comes in the fall in the aerifying holes in our area is not always true as far as my observations are concerned. Two hundred miles south it might be a desired situation but I am making an observation about my area only. Of course, if you have nothing but poa on your greens, then what do you expect? A miracle encroachment of bent grass? That will hardly be the case. But I'll give you a little secret. Throw some creeping bent seed into the topdressed holes wherever the grass is weak, wherever the riding mowers turn, or over the whole green if its mostly poa-annua. I sometimes get very good germination. If your other cultural practices, such as fertilizing, watering, topdressing, seeding, and spraying, are done with common sense you aren't going to get any more poa infestation than you would in the summer. But I caution young supts. in our area to watch out for spring aerifying when poa is germinating.
3. Twice or more during the summer I reseed all ballmarks on the greens. This practice also adds fresh bent to our greens.
4. I try to use the proper fungicides in the summer. Fungicides mixed in plenty of water won't shock the grass if they are applied per label. Into my fungicide solutions, I always throw in a little soluble nitrogen — never any other fertilizer. This method keeps the greens in good color but with no appreciable growth to cause a poor putting surface.
5. For many years I used lead arsenate in my last fall and my first spring fungicidal program. Arsenics are taken through the plants roots in a similar manner to that of P. Arsenic and phosphorus are difficult to separate and since the plant needs the P this causes problems, especially for young plants. When the arsenic level is fairly high compared to P in the soil, the poa-annua and other plants will take up arsenic to cause trouble.

C. W. Lobenstein has noted poa control success depends upon very careful control of the arsenic and phosphate levels in the top layer of the rootzone so that the weedy species absorb toxic quantities of arsenic in the place of phosphate while the desired turf species escape injury. The use of phosphate fertilizers preceding or soon after arsenate application must be discouraged. He then goes on to conclude that an arsenical program ought to be even more effective on soils of low phosphate content. It should be noted that research has demonstrated that arsenic applications on soils low in available P has caused serious damage to Kentucky bluegrass turf.

Last, and perhaps most important of all, I use good watering practices. In my opinion, I use less than anyone else in my area. Carl Swartzkoph puts it this way: "As a result of using minimal amounts of water at Briarwood, additional physiological stress has been experienced by the poa-annua, thereby giving the more desirable and permanent grasses a chance to become established on greens and fairways."

Maybe along with all this I also have been fortunate in having had good superintendent friends to advise me, to show me their errors and their secrets and their golf courses in stress times and good times. Plus a lot of commercial people who were helpful with their fertilizer information. Plus a few wonderful outstanding agronomy professors from major universities who have been available whenever I had a question or a big problem. And, of course, my friends in the USGA have been very helpful. So twenty years later, every time I look at my creeping Washington bent in the month of the "falling yellow," when old lonely October turns them dark purple, I realize with pride that I still have 90 percent (or better) creeping bent greens. I know in my mind that I have done the right thing and I know in my heart that *I have been lucky.* **WTT**

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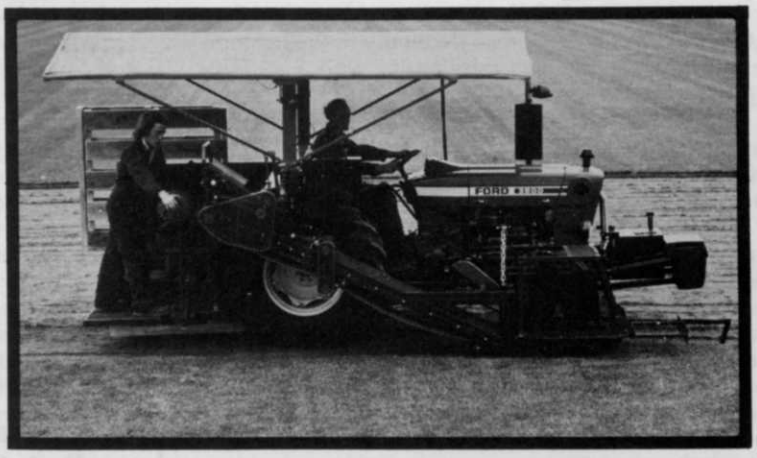

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