over a properly prepared surface - improves water infiltration and retention during the hot dry summer weather and reduces the need for irrigation. Soil moisture vapor can condense on the cooler mulch at night and return moisture to the soil. In the spring or during rainy periods, when the upper soil layers tend to be saturated, some mulches act like sponges and hold water. Unless the mulch texture is too fine, roots can grow through the upper mulch layers and receive adequate amounts of oxygen and moisture.

Soil temperature moderation is important. Mulch can keep summer soil temperatures lower and winter soil temperatures higher. Turf and bare ground temperatures in the summer often exceed the limits past which roots of trees and shrubs can live. Without snow in the winter, turf and bare ground may freeze, and when soil temperatures drop below 10 degrees F roots begin to die. Summer heat and drought can kill tree and shrub roots that grew in late spring. Then they'll regrow them in the fall, only to lose them again to winter cold. This abnormal root loss requires great expenditures of energy for regrowth and winter loss may affect mineral absorption in early spring during foliation. By minimizing temperature fluctuations, mulch helps more roots survive to support top growth.

Soil Property Improvement. Physical Properties. Most organic mulches are light and porous. When incorporated, they can improve the aeration of heavy (clay) soils and the water-holding capacity of light (sand) soils. Organic mulch can increase the size of soil aggregates in the surface soil and total porosity. Improved aeration favors root growth and other biological activity which, in turn, enhances soil structure. Mulch helps prevent erosion and compaction. It also prevents cracking of clay soil Cracks increase water loss and break roots.

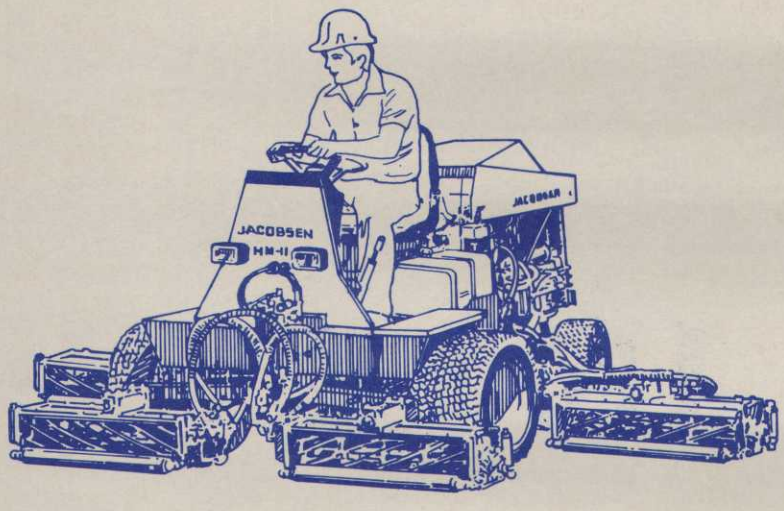
Chemical Properties. As organic mulches decompose they are converted to humus. During this change, much of the nitrogen, soil phosphate, sulfate, and other inorganic elements become part of the humus fraction of the soil. With the aid of various microorganisms, the minerals of humus are made available to the roots. Also, by lowering surface soil evaporation, mulches reduce the soluble salt content which can build to toxic concentrations during periods of low rainfall.

Biological Properties. Mulch provides a favorable environment for the growth and development of many types of soil fauna and flora. The stimulation of aerobic organisms will improve soil granulation, stability, and water infiltration. Mulch makes a favorable environment for earthworms. Research has shown that composted hardwood bark mulches can reduce root diseases: the increased biological activity is helpful in favoring decomposing organisms and reducing pathogens. Mulches reduce week competition by inhibiting germination.

NEW EXCITING FAIRWAY MIX

"Bred to meet the needs of the superintendent –
Engineered for the mechanic —
keeping the operator in mind."

49

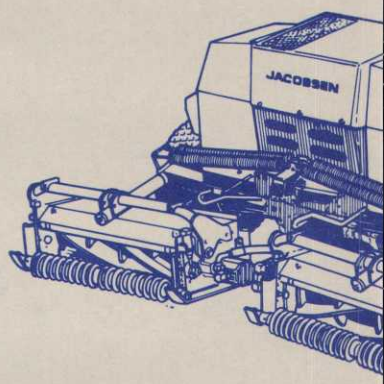


ALL NEW HM-11
49 HP Diesel Water Cooled

***M.T.P.**
MULTI-TRACTION PRODUCT

Optional **ALL WHEEL DRIVE**
Available for all models,
features on the go
engagement/disengagement.

** "M.T.P. GOES WHERE THE GRASS GROWS!!"*



ALL NEW DIES
16 HP Diesel

- Unmatched benefits an
  consistent and predicta
  grass or existing turf.
- Out performs the comp
- One of the most efficie
  in the industry.
- Compact liquid cooled
  even turf mowing over
  low fuel consumption, e
- Fast and accurate ball
- Quick visual results.
- Promotes vigorous cutt
- Compatible with a full
  Maintenance Equipmen

JACOBSEN TEXTRON

Jacobsen Division of Textron Inc.

16

SEL TRI-KING

Water Cooled

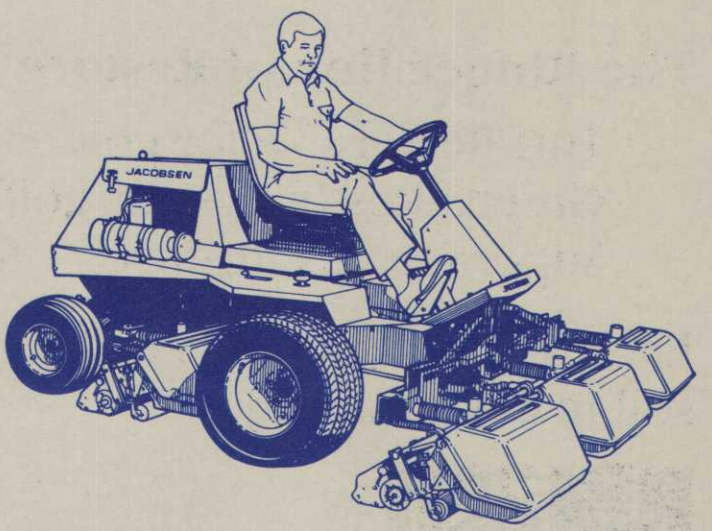
d results that are
ble on newly planted

petition in sun or shade.
nt cost per acre figures

engines that promote
an extended period with
conomical diesel engine.
roll.

ting.
range of Jacobsen Turf
nt.

22



ALL NEW LF-100

22 HP Diesel Water Cooled

Our quality consistent **49 • 16 • 22** formulation will provide you all the performance flexibility and in-stock selection you need for Fast and Accurate response to the toughest turf challenges —

Call Today To Arrange A Demonstration On Your Turf!

"WE INITIATE SATISFACTION"

NST

NORTH STAR TURF, INC.

3080 Centerville Road • St. Paul, MN 55117

1-612-484-8411
1-800-592-9513

RINGER™

Q. Why is America's interest in Ringer growing?

A. Because Ringer has laid the groundwork for a whole new approach to turf care.

The Ringer line of Restore® Products now includes:

Turf Restore® - for golf course and landscape use.
Greens Restore® - for golf course greens and tees.
Super Greens Restore® - for problem greens.

Each of these products restore the biological balance of the soil in a natural way.

RINGER™

- ★ Beat IBDU, SCU, UF, 41-0-0 and Urea, for Color and Quality in Fall Fertilization Study and for Spring Growth!*
- ★ Can be applied at full lb. N.M rate to bent grass at 105° F. Safely without burning!
- ★ 7+ Years of Data Supporting Disease Suppression!
- ★ Quick Green-UP — Slow Release Curve!
- ★ Improves Drainage In Heavy Soils!
- ★ Excellent Results in Sandy (Inert) Soil Environments!
- ★ Naturally Occurring Soil Microbes Selected For Specific Reasons!
- ★ Inhibits L. Korrae, The Cause of Necrotic Ring Spot, And Controls The Disease Under Field Conditions Where It Has Already Started!
- ★ **Proven** To Reduce Thatch!

* For Complete Data and Test Results Contact North Star Turf, Inc.

DISTRIBUTED BY:

"WE INITIATE SATISFACTION"

NST
NORTH STAR TURF, INC.
3080 Centerville Road • St. Paul, MN 55117
1-612-484-8411 1-800-592-9513

Through the millennia, organic plant material, mostly leaves, has provided the natural mineral recycling for plants. The establishment of a more natural environment for the root system will allow for optimum root growth, which in turn allows for better top growth. A healthy plant is more resistant to disease and insect attack.

PART II: DISADVANTAGES

Organic mulches are generally better than inorganic mulches. But even organic mulches can be detrimental to plant health when used incorrectly.

Unfavorable Microclimate. Excess moisture may occur with fine textured mulches, organic and inorganic. Sawdust, fine peatmoss, and grass clippings retain moisture and should not be used as a single mulching material. Also, mulches used over poorly drained soils can result in nitrogen loss (denitrification).

Moisture and oxygen deficiencies are major problems under plastic mulches. Plastic mulch is usually not recommended. If used, it must have holes to allow for water and oxygen infiltration.

Unfavorable temperatures can occur with mulch. Mulches that reflect light and heat can radiate enough heat to injure plants. Dark-colored rock can absorb solar

radiation during the day and radiate heat in the evening. These mulches can stress plants and increase air conditioning costs.

Mulch insulates the soil from surface temperatures. After becoming frozen in the winter,mulch is slow to warm in the spring, which slows root growth and function. It is better to apply organic mulch after a hard frost in the fall or after frost in the spring. The insulating effect of mulch can also delay hardiness development. it should not be placed in contact with trunk surfaces; this will allow the trunk base to acclimate for winter. This may be very important in grafted and budded plants with graft junctions near the ground line. Under certain conditions, as frost occurs, the temperatures just above a mulch may be a few degrees lower than the temperatures above bare soil. This sometimes causes winter injury and bark splitting.

Nutritional Imbalance. A nitrogen deficiency may develop when fresh mulch is used. Mulch should be composted and applied to the surface, but not incorporated. If using fresh mulch, add a little nitrogen fertilizer.

Calcarious materials (e.g. marble, limestone, volcanic rock) should not be used where soil pH is above 6.5. Acidic rainfall dissolves this material, causing the soil pH to raise and makes micronutrients (e.g. iron, manganese, zinc, copper) less available to the plant. This may result in deficiency-related diseases.

Toxicity. Toxic substances can be produced when fresh organic mulch is improperly composted. Composted mulch has an earthy odor; avoid using any mulch with a sour or foul odor. Fresh mulch, especially wood chips, becomes covered with hydrophobic fungal spores. The water is repelled and the chips do not wet; therefore, they do not decompose. A few drops of dish soap or wetting agent will correct with problem.

In 1981 an experiment was begun to study the effects of turf and mulch on 40 newly planted, bare root, 2-2 1/2 inch diameter "Green Mountain" sugar maples. Mulched trees received a basal layer of two inches of composted leaves topped with two inches of wood chips, mostly fresh, applied on eight-foot diameters. Turf trees had turf to the trunk. The mulch has reduced scorch, increased growth and color, and increased survival compared to the trees surrounded by turf. Two inches of fresh wood chips are being added every 203 years.

EARLY SUMMER TREE NOTES

by Bert T. Swanson
MINNESOTA EXTENSION SERVICE

The combination of last year's drought stress and this

Milorganite®

on dormant turf provides nutrients when they are needed

Convenience — Savings — Success

These are the factors that have sold
many clubs on a winter Milorganite application
in lieu of spring feeding.

1. **It works!** Milwaukee Country Club has applied 800 to 1200 lbs. Milorganite per acre each and every winter since 1932. The time — Thanksgiving week, before heavy snow falls on irrigated creeping bentgrass fairways. It works on bluegrass and fescue too.
2. **It Eliminates Spring Feeding!** The grass "greens up" early without over-succulent growth. Since 1932 the first calendar year feeding at Milwaukee Country Club is the second week in June — with Milorganite, naturally.
3. **It's a Work Saver!** No more worries about wet Spring seasons and lack of Spring labor. November through January applications are made on dormant turf with no golfer interference and when the work load is light.
4. **Delivery is Prompt With Nitrogen at its Highest!** October through December are slow shipping months. Thus, rail cars and trucks can deliver promptly. The same months find production of Milorganite with nitrogen at its highest. It is not unusual to get a half percent nitrogen bonus over the guarantee of six per cent.
5. **Storage is no problem!** Unlike chemicals and some synthetic organics, Milorganite is non-leachable. Its weight and adherence qualities also make it stay in place even on severe slopes. Store your spring fertilizer on the ground.
6. **Earlier greening than with spring chemical application!** Plot work in Minnesota proves this. In one series of tests conventional applications of other nitrogen fertilizers failed to catch up with early winter applied Milorganite throughout the entire growing season!
7. **It will not increase snowmold!** In plot work, we have purposely applied the excessive rate of 200 lbs. per 1,000 sq. ft. with no snowmold observed. Putting greens **should** be protected with the fungicide applied dry using Milorganite at 30 to 50 lbs. per 1,000 sq. ft. as the carrier. This has been standard practice for many years in the north country.

CAUTION

The above statements apply only to Milorganite. Other materials may produce excessive early growth or induce unwanted growth during winter thaws.

THE NATURAL ORGANIC
Milorganite®
FERTILIZER

Landscape & Turf
15195 Martin Dr., Eden Prairie, MN 55344 612-934-2380

year's rains has created all kinds of biological activity or lack thereof.

Drought stressed sugar maples were extremely slow and limited in breaking bud on the upper one-third to one-half of the tree. These trees should be watered and fertilized thoroughly to facilitate vegetative growth. By midsummer it should be apparent what is dead and what will continue growing. The dead wood should be removed.

Some drought stress, plus the late hard freeze in Mid April, was significantly injurious to the new growth of many oaks and to some extent growth on green ash. These were set back but have since pushed new buds and appear to be progressing satisfactorily. However, when a second flush is required, it greatly depletes the plant's carbohydrate reserves and decreases its tolerance of any subsequent injuries or diseases.

The birch leafminer, canker worms and the European pine sawfly larvae are certainly taking their toll on trees and shrubs. At this time the feeding period of all three of these insects is about complete so actual treatment of the insect is to no avail. However, some insects such as the birch leaf miner and others will have a second generation hatch about late June. Therefore, it is useful to spray plants with a systemic insecticide according to the label.

This will allow for the building of some insecticide within the plant as well as provide some contact upon arrival of the pest. Two applications may be necessary. The European pine sawfly larvae were particularly devastating on mugo pine. It would take approximately two days for all the old needles on a 3-foot mugo pine to be completely gone. Aphids were already becoming prevalent by June 10 and if the rain continues, be observant for fungal diseases that will be much more aggressive this year than last year.

Treat with insecticides and fungicides according to the label where potential economic injury exists. However, also use preventive treatments by providing proper cultural practices including watering, fertilizing, aeration of the soil for trees in heavy clay, pruning or anything that enhances the fiber and overall growing conditions for the plant.

VERTICILLIUM WILT TROUBLING TO SHADE TREES

by Cynthia Ash & Ward C. Stienstra
MINNESOTA EXTENSION SERVICE

Venticillium wilt is a fungal disease which interferes with the water conducting system in shade trees. The fungus

is soil-borne and enters the plant through wounds in the roots. A natural consequence of having a fungus clogging up the water-conducting system is wilting followed by yellowing and dieback. Trees and shrubs showing partial wilt during the growing season may wilt further and die the following year. Others may recover and not wilt in succeeding years. The pattern depends on the extent of root infection and the severity of other stresses. When most of the roots are infected, the tree may wilt and die before the end of the first summer.

Trees showing general and severe wilt cannot be saved and should be replaced with a nonsusceptible species. Trees with some symptoms may be saved or their life prolonged for some time if they are watered, fertilized with nitrogen, and pruned of dead and wilting branches. Pruning does not eliminate the fungus from the tree, but removes weakened limbs. which may be infected by other fungi.

Trees and shrubs susceptible to Verticillium wilt

Ash - black, blue, European, green, and white
Azalea
Barberry - Japanese
Boxwood - Korean
Catalpa
Cherry
Coffeetree - Kentucky
Dogwood
Elm - American, Chinese, and slippery
Linden - American and littleleaf
Locust - black
Maple - Amur, Norway and varieties, red, silver and sugar
Oak - pin and red
Pagoda tree
Plum
Rose
Russian Olive
Smoke tree
Sumac - fragrant, smooth, and staghorn
Viburnum species

The following list of trees and shrubs might serve well as replacements for any trees the fungus kills:

Arborvitae
Birch
Fir
Ginkgo
Hackberry
Hawthorn
Hickory
Honeylocust
Hophornbeam
Juniper
Larch
Mountainash
Oak - white and bur
Pine
Poplar
Serviceberry
Spruce
Willow

OFF THE TOP OF MY HEAD

GREG HUBBARD, CGCS
Editorial Chairman

DEVELOP AN IRRIGATION PHILOSOPHY - HOLD BACK THE WATER!

As last summer's drought taught us, water availability for golf course use has become a hot issue. As temperatures rose and grass plants withered, water resources suddenly dwindled and watering bans were mandated throughout the state. Where demand did not meet the need, bushes and trees, turfgrass, and mental outlooks suffered. Though many courses have now recovered from the short term drought effects, the long term problem of allocating water supplies fairly continues to grow. Suitable water supplies are becoming more scarce and competition for these limited supplies is growing. The lesson of 1988 is that the economics of water use, like that of the oil crisis in the 70's, will demand that we use this precious resource more sparingly and efficiently in the future. As demand outsrips supply, we will be forced to change our water use philosophy. No longer will water be in unlimited supply, readily available for our demands. As ground water reserves and surface water reservoirs become depleted through increased domestic and commercial use, and as pumping costs rise, more pressure will be put on golf courses to reduce their consumption. We will find ourselves at the end of the water main, last in line for this precious commodity. Now is the time to prepare for this eventuality. Now is the time to develop new water management strategies. HOLD BACK THE WATER!

The first step to developing new water management strategies begins with personal commitment, integrating old practices with new ideas. Rather than reacting to short term water supply problems through new wells and improved pumping systems, a long term comprehensive program on both a political and personal level is necessary. Politically, we should attempt to raise our category of water use prioritization to a higher level. Rather than being on the end of the water pipeline, we must actively influence legislative bodies, emphasizing our importance in the local economy over that of our country club image. We must stress our role in fulfilling recreational needs for our ever aging population and for those with more leisure time opportunities. We can also emphasize our importance in the environment, as wild life preserves, air conditioners, and water reservoirs. On a personal level, we must renew our devotion to the basics of turf management. Through the application of proper water conserva-

tion principles and cultural practices, we can help assure our proper place at the watering trough. Of greatest importance, however, is a personal commitment from you, the golf course superintendent, to conserve water and use it wisely.

Water conservation principles are simple, don't take a large investment of time or money to implement,and provide the greatest return on investment. A quick review of your irrigation practices with these principles in mind can provide the greatest savings. Irrigation should be scheduled on need, as indicated by the turfplants, rather than one of common practice. Water supply should match the percolation rate of the soil, meeting the needs of the plant while avoiding excessive runoff. Irrigation should be done at night, deeply and infrequently, as target areas are more easily covered, drift is minimized, and evaporation rates are lower. When was the last time you checked your irrigation system's operation at night? Can you reduce your irrigation times without any adverse affects? Have you prioritized your irrigation needs? Do you know how much water you use on the course? Apply these basic conservation principles to your course and watch the rewards. This is the second step in developing a new water management philosophy. You must commit yourself to saving water, not abuse the privilege of using it.

Once a commitment to water conservation is established, specific conservation strategies can be put in place. Consider the following practices.

1. Improve your water conservation through education.
2. Change traffic patterns where needed. Reroute golf carts, pedestrian traffic, and equipment traffic patterns.
3. Use mulches around plantings.
4. Erect tree barriers across open areas of land to avoid drying winds.
5. Expand your use of wetting agents and antitranspirants.
6. Investigate soil moisture measuring devices either soil-based (tensiometers, soil resistance blocks), plant-based (canopy temperature devices), or atmosphere-based (ET pans, ET formulas, or weather stations) to aid your water use decisions.
7. Increase the use of drought tolerant grasses where possible.
8. Improve your irrigation system.

IMPROVING YOUR IRRIGATION SYSTEM

Water conservation can be easily accomplished through fine tuning your irrigation system, again at very little cost. The most comprehensive approach would be to install computerized central controllers. These devices can more accurately measure and control the amount of water delivered on site, assuring efficient use of water. Integration of weather satellites, moisture sensors, or evapotranspiration predictors with computerized central controllers can help determine the complete needs of the turfgrass plant. Though the initial expense is high, the cost should be returned through increased water savings, lowered power costs, and better turf.

Other approaches are less expensive, requiring just a few hours of your time. The easiest quick fix is to inspect your irrigation system to make sure it is operating properly. Check and adjust water supply valves to assure proper delivery pressure. Repair leaky pipe, faulty irrigation heads, and mistimed field controller mechanisms. Zone areas with similar soil and contour conditions together. Prioritize your irrigation areas and water accordingly. Try doing with just a little less water on all your irrigated areas. All these can be done at very little expense and at least assure that you are delivering your water efficiently and where you want it. Once the water is where you want it, be sure to add a flow meter to your delivery system so you can measure your conservation efforts and alert yourself to problems. In other words, get the most from your existing system and then try to meet a goal of lowered water consumption.

Another method of conserving water is to develop other supply sources for irrigation purposes. Use of effluent water has become a regular practice in Florida and the Southwestern United States. Secondary or tertiary treated water has no appreciable danger as far as human life and health is concerned. Use of these water sources, however, is limited by supply, location, soil structure, and turfgrass variety. Containment of golf course surface run-off through additional ponding areas or improving the holding capabilities of your irrigation supply pond are also good alternatives to your present source and offer protection in case of system failure.

CULTURAL APPROACHES

The third step to water conservation is through the application of proper cultural practices. Various cultural approaches can be implemented to reduce the amount of water required by your turf plants. The main goal is to improve the general health of the grass plant through enhanced root growth by correcting soil, chemical, or biological properties. The following are some suggested cultural practices which can reduce water needs.

1. Hand syringe rather than program syringe problem areas. Apply a short syringe prior to your main irrigation program to break up hydrophobic soil conditions and aid soil infiltration.
2. Avoid applications of fertilizer and pesticides during stress periods. Practice a fall fertilization program to avoid lush growth during high temperature periods.
3. Increase potassium applications to encourage thicker cell walls and deeper rooting.
4. Use growth regulators wherever possible.
5. Consider applying turf colorants to dormant turf.
6. Increase soil cultivation programs.
7. Try some different mechanical approaches. Reduce the mowing frequency. Raise your height of cut. Remove grooved rollers. Avoid topdressing and vertical mowing. Keep your mowers sharp and well adjusted. In short, reduce the abuse from mechanical equipment and help keep your grassplants healthy.

Western states have been forced to conserve water for years. Water conservation policies are at our doorstep. The wise superintendent will prepare for this eventuality and act. He will correct his deficiencies and develop a new water management philosophy. HOLD BACK THE WATER!

E-Z-GO® TURF VEHICLES

And nobody builds tougher vehicles than E-Z-GO.

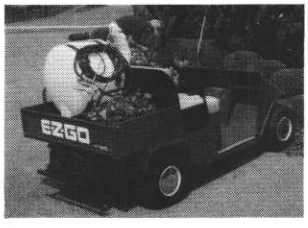
We don't have to tell you how tough it is to maintain your turf. But it's a lot easier with versatile, reliable E-Z-GO turf vehicles.

Designed for durability and easy maintenance, E-Z-GO's three and four wheel gas and electric powered vehicles can handle any job with ease. With payload capacities up to 1500 pounds and an overwhelming assortment of options and attachments, these labor saving vehicles can expand your work force while cutting man-hours.

Look to E-Z-GO to keep your turf in great shape.

GXT-1500 with hydraulic dump.

GXT-1500 with top dresser.

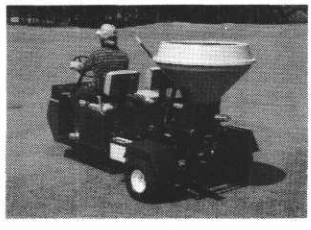


XT-500 with bed mounted sprayer.

GXT-1500 with aerator.

GXT-1500 with loading ramp.

GXT-1500 with sprayer.



GXT-1500 with seeder spreader.

GXT-800 with ball cage.

MTI DISTRIBUTING CO. TORO

14900 - 21st Ave. No. Plymouth, Minnesota 55447-4655 (612) 475-2200

GCSAA GETS NEW HOME

The Golf Course Superintendents Association of America (GCSAA) will break ground in early 1990 to begin construction of a $4 million headquarters complex one mile from the group's current Lawrence, Kansas, site. GCSAA President Dennis D. Lyon, CGCS, said that the association's officers approved schematic plans for the project during a meeting at the U.S. Open in Rochester, N. Y.

"GCSAA's growth has mirrored that of the rest of the golf industry," Lyon said. "We not have more than 8,600 members and the association offers more services to them than ever before. This new building will allow us to keep meeting the needs of our growing membership and the golf community at large."

The new site is just west of the current GCSAA building, which has been located on the Alvamar Golf and Country Club since the association moved to Lawrence in 1974. Despite the relocation, the new headquarters will still overlook an Alvamar course: a new 18-hole championship layout being designed by architect Ken Kavanaugh and developed by Alvamar owner Robert Billings. Construction of the course is set to start early next year and both building and course should be complete and open in 1991.

"We plan to have the building finished and the staff moved by summer of 1991," said John M. Schilling, GCSAA's executive director. Schilling added that the building could be ready for occupancy by spring of 1991 "if the Kansas weather cooperates."

Planned for 35,000 square feet, the new building will nearly triple the space available for GCSAA's 42-member professional staff and still leave room for projected growth. In addition to the four-story headquarters building, the new complex will feature an attached 70-seat classroom and meeting facility. The entire design, which is being completed by the Lawrence architectural firm of Peters, Kubota & Glenn, P.A., will "make superintendents who visit feel proud to be members of GCSAA," according to Lyon.

Since 1926, GCSAA has been the national professional association for the men and women who "keep golf green." By providing a wide range of opportunities for education and professional development for superintendents, the association has played an ongoing role in improving golf conditions both in America and abroad.

ASH YELLOWS IN MINNESOTA

by D. W. French, Professor
Department of Plant Pathology
University of Minnesota

Ash yellows has been confirmed in a woodlot east of Rochester, killing large trees and the understory ash as well. The disease has been there for possibly 3-4 years but has not been detected in any other woodlots in that part of Minnesota.

Ash yellows has caused extensive losses in the northeastern and central states including Indiana and Iowa. Dr. Wayne Sinclair of Cornell University suggested that the disease is limited by colder climates and even though occurring in eastern Canada has been limited in its northward movement. Thus there is some optimism that the weather in Minnesota may not favor development of the disease in this state. A similar disease, elm yellows (also known as phloem necrosis of elm), was found in Minnesota in 1976 in three widely separated areas - Alexandria, North St. Paul and Rochester, but has not bee found since. That year, 1976, could very well have been ideally suited for the movement of the vectors of elms yellows. Because we have not seen elm yellows since 1976 suggests that these organisms may not be able to survive in Minnesota.

There is reason to be optimistic that ash yellows will not cause the losses here that it has in Iowa and Indiana, however the situation suggests planting fewer ash.

Ash yellows can be identified by its ability to kill trees in 1-3 years and groups of trees are affected. Infected trees have thinner crowns, yellow foliage and witches brooms, which occur on the main stem or large branches, sometimes seemingly after the tree is dead.

Suspected trees should be reported to the University of Minnesota, Department of Plant Pathology for checking. Ash are subject to other problems and every problem on ash is not ash yellows.

We should not completely stop planting ash but it may be wise to plant fewer of them. Following Dutch elm disease, 35% or more of newly planted trees were ash.

SUPPORT OUR ADVERTISERS

A VISIT TO HAZELTINE

by John Harris, Lafayette Club

I recently made a call on Chris Hague at my request to view their new pumping station. It was an education to say the least.

Two deep wells supply a holding pond, one of which is a new submersible and a second that has been refurbished. They can fill the holding pond faster than they can drain it via irrigation. The holding pond was enlarged and dredged to a depth of 15 feet. I can't recall the capacity but many zeros followed the number two. A 24" culvert fed a wet well which was 20 feet deep. Three switches controlled the high, low water level and the 3rd for flooding. The pumping station is a prefab with 3 pumps. A 60 hp, 40 hp and a jockey 20 hp delivering up to 1300 GPM. The water flow is monitored by a transducer and flow meter. The data is fed into a small chip in the control box thusly back out to the pump starts and electronic butter fly valves. Only the pumps and water flow needed is delivered, at any rate, in any sequence. Other controls include phase cut out, low pressure cut out, high pressure cut out, heat sensor cut out, a pressure graph, and a flow meter.

The pump house itself was partially buried with vents on each side of the house below grade, facing the pump shafts. A ceiling fan drew air up and out; therefore pulling air through the vents and over the pumps. The added benefit of incoming air, cooled by the surrounding soil was a sound idea.

Outside the pump house there are three green lights and one red, indicating which pump is running or, not at all at a glance. Sky lights in the roof provide ample daytime light and are mounted directly over the pumps for easy removal.

There are other features but for reasons of accuracy maybe you should ask the horses' mouth. Chris was most considerate and very cooperative to take an hour and a half out of his busy schedule and devote it to my education. I thank you and hope to return the favor.