IKES

. . . Can Be Avoided

Employee Desires

A *third* management policy that aids and abets strikes is for management to believe that what the union officials demand for their members is identical with what the rank-and-file employees really want. Very little is actually known by most managements about what the rank-and-file employees really want in the new contract. But do the union leaders know?

Labor leaders say they know. But research indicates that union officer preferences often do not coincide with member preferences.

Professors E. E. Lawler and E. Levin reported in one study *(Industrial and Labor Relations Review,* July, 1968) that "the officers (of unions) tend to greatly overestimate members' desire for additional cash. . . . Part of this overestimation can be attributed to the officers' own high preferences for cash, causing the officers to raise their estimate of the members' desire for cash."

Specifically, as the study indicates, in Company A, union officers far overestimated members' desire for higher pay, seriously underestimated hopes of members for longer vacations in proportion to service, and missed completely members' wishes for early retirement privileges.

In Company B, union officers overestimated members' preference for shorter work week and for more money, and underestimated the desire for sick pay and disability pay. Union officers believed that members would be wholeheartedly behind a major push for more money, when the members were actually lukewarm on this point and more avid for different benefits.

It is inevitable that any list of union demands will not fit the needs of all members of a union, but as is common, when business agents or union negotiators come from the outside, the chance that they will not adequately reflect the members' wishes is enhanced. The outcome? Rejection by the local members of the contract that is prepared (and often recommended) by the union officers.

Within a two-year period, 1966-67, this has occurred in 1,937 instances, according to the Federal Mediation and Conciliation Service—and 20 percent of them were followed by a strike.

Members' increasing rejection of contracts and subsequent strikes may be attributed more and more to this union neglect of members' opinions. By the same token, the rejection of contracts may also be attributed to company ignorance of employee thinking.

New Methods

What can be done about these three misguided management policies? A large California wholesale nursery had had a steady sag in profits for no discernible reason. Came time for negotiation of the new contract, the members rejected the recommended settlement and a three-week strike ensued.

A new contract was offered involving a rearrangement of the package (which added 1¢ to the cost). This was grudgingly and only narrowly accepted, and the employees returned to work. Productivity still was lamentable; grievances increased to a high level; arbitration became more costly; and waste, spoilage and customer complaints increased.

A year's project was started under the aegis of a consultant employing the "listen to the employee" technique. This involved systematic interviewing of all 180 employees throughout the nursery with union approval. Within the first six months some interesting facts emerged.

Within the past two years, the nursery had added about 35 employees in order to meet the needs of the expanding economy. These people were added without proper indoctrination or proper training.

The employees said the foremen screamed at them to increase their output to a speed that their equipment was not capable of maintaining. They also said that even if the machines could be run that fast, it would be impossible to do so without a great deal of spoilage.

Older Employees

Older employees resented the wage scales at which the new (and often younger) people were hired, since it gave no extra recognition to the older workers. After a 90-day probationary period, the newcomers received almost the same scale as the old-timers. This was the only way

A Tree Grows in the Darndest Places

This five-foot aspen undoubtedly was the tallest tree in Greensburg, Ind., when this picture was taken!

It adorns the tower of the Decatur County courthouse.

Grover Brinkman, a free-lance writer and photographer, took this picture some months ago. He noted that the tree "had been there for a long time."

Some proof of what he says can be obtained from the 1966 edition (and perhaps earlier and later ones) of the Rand McNally Road Atlas, which notes in red above the town of Greensburg: "Tree Growing in Courthouse Tower."

Brinkman was told that the tree has been chopped back on occasion, but the roots are so firmly wedged that the tree hasn't died.

the company could hold the newer employees in a tight labor market.

On occasion, whenever work was slow in any one department, the employees would be "farmed out" to other fields which were busy. This, of course, was a method the company used to avoid layoffs, and hence, the manager believed, would be appreciated by the employees.

However, the employees resented being transferred to unfamiliar work in which they were not adept. As a result, they were constantly upbraided by the foremen. Sometimes younger employees were kept in their original field while some of the older people were forced to move.

From this total situation, festering in most of the employees, came the decline in productivity, and the carelessness that upped waste and spoilage, and so on.

The continuous flow of such information which came from the employees through the specialist interviewer led to some immediate changes.

All new employees, and employees with less than six months' service, were put through a training routine which they should have had at the beginning. They were instructed at their equipment—sprayers, tractors, etc., as if they had never seen them before, their questions were patiently answered, they were taken on a tour of the whole nursery—including the offices—to see how their work fitted into the whole operation.

Recognition

Vacations were lengthened (with the consent of the union) to reflect years of service, so that the older workers no longer felt like the older child when the new baby arrives and gets all the attention.

In addition, service clubs for five, ten and more years of service were started, to give recognition to the old-timers. A modest house organ was started to instill a pride of company.

The problem of temporary transfer from one field to another (to avoid layoffs) was alleviated by setting up a rotation system, so that all employees took their turns. Resentment died away. In addition to all this, a host of petty gripes and grievances were cleaned up—e.g., locker room, better maintenance of their equipment, and so on.

The steady climb of productivity, the fall in waste and spoilage, even the decreased labor absenteeism and turnover—all showed the effects of "listening to the employee" and acting promptly and open-mindedly on that information. A custom-tailored supervisory training course was later introduced to instruct foremen on how to handle such problems in their departments.

Nobody Listens

Many of the common problems of employee morale—some of which erupt into costly strikes disguised as demands for more money—are directly traceable to management unawareness of such multitudinous employee discontents.

The larger the nursery or the wider the area a contract applicator or tree company serves, the more an individual worker feels left out of the picture, the more he feels a need for some method of being able to communicate with someone in management, of someone to *listen* to him.

Trite as this may seem, this observation flows from 25 years of listening to employees in every industry in every area of the country. This is set out in greater detail in an earlier article, "Labor Relations: Dealing with the Rank-and-File Rebellion" by A. A. Imberman, Personnel Magazine, Nov./Dec. 1967. (Single copies are available free by writing to the author care of WEEDS TREES and TURF.)

The First Line

Most managements believe they receive reliable reports about employee morale from foremen. But foremen are kept busy checking and judging the work in their departments, maintaining discipline, enforcing company policies and safety regulations, and dealing with union stewards.

Supervisors must be retrained to become the humanizing influence that has been lost between worker and management. Unfortunately, most managements have turned the supervisors into traffic cops — to push production as their sole duty—with the result that they have no time for anything else.

I recall one Illinois contract applicator that had gone through a two-week wildcat strike, led by one obstreperous local union leader. One supervisor, on his own time, sat down with this wildcat leader, and calmly discussed their problem. The story the supervisor received was simple.

The local leader had come from a farm, lived on a farm, loved the farm, came to the city so that he could earn enough to move back to the farm. His mother had died. His father had been on the farm alone, corn dried up, no hired help available, nobody to talk to about it. He was frustrated, and furious with the world. A vast accumulation of trivial employee gripes and grievances without any apparent response from company officials and union officials had triggered his frustrations; his anger at the company and union boiled over.

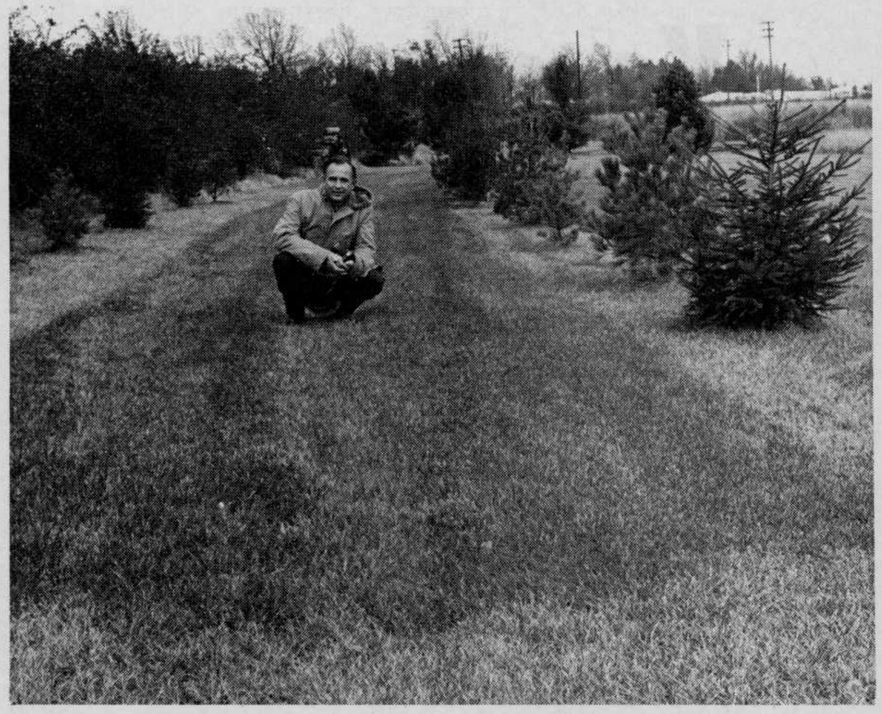
Upon the wildcat's end, the company sent him home for four weeks to straighten out the old man's affairs. He returned to become one of the applicator's finest men. Had this supervisor had the training and time to listen to the men in his crew as part of his regular duties, this, and perhaps other disputes, may have been dissipated in thin air.

Throughout the country are skilled consultants who specialize in guiding managements in installing such labor-management communications systems. Usually, these men are connected with a college or university. (Interested company executives may secure a list of recommended names by writing to the author care of this magazine.)

Other Effects

Of course, worker dissatisfaction and dislike of the company do not always find an outlet in dramatic walkouts or strikes. *Dissatisfaction more often is reflected in high spoilage or waste, low productivity, high absenteeism, or high turnover*—and this state of affairs can drag on for years without an outburst. In these circumstances, it is vital for management to listen systematically to employees in an attempt to discover what is really breeding worker discontent.

In brief, a company, large or small, can have good employee relations only if there is a good *two-way* communications system. However, even in managements persuaded of the soundness of starting such a system, there is always a disposition to wait until trouble arrives at the gates. By that time, the situation is too far gone. The time to listen to employees is while goodwill prevails. The trick is to keep it that way.



Even in a black and white photograph, the effects of fertilizer can be seen, points out Dr. Robert Schery, director of the Lawn Institute. Photos B and C show the difference fertilizer makes, in combination with quality seed, in getting turf established.

Winning Turf Combination:

Good Seed, Good Fertilizer, and . . .

By DR. ROBERT W. SCHERY, Director
The Lawn Institute

THE ONE-TWO punch for establishing and maintaining fine turf is a combination of good lawnseed and subsequent fertilization. Neither without the other is going to make much of a show.

This is especially true of the newer elite varieties of grass now becoming so popular, — cultivars such as Fylking, Merion and Pennstar among the Kentucky bluegrasses, all bentgrasses, and even the newer fine-leaf perennial ryegrasses such as Manhattan, Pelo and NK-100.

True, those attractive fine fescues such as Cascade Chewings, Highlight, Illahee and Pennlawn do well with only moderate fertilization, being noteworthy for their persistence in shade, on poor soil and where subject to drought. But even the fescues respond well to autumn feeding, especially under trees where almost alone they often constitute the turf. Their color and density is improved by autumn fertilization, at a time of year when deciduous trees are about to shed their leaves, thus allowing more sunlight to reach the sod.

As to the affects of fertilization once these good grasses are established, the pictures pretty well tell the story. Photo A points to a very thin turf on the check plot that has received no fertilization for three years (bentgrass mowed at ½ inch). Photo B is an adjacent plot on exactly the same soil, maintained in exactly the same way except that the excellent Highland bentgrass there is fertilized monthly. Note how much denser and more serviceable is the turf.

At the Lawn Institute we find that the exact formulation of the fertilizer is not so important as its regular usage. Properly used almost all fertilizers do a good job, the soluble types requiring judicious application in hot weather, the "slow-release" types generally requiring stepped-up application in order to equal the response from the solubles.

In fact, on the heavy soils of the Lawn Institute grounds, adequately fortified with phosphorus and potassium from previous feedings, high-nitrogen products utilizing urea and other immediately-available nitrogenous sources (viz. Nutro 30-5-8 or 24-6-6) have been among the most responsive types and more economical than the ureaforms or natural organics.

Photograph C shows what a difference an autumn feeding can make on an established Kentucky bluegrass turf. Even in this black-white photograph it is obvious how improved the color and density is on the fertilized area where the author stands. The photo was taken in early November, after a mid-October treatment with a weed-and-

Dandelion Control

feed product supplying about 1½ lbs. of elemental nitrogen to each 1,000 sq. ft.

There may have been some slight supplementary stimulation from the 2,4-D, although the more obvious response from the 2,4-D was nearly complete elimination of dandelions in the fertilized area come the following spring.

AT THE LAWN INSTITUTE, we've noticed that dandelions really get their start from early September until freeze up, says Director Dr. Robert W. Schery. Summer applications of weed-and-feed control the pests at that time, but the dandelion population spreads when those light, air-borne seeds are wafted many miles in the breeze by their feathery parachutes. Settled on the lawn, most seem to strike root through autumn.

"This is proved because best dandelion control comes from October applications," says Dr. Schery, "even though the weeding weather would seem more suitable when it was warmer. Earlier weed-and-feed treatments always seem to miss at least a few late starters* (See Table I). Of course, September weeding in the latitude of Ohio is good, but October is superlative. We are talking about weed-and-feed products that contain both Dicamba (Banvel D) and 2,4-D."

Nutro Weed & Feed, made by Borden, is the product used in the tests.

"Our best turf in spring has been consistently that receiving "strong" weed-and-feed treatments. By strong, I mean one-and-a-half to double the rate recommended on the bag," he continues. Even in warm weather, a good weed-and-feed is unlikely to bother bluegrass or fine fescue used at double strength. In the cool of autumn there is hardly any danger. And is the time of year bluegrasses and fescues gain greatest advantage from the fertilizer as well as the weed control. Nor is there danger to nearby ornamentals in autumn, such as there might be to newly budding trees and shrubs in spring. It's a great time of the year to get after the weeds, and boost the grass.

In Table I, Dr. Schery shows the advantage of an autumn weeding-and-feeding. Nutro Weed & Feed saves labor anytime of the year, he says, but if there is one time when you most "get your money's worth," it is autumn. He recommends a full strength weed-and-feed application yet this year, rather than waiting until spring. Results should be more decisive. A bag meant for 5,000 sq. ft. used on only 3,000 sq. ft. really puts muscle into the product and is recommended for fall.

TABLE I. Results from autumn applications of Weed & Feed at the Lawn Institute as measured by spring dandelion frequency. Counts are an average from at least two test areas.

Treatment	Number of dandelions May 5, 1969 per 1,000 sq. ft.
Fertilizer without herbicide	(about) 600
Sept. 14	
Weed & Feed, Standard rate	60
Weed & Feed, 1½ x	35
Weed & Feed, double rate	35
Oct. 12	
Weed & Feed, 1½ x	2
Weed & Feed, double rate	3

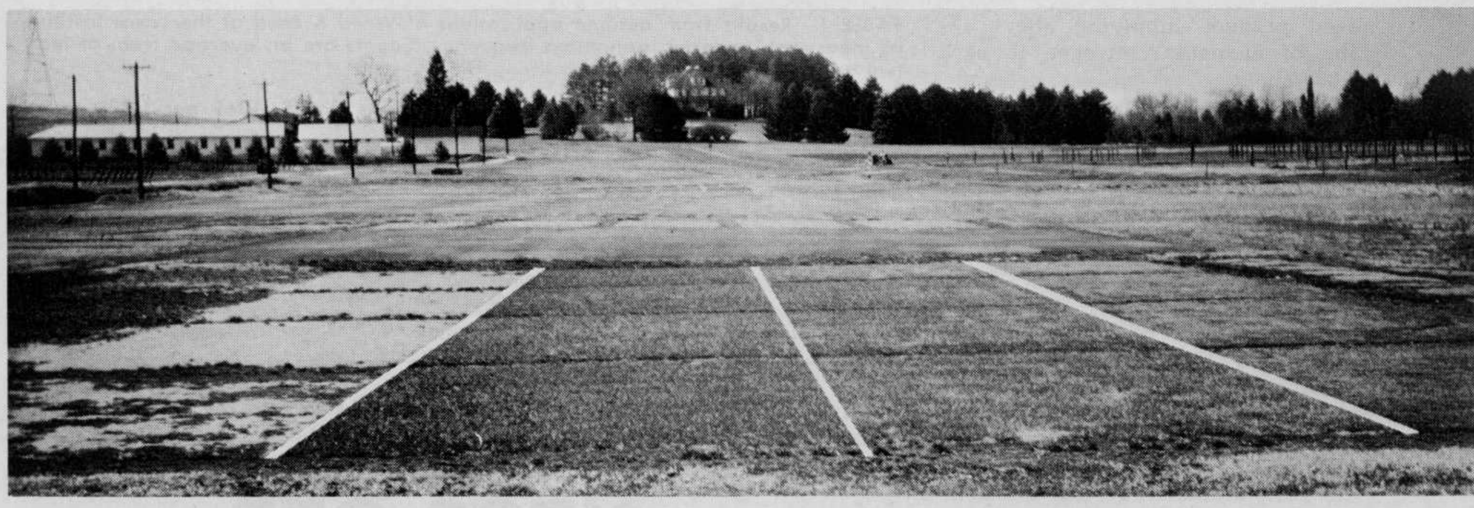


FIG. 1. Bermudagrasses overseeded with cool-season grasses, from left to right, not overseeded, Kentucky 31 tall fescue, ryegrass, and Merion Kentucky bluegrass. The ryegrass has been overseeded a second time.

For Winter Color, Overseed Bermudagrass

By F. V. JUSKA, A. A. HANSON, and A. W. HOVIN*
Agricultural Research Service
Beltsville, Md.

IN THE UPPER South, and in part of the transition zone, bermudagrasses are frequently planted for lawns and for general-purpose turf on playgrounds, athletic fields, driving ranges, and parks.

On some of these sites, either annual or perennial ryegrass has been seeded in the fall to provide winter color. Ryegrass provides winter color in the fall and spring and at some locations throughout the winter months. In late spring ryegrass disappears and the lawn must be overseeded the following fall.

Maintenance costs would be reduced if ryegrass could be replaced with a perennial cool-season turfgrass that would persist when grown with bermudagrass. Information obtained in growing various cool-season grasses, in association with bermudagrass, is reported as a guide to turf managers who are interested in overseeding or in management of combination cool-season and warm-season turf.

Grasses and Seeding Rates:

At Beltsville, Md., duplicate plots (18 feet x 60 feet) were sprigged in July 1962, with the following bermudagrasses: Tufcote, Tifgreen, H-8 (Kansas selection), and Burning Tree (Maryland selection). The bermudagrasses varied in texture—H-8 and Tifgreen are relatively fine, Tufcote is intermediate, and Burning Tree is coarse.

In September, 1964, after spiking the test area three times and aerifying once, the bermudagrasses were overseeded with cool-season grasses.

Each bermudagrass plot was divided into six subplots (18 feet long x 10 feet wide) and seeded as follows: 1) Check—no overseeding; 2) perennial ryegrass—6 pounds; 3) Pennlawn red fescue—5 pounds; 4) *Poa annua*—3 pounds; 5) Merion Kentucky bluegrass—4 pounds; and 6) Kentucky 31 tall fescue—6 pounds.

Rates for all grasses are shown as pounds per 1,000 square feet. The overseeding treatments were randomized with each of the two bermudagrass replications.

Management Practices:

The grasses were mowed weekly during the growing season at a height of one inch and clippings removed. Phosphorus, potassium, and lime levels were maintained for optimum growth as indicated by soil tests.

During 1964 and 1965, one-pound increments of elemental N were applied during the season until 5 pounds of N as urea were applied.

Split applications of N fertilizer were applied in 1966 and 1967; one-half of the plot received 3 pounds of N and the other one-half 6 pounds of N for the growing season. Thatch was not removed from the bermuda plots during the period of this trial.

In September, 1965, it was necessary to reseed both the ryegrass and *Poa annua* plots. Seedbed preparation and seeding rates were the same as those used in September 1964.

Visual observations on cool-season grass cover in bermudagrass selections were taken twice in late fall and twice in early spring of 1965 and 1966. Single ratings were made in late fall and early spring of 1967.

Results:

Fertility levels had little effect on the percent cover of the cool-season grasses, although red fescue, *Poa annua*, and perennial ryegrass thinned out more rapidly at the higher than at the lower fertility level. There was a significant reduction in red fescue stands at the 6-pound N level.

The average percent stand for the five cool-season grasses over the 3-year period for each of the bermudagrasses is given in Table 1. Merion Kentucky bluegrass ranked first with 71% cover for the 3-year period.

Both tall fescue and red fescue received almost identical average

* Research Agronomist, Agricultural Administrator, and Research Agronomist, respectively, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md.

TABLE 1. Cool-season grass cover in bermudagrasses. Average percent for 3 years (1965-67.

Cool-season grasses	Bermudagrasses					
	Tufcote	Tifgreen	H-8 (Kansas)	Burning Tree	Aver.	Rank
Check	0.0	0.0	0.0	0.0	0.0	
Ryegrass	23.3	24.4	20.7	29.1	24.4	4
Red fescue	45.1	49.5	54.3	61.3	52.6	3
Poa annua	13.1	16.2	13.2	16.8	14.8	5
Merion	65.7	78.1	64.8	75.4	71.0	1
Tall fescue	50.4	42.3	57.3	61.0	52.8	2
Average	39.5	42.1	42.1	48.7		

scores. Under the conditions of this experiment, perennial ryegrass and *Poa annua* did not furnish satisfactory cover.

Merion produced the densest cover; however, in 1966 and 1967 parts of the Merion plots were injured by a fungus disease. In 1968, the disease caused rather large brown areas that detracted from the appearance of the Merion even though this grass rated first in total cover. The bermudagrasses in the browned-out areas of Merion recovered very slowly.

Red fescue provided uniform cover at the 3-pound N level. Thinning of red fescue was very prononuced in 1968 at both N levels, and bermudagrass recovered very slowly after the red fescue disappeared.

Tall fescue cover was rather sparse but uniform in the plots. The sparser distribution of tall fescue in the bermuda plots can be attributed to the low seeding rate (6 pounds per 1,000 square feet) used in this study. Because of the large size of tall fescue seed, this species should be overseeded in bermudagrasses at 12 to 20 pounds per 1,000 square feet.

Thus far, disease has not been a problem in the tall fescue plots. Tall fescue stands were not affected by the one-inch cutting height. Results suggest that tall fescue overseeded in bermudagrass may provide a combination turf for several years; however, it may be necessary to dethatch periodically.

In this study *Poa annua* did not reseed itself as is normally expected. This might be attributed to the heavy thatch accumulation in the bermudagrass plots. The comparatively poor perennial ryegrass cover can be explained by the low seeding rate and poor persistence of this species.

The overall cool-season grass cover was somewhat higher for the Burning Tree strain than for the other three bermudagrasses. There was no appreciable difference in cool-season grass cover among Tufcote, Tifgreen, and H-8.

In general, overseeding with perennial ryegrass will require annual seedings at a rate of 12 to 20 pounds per 1,000 square feet. In 1968, ryegrass and *Poa annua* had disappeared almost entirely.

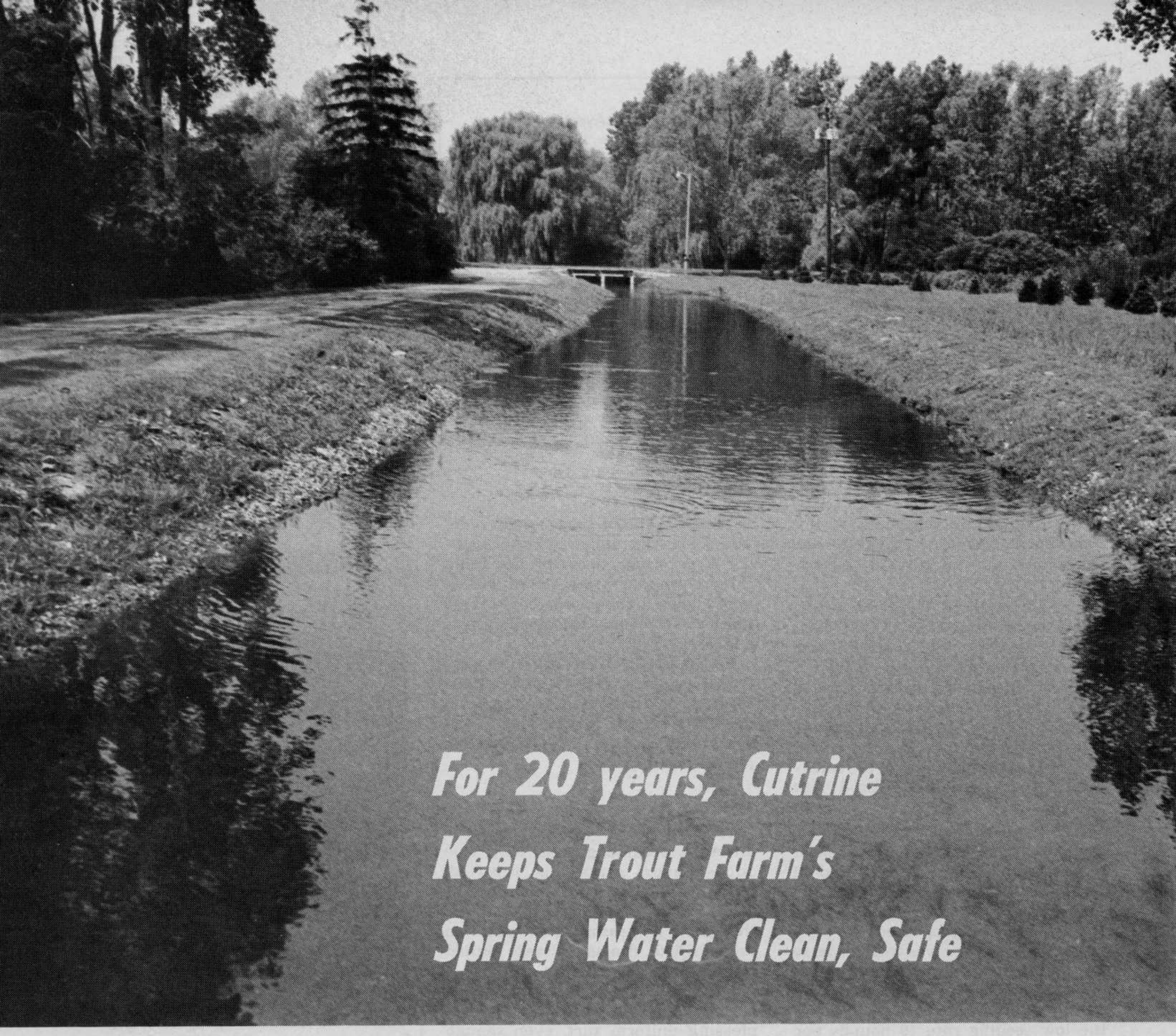
Summary:

The results of overseeding four different bermudagrasses with five cool-season grasses is reported. Merion bluegrass provided the best combination bermudagrass turf for the first 3 years; after that an unidentified fungus disease killed large areas, leaving bare spots.

A combination of tall fescue with bermudagrass produced the most pleasing uniform turf, even though the tall fescue was sparser than Merion. The sparser tall fescue turf can be explained by the comparatively low seeding rate used in this experiment.

Tall fescue withstood mowing at one inch and was not infested by any fungus diseases. Red fescue provided good cover for the first 2 years, then it began to thin out rapidly. Perennial ryegrass and *Poa annua* were the poorest cool-season grasses used in this test.

Under the conditions of this study, tall fescue produced the best combination turf with bermuda. Tall fescue, where adapted in the transition zone and upper South, may provide a good combination turf for several years. It could be particularly useful in overseeding parks, lawns, and play areas that are planted to bermudagrass.



For 20 years, Cutrine Keeps Trout Farm's Spring Water Clean, Safe

A SPRING-FED stream would seem to be the perfect resource for a trout farm. Yet the waters of one near Castalia, O., have required chemical treatment for the past 22 years to keep the fish alive and healthy.

Castalia Trout Farm is fed by two springs. One is the famous Blue Hole, a tourist attraction; the other is "Castalia's own Blue Hole," as Walter Gysan calls it. Gysan has worked at the farm more than 30 years and has been manager for the past decade.

Begun in the mid-30s by about 45 sportsmen and called the Castalia Trout Club, the farm has served both as a peaceful retreat and a commercial venture for its owners.

Its current owner is the huge industrial firm, Owens-Illinois, Inc., a leading manufacturer of glass, plastic, paper, and ceramic containers and maker of a host of other products.

Owens-Illinois uses the farm—it looks more like a sprawling country estate with more than one main house—for gatherings of various kinds, to include business conferences. There's another use: to raise and sell some 200,000 trout a year.

Table I

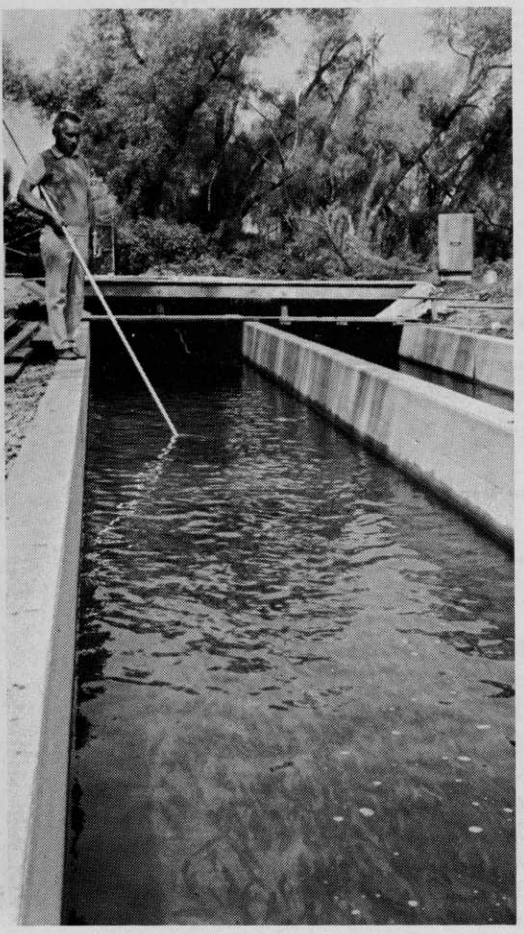
Chemical Analyses of Trout Stream Entering Castalia Trout Farms. (As of September, 1954)

	In Terms of P.P.M.
Total Alkalinity	230.0
Total Hardness	1148.0
Carbonate Hardness	230.0
Non-carbonate Hardness	918.0
Chlorides	22.0
Nitrates	trace
Nitrites	0.001
pH Value	7.0

No Free Oxygen in Spring

A peculiar characteristic of the springs is that the water contains no free oxygen and, therefore, it will not support any life forms. It must be aerated, either naturally or artificially. Waters from Blue Hole become aerated in the six-mile flow before reaching the farm. Waters that swell out of Castalia's Blue Hole (not more than 25x60 yards but 40 to 60 feet deep) at the rate of from 1800 to 2700 gallons per minute are aerated by two huge city disposal type airifiers.

You can easily see that the waters of the Castalia Trout Farm, Castalia, Ohio, are free of aquatic weeds from the use of Cutrine algaecide. If you look closely, you can see in the picture below thousands of fingerling trout, kept healthy in part by Cutrine's effectiveness, also, in preventing a buildup of toxic hydrogen sulphide.



Another characteristic of the water is its unusually high carbonate content (See Table 1) which complicated an algae problem that developed in the mid-40s.

Several miles of this continuous trout stream became clogged with long filamentous algae, floating chiefly on the surface water. It hindered trout fishing and the efficient management of the trout farm.

Because of the high carbonate content, the use of copper sulphate as the algaecide would cause a heavy copper carbonate precipitate in the water and cause trouble with the fish and develop toxic copper accumulations in the bottom muds, resulting in the reduction of fish food organisms.

Furthermore, high doses of copper sulphate would be needed so that after the copper carbonate formation is satisfied there would still be some ionic copper left in the stream to kill the excessive algae growth.

Cutrine Use Begun in 1949

Dr. B. Domogalla, President and Director of Research, Applied Biochemists and Associates, recommended a then new organic copper algaecide compound, Cutrine.

Unlike copper sulphate, the copper ions in Cutrine are all available to kill the excessive algae growths. They stay in clear solution in the trout stream and do not react or form a precipitate with the carbonates in the water.

Dr. A. S. Hazzard, Assistant Director of the Pennsylvania Conservation Commission, had been doing consulting work for the farm and gave this report after the initial treatment in 1949:

"After the addition of 3,700 lbs. of dry Cutrine algaecide, we found no nuisance algae growth present; the water cress was growing luxuriantly and we found throughout the stream an abundance of sow bugs, snails, shrimp, caddis and black flies. All trout caught were found to be in good condition."

So Cutrine has been used at Castalia Trout farms ever since. Its use is multiple—to kill algae, bacteria and to control certain fish diseases.

The recurring problem, says Gysan, is that with algae present, fecal matter is trapped; and in the decaying process hydrogen sulfide gas, highly toxic to fish, is formed.

Keeping the raceways clean enables the fecal matter to move downstream.

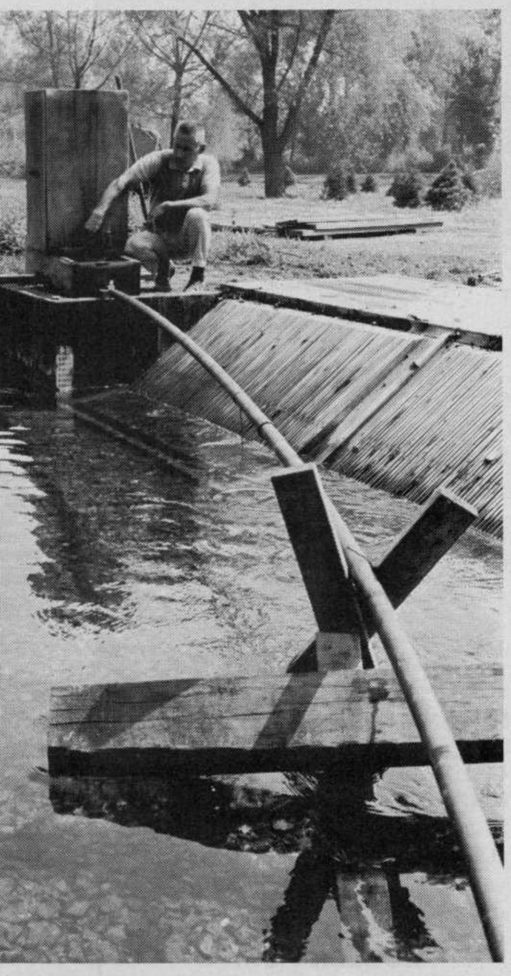
Method of Application

"You have to introduce the Cutrine solution carefully and slowly," cautioned Gysan, "otherwise it will drive the fish downstream and into bunches. Then you have another problem."

Gysan begins with a ¼ p.p.m. He fashioned a 50-gallon drip tank that controls the flow as accurately as possible. The tank is filled with 4% Cutrine.

To compensate for the variations in the weight of the solution during the hours of dripping (the more weight, the faster it would flow), Gysan added a feeding box to the tank outlet that contains a simple float.

Once the Cutrine feeding rate is calculated to the volume and flow



Manager Walter Gysan fashioned a simple, but efficient, automatic 'drip tank' to introduce Cutrine into raceways at a calculated rate. The large tank in the top picture flows into the small holding tank shown in the bottom picture. A fitted wooden block float inside an ordinary clay drain tile regulates the flow from the large to small tank. The flow is stopped when a dowel in the center of the float is raised upward into the spigot. Cutrine drips into the stream through holes at intervals in the pipe that extends across the raceway.

Table No. 2

Soluble Copper Content of Main Stream, Castalia Farms, (May 2, 1953)

Grab samples taken at different stations along Main Stream after we started dripping dilute Cutrine at head end of stream (¼ P.P.M. rate of drip).

	P.P.M. Sol. copper One Hour after treatment	P.P.M. Sol. copper 8 Hours started
Main Stream upon entering Castalia Farms sampled just **before** the Cutrine drip	0.0	0.0
Grab sample taken below the Cutrine drip; at first wooden bridge	0.05	0.20
Grab sample taken at second bridge below entrance of Main Stream	0.0	0.15
Grab sample taken of Main Stream at Guest House	0.0	0.01
Main Stream ½ mile below Guest House (2 miles from Cutrine dripping station)	0.0	0.005

Table 3

Toxic Hydrogen Sulphide Found in the Castalia, Ohio Trout Streams (August 24 to August 30, 1957)

Hydrogen Sulphide Content **before** Cutrine Treatment:	
In the lower nursery muds	20 P.P.M.
In the water above the mud	2 P.P.M.
Total bacteria count in water above the mud	55,000 per c.c.
(fungi also found present)	
Hydrogen Sulphide Content **one week after** Cutrine Treatment:	
In the lower nursery muds	5 P.P.M.
In the water above the mud	0 P.P.M.
Total bacteria count in water above the mud	5,000 per c.c.

rate of the water and the setup installed, the dripping of the solution is automatic, thereby keeping manual labor to a minimum for this aquatic weed and disease management practice.

After the fingerling trout get use to the Cutrine (it looks like ordinary bluing) the dripping rate is increased to ½ p.p.m.

"We drip for an 8- to 10-hour run three consecutive days about once a month through the summer," Gysan said.

Controls Fin Rot

Cutrine has been especially effective in controlling fin rot. The chemical kills the gyrodactylidae bugs that eat the dorsal fin then enter the body and kill the trout.

"When we take inventory at fingerling size, those fish showing evidence of fin rot are dipped with a wire basket in a solution of one part Cutrine to 100 parts water for two minutes.

"We tried one experiment with a dozen mature trout in which the dorsal fin had been eaten right down to the body. We sponged them with full-strength Cutrine. In 24 hours, two died but the others recovered and had even reestablished a healthy film."

To determine Cutrine's effect on fish food organisms, Dr. Hazzard placed a known number in a "Vibert" plastic hatching box then placed them in various parts of the stream being treated. Though some of the animals escaped, Dr. Hazzard concluded that even at ½ p.p.m., of ionic copper in the water, it was not toxic to small fish food organisms. After subsequent checks, Dr. Hazzard wrote that "the important trout foods such as sowbugs, shrimp and caddis worms appear to be abundant as ever.