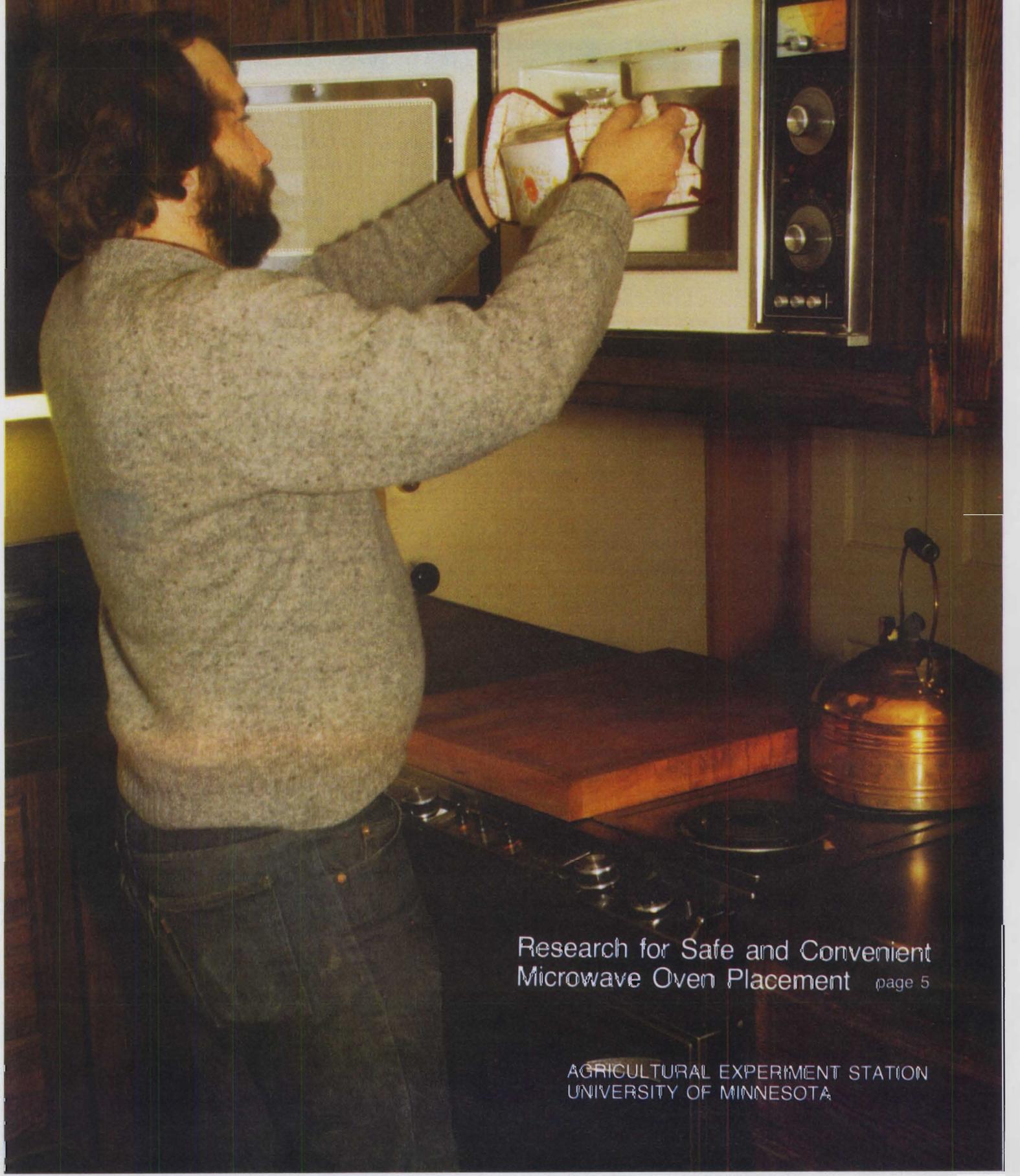


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AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF MINNESOTA

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On the cover: The microwave oven is becoming increasingly "standard" equipment in urban and rural Minnesota households. Recent Agricultural Experiment Station research has shown that food preparation can be easier or more difficult, depending on where the microwave is located. The research also showed that the height of its placement affects the safety and convenience with which it can be used by family members. See story, page 5.

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Adolescent Prostitution: Shades of Gray

THE WORLD'S "OLDEST PROFESSION" is being studied in a new way by Mike Baizerman of the Center for Youth Development and Research (CYDR). Baizerman's research is aimed at shedding light on the world of adolescent prostitution.

As a social scientist, Baizerman views that world not as black or white, good or bad, but filled with shades of gray. "We don't see ourselves dealing with morality but with individual human beings," he says, "so we see and hear things that don't always fit the mold."

From this standpoint, the prostitutes Baizerman studies aren't "bad girls" with character defects, but girls who get involved or stay involved in prostitution for a variety of reasons that fall within the context of adolescent development.

How does a university professor make contact with the street world to get the information he needs to study prostitution? Baizerman works closely with people in the community, particularly a youthworker from Lutheran Social Service of Minnesota, who makes herself available to girls on the street. He sees this as an ideal arrangement that benefits both research and practice. During the past six years, they've been in contact with more than 300 girls providing fee-for-service sex in the Twin Cities.

Emphasis Is on Adolescence, Not Prostitution

"What we do best is see the adolescent, not just the prostitute," Baizerman says. In interviewing the girls, he finds that their concerns are the concerns of other youth and that the ways

they got into prostitution often involved normal adolescent behavior, such as romanticism or breaking away from parents. For example, a girl may romanticize her relationship with her pimp and become very attached to fellow prostitutes and "street people," just as other young people have their cliques or groups. Her need to "belong" is normal.

However, Baizerman adds, "Few youths we interviewed seem to understand their situations in any depth." They almost never refer to sex. If they do at all, it's in terms of a job, with no moral implications.

The research has documented three main paths into prostitution in the Twin Cities area. In the first, a girl leaves home on good or bad terms, ends up selling sex to earn money for basic needs, then gets deeper into the lifestyle by using this as her primary means of income and affiliating with other prostitutes or a pimp.

Or, a girl is actively recruited by a pimp. In the Twin Cities, this usually involves a Black male and a Caucasian female. Without knowing that she's being set up, the girl falls in love with the pimp, becomes his "woman," and works at prostitution to "show her love."

A third pattern involves girls who grow up in neighborhoods with street prostitution and take it up as a normal way of life. In interviews with adolescent boys from urban schools, Baizerman found a similar pattern of boys seeing pimps as role models, successful in their subcultures, and people to emulate.

Other variations exist. Baizerman estimates, for example, that

50 coeds at the university are paying their way through school via fee-for-service sex.

What is obvious, he says, is that there is no stereotype. The girls get into prostitution in many different ways.

Getting Out— A Complex Issue

Baizerman's contention that "good research leads to richer questions rather than simple answers" was demonstrated when he began looking at pathways

out of adolescent prostitution. "Getting out" means something different to each girl. Many try it over and over.

A girl can be "pulled out" by police, her family, or youthworkers. She might run away from



In Minnesota, adolescent prostitutes arrested as juveniles are likely to be dealt with as runaways or incorrigibles because there is no state law on adolescent prostitution. Most services once available for their treatment have been cut back due to budgetary difficulties.

her pimp, or "walk" away and not be followed or coerced to come back. She might marry her pimp, get pregnant by her pimp or a customer, or retire and recruit other girls for her pimp. She may think of herself as having gotten out if she's promoted to "higher" levels of prostitution, such as working in saunas or being "retained" by a corporation. She may eventually be "pushed out" by her pimp because of her age, drug use, or arrest record. Or, she may die by suicide, "accident," or murder.

It isn't easy for a girl who wants to leave the "street scene." In some cases, her human and civil rights are violated because of overt threats from her pimp if she tries to leave.

In other cases, there's a more subtle pressure. "Some say she's brainwashed," says Baizerman, "but that's just a metaphor for the attachments and relationships she's formed.

Being a prostitute isn't simply selling sex. It's an entire subculture—a support structure, a way of life. If a girl wants to leave, what takes its place? She can't go back to who she was. She *is* different. She needs something or someone to help her through the transition. Based on his research, Baizerman suggests the youthworker be that someone and "be available," rather than trying to pull the girl away from her pimp.

No State Statute Deals With Adolescent Prostitution

In a journal article about adolescent prostitution, Baizerman wrote, "So often we were struck by the difference between how

old they looked and how young they thought and spoke."

That the girls look older than they are and usually carry false I.D.s is an important part of how they are treated if arrested. Booked as adults, they essentially escape the judicial system by getting released on bail and going back to work.

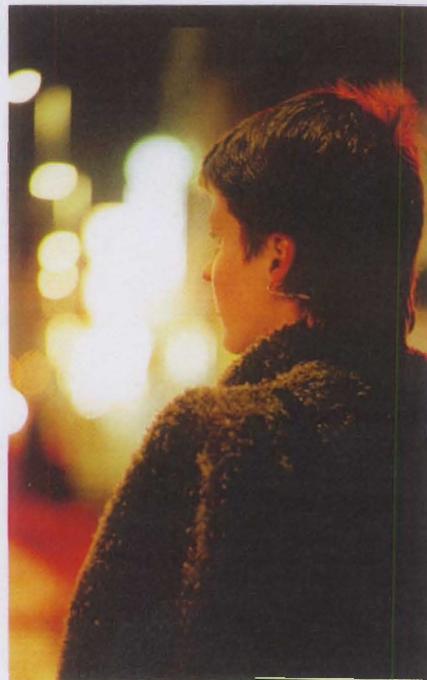
If they are arrested as teens and processed through the juvenile system, at least some decisions can be made concerning their treatment, Baizerman says. However, treatment is made difficult because there's no Minnesota statute on adolescent prostitution, so the girls are dealt with as "runaways" or "incorrigibles." Also, most services once available for their treatment have been cut back.

Baizerman hopes that the CYDR's efforts "to understand, not just explain" will provide greater insight for legislators, youthworkers, or anyone else in the state who makes decisions affecting adolescent prostitutes.

Unfortunately, he can identify two reasons why it's difficult to bring about enlightenment or change: "Support of adolescent prostitution is spread throughout the social structure, encompassing a wide variety of occupations and motives," he says, and "while our knowledge is increasing, money for help is decreasing."

During a time when social programs are being cut, Baizerman worries about the tendency to oversimplify issues. His research helps us understand why simply seeing prostitution as wrong and something to get rid of ignores the reasons for its existence, the lives of people involved, the shades of gray.

—Sharon Farsht



Research Opens Door to Safer, More Convenient Microwave Oven Use

DO YOU HAVE A MICROWAVE oven in your kitchen? Whether you installed it on the countertop, as a built-in, or over the range, did you consider the safety and convenience of its placement?

Wanda W. Olson, an extension specialist on household equipment and one of the researchers involved in an experiment station study on microwave oven placement, suggests that people planning to install a microwave oven think of the height of family members.

"It's nice if the microwave is safe and most convenient for the major user, but it should be safe for all users," says Olson. "The location of a microwave is important because of the danger of spilling hot foods, especially liquids, and the fact that the mi-

crowave is used by everyone in the family."

The research done by Olson and Becky Love Yust, an instructor in the Department of Family Social Science, establishes guidelines for safe use and the most convenient location of a microwave oven in the residential kitchen.

In the first phase of their research, Olson and Yust tested various placement heights for safety and convenience.

Thirty people varying in age (18 years to over 55) and in height (5'3" to 5'9") rated 10 tasks for safety and convenience. The tasks were those for which people typically use a microwave oven, such as heating a bowl of soup, baking a cake or casserole, and cooking meat on a rack.

In the laboratory, the re-

searchers positioned microwave ovens at the eight heights at which these appliances are commonly installed as countertop, built-in, or over-the-range units. The participants rated the 10 tasks for safety and convenience on a 1-to-5 scale at each height, with 5 being "very safe" or "most convenient."

Heating Bowl of Soup Rated Most Hazardous Task

All the participants rated heating soup in a bowl as the most hazardous task. So, this task was used to establish the safety guidelines for microwave height placement. The research showed that for safe use, the microwave oven should be located so the cooking surface—the oven shelf or rack—is no higher than the user's shoulder.

Researchers determined the best height for microwave oven placement by having study participants rate for safety and convenience tasks they performed with microwave ovens positioned at the eight heights these appliances are commonly installed.



"When you reach above your shoulder level, you don't have good control," Olson explains. "And when food is no higher than your shoulder, you can see inside the casserole to see if the food is bubbly and you can see the food when lifting the dish out."

The research also showed that participants 55 years old or older preferred the oven shelf or rack to be about 3 inches below their shoulder. Again, this was for best control when removing hot food from the oven.

Many tasks rated "safe" at the different oven heights were not rated "convenient." The guidelines for the most convenient location were based on the convenience ratings of all tasks. To be most convenient for the user to load the oven, see the food, or clean the oven, the research showed that the oven shelf or rack should be at a height between 2 inches below and 10 inches above the elbow.

In phase two of their research, Olson and Yust are investigating where a microwave oven should be placed in a kitchen to reduce unnecessary steps when cooking.

The home kitchen has areas kitchen planners call "work centers." These centers have been labeled sink, mix, range, refrigerator, and serving. The lines between the sink, range, and refrigerator define the area called the "work triangle." Adding a microwave oven to a kitchen could create another work center or replace the range in the usual sink-range-refrigerator work triangle.

To study this, Olson and Yust had 24 randomly selected microwave oven owners prepare a standardized meal in an L-shaped



The research showed that the height and age of family members should be considered in deciding whether to install a microwave oven over the range, as a built-in, or on a countertop.

laboratory kitchen. The participants were divided into four groups. A control group cooked the meal on a range. The remaining participants cooked with a range and a microwave oven. The microwave was located near the mix center, near the range center, or outside the work triangle.

First, the participants made coffee and a dessert to acquaint themselves with the lab kitchen. Then, they were videotaped as they cooked spaghetti, browned hamburger, prepared a meat sauce, heated bread, and prepared a frozen vegetable.

The researchers were interested in the number and sequence of trips made between the work centers while preparing the meal. They were interested also in the time spent at each center.

Research done at Cornell University and the University of Illinois in the 1950s had shown that with a range in the kitchen, a person preparing food used the sink center most often and made the most trips between the range and sink centers. Also, many trips were made between the mix and sink centers.

Addition of Microwave Oven Creates New Work Triangle

Olson and Yust's research showed that, with the introduction of a microwave oven, the mix center became the most-used center and the most trips were made between the sink and mix centers. Next in frequency were trips between the microwave and the mix center.

Says Olson, "The microwave oven may take the place of the range in a kitchen. It is critical to locate it so someone just walking through does not cross the traffic patterns of the person cooking."

Microwave manufacturers, cabinetmakers, and kitchen planners have expressed interest in the results of Olson and Yust's research. The researchers plan to study work patterns in home kitchens before finalizing their recommendations for microwave oven placement.

"This research provides some concrete information for consumers that should be useful in their dealings with kitchen planners and microwave dealers," Olson says.

—Gail Tischler Marko

Beating the Budworm to the Post

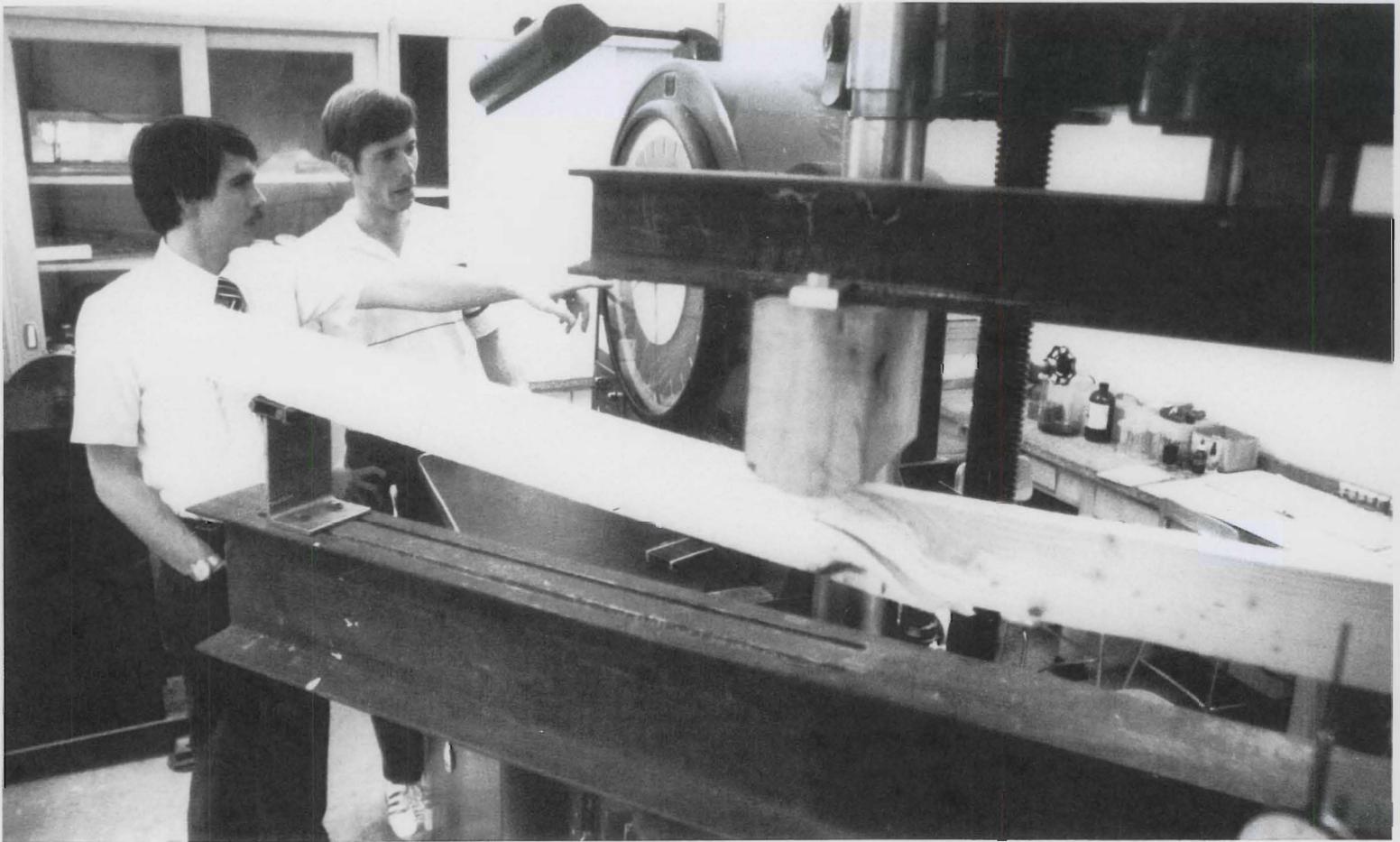
Steven A. Sinclair and lab technician Charles Evenson test the bending strength of a full-size 2×4 from a budworm-killed balsam fir at Kaufert Laboratory of Forest Products and Wood Science on the St. Paul campus.

IF THERE'S A STATUS LADDER for trees in the Lake States, the balsam fir is probably on one of the lower rungs. It's abundant—there are 900 million cubic feet of it in Minnesota—but it's not the favorite of loggers or fine furniture makers. It is, in fact, largely ignored by all but the spruce budworm, an insistent pest that finds in the balsam fir its favorite food.

For truth in labeling, the spruce budworm really should be named the balsam fir budworm. The budworm will attack red

spruce, white spruce, black spruce, and occasionally tamarack and hemlock. But it is its first choice—the balsam fir—that suffers the most. Right now the northeastern portion of the continent, including Minnesota, is experiencing an epidemic of the budworm. In Minnesota, more than 100,000 acres of spruce-fir forest types were defoliated each year between 1968 and 1976, and the budworm shows no sign of stopping.

This might not be so tragic, one might say, since the balsam





Above: Forest products scientist James L. Bowyer color codes the ends of logs from budworm-killed balsam firs of various diameters. Below: The color-coded logs were then milled into 2×4s and 2×6s at Latvala Brothers Forest Products, Nashwauk, Minnesota, enabling the University of Minnesota research team to determine the yield of dimension lumber from each tree size.



fir seems to be dying from neglect anyway. But the budworm-killed trees increase the fire hazard in Minnesota forests. And the present underutilization of this natural resource encourages the budworm's spread into balsam as well as other species, and increases the likelihood of future epidemics.

Since 1979, University of Minnesota forest products scientists, under the direction of Steven A. Sinclair, have been looking at the problem to see if there isn't a way to make better use of balsam fir, one of our least-used softwood species, and at the same time stymie the spread of the spruce budworm. While some scientists have been looking at its potential for composite panel products, such as waferboard and particleboard, James L. Bowyer and Sinclair have

been concentrating on balsam fir's potential for dimensional lumber. A home-grown source could help reduce Minnesota's reliance on Canadian softwoods, Douglas fir from the Pacific Northwest, and southern pine.

Underutilization Represents Considerable Loss of Potential Public Revenues

Right now, only 10 million cubic feet of balsam fir is harvested each year in Minnesota, and that mostly for pulpwood. Since more than half of the state's commercial forest land is publicly owned, this underutilization represents a large loss in potential public revenue.

"Despite the fact that balsam fir has long found wide usage in Canada and the northeastern U.S., it basically isn't being used locally, and there are a couple of reasons why," says Bowyer. "One is that the diameter of Lake States fir is relatively small. Another is there is a fair amount of pitch in balsam fir, resulting in a preference on the part of the sawmill operators for other species. And I suppose another thing that is going against balsam fir is just tradition. Local people haven't used it, and there is reluctance to change."

To see if there was good reason for those prejudices to change, the scientists first examined more than 2,500 logs in a log concentration yard that were from trees that had been felled for pulpwood. "We figured that what was in the log yard was a good representation of what was in the forest," Bowyer says. Various defects, such as ring shake, crook, and heartrot, were assessed and log diameters were tallied. More than 50 percent of the volume of the pulpwood logs



At Latvala Brothers Forest Products, Sinclair, Bowyer, and others inspect the lumber cut from the color-coded logs. The lumber was later graded by a chief inspector of the Northern Hardwood and Pine Manufacturers Association before being shipped to Kaufert Laboratory for strength tests.

was found to be of sawlog size and quality. More than half of the volume in log diameter classes of 8 inches and larger, and about two-thirds of randomly selected logs, was completely free of defects.

The next step was to convert a representative sample of logs to lumber. The ends of the sample logs were painted to color-code them according to diameter so that later, after sawing, the scientists could determine the yield from each tree size. The logs were sawed in a commercial sawmill into two dimensional lumber sizes—2×4s and 2×6s—then graded by a certified lumber grader.

"Then, we brought the green sawed logs back to our lab, had them dried, and regraded. A subsample was tested in the lab for strength," Bowyer says.

Tests Reveal Strength Values Were Underestimated

The tests revealed that the old published strength values for the wood had been underestimated, and that may be part of the reason why balsam fir has not been used to its full potential. "The original strength values were based on tests of a very small number of trees," Bowyer says. "We're finding these values need to be upgraded."

The intent of the research was not just to find a way to use healthy balsam fir, but also to find if budworm-infected or even budworm-killed trees might be usable. "Our data indicate that one-year dead trees can still be converted to lumber. But anything over two-years dead gener-

(Continued on page 16)

Ethanol Plant in Operation; Stillage Feeding Under Way



Les Lindor stands beside the buggy in which all grain is weighed before being fermented in the demonstration plant's cooker-fermenters (the large tanks in the background).

THE FARM-SCALE ETHANOL demonstration plant built last summer at the West Central Experiment Station, Morris, is now producing ethanol and steers are being fed the stillage by-products from the plant.

The plant was constructed with a \$200,000 appropriation from the 1981 Minnesota legislature, with provisions that it be operated for at least two years.

Operation and monitoring of the plant, livestock feeding trials, and economic feasibility studies involve researchers from the departments of Agricultural Engineering, Animal Science, and Agricultural and Applied Economics and West Central Experiment Station personnel.

Although ethanol will eventually be produced from several feedstocks, corn is now being used in it.

"Our primary objective is to produce sufficient stillage to evaluate the feed value of the stillage in feeding trials," says Les Lindor, the agricultural engineer who oversees the plant's operation.

"Right now, we're producing about two gallons of 180- to 185-proof ethanol per bushel," Lindor says. "We usually get about 3,000 gallons of stillage per week. We filter the solids from the fermented material and run the liquid portion through distillation columns to remove the alcohol before using the stillage in our feeding trials.

"You usually recover about one-third of the dry matter present in the feedstock as stillage. Of that, about 60 percent will be in the solid portion of the stillage and the rest of the solids will be in suspension in the liquid portion."

Lindor says, "Research done elsewhere has shown that the protein content of the feedstock is practically tripled in the fermentation process."

Arnold Flikke, head of the Department of Agricultural Engineering, describes the plant as one with conventional batch fermentation and semicontinuous, atmospheric-pressure distillation. He says that although the plant is of a design that could be used by a single farmer, it could also provide information for larger ethanol plants.

"The plant is instrumented with meters and a daily log is kept of all utilities required for its operation as well as the corn used and the yields of ethanol and stillage by-products," Flikke says.

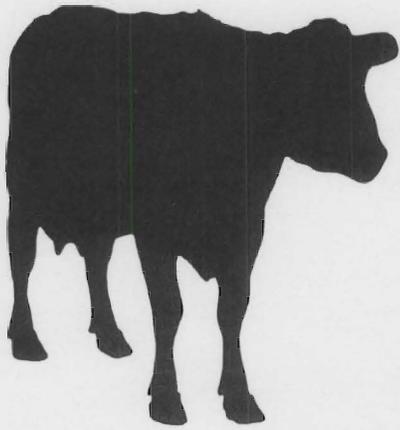
"A lot of people quoting ethanol production costs do not have accurate records, but the data we're gathering should enable us to nail down exactly what the inputs are. The material, energy, and monetary accounting of the enterprise should provide baseline data with which we can compare the efficiency of this plant with other suggested processes for producing ethanol on the farm."

Flikke says his department is completing blueprints for a small-scale ethanol plant and an informational brochure. These will be available free to Minnesotans.

Persons wishing to tour the demonstration plant should contact Les Lindor at the West Central Experiment Station. His telephone number is (612) 589-1711.

—Sam Brungardt

A Matter of Good Breeding



TEN MILLION OF THE approximately 11 million dairy cattle in the United States are Holsteins. Evidently, for most dairy farmers, Holsteins are the cream of the crop.

Why, then, would anyone want to spend time working to improve the Milking Shorthorn, a breed that accounts for little more than one-tenth of 1 percent of all U.S. dairy cattle? For Charles Young, experiment station animal scientist, the answer lies in two words: genetic variation.

"Concentration on a single breed such as the Holstein to the exclusion of all others reduces or eliminates the flexibility needed for improving the cattle population or for adapting to changes in the environment," Young explains. "Crossbreeding has not been used much to improve U.S. dairy cattle, but elimination of its potential for that purpose should not be taken lightly."

The benefits of crossbreeding are nowhere more evident than

in the Milking Shorthorn herd at the Rosemount Agricultural Experiment Station. In the early 1960s, the red and whites in the Rosemount herd—and in other Milking Shorthorn herds in the United States—seemed to be at a genetic dead end. Milk production was low; consequently, the breed had little appeal for dairy farmers. Young's predecessor, C. L. Cole, hoped to find an American Milking Shorthorn bull that would improve the Rosemount herd's potential, but, Young recalls, "It wasn't long before he came to the conclusion that there was not a bull in the entire breed worthy of use."

Importations Give Breed New Lease on Life

Cole's solution was to broaden the herd's genetic base by importing frozen semen from New Zealand Milking Shorthorns and, later, from Australian Illawarra Shorthorns. The latter breed contains genes from the Ayrshire, Devon, and local Australian breeds. Young, who took over the management of the Rosemount herd in 1969, continued the crossbreeding experiments by adding a number of Ayrshire bulls and a Norwegian Red bull to the gene pool. The Norwegian Red breed is itself an amalgamation of several breeds, including ones from Sweden and Finland.

The effects of this infusion of new genetic material have been dramatic. Milk production and fat content have nearly doubled since 1960, several Rosemount cows have set class-leading

records (that is, they've produced more milk than other cows of their breed and age classification), and the two bulls now in use have demonstrated a genetic potential for improving production that far exceeds that of their predecessors.

Since 1960, the Rosemount herd's rolling herd average (RHA) has increased from 7,220 pounds of milk to 13,200 in 1981. (The RHA shows how much the average cow in a herd has produced in a 12-month period.) In the same period, average butterfat production increased from 258 to 515 pounds.

Compared to the Rosemount station's Holstein herd, the red and whites' RHA averaged 49 percent of the Holsteins' in 1961 and 78 percent by 1981; fat production increased from 53 to 84 percent of the Holsteins' RHA in the same period.

Society Accepts New Blood into Its Herdbook

Two years ago, the Norwegian Red bull, K. Schie, which has been used extensively in the red and white project at Rosemount, was accepted into the American Milking Shorthorn Society's herdbook. Daughters of K. Schie in many Norwegian herds averaged 13,750 pounds of milk and 563 pounds of fat per standardized lactation. In comparison, quarter-Holstein cows, sired by sons of 20 top U.S. and Canadian Holstein sires, averaged 12,877 pounds of milk and 504 pounds of butterfat.

One crossbred bull, Korncrest Pacesetter, has proven to be



"the best bull in the breed, even better than the purebreds," according to Young. "His current USDA Predicted Difference (PD) is in excess of +2,000 pounds of milk, a level that has not been achieved by any other bull in the breed and by relatively few bulls in other breeds." The PD is an estimate of the superiority that a bull will transmit to his offspring.

Korncrest Pacesetter's sire is Minn Duke Darius, a bull bred at the Rosemount station, and his maternal grandsire is Sunny View Princess Promise, an Australian Illawarra Shorthorn. The performance of Korncrest Pacesetter's daughters should help lay to rest what Young calls a "myth"—the belief that crossbred animals have little value as breeding stock.

In the immediate future, the sons of these two bulls will be sampled; their progeny will be tested for milk yield and quality. The long-range goal, Young says, is to assemble the best genes from several breeds, and then, through selection, improve the transmission of those genes. The end result should be stock that will be competitive economically with U.S. Holsteins.

Specific performance goals for the Rosemount herd include a milk yield 90 to 95 percent of the Holstein average, milk composition 105 percent of the Holsteins', and a cow salvage value equal to 98 percent of the Holsteins'.

These cows, typical of those in the Rosemount red and white herd, contain various percentages of Milking Shorthorn, Norwegian Red, and Ayrshire blood. All except the middle cow are daughters of the Norwegian Red bull, K. Schie.

Science Notes

VERTICILLIUM WILT IS FOUND IN MINNESOTA ALFALFA FIELDS

Verticillium wilt, a fungus disease of alfalfa, was identified in 1981 in three Minnesota counties by USDA plant pathologist F. I. Frosheiser, who is stationed at the University of Minnesota, and graduate student E. H. Hijano.

The disease, caused by *Verticillium albo-atrum*, was first found in the United States in 1976, in Washington State. In 1980, it was found in Wisconsin, where it has since been identified in 24 counties. Although Verticillium wilt has been found only in Carver, Sherburne, and Dakota County alfalfa fields so far, it may be much more widespread in Minnesota. Alfalfa fields throughout the state will be examined in 1982 to determine the distribution and severity of the disease.

Symptoms are a wilting and yellowing of the leaves of infected plants, with the stems often remaining green after the leaves have died. The upper taproot and crown usually have light brown to orange streaks. Regrowth from infected crowns is weak and stunted.

Verticillium wilt is usually not observed on alfalfa until the third production year. So, it generally is not serious in a short rotation of two or three production years, Frosheiser and extension plant pathologist W. C. Stienstra say. However, once established, the disease may spread rapidly and deplete a stand within a year after it's observed.

The fungus can be introduced into a field in diseased alfalfa hay and seed, in manure, or on machinery or animals. The most likely long-distance spread, the pathologists say, is by seed that is not thoroughly cleaned. Once established on plants in a field, spores of the fungus are spread during harvest to healthy plants

The research at Rosemount is part of a North Central Regional project to improve dairy cattle through genetics. The emphasis, Young points out, is on dairy qualities rather than dual purpose. A dual-purpose cow is one that not only excels in dairy production but also has a good salvage value at the end of its production life.

Young foresees a time, perhaps in the late 1990s, when the Milking Shorthorn might be crossed with the Holstein to produce cows that will be more profitable for commercial dairy farmers. For the present, though, he intends to continue to develop a Milking Shorthorn that will compete with the Holstein and, in the process, help preserve the genetic variation so necessary to the vitality of any species.

—Louise Jones

Animal scientist Charles Young shows off a daughter of K. Schie and an Ayrshire-Milking Shorthorn dam. In the background is Mike Strasser, herdsman at the Rosemount Agricultural Experiment Station.



by wind, water, machinery, and other means.

Frosheiser and Stienstra say precautions that can be taken to reduce the chances of establishing or spreading *Verticillium* wilt include planting only well-cleaned seed and treating seed with thiram. Since the fungus can live long in diseased alfalfa stems, infested hay or manure from animals fed infested hay should not be spread on alfalfa fields or on fields to be planted to alfalfa. They also recommend harvesting younger stands before moving to older fields or to fields known to have the disease and washing harvesting equipment between fields to remove all plant debris.

Seed companies have released several varieties purported to be resistant to *Verticillium* wilt. These are being tested for productivity and persistence in Minnesota as well as for resistance to other major alfalfa diseases, all important factors farmers should consider in selecting a new variety.

—Jack Sperbeck

NEW OAT VARIETY SUITED FOR COMPANION CROP USE

The Agricultural Experiment Station has released a new oat variety, Preston, that was developed for use as a companion crop in establishing stands of perennial forages. Oat breeder Deon Stuthman says the new variety, which was tested as Mn 76161, is expected to be as good a companion crop as any other oat variety, including E-77.

Preston exceeded E-77 in grain yield by at least 10 percent at six Iowa locations in 1981, about the same difference in yield as that derived from indirect comparisons of the two varieties in Minnesota during the 1970s.

Data collected on Preston at Waseca, Lamberton, Rosemount, Morris, Crookston, and Grand Rapids for four years before its release showed its average grain

yield to be 85 bushels per acre, compared to 90 for Noble, 93 for Lyon, 97 for Benson, and 99 for Moore.

During 1979 and 1981, Preston produced as much protein per acre as any oat tested in Minnesota. Although it yielded slightly less than Noble, its higher bushel weight, groat percent, and protein content resulted in an average yield of 387 pounds of protein per acre, compared to 339 for Noble. This is important, Stuthman points out, because most growers will be feeding the crop as forage or grain and will thus benefit from Preston's higher protein content.

Preston matures early, is short, and has good straw strength, all characteristics which make it a good nurse crop variety. It is about equal to Noble in height and maturity, but is slightly more susceptible to lodging. It has intermediate resistance to crown rust and smut and some tolerance to red leaf (yellow dwarf virus).

University agronomists believe that Preston will be an attractive alternative to E-77 and Noble, especially in the more southerly parts of Minnesota, where an oat companion crop is more likely to be used.

—Sam Brungardt

HERBICIDES REDUCE LOSSES CAUSED BY VOLUNTEER CORN IN SOYBEAN FIELDS

Heavy populations of volunteer corn reduced soybean yields as much as 83 percent, but were controlled by herbicides, in tests conducted over the past two years by Agricultural Research Service weed scientist Robert N. Andersen, Southwest Experiment Station agronomist J. Harlan Ford, and Southern Experiment Station agronomist William E. Lueschen.

In the tests, corn was planted in clumps of 10 kernels each at three spacing rates, 2, 4, and 8 feet apart, in Hodgson soybeans planted in 30- or 40-inch rows.



Volunteer corn can reduce soybean yields by as much as 83 percent. Fortunately, farmers can eliminate such losses with herbicides.

Reports Andersen, "We need clumps because they are more typical of naturally occurring volunteer corn populations. Our infestation levels were high, but such levels can occur in patches in farm fields."

The 2-foot corn spacings cut soybean yields an average of 83 percent; the 4-foot spacings, 58 percent; and the 8-foot spacings, 31 percent in the tests, which were conducted at Rosemount, Lamberton, and Waseca. Average yield loss of soybeans per clump of corn on the plots with the lightest infestation rate, one clump per 8 feet, was 0.32 pound.

"In other words, every 180 clumps of volunteer corn per acre will reduce the yield about 1 bushel," Andersen says. This estimate includes only the direct reduction in seed production, he adds; there would be additional losses due to harvesting problems caused by the corn.

The researchers also compared the herbicides currently registered for volunteer corn control: dicolfop (Hoelon), for early postemergence spray application, and glyphosate (Roundup), applied selectively, as

with a rope-wick system, which permits herbicide contact only with the corn.

Two applications of glyphosate were made in all but one test, and the plots were cultivated and handweeded to remove all weeds other than the corn.

The researchers found that diclofop was more effective in increasing soybean yields than was glyphosate at the higher corn densities. Andersen says this was probably because the diclofop spray application could be made an average of 19 days earlier than the glyphosate ropewick application, allowing corn less time to compete with the beans. The researchers had to wait for the corn to grow above the soybeans before the ropewick application could be made.

Andersen suggests that early overtop application of diclofop for heavy infestations of volunteer corn in soybeans may be best. However, for lighter infestations, it may be cheaper to use glyphosate applied with a selective applicator.

—Ray Pierce

SCIENTIST REPORTS: PROGRESS IN CATTLE CLONING RESEARCH

Work on cattle cloning—producing from a single fertilized egg many identical cattle—is progressing at the university, according to Alan G. Hunter, leader of the five-person team working on the Agricultural Experiment Station project.

The project involves several stages, including freezing embryos and embryo transfer. But one initial hurdle was recently overcome with the development of a new way to retrieve eggs for fertilization which eliminates the expensive surgical removal from the cow of one egg at a time.

The eggs are retrieved by removing a cow ovary at the slaughterhouse, taking it back to the laboratory, and gently scraping or scoring the surface of the

ovary to release the eggs or ova. All of a cow's eggs are present in her ovary, though in an arrested state.

Before the development of this technique, the method used to get the embryo needed to begin the cloning process was time consuming and expensive. The cow was bred, then the egg was surgically removed three or four days after breeding. By this time, the egg, if fertilized, would have developed into eight cells. The eight-cell egg could then be split into four parts to create four identical embryos. However, this surgical procedure costs about \$2,000, and even then one cannot be certain until after the egg has been removed whether it has actually been fertilized.

"Now, in an afternoon's work, I can get 10,000 eggs," Hunter says of the new technique. He has kept these eggs alive for two weeks in the laboratory. "But I think it's realistic to be able to keep them alive for four to five days," he says.

Because the eggs have been retrieved in an arrested state, before they can be fertilized they must be matured to the same state as if the cow had ovulated them. This step has also been accomplished in the lab.

"We've matured the egg in the test tube. The next step is to try to fertilize it in the test tube, and create an eight-cell embryo in the test tube," Hunter says.

The process of cloning moves in several stages, and the success of each step depends on critical factors such as egg maturity and the hormonal balance of the recipient cow. Hunter hopes to be working at the implanting stage of the process by this summer.

Eventually, cloned cattle will be useful in research in separating genetic from environmental variables. Cloning would also give the cattle industry the ability to select top-producing cows and keep reproducing them to get more.

—Jennifer Obst

CORN HYBRIDS EVALUATED FOR HEAD SMUT RESISTANCE

Although corn head smut was found last summer in three of the four Minnesota counties where it was first identified in 1980, university scientists do not expect the fungal disease to be a major problem for the state's farmers.

"Planting resistant hybrids and rotating infected fields away from corn are the best ways to control head smut," advises Ward Stienstra, who studied the disease with fellow plant pathologists Thor Kommedahl and Erik Stromberg.

Stienstra points out that corn head smut was not found for a second consecutive year in Stearns County, where fields infected in 1980 were planted to small grains or soybeans in 1981.

The researchers evaluated 175 commercial hybrids for resistance to the disease last summer, averaging hybrid performance over three planting dates. Eight of the hybrids evaluated had no smut and were classified as "resistant," and 111 hybrids with less than 5 percent infection were classified as "moderately resistant."

"In locations where head smut has been found in the state, the most popular hybrids are thought to be some of the most susceptible," Stienstra says. "Farmers with fields known to have head smut should select lines resistant or moderately resistant to the disease."

The researchers also looked at the efficacy of chemicals in controlling the disease, which is primarily soil borne, but may also be spread by planting seed contaminated with head smut spores.

Chemical control with registered seed treatment products is of little value," concludes Stienstra. "Vitavax (carboxin) did not prevent infection in our test—and it was reported to be of little value in a Canadian test."

—Jack Sperbeck

(Continued from page 9)

ally has deteriorated too much to be usable," Bowyer says.

The spruce budworm feeds on the foliage of balsam firs, and, as it does the crowns of the trees become gray, grow thin, and eventually the trees die. After that comes decay. "But there is a lot of time with this disease; the trees don't die overnight," Bowyer says. "The best thing to do to control the budworm is to harvest any stand with lumber potential that becomes infected or is threatened with immediate attack."

But it is one thing to find a good use for balsam fir wood and another to convince others to use it.

Most Minnesota contractors are not familiar with the merits of balsam fir for structural light framing. As dimensional lumber, it is light weight, has adequate strength properties, nails easily, has small knots, and does not tend to warp very much.



Dead balsam firs increase the fire hazard in Minnesota forests. Agricultural Experiment Station scientists have found that the larger budworm-killed trees yield high-quality dimension lumber if felled and milled within a year of their demise.

Bowyer believes that with demand, old prejudices about balsam fir will fade. How about the problem of pitch, for example? "White pine and red pine have a fair amount of pitch, too, and they're used," he says. "There are some reasons why a logger would prefer to harvest something else, but if it's got commercial possibilities, these problems can be solved."

That commercial demand may be coming, once the current slump in housing construction ends. The United States overall has faced for a long time a general shortage of construction lumber. Before the current construction slump, we imported approximately 20 percent of our wood needs, even though ours is a timber-rich nation.

So with increased familiarity, and use, loggers and others in the wood products industry may grow to love the balsam fir just as much as the budworm does.

—Jennifer Obst

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