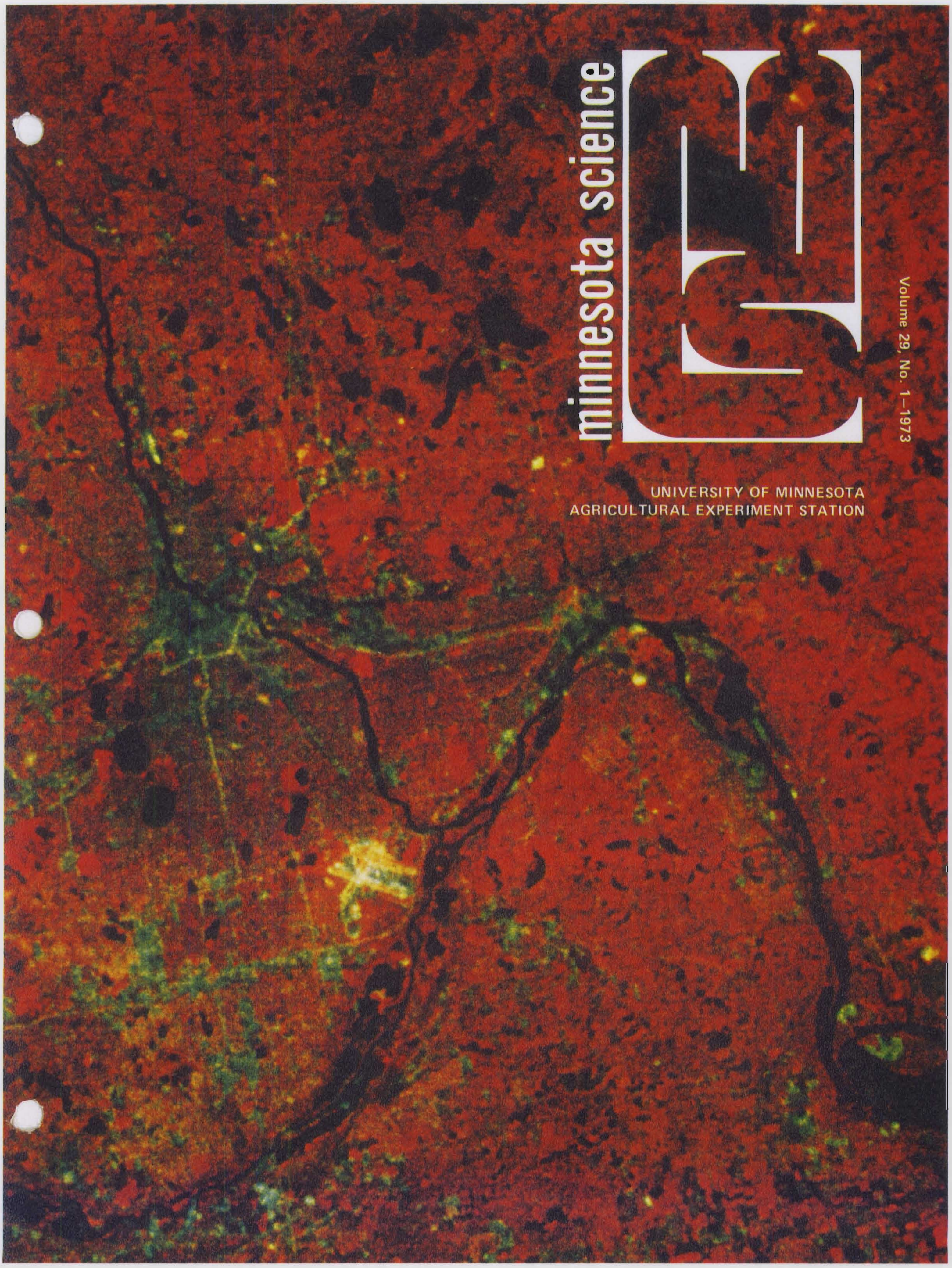

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UNIVERSITY OF MINNESOTA
AGRICULTURAL EXPERIMENT STATION

An old practice is being revived to avoid animal waste buildup and potential pollution from feedlot operations.

NITRATE BUILDUP CAN CONTAMINATE GROUNDWATER SUPPLIES

Farm and feedlot operators should avoid continued application of animal wastes and fertilizers that result in the buildup of nitrates in soils because ground water contamination may follow, warn Experiment Station researchers Robert Gast and Philip Goodrich.

"After such a buildup is allowed to occur, there may be a slow, but irreversible movement of nitrates through the soil into the groundwater for years in the future," they say.

Nitrogen is the major component of animal wastes and fertilizers "posing a significant threat to groundwater quality," when the two are "distributed uniformly on soil surfaces at reasonable rates," says Gast. Phosphorus and potassium are other components, but the soil usually adsorbs most of them.

However, this may not be the case when large quantities of fertilizers and animal wastes are concentrated in a small area, they add. Then phosphorus, potassium, and disease-causing organisms may move directly into groundwater through such pathways as sinkholes, defective well casings, and sandy soils with shallow water-bearing rock layers. Groundwater contamination from such sources "can be minimized" by locating larger feedlot operations in areas with suitable soil and water conditions.

Nitrogen is of concern for three reasons. First, large quantities are involved in the application of both fertilizers and animal wastes. Second, in the form of nitrates, nitrogen potentially has a rapid rate of movement in soils. Finally, nitrogen on some farms can be toxic to humans and animals.

However, farmers should not be dissuaded from using nitrogen fertilizers, the researchers say. "Chopping practices in the U.S. over the past 100 years have continuously removed more plant nutrients, especially nitrogen, than has been returned to the soil by fertilizers, plant residues, legume crops, rainwater, and animal wastes. "This 'mining' of the soil continues in many instances and can only be prevented by increased use of fertilizer nitrogen, if current crop production is to be maintained. Fertilizer nitrogen applied in these cases results in little if any increase in nitrate accumulation in the soil."

Research at the St. Paul and branch stations has shown that if the amount of fertilizer nitrogen added is about the same as the amount removed by the crop, excessive nitrates will not accumulate in the soil. In fact, in the case of continuous corn production, "fertilizer nitrogen can be applied at rates found to give maximum yields without significant buildup of nitrates."

DUTCH ELM CONTROL MEASURES HELP PROTECT HEALTHY TREES

A wonder cure for Dutch elm disease isn't just around the corner, but some scientists think they may be on the right track with benomyl fungicide. University plant pathologists say the label registering the fungicide "benlate" for Dutch elm disease control restricts its application to only trained arborists. The reason for this restriction is that applicators must know what results are realistic to expect and how the product can be used to supplement existing control measures.

The person who selects the trees to treat and the manner they are to be treated should receive primary training,

the plant pathologists say. Spraying operators, survey crews, and injector applicators also need special training to do their jobs satisfactorily.

Only a percentage of infected elms have a reasonable chance of survival following treatment with present methods. Criteria have been designated by the plant pathologists for selecting elms to treat with "Benlate."

Elms should be selected for preventive treatment with care. This will help to insure the greatest opportunity for success. Elms best suited for preventive treatment are in areas where losses range from two to eight percent. There should be no root graft problems.

Treatment may be made by injection or foliar application as soon as leaves are well expanded, usually after May 15 and up to about June 15. This is when bark beetles feed substantially. The fungus that causes the disease is spread by European and native elm bark beetles.

Dutch elm disease only infects elm trees, but some elm species are less susceptible to the disease than others. Individual trees, especially in the Chinese and Siberian elm group, have some resistance to Dutch elm disease.

The disease results in rather rapid leaf wilting. Some trees die a few weeks after becoming infected. Others wilt slowly and survive for a year or longer. A brown, broken ring forms in the sapwood of wilting branches, usually in springwood vessels of the current year's growth. Other fungus diseases and wounds may result in similar discolorations. The disease can be identified with certainty only by isolating the fungus in the laboratory from suspected trees.

People who suspect Dutch elm disease in their elm trees, should cut four pieces of small, newly wilted branches. Pieces should be one-quarter to one-half inch in diameter and about 6 inches long, and show discoloration in the outer wood. Wrap the sample in waxed or heavy paper; include your name, address, and location of the tree. Send the sample to the Dutch Elm Disease Laboratory, 670 State Office Building, St. Paul, Minnesota 55101. No charge is made for diagnosis of the disease.

Chemicals kill bark beetles before they can transmit the fungus to healthy trees. Spread of Dutch elm disease through naturally grafted root systems can also be prevented. For more information on chemicals, spraying, and root treatments, see Extension Folder 211, "The Dutch Elm Disease," available from your local Extension office or Bulletin Room, University of Minnesota, St. Paul, Minnesota 55101.

SOME GRAIN PRESERVATIVES INEFFECTIVE MOLD INHIBITORS

Grain treated with propionic acid or a propionic-acetic acid mixture remained free of fungi in storage for 140 to 210 days, but a grain preservative, Grain Shield, did not inhibit fungi development, says Experiment Station plant pathologist Clyde M. Christensen.

Grain preservatives, a group of relatively new products that have received considerable publicity, are being promoted as a means of preventing mold growth in stored grain. They make it possible to store high-moisture grain without artificial drying, cribbing, or ensiling.

Treating grain with these preservatives is often referred to as "pickling," due to the vinegar-like smell of grain after treatment. Most grain preservatives contain propionic acid or a combination of propionic and acetic acids. Acetic acid, better known as vinegar, is used to preserve pickles, which explains why the process has been tagged "pickling."

In Experiment Station research, sorghum, corn, soybeans, and alfalfa pellets were treated with five-tenths to one percent propionic acid or a mixture of 60 percent acetic acid and 40 percent propionic acid. Also, grain samples received the recommended dosage of Grain Shield—10 percent propionic acid and 90 percent inert materials. However, that product did not inhibit fungi development on samples of moist stored grain. Even samples treated with double the recommended dosage were heavily invaded by fungi within a few days to a week. And when the temperature was raised, these treated samples became heavily infested with mites, Christensen says.

The odor of propionic acid became very faint or disappeared in grain samples treated with propionic acid or the propionic-acetic mixture when the samples were dried after several months of storage. But when samples were moistened, the odor became as evident as it had been before the grain was dried.

Because of the odor and a tendency for embryos of most corn kernels to turn medium to dark brown after treatment, such grain would almost certainly be designated "sample grade" or "distinctly low quality," Christensen says, if it passed through state or federal inspection. Unless buyers and sellers agreed to waive the grading rules, treated corn would be discriminated against in marketing.

The high storage hazard for alfalfa pellets is another consideration in the use of grain preservatives. Christensen says that alfalfa pellets should be stored at no higher than eight percent moisture content because of the possibility of losses from fire. But it's not necessary to store the pellets at 8 percent moisture to prevent molding, he adds.

Grain treatment with five-tenths percent propionic acid might provide "a very attractive alternative to drying" if it would protect the grain from molding at moisture contents up to 16 percent as it did in these tests, Christensen says.

UNIVERSITY RESEARCHER AIDS IN ANTARCTIC SEAL PROJECT

While most Minnesotans faced the trials and tribulations of heavy snow and subzero cold, Jack Otis, a cell geneticist with the Experiment Station, spent the winter in "balmy" Antarctica.

Otis, an assistant scientist in the Department of Animal Science, left St. Paul December 20 for Antarctica near the Ross Sea, where the mercury soars to a "summer" high of about 40 degrees.

For the third straight year, Otis participated in a seal study project funded by the National Science Foundation. He assisted other scientists who are attempting to determine whether it is economically feasible to harvest seals for food, fur, and other uses. If the scientists find this is possible, they will then determine how many seals can be harvested without endangering the species. Several large whale species and the southern fur seal have almost been hunted to extinction, Otis says.

Donald Siniff of the University's Department of Ecology and Behavioral Biology and Albert W. Erickson of the Wilderness Research Center at the University of Idaho, head the seal project. Otis flew with Erickson to Christ Church, New Zealand, then sailed on a U.S. Coast Guard icebreaker to McMurdo Station, Antarctica. The entire trip took about 7 days.

Conditions in Antarctica during January and February are more ideal than at any other time of the year for research work. During this time there is daylight 24 hours a day and the chill factor is less severe than during other seasons.

Basic information was gathered on seal population distribution and density. Radio tracking devices were placed on the animals to learn about the movement of individual seals and entire populations.

Although the project is primarily concerned with seals, Otis gathered blood samples from penguins. This will enable him to study the bird's chromosomes, the threadlike bodies that carry genes. At the University Otis is presently involved in chromosomal study of poultry species.

The Housing Shortage:
Can Wood Meet the Demand?

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Wood or timber houses have been a dominant feature of U. S. architecture since the first settlers set foot on our shores. Timber was abundant in America and since colonists were familiar with its use, wood's popularity as a building material was insured. Timber-framed houses were commonplace among artisan and agricultural classes in the villages of southeastern England, an area where many early colonists once lived.

Types of Wood Construction

Wood construction consists of two basic structural systems: the horizontal timber building and the frame building. Log houses in which timbers are stacked horizontally are prime examples of horizontal timber buildings. Frame buildings are characterized by upright or vertical posts that support horizontal timbers.

Frame buildings can be of two types: the heavy frame, sometimes called post and beam, and the light frame, which is used in most present-day single-family housing structures. Timber frame construction is used chiefly for larger buildings, but it is easily adapted to single-family homes. The heavy frame timber structure has become the model for all modern buildings formed with steel or concrete. Concrete posts and beams form the structural framework in this system and the walls are filled in with stone, cement block, brickwork or sometimes with non-supporting window walls.

The light frame wood building is the most popular for small structures, especially single-family homes and apartment buildings not over three stories high. It is relatively simple, fast, and uses smaller sized pieces of wood or dimension lumber, as it is called. Smaller lumber allows more efficient and complete use of wood than if trees were only converted to timbers. Light framing employs a series of 2 x 4 uprights or "studs" that support headers or lintels over relatively short spans. Studs are normally spaced 16" or 24" apart compared to spans of 10 feet and longer in a post and beam structure.

Wood has been less expensive than other building materials for housing. It partially accounts for the U.S. being the best housed nation in the world with an occupancy rate of 0.6 persons per room. Abundance and renewability of our forests account for the low cost of wood in the U.S. But wood is not as well accepted in all parts of the world. Wood houses are prevalent in countries rich in forest resources and where their use has developed traditionally–in the U.S., Canada, Oceania, Japan, and northern Europe (principally Norway and Sweden). Russia, which has the largest share of the world's forest reserves, is not a leader in using wood for house construction. Developing nations use brick or concrete materials for permanent housing; wood is largely used for rural or temporary housing.

Housing Shortage

Housing is in short supply in all countries of the world. But according to the United Nations Housing Center that shortage is most critical in developing countries. In industrially developed nations, such as the U.S., the shortage of housing affects the poor more than the middle and higher income groups.

The U.S. Department of Housing and Urban Development (HUD) has called for development of 26 million housing units, 2.6 million units annually, in the decade 1969-78. U.S. housing production exceeded 2 million units for the first time in 1971. Less than 1½ million were produced in 1969 and again in 1970. So a substantial backlog of housing starts already exists, making it even more difficult for HUD to realize its goal.

A major problem in meeting the U.S. housing goal is a shortage of skilled tradesmen. New approaches using mass production and engineering technology, and experimentation with such non-wood materials as concrete, metals, and plastics have been encouraged by HUD. Operation Breakthrough, a program designed to develop new housing systems, has been in existence for 3 years. Of the 22 systems approved as finalists, six are total wood systems and others have incorporated some wood in their structure.

Wood—Advantages and Disadvantages

Manufactured housing systems using wood appear to offer the best chances for alleviating the U.S. housing shortage. But these systems require a considerable amount of research to insure they are structurally sound and environmentally safe.

Two characteristics of wood offer some important advantages that are also considered objectionable for safe and sound construction. These characteristics are that wood is combustible and it decays. Advantages of these characteristics are disposability by fire and biodegradability. However, the possibility of fire and the potential for deterioration if units are not properly constructed are relative disadvantages. It is difficult for the public to understand that wood houses or buildings are actually safer than some buildings often regarded as fireproof. The public knows that wood burns and they have been conditioned to associate fire with death and destruction. But earthquakes, tornadoes, hurricanes, and floods are more destructive forces than fire. And wood houses generally outperform other types of structures when these natural disasters strike. Research being carried out in many countries is increasing our knowledge of the behavior of wood and wood-based products in fires. Information from this research will show ways in which hazards can be reduced to an acceptable level and are likely to find early recognition for regulation purposes.

Hurricane Donna, whose 120-180 mph winds hit the Atlantic Coast in early September 1960, made the entire area from Florida to New England a gigantic laboratory for buildings that stood in its path. It definitely demonstrated that wood frame buildings, properly tied and braced, will withstand high winds that demolish rigid, so-called "hurricane-proof" structures. The fact that wood is flexible enables it to withstand stresses.

Two huge earthquakes also strikingly indicated the superiority of wood construction. A 1963 quake at Skopje, Yugoslavia, destroyed an estimated 95 percent of the city's homes and killed 1,050 of its citizens. The Alaskan quake at Anchorage on Good Friday 1964 destroyed 750 living units and killed 131 people. Both quakes were of nearly equal intensity. Research teams from the U.S. Forest Products Laboratory at Madison, Wisconsin, and from the American Plywood Association, Tacoma, Washington, concluded that the wide use of wood construction in Alaska may have been responsible for saving some lives in Anchorage.

In Anchorage a 2-story wood frame house was not damaged while a new 5-story, lift-slab apartment building on the next lot was totally demolished. A plywood-sided house

The 1964 Alaskan earthquake toppled this home from its foundation but the wood house held its shape and helped protect the lives of its occupants.

dropped into a fissure 15 feet deep but suffered little damage. It could have been pulled out, placed on a new foundation, repaired, and reoccupied.

Factory Housing

In 1962 the lumber industry introduced a new housing construction system called Unicom. The name was chosen because it provided a uniform basis for manufacturing housing components and involved a new concept of coordinated modular dimensioning. The system permitted faster planning and erection of a house along with more efficient use of lumber and lower construction costs. Unicom provided many workable ideas for the factory built housing industry that followed later.

The latest modular framing system is one jointly promoted by the American Plywood Association and Western Wood Products Association (WWPA) called Mod 24. Mod 24 brings together a series of important construction advances made over several years and new data based on cost studies and structural testing of 24" spaced wall and floor support members. The Mod 24 system involves alignment of all basic structural members, producing a series of in-line frames using both lumber and plywood. This system is now accepted by the Federal Housing Administration (FHA) and most building codes for single-story frame construction. Recent research has confirmed it can be used for 2-story buildings. Code approval for 2-story structures is expected soon. Savings in the range of $200 per house are claimed because less lumber and labor are required.

Industrialized or factory built housing will probably as-

(Continued on page 11)

remote sensing lab

Surveying Minnesota's Resources

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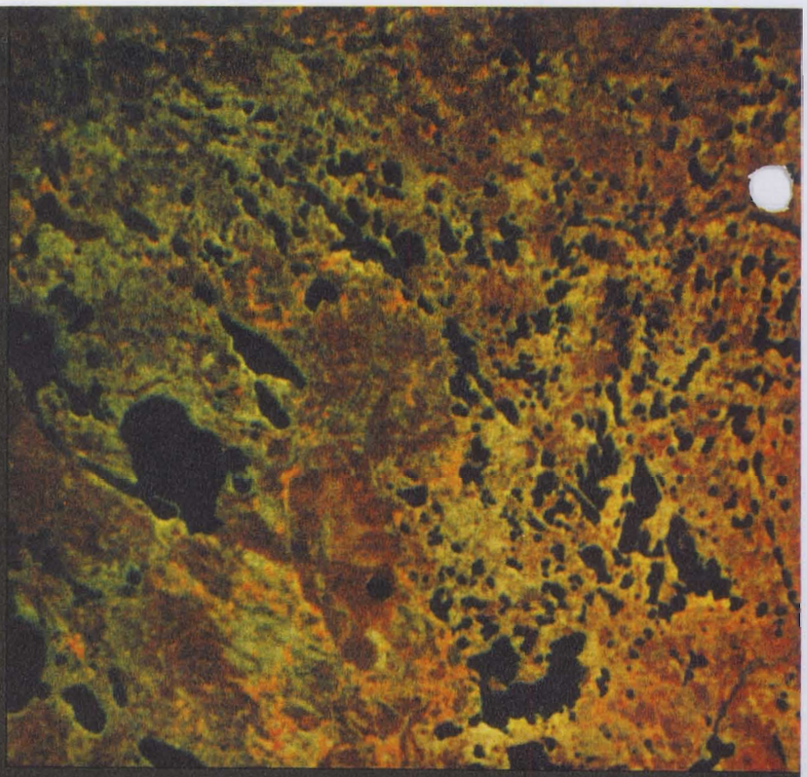


The complex lake and geological patterns in the Boundary Waters Canoe Area (BWCA) formed by glaciers during the ice ages are very evident in this image. Ely (lower center) appears as light blue spot.

During World War II the Germans developed elaborate camouflage techniques to hide vital factories, harbors and ships, and other strategic sites from Allied bombers. One notable ruse involved use of several square miles of canvas, stretched taut and painted to mask the true location of an important port. For a time, Allied reconnaissance photographers were fooled.

However, an unusual development in aerial photography soon uncovered the German's ingenious attempts to conceal precious cargoes. A newly developed camouflage detection or "infrared" film revealed what conventional film was unable to see: the harbor and its covey of ships were 2 miles "inland" under the canvas cover.

A significant feature of infrared film was that it used wavelengths of energy other than those visible to the human eye. It took 15 years or more before scientists began earnestly to develop this idea and take advantage of many of the wavelength bands.

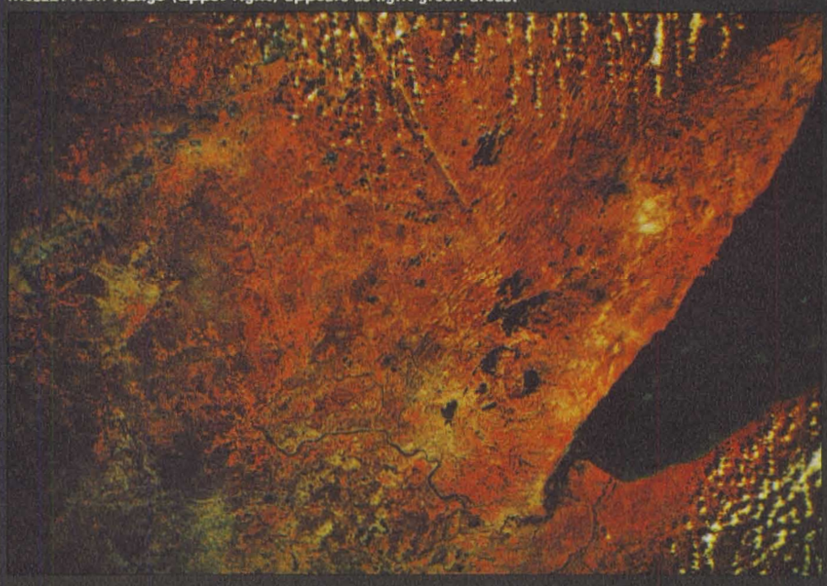
Different wavelengths of energy enhance different objects. Healthy vegetation reflects infrared energy rather well, while stressed or dead vegetation does not. This knowledge is used today to enable scientists to detect the differences between diseased and healthy crops and trees.

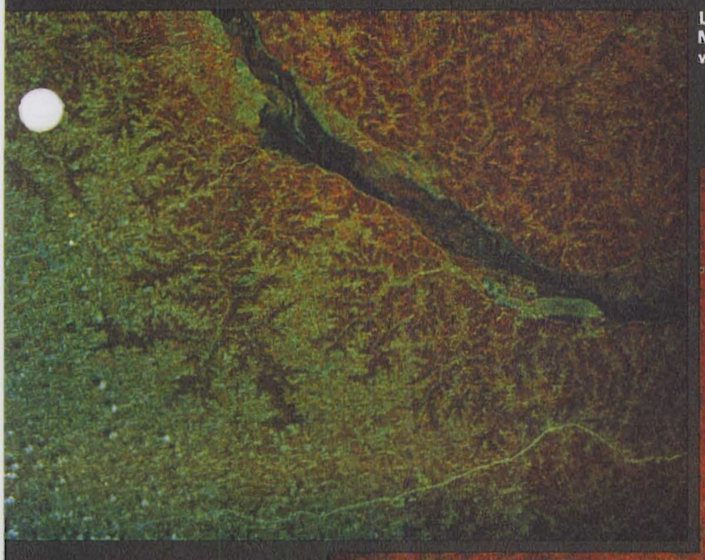
This technique and others are encompassed in the term remote sensing. Usually, remote sensing refers to detection of energy transmitted or reflected from natural resource objects on earth by aerial cameras, television, scanners, or radar in aircraft or spacecraft. It also includes the processing and interpretation of this information.

Research involving remote sensing techniques has been a long-time project with Experiment Station forest scientists. But in recent months, research in this area has taken a giant leap forward due to two developments. The first was the establishment of the Institute of Agriculture Remote Sensing Laboratory in the College of Forestry. The second was involvement of the Remote Sensing Lab in a NASA ERTS satellite project. The project enabled forest scientists and other University researchers to use data gathered by the first Earth

Left. A portion of Chippewa National Forest near Bowstring Lake appears as various shades of yellow, orange, and brown, corresponding to different types of forest vegetation in the area.

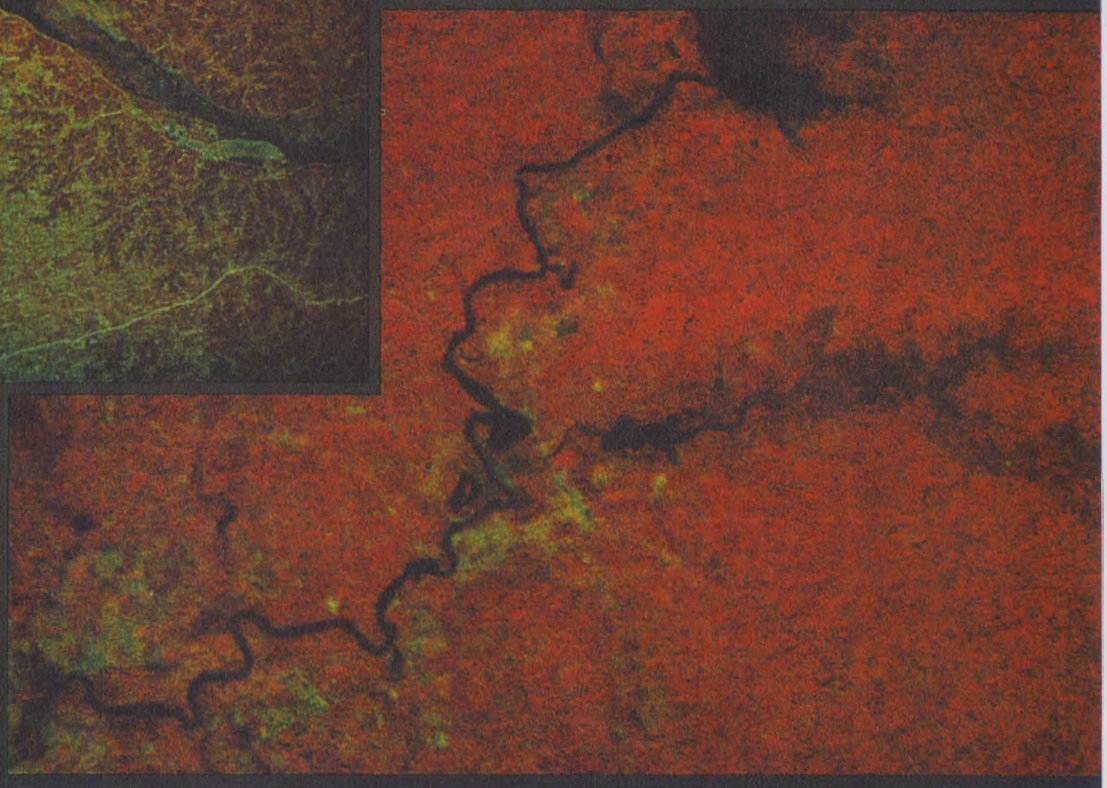
Below. A spectacular view of the tip of Lake Superior and the area north of Duluth. The Mesabi Iron Range (upper right) appears as light green areas.





Left. Winona (middle right of photo) appears light green lying adjacent to the Mississippi River. Interstate 90 is visible along bottom and clouds appear as white spots in lower left.

Below. Live and healthy vegetation neighboring Eau Claire and Chippewa Falls, Wisconsin causes most of this photograph to appear red. The Chippewa River runs diagonally to lower left.



resources technology satellite (known as ERTS-A). The $112 million spacecraft was launched into a near-polar orbit July 23, 1972. It circles the earth every 103 minutes at an altitude of about 570 miles.

Aboard the orbiting satellite is a wide array of sophisticated electronic gear: a scanning device sensitive to four different wavelength bands of light, a three-camera return beam vidicon (similar to TV cameras), tape recorders, radio transmitters and receivers. This package of complex equipment scans an area approximately 115 by 115 miles as it passes over the earth. Any point on the earth's surface is imaged every 18 days at the same hour. Its sensors pick up and analyze different intensities of light reflectance from the ground and vegetation below. These differences are sensed and converted electronically to digits: the more intense the light reflected, the higher the number. Millions of these numbers are either recorded and stored for later transmission or beamed directly back to one of the receiving stations around the globe or to one of three stations in the United States, either Fairbanks, Alaska; Goldstone, California; or Greenbelt, Maryland. There, data are fed into computers or photographed on electron beam recorders to produce a composite photograph-like image from the numerical signals.

The spacecraft was originally designed to view the earth with two systems, one using television cameras and the other a set of light reflectance scanners. However, the TV cameras developed a power problem. As a result the Remote Sensing Lab is only receiving data from the scanning system. This was of great concern initially since the sharpest images were expected to come from the television cameras.

Despite this initial setback, our staff has been pleasantly surprised to find that even though television imagery is not being received, scanner data are extremely good. A measure of the quality of scanner imagery was evidenced by the Lab's study of a hardwood forest in southeast Minnesota. It was discovered that a small woodlot of trees measuring about 5 acres was detectable on the imagery.

Despite the satellite's extremely high altitude, surprisingly small ground detail is sometimes visible. In one study area in the Chippewa National Forest, it was possible to recognize different plant communities of trees in large groups extremely well. Hardwood trees such as aspen, maple, or basswood show up as beige areas; conifer trees such as pine, spruce, and fir show up as dark brown areas; grass, shrubs, and some crops show up as orange areas; water appears black or dark blue; man developed areas show up as green; and mines and tailings appear white.

The image signals received by the NASA data processing facility are recorded on 70 mm film transparencies. These films are then passed on to field project locations, such as the Remote Sensing Lab, for analysis. Plant pathologists, entomologists, soil scientists, wildlife specialists, and economists have joined in to apply the findings to areas other than strictly forestry.

The satellite imagery is being studied in the Remote Sensing Lab to determine water quality in forested areas of Itasca County; to determine forest land-use status and change in portions of the Chippewa National Forest, southern Koochiching County, Superior National Forest, Itasca State Park and surrounding areas, and the hardwood forest of southeastern Minnesota; to classify and map forest types and wildlife habitat in most of the areas mentioned; to detect and assess tree disease in forested areas; to detect and analyze saline soils in the Red River Valley; and to analyze land-use conflicts on selected forest and rangeland areas in Montana.

The Remote Sensing Lab has a fairly complete line of equipment to analyze imagery from the spacecraft. An additive color viewer enables our staff to make color composite images from many different black and white images and to enhance the differences between objects. An image analyzer permits us to enhance the film images to a greater extent. Each gradation of red, blue, green, and near-infrared light tells a story of the land lying nearly 600 miles below.

A second ERTS spacecraft is scheduled for launch in May 1976. The second satellite is expected to have the same type of sensors, but of better quality, and an additional sensor to detect thermal infrared energy. It is anticipated that it will be possible to pick out objects as small as 90 to 100 feet in diameter with the TV cameras. The infrared scanner will detect differences in heat energy of objects.

Despite the promise shown by ERTS imagery, remote sensing is not a total solution for many pollution and agricultural problems that plague man. Many people believe that remote sensing using satellite photographs will detect all crop disease catastrophies that happen around the world before they become serious. But by the time the crop disease or infestation is detectable on space photography, it may be too late to start an effective control program.

However, remote sensing is being used successfully for many tasks. For example, one of the Lab's projects involves assisting the U.S. Department of Interior's Bureau of Land Management in the survey of the surface resource values of a 1,500 square-mile area in southeastern Montana, which is underlain by strippable coal. The land is largely privately owned, but mineral rights are retained by the federal government, which has the responsibility for determining if, when, where, and how exploitation is to be accomplished. High altitude color infrared aerial photography is being used to locate and evaluate surface resources of the region such as livestock forage, wildlife habitat, forests, scenic areas, and archeological sites. This information is being used to determine specific areas where strip mining might be allowed and how it can be done with minimum damage to the environment.

In other projects the Remote Sensing Lab is working with the State Planning Agency and the Center for Urban and Regional Affairs in an attempt to classify land-use areas for the State, and with the Space Science Center to detect the spread of forest insect and disease infestations. Another project with Honeywell is investigating the possibility of automating the interpretation process from satellite imagery.

Besides the practical value in providing information for resource management decisions, the Remote Sensing Lab trains as many as 350 students per year in aerial photography and remote sensing techniques. Students come from many disciplines to take advantage of this training: wildlife, soils, geography, plant pathology, landscape architecture, resource community development, ecology, and forestry. With continuing improvement in remote sensing equipment and a growing body of research information, the future of remote sensing as a tool to manage the Earth's resources seems promising.

HOUSING SHORTAGE

(Continued from page 7)

sume increasing importance in the U.S. because of the shortage of skilled labor. The original attraction of factory housing was reduced costs, but transportation costs from factory to site, plant overhead, and profit often cancel savings on labor and materials. Factory built housing may still be the only answer to a serious labor shortage. An estimated 1 million additional man-years of labor will be needed in housing and other construction by 1975. Housing factories can standardize many skilled operations. Factories also have greater potential to produce more housing by using less skilled workers who are more numerous. Industrialization will undoubtedly lead to new structural systems and concepts. New materials and combinations of materials will be used to provide better and less costly housing.

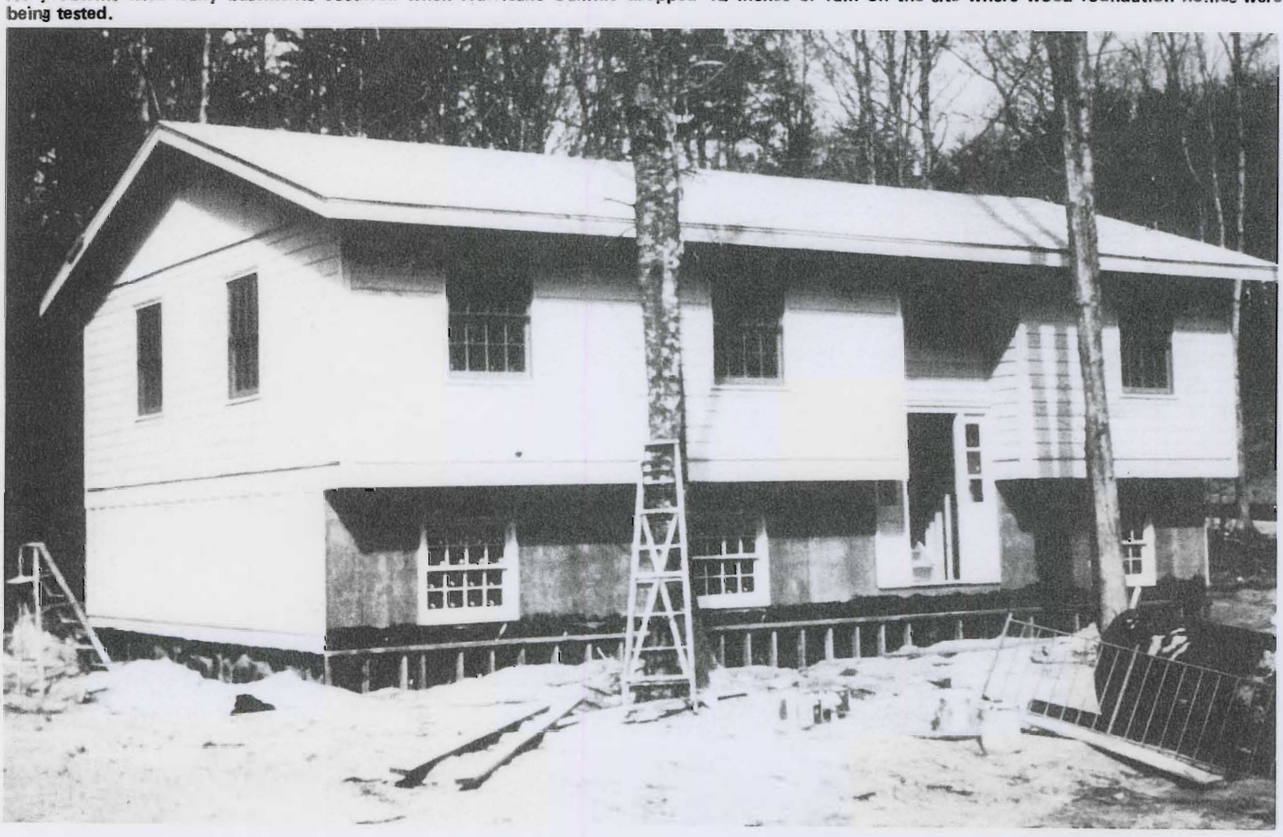
Since U.S. systems set the patterns for housing that will be adapted by developing nations, extra care must be taken in research and development of new ideas to insure safety standards and ecological commitments are met.

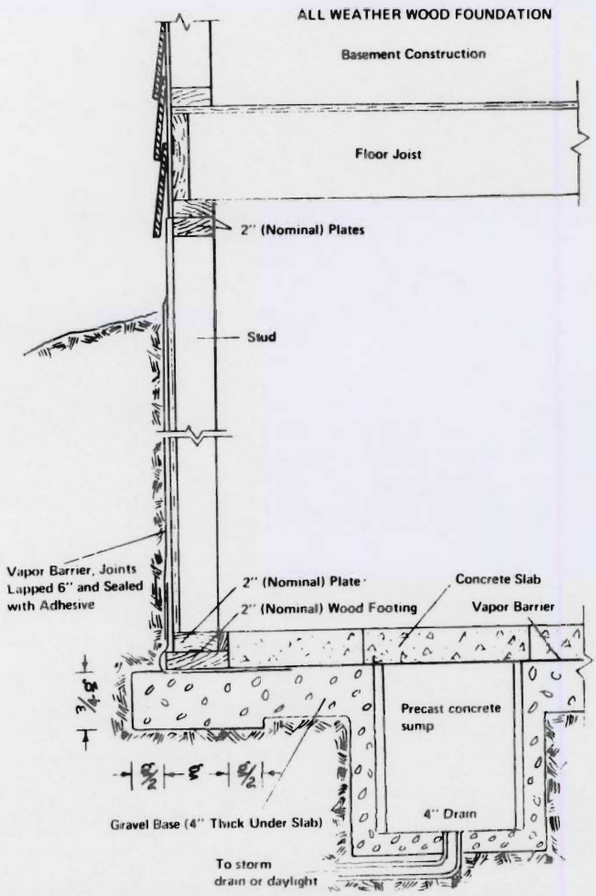
All Weather Wood Foundations

A recent development that might benefit the housing industry is the all weather wood foundation system. This innovation has been shown to be practical in actual house construction. The all weather foundation system is fabricated of pressure-treated lumber and plywood, either on the site or in a factory. Pressure-treated wood footing plates rest on a 4"

All weather wood foundations eliminate the need for concrete in homes. Pressure-treated wood footing plates rest on a 4-inch or thicker bed of gravel.

Pressure-treated plywood walls saved approximately $280 in materials and 60 man-hours in construction time at a Lexington, Maryland test site. No problems with leaky basements occurred when Hurricane Camille dropped 12 inches of rain on the site where wood foundation homes were being tested.





Cross section of the all weather wood foundation. The drainage system under the concrete slab floor includes a sump with a positive drain.

or thicker bed of gravel. This eliminates the need for concrete at all, except for a 3" thick concrete basement floor if it is preferred. Wood foundation systems reduce possible delays due to inclement weather, result in cost savings for both materials and labor, and provide more comfortable living in the basement area.

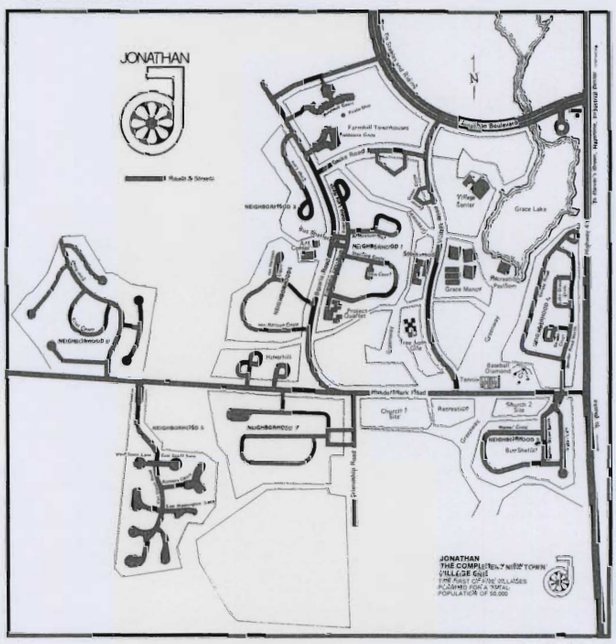
A 1969 research project compared results and performance of three pressure-treated wood basement foundations with a concrete block basement foundation. Wood foundation panels were constructed by Kingsberry Homes in their plant at Emporia, Virginia. Panels were erected in a housing project at Lexington, Maryland in April 1969. The site was too wet and muddy to build the control masonry foundation. Using a group timing technique to record the labor content of each operation, it was determined that the wood foundation saved approximately $280 in materials and eliminated 60 man-hours of construction time on a single house. According to the builder, the wood foundation houses have been subjected to adverse weather conditions since they were constructed, including a 12-inch rain that fell in a 24-hour period from Hurricane Camille. Much flooding and damage to other houses occurred in the Lexington Park area. During this time, houses with wood foundations were occupied, and families lived comfortably with no problems from leaky basements. The unique drainage system in the wood foundation homes, including a sump with a positive drain to a storm sewer, allowed them to remain dry while other basements flooded.

Planned Unit Development

The American Wood Council is currently active in Planned Unit Development (PUD). The PUD involves a variety of housing types and related community facilities such as schools, churches, recreational buildings, and shopping centers for new towns or large-scale suburban developments. An example of this type of development is Jonathan, a new town near Chaska, Minnesota. PUD uses a cluster concept to attain high density and prevent suburban sprawl. Pleasant architectural effects are being achieved with wood structures that blend in with existing terrain and natural land features. Skilled architectural designs with wood could provide homes with individuality for the 701,000 families that reach potential home-buying age each year.

The forest products industry has exhibited a long-time interest in housing and will have a large role to play in alleviating the U.S. housing shortage. Their past record, together with the fact that wood is a renewable resource, places the industry in a favorable position to continue its effort to house the nation.

Planned Unit Development (PUD), such as the new town of Jonathan, Minnesota, involves a variety of housing types and community facilities. Homes are clustered to attain high density and to avoid urban sprawl. Architecture is designed to blend in with the existing terrain and natural features.



WILD RICE
Historic Commodity Under Study

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Research on a slender, round, purplish-black grain could give several northern Minnesota communities a major economic boost. The grain crop in question is wild rice, sometimes called Indian rice or water oats. The expensive delicacy was once the staple food of Sioux and Chippewa Indians.

Today, Minnesota ranks first in worldwide wild rice production. But University researchers question how long the state can keep a corner on the market if several problems are not solved. At one time, Minnesota had 90 percent of the world's wild rice market. Now it produces about two-thirds of the world's supply of this precious grain.

Minnesota Indians still harvest wild rice in the same way as their ancestors did centuries past—in shallow waters usually less than 3 feet deep. Wild rice seeds lie dormant on lake bottoms during winter and germinate in spring. Resulting

plants produce more seeds, some that ripen late in August, and others that ripen at different times and fall off plants as they mature.

Wild rice is always hand-harvested from public waters by the canoe-and-flail method. State licenses are required to harvest, buy, and process wild rice from public waters.

In recent years wild rice has also been grown commercially in man-made paddies and harvested with mechanized equipment. It is still cleaned the same way as rice taken from lakes and rivers. But 1 acre in a constructed paddy yields six to ten times as much wild rice as a natural stand. Even though commercial wild rice production is relatively new, prospects are excellent for its continued success, say University researchers.

Grower Survey

During 1971, about 18,000 acres of wild rice was grown commercially in the state. Most of this cultivation took place in north central and northeastern Minnesota, including the Aitkin, Grand Rapids, Waskish, and Clearbrook-Fosston-Gonvick areas. These areas are largely dependent on tourism and could benefit from a more diversified economy, according to University agronomist Ervin Oelke. Wild rice sells for about $4.80 a pound at the supermarket. At present prices, development of commercial wild rice paddies is expected to continue its steady increase.

Commercial wild rice production in Minnesota generally is on fairly inexpensive land, but diking and leveling this undeveloped acreage greatly increases the grower's initial costs. An Experiment Station survey sponsored by the University's Agricultural Extension Service and Wild Rice Growers Association shows the average cost for establishing rice paddies was $167 an acre. These operations include land clearing, soil preparation, diking, water pumping systems, and fertilizer.

All wild rice growers who applied for state water permits to plant the grain were surveyed. Thirty-nine of 94 growers who were contacted returned survey forms. The survey revealed that average equipment cost per acre expected in 1972 was $209. Payrolls for commercial wild rice operations varied considerably—from nothing to $51,000 a year. Average payroll per acre in production in 1971 was $45.50.

Besides more jobs on the farm—equipment sales and maintenance, harvesting, and processing provide other opportunities for employment and higher incomes in wild rice growing areas, Oelke says.

Nine of the 36 growers indicated they started new businesses related to wild rice production because of commercial wild rice development. Some businesses were in marketing and others in equipment and supplies. Most growers indicated land values have increased considerably in their areas due to wild rice production. One said land values have increased 300 to 500 percent during the past 5 years.

University scientists who analyzed comments made by Minnesota growers concluded that research is needed on all aspects of wild rice production. Production problems cited by growers include diseases, insects, weeds, blackbirds, fertilizing practices, overly thick stands in the second year, proper water levels, losses from shattered wild rice seed, and improper harvesting equipment for wet soils. Many of these problems could be solved by better wild rice varieties. Other problems involve financing and marketing the grain.

Improving Wild Rice

Since 1960, University scientists have recognized problems impeding wild rice production and have pressed for needed research.

Recently funded research seeks to develop improved varieties, seeding rates and techniques, thinning methods for second and succeeding year paddies, fertilizer use, and control of insects and weeds.

Plant breeder Anson Elliott is collecting wild rice seed from natural stands and crossing them with presently available varieties in an attempt to "breed out" problems characteristic of wild rice:

Shattering of grain. This results in plant populations that are too thick the second and succeeding years.

Susceptibility to disease. Plant pathologists will assist in developing disease-resistant varieties.

Delayed growth or seed dormancy. Seeds fall into the shallow water in autumn but don't always germinate the next spring. Dormancy makes it difficult to change from an inferior to superior type of rice in a paddy.

Late maturity. Late season production hazards could be avoided with an early maturing type. New varieties would also provide a longer harvesting season.

Long plant stems. Shorter plants that stand better and are better adapted to machine harvesting are needed.

Disease and Insect Control

Plant pathologists Milton Kernkamp and Robert Kroll are observing, collecting, and attempting to identify causes of diseased plants in commercial and wild stands. They are studying the life cycle of various diseases and how plants are affected by disease organisms. Fumigation is being researched as a means of controlling disease, since a primary infection source is field debris.

Plant pathologists are studying stem rot organisms at plots developed last fall at the Grand Rapids Experiment Station. Chemical control of leaf blight and the effect of plant density of disease incidence is also being researched at Grand Rapids.

Plant breeders are looking at all aspects of production, including the best time to thin plants, methods of thinning (cutting vs. pulling), seeding depths, time of planting, tilling methods, use of herbicides in paddies, use of dikes, the relationship between fertility and plant populations, and the distribution of seed in the soil of three- and four-year-old paddies. Cultural studies will make use of individual growers' fields in addition to the Grand Rapids plots.

Other questions facing researchers are how to get rid of seeds so they won't grow the following year and the amount of water needed per acre of wild rice. Seed dormancy and storage problems are being studied this winter.

Entomologist David Noetzel is comparing application rates and timing of chemicals to control the wild rice worm which eats the developing kernel. He is also studying the use of a combination insecticide-bactericide for wild rice worm control and other chemicals to control the midge. Larvae of this insect attach themselves to the seedlings and eat the plant's leaves before they emerge from the water. A survey of other insects present in wild rice are being surveyed by the entomologist.

All these research efforts will attempt to reverse biological trends limiting the potential of wild rice. The outcome should insure that wild rice continues to be a major economic stimulant in northeast and north central Minnesota.

WELFARE FAMILIES
A Lopsided Stereotype

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The general public has an inaccurate image of mothers receiving Aid to Families with Dependent Children (AFDC), according to the first section of an Experiment Station research study of Hennepin County AFDC recipients.

The study was conducted by Margaret P. Grindereng, head of the Department of Textiles and Clothing. It confirmed some earlier findings regarding stereotyped attitudes toward AFDC recipients. Evidence from Ms. Grindereng's research debunks the notion that AFDC rolls are loaded with "welfare loafers." About 29 percent of the mothers in a random sample of 100 Hennepin County families were working when the study was conducted. Of this group, almost 55 percent were employed full time when interviewed. Employment was highest for women living in suburbs whose children were over 11 years old and who had only one or two children at home.

An overwhelming majority of the unemployed women said that if adequate child care were available, they would be interested in obtaining employment. Even given the unattractive possibility of giving up AFDC medical aid and the added costs involved in employment (transportation, meals, clothing, and possibly child care), 80 percent of the unemployed expressed a desire for employment.

The often-heard charge that AFDC encourages women to have children out of wedlock and encourages fathers to desert their families appears unfounded. The study revealed that only slightly more than five percent of the sample were unmarried and two and one-half percent had been deserted.

Marital instability is another characteristic often attributed to welfare recipients. Ms. Grindereng's study shows that for almost 77 percent of the respondents it was the first marriage and for 67 percent it was the first and only marriage for both partners.

Another common charge leveled against AFDC recipients is that they are destined to remain on public welfare rolls indefinitely. But the research study showed that 57 percent of the respondents had been on the program for less than 3 years. For 74 percent, it was their first experience as AFDC recipients.

An overwhelming majority—82 percent of the women surveyed—said they would be able to go off the program in the future. Families with five or more children and families on AFDC for more than 3 years were less optimistic about going off relief, Ms. Grindereng says.

Only 18 percent of the families surveyed—22 percent in city and 15 percent in the suburbs—had parents who had received AFDC. But almost 38 percent of the families surveyed—51 percent in the city and 25 percent in the suburbs—had relatives who had received AFDC payments.

Smaller families in this study remained on AFDC rolls longer: Forty percent of the families with only one or two children had been on the program for 5 or more years. Families with three or four children made up 26 percent of this group and 15 percent were families with five or more children.

An assumption frequently made about welfare recipients is that they were born in the South and moved north to take advantage of better welfare benefits. However, of the 25 percent who lived in another state some time during the past decade, only about 6 percent moved to Minnesota from southeastern states. Some women who lived in another state during this time were born in Minnesota. They lived in another state for a limited time only because of their husband's employment, the research revealed.

Welfare recipients were predominantly white, but minority groups were disproportionately represented on AFDC rolls compared to the total Hennepin County population.

Often welfare recipients are pictured as little more than wandering gypsies. A majority of the women in this study sample—61 percent—had lived in their community for 10 years or more. Only 5 percent had lived in the community for less than a year. But while many women had stable residential patterns related to a particular community, their change of address within the community indicated less stability. Thirty-five percent of the families lived at their present address for less than a year and only about 23 percent lived at their present address for 5 years or more.

Ms. Grindereng's research shows that it's not fair to assume that all AFDC mothers have little or no education. A third of the women in the sample received some type of training outside of high school and college. Most of the training was in business or vocational schools or through adult education classes.

Inadequate Clothing Allowances

Clothing allowances for AFDC families should be based on current data so that grants truly represent at least a "mini-

mum" subsistence level and not something below that figure, Ms. Grindereng says.

"Clothing allowances have been the target of repeated complaints by AFDC mothers. Many of their complaints seem justified or at least worthy of study," she adds.

The present monthly $8.25 clothing allowance which was raised from $7 in July 1969, is a fixed amount. Before 1966, clothing allowances in Minnesota were figured on a sliding scale by age and sex categories. The sliding scale was eliminated to simplify the intake procedure and reduce errors in computation. But it also reduced the grant for older children while increasing it for younger ones, Ms. Grindereng says.

AFDC clothing allowance dollar amounts are based on three criteria: (1) the number of items considered "minimum" for each major apparel category; (2) the rate of replacement considered "normal" for these items; and (3) the minimum cost of each item, which is checked periodically in local markets by welfare agencies. Occasionally, the apparel category costs are updated.

Minimum number of items, replacement rates, and major clothing categories are established through studies of wardrobe inventories and family clothing purchases through the county. But most of these studies were conducted in the 1940's. The last Minnesota study was completed in 1949. "There is reason to question whether or not these studies still represent the normal patterns of clothing expenditures or wardrobes for people in the 1970's," she says.

The life expectancies of many clothing items have been shortened by easy-care finishes. These finishes, in many cases, have also increased the cost of clothing. It is also quite possible that replacement rates for clothing have accelerated during the past 30 years since it is almost impossible to find many clothing items without easy-care features, Ms. Grindereng says.

AFDC mothers in 1964 and 1965 began meeting with Twin Cities area public welfare agency administrators to request increases in the clothing allowances. In 1969, AFDC mothers staged sit-ins at the Hennepin County welfare office. During 1970 and 1971, protests, marches, and rallies were held in the Twin Cities to focus attention on the clothing grants, which mothers felt were insufficient to provide adequately for their families.

Emergency allowances above $8.25 per person a month can be made when clothing is lost, stolen, or damaged beyond repair. But funds available for emergencies are limited. Minnesota does not have special allowances, as some other states do, for winter or back-to-school clothing where need can be shown. Until 1968, Minnesota had a supplemental fund for special clothing needs, such as for graduation exercises, confirmations, or scouting. But this fund is no longer in existence.

In Hennepin County a small supplemental fund for gym needs for grade school children was lowered in 1972 from $5 to $3 for students in grades 1-6 and from $15 to $9 for children in grades 7-12.

Ms. Grindereng cites the importance of adequate clothing for emotional and social well being as well as protection against the weather. Studies have shown that many students refuse to go out or participate in social activities because of inadequate or inappropriate clothing. This can be critical in adolescence when acceptance by a youngster's contemporaries is very important.

"Whether or not the clothing allowance is sufficient for most AFDC children to participate in the range of social activities common to their peers is open to question. In some cases, it has been demonstrated to be insufficient for them even to attend classes in schools.

"Since clothing allowances have most frequently been the target of complaints by AFDC recipients, a study of the basis for these allowances seems important to determine if the allowance is in fact a weak link in the total budget chain," she says.

A budget designed to meet a minimum subsistence level leaves no margin for error. An additional strain is put on the family's money management if they miscalculate a basic budget category. The AFDC family generally must "borrow" the difference from funds provided for another basic category to compensate for an error in another category.

"The psychological and social stresses characteristically present in so many AFDC families may be increased by the hopelessness of providing even minimum standards in all basic budget categories," she says.

Studies have indicated that age and sex make a difference in clothing needs. The number of children in a family and the sex sequence of the children also affects clothing requirements. Where the family lives may have a bearing on its clothing problems. At present only 20 percent of the total Hennepin County AFDC case load lives in the suburbs, but that percentage is on the rise.

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