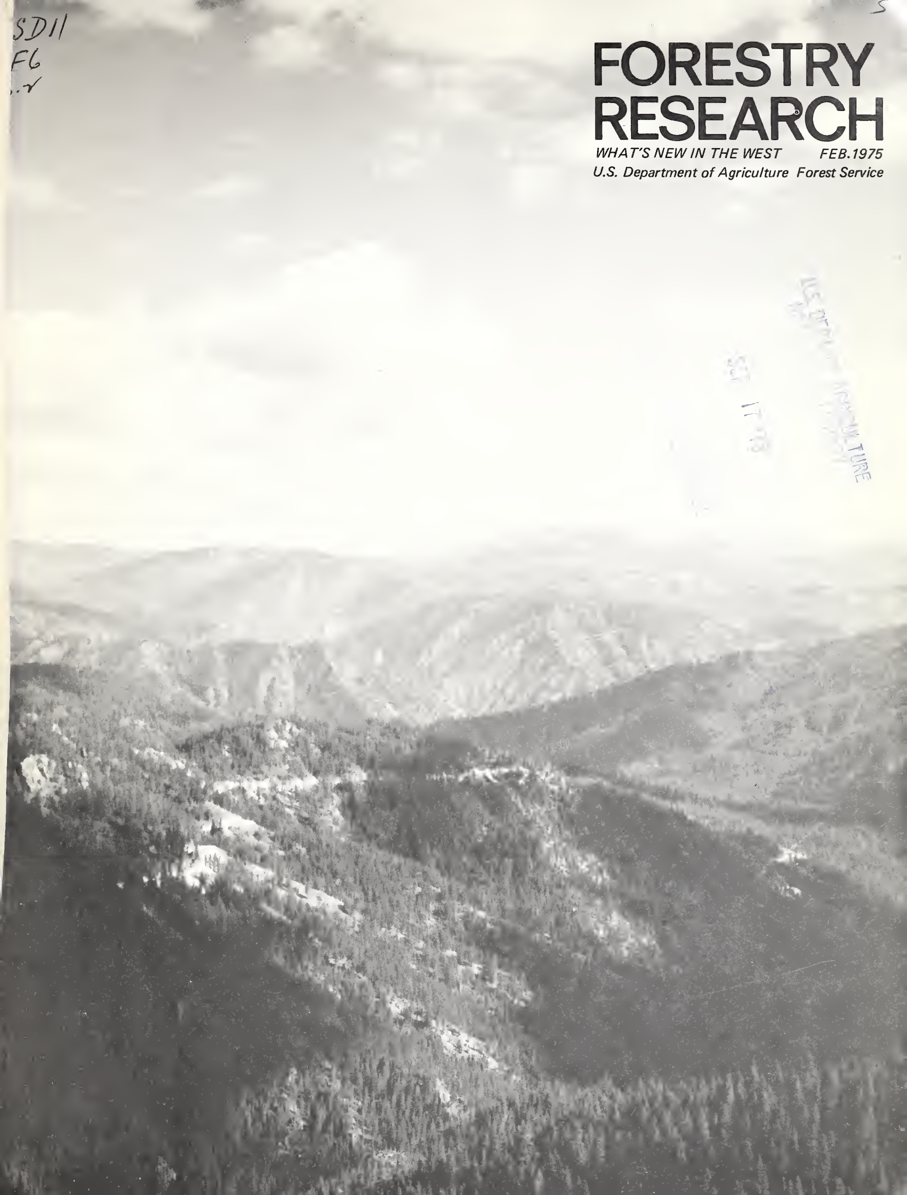
FORESTRY RESEARCH

WHAT'S NEW IN THE WEST FEB.1975

U.S. Department of Agriculture Forest Service



a note to you

On the cover — a portion of the Idaho Batholith, drained by the South Fork of the Salmon River (see story, page 3).

FORESTRY RESEARCH: What's New in the West, is a report on the work of the USDA Forest Service's four Forest and Range Experiment Stations in the West. These research centers are: Rocky Mountain (North Dakota, South Dakota, Nebraska, Kansas, Colorado, Arizona, New Mexico, and part of Wyoming, Oklahoma, and Texas); Intermountain (Montana, Idaho, Utah, Nevada, and part of Wyoming and Washington); Pacific Northwest (Alaska, Oregon, and part of Washington); and Pacific Southwest (California, Hawaii, Guam and American Samoa).

some credits

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our addresses

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Logging the Idaho Batholith

If you want to learn how to harvest and how not to harvest timber over much of the mountainous West, the Idaho Batholith provides an excellent laboratory. Covering about 16,000 square miles in central Idaho where it spans portions of six National Forests, the Idaho Batholith is larger than New Hampshire, Delaware, and Connecticut combined. The climate can be desert-like in summer, Arctic in winter. Much of the Batholith is A-frame-steep, granitic rock covered by shallow soil that slides, washes, or blows when man or nature strips away the trees, shrubs, and grasses that have become adapted to this harsh environment.

Over much of the Batholith the protective blanket of vegetation is kept thin and threadbare by too much sun and wind. A soaking rain, or a hunter's Jeep, can inflict wounds that eventually start the mountain sliding down. Some of the logging done here more than a decade ago, for example, started massive landslides. Although the destructive logging practices were stopped, protests about the damage done to the Batholith continue today.

Many of the slopes still offer Douglas-fir and ponderosa pine ripe for the mill. So, a team of scientists from the Intermountain Forest and Range Experiment Station (INT) is currently probing the effects of various logging practices on this fragile forest environment. Team leader is Dr. Walter E. Megahan; his group is from Intermountain's Forestry Sciences Laboratory in Boise.

◄ Well-fractured, slightly weathered rock, Idaho Batholith

Because erosion and stream sedimentation are two major hazards on the Batholith, these were the first targets of INT scientists. In 1972, Dr. Megahan and Walter J. Kidd reported in the *Journal of Forestry* that skidding logs from stump to truck increased stream sedimentation only slightly over the natural level. The authors also compared the amount of sedimentation caused by two different skidding methods — the skyline system, a portable aerial tramway that keeps logs off the ground much of the time; and the jammer, a mobile winch that drags logs along the ground. The authors concluded that there was no difference in the amount of sedimentation created by the two systems.

Sediment increase

The main increase in sedimentation, reported the scientists, came not from skidding logs, but from building the network of roads required to move the jammer within reach of felled trees. Roadbuilding increased sediment production an average of 750 times over the natural rate for the 6-year period following construction. Among the remedial measures recommended were planning timber sales to keep roadbuilding to a minimum and avoiding erosion-prone areas.

In a following research paper (INT-123-FR3), Megahan and Kidd explored in greater detail the relationship between roadbuilding and erosion. Surface erosion, they reported, was very high immediately following road construction, but decreased very rapidly thereafter. More than 90 percent of the erosion measured for the 6-year study period occurred during the first 2 years. Similar trends have been found elsewhere in the Batholith. The scientists believe that road erosion can be reduced by applying control measures immediately after the road is constructed and protecting the soil surface until vegetation becomes established.

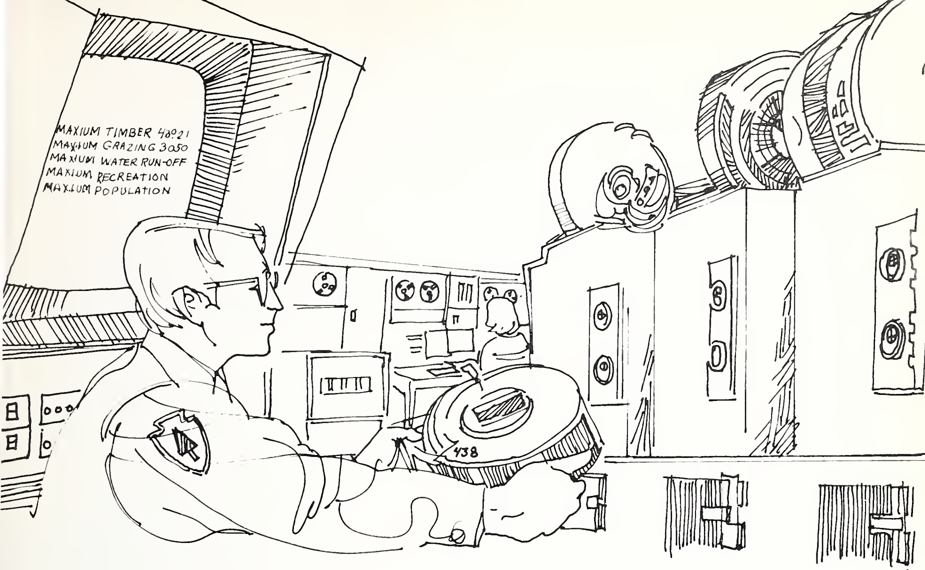
Studies have shown that excessive erosion need not be an inevitable consequence of road construction. Mulching, coupled with reseeding or transplanting, can reduce surface erosion rates by more than 95 percent. Transplanting deep-rooted shrubs and trees offers the additional benefit of reducing the landslide hazard on roadfills. Survival of ponderosa pine planted on roadfills has averaged 97 percent 4 years after planting.

Working with what they have discovered so far, Dr. Megahan and his scientists are looking deeper into the erosion and sedimentation phenomena in the Batholith. They have learned that from June through September, the period of most intense rainfall, erosion rates on roadfills are three times greater than at any other time of year. Erosion occurs during the drier months as well. Over a 4-year study period, about 20 percent of the roadfill erosion that occurred during the summer and early fall happened when there was no rainfall. During 2 of the years sampled, more than 50 percent of the total erosion occurred during periods when it did not rain. The soil was carried away by "dry creep," a form of wind erosion usually thought to be a serious problem on the Great Plains, not the forested mountains of Idaho.

Also in progress is a cooperative study between INT scientists and Dr. Delon Hampton, Howard University, Washington, D.C., aimed at identifying the basic physical, chemical, and hydrological properties of both soil and bedrock. From data gathered thus far, James L. Clayton and John F. Arnold have developed a method for classifying the weathering and fracturing properties of granitic rocks. The technique, described in General Technical Report INT-2-FR3, can help identify areas where massive landslides might occur after roadbuilding or logging.

Silver Creek study

What about effects of logging other than erosion? In cooperation with forest managers on the Boise National Forest, a 2,200-acre study area has been set up in the Silver Creek drainage, north of Boise. Here Dr. Megahan and his scientists will try to find out how logging and the attendant road construction affect cycling of soil nutrients, wildlife (including birds and small mammals), reforestation, streamflow and water chemistry, productivity of the residual timber stand, patterns of vegetative succession, aquatic insect populations, and many other facets of forest communities. Specialists in forestry, range and wildlife ecology, hydrology, soil science, and silviculture will do the study. Scientists stationed at Forestry Sciences Laboratories in Missoula, Montana, Bozeman, Montana, and Moscow, Idaho, will also participate (see p. 15).



Tools for land-use planning

Can the dollar value of resource commodities such as wood, water, and forage be determined? Is it possible to assign meaningful values to non-market products and amenities such as wildlife habitat and scenery? How can the assignment of values to your resources help you with your multiple-use land planning?

Economists of the Rocky Mountain Forest and Range Experiment Station watershed evaluation project at Tucson, Arizona, believe there are answers to these questions — answers that can be shaped into planning tools.

A number of multiple-use planning tools are being developed in the western United States. Several of these are models designed to predict the ability of land to generate desired levels of resources at minimal management expense.

The economists at Tucson are adding to the utility of these models by devising ways and means to ascertain the worth of forest resources to the public. Their objective is to incorporate public demands, impacts, and concerns, as well as the productive capabilities of the land, into the planning process. (see p. 10)

Planners look ahead with VIEWIT

▼ Foresters Bob Addison (left) and Gary Morrison (right) used VIEWIT for the Big Sur Unit, Los Padres National Forest

Sometimes it's difficult to predict how a new road, timber sale, or other proposed use will affect the way a forest landscape looks. Some planners are finding that a computer program known as VIEWIT is useful to them when they need to know what sort of visual impact a project will have.

VIEWIT, first put together 8 years ago, has since that time been refined and tested on more than 2 million acres of forest land in the Western U.S. The VIEWIT package was developed by researchers at the Pacific Southwest Station and by the people in the National Forest System who have used the program and have suggested many of the options VIEWIT now incorporates.

Most popular of the VIEWIT offerings is the seen-area analysis. Here's how it works. Let's say the VIEWIT user wants to know exactly what (and how much) forest terrain can be seen by someone standing at an observation point. The vantage point the user selects could be a fire tower, or a proposed location for a highway turn-out, or some similar outlook. Once the user gives the computer the required information about the forest terrain, and a set of instructions, the computer can perform the analysis, and display the results, in a few seconds.

Using only one observer point is seen-area analysis at its simplest. It's possible for the user to submit requests for much more complicated analyses because the VIEWIT program can accommodate a lot more observer points. For example, let's say the VIEWIT user has drawn up three alternative routes for a proposed forest road. By stringing observer points along each route, the user can define the alternative roads for the computer. Then, the user can instruct the computer to display the location and the amount of forest terrain that could be seen by visitors traveling along each of the proposed routes.

Two of the scientists who have helped develop the VIEWIT program are Gary Elsner and Elliot Amidon of the Pacific Southwest Station. They say the VIEWIT seen-area analyses are somewhat like the line-of-sight surveys that the military uses.

In order to run a seen-area analysis, or to use any of the other VIEWIT options, the planner needs to:

- divide the study area up into small, uniform units called "terrain cells" and to
- digitize each cell's elevation, so the elevation will be in a format that can be read by computer.

It's up to the user to decide how much actual terrain each cell represents. One group that wanted a very detailed VIEWIT analysis used cells that represented less than one acre per cell. Another team used cells that took in more than 10 acres per cell.

There are a lot of different ways to get elevation data digitized. Some people have done the work themselves, using a digitizer and 7½-minute topographical maps prepared by the U.S. Geological Survey. Others have arranged for someone outside their organization to provide magnetic tapes of terrain data.

Each of the VIEWIT printouts is based upon the terrain cell format. The types of printouts available to the user are: the grey-scale map, in which different shades of grey indicate the information the user requested; the numeric map, or tables.

VIEWIT currently includes about 14 different options. A planner, for example, can use VIEWIT to determine how many times (or what percentage of times) observers will see each cell. Or, the user can get a VIEWIT printout that indicates the aspect of each cell in relation to the prospective observer. In this analysis, the computer assigns from zero to 10 points to each cell: a cell facing an observer head-on, for example, is going to have more visual impact –– and thus more points –– than a cell which is oriented away from the viewer. Using other instructions, the planner can get a printout of the slope class of each cell. (see p. 15)

What makes deer choosy eaters?

In the woods foresters try to prevent excessive animal damage to young trees. But at a research site in Olympia, Washington, forest scientists step out of the laboratory to watch deer browsing on young trees in nearby pens.

The deer are confined in large experimental areas as part of a research effort to find solutions to the problems of animal damage to trees in Northwest forests.

One of the scientists in the three-man research team at Olympia is M. A. Radwan, a plant physiologist and chemist. Radwan's colleagues are Glenn Crouch, project leader, and Ned Dimock, silviculturist.

Radwan originally worked in the broad area of animal damage –– including that caused by rabbits, bear, deer, and mice. In recent years, however, he has concentrated on the problem of black-tailed deer browsing on Douglas-fir trees. One objective is to find out if it is possible to breed Douglas-fir trees that are resistant to nibbling by deer. Even if complete resistance is not accomplished, the scientists should learn enough to help foresters get young seedlings beyond the deer browsing years more quickly.

The researchers think the answer to resistance lies in chemistry. For years, it has been observed that deer like some species more than others. Glenn Crouch, for example, has found that deer prefer Douglas-fir to red alder, and red alder to vine maple in winter. Even within a species, some trees are browsed more often than others.

"The trees within a species all look pretty much the same," Radwan says, "so there must be some chemical variation that causes the difference in animal preference." His job is to find out what the variation is. Right now, he's looking for "chemical indicators of resistance," or those compounds which occur in larger quantities in resistant trees.

Scientists begin their study of a problem with the literature already published on the subject. Some of the current studies of deer browsing indicate that plants high in protein and sugar (therefore more nutritious) are more likely to be browsed heavily. Radwan pooh-poohs this "theory of nutritional wisdom."

▼ PNW chemist and plant physiologist M. A. Radwan

▲ This chromatograph printout indicates the amount of terpene compounds in the mixture

He cites studies which show that deer frequently avoid red alder and other species that are very high in nutritive value. Some of Radwan's early papers have attempted to resolve the literature on this point. For a summary, see especially an article entitled, "Plant Characteristics Related to Feeding Preference by Black-Tailed Deer, *Journal of Wildlife Management* (38(1):32-41).

Radwan is concerned primarily with two large group of chemicals —— the phenols and terpenes. Both appear to affect preference, but it is not clear yet which is more important.

Phenols are the second largest group of plant compounds. For years, scientists have suspected that phenols affect disease and insect resistance. But these compounds have never before been studied in Douglas-fir foliage.

Phenols are detected by a simple laboratory technique in which the foliage is put into a solvent, concentrated, purified to eliminate chlorophyll, sugars, and other unneeded compounds, and applied to a filter paper. The compounds that separate out —— at different spots on the paper —— can then be analyzed by various techniques, including study under fluorescent light.

Radwan is especially excited about one of the phenolic compounds. "Imagine my delight," he says, "when we began to look at the filter paper under fluorescent light, and a bright blue color kept showing up from foliage that was susceptible to browsing." It turned out to be chlorogenic acid, a combination of caffeic and quinic acids.

Not only do deer more consistently browse trees that are high in chlorogenic acid, but they also prefer mature Douglas-fir which is even higher in chlorogenic acid than young trees. (Deer browse young trees more frequently simply because they can reach them more easily.)

Browsing preference tests have been conducted by Ned Dimock, using trees from the Soleduck Ranger District in the Olympic National Forest. This has provided a specific, but very localized sample with which to work. Radwan believes that somewhere in the vast gene pool of nature there are Douglas-fir trees that have more variation —— some that have more chlorogenic acid, others that have less. One of the next items on the research agenda is to take a larger sample of trees and try them out on deer in the pens.

Once Radwan finds the compounds which affect resistance, if these exist, there are at least three ways to use the chemicals to solve deer browsing problems. The first is to breed trees that are resistant, and use them in planting programs which favor those trees. The second technique is to use chemicals from the resistant trees as natural repellents, which could be sprayed on the trees at critical times of the year. The third is to identify an attractant which could be sprayed on nearby vegetation to encourage browsing there.

Radwan's search for factors affecting animal preference for plants is one of several studies underway at Olympia. Others of major importance involve accurately assessing the impact of damage to young trees, and investigating the opportunities for modifying silvicultural practices to reduce animal damage. □

Value tools continued

Paul F. O'Connell is working on a method to determine current and future dollar values for timber, forage, and water resources. He has successfully tested his approach in a trial estimation of the worth of these resources in Arizona's Salt-Verde Basin. O'Connell is also investigating ways to predict the impact of land management decisions on the economy and social structure of surrounding communities. The Mogollon Rim of Arizona is his test site for this research.

James M. Turner is seeking ways to predict the expense of different types and intensities of land management. His current study encompasses five different treatments to increase water yield from ponderosa pine forests on Arizona's Beaver Creek watersheds. Turner's research reveals that man and equipment hours, and total treatment costs, can be forecast from data on the basal area and other characteristics of timber planned for removal.

Ron S. Boster is concentrating on a system for measuring the importance of esthetic features on wildlands. Boster and his colleagues say a modification of the psychologists' "theory of signal detection" holds promise as a reliable technique for doing this job. It provides a means for unbiased measurement of perceptual reactions to scenic views of managed and unmanaged landscapes. The technique has been successfully tested on watersheds in the Beaver Creek drainage.

The Tucson crew is moving steadily toward refinement of the value, cost, and esthetic measures described. These value tools are of little use to land planners, however, without means to predict the productivity of the land under alternative types of management. So, other Rocky Mountain Station projects at Tempe and Flagstaff, Arizona, are providing facts on land capability. Researchers in these projects are discovering how wildlife habitat, recre-

▼ Radwan (right) and Dale Ellis (left) use a gas chromatograph to analyze the content of browse species

ation opportunities, soil productivity, fire hazard conditions, and timber, water, and forage values vary in response to an array of land treatments.

How can these production capabilities and their associated values be combined into a workable tool that will help resource administrators make land management decisions? O'Connell, leader of the economics project, says they can be organized into models — mathematical computer models that will yield a variety of management approaches to achieve desired resource production goals. Accompanying these alternatives are costs associated with each, plus the values to society of the products produced. From these figures, cost-benefit ratios may be readily calculated.

Model tests

So far, a partial model test has been run on the Woods Canyon Management Unit of the Beaver Creek watershed, Coconino National Forest. In this test, dollar values and production capabilities were assigned to timber, water, and forage. Esthetic quality and wildlife habitat values were expressed by index scales. Results of the model run are currently being analyzed. A similar experiment is planned for the Thomas Creek watersheds on the Apache National Forest.

O'Connell points out that the model his team is designing is not intended to produce "the one ultimate scheme" for managing the natural resources on any land unit. That final decision will always rest with the responsible manager. What the model will do is display alternative combinations of products the land is capable of producing, and the estimated cost of management necessary to produce each product combination. It will also provide a measure of the social and economic consequences of each management alternative. For areas where resource production is free to fluctuate with changing demands (as opposed to agency-established production goals), the model will show which of the alternative treatment patterns would result in maximum return for public dollars invested (most favorable cost/benefit ratio).

If you would like to know more about the economic decisionmaking aids being developed by the Tucson project, write to the Rocky Mountain Station for some of the following publications:

Boster, Ron S., and Terry C. Daniel. 1972. Measuring Public Responses to Vegetative Management. *In* Proc. 16th Annu. Ariz. Watershed Symp. (Phoenix, Ariz., Sept. 1972.) Ariz. Water Comm. Rep. 2, p. 38-43.

Brown, Thomas C., and Ron S. Boster. 1974. Effects of Chaparral-to-Grass Conversion on Wildfire Suppression Costs. USDA Forest Serv. Res. Pap. RM-119-FR3. 11 p.

Brown, Thomas C., Paul F. O'Connell and Alden R. Hibbert. 1974. Chaparral Conversion Potential in Arizona. Part 2: An Economic Analysis. USDA Forest Serv. Res. Pap. RM-127-FR3. 28 p.

O'Connell, Paul F. 1970. Economic Modeling in Natural Resource Planning. *In* Proc. 14th Annu. Ariz. Watershed Symp. (Phoenix, Ariz., Sept. 1970.) Ariz. State Land Dep. Ariz. Landmarks 1(2):31-38.

O'Connell, Paul F. 1972. Economics of Chaparral Management in the Southwest. *In* Watersheds in Transition. (Proc. Symp. Amer. Water Resour. Assoc., Fort Collins, Colo., June 1972.) Am. Water Resour. Assoc. Proc. Ser. 14, p. 260-266.

O'Connell, Paul F. 1972. Valuation of Timber, Forage, and Water From National Forest Lands. *Ann. Reg. Sci.* 6(2):1-14.

O'Connell, Paul F., and Ron S. Boster. 1974. Demands on National Forests Require Coordinated Planning. *Ariz. Rev.* 23(2):1-7.

O'Connell, Paul F., Ron S. Boster, and James Thompson. 1974. Recreation Uses Change Mogollon Rim Economy. *Ariz. Rev.* 23(8-9):1-7.

Turner, James M. 1974. Allocation of Forest Management Practices on Public Lands. *Ann. Reg. Sci.* 8(2):72-88.

Turner, James M., and Frederic R. Larson. 1974. Cost Analysis of Experimental Treatments on Ponderosa Pine Watersheds. USDA Forest Serv. Res. Pap. RM-116-FR3. 12 p. □

Shelterwood harvesting

It has been 12 years since the Forest Service began experimenting with shelterwood harvests in old-growth Douglas-fir in the Pacific Northwest. Originally, the system was tried in an effort to get regeneration on difficult sites (too hot, dry, or cold) where clearcutting was not satisfactory.

Now, Dick Williamson, a research forester with the PNW Station in Olympia, Washington, has taken a close look at 21 shelterwood units in western Oregon, logged between 1962 and 1968. All were at elevations between 3,000 and 5,200 feet. In addition to checking for regeneration, the researchers took a look at the survival and condition of the overstory trees left from the first logging.

Results of the study seem to support the opinion stated years ago by the noted forest scientist Leo A. Isaac –– that shelterwood harvesting is a viable alternative to clearcutting. Williamson recommends that foresters leave the most vigorous, dominant trees in the stand. This helps prevent windthrow and improves the genetic constitution of the new forest. Where protection from rather severe environmental conditions is necessary, a shelterwood stand of about 100 to 180 square feet of basal area per acre is recommended. If conditions are more favorable, a more open shelterwood or seed tree treatment may be possible.

See "Results of Shelterwood Harvesting of Douglas-fir in the Cascades of Western Oregon," Research Paper PNW-161-FR3 by Richard L. Williamson.

Fir engraver studied

Site class, crown class, and logging history may each influence the degree to which white fir are –– or are not –– susceptible to attack by fir engravers. This is what George Ferrell, a Berkeley entomologist, reports in "Stand and Tree Characteristics Influencing Density of Fir Engraver Beetle Attack Scars in White Fir." The report (Research Paper PSW-97-FR3) is available from the PSW Station.

In this California study, Ferrell looked at cross-sections from 603 trees. His unit of measure was "mean scar density" –– the number of scars he found in each bole cross-section divided by the volume and the age of the cross-section.

He found that:

- tree age by itself is not an accurate indicator of a tree's susceptibility to fir engraver attack;
- trees growing on high-quality sites had lower mean scar densities than those growing on poorer sites;
- trees of the dominant crown class had lower mean scar densities than suppressed and intermediate trees;
- logging and site quality apparently

interact: trees in a heavily logged stand, growing on the poorest quality site studied, had higher scar densities than the trees of the other study plots.

Ferrell also did an earlier study on the same subject, which he wrote up in "Weather, Logging, and Tree Growth Associated with Fir Engraver Attack Scars in White Fir" (Research Paper PSW-92-FR3: contact PSW for copies).

He found that increases in both scar abundance and fir mortality usually coincided with periods in which the tree's growth slowed down, and were usually preceded by one or more years of below-normal precipitation.

Ferrell thinks the following might reduce the amount of damage fir engravers inflict on the white fir in cutover sites:

- if possible, avoid logging during periods of drought and subnormal tree growth;
- avoid silvicultural systems that require repeated logging, with rapid removal of a high percentage of the mature stand;
- dispose of slash.

Avalanche guidebook

People are traveling mountain highways and flocking to winter sports areas in increasing numbers. Developers are buying up mountain lands for vacation home subdivisions. Mining and other resource-using industries are building facilities in the mountains. Communications networks and energy transport lines criss-cross our mountain ranges. All are threatened by destructive avalanches unless the hazard is considered in the process of planning for mountain land use and development.

Mario Martinelli, Jr., has recently completed a guide that mountain planners will find useful in helping them locate and assess avalanche problem areas. Martinelli is principal meteorologist and leader of avalanche research at the Rocky Mountain Station's Fort Collins laboratory. The guide is "Snow Avalanche Sites: Their Identification and Evaluation," USDA Forest Service Agriculture Information Bulletin 360-FR3.

In his guide, Martinelli stresses the need for identifying and evaluating avalanche potential. He describes evidence planners may use, both winter and summer, to identify avalanche paths. He then goes on to suggest ways to estimate the size and frequency of avalanches when formal observation records are not available. Numerous photographs illustrate described conditions. He concludes with a sample of a form planners can use for avalanche site evaluation, and a reference list of additional publications on the subject.

For a copy of Bulletin 360-FR3, write to the Rocky Mountain Station.

Budworm damage

The western spruce budworm inflicts a peculiar type of damage on western larch, one of the most important conifers in the northern Rockies. The budworm larvae not only feed on the foliage, in much the same way as they do on other species, but they also sever the stems of new shoots. This often results in deformed and forked trees as lateral shoots turn up to replace the severed leader. Net height growth on trees that have their terminal leaders cut by budworm larvae is also reduced by 25 to 30 percent.

David G. Fellin and Wyman C. Schmidt of the Intermountain Station have made studies of how budworm damage affects form and height growth. A report on the quantitative aspects of their studies is in the *Canadian Journal of Forest Research* (3(1):17-26).

In a later report, "How Does Western Spruce Budworm Feeding Affect Western Larch?" (General Technical Report INT-7-FR3), Fellin and Schmidt use photos to illustrate how the larvae damage the trees. These examples should help the reader predict how western larch will be affected by repeated attack. Copies of the Technical Report are available from the Intermountain Station.

Sagebrush control

Under certain conditions, cattle ranchers might find that sheep could be just what the ranchers need to sustain and improve the grazing capacity of cattle ranges. Here's why:

During the past 30 years, range managers have tried to rehabilitate depleted, overgrazed areas. One of the most commonly used measures for restoring rangeland is removal of woody species that compete for moisture. No species in the Western U.S. competes more vigorously than big sagebrush (*Artemisia tridentata*). After removal of the sagebrush, managers often reseed with a good forage grass –– crested wheatgrass (*Agropyron desertorum*) has been one of the most successful grasses for reseeding throughout the sagebrush zone. However, the wheatgrass stands are very vulnerable to reinvasion of the sagebrush. Unless control measures are maintained, the big brush again becomes dominant to the extent that the ranchers are right back where they started –– the range again needs rehabilitation.

This is where sheep come in. If turned onto the range in late fall, before the sagebrush becomes too dense, sheep can do an excellent job of controlling sagebrush.

Density of the sagebrush is a vital factor in the success of this control program. Results of a 6-year study conducted at the Benmore Experimental Range in Tooele County, Utah, showed that when sagebrush density was about 1½ plants per 100 square feet of area, the seeded grass did well. However, if there were 13 plants per 100 square feet, the sagebrush won. Sheep maintained their weight on an area where sagebrush density was light, but lost weight where the sagebrush was dominant.

The researchers doing the study also evaluated spring grazing by cattle as a control measure. Under the conditions at the Benmore Range, cattle failed miserably in controlling sagebrush. These animals ate only a few flower stalks of sagebrush –– they simply didn't like the menu!

Using sheep to control sagebrush is a relatively simple means of biological control. It is cheaper than chemical or mechanical sagebrush control treatments of seeded ranges. And, the shrub provides forage for the sheep.

By using "woolies" in range management, cattle ranchers will not only improve their ranges, but may also realize a profit in the wool produced by their "brush controllers."

Write to Intermountain Forest and Range Experiment Station for a copy of "Sheep Can Control Sagebrush on Seeded Range If . . . " RP-299-FR3, by Neil C. Frischknecht and Lorin E. Harris.

▼ In a Utah test, sheep controlled sagebrush growth

VIEWIT continued

Some of the VIEWIT options are a combination of different types of analyses. Most of these combinations involve "weighting," a mathematical process that was not intended to — and won't — make the computer the decisionmaker.

One such combination is the "times seen and distance weighting analysis." In another option, the user can combine times seen with relative aspect and distance weighting.

More information on the VIEWIT options is in a user's guide written by Wayne Iverson and Christine Johnson of the Forest Service's California Region and by Mike Travis and Gary Elsner of the PSW Station. The guide will be published by the PSW Station.

Right now, the Station has three papers with background information on the program. "Computing Visible Areas from Proposed Recreation Developments . . . A Case Study" is a Research Note (PSW-246-FR3) in which Gary Elsner describes how he and members of the Black Hills National Forest staff used VIEWIT to find out what areas of the Forest could be seen from 12 different recreation areas and from three routes proposed for a scenic tramway. "Delineating Landscape View Areas . . . A Computer Approach" (Research Note PSW-180-FR3) is an earlier report by Elsner and colleague Elliot Amidon. Burt Litton explains how VIEWIT was used in a case study on the Teton National Forest in "Landscape Control Points: a Procedure for Predicting and Monitoring Visual Impacts" (Research Paper PSW-91-FR3).

Other sources of information on VIEWIT are the recreation or engineering units of some of the USDA Forest Service Regions in the West, and Gary Elsner of the PSW Station in Berkeley.

Prospective users of the VIEWIT program might be interested in the Forest Service's new series on landscape architecture in wildland management. The first of these publications are "National Forest Landscape Management Volume 1" (Agriculture Handbook No. 434, $1.50, catalog number A1. 76:434 Vol. 1) and "National Forest Landscape Management Volume 2, Chapter 1 — The Visual Management System" (Agriculture Handbook No. 462, $1.80, catalog number A1. 76:462). Both are basic texts and are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

A comprehensive research report on how to classify forest landscapes is Burt Litton's "Forest Landscape Description and Inventories — a Basis for Land Planning and Design" (Forest Service Research Paper PSW-49-FR3). Contact PSW for copies. □

Batholith continued

If you would like copies of the cited reports, contact the Intermountain Forest and Range Experiment Station, Ogden.

Megahan, Walter F., and Walter J. Kidd. 1972. Effects of Logging and Logging Roads on Erosion and Sediment Deposition for Steep Terrain. *J. For.* 70(3):136-141.

Megahan, Walter F., and Walter J. Kidd. 1972. Effect of Logging Roads on Sediment Production Rates in the Idaho Batholith. USDA Forest Serv. Res. Pap. INT-123-FR3. 14 p.

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