Notes & Observations

North American Forestry Commission Formed

The first session of the newly formed North American Forestry Commission, a body of the Food and Agriculture Organization of the United Nations, was held in Mexico City, July 24-29.

This Commission is the latest among six similar regional organizations through which FAO's regional program is carried out. The others are Europe, Africa, Latin America, Asia Pacific, and Near East.

The following officers were elected unanimously to serve during the inaugural session:

Chairman—Dr. Enrique Beltrán, Mexico;

1st vice chairman—Dr. J. D. B. Harrison, Canada;

2nd vice chairman—Dr. R. E. McArdle, U. S. A.;

Rapporteur—Ing. Juan Manuel González, Mexico.

The United States delegation was headed by R. E. McArdle, chief of the U. S. Forest Service, with V. L. Harper, assistant chief, as his alternate. The other members were Tom Gill, The Charles Lathrop Pack Forestry Foundation; John F. Shanklin, Department of the Interior; and James N. Diehl, U. S. Forest Service.

The delegations of Canada, Mexico, and the United States each gave brief statements broadly reviewing the areas of interest and principal forestry and forest product problems of their countries.

On the question of forest insect pests and diseases, Dr. M. L. Prebble of Canada presented a statement and emphasized the highlights of the problems from a regional and intercontinental point of view. Following thorough discussion the Commission decided:

1. To create a working group on forest insects and diseases;
2. To invite the incoming chairman of the Commission to organize this working group by requesting member governments to nominate specialists to the group, and instructing the group to select its own officers and to (a) prepare an analysis of the principal problems in the region; (b) indicate which problems are of immediate concern; and (c) suggest priorities among these problems for study and action.

OFFICERS of FAO North American Forestry Commission for current 2-year period. *L* to *R:* Richard E. McArdle, Chief, U. S. Forest Service, *1st vice chairman;* J. D. B. Harrison, Canadian Deputy Minister of Forestry, *chairman;* Enrique Beltrán, Sub-Secretary of Forest Resources and Wildlife, Ministry of Agriculture and Animal Husbandry of Mexico, *2nd vice chairman;* and A. L. Best, Economics Division, Canadian Department of Forestry, *rapporteur.*

Following a discussion of the subject of forest fires by J. N. Diehl of the United States, the Commission adopted the recommendation that a continuing working group be established for forest fire control and invited the incoming chairman to obtain nominations for membership of the group from the member countries. The working group is to periodically review the forest fire situation and make proposals to the Commission. Sections within the group are to review specific areas as follows: (a) forest fire prevention, (b) forest fire control technology, and (c) forest fire research.

The subject of international trade in forest products was discussed by Juan Manuel González of Mexico. The chairman suggested that the members of the Commission might wish to give further consideration to this subject and the incoming chairman was invited to explore it with members of the Commission with a view to taking such action as deemed appropriate.

Other subjects discussed included liaison between FAO and the North American Forestry Commission, technical assistance programs, and miscellaneous matters.

Canada will be host to the next session of the Commission in 1963 at a date to be later decided.

The following officers were unanimously elected for the forthcoming biennium:

Chairman—Dr. J. D. B. Harrison, Canada:

1st vice chairman—Dr. R. E. McArdle, U.S.A.;

2nd vice chairman—Dr. Enrique Beltrán, Mexico;

Rapporteur—Mr. A. L. Best, Canada.

Growth and Mortality in the Wind River Natural Area

Twelve years of observation in a 350-year-old stand of Douglas-fir (*Pseudotsuga menziesii*) on the Wind River Natural Area emphasize the impact of mortality in mature forests. Despite its advanced age, the stand is still making considerable annual growth, but a large part of this growth is being offset through mortality. Although the figures given here may not be typical of all such stands, they illustrate some of the problems con-

Table 1.—Inventory and Annual Growth and Mortality in the Wind River Natural Area[1] (Per-Acre Basis)

Species	Inventory (1959)			Growth and mortality (1947-1959)					
				Cubic volume			Scribner volume		
	Trees	Cubic volume	Scribner volume	Gross growth	Mortality	Net growth	Gross growth	Mortality	Net growth
	No.	Cu. ft.	Bd. ft.	Cu. ft.			Bd. ft.		
Douglas-fir	23	9,241	63,036	26	51	−25	179	350	−171
Western hemlock	76	4,208	24,992	60	24	36	397	149	248
Pacific silver fir	38	899	4,024	11	8	3	72	31	41
Western redcedar	6	595	4,145	6	2	4	45	13	32
Western white pine	1	105	683	3	11	−8	6	71	−65
Total	144	15,048	96,880	106	96	10	699	614	85

[1]Cubic volume includes all trees 2.6 inches d.b.h. and larger for entire stem. Board-foot volume (Scribner) includes all trees 11.6 inches d.b.h. and larger to an 8-inch merchantable top.

nected with management of old-growth Douglas-fir.

Approximately 1,100 acres of old-growth Douglas-fir within the Wind River Experimental Forest was set aside by the U. S. Forest Service in 1932 as a natural area. One of seven natural areas located on national forest land in the State of Washington, the Wind River tract is located about 9 miles north of the Columbia River Gorge on the Gifford Pinchot National Forest. To measure growth and mortality, a grid of permanent sample plots was established in 1947. Growth has been measured every 6 years and mortality every 2 years. A report summarizing the first 6 years of measurement was published in 1955.[1]

Parts of the area contain an almost pure stand of Douglas-fir in which western hemlock (*Tsuga heterophylla*) and Pacific silver fir (*Abies amabilis*) are just beginning to form part of the overstory. In other places, Douglas-fir has become decadent and has been completely replaced by western hemlock and Pacific silver fir (Fig. 1). An occasional western white pine (*Pinus monticola*) and western redcedar (*Thuja plicata*) may be found scattered throughout the area. Pacific yew (*Taxus brevifolia*), vine maple (*Acer circinatum*), and Pacific dogwood (*Cornus nutallii*) compose the major proportion of the understory.

[1]Steele, Robert W., and Norman P. Worthington. Increment and mortality in a virgin Douglas-fir forest. U. S. Forest Service, Pacific Northwest Forest and Range Expt. Sta. Res. Note 110. 6 pp. Illus. 1955.

Apparent discrepancies in inventory and growth data between this 1955 report and the present report may be attributed to sampling error.

Fig. 1.—A stand in the Wind River Natural Area where overmature Douglas-fir is being replaced by western hemlock and Pacific silver fir.

Ground cover includes salal (*Gaultheria shallon*), Cascades mahonia (*Mahonia nervosa*), deerfoot vanillaleaf (*Achlys triphylla*), common beargrass (*Xerophyllum tenax*), and red whortleberry (*Vaccinium parvifolium*).

Physically, the area is typical of the western side of the Cascade Range. Topography is moderate to steep, with elevations ranging from 1,100 to 2,100 feet. Aspect is easterly and southeasterly, and the area is fairly well drained. The climate is distinctly marine, with an average annual rainfall of 89.89 inches and a mean annual temperature of 48.1° F. However, extreme temperatures and low humidities are not uncommon, and droughts of more than 2 months' duration have been recorded.[2] Site quality for the natural area averages a low III.[3]

In 1959 the stand contained 15,048 cubic feet or 96,880 board feet per acre (Table 1). Douglas-fir composed 68 percent of the board-foot volume in 1947, but gradually decreased to 65 percent by 1959. During the same period, western hemlock volume increased from 23 to 26 percent of the total stand. Pacific silver fir and western redcedar volumes have shown no change. Western white pine has all but been eliminated due to white pine blister rust, caused by the fungus *Cronartium ribicola*.

Gross growth over the entire 12

[2]Steele, Robert W. Wind River climatological data 1911-1950. U. S. Forest Service, Pacific Northwest Forest and Range Expt. Sta. 21 pp. 1952.

[3]McArdle, Richard E., Walter H. Meyer, and Donald Bruce. The yield of Douglas fir in the Pacific Northwest. U. S. Dept. Agric. Tech. Bul. 201 (rev.) 74 pp. Illus. 1949.

years averaged 106 cubic feet or 699 board feet per acre per year. While Douglas-fir contributed only 26 percent of the board-foot increment, western hemlock accounted for over twice that amount, or 57 percent.

However, most of the gross growth was lost through mortality, resulting in an average net annual growth of only 10 cubic feet or 85 board feet per acre. During the 12 years from 1947 to 1959, annual mortality varied from 221 to 1,216 board feet per acre, averaging 614 board feet per acre: 57 percent occurred in Douglas-fir, 24 percent in western hemlock, 12 percent in western white pine, and 7 percent in Pacific silver fir and western redcedar.

An epidemic of bark beetles (*Dendroctonus pseudotsugae*), which reached a climax during the 1951-1953 period, took a heavy toll of Douglas-fir. Since that epidemic subsided, windthrow has been the chief cause of death in Douglas-fir. Windthrow has also caused substantial losses in western hemlock, but disease—principally dwarfmistletoe (*Arceuthobium* spp.)—has been responsible for the greatest losses in that species. White pine blister rust has been the primary cause of nearly all the western white pine mortality.

Studies in undisturbed forest stands help provide the forester with a reliable yardstick for comparing results obtained in managed stands. The data from the Wind River Natural Area also have more immediate implications. They show that annual mortality is high in old-growth Douglas-fir stands and indicate that salvage logging should be given serious consideration where final harvest will be deferred for a number of years.

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Selection of Pine Seedlings in Nursery Beds For Certain Crown Characteristics

At least two accounts[1] are found in the literature describing the selection and subsequent testing of so called "super-seedlings" from nursery beds. Progress reports on early growth comparisons of these oversized nursery bed selections indicate that in the majority of cases they have maintained their early height superiority over average or inferior seedlings several years after establishment in the field. Thus, it appears that the phenotypic selection of seedlings for inherent vigor holds some promise in a program of tree improvement. It also substantially contributes to the development of valid juvenile selection criteria for use in progeny testing at an early date.

Because the selection for vigor in nursery beds has apparently been effective in these reported cases, the authors thought it would be of interest to determine the effectiveness of selection for morphological characteristics such as crown width and limb size among nursery bed seedlings. It is recognized that a considerable and significant amount of the observed morphological variation among individual seedlings, in what is commonly referred to as uniform nursery beds, is environmental in nature. Differences in rates of seed germination, seed bed density, and minor variation in soil properties, among other things, obviously influence the phenotypic expression of seedling growth and form. For these reasons, the seedlings used in this study were all oversized in development and extended well above the mean level of neighboring seedlings. Seedlings such as these definitely possessed unrestricted crown space, and, theoretically, environmental advantages for the early expression of crown differences.

Eighty loblolly pine (*Pinus taeda* L.) seedlings were initially selected for conformity to each of the following artificial crown width classes: (1) seedlings without or with extremely short and fine lateral branches, (2) seedlings with average or apparently normal sized lateral branches, and (3) seedlings with exceptionally long and coarse lateral branches. For ease in classification these are hereafter referred to as (1) narrow, (2) medium, and (3) wide crown classes, respectively.

After initial measurements, the seedlings were outplanted by crown width classes, in 20-plant rows, with 4 replications. They were planted at a 6 × 8 foot spacing on an especially prepared, disked, site. The measurements recorded for each plant were: (1) total height, (2) stem diameter at ground line, (3) length of longest branch, (4) diameter of longest branch, and (5) diameter of bole subjacent to the measured branch. The same measurements were made 12 months later on each seedling in the field. It should be noted that the longest lateral branch, in the most prominent whorl, was measured in both instances regardless of its relative position on the individual plant. Hence the initial and final measurements of branch size are not necessarily restricted to the same branch. This discrepancy results from the fact that the largest branches in 1-0 seedlings usually occur at the distal end of the first or second growth flush, although the seedlings used in this study made a total of 3 or even 4 growth flushes while in the nursery bed. By the end of the second growing season the most prominent whorl and largest branches had, in many seedlings, shifted upward to the distal end of the first season's growth; hence it seemed pertinent and appropriate to measure the largest branch wherever it occurred on the individual plant. The mean initial and final measurement data are given in Table 1.

Some idea of the relationships

[1]Ellertsen, Birger W. Selection of pine super-seedlings—an exploratory study. Forest Sci. 1:111-114. 1955.
Zobel, B. J., F. C. Cech, and R. E. Goddard. Outstanding nursery seedlings—a progress report. Tex. Forest Serv., Res. Note 18. 14 pp. 1957.

Table 1.—Summary of Measurements of Loblolly Pine Seedlings Selected for Certain Crown Characteristics

	Narrow 1-0	Narrow 1-1	Medium 1-0	Medium 1-1	Wide 1-0	Wide 1-1
Total Height (Cm)						
Rep I	46.9	67.8	49.9	69.3	48.7	73.2
II	48.0	72.6	46.8	69.9	47.0	68.5
III	44.0	63.4	48.6	71.1	46.0	67.2
IV	45.8	79.3	44.9	82.5	51.5	75.1
All Reps	46.6	70.8	47.1	73.8	48.1	71.0
Stem Diameter at Ground Line (Cm)						
Rep I	.71	1.16	.74	1.32	.82	1.32
II	.79	1.26	.79	1.36	.79	1.33
III	.60	.90	.74	1.27	.85	1.22
IV	.68	1.12	.78	1.52	.82	1.45
All Reps	.70	1.15	.77	1.38	.82	1.33
Length of Lateral Branches (Cm)						
Rep I	1.4[1]	19.8[2]	4.9	22.1	9.5	20.5
II	1.4	24.0	5.7	22.6	12.4	23.6
III	1.6	16.6	5.2	20.9	9.1	23.2
IV	2.1	21.7	5.2	23.8	10.2	24.0
All Reps	1.6	20.7	5.3	22.5	10.2	22.5
Diameter of Lateral Branches (Cm)						
Rep I	.44[1]	.77[2]	.44	.86	.56	.84
II	.48	.80	.44	.76	.49	.90
III	.36	.48	.48	.77	.48	.83
IV	.42	.80	.44	.88	.50	.80
All Reps	.43	.74	.45	.82	.51	.85
Bole Diameter Subjacent to Measured Branch (Cm)						
Rep I	.44	.77	.44	.86	.56	.84
II	.48	.80	.44	.76	.49	.90
III	.36	.48	.48	.77	.48	.83
IV	.42	.80	.44	.88	.50	.80
All Reps	.48	.74	.45	.82	.51	.85

Crown Width Class.

[1]Seedlings lacking branches at this measurement not included.
[2]Mean of all seedlings at this measurement.

between the three crown width classes can be gained from the means presented in Table 1. Initially, seedling height and diameter showed a slight positive association with crown width. These trends were no longer evident after one year in the field, although mean diameter of the narrow crown selections was less than that of the other two classes. There is no real evidence in the height and diameter performance of the seedlings that would suggest substantial differences in general vigor between crown classes.

The most striking result obtained from this study is the complete erasure of the pronounced initial differences in branch length and diameter among the three crown classes by the end of the first growing season. The failure of these differences to be maintained was also confirmed by analyses of variance for final branch length and diameter. Had the selection been of value in recognizing trees that would retain a narrow-crowned habit, it is expected that these trees would have maintained at least a statistically identifiable portion of their original differences after one year in the field.

In view of the uniformity that was observed, it is unlikely that there is any value in selecting for narrowness of crown or fineness of limbs in 1-0 loblolly pine seedlings in nursery beds of unknown parentage.

The results of this study should not be interpreted to mean that selection for narrowness of crown or small branch diameters would not be effective among progeny groups from selected parents at a very early age. In fact, it is known that distinct differences in crown widths do appear in slash pine (*Pinus elliottii* Engelm.) at an early age in 1-parent progeny tests of selected parents as demonstrated by Barber et al.[2] Whether these differences could be validly detected in first year seedlings is questionable, hence it is obvious that more detailed studies are needed on the correlation of juvenile and mature characteristics with progeny from selected parents. This is especially true if, in the not too distant future, the nurseryman is to take full advantage of screening or grading myriads of genetically improved seedlings from known parentage.

[2]Barber, John C., Keith W. Dorman, and R. Aaron Jordan. Research Note No. 86. U. S. Forest Service, Southeastern Forest Expt. Sta Asheville, N C.

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Photomicrographs by Direct Projection[1]

Research workers in specialized fields of forestry often need photographs of microscopic structures to illustrate findings for publication. The preparation of photomicrographs is a painstaking and time consuming process. Assembling the necessary equipment, determination of light intensity, selection of usable slides, and the actual photographing are only part of the job. Film or plates must be developed, fixed, washed, and dried before printing.

A simple method to supplement the usual procedure for preparing photomicrographs is to use a microscope as a photographic enlarger and project the slide image directly to print paper. Although the projecting microscope has had wide usage in schools and research institutions, the adaptation of this piece of equipment as a photographic enlarger is not widely known.

The procedure for the preparation of direct projections is simple. After choosing a slide, it is inserted in the projecting microscope and the image is focused on a standard enlarger easel. The room is darkened except for safe lights. A sheet of photographic print paper is placed in the easel, the projector switch is snapped on momentarily, and the paper is then developed.

[1]This work was done in cooperation with the Georgia Forest Research Council and the College Experiment Station, University of Georgia, Athens.

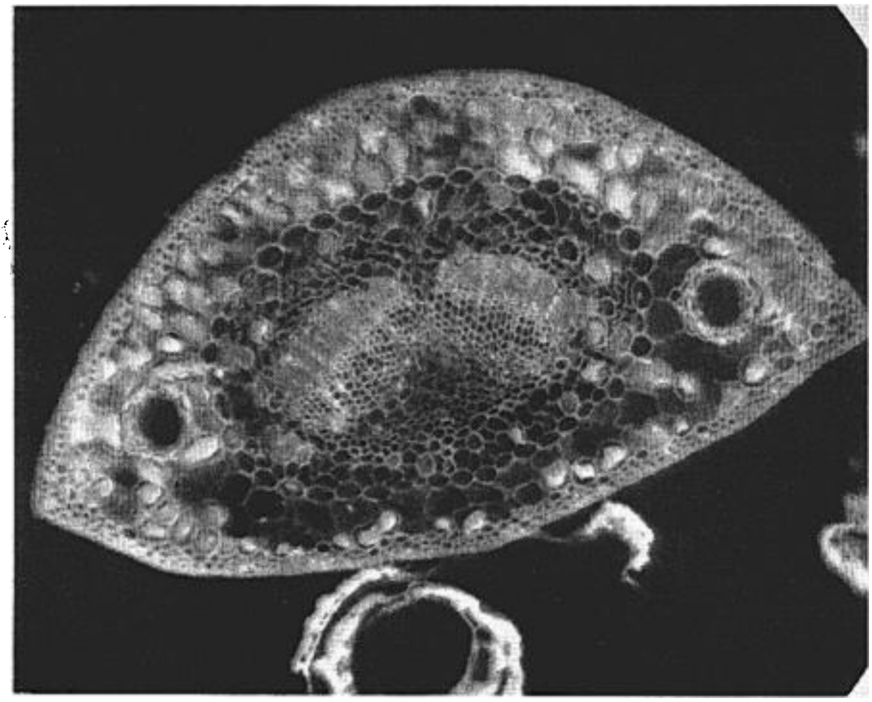

FIG. 1.—Cross section of a pine needle projected directly on print paper using a projecting microscope.

The resulting print is a negative of the projected image, but this is of little consequence if the desired contrast of minute structures is obtained (Fig. 1).

Both contact and enlarger papers may be used. Contact papers require more light for exposure and may be used if the image is particularly bright and clear, or if the image is concentrated on a small area. On larger projections or when the image is obscure, enlarger paper works well. High contrast papers, numbers 4 and 5, are best for most work. Prints obtained by this method have been used in a publication.

The procedure can be modified by using a timer to cut the projector on and off in the same manner as a photographic enlarger. Test strips cut from papers of various degrees of contrast will help in choosing the proper exposure time and the desired contrast. Filters aid in controlling light intensity. Direct positive papers are manufactured by several companies and may be suitable for obtaining positive prints.

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Computation of Height Growth on Continuous Forest Inventory Plots

Continuous Forest Inventory is characteristically a system of permanent plots upon which individual tree records are maintained for the purpose of securing representative forest management information. Volume and growth of these trees are determined from repeated measurements of diameter and height and their computation from standard volume tables or formulas. Emphasis is placed upon accurate and consistent results. While diameter can be directly measured with these results, height measurements are not as precise and are subject to personal errors. With many short-bodied trees, merchantable height can be measured accurately by the use of a calibrated pole. As the trees increase in height or where total height is obtained, less accurate methods must be relied upon. Personal judgment in these methods can greatly affect both volume and growth determinations.

It is the purpose of these notes to review and compare several methods that have been used in C.F.I. work. For the purpose of comparison, Table 3, entitled "Composite Tables: Gross Peeled Volume in Cubic Feet, Entire Stem, by Total Height," by Gevorkiantz and Olsen[1] will be used. This table can be expressed by the formula:

$$V = 0.42\ BH$$

V = the peeled cubic foot volume
B = the basal area in square feet computed from the diameter outside bark at breast height
H = the tree's total height in feet

The first method that has been used involves the curving of height over diameter for selected trees and the construction of a local volume table which is applied to the measurements for the beginning and the end of the growth period. Assuming this curve of total height over diameter to be:

$$H = 101 - \frac{288}{D}$$

D = the diameter outside bark at breast height

Then, any tree 10 inches in diameter will be given a height of 72 feet and a subsequent volume of 16.5 cubic feet. If the diameter has increased to 11 inches at the end of the growth period, a height of 75 feet will be assumed and the subsequent volume of 20.8 cubic feet will result in a growth of 4.3 cubic feet. This will be the case whether the original height of this tree was actually 72 feet or was 50 feet or even 90 feet. The chief difficulty of this method is that the tall and short-bodied trees are assumed to have the same height. This commonly results in underestimating the volume of densely stocked plots and an overestimation on lightly stocked plots.

For this reason, many C.F.I. users have required separate height determinations for each tree. Since heights are determined independently at the beginning and end of each growth period, a distinction is made in the volume and growth computed for trees of different heights. Continuing with the above example, a 10-inch tree 50 feet in height will have a volume of 11.4 cubic feet, while a volume of 20.6 cubic feet will be computed for a

[1]Gevorkiantz, S. R., and L. P. Olsen. Composite volume tables for timber and their application in the Lake States. Tech. Bul. No. 1104. U. S. Department of Agriculture. Washington, D. C. 1955.

tree 90 feet in height. If no change in the height is detected during the growth period, these trees when reaching a diameter of 11 inches will have volumes of 13.9 and 24.9 cubic feet for a growth of 2.5 and 4.3 cubic feet, respectively. From an inspection of the volume formula, it appears that this growth will be increased or decreased 0.28 cubic feet for each foot of height growth. Since an increase of 0.1 inch in diameter would result in an increase of 0.35 cubic feet, a change of 5 feet in height at the second measurement will have the same effect upon volume that a 0.4 inch change in diameter would have. Errors of a few feet in height arising from personal judgment, can completely confound the growth figures obtained on individual trees.

A better solution than either of the above methods would be to combine the more accurate tree volume based upon individual tree height, with an unbiased estimate of height growth, such as is allowed for in the local volume table. This could be accomplished by reading the height growth directly from the curve of height over diameter and adding this growth to the actual height of the individual tree to compute volume growth. An objection might be made that short-bodied trees will show less height growth per inch of diameter increase than tall-bodied trees. It is more reasonable to assume that a tree will maintain the same ratio of individual height to curved height during the growth period. Using this method, the 50-foot tree would be computed to increase to 52 feet in height and from 11.4 to 14.4 cubic feet for a growth of 3.0 cubic feet. The 90-foot tree would be computed to increase to 93 feet and from 20.6 to 25.7 cubic feet for a growth of 5.1 cubic feet. This relation can be written in equation form for machine calculation as follows:

$$\frac{H_1}{H_2} = \frac{h_1}{h_2}$$

H_1 = original total height in feet
H_2 = computed total height at end of growth period
h_1 = curved total height for original diameter
h_2 = curved total height for diameter at end of growth period.

Therefore, the formula for individual tree growth can be written as follows:

$$V_2 - V_1 = 0.42 \left[B_2\left(\frac{h_2}{h_1} \times H_1\right) - B_1H_1\right]$$

V_1 = original cubic foot volume
V_2 = cubic foot volume at end of growth period
B_1 = original basal area
B_2 = basal area at end of the growth period

The assumption that an individual tree will maintain its past superiority or inferiority in height growth as compared with an average curve, is also made in constructing a family of site index curves. The use of this assumption allows accurate volume computations for individual trees, while providing an unbiased estimate of height and volume growth.

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Characteristics of Good and Poor Managers of Small Woodlands is a very interesting four-page leaflet issued as Research Summary No. 73 by the Federal Extension Service, USDA. Prepared by Fred P. Frutchey, the summary pinpoints the characteristics of small woodland owners from eight source studies.