Notes

Ponderosa Pine Cone Cutting by Squirrels

Squirrels may harvest a far greater proportion of ponderosa pine cones than many foresters realize. This was evident while making a routine cone count on a number of permanent plots on the Stanislaus Experimental Forest near Pinecrest, California, in September 1952. Ponderosa and Jeffrey pines were the predominant species affected. Many ponderosa pines had more than half their total number of cones cut and destroyed.

FIG. 1.—Pile of 863 ponderosa pine cones cut from one tree by squirrels in 1952.

The ground beneath one ponderosa pine tree was almost completely covered with cone scales and cores. The cores and the few intact cut cones were counted and then piled. The amazing total was 805 cut from this one tree. A count of the cones still on the tree indicated a total production for this tree of 926 cones. A week later, when the accompanying photograph was taken, an additional 58 cones had been cut. Thus a grand total of 863 cones, or a little over 93 percent of the crop, was cut by squirrels, mainly pine squirrels (*Tamiasciurus* spp.). The squirrels were still active on the tree at the time the photograph was taken.

This particular ponderosa pine tree was surrounded by several large sugar pines bearing 50 or more cones each. Very little cone cutting was evident on sugar pine trees in the same general area.

Although this observation gives no clue as to how widespread or frequent squirrel damage to ponderosa pine seed may be, it seems clear that squirrels at times may be a major deterrent to regeneration. Foresters may find upon further study that squirrels must be classed along with mice and other small rodents as serious seed predators.

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Slash Burning and Soil Organic Matter Maintenance

Organic matter has often been called the heart of a forest soil. It is important to tree nutrition as a source of nitrogen and other nutrient elements as well as growth promoting substances. Organic matter provides food and energy materials to micro- and macro-organisms in the soil. The activities of these organisms plays an important role in the maintenance of soil fertility and particularly in the maintenance of optimum physical conditions. The role of organic matter although not completely understood is, without dispute, of utmost silvicultural importance. Its preservation should be one of the primary aims in forest management.

Foresters in the Douglas-fir region are faced with the dilemma of having to dispose of the tremendous volumes of highly inflammable slash remaining after logging old-growth stands and at the same time maintain soil productivity at a high level. A common practice in the past (and unfortunately too common at present) was to burn the slash at the end of the long dry season just prior to a forecasted rain, which as often as not failed to materalize. The obvious result was an extremely hot fire that destroyed much of the soil organic matter or humus. In addition, the loose surface soils were also subject to erosion during the subsequent winter rains.

During the course of a direct seeding experiment on the Weyerhaeuser Timber Company's McDonald Tree Farm in Lewis County, Washington, a series of samples of the surface three inches of soils was collected from the plots. The soil was an Olympic silt loam, the exposures were north, ridge top, south, and southwest. The area was logged in the fall of 1949 and spring of 1950 and the slash was burned in the fall of 1950. The soil samples were collected in the spring of 1952 or about 18 months after slash burning. Visual evidence indicated a moderate burn on the north slope and ridge top and a severe burn on the south and southwest slopes.

Organic matter was determined by oxidation with chromic acid and titration with ferrous ammonium sulfate. The results presented in

Table 1 represent the average for eight pairs of samples from each exposure.

Table 1.—Content of Soil Organic Matter in Surface 3 Inches of Soil After Logging and Slash Burning

Exposure	Content of soil organic matter
	Percent
North	8.52
Ridge top	7.33
South	4.40
Southwest	3.92

The organic matter content of the surface three inches of soil in adjacent undisturbed stands ranged from 12 to 15 percent. The severity of the slash burn is, therefore, reflected in the depletion of soil organic matter.

The general policy of the Weyerhaeuser Timber Company in maintaining their forest lands in a highly productive state is apparent in the slash burning methods practiced on some of their tree farms. The slash is not burned until after there has been four or five inches of rain in the fall. The inflammable material above ground dries out faster than the surface soils and, as a result, when the slash is burned the soil organic matter is not destroyed. In the spring of 1952 an inspection was made on the Calapooya and Millicoma Tree Farms in Oregon (Weyerhaeuser Timber Company) of areas on which the slash had been burned the previous fall under conditions as described above. Little or no soil damage was evident. In many instances the surface leaf litter was still present and only slightly charred. Fine roots and fungal mycelia were abundant in the surface few inches of soil and the soil structure was excellent, i.e., its stability had been maintained.

In these instances the fire hazard was eliminated and the soil organic matter and productivity was not damaged. These ends should be the ultimate aim in slash disposal operations.

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Light as a Factor in the Germination of Some Bottomland Hardwood Seeds[1]

The influence of light on the germination of seed has been a matter of debate for a long time. Stiles (*4*) reviews and discusses the European work, and Bass (*1*) takes cognizance of the European and some American approaches to the problems. Both Stiles and Bass refer particularly to herbaceous plants.

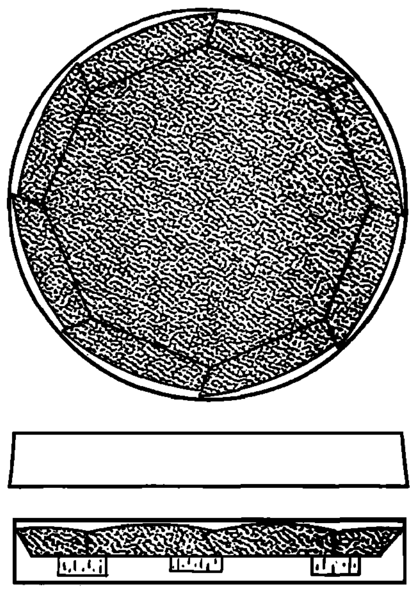

Fig. 1.—Modified petri dish-blotter germinator. The blotter is kept continually moist by pith supports in a water well.

Consideration of the influence of light on germination of forest tree seed has been obscured by the greater emphasis on moisture relationships and temperature of the seedbed on exposed sites. Nelson (*2*), however, found that the absence of light reduced the rate of germination of longleaf pine (*Pinus palustris* Mill.), loblolly pine (*P. taeda* L.), slash pine (*P. caribaea* Morelet), and shortleaf pine (*P. echinata* Mill.). Sarvos (*3*) demonstrated with four Finnish species that a spruce and two birches had a more rapid germination in the light than in the dark but the same final or total germination. Sarvos used high light intensities and was able to minimize heat effects by use of daylight-type low-pressure mercury vapor lamps.

[1]Portion of a thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Plant Ecology, Duke University, Durham, N. C. 1952.

In this, the first of several experiments designed to determine the significance of germination and survival of seedlings in early phases of lowland succession, the seed or fruit of five tree species and one shrub were tested for light sensitivity. These species were sycamore (*Platanus occidentalis* L.), river birch (*Betula nigra* L.), red maple (*Acer rubrum* L.), American elm (*Ulmus americana* L.), winged elm (*U. alata* Michx.), and hazel alder (*Alnus rugosa* [Du Roi] Spreng.).

The germinator used was a modification of the moist blotter-petri dish type (Fig. 1). Oversize circles of seed-laboratory blotter were slit along the edges at eight equidistant points and then shallowly indented with a sharp blade from base to base of the adjacent slits. These circles were then fitted into the bottom halves of petri dishes on top of three equally spaced sections of pith 6 mm. high. The slit and bent-up edges provided a shoulder which confined the seeds and also added rigidity to the flat seed-containing surface. Further addition of water was dictated by the rate of total germination, but such a unit would go unattended for four to six days. With a reasonable amount of care in handling, an air layer could be kept above and below the moist blotter.

Seed of the six species were collected at different stages of maturity and dried and stored for varying lengths of time. A description of all the seed used in germination studies is presented in Table 1. These lots were selected on the basis of highest total germination as determined by samples of 1,000 in 100-seed units. For red maple the procedure was varied to 20 units of 50 because of the largeness of the fruit. Despite the precaution of preheated germinators and the use of distilled water, fungal development in excess of laboratory

TABLE 1.—DESCRIPTION OF SEED LOTS USED IN GERMINATION TRIALS

	Sycamore	Red maple	American elm	Winged elm	River birch	Alder
Date collected	Mar. 6-9, '51	Apr. 11, '51	Apr. 10-16, '51	Apr. 6-8, '51	May 22-27, '51	Sept. 8-16, '50
Color and comparative degree of maturity	Buff, balls firm, premature	Red-green, disseminating, mature	Green-brown, disseminating, mature	Slate-gray, disseminating, mature	Dun, disseminating, mature	Brown, premature
Drying interval days	7	2	2	2	3	11
Days stored at 41° F.	121	66	83	80	36	206
Treatment prior to test	Cleaned, $NaHClO_3$	De-winged	None	None	None	Moist stratification
Cause of non-germination	Small size, and or degree of gray fungal coloration	Not evident	Not evident	Not evident	Small, empty or partial embryo	Dormancy

contaminates was conspicuous in the sycamore trials. It was found that soaking the seed in a 2-percent solution of sodium hypochlorite for 10 minutes with subsequent rinsing in distilled water greatly reduced the fungal activity and increased total germination. Close examination of the fruit heads revealed that what appeared to be a soot-like deposit was in fact a concentration of pycnial bodies of a member of the Phomaceae, as later determined on agar. In preliminary trials all other species were treated the same way and it was found that with the exception of American elm, no significant difference in germination resulted. The hypochlorite treatment significantly reduced total germination of American elm. Therefore, only sycamore was treated in the final run.

Light tests were carried out in mazda light ranging in intensity from 11 to 13 f.c. The dark tests were run in sealed cabinets. The temperature range was 23° to 27° C. in the light and 24° to 27° C. in the dark with a consistent lag of 2° in the dark.

The interval of germination in days was determined by preliminary runs in which a time point was established at which less than 2 percent of the total germinated with additional time.

Tallies were made daily of the seeds that showed complete emergence of the radicle. This made it possible to compare the rapidity of germination, and the number of days required to produce 75 percent of the total germination was used as a comparative index.

Mean variances for individual treatments were calculated and then used in the further calculation of the least significant mean difference. The results are presented in Table 2.

The significant mean differences (Table 2) indicate that river birch, sycamore, and American elm seeds are light sensitive in this order under the conditions imposed by low light and drying and storage. This sensitivity is indicated by a higher total percentage of germination as well as a shorter time until germination was 75 percent complete. The dark germination rate of river birch at 75 percent of total is particularly slow. Red maple, winged elm, and alder are seemingly not sensitive to low light intensity.

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2. NELSON, M. L. 1940. Light influences germination of southern pine seed. South. Forest. Notes 31. South. Forest Expt. Sta.
3. SARVOS, R. 1950. Effect of light on the germination of forest tree seed. Oikos 2:109-119.
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TABLE 2.—GERMINATION OF BOTTOMLAND HARDWOOD SEEDS IN LOW LIGHT AND IN DARK

Species	Mean germination In light (y_1)	Mean germination In dark (y_2)	Difference required for significance at 5-percent level	Actual difference (y_1-y_2)	Germination time	Time till germination 75 percent complete In light	Time till germination 75 percent complete In dark
	Percent	*Percent*	*Percent*	*Percent*	*Days*	*Days*	*Days*
Sycamore	17.50	3.10	2.56	14.40*	11	3	4
Red maple	83.60	86.40	6.47	2.80	9	2	2
American elm	17.20	10.40	4.50	6.80*	12	4	6
Winged elm	86.10	86.80	4.79	0.70	11	3	3
River birch	22.30	1.10	2.57	21.20*	10	4	7
Alder	36.10	36.30	6.19	0.20	10	2	2

*Significant mean difference at the 5 percent level.

Chain-Foot Converter

Converting linear measurements of chain and links into feet and inches is a chore that confronts college students and field surveyors alike. While a slide-rule requires only one manipulation, it is only accurate to three, possibly four, figures. For example, using the figure 427650, only the 427 is accurate, regardless of whether the decimal point is before the 4 or after the 0. This, then, leaves the alternative of manual arithmetical operation. This past summer, however, Philip Suters, a senior at the New York State College of Forestry in Syracuse, devised a circular type converter-rule which reduces the element of error to a minimum and can be used quickly and accurately to the one-hundredth part of a foot.

The converter, which can be made for a few pennies' cost, is constructed in the following manner:

Four discs of thin cardboard are placed atop one another and fastened through the center so as to revolve easily. The top disc is approximately $3\frac{1}{2}$ inches in diameter and each successive circle about $\frac{1}{4}$ inch larger, making the overall size of the converter 5 inches-$5\frac{1}{2}$ inches in diameter.

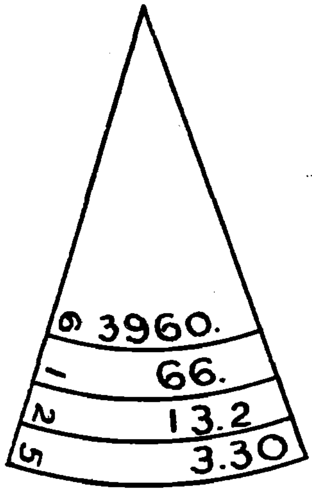

Fig. 2.—Scale set to convert 61 chains and 25 links into feet (4,042.50).

The four concentric circles are then treated as one large one and the whole is divided into ten equal pie-shaped segments radiating from the center. Within each disc's portion of one of the segments is placed the number 1, printed or typed along the radiating line (Fig. 1). The number 2 is then placed in the next segment of each of the four circles and so forth through 9. The number 10 is placed in the usual position on the top disc only, leaving the lower three blank.

The center, or smallest, disc indicates tens of chains; the next, single chains; the third, tens of links; and the last, single links. If the rule is then held so that the four circles with the sections numbered 3 coincide, it is read as 3-3-3-3 : 33 chains and 33 links.

At right angles to the radiating line and in each disc's tiny section are inserted the numbers shown in Figure 1. These figures are so aligned that all decimal points are exactly one above the other. This is important for simplicity in reading, since the addition of the resulting four-figure column gives the answer. The total can be set down on paper immediately since three figures is the maximum number ever to be added at one time.

Here is an illustration of the rule's use. If we wish to convert 61 chains and 25 links into feet, we swing each disc so that reading from the center outward, the numbers 6-1-2-5 are aligned (see Fig. 2). By then glancing at the "adding column" we see: 3960.
66.
13.2
3.30

the answer to which can be set down simply: 4.042.50 feet. And the original problem figures are still in sight.

Only a few seconds are needed for the solution of the problem, and, obviously, the converter can be more elaborately constructed for even faster action. One suggestion is that the discs be made of plastic with small finger indentations somewhere on each of the circles. With a "stop bar" extending out from the hub, the figures could be dialed to position like a telephone

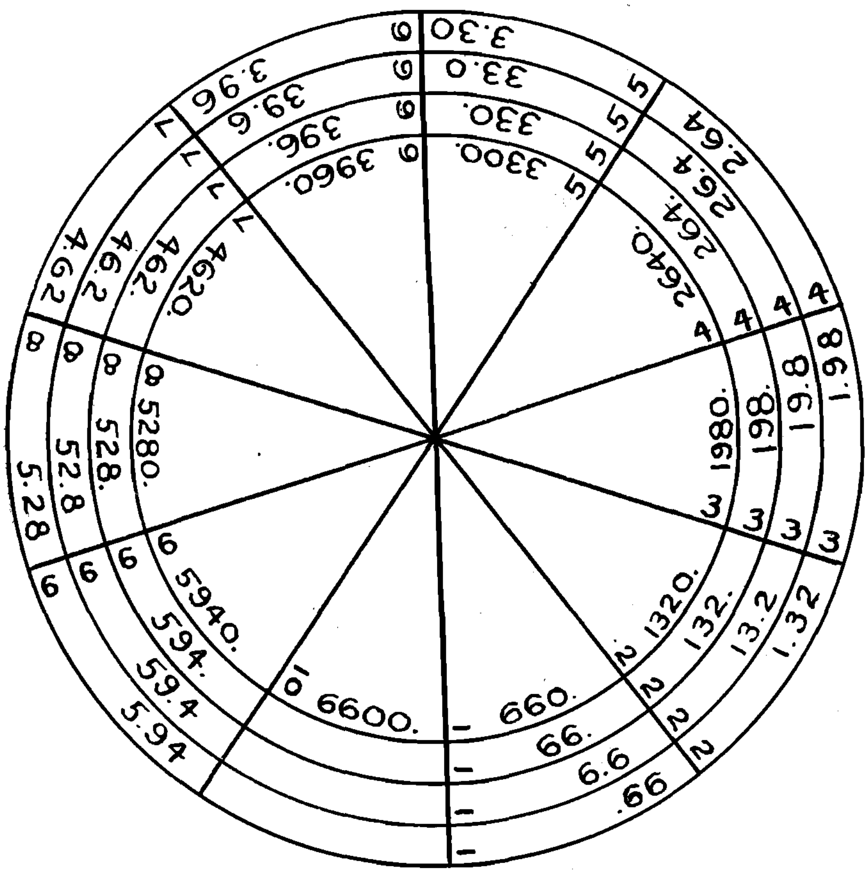

Fig. 1.—An easily constructed and inexpensive scale for converting linear measurement in chains and links into feet.

dial, except, of course, they would all remain aligned at the stop bar until the next dialing.

Philip Suters used this device on the Highland Forest in New York for several months in 1952 with such amazing efficiency he feels the converter would prove a valuable asset to anyone who has to work with problems of chain-foot conversion.

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Grazing Capacity as Related to Range Condition

An area of 4,281 acres of sagebrush-bunchgrass range in southeastern Oregon was selected for a study of herbage production and grazing capacity. The area has been stocked with cattle at the rate of 10 to 13 acres per animal unit month during the past 12 years. A decline in range condition under this degree of stocking has been apparent; although proper grazing capacity has been rated at 10 acres per animal unit month.

During the summer of 1951, which was about an average year in terms of precipitation, the area was mapped into three condition classes with 56 percent of the area rated poor, 41 percent fair, and 3 percent good. Herbage production was sampled on each condition class by taking about four hundred 9.6 square-foot samples. A sampling technique of estimating and weighing the grams of herbage was used. Estimates on unclipped plots were corrected to a regression line between actual weights and estimated weights. The amount of herbage previously cropped was estimated for each sample and added to the amount of herbage remaining to obtain an estimate of total herbage produced. The results of sampling are shown in Table 1.

TABLE 1.—HERBAGE PRODUCTION BY RANGE CONDITION

Range condition	Air dry herbage *Pounds per acre*	Range acreage *Percent*
Poor	88	56
Fair	195	41
Good	322	3
Weighted average	139	----

Assuming proper utilization at 50 percent and a daily ration of 20 pounds of air-dry herbage per animal unit, grazing capacity is 13.64, 6.15, 3.73, and 8.63 acres per animal unit month respectively for poor, fair, and good condition range, and weighted average. Total stocking rate for the entire area could then be 496 animal unit months under proper seasonal balance of cropping.

If range deterioration has occurred during the past 12 years with stocking at 330 to 428 animal unit months, a serious error exists in the above procedure. Although 50 percent utilization is generally considered to be moderate, it probably represents excessive cropping on the range under consideration because of the large proportion of poor and fair range condition.

TABLE 2.—FORAGE PRODUCTION AS RELATED TO RANGE CONDITION

Range condition	Air dry herbage *Pounds per acre*	Residue desired *Pounds per acre*	Air dry forage *Pounds per acre*	Acreage	Total forage *Pounds*
Poor	88	160	—72	2,396	—172,512
Fair	195	160	35	1,781	62,335
Good	322	160	162	104	16,848
Average	139	160	—21	Total	— 93,329

It may be more accurate to compute grazing capacity by assuming that 50 percent of the production on the good condition areas should remain after grazing, and that a similar amount of residue must be left on the areas in poor and fair condition if they are to be improved to good condition. With this assumption the amount of residue should be 160 pounds per acre at the close of the grazing season. As shown in Table 2, however, a deficit of 93,329 pounds of herbage exists on the range under consideration. Non-grazing use is indicated, therefore, as opposed to the average of 8.63 acres per animal unit month calculated the other way. However, if grazing could be limited to the fair and good condition areas, there is adequate forage for 132 animal unit months. This is a stocking rate of 14.3 acres per unit for those areas of the range. With further consideration in terms of season of grazing it should be assumed that not more than half of the cropping allowance may be taken during the growing season. Consequently, at the close of the growing season the proper amount of residue should be 240 pounds per acre. Since herbage production on the fair condition areas was estimated to be 195 pounds per acre, all grazing should be deferred until the grasses have matured.

Range managers and range livestock operators may view with considerable distress the indication that non-grazing use of poor range condition areas and deferred-grazing use of fair condition areas may be necessary for range improvement. Grazing capacity determinations have given rise to a popular philosophy which has led to recurring reductions in stocking; although the livestock industry must live and prosper or true range management objectives will be lost. Overgrazing may sometimes be necessary until a favorable balance can be reached through such means as reseeding, brush control, improved distribution of grazing, and better seasonal balance of cropping. An increased supply of forage through these methods must not be balanced by an increased number of livestock, but must be applied to the over-all plan of range management and improvement. Greater emphasis upon artistical ability in range management is thus called for.

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