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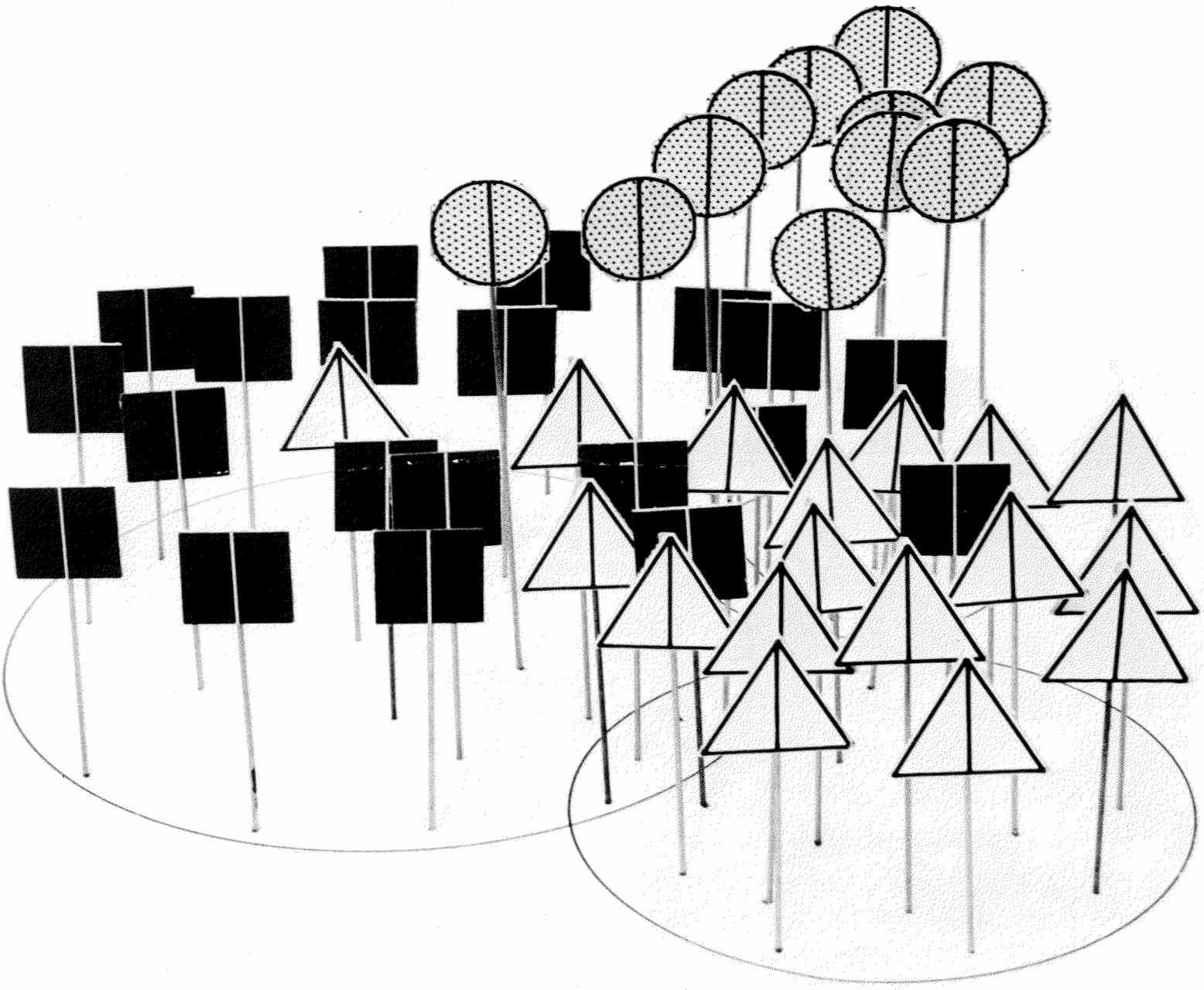
ASPEN CLONES

Their Significance and Recognition



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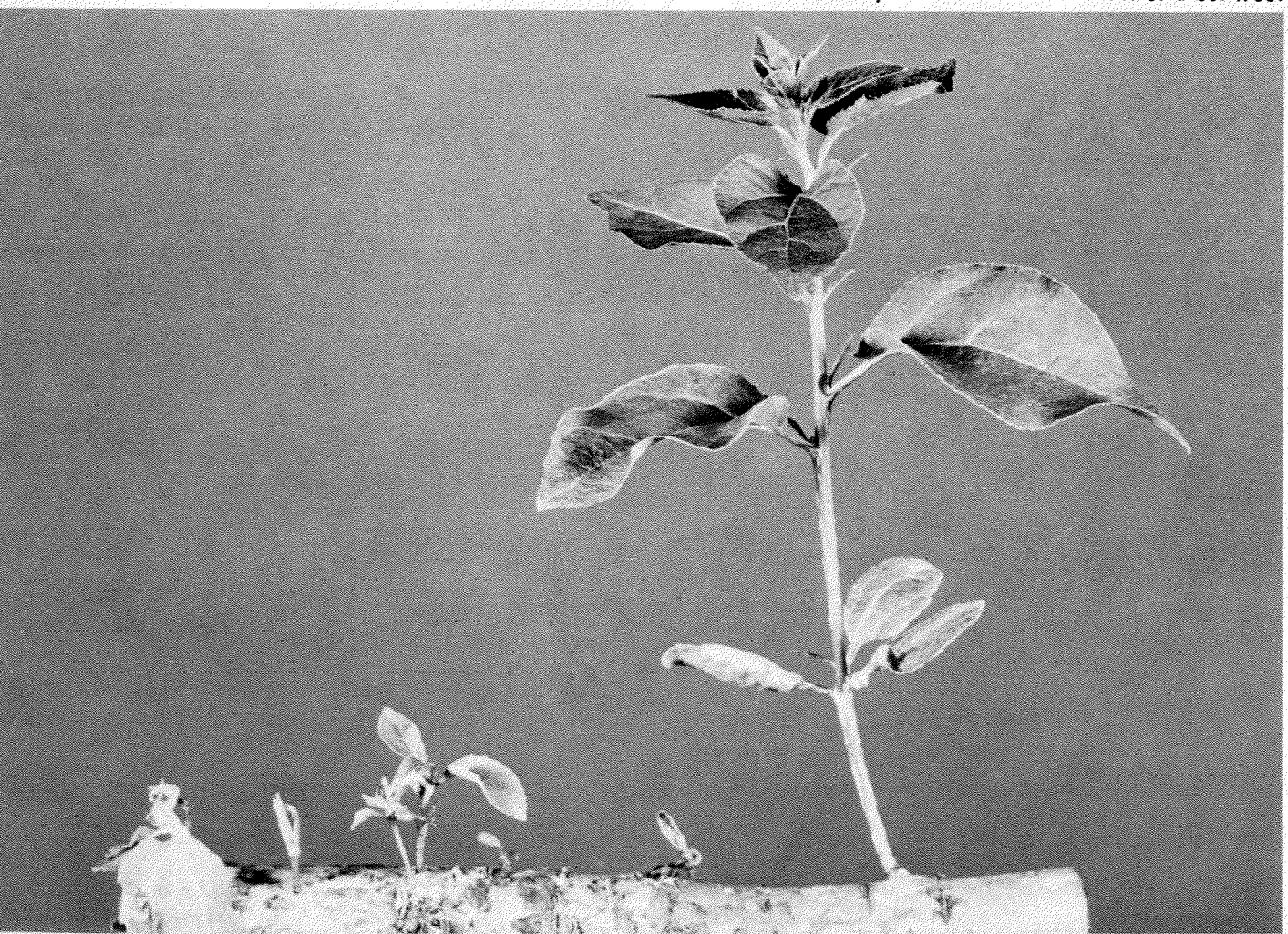
ASPEN CLONES
Their Significance and Recognition

Trembling aspen has a number of characteristics which differ from most other tree species: it grows on a wide variety of sites, has a short life span and usually reproduces by means of root suckers. A group of such suckers, having developed through repeated vegetative reproduction from the root system of a tree of seed origin, is called a CLONE, while individual trees making up the clone are called ramets. Most aspen stands consist of a mosaic of clones of varying size and form.

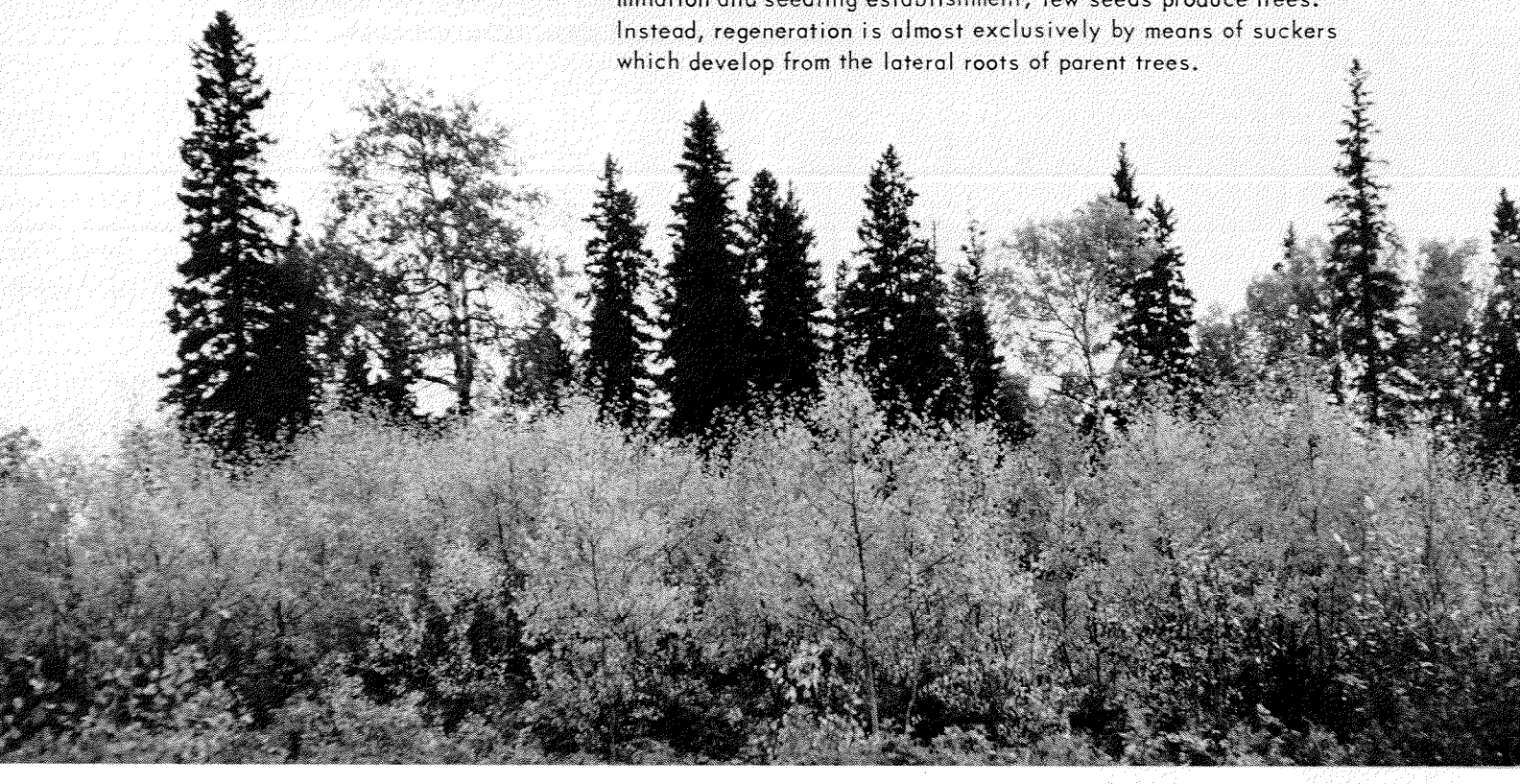
The aim of this brochure is to increase the general awareness of aspen clones among resource managers and naturalists and to point out ways in which such awareness can assist in the management and understanding of aspen stands. In addition, tree characteristics useful for the recognition of clones are described.

Sucker development on the lateral root of a cut tree.



Development of Clones

Trembling aspen[1] is a prolific seed producer as indicated by the snow-flurry-like quantities of seed released during the first weeks of June. However, due to the exacting requirements for germination and seedling establishment, few seeds produce trees. Instead, regeneration is almost exclusively by means of suckers which develop from the lateral roots of parent trees.



Abundant sucker regeneration following clear-cutting.

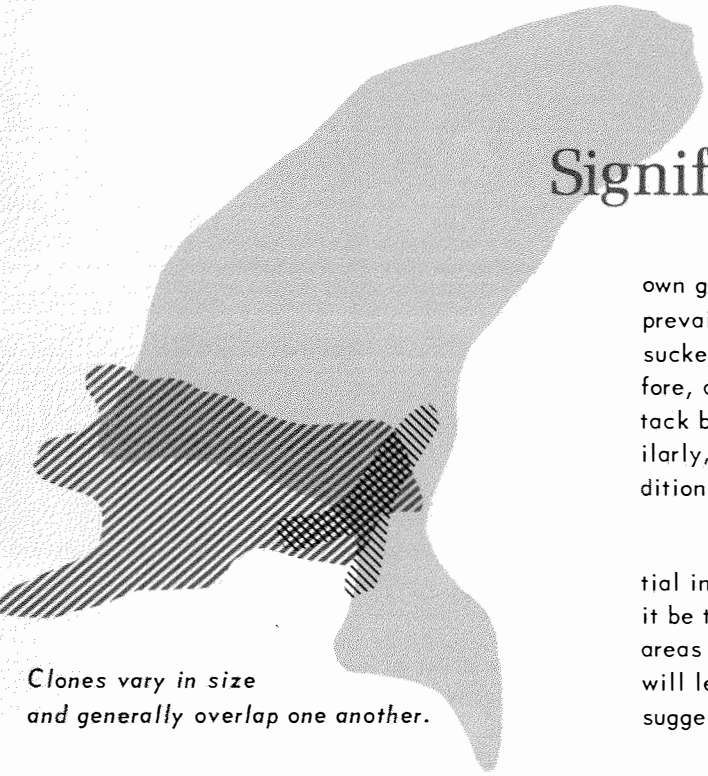
Removal of the parent trees by cutting or burning results in increased soil temperatures through exposure to direct sunlight, which in turn stimulates sucker growth. Removal of all trees simultaneously will result in an even-aged and fairly evenly spaced stand of suckers, while incomplete removal of the old stand will result in uneven sucker development with many large openings often leading to invasion by shrub species.

Suckers grow quickly during the first few years by drawing upon the extensive root system of their parent trees. These parent roots extend far into the soil and provide the young trees with an abundance of nutrients and moisture. The resulting initial growth rate of the suckers easily exceeds that of most other vegetation grown under similar conditions of climate and soil.

In all probability successive reproduction through suckering has been going on for centuries, so, while an individual tree in a clone may not live more than 100 to 150 years, the age of the clone to which it belongs could well date back several thousands of years.

[1]*Populus tremuloides* (Michx.)

By repeated suckering clones may eventually occupy large areas. In parkland communities, clones can encroach upon grassland vegetation, while in upland forest communities one clone can expand at the expense of others through better suckering ability and superior growth. Observations in several upland aspen stands in Manitoba have shown clone size to vary from a few yards (one or two trees representing a clone) to several acres.



Clones vary in size and generally overlap one another.

Significance of Aspen Clones

In forest stands, each individual tree of seed origin has its own genetic make-up, and responds in its own particular way to prevailing environmental conditions. In trembling aspen stands of sucker origin the clone takes the place of the individual. Therefore, adverse conditions such as drought, early or late frost, attack by insects or disease, will tend to affect an entire clone similarly, while the effect on another clone exposed to the same conditions can be quite different.

Since most aspen stands are of sucker origin, it is essential in the management of this species that the clonal growth habit be taken into consideration. The following discussion outlines areas where conventional practices, used in stands of seed origin, will lead to pitfalls when applied to aspen. Other approaches are suggested.

1 Stand Inventory and Site Productivity

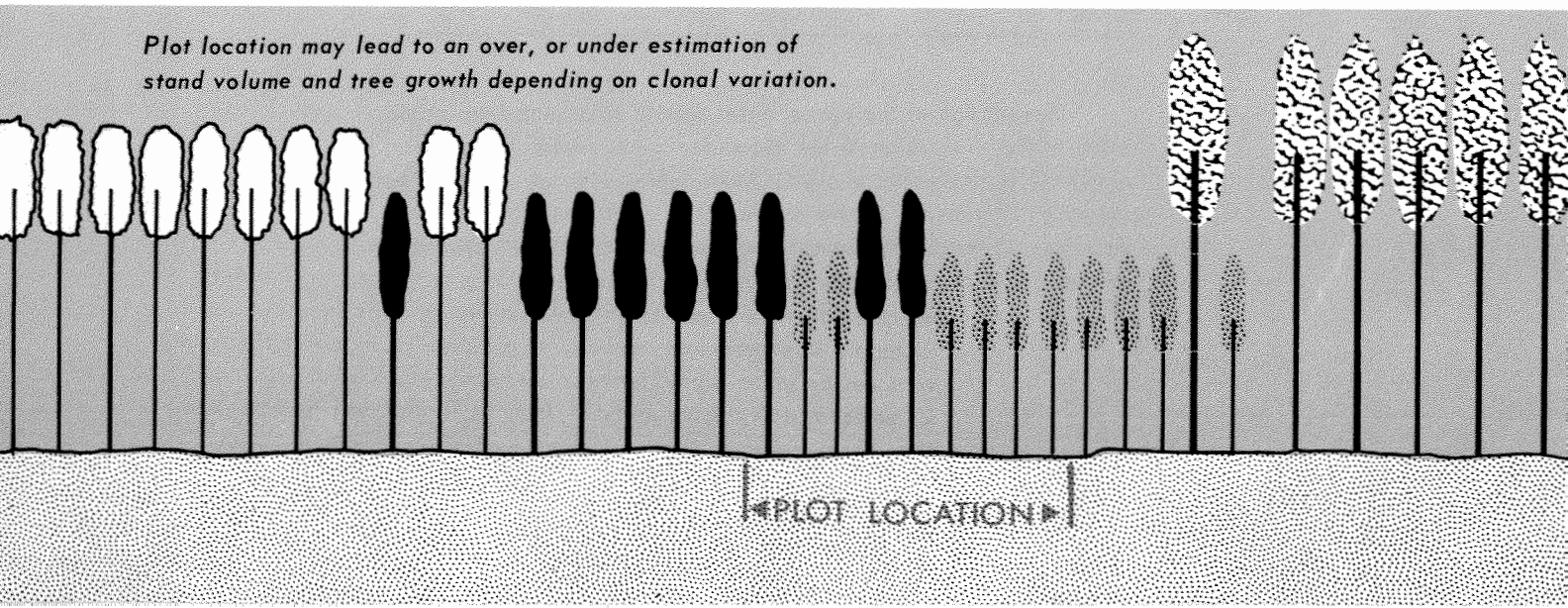
An accepted way of taking stand inventory and determining growth performance in relation to site in stands of seed origin is by calculating stand volume and average dominant height on small sample plots and relating these growth features to stand age. In aspen stands such plots may often contain only a single clone. Measurement of trees for height and diameter in such plots is, therefore, essentially the measurement of one individual. Therefore, a good estimate of volume and dominant height for the stand as a whole is not obtained, since all trees making up the clone within the sample plot exhibit a similar growth pattern. The full range of diameters and heights within the stand is therefore not sampled. Measurements confined to a single clone can either over, or under estimate productivity in terms of height by as much as 25 per cent and volume production by much greater percentages.

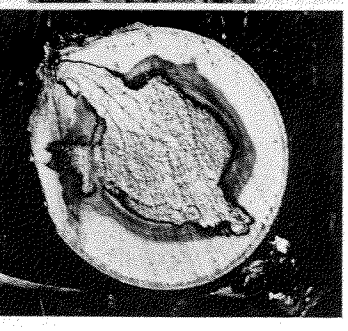
Measuring height and diameter in order to determine stand volume and tree growth.

Observations in some 30- to 40-year-old stands on the same site in Manitoba have shown height differences, between dominant trees of different clones, of up to 10 feet. Furthermore, it is possible that superior clones on a medium site may perform better than inferior clones on a good site.

Clearly, estimates of standing volume and site productivity should be based on the performance of five or more clones. A reliable estimate of stand growth is not likely to be obtained if only one or two clones are sampled. Since time often does not permit the identification and separation of clones, sampling along a transect should have the desired effect.

Plot location may lead to an over, or under estimation of stand volume and tree growth depending on clonal variation.





Fruiting bodies of Fomes igniarius are an indication of severe stem decay.

2 Estimation of Cull Losses

Cull studies in the past have shown extreme variation in decay within an age group. This variation has been so great that suggested rotation ages, based on average cull volumes at a given age, are frequently of questionable value. Recent examination of several stands have shown clones, heavily riddled with *Fomes igniarius* (the main trunk rot fungus in aspen) occurring beside clones practically free of the fungus.

Other indicators of stem quality, e.g., branchiness, burls, cankers, may vary from clone to clone in the same locality. It follows that the same precautions must be followed as in estimating stand volume and site productivity. In any locality several clones must be sampled. Since decay percentage between clones in mature stands can vary from 0 to as high as 80 per cent, somewhat more than the five or six clones stipulated before may be necessary to obtain a good estimate of cull. Transect sampling could also be used.

3 Selection of Superior Clones

Here the growth habit of clones offers a distinct advantage over stands of seed origin since:

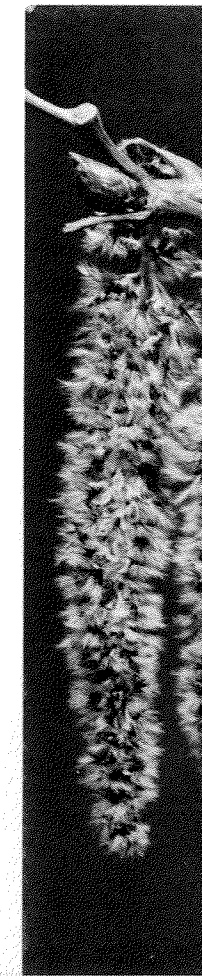
(a) observation of the qualities of a clone is much easier when a number of individuals—rather than a single specimen—exhibit such qualities;

(b) features that are common to all individual trees of a clone are likely to be genetically rather than environmentally controlled, and will therefore tend to be retained when the selected material is propagated.

Selection will depend on the purpose for which the clones are required. It is possible to improve aspen as a source of pulp since interclonal variation in pulping properties, such as fibre length and strength, has been detected. Variation among clones in stem form, branching habit, natural pruning, bark characteristics and resistance to insects and diseases could be used in the selection for shelterbelts and recreational areas.

Knowledge of the clonal habit should find immediate application in the evaluation of the aspen resource, particularly with reference to estimates of productivity and quality of stands. The selection of superior native aspen stock is at present restricted by a lack of intensive management and by poorly developed methods of artificial propagation.

Male and femal



Recognition of Clones

Clone recognition is based on the fact that trees within a clone have the same genetic make-up, and tend to show a similar response to a given environment, while trees from different clones generally will not.

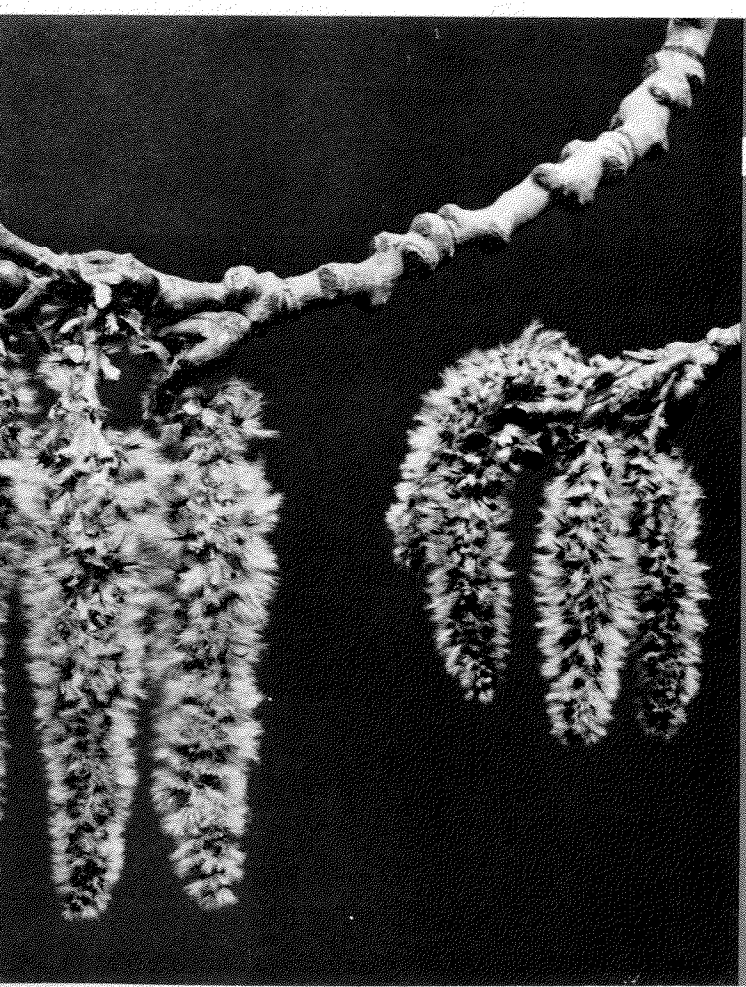
Following are a number of features and characteristics which can be used, by themselves or in combination, to distinguish between clones:

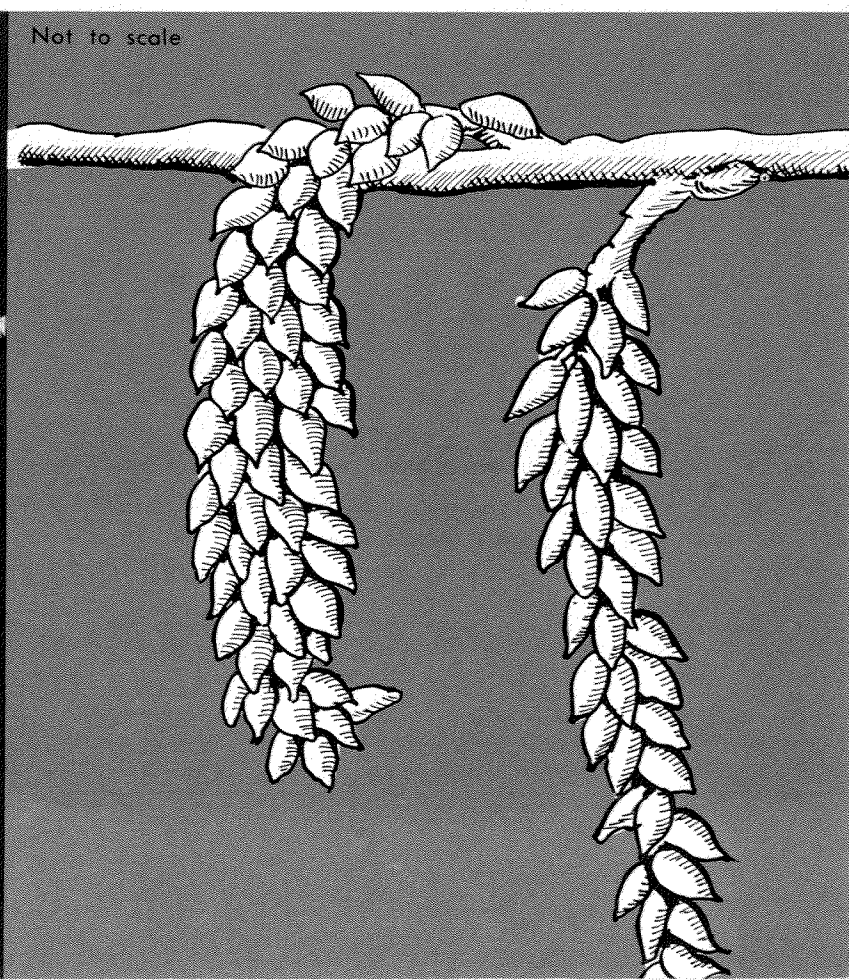
1 Flowering

Male and female flowers occur on separate clones. In the prairie provinces flowering occurs in late April and early May. All trees within a clone develop their flowers simultaneously, although clones themselves flower at different times. Observations in Manitoba have shown that male flowers appear before female flowers. Male and female flowers look very much alike from a distance and careful examination is required to distinguish between them.

Female clones are most easily recognized during the latter stages of flowering before leaf flushing, when the fruits on the catkins give a green tinge to the tree crown. Male flowers have usually been shed by this time.

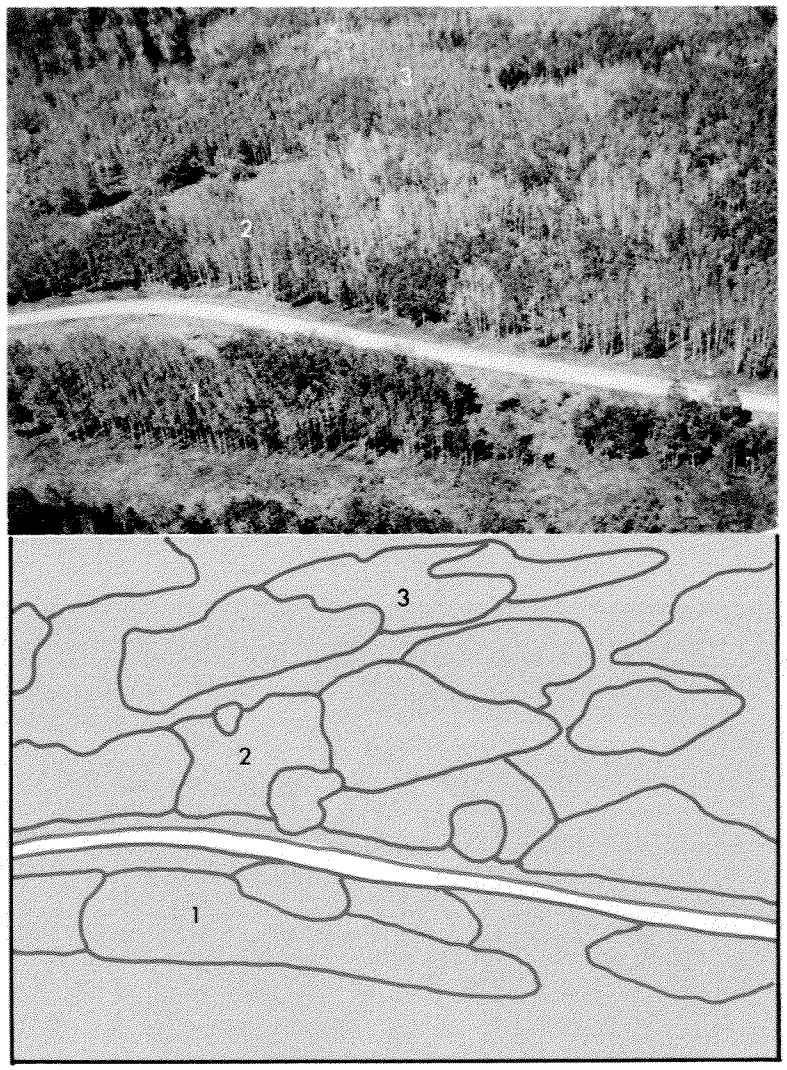
wers and fruit of aspen.



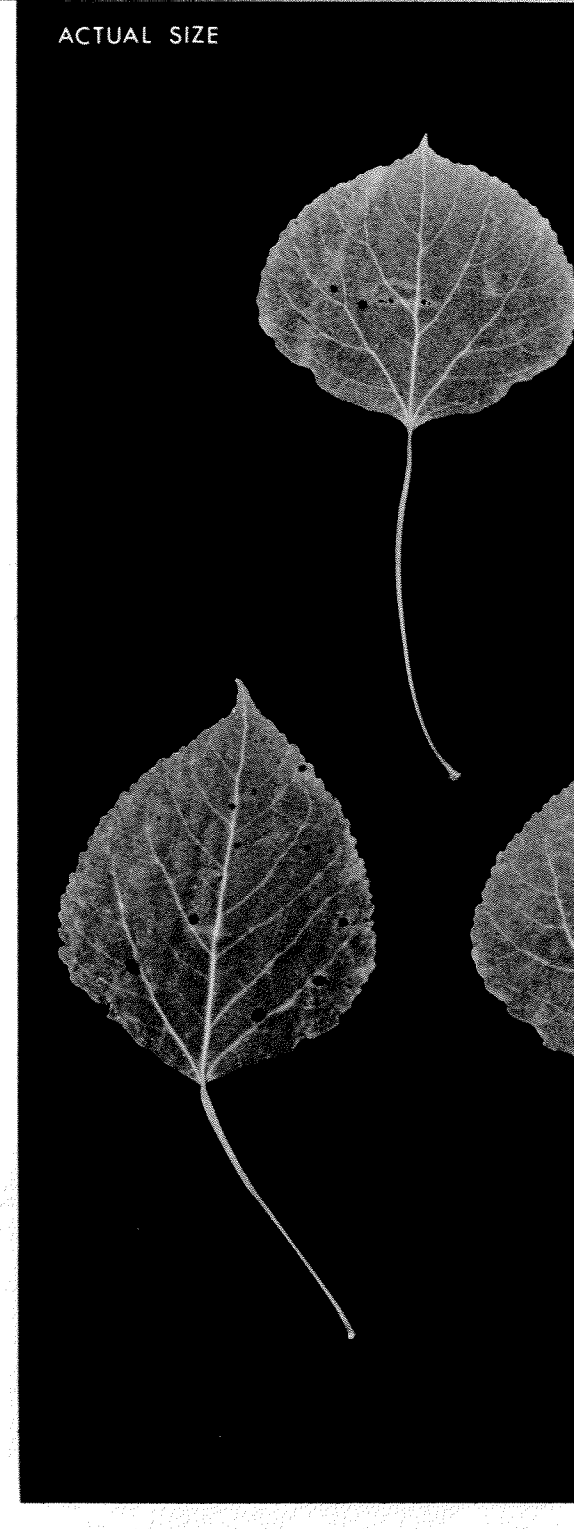


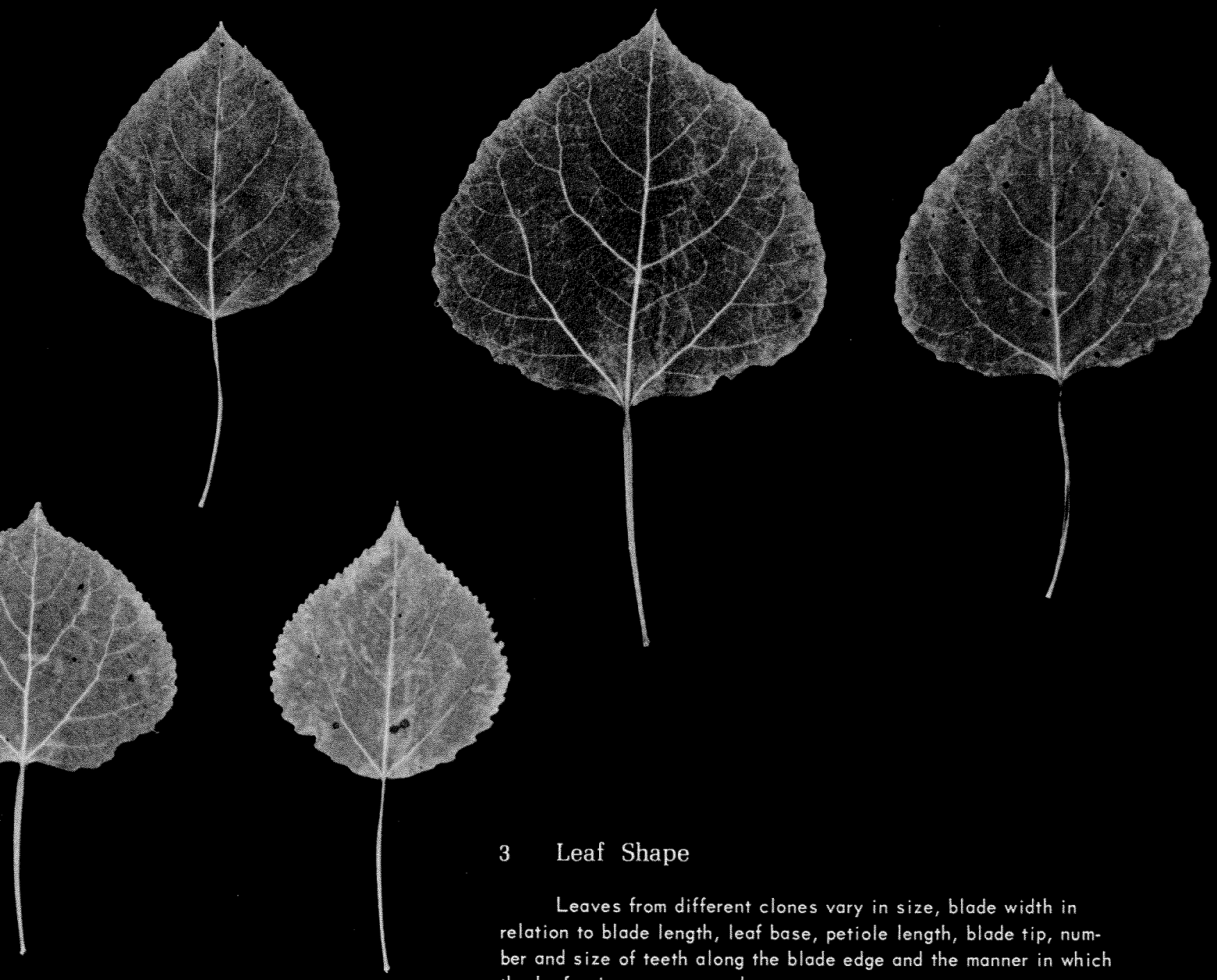
2 Leaf Flushing and Leaf Fall

Leaf flushing and leaf fall occur simultaneously for all trees within the clone. Earliest and latest flushing clones may be one to three weeks apart. This time interval results in stands exhibiting a patchwork appearance, which can again be observed in the autumn at the time of leaf discoloration and fall. The interval over which leaves of different clones fall may be several weeks.



Clones are readily distinguishable in the spring due to differences in time of leaf flushing.





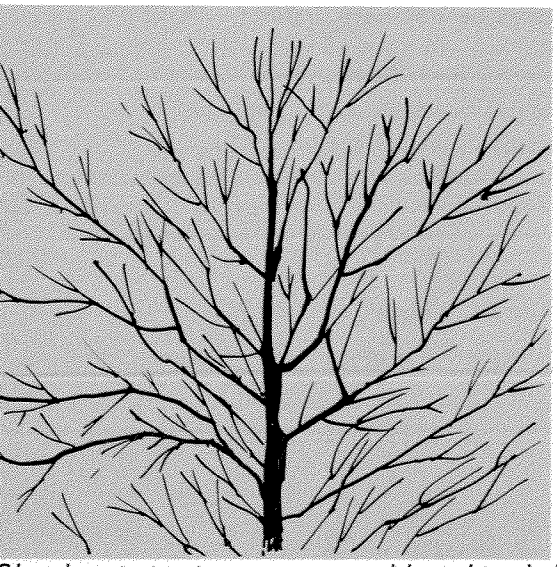
3 Leaf Shape

Leaves from different clones vary in size, blade width in relation to blade length, leaf base, petiole length, blade tip, number and size of teeth along the blade edge and the manner in which the leaf veins are arranged.

When foliage is used to distinguish between clones, only middle leaves on short (1" to 2") lateral shoots should be sampled, since they tend to exhibit a standard form.

4 Bark Colour and Texture

Considerable variation in bark colour and texture is noticeable between clones. Bark colour can range from near white and cream-coloured to greenish and grey, while shades of rust-brown and orange are occasionally observed. Bark can be thin and smooth or deeply furrowed while lenticels in the stem can show characteristic diamond shapes or be inconspicuous. When comparing trees, care should be taken to view stems always from the same direction, since the bark on one side of a stem is usually quite different from that on the opposite side.



Clonal variation in tree crown and branching habit.

5 Tree Form

Stem straightness, branchiness of the tree, degree of natural pruning and the angle between branches and the stem are other distinguishing features. An entire clone can often be distinguished, especially in parkland areas by a dome-shaped canopy pattern.

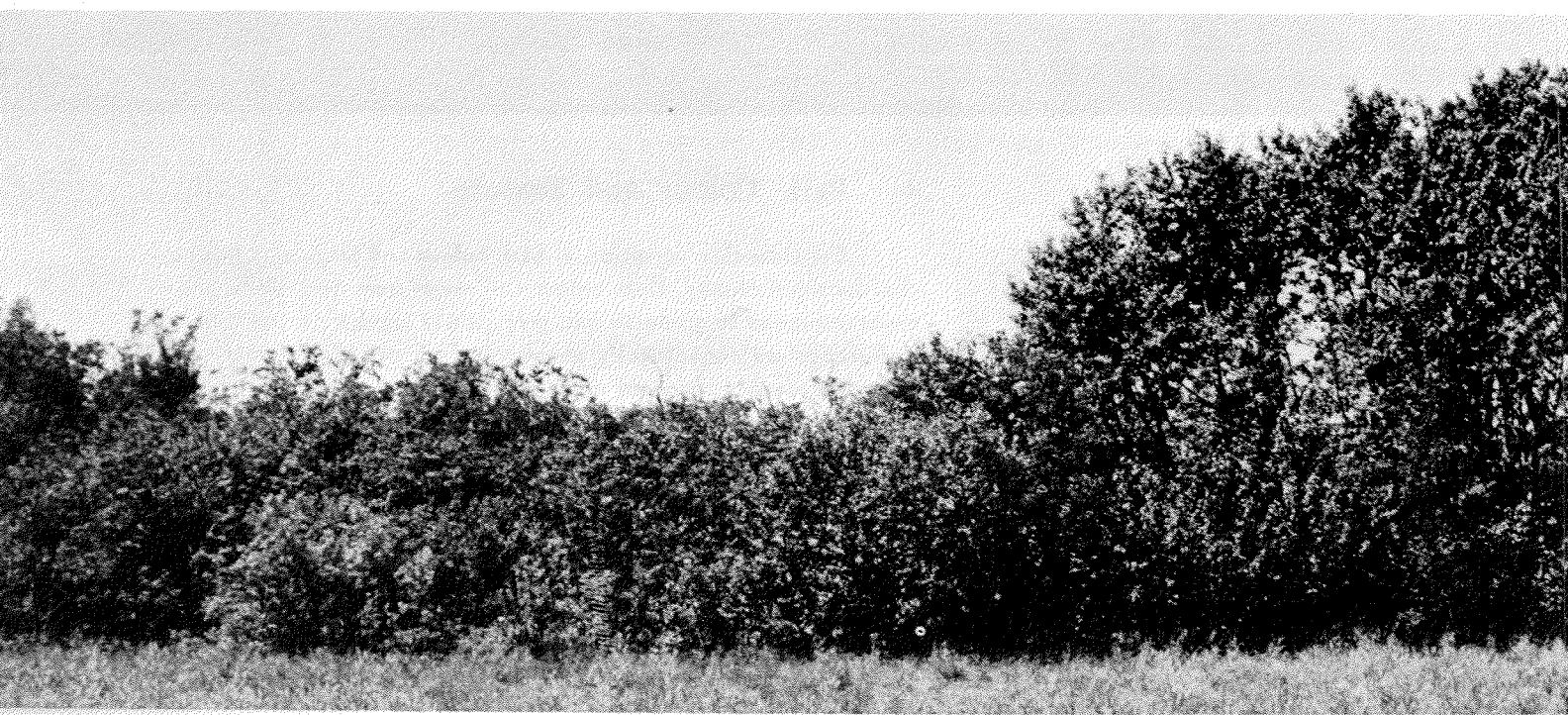
Clones can be identified more quickly in some stands than in others and is facilitated by practice. Although differences in leaf flushing and fall coloration are usually the most outstanding and useful features in identifying clones, it is not possible to list distinguishing features in order of importance. While two adjacent clones may be distinguished on the basis of leaf flushing, the most distinct difference between two other clones may be in the pattern of their bark or in their stem form.

A serious attempt to separate all clones within an area will require the observation of at least two sets of features. This often means two visits to the stand during the year. As an example: simultaneous leaf flushing of a group of trees may indicate one clone, although certain bark features may suggest the presence of more. To confirm, examine the leaves during the growing season.

When it is not necessary to distinguish each individual clone but merely to determine the extent of clonal variation and approximate clone size, one visit to the stand at any one time during the year should be sufficient.

Clone recognition is made easier by the fact that the individual trees within a clone are usually in close proximity to each other. Clones may occur as discrete "islands" within the stand, or trees from one clone may be intermixed with those of others.

Field observations have shown that with increasing stand age (e.g. stands 60 years old or over) clone recognition becomes



easier, since bark and crown features become more distinct.

In summary, there are no rules or identification keys for distinguishing one clone from another. However, with some practice identification of clones is possible in most cases.

Selected Reading

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Dome-shaped canopy pattern of clones found in parkland areas.

Additional information or copies of this report may be obtained from

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