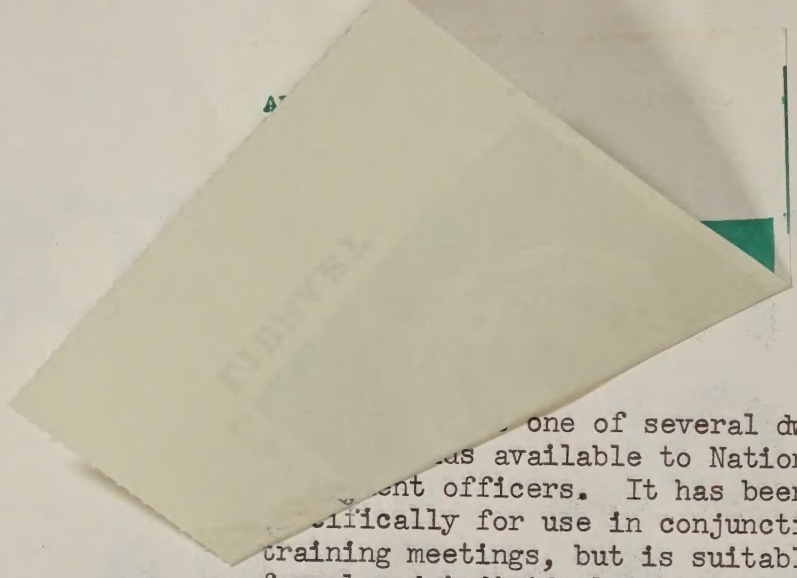
DWARFMISTLETOE CONTROL IN CALIFORNIA

AN OUTLINE OF BASIC PRINCIPLES

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE, REGION 5



one of several dwarfmistletoe
as available to National Forest timber
ent officers. It has been designed
ifically for use in conjunction with organized
training meetings, but is suitable also for less
formal and individual instruction. Additional
copies may be ordered from the Division of
Timber Management, San Francisco.

Available also are 35 mm colored slides and
30" x 40" black and white copies of the charts
from which the graphic material was taken.

This outline is intended only as a brief
introduction to the subject of dwarfmistletoe
control. For further details see:

1. Dwarfmistletoes of California and Their Control by J. W. Kimmey, Pacific Southwest Forest and Range Experiment Station, Technical Pub. 19, 1957.

2. Facts for Control -- Dwarfmistletoe Control in Ponderosa and Jeffrey Pine. (A Category II Handbook now in preparation.)

PART 1

FACTS ABOUT DWARFMISTLETOE

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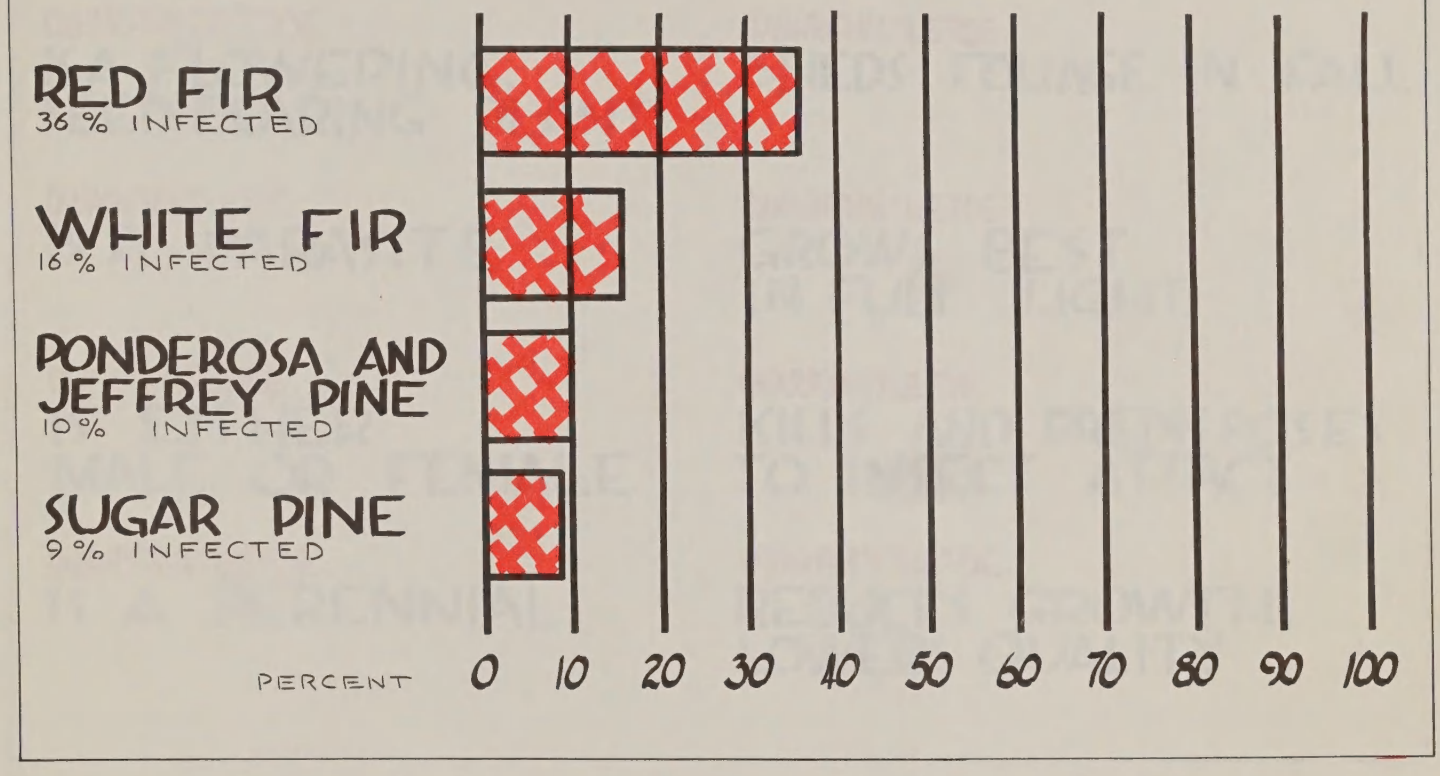
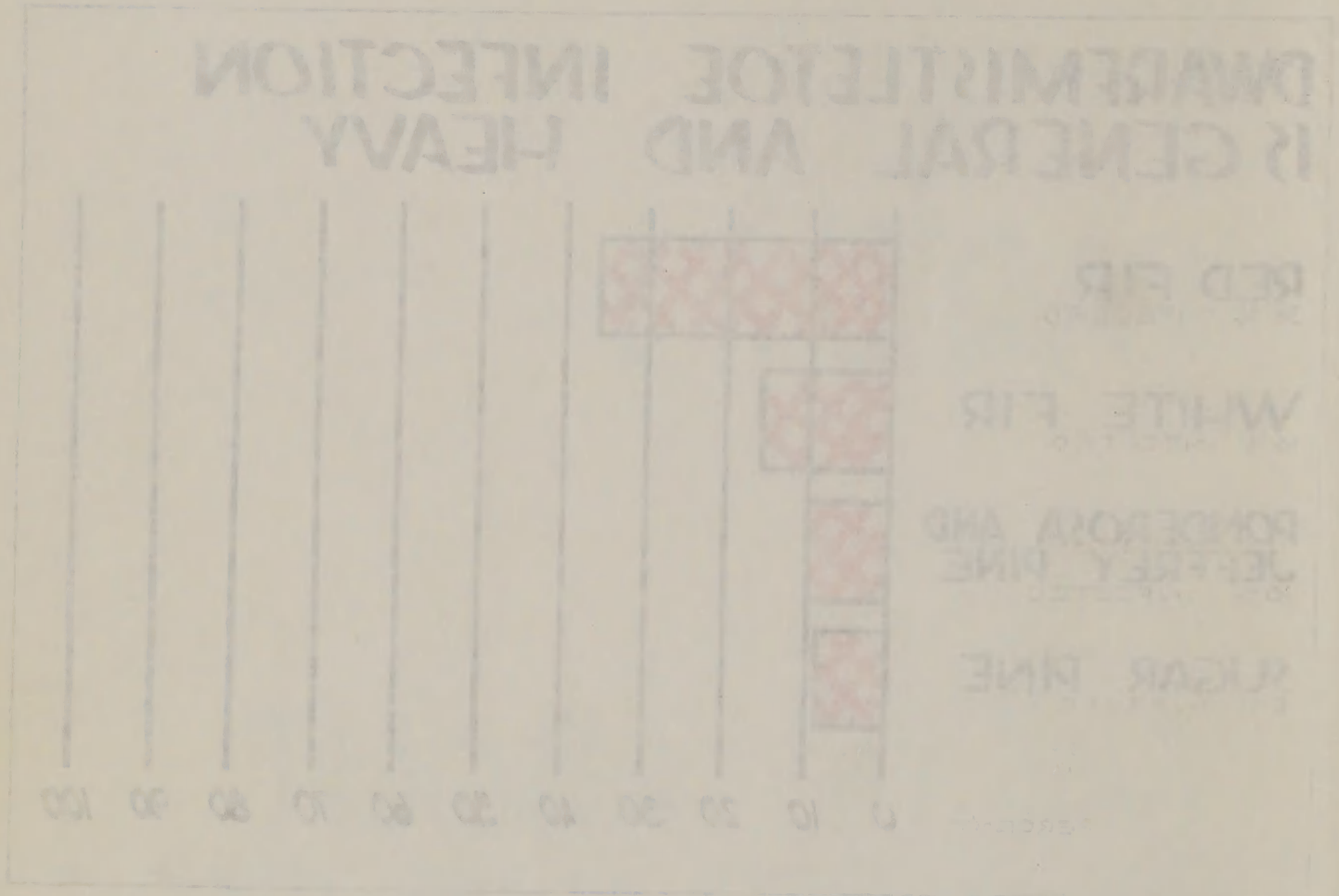
FACTS ABOUT DWARF MISTLETOE

DWARFMISTLETOE INFECTION IS GENERAL AND HEAVY



Dwarfmistletoe is a native parasite and originally existed in ecological balance with its host. High-grade logging in the early days, tree-selection harvest methods, fire protection, and other changing management practices have upset this balance. The disease is now increasing and may be expected to become progressively worse unless remedial action is taken.

The Pacific Southwest Forest and Range Experiment Station is conducting a 10-year survey of forest tree disease conditions in California. At the end of the third year about 5,000 true firs and pines on 300 plots had been examined. Preliminary results of the survey are given in the table above.



A PROFILE OF THE PEST

DWARFMISTLETOE
IS A FLOWERING, SEED-BEARING PLANT

DWARFMISTLETOE
IS A PARASITE

DWARFMISTLETOE
IS EITHER MALE OR FEMALE

DWARFMISTLETOE
IS A PERENNIAL

DWARFMISTLETOE
SHEDS FOLIAGE IN FALL

DWARFMISTLETOE
GROWS BEST IN FULL LIGHT

DWARFMISTLETOE
KILLS AND PREDISPOSES TO INSECT ATTACT

DWARFMISTLETOE
REDUCES GROWTH, LOWERS QUALITY

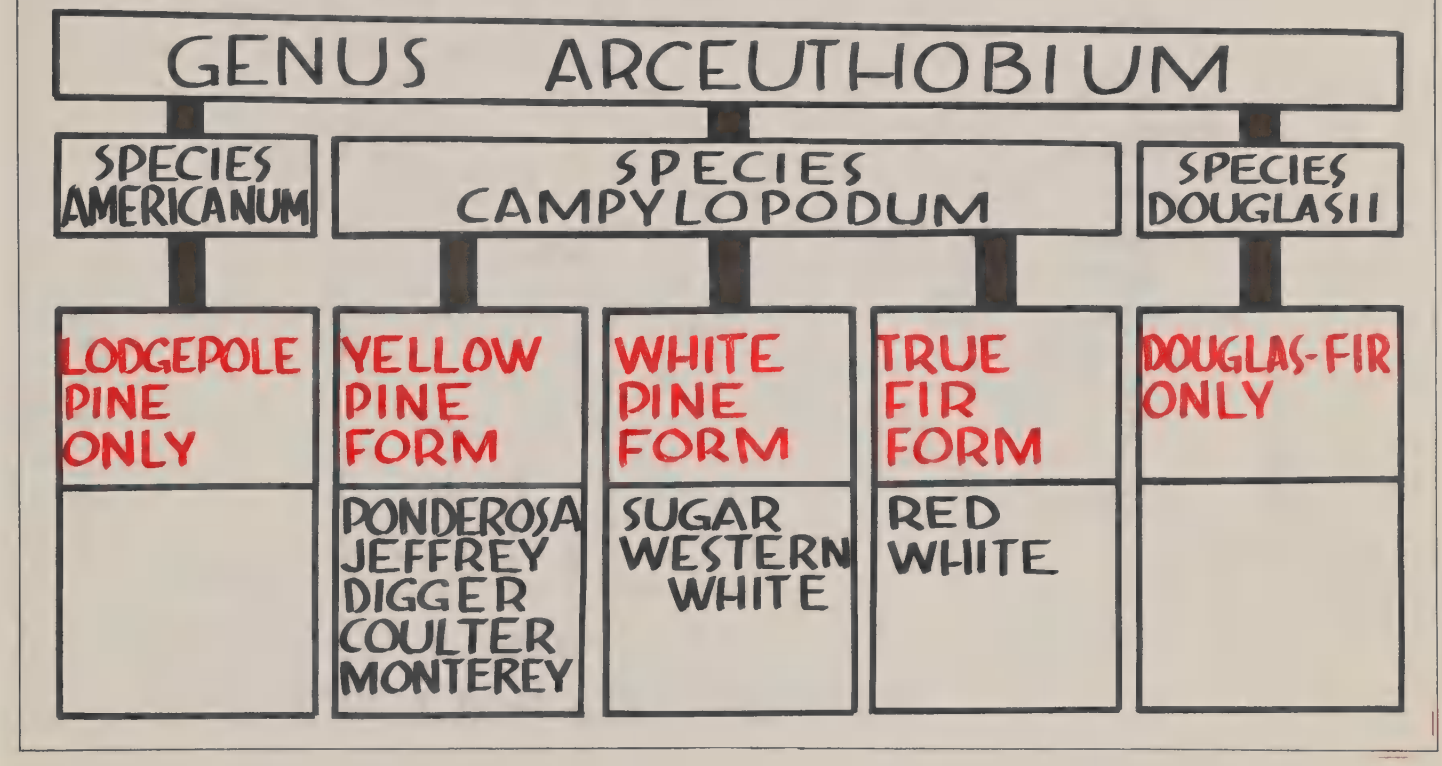
Most forest tree diseases are caused by primitive organisms such as fungi, bacteria, and viruses. Dwarfmistletoe on the other hand is one of the higher plants. It has stems and roots, leaves and flowers, and reproduces by means of seed in basically the same way as other broadleafed plants.

Dwarfmistletoe leaves and stems contain very little chlorophyll and the plant is incapable of meeting its own nutritional requirements. For this reason it can exist only as a parasite on a suitable coniferous host.

A PROFILE OF THE PEST

IS A FLOWERING SEED-BEARING PLANT	SHEDS FOLIAGE IN FALL
IS A PARASITE	GROWS BEST IN FULL LIGHT
IS EITHER MALE OR FEMALE	KILLS AND PREDISPOSES TO INSECT ATTACT
IS A PERENNIAL	REDUCES GROWTH, LOWERS QUALITY

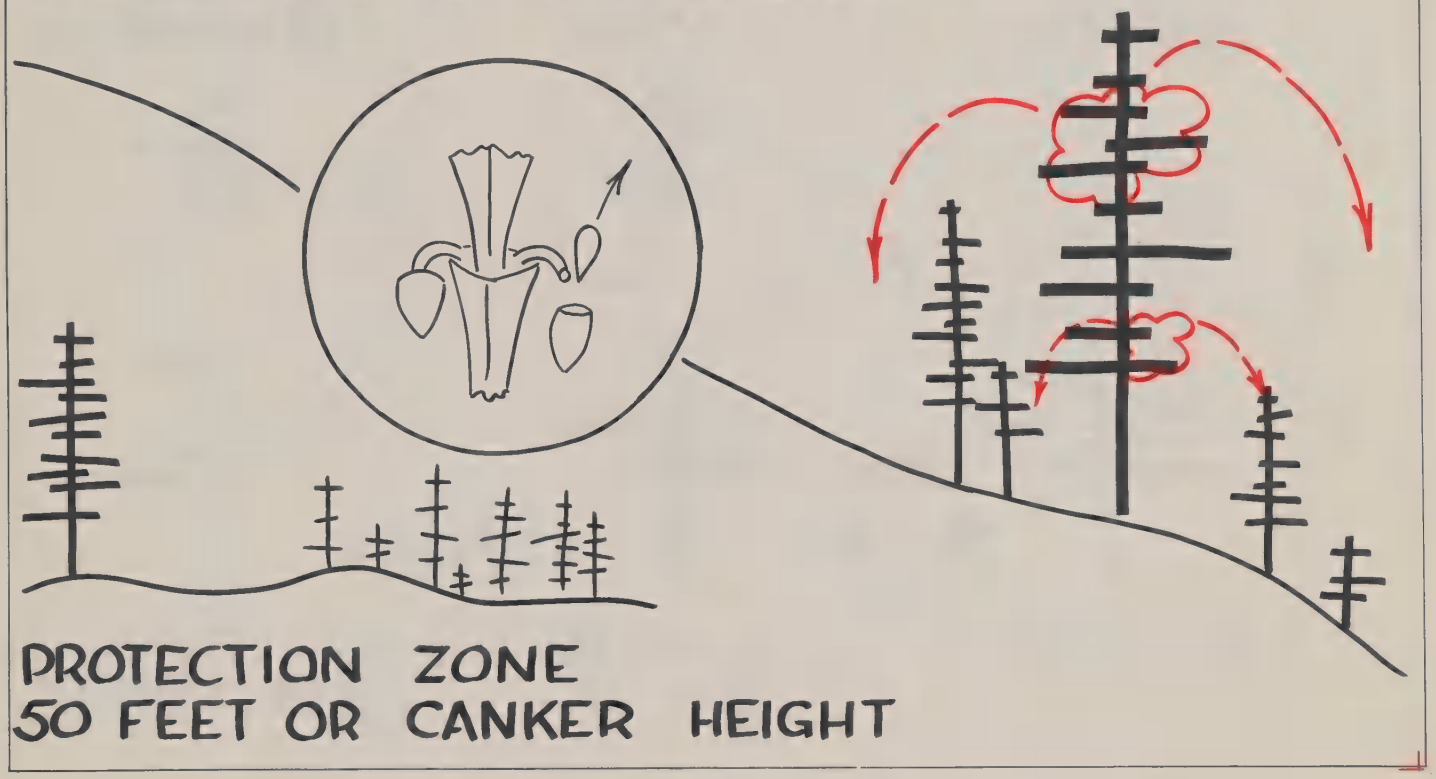
PRINCIPAL DWARFMISTLETOES OF CALIFORNIA



Most coniferous species or groups of similar species have their own dwarfmistletoe which can attack it alone. In California there are five types of dwarf-mistletoe that attack commercially important species. Others occur on pinyon pine, high elevation pines, spruces and hemlocks. Incense cedar, junipers and related species are not affected by dwarfmistletoe.

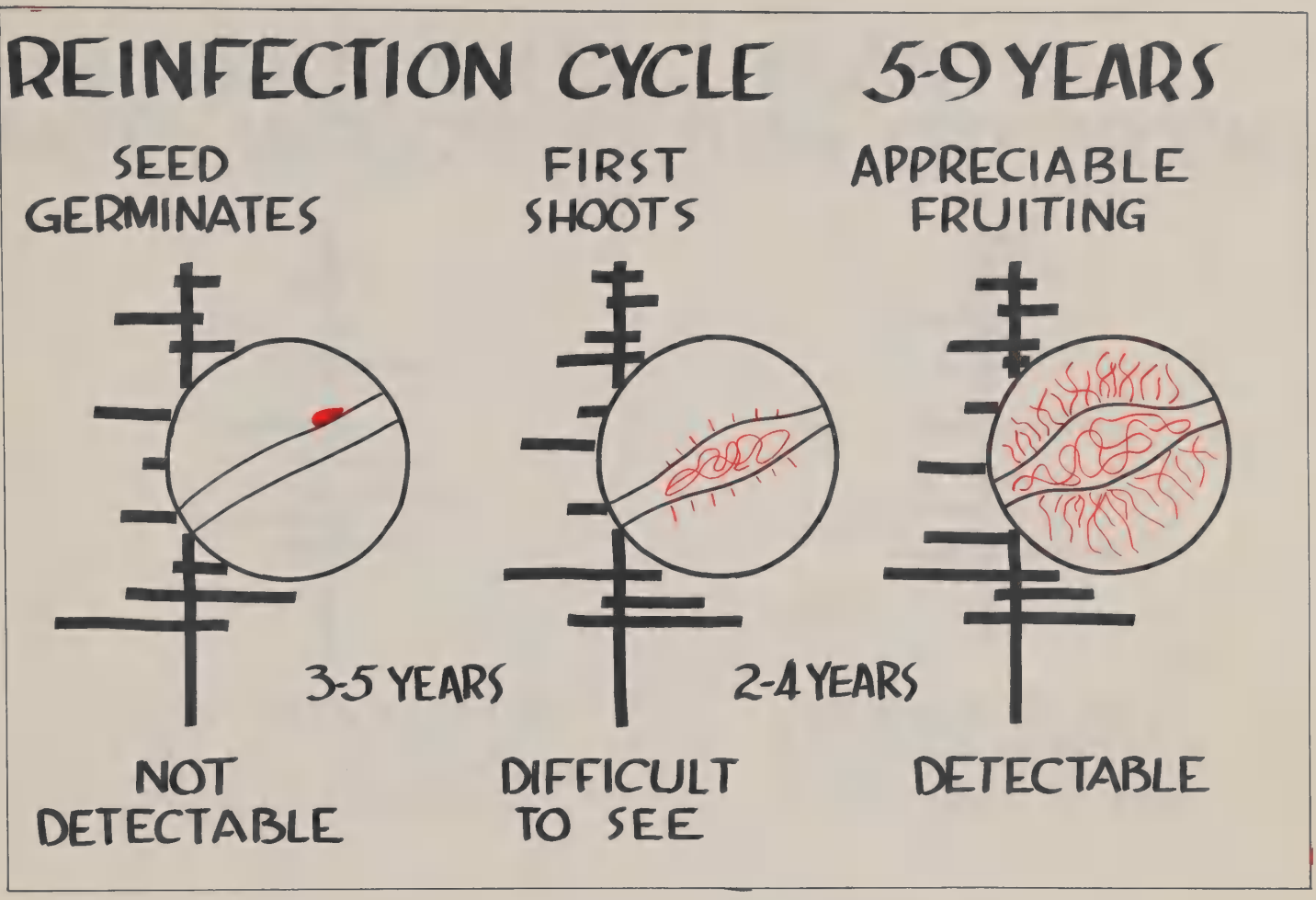
The familiar mistletoe of oaks and other hardwoods is a closely related genus of the same family. It is found on white fir south of the Tahoe National Forest on incense cedar, juniper, and cypress, as well as on the hardwoods.

DWARFMISTLETOE SPREADS BY SHOOTING SEEDS



Dwarfmistletoe spreads entirely by shooting seeds. These are borne in small, liquid-filled fruits which ripen in the fall. When fully ripe the fruit develops an internal pressure capable of ejecting the seed for horizontal distances as great as 30 feet.

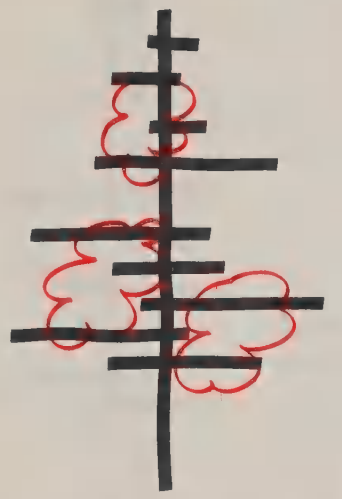
The effective distance the disease can spread from a fruiting plant depends mainly on the height of the plant and the degree of slope. If protection zones are needed around planted areas or control units they must be as wide as the height of bordering infections, but may not be less than 50 feet.



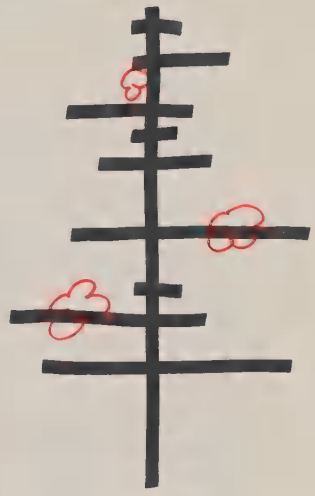
A period of 5-9 years is required for a new dwarfmistletoe infection to develop to the point where appreciable reinfection is possible. During most of this time the parasite develops within the host tissue and is not detectable except by very close examination.

Follow-up treatment to get these incipient growths and others missed by treatment crews is necessary in all dwarfmistletoe control work. Follow-up treatment should be scheduled 3-5 years after the initial work. In some cases more than one retreatment may be necessary.

VIGOROUS, YOUNG PLANTS MORE INFECTIOUS THAN OLD BROOMS



OLD BROOMS
EASY TO SEE
LITTLE FRUITING



VIGOROUS PLANTS
HIGHLY INFECTIOUS
OFTEN HARD TO SEE

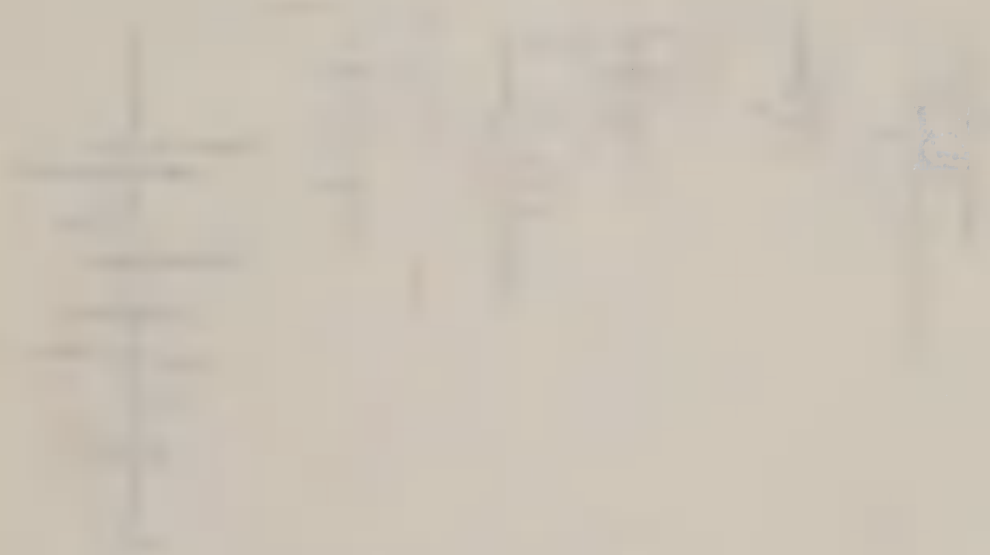
Massive, easily spotted dwarfmistletoe brooms are important growth impact and risk factors. As a source of new infection, however, they are far less active than vigorous, young growths. Consequently, the detection and elimination of the smaller, less easily detectable infections is the most difficult and important part of the control job.

The heavy bark of old brooms restricts development of dwarfmistletoe stems. The parasite is not dependent on these except for seed production, however, and can live indefinitely without generating aerial parts.

FASTEST SPREAD IS FROM RESIDUAL OVERSTORY TO UNDERSTORY

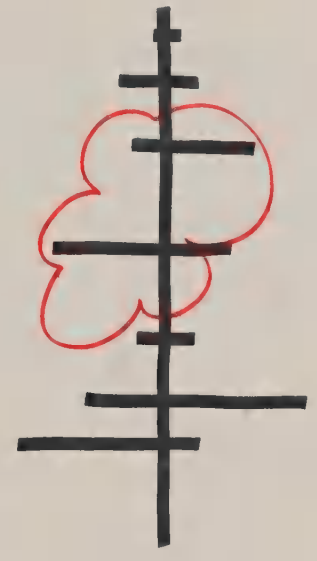
Height of infection and side screening are the major factors in determining rate of dwarfmistletoe spread. The most rapid intensification will take place following logging, when infected residual trees shower seeds down on a new or released stand. By comparison, lateral spread through a young, even-aged, well-stocked stand is relatively slow.

In all release or tree selection cutting give careful consideration to dwarfmistletoe occurrence in the residual overstory.



LATERAL SPREAD IS SLOW BUT SURE

ONE INFECTED TREE TODAY



IN 90 YEARS
2/3 – 1 1/4
UNPRODUCTIVE
ACRES

(R-3 DATA)

Recent investigations in the Southwest Region show that a single infected overstory ponderosa pine can infect up to $1\frac{1}{4}$ acres of young trees in 90 years. The initial spread from an overstory source infected about 1/4 acre. Subsequent lateral spread, which took place over 60 to 70 years, occurred at the rate of about $1\frac{1}{2}$ feet per year.

Although these statistics apply directly only to the ponderosa pine stands of the Southwest, the principle is generally true and the rate of spread in California may be even more rapid.

TIME OF YEAR IS IMPORTANT FOR SURVEYS, FOR MARKING, FOR CONTROL

Much of the aerial portion of dwarfmistletoe plants is shed each fall. New growth does not begin until late in the following spring. As a result during most of the year many of the small, highly-infectious growths are detectably only with great difficulty.

Marking and control should be undertaken only when the aerial parts are fully developed. Occasionally surveys may be extended somewhat, but normally no dwarfmistletoe work should be undertaken earlier than June or later than October. If possible, control work should be completed before the fruit ripens in the fall.

PART 2

DECIDING FOR CONTROL

DWARFMISTLETOE CONTROL OBJECTIVES

FIRST PRIORITY

PROTECTION
OF EXISTING STANDS
PREVENTION
IN REGENERATION AREAS

SECOND PRIORITY

SALVAGE
OF DETERIORATING STANDS

THIRD PRIORITY

RECLAMATION
OF TIMBER-PRODUCING SITES

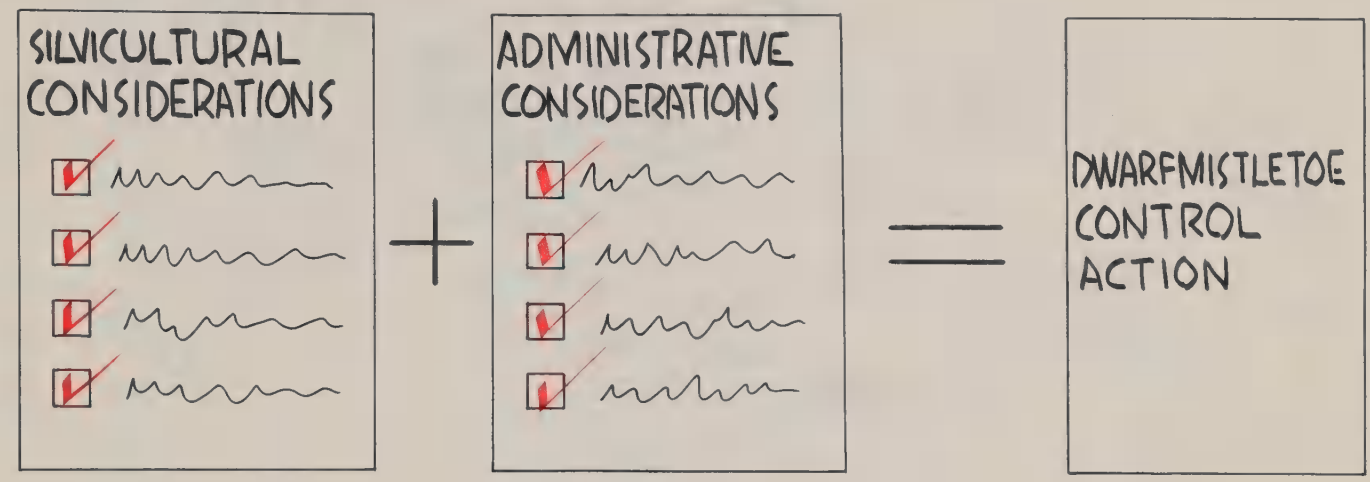
First priority in dwarfmistletoe control is given to situations where potential loss is the greatest and control is most easily accomplished. Regeneration areas and lightly infected young stands are among the high priority situations.

Where control costs are high and immediate benefit to the stand is limited, as in the case of infected pole stands, deferment of treatment is often desirable.

In some heavily infected stands salvage of all merchantable material followed by site preparation and regeneration is the only recommended treatment for dwarfmistletoe.

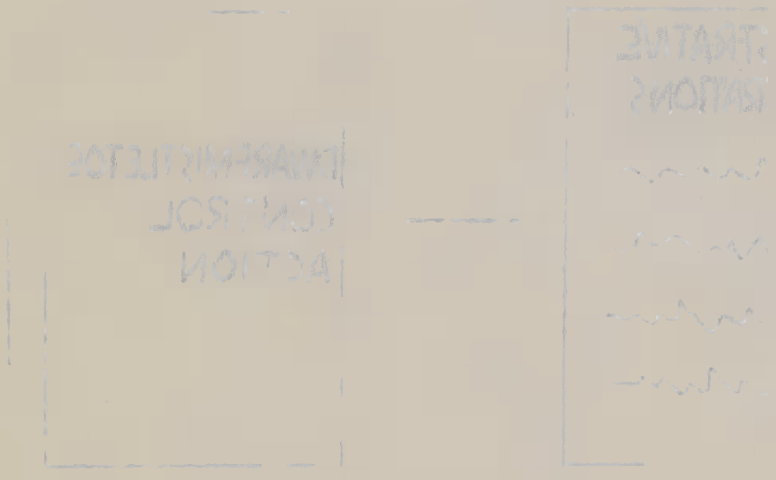
CONTROL OBJECTIVES

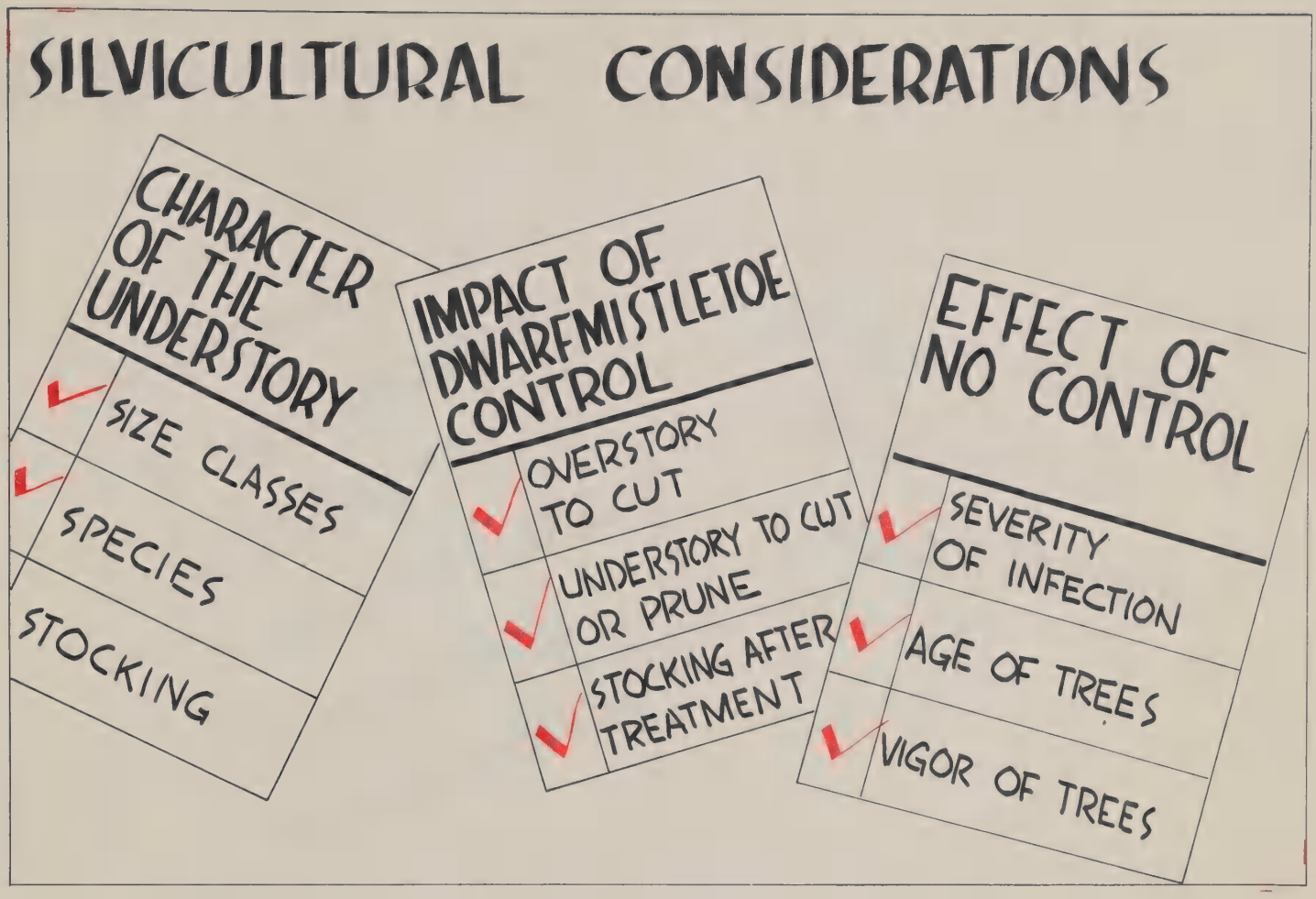
THE DECISION FOR CONTROL



Dwarfmistletoe control involves all phases of timber management from pre-sale planning to post-sale stand improvement. It often requires severe measures and results in high treatment costs. The decision for or against control can have a major effect on the over-all timber management program as well as on the treated stand.

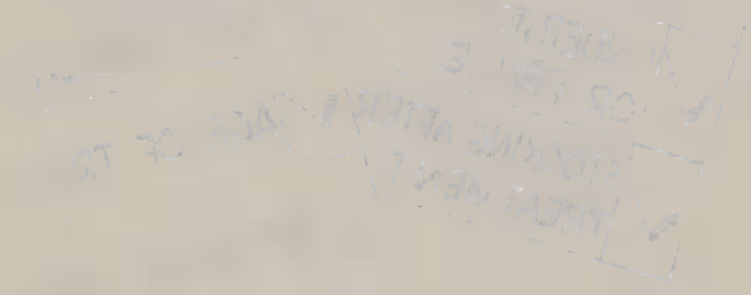
For these reasons, the silvicultural and administrative considerations bearing on dwarfmistletoe control should receive careful evaluation.

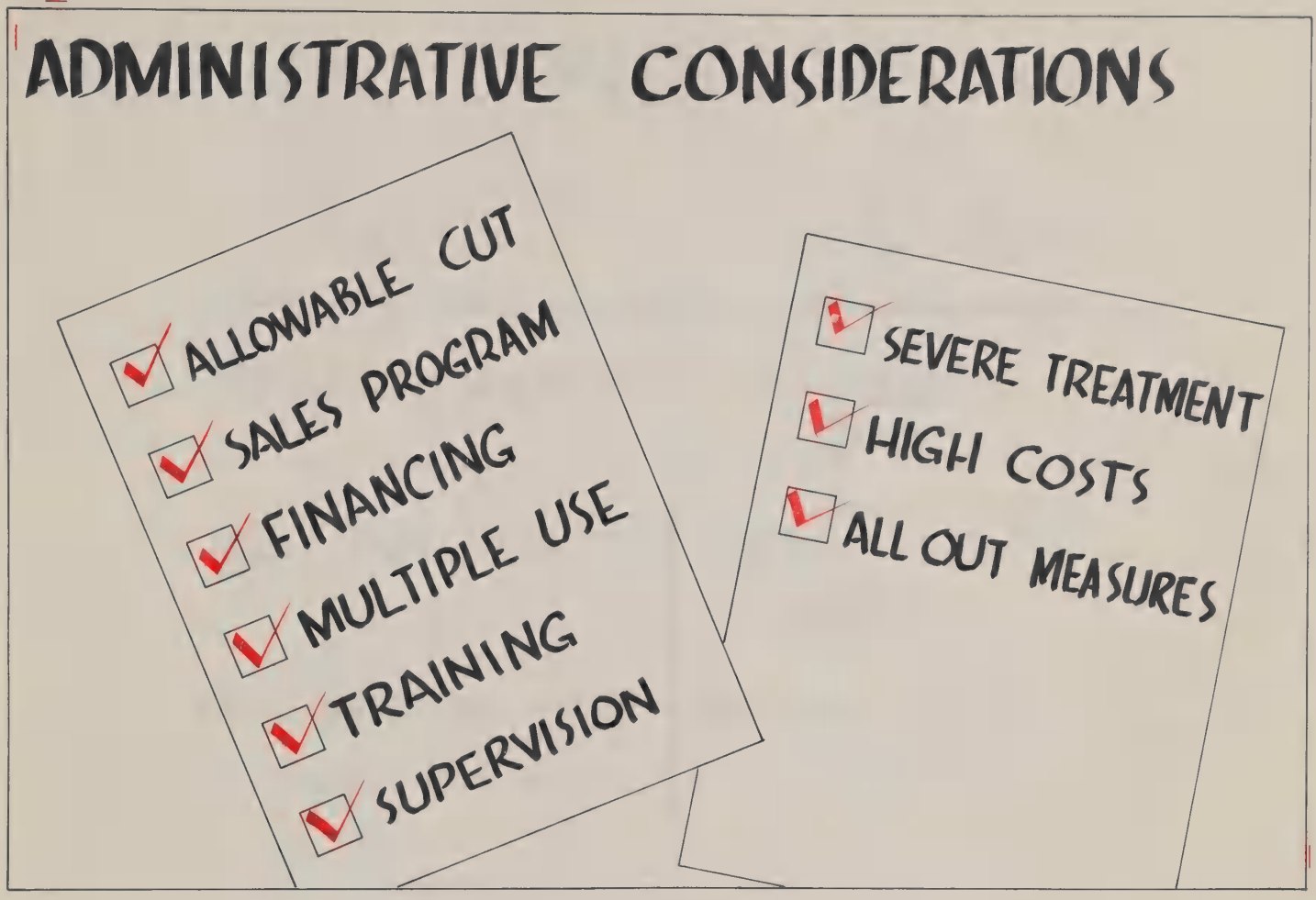




Silviculturally dwarfmistletoe control is not equally desirable for every infected stand. Some will benefit greatly; others are better left untreated. The decision for a given infection center is dependent upon concrete information about the stand. What is the nature of the understory? How will dwarfmistletoe control otherwise affect the stand? What would be the effect of no control?

Dwarfmistletoe control should not be undertaken except where substantial silvicultural benefit to the stand can be shown.





Equally important are the administrative factors. What will be the impact on the sales program and cutting cycle? Is full financing for both initial and follow-up work assured? Will adequately trained and supervised personnel be available? How will dwarfmistletoe control fit into the over-all land use picture?

These and similar questions must be answered against a background of possible severe treatment, high costs, and an all-or-none control effort.

PRIORITY CONSIDERATIONS

HIGHER	LOWER
SEEDLINGS, SAPLINGS	POLES
LIGHT INFECTION	HEAVY INFECTION
YOUNG INFECTION CENTER	OLD INFECTION CENTER

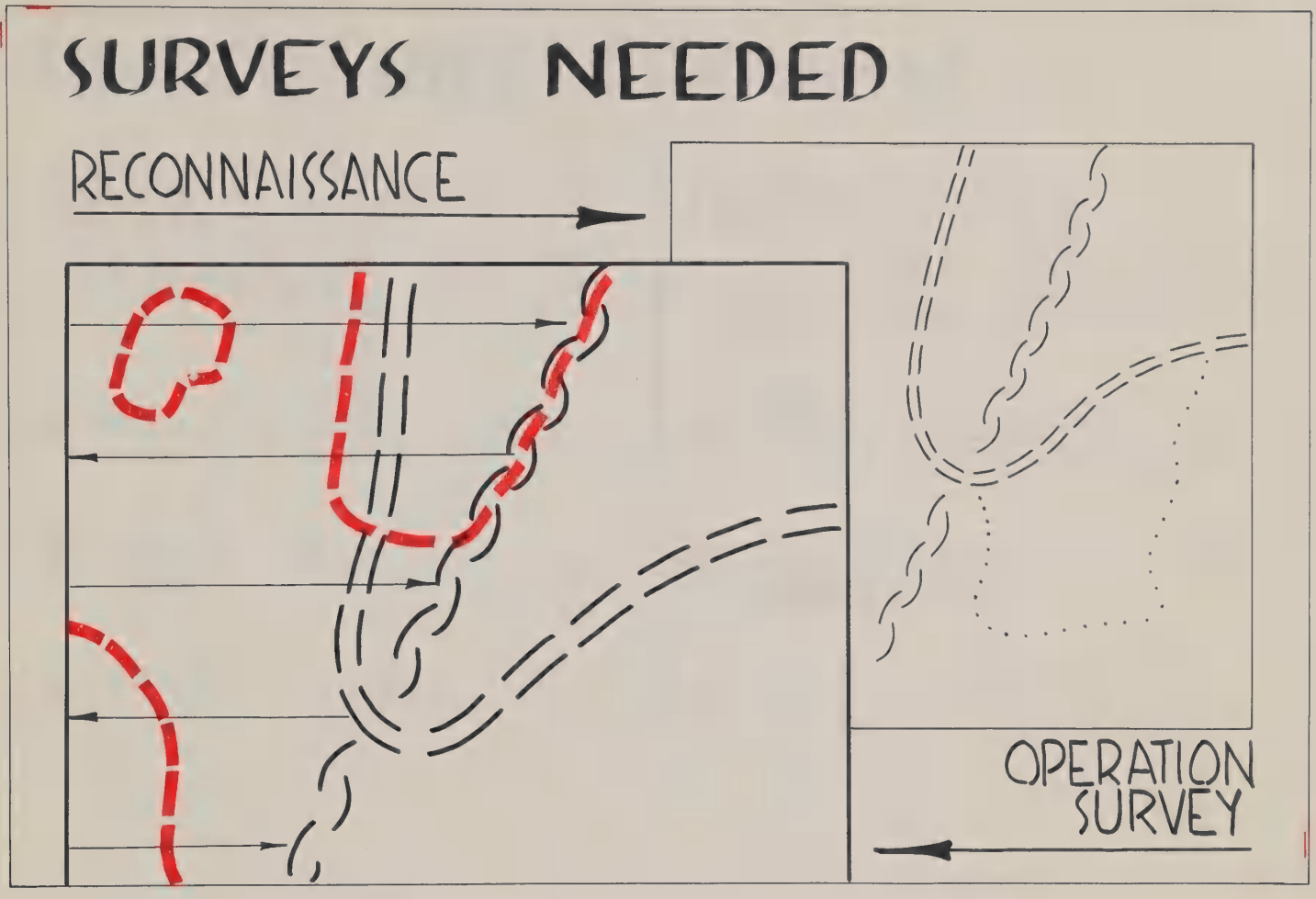
In stands where full treatment of the overstory is practicable the decision for or against dwarfmistletoe control often hinges on the type of stand in which post-sale work will be done, and on the age and intensity of the infection itself. Control in young, lightly-infected stands is comparatively inexpensive and easily realized. In older stands a thorough job may be difficult to accomplish, very costly, and may destroy much rapidly growing young timber.

Naturally, other silvicultural factors play a part. Thinning for cultural purposes goes hand in hand with dwarfmistletoe control in stagnated stands, and pruning infected branches fits nicely into the normal TSI program.

PART 3

CONTROL OPERATIONS

SURVEYS NEEDED



A reconnaissance is made of all sale areas in which dwarfmistletoe is known to occur. It is an extensive examination made by riding the roads and briefly inspecting less accessible areas. It is intended to distinguish between obvious extremes and to determine the need for an operation survey.

The operation survey is a measured strip sample in which infection centers are mapped and data are taken regarding the character of the stand, the degree of infection, stocking, and the difficulty of control. Mapping of separate infection centers is an important part of this survey since dwarfmistletoe can be controlled locally and each center may be considered independently of the others.

OPERATION
SURVEY

TIMBER SALE APPRAISAL

IMPACT ON STUMPAGE PRICE

- SMALLER SIZE CLASSES
- LOWER QUALITY
- POLE CLAUSE

IMPACT ON SALE AREA BETTERMENT

- LARGE AMOUNT OF TSI WORK NEEDED
- GREATER KV COLLECTIONS NECESSARY
- FIRST PRIORITY FOR DWARFMISTLETOE CONTROL

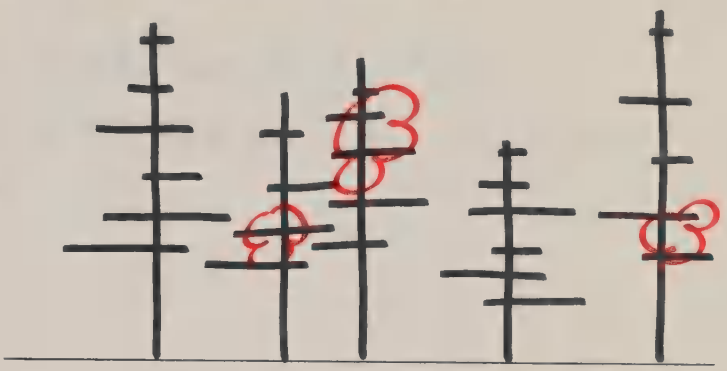
Dwarfmistletoe control can affect timber sales appreciably and must be included in the timber sale appraisal. In general, the higher proportion of small logs will lower stumpage prices while at the same time post-sale dwarfmistletoe treatment will require greater K-V collections.

Since dwarfmistletoe control is an all-or-none operation, full financing must be assured before any work is undertaken. If K-V resources are limited, dwarfmistletoe control may limit the amount of other sale area betterment activities.

FULL CONTROL ESSENTIAL

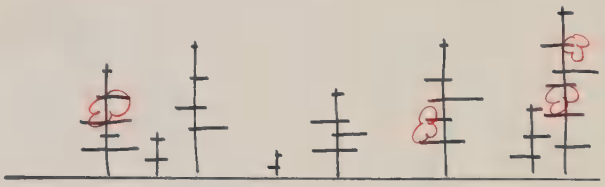
FIRST STEP

HARVEST ALL INFECTED OVERSTORY TREES



SECOND STEP

CUT OR PRUNE ALL INFECTED UNDERSTORY TREES



THIRD STEP

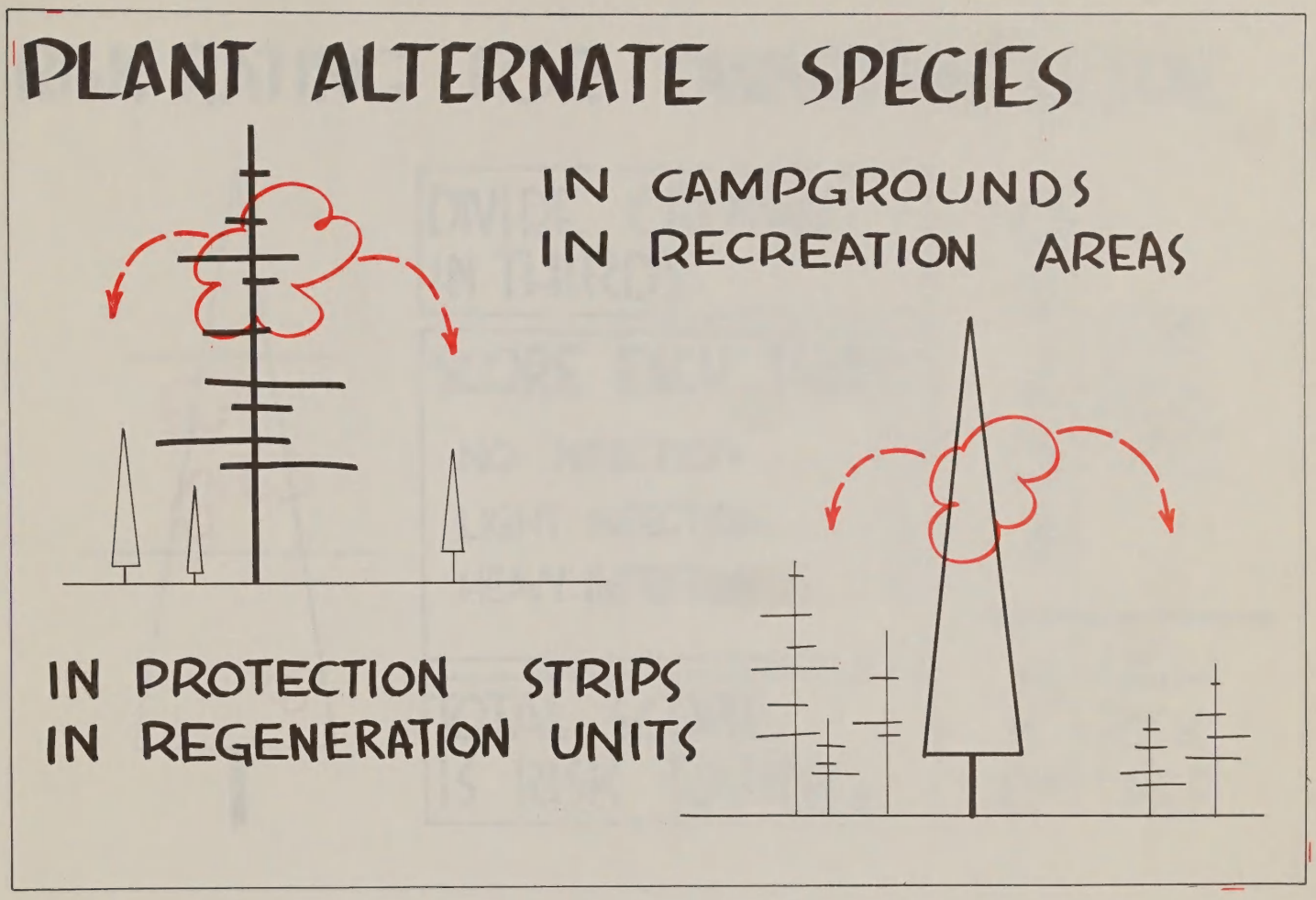
FOLLOW-UP IN 3-5 YEARS

Either a full program of dwarfmistletoe control must be carried out or none should be attempted. (Local control is possible, of course, and the decision need not be made for the entire sale area.)

Complete removal of infected overstory trees both in the control unit and in the immediate perimeter area is particularly important since follow-up treatment of the overstory is rarely possible.

Infected branches less than one inch can be pruned successfully if the nearest visible dwarfmistletoe swelling is more than 4 inches from the bole. In larger limbs a 6-inch safety margin is necessary.

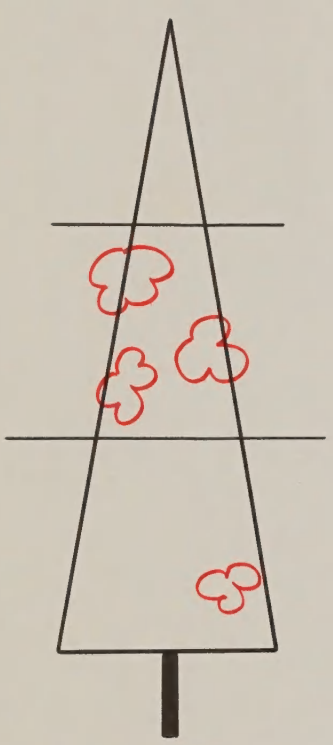
FIRST STEP
HARVEST ALL INFECTED
OVERSTORY TREES
SECOND STEP
CUT OR PRUNE ALL
INFECTED UNDERSTORY TREES
THIRD STEP
FOLLOW-UP IN 3-5 YEARS



In some situations control can be accomplished by planting an alternate species that is not susceptible to the local form of dwarfmistletoe. This approach is particularly well suited to non-commercial areas where the aesthetic and recreational considerations are paramount. In these cases a wider variety of species is available than in timber-producing forests.

In commercial forests the use of alternate species should be considered in small regeneration units surrounded by an infected overstory. Alternate species may also be used in protection strips surrounding plantations.

RISK RATING FOR DWARFMISTLETOE



DIVIDE CROWN IN THIRDS

SCORE EACH THIRD

NO INFECTION 0
LIGHT INFECTION 1
HEAVY INFECTION 2

TOTAL SCORE IS RISK RATING

0	LOW RISK TREE
1	
2	
3	
4	
5	HIGH RISK TREE
6	

This system may be used in connection with crown condition class cruises and unit area control sales. It is intended to be applied as a supplement to the usual risk ratings and should serve as a guide for the field man, not as a rigid principle.

In classifying each third of the crown, if more than one-third of the foliage is affected or if multiple small infections are observed, the rating HEAVY INFECTION should be given; otherwise the portion should be classed as LIGHT or NO INFECTION.