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PINE STANDS INFECTED WITH DWARF MISTLETOE IN THE ATHABASCA FOREST

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PINE STANDS INFECTED WITH DWARF MISTLETOE IN THE ATHABASCA FOREST

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The occurrence of dwarf mistletoe infected pine stands in northeastern Alberta has been known for some time.[1] The Alberta Forest Service, has recently expressed an interest in evaluating this problem within the Athabasca Forest. A preliminary meeting of Messrs. J. Lowe, Forester in charge of Inventory Surveys Alberta Forest Service; R. Stevenson, Forestry Officer, Canadian Forestry Service and R. Blaud, Research Officer, Canadian Forestry Service; served to focus attention on the design of practical evaluation procedures and possible control measures compatible with the economic goals and management objectives of the Athabasca Forest.

This meeting was followed by a brief aerial and ground look at the dwarf mistletoe infected pine stands in the Athabasca Forest, conducted November 7 and 8 by Messrs. R. Grey, Management Forester, Athabasca Forest, Alberta Forest Service, J. Lowe and R. Blaud. Aircraft for the flight was supplied by the Alberta Forest Service. The flight line and dwarf mistletoe infected pine stands seen along it are noted on the accompanying map.

Survey Observations

1. Several areas of dwarf mistletoe infected pine do exist in the Athabasca Forest (refer to accompanying map).

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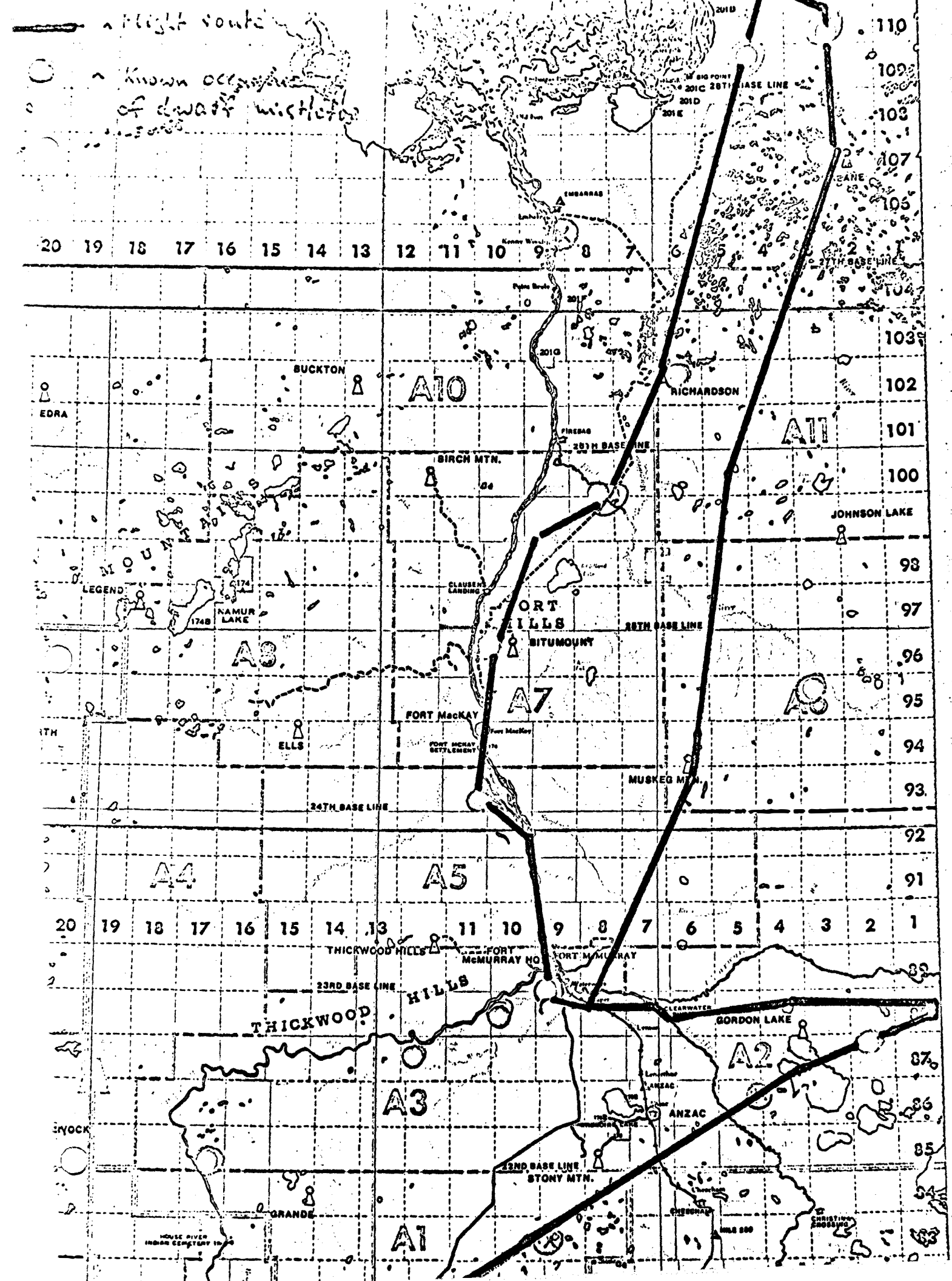
[1] 1952 through 1970 - Annual Report of the Forest Insect & Disease Survey, Canadian Forestry Service.

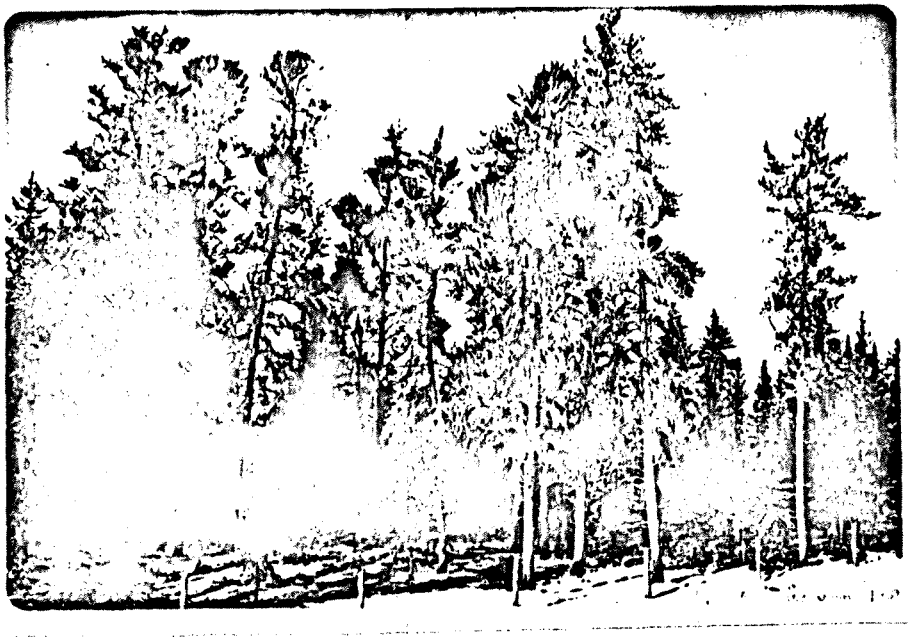

flight route
Known occurrences of dwarf mistletoe
20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
110
109
108
107
106
105
104
103
102
101
100
99
98
97
96
95
94
93
92
91
90
89
88
87
86
85
84
83
EMBARRAS
BUCKTON
EDRA
A10
A11
RICHARDSON
JOHNSON LAKE
BIRCH MTN.
LEGEND
NAMUR LAKE
CLAUSEN'S LANDING
BITUMOUNT
A8
A7
A9
FORT MacKAY
ELLS
MUSKEG MTN.
A4
A5
THICKWOOD HILLS
FORT McMURRAY
CLEARWATER
GORDON LAKE
A2
A3
ANZAC
STONY MTN.
GRANDE
A1
CHRISTINA CROSSING

2. Dwarf mistletoe brooms can be spotted from the air via oblique angle observation at a sampling height of approximately 700' above ground level (photo #1).

#1

These brooms indicate older mistletoe infections (photo #2).

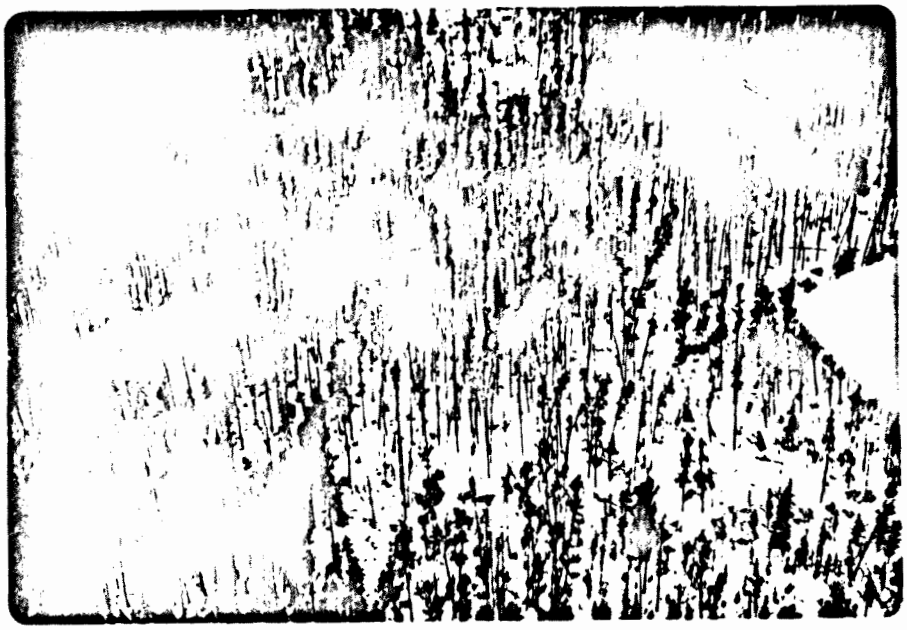
#2



3. Three "apparent" levels of stand infection were observable from the air.

Level I: Severely broomed pine stands (photo #3 & #4).

#3

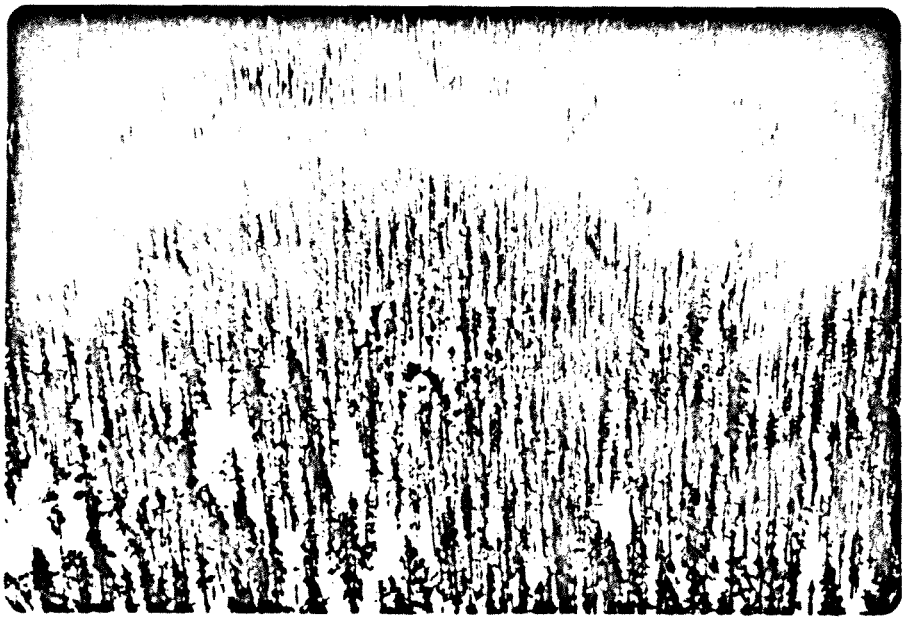


#4

Level II: Partially broomed pine stands (scattered patches). (Photo #5).

Level III: "Apparent" broom free pine stands.

#5



4. On the ground, trained observers can:

   a. easily spot pine having incipient through well developed dwarf mistletoe brooms.

   b. with some difficulty find new infections where small branch swelling and aerial mistletoe shoots are present.

5. Broomed dwarf mistletoe infected fire residuals occur throughout the area. These fire residuals are left in the following patterns:

a. strips: usually along ridges or low wet areas (photo #6).

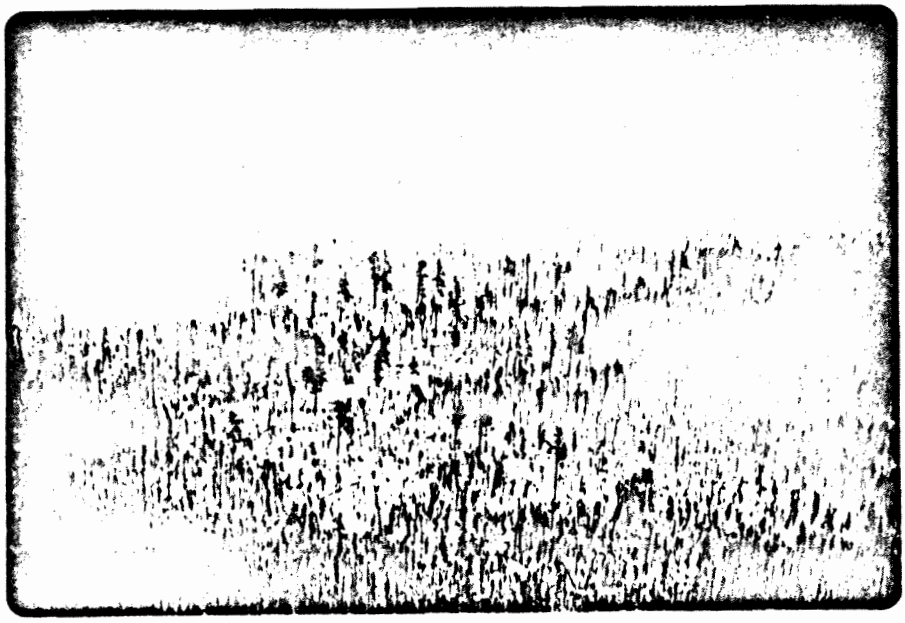
#6

b. pockets: clumps of trees for various reasons are left alive within burn areas (photo #7).

#7

c. scattered individuals: "escape" trees occasionally occur - probably in fires of lower intensity (photo #8).

#8



Questions and Remarks about Evaluating Procedures

1. Using aerial sampling techniques:

   (a) with what accuracy do "apparent" broom free areas indicate non-infected stands.

   (b) what factors (e.g. patterns, frequency distribution, numbers, percentages of stand infection) regarding "partially broomed pine" are indicative of current or "within rotation age" economic threat to the stand.

   (c) what size of broom need be present for accurate aerial recognition.

   Answers to the above could be obtained through limited aerial survey co-ordinated with ground control checks.

2. At what distance can dwarf mistletoe infections assumed to be spread from "older broomed infections" that can be spotted from the air?

   Based on work done in Alberta[2,3,4,5 & 6] the following concepts emerge:

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[2] Baranyay, J.A. 1970; Lodgepole pine dwarf mistletoe in Alberta. Can.For.Ser. pub.#1286.

[3] Baranyay, J.A. and Safranyik, L. 1970. Effect of dwarf mistletoe on growth and mortality of lodgepole pine in Alberta. Can.For.Ser. Pub. #1285.

[4] Muir, J.A. 1968. Epidemiology of dwarf mistletoe in Alberta. Can. For.Ser. Internal report A-16.

[5] Muir, J.A. 1968. Biology of dwarf mistletoe in Alberta. Can.For.Ser. Internal report A-15.

[6] Muir, J.A. 1968. Incidence of the fungal parasite Colletotrichum gloeosporioides and its possible effects on intensification of dwarf mistletoe. Can.For.Ser. Internal report A-17.

(a) There are no finite limitations on the distance mistletoe can spread from an infection source.

(b) Mistletoe spread usually depends on short distance spread mechanisms (seed ejection- path of projectile- target size). Muir found the maximum distance spread by new infections to be 130 ft from the infection source with the majority of the infections restricted to within 45 ft of the infection source.

(c) Occasionally a long distance spread occurs (thought to be the result of a seed carried by a bird, squirrel or storm).

Questions and Remarks about Control Procedures

1. Can harvesting the infected stand be used as a control?

   Yes, where clear cutting operations are economically and silviculturally sound. The key to control lies in the complete elimination of the dwarf mistletoe infected individuals during the felling operations. Practically speaking, this means cutting down all the trees, as workmen could not easily determine non-infected from infected trees. Further new mistletoe infections incubate in stems for between 2 - 6 years before aerial shoots are produced, thus making it virtually impossible to detect all the infected trees.

2. Are thinning control measures feasible in this area?

   No. In my opinion there are no large areas in the Athabasca Forest where individual tree treatments are economically sound. Exceptions to this would lie in a few well defined extremely high use recreational areas of very limited size which might develop in the future.

3. Are there any viable alternative controls?

Yes. In essence they hinge around the concept of Fire sanitation. The controls I see as economically possible and biologically sound are:

A. wild fire and infected residual cleanup: by withdrawing wild fire protection from well defined areas where dwarf mistletoe infection has made the forest uneconomical to harvest and following the inevitable wild fire with inspection of the residuals for infection and arranging for the demise of the infected residuals by either

a. prescribed burning

b. felling or girdling

c. silvicide procedures

The follow up is a vital step to ensure the destruction of mistletoe inoculum sources which survive on the fire residuals left by natural wild fires, and spread to the regeneration thus perpetuating mistletoe infected areas.

B. Prescribed burning and infected residual cleanup. This has the advantage of controlling the time of forest rotation and achieving the best sanitation by timing the burn to co-ordinate fuel types with desirable conditions.

4. How soon after a fire should dwarf mistletoe infected residuals be cleaned up?

As soon as possible to be the most effective. This also presents

the possibility of utilizing the fire suppression crews and equipment on hand at the time of the fire and allows for burning the residuals when other fuel hazards have been eliminated via the original fire.

5. Which of the infected sites are capable of producing commercial quality pine stands?
   Since there have been no forest capability studies carried out in the Athabasca Forest this largely remains an unanswered question, however the Athabasca Forest does have potential as a pulpwood producing area.

6. Is there any sense in control measures on other sites?
   In certain instances where poor sites are directly adjacent to good sites, a sanitized buffer zone extending 150' into and along the poor site would be of considerable value. This zone would serve to trap the main inoculum load. It may also be feasible to seed a buffer zone with a resistant species (such as spruce) which would act as an inoculum trap and not allow short distance disease spread (the main mode of spread by dwarf mistletoe).

In conclusion it must be stressed that the controls recommended in this paper are not intended for application to all dwarf mistletoe infected pine stands in Alberta. Rather forest managers should consider the procedures as part of a useful set of tools at their disposal and must decide whether implementation is desirable within specific forested areas.