

**Saskatchewan Environmental Society Submission for
the Public Review of Saskatchewan Environment's proposed
"Dwarf Mistletoe Standards and Guidelines"**

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I. Background and Overview

The proposed "Dwarf Mistletoe Standards and Guidelines" component¹ of the Forest Planning Manual was released for public review on 14 November 2005. This document proposes Objectives, Provincial Standards and Provincial Guidelines² for the management of dwarf mistletoe, a flowering plant that parasitizes jack pine in the central and northern Saskatchewan.

In Canada, dwarf mistletoe ranges from Manitoba to British Columbia and is an obligate parasite of jack pine and lodgepole pine trees. It is a common species native to Saskatchewan's boreal forest. Additional information on the life history of dwarf mistletoe has been provided by Saskatchewan Environment in background documents.³

A recently released Saskatchewan Environment Fire and Forest Insect and Disease Management Policy Framework includes the following excerpts:

- "forest insects and diseases also play an important role in forest ecology", and
- "[communication] emphasis will be placed on the beneficial role of fire and forest insects and diseases in ecosystems."⁴

Saskatchewan Environment has also embraced the following sustainability principle: "environmental protection and resource management should be based on an ecosystem-based approach, recognizing that all components in an ecosystem are closely linked and cannot be managed in isolation"⁵.

In the introduction of the "Dwarf Mistletoe Standards and Guidelines" document, Saskatchewan Environment does acknowledge that "dwarf mistletoe is an integral component of the boreal forest". However, the remainder of the standards document focuses exclusively on actions to eradicate or greatly diminish dwarf mistletoe across Crown forest lands, with the sole exception of Representative Areas and Ecological Reserves. The standards document refers to dwarf mistletoe as a "pathogen" and an "infection" and does not present any positive information about the species. Saskatchewan Environment's proposed dwarf mistletoe management direction is not consistent with an ecosystem-based management approach.

Dwarf mistletoe is a plant species like any other and worthy of conservation. The ecological role of dwarf mistletoe has received little study in jack pine forests, but mistletoe and resultant witches' brooms may serve as important food or habitat for other forest inhabitants. For other species of dwarf mistletoe in the same genus (*Arceuthobium*), the high value of witches' brooms as wildlife habitat has been well documented. In Oregon, long-eared owls, northern spotted owls

and Cooper's hawks usually nest in mistletoe brooms.⁶ In New Mexico, mistletoe brooms were preferred nest sites for Mexican spotted owls.⁷ In Colorado, bird abundance and species richness were positively associated with the level of mistletoe abundance.⁸ In Oregon, both red squirrels and northern flying squirrels preferred mistletoe brooms as rest sites.⁹ Several of these studies recommend retention strategies for dwarf mistletoe in logged over areas.

Although these studies are not specific to Saskatchewan, they point to a clear ecological function of dwarf mistletoe in forests generally. The positive ecological role of mistletoes has been recognized in the United States and Europe for many years.¹⁰ The reason there may be no data on the role of mistletoe as wildlife habitat in Saskatchewan is that the necessary research has never been conducted. For example, bird community monitoring has been conducted in various age classes of jack pine stands across Saskatchewan, but stands with high mistletoe incidence and severity have not been sampled¹¹.

One of the specific objectives of the proposed "Dwarf Mistletoe Standards and Guidelines" document was "to improve understanding of dwarf mistletoe (p. 7)", but the document itself does little to educate readers about the role of the species in forest ecosystems. The fact that no reference is made to the positive benefits of dwarf mistletoe in the proposed standards document or in the background documents¹², points to the fact that the focus is still exclusively on treating dwarf mistletoe as a disease affecting an economically important forest tree species. It appears to be a continuation of the "traditional species-centric approach to resource management"¹³ rather than an attempt to genuinely attempt ecosystem-based management.

The above discussion of the positive ecological role of dwarf mistletoe is not meant to trivialize the negative economic impacts of the species, which have been well documented.¹⁴ If dwarf mistletoe was to increase in incidence and severity, it could have a serious effect on future forestry operations. The issue is not whether dwarf mistletoe should be managed. Clearly it should be managed. The issue is whether the forest as whole is (i) managed solely for the production of economically valuable tree species, or (ii) managed as an ecosystem that includes both economically valuable tree species (e.g. jack pine) and species important for other reasons (e.g. dwarf mistletoe).

Recommendations:

- A. *The document should be amended to include a section describing the known or potential positive ecological benefits of dwarf mistletoe.*
- B. *Research should be undertaken by Saskatchewan Environment and Licensees to evaluate the influence of dwarf mistletoe on bird communities and other wildlife in Saskatchewan jack pine stands.*

As these results of wildlife research become available, the Objectives, Provincial Standards and Provincial Guidelines should be modified as necessary according to the principles of adaptive management.

II. Proposed Objectives

In the context of Saskatchewan Environment's legislated manuals, an Objective "states a desirable forest practice or future condition of a forest resource or forest use, which is attainable through the actions of the licensee". Objectives are to be specific, and linkages to higher level objectives are to be explicit.

The document proposes four Objectives:

1. "To limit seed dispersal and subsequent spread and infection of dwarf mistletoe into adjacent stands" (p.14),
2. "To remove the source of dwarf mistletoe spread and infection into regeneration. Infected living trees that contain living dwarf mistletoe, and a viable seed source, must be killed to reduce the risk of infection in new regeneration" (p. 15),
3. "The objective of follow up surveillance and assessment is to ensure removal of dwarf mistletoe from the site following dwarf mistletoe management action [~~was effective~~]. Follow-up surveys reveal and allow for the removal of trees or advanced regeneration that may not have [been] identified in the initial action" (p. 17), and
4. "The objective is to prevent the spread of dwarf mistletoe from infected protected areas into adjacent susceptible regeneration, while considering significant values at risk and maintaining ecological values in the forest" (p. 18).

Although these proposed Objectives are not numbered in the standards document, I will refer to them as proposed Objectives 1, 2, 3, and 4, respectively.

These four proposed Objectives lack explicit links to higher level objectives. For example, proposed Objectives 1 through 3 relate to areas available for wood supply and proposed Objective 4 relates to representative and protected areas. But what is the balance across the Crown forests between the area of land designated as available for wood supply and the area of land designated as representative? These proposed Objectives cannot be fairly evaluated from an ecological perspective until the relative proportion of the landscape designated as representative is known.

Recommendation:

C. *Add the following as a new Objective.*

"A specific percentage of Crown Forest, across all ecozones, should to be explicitly set aside from forest exploitation and dwarf mistletoe management activities. This percentage should be between 20 percent, the recommendation of the Senate Sub-Committee on the Boreal Forest¹⁵ and 50 percent, the recommendation of the Boreal Forest Conservation Framework¹⁶."

The Boreal Forest Conservation Framework is a vision to sustain the ecological and cultural integrity of the Canadian boreal forest region shared by a growing alliance of groups representing conservation organizations, First Nations and the forest industry. The goal is "to

conserve the cultural, sustainable economic and natural values of the entire Canadian boreal region by employing the principles of conservation biology to:

- protect at least 50% of the region in a network of large interconnected protected areas, and
- support sustainable communities, world-leading ecosystem-based resource management practices and state-of-the-art stewardship practices in the remaining landscape."¹⁷

In light of this framework, the Saskatchewan commitment to protecting 12% of its lands and waters¹⁸ is insufficient to ensure forest sustainability.

Proposed Objectives 1 through 3 should contain a specific reference to the fact that they apply to only a portion of the landscape (i.e. explicitly do not apply to representative areas and protected areas).

Proposed Objectives 1 and 2 are far too general. If these two objectives were successfully achieved, then dwarf mistletoe would be eliminated as part of the natural biodiversity from a large portion of the Crown forest. If dwarf mistletoe could not establish by spread from an adjacent stand or by spread from older trees to regenerating trees in the same stand, then it could not perpetuate itself. Even in areas managed for wood supply, it is unreasonable to try to completely eliminate a native species.

In the Forest Planning Manual, Saskatchewan Environment defines sustainability as "the ability of an ecosystem to maintain ecological processes and functions, biological diversity, and productivity over time". Proposed Objectives 1 and 2 above are not valid in that they threaten the maintenance of an ecological process (parasitism) and the distribution of a component of native biodiversity (dwarf mistletoe). The Forest Stewardship Council's 2004 National Boreal Standard¹⁹ requires that the viability of native species will not be "knowingly put at risk by the applicant through activities related to forest management" (Indicator 6.3.9). Saskatchewan Environment should avoid applying Objectives that might inhibit licensees from achieving FSC certification.

The "Dwarf Mistletoe Standards and Guidelines" document refers to "minimum, measurable standards that ensure management actions are conducted in an ecologically, and economically feasible manner" (p. 6). Proposed Objectives 1 and 2 are not economically realistic. Given the current level of staffing and resources at Saskatchewan Environment, it is extremely unlikely that management actions could be undertaken on all stands containing dwarf mistletoe across Crown's forests over any meaningful time frame.

The forest management issue of concern should not be the continued presence of dwarf mistletoe in Crown forests. In western U.S.A, it is recognized that "healthy lodgepole pine forests may always contain a mosaic of mistletoe infection centers and uninfected stands."²⁰ The future presence of dwarf mistletoe in Saskatchewan should be accepted. The pre-industrial forest, which was exploited during the timber boom of the early 1900s and during the latter half of the 20th Century by the pulp industry, contained endemic dwarf mistletoe. This level of dwarf mistletoe did not inhibit economic utilization of Saskatchewan's forests.

A valid forest management issue of concern is the risk of expanding the area of jack pine with high dwarf mistletoe incidence/severity rates. In a Saskatchewan Environment 2005 news release²¹, it is claimed that dwarf mistletoe is spreading because of forest fire control efforts. However, background documents released by Saskatchewan Environment presented no scientific evidence that dwarf mistletoe has increased its spatial distribution, or increased its incidence/severity within its current distribution, during the era of modern fire control.

The FSC National Boreal Standard requires characterization of the pre-industrial forest condition and disturbance regime (Indicator 6.1.5). This should include the incidence and severity of dwarf mistletoe at a landscape scale. This pre-industrial condition analysis should be subjected to peer-review and be available for public review (Indicator 6.1.6).

Recommendation:

- D. *Saskatchewan Environment should collect and analyze data on changes in the distribution, incidence rate and severity of dwarf mistletoe in jack pine populations within a subset of study areas across the province, to determine whether the abundance of dwarf mistletoe is increasing, stable, or decreasing over recent decades.*

This would entail examining aerial photos, timber cruising data, logging records, surveyor notes or other evidence of dwarf mistletoe population status in past and present forests. This should be done on randomly selected areas, not just in areas currently exhibiting high incidence of dwarf mistletoe.

Without scientific evidence that dwarf mistletoe is increasing, the management goal of reducing dwarf mistletoe is questionable. Large reductions in dwarf mistletoe could be justified if the chosen management approach was to maximize yields for a single species with no concern for biodiversity and ecological processes. However, such reductions can not be justified if the chosen management approach is ecosystem-based management where "the focus is on managing the effects of human activities on ecosystems instead of trying to control ecosystems themselves".²²

In the absence of evidence that dwarf mistletoe is increasing, it is still valid to ensure that forest management activities do not serve to increase the extent, incidence rate, or severity of dwarf mistletoe relative to historic levels of abundance. The proposed Objectives should be re-written to reflect this more modest aim. It is ecologically sound and economically feasible.

Recommendation:

- E. *The first two proposed Objectives should be modified as follows:*
1. *"To limit seed dispersal and subsequent spread of dwarf mistletoe into adjacent stands (p.14) if adjacent stands are:*
 - (a) *harvested or silviculturally treated,*
 - (b) *at risk to increased incidence/severity relative to historic levels, and*

(c) outside of ecological reserves, representative areas, provincial parks and other protected areas".

2. *"To remove internal sources of dwarf mistletoe spread into regeneration if this regeneration is*
 - (a) in an area that is scheduled for harvest or silvicultural treatment,*
 - (b) at risk to increased incidence/severity relative to historic levels, and*
 - (c) outside of ecological reserves, representative areas, provincial parks and other protected areas.**Trees that contain living dwarf mistletoe, and a viable seed source, may need to be killed to reduce the risk of dispersal to new regeneration".*

The above modified Objectives limit the scope of mistletoe management efforts to a smaller subset of jack pine stands. It would not be consistent with an ecosystem-based management approach to send silviculturalists throughout the entire forest with the aim of preventing all dispersal and reproduction of dwarf mistletoe.

The current reality is that there is little chance that any control efforts proposed by Saskatchewan Environment or Licensees could actually come close to eliminating dwarf mistletoe in Provincial Forests in the near future. Currently available dwarf mistletoe control methods such as falling and girdling trees are slow and expensive. However, a breakthrough in biological or chemical treatments could make more efficient control methods available in the future. An overly ambitious Objective, such as eliminating or severely limiting dwarf mistletoe dispersal, becomes far more problematic when a cost-effective method of achieving such an objective suddenly becomes available. This is another reason why it is incumbent upon Saskatchewan Environment to communicate not just the negative effects of dwarf mistletoe, but also the "beneficial role"²³ of dwarf mistletoe in forest ecosystems.

If reductions in dwarf mistletoe incidence and severity are selected as management choices by Saskatchewan Environment for some areas, because ecosystem-based management rationales are trumped by economic forestry production concerns, then the magnitude of these reductions needs to be specified at both the stand scale and the landscape scale. Dwarf mistletoe should be explicitly acceptable at some non-zero incidence rate within some stands and within all landscapes.

The greater the proportion of land set aside as protected from dwarf mistletoe control (and industrial forest exploitation) in the boreal region, the greater will be the reduction in dwarf mistletoe that is acceptable in the remaining landscape. The Senate Subcommittee Report on the Boreal Forest recommended that only 20 percent of the boreal forest should be intensively managed.²⁴ Following this guideline, it might be appropriate to initiate major reductions in dwarf mistletoe over 20 percent of the stands it is present within.

Proposed Objective 3 purports to be about surveillance and assessment. Surveillance and assessment should be the measuring and reporting of incidence and severity rates in stands regenerating after harvest or silvicultural treatment, and as a comparative reference, in stands regenerating after natural disturbance.

Recommendation:

F. *The third proposed Objective is unclear in meaning. It should be modified as follows:*

3. *"Surveillance and assessment of dwarf mistletoe should be carried out prior to harvesting, silvicultural treatment, prescribed fire, or natural disturbance, and at predetermined time intervals thereafter to provide evidence to aid in management decisions. This stand-scale surveillance and assessment data needs to be brought together at the landscape scale to evaluate the persistence of dwarf mistletoe within the landscape".*

Surveillance and assessment are essential, but should include data collection in the stand prior to and following treatment or disturbance. If this type of data was available for sites harvested 20 to 40 years ago, it would be possible to make scientifically valid determinations about whether the levels of mistletoe incidence and severity have increased or decreased over time.

Surveillance and assessment should be considered an evaluative function and kept separate from control actions. Assessment data will serve as inputs into the decision-making process, but mere presence of dwarf mistletoe should not automatically trigger further control efforts. If surveillance data reveals dwarf mistletoe incidence rates at or below the acceptable level at the stand or landscape scale, then further control efforts will not be required.

Proposed Objective 4 is specific to "protected areas" and "recreational areas". However, these terms are not defined in the Forest Planning Manual. Reference is made to allowing mistletoe to function undisturbed in Representative Areas Ecological Reserves, but Provincial Parks are specifically excluded from the definition of Representative Area Ecological Reserve. The intent for Provincial Parks is extremely unclear. Provincial Parks should be managed in the same manner as Representative Area Ecological Reserves, as they contribute to the Representative Areas Network. To manage dwarf mistletoe in Provincial Parks the same way it is managed in areas available for wood supply brings into question whether Provincial Parks are protected areas and whether they actually contribute anything to the Representative Areas Network.

There is only limited overlap between the distribution of severe dwarf mistletoe in Saskatchewan²⁵ and the distribution of Representative Area Ecological Reserves²⁶ within the commercial forest region. Therefore, efforts are required to maintain populations of dwarf mistletoe in Provincial Parks such as Meadow Lake and Narrow Hills.

Recommendation:

G. *The fourth proposed Objective should be rewritten as follows:*

4. *"To limit the spread of dwarf mistletoe from protected areas (including ecological reserves, representative areas, provincial parks and recreation sites) into adjacent regeneration in areas susceptible to increased incidence or severity of*

dwarf mistletoe , while considering significant values at risk and maintaining ecological values in the forest."

Prevention of all dispersal of dwarf mistletoe from protected areas to other parts of the landscape is gross interference with an ecological process. Absolute inhibition of dwarf mistletoe dispersal can not really be the desired objective. It should not be the intention of Saskatchewan Environment to reproductively isolate dwarf mistletoe in Representative Areas. Protected areas should not be disconnected from the larger scale landscape. The 2005 RAN Status Report acknowledges that "connectivity enhances the movement of species and their genetic materials across the landscape"²⁷.

Recommendation:

H. Another Objective should be added:

"To allow dwarf mistletoe to function as an integral part of the boreal forest ecosystem within protected areas including ecological reserves, representative areas, provincial parks and recreational sites, unless non-intervention threatens to alter native communities through species conversion, and to allow sufficient genetic exchange between dwarf mistletoe populations to prevent reproductive isolation within protected areas".

This final Objective makes explicit the goal of having dwarf mistletoe perpetuate itself under natural conditions within portions of the landscape while ensuring it is not reproductively isolated in these areas. If Saskatchewan Environment has truly dropped the narrow goal of maximizing the yield for single resource and embraced an ecosystem-based management approach, then there should be generous room in the province for areas where native species such as dwarf mistletoe are not subject to perpetual control efforts.

The above-recommended changes to the proposed Objectives help to better define desired forest future forest conditions.

III. Proposed Provincial Standards

According to the Saskatchewan Environment Forest Planning Manual:

"a standard is a specific measurable activity, result or unit of measure. Good standards are measurable, scientifically sound, operationally feasible, linked to management objectives, and integrated with other standards. SE will enforce a licensee's adherence to the standards and can modify standards when the monitoring of results or new knowledge indicates a change is required."

Although the Objectives proposed by Saskatchewan Environment and the Objectives proposed in this review are important for setting out the intent for dwarf mistletoe management activities, it is the Provincial Standards that will be the most important because these Provincial Standards will be monitored and enforced.

The following Provincial Standards are proposed by Saskatchewan Environment.

1. Buffer width shall measure 20 meters between infected adjacent stand and susceptible regeneration
2. In harvest blocks containing jack pine infected with dwarf mistletoe, all living jack pine shall be felled, cut or completely killed.
 - Live residual trees that are susceptible to dwarf mistletoe and have been left for retention values must be uninfected.
 - Infected trees may be left standing for retention values provided they are killed.
3. Sites where dwarf mistletoe management has been implemented shall be mistletoe-free at the time of the first post-harvest silvicultural assessment
 - Susceptible tree species shall not be considered free – to- grow if:
 - i. Any tree shows signs of stem infection;
 - ii. Trees <2m tall show signs of branch infection;
 - iii. Trees >2m are infected in the top half of the crown; or
 - iv. Any susceptible tree is growing within 20 m radius of any living infected overstory or residual tree.
4. Dwarf mistletoe management may be undertaken within Protected and Recreational Areas. Management activities must be conducted in full compliance with Riparian Areas Management standards and guidelines. The Following standards apply:
 - i. For the purposes of dwarf mistletoe management, only infected susceptible species can be cut or killed and left standing;
 - ii. The 10-meter "no-equipment zone" as defined in the Riparian standards and guidelines, must be strictly followed. Infected trees within the 10 m zone may be killed and left standing.
 - iii. Intervention may be permitted in Representative Areas if the mistletoe infection threatens to convert an area of Jack pine to open grass or shrubs, or if elevated fire risk threatens human safety or adjacent forest values at risk.

Although the proposed Provincial Standards are not numbered in the document, I will refer to them as Provincial Standards 1, 2, 3, and 4, respectively.

Provincial Standard 1 relates only the width of buffers and is reasonable where buffers are advisable.

Provincial Standard 2 contradicts itself. If "all living jack pine shall be felled, cut or completely killed" then live residual jack pine trees referred to in the subsequent bullet are precluded.

Efforts to mimic natural disturbance patterns may require leaving residual trees and residual tree patches within cutover stands. If all wildfires killed all jack pine with dwarf mistletoe, and dwarf mistletoe in regenerating even-aged, post-fire stands disperses at rates of less than 1 m per year²⁸ then there would likely have been very little dwarf mistletoe in the fire-generated pre-industrial forest landscape. Although there appears to be very little research on fire effects on the spatial distribution of dwarf mistletoe in jack pine stands, it is likely that residual live trees with dwarf mistletoe do frequently survive in burned over areas.

The zero tolerance approach to dwarf mistletoe advocated in these proposed Provincial Standards is unjustified. Using an ecosystem-based approach, there should be tolerance of some endemic distribution of dwarf mistletoe in managed forests.

Recommendation:

I Provincial Standards 2 and 3 should be modified to abandon zero tolerance and permit a level of mistletoe presence in the landscape. Efforts to control mistletoe should be restricted to only portions of cutovers (e.g. 80% of area) or restricted to only a portion of all cutovers (e.g. 80% of cutovers). In the 20% of remaining cutover area or 20% of remaining cutovers, mistletoe presence should be allowed at some incidence rate.

These modifications to the proposed Provincial Standards will prevent penalization of licensees for allowing a native species to persist at some level of incidence within FMA. Licensees would have difficulty achieving FSC certification if it is their intent to eradicate a native species in their license area. The actual proportions (e.g. 80% to 20%) could be experimented with in a controlled study to develop scientific data to justify how much mistletoe is enough to perpetuate the species and provide for wildlife habitat values.

A spatial approach has been recommended for forest assessment.²⁹ If you accept that dwarf mistletoe is an integral part of the ecosystem, and that it will be a component of the future forest ecosystem, then a spatial strategy is required to ensure that dwarf mistletoe continues to persist in some locations within the landscape at all times, even outside of representative areas.

The proposed standards document states that "mistletoe management activities are not permitted inside established RA's unless the roles and objectives of the representative area are threatened". Although this statement is made, why is it not incorporated as an explicit Provincial Standard?

Despite Saskatchewan Environment's adoption of ecosystem-based management, all of the proposed Provincial Standards relate to mistletoe eradication outcomes.

Recommendation:

- J. *Mistletoe persistence outcomes at some limited spatial distribution or incidence rate should be desired and should be established as an enforceable Provincial Standard.*

Proposed Objective 4 relates to preventing the spread of mistletoe from protected and recreational areas to adjacent areas. Modification of this proposed Objective was recommended above. Proposed Provincial Standard 4 should be related to the proposed Objective 4. However, proposed Provincial Standard 4 enables the cutting or killing of jack pine containing dwarf mistletoe in protected areas, including riparian areas and Representative Areas, whether or not such control activities are required to prevent the spread of dwarf mistletoe to adjacent areas.

If the proposed Provincial Standard 4 is meant to measure achievement of the proposed Objective 4, then mistletoe control activities within protected areas should be restricted to peripheral areas within 20 m of susceptible stands outside of the protected area. Because of the slow dispersal rates of mistletoe³⁰, control activities within the core of the protected area are not necessary to achieve proposed Objective 4.

Recommendation:

- K. *The first sentence in the fourth proposed Provincial Standard should be reworded as follows:*

"Dwarf mistletoe management may be undertaken within Protected and Recreational Areas only within 20 m of their boundaries."

The portion of proposed Provincial Standard 4 related to intervention in Representative Areas included is not required to achieve proposed Objective 4. Furthermore, no scientific evidence is presented in the document to back up the assertion that dwarf mistletoe leads to elevated risk of forest fires.

Historically, classically trained foresters have had biases against stands that are not fast growing and have constructed arguments to justify their conversion. For example, older stands are called "decadent" and "over mature" and are targeted as "fire hazards". Similar biases exist against stands with high densities that are slow growing, stands with high incidence rates of mistletoe, etc. All of these types of stands existed in natural forests with natural disturbance regimes prior to industrial forestry activities.

If an ecosystem-based approach has been adopted, and Saskatchewan Environment is moving forward with adaptive management where decisions are based on evidence, then unwarranted biases must be left behind. The probability of burning is dependent on weather variation, in particular the occurrence of persistent high-pressure systems,³¹ a factor that is unrelated to the presence or absence of dwarf mistletoe. Under the right conditions a wildfire will burn anything

in its path, young or old, fast-growing or slow growing, high incidence of dwarf mistletoe or low incidence of dwarf mistletoe. If dwarf mistletoe drastically increased the probability of fire, then stands with dwarf mistletoe would burn more often, thereby reducing the incidence and severity of dwarf mistletoe. Lightning creates fire, clear weather dries fuel, and wind pushes fire. Lightning, dry weather and wind occur independent of the presence or absence of dwarf mistletoe. The danger of including the reference to elevated fire risk in a Provincial Standard is that forest managers may be tempted to act on old biases and intervene to reduce dwarf mistletoe in Representative Areas and Provincial Parks when such intervention is unwarranted.

Recommendation:

- L. *The last portion of proposed Provincial Standard 4 could be modified as follows to serve as a Provincial Standard related to the final additional Objective proposed in this review.*

"Intervention shall only be permitted in protected areas including Representative Areas, Ecological Reserves, Provincial Parks and Recreation Areas, if monitoring data reveals that dwarf mistletoe is causing jack pine mortality at rates in excess of jack pine recruitment such that conversion of a forest stand to open grass or shrubs will occur within 10 years".

Such a conversion of a forest to a non-forest ecosystem driven by dwarf mistletoe is highly unlikely. Dwarf mistletoe is an obligate parasite, which would not have survived if it generally eliminated its host across large areas.³²

In summary, the proposed Provincial Standards are too drastic and if actually enforced, could result in a major reduction in the distribution and incidence rate of dwarf mistletoe in Saskatchewan's boreal forest. This could have effects on forest wildlife which utilize mistletoe brooms as habitat. The approach of one universal prescription for all sites is not consistent with ecosystem-based or adaptive management approaches.

Managing various portions of the landscape (e.g. protected areas and areas available for wood supply) differently, and various stands within the same portions of the landscape (most cutovers and the remainder) differently, provides an insurance policy in case mistakes are made. A universal approach to dwarf mistletoe management increases risk because errors, if they occur, will be occurring everywhere across the Provincial Forest.

IV. Proposed Provincial Guidelines

The Forest Management Planning Manual defines Provincial Guidelines as "recommended practices and are options for achieving standards and objectives given expected conditions." Licensee adherence to Provincial Guidelines will not be enforced, but will be audited.

Provincial Guidelines are provided for only two of the four proposed Objectives. The following proposed Provincial Guidelines listed under proposed Objective 1:

- "Where plantations border non-merchantable jack pine stands infected with dwarf mistletoe, other species not susceptible to dwarf mistletoe, should be considered for planting in the 20 meter buffer zone" (p. 8.), and
- "Where plantations border merchantable jack pine stands a progressive harvesting strategy should be implemented until all adjacent infected merchantable jack pine stands are harvested" (p.8).

In some areas there are very large expanses of dwarf mistletoe,³³ which may require limits the total size of an area to be progressively harvested.

Recommendation

M. The Provincial Guidelines should be modified to reflect the need to permit some dwarf mistletoe residual persistence in merchantable stands or harvested areas, and to limit the size of progressive cutovers designed for dwarf mistletoe control.

Otherwise, the guidelines may be used to harvest very large contiguous areas in very short periods of time. Although fires do burn large areas, they leave behind far more undisturbed patches, far more biomass and far more propagules than would be left behind by harvesting according to Saskatchewan Environment's proposed Provincial Standards.

The following proposed Provincial Guidelines are listed under proposed Objective 4:

1. "Establish a 20 meter buffer zone. The buffer should be maintained clear or planted with non-host species, as per buffer zone guidelines" (p. 18),
2. "If adjacent stands contain mixed species, comprised of host and non-host trees, remove all susceptible host trees within a 20 m distance of the boundary of the RA and encourage non-host regeneration" (p. 18), and
3. "Management in Representative Areas is permitted to protect ecological integrity. The following guidelines should be followed:
 - Whenever possible native insects and diseases should be allowed to proceed through their natural cycles;
 - Management action should be considered where non-intervention threatens to alter native communities (for example Jack pine forests altered to shrub or grassland) (p. 18).

The first two in this group of proposed Provincial Guidelines are acceptable. The third, with a change in emphasis, could serve as a Provincial Guideline related to the final additional

Objective proposed in this review. The emphasis should not be on enabling dwarf mistletoe management activities in Representative Areas, but rather restricting dwarf mistletoe management activities within Representative Areas except for very strict sets of circumstances.

Recommendation:

N. *The third proposed Provincial Guideline listed under Objective 4 should be changed as follows.*

3. *"Management of dwarf mistletoe is not normally permitted and will only rarely occur in Protected Areas including Representative Areas, Ecological Reserves, Provincial Parks and Recreational Areas.*
 - *In the absence of evidence that ecological integrity is threatened, native insects, diseases and dwarf mistletoe will be allowed to proceed through their natural cycles within Representative Areas.*
 - *Management action to control dwarf mistletoe should only be considered when there is evidence that non-intervention will result in loss of a native community."*

Representative Areas free of dwarf mistletoe control activities are necessary as benchmarks against which conditions in managed landscapes can be compared. Such comparisons should be an ongoing effort as part of an adaptive management approach.

V. Summary and Conclusions

Saskatchewan Environment has proposed a strategy to manage dwarf mistletoe that is little different from the standard approach that has been in place in Saskatchewan and neighbouring jurisdictions for many years, i.e., large expansive clearcuts lacking jack pine residuals and mistletoe broom habitat (Figure 1).

Figure 1. Mistletoe control cutover north of Smeaton, SK, September 2005.



Nothing distinguishes the proposed "Dwarf Mistletoe Standards and Guidelines" as being ecosystem-based. The proposed universal application of zero-tolerance of dwarf mistletoe for all Crown forests outside the boundaries of Representative Areas is unacceptable as it violates the risk-spreading principle of forest biodiversity conservation, i.e. "don't do the same thing everywhere".³⁴ Recommendations A through N above will have to be adopted if dwarf mistletoe management in Saskatchewan is to move into the modern era of ecosystem-based management.

Dwarf mistletoe must not only receive acknowledgment in the standards document as an integral component of the boreal forest ecosystem, but also must be actively managed and conserved on the landscape as an integral component of the boreal forest ecosystem. The value of mistletoe brooms to wildlife must be quantified through research, and management action must be applied such that this ecological role of dwarf mistletoe is maintained at some planned level.

Designs to reduce the distribution, incidence and severity of dwarf mistletoe should be based on a scientific assessment of pre-industrial forest conditions. Reductions of dwarf mistletoe should not be pursued only because of biases that pre-date the ecosystem-based approach to forest management. Moderate reductions in dwarf mistletoe distribution, incidence and severity are not necessarily problematic from an ecological point, but reductions should be pursued in a spatially planned manner to ensure the continued persistence of the species and avoid the reproductive isolation in a very limited number of sites. Severe reductions in the incidence and severity of dwarf mistletoe should be limited to a small portion (20 percent or less) of inhabited stands that are subject to intensive management.

Adaptive management requires that mistletoe management actions should be studied and compared to undisturbed benchmark areas where mistletoe management activities are not carried

out. Undisturbed benchmark areas where dwarf mistletoe is not controlled should include Representative Area Ecological Reserves, Provincial Parks and other protected areas that encompass in excess of 20 percent of the Provincial Commercial Forest. Management experiments need to be followed over time to determine whether the management actions achieve desired results and if there are any unintended consequences.

VI. Endnotes

¹ Saskatchewan Environment Forest Service, 2005. Dwarf Mistletoe Standards and Guidelines. http://www.se.gov.sk.ca/forests/forestmanagement/051109%20DMT%20Standards%20%20Guidelines%20_Public%20review-draft%201_.pdf

² To be clear, I will capitalize the words Objective, Provincial Standard, and Provincial Guideline when the words are used as defined in the Forest Planning Manual, and not capitalize these words when used in a generic sense (e.g. the objective of this document").

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