ASSESSMENT OF FOREST INSECT, DISEASE AND STAND CONDITIONS IN CYPRESS HILLS PROVINCIAL PARK, SASKATCHEWAN

by

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BACKGROUND

A request was received through Mr. Alex Gardner (CFS, Regional Office in P.A.) from Saskatchewan Parks, Recreation and Culture (specifically Mr. Bruce Walter, Forester with S.P.R.C.) to examine several insect, disease and stand concerns in Cypress Hills Provincial Park, Saskatchewan. Sites for examination had been pre-selected by Bruce Walter, who accompanied us along with Dr. Madan Pandila (S.P.R.C. in Prince Albert). The visitation was made June 21-22, 1988, and included several sites in each of the Center and West blocks of the Cypress Hills (see attached Map).

Some of the concerns expressed in the Center Block were in association with the main park facilities and recreational activity areas where visitor use is high. In these areas, sites were examined for insect and disease pests and stand and tree conditions along hiking trails, near cottages and other buildings, in campgrounds and picnic sites, and in previously planted sites of jack pine, lodgepole pine and Scots pine.

In the West Block, park amenities for people enjoyment are less emphasized and developed, but there is a strong emphasis placed on multiple use aspects that include cattle grazing, wildlife management and forestry. Among the sites examined here was a recent clearcut area newly planted to lodgepole pine in 1988, which is part of a long-term forest renewal program aimed at reducing the declining lodgepole pine forests, reducing their vulnerability to the mountain pine beetle (Dendroctonus ponderosae), and to help perpetuate the lodgepole pine forest character of Cypress Hills Provincial Park.

Our purpose was to identify potential forest insect and disease problems; interpret their role and relationships in forest and tree damage and decline; assess tree hazard for human and park safety; and suggest possible solutions for the park management.

The sites visited are dealt with in sequence as identified on the attached map, separately for the Center and West blocks. A discussion and some recommendations are included at the end. Insect, disease and other damage agents of importance are dealt with in the text and are listed with other minor identified species in Tables 1 and 2.

CENTER BLOCK : SITES 1 TO 6

Site 1: This is located near the north end of Loch Leven in a mixed spruce-aspen-pine site through which a hiking trail (Valley of the Rippling Waters Nature Trail) has been established. The forest character is mature to overmature and has a scattering of dead and dying white spruce and lodgepole pine. Some of the dying spruce are in small groups of one to three trees, suggesting pockets of infection of root decays and/or bark beetles. Our limited sampling, however, did not confirm this. Blowdown and safety to visitors are important concerns.

On aspen trees, stem decays caused by the false tinder fungus (Phellinus

tremulae) and Hypoxylon canker (Hypoxylon mammatum) were common. Species of bark beetles, including the spruce beetle (Dendroctonus rufipennis) and an Ips species were found on some 1988-cut spruce blocks, while the lodgepole pine beetle (Dendroctonus murrayanae) was extracted from a dying pine. Other causal agents of the tree decline were not observed, but overmaturity and root/stem decays are strong suspects. The pattern of tree mortality that has occurred is expected to continue.

Site 2: The location of this site was on the southeast side of Loch Leven where cottage development has been established in a mature lodgepole pine stand. Several mature size trees were dying but the causal agent(s) could not be determined but was likely soil-related. Atropellis canker (Atropellis piniphila) disease was common on several pine trees, some of which had as many as 5 to 6 stem cankers. There is concern in this area for blowdown of trees onto cottages and other property, and risk to people.

Site 3: This site is in a campground established within a mature pine forest. One recently cut tree at the site had advanced red ring rot (Phellinus pini) developed in the lower stem, along with a gallery network in the heartwood excavated by carpenter ants (Camponotus sp.). A basal scar was evident, possibly of fire origin, and was likely the initial entry point for the ants. A core sample extracted from a second tree with a basal scar also had red ring rot, and possibly carpenter ants as well. The external symptoms of basal scars and boring sawdust may be used to identify trees of high-risk, and their relative windfirmness can likely be confirmed by taking increment borings. Risk of blowdown during high winds and storms was the main concern here, and some means of identifying high-risk trees would be useful.

Site 4: This site located along Bald Butte Road, included two plantations originating about 1962; one was lodgepole pine (seed source assumed to be from the Cypress Hills) planted on one side of the road, the other was jack pine (seed source unknown but likely from central Saskatchewan) planted across the road from the lodgepole pine. Both species had been planted at about 2m spacing and were now 10-15 cm DBH and about 7-8 m tall. Concern was expressed that since the two species are known to interbreed and produce hybrids, and that jack pine is not native to the Cypress Hills, the long term effect may result in the propagation of genetically undesirable hybrid trees. The suggestion was made that the jack pine plantation should be completely removed. At the present time, however, both planted species appear to be producing male and female flowers, and so genetic exchange may already have taken place. Young pine trees growing at the roadside between the two plantations exhibited form characteristics of both species, which phenotypically appeared to be distinctly jack pine or lodgepole pine.

Some of the planted jack pines were leaning badly, and may have resulted from container-planted stock with subsequent restricted root or 'J-root' development.

Site 5: This site consisted of a few planted Scots pine trees in a small clearing adjacent to the road and an aspen forest. The trees were

mostly 3-5 m tall and some were severely damaged by sapsuckers (Sphyrapicus varius varius) and porcupine (Erethizon dorsatum) girdling. It appeared that this pine species was more prone to the damage of both animal species than was the native lodgepole pine.

Site 6: This site was located within a mature lodgepole pine stand in which narrow strip clearcuttings (about 20 m wide) were done about 26 years ago, and have since regenerated naturally back into predominantly lodgepole pine. Because of the shading from the adjacent mature trees and fairly dense stocking, most of the trees show good height and stem form. Within the young stands, there was evidence of mortality caused by Armillaria root rot (Armillaria obscura). Other possible defects resulted from heavy snow damage 2 or 3 years ago, and a present low incidence of western gall rust (Endocronartium harknessii). Atropellis cankers were common on adjacent mature trees and the disease may already have started infecting the younger stands.

WEST BLOCK : SITES 1 TO 5

Site 1: This was primarily a mature white spruce site on a north-facing steep slope adjacent to the roadway. Several spruce died 3-4 years ago but did not show evidence of spruce beetle or other disease causing agents. A few spruce trees are now leaning and it appears that the surface soil strata is unstable and may be contributing to the mortality. Because the adjacent roadway is steep, road salts may have been applied in the winter time and any accumulations in the soil down slope may be contributing to the mortality.

Site 2: This site was located in a coulee area, sloping northward with a mainly mature lodgepole pine component and some younger spruce in the understory. No significant tree damage agents were observed here although several minor insect and disease species were noted (Table 2).

Site 3: Considerable time was spent in this site, one of the recent areas clearcut and hand-planted during the first week of May, 1988. The area is about 26 ha and was mostly mature to overmature lodgepole pine that was clearcut during 1986-87. Post-logging treatment consisted of piling and burning the slash in November, 1987. The site was planted with container-grown one-year old lodgepole pine seedlings. Good survival of seedlings (est. 80+%) was apparent at the time of the examination, but the area was quite dry and devoid of shade, so that some additional mortality may have occurred before the rainfall in July. The seedlings were also very vulnerable to cattle grazing in the area, and mortality was particularly evident along pathways used by the cattle. The site is an important one to monitor since it represents a large-scale experimental trial of site preparation and planting treatments new to the Cypress Hills.

It was too early to detect any potential insect or disease problems likely to develop within the clearcut area, but various pests occur in the surrounding mature trees, including the root collar weevil (Hylobius warreni), western gall rust (Endocronartium harknessii), and Atropellis canker (Atropellis piniphila). Heavy infections of

Atropellis cankers occur on the adjacent pine trees and these could invade the young pine stand at an early age along with western gall rust and root collar weevil.

One dying mature pine at the periphery of the clearcut was examined for suspected mountain pine beetle attacks, but only secondary bark beetle species were observed including the red turpentine beetle (Dendroctonus valens).

Site 4: The location of this site was along Gordon Point Trail and was an area clearcut about 1962 in alternate narrow strips, each cut strip and residual strip being one chain or about 20 m wide (similar treatment as described above in Site 6, Center Block). The residual stand is predominantly lodgepole pine with some mixed white spruce and aspen. Stocking of natural regeneration appears adequate for forestry purposes, and appeared to have been regenerated in about the same proportional mix of species as the residual stands. A number of minor insect and disease pests were identified here, most obvious on the regeneration trees (Table 2). The incidence of young lodgepole pine mortality was low ($\lesssim$5%) but has been occurring for several years. The root collar weevil and Armillaria root rot were the only agents causing mortality. There was also a low incidence of Atropellis canker on the surrounding residual pine trees.

There was a visually distinct difference in ground floral composition between the residual and clearcut strips. In the residual stand, ground vegetation was generally sparce and characterized with xerophytic species such as lichen and bearberry. In contrast, the regenerated clearcut strips appeared more mesophytic with a greater representation of grasses and small herb species.

Site 5: This was an unscheduled site along the Battle River where fairly mature white spruce was growing along the banks. One collection of interest made here was a rather spectacular display of a yellow lichen (Xanthoria polycarpa) growing on the upper surface of the spruce branches. The lichen growth was heavy on several trees at the site, but did not show any apparent effect on the growth of the trees.

DISCUSSION AND RECOMMENDATIONS

Sites 1, 2, and 3 occur within the core area of the Center Block where maintenance of park recreational values is essential. Evidence of tree decline of all three major species was apparent to some degree in these three sites. The symptoms of decline are characteristic of overmaturity of the stands, and many of the insects and diseases observed are all natural ecological consequences associated with such stands. Monitoring for their presence can therefore help to identify, for example, trees of high risk to blowdown.

In the predominantly white spruce forest examined at Site 1 (Center Block), only a few of the dead and dying trees were examined, and in each case secondary insect pests such as bark beetles, woodborers and carpenter ants

were evident. On trees which had blown over or had snapped off near ground level, stem decays and fungal-causing stains were usually present. These no doubt make the trees less wind firm especially during high winds and major storms.

Recommendation 1: Some alleviation of the risk to blowdown and potential damage can be made by regular seasonal inspection of trees especially adjacent to buildings, picnic sites, campgrounds and hiking trails. With experience, some external and internal symptoms of decay or stem weakening can be diagnosed in advance by examining for top die-back, foliage color change, basal entry holes and sawdust from carpenter ants, conks on the stem, and pitch tubes on the lower stem made by bark beetles. Sample cores obtained with an increment borer may also provide useful information on growth rate (tree vigor) and the presence of advanced decay and decay-causing fungi. Trees diagnosed as high-risk should be removed when identified.

Small openings created in the forest, either by natural mortality or by single tree removal, could be replanted with the appropriate species. Probably, only those dead trees should be removed that threaten the immediate safety of people and property; otherwise they provide useful perching and nesting sites for a variety of bird species.

Jack pine has been planted in both the Center and West blocks in the past and the trees are presently at a reproductive age to hybridize with the native lodgepole pine. Young pine trees, 1-2 m tall, have regenerated naturally adjacent to the plantations at Site 4 and indicate phenotypic characteristics of the two species growing side-by-side. Thus if the two species hybridize readily under natural conditions, then some hybridization has most likely occurred. If this is so, then complete removal of the planted jack pine in the Cypress Hills would not eliminate the genetic exchange already in place. The incidence of insect and disease pests appeared to be similar on the two pine species.

Recommendation 2: If the long term goal of the Cypress Hills Provincial Park is to maintain the unique lodgpole pine forest, then all planted jack pine should be removed as soon as possible, to at least minimize the propagation of hybrid stock.

Recommendation 3: Observations on the few Scots pine trees at Site 5, suggested that this species was more prone to animal damage (porcupine and sapsucker) than was lodgepole pine, and should not be used in place of the native lodgepole pine for landscape or "fill-in" plantings.

Site 6 in the Center Block and Site 4 in the West Block provide clear demonstration of a successful forest management approach for removal of mature and overmature lodgepole pine forests using small clearcuts and allowing for regeneration by natural means. The clearcuts did not appear to be over- or under-stocked, contained a species mix similar to the residual stands, and showed good growth characteristics. In addition, the growth conditions in the clearcuts was probably enhanced by the increased growth of grasses and herb species. This may be attributed in part to the entrapment of heavier snow accumulations in the clearcuts

because of the narrow strips and their orientation. While some mortality of young pine was observed, the incidence did not appear to be serious. Some concerns with this management system might be that the risk of mechanical damage to the regeneration would be high during removal of the adjacent residual timber strips. Another concern might be the risk of early invasion into the young stands from adjacent residuals of such organisms as western gall rust, Atropellis canker and root collar weevil. The potential seriousness of these agents would have to be monitored more carefully. However, site preparation and regeneration costs would likely be less than in large block clearcuts.

Recommendation 4: The clearcutting strategy of removing mature lodgepole pine stands in narrow (20 m wide) strips should be considered in the overall park management plan since it is a proven successful method for perpetuating and renewing the natural pine forest character, and could help to ensure a distribution of uneven age classes in the park. Some variations in the strategy could be tried such as arranging the clearcut strips in contour with the landscape, rather than in straight lines. Perhaps the widths of the clearcuts could also be varied. It is possible that seedling damage by cattle would also be less significant in the smaller narrow clearcuts than in the larger cut blocks, such as in Site 3, West Block.

Recommendation 5: The survival and growth of planted seedlings need to be closely monitored in the new clearcut blocks.

TABLE 1. List of forest insect, disease and other tree damage agents identified June 21, 1988, in the Center Block of Cypress Hills Provincial Park, Saskatchewan.

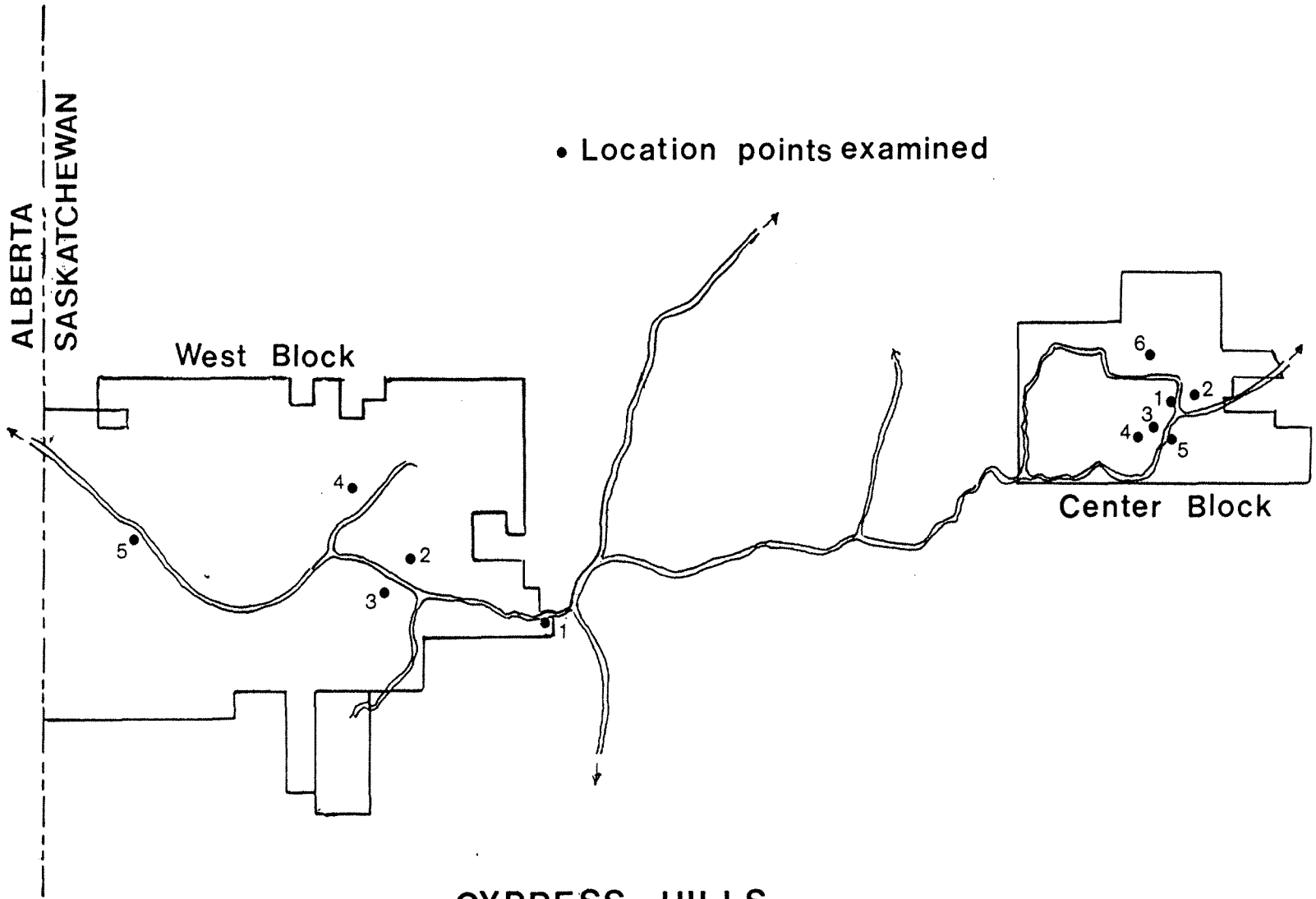
Insect/disease/damage agent	Common name	*Host tree	Site
Adelges cooleyi	Cooley spruce gall adelgid	Ws	1
Armillaria obscura	Armillaria root rot	Lpp	6
Atropellis piniphila	Atropellis canker	Lpp	2,6
Camponotus sp.	Carpenter ant	Lpp	3
Chionaspis pinifoliae	Pine needle scale	Jp,Lpp,Sp	4,5
Choristoneura fumiferana or (Zeiraphera canadensis)	Spruce budworm (Spruce bud moth)	Ws	1
Chrysomela sp.	A leaf beetle on poplar	Bp	1
Coleotechnites starki	Lodgepole needle miner	Lpp	3
Dendroctonus murrayanae	Lodgepole pine beetle	Lpp	1
Dendroctonus rufipennis	Spruce beetle	Ws	1
Dioryctria sp.	Coneworm/pitchworm	Lpp	6
Endocronartium harknessii	Western gall rust	Lpp	1,5,6
Erethizon dorsatum	Porcupine	Sp	4,5
Hypoxylon mammatum	Hypoxylon canker	Ta	1
Ips spp.	Engraver bark beetles	Ws, Lpp	1,3
Malacosoma disstria	Forest tent caterpillar	Ta	5
Nymphalis antiopa	Mourning cloak butterfly	Ta	5
Petrova metallica	A pitch twig moth	Lpp	1,6
Phellinus pini	Red ring rot	Lpp	3
Phellinus tremulae	False tinder fungus	Ta	1
Pinius coloradensis	A wooly aphid on pine	Jp	4
Pseudexentera oregonana	Aspen leaf roller	Ta	1
Sphyrapicus varius varius	Sapsucker	Sp	5
Uncinula sp. (?)	Powdery mildew on poplar	Bp	1

*Host species: Jp = jack pine; Lpp = lodgepole pine; Sp = Scots pine
Ws = white spruce
Bp = balsam poplar; Ta = trembling aspen.

TABLE 2. List of forest insect, disease and other tree damage agents identified June 22, 1988, in the West Block of Cypress Hills Provincial Park, Saskatchewan.

Insect/disease/damage agent	Common name	*Host tree	Site
Adelges cooleyi	Cooley spruce gall aphid	Ws	2,4
Armillaria obscura	Armillaria root rot	Lpp	4
Atropellis piniphila	Atropellis canker	Lpp	3,4
Chionaspis pinifoliae	Pine needle scale	Lpp	4
Choristoneura conflictana	Large aspen tortrix	Ta	1
Choristoneura fumiferana or (Zeiraphera canadensis)	Spruce budworm (Spruce bud moth)	Ws	4
Chrysomyxa arctostaphyli	Yellow witches' broom	Ws	4
Coleotechnites starki	Lodgepole needle miner	Lpp	2,4
Dendroctonus valens	Red turpentine beetle	Lpp	3
Endocronartium harknessii	Western gall rust	Lpp	2,4
Hylobius warreni	Warren rootcollar weevil	Lpp	4
Hylurgops rugipennis	A bark beetle	Lpp	3
Hypoxylon mammatum	Hypoxylon canker	Ta	4
Ips specie	Engraver beetle	Lpp	3
Ips pini	Pine engraver	Lpp	3
Lophodermella concolor	Needle cast disease	Lpp	2,4
Petrova metallica	A pitch twig moth	Lpp	4
Phyllocnistis populiella	Aspen serpentine leafminer	Ta	4
Pineus coloradensis	A wooly aphid	Lpp	2
Pinius pinifoliae	Pine leaf adelgid	Ws	4
Xanthoria polycarpa	A yellow lichen	Ws	5

*Host species: Lpp = lodgepole pine; Ws = white spruce; Ta = trembling aspen.



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