ECOLOGICAL SUMMARY AND NARRATIVE for the Kamloops Future Forest Strategy

IDFxh

Short- term Vulnerability = MOD
Long-term Vulnerability = HIGH

Ecological Narrative for the IDFxh through to 2080:

2008 to 2050

The influence of climate change

This hot and dry subzone will become hotter and subsequently drier, moving away from a tree-dominated subzone to one where grasslands will begin to dominate. Northern exposures and the highest elevations will have less change, while more extreme conditions on southern exposures will result in widespread mortality in many of the mature and maturing stands.

This subzone presently experiences significant summer moisture deficits. Increased summer temperatures and more frequent prolonged summer droughts will lower vigour of established Douglas-fir and Ponderosa pine stands, already under stress from frequent drought. Ponderosa pine currently has high levels of mortality from western and mountain pine beetle epidemics. The result will be more grassy openings and grassland expansion, especially on south slopes, as seed source and suitable shading will limit ponderosa pine re-establishment.

Tussock moth, will remain a significant threat to Douglas-fir in this subzone, and could increase with warmer drier summers. Western spruce budworm, however, may decline, reducing its impact on Douglas-fir stands as the climate warms. Root pathogens, such as *Armillaria* will remain in isolated pockets, at relatively low levels of incidence with the warmer and drier conditions.

An expanded summer drought period, higher mortality, and a high degree of public access will increase the risk of a stand-replacing fire across this subzone. Risk may vary as concentrations of dead trees pass through high risk phases and normal climate cycles, subsiding once fuels are on the ground, and stands are less continuous and more open. Fire disturbance may shift large areas into an early seral / grassland condition. Climatic conditions more severe for establishment could result in an expansion of invasive plant species, many of which have already gained a foothold here. This would be most evident on warmer slopes.

Estimated future forest condition of stands currently mature

Currently, most stands are dominated by Douglas-fir, with dying ponderosa pine mixed in on warmer aspects or ridges. Douglas-fir will remain the dominant species on mesic sites. Increased drought stress will increase risk from Douglas-fir bark beetle and tussock moth when climate cycles and favourable insect conditions converge. This will likely result in more open, discontinuous, possibly uneven stand structures.

From now to 2050 there will be greater summer moisture deficits on all sites. This will likely result in significant stress even on diverse wetter sites (draws and seepage areas) causing mortality in redcedar, spruce and cottonwood. Although impacts may be less for aspen and birch some mortality may occur. While these wetter sites are not used extensively for timber production in this subzone, they do provide significant habitat for wildlife that will be increasingly vulnerable due to increased mortality.

Estimated future forest condition of young stands

Mature trees and regeneration are often intermixed in gappy open stands[1] as a result of harvesting or fire, resulting in abundant Douglas-fir regeneration in gaps on north slopes and relatively open and sparse regeneration on southern exposures. With an increase in severity and length of droughts, there is a likelihood

[1] e.g., faller selection, diameter limit harvesting, true single tree selection

of increased stress in both understory and overstory trees. This stress could result in high levels of periodic mortality due to cyclical spruce budworm and Douglas-fir tussock moth – both insects that thrive in these uneven-aged stand conditions. However as climate continues to warm, spruce budworm impacts may occur less often. As well, large fires may create large patches of grasslands.

Between extreme years, both ponderosa pine and Douglas-fir that are established on mesic to wetter sites will experience similar to slightly slower growth rates than the present due to the reduced period of available moisture. Shade will be a key for early regeneration success for both Douglas-fir and ponderosa pine.

2050 to 2080

The influence of climate change

The longer term outlook for this subzone does not bode well for tree growth or survival. More severe drought will combine with insects to increase mortality and subsequently, fuels and fire risk. The risk of large stand replacing fires may become extreme in drier years. Species presently located on wetter sites will be marginalized as these sites contract, with survivors limited to sheltered north aspects. Wildlife dependent upon the less common tree species will be affected negatively. Snow levels will be low and winter temperatures moderate, reducing the need for snow interception and possibly thermal cover for winter range. Long-term timber management for this subzone will be severely limited by the year 2080 under both scenarios.

Estimated future forest condition of stands currently mature

By 2080 forested landscapes will be limited to patchy stands on north slopes, upper elevations and in seepage areas and draws. Grasslands will dominate warmer aspects with a few surviving trees found in favourable microclimates. Rare remnant ponderosa pine will fair better than Douglas-fir.

Estimated future forest condition of young stands

Surviving open Douglas-fir stands have less favourable conditions for re-establishment of Douglas-fir, due to moisture deficits. Planted or managed ponderosa pine should continue to cope with the changing climatic conditions, unless bark beetles build to epidemic proportions in surrounding stands and subzones (an unclear risk). Overhead shade will be critical for establishment throughout the subzone on mesic or drier sites.

Vulnerability summary

This subzone will experience a trend from a mostly forested condition to a mostly grassland condition from 2008 to 2080.

CURRENT CONDITIONS

7% of the TSA
8% of the THLB

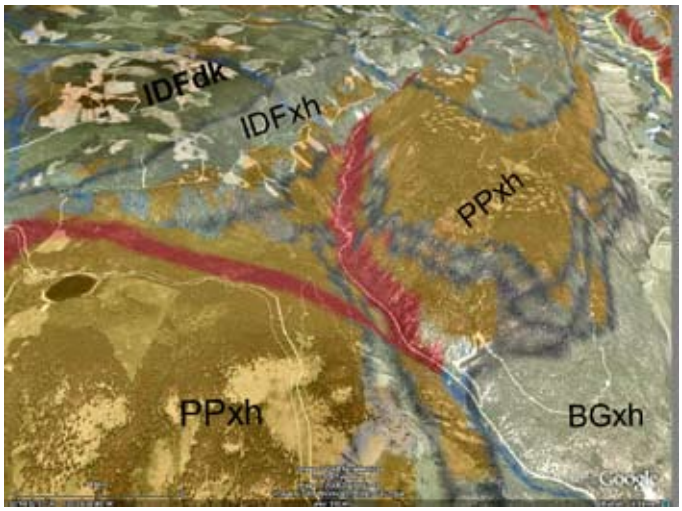
Jamieson Cr.

Sites Naturally Associated with IDFxh	Plant Communities Associated with Current Subzone
Zonal site association	Gentle slopes; closed mixedwood stands Cw, Sxw, Hw, Fd, Pl, Bl, At & Ep; moderate shrub cover of falsebox, spirea, rose, huckleberrry, maple; moderate herb layer of bunchberry, twinflower, prince's pine; moderate cover of feathermosses
Dry site association	Open stands of Py and Fd; sparse shrub cover of saskatoon, spirea, snowberry, juniper, soopalallie; sparse herb layer of pinegrass, bluebunch wheatgrass, kinnikinnick, arrow-leaved balsamroot, showy aster; sparse ragged moss and lichens
North slope site association	Closed stands of Fd (Py); moderate shrub cover of spirea, saskatoon, snowberry, maple; moderate herb layer of pinegrass, arnica, twinflower; moderate to dense feathermosses, ragged moss & pelt lichens
Wet site association	Closed stands of Sxw & Fd (Ep, Act) with Fd, Ep & At in seral; moderate shrub cover of snowberry, maple, rose, dogwood, alder, twinberry; moderate herb layer of sweet cicely, twinflower, violet; sparse feathermoss and ragged moss

Age Classes	Leading Stand Species	% of IDFxh
<20	Fd 90% Py 10%	11
20-60	Fd 75% At 25%	1
60-120	Fd 90% Py 10%	23
120+	Fd 95% (Py)	65

Climate Scenarios

PCM-B1 2050 (least change)



Relative Elevations	Predicted Subzone Climate	% IDFxh
Upper	IDFxh	6
Mid	PPxh	86
Lower	BGxh	8
Valley and upper boundary areas may have slightly moister conditions		

Annual Climate Variables	Now	2050	Change
mean annual temp. (°C)	4.8	5.9	1.1
mean summer temp. (°C)	15.1	16.4	1.3
Mean temp warmest month (°C)	16.1	17.8	1.7
frost free period (days)	101	118	17%
number of frost free days	174	191	10%
mean annual precipitation (mm)	384	400	4%
mean summer precipitation (Jun-Aug) (mm)	182	181	-1%
precipitation as snow (mm)	124	1115	-7%
annual heat:moisture index	39	40	3%
mean summer heat: moisture index (May-Sept)	90	100	11%

HAD-A1F1 2050 (most change)

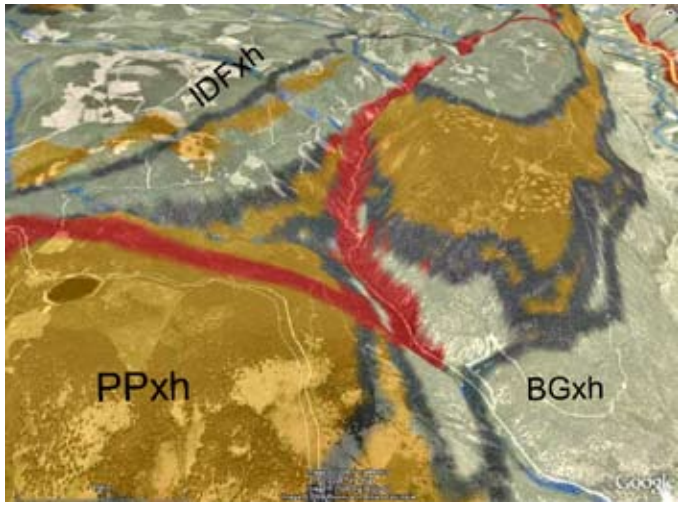
Relative Elevations	Predicted Subzone Climate	% of IDFxh
Upper	PPxh	4
Hills and lower boundary areas may have slightly drier conditions		
Mid	BGxw	1
Hills and lower boundary areas may have slightly drier conditions		
Lower	BGxh	95

Annual Climate Variables	Now	2050	Change
mean annual temp. (°C)	4.8	8.3	3.5
mean summer temp. (°C)	15.1	20.0	4.9
mean temp warmest month (°C)	16.1	22.1	5.9
frost free period (days)	101	138	36%
number of frost free days	174	224	29%
mean annual precipitation	384	393	2%
mean summer precipitation (Jun-Aug)	182	161	-11%
precipitation as snow (mm)	124	96	-22%
annual heat:moisture index	39	47	20%
mean summer heat: moisture index (May-Sept)	90	139	55%

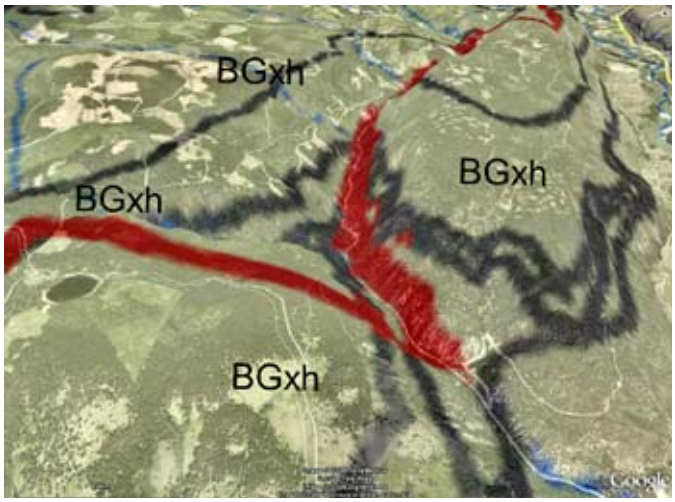
Normal summer heat:moisture index comparisons:
ICHvk – 28; ICHmw – 42; IDFxh – 90; BGxh – 139

Looking Even Farther Ahead:

PCM-B1 2080 (least change)



HAD-A1F1 2080 (most change)



Overview of Changing Climate focussing on 2050:

General Description

The precipitation regime and slightly higher temperature gives a similar drought code as the current IDFxh for the least-change PCM scenario. However, hotter temperatures (especially summer) under the most-change HAD scenario brings the drought code up to PPxh levels, except that there will be more precipitaion. The result will be a slightly milder PP. This subzone varies dramatically from north to south slopes. The manner in which climate change will influence the PPxh subzone suggests that ponderosa pine may not necessarily be more resilient than Douglas-fir, even though ponderosa pine can typically withstand more drought. Northerly slopes here will likely continue to look like IDF (with existing timber) but there will likely be some scattered mortality that will thin out the stands and lower timber volumes. South slopes will become very open and dominated by grasses. Grass composition may shift slowly from pinegrass to fescues and bunchgrasses, however, because pinegrass is rhizomatous this is unlikely to occur very quickly. Douglas-fir will be limited to draws.

Summary of Ecological Vulnerabilities and Opportunities

INSECTS - Tussock moth (most likely) and spruce budworm (less likely) will become increasingly problematic. Hemlock looper could be an issue in regenerated stands as it currently attacks precommercially thinned Douglas-fir stands in the IDFxh south of Kamloops.

ROOT DISEASE – There is likely not much *Armillaria* here now. *Phellinus* is patchy and will become less viable in the hotter, drier climate.

FIRE – There will likely be a high degree of mortality on south slopes from drought stress and insects. This could create a considerable short term fire risk with significant fine fuels while the dead trees retain most of their crown branches. This subzone is also often situated relatively close to interface situations.

INVASIVE PLANTS – Invasive species can be expected to quickly establish in any disturbed area in this subzone, as human accessibility is good and ranging cattle are abundant and therefore the probability of introduction is high. It may be advisable to establish some native, long-lived grasses (not domestics)

immediately following disturbances.

Regeneration Vulnerabilities and Opportunities

MESIC SITES:

• With the least change (PCM) scenario it will be necessary to provide shelter in order to get Douglas-fir established. Focus for regeneration should be on north or east facing slopes.

SUBMESIC/SUBXERIC SITES:

• Consider pursuing open grasslands here with an emphasis on maintaining or enhancing native grasses. Where logging occurs, a few clumps of retained ponderosa pine should be left strategically in draws and other moisture recieving microsites so as to provide some shelter for developing regeneration.

Maturing / Mature Stand Vulnerabilities

Species	Vulnerability Class [1]	Opportunity Class [2]	Rationale
Fd	High possibly VH (S slopes) and M (N slopes)	Nil	Strong divergence with condition differences from north to south slopes. Expected mortality on south slopes will be due to a combination of drought and insects.

[1] **Vulnerability Classes**
Low – Stands will suffer minor losses due to climate change.
Mod – likely will suffer more than current losses, but will be manageable losses and or secondary risks (fire etc.)
High – likely will suffer signficant losses or incur high secondary risks, but catastrophic losses unlikely.
Very High – likelihood for catastrophic losses are high.

[2] **Opportunity Classes**
Nil – No opportunity to enhance growth.
Minor – Minor growth enhancement likely.
Significant – significant growth enhancement likely.