

PPxh

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

Ecological Narrative for the PPxh through to 2080:

2008 to 2050

The influence of climate change

This hot and very dry subzone will become hotter and drier in the critical summer months, moving away from a tree - gap dominated mosaic to one where grasslands will dominate. Drought stress will result in widespread mortality in many of the mature and maturing stands over time.

Increased summer temperatures and more frequent prolonged summer droughts will lower vigour of established Douglas-fir and ponderosa pine stands that are already under frequent stress from drought. Mature ponderosa pine are currently disappearing with high levels of mortality from western and mountain pine beetle epidemics. The result will be more grassland ecosystems, especially on south slopes, as seed source and suitable shading will limit ponderosa pine establishment. While wetter sites are not used for timber production in this subzone, they do provide significant habitat for wildlife that will be increasingly vulnerable due to contraction of wet sites and increased mortality in trees and key understory plants.

Fire risk may vary as concentrations of dead trees pass through high risk phases and normal climate cycles continue. However, extended high risk fire seasons may be more common over a period of years. Over time with reduced fuel availability, the risk of forest fires will decrease while the risk of brush or grass fires will remain high, considering proximity to the urban interface. Fire disturbance may hasten the transition to a non-treed ecosystem, possibly encouraging expansion of invasive plant species, many of which are presently established in the subzone.

Estimated future forest condition of stands currently mature

Mature or old tree species diversity in this subzone is currently low, with most sites dominated by Douglas-fir and or dead ponderosa pine. Stands are often open with grassland conditions interspersed as a mosaic. Draws and seepage areas have slightly greater diversity with cottonwood and in some cases aspen mixed with the ponderosa pine and Douglas-fir.

Rare remnant ponderosa pine, surviving the bark beetle epidemic prior to 2010 and some scattered Douglas-fir will remain on mesic and wetter sites. Douglas-fir elsewhere will be very stressed by drought, suffering significant mortality, especially when combined with bark beetle and tussock moth when climate cycles and favourable insect conditions converge. This will result in patchy open, discontinuous, or uneven stand structures on cooler slopes.

Estimated future forest condition of young stands

Young stands have a limited footprint within this subzone as most stands are irregular or multi-aged. With an increase in severity and length of droughts, there is a likelihood of increased stress in both understory and overstory trees.

Between extreme years, both ponderosa pine and Douglas-fir that are established on mesic to wetter sites will experience 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

Limiting conditions for tree growth will be exceeded if scenario predictions are met. High stress from drought will increase risk to insects resulting in more dead trees and increased fuel loading which will increase fire risk. Species that are presently located on wetter sites will be marginalized, with survivors limited to sheltered north aspects. Wildlife dependent upon the less common tree species will be affected negatively. Timber management for this subzone will not be an option by the year 2080 under both scenarios.

Estimated future forest condition of stands currently mature

By 2080 forested landscapes will be limited and patchy – found mostly on north slopes, upper elevations and in seepage areas and draws. Grasslands will dominate warm southern and western slopes with isolated surviving trees found in favourable microclimates.

Estimated future forest condition of young stands

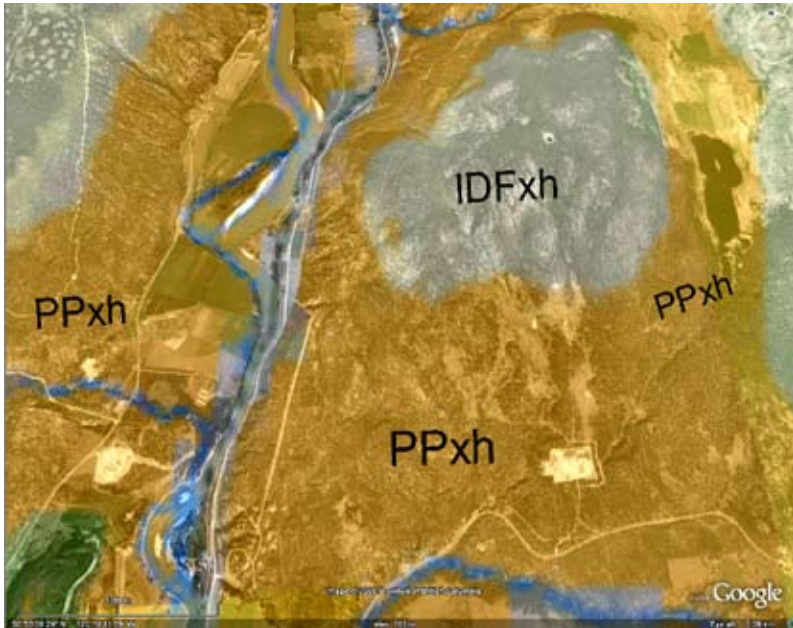
Young stands will not be found, as climate extremes will limit successful establishment. Grasslands will dominate. Proximity to the urban interface will continue to create significant disturbance in these grasslands, contributing to moderate-high levels of invasive plants throughout.

Vulnerability summary

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

CURRENT CONDITIONS

3% of the TSA
1% of the THLB



Heffley Cr. /
Knouff Lk.

Sites Naturally Associated with PPxh	Plant Communities Associated with Current Subzone
Zonal site association	Open stands of Py (Fd, At); sparse shrub cover of saskatoon, sagebrush or rabbit-brush; sparse herb layer of bluebunch wheatgrass, rough fescue, desert parsley, shrubby penstemon; sparse sidewalk moss and clad lichens
Dry site association	Sparse stands of Py(At); very sparse shrub cover of saskatoon, sagebrush or rabbit-brush; very sparse herb layer of red three-awn, bluebunch wheatgrass, needlegrass, arrow-leaved balsamroot, shrubby penstemon; sparse sidewalk moss and clad lichens
North slope site association	Closed stands of Fd & Py; moderate shrub cover of spirea, saskatoon, oregon grape, snowberry, maple; moderate herb layer of pinegrass, milk-vetch, twinflower; moderate to dense feathermosses, heron's bill moss, ragged moss & pelt lichens
Wet site association	Moderately closed stands of Act, At (Fd); moderate shrub cover of snowberry, maple, rose, dogwood; moderate herb layer of Kentucky bluegrass, pinegrass, wintergreen, twinflower, violet; sparse ragged moss
Grassland sites	Less than 10% tree cover of Py; sparse shrub cover of big sagebrush and rabbit-brush; sparse herb layer of bluebunch wheatgrass, sagewort, balsamroot, silky lupine, rough fescue, pinegrass; very sparse clad lichens and sidewalk moss
Xeric site association	Very open, short Py(Fd); very sparse juniper, spirea, soopalallie, saskatoon; very sparse bluebunch wheatgrass, pinegrass, kinnikinnick, shrubby penstemon, yarrow; sparse sidewalk mosses and clad lichens

Age Classes	Leading Stand Species	% of PPxh
<20	Fd60% Py40%	5
20-60	Fd50% Py50%	1
60-120	Fd60% Py40%	22
120+	Fd60% Py40%	72

Climate Scenarios

PCM-B1 2050 (least change)



Relative Elevations	Predicted Subzone Climate	% of PPxh
Upper	PPxh	3
Mid & Lower	BGxh	97
Upper boundary areas may have slightly moister conditions		

Annual Climate Variables	Now	2050	Change
mean annual temp. (°C)	6.0	7.1	1.1
mean summer temp. (°C)	16.3	17.6	1.3
Mean temp warmest month (°C)	17.6	19.2	1.6
frost free period (days)	119	134	13%
number of frost free days	191	209	9%
mean annual precipitation (mm)	327	342	4%
mean summer precipitation (Jun-Aug) (mm)	156	155	-1%
precipitation as snow (mm)	97	88	-9%
annual heat:moisture index	50	51	2%
mean summer heat:moisture index (May-Sept)	114	126	10%

HAD-A1F1 2050 (most change)



Relative Elevations	Predicted Subzone Climate	% of PPxh
Upper, Mid & Lower	BGxh	100

Annual Climate Variables	Now	2050	Change
mean annual temp. (°C)	6.0	9.4	3.4
mean summer temp. (°C)	16.3	21.2	4.9
mean temp warmest month (°C)	17.6	23.4	5.9
frost free period (days)	119	156	32%
number of frost free days	191	243	27%
mean annual precipitation	327	335	2%
mean summer precipitation (Jun-Aug)	156	138	-12%
precipitation as snow (mm)	97	74	-24%
annual heat:moisture index	50	59	19%
mean summer heat:moisture index (May-Sept)	114	172	51%

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

Looking Even Farther Ahead:

In 2080 both PCM and the HAD scenarios indicate a climate similar to the BGxh, except even warmer.

Overview of Changing Climate focussing on 2050:

General Description

The temperature will be warmer than the BGxh (at least in the summer) for the bookend scenarios.

Precipitation will stay at PPxh levels, except likely a bit higher in spring and fall but less in summer (although still relatively high). With HAD, summer precipitation will drop to 15% less than BGxh (June to Sept.) and the drought index is very close to BG (except it is significantly warmer and fall and spring are a bit moister).

Summary of Ecological Vulnerabilities and Opportunities

DROUGHT – As the average temperature goes up the probability of drought goes up as well. A significant factor for the maintenance of ponderosa pine on grasslands, therefore, will be the timing of summer rains. In southern Mexico, for example, ponderosa pine is maintained by rains in July.

FIRE – There is already a lot of dead ponderosa pine already here, and mortality in Douglas-fir can be expected over time. The fire risk goes up while trees retain dead foliage, then down as the foliage falls off, and up again as trees fall and accumulate on the ground. It is possible that heavier grass cover may result from increased winter and spring rains, which would add more fine fuels. It is unknown whether or not there will be more intense lightning storms in the summers.

Regeneration Vulnerabilities and Opportunities

MESIC SITES and SUBMESIC/SUBXERIC SITES:

- It is not yet known whether ponderosa pine will be able to adapt to anticipated earlier than usual bud flush in spring caused by a warming climate.
- This may be a subzone where we only manage for ponderosa pine on a microsite basis (e.g. moisture receiving ravines) for biodiversity functions and landscape aesthetics. The balance of the area will be grassland.
- The number of adequate growing locations for trees will likely go down. As 30-50% of BC's red and blue listed species occur in this region, this will be a good area to manage for ecological conditions rather than timber. Perhaps consider managing for savannah (scattered trees with grasslands) using introduced pinyon pine or juniper (very hardy).
- Some mixed stands of ponderosa pine and Douglas-fir could be encouraged for wildlife habitat purposes.

Maturing / Mature Stand Vulnerabilities

- Ponderosa pine stands are vanishing quickly due to the current mountain pine beetle epidemic. Douglas-fir is found only on the northern and eastern slopes where it is more protected.