

Overview of Guidance to Adapt Forest Management for Climate Change in the Kamloops TSA. ¹

FIRST APPROXIMATION (June 7, 2012) which should be viewed as a continuous work in progress.

The following overview information is based on the document *Guidance to Adapt Forest Management for Climate Change in the Southern Interior of BC (June 7, 2012)*, which explains in more detail each recommended adaptive action and the modeling trends tied to climate change that underlie it. Please refer to that document for more details.

Regeneration Guidance:

The following guidance could be incorporated into plans right away in some areas. In others some of the recommendations below may require discussions with ecologists, silviculturists, agency planners and licensee planners to localize.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
Dry Fdi (Py)	IDF and PP subzones too hot and dry for Pli	Increase presence and % of Py in stands	Target Stocking within current Py range²: <i>Dry sites</i> – 50% Py as a start (with Fd). <i>Mesic sites</i> – 25-30% Py as a start (with Fd). Target Stocking outside current Py range: Work with local ecologists to introduce gradually, building on successes over time.
		Maintain presence of At on landscape for habitat and species diversity as long as possible	Avoid removal of aspen (where concentrated) through brushing and other activities. Make strategic use of stratification and free-growing stocking standards.
Dry subzones with Pli	IDF with Pli (e.g. IDFdk) and very dry MS (e.g. MSxk)	Avoid conversion of Douglas-fir and other non-lodgepole leading stands to Pli leading stands	Manage for a majority of Fd, Sx and other appropriate non-lodgepole species. Restrict Pli to 20-30% of stocking or restrict to “acceptable” stocking status in silvicultural surveys.

¹ Based on: *Validating Impacts, Exploring Vulnerabilities, and Developing Robust Adaptive Strategies under the Kamloops Future Forest Strategy (K2-2011)* – Future Forest Ecosystems Scientific Council (FFESC) Interdisciplinary Climate Change Adaptation Research for Forest and Rangeland Ecosystems, and *Adapting Forest Management in the Kamloops TSA to Address Climate Change* – The Kamloops Future Forest Strategy (K1 – 2009). For more information – see: <http://k2kamloopstsa.com> and <http://www.for.gov.bc.ca/hcp/ffs/kamloopsFFS.htm>

² Species mixtures at the stand level are preferred to increase resilience of stands across the landscape. Some tradeoffs between the stand level and species level for targets are appropriate.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
<p align="center">Dry subzones with Pli (Continued)</p>	<p>IDF with Pli (e.g. IDFdk) and very dry MS (e.g. MSxk)</p>	<p>Avoid (where practically possible) establishment of pure Pli stands in stands that were Pli leading preharvest.</p>	<p>Determine sites and situations that offer opportunities for other species and target a minimum of 25% stocking of Fdi, Sx. Py could be introduced at lower levels on drier sites – work with local ecologists.</p>
		<p>Maintain presence of At on landscape for habitat and species diversity as long as possible</p>	<p>Avoid removal of aspen (where concentrated) through brushing and other activities. Make strategic use of stratification and free-growing stocking standards.</p>
<p align="center">Dry Transition</p>	<p>(IDFmw and ICHdw)</p>	<p>Avoid conversion of Douglas-fir and other non-lodgepole leading stands to Pli leading stands</p>	<p>Manage for a majority of Fd, Py, Lw, Pw and other appropriate non-lodgepole species. Restrict Pli to 20-30% of stocking or restrict to “acceptable” stocking status in silvicultural surveys.</p>
		<p>Avoid (where practically possible) establishment of pure Pli stands in stands that were Pli leading preharvest.</p>	<p>Target a minimum of 25% stocking of Fdi, Py (dry sites) and mixing in Lw and Pw on moister sites. For introductions of species new to the subzone, start at lower levels and work with ecologists.</p>
		<p>Maintain presence of At on landscape for habitat and species diversity</p>	<p>Avoid removal of aspen (where concentrated) through brushing and other activities. Make strategic use of stratification and free-growing stocking standards.</p>
<p align="center">Moist Transition</p>	<p>Moist ICH subzones (e.g. ICHmw, ICHmk)</p>	<p>Avoid conversion of Douglas-fir and other non-pine leading stands to Pli leading stands</p>	<p>Manage for a majority of Fd, Py, Lw, Pw and other appropriate non-pine species. Restrict Pli to 20-30% of stocking or restrict to “acceptable” stocking status in silvicultural surveys.</p>
		<p>Encourage species diversity across the landscape.</p>	<p>On average across the landscape, maintain species diversity at natural / historic levels. Target drier-than-mesic sites for introduction of some ponderosa pine (e.g. 20-25%) where it is ecologically feasible (e.g. south slopes in the ICHmw).</p>
		<p>Avoid creation of Sx leading stands on mesic and subhygric sites</p>	<p>Mix in western redcedar and/or other species to reduce the proportion of spruce.</p>
		<p>Maintain presence of At, Ac and Ep on landscape for habitat and species diversity</p>	<p>Avoid removal of aspen (where concentrated) through brushing and other activities. Make strategic use of stratification and free-growing stocking standards.</p>

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
Plateau	Transitional to higher elevations (e.g. MSdm, SBS mm ESSFdc)	Avoid conversion of Douglas-fir or Spruce leading stands to Pli leading stands	Manage for a majority of Fd, Py, Lw, Pw and other appropriate non-pine species. Restrict Pli to 20-30% of stocking or restrict to “acceptable” stocking status in silvicultural surveys.
		Encourage species diversity across the landscape.	On average across the landscape, maintain species diversity at natural / historic levels. Target warm lower elevation sites for increased amounts of Douglas-fir (e.g. 20-35%) where it is ecologically feasible.
Plateau (cont)	Transitional to higher elevations (e.g. MSdm, SBS mm ESSFdc)	Maintain presence of At on landscape for habitat and species diversity	Avoid removal of aspen (where concentrated) through brushing and other activities. Make strategic use of stratification and free-growing stocking standards.
Wet ESSF	e.g. ESSFwk	Encourage tree species diversity as much as possible across the landscape	Spruce is still a good choice for regeneration – monitor carefully for increased weevil damage at lower elevations, where redcedar should be gradually mixed in.

Harvesting:

The harvesting guidance below is strategic in nature and as such requires thoughtful strategic planning directing well-coordinated tactical plans. Work will be necessary to identify the vulnerable stand types and make appropriate decisions regarding economics and timing of treatment. Incentive and other mechanisms not yet in place may be needed.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
Dry Fdi (Py)	IDF and PP subzones too dry for Pli	Reduce fuels with commercial thinning and/or juvenile spacing	With well designed fire management strategies encourage vigor and health and reduce fire risk by significantly reducing stand stocking densities.
Dry subzones with Pli	IDF with Pli (e.g. IDFdk) and very dry MS (e.g. MSxk)	Targeted harvesting to address high risk stands.	Target stands more vulnerable to fire (with climate change) as a priority for harvesting, retaining those stands that are less vulnerable for future passes and other objectives.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
Dry Transition	(IDFmw and ICHdw)	Targeted harvesting to address high risk stands.	Identify and target for harvesting in the short term (e.g., over the next 10 years) - mixedwood stands with an older Douglas-fir component that are at high risk of increased mortality (due to a number of factors) and possible transition to a non-economic status over time with climate change.
			Identify and target for harvesting in the short to midterm (e.g., over the next 10-40 years) – stands that are currently, or will be (with climate change) highly vulnerable to wildfire.
Moist Transition	Moist ICH subzones (e.g. ICHmw, ICHmk)	Targeted harvesting to address high risk stands.	Identify and target for harvesting in the short term (e.g., over the next 10 years) - mixedwood stands with an older Douglas-fir component that are at high risk of increased mortality (due to a number of factors) and possible transition to a non-economic status over time with climate change.
			Identify and target for harvesting in the short to midterm (e.g., over the next 10-40 years) – stands that are currently, or will be (with climate change) highly vulnerable to wildfire.
Plateau	Transitional to higher elevations where Pli, occasionally Fdi is found with Sx/BI (e.g. MSdm, SBSmm ESSFdc)	Design a harvest / reserve strategy that considers risks	Monitor older Sx/BI stands for increased moisture stress. Be aware of threats from bark beetle populations as it changes with climate. Note the recommendations in “other” section regarding retention strategies.
Wet ESSF	e.g. ESSFwk	Design a harvest / reserve strategy that considers risks	Monitor older Sx/BI stands for increased moisture stress. Be aware of threats from bark beetle populations as it changes with climate. Design a harvest / reserve strategy that ensures we are reserving and recruiting old and mature forest where it has the best chance to persist to meet objectives.
		Reduce risks of damage to roads and other infrastructure	Consider designing roads, bridges, culverts and other infrastructure considering more frequent and severe flood events.

Incremental Silviculture Guidance:

Incremental activities require a strategic context so the guidance provided below must be integrated into a strategic plan intended to best direct funding for incremental activities. The guidance below is intended as options based on the vulnerabilities present in these zones from climate change.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
Dry Fdi (Py)	IDF and PP subzones too hot and dry for Pli	Juvenile spacing combined with commercial thinning in over-dense Fd and Fd(Py) stands	To reduce ladder fuels and encourage a stand structure under a silvicultural system that will provide for a continuous supply of timber. See Harvesting guidance as well.
Dry subzones with Pli	IDF with Pli (e.g. IDFdk) and very dry MS (e.g. MSxk)	Fertilization to promote short rotations on existing young pine stands - target young lodgepole pine stands	Target young lodgepole pine stands that were too young/small to be damaged by mountain pine beetle in the recent epidemic possibly for multiple treatments over the next 20-40 years – to cycle them quickly into more resilient stand types.
		Juvenile spacing possibly combined with commercial thinning.	Drier Douglas-fir dominated stands – where there is a high fire risk (considering climate change) to reduce fuel loading and reduce moisture stress.
Dry Transition	(IDFmw and ICHdw)	Juvenile spacing possibly combined with commercial thinning.	Drier Douglas-fir dominated stands – where there is a high fire risk (considering climate change) to reduce fuel loading and reduce moisture stress.
		Fertilization to promote short rotations on existing young pine stands - target young lodgepole pine stands	Target young lodgepole pine stands that were too young/small to be damaged by mountain pine beetle in the recent epidemic possibly for multiple treatments over the next 20-40 years – to cycle them quickly into more resilient stand types.
		Juvenile spacing possibly combined with commercial thinning.	Drier Douglas-fir dominated stands – where there is a high fire risk (considering climate change) to reduce fuel loading and reduce moisture stress.
Plateau	Transitional to higher elevations where Pli, occasionally Fdi is found with Sx/BI (e.g. MSdm, SBSmm ESSFdc)	Fertilization to promote short rotations on existing young pine stands - target young lodgepole pine stands	Target young lodgepole pine stands that were too young/small to be damaged by mountain pine beetle in the recent epidemic possibly for multiple treatments over the next 20-40 years – to cycle them quickly into more resilient stand types.
Wet ESSF	e.g. ESSFwk	Nothing specific to climate change	

Other:

The following recommendations will support and enhance those made for regeneration, incremental silviculture and harvesting. They may not necessarily be taken on by the management team in a particular TSA, but could be a regional or provincial task. Nevertheless, they will help ensure success over the long term.

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
<p>ALL ALL (cont)</p>	<p>ALL ALL (cont)</p>	<p>Continuous challenge and explore to address uncertainty and reduce risk.</p>	<p>Challenge and explore both the direction provided here, and the assumptions behind the direction – in this way practices will continuous to evolve and adapt in a suitable manner.</p>
		<p>Update and refine recent fire risk mapping³</p>	<p>To determine the high risk areas within the TSA – now and with climate change.</p>
		<p>Update/design a fire management strategy that considers the climate change trends</p>	<p>Work with wildfire management branch specialists and integrate with other objectives.</p>
		<p>Manage OGMA's in a flexible manner over time.</p>	<p>Track amounts of old forest and make adjustments for OGMA's that may have burned or been affected by severe insect attacks. Consider stand types best suited to persist and recruitment of future OGMA's.</p>
		<p>Develop a retention strategy for biodiversity at a number of scales (or refine an existing one) that considers climate change</p>	<p>To maintain and recruit acceptable levels of old forest habitats and attributes across this ecological landscape. This strategy must fit with the wildfire management strategy and be integrated into harvest planning over time.</p>
		<p>Establishing Annual Allowable Cuts (AAC) in the future will need to increasingly consider the impacts of climate change on our forests.</p>	<p>During the setting of an AAC, the decision maker would be well served to have similar information as was presented in K2. Ideally climate change impacts would be characterized for each of the Regions in BC every 5 years using the best available information on climate change and its impacts on forests.</p>

³ Was recently completed and released by WMB (April 2012)
http://bcwildfire.ca/Industry_Stakeholders/industry/Assessment_Abatement.htm

Ecological Landscape (Ecozones)	Associated BEC subzones	Guidance	Details
<p>All dry ecozones and the moist transition</p>	<p>PPxh, IDFxh, IDFdK, MSxk, IDFMw, ICHdw, ICHmw, ICHmk</p>	<p>Encourage researchers to investigate increased use and range expansion of ponderosa pine in the Southern Interior.</p>	<p>Regional agency researchers, University and other researchers.</p>
		<p>Experiment and expand use of partial-cutting silvicultural systems</p>	<p>Use a variety of silvicultural systems and partial cutting intensities to allow for establishment of regeneration across the range of sites over time. Support with appropriate incentives, monitoring, training and other support.</p> <p>Encourage researchers to investigate a broad use of lower overall stand stocking levels with partial cutting silvicultural systems to: encourage uneven-aged and irregular stand structures; lower stand level moisture stress; reduce fuels and fire risks in dry Douglas-fir / ponderosa pine stands. The current BC ecosystem restoration program and similar work conducted in the USA may be a helpful starting point.</p>