APPENDIX 6 - ASSESSING TSA VULNERABILITIES TO CLIMATE CHANGE – A Summary of Sensitivities, Adaptive Capacity Vulnerabilities.

Contents:

Background – Assessing Adaptive Capacity and Vulnerabilities

Intent and Focus of this Section:

A central focus for the KFFS is to provide direction and management actions and/or options to help address potential impacts from climate change. In designing this direction, implementation barriers and knowledge/ data gaps were also tracked. With the climate modeling data and the ecological sensitivities identified, the essential components are present for an initial vulnerability analysis to climate change in the TSA. Such an analysis helps to characterize priorities and challenges for implementation.

Since vulnerability assessments are relatively new to forestry practitioners, this section will first review classic vulnerability assessment concepts and introduce the approach used in the Kamloops TSA. As well, relevant components will be summarized and discussed for the entire TSA including:

- Ecological sensitivities
- Management sensitivities
- Adaptive Capacity considerations – implementation barriers.

Lastly this section will describe the potential management vulnerability and the projected management vulnerability by Subzone Group, explain the difference between the two, and their implications for management.

Background on Vulnerability Assessment

Vulnerability assessments for climate change are characterized using the following relationship (Johnston and Williamson 2007[63]):

$$V = f(E, S, A)$$

With this approach, *V* is vulnerability of the system of interest, *E* is exposure, *S* is system sensitivity, and *A* is adaptive capacity. *V* is a positive function of the system's exposure and sensitivity, and a negative function of the system's adaptive capacity.

Exposure (*E*) refers to the nature of the changing climate. In this project it was explored in detail for twelve BEC subzones. Sensitivity of the management system is based on sensitivity of the ecosystems that are being managed. For that reason, in this project ecological sensitivity was differentiated from management sensitivity (Fig A6.1).

Ecological sensitivity was first assessed for the twelve key BEC subzones by considering how local climate is expected to impact (exposure) the current ecological conditions and processes to help predict the subsequent alterations in ecosystems that may occur (ecological sensitivity). Similarities in ecological sensitivities, and current ecological attributes that influence management prompted aggregation of the twelve subzones into five Subzone Groups.

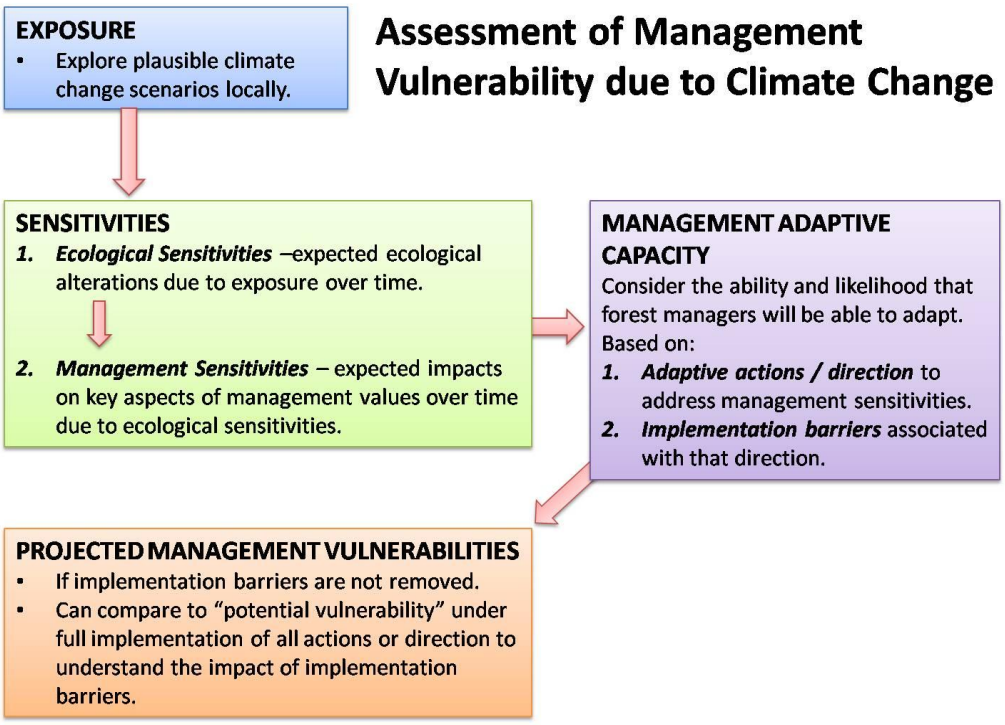

Fig A6.1. Diagrammatic flow chart of the assessment procedure for management vulnerability in the Kamloops Future Forest Strategy.

[63] Johnston, M., T. Williamson. 2007. A frameworks for assessing climate change vulnerability of the Canadian forest sector. Forestry Chronicle, Vol. 83, No. 3. Pp 358-361.

Management sensitivity was determined by considering the expected alteration, either positive or negative to the key aspects of management values in the five subzone groups, i.e., the level of impact on the value based on climate change. Projected management vulnerabilities are the product of management sensitivities adjusted by the ability of the management system to adapt, or the likelihood that the manager will be willing and able to implement actions to adapt (management adaptive capacity).

The management adaptive capacity is determined by considering the proposed management actions / direction and the implementation barriers associated with those actions / direction. The importance of the implementation barriers can be highlighted by considering the difference between projected vulnerability, and potential vulnerability - if all management actions/direction is followed and implementation barriers removed (no adaptive capacity issues).

It should be noted that determination of adaptive capacity in the KFFS only considered climate change as a feature of "exposure". Additionally, only implementation barriers that can be influenced by the government and stakeholders in British Columbia were explored. Exposure influences such as projected population expansion and land use changes were not considered. Adaptive capacity influences such as projected global markets were also not considered.

Summary of Ecological Sensitivities in the Kamloops TSA

Over 60% of the Timber Harvesting Land Base (THLB) within the TSA is projected to be threatened with a moderate-to-high or a high ecological sensitivity (Table A6.1). This means that a high or moderate-to-high degree of ecological alteration is expected within these subzone groups.

The most susceptible subzones fall within the two dry subzone groups and the moist transitional subzones in the ICH and IDF. In the dry subzone groups a significant proportion of the area is forecast to change from coniferous forests to a grassland or forested grassland type. In the ICH-IDF transitional subzones a significant decline in the proportion of the coniferous content in mixedwood types is expected. Continuous coniferous stands are expected to become open, irregular conifer stands or mixedwoods.

Only 21% of the THLB in the Kamloops TSA is expected to have a low ecological sensitivity. This area is in the wet cool / cold subzones where stands will change in subtle ways with fewer obvious changes across the landscape over time.

For more information on ecological sensitivities:

- For the five subzone groups – see *Appendix 3*.
- For the 12 individual subzones - see *Ecological Narratives* in the *Compendium of Supporting Documentation*.

Table A6.1 Overview of ecological sensitivities in the Kamloops TSA, based on expected impacts from climate change, ecological conditions and perceived ecological adaptive capacity. The sensitivitity ranking indicates the degree of ecological alteration that is forecast by the scenarios tested (e.g. changing plant communities, disturbance regimes and other processes). The rationale includes key points from the ecological narratives, that tend to emphasize the worst-case / most change climate scenario to explore how much change may occur.

SUBZONE GROUP	BEC subzones	% of THLB in TSA	Ecological Sensitivity	Summarized Rationale for Sensitivity
Dry Subzones with Pli	MSxk, IDFdk, (SBPS)	28	HIGH	• Too hot and dry after 2050 for Pli. • Estimate 37% of THLB in young Pli that will not be ecologically suitable past 2050. • Increased fire risk.
Dry with Fd & Py	IDFxh, PPxh	10	HIGH	• Continuing mortality in Fd will thin out and open up stands. • Increased grassland patches. • Increased fire risk.
ICH-IDF Transition	ICHmw, ICHdw, IDFmw, (ICHmk)	26	MOD-HIGH	• Fd drops out of mixedwoods due to drought / Armillaria / D-fir beetle combo. • Lose considerable Cw, Sx, Ep past 2050 • Increased fire risk.
Dry- Moist Plateau/ High Elev	MSdm, SBSmm, ESSFdc, (ESSFxc)	15	MOD	• Increased growth in most species (except Bl) up to 2050. • Beyond 2050 – Bl drops out, Pli at high risk, Sx questionable on some sites lower down. May see a few large fires.
Cool/Cold & Wet	ESSFwc, ICHwk, (ICHvk)	21	LOW	• Increased mortality in old growth • Increased growth in young stands • Weevil increasing problem for young Sx.

Summary of Management Sensitivities in the Kamloops TSA

Using the understanding of ecological sensitivities and the types of changes that may occur across the TSA, management actions can be adjusted over time to avoid being "painted into a corner" leaving only a few difficult options available. To achieve this goal management values and the impact of plausible climate change scenarios were investigated.

Potential management sensitivities were estimated by considering the ecological sensitivity, the ecological conditions that create that sensitivity, and the important aspects of each management value in each subzone group (Table A6.2). The rankings help focus attention on management concerns by area and value.

Table A6.2 Overview of management sensitivities in the Kamloops TSA, based on expected impacts on management from the ecological sensitivities in Table A6-1. The sensitivity ranking indicates the degree of impact on various aspects of key management values. The rationale tends to emphasize impacts from the worst-case / most change climate scenario to explore how much change may occur.

SUBZONE GROUP	BEC subzones	% of THLB in TSA	Management Sensitivity	Summarized Rationale for Sensitivity
Dry Subzones with Pli	MSxk, IDFdk, (SBPS)	28	MOD-HIGH	• High impacts on productivity and growing stock for timber. • High impacts on biodiversity and a range of habitats and fish. • Significant issues for water, interface, and First Nations culturally important plants.
Dry with Fd & Py	IDFxh, PPxh	10	HIGH	• High impacts on THLB, productivity and growing stock for timber. • High impacts on biodiversity and a range of habitats and fish. • High impacts for water, interface, and First Nations culturally important plants. • Significant issues for visual quality
ICH-IDF Transition	ICHmw, ICHdw, IDFmw, (ICHmk)	26	MOD-HIGH	• High impacts on productivity and growing stock for timber. • Significant issues on biodiversity and a range of habitats and fish. • Significant issues for water, and interface. • Significant issues for visual quality
Dry- Moist Plateau/ High Elev	MSdm, SBSmm, ESSFdc, (ESSFxc)	15	MOD	• Moderate impact on growing stock for timber. • Significant issues for some habitats and fish • Moderate impacts for water and First Nations culturally important plants.
Cool/Cold & Wet	ESSFwc, ICHwk, (ICHvk)	21	MINOR-MOD	• Minor timber supply concerns long term – may be some short term benefits. • Minor concerns for habitat, except for Caribou where there are many outstanding questions. • Signficant issues possible for water quality.

The rankings used in the table were determined as follows:

High sensitivity– There is a high likelihood of a substantial negative impact on the management concern.

Moderate sensitivity – There is a high likelihood of a limited negative impact on the management concern.

Minor Sensitivity – There is a likelihood of a small impact.

A comparison of tables A6.1 and A6.2 reveals that ecological sensitivity has a significant impact on management sensitivity. It is clear however that the two sensitivities should not be assumed to be the same in the subzone groups. Management sensitivity is influenced by the range of management values present and their importance in the subzone group (Table A6.3).

Table A6.3 Example of a subzone group overview of management sensitivities, potential managed vulnerability (all direction followed and barriers removed), and projected managed vulnerability (no barriers removed and implementation is impeded accordingly). The +/- symbols merely help to show relative perceived changes. Similar tables for all subzone groups are found in subsection 8-6 (end of this section)

Dry Subzones with Lodgepole Pine - MSxk, IDFdk (SBPSmk)

			Potential Managed Vulnerability		PROJECTED MGMT. VULN.
Management Value	Specific Concern	Sensitivity RATING	Ability to change with Mgmt	Potential Managed Vuln Rank	RANK
SUBZONE GROUP	Size of working landbase	MODERATE TO HIGH	Very Low	MODERATE TO HIGH	MODERATE - HIGH
	productive capacity of the working landbase	HIGH	High	MINOR	HIGH -
	Growing stock on the working landbase	HIGH	Mod-High	MINOR TO MODERATE	HIGH -
	Economics	MODERATE	Very Low	MODERATE	MODERATE
BIODIVERSITY	Old growth habitats	HIGH	Mod	MODERATE	HIGH -
	Wildlife trees/ WTPs and landscape permeability	HIGH	High	MINOR	HIGH -
	CWD	MODERATE	High	MINOR - -	MINOR TO MODERATE ++
	Ungulates (designated winter ranges)	MINOR		MINOR	MINOR
	Other species of concern or at risk (red and blue)	HIGH	Mod	MODERATE	HIGH -
	Invasive species	HIGH	Mod	MODERATE	HIGH -
FIRST NATIONS	Culturally important plants	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
INTERFACE	Fire risks	MODERATE TO HIGH	High	MINOR -	MODERATE ++
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
	Fish Habitat - Salmonids	HIGH	Very Low	HIGH	HIGH
OTHER	Visual Landscape Management	MODERATE	High	MINOR - -	MINOR TO MODERATE ++

The most important management sensitivities in the Kamloops TSA emerge due to increased stand mortality as conditions become hotter and drier through the summer, especially beyond 2050. This mortality will be due to drought stress, insects, pathogens, and a higher incidence of larger and more severe wildfires. Impacts will be significant for biodiversity, habitats, fish, timber, interface values, watershed values, and First Nations culturally important plants.

It should be noted that for timber management these extreme conditions will reduce productivity on many sites, especially in dry subzones. It will also have large impacts on growing stock, with substantial losses occurring in pulses of mortality that coincide with warmer, drier climatic cycles. These impacts will similarly have a major influence on biodiversity and habitat, with a significant decline in structural and habitat complexity, a large increase in early seral communities, the appearance of novel plant communities and an increase in invasive species.

Other values that depend on a significant amount of forest cover, such as visual quality will be degraded in a number of areas. First Nations culturally important plants will be displaced locally in some subzones. Water quantity and storage will be a major concern, especially in watersheds with a preponderance of drier subzones. In the cool wet subzones, the projected increase in precipitation delivered during extreme weather events may cause problems with water quality, and could possibly threaten infrastructure. Salmonid populations are expected to decline, potentially disappearing in some locales, as adverse water temperatures spread through the warmer portions of the TSA.

Adaptive Capacity considerations

As previously mentioned adaptive capacity describes ability of the management system to adapt, or the likelihood that the manager will be willing and able to implement actions to adapt to climate change.

For the purposes of this strategy, management adaptive capacity is defined as:

> *The ability of our current management system to adapt and adequately address the management challenges we face with climate change, using the direction from this project as a starting point. The current management system is intended to include: current legislation, policies, administrative structures, and other factors that shape the way forest management functions in the TSA, including its influence on the direction and management actions that managers will be willing and/or able to implement.*

Management adaptive capacity may therefore be considered to be a measure of the ease or difficulty attached to implementation of the direction in the strategy. In the KFFS it is reflected by two different expressions of vulnerability over time - potential and projected vulnerabilty.

Issues associated with adaptive capacity for management can significantly contribute to the vulnerability of a management value or attribute of that value. Accordingly, adaptive capacity was examined and considered by exploring the estimated influence of implementation barriers on the ability of the strategy to mitigate expected climate change impacts over time.

For each subzone group management sensitivity was ranked based on the sensitivitity from low to high. Next, each proposed management action was considered for its ability to mitigate climate change impacts and lower the sensitivity ratings for the various management concerns associated with each management value. This was achieved by applying an appropriate factor to net-down the sensitivitity ranking. Adaptive capacity was then considered by grouping all the implementation barriers into five broad themes or general barriers:

(1) the lack of a comprehensive strategic planning process;

(2) more costly reforestation;

(3) more costly or break-even harvesting;

(4) the need for on-going stand management beyond free growing through the rotation;

(5) a requirement for government to take on increased management risk.

Adaptive capacity issue 1. Lack of strategic planning process

A common theme emerged from the management workshops within this project. Managers and practitioners from every agency and licensee company expressed frustration that the forest management cycle of planning and implementation is too fragmented and dysfunctional within the TSA. Planning and implementation for different values and objectives is often done in silos with little connection between them. There are numerous examples of this problem in the TSA.

Example A: Some excellent mapping was conducted through the ecosystem restoration program in the dry southern portion of the TSA to identify "ecosystem restoration" opportunities, based on fuel loading and fire risks. Currently, BC is designing a provincial wildland fire management strategy that is intended to eventually help explore how fire can be managed at a landscape level, shifting to a proactive combination of modelling, strategic placement of cutblocks and fuel management at several scales. The mapping completed under the restoration program would be very instructive to build on this process and improved to incorporate climate change influences. However, the regional staff involved in the wildland fire management strategy were not aware of this mapping. It would be useful to integrate these initiatives and include climate change considerations over time, but there is currently no strategic process to facilitate such integration.

Example B: Some wildlife habitat biologists are similarly frustrated by the vague parameters and objectives used to establish landscape level reserves such as OGMAs in the TSA. As well, there is little strategic direction or spatial targets for wildlife tree retention, with no functional linkage to OGMAs and other habitat considerations. A retention strategy was designed by Tolko in 2003, which had broad direction for retention based on biogeoclimatic zones. Although this strategy was supported by the Ministry of Forests and Range and other licensees, it is not clear how this direction was implemented and if it is achieving the desired results, again mostly because there is no strategic planning mechanism in which to implement such strategies beyond SFM plans for certification. Clearly the

major issue facing management of habitat is that it is unknown whether or not the overall pattern and amount of retention and reserves is appropriate to sustain native biodiversity now or in the face of changing climate.

Example C: Currently, strategic timber management is often acknowledged to be a process of finding enough timber volume to sustain milling requirements over the short term, while meeting short term obligations set by the government. The types of actions suggested in the KFFS including: proactive harvesting of vulnerable stands, harvesting to reduce fuels, stand tending treatments and monitoring of post free growing stands - have no planning process or forum in which they can be adequately analysed, discussed and integrated with other values so they can be implemented effectively in time and space.

Climate change is anticipated to cause considerable disturbance, even over the next forty years in many of the ecosystems in the Kamloops TSA. This disturbance could have a variety of impacts on a range of values at different scales. Management to mitigate these impacts will not be successful by continuing to plan for biodiversity, timber, ungulate winter range, the urban-forest interface, and other values in disconnected silos, often using simplistic approaches.

The type of strategic planning that is needed to adequately address climate change is not a new concept for forest management:

- Rempel et al. (2004)[64] suggest that forest management should involve five elements: 1) establishing a clear set of values and goals, 2) planning actions that are most likely to meet those goals, 3) implementing appropriate management activities, 4) monitoring the outcomes of management to check on predictions, effectiveness, and assumptions, 5) evaluating monitoring outcomes and adjusting management if goals are not met.
- Baskerville (2002)[65] suggests that the key to forest management is to functionally link all local actions to one overall outcome. The leading aspect of "good forest management" defined by Baskerville (1986)[66] is that there is a responsible manager of a defined forest with an explicit target forest structure that a management plan is attempting to reach.
- Kimmins (2002)[67] suggested that we must use our accumultated knowledge and experience, projected in ecosystem management scenario models linked to visualization, to conduct an ethical audit on the decisions we make today about changing the way we management forests.

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[64] Rempel, R.S., D.W. Andison, and S.J. Hannon. 2004. Guiding principles for developing an indicator and monitoring framework. Forestry Chronicle, Vol 80, No 1, pp. 82-90.

[65] Baskerville, G.L. 2002. A functional basis for planning management of a forest. Unpublished report.

[66] Baserville, G.T. Understanding forest management. The Forestry Chronicle, August, 1986.

[67] Kimmins, J.P. 2002. Future shock in forestry – Where have we come from; where are we going; is there a "right way" to manage forests? Lessons from Thoreau, Leopold, Toffler, Botkin and Nature. The Forestry Chronicle, Vol. 78, No. 2, pp263-271.

- Johnson and Williamson (2007)[68] highlight the importance of strategic planning to address climate change by suggesting that long-term forest management plans are the vehicle for considering and addressing the effects of climate change.

Climate change requires a long-term, multi-layered focus for forest management that must be approached proactively with operational strategic planning. Otherwise, management will fail to address the issues as they emerge over time.

Adaptive capacity issue 2. More costly reforestation

Management actions suggested in the KFFS to address climate change impacts are dominated by the introduction of more resilient species mixes across the TSA. More specifically there is a general suggestion to reduce the reliance on lodgepole pine and subalpine fir and increase the use of a range of other species in a number of subzones. The challenge is that both lodgepole pine and subalpine fir are often less expensive reforestation options on many sites.

Both of these species often provide significant amounts of natural regeneration after disturbance. When planting is necessary, Douglas-fir and other species may cost up to $300 per hectare more, considering: nursery costs, fill planting requirements, and possible additional survey costs. As well, the current stumpage appraisal system encourages a least-cost silviculture approach to meet free-growing obligations, with no allowances or incentives for more costly innovative species choices. Lastly, the more rapid achievement of free-growing generally provided by lodgepole pine represents a lower cost, lower risk approach for licensees concerned about meeting legislated obligations (See the Timber Management section in Appendix 4 for more information).

It is anticipated that some planting of the more resilient species mixes promoted by the KFFS will occur without addressing the implementation barriers described above. However, it is expected that this effort will not be sufficient to make the changes required to the future forest condition.

Adaptive capacity issue 3. More costly or break-even harvesting

This barrier is related to the lack of strategic planning, in that it refers to the suggested proactive harvesting of stands that are vulnerable to climate change. First, there is no planning mechanism to actually set targets for such harvesting, nor to integrate it effectively with other resource values (e.g., through scenario evaluation). Also, there is little incentive or allowance, economic or otherwise, for licensees to undertake such harvesting.

Adaptive capacity issue 4. The need for on-going stand management beyond free growing through the rotation.

This broad barrier is also related to the lack of a strategic planning process. But it also relates to the lack of incentives for licensees to engage in management beyond free-

[68] Johnston, M., T. Williamson. 2007. A frameworks for assessing climate change vulnerability of the Canadian forest sector. Forestry Chronicle, Vol. 83, No. 3. Pp 358-361.

growing. It is likely that some stand management beyond free growing suggested in the KFFS may occur in the TSA through FFT projects and funding. However, without a clear mandate, a long-term strategic plan, and a long-term commitment to funding, these treatments are likely to be ephemeral. It is also doubtful that they will be well-integrated into planning for biodiversity, fuel management and other objectives.

Adaptive capacity issue 5. Requirement for government to take on increased management risk

Even if the other barriers are addressed, management of the forest throughout the rotation and use of tree species for planting and other untested silvicultural treatments will require government to take on more of the risks associated with these activities. It is not clear whether the government will accept such risk.

Vulnerability Determination

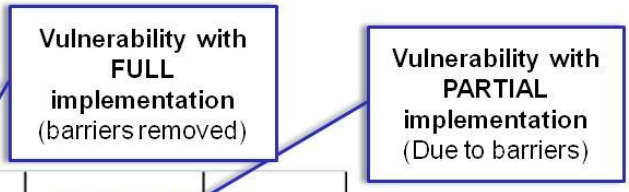
Once adaptive capacity is considered, vulnerabilities across the TSA , general TSA vulnerabilities were determined. To determine vulnerabilties, a factor was designed for each broad barrier described above, based on the estimated degree to which it would impede full implementation of the KFFS direction. The result is a snapshot of *projected* management vulnerability compared to *potential* management vulnerabilty (Table A6.4).

When *projected* management vulnerabilities are summarized across all subzone groups and compared to the *potential* management vulnerabilty if all direction is followed and all barriers are removed (middle column, Table A6.4), the influence of management adaptive capacity in the Kamloops TSA is striking.

Using the assumptions associated with the *projected* management vulnerabilities, some of the initial sensitivies may be partially addressed , but not significantly, unlike the situation if all barriers were removed and the KFFS was followed as suggested (*potential* management vulnerability). With none of the barriers removed, planning would occur as it does now, with no operational strategic process in place. It would therefore be unlikely that managers would be willing to undertake many of the management actions suggested. There would be no forum to discuss and plan these actions across a TSA, and little incentive for individual licensees to do so on their own.

The comparison of vulnerabilties, based on a consideration of adaptive capacity, illustrates that mitigation of many climate change impacts on management is achievable to a certain extent with thoughtful and timely management actions. Those actions will be challenging to implement without first addressing the implementation barriers that influence adaptive capacity. Many of these barriers and issues are provincial in scope. Until these barriers and issues are addressed, much of the TSA is projected to have a moderate to high vulnerability to climate change.

Table A6.4. Comparison of *potential* management vulnerability (assuming all barriers for implementation were removed), and *projected* vulnerability (assuming no barriers are removed). The two vulnerabilities are compared to the original management sensitivity ranking.



SUBZONE GROUP	Mgmt Sensitivity	Potential Vulnerability	Projected Vulnerability	% OF AREA
Dry with Pli	MODERATE TO HIGH+	MINOR TO MODERATE +	MODERATE TO HIGH -	28%
Dry with Doug-fir and Ponderosa pine	HIGH -	MINOR TO MODERATE +	MODERATE TO HIGH +	10%
Transitional Cedar-Hemlock to Douglas-fir	MODERATE TO HIGH -	MINOR TO MODERATE -	MODERATE TO HIGH --	26%
Transition to Plateau or High Elevations	MODERATE -	MINOR -	MODERATE -	15%
Cool and Wet	MINOR TO MODERATE -	MINOR -	MINOR +	21%

Potential management vulnerability - is the expected result if the KFFS was fully implemented as suggested with all implementation barriers removed. This vulnerability ranking expects the strategy to evolve over time, with comprehensive strategic planning, good monitoring and adequate research of key questions. Learning is quickly incorporated into the strategy and good use of models for integrated scenario forecasting helps to balance impacts and adjust targets to adequately meet the objectives for management values.

Projected management vulnerability - is the expected result if the KFFS was implemented with none of the implementation barriers removed (Table A6.4 - right hand coloured column). Implementation would be attempted without any changes to our current approaches to planning, monitoring systems and other administrative structures. Likely the easier proposed management actions would mostly be implemented, possibly with some progress on a few more difficult management actions.

Comparison of Sensitivity, Potential Vulnerability and Projected Vulnerability for the Five Subzone Groups in the Kamloops TSA.

Dry Subzones with Lodgepole Pine - MSxk, IDFdk (SBPSmk)

Management Value	Specific Concern	Sensitivity RATING	Potential Managed Vulnerability: Ability to change with Mgmt	Potential Managed Vulnerability: Potential Managed Vuln Rank	PROJECTED MGMT. VULN. RANK
SUBZONE GROUP	Size of working landbase	MODERATE TO HIGH	Very Low	MODERATE TO HIGH	MODERATE - HIGH
	productive capacity of the working landbase	HIGH	High	MINOR	HIGH -
	Growing stock on the working landbase	HIGH	Mod-High	MINOR TO MODERATE	HIGH -
	Economics	MODERATE	Very Low	MODERATE	MODERATE
BIODIVERSITY	Old growth habitats	HIGH	Mod	MODERATE	HIGH -
	Wildlife trees/ WTPs and landscape permeability	HIGH	High	MINOR	HIGH -
	CWD	MODERATE	High	MINOR - -	MINOR TO MODERATE ++
	Ungulates (designated winter ranges)	MINOR		MINOR	MINOR
	Other species of concern or at risk (red and blue)	HIGH	Mod	MODERATE	HIGH -
	Invasive species	HIGH	Mod	MODERATE	HIGH -
FIRST NATIONS	Culturally important plants	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
INTERFACE	Fire risks	MODERATE TO HIGH	High	MINOR -	MODERATE ++
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
	Fish Habitat - Salmonids	HIGH	Very Low	HIGH	HIGH
OTHER	Visual Landscape Management	MODERATE	High	MINOR - -	MINOR TO MODERATE ++

Dry Subzones with Douglas-fir and Ponderosa Pine - IDFxh, PPxh

Management Value	Specific Concern	Sensitivity RATING	Potential Managed Vulnerability: Ability to change with Mgmt	Potential Managed Vulnerability: Potential Managed Vuln Rank	PROJECTED VULNERABILITY RANK
SUBZONE GROUP	Size of working landbase	HIGH	Very Low	HIGH	HIGH
	productive capacity of the working landbase	HIGH	Mod-High	MODERATE	HIGH -
	Growing stock on the working landbase	HIGH	Mod-High	MODERATE	HIGH
	Economics	MODERATE	Very Low	MODERATE	MODERATE
BIODIVERSITY	Old growth habitats	HIGH	Mod	MODERATE	HIGH -
	Wildlife trees/ WTPs and landscape permeability	HIGH	High	MINOR	HIGH
	CWD	MINOR	High	MINOR -	MINOR-MODERATE
	Ungulates (designated winter ranges)	MODERATE	High	MINOR -	MINOR TO MODERATE
	Other species of concern or at risk (red and blue)	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
	Invasive species	HIGH	Mod	MODERATE	HIGH -
FIRST NATIONS	Culturally important plants	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
INTERFACE	Fire risks	HIGH	High	MINOR	HIGH - -
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	HIGH	Mod	MODERATE	HIGH -
	Fish Habitat - Salmonids	HIGH	Very Low	HIGH	HIGH
OTHER	Visual Landscape Management	MODERATE TO HIGH	High	MINOR	MODERATE TO HIGH - -

ICH-IDF Transition Subzones - IDFmw, ICHdw, ICHmw (ICHmk)

Management Value	Specific Concern	Sensitivity RATING	Potential Managed Vulnerability: Ability to change with Mgmt	Potential Managed Vulnerability: Potential Managed Vuln Rank	PROJECTED VULNERABILITY RANK
SUBZONE GROUP	Size of working landbase	MINOR	Very Low	MINOR	MINOR
	productive capacity of the working landbase	HIGH	High	MINOR	HIGH - -
	Growing stock on the working landbase	HIGH	Mod-High	MINOR TO MODERATE	HIGH - -
	Economics	MODERATE	Very Low	MODERATE	MODERATE
BIODIVERSITY	Old growth habitats	HIGH	Mod	MODERATE	HIGH -
	Wildlife trees/ WTPs and landscape permeability	MODERATE	High	MINOR -	MODERATE
	CWD	MINOR	Very High	MINOR --	MINOR -
	Ungulates (designated winter ranges)	MODERATE	Mod	MINOR	MODERATE
	Other species of concern or at risk (red and blue)	MODERATE	Mod	MINOR	MODERATE +
	Invasive species	HIGH	Mod	MODERATE	HIGH -
FIRST NATIONS	Culturally important plants	MODERATE	Mod	MINOR	MODERATE +
INTERFACE	Fire risks	MOD.TO HIGH	HIGH	MINOR -	MODERATE TO HIGH --
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	MOD.TO HIGH	Mod	MINOR TO MODERATE	MODERTATE TO HIGH - -
	Fish Habitat - Salmonids	HIGH	Very Low	High	HIGH
OTHER	Visual Landscape Management	MOD. TO HIGH	High	MINOR -	MODERATE ++

Dry to Moist Plateau or High Elevation Subzones - MSdm, SBMmm, ESSFdc (ESSFxc)

Management Value	Specific Concern	Sensitivity RATING	Potential Managed Vulnerability: Ability to change with Mgmt	Potential Managed Vulnerability: Potential Managed Vuln Rank	PROJECTED VULNERABILITY RANK
SUBZONE GROUP	Size of working landbase	MINOR	Very Low	MINOR	MINOR
	productive capacity of the working landbase	MINOR	High	MINOR --	MINOR -
	Growing stock on the working landbase	MODERATE	Mod-High	MINOR -	MODERATE -
	Economics	MINOR TO MODERATE	Very Low	MINOR TO MODERATE	MINOR TO MODERATE
BIODIVERSITY	Old growth habitats	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
	Wildlife trees/ WTPs and landscape permeability	MODERATE TO HIGH	High	MINOR -	MODERATE TO HIGH -
	CWD	MINOR	Very High	MINOR --	MINOR -
	Ungulates (designated winter ranges)	MINOR	Mod	MINOR --	MINOR
	Other species of concern or at risk (red and blue)	MODERATE	Mod	MINOR	MODERATE
	Invasive species	MODERATE	Mod	MINOR	MODERATE -
FIRST NATIONS	Culturally important plants	MODERATE	Mod	MINOR	MODERATE
INTERFACE	Fire risks	MINOR TO MODERATE	High	MINOR --	MINOR TO MODERATE -
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	MODERATE	Mod	MINOR	MODERATE -
	Fish Habitat - Salmonids	MODERATE TO HIGH	MOD	MINOR TO MODERATE	MODERATE TO HIGH -
OTHER	Visual Landscape Management	MINOR TO MODERATE	MOD	MINOR -	MINOR TO MODERATE -

Wet Cool / Cold Subzones - ESSFwc, ICHwk, (ICHvk)

Management Value	Specific Concern	Sensitivity RATING	Potential Managed Vulnerability: Ability to change with Mgmt	Potential Managed Vulnerability: Potential Managed Vuln Rank	PROJECTED VULNERABILITY RANK
SUBZONE GROUP	Size of working landbase	MINOR	Very Low	MINOR	MINOR
	productive capacity of the working landbase	MINOR	High	MINOR --	MINOR -
	Growing stock on the working landbase	MINOR	Mod-High	MINOR --	MINOR -
	Economics	MODERATE	Very Low	MODERATE	MODERATE
BIODIVERSITY	Old growth habitats	MINOR	Mod	MINOR -	MINOR
	Wildlife trees/ WTPs and landscape permeability	MINOR	High	MINOR --	MINOR -
	CWD	MINOR	Very High	MINOR --	MINOR -
	Ungulates (designated winter ranges)	MINOR	Mod	MINOR -	MINOR -
	Other species of concern or at risk (red and blue)	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MODERATE TO HIGH -
	Invasive species	MINOR	Mod	MINOR -	MINOR
FIRST NATIONS	Culturally important plants	MINOR	Mod	MINOR -	MINOR
INTERFACE	Fire risks	MINOR	High	MINOR --	MINOR -
WATER AND AQUATIC ECOSYSTEMS	Watershed management - water supply	MINOR	Mod	MINOR -	MINOR -
	Watershed management - water quality and infrastructure	MODERATE TO HIGH	Mod	MINOR TO MODERATE	MINOR -
	Fish Habitat - Salmonids	MINOR	LOW	MINOR -	MINOR
OTHER	Visual Landscape Management	MINOR	High	MINOR --	MINOR -