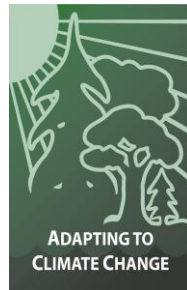


Climate Change Adaptation

SUMMARY OF WORKSHOP OUTPUTS

Opportunities to Foster Resilient Forests in a Changing Climate



Dec 9, 2011



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INTRODUCTION

This report synthesizes the results of four workshops held in June 2011 in BC. These workshops were designed to assist the Ministry of Forests, Lands, and Natural Resource Operations in adapting forest management so that forests can remain resilient in the face of a changing climate. Workshops were held in Nanaimo (June 14th), Prince George (June 21), Creston (June 23), and Kamloops (June 29).

Workshop Objectives

- a) To present a conceptual framework for fostering ecosystem resilience within the FRPA framework;
- b) To identify opportunities to move towards managing for ecosystem resilience objectives in a changing climate; and,
- c) To determine how the most promising opportunities could be operationalized.

The workshops sought input from operational people in government and industry. Participants were asked to identify the opportunities, rank them, and identify both what could be done in the short term, long term, and the pivotal issues that would be important to longer term success. In addition, two proposed objectives for tree species diversity were placed in sharp focus:

- Objective 2.1 Reforested stands and landscapes should have no less diversity than that prior to harvest.
- Objective 2.2: Reforested stands and landscapes should have sufficient stocking in secondary and/or tertiary species to meet minimum stocking levels for the site.

Results of the workshops and further outreach and analysis will be used to inform provincial scale actions.

Because the workshops evolved somewhat after the first session, a follow-up conference call with Nanaimo participants in July provided an opportunity to gather input on the revised questions posed during the other three sessions.

This summary represents the views of the participants and is not necessarily reflective of the intentions of the Government or the Ministry.

DESIRED OUTCOMES FOR A CHANGING CLIMATE

As background reading material for the four workshops, participants were provided with a Conceptual Framework outlining a set of proposed principles, goals, desired outcomes and objectives designed to foster forests that are resilient to climate change and other stressors. This conceptual framework is presented in Appendix 1. It includes the following desired outcomes:

Desired Outcomes in a Changing Climate

Outcome One	Managed forests that are suited to a changing climate;
Outcome Two	Forest ecosystems and landscapes that are complex and diverse;
Outcome Three	Adequate seed that safeguards future forest management options and benefits;
Outcome Four	Enhanced benefits and reduced climate change impacts and risks over a rotation.
Outcome Five	Increased knowledge, awareness and organizational capacity.

The Discussion Paper and other materials provided to participants are at:

<http://www.for.gov.bc.ca/ftp/HFP/external!/publish/ClimateChange/FRPA/Workshop/>

WORKSHOPS - WHAT WAS HEARD

There was a general sense that participants understood the need for resilient forests and adaptation to climate change. A common theme was that resilient forests would require planning at a broader level than the stand level. There also seemed to be appetite for government to provide clear direction and guidance on the goals and objectives to be achieved. More clarity and precision was sought on targets, thresholds and definitions for parameters including diversity. It will be important to address incentives including cost and risk of doing things differently.

MOST PROMISING OPPORTUNITIES

The Most Promising Opportunities identified by workshop participants were:

1. **Vision, Goalposts and Clear Direction:** Communicate the vision for adapting BC's forest practices for a changing climate, and provide direction and the knowledge to achieve it. What would a resilient stand/ landscape look like?
2. **Planning:** Large scale silviculture strategies that are informed by climate change should guide operational planning. Plan for and measure variability and diversity at the forest scale using silviculture strategies that address future forest conditions. Accept considerable variability at lower (larger) scales that result in diversity and complexity.
3. **Reforestation:** Manage for a wider variety or broader mixes of species and seedlots. Align reforestation with the direction of climate change (landscape and stand level); increase densities

in problematic ecosystems to address specific risks. Stocking standards at both the stand and landscape level to support resilience and provide future options, with training, guidance, and supporting rationales in FSPs. (Note: stocking standards typically provide many species to work with, however nothing requires or encourages the use of the whole range of acceptable species).

4. **Monitoring:** Improve monitoring (especially post-free growing) and feedback loops to support ecosystem resilience goals and objectives; incorporate climate change related monitoring data and collection into existing programs; assess and monitor the vulnerability of values to set priorities for further action.

Other opportunities that rated highly in some locations were setting landscape level stocking standards to the age of the 'crop' (vs. stand level to free growing); harvesting vulnerable stands / species first; and providing training, knowledge and decision support tools.

TREE SPECIES DIVERSITY OBJECTIVES: HOW THEY COULD WORK

Workshop participants were provided with two proposed notional objectives (2.1 and 2.2), and, using a ritual dissent technique, asked to identify why these objectives might not work and how they could.

Objective 2.1	Reforested stands and landscapes have no less diversity than that prior to harvest.
Objective 2.2:	Reforested stands and landscapes should have sufficient stocking in secondary and/or tertiary species to meet minimum stocking levels for the site.

After identifying a robust set of reasons why they might not work, participants at all workshops found ways in which the notional objectives for tree species diversity could work. Their suggestions aligned around the following themes:

- Be strategic, rather than rules-based.
- Clarify goals and definitions
- Determine appropriate levers
- Consider incentives, and how to share / balance cost and risk
- Determine scope and scale
- Consider implementation requirements
- Build in flexibility and encourage experimentation
- Empower locally effective solutions
- Figure out how we monitor, measure and report

Details of these suggestions within these theme areas are outlined in Appendix 2. It might be prudent to consider species and genetic diversity together using a climate change lens, to provide more options to increase diversity. Work is needed to develop and communicate the knowledge and tools that would support this. It will also be important to define the metrics re: climate change and the diversity statistics.

WHAT WE CAN DO IN THE SHORT TERM

Provide Clear Direction

Revise stocking standards, particularly by providing landscape level stocking standards or set 'crop' standards that would apply at rotation age, vs. stocking standards that only apply in the regeneration phase of the stand. Underpin these with Chief Forester guidance and training, and require a supporting rationale in FSPs. Provide clear direction from the Chief Forester to allow climate-change appropriate innovation.

Regional/Management Unit/ Landscape Level Strategies and Plans

Develop strategies at the regional, management unit or landscape level, with a particular focus on tree species diversity at the local level. Recognize regional differences in the requirements for these plans.

Provide Knowledge and Tools

Roll up these results into the hands of practitioners:

- Websites
- Link sent by Chief Forester
- e-mail list of all attendees sent out

Provide info on species/pest/climate change (website).

Finalize the tree species selection tool

Publicize all the relevant [FREP studies](#). Discuss best practices with local working groups.

Other Short-Term Actions (Quick Wins) Identified:

- Evaluate FSPs prior to re-approval.
- Prescribing professionals implement now with a clear rationale. Reviewing foresters be open to innovative ideas.
- Improve seed transferability (ownership and location). Shift elevation of planting stock within current limits.
- Acknowledge FFT progress; further leverage resilience principles and objectives through the Forests for Tomorrow program; and put multiple species on landscape level into FFT.
- Report out on all age classes periodically; focus on stand age with most risk
- Link to related initiatives already underway such as MOE cumulative monitoring pilot.

LONGER TERM AND PIVOTAL ISSUES

BC's ability to foster ecosystem resilience and adapt successfully to a changing climate over the longer term is contingent upon several issues that will take time to implement. They include:

- 1) Forest level planning
- 2) Recognition of additional costs for innovation related to resilience; and addressing the risk to licensees for failure of novel plantations or doing something different;
- 3) Balancing objectives

- 4) Factoring climate change and resilience into timber supply;
- 5) Improving capacity to adapt; and,
- 6) Monitoring to support/align with climate change adaptation.

1. Forest level /(strategic) planning: setting direction and objectives, and linking all resource values sustainably over the long term.

Resilience cannot be achieved at the stand level alone, it requires land management planning at a forest and/or landscape level, potentially through a cooperative planning model for TSAs. This is a long-term policy issue that needs to be forward-looking. We need clear direction, goalposts, and a proper framework: a consistent set of objectives and plans, a strategy to monitor over time; and guidance. Both direction and flexibility are needed to manage all the resources using the lens of climate change.

Government's objectives with respect to climate change must be reflected in our current stand management strategies. Measure and plan for variability and diversity at the forest scale: accept considerable variability at other scales that result in diversity and complexity. This could include, for example, crop standards that embed resilience at future time, management of post-free-growing stands for the entire rotation. There is a call to integrate biophysical, social and economic into a functional framework and across agency initiatives, and an advantage to managing some landbase intensively for timber/ fiber, where the objective would not be a variety of species. We want to avoid limiting opportunities for innovative forest licenses (e.g. short-rotation species), rather, look for ways to be more efficient, create closer partnerships, more consistent with both planning objectives and monitoring.

2. Create incentives: Address cost and risk.

- a) **Cost:** Currently there is no financial reason for licensees to increase resilience or address longer term issues. Professional reliance can only be effective if the right cost and risk structures are in place for licensees. How can we create both incentives for licensees to do the right thing – and a level playing field? It may be economically impractical to achieve multiple species per site in some areas, and silviculture investments may not meet the FRPA test for value. Consider also the risk of failure. Pressing for treatments in mid-aged stands will drive investment away. Need to address policy issues.

A falling appraisal cost estimate reduces money available for innovation, and makes it more difficult to incorporate more species. There may be Softwood Lumber Agreement¹ issues related to paying licensees to plant more expensive species to meet government objectives. Consider the economic realities: the value of product will not allow the increased investment. How do we make it worthwhile for licensees to deliver resilience outcomes?

Potential solutions proposed:

- Include incentives for changed behavior, such as governments directly funding trials or desired practices, or reducing risk to licensees.
- Resilience measures can be considered as “insurance” versus investment. Consider the benefit for other players.

¹ Note Article XVII (2) of the SLA exempts actions to protect, restore or enhance ecosystems:
<http://www.international.gc.ca/controls-controles/assets/pdfs/softwood/sla-en.pdf>

- Consider remedies through the tenure system to effect long term species composition.
- Consider funding through carbon credits.
- Cost/risk sharing? Should there be a “license to fail”? Define the Government’s (regulatory) position on (acceptable) risk for specific values.

b) Risk: In a risk-averse environment, cost- and risk-intolerance, along with differences in the risk tolerance of individuals deters innovation. There are differences between long-term and short term risk: licensees bear the risk until free-growing, while the Crown has the post-free-growing risk. There is no mutual understanding of how to manage the whole risk package.

Potential solutions proposed:

- Together we need a way to increase risk tolerance and willingness to accept some failures (in a controlled manner) when proposed practices can be justified as appropriate given a changing climate.
- **SHARED RISK:** Adopt innovation: diverse practices with many licenses doing different things. To address the risk in innovation, identify the trade-offs: “if we do this and it doesn’t work, can we identify the parameters for the Crown to deem that FG is achieved?” Be prepared to accept trade-offs – we cannot maximize all our values at the same time. Create incentives for investments. Consider risk to the licensee – and remove the ‘penalty’ for innovation.

3. Reconcile timber supply implications

In BC’s Timber Supply Review (TSR) the current focus is on a commercial crop to maximize productivity. There are concerns about compromising timber supply by growing less productive species such as birch, aspen, and offsite *Abies*. TSR and harvest sequencing do not yet recognize resilience and climate change adaptation goals – both should include a robust climate change & resilience piece that accounts for uncertainty. There should be discussion of trade-offs in timber supply: do we want carbon or only conifer sawlogs? We should be able to draw a clear link between TSR assumptions and stand-level practices (e.g. stems per hectare by species) (concern is monoculture pine).

TSR determinations provide an opportunity for Chief Forester policy direction and guidance to address climate change impacts, adaptation, policy issues, direction and guidance.

Potential Solutions Proposed

- Incorporate climate change strategies into TSR, and define success for TSR based on other values.
- Make TSR more proactive and forward looking, using scenarios and setting targets.
- Reconcile ‘FG target’ restrictions with resilience objectives
- Consider recommendations to monitor and adapt practices and work with climate change adaptation specialists and others.

4. Improve capacity

There is a cultural dynamic in the context of climate change: too much turnover in government and major industry. ‘Licensees have suffered reduction to 50% of their staff’. Ministries too have had large staff reductions. Organizational stability and staffing are crucial because adaptation involves complex issues requiring increased capacity. Need to have people to handle this – this lack is a strong impediment. Mentoring is lacking for future managers to address managing in context of change (learn as you go). Forest managers may not have the knowledge (e.g. for a replacement species) to implement the objective if climate change is too great.

There is a risk to the professional to manage ‘out of the box’ to try to adapt to change. Professionals need to build their knowledge base and share info. Some felt that we should free-up government staff to do the work (through increased streamlining and use of professional reliance); others questioned whether professional reliance could work without adequate financial and/or other incentives/levers for industry.

Potential Solutions Proposed

- More science to help tell us what resilience looks like and inform the decision process (spend some money on research). Make research results and extension -- essential information – accessible to practitioners (progeny info, landscape level stocking standards and species selection, risks, feedback on current performance). Use information from the Future Forest Ecosystems Scientific Council (FFESC) to inform progress.
- Improve predictive modeling – better data, science, communication. Interpretive tools are needed; and a formalized platform to create the stand & landscape-level treatments.
- Increase capacity for government to assist. Funding and how it is directed - research, tree breeding, seed orchards.
- Need to work through a piece of ground – i.e., learning as we go – need to structure our organization to allow for this.
- All professionals need to have the conversation, and more flexibility to do different things; Involve other stakeholders / universities.

5. Monitoring to support strategic framework

Success will depend upon a commitment to long term monitoring of resources, including, e.g. seedling deployment. Monitoring must be functionally linked to the strategic planning framework so we can see how things are functioning together². Current tracking mechanisms are inadequate (e.g. having difficulty tracking existing FRPA outcomes such as condition of static reserves).

Potential Solutions Proposed

- We need to evaluate success over longer timeframes and link it back to our strategic planning framework and institutions. Think beyond timber to include water, wildlife, climate change monitoring data and collection (e.g. G&Y, inventory, ecosystem mapping) in existing programs (FREP).
- Report out on all age class stages periodically to look for age/risk pinch points. Monitor trends and results of traditional and innovative practices through operational and gray literature, etc.

² Stand Development Monitoring is linked to TSAs and thereby to the strategic planning framework

- Need to adapt management as science becomes available and build partnerships with agencies so everyone is rowing in the same boat.
- Use management as the experiment: test a range of modelled options with rigour, and monitor. Use passive adaptive management -- learn as you manage, and incorporate the learning.

Related Issues

Related issues were those raised by participants but out of scope for the FRPA policy initiative (Phase 2 workshops). They were deemed to be of considerable importance by workshop participants, named by some as key drivers³.

1. Don't look at FRPA in isolation; Broaden the review beyond FRPA to include HLPs, TSR, GAR, Old Growth Orders, Land Based Investment Strategy, fire, etc.). By separating out FRPA from other related elements, we are tugging on one side of the spider web.
2. Broaden the climate change strategy to encompass the entire managed land base. Consider the interface between managed and unmanaged landscapes (natural vs. plantation). Inventory the values provided in unmanaged stands e.g. reserves: UWR, OGMA, PA etc. Leave / maintain some unmanaged stands as "lifeboats" (e.g. for arboreal lichen).
3. Don't restrict the focus to timber: Broaden the legacy to include the whole ecosystem not just tree species. This review should consider a full range of ecosystem services. Other values need to be brought in (with other committees): we want to avoid unacceptable cumulative effects.
4. Tenure and tenure reform is a pivotal issue. There is no incentive to manage the inventory on FLs, but on TFLs we can manage to the next rotation. Area based tenures provide far better incentives for licensees to manage with a long term focus than volume based tenures. Convert FL's to TFL's. In many areas of the province where there are existing operating area agreements (handshake deals between licensees) this should be relatively easy to do. Area based tenures encourage licensees to think long term which may further engage them in the climate change discussions / planning / actions.
5. Funding and how it is directed (e.g. for research, inventory; tree breeding, orchards; tracking mixed-species management areas); we need resources to lead and for involvement. Need more research to deal with the other FRPA values, including research on grasslands.
6. Inventory quality, frequency is a pivotal issue. Fund inventory and monitoring! We need a better inventory of values to know what all is there. (1) Inventory current 'state of forest' and how management has changed it; (2) compare to governments goals & objectives; (3) make the plan. The VRI program isn't covering enough area at present.
7. Fuel/fire concerns are a liability issue and a pivotal issue. We are largely missing the issue of fuels and fire within our legal framework whether it be FRPA, the Wildfire Act, or most higher level plans within the Province. As a result there is no requirement to address fire and fuels in FSPs. More fire on the landscape as a result of climate change means we need to capture this opportunity within the legal framework. This is a gap to be addressed.

³ Related issues, while out of scope of the FRPA policy assessment project, will be brought forward to Ministry Executive.

KNOWLEDGE, DATA AND INFORMATION GAPS

Participants identified a number of gaps in our knowledge toolkit where more work is needed. This includes e.g. defining what we mean by diversity, managing across scales (of time – beyond the free growing window, and space –forest and landscape level), the need for resilience standards and milestones, metrics, policy, and economic instruments such as risk management tools. Areas warranting attention include:

- How do we measure the desired level of (stand) and landscape level diversity?
- How do we put a strategic and risk management lens on diversity?
- How do we more effectively communicate what we're already doing?
- Commitment to measure/monitor/assess/report on what we're actually doing.

POLICY IMPLICATIONS

Policy issues will influence the shape of change going forward. Clear direction and a forest level planning framework are important first steps. Because climate is changing incrementally over the long term, a phased approach and sustained long term actions will underpin success. Implementing forest policies and practices to adapt to climate change may have both legal implications and those outside the legal realm. It may be prudent to watch out for such things as:

- conflicting objectives (one manager, one land base, integrated resource management);
- unintended consequences (acceptance of risk/failure; cumulative impacts/effects);
- societal issues and impacts related to how we adapt as organizations, industries and communities. Involving partners as part of the process will be important.
- economic considerations (how to create approaches that are feasible, practicable and cost-effective);

Some of these issues may call for the attention of the Natural Resource Committees.

NEXT STEPS: MOVING FORWARD

Proposed Action Plan and Strategy: There is an opportunity to set an agenda for managing for ecosystem resilience: an agenda that can be phased over the next 5-20 years. This opportunity could include setting near term, mid-term and longer term objectives. A Chief Forester report card (e.g. scorecard) on ecosystem resilience status and trends could go some distance to lever future investment opportunities, change legislation /policy, build adaptive capacity, and support beneficial practices. Industry support can be garnered by featuring good performers. A key success factor will be ensuring we have an adequate (even if rudimentary) monitoring and reporting system now.

Key messages & closing thoughts

Resilience is achievable if we can adapt our practices. Many of these things are directly within our control, we just need to act. There is considerable flexibility available in our legislation and regulation, but we are not taking advantage of it. Some of our policies and procedures inhibit adaptation of our practices. We can't take on everything. Prioritize based on likelihood, impact and cost/benefits for development of short, intermediate and long term policy actions.

APPENDIX 1

FRPA Policy Assessment Conceptual Framework Summary of Proposed Principles, Goals, Desired Outcomes, and Objectives July 19, 2011

Note: this conceptual framework was the starting point for workshops held in June, 2011.
All components may be subject to change as the thinking evolves.

PRINCIPLES

Four core principles have been identified to guide the adaptation of BC's forest policies and practices for a changing climate. They are:

- Principle One** An effective response to climate change must **consider both the landscape level and the stand block level**: Both lenses are necessary: the block level alone is insufficient. Stand level strategies must be consistent with the landscape level goals.
- Principle Two** Project outcomes will seek to provide sufficient guidance, empowerment, and flexibility to enable success through **reliance upon professionals**.
- Principle Three** Because of their singular opportunity to influence the future forest estate, **stand establishment practices should consider a full suite of values and objectives over the landscape and the rotation**.
- Principle Four** In order to deal with increasing uncertainty of management outcomes in a changing climate, **future forest management will consider a range of possible outcomes**, and favor those activities that can produce favorable outcomes for society over a range of potential climatic futures.

GOALS

Five goals have been identified for adapting British Columbia's forest practices for a changing climate. They are:

- Goal One** **Keep Pace** with a changing climate: Managed forest ecosystems that are suited to a changing climate.
- Goal Two** **Maintain Diversity**: Complex and diverse ecosystems and landscapes that foster resilience to impacts of climate change.
- Goal Three** **Protect Resources and Values**: A full suite of forest resources and values are maintained to safeguard future management options and benefits.
- Goal Four** **Manage Risks and Capture Opportunities**: Enhanced benefits and reduced climate change impacts and risks over a rotation.

Goal Five **Build Adaptive Capacity:** Increased capacity to apply climate change information, knowledge and tools in BC forest management.

DESIRED OUTCOMES

These desired outcomes are designed to work together toward the objective of ecosystem resilience in a changing climate. Each one alone is insufficient, but together they represent a suite of desired outcomes that could lever practices toward increased ecosystem resilience. Other desired outcomes may be identified to support each goal in the future. The desired outcomes are:

Desired Outcomes in a Changing Climate

- | | |
|----------------------|--|
| Outcome One | Managed forest ecosystems that are suited to a changing climate so that forest productivity and associated ecological, social, and economic benefits are maintained or enhanced; |
| Outcome Two | Ecosystems and landscapes that are complex and diverse (e.g. biological, genetic, and functional diversity; and diverse forest species and age class distributions) to foster resilience to impacts of climate change; |
| Outcome Three | Adequate biological legacies (e.g. seed and areas that are likely to tolerate climate change impacts) are managed to safeguard future forest management options and benefits; |
| Outcome Four | Enhanced benefits and reduced climate change impacts and risks over a rotation. Can include such elements as increasing productivity on cold sites, increasing forest carbon sequestration, fuel management, etc.; |
| Outcome Five | Increased knowledge, awareness and organizational capacity of forest and natural resource policy makers, practitioners and decision makers to consider climate change adaptation within BC forest management. |

Currently, the proposed desired outcomes are notional in nature. They should not be interpreted as FRPA objectives which are set by government through regulations. Nor are they equivalent to “results” in Forest Stewardship Plans. There are many possible ways to get to desired outcomes: not necessarily through a result or strategy. In future it may be possible to incorporate some or all of these desired outcomes as policy levers or implementation mechanisms arising from them, within the FRPA policy framework, or elsewhere such as in plans or decision support tools.

OBJECTIVES

Objectives help answer “what” we might hope to achieve under each goal. In many cases, multiple objectives could be articulated for any given goal, and the ones presented here represent an initial attempt to articulate what we should be aiming for in order to adapt forest management practices to a changing climate in BC. (Similarly, there may be multiple opportunities available to meet any Proposed Objective). Several proposed objectives have been identified to support the goals and desired outcomes. Over time, it is anticipated that additional objectives could be developed. Just as multiple

objectives could contribute to a single goal or desired outcome, a single objective could contribute to multiple goals.

The proposed objectives include:

- Objective 1.1** Forests are planted with stock suitable for a changing climate.
- Objective 2.1** Reforested stands and landscapes have no less diversity than that prior to harvest.
- Objective 2.2:** Reforested stands and landscapes should have sufficient stocking in secondary and/or tertiary species to meet minimum stocking levels for the site.
- Objective 3.1** BC has a mechanism in place to ensure the adequacy of biological legacies to safeguard future management options and benefits.
- Objective 4.1** BC's forests are managed in a way that captures opportunities and addresses climate change risks and impacts.
- Objective 4.2** Cumulative impacts associated with climate change are considered in forest management decisions.
- Objective 4.3** BC has measures in place to assess the achievement and progress in sustaining ecosystem benefits in a changing climate.
- Objective 5.1** BC forest managers have the knowledge, tools and organizational capacity to adapt BC forest practices for a changing climate
- Objective 5.2** Research, extension, monitoring, and training supports the development of policy, administrative guidance and decision support tools that address climate change adaptation in BC forest management.

A note about objectives for climate change adaptation

The objectives outlined in this paper have no legal status of May 2011. Rather, they are notional in nature. The intent of bringing them forward is to initiate a conversation as part of a policy assessment process geared towards managing public forests sustainably in a changing climate. In other words, the proposed objectives outlined here are not FRPA Objectives (Objectives Set By Government for the values outlined in FRPA, nor are they Objectives set by Regulation, etc.) at this time.

APPENDIX 2 OBJECTIVES 2.1 AND 2.2

Suggestions from workshop participants on how Objectives 2.1 and 2.2 could work:

Theme	Objective 2.1 Reforested stands and landscapes have no less diversity than that prior to harvest.	Objective 2.2 Ensure adequate stocking in case one species fails
Be strategic, rather than rules-based.	<ul style="list-style-type: none"> • Rewrite/upgrade stocking standards at the start of the new FSP cycle: Resilience standards added to free-growing standards; Free Growing (FG) becomes one benchmark in a crop plan. Consider commercial value. • Needs to be linked to a strategic plan, and coordinated with HLPs. Management plan – set targets; referenced as practice requirement (FPPR)? Or, through FSP; how to measure [and verify]? Create a plan with guidance for species composition objectives. Tie back to the proper ecological, landscape and resource objectives context and consider risk and consequences of the long term developing future stand structure. Performance should tie back to AAC determinations – so repercussions for non-performance should even be more strategic. People need to work together locally to identify what is desired and what can feasibly be done. 	<ul style="list-style-type: none"> • Legal /new objectives for climate change driving results and strategies in FSPs; extend FSP terms contingent on resilience commitments. Consider whether to assess / update HLP Objectives; Ministry take the lead to update HLP's • Landscape level species targets (developed collaboratively - to meet objectives and provides professional guidance and flexibility). Not every species need be present on every site BUT every species (primary, secondary, tertiary) is present on the landscape at its target level. New standards for measuring success – resiliency • Focus on biodiversity objective rather than timber production [objective], but recognize sustainability includes economic sustainability. There is a demand side benefit to having other species and potential future product lines (short term vs. long economic lens).
Clarify Goals and definitions	<ul style="list-style-type: none"> • Have clearly defined objectives that one could work towards. Define diversity (number of species, proportions). Why diversity – new objectives; measurable. What is this diversity for? What size of trees count? (Landscape and block); provenances / climate-based seed transfer; tree species selection tool; minimum % needed to make this operational. Define – Landscape; should it be an analysis unit? Landscape unit? BEC unit? TSA? Region? • Need to specify (in forest practices legislation/FPPR) at what stage does the objective apply (i.e. is it measured) (stand establishment, free growing, or some date after that?). • Specify species composition requirements (in forest practices legislation (FPPR) (or too detailed for FRPA?). Need to specify when the survey would be done, what size 	

Theme	Objective 2.1 Reforested stands and landscapes have no less diversity than that prior to harvest.	Objective 2.2 Ensure adequate stocking in case one species fails
	<p>and numbers/proportion is desired/minimum. These need to link back to what is known about the stand dynamics of specific species mixes in specific sites – how they develop over time. To fit in some cases - may need to think about mixing in clumps of one species in a matrix of another as a mixture.</p> <ul style="list-style-type: none"> • Not restricted to the same species as before harvest (allow non-native species?). Provenances / climate-based seed transfer; tree species selection tool. 	
Determine appropriate levers	<ul style="list-style-type: none"> • Level the FG standards playing field. Increase variation to general stocking standards; recognize stocking for other products (e.g. bio-energy); expand or loosen preferred/acceptable species to achieve more diversity, advanced regeneration. Consider incremental steps, and a variety of potential levers. For example, forest management plans: guidance documents for Forest Health / Silviculture Strategies – landscape level; modifying FRPA tests or making them explicit regarding climate change. Remove policy/leg/practice barriers. (Implement through) modifications to GAR; climate based seed transfer. • Results & strategies required in the FSP for species diversity; Amend FSPs – species diversity requirements; FSP guidance / guidebook to address climate change • Be more directive in areas that are more sensitive (e.g. riparian areas, areas with increased likelihood of Climate change impacts), and Improve sharing of information (current practices, performance); More training/awareness; Learn from experience! • Take up thru certification; reported out in certification (indicators/reports). FSC reporting requirements 	<ul style="list-style-type: none"> • Some administrative tools are already in place (i.e. assignment of proportional responsibility). • Assess appropriateness of the FPPR's [practice] requirements (e.g. Green-up requirements). Make it an FSP result; extend FSP terms; new objectives /strategies in FSPs • Revise stocking standards; allow for more professional reliance, less cookie-cutter regime selection; Diverse minimum stocking standard more tuned to the ecosystem. More open to proactive proposals (i.e. stocking standards); or a site plan commitment
Consider incentives, and how to share / balance cost and risk	<ul style="list-style-type: none"> • Shared / balanced risk; and minimize risk to stand productivity. If we create monocultures on a certain portion of the land base, we'd better be thinking 'short rotation' in order to deal with the risks of an insect, disease or other agent taking the stand out. More acceptance for losses. 	<ul style="list-style-type: none"> • Three options: <ul style="list-style-type: none"> • Separate harvesting and reforestation obligations • Long-term area abased tenure for licensees • Different measure for milestone (i.e. Diversity Index and/or MSS prescription? plan?

Theme	Objective 2.1 Reforested stands and landscapes have no less diversity than that prior to harvest.	Objective 2.2 Ensure adequate stocking in case one species fails
	<ul style="list-style-type: none"> Accept that the resilience objective may reduce timber supply. Provide incentives to manage for more than short term timber: e.g. in AAC, area-based tenure, stumpage. Provide an option to manage stand post-free-growing and realize the returns throughout the rotation; realize reward in market pricing system (BCTS = major licensees). Provide adequate direction and incentives to implement through professional reliance. North American CO2 emissions legislation bringing about a carbon market; could mean diverse species; including marginal species. Market for fringe species. 	<ul style="list-style-type: none"> Crown owns the land and holds the incentive to do this stuff. Create an incentive, or remove disincentive, for least cost /lowest risk options to achieve FG for licensees. Fund innovative silviculture in appraisal system: Recognize increased costs to deal with complexity and logistics. Increase risk tolerance to provide other approaches. Determine an acceptable threshold for failure as a result of trying innovative ideas. How often would we be okay with stands falling below some minimum stocking standard due to, e.g. major elk damage, Pw plant failure, etc. Shared goals and understanding of risks and how risks will be shared (industry, government); clarify short term and long term risks. Remove administrative constraints of leaving deciduous species for diversity reasons when it may impede achievement of FG
Determine scope and scale	<ul style="list-style-type: none"> We need to define the scale; Revise scope to landscape (provides for more stand-level flexibility). Start at Stand - LU combination – TSA – Region – Province. Zonation of priority areas (identify through vulnerability assessments – consideration of legacy practices, Climate change impacts and observations): Define where and when it should apply: Multiple species may be better suited to the landscape or other scale rather than an individual block Take into consideration stand-level retention, reserves, features; Diversity matrix. 	<ul style="list-style-type: none"> Determine at what scale to measure this objective. It's more easily managed across the landscape (i.e. flexibility). Consider a 'landscape mosaic' approach – with a mixture of monocultures; use salvage as a tool if things don't work out; rather than an objective that results in a range of species everywhere; need to manage for inter-stand variability. Also, fits better with options for shorter rotations in some stand, with plantation forestry on a limited portion of the land.
Consider Implementation Requirements	<ul style="list-style-type: none"> Reforest with multiple species including deciduous; free growing stand includes both commercial and non-commercial species (resiliency). Manage for higher densities via site prep. Consider stand dynamics and natural regeneration: Can plant other species when some will come back naturally. Increase genetic diversity – e.g., rust resistance, GY...Make sure everyone can get the seed they need; including the diversity (e.g. [rust-tolerant] blister rust [seed sources]). Cross-border collaboration. Mixed-species management by multi-species, multi- 	<ul style="list-style-type: none"> Strong link between planning and silviculture. Consider alternative harvest opportunities, and a simple multi-block approach. Need to accurately measure pre-harvest diversity, and a post-harvest survey to measure natural regen / residuals prior to prescribing planting treatments. Complete PEM mapping as a priority Improve / increase our seed bank inventory of traditionally less desirable species

Theme	Objective 2.1 Reforested stands and landscapes have no less diversity than that prior to harvest.	Objective 2.2 Ensure adequate stocking in case one species fails
	<p>rotation; (funding for inventory to track). Align and diversify silvicultural systems to make it work.</p> <ul style="list-style-type: none"> Accept broadleaved trees – where suited to meet the stated diversity objectives and ecologically suited to the area now and into the future. May need to redefine stocking standards for broadleaves. 	
Build in Flexibility and Encourage Experimentation		<ul style="list-style-type: none"> Continue research in future species/climate envelopes. Models are being developed to increase certainty in future species ranges. Accept more variability in standard: Change paradigm of 100% productivity to allow for and accept stocking variability (i.e. TSR). Provide flexibility in delivering secondary and tertiary species: Be playful with off-site species (e.g. larch). Offer the possibility to substitute genotypes of a species (within a species mix) We need it to work. Due diligence/professional reliance, and adaptive management
Consider how we monitor, measure and report	<ul style="list-style-type: none"> Monitor, efficiently report, and adapt – accepting change as part of the planning framework. Adequate resourcing of this is key. Track beyond FG to keep management intent intact – (inventory, RESULTS) 	<ul style="list-style-type: none"> Milestone reporting (5 year) incentive – due diligence Robust monitoring and reporting system; Monitor and provide feedback – hold people accountable (potential certification impact)