

Adapting British Columbia's Forest Practices for a Changing Climate

FRPA Policy Assessment Workshop 'As it was Heard' Report

Prince George, BC



June 21, 2011



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Abstract

Under the sponsorship of Chief Forester Jim Snetsinger, RPF, the BC Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO) has embarked on a process to examine the Forest and Range Practices policy environment and identify opportunities to foster forest ecosystem resilience in British Columbia. In June 2011, a four workshops were held in centres across the province to invite operational input to the process. The workshop objectives were:

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

This brief report summarizes the input received at the workshop in Prince George on June 21, 2011. Approximately 30 participants spent a day engaged in a facilitated discussion that represented the views of industrial, governmental and consulting forest professionals. The scope of the conversation was confined to items within the FRPA policy realm, and related issues outside the scope have been inventoried but not critically discussed.

The three most promising opportunities were identified as:

1. Grow a broader species mixture at the stand and landscape levels.
2. Designate responsibility for landscape-level planning.
3. Broader seed-transfer guidelines.

The following notes are intended to be combined with similar notes from other sessions, and compiled into a summary/action plan in fall 2011.

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Session Notes – Prince George, B.C.

	Adapting Forest Practices for a Changing Climate
Introduction	<ul style="list-style-type: none"> • Phase 1 of this project used two reports: <ul style="list-style-type: none"> • Ecological resilience and complexity • Vulnerability of Canada's tree species to climate change • Identified 28 potential management options • Tree species vulnerability is mainly from <ul style="list-style-type: none"> • Disturbance • Maladaptation -- e.g. Illingworth trial • Resilient ecosystems are complex, diverse, have biological legacies, seed and pollen dispersal, multiple representation of values, connectivity, reduced exposure and sensitivity to disturbance • Phase 1 found that most of the 28 options apply in BC <ul style="list-style-type: none"> • Lumped them into buckets, assigned a goal statement for each <ul style="list-style-type: none"> • Defined desired outcomes • Defined Objectives • Now seeking opportunities • Implementation direction • FRPA is silent on many of the goals • FRPA has few requirements, lots of flexibility • Described the Principles for the FRPA Policy Assessment initiative <ul style="list-style-type: none"> • Landscape and block level • Reliance on professionals • Stand establishment decisions consider all FRPA values • Activities that can produce good outcomes over a range of climate futures • Why now? <ul style="list-style-type: none"> • FSPs are up for renewal over the next 1.5 years -- want to inform the renewal process • Five Goals <ul style="list-style-type: none"> • Keep pace with climate change - Managed ecosystems suited to a changing climate <ul style="list-style-type: none"> • move practices as climatic envelopes migrate – e.g. Assisted migration • Avoid reducing diversity -- avoid simplification • Protect resources and values -- full suite of FRPA values <ul style="list-style-type: none"> • Adequate biological legacies, seed • Manage risk: reduced climate impacts and risks over a rotation <ul style="list-style-type: none"> • capture opportunities • Build adaptive capacity to move towards resilient ecosystems

Conversation	Adapting Forest Practices for a Changing Climate
FRPA Issues	<ul style="list-style-type: none"> • How is investment encouraged or discouraged? • How do licensees have any incentives to do the right thing? • Natural disturbance regimes don't produce the same situation as clearcutting • Baseline diversity in-situ is not the same as desired future resilience • There is no financial reason for licensees to increase resilience • Legislative and policy requirements • Process to acquire variances is onerous • Many of the management options are covered in the Land-use Plan • Existing objectives under land use plans • Evaluate strategies on all objectives including but not limited to timber

Group Exercise 1: Courtyard Cafe: Potential Management Options for Adaptation

Planning

Identifying Opportunities	Management Options for Adaptation within FRPA
Management options missing	<ul style="list-style-type: none"> • Tools to form a landscape level plan • Coordinated approach between agencies • Assess adaptability of stands and the risk of loss of the inventory • Plan retention at the landscape level • Feed information to planning at the appropriate scales • Planning for biological legacies: identify / develop refugia • Planning with climate change lens
Most promising opportunities ¹	<ul style="list-style-type: none"> • Designate responsibility for landscape planning • Use existing tools (Parks, OGMAs, WHAs, etc) to form a comprehensive landscape level plan • Assess adaptability of stands in your growing stock (inventory) – assess risk of loss
Barriers	<ul style="list-style-type: none"> • Professional reliance without sufficient resources • Tenure system, pricing, boundaries • Unclear responsibilities for inventory and landscape planning • Funding / capacity • Preoccupation with MPB epidemic • No monitoring or record keeping for stand-level retention • Cumulative effects: monitoring and managing impacts • Effective decision-making processes • Lowest common denominator -- large spatial scale results in averaging the good with the bad • Political focus: Licensees and BCTS don't want more landscape-level constraints
Levers	<ul style="list-style-type: none"> • Certification • Incentives for licensees -- AAC? • New government structure. • Planning with accountability at multiple scales • Sufficient resources to support professional reliance • Designate responsibility for landscape-level planning

¹ Derived from ranking process by larger group

Group Exercise 1 (cont'd) Courtyard Cafe: Potential Management Options for Adaptation

Harvesting

	Management Options for Adaptation within FRPA
Management options missing	<ul style="list-style-type: none"> • Increase capture of salvage through policy incentives
Most promising opportunities	<ul style="list-style-type: none"> • Focus management on most productive sites • Reflect disturbance regimes rather than simply "partial harvesting"
Barriers	<ul style="list-style-type: none"> • There is no driving incentive for partial harvesting • TSR Assumptions • Focus on Pli and IBM: partition the cut • Forest health and extent of infestation • Admin systems built for clearcutting inhibit partial cutting
Levers	<ul style="list-style-type: none"> • Licensee steering committees through certification, SFMP schemas • Depending on species/Silvics, propose alternate silviculture systems on cutblocks where an alternate species is reforested (e.g. in alternate policy rationale to Chief Forester) • Extend LUPs directly to harvest planning • Objectives Set By Government (OSBG) re: harvesting/timber

Reforestation

	Management Options for Adaptation within FRPA
Management options missing	<ul style="list-style-type: none"> • Include natural regeneration in the regen options • Broader range of assisted migration opportunity • Partial cutting as a regen strategy • Risk rating and hazard mapping for forest health and reforestation • Take stock of available seed and determine strategic needs / options • More useful planning tools to assess needs and opportunities for seed and deployment • More collective and joint use of available seed (vs. hoarding) • Seed trading -- exchange new high-gain seed for old B-class • <u>Strategic</u> inclusion of deciduous species over the landscape for multiple objectives (fire, diversity, future markets, etc.) • Landscape success vs. block by block success • Tracking and communication of innovative results into the future
Most promising opportunities	<ul style="list-style-type: none"> • Short rotation ages (with A class seed, fertilization; prompt reforestation) • Manage stand density to get bigger trees earlier • Choose species with broad ecological amplitude • Broader species mix at the stand and landscape levels • Avoid options that generate uniform stands • Strategic mixed-wood management
Barriers	<ul style="list-style-type: none"> • Risk aversion / inertia (tenure system) • Seed transfer guidelines • Timing • Information on what future climate conditions to plan for • Appraisal allowances for reforestation • Lack of Provenance trials to support decisions • Rationalize use of novel species • Tenure security is a disincentive on TSA lands • Lack of incentives to manage post-free growing • Decision support for Delegated Decision-Makers • Lack of training for DDMs to give more comfort & exposure to reforestation
Levers	<ul style="list-style-type: none"> • Clear management-unit objectives • Chief Forester Guidance on seed use • Seed Transfer Guidelines

Stand Tending

	Management Options for Adaptation within FRPA
Management options missing	<ul style="list-style-type: none"> • Spraying for <i>Dothistroma</i> • Spraying for spruce budworm • Rust pruning • Longer and shorter rotations • Thinning to promote subordinate species • Under-burning to remove fuels • Thinning for mistletoe • Hazard mapping • Post-free-growing stand tending • Post-free-growing stand monitoring • Spatially explicit inventories post free-growing at the stand level. (Barrier = cost) • Forest Health: Other tools in FPPR Section 96 for issues other than <i>Dothistroma</i> (e.g. rusts). • Encourage up-front management for known forest health issues • Definition for long term in the context of forest health
Most promising opportunities	<ul style="list-style-type: none"> • Risk mapping • Fertilization • Thinning for sanitation • Under-plant dead pine with Fd • Shorter rotations • Assess success of species throughout their development and actively manage
Barriers	<ul style="list-style-type: none"> • Dollars and who pays • Uncertainty about climate change impacts • Risk of loss • Volume-based tenures • Return on Investment (ROI) -- risk-adversity in government and industry • Knowledge/training /experience has been reduced
Levers	<ul style="list-style-type: none"> • Stumpage credit • FRDA IV funding • Use existing tenure to promote thinning (no stumpage) • Innovative Timber Sale Licenses (ITSLs), bioenergy

Rank and Prioritize Opportunities

Setting Priorities	Ranking Opportunities within FRPA
Top 3 opportunities	<ol style="list-style-type: none"> 1. Grow a broader species mixture at the stand and landscape levels. 2. Designate responsibility for landscape-level planning. 3. Broader seed-transfer guidelines.
How they could be operationalized	<ol style="list-style-type: none"> 1. Broader species mix at the stand- and landscape-level <ol style="list-style-type: none"> a. Landscape level species deployment strategies b. Multi-block stocking standards (“without unduly restricting timber supply”) c. Get rid of the 5% rule d. Link stocking standards to TSR better 2. Designate responsibility for landscape planning <ol style="list-style-type: none"> a. Area-based tenure b. Make people responsible for landscape level objectives c. Incentive for factors besides timber d. Collaborative planning mechanism for industry and government 3. Broader seed-transfer guidelines <ol style="list-style-type: none"> a. Include trial costs as specified operations to keep appraisal costs up b. Increase 5% tolerance c. More professional reliance d. More science, research, modelling e. Expand number of species f. More incentive for operational trials (with respect to 5%) g. Recognize cost of trials in appraisal allowance (up front) h. Cost differential between species and stock types i. Utilize flexibility already in place

Group Exercise 2: Tree Species Diversity Objectives 2.1 and 2.2

	Objective 2.1: No less diversity at stand and landscape level
Reasons why this objective might not work	<ul style="list-style-type: none"> • Successional state is different after cutting (early seral has less diversity than late seral (but could manage with retention) • Future climate may not support the same diversity • Some species that benefit resilience aren't currently viable commercially – compromised timber supply • Having to achieve diversity might impede early free-growing • Traditional cutting practices influence species selection • Nursery practices and experience limit stock availability • May be difficult to achieve at the stand level or in every stand • Advantage to manage some landbase intensively for timber/ fibre, so objective is not variety of species • Don't recognize value of deciduous or other species in ecosystem/forest health • Majority of stocking standards are based on a legacy of past practises, FPC stocking standards - (but in FRPA could propose alternatives)- challenging to amend • DDMs may be risk-averse and not approve • Not recognizing the value of deciduous and other alternative species in a healthy ecosystem/forest • Limits opportunities for innovative forest licence (e.g. short-rotation species) • Current stocking standards have sawlog focus (don't recognize species for bioenergy) • Lack of practitioner understanding/experience of species diversity / with minor species • More complex administration • Compromised timber supply

Group Exercise 2 (cont'd)

	Objective 2.1: No less diversity at stand and landscape level
How this objective could work	<ul style="list-style-type: none"> • More training/awareness • Create a plan with guidance for species composition objectives • Free Growing (FG) becomes one benchmark in a crop plan • Resilience standards added to free-growing standards • Remove policy/leg/practice barriers • Expand or loosen preferred/acceptable species to achieve more diversity, advanced regeneration • Track beyond FG to keep management intent intact – inventory, RESULTS • Accept that the resilience objective may reduce timber supply • Increase variation to general stocking standards • Recognize stocking for other products (e.g. bioenergy) • Mixed-species management by multi-species, multi-rotation; (funding for inventory to track) • Diversify silvicultural systems • Incentives to manage for more than timber: e.g. in AAC, area-based tenure, stumpage • Option to manage stand post-free-growing and realize the returns throughout the rotation • Realize reward in market pricing system (BCTS = major licensees) • Commercial thinning is a regular practice and brings benefits throughout rotation • More acceptance for losses • Minimize risk to stand productivity • Reforest with multiple species including deciduous; free growing stand includes both commercial and non-commercial species (resiliency) • Rewrite/upgrade stocking standards at the start of the new FSP cycle: Learn from experience!

Group exercise: 2 (cont'd)

	<p>Objective 2.2: Ensure Adequate Stocking in Case One Species Fails</p>
<p>Reasons why this objective might not work</p>	<ul style="list-style-type: none"> • Allow secondary and tertiary species which may not be climactically resilient • Models that identify potentially new ecosystems., and thereby new stocking standards have questionable reliability • Some ecosystems have no diversity present now • Small scale to manage at the stand level (concern about commercial viability; more difficult to manage) • Implies higher initial density -- higher cost • Accept reduced targets, impacts on timber supply • Doesn't address logistics of planting such complexity • Site ecology limits (e.g. dry pine) • Inadequate knowledge of future climate/species suitability • Focus on even-aged plantation vs. partial cutting • Key drivers are mostly outside the FRPA framework
<p>How this objective could work</p>	<ul style="list-style-type: none"> • More alternate (non-pine) are being planted than before to reduce risk of losing plantations. This response will continue as required. • Due diligence/professional reliance • More easily managed across the landscape i.e. flexibility • Do plantation forestry on a limited portion of the landbase -- sort out short rotation timber production lands • De-link woodlands from mills • Diverse minimum stocking standard more tuned to the ecosystem • Recognize increased costs to deal with complexity and logistics • Monitor and provide feedback – hold people accountable (potential certification impact) • Crown owns the land and holds the incentive to do this stuff. Alternatively, area-based long term tenure • More open to proactive proposals (i.e. stocking standards) • Be playful with off-site species (e.g. larch) • Continue research in future species/climate envelopes • Models being developed to increase certainty in future species ranges • We need it to work. • Landscape level species targets • New standards for measuring success – resiliency • Increase risk tolerance to provide other approaches • Shared understanding of risks and how risks will be shared (industry, government) • Shared goals • Clarify short term and long term risks

Time Frames

Workshop outcomes	What could we do in the short term? (“Quick Wins”)
Quick Wins	<ol style="list-style-type: none"> 1. Specific direction/ guidance to DDMs from Chief Forester (re stocking standards and climate change) for FSPs is ‘gold plate’ that feeds into professional reliance 2. Do evaluations prior to re-approval and inform the 150 FSP re-submissions coming in the next 1.5 years, what are learnings? <ol style="list-style-type: none"> a. We know more now than we knew last time b. Discussion of what has worked, what hasn't 3. Have species/pest, climate change, assisted migration information available in one database, one website, easy to find with landscape descriptions. 4. Landscape level stocking standards 5. Opportunity to propose new stocking standards at renewal of FSPs: needs Chief Forester guidance to encourage MFLNRO staff to allow these new stocking standards. 6. Needs to be done: <ol style="list-style-type: none"> a. Direct that innovation should not be rejected out-of-hand b. Supporting rationales needed -- have a dialogue before submission <ol style="list-style-type: none"> i. Dialogue is personal -- call, visit ii. Do your homework iii. Develop trust iv. More awareness and training -- how are things inter-related 7. Test innovative practices at small scale before going operational 8. Training on risk management 9. Training on ecosystem resilience 10. Create a culture of dealing with climate change and uncertainty 11. More workshops like this one 12. Stop re-organizing the Ministry

Workshop outcomes	What could we do in the longer term? (Pivotal Issues)
<p>Pivotal issues to ensure long term success</p>	<ol style="list-style-type: none"> 1. Make research results and extension -- essential information accessible to practitioners (progeny info, landscape level stocking standards and species selection, risks, feedback on current performance) 2. Crop standards or crop planning that embed resilience at future time 3. Report out on all age class stages periodically to look for age/risk pinch points 4. VRI program isn't covering enough area at present 5. More science to help tell us what resilience looks like and inform the decision process (spend some money on research) 6. Adapt management as science becomes available 7. Use management as the experiment test a range of modelled options with rigour, and monitor. Monitor trends 8. Passive adaptive management -- learn as you manage, and incorporate the learning 9. Incentives for changed behaviour: either \$, stumpage, or reduced risk 10. Risk in innovation -- identify the trade-offs --" if we do this and it doesn't work, then what?" The crown would allow FG to be achieved? SHARED RISK 11. Discussion of trade-offs in timber supply: do we want conifer sawlogs or only carbon 12. Policy issues of economics is a missing piece for licensees-- how do we ensure this has economic sense 13. Policy change with regard to 5% rule 14. Falling appraisal cost estimates reduces \$ available for innovation; makes it more difficult to incorporate more species 15. Have Crown pay for trials (e.g. planting white pine)

Related Issues

Related Issues	Within Scope of the FRPA Policy Assessment
Group Conversation	<ul style="list-style-type: none"> • Natural disturbance regimes don't produce the same succession as clearcutting • Baseline diversity in-situ is not the same as desired future resilience • There is no financial reason for licensees to increase resilience (therefore is professional reliance the tool?) • Legislative and policy requirements • Process to acquire variances is onerous • Many of the management options are covered in the Land-use Plan • Existing objectives under land use plans • Evaluate strategies on all objectives including timber, but not timber only

Related Issues	Beyond Scope of the FRPA Policy Assessment
Group Conversation	<ul style="list-style-type: none"> • Inventory – quality, frequency (pivotal issue) • Rationalize objectives for sawlog, biomass, carbon • Carbon Offset Protocols • Clear link between TSR assumptions and stand-level practices stems per hectare by species (concern is monoculture pine) • Funding (e.g. for research, inventory; to track mixed-species management areas) • Seed orchards • Tenure, volume vs. area-based • Appraisal system and recognized costs • Softwood Lumber Agreement issues related to payment to licensees to plant more expensive species to meet government objectives (PI \$.11/tree; Fd \$.40) • How is investment encouraged or discouraged? • How do licensees have any incentives to do the right thing?
Building Capacity items	<ul style="list-style-type: none"> • Separating out FRPA from other related elements-- we are tugging on one side of the spider web • No incentive to manage the inventory on FLs, but on TFLs we can manage to the next rotation • We don't manage post-free-growing stands -- we ignore stands for the 8/10 of the rotation • Funding and how it is directed - research, tree breeding, orchards • Pressing to have people invest in mid-aged stands will drive investment away - Cost/risk sharing? • Cooperative planning models for TSAs

Wrap -up	Key highlights and take away messages
Key highlights "As they were heard"	<ol style="list-style-type: none"> 1. We are facing an uncertain future. <ul style="list-style-type: none"> • We don't manage risk well because it is divided up between government and industry 2. We lack strategic thinking in forest management, which makes it impossible to manage landscapes effectively 3. Government's objectives with respect to climate change are not reflected in our current stand management strategies. 4. Some of our policies and procedures inhibit adaptation of our practices
Key messages	<ol style="list-style-type: none"> 1. Resilience is achievable if we can adapt our practices 2. Land management planning is a necessity 3. There are trade-offs necessary – we cannot maximize all our values at the same time. 4. There is considerable flexibility available in our legislation and regulation, but we are not taking advantage of it.
Summing Up: What was heard	<ol style="list-style-type: none"> 1. A sense of risk -- everyone has a different risk tolerance, and it may be small <ol style="list-style-type: none"> a. Makes it difficult to innovate b. Increase risk tolerance 2. Many of these things are directly within our control, we just need to act 3. Cost- and risk-intolerance prevents innovations 4. Who bears the risk? <ol style="list-style-type: none"> a. Licensees have a certain risk to free-growing <ul style="list-style-type: none"> • Results and strategies mitigate their risk b. Crown has the post-free-growing risk c. No mutual understanding of how to manage the whole risk package because it is divided 5. Long-term vs. short term risk 6. Strategies change after forthright dialogue about risk -- e.g. Changes in deployment of PI in the Bulkley after Dothistroma was pointed out.

Wrap -up	Workshop Evaluation
What worked well?	<ul style="list-style-type: none"> • Discussion groups • Diversity in groups – licensees • Preparatory pre-reading useful • Safe environment for discussion • Good room size • Cookies • Discussions had enough time
Tricky	<ul style="list-style-type: none"> • Staying within the scope • Looking at all natural resources (not just forest): closely linked issues • Natural resource policy • Going through silent/impeded list on the green sheet
Do Differently Next Time	<ul style="list-style-type: none"> • Hand-outs on different colored paper • List of all participants and where they're from • Central location for documents • Send out agenda • Potential management options: cover only those items that are not silent • Include a legend on the side of the green sheet

Appendix 1 Potential Management Options for Adaptation

Source Material for Morning Session, Group Exercise1 – Identifying Opportunities within FRPA

#	Potential Management Option
	PLANNING
1	Retain or restore areas buffered against climate change ('climate refugia') to retain plants and animals that could provide propagules
2	Develop landscape structures that enable species and genotype flow northward and upslope.
3	Develop In situ and ex situ conservation strategies(including but not limited to natural reserves) to maintain biological legacies for future climate (not necessarily FRPA)
4	Establish genetic outposts (small plantations of seed sources that are adapted to predicted future climates in remote locations) to hasten the adaptation of forests in unmanaged areas
5	Measure and plan for variability and diversity at the forest scale: Accept considerable variability at lower scales that result in diversity and complexity at the systems scale (the forest)
6	Plan for and manage within the context of an uncertain future: include experimentation, learning and adapting to deal with uncertain ecological and management interactions, shifts in disturbance regimes, and ecological community reorganization
	HARVESTING
1	Manage age classes to enable continual recruitment of biological legacies
2	Focus management on currently productive sites and those likely to remain more productive under future clim
3	Harvest vulnerable and poorly adapted stands first, including and species most susceptible to pests.
4	Develop forest harvest patterns and regeneration regimes that generate a diversity of stand ages and compositions over landscapes
5	Manage age classes - not just for the first 20 years, but all the way through the rotation.
6	Vary the size and shape of clearcuts, and leave patches or stream buffers
7	Broadly implement alternative partial harvest systems and various silviculture techniques to generate micro-environment suitable for survival of migrated species
8	Use harvesting as a forest health tool for stand replacement. Replace with better adapted species/genotype. Strategically determine where harvesting occurs. Cut the forest profile. Address FH issues
9	Account for changes in future site conditions in management decisions (e.g., anticipate where moisture may become limiting)
10	Manage species for shorter rotations to minimize losses to the current inventory from climate change-induced disturbances
11	Where economic conditions allow, use intensively managed plantations dedicated to wood supply to focus efforts on a smaller more productive forest estate which could be managed to reduce the impacts of climate change. Aim for carbon conservation benefits on other areas.
12	Use silvicultural systems that maintain or enhance genetic diversity
	STAND TENDING
1	Undertake sanitation cutting in stands already infected
2	Control root disease by removing infected stumps where feasible
3	Implement measures to reduce hazard and/or risk of loss to forest health agents.
4	Use prescribed burning to reduce fire risks and forest vulnerability to insect outbreaks
5	Prevent the introduction or spread of invasive species, and remove or control undesirable invasive species
6	Modify management of the current generation of trees such that the risks of species mal-adaptation are

#	Potential Management Option
	taken into account : e.g. Fertilize high value stands to bring them to rotation before climate change-induced mortality; e.g. Thin stands on drought-prone sites to reduce water use where it will not increase susceptibility to wind throw or disease
	REFORESTATION
1	Introduce fire into ecosystems where historical fire cycles have been disrupted by past fire exclusion
2	Plant species mixes based on novel assemblages identified through scenario-based climate modeling
3	Assist migration (potentially of seed, seedlings, pollen etc)
4	Avoid practices that generate uniform post-disturbance stands that may be highly vulnerable to future disturbance (OK in a small percentage of stands (5%?) but not across the landscape. There are trade-offs between yield and protection.)
5	Plant resistant genotypes—use resistant (and/or pest and disease tolerant) planting stock to help; consider companion planting /tree species mgmt (certain species grow well together, spread/re-direct harmful pests/pathogens to other hosts/understory shrub and vegetative community ¹²
6	Increase genetic variation at multiple scales (e.g. use a range of seed sources at the stand and landscape level) to reduce cum. impacts from over-planting the same source(s) /seedlot(s) in an area or MU
7	Plant a broader range and new mixes of tree species over landscapes –e.g. hardwood/conifer mix and seedlings from a range of seed sources, particularly from more southern or lower-elevation populations.
8	Emphasize species or populations that have the genetic ability to tolerate a wide range of environmental conditions
9	Develop genetic resource mgmt /seed strategies to assess what seed sources may no longer be appropriate for BC, or will no longer be appropriate within several decades; manage seed inventory accordingly.
10	Plant and monitor species and provenance over a broader range of climatic and edaphic conditions to hedge against the risk of losing management investments.
11	Plant drought-resistant species in areas that are prone to increased drought
12	Prompt reforestation of all harvested and disturbed forests with a suitable variety of species and provenances adapted to both today’s and predicted future climates (e.g. assisted migration); this could include planting species that have historically occurred south of the BC border. (A time frame of 30 years out may be as far as we can reliably forecast for climate based seed deployment).
13	Bank surplus seed – broader use of non-local seed sources may require the procurement and banking of many different seedlots.