

Links to various tools available for practitioners



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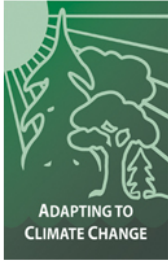
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Ministry of Forests, Lands and Natural Resource Operations

Adapting BC's Natural Resource Management to Climate Change

- **The Context:** British Columbia's overarching [Climate Change Adaptation Strategy](#) as articulated by the Climate Action Secretariat envisions that "British Columbia is prepared for and resilient to the impacts of climate change". Adapting B.C. forests to climate change is an important part of the adaptation work being undertaken in B.C.
- **B.C.'s Forest Stewardship Action Plan for Climate Change Adaptation** outlines a new vision and signals an important new policy direction for climate change adaptation for forest management in British Columbia. Released in February 2012, it outlines goals, objectives and actions the Ministry will take over the next five years to adapt forest stewardship to a changing climate.
- **Adaptation Knowledge and Tools for Adapting B.C.'s Forest Management** points to B.C. forest policies for adapting to climate change, and provides links to a suite of knowledge and tools to assist forest managers adapt their practices so that forests will remain resilient in the face of climate change, variability and other stressors.
- **Future Forest Ecosystems Scientific Council** The FFESC funded 27 research projects to inform adaptation of BC forest and range policies and practices to climate change. This web site includes information on FFESC, and its many new project reports. A synthesis of research outcomes and the results of the June 2012 closing conference will soon be available.



A companion document to Fostering Resilient Forests and Ecosystems – Climate Change Adaptation Workshops – winter 2013

The following links are meant to help integrate Climate Change into your day to day practice. They cover a range of topics, some provide computer adapted tools, and others provide guidance as text or examples. There is much to see, take your time, drill-in and enjoy.
The Climate Change Adaptation Team - October 2013

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Climate Change Policy link

<http://www.for.gov.bc.ca/het/climate/knowledge/index.htm>

Climate-Based Seed Transfer policy and guidance link

http://www.for.gov.bc.ca/hti/climate_based_seed_transfer/index.htm



http://www.for.gov.bc.ca/hti/climate_based_seed_transfer/2cbst_project.htm

- Ongoing project; see CBST project charter, 2012 to 2017

http://www.for.gov.bc.ca/hti/climate_based_seed_transfer/3cbst_project.htm

- Provides links to upward elevation transfer limit changes (Nov. 2008)
- Provides links to the recent range expansion for Lw (June, 2010)

For further information on statutory seed use requirements, see the Chief Forester's Standards for Seed Use at:

<http://www.for.gov.bc.ca/code/cfstandards/>

Knowledge link - a useful gateway

<http://www.for.gov.bc.ca/het/climate/knowledge/knowledge.htm>

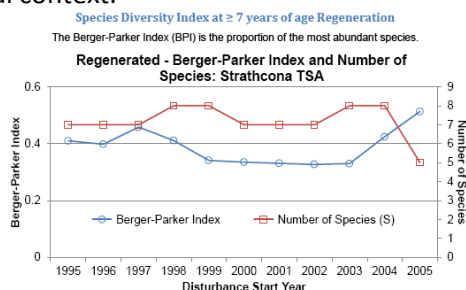
Species monitoring report

[http://www.for.gov.bc.ca/hfp/sof/species/Spp%20Monitoring%20Report%20-%20Province%20\(May%2010,%202012\).pdf](http://www.for.gov.bc.ca/hfp/sof/species/Spp%20Monitoring%20Report%20-%20Province%20(May%2010,%202012).pdf)

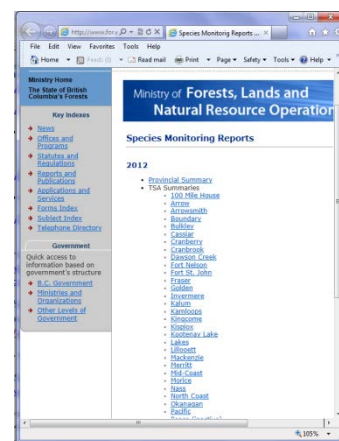
TSA Species summaries

<http://www.for.gov.bc.ca/hfp/sof/species%20monitoring%20reports.htm>

- Provides local context.



The index addresses the proportion of species present not simply presence or absence as richness describes.



Understanding the Berger-Parker Dominance Index

$$d = N_{\max}/N$$

$N_{\max}$ = Nmax is the volume in the most abundant species

N: Total volume of individuals

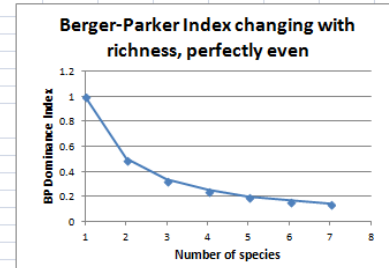
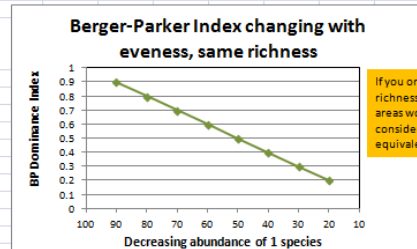
Note that the most abundant species is not constant

Perfectly even - all species have equal abundance

Number of species (richness)	Pine	Spruce	Fir	Hardwood	Larch	True fir	Cedar	Total	B-P Index
1	1000							1,000	1
2	500	500						1,000	0.5
3	333	333	333					1,000	0.33333
4	250	250	250	250				1,000	0.25
5	200	200	200	200	200			1,000	0.2
6	167	167	167	167	167	167		1,000	0.16667
7	143	143	143	143	143	143	143	1,000	0.14286

Constant richness - 5 species in all cases

Decreasing abundance of primary species (increasing evenness)	Pine Abundance	Spruce	Fir	Larch	True fir	Total	B-P Index
90	900	25	25	25	25	1,000	0.9
80	800	50	50	50	50	1,000	0.8
70	700	75	75	75	75	1,000	0.7
60	600	100	100	100	100	1,000	0.6
50	500	125	125	125	125	1,000	0.5
40	400	150	150	150	150	1,000	0.4
30	300	175	175	175	175	1,000	0.3
20	200	200	200	200	200	1,000	0.2



If you only considered richness all of these areas would be considered equivalent.

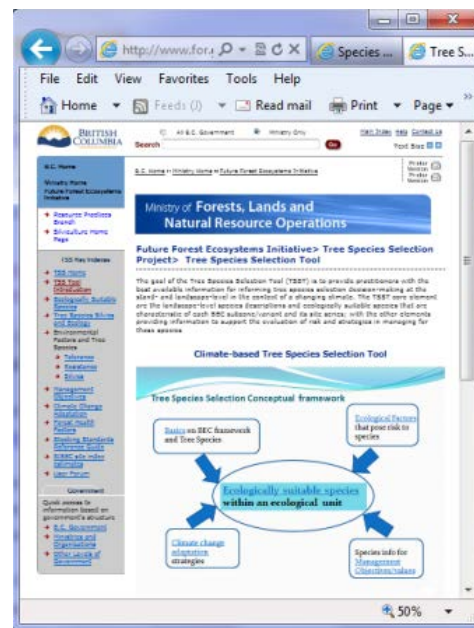
Tree Species selection tool

<http://www.for.gov.bc.ca/hfp/silviculture/TSS/tss.htm>

- This link provides a description of the Tree Species Selection Tool. Choose the green box and it takes you to the tool at right.

The following Link provides an example, using Lw on where information is found within the site to help make a decision on use.

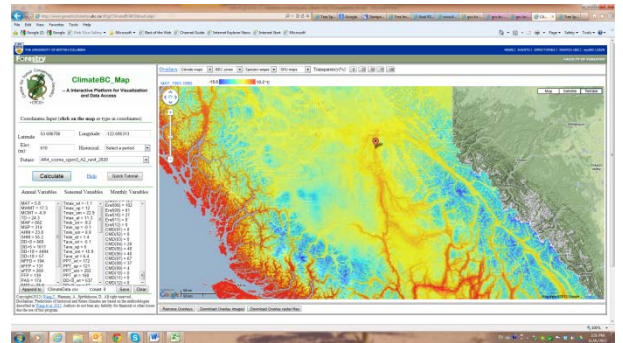
<http://www.for.gov.bc.ca/hfp/silviculture/TSS/example1.pdf>



Google map version of Climate BC

<http://www.genetics.forestry.ubc.ca/cfcg/ClimateBC40/Default.aspx>

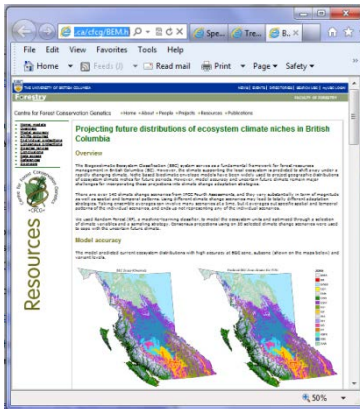
- Allows for easy exploration of scenarios.



BioClimatic Envelope Modes - shows shifts the zone scale

<http://www.genetics.forestry.ubc.ca/cfcg/BEM.html>

- Note: 20% shifted already from historic climate data. Consensus maps show greater consensus in 2020 diminishing with time as uncertainty increases. Presently this information has been summarized and is linked with species by BEC site series data for easy observation in shifts over time.

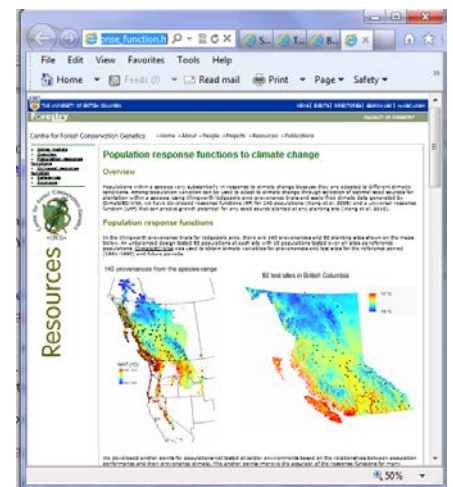


Population response functions to climate change

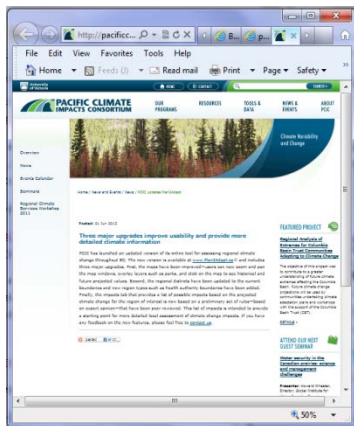
<http://www.genetics.forestry.ubc.ca/cfcg/response>

[function.html](#)

- Stress here the need to track seed source – may already be seed out there that has the propensity for maladaptation.



Plan2Adapt



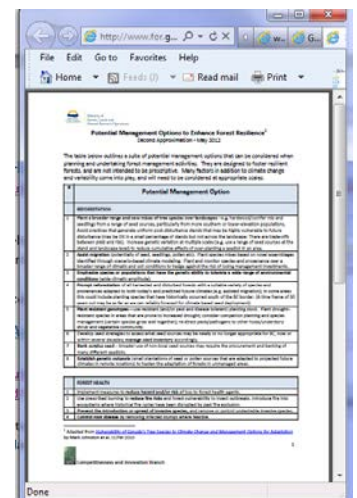
<http://pacificclimate.org/news/2012/pcic-updates-plan2adapt>

- This tool has been explored earlier.

Potential Management Options for Adaptation, Link to pdf on FTP.

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/ClimateChange/Adaptation/Options/Management_Options_May9_2012.pdf

- This provides an overall list of general strategies. Where and how they are used will need local involvement, planning, implementation and monitoring. Worthwhile perusing the list.





FFESC Output

<http://www.for.gov.bc.ca/het/climate/knowledge/knowledge.htm>
http://www.for.gov.bc.ca/hfp/future_forests/council/

- Links to program description and research project websites and reports.
- Not presently on the Tools webpage – should be linked

Stand Level Risk and Decision Tool, Link is to a FTP site

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/ClimateChange/Seminar_Series/2012/DeLong/

- We will go to the tool link and describe what is being provided. Note it is not presently available for the Coast. This information may be used in some area specific guidance.
- Need to obtain the newer version with wider scope.

Changing tree species in the West Kootenays

http://www.kootenayresilience.org/WK-CC-Tree-spp-shifts_6-30-11.pdf

- Presentation that shows different plausible futures and possible impacts for species choice.
- <http://www.kootenayresilience.org/> for full list of publications

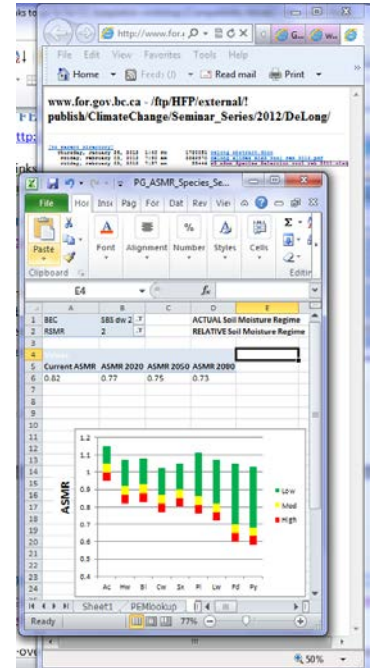
K2 information.

<http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Web/FFESC/reports/NelsonrevisedK2adaptationguidanceoverview120607.pdf>

- This is the guidance overview

<http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Web/FFESC/reports/NelsonrevisedK2adaptationguidance120607.pdf>

- A more detailed guidance piece with discussion of similarities and differences from K1.



Guidance	Details
Regeneration Guidance	The following information is based on the discussion document on Adapt Forest Management to Climate Change in the Kootenays TLA and is intended to provide a high-level overview of the guidance. The guidance is intended to be used as a starting point for developing more detailed guidance.
Site Preparation	Site preparation should be done in a way that is consistent with the guidance. The guidance is intended to be used as a starting point for developing more detailed guidance.
Planting	Planting should be done in a way that is consistent with the guidance. The guidance is intended to be used as a starting point for developing more detailed guidance.
Monitoring and Evaluation	Monitoring and evaluation should be done in a way that is consistent with the guidance. The guidance is intended to be used as a starting point for developing more detailed guidance.

Bulkley Valley project link

http://bvcentre.ca/research/project/a_multi-scale_trans-disciplinary_vulnerability_assessment/

- Nadina Vulnerability Assessment.
- Lots to see here.

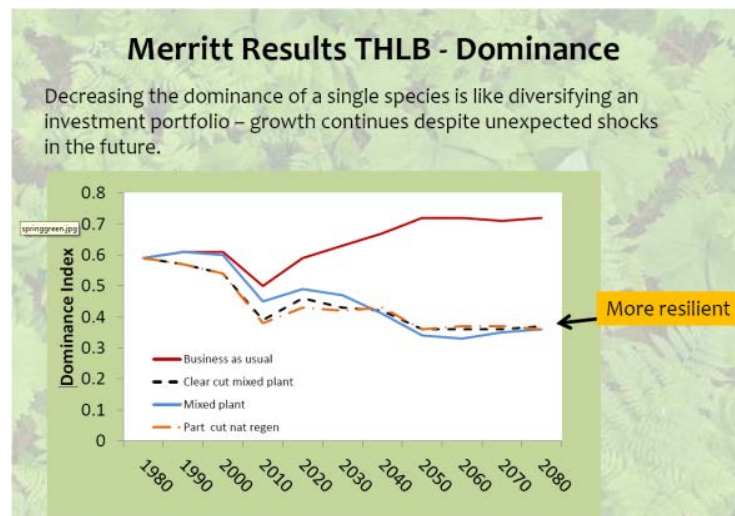


Quantifying risks and opportunities from climate change interim results from the Merritt TSA

- ftp://ftp.for.gov.bc.ca/HFP/external/!publish/ClimateChange/Seminar_Series/2012/Dymond/Dymond_slides_Socio-econ%20risk%20and%20opps-Merritt%20v3.pdf
- Not presently on the FLNRO site but can be found through FLNRO FTP site.

The socio economic portion is not yet complete but preliminary information shows that species mixes can provide for greater long term net revenue than business as usual.

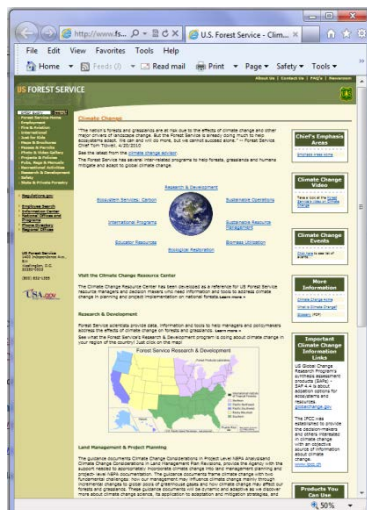
Contact: Caren Dymond Caren.Dymond@gov.bc.ca



USFS links

The USFS has embraced climate change as reality and has created a range of resources that are useful for understanding the impacts, provide tools to screen projects for applicability and assess options. The following provide an entry point into their system.

<http://www.fs.fed.us/climatechange/>



<http://www.fs.fed.us/climatechange/advisor/>

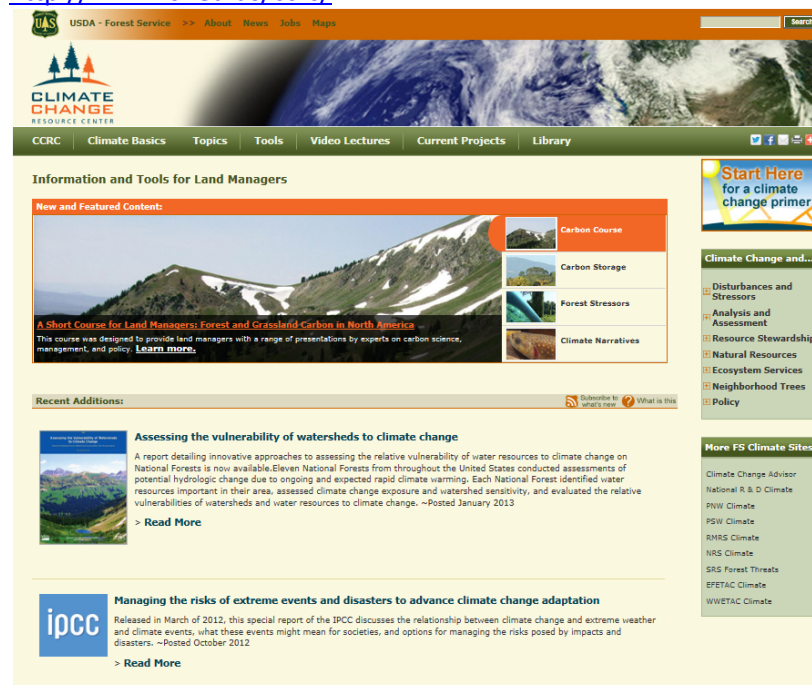
<http://www.fs.fed.us/ccrc/>

- This provides a portal to some of the work being done south of the border.

For a thorough overview of adaptation and mitigation see:

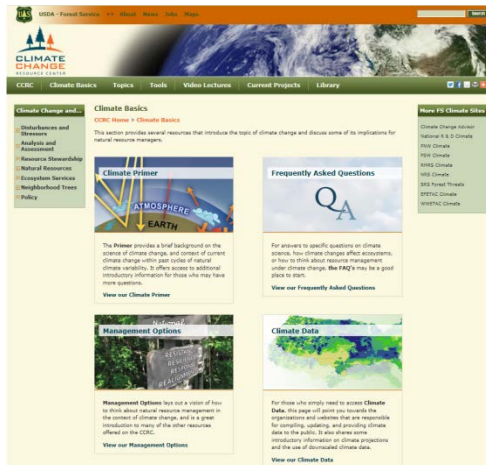
http://www.fs.fed.us/psw/publications/millar/MillarSwanson_inpress.pdf in Millar, C.I. and C. Swanston. In press. [Adaptation and Mitigation](#). Chapter 4 in National Climate Assessment. US Global Change Research Program.

<http://www.fs.fed.us/ccrc/>



Links to climate background information

<http://www.fs.fed.us/ccrc/climate-basics/>



Useful site for understanding climate in an easy to follow approach.

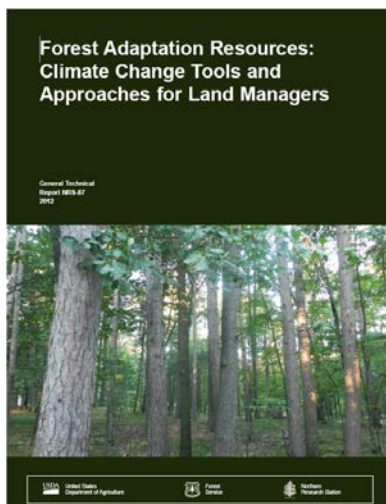
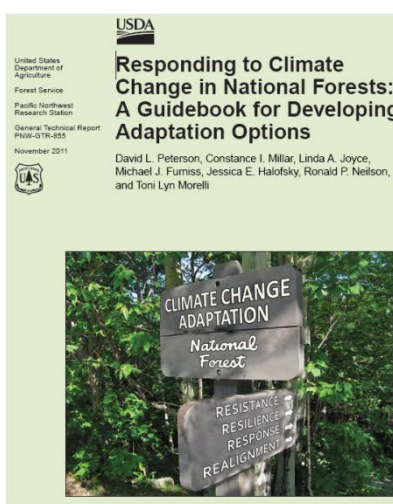
Links to short presentations –worth checking out, an example link below to a presentation by Connie Millar on adaptation:

http://www.fs.fed.us/ccrc/hjar/management_strategies.html **Good overview of**

collaboration: [http://www.fs.fed.us/psw/publications/millar/psw_2011_millar004\(littell\).pdf](http://www.fs.fed.us/psw/publications/millar/psw_2011_millar004(littell).pdf)

Adaptation resources: http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs87.pdf

http://www.fs.fed.us/pnw/pubs/pnw_gtr855.pdf



This publication provides a clearly laid out approach to address climate change, with examples. The appendix provides a series of worksheets that aid in identifying vulnerable conditions, options and steps to address the issue.

Link to climate change options: http://www.fs.fed.us/ccrc/mgmt_options/

CCRC

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Analysis and Assessment

Resource Stewardship

Natural Resources

Ecosystem Services

Neighborhood Trees

Policy

Re-Framing Forest and Resource Management Strategies for a Climate Change Context

CCRC Home > Management Options

Among the surprising developments during the 2007 year-of-climate-dawning was an abrupt change in the nature of dialog between scientists and natural-resource managers. In previous years the primary communication involved researchers talking with managers about climate change and its impacts on ecosystems. By early 2007 the significance of climate became widely embraced, and the conversation did an about-face. From national agency headquarters to local field offices, the collective voice of decision-makers echoed resoundingly back to science: "OK, we get that climate is important. Now, what do we do about it?"

That question initially silenced many in the research community, although serious efforts have been investigating resource management implications for some years (e.g., Dale et al. 2001, Spittlehouse and Stewart 2003, Willows and Connell 2003, Joyce et al. 2007). While field-proven conceptual frameworks and desktop manuals will be developed only through collaborative efforts of scientists and managers, we offer the following as an overarching framework of options for addressing climate change issues in resource contexts such as encountered in western mountain environments (Millar et al. 2007, Joyce et al., in press).

Defining Assumptions

- Embrace and work with change.

While this may seem obvious, many existing resource-management practices rest on assumptions that ecological backgrounds are stable over time even though they acknowledge short-term successional dynamics. Likewise, engrained institutional traditions commonly rest implicitly on assumptions of persistent and stable behavior. Make friends with change, while still working to mitigate it.
- Accept uncertainty as a premise for decision-making.

While opportunities for prediction and forecasting will be presented to managers, uncertainty will always lurk close at our shoulders -- at least at the scale relevant to most resource-management projects. Addressing uncertainty head-on will often be more effective than taking a course of action based on a narrowly defined future. For many situations, we will never have enough knowledge to predict future outcomes at scales that matter to managers. Evaluate the wisdom of "putting your eggs in one basket" (accepting a definite future) versus "hedging your bets" (accepting uncertainty) strategies.
- Recognize that some existing management paradigms have limited value.

This is because many traditional practices are based on assumptions that the future will be similar to the past -- that ecosystems are not changing over time. Climate change puts that notion finally to bed. Many ecosystem-management philosophies will still make sense, especially when practiced creatively. This is a good time to experiment with old techniques in new ways and pioneer altogether novel approaches.
- Manage for desired future processes rather than desired future conditions.

Composition and structure relate to static rather than dynamic goals; a focus on ecosystem services and ecological and physical functions as management targets fixes the aim on dynamic process.

NEW GUIDEBOOK:
Responding to
climate change in
national forests: a
guidebook for
developing
adaptation options

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Reduce

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Note the tool bar along the top has links to many useful sites.

Taccimo (Template for Assessing Climate Change Impacts and Management Options) – science at your fingertips – web tool: <http://www.sgcp.ncsu.edu:8090/>

The Template for Assessing Climate Change Impacts and Management Options (TACCIMO) is a collaborative endeavor of the Eastern and Western Threat Centers and Regional Forest Planning units of the USDA Forest Service. The Threat Assessment Centers provide forest landowners, managers, and scientists with the latest research and expertise concerning environmental threats to forests.

US

WETAC

VERSION 2.2 IS HERE!

- New reporting formats
- Simplified literature explorer
- Updated content and organization
- Now supporting FS Regions 5, 8, & 9

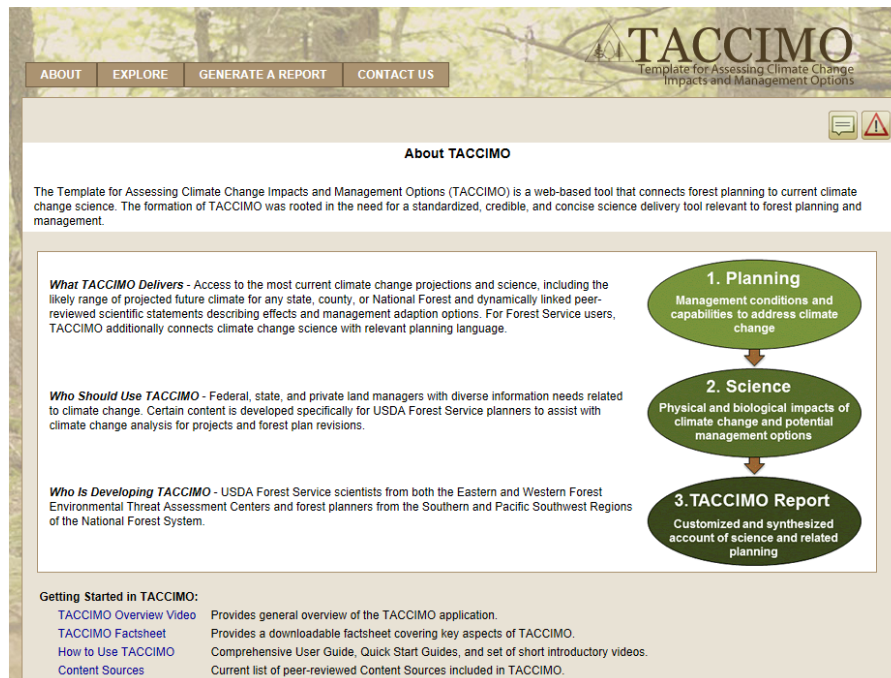
TACCIMO

Template for Assessing Climate Change Impacts and Management Options

Enter Site

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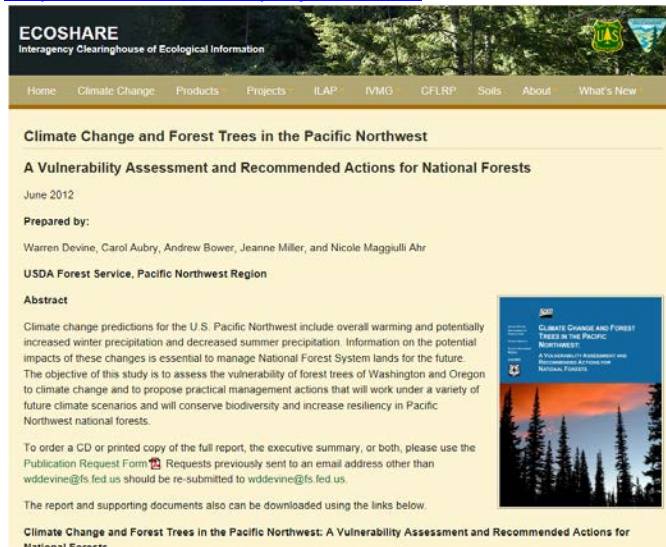
Links for CC Adaptation Workshop Fall 2013 Version



Taccimo is worth a look through, it is created to help USFS planners but has information useful to all planning with a Climate Change filter.

Climate change and forest trees in the Pacific Northwest: A vulnerability assessment and recommended actions for National Forests:

<http://ecoshare.info/projects/ccft/>

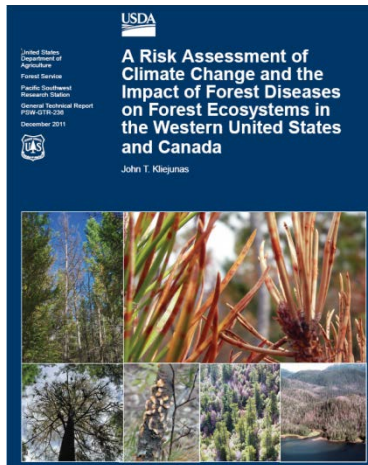


This document provides a list of vulnerabilities based on different characteristics. It clearly provides assumptions and is a useful reference to begin thinking about tree vulnerability.

Forest Health links

A Risk Assessment of Climate Change and the Impact of Forest Diseases on Forest Ecosystems in the Western United States and Canada

http://www.fs.fed.us/psw/publications/documents/psw_gtr236/psw_gtr236.pdf



Information is provided on Dothistroma, Swiss Needle Cast, Sudden Oak Death, Ramorum Blight, White Pine Blister Rust, Cytospora Canker of Alder, Dwarf Mistletoes, Armillaria Root Disease, Yellow Cedar Decline.

Armillaria example (page 2-4)

Likelihood and the consequences were each assigned a certainty category as described in Orr and others (1993). The certainty categories are a function of the information that is available and the confidence of the assessor in it. Certainty categories used in the risk assessment process are:

- *Very certain*
- *Reasonably certain*
- *Moderately certain*
- *Reasonably uncertain*
- *Very uncertain*

Likelihood of increased disease damage

Warmer, drier–High (very certain) (Applicable criteria: a, b, d, e).

Warmer, wetter–Moderate (moderately certain) (Applicable criteria: a, d, e).

The incidence of Armillaria root disease is likely to increase as temperatures increase and precipitation decreases (Shaw and Kile 1991, U.S. Office of Technology Assessment 1993), especially when hosts are stressed by moisture deficiency.

Five criteria were used to estimate likelihood (risk) of increased disease damage:

- a. Suitability of conditions for pathogen survival, reproduction, spread, or host infection will increase as climate changes.*
- b. Changes in climate will stress the host and increase its susceptibility to the pathogen.*
- c. Pathogen is capable of substantial increases in population size (has a high reproductive potential).*
- d. Pathogen has a broad host range.*
- e. Control techniques are unknown, not feasible, or ineffective.*

Consequences of increased disease damage (pages 40-41)

High (reasonably certain) (Applicable criteria: a, b, c). As precipitation decreases, increased growth reduction and mortality losses in British Columbia could increase. Increased growth loss and mortality would likely increase as sites become drier elsewhere as well.

Risk potential–

Warmer, drier–Very high (9) (Likelihood of increased disease damage = high; consequences of increased disease damage = high). Warmer, wetter–High (6) (Likelihood of increased disease damage = moderate; consequences of increased disease damage = high). A warmer climate will generally increase Armillaria incidence and impact as host stress increases. A drier climate would, in general, stress hosts more than a wetter climate, and thus increase host susceptibility.

Review of Literature on Climate Change and Forest Diseases of Western North America

http://www.fs.fed.us/psw/publications/documents/psw_gtr225/psw_gtr225.pdf



Provides good general guidance: e.g.: below

Key points:

“Although rusts can adapt to a wide range of environmental conditions, their tolerances are unknown. Under a changing climate, the incidence of rusts will be determined chiefly by host distribution. Rusts are likely to remain the cause of damaging and lethal diseases. Typically, rusts increase in intensity and distribution in “wave years” during which the weather is especially favorable for sporulation, dispersal, and infection. As climate changes, the frequency of such wave years is expected to change.” P 19

Predicting Forest Insect Disturbance under Climate Change (Allan Carroll)

<http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Web/FFESC/reports/Carrollfinalreport.pdf>

“ABSTRACT

This paper comprises a review of literature regarding climate change impacts to forest insect disturbances. Its primary objectives were three-fold. First, commonalities were sought among systems regarding the effects associated with altered temperature and/or precipitation patterns on forest insect herbivores, the proximate and ultimate form of the response by the insects, and the outcome in terms of forest disturbance. Second, a general framework within which to assess future disturbances to temperate and boreal forests by insect herbivores was constructed. Finally, uncertainty regarding predictions of the extent/severity of forest insect disturbances under climate change into the future was discussed.

Conclusions

The preceding analysis suggests that disturbance by bark beetles is more likely to be exacerbated by climate change than defoliators, mainly because of the former's positive response to host tree stress and lack of a requirement for strict phenological synchrony. Given that there is little doubt of climate change-aggravated disturbance by bark beetle populations occurring already, priority should be given to development of realistic predictive tools that will facilitate proactive strategies intended to minimize impacts. Vigilance toward native innocuous, native invasive and alien invasive species should also be stressed due to their potential to erupt unpredictably in space and time. For example, lesser known bark beetle species occurring in the southern regions of North America have the potential to move northward as temperatures increase (Gan 2004, Bentz et al. 2010). Although the response by defoliators may be less predictable compared to bark beetles, their potential to cause disturbances over vast areas of forest cannot be ignored. The predictive framework suggested in this study provides a suite of potential outcomes for an eruptive forest defoliator under climate change; however, research efforts should focus on the development of predictive models of defoliator dynamics in a warming environment.”

Climate change and forest diseases – Sturrock et al 2011

<http://onlinelibrary.wiley.com/doi/10.1111/j.1365-3059.2010.02406.x/abstract>

Table 1 Predicted change in impact on forests of several examples of forest diseases as they respond to warmer and drier or warmer and wetter future climates (adapted from Dukes *et al.*, 2009)

Group	Forest disease (pathogen)	Climate change			
		Warmer/Drier	Warmer/Wetter	Predicted change in impact ^a	Level of uncertainty ^b
Diseases caused by group-1 pathogens (temperature and moisture directly affect pathogen reproduction, spread, infection and survival)	Phytophthora root rot (<i>Phytophthora cinnamomi</i>)	+/0	L	+	L
	Sudden oak death/ramorum blight (<i>Phytophthora ramorum</i>)	-	M	+	L
	Dothistroma needle blight (<i>Dothistroma septosporum</i> , <i>Dothistroma pini</i>)	0/-	M	+	L
	Swiss needle cast (<i>Phaeocryptopus gaeumannii</i>)	-	M	+	L
	White pine blister rust (<i>Cronartium ribicola</i>)	-	L	0	M
Diseases caused by group-2 pathogens (temperature and moisture more directly affect host susceptibility to pathogen)	Armillaria root disease (<i>Armillaria</i> spp.)	+	L	0	M
	Sphaeropsis shoot blight (<i>Sphaeropsis sapinea</i>)	+	L	0	M
	Charcoal canker (<i>Biscogniauxia mediterranea</i>)	+	L	0	M
	Botryosphaeria canker (<i>Botryosphaeria</i> spp.)	+	L	0	M
	Pitch canker (<i>Fusarium circinatum</i>)	+	M	+	H
Decline and abiotic diseases	Septoria canker (<i>Septoria musiva</i>)	+	M	0	M
	Yellow-cedar decline	+	L	+	M
	Sudden aspen decline	+	L	0/+	M
	Oak decline	+	M	0	M

^a+, increase in impact; -, decrease in impact; 0, no change in impact.

^bThe effects of climate change on pathogen/host interactions are complex and uncertain. Dukes *et al.* (2009) lists four types of uncertainties: those associated with (i) internal ecosystem processes, (ii) climate projections (general agreement that mean annual surface temperatures will increase but amount of warming and nature of precipitation change is less certain), (iii) future human actions, and (iv) a lack of data on the pathogens themselves. These four types of uncertainty were considered when estimating predicted changes in impact by the case study diseases; associated uncertainty levels were estimated to be low (L), moderate (M) or high (H).

R. N. Sturrock et al.

Plant Pathology (2011) 90, 133–149

Yellow-cedar decline and climate change

http://www.nrs.fs.fed.us/pubs/jrnl/2012/nrs_2012_hennon_001.pdf

Articles

Shifting Climate, Altered Niche, and a Dynamic Conservation Strategy for Yellow-Cedar in the North Pacific Coastal Rainforest

PAUL E. HENNON, DAVID V. D'AMORE, PAUL G. SCHABERG, DUSTIN T. WITTWER, AND COLIN S. SHANLEY

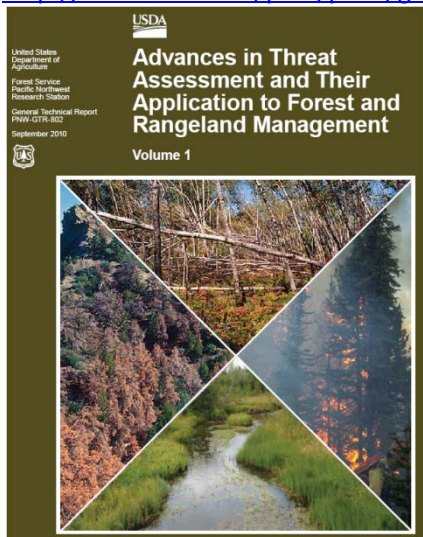
The extensive mortality of yellow-cedar along more than 1000 kilometers of the northern Pacific coast of North America serves as a leading example of climate effects on a forest tree species. In this article, we document our approaches to resolving the causes of tree death, which we explain as a cascade of interacting topographic, forest-structure, and microclimate factors that act on a unique vulnerability of yellow-cedar to fine-root freezing. The complex causes of tree mortality are reduced to two risk factors—snow depth and soil drainage—which are then used to model present and future cedar habitat suitability. We propose a dynamic, comprehensive conservation strategy for this valuable species on the basis of zones created by shifting climate, cedar's ecological niche, and observed risk factors. Research on yellow-cedar decline is offered as a template for understanding and adapting to climate change for other climate-forest issues.

Keywords: climate adaptation, forest decline, root cold tolerance, *Callitropsis nootkatensis*, *Chamaecyparis nootkatensis*

Provides compelling evidence of snow level impacts on yellow cedar – shows that the impacts of climate change may not be simple to identify.

Advances in threat assessment and their application to Forest and Rangeland Management

http://www.fs.fed.us/pnw/pubs/gtr802/Vol1/pnw_gtr802vol1.pdf



Interesting reference, may be of limited use in BC.

Forest Health and Climate Change: A British Columbia perspective.

http://bcwildfire.ca/ftp/HFP/external/!publish/ClimateChange/FRPA/Workshop/Forest_Health_CC.pdf

Forest health and climate change: A British Columbia perspective

by Alex J. Woods¹, Don Heppner², Harry H. Kope³, Jennifer Burleigh³ and Lorraine MacIsaac⁴

ABSTRACT

BC's forests have already faced two simultaneous, globally significant, epidemics linked to climate change; the Dothistroma needle blight epidemic in NW BC and the massive mountain pine beetle epidemic throughout the BC Interior. Building on these experiences, we have compiled our best estimates of how we believe other forest health agents may behave as climate change continues to influence our forests. We have drawn on literature from around the world but have focused on the situation in BC. We have made management recommendations based on what we have seen so far and what we expect to come.



Fig. 1. Landscape-scale damage in central BC, dominated by current mountain pine beetle epidemic.



Fig. 2. Mature forest with significant pine beetle damage (left) and a young forest (right). Both examples of Dothistroma needle blight. Related mortality is high.

BC context.

Is the health of British Columbia's forest being influenced by climate change? If so, was this predictable? By Alex Woods, 2011

http://journals2.scholarsportal.info/details.xqy?uri=/07060661/v33i0002/117_ithobcciswtp.xml

An excerpt from the conclusion: *“The current MPB epidemic in BC was arguably predictable given the strong link between the insect’s vulnerability to very cold winter temperatures and the recent marked increase in winter minimum temperatures. Increasing winter temperatures are one of the most confidently predicted trends in climate change projections. Forest pathogens are similarly following a pattern of increased incidence and impact but the greater role that precipitation plays in their collective life histories presents a far less predictable scenario. The DNB epidemic in northwest BC has been linked to an increase in summer precipitation but increasing precipitation should have been beneficial for the trees. Increasing precipitation and warmer temperatures should also have benefited lodgepole pine plantations in the central interior but instead hard pine rusts may be increasing due to these new environmental conditions. A shortage of winter precipitation combined with increasing temperatures is causing more severe drought in portions of the southern interior which may already be exacerbating root disease severity.”*

Forest health hazard ratings in BC: what is potentially an issue?

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/SEDA_maps/Individual%20Regional%20PDFs/

Example for Armillaria Root disease from the SEDA maps showing hazard rating – good starting point when looking forward in time. Note the high hazard area is for the entire BEC unit and may have areas within that have characteristics that are either greater or less than the identified hazard rating.

SEDA link from FORREX <http://www.forrex.org/stand-establishment-decision-aids-sedas>



RESULTS data on incidence

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/RESULTS%20incidence%20maps/

This site houses incidence maps based on survey information found in RESULTS. This provides a description of severity in a local area from actual data and is not extrapolated.

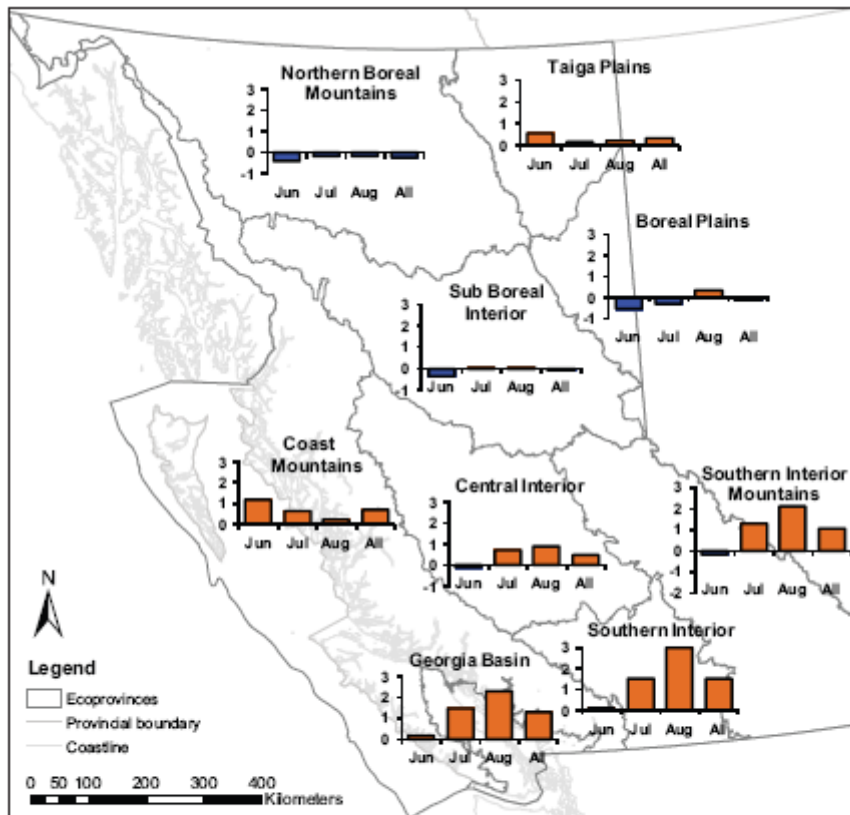


FIGURE 1. Projected changes (approximating the 2080s under the A2 scenario) for British Columbia from current monthly (MSR for June, July, August) and seasonal mean severity ratings (SSR, "all") by ecoprovince. Change is expressed as absolute change in MSR; baseline MSR values range from 0 to 12, with higher values in the south and lower values in northern and coastal areas. Data are summarized and extended from Taylor et al. (2010).

Example information on severity using the Canadian Fire Weather Information System – note regional variation.

Direction on fuel management in the Wildland Urban Interface

The attached link provides some guidance on integrating fuel management regimes into silvicultural treatments and high lights a prime opportunity for collaboration with fuel and fire management specialists throughout the province so that when planning and undertaking FFT treatments we can realize multiple benefits.

Thanks to all those who contributed comments in the development of this document and especially thanks to Ed Korpela and Bev Atkins for their very detailed contributions. (Al Powelson contact)

http://www.for.gov.bc.ca/ftp/HFP/external/!publish/LBIS_web/Guidance/FFT%20guidance%20-Silvicultural%20Regimes%20for%20Fuel%20Management%20in%20the%20WildLand%20Urban%20Interface_V2.3.pdf

RESOURCE PRACTICES BRANCH



Silvicultural Regimes for Fuel Management in the Wildland Urban Interface or Adjacent to High Landscape Values - Guidance

Scope

This guidance covers silviculture activities by Forests For Tomorrow (FFT) within the Wildland Urban Interface¹ or adjacent² to identified high landscape values.

The main focus of the FFT funded silviculture activities within these areas will be on future timber production, however, modification of treatment prescriptions will be employed to reduce current and future wildfire hazard where possible

1. Introduction

Silvicultural treatments can be used to influence stand structure which, in turn, can influence wildfire behaviour and severity. There is a potential to use stocking standards (including species choice), site preparation, thinning, and pruning (*not yet eligible under FFT*) as tools to reduce or modify surface, ladder, and canopy fuels.

2. Purpose and Objectives

The purpose of this Ministry of Forests, Lands, and Natural Resource Operations (FLNR) Silvicultural Regimes for Fuel Management in the Wildland Urban Interface guidance is to provide direction on modifying silviculture regimes when they occur within the wildland urban interface or adjacent to identified high landscape values to reduce wildfire impacts while still targeting the primary objective of future timber production.

The secondary objective is to direct that, where feasible and ecologically appropriate to do so, FFT silviculture activities undertaken within the wildland urban interface or adjacent to identified high landscape values will use regimes that minimize current and future wildfire hazard.

3. General Principle

Altering tree species composition and/or reduction in aerial and/or ground fuels coupled with adequate tree crown base height management generally results in fires, should they occur, of reduced intensity and reduced likelihood of crown fire. Resulting surface fires of reduced intensity are generally easier to control and may result in less damage to values at risk as well as the stand itself.

¹ The wildland urban interface is any area where combustible wildland fuels (vegetation) are found adjacent to homes, farm structures or other outbuildings. Typically, the wildland urban interface is defined as an area within 2 km of a community, however, for the purposes of modifying treatments to reduce wildfire risk and hazard the zone will encompass those FFT treatments within 10 km of a community.

² In reference to wildfire planning adjacent means within 10 km a community (community zone) or an area identified as having a high landscape values
<https://www.firemartcanada.ca/images/uploads/resources/chapter1.pdf>

Useful link for managing habitat – Just add a climate change lens

http://www.env.gov.bc.ca/fia/documents/mca_silvbmp.pdf

Suggested links on specific subjects – some specific to the North regions:

Prescribed Fire In BC

<http://bcwildfire.ca/prevention/PrescribedFire/docs/BC%20Prescribed%20Fire%20Council%20Brochure.pdf>

Ecosystem Restoration in BC <http://www.for.gov.bc.ca/hra/Restoration/>, <http://www.trencher.com/library/search/search&keywords=wildfire/>

Best Management Practices for Invasive Plants in the Oil and Gas Industry:

http://prrd.bc.ca/services/environmental/weed_control/documents/OG-Guide.2013.FINAL.pdf

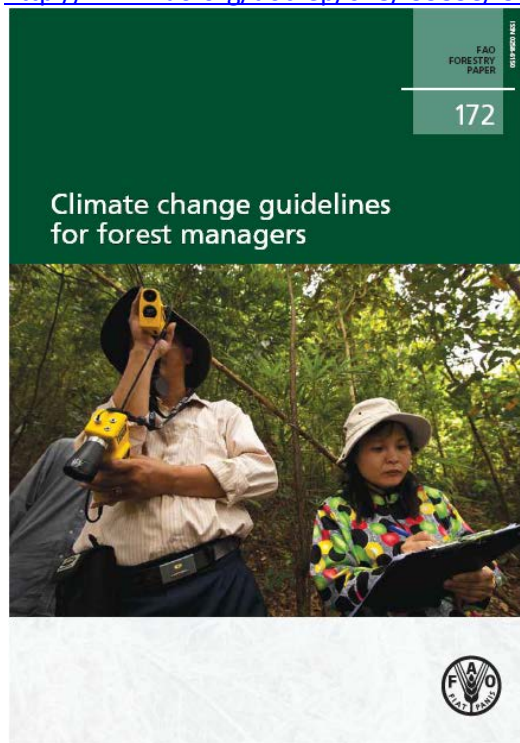
Seeding Manual for British Columbia http://www.for.gov.bc.ca/hra/Publications/practices/Seeding-Manual/MobileSeedManual/BC%20RL%20Seeding%20Manual_web_single_150dpi.09.04.pdf

Peace Liard Revegetation Manual

http://prrd.bc.ca/services/environmental/weed_control/documents/NEIPC_Reveg_manual_PeaceLiard_April2010_000.pdf

Climate Change Guidelines for Forest Managers

<http://www.fao.org/docrep/018/i3383e/i3383e.pdf>



The framework is on page 24:

- Yield & productivity p. 26
- Biodiversity p. 28
- Species p. 29
- Water p. 31
- Fire p. 34
- Pests p. 38
- Extreme events p. 41
- Sea level rise p. 44
- Social p. 46
- Economic p. 50
- Institutional p. 54
- Mitigation p. 55

Canadian Council of Forest Ministers – suite of four useful resource documents

<http://www.ccfm.org/english/coreproducts-cc.asp>

Canadian Council
of Forest
Ministers



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des ministres
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Climate Change

[A Vision for Canada's Forests: 2008 and Beyond](#)

[Climate Change](#)

[Wildland Fires](#)

[Forest Pests](#)

[Forests In Mind](#)

As Canada's forest sector continues to evolve it is subject to the effects of many global forces. A changing climate is one factor that will provide opportunities for and present major threats to Canada's forests, their economic benefits, and the livelihoods of those who depend on them. Adapting to a changing climate is therefore essential for Canada's forest sector to remain resilient and vibrant and for our forest industries to remain competitive in the global marketplace.

In 2008, Canada's premiers, via the Council of the Federation, asked the Canadian Council of Forest Ministers (CCFM) to collaborate on adaptation in forestry. This work was undertaken by the CCFM's Climate Change Task Force (CCTF), which initiated a two-phase program in this area.

Phase 1 culminated in 2010 with the publication of two reports:

- [Vulnerability of Canada's Tree Species to Climate Change and Management Options for Adaptation](#)
- [A Framework for Forest Management Offset Protocols](#)

These reports have been widely distributed to forestry organizations and are being used to help inform policies and practices.

Phase 2 addresses adaptation at the forest ecosystem and forest sector levels, responding directly to a key CCFM objective that "consideration of climate change and future climatic variability is needed in all aspects of sustainable forest management" (as described in *A Vision for Canada's Forests: 2008 and Beyond*). The primary goal is to provide members of the forest sector with state-of-the-art tools and new knowledge that will allow them to assess the vulnerabilities, risks, and opportunities associated with climate change. The CCFM vulnerability assessment tools and techniques are described in a series of inter-related reports, specifically designed for forest management decision-makers. Several reports are now available, with the remaining reports targeted for release in early 2013:

- Adapting sustainable forest management to climate change: preparing for the future
[\(Abstract\)](#) [\(Full Report\)](#)
- Adapting sustainable forest management to climate change: a systematic approach for exploring organizational readiness
[\(Abstract\)](#) [\(Full Report\)](#)
- Adapting sustainable forest management to climate change: a framework for assessing vulnerability and mainstreaming adaptation into decision making
[\(Abstract\)](#) [\(Full Report\)](#)
- Adapting sustainable forest management to climate change: scenarios for vulnerability assessment
[\(Abstract\)](#) [\(Full Report\)](#)

The CCTF's work has been strongly supported by all members of the CCFM and is intended to catalyze and accelerate the transformation of sustainable forest management policies, planning, and practices in accordance with the needs of various forest management organizations across Canada. We hope that you find this work informative and beneficial.

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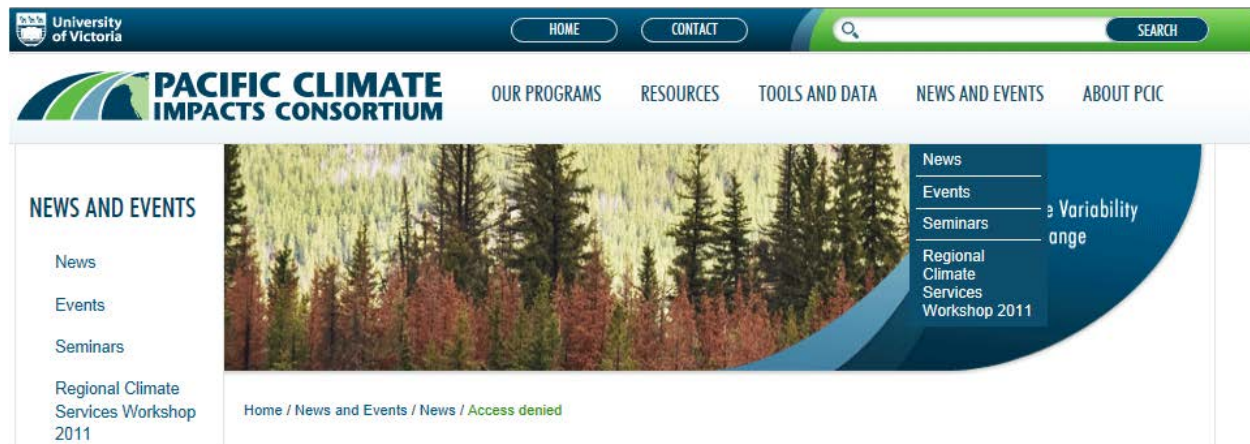
Canadian Council
of Forest
Ministers



Conseil canadien
des ministres
des forêts

Link to Regional summaries by PCIC

<http://www.pacificclimate.org/news-and-events/news/2013/regional-climate-summaries>



Future webinar to solicit feedback

The Pacific Climate Impacts Consortium will be running a webinar in the coming months as part of a project to develop National Guidelines on the Use of Climate Scenarios for NRCAN, in collaboration with Ouranos <http://www.ouranos.ca/en>. As an attendee, you will be invited to attend. The purpose of the webinar is to obtain feedback and questions from people who have attended climate change workshops in regards to what information would be most valuable to include in a guidelines document on the use of climate information.