

# Species selection in a changing climate? What have we done in the past, what changes do we make in the future?

Graham J. Hues RPF Western Forest Products Inc.



## Species selection in a changing climate? What have we done in the past, what changes do we make in the future?

- "The Forest Industry is anchored in a framework of scientific concepts and methodology and filtered by PRACTICAL EXPERIENCE and KNOWLEDGE that is expected to be efficiently realistic".
- "Over the decades THE SCIENCE has increasingly played an important role in regulating natural resource management but *practical knowledge* and *experience* is the *ART* which remains a significant component of the process" #5







> GROW

> MORE

> ALDER









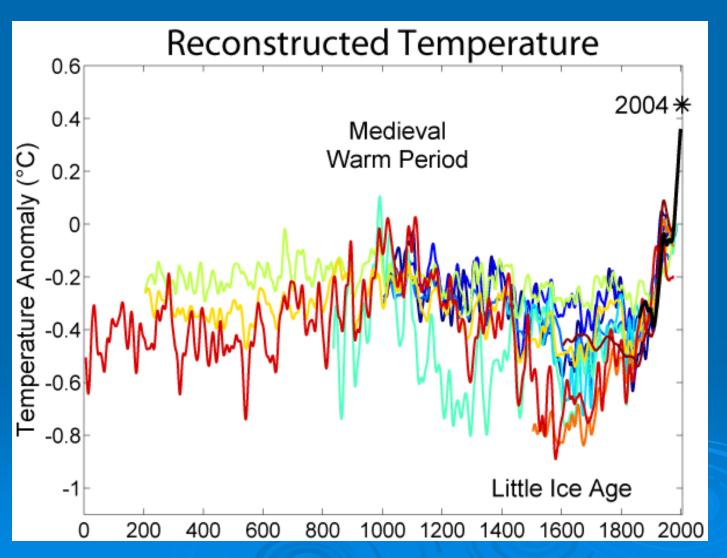
> ANY QUESTIONS?



## Species Selection - Past

- ➤ Looking Back Development Stages (ARISTOTLE If you would understand anything, observe its beginning and its development)#1.
- Basic assumption ABCFP C.O.E.
- 4.6 KEEP INFORMED IN MEMBERS FIELD OF PRACTICE AND TO BE AWARE OF CURRENT ISSUES AND DEVELOPMENTS
- CURRENT SCIENCE ARE WE SURE THAT WE KNOW WHAT WE THINK WE KNOW?

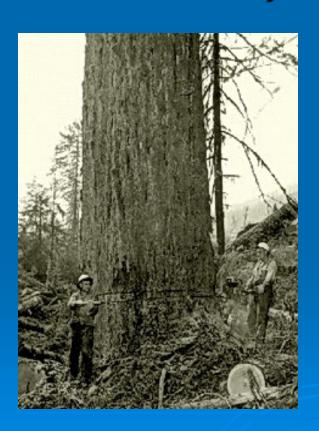






## 1950's-60

#### **Increased Efficiency**



#### **Many Changes**





## Species Selection – 50/60's

- > SEED PLANNING ZONES- (since 46) #3
- > NOT DRIVEN BY ECOLOGY
- > SPECIES SELECTION WAS LIMITED SEED WHAT COULD BE COLLECTED WHAT COULD BE GROWN:
- 1956- "The Sloan Report" Honourable Mr. G. SLOAN REPORT (Commissioner - Chief Justice of BC)
- Dr. a. Orr-Ewing (BCFS) –TREE IMPROVEMENT -INTRODUCED A SEEDLOT REGISTRY – into POLICY 1957.#3
- > IMPROVEMENTS IN SEED EXTRACTION-DUNCAN #2
- PLANTING MOSTLY BY FOREST SERVICE THEN INDUSTRY #2



## Species Selection – 50/60's

- > HADDOCK UBC '62
- > INCREASED SEEDLING DEMAND:
- > EXPANSION IN EXTRACTION AND PRODUCTION:
- > 1959 8 MILLION PROVINCE WIDE
- > 1969- 25 MILLION
- > INFANCY OF CONTAINER NURSERY PROGRAM



## 70/80's

1970's



70/80's







### Species Selection – 70/80's

- PROVINCE WIDE SEED PLANNING ZONES -1974 #3
- CONTINUED INCREASE IN # NURSERIES AND PRODUCTION.
- > 1976 Pearse Commission
- > 1983 FORMAL REVIEW SEED TRANSFER GUIDELINES FIXED-BOUNDARY AND FLOATING SEED TRANSFER. #5
- EARLY 80'S 100 MILLION PROVINCE WIDE
- 1984: FOREST ACT Basic Silviculture Stocking Standard, preferred, acceptable...etc. #1
- 1984- Site Diagnosis, tree species selection and <u>slash</u> <u>burning</u> guidelines for the Vancouver Region. R.N. Green, K. Klinka [et al].
- 1987 (OCT) Section 129.2 of Forest Act to impose obligations on Licensee's. PHSP was further developed and was subject to government approval.#1

  CSC February 26, 2015



## 90's





## Species selection 90's-Now

- Continual updates to Seed planning zones and transfer rules. #3
- 1990 "First Approximation of Correlated Guidelines for free Growing Stocking Standards for Ecosystems of BC" was published. #1
- A Field Guide for Site Identification and Interpretation for the Van. Region R.N. Green and K. Klinka – 1994
- 1995 Forest Practices Code - BLOCK BY BLOCKS STOCKING STNDS. - FREE GROWING GUIDEBOOKS.
- Provincial Annual Demand 200,000,000 seedlings
- > 2000 FREE GROWING GUIDEBOOKS STREAMLINED. (COUNTABLE BROADLEAVES). #1

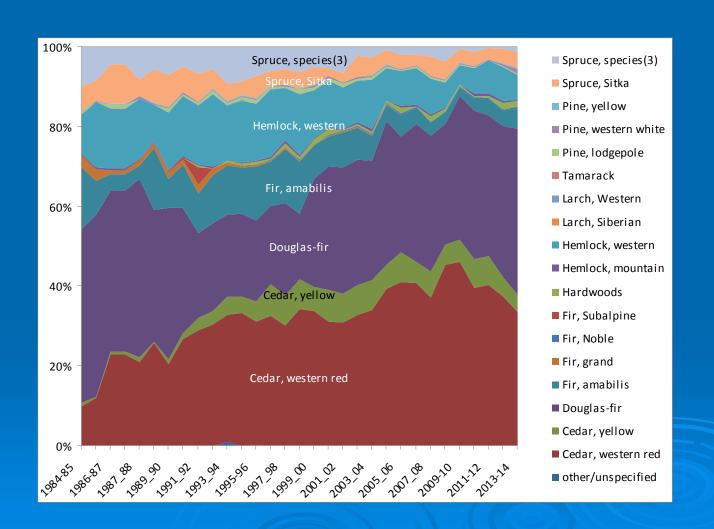


## Species selection 90's-Now

- 2002 Stocking Standards (S.S.)– FDP requirement. Approved by DM –eliminated Block by Block S.S. #1
- > 2004: −
- FOREST AND RANGE PRACTICES ACT. END of FDP – Enter FSP's
- FPPR Stocking Standard Legislated Tests. #1



## Species Planted 1984-2013/4





WFP's - Silviculture Strategy for Climate Change Impacts – Adaptation and Mitigation –Framework and Recommendations W. J. Beese, MF,RPF, Annette van Niejenhuis, RPF, Paul Bavis RPF -WFP

#### Goals

- "Maintain or enhance the long-term productivity and viability of WFP forest tenures;"
- 2. "Minimize risk to the present and future profitability of WFP Timberlands operations;"
- 3. "Support the sustainability goals of WFP's certification systems and the Western Forest Strategy."



#### WFP - Silviculture Strategy for Climate Change Impacts-Adaption and Mitigation

- Launch Strategy within workshop to obtain into from Operations on challenges, solutions and opportunities.
- Establish a working group to further develop and guide strategy.
- Implement a new species and seed transfer guidelines.
- Develop and implement a broad silviculture strategy that provides direction on landscape species mixtures, hardwoods and introduced species.
- Ensure adequate tree species and forest health monitoring is occurring under existing operational activities and the Western Forest Strategy adaptive management framework.





#### Climate and tree growth

## Effects on resources required by trees

- Moisture availability
- Nutrient availability
- CO2 fertilization

#### Effects on site conditions

- Permafrost melting
- Drying of wetlands
- Creation of wetlands
- Changes in snow depth
- Soil erosion
- Water-logged soils

#### Effects on disturbance

- Extreme weather (including drought)
- Wildfire
- Insects
- Diseases
- Freeze-thaw cycles
- Flooding

#### Effects on individual organisms

- Phenology
- Respiration
- Photosynthesis
- Metabolism
- Growth
- Health
- Mortality
- Reproduction
- Water-use efficiency

Adapted from "Figure 2: A map of climate change impacts on forests" in Williamson, T.B., S.J. Colombo, P.N. Duinker, R.J. Hennessey, D. Houle, M.H. Johnston, A.E. Ogden, and D.L. Spittlehouse. 2009. Climate change and Canada's forests: from impacts to adaptation. Sustain. For. Manag. Netw. And Nat. Res. Can., Can. For. Serv., North. For. Cent., Edmonton, AB. 104 pp.



#### Climate and tree growth

#### Contributing factors to scale of impact

- Age of trees
- Actual weather
- Location
- Site conditions
- Species interactions native and new species
- Synchrony of phenology
- Tolerance of individuals
- Acclimatization (phenotypic change)
- Biological adaptation (genotypic change)
- Ability to migrate
- Human adaptive efforts







- Objectives
- Regulations
- Climate 'envelopes' BEC
- Climate-related hazards
- Seed sources
- Mixtures



- Objectives
- Regulations
  - 1. Forest and Range Practices Act Forest Stewardship Plan (FSP)
  - 2. Forest Planning and Practices Regulation FSP Content Stocking Standards
  - 3. Chief Forester's Standards for Seed Use no GMO, native species, seed sources
- Climate 'envelopes' BEC
- Climate-related hazards
- Seed sources
- Mixtures











- Objectives
- Regulations
- Climate 'envelopes' BEC The BEC Framework and Climate Change
  - Biogeoclimatic ecosystem classification is a framework for understanding the important components of terrestrial ecological systems. These components include climate, site factors, and associated vegetation.
  - The classification is a tool for reducing complexity and organizing and communicating ecological knowledge between users.
  - ❖ BEC has two spatial scales of focus. The site component addresses environment drivers at a local scale to differentiate relative site quality. And a zonal or climatic component describes and maps regional bioclimates.

http://www.for.gov.bc.ca/HRE/becweb/program/climate%20change/index.html

- Climate-related hazards
- Seed sources
- Mixtures





- Objectives
- Regulations
- Climate 'envelopes' BEC
- Climate-related hazards
  - ❖Insects ....
  - Diseases Swiss Needle Cast (Douglas-fir) Pacific NW
  - Abiotic factors Yellow Cypress dieback Alaska, BC Coast
- Seed sources
- Mixtures

- Objectives
- Regulations
- Climate 'envelopes' BEC
- Climate-related hazards
- Seed sources
  - Transfer limits wild seed
  - Transfer limits orchard seed
  - American parents in breeding programs

Mixtures

Sitka spruce common garden materials with populations from across the species range:

From left to right, ordered by mean annual temperature:

Redwood (CA), Columbia river (OR), Vancouver (Southern BC), Ocean Falls (Central BC), Prince Ruppert (Northern BC), Kodiak Island (South-central AK), Icy Bay (South-eastern AK), Rocky Bay (South-Central AK), Valdez (South-central AK).



- Objectives
- Regulations
- Climate 'envelopes' BEC
- Climate-related hazards
- Seed sources
- Mixtures
  - Multi-species patchwork mixtures
  - Multi-species intimate mixtures
  - Single species seed source mixtures





#### Recommended Steps for Strategy Development

- Identify Scope WFP Tenures Scale –Timeframe 10 years then evaluate/revise
- Establish Partnerships –FN's, Academic, Govn't agencies, research institutions, public etc
- Review current and relevant Literature, models and initiatives.
- Assess Vulnerabilities and Opportunities (ecological, economic) –build on previous work
- Rank; Priority, Capacity, (critical step)
- Develop Adaption and Mitigation options, strategies, approaches and tactics
- Plan and Implement at Appropriate Scale
- Evaluate Effectiveness

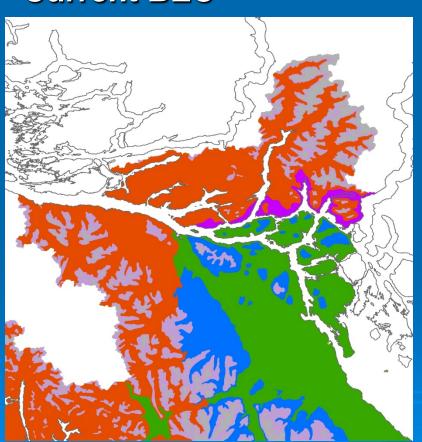


## Recommended Steps for Strategy Development (cont'd)

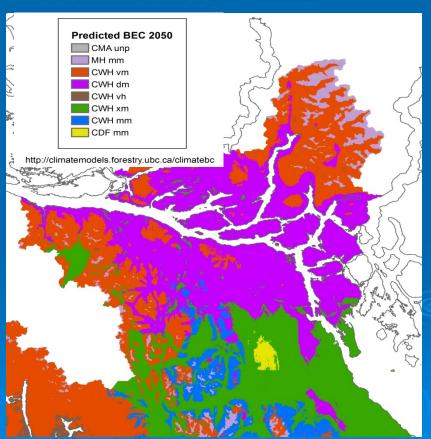
- Potential change in site productivity and impacts to AAC
- Silvicultural Systems longer term
- Expanded role of Fdc –
- Planting vs, natural fill-in
- Landscape-level species targets and diversification
- Increase levels of hardwoods ②
- Increase use of Pw and Ss.
- Limited Introduction of non-natives



#### **Current BEC**



#### **2050 Predicted BEC**





May-13	BEC Unit	Zonal	Site Se	ries -Pre	ferred	and Ac	ceptabl	e Speci	es / Free	Growi	ng Heigh	nts (from FSP)
Current	CWH vm1	Cw/1.5	Fd/3.0	Hw/3.0	Yc/1.5	Ss/3.0	Ba/1.7	Dr/4.0	Mb/4.0			
Site Index		22	36	28		31	29					
Model	CWH dm	Cw/1.5	Fd/3.0	Hw/3.0	?	?	?	Dr/4.0	Mb/4.0	Pw/2.5		
Site Index		28	34	31						?-		
Current	CWH xm1	Cw/1.5	Fd/3.0	Hw/2.0				Dr/4.0	Mb/4.0	Pw/2.5		
Site Index		24	34	24				?	?	?		
Model	CWH dm	Cw/1.5	Fd/3.0	Hw/3.0				Dr/4.0	Mb/4.0	Pw/2.5		
Site Index		28	34	31				?	٠.	?-		
Current	MH mm1			Hw/1.0	Yc/1.0		Ba/0.6	Bp/1.0	Hm/1.0			
Site Index				?	٠.		12		16			
Model	CWH vm2	Cw/1.5	Fd/2.2	Hw/2.5	Yc/1.5	Ss/3.0	Ba/1.7		Hm/1.0			
Site Index		20	?	28	٠.	?	26		?			
Current	CWH mm1	Cw/1.5	Fd/3.0	Hw/2.0	Yc/1.5		Ba/0.7				Bp/2.0	
Site Index		24	28	24	?-		?					
Model	CWH dm	Cw/1.5	Fd/3.0	Hw/3.0	?			Dr/4.0	Mb/4.0	Pw/2.5		
Site Index		28	34	31			?	?	?	?		



- Could (or is it when) we see an increase within insect populations and frequency? Could there be a MPB type of infestation on the coast?
- Some recent observations:
- Douglas Fir Pole Borer Summer 2014 CSC
- Balsam Woolly Aphid -
- Lygus bug Summer 2014 Quadra Island
- European pine shoot moth TFL 39 Block 2
- > Others:
- Western Spruce budworm ?-

- European pine shoot moth. Rhyacionia buoliana.
- > Reference; Jim Corrigan, Biologist Kalamalka Seed Orchard, Tree Improvement Branch BC MoF.
- First recorded in North America in 1914 (Long Island New York)
- Reference; Entomology Penn State –Insect Advise extension







- Lygus bug
- Lygus lineolaris, was first identified in British Columbia as a serious pest in bareroot and container nurseries in 1983.
- > Found in 2014 on Quadra Young Fdc Plantation CMIB Woodlot
- Reference; Natural Resources Canada





> CONCLUSIONS:

# Species selection in a changing climate? What have we done in the past, what changes do we make in the future? Acknowledgements and Special Thanks ©

- Craig Wickland, RPF Section Head, Forest Stewardship, Coast Area, FLNRO
- Dave Weaver RPF, Silviculture Performance Assessment Specialist, Resource Practices Branch, FLNRO
- Allan Powelson RPF, Stand Management Leader & Data Custodian, Harvesting and Silviculture Practices, FLNRO
- Mei-ching Tsoi RPF, Independent consultant
- > Brian Robinson, RPF Director of Professional Development and Member Relations ABCFP.
- Lee Charleson, MBA, RPF Seed Policy Officer, Tree Improvement Branch. FLNRO
- Diane Douglas M. Ed., P.Ag. Extension and Communications, Tree Improvement Branch FLNRO
- > Tim Ebata, Forest Health Officer, Resource Practices Branch, FLNRO,
- Dave Mogensen RPF, Paul Bavis RPF and Annette van Niejenhuis RPF WFP
- > Stefan Zeglen, Forest Pathologist, Forest Stewardship FLNRO

# Species selection in a changing climate? What have we done in the past, what changes do we make in the future? References;

- 1. A Short History of the Control of Species Selection for Reforestation in BC. K. Astridge RPF and R. Winter RPF Practices Branch (March 2012)
- 2. Excellence in Cone and Seed Services The first 50 years BCFS Tree Seed Centre FLNRO
- Chronology of Transfer Rules and Seed planning Zone Changes FLNRO
- 4. The development of BC's tree seed guidelines
- 5. Purpose, concept, methodology, and implementation. C. C. Ying and A. D. Yanchuk (2006)
- 6. ABCFP Code of Ethics (Sept 2013).
- 7. A Climate Change Strategy for Red Alder in British Columbia Craig Farnden, Louise de Montigny and Bruce C. Larson et al April 2012



## Questions?



for more information - www.westernforest.com