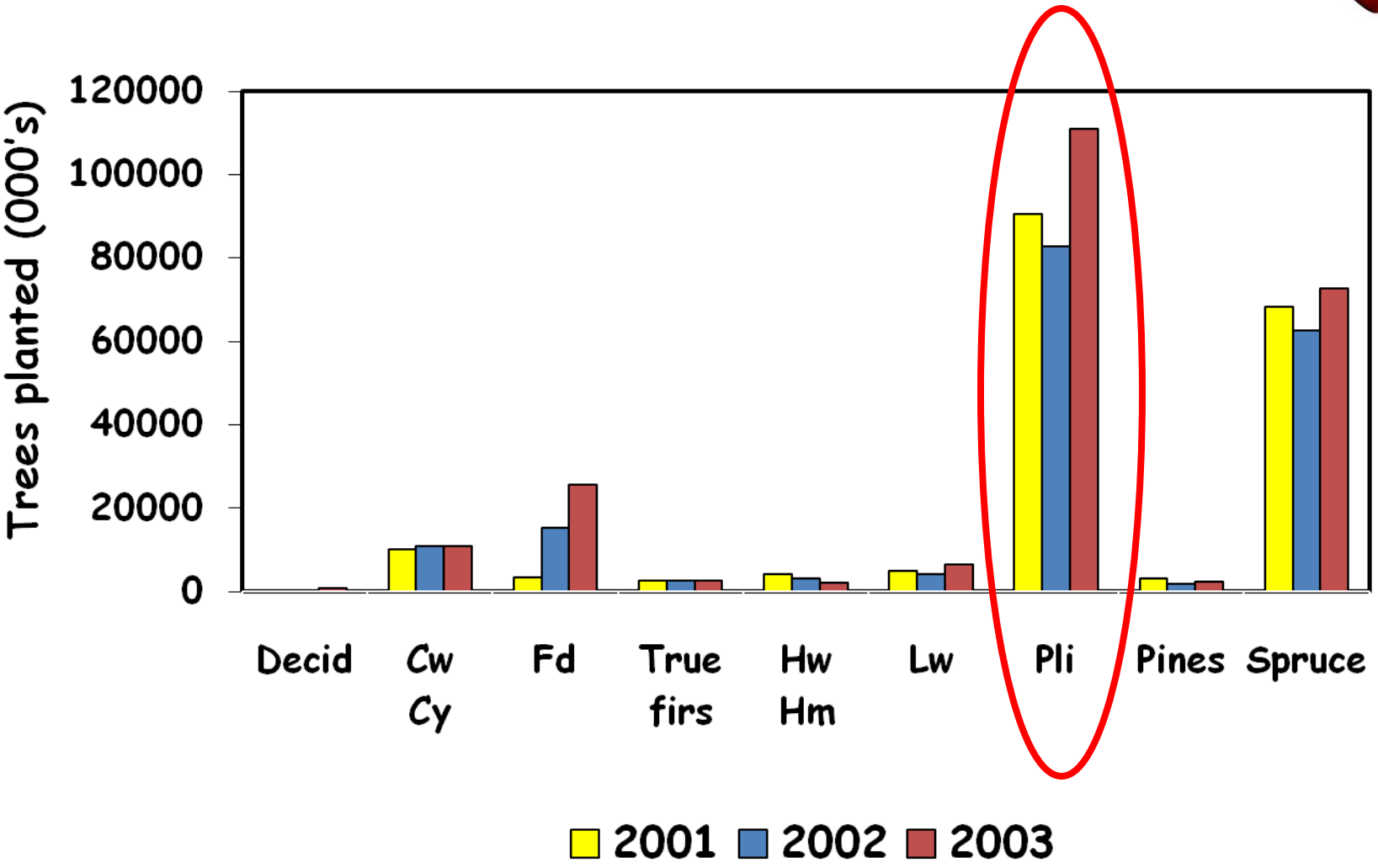
The longest title in the history of SISCO!!

The trouble with pine

- Nathan Davis, Blackwell and Associates
- Jeff McWilliams, Blackwell and Associates
- Suzanne Simard, UBC
- Alan Vyse, TRU

Our love affair with lodgepole pine



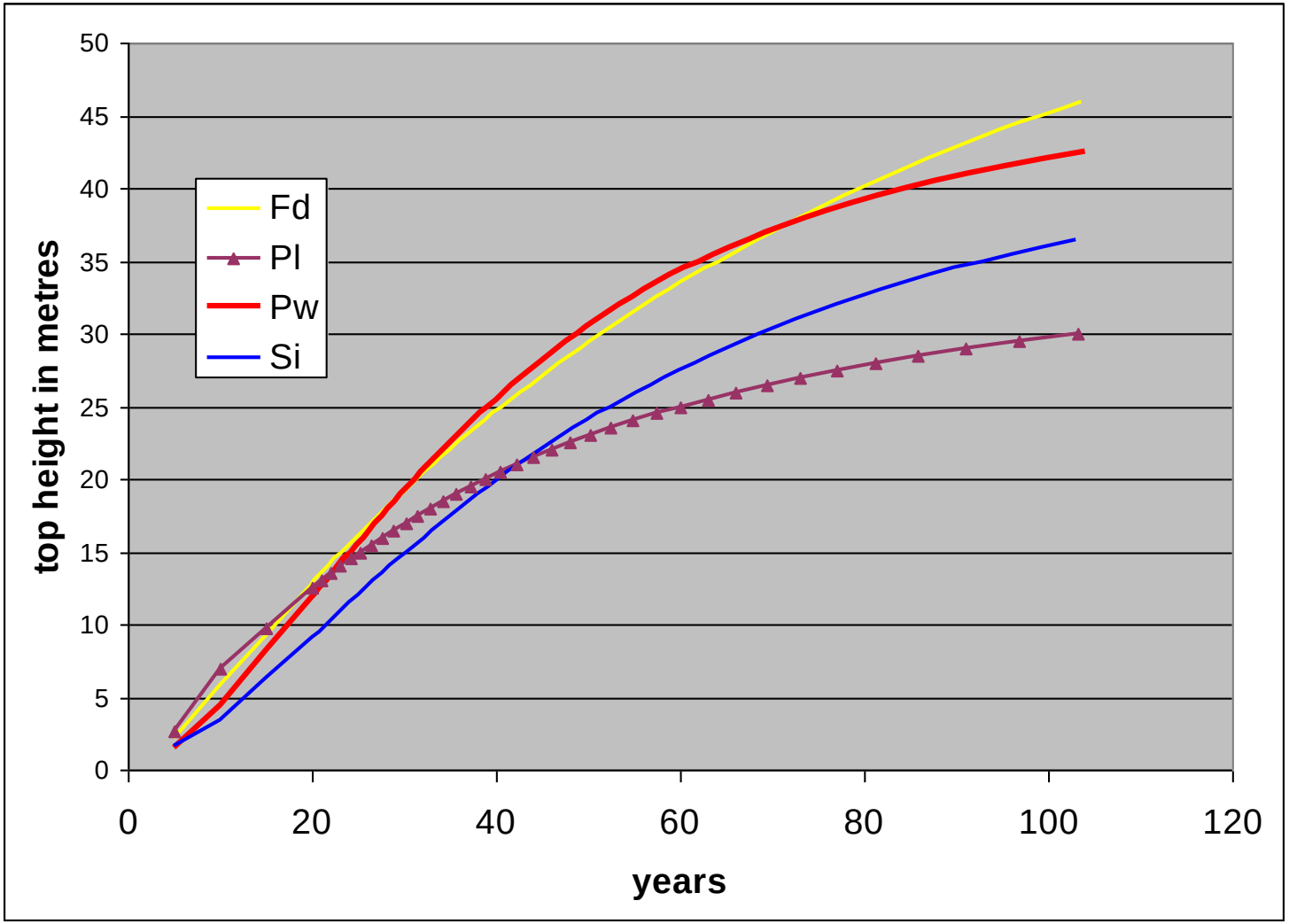
The free growing-height growth trap

Good survival

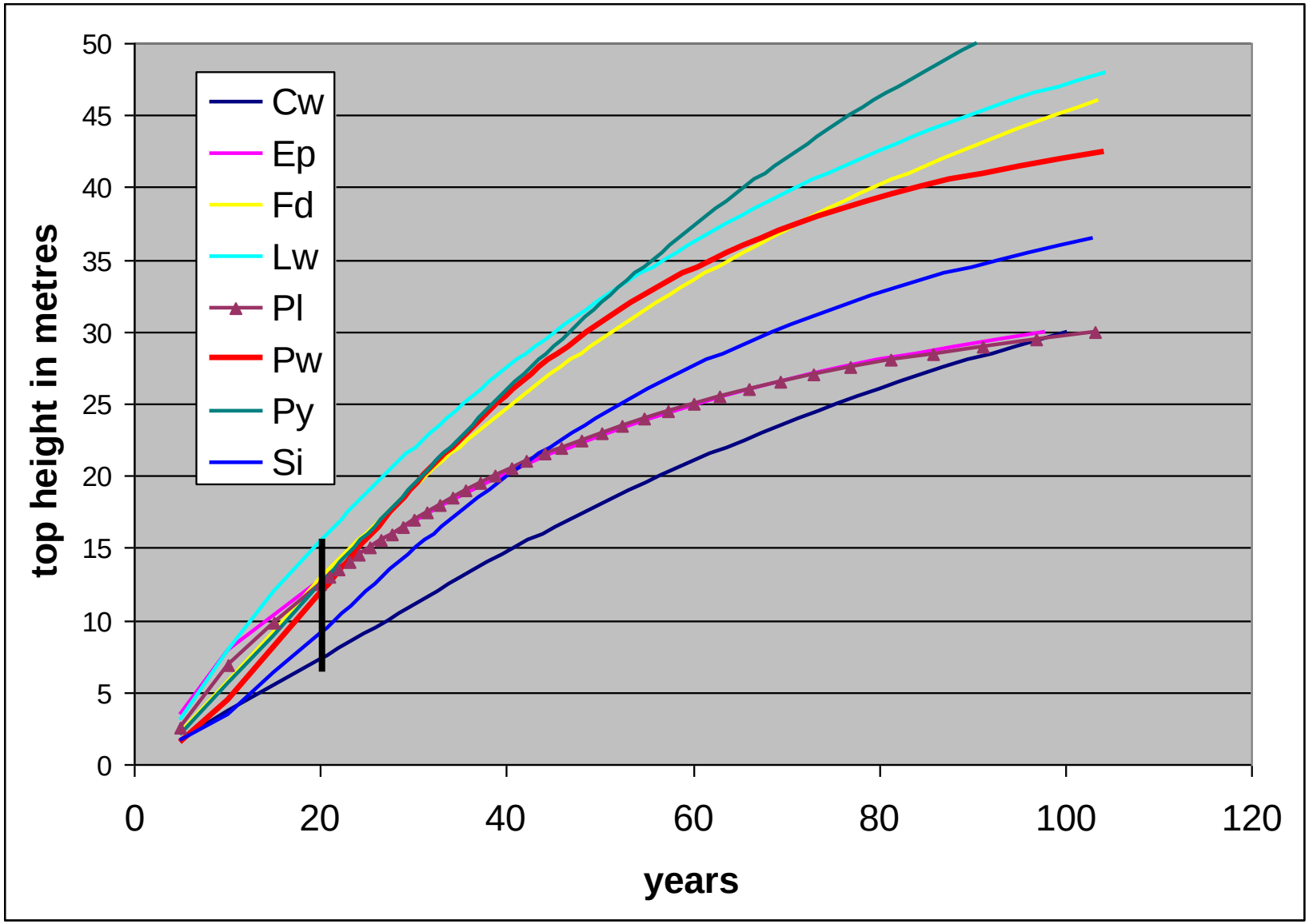
Rapid early height growth

The free growing- height growth trap

EP 904



EP 1153

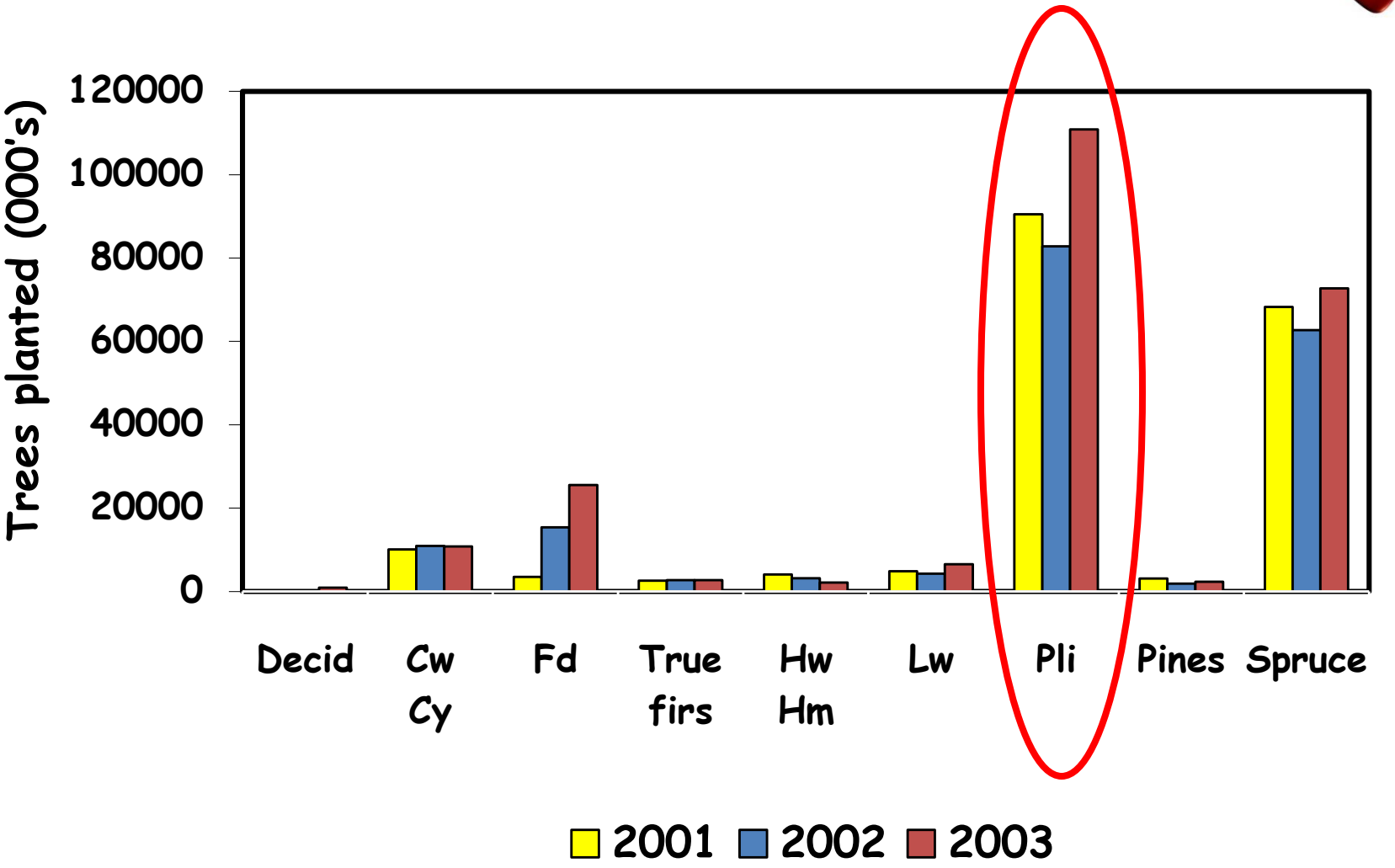

top height in metres
years
0
5
10
15
20
25
30
35
40
45
50
0
20
40
60
80
100
120
Cw
Ep
Fd
Lw
Pl
Pw
Py
Si

The Trouble With Pine

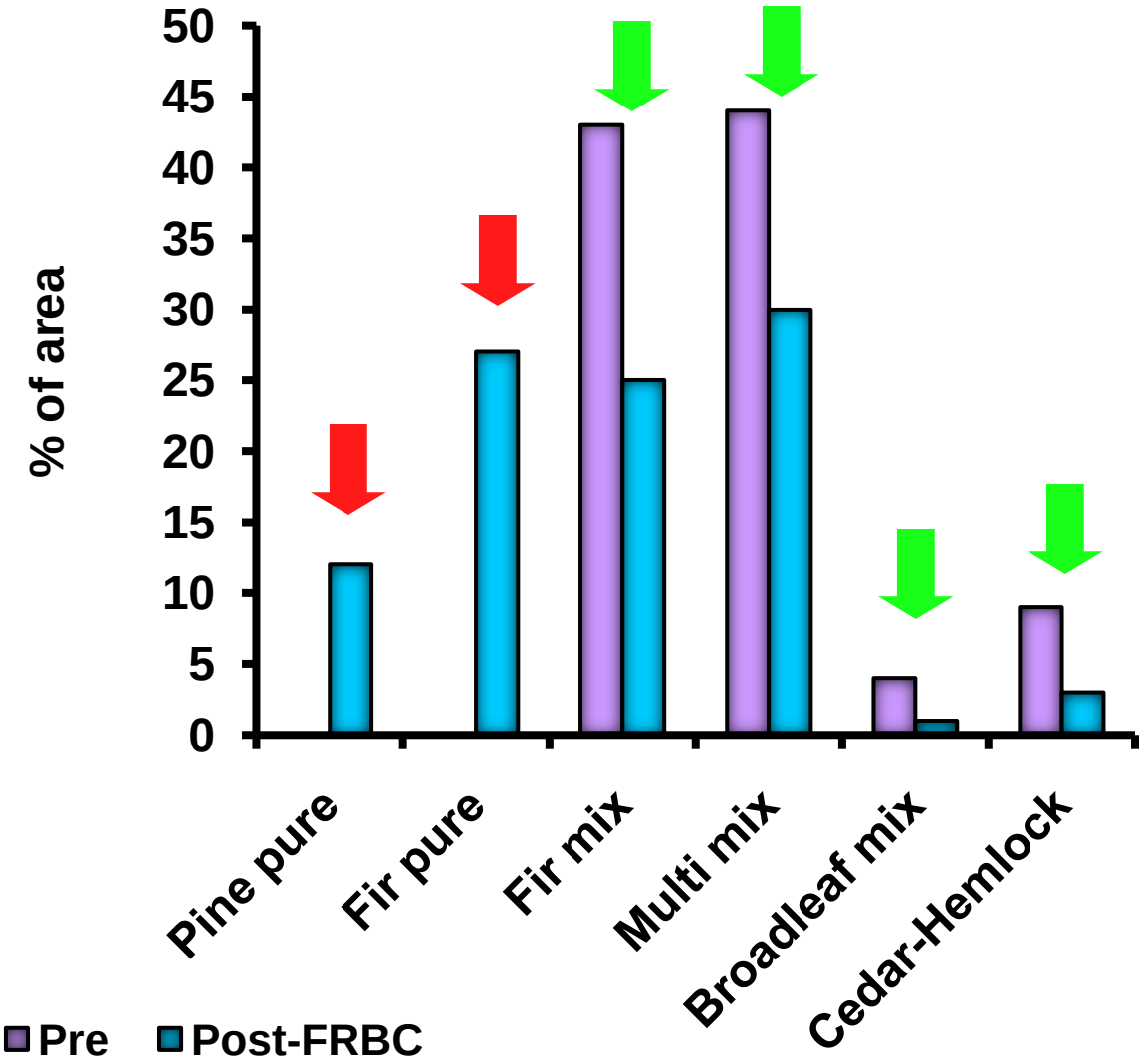
Jean Heineman, Jean Mather, Don Sachs and Suzanne Simard, Alan Vyse

April, 2010

Our love affair with lodgepole pine



Managed shifts in ICH stand types



- Created two pure classes: Pli and Fdi
- Reduced mixed classes by 40% overall

Today's poster pests of lodgepole pine

Mountain pine beetle
(Dendroctonus ponderosae)

Aukema et al. 2008

Dothistroma needle blight
(Mycosphaerella pini)

Woods et al. 2006

…less flamboyant cousins

www.for.gov.bc.ca

Western gall rust (*Endocronartium harknesii*)

Commandra blister rust (*Cronartium comandrae*)

Stalactiform blister rust (*C. coleosporioides*)

Atropellis canker (*Atropellis piniphila*)

Pine needle cast (*Lopherdermella concolor*)

Terminal weevil (*Pissodes terminalis*)

Sequoia pitch moth (*Synanthedon sequioae*)

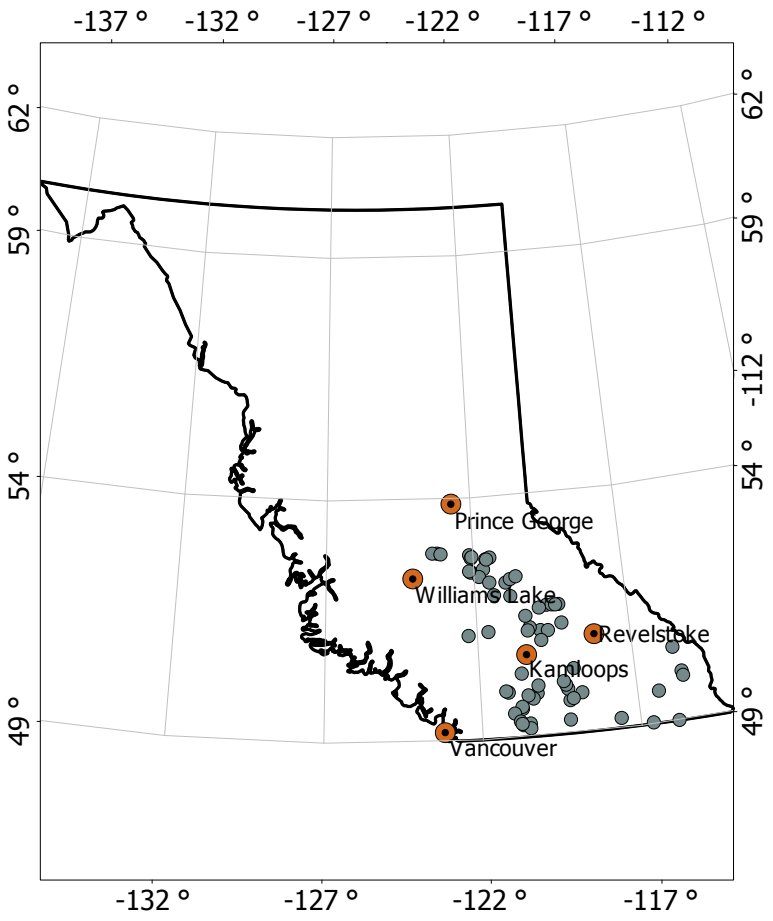
Warren's root collar weevil (*Hylobius warreni*)

Study Objectives

1. Do declared stands continue to meet free-growing standards past the juvenile stage?
2. How much natural ingress is there?
3. What are the causes of the stocking reduction?
4. Is the risk of damage by specific agents associated with climatic, location, site or silviculture treatment factors?
5. Are these problems liken to increase with climate change?
6. What are some things we can do about it?

Sampling Method

- 66 Pl-leading sites randomly selected in RESULTS in SIFR in 2007
- Planted to Pl 1977-1997; declared FG before 2007 (5-13 yrs); ≥15 ha
- In 2007-08, nine 50 m^2 plots were sampled per site, 100 m apart, random start
- Slope, aspect, slope position, SMR
- Total, well spaced and free-growing densities by species
- Height class and diameter
- Symptomatic presence of damage (disease, insects, animal, abiotic)
- Climate variables using ClimateBC
- Silviculture treatment history



Data Analysis

- Summary statistics
- Logistic regressions run to determine if risk of stocking or damage was associated with climate, location, site or treatment factors

$$p(Y) = \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k)/1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots + \beta_k x_k)$$

- Odds ratio: odds of stocking or damage increasing or decreasing with a change in the predictive factor

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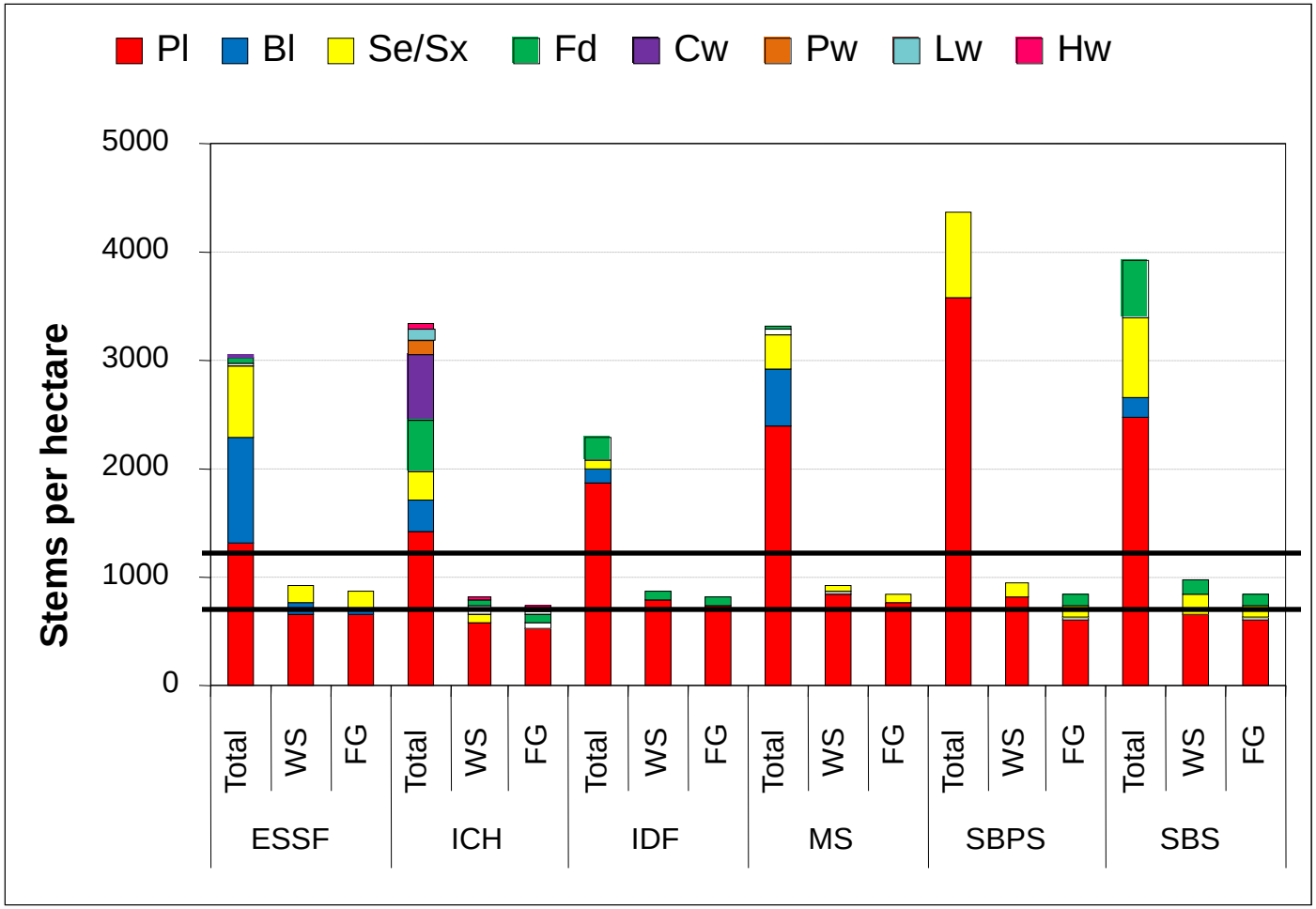
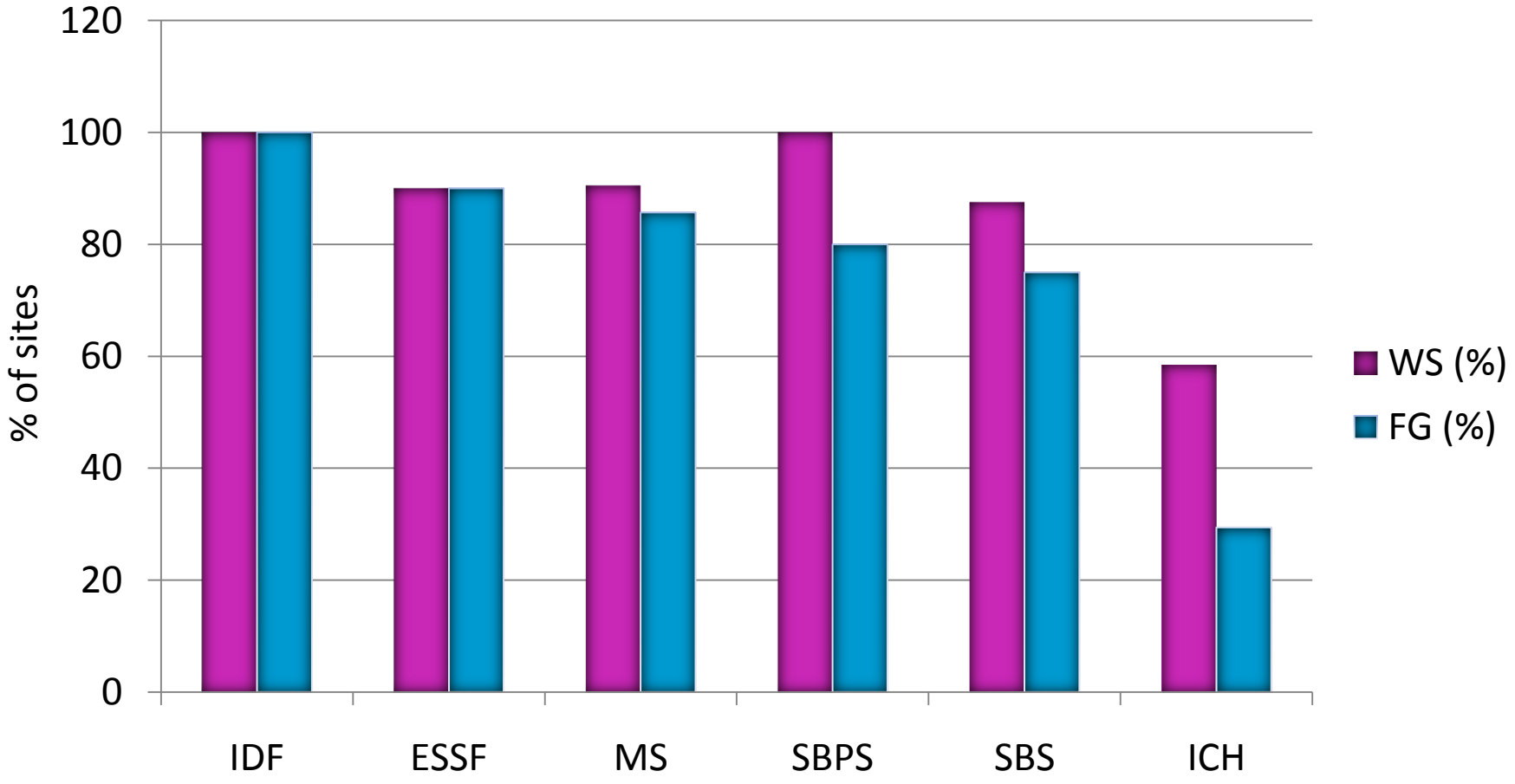
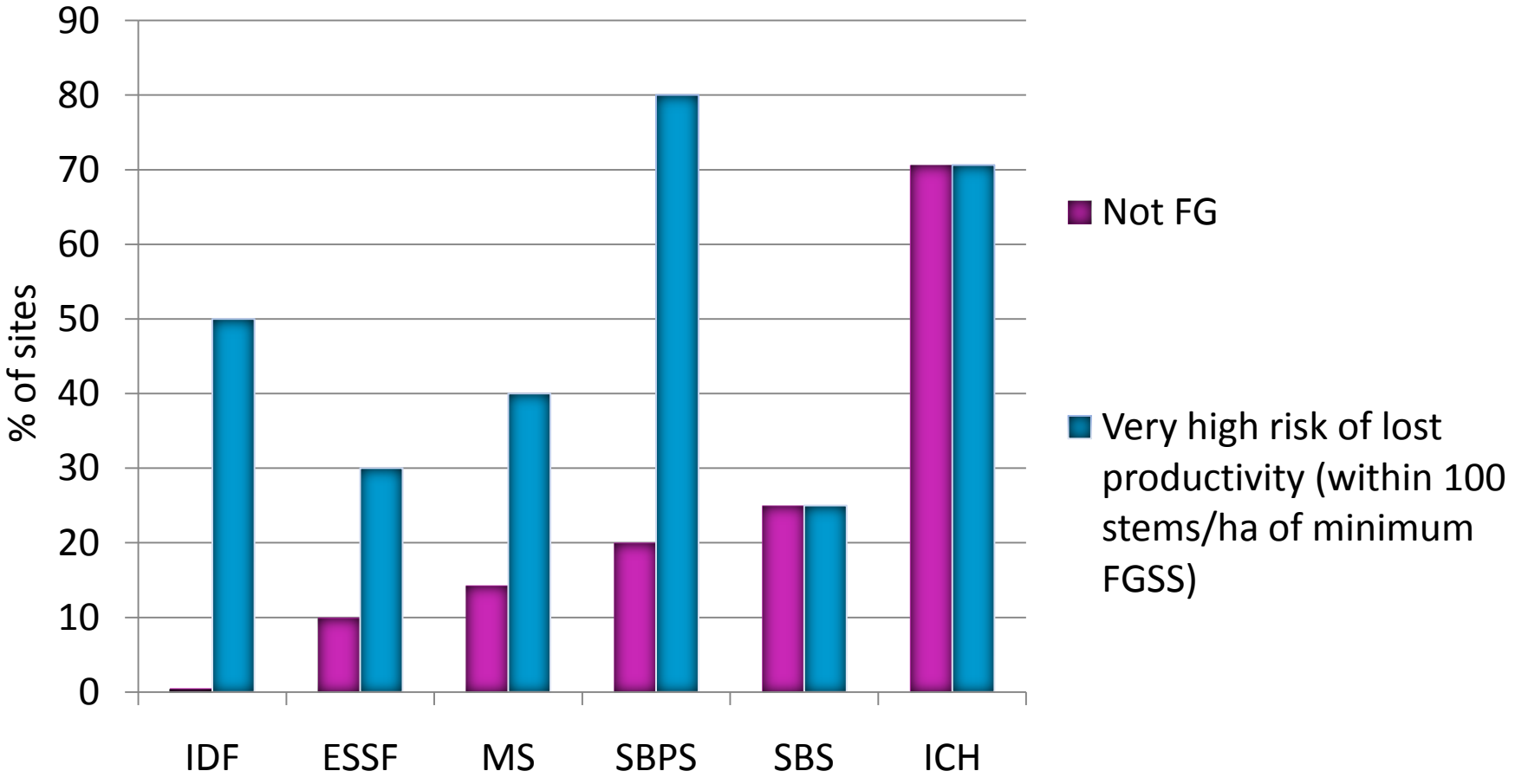
Stocking by Biogeoclimatic Zone



Proportion of sites meeting minimum WSS and minimum FG



Proportion of sites no longer FG and at very high risk of lost productivity



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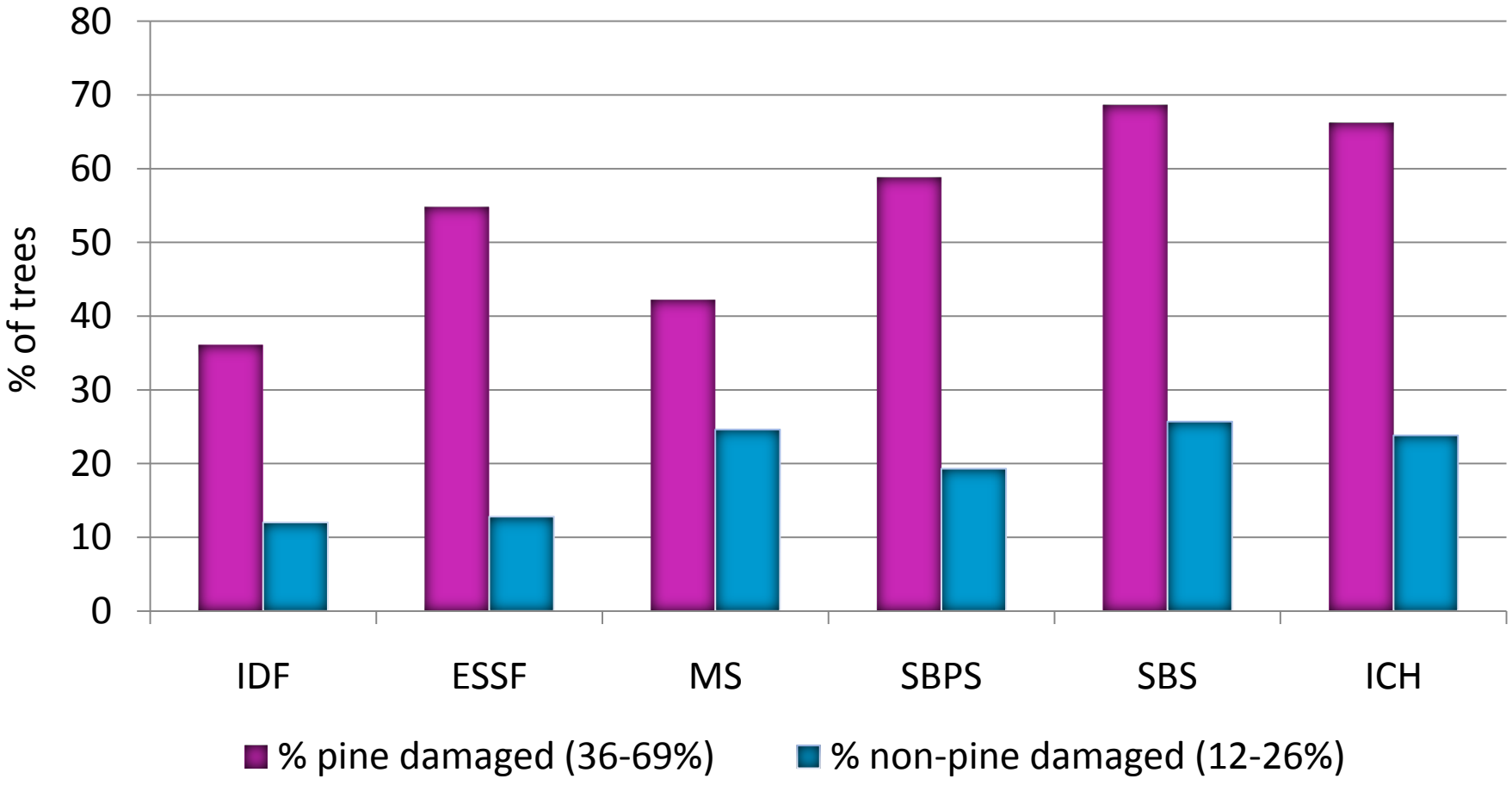
Over half of lodgepole pine stems suffered damage on all sites and was the principle reason for not meeting standards, followed by not meeting minimum spacing requirement

Minimum height and competitive status unimportant

Proportion of trees with serious damage



The trouble with pine: 30% of our lodgepole pine plantations across the southern Interior are no longer free growing because of pest damage. How do we take species selection guidelines in a new direction? And John spilled wine all over the floor last night after giving a great slide show on elephants and giraffes and lions ..

Damage causes (14 agents)

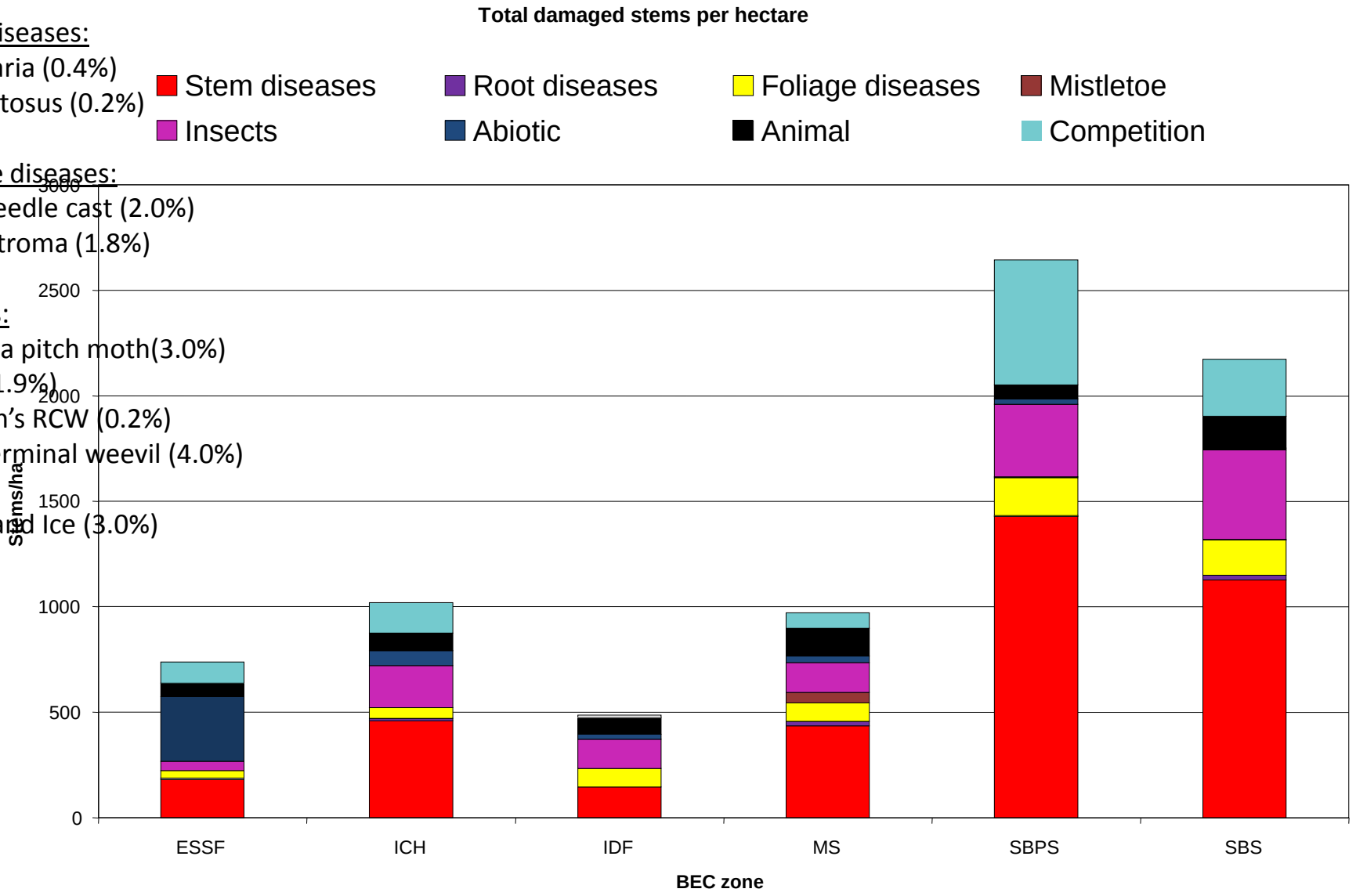
Stem diseases:
Western gall rust (20.8%)
Stalactiform blister rust (1.3%)
Comandra blister rust (1.5%)
Atropellis canker (0.8%)

Root diseases:
Armillaria (0.4%)
Tomentosus (0.2%)

Foliage diseases:
Pine needle cast (2.0%)
Dothistroma (1.8%)

Insects:
Sequoia pitch moth(3.0%)
MPB (1.9%)
Warren's RCW (0.2%)
Pine terminal weevil (4.0%)

Snow and Ice (3.0%)



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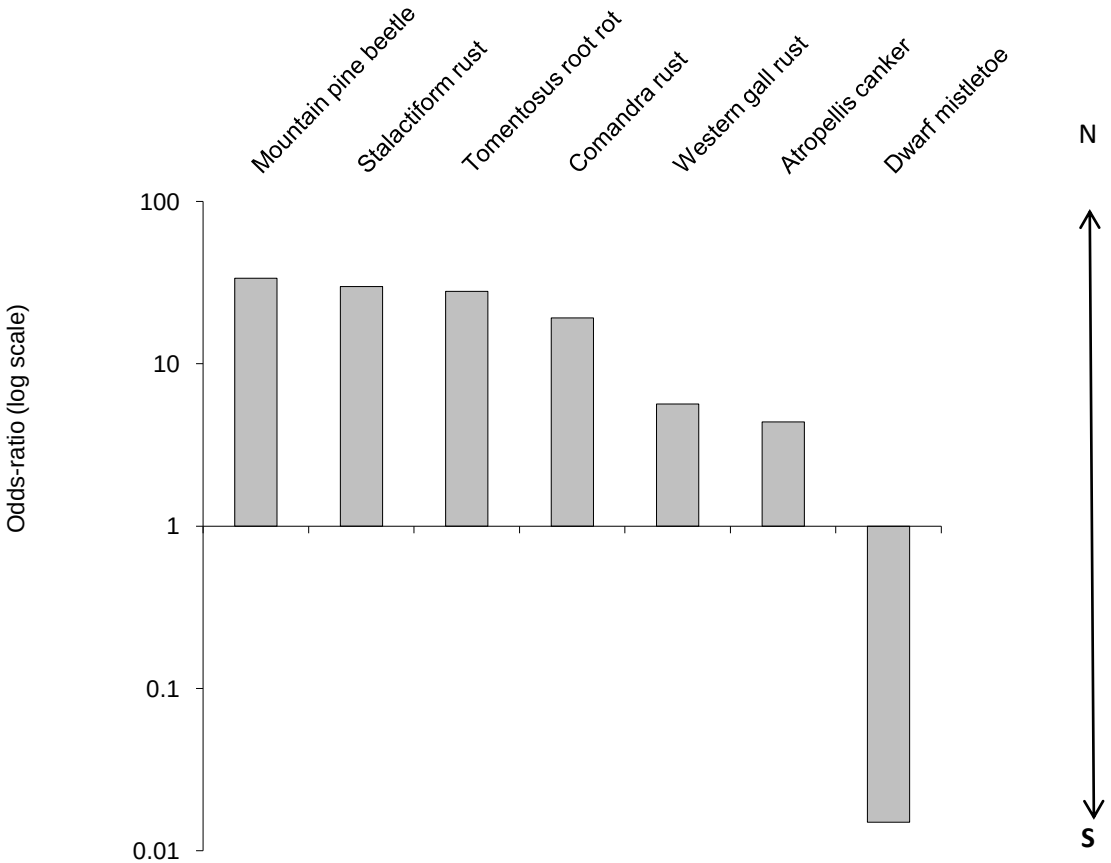
Odds ratio

- Odds of damage occurring
- Odds ratio is the multiplier by which risk of damage changes when the risk factor changes by one unit
- Odds ratio<1 means risk is decreasing
- Odds ratio>1 means risk is increasing
- Logarithmic (factor raised to power ‘x’)

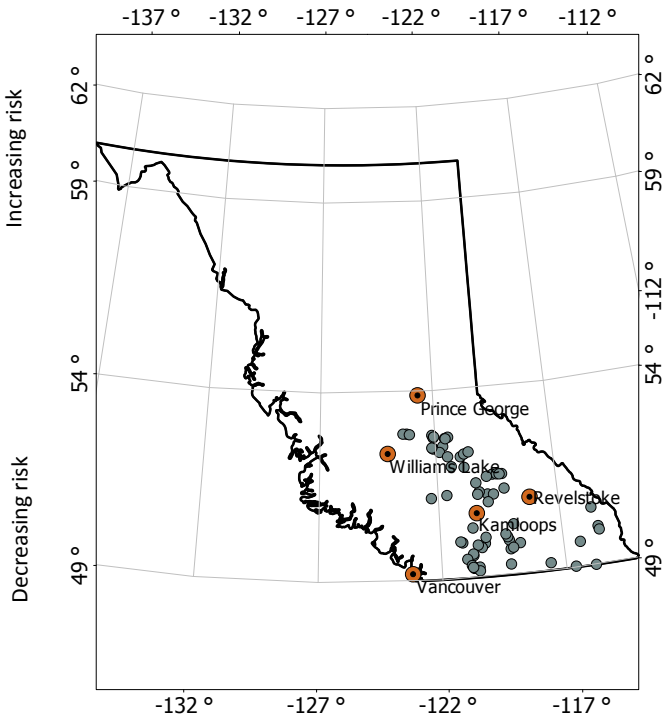
Location

Risk of damage generally increases with latitude

Latitude

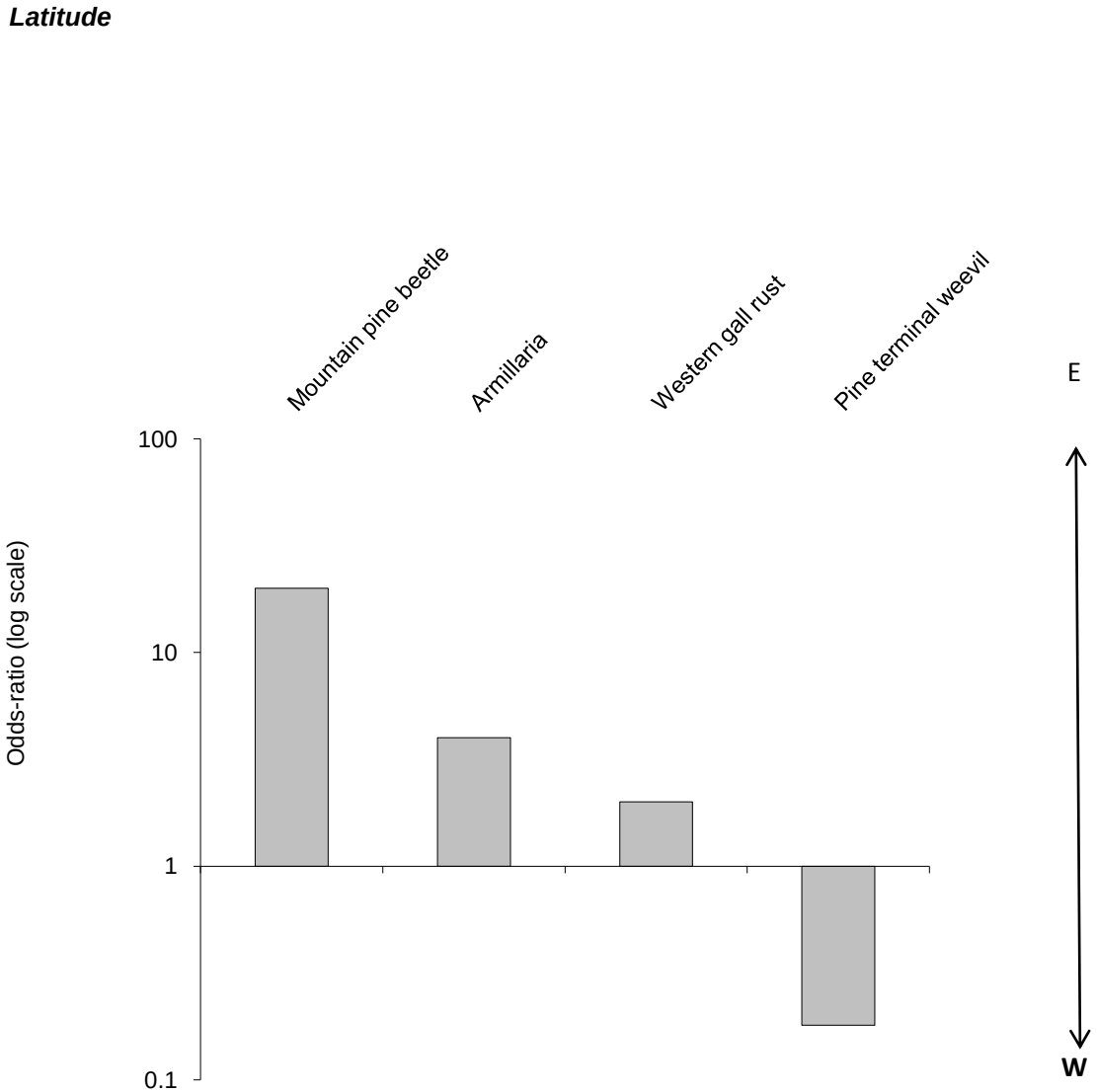


•odds ratio is 5 in the model predicting western gall rust from latitude; if go 4 degrees north, you increase the risk by 5x5x5x5 (625) times

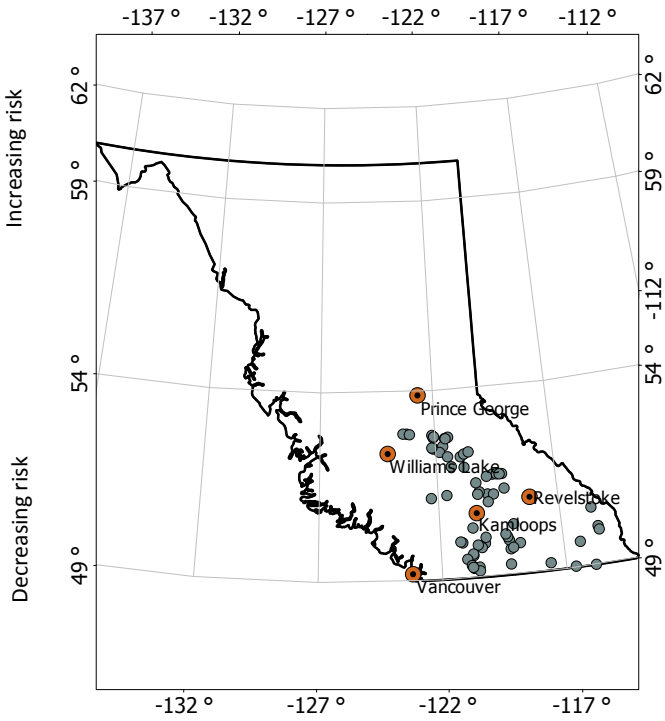


Location

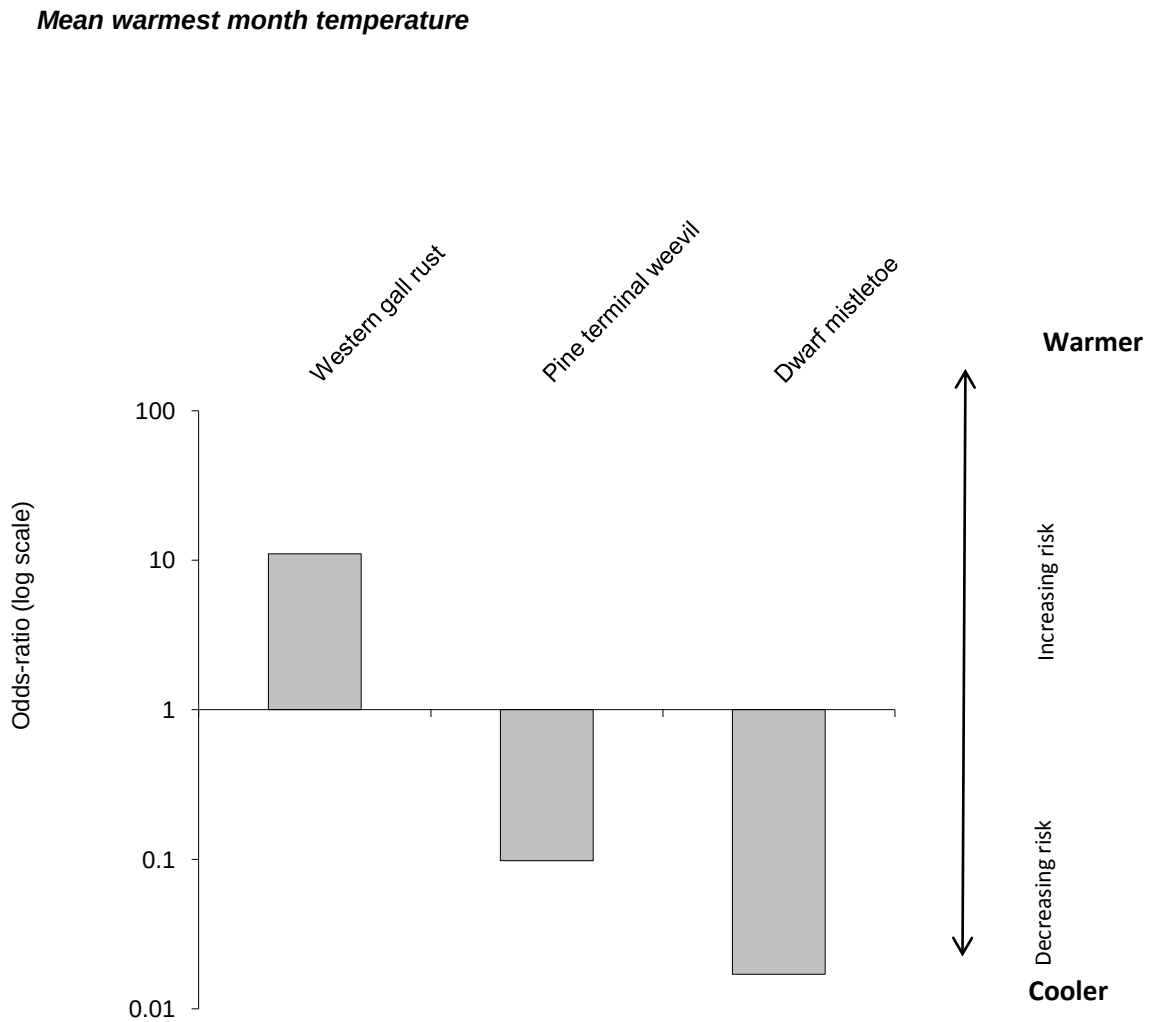
Risk of damage generally increases with longitude



- odds ratio is 5 in the model predicting Armillaria root disease from longitude; if go 4 degrees east, you increase the risk by 5x5x5x5 (625) times

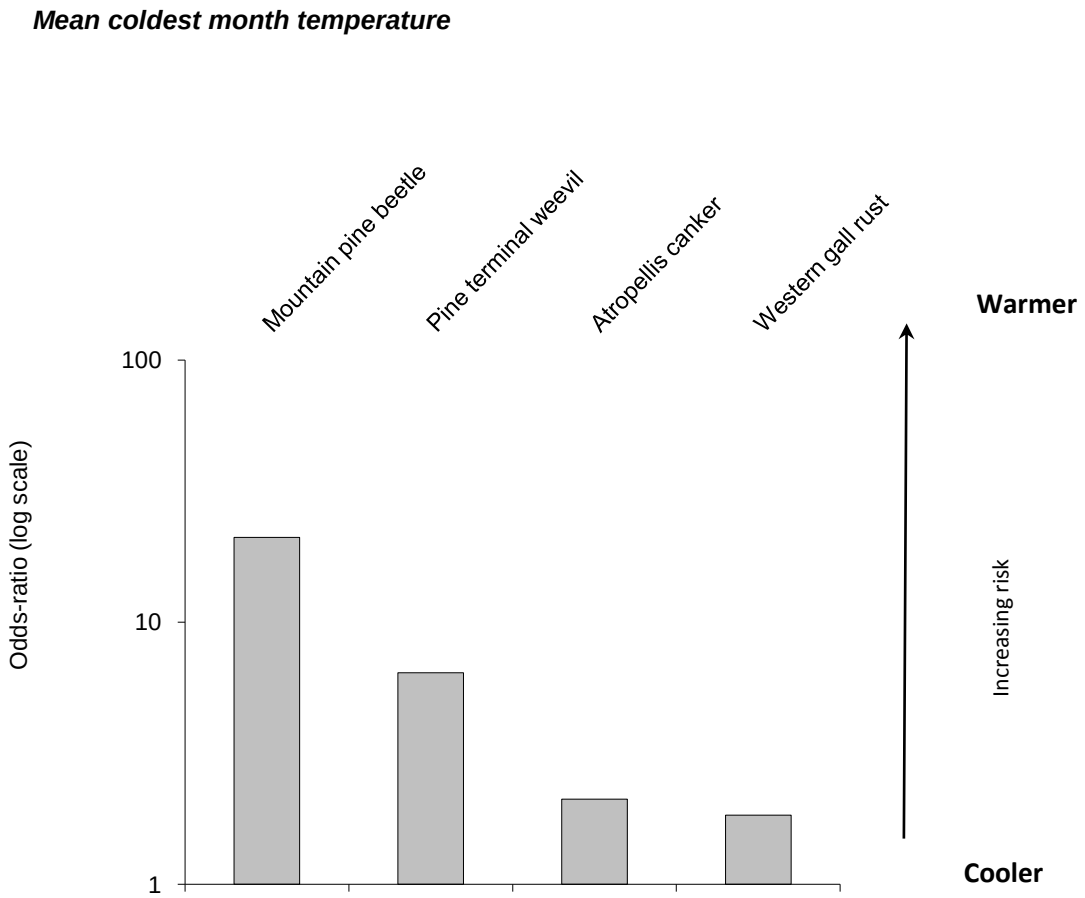


Risk of damage from western gall rust increases with warmer summers



- odds ratio is 10 in the model predicting western gall rust from MWMT; if summer temperature increases by 2°C, you increase the risk by 10x10 times (100) times

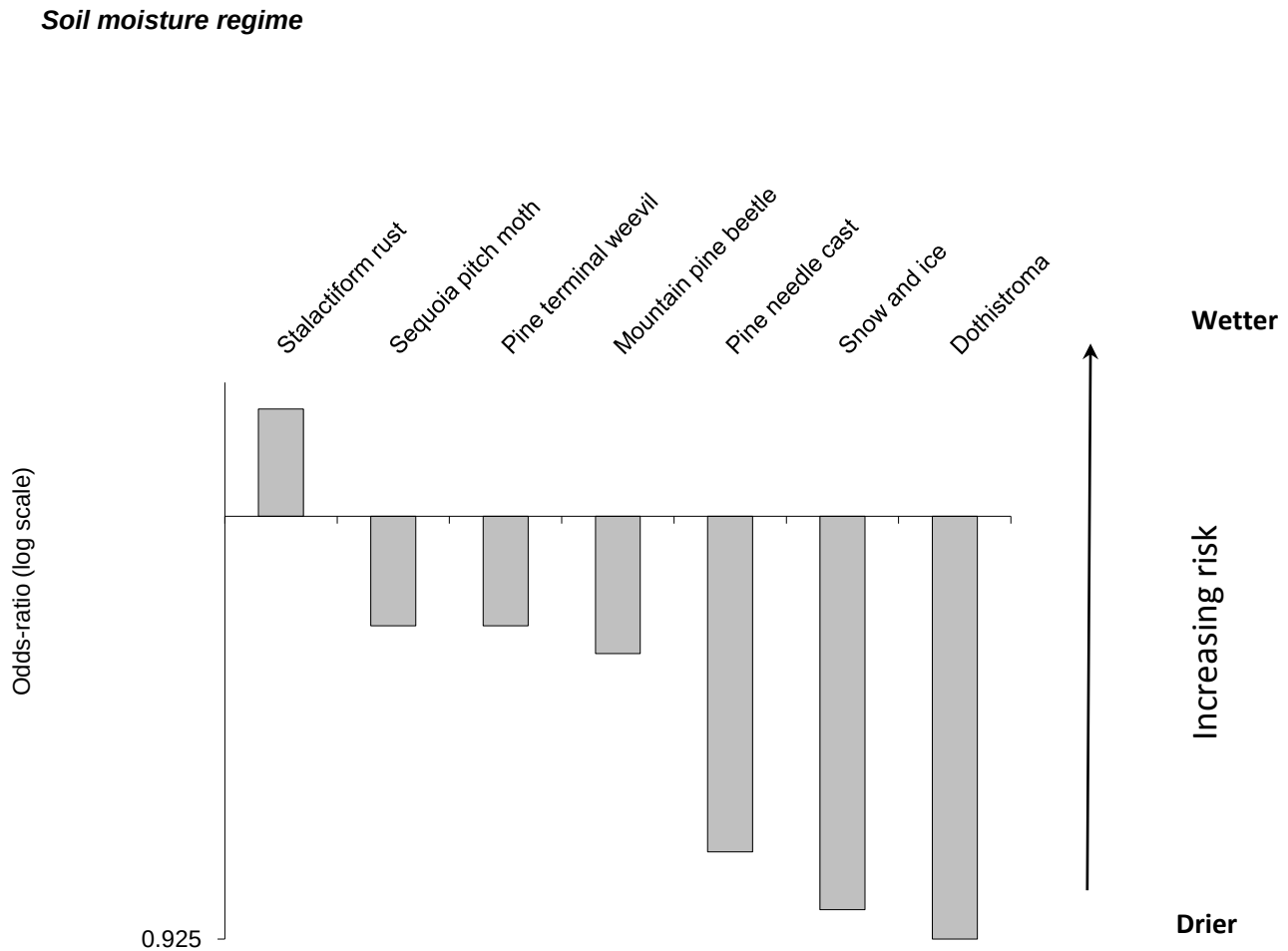
Risk of all damage increases with warmer winters



- odds ratio is 6 in the model predicting western gall rust from MWMT; if winter temperature increases by 2°C, you increase the risk by 6x6 times (36) times (441 times for MPB)

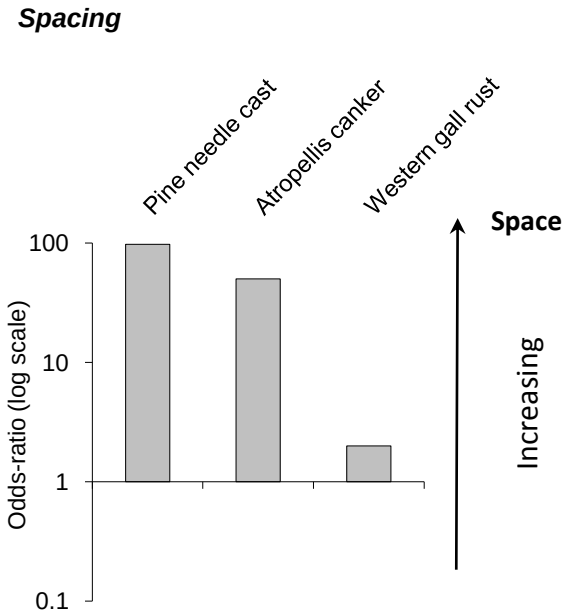
Site

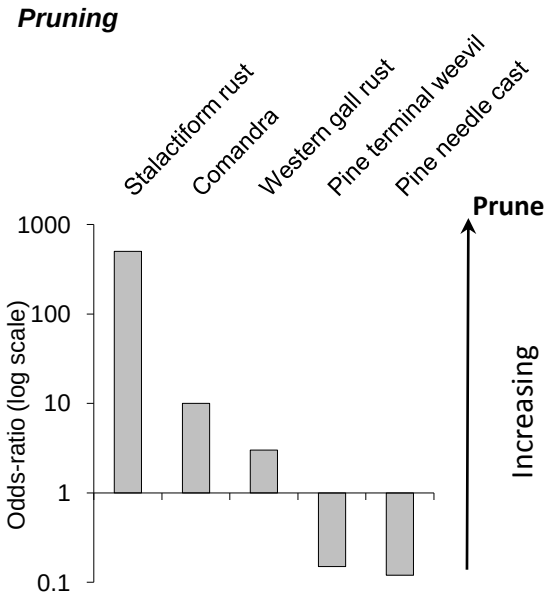
Risk of damage is greater on drier sites

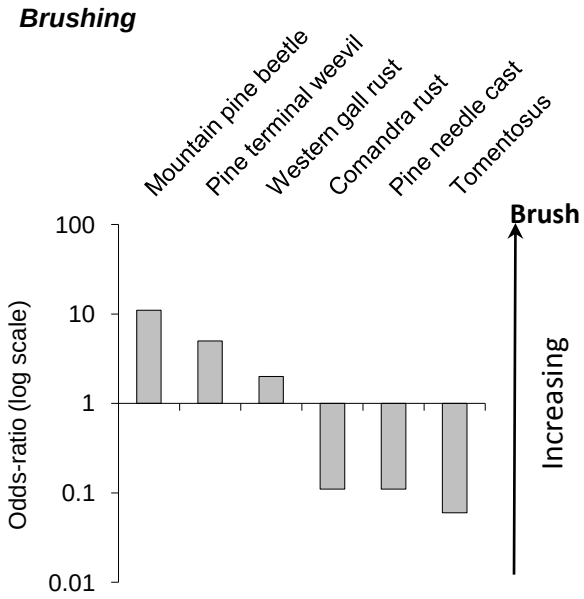


Silviculture treatment

Risk of damage often increases with spacing, pruning and brushing







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Yes!

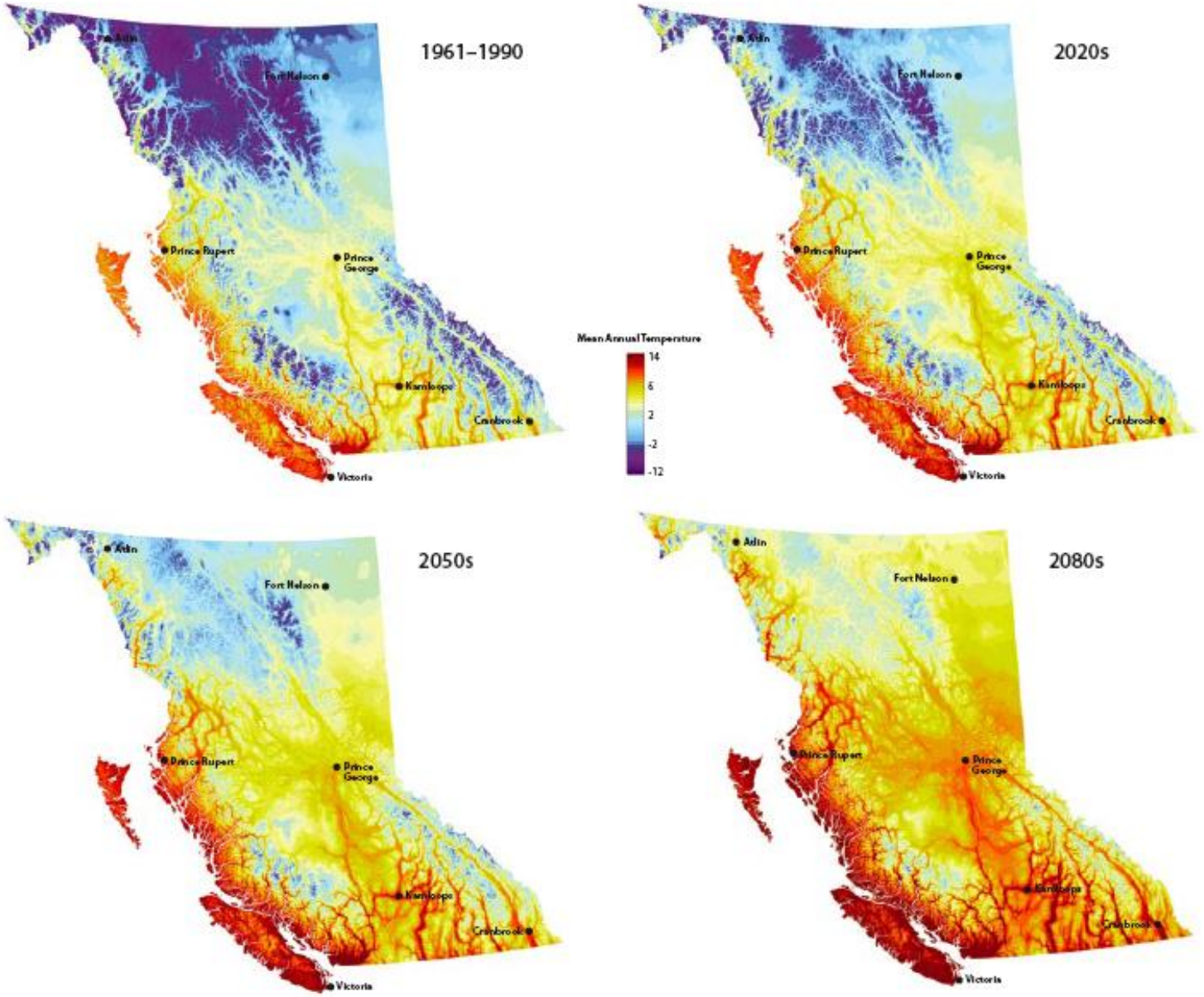


FIGURE 2 *Mean annual temperature for British Columbia for 1961–1990 and that predicted for British Columbia in 2020s, 2050s, and 2080s for the A2 scenario from CGCM2. Downscaling was done with the ClimateBC software. (Source: ClimateBC v.2.2 [Wang et al. 2006]. Cartography by Ministry of Forests and Range, Research Branch.)*

Spittlehouse 2008

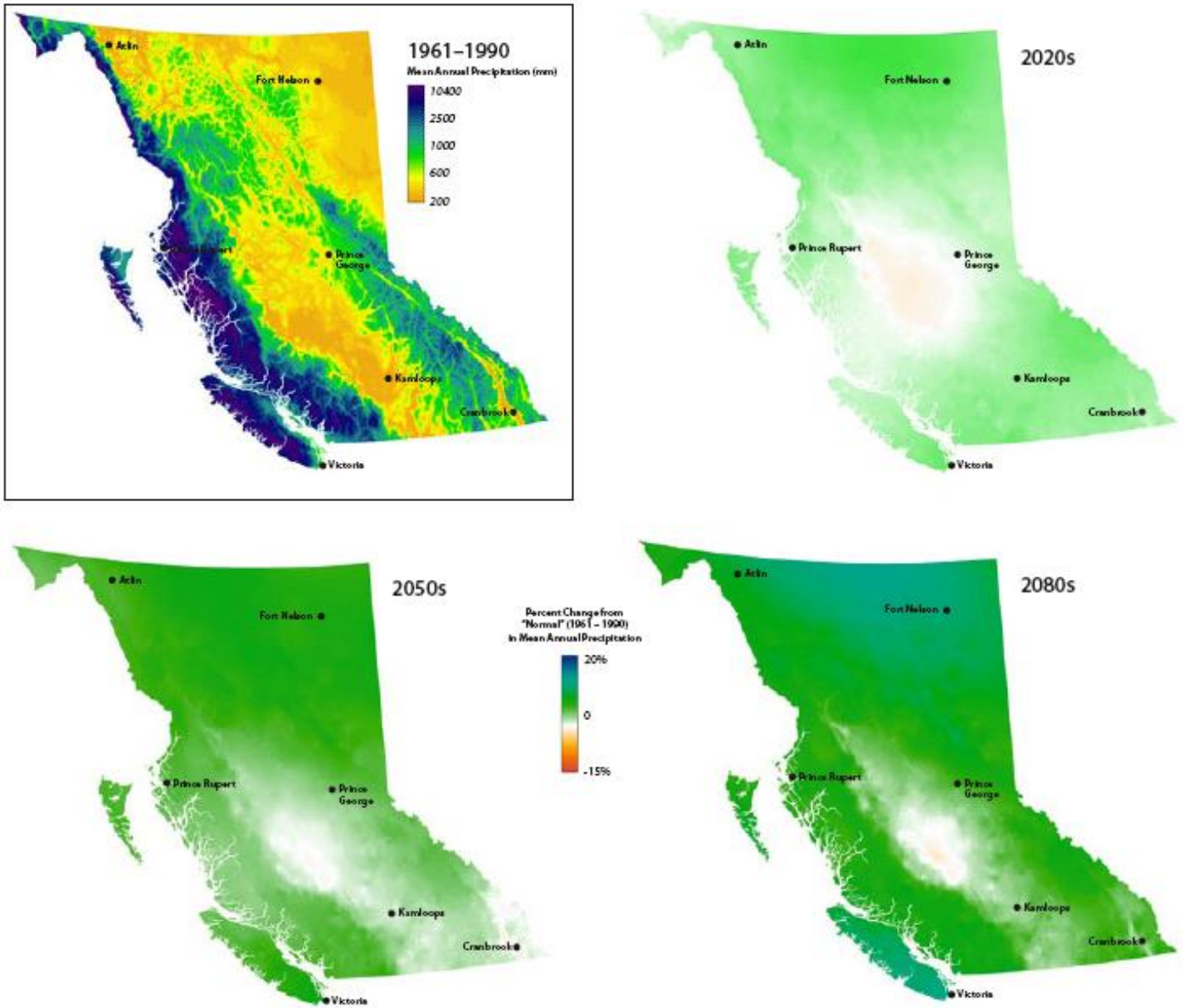
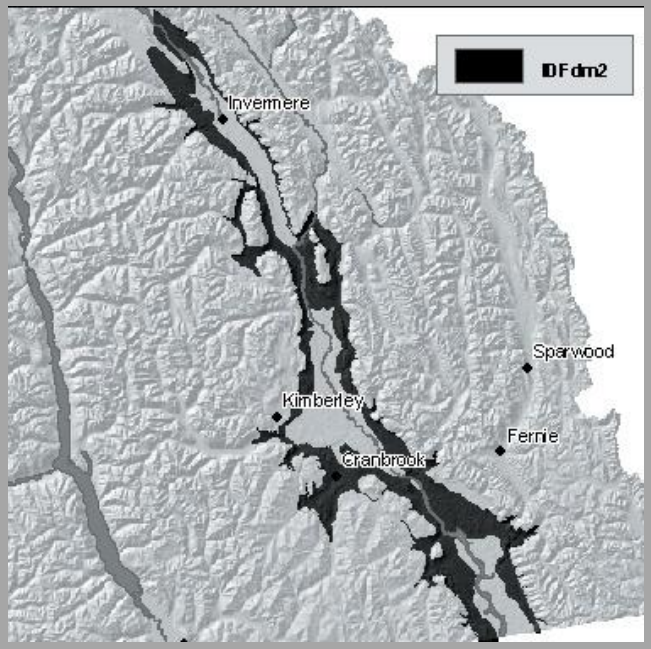


FIGURE 3 *Mean annual precipitation for British Columbia for 1961–90 and the percentage change predicted for British Columbia in 2020s, 2050s, and 2080s for the A2 scenario from CGCM2. Downscaling was done with the ClimateBC software. (Source: ClimateBC v.2.2 [Wang et al. 2006]. Cartography by Ministry of Forests and*

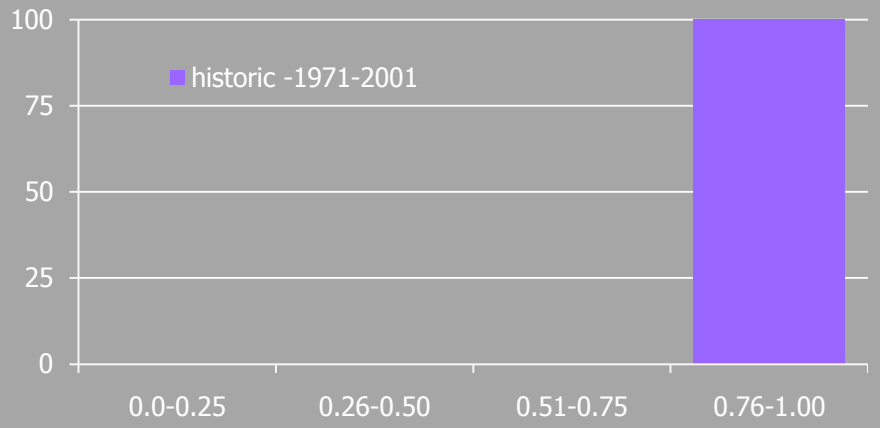
Spittlehouse 2008

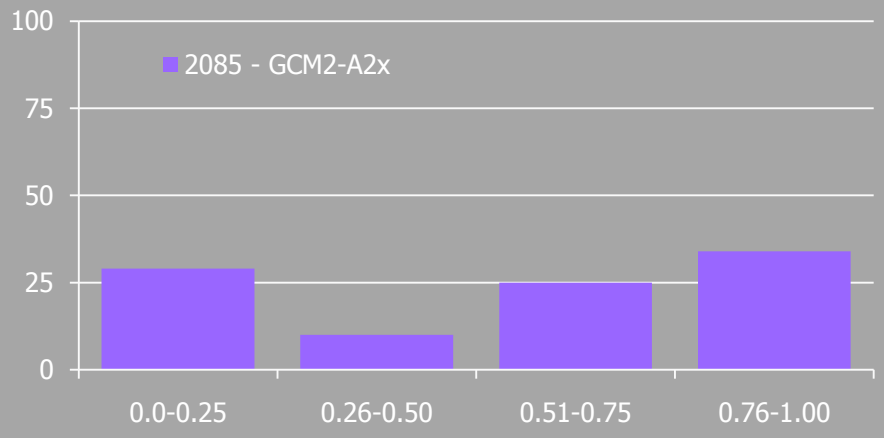
Lodgepole pine seedling survival: drought & spring frost



- frequency distributions of survival probability
- Interior Douglas Fir zone (dry, mild)
- moderate soil drainage
- CGCM2-A2x

(Nitschke & Campbell , in prep)





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Call to action

- Curtail planting of pure lodgepole pine plantations, especially in ICH and wetter ESSF
- Revise free-growing standards; particularly drop minimum height, minimum spacing, and competitive status requirements
- Reduce risk by planting mixtures; smart mixtures based on species vulnerabilities
- Favor natural regeneration
- Avoid unnecessary intensive silviculture practices, such as brushing, spacing or pruning
- Monitor and adapt

Summary

1. Almost one-third of declared stands are no longer free-growing after 5-13 years, with 70% of lodgepole pine plantations failing in the ICH.
2. Natural regeneration is common, but usually not counted as FG because it is too short, too clumpy or not of an acceptable species.
3. Damage, particularly from western gall rust, underlies plantation failures. The other agents have lower incidence but there are plenty of hot spots to be wary of.
4. Stocking is sufficiently reduced that predicted yield will decline in most zones.
5. Risk of damage increases with lat/long, warming summers and winters, drier soils, and intensive silviculture.
6. These problems will likely increase with climate change.
7. Need to take a conservationist approach to management. Maintaining species diversity and structure are key to mitigation and adaptation.
8. Monitoring, research and adaptive management.

B.A. Blackwell
& Associates Ltd.

The Trouble with Pine

Outline:

- Review of FREP Report 19:
  - FSP Stocking Standards Evaluation
- Are we growing our pine stands properly?
- Recommendations

B.A. Blackwell
& Associates Ltd.

Are we growing pine properly?

- How does pine grow naturally
- Right densities
- Right sites
- Mixes vs pure

FREP Report #19

Introduction

- Report and Action Plan available on FREP website
- Objectives of this FSP stocking standards monitoring project were to evaluate:
  - the consistency between stocking standards and timber supply review,
  - the accuracy of stocking standards in RESULTS, and
  - the implementation of stocking standards at the block level.

Summary of Methods

- One FSP was randomly chosen from each Forest Region (RCO, RNI and RSI)
- 10 to15 blocks were randomly chosen from each FSP for evaluation in the office.
- 9 to 10 blocks from each FSP were assessed in the field
- Where possible managed FTG stands in the vicinity of the sample blocks were assessed

Key Results

- Despite the provisions for flexibility and innovation in FRPA, the FSP stocking standards are largely similar to the original stocking standards developed by the MFR over 20 years ago.
- There is a reasonable and improving linkage between stocking standards and TSR.
- Overall in the majority of areas assessed under this project, stocking standards have played, and are playing, a positive role in good overall reforestation results.

FREP Report #19

Key Results Cont'd

- However, there is significant concern for the future development of pine-leading stands established according to the stocking standards in the area represented by the RNI FSP inspections.
- The concerns relate to the impacts of the high incidence of hard pine rusts and/or the poor quality attributes of pine stands on medium to good sites grown to the densities targeted in the stocking standards.

Context for of Pine Issues

- Monitoring projects in several areas have confirmed that incidence levels are generally high, there is un-certainty about the future impacts.
- Observations from RNI estimated 20 to 50% overstory pine with hard pine stem rust infections
- Lakes TSA hard pine stem rust infections of >20%
- There is un-certainty about how long trees with main stem hard pine rust infections will survive.
- However several researchers have stated that these infections usually cause mortality before rotation age.

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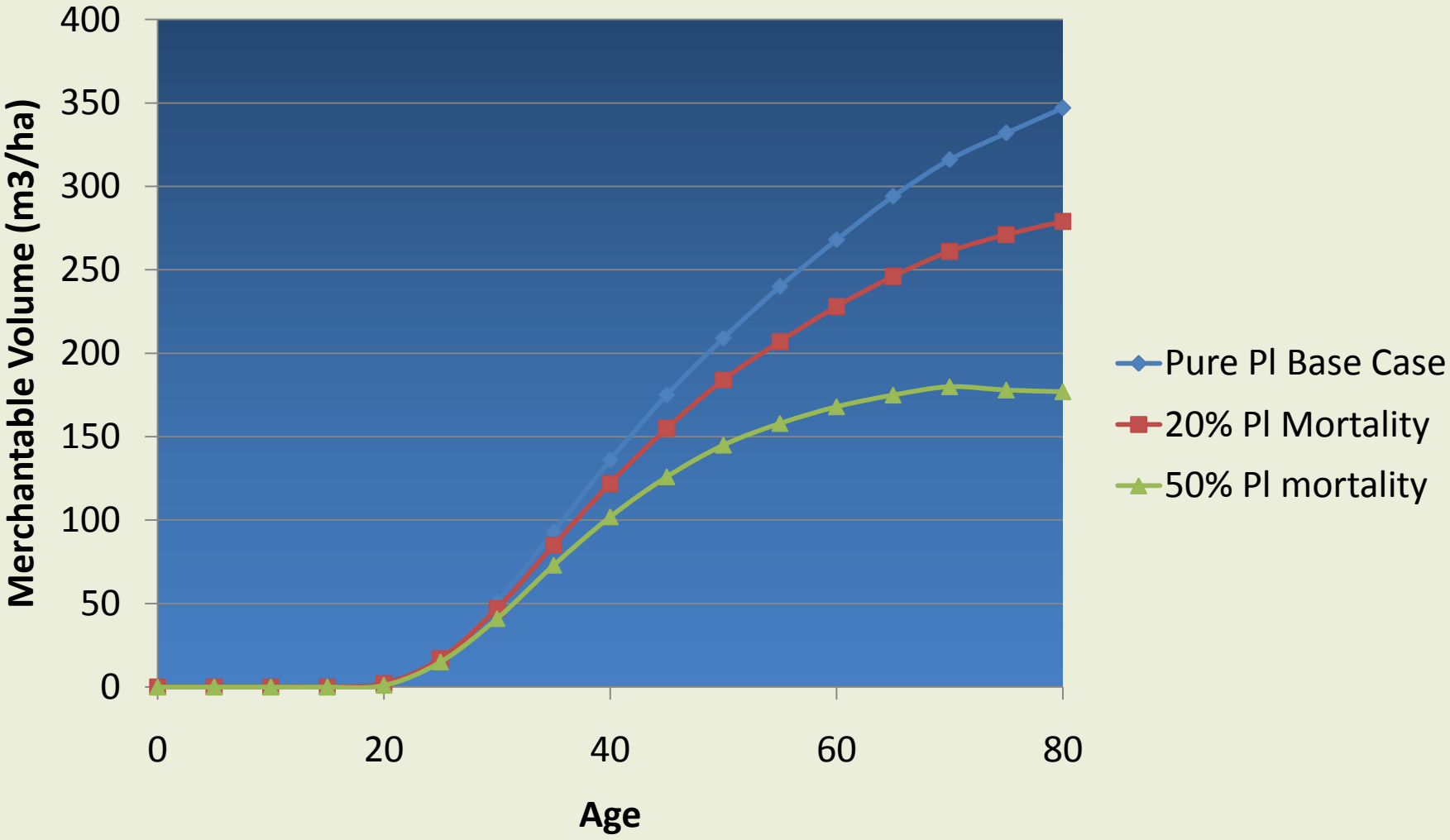
FREP Report #19



Key Results Cont'd

- There should be considerable concern about this situation given the:
  - Widespread use of pine established at similar densities in the interior,
  - Widespread range and incidence of forest health agents which affect pine and the uncertainty about the impacts of these health issues on future stand development and,
  - The importance of existing managed and future stands to the mid-term timber supply in MPB impacted FMUs.

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& Associates Ltd.

Are we growing pine properly?

Recommendations:

- There is an immediate need to review TSR, stocking standards and reforestation practices in areas where immature pine leading stands are at high risk from forest health agents.
- There is the need for short and long term research on the impacts of forest health agents affecting immature pine.
- There is a need for extensive and long-term monitoring of free growing stands throughout BC to ensure they are meeting timber supply projections and quality expectations.

Forest For Tomorrow
Reflections on decision making in age class 2 Pine stands

By
Nathan P. Davis
B.A. Blackwell and Associates Ltd.

April 2010

- A tree is a tree - how many more do you need to look at.

-- Ronald Regan (1982)

"One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise."
— Aldo Leopold (1948)

April 2010

April 2010

April 2010

April 2010


2009/08/27

April 2010

April 2010

April 2008

April 2010

April 2010