

# DIY Climate Based Seed Transfer

Greg O'Neill

British Columbia Ministry of Forests

Canadian Forest Genetics Association  
Tree Seed Working Group

June 23 2022

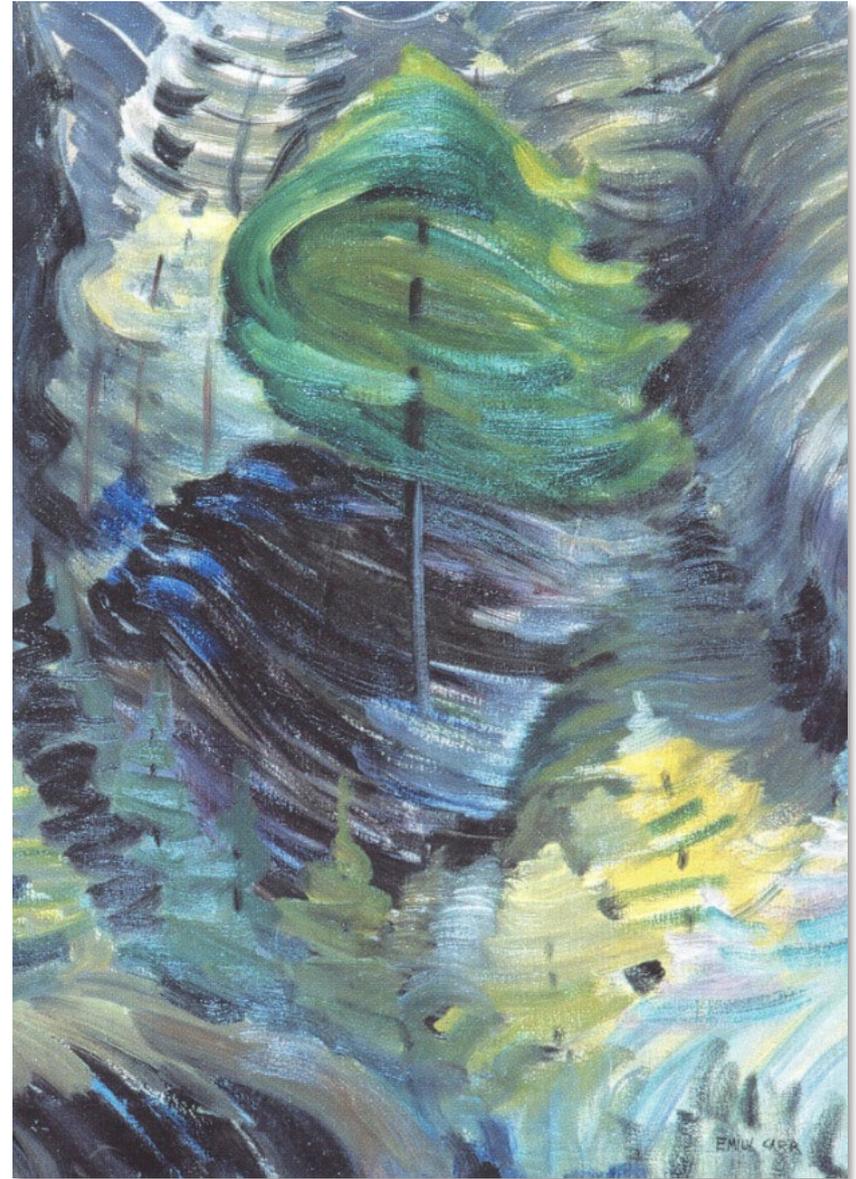


Image: Emily Carr, Art Gallery of Greater Victoria

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Rationale  
System  
Research



# DIY Climate Based Seed Transfer



Photo: Alex Woods      Dothistroma needle cast



Photo: P. Hennon      Yellow-cedar decline - Alaska

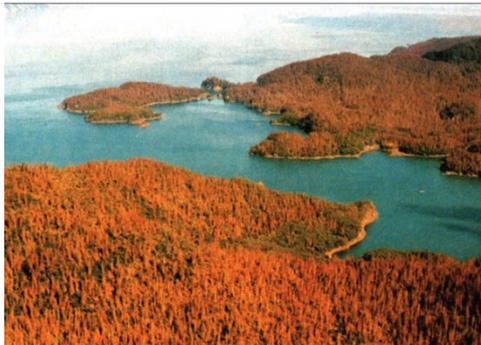


Photo: Ed Halsten      Spruce beetle - Alaska



Photo: Kevin Buxton      Drought mortality- Okanagan



Photo: L. McLachlan      Mountain pine beetle



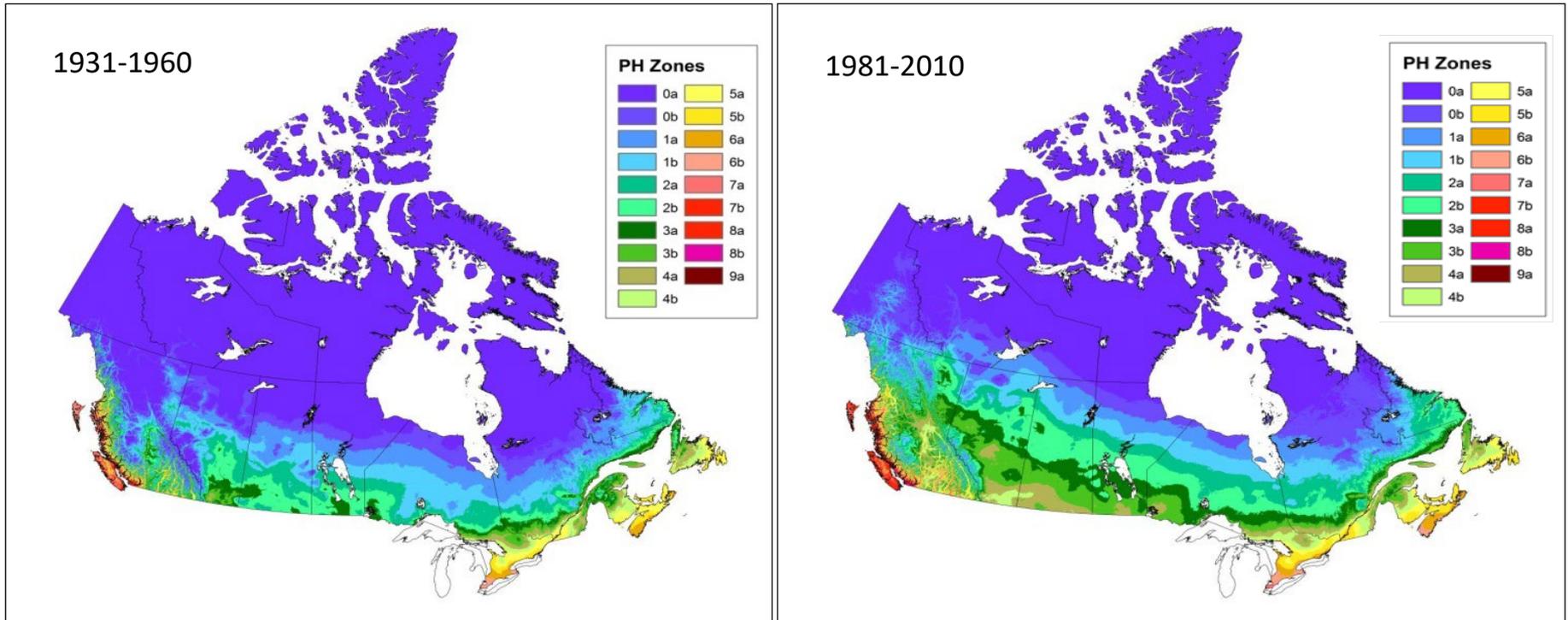
Photo: T. Hogg      Spruce and aspen dieback



# DIY Climate Based Seed Transfer



## Plant Hardiness zone map



McKenney et al. 2014. BioScience

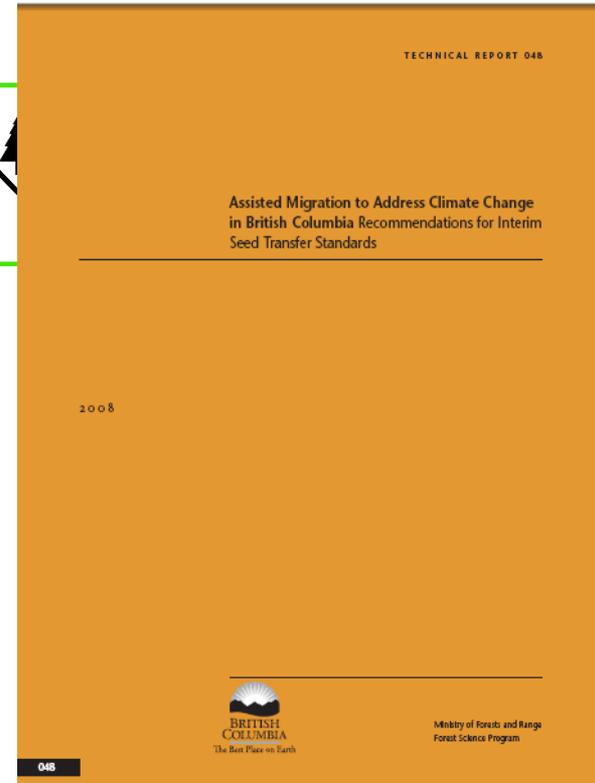
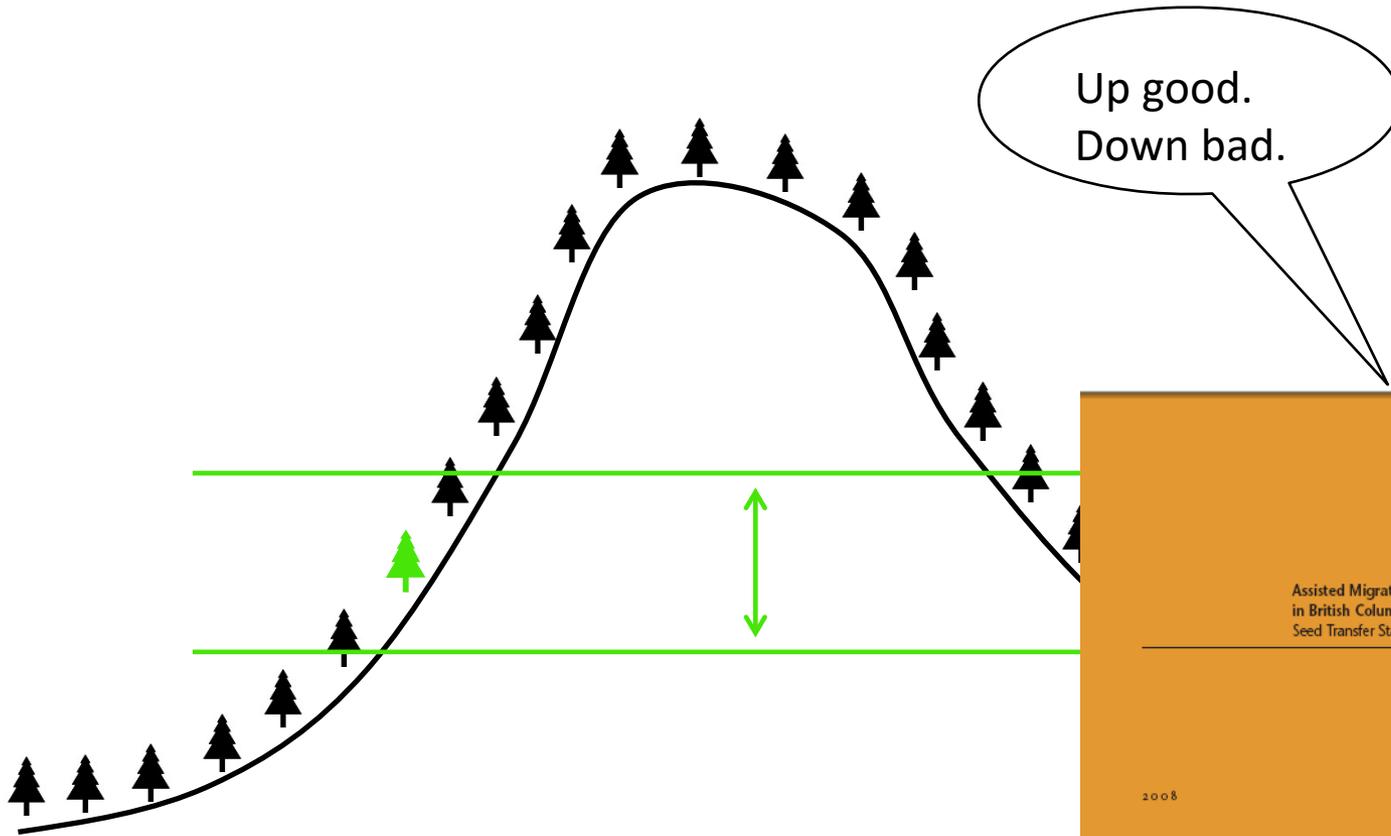




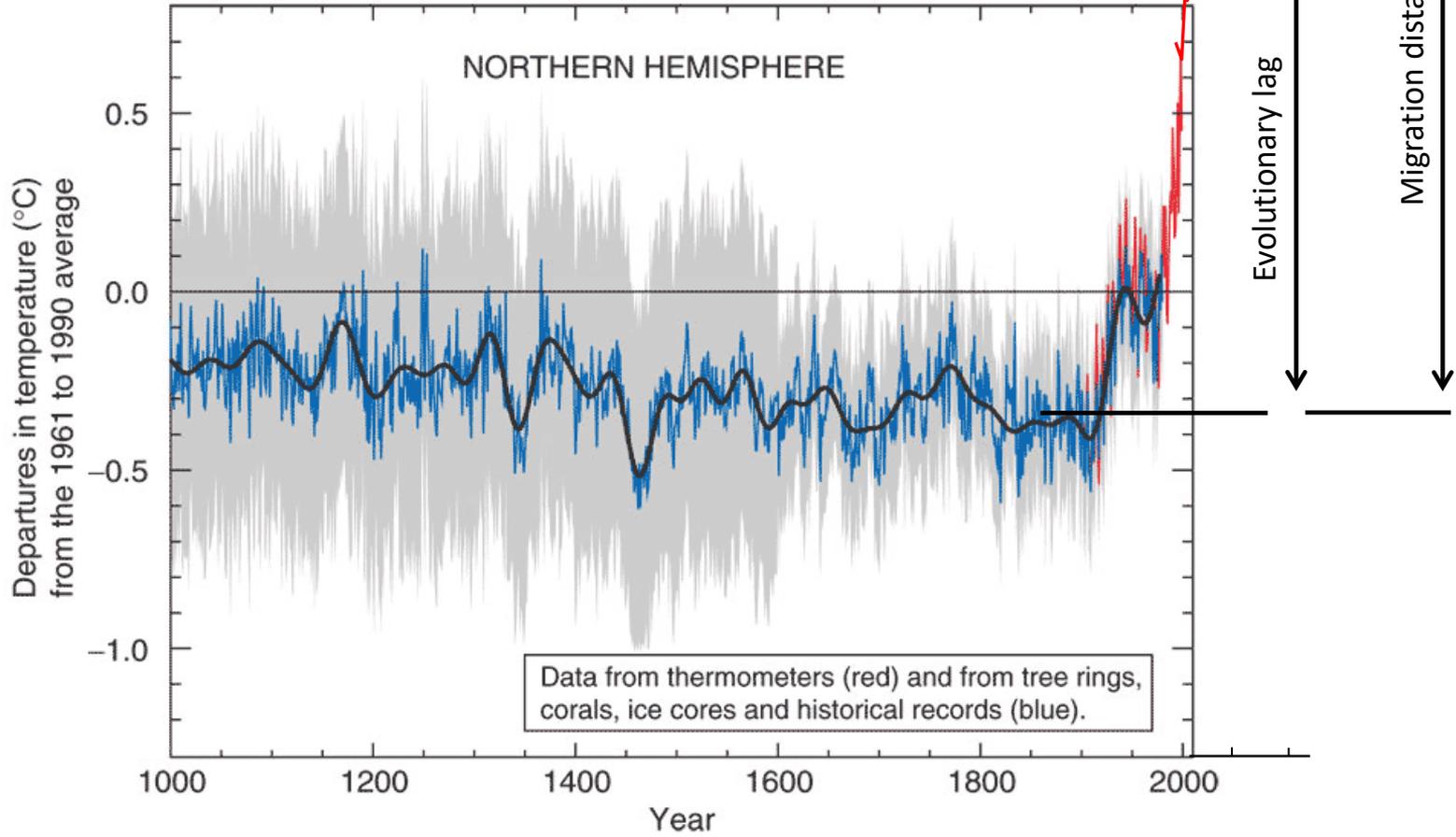
Image: Peter Strother





Proxy temperatures

Observed temperatures



IPCC 2001



# DIY Climate Based Seed Transfer



Rationale  
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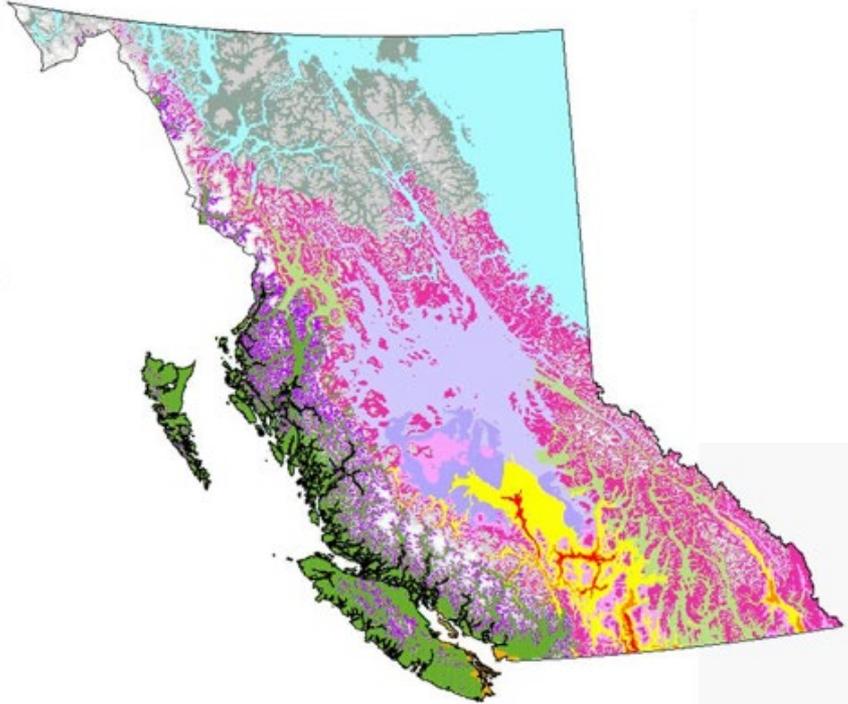
Photo: Rita Leistner



# DIY Climate Based Seed Transfer



BEC Zones



BEC Variants

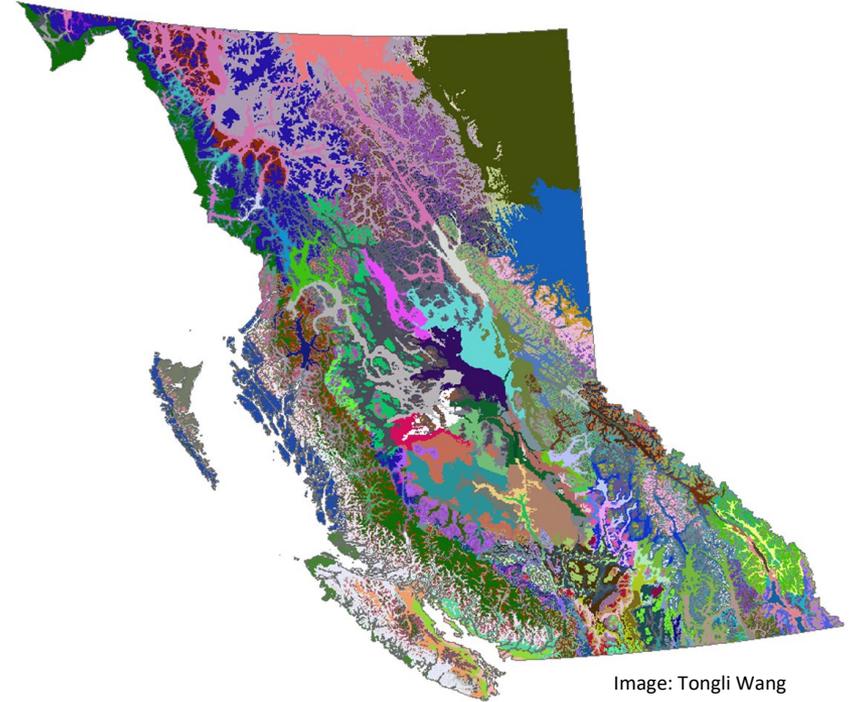
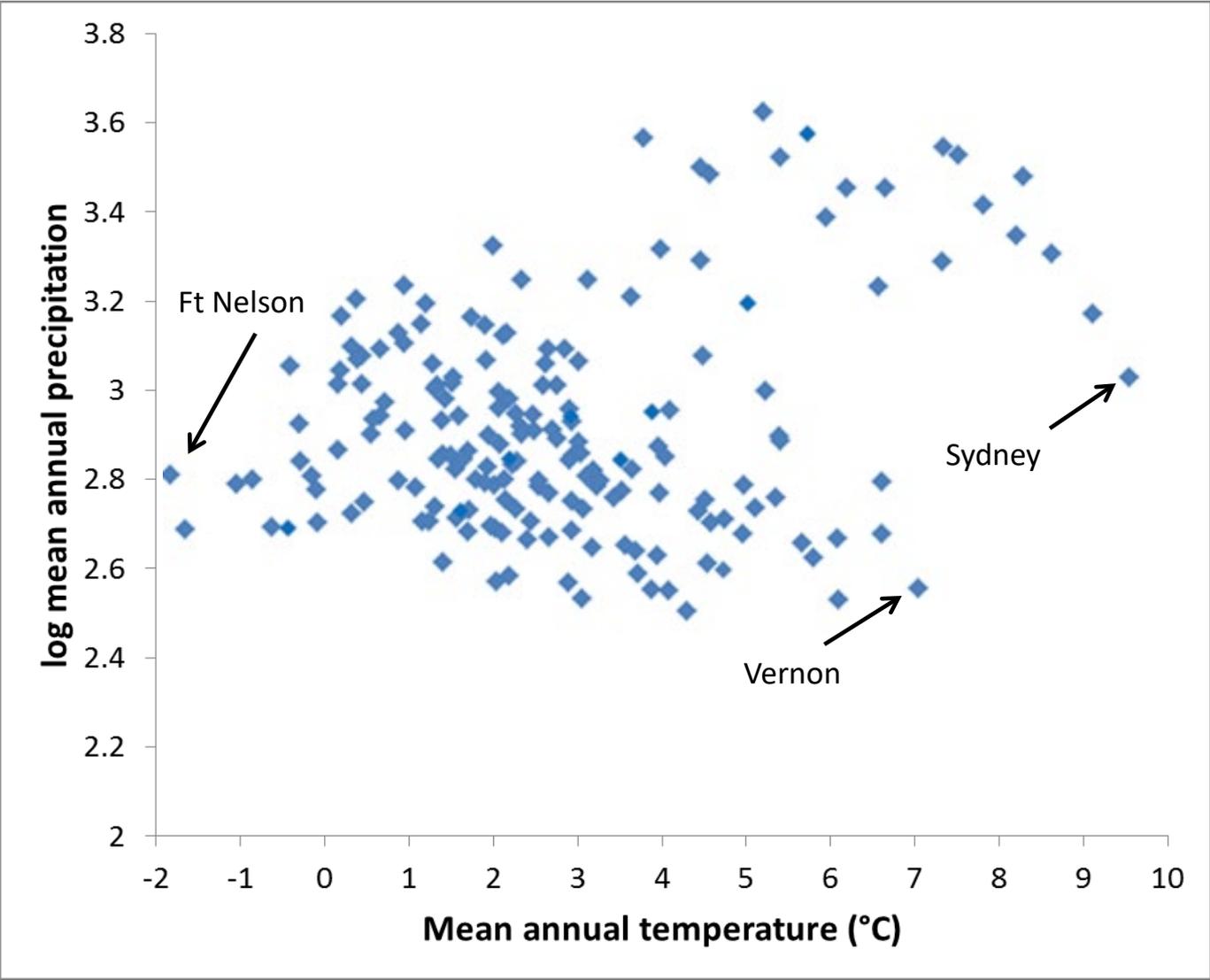
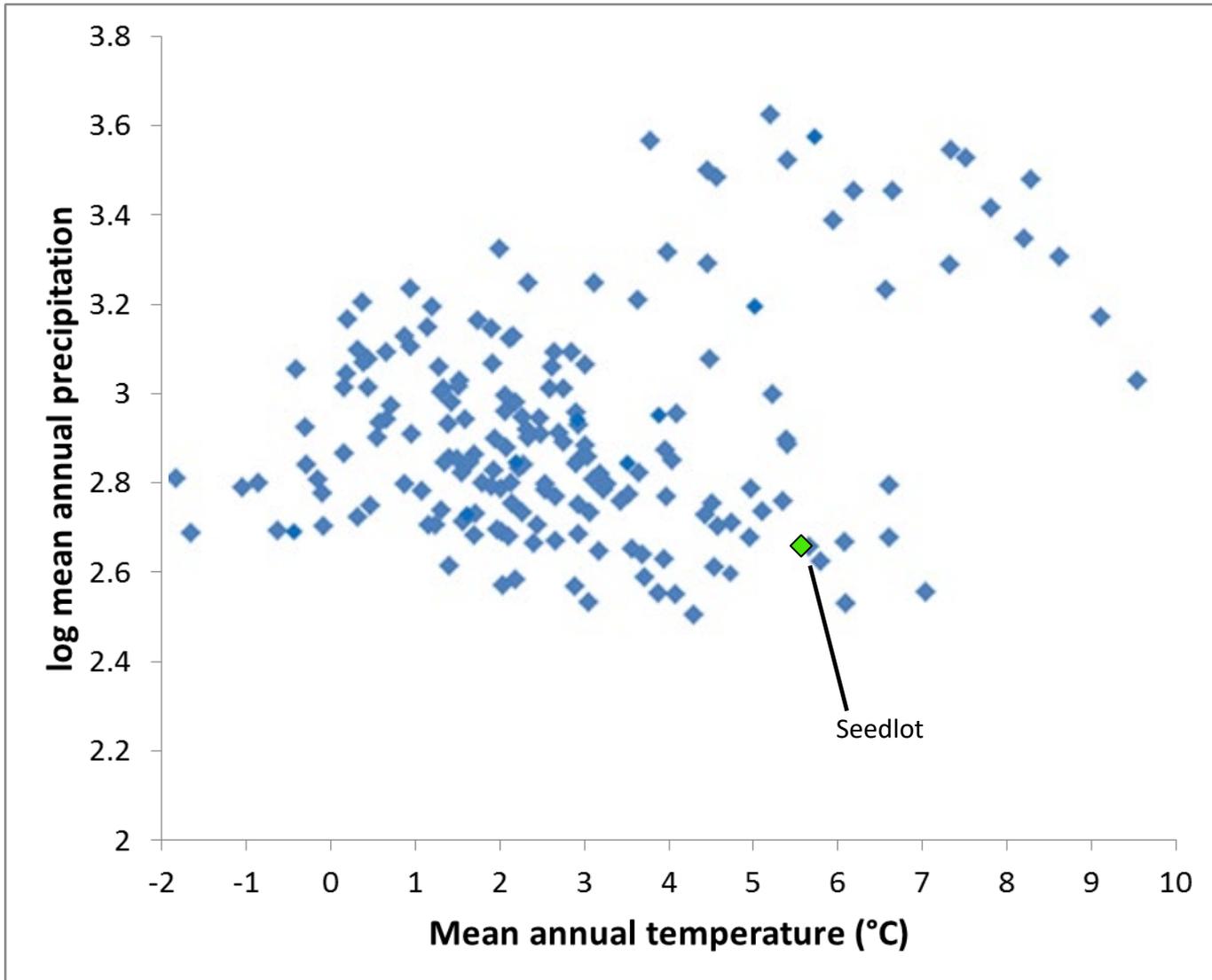
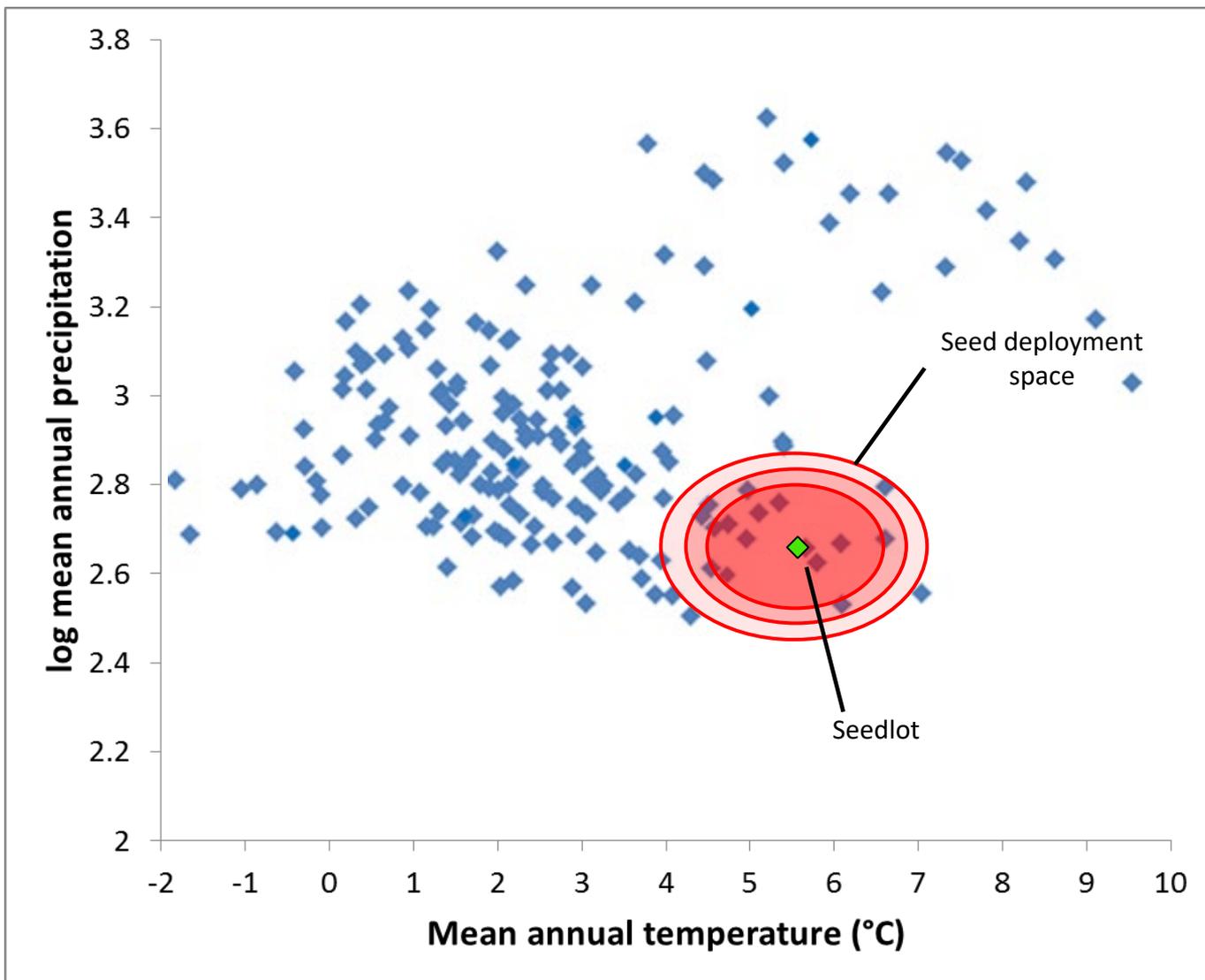


Image: Tongli Wang

# Forested BEC variants of BC

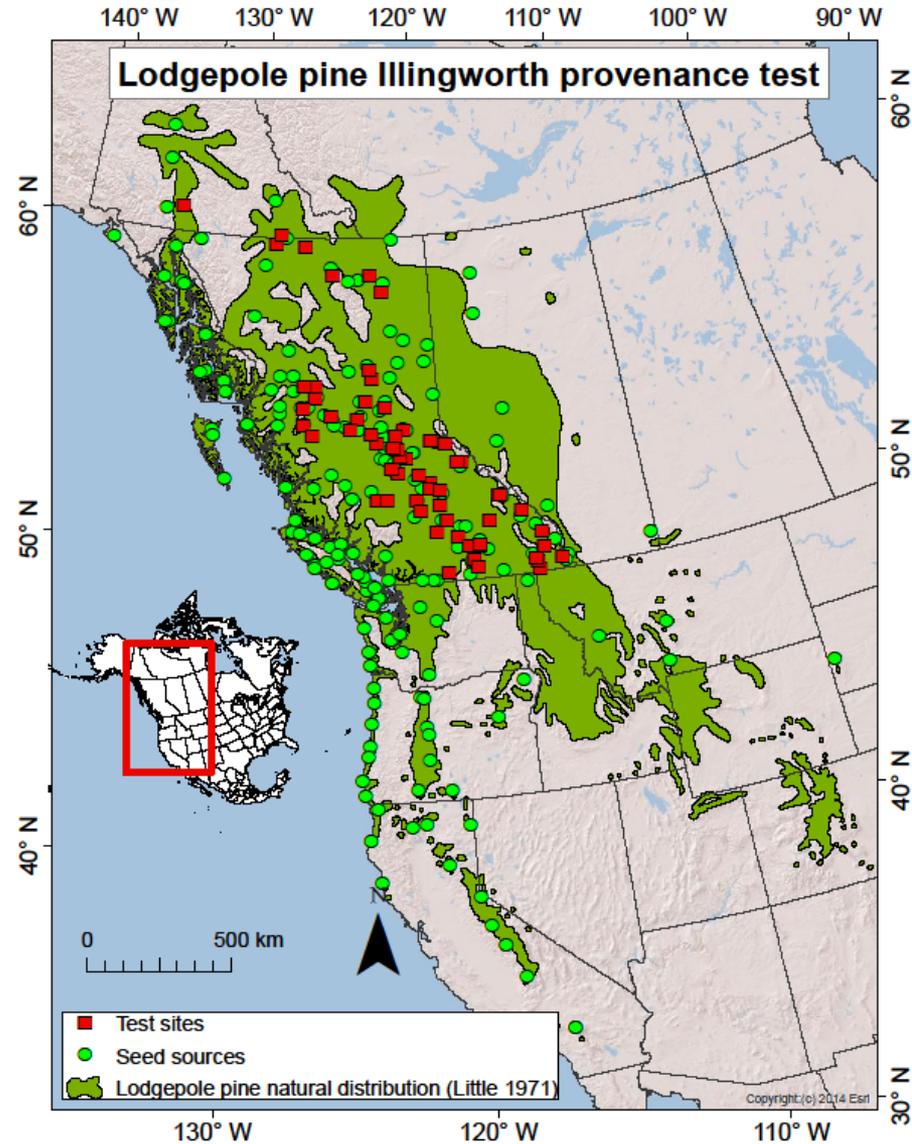


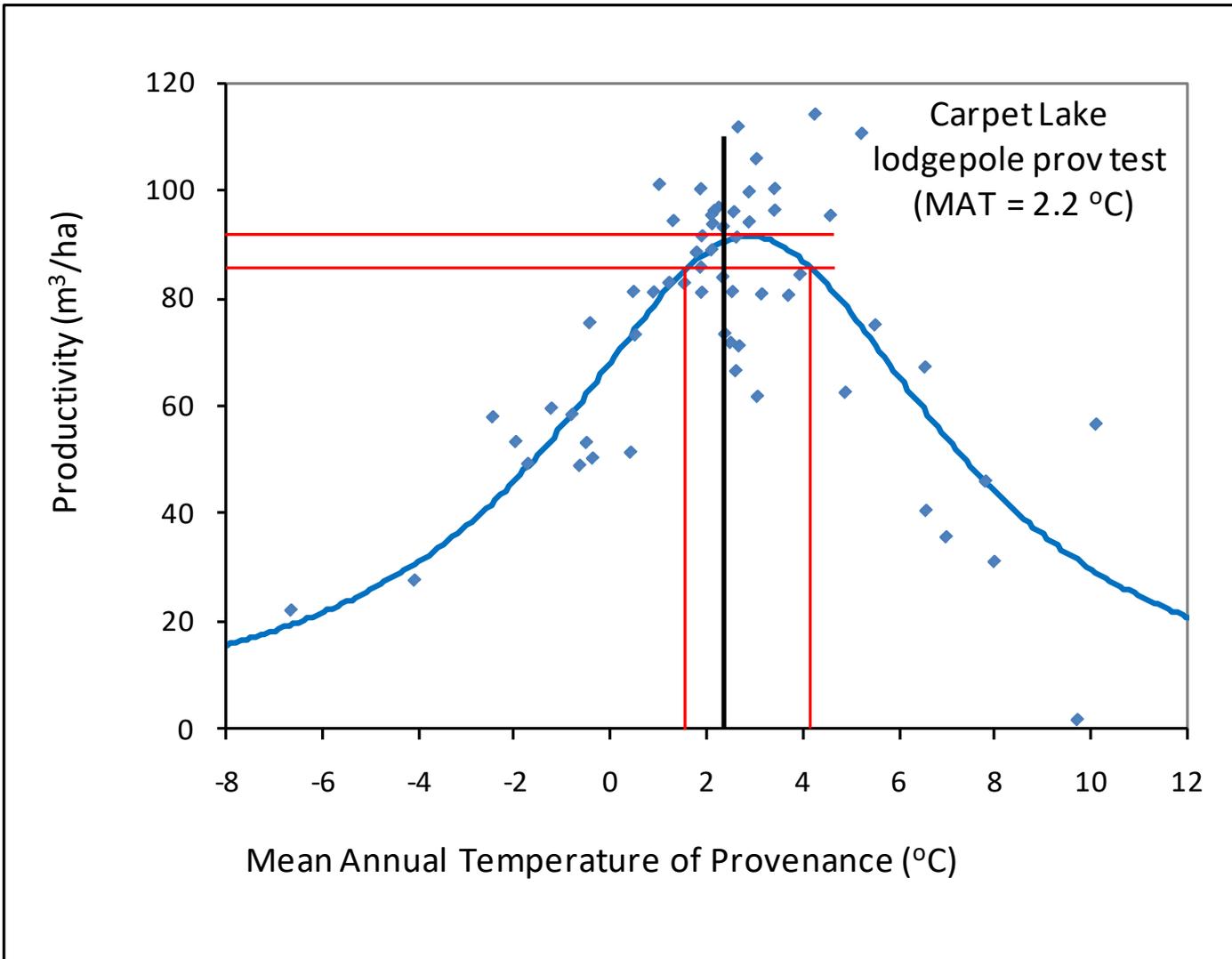






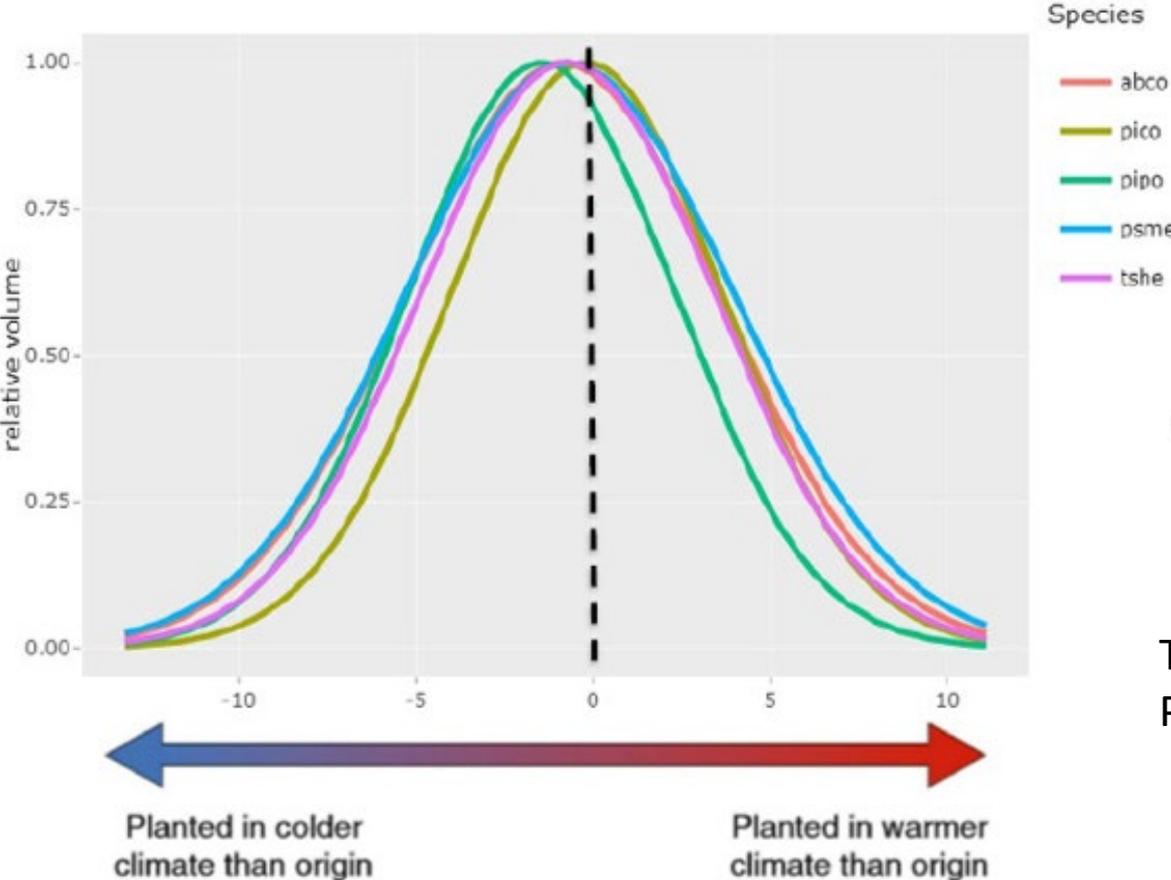
# DIY Climate Based Seed Transfer



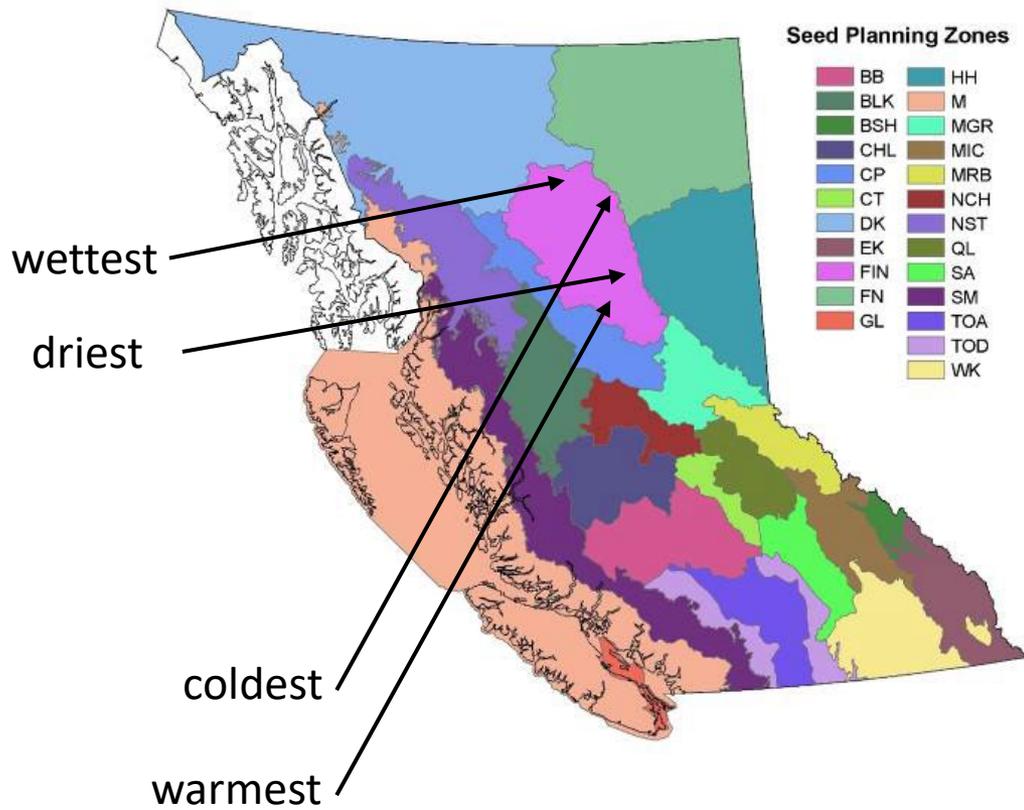




# DIY Climate Based Seed Transfer



Temp +/- 2°C  
Precip +/- 40%



SSTD temp = warmest – coldest  
 SSTD precip = wettest - driest

**ClimateNA\_MAP**  
 -- An Interactive Platform for Visualization and Data Access

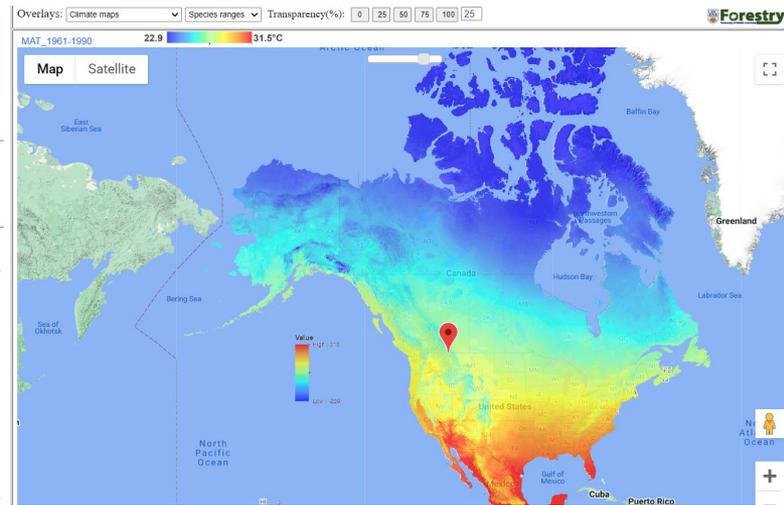
Coordinates Input (click on the map or type in coordinates)

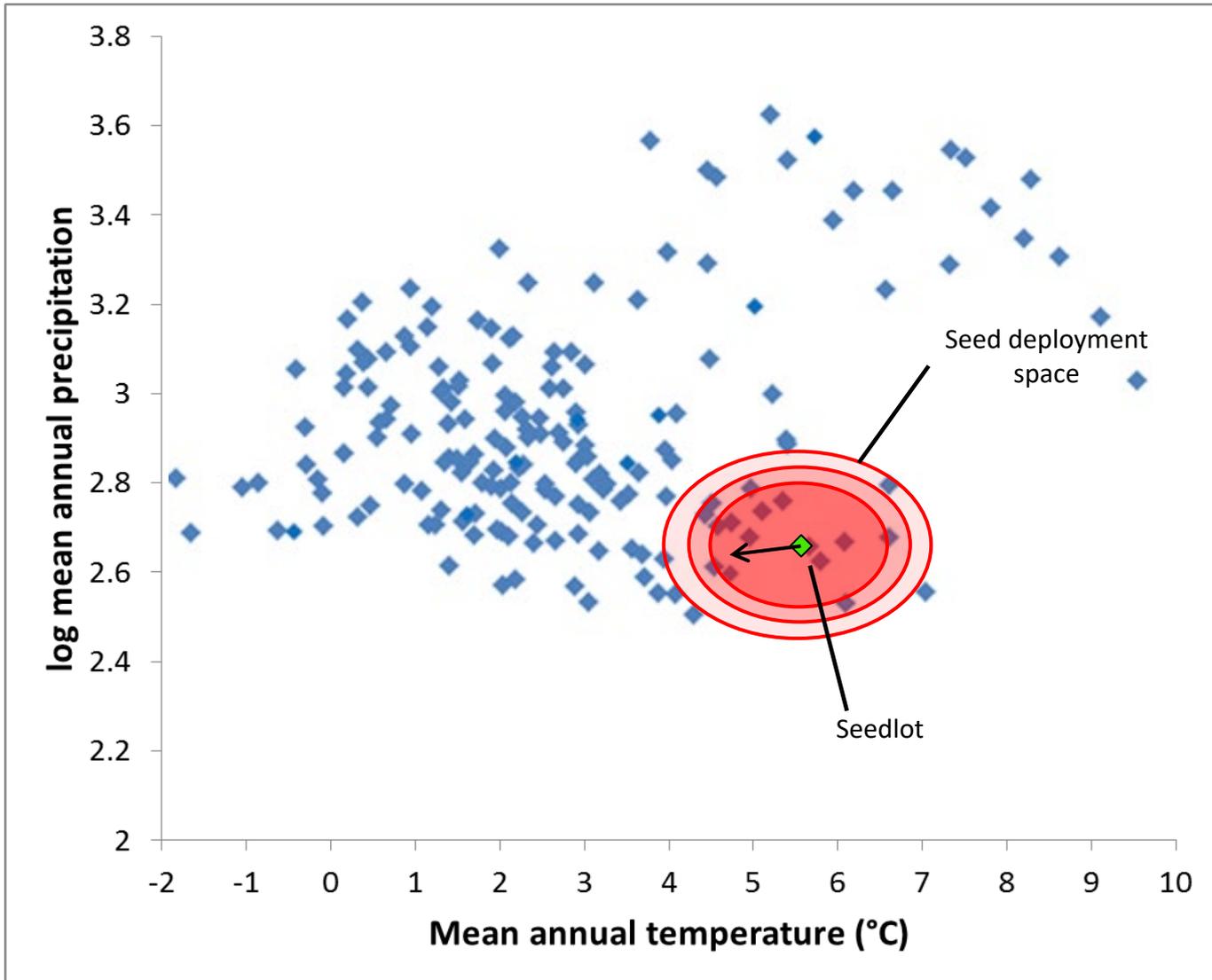
Latitude:  Longitude:

Elev (m):  Historical:

Future:

Annual Variables:   
 Seasonal Variables:   
 Monthly Variables:







# Tree Improvement Branch: Seedlot Selection Tool Version 4.1

Instructions | I Have A Cutblock | I Have A Seedlot

Seedlot Number:

Set Species & BEC

OR

Species:

BEC Variant:

Assisted Migration Scenario:

Minimum Genetic Suitability:

Minimum Species Suitability:

GO

Plantation BEC	Seed BEC	Genetic Suitability	Species Suitability
IDFdk2	IDFdk2	100.0	65.2
ICHmk1	IDFdk2	99.7	71.5
MSdm1	IDFdk2	99.4	80.4
IDFdk1	IDFdk2	99.4	53.8
ICHmk2	IDFdk2	99.0	71.5
IDFdm1	IDFdk2	98.9	58.0
IDFdc	IDFdk2	98.9	62.4
IDFxc	IDFdk2	98.7	45.1
ICHdw3	IDFdk2	98.5	53.6
MSdm3	IDFdk2	98.5	75.5
MSdm2	IDFdk2	98.3	77.2
ICHmw2	IDFdk2	98.2	43.1
ICHdw2	IDFdk2	98.2	61.9





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Instructions | I Have A Cutblock | I Have A Seedlot

Seedlot Number:

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OR

Species:

BEC Variant:

Assisted Migration Scenario:

Minimum Genetic Suitability:

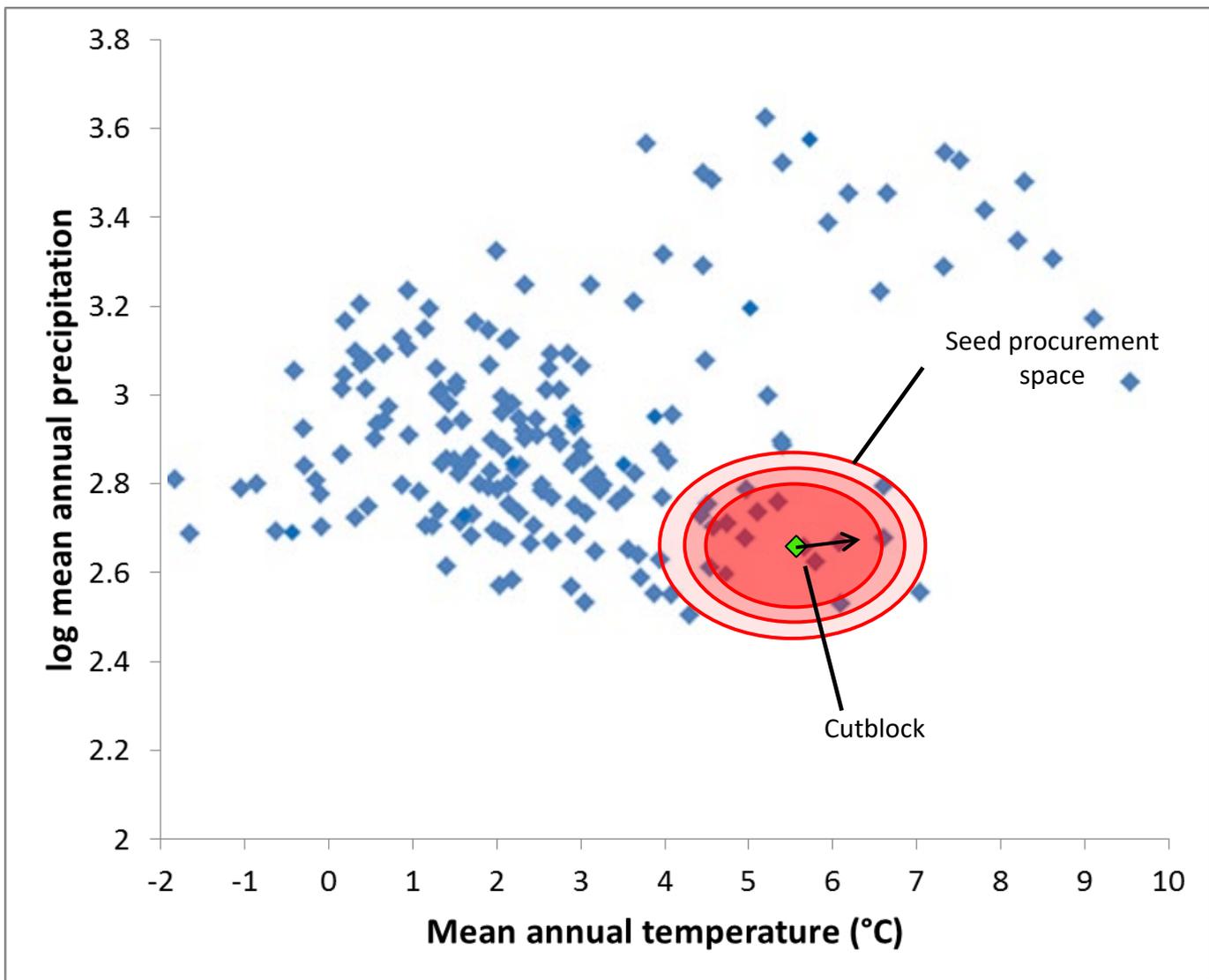
Minimum Species Suitability:

GO

Plantation BEC	Seed BEC	Genetic Suitability	Species Suitability
MSxk1	IDFdk2	99.7	80.3
MSxk2	IDFdk2	99.7	60.0
IDFdc	IDFdk2	99.4	42.8
MSdm2	IDFdk2	99.0	64.0
MSdc1	IDFdk2	99.0	61.4
MSxk3	IDFdk2	98.9	77.0
MSdm3	IDFdk2	98.7	77.7
MSdm1	IDFdk2	98.6	71.4
IDFdw	IDFdk2	98.6	71.6
ESSFxc2	IDFdk2	98.5	85.1
ESSFdc1	IDFdk2	98.4	76.2
SBSmm	IDFdk2	98.3	85.3
SBSmc1	IDFdk2	98.2	76.1



Switch  
Print  
Layers





# Tree Improvement Branch: Seedlot Selection Tool Version 4.1

Instructions | I Have A Cutblock | I Have A Seedlot

Seedlot Number:

Set Species & BEC

OR

Species:

BEC Variant:

Assisted Migration Scenario:

Minimum Genetic Suitability:

Minimum Species Suitability:

GO

Plantation BEC	Seed BEC	Genetic Suitability	Species Suitability
IDFdk2	IDFdk2	100.0	65.2
ICHmk1	IDFdk2	99.7	71.5
MSdm1	IDFdk2	99.4	80.4
IDFdk1	IDFdk2	99.4	53.8
ICHmk2	IDFdk2	99.0	71.5
IDFdm1	IDFdk2	98.9	58.0
IDFdc	IDFdk2	98.9	62.4
IDFxc	IDFdk2	98.7	45.1
ICHdw3	IDFdk2	98.5	53.6
MSdm3	IDFdk2	98.5	75.5
MSdm2	IDFdk2	98.3	77.2
ICHmw2	IDFdk2	98.2	43.1
ICHdw2	IDFdk2	98.2	61.9



Switch  
Print  
Layers

Instructions I Have A Cutblock I Have A Seedlot

Species:  
 PLI

BEC Variant:  
 IDFdK2

GO

Plantation BEC	Seed BEC	Species Suitability	Limit
IDFdK2	IDFmw1	Suitable	
IDFdK2	IDFww1	Suitable	
IDFdK2	ICHdw4	Suitable	
IDFdK2	ICHxw	Suitable	
IDFdK2	IDFdm1	Suitable	
IDFdK2	ICHdw1	Suitable	
IDFdK2	IDFww	Suitable	
IDFdK2	IDFmw2	Suitable	

Seedlot	Orchard	GW	Class	Seed BEC

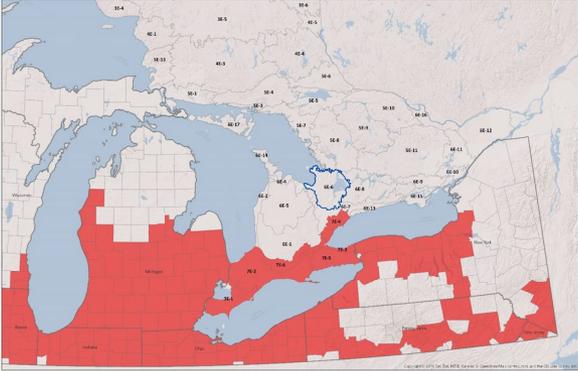




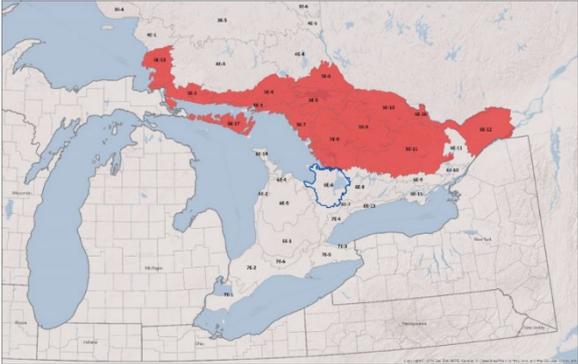
# DIY Climate Based Seed Transfer



## Ontario's focal zone system



I have a cutblock. Where can I get seed?



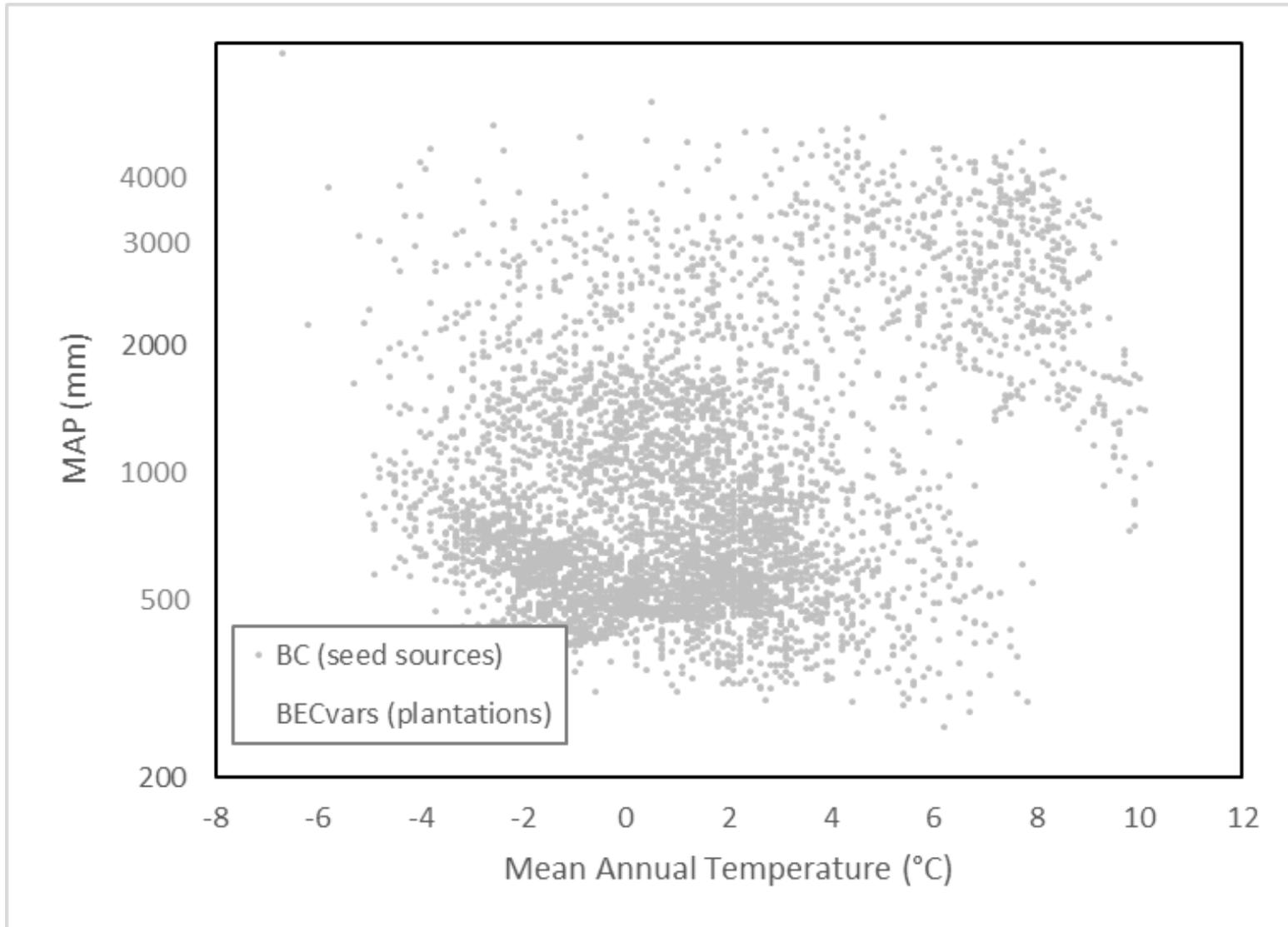
I have a seedlot. Where can I use it?



Rationale  
System  
Research

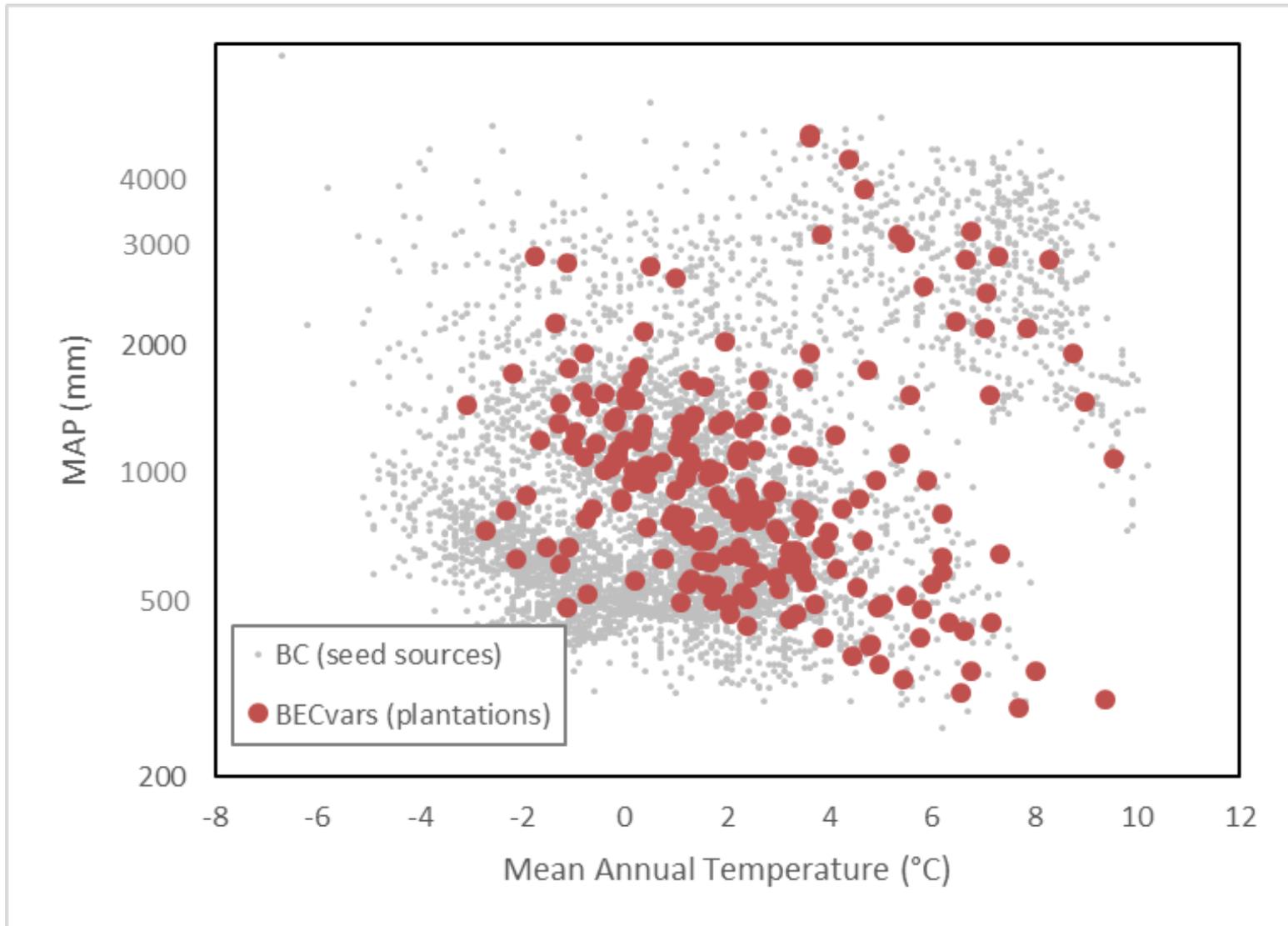


## Future Seed Procurement



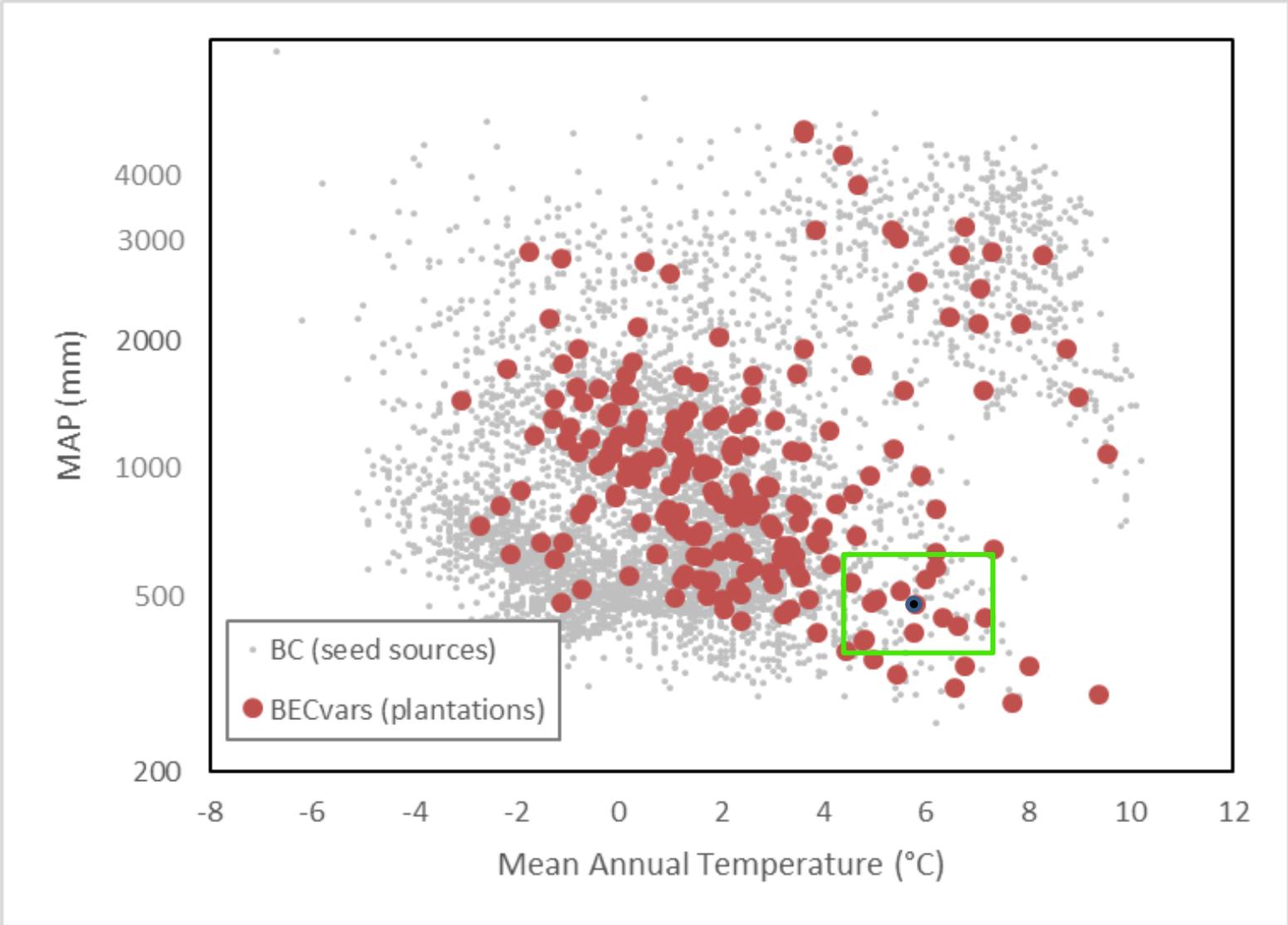


## Future Seed Procurement



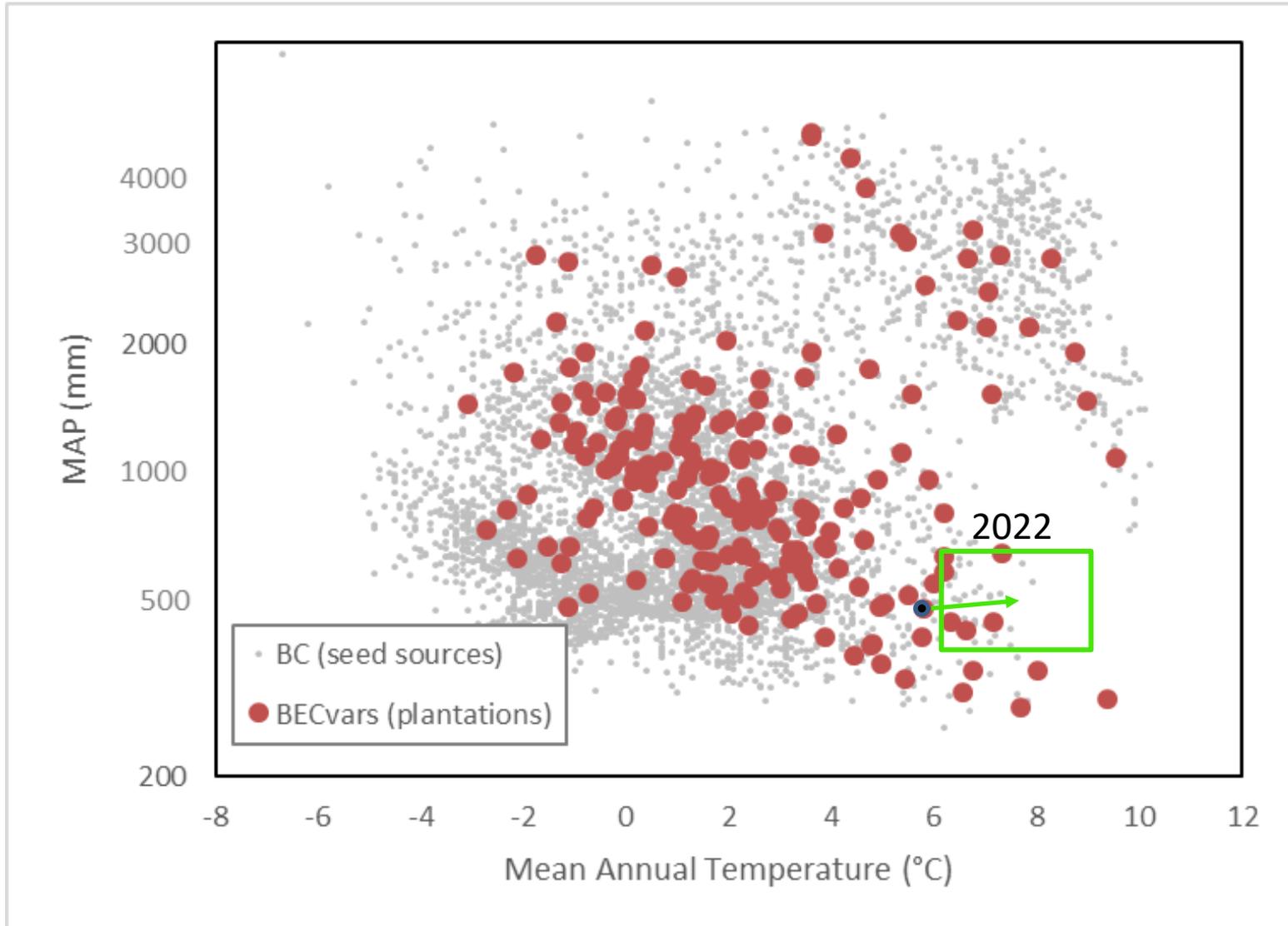


## Future Seed Procurement



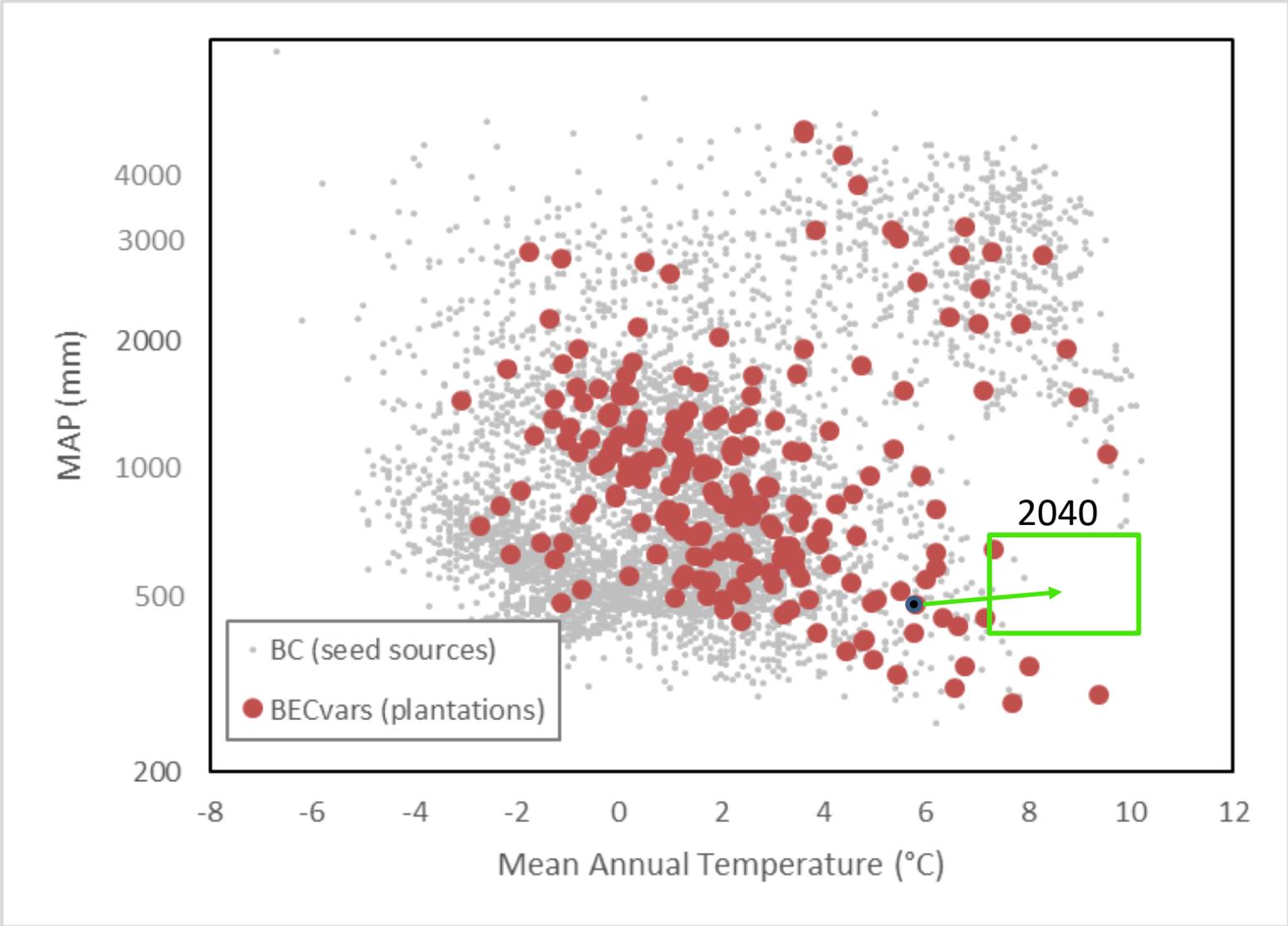


## Future Seed Procurement



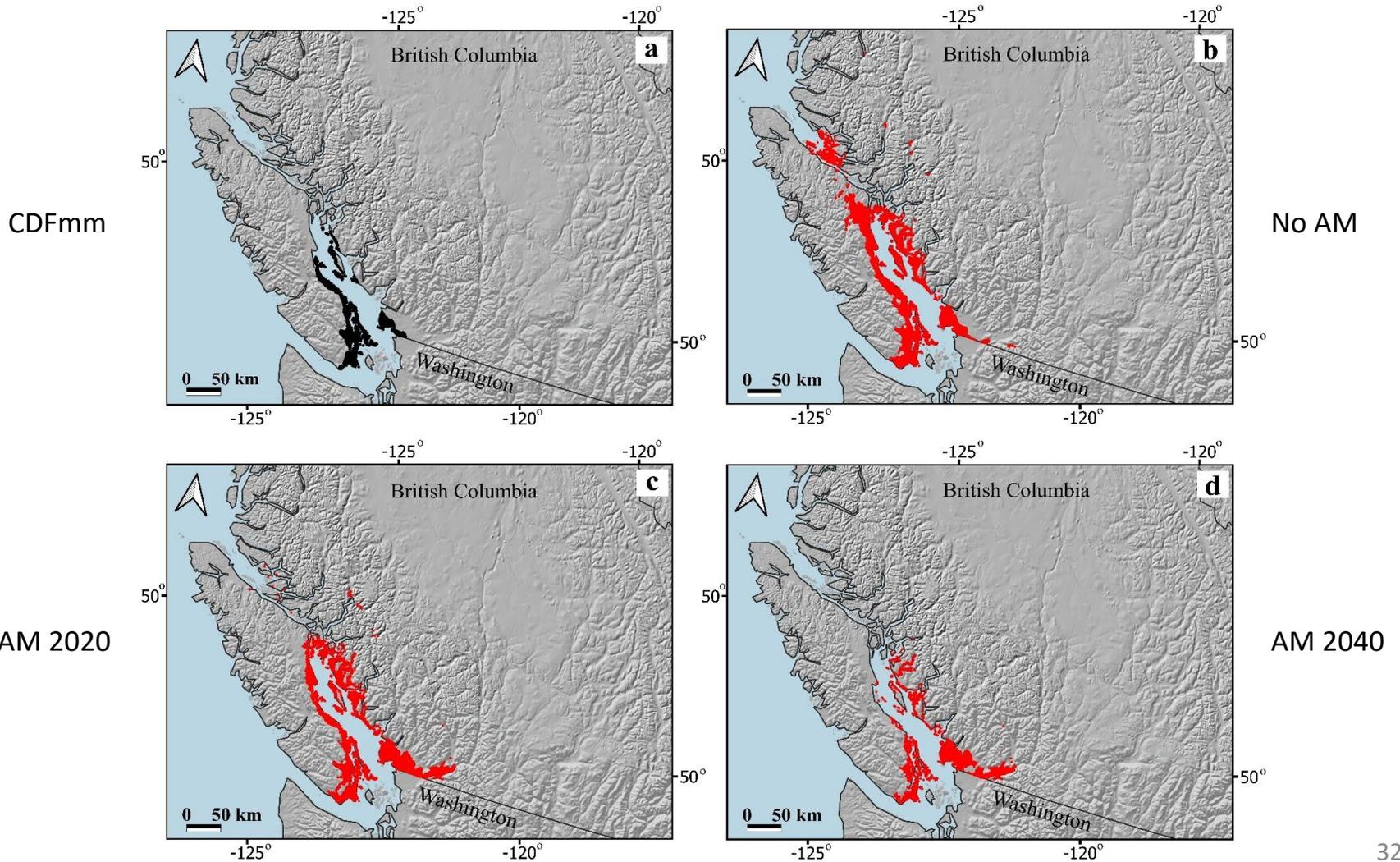


## Future Seed Procurement



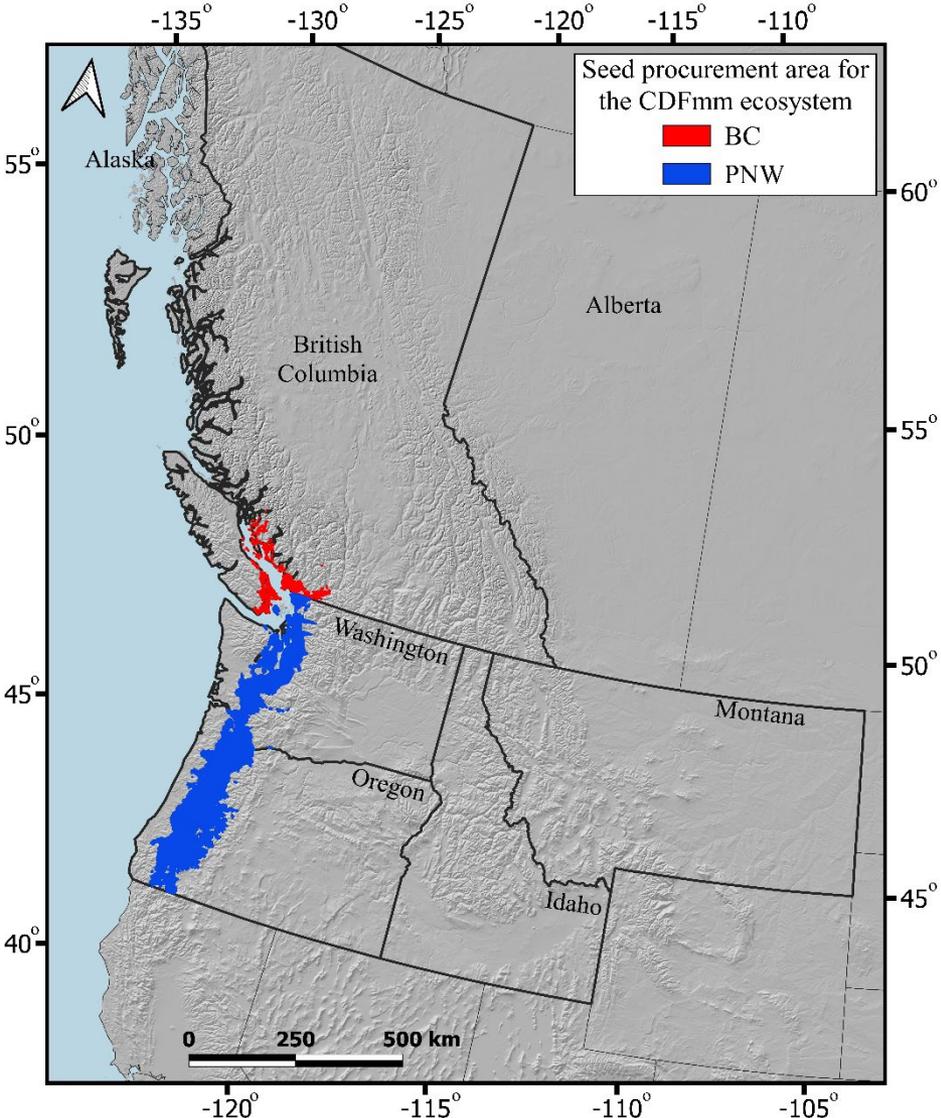


## Future Seed Procurement



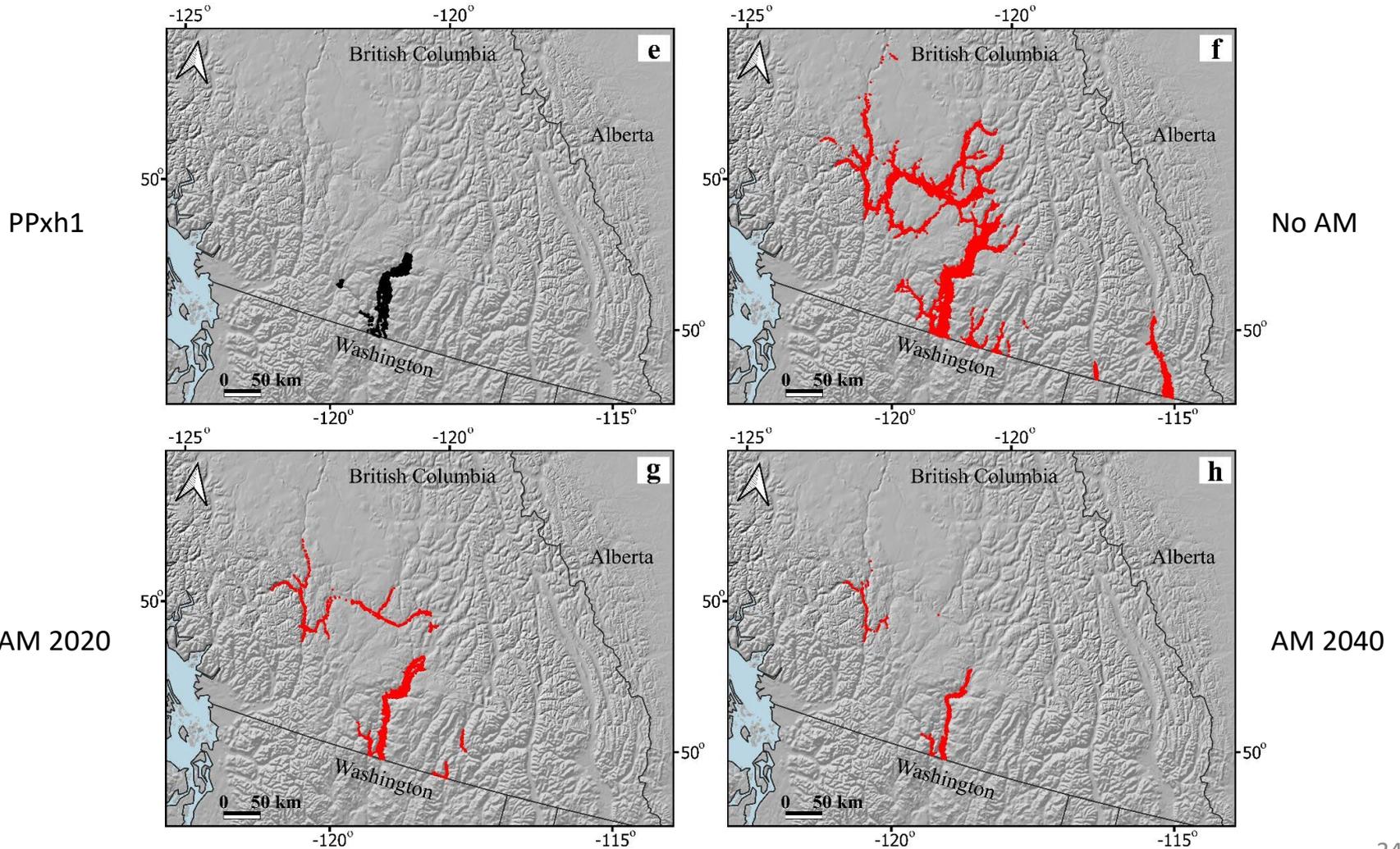


## Future Seed Procurement



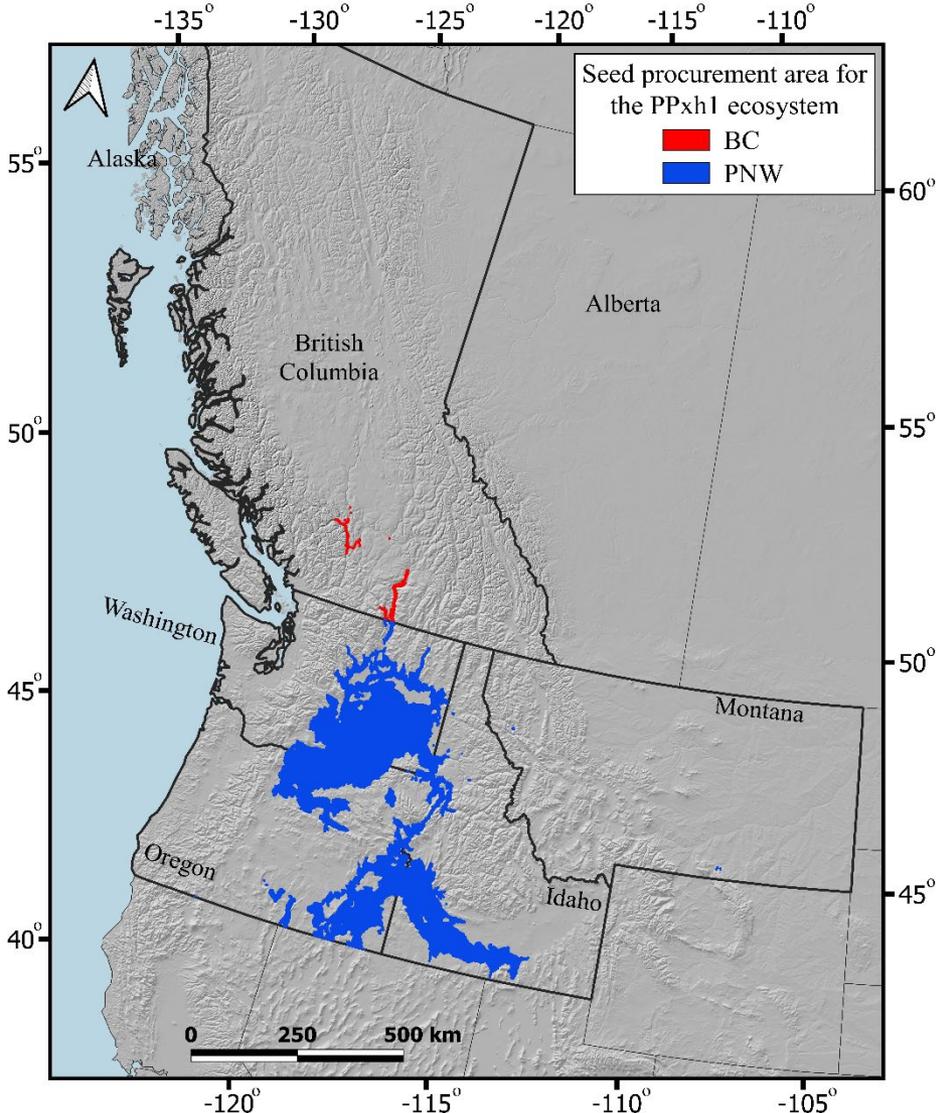


## Future Seed Procurement





## Future Seed Procurement



Thank you



**Acknowledgments**

Tongli Wang

Nick Ukrainetz

Alvin Yanchuk

Susan Zedel

Michael Stoehr

Margo Spence









# Assisted Migration Adaptation Trial (AMAT)



Photo: Ward Strong

- 15 tree species; 1-10 seed sources/species
- 48 test sites
- Established 2009-2012
- 152 000 trees

## Objectives:

- Quantify safe seed transfer distance
- Assess fundamental niche of tree species to help guide assisted migration

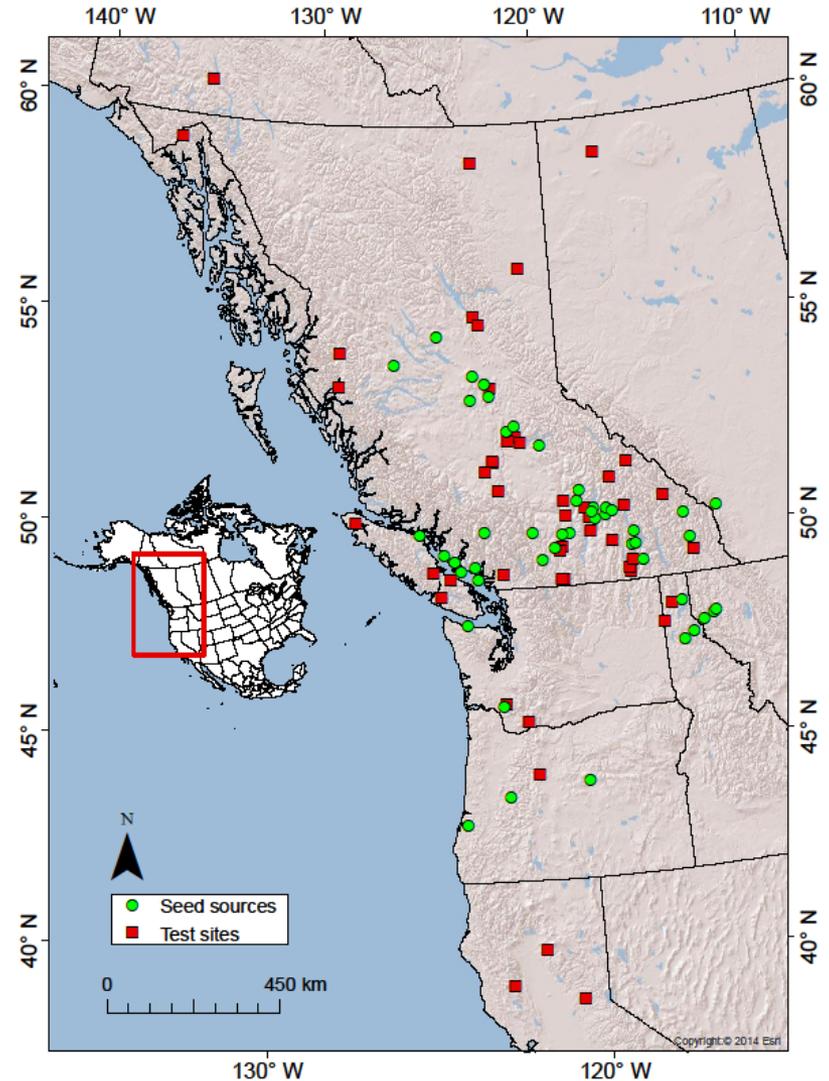
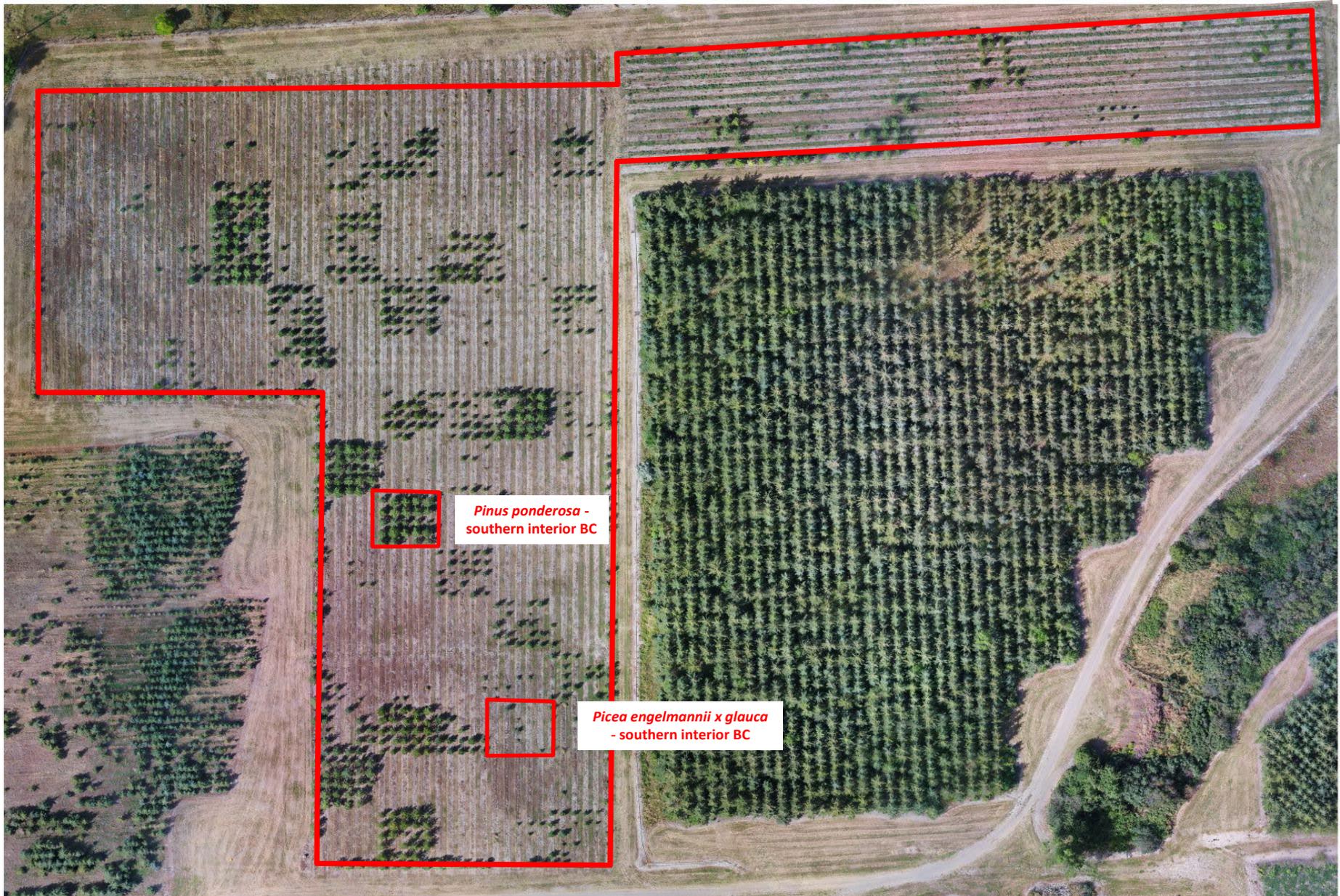


Image: Amy Vallarino

# Nitinat AMAT, Vancouver Island, BC

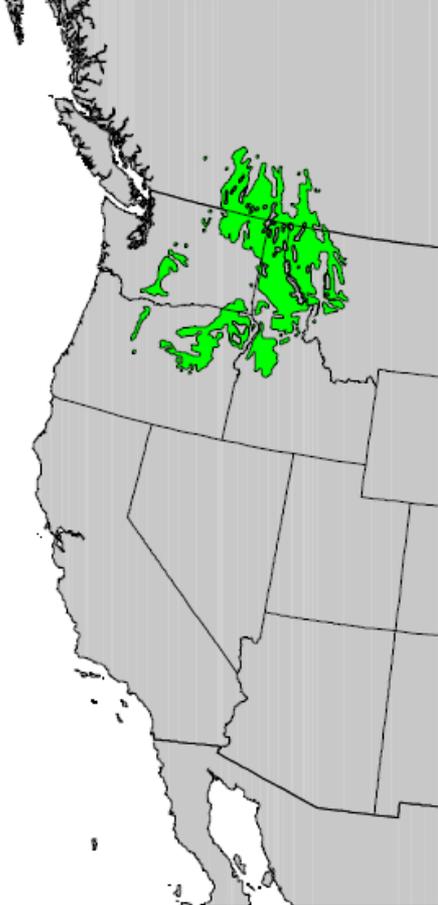
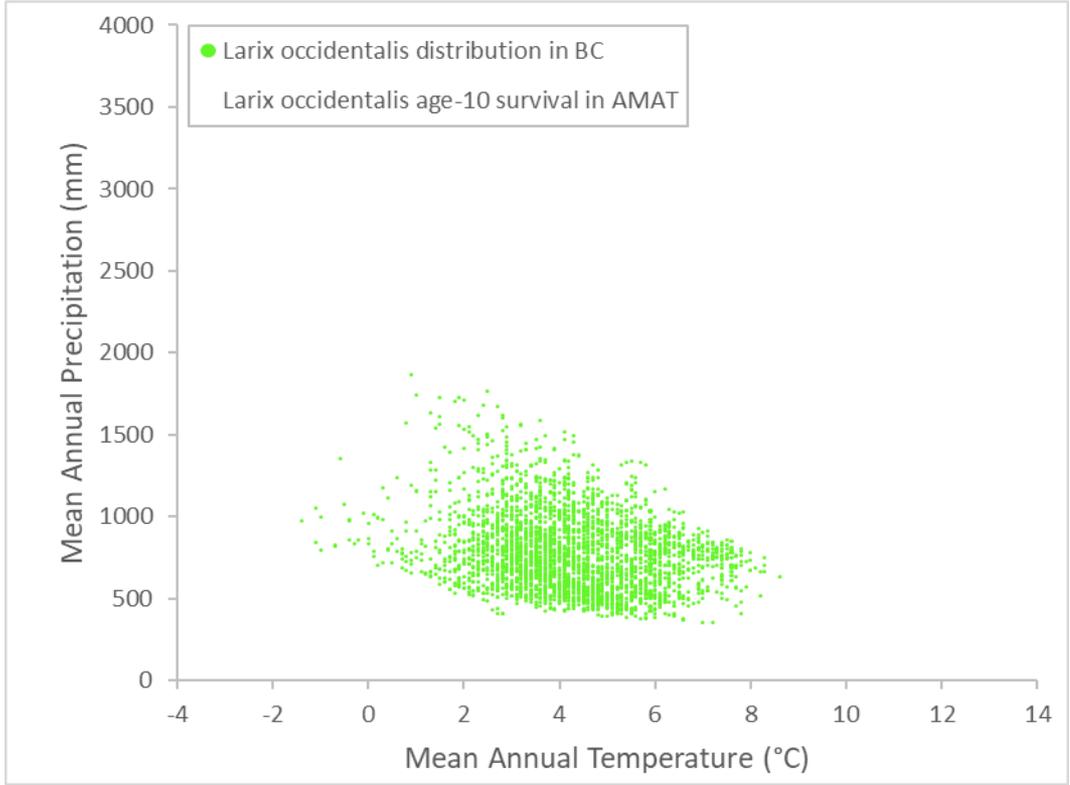


# Kalamalka AMAT - Vernon, BC

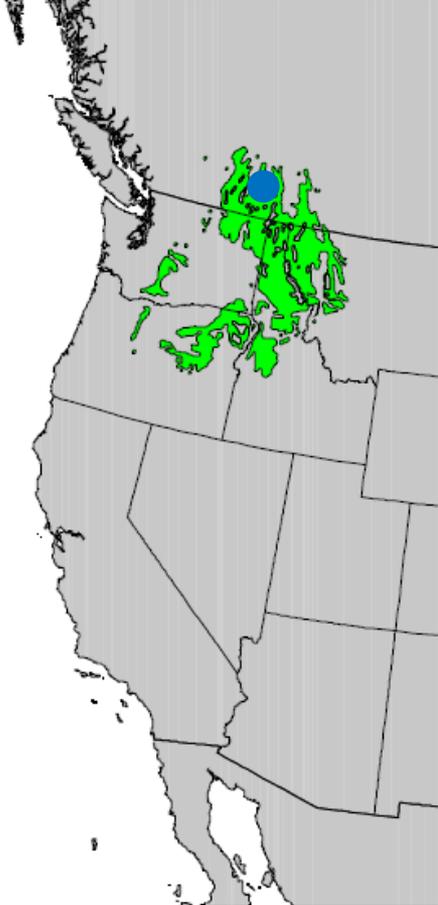
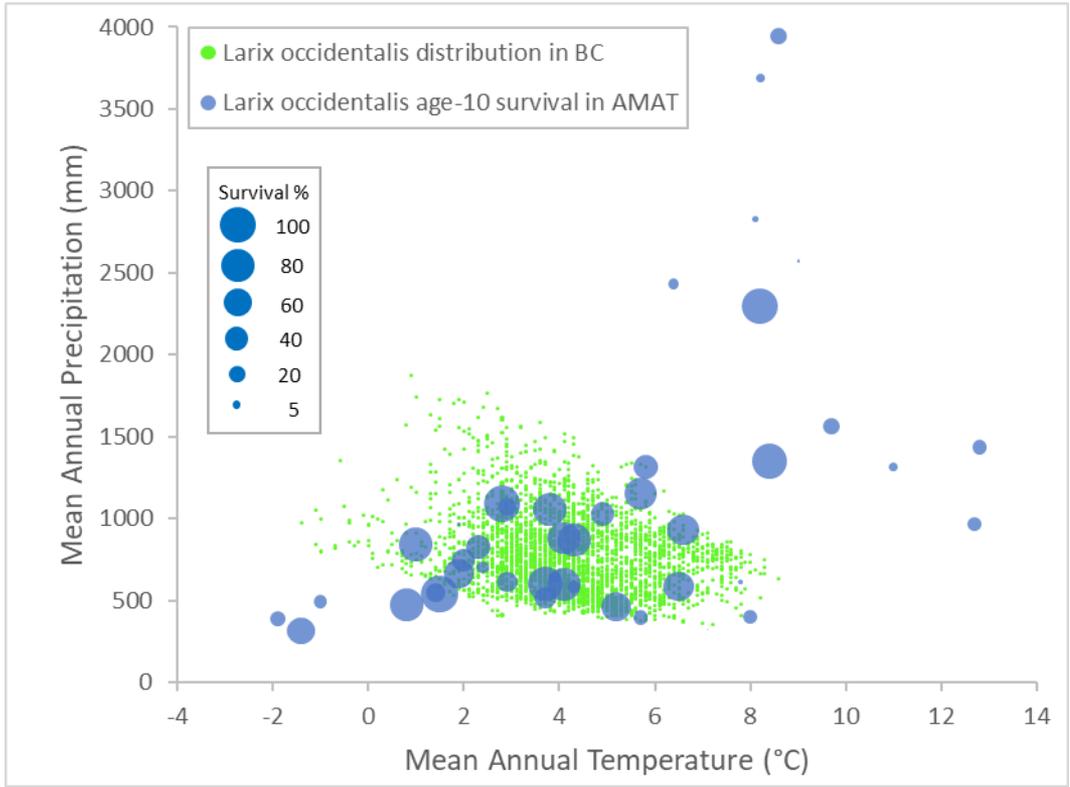


*Pinus ponderosa* -  
southern interior BC

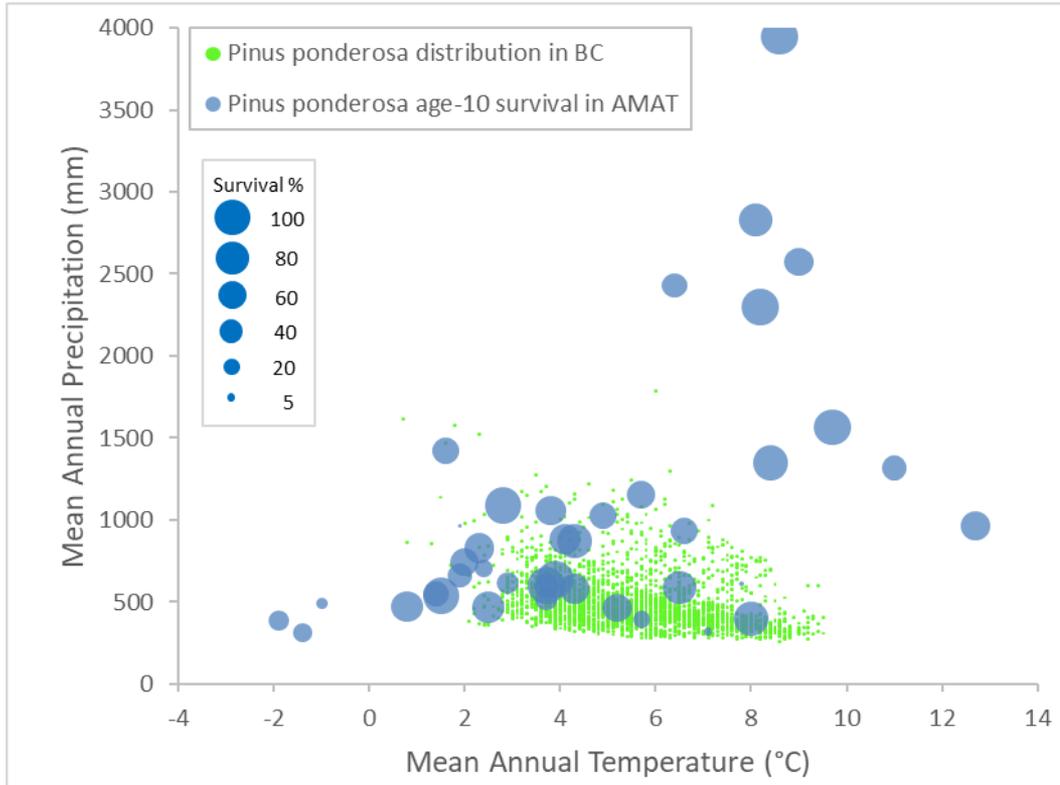
*Picea engelmannii* x *glauca*  
- southern interior BC



Range map: Little



Range map: Little



Range map: Little





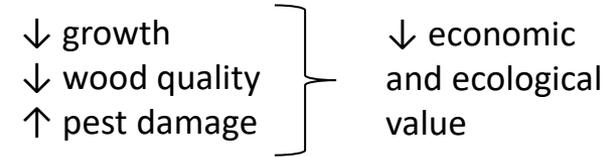


Seed source -1.3 °C MAT  
Plantation -1.3 °C MAT

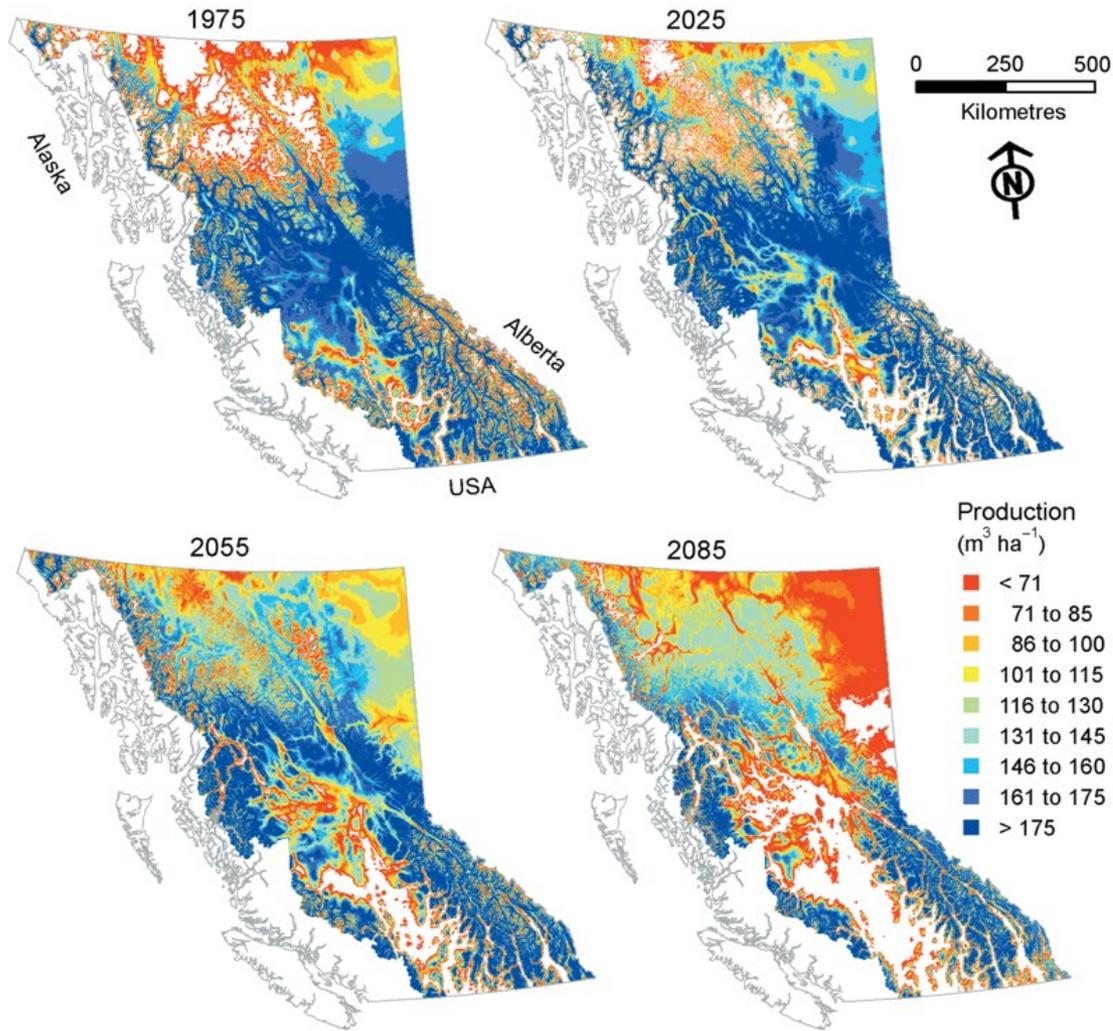


Seed source -1.3 °C MAT  
Plantation 2.9 °C MAT

### Climate change is not good for trees!



# Lodgepole pine productivity



**Climate change is not good for trees!**

Productivity decline: 10-30% by 2080

O'Neill, Wang, Hamann 2008



## Summary

### Requirements for CBST

1. Climatically uniform zones.
2. Safe Seed Transfer Distance
3. Migration Distance Prov test or existing fixed seed zones