

Climate Change and Ecosystems in the West Kootenays

Climate Change Vulnerability and Resilience for
Ecosystems and Forest Management



www.kootenayresilience.org

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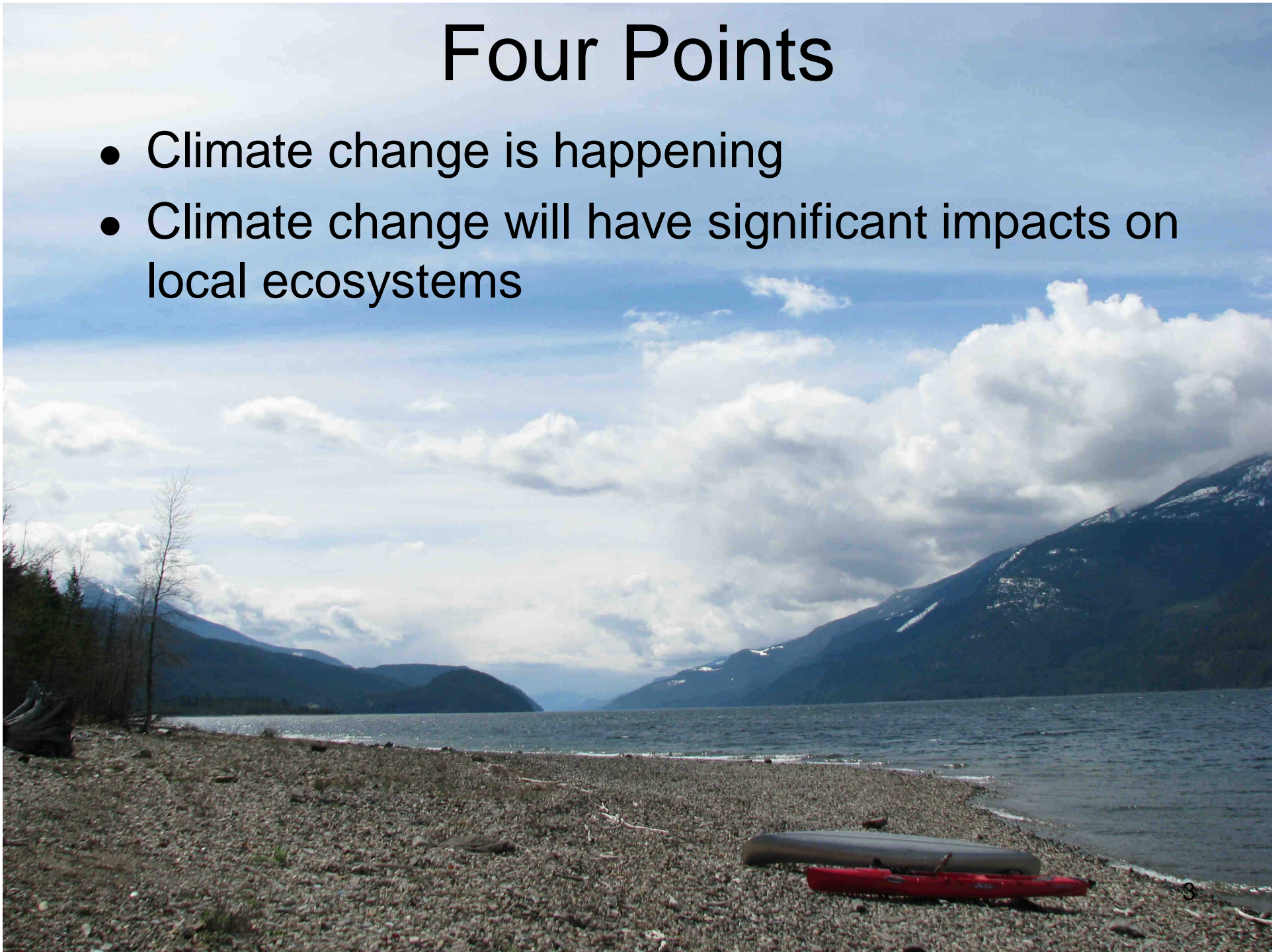
Four Points

- Climate change is happening



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- Climate change will have significant impacts on local ecosystems



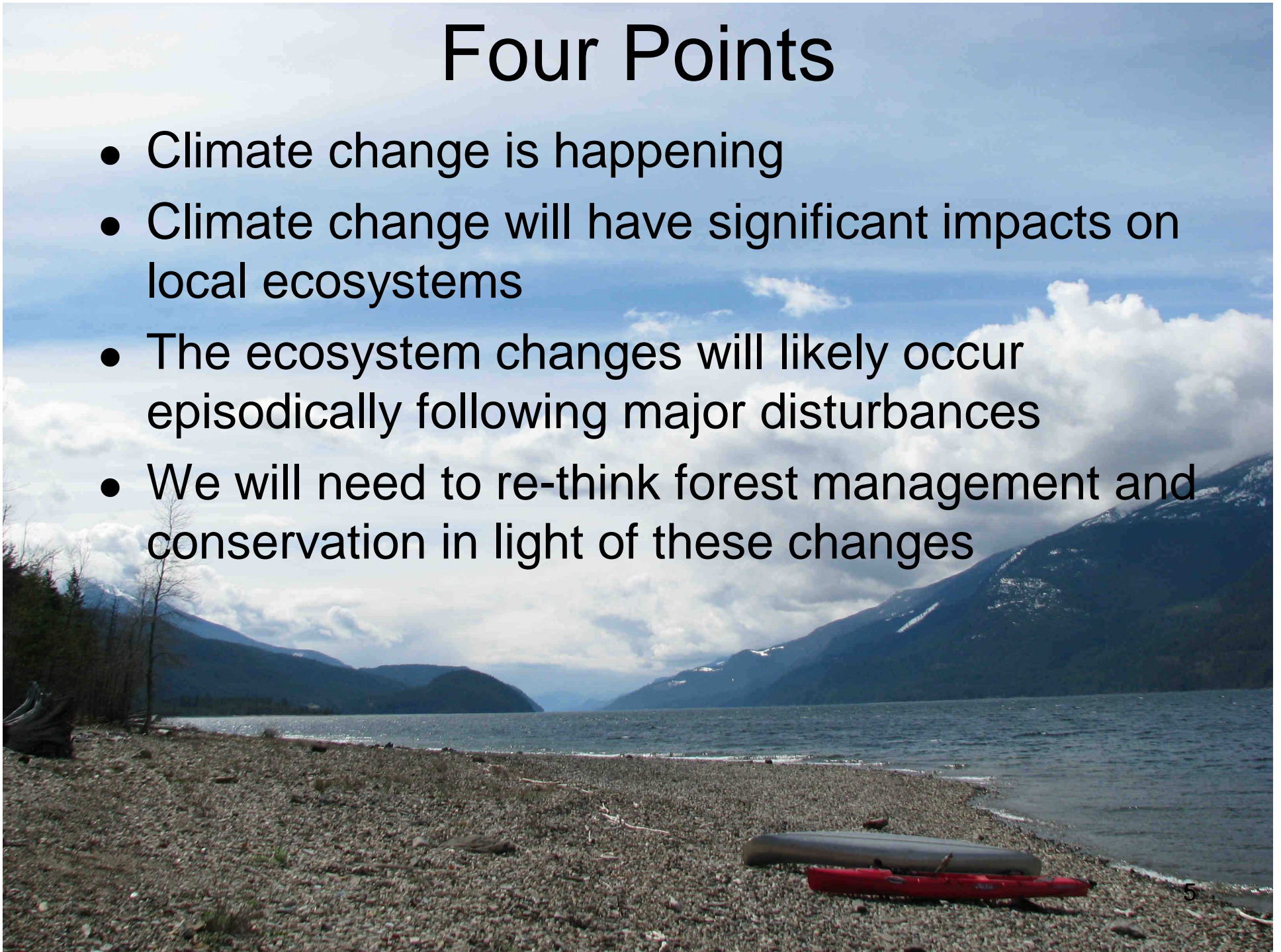
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- Climate change is happening
- Climate change will have significant impacts on local ecosystems
- The ecosystem changes will likely occur episodically following major disturbances



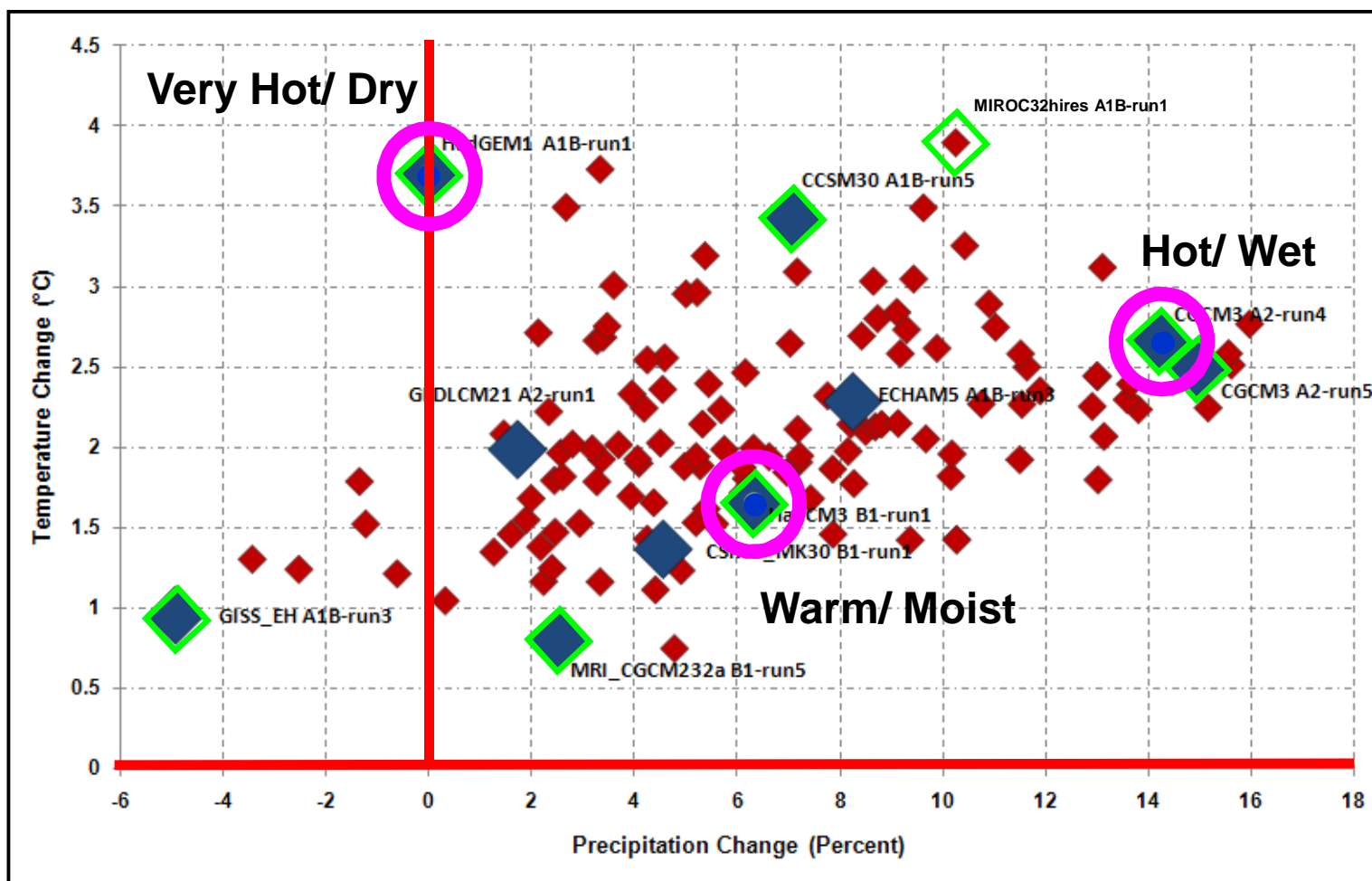
Four Points

- Climate change is happening
- Climate change will have significant impacts on local ecosystems
- The ecosystem changes will likely occur episodically following major disturbances
- We will need to re-think forest management and conservation in light of these changes



GCM / Scenario Combinations

2050s Mean Projections for British Columbia
Annual Temperature and Precipitation

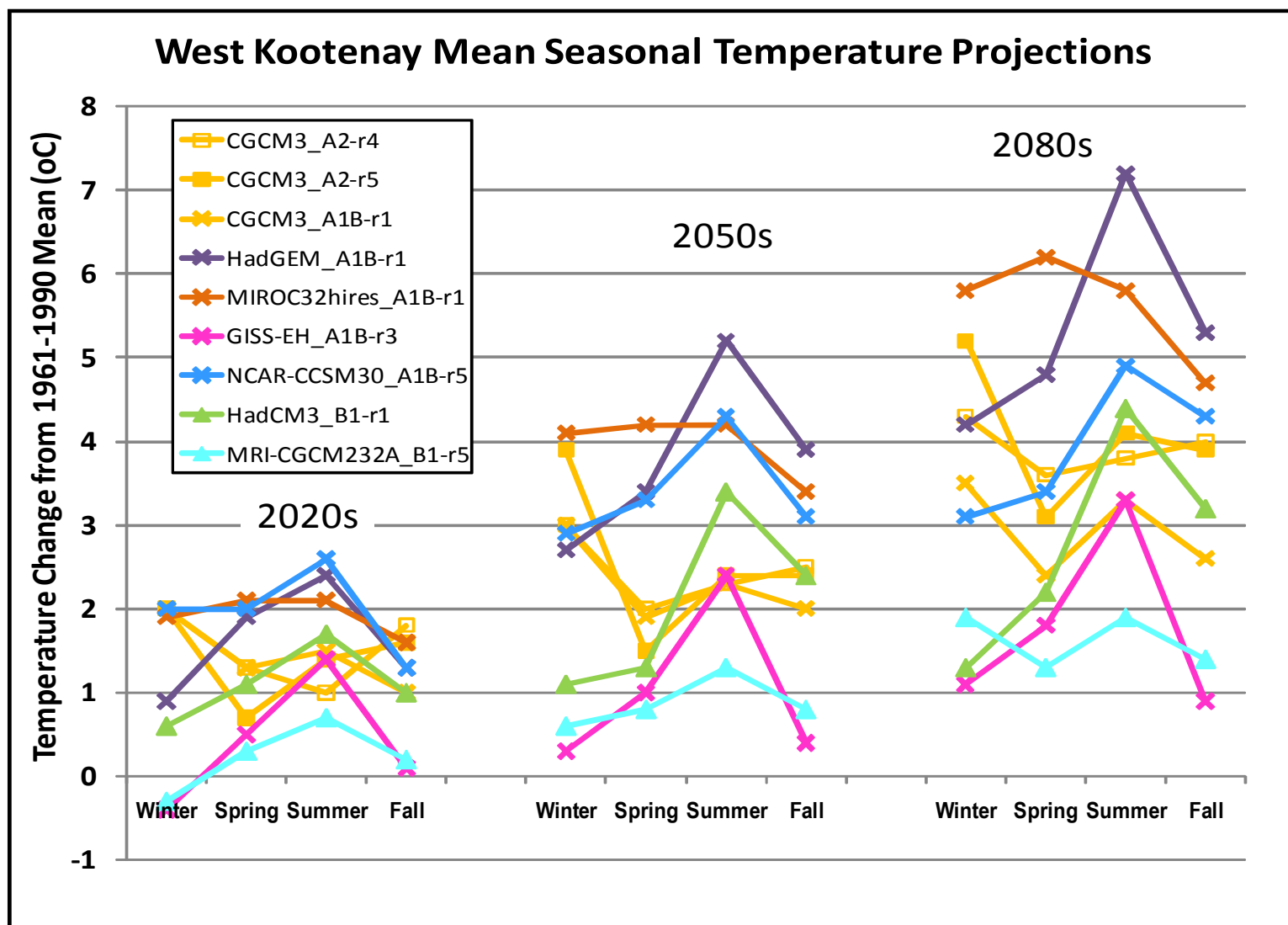


Blue diamonds recommended scenarios

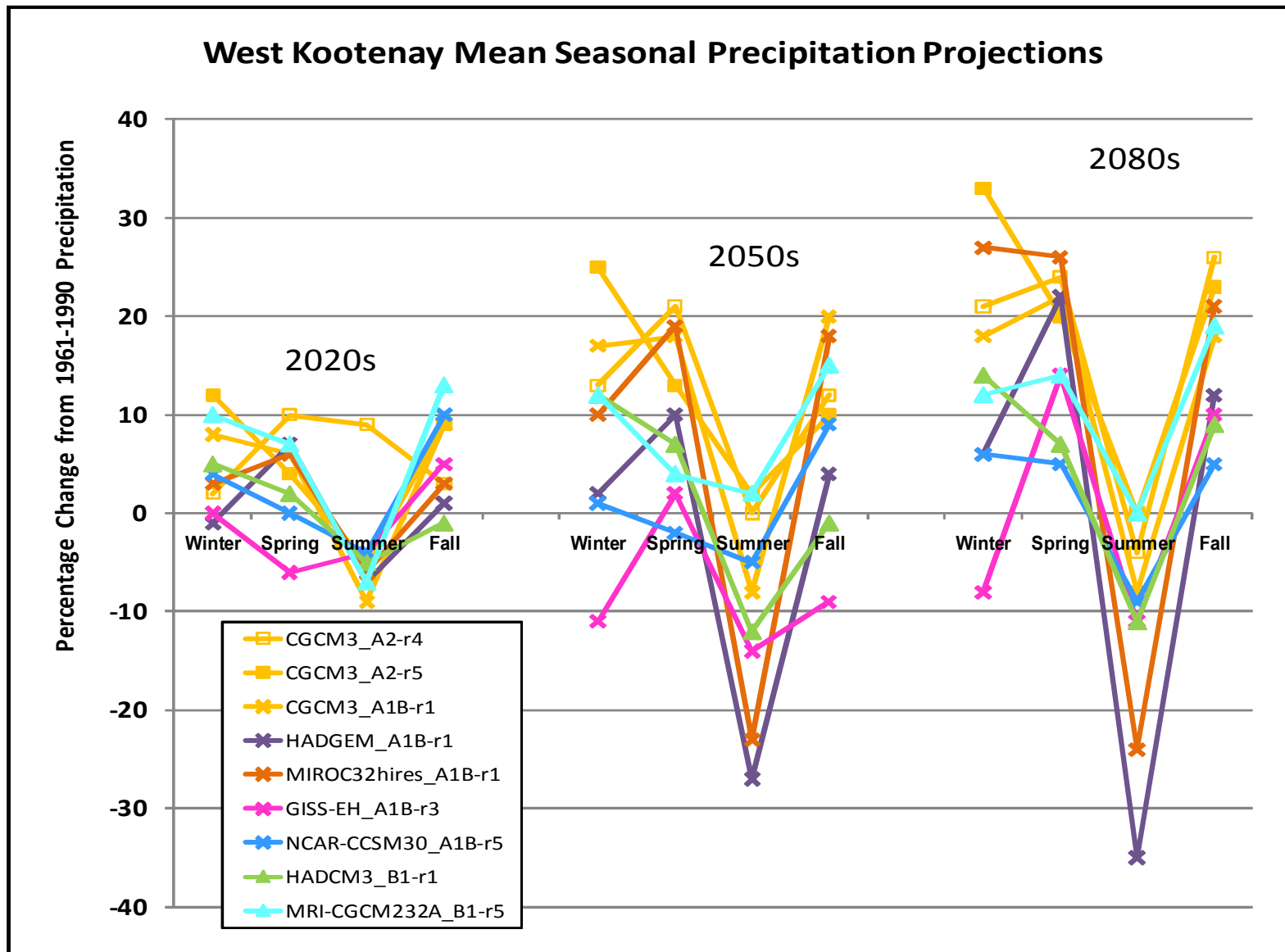
Green outlines scenarios investigated for the West Kootenays

Adapted from:

Murdock and Spittlehouse 2011



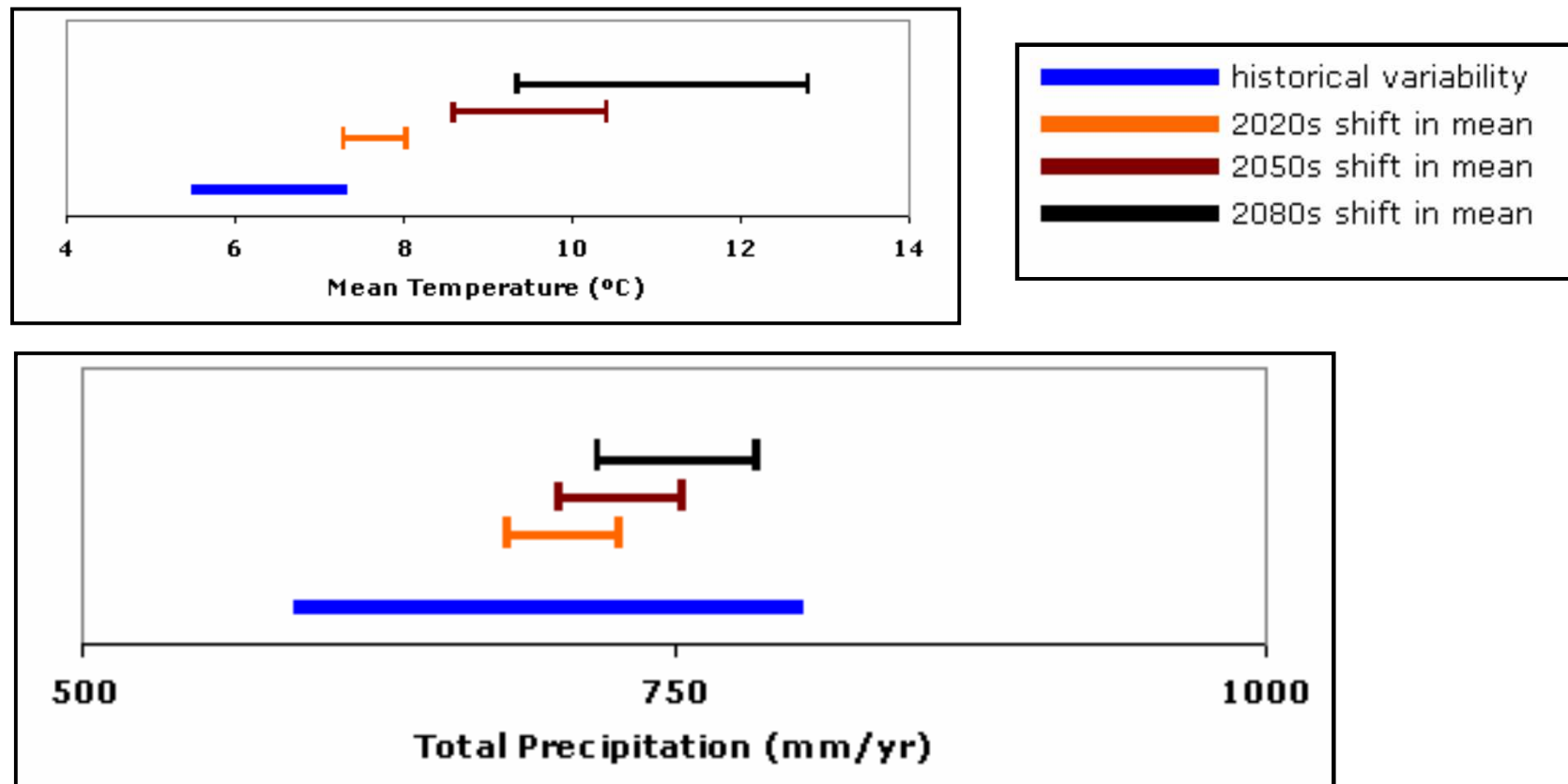
Note that all are projecting increasing temperatures, and many are projecting larger increases for the summer



Note the generally consistent seasonal pattern among the models:
wetter in the winter, spring and fall, and drier in the summer

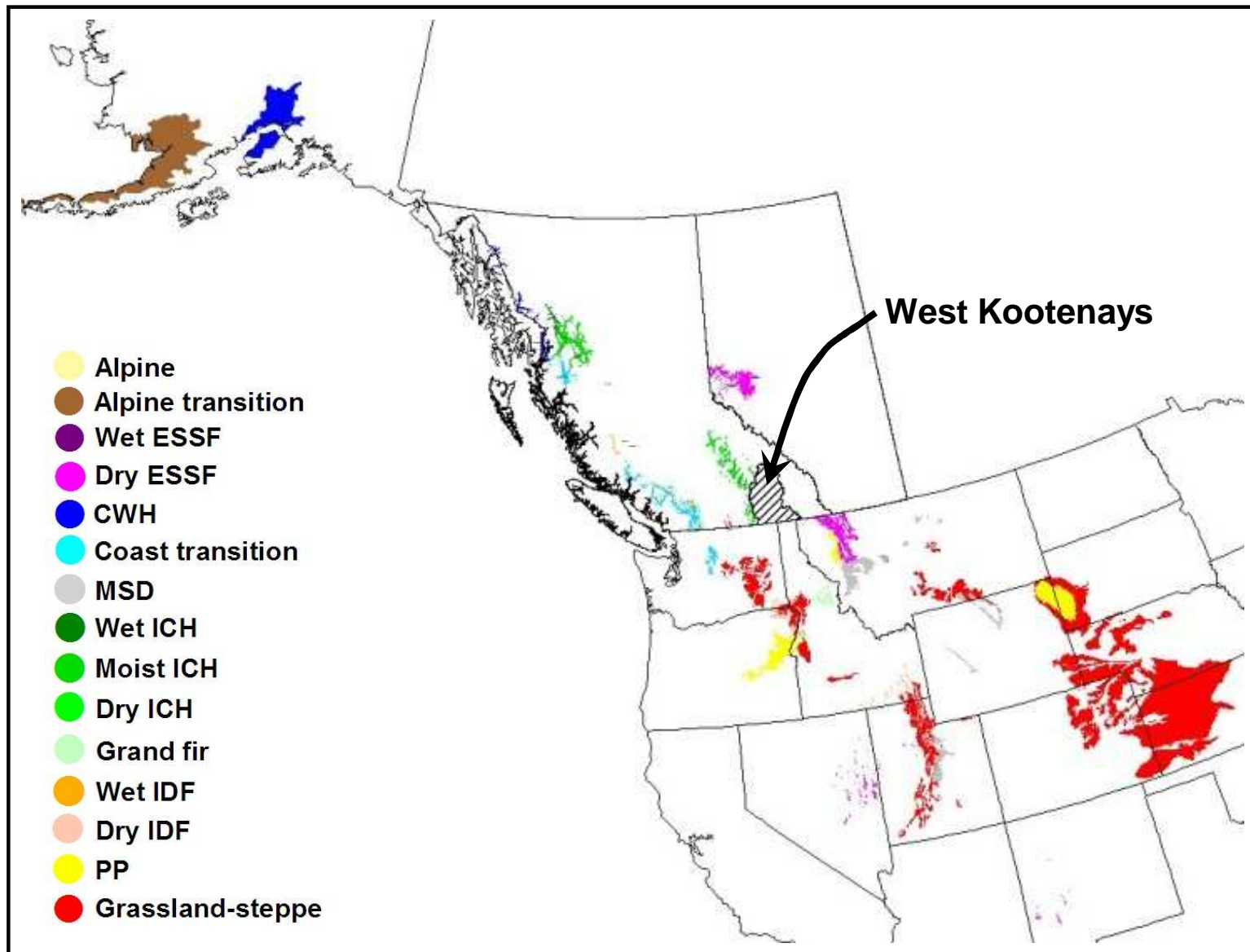
Variability: Past vs. Potential Future for the Columbia Basin

Note that the projected annual temperature shifts far exceed historical variability (20th century), while the projected precipitation shifts do not.

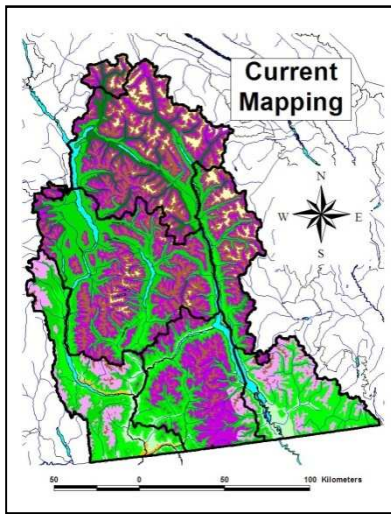


From: Murdock 2006 - PCIC-CBT

Bioclimate Envelopes and Ecosystems

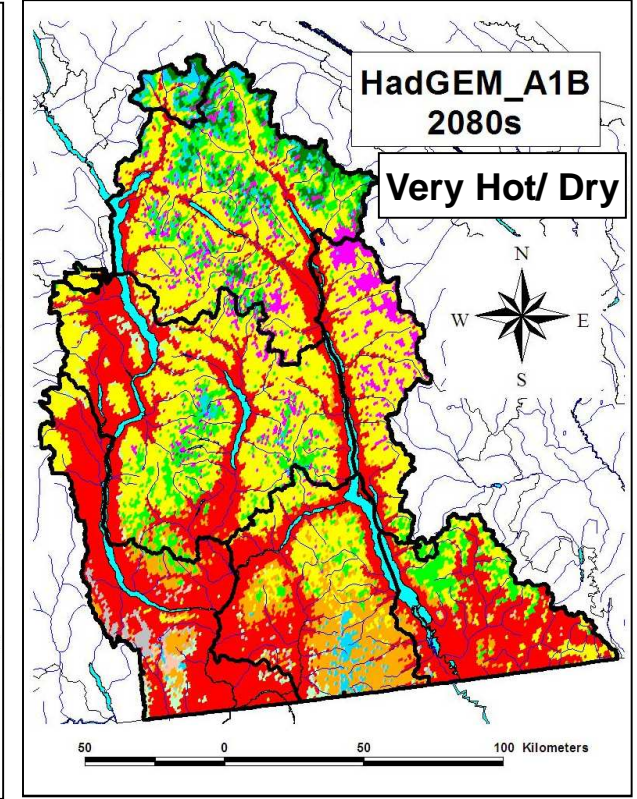
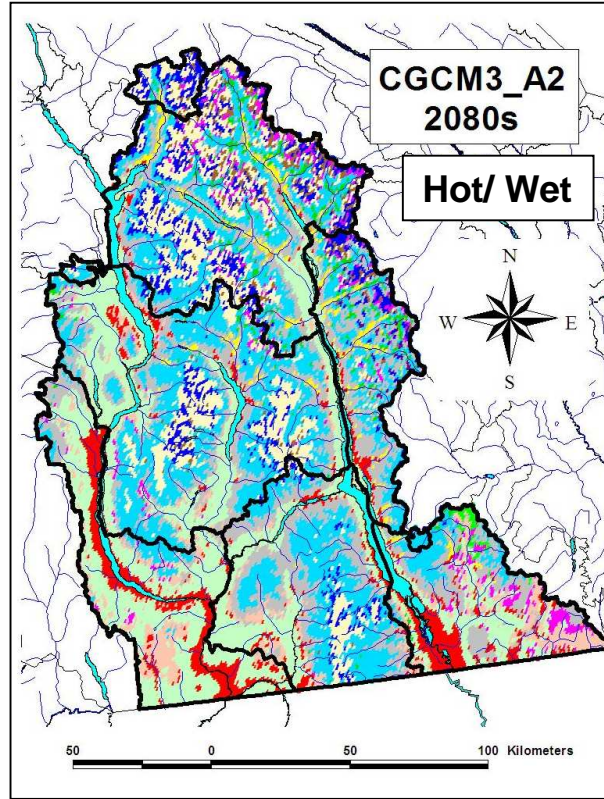
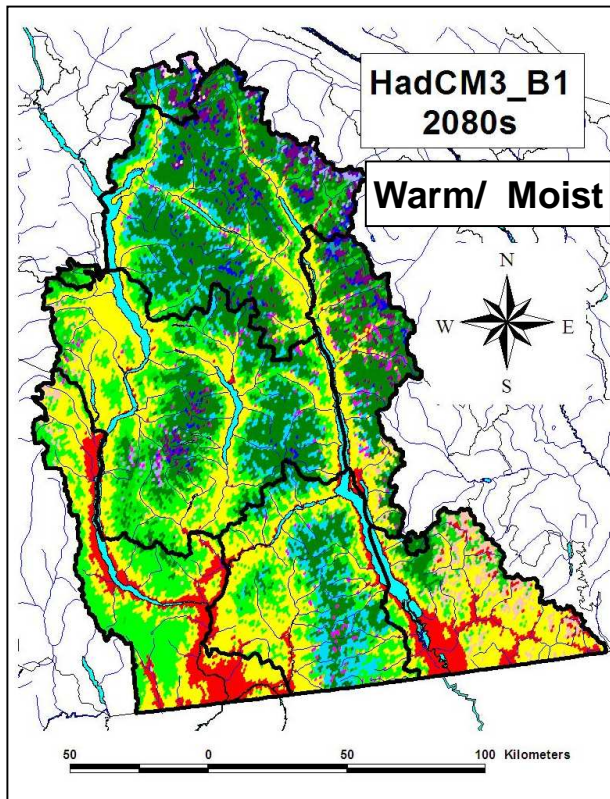
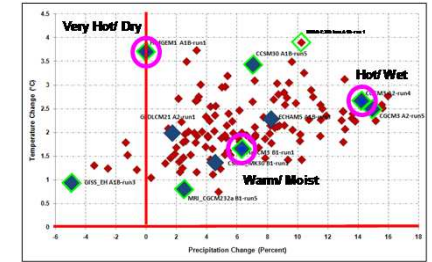


Original data from: Roberts and Hamann, U of A



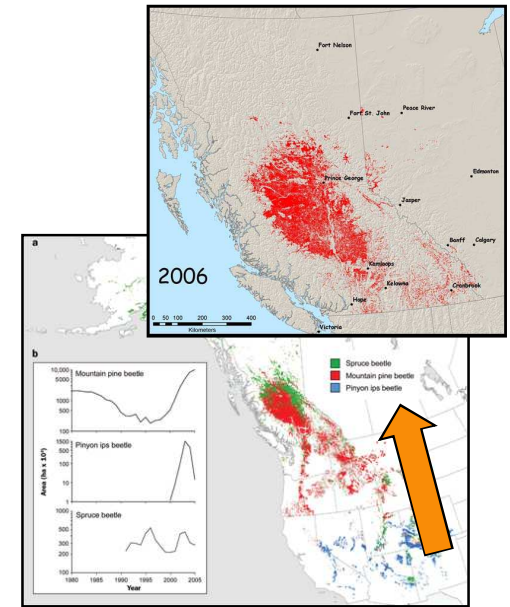
- Alpine
- Alpine transition
- Wet ESSF
- Dry ESSF
- CWH
- Coast transition
- MSD
- Wet ICH
- Moist ICH
- Dry ICH
- Grand fir
- Wet IDF
- Dry IDF
- PP
- Grassland-steppe

Projected Bioclimate Envelopes

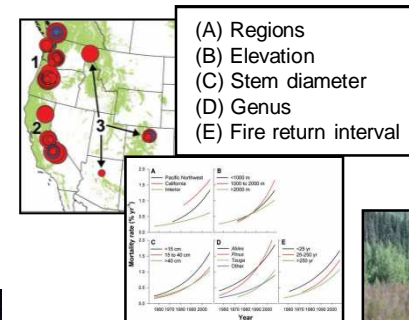


Insects/ Pathogens /Decline Syndromes

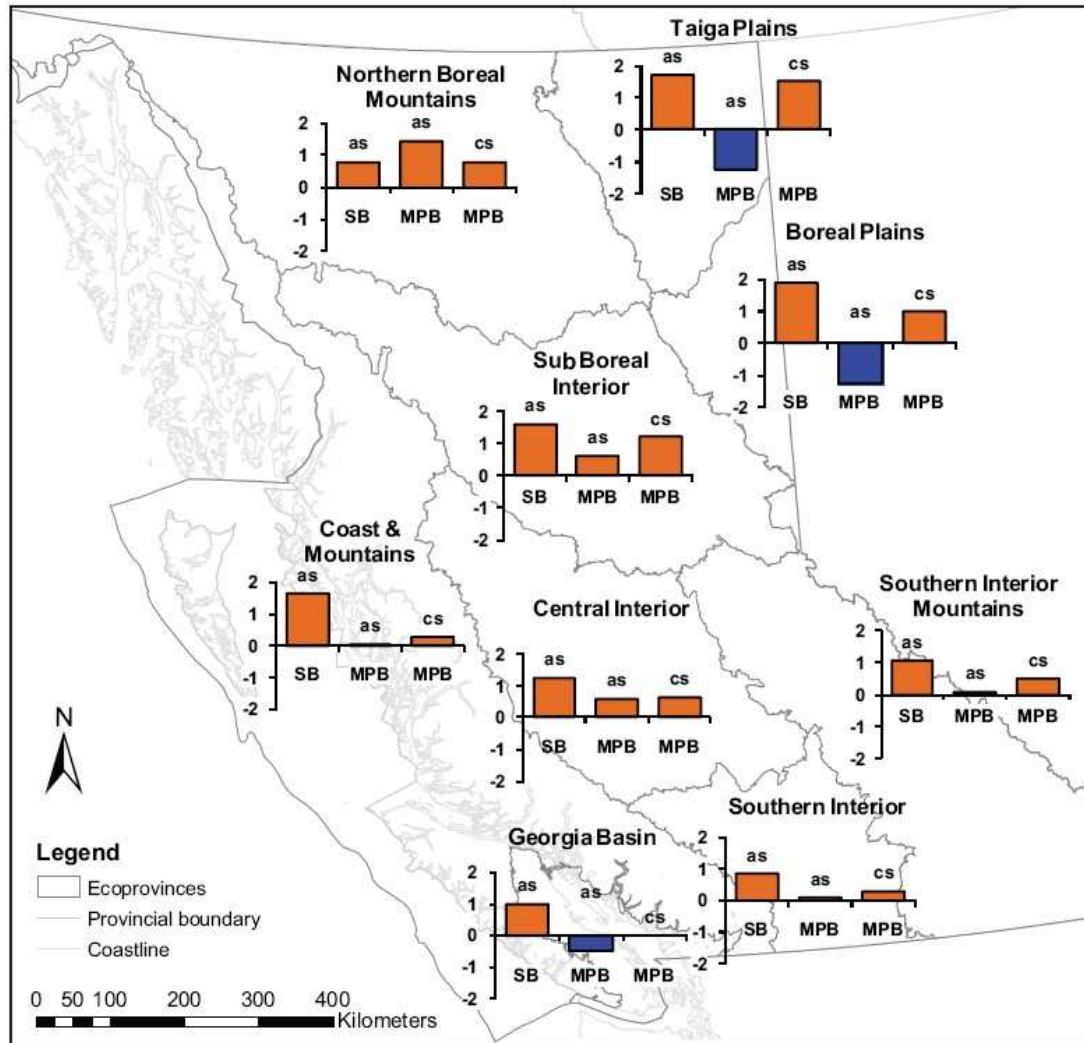
- Tree decline – drought/ loss of resistance
- Bark Beetles
 - Mountain pine beetle, spruce bark beetle, Ips beetles, Douglas-fir beetle
- Defoliators, blights, pathogens
 - Spruce budworm, dothistroma, larch needle cast, root disease
- Complex Interactions
 - Birch die-back, yellow cedar, 5-needle pines



From: Raffa et al. 2008



Projected Changes in Risk of Beetle Outbreaks



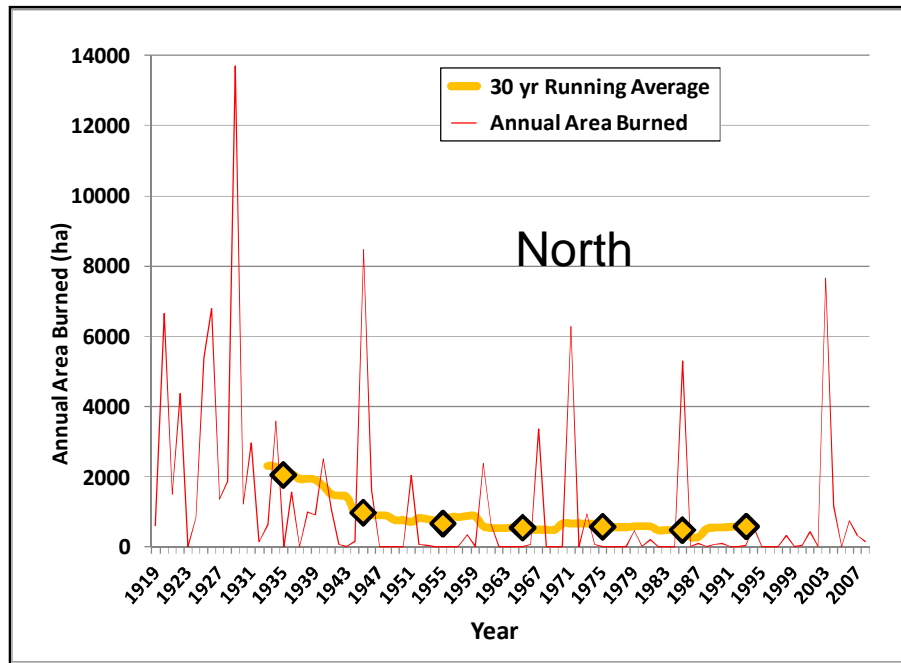
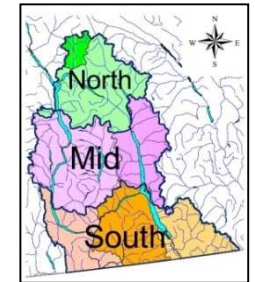
SB – spruce beetle
MPB – mountain pine beetle

as – adaptive seasonality
cs – cold survival

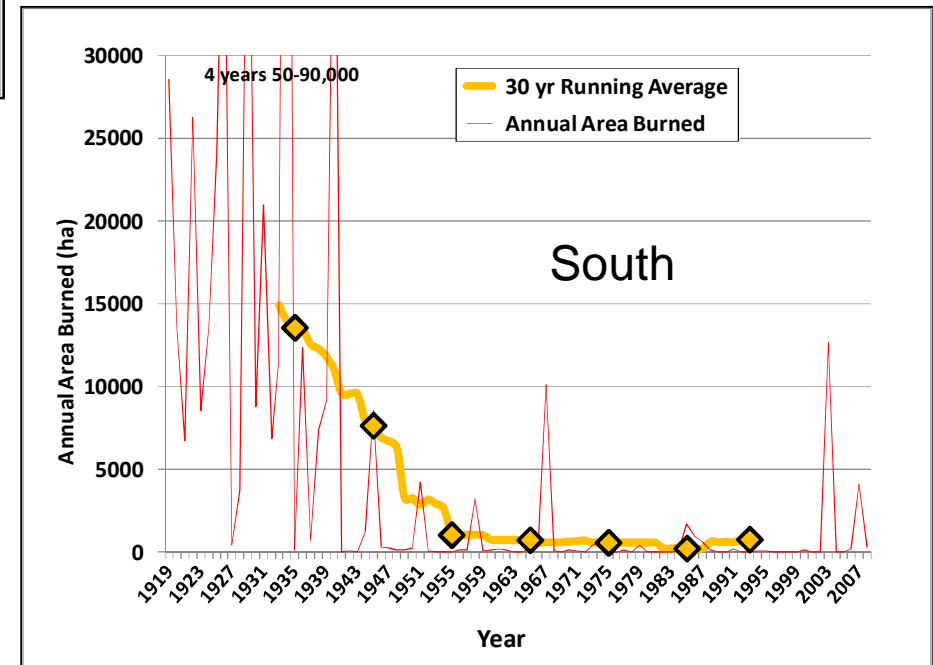
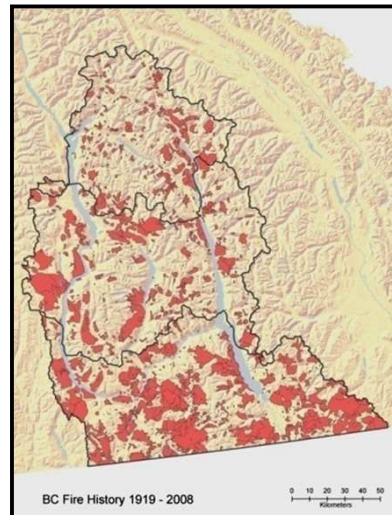


West Kootenay Fire History

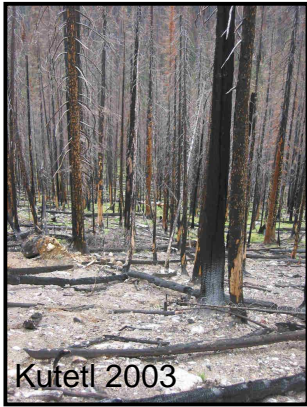
Area Burned



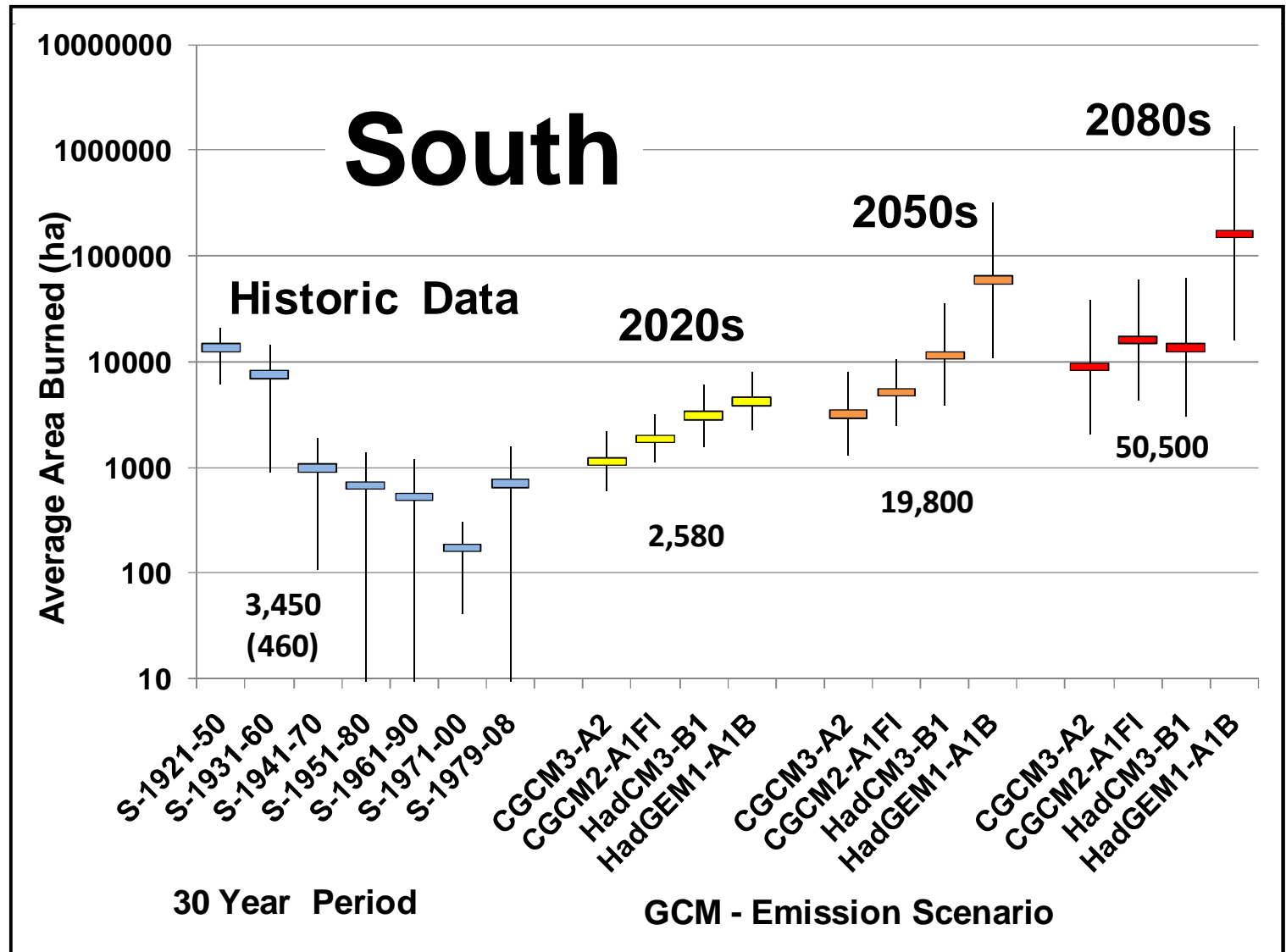
Touchstones Archives, Nelson



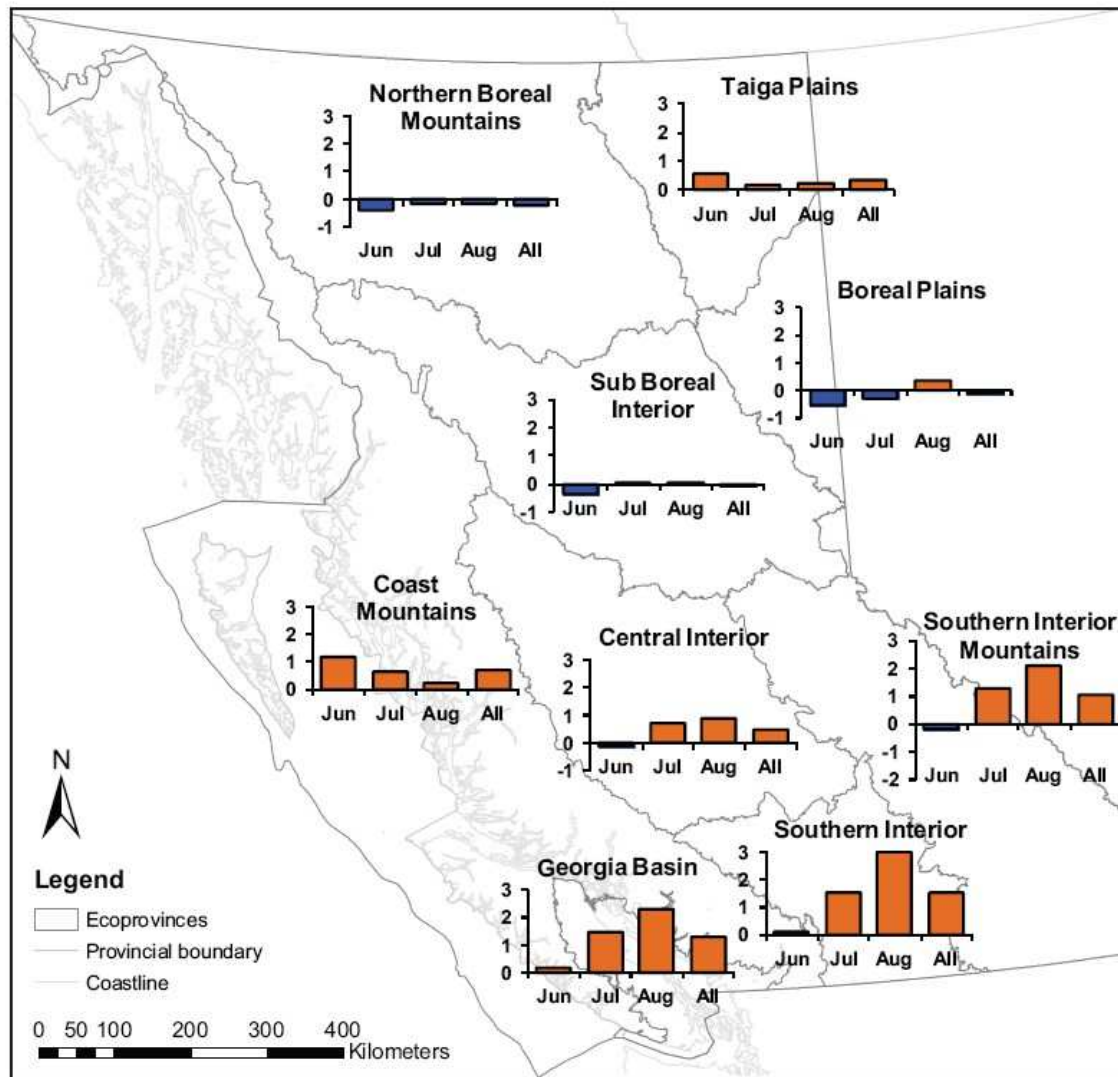
Multiple Regression Analysis



Jordan 2007



Projected Changes in Monthly and Seasonal Fire Severity Ratings

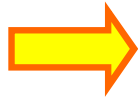
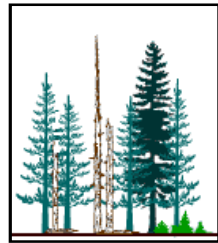


Calculated from modeling of the Canadian Fire Weather Index (FWI) based on climate projections from the Canadian Regional Climate Model (CRCM_A2)

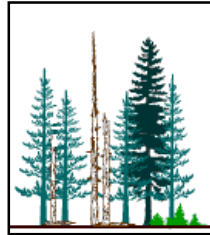


From:
Haughian et al. 2012

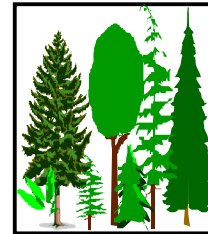
Ecosystem Response



**Range
Shifts**



and/or



**Re-
Organization**



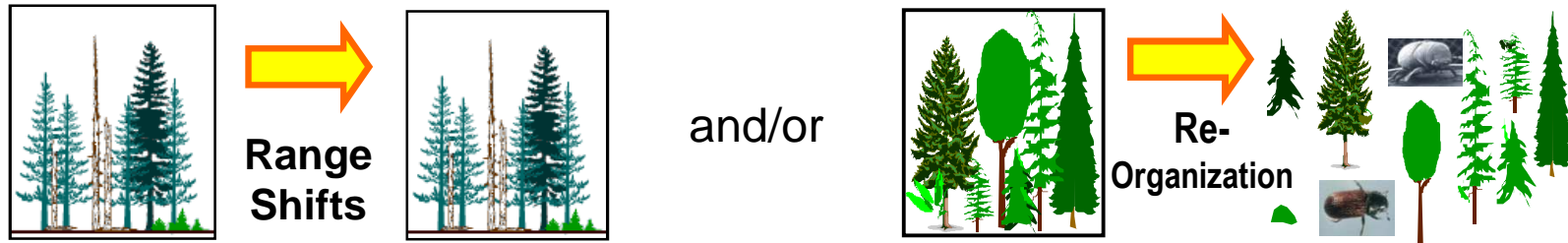
Ecosystem Response



Management Responses

- Seek to understand what changes may occur
- Plan for uncertainty – expect the unexpected – build in flexibility, redundancy and wide safety margins
- Look for “robust” alternatives – options that are viable under a range of potential climate futures
- Remember: adaptation is only treating the symptoms – stopping GHG emissions is the only real answer

Ecosystem Response



Management Responses

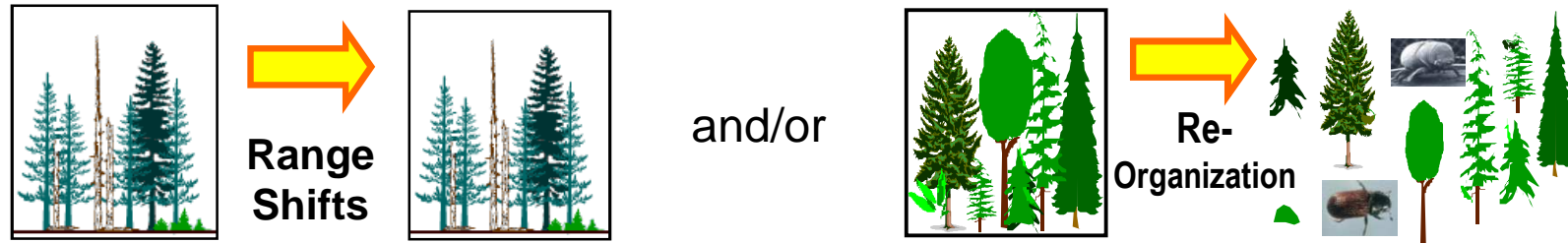
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Thank You

“We have options, but the past is not one of them”

Sauchyn and Kulshreshtha 2008, p.295

“Times have changed – no longer is our goal sustainable development our goal must now be sustainable survival”

Blackstock 2008, p.15