

## The genomic basis of adaptive and plastic responses to climate in conifers

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**Abstract:** Conifers display extensive evidence of local adaptation, with divergence among populations in a range of phenotypes, from budset to cold injury tolerance. They can also respond plastically to a wide range of climatic stresses, which can result in repatterning of gene expression. Here, we use comparative genomic approaches to study how both gene expression and adaptive differentiation respond to climate in lodgepole pine (*Pinus contorta*) and interior spruce (*Picea engelmannii*, *Picea glauca*, and their hybrids). We compare RNAseq expression profiles under 7 different environmental treatments and characterize genes that respond similarly vs. differently in their expression. We also explore the genetic basis of adaptive differences among populations using exome capture and phenotype- and environment-association analyses. We find 47 genes with strong signatures of convergent adaptation to climate in both species, despite 140 million years of independent evolution. Interestingly, the genes that are involved in convergent adaptation are also more likely to have conserved gene expression profiles. We are now expanding this study to explore climate adaptation in Douglas-fir, western larch, and jack pine, as well as to study the basis of resistance to dothistroma in lodgepole pine, and Swiss needle cast in Douglas-fir.

**Bio:** Dr. Sam Yeaman works at the University of Calgary in the Department of Biological Sciences as an Assistant Professor and AIHS chair in computational biology and bioinformatics. He did a B.Sc. at Trent University and his Ph.D. at University of British Columbia under the supervision of Mike Whitlock. Further research took him to Neuchâtel for a postdoc with Laurent Lehmann, before returning to UBC to work with Sally Aitken and Loren Rieseberg on climate adaptation in conifers. His research focuses on how evolution gives rise to adaptation, using a combination of theoretical and empirical studies in a range of organisms including conifers, fruit flies, sunflower, and stickleback.

### Further information:

Yeaman S, Hodgins KA, Lotterhos KE, Suren H, Nadeau S, Degner JC, Nurkowski KA, Smets P, Wang T, Gray LK, Liepe K, Hamann A, Holliday JA, Whitlock MC, Rieseberg LH, Aitken SN. Convergent local adaptation to climate in distantly related conifers. *Science*. **353**:1431-1433.

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