<!-- Slide number: 1 -->
# Cold Tolerance in Blueberry
Spencer Chadinha

<!-- Slide number: 2 -->
# Current Understanding of Plant Cold Acclimation
The signal pathways are better understood than the genes they regulate.
There are over a thousand genes involved in the cold acclimation response.
Many genes in the cold acclimation process are also involved in other responses such as heat shock and drought resistance.

<!-- Slide number: 3 -->
# Basic Cold Response Pathway

![Generalcoldresponse2.pdf](Picture4.jpg)

<!-- Slide number: 4 -->
# Signaling Pathways

CBF Pathway
ZAT12 Pathway
ABA Pathway
All the pathways are interconnected, with some transcription factors in one pathway regulating transcription factors in the other pathways.

<!-- Slide number: 5 -->
# CBF Signal Pathway

![Screen Shot 2013-02-25 at 9.17.33 PM.png](Picture3.jpg)

<!-- Slide number: 6 -->
# CBF Signal Pathway

![Screen Shot 2013-02-25 at 9.19.07 PM.png](Picture4.jpg)

<!-- Slide number: 7 -->
# Changes Related to Cold Acclimation
Protein regulation
Plasma membrane
metabolome

<!-- Slide number: 8 -->
# Protein Regulation
Dehydrins (LEA) [function unclear]
Antifreeze proteins [prevent ice crystalization]
Heat shock proteins [chaperone proteins]
Cold shock domain proteins [RNA chaperone]

<!-- Slide number: 9 -->
# Plasma membrane
Increase specific phospholipids
Desaturation of fatty acids (lowers transition to rigid membrane)
Simple sugars, dehydrins, and lipocalins accumulate in the membrane.

<!-- Slide number: 10 -->
# metbolome
sugar-signaling pathway [modulates development depending on abiotic factors]
Chloroplast signaling [initiates part of the cold acclimation response]
Reactive oxygen species [regulates some cold response genes]

<!-- Slide number: 11 -->
# Cold Response Genes
Every process mentioned is mediated by proteins, proteins are created from genes, thus there are many genes involved in the cold acclimation process.
Many of the genes involved are also apart of other processes and regulation pathways.