1. How often is snow important?
2. Why is it important?
3. Alpine or not alpine- further research, why is it different from alpine
4. Prairie phenology and snow

Wang (2017)

* Tree vegetation study using aerial images
* Less snow related to advanced snow melt- initiate growth earlier, extending the growing period
  + More evapotranspiration could lead to dryer soils in growing season
* Winter snow affects soil moisture availability in growing season- soil moisture anomaly formed from melting snowpack takes months to dissipate
* Good Explanation of path analysis
* Increased snow delays snowmelt and spring onset and suppresses growth in Alaska and Central Europe
* Grow period is determined by winter SWE (snow water equivalent), timing of snowmelt, spring onset date on vegetation productivity
* Increased snowpack doesn’t necessarily mean delayed snow melt
* Snowmelt is accompanies by increased temperatures which is largely recognized as most ecologically relevant cue for spring onset in many species.
* Spring onset was not synchronized with snowmelt- insufficient heat accumulation after snowmelt and light limitation might prevent plants from taking advantage of snow melt

Sherwood (2017)

* Temperature
* Early DOBG may lead to frost damage in plants which could be the reason that DOBG and snowpack didn’t influence flowering phenology for early plants
* Heat treatment had less frost kill than when snow was removed.
* Less snow pack lead to earlier emergence of species.
* Examples of asynchrony for plants and insects…
* Flower buds are particularly sensitive to cold temperatures. Earlier plants could have exaggerated responses to cold when snow melt happens too soon
* Heating increased growth and reduced frost-killed buds

Semenchuk (2016)

* Late-season phases/plants are triggered by environmental thresholds of factors such as day length, light quality, temperature, and soil moisture
* Phenology response to snowmelt date may be species-specific
* Hypotheses: phenoperiods are shorter in late-melting snow
  + Short seed maturation decreases viability
  + Species- specific
* How to cite R
* DOBG and snowpack might not have much of an effect because, plants may shorten their phenophases to compensate for a late start
* Shorter phenophases could mean lower seed viability- they found more of an interannual effect than snow depth.
* In some species the soil moisture from the deep snow may have played a bigger role in development than the active period duration
* Flowering period was unaffected by snow regime- flowering duration is more closely linked to temperature.
* Deeper snow protects sensitive buds from frost damage.
* Warmer temperatures could also speed up phenophases
  + Periodicity may be a competitive trait in species attempting to reside in tundra ecosystems.

Bjorkman (2015)

* Snowpack can influence plant phenology through timing of snowmelt, freeze damage, volume of water released by snowmelt
* Plots with structures to increase temperature
* Increase in snowpack, increase in temperatures, delayed flowering in most species
* Different species have different variables driving the flowering phenology
* Date of snowmelt was significant and strongly related to flowering
* Temperate plants- early flowering plants are more sensitive to temperature than late-flowering plants
* Shifts in plant communities based on responses to precipitation and temperatures.

Venn (2017)

* Shrubs are encroaching on alpine herbfields
* Shrubs can trap snow drifts, lengthening the protection from snow against freeze damage.
* Study investigates the differences in freeze resistance in alpine shrubs released from snow early and two weeks later
* Measured freeze resistance of upper foliage and lower foliage of the shrub- upper exposed earlier than lower.
* Used FV/FM after a freezing assay
* Electrolytic leakage was not used because hard materials may not release electrolytes easily- giving a false high freeze resistance
* The timing of snowmelt with exposed and protected foliage was only significant for foliar freeze resistance in one species.
* These species are unlikely to be affected by even the most severe frosts in the area
* Most studies in frost resistance have found species-specific responses