ABSTRACT. Snowfields at Glacier National Park will likely retreat or disappear with climate change. As snowfield edges melt inward in summer they provide a water-rich microhabitat for alpine plants capable of growing in the harsh snowfield environment. We hypothesize that the distribution of alpine plant species and morphological types will change with the retreat or disappearance of snowfields. Retreating snowfields will open habitat that may be colonized by trees, especially since they are currently found close to most snowfields.

Along permanent geospatially referenced transects established in 2012-14 at the lateral and leading edges of snowfields at Siyeh, Logan, and Piegan passes, at Preston Park, and on the Mt. Clements moraine (the outer, downslope boundary of a vast snowfield), we:

1) Quantified leaf functional traits. Specific leaf area (SLA, mm²/mg) and circularity were greatest near the snow, while perimeter, dry weight and area increased with distance from the snow at the Mt. Clements Moraine (MCM).

2) Classified plants according to the Raunkiaer scheme. Most were protohemicryptophytes, (overwintering buds at or just below the ground surface), although geophytes (overwintering buds farther beneath the ground), and therophytes grew within 50 m and often closer to the snow. Relatively thin-leaved (and likely less drought tolerant) plants grew near the snowfield’s edge while cushion plants grew farther from the snowfields;

3) Found a greater percentage of fine soil particles near snow at MCM;

4) Grew Patagonia araucana, Sibbaldia procumbens, Arenaria capillaris, Carex sp. and Poa alpina from snowfield seed bank soil.

Nearby, on striped periglacial patterned ground:

1) A greater percentage of rare arctic-alpine plants lived on the stony treads, and;

2) Krummholz trees (Pinus albicaulis and Abies lasiocarpa) were absent from stony treads but present with mat forming plants (Dryas octopetala and Salix arctica) on risers of striped periglacial patterned ground. Association of trees with mat-forming plants on risers may serve as a leapfrog mechanism for movement of treeline.

The Interface Between Snowfields and Treeline at Glacier National Park, Montana
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