



Nunataks

Shifts in the composition and structure of sensitive plant communities may provide early indication of change. Subtle changes in the environment may have significant long-term effects on communities that are strongly controlled by physical factors (e.g., hydrology, snow cover) or occur at the edge of their range. Among the sensitive communities targeted for monitoring in Southwest Alaska parks are *nunataks*, alpine ridges surrounded by ice. Nunataks are of interest due to their geographic isolation, their expected sensitivity to environmental change (Jørgensen et al. 2011), and the possibility that some of these sites may have supported populations that survived the Last Glacial Maximum (Late Wisconsin), approximately 20,000 years bp (Manley 2002). In addition to serving as refugia for rare species, nunataks may also play a role in the re-establishment of species into recently deglaciated areas.



NPS/James Walton

Amy Miller collects vegetation plot data on a nunatak in Wosnesenski Glacier, Kenai Fjords National Park.

Findings

Nunatak monitoring sites were established in Lake Clark National Park and Preserve and Kenai Fjords National Park in 2005 and resurveyed in 2016 (Figure 1). Several of the sites are characterized by well-developed soils and a suite of species that suggests they could have been ice-free for millennia. Rare taxa include several Rocky Mountain disjuncts (e.g., Lemmon's rockcress, *Boechera lemmonii*; rayless arnica, *Arnica diversifolia*; Drummond's cinquefoil, *Potentilla drummondii*); Pacific coastal species (e.g., dunhead sedge, *Carex phaeocephala*), and Alaska-Yukon endemics (e.g., Alaska rock jasmine, *Douglasia alaskana*; pale poppy, *Papaver alboroseum*).

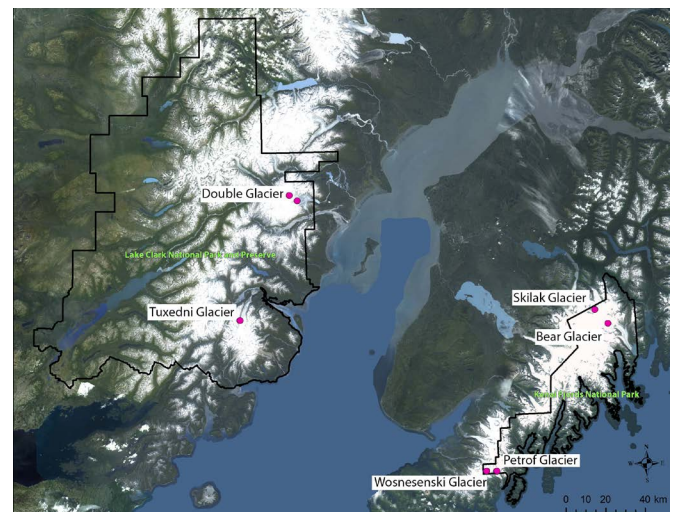


Figure 1. Nunatak monitoring sites in Lake Clark National Park and Preserve and Kenai Fjords National Park.



Across all sites, mean species richness tends to decrease with elevation and distance from the coast (Figure 2). Maritime-influenced, low-elevation sites (e.g. Petrof, Wosnesenski, Tuxedni) support a rich assemblage of mesic or snowbed species, while sites at higher elevation tend to be drier and support primarily fellfield and dry alpine meadows.

Species richness remained relatively stable over the first ten years of monitoring, with most sites showing a gain or loss of only 2-3 taxa (Figure 3). However, one site in Kenai Fjords National Park (Petrof) showed a roughly

20% turnover of species between 2005 and 2016. There, we recorded a loss of several alpine species and a gain of grasses and sedges. We also recorded one new exotic species, the common dandelion (*Taraxacum officinale*), which was not present in 2005. A second site (Bear) showed a roughly 30% increase in species richness, evidence of primary succession on an otherwise species-poor site. Sites in Lake Clark National Park and Preserve showed little change over the sampling interval, and the eruption of Mt. Redoubt (in 2009) appeared to have no lasting effect on species composition.

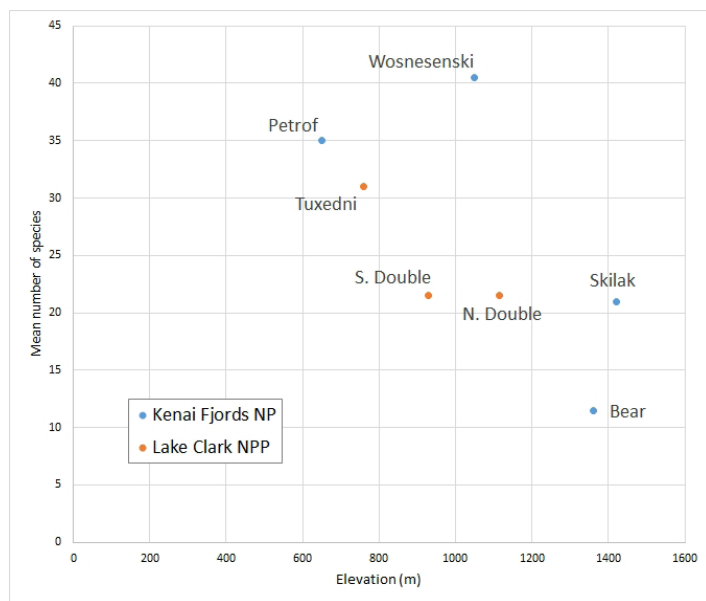


Figure 2. Mean species richness decreases with elevation across the eight sites in Kenai Fjords National Park and Lake Clark National Park and Preserve.

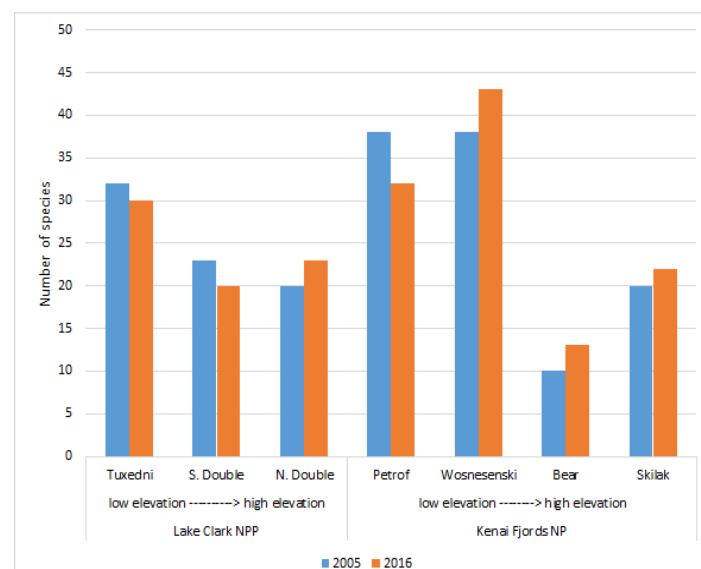
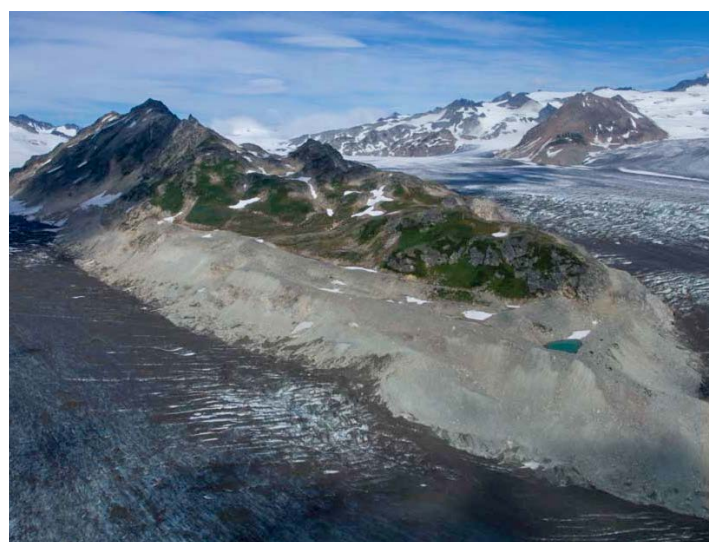


Figure 3. Variation in species counts (richness) at nunatak sites across two sampling dates.



An aerial view of Double Mountain nunatak, Lake Clark National Park and Preserve.

References

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