

YOSEMITE'S SKY ISLANDS

YOSEMITE'S SKY ISLANDS AND HIGH ELEVATION PLANTS

BY ALISON COLWELL, PHD. BOTANIST

Scattered along the crest of the Sierra Nevada from the northern end of Yosemite to the southern end of Sequoia-Kings Canyon National Parks are a series of small, isolated table lands perched atop soaring escarpments. These odd landscape features, dubbed 'Sierra sky-islands' by John Thomas Howell, are fragments of an ancient land surface that existed prior to glaciation. These boulder and sand-surfaced sky islands are thought to be sculpted primarily by frost, thaw and wind-scour forces. They were left behind by the glaciers that shaped much of Yosemite, and at their high elevation are relatively arid and cold. They typically face south or west, exposing them to the sun and the prevailing winds, which melt and scour away much snowfall. Together, these forces create an unusually harsh but also uniquely stable environment.

In this environment, over many millennia, an extremely specialized community of sedges, grasses and "cushion plants" has evolved. Cushion plants are typically compact, slow growing, and have remarkable longevity. These traits facilitate survival in a harsh climate with a very short growing season, but leave the plants vulnerable to competition and replacement in a warming climate by faster-growing species from lower elevations. These plants are dependent on a stable habitat, specifically one with soil moisture maintained by some snow cover in the winter and cool temperatures in the summer.

The decreasing snowpack predicted by climate change models will leave these plants vulnerable to extinction. The typical response to climate warming noted worldwide is that of species' ranges trending upward in both elevation and latitude.



TOP Parson's Peak, one of Yosemite's sky islands, is a striking example of a high elevation unglaciated surface.

BOTTOM The proportionally large and showy flowers of this sky pilot help attract pollinators in alpine regions.

For plants such as these, already inhabiting the highest level of the landscape, uphill migration is not an option and local extinction is instead the probable outcome. In Yosemite, the distance between sky island sites is large, so survival of sky island species by natural dispersal to other, similar sites is a very unlikely event. Most of Yosemite's sky islands are difficult to reach and thus relatively protected from human impacts such as trampling. However, emerging knowledge about the impact of climate warming on this region makes it imperative that their at-risk plant communities be documented soon.



ABOVE The fellfield daisy (*Erigeron vagus*) spreads beneath loose talus rock on Excelsior Mountain

Yosemite Conservancy is currently funding a botanical survey of the flora of ten sites over three years of Yosemite's sky islands. This survey, started in July 2010, is finding and documenting all the plant species present, and gathering baseline information that will both preserve basic information for posterity and inform potential future monitoring efforts on the flora.

Surprisingly few of the sky islands in the Yosemite region had their flora inventoried before this current study. The best known sky island flora, thanks in large part to the early effort of Yosemite Ranger-Naturalist Carl Sharsmith, is that of the Dana Plateau, a 500-acre site east of Tioga Pass in the Humboldt-Toiyabe National Forest. Information from the Dana Plateau and a handful of similar sites reveal that Sierra sky islands support a surprising diversity of plants. There are 225 known species, 51 of which are listed by the California Native Plant Society as rare, and 71 of which are endemic to these alpine habitats (e.g. found nowhere else). In the first year of the project, the survey team was able to inventory the flora of Mount Conness, Excelsior Mountain, an unnamed plateau north of Granite Lakes, and began work on Mount Dana and Mount Gibbs, despite a short working season due to a late-melting snowpack. With this year's heavy snowpack,

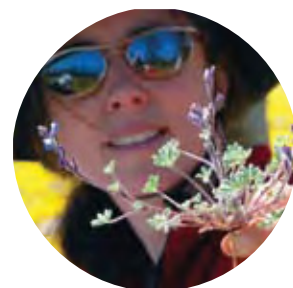
plant inventory will likely start in August and continue until snow falls in September.

After surveying is complete in 2012, the team will have significantly added to the knowledge of the range, habitat preference and population sizes of sky island plant species in Yosemite. Botanical specimens collected and preserved by the survey team will serve as long-term verification of species occurring in these locations. Specimens collected during this survey will be deposited in public herbarium collections where they can be studied by experts, thus expanding their value as research tools for the scientific community. Specimens of the Yosemite sky-island collections of the black-and-white sedge (*Carex albonigra*) have already come to the attention of such an expert and, along with collections from 40 other locations in the high Sierra Nevada, will soon receive formal designation as a new species.

Information gathered will give us a better understanding of the wealth of biodiversity on Yosemite's peaks, and help scientists assess the risk of loss for each species from climate change and other potential pressures such as overuse or atmospheric pollution. However, the scientific observations and data collected by members of the sky islands team is just one perspective.

We can only imagine what future generations will add to this knowledge base, including the perspectives of artists, historians, philosophers and passers-by. It will take all of us to convey the deeper meaning of the flora on Sierra sky islands and how it helps enrich our experience and relationship with Yosemite. ■

ALISON COLWELL is a botanist at Yosemite National Park where her focus is inventory and monitoring of the park's rare plants. She earned her Ph.D. in Population and Evolutionary Biology from Washington University, where she studied gene evolution in parasitic plants. Before coming to Yosemite in 2003, Alison worked for the USGS Western Fisheries Research Center in Seattle where she developed genetic markers for Myxozoan parasites of fish. Although her main passion is investigating Yosemite's fascinating flora, Alison also finds time to study her current favorite group of parasites, the flowering plants of the genus *Orobancha*.



ALISON COLWELL WITH LUPINE