



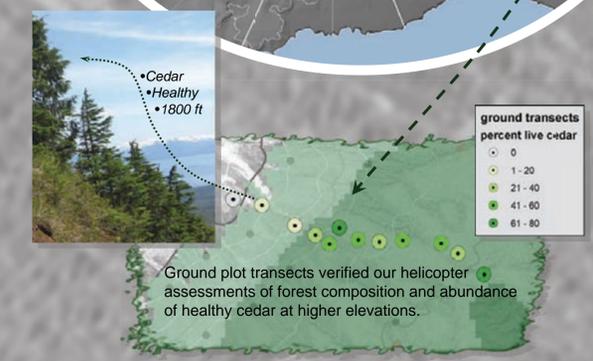
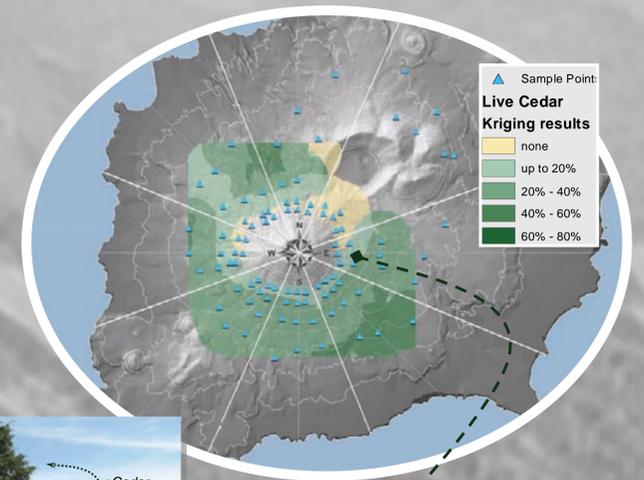
Yellow-cedar, a culturally and economically valuable tree in Alaska, has been subjected to wide-spread decline during the last century. Recent evidence suggests this decline is climate induced, related to a reduction of an insulating snow pack in winter and early spring. We chose Mt. Edgecumbe, an inactive volcano near Sitka, Alaska, to test the influence of various terrain factors. Unique radial symmetry, relatively even slope gradient, homogeneous soils and apparent presence of yellow-cedar forests from sea level to timberline presented an ideal setting to evaluate how landscape features and snow are associated with this forest decline.

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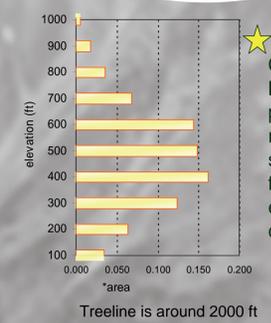
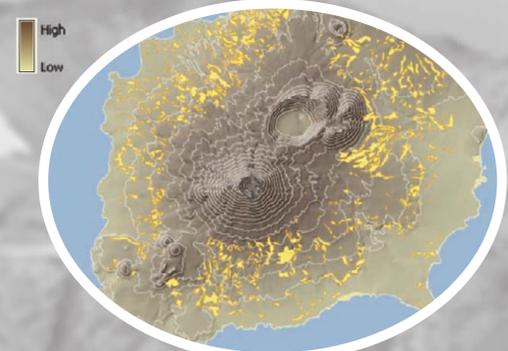
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 Year 2 of 2

Detecting healthy cedar forests: Does cedar grow above the dead zone?



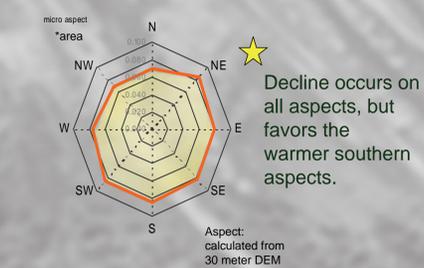
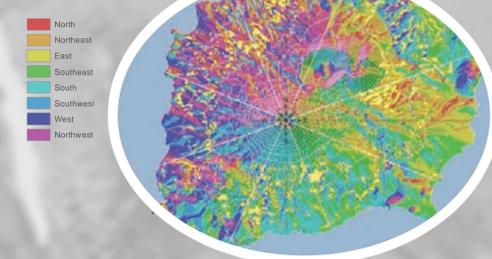
Ground plot transects verified our helicopter assessments of forest composition and abundance of healthy cedar at higher elevations.

Elevation



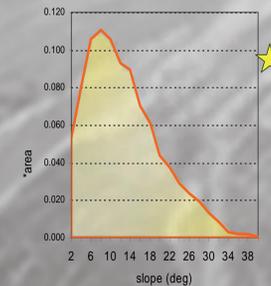
Cedar decline is limited to lower elevations, presumably because tree roots are not protected by snow, allowing them to freeze in late winter and early spring during brief cold periods.

Aspect



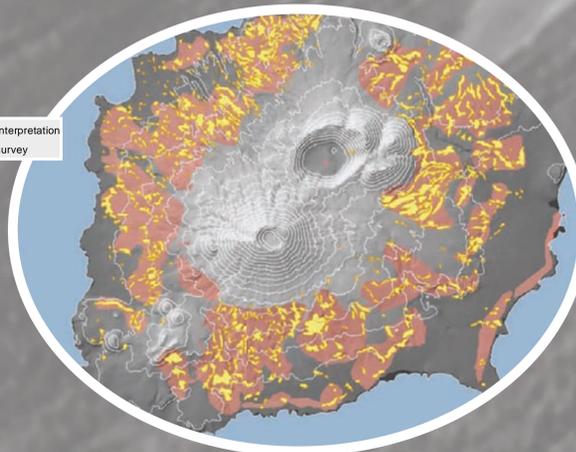
Decline occurs on all aspects, but favors the warmer southern aspects.

Slope



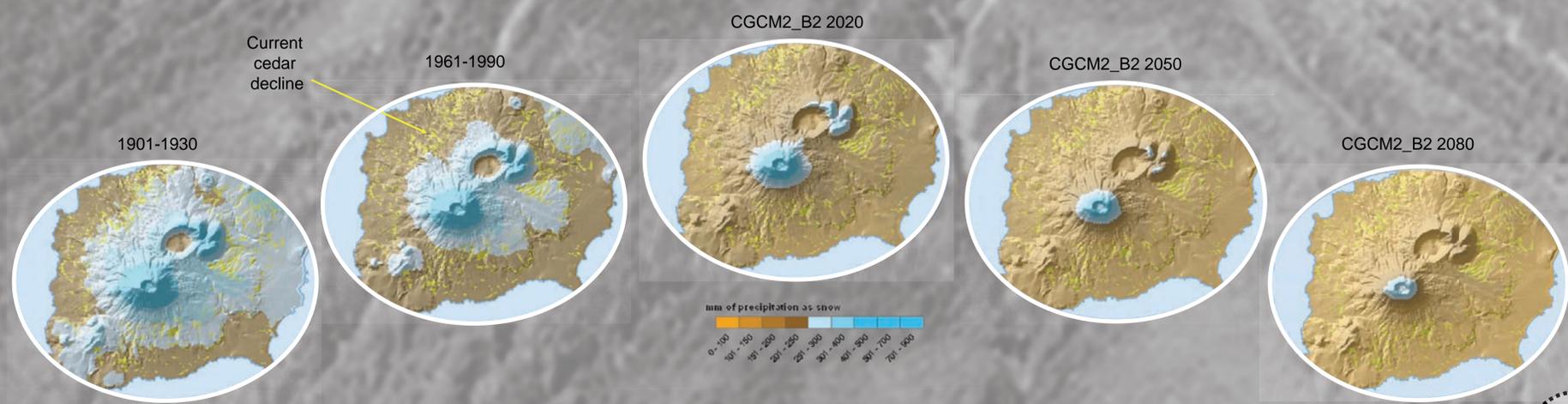
Cedar decline is more prevalent on gentle slopes with poor drainage. Steeper, well-drained slopes support more insulating canopy and deeper roots.

Mapping cedar decline by aerial photography v. aerial survey



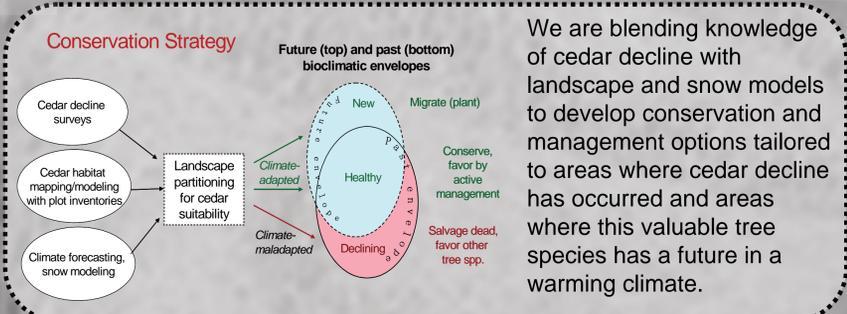
Although both detection methods map the same general area, aerial survey is a coarser detection method than using aerial photographs:
 • Aerial photographs yielded only 25% of the acreage
 • Aerial photographs produced 25X more discrete polygons

Snow modeling to identify suitable cedar habitat



Snow models and cedar decline on Mount Edgecumbe.

Past and projected (CGMC2 B2 scenario shown here) annual snow accumulations using PRISM, with elevational adjustment (Wang et al. 2005). Light blue zones represent sufficient snow to protect cedar from spring freezing injury (annual precipitation as snow = 2500mm); current areas of cedar decline mapped from aerial photographs are yellow. Note the abundance of habitat protected by snow (blue) in the early 1900s and progressive shrinking of this habitat through this sequence, to being nearly absent by 2080.



We are blending knowledge of cedar decline with landscape and snow models to develop conservation and management options tailored to areas where cedar decline has occurred and areas where this valuable tree species has a future in a warming climate.

