Yellow-Cedar Decline: Evaluating Key Landscape Features of a Climate-Induced Forest Decline

Yellow-cedar, the most economically valuable tree in Alaska, has been subjected to widespread 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 place to study decline distribution.

1. Decline Distribution is not Simply Defined by the Extent of Yellow-Cedar Forests
   - On the need to determine whether or not the observed larch/decline relationships were a factor of recent climate influences or simply driven by the presence or absence of live cedar.
   - Although dead yellow-cedar can be mapped by air and detected on remotely sensed images, the presence and abundance of live yellow-cedar in healthy forests is not easily distinguishable from other species and not currently quantified or mapped on a broad scale.
   - To assess the extent of live yellow-cedar past and above the limits of the mapped region, we set up 32 plots equally spaced in eight cardinal directions and along four contours from 300 feet elevation to 1000 feet elevation.
   - The records indicate species composition and health from a heli-plotter, using the digital aerial survey system. Results were interpreted into maps showing percentage of live and dead cedar.
   - Healthy yellow-cedar forests clearly extend beyond the elevation limits of the decline.

2. Remote Sensing Methodology Will Utilize UAVs and Historic Imagery
   - Through a collaborative effort with the University of Alaska Fairbanks (UAF), we plan to utilize contemporary aerial images (UAV) to collect real-time health data in pristine boreal forests and provide new perspectives on the relative health of species across a range of elevations.
   - With the drone's low-flying capabilities, we hope to improve upon our live cedar map.

For more visit: www.yellow-cedar.net

Photo Interpretation & Aerial Survey Verification

Aerial surveys verified & refined the FI produced data

Terrain Factors Characterize Decline Distribution and Hint of Climate Influence

a) Elevation
b) Aspect
c) Slope

Photo interpretation and aerial survey analysis for Yellow-Cedar decline mapping.

When comparing the data collected via photo interpretation to the data collected via aerial survey, FI yielded only 35% of the accuracy vs. projected 80% more accurate polygons.