Effects of age & succession type on forest overstory & understory composition

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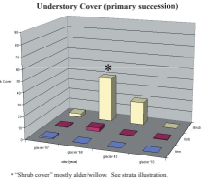
Glacier Microplot Samples

1997 Mendenhall

1968 Mendenhall

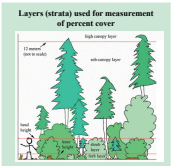
1943 Mendenhall

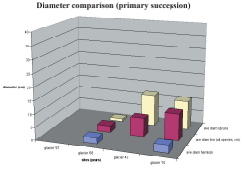
1910 Mendenhall



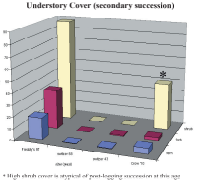
* "Shrub cover" mostly alder/willow. See strata illustration.

Response of understory cover differs between primary and secondary succession. Initial high percent cover in secondary succession is from pre-established understory growth. In later stages of secondary succession, understory growth is often repressed by a rapidly closing canopy.

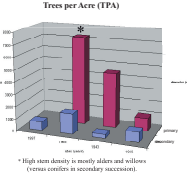




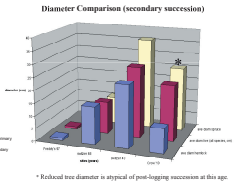
Tree growth in secondary succession is much more rapid and starts earlier than in primary succession. This is because of the lack of an organic soil base in primary succession.



* High shrub cover is atypical of post-logging succession at this age



* High stem density is mostly alders and willows (versus conifers in secondary succession).



* Reduced tree diameter is atypical of post-logging succession at this age.

Purpose

The purpose of our experiment was to determine effects of age and succession type (primary vs. secondary) on forest overstory and understory composition.

Hypothesis We chose to test the null hypothesis that forest composition would not vary by stand age or successional type.

Procedure To determine variations in primary and secondary succession stands, plots were surveyed at corresponding age sites in both post-glacial and post-logging forests. These surveys gathered similar information, in order to measure differing characteristics in each successional type.

- We chose 8 sites to survey. Four had been previously logged (secondary succession) and the other 4 had been covered by Mendenhall Glacier (primary succession).
- We overlaid maps and photos of glacial succession and logging sites/trends in the Arc View computer program in order to identify and select random plot sites for data collection.
- We hiked out to sites following pre-selected GPS coordinates either along the ice line or to logged areas.
- At each site we set up a 30-m by 3-m study plot. All trees within the plot were measured.
- Within the 90m^2 band we set up 10 1-x-1-m^2 plots.
- Vegetation in each plot was quantified: tree height, type, diameter, density, crown depth, canopy cover, moss, shrub, fern and forb cover, and wood & litter cover.
- Four different-aged sites for each succession type were surveyed to demonstrate a change over time.

Conclusion

Our results did not support our null hypothesis of no difference, as there was significant variation between primary and secondary successional types, as well as variation between sites of different ages. Further studies that could be derived from this experiment include: **1)** a crown-depth study, **2)** inventory of animal life dependent on these stands, **or 3)** a continuation involving a larger and more diverse pool of sites, and consideration of snow depth.

Reference to Data Our data have yielded several conclusions. We noted definite trends in understory and overstory growth. In the understory of secondary growth (or logged) sites, we noticed an initial surge of forb, fern, and shrubs, with concentrations dropping off as stand growth and age increased. We believe this is because of rapidly closing canopy and resulting loss of light that occurs in young secondary stands. In secondary succession there was a fairly low tree density (trees per acre) that only fluctuated slightly throughout the differently aged sites and peaked in the logged '68 site.

In primary succession, the same trends hold true, but manifestations of these characteristics were delayed. In primary succession we noticed much higher tree density in younger sites, which lessened as the stand aged (not the case in our glacier '97 plot, as no trees had managed to take hold at time of our survey).

Our overstory observations have also produced several interesting results. In secondary succession sites, trees were taller and thicker on average, and grew faster than trees in primary succession sites. Species-spread throughout the 2 successional types was also very divergent. Primary succession sites showed mostly alder, followed by willow and spruce. Secondary succession sites displayed hemlock as the prevalent species, followed by spruce and a very small amount of red alder. More study is necessary to achieve an acceptable theory of successional differences.

Applications This study shows how major disturbance types affect wildlife habitat and it is important for its documentation of plant regrowth in logged sites of varying ages. Study results can be used by a variety of professionals interested in effects of clear-cut logging on Southeast Alaska's forests. It can help predict successional habitat types that support certain plants, and ultimately, certain animals. There has been considerable work in both post-logging and post-glacial succession. Our study is the first to compare and contrast these succession types in Southeast Alaska.

Post-glacial

Glacier 1997

Glacier 1968

Glacier 1943

Glacier 1910

Post-logging

Fred Meyer 1997

Switzer 1968

Switzer 1943

Crow Hill 1910

Logging Microplot Samples

1997 Fred Meyer

1968 Switzer

1943 Switzer

1910 Crow Hill