Lynx #1 White Paper

The Lynx #1 stand is an important old-growth Douglas-fir research site located on the North Umpqua Ranger District of the Umpqua National Forest. Individual tree growth was followed over the past 50-years to determine the individual and stand response to two light timber harvest entries 20 and 40 years ago. It is currently thought that classical old-growth is not able to add substantive diameter growth once trees reach an old-growth age of greater than 150 years. Hence, minimal additional carbon sequestration is normally attributed to old-growth tree release.

Lynx #1 is a 3.64 hectare (9-acre) partially-harvested stand with light-moderate entries in 1976 and 1996. It is an average Site Class Four quality stand. The stand is at about 1,000 meters elevation (3,300 feet) and is located on Panther Ridge above Steamboat, Oregon. There are three main age classes of old-growth present in the overstory: 150-175 years, 300-350 years, and 500+ years of age.

Every old-growth snag or live tree in Lynx #1, totaling 471 trees, was measured for various growth measures to include diameter, height, increment, and other structural attributes. The trees are individually tagged and mapped. An interactive ArcGis map for this research can be reached at the website:
https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=fde1e86da5a6440ca5b9dea53cfd368c

The main findings of this research, utilizing BioPak allometric equations of different tree components (Means et al., 1994), showed that there was a 33.0% accumulation of carbon over a 40-year period. The average growth increase per tree was greater than 7% per decade throughout the time-frame.

Similarly, the average tree weight increased from 3.13 to 4.17 Mg_Tree, while the average tree increased its diameter by 3.56” over the 40-year period. Remarkably, 89% of the 440 live-trees measured exhibited moderate-fast growth rates following both stand entries at 20-year intervals.

At its current growth rate, the 440 live old-growth trees will “grow back” carbon, totaling what was removed by harvest in 1996, by the year 2020. There was 550.7 Mg_Ha of biomass measured before harvest in 1996. The partial removal in 1996 led to a 15% reduction, or removed 84.2 Mg_Ha of biomass. In 2016, there was 538.64 Mg_Ha of biomass measured in the old-growth trees in Lynx #1; with Lynx stand #1 actively growing at 3.62 Mg_Ha per year.

Concurrently, traditional measures of volume, like Scribner board foot and basal areas per acre, were also analyzed. The board feet within these live old-growth trees increased by 20.8% in the last 40-years. The 440 live old-growth trees increased their basal area by 50 square feet per acre or 123.5 square feet per hectare. This change is equivalent to a 26.7% increase in basal area over the 40-year period.

Clearly the tree data indicates that Lynx#1 is a dynamic and active old-growth all-aged stand. The Classical Ecosystem Theory of old-growth that indicates static or declining growth with age is not evidenced in Lynx stand #1.

Furthermore, it is key to understand that old-growth trees seemingly grow differently than young-growth. The study measured key structural attributes like bark thickness, limb diameter, crown form and noted any visible tree pathogens like conks, fire scars, broken tops or multiple tops. Conventional young-growth thinking is that key crown structural form is important for adequate tree development; e.g. having crown ratios greater than 40% for Douglas-fir and not having a one-sided form.

In testing these hypothesis against the Lynx old-growth some interesting results were found. These might influence future forest management for improving the resilience, health and sustainability of these valued genetic-legacy trees of the forest.

An in-depth look at one-sided crown trees found that while 24% did have poor growth rates, 76% had moderate or fast growth rates. Testing trees with less than 20% crown form found only 13% growing poorly, while 87% grew moderate-fast over the 40-year period. Testing trees with both poor crowns and one-sided structure, found that 23% had poor growth and 77% had moderate-fast growth rates.

Further analysis was done on trees with visible conk indicators. Fifty-one (51) trees with Phellinus pini were measured and while 26% had poor growth rates, 74% had moderate-fast growth rates. Six (6) trees with Phaeolus Schweinitzii were measured and 33% had poor growth rates and 66% were unexpectedly growing moderate-fast. Implications for this additional growth are not normally considered.

Structural components in trees less than 30” diameter at breast height (dbh) were measured, including large limbs, thick bark, and platform branch patterns. Analysis of 323 trees showed that only 16% had limbs sized under 2” diameter while 73% had limb sizes 3-4” diameter. Similarly, of the 323 trees only 29% had bark less than 2” thickness while 68% had bark with 3-4” thickness. Lastly, of the 160 trees measured with platform branch patterns, 73% of them were less than 30” dbh indicating that preferred red tree vole habitat is skewed in Lynx #1 towards the smaller diameter old-growth trees.

Lynx stand #1 represents an average old-growth stand of average site quality across the Umpqua National Forest. Given that, similar results may be expected of similar entries to sustain old-growth health and longevity. A follow-up study site in East Clover, also on the North Umpqua Ranger District, is currently underway as part two of this three stand Umpqua National Forest old-growth analysis effort.

Opportunities for forest managers to increase carbon storage in old-growth trees is now a more viable option to be considered in landscape and watershed decisions. The Umpqua National Forest has over 242,000 hectares, or 600,000 acres, of old-growth cover. Old-growth areas that are partially thinned do realize carbon capture gains afterwards, while increasing fire resiliency, both for individual trees and the entire stand. Thoughtful proactive measures can help improve long-term health and maintenance of old-growth Douglas-fir trees.