

Appendix 7: Forest Stand Historic Range of Variation (HRV)

For every biophysical environment, natural disturbance processes such as fire, floods, wind, etc. have measurable patterns of frequency, intensity, and spatial scale. The pattern of variability over time constitutes the historical range of variation (HRV). This ability of an ecosystem to absorb and recover from disturbances without drastic alteration of their inherent function is central to the concept of HRV.

The study of HRV attempts to understand the ecological context of an area and the landscape-scale effects of disturbance. It also offers context and guidance for managing ecological systems. When humans alter the components and structure of ecosystems beyond the historical range of variation, they risk fundamental change that can threaten biodiversity. One of the largest human influences upon the HRV is the suppression of natural variations that are not economically profitable. Attempts to make landscapes more predictable or profitable by controlling the historic rate of variation through the suppression of certain natural disturbances such as fire or flood may reduce resiliency of ecosystems that arises as a byproduct of these disturbances.

In determining the historic range of variation, it is essential to find the appropriate geographical and temporal scale. Relevance is lost if too long a time period is used, as climate and species variation may have changed drastically. Geographically, a balance must be found that provides a large enough area to fit local systems into regional context without losing the specificity within the HRV of the given area. In measuring historic rates of variation over periods of time and space, basic measurements include mean, median, range and standard deviation. However these measurements can vary depending on the disturbance. For example, fire managers use descriptors such as frequency, severity, size, and shape distributions to establish measurements of the disturbance throughout history.

As these descriptors imply, the size and severity of disturbances vary quite a bit. One aspect of HRV that is not fully understood is how different disturbances interact. Large disturbances can have effects that last a hundred years. This leaves room for interaction between large and small-scale disturbances. Understanding these interactions could be essential in making management practices socially acceptable. It's possible that many small-scale disturbances could compile to mimic effects of a large-scale disturbance. Extreme disturbances, which transformed landscapes, may not be socially acceptable today. For example, large-scale, stand-replacing wildfires are within the HRV for higher elevation sub-alpine fir forests of the Wallowa Mountains, but the occurrence of such a wildfire above the Wallowa Lake Basin poses considerable risk to public safety, private property and the economic well being of the Lake Basin area and the City of Joseph.

Management that sustains the complexity of forest structure and landscape diversity within its historical bounds may also sustain historical biodiversity; however attempting to restore earlier landscapes may not lead to resilience in the face of new forces, such as climate change, mega fires, exotic species invasions, or pollution. At regional scales, changes have been profound and pervasive nearly everywhere and managing ecosystems to function within their historical bounds is neither possible nor desirable. Because these variations not only affect the ecosystem's

function, but the value that humans place upon the ecosystem as well, management plans that include reference to HRV must fit within local social and ecological contexts.

Forest management should try to understand how historical processes shaped ecosystems and set management targets based on the lessons of history, not a re-creation of history. When natural disturbance regimes are absent or altered, restoration and management approaches that integrate concepts of ecosystem responses to natural disturbances may achieve biodiversity goals.

The dominant biophysical environments in the Upper Joseph Creek Watershed are G-4 (Cool Dry Grand Fir Stands) and G-7 (Warm Dry Ponderosa Pine / Douglas-fir Stands). G4 has a historic fire return interval of 20-30 years for small under-story fires, and G7 has a return interval of 7-14 years. Historically, these fires served to eliminate under-story conifers and maintain an open park like structures of ponderosa pine and Douglas fir; however, even with these reoccurring low intensity fires, there would be occasional intense fires in areas of fuel build up.

When fire regimes were altered in the Upper Joseph Creek Watershed, succession, rather than disturbance became a much larger force in altering forest structure. Succession shifts forest composition towards increasingly shade tolerant species, which in the absence of normal fire disturbance leads to overcrowded stands and increased risk of severe fire and pest disturbance. Recent field exams and analysis suggest that 68% of the public lands within the UJCW are significantly altered from their historical fire regimes. Both fire and pest infestations are part of the HRV in the Upper Joseph Creek Watershed. However the density and uniformity of forest structure created through overstory logging and fire suppression could cause a large-scale catastrophic disturbance that is not consistent with the historic pattern. Such an event could inhibit the ecosystem from returning to steady-state equilibrium and thus cause it to depart even further from its historical state.

In response to our understanding of HRV within the Upper Joseph Creek Watershed, forest thinning practices are gradually being implemented to reduce fuel loads, increase heterogeneity in stand structure and species composition, and promote more late and old structure.