



Effects of Elk on Aspen Growth

The Question: What factors affect the ability of aspen stands to successfully regenerate on the winter elk range?

Observations indicate a decline in aspen on elk winter range in Rocky Mountain National Park. Previous studies have linked this decline to heavy elk browsing. Decline in number of aspen stands may cause substantial reductions in biodiversity on the landscape because aspen communities support a rich diversity of bird, butterfly, and plant species. However, previous park aspen studies have not identified the amount of browsing or the elk population size that affects aspen regeneration or examined the relationship of weather trends, which may intensify the effects of elk browsing.

The Project: Study relationships between elk populations, aspen conditions, and climate and topographic conditions.

Scientists from the US Geological Survey, led by Linda Zeigenfuss, investigated the conditions that may contribute to the regeneration of aspen stands on the low elevation, east-side of the park. These conditions include the level of elk browsing that suppresses growth and regeneration of aspen stands. A special focus of the study was stands along the edges of open meadows or parks such as Moraine and Horseshoe parks in the core elk winter range. Scientists sampled winter and summer consumption rates, or offtake, and annual vegetation production, of aspen stands. They measured annual growth, sapling heights, and aged trees by counting growth rings. Elk use of aspen was determined by estimating the amount of current year's twig growth removed by browsing and assessing the amount of bark scarring due to elk browsing. They examined trends in the elk population size and density on the winter range. The team also analyzed weather trends, including precipitation and temperature, and topographic variables, such as elevation and slope that might have affected growing conditions. They compared the variables between regenerating and non-regenerating stands to determine factors in addition to elk browsing that may affect the establishment of new trees.



A USGS increment corer in an aspen tree.

The Results: Evidence clearly indicates that declines in aspen stand regeneration are primarily related to high levels of elk browsing on the winter elk range. Climate and topography contribute to the patterns of elk browsing.

Stands with high levels of browsing (>15% offtake) had fewer and shorter aspen suckers (shoots from underground roots or stems). However, the potential of healthy suckers to produce substantial annual growth was not damaged by elk browsing. The level of offtake increased with increasing elk densities. Individual site characteristics and climate likely contribute to the effects of elk browsing. For example, stands at the higher elevations on steep slopes of the winter range appear to be used less by elk. These higher elevation stands also have significantly greater regeneration.

During the 1960s, a decline in snowfall may have contributed to reduced aspen establishment. At the same time, elk populations and browsing pressure were increasing as a result of the cessation of the park's elk reduction program due to a change in National Park Service policy. Study results indicate that many non-regenerating stands on the winter range will likely regenerate successfully if protected from browsing.



USGS research in aspen stands conducted in 2007.