BUILDING RESILIENCE INTO QUAKING ASPEN MANAGMENT

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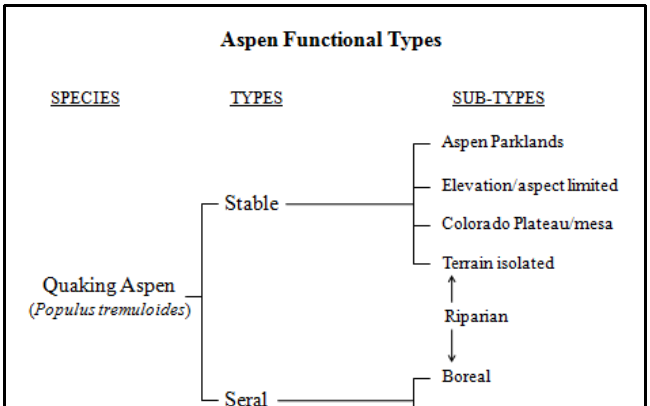
Overview

Throughout the 20th century, forest scientists and land managers were guided by principles of succession with regard to aspen forests. The historical model depicted aspen as a "pioneer species" that colonizes a site following disturbance and is eventually overtopped by conifers. Aspen systems are more diverse, however, than previously described. Not only are there distinctive seral and stable aspen, but variations within these types require appropriate management considerations (Rogers et al. 2014). We recommend a strategic approach to aspen resilience that builds upon traditional aspen ecology and incorporates knowledge of varying aspen functional types, effective monitoring, historical disturbance ecology, and collaborative problem-solving.



Adapted from Rogers et al. 2014

Background

In western North America aspen has a storied history in popular, management, and scientific realms. As Euro-Americans settled this region, aspen was favored for livestock forage and passed over, sometimes actively eliminated, as a timber resource. Ironically, these activities during the 19th century inadvertently promoted aspen as they commonly employed fire after use. The elevated level of forest and rangeland burning during this period resulted in many of the mature aspen forests we see today (Kaye 2011).

Montane seral (L) and Colorado Plateau stable (R) aspen

Aspen forests are highly dynamic ecosystems; they change through time due to relatively short life spans. Also, their thin bark makes them highly vulnerable to physical damage from insects, disease, wildlife, fire, and even sun scald. Over the past 150 years these forests have experienced long-term declines, even while aspen expanded in other areas (Kulakowski et al. 2013). Many of these decades-long changes result from human interventions to some degree (Kaye 2011).

Many aspen stands carry on an intimate relationship with fire. Forest ecologists are familiar with aspen's susceptibility to both human- and lightning-caused fire in its seral state. As conifers infill over time, the forest becomes more susceptible to fire ignition and consumption. Whether stand-replacing or mixed-severity, fire inevitably will affect these forests. Stable aspen types—where aspen occur with few or no conifers—are largely fire resistant. These forests are difficult to burn unless conditions are just right (Shinneman et al. 2013). Fire's role in aspen forests is highly variable depending on what type of aspen community is at hand, as well as its condition, slope, aspect, and proximity to water, among other factors.

Browsed aspen suckers soon after wildfire in northern Arizona

Regardless of disturbance or aspen type, maintaining aspen resilience is highly dependent on local levels of ungulate herbivory (Seager et al. 2013). In the West, prominent aspen browsers include cattle, sheep, elk, and deer. If great care is not taken to protect post-disturbance and post-treatment stands from large ungulate browsing, indispensable flushes of aspen sprouts may be consumed. Repeated browse of aging aspen can accelerate conifer encroachment in seral aspen and lead to system collapse in stable aspen (Seager et al. 2013; Rogers and Mittanck 2014). Key indicators of aspen stand resilience include amount, height, and browse level of regeneration (stems < 2 m tall); number of recruitment stems (>2 m and < dominant mature tree height) as a percent of live mature stems; pellet counts by herbivore species; and mortality of mature trees (Rogers and Mittanck 2014).

Monitoring and Science Guide Actions

Decision-making requires current scientific knowledge even when "no action" is the most appropriate course. For example, a clear understanding of aspen types dictates that clearfelling in stable aspen types will yield inappropriate age-class structures more vulnerable to excessive browse. Site- or landscape-specific monitoring prior to implementing actions will help guide appropriate management. Follow-up monitoring will inform adaptive practices, as well. The following steps will help guide management toward aspen resilience:

ASPEN RESILIENCE STEPS

Key Findings:

1. Aspen types vary considerably and are driven by multiple processes. Understand distinct types and manage accordingly.
2. Connect aspen types to historical ecology. Knowing dominant disturbances, historic impacts, and cover changes places current actions in a long-term context.
3. Browsing intensity varies greatly. Monitoring for herbivory (i.e., recruitment success), and other impacts, prevents acting on invalid assumptions.
4. Stewardship toward resilient aspen increases the chances of success under changing climates.

Sources

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