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# Managing Ungulate Browsing for Sustainable Aspen

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WAA BRIEFS

# MANAGING UNGULATE BROWSING FOR SUSTAINABLE ASPEN

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**Overview**
In montane forests of the Intermountain West composition and function are often defined by what happens with quaking aspen. Aspen is a pioneer species that regenerates quickly following disturbance and then establishes ecological conditions under which the rest of the biological community develops. Quaking aspen forests have high biodiversity and provide ideal habitat for many animals. Aspen regeneration from root sprouts is highly palatable to wildlife and livestock. When browsing becomes chronic it leads to regeneration failure and eventual loss of aspen forests and associated species. Ironically, this can result in habitat and forage loss for wildlife and livestock. Here we address ecological conditions and management approaches that increase aspen resilience to ungulate herbivory.

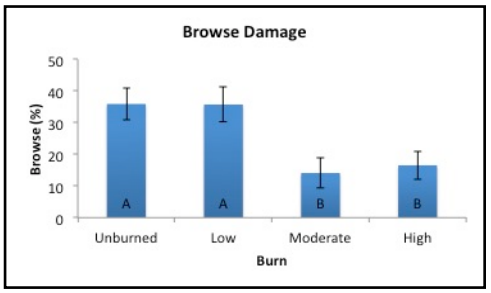
**Background**
Aspen plays a fundamental role in facilitating post-disturbance re-establishment of forest communities, but intense browsing by ungulates can be detrimental to aspen establishment and recruitment (Seager et al. 2013). A regional survey of aspen understories across central and southern Utah showed that approximately 40% of aspen stems display evidence of browsing. Incidence and severity of browsing vary, suggesting that there are multiple factors that influence aspen browse susceptibility. However, aspen forests only require 500 to 1,000 suckers per acre to escape herbivory and recruit into the overstory for the stand to persist.

*Elk browsing aspen (Photo: Wayne Shepperd)*

**Factors Affecting Browsing in Aspen**
Aspen can counteract or escape browsing through growth and production of defense chemicals (Lindroth and St. Clair 2013). In general, though, ecological conditions strongly influence the effectiveness of aspen's defense against herbivory. Based on recent research, four factors are important to assess and consider when managing for aspen resilience to ungulate browsers.

1) *Ungulate community activity*: The size and activity of wildlife and livestock communities are obviously important for determining browse risk and can be monitored using pellet counts, cameras, and GPS collars. However, understanding the timing and the species is important (Bork et al. 2013). Recent research suggests that other forage species may be preferred by ungulates during the summer months but that they seem to prefer aspen in the late summer/early fall as other forage species senesce and lose their nutritional quality (Villalba et al. 2014). Areas with high overlapping wildlife and livestock use in August and September appear to be particularly hard hit. Therefore management approaches need to be targeted to a location and season.

2) *Fire characteristics:* Aspen forests are particularly prone to herbivory damage following disturbances that change stand structure from overstory trees that are safe from herbivores to root suckers that are susceptible. Fire size and severity are particularly important in determining aspen regeneration success against browsing. We found that aspen suckers regenerating in high severity burns experienced less browsing and faster growth, greater production of defensive chemicals, and greater dispersion of ungulates (Wan et al. 2014a). Subsequent work suggested that both high fire severity and larger fire size increase aspen regeneration success (Wan et al. 2014b).



3) *Aspen abundance*: The density and extent of aspen also matters, with large, dense stands generally regenerating better. Whereas the fires in Yellowstone in 1988 were large and severe, there was still significant aspen and willow decline due to herbivory because there was limited browse material in this landscape to begin with. We have observed similar problems in southern Utah where patchy aspen stands regenerating after fire are browsed heavily even when ungulate populations are moderate.

*Elk scat and browsed aspen sucker following a wildfire in Arizona.*

4) *Aspen functional type*: As discussed in WAA Brief #1, there are different ecological considerations depending on whether the target aspen community is seral to conifer succession or stable (remaining in aspen cover over long periods). While seral aspen undergoes periodic rejuvenation via suckering/seeding following stand-replacing disturbance, stable aspen does not generally experience large disturbance (Rogers et al. 2014). In terms of recruitment opportunities, there is marked difference between continuous regeneration resulting in complex structure in stable stands, and generally even-aged aspen in seral communities. Thus, reliance on human or natural disturbance as a regeneration "engine" may be inappropriate for stable stands. For these forests, careful regulation of browsers is very important where lack of successful recruitment has been demonstrated through prior monitoring.

**Management Recommendations**

In areas with high ungulate browse potential: 1) avoid small, low severity burns; 2) protect small patches of isolated aspen, where practical, with fencing or other methods; 3) work with livestock and wildlife managers to reduce or move ungulates during high risk periods (i.e., late summer or post-fire); and 4) conduct follow-up monitoring and adjust tactics if necessary.

**Key Findings:**

1. Herbivory commonly inhibits successful aspen re-establishment, though browsing intensity varies geographically. Ungulate browsing of aspen tends to be greatest in late summer-early fall.
2. Susceptibility among clones varies due to levels of defense chemicals in aspen.
3. Key monitoring variables include browse intensity and stand-level recruitment.
4. Number and movement of herbivores, total aspen available stems, disturbance size and intensity, and aspen functional type play key roles in facilitating aspen recovery.

**Sources**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