WAA BRIEFS

WESTERN ASPEN ALLIANCE

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BIODIVERSITY WITHIN ASPEN FORESTS

WAA Brief #7: May 2019

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Overview

Aspen have long been known for supporting lush vegetation and rich wildlife habitat. These features, alongside brilliant green and gold seasonal coloration, accompany a broadly appreciated aesthetic for aspen forests by the public at-large. However, in earlier times timber producers in many locales considered aspen to have low value and actively eliminated them. More recent research has pointed out that relative moisture held within aspen communities facilitates a wide array of species – collectively, biodiversity – compared to surrounding vegetation types. Aspen groves in the Intermountain West, for example, are known to be second only to riparian forests is supporting the greatest number of species. This newer image of aspen as an enabler of many plants and animals, a "keystone species," has greatly changed how we view, manage, and (in some cases) restore these important ecosystems.

Background

In May 2019, the United Nations released a summary report that cataloged the worldwide impact humans are having on biodiversity loss. The report's authors conclude, "This loss is a direct result of human activity and constitutes a direct threat to human well-being in all regions of the world." Aspen forests, in western North America and around the northern hemisphere, contribute a wide array of benefits. For example, aspen possess intrinsic values, such as beauty, comfort, or spiritual/meditative attributes. Also, aspen provide hunting, fishing, and recreation resources, as well as use for grazing, water conservation, and wood products. And these forests are often photographed for tourism, recreation, and real estate advertising purposes. But how does biodiversity fit into this array of community attributes? The plant and animal life that makes the aspen groves and forests so valuable for beauty, resources, and tourism are directly dependent on the aspen. As a keystone species, aspen increase or decrease relates directly to the species that aspen support. (Fig. 1; Rogers & Ryel 2008, Kouki et al. 2014). This leads us beyond merely preserving aspen as an immediate resource (though that is important, too!), to perhaps its greatest role as a facilitator of diverse communities.

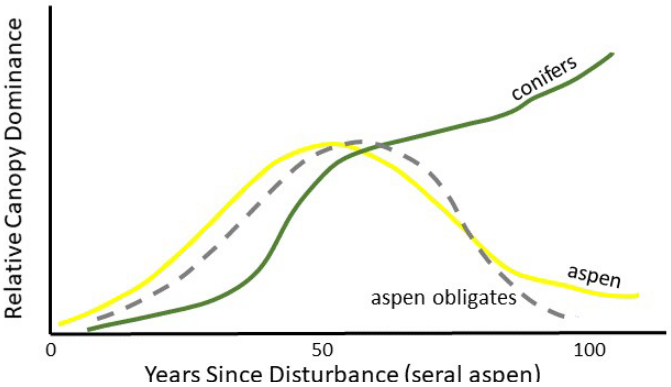

Fig. 1. *Aspen obligate species naturally decline with aspen cover.*

Biodiversity: Assessment & Monitoring

In many locales, aspen systems are biodiversity hotspots even though they are often a minority species among vast conifer forests. This highlights the fact that even small stands of aspen add disproportionately to overall landscape diversity. For example, in those places where aspen stands in the southwest U.S. are in decline, avian diversity has been shown to decrease (Martin and Maron 2012). Similar dependencies have been demonstrated for small mammals, insects, the herbaceous understory, and epiphytic lichens (Rogers 2017). States, regions, or watersheds with low aspen cover display an inverse relationship; less aspen increases the importance of these stands (relatively) in accounting for total landscape diversity as compared to settings with greater aspen cover. Overall, though aspen are widespread their degradation holds outsized capacity for influencing broad-scale regional and continental biodiversity (Kouki et al. 2014).

Fig. 2. *Northern Flicker* (Colaptes auratus) *in aspen*

Because aspen support myriad other organisms, we must first know that the foundational species is thriving. As a baseline measure of aspen system resilience, we must ensure that each forest is actively recruiting new members. Since aspen reproduce primarily from continuous root suckering, metrics of regeneration, and especially recruitment (immature suckers greater 6 ft./2 m height), are central to any assessment of resilience. If there are not at least replacement levels of recruitment (Rogers & Mittanck 2014), it will be of little value to focus resources on maintaining system biodiversity. At the

landscape scale, a diverse assemblage of aspen and conifer age cohorts, ideally alongside varied aspen functional types (Rogers 2017), will in general promote landscape-level species diversity. Such is the case, for instance, where active beaver communities generate dynamic, multi-age, aspen landscapes teaming with riparian and upland diversity (Fig. 3; WAA Brief #6).

Fig. 3. *Age diversity resulting from active beaver use facilitates overall biodiversity.*

The most common, though not the only, subject of biodiversity monitoring has been understory plant communities. Chong et al. (2001) established aspen's preeminence among forest types for supporting wide species arrays through their systematic survey of Colorado's forests. Plant survey have also been used in aspen communities to supplement traditional metrics in aspen forests. For example, current work underway at the famed Pando aspen clone (WAA Brief #4) is establishing a baseline inventory of plant species present in three different treatment types at Pando (Fig. 4). Additional methods may target specific plant or animal functional group inventories under varying aspen conditions.

The lush and diverse flora of aspen undergrowth not only contributes significantly to biodiversity, but also holds more moisture in the plant community, thereby facilitating water retention and, among other things, contributing to aspen's ability to impede wildfire. Thus, metrics of moisture with plant and soil communities may indicate further resource values.

Management Implications

In both North America and Europe, aspen forests support an abundance of species. Managers should be cognizant of this important value when preparing and implementing resource plans. While excessive herbivory may have significant impacts on aspen recruitment, it also directly affects plant diversity with cascading effects on a wide range of obligate animals, from mammals, to birds, to invertebrates. Direct biodiversity monitoring (Fig. 4), as well as aspen recruitment measures, should be implemented to understand species, functional group, and community status prior to management

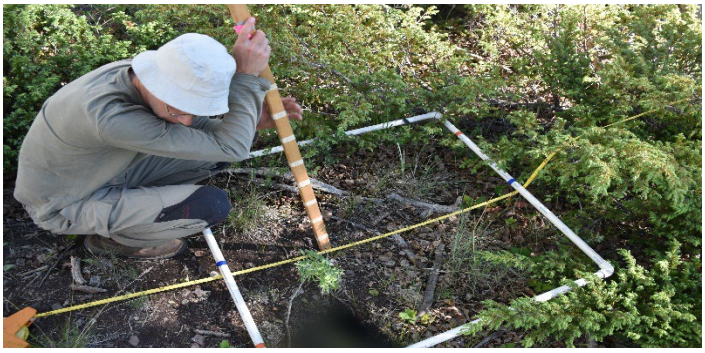

Fig. 4. *Understory monitoring catalogues species names and their relative cover through systematic sampling.*

actions. These measures may be compared to post-treatment conditions to gauge progress and/or instigate adaptive changes. In sum, resilient and sustainable management for healthy aspen forests translates to sound stewardship for a wide diversity of plants and animals.

Key Findings:

1. Aspen are second only to riparian forests in supporting the most biodiverse plant and animal assemblages.
2. Species which are dependent on aspen will decline via loss of habitat if aspen forests diminish. In turn, obligate species will flourish in thriving aspen landscapes.
3. Biodiversity is supported by dynamic, multi-aged, aspen mosaics at the landscape-scale. Such diverse, patchy, forest landscapes carry other benefits, such as fire resistance.
4. Monitoring of aspen forests hinges upon ample recruitment, which, if adequate, will support ongoing biodiversity in understory and animal functional groups.

Sources

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