United States Department of Agriculture

Natural Resources Conservation Service

CEAP Conservation Insight
Conservation Effects Assessment Project

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Targeted Conifer Removal: a Proactive Solution to Conserving Sage-Grouse

Summary Findings

The expansion of juniper and other conifers into sagebrush rangelands degrades habitat for sage-grouse. A new assessment in eastern Oregon found no active sage-grouse leks remained active where conifers covered more than 4% of the surrounding land area.

Breeding activity diminished not only where trees were well established, but also in areas in early stages of encroachment where many small conifers were scattered across the landscape.

This suggests the most effective approach for conifer treatment is to target early encroachment stands (Phase I and II) before the understory sagebrush community is lost and birds abandon breeding areas.

Background

Over the past 150 years, a wave of juniper and pinyon pine trees have swept across the western sagebrush landscape. Conifers have expanded well beyond their historical distribution due to a combination of fire suppression, historic overgrazing by domestic livestock and favorable climate conditions.

This invasion of trees has degraded habitat for sage-grouse and many other species that depend on the sagebrush-steppe ecosystem.

Assessment Approach

A recent study in eastern Oregon, carried out under an NRCS Sage Grouse Initiative (SGI) Conservation Effects Assessments Project (CEAP) partnership with The Nature Conservancy (TNC) and the University of Idaho asked the questions: how much conifer cover is detrimental to grouse, and what size and spatial patterns of trees affect sage-grouse lek, or breeding ground, activity (Baruch-Mordo et al. 2013, Figure 1).

The project utilized previous CEAP-sponsored conifer mapping work that had processed high-resolution imagery across more than 6 million acres using a remote sensing technique called spatial wavelet analysis (Falkowski et al. 2006) (Figure 1). That product allowed researchers in this study to examine not only where juniper occurred but also the size of trees and their spatial configuration on the landscape. The researchers then analyzed how those stand characteristics related to sage-grouse lek activity.

To account for other factors known to influence lek activity, investigators also examined the ruggedness of the terrain, amount of sagebrush cover, climate factors, fire and the level of human-related disturbance on the landscape, such as roads, agriculture, and development.

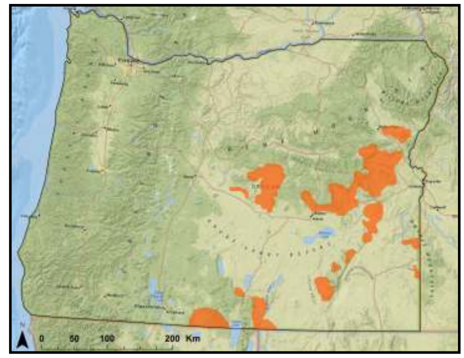

Figure 1. Investigators examined juniper spatial patterns in relation to active and inactive leks across 6.2 million acres of eastern Oregon.

Shrub-steppe to Woodland: a Problem for Sage-Grouse

A key finding from this study was that sage-grouse were very sensitive to even very low levels of conifer encroachment, with no active leks remaining when conifer cover exceeded 4% on the landscape (Figure 2). Further, the pattern of trees was important: active leks disappeared where small trees were scattered throughout the sagebrush, typical of early juniper encroachment.
When conifers invade sagebrush shrub-steppe, they rapidly deplete soil moisture, eventually drying up springs and streams that are so criti-

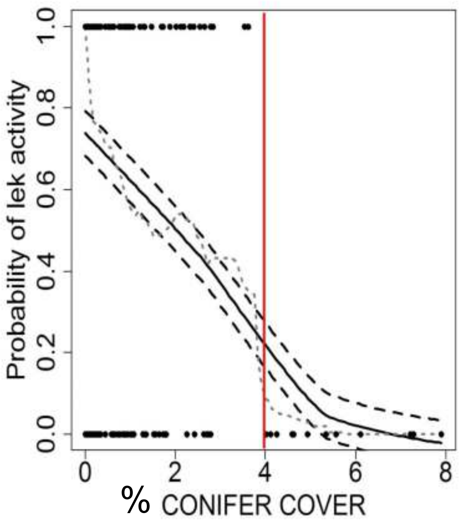

Figure 2. The probability of lek activity in relationship to percent conifer cover (black dots denote leks: for active leks probability = 1, and for inactive leks probability = 0.). Where conifer cover in sagebrush rangeland exceeded 4%, no active leks were found.

cal to dry sage-steppe environments. The trees alter soil acidity, shade out other plants and compete with understory grasses and herbs for water and nutrients, which eventually reduces food and cover for grouse and eliminates forage for other wildlife and livestock (Miller et al. 2005). Larger trees also serve as perches and roosts for hawks, ravens, and other birds that prey on sage-grouse eggs and chicks.

Predictable changes occur during the woodland succession process. In the early stages of conifer encroachment (Phase I), sagebrush still dominates but small trees are dispersed across the landscape. In Phase II, trees co-dominate with sagebrush, and the understory grasses and herbaceous plants critical to sage-grouse and other wildlife begin to decline. By Phase III, conifers are well-established, shrubs begin to disappear, and the area is transformed into juniper or pinyon-juniper woodland, supporting an entirely different array of birds and plants (Miller et al. 2005).

In the Oregon study, the spatial patterns of trees on the landscape proved essential. Leks were more likely to be active in areas where trees were clustered or clumped and large clear patches of sagebrush remained.

As might be expected, the chance of finding active leks was low in established woodlands with densely clustered mature trees. More surprisingly, lek activity also declined where small trees were widely scattered across the landscape (Figure 3). This suggests that grouse avoid areas with active tree expansion as well as established woodlands.

Investigators stressed the importance of spatial configuration as it applies to other disturbances in sage-grouse habitat as well. Whether it is conifer encroachment or human development, both the amount and distribution of the disturbance on the landscape are critical in determining whether habitats are acceptable to grouse.

Targeting Investment for Conifer Removal

These findings suggest managers can be most effective by focusing conifer removal treatments on early encroachment stands in and around landscapes that still provide usable habitat for sage-grouse. Prioritizing Phase I stands—those with young scattered trees, <10% conifer canopy cover and intact sagebrush and understory vegetation—for complete removal of conifers will likely prove the most effective for restoring and sustaining habitat (Figure 4). Treating early Phase II stands can also prevent conversion to conifer woodlands and may help functionally re-

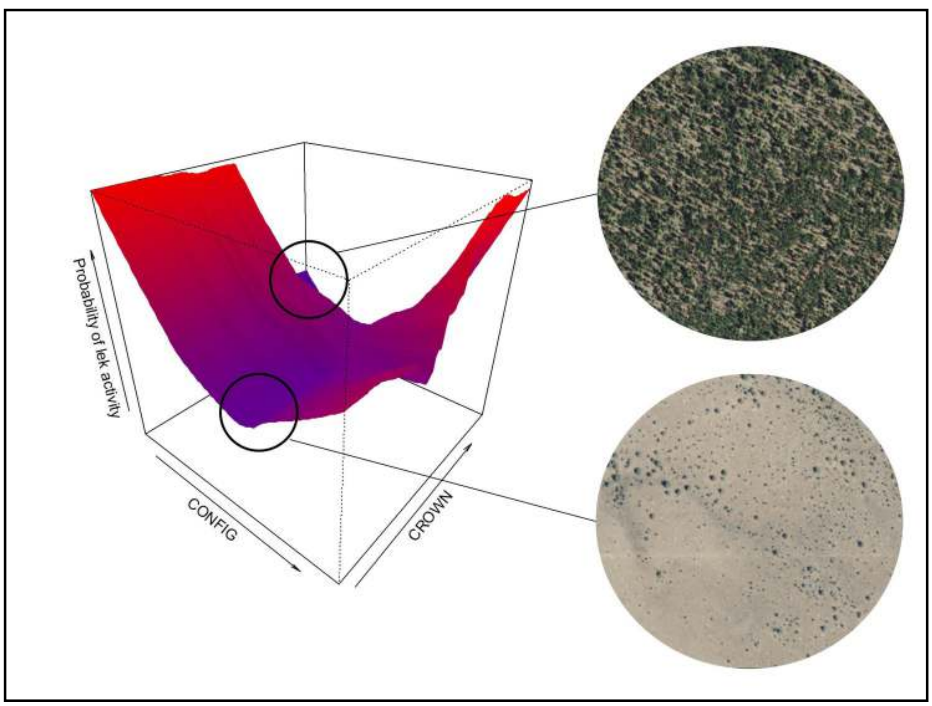

Figure 3. The probability of sage-grouse lek activity in relation to conifer crown area (CROWN) and the spatial configuration of trees in the landscape (CONFIG). Lek activity drops off where large conifers are clustered in well-established woodlands (top circle) and where small trees are scattered across the landscape (bottom circle).

PHOTO: ANDY GALLAGHER

Figure 4. Sagebrush shrub-steppe restored: a 1-square mile area before (top) and after mechanical conifer removal (bottom). The NRCS Sage Grouse Initiative has helped treat hundreds of thousands of acres of early phase conifer invasion to sustain sagebrush habitats.

store sagebrush habitat for several decades. Emphasizing mechanical treatment techniques that surgically remove trees while retaining the shrub community is key to improving habitat suitability in the near term.

A recent study by the U.S Geological Survey reinforces the importance of using the right techniques in the right places. The project evaluated prescribed burn treatments of mature pinyon-juniper woodlands and found that 6 to 24% of conifer cover remained after burning. In the short time frame of the study (3 to 5 years) they found no positive response by sagebrush birds to woodland burning. However, on two sites that had existing sagebrush and were adjacent to large sagebrush expanses, sagebrush-obligate songbirds returned after mechanical removal reduced juniper cover to <0.2% (Knick et al. 2014).

This suggests that although prescribed fire is a cost effective tool for greatly reducing woodland cover and producing long-term ecosystem benefits, the full restoration of shrub-steppe communities from mature woodland is a long-term process of regeneration that may require more complete tree removal to benefit sagebrush-obligate species. In the short term, targeted mechanical removal of conifers where sagebrush is still intact is a management strategy that can put the ecosystem back on a desired functional trajectory while also maintaining critical habitat elements for sagebrush-dependent wildlife (Boyd et al. 2014).

These results provide some practical guidelines for conifer treatment designed to benefit sage-grouse and maintain ecosystem health:

- Target stands in early stages of encroachment with still-intact sagebrush and other desired understory species.
- Remove all post-settlement aged conifers to reduce tree cover to well below 4%, preferably <1%.
- Use treatment methods that maintain the sagebrush and understory cover to the extent possible.

Furthermore, study investigators calculated the economic cost of large-scale conifer removal using this targeted strategy and found that addressing the early encroachment problem within the study area would be well within reach of existing conservation investment by public-private partnerships already well underway through the NRCS Sage Grouse Initiative (SGI).

While SGI has adopted this strategy to target investments for immediate habitat benefits, it is also sponsoring studies to better understand bird response to conifer treatments. Two long-term research studies in the Warner Mountains of southeast Oregon are currently underway to quantify how sage-grouse and sagebrush-obligate songbirds respond to targeted conifer removal. The findings will help inform adaptive management efforts to reduce the threat of conifer encroachment.

Proactively addressing complex ecosystem problems, such as conifer encroachment, offers a viable means of conserving sage-grouse and other at-risk species supported by healthy and functioning sagebrush ecosystems (Boyd et al. 2014).

A Rangewide Tool for Scaling Up Implementation

Results from this work provide added justification for accelerating carefully targeted conifer removal. However, improved geospatial tools would enable practitioners to better quantify the extent and distribution of the problem and more efficiently target resources to reduce the threat. A new CEAP-sponsored partnership

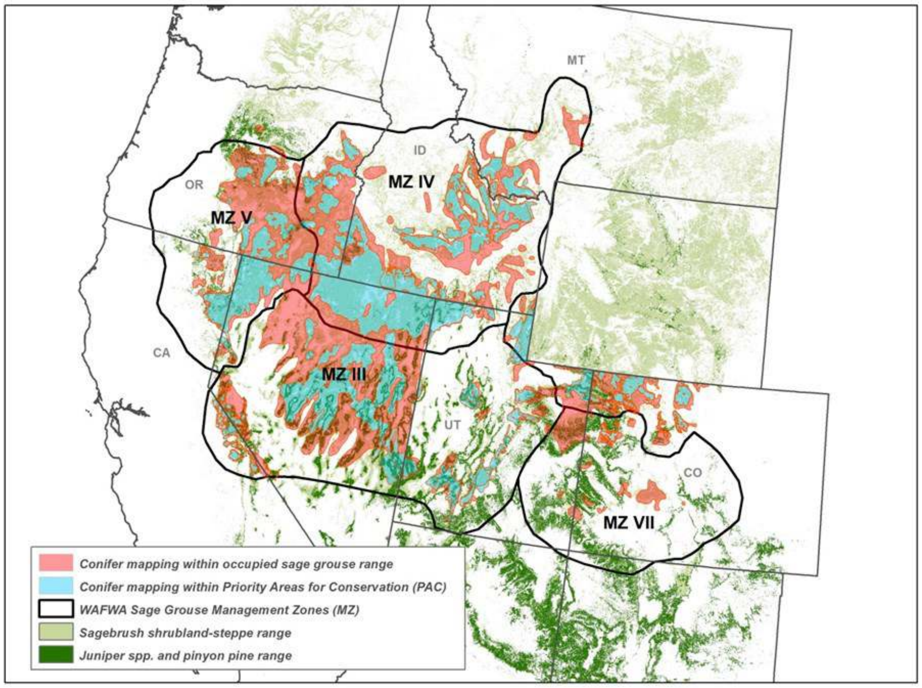

Figure 5. Using the approach developed in Oregon, range-wide high-resolution conifer cover mapping is currently underway to provide managers with tools for prioritizing removal of encroached conifers in Sage-Grouse Management Zones III, IV, V and VII.

is now underway to complete high-resolution (1-m) conifer cover mapping, using the previously perfected spatial wavelet analysis technique, across an estimated 102.5 million acres of occupied habitat within Sage-Grouse Management Zones III, IV, V and VII (Figure 5). GIS products are made available to all partners as mapping is completed to support collaborative, strategic habitat conservation delivery efforts across private and public lands.

To learn more about conifer removal, decision support tools, map products, and sage-grouse habitat conservation and the Sage Grouse Initiative, visit the SGI website at www.sagegrouseinitiative.com/.

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The Conservation Effects Assessment Project: Translating Science into Practice

The Conservation Effects Assessment Project (CEAP) is a multi-agency effort to build the science base for conservation. Project findings will help to guide USDA conservation policy and program development and help farmers and ranchers make informed conservation choices.

One of CEAP's objectives is to quantify the environmental benefits of conservation practices for reporting at the national and regional levels. The CEAP wildlife national assessment works through numerous partnerships to support relevant assessments and focuses on regional scientific priorities.

This assessment was conducted through a partnership among NRCS, The Nature Conservancy (TNC) and the University of Idaho (UI). Primary investigators on this project were Sharon Baruch-Mordo and Jeff Evans (TNC) and John Severson (UI).

For more information: www.nrcs.usda.gov/technical/NRI/ceap/, or contact Charlie Rewa at charles.rewa@wdc.usda.gov.

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