



# SCIENCE TO SOLUTIONS



## Big Picture of Woodland Management in Sagebrush Country

### *In Brief:*

- The western U.S. is experiencing many of the same challenges associated with the woodland invasion of grasslands that is happening globally.
- New conifer cover comparison maps give a clearer, more comprehensive picture of where conifer reduction is occurring in sagebrush rangelands.
- From 2011-2017, the extent of conifer cover in sagebrush country decreased by 1.6%. Human management efforts are responsible for 2/3 of the total reduction; the other 1/3 is due to wildfires.
- Public/private partnerships are successfully reducing conifers in highly targeted priority watersheds, such as in northwest Utah.
- The maps also show that woodlands are still expanding into many sagebrush landscapes. Continued partnership efforts are needed to strategically conserve priority shrublands.

## Background

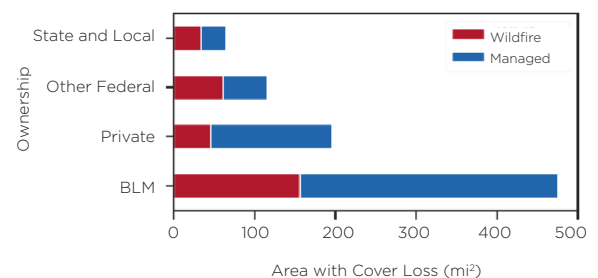
Around the world, trees are taking over productive shrub and grasslands. Every continent except Antarctica is now experiencing the challenges associated with woodland invasion. In North America, one of the most concerning vegetation transitions is the encroachment of pinyon-juniper woodlands into sagebrush rangelands. Expanding conifer trees threaten habitat for sagebrush-dependent wildlife, reduce water availability, increase the risk of high-severity wildfires, and diminish forage for livestock.

In the Great Basin, conifers have expanded their range by up to 600% in places. If no action is taken to reverse the trend, it is estimated that 75% of the lands experiencing conifer invasion will convert into dense woodlands within the next 30-50 years, crowding out native bunchgrasses and sagebrush that wildlife and livestock rely upon.

Luckily, research shows that targeted removal of pinyon-juniper provides almost immediate benefits for songbirds, mule deer, sage grouse, and livestock. Public and private conservation partners have been working together to halt the invasion of trees onto rangelands. However, since conifer treatments span multiple states, counties, and land ownerships, it's been difficult to calculate the full extent of pinyon-juniper removal.

“Partnerships are restoring precious sagebrush ecosystems in priority watersheds, but we’re still getting flanked by infilling trees across many western rangelands. This new research shows that we need to keep our foot on the gas implementing sagebrush conservation practices like conifer removal to keep rangelands healthy and productive.”

Steve Small  
BLM



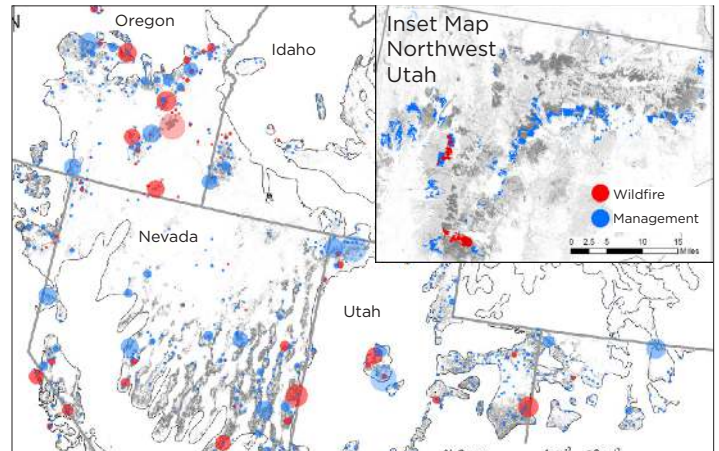
Bar graph showing conifer reductions by land ownership.

## SCIENCE TO SOLUTIONS: CONIFER MAPPING

### Methods

Using Landsat satellite imagery from 2011-2013, researchers mapped conifer cover across 285,000 square miles of sagebrush range (about the size of Texas). Roughly 29% of the mapped sagebrush range contained conifers. Next, they re-mapped the same region with satellite images from 2015-2017 to compare changes in conifer cover over time. The resulting maps were 96% accurate.

Using Google Earth Engine, geospatial datasets, and modeling programs, the researchers assessed: 1) where conifers had been reduced through management efforts, 2) areas where wildfires had reduced the percentage of conifer cover, and 3) places where conifer cover increased.



Map showing (a) predicted conifer management and wildfire locations across sagebrush range with (b) inset map of a priority watershed in northwest Utah where conifer was reduced by 4% in the last five years

### Conclusions

The conifer cover comparison maps provide important big picture context for ongoing management efforts. Previously published estimates suggest the rate of expansion is 0.4-1.5% per year. **Over the past five years, conifer cover actually decreased by 1.6%.** Although it's encouraging that these efforts are curtailing conifer expansion, results suggest that management is barely keeping up with the rate of woodland expansion in sagebrush country. Analysis showed that 65% of this reduction was attributable to woodland management efforts, while 35% was due to wildfires.

### Science in Action

Public and private partners in sagebrush country are leveraging funding to remove encroaching conifers across land ownership boundaries. Many proactive, science-based woodland management projects target mechanical removal in areas with younger, low-density trees and an existing understory of grass and sagebrush. This provides ecosystem resiliency across whole watersheds, which protects wildlife strongholds, decreases fuel loads to reduce the threat of potential mega-wildfires, and boosts agricultural productivity.

This research was made possible due to cross-boundary partnerships. The Bureau of Land Management through the *Partnering to Conserve Sagebrush Rangelands* effort with the Intermountain West Joint Venture contributed funding for this study.

This research also revealed that strong cross-boundary partnerships are working to restore a few priority watersheds. In northwestern Utah, for instance, some of the most intensive conservation efforts to date have reduced conifer cover by 4.3% in this region, nearly three times the range-wide rate.

Unfortunately, the maps also show that woodlands are still encroaching into many sagebrush landscapes. These maps can help land managers and partners plan future conifer removal efforts to ensure we conserve the West's irreplaceable rangelands.

### Source

Reinhardt, Jason et. al. 2019 (publication in review). Invasion meets innovation: Assessing the effectiveness of conifer reduction in North America's sagebrush-steppe.

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*Working Lands for Wildlife*, led by USDA's Natural Resources Conservation Service, a partnership-based, science-driven effort to proactively conserve America's working agricultural lands and wildlife.