Pinyon & Juniper Adaptation & Management Workshop

Pre-Work Request

Thursday, October 12, 2023 from 9 a.m. – 5 p.m. MT
Friday, October 13, 2023 from 8 a.m. – 12 p.m. MT
Homewood Suites by Hilton, 1521 Oakridge Dr, Fort Collins, CO 80525
https://forestadaptation.org/learn/pinyon-and-juniper-adaptation-and-management

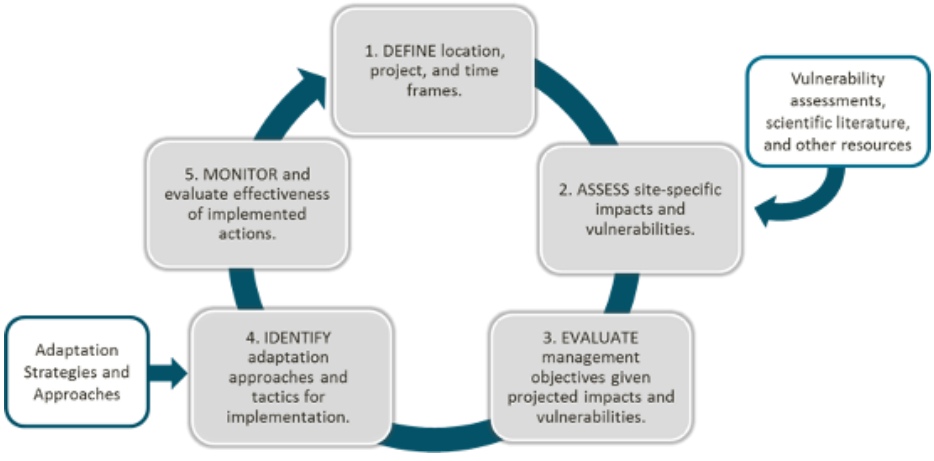
There is an increasing need to consider the effects of climate change on ecosystems and identify management actions that respond to these changes. This workshop will support participants that manage pinyon and juniper in ecosystems on the Colorado Plateau in determining which climate impacts are of greatest concern to them, and identify management opportunities for adapting to change. This workshop stems from a collaboration among the BLM, Climate Adaptation Science Center, USGS, University of Colorado Boulder, University of California Berkeley, and Colorado State University.

During the workshop, participants will:

- Review regional and local effects of climate change on pinyon-juniper ecosystems
- Explore resources and tools that can be used to integrate climate change into pinyon-juniper management
- Identify challenges and opportunities for land managers related to pinyon and juniper
- Test a new decision support and prioritization tool for pinyon and juniper treatments under future climate on the Colorado Plateau
- Develop actionable steps to adapt pinyon and juniper management approaches to changing climate regimes

Adaptation Workbook Process:

Throughout the workshop, we will be using the Adaptation Workbook process (also described in Swanston et al. 2016 Chapter 5, pp. 74-89, of *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers, 2nd Edition*). We will walk through each of these steps to test the Pinyon-Juniper decision-support tool for the Colorado Plateau.



Pinyon-Juniper Ecosystems

Ecosystems dominated by various species of pinyon and juniper trees (PJ) collectively represent the third most extensive vegetation type in the continental US, one of the predominant vegetation types administered by federal land-management agencies in the West, and are the most abundant type of mature and old-growth forests in the federal inventory. PJ ecosystems extend over 100 million acres of the western US and exist along a gradient from closed canopy woodlands to open savannas that often transition into adjacent semi-arid shrub and grasslands.

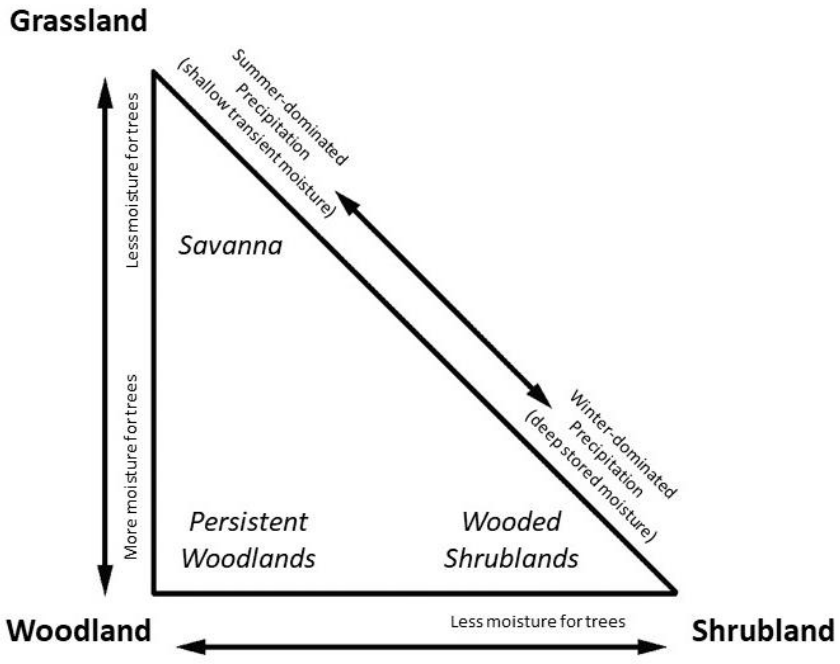
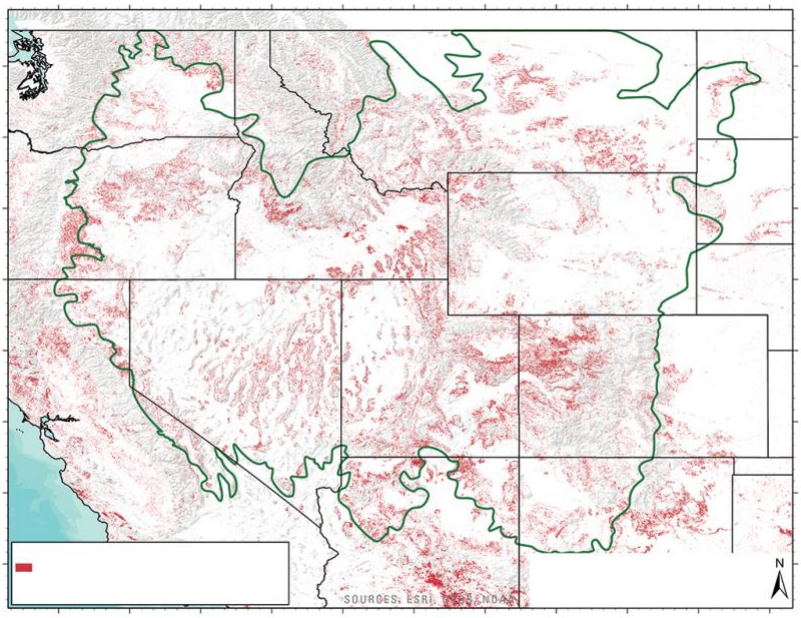


Figure: Remington et al. 2021

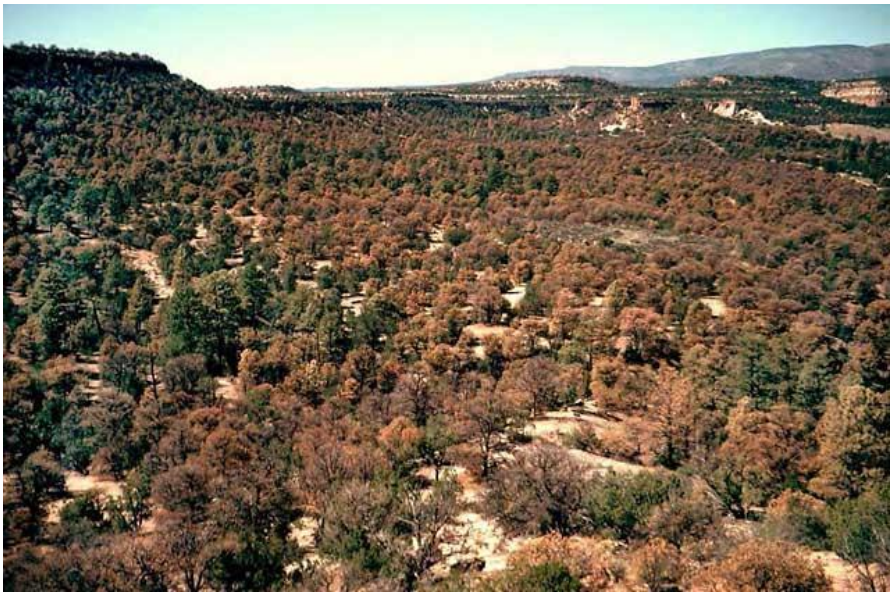
PJ ecosystems are an important habitat for many wildlife species including pronghorn, a species of management concern in some regions, and Pinyon jay, a petitioned species whose status is undergoing review for listing under the Endangered Species Act. PJ systems are also important for livestock use, recreation, and cultural and ceremonial purposes.

There has been marked infilling and expansion of PJ populations into adjacent sagebrush (*Artemisia* spp.) and grassland communities. This large-scale ecological transformation across western rangelands has significant consequences for the conservation and management of these ecosystems (e.g. declines livestock forage and wildlife habitat, changes in fire regimes), especially habitat loss of the near-threatened greater sage-grouse (*Centrocercus urophasianus)*.



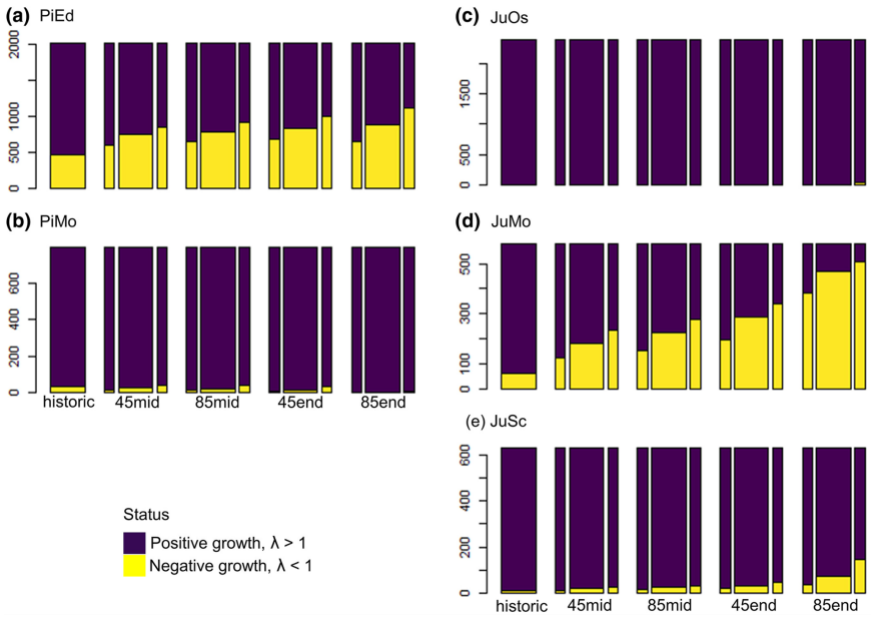
Areas in Red are rangelands experiencing a significant ($p<0.10$) increase in tree cover in US (1999-2018; Map: Esri).

Over the last two decades, drought and insect induced dieback of both pinyon and juniper species has also led to contractions of these populations across a wide range of PJ woodlands. Regional scale dieback events such as those that have been observed in PJ woodlands over the last two decades has significantly altered the structure, function, and composition of these ecosystems.

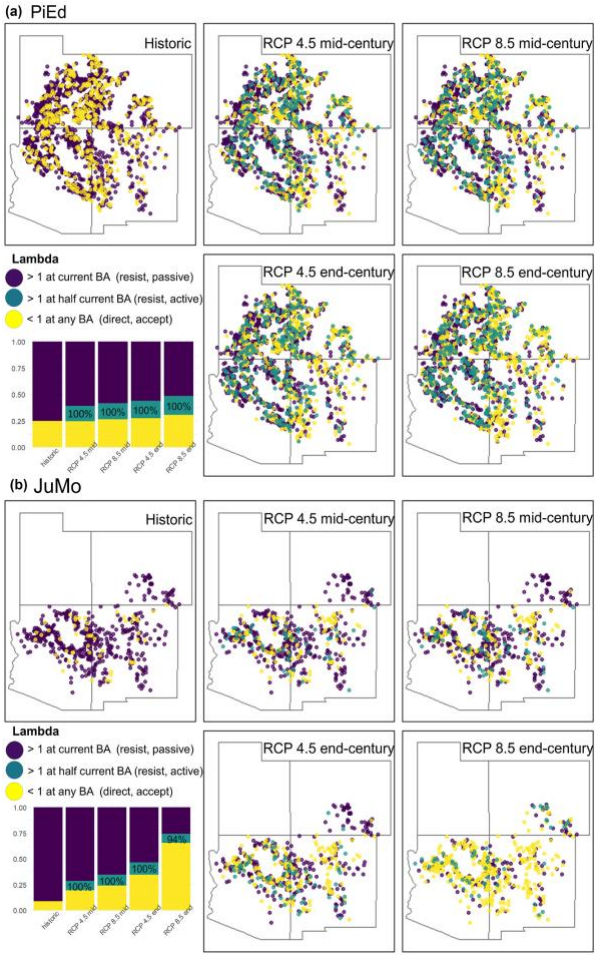


Pine mortality in New Mexico. Photo: Craig D Allen

Where can managers effectively resist climate-driven ecological transformation in PJ woodlands of the US Southwest?



For each tree species (a-e), proportion of plots that are projected to retain viable population growth rates (purple; $\lambda > 1$) or to have vulnerable population growth (yellow; $\lambda < 1$) at each time and RCP scenario. The full-width middle bar represents median ranked values and narrow bars on the left and right indicate results across the range of global circulation models (rank 2 and rank 10 results, respectively). JuMo, *Juniperus monosperma*; JuOs, *Juniperus osteosperma*; JuSc, *Juniperus scopulorum*; PiEd, *Pinus edulis*; PiMo, *Pinus monophylla*.



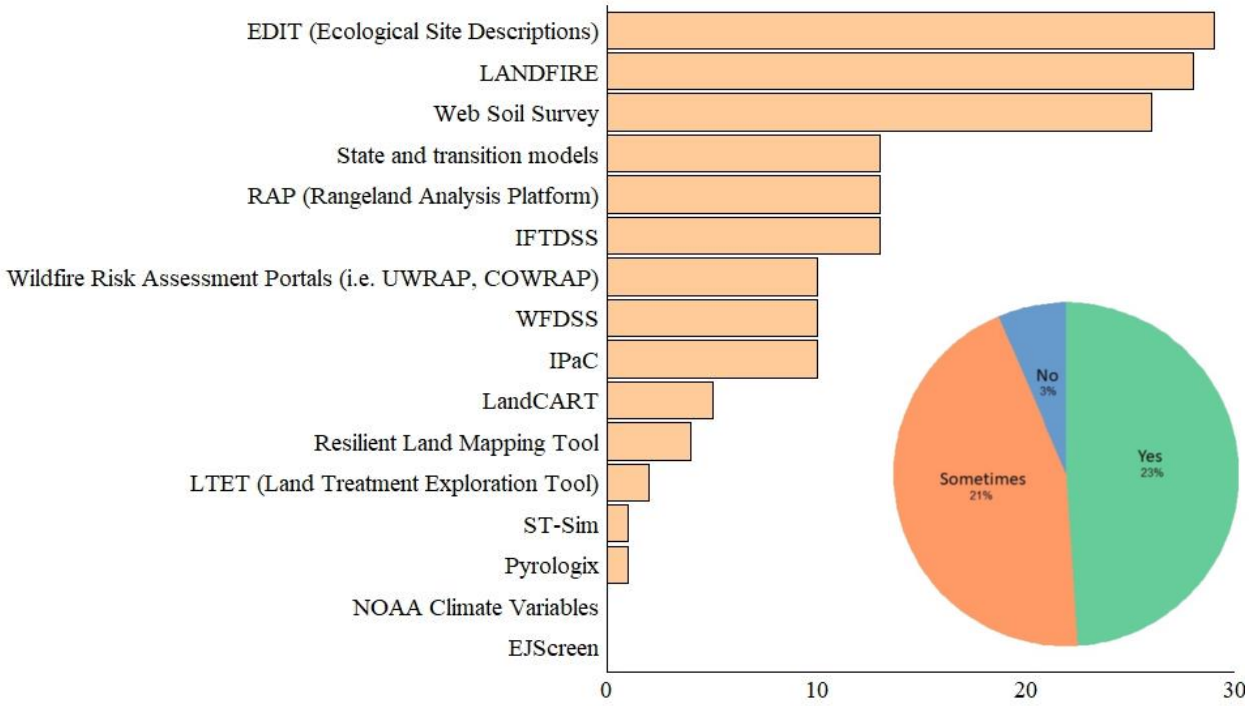
Figures From - Global Change Biology, Volume: 29, Issue: 15, Pages: 4327-4341, First published: 29 May 2023, DOI: (10.1111/gcb.16756).

Species population growth response to 50% BA reduction for *P. edulis* (a) and *J. monosperma* (b) across their range of sites. Stacked barplot shows proportion of sites (*P. edulis*, $n = 2013$; *J. monosperma*, $n = 578$) at each λ. We can classify plots according to the resist–accept–direct framework based on expectations for a plot to (1) passively resist transformation ($\lambda > 1$ at current BA [purple, positive population growth]), (2) actively resist transformation with management ($\lambda > 1$ with 50% BA reduction [blue, positive growth with BA reduction]), or (3) transform and require managers to either accept or direct the trajectory ($\lambda < 1$ regardless of BA reduction [yellow, negative population growth]). Percentage values on the blue bars are the percentage of sites with consistent increase in λ under reduced BA, representing demographic uncertainty (climate uncertainty shown in Figure S4). Map lines delineate study areas and do not necessarily depict accepted national boundaries. BA, basal area; JuMo, *Juniperus monosperma*; PiEd, *Pinus edulis*.

For Questions, Contact: Adam Noel at anoel@usgs.gov or John Bradford at jbradford@usgs.gov.

Making PJ management decisions that incorporate climate change

A consistent and ongoing theme in our conversations with natural resource managers across the Colorado Plateau has involved a lack of understanding in how to prioritize PJ treatments in a way that achieves multiple management goals while integrating future climate into the planning process.



Percentage of stakeholders that rely on listed data and tools for PJ management decisions

During summer 2023, we surveyed federal stakeholders to better understand the current planning process for PJ management. Most respondents (23%) always or sometimes (21%) incorporate changing climate into their management strategies. However, none of the most heavily used data or decision support tools includes a climate component, suggesting that a decision-support tool that explicitly integrates climate could be useful.

We have huge knowledge gaps in our understanding of how PJ systems will respond to future climate but we do know a lot about these systems, how they respond to different management decisions, and the impact that current climate is having on them. We have compiled much of this knowledge into a climate infused *draft* decision support and prioritization tool. Our goal is that through these workshops and by integrating your expertise with these systems and your management priorities, this tool will become a useful and ever evolving guide for stakeholders managing PJ systems.

If you have questions/issues before, during, or after the workshop, please contact Mandy Slate email: mandy.slate@colorado.edu; cell: 503-960-6346