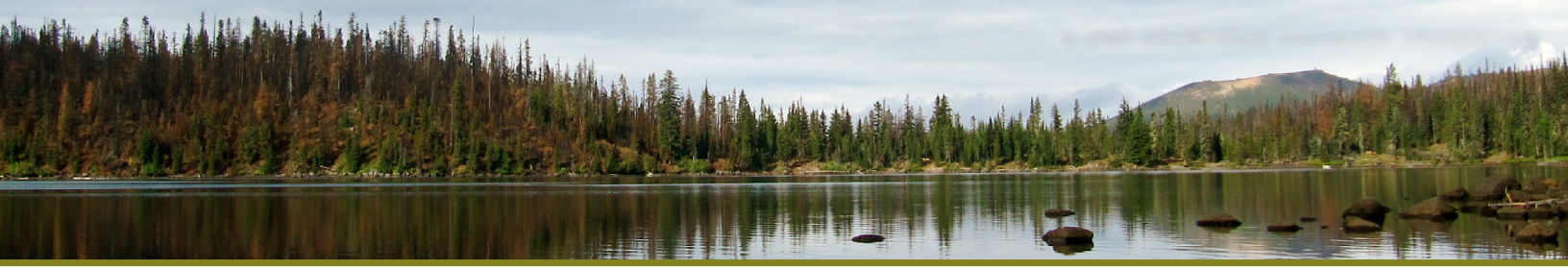
Northwest Fire Science Consortium
A JFSP FIRE SCIENCE EXCHANGE NETWORK



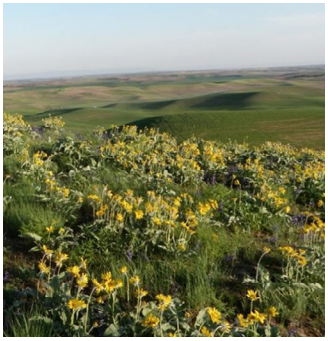
FIRE AND LAND COVER CHANGE IN THE PALOUSE PRAIRIE-FOREST ECOTONE

RESEARCH BRIEF 23 • FALL 2021

The Palouse Prairie is a highly endangered ecosystem found along the Idaho–Washington border. The Palouse Prairie intermixes with the imperiled ponderosa pine savanna along this border, making the ecotone between these communities particularly diverse and ecologically important. Unfortunately, like many grassland and savanna communities across North America and the world, this rich prairie–pine ecotone is now highly fragmented and degraded.

Historical fires in the Palouse ecotone occurred from lightning strikes and burning by Indigenous people. These historical fires were likely large, due to continuous rolling terrain and vegetation that was dry in summer and fall. Fires would have naturally extinguished as they encountered wetter fuels in deep forests and at higher elevations. Today, fire frequency in the region is dramatically reduced due to a mixture of new land uses and active and aggressive fire suppression. In addition, the modern landscape dominated by agricultural lands and roads limits the spread of lightning ignitions. The authors in this study used historical records, remote-sensing data, and reconstructed fire histories to better define the historical extent of the Palouse Prairie ecotone, estimate the historical fire return interval and identify and discuss implications for the future.

The rolling hills of the Palouse Prairie are today dominated by intensive agriculture with fields of wheat and legumes separated by roads and bordered by dense mixed-conifer forests. Credit: James Riser 2017.



***Left**: Plant communities were historically dominated by dense bunchgrasses mixed with forbs and shrubs as seen in a remnant prairie in Kamiak Butte County Park, Whitman County, Washington. Credit: Stephen Bunting 2018. **Right**: One of the old fire-scarred ponderosa pine stumps sampled to reconstruct fire history. Credit: Max Nielsen-Pincus 2008.*

KEY FINDINGS

- No ponderosa pine savanna currently exists in the Palouse Prairie ecotone; historically, savanna made up 16% of the ecotone.
- Fires were historically frequent in the in the Palouse Prairie-forest ecotone, occurring every 5 to 8 years, either from lightning or people.
- Currently, lightning-caused fires rarely occur in the Palouse bioregion compared to the surrounding areas, due to the high cover of agricultural lands.
- Between 1992–2015, there were 2359 fires; only 17% of those fires were caused by lightning.
- Almost half of the fires between 1992–2015 occurred in 2015.

The Northwest Fire Science Consortium is a regional fire science delivery system for disseminating knowledge and tools, and a venue for increasing researcher understanding of the needs of practitioners.

RESULTS

The three lines of evidence the authors used all document extensive change in the composition of the Palouse Prairie ecotone and the extent and frequency of fire in the ecotone. Notes and records from General Land Office (GLO) surveys described rolling prairie dotted with shrubs and pines bordered by savanna and forest. Where there was once diverse bunchgrass prairie with adjacent open pine savanna, the area is now dominated by agriculture and residential development. This development fragmented the prairie into small remnants, now comprising less than 1% of its historical extent. Pine-dominated savanna comprised 16% of the bioregion, however, this is likely underestimated due to the challenge of determining the extent of the savanna from GLO data. The once extensive ponderosa pine savanna no longer exists; fire suppression and land-use change have converted the savanna to closed forest and shrubland.

Large, synchronous fires occurred during warm, dry summers, likely ignited both from lightning and from people. Fires were frequent from 1650 to 1900, occurring every 5 to 8 years at most of the eight sites sampled. Modern fires caused by lightning are rare in the Palouse Prairie compared to surrounding areas (Figure 2). Of the 2359 fires reported between 1992 and 2015, only 17% (412) were started by lightning. Nearly half of the reported fires occurred in the drought year of 2015. The low density of lightning-caused fires is likely due to differences in the current distribution of land cover classes. Lightning-ignition efficiency (LIE) is lowest in agricultural lands (0.3 fires per 1000 strikes) compared to a LIE of 1.1 for shrubland and 2.4 fires per 1000 strikes for forest land. There was not enough prairie land remaining to estimate the LIE of this land cover type.

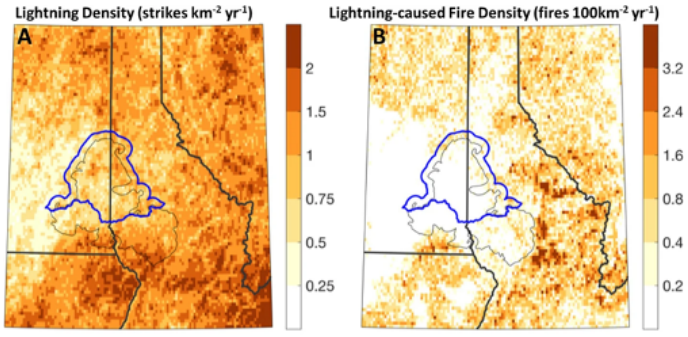


Figure 1. *(A) Warm season lightning strike density (strikes km−2 yr−1) averaged from 1992–2015, and (B) lightning-caused fire density (fires per 100 km-2 yr−1) from 1992–2015 for the mapped area within Idaho, Washington, Oregon, and Montana, USA. The blue line is the study area defined as the Palouse bioregion north of the Snake and Clearwater rivers, while the light gray boundary outlines the entire Palouse bioregion.*

MANAGEMENT IMPLICATIONS

While the Palouse Prairie region is highly fragmented from its historical conditions, modern conservation efforts such as the Conservation Reserve Program and the Idaho Wildlife Habitat Incentive Program are converting some agricultural lands back to grasslands and forests. The historical composition of the prairie-forest ecotone described in this paper presents potential regional restoration targets for prairie and savanna cover. However, while restoring agricultural lands to prairie and savanna has many benefits for people and wildlife, it also increases fire risk. Human-caused wildfires are more common in developed areas and these conservation lands exist within a matrix of residential development. Roads also aid fire suppression in this landscape dominated by private ownership. Close partnerships and communications between property owners, land managers, and fire management organizations will provide opportunities for effective wildfire risk reduction and habitat restoration using prescribed burning and other vegetation management tools.

Scattered ponderosa pine trees in pine savanna adjacent to the Palouse Prairie today. Credit: Penelope Morgan 2018.

MORE INFORMATION

This brief is based on the following article:

Morgan, P., E.K. Heyerdahl, E.K. Strand, S.C. Bunting, J.P. Riser II, J.T. Abatzoglou, M. Nielsen-Pincus, and M. Johnson. 2020. Fire and land cover change in the Palouse Prairie-forest ecotone, Washington and Idaho, USA. *Fire Ecology* 16:2. https://doi.org/10.1186/s42408-019-0061-9.

Contact: *nw.fireconsortium@oregonstate.edu*

This research brief was funded by the Joint Fire Science Program.