AZ Wildfire INITIATIVE
NAU NORTHERN ARIZONA UNIVERSITY
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JOINT FIRE SCIENCE PROGRAM

SOUTHWEST FIRE SCIENCE CONSORTIUM

FACT SHEET // JAN. 2025

SOUTHWEST INDIGENOUS FIRE STEWARDSHIP
Annotated Bibliography Reference Sheet

SUMMARY

Indigenous Peoples have used fire in their stewardship of Southwest landscapes for thousands of years. Understanding how, when, and why Indigenous Peoples have used fire can help keep southwestern ecosystems healthy and resilient. However, this information can be difficult to find. We conducted a literature review to aid in information sharing about Indigenous fire practices in the Southwest, elucidate knowledge gaps in the literature, and to highlight how Indigenous Knowledges can be incorporated with western science research methods in respectful ways. We understand that most of this knowledge isn't captured in scientific literature, but this guide was created to share what we do know from scientific literature.

This fact sheet lists 14 articles published between 2014 and 2024 on historical and modern Indigenous fire practices and cultural burning in the southwestern states of Arizona and New Mexico. For a full summary of these sources, see our Indigenous Fire Stewardship Annotated Bibliography.

MANAGEMENT IMPLICATIONS

- Understanding the frequency, seasonality, and extent of past Indigenous burning practices can inform prescribed and managed wildfire usage today and lessen the impact of climate change.
- The use of fire is nuanced, treatments need to be tailored to location and vegetation type.
- To help prevent extractive research methods, studies should be produced collaboratively with Indigenous people, consider cultural priorities, and respect the ways knowledge is produced and guarded by Tribes.

INCLUSION CRITERIA

How did we select publications for this guide?

- Must be focused on historical or current use of fire by Indigenous People as a land management tool.
- Must be within the Colorado Plateau, Mogollon Rim, Sonoran Desert, and Sky Island bioregions, largely within the US states of Arizona and New Mexico.
- Must be a peer or editorially reviewed journal article, book chapter, Tribal publication, or government agency publication.
- Must have been published between 2014 and July 2024.

San Carlos Apache Tribal Lands. Photo by Molly McCormick.

Read the full annotated bibliography: Scoresby, S., Elko, A., & McCormick, M. (2024). Indigenous fire stewardship annotated bibliography. *The Southwest Fire Science Consortium*. https://www.swfireconsortium.org/2025/01/24/southwest-indigenous-stewardship-annotated-bibliography/

SHORT ANNOTATED BIBLIOGRAPHY

Source	Region	Findings
Pyne, S. J. (2014). Squaring the Triangle: Fire at San Carlos (p. 13). Fire Research and Management Exchange System. https://www.frames.gov/catalog/17764	San Carlos Apache Reservation	After a century of fire exclusion, San Carlos tapped into cultural priorities and decision-making methods to steward natural ignitions towards a fire resilient landscape. Pyne concludes that while such culturally specific practices cannot be copied, they should be learned from and built upon by other southwestern forest and fire managers.
Stan, A. B., Fulé, P. Z., Ireland, K. B., & Sanderlin, J. S. (2014). Modern fire regime resembles historical fire regime in a ponderosa pine forest on Native American lands. International Journal of Wildland Fire, 23(5), 686–697. https://doi.org/10.1071/WF13089	Hualapai Reservation	The authors recommend that managers vary burning schedules to align more closely with the historical period, and state that continued monitoring and adaptation are crucial in the face of climate change.
Victor Jr, M., Thode, A. E., Fule, P. Z., & Huang, C.-H. (2014). Fire Management of the San Carlos Apache Tribe: A Case Study in Southeastern Arizona. Professional paper, Northern Arizona University, Flagstaff, Arizona. https://nau.edu/wp-content/uploads/sites/140/2014.MarvinVictor.FireManagementSanCarlosApache.pdf	San Carlos Apache tribal lands in southeastern Arizona	This professional paper looks at the success of a large-scale, resource benefit fire as an example of Tribal management using Traditional Fire Knowledge in combination with western fire science to meet cultural objectives of ponderosa forest management.
Spoon, J., Arnold, R., Lefler, B. J., & Milton, C. (2015). Nuwuvi (Southern Paiute), shifting fire regimes, and the carpenter one fire in the Spring Mountains National Recreation Area, Nevada. Journal of Ethnobiology, 35(1), 85–110. https://doi.org/10.2993/0278-0771-35.1.85	Southwestern Nevada	They propose moving forward with the Nuwuvi Working Group's (a Nuwuvi, land manager, and stakeholder collaboration) monitoring of site conditions in areas with long-term cultural value and advising Forest Service personnel. Under this collaboration, Nuwuvi people would be encouraged and supported in harvesting pine nuts, land stewardship and post-fire replanting, and restoring spiritual and cultural connection to the Land.
Liebmann, M. J., Farella, J., Roos, C. I., Stack, A., Martini, S., & Swetnam, T. W. (2016). Native American depopulation, reforestation, and fire regimes in the Southwest United States, 1492–1900 CE. Proceedings of the National Academy of Sciences, 113(6). https://doi.org/10.1073/pnas.1521744113	Jemez Province, New Mexico	After the population decreased, the areas around the 18 Jemez villages examined in this study showed an increase in the recruitment of ponderosa pine stands and extensive surface fires, resulting in a net increase in carbon sequestration, further negating simplistic assumptions about human-fire relationships.

Source	Region	Findings
Whitehair, L., Fulé, P. Z., Meador, A. S., Azpeleta Tarancón, A., & Kim, Y.-S. (2018). Fire regime on a cultural landscape: Navajo Nation. Ecology and Evolution, 8(19), 9848–9858. https://doi.org/10.1002/ece3.4470	Ponderosa pine dominated high-elevation pass on the Navajo Nation	Fires were more frequent and smaller in the interior (higher-use) area of the pass when compared with the outer (lower-use) area. Fire years at this site were shown to be largely synchronous with regional fire years across the Southwest, but were of lower severity and non-stand replacing, likely as a result of cultural landscape use by Navajo people.
Guiterman, C. H., Margolis, E. Q., Baisan, C. H., Falk, D. A., Allen, C. D., & Swetnam, T. W. (2019). Spatiotemporal variability of human–fire interactions on the Navajo Nation. Ecosphere, 10(11), e02932. https://doi.org/10.1002/ecs2.2932	Navajo Nation	The exclusion of fire from Navajo Nation forests over the last 130 years has led to actual and potential risk for extensive high-severity fires, and the authors support the return of frequent, low-severity surface fires to lessen forest susceptibility to such extreme fire events.
Carter, V. A., Brunelle, A., Power, M. J., DeRose, R. J., Bekker, M. F., Hart, I., Brewer, S., Spangler, J., Robinson, E., & Abbott, M. (2021). Legacies of Indigenous land use shaped past wildfire regimes in the Basin-Plateau Region, USA. Communications Earth & Environment, 2(1), 72. https://doi.org/10.1038/s43247-021-00137-3	Fish Lake, Utah high-elevation forests of the Great Basin and Colorado Plateau	The authors hypothesize that the Indigenous use of fire likely mitigated risk from drought and believe that understanding how fire was used in the past can help current managers minimize catastrophic wildfire impacts today.
Fulé, P. Z., Edgeley, C. M., Chambers, C. L., Hoagland, S., & Céspedes, B. (2021). Fire Ecology and Management of Southwestern Forests. In C. H. Greenberg & B. Collins (Eds.), Fire Ecology and Management: Past, Present, and Future of US Forested Ecosystems (Vol. 39, pp. 437–463). Springer International Publishing. https://doi.org/10.1007/978-3-030-73267-7_11	Arizona and New Mexico	Indigenous cultural practices are tied to the success of the Red Hats (Native American wildland fire crews), and Traditional Ecological Knowledge (TEK) is emphasized as a necessary component of ongoing adaptation strategies.
Roos, C. I., Swetnam, T. W., Ferguson, T. J., Liebmann, M. J., Loehman, R. A., Welch, J. R., Margolis, E. Q., Guiterman, C. H., Hockaday, W. C., Aiuvalasit, M. J., Battillo, J., Farella, J., & Kiahtipes, C. A. (2021). Native American fire management at an ancient wildland–urban interface in the Southwest United States. Proceedings of the National Academy of Sciences, 118(4), e2018733118. https://doi.org/10.1073/pnas.2018733118	Hemish (ancestors of Jemez Pueblo in northern New Mexico) high elevation ponderosa pine forests	The Hemish people extensively used frequent, low-severity, small fires to create a resource-rich mosaic landscape with a significantly reduced incidence of high severity or crown fires leading the authors to suggest a similar community-based management involving intensive thinning and collecting for firewood, increased cultural tolerance for smoke from prescribed fires, increased defensible space around homes and towns, and use of many small, discontinuous fires to mitigate potential for large and intense high-severity fire.

Source	Region	Findings
Roos, C. I., Guiterman, C. H., Margolis, E. Q., Swetnam, T. W., Laluk, N. C., Thompson, K. F., Toya, C., Farris, C. A., Fulé, P. Z., Iniguez, J. M., Kaib, J. M., O'Connor, C. D., & Whitehair, L. (2022). Indigenous fire management and cross-scale fire-climate relationships in the Southwest United States from 1500 to 1900 CE. Science Advances, 8(49), eabq3221. https://doi.org/10.1126/sciadv.abq3221	Diné (Navajo), Hemish (Jemez), and Ndée (Apache) ponderosa pine forests	The authors argue that centering and scaling-up strategic Indigenous-managed pyro-diversity could lead to benefits for biodiversity, fire-vulnerable communities, global carbon emissions, and Indigenous people.
Stan, A. B., Fulé, P. Z., & Hunter Jr., M. (2022). Reduced forest vulnerability due to management on the Hualapai Nation. Trees, Forests and People, 10, 100325. https://doi.org/10.1016/j.tfp.2022.100325	Hualapai Nation on the western end of the Grand Canyon	The authors conclude that collaboration of Indigenous knowledge, ecological and climate science, and ongoing forest monitoring has been successful at and is necessary for maintaining this culturally and ecologically vital ponderosa pine forest.
Roos, C. I., Laluk, N. C., Reitze, W., & Davis, O. K. (2023). Stratigraphic evidence for culturally variable Indigenous fire regimes in ponderosa pine forests of the Mogollon Rim area, east-central Arizona. Quaternary Research, 113, 69–86. https://doi.org/10.1017/qua.2022.61	Ancestral Pueblo and Western Apache lands in east-central Arizona	The authors show that the fire regimes in these watersheds were driven by land use practices rather than climate.
Roos, C. I., Swetnam, T. W., & Guiterman, C. H. (2023). Indigenous Land Use and Fire Resilience of Southwest USA Ponderosa Pine Forests. In J. A. Whitaker, C. G. Armstrong, & G. Odonne (Eds.), Climatic and Ecological Change in the Americas (1st ed., pp. 87–103). Routledge. https://doi.org/10.4324/9781003316497-6	Southern Colorado Plateau, Mogollon Rim in Arizona and Jemez Mountains in New Mexico	Together, these data provide strong evidence that Indigenous fire use led to higher forest resilience and resistance to state transitions (i.e. change from mature forest to shrublands), in part due to pyro-diverse small patch burning practices and frequent use of low-severity fires. Continuing the practices of Indigenous fire management can help ensure that ecologically and culturally appropriate fires are kept on the landscape and strengthen forest resilience in the face of increasing climate variability.

*The **Southwest Fire Science Consortium** (SWFSC) is a regional organization that facilitates knowledge exchange and disseminates wildland fire research and information across agency, administrative, and state boundaries in the Southwest. The SWFSC is one of 15 Fire Science Exchange Networks funded by the Joint Fire Science Program.*

*The **Arizona Wildfire Initiative** (AZWI) at the Northern Arizona University's School of Forestry supports Arizona's wildland fire needs by enhancing workforce development and education, communicating science, and increasing resilience to Arizona's communities. AZWI is funded by the state of Arizona.*