NORTHERN ARIZONA UNIVERSITY | Ecological Restoration Institute

FACT SHEET

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Estimating the Return on Investment from Restoration and Fuel Treatments in US Western Frequent-Fire Forests

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Introduction

Frequent-fire forests such as ponderosa pine and dry-mixed conifer in the western US are experiencing uncharacteristic wildfires, which have resulted in ecological, social, and economic effects. Forest restoration and fuel treatments, including thinning and prescribed burning, have become the primary approaches for reducing the abundance of overly dense stands and reestablishing natural fire regimes. Although there is a strong body of biophysical science supporting these approaches, little known about their cost effectiveness. A better quantification of the economic outcomes of forest restoration and fuel treatments may help to enhance discussions about these approaches and shift the focus from simple measures like acres treated.

Methods

We conducted a meta-analysis of benefit-cost ratios for forest restoration and fuel treatment benefit types documented in the literature for western US dry mixed-conifer forests at risk of uncharacteristic wildfires. The analysis evaluates cost effectiveness by examining benefit-cost ratios from 16 studies that provided 120 observations conducted over the last two decades. Forest restoration benefits include: 1) enhanced initial ecosystem services, and 2) avoided wildfire costs (AWC) (Figure 1). We identified 17 different types of individual restoration benefits in the literature, though many more benefits exist that have yet to be quantified. The AWCs include avoided suppression costs, avoided structure costs (AWC built), avoided health costs, and avoided ecosystem service costs.

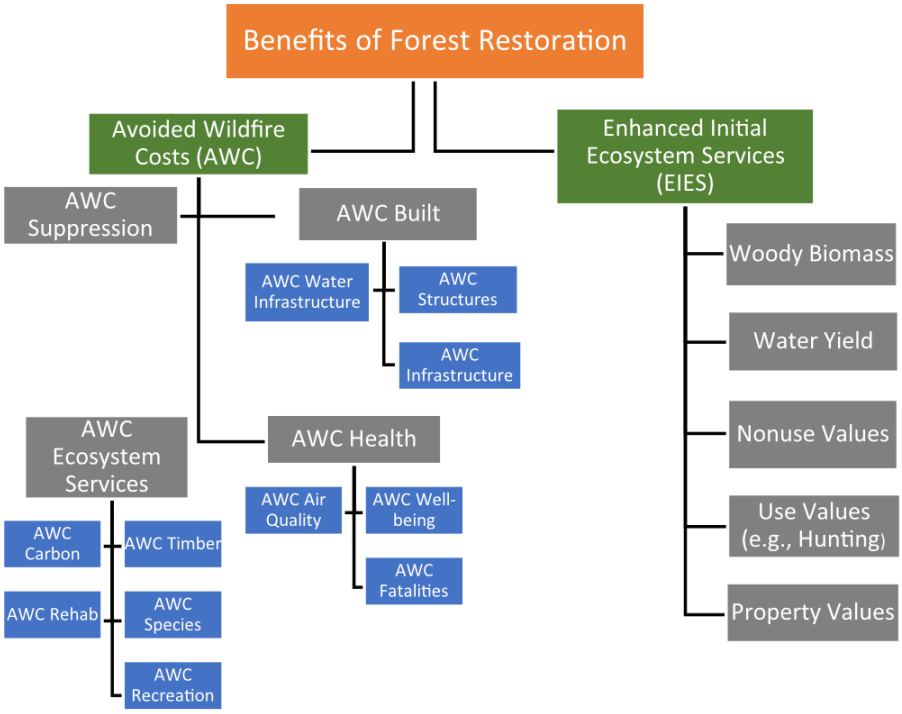

Figure 1. *Types of forest restoration benefits quantified in the literature. Gray boxes are broad benefit types; blue boxes are individual benefit types that compose broad AWC categories.*

There are five enhanced initial ecosystem services that encompass a total of nine forest restoration benefit types (gray boxes). Using the assumption that forest restoration benefit types provide different value based on their economic importance to society, we developed a model to test our hypothesis.

The Ecological Restoration Institute is dedicated to the restoration of fire-adapted forests and woodlands. ERI provides services that support the social and economic vitality of communities that depend on forests and the natural resources and ecosystem services they provide. Our efforts focus on science-based research of ecological and socio-economic issues related to restoration as well as support for on-the-ground treatments, outreach and education.

Findings

Our findings highlight the significant variation in the value of restoration and fuel treatment benefits. The 17 different forest restoration benefits we quantified in the literature were not overlapping and can be aggregated into a collective basket of restoration benefits in locations where those values are applicable. This collective basket of restoration benefits can be used to illustrate a return on investment (ROI) for forest restoration. For example, aggregating the means of the individual 17 forest restoration benefit types, shows the total benefit-cost ratio to be 7.04 (Figure 2). That is, **for every dollar invested in forest restoration in high risk, high-value forested watersheds where all quantified benefits are present, over seven dollars of benefit may be returned to investors**. Applying a financial type of return-on-investment to forest restoration, where only returns in excess (or below) of the initial investment are calculated, indicates **the potential for a 600% return on investments in the most valuable at-risk forested watersheds**. Importantly, many other unique restoration benefits exist that have not been economically quantified and are not included in our meta-analysis. This indicates that **the total returns on investments in forest restoration are likely greater than presented here**.

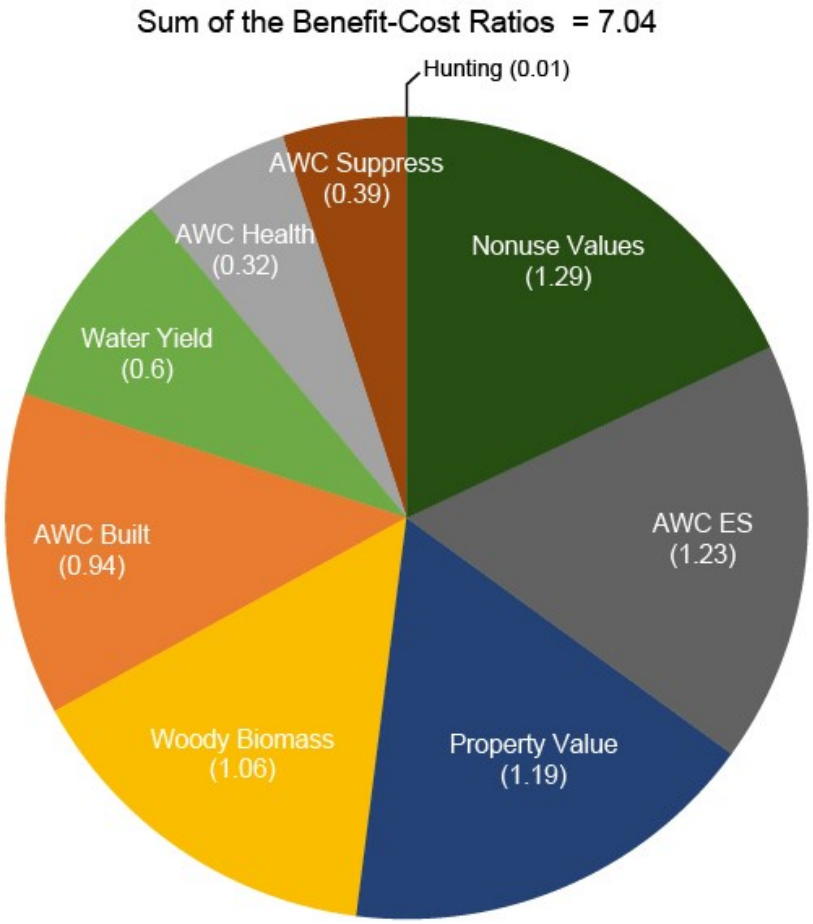

***Figure 2**. Aggregated total potential returns on forest restoration investments. Mean benefit-cost ratios for nine broad types of forest restoration benefits are in parentheses.**

Conclusions

This detailed analysis highlights the need to prioritize forests where restoration will bring the most significant benefits. It also supports the economic rationale for expanding forest restoration efforts and maintaining funding. This approach may also be used to develop an economic measure for the value of a restored acre, which includes improved ecological conditions and wildfire resilience. Calculating the value of a restored acre would help to shift the conversation away from performance measures tied to timber volume and acres treated and provide greater clarity about the social and ecological benefits of forest restoration.

This fact sheet summaries information from the following publication

Hjerpe, E.E., M.M. Colavito, A.E.M. Waltz, and A.J. Sánchez Meador. 2024. Return on Investments in Restoration and Fuel Treatments in Frequent-Fire Forests of the American West: A Meta-Analysis. *Ecological Economics,* 223: 108244.

*Three broad benefit types include the sum of means for multiple individual restoration benefit types: 1) AWC Built includes AWC Structure, AWC Infrastructure, and AWC Water; 2) AWC ES includes AWC Carbon, AWC Timber, AWC Rehab, AWC Recreation, and AWC Species; and 3) AWC Health includes AWC Air Quality, AWC Well-Being, and AWC Fatalities.

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