

META-ANALYSIS DESIGN AND INTERPRETATION: A CASE STUDY
OF PRESCRIBED FIRE EFFECTS ON FUEL LOADINGS IN
PONDEROSA PINE ECOSYSTEMS

by

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Introduction

An observant hiker, naturalist or outdoor enthusiast is bound to encounter tree tags, duff pins or plot stakes in the forest, simply due to the sheer number of forest research plots that have been installed by scientists over the past several decades. Although many of the methods used to collect and analyze forest data, such as fire effects, have been refined over the years, the information from each individual study is unique and valuable. Meta-analysis is a statistical technique used to quantify datasets of varying sizes and formats, and thus, can be used to synthesize the vast wealth of data gathered from numerous studies over many years. However, meta-analysis has only recently been applied to ecological research, and appropriate techniques for its application are still a topic of debate among both ecologists and statisticians.

Focusing on ponderosa pine ecosystems, I performed a meta-analysis of 20 individual studies, in 8 journal articles, of the effects of prescribed fire on ground fuel-load reduction. This thesis examines the procedures, strengths, and weaknesses of meta-analysis as a technique for quantifying and analyzing fire ecology research. The results of the meta-analysis on fuel reduction are presented along with an examination of the methodology and supplemental appendices for technical use.

I explored meta-analysis as it pertains to projects such as the Fire and Fire Surrogate study, a 2 x 2 factorial experiment on the effects of prescribed fire and silvicultural treatment (thinning) on 13 study sites throughout the United States (Weatherspoon *in press*), and the National Park Service's fire monitoring program, which maintains long-term fire effects plots throughout the country.

Prescribed fire and silvicultural treatments have become common practice for resource managers faced with the responsibility to protect public lands and resources from wildfires, as mandated by the USDA Forest Service Wildland Fire and Urban Interface Initiative. Fire effects research projects, which utilize quantitative data analyses, help to distinguish between useful and ineffective management techniques for fire and resource managers.