

The Effect of Pre-Fire Fuel Manipulations on Alien Plant Invasion

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Fuel Reduction High Priority

A photograph of a forest fire. Bright orange and yellow flames are visible, rising from the ground and around the base of several trees. The background is filled with dark, silhouetted trees and a thick layer of smoke or mist, creating a dramatic and somewhat somber atmosphere. The lighting is primarily from the fire, casting long shadows and highlighting the textures of the tree bark and the ground.

- **National Fire Plan**
- **Healthy Forest Restoration Act**
- **Increased pre-fire fuel manipulation projects**

Fuel Breaks



 USGS

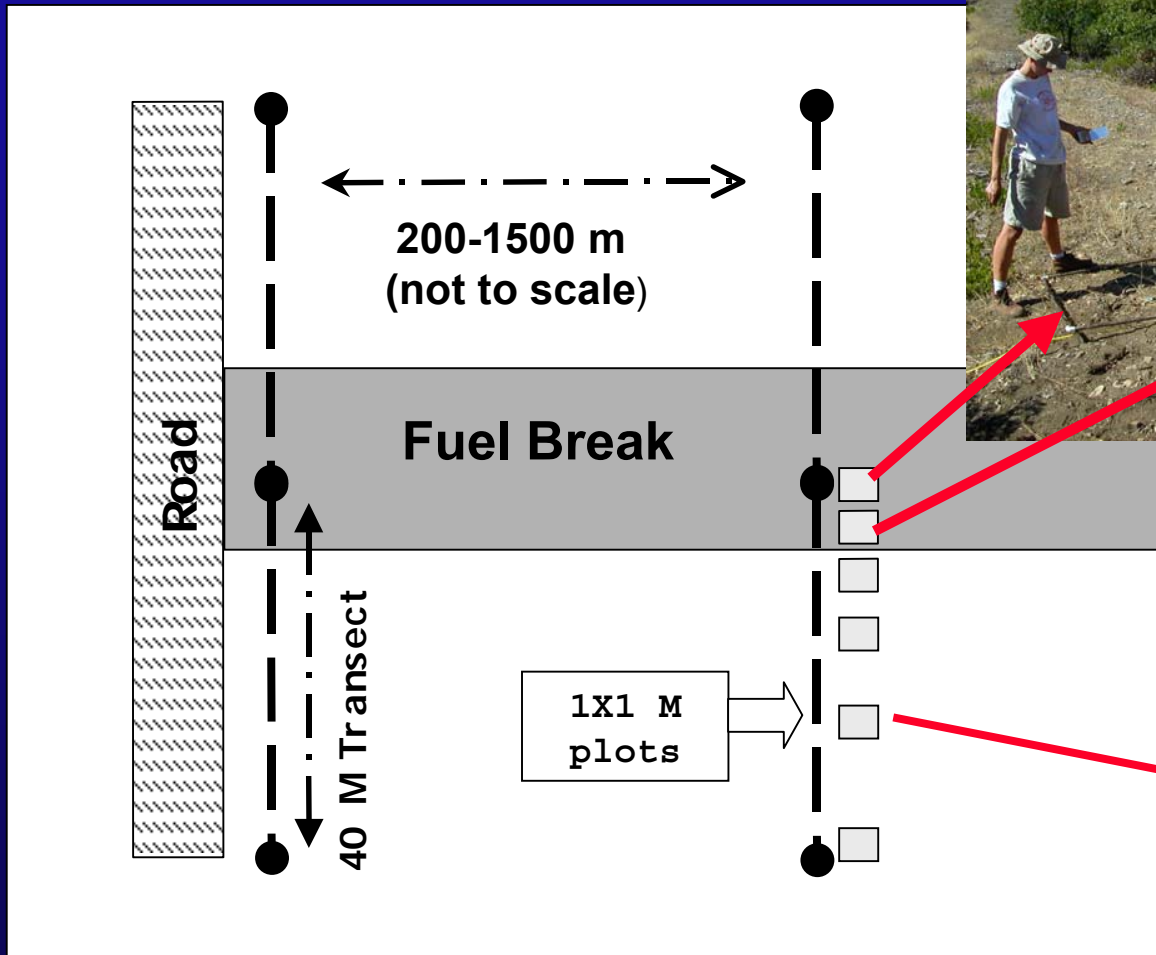


Fuel breaks and invasive plants?

- Reduce competition, alter soil properties, create sites for establishment, introduce nonnative seeds
- Act as nonnative seed source that promotes invasion of adjacent wildlands?

Research Questions

- Are nonnative plants more abundant on fuel breaks?
- Are some fuel breaks less likely to support nonnative species?
- Do nonnatives move into wildland areas adjacent to fuel breaks?

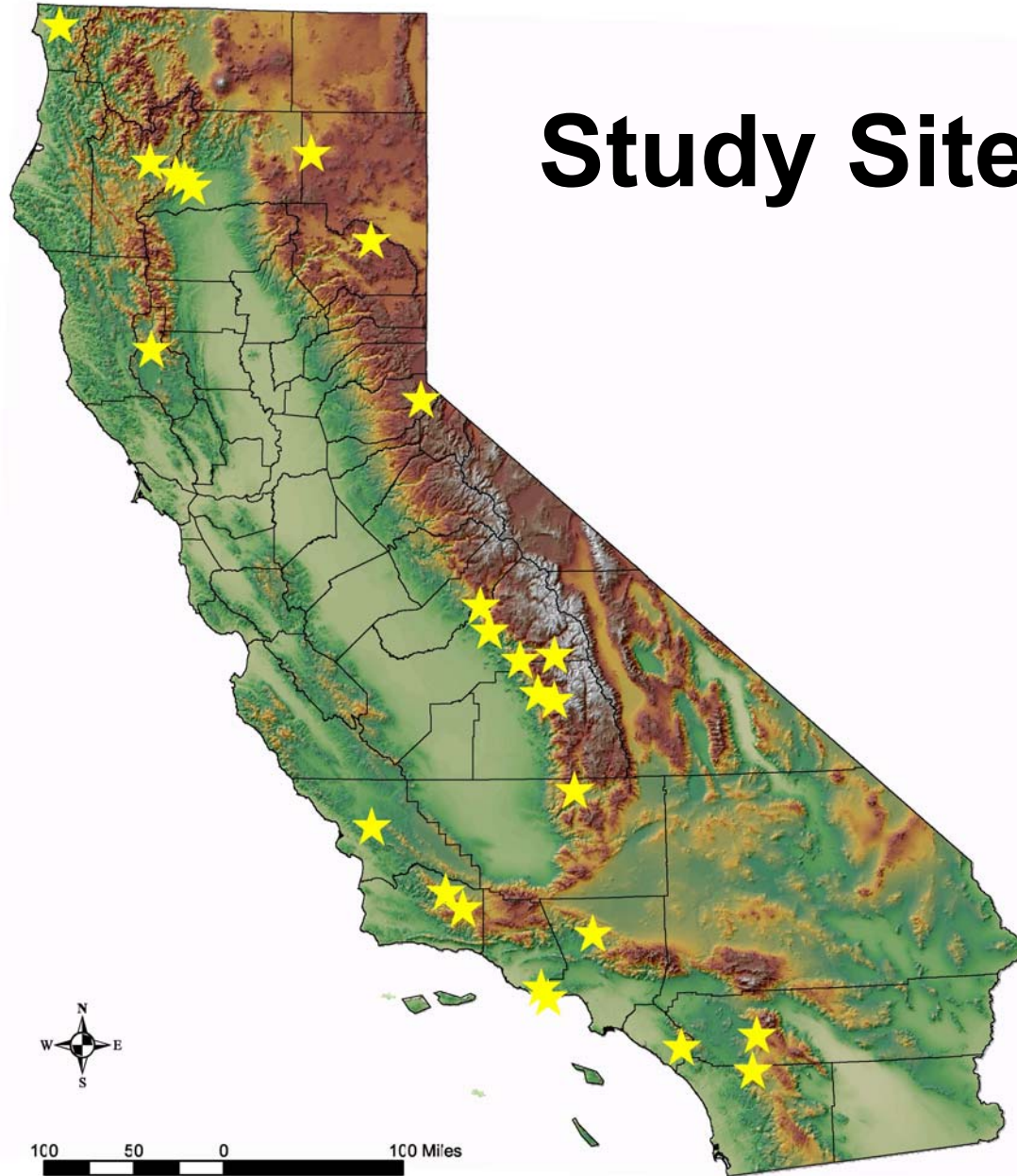


Methods

- **Species composition, cover and density**
- **Ground cover**
- **Overstory canopy cover**
- **Litter and duff depth**
- **Soil N, C, moisture**
- **Slope, aspect, elevation**



Study Sites



General Results

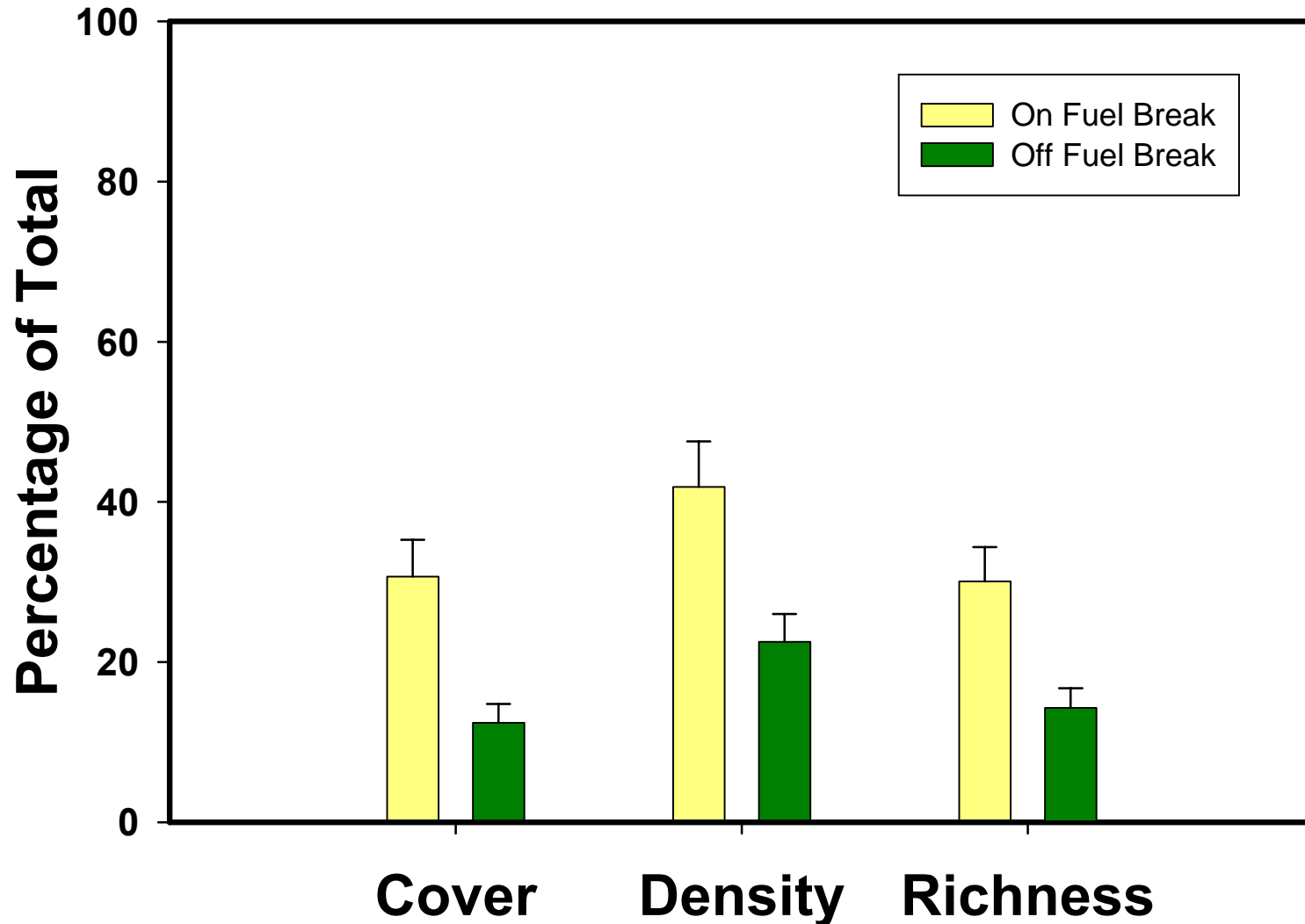
- **737 species: 85% native, 11% nonnative, 4% unknown**
- **1547 study plots, nonnatives present in 49%**
- **12 of 79 nonnative species on Cal-IPC list**



Cheat grass, *Bromus tectorum*

Photo from Brossard et al. 2000

Relative Nonnative Cover, Density and Richness

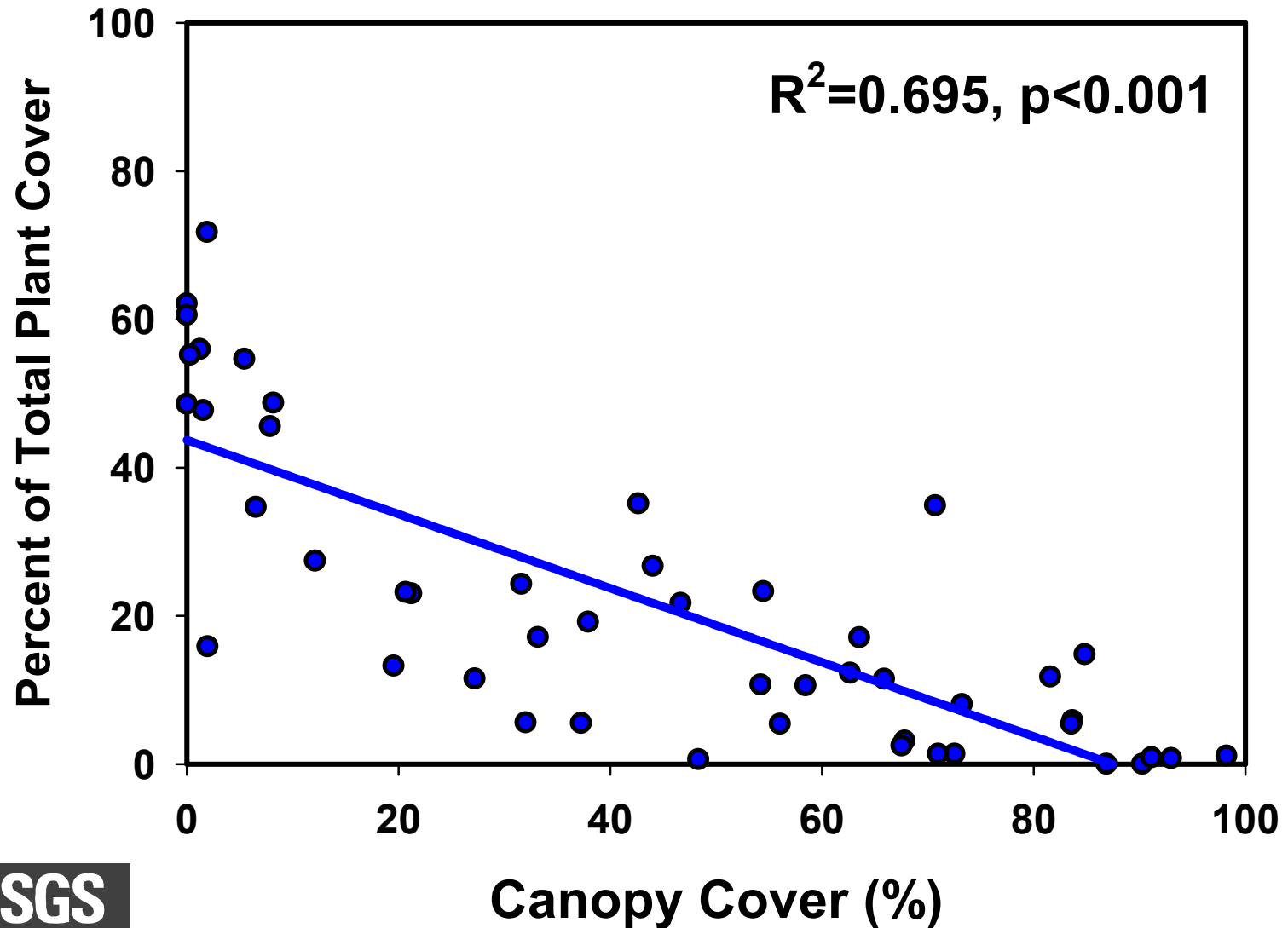


MANOVA, N=46, Wilk's $\lambda=0.002$

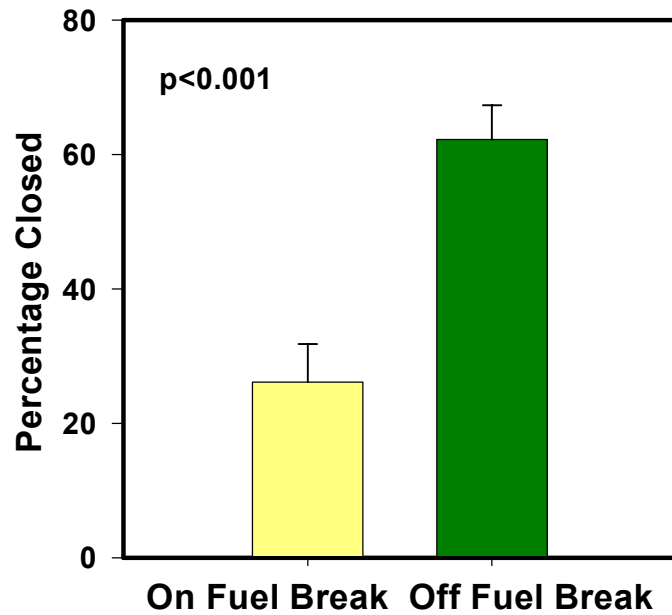
Environmental factors associated with nonnatives

- Slope
- Elevation
- Solar Radiation
- Duff Depth
- Litter Cover
- Bare Ground
- Rock Cover
- Overstory
- Canopy Cover
- Soil Nitrogen

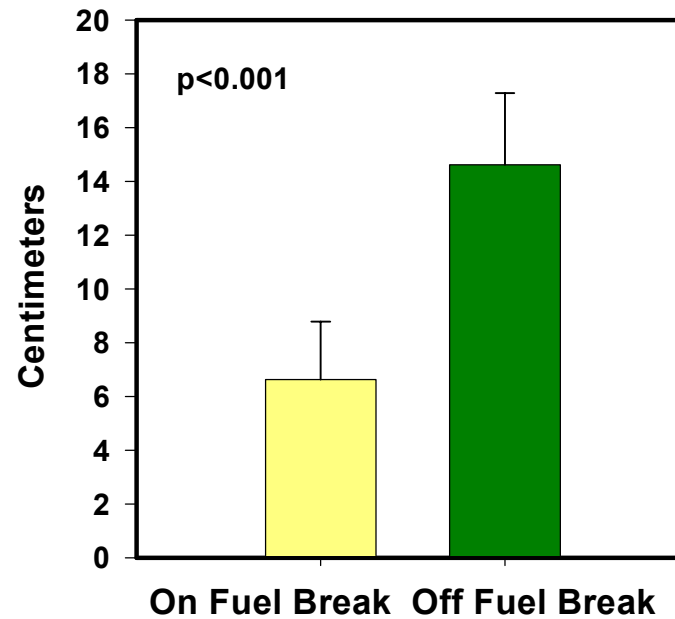
Overstory Canopy Cover and Relative Nonnative Cover



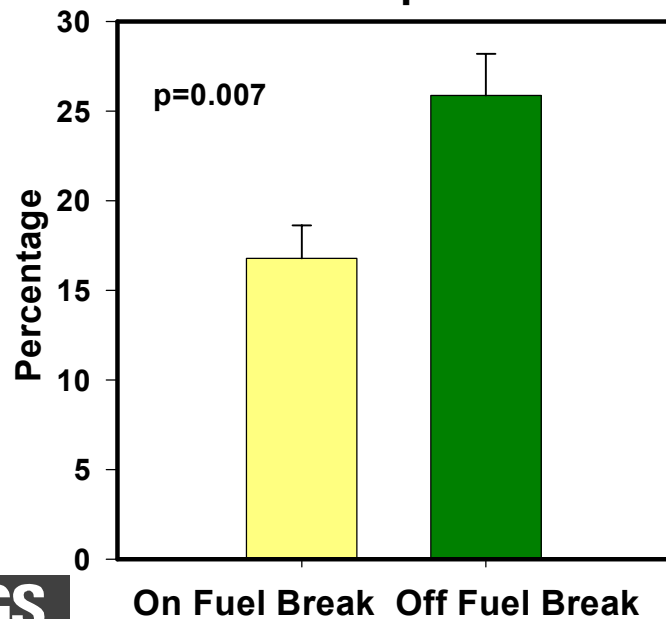
Overstory Canopy Cover



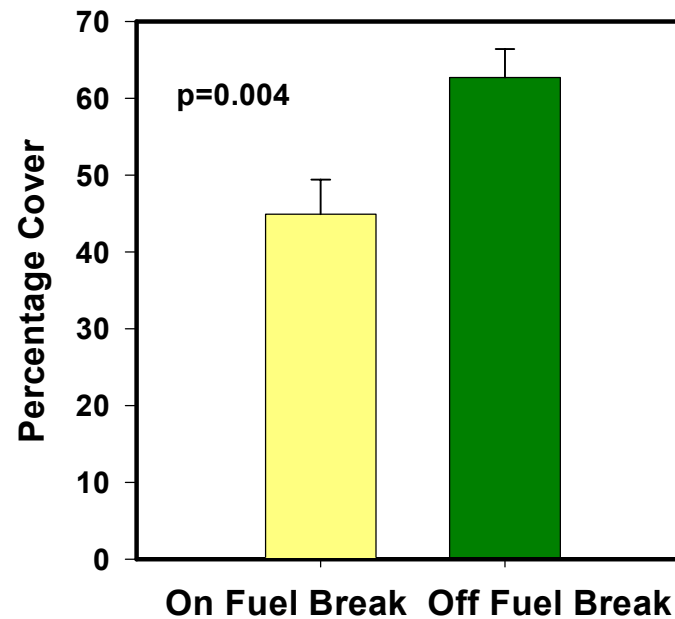
Duff Depth



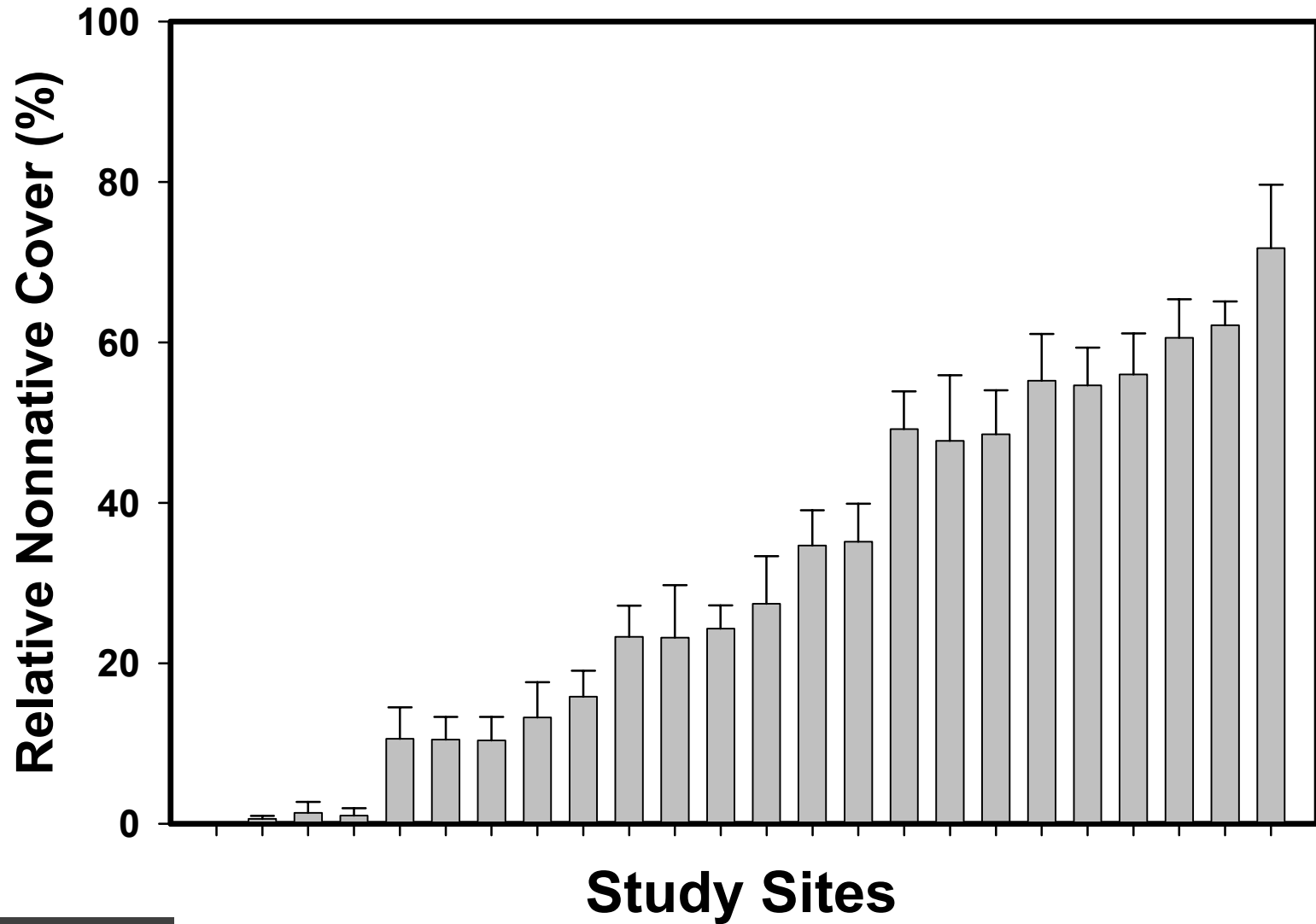
Slope



Litter Cover



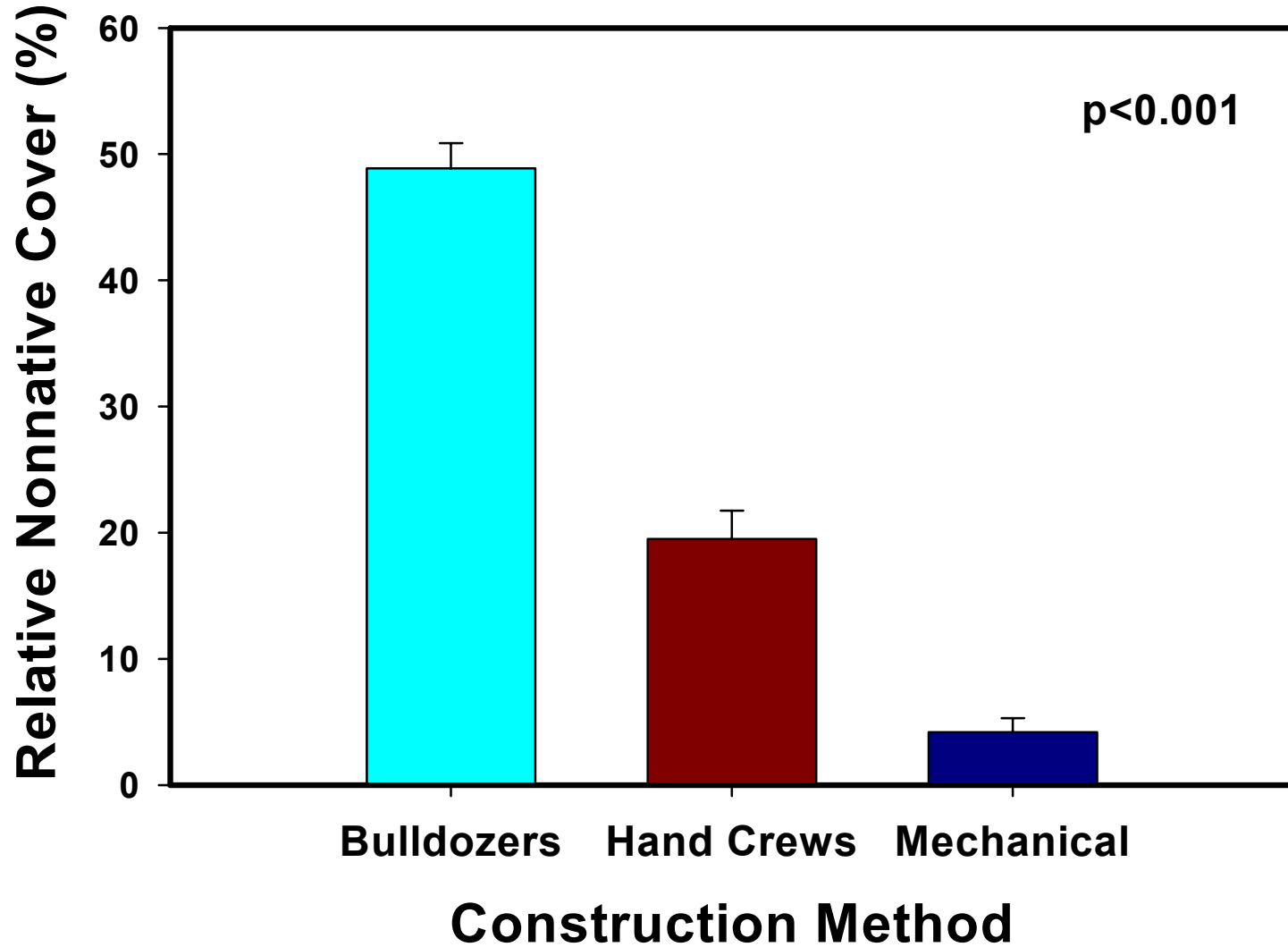
Fuel Break Variation



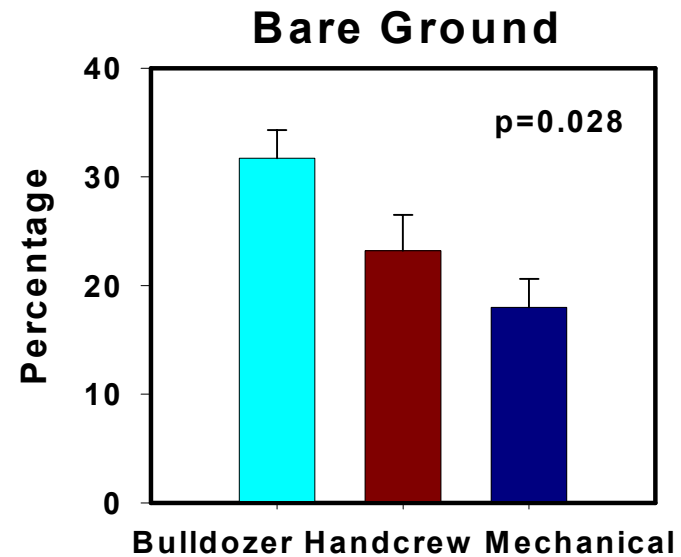
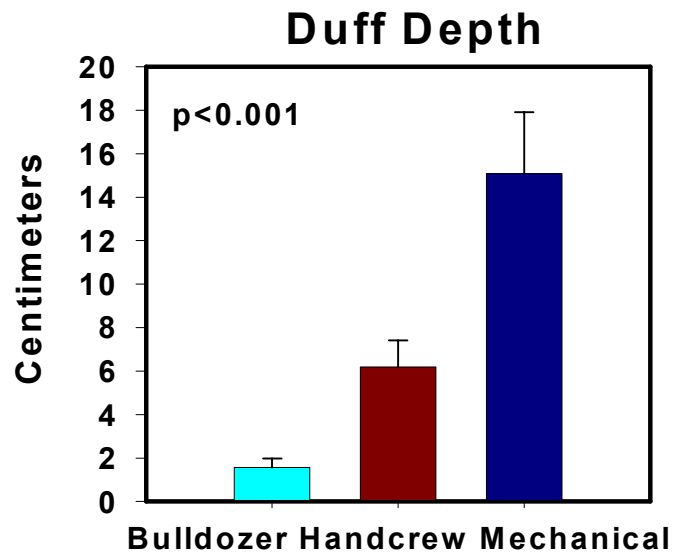
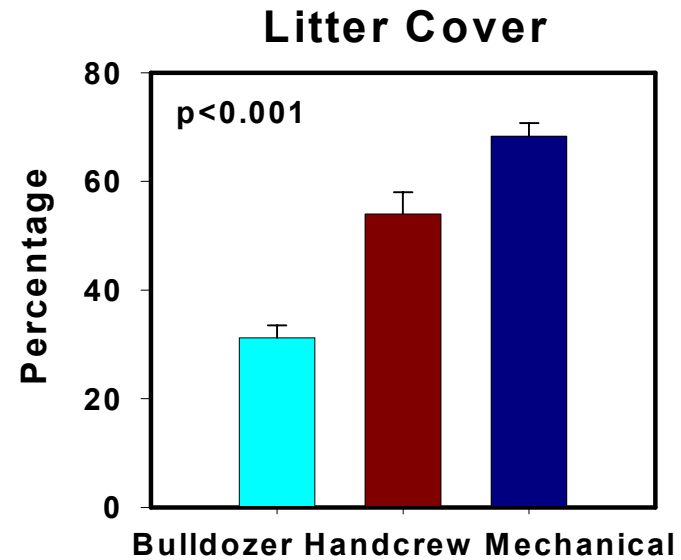
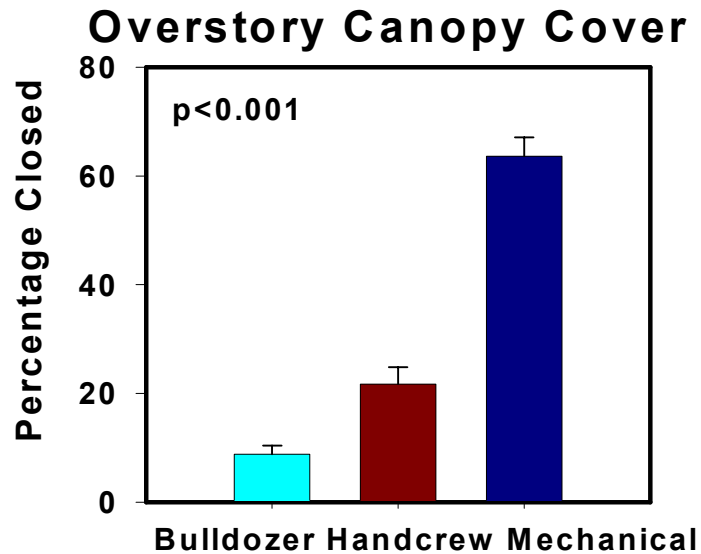
What anthropogenic factors associated with nonnatives?

- *Construction Method*
- *Maintenance Frequency*
- *Fuel Break Age*
- *Distance to Roads*
- *Maintenance Method*

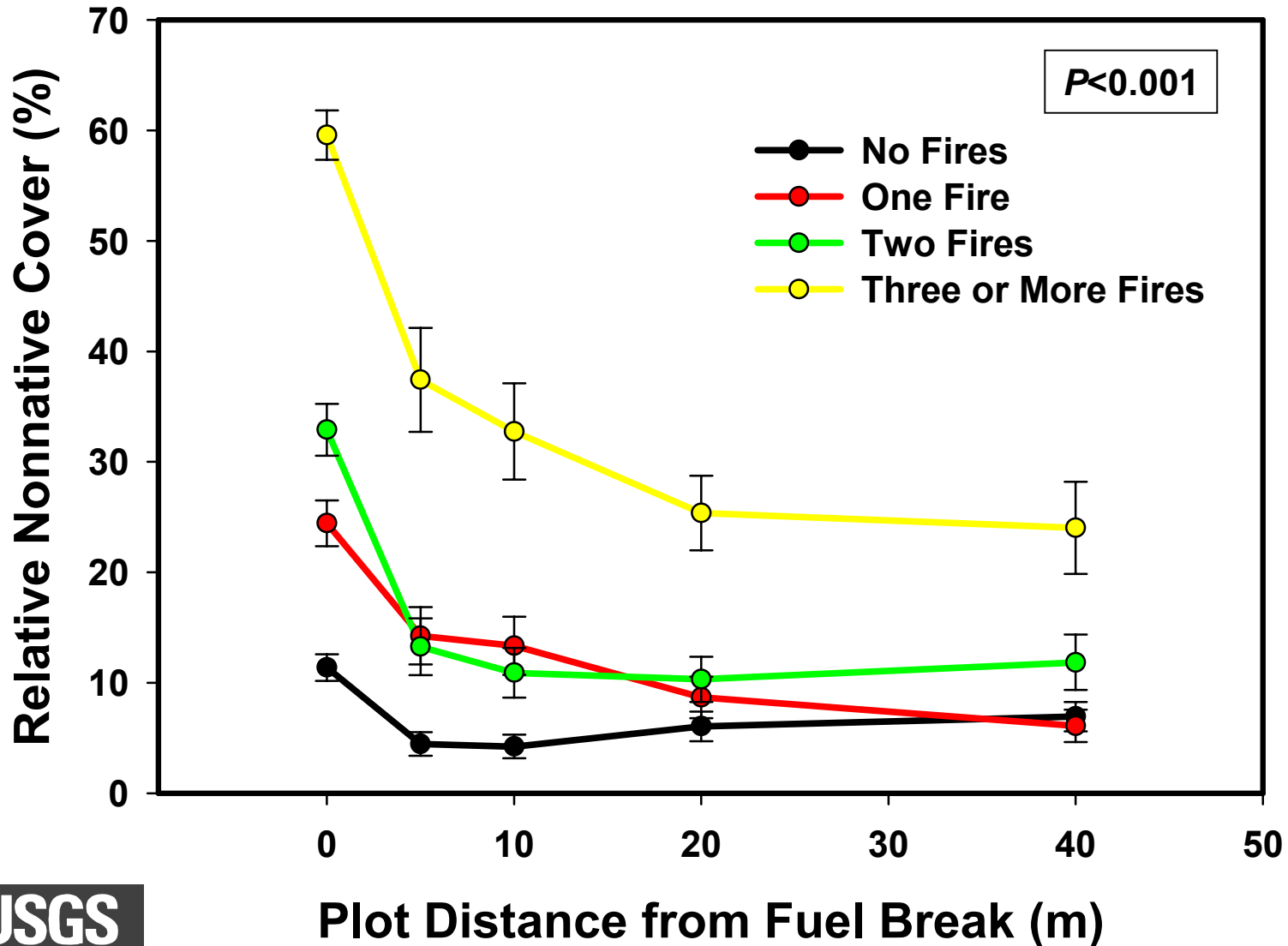
Fuel Break Construction Method and Relative Nonnative Cover



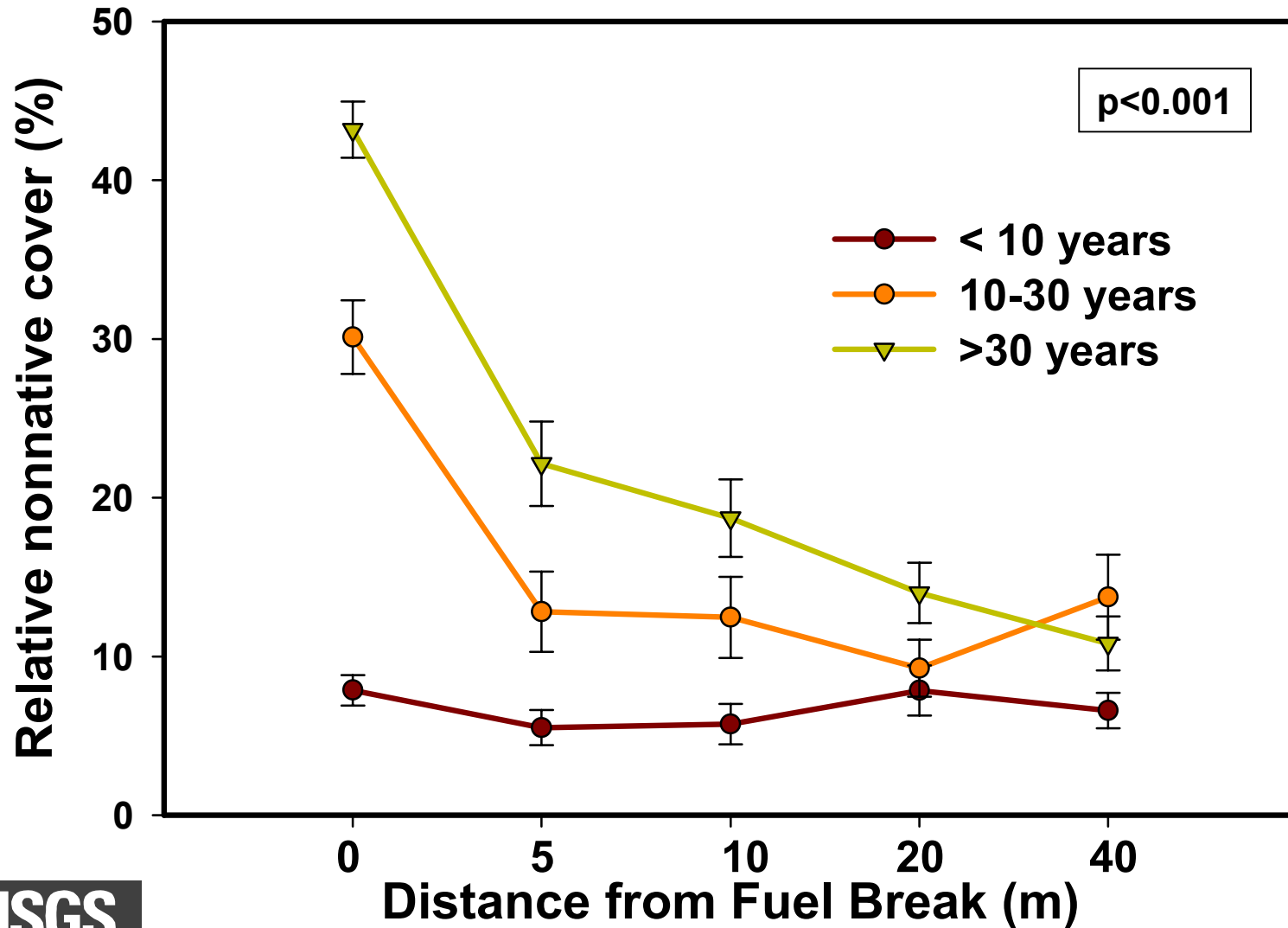
Construction Method and Environmental Covariates



Fire Number and Distance from Fuel Break



Fuel Break Age Category and Distance from Fuel Break



Summary

- **Nonnative plants are more abundant on fuel breaks.**
- **Some fuel breaks are less likely to support nonnative species.**
- **Nonnative plants are more abundant adjacent to fuel breaks after fire and with fuel break age.**

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