Principal short-term findings of the national Fire and Fire Surrogate study by site and ecoregion

All of the numbers in this table represent publications.
To find the citation for any number, refer to the Look-up Table for Publication Numbers and Citations.

FFS site	U.S. Environmental Protection Agency Level III ecoregion	Findings	References
Northeastern Cascades	East Cascades Slopes	Hand-felling and helicopter yarding met thinning prescriptions, but a spring burn under cool moist conditions failed to reduce fire risk in treated stands. Although treatment effects were marked in some cases, they were generally overwhelmed by considerable within-site variability in topography, soils, and fire history. Mechanical + burn treatments had by far the greatest influence on the ecosystem, resulting in the highest quality habitat for cavity nesting birds, the greatest increases in both native and exotic plant species richness, and the greatest reduction in the incidence of dwarf mistletoe.	2, 4, 8, 9, 10, 11, 12, 19
Blue Mountains	Blue Mountains	Cut-to-length logging system (harvester + forwarder) met thinning prescriptions with net revenue gain, and fall burns initially reduced fire risk and reduced fuel mass for up to 4 years. Treatment effects on the ecosystem were generally subtle, but differed between mechanical and burn treatments, with thinned stands generally having effects similar to untreated stands. Although treatment effects were sometimes confounded by variation in soils, mechanical + burn treatments had the greatest overall influence on the ecosystem, resulting in the highest quality habitat for nuthatches, the greatest changes in both native and exotic understory plant species, the highest incidence of bark beetle attack and tree death, the greatest reduction in coarse woody debris, and the most reduction in duff mass and fine root biomass.	21, 24, 26, 27, 28, 29, 31, 33
Northern Rocky Mountains	Middle Rockies	Cut-to-length logging system (harvester + forwarder) met thinning prescriptions, and a spring prescribed fire reduced fuel mass and fire risk. Because of patchiness of fire severity, burning increased spatial heterogeneity of surface fuels and total inorganic nitrogen, which in turn led to higher plant species richness at the stand level up to 2 years after treatment. Treatment effects on the ecosystem were generally subtle, but differed between mechanical and burn treatments, with thinned stands generally having effects similar to untreated stands. The mechanical + burn treatment was the most effective in creating stand conditions that could resist moderate wildfire, and resulted in habitat changes for small mammals and birds, the greatest increases in both native and exotic plant species richness, and changes in processes associated with decomposition.	34, 36, 37, 39, 41, 45
Southern Cascades	East Cascades Slopes	Trees cut with a feller-buncher and skidded whole, a system that met thinning prescriptions, and a fall prescribed fire were successful for reducing fuel mass and fire risk. The mechanical + burn treatment was the most effective in creating stand conditions that would reduce the probability of crown fire. Burning increased bark beetle-caused tree mortality (both pine and fir), with mortality concentrated in the smaller diameter trees. For soils, thinning did not serve as a surrogate for fire, with notable changes owing to burning in soil pH, total inorganic nitrogen, soil carbon, and microbial actions and these changes could lead to differences in tree growth in the intermediate term.	48, 49, 50, 51
Central Sierra Nevada	Sierra Nevada	Trees >25 cm in diameter were hand-felled, limbed and bucked, then yarded by skidder, trees <25 cm were masticated on site, and with these mechanical practices thinning prescriptions were achieved; a relatively intense late fall prescribed fire reduced surface fuel mass and treatments including fire were successful at reducing projected fire risk. The mechanical + burn treatment was the most effective in creating stand conditions that would enhance fire resiliency, but also had the greatest impact on ecological conditions, by reducing coarse woody debris, altering soil carbon and nitrogen conditions, increasing exposed mineral soil, increasing the density of fir and pine seedlings, and increasing the cover and richness of exotic plant species. Logging and burning both increased spatial heterogeneity, which may have played a role increasing both plant and arthropod species richness in treated stands. In general, observed soil chemical effects of burning would be expected to enhance short-term stand productivity.	52, 53, 54, 55, 56, 60, 61, 63, 64
Southern Sierra Nevada	Sierra Nevada	No mechanical treatments were applied, but both spring and fall burns reduced total fuel loads and projected fire risk. Native plant species richness increased after both spring and fall burns and burning off-season (spring) was not measurably detrimental to native plants. There was no difference in effects between spring and fall burns on tree mortality, pine bark beetle incidence, and ground arthropod or small mammal populations; fall burns however, consumed more total fuel mass and coarse woody debris, and had a more dramatic effect on soil abiotic conditions, mineral soil carbon, total inorganic nitrogen, and microbial activity, whereas spring burns caused higher incidence of fir bark beetles. Both spring and fall burning substantially increased within-stand heterogeneity, indicating that prescribed fires in Sierra Nevada forests can mimic wildfires in the creation of spatial mosaics.	68, 69, 71, 72, 73, 74

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Southwest Plateau	Arizona Plateau	Trees >13 cm in diameter were hand-felled, limbed and bucked, then yarded by skidder, trees <13 cm were felled, limbed and scattered, and with these mechanical practices thinning prescriptions were achieved. A fall prescribed fire reduced surface fuel mass when applied without prior thinning, but mechanical + burn treatments had about the same total fuel mass as controls; overall, the three active treatments only slightly reduced projected fire risk. Most soil properties either were unchanged by treatment, or showed subtle effects: vegetation carbon declined in all treatments, dead wood increased in the two treatments including thinning, and the remaining soil properties were unchanged, including soil nitrogen, total ecosystem carbon, soil pH, total inorganic nitrogen, soil carbon:nitrogen ratio, and soil bulk density. Burning increased deer mouse abundance, but reduced pine chipmunk abundance. Bluebird home-range size was 50 percent bigger in thin-only units compared to controls, but 30 percent smaller in the mechanical + burn units.	75, 77, 78
Central Appalachian Plateau	West Allegheny Plateau	Trees were felled by hand and yarded by skidders to landings. Mechanical treatments met all prescription elements. Dormant season prescribed fires followed and burned under prescribed intensity. All active treatments changed forest structure and the surface fuel bed. The mechanical + burn treatment produced the coolest burns, probably because additional slash had not dried sufficiently before fire. Even on more favorable xeric sites, oak regeneration remained at a competitive disadvantage 4 years after treatment, suggesting that repeated hot fires may be necessary to restore hardwood forests to oak dominance. On mesic sites, oak reestablishment in more problematic. In general, treatment effects on the soil, forest floor, understory vegetation, and tree species were modest and transient.	79, 81, 84, 85, 86, 89, 92, 97, 98, 99, 100, 101, 102
Southern Appalachian Mountains	Blue Ridge	All trees and ericaceous shrubs >1.4 m high were cut and left on site, as per prescription; dormant-season burns were then conducted to top-kill suppressed trees and reduce shrub cover. For some ecological variables (e.g., reptiles and amphibians), fuel treatments had subtle effects; for other variables (pollinator species richness, overall bird diversity, understory plant species richness and cover), the combined mechanical + burn treatments had the greatest magnitude effects.	146, 151, 152, 153, 154, 158, 159, 167
Southeastern Piedmont	Piedmont	Trees were thinned from below, and yarded by skidders to landings. Mechanical treatments successfully met all prescription elements. Dormant-season fires followed and burned under prescribed intensity. In general, treatment effects on ecological variables were modest and transient, including components of the fauna (birds, spiders, beetles), the flora (understory and overstory richness), and the soils (carbon, nitrogen, bulk density). Thinning did not serve as a surrogate for fire for most ecological variables, including bats, understory plant species richness, microbial activity and rates, foliage-gleaning and canopy nesting birds, and lizard and reptile abundance.	110, 111, 113, 117, 119, 124, 127, 129, 130, 165, 166, 167
Gulf Coastal Plain	Southeast Plains	Thinning from below and underburning were implemented within prescription, to produce predicted changes in tree density, tree basal area, and down woody fuels. Slash removal after thinning but before burning decreased residual tree mortality owing to fire. Thinning was most effective for reducing mid-story hardwoods, while burning was more effective at reducing understory hardwoods; therefore, the combination treatment would most rapidly achieve longleaf pine (*Pinus palustris*) restoration goals. Small mammals were differentially affected by fuel reduction treatments.	135, 138, 139, 140, 141
Florida Coastal Plain	Southern Coastal Plain	Mastication of saw palmetto understory successfully met fuel reduction prescription. Burns during the growing season met prescribed intensity; flanking fires were the most successful in avoiding crown scorch. Fire treatments lowered soil moisture levels below that favorable to microbial activity.	132, 133, 136, 137