Using thinning as a fire surrogate to improve native plant diversity in a South Florida pine rockland habitat

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Using Thinning as a Fire Surrogate Improves Native Plant Diversity in Pine Rockland Habitat (Florida)

Joyce Maschinski, Jennifer Possley, Meghan Q.N. Fellows, Cynthia Lane, Adrianna Muir, Kristie Wendelberger, Samuel Wright and Hannah Thornton, Fairchild Tropical Botanic Garden, 11935 Old Cutler Rd., Miami, FL 33156-4242, jmaschinski@fairchildgarden.org

Periodic fire is considered crucial for maintaining the diverse rare plant species and communities found in the pine rockland ecosystems of south Florida (Snyder and others 1990). This globally endangered ecosystem, which is characterized by a limestone substrate, shallow sandy soils, mean annual rainfall of 64 inches (163 cm), south Florida slash pine (*Pinus elliottii* var. *densa*) and saw palmetto (*Serenoa repens*), occurs on only about 2,273 acres (920 ha) outside of Everglades National Park (USFWS 1999). Unfortunately, most of these remnants have not experienced fire for decades.

Because many remnant pine rocklands in Miami-Dade County are small and enmeshed in the urban landscape, the introduction of fire raises public concern about threats to structures, smoke-induced health problems, and personal safety. As a result, land managers often use thinning as a fire surrogate, although it is extremely labor intensive and more expensive than conducting controlled burns. Since little is known about whether thinning treatments replicate the ecological service of fire and maintain a healthy diverse understory community in the pine rockland, our research addressed whether thinning and duff removal influenced vegetation structure and pine rockland plant community composition.

We randomly placed ten 15-m x 30-m plots (four thinned, four control, and two reference) within a 32.9-acre (13.3-ha) pine rockland fragment that had a variable fire history. We established the reference plots in an area where fire had occurred within the past 15 years (J. Klein pers. comm.) and that supported populations of the federally endangered plant, Small's milkwort (*Polygala smallii*). Comparing the thinned and control plots containing dense thickets of south Florida slash pine and saw palmetto to the reference plots enabled us to test the effects of manual thinning on vegetation structure and composition.

In March 2002, crews cut 30 percent of the small pines (0.8- to 4-inch or 2- to 10-cm diameter) to the ground using a chainsaw, cut and treated 20 percent of palm stumps with a 20-percent solution of Garlon 4 (triclopyr), and removed about 85 percent of the forest litter from the thinned plots at a total cost of $22,730/acre ($56,1431/ha). One month prior to treatment, we sampled percent cover of vegetation and abundance of species of interest in three 2.5-m x 10-m subplots within each plot. We resampled the plots two months after the thinning treatment and again one year later. During each sampling period, we mea-

Table 1. Median percent cover values for pine rockland habitat before and after thinning treatment. Significant differences across groups are indicated by different upper case letters. Significant differences across time within a group are indicated by different lower case letters.

Treatment Plots	Tree (0-0.5 cm)	Tree (0.5-2cm)	Tree (2-10cm)	Herbs	Grasses	Shrubs
Control Pre-2002	2.5 Aa	2.5 Aa	15.5 Aa	2.5 Aa	2.5 Aa	38.0 Aa
Control Post-2002	0.0 b	2.5 a	15.5 a	2.5 Aa	2.5 a	38.0 a
Control Post-2003	1.4 b	4.1 b	20.5 a	6.7 b	0.7 b	53.0 b
Thinned Pre-2002	2.5 Aa	2.5 Aa	38.0 Ba	2.5 Aa	2.5 Ba	38.0 Ba
Thinned Post-2002	2.5 a	2.5 a	2.5 b	2.5 a	2.5 a	15.5 b
Thinned Post-2003	1.4 b	6.7 b	6.7 b	6.7 b	6.7 b	20.5 b
Reference Pre-2002	0.0 Ba	0.0 Ba	2.5 Ca	2.5 Aa	9.0 Ca	38.0 Aa
Reference Post-2002	0.0 a	0.0 a	0.0 b	2.5 a	2.5 b	38.0 a
Reference Post-2003	0.0 a	0.0 a	0.7 c	6.7 b	20.5 c	20.5 b

sured species presence in whole plots after determining the optimal size for detecting species.

Prior to treatment, control and thinned plots had similar numbers of species per 900 m^2 (59 and 51, respectively), while reference plots had 63 species. All plots had similar shrub cover (38 percent, Table 1). However, control and thinned plots had significantly higher tree cover (20 percent and 43 percent, respectively) than reference plots (2.5 percent; Table 1).

Thinning significantly reduced cover of trees by 26 percent and shrubs by 23 percent. After one year, we found that thinned and reference plots maintained significantly less tree and shrub cover and more grasses than the control plots (Table 1). Thinned plots had significantly greater species richness (80 species) than either the control (63) or reference plots (54). There was a trend, although not significant, for higher abundance of native species (549) in thinned plots compared to control (409) or reference plots (196). Most important, the thinning treatment *did not* introduce a new and more abundant suite of exotic species. However, thinned and control plots had similar abundance of exotic species (22 and 26 species, respectively) and greater abundance than reference plots (seven species).

Several species increased significantly in response to thinning—especially partridge pea (*Chamaecrista fasciculata*), rabbitbells (*Crotalaria rotundifolia*), and two rare species—quail berry (*Crossopetalum ilicifolium*) and pineland clustervine (*Jacquemontia curtissii*). Because this treatment did not increase the occurrence of Small's milkwort, which was still present only in reference plots one year after treatment, it may not be an effective tool for managing all rare species.

Our experiment suggests that mechanical thinning can improve the numbers and diversity of native species in the pine rockland understory without increasing exotic species invasion, at least in the short term. Among the species positively influenced by thinning were those that are characterized as gap species. In contrast, reference plots were more open, but did not have more species.

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FROM: Proceedings of the 2003 National Silviculture Workshop

67.1

Spatial Distribution of Ponderosa Pine Seedlings along Environmental Gradients Within Burned Areas in the Black Hills, South Dakota. Bonnet, V.H., MatCom, Fort Collins, CO; A.W. Schoettle and W.D. Shepperd. Pp. 93-101.

These researchers set out 20 transects to study pine regeneration two years after a large, severe forest fire in contiguous ponderosa pine (*Pinus ponderosa*) forest. The transects ran for 117 ft (36 m) from the unburned areas to the centers of burned areas. Variables included vegetation, ground covers, topography, soil moisture, soil temperature, floristic richness, tree density, and tree measurements. Results showed that seedling establishment was highest on the peripheries of burned areas where there were nearby seed sources, good seedbed conditions, and less competition. The authors conclude that burned areas larger than 198 ft (60 m) in diameter may require artificial regeneration of ponderosa pine. The study results should be helpful to foresters managing post-fire logging operations.