# INFLUENCING FACTORS ON VEGETATIVE COGONGRASS SPREAD INTO PINE FORESTS ON THE MISSISSIPPI GULF COAST

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**Abstract**—Cogongrass [*Imperata cylindrica* (L.) Beauv.] is an invasive species that is spreading throughout forested ecosystems across the Southeastern United States. A field experiment was conducted in Hancock County, MS to determine if mid-rotation mechanical disturbance increased the rate of growth and spread of roadside cogongrass patches into adjacent forest stands. Logging disturbance was replicated on 18 treatment sites using a 65 horsepower New Holland tractor and a box blade. The distance of linear spread and tiller growth into adjacent forest stands was measured during and after the growing season following disturbance. Comparisons were made between disturbed and undisturbed sites. Cogongrass exhibited significantly higher rates of spread in disturbed sites versus undisturbed sites and rhizome biomass was strongly related to this process.

## INTRODUCTION

Cogongrass (*Imperata cylindrica* (L.) Beauv.) is a non-native invasive that has been invading southern forests for nearly a century. Introduced in the winter of 1911-1912 as packing material for a crate of oranges, cogongrass has spread from the site of original introduction and covered thousands of forested acres in the Southeastern United States (Tabor 1952). Cogongrass is a warm season, rhizomatous, perennial grass native to Southeast Asia (Holm and others 1977). The negative impacts of cogongrass are numerous and include the exclusion of native vegetation, altered natural fire regimes, degraded wildlife habitat, and difficult regeneration of southern pine (Dozier and others 1998, Ramsey and others 2003).

Cogongrass forms dense monotypic patches void of most forms of native vegetation. Arising from an extensive rhizome system that can reach 16 tons per acre of below ground biomass, tillers reach average heights of 0.5 to 4 feet (Holm and others 1977). One to four leaves will branch off each tiller becoming progressively shorter upwards on the tiller. Leaves are approximately 0.5 inches wide with raised scabrous margins and a white offset midrib (Bryson and Carter 1993, Dozier and others 1998).

Spreading by seed and rhizome, each method presents notable challenges to forest managers and landowners. Cogongrass seed heads contain up to 3,000 wind disseminated seeds that must contact bare mineral soil for germination to occur (Shilling 1997). The tufted inflorescences travel an average of 49 feet, although much longer distances have been reported (Holm and others 1977). Vegetative spread by rhizome is also a significant concern. The introduction and spread of cogongrass throughout MS and FL has been primarily attributed to the use and transportation of contaminated fill material (Patterson and McWhorter 1983, Willard 1988). Cogongrass has also spread by rhizome movement from established patches by blades, discs, mowers, grapples, tires and other pieces of machinery (Dozier and others 1998, Willard 1988). Only 0.0035 ounces of rhizome are required for successful establishment of a cogongrass plant (Soerjani and Soemartwoto 1969). Rhizome pieces have been documented to spread up to 172 square feet and produce 350 shoots in 11 weeks (Eussen 1980).

The ability of cogongrass to reproduce and spread in a forested setting may depend on current and past management activities. Disturbances that displace and disturb the litter layer and underlying soil such as mechanical thinning, harvesting, burning, and herbicide and fertilizer application can create conditions conducive to the growth and spread of cogongrass (Holm and others 1977). Holm and others (1977) also recognized the concept of dense shrub and herbaceous cover acting as a forest barrier preventing cogongrass invasion. Driving or operating machinery within a forest stand disturbs the shrub and herbaceous layers creating “pathways” for cogongrass to enter. What remains unknown is the extent that disturbances increase growth and spread rates of cogongrass and what specific factors influence these rates. This study assessed the change in growth and spread rates following a simulated logging disturbance and also considered multiple influencing factors.

## METHODS

To test the hypothesis that logging disturbance increases the rate of cogongrass spread, 18 roadside cogongrass plots were chosen to receive a simulated logging disturbance treatment, while an additional 18 plots were chosen for control. Criteria for plot selection were developed to avoid physical obstructions (i.e., deep ditches) and to prevent variation in data due to factors such as standing water, low understory density, and open canopy. Logging disturbance was simulated by dragging a 5-foot box blade through each 12 by 30 foot treatment plot with a 65 horsepower New Holland tractor until the disturbance resembled that of an actual disturbance created by dragging felled timber to the roadside using conventional skidding methods. Initial measurements were taken in February 2006 and included distance from an established baseline to furthest cogongrass tiller and number of tillers in a 3 by 10 foot sub-plot. Subsequent measurements were taken in November

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2006 after one growing season. Mean growth and spread rates were tested for significance using one-way ANOVA ($\alpha$ = 0.05), and related factors were identified using simple linear regression.

## RESULTS

The rate of cogongrass spread in disturbed plots was significantly greater (p = 0.0127) with an average of 45.5 inches while control plots averaged 10.6 inches (fig. 1). The number of new cogongrass tillers in disturbed plots (53.4 tillers) was also significantly (p = 0.0018) higher than in control plots (8.9 tillers) (fig. 2). November 2006 measurements indicated a maximum gain of 203 tillers, and over 13 feet of spread in particular disturbed plots after one growing season. Using simple linear regression, the only strong linear relationship ($p \leq 0.0001$) observed was between cogongrass tiller growth and rhizome biomass with an $R^2$ value of 0.81.

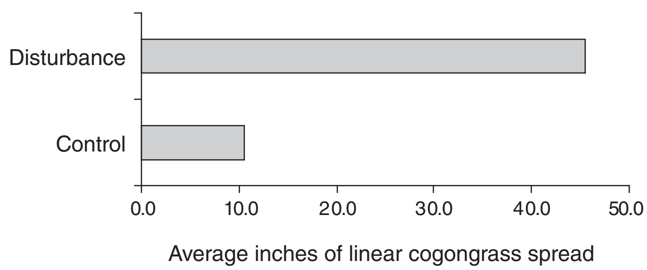


Figure 1—Average inches of linear cogongrass spread into a forest Stand in disturbed and control plots after one growing season following a simulated logging disturbance at John C. Stennis Space Center in Hancock County, MS during 2006.

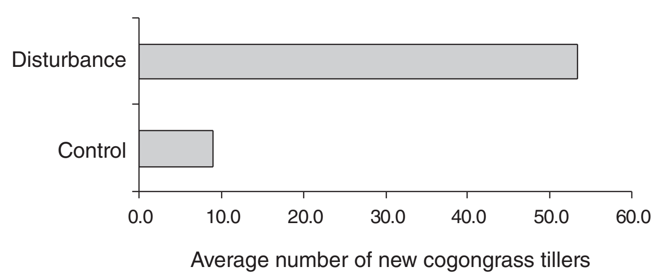


Figure 2—Average number of new cogongrass tillers in disturbed and control cogongrass plots after one growing season following a simulated logging disturbance at John C. Stennis Space Center in Hancock County, MS during 2006.

## DISCUSSION AND CONCLUSIONS

This study showed that disturbance related to certain forest management activities, such as a logging disturbance, increased the growth and spread rates of roadside cogongrass patches into an adjacent forest stand. To control the spread of cogongrass, managers and landowners must take action to minimize or reduce disturbance in or around cogongrass patches, or by gaining control of cogongrass with herbicide applications in areas where disturbance is unavoidable. Additionally, buffer strips of dense shrubs should be left intact where cogongrass patches adjoin the forest stand. Protecting the integrity of these buffers can potentially reduce spread by increasing light competition and by slowing wind speeds limiting the travel distance of cogongrass seeds. Results of this study also indicated that rhizome biomass was the primary influencing factor behind the growth of cogongrass on sites disturbed similar to that of a logging disturbance. The positive correlation between rhizome biomass and tiller growth indicated that although above ground spread into adjacent forest stands may not be obvious, underground rhizomes were spreading into the stand and waiting on some disturbance to encourage foliar growth. Given that most rhizome mass was contained in the upper soil strata, deeper disturbances increase the odds of rhizomes being displaced and producing new plants farther into the forest.

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