BIOLOGICAL IMPACT OF AND CONTROL MEASURES FOR COGONGRASS IN THE SOUTHEASTERN UNITED STATES

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ABSTRACT

Cogongrass (*Imperata cylindrica* (L.) Beauv.) is a non-native, invasive weed that is disrupting economically and ecologically important plant communities in the southeastern United States. Cogongrass accidentally entered the U.S. at several locations, one of which was near Grand Bay, AL, in Mobile County, around 1911. Since that time, this aggressive, perennial, warm-season grass has infested over 200,000 ha in southern Alabama, Mississippi, and Florida. Several intentional introductions have been documented, and unauthorized acquisitions from these areas also account for many hectares of infestation in central and southern Florida and in certain areas of Mississippi. Cogongrass, known also as speargrass, japgrass, or alang-alang, causes damage in forests, rights-of-way, protected natural areas, industrial lands, tree and fruit crops, and soil disturbance following its establishment is usually minimal. Due to the intensive tillage commonly practiced in row crop agriculture, cogongrass has yet to become a serious pest in this industry. Cogongrass is particularly damaging to forested land because it decreases biodiversity and wildlife habitat, hinders plantation establishment, creates a wildfire hazard, and is assumed to decrease wood and fiber production. Effective control and management treatments are critically needed by forest landowners and managers for rehabilitating cogongrass-infested lands. Tree plantations have been established in Asia to aid rehabilitation and could hold promise for reclaiming infested lands in the Southeast. The primary research objective of this project was to investigate integrated vegetation management options for the establishment and/or reforestation of loblolly pine (*Pinus taeda* L.) into cogongrass-infested areas.

The study site was located in Mobile County, AL. The experiment was a factorial arrangement that tested two herbicide site preparation (SP) treatments, two mechanical SP treatments, and two pine release herbicide treatments. Herbicide SP levels were none and a broadcast-applied tank mixture of glyphosate at 3.3 kg ae/ha, imazapyr at 0.34 kg ae/ha, and nonionic surfactant at 0.5 % v/v. Application was on October 3-4, 2001. Mechanical SP levels were a scalping treatment and none. Scalping consisted of using a bulldozer and fire plow to remove the upper 10 to 15 cm of cogongrass rhizomes and roots, folding these back upon intervening grass to create a furrow in which seedlings were planted. Scalping was performed on December 19, 2001. Release treatment levels were band-applied herbicide and none and were applied after seedling planting. In addition to the eight plots in the factorial core, a ninth treatment, termed “complete control,” was added. The nine treatments were replicated four times in a randomized complete block design. Bare-root, improved loblolly pine seedlings were hand-planted on January 15, 2002.

Biomass Response

In the year immediately following planting of trees, mechanical SP reduced biomass in each category. However, in the following year, regrowth occurred to an extent that mechanical SP made no treatment differences. The combination treatment of mechanical and herbicide SP reduced live grass by 98.5% compared to the non-treated check in the first year, which suggests greater than an additive effect when combined compared to a single use. Live cogongrass regrew by eightfold to eighteenfold by the second year on all SP treatments, and all treatments

contained live grass at the 2003 harvest (780-7400 kg/ha). Other woody and herbaceous plant biomass was least in the non-treated (830 kg/ha) and greatest in the complete control (8310 kg/ha). Herbicide SP and complete control yielded the greatest recruitment of other woody and herbaceous species in both years to assist with the rehabilitation process (8310 kg/ha in year two). The herbicide SP yield was significantly greater than both the mechanical SP and the non-treated, while mechanical SP yielded woody and herbaceous biomass equivalent to the non-treated. Data analysis revealed few significant differences between treatments or establishment methods for live grass and other species at year two. Despite intensive control efforts, cogongrass remained a significant component of the plant community as live cogongrass made up at least 15% of the total plant biomass through year two. Herbicide SP resulted in at least 30% other species, increasing the overall plant community diversity in those treatments.

Tree Response

Loblolly pine survival was equal to or exceeded 90% on all treatments including the non-treated check in years one and two after planting. Treatments with herbicide SP had greater survival, either with or without mechanical SP or release. Site preparation, whether herbicide or mechanical, yielded a significant increase in ground-line diameter (GLD) compared with no SP, while the addition of release made no difference in GLD in the first year. On average, herbicide SP and release showed an additive effect for GLD response. Tree height in year one ranged from 46.1 to 66 cm. Herbicide SP yielded 6-cm taller trees than mechanical SP unless combined with mechanical SP, in which case an antagonistic effect was found. The negative interaction of mechanical SP and herbicide SP was significant for both loblolly pine GLD and HT. One possible explanation for this response is that soil, previously treated with SP herbicides, sloughed into the mechanically created furrows, thus concentrating herbicide around the seedlings. Stunting of the trees resulted along with a visual yellowing of needles during the first growing season. This effect was evident in both treatments that received herbicide SP followed by mechanical SP. Effects were transient, however, and not observed during the second growing season. Site preparation significantly increased tree growth in the second year by all measures compared to no SP. Aside from the non-treated trees, the release only treatment consistently yielded the smallest trees. For HT only, herbicide SP yielded taller trees than did mechanical SP. These data suggest that 2 years after application, herbicide SP is positively influencing loblolly pine growth more than the other establishment techniques. Release alone was not as effective as other establishment techniques because trees were generally smaller than those treated with SP.

Summary

Herbicide SP consistently increased loblolly pine growth, decreased live cogongrass, and increased overall plant community diversity. Release alone was not an effective reforestation technique; however, it was generally additive when combined with an SP treatment. The use of herbicides was critical to the recruitment of woody and herbaceous species other than cogongrass. No reforestation technique reduced cogongrass to acceptable levels; however, the establishment of loblolly pine was successful, so some productivity was restored to the land.