

## ABSTRACT OF THE THESIS

# The Effects of Chemical and Mechanical Manipulation of Old-Field Plant Populations; An Evaluation of Ragweed Control Techniques

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Studies were conducted to evaluate the effectiveness of artificial (chemical or mechanical) versus natural population control of common ragweed (Ambrosia artemisiifolia L.). The studies were also conducted to show the effect of artificial ragweed control techniques on associated old-field plant populations.

During the summer of 1969 field plots in the first and third year of succession were mowed, burned, sprayed with 2,4-D, mowed and then burned, or sprayed with 2,4-D and then burned. The percent cover of all plant species in the plots was sampled at the beginning of summer, 1969, prior to treatment application; at the end of summer, 1969, subsequent to treatment applications; and at the end of summer, 1970, a year after treatment applications. In addition, the peak ragweed density, frequency, cover, and biomass/m<sup>2</sup> was measured, by the harvest method, during the summer of 1970.

All treatments applied to first and third year field plots caused a significant reduction in the percent cover of ragweed by the end of the first summer, with the exception of the burn treatment in the first year plots. With

this exception, there was no treatment which was significantly better than any other on the basis of ragweed removal alone. A year after application there was no treatment group with a significantly lower ragweed density, cover, frequency, or biomass/m<sup>2</sup> than that found in the control.

At the end of the first summer the cover of ragweed was 51 percent in the first year control and 73 percent in the third year control. By the end of the second summer the cover of ragweed was approximately one percent in the first year control and two percent in the third year control. The control response showed that in the absence of treatment, ragweed was displaced naturally through successional processes.

Examination of the entire vegetational system showed that maximum disruption occurred during the summer of treatment application. The response in all first and third year plots, with the exception of the burn treatment in the first year field, was an increase in graminoid cover coupled with a decrease in non-graminoid cover. The most severe effect of manipulating the first year plots was seen a year after treatment. In these plots perennial cover was significantly lower than in the control, indicating successional retardation. All third year plots, except for those which were sprayed, and sprayed and burned, recovered rapidly from the system manipulation and did not differ significantly from the control a year after

treatment application. Spraying with 2,4-D was an extremely severe treatment. A year after treatment the vegetational system in the third year sprayed plots had not yet recovered. The sprayed plots had a significantly lower non-graminoid cover and a significantly higher annual grass cover when compared with the control. The vegetation in these plots had thus regressed to a successional younger composition.

On the basis of these results, it is recommended that in most cases newly disturbed areas which will advance successional should not be chemically or mechanically manipulated for ragweed control. The only exception would be in vegetational systems containing perennial grass. In these systems the use of 2,4-D for ragweed control could be expected to speed up succession by favoring the grass while killing the broad leaved plants. In successional older areas where perennial and biennial vegetation has become established, ragweed may be removed by mowing or burning. If the older area contains perennial grass, ragweed may be removed by using 2,4-D.