

# Effects of mowing, herbicide and fire on *Artemisia vulgaris*, *Lespedeza cuneata* and *Euphorbia cyparissias* at the Hempstead Plains grassland, Long Island, New York.

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Marilyn J. Jordan, Ph.D.  
Bruce Lund and William A. Jacobs  
The Nature Conservancy, Long Island Chapter  
250 Lawrence Hill Road, Cold Spring Harbor, NY 11724  
631-367-3384 ext 121, [mjordan@tnc.org](mailto:mjordan@tnc.org)

## Abstract

The Hempstead Plains is a tall grassland community in Nassau County, Long Island, NY that once covered > 40,000 acres but has been almost entirely lost to urban development. Invasive, non-native plant species common near the disturbed periphery of a 19 acre grassland remnant include *Artemisia vulgaris* (mugwort), *Lespedeza cuneata* (Chinese lespedeza) and *Euphorbia cyparissias* (cypress spurge). Eighteen 10 m x 10 m experimental plots were established in 1991-1992 in areas of dense mugwort or lespedeza. Treatments included mowing once, twice or three times annually for three successive years; one herbicide application (Roundup at 0.10 oz/m<sup>2</sup>) in July 1992, July 1993 or both years; one or two prescribed burns (spring or fall) in 1991-1995; or a combination of herbicide and burning. Ocular estimates of cover of every plant species were made in 1992-1995 and 2001. Results were assessed graphically. Mugwort, a clump-forming rhizomatous perennial, was nearly eliminated by either repeated mowing or herbicide application for 2-3 years, with little regrowth. Mugwort was not affected by dormant-season burning. Chinese lespedeza was not controlled by repeated mowing; effects of fire were variable. Although nearly eliminated by one herbicide application, lespedeza regrew (probably from the seed bank) and approached pre-treatment abundance within 2-6 years. Low-growing cypress spurge was not controlled by mowing, herbicide or fire and greatly increased in cover and extent, perhaps facilitated by removal of taller competitors. Invasive plant control methods and timing should be appropriate for target growth form, reproductive attributes, and competitive ability. Long term monitoring and follow-up are essential.

## Introduction

The Hempstead Plains is a tall grassland community in Nassau County, Long Island, NY that once covered more than 40,000 acres but has now been almost entirely lost to urban development. Since ~1989 the Nature Conservancy has managed a 7.69 hectare (19 acre) remnant (formerly Mitchell Field airport) owned by Nassau Community College, and carried out prescribed burning from 1991-1995. The central part of the preserve supports the best areas of native grassland. Several invasive, non-native plant species are common. *Artemisia vulgaris* (mugwort) is almost entirely restricted to the periphery and

along an old gravel road. *Lespedeza cuneata* (Chinese lespedeza) is also most abundant along the periphery and road, but also is scattered throughout most of the central grassland. *Euphorbia cyparissias* (cypress spurge) occurs in defined patches near the periphery of the grassland, especially in the western half of the preserve.

## Methods

A total of eighteen 10 m x 10 m plots were established in 1991 and 1992 in areas of dense mugwort or Chinese lespedeza (Figure ). Cypress spurge initially was present in just three plots. Treatments included mowing once, twice or three times annually; one herbicide application (Roundup at 6 oz/gal; 0.10 oz/m<sup>2</sup>) in 1992 or 1993; one herbicide application in both 1992 and 1993; prescribed burning in spring or fall in one or two years 1991-1995; and a combination of herbicide application and prescribed burning. The total cover of every plant species was estimated by eye (prior to mowing or herbicide application) for every plot in 1992, 1993, 1994, 1995 and 2001.

## Results

Fairly clear trends were apparent over the ten year period for most species x treatment combinations, though the limited replication and lack of randomization prevented statistical analysis.

**Mugwort** was nearly eliminated by mowing 2-3 times/year for three years, or by applying herbicide two years in a row, with little subsequent regrowth. Surprisingly, mugwort also decreased in the one untreated plot, and either decreased or remained unchanged in the burn and burn+herbicide plots (Fig. ). In contrast, Burke et al. (unpublished; see companion poster) found that between 1995 and 1999 mugwort increased in some 2m x 2m mapping units and decreased in others, but the overall trend was an increase. More data are needed to resolve this discrepancy.

**Chinese lespedeza** cover did not change much in the untreated control, was only temporarily reduced in the mowed plots, and showed variable change in burn only plots. In burn+herbicide plots lespedeza was nearly eliminated within 2 years, but regrew to cover levels equaling or exceeding initial abundance.

**Cypress spurge** was present in only three plots in 1992. In these plots, as well as in four plots newly invaded in 1992-1995, spurge increased substantially and reached cover levels of 25-75%. All treatment types were invaded.

## Discussion

**Mugwort** is a clump-forming rhizomatous perennial that reproduces primarily by vegetative spread. Reduction by repeated mowing or herbicide application probably was due to exhaustion of stored reserves in the rhizomes.

**Chinese lespedeza** spreads primarily by seeds, and its rapid reappearance following herbicide application is likely due to germination of seeds in the persistent soil seed bank. Mowing was also ineffective at controlling lespedeza, due either to root sprouting and/or reappearance from the seed bank.

**Cypress spurge** appears to reproduce only vegetatively at the Hempstead Plains, and was impossible to control by mowing, fire or herbicide. Removal of taller competitors by

mowing or herbicide may have facilitated the dramatic increase of the low-growing cypress spurge.

## Conclusions

Invasive plant control methods and timing should be appropriate for target growth form, reproductive attributes, and competitive ability. Long term monitoring and follow-up are essential, as shifts in species abundance may be gradual over a period of several years.

Figures: Units are areas within the site, and letters indicate plots within units.

