Planting trials for native grasses at Lexington Hills, Folsom, CA,: 1990-1995

Jeff Glaspy and John Zentner

Introduction

The Lexington Hills subdivision consists of about 210 ha in the foothills south of Folsom Lake in the City of Folsom. Wetland permits required that about 12 ha of the site be restored to wetlands or left as upland buffer for the wetlands. During construction of the subdivision, the native soils of this area were significantly disturbed or actually excavated to leave exposed subsoil. Native plants soon dominated the wetlands but the upland buffers produced a significant crop of non-native weeds, including large areas dominated by yellow star thistle (*Centaurea solstitialis*). Spring 1990 vegetation surveys found that cover of the thistle ranged from 25% to almost 100% in 8 sample plots randomly located in the uplands[1]. Total cover by non-natives averaged 85% in this area. This paper documents our efforts over the 5 years between 1990 and 1995 to develop a native grass cover on these upland areas.

Early Efforts

Mowing has been described as an important tool to control exotics and enhance native grass growth. Flail mowing of the upland areas in the summer of 1990, just after flowering of the thistle, resulted in many species re-flowering below the level of the mower blades. Machine mowing on natural landscapes (as opposed to farm fields) occurs at a relatively high height—typically 10 to 15 cm off the ground—due to surface irregularities. Additionally, mowing on this site appeared to transform yellow star thistle from an annual to a biennial.[2] Although the upland area was then seeded with a variety of native grasses in the fall of 1990 (*Nasella pulchra*, *Leymus glaucus*, and *Hordeum brachyantherum*) as well as somewhat aggressive native forbs such as yarrow (*Achillea millefolium*), non-native cover in the spring of 1991 remained at the previously recorded levels; the native seeds appeared to be simply "drowned" by the ocean of weed propagules.

Other strategies undertaken in the same period provided more promising results. Test plantings by Dr. Steve Talley and Rod Macdonald of Zentner and Zentner and Everett Butz of Wapunme Nursery in 1990 of plugs[3] of creeping wild rye (*Leymus triticoides*) and purple needle grass (*Nasella pulchra*) at Lexington Hills had not resulted in appreciable cover (>5%) but the plantings had relatively high survival (approximately 60%) and growth rates in the midst of the non-natives. We also planted deer grass (*Muhlenbergia rigens*) in 3.8 l (1-gallon) containers along the edges of many seasonal wetlands, inspired by the success of John Anderson with this species at Hedgerow Farms. These also had high survival rates (>80%) and significant new growth. Further, in areas where competition with non-native species was reduced by manual clearing or by fluctuating water levels these grasses appeared to grow quite rapidly (basal diameter increases of 200 to 300% within 3 months, on average).

The First Needle Grass Tests

In July 1992, approximately 0.6 ha of the upland area were mowed and a spray irrigation system installed that would provide full coverage of this "study area". Irrigation was applied and the resulting growth mowed in late August and treated with a post-emergent herbicide in October. This area was then divided among 8 sample plots, each approximately 750 sq m in extent. Each plot was then treated with a different combination of pre- and post-emergent herbicides[4] and irrigation regimes.

Each plot was then planted with almost 2,000 plugs on 0.7 m centers in a 50/50 mix of purple needle grass and nodding needle grass (*Nasella cernua*) in January 1993. Nodding needle grass was added to the planting mix at the suggestion of Dr. Glen Holstein of Zentner and Zentner due to its affinity for rockier soils compared to the relatively heavy clay soils favored by purple needle grass. By late Spring 1993, 6 of the 8 plots had little or no weed growth. However, few native grasses survived due to the affects of the herbicides. The approximately 15% of the plugs that did survive were all nodding needle grass. Additionally, their growth rates were quite high with 100 to 200% increases in basal diameter within 30 to 45 days.

The seventh plot was dominated (80% cover) by weeds. However, the eighth plot had almost no weeds (>5% cover), 50% survival of purple needle grass and almost 100% survival of nodding needle grass. Interestingly, varying irrigation regimes had no significant affect on survival rates for any of the sample plots[5].

Final Tests

The study area was mowed with weed-eaters in September 1993. In November, the seven plots without significant cover by native grasses were sprayed with a post-emergent herbicide. In December, 20,000 plugs of nodding needle grass were planted by 5 people in 2 days. In March 1994, 25% of the study area was treated with a pre-emergent herbicide and irrigated. No post-emergent was applied.

Vegetation sampling in May 1994 found 50% cover by nodding needle grass and 10% cover by non-native species. Two days of hand weeding by 3 people eliminated almost all weeds. The application of the spring pre-emergent had no

This article is reprinted from the June 1995 issue of Grasslands, the Publication of the California Native Grass Association. For more information please contact us at:
Zentner and Zentner, 510-284-6270 or
Los Robles Native Plants, 916-385-1205

significant affect on weed or native grass cover, judging by the similarity of native and weed cover in the treated and untreated areas. By June, the grasses were almost uniformly setting seed with culms reaching 0.7 m in height. As of this writing, (February 1995) the plugs have expanded to cover approximately 75% of the study area and individual plugs now measure approximately 20 cm in basal diameter, a 2000% increase.

Summary

Our work at Lexington Hills is specific to that site. The following summary description of our current methods in native grass restoration is based on this experience and our work at an admittedly limited number of other sites. These steps should not be applied blindly under other conditions but must be continually re-evaluated in light of new evidence and each site's unique environment.

1. Disturbance of the soil to the absolute minimum practicable from the start is one of the most effective means of reducing weed growth.

2. Understanding site soil conditions and ecology and developing a target vegetation association specific to the site is crucial.

3. Where practicable, beginning the project a year prior to planting is extremely helpful. We now begin by mowing the existing weed crop in early fall (October) and follow this with a pre- and post- emergent herbicide application timed to occur just before significant rains (pre-emergents almost uniformly need watering after application) to eliminate existing weeds and reduce the weed seed bed. In early spring (February), we apply a second round of pre-emergent. In the fall of year 2, we mow again using the "high" setting on the mower to avoid soil disturbance. After the first rains of year 2 have provided any remaining weeds an opportunity to appear we spot-spray with a post-emergent if needed. We then wait at least 1 week or until mid-November (whichever is longer) and plant the grasses, using plugs. In the spring, we may spot-spray with a broadleaf specific,post-emergent herbicide, although this has not generally been required; hand weeding has been sufficient.

Research Needs

These methods have been used at several sites in central California and each of the sites now contain a good to moderate cover (>60%) of native grasses within 2 years of planting. However, this regime does not allow for the planting of native broadleaved forbs for at least the first 1 to 2 years of the planting cycle, reducing the potential diversity and "naturalness" of the grassland during this initial period. planting of forbs in the second year after grass planting is practicable but our work in this area is too new to provide useful results.

Voluntary grass seedling growth at the plantinghas, to date, been minimal (<5% cover at any site). The reduction in above-ground organic matter through repeated mowing and reduction in weed cover appears to play a significant role. Several small plots (<3 sq m) with 5 to 8 cm of redwood fiber bark had significant seedling growth (>25% cover in 2 years) of purple needle grass at one site with heavy clay soils.

The potential role of irrigation was briefly explored in one experiment at Lexington Hills. Given the cost and soil disturbance associated with a spray system, irrigation should be reviewed further before recommending its use.

The procedures described above use herbicide applications over 1 to 2 years. We use only Class II herbicides (designated as "benign") and came to even their use slowly; however, several years of attempting to eradicate weeds manually convinced us of the futility of this effort for any but the smallest sites. However, we are working to reduce chemical use and further research is important.

Plug planting is labor intensive. Farm equipment that can plant these plugs are adapted for work only within farm conditions, *i.e.*, well-tilled soils without ruts and rocks. Working within native landscapes and seeking minimal soil disturbance has required hand planting to date. Development of an all-terrain planter would be an exceptional benefit.

We would especially like to acknowledge the assistance of the many individuals who have worked with and inspired us over the past half-decade, especially John Anderson of Hedgerow Farms, Rob Metheny of Central Valley Transplant and current and former members of Zentner and Zentner including Dr. Glen Holstein, Scott Volmer, Rod Macdonald, and Dr. Steve Talley. Please visit the study area and enjoy the experience. Contact either of us for guided tours.

Footnotes

1 Analysis methods and personnel over the course of the study varied. While cover was always measured through visual observation using Braun-Blanquet cover classes at more-or-less randomly selected sample points, the sample points have varied in size and number. In the period 1990 through 1992, sample points were 1 sq m in extent. From 1992 through 1994, 1 sq m to 3m x 3m quadrats were used. From 1994 to the present, 3m x 10m sample quadrats were used.

2 On other sites with soils that were less favorable to the thistle, *e.g.*, heavy clays, we have had better luck with controlling yellow star thistle with mowing. At a site in southern Sacramento County with an old terrace soil of the San Joaquin series, mowing reduced thistle cover from 65% to 25% in one year as measured at 25 plots.

3 "Plugs" as used in this article refers to small (approximately 1 cm x 1 cm x 8 cm) propagules. These may be either bare-root, as in the 1990 plantings, or containerized, as is the case for the later plug plantings described in this article.

4 This paper does not specify the trade names or amounts of the herbicides used in this study so as to avoid appearing to prescribe specific treatments.

5 This may be a result of the relatively high clay concentrations and buried duripan of the Hicksville soils on this particular site which resulted in high soil moisture levels in the spring.