FIRST YEAR SURVIVAL OF WOODY VEGETATION ON CONSERVATION RESERVE (CRP) PLANTINGS IN SOUTHEASTERN WASHINGTON

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INTRODUCTION

The Conservation Reserve Program (CRP) initiated in 1985 encouraged planting perennial cover on highly erodible cropland. Many of the first plantings controlled soil erosion using simple mixtures or grass monocultures. Building upon the success of that program, CRP now emphasizes improving wildlife habitat, as well as curbing soil erosion. Complex plant mixtures or vegetation structure, food plots, and watering facilities have been added to the program to enhance wildlife habitat values on CRP acreage.

Many producers have elected to plant trees and/or shrubs on CRP ground to meet these objectives. Over 4 million shrub and tree seedlings were planted on CRP fields between 1998-2000 in Washington State. Some 320,000 seedlings were planted during 2000 in Asotin County alone.

First year survival of woody vegetation depends on factors such as competition, site preparation technique, and species adaptability. This study compares vegetation suppression techniques and environmental factors affecting survival of shrubs & trees planted into CRP stands in a semiarid Pacific Northwest locale.

METHODS & MATERIALS

Fourteen sites in Asotin County were selected on which trees and shrubs were planted in the spring of 2000. These represent two vegetation types and precipitation zones: <15" MAP dominated by Tall Wheatgrass; and ≥ 15" MAP dominated by Smooth Brome and Orchardgrass.

Seventeen species were hand-planted between March 23 and April 16 into established grass cover. Not all 17 occurred on each site. Species selection and pre-plant site preparation methods were chosen by individual producers.

Three pre-plant preparation techniques were selected:

1) Glyphosate applied immediately prior to tree/shrub planting, Glyphosate (Yr)
2) Glyphosate applied the previous year to tree/shrub planting, Glyphosate (Yr-1)
3) Scalping with a moldboard plow

Two post-plant graminicide treatments were also compared in previously untreated areas planted to woody vegetation:

1) Fluazifop (Fusilade DX ™) at 0.18 lb/ac + 0.5% surfactant
2) Sethoxydim (Ultima 160 ™) at 0.47 lb/ac + 0.5% surfactant

In addition to survival of trees and shrubs, data were collected on the condition of plant materials at planting, injurious effects of the graminicides, and biomass production of competing vegetation. Standing biomass was sampled at the end of the growing season (September/October) on herbicide and paired untreated areas.

Permanent transects were established on all sites marking the locations of individual plants on a grid system. Plant survival was taken at the end of the growing season (September /October).

Plant survival or mortality was analyzed as binomial data using log-likelihood analysis, with pooling and subdividing following Zar (1974). Principal Components Analysis and Multiple Regression were also utilized to identify factors affecting survival.

RESULTS AND DISCUSSION

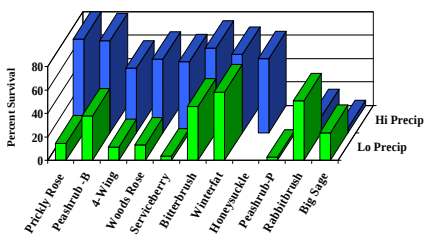
Some 9,600 plants, or 3% of all woody vegetation planted during 2000 by contract manual crews were sampled. Overall survival, weighted by proportions of each species, was 46.4 %.

Lack of summer precipitation undoubtedly reduced plant survival during 2000. Combined July-August precipitation was the driest period for these two months in 48 years of record.

Regression and Principal Components Analysis pooled over all species showed that precipitation zone, seedling quality, and species were significant factors affecting plant survival (P< .05, n=132). Site preparation, competing vegetation type, and type of plant (bare-root or containerized) also impacted survival, but these factors varied among species.

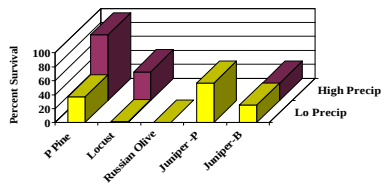
Survival was generally greater in higher precipitation areas (Figure 1). Shrub survival averaged 62% in ≥15" MAP zone versus 21% where shrubs were planted at or below 15" MAP. Two species, Sagebrush and Rabbitbrush, averaged greater survival at or below 15" average annual precipitation compared to their survival at higher precipitation. Buffaloberry (not shown) had 100% mortality in all locations. Higher Sagebrush survival with low precipitation (and lower elevation) reflects inadequate hardening. Nearly all Sagebrush mortality occurred shortly after planting following one or more nights of frost.

Figure 1. First Year Survival of Shrubs in 2 Precipitation Zones



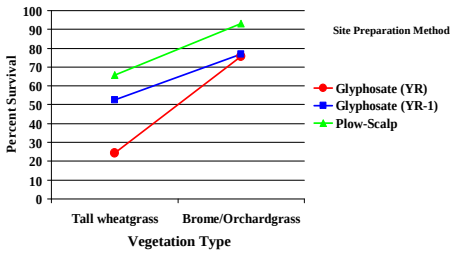
Survival of Ponderosa Pine and Black Locust was also greater in higher precipitation zones, while bare-root Juniper survival was comparable above or below 15" MAP (Figure 2). Survival of Russian Olive was poor, but it was planted in only the driest sites.

Figure 2. First Year Survival of Tree Species in 2 Precipitation Zones



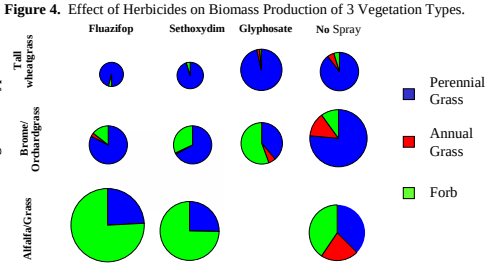
The most comprehensive comparison of plant species' survival among site preparation methods was for bare-root Peashrub (Figure 3). In the Tall Wheatgrass type Glyphosate (YR) had significantly lower Peashrub survival than did other treatments (P<0.001), while Glyphosate (YR-1) and Plow-scalping differed at the 0.10 level. In Brome/Orchardgrass cover, Plow-scalping produced significantly higher woody plant survival (P< 0.001). At less than 15" MAP, Plow-scalping also produced higher survival for Winterfat and both Rose species than did Glyphosate (YR), but lower survival for Fourwing Saltbush. Bare-root Juniper had significantly higher survival (P< 0.01) with Glyphosate (YR-1) at low precipitation.

Figure 3. First Year Survival of Bare-root Peashrub in Relation to Vegetation Type and Site Preparation Method



Graminicide treatments supressed competing vegetation in the Tall Wheatgrass and Brome/Orchardgrass types (Figure 4). In the Alfalfa/grass seeding, however, reduced annual grass yield encouraged growth of alfalfa, resulting in higher total standing crop wih the graminicides. Glyphosate (YR) suppressed competing vegetation in the Brome/Orchardgrass type, but produced higher standing crops in the Tall Wheatgrass type. This demonstrates the erratic effect of Glyphosate on Tall Wheatgrass.

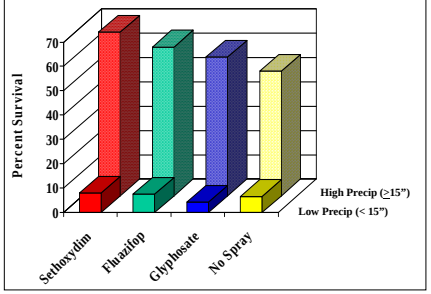
Figure 4. Effect of Herbicides on Biomass Production of 3 Vegetation Types.



Relative Biomass Production (Size of Circle Corresponds to Biomass Production)

Tree and shrub survival was uniformly low with all herbicides or control treatments at the lower precipitation zone (Figure 5). At higher (≥ 15") precipitation, six of eight statistical tests showed significantly greater survival with one or more herbicide treatments. However, neither Sethoxydin, Fluzazifop, nor Glyphosate (Yr) consistently showed greater tree and shrub survival.

Figure 5. First Year Survival of All Species by Precipitation Zone and Herbicide Treatment



CONCLUSIONS

Climate, including precipitation zone and summer drought, were critical for tree and shrub survival. Consistently lower survival in lower precipitation zones under the conditions studied indicates that mulching, irrigation, fall plantings, summer fallow, or other methods may be needed to successfully establish woody vegetation in areas of high moisture stress.

Plow-scalping and Glyphosate (YR-1) were the most effective site preparation methods, particularly at lower precipitation. Plow-scalping exposes mineral soil, providing warmer soil temperatures for early season growth. Glyphosate (YR-1), like summer fallow, stores additional soil moisture. A single application of Glyphosate immediately prior to planting woody vegetation was the least effective site preparation technique in Tall Wheatgrass cover, where this herbicide was inconsistent.

Post-plant graminicide treatments improved plant survival slightly at higher precipitation but were ineffective at lower precipitation, even though the graminicides provided acceptable control of the grasses. The control came too late in the drier regions, and much of the stored soil moisture was already utilized by the grasses.

Poor stock quality (improperly hardened, insufficiently developed root system, and/or poorly developed stem tissues) also resulted in poor survival. Quality assurance is needed to maintain stock quality and proper handling and planting techniques.

USDA NRCS