Seed and Seedling Production of

Blue Wild-Rye

(*Elymus glaucus*)

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Figure 1 • Twelve-wk-old Elymus glaucus *seedlings ready for outplanting.*

Abstract

We grow blue wild-rye (*Elymus glaucus* Buckley [Poaceae]) for seed production on former bareroot conifer nursery beds. When fall sown at 11 to 17 kg/ha (10 to 15 lb/ac), first and subsequent seed yields are 560 kg/ha (500 lb/ac), although this varies by seed source. After seed harvest, stems can be baled and marketed for use in erosion control or as mulch. Container crops of *Elymus glaucus* for planting on restoration sites can be easily grown in about 3 mo. Production protocols are provided.

KEYWORDS: restoration, federal nurseries, bareroot, container seedlings

NOMENCLATURE: ITIS (1998)

In the Pacific Northwest, blue wild-rye (*Elymus glaucus* Buckley [Poaceae]) is used extensively for erosion control, fire rehabilitation, forage, soil stabilization, and other restoration activities. At JH Stone Nursery, we grow *Elymus glaucus* in containers (Figure 1) and in recently converted former bareroot conifer beds (Figure 2). In the later situation, we still use much of our bareroot seedling equipment in production, and most of our methods have evolved from bareroot seedling culture.

Field Production of Seeds

Field Preparation

Seed production begins at our nursery by fumigating soil in late August or early September with granular dazomet (Basamid) at a rate of 392 kg/ha (350 lb/ac). After fumigation, we rip and disc the soil and form 1.2-m-wide (4-ft) raised beds typical of bareroot conifer seedlings. In fall prior to sowing, beds are fertilized with a bander that applies a mixture of ammonium phosphate ($11N:52P_2O_5:0K_2O$) and potassium sulfate ($0N:0P_2O_5:53K_2O$) on 15-cm-wide (6-in) rows at a rate of 280 kg/ha (250 lb/ac) of both P and K.

Sowing

Elymus glaucus germinates without stratification or other presowing treatments. However, awns must be removed from seeds before sowing, easily done with brush machines at the seed extractory. Average seeds per kilogram is 36,000 to 67,500 (80,000 to 150,000 seeds/lb) and germination rates are in the 80% range. We sow seeds through a Love/Øyjord seed drill at a rate of 33 to 40 seeds per linear m (10 to 12 per linear ft) [11 to 17 kg/ha (10 to 15 lb/ac)]. Seeds are surface-sown in 4 rows 30 cm (12 in) apart with the outer rows 15 cm (6 in) from the edge of the bed, pressed into the soil with rollers and immediately covered with a 6- to 8-mm (0.25- to 0.33-in) layer of sawdust. Site specific seed collections are sown into seedbeds separated by at least 46 m (150 ft) to prevent cross pollen contamination. Daily irrigations are made when the seed zone begins to

Figure 2 • Rows of emerging Elymus glaucus *on 15-cm-wide (6-in) rows.*

dry out. The irrigations are very weather dependent, but at our nursery average about 1 to 1.5 h/d. This regime is continued until seedlings emerge, usually 7 to 14 d after sowing (Figure 2).

Although seedlots can be sown in spring (February through April), we prefer to sow from 1 October through 15 November. We find that there are less weeds associated with fall sowing because cooler fall weather limits germination and growth of many local weed species. Another benefit of fall sowing is that first year seed yields are higher than spring sown *Elymus glaucus*.

Nursery Culture

Except for seed harvest time when irrigation is withheld, soil moisture is maintained at field capacity. After harvest, moisture at field capacity is desired to promote plant vigor. Granular fertilizers are applied broadcast. In early spring, 2 applications of ammonium nitrate ($33N:0P_2O_5:0K_2O$) are made at a rate of 112 kg/ha (100 lb/ac) at a 14 to 21 d interval. We also apply ammonium nitrate just as seed heads are maturing (late May) and once in the fall (late September), both times at a rate of 112 kg/ha (100 lb/ac).

For established plantings (second and subsequent years), 2 applications of $13N:13P_2O_5:13K_2O$ at 308 kg/ha (275 lb/ac) are made in early spring 1 mo apart. Two additional applications at a rate of 112 kg/ha (100 lb/ac) are made; one in late May and another in late September.

Pests

Mites have been the most serious insect pest on the grass crop. We make spot applications of chlorpyrifos (Dursban) when mites are noted. Rusts, smut, and ergot have been the most notable fungal pests and are treated with propiconazole (Banner Maxx). Applications are made only if the pest threshold level defined in our integrated pest management protocol is exceeded.

We apply herbicides (glyphosate (Roundup) and oxyfluorfen (Goal) at standard label rates) between planted beds and along irrigation pipelines both pre- and post-emergence. Nozzles are shrouded to prevent crop damage. Dicamba (Banvel) is used for broadleaf control in seedbeds but only when weed loads are heavy. Weeding is by far the greatest cost of production and most weeding is performed by contract crews.

Seeds are considered ready to harvest when the caryopsis is hard and individual seeds are easily removed from the seed stalk (June to August). We harvest seeds 2 ways: combining and a combination of swathing and combining. If biomass is not too great, a combine can be used to cut the seed stalks and separate seeds in one step. However, our primary harvest method is swathing followed later by combining. We use a modified John Deere swather sicklebar with belt draper to cut the base of the seed stalk. Cut stalks are allowed to lay on the surface of the bed and dry for 2 to 4 d before the cut material is processed through the combine (Figure 3).

Harvest yields vary by seedlot, weather, and age of planting. Average yields range between 224 to 1008 kg/ha (200 to 900 lb/ac). Approximate first-year yield for spring sown crops is 224 kg/ha (200 lb/ac), while fall sown crops yield 560 kg/ha (500 lb/ac). Our data suggests that seed yield remains constant with increasing seedbed age (Figure 4).

After harvesting, we either mow seedbeds to remove the stems or bale the material for client use in erosion control or mulching.

Seed Processing and Storage

Once a seedlot is harvested, it is placed in a drying bin. Large trays (1.2 X 1.2 X 0.5 m [4 X 4 X 1.5 ft]) with screened bottoms are stacked 5 high over a warm air duct. Air is heated to 38 °C (100 °F) and drawn

Figure 3 • A Nursery Master Elite 140 plot research combine (Wintersteiger, Salt Lake City, UT) combining swathed Elymus glaucus .

TABLE 1

Characteristics of the container type used at JH Stone Nursery

	Cavity							
	Depth		Diameter		Volume		Density	
Common names	in	mm	in	mm	in^3	ml	ft^2	m^2
Styro-6, 112/105, or 415B	5.9	149	1.4	35	6.3	93	49	527

through the trays for 12 h. Seed moisture is checked and seedlots with a target moisture content between 5% and 8% are removed. Dried seeds are placed in plastic bags (4 mils) in boxes. Boxes are stored in coolers 1 °C (34 °F) and/or freezers (–17 °C [2 °F]) for long term storage. We have found that most seeds stored under either storage condition remain viable for at least 8 y and probably much longer.

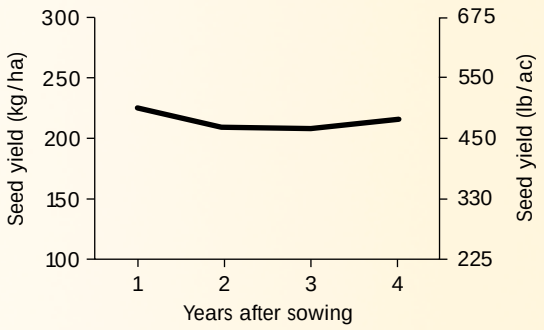

Figure 4 • Seed production of fall-sown Elymus glaucus *plants is constant for at least the first 4 growing seasons.*

Container Production

We use Styroblock containers (Table 1) filled with 1:1 peat moss:vermiculite. Filled containers are brought to field capacity before sowing. We sow 10 to 12 seeds per cell and cover them lightly with sand (# 1/20 sandblasting type). Containers are given light mistings to keep the sand moist during the germination period (5 to 7 d). After *Elymus glaucus* grows 2.5 to 5 cm tall (1 to 2 in), we water thoroughly (resaturate the medium) twice each week. Once each week, we add Peters Plant Starter ($9N:45P_2O_5:15K_2O$) at 50 ppm N to the irrigation water. Seedlings are in the greenhouse the first 3 to 4 wk, then moved to the shadehouse. Containers are not thinned so that there is sufficient shoot biomass to grab for extraction and enough roots to hold the soil plug together when target height (20 to 25 cm [8 to 10 in]) for shipping is reached in about 12 wk (Figure 4). We top prune the grass to 15 to 20 cm (6 to 8 in) only when necessary to keep it from falling over. If seedlings are used locally, we ship the grass in the containers to the field. If long distance shipping is required, we extract seedlings, place them in plastic bags inside boxes, and store them at 1 to 2 °C (34 to 36 °F), but never for more than a couple of days. Problems with mold (*Botrytis* spp.) can occur if *Elymus glaucus* is held too long before planting, particularly if tall plants lay over.

Reference

[ITIS] Integrated Taxonomic Information System. 1998. Biological names. Version 4.0 (on-line database). URL: http://www.itis.usda.gov/plantproj/itis/itis_query.html (updated 15 December 1998).

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