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ST. JOHNS LANDFILL
1997 VEGETATION MAINTENANCE PROGRAM

Task Two: Native Grassland Management Plan
Draft Report

prepared for

Metro Department of Regional Environmental Management

prepared by

Mark Griswold Wilson
Restoration Ecologist

March 1997

Landscape Contractor (Oregon LCB Number 11610)

SCOPE OF WORK
ST. JOHNS LANDFILL VEGETATION MAINTENANCE PROGRAM - 1997

TASK 1:

Prepare an integrated vegetation management plan that specifies control measures for invasive weeds of concern at the St. Johns Landfill.

Invasive, non-native weeds will be identified by line drawing and photographed in flower. Control measures, developed in compliance with Metro Executive Order No. 60: Developing an IPM Plan for Metro facilities, will be prepared. The IVM Plan will identify naturally occurring weed control measures such as biological diversity, plant competition and succession and specify how they may be integrated with various mechanical, cultural and chemical controls and habitat modification techniques.

Submittal dates: March 21, 1997 (text and line drawings)
June 1, 1997 (photos)

TASK 2:

Develop a management plan for the native grassland plots in Subareas 1, 4, and 5A.

The goals of the native grassland plan will be to maintain a high cover of natives within the plots and maximize native seed production. In order to meet those goals, specific field management guidelines will be developed for weed control, fertilization, and seed harvest and storage.

Submittal dates: March 14, 1997 (draft text)
March 21, 1997 (final)

TASK 3:

Prepare a management plan for areas of the landfill deemed suitable for grazing by sheep.

Sheep grazing guidelines will be developed in order to manage the native and non-native grasslands on the landfill and prevent overgrazing and erosion. Guideline objectives are as follows:

A. Using the principals of intensive grazing management and field observation, determine the timing and duration of grazing events. Determine if timely sheep grazing can limit the seed production of non-native grasses and invasive weeds **[see TASK 1 above]**.

B. Determine the palatability of *Bromus carinatus* (California brome-grass) to sheep. Observe if timely sheep grazing can be used to reduce short term accumulations of *Bromus* biomass and increase seed production.

C. Prepare a fencing/cross fencing plan in consultation with metro staff and the sheep herdsman.

Submittal dates: February 15, 1997 (draft field study text)
May 1, 1997 (completion of field studies)

ST. JOHNS LANDFILL VEGETATION MAINTENANCE PROGRAM

TASK 2:

Develop a management plan for the native grassland plots in Subareas 1, 2, 4, and 5.

The goals of the native grassland plan will be to maintain a high cover of natives within the plots and maximize native seed production. In order to meet those goals, specific field management guidelines will be developed for weed control, and seed harvest and storage.

Submittal dates: March 14, 1997 (draft text)
March 21, 1997 (final)

Background: Chronology of Native Grassland Plot Establishment at SJL

Since the fall of 1992, approximately 20.6 acres of the St. Johns Landfill (SJL) have been seeded to native grassland species. A total of twelve native grassland plots have been established on Subareas: 1, 2, 4, & 5. On ten of the twelve plots, a single species or a simple mix of two native grasses were seeded. These species included: *Bromus carinatus* (California brome-grass), *Elymus glaucus* (blue wildrye) and *Festuca idahoensis* (Idaho fescue). [**See illustrations in the Appendices**]. On the remaining two plots, mixtures of native grass, cover crop and wildflowers were seeded. Because of the unavailability of appropriate locally produced native grass seed, all plots were seeded with out of area seed obtained from commercial producers west of the Rocky Mountains. All the testplots were seeded using three different seed establishment techniques: Dual stage hydroseeding, Broadcast & track, and No-till drilling.

Table 1 summarizes the establishment and status of the twelve native grass testplots and contains the following specific information:

- grassland plot name, location and size
- site preparation techniques used to prepare the site for seeding
- date of seeding and seed application method used
- native species seeded
- seed application rate expressed in pounds/Acre
- current status (as of March 1997)

TABLE 1: SJL Native Grass Testplots 1992-1996

Location/Size	Site Prep.	Date/Method	Species	App. Rate	Status
Mesic Plots: SA-1 4 Acres total	None	9/92 - Track & Broadcast Hydroseed	covercrop + 4 grasses 7 forbs	variable (mix)	abandoned: failure
Xeric Plots: SA-1 4.5 Acres total	None	9/92 - Track & Broadcast Hydroseed	covercrop + 4 grasses 3 forbs	variable (mix)	abandoned: failure
Plot 1A: SA-1 .5 Acre	Herbicide-Tillage	9/94 No-till drill	BRca & FEid	8.5 #/Acre equal mix	uncertain
Plot 1B: SA-1 .6 Acre	Herbicide-No Tillage	9/94 No-till drill	BRca & FEid	8.5 #/Acre equal mix	seed production
Plot 2A: SA-1 .10 Acre	Solarization	9/94 No-till drill	BRca & FEid	8.5 #/Acre equal mix	seed production
Plot 2B: SA-1 .25 Acre	Tillage only	9/94 No-till drill	BRca & FEid	8.5 #/Acre equal mix	uncertain
Plot 3A: SA-1 .6 Acre	Tillage only	9/94 No-till drill	BRca & FEid	16.3 #/Acre equal mix	seed production
Plot 3B: SA-1 .55 Acre	Acid pH	9/94 No-till drill	BRca & FEid	16.3 #/Acre equal mix	abandoned: failure
Plot 4: SA-2 1.5 Acres	None	9/94 No-till drill	BRca & Feid	16.3 #/Acre equal mix	abandoned: failure
Plot A: SA-4 1 Acre	None	9/95 - Track & Broadcast	ELgl	30 #/Acre	abandoned: depredation
Plot B: SA-5 1 Acre	Sterile Soil	9/96 - Track & Broadcast	BRca & ELgl	30 #/Acre equal mix	uncertain
Plot C: SA-5a 6 Acres	Sterile Soil	9/96 - Track & Broadcast	BRca & ELgl	30 #/Acre equal mix	uncertain

Species: BRca=Bromus carinatus/FEid=Festuca idahoensis/ELgl=Elymus glaucus

Of the twelve plots seeded, five have been abandoned. In four of the five abandoned plots, the seedings of native grasses failed, primarily due to competition from unseeded non-native grasses in the seedbank or from a seeded covercrop. The fifth plot has been abandoned due to it's depredation by waterfowl grazing. It should be noted that of the five abandoned grassland plots, four were on plots that had no site (or soil) preparation manipulation other than cover soil placement.

At this time (March 1997), four of the twelve grassland plots have an uncertain status. Two of the four uncertain plots were seeded in the fall of 1996 and it is too soon to tell if the native seedings will be successful. These 1996 plots, seeded on sterile "cooked" soil, will be monitored and maintained during the 1997 season. The other two uncertain plots will be monitored during the early portion of the 1997 growing season to determine the advisability of continuing management.

Three of the twelve grassland plots produced significant amounts of native grass seed during the summer of 1996, but it was not harvested. All three plots were established using the no-till drill method. These three plots (totaling 1.3 Acres) will be managed for seed production and harvest during the 1997 season.

The Uncertain Plots: Adaptive Monitoring and Management Guidelines

As of March 1997, four of the twelve native grassland plots have an uncertain status: Plots 1A and 2B in Subarea 1 are the oldest of the four, having been established in the fall of 1994. Both *Bromus carinatus* (BRca) and *Festuca idahoensis* (FEid) were seeded in an equal weighted mix on plots 1A and 2B but, by the early spring of 1995 only the *Bromus* had survived. Most of Subarea 1 will be grazed this spring season, which will necessitate the construction of exclosure fencing around the plot(s) determined, by weekly monitoring, to have a *Bromus* cover >50%.

Plots B and C in Subareas 5 and 5a respectively, were established in the fall of 1996. Both plots were seeded with an equal weight mix of *Bromus carinatus* and *Elymus glaucus* (ELgl). Although the plots exhibit healthy, reasonably weed-free, stands at this time (March 1997), the long term status of the plots and the two individual species is unclear. Subarea 5 is not proposed for grazing, therefore, the plots do not need to be fenced but, rather, marked with survey stakes and flagging for field identification purposes.

During the 1997 growing season, all four uncertain plots are to be monitored weekly by the consultant and/or Metro staff and managed by Metro staff. All monitoring and management activities will be documented in a field notebook. The following monitoring and adaptive management guidelines identify work tasks to be accomplished from March through June 1, 1997 for the Subarea 1 plots and from March through September 1 for Subarea 5 and 5a plots respectively. The exact timing of proposed work tasks is to be determined in the field.

Subarea 1: Plots 1A and 2B

March (prior to beginning of grazing season)

- Evaluate the quality of *Bromus carinatus* in each plot. Determine, through early season monitoring, which plot has a *Bromus* cover >50%. Allow grazing of plot(s) with *Bromus* cover <50%.
- In the high cover plot(s), flail mow a 25 foot strip around the perimeter and erect exclosure fencing to prevent grazing. Inspect the plots weekly to determine native / non-native grass identity and percent cover. As the vegetation matures and it's identity becomes known, adjust plot boundary as necessary.

Mid March through June 1

- Continue monitoring to determine the native / non-native species composition and percent cover of each plot. Allow plots with a low percent cover to be grazed; exclose plots with higher percent covers with fencing.
- Monitor plots for the presence of noxious weeds [**see Noxious Weed list in the Appendix**]. If found, flag location and carefully remove the plant without disturbing the ground. If removal is not possible, clip off flowers.
- Continue flail mowing of plot perimeter to reduce drift of non-native grass seed into plots.
- As required, utilize techniques and tools to selectively favor the growth of the *Bromus* and discourage the growth and seed set of competing annual and perennial grasses. Early growing season techniques and tools include: high mowing using either tractor drawn flail, sickle bar or a high wheeled mowers such as the "Gravely" mower; and string line trimming to reduce the height of quick growing non-natives before they can overtop the slower growing natives. (Such trimming will also delay plant flowing and reduce seed set). Late growing season techniques are limited to seed head clipping by hand. Although tedious, the removal of the mature seed heads of the non-native grasses can prevent further infestation of the plots by preventing seed dispersal. Clippings should be removed from the site, as some seed may be ready to germinate due to uneven ripening.

Subarea 5 and 5a: Plots B & C

March

- Evaluate the quality of *Bromus carinatus* and *Elymus glaucus* in each plot. Flag patches of non-native grass for future monitoring and management. Mark the boundaries of the native / non-native grasses on the plot perimeter.

- Monitor plots for the presence of noxious weeds [**see Appendix**]. If found, flag location and carefully remove the plant without disturbing the ground. If removal is not possible, clip off flowers.
- Flail mow a 25 foot strip around perimeter and stake and flag the plots. Inspect the plots weekly to determine native / non-native grass identity and percent cover. As the vegetation matures and it's identity becomes known, adjust plot boundary as necessary.

Mid March through September 1

- Continue monitoring to determine the native / non-native species composition and percent cover of each plot.
- Continue monitoring for noxious weeds. Remove if possible.
- Continue flail mowing of plot perimeter to reduce drift of non-native grass seed into plots.
- As required, utilize techniques and tools to selectively favor the growth of the *Bromus* and *Elymus* and discourage the growth and seed set of competing annual and perennial grasses. Early growing season techniques and tools include: high mowing using either tractor drawn flail or sickle bar or a high wheeled mowers such as the "Gravely" mower; sting line trimming to reduce the height of quick growing non-natives before they can overtop the slower growing natives. [Such trimming will also delay plant flowing and reduce seed set]. Late growing season techniques are limited to seed head clipping by hand. Although tedious, the removal of the immature seed heads of non-native grasses during their flowering period can prevent further infestation of the plot by preventing seed dispersal. Clippings should be removed from the site, as some seed may be mature due to uneven ripening.
- Note in plot records if *Elymus* flowers and sets seed during it's first growing season. The collection of *Elymus* seed is not advised in 1997.

The Seed Production Plots: Adaptive Monitoring and Management Guidelines

The three Subarea 1 native grassland plots: Plots 1B, 2A, and 3A were seeded in the fall of 1994 with an equal weight mix of *Bromus carinatus* and *Festuca idahoensis*. By the beginning of the second growing season it was apparent that the slower growing *Festuca* seedings had failed. All plots produced *Bromus* seed, however, in the summer of 1996 and are proposed for management and seed harvest during the 1997 season. Plot 1B and 2A were fenced to prevent grazing during the 1996 season; Plot 3A was not fenced and it was free grazed by sheep during the 1996 season.

During the 1997 growing season, all three seed production plots are to be monitored weekly by the consultant and/or Metro staff and managed by Metro staff. All monitoring and management activities will be documented in a field notebook. The following monitoring and adaptive management guidelines identify work tasks to be accomplished

from March through September 1. The exact timing of proposed work tasks is to be determined in the field.

March

- Evaluate the quality of *Bromus carinatus* in each plot. If isolated non-native grasses in the plot are identifiable, flag them and remove if possible. If larger islands of non-native grasses are found within the plots, flag them and use a string line trimmer to delay their flowering and reduce seed set. Repeat as necessary.
- Flail mow a 25 foot strip around perimeter of each plot and erect exclosure fencing to prevent grazing. Inspect the plots weekly to determine native / non-native grass identity and percent cover. As the vegetation matures and it's identity becomes known, adjust plot boundary as necessary.

Mid March through mid July

- Continue weekly monitoring to determine the native / non-native species composition and percent cover of each plot.
- Monitor plots for the presence of noxious weeds [**see Appendix**]. If found, flag location and carefully remove the plant without disturbing the ground. If removal is not possible, clip off flowers.
- Continue flail mowing of plot perimeter to reduce drift of non-native grass seed into plots.
- By mid May initiate daily monitoring of the plots in order to become familiar with the grass flowers (called inflorescences) and determine the onset of flowering (called anthesis - the shedding of pollen) [**See Timing Seed Collection section following**].
- When the grass seeds have matured to a point between the soft-dough and hard-dough stages begin harvesting the seed by hand. Harvest seed in small batches until the seed is dropping from the inflorescences (called seed dehiscence) [**See Seed Harvest section following**].
- At the end of each collection period, spread the seed out in a suitable dry and shady location so the seed can cool and dry. [**See Seed Drying and Storage section following**].

Mid July through September 1

- After the completion of seed harvest, select one of the three Subarea 1 testplots to be trampled by sheep. Open one side of the exclosure fence around the plot(s) and allow a select number of sheep to free feed and trample *Bromus* thatch for an amount of time (to be determined in the field). Remove sheep from exclosure. Secure fencing.
- Continue weekly monitoring to determine the native / non-native species composition and percent cover of each plot.
- Monitor plots for the presence of noxious weeds [**see Appendix**]. If found, flag location and carefully remove the plant without disturbing the ground. If removal is not possible, clip off flowers.

- Continue flail mowing of plot perimeter to reduce drift of non-native grass seed into plots.

Timing Seed Collection

The successful collection of Bromus seed in the Subarea 1 testplots will depend on the observation of three stages in the plant's life cycle: flowering, seed formation and seed maturity. A noting of the date of anthesis will give a good clue about the date of seed maturity. In most years *Bromus* flowers in early to mid June; seed dehiscence generally occurs 3-4 weeks later. After flowering and pollination occur, seed maturation occurs in two stages: the soft-dough stage and the hard-dough stage. Seed should be harvested when it is as close to the hard-dough stage as possible but before dehiscence. An immature seed at the soft dough stage is indicated by the excretion of dough when a seed is squeezed. A mature seed at the hard dough stage is not able to be squeezed and is usually too hard to bite. Records noting dates of flowering and seed collection should be kept to guide collection planning in future years.

Seed Harvest

When the *Bromus* seeds are mature and ready for harvest the following materials should be brought to the plot:

- 2-3 gallon plastic nursery containers with the bottom holes taped shut and belt loop slits cut near the upper lip of the pot.
- large size uncoated kraft paper bags
- long sleeve shirt and gloves
- field notebook and waterproof pens

Seed can be easily harvested in the following manner:

- Position nursery pot on hip so both hands are free to strip ripe grass seed from the inflorescence using a gloved hand.
- When pot is full, transfer seed to paper bags. Keep collections from each plot separated.
- At end of collection period spread out seed on a clean dry surface out of the sun and wind to dry for several days. Do not mix collections from different plots or different collection days. Cover seed at night if out-of-doors.

Seed Drying and Storage

After the *Bromus* seed has thoroughly air dried for several days, the seed can be stored for a short time (several months) in a cloth seed bag or a pillow case in a cool, dark, dry storage place. If seed is to be held for a longer period in dry storage, a small amount of indicator silica gel should be placed in each storage bag to further reduce the moisture content of the seed. Bromus seed can also be either refrigerated or frozen; seed stored thusly does not benefit from treatment with silica gel. *Bromus* seed should be planted within two years of harvest for best result.

REFERENCES

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Harrington, H.D. **How to Identify Grasses and Grasslike Plants**. Swallow Press - Ohio University Press. 1977

Hitchcock, A.S.. **Manual of the Grasses of the United States** - In Two Volumes. Reprint of: Miscellaneous Publication Number 200 U.S.D.A. Dover Press. 1971

Hitchcock, C. Leo; Cronquist, Arthur; et all. **Vascular Plants of the Pacific Northwest** (in five volumes). **Volume One**: Vascular Cryptograms, Gymosperms and Monocotyledons. University of Washington Press. Sixth printing - 1994.

Young, James and Young, Cheryl. **Collecting, Processing and Germinating Seeds of Wildland Plants**. Timber Press, 1986.

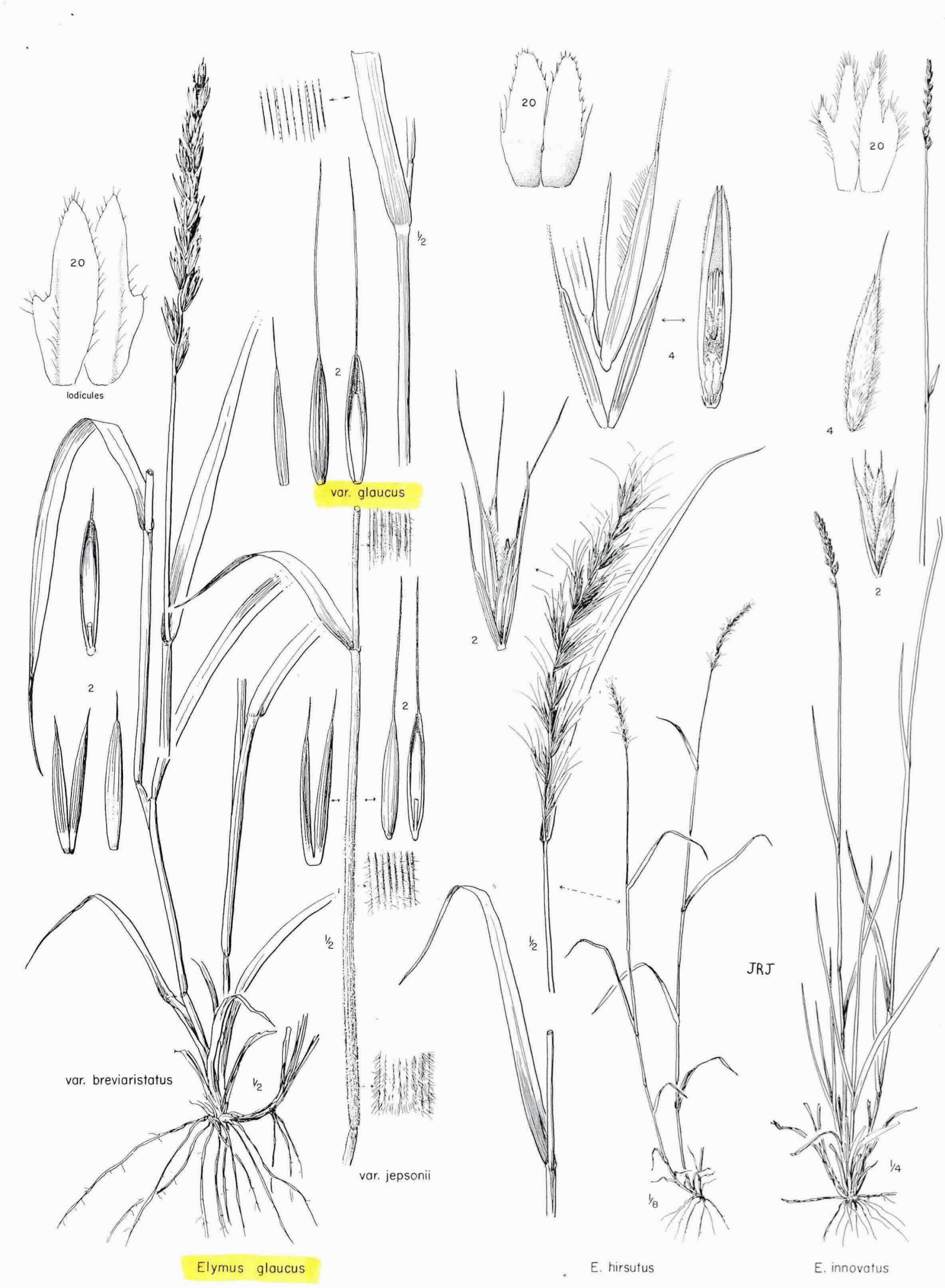
WORKSHOP

Grasses, Sedges and Rushes Plant Identification Workshop: an annual two day workshop during the summer season. Contact: Hortus West, PO Box 2870, Wilsonville, OR 97070-2870, (503) 570-0800.

APPENDICES

- *Bromus carinatus* and *Elymus glaucus* botanical illustrations [from **Vascular Plants of the Pacific Northwest**]
- Hort Sense Reprints- Collecting Good Seed, Post-Harvest Handling of Native Plant Seeds, Seed Storage [written by Mike Evans in **SER News 1991-1992**]
- Noxious Weeds in Oregon and Washington


24
lodicules
4
var. maritimus
½
2
½
2
4
24
1/10
1/10
JRJ
var. carinatus
Bromus carinatus
var. linearis
B. ciliatus


20
lodicules
2
½
var. glaucus
2
2
½
var. breviaristatus
½
var. jepsonii
Elymus glaucus
20
4
2
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E. hirsutus
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JRJ
¼
E. innovatus

Hort Sense--a common sense approach to horticulture in restoration

by Mike Evans, Tree of Life Nursery, P.O. Box 736, San Juan Capistrano, CA 92693

Collecting Good Seed

Volumes have been written and published about harvesting and storing seeds. This article, however, will be short and to the point. As restorationists, we are often required to collect, store and handle the seeds of a wide variety of native plants. In this issue we discuss a few practical aspects of collecting seeds for restoration projects. In the next issue we will discuss storage, handling, and special pre-planting treatment of seeds.

Timing

Most crop plants have been selected so that fruits will all mature at the same time to aid in harvesting. In contrast, many wildland plants continue to grow and flower while the earliest fruit is beginning to ripen. This is a very safe strategy for plants that need to spread their bets thin to achieve at least some reproduction in a given time frame. It is, however, a characteristic that makes it difficult to time seed collection. The first consideration is "How much seed do you really need?" If a large quantity is required, several well-timed collecting trips to the site will assure good quantities and good viability when compared to hastily harvesting unripe seed all at once. If a small quantity is needed, it will be important to pick the most mature seed available. You may want to conduct germination tests on particular batches of seed.

As a general rule, when the seed is no longer increasing in size and the moisture content is decreasing, the seed is approaching maturity. As the fruit (pod, cone, achene, capsule, etc.) ripens, the seed may be dispersed by wind or may simply fall on the ground. Many species depend on animal predation for dispersal. Usually, it is easier to collect ripe seed while it is still in its fruit and still on the plant. In order to time this correctly, the fruit may not appear ripe. The key factors are seed size and moisture content. Be sure to watch the weather and the activities of animal predators because the condition of ripening seed can change quickly and you may lose your best chance.

Provenance

The goal for ecological restoration from seed is usually to achieve genetic variability without compromising the genetic integrity of the site. For most projects, the collector should try to pick from a large number of individual plants (30-50) from several stands within a single population and keep careful records. Collect roughly the same amount of seed from each plant. Do not deplete the seed load from any individual plant or any particular area. If in doubt, consult a population geneticist rather than relying on your best guess. Each collection, (not just each species) should be clearly labeled with collection date, location, species, number of donor plants, and stage of phenology. Descriptive notes regarding the site, associated species, the weather, or other ecological observations are also valuable. Many collectors have found photographs to be important references for site and plant conditions in the future.

By using a few simple tools, an ingenious collector can make good progress.

Technique

We would hardly dream of harvesting massive quantities of small grains such as wheat or rice by hand, yet hand harvesting remains the normal collection method for restoration projects large and small. By using a few simple tools, an ingenious collector can make good progress. Because of the extended ripening period, it is best to plan several brief trips in order to collect the proper amount of high quality seed rather than one long period spent collecting unripe or otherwise poor quality seed.

Some basic tools include:
1) Protective clothing (for some species), gloves, long sleeved shirt, dust mask to prevent skin irritation. 2) Labels, data sheets, maps, clipboard, pencils, binoculars, camera, film, etc. for record keeping, genetic information, field notes. 3) Buckets, baskets, or sacks which tie around the belt to allow both hands free for picking. 4) Large, air-porous sacks for transferring from the collecting containers. Paper bags of polypropylene woven fiber gunny sacks will allow enough air to prevent the seeds from molding. 5) Paddles (i.e. ping-pong), rubber padded cement trowels, tennis rackets, or light-weight sticks for flailing seeds. Try to minimize the beating impact on the donor plants. Flail into containers such as plastic trash cans, wash tubs, cardboard boxes, etc. 6) Ground tarps for retrieving seed that can be shaken from the plants. 7) Leaf rake, broom, scoop, dust pan, and large sheets of cardboard for sweeping seeds off the ground. 8) Machete, pruning shears, pole pruner, sickles, knives for cutting seed heads. 9) Home-made seed strippers made of wood and sheet metal which cn be used like a comb. A bucket or similar receptacle can be attached to the stripper to catch the seeds with a combing motion on the stem or branch. 10) Lunch, water, bean can for making cowboy coffee.

Aside from the logistics of timing and technique, the genetic and ethical implications of wildland seed collecting require that we demonstrate the professional level of responsibility embraced withing the purposes of the Society for Ecological Restoration.

Hort Sense--a common sense approach to horticulture in restoration

by Mike Evans, Tree of Life Nursery, P.O. Box 736, San Juan Capistrano, CA 92693

Post-harvest handling of native plant seeds

After collecting seed for restoration projects, it must be processed correctly in order to assure that it will remain viable until planting time. Last issue we discussed collecting technique; in this issue we will consider seed cleaning and processing, and in the next installment we will look at cataloging and storage of seed.

Transport after Collection

It is usually best to transport freshly collected seeds to the processing area in the bags or containers which were used at the collection site. The raw seed collection may include ripening fruit, chaff, leaves, pebbles and dirt, and a few insects which happened to be on the mother plants or in fruit when it was collected. Avoid contamination of the area where seeds are to be cleaned by promptly dealing with insect or pest problems, using the appropriate pesticides as spray or drench.

If you plan to leave the seed collection unattended, be sure to protect the fruit, seed, cone, etc, from granivores, especially birds. It is amazing how quickly large numnbers of jays, wooddpeckers, and other seed eaters can key into a seed processing facility during the collection season. Even sealed bags are vulnerable to rodent damage, most of which takes place at night.

Prepare two identification labels (using the information from your field labels and notes) and attach one to the outside of the container holding the seed, and place one label inside with the seed. If paper bags are used, the information can be written (a third time) directly on the bag. The purpose of the multiple labeling is so you will not have to guess the seed's ID later on. Often a short period of post-harvest ripening is necessary and usually the seeds need to be thoroughly dried before they are packaged for long term storage. Keep the labels with the seeds at all times.

Drying

To properly dry the seeds, you need good air circulation and a relative humidity below equilibrium with the seed moisture. Excessive or rapid drying may damage the seed. Some species' seed are adversely affected

(continued on p. 10)

Hortsense (cont. from p. 5)

by light. It is important to understand the optimum moisture content and any special requirements for each species you are handling.

By locating the seeds in a calm, sunny spot by day, and bringing them in to keep the dew off of them by night, the seeds can be dried in a few days. Place the collection on wood frame screens over newspaper or a tarp, and cover them with screens or netting to protect them from animal predators at all times. If the collection is to be left outdoors at all, remember that a quick gust of wind may "sow" your seed for you in all the wrong places.

Cleaning and Processing

Fleshy Fruits - Seeds which are contained in fleshy fruits are perhaps the most difficult to clean and dry. Most industrial seed cleaning equipment is designed for use with dry grains so you will need to be inventive if you wish to mechanize.

Small lots of fleshy fruit can be macerated using a modern food processor or a blender. You may want to experiment with different speeds and durations. If the sharp blades damage the seeds, try slipping short lengths of surgical tubing over them. You can pour the slurry of water, macerated fruit and seeds over the wood frame screens. For this, it is handy to have different mesh sizes available. Screens can be made using 1" by 4" redwood frames stretched with 1/8", 1/4", or 1/2" hardware cloth. Finer mesh window screen will also be needed. A wide selection of screen sizes called the "U.S.Standard Sieve Series" is available through various laboratory supply houses. To complete your equipment needs, you can choose ten or twelve sizes in the numbered series of 8" diameter, round, brass nesting screens. By combining and stacking the screens, you can retain and discard the material as you wish. Fruit and seeds can be worked through the screens with rubberized paddles, a gloved hand, or a wooden pestle.

Use of a sluice box for cleaning seed is similar to processing gold ore; the idea is to manage a continuous stream of water which flows in a flat-bottomed tray with low side walls. The stream flows through the rough collection consisting of macerated fruit, seed leaves, stems. By setting the tray at a slight angle, the heavier seed will be separated by the swirling flow of water which carries the debris away. You can tend the whole operation from the side of the tray using a rubber paddle or similiar tool for working the slurry. A sluice box can be used in conjunction with screens.

Dried fruits or dry seed with chaff - dried fruit or capsules can be treated much like fleshy fruit with a food processor or blender but without the need for rinsing between the screening. When using hand screens for dry material, you will neeed to shake and sieve the seed and chaff through the sscreens or use air from a fan, compressor or vacuum to blow the lighter charr through or away from the seed. A hand lens may be necessary to distinuish minute screened chaff.

After collecting good seed, the responsible restorationist will want to process it correctly in preparation for storage and planting.

A popular small machine for the home farm called the "Farm Size Vac-A-Way Seed and Grain Cleaner" is available with a series of screens. Seed of most wildland species can be cleaned with this machine providing the material is dry. Contact: The Hance Corporation, 235 East Broadway, Westerville, OH 43081 (614) 882-7400 for information on the machine and screen sizes.

Cones - Seed extraction from conifer species requires drying the cones to open them shaking seeds out, separating seeds from cone scales and debris, seedwings, and separating clean full seed from wings, dust, empty seeds and other small particles. Cones are often dried in burlap sacks on racks without artifical heat where weather is warm and dry. In cooler, moist climates, cones will open in dry, well-ventilated attics, lofts, and other covered areas. In very cold areas, kiln drying is often necessary. Seeds can be extracted from small batches of closed cones by placing them on a cookie sheet in the oven at low heat (100-150 degrees F) until they open. Remove them promptly to avoid a) a fire, b) roasting the seeds.

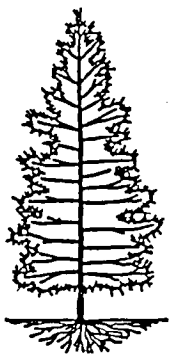
Grasses - Some of the most difficult seeds of wildland species to handle are the grasses which have awns attached to the seed (i.e.: Stipa spp.) To prevent your seeed from looking like a tight-woven bird's nest, do not pack the seed into the bag when collecting. Collect clean seed and you will not need to process it before planting. Leave the awns intact during the storage period. If they must be removed for ease of planting, do so immediatley prior to sowing.

This article describes some of the basic equipment and principles used for cleaning and processing wildland seed. The only way to perfect the technique is to practice. After collecting good seed, the responsible restorationist will want to process it correctly in preparation for storage and planting.

Suggested Additional Reading:

U.S. Dept. of Agriculture, Forest Service - 1974. Seeds of woody plants in the United States. USDA Agricultural Handbook No. 450. U.S. Govt. Printing Office, Washington, D.C. 883 pp.

Young, Janes A. and Cheryl G. Young - 1986. Collecting, Processing and Germinating Seeds of Wildland Plants. Timber Press. Portland, OR. 236 pp.



Hort Sense--a common sense approach to horticulture in restoration

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Seed Storage

After collecting and processing your seed, you will need to properly store it in order to have a viable supply whenever it may be needed. In this article we will discuss a few basic guidelines to keep the good seed until you are ready to plant it. Fully ripened, undamaged seed of high initial viability will store better than seeds collected when immature, or seed that has been damaged. Proper handling during collection and processing will help to ensure viability in storage.

Temperature, Humidity and Environmental Factors

The two most critical factors which effect seed storage are temperature and humidity. For many species, the lower the temperature and the lower the seed moisture content, the longer the period of viability. The adverse activities of insects and diseases are effectively slowed or stopped when seed is stored at low temperature with a low moisture content. Seed lots of inferior quality should be either discarded or scheduled for earliest use and the best seed should be retained for long term storage. A rule of thumb used for agricultural seeds is that conditions for long term storage are good if the sum of the degrees F. and percent relative humidity is 100 or less. At the National Seed Storage Laboratory, seeds of many different plants are stored in screw-tight containers at 40° F. and 32 percent relative humidity (Schopmeyer). Seeds can be stored at room temperature for several weeks or months in an area with good air circulation and minimal fluctuation in temperatures. Air drying prior to packaging is usually necessary to prevent heating within the mass of packaged seeds and multiplication of microorganisms. The ideal moisture content will vary between species, but tends to range between 5 and 12 percent. Seeds can be harmed by overdrying. Insects and harmful fungi are usually held in check in cool (near freezing) temperatures and low humidity. As a general rule, higher humidities can be tolerated if the temperatures are very cold. Some seeds need to be stored moist. Normally they are short lived and are stored only for short periods, such as for overwintering. For example, the moisture content of oak seed, (Quercus spp.) should be kept above 30 percent of dry weight. Such seeds can be stored in a clean moistened medium (vermiculite, peat, etc.) in plastic bags (4 to 10 mil thick) in a refrigerator set at about 40°F Recommended storage temperatures vary by species in the range from 32° to 50°F. with those under 41° best (Hartmann and Kester 1968).

For many species, the lower the temperature and the lower the seed moisture content, the longer the period of viability.

Storage Containers

For ease of handling and their capability of being stacked, various types of bags are excellent containers for seed storage. You can choose from plastic, paper, cotton cloth, burlap, polypropalene woven or canvas. To meet the critical objectives of temperature and humidity control, you will have to select the container which will serve the best for the situation; in other words: plastic OK in low temperatures, canvas, cotton or burlap where temperatures are constant and cool, paper when further drying is necessary. If more space is afforded, jars can be used. Seeds of many species species are adversely affected by light, so glass jars should be covered or stored in the dark. Fill containers completely to ensure that the entrapped air and the seed do not freely exchange moisture. Allow for good aeration throughout the storage facility when stacking packaged seeds. When seed moisture content or relative humidity is high, containers should be moisture resistant and sealed tight.

Labeling and Cataloging

Seed lots should be labeled with all pertinent collection information as well as botanical name and date. A label placed inside the container with the seed in addition to the information on the outside of the container is a good fail-safe in case of damage or weathering to the container. A seed collection, processing and storage data base can be created in your notebook, on index cards or using your computer storage.

Suggested Additional Reading

U.S. Department of Agriculture, Forest Service. 1974. Seeds of Woody Plants in the United States. USDA Agricultural Handbook No. 450. U.S. Government Printing Office, Washington, D.C. 883 pp.

Hartmann, Hudson T., and Kester, Dale E. 1968. Plant Propagation, Principles and Practices. Ed 3 Prentice-Hall, Inc., Englewood Cliffs, N.J. 662 pp.

Noxious Weeds in Oregon and Washington

Table 1. "A" Designated Weeds as Determined by ODA.

Common Name	*Scientific Name*
Bearded creeper (Common crupina)	*Crupina vulgaris*
Camelthorn	*Alhagicamelorum*
Creeping yellow cress	*Rorippa sylvestris*
Hydrilla	*Hydrilla verticillata*
Iberian starthistle	*Centaurea iberica*
Maltgrass	*Nardus stricta*
Purple starthistle	*Centaurea calcitrapa*
Silverleaf nightshade	*Solanum eleagnifolium*
Smooth cordgrass	*Spartina alterniflora*
Smooth distaff thistle	*Carthamus baeticus*
Squarrose knapweed	*Centaurea virgata*
Whitestem distaff thistle	*Carthamus leucocaulos*
Woolly distaff thistle	*Carthamus lanatus*

Table 2. "B" Designated Weeds as Determined by ODA.

Common Name	*Scientific Name*
Austrian peaweed (Swainsonpea)	*Sphaerophysa salsula*
Buffalo burr	*Solanum rostratum*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Cirsium aryense*
Dalmation toadflax	*Linaria dalmatica*
Diffuse knapweed	*Centaurea diffusa*
Dodder	*Cuscuta spp.*
Dyer's woad	*Isatis tinctoria*
Eurasian watermilfoil	*Myriophyllum spicatum*
Field bindweed	*Convulvulus arvensis*
French broom	*Cytisus monspessulanus*
Giant horsetail	*Equisetum telmatela*
Gorse	*Ulex europaeus*
Halogeton	*Haloteton glomeratus*
Italian thistle	*Carduus pycnocephalus*
Japanese knotweed (Fleece flower)	*Polygonum cuspidatum*
Johnsongrass	*Sorghum halepense*
Jointed goatgrass	*Aegilops cylindrica*
Kochia	*Kochia scoparia*
Leafy spurge	*Euphorbia esula*
Meadow knapweed	*Centaurea jacea x nigra*
Mediterranean sage	*Salvia aethiopis*
Medusahead rye	*Taeniatherum caputmedusa*
Milk thistle	*Silybum marianum*
Musk thistle	*Carduus nutans*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Puncturevine	*Tribulus terrestris*
Purple loosestrife	*Lythrum salicaria*
Quackgrass	*Agropyron repens*
Ragweed	*Ambrosia artemisiifolia*
Rush skeletonweed	*Chondrilla juncea*
Russian knapweed	*Acroptilon repens*
Scotch broom	*Cytisus scoparius*
Scotch thistle	*Onopordum acanthium*
Slender-flowered thistle	*Carduus tenuiflorus*
South American waterweed (Elodea)	*Elodea densa*
Spikeweed	*Hemizonia pungens*
Spiny cocklebur	*Xanthium spinosum*
Spotted knapweed	*Centaurea maculosa*
St. Johnswort (Klamath weed)	*Hypericum perforatum*
Tansy ragwort	*Senecio jacobaea*
Western horsetail	*Equisetum arvense*
White top (Hoary cress)	*Cardaria spp.*
Wild proso millet	*Panicum miliaceum*
Yellow nutsedge	*Cyperus esculentus*
Yellow starthistle	*Centaurea solstitialis*
Yellow toadflax	*Linaria vulgaris*

Table 3. "T" or Target List, Determined by ODA.

The Oregon Department of Agriculture annually develops a target list of weed species that will be the focus of control by the Weed Control Program, sanctioned by the Oregon State Weed Board. Because of the economic threat to the state of Oregon, action against these weeds will receive priority.

Common Name	*Scientific Name*
Beared creeper (Common Crupina)	*Crupina vulgaris*
Gorse	*Ulex europaeus*
Leafy spurge	*Euphorbia esula*
Rush skeletonweed	*Chondrilla juncea*
Squarrose knapweed	*Centaurea virgata*
Tansy ragwort	*Senecio jacobaea*
Woolly distaff thistle	*Carthumus lanatus*
Yellow starthistle	*Centaurea solstitial*