

GUIDELINES FOR ESTABLISHING NATIVES FROM SEED

A primary benefit of seeding natives is the low cost compared to transplants, cuttings and other forms of plant propagation. Successfully seeding natives is not a simple process. “Johnny Apple Seed” broadcasting seed randomly along a forest road works in fairytales but is not a best management practice (BMP) to establish seeds in upland, riparian or wetland sites. Competition for sunlight, soil and moisture from broadleaf and grassy weeds, domestic turf and forage crops is the most limiting factor to successful native seed establishment. Cultural and management practices to encourage native seed establishment are highly recommended. Once fully established natives species may dominate a specific region, ecological province, watershed or mitigation site. The key is site preparation pre and post establishment to encourage and enhance native seed establishment.

COMMERCIAL VS. SITE COLLECTED SEED

Commercial native seed propagation of pre-variety germplasm sources is a relatively young industry in the Pacific Northwest. In contrast to native seed collected on site differences between the two sources of seed can be significant. Commercial seed represents an advanced generation of site collected seed typically described by the number of generations from the vouchered source collection (G0) such as G1, G2, G3 and so on. Advanced generation seed is genetically similar to original source seed only if proper field history, sufficient isolation to eliminate cross-pollination (same or related species) is established and a similar growing climate and environment is selected for cultivation. Deviation from these and other practices may encourage genetic erosion (genetic drift) of source material. Additionally, the most significant difference between site collected seed and properly produced commercial pre-variety germplasm seed is mechanical seed quality. Often site-collected seed has low germination, poor seedling vigor resulting in inferior mechanical seed quality. High mechanical quality commercial seed is often free of weed and crop seed, low in inert matter and has good germination. Commercial seed must go through a series of conditioning steps starting with windrows, combining followed by seed cleaning using air screen separation, size separation with disk, indent or gravity cleaners. Properly conditioned commercial seed is physically superior to site collected seed with optimal embryo to endosperm ratio for enhanced seedling vigor and germination. Also many native species may require awn and seed coat (lemma & palea) removal to facilitate planting. Many native species must have awns and some seed coats removed or buffered prior to conditioning of seed. Examples include blue wildrye, meadow barley, needlegrass and many others.

SITE PREPARATION

Option 1 – (Soil seed-bank weed reduction) Plow, disk or lightly harrow soil to bury vegetation, organic material and bring weed seed to soil surface. Weed seed needs sunlight, moisture and proper soil temperature to germinate. Always level and pack soil surface to enhance weed seedling germination. If time and budget permit continue this process throughout spring, summer and fall. Just prior to seeding natives apply a contact

herbicide such as RoundUp or Finale on existing vegetation. Both herbicides are deactivated by soil microbial activity so they will not adversely affect germinating native seed unless heavy straw load is present in the soil (active ingredient can wick on organic material like straw and kill germinating native seedlings). Plant desired species once fall precipitation starts (late September, October). Make application of contact herbicide (RoundUp or Finale) post seeding but prior to native germination. This provides both pre and post plant weed control and suppression. If chemical herbicides are not used or warranted then do the process above without herbicides and minimize the depth and frequency of soil disturbance. Consider other alternatives such as black plastic or organic mulching of sufficient depth in lieu of herbicide applications.

Option 2 – (Cover cropping) Plow, disk, harrow or disturb soil in spring and fall. Smooth and pack soil surface to provide uniform weed seedling emergence. Plant a companion or cover crop with natives or domesticated species. Consider companion (nurse) crop of large seeded strong germinating natives such as wheatgrass, blue wildrye, meadow barley, California brome, sitka brome. Domesticated species for cover cropping can also be used such as common vetch, crimson clover, wheat, rye, triticale, sterile wheat or sterile triticale. Spray with foliar active herbicide such as RoundUp or Final in spring or fall followed by no till, or modified drill seeding or broadcast application of natives followed by native straw or sterile mulch. Caution. Make sure you flail mow the sprayed and dead vegetation prior to seeding.

Option 3 – (Nurse/companion cropping and strip seeding) Plow, disk, harrow or disturb soil in spring and fall. Smooth and pack soil surface to provide uniform weed seedling emergence. Plant a companion or nurse crop with natives. Establish companion (nurse) crop of large seeded strong germinating natives such as wheatgrass, blue wildrye, meadow barley and California brome. This companion crop native can be done on site(s) where these species may not be adapted. In spring or fall of the following year narrow strips can be mowed, cultivated and smoothed and seeded with species best adapted to this site. An example of this would be seeding of former wet prairie or upland site with blue wildrye and then strip seed with natives such as Roemer's fescue or California oatgrass.

Option 4 – (Herbicide/seeding) Spray contact foliar active herbicide such as RoundUp and Finale followed by flail mowing of dead vegetation. Do this in early spring or late fall when soils are properly hydrated for optimal plant growth. Allow "green-up" and apply second application of herbicide. Seed natives with no-till drill or broadcast seeding.

Option 5 – (Solarization) Use any of the above methods to remove vegetation, mechanically work and prepare soil followed by solarization (black or white plastic) to kill weed seeds.

SEEDING METHODS

Four common seeding methods are drill, no-till, broadcast (drop seeding) and hydraulic seeding. Drill seeding In areas that can be intensively farmed, plowing, disking and harrowed drill seeding is best. Drill seeding provides the best seed soil contact. Proper

seed soil contact is highly correlated with successful germination, emergence and establishment. Post seeding applications of foliar active herbicide properly timed prior to native seedling emergence can also help control fast germinating broadleaf and grassy weeds. If your budget permits intensive seedbed preparation should be done over a season or more to reduce the weedy seed bank prior to establishing native species. The no-till drill is a tractor-pulled machine that opens a furrow in untilled soil, drops native seed at a given rate and depth, and rolls or packs the furrow close. This method is practical on sites accessible to machinery, is less expensive than drill seeding land preparation, and significantly reduces the threat of erosion. Most importantly this methods allows for site preparation without disturbing the soil. Disturbed soils encourage soil seed bank weed germination so no-till is excellent means of reducing post establishment weed pressure. Generally the site is mowed or flailed prior to seeding to encourage sunlight penetration of the soil surface. Herbicides pre and post no-till drilling are also recommended. Broadcast seeding is recommended on sites with poor access for machinery or for small-scale projects. Seeds are broadcast using a hand-held scattering device, a spinning bucket pulled by a tractor or ATV, drop seeder followed by a drag harrow and roller to pack seed. This method requires a heavier seeding rate (1/3 to twice the rate of drill seeding) because of lower seed germination than either the drill or no-till drill seeding. Hydraulic seeding is a method of seeding natives in a sprayed slurry of water, tacifier, soluble solid (carrier) and nutrients. Hydraulic seeding provides a very uniform distribution of seed across a soil surface. Highly sloped areas that simply cannot be seeded conventionally are excellent sites for hydraulic seeding. Seeding rates are generally increased 20-30% when compared to drill seeded rates.

SEEDING DEPTH

Seeding depth is generally based on seed size. The larger the seed size the larger the endosperm the greater food source to sustain an emerging hypocotyl, coelyoptile or cotyledon. Large seeded natives such as California brome, blue wildrye, California oatgrass, meadow barley, lupines, checker mallow can be seeded from ¼ to 1/2 inch in fully packed and rolled soils. Intermediate sized seed such as American sloughgrass, self heal, Roemer's and Idaho fescue should be seeded from ¼ to 3/8 inch. Small seeded species such as spike bentgrass and tufted hairgrass should be seeded no more the ¼ or in shallow open drill rows.

SEED SIZE & SEEDING RATES

Seed size of native grass, herbaceous forbs and wildflowers differ significantly. Seed size (weight) often dictates recommended seeding rates in wetland, riparian and upland site restoration and mitigation. In general the larger the seed the higher the seeding rate. The smaller the seed size the lower the seeding rate. Large seeded species such as blue wildrye, California brome, wheatgrass, meadow barley, lupines and water plantain are seeded at 10-30 lbs per acre. Intermediate size seed such as American sloughgrass, roemer's fescue, needlegrass, western fescue, water foxtail are seeded at 8-15 lbs per acre. Small size seed such as spike bentgrass, tufted hairgrass, slender hairgrass, pine bluegrass, Canadian goldenrod, yarrow and many sedge and carex species are seeded at 2-6 lbs per acre.

Common name	Genus species	Seed size	Seeds/lb
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Blue wildrye	<i>Elymus glaucus</i>	large	120,000
California brome	<i>Bromus carinatus</i>	large	95,000
Meadow barley	<i>Hordeum brachyantherum</i>	large	90,000
Roemer's fescue	<i>Festuca roemeri</i>	intermediate	420,000
American sloughgrass	<i>Beckmannia syzigachne</i>	intermediate	1,000,000
Dense spike primrose	<i>Epilobium densiflora</i>	intermediate	1,200,000
Canadian goldenrod	<i>Solidago canadensis</i>	small	4,500,000
Common downingia	<i>Downingia elegans</i>	small	7,000,000
Spike bentgrass	<i>Agrostis exerata</i>	small	5,500,000

PLANTING DATES

Fall planting is recommended to coincide with the natural supply of precipitation to encourage seed germination. In addition weed pressure as farmers have learned may be significantly less during fall planting than during summer planting. However, spring seeding can be done effectively if soil or site preparation to reduce weed seed competition had been done the season before. Seeding must however be done in early spring (March/April) to ensure proper seeding establishment prior to summer drought and reduced precipitation during summer season in the Pacific Northwest. Supplemental irrigation may be required in some situations and sites.

SEED QUALITY

Pacific Northwest Natives is the premier supplier of Ecosystem Friendly™ native seeds for western Oregon, Washington, British Columbia and Alaska. Seed is a cost effective and reliable delivery system for native genetic enhancement and genetic diversity. Ecosystem Friendly™ native species from Pacific Northwest Natives helps ensure the utilization of seed adapted to local soil and climate conditions. Seed quality is defined as a combination of genetic origin, mechanical quality and seed viability. Pacific Northwest Natives contract and/or speculatively produce native seeds collected by agencies, private groups and landowners from site specific areas. Native seed production fields established from these wild collections may be a fraction of an acre in size to many acres. Most fields are entered into state seed certification programs for quality assurance purposes. Land history, isolation, seedling and crop inspections help ensure the highest quality seed possible. Seed is combine harvested on the farm and conditioned in a seed cleaning plant specifically for small lots of custom produced native seeds. Mechanical quality is defined as the amount of native seed (pure seed) to other components in each lot of conditioned seed including other crop seed, inert matter (sticks, florets, dirt and etc) and weed seed. Seed viability can be determined in native seeds by standard germination, dormant seed or tetrazolium testing. Standard germinations are the most common, however natives are notorious for dormant but viable seed (viable seed that do not germinate under standard germination procedures). Therefore, tetrazolium tests (TZ's) are standard in the native seed trade. TZ's accurately predict viable seed levels and can be used as multiplier in determining pure live seed (PLS).

PURE LIVE SEED

Pure Live Seed (PLS) is often used as a means of determining seed viability of collected and commercial sources of native seed. Traditionally, unconditioned collected seed may have superior genetic integrity but may have poor mechanical and seed viability. Therefore, buyers and sellers may utilize PLS as a means of determining total seed viability of a given unit of seed. PLS is defined as percent purity multiplied by the percent germination plus any dormant seed. Example would be 95% blue wildrye multiplied by the 80% germination = 76% PLS or pure live seed. Therefore it would take approximately 1.31 lbs of this seed to make 1 lbs of PLS or pure live seed (1 lb / .76 PLS = 1.31 lbs). Buyer and sellers alike need to specify if purchase of seed is based on bulk or PLS.

Contact

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