Oil Sands Vegetation Cooperative

COSIA
CANADA'S OIL SANDS INNOVATION ALLIANCE

In This Issue:

Harvest Species (2019)

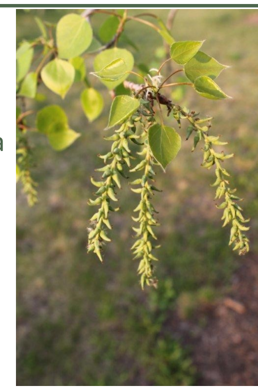
NAOS

Betula papyrifera
Populus tremuloides
Larix laricina
Alnus viridis
Amelanchier alnifolia
Arctostaphylos uva-ursi
Cornus sericea
Dasiphora fruticosa
Linnaea borealis
Prunus pensylvanica
Prunus virginiana
Rhododendron groenlandicum
Ribes species
Salix bebiana
Salix discolor
Shepherdia canadensis
Vaccinium myrtilloides
Vaccinium vitis-idaea
Viburnum edule

SAOS & COLK

No harvests are planned in 2019.

Species of Interest



Trembling aspen (*Populus tremuloides*) is a keystone tree species in the central mixedwood region of Alberta. Its presence or absence impacts community formation following disturbance. It is a gauge of successional stage. The quick growing trees arrive on disturbed sites early due to wind dissemination of the large number of small seeds. Aspen closes canopy while slower growing conifers remain part of the understory. Later, as the aspen age out, a climax conifer community results. Although a prolific seed producer, the seed is notoriously short-lived. Despite viability dropping quickly at warm temperatures, dried seed can be processed quickly and stored frozen to extend the life of the seed, over ten years.

Seeds Longevity

Seed longevity is determined by species (some species are naturally longer lived than others), condition of the seeds at harvest and storage conditions. Seeds harvested before or after peak ripeness start with reduced viability. This deficit is compounded over storage time, impacting the viability of a seedlot and often decreasing seedling vitality.

Orthodox seeds, as those of most boreal species, can be dried to low moisture contents without causing damage to the embryo and can be held at low temperatures to increase longevity. Harrington's Rule of Thumb suggests that for each 1% the moisture content drops, (to a minimum of 4%) the life of orthodox seed is doubled. To prevent changes in moisture during storage, seed should be stored in hermetically sealed containers, such as glass jars or foil pouches.

Similarly, Harrington's Rule of Thumb states that for every 5°C drop in storage temperature, seed life doubles to a limit of approximately –18°C. Using these rules, the longevity of seeds like aspen and willow, often measured in months, can be increased to years. For species with naturally high longevity, such as conifers, longevity can be increased to a century or longer.

2019 Harvest Partners

NAOS: Canadian Natural Resources Ltd., Imperial Oil Ltd., Suncor Energy, Syncrude Canada Ltd.

Learn more about the OSVC and find previous issues, at http://www.cosia.ca/oil-sands-vegetation-cooperative

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Viability vs Germination vs Emergence

Although these three terms are often used interchangeably, especially in lay-literature, more accurate use of these terms can lead to better communication.

Viability refers to the potential of a seed to germinate. Any seed that is capable of germinating is viable—it is alive and respiring at some level. Although tetrazolium staining can be used to accurately determine viability of a seedlot it requires trained technicians who understand seed morphology to interpret results.

Germinated seeds of aspen *in vitro*

Recently emerged seedling of *Rosa acicularis*

Germination is the appearance of a radicle (or in some cases a shoot) as the embryo grows and breaks through its seed coat. Although this generally occurs below-ground, it can be observed *in vitro* on a surface of paper or other media. For very small seeds, especially those with little or no dormancy, germination tests are often used in place of viability tests.

Emergence occurs when a seedling pushes through the soil (or other medium in which it is buried) surface. Although all emergent seedlings have germinated, some germinated seed can fail to emerge due to excessive planting depths, soil compaction, or predation.

Pelleting

Many native seeds are small or lightweight, irregularly shaped or otherwise poorly adapted to direct broadcast or drill sowing. Emergence is poor for a number of reasons including, but not limited to, seed-soil contact, seeding depth, predation and dormancy requirements. Pelleting can address some of these issues. Seed pelleting is a process widely used in agriculture, where individual seeds are coated with inert materials to increase their size and weight. This allows broadcast seeds to drop to the soil rather than being blown away by wind, improving seed/spoil contact. Coated seeds are also much easier to sow using seed drills as they flow better through the seed hopper if all seeds are the same size and shape. The coating can protect the seed against drying and from predation until germination occurs . Although most coating materials are inert (such as clay) the composition of the coat can aid in germination as well, particularly if it assists in water retention or contains nutrients. A study is currently underway at NAIT Centre for Boreal Research (Dr. Jean-Marie Sobze) to examine how to pellet seeds of boreal species.

Technical Note. Native Boreal Seed Enhancement: Seed Pelleting.
Technical Video. Native Boreal Seed Enhancement: Seed Pelleting.

Dormancy

There are a wide range of opinions as to what does or does not constitute dormancy in seeds (Vleeshouwers *et al.* 1995). It is generally agreed that dormant seed, despite being given ideal germination conditions, fails to germinate. Baskin & Baskin (2001) break dormancy down into five main types: physiological, morphological, physical, chemical and mechanical. Physiological dormancy can result from low permeability to oxygen and is often overcome with stratification. Seeds are exposed to moist cold conditions for a few weeks to several months to simulate winter conditions. This is a common dormancy for seeds of temperate species. Occasionally a species is adapted to spending an entire year buried prior to germination, requiring a warm followed by a cold stratification. Baskin & Baskin further divide physiological dormancy into non-deep, intermediate and deep dormancy.

Morphological dormancy occurs in seeds with underdeveloped embryos. These seeds continue to develop after they are dispersed Some morphologically dormant seeds are also physiologically dormant, requiring both time and conditions to finish developing as well as cold stratification.

Physical dormancy involves impermeability to water, usually a result of a hard seed coat. Some physically dormant seeds have plug-like structures that move to allow water uptake. Rubbing with sandpaper or nicking the seed coat, or exposure to acid can break down the coat or dislodge blockages. These treatments allow water and/or gasses to permeate the seed coat (Mayer and Poljakoff-Mayber 1982), a requirement for seedling development.

Chemical dormancy results when an inhibitor prevents germination. This is often overcome by removing the fleshly fruit and/or leaching. Inhibitors in the fruit is an adaptation of species consumed by frugivores, requiring digestion of the fruit prior to germination.

Mechanical dormancy results from hard woody fruit or stony endocarps and often occurs in combination with physiological dormancy.

Once dormancy has been broken, viable seed exposed to ideal conditions should germinate. Light is not an uncommon requirement for germination, however, it rarely affects dormancy. Likewise, although warm temperatures might be required for germination, it may or may not need a warm stratification.

For more information on germination and dormancy, consider attending the Seed Storage and Collection course offered by Lindsay Robb (Provincial Seed Specialist) at Alberta Tree Improvement and Seed Centre.

Baskin, CC & JM Baskin. 2001. Seeds: Ecology, biogeography, and evolution of dormancy and germination. Academic press. Sand Diego, California. 666 pages.

Mayer, AM & A Poljakoff-Mayber. 1982. The germination of seeds 3rd edition. Pergamon Press. Oxford, England. 211 pages.

Vleeshouwers, LM, HJ Bouwmeeser & CM Karssen. 1995. Redefining seed dormancy: an attempt to integrate physiology and ecology. Journal of Ecology 83: 1031-1037

Publication of Interest

Hudson JJ, CK Yucel, AL Schoonmaker & J-M Sobze. 2017. Effects of cold stratification on the germination of *Vaccinium myrtilloides* (common blueberry) and *Vaccinium vitis-idaea* (bog cranberry) seeds from Alberta, Canada. Native Plants Journal 18(3): 245-251.