Woodland Seed Collection

44th Street and West River Road
June 22, 2005

Led by Carolyn Carr, Ecological Strategies

Seeds of most plants benefit from drying out. This is because drying lowers the moisture content and protects against pathogens, while also slowing down the seed's metabolism, preparing it for dormancy. Usually a dormancy period of 2-3 months must occur before the seed will germinate.

However, as woodland conditions are characterized by consistent moisture levels, many woodland species have evolved seeds which require constant moisture levels.

Hydrophilic Seeds

Woodland species with seeds which cannot tolerate drying out can be described as having "hydrophilic" seeds. Seeds should be collected, cleaned, and immediately sowed onto the site. Examples of these species which are present in Minnesota include:

*Asarum spp. (Wild Ginger) +
Claytonia (Spring Beauty)
*Dicentra spp. (Dutchman's breeches and Bleeding heart) +
Hepatica
Podophyllum peltatum (May Apple)
*Sanguinaria (Bloodroot) +
Trillium spp. +
*Uvularia (Merry Bells)
(*present in the Longfellow River Gorge)

Seeds of several of these woodland species have fleshy lipid-rich appendages called *elaiosomes*, which are gathered and consumed by ants or other insects, thus dispersing the seed (indicated by +). The presence of this structure is a remarkable example of convergent evolution, as woodland plants of several families have this trait, although other plants in the same families have conventional, non-hydrophilic seeds. Examples are Bloodroot in the Poppy family, and other plants not present in Minnesota - Crested Iris in the Iris family, Gold-star in the Daisy family and *Euphorbia purpurea* in the Spurge family. Seeds of these species can be nearly indistinguishable. Cullina (2000) suggests that the evolution of hydrophilic seeds has occurred because in a temperate climate with consistent even rainfall, in sites that maintain that moisture (because of soils, hydrology, slope and aspect), there's no need to waste resources preparing for dessication if it is simply not a threat.

Fleshy Fruits

Other woodland species have fleshy fruits dispersed by birds and mammals. These species require that the fleshy fruit be removed to eliminate the germination-inhibiting

chemicals they contain. Flesh can be removed mechanically (put them in a blender with water) or chemically (leave them to ferment and then strain to obtain seeds).

*Actaea spp (Baneberry) – red or white fruits, depending on species
*Arisaema (Jack in the pulpit) – red fruits
*Caulophyllum + (blue cohosh) – seed with a blue seed coat that looks like a fruit, but technically is not. Deep blue-black when ripe, with one seed inside. Can be collected before it is ripe and the seed coat hardens.
*Polygonatum biflorum + (Solomon's seal) – blue-black fruit with white seeds
*Smilacina racemosa + (False Solomon's seal) – fruit is green, then pearly white, with red flecks, then all red when fully ripe.

(*present in the Longfellow River Gorge)

Some of these species have hypogeal germination (+), meaning that the first year's growth is a cotyledon that occurs underground, with the first true leaf emerging in the second or even third spring. (This is in contrast to epigeal germination, in which the cotyledon emerges from the ground in the first season, followed by leaves).

Vegetative propagation is easy for many woodland species and is typically conducted in the fall. Species where this is fairly easy include:

Asarum (wild ginger)
Podophyllum peltatum (May Apple)
Polygonatum (Solomon's seal)
Sanguinaria (Bloodroot)
Smilacina racemosa (False Solomon's seal)

Other woodland species:

Thalictrum (Meadow Rue) – seed with a papery green husk. Ripe when seeds break off stem easily. The only wind-pollinated species in a plant family of insect-pollinated species.

Signs of ripeness:

Seed coat will turn from green or white to gold, brown or black, when ripe.
If the seeds are contained in a fleshy fruit, the fruit will ripen and change color.
Seeds in pods or capsules will be ready when the container begins to yellow, split or dry.

Collection rules:

Collecting seed from a wild population lowers the chances of that population's long-term success. For this reason:

- Never collect seeds of rare plants, this can jeopardize their existence in the wild.
- Limit the amount of seed you collect – only a few seeds from each plant. Shoot for 10%, not 75%... For plants with only a single pod or capsule, collect only a few from the population as whole.

- Never collect seeds without permission. In Minneapolis Parks and Minnesota State Parks it is prohibited to collect plants or plant parts including seeds. We have permission to collect for this event.
- Never collect plants from the wild.

Resources:

W. Cullina, 2000. New England Wildflower Society's Growing and Propagating Wildflowers of the United States and Canada. "A Frances Tenenbaum book" Houghton Mifflin Company. Boston and New York.

Native Iowa Woodland Understory Restoration: A Guide to Collecting and Germinating Seeds. http://web.grinnell.edu/individuals/mottll/ Accessed 20June 05.

Native Plants Propogation Protocol Database. University of Idaho. http://nativeplants.for.uidaho.edu/network/general.asp

Woodland Species

Eupatorium rugosum – White snakeroot
Solidago flexicaulus- Zig-Zag goldenrod

Other Interesting things:

Apocynum (Dogbanes) – have very high rates of insect visiting, but very poor pollen flow. Their flowers are actually structured in such a way that pollen import and export are nearly fully prevented. With very low reproduction by seed set, they are a predominantly clonal species. Not a woodland plant.

About Elaiosomes and Ants

Morales and Heithaus (1998)

Basic facts: ants pick up seeds in response to chemical stimulus (which is independent of the elaisome itself)
ants "satiate" to elaiosomes, so relatively few (<40) seed of all myrmecochorous species are carried into a single nest over an entire growing season.

Benefits of seed dispersal by ants (myrmecochory)
To plants:
Reduces parent-offspring or interspecific competition
Decreases seed predation
Moves seeds to fertile microsites
Protects seeds from fires

To ants:
Food for larvae
Single-queen ant colonies fed extra elaisomes produced significantly higher numbers of reproductive females (gynes) – est. by this study by Morales and Heithaus (1998).

About Woodland Dispersal since Glacial Retreat

Woodland plants are distributed 1000-2000 km in the north-south direction. A study was done to figure out if is possible for ants to have facilitated the spread of wild ginger over that distance, over the time since glaciation. Ants have moved wild ginger seed 35m – the largest distance ants are known to move any seed of any woodland herb. Diffusion models calculate that over 16000 since glacial retreat, at that rate of movement, wild ginger would have only spread 10-11 km. In fact, the plants have moved 100s of km (between 450 and 2000 km). which requires a mechanism that is currently unknown.

Longer-range dispersal had to have happened , and happened frequently, in order to explain the current distribution. (Cain, et al, 1998. Ecological Monographs).