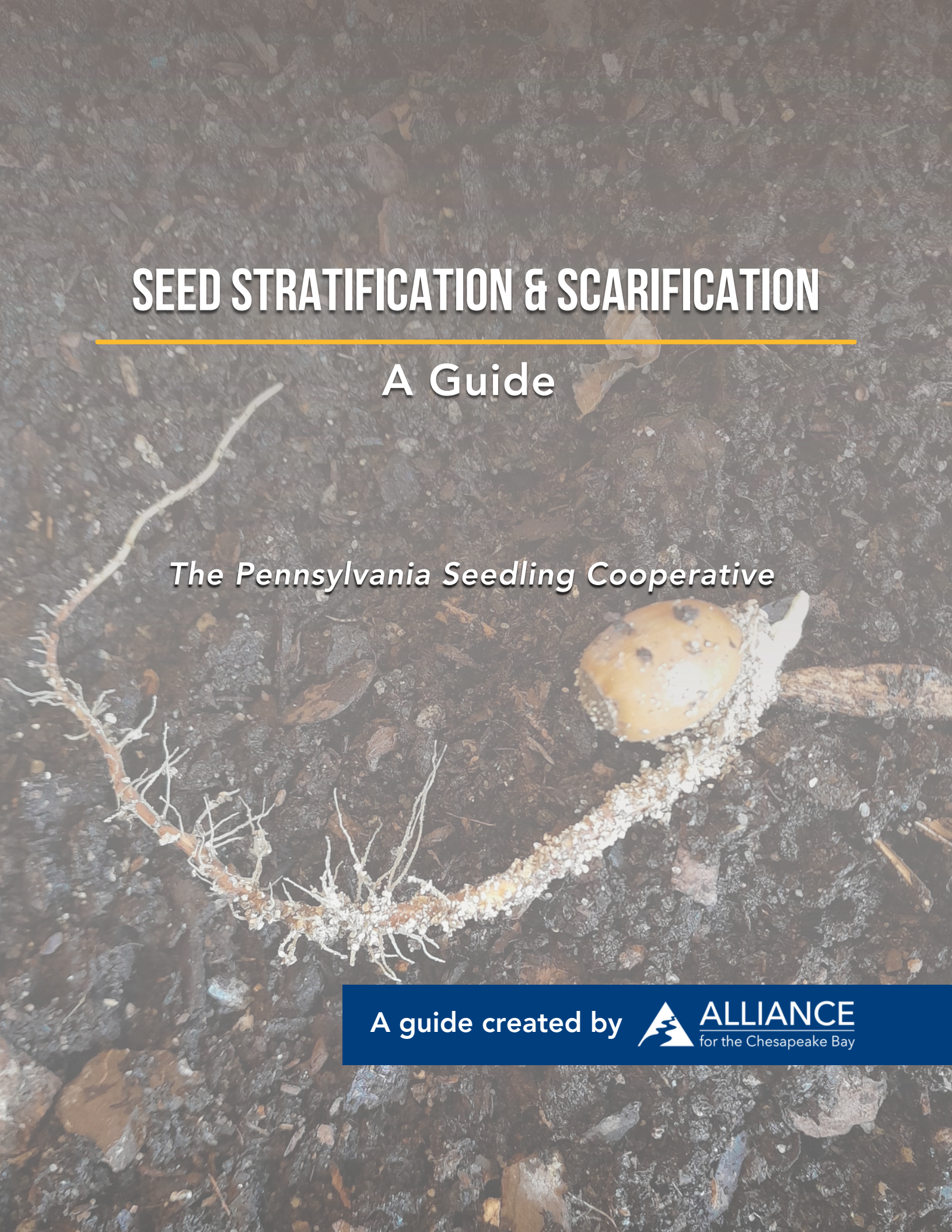

SEED STRATIFICATION & SCARIFICATION

A Guide

The Pennsylvania Seedling Cooperative

A guide created by ALLIANCE for the Chesapeake Bay

GUIDE CREDIT

This guide was created by the Alliance for the Chesapeake Bay with additional support from Penn State Extension and reviewers.

This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement CB – 95336101 to the National Fish and Wildlife Foundation. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.

ALLIANCE for the Chesapeake Bay

PennState Extension

A guide create by the Alliance for the Chesapeake Bay with review by Penn State Extension.

This information in this edition is dated August 2026.

Thank you!

BREAKING SEED DORMANCY

Species Specific Instructions

This section represents compiled research, as well as the methods discussed by veteran growers, regarding methods to break dormancy and/or the best, most efficient method of growing. Dormancy refers to conditions a seed must undergo prior to germinating. **Stratification** is a method to break internal dormancy, and **scarification** breaks external dormancy. Scarifying is the act of agitating the seed coat, generally to allow the imbibition (soaking up) of water. The level of required agitation varies depending on the species, as some species have more durable seed coats. Mimicking certain natural processes to encourage germination is stratification. This generally concerns a seed embryo needing to undergo certain seasonal conditions.

This Stratification and Scarification Guide existis in conjuntion with the Guide on the Practice of Growing From Seed- The Pennsylvania Seedling Cooperative by the Alliance for the Chesapeake Bay.

KEY SCOOP SPECIES

The follow list contains the germination requirements of the 'heavy hitter' key species planted by the Alliance for the Chesapeake Bay (alphabetical by common name):

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
American sycamore (*Platanus occidentalis*)	Collect seed in late winter to early spring (February-April) so it has already undergone its required dormancy or cold stratification on the tree. It is best to collect the seed while it is still in its "ball form" (prior to the achene opening and the sycamore fluff spreading). If collecting the seed in October-November, seed should be stored in cold moist storage for 2-3mo. Seed should be stored and sown broken out of the "ball" form. Sycamore seed maintains hairs that may cause irritation to skin, eyes, etc, so use caution when handling. Recommendations are to plant into trays in late March or early April (earlier is possible if you have access to a greenhouse), for later transplanting since seed viability is low and/or inconsistent.
black locust (*Robinia pseudoacacia*)	Collect seeds around November and store using the paper bag method until about March. Successful methods for radical emergence concern, remove seed from pod then either rub each individual seed on a piece of sandpaper or another file type or place seeds into a mortar and disturb seed coat with pestle until agitation is visible on seed coat. An additional method mentioned in literature is to place seeds in water around 190 degrees F, allow water to cool naturally and remove seeds once they've swelled approximately 3 times the orginial size. The blender method described by a grower (see eastern redbud) would likely be an effective method to break dormancy of the impermeable coat as well. Once agitation of the seed coat to break dormancy has occurred, sow into trays for later transplanting, or directly into pots (at your discretion).

KEY SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
box elder (*Acer negundo*)	Ensure seeds are not collected too early to allow the embryo adequate time to mature (Mid-October to Mid-November). Store seeds in a paper bag for moisture retention until approximately mid-January, at this time the samara is ready to be placed into cold, moist storage in peat moss, sand or vermiculite. At approximately one month in storage, the radical will have likely emerged and can be sown into field plots, trays or individual pots. Research states that after collection in late fall, place seeds into warm water for 24 hrs. Following the soak, seeds can be planted into a field plot to break physiological dormancy naturally. Seedlings should pop up in early spring.
honey locust (*Gleditsia triacanthos*)	Collect seeds around November and store using the paper bag method until about March. Successful methods for radical emergence concern removing the seed from the pod, then either rub each individual seed on a piece of sandpaper or another file type, or placing seeds into a mortar and disturbing the seed coat with a pestle until agitation is visible on the seed coat. An additional method mentioned in literature is to place seeds in water around 190 degrees F, allow water to cool naturally, and remove seeds once they've swelled by about 3 times. The blender method described by a grower (see eastern redbud) would likely be an effective method to break dormancy of the impermeable coat as well. A drill or light acid bath can also be used to break the seedcoat. Once agitation of the seed coat to break dormancy has occurred, sow into trays for later transplanting, or directly into pots (at your discretion).

KEY SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
silver maple (*Acer saccharinum*)	Samaras can be found mature from April to June. Silver maple should be sown as soon as it drops to give sufficient growing time. No stratification of scarification required. Prior to sowing, remove the samara from seed; this can help in determining the health of the seed. If storing Silver Maple samaras overwinter, store in the fridge in a paper bag, leave the seed in the samara to help with maintaining moisture for the seed embryo to remain viable.

COMPREHENSIVE LIST OF SCOOP SPECIES

The Alliance greatly values diversity of species in plantings, the following is a comprehensive list of commonly planted species (alphabetical by common name):

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
American plum (*Prunus americana*)	Collect fruit August through October to allow the seed time to reach maturation. To stratify, begin by removing fruit flesh from the seed (see black cherry for more information on this process). Research states complete 4 month cold moist storage in vermiculite or sand; no scarification necessary.
arrowwood viburnum (*Viburnum dentatum*)	Collect seed September through early November. Seed is mature when the fruit is red. Research states that seeds require 3 month cold moist storage. Cold storage can be completed in vermiculite, sand or peat moss.
basswood (*Tilia americana*)	Collect seed from September through early October. Seeds should be scarified prior to entering into 3 month cold moist storage. Cold storage can be completed in vermiculite, sand or peat moss. Seeds will germinate under spring temperatures, research states. Consider beginning the breaking dormancy process in mid-December so seeds can go into flats in March.
hickory species (*Carya spp.*)	Collect dropped seeds around late September through October. A float test to determine viability is suggested. Place the seeds in cold stratification for approximately 2-4 months. A radical will have likely emerged, gently place it into an individual pot.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
black cherry (*Prunus serotina*)	Collect fruit August through October to allow the seed time to reach maturation. To stratify, begin by removing fruit flesh from the seed. Veteran growers recommend saturating the seed in antifungal (captan or hydrogen peroxide). Once removed from the antifungal bath, allow the seeds to dry out (3 days to a week). Then complete 3-4 month cold DRY storage in peat moss, sand or vermiculite. Black cherry is highly susceptible to molding issues. Methods to remove fruit from seed: by hand, gently agitate it off using a blender then allow pulp and non-viable seeds to float, or macerate the berry on a sieve. Research states that black cherry can undergo cold wet storage (3-4 months). Recommendations are to use equal parts vermiculite to seed with very little water.
black chokeberry (*Aronia melanocarpa*)	Collect seed from late September into late October. Black chokeberry requires 3 months cold, moist stratification at 34 degrees Fahrenheit or colder. Black chokeberry is reported to be slow to germinate; assume it will take a month of 70-plus degree weather for cotyledon emergence.
black gum (*Nyssa sylvatica*)	Collect seed as it falls from the tree August through October. Fruit is removed from the seed (see black cherry and spicebush sections), then complete 3-4 month cold moist stratification in sand, this significantly improved germination rate (evidence from our veteran growers). No scarification necessary.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
black walnut (*Juglans nigra*)	Collect seed as it falls from the tree, husk needs to be removed before planting. Cool moist stratification for 3-4 months. No scarification necessary.
black willow (*Salix nigra*)	Easy to root via cutting. Seeds are only viable for 1-2 days after dropping. No stratification is required. The seed needs to be kept moist.
buttonbush (*Cephalanthus occidentalis*)	Easy to root via cutting. Seed is best collected when the nutlets have turned reddish-brown. No stratification or scarification is necessary, though germination rates are low.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
eastern redbud (*Cercis canadensis*)	Collect seed pods in November, although this can be done sooner. Store seeds in or out of the pod in dry storage (paper bag, ziplock or container with no moisture) until about early January, then begin the scarification process. Redbud seeds have an impermeable seed coat that must be broken for germination to occur. Successful methods to break this impermeability included: place the entire seed pod into a blender until the pod is essentially dust and seed coat is visibly agitated, removing seed from pod then place seeds into a mortar and disturb seed coat with pestle until agitation is visible on seed coat, or even placing seeds once separated from pod, into boiling water and allow to soak overnight. Acid baths can also be done. Once the tough, impermeable seed coat is broken, place the seed into wet sand, peat moss or vermiculite for 2-3 month cold storage (radicals may emerge while in storage). Recommendations are to place seeds into trays or field plantings (not into individual pots due to uncertain germination rate) for later transplanting.
elderberry (*Sambucus canadensis*)	Berries typically ripen August to October. Readily grows from cuttings.
flowering dogwood (*Benthamidia florida*)	Collect seeds from mid October to November. Warm, moist stratification for 60 days followed by long periods (120 days) of cold temperatures increases germination. Scarification is helpful.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
gray dogwood (*Swida racemosa*)	See other dogwoods.
hackberry (*Celtis occidentalis*)	Collect seeds from September to October. Stratification and pulp removal increase germination. Seeds should be stratified at 41 degrees Fahrenheit for 60-90 days, or planted in the fall.
hazelnut (*Corylus americana*)	Collect seeds September to October. Anecdotally from veteran growers- seed predation by squirrels is high. Separate seeds from husk. Seeds need cold stratification.
Kentucky coffeetree (*Gymnocladus dioicus*)	Collect the seed pods from the tree around February or March, the seeds do not require any stratification. The seeds should be removed from the pod, then the impermeable seed coats should be agitated. Methods proven to be successful by growers are to drill a small hole into the coat. Additional methods that may be successful are the blender method, and the mortar and pestle method. Once the seed coat has been agitated, the seeds should be stored overnight in warm to room temperature water (you will see it imbibe and expand in size). Then the seeds can be placed in individual pots. Research recommends placing seeds into greenhouse temperatures for improved germination.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
ninebark (*Physocarpus opulifolius*)	Can be propagated from cutting or seeds. Seeds require no treatment.
pawpaw (*Asimina triloba*)	Pawpaw fruits are present on trees from late August into September. If storing seeds prior to stratification, ensure the seeds stay moist or viability may be affected. The most efficient, cost-effective way to do this is to simply place seeds in a moist paper towel, then into a plastic bag or container at room temperature. Check for mold periodically. Prior to stratifying, remove the seed from the fruit flesh. No scarification necessary. Simply, provide seeds 3-4 months cold storage in moist sand, peat moss or vermiculite. Some research recommends placing stratified seeds into room temperature water overnight prior to sowing (allowing the embryo to imbibe water). Germination (cotyledon emergence) will occur in the heat of the summer (requires 1-2 weeks of 90-95 degree weather for best germination). Consider germinating in a greenhouse if one is accessible to "trick" seeds into germinating. Germination rate can run from 10-50% based on seed collection location and year, research states, so consider seeding more than you actually want to grow. Some Alliance veteran growers have sown pawpaw seeds as early as March and found success. Research has suggested that pawpaw seedlings may put on very little growth if exposed to full sun.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
persimmon (*Diospyros virginiana)*	Collect the fruit as early as September in some locations, usually mature in October and November. Fruit flesh needs to be removed from the seed. Research recommends cutting fruit in half, then removing seeds by hand or using the maceration process. Complete 2-4 month cold, moist stratification. Ensure that the cold stratification medium does not dry out. Seeds will likely begin to germinate while in storage within the last month Some veteran growers recommend light scarification to the seed coat (with sandpaper or a file) prior to cold storage. No research discussed this idea.
pussy willow (*Salix discolor*)	Seeds should be collected between April and May, seeds are only viable for a few days Due to short viability no treatment is necessary. Willow readily reproduces from cuttings.
red chokeberry (*Aronia arbutifolia*)	Clean seeds of fruit and let them air dry. Cold, moist stratify seeds for 90 days. Reports indicate low germination rates. Can be propagated though softwood cuttings.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
red maple (Acer rubrum)	Seeds should be collected between April and June, seeds should be planted as soon as they are collected. No seed treatment is required, seeds readily germinate. If storing them over winter see instructions for Silver Maple.
red oaks *(Quercus sp.)*	Both oak groups do not require scarification. Both groups can utilize the float test to determine seed viability. It is generally thought that those that sink are viable. Acorns must be kept moist; do not allow them to dry out, or risk drastically decreasing viability. red oak Group species: Ex. Northern red oak, scarlet oak, black oak, pin oak, willow oak As soon as you collect and float test the acorns, store the acorns in zip lock plastic bags in moist sphagnum moss in the refrigerator. Vermiculite can work as an alternative to sphagnum moss. Check periodically to ensure that the storage medium remains moist and spray the containers/bags if they seem dry. Both red and white oak groups can be out-planted in late March to early April taking care to look out for upcoming freezing temperatures. New above ground growth will likely die off from a freeze, but the radical is persisting in the potting media- take care not to cull these.
red osier dogwood (*Swida sericea*)	Collect fruit when the fruit ripens August to September. Easily propagated through cuttings and can be livestaked.
river birch (*Betula nigra*)	Seeds can be collected late spring to early summer. Seeds don't need treatment.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
sassafras (*Sassafras albidum*)	Best germination rate requires further testing. A veteran grower found an approximate 10% germination rate resulted from 3-4 months cold moist storage in peat moss, after removing the seed from the berry and applying fungicide. Research states, collect seeds from August to September. Remove the berry from the seed and implement 4 months of cold storage.
serviceberry (*Amelanchier canadensis*)	Collect seeds around July or August, before the fruit flesh hardens. Remove the fruit flesh from the seed, then soak the seed in a warm water bath for 24hrs. Following the water bath, seeds should be placed into warm moist stratification (essentially room temperature- maybe place on a windowsill) for 60 days. Ensure seed and germination medium stays moist. Finally, place in cold, moist stratification for 2-4 months. Research states that after removing fruit flesh from seed, simply place the seed in cold moist stratification for 3-4 months.
silky dogwood (*Swida amomum*)	Collect seeds August to October when fruit is slightly tinged blue. Seeds should be cleaned of fruit and dried. Seeds should be stored cold and dry until sewing them in spring.
smooth alder (*Alnus serrulata*)	Seeds should be collected in fall, to separate the seeds from the cones, wait until the cones are dry then crush cones by hand. Alder seeds should be sown within 1 month of collection, and be cold moist stratified outside. Can likely be propagating through cuttings though no specific method was found when researched.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
speckled alder (*Alnus incana*)	See Smooth Alder
spicebush (*Lindera benzoin*)	Collect seeds around September-October, when the red berry appears ripe and mature. Remove the fruit flesh from the seed. Research recommends placing seeds in a plastic bag for 1-2 weeks to force the fruit to soften, so it is easy to macerate by hand or with a sieve. Once macerated, get the flesh and seed mixture into water so flesh and non-viable seeds will float and it will be easy to separate from viable seeds that sink. Place seed in cold, moist storage (sand, vermiculite or peat moss) for 4 months. Research states the importance of not letting the seed dry out or risk decreasing viability. Some research states that Spicebush seeds should be exposed to 1 month warm, moist storage prior to entering cold, moist stratification.
sugar maple (*Acer saccharum*)	Collect seeds in the fall. Cold moist stratification for 35-90 days. 1 degree Celcius is optimal, warmer than 10 Celcius is ineffective.
staghorn sumac (*Rhus typhina*)	Seeds should be collected in september to november. Seeds will need to be separated from each other before planting Germination rates benefit from an acid bath or how water treatment.
sweetbay magnolia (*Magnolia virginiana*)	Seeds should be collected in October. Cold stratify for 30-60 days.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
sweet birch (*Betula lenta*)	Seeds should be collected mid September to November. Cold stratification doesnt increase germination. germination takes 4-6 weeks. Optimal storage of sweet birch is 1-3% moisture content at 2 degrees Celsius.
sweetgum (*Liquidambar styraciflua*)	Collect seed September through November. Cold moist stratification for 30-60 days. Seed heads can be dried for 5-10 days in a bag. Seeds should be easily separated by shaking the bag.
tulip-poplar (*Liriodendron tulipifera*)	Collect the brownish aggregate pods around November; they have usually fallen off the tree at this point. The seeds can be removed from the samara, and then given 3 months cold moist storage. Expect a low germination rate, it is stated that only about 10% of the samaras within the aggregate are viable. Due to the low germination rate, recommendations are to seed heavily in trays or field plots for later transplanting. If planting into field plots, seed as soon as seed is collected from the tree, and allow seeds to undergo a natural stratification process.
Washington hawthorn (*Crataegus phaenopyrum*)	Collect seeds September through October. Remove seed from fruit. Seeds should be dried than cold stratified until spring, or sewn in winter and protected.

COMPREHENSIVE LIST OF SCOOP SPECIES

Species (Scientific Name)	**Potential stratification, scarification methods & other notes**
white oaks (*Quercus sp.*)	See notes from red oak group above. White Oak Group: Ex. white oak, swamp white oak, chikapin oak, bur oak, chestnut oak Treat these the same as red oaks up to the point of storing them; this is because this group does not need to be stratified before germinating. Store the acorns in plastic containers filled with moist vermiculite, ensuring to place the acorns on their sides at one side of the container with their pointed ends toward the other end. Leave room to accommodate the radicals when they emerge, as they can grow to 4 or 5 inches in some species. When potting up, acorns must be removed gently from the container to avoid damaging the radicals. The white oak group can emerge at any point after collection and storage.
winterberry holly (*Ilex verticillata*)	Harvest seeds August-September. Remove pulp as soon as possible either by hand, blender, or sieve. Let seeds dry for one week before stratifying them. Warm moist stratification in perlite or vermiculite for 60 days followed by cold moist stratification for 60 days. Cold store until planting.
witch-hazel (*Hamamelis virginiana*)	Collected seeds in September and October before the pods split open. Cold stratify for 120-180 days.

RESOURCES/ CONTACTS

Be sure to check out our website for more resources and information on the PA SCoop program and other forestry opportunities:

allianceforthebay.org/project/pennsylvania-seedling-cooperative/

Volunteers make this program a success!