

## Propagation Protocols

### Plants Produced for Apostle Islands National Lakeshore



Various restoration projects at  
Apostle Islands National  
Lakeshore.

Photographs courtesy of Apostle Islands National  
Lakeshore staff

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## **Introduction:**

The Natural Resources Conservation Service Rose Lake Plant Materials Center has worked in partnership with the National Parks Service to propagate plants for restoration projects at the Apostle Islands National Lakeshore in Lake Superior. Since 2000 the Plant Materials Center has propagated and delivered 30 different plant species to Apostle Islands National Lakeshore. The following are propagation protocols for those plants. They are a summary of techniques used to propagate plants from source materials supplied by Apostle Islands. This information should have applicability to plant materials collected from other geographic areas as well.

Techniques described in this document are what provided the best germination for each species based on propagation experiments and experiences of the Plant Materials Center staff. There are additional propagation techniques reported in scientific and popular literature for many of the species propagated, but the ones reported in this document produced the best results in trials conducted at the Plant Materials Center. Propagation success varied from year to year based on seed viability.

## **General Procedures:**

Plants propagated by the Rose Lake Plant Materials Center were grown under greenhouse conditions. Seeds were typically planted in December – March of each year, depending on the species and availability of greenhouse space. Vegetative material was placed in pots, flats, or other containers within 7 days of receipt. Plants were either kept in the greenhouse or placed in cold storage throughout the winter. Target temperature range for plant growth in the greenhouse was 50°F (10°C) to 80°F (26°C). Supplemental light was provided based on conditions inside the greenhouse.

Plants were transferred to an outdoor shade house for at least 14 days before shipment to give plants time to acclimate to outdoor conditions before being transplanted in the field.

Planting media used for propagation was a peat-based “soil-less” media. Several compositions were used over the course of the project but all had peat and perlite. Some products had coir fiber as well.

Plants were watered and fertilized several times throughout the day depending on the growth stage of the plants and environmental conditions in the greenhouse. Fertilizer was injected into irrigation water. Fertilizer was applied to deliver 100 – 200 ppm nitrogen. Phosphorus and potassium levels varied depending on the formulation of the fertilizer product used.

Seeds requiring scarification with sulfuric acid were placed in a container of concentrated (92%) sulfuric acid for the amount of time stated on the protocol. Seeds were removed from sulfuric acid and rinsed thoroughly with water before further handling.

Seeds requiring stratification were placed in a porous cloth bag or wrapped in muslin cloth. Seeds were placed in a “zip-lock” bag containing 100% peat. Peat was moistened (but not to the point of excess water in the bag) and the bag was sealed. Bags were labeled and placed in a germination chamber or refrigerator set to the desired temperature.

Seedling emergence was recorded at regular intervals, depending on the species. Some species had nearly complete germination by 28 days after planting and some species required several months to achieve complete germination.

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## *Agrostis hyemalis*

## Red top

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads mature and turn brown.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seed from seed head by hand, with brush huller or similar machine.
- Separate seed from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is moderate (50 – 70%). Plant seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Alnus rugosa*

## Speckled alder

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when cones start to open.

### SEED MATURITY DATE:

- August - October

### SEED CLEANING METHODS:

- Allow cones to dry after harvest. If kiln drying is used set the kiln temperature no higher than 110°F (45°C). Dry cones will release most of their seeds.
- Separate seeds from cones using a hammer mill, debarker, or similar machine.
- Separate seeds from inert material with hand screens or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low to moderate (15 - 50%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 90 – 100 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep.. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Ammophila breviligulata*

## Beachgrass

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect stems and rhizomes with as much root tissue as possible.
- Collect seeds when seed heads become mature and turn brown.

### SEED MATURITY DATE:

- September – October

### SEED CLEANING METHODS:

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) with roots and rhizomes in moist paper until planted.

### PROPAGATION METHODS:

- Vegetative propagation most effective. Separate vegetative material into single or multiple stem plants with healthy root and/or rhizome material present. Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6” (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.
- Seed germination is low (3 – 7%). Plant seeds in pots at 1/8 – 1/4” (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Arctostaphylos uva-ursi*

## Bearberry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect stems with as much root tissue as possible. Collect when dormant.
- Collect stem tip cuttings of at least 3 – 4" (7 – 11 cm). Collect when dormant.
- Collect seeds when fruits become mature and turn red.

### SEED MATURITY DATE:

- July - September

### SEED CLEANING METHODS:

- Soak seeds in water until berries (stones) are soft. Separate seeds from stones by hand or in a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) with roots and rhizomes in moist paper until planted.

### PROPAGATION METHODS:

- Place stem + root material into pots so that roots are covered. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.
- Strip the bottom leaves off of stem tip cuttings. Treat cut end with 1000 ppm indole butyric acid and insert treated area in planting media. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.
- Seed germination is low (5 - 8%). Scarify seeds by soaking them in concentrated sulfuric acid for 3 – 7 hours. Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 90 days, followed by storage at 40°F (4°C) for 120 days. Plant individual seeds or entire stones in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage. Plants propagated by seed or vegetative methods exhibit slow growth and moderate mortality.

## *Artemisia campestris*

## Wild wormwood

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads mature and turn brown.

### SEED MATURITY DATE:

- September - October

### SEED CLEANING METHODS:

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is moderate (50 – 70%). Plant seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Asclepias syriaca*

## Common milkweed

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed pods mature and turn brown.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from seed pods by hand, with brush huller or similar machine. Removal of fluffy appendages from seed is beneficial.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is high (>70%). Plant seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Calamagrostis canadensis*

## Canada bluejoint

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads mature and turn brown.

### SEED MATURITY DATE:

- July - August

### SEED CLEANING METHODS:

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is high (>70%). Plant seeds in pots at  $\frac{1}{8}$  –  $\frac{1}{4}$ " (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Carex pensylvanica*

## Pennsylvania sedge

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect stems and rhizomes with as much root tissue as possible.
- Collect seeds when seed heads become mature and turn brown.

### SEED MATURITY DATE:

- July - August

### SEED CLEANING METHODS:

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) in moist paper until planted.

### PROPAGATION METHODS:

- Seed germination is moderate (34 – 45%). Stratify seeds by placing them in moist peat and store at 40°F (4°C) for 90 days. Plant seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall.
- Vegetative propagation is effective. Separate vegetative material into small clumps of one to five shoots with healthy rhizome and root tissue. Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

*Cornus canadensis*

Canada dogwood/bunchberry

TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits become mature and turn orange or red.

SEED MATURITY DATE:

- August - September

SEED CLEANING METHODS:

- Separate seeds from berries by hand or with a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

PROPAGATION METHODS:

- Seed germination is low (10 – 20%). Scarify seeds by soaking them in concentrated sulfuric acid for 30 – 60 minutes. Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 90 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.
- NOTE: Canada dogwood prefers full shade. Plants do not survive in full sun. Canada dogwood plants prefer acidic soil conditions and cool soil temperatures.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage. Place in areas of full shade and acidic soil conditions.

## *Cornus sericea*

## Redosier dogwood

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when berries are mature and turn white.
- Collect hardwood cuttings 6 – 8” (15 – 20 cm) long, ¼ - ½” (0.6 – 1.2 cm) diameter after leaves fall from the stem.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) in moist paper until planted.

### PROPAGATION METHODS:

- The underground end of vegetative material should be treated with rooting hormone (500ppm indole butyric acid) and placed in PEAT + SAND medium so that at least two nodes are below the soil surface. Keep in greenhouse until root system has filled the pot.
- Seed germination is low (10 – 20%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 120 days. Plant individual seeds in pots at ⅛ – ¼” (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## ***Danthonia spicata***

## **Poverty oatgrass**

### **TYPE OF MATERIAL COLLECTED FOR PROPAGATION:**

- Collect seeds when seed heads becomes mature. Collect seed from the upper and lower parts of the plant.

### **SEED MATURITY DATE:**

- July - August

### **SEED CLEANING METHODS:**

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### **STORAGE REQUIREMENTS:**

- Store seeds at 40°F (4°C) at 40% relative humidity.

### **PROPAGATION METHODS:**

- Seed germination is low (28 - 35%). Plant seeds in pots at  $\frac{1}{8}$  –  $\frac{1}{4}$ " (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Deschampsia flexuosa*

## Wavy hairgrass

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect stems and rhizomes with as much root tissue as possible.
- Collect seeds when seed heads becomes mature.

### SEED MATURITY DATE:

- September – October

### SEED CLEANING METHODS:

- Separate seeds from seed heads by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) with roots and rhizomes in moist paper until planted.

### PROPAGATION METHODS:

- Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and grow to 3 – 6" (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot.
- Seed germination is high (72 – 83%). Plant seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system as filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Elymus canadensis*

## Canada wildrye

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads become mature and turn brown.

### SEED MATURITY DATE:

- July - September

### SEED CLEANING METHODS:

- Separate seeds by hand, with debearder, brush huller or similar machine.  
CAUTION – Seeds can be damaged by excessive debearding or using large mesh mantles in brush huller.
- Separate seeds from inert material by hand screens or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is high (70 – 90%). Plant seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Epilobium angustifolium*

## Fireweed

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed capsules mature and turn brown. Seeds have fluffy white appendages.
- Collect rhizomes with healthy root tissue in autumn or spring.

### SEED MATURITY DATE:

- August - October

### SEED CLEANING METHODS:

- Separate seeds from capsules by hand, with brush huller or similar machine. It is not necessary to remove fluffy appendages from seed.
- NOTE: Seeds lose viability after 24 months of storage.
- Separate seeds from inert material by hand screening or fanning mill. Fluffy appendages on seed may make separation of seed from inert material difficult.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) in moist paper until planted.

### PROPAGATION METHODS:

- Seed germination is moderate (50-70%). Plant seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.
- Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

***Fragaria virginiana***

**Wild strawberry**

**TYPE OF MATERIAL COLLECTED FOR PROPAGATION:**

- Collect plants or rooted stolons in autumn.

**SEED MATURITY DATE:** N/A. Wild strawberry commonly propagated vegetatively.

**SEED CLEANING METHODS:** N/A.

**STORAGE REQUIREMENTS:**

- Store vegetative material at 40°F (4°C) in moist paper until planted.

**PROPAGATION METHODS:**

- Plant vegetative material into pots or flats so that roots are covered. Plants can be separated and replanted when new stolons develop roots at the node. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs in May or June when there is minimal danger of frost damage.

## *Geum aleppicum*

## Yellow avens

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads mature and turn brown.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from seed head by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low to moderate (30 - 50%). Plant seeds in pots at  $\frac{1}{8}$  –  $\frac{1}{4}$ " (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Juniperus communis*

## Common juniper

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits become dark blue and are 2-yr old. Two year old berries are distinguishable from 1-yr old berries in that 1-yr old berries have a powder blue bloom and are hard in consistency.

### SEED MATURITY DATE:

- September - October

### SEED CLEANING METHODS:

- Soften berries by them in a 1% lye solution for 48 hours, rinsing in fresh water. Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 4°C at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (5 – 20%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 90 - 120 days followed by storage at 85°F (30°C) for 180 days. Store at 40°F (4°C) for an additional 60 – 90 days. Plant individual seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot. Plants may not be ready to transplant until the second year after seedling emergence.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Lathyrus japonicus*

## Beach pea

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when pods are mature and turn tan or brown. Seed pods can split open so harvest timing is important.

### SEED MATURITY DATE:

- July - September

### SEED CLEANING METHODS:

- Separate seeds from seed head by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (5 - 20%). Coat seeds with an inoculant appropriate for *Lathyrus* species (consult inoculant manufactures for recommended strains). Plant seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. No scarification or stratification of seeds is required. Scientific literature described scarification with sulfuric acid to improve germination. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Maianthemum canadense*

## Canada mayflower

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits become mature and turn light red.
- Collect rooted rhizomes in autumn or spring.

### SEED MATURITY DATE:

- July - September

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) in moist paper until planted.

### PROPAGATION METHODS:

- Seed germination is low (5 – 30%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) conditions for 60 - 90 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and have a fully expanded leaf. Keep in greenhouse until root system has filled the pot. Plants may not be ready to transplant until the second year after seedling emergence.
- Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Plants can be separated and replanted when new shoots emerge and have a fully expanded leaf. Keep in greenhouse until root system has filled the pot.
- NOTE: Canada mayflower is shade tolerant and is adapted to a wide range of shade conditions.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Oenothera sp.*

## Evening primrose

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed capsules mature.

### SEED MATURITY DATE:

- July - September

### SEED CLEANING METHODS:

- Separate seeds from capsules by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is moderate (50-70%). Plant seeds in pots at  $\frac{1}{8}$  –  $\frac{1}{4}$ " (0.3 – 0.6 cm) deep. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Prunus pensylvanica*

## Pin cherry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits are mature and turn red.

### SEED MATURITY DATE:

- July - August

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (15 - 20%). Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 60 days followed by storage at 40°F (4°C) for 90 days. Plant individual seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## ***Prunus pumila***

## **Sand cherry**

### **TYPE OF MATERIAL COLLECTED FOR PROPAGATION:**

- Collect seeds when fruits are mature and turn black.

### **SEED MATURITY DATE:**

- July - August

### **SEED CLEANING METHODS:**

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### **STORAGE REQUIREMENTS:**

- Store seeds at 40°F (4°C) at 40% relative humidity.

### **PROPAGATION METHODS:**

- Seed germination is moderate to high (45 - 85%). Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 60 days followed by storage at 40°F (4°C) for 90 days. Plant individual seeds in pots at 1/8 - 1/4" (0.3 - 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## ***Rosa blanda***

## **Wild rose**

### **TYPE OF MATERIAL COLLECTED FOR PROPAGATION:**

- Collect seeds when fruits (hips) change from a dark green color to a reddish color. Fruits collected shortly after ripening may germinate more readily than those allowed to dry in the hip.

### **SEED MATURITY DATE:**

- Throughout the summer.

### **SEED CLEANING METHODS:**

- Separate seeds from hips by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### **STORAGE REQUIREMENTS:**

- Store seeds at 40°F (4°C) at 40% relative humidity.

### **PROPAGATION METHODS:**

- Seed germination is low to moderate (10 – 60%). Scarify seeds by soaking them in concentrated sulfuric acid for 120 minutes. Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 120 days. Plant individual seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Rubus allegheniensis*

## Blackberry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits become mature and turn dark purple or black.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (10 – 20%). Scarify seeds by soaking them in concentrated sulfuric acid for 60 minutes. Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 90 days followed by storage at 40°F (4°C) for 120 days. Plant individual seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

***Rubus idaeus ssp. strigosus***

**Wild red raspberry**

**TYPE OF MATERIAL COLLECTED FOR PROPAGATION:**

- Collect seeds when fruits are mature and turn light red.

**SEED MATURITY DATE:**

- July - August

**SEED CLEANING METHODS:**

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

**STORAGE REQUIREMENTS:**

- Store seeds at 40°F (4°C) at 40% relative humidity.

**PROPAGATION METHODS:**

- Seed germination is low (5 – 25%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 120 days. Plant individual seeds in pots at 1/8 – 1/4“ (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Rubus parviflorus*

## Thimbleberry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when berries mature and turn red.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (15 - 25%). Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 90 days followed by storage at 40°F (4°C) for 90 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Sambucus pubens*

## Red elderberry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits are mature and turn red.

### SEED MATURITY DATE:

- August - September

### SEED CLEANING METHODS:

- Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low to moderate (20 – 50%). Stratify seeds by placing them in moist peat and storing at 85°F (30°C) for 90 - 100 days followed by storage at 40°F (4°C) for 90 - 100 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot. Plants may not be ready to transplant until the second year after seedling emergence.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Solidago canadensis*

## Canada goldenrod

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when seed heads are mature and turn brown. Seed production and viability is low so it is necessary to collect a large number of seed heads.

### SEED MATURITY DATE:

- August - October

### SEED CLEANING METHODS:

- Separate seeds from seed head by hand, with brush huller or similar machine.
- Separate seeds from inert material by hand screening or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.

### PROPAGATION METHODS:

- Seed germination is low (5 - 20%). Plant seeds in pots or flats **AT THE SOIL SURFACE**. Warm soil temperatures [72 – 75°F (22 - 24°C)] will improve germination. Use peat-based planting media. No pre-treatment of seeds is required. Keep in greenhouse until root system has filled the pot.

**RE-ESTABLISHMENT TECHNIQUES:** Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage.

## *Thuja occidentalis*

## Eastern white cedar

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when cones are mature and start to open. The period between cone ripening and the start of cone opening is 7 – 10 days.

### SEED MATURITY DATE:

- September – October

### SEED CLEANING METHODS:

- Allow cones to dry after harvest. If kiln drying is used set the kiln temperature no higher than 110°F (45°C). Dry cones will release most of their seeds.
- Separate seeds from cones using a hammer mill, debarker, or similar machine.
- Separate seeds from inert material with hand screens or fanning mill.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Do not store in sealed plastic. Store in mesh, cloth or paper bag.

### PROPAGATION METHODS:

- Seed germination is low to moderate (40 – 60%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) conditions for 60 days. Plant individual seeds in pots at 1/8 – 1/4" (0.3 – 0.6 cm) deep. Use peat-based planting media. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage. Seedlings must be protected against deer browse.

## *Vaccinium angustifolium*

## Low bush blueberry

### TYPE OF MATERIAL COLLECTED FOR PROPAGATION:

- Collect seeds when fruits are mature and turn bright blue.
- Collect rhizomes with healthy root tissue in autumn or spring.

### SEED MATURITY DATE:

- July – September

### SEED CLEANING METHODS:

- Store blueberry fruit at 50°F (10°C) for 2 – 7 days after harvest. Separate seeds from berries by hand or using a macerator.
- Separate seeds from inert material by floating inert material away from seeds with water. Discard seeds that float. Potentially viable seeds will sink in water. Allow seeds to dry before placing in storage.

### STORAGE REQUIREMENTS:

- Store seeds at 40°F (4°C) at 40% relative humidity.
- Store vegetative material at 40°F (4°C) in moist paper until planted.

### PROPAGATION METHODS:

- Seed germination is low (5-30%). Stratify seeds by placing them in moist peat and storing at 40°F (4°C) for 90 - 120 days. Plant seeds in flats placing seeds ON THE SOIL SURFACE. Cover flats with plastic film. Use acidic fertilizer to reduce soil pH. Target pH should be 4.0 – 5.5. Use peat-based planting media. Transplant seedlings into pots after shoots are 3 – 6” (7.5 – 15 cm) tall. Keep in greenhouse until root system has filled the pot. Plants may not be ready to transplant until the second year after seedling emergence.
- Plant vegetative material into pots so that roots and rhizomes are covered. Use peat-based planting media. Use acidic fertilizer to reduce soil pH. Target pH should be 4.0 – 5.5. Keep in greenhouse until root system has filled the pot.

RE-ESTABLISHMENT TECHNIQUES: Transplant rooted plugs or seedlings in May or June when there is minimal danger of frost damage. Plant in areas with low soil pH.