Oxbow Farm & Conservation Center JASON AZIZIAN, PRODUCTION TECHNICIAN

Propagation Protocols for Ericaceae Species:

Best practices for establishing native forest understory plants from seed

Rhododendron macrophyllum

SEED HARVESTING, PROCESSING, AND SOWING:

Cleaned seeds are stored in a refrigerator at 40 degrees F and 60% humidity until the desired sow date. Seeds are sown in early-mid January. These seeds needs light to germinate, so seeds are surface sown into 7 ci cones at a density of about 4 seeds per cell, or 0.3 grams per tray (98 cones). Cones are filled with sphagnum peat moss and water thoroughly before sowing. Do not overfill cones with peat, as to leave space for the seeds settle and prevent accidental displacement from wind or remay fabric cover. Once seeds are surface sown, mist in and placed under remay cover. Check once a week to record germination rate and mist with water when appropriate. Germination begins in the middle of March of the same year. In 2025, Oxbow recorded 99% germination of our *Rhododendron macrophyllum* cones.

TRANSPLANTING/UP-POTTING:

Seedlings take a year or more to establish in 7 ci cones before transplanting up into larger sizes. Oxbow's *Rhododendron macrophyllum* mature for two years before transplanting to enable low to no transplanting die off. The 7 ci cones are up-potted to large band pots, where they remain for another year or two to establish and harden off. The potting media remains to be just sphagnum peat moss. *Rhododendron macrophyllum* do well in acidic growing media that retains water for a long period of time, as they do not take well to drying-down, so peat moss is a great media for them to grow in. This species root system is fibrous, fragile, and very slow to establish. During any transplanting stage, disturb roots as little as possible. To minimize damage, cut the tip of the cone if necessary and gently loosen the roots with your fingers to encourage outward growth.

MAINTENANCE:

Oxbow's *Rhododendron macrophyllum* thrive where they have consistent shade cover throughout the year. *Rhododendron macrophyllum* is a relatively low maintenance species. Remove any leaf browning or blight throughout the year. When watering, avoid getting water on their foliage. It is important to keep the peat in their pots moist consistently. If they dry down too much, their leaves can wilt and get damaged.

During the growing season, give *Rhododendron macrophyllum* pots and cones liquid fertilizer, fish and guano, every other week, being careful not to get fertilizer or water on their leaves. Fertilizer is diluted to 1 cup of liquid fish and guano to 16 gallons of water. This species doesn't tolerate slow-release fertilizer well.

Vaccinium membranaceum

SEED HARVESTING, PROCESSING, AND SOWING:

Berries are harvested in late summer and can stored in a refrigerator at 40 degrees F and 60% humidity for a few days prior to processing, though it is best to process them as soon as possible to prevent mold development. When ready to process, submerge the berries in water in a food processor. Use dulled blades (Plasti Dip) to avoid damaging the seeds. Blend repeatedly to separate seeds from fruit pulp, adding water to increase the space between sinking seeds and floating debris. Pour off the debris and repeat this process until little to no fruit material remains.

Cleaned seeds are dried for 24 hours using a heatless, low-power fan. Spread seeds between mesh screens to allow for even airflow. Once fully dry, use a flat tray to winnow remaining debris. Break apart dried fruit material and gently blow air across the tray while angling it so the heavier seeds fall toward you and lighter debris is blown away. Repeat until seeds are sufficiently clean. While small amounts of debris will not prevent germination, excess organic matter increases the likelihood of mold during storage.

Cleaned seeds are stored in labeled plastic bags with a silica gel packet and placed in a refrigerator at 40 degrees F and 60% humidity until the desired sow date. Seeds processed in late summer are held in cold storage until late October or early November.

For sowing, prepare flat trays filled with moist sphagnum peat moss. To ensure even distribution, mix seeds with one tablespoon of sand for distribution when sowing. Sow approximately 0.25 grams of seed per tray. Seeds require light to germinate and should be surface sown. Mist seeds in using a fine spray and place trays under cover for pest protection. Check trays weekly to monitor moisture and germination. Germination begins in early spring. In 2025, Oxbow recorded approximately 40% germination for *Vaccinium membranaceum* trays. Once germination slows, cover exposed media with chicken grit to prevent moss and algae growth.

TRANSPLANTING/UP-POTTING:

Vacciniums are slow-growing species and can remain in their original flat trays for multiple years without becoming root bound. This extended tray time allows delayed seeds to germinate, increasing overall plant yield. Transplanting should only occur once seedlings have developed substantial root systems.

When ready to transplant, prepare racks of 7 ci cones by filling them with sphagnum peat moss and thoroughly hydrating the media. To remove seedlings from the flat tray, flip the tray over while supporting the peat and plants with one hand. Minimize root disturbance during division, as slow-growing species recover poorly from excessive root damage. For easier handling, divide the tray into smaller sections before separating individual plants. While holding a section of peat and seedlings in one hand, gently separate the most accessible plants using a slow, circular motion to ease roots apart.

Once a seedling with a well-developed root system is separated, create a planting hole in the prepared 7 ci cone using a spatula or similar tool. Guide the roots downward into the hole and firm the media gently around the plant. After all cones are planted, water thoroughly. Vaccinium seedlings may remain in 7 ci cones for several years.

After plants are fully established and hardened off in 7 ci cones, they can be up-potted incrementally. At Oxbow, seedlings are moved next into 19 ci cones and later into large band pots. Gradual increases in pot size

are critical, as sudden transitions to oversized containers increase the risk of root rot, a common cause of mortality in nursery-grown huckleberries. During any transplanting stage, disturb roots as little as possible. To minimize damage, cut the tip of the cone if necessary and gently loosen the roots with your fingers to encourage outward growth.

At the 7 ci to 19 ci transition, the growing media is changed. Oxbow uses a custom bark-based mix consisting of 5 cubic feet of western red cedar fine bark mulch, 1.5 pounds of 16-4-8 Sustane fertilizer (or 540 grams of 8-2-4 Nutririch fertilizer), and 232 ounces of compost. Seedlings are transplanted directly into this mix and watered thoroughly to settle the media.

MAINTENANCE:

Huckleberry species in our nursery, with the exception of Vaccinium ovatum, are grown in the shaded understory section of the greenhouse. During the germination stage in flat trays, consistent moisture is critical. Trays should be checked weekly and watered with a fine mist hose head whenever the surface of the peat moss begins to dry. Once seedlings are established and there is no longer a risk of seeds splashing out, watering can transition to a regular hose head.

Routine maintenance of flat trays includes monitoring for pests and pathogens. Trays should be inspected regularly for botrytis and powdery mildew. Remove any affected foliage promptly and increase airflow between plants whenever possible to reduce disease pressure. Caterpillars are also a common pest. Signs of herbivory include chewed leaves and folded foliage where insects shelter. Remove and discard affected leaves as they are found.

During establishment in 7 cubic inch cones, careful moisture management remains essential. When the surface peat appears dry, perform a weight test and inspect a few cones to determine whether irrigation is needed. *Vaccinium membranaceum* does not tolerate drying down and requires consistently moist media.

For deciduous Vaccinium species, manual leaf removal is conducted annually in late autumn, regardless of pot size. Removing foliage improves plant appearance, reduces overwintering pathogens, and helps prevent botrytis infection during the wet season. Corrective pruning is also performed as shrubs mature and are transitioned into larger pot sizes.

Fertilization practices vary by container size. Plants in 1-gallon pots receive one tablespoon of 16-4-8 slow-release fertilizer applied as a top dressing twice per year. Plants in smaller containers, including flat trays and 7 ci cones receive organic liquid fertilizer (fish and guano) every other week during the growing season. Fertilizer is diluted to 1 cup of liquid fish and guano to 16 gallons of water.

Gaultheria shallon

SEED HARVESTING, PROCESSING, AND SOWING:

Oxbow collects *Gaultheria shallon* berries from our nursery plants, and on site in our uplands area, starting in August and ending around October. The protocol for processing salal berries is identical to how we process huckleberries. Please refer to the instructions in the *Vaccinium membranaceum* section for details on how Oxbow processes and stores wet seeds. After cleaning and storing, the seeds are taken from our temperature-controlled seed storage, a refrigerator, and sown right away. Our sow date was in late October. This species needs light for their seeds to germinate as well, so these seeds are surface sown into 7 ci cones, aiming for about 4 seeds per cell, or 0.15 grams per tray (98 cones). Cones are filled with sphagnum peat moss, leaving some room at the top, so the seeds are protected from wind or reemay fabric, and are watered thoroughly before sowing. Once seeds are placed on the surface, they are misted in and placed under reemay where they will be checked once a week to record germination rate, and to get misted in with water when appropriate. In our experience, germination began taking off in the middle of January of the same year. This past year, Oxbow recorded 98% germination of our *Gaultheria shallon* cones.

Gaultheria shallon berries are collected August through October. Seed processing follows the same wet-seed protocol used for huckleberries. Refer to the *Vaccinium membranaceum* section for full details on seed cleaning, drying, and cold storage procedures.

After cleaning, seeds are stored in a refrigerator at approximately 40 degrees F and 60% humidity until sowing. Seeds are sown in late October.

Seeds require light to germinate and are surface sown into 7 cubic inch cones at a density of approximately four seeds per cell, or 0.15 grams per tray (98 cones). Cones are filled with sphagnum peat moss, leaving space at the top to protect seeds from displacement by wind or remay fabric. Media is thoroughly watered prior to sowing. After seeds are sown, they are misted in and placed under remay cover. Cones are checked weekly to monitor moisture and record germination. Germination typically accelerates in mid-January. In 2025, Oxbow recorded 98% germination in *Gaultheria shallon* cones.

TRANSPLANTING/UP-POTTING:

Seedlings typically require more than one year to establish in 7 ci cones before transplanting. *Gaultheria shallon* is a slow-growing species and may remain in 7 ci cones for multiple years while developing a strong root system. Once established, plants are up-potted into 19 ci cones, where they remain for an additional one to two years to harden off.

At the 7 ci to 19 ci transition, the growing media is changed to Oxbow's bark-based mix (see the *Vaccinium membranaceum* transplanting section for the full media recipe). After establishment in 19 ci cones, plants are transplanted into 1-gallon pots.

Because this species develops a relatively fine and slow-growing root system, root disturbance should be minimized during transplanting. To reduce damage, cut the tip of the cone if needed and gently loosen roots by hand to encourage outward growth without tearing the root mass.

MAINTENANCE:

Gaultheria shallon is grown in consistent year-round shade. Routine maintenance includes monitoring for foliar disease and removing damaged or infected leaves as needed. Leaf spotting and minor blight may occur and can be managed through sanitation pruning.

Powdery mildew presents the greatest challenge during summer and fall and may require removal of affected foliage. During the winter months, attention shifts to botrytis prevention, particularly due to dense foliage and reduced airflow. Increasing air circulation and removing excess foliage helps reduce disease pressure.

Moisture management is important throughout production. Media should remain consistently moist but not saturated. Unlike huckleberries, *Gaultheria shallon* tolerates brief dry periods and may benefit from slight drying between irrigations. Allow the media to dry moderately, then irrigate thoroughly before visible signs of water stress occur. Indicators of water stress include leaf wilting or desiccation. When irrigating, avoid excessive wetting of foliage to reduce disease incidence.

Fertilization varies by container size. Plants in 1-gallon pots receive one tablespoon of 16-4-8 slow-release fertilizer applied as a top dressing twice annually. Plants in 7 ci cones receive organic liquid fertilizer (fish and guano) every other week during the growing season, following the same concentration protocol used in Rhododendron production. Corrective pruning is conducted as plants mature and transition into larger container sizes.