CENTRE FOR BOREAL RESEARCH
TECHNICAL NOTE #29
PLANT AND SEED TECHNOLOGIES - NOVEMBER 2019

Greenhouse Propagation of Endemic North American Reed Grass (*Phragmites australis americanus*)

INTRODUCTION

Reed grass (*Phragmites australis*) is a 1.5 to 5 m tall perennial grass commonly found in riparian areas and along the edges of wetlands. The species establishes quickly over disturbed landscapes and has a high tolerance for growing in areas with elevated salinity or heavy metal contamination. The ability to grow in harsh conditions makes in-situ phytoremediation with common reed grass beds a promising technique to dewater contaminated wet soils. Dewatering soils prior to remediation can significantly reduce reclamation costs.

Two species of reed grass are commonly found in Alberta: the endemic North American reeds (*P. australis americanus*)(Figure 1) and introduced common reed (*P. australis australis*). The endemic species grows harmoniously with other boreal plant species, while the introduced lineage is vigorously invasive: it is considered a weed in Alberta and propagation is not permitted.

HARVESTING CHALLENGES

- DNA testing is the only way to guarantee the correct identification of endemic vs. introduced *Phragmites*. Physiological indications, such as leaf shape and stem colour, are subjective to maturity, environmental and seasonal differences.
- Once the endemic species is confirmed through DNA testing, there is minimal information about optimal harvesting, handling, and greenhouse production methods.

Phragmites is recognizable with its plume-like inflorescence and creeping rhizomes. The NAIT Centre for Boreal Research harvested wild North American reeds (*P. australis americanus*) inflorescence and rhizomes, confirmed the species with DNA testing, and trialed 3 different greenhouse production methods for use in reclamation activities (Figure 2). The propagation methods outlined in this technical note are: seed, field rhizomes, and greenhouse rhizome cuttings.

Figure 1. North American reed grass (*P. australis americanus*).

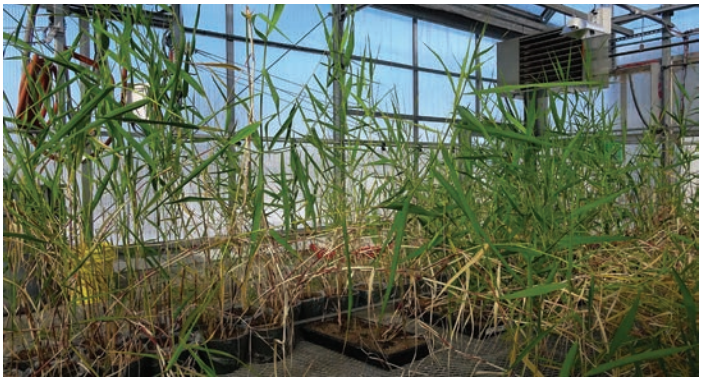

Figure 2. *P. australis americanus* grown in the greenhouse at the Centre for Boreal Research.

MATERIALS

FIELD HARVESTING

- Hip waders
- Pruning shears
- Paper bags
- Coolers and ice packs
- Shovel (for rhizome collection)

SEED PREPARATION AND STORING

- Drying screens
- Vacuum
- Stacked soil sieves (Figure 3)
- Column blower (Agriculex Inc. CB-2A) (Figure 4)
- Drying oven
- Scale (4 digits)
- Freezer
- Petri dishes
- Parafilm™

Note: sieve sizes will vary according to seed lot. Stack to allow seed to fall to bottom pan.

GREENHOUSE PRODUCTION

- Substrate (milled peat)
- Styroblock® 412A (77/170 ml) and 723A (20/700 ml)
- Round plastic container, 18 cm i.d. and 14 cm deep
- Rectangular plastic trays, 25 cm x 25 cm x 6 cm and 55 cm x 37 cm x 6 cm (L x W x H)
- Horticultural grit

Figure 3. Seed propagules in stacked soil sieves.

Figure 4. Column blower.

METHODS

SEED PROPAGULES

SEED HARVESTING

Seed was collected from approximately 30 individual plants. Pruning shears were used to clip off the inflorescence (the complete spike of the plant)(Figure 5). Clippings were transported in paper bags, and kept in cool and dry conditions. To ensure that seed was collected from the endemic North American reeds (*P. australis americanus*) field samples of the green leaf part of the plant were collected and sent for DNA analysis before propagule preparation.

SEED PREPARATION AND GREENHOUSE PRODUCTION

1. Air dry inflorescence on screens in a cool and dark location, allowing approximately 2 weeks for the palea and lemma to open and expose the pappus and the seed (will look "fluffed up").
2. Extract seed with a vacuum (Figure 6).
3. Place extracted materials in soil sieves to separate pappus and seed (Figure 7).
4. Pass seed through a column blower to remove light debris.
5. Test seed moisture content according to Alberta Seed Testing Standard (2016).
6. Store in freezer at -20˚C until ready for greenhouse planting.
7. Seed stratification trial used in this study: wet filter paper in a petri dish sealed with Parafilm™.
8. Plant germinated seed in Styroblocks® with a heavy watering regime to keep the substrate damp. For seedlots with less than 10% germination, sow 10 to 15 seeds per cavity.

Figure 5. Clipped North American reed (*P. australis americanus*) inflorescence on a paper bag.

Figure 6. Vacuum nozzle (right) used to extract pappus from the stem.

Figure 7. Separated seed in the bottom soil sieve pan.

METHODS

RHIZOME PROPAGULES

RHIZOME HARVESTING

Rhizomes from 10 individual plants were collected with shovels from the field.

They were collected according to visual length observations:

- **Short rhizomes:** approximately 15 to 20 cm roots with new shoots growing close to the stem (Figure 8).
- **Long rhizomes:** approximately 30 to 45 cm roots with colonizing new shoots spreading away from the stem (Figure 9).

Stored and transported in coolers filled with water kept at a cool temperature with the addition of ice packs.

RHIZOME PREPARATION AND GREENHOUSE PRODUCTION

To ensure adequate greenhouse container size for the field established roots, rhizomes were divided into two groups based on length. Short rhizomes were planted into round containers and long rhizomes were planted into the rectangular trays. One rhizome was planted per pot.

GREENHOUSE CUTTINGS

Rhizomes which start to form a small shoot at the node (Figures 10 and 11) can be transplanted (Figure 12). If transplanting, cut the shoot when it is approximately 2 cm long, leaving 1 cm above and below the node. Longer shoots can be transplanted if there is not too much leaf area. The far-left transplant in figure 12 is the maximum recommended leaf area (if the leaf transpiration is greater than root establishment there is increased mortality). Alternatively, the plant can be layered (new rhizome placed over new container) before clipping.

Figure 8. Short rhizomes with a new shoot (centre) growing close to established stems.

Figure 9. Long rhizomes with a new colonizing shoot (bottom centre) growing away from established stems (top centre).

Figure 10. Shoot starting to form at the node, not yet ready to transplant.

Figure 11. Shoot cut 1 cm above and below the node, and ready to transplant.

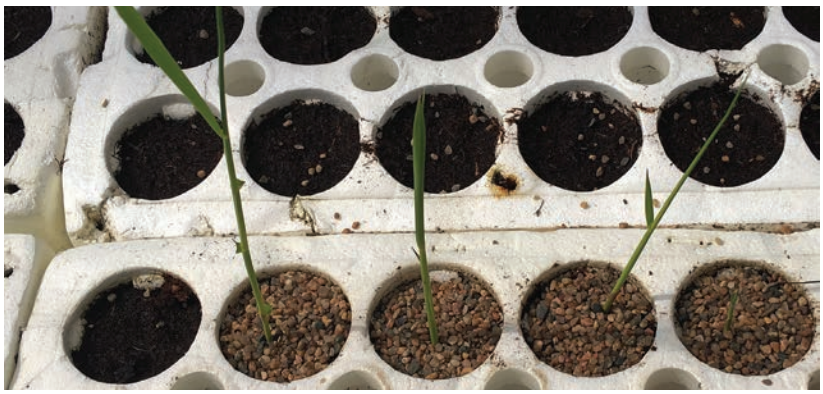

Figure 12. Transplanted shoots.

RESULTS

HARVESTING PROPAGULES

Results from DNA testing confirmed that collected propagule were North American reeds (*P. australis americanus*). The species appeared to prefer a habitat with shallow standing water, sheltered from strong winds.

The collection and storage methods were successful for rhizome material but not for seed. The inflorescence did not open before extraction, resulting in poor seed handling.

GREENHOUSE PRODUCTION TRIALS

SEED

All seed stratification treatments had germination rates less than 10%. Germinated seed performed well and can be grown in greenhouse Styroblock® containers (approximately 75% survival). Low germination rates occurred likely because of the length of time before extraction from inflorescence, and uncertainty regarding the correct time of year for harvest. Further research is necessary to determine the feasibility of seed propagation.

RHIZOMES

All rhizomes performed well in the greenhouse, regardless of initial length (short or long). All lengths of rhizomes grew to a similar size in the greenhouse, however long rhizomes produced roots more quickly at the beginning of the trial. Results indicate that short or long rhizomes harvested from the field or greenhouse are a feasible propagation method, producing plants that can be out-planted in approximately 2 months.

LESSONS LEARNED

- Low seed germination (less than 10%) likely attributed to poor seed handling.
- Preliminary trials show harvesting the inflorescence with the stem attached induces exposed seed sooner. Future trials are required to determine if this method can improve seed handling techniques.
- Long rhizomes grown in the greenhouse can be out-planted sooner than short rhizomes.
- Styroblock® containers should be selected by budget and timeline: bigger blocks increased costs but encouraged larger rhizome growth and quicker site colonization.
- Greenhouse container substrate should be kept damp, with a recommended heavy watering regime. Applying horticultural grit retained moisture and reduced algae growth.
- Greenhouse grown North American reeds (*P. australis americanus*) are not wind firm, growing to a height of 1 to 1.5 m before falling over.
- The sections that fall over and start forming shoots can be cut (Figure 13) and transplanted, if the leaf area is not too large.

Figure 13. Three different-sized shoots from greenhouse grown *Phragmites*. The cutting furthest from the ruler had all but 1 leaf removed to reduce leaf transpiration rates.

VISIT OUR WEBSITE
nait.ca/borealresearch
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CONTACT US
boreal@nait.ca
780.648.2600

AUTHORS
Ryan O'Neill, Jean-Marie Sobze, Catherine Brown, Centre for Boreal Research, NAIT.
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