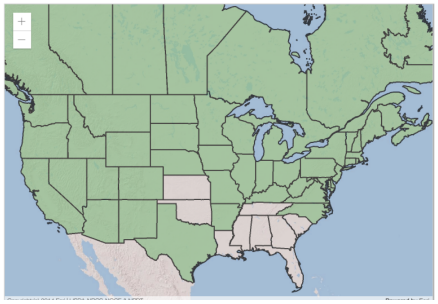
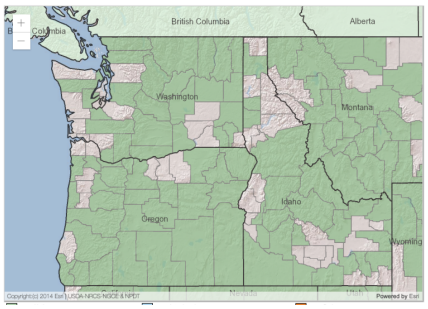
Plant Propagation Protocol for *Populus Tremuloides*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2021/*POTR5.pdf*

TAXONOMY	
Plant Family	
Scientific Name	*Salicaceae*
Common Name	Willow
Species Scientific Name	
Scientific Name	*Populus Tremuloides* Michx.
Varieties	A number of species and varieties have been described, however, none are currently recognized.
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Trembling aspen, golden aspen, mountain aspen, trembling poplar, white poplar, popple, aspen.[8]
Species Code (as per USDA Plants database)	POTR5
GENERAL INFORMATION	

Geographical range	  Distribution maps.[7] Quaking aspen is the most widely distributed tree species in North America,[5] grows north of South Carolina and Tennessee, and in all of the western states except for Oklahoma and Kansas.[5]
Ecological distribution	Quaking aspen grows on a variety of soil types, particularly sandy and gravelly slopes.[8] Good aspen soils are usually well-drained, loamy, and high in organic matter. Due to its rapid growth cycle and demand for nutrients, quaking aspen plays an important role in cycling nutrients through ecosystems.[8]
Climate and elevation range	Climatic conditions for quaking aspen vary greatly over the range of the species, especially when it comes to winter minimum temperatures and annual precipitation.[8] Depending on the location of the population the tree has different growing requirements, but in general quaking aspen occurs where annual precipitation exceeds evapotranspiration.[8]
Local habitat and abundance	Grows with a large number of different trees and shrubs due to its extensive range, however, it is a major component of three forest cover types: Aspen (Eastern Forest), Aspen (Western Forest), and White Spruce-Aspen.[8]
Plant strategy type / successional stage	A dominant species in many communities and at mid elevations. The quaking aspen is a shade-intolerant, and is quick to pioneer disturbed sites.[8] This fast-growing tree is short-lived,[8] and is gradually replaced in succession by more tolerant slower-growing species.[5]

Plant characteristics	From the Willow Family (Salicaceae), a native tree which grows 5-30 m high. However, it typically grows less than 15 m. Lateral roots can extend over 30 meters and the tree can have vertical sinker roots which can extend downwards into the ground up to 3 m. Bark is typically smooth, gray-white to greenish-white, and is often thin and peeling, which becomes thicker and more furrowed with age. Leaves are simple, deciduous, and broadly ovate to nearly round, with rounded teeth on margins.[5] One of quaking aspen's most distinguishable characteristics is that it is largely clonal, with some clones thought to be millenia old and enormous in size.[4]
PROPAGATION DETAILS: Vegetative Propagation by Root Cutting	
Propagation Goal	Plants, mother plants for cuttings
Propagation Method	Vegetative
Product Type	Container (plug)
Stock Type	N/A
Time to Grow	About a year from arrival to nursery to ready for outplanting.
Target Specifications	Tree should be about 3-5 feet tall and potted in a 1-gallon container by the end of nursery growth.
Propagule Collection Instructions	Collect cuttings in winter or early spring from healthy adult trees before the donor plant is in leaf flush and early shoot extension.[9] After the ground has thawed (if applicable) expose the roots to collect cuttings, roots taken should have a diameter of 1-3cm, and be about 30cm in length.[2]Roots collected from just beneath the soil surface to 15cm deep generate more shoots than those collected deeper in soil.[4] When harvesting root cuttings, note the distal and proximal ends of the cutting.[9] Propagules should be handled carefully and wrapped in damp paper and placed in a plastic bag for transportation, to prevent roots from drying out.[2] Under favorable conditions, aspen roots have the potential to generate a plethora of shoots.[4]
Propagule Processing/Propagule Characteristics	Root cuttings should be about 30cm in length and about 1-3cm in diameter.[2]
Pre-Planting Propagule Treatments	Seal cut ends of roots with paraffin to prevent fungal or bacterial infection during transport and storage.[4]Roots should be kept moist in transportation, and then planted as soon as possible.[2] Clean roots thoroughly under cold running water.[9]

Growing Area Preparation / Annual Practices for Perennial Crops	For rooting phase either a mist propagation bed with bottom heat maintained at 74 degrees Fahrenheit or flats under a plastic tent with a bottom heat mat.[4] For planting in containers, start with cone-tainers and gradually increase in container size until a 3 gallon container, which is what the tree will be outplanted from.[4]
Establishment Phase Details	Place root sections in mist bed or flat horizontally, and barely cover them with medium, shoots should emerge in about 2-3 weeks.[4]Usually, numerous shoots will emerge per root section.
Length of Establishment Phase	2-3 Weeks
Active Growth Phase	Using a sharp blade, cut young suckers from the root section when they are 2-3 cm tall, and treat with 2000 ppm rooting hormone.[4]Immediately place cuttings into a mist propagation bed or under a plastic tent, making sure the cuttings are shaded either way and have bottom heating.[4] Rooting can be seen in as little as 14 days if proper environmental conditions are maintained.
Length of Active Growth Phase	Approximately 2 weeks
Hardening Phase	Bottom heat should be turned off to harden cuttings off from the rooting environment prior to lifting and potting. Turning bottom heat off encourages the growth of secondary roots.[4] Medium should not be allowed to dry out during the hardening process, but misting frequency should be gradually reduced.[4]These procedures should continue over a 3-4 week period. Hardening of cuttings prior to lifting and potting is crucial for rooted aspen shoots which are herbaceous at this phase and do not recover well from transplant shock.[4]Plant cuttings with 1.0-1.5 cm of the proximal end of the root above soil level.[9] Plant into conetainers or small containers. A good growing medium should be a gritty compost composed of 50% sharp sand or grit and 50% compost.[2]
Length of Hardening Phase	3-4 Week Period
Harvesting, Storage and Shipping	The following spring, trees can be transplanted into larger containers between 1-3 gallons and are ready for outplanting at the end of the season.[4]
Length of Storage	Seedlings can be planted in spring or fall, depending on when outplanting is to occur seedlings can be stored frozen at -3 degrees Celsius until ready for outplanting.
Guidelines for Outplanting / Performance on Typical Sites	Make sure that vegetative competition is cleared from the outplanting site, especially grasses, to ensure successful outplanting of quaking aspen seedlings.[3]

Other Comments	Propagation through root cuttings is the most successful way to reproduce quaking aspen.[1]
PROPAGATION DETAILS: By Seed	
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	N/A
Time to Grow	Depending on when seeds were planted, 1 to 1 ½ years, as some storage time may be necessary before outplanting.
Target Specifications	Plants with high root:shoot ratios
Propagule Collection Instructions	Collect seeds in summer,[6] they have generally ripened in May or June.[3] Window for collection is generally between 3-5 days, and female trees should be identified and monitored during seed ripening phase. Generally catkins should be harvested when enclosed seeds are a light straw or darker tan color.[3] Do not pack catkins too tightly upon collection as they will heat up and lose viability.[3]
Propagule Processing/Propagule Characteristics	Seed viability rates are quite high, over 95%.[3] Aspen seeds can quickly lose viability (within a few weeks) when stored at room temperature so seeds should be sown or stored frozen immediately after cleaning.[3]
Pre-Planting Propagule Treatments	Aspen seeds have no dormancy and can germinate immediately, due to this fact, most seeds remain viable in the field only a few weeks even under the most favorable conditions.[3] Before sowing seeds, pre-soak them in a two molar solution of sucrose for 30 minutes.[6] Germination is triggered by moisture, which is imbibed by the seed within a few hours.[3]
Growing Area Preparation / Annual Practices for Perennial Crops	Make sure aspen seedlings will have access to lots of water and lots of light, as both are critical to their development.[3] Quaking aspen grows best in well-drained loamy soils high in organic material, growers should also make sure that soils aren't too saturated with water.[3]
Establishment Phase Details	Plant seeds in Autumn.[6] Germinated plants are very susceptible to drying, and need immediate access to light for continued development.[3] During the first year, aspen seedlings develop primarily fibrous lateral root systems with few taproots, but may also produce suckers.[3]

Length of Establishment Phase	Time required to germinate is two days, however, some seeds may germinate in as little as 12 hours.[6]
Active Growth Phase	Aspens have an indeterminate growth strategy, and typically attain a height of between 15-60 cm in the first growing season if conditions are not limiting.[3]
Length of Active Growth Phase	1-3 years depending on conditions in the nursery and when hardening begins.[8] Outside of nurseries, quaking aspen grows rapidly for the first 20 years of its life.[8]
Hardening Phase	To reduce shoot growth in aspen reduce water and nutrition availability, and shorten days for the plant. This will result in more root growth which should make the seedling more viable in outplanting.[3]
Length of Hardening Phase	About six months, until a favorable root:shoot ratio is achieved.
Harvesting, Storage and Shipping	If seedlings are to be planted in spring, they should be lifted in the late fall and then bagged and packed in wax boxes and stored frozen at -3 degrees Celsius.[3] Or plant seedlings in the spring.
Length of Storage	About six months if kept frozen from late fall to spring.
Guidelines for Outplanting / Performance on Typical Sites	Seedlings with high root:shoot ratios generally perform better in outplanting.[3]Vegetation management might be required on an outplanting site to provide newly planted aspen seedlings with less competition and more sunlight, aspen is very sensitive to competition with grasses.[3]
Other Comments	

INFORMATION SOURCES

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