

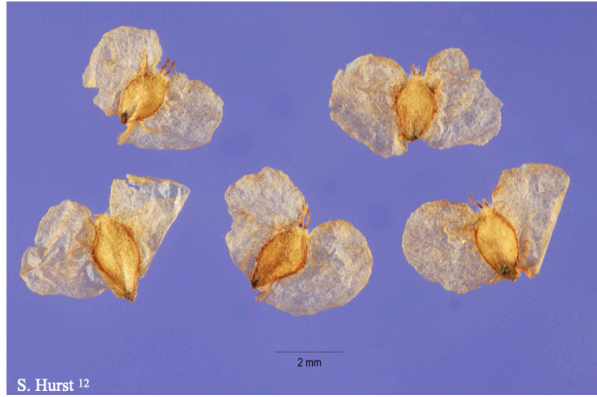
Plant Propagation Protocol for Paper Birch (*Betula papyrifera*)

ESRM 412 – Native Plant Production

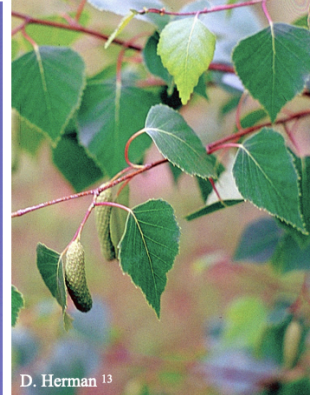
URL: <https://courses.washington.edu/esrm412/protocols/2026/BEPA.pdf>



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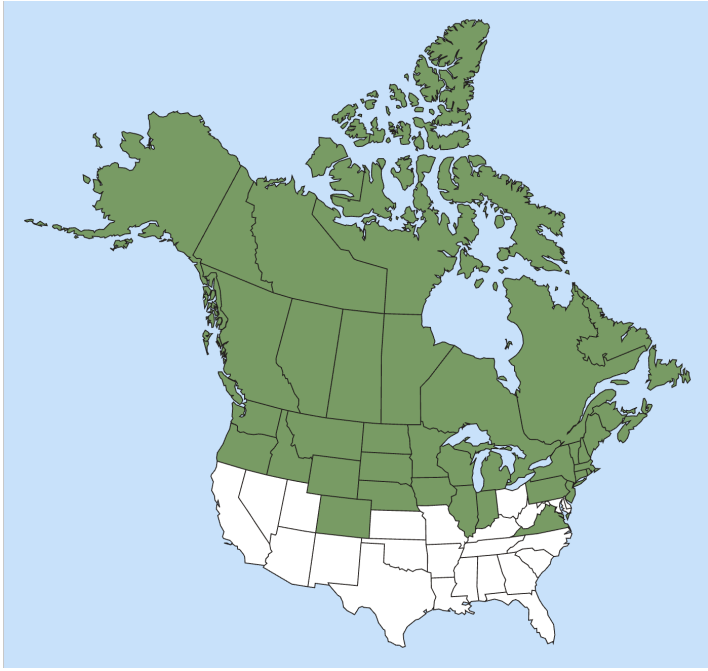



D. Herman ¹³

TAXONOMY	
Plant Family	
Scientific Name	Betulaceae
Common Name	Birch family
Scientific Names	
Scientific Name	<i>Betula papyrifera</i> Marshall
Varieties	<p><i>Betula papyrifera</i> Marshall var. <i>minor</i> (Tuck.) S. Watson & J.M. Coult.</p> <p><i>Betula papyrifera</i> Marshall var. <i>humilis</i> (Regel) Fernald & Raup</p> <p><i>Betula papyrifera</i> Marshall var. <i>neolaskana</i> (Sarg.) Raup</p> <p><i>Betula papyrifera</i> Marshall var. <i>occidentalis</i> (Hook.) Sarg.</p> <p><i>Betula papyrifera</i> Marshall var. <i>cordifolia</i> (Regel) Fernald</p> <p><i>Betula papyrifera</i> Marshall var. <i>kenaica</i> (W.H. Evans) A. Henry</p> <p><i>Betula papyrifera</i> Marshall var. <i>papyrifera</i></p> <p><i>Betula papyrifera</i> Marshall var. <i>commutata</i> (Regel) Fernald</p> <p><i>Betula papyrifera</i> Marshall var. <i>elobata</i> (Fernald) Sarg.</p> <p><i>Betula papyrifera</i> Marshall var. <i>macrostachya</i> Fernald</p> <p><i>Betula papyrifera</i> Marshall var. <i>pensilis</i> Fernald</p> <p><i>Betula papyrifera</i> Marshall var. <i>subcordata</i> (Rydb.) Sarg.</p>
Sub-species	<p><i>Betula papyrifera</i> Marshall ssp. <i>humilis</i> (Regel) Hultén</p> <p><i>Betula papyrifera</i> Marshall ssp. <i>occidentalis</i> (Hook.) Hultén</p>

Cultivar	No cultivars recognized for this species
Common Synonyms	<i>Betula neoalaskana</i> Sarg. ¹ <i>Betula cordifolia</i> Regel ¹ <i>Betula kenaica</i> W.H. Evans ¹ <i>Betula alba</i> L. var. <i>cordifolia</i> (Regel) Regel ¹ <i>Betula alba</i> L. var. <i>commutata</i> Regel ¹ <i>Betula papyracea</i> Aiton ² <i>Betula papyrifera</i> var. <i>elobata</i> (Fernald) Sargent ² <i>Betula papyrifera</i> var. <i>macrostachya</i> Fernald ² <i>Betula papyrifera</i> var. <i>pensilis</i> Fernald ² <i>Betula papyrifera</i> var. <i>subcordata</i> (Rydberg) Sargent ²
Common Names	paper birch white birch canoe birch
Species Code	BEPA

GENERAL INFORMATION

Geographical range	 <p>[2]</p>
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	 <p>[1]</p>
<p>Ecological distribution</p>	<p><i>Betula papyrifera</i> is found in mixed hardwood–conifer forests across northern North America. The species is well adapted to cool environments with moderate soil moisture and high light availability. It can grow across a wide range of soils and topographic conditions from steep rocky outcrops to flat wetlands, but achieves best growth on deep, well-drained to moderately well-drained soils.^{3,4,7}</p>
<p>Climate and elevation range</p>	<p><i>Betula papyrifera</i> can tolerate wide variation in annual precipitation. The species is well adapted to cold northern climates with short summers and long winters, even reaching the northern limit of tree growth in Alaska and Canada. In the southern portion of its range it is often found at higher elevations and cooler north-facing slopes.^{3,5}</p>
<p>Local habitat and abundance</p>	<p><i>Betula papyrifera</i> is commonly found on forest edges, lake shores, roadsides, and disturbed openings. In the Pacific Northwest region, it is frequently associated with mixed conifer forests containing <i>Pseudotsuga menziesii</i>, <i>Tsuga heterophylla</i>, <i>Abies grandis</i>, <i>Pinus contorta</i>, <i>Pinus ponderosa</i>, and <i>Thuja plicata</i>, as well as deciduous associates such as <i>Populus tremuloides</i>, <i>Populus trichocarpa</i>, <i>Acer macrophyllum</i>, and <i>Alnus rubra</i>.^{6,7}</p>
<p>Plant strategy type / successional stage</p>	<p><i>Betula papyrifera</i> is characterized as an early-seral pioneer species often forming nearly pure stands following a disturbance such as fire, avalanche or logging. The species reproduces readily</p>

	by seed and can rapidly establish dense stands following disturbance, allowing it to persist in dynamic forest systems. It is strongly shade intolerant and exhibits traits typical of fast-growing, short-lived deciduous trees in northern temperate and boreal ecosystems.
Plant characteristics	<i>Betula papyrifera</i> is a small- to medium-sized deciduous tree that typically reaches 20 m in height but may grow up to 30 m tall. Mature trees develop narrow rounded crowns and usually have single trunks, though multiple trunks may occur. The bark is distinctive, becoming creamy white to copper-brown with age and peeling in thin papery strips. Leaves are ovate with sharply serrated margins. The species produces pendulous cylindrical catkins that release winged samaras in late fall. Twigs lack the strong wintergreen odor characteristic of some other birch species. ^{2,4}
PROPAGATION DETAILS: FROM SEED	
Ecotype	Lakeshore population at Lake McDonald (approximately 1000 m elevation) in Glacier National Park, Flathead County, Montana. ⁸
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container (plug)
Stock Type	172 mL conetainer ⁸
Time to Grow	8 months ⁸
Target Specifications	Stock is typically considered suitable for outplanting when seedlings reach a stem caliper of approximately 5.5 mm at the ground line, about 20 cm of top growth, and a firm, well-formed root plug filling the container. ^{8,16}

Propagule Collection Instructions	Seeds are collected from mature trees during late September to October when catkins turn papery but remain slightly green. Because catkins disperse seed readily at maturity, branches are commonly clipped using pole pruners and collected directly into bags or onto tarps placed beneath trees to minimize seed loss. Collected material is dried in paper bags or on ventilated screens prior to seed extraction and processing. ^{8,9,16}
Propagule Processing/Propagule Characteristics	Seeds are extracted by tumbling and screening catkins, though separation of viable and empty seeds can be difficult. Cleaned seed averages approximately 1,000,000 seeds/kg with reported germination rates of 47–87% for fresh seed. Paper birch is a prolific seed producer, with large seed crops produced at frequent intervals. ^{8,15}
Pre-Planting Propagule Treatments	24-hour water soak followed by 60 days cold-moist stratification at 1–3°C in moistened peat moss. ^{8,9}
Growing Area Preparation / Annual Practices for Perennial Crops	Greenhouse and outdoor nursery production under day temperatures of 21–25°C and night temperatures of 15–18°C. Seeds are surface sown in a peat-based medium (6:1:1 peat:perlite:vermiculite) amended with controlled-release fertilizer and micronutrients. Light shading and frequent irrigation may improve early establishment by reducing surface drying during germination. ^{8,16}
Establishment Phase Details	Seeds are light-sensitive and should remain near the soil surface during germination. Germination is greatest under continuous or prolonged light exposure at moderate temperatures (approximately 14–18°C). ^{9,14} Germination occurs uniformly within ~3 weeks. True leaves form within 2 weeks after germination. Seedlings are thinned after establishment. ⁸
Length of Establishment Phase	4 weeks ⁸
Active Growth Phase	Rapid growth following establishment. Fertilized with 20-20-20 NPK at 100 ppm. Plants reach ~9 cm height and ~5 mm caliper after 4 months. Can be up-potted after ~16 weeks. ⁸

Length of Active Growth Phase	16 weeks ⁸
Hardening Phase	Plants are fertilized with 10-20-20 NPK at 200 ppm in fall. Pots are leached and given a final irrigation before overwintering in outdoor nursery conditions to allow for natural cold acclimation. ^{8,9}
Length of Hardening Phase	4 weeks ⁸
Harvesting, Storage and Shipping (of seedlings)	Seedlings are harvested after 8 months of growth, typically in September. Overwinter storage occurs outdoors under insulating foam and snow cover prior to transport and outplanting. ⁸
Length of Storage	5 months ⁸
Guidelines for Outplanting / Performance on Typical Sites	Establishment success is expected to be greatest on open, high-light sites with reduced competition, such as disturbed areas, forest edges, or early-successional habitats. ⁶
Other Comments	<p>Propagation protocols used here originate from Montana and Maine seed sources and provide generally similar information, however the Montana protocol was emphasized due to its recency and closer geographic relevance to the Pacific Northwest.</p> <p>Young seedlings may require protection from browsing in early field establishment areas where deer are present. ¹⁶</p>
PROPAGATION DETAILS: VEGETATIVE	
Ecotype	Not specified for vegetative propagation
Propagation Goal	Cuttings

Propagation Method	Vegetative
Product Type	Propagules (cuttings)
Stock Type	Rooted semi-hardwood cuttings
Time to Grow	At least ~45 days to rooting, followed by additional greenhouse production time prior to outplanting (not specified in sources) ⁸
Target Specifications	Rooted cuttings with a well-developed adventitious root system capable of transplanting to containers or field sites (no specific size specified in sources) ⁸
Propagule Collection Instructions	Semi-hardwood cuttings are collected during active summer growth when the stem base has begun to firm but before terminal bud development. Cuttings are typically 10–20 cm long and prepared with a shallow basal wound. July-collected apical cuttings have shown improved rooting success. Juvenile material roots more readily than cuttings collected from mature trees. ^{3,8}
Propagule Processing/Propagule Characteristics	Cuttings are treated with auxins including IBA, though IAA, and related rooting compounds can be used. Rooting percentages can range from ~33% to 80% depending on treatment, timing, and genotype. ¹⁰
Pre-Planting Propagule Treatments	Cuttings are treated with indolebutyric acid (IBA) to improve rooting success. Semi-hardwood cuttings treated with 8000 ppm IBA talc under mist and bottom heat achieved high rooting percentages. Earlier studies reported approximately 80% rooting

	of juvenile cuttings placed in 10% Hoagland's solution under a 16-hour photoperiod. ^{3,8}
Growing Area Preparation / Annual Practices for Perennial Crops	Not specified in sources
Establishment Phase Details	Rooting success is highest in juvenile material and lower in mature trees. Cuttings are maintained under mist and bottom heat during establishment. Root initiation generally occurs within approximately 45-55 days under controlled greenhouse conditions. Timing of collection is critical for successful rooting. ^{3,8}
Length of Establishment Phase	45-55 days ^{8,10}
Active Growth Phase	Following rooting, cuttings may be transplanted into containers and grown under greenhouse or nursery conditions prior to field establishment. ⁸
Length of Active Growth Phase	Not specified in sources
Hardening Phase	Rooted cuttings are gradually acclimated from greenhouse to outdoor nursery conditions prior to field establishment. ⁸
Length of Hardening Phase	Not specified in sources
Harvesting, Storage and Shipping	Cuttings are harvested during active summer growth and immediately placed into mist propagation systems for rooting. Once rooted, plantlets may be transplanted into containers and grown in nursery conditions prior to outplanting. ⁸

Length of Storage	No storage period reported, cuttings are processed immediately after collection and not stored prior to rooting. ⁸
Guidelines for Outplanting / Performance on Typical Sites	Vegetatively propagated plants may be useful on difficult or drought-prone sites where supplemental regeneration is desired. Establishment success is expected to be greatest on open, high-light sites with reduced competition. ¹⁰
Other Comments	Rooting success varies among individual trees and is generally greater in juvenile plants than mature donor trees. <i>Betula papyrifera</i> may also be propagated through grafting, air-layering, and tissue culture techniques. ³

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