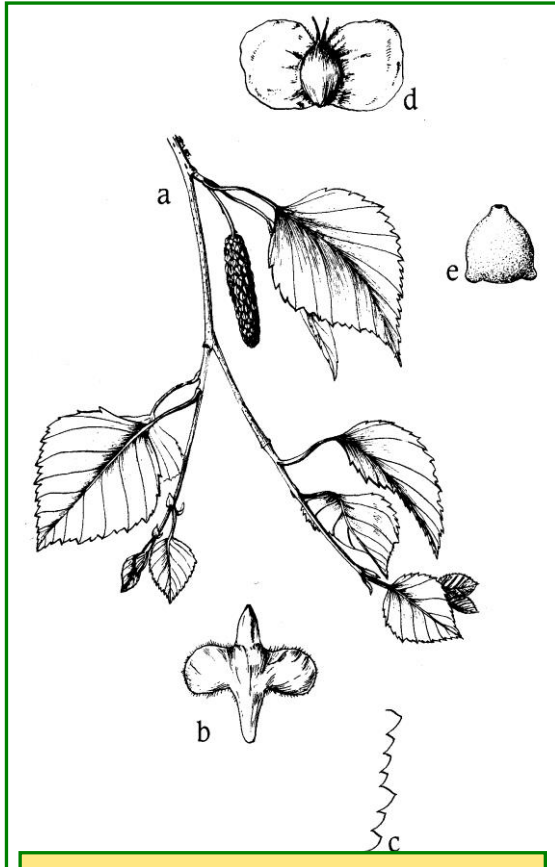


Scientific Name: *Betula papyrifera* Marsh.

Family: *Betulaceae*

Common Names: paper birch, western birch, white birch, canoe birch



***Betula papyrifera*. a. branch with leaves and seed catkin. b. cone bract. c. leaf margin. d. seed. e. pollen.**

Plant Description

Perennial tree, up to 30 m high; trunk to 60 cm diameter, bark white to red-brown, brown lenticels, peeling in sheets; dark brown branches with fuzzy twigs; oval to diamond-shaped leaves, 4 to 9 cm, toothed, fuzzy beneath, tufts of hair on vein axils; catkins, 2 to 3 cm (Moss 1983). Relatively short-lived: 80 to 120 years (CYSIP: Botany n.d., Government of the Northwest Territories n.d.).

Fruit: Pendulous aments paired on spur shoots (Moss 1983).

Seed: Samaras, 3 per bract; flat, oblong, membranous winged nutlets, 2.5 to 3.5 mm x 1.5 to 2 mm (4 to 5 mm with wings), ridged, brown.

Habitat and Distribution

Co-dominant in mixed woods with *Populus tremuloides*, *Picea mariana*, *Picea glauca*, *Pinus banksiana*, and *Abies balsamifera*. Prefers north or east facing slopes. Paper birch is shade intolerant and has high drought tolerance (Hardy BBT 1989).

Seral Stage: Can form pioneer stands on disturbed sites in boreal systems. (Hardy BBT 1989).



***Betula papyrifera* often becomes a multi-stemmed tree.**

Soil: Grows on a variety of soil types, but best on well-drained deep, sandy or silty soils. Can tolerate moderate acidic soils to as low as pH 3.2 (Hardy BBT 1989). Paper birch tolerates flood and drought and has a moderate salinity tolerance (Gerling et al. 1996).

Distribution: In Alberta, found in mountains, widespread across boreal forest and occasional in parkland; Alaska, Yukon, southwestern District of Mackenzie, northern Saskatchewan, central Manitoba, Great Lakes to Labrador south to Washington, Montana, Colorado, northern Nebraska, Minnesota, New York, Pennsylvania (Moss 1983). Widespread in central and northern Alberta forming pure stands on burned or cutover areas (Hardy BBT 1989).

Phenology

Female plants mature around 15 years (Government of the Northwest Territories n.d.). Flowers in mid-April to early June, seeds mature in August and September. Seeds disperse from August through the following spring (Young and Young 1992).

Pollination

Pollinated by wind.

Seed Dispersal

Seed is dispersed by wind.

Genetics

$2n=56, 84$ (Moss 1983).

Symbiosis

Ectomycorrhizal (Hagerman and Durall 2004). Birch trees may also serve as refuge for multi- and late-stage fungi (Kranabetter 1999).

Seed Processing

Collection: Catkins are easily stripped from branches. Pole-pruners or felling are necessary to harvest from tall trees.

Seed Weight: 0.090 to 0.175 g/1,000 seeds (0.152 average).

Harvest Dates: Late July to September in northeastern Alberta. Ripe catkins will be green or yellow to brown in colour (Banerjee et al. 2001). Collect August 1 to September 15 (Formaniuk 2013).

Cleaning: Air-dry fruits/cones at 15 to 25°C. Crush material or remove large chaff and crush remaining material. Sieve to remove seeds from chaff using appropriate size screens (8/64 inch screen size) (Young and Young 1992).

Storage Behaviour: Orthodox; seeds can be dried, without damage, to low moisture contents, their longevity increases with reductions in both moisture content and temperature (Royal Botanic Gardens Kew 2008).

Storage: Store at cool temperatures (2 to 5°C) at 1% to 3% moisture (Young and Young 1992). Hermetic storage at temperatures of -25°C to 3°C with 1% to 3% moisture content recommended for long-term storage by (Royal Botanic Gardens Kew 2008).

Longevity: Seed can remain viable up to 3 years (Smreciu et al. 2002). Safford et al. (1990) suggest that storage up to 8 years is possible when stored in sealed containers at 2 to 4°C at low moisture.



Emerging seedling of *Betula papyrifera*.

Propagation

Natural Regeneration: Establishes itself from seed (Hardy BBT 1989) and suckers (Tannas 1997). Seeds that disperse in late fall and winter exhibit

higher germination capacity than seeds dispersed early (Safford et al. 1990).

Germination: >60% germination following 30 days cold stratification with fresh seeds of subspecies *neoalaskensis* (Smreciu et al. 2002).

Seeds lose viability quickly. Seed germination and conditions are shown to vary depending on where the seed was collected (Baskin and Baskin 2001).

Seed germinated at 25°C (Baskin and Baskin 2001).

Pre-treatment: Four weeks cold stratification before seeding (Wood pers. comm.); 60 to 90 days cold stratification (Formaniuk 2013, Nichols 1934).

Can germinate in the presence or in the absence of light, but light increases the success rate of seed germination (Baskin and Baskin 2001, Brunvatne 1998, Young and Young 1992).

If tested under light at 20 to 25°C, no pre-treatment necessary for germination (Brinkman 1974). Seeds germinated at 25°C (Baskin and Baskin 2001).

Direct Seeding: 0.06% emergence the first year to 0.09% by year 4 with resulting robust seedlings.

Best germination occurs on mineral soil under 45% sunlight (Safford et al. 1990).

Seed Rate: 200 seeds/m² results in approximately 1 plant/m².

Vegetative Propagation: Reproduces from suckers (Uchytel 1991) and by regeneration from stump base and root collar.

Fifteen to 24 cm long nodal cuttings with a long shallow wound may root if treated with 2,000 to 8,000 ppm IBA-solution before planting in a peat:sand medium (Dirr and Heuser 1987).

Paper birch can also be propagated by grafting and layering (Babb 1959).

Micro-propagation: Shoot tip culture, extraction of axillary bud from young stem segments (Dirr and Heuser 1987).

Greenhouse Timeline: 16 weeks in the greenhouse before out-planting. Plants can be over wintered for a spring or early fall plant (Wood pers. comm.). Grow for 120 days prior to harvest (Formaniuk 2013).



Emerging seedling of *Betula papyrifera*.

Aboriginal/Food Uses

Food: The inner bark can be eaten as a sweet treat and starvation food; leaves, inner bark and root inner bark can be boiled to make a beverage; sap can be drunk or boiled down to make syrup (CYSIP: Botany n.d., Marles et al. 2000) or a light beer (Royer and Dickinson 1996).

Medicinal: Leaves can be used as wasp sting plaster; birch bark can be boiled and used in a decoction to enhance fertility; bark can be applied as a poultice for aching bones; powdery outer layer can be sprinkled on a sprained ankle; a sleeve of bark can become a cast for an arm or leg; a piece of sweet bark can relieve teething; the bark, as part of a compound decoction, can be drunk to treat tuberculosis and other lung problems; the reddish inner bark tea can be used as a gargle, for sore throats and colds; buds mixed with lard makes an ointment for treating skin sores and infections; roots can be used in a decoction to relieve menstrual cramps (Marles et al. 2000).

Roots or buds could be boiled to make a wash for the eyes of people afflicted by snow blindness (CYSIP: Botany n.d.).

Oil in the bark contains methylsalicylate and a poultice of the boiled bark was used to treat bruises, wounds and burns (Wilkinson 1990).

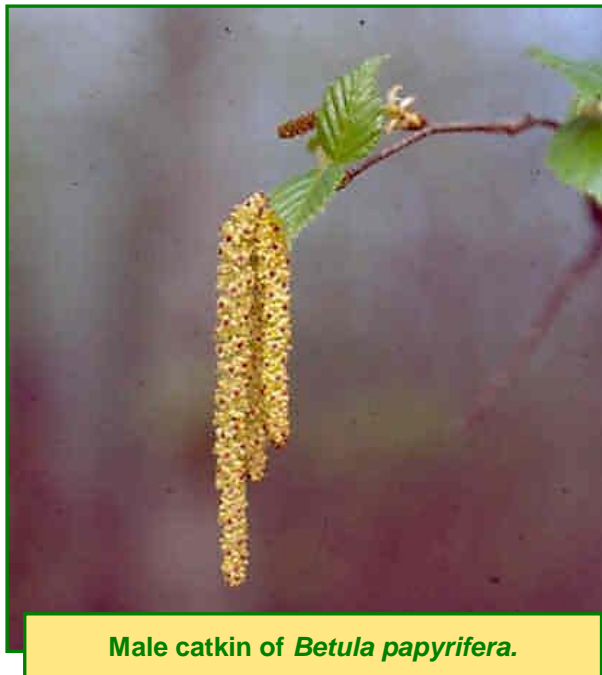
Other: Sheets of bark can be made into baskets, bowls, tube to call moose, canoes, tepee covers, writing/drawing materials, weaving shuttles, artwork drum frames, handles, ceremonial rattles and



kindling; wood used to make spoons, bows, sleds, snowshoe frames, canoe paddle, arrows,; inner bark can be made into yellow-red dye; birch branches are used to make sweat lodge frames (Government of the Northwest Territories n.d., Marles et al. 2000, Wilkinson 1990).

Rotting wood is considered good for smoking skins (CYSIP: Botany n.d.).

Cree made a body powder from an extract of rotten wood and Labrador tea (Royer and Dickinson 1996).



Male catkin of *Betula papyrifera*.

Wildlife/Forage Usage

Wildlife: Paper birch is browsed by moose and white-tailed deer and is an important component of their diet. Snowshoe hares feed on saplings and porcupines eat inner bark. Small mammals (voles and shrews) and birds (CYSIP: Botany n.d.) feed on catkins, seeds (redpoll, pine siskin, and chickadee), and buds. Sapsuckers favour paper birch sap leading to use by hummingbirds and squirrels. Ruffed grouse eat male catkins and buds (Safford et al. 1990).

Birch stands also provide habitat for all types of wildlife (Uchytel 1991).

Livestock: Moderately palatable and used by livestock mostly in winter and spring (Tannas 1997).

Grazing Response: Tolerant of moderate to heavy grazing (Uchytel 1991).

Reclamation Potential

This fast growing, aggressive pioneer species rapidly colonizes open sites following disturbances (wildfire, wind throw, avalanche) and is recommended as an early successional species (Tannas 1997). Paper birch is a prime hardwood species for revegetation of disturbed sites. The litter formed by this species contributes to the nutrient content of the forest floor (enriched with calcium, potassium, magnesium, phosphorus and boron) (Safford et al. 1990). *Betula papyrifera* produces an abundance of lightweight seeds that are easily dispersed by wind, and in the case of a wildfire, the fire-prepared seedbeds make for rapid seedling establishment. However, paper birch seedlings have poor survival and dieback in the first 5 years after major disturbances (e.g., mining). After only one generation, it will be replaced by shade tolerant conifers or northern hardwoods (Uchytel 1991).

Commercial Resources

Availability: Available commercially in various stages (seed, saplings) at Alberta and Saskatchewan nurseries.

Seeds have been collected by the Oil Sands Vegetation Cooperative for use in the Athabasca oil sands region.

Cultivars: At least two cultivars are available in the horticultural trade but these are unsuitable for revegetation use.

Uses: Birch wood is valued in the fabrication of veneer, plywood and pulpwood. The treetops are used for interior decorating, and the branches are used for decorative furniture, baskets, wreaths, birdcages and other decorative purposes.



The essential oil is used in aromatherapy. Birch bark contains betulin, an antiviral drug against the AIDS virus and betulinic acid against melanoma and brain tumors (Marles et al. 2000).

Notes

Betula papyrifera is listed as 93% intact (less occurrences than expected) in the Alberta oil sands region (Alberta Biodiversity Monitoring Institute 2014).

Betula papyrifera is short-lived. It ceases to grow in height at 60 to 70 years old. Most trees do not live more than 140 years.

Because of their canopy's high moisture content and their lush understory, paper birch stands are one of the least flammable forest types (Uchytel 1991). Although Hardy BBT (1989) indicates that paper birch is deep rooted, Safford et al. (1990) found that their root network is mostly found in the top 60 cm of soil and does not form taproots.

Stressed plants are subject to attack by the bronze birch borer (*Agrilus anxius* Gory)(Cerezke 1994), three species of birch leaf miners (*Fenusa pusilla* Lepeletier, *Profenusa thomsonii* Konow and *Heterarthrus nemoratus* Fallen)(Wong et al. 1991), and in some cases by the large aspen tortrix (*Choristoneura conflictana* (Walker) when they are epidemic(Cerezke 1992).

Photo Credits

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Photo 2: Steve Hurst @ USDA plants 2012.

Line Diagram: John Maywood, used by permission of Bruce Peel Special Collections, University of Alberta.

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