

Scientific Name: *Pinus banksiana* Lamb

Family: *Pinaceae*

Common Name: jack pine

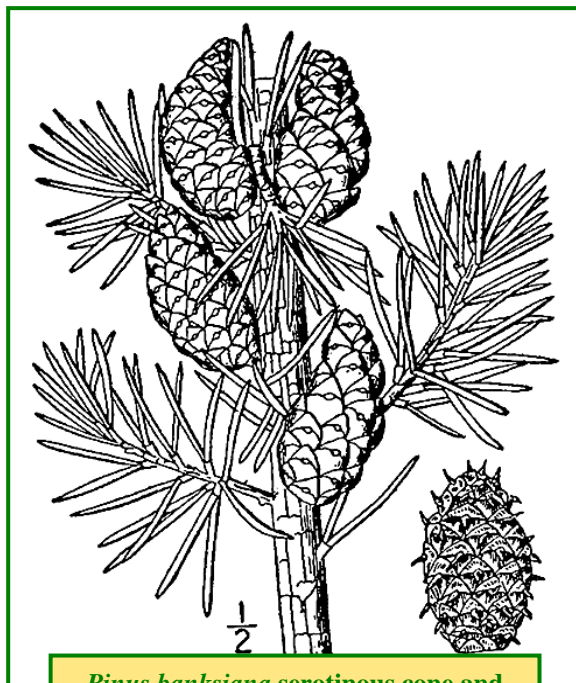
Plant Description

Common tree of south boreal region, up to 20 m tall or shrubby between 5 to 10 m; flaky red brown old bark becoming deeply grooved with aging; crown narrow with drooping lower branches when wide; leaves are paired needles with a papery basal sheath, yellow green; can be twisted and spreading; pollen cones clustered at branch ends, 1 cm in length; seed cone tan, curved towards branch tips, thickened smooth scales 3 to 7 cm long; cones serotinous without scale prickles at maturity (Farrar 1995). Plants live for 150 years (Government of the Northwest Territories n.d.).

Seed: Winged, small, black and ribbed (Farrar 1995).

Habitat and Distribution

Occurs on poor quality sites such as coarse sands, shallow soils and rock out crops, even on permafrost.



Pinus banksiana serotinous cone and paired needles



Enlarged *Pinus banksiana* seeds showing cross-section.

Best growth occurs on moist upland, well-drained sandy soils (Hardy BBT Limited 1989).

Grows in pure or mixed stands and is shade intolerant (Farrar 1995, Rook 2002).

Seral Stage: *P. banksiana* is an early colonizer; thrives after fires (Government of the Northwest Territories n.d.). Intolerant of shade (Hardy BBT Limited 1989).

Soils: Can grow on fine to coarse textured soils with optimal soil pH 6.0 to 8.2 (USDA NRCS n.d.). Survives on nutrient-poor sites and has low nutrient requirements (Hardy BBT Limited 1989).

In a greenhouse study, Franklin et al. (2002) found jack pine seedlings were more sensitive to NaCl than Na₂SO₄ salts.

Distribution: Western District of Mackenzie to Newfoundland south to Great Lakes (Moss 1983).

Phenology

Flowering initiates in May to June of the first year with seeds maturing and dispersing in September the following season (Young and Young 1992).

Trees begin to produce viable seed between 3 and 15 years of age (females mature at 5 to 10 years –



Government of the Northwest Territories n.d.). The cones turn from green to shiny yellow or brown when they are ripe (Bonner and Karrfalt 2008).

Pollination

Pinus spp. are monoecious and female cones are generally found in the upper crown of the tree whereas the males are found in the lower crown (Young and Young 1992).



Seed Dispersal

Dispersal occurs 13 months after pollination. Serotinous cones require heat to open. Wind dispersed following fire as well as some caching by seed predators. Wind dispersed to a maximum of 33 to 39 m (Rook 2002).

Genetics

$2n=24$ (Moss 1983).

Symbiosis

Are usually colonized by ectomycorrhizal fungi (Hardy BBT Limited 1989) as well as arbuscular mycorrhizae and dark septate endophytic fungi (Wagg et al. 2008). Danielson (1994) listed 56 fungi species found at the Richardson Fire Tower near Fort McMurray that were considered to be potential symbionts of jack pine.

Seed Processing

Collection: Ripe cones are tawny yellow and larger cones generally contain more seeds. Ripe cones can be collected from standing trees, freshly fallen trees and animal caches (Young and Young 1992).

Seed Weight: 3.47 g/1,000 seeds (Young and Young 1992).

Seed per Fruit: 10 g seed/kg of cones (Bonner and Karrfalt 2008).

Harvest Dates: August to October. Collect anytime (Formaniuk 2013).

Cleaning: Dry in kiln for 2 to 4 hrs at a temperature of 72°C (Young and Young 1992). Seed shed from cones can be screened to remove chaff.

Storage Behaviour: Orthodox; dry seed to low relative humidity prior to cold storage (Royal Botanic Gardens Kew 2008).

Storage: As a general rule *Pinus* spp. should be dried to a moisture content between 5% and 10% before storing at cold temperatures ranging from 2 to 5°C (Young and Young 1992). In Alberta, seeds are dried to 5% to 8% moisture and stored at -18°C (Palamarek pers. comm.).

Longevity: 10 years or longer (Government of the Northwest Territories n.d., Palamarek pers. comm., Young and Young 1992). Up to 50% of 20-year-old seed may be viable (Rook 2002).

Propagation

Natural Regeneration: By seed and by layering (Farrar 1995). Layering is often the primary method of reproduction on organic soils where conditions for seed germination are poor (Farrar 1995). Seed regeneration is common after fire.

Germination: Epigeal germination takes 14 days at 20/30°C (Young and Young 1992).

72 to 86 % germination after 9 to 10 days, 8 hours of light at a temperature of 30°C and 16 hours dark at 20°C (Bonner and Karrfalt 2008).

Pre-treatment: Overnight soak in water (Wood pers. comm.). 14 days stratification (Formaniuk 2013).

Direct Seeding: Can be sown in either the spring or winter at a depth of 0.6 cm (Young and Young 1992).

Seed Rate: 320 seeds per m² (Young and Young 1992).

Planting Density: Recommended planting densities for a variety of oil sands ecosites is provided in Alberta Environment (2010).

Greenhouse Timeline: 20 to 22 weeks in the greenhouse prior to out-planting. Dormant plants can be overwintered frozen for planting in spring (Wood pers. comm.). Grow for 150 days before harvest (Formaniuk 2013).

Aboriginal/Food Uses

Other: Trunks were used as canoe timbers (USDA NRCS n.d., Wilkinson 1990).

Wildlife/Forage Usage

White-tailed deer browse saplings and young trees; intermediate forage for white tail deer (USDA NRCS n.d.).

Snowshoe hares feed on seedlings; porcupines feed on bark; red squirrels, chipmunks, mice, goldfinches, and robins consume seeds (Rook 2002, USDA NRCS n.d.).

Will sustain light to moderate browsing (Hardy BBT Limited 1989).

Provides shelter for white-tailed deer and snowshoe hare (Borealforest.org n.d.).

Reclamation Potential

After seven years testing on amended tailings sands near Fort McMurray, jack pine had the highest survival, vigour and growth. At another site jack pine survival levelled off at 70% at four years. Competition from ground cover appeared to reduce survival (Hardy BBT Limited 1989).

Farnden et al. (2013) showed that jack pine heights on a reclaimed oil sands tailings dyke at Syncrude were affected more by soil organic matter content than soil depth. The effects were more pronounced for organic matter content increases up to 8% and less pronounced thereafter.

In a greenhouse trial, Danielson and Visser (1988, 1989) found container-grown jack pine inoculated with 12 fungi resulted in 9 of the species forming mycorrhizae. The seedlings were planted on a tailings dyke at Syncrude and after one season four of the species had infected new roots extending into the surrounding reconstructed soil. By the end of the 3rd season only one species (E-strain) remained. Resident fungi had taken over the seedlings by end of the 3rd season. Seedling shoot weight was higher with inoculation but the advantage over the controls decreased by the 3rd season.

Jack pine has shown growth on anthracite (coal) spoils and is recommended for oil sands planting in Northeastern Alberta, at a density of 1,111 stems/ha or 687 stems/ha on overburden sites (Carey 1993). *Pinus banksiana* colonizes areas where disturbance, such as fire, has exposed the mineral soil. It also grows on stabilized sand dunes (Carey 1993).

Commercial Resources

Availability: Plants are available in Alberta (ANPC 2010).

Cultivars: Horticultural cultivars are not suitable for reclamation.



Uses: Important source of commercial timber – lumber, railway ties, timbers, telephone poles, fence posts, pilings, silos – and pulpwood (Borealforest.org n.d., Rook 2002, USDA NRCS n.d., Wilkinson 1990).

Notes

Synonym *Pinus divaricata* (Bonner and Karrfalt 2008).

Hybrids occur with *Pinus contorta* (lodgepole pine) with fertile offspring (Farrar 1995, Inkpen and Van Eyk n.d.).

P. banksiana is listed as 95% intact (less occurrences than expected) in the Alberta oil sands region (Alberta Biodiversity Monitoring Institute 2014). Planting, direct seeding, scattering of slash with cones, seed tree and burn silviculture are all used for stand regeneration (Carey 1993).

Roots may extend 2.74 m deep though most roots are within the upper 0.5 m of soil (Rook 2002).

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Photo 1: Wikimedia Commons, Accessed at http://commons.wikimedia.org/wiki/File:Pinus_banksiana.jpg May 28, 2012.

Photo 2: K. Wood. Alberta Provincial Seed Technician 2013.

Photo 3: Wikimedia Commons, Accessed at http://commons.wikimedia.org/wiki/File:Pinus_banksiana.jpg May 28, 2012.

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