

***Taxus canadensis* Marsh.**
TAXACEAE

Canada yew

Synonyms: *Taxus minor* (Michaux) Britt.
Taxus procumbens Loddiges
Taxus baccata L. var. *canadensis* Gray
Taxus baccata L. var. *minor* Michx.
Taxus baccata L. var. *procumbens* Loud



Drawing source: Britton and Brown 1913

General Description.—The common name most often used for *Taxus canadensis* is Canada yew. It is also known as American yew and ground hemlock; a common French name used in Quebec for this species is Buis de Sapin. This evergreen species is usually a low-growing, straggling non-aromatic shrub, with ascending branches up to 2 m tall. Branches often extend two-thirds of their length laterally before curving upwards. The bark is thin, scaly and red to reddish-brown. Twigs are green and alternately arranged, and winter buds are composed of imbricate (overlapping), lanceolate, keeled scales. The leaves are needle-like, on short stalks, and persist for several years. The leaf blades are spirally arranged, flattened, often in two ranks, linear, abruptly narrowed into a fine point, 1.2 to 2.2 cm long, with pale green bands on the under surface. The midrib is slightly elevated on the top surface. The leaves lack resin ducts. In

winter, the leaves can be slightly reddish. Being a gymnosperm, Canada yew lacks true flowers or fruits. It does produce pollen and seeds, on separate plants (dioecious) or on the same plant (monoecious) in axillary cones. The pollen is produced by the male cones, which appear as stalked heads and mature in the first season. Each male cone is a compound of four to 16 reduced, stalked, specialized leaves called sporophylls. The stalk is attached to the center of the sporophyll (i.e. they are peltate). Each sprophyll produces two to nine pollen sacs (sporangia) where the pollen is produced. The pollen is spherical and lacks wings. The female cones are reduced, subtended by a series of small, inconspicuous bracts. Each cone produces one ovule that develops into a single seed, maturing in one season. The seeds are brown, flattened, slightly broader than long, 4 to 5 mm long. Each seed is surrounded by a fleshy, scarlet, cup-shaped aril that is open at the top, exposing the seed. Inside the aril is a clear, mucilaginous liquid called albumen (Fernald 1950, Pilger 1903, Soper and Heimburger 1982).

Range.—Canada yew is native to Eastern Canada (Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec) and the Northeastern United States (Connecticut, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, West Virginia, Wisconsin) (Hils 1993, Natural Resources Conservation Service 2003). It becomes rare above 50 °N (Soper and Heimburger 1982).

Systematic Botany.—The genus name *Taxus* is from the Greek word, taxos, for yew. Approximately eight species of *Taxus* are recognized, and all of them are similar morphologically, even though they are well-separated geographically (Hils 1993). Canada yew

is the only native yew throughout its range. However, it can be confused with two other yew species--English yew (*T. baccata* L.) and Japanese yew (*T. cuspidata* Sieb. & Zucc.)--and a hybrid between them, (*T. media* Rehd.) that occasionally escapes from cultivation. Canada yew can be distinguished from these by its low-growing, straggling nature. Immature saplings are unidentifiable to species. Canada yew has $2n = 24$ chromosomes (Hils 1993).

Ecology.—Canada yew, a slow-growing species, is tolerant of shade, which gives it a competitive advantage over other species with which it must compete. It grows best in at least partial shade (Sullivan 1993). Canada yew is found in rich soil in a variety of habitats including bogs, swamps, and rocky banks at elevations up to 1,500 m. It prefers soils that are well-drained and that have pH's between 5.0 and 7.5. The climate is humid and cool. Exposure to winds from the ocean is not tolerated. The species grows in many forest associations and is taken as an indicator of old-growth forest. It does not occur in seral communities. Canada yew is apparently easily killed by fire. Wildfires and other influences that open the forest canopy reduce the competitive ability of the species (Sullivan 1993).

Reproduction.—Canada yew flowers in April and May and is wind pollinated. Individual plants are not self-fertile (Plants For a Future 2003). It produces seed almost every year (Sullivan 1993). The seeds mature in late summer and autumn. There are 33,000 to 62,400 seeds/kg (Rudolf 1974). The seeds are dispersed by birds (Sullivan 1993). Canada yew spreads vegetatively by layering (Rook 1998). The connections between plants of a clonal group usually rot away (Sullivan 1993). Small plants tend to be males and browsing and other stresses on a population tends to increase the proportion of male plants in the population (Sullivan 1993).

Growth and Management.—Canada yew is slow growing (Public Forest Council 2003). It is the hardiest of all yew species; however, it is the least attractive yew species used as an ornamental due to its low-growing, straggling habit (Rehder, 1940). The species may be propagated with seeds and by cuttings of half-hardened or hardened terminal shoots that root with good success (Plants For a Future 2003). Warm stratification for 4 months followed by 4 months of cold stratification are suggested to promote more rapid germination of seeds (Dirr and others 1987). Seeds may be

sown in nursery beds in the fall and covered by 10 to 12 mm of mineral soil topped by mulch. However, fall-sown seeds usually germinate the second spring (Rudolf 1974). Seedlings should be transplanted while still small. However, they are slow growing and they must be maintained for 2 years in nursery beds or pots at a minimum. Seedlings should be outplanted in late spring or early summer after the last frost has occurred. Established plants will tolerate pruning (Brand 2003).

Benefits.—Canada yew is an important component of the forest understory in Northeastern forests, helping to protect the soil and imparting beauty to forest landscapes. The species is used as an ornamental for ground cover and mass plantings, and for parental stock in yew breeding (Sullivan 1993). The toxic compound that is present in the plant is the alkaloid taxine (Kingsbury 1964). The seeds and the dried foliage have been fatal to livestock, but the fresh foliage is browsed by deer (Fernald 1950, Hils 1993). Moose also browse the species and have seriously reduced Canada yew abundance on Isle Royale, Michigan, since their introduction. The fleshy aril is eaten by numerous species of birds (Sullivan 1993). The pulp of the arils is sweet and edible to humans (Fernald 1950) but has a slimy texture (Soper and Heimburger 1982). A number of Native American groups made decoctions of leaves and twigs to treat rheumatism. Infusions and decoctions were also used to treat numbness of fingers and legs, colds, gonorrhea, and as a diuretic (Moerman 1986). New foliage and green stems are commercially harvested for the extraction of paclitaxel (Public Forest Council 2003). Paclitaxel is a white crystalline powder extractable from any of the *Taxus* species. It is a cytotoxic anticancer drug used to treat ovarian, breast, and lung cancers, and Kaposi's sarcoma (SFT Enterprise 2003).

References

- Brand, M.H. 2003. Plant UConn database of trees, shrubs and vines: *Taxus canadensis*. <http://www.hort.uconn.edu/plants/t/taxcan/taxcan3/html>. 2 p.
- Britton, N.L. and A. Brown. 1913. Illustrated flora of the northern states, Canada, and the British possessions. Vol. 2, 2nd Ed. Scribner, New York. 735 p.

- Dirr, M.A., M.W. Heuser, Jr., and B.L. Dirr. 1987. The reference manual of woody plant propagation. Varsity Press, Athens, GA. 239 p.
- Fernald, M.L. 1950. Gray's manual of botany. American Book Co., New York. 1,632 p.
- Hils, H.J. 1993. Taxaceae. In: Flora of North America Editorial Committee, eds. Flora of North America. Vol. 2. Oxford University Press, New York. p. 423-427.
- Kingsbury, J.M. 1964. Poisonous Plants of the United States and Canada. Prentice-Hall, Inc., Englewood Cliffs, NJ. 626 p.
- Moerman, D.E. 1986. Medicinal plants of Native America. Technical Reports 19. University of Michigan Museum of Anthropology, Ann Arbor, MI. 534 p.
- Natural Resources Conservation Service. 2003. Plants profile: *Taxus canadensis* Marsh. http://plants.usda.gov/cgi_bin/plant_search.cgi?mode=Scientific+Name&keywordquery=Ta... [not paged].
- Pilger, R.K.F. 1903. Taxaceae. In: H.G.A. Engler, ed. Das Pflanzenreich. V.18(IV,5). p. 1-124.
- Plants For a Future. 2003. *Taxus canadensis*. http://www.ibiblio.org/pfaf/chi-bin/arr_html?Taxus+canadensis. 7 p.
- Public Forest Council. 2003. Ground hemlock (*Taxus canadensis*). Public Forest Council Fact Sheet. Charlottetown, Prince Edward Island, Canada http://www.gov.pe.ca/af/agweb/library/factsheets/ground_hemlock.pdf. 2 p.
- Rehder, A. 1940. Manual of cultivated trees and shrubs. Macmillan Publishing Co., New York. 996 p.
- Rook, J.S. 1998. *Taxus canadensis*, Canada yew. <http://www.rook.org/earl/bwca/nature/shrubs/taxuscan.html>. 3 p.
- Rudolf, P.O. 1974. *Taxus* L., yew. In: C.S. Schopmeyer, tech. coord. Seeds of woody plants in the United States. Agriculture Handbook 450. U.S. Department of Agriculture, Forest Service, Washington, DC. p. 799-802.
- SFT Enterprise. 2003. Natural pacticaxel, full information. <http://www.21cep.com/sft/pxsft.htm>. 9 p.
- Soper, J.H. and M.L. Heimburger. 1982. Shrubs of Ontario. Royal Ontario Museum, Toronto, Ontario, Canada. 495 p.
- Sullivan J. 1993. *Taxus canadensis*. In: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Fire Effects Information System. <http://www.fs.fed.us/database/feis/plants/shrub/taxcan/all.html>. 10 p.
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