

Family: *Pinaceae*

Taxon: *Pinus strobus*

Synonym: *Pinus strobus f. prostrata (Rehder ex Beissn.)* **Common Name:** Eastern white pine
White Pine

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation: H(HPWRA)
Status:	Assessor Approved	Data Entry Person:	Assessor	WRA Score 9
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"		(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
203	Broad climate suitability (environmental versatility)		y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates		y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?		y=-2, ?=-1, n=0	y
301	Naturalized beyond native range		y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed		n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs		y=1, n=0	n
402	Allelopathic		y=1, n=0	n
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	n
405	Toxic to animals		y=1, n=0	n
406	Host for recognized pests and pathogens		y=1, n=0	
407	Causes allergies or is otherwise toxic to humans		y=1, n=0	n
408	Creates a fire hazard in natural ecosystems		y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle		y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		y=1, n=0	y
411	Climbing or smothering growth habit		y=1, n=0	n

412	Forms dense thickets	y=1, n=0	y
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score **9**

Supporting Data:

101	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is the species highly domesticated? No] "P. strobus has been a candidate for tree breeding efforts throughout its native range. In the northern part of its range, throughout eastern Canada, the north-eastern US and the Lake States, planting programmes have been limited by susceptibility to weevil and rust. While seed orchards exist throughout this region (Eckert and Kuser, 1988; Garrett, 1986; Lamontagne, 1992; Miller, 1987; Nielsen et al., 1995; Smith et al., 1997; Zsuffa, 1985, 1986), the level of effort reflects the restricted size of planting programmes. Pests are less of a problem for breeding programmes in the Central States, where selection and hybrid breeding can focus on vigour (Kriebel, 1983). Outside of the natural range in Europe, selection within southern Appalachian provenances and crossing with other white pines, such as <i>Pinus walllichiana</i> , are used to develop fast-growing, rust-resistant hybrids (Kriebel, 1983). Most seed orchards currently in production were established by grafting cuttings from plus-trees, and establishment in cultivated field environments. Grafting success is usually very high. Flowering in field orchards can be enhanced by means of cultural treatments such as fertilisation (Hocker, 1962; Stephens, 1964). Flowering of young white pine grafts can also be stimulated by means of various cultural treatments, particularly those involving gibberellin A4/7, and this has facilitated the turnover of breeding cycles (Ho and Eng, 1995; Ho and Schneckeburger, 1992)."
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Species suited to tropical or subtropical climate(s) 0-Low] "Eastern white pine is found across southern Canada from Newfoundland, Anticosti Island, and Gaspé peninsula of Quebec; west to central and western Ontario and extreme southeastern Manitoba; south to southeastern Minnesota and northeastern Iowa; east to northern Illinois, Ohio, Pennsylvania, and New Jersey; and south mostly in the Appalachian Mountains to northern Georgia and northwestern South Carolina. It is also found in western Kentucky, western Tennessee, and Delaware. A variety grows in the mountains of southern Mexico and Guatemala." ... "The climate over the range of white pine is cool and humid. The distribution of white pine coincides reasonably with that part of eastern North America where the July temperature averages between 18° and 23° C (65° and 74° F)."
202	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Quality of climate match data? 1-Intermediate] "Eastern white pine is found across southern Canada from Newfoundland, Anticosti Island, and Gaspé peninsula of Quebec; west to central and western Ontario and extreme southeastern Manitoba; south to southeastern Minnesota and northeastern Iowa; east to northern Illinois, Ohio, Pennsylvania, and New Jersey; and south mostly in the Appalachian Mountains to northern Georgia and northwestern South Carolina. It is also found in western Kentucky, western Tennessee, and Delaware. A variety grows in the mountains of southern Mexico and Guatemala."
202	2006. Rook, E.S.. <i>Pinus strobus</i> - White Pine. http://www.rook.org/earl/bwca/nature/trees/pinusstrob.html	[Quality of climate match data? 1 Intermediate] "Seeds require cold stratification to break dormancy" [1]For the special cases of a temperate species whose seeds have been reported to require cold stratification for germination, the answer to this question is 0(low) and the answer to question 2.02 is 1 (intermediate) regardless of knowledge of the species native range. Curt Daehler, pers. Comm]

203	1990. Burns, R.M./Honkala, B.H.. <i>Silvics of North America</i> . Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Broad climate suitability (environmental versatility)? Yes. Broad temperate climate suitability] "The climate over the range of white pine is cool and humid. The distribution of white pine coincides reasonably with that part of eastern North America where the July temperature averages between 18° and 23° C (65° and 74° F). Annual precipitation ranges from about 510 mm (20 in) in northern Minnesota to about 2030 mm (80 in) in northwestern Georgia. In the area surrounding the Great Lakes, about two-thirds of the precipitation occurs during the warm season, April to September. Elsewhere, half of the precipitation occurs during the warm season. The length of the growing season ranges from 90 to 180 days. Throughout the range of white pine, precipitation is about 1 to 1.5 times the evaporation from shaded free water surfaces (71). Annual potential evapotranspiration is between 430 and 710 mm. (17 and 28 in), of which 56 to 68 percent occurs in the warm season. There is a moisture surplus in all seasons." ... "In New England and New York, white pine generally grows at elevations between sea level and 460 m (1,500 ft), occasionally higher. In Pennsylvania, the elevation ranges from 150 to 610 m (500 to 2,000 ft) (71). In the southern Appalachians, white pine grows in a band along the mountains between 370 and 1070 m (1,200 and 3,500 ft) above sea level, occasionally reaching 1220 m (4,000 ft). In Pennsylvania and the southern Appalachians, most white pine is found on northerly aspects, in coves, and on stream bottoms. Elsewhere, aspect seldom restricts its occurrence (71)."
203	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? Yes] "P. strobus is distributed over a larger area than any other North American white pine, and has demonstrated its capacity to grow and compete under a wide variety of environmental conditions (Stiell, 1978, 1985)."
204	1990. Burns, R.M./Honkala, B.H.. <i>Silvics of North America</i> . Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Native or naturalized in regions with tropical or subtropical climates? No] "Eastern white pine is found across southern Canada from Newfoundland, Anticosti Island, and Gaspé peninsula of Quebec; west to central and western Ontario and extreme southeastern Manitoba; south to southeastern Minnesota and northeastern Iowa; east to northern Illinois, Ohio, Pennsylvania, and New Jersey; and south mostly in the Appalachian Mountains to northern Georgia and northwestern South Carolina. It is also found in western Kentucky, western Tennessee, and Delaware. A variety grows in the mountains of southern Mexico and Guatemala."
205	1980. Skolmen, R.G.. <i>Plantings on the forest reserves of Hawaii: 1910–1960</i> . Institute of Pacific Islands Forestry, Pacific Southwest Forest & Range Experiment Station, US Forest Service, Honolulu, HI	[Does the species have a history of repeated introductions outside its natural range? Yes] "Hilo: Year Planted: 1953; Number Planted: 2; Holualoa: Year Planted: 1959; Number Planted: 11; Mauna Kea and Pohakuloa: Year Planted: 1932 (24 planted), 1938 (9 planted); 1939 (18 planted), 1960 (4 planted); State Total = 68"
205	2004. Miller, J.T./Knowles, F.B./Burdon, R.D.. <i>Five-Needle Pines in New Zealand: Plantings and Experience</i> . USDA Forest Service Proceedings. RMRS-P-32: 141-147.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Abstract—Five-needle pines that have been tried as plantation crops in New Zealand are: <i>Pinus strobus</i> L., <i>P. lambertiana</i> Dougl., <i>P. monticola</i> Dougl. ex D. Don., and <i>P. wallichiana</i> A.B. Jacks."
205	2004. Richardson, D.M./Rejmánek, M.. <i>Conifers as invasive aliens: a global survey and predictive framework</i> . <i>Diversity and Distributions</i> . 10: 321–331.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Appendix List of naturalized or invasive (in bold) conifers (Pinopsida), based on hundreds of published and unpublished sources and the unpublished data and personal observation of the authors over more than a decade." ... ". <i>strobus</i> (Belorussia; Bulgaria; Czech Republic; Germany; Great Britain; Hungary; New Zealand; Poland, Russia; Ukraine (former USSR))"
301	2004. Adamowski, W.. <i>Why Don't Alien Conifers Invade the Białowieża Forest?</i> . <i>Weed Technology</i> . 18(sp1): 1453-1456.	[Naturalized beyond native range? Yes] "Abstract: In the area of the Białowieża Forest (an extremely well-preserved forest complex in Central–Eastern Europe), despite the planted 49 conifer taxa, only jack pine and white pine show expansional tendencies. The reasons for this response can be grouped as follows: (1) climatic conditions, (2) biological properties of the plants, (3) late introduction of conifers for plantation and their small contribution among the planted species, (4) competition from the existing plant cover, and (5) the activity of herbivores and pathogens."
301	2004. Miller, J.T./Knowles, F.B./Burdon, R.D.. <i>Five-Needle Pines in New Zealand: Plantings and Experience</i> . USDA Forest Service Proceedings. RMRS-P-32: 141-147.	[Naturalized beyond native range? Yes] "Pinus strobus has proved to be vigorously invasive in some localities. It has regenerated freely around Rotorua, spreading up to 3 km from the parent source into scrubland. It has also become naturalised in the South Island in Nelson, North Canterbury, and at Mt Linton (Lat. 46°S)."
301	2004. Richardson, D.M./Rejmánek, M.. <i>Conifers as invasive aliens: a global survey and predictive framework</i> . <i>Diversity and Distributions</i> . 10: 321–331.	[Naturalized beyond native range? Yes] "Appendix List of naturalized or invasive (in bold) conifers (Pinopsida), based on hundreds of published and unpublished sources and the unpublished data and personal observation of the authors over more than a decade." ... ". <i>strobus</i> (Belorussia; Bulgaria; Czech Republic; Germany; Great Britain; Hungary; New Zealand; Poland, Russia; Ukraine (former USSR))"

301	2010. Carrillo-Gavilan, M.A./Vila, M.. Little evidence of invasion by alien conifers in Europe. <i>Diversity and Distributions</i> . 16: 203–213.	[Naturalized beyond native range? Yes] "We only found information for 37 of the 54 alien conifers in Europe listed in DAISIE. Among them, ISI papers only mention seven species as naturalized and one species (<i>P. strobus</i> in the Czech Republic) as invasive. In contrast, Richardson & Rejmanek (2004), whose review also considered other scientific papers, the grey literature and unpublished sources, listed 18 species as naturalized and nine as invasive. For example, naturalization of <i>P. strobus</i> has also been documented in Poland and Austria according to non-ISI papers (Adamowski, 2004; Essl, 2007)."
302	1993. Carey, J.H.. <i>Pinus strobus</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinus/tr/all.html	[Garden/amenity/disturbance weed? No. But adapted to disturbance] "Eastern white pine forests frequently establish after disturbance and are even-aged. However, uneven-aged forests also occur. Eastern white pine has dominated an uneven-aged old growth forest in southern Ontario for at least 700 years. In this forest, canopy gaps created by the death of individual trees from surface fire or windthrow enable eastern white pine to regenerate [44]."
303	2007. Randall, R.P.. Global Compendium of Weeds - <i>Pinus strobus</i> [Online Database]. http://www.hear.org/gcw/species/pinus_strobus/	[Agricultural/forestry/horticultural weed? No] "casual alien, cultivation escape, environmental weed, naturalised, weed "
304	2006. Krivánek, M./Pysek, P.. Predicting invasions by woody species in a temperate zone: a test of three risk assessment schemes in the Czech Republic (Central Europe). <i>Diversity and Distributions</i> . 12: 319–327.	[Environmental weed? Yes] "For example, <i>Pinus strobus</i> has been planted in the Czech Republic for more than two centuries; it invades unique natural sandstone habitats. The invasion of this species has been one of the most dramatic by woody species in this country (Hadincová et al., 1997). It does not produce a good quality timber and could be replaced in many cases by aliens that are not invasive in the Czech Republic, such as <i>Pseudotsuga menziesii</i> or <i>Abies grandis</i> (Forest Management Institute 1994); yet new plantations of <i>P. strobus</i> are being established (Czech Statistical Office, 2002)."
304	2008. Hadincová, V. et al. Dispersal of invasive <i>Pinus strobus</i> in sandstone areas of the Czech Republic. Pp. 117-132 in B. Tokarska-Guzik et al (eds) <i>Plant invasions: human perception, ecological impacts & management</i> . Backhuys Publishers,, Leiden, The Net	[Environmental weed? Yes] "Understanding dispersal ability of an invasive species is crucial for describing its potential spread. Despite this, we still know relatively little about the dispersal potential of many invasive species. This paper explores dispersal spectra in <i>Pinus strobus</i> L., an invasive tree in sandstone areas in Central Europe. Data on the distribution of self sown trees are compared to predictions of a simple dispersal model. <i>Pinus strobus</i> can disperse up to 752 m from the parent source. This estimate is one of the largest estimates of dispersal based on systematic data collected for a large range of distances from the seed source. The observed dispersal pattern falls within the confidence intervals of the predictions based on a simple exponential model, indicating that this model has the potential to approximate field distribution patterns."
305	1992. Holt, R.A.. Control of Alien Plants on Nature Conservancy Preserves. Pp. 525-535 in Stone et al. (eds.). <i>Alien Plant Invasions in Native Ecosystems of Hawai'i: Management and Research</i> . Cooperative National Park Resources Studies Unit, University of	[Congeneric weed? Yes] "Control of pines and other conifers escaping from established stands in both Kamakou and Waikamoi Preserves is important to maintenance of both low-elevation and subalpine shrublands. While removal of individual trees is technically quite simple, the control effort is made difficult by the steep terrain the trees are invading. In the long run, complete removal of source tree stands from preserves may be the only effective solution. The Conservancy's concern is that these stands be removed in a way that allows native vegetation to become reestablished and avoids accumulation of large pine slash and detritus fuel loads. At Kamakou, The Conservancy is contemplating gradual thinning of stands, with thinned trees sold or donated for biomass energy products or rough lumber. Most trees in these stands are not of millable size."
305	1992. Loope, L.L./Nagata, R.J./Medeiros, A.C.. Alien plants in Haleakala National Park Pp. 551-576 in Stone et al (eds) <i>Alien plant invasions in native ecosystems of Hawaii</i> . Coop. Nat. Park Resources Studies Unit, University of Hawaii, Honolulu, HI	[Congeneric weed? Yes] "Three planted pine species (<i>Pinus radiata</i> , <i>P. patula</i> , and <i>P. pinaster</i>) perpetually establish fast-growing seedlings on Park lands, and if unchecked these species would eventually convert large expanses of native shrubland to alien coniferous forest."
305	2004. Richardson, D.M./Rejmánek, M.. Conifers as invasive aliens: a global survey and predictive framework. <i>Diversity and Distributions</i> . 10: 321–331.	[Congeneric weed? Yes] "We summarize information on naturalized and invasive conifers (class Pinopsida) worldwide (data from 40 countries, some with remote states/territories), and contrast these findings with patterns for other gymnosperms (classes Cycadopsida, Gnetopsida and Ginkgoopsida) and for woody angiosperms." ... "Twenty-eight of the known invasive conifers belong to one family (Pinaceae) and 21 of these are in one genus (<i>Pinus</i>)."
401	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Produces spines, thorns or burrs? No] "A medium-sized tree, up to 30 m tall (occasionally up to 67 m), 100 cm in diameter at breast height (occasionally to 180 cm), and 200 or more years old. On young trees, the crown is conical with regular whorls of branches. On mature trees, the crown is irregular, with a few long, stout branches set roughly at right angles to the trunk, and branches in the upper crown ascending, giving a broadly oval flat-topped outline that becomes one-sided due to the prevailing wind."

402	1990. Burns, R.M./Honkala, B.H.. <i>Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.</i>	[Allelopathic? No] "In general, on dry sites the understory vegetation is usually of one or more species of blueberries (<i>Vaccinium</i> spp.), teaberry (<i>Gaultheria procumbens</i>), dwarf bush honeysuckle (<i>Diervilla lonicera</i>), sweetfern (<i>Comptonia peregrina</i>), bracken (<i>Pteridium aquilinum</i>), clubmoss (<i>Lycopodium</i> spp.), and broomsedge (<i>Andropogon virginicus</i>). The moist, rich sites support a ground vegetation made up principally of several species of woodsorrel (<i>Oxalis</i>), partridgeberry (<i>Mitchella repens</i>), wild sarsaparilla (<i>Aralia nudicaulis</i>), jack-in-the-pulpit (<i>Arisaema</i> spp.), and hayscented fern (<i>Dennstaedtia punctilobula</i>). Intermediate sites have ground vegetation containing various amounts of the above with dogwood (<i>Cornus</i> spp.) and false lily-of-the-valley (<i>Maianthemum canadense</i>)." [Pinaceae]
403	2005. CAB International. <i>Forestry Compendium. CAB International, Wallingford, UK</i>	[Parasitic? No] "A medium-sized tree, up to 30 m tall (occasionally up to 67 m), 100 cm in diameter at breast height..." [Pinaceae]
404	1993. Carey, J.H.. <i>Pinus strobus</i> . In: <i>Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pins/tr/all.html</i>	[Unpalatable to grazing animals? No] "Eastern white pine provides food and habitat for numerous wildlife species. Songbirds and small mammals eat eastern white pine seeds. Snowshoe hares, white-tailed deer, and cottontails browse the foliage; the bark is eaten by various mammals [68]. Pocket gophers graze the roots of seedlings and young trees [21]. ..."PALATABILITY : Eastern white pine browse is of intermediate preference to white-tailed deer [12]. Although available, it was not browsed by moose in Ontario [6]."
404	2009. Peck, J.L.E./Zenner, E.K.. <i>Spatial patterns of natural Pinus strobus L. regeneration in a Pinus resinosa Ait. Stand. The Journal of the Torrey Botanical Society. 136(3): 369-379.</i>	[Unpalatable to grazing animals? No] "Over the past 150 years, recruitment into the sapling layer has been poor for <i>P. strobus</i> (Carleton et al. 1996). In recent decades, potential culprits reducing recruitment have included poor seedbed quality (McRae et al. 1994), browsing by whitetailed deer (<i>Odocoileus virginianus</i> Zimm.) and small mammals (Pastor 1992, Tester et al. 1997, Cornett et al. 1998),... " ..."Alternatively, short regen may also result from repeated browsing by deer and small mammals of the leader, which can slow or even stop increases in <i>P. strobus</i> height in this region (Ross et al. 1970, Steingraber 1989)."
405	2005. CAB International. <i>Forestry Compendium. CAB International, Wallingford, UK</i>	[Toxic to animals? No] "Porcupines, <i>Erethizon dorsatum</i> , seek shelter in white pine forests and may kill or deform small numbers of trees by feeding on the bark. The snowshoe hare, <i>Lepus americanus</i> and the eastern cottontail rabbit, <i>Sylvilagus floridanus</i> , commonly feed on bark and buds of young trees, particularly during the winter months (Bergeron and Tardif, 1988; Radvanyi, 1987). The red squirrel, <i>Tamiasciurus hudsonicus</i> commonly causes damage to shoots in the process of removing cones (Syme, 1985). Many small mammals such as squirrels, mice, voles, chipmunks and shrews are heavy consumers of white pine seed (Abbott, 1961; Graber, 1969; Radvanyi, 1974) and many will feed on seedlings when food is scarce during the winter months. Although mammals can cause damage to white pine, ground level disturbance caused by their feeding and digging activities can contribute to the preparation of favourable seedbeds and result in better regeneration (Alexander et al., 1986)."
406	2005. CAB International. <i>Forestry Compendium. CAB International, Wallingford, UK</i>	[Host for recognized pests and pathogens? Potentially] "While many organisms damage <i>P. strobus</i> in forest ecosystems, few are responsible for significant losses. The two most important are the white pine weevil, <i>Pissodes strobi</i> and white pine blister rust caused by the fungus <i>Cronartium ribicola</i> (Syme, 1985)."
407	1990. Burns, R.M./Honkala, B.H.. <i>Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.</i>	[Causes allergies or is otherwise toxic to humans? No] No evidence
407	2008. Wagstaff, D.J.. <i>International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL</i>	[Causes allergies or is otherwise toxic to humans? No] No evidence
407	2012. Pollen Library. <i>Eastern White Pine (Pinus strobus)</i> . IMS Health Incorporated, http://www.pollenlibrary.com/Specie/Pinus+strobus/	[Causes allergies or is otherwise toxic to humans? No] "Allergenicity: No allergy has been reported for Eastern White Pine (<i>Pinus strobus</i>) species."
408	1993. Carey, J.H.. <i>Pinus strobus</i> . In: <i>Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pins/tr/all.html</i>	[Creates a fire hazard in natural ecosystems? Yes] "The needles have relatively low resin content so are not highly flammable [30]. Forests dominated or codominated by eastern white pine have different fire regimes depending on site and associated species. The natural fire regime in eastern white pine-red pine forests consists of nonlethal surface fires at 5- to 50-year intervals punctuated by severe stand-replacing fires at longer intervals." [Although not very flammable relative to other <i>Pinus</i> species, this tree would increase the fuel load and potential for catastrophic fires in the Hawaiian Islands, or other ecosystems not adapted to frequent fires.]

409	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Unfavorable seedbed conditions can be corrected by scarification or can be overcome by shade. However, dense, low shade such as that cast by slash piles or hardwood brush is adverse to later survival and the shade of young stands of gray birch (<i>Betula populifolia</i>) or pitch pine reduces growth in the later stages. Overstory shade resulting from a form of shelterwood cut provides good protection during the early stages of growth and is least damaging to later stages (71)."
409	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is a shade tolerant plant at some stage of its life cycle? Yes] "P. strobus is considered intermediate in its tolerance to shade, somewhat less tolerant than eastern spruces and more tolerant than its pine associates (Daniel et al., 1979)."
410	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Tolerates a wide range of soil conditions? Yes] "White pine grows on nearly all the soils within its range (71), but generally competes best on well drained sandy soils of low to medium site quality. These soils permit fair growth of white pine but not hardwoods. On these sandy sites, white pine regenerates naturally, competes easily, and can be managed most effectively and economically (40,47). On medium textured soils (sandy loams), it will outproduce most other native commercial species in both volume and value (47). White pine also grows on fine sandy loams and silt-loam soils with either good or impeded drainage when there is no hardwood competition during the establishment period-as on old fields and pastures, bums, and blowdowns. It has been found on clay soils and on poorly drained or very poorly drained soils with surface mounds. It can be very productive on these sites but usually occurs only as individual trees or in small groups (47). This pine should not be planted in heavy clay soils. Poorly drained bottom land sites and upland depressions are also poor choices for planting (6)."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "A medium-sized tree, up to 30 m tall (occasionally up to 67 m)..."
412	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Forms dense thickets? Yes] "The ground vegetation in a white pine stand varies greatly, as evidenced by the number of forest cover types in which it is a major or minor component. Beneath pure or nearly pure stands of white pine, understory plants usually are sparse compared to those in the pine-hardwood mixtures (70)."
501	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Aquatic? No] Terrestrial
502	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Grass? No] Pinaceae
503	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Nitrogen fixing woody plant? No] Pinaceae
504	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "A medium-sized tree, up to 30 m tall (occasionally up to 67 m), 100 cm in diameter at breast height (occasionally to 180 cm), and 200 or more years old. On young trees, the crown is conical with regular whorls of branches. On mature trees, the crown is irregular, with a few long, stout branches set roughly at right angles to the trunk, and branches in the upper crown ascending, giving a broadly oval flat-topped outline that becomes one-sided due to the prevailing wind."
601	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Evidence of substantial reproductive failure in native habitat? No] "Good seed years are thought to occur every 3 to 5 years, a few seeds being produced in most intervening years. However, at the Massabesic Experimental Forest in southwestern Maine, and at other New England locations, there was virtually no seed produced for 7 years and no good seed crop for 10 years. The major cause of these failures probably is the white pine cone beetle (<i>Conophthorus coniperda</i>)."
602	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Produces viable seed? Yes] "Seed Production and Dissemination- Good seed years are thought to occur every 3 to 5 years, a few seeds being produced in most intervening years."

603	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Hybridizes naturally? Yes] "Eastern white pine crosses readily with western white pine (<i>Pinus monticola</i>), Balkan pine (<i>P. peuce</i>), blue pine (<i>P. griffithii</i>), and Japanese white pine (<i>P. parviflora</i>). It can also be crossed with limber pine (<i>P. flexilis</i>) and Mexican white pine (<i>P. ayacahuite</i>) (21). The cross <i>P. strobus</i> x <i>griffithii</i> is more vigorous than <i>P. strobus</i> in Northern Ohio and more winter hardy than <i>P. griffithii</i> (37)."
604	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Self-compatible or apomictic? Potentially] "Flowering and Fruiting- White pine is monoecious. The male strobili are oval, 8 to 10 mm (0.3 to 0.4 in) long and occur mostly on the basal part of new shoots and mostly on older lateral branches in the lower crown. At the time of pollen shed, they are light brown to brown. Female flowers are found most often in the upper crown, primarily at the apical end of the main branches in the position of subterminal or lateral buds (39). At the time of pollination, they are green, and 5 to 38 mm (0.2 to 1.5 in) long. In the northeastern United States, flowering occurs between May and June. The male flowers develop from one to several weeks before the female flowers."
604	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Self-compatible or apomictic? Yes. Capable, although outcrossing is more effective] " <i>P. strobus</i> is a wind-pollinated, monoecious species, and outcrossing is by far the most prevalent mating system. Simple polyembryony in <i>P. strobus</i> results from 2 to 3 archegonia in each megagametophyte. As only one embryo normally germinates from the mature seed, it is likely that competition during seed development eliminates many weaker embryos, including those resulting from self-fertilisation (Willson and Burley, 1983). An isozyme study of populations in Quebec demonstrated a high outcrossing rate, with few loci deviating from Hardy Weinberg equilibrium (Beaulieu and Simon, 1995). This study found evidence of family structure, with greater inbreeding in the filial than in the parental population, although the few of the inbred genotypes were expected to reach reproductive age, due to natural selection." ... " <i>P. strobus</i> is an outcrossing species that carries a fairly heavy load of deleterious recessive genes. Individuals are generally self compatible, so that this genetic load is revealed by self-fertilisation (Fowler, 1965a; Fowler and Heimburger, 1969a). Although there is no reduction in numbers of filled seeds after selfing (Fowler, 1965b), selfed seedlings may be stunted, slow-growing, chlorophyll-deficient and deformed (Fowler, 1965b; Johnson, 1945; Patton and Riker, 1958a)."
605	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Requires specialist pollinators? No] " <i>P. strobus</i> is a wind-pollinated, monoecious species, and outcrossing is by far the most prevalent mating system."
606	1993. Carey, J.H.. <i>Pinus strobus</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pins/tr/all.html	[Reproduction by vegetative fragmentation? No] "Eastern white pine does not reproduce vegetatively [68]."
606	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Reproduction by vegetative fragmentation? No] "While <i>P. strobus</i> does not regenerate vegetatively under natural conditions (Wendel and Smith, 1990), planting stock can be produced by means of vegetative propagation. While older trees are often difficult to propagate using long-shoot cuttings, those from 2- to 3-year-old seedlings have long been known to root easily (Deuber, 1942; Kiang and Garrett, 1975; Kiang et al., 1974; Patton and Riker, 1958b; Struve and Blazich, 1982; Zsuffa, 1973)."
607	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Minimum generative time (years)? 5+] "Trees may start to bear female flowers when 5 to 10 years old (71). In the Philadelphia area, quantity production of female flowers does not begin until the trees are about 6 m (20 ft) tall. At that size, 200 to 300 flowers may be produced in 1 year; the number is only a little greater on larger or older trees. Few or no male flowers appear during the early flowering years. Femaleness persists even on older trees 30 to 61 cm (12 to 24 in) in diameter, although trees of this size do produce small to moderate amounts of pollen (71)."
701	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "Seeds: reddish-brown, mottled with black, 5 to 8 mm long; wing 18 to 25 mm long (Farrar, 1995; Kral, 1993)."[No evidence, or means of external attachment]
702	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] " <i>P. strobus</i> also responds well to nursery culture and is commonly used for reforestation, urban forestry and Christmas tree plantations."

703	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Propagules likely to disperse as a produce contaminant? No] "Seeds are dispersed primarily by wind. Seeds travel 200 feet (60 m) within a stand and more than 700 feet (210 m) in the open. Animals also disperse seeds."
704	2010. Munzbergova´, Z./Hadincova´, V./Wild, J./Herben, T./Maresova, J.. Spatial and temporal variation in dispersal pattern of an invasive pine. Biological Invasions. 12: 2471–2486.	[Propagules adapted to wind dispersal? Yes] "Pinus strobus L. (eastern white pine, northern white pine) is native to eastern North America (Wendel and Smith 1990). It is a conifer tree with winged seeds dispersed by wind."
705	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Propagules water dispersed? No] "Seeds are dispersed primarily by wind."
706	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Propagules bird dispersed? No] "Songbirds and small mammals eat eastern white pine seeds." [Seeds adapted for wind dispersal. Animals act as seed predators, rather than dispersers]
707	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Propagules dispersed by other animals (externally)? Yes. Introduced rodents may serve a similar function in Hawaiian Islands] "Most of the seeds are dispersed within the month following cone maturity. The seeds travel at least 60 m (200 ft) within a white pine stand and more than 210 m (700 ft) in the open (71). Gray squirrels were found responsible for much of the white pine reproduction under mature red oak stands in southern New Hampshire; they bury and recover the seeds (3)."
707	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Propagules dispersed by other animals (externally)? Yes] "Seeds are dispersed primarily by wind. Seeds travel 200 feet (60 m) within a stand and more than 700 feet (210 m) in the open. Animals also disperse seeds. Gray squirrel seed caches were responsible for white pine reproduction under red oak (Quercus rubra) stands in southern New Hampshire [68]. White-footed mice and red backed voles bury caches containing 20 to 30 eastern white pine seeds beneath the litter but on top of the mineral soil. Caches that escape revisitation and decimation produce seedlings [1]."
708	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Propagules survive passage through the gut? Probably No] "Songbirds and small mammals eat eastern white pine seeds." [Seeds adapted for wind dispersal. Animals act as seed predators, rather than dispersers]
801	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Prolific seed production (>1000/m2)? Potentially] "In a comprehensive German study of white pine seed production, it was found that a 90-year-old stand produced about 73 kg of seeds per hectare (65 lb/acre); a comparable 60-year-old stand produced only one-fifth as much. In these stands, dominant trees produced twice as many cones as codominant trees (71). In Maine, intermediate density stands 27.6 m ² /ha (120 ft ² /acre) produced 4,430,000 viable seeds per hectare (1,793,220/acre) in a good seed year (29). In high density stands 42.9 m ² /ha (187 ft ² / acre), seedfall was 36 percent less and in low density stands 18.4 m ² /ha (80 ft ² /acre), seedfall was 30 percent less than in the intermediate density stands. There are 58,400 seeds per kilogram (26,500/1b) with a range from 38,600 to 116,800/kg (17,500 to 53,000/1b) (39). In a study of 250 different parents from all parts of the white pine range, the number of good seeds per cone ranged from 0 to 73. The lowest sets were found in stands at the extremes of the range."
802	1993. Carey, J.H.. Pinus strobus. In: Fire Effects Information System, [Online].. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/plants/tree/pinstr/all.html	[Evidence that a persistent propagule bank is formed (>1 yr)? Yes] "Eastern white pine shows very limited delayed emergence the second year after seed fall, and none after 3 years [57]."

802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/	[Evidence that a persistent propagule bank is formed (>1 yr) Potentially Yes] "Storage Conditions: 93% germination following 10 years hermetic storage at 3°C with 8% mc (Harrington, 1972); 50% germination following 10 years hermetic storage at 5-10% mc and 5°C (Krugman & Jenkinson, 1974); 0-18% viability lost after 15-20 years hermetic storage at -18°C with 8-8.7% mc, 32- 77% viability lost after 15-20 years at 2°-4°C with 5.6-6.5% mc (Wang et al., 1994)"
803	2012. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] Despite naturalization and invasiveness, no information was found on chemical control methods of this tree. Probably susceptible to mechanical control, similar to other <i>Pinus</i> spp.
804	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes. Moderately tolerant of and benefits from fire] "Competition problems are most severe on heavier, moist, rich soils, where <i>P. strobus</i> will perform well, only if natural disturbance, such as fire, or silvicultural site treatments allow the pine to become established well ahead of the hardwoods that normally occupy such sites (Chapeskie et al., 1989; Horton and Bedell, 1960; Little et al., 1973; Stiel, 1985). <i>P. strobus</i> is considered to be moderately fire resistant (Carey, 1993). Older trees have thick, heat-resistant bark, but the thinner bark on exposed roots and younger stems is sensitive to fire. Even light fires can have a detrimental impact on seed supply, but may also reduce hardwood competition and leave a seedbed that is more conducive to the establishment of new germinants."
805	1990. Burns, R.M./Honkala, B.H.. Silvics of North America. Volume 1: Conifers. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown for Hawaiian Islands] "Damaging Agents- There are a total of 277 insects and 110 disease organisms known to attack white pine. Only 16 insects and 7 diseases cause sufficient injury or mortality to be of concern. The three most important are white pine weevil (<i>Pissodes strobi</i>), white pine blister rust (<i>Cronartium ribicola</i>), and <i>Armillaria mellea</i> (63). The white pine weevil kills the terminal shoot, which may include the last 2 or 3 years of growth. The tree is seldom killed unless it is very small; lateral branches from the highest live whorl turn upward to produce new terminal shoots. Bole crook and loss of stem length result from this injury (71). There is evidence that white pine provenances differ in resistance to weevils but even the lowest levels of injury are unacceptable (25)."
805	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown for Hawaiian Islands] "While many organisms damage <i>P. strobus</i> in forest ecosystems, few are responsible for significant losses. The two most important are the white pine weevil, <i>Pissodes strobi</i> and white pine blister rust caused by the fungus <i>Cronartium ribicola</i> (Syme, 1985)."