Key Words: High Risk, Environmental Weed, Pine Tree, Dense Stands, Fire Hazard, Wind-dispersed

Family: ***Pinaceae***

Taxon: ***Pinus nigra***

Synonym: *Pinus laricio Poir.*
Pinus laricio var. austriaca (Höss) Loudon
Pinus laricio var. calabrica Loudon

Common Name: Austrian pine
Black pine
Calabrian black pine
Corsican pine

Questionaire : current 20090513 **Assessor:** Chuck Chimera **Designation:** H(HPWRA)
Status: Assessor Approved **Data Entry Person:** Chuck Chimera **WRA Score 7**

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)**	**High**
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**	
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**	**y**
407	**Causes allergies or is otherwise toxic to humans**	**y=1, n=0**	
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**	**n**
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**	
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**	**n**
708	**Propagules survive passage through the gut**	**y=1, n=-1**	**n**
801	**Prolific seed production (>1000/m2)**	**y=1, n=-1**	**y**
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**	**n**
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** 7

Supporting Data:

101	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 the species highly domesticated? No, but naturally variable] "Within the climatically and topographically diverse and disjunct distribution of European black pine, recognizable differences in the population have evolved through natural selection. As early as the third century B.C., Theophrastis (370- 285 B.C.) recognized several striking variations within what is here called Pinus nigra." … "The taxonomic record indicates that Pinus nigra is an extremely variable taxon, including more than 100 Latin specific, varietal, and formal names."
101	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is the species highly domesticated? No] No evidence
102	2012. WRA Specialist. Personal Communication.	NA
103	2012. WRA Specialist. Personal Communication.	NA
201	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Species suited to tropical or subtropical climate(s) 0-Low] "The climatic area of distribution is temperate. The different subspecies react differently to temperature extremes. All have a fairly good resistance to low temperatures, with younger individuals surviving even at temperatures as low as -25°C. Pinus nigra subsp. nigra (Austrian pine) is less thermophile than P. nigra subsp. Laricio (Corsican pine), although the latter tends to be more oceanic and less resistant to frost damage. Ideal mean temperature is 7-12°C with the mean temperature of the coldest month around -2°C. The species can maintain active photosynthesis at temperatures as low as -6°C and continue its respiratory activity down to -19°C. Fourt et al. (1971) and Read (1967) summarise effects of climatic factors on black pine grown in the UK."
202	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Quality of climate match data 2-High]
203	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.	[Broad climate suitability (environmental versatility)? Yes] "In Europe, black pine is found at elevations ranging from 250 to 1800 m (820 to 5,910 ft)." [Elevation range exceeds 1000 m]
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? Yes] "As far as precipitation is concerned, Pinus nigra is a drought resistant species, although to varying degrees according to the different subspecies. P. nigra subsp. nigra thrives in zones with a low annual rainfall (650 1000 mm), but the hottest month (July) is also the wettest one. Pinus nigra subsp. laricio, however, grows best in areas with a mean rainfall more than 1000 mm, with moderate but not severe summer droughts with a total summer rainfall (June-August) of between 80 and 100 mm. The distribution of precipitation varies from bimodal (Mediterranean montane type) to winter regime (also Mediterranean), with a limited period of summer drought. The ideal climate for Pinus nigra is a montane one. In the southernmost regions of its distribution area it thrives in a Mediterranean climate (sub-humid, humid, perhumid), with rainfall occurring for the most part in the autumn-winter period, and a marked dry season in summer. Climatic amplitude (estimates) - Altitude range: 300 - 2000 m - Mean annual rainfall: 650 - 2500 mm - Rainfall regime: winter; bimodal - Dry season duration: 0 - 2 months - Mean annual temperature: 6 - 13ºC - Mean maximum temperature of hottest month: 16 - 23ºC - Mean minimum temperature of coldest month: -4 - 2ºC - Absolute minimum temperature: > -25ºC"
204	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.	[Native or naturalized in regions with tropical or subtropical climates? No] "In parts of its native European habitat, black pine grows in a cool to cold temperate climate (23). The northern varieties are very frost-hardy, withstanding temperatures of -30° C (-22° F), and the southern varieties tolerate -7° C (19° F) temperatures. Annual precipitation varies from 610 to 1020 mm (24 to 40 in). The species has been shown to carry on photosynthesis at -5° C (23° F), with respiration still detectable at -19° C (-2° F) (21). Black pine withstands the weight of ice well and is considered hardy except in the coldest, hottest, and driest regions."
204	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Native or naturalized in regions with tropical or subtropical climates? No] "The climatic area of distribution is temperate. The different subspecies react differently to temperature extremes."
205	1980. Skolmen, R.G.. Plantings on the forest reserves of Hawaii: 1910–1960. 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] 762 planted in 1958; 757 on Molokai, 5 on Hawaii Island

205	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.	[Does the species have a history of repeated introductions outside its natural range? Yes] "European black pine (Pinus nigra), also called Austrian pine, was one of the early tree introductions into the United States, first reported in cultivation in 1759 (52)."
205	2000. Leege, L.M./Murphy, P.G.. Growth of the non-native Pinus nigra in four habitats on the sand dunes of Lake Michigan. Forest Ecology and Management. 126: 191-200.	[Does the species have a history of repeated introductions outside its natural range? Yes] "In North America, P. nigra has been successfully planted from Nova Scotia to northern Missouri, a range of latitudes comparable to its native distribution (Burns and Honkala, 1990)."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Yes] "Outside Europe, it has been introduced into New Zealand (Miller and Knowles, 1986), and has been planted in provenance trials in New Zealand and the North Central USA (Wheeler et al., 1976). Austrian pine (P. nigra subsp. nigra) was one of the earliest introductions into the USA, and was tested for adaptation in the Sandhills region of Nebraska in the late 19th century; it was also planted as an ornamental and as a windbreak species on the Great Plains early in the 20th century (Burns and Honkala, 1990)."
301	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.	[Naturalized beyond native range? Yes] "Black pine is hardy in southern Ontario and New England, the North Central United States, and in parts of the West; and, along with Scotch pine (Pinus sylvestris), Japanese black pine (P. thunbergii), and Japanese red pine (P. densiflora), it is reported to have become naturalized in parts of New England and the Lake States (72). Its escape from cultivation locally in the northeast, and west to Missouri, is acknowledged, but it is not generally recognized as having become naturalized (36)."
301	1994. Richardson, D.M./Williams, P.A./Hobbs, R.J.. Pine Invasions in the Southern Hemisphere: Determinants of Spread and Invadability. Journal of Biogeography. 21(5): 511-527.	[Naturalized beyond native range? Yes] "Pinus nigra Arnold (Corsican pine; Austrian pine) Pinus nigra is sporadically naturalized in North and South Islands, New Zealand (Sykes, 1981; Webb et al., 1988; Wardle, 1991)."
301	2003. Hosking, J.R./Conn, B. J./Lepschi, B.J.. Plant species first recognised as naturalised for New South Wales over the period 2000–2001. Cunninghamia. 8(2): 175-187.	[Naturalized beyond native range? Yes] "Pinus nigra J.F.Arnold var. corsicana (Loudon) Hyl" … "A few plants are scattered through weedy native vegetation at the collection site. This species is also naturalised in Victoria and South Australia (Jessop in Jessop & Toelken 1986, Entwisle in Walsh & Entwisle 1994)."
301	2004. Richardson, D.M./Rejmánek, M.. Conifers as invasive aliens: a global survey and predictive framework. Diversity and Distributions. 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." … "P. nigra (Australia (NSW, Vic, SA); Czech Republic; Great Britain; Hungary; Lithuania; New Zealand; Russia; USA (Michigan; New England))"
302	2012. WRA Specialist. Personal Communication.	[Garden/amenity/disturbance weed? No] An environmental weed
303	2012. WRA Specialist. Personal Communication.	[Agricultural/forestry/horticultural weed? No] Environmental weed
304	1994. Richardson, D.M./Williams, P.A./Hobbs, R.J.. Pine Invasions in the Southern Hemisphere: Determinants of Spread and Invadability. Journal of Biogeography. 21(5): 511-527.	[Environmental weed? Yes] "It has invaded extensively grazed grass- lands on the Amuri Range (Hunter & Douglas, 1984), and has spread from plantations near Naseby in eastern Central Otago (Allen & Lee, 1989). Trees are scattered throughout the Amuri Range, with dense thickets in some areas (Hunter & Douglas, 1984; see Fig. 2). Spread is limited in places by improved grasslands (Hunter & Douglas, 1984). However, Allen & Lee (1989) note that invaded Chionochloa rigida tussock grassland in eastern Central Otago has been neither burnt nor grazed for more than 10 years (see also Wardle, 1991). In Central Otago, where P. nigra invades grazed grasslands, it is severely browsed by possums (Wills & Begg, 1986). In North eastern Victoria, Australia, P. nigra has invaded natural eucalypt forests (Minko & Aeberli, 1986, p. 23). Corsican pine was planted at several localities in South Africa (Legat, 1930; Poynton, 1979), but has not spread."
304	2001. Leege, L.M./Murphy., P.G.. Ecological effects of the non-native Pinus nigra on sand dune communities. Canadian Journal of Botany. 79:: 429-437.	[Environmental weed? Yes] "Pinus nigra stands were associated with lower light levels than native stands of comparable or greater stand densities (Pinus banksiana in wetpannes and Populus deltoides in foredunes). In addition, P. nigra sites were drier than P. banksiana sites in wetpannes. The non-native pines may have modified the four dune habitats and appear to be functionally different from stands of native trees."
304	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Environmental weed? Yes] "Where invasive, the tree forms dense stands that reduce light levels and shade out native plants. The tree becomes dominant and accelerates succession to woody communities on invaded sand dunes in central USA. It establishes also in native tussock grasslands of New Zealand and transforms them to woodland."

304	2008. Boulant, N./Kunstler, G./Rambal, S./Lepart, J.. Seed supply, drought, and grazing determine spatio-temporal patterns of recruitment for native and introduced invasive pines in grasslands. Diversity and Distributions. 14: 862-874.	[Environmental weed? Yes] "Because of the time lag between introduction and invasion (Richardson & Pysek, 2006), the spread of P. nigra remains limited. Despite its delayed maturity and heavier seeds (Debain et al., 2003), usually related to a low invasiveness (Grotkopp et al., 2002; Richardson & Rejmánek, 2004), the introduced P. nigra should, however, ultimately be more invasive than the native P. sylvestris because of its higher effective seed dispersal distances, competitive ability, and effective fecundity in all environmental conditions. Plantations of P. nigra in the eastern part of the plateau, by introducing a strongly invasive species and by adding seed sources in an area where native pine woods were rather scarce, will therefore speed up the conversion of grasslands to pine woodlands."
304	2011. Gulezian, P.Z./Nyberg, D.W.. Naturalized Pine (Pinus nigra) Promotes Growth of Woody Vegetation in Native Sand Prairie: Impacts of Invasion 130 Years After Introduction. Natural Areas Journal. 31(1): 6-13.	[Environmental weed? Yes] "The successional dynamics of sand dune systems provide an opportunity to examine how non-native plant species affect plant communities over small spatial scales. We investigated the status of non-native pine species introduced as seeds about 130 years ago at Illinois Beach State Park, Illinois (IBSP). Five patchy stands of Pinus nigra (Austrian pine) were found and studied (spatial relations, age by dendrochronology, diameter, nearest neighbor distance) to reconstruct the invasion process." … "Graminoid and forb ground cover decreased significantly and progressively with pine stand age and distance from pine trees. This introduced, non-native tree species has significantly altered the dune vegetation at IBSP. This study is a rare assessment of the community-level effects of an invasive species over a century after its introduction." … "Finally, the case of P. nigra at IBSP illustrates the importance of human subjectivity in determining which species receive the 'invasive' label. Pinus nigra is not listed on the federal noxious weed list or any of the 46 state noxious weed lists available from the USDA (http://plants.usda.gov). But while it is not considered an invasive species by most people, it is clearly a significant ecological problem that threatens the integrity of the sand prairie community at IBSP."
304	2011. Queensland Government. Weeds of Australia - Corsican pine, Pinus nigra subsp. Laricio. http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Pinus_nigra_subsp._laricio.htm	[Environmental weed? Yes. Subspecies laricio] "Corsican pine (Pinus nigra subsp. laricio) is regarded as an environmental weed in Victoria and South Australia, and is a potential environmental weed in other parts of southern Australia. This species has been cultivated as an ornamental and in forestry plantations in temperate regions. It has spread from these plantings and is invading nearby natural vegetation, like other invasive pine trees. Corsican pine (Pinus nigra subsp. laricio) is ranked as a high impact species in the Angahook-Otways region in Victoria, because it has the ability to cause disruption to ecological processes, dominate vegetation strata, cause severe loss of biodiversity, and reduce the regeneration opportunities of native plants."
305	1992. Holt, R.A.. Control of Alien Plants on Nature Conservancy Preserves. Pp. 525-535 in Stone et al. (eds.). Alien Plant Invasions in Native Ecosystems of Hawai`i: Management and Research. 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	1998. Medeiros, A.C./Loope, L.L./Chimera, C.G.. Flowering Plants and Gymnosperms of Haleakala National Park. Technical Report 120. Pacific Cooperative Studies Unit, Honolulu, HI	[Congeneric weed? Yes] "The most serious weeds of the subalpine zone appear to be Cortaderia jubata (Andean pampas grass), Eucalyptus globulus (blue gum), Pinus radiata (Monterey pine), Pinus pinaster (maritime pine), Pinus patula (Mexican weeping pine), and europaeus (gorse); however, all these are effectively controlled currently in the subalpine zone of the park by resource management personnel."
305	2004. Richardson, D.M./Rejmánek, M.. Conifers as invasive aliens: a global survey and predictive framework. Diversity and Distributions. 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 (Pinus)."

401	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces spines, thorns or burrs? Yes] "Young P. nigra trees are tall and slender in shape, gradually becoming rounder as the tree gets older, in some cases even developing a flattened, umbrella-shaped crown. Generally, P. nigra trees grow to height 15-35 m, rarely higher, except in the case of Pinus nigra subsp. laricio, where both the Corsican and Calabrian varieties can frequently reach heights of 40 (50) m. Stem d.b.h. can reach 100 cm. Very old individual P. nigra subsp. Laricio in southern Italy have dimensions of height 42.5 m and stem d.b.h. 185 cm."
402	1979. Rice, E.L.. Allelopathy: An Update. Botanical Review. 45(1): 15-109.	[Allelopathic? Possibly No] "Water soluble leachates of fallen leaves of catalpa (Catalpa bignonioides Walt.), mimosa (Albizzia julibrissin Durasz.), horse chestnut (Aesculus hippocastanum L.), Austrian pine (Pinus nigra L.), and coral bean (Sophora japonica L.) were tested against seed germination of various trees and shrubs. Catalpa had the greatest inhibitory activity and pine and coral bean the least activity."
403	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Parasitic? No] Pinaceae
404	2005. Buckley, Y.M./Brockerhoff, E./Langer, L./Ledgard, N./North, H./Rees, M.. Slowing down a pine invasion despite uncertainty in demography and dispersal. Journal of Applied Ecology. 42: 1020-1030.	[Unpalatable to grazing animals? Palatable to rabbits] "The exclusion of rabbits during a plantation establishment trial doubled establishment of P. nigra from seed (Davis, Grace & Horrell 1996)."
404	2006. Chauchard, S./Pille, G./Carcaillet, C.. Large herbivores control the invasive potential of nonnative Austrian black pine in a mixed deciduous Mediterranean forest. Canadian Journal of Forest Research. 36: 1047-1053.	[Unpalatable to grazing animals? No] "Cattle do not appear to affect tree growth as it is similar inside and outside the fenced area, but they control the regeneration of nonnative Austrian black pines, which can spread in the absence of cattle. If nonnative black pine poses a risk for forest conservation, large herbivores may play a useful role in maintaining this species at low abundance."
404	2008. Boulant, N./Kunstler, G./Rambal, S./Lepart, J.. Seed supply, drought, and grazing determine spatio-temporal patterns of recruitment for native and introduced invasive pines in grasslands. Diversity and Distributions. 14: 862-874.	[Unpalatable to grazing animals? No] "The environmental factors driving invasion rates can differ between tree species (Rouget & Richardson, 2003). In our study, the introduced P. nigra was more resistant to drought but less resistant to grazing than the native P. sylvestris."
405	2006. Chauchard, S./Pille, G./Carcaillet, C.. Large herbivores control the invasive potential of nonnative Austrian black pine in a mixed deciduous Mediterranean forest. Canadian Journal of Forest Research. 36: 1047-1053.	[Toxic to animals? No] No evidence
405	2008. Boulant, N./Kunstler, G./Rambal, S./Lepart, J.. Seed supply, drought, and grazing determine spatio-temporal patterns of recruitment for native and introduced invasive pines in grasslands. Diversity and Distributions. 14: 862-874.	[Toxic to animals? No] "In our study, the introduced P. nigra was more resistant to drought but less resistant to grazing than the native P. sylvestris." [No evidence]

406	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Host for recognized pests and pathogens? Yes] "In the nursery, P. nigra seeds and seedlings are subject to attack by fungi of the genera Fusarium, Phytophthora, Pythium and Rhizoctonia. These fungi can cause seedling mortality. Young plantations can succumb to infection by the fungus Gremmeniella abietina, which attacks and kills branchlets (Read, 1968). In plantations, needles and twigs can be attacked by several weak fungal parasites. These include the rust fungi Melampsora populnea f.sp. pinitorqua and Cronartium flaccidum; needle blight caused by Mycosphaerella pini, and needle cast diseases such as Lophodermium pinastri and Naemacyclus minor. Peterson and Read (1971) reported that, in Nebraska, USA, of 21 geographic races of P. nigra, only one, a Yugoslavian source, showed universal resistance to the fungus Mycosphaerella pini, although 16 of the sources had individual trees which exhibited high resistance. Dothistroma needle blight, caused by the fungus Dothistroma pini, is one of the most damaging of the foliage diseases of black pine. The fungus has been found in 23 States in the USA and in three Provinces in Canada. Dothistroma needle blight is widespread and causes extensive damage to P. nigra in Christmas tree plantings in Minnesota, and in shelterbelt, ornamental, and Christmas tree plantings in the central and southern Great Plains. Infection of current-year needles first occurs in mid-July, while infection of second year needles begins in late May in the Great Plains, USA, and in British Columbia, Canada. Symptoms develop in early September to early November and consist of yellow and tan spots and bands that appear water-soaked on the needles. The bands and spots may turn brown to reddish brown, and the distal end of the needle becomes chlorotic, then necrotic, while the base of the needle remains green. Infected needles are cast prematurely (Petersen, 1975; Nichols and Hudler, 1971). P. nigra can be infected by the root disease fungus, Heterobasidion annosum. Diplodia needle blight, caused by the fungus Sphaeropsis sapinea, can cause severe damage to P. nigra plantations, especially if they are subject to stress by abiotic factors, particularly excess nitrogen deposition, which has been reported from the Netherlands (Roelofs et al., 1985; de Kam et al., 1991). P. nigra planted in the eastern USA appears to be susceptible to the pinewood nematode, Bursaphelenchus xylophilus (Bergdahl, 1988). This nematode is native to North America and indigenous North American conifers are tolerant to attack. It has been introduced into China and Japan where it has caused significant damage to several native pines."
407	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Causes allergies or is otherwise toxic to humans? No] No evidence
407	2012. Plants for a Future Database. Pinus nigra. http://www.pfaf.org/User/Plant.aspx?LatinName=Pinus+nigra	[Causes allergies or is otherwise toxic to humans? Possibly] "The wood, sawdust and resins from various species of pine can cause dermatitis in sensitive people."
407	2012. Pollen Library. Austrian Pine (Pinus nigra). IMS Health Inc., http://www.pollenlibrary.com/Specie/Pinus+nigra/	[Causes allergies or is otherwise toxic to humans? No] "Allergenicity: No allergy has been reported for Austrian Pine (Pinus nigra) species."
408	2011. Cseresnyes, I./Szecsy, O./Csontos, P.. Fire risk in Austrian pine (Pinus nigra) plantations under various temperature and wind conditions. Acta Botanica Croatica. 70(2): 157-166.	[Creates a fire hazard in natural ecosystems? Yes] "The Austrian pine (Pinus nigra), an introduced conifer in Hungary, forms a highly flammable vegetation type." … "A serious fire risk of these plantations was determined."
409	2001. Tapias, R./Gil, L./Fuentes-Utrilla, P./Pardos, J.A.. Canopy seed banks in Mediterranean pines of southeastern Spain: a comparison between Pinus halepensis Mill., P. pinaster Ait., P. nigra Arn. And P. pinea L.. Journal of Ecology. 89: 629-638.	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Prolific seeding every 3–4 years compensates for low seed production in the intervening period, and shade tolerance (Regato-Pajares & Elena-Rosselló 1995) may allow colonization of tree-fall gaps following dispersal of the small winged seeds."
409	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "Since Pinus nigra does not tolerate too much lateral shade, it is advisable to thin out stands when the trees are aged about 25-30 years, and thinning should be repeated every 10 years."
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] "European black pine is adapted to many soil types and topographic habitats. In its native range the species commonly is separated into three geographic groupings: western, central, and eastern. Sources from southern France and Spain, the western group, often are indifferent to soil type; sources from Corsica, Italy, and Sicily, the central group, grow poorly on limestone soils; while sources from the Balkans and the Crimea, U.S.S.R., the eastern group, appear to do well on the poorer limestone soils (31). Black pine also grows well on podzolic soils (8)."

410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions? Yes] "Pinus nigra presents no special requirements as far as soil texture is concerned (it can adapt to very loose and sandy soils, also to heavy, clayey ones), nor as far as the soil chemical properties are concerned, since it will grow spontaneously in both calcareous terrains and also those of siliceous origin. It can grow in scanty, rocky soils with little soil organic matter. But there are marked differences among the subspecies."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "Young P. nigra trees are tall and slender in shape, gradually becoming rounder as the tree gets older, in some cases even developing a flattened, umbrella-shaped crown. Generally, P. nigra trees grow to height 15-35 m, rarely higher, except in the case of Pinus nigra subsp. laricio, where both the Corsican and Calabrian varieties can frequently reach heights of 40 (50) m. Stem d.b.h. can reach 100 cm. Very old individual P. nigra subsp. Laricio in southern Italy have dimensions of height 42.5 m and stem d.b.h. 185 cm. "
412	2001. Leege, L.M./Murphy., P.G.. Ecological effects of the non-native Pinus nigra on sand dune communities. Canadian Journal of Botany. 79:: 429-437.	[Forms dense thickets? Yes] "In its native range, it often occurs in pure stands and can live for 300 years (Vergos 1985; Vidakovic 1991)."
412	2005. Buckley, Y.M./Brockerhoff, E./Langer, L./Ledgard, N./North, H./Rees, M.. Slowing down a pine invasion despite uncertainty in demography and dispersal. Journal of Applied Ecology. 42: 1020-1030.	[Forms dense thickets? Yes] "Pinus nigra and other wind dispersed invasive conifers are of major conservation concern because of their conversion of grassland into exotic monocultures, excluding native species and reducing land use options for managers"
501	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Aquatic? No] Terrestrial tree
502	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Grass? No] Pinaceae
503	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[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] "Young P. nigra trees are tall and slender in shape, gradually becoming rounder as the tree gets older, in some cases even developing a flattened, umbrella-shaped crown. Generally, P. nigra trees grow to height 15-35 m, rarely higher, except in the case of Pinus nigra subsp. laricio, where both the Corsican and Calabrian varieties can frequently reach heights of 40 (50) m. Stem d.b.h. can reach 100 cm. Very old individual P. nigra subsp. Laricio in southern Italy have dimensions of height 42.5 m and stem d.b.h. 185 cm. "
601	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Evidence of substantial reproductive failure in native habitat? No] No evidence
602	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Produces viable seed? Yes] "Flowering occurs in spring, between April and early June depending on site and exposure. Pollination is anemophilous. Cones ripen in the autumn of their second year and are shed the following spring after having scattered their seeds, but - usually - still intact. Needles persist on the branch on average about (3) 4 (8) 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] "Reports of natural hybridization between European black pine and other pine species in Europe include: Pinus nigra and P. montana (58), P. nigra and P. sylvestris (65), and P. nigra and P. heldreichii var. leucodermis (22), although P. heldreichii is considered synonymous with P. nigra by many. In the United States, natural hybridization has been reported between Pinus nigra and Japanese red pine (P. densiflora) in planted stands within close proximity of one another (71); although research based on enzyme analyses, suggests that red pine cannot be the pollen donor in this naturally occurring putative hybrid (41). Ninety-two percent of the seedlings derived from open-pollinated cones collected from the black pine stand were hybrids, and heterosis was evident in these seedlings."
604	2012. Plants for a Future Database. Pinus nigra. http://www.pfaf.org/User/Plant.aspx?LatinName=Pinus+nigra	[Self-compatible or apomictic? No] "The plant is not self-fertile."
605	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Requires specialist pollinators? No] "Flowering occurs in spring, between April and early June depending on site and exposure. Pollination is anemophilous."

606	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.	[Reproduction by vegetative fragmentation? No. Not naturally] "Vegetative Reproduction- At present, grafting is the most common method for vegetatively propagating European black pine. Needle fascicles have been rooted, but only fascicles from 1-year-old short shoots on young (5-year-old) plants were able to form callus or to root. Propagation by cuttings and airlayering has not been reported."
606	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Reproduction by vegetative fragmentation? No] "Pinus nigra propagates essentially by seed. Spring sowing is possible after a period of 30 45 days of vernalization (but pre-refrigeration is not necessary). On average, 8-12 kg of seed per hectare is needed for direct sowing."
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)? 15+] "Minimum seed bearing age is 15 to 40 years (40,52,67). In England, black pine from Corsican sources produce their first heavy cone crops at ages 25 to 30 years and reach maximum production between 60 and 90 years of age (27). The interval between large cone crops is 2 to 5 years."
607	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Minimum generative time (years)? 15+] "Pinus nigra reaches sexual maturity at about 15-20 years of age (40-50 years in dense stands or in difficult stand conditions). Generally, fructification occurs annually, with a large seed crop every 2-5 years."
701	2000. Leege, L.M./Murphy, P.G.. Growth of the non-native Pinus nigra in four habitats on the sand dunes of Lake Michigan. Forest Ecology and Management. 126: 191-200.	[Propagules likely to be dispersed unintentionally? Possibly moved along transportation corridors] "It tolerates a wide variety of soil conditions and is planted extensively along highways because of its tolerance to road salt run off (Wheeler et al., 1976; Burns and Honkala, 1990)."
702	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 intentionally by people? Yes] "Today, European black pine is one of the most common introduced ornamentals in the United States."
702	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] "Pinus nigra is one of the most important silvicultural species in Central and southern Europe, particularly on account of its frugality and pioneer qualities. It is extremely useful in reforestation projects, including those in difficult stand (edaphic) conditions. The species is very long-lived: in Corsica there are individuals whose age is estimated to be 1000 years old, and in the Sila mountains (southern Italy) some trees are more than 350 years of age. This species is a mountain pine, found around the northern Mediterranean basin (and in western North Africa) as far east as Anatolia (Turkey) and the Crimea (Ukraine). Currently the distribution area of Pinus nigra is highly fragmented and involves almost exclusively mountainous areas. Corsican pine occupies an area of 22,000 ha in Corsica and 50,000 ha in Calabria (S. Italy); in Lower Austria it covers about 80,000 ha; in Spain P. nigra occupies about 400,000 ha and in Turkey more than 1,000,000 ha. Pinus nigra subsp. laricio (Corsican pine) is the most important subspecies for timber production."
703	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules likely to disperse as a produce contaminant? No] "The seeds are not very large (5-7 mm long), slightly cuneiform and compressed, their colour ranging from brownish grey to ash grey; the wing is several times as long as the seed." [Unlikely. No evidence of dispersal by produce contamination documented]
704	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 adapted to wind dispersal? Yes] "Seeds are dispersed from October through November of the second growing season. Seeds are reddish brown, often mottled, 6.4 mm (0.25 in) long at one end of a membranous wing 19 mm (0.75 in) long (49). Two winged seeds are produced on the upper surface of each scale of the cone except for those at the tip and base."
704	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules adapted to wind dispersal? Yes] "The seeds are not very large (5-7 mm long), slightly cuneiform and compressed, their colour ranging from brownish grey to ash grey; the wing is several times as long as the seed."
705	2012. WRA Specialist. Personal Communication.	[Propagules water dispersed? No] Wind-dispersed
706	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 bird dispersed? No evidence] "Seeds are dispersed from October through November of the second growing season. Seeds are reddish brown, often mottled, 6.4 mm (0.25 in) long at one end of a membranous wing 19 mm (0.75 in) long (49). Two winged seeds are produced on the upper surface of each scale of the cone except for those at the tip and base."

707	2004. Ordóñez, J.L./Retana, J.. Early Reduction of Post-Fire Recruitment of Pinus nigra by Post-Dispersal Seed Predation inDifferent Time-Since-Fire Habitats. Ecography. 27(4): 449-458.	[Propagules dispersed by other animals (externally)? No] "This study analyses the effects of post dispersal predation of Pinus nigra seeds on the initial recruitment of this species in areas burned by large wildfires, where P. nigra shows very low regeneration. In three different habitats obtained in a gradient of time since fire in Catalonia (NE Spain), we have evaluated the effects of seed predators (ants, rodents and birds) on post-dispersal seed removal and early seedling establishment of P. nigra by using selective exclosures limiting their access to seeds. Ants were the most efficient seed predator group, followed by rodents and birds. The contribution of each group to overall predation showed large seasonal variations. The first seeds dispersed in winter were mainly predated by rodents, which also registered their highest abundance in this season of the year. In spring, at the end of the natural dissemination period of P. nigra seeds, ants became the major predators, this fact coinciding with their increased abundance. Birds showed the lowest predation values. In the seedling establishment experiment, only in the exclusion treatment of the three predator groups was there initial establishment in all habitats, especially in the recently burned area, where there was seedling establishment in all exclusion treatments. The post dispersal seed predation by different animal groups and low seedling emergence in the different habitats obtained in this study, together with the low seed availability of P. nigra seeds in burned areas, do not predict a favourable outlook for the natural post-fire recolonization of this species, which might even affect its overall distribution area in the region."
708	2004. Ordóñez, J.L./Retana, J.. Early Reduction of Post-Fire Recruitment of Pinus nigra by Post-Dispersal Seed Predation inDifferent Time-Since-Fire Habitats. Ecography. 27(4): 449-458.	[Propagules survive passage through the gut? No] "The first seeds dispersed in winter were mainly predated by rodents, which also registered their highest abundance in this season of the year. In spring, at the end of the natural dissemination period of P nigra seeds, ants became the major predators, this fact coinciding with their increased abundance. Birds showed the lowest predation values"
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)? Possibly intermittently] "Minimum seed bearing age is 15 to 40 years (40,52,67). In England, black pine from Corsican sources produce their first heavy cone crops at ages 25 to 30 years and reach maximum production between 60 and 90 years of age (27). The interval between large cone crops is 2 to 5 years."
801	2005. Buckley, Y.M./Brockerhoff, E./Langer, L./Ledgard, N./North, H./Rees, M.. Slowing down a pine invasion despite uncertainty in demography and dispersal. Journal of Applied Ecology. 42: 1020-1030.	[Prolific seed production (>1000/m2)? Yes] "Knowles (1986) state that P. nigra produces large seed crops every 2–5 years, with some seed usually produced each year."
801	2008. Boulant, N./Kunstler, G./Rambal, S./Lepart, J.. Seed supply, drought, and grazing determine spatio-temporal patterns of recruitment for native and introduced invasive pines in grasslands. Diversity and Distributions. 14: 862-874.	[Prolific seed production (>1000/m2)? Possibly Yes] "Pinus nigra begins reproduction later than P. sylvestris and once mature produces markedly more saplings in all studied environmental conditions, as reported for a single site by Debain et al. (2007)." … "At a given age, the higher effective fecundity of P. nigra than of P. sylvestris may result from a higher seed production; to our knowledge, however, no study has compared the seed production of the two species."
802	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 that a persistent propagule bank is formed (>1 yr)? Yes] "Seedling Development- European black pine is easily grown from seed and transplants well. Fresh seeds require no presowing stratification; but stored seeds can be cold stratified up to 60 days to hasten germination. Ninety nine percent germination was obtained from seeds stored 10 years in closed containers at 6.6 percent moisture content (ovendry-weight basis) at 0° to 2° C (32° to 36° F). No loss of viability occurred in seeds stored in sealed containers at room temperature after 2 years."
803	1994. Richardson, D.M./Williams, P.A./Hobbs, R.J.. Pine Invasions in the Southern Hemisphere: Determinants of Spread and Invadability. Journal of Biogeography. 21(5): 511-527.	[Well controlled by herbicides? No] "Pine seedlings can also be killed by foliar applications of several herbicides, especially when applied during the summer growing season (Crozier, 1990). Pines vary in their susceptibility, and P. nigra is again among the least susceptible to chemicals"
803	2003. Weber, E.. Invasive Plant Species of the World. A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Well controlled by herbicides? Possibly] "Specific control methods for this species are not available. Seedlings and saplings may be pulled or dug out. Larger trees can be cut and the cut stump treated with herbicide, or ringbarked."
804	2001. Tapias, R./Gil, L./Fuentes-Utrilla, P./Pardos, J.A.. Canopy seed banks in Mediterranean pines of southeastern Spain: a comparison between Pinus halepensis Mill., P. pinaster Ait., P. nigra Arn. And P. pinea L.. Journal of Ecology. 89: 629-638.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "P. nigra is one of the longest-lived Iberian plants, with extant individuals more than 1000 years old (Creus 1998), and like P. pinea can withstand low intensity fires." … "Other ground-fire resistant pinyon pines, such as P. monophylla and P. cembroides, have similar life-history characteristics to P. pinea (Mccune 1988), whereas P. nigra is more like P. ponderosa and P. palustris. None of these species have serotinous cones because flames do not reach the canopy and adult trees are able to survive ground fires (Mccune 1988)."

804	2008. Fernandes, P.M./Vega, J.A./Jimenez, E./Rigolot, E.. Fire resistance of European pines. Forest Ecology and Management. 256(3): 246-255.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Pimont and Rigolot (2005) observed in Corsica, France, that P. nigra is more vulnerable to fire than P. pinaster, especially at higher fire intensities. However, the species is able to persist through a surface fire regime over several centuries, as testified by a relict and multi-aged forest in eastern Spain (Fule´ et al., 2008)."
805	2012. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Widely naturalized
- Temperate tree with a broad elevation range
- Environmental weed in the USA, Australia and New Zealand
- Flammable and increases fire risks
- Shade tolerant
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Can form dense thickets
- Hybridizes with other Pinus species
- Periodically produces large seed crops
- Seeds may persist in the soil
- P. nigra is among the least susceptible to herbicides
- Tolerates low intensity fires

Low Risk / Desirable Traits

- Temperate tree could probably only be grown at higher elevations of tropical countries
- Palatable to grazing animals (could prevent spread)
- Non-toxic
- Not self-fertile
- Long time to reproductive maturity (15+ years)
- Landscaping and ornamental value (Christmas tree)