Keywords: Low Risk, Naturalized, Christmas Tree, Disturbance-adapted, Wind-dispersed

Family: ***Pinaceae***

Taxon: ***Pinus virginiana***

Synonym: *NA*

Common Name: scrub pine
Virginia pine
Jersey pine

Questionaire : current 20090513
Status: Assessor Approved

Assessor: Assessor
Data Entry Person: Assessor

Designation: L
WRA Score -1

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**	**n**
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)**	
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)**	**n**
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**	
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**	**n**
409	**Is a shade tolerant plant at some stage of its life cycle**	**y=1, n=0**	**n**
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**	
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**	
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**	
708	**Propagules survive passage through the gut**	**y=1, n=-1**	**n**
801	**Prolific seed production (>1000/m2)**	**y=1, n=-1**	**n**
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y=1, n=-1**	
803	**Well controlled by herbicides**	**y=-1, n=1**	
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y=1, n=-1**	**n**
805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	**y=-1, n=1**	

Designation: L **WRA Score** -1

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] "Most of the variation in Virginia pine is attributable to differences among individual trees or stands rather than to geographic origin, though it is suspected that populations in the Talladega Mountains of central Alabama and on the deep sands of the mid-Atlantic Coast are distinct ecotypes (25). A range wide sample of 2,114 trees revealed no evidence of north-south or east-west trends in specific gravity (unextracted wood) (12). In studies of six wood properties of mature Virginia pine in Kentucky and Tennessee, variation usually was greater within a stand than among stands. However, tracheid length increased from south to north within this region (42). Progeny tests of trees from the same locations also revealed significant variation in monoterpene content and in stem volume at age 5. This variation was attributable to difference among stands and among individual trees within stands (29,34). These and other progeny tests indicate that tree improvement programs for Virginia pine can significantly improve the stem form and growth rate."
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. 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] "Virginia pine generally grows throughout the Piedmont and at lower elevations in the mountains from central Pennsylvania southwestward to northeastern Mississippi, Alabama, and northern Georgia. It is also found in the Atlantic Coastal Plain as far north as New Jersey and Long Island, NY, and extends westward in scattered areas into Ohio, southern Indiana, and Tennessee."
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 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)? No. Less tolerant of tropical climates] "The annual precipitation in the native range of Virginia pine averages 890 to 1400 mm (35 to 55 in) and is fairly well distributed throughout the year. Rainfall generally is greatest in the southwestern portion of the range. The climate throughout most of this area is classified as humid. Summer temperatures average about 21° to 24° C (70° to 75° F); winter temperatures range from -4° to 4° C (25° to 40° F); and the average number of frost-free days varies from more than 225 on the eastern and southern edge of the Piedmont to 160 days on the more mountainous areas to the west and north."
203	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Broad climate suitability (environmental versatility)? No] "Climatic amplitude (estimates) - Altitude range: 15 - 900 m - Mean annual rainfall: 890 - 1400 mm - Rainfall regime: uniform - Mean maximum temperature of hottest month: 21 - 24ºC - Mean minimum temperature of coldest month: -4 - 4ºC"
204	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Native or naturalized in regions with tropical or subtropical climates? No] No evidence
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Yes] "It has been planted in Korea Republic, and experimental plantations have also been established in France, and earlier on in Zimbabwe (Mullin et al., 1978)."
301	2010. Georgia Wildlife Federation. Virginia Pine - Pinus virginiana. http://www.fisharama.org/resources/wildlifehabitats/pinusvirginiana.html [Accessed 19 July 2013]	[Naturalized beyond native range? Yes] "Naturalized populations occur in British Columbia and Alberta. It is a pioneer species in virtually any habitat, from river bottoms to open fields to forest edges."
301	2012. Earle, C.J.. The Gymnosperm Database - Pinus virginiana. http://www.conifers.org/pi/Pinus_virginiana.php [Accessed 18 July 2013]	[Naturalized beyond native range? Yes] "Naturalized in Canada: Alberta, British Columbia, and Ontario (Brouillet et al. 2006, cited by PLANTS database 2009.03.31)."
302	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Garden/amenity/disturbance weed? Invades disturbed sites] "Virginia pine is an aggressive invader of burned sites [5,14,37]. It is intolerant of shade [7,14]. Virginia pine is a transitional type, and is usually quickly replaced by tolerant hardwoods [7]."

302	1997. Barton, A.M./Wallenstein, M.D.. Effects of Invasion of Pinus virginiana on Soil Properties in Serpentine Barrens inSoutheastern Pennsylvania. Journal of the Torrey Botanical Society. 124(4): 297-305.	[Garden/amenity/disturbance weed? Invasive in the successional sense] "The New Texas serpentine barrens is a rare, natural savanna in southeastern PA that is rapidly succeeding to forest, probably as a result of fire exclusion. We tested the hypothesis that the invasive tree, Pinus virginiana, is modifying soil conditions in a way that may promote conversion to forest"
302	1999. Iverson, L.R./Prasad, A./Schwartz, M.W.. Modeling potential future individual tree-species distributions in the eastern United States under a climate change scenario: a case study with Pinus virginiana. Ecological Modelling. 115(1): 77-93.	[Garden/amenity/disturbance weed?] "Virginia pine establishes easily on abandoned and cutover lands, nearly to the point of being considered a 'weed species' by some."
302	2007. Cumming, J.R./Kelly, C.N.. Pinus virginiana invasion influences soils and arbuscular mycorrhizae of a serpentine grassland. The Journal of the Torrey Botanical Society. 134(1): 63-73.	[Garden/amenity/disturbance weed? Successional] "The serpentine grassland ecosystem historically dominating serpentine soils in Maryland is being displaced by Virginia pine (Tyndall and Farr 1989, 1990, Tyndall 1992a, 1992b). Following pine encroachment, soils are modified by biological weathering beneath the pines (Barton and Wallenstein 1997), which may influence the capacity of these soils to support serpentine grassland endemic species, including native AMF. The invasion of pines into serpentine grasslands has been considered a successional process (Tyndall 1992a, 1992b, Barton and Wallenstein 1997), and the resulting soil changes may feed forward to further promote conversion to forest on these sites (Barton and Wallenstein 1997)."
303	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.	[Agricultural/forestry/horticultural weed] ""Virginia pine (Pinus virginiana) has a definite place among trees of commercial importance in spite of once being considered a "forest weed" and called scrub pine."
304	2012. Randall, R.P.. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	[Environmental weed? No] No evidence
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	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Produces spines, thorns or burrs? No] "Virginia pine is a native, medium-sized, two needle pine. Average height at maturity (50 years of age) is 50 to 75 feet (15-23 m) on better sites [7]. Its long horizontal branches are irregularly spaced [5,19]. Open-grown trees have persistent, heavy branches to the ground [25]. The trunk is relatively short, with an open, flat-topped crown [12]. The needles are about 2 inches (5 cm) long. The bark of young stems is smooth; older stems have platy scales with shallow fissures [14,25]."
402	2007. Cumming, J.R./Kelly, C.N.. Pinus virginiana invasion influences soils and arbuscular mycorrhizae of a serpentine grassland. The Journal of the Torrey Botanical Society. 134(1): 63-73.	[Allelopathic? Modifies soils] "The serpentine grassland ecosystem historically dominating serpentine soils in Maryland is being displaced by Virginia pine (Tyndall and Farr 1989, 1990, Tyndall 1992a, 1992b). Following pine encroachment, soils are modified by biological weathering beneath the pines (Barton and Wallenstein 1997), which may influence the capacity of these soils to support serpentine grassland endemic species, including native AMF. The invasion of pines into serpentine grasslands has been considered a successional process (Tyndall 1992a, 1992b, Barton and Wallenstein 1997), and the resulting soil changes may feed forward to further promote conversion to forest on these sites (Barton and Wallenstein 1997)."
402	2010. Georgia Wildlife Federation. Virginia Pine - Pinus virginiana. http://www.fisharama.org/resources/wildlifehabitats/pinusvirginiana.html [Accessed 19 July 2013]	[Allelopathic? Potentially] "They also benefit plant life and make excellent mulch. They acidify the soil slightly when they decay, and are especially useful for acid-loving plants like Blueberries, Mountain laurel, native Azaleas, and other Ericaceous plants."
403	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Parasitic? No] "It is a medium-sized tree, to about 18 m maximum height, and stem d.b.h. 50-80 cm." [Pinaceae]

404	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Unpalatable to grazing animals? No] "When used for revegetation of mine spoils, Virginia pine has high value for wildlife cover and food [61]. It provides browse for white-tailed deer, and probably for other animals as well [52]. Virginia pine forests are the second highest producers of choice browse for white-tailed deer in the Oconee National Forest, Georgia [21]."
405	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Toxic to animals? No evidence] "When used for revegetation of mine spoils, Virginia pine has high value for wildlife cover and food [61]. It provides browse for white tailed deer, and probably for other animals as well [52]. Virginia pine forests are the second highest producers of choice browse for white tailed deer in the Oconee National Forest, Georgia [21]."
405	2008. Wagstaff, D.J.. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	[Toxic to animals? No] No evidence
406	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.	[Host for recognized pests and pathogens?] "Damaging Agents- Heart rot due to Phellinus pini often is present in stands more than 60 years old, but it is rare in stands less than 50 years of age. In a severe case, as much as 34 percent of the trees in a 59-year-old stand were infected (36). Partly because of its susceptibility to heart rot, pulpwood rotations generally are preferred to sawtimber rotations in Virginia pine. The other serious disease of Virginia pine is pitch canker (Fusarium moniliforme var. subglutinans), which enters twigs or stems through small wounds and causes a heavy exudation of pitch. The canker enlarges rapidly and eventually girdles the twig or stem. Seedlings infected with pitch canker have a mortality rate of about 90 percent (15). Some variation in susceptibility to pitch canker appears to have a genetic basis (2). Other diseases usually cause little loss of growth in Virginia pine. Stem cankers (Atropellis tingens), eastern gall rust (Cronartium quercuum), a stem rust (C. comptoniae), root rot (Heterobasidion annosum), and butt rots (Poria subacida, Phaeolus schweinitizii) occasionally infest Virginia pine. The principal forest insects that cause significant damage to Virginia pine are the southern pine beetle (Dendroctonus frontalis), Ips spp., and pine sawflies, the Virginia pine sawfly (Neodiprion pratti pratti) and the redheaded pine sawfly (N. lecontei). Trees under stress of lightning, fire, or logging injury are more susceptible to insect attack than sound healthy trees (39). The pales weevil (Hylobius pales), which feeds on and often kills small seedlings of several pine species, can greatly reduce the regeneration of Virginia pine. Attacks are most likely on recently cutover areas where pine roots provide the food needed to build up a large larval population."
406	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Host for recognized pests and pathogens?] "Principal diseases of Virginia pine include heart rot and pitch canker. Principal insect pests include the southern pine beetle, Ips spp., Virginia pine sawfly, redheaded pine sawfly, and pales weevil. Meadow mice may girdle young trees [7]. Virginia pine is resistant to damage by ozone [13,20]."
407	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.	[Causes allergies or is otherwise toxic to humans? No evidence] "Of the southern conifers, Virginia pine is most preferred as a Christmas tree."
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	2010. Georgia Wildlife Federation. Virginia Pine - Pinus virginiana. http://www.fisharama.org/resources/wildlifehabitats/pinusvirginiana.html [Accessed 19 July 2013]	[Causes allergies or is otherwise toxic to humans? No evidence] "Its needles, like all pines, are high in vitamin C and entirely edible. They make an excellent and nutritious addition to salads, soups, and have a wonderfully fragrant smell."
407	2013. Pollen Library. Virginia Pine (Pinus virginiana). IMS Health Inc., http://www.pollenlibrary.com/Specie/Pinus+virginiana/ [Accessed 18 July 2013]	[Causes allergies or is otherwise toxic to humans? No] "Allergenicity: No allergy has been reported for Virginia Pine (Pinus virginiana) species."

408	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Creates a fire hazard in natural ecosystems? No. Invades other habitats modified by fire] "Virginia pine populations are maintained by fire or other disturbance; Virginia pine is a colonizer of recently burned sites [37]. Root crown sprouts have been reported, but are apparently not an important fire survival mechanism [7].Fire regimes in habitats containing Virginia pine have been altered by humans for many years. It is thought that prior to European settlement, Indians maintained large tracts of pine forests through intentional burning of forest lands for various purposes (e.g., agriculture, wildlife harvest) [9,57]. These fires created a patchwork of communities, increasing the amount of area covered by pioneer or pyrophytic species such as Virginia and pitch pines [57]. Currently, lightning fires do occur, but are of low importance compared to those started by people [9]. Landers [27] estimated the fire return interval in the southeastern United States at approximately 2 fires of high intensity per 100 years. In the Great Smoky Mountains National Park, Tennessee and South Carolina, fire intervals for 1856 to 1900 and for 1900 to 1940 were both estimated to be 9.2 years below 2,000 feet (610 m) elevation, and 11.3 years above that elevation [22]."
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? No] "Seedlings require direct sunlight for best growth. Even partial shade reduces growth, and seedlings do not survive under full shade." … "Being intolerant of shade, Virginia pine is a transitional type and is eventually replaced by more tolerant hardwood species. It is a pioneer species, coming in after fire, and on eroded areas or wornout old fields. Compared with associated pines, it is generally more successful on poorer sites. Virginia pine seedlings cannot become established under the shade of an existing stand, so hardwoods invade the understory."
409	2005. Andersson, F.A.. Ecosystems of the World. Volume 6: Coniferous Forests.. Elsevier, Amsterdam, The Netherlands	[Is a shade tolerant plant at some stage of its life cycle? No] "Pinus virginiana and P. rigida do not tolerate shade. Generally, these species grow in pure stands regenerating from a major disturbance."
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 (or limestone conditions if not a volcanic island)? Yes] "Virginia pine grows well on a variety of soils derived from marine deposits, from crystalline rocks, sandstones, and shales, and from limestone to a lesser extent. These are classified as Spodosols and Inceptisols. After harvesting or fire, these soils are subject to moderate sheet and gully erosion; erosion can become severe on shale soils. On many areas that now support Virginia pine, much of the A horizon is gone because of past erosion under intensive agricultural use. The species grows best on clay, loam, or sandy loam; it generally does poorly on serpentine soils, shallow shaly soils, and very sandy soils. It thrives only in moderately well drained to well drained soils and is less tolerant of wet sites and impeded drainage than pitch and loblolly pines (Pinus rigida and P. taeda). Virginia pine generally tolerates soil acidities ranging from pH 4.6 to 7.9 (39)."
410	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Tolerates a wide range of soil conditions? Yes] "It grows well on a variety of soils; it is less tolerant of wet sites and impeded drainage than loblolly and pitch pine (Pinus rigida, P. taeda); however, it is more tolerant of low soil moisture than many pine species (Carter and Snow, 1990). It often grows as a pioneer species on old fields or burned areas, and succeeds on eroded soils."
411	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Climbing or smothering growth habit? No] "It is a medium-sized tree, to about 18 m maximum height, and stem d.b.h. 50-80 cm. "
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] "Virginia pine often grows in pure stands, usually as a pioneer species on old fields, burned areas, or other disturbed sites."
501	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Aquatic? No] Terrestrial
502	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[Grass? No] Pinaceae
503	2013. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl	[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] "It is a medium-sized tree, to about 18 m maximum height, and stem d.b.h. 50-80 cm. "
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] No evidence

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] "Virginia pine produces some seed each year, with heavy cone crops occurring at intervals of 3 or more years. Good cone crops can be produced in 2 successive years, however, and peak seed years do not necessarily coincide throughout the range."
602	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Produces viable seed? Yes] "Virginia pine is a prolific seed producer [15,29]. The cones open at maturity, and persist for at least several years [14]."
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? Unknown from natural settings] "Hybrids of Virginia pine and Ocala sand pine (Pinus clausa var. clausa) can be made under controlled conditions with either species as the seed parent. Controlled crosses of P. virginiana with jack pine (P. banksiana) and lodgepole pine (P. contorta) have not been successful (25)."
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? Yes] "Virginia pine is wind pollinated and primarily outcrossing, though self-fertilization is possible."
605	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.	[Requires specialist pollinators? No] "Virginia pine is wind pollinated and primarily outcrossing, though self-fertilization is possible. Fertilization takes place in early June some 13 months later, when the cones have nearly reached full size."
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] "Vegetative Reproduction- Sprout growth on Virginia pine is rare. Occasionally, cut stubs produce a few short-lived sprouts from dormant buds. Rooting of cuttings from 7- and 8-year-old Virginia pine is most successful (72 percent rooted) when cuttings were taken in December and treated with 0.2 percent indolebutyric acid before being placed in a mist chamber (40). Cuttings from 1-year-old seedlings also can be rooted, but those taken from mature trees fail to root (25)."
606	2012. Earle, C.J.. The Gymnosperm Database - Pinus virginiana. http://www.conifers.org/pi/Pinus_virginiana.php [Accessed 18 July 2013]	[Reproduction by vegetative fragmentation? No] "Life History: Vegetative reproduction does not occur naturally."
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)? Typically 5+ years] "Open-grown trees often produce cones as early as 5 years of age, and a few trees have been known to flower at 18 months (3). In dense stands, cone production can be delayed for as many as 50 years. As stands become more open, cone production is accelerated (36)."
607	2005. Andersson, F.A.. Ecosystems of the World. Volume 6: Coniferous Forests.. Elsevier, Amsterdam, The Netherlands	[Minimum generative time (years)? 3] "Pinus virginiana is a prolific seed producer, and also precocious (it stars as early as three years."
701	1952. Ross, M.I.. Pinus virginiana in the Forest Primeval of Five Southern Indiana Counties. Butler University Botanical Studies. 10: 80-89.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Unknown] "It is found in the open fields, along roadsides, in pastures, ditches and fence corners." [Seeds are adapted for wind dispersal, and lack means of external attachment, but their relatively small size (4-7 mm length) may allow for some inadvertent transport along heavily trafficked corridors]
701	1999. Iverson, L.R./Prasad, A./Schwartz, M.W.. Modeling potential future individual tree-species distributions in the eastern United States under a climate change scenario: a case study with Pinus virginiana. Ecological Modelling. 115(1): 77-93.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Unknown] "Virginia pine establishes easily on abandoned and cutover lands, nearly to the point of being considered a 'weed species' by some."
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] "Of the southern conifers, Virginia pine is most preferred as a Christmas tree. If families with desirable traits are selected and appropriate cultural practices are used, marketable Christmas trees can be produced in as few as 3 years, although the usual rotation age for Virginia pine Christmas trees is 5 to 10 years (4,24)."
702	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Propagules dispersed intentionally by people? Yes] "It is a good species for use in revegetation of abandoned and cutover land, and on mine spoil sites. It is now a principal source of lumber and pulpwood in the regions in which it grows (Carter and Snow, 1990)." [Also a source of Christmas trees]
703	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 likely to disperse as a produce contaminant? No] "Most of the seeds fall within 30 m (100 ft) of trees with an average height of 18 m (60 ft); however, stocking often is adequate at greater distances, particularly on the lee side of a seed source." [Primarily wind and gravity dispersed. No evidence found in literature of seed contamination of other produce]

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. Wind and gravity] "Seed dispersal starts in October and is complete within 3 months, though some seeds may continue to be released until the following spring. Most of the seeds fall within 30 m (100 ft) of trees with an average height of 18 m (60 ft); however, stocking often is adequate at greater distances, particularly on the lee side of a seed source."
705	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 water dispersed? No] "Most of the seeds fall within 30 m (100 ft) of trees with an average height of 18 m (60 ft); however, stocking often is adequate at greater distances, particularly on the lee side of a seed source." [Wind-dispersed, and distribution of trees does not suggest movement by water]
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] "Virginia pine seeds are an important food source for many small mammals and birds, including northern bobwhites [14,52]. " [Seeds may be dispersed by birds, but they are primarily predators, rather than legitimate 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)? Possibly] "Virginia pine seeds are an important food source for many small mammals and birds, including northern bobwhites [14,52]. " [Rodents, and other seed predators, may carry seeds externally for consumption and potentially disperse seeds that are not consumed]
708	2010. Georgia Wildlife Federation. Virginia Pine - Pinus virginiana. http://www.fisharama.org/resources/wildlifehabitats/pinusvirginiana.html [Accessed 19 July 2013]	[Propagules survive passage through the gut? No] "Seeds are eaten by the ground dove, quail, and wild turkey." [Seeds are adapted for wind dispersal, and are presumably destroyed by bird consumption]
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)?] "Over a 4-year period, seedfall per hectare ranged from 15,800 to 98,800 (6,400 to 40,000/acre) (18)." [ca 4 to 24 seeds/square meter]
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)? Possibly. Unknown from field conditions] "Storage Behaviour: Orthodox p. Storage Conditions: 50% germination following 5 years hermetic storage at 5°C with 5-10% mc (Krugman & Jenkinson, 1974)"
803	2013. WRA Specialist. Personal Communication.	[Well controlled by herbicides? Unknown] Despite naturalization, no information was found on chemical control methods of this tree. Probably susceptible to mechanical control, similar to other Pinus spp.
804	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, or benefits from, mutilation, cultivation, or fire? No. Not fire] "Young Virginia pines are particularly vulnerable to fire because of their thin bark and their lack of long lived dormant buds at the base, along the bole, and in the crown. Fire reduces the Virginia pine component in stands where this species is mixed with pitch, shortleaf, or loblolly pines."
804	1993. Sullivan, J.. Pinus virginiana. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, http://www.fs.fed.us/database/feis/ [Accessed 18 July 2013]	[Tolerates, or benefits from, mutilation, cultivation, or fire? No] "Virginia pine is not well adapted to survive fire due to thin bark and shallow roots [12]. Large trees however, are apparently able to survive fires. "
805	2013. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Reported to be naturalized in British Columbia and Alberta, Canada
- Aggressive invader of burned sites
- Related *Pinus* species have become highly invasive
- Can modify soil chemistry and increase acidity
- Tolerates many soil conditions (and potentially able to exploit many different habitat types)
- Can form dense thickets in native range
- Self-fertilization is possible
- May reach maturity in 3 years
- Seeds dispersed by wind and gravity

Low Risk / Desirable Traits

- Temperate tree could probably only be grown at higher elevations of tropical countries
- Palatable to deer and possibly other grazing animals (could prevent spread)
- Non-toxic
- Shade-intolerant
- Will not spread vegetatively
- Killed by wildfire (but rapidly colonizes burned areas)
- Landscaping and ornamental value (Christmas tree)