

| | |
|--|--|
| Taxon: <i>Afrocarpus mannii</i> (Hook. f.) C. N. Page | Family: Podocarpaceae |
| Common Name(s): pinheiro da terra São Tomé yellow-wood | Synonym(s): <i>Decussocarpus mannii</i> (Hook. f.) de Nageia mannii (Hook.f.) Kuntze <i>Podocarpus mannii</i> Hook. f. |

| | | |
|--------------------------------|----------------------------------|------------------------------|
| Assessor: Chuck Chimera | Status: Assessor Approved | End Date: 16 Oct 2018 |
| WRA Score: -1.0 | Designation: L | Rating: Low Risk |

Keywords: Tropical Tree, Naturalizing, Dioecious, Wind-Pollinated, Animal-Dispersed

| Qsn # | Question | Answer Option | Answer |
|-------|---|--|--------|
| 101 | Is the species highly domesticated? | y=-3, n=0 | n |
| 102 | Has the species become naturalized where grown? | | |
| 103 | Does the species have weedy races? | | |
| 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) | High |
| 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 | y |
| 205 | Does the species have a history of repeated introductions outside its natural range? | y=-2, ?=-1, n=0 | n |
| 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) | n |
| 305 | Congeneric weed | | |
| 401 | Produces spines, thorns or burrs | y=1, n=0 | n |
| 402 | Allelopathic | | |
| 403 | Parasitic | y=1, n=0 | n |
| 404 | Unpalatable to grazing animals | | |
| 405 | Toxic to animals | y=1, n=0 | n |
| 406 | Host for recognized pests and pathogens | | |
| 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 | | |

| Qsn # | Question | Answer Option | Answer |
|-------|--|---|--------|
| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | | |
| 411 | Climbing or smothering growth habit | y=1, n=0 | n |
| 412 | Forms dense thickets | y=1, n=0 | n |
| 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 | | |
| 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 | 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 | n |
| 705 | Propagules water dispersed | y=1, n=-1 | n |
| 706 | Propagules bird dispersed | y=1, n=-1 | y |
| 707 | Propagules dispersed by other animals (externally) | y=1, n=-1 | n |
| 708 | Propagules survive passage through the gut | y=1, n=-1 | y |
| 801 | Prolific seed production (>1000/m ²) | y=1, n=-1 | n |
| 802 | Evidence that a persistent propagule bank is formed (>1 yr) | y=1, n=-1 | y |
| 803 | Well controlled by herbicides | | |
| 804 | Tolerates, or benefits from, mutilation, cultivation, or fire | | |
| 805 | Effective natural enemies present locally (e.g. introduced biocontrol agents) | | |

Supporting Data:

| Qsn # | Question | Answer |
|-------|---|--|
| 101 | Is the species highly domesticated? | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | [No evidence] " <i>Afrocarpus mannii</i> is endemic on the volcano Pico de Sao Tome from ca. 1450 m to the summit area at 2142 m a.s.l." |

| | | |
|-----|---|-------|
| 102 | Has the species become naturalized where grown? | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | NA |

| | | |
|-----|--|-------|
| 103 | Does the species have weedy races? | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | NA |

| | | |
|-----|---|---|
| 201 | Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical" | High |
| | Source(s) | Notes |
| | USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 12 Oct 2018] | "Native Africa WEST-CENTRAL TROPICAL AFRICA: Sao Tome and Principe (Sao Tome)" |

| | | |
|-----|---|-------|
| 202 | Quality of climate match data | High |
| | Source(s) | Notes |
| | USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 12 Oct 2018] | |

| | | |
|-----|---|---|
| 203 | Broad climate suitability (environmental versatility) | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | " <i>Afrocarpus mannii</i> is endemic on the volcano Pico de Sao Tome from ca. 1450 m to the summit area at 2142 m a.s.l." [Elevation range of 692 m in native range] |
| | Earle, C.J. (2018). The Gymnosperm Database - <i>Afrocarpus mannii</i> . https://www.conifers.org/po/Afrocarpus_mannii.php . [Accessed 15 Oct 2018] | "Zone 10 (cold hardiness limit between -1°C and +4.4°C) (Bannister and Neuner 2001)." |

| Qsn # | Question | Answer |
|-------|---|---|
| 204 | Native or naturalized in regions with tropical or subtropical climates | y |
| | Source(s) | Notes |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18 | " <i>Afrocarpus mannii</i> (Hook.) C.N. Page [Syn: <i>Nageia mannii</i> (Hook.) Kuntze] This tree was first planted in the Arboretum in 1939. Planted specimens at the Arboretum were observed in three separate locations, and in all cases seedlings and saplings were observed in the immediate vicinity. Leaves are opposite, linear, 7–15 cm long and ca. 1 cm wide. Receptacles ("fruits") are fleshy, green, pear-shaped, 4–5 cm long. The spread of this species may be limited by lack of an efficient animal disperser. Material examined: OAHU: Growing wild among <i>Ardisia elliptica</i> and ginger, on steep slope, Haukulu, Lyon Arboretum, 14 Jun 2005, C. Daehler 1313 (BISH); labeled as <i>P. usambarensis</i> , Lyon Arboretum (cultivated), 3 Jan 1974, S. Ishikawa 368 (HLA)." |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Distribution - West Central Africa (Gulf of Guinea Islands): Sao Tome." |
| | USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 12 Oct 2018] | "Native Africa WEST-CENTRAL TROPICAL AFRICA: Sao Tome and Principe (Sao Tome)" |

| | | |
|-----|---|---|
| 205 | Does the species have a history of repeated introductions outside its natural range? | n |
| | Source(s) | Notes |
| | Earle, C.J. (2018). The Gymnosperm Database - <i>Afrocarpus mannii</i> . https://www.conifers.org/po/Afrocarpus_mannii.php . [Accessed 15 Oct 2018] | " <i>Afrocarpus mannii</i> (Hook.) C.N. Page [Syn: <i>Nageia mannii</i> (Hook.) Kuntze] This tree was first planted in the Arboretum in 1939. Planted specimens at the Arboretum were observed in three separate locations, and in all cases seedlings and saplings were observed in the immediate vicinity." |

| | | |
|-----|---|---|
| 301 | Naturalized beyond native range | y |
| | Source(s) | Notes |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18 | " <i>Afrocarpus mannii</i> (Hook.) C.N. Page [Syn: <i>Nageia mannii</i> (Hook.) Kuntze] This tree was first planted in the Arboretum in 1939. Planted specimens at the Arboretum were observed in three separate locations, and in all cases seedlings and saplings were observed in the immediate vicinity. Leaves are opposite, linear, 7–15 cm long and ca. 1 cm wide. Receptacles ("fruits") are fleshy, green, pear-shaped, 4–5 cm long. The spread of this species may be limited by lack of an efficient animal disperser. Material examined: OAHU: Growing wild among <i>Ardisia elliptica</i> and ginger, on steep slope, Haukulu, Lyon Arboretum, 14 Jun 2005, C. Daehler 1313 (BISH); labeled as <i>P. usambarensis</i> , Lyon Arboretum (cultivated), 3 Jan 1974, S. Ishikawa 368 (HLA)." |

| | | |
|-----|---------------------------------|---|
| 302 | Garden/amenity/disturbance weed | n |
|-----|---------------------------------|---|

| Qsn # | Question | Answer |
|-------|---|--------------|
| | Source(s) | Notes |
| | Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall | No evidence |

| | | |
|------------|---|--------------|
| 303 | Agricultural/forestry/horticultural weed | n |
| | Source(s) | Notes |
| | Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall | No evidence |

| | | |
|------------|---|--------------|
| 304 | Environmental weed | n |
| | Source(s) | Notes |
| | Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall | No evidence |

| | | |
|------------|---|--|
| 305 | Congeneric weed | |
| | Source(s) | Notes |
| | Geldenhuys, C. J. (2013). Converting invasive alien plant stands to natural forest nature's way: Overview, theory, and practice. Pp. 217-238 in Jose, S. et al. (eds.). Invasive Plant Ecology. CRC Press, Boca Raton, FL | [<i>Afrocarpus falcatus</i> is potentially invasive in South Africa outside natural range] "In the Cape Peninsula (Cape Town), South Africa, the South African national tree and a nationally protected tree, <i>Afrocarpus</i> (<i>Podocarpus</i>) <i>falcatus</i> , grows about 250 km to the west and outside of its natural range and has become an invasive "alien" tree species. Its bat-dispersed seeds are spreading from a few scattered planted trees within Table Mountain National Park and also from the suburbs below the national park. Dense seedling banks are established in the understory of the small natural forest patches and have to be removed (with much debate over this controversial issue). In general, these species have a very confined, patchy occurrence in the natural forest. The best strategy is to remove the seed-bearing trees inside or close to the forest and to maintain a close observation or monitoring of such areas to prevent the seedlings from becoming dense and suppressive or growing into future seed-bearing trees. Fortunately, most shade-tolerant species, native or alien, grow relatively slower under the forest canopy." |

| Qsn # | Question | Answer |
|-------|---|--|
| 401 | Produces spines, thorns or burrs | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | [No evidence] "Trees generally to 15 m tall but on the summit area as krummholz. Bark undescribed. Branches ascending and spreading forming a broad crown. Foliage relatively sparse; new lateral branchlets ridged or more or less quadrangular; terminal buds small, ca. 2 x 1 mm, or absent; bud scales triangular, acuminate. Leaves spirally arranged, on seedlings and young plants linear-lanceolate to subfalcate, up to 16 cm long and 4-8 mm wide, straight or falcate, tapering to a fine point. Adult leaves slightly shorter, (2-)3-8(-11) cm long, 3-7(-8) mm wide, twisted at the petiole base, spreading, straight or slightly falcate, lanceolate to linear-lanceolate, with a conspicuously raised midrib adaxially (lower side) and obscurely present abaxially, grey-green; apex acute to obtuse." |

| | | |
|-----|--|---------|
| 402 | Allelopathic | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | Unknown |

| | | |
|-----|---|--|
| 403 | Parasitic | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Trees generally to 15 m tall but on the summit area as krummholz." [Podocarpaceae. No evidence] |

| | | |
|-----|--------------------------------|-------|
| 404 | Unpalatable to grazing animals | |
| | Source(s) | Notes |

| Qsn # | Question | Answer |
|-------|---|---|
| | Tekle, K., Backéus, I., Skoglund, J., & Woldu, Z. (1997). Vegetation on hill slopes in southern Wello, Ethiopia: Degradation and regeneration. <i>Nordic Journal of Botany</i> , 17(5), 483-493 | [Unknown. Related species <i>Podocarpus</i> (<i>Afrocarpus</i>) <i>falcatus</i> may be grazed] "A study was made of the vegetation in southern Wello (Ethiopia) in relation to human impact and the environment. 65 sample plots were laid out and analysed with respect to the cover value of vascular plant species. Altitude, slope, aspect and estimates of grazing pressure for each plot were also recorded along with physical and chemical soil properties analysed for samples taken from each plot. The following environmental factors, isolated by forward selection, show correlation with the axes of Canonical Correspondence Analysis (CCA): altitude, grazing, pH, K, Ca, Mg, slope and aspect. Through hierarchical and non-hierarchical clustering methods the vegetation was divided into eight types, from which one was secondary forest characterised by patch dominance of <i>Juniperus procera</i> and <i>Olea europaea</i> ssp. <i>cuspidata</i> . These forest patches are found at high altitude sites and because of their inaccessibility are usually characterised by low livestock density and consequently low grazing pressure. The presence of large boulders and stones in <i>Podocarpus falcatus</i> forest decreases accessibility and creates natural protection for the trees. The other vegetation types, most of which are found at lower altitude and associated with varying intensities of grazing, include grasslands (grazed and protected), regenerating sites dominated by <i>Euclea racemosa</i> and <i>Dodonaea angustifolia</i> , dense and open shrublands and <i>Olea europaea</i> ssp. <i>cuspidata</i> woodlands. Human interference has a major impact on the vegetation of the study area and its recovery will depend on the degree of participation of the local people." |

| 405 | Toxic to animals | n |
|-----|---|---|
| | Source(s) | Notes |
| | Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL | No evidence |
| | Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL | No evidence. Medicinal uses reported for other species in genus |

| 406 | Host for recognized pests and pathogens | |
|-----|---|--|
| | Source(s) | Notes |
| | Aerts, R. 2008. <i>Afrocarpus falcatus</i> (Thunb.) C.N.Page. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). <i>Prota 7(1): Timbers 1</i> . [CD-Rom]. PROTA, Wageningen, Netherlands | [Unknown. Related taxon affected by some pests & pathogens] "Diseases and pests <i>Fusarium oxysporum</i> and <i>Polyporus</i> sp. are pathogenic to seeds and seedlings. An unidentified fungus causing blackish tumours on twigs and leaves causes vitality problems in relict populations of <i>Afrocarpus falcatus</i> in northern Ethiopia. Seeds are commonly attacked by insects, which may cause considerable losses." |
| | WRA Specialist. 2018. Personal Communication | Unknown |

| Qsn # | Question | Answer |
|-------|---|---|
| 407 | Causes allergies or is otherwise toxic to humans | n |
| | Source(s) | Notes |
| | Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL | No evidence |
| | Quattrocchi, U. 2012. CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL | No evidence. Medicinal uses reported for other species in genus |

| 408 | Creates a fire hazard in natural ecosystems | n |
|-----|---|---|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | " <i>Afrocarpus mannii</i> is endemic on the volcano Pico de Sao Tome from ca. 1450 m to the summit area at 2142 m a.s.l. It is nowhere a tall tree and at the summit it is reduced to dwarfed krummholz. It is common in the high montane cloud forest where this has remained undisturbed." [No evidence from native range] |

| 409 | Is a shade tolerant plant at some stage of its life cycle | |
|-----|---|--|
| | Source(s) | Notes |
| | Aerts, R. 2008. <i>Afrocarpus falcatus</i> (Thunb.) C.N.Page. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). Prota 7(1): Timbers 1. [CD-Rom]. PROTA, Wageningen, Netherlands | " <i>Afrocarpus falcatus</i> is characterized as a non-pioneer, shade-tolerant species." [Related taxon shade tolerant] |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Ōahu. Bishop Museum Occasional Papers 87: 3-18 | [Possibly shade tolerant if growing under other vegetation] "This tree was first planted in the Arboretum in 1939. Planted specimens at the Arboretum were observed in three separate locations, and in all cases seedlings and saplings were observed in the immediate vicinity." ... "Growing wild among <i>Ardisia elliptica</i> and ginger, on steep slope, Haukulu, Lyon Arboretum" |

| 410 | Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island) | |
|-----|---|---|
| | Source(s) | Notes |
| | Aerts, R. 2008. <i>Afrocarpus falcatus</i> (Thunb.) C.N.Page. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). Prota 7(1): Timbers 1. [CD-Rom]. PROTA, Wageningen, Netherlands | [Unknown for <i>A. mannii</i>] "It performs best on well-drained, deep, humus-rich and light-textured soils with pH of 5-7." |

| 411 | Climbing or smothering growth habit | n |
|-----|---|---|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Trees generally to 15 m tall but on the summit area as krummholz." |

| Qsn # | Question | Answer |
|-------|---|--|
| 412 | Forms dense thickets | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | " <i>Afrocarpus mannii</i> is endemic on the volcano Pico de Sao Tome from ca. 1450 m to the summit area at 2142 m a.s.l. It is nowhere a tall tree and at the summit it is reduced to dwarfed krummholz. It is common in the high montane cloud forest where this has remained undisturbed." [No description from native range] |

| 501 | Aquatic | n |
|-----|---|--|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | [Terrestrial] "Trees generally to 15 m tall but on the summit area as krummholz." ... "It is common in the high montane cloud forest where this has remained undisturbed." |

| 502 | Grass | n |
|-----|---|-----------------------|
| | Source(s) | Notes |
| | USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 12 Oct 2018] | Family: Podocarpaceae |

| 503 | Nitrogen fixing woody plant | n |
|-----|---|-----------------------|
| | Source(s) | Notes |
| | USDA, ARS, Germplasm Resources Information Network. 2018. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html . [Accessed 12 Oct 2018] | Family: Podocarpaceae |

| 504 | Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers) | n |
|-----|---|--------------------------------|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Trees generally to 15 m tall" |

| Qsn # | Question | Answer |
|-------|--|---|
| 601 | Evidence of substantial reproductive failure in native habitat | n |
| | Source(s) | Notes |
| | Farjon, A. (2013). <i>Afrocarpus mannii</i> (errata version published in 2018). The IUCN Red List of Threatened Species 2013. http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T32770A2823290.en . [Accessed 15 Oct 2018] | "The current population of this species is confined to the Pico de Sao Tomé from above 1,450 m a.s.l. to the summit. This area is less than 25 km ² within which the area of occupancy of <i>Afrocarpus mannii</i> must be substantially smaller than this. It is certainly smaller than the threshold for Vulnerable under D2. As the only known population, it is vulnerable to stochastic events such as volcanic eruptions, fires or severe storms." [Small native range makes plant vulnerable] |
| 602 | Produces viable seed | y |
| | Source(s) | Notes |
| | Farjon, A. (2017). <i>A Handbook of the World's Conifers</i> . Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, Ōahu. Bishop Museum Occasional Papers 87: 3-18 | "This tree was first planted in the Arboretum in 1939. Planted specimens at the Arboretum were observed in three separate locations, and in all cases seedlings and saplings were observed in the immediate vicinity." |
| 603 | Hybridizes naturally | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | Unknown. No evidence found |
| 604 | Self-compatible or apomictic | n |
| | Source(s) | Notes |
| | Page, C. N. (1988). New and maintained genera in the conifer families Podocarpaceae and Pinaceae. Notes from the Royal Botanic Garden, Edinburgh 45(2): 377-395 | " <i>Afrocarpus</i> ... Dioecious, columnar, tall evergreen trees." |
| 605 | Requires specialist pollinators | n |
| | Source(s) | Notes |
| | Farjon, A. (2008). <i>A Natural History of Conifers</i> . Timber Press, Portland, OR | "Whereas all conifers are wind pollinated, the Podocarpaceae have abandoned the conifer cone as a means to keep seeds before dispersal and pretend to have fruits like angiosperms." |
| | Aerts, R. 2008. <i>Afrocarpus falcatus</i> (Thunb.) C.N.Page. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). <i>Prota 7(1): Timbers 1</i> . [CD-Rom]. PROTA, Wageningen, Netherlands | [Related species wind-pollinated] "The pollen is dispersed by wind, but most of it does not get far from the male tree." |

| Qsn # | Question | Answer |
|-------|--|---|
| 606 | Reproduction by vegetative fragmentation | n |
| | Source(s) | Notes |
| | Useful Tropical Plants Database. (2018). <i>Afrocarpus mannii</i> . http://tropical.theferns.info/viewtropical.php?id=Afrocarpus+manna . [Accessed 15 Oct 2018] | [No evidence] "Propagation Seed - remains viable for several years in normal storage. The seed has two types of dormancy; a chemical, which is overcome by removing the fleshy layer and a mechanical, imposed by the hard seedcoat. To ensure a high and even germination the seedcoat must be broken and removed. This can be done in a vice but it is very time consuming. Freshly collected seeds will normally germinate well, up to 60% in nine weeks, even with seedcoat but once the seeds have been dried, germination can take more than six months unless the seedcoat is removed. Some reports say that soaking in saturated salt water just before sowing can improve germination. Others recommend stratification between two layers of compost for 3 - 5 days in order to weaken the seedcoat[325]. The seeds are sown directly in nursery bags or in seedbeds in a mixture of compost and sand (1:1). The seed must be pushed into the mixture and covered with a fine layer of soil. The mixture must never be allowed to dry out[325]. Cuttings taken from end shoots (as opposed to cuttings from lateral branches and shoots) in order to produce plants with upright growth[325]." |

| | | |
|-----|---|--|
| 607 | Minimum generative time (years) | >3 |
| | Source(s) | Notes |
| | Farjon, A. (2017). <i>A Handbook of the World's Conifers</i> . Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Trees generally to 15 m tall but on the summit area as krummholz." [Exact time to maturity unknown, but given size & age of maturity of related species, likely >3 years] |
| | Aerts, R. 2008. <i>Afrocarpus falcatus</i> (Thunb.) C.N.Page. In: Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). <i>Prota 7(1): Timbers 1</i> . [CD-Rom]. PROTA, Wageningen, Netherlands | [Related taxon begins fruiting at 10 years] "Fruiting starts when the tree is 10 years old." |

| | | |
|-----|---|--|
| 701 | Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas) | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). <i>A Handbook of the World's Conifers</i> . Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." [No evidence. No means of external attachment] |

| | | |
|-----|---|---|
| 702 | Propagules dispersed intentionally by people | y |
| | Source(s) | Notes |
| | Figueiredo, E., Paiva, J., Stevart, T., Oliveira, F., & Smith, G. F. (2011). Annotated catalogue of the flowering plants of São Tomé and Príncipe. <i>Bothalia</i> , 41(1), 41-82 | "There is only one native gymnosperm in STP, <i>Afrocarpus mannii</i> (Hook.) C.N.Page, a species endemic to S.Tomé which is widely planted as an ornamental tree." |

| Qsn # | Question | Answer |
|-------|---|---|
| 703 | Propagules likely to disperse as a produce contaminant | n |
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." [No evidence & unlikely. A tree with relatively large seeds & not cultivated with commercial produce] |

| 704 | Propagules adapted to wind dispersal | n |
|-----|---|---|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." |

| 705 | Propagules water dispersed | n |
|-----|--|--|
| | Source(s) | Notes |
| | Farjon, A. (2008). A Natural History of Conifers. Timber Press, Portland, OR | "Birds, having colour vision, are the main dispersers, swallowing the whole cone, digesting the receptacle, and dropping the seed. This strategy is performed differently in some other genera of Podocarpaceae, such as the African <i>Afrocarpus</i> and the South American <i>Prumnopitys</i> . There is no receptacle- everything except a single fertilized seed disappears-but a fleshy layer (epimatium) envelops the nearly globular seed, producing something remarkably similar to a cherry" |

| Qsn # | Question | Answer |
|-------|---|---|
| 706 | Propagules bird dispersed | y |
| | Source(s) | Notes |
| | Farjon, A. (2008). A Natural History of Conifers. Timber Press, Portland, OR | "Birds, having colour vision, are the main dispersers, swallowing the whole cone, digesting the receptacle, and dropping the seed. This strategy is performed differently in some other genera of Podocarpaceae, such as the African <i>Afrocarpus</i> and the South American <i>Prumnopitys</i> . There is no receptacle-everything except a single fertilized seed disappears-but a fleshy layer (epimatium) envelops the nearly globular seed, producing something remarkably similar to a cherry The birds are certainly attracted and perform the same service as for <i>Podocarpus</i> ." |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." |

| 707 | Propagules dispersed by other animals (externally) | n |
|-----|---|--|
| | Source(s) | Notes |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-3 (-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." [No evidence. No means of external attachment] |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18 | "Receptacles ("fruits") are fleshy, green, pear-shaped, 4–5 cm long. The spread of this species may be limited by lack of an efficient animal disperser." |

| 708 | Propagules survive passage through the gut | y |
|-----|--|---|
| | Source(s) | Notes |
| | Farjon, A. (2008). A Natural History of Conifers. Timber Press, Portland, OR | [Presumably yes. Adapted for dispersal by birds & possibly other frugivorous animals] "Birds, having colour vision, are the main dispersers, swallowing the whole cone, digesting the receptacle, and dropping the seed. This strategy is performed differently in some other genera of Podocarpaceae, such as the African <i>Afrocarpus</i> and the South American <i>Prumnopitys</i> . There is no receptacle-everything except a single fertilized seed disappears-but a fleshy layer (epimatium) envelops the nearly globular seed, producing something remarkably similar to a cherry The birds are certainly attracted and perform the same service as for <i>Podocarpus</i> ." |

| | | |
|-----|-------------------------------------|---|
| 801 | Prolific seed production (>1000/m2) | n |
|-----|-------------------------------------|---|

| Qsn # | Question | Answer |
|-------|---|--|
| | Source(s) | Notes |
| | Daehler, C. C. & Baker, R. F. 2006. New Records of Naturalized and Naturalizing Plants Around Lyon Arboretum, Mānoa Valley, O'ahu. Bishop Museum Occasional Papers 87: 3-18 | "Receptacles ("fruits") are fleshy, green, pear-shaped, 4–5 cm long. The spread of this species may be limited by lack of an efficient animal disperser." [Unlikely. Seeds relatively large] |
| | Farjon, A. (2017). A Handbook of the World's Conifers. Volume 1. Second, Revised Edition. Koninklijke Brill NV, Leiden, The Netherlands | [Unlikely. Seeds relatively large] "Mature seed cones with a single seed subtended by a single, short bract; with seed enclosed by a fleshy, firm epimatium that ripens from glaucous green to reddish brown, obliquely pyriform, 20-30(-35) mm long, resinous. Seed proper nearly obovoid but slightly compressed laterally, 16-25 mm long, with an uneven surface and a 4-5 mm thick, hard seed coat." |

| | | |
|------------|--|---|
| 802 | Evidence that a persistent propagule bank is formed (>1 yr) | y |
| | Source(s) | Notes |
| | Useful Tropical Plants Database. (2018). <i>Afrocarpus mannii</i> . http://tropical.theferns.info/viewtropical.php?id=Afrocarpus+mannii . [Accessed 15 Oct 2018] | "Seed - remains viable for several years in normal storage. The seed has two types of dormancy; a chemical, which is overcome by removing the fleshy layer and a mechanical, imposed by the hard seedcoat. To ensure a high and even germination the seedcoat must be broken and removed. This can be done in a vice but it is very time consuming. Freshly collected seeds will normally germinate well, up to 60% in nine weeks, even with seedcoat but once the seeds have been dried, germination can take more than six months unless the seedcoat is removed. " |

| | | |
|------------|--|---|
| 803 | Well controlled by herbicides | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | Unknown. No information on herbicide efficacy or chemical control of this species |

| | | |
|------------|--|--|
| 804 | Tolerates, or benefits from, mutilation, cultivation, or fire | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | Possibly. Other species tolerate regular, frequent pruning |

| | | |
|------------|--|--------------|
| 805 | Effective natural enemies present locally (e.g. introduced biocontrol agents) | |
| | Source(s) | Notes |
| | WRA Specialist. 2018. Personal Communication | Unknown |

Summary of Risk Traits:

High Risk / Undesirable Traits

- Grows in tropical climates (conducive to spreading further in tropical island ecosystems)
- Locally naturalizing in Lyon Arboretum, Oahu, Hawaiian Islands
- Produces viable seeds
- Large seeds potentially dispersed by birds, other animals & intentionally by people
- Seeds may form a persistent seed bank
- Gaps in biological & ecological information may reduce accuracy or risk prediction

Low Risk Traits

- No reports of detrimental impacts, but no evidence of widespread introduction outside native range
- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Not reported to spread vegetatively
- Relatively large seeds reduce risk of inadvertent or long-distance dispersal