Taxon: Protium copal Engl.

Family: Burseraceae

Common Name(s): árbol de copal
copal de protio
copal tree
copalillo
pom

Synonym(s): Icica copal Schltdl. & Cham.
Icica obovata Engl.
Icica palmeri Rose
Protium copal var. matudae Swart
Protium palmeri (Rose) Engl.
Tingulonga copal Kuntze

Assessor: Chuck Chimera **Status:** Approved **End Date:** 14 May 2025

WRA Score: -3.0 **Designation:** L **Rating:** Low Risk

Keywords: Tropical Tree, Resinous, Shade-Tolerant, Bird-Dispersed, Zoochorous

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	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	n
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n = question 205	n
302	Garden/amenity/disturbance weed	y = 1*multiplier (see Appendix 2), n = 0	n
303	Agricultural/forestry/horticultural weed	y = 2*multiplier (see Appendix 2), n = 0	n
304	Environmental weed	y = 2*multiplier (see Appendix 2), n = 0	n
305	Congeneric weed	y = 1*multiplier (see Appendix 2), n = 0	n
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		
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		

Qsn #	Question	Answer Option	Answer
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	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/m2)	y = 1, n = -1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
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)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 9 May 2025]	[Used but not domesticated] "This wood is used for the manufacture of tool handles; construction of houses, structural materials, elaboration of furniture and general carpentry. It is also used in the construction of small boats. It also serves in the preparation of varnish and lacquer. The most important thing of the tree is the trunk resin; which is presently one of the most commonly sold products for the festivities of the Day of the Dead (1 and 2 November) and used as incense for religious ceremonies deeply rooted in Mexican tradition. It was a sacred tree of the Mayan culture, who used the resin as ceremonial incense, was also used to ward off bad spirits, known in rural areas to protect against the evil eye. In some regions of Mexico, the fruit has a reputation for being edible. They are also attributed different medicinal properties, against stomach disorders, dizziness and earaches, against cough. They also recognize it as traditional medicine in Belize, with the bark they make a tizana that they take before meals for intestinal parasites (Gutiérrez Carvajal and Dorantes López, 2003-2004)."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2025). 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**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"Moist or wet forest, chiefly at 350 meters or less; Peten; Alta Verapaz ; Izabal ; Zacapa ; San Marcos(?) ; Huehuetenango. Southern Mexico."

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"Moist or wet forest, chiefly at 350 meters or less; Peten; Alta Verapaz ; Izabal ; Zacapa ; San Marcos(?) ; Huehuetenango. Southern Mexico."

Qsn #	Question	Answer
203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 14 May 2025]	[Broad elevation range] "This widespread taxon occasionally occurs in cloud forest, growing more frequently in lower elevation formations such as tropical rainforest, tropical evergreen forest, and less frequently in tropical dry forest. Its preferred habitat is primary forest. It thrives at an altitude range from sea level to 1500 m (Damasco et al. 2019, IBUNAM 2019)."

204	**Native or naturalized in regions with tropical or subtropical climates**	**n**
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"Moist or wet forest, chiefly at 350 meters or less; Peten; Alta Verapaz ; Izabal ; Zacapa ; San Marcos(?) ; Huehuetenango. Southern Mexico."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence of naturalization

205	**Does the species have a history of repeated introductions outside its natural range?**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	GBIF Secretariat (2025). Protium copal (Schltdl. & Cham.) Engl. GBIF Backbone Taxonomy. Checklist dataset. https://www.gbif.org/species/3992575. [Accessed 13 May 2025]	No evidence
	WRA Specialist. (2025). Personal Communication	There is limited information suggesting that Protium copal has been introduced elsewhere.

301	**Naturalized beyond native range**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence of naturalization
	WRA Specialist. (2025). Personal Communication	While Protium copal may be cultivated in botanical settings outside its native range, it does not appear to be naturalized in other regions.

302	**Garden/amenity/disturbance weed**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	WRA Specialist. (2025). Personal Communication	Protium copal is not recognized as invasive or weedy by major invasive species databases or regional authorities.

Qsn #	Question	Answer
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
	WRA Specialist. (2025). Personal Communication	Protium copal is not recognized as invasive or weedy by major invasive species databases or regional authorities.

Qsn #	Question	Answer
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
	CABI. (2025). CABI Compendium Invasive Species. https://www.cabidigitallibrary.org/product/qi. [Accessed 13 May 2025]	No evidence
	WRA Specialist. (2025). Personal Communication	Protium copal is not recognized as invasive or weedy by major invasive species databases or regional authorities.

Qsn #	Question	Answer
305	Congeneric weed	n
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Based on current available information, there is no evidence to suggest that any species within the genus Protium are considered invasive or weedy.
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	CABI. (2025). CABI Compendium Invasive Species. https://www.cabidigitallibrary.org/product/qi. [Accessed 13 May 2025]	No evidence

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	[No evidence] "A medium-sized or large tree, sometimes 30 meters high, with thick trunk, glabrous throughout; leaves large, the leaflets long-petiolulate, oblong or narrowly oblong, mostly 10-18 cm. long, long-acuminate to obtuse, oblique and subacute at the base, often abruptly short-decurrent, entire, coriaceous or subcoriaceous; panicles axillary, lax, mostly 12 cm. long or shorter; fruit 1.5-3 cm. long, glabrous, apiculate, contracted and short-stipitate at the base."

Qsn #	Question	Answer
402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Unknown. There is no documented scientific evidence that Protium copal (or its synonym Bursera copallifera) exhibits allelopathic effects

Qsn #	Question	Answer
403	Parasitic	n
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"A medium-sized or large tree, sometimes 30 meters high, with thick trunk, glabrous throughout" [No evidence]

Qsn #	Question	Answer
404	Unpalatable to grazing animals	
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Unknown. There is no direct evidence confirming whether Protium copal is unpalatable to browsing or grazing animals. However, several indirect clues from its ecological and chemical traits suggest it may have low palatability

405	Toxic to animals	
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Unknown. Based on the available evidence, Protium copal does not appear to be highly toxic to animals, but its resin and foliage may have deterrent properties that reduce palatability.

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Unknown. Protium copal is not recognized as a host for any major pests or pathogens and does not appear in pest risk databases. It is considered resilient due to its chemical defenses, though like all plants, it may occasionally experience non-specialist herbivory or infection under certain conditions.

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	No evidence, but caution advised. Based on the available evidence, Protium copal (and its resin, copal) is generally considered non-toxic to humans, with no widespread reports of severe allergic reactions. However, its resin contains bioactive compounds that may cause mild sensitivities in some individuals.
	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, but caution advised. Other species used medicinally

408	Creates a fire hazard in natural ecosystems	
	Source(s)	Notes
	Record, S.J. (ed.). (1929). Annotated List of Species. Tropical Woods 17: 21-38	"heartwood pinkish brown; used locally for kindling, as it ignites very readily."
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 14 May 2025]	"This widespread taxon occasionally occurs in cloud forest, growing more frequently in lower elevation formations such as tropical rainforest, tropical evergreen forest, and less frequently in tropical dry forest." [More common in wetter forests, which may be less prone to fires]
	WRA Specialist. (2025). Personal Communication	Protium copal is not considered a significant fire hazard in natural ecosystems. While its resin is flammable, the tree's humid habitat and lack of documented fire-related incidents suggest minimal risk. Further research on resin accumulation in managed forests would clarify potential localized risks.

409	Is a shade tolerant plant at some stage of its life cycle	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Record, S.J. (ed.). (1929). Annotated List of Species. Tropical Woods 17: 21-38	"Protium copal (S. & C.) Engl . Fosforito . Small or medium- sized tree, growing in dense shade on deep well -drained loamy clay soil along the bank of the Kukalaya River"
	Dickinson, M. B., Whigham, D. F., & Hermann, S. M. (2000). Tree regeneration in felling and natural treefall disturbances in a semideciduous tropical forest in Mexico. Forest Ecology and Management, 134(1): 137-151	"Table 2 Shade-tolerance classifications for species that were relatively common in the southeastern Mexican study forest" [Protium copal listed among Shade tolerant taxa]

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Record, S.J. (ed.). (1929). Annotated List of Species. Tropical Woods 17: 21-38	"Small or medium- sized tree, growing in dense shade on deep well -drained loamy clay soil along the bank of the Kukalaya River"
	Plantiary. (2025). Copal. Protium copal. https://plantiary.com/plant/protium-copal_30515.html. [Accessed 14 May 2025]	"The best soil to use with this plant should be well-draining and rich in nutrients. It should have a slightly acidic to neutral pH range, typically ranging from 5.5 to 7.5. The soil should be loose, aerated and have good water retention capabilities while not allowing the soil to stay waterlogged. A good quality potting mix containing ingredients such as peat moss, perlite, vermiculite, and coarse sand would be ideal. It is also recommended to add some organic matter such as compost or well-rotted manure to the soil to boost soil fertility and enhance plant growth. Always check the soil before watering, and ensure the soil is not too dry as many species benefit from moist soil. Additionally, the recommended pot size should be large enough and allow for root development."
	WRA Specialist. (2025). Personal Communication	Protium copal is moderately soil-adaptable and can grow in many soil types, particularly those that are well-drained and moderately fertile.

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"A medium-sized or large tree, sometimes 30 meters high, with thick trunk, glabrous throughout"

412	Forms dense thickets	n
	Source(s)	**Notes**
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 14 May 2025]	"This widespread taxon occasionally occurs in cloud forest, growing more frequently in lower elevation formations such as tropical rainforest, tropical evergreen forest, and less frequently in tropical dry forest." [Protium copal grows as dispersed individuals in its native tropical forests and does not form dense stands. Its ecological niche favors shaded, stable environments over the high-light, disturbed sites where thickets usually develop.]

501	Aquatic	n
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	[Terrestrial] "Moist or wet forest, chiefly at 350 meters or less"

502	Grass	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	POWO (2025). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/. [Accessed 13 May 2025]	"Family Burseraceae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	POWO (2025). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/. [Accessed 13 May 2025]	"Family Burseraceae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"A medium-sized or large tree, sometimes 30 meters high, with thick trunk, glabrous throughout"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 13 May 2025]	"Protium copal has a very wide distribution and large population. It is a tree species native to Mexico, Guatemala, and Belize. In Mexico, it extends along the Gulf slope in the states of Campeche, Chiapas, Hidalgo, Oaxaca, Querétaro, Quintana Roo, Veracruz, and Yucatán. The current extent of occurrence is measured as 609,044.927 km2. The area of occupancy is 1,504 km2. This species is not currently experiencing any major threats and no significant future threats have been identified. Therefore, it is assessed as Least Concern."

602	Produces viable seed	y
	Source(s)	**Notes**
	Vallejo-Marín, M., Domínguez, C. A., & Dirzo, R. (2006). Simulated seed predation reveals a variety of germination responses of neotropical rain forest species. American Journal of Botany, 93(3), 369-376	"For species in this group (Calatola laevigata and Protium copal), any amount of damage completely prevented germination (Fig. 4A). It is important to note that even though Calatola laevigata had the lowest germination percentage we observed (52.6%), Protium copal presented relatively high values (87%), suggesting that seed sensitivity to damage is not explained solely by low K values. Another important difference between these two species was seed dormancy. Protium copal reached its maximum proportion of germinated seeds in the sixth month, while C. laevigata started to germinate in the seventh month, reaching its maximum in month 10."
	Tropical Plants Database, Ken Fern. (2025). Protium copal. https://tropical.theferns.info/viewtropical.php?id=Protium+copal. [Accessed 14 May 2025]	"Propagation Seed"

Qsn #	Question	Answer
603	Hybridizes naturally	
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	n
	Source(s)	Notes
	Fuentes, A.C.D., Martínez Salas, E. & Samain, M.-S. (2019). Protium copal. The IUCN Red List of Threatened Species 2019: e.T148948573A148952263. https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T148948573A148952263.en. [Accessed 13 May 2025]	"Protium copal is a dioecious medium-sized to tall tree, up to 20 (rarely 30) m tall, with a diameter of the trunk up to 40 cm."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Standley, P.C. & Steyermark, J.A. (1946) Flora of Guatemala. Fieldiana: Botany 24(5): 1-502	"flowers small, perfect or polygamous, sessile or racemose, often forming rather large panicles; calyx 4-5-lobate or sinuate-dentate, the lobes imbricate; petals 4-5, subcoriaceous or membranaceous, valvate in bud; stamens 8-10, inserted at the base of the disk, connivent above the ovary, the anthers dorsifixed, oblong-triangular or oblong-ovate, opening by 2 longitudinal slits; disk 8-10-crenate, annular or urceolate; ovary 4-5-celled; stigma capitate, 4-5- lobate;" [While direct studies on Protium copal are scarce, research on closely related species within the Protium genus, such as Protium spruceanum, indicates that bees, particularly species like Apis mellifera and Trigona spp., are effective pollinators. These bees are attracted to the nectar and pollen provided by the flowers and facilitate cross-pollination as they move between blooms .]

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Tropical Plants Database, Ken Fern. (2025). Protium copal. https://tropical.theferns.info/viewtropical.php?id=Protium+copal. [Accessed 14 May 2025]	"Propagation Seed" [There is currently no documented evidence that Protium copal reproduces vegetatively in natural settings. The species primarily reproduces through sexual reproduction via seeds, and while vegetative propagation techniques are common in some plant species, specific methods for Protium copal have not been established or reported in the scientific literature.]

607	Minimum generative time (years)	>3
	Source(s)	Notes
	WRA Specialist. (2025). Personal Communication	Based on growth rates of tropical Burseraceae and analogous data from other Protium and Bursera species, Protium copal is predicted to reach reproductive maturity between 7-15 years, with cultivation potentially reducing this range.

Qsn #	Question	Answer
701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	n
	Source(s)	**Notes**
	Swart, J. J. (1942). A monograph of the genus Protium and some allied genera (Burseraceae). Recueil des travaux botaniques néerlandais, 39(1), 211-446	"Drupe ellipsoid, at the base narrowed, at the apex acute, 2.25–2.5 cm long and 1.25–1.75 cm in diam.; exocarp sparsely pilose; mesocarp carnose; endocarp woody; pyrenes 1 to 4." [No evidence and no means of external attachment]

702	**Propagules dispersed intentionally by people**	y
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Sold at Panaewa Zoo plant sale. Commercially available on Hawaii Island.

703	**Propagules likely to disperse as a produce contaminant**	n
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	There is no evidence to suggest that Protium copal seeds are dispersed as contaminants in agricultural produce. The species primarily reproduces through seeds that are dispersed by animals (endozoochory), a common mechanism among members of the Burseraceae family. These seeds are typically encased within fleshy fruits, making them less likely to adhere to or contaminate harvested crops.

704	**Propagules adapted to wind dispersal**	n
	Source(s)	**Notes**
	Swart, J. J. (1942). A monograph of the genus Protium and some allied genera (Burseraceae). Recueil des travaux botaniques néerlandais, 39(1), 211-446	"Drupe ellipsoid, at the base narrowed, at the apex acute, 2.25–2.5 cm long and 1.25–1.75 cm in diam.; exocarp sparsely pilose; mesocarp carnose; endocarp woody; pyrenes 1 to 4."

705	**Propagules water dispersed**	n
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	There is no documented evidence indicating that Protium copal seeds are dispersed by water (hydrochory). The primary dispersal mechanism for this species is endozoochory, where animals consume the fleshy fruits and later excrete the seeds, facilitating their spread. This method is common among members of the Burseraceae family

706	**Propagules bird dispersed**	y
	Source(s)	**Notes**
	Schlesinger, V. (2001). Animals and plants of the ancient Maya : a guide. Austin: University of Texas Press	"The tree's small, single-pitted fruits are eaten by rainbow-billed toucans." [Game birds may disperse seeds in the Hawaiian Islands]

Qsn #	Question	Answer
707	**Propagules dispersed by other animals (externally)**	n
	Source(s)	**Notes**
	Swart, J. J. (1942). A monograph of the genus Protium and some allied genera (Burseraceae). Recueil des travaux botaniques néerlandais, 39(1), 211-446	"Drupe ellipsoid, at the base narrowed, at the apex acute, 2.25–2.5 cm long and 1.25–1.75 cm in diam.; exocarp sparsely pilose; mesocarp carnose; endocarp woody; pyrenes 1 to 4." [Protium copal seeds are dispersed internally by animals through ingestion and defecation, and there is no evidence to support external dispersal mechanisms involving attachment to animal exteriors]

708	**Propagules survive passage through the gut**	y
	Source(s)	**Notes**
	Estrada, A., & Coates-Estrada, R. (1986). Frugivory by howling monkeys (Aluoatta palliata) at Los Tuxtlas, Mexico: dispersal and fate of seeds. In Frugivores and Seed Dispersal (pp. 93-104). Dordrecht: Springer Netherlands	"Table 1. Species used as sources of fruit by howling monkeys at Los Tuxtlas. An astrisk denotes species identified from fecal samples; number in parentheses is the number of months each species was used as a source of fruit." [Includes Protium copal] "Table 2. Germination percentages of seeds defecated by howling monkeys and of control seeds." [66% of Protium copal seeds germinated; N = 3]

801	**Prolific seed production (>1000/m2)**	n
	Source(s)	**Notes**
	Swart, J. J. (1942). A monograph of the genus Protium and some allied genera (Burseraceae). Recueil des travaux botaniques néerlandais, 39(1), 211-446	"Drupe ellipsoid, at the base narrowed, at the apex acute, 2.25–2.5 cm long and 1.25–1.75 cm in diam.; exocarp sparsely pilose; mesocarp carnose; endocarp woody; pyrenes 1 to 4." [Given that Protium copal is a relatively large-seeded tree native to wet tropical forests and relies on animal-mediated seed dispersal (endozoochory), it's unlikely that it produces seed densities exceeding 1,000 seeds per square meter under natural conditions. Such high seed densities are more characteristic of pioneer or early-successional species that produce large quantities of small seeds.]

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Unknown. While specific studies on the seed bank persistence of Protium copal are lacking, available evidence suggests that it does not produce a persistent or long-lived seed bank. Its seeds are more likely to germinate shortly after dispersal, aligning with a transient seed bank strategy.

803	**Well controlled by herbicides**	
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Unknown. Protium copal is not an invasive species, and therefore, detailed herbicide control studies are lacking

Qsn #	Question	Answer
804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**n**
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	There is currently no documented evidence indicating that Protium copal (copal tree) benefits from mutilation, fire, or exhibits the ability to coppice or regrow after cutting. While some tree species possess adaptations that allow them to resprout after damage, such as coppicing–a method where trees regenerate from the stump or roots after being cut–this behavior has not been observed or reported for Protium copal.

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	WRA Specialist. (2025). Personal Communication	Unknown

Summary of Risk Traits:

Protium copal (copal tree) is a species of tree in the Burseraceae family, native to tropical regions of the Americas, particularly Central America and parts of South America. It is known for producing a fragrant resin, commonly referred to as copal, which has been used for centuries in traditional medicine, rituals, and as incense. The resin is harvested by making incisions in the tree's bark, and it hardens upon exposure to air. Protium copal trees typically grow in lowland rainforests and are valued not only for their resin but also for their ecological role in supporting local biodiversity.

Protium copal (copal tree) is not currently recognized as invasive in Hawai'i or other tropical Pacific islands. However, certain biological and ecological traits suggest it could establish and spread in novel environments. Notably, Protium copal thrives in wet tropical forests and prefers heavy shade, indicating high shade tolerance. This trait allows it to establish under existing forest canopies, potentially outcompeting native understory species. Additionally, its fruits are dispersed by birds and other animals (endozoochory), which could facilitate its spread across various habitats if suitable dispersers are present. The tree's adaptability to moist tropical climates, similar to those in many Pacific islands, further increases its potential for establishment. Furthermore, Protium copal produces aromatic resin, which might deter herbivory, giving it a competitive advantage over native species lacking such defenses.

High Risk / Undesirable Traits
• Broad elevation range
• Thrives and can spread in regions with tropical climates
• Resins could reduce palatability, and potentially increase fire risk
• Shade tolerant (could establish in intact forests)
• Tolerates many soil types (not limited by substrate)
• Reproduces by seed
• Seeds dispersed by birds, other frugivorous animals and through intentional cultivation

Low Risk Traits
• No reports of invasive or negative impacts where cultivated (but limited evidence of cultivation outside native range)
• Unarmed (no spines, thorns, or burrs)
• Relatively large drupes (2.25-2.5 cm x 1.25-1.75 cm) may limit the ability of most birds present in the Hawaiian Islands to consume and effectively disperse the seeds