

Family: *Oleaceae*

Taxon: *Olea europaea ssp europaea*

Synonym: *Olea europaea subsp. oleaster* (Hoffmanns. & Link)
Common Name: olive

Questionnaire :	current 20090513	Assessor:	Chuck Chimera	Designation: EVALUATE
Status:	Assessor Approved	Data Entry Person:	Chuck Chimera	WRA Score 3
101	Is the species highly domesticated?	y=-3, n=0	y	
102	Has the species become naturalized where grown?	y=1, n=-1	y	
103	Does the species have weedy races?	y=1, n=-1	y	
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)	Intermediate	
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	y	
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y	
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	n	
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n	
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y	
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	n	
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	y	
408	Creates a fire hazard in natural ecosystems	y=1, n=0		
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	n
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	y
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	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: EVALUATE

WRA Score 3

Supporting Data:

101	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Is the species highly domesticated? Yes] "The domestic olive (<i>Olea europaea</i>) is a group of more than 2500 cultivars that have evolved from a range of wild forms which occurred on the southern and eastern periphery of the Mediterranean (Turrill 1951; Levinson and Levinson 1984; Rugini and Lavee 1992; Zohary 1994). Two olive species occur on the Australian mainland and offshore islands: 2 introduced varieties (<i>Olea europaea europaea</i> and <i>O. e. africana</i>) of the same species and one native (<i>O. paniculata</i>)."
101	2002. Green, P.S.. A Revision of <i>Olea</i> L. (<i>Oleaceae</i>). <i>Kew Bulletin</i> . 57(1): 91-140.	[Is the species highly domesticated? Yes] "The olive, <i>Olea europaea</i> L., is one of the world's major economic plants and its original involvement with man is lost in the mists of time. The cultivated plant, subsp. <i>europaea</i> , is not known in the wild and must be considered an ancient cultigen. However, wild forms of this species with smaller, less oily fruits are known over a wide area, from Africa, Macaronesia and Asia."
102	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Has the species become naturalized where grown? Yes] "European Olive (<i>Olea europaea</i> subsp. <i>europaea</i>) is well documented as an environmental weed in Australia, particularly in the Adelaide region of South Australia where cultivated trees have been abandoned and their progeny have established in remnant bushland (Spennemann & Allen 2000a, Crossman 2002)."
103	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Does the species have weedy races? Yes] "European Olive (<i>Olea europaea</i> subsp. <i>europaea</i>) is well documented as an environmental weed in Australia, particularly in the Adelaide region of South Australia where cultivated trees have been abandoned and their progeny have established in remnant bushland (Spennemann & Allen 2000a, Crossman 2002)."
201	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Species suited to tropical or subtropical climate(s) 1-intermediate] "The habitat of <i>Olea europaea</i> is semi-arid to subhumid, warm to temperate regions, with hot dry summers and winter-dominant rainfall, i.e. a Mediterranean climate (Connell 1994)."
202	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Quality of climate match data 2-high] "The habitat of <i>Olea europaea</i> is semi-arid to subhumid, warm to temperate regions, with hot dry summers and winter-dominant rainfall, i.e. a Mediterranean climate (Connell 1994)."
202	2005. Staples, G.W./Herbst, D.R.. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Quality of climate match data 2-high] "Olives require at least two months of nighttime temperatures down to 50° F to induce flowering. The only places in Hawaii where flowering takes place (and fruit is produced) are above 3,500' elevation, where cooler conditions prevail."
203	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Broad climate suitability (environmental versatility)? No] "The parameters limiting the natural dispersal of olives in Australia are a minimum annual rainfall of 500 mm, and night chilling in winter (Parsons and Cuthbertson 1992)." ... "Olives can still grow if planted and established in drier or warmer areas, but do not necessarily fruit (Simpfendorfer 1975). Olives have been successfully established in Broken Hill, where a tree now exists without watering in a rainfall area of 230 mm per year (Hall 1972). Frosts during bloom and seed development are detrimental for fruit development, while temperatures of -12°C and below are lethal (Antognozzi et al. 1994)." ... "Even though the subtropical oceanic climate of Norfolk Island is not suitable for the self propagation of <i>O. e. europaea</i> (due to the absence of cold winters), it was successfully established as a horticultural plant during the penal colony period (Stevenson 1997). <i>Olea e. africana</i> on the other hand, initially introduced as a source for fence post timber, has become a major invasive weed in cleared areas of the Norfolk Island forest, as much of its seed crop germinates (Skeat 1984; Stevenson 1997)."
203	2005. Staples, G.W./Herbst, D.R.. <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	[Broad climate suitability (environmental versatility)? No] "The fruit is large (up to 0.4" in diameter) with a thick, oily flesh layer, but the plant does not bear well in our warm climate and has never become commercially important here. Olives require at least two months of nighttime temperatures down to 50° F to induce flowering. The only places in Hawaii where flowering takes place (and fruit is produced) are above 3,500' elevation, where cooler conditions prevail."
204	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Native or naturalized in regions with tropical or subtropical climates? Yes] "(recently naturalized but spreading rapidly by game birds on Parker Ranch, west of Ke'amuku Camp, ca. 900-920 m, Hawai'i). The first naturalized collection of subsp <i>europaea</i> was made in 1982 (Wagner et al. 4733, BISH)."
205	2001. Parsons, W.T./Cuthbertson, E.G.. <i>Noxious Weeds of Australia</i> . Second Edition. CSIRO Publishing, Collingwood, Australia	[Does the species have a history of repeated introductions outside its natural range? Yes] "The olive tree is now endemic throughout the Mediterranean region but, as it has been cultivated in the whole of that area for some thousands of years of years, one cannot categorically state that it is indigenous to the region. Suffice it to say, it is now grown in most warm-temperate regions of the world."

301	1999. Starr, F./Martz, K./Loope, L.L.. New plant records from East Maui for 1998. Bishop Museum Occasional Papers. 59(2): 11-15.	[Naturalized beyond native range? Yes] "On Maui, this subspecies has not spread as rapidly as subspecies <i>cuspidata</i> (syn. <i>africana</i>) but has proliferated beyond original plantings and is naturalizing in the Kula area. Material examined. MAUI: Makawao District, East Maui, Kula, 'A'apueo, Haleakalā Hwy., adjacent to pasture land, 2720 ft [830 m], 17 Aug 1998, Starr & Martz 980817-1."
301	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Naturalized beyond native range? Yes] "(recently naturalized but spreading rapidly by game birds on Parker Ranch, west of Ke'amuku Camp, ca. 900-920 m, Hawai'i). The first naturalized collection of subsp <i>europaea</i> was made in 1982 (Wagner et al. 4733, BISH)."
301	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889-901.	[Naturalized beyond native range? Yes] "Naturalised olives have also spread and become an environmental problem in Australia (Robertson 1984; Skeat 1984; Dellow et al. 1987; Hermes 1987; Cooke 1989; Bellette 1993; Hawkins 1994; Spennemann and Allen 1998a; Cuneo pers. comm.; Doyle pers. comm.) (Fig. 1)."
301	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. Cunninghamia. 9(4): 545-557.	[Naturalized beyond native range? Yes] "In Australia both the European Olive (<i>Olea europaea</i> subsp. <i>europaea</i>) and African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) have naturalised."
302	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889-901.	[Garden/amenity/disturbance weed? No. Environmental Weed. See 3.04]
303	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889-901.	[Agricultural/forestry/horticultural weed? No. Environmental Weed. See 3.04]
304	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889-901.	[Environmental weed? Yes] "Abstract. Olives (<i>Olea europaea</i> ssp. <i>europaea</i>), dispersed from 19th century orchards in the Adelaide area, have become established in remnant bushland as a major environmental weed. Recent expansion of the Australian olive industry has resulted in the widespread planting of olive orchards in South Australia, Victoria, New South Wales, Western Australia, Queensland and parts of Tasmania. This paper reviews the literature on the activity of vertebrate (principally avian) olive predators and their potential as vectors for spreading this plant into Australian remnant bushland. The effects of feralisation on the olive plant, which enhances its capacity for dispersal as a weed, place wider areas of south-eastern Australia at risk. A number of approaches for the control of olives as woody weeds are addressed. Proponents of new agricultural crops have moral and environmental obligations to assess the weed potential of these crops." ... "Olives are listed in South Australia as a proclaimed plant class 5, unless planted for domestic or commercial use (SAAPCC 1990; Cooke n.d.) and a number of weed control programs have been conducted to contain their spread (Robertson 1984; Stafford and Venning 1984; Bellette 1993; Hawkins 1994). In Victoria, olives are considered an environmental weed (Carr et al. 1992)."
304	2006. Crossman, N.. Feral Olives in South Australia: Impacts & Management. Pp. 1-2 Proceeding of Forum on the Olive industry and feral olives. 9 August 2006. The Weed Society of New South Wales, Wahroonga, Australia	[Environmental weed? Yes] "A recent study (Crossman 2002) suggests feral olives have an impact on native canopy cover and diversity in native Eucalypt woodland. This comparative study (Crossman 2002) found that the dense cover of feral olive canopy coincides with reduced cover of native plants in heavily invaded woodland. Grey box eucalypt (<i>Eucalyptus macrocarpa</i> Maiden) upper stratum cover and golden wattle (<i>Acacia pycnantha</i> Benth) mid-stratum cover was 80% and 75% lower, respectively, at a heavily invaded site (Crossman 2002). Native species richness and abundance were found to be significantly lower at the sites heavily invaded by feral olives. Species most at risk were herbaceous and shrub forms found in the lower- and midstrata. Crossman (2002) reported that native plant species richness and abundance was more than 50% lower at one heavily invaded site."
304	2007. Hussey, B.M.J./Keighery, G. J./Dodd, J./Lloyd, S.G./Cousens, R.D.. Western Weeds. A Guide to the Weeds of Western Australia. The Weed Society of Western Australia, Victoria Park, WA	[Environmental weed? Yes] "It is a very severe bushland weed in South Australia, where its pollen has been recorded as a major cause of hayfever. It is increasing in bushland around Perth and other parts of the south-west and is expected to become even more common as it is being planted widely, both in commercial groves and as an ornamental."
304	2012. Western Australian Herbarium. FloraBase — The Western Australian Flora - <i>Olea europaea</i> L..', http://florabase.dec.wa.gov.au/browse/profile/6503	[Environmental weed? Yes] "Notes. A serious bushland weed in South Australia. Forms mixed age thickets that virtually preclude native plant recruitment. Eastern Australian populations have been introduced from South Africa (ssp. <i>cupidata</i>) and South Australian and Western Australian populations have originated in Europe (ssp. <i>europaea</i>)."

305	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Congeneric weed? No. But subsp. <i>cuspidata</i> is an environmental weed] "Abstract: African Olive, <i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. ex G.Don) Cif. (family Oleaceae) is a dense-crowned tree introduced into Australia for horticulture in the mid 19th century. In recent decades, African Olive has become an aggressive woody weed, capable of forming a dense and permanent canopy in a wide range of vegetation types in south-west Sydney and beyond."
401	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Produces spines, thorns or burrs? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown."
402	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Allelopathic? Unknown] "A distinctive bare soil zone is evident along the margins of established stage African Olive stands, beyond the tree crown, but it is not known whether the development of a dense African Olive crown has an allelopathic effect on native species, similar to that described for weedy European Olives in Australia (Plant & Animal Control Commission 2006)."
403	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Parasitic? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown."
404	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Unpalatable to grazing animals? No] "Olives in the Adelaide hills and in Camden/ Campbelltown (New South Wales) spread quickly following the removal of grazing livestock (Cooke n.d.; Dellow et al. 1987). The spread could be contained by reintroduction of stock (Stafford and Venning 1984). Once an olive seedling has firmly established itself before being bitten back by livestock, it will produce small leaves near the stem which are not grazed upon, ensuring the survival of the plant. Thus, while continued high grazing pressure appears to be able to contain the spread of olives, occasional agistment of stock does not (e.g. Wagga Wagga, Spennemann 1998b)." ... "Systematic heavy grazing of roadside edges adjacent to orchards would reduce the survival chances of the seedlings."
405	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Toxic to animals? No] "Olives in the Adelaide hills and in Camden/ Campbelltown (New South Wales) spread quickly following the removal of grazing livestock (Cooke n.d.; Dellow et al. 1987). The spread could be contained by reintroduction of stock (Stafford and Venning 1984). Once an olive seedling has firmly established itself before being bitten back by livestock, it will produce small leaves near the stem which are not grazed upon, ensuring the survival of the plant. Thus, while continued high grazing pressure appears to be able to contain the spread of olives, occasional agistment of stock does not (e.g. Wagga Wagga, Spennemann 1998b)."
406	2005. CAB International. <i>Forestry Compendium</i> . CAB International, Wallingford, UK	[Host for recognized pests and pathogens? Unknown] "Pests recorded Insects: <i>Anastrepha fraterculus</i> (South American fruit fly) <i>Aonidiella aurantii</i> (red scale) <i>Aonidiella orientalis</i> (oriental yellow scale) <i>Apatite monachus</i> (black borer) <i>Bactrocera tryoni</i> (Queensland fruit fly) <i>Chrysomphalus dictyospermi</i> (Spanish red scale) <i>Cryptophlebia leucotreta</i> (false codling moth) <i>Hemiberlesia lataniae</i> (latania scale) <i>Hylesinus varius</i> (bark beetle, ash) <i>Lepidosaphes ulmi</i> (oystershell scale) <i>Metcalfa pruinosa</i> (frosted moth-bug) <i>Orthezia insignis</i> (greenhouse orthezia) <i>Otiorynchus armadillo</i> (armadillo weevil) <i>Palpita unionalis</i> (jasmine moth) <i>Rosellinia necatrix</i> (dematophora root rot) <i>Saissetia coffeae</i> (hemispherical scale) <i>Saturnia pyri</i> (giant emperor moth) <i>Selenaspis articulatus</i> (West Indian red scale) <i>Siphoninus phillyreae</i> (ash whitefly) <i>Zeuzera pyrina</i> (moth, wood leopard) Mites: <i>Brevipalpus phoenicis</i> (false spider mite) <i>Eutetranychus orientalis</i> (Citrus brown mite) Nematodes: <i>Helicotylenchus dihystra</i> (common spiral nematode) <i>Meloidogyne hapla</i> (root knot nematode) <i>Pratylenchus vulnus</i> (walnut root lesion nematode) <i>Trichodorus</i> (stubby root nematodes) Fungus diseases: <i>Alternaria alternata</i> (alternaria leaf spot) <i>Armillaria mellea</i> (armillaria root rot) <i>Aspergillus niger</i> (collar rot) <i>Colletotrichum acutatum</i> (black spot: strawberry) <i>Eutypa lata</i> (<i>Eutypa dieback</i>) <i>Fusarium oxysporum</i> <i>Glomerella cingulata</i> (anthracnose) <i>Leveillula taurica</i> <i>Macrophomina phaseolina</i> (charcoal rot of bean/tobacco) <i>Nectria haematococca</i> (dry rot of potato) <i>Phialophora parasitica</i> (wilt: date palm) <i>Verticillium dahliae</i> (verticillium wilt) Bacterial diseases: <i>Pseudomonas savastanoi</i> pv. <i>Savastanoi</i> (oleander knot) Virus diseases: Cherry leaf roll virus (walnut ringspot)"
407	2007. Hussey, B.M.J./Keighery, G. J./Dodd, J./Lloyd, S.G./Cousens, R.D.. <i>Western Weeds. A Guide to the Weeds of Western Australia</i> . The Weed Society of Western Australia, Victoria Park, WA	[Causes allergies or is otherwise toxic to humans? Yes] "It is a very severe bushland weed in South Australia, where its pollen has been recorded as a major cause of hayfever."

408	1998. Spennemann, D.H.R.. The spread of Olives (<i>Olea</i> sp.) on Wagga Wagga Campus III. Impact on heritage resources and eradication. The Johnstone Centre, Charles Sturt University, Albury, NSW	[Creates a fire hazard in natural ecosystems? Potentially Yes] "A side effect of an olive infestation of a site or its environs is that olives are highly inflammable plant species. Increased infestation creates an exponentially greater fire hazard, with a greater fuel production (Cooke 1991). Substantial growth of olives, however, increases leaf litter generation and fire risk (Parsons & Cuthbertson 1992, p. 523). The main hazard of feral olives stems from the high proportion of dead and dry fruitwood in the canopy. This wood is predominately very thin ($\phi \leq 10\text{mm}$) and well aerated, leading to increased combustibility (Brian Lord pers comm.)."
409	2000. Rauch, F.D./Weissich, P.R.. Plants for tropical landscapes: a gardener's guide. University of Hawaii Press, Honolulu, HI	[Is a shade tolerant plant at some stage of its life cycle? No] "It must have full sun, tolerates drought, heat, wind and poor soils, but does best in rich, deep soils."
410	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Tolerates a wide range of soil conditions ? Yes] "Olives prefer a sandy loam soil of moderate depth, but will grow on calcareous soils (Connell and Catlin 1994)."
410	2001. Parsons, W.T./Cuthbertson, E.G.. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Tolerates a wide range of soil conditions ? Yes] "...occurring on a wide range of soils."
411	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Climbing or smothering growth habit? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown."
412	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Forms dense thickets? Yes] "Once established, <i>O. europaea</i> forms a dense and permanent crown under which olive seedlings can grow, but native trees cannot (Manders and Richardson 1992)."
501	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Aquatic? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown."
502	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Grass? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown." [Oleaceae]
503	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Nitrogen fixing woody plant? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown." [Oleaceae]
504	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] " <i>Olea europaea</i> is a much-branched evergreen tree, ranging from 2 to 15 m in height with a dense, round crown." [Oleaceae]
601	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Evidence of substantial reproductive failure in native habitat? No] No evidence
602	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. Australian Journal of Experimental Agriculture. 40: 889–901.	[Produces viable seed? Yes] "While propagation of olives from seeds is possible, a large percentage of seeds do not germinate (Marvin 1888; Wickson 1900; Allen 1901a; Thomas 1995). Germination is affected by both internal dormancy requirements (inhibitors in the embryo or seed coat) and mechanical inhibitors (inability of the embryo to penetrate the hard endocarp; Sutter 1994; Voyiatzis and Pritsa 1994). The sclerous endocarp also inhibits the hydration and oxygenation of the embryo (Leon and Altisent 1994). In a horticultural setting, to obtain ideal germination conditions the seed is usually cracked without injuring the embryo (Wickson 1900; Allen 1901a; Dal Pero Bertini 1960). The matter is different however, if the drupes have been eaten by animals and passed through the alimentary canal. Indeed, traditional propagation techniques before the advent of modern horticultural procedures relied on feeding drupes to domestic birds to obtain viable seed (Davenport 1870; Boothby 1878; Marvin 1888). Thus, while self seeded olives may have a low chance of germination, bird- and animal-dispersed olives stand a better chance of propagation."

603	2007. Besnard, G./Henry,P./Wille, L./Cooke, D./Chapuis, E.. On the origin of the invasive olives (<i>Olea europaea</i> L., Oleaceae). <i>Heredity</i> . 99: 608–619.	[Hybridizes naturally? Possibly Yes] "Furthermore, Besnard et al. (2007) identified hybridization and reticulation among the olive subspecies. Consequently, subspecies <i>europaea</i> and <i>cuspidata</i> are likely to hybridize or introgress when in sympatry (Besnard et al., 2001c; Rubio de Casas et al., 2006). This phenomenon could alleviate the loss of genetic diversity due to bottlenecks arising from small initial founder populations during colonization events (Husband and Barrett, 1991; Lee, 2002) and contribute to the ecological success of colonizing populations. However, genomic incompatibilities may affect the fitness of early generations of hybrids (Rieseberg et al., 1996)."
603	2008. Breton, C./Guerin, J./Ducattillon, C./Medail, F./Kull, C.A./Berville, A.. Taming the wild and 'wilding' the tame: Tree breeding and dispersal in Australia and the Mediterranean. <i>Plant Science</i> . 175: 197–205.	[Hybridizes naturally? Possibly No] "However, even though both subsp. Have been introduced in Australia, subsp. <i>cuspidata</i> x subsp. <i>europaea</i> may not cross naturally. This is suggested by experiments provided by P. Villemur (unpublished) in the nursery of Institut National de la Recherche Agronomique in Montpellier which show a shift in blooming by 1 month between the two subspecies. An equivalent situation is found in Morocco where the two subsp. <i>maroccana</i> and <i>europaea</i> are in sympatry (thrive in the same area), but they did not cross because subsp. <i>maroccana</i> blooms 1 month earlier than subsp. <i>Europaea</i> [85,86]."
604	2000. Rey, P.J./Alcantara, J.M.. Recruitment Dynamics of a Fleshy-Fruited Plant (<i>Olea europaea</i>): Connecting Patterns of Seed Dispersal to Seedling Establishment. <i>Journal of Ecology</i> . 88(4): 622-633.	[Self-compatible or apomictic? Yes] "Pollination is anemophilous with partial self compatibility (Fernandez 1979). Functional dioecy, through some individuals expressing only male function, has been suggested (Jordano 1987)." [Although seed set from self-pollinated plants may be lower than outcrossed individuals]
604	2008. Breton, C./Guerin, J./Ducattillon, C./Medail, F./Kull, C.A./Berville, A.. Taming the wild and 'wilding' the tame: Tree breeding and dispersal in Australia and the Mediterranean. <i>Plant Science</i> . 175: 197–205.	[Self-compatible or apomictic? Possibly No] "About 60 cultivars have been introduced and feral olives are expected to derive from some of them. However, due to self-incompatibility for most of them we expected that crosses occurred between those cultivars."
605	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Requires specialist pollinators? No] "As pollination does not seem a limiting factor for feral/wild olives, the fruit production and ultimately the propagation of olives can proceed unfettered once they have become feral."
605	2007. Besnard, G./Henry,P./Wille, L./Cooke, D./Chapuis, E.. On the origin of the invasive olives (<i>Olea europaea</i> L., Oleaceae). <i>Heredity</i> . 99: 608–619.	[Requires specialist pollinators? No] "Two subspecies display a large continental distribution: subsp. <i>Europaea</i> in the Mediterranean basin and subsp. <i>cuspidata</i> from Austral Africa to China. These taxa are diploids, allogamous and anemophilous, and their seeds are dispersed by birds (Spennemann and Allen, 2000; Green, 2002)."
606	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Reproduction by vegetative fragmentation? Possibly] "Olives will propagate vegetatively even in near tropical environments (Connell 1994), but spread only very slowly."
607	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Minimum generative time (years)? 5+] "Under normal circumstances of 500 mm rainfall per year, olives will bear their first fruit after 10–12 years; in irrigated areas trees produce after 4–5 years (Anon. 1952)." ... "It is important to note also that the spread of olives is slowed by the 10–12 years (or less in more suitable environments) it takes for seedlings to bear their first fruit. On the one hand this provides an opportunity for eradicating infestations, but on the other it may also mask the extent of the problem."
701	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "Feral, i.e. self-seeded (and bird or animal dispersed) olives are substantially smaller than those of the original cultivars (Parsons and Cuthbertson 1992; Spennemann and Allen 1998b). The size of the Australian feral drupes increasingly resembles that of the truly wild olives in Spain (cf. Jordano 1987)."
702	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Propagules dispersed intentionally by people? Yes] "European olives (<i>Olea europaea</i> ssp. <i>europaea</i>) which escaped from commercial olive orchards have become a major weed problem in the Adelaide Hills. In the absence of natural enemies, coupled with the recent massive resurgence of interest in the plant as a farm crop, the olive has the potential to become another introduction running out of control."
703	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Propagules likely to disperse as a produce contaminant? No] "To concentrate bird dispersal, suitable perch trees surrounding the orchard should be provided and a broad, tree-free, heavily grazed zone established at the property boundaries. This will entice birds to use the perches provided and self-seeded olives will be largely concentrated in a manageable area."

703	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Propagules likely to disperse as a produce contaminant? No] "Fruit – purple/black oval drupe 15–25 mm long x 6 mm diameter," [No evidence, and drupes relatively large & unlikely to contaminate produce]
704	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Propagules adapted to wind dispersal? No] "Fruit – purple/black oval drupe 15–25 mm long x 6 mm diameter,"
705	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Propagules water dispersed? No] "Fruit – purple/black oval drupe 15–25 mm long x 6 mm diameter," [Adapted for bird, and other vertebrate dispersal]
706	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. Manual of the flowering plants of Hawaii. Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Propagules bird dispersed? Yes] "(recently naturalized but spreading rapidly by game birds on Parker Ranch, west of Ke'amuku Camp, ca. 900-920 m, Hawai'i)."
706	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Propagules bird dispersed? Yes] "Once economic reality had shown them to be unprofitable, many olive groves were abandoned and became havens for fruit eating birds." ... "The best known Australian invasion of olives as weeds has occurred in South Australia (Fuller 1942). Fowler (1939) commented that 'seeds dropped about promiscuously by birds germinate and grow freely in the foothills' of Adelaide." ... "The 5–30% oil content of the ripe fruit makes the olive an important energy source for birds and small mammals (Levinson and Levinson 1984). Several bird species depend on wild (<i>O. e. sylvestris</i>) and cultivated olives for their survival in Spain (Herrera 1984; Jordano 1987; Rey 1993, 1995), France (Boothby 1878; Debussche and Isenmann 1983), Italy (Boothby 1878; Neville-Rolfe 1898), Croatia (Tutman 1952, 1962, 1969), Greece (Bigler and Delucchi 1981), Libya (Moltoni 1934 quoted after Tutman 1969), and Tunisia and Morocco (Loussert and Brousse 1978, quoted after Bigler and Delucchi 1981). Studies have shown the ecological importance of orchards for the survival of resident avian species especially during winter (Niethammer 1966; Rey 1995) and for migratory birds en route (Finlayson 1981). In California (Marvin 1888), Hawaii (Green 1995) and South Africa (Richardson and Fraser 1995) similar bird feeding occurs. In total, members of the families Columbidae, Corvidae, Laridae, Muscipapidae, Passeridae, Phasianidae, Sturnidae, and Sylvidae have been reported as feeding on olives and dispersing their seeds."
707	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Propagules dispersed by other animals (externally)? No evidence, or means of external attachment] "Fruit – purple/black oval drupe 15–25 mm long x 6 mm diameter,"
708	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889–901.	[Propagules survive passage through the gut? Yes] "Some bird species facilitate long range dispersal of the seed by swallowing the drupe whole and then either regurgitating pellets containing the defleshed seeds later on, or passing them through the digestive tract." ... "Not all birds feeding on olives however, are seed dispersers. Some granivorous birds, such as turkeys (<i>Meleagris gallopura</i>) and parrots, swallow drupes and grind up the hard endocarp as well (Mort 1949), while smaller species merely peck the flesh off the fruit either on the tree or on the ground [e.g. Silvereyes (<i>Zosterops lateralis</i>)]. ... "While birds are the main vector of dispersal, grounddwelling mammals feeding on fallen olives must not be excluded: rabbits (<i>Oryctolagus cuniculus</i>), sheep (<i>Ovis aries</i>), goats (<i>Capra hircus</i>), and deer (<i>Cervus</i> spp.) have been observed consuming the fruit (Marvin 1888; Chapman 1896; Bigler and Delucchi 1981; Jordano 1987). In Australia, foxes (<i>Vulpes vulpes</i>) are a major non-avian vector of dispersal (Paton et al. 1988; Cooke 1991; Spennemann and Allen 1998a)."
801	2000. Rey, P.J./Alcantara, J.M.. Recruitment Dynamics of a Fleshy-Fruited Plant (<i>Olea europaea</i>): Connecting Patterns of Seed Dispersal to Seedling Establishment. <i>Journal of Ecology</i> . 88(4): 622-633.	[Prolific seed production (>1000/m ²)? No] "Table 3 Effect of microhabitat on seed density, seed predation, density of emerged seedlings, and starting density of old-sap- lings (mean across microhabitats ? I SE)... Seed density (m ⁻²) = 37.2 ± 2.8"
801	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Prolific seed production (>1000/m ²)? No] "European Olive <i>Olea europaea</i> subsp. <i>europaea</i> ... Fruit – purple/black oval drupe 15–25 mm long x 6 mm diameter." [Unlikely, given larger drupe size than ssp <i>cuspidata</i>]

802	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Evidence that a persistent propagule bank is formed (>1 yr)? Yes] "Seed longevity in the soil seedbank is considered to be up to 2 years (von Richter, unpub. data), similar to other Oleaceae genera such as Privet (Panetta 2000)." [Seed longevity of <i>Olea europaea</i> ssp <i>europaea</i> presumably similar to <i>O.e.</i> ssp <i>cuspidata</i>]
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)? Yes] "Storage Conditions: Viability can be maintained for 2-3 years in open storage at room temperature (Krugman, 1974c; Ellis et al., 1985c) About 16% of excised embryos extracted from seeds which had been stored at 4C (mc not reported) for 7 months germinated in vitro desiccation of excised embryos reduced germination, about 95% and 60% of the excised embryos germinated in vitro on desiccation to 10% and 3% mc, respectively, of which 70% and 40% of the excised embryos survived 6 hours in liquid nitrogen, respectively (Gonzalez-Rio et al., 1994)."
803	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Well controlled by herbicides? Yes] "The South Australian Animal and Plant Control Commission recommends that priority be given to the removal of seedlings from sites with no established olive trees, as seedlings up to 6 months old will not regrow after spot-spraying with glyphosate. This work needs to be carried out repeatedly however, as seedlings from old dispersed seeds may germinate. Older plants (up to 2 years) should be spot sprayed with triclopyr, while mature olives need to be cut and the stump, with sections of bark filled back, treated with undiluted triclopyr (Cooke 1991; Parsons and Cuthbertson 1992; Robertson 1984)."
803	2001. Parsons, W.T./Cuthbertson, E.G.. <i>Noxious Weeds of Australia</i> . Second Edition. CSIRO Publishing, Collingwood, Australia	[Well controlled by herbicides? Yes] "Mature plants are best controlled by cut-stump or basal bark treatments. In the cut-stump technique, apply undiluted picloram + triclopyr, triclopyr or ester 2,4-D immediately after cutting, peeling off the bark and applying the herbicide over the whole stump. With the basal bark technique, apply triclopyr undiluted in diesel oil to the first 50 to 60 cm of trunk, wetting the bark to the point of run-off."
803	2003. Motooka, P./Castro, L./Nelson, D./Nagai, G./Ching, L.. <i>Weeds of Hawaii's Pastures and Natural Areas: An Identification and Management Guide</i> . CTAHR, UH Manoa, Honolulu, HI http://www.ctahr.hawaii.edu/invweed/weedsHi.html	[Well controlled by herbicides? Yes] "Management: Large olive trees injured by cut surface applications of triclopyr, glyphosate, and 2,4 D, in descending order of severity, although the kill rate was low at 1 year after treatment. Continuous ring cut-surface applications or drilling should provide effective kill. Saplings very sensitive to basal bark application of triclopyr at 4% product in diesel oil. Mature trees have proven tolerant of soil applications of hexazinone and tebuthiuron. Crown and root sprouting of herbicide treated trees should be expected and retreatment planned. Grazing reduces new seedling volunteering(61)."
804	2000. Shelden, M./Sinclair, R.. Water relations of feral olive trees (<i>Olea europaea</i>) resprouting after severe pruning. <i>Australian Journal of Botany</i> . 48(5): 639-644.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Abstract. Water relations of feral olives (<i>Olea europaea</i> L.) were studied on a location in the Mt Lofty Ranges, South Australia. In spring (October–November), 6 months before the study commenced, an area of trees had been cut back to stumps as part of an eradication project. The stumps resprouted vigorously over summer, similarly to regrowth seen following wildfire."
804	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Merely slashing established seedlings or cutting off a tree has no lasting effect at all, as the regrowth of the tree will be between 1 and 2 m tall after 20 months (Dellow et al. 1987)." ... "Among broad scale approaches to prevent new infestations, frequent slashing is suitable for open areas, but will not work for tree-studded, roadside corridors and bushland. Heavy burning will kill very young, but not established, olives. Since heavy burns cannot be repeated annually due to the lack of fuel build-up, olives will establish."
805	1999. Wagner, W.L./Herbst, D.R./Sohmer, S.H.. <i>Manual of the flowering plants of Hawaii</i> . Revised edition.. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Effective natural enemies present locally (e.g. introduced biocontrol agents) Unlikely] "(recently naturalized but spreading rapidly by game birds on Parker Ranch, west of Ke'amuku Camp, ca. 900-920 m, Hawai'i). The first naturalized collection of subsp <i>europaea</i> was made in 1982 (Wagner et al. 4733, BISH)." [Has not formed dense stands in Hawaiian Islands like it has in Australia]
805	2000. Spennemann, D.H.R./Allen, L.R.. Feral olives (<i>Olea europaea</i>) as future woody weeds in Australia: a review. <i>Australian Journal of Experimental Agriculture</i> . 40: 889-901.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Not in Australia] "Biological control of feral olives is not possible without harming the fruit-industry as well."
805	2006. Cuneo, P./Leishman, M.R.. African Olive (<i>Olea europaea</i> subsp. <i>cuspidata</i>) as an environmental weed in eastern Australia: a review. <i>Cunninghamia</i> . 9(4): 545-557.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Possibly, however has not stopped its spread] "Olive Lace Bug is known as a pest of European Olive (WA Agriculture 2004) and has established widely on weedy European olives in South Australia, causing small olive fruits on heavily infected trees to fall before ripening (Robertson 2005)."

