Olea europaea **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Scrophulariales	Oleaceae

Common name black olive (English), olive (English), oliva (Spanish), African olive (English), golden olive (English), 'oliwa haole (Hawaiian), feral olive (English), European olive (English), orive (Tahitian), 'oliwa (Hawaiian)

Synonym *Olea europea*

Similar species

Summary In Europe and Northern Africa, the olive tree (*Olea europaea*) has been widely cultivated for its fruit and valuable oil for thousands of years (i.e. subspecies *europaea*). Escapes from cultivation are known to occur due to the large amount of bird-dispersed seed produced; potentially resulting in the formation of dense monocultures which can permanently displace native plant species and increase the fire hazard. There are several physical and chemical management options available for *O. europaea*; but these are generally labour intensive and require follow-up operations due to the large amount of seed produced as well as its coppicing ability.

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Species Description
Olea europaea is a long-lived evergreen tree between 8 - 15m tall (Parsons & Cuthbertson, 1992); some specimens are reported to live for up to 1000 years (Baali-Cherif & Besnard, 2005). *O. europaea* is recognisable through its dense assembly of limbs, the short internodes, and the compact nature of the foliage; unpruned trees develop multiple branches with cascading limbs, so dense that light is unable to reach the trunk (Martin, 2003). The leaves of *O. europaea* are thick, leathery and oppositely arranged, growing over a 2 - 3 year period before abscising (Martin, 2003). Stomata are present on the lower surface of the leaf only, nestled in peltate trichomes that restrict water loss and make the olive relatively resistant to drought; some multicellular hairs are also present on leaf surfaces (Martin, 2003).
Flower bud inflorescences develop in the axil of each leaf with buds that are capable of remaining dormant for over a year; these usually form on the current seasons growth and do not visibly grow and develop viable flowers until the next season. (Martin, 2003). Each inflorescence contains 15 - 30 small, inconspicuous, yellow-white flowers with each containing a short 4-segmented calyx and a short-tubed corolla containing 4 lobes (Martin, 2003). There are 2 stamens in each flower, positioned opposite each other on the either side of the 2-loculed ovary which possesses a short style and capitate stigma (Martin, 2003). Two types of flower are borne by *O. europaea* each season: perfect or pistillate flowers that contain both a large pistil which nearly fills the space within the floral tube, and functional stamens; and, staminate flowers that contain functional stamens but aborted pistils (Martin, 2003). While the exact proportion of these two flowers vary with inflorescence, year and cultivar, there are always more staminate flowers than pistillate flowers; some commercial crops have 1 -2 pistillate flowers in each 15 - 30 flower inflorescence (Martin, 2003). In addition, male sterilities (i.e. absence of dehiscent pollen) have been reported in a few cultivars (with a high vigour; e.g. Chemlal or Zarrazi) as well as in wild populations. It has been demonstrated that the determinism of one type of male sterility involves cytoplasmic genes (i.e. cytoplasmic male sterility; Besnard *et al*., 2000).\r\n
The fruit of *O. europaea* is a drupe (2 - 2.5 cm long; Parsons & Cuthbertson, 1992), possessing a central pit which encloses the seed surrounded by the edible mesocarp and hair free exocarp which also possesses stomata (Martin, 2003). The mature seed is covered with a thin coat that covers the starch-filled endosperm. This surrounds the tapering, flat, leaf-like cotyledons, a short radicle (root), and the plumule (stem) (Martin, 2003).
See Notes for differences between subspecies.

Notes
ITIS (2010) lists two direct subspecies of *Olea europaea*, the European olive, subsp. *europaea* and the African olive, subsp. *cuspidata* also referred to as subsp. *africana* (particularly in Australia), *O. africana* and *O. chlorophylla* (Orchard, 1994; ITIS, 2010). *O. e. europaea* differs from *O. e. cuspidate* by having larger, oval shaped fruit and whitish or gray lower leaf surfaces as opposed to the round fruit and pale green to yellowish brown lower leaf surfaces of *O. e. cuspidata* (Green, 2002; Starr *et al*., 2003a; Cuneo & Leishman, 2006). The leaf apex of *O. e. cuspidata* also has a hooked tip, absent in O. e. europaea (Cuneo & Leishman, 2006). Additionally, *O. e. cuspidata* tends to naturalise in coastal habitats whereas *O. e. europaea* tends to naturalise in more inland habitats with a drier climate (Cuneo & Leishman, 2006). Hybridisation between the two subspecies is possible where they are sympatric (Besnard *et al*., 2007). \r\n
Green (2002) lists a total of six subspecies: subsp. *europaea*, native to Mediterranean region; subsp. *cuspidata*, native to southern and eastern Africa to southern Asia; subsp. *laperrinei*, native to Sahara; subsp. *maroccana*, native to Morocco ; subsp. *cerasiformis*, native to Madeira; supsp. *guanchica*, native to the Canary Islands. The subspecies *maroccana*, *cerasiformis* and *laperrinei* have very limited distributions and are considered threatened taxa (e.g. Baali-Cherif & Besnard, 2005).

Lifecycle Stages
In Australia, invasions by *Olea europaea* subsp. *cuspidata* are known to start out as seeds deposited by birds in the forest understory, under isolated trees and along roads under power lines (Cuneo & Leishman, 2006). In ideal conditions (moist and protected), sexual maturity is reached in 5 - 6 years by which time, *O. e. cuspidata* individuals are shrubs 3 - 4 m high and 3 - 4 m wide (Cuneo & Leishman, 2006). These shrubs produce high density seedling mats capable of being suppressed at this stage for many years with up to 950 seedlings / m^2 commonly observed (Cuneo & Leishman, 2006). Once established after about 7 years, a dense and permanent crown is formed, shading out native vegetation and suppressing their recruitment (Cuneo & Leishman, 2006). More shade tolerant and resilient species are still capable of persisting at this stage (Cuneo & Leishman, 2006). When fully mature at around 15 years of age, the vegetation structure changes towards a more uniform stand dominated by multi-trunked trees with an open understory. At this stage, light levels at ground level are sufficiently low for conspecific seedlings to be suppressed, with only the most highly shade tolerant native species capable of persisting (Cuneo & Leishman, 2006).

Uses
Olea europaea subsp. *europaea* has been widely cultivated for its fruit and valuable oil production for thousands of years (Parsons & Cuthbertson, 1992; Martin, 2003). While *O. e. cuspidata* is of less economic importance, its wood is used for making furniture in South Africa (Besnard *et al.*, 2007), and it is widely cultivated in Hawaii as a windbreak and hedge (Starr *et al.*, 2003a). It was also introduced to Sydney, Australia for erosion control and as a rootstock in the 1800s. It was introduced to Norfolk Island in 1788 as a source of fence pole timber (Spennemann & Allen, 2000; Starr *et al.*, 2003a). Both subspecies are sometimes used as ornamental species; Starr *et al.* (2003b) report occasional use of *O. e. europaea* as an ornamental on Maui, Hawaii, and Besnard *et al.* (2007) report the use of *O. e. cuspidata* as an ornamental in China.

Habitat Description
Growth of *Olea europaea* is most prolific in semi-arid to sub-humid warm-temperate regions, usually with winter-dominant rainfall and hot, relatively dry summers. It grows on a range of soils (Parsons & Cuthbertson 1992) but prefers sandy loam soils of moderate depth (Spennemann & Allen, 2000a). See Notes for differences between subspecies.

Reproduction
The seeds of *Olea europaea* are dispersed by birds. Modern cultivated olives are vegetatively multiplied, and are produced by rooted cuttings or grafting for standardizing the fruit production but also because of the difficulty of seed handling, a low germination percentage, and slow initial seedling growth rate making seedling production impractical (Martin, 2003). In Australia, seeds germinate in autumn and seedlings grow at a moderate rate over winter, slowing as moisture is scarcer over the summer; this continues for a number of years until flowering begins (Parsons & Cuthbertson, 1992).

General Impacts
In its invasive range *Olea europaea* forms a dense canopy which shades out native species while still allowing conspecific seedlings to establish. The result of this is the formation of dense monocultures capable of altering ecosystems and habitats through the loss of native biodiversity (Cuneo & Leishman, 2006). Due to its longevity, native species seeds present in the soil are also eventually depleted, limiting the ability for native plant communities to regenerate after *O. europaea* is removed (DECCW, 2010).
There is also the risk of *O. europaea* increasing the fire hazard of dry woodland environments, being an inflammable species with a high oil content (Animal and Plant Control Commission, 2001).

Management Info
Preventative measures: Risk assessments for Hawaii and the Pacific Islands and Australia returned scores of 5 and 2 respectively requiring further evaluation before recognised as a risk (PIER, 2010). *O. e. cuspidata* has been declared a Class 4 noxious weed under Section 7 of the New South Wales Noxious Weeds Act 1993 for the Ryde (Local Government Area) LGA; in South Australia, *O. europaea* (including all subspecies) has been listed as a Class 5d weed under the South Australia Natural Resources Management Act 2004 (Cuneo & Leishman, 2006). A number of measures have been put into place in Tasmania to prevent the spread of the species, including creating an olive register, establishing a code of practice, risk assessment, and educating both commercial growers and home gardeners (Holding, 2004).
In New Zealand, *O. europaea* is listed as a \"Research Organism\" under the Auckland Regional Pest Management Strategy 2007-2012 with no rules or regulations currently restricting its propagation or growth (Auckland Regional Council, 2007).
Monitoring: In addition to grid searching, aerial surveillance by helicopter was used to monitor *O. e. cuspidata* on Raoul Island (West, 2002). Satellite imagery and supervised classification techniques were also used to map landscape distribution of *O. e. cuspidata* in southwest Sydney (Cuneo *et al.*, 2009).
Physical: Hand pulling of seedlings and small plants is effective for individuals or isolated patches of *O. europaea*; cutting without subsequent herbicide application has little effect due to resprouting (Spennemann & Allen, 2000a). Burning at low intensity can kill smaller plants and seedlings (but not larger plants) (von Richter *et al.*, 2005). Mulching using a drum mulcher attached to an excavator has been used successfully for large scale mature infestations of *O. e. cuspidata* in Australia (Cuneo & Leishman, 2006). Heavy continuous grazing may contain the spread of *O. europaea*, however, this could compromise conservation efforts for other plant species (Spennemann & Allen, 2000).
Chemical: A range of herbicides and different applications have been shown to be effective against *O. europaea*. Application techniques include: foliar spraying of smaller plants and seedlings; basal bark spraying; cut stump surface applications and cutting or drilling regularly spaced holes around the trunk and then squirting or injecting the herbicide inside. Triclopyr based herbicides were generally the most effective in trials (Santos *et al.*, 1992) while picloram, glyphosate, metsulfuron-methyl and 2, 4-D based herbicides have also been recommended for different applications (See Management Info document).
Biological: The Australian native Olive Lace Bug (*Froggatia olivinia*) is known as a pest on *O. e. europaea* but not *O. e. cuspidata* ; any attempts to release a biological control agent would likely encounter strong resistance from the fruit industry (Cuneo & Leishman, 2006).
Please follow this link for more detailed information on the management options available to prevent and manage the spread of *Olea europaea*.

Pathway
Olea e. europaea is occasionally grown as an ornamental tree in Hawaii (Starr *et al.*, 2003b).

Principal source:

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ALIEN RANGE

[6] AUSTRALIA
[3] FRENCH POLYNESIA
[1] NEW CALEDONIA
[1] NORFOLK ISLAND
[1] ECUADOR
[1] GUAM
[2] NEW ZEALAND
[1] SAINT HELENA

[1] TONGA
[1] UNITED STATES MINOR OUTLYING ISLANDS
[4] UNITED STATES

Red List assessed species 1: CR = 1;

Trochetiopsis ebenus **CR**

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