

Issues posed by Feral Olives in New South Wales

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ABSTRACT

Two subspecies of olive (*Olea europaea*) are widely planted in NSW, these being subsp. *europaea*, (European olive), used for oil and culinary production and subsp. *cuspidata* (African olive), used for hedging and ornamental purposes. Both subspecies have naturalised and become 'feral' (not planted or maintained for commercial or domestic use).

Olives have generally naturalised in areas of 400-800 mm of median annual rainfall and on a broad range of soil types. Seed dormancies of up to 20 months have been recorded and seedlings have a 5-10 year juvenile phase before fruit is borne. Individual trees may live for centuries and regenerate from stumps.

Over 17 species of birds spread olive seeds, with and without ingestion. Such dispersal is minimised when good husbandry such as timely harvest occurs. The risks of dispersal and naturalisation are increased significantly when incomplete harvest occurs, when new plantings occur in areas where no olives yet exist, from existing feral populations and abandoned orchards and from backyard/hobby farm plantings that are not harvested. Management of feral populations is generally costly (up to \$20,000/ha), time consuming and requires careful planning to avoid further land degradation.

As a woody weed, feral olives reduce native species richness and abundance, affect other ecological relationships and threaten the integrity of *Eucalyptus* grassy woodlands that have conservation significance. Feral olives may also harbour diseases and pests of commercial olives and decrease the recreational and aesthetic value of invaded landscapes. In contrast, feral olives are sometimes harvested, have been investigated as a genetic resource for future Australian cultivars and may provide alternative habitat where no other exists.

The development of a national/state olive industry code of practice is needed to prevent the establishment of, and manage the occurrence of feral olives. Since further declarations in NSW are likely, a NSW feral olive management plan also needs to be developed.

BACKGROUND

The issue of 'feral' olives, the declaration of olives as noxious weed and the development of an industry code of practice has been a matter for discussion in New South Wales (NSW) since at least 1999. Efforts to resolve the issues of invasiveness versus industry value have been hampered by resources and lack of clear "ownership" of the problem. The public and NSW weed control authorities are increasingly raising the problem of olive invasiveness.

A number of local control authorities have approached NSW DPI and the Noxious Weeds Advisory Committee in attempts to have olives declared as noxious weeds in their areas or regions. This paper discusses some of the issues surrounding 'feral' olives so that proactive and co-operative solutions with industry can be initiated.

THE NSW OLIVE INDUSTRY

Olives are an ideal crop for many areas in NSW. Commercial production in olive orchards and production in home gardens are well established supplying an important domestic market for both fruit and oil. Depending on price, domestic and export markets are likely to grow as demand increases (RIRDC 2003).

Continued demand for olive products will result in increased plantings in NSW. For example, it is estimated that 1.3 million olive trees were sold during the period 1990-2000; while another 0.6 million trees were ordered for the three year period 2000-2002. In NSW, plantings are likely to exceed 8000 hectares by 2012 and may be worth in excess of \$100 million for oil production alone (Beckingham 2006).

TAXONOMY OF OLIVE SPECIES IN NSW

Only two olive (*Olea*) species are recognised in NSW (Hardin 1992). The first is the native *Olea paniculata* (native olive) which is found in eastern and coastal NSW. The other species is the introduced *Olea europaea* of which there are two subspecies (subsp.). These are *O. europaea* subsp. *europaea* (olive, common olive, European olive) and *O. europaea* subsp. *cuspidata* (African olive, small-fruited olive, wild olive). *Olea africana* and *Olea europaea* subsp. *africana* are other names that have been used for *Olea europaea* subsp. *cuspidata* (Shepherd *et al.* 2001; PlantNET 2007).

Olea europaea subsp. *europaea* is grown for olive fruit and oil, and is widely planted in orchards, in home gardens and in amenity plantings in NSW. Plants of both subspecies have naturalised (escaped) and are considered as 'feral' (see below).

DEFINITION OF FERAL OLIVES

Feral olives may be defined as naturalised plants that have dispersed from cultivated trees. These plants are not planted and maintained for commercial or domestic use but may have naturalised from such situations in the past (Crossman 2002; DWLBC 2003).

CURRENT NATURALISATIONS IN NSW

Both subspecies of *O. europaea* have naturalised in NSW. *Olea europaea* subsp. *europaea* is relatively common near some older plantings of olives for fruit or oil production and is, as yet, occasionally naturalised from Inverell on the north western plains to Wagga Wagga on the south western slopes (Hardin 1992; J. Hosking pers. comm.). Although Muyt (2001) indicated that subsp. *cuspidata* is generally less widespread in Australia, Hardin (1992) indicated that the species is often invasive in coastal areas of NSW from Lismore on the north coast to near Ulladulla on the south coast.

ENVIRONMENTAL AND SOIL TOLERANCES

In South Australia (SA), olives have predominantly naturalised in the 400–600 median annual rainfall zone (Crossman 2002), but in NSW they have also naturalised in much higher rainfall zones, for example, on the North Coast, in the lower Hunter Valley and around Sydney.

Although olive species have drought tolerance, they require good winter and spring rainfall to flower and fruit. An average rainfall of 500 mm/annum appears to be required for successful fruit production but several observations indicate that olives are able to survive in regions receiving less than 500 mm, and even in areas that receive an annual rainfall of 175 mm at Broken Hill (APCC 1999; Crossman *et al.* 2002).

Olives are tolerant of a range of different soil types but prefer well drained, neutral to alkaline (pH 6.5-8.5) loam soils. Olives tolerate mildly saline soils but will not tolerate waterlogged sites (APCC 1999).

THE LIFECYCLE OF OLIVES

The following information largely refers to *O. europaea* subsp. *europaea*.

Seed dormancy of up to 20 months has been recorded. Self sown seedlings establish on roadsides, in woodland and abandoned pasture (APCC 1999) but these do not form woody tissue until at least one year of age. Seedlings have a juvenile period of 5-10 years before they begin to bear fruit (APCC 1999). These characteristics result in delayed emergence of feral trees, but also provide a considerable window of opportunity to treat new feral olive outbreaks. Individual trees live for many centuries and are able to regenerate from stumps.

DISPERSAL

Olive fruit are almost entirely dispersed by birds with at least 17 species recorded (APCC 1999; Crossman 2002). Many birds do not swallow the seed and hence disperse it no more than 100 metres away from the source (APCC 1999). Starlings are by far the most prevalent dispersal agents in SA and average flock sizes of 100 can disperse thousands of seeds daily, although if roosting sites are available, most seeds are regurgitated within an hour and rarely spread more than 100 m from parent trees (APCC 1999; Crossman 2002; Crossman *et al.* 2002).

Starlings, emus and foxes swallow whole fruit which may result in dispersal over a number of kilometres (APCC 1999; Crossman 2002; Crossman *et al.* 2002). The nursery trade and planting of orchards are responsible for long distance dispersal of olives.

NEGATIVE IMPACTS

Feral olives are a woody weed and produce various negative impacts. The invasion of native vegetation has been recorded in SA, NSW, Victoria, Queensland and Western Australia by at least 11 research publications and has been summarised by Crossman (2002).

Of particular concern is the invasion of remaining patches of *Eucalyptus* woodlands that have conservation significance. This invasion resulted in reductions in native species

richness and abundance (biodiversity) of up to 50% and a reduction in canopy cover of native trees and shrubs by up to 75% in SA (Crossman *et al.* 2002). At least one endangered orchid is also threatened by feral olive invasion. Although feral olives reduce biodiversity, the abundance of some native plant species may be enhanced in certain situations (Crossman 2002; Crossman *et al.* 2002).

Crossman (2002) argued that the reduction in light infiltration under dense feral olive canopies prevented regeneration of native species. Alteration of ecological relationships caused by feral olives also has the potential to substantially affect plant and animal succession, permanently altering landscapes; changes that may take hundreds of years to be fully manifested (Crossman *et al.* 2002).

There are a number of other concerns that feral olives raise. For example, feral olives harbour diseases such as olive peacock spot and pests such as olive fly and olive lace bug that may cause losses to the olive industry. Feral olives produce increased fire hazards due to their dense growth and high oil content and may reduce access for those fighting fires (Crossman 2002; DWLBC 2003).

Although much harder to quantify, feral olives reduce the recreational value of parklands, restrict access for bushwalkers and decrease the aesthetic value of invaded landscapes (Crossman 2002; DWLBC 2003).

POSSIBLE FUTURE NATURALISATIONS IN NSW

Dispersal of seed from olive orchards can be minimised by careful management including timely harvest and reducing fruit losses to birds (APCC 1999). Where these practices are in place, seeds from commercial orchards are likely to compose only a small percentage of seeds that enter the wider environment. Significant feral olive risk arises from commercial orchards that are incompletely harvested, that have not yet reached economically viable commercial harvest yields and from new plantings in areas where no olives yet exist. Of equal concern is seed from existing and future feral populations, from backyards, amenity plantings, on hobby farms and from abandoned olive orchards where fruit production is significant and rarely harvested (DWLBC 2003).

Continued naturalisations are likely to occur in a number of areas in NSW. The 400-600 mm median annual rainfall zone, previously dominated by *Eucalyptus macrocarpa* (Grey box) and other grassy woodland communities is susceptible because these areas coincide with a large proportion of the expansion of the olive industry, as the SA experience indicates (APCC 1999; Crossman *et al.* 2002). Areas receiving at least 600-800 mm median annual rainfall are also susceptible as current naturalisations in the lower Hunter valley and north west slopes around Tamworth and Quirindi, and commercial plantings in this rainfall zone indicate.

VESTED INTERESTS

Olives may be harvested from feral trees (one estimate puts this at 20,000 trees in SA, APCC 1999) and some harvest may occur from feral trees in NSW (C. Evans pers. comm., J. Hosking pers. comm.). Feral olives may also be a useful genetic resource in the breeding of future olive cultivars that are adapted to Australian conditions (APCC 1999; RIRDC 2003). Crossman *et al.* (2002) stated that, as a result of widespread clearing, feral olives now provide habitat and food for many small birds.

CURRENT LEGISLATIVE CONTROL IN NSW

Only one local government control area in NSW (Ryde) has a listing of feral olives (*Olea europaea* subsp. *cuspidata*) as a noxious weed. Under the *Noxious Weeds Act 1993*, this declaration states that “*the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed*”. A further 14 requests for the declaration of this subspecies have been lodged from the Sydney north and Sydney west/Blue Mountains regional committees covering all local government jurisdictions within these two broad areas. Other requests are likely, especially from the central and south west of NSW, and the issue has been raised at regional weed forums. Adequate resources for the management of feral olives by local government will be required to support such requests but it can be reasonably expected that the NSW Government will be called upon to provide some resources.

OLIVE INDUSTRY CONCERN

There is concern among members of the NSW Olive Council about issues surrounding feral olives and abandoned orchards. With NSW DPI, Local government representatives and other interested stakeholders, NSW olive council representatives participated in a forum to discuss the issues that surrounded feral olives in NSW in 2006. A draft NSW industry code of practice to prevent the establishment of, and manage the occurrence of feral olives is yet to be developed.

Concern about feral olives is shared by the Australian Olive Association (RIRDC 2003). A combined Rural Industries Research and Development Corporation (RIRDC)/Australian Olive Association research and development plan identified that strategies and guidelines were needed to limit the “threat of olive ‘weeds’ entering off-farm locations particularly from abandoned groves”. Although NSW DPI is only able to enact legislation within the state, it would also be desirable to consider the issues surrounding feral olives at a national level.

MANAGEMENT

Adult olive plants are difficult to control and often require regular follow up treatment to reduce resprouting (Crossman *et al.* 2002). Control of feral olives is a costly and time consuming exercise requiring careful planning. Removal of these trees can result in other problems in invaded ecosystems such as erosion or establishment of other weeds (Crossman *et al.* 2002; DWLBC 2003).

Expected costs of removing trees are \$750-\$3000 per hectare with an additional \$500 per hectare needed for follow up treatment. Removal of dense infestations may cost up to \$20,000 per hectare (Crossman *et al.* 2002; DWLBC 2003). Sheep grazing has controlled feral olive recruitment in the past (APCC 1999).

Since the distribution of native olives has some commonality with introduced olives, correct identification prior to management will be required.

SOUTH AUSTRALIAN OLIVE RISK MANAGEMENT STRATEGY

The South Australian Government has developed a risk management strategy with three components for the olive industry in that state. These components are outlined below. It

should be noted that there is no legal requirement to use the risk assessment strategy in SA.

Orchard Code of Practice

- Harvest of all fruit each year.
- Fox and exotic bird control to limit seed dispersal.
- A buffer zone between orchards and native vegetation. This buffer zone should preferably be at least 200 m wide with perch sites (planted native trees) within the zone to act as a sink for bird dispersed seeds. Olive seedlings are then controlled in this zone.
- Orchards not harvested for two successive years are declared 'abandoned' requiring removal of all olive trees by the landholder.
- Netting of orchards has been posed as one solution but at costs of \$15,000 per hectare and replacement every 12-15 years this is not seen as an economic solution in many cases (APCC 1999).
- Existing feral olives on private land that are brought into production and managed according to the guidelines are no longer subject to control requirements. The harvest of feral olives on public lands will be phased out.

Olive Grove Register

This involves recording new and existing orchard locations so that local government can monitor locations and risk management practices (APCC 1999). Domestic plantings of up to 10 trees are excluded (APCC 1999). Unfortunately there has been a poor level of cooperation to date (Crossman *et al.* 2002).

Risk Assessment for New Orchards (APCC 1999)

A simple to use decision tool (an excel worksheet) has been developed for local government planners to accept or reject orchard proposals. Scoring within the tool is based on two factors, the likelihood of olive spread and consequences of this spread. The likelihood of spread is itself based on two factors, these being non-management factors that are outside the control of the orchardist e.g. rainfall, surrounding land use and soil characteristics, and management factors the orchardist has some control over e.g. bird control, fruit maturity, fruit size, fallen fruit visibility, control zone around orchards and fox control. The consequences of spread factors considered are distance to significant native vegetation, presence and control of feral olives and presence of existing orchards.

FUTURE DIRECTIONS AND FURTHER INFORMATION

The following recommendations/directions arise from the information presented in this paper: -

1. that the Australian Olive Association liaise with NSW Olive Council regarding the development of a national code of practice to prevent future feral olive problems;
2. that all relevant stakeholders develop a draft NSW industry code of practice to prevent the establishment of, and manage the occurrence of feral olives (this is a key action yet to occur from the feral olive forum discussed earlier);
3. that further declarations of feral olives be called for and considered across NSW; and
4. that a NSW feral olive management plan be developed encompassing the industry code and new declarations of olives in NSW.

The South Australian government has formulated information, policy issues and a risk assessment system for the management of feral and new olive plantations in the state. This is available at http://www.dwlbc.sa.gov.au/files/oliv_ram.pdf

TAKE HOME MESSAGES

- Although the two subspecies of olive (*Olea europaea*) are widely planted in NSW for oil and culinary production, or for hedging and ornamental purposes, both subspecies have become weedy.
- Both olive subspecies are able to be grown (and have naturalised) across large areas on NSW. The risk of further naturalisations is significant especially when incomplete harvest of olive groves occurs, from new plantings where no olives yet exist, from existing feral populations and from abandoned orchards or backyard/hobby farm plantings.
- Feral olives reduce biodiversity and may harbour diseases and pests. Management of feral populations is costly and time consuming.
- A code of practice needs to be developed to prevent the establishment of, and manage the occurrence of feral olives in NSW. This code, combined with any future noxious weed declarations will be integral to the success of a plan to manage feral olives in the state.

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