Introduction

Melaleuca trees (*Melaleuca quinquenervia*) were brought to the United States from Australia in 1887 for use in landscaping, agricultural windrows, highway plantings, and soil stabilization. Natural areas of southern Florida were invaded by the exotic melaleuca tree more than 100 years ago. Aided by wind-dispersed seed, melaleuca rapidly spread and by 1994 nearly a half-million acres were in southern Florida, with extensive stands in the Everglades, Big Cypress National Preserve, and Arthur R. Marshall Loxahatchee National Wildlife Refuge. Everglades National Park, one of the “crown jewels” of the National Park System, is threatened by stands of melaleuca encroaching from the east Everglades.

Melaleuca forms dense stands called monocultures that completely transform the character of natural habitats. It displaces native plant communities and associated wildlife, disturbs natural water flow, and alters soil conditions. Areas once home to endangered species such as the Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*), wood stork (*Mycteria americana*), and Florida panther (*Puma concolor coryi*) are no longer suitable because of melaleuca invasion. When fire occurs, melaleuca trees burn at extremely high temperatures, causing additional environmental destruction. Melaleuca may have the greatest negative impact on migrating birds, which have depended over thousands of years on native plants for seeds, fruits, and insects as fuel for their journeys. It is estimated that if left uncontrolled, melaleuca could overtake much of Florida’s remaining natural habitat by 2025. In addition, it is predicted that its uncontrolled spread would significantly restrict the use of parks and recreation areas, negatively impacting ecotourism in Florida.
Fortunately, something continues to be done about the problems with melaleuca in Florida. Federal and state agencies have cooperated to identify biological control agents and develop herbicide technology that can be used against melaleuca. Over a 20-year period beginning in the late 1990s, Florida agencies spent more than $30 million controlling melaleuca. The South Florida Water Management District (SFWMD) now has melaleuca under maintenance control in the Water Conservation Areas (WCA) in Lake Okeechobee, and crews routinely conduct spot treatments to eliminate melaleuca reinfestation, using ground application of herbicides. Additionally, introduced biological control agents (insects) are helping to curb reinfestation in these areas by suppressing seed production and seedling growth (Francois Laroche, SFWMD, personal communication).

Successful reduction of the melaleuca problem in Florida depends on a multifaceted management approach called integrated pest management (IPM). IPM incorporates several methods of control, including biological controls, mechanical control, and herbicides. Public participation is key to successful integrated management of melaleuca on public lands. Melaleuca trees not controlled on private and commercial property are a constant source of windblown seed that can infest new areas and reinfest natural areas on public lands where trees have already been controlled. This publication provides information to empower Florida citizens to protect the state’s natural areas from melaleuca. See other publications on EDIS to learn more about controlling other invasive plant species in Florida (http://edis.ifas.ufl.edu/topic_ag_natural_area).

How to Recognize Melaleuca

- Melaleuca is an evergreen tree that averages 65 feet in height and can have a single trunk or multiple trunks.
- The bark is thick, pale, and papery, and it peels easily (Figure 2).
- Leaves are narrowly lance-shaped and grow up to 4-inches long by ¾-inch wide. They are leathery with three prominent veins and emit a smell of camphor when crushed (Figure 3).
- Flowers are bottlebrush-shaped and creamy white; they grow up to 6 inches long and can occur throughout the year but mainly from November through February with a peak in December (Figure 4).
- Seeds are contained within persistent, woody capsules clustered on stems (Figure 5).

Integrated Management of Melaleuca

Biological Control

Biological control is using a pest’s natural enemies to lower its population. When melaleuca was introduced into Florida, it was done without any of the insects or pathogens from Australia that attack the tree and help to limit its numbers. Researchers have studied the insect populations in Australia and identified many species that feed on melaleuca. However, of those insects found damaging melaleuca,
only those proven to be non-harmful to desirable plants are released for melaleuca control in the United States.

Three insects have shown promise in integrated management of melaleuca: the melaleuca weevil (*Oxyops vitiosa*) (Figure 6) released in 1997, the melaleuca psyllid (*Boreioglycaspis melaleucae*) (Figure 7) released in 2002, and the melaleuca stem-gall midge (*Lophodiplosis trifida*) (Figure 8) released in 2008. USDA researchers released the bud-gall fly (*Fergusonina turneri*) in 2005, but it failed to establish. Although these insects are not expected to kill mature melaleuca trees, they are reducing tree vigor, seed production, and seedling establishment.

Biological controls spread from tree to tree on their own; the melaleuca weevil and melaleuca psyllid are present in most areas of the state where melaleuca occurs, whereas the stem-gall midge is still spreading. Conditions such as extreme cold and standing water can reduce their populations, especially of the weevil, which completes its life cycle in the soil. However, insect populations will eventually rebound in melaleuca-infested areas when favorable conditions resume.

Another insect that attacks melaleuca is the lobate lac scale (*Paratachardina lobata lobata*) (Figure 9). However, lobate lac scale should not be confused with biological control agents deliberately released to control melaleuca. This is an invasive insect native to India and Sri Lanka that was first found in Broward County in 1999. Evidence of the lac scale includes a dark, sooty mold covering leaves and high numbers of minute, bark-like bumps or scales on twigs. This insect is not only destructive to melaleuca but also to many ornamental plants and native vegetation. Information on how to control lac scale in the landscape can be obtained from your county Extension office (to find your local office, visit http://solutionsforyourlife.ufl.edu/map/).

### Mechanical Controls

Logging equipment and heavy-duty mowing equipment are sometimes used for removing melaleuca trees. Mechanical removal is expensive and causes soil disturbance, which is conducive to reinfestation by melaleuca and other invasive species. This method is usually used for land clearing for development and removal along canal, roadside, and utility rights-of-way. Mechanical removal is generally not used for melaleuca control in natural areas.
Herbicides

Herbicides are used for killing individual or populations of melaleuca trees. To control large, dense populations of mature melaleuca trees, state and federal agencies have applied herbicides by helicopter with the active ingredients glyphosate and imazapyr. Large-scale helicopter applications have been used less frequently as melaleuca populations have been reduced to manageable levels that only require ground applications by skilled professional spray crews.

Glyphosate and imazapyr are also applied with handheld equipment to control seedling and sapling trees. Both glyphosate and imazapyr can kill native/nontargeted plants when leaves come in contact with these herbicides, and imazapyr can also kill plants when it comes into contact with roots. Therefore, helicopter applications are only made to dense stands of melaleuca where few to no nontarget plants exist. When applying herbicide to seedlings and saplings in areas where desirable vegetation exists, care must be taken to apply the herbicide only to the melaleuca.

Individual trees can be killed by applying herbicide using a technique known as “frill-and-girdle” (or “hack-and-squirt”) (Figure 10). Frill-and-girdle involves cutting away the tree's thick bark and applying a herbicide mixture of imazapyr or imazapyr and glyphosate to the living portion of the trunk (cambium), just inside the bark and just outside of the wood (Figure 11). This technique leaves the trees standing and can be unsightly and potentially hazardous when trees decay and fall.

When it is undesirable to leave trees standing, they can be felled, but regrowth will occur from the stump. To prevent regrowth, herbicide is applied to the fresh cut (Figure 12). This method is time-consuming and labor-intensive, but has the advantage that trees are not left standing. Land management agencies usually use an herbicide product that contains imazapyr for treating melaleuca stumps. Imazapyr is readily absorbed by the plant roots and can kill desirable...
plants if it touches their roots. Therefore, it is not recommended for use in landscapes.

**Control Methods for Homeowners**

Private property owners can use similar control methods to those used by professional land managers for melaleuca but at a different scale. Property owners with large numbers of melaleuca trees are advised to consult a professional weed management company or a local agency for assistance. Property owners with a small number of trees will probably want to cut the trees down or have them cut down by a professional tree trimming company. Grinding the stumps may prevent regrowth but can be expensive. Treating the stumps with herbicide to prevent regrowth is less laborious and expensive, results in less soil disturbance, and provides consistent results.

Property owners can use glyphosate- or triclopyr-containing herbicide products available for purchase at retail garden stores. These products are conveniently packaged for homeowner use and are available in small quantities if homeowners only have a few stumps to treat (Table 1). A product containing 30.8% glyphosate will provide more consistent results than a dilute product of glyphosate or triclopyr (e.g., 8.8%). Stumps should be cut within 4 inches off the ground and level so that herbicide does not run off. The herbicide mixture should be applied and concentrated near the living portion of the stump (cambium), located just inside the bark. Herbicide should be applied as quickly as possible after felling the tree (at least within 15 minutes). If a large number of stumps are treated, herbicide should be applied when rainfall is not expected for 24 hours. If only a small number of stumps are treated, they can be covered with waterproof material to prevent rainfall from washing the herbicide off the stump.

**What You Can Do**

- Learn to recognize melaleuca and how it is controlled.
- If you have melaleuca on your property, remove it.
- Dispose of melaleuca debris where it will be incinerated or buried deep in a landfill, or where seedlings and vegetative growth can be destroyed.
- Inform others about the problems caused by having melaleuca on their property and encourage them to remove it.
- Persuade government officials to have melaleuca removed from public property.
Additional Information

- UF/IFAS Extension – http://solutionsforyourlife.ufl.edu/
- UF/IFAS Extension publications - http://edis.ifas.ufl.edu
- UF/IFAS Center for Aquatic and Invasive Plants - http://plants.ifas.ufl.edu
- Florida Exotic Pest Plant Council - http://www.fleppc.org

Citations are omitted from this publication but a comprehensive literature review of melaleuca is presented in:


Related EDIS Publications

- Help Protect Florida’s Natural Areas from Non-Native Invasive Plants: http://edis.ifas.ufl.edu/ag108
- Integrated Management of Nonnative Plants in Natural Areas of Florida: http://edis.ifas.ufl.edu/wg209
- Ecological Consequences of Invasion by Melaleuca Quinquenervia in South Florida Wetlands: Paradise Damaged, Not Lost: http://edis.ifas.ufl.edu/uw123
- Biological Control Containment Facilities in Florida: http://edis.ifas.ufl.edu/in509
- Classical Biological Control of Weeds with Insects: Melaleuca Weevil: http://edis.ifas.ufl.edu/in172
- Melaleuca Snout Beetle, Melaleuca Weevil (unofficial common names), Oxyops vitiosa (Pascoe) (Insecta: Coleoptera: Curculionidae): http://edis.ifas.ufl.edu/in368
- Lobate Lac Scale, Paratachardina lobata lobata (Chamberlin) (Hemiptera: Sternorrhyncha: Coccoidea: Kerriidae): http://edis.ifas.ufl.edu/in471
- Landscape Mulches: What Are The Choices in Florida?: http://edis.ifas.ufl.edu/fr079
Table 1. Herbicides used for controlling melaleuca.

<table>
<thead>
<tr>
<th>Active ingredient/concentration(^1)</th>
<th>Container size</th>
<th>Availability</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate/30.8%–39.9%</td>
<td>1 gal and larger</td>
<td>Agriculture supply stores</td>
<td>Not absorbed by plant roots</td>
</tr>
<tr>
<td>Glyphosate/30.8% or less</td>
<td>1 gal or smaller</td>
<td>Garden supply stores</td>
<td></td>
</tr>
<tr>
<td>Triclopyr amine/31.8%</td>
<td>2.5 gal and larger</td>
<td>Agriculture supply stores</td>
<td>Can be absorbed by plant roots</td>
</tr>
<tr>
<td>Triclopyr amine/0.8%–8.8%</td>
<td>1 gal or smaller</td>
<td>Garden supply stores</td>
<td></td>
</tr>
<tr>
<td>Imazapyr/23.4%</td>
<td>1 gal or larger</td>
<td>Agriculture supply stores</td>
<td>Not recommended for landscape use</td>
</tr>
</tbody>
</table>

\(^1\) Expressed as the free acid