

Natural Area Weeds: Old World Climbing Fern (*Lygodium microphyllum*)¹

Kenneth A. Langeland and Jeffery Hutchinson²

Non-native species make up 31% (1,180) of all the plants found growing out of cultivation in Florida (Wunderlin 1998). These are plants that were introduced to Florida accidentally or for agricultural or landscape purposes and then became naturalized (able to reproduce out of cultivation). Over 120 of these naturalized plants are considered to be invasive to some degree by the Florida Exotic Pest Plant Council (FLEPPC), and 28 of these are prohibited from possession or sale by the Florida Department of Environmental Protection or the Florida Department of Agriculture and Consumer Services (DACS). Old World climbing fern is listed as an invasive species by FLEPPC and it is listed by DACS on the Florida Noxious Weed List (5B-57.007 FAC). It may be the most serious threat to Florida's natural areas.

Distribution and Spread

Old World climbing fern (*Lygodium microphyllum*), native to Africa, Asia, and Australia, is a newcomer to Florida that has spread at an alarming rate since its introduction. The first record in Florida was collected from a plant in cultivation at a



Figure 1. Old World climbing fern spreads along the ground, over shrubs, and climbs by twining around other structures, such as trees and other vines.

Delray Beach nursery in 1958 (University of Florida Herbarium record). Subsequently, a collection was made from the wild in Martin County in 1960 (Florida State University Herbarium record), and two additional collections from the wild in Martin County in 1965 (University of Florida Herbarium record). By 1978, it was well established and had already affected native vegetation by smothering shrubby and herbaceous plants in southern Florida (Nauman and

1. This document is SS-AGR-21, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date: August 2001. Revised: June 2005. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.
2. K. A. Langeland, professor, Agronomy Department; and Jeffery Hutchinson, Graduate Research Assistant, Center for Aquatic and Invasive Plants; Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.
The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. Use herbicides safely. Read and follow directions on the manufacturer's label.

Austin 1978). Owing to the fern's ability to reproduce by wind-dispersed spores, new populations are found in remote areas far from existing populations. Spores are produced year round in south Florida, and a single fertile leaflet can produce up to 28,600 spores with each spore potentially capable of starting a new population of the fern at a distant location (Lott et al. 2003; Volin et al. 2004). Area coverage of the fern increased from 27,000 acres in 1993 to 122,787 acres in 2005 (Amy Ferriter, SFWMD, personal communication). In 2005, the most northern distribution of the fern in peninsular Florida was recorded in Orange County about 5 miles east of Orlando (Pemberton 2003). In 2005, Old World climbing fern is found on both the Atlantic and Gulf Coasts of Florida as far North as Hillsborough and Brevard Counties (Wunderlin and Hansen 2004).

Impacts to Natural Areas

Old World climbing fern climbs into the tree canopy where it competes with canopy trees and understory vegetation for light (Figure 1). It can completely engulf Everglade tree islands (Figure 2), pinelands, and cypress swamps, and spreads across open wetland marshes. It can kill mature trees along with their associated epiphytic orchids and bromeliads and smother understory vegetation, preventing regeneration of the native plant community. As time progresses, a thick mat of old fern material accumulates on the ground that severely alters the habitat. When fire occurs, the fern carries fire into the tree canopy, causing greater damage and carrying fire through wet areas, which would otherwise present a boundary to spread of fire. Rare plant species, such as the tropical curlygrass fern (*Actinostachys pennula*) and thin-leaved vanilla orchid (*Vanilla mexicana*) are threatened in their last remaining habitats, such as northern Everglade tree islands and coastal bay swamps. However, the potential for the most significant damage to native plant populations is highest in areas such as Faxahatchee Strand State Preserve and Big Pine Key National Wildlife Refuge, where numerous rare plants occur.



Figure 2. Old World climbing fern smothering a tree island in the northern section of the Arthur R. Marshall Loxahatchee National Wildlife Refuge in Palm Beach County.

How to Recognize Old World Climbing Fern

Old World climbing fern plants consist of long fronds (to 90 feet long) that spread along the ground, over shrubs, or climb by twining around other structures, such as trees and other vines (Figure 1). Rhizomes (underground stems), and rachis (main stem of the frond) are dark brown to black and wiry. Leafy branches (Pinnae, Figure 3) off the rachis are 2 to 5 inches long with several pairs of leaflets (pinnules). Fertile leaflets (Figure 4) are fringed with tiny lobes of enrolled leaf tissue along the leaf margin, which cover the reproductive tissues.



Figure 3. Leafy branches (pinnae) of Old World climbing fern are 2 to 5 inches long with several pairs of leaflets (pinnules). Photo by Richard Roberts.



Figure 4. Fertile leaflets (pinnules) of Old World climbing fern are fringed with tiny lobes of enrolled leaf tissue along the leaf margin, which cover the reproductive tissues. Photo by Richard Roberts.

Management

The most common method of controlling Old World climbing fern is spraying the foliage with a herbicide that contains the active ingredient glyphosate (3-4 lb active ingredient per gallon) or metsulfuron methyl (Table 1). Glyphosate products are usually applied at a concentration of 1.0-3.0% v/v but lower concentrations may be effective. Metsulfuron methyl is applied at an equivalent of 2 oz of product (60% active ingredient) per 100 gal (0.6 g/gal or 0.02 oz/gal). The two herbicides are also often applied together. Plants treated with glyphosate alone will begin dying within three weeks, while plants treated with metsulfuron methyl alone may take several months. Treated populations must be monitored for regrowth and re-treated as necessary. It is recommended that treated sites be revisited a minimum of every 6 months following treatment. During site visits, all regrowth needs to be treated.

Products that contain metsulfuron methyl and certain products that contain glyphosate are packaged for commercial use and available only from agricultural supply stores (Table 1). Some glyphosate products are packaged for homeowner use and available from retail garden supply stores. Federal law requires that anyone who applies a herbicide reads the entire label first and follows the label instructions. Information on applying herbicides safely can be obtained from your County Cooperative Extension Service.

Spot treatments are usually made with a backpack sprayer or other hand-held sprayer. If fronds extend up into trees where herbicide cannot be applied to all the foliage, the fronds are cut at about waist height and herbicide is applied to the lower (rooted) portion. Large populations, usually on public lands, are treated by helicopter at rates of 7.5 pints glyphosate product (4 lbs active ingredient per gallon) per acre or 2 oz metsulfuron methyl product per acre. If the ferns are in water and the herbicide will be applied directly to water, a product that is registered for use in aquatic sites must be used. Certain glyphosate-containing products are labeled for use in aquatic sites (Table 1). Escort XP, which contains metsulfuron methyl, is labeled in Florida for use by public agencies to control Old World climbing fern over water.

Table 1. Herbicide use for controlling Old World climbing fern.

| Active Ingredient | Product(s) | Comments |
|--|--|--|
| Glyphosate 3 lb ¹ /gal | Roundup Pro Glyphos Glypro Plus Touchdown Pro Dupont Glyphosate | Not registered for application directly to water. Available from agricultural supply stores. |
| Glyphosate 3.7 lb ¹ /gal | Roundup Super Concentrate | Available at retail garden supply stores. |
| Glyphosate 4 lb ¹ /gal | Rodeo Aquamaster Aquaneat Eagre Aqua Pro Glypro Accord | Registered for application directly to water. Available from agricultural supply stores. |
| Metsulfuron methyl 60% | Escort XP | State label for application by state agencies to control Old World climbing fern growing in water. |

¹ Acid equivalent.

Integrated management of Old World climbing fern with prescribed burning, biological controls, mechanical removal, and herbicides is under active investigation. In February 2005, a moth (*Austromusotima camptonozale*) (Figure 5) was

released in southeast Florida as the first biocontrol agent to help in the battle to control Old World climbing fern. However, it may several years or decades before the effects of biocontrols are known. Several more insects will be released as biocontrols over the next 3-4 years. A discussion of these efforts is presented in the “Lygodium Management Plan”, which is available on at <http://fleppc.org>.



Figure 5. The first biocontrol agent to manage infestations of Old World climbing fern was released in Jonathan Dickinson State Park in Martin County in February 2005. Credits: USDA-ARS

What You Can Do

Citizens who want to help protect Florida's natural areas from Old World climbing fern should become familiar with how to identify it, be on the lookout, and teach others about the problem. If you find new populations of Old World climbing fern on public property, you should contact the property manager, or appropriate agency such as a county Environmental department, a Water Management District, or a Florida Department of Environmental Protection Biologist.

If you find Old World climbing fern on your own property, pull it up by the roots or spray it with herbicide. Monitor and re-treat if regrowth occurs. Homeowners can purchase glyphosate-containing herbicide in small quantities from retail garden supply stores. Do not dispose of Old World climbing fern in such a way that will cause further spread.

Literature Cited

- Lott, M. S., J. C. Volin, R. W. Pemberton, and D. F. Austin. 2003. The reproductive biology of the invasive ferns *Lygodium microphyllum* and *L. japonicum* (Schizaeaceae): implications for invasive potential. *American Journal of Botany* 90: 1144-1152.
- Nauman, C. E. and D.F. Austin. 1978. Spread of the exotic fern *Lygodium microphyllum* in Florida. *Amer. Fern J.* 68:65-66.
- Pemberton, R. W. 2003. Northward range extension in Florida of the invasive fern *Lygodium microphyllum* (Lygodiaceae). *Sida* 20: 1759-1761.
- Volin, J. C., M. S. Lott, J. D. Muss, and D. Owen. 2004. Predicting rapid invasion of the Florida Everglades by Old World climbing fern (*Lygodium microphyllum*). *Diversity and Distributions* 10: 439-446.
- Wunderlin, R. P. 1998. *Guide to the Vascular Plants of Florida*. University of Florida Press, Gainesville. 806 pp.
- Wunderlin, R. P., and B. F. Hansen. 2004. *Atlas of Florida Vascular Plants* (<http://www.plantatlas.usf.edu/>). [S. M. Landry and K.N. Campbell (application development), Florida Center for Community Design and Research.] Institute for Systematic Botany, University of South Florida, Tampa.