

Flame Vine (*Pyrostegia venusta*): An invasive plant of mature scrub and potentially other natural habitats in Florida

by Jeffrey T. Hutchinson, Center for Aquatic and Invasive Plants, University of Florida

PHOTOS BY JEFFREY T. HUTCHINSON



The flower of flame vine has been described as the most beautiful flower in the world.

While problematic and highly invasive non-native plants are well known in Florida (FLEPPC, 2005), other non-native plants may remain obscure or become locally invasive in small geographic areas or single locations. At Archbold Biological Station (ABS) in Lake Placid (Highlands County), Florida, flame vine (*Pyrostegia venusta*) was planted at seven locations in the northeast section of the original property circa 1936 at the edge of scrub habitat (ABS Archives). Today, those plants still persist and have spread beyond the original introduction point into scrub habitat. Flame vine is easily propagated from fragments (Watkins and Sheehan,

1975), and the area with the highest density of flame vine at ABS is an area that is frequently disked for firebreaks.

Flame vine is an evergreen, woody vine native to Brazil that produces one of the most beautiful flowers in the world (Menninger, 1970). Its showy orange flowers open in the winter (February to April), making it a potentially popular and highly conspicuous landscape plant. Flame vine grows rapidly, covering trees, fences, and other structures (Whistler, 2000). Its leaves are compound, bifoliate or trifoliate, with three part tendrils that facilitate its ability to climb. Flame vine thrives in open areas, is drought tolerant, and appears to tolerate a wide variety of

soils (Riffle, 1998). In Florida, this species spreads vegetatively and is not known to produce seeds (Watkins and Sheehan, 1975).

Flame vine is promoted as a landscape plant in Florida (Black, 2001), but plantings are recommended with caution because the vine can cover and strangle trees (Gilman, 1999). It is documented from only Brevard and Broward Counties in Florida (Wunderlin and Hansen, 2003). However, flame vine has been observed in many areas of south-central Florida growing along fence lines, orange groves, snags, power line poles, and old homesites, often covering extensive areas along the ground and in the canopy.

A PLANT TO BE WATCHED

Flame vine (*Pyrostegia venusta*) is being watched by the FLEPPC Invasives List Committee for further spread into natural areas. It has been observed spreading slowly in a few urban parks in central Florida. If you have seen this species in other conservation lands, please submit a record of the occurrence to the FLEPPC database (www.fleppc.org/database). If the record represents a new county of occurrence, please make a herbarium specimen as a voucher for the Plant Atlas (www.plantatlas.usf.edu). Tips on making vouchers can be found via a link at the FLEPPC database introduction page.

– K.C. Burks
List Committee Chair



Flame vine growing over scrub vegetation at Archbold Biological Station.

The author has observed the vine in Desoto, Glades, Hardee, Highlands, and Okeechobee Counties, but there are no reports of flame vine invading natural areas in Florida.

In January 2005, Tony Pernas and Jonathan Taylor mapped the distribution of Old World Climbing Fern, Melaleuca, Brazilian pepper and Australian pines from Lake Okeechobee northward to Orlando. These systematic reconnaissance flights (SRF) are part of a joint mapping effort between the South Florida Water Management District and the National Park Service. During these flights flame vine was readily identified from the air due to its bright inflorescence and its presence in the canopy of trees. The observers noted that the species was particularly abundant in the Tampa/St. Petersburg area. Flame vine was not mapped during the flights but possibly can be added in future mapping efforts.

Flame vine is listed as a weed in Peru (Holm et al., 1979) and documented as invasive in Tanzania after fragments were discarded along the edge of a tropical forest (Binggeli, 2000). The potential range of this plant in the United States includes warmer regions such as peninsular Florida, southern Louisiana, southeastern Texas, southwestern Arizona, and coastal California (Gilman, 1999). If ambient temperatures drop below -2.0 C, flame vine is damaged or top-killed (Menninger, 1970).

Characteristics of Flame Vine in Long Unburned Scrub Habitat

At ABS, flame vine is prominent in the northeast section of scrub habitat that has not been burned in > 75 years. It spreads by vegetative growth both horizontally and vertically, climbing into the canopy with clasping tendrils. The vine encircles and covers scrub vegetation such as scrub palmetto (*Sabal etonia*), scrub hickory (*Carya floridana*), and various species of scrub oaks (*Quercus* spp.). Flame vine can form a near complete canopy over shrubs and trees. At ABS, flame vine quickly invades gaps created from tree fall or wind damage, often forming > 80% ground coverage. The main roots lie prostrate along the ground or just under the debris or duff layer with each node developing a single descending tap root with multiple fine roots and one to multiple ascending stems. The three-part tendrils attach to limbs, leaves, bark, and other structures that allow the plant to climb into the canopy. The root system of flame vine consists of a matrix from above-ground nodes that are spaced ca. 15.0 – 90.0 cm apart, with roots growing over one another.

At ABS, continuous roots were measured in excess of 22 m in length with numerous stems emerging from crowns along the main root and ascending into the canopy. Several sprouts occur at each



Resprouts of flame vine following a prescribed burn.



Treatment of flame vine requires that all nodes be treated with herbicide.

crown growing vertically along adjacent stems and other vegetation, or horizontally along the ground forming new crown nodes. Some vines pulled from the canopy were > 15 m in length, while the height of the surrounding vegetation was < 9 m. Once flame vine reached the top of the canopy, it grew horizontally along the top of the canopy or dropped over the edge.

Invasive Potential of Flame Vine

At ABS, flame vine coverage increased from less than a few square meters at seven point locations along the boundary fence line in 1936 to 1.3 ha in 2003 based on area coverage estimated with GPS. The average annual rate of spread was 0.02 ha (200 m²) per year over the last 68 years. Most of the coverage was both vertical and horizontal, but only horizontal coverage was calculated. From April, 2002 to October, 2003 more than 11,500 stems and roots were physically removed from the ground, sub-canopy, and canopy layers, and the root-crown nodes were treated with herbicide. However, flame vine is still present as numerous nodes went undetected during treatment.

Table 1. Weekly growth rates of flame vine under different light and moisture conditions.

Growth Conditions	Weekly Growth Rate (cm)
Shade (75%) and Water	12.7
Open Sunlight and Water	10.6
Shade and No Water	10.0
Open Sunlight and No Water	0.0

Observations at ABS indicate that flame vine spreads slowly and does not appear to be a major threat to natural areas unless it is planted near or adjacent to a natural area and allowed to persist. Since flame vine spreads exclusively by vegetative growth and no sexual reproduction has been observed in Florida, the vine should not be planted within 100 meters of any natural area in Florida.

Control of Flame Vine

Flame vine re-sprouted within 7 days from all root nodes that were cut (n = 25). Prescribed burning resulted in 19 resprouts (76%; n = 25) with resprouts being observed after 25 days. This indicates that flame vine is tolerant to fire. The use of fire was successful in removing the aboveground portion of the plant and burning off the duff layer, making subsequent herbicide treatments easier.

Garlon 4 (triclopyr, 10% product) mixed with Veg Oil (90%) was successful in controlling flame vine. No resprouts (n = 25) were recorded for stems cut and treated at the node with 10% Garlon 4. Vines growing vertically above the cut were not treated and died. However, resprouts were observed on untreated nodes > 0.75 m from the treated node attached to the same root, indicating that herbicide translocation may not occur from node to node. Thus, every node, possibly thousands per hectare, must be treated for complete control.

Foliar spraying of flame vine along a fence line in the northeast section of ABS with Roundup (glyphosate, 3% product) or Weedmaster (2,4-D and dicamba, 3% product) was successful in defoliating the

vine, but the vine resprouted in < 6 months. A second treatment along the fence line with each herbicide again resulted in defoliation, but subsequent resprouting occurred again within 6 months. Thus, foliar spraying is not recommended unless followed with herbicide treatment of the nodes.

Resprouting Potential and Growth Rate

Stems (n = 25), roots (n = 25), and nodes (n = 25) were placed in sand and exposed to four conditions: 1) direct sunlight, 2) 75% canopy cover, 3) direct sunlight and watered daily, and 4) 75% canopy cover and watered daily, to evaluate the sprouting potential of flame vine. In treatments under shade or watered, all crown nodes re-sprouted within one week, but no stems or roots re-sprouted. For treatments placed in the open sunlight and not watered, no sprouts were recorded for stems, roots, or nodes, indicating that flame vine nodes need moisture or shade to re-sprout.

Vegetative growth from nodes was observed within 6-7 days. Tendrils were documented at 32 days following planting. Multiple sprouts were recorded for most nodes with the highest number of sprouts for a single node being 18. The highest growth rate recorded was 12.7 cm per week for a single sprout from a node that was under shade and watered. The highest growth rate for a sprout receiving water and exposed to sun was 10.6 cm per week, while the highest growth rate for a sprout receiving no water and placed in the shade was 10.0 cm per week (Table 1). Based on



Resprouts of flame vine along a frequently disked fire-lane at ABS.

these results, the nodes of flame vine could easily become established at other locations at ABS during disking, especially during the rainy season. At ABS, numerous flame vine plants occur along a 1.2 km stretch of frequently disked fire-lane that is > 0.6 km from where the initial plants were planted. Similar growth rates were observed for resprouts that were cut or burned. After seven months, the growth rates of flame vine after cutting (n = 25) or burning (n = 25) indicated that it can grow to lengths > 4.0 m (or ca. 14 cm per week).

Conclusion

At ABS, flame vine is locally invasive in long unburned scrub where it was established as a landscape plant in 1936. It occurs in ruderal sites in Highlands and other counties in south-central Florida, but dispersal is limited to human introduction and vegetative growth. Once established, flame vine spreads vertically creating a closed canopy cover and altering the structure and composition of the area it has invaded. Its horizontal matrix of roots and nodes makes control very difficult once the plant is established. However, horizontal spread of the plant is slow possibly due to the fact that it does not produce seeds in Florida. At ABS, the spread of flame vine is more invasive vertically

...continued on page 11

than horizontally as it creates a shaded understory that limits sunlight to other plants and may inhibit fire. The horizontal rate of spread calculated from ABS of ca. 6.9 m / year was less than the spread documented in Tanzania of 10.0 m / year in a tropical hammock (Binggeli, 2000).

Flame vine is adaptable to a wide array of habitat types from tropical forests (Binggeli, 2000) to xeric habitats such as scrub, but appears to require moisture or shade for initial establishment. The extensive canopy it creates forms mesic-like habitat below in a xeric ecosystem that may facilitate vegetative spread due to increased soil moisture. It resprouts robustly following cutting and burning, but can be controlled using Garlon 4 (10% product) as long as each node is treated.

At ABS, the spread of flame vine was probably facilitated by the spread of root fragments with nodes during disking of fire-lanes. Numerous sprouts are common along the fire-lanes in the northeast section of ABS. Binggeli (2000) noted that discarded fragments of flame vine covered a section of tropical hammock within 1 year of the fragments being discarded. In planters, small fragments with nodes sprouted within a week under moist or shaded conditions. Thus, mechanical treatment such as disking may spread plant fragments such as nodes that develop and spread into natural areas. Flame vine exhibits the potential to become a problematic plant in xeric habitat, and possibly tropical hardwood hammocks and other mesic habitats if it becomes a highly popular landscape plants.

The invasive potential of flame vine in natural areas is moderate if it is planted nearby, and eradication is difficult to achieve,

even for an area as small as 1.3 ha. Flame vine is not problematic on a landscape level like other species of invasive vines in Florida such as Old World climbing fern (*Lygodium microphyllum*), skunk vine (*Paederia foetida*), air potato (*Dioscorea bulbifera*), or rosary pea (*Abrus precatorius*). However, in the ever increasing urban-wildland interface that occurs as Florida is rapidly developed, it is likely that more land managers and naturalists will face increased numbers of non-native plants such as flame vine spreading from urban into natural areas.

For more information, contact Jeffrey Hutchinson at the Center for Aquatic and Invasive Plants, 352-392-9981, jthutchinson@ifas.ufl.edu

Binggeli P. 2000. The East Usambaras (Tanzania) - The pearl of Africa. *Aliens* 10: 14-15. Available on line at: <http://members.lycos.co.uk/WoodyPlantEcology/invasive/aliens.htm>

Black, R. J. 2001. Vines of Florida. Institute of Food and Agricultural Sciences, Circular 860. University of Florida, Gainesville. 16 pp.

FLEPPC. 2005. List of Florida's Invasive Species. Florida Exotic Pest Plant Council. Internet: <http://www.fleppc.org/05list.htm>.

Gilman, E. F. 1999. *Pyrostegia venusta*. Institute of Food and Agricultural Sciences, Fact Sheet FPS-496. University of Florida, Gainesville. 3 pp.

Holm, L. G. J. V. Pancho, J. P. Herberger and D. L. Plucknett. 1979. A geographical atlas of world weeds. Krieger Publishing, Florida.

Menninger, E. A. 1970. Flowering vines of the World. Hearthside Press Incorporated, N.Y. 410 pp.

Riffle, R. L. 1998. The Tropical Look: An Encyclopedia of Dramatic Landscape Plants. Timber Press, Portland, Oregon. 428 pp.

Watkins, J. V., and T. J. Sheehan. 1975. Florida Landscape Plants. University of Florida Press, Gainesville. 420 pp.

Whistler, W. A. 2000. Tropical Ornamentals. Timber Press, Portland, Oregon. 542 pp.

Wunderlin, R. P., and B. F. Hansen. 2003. 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.

**For the plants you
love to hate...**

**Pandion
Systems, Inc.**



**Invasive Exotic Plant
Management**

**Ecologists and land
managers...**

Specializing in complex control and research projects requiring a high degree of ecological proficiency and experience.

Gainesville, Florida
352-372-4747

www.pandionsystems.com
exotics@pandionsystems.com



**"Over 20 Years...
Leading the way
in effective, efficient
and economical
Aquatic & Natural Area
Exotic Pest Plant Management"**

P.O. Box 1469
Eagle Lake, FL 33839
1-800-408-8882
www.appliedaquaticmgmt.com

**AQUATIC
VEGETATION
CONTROL, INC.**
ENVIRONMENTAL SERVICES

**"Sound,
value-oriented
environmental
stewardship"**

6753 Garden Road, Suite 109
Riviera Beach, FL 33404
(561) 845-5525
(800) 327-8745

Fax: (561) 845-5374
email: L1J2@aol.com
www.avcaquatic.com

