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# Florida Bonamia

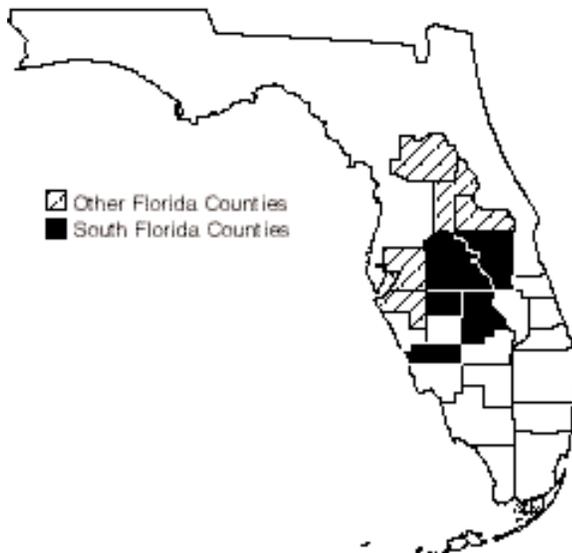
## *Bonamia grandiflora* (A.Gray) Heller

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| <b>Federal Status:</b>       | <b>Threatened (November 2, 1987)</b> |
| <b>Critical Habitat:</b>     | <b>None Designated</b>               |
| <b>Florida Status:</b>       | <b>Endangered</b>                    |
| <b>Recovery Plan Status:</b> | <b>Contribution (May 1999)</b>       |
| <b>Geographic Coverage:</b>  | <b>South Florida</b>                 |

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Figure 1. County distribution of the Florida bonamia.



*Bonamia grandiflora* is a member of the morning glory family (Convolvulaceae), and is the only species of its genus in the continental United States. This endemic scrub, with its large, attractive flower, is found only on scrub areas of central and South Florida. Destruction of Florida's scrub habitat for residential housing and agricultural expansion has dramatically reduced the size and number of *B. grandiflora*'s population, resulting in its Federal listing as a threatened species.

This account represents South Florida's contribution to the existing recovery plan for the Florida bonamia (FWS 1996).

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### Description

*Bonamia grandiflora* is a perennial vine with appressed hairs and long prostrate stems a meter or more in length. It has a long, relatively slender tap root. The leathery sessile or subsessile leaves are up to 4 cm in length and ovate in shape. The flowers are solitary and sessile in the leaf axils. The funnel-shaped corolla is 7 to 10 cm long and 7 to 8 cm across. It has a deep blue or bluish-purple color with a white throat. The flowers open in the morning and are wilted by early afternoon (G. Romano, University of Florida, personal communication 1996). The fruits are capsules, normally containing four seeds. The seeds are smoothish, pale brown or greenish-brown, 5 to 8 mm long, and oblong (G. Romano, University of Florida, personal communication 1995). The outer face is convex, and the inner two faces are flat, forming an angle (Wunderlin *et al.* 1980). *B. grandiflora* is the only morning glory vine found in scrub areas with a large blue flower (Wunderlin *et al.* 1980), but could be confused with *Stylisma villosa*.

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### Taxonomy

*Bonamia grandiflora* was originally named by Asa Gray in 1880 as *Breweria grandiflora*. In 1897, Hans Hallier transferred it to the genus *Bonamia*. There have been no other taxonomic treatments of the species since then (Myint and Ward 1968).

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## Distribution

*Bonamia grandiflora* formerly occurred in central Florida from Volusia and Marion counties south to Highlands and Charlotte counties (Wunderlin *et al.* 1980). The plant was historically collected in Sarasota, Manatee, and Volusia counties in 1878, 1916, and 1900, respectively (Wunderlin *et al.* 1980). It is currently found in Charlotte, Hardee, Highlands, Hillsborough, Lake, Manatee, Marion, Orange, Osceola, and Polk counties (FWS 1996) (Figure 1).

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## Habitat

*Bonamia grandiflora* is a scrub endemic of central Florida. All of its known populations occur within or near scrub or on the edge of scrub habitat in the white sands associated with the ancient Pleistocene dune systems of the central ridge system (Ward 1979). These sands are of the St. Lucie-Paola complex, highly porous, acidic (4.5 to 6.0) and containing few nutrients (Wunderlin *et al.* 1980). This substrate is associated with a sand pine scrub vegetation consisting of evergreen scrub oak (*Quercus myrtifolia* and *Q. germinata*) and sand pine (*Pinus clausa*) with openings between the trees and shrubs occupied by lichens and herbs. The openings are cleared by infrequent fires or by mechanical disturbance. *Bonamia grandiflora* is also known to live in disturbed areas near roadways and clearings caused by logging operations (50 FR 42068). This species is not found on altered soils such as the clay applied to logging roads (Miller 1989).

As the scrub community reaches maturity, encroachment and shading from overstory pines and oaks cause the decline of this species as well as other associated endemics (Wunderlin *et al.* 1980). It seems that this species prefers an open canopy in full sunlight in order to avoid competition from the surrounding shrubs. For example, in Ocala NF, the *Bonamia* grows in a variety of growth stages of sand pine, but flowers profusely only in the open, sunny conditions of regeneration stands, and sparsely if at all in older stands.

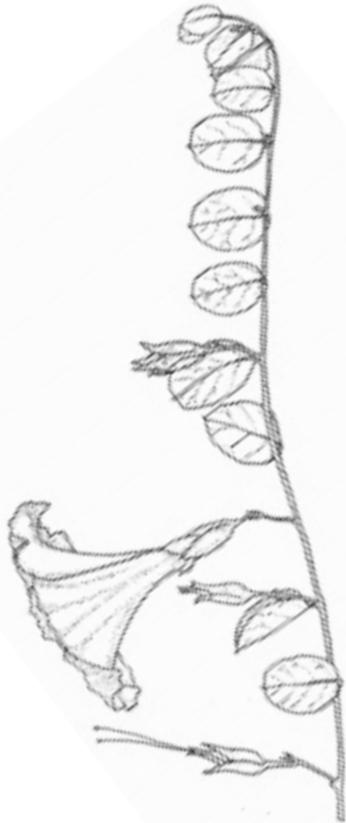
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## Reproduction

*Bonamia grandiflora* grows for 3 or more years (50 FR 42068, Wunderlin *et al.* 1980), flowering from spring to summer (Small 1933). It has a mixed mating system; it is highly self-compatible, it can self-pollinate, and it can produce seeds without fertilization (G. Romano, University of Florida, personal communication 1998). Pollinators are essential, however, to ensure substantial seed production by self- as well as cross-fertilization. *Bonamia grandiflora* shows some inbreeding depression in selfed fruits and seeds but it does not appear to be enough to hinder the present populations (G. Romano, University of Florida, personal communication 1998). The seeds of *Bonamia* become dormant, but may not require dormancy to germinate, particularly if the seeds are planted immediately. Hartnett and Richardson (1989) observed that populations of this species have large seed banks of dormant seeds, mostly within 1 cm of the surface, distributed rather homogeneously, with no relation to the distribution of mature plants. The seedlings germinate throughout the summer until September.

**Florida bonamia.**

Original drawing by Bruce Edward Tatje; original flower photograph by Steve Shirah.



The necessity of fire for germination has not been studied; however, germination occurs on sites with sparse vegetation that have not burned recently (G. Romano, University of Florida, personal communication 1996).

Seedling survival rates are not known but are currently being investigated (G. Romano, University of Florida, personal communication 1996). Due to the nature of *Bonamia*'s growth, identifying seedlings from older individuals' stems that are actually connected to other stems below-ground can be difficult. However, it is possible to distinguish these two life phases. Hartnett and Richardson (1989) excavated several plants and found that the clumps of prostrate stems seen at the surface are all connected to a "large central and somewhat woody rootstock." They had no difficulty distinguishing such well-established older individuals from young single-stem plants that had grown from seed.

According to Hartnett and Richardson (1989), fire stimulates seed production and germination as well as regrowth from clonal stems. The first season after a fire, clonal stem production is the greatest and then declines. However, seed production is greatest during the second season after a fire. The lag is probably due to the increased energy needed for regrowth following fire; seed production is postponed to conserve energy. New seed production replaces the seed banks that are often destroyed by fire.

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### Relationship to Other Species

Federally listed species found in association with *B. grandiflora* are the Highlands scrub hypericum (*Hypericum cumulicola*), papery whitlow-wort (*Paronychia chartacea*), and the scrub plum (*Prunus geniculata*) in Highlands and Polk counties. The scrub lupine (*Lupinus aridorum*) is associated with *B. grandiflora* in Orange County (50 FR 42068).

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## Status and Trends

*Bonamia grandiflora* was federally listed as threatened on November 2, 1987, due to habitat destruction, excessive collection, and habitat degradation due to invasive exotics, off-road vehicles, and lack of proper management (52 FR 42068). By the time of listing, much of its suitable habitat had been destroyed. In Highlands County, about 64 percent of the xeric vegetation (scrub, scrubby flatwoods, and southern ridge sandhills) present before settlement was destroyed by 1981, and an additional 10 percent of the xeric vegetation was moderately disturbed, primarily by construction of roads for housing subdivisions (Peroni and Abrahamson 1985). Remaining tracts of scrub are rapidly being developed for citrus groves and housing. Habitat destruction is similar in Polk County, the leading county in the state for citrus production (Fernals 1981). Farther north, most of the former habitat of the plant in northwest Osceola, western Orange, and central Lake counties has been converted to agricultural or urban uses. The five known sites for the plant in Orange County are all on small remnants of scrub vegetation or vacant lots surrounded by houses or orange groves west and southwest of Orlando, one of the fastest growing urban areas in the United States. Because *B. grandiflora* is limited to small areas of scrub surrounded by residential housing and cultivated lands, habitat destruction or degradation often occurs because of trash dumping, invasion by exotics and weeds (e.g. cogon grass, *Imperata* sp.) and off-road vehicle use.

*Bonamia grandiflora* is dependent on the sunny cleared areas left by periodic fires or physical disturbance (52 FR 42068). Historically, lightning fires swept through the scrub and surrounding communities, burning large tracts of land. Today, fragmentation of habitat and fire suppression have interrupted the natural burn regime. Reduced fire frequency has left many of the scrub sites overgrown and unsuitable for highly specialized scrub endemics that require open sunny patches. *Bonamia grandiflora* can be found growing along roadsides that are often the only available openings. However, these areas cannot be considered a safe refuge for rare species. Roadsides are often filled with invasive exotics that compete with scrub endemics. In addition, road maintenance activities such as mowing, herbicide spraying, and soil disturbance can adversely affect native species.

*Bonamia grandiflora* is striking when flowering and grows in accessible areas. This morning glory may be adversely affected because of excessive scientific collecting. Horticulturists may also desire this flower as an ornamental. Collecting is regulated in Ocala NF, but regulations have been difficult to enforce.

*Bonamia grandiflora* may also be affected by fungus. G. Romano (University of Florida, personal communication 1996) reported that in one location all plants bloomed, but few produced viable seed. She found that fungus infested the fruit capsules and prevented development of the seed. This fungus did not appear in the same site the following year. The frequency and long-term effects of fungal infestations are unknown for this species.

Except for a fairly large reservoir of *B. grandiflora* in the Ocala NF, Marion County, this species appears to be in decline. South of Marion County, most sites where this species occurs are small remnants of a once larger xeric community. In Lake and Orange counties, this species is severely affected by habitat loss and

degradation. In Orange County, *B. grandiflora* is found with the endangered *Lupinus aridorum*. *Bonamia grandiflora* is found in Manatee County though this area has not been adequately surveyed for scrub endemics (K. DeLaney, Environmental Research Consultants, Inc., personal communication 1995). In South Florida, this species is found on scattered scrub sites in Charlotte, Hardee, Highlands, Osceola, and Polk counties. This species may be more abundant in Hardee and Charlotte counties since little survey effort has been expended in these counties (K. DeLaney, Environmental Research Consultants, Inc., personal communication 1995). *B. grandiflora* has disappeared from many of its historical locations (Ward 1979).

*Bonamia grandiflora* is protected on several sites due to the intense land acquisition efforts on the Lake Wales Ridge in recent years. However, even protected sites cannot ensure the preservation of this species. For example, the species is no longer found at Archbold Biological Station despite its history of conscientious land management practices (Christman and Judd 1990). The species at The Nature Conservancy's Tiger Creek Preserve seems to be in decline as well (G. Romano, University of Florida, personal communication 1996).

*Bonamia grandiflora* is protected at the following sites: Wingate Creek State Preserve in Manatee County, Turkey Lake Park, Lakes Cane and Marsh Park in Orange County, Lake Louisa SP in Lake County, Crooked Creek owned by the Lake County Water Authority, Ocala NF, and Tiger Creek Preserve, Saddle Blanket Lakes Preserve, Lake Wales Ridge SF, Flamingo Villas, and Sun Ray Preserve in Polk and Highlands counties. There are no protected sites for this species in Osceola, Charlotte, and Hardee counties.

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## Management

The sand pine scrub community historically burned every 20 to 70 years, and like many other scrub plants, *B. grandiflora* needs fires or mechanical disturbances to reduce competition and maintain a healthy population. Periodic fire also stimulates flowering and seed production of mature plants, stimulates germination of seed, and causes turnover of stored seed banks. This species resprouts after fire. *Bonamia grandiflora* can also withstand mechanical site preparation or low-intensity mowing, but the timing of the mowing is very important. If mowed repeatedly while growing or blooming, energy stores would be used for regrowth and not reproduction. Postponing reproduction for a full growing season could have long-term detrimental effects. However, mowing may be a useful management tool if used after seed set or before leaf out (G. Romano, University of Florida, personal communication 1997).

The USFS, Lake George Ranger District, has developed *B. grandiflora* management recommendations that provide for open, sunny habitat and prevention of cogon grass (*Imperata* spp.) invasion. The only available method to control cogon grass is by spot herbicide application, but this treatment may kill a few *B. grandiflora* plants. Efforts should be made to use grass-specific herbicides and spray during *B. grandiflora*'s dormancy when possible to minimize accidental mortality of this threatened species.

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# Recovery for the Florida Bonamia

## *Bonamia grandiflora* (A. Gray) Heller

**Recovery Objective:** DELIST the species once recovery criteria are met.

**South Florida Contribution:** STABILIZE and increase the population.

### Recovery Criteria

The South Florida Recovery objective can be achieved when: sites, within the historic range of *B. grandiflora*, are adequately protected from habitat loss, degradation, and fragmentation; when these sites are managed to maintain the seral stage of xeric oak scrub communities to support *B. grandiflora*; and when monitoring programs demonstrate that these sites support the appropriate numbers of self-sustaining populations, and those populations are stable throughout the historic range of the species. Currently, most protected *B. grandiflora* individuals are protected on the Ocala National Forest. To adequately conserve the species, protected sites are needed throughout its entire range, including South Florida.

### Species-level Recovery Actions

- S1. Determine current distribution of *B. grandiflora*.** Some portions of *B. grandiflora*'s range have been well surveyed (Ocala NF and the southern Lake Wales Ridge), yet a distribution has not been ascertained for this species. Lack of survey knowledge in much of its range makes defining distribution difficult.
- S1.1. Conduct surveys for additional populations of *B. grandiflora*.**
- S1.1.1. Survey scrub habitat in Osceola, Charlotte, Hardee, and Hendry counties.** Adequate survey work has not been performed off the Lake Wales Ridge. Sites on private property should be surveyed and we should work with landowners to protect them.
- S1.1.2. Continue surveys in Polk and Highlands counties.** The Lake Wales Ridge has probably been adequately surveyed, though new sites for *B. grandiflora* may still be found.
- S1.1.3. Continue surveys for *B. grandiflora* on protected lands.** New sites for listed species are still being found on protected lands. This survey work should be continued to catalog all existing protected sites and new sites as they are purchased.
- S1.2. Maintain distribution of known populations and suitable habitat in GIS database.** Use GIS to map existing populations and to assess the species' status and trends over

time. The database should contain information on locations, population sizes, and status. This information should also be used for project review, in land acquisition activities, and to coordinate updates with the Florida Natural Areas Inventory database. Currently, the Lake Wales Ridge Ecosystem Working Group and Archbold Biological Station are proposing to map the entire central ridge. This information would show potential habitat for scrub endemics based on their habitat needs.

- S2. Protect and enhance existing populations.** Much of the native xeric uplands on the Lake Wales Ridge and surrounding counties have been converted to agriculture or urban development. The remaining habitat is fragmented into small parcels and in many cases, isolated. For this reason, existing populations are in need of protection from a variety of threats.
- S2.1. Acquire or otherwise protect privately owned habitat through acquisition, conservation easements, or agreements with landowners.**
- S2.2. Protect populations of *B. grandiflora* on public lands.** Develop management guidelines that allow for a fire regime that includes a mosaic of successional stages.
- S2.3. Use local or regional planning to protect habitat.** Utilize available regional and county planning processes to encourage protection of suitable habitat, both unoccupied and occupied of *B. grandiflora*.
- S2.4. Continue *ex situ* conservation.** *Ex situ* collections are important for preserving genetic diversity, preventing extirpation, and determining ecological characteristics and habitat management needs of species. These collections will be instrumental in the recovery of *B. grandiflora*.
- S2.4.1. Conserve germ plasm.** The seed for this species is not presently in long-term storage.
- S2.4.2. Maintain *ex situ* collection.** Currently, the Center for Plant Conservation coordinates conservation activities and maintains a database for the National Collection. Bok Tower Gardens, as a participating institution, maintains and propagates *B. grandiflora* as part of the National Collection.
- S2.5. Enforce available protective measures.** Use local, State and Federal regulations to protect this species from overcollecting and damage from off-road vehicle use. Regulations should also be used to protect xeric vegetative communities where *B. grandiflora* lives.
- S2.5.1. Initiate section 7 consultation when applicable.** Initiate section 7 consultations when Federal activities may affect this species.
- S2.5.2. Enforce take and trade prohibitions.** This species is protected by take provisions of the ESA (including its prohibition against removing and reducing to possession any endangered plant from areas under Federal jurisdiction; maliciously damaging or destroying any such species on any such area; or removing, cutting, or digging up any such species), by the Preservation of Native Flora of Florida Act, and by the Florida rules regarding removal of plants from state lands.
- S3. Conduct research on life history characteristics of *B. grandiflora*.** Much of the basic biology and ecology of this species remains poorly understood. To effectively recover this species more specific biological information is needed.

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- S3.1.** Continue research to determine demographic information, such as numbers of sites and populations, numbers of individuals in a population, recruitment, dispersal, growth, survival, and mortality.
- S3.2.** Once demographic data are known, conduct population viability and risk assessment analysis to determine the numbers of plants, sites, subpopulations/populations, and spatial distribution needed to ensure persistence of the species.
- S3.3.** Conduct research to assess management requirements of *B. grandiflora*. Determine which natural populations can be stabilized or increased by habitat management. Surveys, research, and monitoring information will provide factors contributing to any declines at each site. Monitoring of populations should be in reference to various habitat management practices. Site-specific management guidelines should be provided to land managers and close coordination among land managers is essential to develop adaptive management techniques.
- S4. Monitor existing populations of *B. grandiflora*.**
- S4.1. Develop monitoring protocol to assess population trends for *B. grandiflora*.**
- S4.1.1. Monitor to detect changes in demographic characteristics, such as reproduction, recruitment, growth, dispersal, survival and mortality.** Also monitor for pollinators, herbivory, disease, and injury.
- S4.1.2. Monitor the effects of various land management actions on *B. grandiflora*.** Assess any changes in demographic characteristics of *B. grandiflora* in response to land management activities, such as prescribed fire, exotic plant control, *etc.*
- S4.2. Develop a quantitative description of the population structure of *B. grandiflora*.** This description will provide a baseline for monitoring population dynamics in response to natural environmental changes and management treatments. Data recorded should include morphology, survivorship, mortality, and reproduction for individual plants. Data about each plant's microsite (vegetation cover, litter depth, substrate, and closest neighbors) should also be included.
- S5. Provide public information about *B. grandiflora*.** It is important for the recovery of this species that governmental agencies, conservation organizations such as the Florida Native Plant Society, and private landowners be appropriately informed about this species. Public outreach efforts must also continue to address the increasing concern that horticultural demand for this and other rare species may not benefit conservation of threatened and endangered species. Public education should identify that commercial production and horticultural uses of endangered species provide little benefit to species, since the recovery of *B. grandiflora* and other rare species requires a self-sustaining, secure, number of natural populations.

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### Habitat-level Recovery Actions

- H1. Prevent degradation of existing habitat.** Extensive habitat loss, degradation, and fragmentation have already occurred throughout the range of this species. Both development and fire suppression have decreased the available habitat. To date, there are five protected sites for *B. grandiflora* in Polk and Highlands counties; however there are no protected sites in Charlotte, Hendry, Hardee, or Osceola counties.

- H1.1. Secure habitat through acquisition, landowner agreements, and conservation easements.** With so little xeric scrub habitat left, any method of securing protected populations should be sought.
- H1.2. Manage and enhance habitat.** Manage habitat to maintain *B. grandiflora* populations by preventing damage from off-road vehicle use, and from over collection, and by providing proper management of habitat including prescribed fire.
- H1.2.1. Conduct prescribed burns.** Fire is a necessary and integral characteristic of the scrub community. A variable interval in fire return and in season is important to mimic the natural fire regime. In addition, spatial variation in fire intensity and unburned patches is necessary to construct a natural fire landscape. The scrub is naturally made up of islands of suitable and unsuitable habitat. To repeat this landscape pattern, sites should be burned as a mosaic when possible to allow for variation.
- H1.2.2. Control and eliminate exotic and invasive plants and animals.** Exotic plant and animal species are not yet a major threat in Florida scrub as compared to other communities in South Florida. However, in isolated areas, exotic species are becoming established. Without control, exotic/invasive plants may become a threat to the survival and recovery of *B. grandiflora*.
- H1.2.3. Control access to areas where listed plants are growing.** Collection, trampling, and off-road vehicles can severely threaten individual populations.
- H2. Restore areas to suitable habitat.** Native habitats that have been disturbed or that have experienced a long history of fire suppression may be good candidates for future reserves.
- H2.1. Restore natural fire regime.** Long periods without fire can change the species composition and the ability of the site to carry fire. Rehabilitation of a site may be a lengthy process, but with fewer and fewer sites remaining, these sites may become more valuable for future recovery. On these sites a seed bank may exist that could include rare endemic species.
- H2.2. Enhance sites with native plant species.** Because of logging or long periods without fire, certain native plant species that were present historically may now be absent from the natural composition of the community. These species can be reintroduced if natural colonization is not possible.
- H3. Conduct habitat-level research projects.** Study the response of *B. grandiflora* to various land management practices, such as prescribed fire regimes, vegetative thinning, and control of exotic/invasive vegetation.
- H4. Monitor habitat/ecological processes.** Monitor the effects of land management actions, such as prescribed fire, exotic plant control, *etc.*, on the habitats where *B. grandiflora* occurs.
- H5. Provide public information about scrub and its unique biota.** Educational efforts, especially those conducted by Archbold Biological Station, have been successful. Without these successful efforts, the Lake Wales Ridge NWR would not have been created. Florida's system of biological preserves depends on a broad base of public understanding and support for its funding and future success. In addition to past and ongoing educational efforts by The

Nature Conservancy, Bok Tower Gardens, and Archbold Biological Station, future efforts by these organizations, and the Florida Park Service, the Florida Division of Forestry, the SFWMD, the Florida Native Plant Society, and local garden clubs are crucial in increasing public appreciation of scrub and high pine communities, and their associated plant species. The Arbuckle Appreciation Day sponsored by the Florida Division of Forestry has been especially successful in disseminating knowledge about these unique communities.

