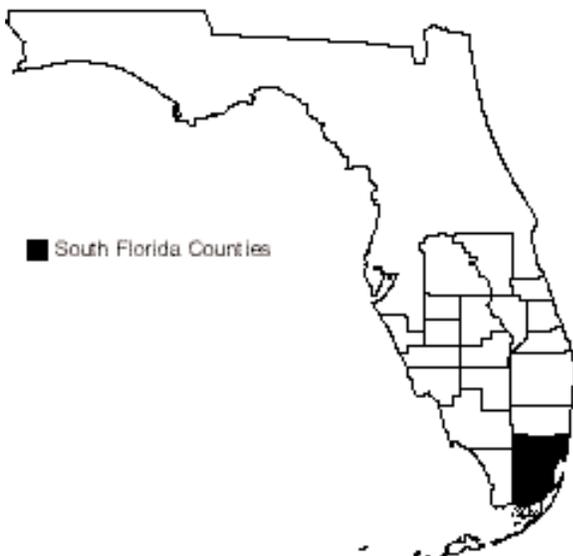

Small's Milkpea

Galactia smallii H.J. Rogers ex Herndon

Federal Status:	Endangered (July 18, 1985)
Critical Habitat:	None Designated
Florida Status:	Endangered
Recovery Plan Status:	Revision (May 18, 1999)
Geographic Coverage:	Rangewide

Table 1. County distribution of Small's milkpea.



Small's milkpea is endemic to the pine rocklands of Miami-Dade County. Throughout South Florida, most of the pine rocklands have been destroyed for residential housing, commercial construction, or agriculture. Less than 2 percent of the original pine rockland habitat of the Small's milkpea remains and most of that habitat occurs in small, isolated stands that are difficult to protect or manage. Continued habitat loss and fragmentation, fire suppression, and invasion by exotic plant species threaten the existence of Small's milkpea.

This account represents a revision of the existing recovery plan for the Small's milkpea (FWS 1988).

Description

Galactia smallii is a small, trifoliolate, perennial legume with small, purple flowers and a prostrate habit. The stems are grayish, due to a covering of short hairs, and grow up to 2 m long. The stem internodes are well-developed and have long, straight, soft hairs. The 1 to 2.2 cm long leaflets are broadly ovate to elliptic. The undersides of the leaves have long, soft, wavy hairs lying almost flat against the surface. The upper surface of the leaves are either hairless (glabrate) or have sparse, stiff hairs, lying flat on the surface (strigose). The inflorescences are 2 to 6 cm long with one to five flowers at the apex or along the axis. The flower buds are 5 to 7 mm long, and the calyx is about 7 mm long and loosely strigulose. The corolla is 11 to 12 mm long and pinkish purple or lavender. The legume is 3 to 4 cm by about 4 m in size and is strigulose or villosulous (Isley 1990).

There are five species of *Galactia* that occur in Miami-Dade County; four of these occur in pine rocklands (O'Brien and Koptur 1995). *Galactia smallii*, *G. pinetorum*, and *G. floridana* each have large flowers and a prostrate habit. *Galactia parvifolia* is a single, small-flowered species. *Galactia smallii* has been confused with *G. pinetorum* because the key characters given by Small (1903) to distinguish the two taxa were unstable. The two species are

distinct, however, and can be separated by the nature of the pubescence on the stems (Herndon 1981). The pubescence on the stems of *Galactia smallii* is ascending or spreading-sericeous, while *G. pinetorum* is strigose, retrorse-appressed, and thin. The third large flowered milkpea, *G. floridana* has some intergrading with *G. smallii*, but Herndon (1981) feels their appearance in the field is strikingly distinct. *Galactia floridana* has conspicuously sericeous pubescence covering the stem and leaves, but the pubescence of *G. smallii* leaves is not apparent without close inspection (Herndon 1981).

Taxonomy

Small's milkpea was originally described as *G. prostrata* by Small in 1933. However, H.J. Rogers (unpublished dissertation, Duke University, 1949) discovered that this name is a homonym, unavailable for use, and suggested *G. smallii*. Since Rogers' proposal was never published, the incorrect name persisted. Herndon (1981) published Rogers' finding and proposed the name change to *G. smallii*.

Distribution

Galactia smallii occurs in the Redland pine rocklands of southern Miami-Dade County, Florida (O'Brien and Koptur 1995) (Figure 1). Its distribution is spotty because of the limited habitat available. The type locality is listed as near Silver Palm, Miami-Dade County, in an area now encompassed by Redland pine rocklands.

Habitat

Preliminary results of a study of the abundance, distribution, and habitat preferences of *Galactia* species in Miami-Dade County pine rocklands indicate that *G. smallii* prefers higher elevations and lower shrub cover than the more common *Galactia* species (O'Brien 1994). The distribution of *G. smallii* is correlated with soil depth and color in Redland pine rocklands. It does not occur in sites with a high amount of exotic plant cover, specifically, *Schinus terebinthifolius* and *Neyraudia reynaudiana* (O'Brien and Koptur 1995).

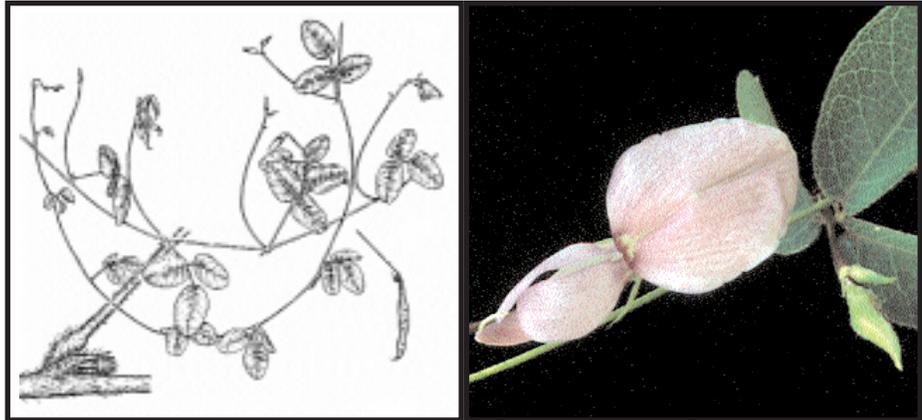
Reproduction

Small's milkpea is a perennial legume that usually flowers during the summer months. However, numerous flowers may occur following a burn at anytime throughout the year (Small 1933, and Long and Lakela 1971). Fire may synchronize and intensify flowering of plants in the burned area (A. Herndon, personal communication 1998). Its pollinators include three species of bees, one species of wasp, and the Cassius blue butterfly (*Leptotes cassius theonus*).

Relationship to Other Species

The pine rockland habitat where the Small's milkpea occurs is characterized by a canopy of slash pine (*Pinus elliottii* var. *densa*) and a shrub canopy of saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), poisonwood

Small's milkpea flower.
Original photograph by Steve Shirah.



(*Metopium toxiferum*), and willow bastic (*Sideroxylon salicifolium*). Common herbaceous associates include *Schizachyrium sanguineum* var. *sanguineum*, *Schizachyrium gracile*, *Aster adnatus*, and *Acalypha chamaedrifolia*.

Status and Trends

Small's milkpea was listed as endangered because of the loss of pine rockland habitat to residential and commercial development (50 FR 29349). At the time of its listing, Small's milkpea was only known at two sites near Homestead in Miami-Dade County. A 1994 survey found Small's milkpea at seven additional sites on public land: Seminole Wayside, Navy Wells, Sunny Palms, Pine Island, Ned Glenn, Goulds, and the HRS site in Florida City/Miami-Dade County Park and Recreation Department is actively managing five of the six publicly owned sites.

Small's milkpea was also found in small numbers on privately owned pine rockland fragments. The privately owned sites are not managed, have become overgrown, and have high densities of exotic plants that threaten Small's milkpea on these sites (J. O'Brien, Florida International University, personal communication 1996). *Galactia smallii* is not known to occur on Long Pine Key in Everglades National Park (Herndon 1998).

By 1984, about 98 to 99 percent of Miami-Dade County's pine rocklands had been destroyed; that destruction continues today. Most of the remaining pine rocklands in this county are small fragments that are difficult to manage because of their size and proximity to residential housing. In addition, fire suppression and invasion by exotic plants also threaten the survival of Small's milkpea.

Management

The pine rocklands of Miami-Dade County have evolved and adapted to frequent fires (Snyder *et al.* 1990). After two to three decades of fire suppression, pine rocklands mature into tropical hammocks, which have only a few pines in the canopy (Snyder *et al.* 1990). Therefore, any management of pine rocklands to maintain the structure and composition of this vegetative community requires fire.

A fundamental question concerning the fire ecology of pine rocklands is how frequently they should burn and at what season of the year. Snyder *et al.* (1990) inferred historic burn regimes by looking at the time it takes for the herbaceous layer to be excluded from an area by shading (maximum time between fire) and the point when enough fuel is available to carry a fire (minimum time between fires). The minimum fire regime they found was 2 to 3 years and the maximum was 15 years. This wide range in fire frequencies would result in different forest structures and dynamics.

Based on this information, prescribed burns should be conducted in a mosaic pattern to manage pine rocklands. Presently the recommended burn regime is 3 to 7 years with summer fires generally preferred to winter. Summer fires are preferred since most of the lightning strikes (the historical cause of fires) occur in the summer months. In areas where fires have been suppressed for many years, the reintroduction of fire may have to be done in step-wise fashion. In some areas it may even include manual removal of some fuel to prevent a very hot fire.

Any prescribed fire management should include a monitoring program to determine the effectiveness of the prescription. Monitoring should include the species distribution (presence/absence), quantitative assessment of abundance or condition, and demographic information on individual plants (Menges and Gordon 1996). There should also be a component to the monitoring that captures the health of the community and species that occur in association with Small's milkpea (C. Kernan, Fairchild Tropical Garden, personal communication 1996).

Invasive exotic species, especially *Schinus terebinthifolius*, and *Neyraudia reynaudiana*, threaten Small's milkpea and other rare pine rockland plants. The control of exotic species in the pine rocklands is a very important part of maintaining the habitat, although it can be very costly, once exotics are established in an area. In most cases the control of exotics includes the use of manual labor, herbicides and prescribed fire. In heavily infested areas removal is very labor intensive, with a field crew pulling the plants by hand or cutting. Prescribed fire and herbicide treatments are then used to control the exotic plants. Once an area is cleared of exotics, proper management can reduce the costs of control and maintain the site relatively exotic free.

Management of pine rocklands in Miami-Dade County is problematic because most of the remaining habitat occurs in small fragmented areas surrounded by residential areas. These residential areas are often a source of exotic plant species that invade the pine rocklands. The small size of the pine rocklands make it easier for these exotics to invade. Controlling these invasive exotics will require an active strategy that should include a multi-lingual outreach program, which stresses the importance of invasive exotic control in areas surrounding pine rockland habitat. The pine rocklands in Everglades NP are managed by Park personnel for the benefit of the protected species. Exotic species control and fire management are ongoing planned activities in the Park's habitat management program.

Small's milkpea is easy to propagate. An *ex situ* population is maintained by the Center for Plant Conservation and Fairchild Tropical Garden in Miami

and may be used to augment existing populations. Results of research by O'Brien and Koptur (1995) may provide useful information for choosing appropriate sites for possible reintroduction. Since the historic range of this species is poorly understood, it would be wise to delay introductions and reintroductions until more genetic information is available and a clear plan is devised. Fairchild Tropical Garden maintains an *ex situ* conservation collection of *G. smallii* at the Research Center. This collection needs to be expanded in order to build a genetically representative conservation collection. Fairchild Tropical Garden has identified propagation and cultivation methods. (D. Garvue, Fairchild Tropical Garden, personal communication, 1998.)

Literature Cited

- Garvue, D., C. Kernan, and J. Kornegay. 1998. Comments on technical/agency draft multi-species recovery plan for South Florida. September 30. 1998.
- Herndon, A. 1981. *Galactia smallii*: A new name for *Galactia prostrata* Small. *Rhodora* 83:471-472.
- Herndon, A. 1998. Comments on technical/agency draft multi-species recovery plan for South Florida. September 30. 1998.
- Herndon, A. 1998. Life history studies of plants endemic to Southern Florida, October 1, 1995 to April 30, 1998. Final report to the National Park Service under Cooperative Agreement No. CA5280-5-9019.
- Isley, D. 1990. Vascular flora of the southeastern United States, vol. 3, part 2, Leguminosae (Fabaceae). University of North Carolina Press; Chapel Hill, North Carolina.
- Kernan, C. 1996. Visit to Fairchild Tropical Garden research center. December 12, 1996.
- Long, R.W. and O. Lakela. 1971. A flora of Tropical Florida. University of Miami Press; Miami, Florida.
- Menges, E.S., and Gordon, D.R. 1996. Three levels of monitoring intensity for rare plant species. *Natural Areas Journal*. 16:227-237.
- O'Brien, J.J. 1994. Research on South Florida *Galactia* (Fabaceae). *Plant Conservation* 8(1).
- O'Brien, J.J., and S. Koptur. 1995. The ecology of rare and common *Galactia* species (Fabaceae) native to South Florida pine rocklands [abstract]. In: 1995 annual meeting of the Botanical Society of America and the American Institute of Biological Sciences, San Diego, California, USA, 6-10 August 1995. *American Journal of Botany* 82:6.
- O'Brien, J.J. 1996. Telephone communication. 5 December 1996.
- Snyder, J.R., A. Herndon, and W.B. Robertson, Jr. 1990. South Florida rockland. Pages 230-274 in R.L. Myers and J.J. Ewel, eds. *Ecosystems of Florida*. University of Central Florida Press; Orlando, Florida.
- Small, J.K. 1933. *Manual of the southeastern flora*. University of North Carolina Press; Chapel Hill, North Carolina.
- Small, J.K. 1903. *Flora of the southeastern United States*. Published by the author; New York, New York.
- Snyder, J.R. 1986. The impact of wet season and dry season prescribed fires on Miami rock ridge pineland, Everglades National Park. Unpublished report (SFRC-86/06) prepared for the National Park Service, South Florida Research Center; Homestead, Florida.
- U.S. Fish and Wildlife Service [FWS]. 1988. Recovery plan for five Florida pine rockland plant species. U.S. Fish and Wildlife Service; Atlanta, Georgia.

Recovery for the Small's Milkpea

Galactia smallii

Recovery Objective: PREVENT EXTINCTION, then stabilize.

Recovery Criteria

Galactia smallii will, most likely, never reach a level at which reclassification could be possible. The objective of this recovery plan is to increase existing populations and prevent extinction. *Galactia smallii* may be considered stabilized when existing populations, within the historic range, are adequately protected from further habitat loss, degradation, exotic plant invasion, and fire suppression. These sites must also be managed to maintain pine rocklands to support *G. smallii*. Monitoring programs should demonstrate that populations of *G. smallii* on these sites support sufficient population sizes, are distributed throughout the historic range, and are sexually or vegetatively reproducing at sufficient rates to maintain the population.

This recovery objective is an interim goal because of the limited data on the biology, ecology, and management needs of this species. The recovery objective will be reassessed annually based on new research, management, and monitoring information. Reclassification criteria may be developed if new information identifies ways of re-establishing populations of this species to expand its distribution within its historic range.

Species-level Recovery Actions

- S1. Conduct surveys to determine distribution of pine rockland plants.** Pine rockland plants have been thoroughly surveyed in Miami-Dade County. However, other populations may be noted during acquisition and restoration program implementation. Fire may eliminate litter concealing listed species, or enable seeds in the seed bank to germinate. For that reason, pine rocklands that did not contain listed species when unmanaged should be resurveyed after fire events.
- S1.1. Inventory known populations.** Conduct thorough ground surveys to determine the distribution of *G. smallii*. Collect and archive herbarium voucher specimens for all populations. Initiate a quarterly monitoring program. Use existing standardized monitoring protocols developed by the Florida Natural Areas Inventory to record baseline data regarding the biology and ecology of *G. smallii*.
- S1.2. Search for additional populations of *G. smallii*.** Resurvey historic locations. Conduct thorough ground surveys to locate unrecorded individuals and populations of *G. smallii*.
- S1.3. Map distribution of known populations and suitable habitat.** Map populations, including obtaining GPS coordinates and developing GIS coverages.

- S2. Protect and enhance existing populations.** It is imperative for the recovery of pine rockland plants that populations not be lost.
- S2.1. Augment natural populations of *G. smallii*, where appropriate.** Many pine rockland plant species are in a precarious situation. *Ex situ* collections exist for *Galactia* spp. at Fairchild Tropical Garden. If possible, additional collections should be established. These may be used to cultivate pine rockland plants and augment sparse populations in protected areas. Experiments with reintroductions will be useful in the future, and could be essential for the recovery of pine rockland plant species.
- S2.2. Continue work with *ex situ* propagation and seed banks.** Seeds should continue to be banked for all the listed species possible, and should be identified precisely as to collection location.
- S2.2.1. Conserve germplasm.** Fairchild Tropical Garden maintains an *ex situ* conservation collection of *G. smallii* at its Research Center. This collection needs to be expanded in order to capture the genetic variation found in the wild. Fairchild Tropical Garden has identified propagation and cultivation methods. Continue work with *ex situ* propagation and seed storage banks. Identify seed storage potential and methods.
- S2.2.2. Study the feasibility of translocating propagules into historically appropriate and protected natural habitats.**
- S2.3. Identify potential reintroduction sites and reintroduce *G. smallii* plants, where appropriate.** Sites identified as suitable for reintroduction within the known historic range of each species should be surveyed and prepared to receive plants. Federal lands under proper management regimes may be good recipient sites. These sites should receive reintroduction stock.
- S2.3.1. Use reintroduction protocols established by the conservation community.**
- S2.3.2. Monitor the experimental outplantings.** Monitoring of reintroduced plants is essential for assessing the success of recovery efforts. Growth and survivorship should be measured.
- S2.4. Enforce available protective legislation.** State, Federal, and local regulations should be used to protect the pine rockland ecosystem and the listed plants.
- S2.4.1. Initiate section 7 consultation when applicable.** Section 7 of the Endangered Species Act applies to Federal activities which might impact listed species.
- S2.4.2. Encourage implementation of management plans.** Federal agencies are obligated under section 7(a)(1) of the Endangered Species Act to perform positive conservation programs for the benefit of listed species. Implementation of the Richmond Pine Rocklands Management Plan (DERM 1994) would constitute such a positive conservation program and should be implemented by the U.S. Army Reserve Center in Perrine, the U.S. Coast Guard site, the Department of Correction's Miami Correctional Center, and any other Federal agency property owner in this area.
- S2.4.3. Continue to enforce take and trade prohibitions.** The take and trade restrictions of the Federal Endangered Species Act and the Preservation

of Native Flora of Florida Act protect *G. smallii*. Since these are inconspicuous plants, take and trade are nonexistent or uncommon.

- S3. Conduct research on the biology of *G. smallii*.** Additional information on the ecology and life history of pine rockland plants needs to be collected. Determine size and viability of all populations. Known populations of the listed pine rockland plants should be evaluated. Population viability needs to be investigated and determined for each listed plant species.
- S3.1. Study the reproductive biology of *G. smallii*.**
 - S3.2. Study the response of *G. smallii* to habitat management treatments.**
 - S3.3. Study the fire ecology of *G. smallii*.**
 - S3.4. Determine population size and viability of all populations.**
 - S3.5. Characterize the habitat and identify suitable sites for experimental outplantings.**
 - S3.6. Conduct genetic studies to document the genetic variation within and between populations.**
 - S3.7. Apply and modify, if need be, reintroduction protocols established by the conservation community.**
- S4. Develop standardized monitoring.** Standardized monitoring needs to be developed for listed pine rockland species in order to determine the effect of management actions on these species. Use existing standardized monitoring protocols developed by the Florida Natural Areas Inventory to record baseline data regarding the biology and ecology of *G. smallii*. Initiate quarterly monitoring program.
- S4.1. Collect existing and historical data and place in a central location.** Contact former researchers for historical data, gather information from herbaria and museums, and contact all present researchers to compile data and place in a GIS database in the FWS's South Florida Ecosystem Office. This location will allow all researchers access to both historic and current data, and provide the FWS with a means to monitor the success of recovery tasks.
 - S4.2. Convene a meeting of researchers and land managers.** A meeting of current pine rockland researchers and land managers would enable the FWS to locate information sources and begin the process of compiling those data. The meeting would also afford cooperators an opportunity to discuss monitoring and management procedures and set realistic species level goals.
 - S4.3. Monitor status and success of all populations; change management practices if so indicated.** Because of the varying vegetation conditions and fire histories, different management may be required at different pine rockland sites. Different prescribed burn intervals may be necessary for best results. Intervals should be adjusted over the years to promote pine re-establishment and hardwood reduction.
 - S4.4. Monitor reintroduction success and modify procedures as necessary.** Plant reintroductions should be monitored to determine the success of the procedure. The goal of reintroduction should be to establish a viable population. Management of the reintroduction sites should be modified as necessary to improve results.
- S5. Continue to provide public information about pine rocklands and their unique flora.** Public support will increase the chances of recovery for these species. Informational and educational

materials have been produced. DERM and Miami-Dade County Natural Areas Management have developed flyers, displays, newsletters, and press releases, and have held workshops with the general public. Organizations best able to carry out information and education programs include: Miami-Dade County Parks and Recreation Department, the Florida Native Plant Society, Everglades NP, and Miami-Dade County DERM. Support of local press coverage should continue. DERM has developed a web page that will also aid in disseminating information about this endangered plant community to the public.

Habitat-level Recovery Actions

- H1. Continue to protect and prevent degradation of pine rockland plant habitat.** The decline of the five listed pine rockland plants is due to the almost complete elimination or alteration of pine rocklands in South Florida. Without protection and proper management, the remaining rockland sites will be developed or will deteriorate.
- H1.1. Protect pine rockland habitat.** Acquisition of remaining private sites may be the only effective way to protect or conserve pine rockland habitat. Miami-Dade County's Environmentally Endangered Lands program and the State of Florida's CARL program have acquired over 450 acres of pine rocklands since 1990. It should be noted that public lands may still be subject to development for recreational, maintenance, or other purposes. Such disturbances, unless carefully planned, may directly destroy pine rockland and may secondarily result in exotic plant infestations as well as destructive human uses.
- H1.2. Protect or acquire privately owned sites.** Less-than-fee-simple acquisition should be used, where appropriate, as an alternative means of protecting pine rockland habitat. Covenants, as provided for under Miami-Dade County regulations, provide tax incentives for private landowners to protect pine rockland sites. A site owned by Florida Power and Light Company may be maintained through cooperation with that utility. This avenue of protection should also be pursued with the railroad company that owns the site of one of the three largest populations. Miami-Dade County DERM is developing a private lands management and grant program for pine rockland protection and restoration; this program should be implemented as soon as possible.
- H1.3. Implement additional management to meet habitat needs.**
- H1.3.1. Eliminate human-caused degradation.** Preventing trash dumping or other destructive human activities in pine rocklands is important. In order to accomplish this task, fencing and access restrictions may be necessary.
- H1.3.2. Control invasive plant species, particularly exotics.** Burma reed or persistent hardwoods need to be controlled and may require special techniques including herbicide, fire, mechanical, and hand clearing at most sites. Other management needs indicated by ongoing research should also be implemented.
- H2. Restore areas to suitable habitat.**
- H2.1. Eliminate physical degradation of habitat and restore to optimal conditions.** Physical degradation of pine rocklands continues to occur. Hurricane Andrew in 1992 killed most of the adult pines in the Richmond tract and at various sites throughout Miami-Dade County. The adult pines on Long Pine Key in Everglades NP were not as severely damaged (Herndon, 1980). The continued degradation of these areas should

be curtailed and restoration of uneven-aged pine stands undertaken. Tubelings or direct seeding experiments may be used to accomplish this task. In order to use direct seeding techniques, collection of local pine seeds must continue.

- H2.2. Continue to refine best management practices for pine rocklands.** This would include development of fire management strategies that would best benefit pine rockland species.
- H2.3. Management plans for sites including *Gsmallii* should be implemented and modified as necessary for the benefit of this species.** Without active fire and exotic plant management, pine rocklands will continue to disappear or degrade. Because of the highly fragmented and restricted nature of remaining pine rocklands in urbanized Miami-Dade County, intensive management may be necessary at many of the remaining sites.
- H2.4. Continue to conduct prescribed burns.** Prescribed fire should be conducted at sites where *G. smallii* occurs at the appropriate times of the year to lower fuel loads. Growing season burns should then be employed after fuel levels are under control. The response of *G. smallii* to prescribed burns should be studied. Special consideration must be incorporated when planning prescribed fire for pine rocklands invaded by Burma reed. Incorporate appropriate actions to minimize additional Burma reed infestations in these areas. Due to the highly urbanized lands surrounding some of the pine rockland sites, burning involves risks of smoke damage and annoyance, or worse, losing control of the fire. The Florida Division of Forestry has expertise in carrying out controlled burns in Miami-Dade County, and should be contacted to assist with burns. Fire management is necessary for all Federal and county lands. Miami-Dade County is composing a Strategic Fire Management Plan; this plan should be implemented once approved.
- H3. Continue to investigate and refine the habitat needs of each species.** The habitat needs of these species have been studied, but are still not completely understood. The pollination, germination, or other requirements have not been fully investigated. Research should address how light levels affect survival and how fire management affects light levels, reproduction, and regeneration of these species.
- H4. Monitor habitat and ecological processes.**
- H4.1. Monitor sites with *G. smallii* restoration programs to determine success.** A protocol developed by Fairchild Tropical Garden for monitoring plant communities at sites where *G. smallii* occurs should be implemented.
- H4.2. Investigate fire history and incorporate into management strategies.** Look at fire history for pine rocklands in Miami-Dade County, incorporate into GIS database and analyze relative to healthy populations. This exercise will provide adequate information on fire history and intervals in urbanized and non-urbanized settings and enable assessment of the appropriateness of proposed management regimes in Miami-Dade County.
- H4.3. Develop a GIS database on the five listed pine rockland species and their habitats.** Distribute the database to researchers, land managers, and conservationists.
- H4.3.1. Assess the available GIS data.**

H4.3.2. Create coverage of population locations.

H4.3.3. Acquire recent imageries of the sites.

H4.3.4. Distribute the coverages.

H5. Continue implementation of the fire education program and modify as necessary any fire management education program that has been developed. Future modifications to this program may include tri-lingual language (Spanish, English, and Haitian Creole).