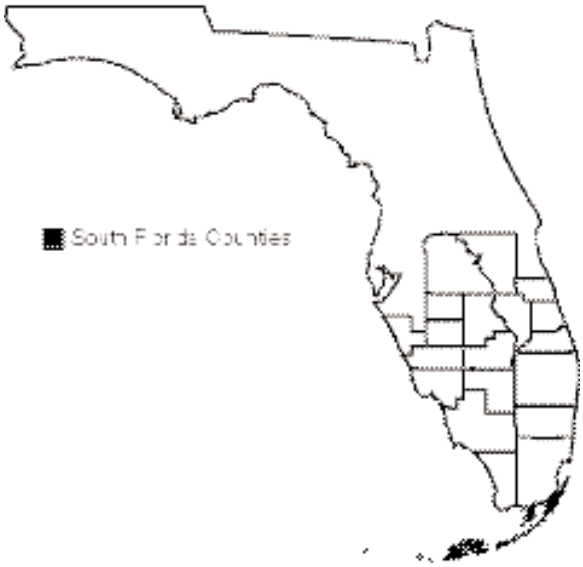
Key Tree-cactus

Pilosocereus robinii (Lemaire) L. Benson

Federal Status:	**Endangered (July 19, 1984)**
Critical Habitat:	**None Designated**
Florida Status:	**Endangered**
Recovery Plan Status:	**Revision (May 18, 1999)**
Geographic Coverage:	**Rangewide**

Figure 1. Florida distribution of the Key tree-cactus; within the U. S. this species is found only in the Florida Keys.



Pilosocereus robinii is a large, tree-like cactus known in the U.S. only from the Florida Keys. The Key tree-cactus produces large white flowers and a purplish-red fruit. It is a member of the rare and declining tropical hammock communities on Upper and Lower Matecumbe, and Long and Big Pine keys. Populations formerly found on Key West and Windley and Boca Chica keys are believed to be extirpated. As early as 1917, this cactus was on the edge of being extinct as a result of habitat destruction. The Key tree-cactus was listed as endangered because of severe population declines caused by destruction of its habitat for commercial and residential development.

This account represents a revision of the existing recovery plan for the Key tree-cactus (FWS 1986).

Description

The Key tree-cactus is a large, tree-like cactus with erect columnar stems, reaching 10 m in height. At maturity, the plants are either much-branched (in variation *robinii*), or remaining few-branched (in variation *deeringii*). The stems of the tree-cactus are cylindrical, green, succulent, and 5 to 10 cm thick, with nine to 15 prominent ribs. Areoles bear 15 to 30 acicular spines that are up to 2 cm long and are thickly pubescent when young. Flowers are solitary in the upper areoles, nocturnal, and 5 to 6 cm long. The outer perianth segments of the flowers are green, with tips pointed (in variation *robinii*) or rounded (in variation *deeringii*). The inner perianth segments of the flowers are white. The style is slightly exserted (in variation *robinii*) or included (in variation *deeringii*). The fruit of the Key tree-cactus is globose, depressed, and 3.5 to 4.0 cm in diameter. The coat of this fruit is thin, leathery, bright red, and splits open at maturity. The seeds are small, hard, shiny black, and set in a soft, white pulp (Benson 1982, Britton and Rose 1937, Small 1931).

Taxonomy

Torrey and Gray first referred to the species in 1838 as *Cereus peruvianus* (L.) Miller. Chapman later referred to a tree-cactus species occurring in Key West as *Cereus monoclonos* D.C. Lemaire (Chapman 1860). Lemaire (1864) referred to a tree-cactus he considered endemic to the northwestern coast of Cuba as *Pilocereus robinii*. The species was later described as two separate species in *Cephalocereus*. *Cephalocereus keyensis* Britton and Rose was described from plants collected in Key West (Britton and Rose 1909). *Cephalocereus deeringii* Small was described from plants found growing on Lower Matecumbe Key (Small 1917). In 1957, Leon and Alain retained the genus *Pilocereus* for this species and treated it as endemic to Cuba. The genus *Pilocereus* was rejected on nomenclatural grounds by Byles and Rowley (1957) who proposed *Pilosocereus* as a replacement. This change was taken up by Liogier (1969).

More recently, Benson (1969), citing the uncertainties of genetic boundaries within the ceroid cacti, transferred the species into an inclusive *Cereus*. Benson identified *Cephalocereus keyensis* with *Cereus robinii* var. *robinii* and treated *Cephalocereus deeringii* as a distinct subspecies, *Cereus robinii* var. *deeringii* (Benson 1969). This treatment was confused by Long and Lakela (1971) who equated *Cephalocereus keyensis* with *Cereus robinii* var. *deeringii* and *Cephalocereus deeringii* with *Cereus robinii* var. *robinii*. Benson (1982) has since published a book covering the species, in which he maintains his original treatment. D.F. Austin (1984) has published some observations on the species in which he questions the distinctiveness of the two varieties.

The genus *Pilosocereus* was reinstated by Kartesz and Gandhi (1991), who transferred *Cereus robinii* (Lemaire) L. Benson var. *deeringii* (Small) L. Benson to *Pilosocereus robinii* (Lemaire) Byles and Rowley var. *deeringii* (Small) Kartesz and Gandhi.

Distribution

The Key tree-cactus is found in the coastal hammocks of the Florida Keys (Avery 1982,Benson 1982, Britton and Rose 1937, Small 1917, 1921) (Figure 1), and in the coastal thickets of the Matanzas and Habana provinces of Cuba (Benson 1982, Britton and Rose 1937). The historical distribution of this species in the Florida Keys—which included populations that are now extinct on Key West, Boca Chica, and Windley Keys—has been substantially diminished by the destruction of populations occurring in the Lower Keys, particularly Key West (Avery 1982, Britton and Rose 1937, Small 1917, 1921). Key tree-cactus populations presently occur on Upper Matecumbe Key (two populations), Lower Matecumbe Key (one population), Long Key (three populations), and Big Pine Key (two populations) (Adams and Lima 1994).

Habitat

The Key tree-cactus grows in a narrow range of plant associations which include tropical hardwood hammocks and a thorn-scrub association known locally as a "cactus hammock." Hardwood hammocks inhabited by the species are typically in an early stage of succession following disturbance (Avery [no

Key tree-cactus.
Original photograph by Kalani Cairns.

date], Small 1917, 1921). Dominant tree species include *Bumelia salicifolia, Bursera simaruba, Coccoloba diversifolia, Ficus aurea, Krugiodendron ferreum, Metopium toxiferum*, and *Piscidia piscipula*. The lower story of the canopy typically contains small trees of the dominant species and plants of *Amyris elemifera, Ateramnus lucidus, Bumelia celastrina, Capparis flexuosa, Eugenia foetida, Guapira discolor, Pithecellobium guadelupense, Randia aculeata*, and *Zanthoxylum fagara* (Austin 1980, Weiner 1979). These hardwood hammocks are upland communities which are flooded only rarely (during major storms) and are mesic in character (Weiner 1979).

The thorn-scrub, "cactus hammock" association occurs at relatively low elevations in the Keys and is prone to more frequent flooding. Consequently, the canopy of this vegetative community is lower and more open than

hardwood hammocks. *Conocarpus erectus* and *Ximenia americana* are the most typical dominant tree species (Weiner 1979). *Cereus gracilis, Cereus pentagonus*, and *Opuntia dillenii* are common associates of the Key tree-cactus in these habitats. The Key tree-cactus is found on high sites within cactus hammocks that are rarely flooded. These sites support the hardwood hammock species listed above, but rarely are extensive enough to allow the development of hardwood hammocks.

The hardwood hammocks and cactus hammocks in which Key tree-cactus is presently known to grow are all developed on coral rock. Key tree-cactus grows well on well-drained upland sites with little or no soil development. Mineral soil is represented, if at all, by a very thin (<1 cm) layer of rock rubble, calcareous sands or calcareous marl (Austin 1980). A layer of leaf litter 1 to 2 cm thick is typically present (Austin 1980). Deeper accumulations of soil may be found in pockets and crevices in the rock. These soils are classified as Histosols (Soil Conservation Service 1975) and are placed in the "catch-all" rockland groups (Jones 1948). No detailed work has been done on soil types in the Keys due to their small area, agricultural insignificance, and the lack of well-developed soils. Hammocks on Key West and Boca Chica Key, where Key tree-cactus grew in the past, were located on oolitic limestone. Soil conditions at these sites were not recorded, but were probably similar to those listed above.

The Key tree-cactus grows in small, isolated patches or clumps. The patches may consist of a single plant, or a group of plants may cover an area of tens of square meters (Austin 1980, Small 1917). When many plants are found in a clump, most, if not all, of the separate stems represent vegetative offshoots of one or a few founders.

Reproduction

Long-distance dispersal and establishment of new Key tree-cactus populations is dependent upon the production of seedlings. However, reproduction within a single population (a clump) is mostly, if not entirely, vegetative (Adams and Lima 1994). Vegetative reproduction is commonly observed as a result of old stems being knocked to the ground. This reproductive strategy (formation of clonal clumps from rooted wind-thrown branches) also accounts, in part, for the clumped distribution of the species (Adams and Lima 1994). Pollination agents are unknown but may include sphingid moths (Adams and Lima 1994). The Key tree-cactus can set fruit in the absence of large pollinators (Hennessey and Habeck 1994).

The Key tree-cactus can flower year-round, but July, August, September, and October are peak flowering periods (Adams and Lima 1994, Hennessey and Habeck 1994). Mature flowers develop in approximately 12 to 14 days, and many flowers may occur simultaneously on a single pseudocephalium (Adams and Lima 1994). Seed dispersal, based on one observation, occurs in August (Austin 1980, Avery [no date.]). Seed dispersal by birds such as *Cardinalis cardinalis* is indicated for this species (Austin 1980). The effective dispersers would be those fruit-eating birds which favor openings in the woods.

Relationship to Other Species

Ants (*Crematogaster ashmeadii* and *Solenopsis abdita*) prey upon the fruit, pulp, and seeds of *P. robinii* (Adams and Lima 1994). The endangered Key deer (*Odocoileus virginianus clavium*) has been observed to feed on and damage Key tree-cactus. Foraging behaviors of the Key deer may be an important cause of windthrow or plant dispersal in the cactus hammock (Hennessey and Habeck 1994).

Status and Trends

The Key tree-cactus was federally listed as endangered on July 19, 1984 (49 FR 29237), because of severe population declines caused by destruction of upland areas in the Keys for commercial and residential development activities. Populations of the Key tree-cactus have most likely always been uncommon and widely scattered (Small 1917, 1921). Several populations of Key tree-cactus have been eliminated over the last 70 years by development (Austin 1980, Avery [n.d.]; Small 1921, 1924). Key West once held a large population of this species (Britton and Rose 1937, Small 1917). The last plants apparently died when the final remnants of the original forest were cleared on the island during the 1920s (Small 1921). Plants on nearby Boca Chica Key (Britton and Rose 1937) presumably shared the same fate. Populations reported for Windley and Lower Matecumbe keys (Small 1917) were presumed to have been destroyed (Avery 1982); although the population on Lower Matecumbe Key was recently rediscovered (Adams and Lima 1994). In recent years, a population of *P. robinii* on Long Key was destroyed when the hammock where it grew, just east of the town of Layton, was cleared for development.

A 1991-1993 survey throughout the Florida Keys found 624 key tree-cactus plants (3,360 stems) distributed among eight populations on four of the Keys—Upper Matecumbe, Lower Matecumbe, Long Key, and Big Pine Key. The population on Upper Matecumbe Key is seriously threatened by residential and commercial construction and there is no flowering occurring. The status on Lower Matecumbe Key is uncertain; there is no flowering occurring and the location is a private lot. The population on Big Pine Key is considered stable because it is protected and producing viable seed. Plants on Long Key that are protected may be considered stable; however, status of other plants is uncertain at this time.

Threats

The Key tree-cactus has probably always been rare in Florida. The primary cause for this rarity seems to be the rather restrictive habitat requirements of the species. It grows only on lightly shaded, upland sites. This habitat is not common on the Keys, and, furthermore, is transient in nature. The habitat preferred by Key tree-cactus occurs primarily in disturbed patches of hammock (Avery [no date], Small 1917, 1921). The location of these patches changes with time as disturbed areas re-grow and new sites are disturbed.

By far, the major threat to the continued existence of this cactus in Florida is habitat loss for the construction of commercial facilities and residential

housing on the upland areas in the Keys. This construction activity has been directly responsible for the destruction of several Key tree-cactus populations over the past seven decades (Austin 1980, Avery [no date], Britton and Rose 1937, Small 1921, 1924). An additional threat to the survival of this species is the environment it occupies; a possible catastrophic event in the Keys could further reduce its population size.

Management

The survival and recovery of the Key tree-cactus depends on protecting the remaining tropical hardwood hammock areas throughout the Keys. The original recovery plan recommended reclassification of this species to threatened when four vigorous self-sustaining populations throughout the Keys were established. Seven self-sustaining populations were needed to be established to delist the species (FWS 1986). Presently, two self-sustaining sites are in existence: one is on Big Pine Key in the cactus hammock, and the other is on Long Key. The National Audubon Society identified areas of tropical hardwood hammocks throughout the Keys for proposed acquisition by the State of Florida that are necessary to preserve the biological diversity of the hammock ecosystem. The FWS believes that protection, conservation, and management of these areas is critical to the survival and recovery of the Key tree-cactus.

Data on the autecology of the Key tree-cactus has been provided by Hennessey and Habek (1991) and Austin (1980, 1984). Hennessey and Habek (1991) conducted preliminary studies on the reproductive biology of the Key tree-cactus, while Austin (1980) provided information on the taxonomy, extant populations, herbarium specimens, and biotic associates. Additional research conducted by Adams and Lima (1993, 1994) has provided an inventory of all extant populations. Current management includes research on the reproductive biology and the establishment of an *ex situ* germ plasm. This germ plasm collection can later be used to make reintroductions and gain additional life history information.

The National Key Deer Refuge manages Key tree-cactus habitat through: (1) the control of exotic plants (primarily Brazilian pepper, *Asiatic colubrina*, and C*asuarina*) (2) law enforcement patrolling of areas to prevent collectors from illegally taking specimens, (3) the prohibition of aerial application of mosquito spraying to avoid impacts on pollinators, and (4) prohibition of human access to areas occupied by the Key tree-cactus.

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Recovery for the Key Tree-cactus

Pilosocereus robinii (Lemaire) L. Benson

Recovery Objective: RECLASSIFY to threatened.

Recovery Criteria

The Key tree-cactus has experienced local extirpations and is vulnerable to extinction as a result of habitat loss and other anthropogenic factors. Consequently, the objective is to reclassify the Key tree-cactus from endangered to threatened by protecting and managing its habitat in the Keys, restoring potential habitat, and increasing the size of its population. This objective will be achieved when: further loss, fragmentation, or degradation of suitable, occupied habitat has been prevented; when native and non-native nuisance species have been reduced by 80 percent; when all suitable, occupied habitat on priority acquisition lists is protected either through land acquisition or cooperative agreements; when potential habitat on protected lands is restored or rehabilitated for the Key tree-cactus; when stable populations of the Key tree-cactus are distributed on secure sites within its historic range (including two on Upper Matecumbe, one on Lower Matecumbe, three on Long Key and two on Big Pine Key); and when three, additional, stable populations have been established on Windley Key, Boca Chica Key, and Key West. These populations will be considered demographically stable when they exhibit sexual reproduction and have a rate of increase (r) equal to or greater than 0.0 as a 3-year running average for 6 years.

Species-level Recovery Actions

S1. **Conduct surveys to determine the distribution and status of *P. robinii*.** Known *P. robinii* populations occur in coastal hammocks on Upper Matecumbe Key, Lower Matecumbe Key, Long Key, and Big Pine Key (Adams and Lima 1994), but other populations may exist. Survey historic range and determine distribution and status of *P. robinii*. Conduct surveys on private lands first since these are most likely to be vulnerable to disturbance.

S1.1. **Inventory known populations**. Conduct thorough ground survey. Collect and archive herbarium voucher specimens for all populations. Initiate a quarterly monitoring program. Use standardized monitoring protocols to record baseline data regarding the biology of *P. robinii*.

S1.2. **Search for populations of *P. robinii*.** Resurvey historic locations. Conduct thorough ground surveys to locate unrecorded individuals and populations of *P. robinii.*

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. The remaining population sites must be protected as the first step toward recovery. These sites are currently the only ones which will offer assurance of supporting the species. Plant stocks for expansion of the population must come from the remaining specimens.

S2.1. Minimize and eliminate disturbance or mortality to *P. robinii.*

S2.2. Continue to enforce take prohibitions. The take restrictions of the ESA and the Preservation of Native Flora of Florida Act protect *P. robinii*.

S2.3. Conserve germ plasm.

S2.3.1. Center for Plant Conservation-designated sites such as Fairchild Tropical Garden maintain *ex situ* conservation collections of *P. robinii*. These collections need expansion to fully represent genetic variation in the wild. Identify seed storage potential and methods and continue to identify propagation and cultivation protocols.

S2.3.2. Study the feasibility of translocating propagules into historically appropriate and protected natural habitats.

S2.3.3. Identify potential reintroduction sites.

S2.3.4. Use reintroduction protocols established by the conservation community.

S2.3.5. Monitor the experimental outplantings. Monitoring of reintroduced plants is essential for assessing the success of recovery efforts. Growth and survivorship will be measured.

S3. Conduct research on the biology of *P. robinii.*

S3.1. Study the reproductive biology of *P. robinii*.

S3.2. Conduct genetic studies to document genetic variation within and between populations.

S3.3. Determine population size and viability of all populations.

S3.4. Study the response of *P. robinii* to habitat management treatments.

S3.5. Characterize the habitat and identify suitable sites for experimental outplantings.

S4. Monitor *P. robinii* populations. Annual monitoring is the primary means to determine whether management practices are effective and what changes are needed. Inventories should detect changes in health, abundance, distribution, and threats.

S4.1. Conduct long-term monitoring of the status of *P. robinii*. Use existing monitoring protocols to record baseline data regarding the biology and ecology of *P. robinii,* its presence/absence, range and distribution, degree of abundance, and health every year until recovered. Determine the effect of management actions on *P. robinii*.

S4.2. Monitor the status of known pollinators. Once pollinators are determined, monitor the status of their populations, distribution, and habitat. Include pollinators in the development of management strategies and reserve design.

S4.3. Collect and archive existing and historical data.

S5. **Increase public awareness and instill stewardship.** Develop informational materials and host public workshops to increase awareness about *P. robinii* and instill a sense of stewardship for the protection of this endangered species. Conduct outreach efforts on national wildlife refuge properties and the State Recreation Area, through the Monroe County school system, and through press releases to emphasize the importance of the plant community, the conservation ethic, and Federal and State regulations and laws, including penalties for collection and vandalism.

S5.1. **Prepare informational material for the general public.** Distribute materials at visitor information centers and local chambers of commerce.

S5.2. **Inform Federal and State personnel regarding the presence of *P. robinii*,** its protection under the ESA, methods to manage populations, and ways to minimize impacts.

S6. **Establish reclassification and delisting criteria.** Develop measurable reclassification criteria based on the factors that would produce a stable or increasing population, including total population size, number of subpopulations, habitat condition and availability, and level of threats. Evaluate and monitor *P. robinii*'s status in relation to reclassification criteria. Refine recovery goals. It is necessary to establish a realistic recovery objective for the species based on its biological characteristics. Recovery objectives should be re-evaluated and revised as necessary. Determine additional actions necessary to achieve the recovery objective. These actions must include legal protection, research, habitat protection, and other management strategies necessary to achieve recovery.

Habitat-level Recovery Actions

H1. **Conserve existing habitats.** The survival and recovery of *P. robinii* depends on preserving enough suitable habitat to achieve the recovery goals. The habitat of *P. robinii* must be maintained, including the plant species diversity of the hammock and the ecological integrity of the individual site. Coordinate with regulatory and land management authorities and private entities to ensure their actions will not affect the cactus or its habitat.

H1.1. **Acquire habitat.** Acquire and protect occupied habitat within historic range. Acquire the plant's suitable unoccupied sites that contain habitat associations important to *P. robinii*.

H1.1.1. **Continue Federal acquisition efforts.** Continue to acquire habitat within the National Key Deer Refuge boundaries. The Land Protection Plan for National Key Deer Refuge recommends fee title acquisition of *P. robinii* habitat within the approved refuge boundary. Acquire and incorporate private sites into the National Key Deer Refuge.

H1.1.2. **Support State acquisition efforts.** Continue to support the acquisition of state lands by programs such as Florida's Conservation and Recreation Lands (CARL) program.

H1.1.3. **Support and encourage land acquisition by non-governmental agencies.** Habitat not listed for Federal, State, or county acquisition may become available for private purchase and management by such organizations as The Nature Conservancy and Florida Keys Land Trust.

H1.2. Protect and manage *P. robinii* on private and public lands. The recovery of *P. robinii* depends on active protection and management of both occupied and unoccupied habitat on private and public lands. Protect and manage habitat through conservation agreements with landowners, exotics removal, enhancement, and selective canopy removal for light requirements. Coordinate with county and State agencies to develop and implement appropriate management practices.

H1.2.1. Prevent detrimental land-use changes within hardwood hammocks. Ensure proposed land use changes on sites supporting *P. robinii* are consistent with recovery of this species. Coordinate with Monroe County and State agencies on land-use guidelines.

H1.2.2. Prevent land clearing. Clearing of hammocks destroys existing and potential cactus habitat. Prohibit activities that injure or kill *P. robinii* or disturb occupied habitat.

H1.2.3. Prevent disturbance of surface mining. Rock mining within hardwood hammocks destroys the vegetation and may disturb the freshwater lens. Prohibit surface mining that impacts *P. robinii* and its habitat.

H1.2.4. Prevent subsurface saltwater intrusion. Fracturing of the limestone substrate by blasting or excavating channels allows salt water to enter the hammocks resulting in destruction of hammock species.

H1.2.5. Fence or barricade areas. Protect sites by fencing gates or other means to exclude potential collectors and vandals from occupied habitat. Coordinate with private landowners as well.

H1.2.6. Remove invasive exotic vegetation. Invasion of hardwood hammocks by exotic vegetation such as Brazilian pepper and Australian pine threatens the ecological integrity of the hammock ecosystem. Remove individual exotic plants.

H2. Restore areas to suitable habitat. The integrity of hardwood hammocks is important to protect existing populations and provide for future reintroduction sites. Restore and create habitat in areas occupied by *P. robinii* or in proposed reintroduction sites.

H2.1. Eliminate physical degradation of habitat and restore to optimal conditions.

H2.2. Implement management plans for sites including *P. robinii* and modify as necessary for the species.

H2.3. Continue to refine management practices for *P. robinii* and its habitat. *P. robinii* grows well in hardwood forests with an open canopy. As tropical hardwood hammocks mature, or as natural thinning occurs, the suitability for *P. robinii* is altered. Enhance suitable habitat by creating an open canopy. Investigate other habitat management practices that may benefit *P. robinii*.

H3. Conduct research on habitat-level ecological processes. *P. robinii* grows in lightly shaded, well-drained sites and often occurs in disturbed patches of hammock. Investigate the relationship of *P. robinnii* to its habitat.

H3.1. Assess important characteristics of *P. robinii* habitat. Major requirements for successful growth of *P. robinii* include an open canopy and freedom from frequent floods or frequent fires.

H3.2. Develop a GIS database on *P. robinii* and its habitats. Distribute the database to researchers, land managers, and conservationists. Estimate canopy cover and shadiness. Correlate growth forms with plant-specific conditions and recent fire and hurricane history. Determine what constitutes optimal canopy cover.

H3.2.1 Assess the available GIS data.

H3.2.2. Create and distribute coverages of population locations.

H3.2.3. Acquire recent imageries of the sites.

H3.3. Investigate the effect of habitat change. Alterations in canopy cover, light levels, and hydrology will affect growth and survival rates. Investigate natural and human-induced effects on hammocks and evaluate the response in terms of canopy, successional retardation, increased susceptibility to windthrow, and changes in species composition.

H3.3.1. Evaluate patterns of habitat response to hurricanes and the implications on *P. robinii* populations. Identify the effects of past hurricanes on hardwood hammocks and make predictions of likely responses to future hurricanes. Determine what information is needed to help evaluate the effects of a future hurricane on hammocks and *P. robinii*.

H3.3.2. Investigate the relationships of exotic vegetation. Exotic vegetation can outcompete and inundate certain hammock species. Determine the effects exotic vegetation have on hardwood hammocks and *P. robinii*.

H3.4. Determine the level of habitat fragmentation. Populations of *P. robinii* presently occur on Upper Matecumbe Key (two populations), Lower Matecumbe Key (one population), Long Key (three populations), and Big Pine Key (two populations). The separation of these populations may affect the ability of this species to persist. Evaluate habitat fragmentation and how it affects the survival of *P. robinii*.

H3.4.1. Investigate the historic distribution. Determine what geographic range is necessary to recover this species.

H3.4.2. Determine minimum habitat area required for a stable or increasing population. Populations of this species fluctuate from site to site depending upon the availability of suitable habitat. Investigate minimum habitat area requirements.

H3.4.3. Determine the amount and configuration of habitat necessary to support a stable or increasing population of *P. robinii*. Only two populations are believed to be self-sustaining. Investigate the configuration of occupied and unoccupied habitat and determine what is sufficient to recover this species.

H4. Monitor the status of *P. robinii* habitat. Conduct yearly monitoring evaluations of *P. robinii* habitat. Overlay habitat quality with GIS mapping of habitat locations, including what patches are being altered or lost each year. Monitor the availability of *P. robinii* habitat by updating the loss or change of habitat due to residential or commercial construction through GIS.

H5. **Increase public awareness of *P. robinii* habitat and instill stewardship.** Conduct workshops with the public to educate private landowners on appropriate management practices to preserve *P. robinii* habitat. Encourage private landowners to remove exotics, maintain natural hydrology, refrain from destroying habitat, and restore disturbed areas. Prepare literature to provide information regarding *P. robinii* habitat and ways to protect and conserve it.