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Palmetto

Pine Rockland Corridors • New Hope for Florida Ziziphus • Cinnecord – Native or Not?

Connect to Protect:

Creating corridors to protect South Florida's pine rockland plants

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Above: Figure 1 –
Top left – *Amorpha herbacea* var. *crenulata,* photo by Jennifer Possley.
Bottom left – *Ipomoea microdactyla.*
Top right – *Polygala smallii,* photo by Joyce Maschinski.

Florida's burgeoning development has impacted our native flora in a variety of ways, including the loss of critical habitat that supports a number of endangered plant species (Figure 1). The *Connect to Protect* program seeks to develop corridors to alleviate problems of urban fragmentation on rare pine rockland plant populations in South Florida. Funded by a grant from U.S. Fish and Wildlife Service, Fairchild Tropical Botanic Garden created this program to help conserve the federally listed and candidate species found in this remarkable habitat by doing the following:

1) Developing a participatory network of interested public land manager stakeholders and creating a conservation action plan to include corridors between pine rockland natural areas.

2) Assisting land managers to restore habitats in corridors and implementing site-specific activities that can enhance populations of listed and candidate species.

3) Experimentally determining habitat-specific population growth, seedling germination patterns, and establishment requirements of target species in at least two sites.

4) Providing the lay and scientific public information about habitats, their unique flora, and this research.

The program builds on the idea of utilizing wildlife corridors to promote the survival of plants in these shrinking habitats. This idea has gained international prominence in recent years in efforts to assist the survival of charismatic megafauna such as elephants. It has also been part of the effort within the state to preserve the Florida panther (Anderson & Jenkins, 2006). The use of corridors can also be applied to the preservation of plants [SIDEBAR 1, page 6].

Background on the pine rockland habitat

South Florida's pine rockland habitat is one of the most endangered habitats in the world (FNAI, 1990). Pine rockland is typically identified by an open canopy of slash pine (*Pinus elliottii* var. *densa*), a lower layer of both tropical and temperate shrubs and palms and a ground cover of grasses and herbs (FNAI, 1990) (Figure 2).

Because it is situated in the subtropics, this region has a rich diversity of temperate and tropical plants represented for a total of 439 species, including a number that are found nowhere else. In fact, the pine rockland habitat is home to 31 endemics, including 6 federally listed species and 9 that are candidates for listing (Figure 1) [SIDEBAR 2, page 6].

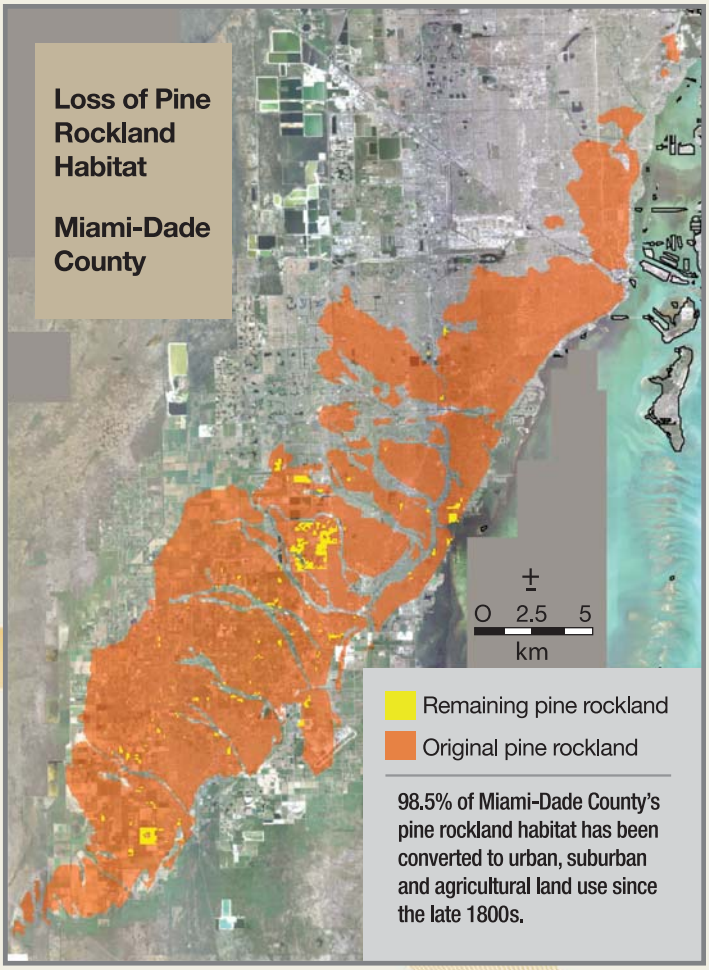
The pine rocklands are situated on a limestone ridge some 80 km long and 6 to 14 km wide known as the Miami Rock Ridge (Snyder et al., 1990). Unlike most pine habitats that are prevalent throughout Florida, pine rocklands have limestone substrate known locally as "pinnacle rock" that is often directly on or very close to the surface (Figure 3). Starting in the northeast part of Miami-Dade

County at an elevation of 7 meters above sea level, this limestone layer gradually decreases in elevation to 2 meters as we travel from the north to the south and west. The ridge emerged from the shallow sea 14,000 years ago exposing cemented limestone. Over time, rain and standing water dissolved softer parts of the rock, leading to a pockmarked, sponge-like appearance with scattered, deep sinkholes. Soils are composed of sand, marl, and organic materials that accumulate in rock depressions.

Because it is located at the tip of continental United States, pine rocklands have a climate that is considered subtropical. Its temperatures are fairly uniform across the year, with a summer average of 27° C (81°F) in July and a winter average of 18° C (64°F) in January. There are occasional freezing events in winter, which limits the establishment of cold sensitive species (Snyder et al., 1990). Precipitation occurs mostly in the form of seasonal rain, averaging 64 inches (163 cm) that falls primarily during the summer months from June to September.

Above: Figure 2 – Pine rockland site. *Photo by Sam Wright.*

Below: Figure 3 – Limestone in pine rockland exposed after fire.



Above: Figure 4 – Original and remnant pine rocklands.
Map developed by Karen Minkowski, Keith Bradley and George Gann.

Historically, the relatively elevated pine rockland areas provided early settlers with a place where they could situate their homes without fear of flooding. Pine trees found in this area also provided opportunities to create a timber industry and rail lines were built through the heart of the pine rocklands to assist in tree harvesting. In more recent years, South Florida's mushrooming development has shrunk the size of pine rockland habitat to less than 2% of what it once encompassed in the 1800s (Figure 4).

The remaining pine rockland fragments in Miami-Dade County are under increasing pressure from a number of sources, including continued development and invasive species. According to the Florida Exotic Pest Plant Council's 2007 List of Invasive Plant Species (http://www.fleppc.org/list/07list_ctrfld.pdf), 62 Category 1 invasive exotics exist in South Florida, making the pine rockland habitat especially vulnerable to this type of stress. When visiting unmanaged private holdings of pine rockland property as part of our work on the *Connect to Protect* project, it is not unusual for us to find large numbers of invasives, such as *Schinus terebinthifolius* (Brazilian pepper), *Neyraudia reynaudiana* (Burma reed), *Casuarina equisetifolia* (Australian pine), *Acacia auriculiformis* (ear-leaf acacia), and *Albizia lebbeck* (Woman's tongue).

Fire, long the critical source of renewal and nutrient recycling for these habitats and a natural way to suppress the growth of invasives, has been severely restricted due to safety concerns within the

Continued on next page

SIDEBAR 1 – **The Corridors Issue**

An important strategy for biological conservation is establishing wildlife corridors between natural areas that may permit organisms to survive while small, fragmented patches may not (Defenders of Wildlife, 1991).

For example, connecting two areas with a planted avenue may permit pollinators and seed dispersers, such as birds, to travel between the two. As they travel, pollinators and dispersers will increase movement of pollen and seeds, making it more likely that gene diversity will increase. Gene diversity may increase the likelihood that populations of endangered plants and animals will be maintained in the face of catastrophic events like flooding or intense hurricanes because there is a greater range of individual responses and adaptations in more genetically diverse groups.

Recent research shows that plants found in areas that were connected by patches showed better survivorship and gene diversity than those that were not connected (Damschen et al., 2006). In areas such as Miami-Dade County where large-scale fragmentation has occurred, promoting such connections may be our best bet for promoting plant survivorship.

In addition, providing corridors with native plants may allow the public to become more familiar with these unusual species. Corridors established with pine rockland species along bike or footpaths will help the general public see these beautiful plants close up and integrated into their urban setting.

highly populated urban and suburban areas in Miami-Dade County. However, if fire does not occur regularly in a pine rockland (about every 3-7 years), there is a good chance that succession from pine rockland hammock species will take place. Without fire, forest litter and dead branches accumulate suppressing the growth of many kinds of plants; when fire does occur, the intensity will be so great that it will damage natives that normally thrive after less intense burning (FNAI, 1990). Recent research focusing on management alternatives to burning shows that mechanical thinning of the accumulated duff that limits seedling growth does result in greater species diversity without increasing exotic invasives (Maschinski et al., 2005). Unfortunately, such work is labor intensive and expensive.

Pursuing the program goals

The *Connect to Protect Network* is pursuing several initiatives to satisfy its objectives.

A number of the remnant pine rockland areas are located within protected natural areas that are managed through the County's Natural Areas Management (NAM) division. These include properties that were recently acquired through the Environmentally Endangered Land (EEL) program – a Miami-Dade County voter approved effort to acquire, protect, and maintain environmentally endangered lands. These areas can be thought of as islands in the sea of the Miami-Dade County urban and suburban landscape. We are working with Miami-Dade County to increase the numbers of pine rockland plants incorporated into the December 2007 Miami-Dade County Parks and Open Space System Master Plan. The County Plan seeks to promote a more sustainable living area by promoting greenway connections among parks, public spaces, natural and cultural areas. The County greenways overlap some 60-70% of our proposed corridors. Thus, we are encouraging the County to incorporate pine rockland plants in these corridors as much as possible. In this way, we hope to build connections or stepping stones between pine rockland natural areas (Figure 5).

SIDEBAR 2 – **Plants in the Pine Rockland**

Currently, 439 native plant species are found in the pine rockland habitat, including the following:

Federally listed as endangered or threatened

Amorpha herbacea var. *crenulata* ..... E
Chamaesyce deltoidea subsp. *adhaerens* ..... E
Chamaesyce deltoidea ..... E
Galactia smallii ..... E
Polygala smallii ..... E
Chamaesyce garberi ..... T

Candidates for federal listing

Argythamnia blodgettii C
Brickellia mosieri C
Chamaecrista lineata var. *keyensis* C
Chamaesyce deltoidea subsp. *pinetorum* C
Chamaesyce deltoidea subsp. *serpyllum* C
Dalea carthagenensis var. *floridana* C
Digitaria pauciflora C
Linum arenicola C
Linum carteri C

KEY:
C = Candidate
E = Endangered
T = Threatened

Listed by the state of Florida as endangered or threatened

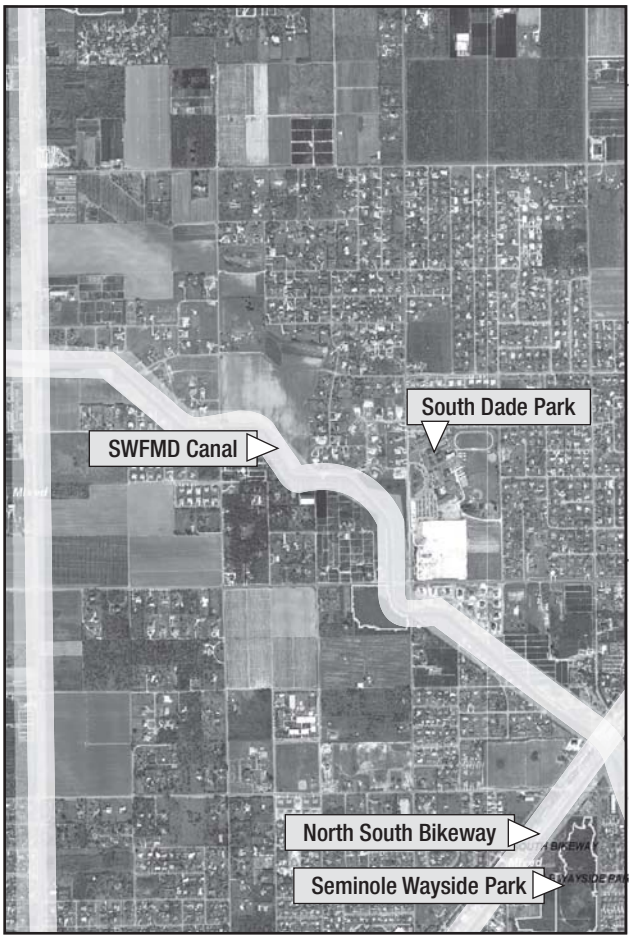
Aletris bracteata ..... E
Alvaradoa amorphoides ..... E
Basiphyllaea corallicola ..... E
Bourreria cassinifolia ..... E
Caesalpinia pauciflora ..... E
Catesbaea parviflora ..... E
Catopsis berteroniana ..... E
Chamaesyce porteriana ..... E
Colubrina arborescens ..... E
Colubrina cubensis var. floridana ..... E
Cyperus floridanus ..... E
Cyrtopodium punctatum ..... E
Dodonaea elaeagnoides ..... E
Ernodea cokeri ..... E
Evolvulus grisebachii ..... E
Glandularia maritima ..... E
Hypelate trifoliata ..... E
Ipomoea microdactyla ..... E
Ipomoea tenuissima ..... E
Jacquemontia pentanthos ..... E
Koanophyllon villosum ..... E
Lantana canescens ..... E
Lantana depressa ..... E
Lechea divaricata ..... E
Linum carteri var. smallii ..... E
Ocimum campechianum ..... E
Odontosoria clavata ..... E
Oncidium ensatum ..... E
Pisonia rotundata ..... E
Poinsettia pinetorum ..... E
Ponthieva brittoniae ..... E
Psychotria ligustrifolia ..... E
Scutellaria havanensis ..... E
Selaginella armata var. eatonii ..... E
Spiranthes torta ..... E
Strumpfia maritima ..... E
Stylosanthes calcicola ..... E
Tephrosia angustissima var. corallicola ..... E
Thrinax morrisii ..... E
Thrinax radiata ..... E
Tillandsia fasciculata var. densispica ..... E
Tillandsia utriculata ..... E
Trema lamarckianum ..... E
Angadenia berteroi ..... T
Bletia purpurea ..... T
Byrsonima lucida ..... T
Chamaesyce pergamena ..... T
Chaptalia albicans ..... T
Chrysophyllum oliviforme ..... T
Coccothrinax argentata ..... T
Crossopetalum ilicifolium ..... T
Crossopetalum rhacoma ..... T
Cynanchum blodgettii ..... T
Digitaria filiformis var. dolichophylla ..... T
Ilex krugiana ..... T
Jacquemontia curtisii ..... T
Jacquinia keyensis ..... T
Manilkara jaimiqui subsp. emarginata ..... T
Melanthera parvifolia ..... T
Pithecellobium keyense ..... T
Psidium longipes ..... T
Pteris bahamensis ..... T
Pteroglossaspis ecristata ..... T
Reynosia septentrionalis ..... T
Rhynchosia parvifolia ..... T
Sachsia polycephala ..... T
Senna mexicana var. chapmanii ..... T
Smilax havanensis ..... T
Solanum donianum ..... T
Spermacoce terminalis ..... T
Swietenia mahagoni ..... T
Tetrazygia bicolor ..... T
Tillandsia balbisiana ..... T
Tillandsia flexuosa ..... T
Tillandsia variabilis ..... T
Tragia saxicola ..... T
Tripsacum floridanum ..... T

Using satellite imagery and knowledge of the area, we have located remnant pine rocklands on private properties and asked landowners to take steps to maintain them. We have discussed the project with landowners, provided support for identifying and clearing invasives, and given away pine rockland plants to help restoration efforts.

We have asked schools located near corridors and natural areas to serve as "stepping stones" between natural areas by planting pine rockland gardens so that pollinators might utilize school ground plantings to refuel as they travel back and forth between the remnant areas. In conjunction with the *Fairchild Challenge Program*, teachers and students have helped us plant pine rockland gardens, cleaned up pine rockland parks, designed logos for the project, and conducted germination research projects utilizing seeds from pine rockland plants (Figure 6). (http://www.fairchildgarden.org/index.cfm?section=education&page=fairchildchallenge)

To build our knowledge of the cultivation and storage capabilities of pine rockland plants, we are researching their germination requirements and testing whether seeds can withstand desiccation and freezing (Figure 7). Many pine rockland plant species have dormancy that requires cold stratification or acid treatments before they will germinate. Seeds that can be dried and frozen are suitable for storage at the National Center for Genetic Resources Preservation in Fort Collins, Colorado.

Finally, the project seeks not only to establish corridors and stepping stones, but to research their effectiveness in supporting the maintenance and recovery of endangered plant species. We will utilize a variety of scientific methods to monitor the success of plantings to determine ways that such connections may make a difference for the pine rocklands. It is our hope that these efforts will ultimately lead to a brighter future for the rare plants found in this habitat.



Above: Figure 5 – Section of Miami-Dade County showing potential corridor connections along canal banks and bikeways to parks. *Map developed by Karen Minkowski, Keith Bradley and George Gann.*

Figure 6 – High school students helping clean out duff in park. *Photo by Joie Goodman.*

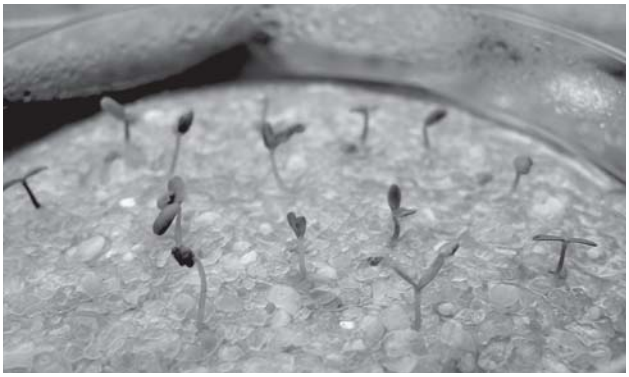


Figure 7 – Germination trials of *Dalea carnea* have been conducted by Don Walters. *Photo by Don Walters.*

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The purpose of the Florida Native Plant Society is to conserve, preserve, and restore the native plants and native plant communities of Florida.

Official definition of native plant:
For most purposes, the phrase Florida native plant refers to those species occurring within the state boundaries prior to European contact, according to the best available scientific and historical documentation. More specifically, it includes those species understood as indigenous, occurring in natural associations in habitats that existed prior to significant human impacts and alterations of the landscape.

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