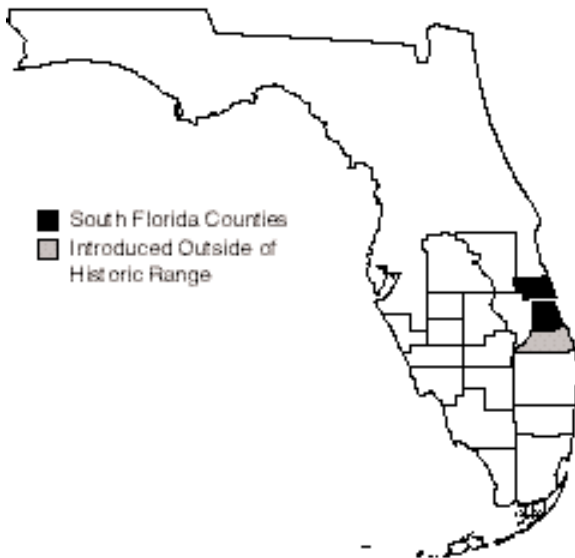

Lakela's Mint

Dicerandra immaculata Lakela

Federal Status:	Endangered (May 15, 1985)
Critical Habitat:	None Designated
Florida Status:	Endangered
Recovery Plan Status:	Revision (May 18, 1999)
Geographic Coverage:	Rangewide

Figure 1. County distribution of Lakela's mint.



Lakela's mint is a small, fragrant shrub that can be differentiated from other *Dicerandra* by its spotless, lavender-rose colored flower. This mint inhabits a very limited area on the Atlantic coastal ridge in South Florida. This species faces a high risk of extinction because so much of its habitat has been destroyed and its populations have become so fragmented. No protected sites exist within its historic range, and the sites at which it occurs are likely to have degraded habitat.

This account represents a revision of the existing recovery plan for the Lakela's mint (FWS 1987).

Description

Dicerandra immaculata is a small, fragrant shrub that reaches 50 cm in height (Kral 1982). Its growth is bushy when in open sun but becomes lax when in shade. It forms small mats or domes of ascending to spreading or sprawling branches. The primary branches arise from a stout, deep, woody-branched taproot, and its numerous innovations arise from spreading or sprawling older growth.

The main leaves are spreading (horizontal) or ascending (pointing upward), while those in the inflorescence (flower cluster) are sometimes reflexed (pointing downward) (Kral 1982). All leaves are linear, oblong-linear, linear-elliptic, linear-lanceolate or linear-oblongate in shape. They are 2 to 3 cm long, 2 to 4 mm wide, smooth, flattened, subsessile, narrowly rounded at the apical end, often slightly emarginate, and entire, though larger leaves can be minutely serrulate at the apical end.

The inflorescence is usually 15 to 25 cm long (Kral 1982). Its flowering cymes overlap and each has one, three, or five flowers. The calyx body is 7 to 8 mm long and is usually purplish, becoming white or roseate toward the orifice. The corolla is 1.9 to 2.0 cm long, immaculate (not spotted), and is a bright lavender-rose. The upper corolla lip is broadly ovate to obovate, approximately 7 mm long, apically upswept, and broadly rounded-emarginate. The

lower lip is broadly obovate, trilobate, 9 to 10 mm long, and downsweped. The lateral lobes are spreading, oblong, broadly rounded, or oblique-truncate and the medial lobe is emarginate. The anthers are exerted, and the style is projecting.

The color of the corolla, lavender-rose to purplish, and its lack of spots separates *D. immaculata* from other species of the *Dicerandra* genus (FWS 1985).

Taxonomy

This species was named by Lakela in 1963 (Lakela 1963). There has been no other taxonomic treatment of the species.

Distribution

The range of *D. immaculata* is extremely small. It is known from a single population that occurs at six isolated sites in an area one-half mile wide by three miles long in southern Indian River and northern St. Lucie counties (Figure 1). The sites are in the vicinity of four small knobs, of greater than 45 ft elevation, along the coastal dune complex between Fort Pierce and Vero Beach (Robinson 1981). These knob formations are typical of this dune system and the next system to the north, however, they are not typical of the next dune system to the south. *Dicerandra immaculata* also occurs on Hobe Sound NWR in Martin County, where it was introduced in 1991 and 1992.

Habitat

Dicerandra immaculata is found in light shade or clearings in scrub along the Atlantic coastal ridge (FWS 1987). It occupies sites with varying degrees of litter, from partly covered to bare sand. These bare sands are probably created through a combination of wind action and fires.

Dicerandra immaculata has been observed growing on both white and yellow sands of the following soil series: Astatula sands, Paola sands, and St. Lucie sands (FWS 1985). These soils are deep, nearly level to sloping, occur on high, dune-like ridges, and are acidic.

Reproduction

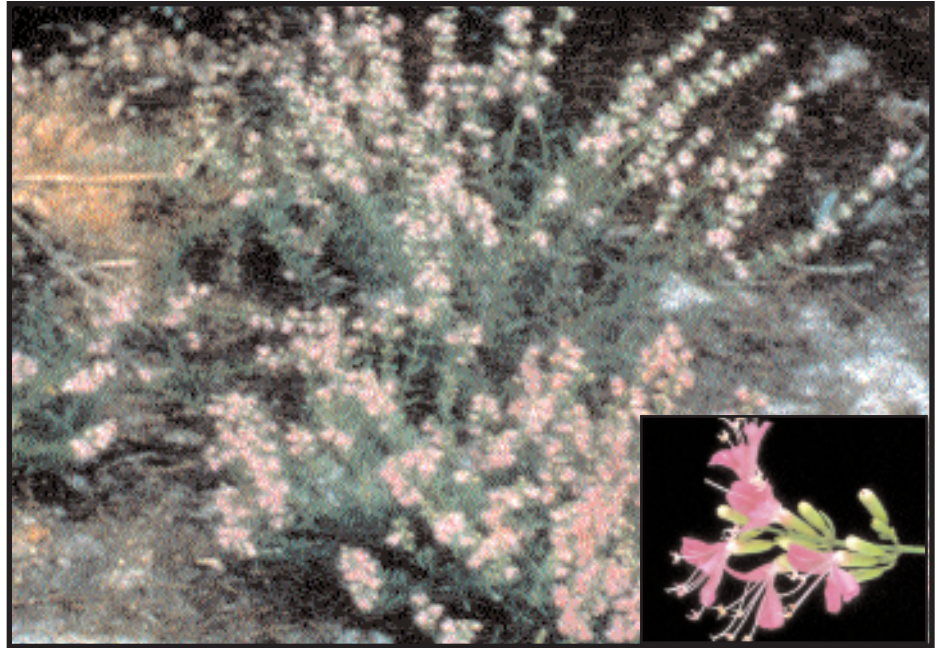
Dicerandra immaculata only reproduces through seeding and needs insects for pollination. Its flowers have spurred anthers, which require triggering by insect vectors to release and disperse pollen (FWS 1987). The insect species responsible for the pollination of this mint are unknown.

Seed dispersal of Lakela's mint is very limited. Introduced colonies at the Hobe Sound NWR have dispersed no more than 2 m from parent plants (Race 1994). In addition, Austin *et al.* (1980) indicated that areas of disturbed sandy soils within the vicinity of Lakela's mint colonies provided no evidence of recolonization.

Leafing occurs from February to August. Anthesis occurs primarily from September to November and sporadically throughout the year. Fruiting occurs primarily from October to December and sporadically throughout the year (Austin *et al.* 1980).

Lakela's mint.

Original photograph courtesy of U.S. Fish and Wildlife Service; flower photograph by Steve Shirah.



Relationship to Other Species

Dicerandra immaculata is a “gap” species. It abounds in open sunlight, but becomes straggly and weak as woody plants and saw palmetto invade open areas (Kral 1982).

Like other *Dicerandra* species, Lakela's mint is protected from insect herbivory by its essential oils (McCormick *et al.* 1993). The cut leaves of one of its relatives, *D. frutescens*, have been shown to repel ants, and only Pyralid moths are known to feed on it (Eisner *et al.* 1990). Whether Lakela's mint is protected to this degree has not been verified.

Though resistant to insect feeding, *D. immaculata* populations have been adversely affected by mildew. Mildew grows on the nectary glands and can cause destruction of the fruits, destroying the viability of seeds before dispersal (Austin *et al.* 1980).

Status and Trends

Dicerandra immaculata was federally listed as endangered because of its extremely small range and the rate at which its habitat was being destroyed (50 FR 20214). Although the opening of Interstate 95 has eased the rate of habitat loss and conversion along U.S. Highway 1 since the plant's listing, Lakela's mint habitat is still vulnerable.

The only protected site for *D. immaculata* exists at Hobe Sound NWR in Martin County. The population at Hobe Sound is doing well. The plants were introduced at two sites, the first in 1991, the second in 1992 (Race 1994). As of 1994, at least one-third of the original plants still survived at the first site, and at least one-half of the plants survived at the second site. Both sites contained new seedlings, which suggests successful reproduction (Race 1994).

In the fall of 1997, the plants were flowering in the second site, and newer plants were well established. The second site is receiving more protection now from visitor disturbance than before, and should continue to flourish. The first site is also still reproductively active.

St. Lucie County is working to purchase a parcel of land in the northern part of the county for preservation purposes (Coward 1995). This parcel is being considered for propagation of Lakela's mint, and could possibly provide the first protected site within the known historic range. St. Lucie County is also considering another site for purchase that would protect the largest remaining population of *D. immaculata*.

Management

Dicerandra immaculata needs a protected site within its historic range. If a site is acquired, augmentation of the population may be helpful. Two successful introductions of *D. immaculata* have been conducted at Hobe Sound NWR, and information from this project may prove useful for future transplants.

The introductions at Hobe Sound occurred at two different sites on the refuge and were conducted at different times of the year. These two introductions had varying degrees of success, and based on these introductions, Bok Tower Gardens gives the following recommendations for transplanting *D. immaculata*. First, the transplanting site cannot be irrigated, because irrigation promotes the growth of species that will compete with Lakela's mint (Race 1994). Second, the planting should be done in early spring while temperatures are cool (Race 1994).

Lakela's mint occupies open areas in scrub, so prescribed burning or equivalent management is necessary to maintain the quality of its habitat. However, the way this species responds to disturbance and the frequency of disturbance needed are not known. The response of its central Florida relative, the scrub mint (*Dicerandra frutescens*), may serve as a reference point from which to begin Lakela's mint management.

Scrub mint individuals die after being burned, defoliated or cut at their base (Menges 1992). However, the species seems to benefit from periodic fires. Colonies found in areas burned within the last 10 years exhibit the most vigorous growth (Menges 1992). The frequency at which burns, or equivalent disturbances, need to be conducted to maintain the scrub mint is unknown. It is found in areas that were last burned as recently as 3 and as late as 65 years ago (Menges 1992).

Literature Cited

- Austin D.E., C.E. Nauman, and B.E. Tatje. 1980. Final report: endangered and threatened plant species survey in southern Florida and the National Key Deer and Great White Heron National Wildlife Refuges, Monroe County, Florida. U.S. Fish and Wildlife Service; Atlanta, Georgia.
- Coward, D. 1995. Letter from R.L. Weigt Environmental Consultants, Inc. to Bok Tower Gardens, Lake Wales, Florida. July 11, 1995. On file at U.S. Fish and Wildlife Service, South Florida Ecosystem Office, Vero Beach, Florida.
- Eisner, T., D. McCormick, M. Sakaino, M. Eisner, S.R. Smedley, D.J. Aneshansley, M. Deyrup, R.L. Myers, and J. Meinwald. 1990. Chemical defense of a rare mint plant. *Chemoecology* 1 (1990):30-37.
- Kral, R. 1982. Some notes on *Dicerandra* (Lamiaceae). *Sida* 9(3): 238-262.
- Lakela, O. 1963. *Dicerandra immaculata* Lakela, sp. nov. (Labiatae). *Sida* 1(3):184-185.
- McCormick, K.D., M. Deyrup, E.S. Menges, S.R. Wallace, J. Meinwald, and T. Eisner. 1993. Relevance of chemistry to conservation of isolated populations: The case of volatile leaf components of *Dicerandra* mints. Pages 7701-7705 in *Proceedings of the National Academy of Science*, Volume 90.
- Menges, E. S. 1992. Habitat preferences and response to disturbance for *Dicerandra frutescens*, a Lake Wales Ridge (Florida) endemic plant. *Bulletin of the Torrey Botanical Club* 119(3): 308-313.
- Robinson, A.F. 1981. Status review of *Dicerandra immaculata* (Lakela's mint). Unpublished report prepared for U.S. Fish and Wildlife Service; Jacksonville, Florida.
- Race, T. 1994. Establishment of a new population of *Dicerandra immaculata* at the Hobe Sound National Wildlife Refuge in Florida. Unpublished report prepared for the U.S. Fish and Wildlife Service; Jacksonville, Florida. On file at U.S. Fish and Wildlife Service, South Florida Ecosystem Office, Vero Beach, Florida.
- U.S. Fish and Wildlife Service [FWS]. 1987. Recovery plan for three Florida mints. U.S. Fish and Wildlife Service; Atlanta, Georgia.

Recovery for the Lakela's Mint

Dicerandra immaculata Lakela

Recovery Objective: PREVENT extinction, then stabilize.

Recovery Criteria

Dicerandra immaculata may never reach a level at which reclassification could be possible. The objective of this recovery plan is to increase existing populations and prevent extinction. *D. immaculata* 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 openings in the coastal scrub to support *Dicerandra immaculata*.

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 refined if new information identifies ways of re-establishing populations of this species to expand its current distribution within its historic range.

Species-level Recovery Actions

- S1. Determine current distribution of *D. immaculata*.** A comprehensive survey of *D. immaculata*'s range was completed in fall 1996. Taxonomic questions still exist with a newly located population at the Martin County border that make a definitive distribution difficult.
- S1.1. Conduct surveys for *D. immaculata*.** Though the range of this species has been thoroughly surveyed, it should be periodically re-surveyed to learn the status of the species on private lands.
- 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 and in land acquisition activities.
- S2. Protect and enhance existing populations.** Much of the native xeric uplands on the Atlantic coastal ridge has 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. Protect habitat through acquisition, conservation easements or agreements with landowners.** This species has no populations on public property within its historic range. A population exists at Hobe Sound NWR, but it is outside of the historic range for this species.

- S2.2. Protect populations on public lands.** Possible county acquisitions may give protected native sites for this species. If these are obtained, management guidelines would need to be developed to replicate natural coastal scrub disturbance. This may be difficult since most of the possible sites are small and may make management difficult.
- 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 *D. immaculata*.
- 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 *D. immaculata*. *Dicerandra immaculata* is easily grown from cuttings and can be kept as young plants for study and for reintroduction material.
- 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 *D. immaculata* 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 *D. immaculata* 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 Endangered Species Act (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.
- S2.6. Augment natural populations of *D. immaculata*.**
- S2.6.1. Establish a protocol for reintroduction.** Records for source plants, techniques for establishing new populations, and protocols for monitoring are needed.
- S2.6.2. Locate potential (re)introduction sites.** Survey habitat within the historic range of *D. immaculata* and identify protected lands, both public and private, that will be suitable habitat.
- S2.6.3. (Re)introduce plants to protected sites.** Use plants under cultivation to (re)establish plants in suitable habitat.
- S3. Conduct research on life history characteristics of *D. immaculata*.** To effectively recover this species, more specific biological information is needed.

- S3.1. Conduct research to determine demographic information**, such as numbers of sites and populations, numbers of individuals in a population, recruitment, dispersal, growth, survival, and mortality. Observations of the relation of flowering to fire, pollination, seed production, and seedling biology will help to guide reintroduction and management efforts.
- S3.2. Once demographic data are known, conduct population viability and risk assessment** analyses 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 *D. immaculata*.** 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 *D. immaculata*.**
- S4.1. Develop monitoring protocol to assess population trends for *D. immaculata*.**
- 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 *D. immaculata*.** Assess any changes in demographic characteristics of *D. immaculata* in response to land management activities, such as prescribed fire, exotic plant control, and off-road vehicle use.
- S4.2. Develop a quantitative description of the population structure of *D. immaculata*.** 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) may prove useful in future management.
- S4.3. Monitor re-introduced plants.** Monitoring of reintroduced plants will be essential for assessing the status of new plants and their contribution to the population as a whole. Compare adult survival, seed production, germination rates, seed survival, seedling survival, and growth rates between transplanted plants and natural plants. Where monitoring indicates that the introduction has been unsuccessful, re-evaluate protocol and methodology.
- S5. Provide public information about *D. immaculata*.** 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. However, caution should be taken to avoid revealing specific locality information of *D. immaculata*.
- 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 *D. immaculata* and other rare species requires a self-sustaining, secure, number of natural populations.

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 urbanization and fire suppression have decreased the available habitat. To date, there are no protected sites for this species in its historic range.
- H1.1. Secure habitat through acquisition, landowner agreements, and conservation easements.** With so little Atlantic coastal scrub habitat left, any method of securing protected populations should be sought.
- H1.2. Manage and enhance habitat.** Manage habitat to maintain *D. immaculata* populations by preventing habitat damage from off-road vehicle use and 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. *Dicerandra immaculata* appears to benefit from burning at irregular intervals of a decade or more.
- 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 *D. immaculata*.
- H1.2.3. Control access to areas where *D. immaculata* plants are growing.** 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 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 *D. immaculata* 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, mechanical disturbance, *etc.*, on the habitats where *D. immaculata* occurs.
- H5. Provide public information about xeric vegetative communities and its unique biota.** Educational efforts, especially those conducted by private conservation organizations, have been successful in providing important information about xeric plant communities to the public. The State's system of biological preserves depends for its funding and future success on a broad base of public understanding and support. In addition to past and ongoing educational efforts by The Nature Conservancy, Bok Tower Gardens, and Archbold Biological Station, future efforts by these organizations, the Florida Park Service, the Florida Native Plant Society and local garden clubs will play crucial roles in increasing public appreciation of xeric plant communities and *D. immaculata*.

