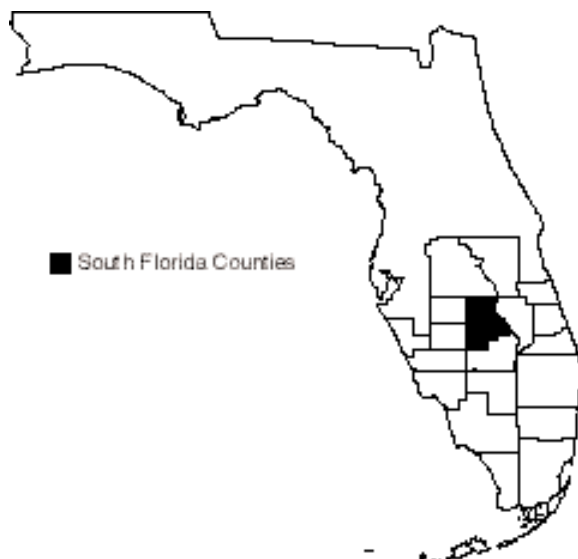

Scrub Mint

Dicerandra frutescens Shinnery

Federal Status:	Endangered (Nov. 1, 1985)
Critical Habitat:	None Designated
Florida Status:	Endangered
Recovery Plan Status:	Revision (May 18, 1999)
Geographic Coverage:	Rangewide

Figure 1. County distribution of scrub mint.



The scrub mint is a small, fragrant shrub that inhabits the scrub of central peninsular Florida. It bears a strong resemblance to another *Dicerandra* species, Garrett's mint, but can be differentiated by its scent, the color of its flowers, and the size of its leaves. Loss of habitat due to residential and agricultural development (particularly for citrus groves), as well as fire suppression in tracts of remaining habitat, are the principle threats to this plant.

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

Description

The scrub mint is a dense or straggly, low-growing shrub (Kral, 1983). It reaches 50 cm in height and grows from a deep, stout, spreading-branching taproot. Its branches are mostly spreading, and sometimes are prostrate. Its shoots have two forms, one which is strictly leafy and overwintering, and another which is flowering and dies back after fruiting.

The leaves vary in shape. They can be narrowly oblong-elliptic, linear-elliptic, or linear-oblongate (Kral 1983). The upper surface of the leaves is dark green, with the midrib slightly impressed. The lower surface is slightly paler, with the midrib slightly raised. They are 1.5 to 2.5 cm long, 2 to 3 mm wide, subsessile, flattish but somewhat fleshy, narrowly or broadly rounded at the apical end, have entire margins, and are not revolute.

Scrub mint has an inflorescence that is elongated and interrupted, and, at least half of the flowering shoot is floriferous (Kral 1983). The calyx, at anthesis, is approximately 9 to 10 mm long, nearly erect, proximally and medially green, and distally tinged with red, with a broad white zone around the orifice. The corolla is 1.9 to 2.0 cm long, with an erect tube that is approximately 7 mm long. The external surface of the throat and limb is white or yellowish white. The upper lip is marked internally with a trellis pattern of lines and dots of deep purple, while the lower lip is maculate with larger, concentric spots from lobe bases to base of the lip.

The flower has two pairs of stamens, with one pair slightly longer than the other (Kral 1983). The filaments are white, and the anthers are purple. Styles are almost white and bent forward or curved downward (usually above the anthers).

Dicerandra frutescens is very similar in appearance to another *Dicerandra* species, *D. christmanii*. These two mints are separated using the following characteristics. One, *D. frutescens* has a minty aroma, whereas *D. christmanii* smells of menthol (Huck *et al.* 1989). Two, the leaves of *D. frutescens* are longer than those of *D. christmanii* (Huck *et al.* 1989). Three, the anthers of *D. frutescens* are deep purple to white in color, while the anthers of *D. christmanii* are a brilliant yellow (Huck *et al.* 1989). Four, the corolla of *D. frutescens* fades from a cream color to white within 1 to 3.5 hours of anthesis, while the corolla of *D. christmanii*, however, retains its cream color throughout most of the first day of anthesis (Huck *et al.* 1989). Five, the anther connectives of *D. frutescens* have more, and larger, glands than those of *D. christmanii* (Huck *et al.* 1989).

Taxonomy

Dicerandra frutescens was named by Lloyd Shinnery (1962); his circumscription of the species was modified by Huck (1981), who reassigned specimens from Sumter and Marion counties to a new species, *Dicerandra cornutissima*. Kral (1982), working independently of Huck, came to the same conclusion.

Distribution

The known range of the scrub mint is quite small. It occurs on the southern portion of the Lake Wales Ridge in Highlands County, and is found from just north of Lake June in Winter, south to the Archbold Biological Station (FNAI 1996, Menges 1992). (Figure 1). The range of Garrett's mint lies only 10 km to the north (Huck *et al.* 1989). The two ranges are separated by a slight break in the ridge at Josephine Creek (Huck *et al.* 1989).

Habitat

Dicerandra frutescens is mostly restricted to excessively drained, yellow sandy soils of the Astatula and Paola soil types (Menges 1992). However, it has been found on a moderately well-drained, yellow sand of the Orsino type (Menges 1992). In these soil types, scrub mint occurs adjacent to or within disturbed areas in sand pine scrub, oak scrub and sandhill habitats (FWS 1987, Menges 1992). It occupies sites with shallow litter layers that have an incomplete, or non-existent, tree and shrub canopy (Menges 1992).

Reproduction

Dicerandra frutescens has perfect flowers (Kral 1983) and reproduces sexually, with outcrossing (Huck 1981). It is not capable of spreading clonally (Menges 1992), but has been shown to root easily from cuttings of vegetative growth (FWS 1987). Growth containing flowers or flower buds will also root, but will often flower then die (FWS 1987).

Scrub mint flower.
Original photograph by Steve Shirah.



Scrub mint needs insects for pollination. Its flowers have spurred anthers, which require triggering by insects to release and disperse pollen (FWS 1987). Though visited by a variety of insects (Huck *et al.* 1989), the scrub mint is pollinated mainly by bee-flies (Menges 1992). Its flowering occurs from August through winter, and fruit production occurs from September through winter (Wunderlin 1984).

The scrub mint's seed dissemination mechanisms are unknown, though they possibly include passive dispersal (E. Menges, Archbold Biological Station, personal communication 1997). It is possible that the seeds are not dispersed far from the parent plant, since seed dispersal in the related Lakela's mint (*Dicerandra immaculata*) is known to be very limited. Observations of an introduced population of Lakela's mint at Hobe Sound NWR indicate that the seedlings occur a maximum distance of 2 m from parent plants (Race 1994). Scrub mint's seeds survive in the seed bank for at least 2 years (E. Menges, Archbold Biological Station, personal communication 1997), and if dispersal in scrub mint is similarly limited, then persistence in the seed bank may be an important strategy that this species uses for colonizing newly disturbed areas.

Relationship to Other Species

Dicerandra frutescens is a gap-utilizing species; it inhabits open areas in the vegetation (FWS 1996). Thus, it does not tolerate shading by other plants.

Scrub mint is not often damaged by herbivores (Menges 1992). It contains essential oils which protect it from feeding animals (McCormick *et al.* 1993). The cut leaves of the plant have been shown to repel ants, and the extracted aromatic chemicals have been shown to repel both ants and cockroaches (Eisner *et al.* 1990). Only caterpillars of Pyralid moths are known to feed on this species (Eisner *et al.* 1990)

Status and Trends

Scrub mint was given endangered status on November 1, 1985 because of its extremely restricted range and the threat of commercial and residential development of its habitat (50 FR 45618). At present, the species is known from only 12 sites in Highlands County, and its scrub habitat continues to be developed or converted to agricultural uses.

Based on estimates from Archbold Biological Station, the total population of *D. frutescens* numbers approximately 12,000 individuals (E. Menges, Archbold Biological Station, personal communication 1997). However, a very large population of an unidentified mint (possibly *D. frutescens*, possibly a different subspecies) exists outside the accepted range of the scrub mint. This population is estimated to contain approximately 44,500 individuals (E. Menges, Archbold Biological Station, personal communication 1997). If it is determined to be *D. frutescens*, then the species is closer to its recovery goal than originally believed, and searches for the mint outside of its accepted range may be warranted. However, if this population is determined to be a new subspecies of the scrub mint, it may be a candidate for listing as an endangered or threatened species.

Dicerandra frutescens occurs mostly on unprotected, private land. Protected sites for the species exist only at Archbold Biological Station (FWS 1996). Though it also occurs on the right-of-way of U.S. Highway 27, the possibility of road widening and changes in land use adjoining the road limit the protective value of the right-of-way (FWS 1996).

Fire suppression may pose an additional threat to the species. *Dicerandra frutescens* inhabits the clearings created by fires and other disturbances. Thus, tracts of land that are protected from fire may be limited in their ability to support scrub mint.

Dicerandra frutescens, and the other *Dicerandra* species, have small ranges and very few protected sites. Among plants of the Lake Wales Ridge, they are second only to scrub lupine (*Lupinus aridorum*) in priority for land acquisition (FWS 1996). Fortunately, the potential for easements exists in Highlands County, as several private lots containing *D. frutescens* are for sale.

Management

Dicerandra frutescens requires clearings in which to grow and seems to benefit from periodic fires. Colonies found in areas burned within the last 10 years exhibit the most vigorous growth (Menges 1992). However, though growth appears most vigorous during this period, it has not been demonstrated to be the optimum frequency of disturbance. In fact, the species may not be sensitive to burning frequency, since it is found in areas that were last burned as recently as 3 and as late as 65 years ago (Menges 1992).

Although colonies of *D. frutescens* respond favorably to periodic fires, the individuals die after being burned, defoliated, or cut at their bases (Menges 1992). Recruitment after a disturbance occurs via the seed bank (Menges 1992). Thus, scrub mint is vulnerable to trampling, and access to protected sites should be restricted.

At this time, *D. frutescens* is in cultivation under the auspices of the Center for Plant Conservation as part of the permanent rare plant collection at Bok Tower Gardens, Lake Wales, Florida. Research on its breeding system, pollinators, demographic patterns, and genetic variability is being conducted by Archbold Biological Station in conjunction with monitoring efforts (FWS 1996).

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Recovery for the Scrub Mint

Dicerandra frutescens Shinnery

Recovery Objective: STABILIZE, then reclassify to threatened

Recovery Criteria

Dicerandra frutescens may be considered stabilized when existing populations, within the historic range of *D. frutescens*, are adequately protected from further habitat loss degradation and fire suppression. These sites must also be managed to maintain xeric oak scrub to support *D. frutescens*.

Once the existing populations are stabilized, *D. frutescens* may be considered for reclassification to threatened status. Reclassification will be considered when: enough demographic data are available to determine the appropriate numbers of self-sustaining populations required to ensure 20 to 90 percent probability of persistence for 100 years; when these populations, within the historic range of *D. frutescens*, are adequately protected from further habitat loss, degradation, and fire suppression; when these sites are managed to maintain the seral stage of xeric oak scrub that supports *D. frutescens*; and when monitoring programs demonstrate that these sites support populations of sufficient 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. Delisting 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. frutescens*.**
 - S1.1. Conduct surveys of *D. frutescens*.**
 - S1.1.1. Continue surveys in Highlands County.** Though the Lake Wales Ridge has been thoroughly surveyed, it should be periodically resurveyed to learn the status of the species on private lands.
 - S1.1.2. Continue surveys on protected lands.** New sites for listed species are still being found on protected lands. This survey work should be continued to catalog all existing protected sites and new sites as they are purchased.
 - S1.2. Maintain distribution of known populations and suitable habitat in GIS database.** Use GIS to map existing populations and to assess the species' status and trends over time. The database should contain information on locations, population sizes, and status. This information should also be used for project review, in land acquisition activities, and to coordinate updates with the Florida Natural Areas Inventory database.

Currently, the Lake Wales Ridge Ecosystem Working Group and Archbold Biological Station are proposing to map the entire central ridge. This information would show potential habitat for scrub endemics based on their habitat needs.

- S1.3. Determine identity of *Dicerandra* population outside accepted scrub mint range.**
- S2. Protect and enhance existing populations.** Much of the native xeric uplands on the Lake Wales Ridge and surrounding counties have been converted to agriculture or urban development. The remaining habitat is fragmented into small parcels and in many cases, isolated. For this reason, existing populations are in need of protection from a variety of threats.
- S2.1. Acquire or otherwise protect privately owned habitat through acquisition, conservation easements, or agreements with landowners.** *D. frutescens* has been found on the right-of-way of Highway 27. Here working with the DOT on management needs, such as altering mowing schedules until after flowering and seed set, should be explored.
- S2.2. Protect populations on public lands.** Develop management guidelines that allow for a fire regime that fosters a mosaic of successional stages.
- S2.3. Use local or regional planning to protect habitat.** Utilize available regional and county planning processes to encourage protection of suitable, unoccupied, and occupied habitat of *D. frutescens*.
- 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. frutescens*.
- 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. frutescens* 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. frutescens* lives.
- S2.5.1. Initiate section 7 consultation when applicable.** Initiate section 7 consultations when Federal activities may affect this species.
- S2.5.2. Enforce take and trade prohibitions.** This species is protected by take provisions of the ESA (including its prohibition against removing and reducing to possession any endangered plant from areas under Federal jurisdiction; maliciously damaging or destroying any such species on any such area; or removing, cutting, or digging up any such species), by the Preservation of Native Flora of Florida Act, and by the Florida rules regarding removal of plants from State lands.
- S2.6. Augment natural populations of *D. frutescens*.** Augmentation of populations on protected land is appropriate because there is little prospect for protecting additional sites.

- 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. frutescens* and identify protected lands, both public and private, that will be suitable habitat.
- S2.6.3. Reintroduce plants to protected sites.** Use plants under cultivation to re-establish plants in suitable habitat.
- S3. Continue research on life history characteristics of *D. frutescens*.** Although recent work on *D. frutescens* can be used to infer answers to some life history questions, much of the basic biology and ecology of this species remains poorly understood. To effectively recover this species more specific biological information is needed.
- S3.1. Continue research to determine demographic information, such as numbers of sites and populations, numbers of individuals in a population, pollinators, dispersal, growth, survival, and mortality.**
- S3.2. Assess genetic variability for the genus *Dicerandra*.** Work on this topic is underway. *Dicerandra* species are taxonomically difficult to distinguish without genetic work.
- S3.3. Once demographic data are known, conduct population viability and risk assessment analysis to determine the numbers of plants, sites, subpopulations/populations, and spatial distribution needed to ensure persistence of the species.**
- S3.4. Conduct research to assess management requirements of *D. frutescens*.** Determine which natural populations can be stabilized or increased by habitat management. Surveys, research, and monitoring at *D. frutescens* sites, will provide information about 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 well provide to land managers and close coordination among land managers is essential to develop adaptive management techniques.
- S4. Monitor existing and reintroduced populations of *D. frutescens*.**
- S4.1. Develop monitoring protocol to assess population trends for *D. frutescens*.**
- 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. frutescens*.** Assess any changes in demographic characteristics of *D. frutescens* in response to land management activities, such as prescribed fire, exotic plant control, etc. At present, the burn frequency for this species is unknown. Though *D. frutescens* grows more vigorously in areas burned within the last 10 years, it can be found in areas that were last burned from 3 to 65 years.ago More information is needed on the role of fire for this species.

- S4.2. Develop a quantitative description of the population structure of *D. frutescens*.** 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 valuable in future management actions.
- S4.3. Monitor reintroduced 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, reevaluate protocol and methodology.
- S5. Provide public information about *D. frutescens*.** 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. frutescens*.
- 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. frutescens* and other rare species require 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 two protected sites for *D. frutescens*.
- H1.1. Secure habitat through acquisition, landowner agreements, and conservation easements.** With so little xeric scrub habitat left, any method of securing protected populations should be sought.
- H1.2. Manage and enhance habitat.** Manage habitat to maintain *D. frutescens* 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 are necessary to construct a natural fire landscape. The scrub is naturally made up of islands of suitable and unsuitable habitat. To repeat this landscape pattern, sites should be burned as a mosaic when possible to allow for variation.
- H1.2.2. Control and eliminate exotic and invasive plants and animals.** Exotic plant and animal species are not yet a major threat in Florida scrub as compared to other communities in South Florida. However, in isolated areas, exotic species are becoming established. Without control, exotic/invasive plants may become a threat to the survival and recovery

of *D. frutescens*.

- H1.2.3. Control access to areas where listed plants are growing.** Trampling, trash dumping, and off-road vehicles can severely threaten individual populations. Research has shown that *D. frutescens* recovers from disturbance only by reseeding. As such, this species is very sensitive to trampling and other types of frequent disturbance.
- H2. Restore areas to suitable habitat.** Native habitats that have been disturbed or that have experienced a long history of fire suppression may be good candidates for future reserves.
- H2.1. Restore natural fire regime.** Long periods without fire can change the species composition and the ability of the site to carry fire. Rehabilitation of a site may be a lengthy process, but with fewer and fewer sites remaining, these sites may become more valuable for future recovery. On these sites a seed bank may exist that could include rare endemic species.
- H2.2. Enhance sites with native plant species.** Because of logging or long periods without fire, certain native plant species that were present historically may now be absent from the natural composition of the community. These species can be reintroduced if natural colonization is not possible.
- H3. Conduct habitat-level research projects.** Study the response of *D. frutescens* to various land management practices, such as prescribed fire regimes, vegetative thinning, and control of exotic/invasive vegetation.
- H4. Monitor habitat/ecological processes.** Monitor the effects of land management actions, such as prescribed fire, exotic plant control, *etc.*, on the habitats where *D. frutescens* occurs.
- H5. Provide public information about scrub and its unique biota.** Educational efforts, especially those conducted by Archbold Biological Station, have been successful. Without these successful efforts, the Lake Wales Ridge NWR would not have been created. Florida's system of biological preserves depends on a broad base of public understanding and support for its funding and future success. In addition to past and ongoing educational efforts by The Nature Conservancy, Bok Tower Gardens, and Archbold Biological Station, future efforts by these organizations, and the Florida Park Service, the Florida Division of Forestry, the SFWMD, the Florida Native Plant Society, and local garden clubs are crucial in increasing public appreciation of scrub and high pine communities, and their associated plant species. The Arbuckle Appreciation Day sponsored by the Florida Division of Forestry has been especially successful in disseminating knowledge about these unique communities.

