

Varronia bellonis and identified its distribution as mountain-sides in the vicinity of Maricao. Liogier and Martorell (1982) stated that the species distribution was the mountain slopes and serpentine hills in northwestern districts of Puerto Rico. Proctor (1991) reported only 4 individuals of *Cordia bellonis* from Cain Alto Ward in the Maricao Commonwealth Forest. Breckon and Kolterman (1993) reported 87 individuals at 17 localities in three areas in Maricao. Half of the localities consist of isolated individuals.

The species was reported for the first time in Susúa in 1992, where a small population of 5 individuals was found (Breckon and Kolterman 1993). *Cordia bellonis* was also unknown from the Río Abajo Commonwealth Forest until 1994 (Federal Highway Administration and Puerto Rico Highway and Transportation Authority 1994). Approximately 116 individuals were found in 12 localities. Eighty-seven (75 percent) of these individuals were removed to a nursery (for possible transplantation) because of the construction of the road PR 10 (PR Highway and Transportation Authority 1995).

Cordia bellonis has been found in serpentine soils at Maricao and Susúa at road edges, river margins, and on steep slopes (Breckon and Kolterman 1993). In Río Abajo Forest, the species was found either on sunny banks along dirt roads growing in thickets of vegetation or in open saddles between limestone hills (Federal Highway Administration and Puerto Rico Highway and Transportation Authority 1994).

Cordia bellonis is an arching to erect shrub of about 1 to 2 meters (3.3 to 6.6 feet) high with very slender twigs appressed-puberulous. The leaves are alternate, oblong to oblong-lanceolate, chartaceous, 2 to 6 centimeters (0.79 to 2.36 inches) long, usually 2.5 to 3 times longer than wide, finely scabrous on upper side, and puberulous beneath. The apex is acute, the base acute or obtuse, the margins are dentate on the apical third, and the petioles are 2 to 7 millimeters (0.08 to 0.28 inches) long. The inflorescence is axillary, subglomerate, nearly sessile, and few-flowered. The calyx in bud is globose-obovoid, 2 millimeters (0.08 inches) long, appressed-puberulous, and with 4 triangular lobes. The corolla is white with 4 subcylindric lobes. The drupe is ovoid, pointed and 5 millimeters (0.20 inches) in length (Proctor 1991). Flowers are unisexual and the plants are dioecious (Breckon and Kolterman 1993).

The species is threatened by habitat destruction and modification, forest

management practices, and restricted distribution. Seventy-five percent of the individuals known from Río Abajo Commonwealth Forest were removed from the forest for the construction of a highway. Breckon and Kolterman (1994) reported that 14 individuals from Maricao appeared to have been eliminated due to clearing along the roadside of the forest. Restricted distribution and its dioecious condition would be a limiting factor for the species. The dioecious condition would require outcrossing, and would pose a threat to a rare plant species.

Furthermore, in a large number of the localities where the species is found, the shrub occurred as isolated individuals.

Cordia bellonis was designated a category 2 candidate species (species for which information in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which sufficient data on biological vulnerability and threat are not currently available to support proposed rules) in the Federal Register notice of review for plant taxa dated September 30, 1993 (58 FR 51144). The species was recommended for listing by Proctor (1991) in a Status Report prepared for the species. In further studies conducted for the species, Breckon and Kolterman (1993) also recommended the species for listing. *Cordia bellonis* is considered a critical plant by the Natural Heritage Program of the Puerto Rico Department of Natural and Environmental Resources.

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to *Cordia bellonis* Urban [*Varronia bellonis* (Urban) Britton], are as follows:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

Destruction and modification of the habitat may be one of the most significant factors affecting the numbers and distribution of *Cordia bellonis*. This species is only known from three areas in Puerto Rico; Maricao, Susúa, and Río Abajo. In Maricao, the species is found at 17 localities in three areas, for a total of 87 individuals. Fourteen of these individuals have been eliminated due to

clearing along the roadside. Half of the localities consist of isolated individuals. The dioecious condition of the species would be a factor limiting reproduction by these individuals. Because the majority of these individuals occur along both sides of two public roads, maintenance of road sides, as well as fires and vandalism, would result in the loss of these individuals.

In Susúa, a small population of only 5 individuals was found in 1992. The species was previously unknown from this area. This small population may be affected by forest management practices. *Cordia bellonis* was also unknown from the Río Abajo forest until 1994. Approximately 116 individuals were found in 12 localities. The localities, each consisting of no more than a few individuals, were scattered along a proposed highway. All the individuals along the proposed route have been removed for possible future transplantation (87 individuals). An area designated for compensation (mitigation) for the proposed highway presently supports eight of the remaining 29 individuals from the original population (116 individuals). The species is also known from a private landholding where extraction of fill material for the construction of the road will likely result in the loss of these plants. The rareness and restricted distribution make this species very vulnerable to habitat destruction and modification.

B. *Overutilization for commercial, recreational, scientific, or educational purposes.* Taking for these purposes has not been a documented factor in the decline of this species.

C. *Disease or predation.* Disease and predation have not been documented as factors in the decline of this species.

D. *The inadequacy of existing regulatory mechanisms.* The Commonwealth of Puerto Rico has adopted a regulation that recognizes and provides protection to certain Commonwealth listed species. *Cordia bellonis*, however, is not yet on the Commonwealth list. Federal listing would provide immediate protection and, if the species is ultimately placed on the Commonwealth list, enhance its protection and possibilities for funding needed for research.

E. *Other natural or manmade factors affecting its continued existence.* Two significant factors affecting this species are its limited distribution and dioecious condition. The limited distribution of this species makes it particularly vulnerable to extinction from catastrophic events and local land management practices. As a dioecious plant, *Cordia bellonis* requires