

to a lack of basic knowledge about the species (USFWS 1988). Instead the recovery plan concentrated on the major actions believed necessary to recover *Frankenia johnstonii*. These actions included maintenance of known populations through landowner cooperation and habitat management, provision of permanent Service or conservation group protection of at least one site, establishment of populations in botanical gardens, obtaining biological information needed to effectively manage the species, and developing public support for the preservation of the species. Among the potential threats to *Frankenia johnstonii* identified in the recovery plan were habitat modification by land management practices that included overgrazing, blading, and bulldozing. The recovery plan also recognized the risk of population losses from intensive land uses and non-specific habitat alterations, including a variety of construction activities. The low reproductive potential of this species was considered another threat to its continued existence since the restricted number of individual plants was thought to imply a small gene pool with limited variability, thereby potentially diminishing the species' ability to tolerate stress and threats (USFWS 1988). Since 1993, intensive surveys in Webb, Zapata, and Starr Counties in South Texas, as well as additional information from Mexico have shown this species to be more widespread and abundant than was previously known (Janssen 1999).

At the time it was listed, *Frankenia johnstonii* was known from only four sites in Texas, two each in Zapata and Starr Counties, and from one locality in Mexico. When the recovery plan for this species was finalized in 1988, seven populations (including the original five) had been identified, all occurring on private land. At that time, the six Texas populations were encompassed within a 56-kilometer (km) (35-mile (mi)) radius, with the population in Mexico located approximately 201 km (125 mi) to the west. Since 1988, the discovery of new populations has extended the species' range to north and west of Laredo in Webb County, farther east in Zapata County, and farther south in Starr County. Currently a total of four

populations are known from Mexico. Three of the four populations in Mexico are in relatively close proximity to one another along Highway 53 in the State of Nuevo Leon, while the fourth population location extends the species' range north-northeast to the vicinity of Nuevo Laredo in western Tamaulipas (Janssen 1999).

Frankenia johnstonii was first collected by Dr. D. S. Correll in 1966 in Zapata County, Texas, about 40 km (25 mi) northeast of San Ygnacio, and soon thereafter at a second site in Starr County, just east of El Sauz (Correll and Johnston 1970). The continued existence of *Frankenia johnstonii* at Correll's first site was confirmed by Poole in 1986, and the population at the second site was revisited by Poole, Turner, and Whalen at various times (USFWS 1988). The species was also found in 1966 by A. D. Wood in the hills northeast of Roma, Starr County (USFWS 1988). In 1967, Correll found a second Zapata County population about 8 km (5 mi) south of Zapata. Although Whalen was unable to relocate the Roma population during her doctoral research, she did relocate Correll's second Zapata County population (USFWS 1988). Collectors James Everitt and R. J. Fleetwood found *Frankenia johnstonii* at a site approximately 21 km (13 mi) north of Roma, Starr County, in 1974. Four different investigators had revisited this population by 1986 (USFWS 1988). In 1971, Turner identified what he considered to be a new species of *Frankenia* from a location 100 km (62 mi) northwest of Monterrey, Mexico, and named it *Frankenia leverichii* (Turner 1973). Whalen later studied specimens from this population as part of her doctoral research on the genus *Frankenia* and concluded that it was not distinct from *Frankenia johnstonii* (Whalen 1980), thus this was the single Mexican population referenced in the listing rule and the recovery plan.

An intensive status survey and study of ecological and biological characteristics of *Frankenia johnstonii* was conducted by Texas Parks and Wildlife Department (TPWD) botanist Gena Janssen between 1993 and 1999. The final report for this 6-year study contained documentation for 58 populations of *Frankenia johnstonii* in

the U.S. and 4 in Mexico (Janssen 1999). Four of the 62 total populations reported by Janssen (1999) were part of the 7 populations referenced in the recovery plan. The results of this recent status survey have dramatically increased the known numbers of individual plants, from approximately 1,500 at the time of listing to greater than 9 million by 1999. The TPWD status survey resulted in an expansion of the species' known range to the northwest, east and south in Texas, and to the north of the previously known location in Mexico (Janssen 1999).

All 58 U.S. populations of *Frankenia johnstonii* identified in Janssen's 1999 report occur primarily on private land, but a portion of one population in Starr County is located on a Lower Rio Grande Valley National Wildlife Refuge (LRGVNWR) tract. A second population occurs, partially, in the Texas Department of Transportation's (TDOT) Highway 83 right-of-way in Zapata County. A third population, found growing on three private ranches in western Zapata County, also extends onto land below the 307-foot elevation mark adjacent to Falcon Reservoir. All property below this elevation mark is controlled by the International Boundary and Water Commission (IBWC). A fourth population, also in close proximity to Falcon Reservoir, may also be on IBWC-controlled land but Janssen was unable to determine exact land ownership for this population (Janssen 1999).

Using Pavlik's suggested method of deriving an estimated minimum viable population size (MVP) (Pavlik 1996), we calculated that approximately 2,000 individual plants may constitute a conservative estimate for a *Frankenia johnstonii* MVP. We used this estimated MVP to evaluate the distribution of known *Frankenia johnstonii* populations in relation to threats to those sites. Table 1 displays the numbers of small, intermediate-sized, and large populations in each Texas county and in Mexico, grouped with the smallest populations numbering below the calculated MVP, the intermediate-sized populations containing between 2,000 to 5,000 plants, and the largest populations consisting of greater than 5,000 individuals.

TABLE 1.—NUMBER AND LOCATION OF SMALL, INTERMEDIATE-SIZED AND LARGE FRANKENIA JOHNSTONII POPULATIONS

Number of individual plants	Starr County, TX	Zapata County, TX	Webb County, TX	Mexico
Less than 2,000	5	16	1	1
Between 2,000 and 5,000	1	6	2	1
Greater than 5,000	1	13	4	0