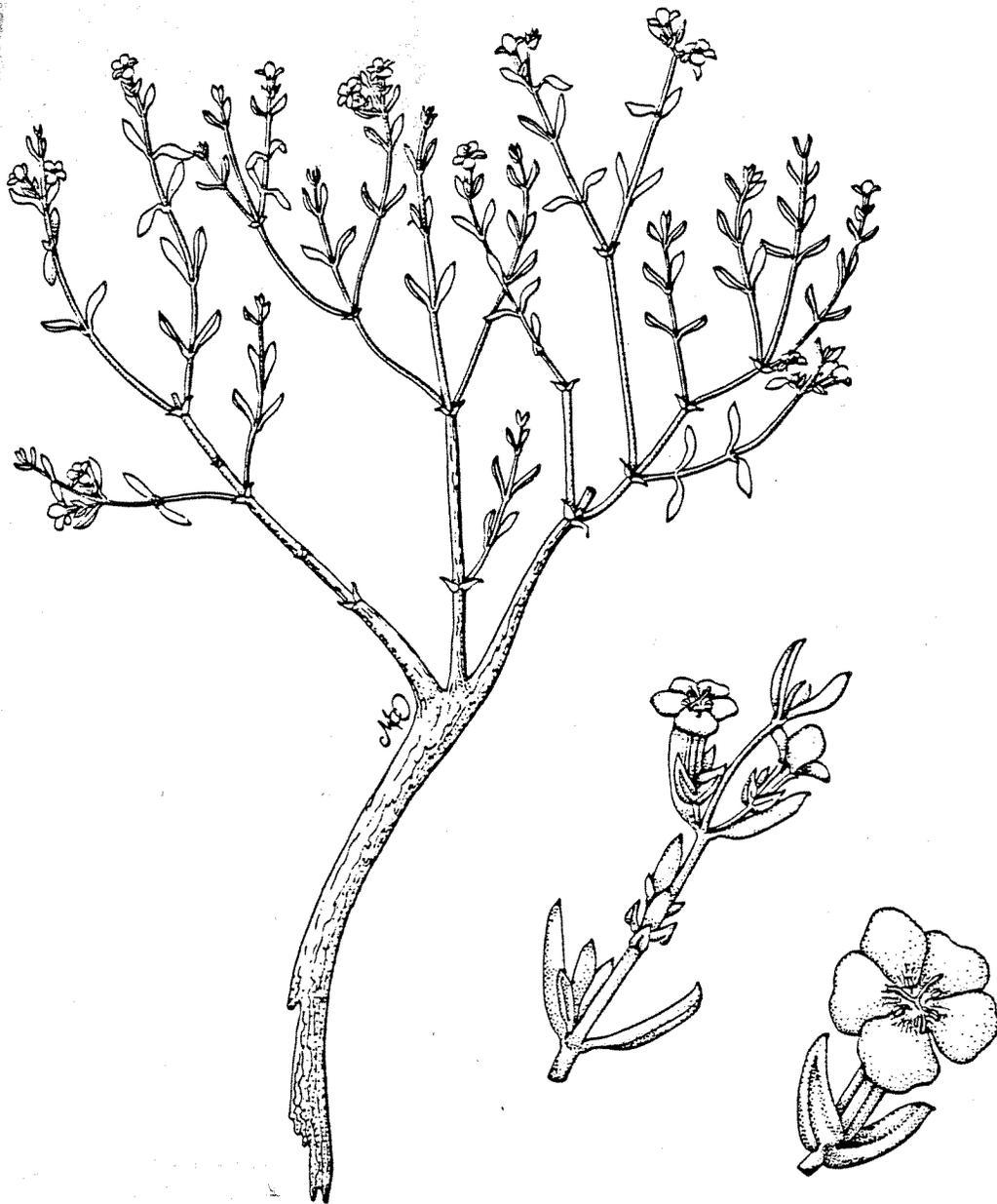


JOHNSTON'S FRANKENIA

(*Frankenia johnstonii*)

RECOVERY PLAN



U.S. Fish and Wildlife Service
Albuquerque, New Mexico

1988

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(Frankenia johnstonii Correll)

RECOVERY PLAN

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Albuquerque, New Mexico

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Date: 5/24/88

DISCLAIMER

This is the completed Johnston's Frankenia Recovery Plan. It has been approved by the U.S. Fish and Wildlife Service. It does not necessarily represent official positions or approvals of cooperating agencies and does not necessarily represent the views of all individuals who played a role in preparing this plan. This plan is subject to modification as dictated by new findings, changes in species status, and completion of tasks described in the plan. Goals and objectives will be attained and funds expended contingent upon appropriations, priorities, and other constraints.

Literature Citations should read as follows:

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SUMMARY

- Goal:** To remove Johnston's frankenia from the Federal list of endangered and threatened species by managing the species and its habitat in a way that will assure the continued existence of self-sustaining wild populations.
- Recovery Criteria:** Quantified criteria for down-listing and/or delisting Johnston's frankenia have not yet been determined. The implementation of studies in this recovery plan will provide the necessary data from which quantified downlisting and/or delisting criteria can be established.
- Actions Needed:** Major steps needed to recover Johnston's frankenia include: maintaining present populations through landowner cooperation and habitat management; providing permanent U.S. Fish and Wildlife Service or conservation group protection for at least one site; establishing populations in botanical gardens; obtaining biological information needed for effective management; and developing public support for preservation of Johnston's frankenia.

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PART I

INTRODUCTION

Brief Overview

Johnston's frankenia, Frankenia johnstonii Correll, was listed as an endangered species on August 7, 1984 (USFWS 1984). This species is known from Starr and Zapata Counties in south Texas, and from Nuevo Leon, Mexico. No other members of the genus Frankenia are presently listed as threatened or endangered, nor are any included as candidates for listing (USFWS 1985). In addition to being listed by the Federal Government, Johnston's frankenia is also listed as endangered by the State of Texas.

The objective of this plan is to outline steps to recover Johnston's frankenia by achieving long-term stability of its populations in the wild, and by removing and preventing threats to the species and its habitat. Attainment of these goals will lead to the ultimate objective of removal of Johnston's frankenia from the list of threatened and endangered species.

This plan begins with background information on the status of Johnston's frankenia including taxonomy, morphology, habitat, associated species, past and present distribution, land ownership, threats, and conservation efforts. This background is

followed by a step-down outline and narrative that provide information on recovery tasks to reduce threats to the species and protect its habitat. The final section of this plan contains an implementation schedule that lists the recovery tasks, their priorities for accomplishment, agencies involved, and estimated costs.

Taxonomy

Johnston's frankenia (frankenia family: Frankeniaceae) was first collected by Dr. D. S. Correll in 1966 in Zapata County, Texas. Later that year he described the new species naming it in honor of Dr. M. C. Johnston (Correll 1966). In 1973, Dr. B. L. Turner described Frankenia leverichii as a new species from Nuevo Leon, Mexico. Dr. M. A. Whalen in her 1980 Ph.D. dissertation on the genus Frankenia, reduced Frankenia leverichii to synonymy under Frankenia johnstonii.

Morphology

Low somewhat sprawling shrub to 3 dm (11.8 in.) tall, 1.5-6 dm (5.9-23.6 in.) across, with a woody taproot 4-12 cm (1.6-4.7 in.) long, and a woody caudex 0.9-2.5 cm (0.4-1.0 in.) in diameter giving rise to several to many ascending or recurved stems, the entire plant grayish- or bluish-green; stems sub-herbaceous, 0.5-1.5 mm (.02-.06 in.) in diameter, moderately to

densely short-pilose, hairs appressed, incurved; internodes 4-10 mm (.16-.4 in.) long; long-shoot leaves distinctly petiolate, the petioles 0.7-2.2 mm (.03-.09 in.) long, 0.3-0.6 mm (.01-.02 in.) wide, slightly winged with the membranous pubescent wings united around the node; leaf-blades oblanceolate, narrowly obovate, or oblong-elliptic, 4-10.5 mm (.16-.41 in.) long, 1.4-4 mm (.06-.16 in.) wide, rounded at base, minutely apiculate at the rounded apex, the margins somewhat revolute, surfaces gray-green, abaxial surface thinly canescent with spreading to appressed, incurved hairs, adaxial surface sparsely short-pilose with antrorsely appressed or incurved hairs; short-shoot leaves borne in fascicles of 2(-6) similar to long-shoot leaves; flowers sessile and solitary or less commonly in dichasia with 1 order of branching bearing 2-3 flowers; peduncles 1.5-5 (-8) mm [.06-.20 (-.31) in.] long; floral bracts leaf-like, 2.5-7 mm (.10-.28 in.) long, blades oblong-elliptic to elliptic, connate at the base into subequal verticils of 4, enveloping lower portion of the calyx for 0.5-0.8 mm (.02-.03 in.); calyces tubular, dilated slightly toward the base, abruptly tapering at very base, indurate, 3.8-6.5 mm (.15-.26 in.) long, 1.2-2 mm (.05-.08 in.) wide, moderately to densely short-pilose, hairs antrorsely appressed and incurved, lobes 5, narrowly triangular, spreading, 1.5-2.5 mm (.06-.10 in.) long; petals 5(-6), spatulate, 6-10 mm (.24-.39 in.) long, white, occasionally with a pink tinge, clawed, with rounded erose-dentate apices; stamens (5-)6(-12), in 2 subequal whorls, 3.5-6.8 mm (.14-.27 in.) long, exerted,

anthers 0.8-1.4 mm (.03-.06 in.) long, yellow, pollen bright yellow; style 3.5-6 mm (.14-.24 in.) long, exerted, white, style-branches 3, filiform, 1.8-2.5 mm (.07-.10 in.) long, one-third to one-half the style length; capsules narrowly ovoid, 2.8-3.5 mm (.11-.14 in.) long, 1.2-1.4 mm (.05-.06 in.) wide, golden-brown, closely enveloping solitary seed; seeds elongate-ovoid, 2.1-3.1 mm (.08-.12 in.) long, 0.8-1.4 mm (.03-.06 in.) wide (Whalen 1980; Correll and Johnston 1970).

Habitat

Johnston's frankenia generally grows on open or sparsely vegetated rocky gypseous hillsides or saline flats. The Texas populations occur in the mesquite-blackbrush brush community (McMahan et al. 1984) within the South Texas Plains vegetation zone (Gould 1975). Whalen (1980) calls this region the Tamaulipan Scrub. The population in Mexico occurs in the matorral xerofilo (Rzedowske 1978), in the transition zone between the Tamaulipan Scrub and the Chihuahuan Desert (Whalen 1980).

Overall, Johnston's frankenia is found on saline sandy or clayey soils having a high gypsum content (an average of 10%). The Zapata county population northeast of San Ygnacio occurs on the Maverick-Catarina soil association (primarily saline, gypsiferous, or saline clays) (Soil Conservation Service 1971;

Thompson et al. 1972). The Zapata County population south of Zapata occurs on the Zapata-Maverick soil association (Zapata soils are very shallow loams over caliche; Maverick soils are saline clays) (Soil Conservation Service 1971; Thompson et al. 1972). The soil at this site was tested by Whalen (1980) and found to be 28 percent clay, 45 percent silt, 21 percent sand, and 6 percent larger particles. The gypsum content was 0.2 percent.

The Starr County populations occur on three soil series: the Copita fine sandy loam, the eroded Maverick soils (saline clays), and the saline Montell clay (Thompson et al. 1972). The eroded Maverick soils at the site north of Roma were tested by Whalen (1980) and found to have a composition of 77 percent silt, 20 percent sand, and 3 percent larger particles. The gypsum content here was 11.7 percent.

Soil at the Mexican locality had a composition of 55 percent silt, 41 percent sand, and 4 percent larger particles. The gypsum content here was 39 percent (Whalen 1980).

Most of the Johnston's frankenia locations are on the Jackson Group geologic formation, which consists of Eocene sandstones and clays (Bureau of Economic Geology 1975a and 1976b). However, one locality occurs on the Laredo Formation (Eocene

sandstones and clays), and another occurs on Rio Grande floodplain alluvium (Holocene clay, silt, sand, gravel, and organic matter) (Bureau of Economic Geology 1976a). In general, the Mexican locality occurs in an area of Cenozoic and Mesozoic marine sediments (principally limestone, shale, and marl) (Rzedowske 1978).

The elevation of populations varies from 77 meters (250 feet) in Starr County to 155 meters (510 feet) at the northernmost locality in Zapata County. The elevation of the Mexican locality is about 762 meters (2500 feet).

Precipitation in the area between Laredo and Rio Grande City averages 51 centimeters (20 inches) per year, with a high in August through October (September being the highest) and a lesser peak in May and June (Bomar 1983). Droughts are common.

In Laredo, the average date of the last freeze is February 10, and the average date of the first frost is December 2 (Bomar 1983). For the area between Laredo and Rio Grande City the average annual low temperature is 16°C (61°F) and the average annual high temperature 29°C (85°F) (Bomer 1983). The average annual temperature is 23°C (73°F) (Larkin and Bomar 1983). The winds in Laredo blow primarily from the southeast (Larkin and Bomar 1983).

Associated Species

Most of the species found with Johnston's frankenia are adapted to the saline and gypseous soils. The common species at the Texas sites are:

saladillo	<u>Varilla texans</u>
seepweed	<u>Suaeda</u> sp.
gray coldenia	<u>Tiquilia canescens</u>
Drummond's jimmy-weed	<u>Isocoma drummondii</u>
whorled dropseed	<u>Sporobolus pyramidatus</u>
guayacan	<u>Porlieria angustifolia</u>
scented lippia	<u>Lippia graveolens</u>
mesquite	<u>Prosopis glandulosa</u>
blackbrush	<u>Acacia rigidula</u>
Texas pricklypear	<u>Opuntia leptocaulis</u>
dog cactus	<u>Opuntia schottii</u>
Heyder mammillaria	<u>Mammillaria heyderi</u>
horsecripler	<u>Echinocactus texensis</u>
claretcup cactus	<u>Echinocereus triglochidiatus</u>

In Mexico, Johnston's frankenia occurs with the following halophytes and gypsophiles:

pickleweed	<u>Allenrolfea</u> sp.
fourwing saltbush	<u>Atriplex canescens</u>
sartwellia	<u>Sartwellia</u> sp.
winged sesuvium	<u>Sesuvium verrucosum</u>
Johnston's machaeranthera	<u>Machaeranthera johnstonii</u>
greggia	<u>Nerisyrenia gracilis</u>
bahia	<u>Bahia</u> sp.
pitchfork	<u>Dicranocarpus</u> sp.
moonpod	<u>Selinocarpus</u> sp.

Past and Present Distribution

Frankenia johnstonii (Figure 1) was first collected by Dr. D. S. Correll on March 16, 1966, in Zapata County about 25 miles (40 kilometers) northeast of San Ygnacio. A visit to this site by Jackie M. Poole in April 1986, confirmed that the population is still extant. On March 17, 1966, Correll collected the species in Starr County just east of El Sauz. This site has been visited by several workers including Poole, Dr. B. L. Turner, and Dr. M. A. Whalen.

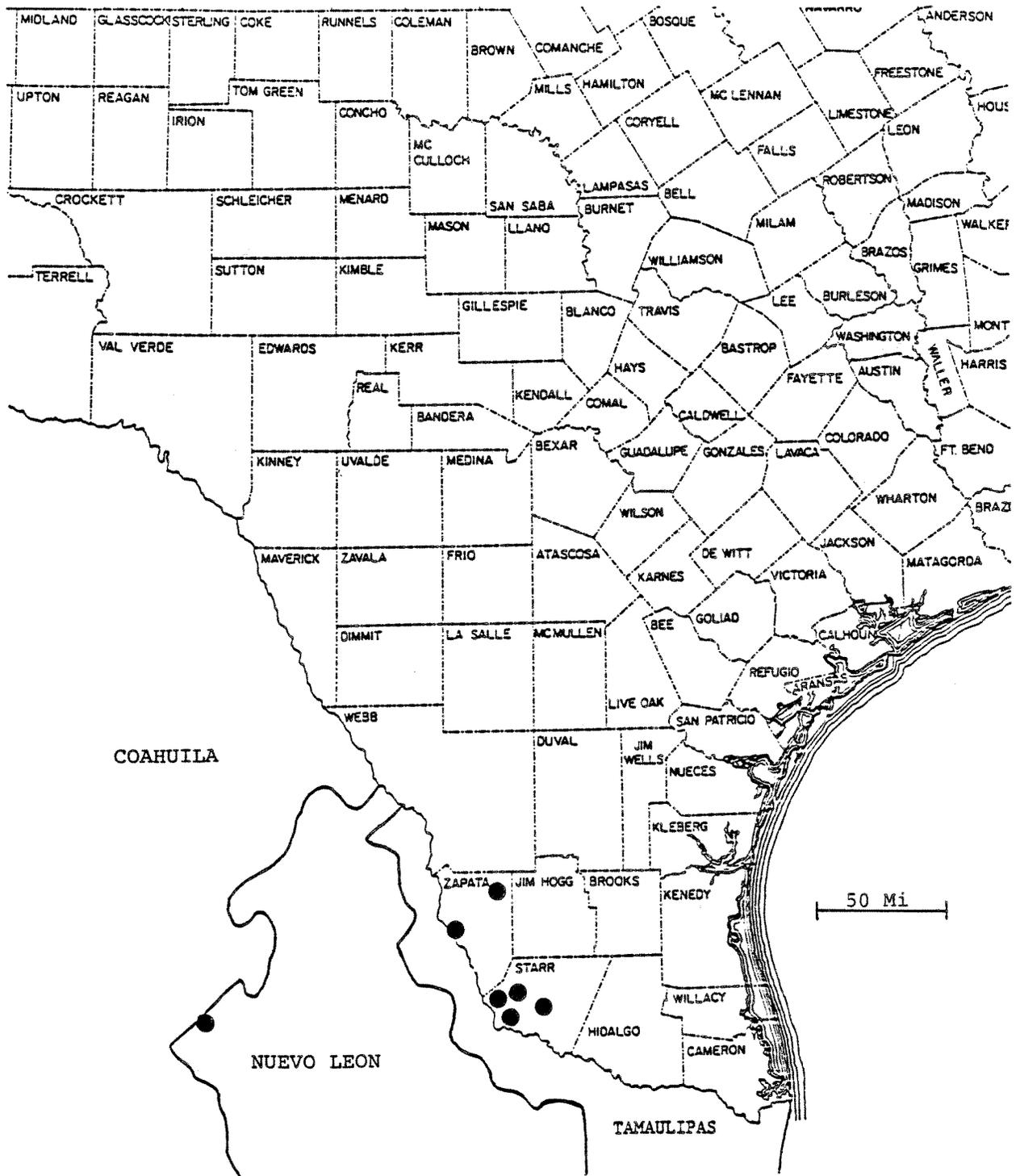


Figure 1. Distribution of *Frankenia johnstonii*.

In 1966, A. D. Wood discovered the species in the hills northeast of Roma in Starr County. Whalen searched for this population during her doctoral work but could not locate it. Correll found a second Zapata County population in 1967 about 5 miles (8 kilometers) south of Zapata. Whalen relocated this population in 1978.

In 1974, James Everitt and R. J. Fleetwood both collected Frankenia johnstonii in Starr County, about 13 miles (21 kilometers) north of Roma on the Loma Blanca road. Drs. Marshall Johnston, Turner, and Whalen, and Jackie M. Poole have all visited this population. Everitt has spent many years working for the U.S. Department of Agriculture in the Starr/Zapata County area. He has traveled the region widely without discovering any populations other than the one north of Roma (Turner 1980).

In April 1986, Poole found a population of two plants in Starr County. The site, the only such area checked, was located by using the Starr County Soil Survey (Thompson et al. 1972) to find areas of eroded Maverick soil.

In 1971, Dr. B.L. Turner and several graduate students discovered a new species of Frankenia, Frankenia leverichii, in Mexico, 100 kilometers (62 miles) northwest of Monterrey (Turner 1973). During her doctoral research on Frankenia, Whalen studied the species and visited the site. She concluded that Frankenia

leverichii is not a distinct species, being only slightly different from Frankenia johnstonii.

Land Ownership

All the Johnston's frankenia sites are in private ownership. Complete landowner information is available from the U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, New Mexico.

Impacts and Threats

Threats to the survival of Frankenia johnstonii range from its own inherent biological characteristics to habitat modification and destruction. These threats include the small number of individuals, the restricted distribution, the low reproductive potential, and the impacts of heavy grazing and land management practices such as blading and dozing.

Currently, there are approximately 1500 plants with no more than a few hundred plants in any of the populations. Such low numbers imply a small gene pool with limited variability, which could diminish the capacity of the species to tolerate stresses and threats.

Scattered populations and disjunct distributions are common in the genus Frankenia (Whalen 1980). The six Texas populations are all within a 35-mile radius, and the Mexican population is about 125 miles to the west (Figure 1). The species occurs in highly specialized habitats with relatively high salt or gypsum content. Although these specialized sites are presently only used for grazing, any intensive land uses such as road construction, oil and gas activities, or gypsum mining could rapidly destroy the limited habitats available for Johnston's frankenia. Also any widespread, non-specific habitat modification such as reservoir construction or residential development could destroy areas where the species occurs.

The reproductive potential of Frankenia johnstonii is low. In the natural habitat seed set is less than 50% (Turner 1980) and seedlings are rarely observed. In the El Sauz population seen by Poole, 16 out of 20 plants had woody growth indicating that the population contains mostly older plants.

Heavy grazing has several detrimental affects on Johnston's frankenia. The tender new growth is eaten by cattle, giving the plants a clipped or hedged appearance; this browsing may be in part responsible for the lowered reproductive rate. Large numbers of cattle trample young plants or seedlings and soil compaction may make germination difficult. At the El Sauz site, Poole noted that Johnston's frankenia was always growing among or

very near other shrubs perhaps indicating a need for protection from browsing or trampling.

Shrubs invading a pasture are often eradicated mechanically (dozing, blading, chaining, disking, etc.) or chemically (herbicides). After clearing, the land is usually reseeded with highly competitive species such as buffelgrass or bermuda grass. These practices are devastating to Johnston's frankenia.

Conservation and Research Efforts

Currently, there are no protected sites for Frankenia johnstonii. The Texas Natural Heritage Program has added one of the populations to its list of sites suggested for protection.

While studying the New World species of Frankenia for her dissertation, Dr. M. A. Whalen did much research on Frankenia johnstonii (Whalen 1980). In addition to studying taxonomic relationships, Whalen examined the soils (at three different sites), conducted germination studies, recorded flower visitors, and reviewed the breeding system.

PART II

RECOVERY

Primary Objective

The primary objective of this recovery plan is to protect and manage the essential habitat of Frankenia johnstonii so existing natural populations can be sustained at levels where the species can be downlisted to threatened and eventually delisted. At this time limited data make it impossible to quantify habitat and plant abundance with the precision needed to establish quantified downlisting and delisting criteria. Information must be acquired on specific habitat requirements, population biology, and population ecology. Continued searches of potential habitat are needed to establish the precise limits of the species' distribution and determine its specific habitat requirements. When the existing threats to Johnston's frankenia are removed, this plan will be reevaluated to: 1) determine if either downlisting to threatened or delisting are practical goals, and if so, 2) establish quantified criteria for delisting.

Step-down Outline

1. Manage the existing plants and habitats by removing and preventing threats.

11. Protect the existing habitat in the United States.
 111. Identify essential habitat required for the species' continued existence.
 112. Contact landowners.
 1121. Work with landowners of essential habitat to help them become aware of the importance of the plants and the habitat.
 1122. Work with landowners on various land management practices.
 1123. Fence essential habitat sites with landowner permission.
 113. Obtain permanent protection of at least one site.
12. Protect the existing habitat in Mexico.
13. Apply data from the study of life history and ecology to remove and prevent threats inherent from the species' biological and ecological characteristics.
14. Develop a management plan.
15. Monitor populations.
16. Establish downlisting and delisting criteria.
2. Study the life history and ecology of Johnston's frankenia.
 21. Determine precise habitat requirements.
 211. Edaphic factors.
 212. Local microclimate.
 213. Air and water quality requirements.
 214. Physiographic and topographic characteristics.

- 215. Vegetation physiognomy and community structure.
- 216. Frequently associated species.
- 217. Dominance and frequency.
- 218. Successional phenomena.
- 219. Dependence on natural disturbance.
- 22. Study population biology.
 - 221. Demography.
 - 222. Phenology.
 - 223. Reproductive biology.
 - 2231. Types of reproduction.
 - 2232. Pollination biology.
 - 2233. Seed dispersal.
 - 2234. Seed biology.
 - 2235. Seedling ecology.
 - 2236. Survival and mortality.
- 23. Study population ecology.
 - 231. Positive and neutral interactions.
 - 232. Negative interactions.
- 3. Search potential habitat for additional populations.
- 4. Establish populations at botanical gardens.
- 5. Develop public awareness, appreciation, and support for the preservation of Johnston's frankenia.

Narrative

1. Manage the existing plants and habitats by removing and preventing threats.

One of the main objectives of a recovery plan is to remove and prevent threats to the species and its habitat. Both are presently threatened by habitat destroying land management practices, heavy grazing, low numbers of individuals, restricted distribution, and low reproductive potential. In order for the species to survive and increase in its natural habitat, threats must be removed and prevented by managing both the habitat and the species.

11. Protect the existing habitat in the United States.

If Johnston's frankenia is to be maintained in nature, suitable habitat must also be maintained. Because the majority of the populations are in the United States, these should have highest priority for protection.

111. Identify essential habitat required for the species continued existence.

The amount of land, including a buffer zone, needed for the survival and expansion of the known populations should be delineated. The buffer zone would include the area with potential influence on the populations. Identification of

essential habitat will help in developing management plans and in working with landowners and other concerned agencies.

112. Contact landowners.

Landowners should be identified. They should be notified of the species' presence, its exact locality on their land, and the effect of State and Federal endangered species laws.

1121. Work with landowners of essential habitat to help them become aware of the importance of the plants and the habitat. Private landowners play a crucial role in protecting endangered species. They should be made aware of the importance of the species and the need to preserve the habitat. Landowners should be offered photographs, status reports, and recovery plans to better inform them about the species. Information brochures such as those available from various conservation groups that detail the importance of species preservation and biological diversity should be sent to landowners.

1122. Work with landowners on various land management practices.

Certain land management practices such as brush clearing and introduction of exotic species are detrimental to Johnston's frankenia. Brush clearing whether by mechanical methods such as blading, dozing, chaining, root-plowing, or disking, or by chemical means (herbicides) destroys the habitat and the species. Grasses such as the exotic buffelgrass introduced for pasture improvement outcompete most other species. Livestock grazing in greater than recommended numbers changes species composition, modifies the habitat through erosion, and causes soil compaction through trampling. Landowners of the essential habitat should be encouraged to avoid such practices and offered alternatives.

1123. Fence essential habitat sites with landowner permission.

With landowner permission, essential habitat sites should be fenced to keep them from being grazed and trampled by

livestock. Fencing would also keep the species from being inadvertently destroyed.

113. Obtain permanent protection of at least one site.

At least one site should be protected by the U.S. Fish and Wildlife Service or other appropriate conservation agency and managed to permanently protect the species and its habitat from any present or future threats. Protection may take the form of acquisition, easement, or conservation agreement.

12. Protect the existing habitat in Mexico.

Although the U.S. Fish and Wildlife Service has no jurisdiction over species and habitats in Mexico, efforts should be made to contact appropriate agencies and conservation groups, inform them of the species, and cooperate with them in protection.

13. Apply data from the study of life history and ecology to remove and prevent threats inherent from the species' biological and ecological characteristics.

After the population biology, population ecology, and habitat preferences have been studied, the data can be used to increase numbers of individuals, increase the

number of populations, and improve the reproductive potential.

14. Develop a management plan.

A plan should be developed to return the habitat to its natural state, and maintain and expand the present populations. This plan should address the known threats (land management techniques, heavy grazing, low numbers of individuals, restricted distribution, and low reproductive potential), and employ the data from the life history and ecology studies in formulating additional management needs.

15. Monitor populations.

The known populations should be visited at least once a year to evaluate any population changes, especially among age classes. Attributes discussed in the population biology section of this outline should be recorded, and the overall reproductive success of each population noted. This information will be used to update the management plan as needed.

16. Establish downlisting and delisting criteria.

Once more is learned about the ecological and life history requirements of the species, and the success of management can be determined, this plan will be reevaluated and if appropriate, quantified downlisting and delisting criteria will be established.

2. Study the life history and ecology of Johnston's frankenia.

Many aspects of the life history and ecology of Johnston's frankenia are unknown, or poorly understood. Precise habitat requirements, population biology, and population ecology studies are needed to better understand and maintain populations of Johnston's frankenia.

21. Determine precise habitat requirements.

Although some habitat preferences of Johnston's frankenia are known, the majority of the habitat requirements are not entirely clear. By acquiring data on a variety of habitat criteria, the precise requirements can be elucidated. This information can be used in the management plan, in the location of previously unknown populations, and in the identification of suitable sites for establishing populations.

211. Edaphic factors.

Only three of the sites have had the soil analyzed. The following characteristics should be recorded for all sites: soil texture, soil moisture and drainage, presence and thickness of litter layer, Soil Conservation Service classification, pH, parent material, bedrock type, depth to bedrock or impermeable pan, percentage of rock cover and percentage of rock throughout soil profile, structure and porosity, soil-water potential, chemical composition, nutrient status and presence of toxic elements.

212. Local microclimate.

A weather station should be established at the northern Zapata County site. This is the known northern limit of the species. Measurements should include temperature, precipitation, wind direction and velocity, and light intensity. Climate data within this report was taken at Laredo and Rio Grande City.

213. Air and water quality requirements.

Most of the populations are near small creeks or drainages, and therefore could be influenced by

water quality. The effect of air quality on the species is unknown.

214. Physiographic and topographic characteristics.

The relief, elevation range, geologic formations, slope and aspect, and watershed or drainage basin should be determined and compared for all the sites occupied by Johnston's frankenia. An overall profile should be developed.

215. Vegetation physiognomy and community structure.

The local vegetation type and the community structure (trees, shrubs, forbs; open, closed, etc.) should be described for each population both in its present state, and if presently disturbed, in its undisturbed state. The latter can probably be only roughly inferred. An overall profile for the species should be developed.

216. Frequently associated species.

A plant list for each population site should be compiled. The lists should be compared and species common to all lists should be noted.

217. Dominance and frequency.

The percentage cover and the frequency of Johnston's frankenia should be calculated for each community where the species occurs. The dominance and frequency of the other associated species should also be calculated and the sites should be compared to see if a pattern is evident.

218. Successional phenomena.

Colonizing ability, tolerance to disturbance, shade tolerance, and growth on unstable substrates should be determined to decide the preferred seral stage of Johnston's frankenia.

219. Dependence on natural disturbance.

Assessment should be done to determine whether Johnston's frankenia depends on dynamic, periodic, and/or cyclic natural disturbances of climate (floods, droughts, temperature extremes), landforms (erosions, deposition), or biotic features (fires, insect population fluctuations, changes in associated species composition).

22. Study population biology.

Most aspects of the population biology of Johnston's frankenia are poorly known. Information gained from studies of these characteristics will be extremely valuable for management of the species.

221. Demography.

Population expansion or decline should be evaluated by recording such details as population area, number of individuals, age or size classes of individuals, density, presence of dispersed seeds, and evidence of reproduction.

222. Phenology

Patterns and times of budding, leafing, flowering, fruiting, seed or fruit dispersal, senescence, and germination should be calculated for all populations. This information would be useful for determining times of easy field identification. The phenology should also be compared to climatic events to determine any correlations.

223. Reproductive biology.

An understanding of the various components of the

species' reproductive biology is necessary for the management of healthy populations.

2231. Types of reproduction.

Methods of reproduction (outbreeding, inbreeding, cloning, and other methods of an asexual reproduction), plant age at reproduction, and the importance of each type of reproduction should be characterized.

2232. Pollination biology.

Pollination mechanisms, agents, additional visitors, and the vulnerability of pollinators to disturbance should be investigated.

2233. Seed dispersal.

Mechanisms and/or agents, vulnerability of mechanisms or agents to disturbance, and dispersal patterns should be examined.

2234. Seed biology.

Amount and variation of production, viability, longevity, dormancy requirements, germination requirements,

and percentage germination should be determined for the species. This data should be collected both in the field and laboratory.

2235. Seedling ecology.

Factors affecting the growth and development of seedlings such as light, moisture, nutrients, and soil disturbance should be investigated.

2236. Survival and mortality.

Causes of mortality and at what life stages they occur should be recorded.

23. Study population ecology.

Knowledge of the interaction of Johnston's frankenia with other species will be important for developing a management plan, expanding natural populations, and growing plants in cultivation.

231. Positive and neutral interactions.

The obligatory or facultative relationships between Johnston's frankenia and other plants or animals should be examined.

232. Negative interactions.

Herbivores, predators, parasites, diseases, intra- or interspecific competitors, and toxic and allelopathic interactions with other organisms should be identified.

3. Search potential habitat for additional populations.

Data from the various studies of life history and ecology can be employed to form a profile of Johnston's frankenia potential habitat. Discovering additional populations could make habitat protection less critical and provide new management information. A greater number of individuals and populations in less threatened habitats could influence any decisions to downlist or delist the species. Any additional populations should be monitored the same as the known populations.

4. Establish populations at botanical gardens.

Much biological information can be obtained most easily from a botanical garden collection. In addition, a permanent, well documented, and accessible botanical garden collection, together with appropriate seed banking, would provide an important source of material for non-destructive research, maintenance of wild populations, and public awareness.

5. Develop public awareness, appreciation, and support for the preservation of Johnston's frankenia.

The general public should be made aware of Johnston's frankenia and encouraged to support its preservation.

Conservation groups, garden clubs, and various organizations concerned with endangered species could be enlisted to help.

Talks, slide shows, and local and statewide newspaper or magazine articles would be useful.

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PART III

IMPLEMENTATION SCHEDULE

The following Implementation Schedule outlines actions and costs for the Johnston's frankenia recovery program. It is a guide to meeting the objectives elaborated in Part II of this plan. This schedule indicates the general category for implementation, recovery plan tasks, corresponding outline numbers, task priorities, duration of tasks ("on-going" denotes a task that once begun should continue on an annual basis), which agencies are responsible to perform these tasks, and lastly, estimated costs for Fish and Wildlife Service tasks. These actions, when accomplished, should bring about the recovery of Johnston's frankenia and protect its habitat. It should be noted that monetary needs for agencies other than Fish and Wildlife Service are not identified and therefore, the Implementation Schedule may not reflect the total financial requirements for recovery of this species.

General Categories for Implementation Schedule

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contamination
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Mgmt. Agrt.
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

Recovery Action Priorities

- 1 = an action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
- 2 = an action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.
- 3 = all other actions necessary to provide for full recovery of the species.

Abbreviations Used

- FWS - USDI Fish and Wildlife Service
 CCES - Corpus Christi Ecological Services
 Field Office
 RE - Realty

PART III - IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task #	Priority #	Task Duration	Responsible Agency			Fiscal Year Costs (EST)*			COMMENTS		
					FWS	Other	Region	Program	Other	FY 1		FY 2	FY 3
M7	Identify essential habitat	111	2	3 years	2	CCES			1,000	1,000	1,000		
M3	Make landowners aware of plants and habitat	1121	1	1 year	2	CCES			750				
M3	Work with landowners on land management practices	1122	1	Ongoing	2	CCES			500	500	500		
M3	Fence sites with landowner permission	1123	1	1 year	2	CCES			5,000	1,000			
A7	Obtain permanent protection of at least one site	113	2	2 years	2	CCES RE			5,000	1,000			
O4	Protect habitat in Mexico	12	2	3 years	2	CCES			1,000	1,000	1,000		
M3	Prevent inherent biological threats	13	2	Ongoing	2	CCES			2,500	2,500	2,500		
M7	Develop a management plant	14	2	1 year	2	CCES			500				

*Costs refer to USFWS expenditures only.

PART III - IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task #	Priority #	Task Duration	Responsible Agency			Fiscal Year Costs (EST)*			COMMENTS
					FWS		Other	FY 1	FY 2	FY 3	
					Region	Program					
I1	Monitor populations	15	2	Ongoing				1,000	1,000	1,000	
O4	Establish down-listing and de-listing criteria	16	3	1 year	2	CCES				250	
I3	Determine habitat requirements	211-219	2	3 years	2	CCES		7,500	7,500	7,500	
I6	Study demography	221	2	5 years	2	CCES		2,000	2,000	2,000	
I14	Study phenology	222	2	3 years	2	CCES		1,000	1,000	1,000	
I14	Study reproductive biology	2231-2236	2	3 years	2	CCES		5,000	5,000	5,000	
I14	Study population ecology	231-232	2	3 years	2	CCES		5,000	5,000	5,000	
I14	Search for additional populations	3	2	2 years	2	CCES		2,000	2,000		
I7	Establish populations in botanic gardens	4	2	Ongoing	2	CCES		4,000	4,000	4,000	
O1	Develop public awareness	5	2	Ongoing	2	CCES		1,000	1,000	1,000	

*Costs refer to USFWS expenditures only.

APPENDIX

List of Reviewers

A technical/agency review draft of the Johnston's Frankenia Recovery Plan was sent to the following individuals and agencies on December 10, 1986.

Ms. Jackie Poole, Texas Natural Heritage Program, Austin, TX

Mr. Gerard Hoddenbach, National Park Service, Santa Fe, NM

Dr. William Mahler, Southern Methodist University, Dallas, TX

Mr. David Riskind, Texas Parks and Wildlife Department, Austin, TX

Mr. Gary Valentine, U.S. Soil Conservation Service, Temple, TX

Dr. Richard Worthington, The University of Texas at El Paso, El Paso, TX

Dr. Elray Nixon, Stephen F. Austin State University, Nacogdoches, TX

Mr. Andrew Sansom, The Texas Nature Conservancy, San Antonio, TX

Dr. Allan Zimmerman, Chihuahuan Desert Research Institute, Alpine, TX

Mr. Harold Beaty, Temple, TX

Mr. Paul Cox, San Antonio Botanical Gardens, San Antonio, TX

Dr. Francis Thibodeau, The Center for Plant Conservation, Jamaica Plain, MA

Executive Director, Texas Parks and Wildlife Department, Austin, TX

Regional Supervisor, Realty, U.S. Fish and Wildlife Service, Region 2

Field Supervisor, Ecological Services, Corpus Christi Field Office, U.S. Fish and Wildlife Service, Region 2

Director (AFA/OES), Office of Endangered Species, U.S. Fish and
Wildlife Service, Washington, D.C.

Director (WR), Division of Research, U.S. Fish and Wildlife
Service, Washington, D.C.

Comments Received

Comment letters are reproduced in this section followed by the Service's response to each comment. Some reviewers submitted comments marked directly on the draft plan or submitted comments by phone. These comments have not been reproduced.

3. The recovery objectives for the threatened bunched cory cactus and Lloyd's Mariposa cactus have interim goals of 10,000 individuals and 20,000 individuals, respectively. Why is the interim goal for the Lloyd's cactus double that of the bunched cory cactus?
4. All maps and drawings should include a scale to better depict size and distance. A-3
5. Most of the plans do not quantify the primary objective. This should be done if at all possible. A-4

I hope these comments are useful as you prepare the final draft of these recovery plans for the Regional Director's approval. Upon his approval, notify the Office of Endangered Species, 500 Broyhill Building, and provide them with 30 copies of the printed plan when it is available.

Ronald E. Lamberton

Attachments

TEXAS NATURAL HERITAGE PROGRAM
 GENERAL LAND OFFICE
 STEPHEN F. AUSTIN BUILDING
 1700 NORTH CONGRESS AVENUE
 ROOM 619
 AUSTIN, TEXAS 78701
 (512) 463-5299
 1-800-252-RARE

January 7, 1987

Dr. Charlie McDonald
 U.S. Fish and Wildlife Service
 Endangered Species Office
 P.O. Box 1306
 Albuquerque, New Mexico 87013

Dear Charlie,

Thank you for allowing me the opportunity to comment on the recovery plan for Frankenia johnstonii.

After I wrote the recovery plan, I visited three sites including one new locality. Thus there are now seven known sites; six in Texas with four being in Starr County. The number of sites should be altered throughout the plan. Additional changes required are given below.

In the Past and Present Distribution section, the second sentence ("Apparently this site has not been revisited") should instead be: "The author revisited this population in April 1986." In the third paragraph of this section, 12 miles should be 13 miles. The last sentence in this paragraph should be changed to : "Dr. Marshall Johnston, Turner, Whalen and the author have all visited this population." Figure 1 needs to have the new population added (see attached map). The following paragraph should be inserted between the fourth and fifth paragraphs of this section. "In April 1986, the author found a small population of Frankenia johnstonii in Starr county. The site was located by using the Starr County Soil survey to find eroded Maverick soil areas. The only such area checked had two plants."

B-1

B-2
 B-3
 B-4

B-5

B-6

In the Recovery Narrative, the weather station (p.23) should be established at the northern Zapata County locality. This is also the known northern limit of the species.

B-7

Sincerely,



Jackie M. Poole
Botanist, Texas Natural Heritage Program

attachment

JMP:mt

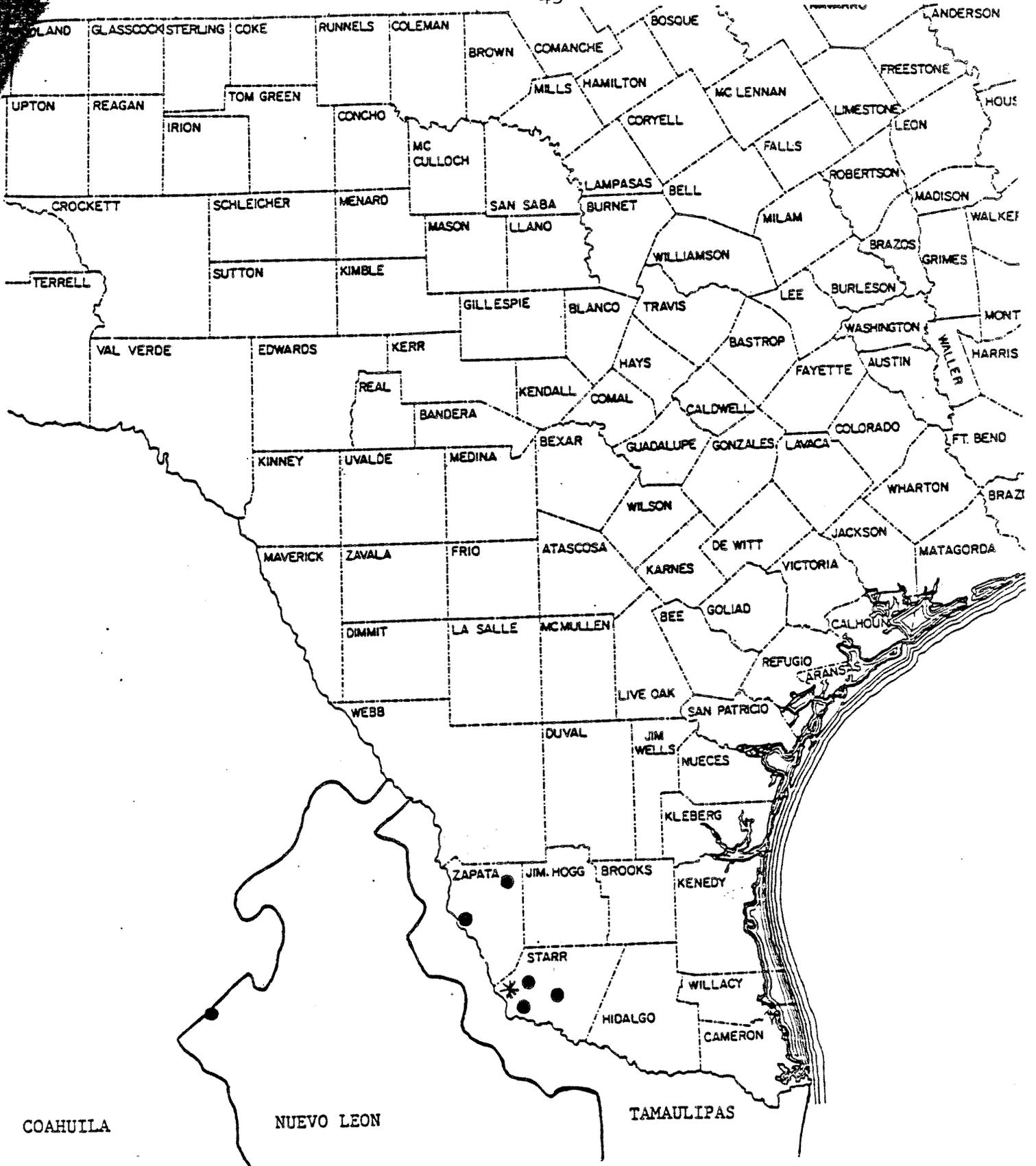


Figure 1. Distribution of *Frankenia johnstonii*.



TEXAS
PARKS AND WILDLIFE DEPARTMENT
4200 Smith School Road Austin, Texas 78744

End. Sp. R-2
JOHNSTON
✓
Barton
Dallas
Galveston
Houston
Lubbock
Marathon
Midland
Odessa
San Antonio
San Diego
San Marcos
Victoria
Waco
Weslaco
Wichita Falls
Willsiepe
Wynne
Yantis
Sanchez
FILE

- RD _____
- DRD _____
- ABA _____
- AFF _____
- ARW _____
- AWE _____
- ALE _____
- APA _____
- AHR _____
- CHARLES D. TRAVIS
Executive Director
- File **SE**
- Action _____
- CL _____

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Laredo

DR. RAY E. SANTOS
Lubbock

January 21, 1987

Mr. Conrad A. Fjetland
Assistant Regional Director
United States Department of the Interior
Fish and Wildlife Service
Post Office Box 1306
Albuquerque, N. M. 87103

Re: Recovery plans for Johnston's frankenia, Texas snowbells, slender rush-pea, and ashy dogwood.

Dear Mr. Fjetland:

The Texas Parks and Wildlife Department has reviewed the four referenced U. S. Fish and Wildlife Service technical/agency draft recovery plans.

All four plants are listed as endangered by the U. S. Fish and Wildlife Service and by the Texas Parks and Wildlife Department. These plant species exist only in very limited numbers and locations. They are also endangered by a variety of problems, such as invading exotic grasses, browsing by wild and domestic animals, and limited reproduction.

The four recovery plans appear to provide the guidance and priorities needed to protect and/or augment populations of the four species.

D-1

Sincerely,

Charles D. Travis
Executive Director

CDT:LER:tj

FWS REG 2
RECEIVED

JAN 30 '87

SE

REC'D
FWS-Region 2

JAN 30 1987

AFF



Responses to Comments

- A-1 Collecting is not considered a threat to Johnston's frankenia so it is believed that the locality information in this plan will not cause any additional risk to the species.
- A-2 The Implementation Schedule has been reviewed to ensure that recovery task priorities are appropriate.
- A-3 Suggestion has been incorporated.
- A-4 For many endangered plants with restricted distributions and low numbers, too little is known about their reproduction and ecological requirements to establish any realistic numerical goals for downlisting or delisting. This plan contains a task to establish numerical goals once adequate biological information is available.
- B-1 The change has been made.
- B-2 The change has been made.
- B-3 The change has been made.
- B-4 The change has been made.
- B-5 The change has been made.
- B-6 The change has been made.
- B-7 The change has been made.
- C-1 Comment noted.
- C-2 Because some non-technical readers may not be familiar with metric measurements, both metric measurements and English equivalents have been used throughout the plan.
- C-3 Suggestion has been followed.
- D-1 Comment noted.
- E-1 Comment noted.