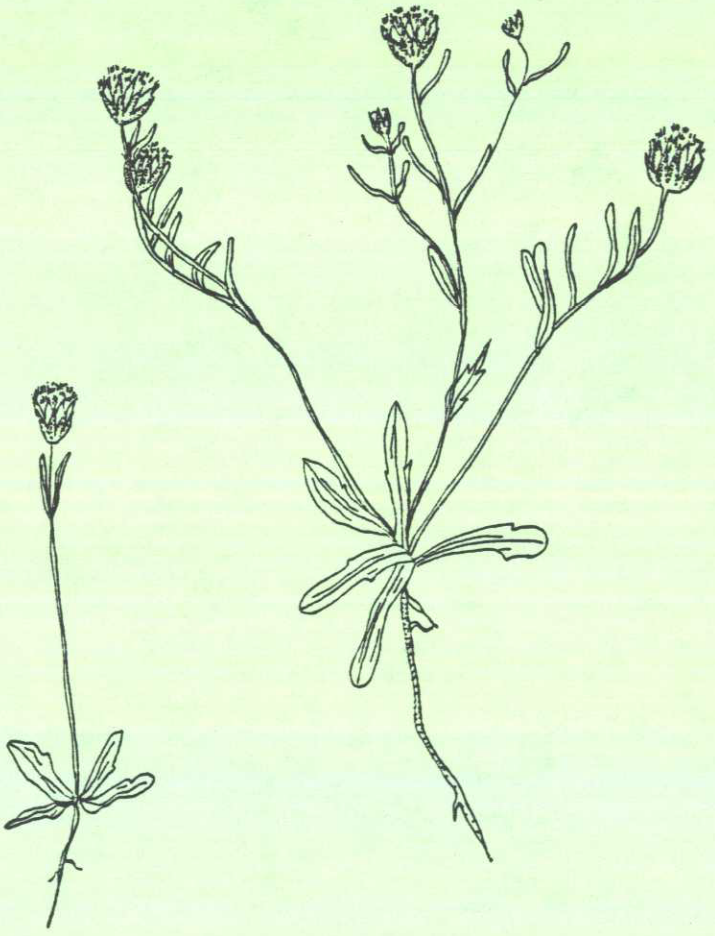
HYMENOXYS TEXANA RECOVERY PLAN



U.S. Fish and Wildlife Service

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HYMENOXYS TEXANA

RECOVERY PLAN

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DISCLAIMER

This is the completed Hymenoxys texana 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.

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SUMMARY

Goal: To remove Hymenoxys texana from the Federal list of endangered and threatened species by managing this species and its habitat in a way that will assure the continued existence of self-sustaining wild populations.

Recovery Criteria: Hymenoxys texana can be downlisted to threatened when at least 50 separate populations, each occupying at least 1 hectare (2.47 acres) of suitable habitat are discovered or established, and when these 50 populations are protected from land use practices or land use changes that could destroy the populations. Hymenoxys texana can be delisted when management practices are established that ensure the numbers of plants at protected populations will remain stable. Since many questions about the biology and habitat requirements of Hymenoxys texana remain unanswered, it may be necessary to modify the downlisting and delisting criteria as additional information is obtained.

Actions Needed: Major steps needed to recover Hymenoxys texana include: maintaining present populations on public lands through effective agency planning and habitat management; maintaining present populations on private lands through landowner cooperation and habitat management; studying propagation and establishing a botanical garden population; searching for additional populations; establishing additional populations in natural habitat, if needed; obtaining biological information needed for effective management; and developing public support for preservation of Hymenoxys texana.

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PART I

INTRODUCTION

Brief Overview

Hymenoxys texana was Federally listed as an endangered species on March 13, 1986 (USFWS 1986). It is also listed as endangered by the State of Texas. Extant populations of this species are know only from western Harris and extreme eastern Fort Bend Counties, Texas. No other members of the genus Hymenoxys are presently listed as threatened or endangered, but three species in the genus are under review for possible listing (USFWS 1985).

The objective of this plan is to outline steps to recover Hymenoxys texana by achieving long-term stability of native populations and by removing and preventing threats to the species and its habitat.

This plan begins with background information on the natural history and status of Hymenoxys texana including taxonomy, morphology, habitat, associated species, distribution, abundance, land ownership, threats, and conservation efforts. This information is followed by a step-down outline and detailed narrative of measures that should be taken to recover the species. The final section of this plan contains an implementation schedule that lists the recovery tasks, their priorities, responsible agencies, and estimated costs.

Taxonomy

Hymenoxys texana (Coulter & Rose) Cockrell, is a member of the Helenieae tribe of the sunflower family (Asteraceae). F. W. Thurow collected the first specimens in 1889 and 1890 near Hockley in Harris County, Texas. Coulter and Rose (1891) described these plants as a new species and placed them in the genus Actinella. Greene (1898) separated the Actinella taxa with free phyllaries into the genus Tetraneuris and placed those with united outer phyllaries into the genus Picradenia. Thus, Hymenoxys texana became Picradenia texana (Coulter & Rose) Greene. Cockrell (1904) recognized Tetraneuris as a distinct genus but could not separate the North American Picradenia species from the genus Hymenoxys of South America. He, therefore, united Picradenia with Hymenoxys and transferred Hymenoxys texana into its present genus. The only specimens available to these early workers were the Thurow collections of 1889 and 1890. Hymenoxys texana was not collected again until 1981 when James Kessler discovered a few small populations north of Cypress in Harris County (Mahler 1982 and 1983).

Kittie F. Parker (1970) prepared a treatment of Hymenoxys for the Manual of the Vascular Plants of Texas. In the manual, her concept of Hymenoxys included those species that lie within the limits of Greene's Tetraneuris. Recently (1981), Parker proposed that the taxa formerly assigned to Tetraneuris do indeed deserve recognition in their own genus. In this classification, Hymenoxys texana, because of its united outer bracts, remains within the genus Hymenoxys sensu stricto.

The relationship of Hymenoxys texana to four annual temperate South American species of Hymenoxys has yet to be thoroughly investigated. Three of these South American taxa lack ray flowers and perhaps one or more of them is the near relative of Hymenoxys texana, which has minute rays. A taxonomic treatment of the South American taxa is available (Parker 1962), and Sanderson (1973) reported the basic chromosome number of n = 15 for all four South American species.

The North American Hymenoxys most similar to Hymenoxys texana is the annual species, Hymenoxys odorata, but the prominent long ray flowers and the deeply pinnately divided leaves of Hymenoxys odorata easily distinguish it from Hymenoxys texana.

Strother (1961) counted the chromosomes of ten species of North American Hymenoxys senus lato and found a base number of X = 15 for both the subgenus Tetraneuris and the subgenus Hymenoxys. A descending aneuploid series of n = 15, 14, 12, and 11 is recorded within the species Hymenoxys odorata (Sanderson and Strother 1973). Kessler and Hatch (1984) reported a chromosome count of 2n = 16 for one population of Hymenoxys texana. Strother and Brown (1988) found meiotic numbers of n = 3 and somatic numbers of 2n = 6 in seven populations of Hymenoxys texana. Meiotic figures show two large and one small bivalent. This remarkable aneuploid reduction with loss of gametic numbers 15 through 4, except for the report of n = 8 from one population, is probably correlated with the ecological specialization and the resulting rarity of Hymenoxys texana.

Morphology

Non-technical

Plants annual 3.5–18 cm (1.4–7.1 in.) high with several divergent branches arising from a rosette of basal leaves. Basal leaves 1–15 mm (.04–.59 in.) wide, up to 4 cm (1.6 in.) long, widest toward the tip, margins with short teeth or lobes from mid-blade to tip. Stem leaves few, linear. Flower heads usually few, small. Bracts of flower heads in two series 5–6 mm (.16–.20 in.) long. Ray flowers minute and concealed by the bracts. Disk flowers yellow, 3–4 mm (.12–.16 in.) long. Fruits about 2 mm (.08 in.) long with 5 apical scales 1–2 mm (.04–.08 in.) long.

Technical

Plants annual with an elongated taproot. Stems erect, 3.5–18 cm (1.4–7.1 in.) high, rising from a rosette of somewhat fleshy leaves. Stems and leaves slightly to moderately densely pubescent with scale-like trichomes, these often forming chains of oval segments. Each plant consisting of a single stem or of 2–5 or more separate stems. Stems often divided 1–9 cm (.4–3.5 in.) above the base into two or more branches. Individual stems or branches terminated by a single flower head. Heads 1–35 or more per plant. Rosette leaves spathulate, triple-nerved on lower surface, 1–15 mm (.04–.59 in.) wide, to 4 cm (1.6 in.) long; margins pinnately lobed from mid-blade to tip; lobes blunt, 1–4 mm (.04–.16 in.) long; larger lobes with one or more smaller secondary lobes. Upper leaves smaller than rosette leaves; lowest stem leaf attached to stem 1–9 cm (.4–3.5 in.) above the base, often associated with the initial branch; larger mid-stem leaves with 1–4 marginal lobes; the lower

1–9 cm (.4–3.5 in.) portion of stem usually leafless. Upper leaves linear, entire. Upper and lower leaf surfaces glandular punctate. Immature flower heads bent downward in a gentle curve, erect at anthesis. Involucre 5–6 mm (.20–.24 in.) long, biseriate. Outer phyllaries 8, 4–5 mm (.16–.20 in.) long, a pale, thick, broad medial rib extends to about 1 mm (.04 in.) below the acute apex; the apex and upper margins green and flexible; lower 1 mm (.04 in.) portion rigid, strongly thickened and united; free above. Inner phyllaries 8, free, 5–6 mm (.20–.24 in.) long, entirely coriaceous, convergent in fruit, the acuminate apex often with a small purple blotch. Flower heads radiate; receptacle high-conical. Ray flowers minute, pistillate, mostly shorter than phyllaries and concealed by them; composed of two parts: lower portion a 1.5–2 mm (.06–.03 in.) long yellow tube with marginal trichomes; upper portion open, glabrous, 0.8–1 mm (.03–.04 in.) long, with three small white to yellow apical lobes. Disk flowers 3–4 mm (.12–.16 in.) long; ovary pubescent; corolla tube two-parted: lower portion a pale yellow (becoming green in age) tube, pubescent with marginal lines of ascending trichomes; upper part an expanded, glabrous, five-lobed, deep yellow tube surrounding the anthers. Achenes about 2 mm (.08 in.) long, compressed to four sided or somewhat terete, with ascending trichomes. Pappus scales 5, 1–2 mm (.04–.08 in.) long, glabrous, broadly to narrowly obovate; apex aristate. Chromosome number $2\underline{n} = 6$ (Strother & Brown 1988) from seven populations and $2\underline{n} = 16$ (Kessler & Hatch 1984) from one population. The chromosome count of $2\underline{n} = 16$ and one of the $2\underline{n} = 6$ counts came from the same site north of Cypress.

Habitat

The known sites of Hymenoxys texana are in Harris and Fort Bend Counties to the west of Houston. This region falls within the Gulf Prairies and Marshes Vegetation Area of Gould (1969).

Hymenoxys texana is found in small conspicuous sparsely vegetated areas of fine-sandy compacted soil. These bare spots are often present on the lower sloping portion of pimple (mima) mounds or on the level land around the mound's base. Pimple mounds are small (usually 10-50 feet in diameter) low (usually less than 12 inches high) mounds of sandier soil than the surrounding flat areas. Pimple mounds occur in the upper Gulf Prairies and are of unknown origin. Other bare spots occupied by Hymenoxys texana occur where soils have been severely disturbed in the past. These areas include abandoned rice fields, vacant lots, and pastures where the pimple mounds have been leveled. In all these circumstances, disturbance occurred long enough in the past that most of the land, except for the bare spots occupied by Hymenoxys texana, has returned to a complete cover of natural vegetation.

The soils in western Harris County where Hymenoxys texana occurs belong to the Hockley-Gessner and Katy-Aris associations of nearly level, loamy prairie soils. These soils have not been mapped in sufficient detail to identify the soil series for all the small Hymenoxys texana sites, but some sites occur on soil of the Narta series. The Narta series consists of nearly level somewhat poorly drained saline soils. These soils occur in marshes and were formed in ancient clayey coastal deposits. A test of soil samples from one Hymenoxys texana site north of Cypress

revealed a high concentration of salts in the light sandy soil of the bare spots and lower levels of the same salts in the adjacent darker soil where Hymenoxys texana was absent. Undoubtedly, soil salinity is one factor that prevents most plants from becoming established on the bare spots.

The bare spots are usually wet to moist during the cool months of winter and early spring, but they dry out to almost desert-like conditions during the hot summer. Hymenoxys texana and most other annual plants on these sites escape the desiccating summer conditions by completing their life cycles in the moist months of early spring. However, in the annual endemics Gutierrezia triflora (Thurovia) and Machaeranthera aurea (Houston machaeranthera) which occur with Hymenoxys texana flower and fruit production occur during the cooler fall months. Most Hymenoxys texana plants are dead by May with the principal period of flowering and seed maturation being from mid-March to mid-April. The few perennial plants on these sites include three succulents and some non-succulent grass and dicot species. The perennial and non-succulent Guilleminea lanuginosa (cottonflower) survives the dry summer by means of a deep root system.

Associated Species

A surprising number of taxa, including two other endemic species, Gutierrezia triflora and Machaeranthera aurea, and some species with their principal ranges to the west, are found with Hymenoxys texana. The following list of associated species was compiled by Larry Brown and Steve Young in the spring of 1987.

MONOCOTS	
Grasses	
Chloris subdolichostachys	Shortspike windmillgrass
Parapholis incurva	Sicklegrass
Spartina spartinae	Gulf cordgrass
Willkommia texana	Willkommia
Vulpia octoflora	Sixweeks fescue
Panicum hallii var. filipes	Filly panicum
Hordeum pusillum	Little barley
Eragrostis secundiflora	Lovegrass
Sporobolus indicus	Smutgrass
Schedonnardus paniculatus	Tumblegrass
Sporobolus pyramidatus	Whorled dropseed
Agrostis elliottiana	Annual bentgrass
Herbs	
Cyperus aristatus	Bearded flatsedge
Northoscordum bivalve	False onion
DICOTS	
Annuals	
Helenium amarum	Bitterweed
Iva angustifolia	Narrowleaf sumpweed
Plantago elongata	Slender plantain
Plantago aristata	Bottlebrush plantain
Plantago hybrida	Plantain
Chaetopappa asteroides	Leastdaisy
Lepidium ruderale	Pepperweed

Ammoselinum butleri	Sandparsley
Hedyotis rosea	Rose bluet
Elatine brachysperma	Waterwort
Machaeranthera aurea	Houston machaeranthera
Cleomella angustifolia	Rhombopod
Krigia occidentalis	Western dwarf-dandelion
Oenothera spachiana	Evening primrose
Oenothera linifolia	Threadleaf sundrops
Centunculus minimus	Chaffweed
Linum imbricatum	Tufted flax
Gratiola flava	Golden hedgehyssop
Euphorbia spathulata	Warty spurge
Hedeoma hispida	Mock pennyroyal
Limnosciadium pumilum	Dog-sunshade
Sabatia campestris	Meadow pink
Sagina decumbens	Pearlwort
Gutierrezia triflora	Thurovia
Evax verna	Common evax
Rumex hastatulus	Heart-wing sorrell
Tillaea aquatica	Pigmy-weed

Perennials

Succulents

Opuntia compressa	Eastern prickley pear
Talinum parviflorum	Prairie flameflower
Portulaca pilosa	Purslane
Portulaca umbraticola	Purslane

Non-succulents

Callirhoe involucrata	Wine-cup
Guilleminea lanuginosa var. tenuiflora	Cottonflower
Evolvulus sericeus	Silky evolvulus
Sida ciliaris	Bracted sida

Distribution, Abundance, and Land Ownership

F. W. Thurow made the first collections of Hymenoxys texana near Hockley in Harris County in 1889 and 1890. These were the only specimens available until 1981 when the species was rediscovered north of Cypress in Harris County by James Kessler. Since no specimens were collected for almost 100 years, the species was reported as "probably extinct" by Correll and Johnston (1970), as "extinct" by Ayensu & DeFilipps (1978), and also as "extinct" by the Soil Conservation Service (1982). Currently, some 21 extant localities are known, all west of Houston in Harris and Fort Bend Counties (Figure 1).

The original paper by Coulter and Rose reported an additional specimen, mounted with the Palmer no. 742 sheet of Actinella odorata (US), from between the Nueces and Frio Rivers on the Old San Antonio Road in LaSalle County, Texas. This location is 230 miles disjunct and in a different vegetational area than the known sites in Harris and Fort Bend Counties. An examination of the Palmer no. 742 sheet by R. B. Faden in 1981 revealed no specimen of Hymenoxys texana mounted on it meaning the presence of the LaSalle County specimen has not been confirmed since Coulter and Rose reported it in 1900. Also, Toney M. Keeney of

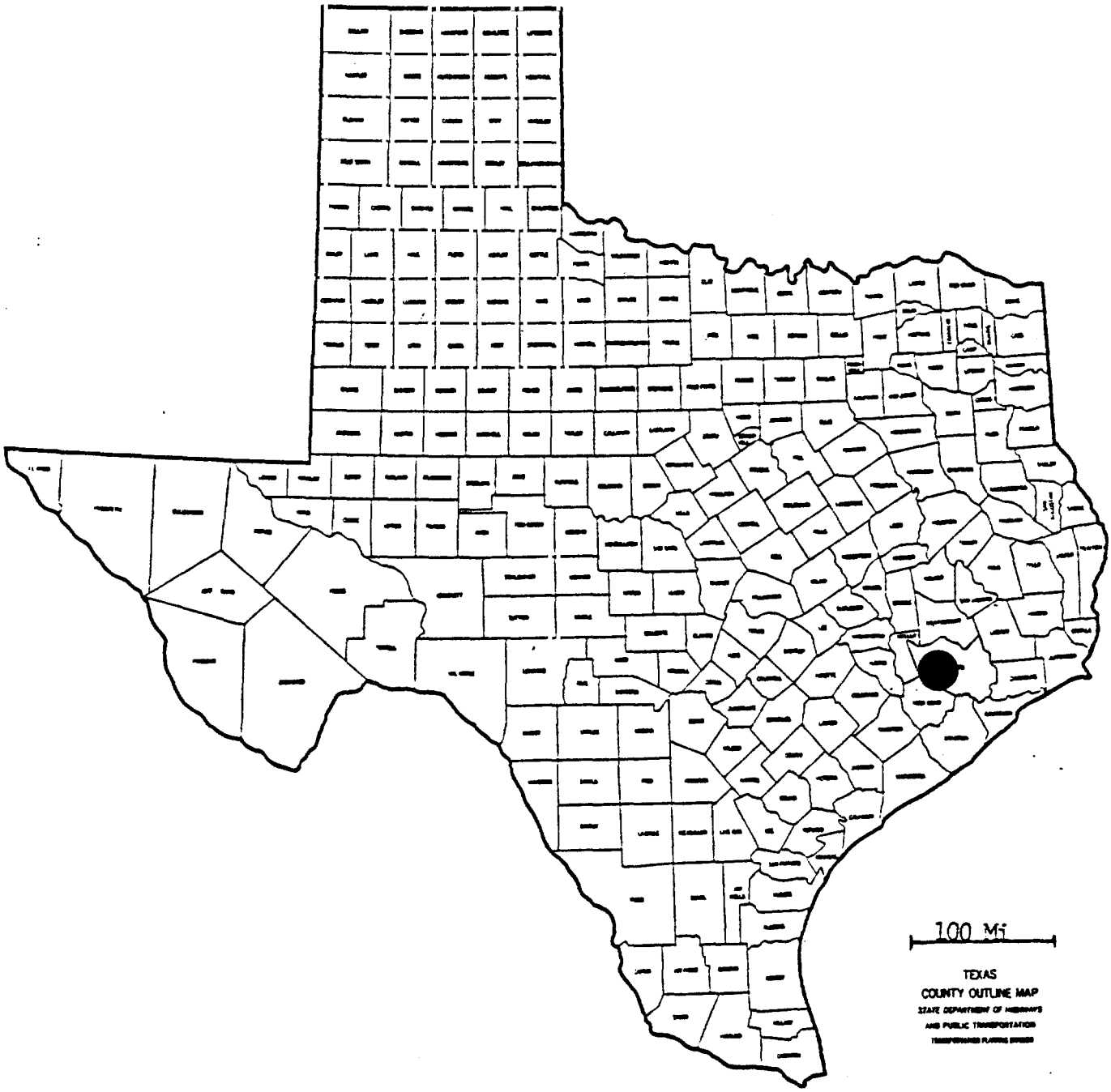

Figure 1. Location of Hymenoxys texana.

Southwest Texas Junior College and William F. Mahler of Southern Methodist University have both searched unsuccessfully in LaSalle County for Hymenoxys texana. Until a specimen of certain identity from LaSalle County is found, the distribution of Hymenoxys texana will be considered for recovery purposes to consist of the range represented by the known localities in Harris and Fort Bend Counties.

Hymenoxys texana grows in small colonies on bare spots and individual colonies are often patchily dispersed among other types of vegetation. For this reason, sites that had been listed as separate populations in some reports are being considered as single localities in this plan. Of the 21 extant localities, 11 occur on Federal property of Addicks and Barker Reservoirs at the western edge of Houston. These reservoirs, which are usually empty, are managed for flood control by the U.S. Army Corps of Engineers. Eight sites occur in Addicks Reservoir and three sites occur in Barker Reservoir. One Barker Reservoir site is in Fort Bend County. This is the only Hymenoxys texana site thus far known from outside Harris County. The other 10 Hymenoxys texana sites occur either within the western city limits of Houston or northwest of Houston in rural Harris County. Of these sites, one is on property of the Houston Community College and the others are on property of various private landowners.

Most Hymenoxys texana sites cover only a few acres with the actual area occupied by the plants being only a small fraction of that. By far the largest site occurs in Barker Reservoir and occupies almost 40 acres (16 hectares). This one site probably occupies more area and contains more plants than all the other known Hymenoxys texana sites combined.

Individual Hymenoxys texana plants are small and hundreds of plants may be found within a few square meters. Therefore, no effort has been expended counting plants at any of the sites. If counts were made, the total number of plants would be quite high, but such figures have little meaning for small annual plants like Hymenoxys texana. Instead, range, number of occupied sites, and area of occupied habitat are all considered better parameters for estimating the abundance of Hymenoxys texana.

Impacts and Threats

The most serious threat to Hymenoxys texana is habitat destruction owing to housing development and road construction in the rapidly developing west and northwest portions of Harris County. Six Hymenoxys texana sites are on land surrounded by current housing construction and one site is on land that is now on the market. The parcel of land for sale is not fenced and numerous off-road vehicle tracks have been seen crossing the area where Hymenoxys grows. The construction of the West Belt Toll Road has destroyed one site in western Harris County, and this new highway and accompanying development may affect other as yet undiscovered populations. Three sites exist on land devoted to stock raising. However, the plants seem to be maintaining themselves under these conditions.

Hymenoxys texana has never been observed on soils recently disturbed by plowing or other similar activities that eliminate the soil horizon. Some associated species may grow on these sites but not Hymenoxys texana. Therefore, any activity that severely disturbs the soil could be a severe threat to the species.

The plants at the Houston Community College are subject to mowing, although thus far this practice has not eliminated them. Before the college was established, this site was a football field with spectator stands. A land use change such as construction of new college buildings could threaten the existence of these plants. In 1986, an article was placed in the college paper to alert the college community to the presence of Hymenoxys texana at this site.

Some of the 11 sites in Addicks and Barker Reservoirs are threatened by possible land use changes by the Corps of Engineers (U.S. Army Corps of Engineers 1986). Plans include widening of roads and expansion of developed parkland. These activities could eliminate many of the small sites. One reservoir site in a road right-of-way may be affected by mowing. Also, blading the roadside could alter the habitat so it would no longer be suitable for Hymenoxys texana.

Conservation and Research Efforts

Little research has been published on Hymenoxys texana. This is understandable since living plants were unknown to botanists from 1890 to 1981. Field work resulted in the discovery of 3 sites in 1981 and 18 additional sites in 1986 thru 1988.

Stephen Young and John Koros of the Mercer Arboretum and Botanic Gardens collected soil samples in 1986 from one site north of Cypress. Analysis of these samples revealed a high concentration of salts in the light sandy soil of the bare spots where Hymenoxys texana grows and lower levels of the same salts in the adjacent darker soil where Hymenoxys texana is absent.

In March 1986, Young tried to determine insect pollinators in a Hymenoxys texana population north of Cypress. He saw no flying insects after one hour of observation but did observe a species of thrips climbing in and out of the flowers. Thirty of these thrips were collected in March 1987 and mailed to S. Nakahara at the U.S. Department of Agriculture who identified them as the composite thrips Microcephalothips abdominalis. This thrips, which is widely distributed throughout the Western Hemisphere and other parts of the world, has been seen in other populations of Hymenoxys texana and could be a factor in pollination.

In the spring of 1987, Steve Young and Larry Brown recorded all plant species in Hymenoxys texana sample plots in the Addicks reservoir. These are listed under Associated Species in this plan.

In March and April of 1987, Larry Brown collected bud material from seven populations for chromosome counts. John L. Strother of the University of California examined this material and found a chromosome number of $2n = 6$ in all seven populations, which is the lowest number reported for the genus (Strother and Brown 1988).

Propagation work on Hymenoxys texana by Mercer Arboretum and Botanic Gardens began in 1986. Seeds collected in April 1986 were kept in a refrigerator until February 1987, when they were planted in pots. Some seeds were watered with fresh water and others with salt water; however, no seeds germinated and the experiment was terminated after 1 month. Seeds were collected again in April 1987. These seeds were planted at various times through the fall and winter in a soil mixture of peat moss, sharp sand, perlite, vermiculite, and maglime. Seeds were watered under a mist bench. Seeds planted in November received no cold treatment. Those planted in January, early February, and late February were refrigerated until planting. All plantings germinated in 13 days and all plants regardless of planting time matured in early May 1988. Seeds were harvested for use in future studies. In May 1988, seeds were collected from the West Belt Toll Road site just before the site was destroyed by road construction. These seeds were planted on August 24, 1988, and they germinated in 2 weeks.

When seeds were collected from the West Belt Toll road site in May 1988, a truckload of soil was also taken to Mercer Arboretum and Botanic Garden. This soil will be used to attempt the establishment of a self-sustaining botanical garden population.

Little additional information is available concerning the population biology, population ecology, or specific habitat requirements of Hymenoxys texana. Many Hymenoxys sites are on Federal land in the Addicks and Barker Reservoirs and efforts by the Corp of Engineers to locate additional reservoir sites are continuing. The goal is to find all sites so appropriate land management measures that will ensure the long term survival of Hymenoxys texana can be implemented.

PART II

RECOVERY

Objectives and Recovery Criteria

The general objectives of recovery for Hymenoxys texana are to prevent further habitat destruction and to establish or maintain healthy populations in natural habitats. Progress toward achievement of these general objectives will make possible the downlisting and delisting of Hymenoxys texana when the following specific criteria are met. Hymenoxys texana can be downlisted to threatened when at least 50 separate populations, each occupying at least 1 hectare (2.47 acres) of suitable habitat, are discovered or established, and 2) when at least 50 populations are protected from land use practices or land use changes that could destroy the populations. Hymenoxys texana can be removed from the threatened and endangered species list when management practices are developed and implemented which ensure the numbers of plants at protected populations remain stable. Since many questions about the biology and habitat requirements of Hymenoxys texana remain unanswered, it may be necessary to modify the downlisting and delisting criteria as additional information is obtained. As recovery tasks are accomplished, the downlisting and delisting criteria will be reevaluated and any necessary adjustments will be included in future revisions of this plan.

The following outline and narrative describe tasks to achieve the recovery objectives for Hymenoxys texana. Accomplishing these objectives, however, will be difficult because of the many development pressures throughout the species' present range.

Step-down Outline

1. Protect Hymenoxys texana and its habitat from existing and future threats.
    11. Contact private landowners and Federal agency personnel.
        111. Work with the landowners and agency personnel to implement management practices that will protect the species.
        112. Establish protected sites on both private and public lands.
            1121. Private lands.
            1122. Public lands.
        113. Develop and implement a long range management plan.
    12. Enforce applicable Federal and State laws and regulations.
    13. Monitor populations.
    14. Alter management plans, if necessary, to reflect improvement or deterioration of populations.
2. Gather information on the natural history of Hymenoxys texana for use in management.
    21. Determine habitat requirements.
        211. Edaphic factors.
        212. Dependence on natural phenomena and cultural practices.
        213. Local microclimate.
        214. Air and water quality.

22. Determine associated species, vegetation types, and community structure.
    221. Record associated vegetation.
    222. Record frequency, density, and dominance.
    223. Determine frequently associated species.
    224. Determine if the bare soil at Hymenoxys texana sites represents an edaphic climax.
23. Study population biology.
    231. Demography.
    232. Phenology.
    233. Reproductive biology.
        2331. Types of reproduction.
        2332. Pollination biology.
        2333. Seed dispersal.
        2334. Seed biology.
        2335. Seedling biology.
24. Study community ecology.
    241. Beneficial and neutral effects of other species.
    242. Negative effects of other species.

3. Update management plans as new data accumulates.
4. Search for new sites and populations.
5. Establish a botanical garden population and, if needed, attempt to establish populations in suitable natural habitat.
    51. Develop and refine propagation techniques.
    52. Establish a self-sustaining botanical garden population.
    53. Search for suitable reintroduction sites.

6. Develop public awareness, an appreciation, and support for the preservation and study of Hymenoxys texana.

Narrative

1. Protect Hymenoxys texana and its habitat from existing and future threats. Since all Hymenoxys texana populations are within the metropolitan area of Houston, the nation's fourth largest city, many factors unique to an urban environment bear upon the long-term survival of the species. Among these are parkland development, road and housing construction, and changes in surrounding agricultural and rangeland use. The species must be protected from these threats or its long-term survival is precarious.

11. Contact private landowners and Federal agency personnel. Landowners and land stewards should be notified of the presence of an endangered species on their property. These people should be informed of the importance of the species, the steps they can take to protect it, and the legal aspects of all applicable State and Federal laws.

111. Work with landowners and agency personnel to implement management practices that will protect the species. Landowners and land stewards will have the greatest impact on Hymenoxys texana because their decisions on land use will determine the survival of Hymenoxys texana sites. These people should be informed of the need to preserve the species' habitat and should be advised on steps to achieve this goal.

112. Establish protected sites on both private and public lands. Landowners and land stewards should be asked to identify specific areas where they will refrain from land uses that are incompatible with survival of the species. In addition to providing habitat for the species, protected sites should contain adequate buffer areas to ensure that surrounding land uses do not impact the species or its habitat.

1121. Private lands.

Landowner cooperation will be necessary to protect populations on private lands. Methods of formalizing this protection range from non-binding conservation agreements to outright gifts or sales to conservation groups or public agencies.

1122. Public lands.

Specific management measures to protect Hymenoxys texana should be included in appropriate agency planning documents. Agencies should also consider special land use designations to further protect areas occupied by Hymenoxys texana.

113. Develop and implement a long range management plan.

As more is learned about the species, this information should be organized into a plan for the long term maintenance of populations. The plan should be provided to public and private land managers and these people should be given as much help as possible in implementing the recommended management measures.

12. Enforce applicable Federal and State laws and regulations.

Federal and State collecting restrictions and permit requirements should be enforced. Federal agencies should conduct required consultations under Section 7 of the Endangered Species Act. Trespassing laws should be enforced on private lands when this will help protect populations.

13. Monitor populations.

Annual changes in such population factors as plant density, extent of range, and reproductive success should be noted in order to evaluate protective measures. This information can be used to adjust the management plan.

14. Alter management plans, if necessary, to reflect improvement or deterioration of populations.

One objective of any management plan is to prevent a decrease in population size. If Hymenoxys texana populations decrease after a plan is in place, then the plan must be altered in a way that will halt the decline.

2. Gather information on the natural history of Hymenoxys texana for use in management.

It may be difficult to adequately manage a plant or its habitat without some basic information on habitat requirements, community structure, population ecology, and reproductive biology. This information must be gathered for the synthesis of an adequate management plan.

21. Determine habitat requirements.

It is not adequately understood why Hymenoxys texana plants occur on prairie bare spots in western Harris County and (as an example) are absent from similar appearing sites in the prairies of southeastern Harris County. The habitat factors that promote the survival of Hymenoxys plants need to be understood. This information could be used to identify new sites that may need protection and sites in other areas where Hymenoxys plants could be successfully introduced.

211. Edaphic factors.

A specific set of soil characteristics seems to be an important habitat requirement for Hymenoxys texana. The following soil characteristics may need to be identified: chemical composition, texture, moisture, pH, parent material, depth to hardpan, soil profile, porosity, soilwater potential, nutrient status, presence or

absence of toxic elements, and SCS classification. Also, Hymenoxys texana is often associated with pimple mounds or with bare areas that remain after pimple mounds have been leveled. The soil characteristics of natural and altered pimple mounds should be investigated.

212. Dependence on natural phenomena and cultural practices.

The maintenance of "prairie bare spots" may partly depend on natural factors such as fires and floods or cultural practices such as mowing, grazing, or soil scraping. Research is needed to determine if factors other than soil characteristics alone are responsible for maintaining Hymenoxys texana habitat.

213. Local microclimate.

The following local climatic factors should be evaluated: temperature, humidity, precipitation, wind direction, wind velocity, light intensity, and light duration. This may be important if Hymenoxys texana plants are to be successfully grown in cultivation. The National Weather Service has a complete weather station at Intercontinental Airport which is about 17 miles northeast of the nearest Hymenoxys site. This weather station is in the Pineywoods Vegetation Area, a different vegetational area from the prairie zone of Hymenoxys texana sites.

214. Air and water quality.

Studies may show that water and air quality have an effect on the growth of Hymenoxys texana plants. This is important because incidents of air and water pollution have been reported for the Houston area.

22. Determine associated species, vegetation types, and community structure.

The vegetation type of Hymenoxys texana sites is unique and should be investigated over a period of time.

221. Record associated vegetation.

The vegetation present in the bare spots and surrounding prairies should be recorded throughout the year.

222. Record frequency, density, and dominance.

The density, dominance, and frequency of the associated vegetation should be calculated and changes from season-to-season or year-to-year should be noted.

223. Determine frequently associated species.

A list of species always present with Hymenoxys texana should be compiled. This information may be useful in evaluating if a site can support the species.

224. Determine if the bare soil at Hymenoxys texana sites represents an edaphic climax.

Hymenoxys texana sites associated with undisturbed pimple mounds probably represent an edaphically controlled climax. However, some sites now occupied by Hymenoxys texana have undergone such disturbances as pimple mound leveling or former cultivation. Longterm study is needed to determine if these formerly disturbed bare areas are now stable or if they are slowly changing to other vegetation types.

23. Study population biology.

Little is known about the population biology of Hymenoxys texana. A knowledge of these factors is essential for the development of a successful management program.

231. Demography.

Annual plants such as Hymenoxys texana are often susceptible to yearly oscillations of population size. Population fluctuations are detected by conducting long term studies of population area, size, and density.

232. Phenology.

Hymenoxys texana plants first appear in late winter but detailed information is absent regarding the time of germination, leaf, bud, flower, and fruit appearance, seed dispersal, senescence, and mortality. The correlation of these phenological events with climatic fluctuations should also be determined.

233. Reproductive biology.

The reproductive mechanisms of Hymenoxys texana must be understood in order to successfully manage wild populations and to achieve garden cultivation.

2331. Types of reproduction.

The breeding biology of Hymenoxys texana is unknown. For example, are seeds formed by outcrosssing, self-pollination, or by apomixis?

2332. Pollination biology.

Limited observation has disclosed the composite thrips to be a regular insect visitor to Hymenoxys texana flowers. The broad aspects of insect-plant relationships should be investigated including insect pollination and the possibility of insect pests.

2333. Seed dispersal.

Hymenoxys texana seeds are small and nothing is known about their dissemination. Information is needed on the mechanism and/or agents of dispersal, dispersal patterns, and the effects of disturbance on dispersal.

2334. Seed biology.

The following information is needed: percent viability and germination, the length of dormancy and the factors that break dormancy, the amount of seeds produced per plant and any fluctuations of this amount, and length of viability. One or more factors may be related to changes in population size and may be important in the cultivation of Hymenoxys texana.

2335. Seedling biology.

Seedling establishment is essential to species survival. A better understanding of seedling light, moisture, and nutrient requirements is needed.

24. Study community ecology.

A surprising variety of species grow on the prairie bare spot habitat of Hymenoxys texana. The influence of these species on the growth of Hymenoxys texana should be investigated. This knowledge is necessary for proper management practices and for the establishment of plants in cultivation.

241. Beneficial and neutral effects of other species.

Some of the associated species may have a neutral influence on Hymenoxys while other species may enhance the growth or reproduction of Hymenoxys plants. This should be investigated.

242. Negative effects of other species.

Possibly detrimental biotic factors should be studied. These could include: herbivores, parasites, disease organisms, plant competitors, toxic organisms, and allelopathic organisms. It would be particularly informative to learn if the limitation of Hymenoxys texana to prairie bare spots is due to the species' inability to compete with other vegetation.

3. Update management plans as new data accumulates.

Some new data may force a change in current management practices.

4. Search for new sites and populations.

As more information is gathered about the species, it should become easier to identify and find new Hymenoxys texana sites. Fort Bend and Brazoria Counties to the south of Harris County have numerous areas with pimple mounds and these counties should have a high priority for additional searches. Newfound sites could provide information or confirm the reliability of old information. If a sufficient number of new sites are discovered, a change in the status of the species may be warranted. New sites should be protected and monitored the same as other sites.

5. Establish a botanical garden population and, if needed, attempt to establish populations in suitable natural habitat.

Much can be learned about Hymenoxys texana through research to establish a botanical garden population. A botanical garden population could also, in an emergency, serve as a seed source for establishing other populations. If the number of natural populations should be reduced to less than 10, or if imminent threats indicate the number of populations will soon be reduced to that figure, efforts should immediately be made to establish at least 4 new populations at protected sites within the known historic range of the species. If a sufficient number of natural populations can not be located to meet downlisting and delisting criteria, the number of natural populations will need to be augmented through establishment of new populations in suitable natural habitat.

51. Develop and refine propagation techniques.

Hymenoxys texana has been grown successfully under greenhouse conditions. But, since this plant is an annual, considerable effort will be required to maintain a population in this manner. The next step in propagation research should be to develop techniques to propagate successive generations with minimum effort.

52. Establish a self-sustaining botanical garden population.

Much biological information can be obtained most easily from a botanical garden population. In addition, a permanent, well documented, and

accessible botanical garden population, together with appropriate seed banking, would provide an important source of material for non-destructive research, maintenance of wild populations, and public awareness.

53. Search for suitable reintroduction sites.

Knowledge about the particular habitat requirements of Hymenoxys texana can be used to identify suitable reintroduction sites. Any suitable sites must be in areas that can be protected and managed for the species.

6. Develop public awareness, an appreciation, and support for the preservation and study of Hymenoxys texana.

If there is a general lack of awareness about the endangered status of Hymenoxys texana, then no broad base of support for saving the species can be developed. Presentations and field trips with environmental groups, garden clubs, and organizations devoted to rare species will encourage preservation of the species. The general public can be best informed through printed and visual media.

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PART III

IMPLEMENTATION SCHEDULE

The following Implementation Schedule outlines actions and costs for the Hymenoxys texana 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 Hymenoxys texana 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 for 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. Management agreement
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
- CLES - Clear Lake Ecological Services
- LE - Law Enforcement
- RE - Realty

CE - U.S. Army Corps of Engineers
TPWD - Texas Parks and Wildlife Department
HC - Harris County Government
HOU - City of Houston

PART III - IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task #	Priority #	Task Duration	Responsible Agency FWS Region	Responsible Agency FWS Program	Responsible Agency Other	Fiscal Year Costs (EST)* FY 1	FY 2	FY 3	COMMENTS
M3	Work with land managers to implement protective management	111	1	ongoing	2	CCES CLES		3,000	3,000	3,000	
A3	Establish protected sites on private land	1121	1	ongoing	2	CCES CLES		5,000	5,000	5,000	
M3	Establish protected sites on public land	1122	1	3 years	2	CCES CLES	CE HC HOU	500	500	500	
M3	Implement a long range management plan	113	2	5 years	2	CCES CLES	CE HC HOU	1,000	1,000	1,000	
02	Enforce laws and regulations	12	2	ongoing	2	CCES CLES LE	TPWD CE	2,000	2,000	2,000	
I1	Monitor populations	13	2	ongoing	2	CCES CLES	CE	1,500	1,500	1,500	
04	Alter management plans as necessary	14	2	ongoing	2	CCES CLES		250	250	250	

*Costs refer to USFWS expenditures only.

PART III - IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task #	Priority #	Task Duration	Responsible Agency FWS Region	FWS Program	Other	Fiscal Year Costs (EST)* FY 1	FY 2	FY 3	COMMENTS
R3	Study soils	211	3	2 years	2	CCES		5,000	5,000		
R10	Study dependence on natural phenomena and cultural practices	212	2	5 years	2	CCES		2,500	2,500	2,500	
R3	Study microclimate	213	3	2 years	2	CCES		2,500	2,500		
R3	Study water and air quality	214	3	2 years	2	CCES		2,500	2,500		
R3	Record associated vegetation	221	3	2 years	2	CCES		1,000	1,000		
R3	Record frequency, density, and dominance	222	3	2 years	2	CCES		5,000	5,000		
R3	Determine frequently associated species	223	3	2 years	2	CCES		1,000	1,000		
R3	Determine if sites represent an edaphic climax	224	2	5 years	2	CCES		3,000	3,000	3,000	
R6	Study demography	231	3	5 years	2	CCES		3,000	3,000	3,000	
R14	Study phenology	232	3	2 years	2	CCES		1,500	1,500		

*Costs refer to USFWS expenditures only.

PART III - IMPLEMENTATION SCHEDULE

General Category	Plan Task	Task #	Priority #	Task Duration	Responsible Agency FWS Region	FWS Program	Other	Fiscal Year Costs (EST)* FY 1	FY 2	FY 3	COMMENTS
R14	Study reproductive biology	2331-2335	2	3 years	2	CCES		15,000	15,000	15,000	
R10	Study beneficial community interactions	241	3	5 years	2	CCES		1,000	1,000	1,000	
R10	Study detrimental community interactions	242	2	5 years	2	CCES		3,000	3,000	3,000	
04	Incorporate new data	3	2	ongoing	2	CCES		250	250	250	
I1	Search for new populations	4	3	3 years	2	CCES		3,000	3,000	3,000	
R7	Develop propagation techniques	51	2	3 years	2	CCES		2,500	2,500	2,500	
M2	Propagate plants in botanical garden	52	2	ongoing	2	CCES		2,000	2,000	2,000	
M2	Search for reintroduction sites	53	2	1 year	2	CCES		1,000			
01	Develop public awareness	6	2	ongoing	2	CCES CLES	CE TPWD	1,000	1,000	1,000	

* Costs refer to USFWS expenditures only.

APPENDIX

List of Reviewers

A technical/agency review draft of the Hymenoxys texana Recovery Plan was sent to the following individuals and agencies on December 14, 1987.

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

Mr. Gerard Hoddenback, 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, Desert Botanical Garden, Phoenix, AZ

Dr. Larry Brown, Houston Community College, Houston, TX

Mr. Stephen Young, Mercer Arboretum and Botanic Gardens, Humble, TX

Director, Harris County Park Planning Department, Houston, TX

Mr. Clyde Bragg, City of Houston Park Planning Department, Houston, TX

Commander, Galveston District, U.S. Army Corps of Engineers, Galveston, TX

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

Assistant Regional Director, Law Enforcement, USFWS, Region 2

Refuge Supervisor, South Texas, USFWS, Region 2

Regional Supervisor, Realty, USFWS, Region 2

Field Supervisor, Ecological Services, Clear Lake Field Office, USFWS, Region 2

Director (EHC/BLR), Office of Endangered Species, USFWS, Washington, D.C.

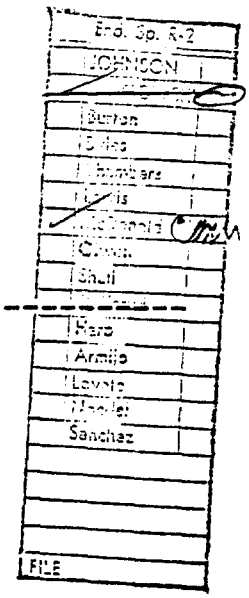
Director (WR), Division of Research, USFWS, Washington, D.C.

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 telephone. These comments have not been reproduced.

The public notice of review for Hymenoxys texana was published in the Houston Chronicle on April 23, 1989 in accordance with the 1988 Amendments to the Endangered Species Act. This notified the public of the 30-day comment period and the availability of the draft recovery plan for public review. No comments were received.

The Federal Register Notice of Review for Hymenoxys texana was published on August 10, 1989 in accordance with the 1988 Amendments to the Endangered Species Act. No comments were received.



TEXAS NATURAL HERITAGE PROGRAM
TEXAS PARKS AND WILDLIFE DEPARTMENT
4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744

(512) 389-4586

12 January 1988

Dr. Charles McDonald
Office of Endangered Species
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

Dear Charlie,

Thank you for the opportunity to review the recovery plan for Hymenoxys texana. As a member of the Texas Plant Recovery Team, I am quite concerned about this species. I would like to offer the following comments.

The major problem with the recovery plan is the lack of understanding or misinterpretation of the habitat of Hymenoxys texana. Under native conditions, Hymenoxys texana inhabits long-lived natural "disturbance" patches within climax grasslands. Granted most of the currently known sites for the species are quite disturbed and the climax community may not be evident to the casual observer. However these areas were once prairies. Hymenoxys texana occurs on naturally bare areas within prairies, in particular at the base of mima (pimple) mounds. A-1

These bare areas are not successional phenomena. They are the result of a fluctuating water table and consequent changes in soil salinity and pH. Conditions are only favorably for plant growth during the winter and early spring, before the onset of inevitable summer dry spells. Thus these areas are always bare. Because there is little or no competition, Hymenoxys texana is able to grow there. Hymenoxys texana is probably tolerant of a wide range of growing conditions but is not able to compete with other species. A-2

The soil types in these areas are not the ones listed in the Harris County Soil Survey. This soil survey was done for an urban environment, and is less detailed than other surveys. One of the soil series on which Hymenoxys texana is found is the Narta. This occurs in Fort Bend and Brazoria counties, as well as western Harris County. The recovery plan authors should contact Gerald Crenwelge of the Soil Conservation Service in Harris County for additional information. A-3

Several problems in the step-down outline of the recovery plan are the result of this misinterpretation of habitat requirements. The number one priority for recovery should be precise identification of the required habitat. Soils, hydrology, and dependence on natural phenomena in particular need to be studied. Local microclimate, air and water quality, physiographic and topographic characteristics, and associated species are all low priority. Succession studies and mima (pimple) mounds studies are not needed. Hymenoxys texana is not part of a successional stage, and mima mounds have been well studied. A-4 A-5 A-6

Other problems with the recovery plan are not related to the habitat. Although the chromosome data is interesting and requires further study, especially of other populations further apart, it does not seem relevant to the recovery of the species. The entire discussion relating to the chromosome counts is highly speculative and ought to be deleted. A-7

Several other rare species are found at the Hymenoxys texana sites. Two of special concern are Machaeranthera aurea (Cat. 3C) and Chloris texensis (Cat. 2). Both are found at the Grant-Kitzman road site, and probably will be found at all sites. Their management and protection should be considered in all decisions affecting the Hymenoxys texana sites. A-8

The species should be protected in its native habitat at all cost. Increasing the number of populations by introduction of transplanted or artificially produced populations should only be done when absolutely necessary. Such sites should be carefully selected after precise habitat requirements are well-known and understood. At this time the species should not be introduced into superficially appearing prairies in southeastern Harris County, and all such references to this area should be deleted from the recovery plan. Tissue culture should be the ultimate last resort in the recovery of any species. Tissue culture defeats genetic diversity. A-9 A-10 A-11

The discussion of the Hymenoxys texana locality from LaSalle County is unclear. Certainly Mahler and Keeney searched in vain for the species, but without precise habitat information. Faden may not have seen the Hymenoxys texana specimen because such mixed collections are now often separated. Original collectors and curators often grouped similar species together on herbarium sheets. Localities were often combined, or only one chosen. The best way to decide if Hymenoxys texana occurs presently in LaSalle County is to precisely delineate the habitat profile and intensively search in those identified areas if any exist. A-12

In conclusion let me again stress the need to delineate an accurate picture of the habitat. Hymenoxys texana inhabits long-lived, environmentally harsh (=disturbed?) areas within climax grasslands. It does not naturally occur on all disturbed sites within these communities. Some of the currently known populations occur in severely disturbed habitats despite this A-13

unnatural perturbation, not because of it. It may not persist at these unnaturally disturbed sites. It does not occupy disturbed areas outside of its associated community or soil type.

Sincerely,

Jackie

Jackie M. Poole
Member, Texas Plant Recovery Team
Botanist, Texas Natural Heritage Program

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

CHARLES D. TRAVIS
Executive Director

January 28, 1988

Dr. Charles McDonald
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

Dear Dr. McDonald:

Thank you for the opportunity to review the recovery plan for Texas bitterweed (Hymenoxys texana). Several areas of concern need to be addressed.

The primary problem with the recovery plan is its incorrect interpretation of the habitat of the Texas bitterweed. Under natural conditions, the Texas bitterweed occurs in permanent areas of natural "disturbance" within ecologically stable grasslands. The Texas bitterweed is found on bare areas within prairies, in particular at the base of mima (pimple) mounds. B-1

These bare areas are not the result of successional phenomena, but are the result of a fluctuating water table and consequent changes in soil salinity and pH. Thus these areas always have scant vegetative cover. Texas bitterweed is able to grow there due to the lack of competition. B-2

Texas bitterweed occurs on the Narta soil series. The Harris County Soil Survey does not include this series because the survey was done at a less detailed level. The recovery plan authors should contact Gerald Crenwelge of the Soil Conservation Service in Harris County for additional information. B-3

Thank you for allowing the Department to comment on this action.

Sincerely,

Charles D. Travis
Executive Director

CDT/JMP/jp

CITY OF HOUSTON

Parks and Recreation Department
Post Office Box 1562 Houston, Texas 77251-1562 713/641-4111

Kathryn J. Whitmire, Mayor

CITY COUNCIL MEMBERS: Larry McKaskle Ernest McGowen, Sr. Vince Ryan Rodney Ellis Frank O. Mancuso John G. Goodner Christin Hartung Dale M. Gorczynski Ben T. Reyes Jim Westmoreland Eleanor Tinsley Jim Greenwood Anthony W. Hall, Jr. Judson Robinson, Jr. CITY CONTROLLER: George Greanias

Donald G. Olson
Director of Parks and Recreation

RD
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Cole
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Action SE
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February 23, 1988

United States Department of the Interior
Fish and Wildlife Service
Post Office Box 1306
Albuquerque, New Mexico 87103

Attn: Conrad Fjetland

Re: Regional 2:SE

Dear Mr. Fjetland:

In response to your letter and plan concerning the Texas bitterweed (Hymenoxys texana) we have reviewed the draft recovery plan and found it to be very thorough and informative. Although this draft mentions downlisting and delisting of this plant is possible after more information is gathered, it does not include a method for mitigation between public, private and governmental agencies and we recommend that it be included. C-1

We are also concerned that on several prime tracts of land, specifically Community Park East in Cullen Park where this plant exists, we have programmed for large recreational facilities in the near future. These facilities could be in jeopardy. C-2

This spring the Department of Parks and Recreation and the Corps of Engineers will walk this area to better determine the location and amount of Bitterweed that exists. At that time, we can better assess our position. C-3

Clyde R. Bragg, Asst. Director
Parks and Recreation Department
Division of Resource Mgmt. & Planning

CRB:TD:ee

Attachment (1)

cc: Richard Long
Corps of Engineers
Addicks Office

FWS RSG 2
RECEIVED
AHR
SE

OPTIONAL FORM NO. 10
MAY 1988 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

U.S. FISH & WILDLIFE SERVICE

Memorandum

TO : Regional Director, Region 2, Attn: Chief, Endangered Species Office, Albuquerque, NM

DATE: 01/13/88

FROM : Field Supervisor, Ecological Services, Houston, TX

SUBJECT: Technical Agency Review Draft Recovery Plan for Texas Bitterweed (Hymenoxys texana)

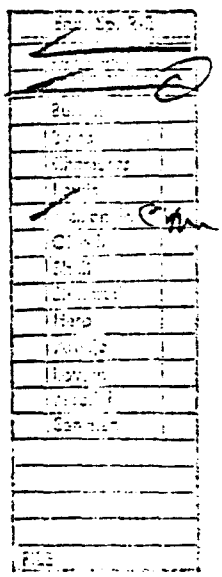
The draft recovery plan for Hymenoxys texana is a very readable and well written document. We would like to recommend changes be made in the Implementation Schedule as to the programs within the Fish and Wildlife Service responsible for completing a planned task. This office believes that the majority of the planned tasks could be accomplished more efficiently by the Clear Lake Ecological Services Field Office, Houston, Texas. The office is within 50 miles of all known Hymenoxys texana sites. Attached is a revised Implementation Schedule reflecting the suggested changes. D-1

In addition, the Hymenoxys texana site cited on page 14 in Barker Reservoir is not an actual verified site and should be removed from the list of known sites. D-2

Thank you for the opportunity to comment.

JKM:pj

Attachment



Response to Comments

A-1 It is likely that the only available habitat for Hymenoxys texana within climax coastal prairies was natural bare areas at the base of pimple mounds. However, there is no way to document that the disturbed bare areas now occupied by the species were indeed natural bare areas prior to disturbance. We will, therefore, not draw an a priori conclusion that coastal prairies are a habitat requirement for Hymenoxys texana.

A-2 It appears that the bare areas occupied by Hymenoxys texana are reasonably stable, but it is not certain they will always be bare. A task has been included in the plan to determine if the bare areas do indeed represent an edaphic climax or whether they are slowly changing to other vegetation types.

A-3 The presence of Hymenoxys texana on the Narta soil series has been included in the plan. Even though the Harris County Soil Survey is less detailed than other surveys it is still the best generally available soils information for Harris County. The use of unpublished information in this plan might create confusion and cause planners and others to overlook potential Hymenoxys texana habitat.

A-4 The first priority for recovery will be protection of known populations. Proper management of these areas will necessitate an understanding of the required habitat for Hymenoxys texana. Tasks to obtain this habitat information are included in the plan.

A-5 The task to study physiographic and topographic characteristics has been deleted from the plan. Tasks to study local microclimate, air and water quality, and associated species, although retained in the plan, have been assigned the lowest possible priority for accomplishment.

A-6 Although they change slowly, some sites occupied by Hymenoxys texana may indeed be changing in species composition. The task to study succession has been rewritten with the emphasis now on determining if bare areas represent an edaphic climax.

A-7 The section that discussed aneuploidy and the tendency of many aneuploids to be weedy annuals when compared with their non-aneuploid relatives has been deleted. The information reporting chromosome numbers for the species has been retained.

A-8 Comment noted.

A-9 The plan now specifies that reintroductions will be attempted if the number of extant populations drops below ten, or if reintroductions are necessary to reach downlisting and delisting goals. Reintroductions will be used only if protection of natural populations fails to reach downlisting and delisting goals.

A-10 No specific reintroduction sites are included in the final plan. Any reintroductions, should they be needed, will use sites that are within the known range of the species.

A-11 Plants now have been successfully grown from seeds in the greenhouse, so it seems unlikely tissue culture propagation will ever be needed. The statement referring to tissue culture propagation has been deleted from the plan.

A-12 The presence of Hymenoxys texana in LaSalle County is poorly documented and for recovery purposes will not be considered part of the known historic range of the species. Searches for additional populations of Hymenoxys texana will concentrate on potential habitat in Fort Bend and Brazoria Counties. Additional searches for Hymenoxys texana in LaSalle County are not included in this plan, but they could be included in future revisions of the plan if new data indicate a need to do so.

A-13 Tasks to accurately delineate the habitat of Hymenoxys texana are contained in this plan. Until these are done, we can not conclude that undisturbed climax grasslands are required for perpetuation of the species or that plants in disturbed habitats are persisting there despite the disturbance. We do agree that most soil disturbance does not create habitat for Hymenoxys texana and that it is incorrect to characterize Hymenoxys texana as a weedy species.

B-1 Under natural conditions, Hymenoxys texana likely did occur only in bare areas at the base of pimple mounds. However, plants now occur in a variety of bare areas and it is impossible to determine whether these areas were always bare of whether land disturbance has created some bare areas

that did not formerly exist. Therefore, the plan will not assume that pimple mounds, whether modified or not, constitute the sole habitat of Hymenoxys texana.

B-2 Soil conditions in the bare areas occupied by Hymenoxys texana are unfavorable for the growth of most plants and it appears these soil conditions are stable for long periods of time. However, no detailed studies have been done to determine if some Hymenoxys texana sites might actually be changing slowly to other vegetation types. A task to determine this possibility has been included in the plan.

B-3 The presence of Hymenoxys texana on the Narta soil series has been included in the plan. But, soils mapping has not been done in sufficient detail in Harris County to determine if Hymenoxys texana is indeed restricted to the Narta soil series. The general soils information available in the published Harris County Soil Survey will be used in this plan because using more detailed but unpublished information might cause planners and others to overlook potential Hymenoxys texana habitat.

C-1 The U.S. Fish and Wildlife Service will work with private landowners on a case-by-case basis to develop Hymenoxys texana management and protection measures. Hopefully, these measures will be compatible with the landowner's intended land use. But, if this is not the case, the Fish and Wildlife Service has no authority to dictate how private land will be used. This is not the case for such Federal lands as Addicks and Barker

Reservoirs, which are managed by the U.S. Army Corps of Engineers. The Corps are required under Section 7 of the Endangered Species Act to protect endangered organisms on Federal land. The Corps are further required to consult with the Fish and Wildlife Service when actions on Federal land may affect an endangered species. Recommendations of conservation measures that will allow projects to continue while still protecting endangered species are part of the Section 7 process. Task 12 of this plan reminds Federal agencies of their Section 7 requirements.

C-2 These projects, which will be on Federal property, are subject to Section 7 consultation between the Corps of Engineers and the Fish and Wildlife Service. In that consultation, all factors will be considered and any recommendations made on how the project might proceed and still protect Hymenoxys texana.

C-3 Comment noted.

D-1 The endangered species program for Region 2 of the Fish and Wildlife Service has been reorganized assigning recovery responsibility for most species to the Ecological Services Field Stations. With this reorganization, lead responsibility for Hymenoxys texana has been assigned to the Corpus Christi Ecological Services Office and supporting responsibility has been assigned to the Clear Lake Ecological Services Office. These changes are reflected in the Implementation Schedule.

D-2 Although the site from the Fort Bend County portion of Barker Reservoir mentioned on page 14 of the draft plan had not been verified when the draft was published, another nearby site has since been located so a documented occurrence of Hymenoxys texana does exist in Fort Bend County.