

**FINAL REPORT**

**As Required by**

**THE ENDANGERED SPECIES ACT, SECTION 6**

**TEXAS**

**GRANT NUMBER E-1-8**

**ENDANGERED RESOURCES BRANCH**

**Project 27: Candidate Species Monitoring**

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## ABSTRACT

Monitoring plans were developed for 278 candidate species or subspecies in Texas. Monitoring plans include information on species distribution, monitoring objectives, monitoring frequency and season, monitoring sites and methodology, red flag conditions for species declines, location of reference materials and resource names, and notes regarding opportunities for use of volunteers. All plans were reviewed by U. S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife Department (TPWD). Species were also assigned a monitoring priority to assist with implementation of candidate monitoring in Texas. These plans should prove useful in monitoring taxa of concern in Texas whether or not a candidate list continues to be maintained by the USFWS.

## FINAL REPORT

**STATE:** TEXAS                      **GRANT NO.:** E-1

**GRANT TITLE:** Endangered and Threatened Species Conservation

**PERIOD COVERED:** September 1, 1990 through August 31, 1996

**PROJECT NO.:** 27

**PROJECT TITLE:** CANDIDATE SPECIES MONITORING

**PROJECT OBJECTIVE:** To provide an annual, biennial, or triennial review (Depending upon the species) for each plant and animal species occurring in Texas that is deemed to be imminently imperiled through developing species specific monitoring plans.

### ACCOMPLISHMENTS

#### CANDIDATE MONITORING APPROACH

The Candidate Monitoring approach was to develop species specific monitoring plans. A total of 332 candidate taxa were considered. The priority of the taxa was determined through interviews and input from TPWD and USFWS personnel familiar with the respective taxa. Because some low priority species were excluded, a total of 278 plans were written.

When developing these plans a few assumptions were made. When these plans are to be implemented a review of the element manual and geographic manual files will be completed prior to field work. There will undoubtedly be changes made in the field when trying to implement some of these plans. Monitoring sites were chosen based on best available knowledge at the time-- this may change by the time these plans are implemented. Some monitoring sites will be chosen upon actual field review. In some cases, landowner contact and access will be a major factor in the success of implementing a monitoring strategy. Overall, TPWD will serve as coordinator of the monitoring efforts to ensure that standardization of monitoring techniques are implemented. When referring to the "Known Occurrences", this refers to the actual Element Occurrence Records in the TPWD Biological Conservation Database.

The estimated time element is for single species monitoring, typically with 2 days set aside for travel. Combined monitoring efforts will change the time factor. Field work is usually most efficient with at least two members performing the field work. In most instances field time can be reduced when more assistance is available.

The reference Candidate Species Monitoring Status Overview for the plants provides a synopsis of priority, county of occurrence, responsible party to monitor or coordinate monitoring,

expected staff and field time, approximate target sites to monitor, month(s) to monitor, monitoring frequency, level of monitoring, and any remarks relevant to that species. This document will be useful in scheduling, budgeting and long-range planning for the implementation aspect of this project.

The following is a description of the status of the monitoring plans for each of the taxa:

#### **PLANTS:**

Of the one hundred and sixty candidate plants, one hundred and seven plans were completed. A portion were excluded as low priority because they have not been seen in recent years. If these species are relocated, then monitoring priority should be considered high. Other species were excluded because new information indicates that they are more abundant than previously thought. The plans submitted have had internal TPWD review and USFWS review. The current Candidate Species Monitoring Status Overview for plants is also included in this report.

#### **INVERTEBRATES:**

The candidate invertebrates include seventy-two species. These include 10 arachnids; 11 crustaceans; 33 insects; and 18 mollusks. A monitoring plan was developed for all species regardless of priority. The two recently listed C2 insects, Cheumatopsyche morsei, Morse's net-spinning caddisfly; and the Hydroptila ouachita, a purse casemaker caddisfly were not addressed in this report. Those species that have been down listed to 3C or proposed for endangered listing were all included in this report. In most cases, very little is known about the species. It is strongly recommended that status surveys be completed for the invertebrates so we will know more about their life history, distribution and abundance. For some species the best season or month to initiate monitoring is not known. Where voucher specimens are collected, following coordination with the respective institutions, materials will be deposited in the best collection appropriate for that taxonomic group. It is suggested that the crustaceans, arachnids, cave invertebrates, and the snails and mussels be deposited at the University of Texas-Austin, Texas Memorial Museum; and the insects deposited with Texas A & M University, Entomological Collection. In many cases, it is not possible to quantify the species being monitored; therefore, presence and absence may be the only indices to monitor until further status information can be gathered. Some species will not be able to withstand repeated collection pressures and noting presence/absence is considered the best approach at this time. In other instances it may be appropriate to monitor water or habitat quality. Other populations located on state, federal or other preserve land may be presumed protected and for that reason, monitoring frequency may be minimized. The final submitted reports for these species may vary depending upon when the actual lab identification-verification occurs. This may take six months or longer in some cases.

#### **AMPHIBIANS AND REPTILES:**

Included are monitoring plans for the ten amphibian and twelve reptile candidate species. These plans have had TPWD and USFWS review. For some species, there is a significant time commitment to monitor the species.

**FISH:**

The twenty species of candidate fish have also been reviewed by TPWD and USFWS staff.

**MAMMALS:**

The thirty-five plans for mammal candidates have been reviewed by both TPWD and USFWS staff. Species with a low priority usually have a brief description of monitoring methodology. When those low priority species will actually be addressed, more detail may be necessary to carry out the monitoring.

**BIRDS:**

The twenty-five plans for the candidate birds have been reviewed by both TPWD and USFWS staff. While a monitoring protocol is suggested for all candidate species, significant effort should be made to assess the usefulness of existing datasources, such as the Texas Colonial Waterbird Census, NBS Breeding Bird Surveys, and Audubon Christmas Bird Counts.

**MONITORING REPORT FORMAT**

Once the implementation of the monitoring is underway a standardized reporting format will be followed. An example of the information in the Report may include: the species being monitored, personnel monitoring, volunteer effort, site-specific location data, maps, search or monitoring hours, specimen data, habitat data, a discussion of the population status relative to previous monitoring years, and any threat to the species or their habitat.

**VOLUNTEER OPPORTUNITIES**

Opportunities for volunteer assistance was noted in each plan with anticipated coordinated participation by site managers on public lands and cooperating agencies and organizations. To date, there has been minimal volunteer involvement with this part of the project. Volunteers were involved with candidate bat research that was going on in east Texas and to some degree with monitoring candidate plants.

In order to best utilize volunteers to obtain useful information a comprehensive program should be developed to include program identity, public awareness, cooperation agreements, training opportunities, written resources, and a standard reporting mechanism. To ensure implementation of this project on available lands, cooperative agreements will be developed with various state and federal agencies and private organizations, including Texas Park & Wildlife Department-- Public Lands Division, Wildlife Division, Non-game Program; National Park Service; US Fish and Wildlife Service; US Forest Service; Texas Forest Service; Texas Department of Transportation; The Nature Conservancy of Texas; and National Audubon Society. These efforts will be developed under the Section 6 Project 72 - Monitoring Program for Species of Concern in Texas, currently underway.

## **ACKNOWLEDGEMENTS**

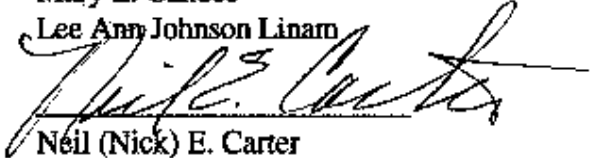
The assistance of many reviewers for this project is appreciated. Thanks is extended to Andy Price, Peggy Horner, Gena Janssen, Jackie Poole, Dean Keddy-Hector, Craig Farquhar, Gary Garrett, David Bowles, Kathryn Kennedy, Lisa O'Donnell, and Carol Beardmore.

## **ATTACHED:**

Appendix A	List of candidate species with monitoring plans
Appendix B	Monitoring plans for ten species of <b>amphibians</b>
Appendix C	Monitoring plans for ten species of <b>arachnids</b>
Appendix D	Monitoring plans for twenty-five species of <b>birds</b>
Appendix E	Monitoring plans for eleven species of <b>crustaceans</b>
Appendix F	Monitoring plans for twenty species of <b>fish</b>
Appendix G	Monitoring plans for thirty-one species of <b>insects</b>
Appendix H	Monitoring plans for thirty-five species of <b>mammals</b>
Appendix I	Monitoring plans for eighteen species of <b>mollusks</b>
Appendix J	Monitoring plans for one hundred and six species of <b>plants</b>
Appendix K	Monitoring plans for twelve species of <b>reptiles</b>
Appendix L	Candidate Species Monitoring Status Overview - Plants

## **SIGNIFICANT DEVIATIONS**

Although this project initially proposed to implement monitoring of candidate species in Texas, TPWD and USFWS staff mutually determined that developing monitoring plans should be the first priority. Implementation will follow through Section 6 Project 72.

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<b>APPROVED BY:</b>	 Neil (Nick) E. Carter Federal Aid Coordinator	11-27-96

**Appendix A:**

**LIST OF CANDIDATE SPECIES WITH  
MONITORING PLANS**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>AMPHIBIANS</b>			
<i>Eurycea neotenes</i> TEXAS SALAMANDER	G1 S1 C1	MEDIUM	HIGH
<i>Eurycea robusta</i> BLANCO BLIND SALAMANDER	G1 S1 C1	LOW	LOW
<i>Eurycea</i> sp 1 JOLLYVILLE PLATEAU SALAMANDER	G1 S1 C1	HIGH	HIGH
<i>Eurycea</i> sp 2 SALADO SPRINGS SALAMANDER	G1 S1 C1	HIGH	MEDIUM
<i>Eurycea</i> sp 5 GEORGETOWN SALAMANDER	G1 S1 C1	HIGH	HIGH
<i>Eurycea</i> sp 6 PEDERNALES RIVER SPRINGS SALAMANDER	G1 S1 C1		MEDIUM
<i>Eurycea</i> sp 7 EDWARDS PLATEAU SPRING SALAMANDER	G1 G3 Q S1 S3 C1		MEDIUM
<i>Eurycea tridentifera</i> COMAL BLIND SALAMANDER	G1 S1 C1	MEDIUM	MEDIUM
<i>Notophthalmus meridionalis</i> BLACK-SPOTTED NEWT	G1 S1 C2		MEDIUM
<i>Siren intermedia</i> pop 1 LESSER SIREN (RIO GRANDE POPULATION)	G2 Q S? C2		MEDIUM



## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>ARACHNIDS</b>			
<i>Archeolarca guadalupensis</i> GUADALUPE CAVE PSEUDOSCORPION	G1 S1 C2	MEDIUM	LOW
<i>Cicurina bandida</i> BANDIT CAVE SPIDER	G1 S1 C2	MEDIUM	HIGH
<i>Cicurina baroni</i> ROBBER BARON CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina cueva</i> A CAVE SPIDER	G1 S1 C2	MEDIUM	HIGH
<i>Cicurina madla</i> MADLA'S CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina ventii</i> VENIS CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina vesper</i> VESPER CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina wartoni</i> WARTON'S CAVE SPIDER	G1 S1 C1	2	HIGH
<i>Neoleptoneta microps</i> GOVERNMENT CANYON CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Texella cokendolphi</i> ROBBER BARON CAVE HARVETMAN	G1 S1 C2	**Status survey recently completed	HIGH

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>BIRDS</b>			
<i>Accipiter gentilis</i> NORTHERN GOSHAWK	G3 SA C2		LOW
<i>Aimophila aestivalis</i> BACHMAN'S SPARROW	G3 S3B C2		MEDIUM-HIGH
<i>Aimophila botteri texana</i> TEXAS BOTTERI'S SPARROW	G4T4 S4B C2		MEDIUM
<i>Ammodramus bairdii</i> BAIRD'S SPARROW	G3 S2 C2		MEDIUM
<i>Ammodramus henslowii</i> HENSLOW'S SPARROW	G4 S2N,SXB C2		MEDIUM
<i>Arremonops rufivirgatus rufivirgatus</i> TEXAS (=SENNETT'S) OLIVE SPARROW	G5T3 S3B C2		LOW
<i>Athene cunicularia hypugea</i> WESTERN BURROWING OWL	G4TU S3B C2		LOW
<i>Buteo nitidus maximus</i> NORTHERN GRAY HAWK	G3G4T3T4 S2B C2		MEDIUM-HIGH
<i>Buteo regalis</i> FERRUGINOUS HAWK	G4 S3B,S4N C2		MEDIUM
<i>Charadrius alexandrinus</i> SNOWY PLOVER	G4 S4B C2		
<i>Charadrius alexandrinus nivosus</i> WESTERN SNOWY PLOVER	G4T3 S2B C2		MEDIUM-HIGH
<i>Charadrius alexandrinus tenuirostris</i> SOUTHEASTERN SNOWY PLOVER	G4T3 S2B C2		HIGH
<i>Charadrius montanus</i> MOUNTAIN PLOVER	G3 S2B C1		HIGH
<i>Chlidonias niger</i> BLACK TERN	G4 S4 C2		LOW
<i>Dendroica cerulea</i> CERULEAN WARBLER	G4 S3B C2		LOW-MEDIUM
<i>Egretta rufescens</i> REDDISH EGRET	G4 S4B C2		MEDIUM-HIGH
<i>Geothlypis trichas inasperata</i> BROWNSVILLE COMMON YELLOWTHROAT	G5T2 S1B C2		HIGH
<i>Icterus cucullatus cucullatus</i> MEXICAN HOODED ORIOLE	G5TU S4B C2		LOW-MEDIUM
<i>Icterus cucullatus sennetti</i> SENNETT'S HOODED ORIOLE	G5TU S4B C2		LOW-MEDIUM
<i>Icterus grunnaecauda auduboni</i> AUDUBON'S ORIOLE	G5T4 S3B C2		LOW-MEDIUM
<i>Lanius ludovicianus</i> LOGGERHEAD SHRIKE	G4G5 S4S5B C2		MEDIUM-LOW

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

Lanius ludovicianus migrans MIGRANT LOGGERHEAD SHRIKE	G4G5T3T4 S2 C2		MEDIUM-LOW
Laterallus jamaicensis BLACK RAIL	G4? S2B C2		MEDIUM
Parula pitiauyumi nigrolora TROPICAL PARULA	G5TU S3B C2		LOW
Plegadis olhihi WHITE-FACED IBIS	G5 S4B C2		MEDIUM

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>CRUSTACEANS</b>			
<i>Gammarus hyalleloides</i> DIMINUTIVE AMPHIPOD	G1 S1 C2	HIGH	HIGH
<i>Gammarus pecos</i> PECOS AMPHIPOD	G1 S1 C2	HIGH	HIGH
<i>Palaeomonetes antronum</i> TEXAS CAVE SHRIMP	G1 S1 C2	MEDIUM	HIGH
<i>Stygobromus balconius</i> BALCONES CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus bifurcatus</i> BIFURCATED CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus dejectus</i> CASCADE CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus flagellatus</i> EZELL'S CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus hadenoecus</i> DEVIL'S SINKHOLE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus longipes</i> LONG-LEGGED CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus petki</i> PECK'S CAVE AMPHIPOD	G1 S1 PE	2	HIGH
<i>Stygobromus reddelli</i> REDELL'S CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>FISHES</b>			
<i>Campostoma ornatum</i> MEXICAN STONEROLLER	G3 S1 C2	HIGH	LOW
<i>Cycoreptus elongatus</i> BLUE SUCKER	G3 S3 C2		LOW
<i>Cyprinella proserpina</i> PROSPERPINE SHINER	G3 S2 C2	HIGH	LOW
<i>Cyprinodon eximius</i> CONCHOS PUFFISH	G4 S1 C2	HIGH	MEDIUM
<i>Cyprinodon pecosensis</i> PECOS PUFFISH	G1 S1 C1		HIGH
<i>Dionda diaboli</i> DEVIL'S RIVER MINNOW	G2 S1 C1	2	HIGH
<i>Etheostoma grahami</i> RIO GRANDE DARTER	G3 S2 C2	HIGH	LOW
<i>Gambusia senilis</i> BLOTCHED GAMBUSIA	G4 SX C2	HIGH	LOW
<i>Hypognathus placius</i> PLAINS MINNOW	G5 S4 C2		LOW
<i>Ictalurus lupus</i> HEADWATER CATFISH	G3 S2 C2	HIGH	MEDIUM
<i>Ictalurus</i> sp 1 CHIHUAHUA CATFISH	G1G2 S1S2 C2	HIGH	?
<i>Macrhybopsis aestivalis retranemus</i> ARKANSAS RIVER SPECKLED CHUB	G5T3 S3 C2		LOW
<i>Micropterus treculi</i> GUADALUPE BASS	G3 S3 C2	MEDIUM	LOW
<i>Notropis buccula</i> SMALLEYE SHINER	G2 S2 C2	MEDIUM	HIGH
<i>Notropis chihuahua</i> CHIHUAHUA SHINER	G3 S2 C2	HIGH	LOW
<i>Notropis jemezzanus</i> RIO GRANDE SHINER	G3 S3 C2		LOW
<i>Notropis oxyrinchus</i> SHARPNOSE SHINER	G3 S3 C2	MEDIUM	HIGH
<i>Polyodon spathula</i> PADDLEFISH	G4 S3 C2		LOW
<i>Satan eurystomus</i> WIDEMOUTH BLINDCAT	G1 S1 C2	HIGH	MEDIUM
<i>Trogloglanis pattersoni</i> TOOTHLESS BLINDCAT	G1 S1 C2	HIGH	MEDIUM

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>INSECTS</b>			
<i>Adhemarius blanchardorum</i> BLANCHARDS' SPHINX MOTH	G1 S1 C2	MEDIUM	HIGH
<i>Anomala tibialis</i> TIBIAL SCARAB BEETLE	GH SH C2	MEDIUM	HIGH
<i>Agria baltmorhea</i> BALMORHEA DAMSELFLY	G2G3 S2 C2		LOW
<i>Asaphomyia texanus</i> TEXAS ASAPHOMYIAN TABANID FLY	GH SH C2	MEDIUM	HIGH
<i>Austrotinodes</i> sp 1 TEXAS AUSTROTTNODES CADDISFLY	G2 S2 C2	LOW	LOW
<i>Batrissodes ventyivi</i> HELOTES MOLD BEETLE	G1 S1 C2	**Status Survey recently completed	HIGH
<i>Chimarra holzenthali</i> HOLZENTHAL'S PHILOPOTAMID CADDISFLY	G1 S1 C2		LOW
<i>Cicindela cazieri</i> CAZIER'S TIGER BEETLE	G1 S1 C2	HIGH	HIGH
<i>Cicindela chlorocephala smythi</i> SMYTH'S TIGER BEETLE	GH TH SH C2	HIGH	HIGH
<i>Cicindela nevadica olmosa</i> LOS OLMOS TIGER BEETLE	G5T2 S1S2 C2		LOW
<i>Cicindela nigrocoerulea subtropica</i> SUBTOPICAL BLUE-BLACK TIGER BEETLE	G5T2 SH C2	HIGH	LOW
<i>Cicindela obsoleta neojuvencilis</i> NEOJUVENILE TIGER BEETLE	G5T1 SH C2	HIGH	LOW
<i>Cicindela politula barbarannae</i> BARBARA ANN'S TIGER BEETLE	G5T1 S1 C2	HIGH	LOW
<i>Cicindela politula petrophila</i> GUADALUPE MOUNTAINS TIGER BEETLE	G5T2 S1 C2	HIGH	LOW
<i>Beronectes neomexicana</i> BONITA DIVING BEETLE	G1 S1 C2		LOW
<i>Eximacris superbum</i> SUPERB GRASSHOPPER	GH SH 2	MEDIUM	HIGH
<i>Haideoporus texanus</i> EDWARDS AQUIFER WATER BEETLE	G1 S1 C2	LOW	HIGH
<i>Haliplus nitens</i> DISJUNCT CRAWLING WATER BEETLE	GH SH C2	LOW	HIGH
<i>Heterelmis comalensis</i> COMAL SPRINGS RIFFLE BEETLE	G1 S1 PE	2	MEDIUM
<i>Limnebius texanus</i> TEXAS MINUTE MOSS BEETLE	GH SH C2	MEDIUM	LOW
<i>Lordithon niger</i> BLACK LORDITHON ROVE BEETLE	GH SH C2		HIGH

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Macromia wabashensis</i> WABASH BELTED SKIMMER DRAGONFLY	G3Q SRF C2		HIGH
<i>Oxyethira florida</i> FLORIDA OXYETHIRAN MIRO CADDISFLY	G2 S? C2		LOW
<i>Protophila arca</i> SAN MARCOS SADDLE-CASE CADDISFLY	G1 S1 C2	MEDIUM	LOW
<i>Protophila balmorhea</i> BALMORHEA SADDLE-CASE CADDISFLY	G2 S1 C2		HIGH
<i>Rhadine infernalis</i> A GROUND BEETLE	G1 S1 C2	**Status Survey recently completed	HIGH
<i>Schinia indiana</i> PHLOX MOTH	GU SH C2		LOW
<i>Somatochlora margarita</i> BIG THICKET EMERALD DRAGONFLY	G1G3 S1S3 C2	LOW	LOW
<i>Stalingsia maculosus</i> MACULATED MANFREDA SKIPPER BUTTERFLY	G2 S2 C2	MEDIUM	HIGH
<i>Stygoparnus comalensis</i> COMAL SPRINGS DRYOPID BEETLE	G1 S1 PE	1	MEDIUM
<i>Taeniopteryx starki</i> LEON RIVER WINTER STONEFLY	G1 S1 C2	MEDIUM	HIGH

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>MAMMALS</b>			
<i>Blarina hylophaga plumbea</i> ARANSAS SHORT-TAILED SHREW	G5T1Q S1 C2		MEDIUM
<i>Choeronycteris mexicana</i> LONG-TONGUED BAT	G3G4 S1 C2		MEDIUM
<i>Conopsea leucorotus texensis</i> GULF COAST HOG-NOSED SKUNK	G5T4? S2 C1		MEDIUM-HIGH
<i>Conopsea mesoleucus telmolestes</i> BIG THICKET HOG NOSED SKUNK	G5T2 S1 C2	MEDIUM	LOW
<i>Corynorhinus (=Plecotus) rafinesquii</i> EASTERN BIG-EARED BAT	G4 S3 C2		MEDIUM
<i>Cynomys ludociclanus arizonensis</i> ARIZONA BLACK-TAILED PRAIRIE DOG	G5T3 S3 C2		LOW
<i>Dipodomys elator</i> TEXAS KANGAROO RAT	G2 S2 C2	LOW	HIGH
<i>Euderma maculatum</i> SPOTTED BAT	G4 S2 C2		MEDIUM-LOW
<i>Eumops perotis californicus</i> CALIFORNIA MASTIFF BAT	G5T? S3 C2		MEDIUM
<i>Geomys arenarius</i> DESERT POCKET GOPHER	G3 S2 C2		MEDIUM
<i>Geomys personatus maritimus</i> MARITIME POCKET GOPHER	G4T2 S2 C2		MEDIUM
<i>Geomys personatus streckeri</i> CARRIZO SPRINGS POCKET GOPHER	G4T1 S1 C2		MEDIUM
<i>Geomys texensis bakeri</i> FRIO POCKET GOPHER	G3T2 S2 C2	MEDIUM	MEDIUM
<i>Myotis austroriparius</i> SOUTHEASTERN MYOTIS	G4 S3 C2		MEDIUM
<i>Myotis ciliolabrum</i> WESTERN SMALL-FOOTED MYOTIS	G5 S3 C2		MEDIUM
<i>Myotis evotis</i> LONG-EARED MYOTIS	G5 SX C2		LOW
<i>Myotis lucifugus occultus</i> OCCULT OR ARIZONA LITTLE BROWN MYOTIS	G5T3T4 SA C2		LOW
<i>Myotis thysanodes</i> FRINGED MYOTIS	G5 S3 C2		LOW
<i>Myotis vellifer</i> CAVE MYOTIS	G5 S4 C2		LOW
<i>Myotis volans</i> LONG-LEGGED MYOTIS	G5 S4 C2		LOW
<i>Myotis yumanensis</i> YUMA MYOTIS	G5 S4 C2		LOW



## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Ondatra zibethicus ripensis</i> PECOS RIVER MUSKRAT	G5T? S2S3 C2	MEDIUM	LOW
<i>Oryzomys couesi aquaticus</i> COUES' RICE RAT	G5T3? S2 C2		LOW
<i>Peromyscus truei comanche</i> PALO DURO MOUSE	G5T2 S2 C2	LOW	MEDIUM-HIGH
<i>Scalopus aquaticus texanus</i> PRESIDIO MOLE	G5T1Q S1 C2	MEDIUM	LOW
<i>Sigmodon ochrogathus</i> YELLOW-NOSED COTTON RAT	G5 S3 C2		LOW
<i>Spilogale putorius interrupta</i> PLAINS SPOTTED SKUNK	G5T5 S3 C2		MEDIUM
<i>Sylvilagus floridanus robustus</i> DAVIS MOUNTAINS COTTONTAIL	G5T3 S3 C2	MEDIUM	MEDIUM
<i>Tamias canipes</i> GRAY-FOOTED CHIPMUNK	G3 S2S3 C2	LOW	MEDIUM
<i>Thomomys bottae guadalupensis</i> GUADALUPE SOUTHERN POCKET GOPHER	G5T2 S2 C2		MEDIUM
<i>Thomomys bottae limpiae</i> LIMPIA SOUTHERN POCKET GOPHER	G5T2 S2 C2	MEDIUM	MEDIUM
<i>Thomomys bottae texensis</i> LIMPIA CREEK POCKET GOPHER	G5T2 S2 C2	MEDIUM	MEDIUM
<i>Vulpes velox</i> SWIFT FOX	G5 S4 C1		HIGH
<i>Vulpes velox macrotis</i> KIT FOX	G5T5 S4 C1		MEDIUM
<i>Vulpes velox velox</i> SWIFT FOX	G5T4T5 S3? C1		HIGH

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>MOLLUSKS</b>			
<i>Ashmunella pasonis</i> FRANKLIN MOUNTAIN WOOD SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Assiminea pecos</i> PECOS ASSIMINEA SNAIL	G2 S1 C1		MEDIUM
<i>Cochliopa texana</i> PHANTOM CAVE SNAIL	G1 S1 C2	HIGH	HIGH
<i>Disconias salinensis</i> SALINA MUCKET	G1 S1 C2	MEDIUM	HIGH
<i>Euchemotrema cheatumi</i> PALMETTO PILL SNAIL	G1 S1 C2		HIGH
<i>Fontelicella davisii</i> DAVIS SPRING SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Fontelicella metcalfi</i> METCALF SPRING SNAIL	G1 S1 C2	HIGH	HIGH
<i>Phreatodrebia imitata</i> MIMIC CAVE SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Polygyra hippocrepis</i> HORSESHOE LIPTOOTH	G1 S1 C2	MEDIUM	HIGH
<i>Poponias popei</i> TEXAS HORNSHELL	G2 S2 C2		HIGH
<i>Potamilus amphichaenus</i> TEXAS HEELSPLITTER	G1 S1 C2	HIGH	HIGH
<i>Quincuncina mitchelli</i> FALSE SPIKE MUSSEL	G2 S2 C2	MEDIUM	HIGH
<i>Sonorella metcalfi</i> FRANKLIN MOUNTAIN TALUS SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Truncilla cognata</i> MEXICAN FAWNSFOOT MUSSEL	G1 S1 C2	MEDIUM	HIGH
<i>Tryonia adamantina</i> DIAMOND Y SPRING SNAIL	G1 S1 C1	2	HIGH
<i>Tryonia brunei</i> BRUNE SPRING SNAIL	G1 S1 C2	HIGH	HIGH
<i>Tryonia cheatumi</i> PHANTOM LAKE TRYONIA	G1 S1 C2	HIGH	HIGH
<i>Tryonia stocktonensis</i> GONZALES SPRING SNAIL	G1 S1 C1	2	HIGH

### List of Candidate Species with Monitoring Plans

PLANS	SCIENTIFIC NAME	STATUS	USEFWS LIST PRI	PRIORITY	COUNTY OF OCCURRENCE
X	<b>PLANTS</b> <i>Acleisanthes crassifolia</i> TEXAS TRUMPETS	G2S2 C2	8	MEDIUM	Kinney, Maverick, Val Verde; Coahuila, Mex
	<i>Agalinis auriculata</i> AURICULATE FALSE FOXGLOVE	G2SX C2	2	Other Region	Tarrant (X-presumed extirpated); AL, AR, IA, IL, IN, KS, MD, MI, MN, MO, MS, NJ, OH, OK, PA, SC, TN, VA, WI, WV
X	<i>Agave glomeruliflora</i> CHISOS AGAVE	G2Q S2 C2	11	LOW	Brewster, Culberson, Hudspeth; Coahuila, Mex
	<i>Agrimonia incisa</i> INCISED GROOVEBUR	G3S1 C2	na	LOW	Angelina, Jasper; Sabine; AL, FL, GA, MS, NC, SC
X	<i>Amsonia tharpii</i> THARP'S BLUE-STAR	G1S1 C2	11	HIGH	Pecos, NM
	<i>Andrachne arida</i> TRANS-PBCOS MAIDENBUSH	G1S1 C2	11	LOW Need to relocate	Presidio, Brewster; Chihuahua and Coahuila, Mexico
X	<i>Anemone edwardsiana</i> var. <i>petraea</i> EDGE FALLS ANEMONE	G3T1 S1 C2	12	MEDIUM	Bandera, Kendall
X	<i>Aquilegia chrysantha</i> var. <i>hinckleyana</i> HINCKLEY'S COLUMBINE	G4T1S1 C2	6	HIGH	Presidio
X	<i>Aquilegia longissima</i> LONG SPUR COLUMBINE	G3S2 C2	11	LOW	Brewster, Jeff, Davis, Presidio, Chihuahua, Coahuila, Nuevo Leon, Mexico
X	<i>Arenaria livermorensis</i> LIVERMORE SANDWORT	G1S1 C2	5	MEDIUM	Jeff Davis
X	<i>Argythamnia aphoroides</i> HILL COUNTRY WILD MERCURY	G2S2 C2	11	MEDIUM	Blanco, Comal, Gillespie, Hays (H), Kendall (H), Kerr, Menard, Mills (H), Tom Green, Uvalde
X	<i>Asclepias prostrata</i> PROSTRATE MILKWEED	G1S1 C2	8	LOW	Starr, Zapata; Tamaulipas Mexico
	<i>Aster laevis</i> var. <i>guadalupeensis</i> GUADALUPE MOUNTAINS ASTER	G5T2QS1 C2	9	LOW	Culberson City; NM
X	<i>Aster puniceus</i> ssp. <i>elliottii</i> var. <i>scabricaulis</i> ROUGH-STEM ASTER	G5T1S1 C1	3	MEDIUM	Anderson, Cherokee, Smith, Van Zandt, Wood
X	<i>Astragalus mollissimus</i> var. <i>marcidus</i> WITHERED WOOLLY LOCO	G5T2S2 C2	12	LOW Need to relocate	Dallam, Jeff Davis (H), Presidio
X	<i>Batesimalva violacea</i> PURPLE GAY-MALLOW	G2 S1 C2	8	MEDIUM	Brewster, Coahuila and Nuevo Leon, Mexico
X	<i>Boerhavia mathisiana</i> MATHIS SPIDERLING	G2 S1 C2	5	HIGH	Live Oak, San Patricio, San Luis Potosi and Tamaulipas, Mexico
X	<i>Bonania ovalifolia</i> BIGPOD BONAMIA	G1S1 C2	8	HIGH	Brewster County, Coahuila, Mexico
X	<i>Brickellia brachyphylla</i> var. <i>hinckleyi</i> HINCKLEY'S BRICKELLBUSH	G5T2 S2 C2	11	LOW	Brewster (H) and Jeff Davis

X	<i>Brickellia brachyphylla</i> var <i>terlinguensis</i> TERLINGUA BRICKELLBUSH	G5TH SH C2	11	LOW Need to relocate	Brewster (H) Hudspeth (H)
X	<i>Brickellia viejensis</i> SIERRA VIEJA BRICKELLBUSH	G1G2 S1S2 C2	11	LOW	Presidio
X	<i>Brongniartia minutifolia</i> LITTLE-LEAF BRONGNIARTIA	G2 S1 C2	11	MEDIUM	Brewster County, Chihuahua, Mexico
X	<i>Caesalpinia brachycarpa</i> BROADPOD RUSHPEA	G2 S2 C2	8	MEDIUM	Crockett (H), Edwards (H), Kinney, Llano (H), Sutton
	<i>Carex hyalina</i> TISSUE SEDGE	G5Q S4 C2	8	LOW taxonomy ?'s	Bowie, Brazoria, Cass, Dallas (H), Denton, Houston, Lamar, Liberty, Madison, Morris, Polk, Red River, and Walker, AR, MS and OK
X	<i>Castilleja ciliata</i> FRINGED PAINTBRUSH	G1Q S1 C2	11	MEDIUM	Jeff Davis
X	<i>Castilleja elongata</i> TALL PAINTBRUSH	G1Q S1 C2	5	HIGH	Brewster
	<i>Cereus greggii</i> var <i>greggii</i> DESERT NIGHT-BLOOMING CEREUS	G3T2S2 C2	9	Need to relocate	Brewster, El Paso, Hudspeth (H), Jeff Davis, Pecos (H), Presidio, Terrell (H); AZ, NM; Chihuahua, Coahuila, Durango, Zacatecas, Mexico
X	<i>Chaetopappa hersheyi</i> MAT LEASTDAISY	G2 S2 C2	11	LOW	Culberson, Hudspeth; NM
X	<i>Chamaesyce chaetocalyx</i> var <i>triligulata</i> THREE-TONGUE SPURGE	G5T1 S1 C2	11	MEDIUM	Brewster, Randall (?); Coahuila Mexico
X	<i>Chamaesyce golondrina</i> SWALLOW SPURGE	G2 S2 C2	11	LOW Need to relocate	Brewster, Hudspeth, Presidio Counties; Chihuahua and Coahuila, Mexico
	<i>Chenopodium cycloides</i> SANDHILL GOOSEFOOT	G4 S3 C2		LOW	Andrews, Crane, Culberson, El Paso, Jeff Davis, Jones, Kent, Loving, Ward, Winkler; CO, KS, and NM
X	<i>Chloris texensis</i> TEXAS WINDMILL-GRASS	G2 S2 C2	8	HIGH	Brazoria, Brazos (H) Chambers, Galveston, Harris, Hidalgo (?), Nueces, and Refugio
X	<i>Chrysothamnus nauseosus</i> ssp <i>texensis</i> GUADALUPE MOUNTAINS RABBITBRUSH	G5T2 S1 C2	12	MEDIUM	Culberson County, NM
	<i>Cleome multicaulis</i> MANYSTEM SPIDERFLOWER	G3 S1 C2	na	Need to relocate	Presidio County; AZ, CO, NM, WY; Chihuahua, Durango, Jalisco, Michoacan, Mexico
X	<i>Colubrina stricta</i> COMAL SNAKEWOOD	G2 S1 C2	11	HIGH	Comal (?), El Paso, Uvalde; Coahuila and Nuevo Leon Mexico
X	<i>Condalia hookeri</i> var <i>edwardsiana</i> EDWARDS PLATEAU CAPUL NEGRO	G5T1Q C2	12	LOW Need to relocate	Edwards

X	<i>Coreopsis intermedia</i> GOLDEN WAVE TICKSEED	G3S3 C2	na	LOW Need to relocate	Anderson, Cass, Cherokee, Franklin, Freestone, Harris, Harrison, Henderson, Houston, Leon, Nacogdoches (?), Trinity, Upshur, Wood (H); LA
X	<i>Coryphantha albicolumnaria</i> WHITE COLUMN	G2 S2 C2	2	LOW	Brewster, Pecos, Presidio; Chihuahua, Mexico
X	<i>Coryphantha chaffeyi</i> CHAFFEY'S CORY CACTUS	G2 S1 C2	11	MEDIUM	Brewster, Coahuila, San Luis Potosi, Zacatecas Mexico
X	<i>Coryphantha dasycantha</i> var <i>dasycantha</i> DENSE CORY CACTUS	G3T3 S2 C2	12	MEDIUM	Brewster, El Paso, Hudspeth, Jeff Davis, Pecos; NM(?); Chihuahua, Mexico
X	<i>Coryphantha duncanii</i> DUNCAN'S CORY CACTUS	G3 S1 C2	11	MEDIUM	Brewster, Presidio; NM
X	<i>Coryphantha hesteri</i> HESTER'S CORY CACTUS	G2 S2 C2	8	MEDIUM	Brewster, Pecos, Terrell
	<i>Coryphantha sulcata</i> var <i>nickelsiae</i> NICKEL'S CORY CACTUS	G4T2 SH C2	12	Need to relocate	Webb (H); Coahuila, Nuevo Leon, Tamaulipas, Mexico
X	<i>Crataegus warneri</i> WARNER'S HAWTHORN	G2Q S2 C2	11	MEDIUM Need to relocate	Anderson, Cherokee, Freestone, Franklin, Houston, Morris, Panola, Smith (H), Upshur, Walker, Wood
X	<i>Croton alabamensis</i> var <i>texensis</i> TEXABAMA CROTON	G3T1S1 C2	8	MEDIUM	Bell, Coryell, Travis
	<i>Cuscuta attenuata</i> MARSHELDER DODDER	G2 S2 C2	5	LOW	Cameron (H) Jackson (H) Liberty (H) Rains and Van Zandt; KS, OK
	<i>Cyperus cephalanthus</i> GIANT SHARPSTEM UMBRELLA SEDGE	G2Q SH X2	na	Need to relocate	Texas (H; county unknown); LA
X	<i>Cyperus grayioides</i> MOHLENBROCK'S UMBRELLA SEDGE	G3G4 S3 C2	na	LOW	Anderson, Angelina, Burleson, Colorado, Franklin, Freestone, Hardin, Henderson, Houston, Leon, Nacogdoches, Newton, Robertson, Rusk, San Augustine, Shelby, Smith, Tyler, Upshur, Van Zandt, Wood; AR, IL, LA, MO
X	<i>Cyperus oerorus</i> DUNE UMBRELLA SEDGE	G2 S2 C2	5	HIGH	Andrews, Ward, Winkler
X	<i>Cypripedium kentuckiense</i> SOUTHERN LADY'S-SLIPPER	G3 S1 C2	na	HIGH	Cass (?) Harrison, Nacogdoches, Newton (X), Sabine, and San Augustine; AL, AR, KY, LA, MS, OK, TN
X	<i>Dalea bartonii</i> COX'S DALEA	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Dalea reverchonii</i> COMANCHE PEAK PRAIRIE- CLOVER	G2 S2 C2	11	MEDIUM	Hood (X), Parker, Wise
X	<i>Dalea sabinalis</i> SABINAL PRAIRIE-CLOVER	G1 S1 C2	8	LOW Need to relocate	Bandera (H), Uvalde (H), and Val Verde

	<i>Hedyotis butterwickiae</i> MARY'S BLUET	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Helianthus paradoxus</i> PUZZLE SUNFLOWER	G1S1 C1	2	HIGH	Pecos, Reeves, NM
X	<i>Helianthus praecox</i> ssp <i>hirtus</i> DIMMIT SUNFLOWER	G5T1QS1 C2		HIGH	Dimmit and Zapata (M)
X	<i>Hexalectris nitida</i> GLASS MOUNTAIN CORAL-ROOT	G3 S3 C2	11	LOW	Bandera, Brewster, Comal, Coryell, Dallas, Hays, Kendall, Pecos (H), Taylor, Travis; NM Coahuila, Mexico
	<i>Hexalectris revoluta</i> CHISOS CORAL-ROOT	G1 S1 C2	11	LOW	Brewster, Culberson; Nuevo Leon, San Luis Potosi, Mexico
X	<i>Hexalectris warnockii</i> WARNOCK'S CORAL-ROOT	G2 S2 C2	?	LOW	Brewster, Dallas, Gillespie, Hays, Jeff Davis (H), Taylor, Terrell; AZ, NM
X	<i>Hibiscus dasycalyx</i> NECHES RIVER ROSE-MALLOW	G1 S1 C2	2	HIGH	Cherokee, Harrison, Houston, Trinity
X	<i>Isoetes lithophila</i> ROCK QUILLWORT	G2 S2 C2	8	MEDIUM	Burnet, Llano, Mason
X	<i>Justicia runyonii</i> RUNYON'S WATER-WILLOW	G2S2 C2	8	LOW	Brazoria (?), Cameron, Goliad (?), Hidalgo; Tamaulipas, Mexico
X	<i>Justicia wrightii</i> WRIGHT'S WATER-WILLOW	G2 S2 C2	8	Need to relocate	Brewster (H) Pecos, Val Verde; NM (?)
X	<i>Kallstroemia perennans</i> PERENNIAL CALTROP	G1 S1 C2	11	MEDIUM	Brewster, Presidio, Val Verde
X	<i>Lachnocaulon digynum</i> TINY BOG BUTTONS	G3 S1 C2	na	MEDIUM	Jasper, Newton; AL, FL, LA, MS
X	<i>Leavenworthia texana</i> TEXAS GOLDEN GLADE CRESS	G1 S1 C2	2	HIGH	Nacogdoches (I), Sabine, San Augustine
	<i>Lechea mensalis</i> CHISOS PINWEED	G1Q S1 C2	11	Need to relocate	Brewster; Coahuila, Mexico
	<i>Leitneria floridana</i> CORKWOOD	G3G4 S1 C2		LOW	Brazoria, Chambers, Fort Bend, Jefferson; AL, AR, FL, GA, LA, MO
X	<i>Lepidospartum burgessii</i> GYPSUM SCALEBROOM	G2 S1 C2	8	MEDIUM	Hudspeth; NM
X	<i>Lesquerella thamnophila</i> ZAPATA BLADDERPOD	G1 S1 C2	2	HIGH	Starr, Zapata
X	<i>Liatris tenuis</i> SLENDER GAY-FEATHER	G2G3 S2S3 C2	8	MEDIUM	Angelina, Hardin, Jasper, Newton, Orange, Sabine, San Augustine, Tyler, LA (?)
X	<i>Lycium texanum</i> TEXAS WOLF-BERRY	G2 S2 C2	11	LOW Need to relocate	Brewster, Culberson, Hudspeth
X	<i>Machaeranthera aurea</i> HOUSTON MACHAERANTHERA	G2 S2 C2	2	HIGH	Galveston, Harris
X	<i>Manfreda longiflora</i> ST. JOSEPH'S STAFF	G2 S2 C2	5	MEDIUM	Cameron (H), Hidalgo, Starr, Tamaulipas, Mexico

	<i>Desmodium lindheimeri</i> LINDHEIMER'S TICKSEED	G4 S1 C2	11	Need to relocate	Comal (?); Coahuila, Nuevo Leon, San Luis Potosi, Tamaulipas Mexico
X	<i>Draba standleyi</i> STANDLEY'S DRABA	G3 S1 C2	7	MEDIUM - LOW	Jeff Davis; AZ, NM; Coahuila, Mexico
X	<i>Echeandia (Anthericum) chandleri</i> LILA DE LOS LLANOS	G3Se C2	8	MEDIUM - LOW	Cameron, Kleberg, Nueces; Coahuila, Mexico (?)
	<i>Echinocereus chloranthus</i> var <i>neocapillus</i> GOLDEN-SPINE HEDGEHOG CACTUS	G4T1 S1 C2	9	No Access	Brewster, Presidio
X	<i>Echinocereus papillosus</i> var <i>angusticeps</i> SMALL PAPILLOSUS	G3T1 C2	3	HIGH Need to relocate	Hidalgo (H), Jim Hogg (?), Starr
	<i>Eleocharis brachycarpa</i> SHORT-FRUITED SPIKESEDGE	G1 SH C2		Need to relocate	South coastal Texas (H); (county unknown); Tamaulipas, Mexico
X	<i>Eleocharis cylindrica</i> CYLINDER SPIKESEDGE	G1 S1 C2	2	LOW Need to relocate	Lubbock (H), Presidio
	<i>Eleocharis wolffi</i> WOLF'S SPIKESEDGE	G4G5 S1 C2		LOW	Jefferson; AL, CO, IA, IL, IN, KS, LA, MN, MO, ND, NE, OH, OK, TN, WI; Alberta and Saskatchewan, Canada
X	<i>Erigeron minnegletes</i> SONORA FLEABANE	G2 S2 C2	8	MEDIUM	Brewster (H), Crockett (H) Edwards (H), Kerr, Real, Schleicher, Sutton, Uvalde, Val Verde (H); Coahuila, Mexico
X	<i>Eriocaulon koernickianum</i> SMALL-HEADED PIPEWORT	G2G3 S1 C2	11	MEDIUM - HIGH	Anderson, Brazos, Limestone, Leon (?), Tyler (H); AR, GA, OK
X	<i>Eriogonum suffruticosum</i> BUSHY WILD BUCKWHEAT	G2 S2 C2	11	LOW	Brewster, Pecos, Presidio
X	<i>Escobaria guadalupensis</i> GUADALUPE MOUNTAINS PINCUSHION CACTUS	G1 S1 C2	11	MEDIUM	Culberson; NM
X	<i>Festuca ligulata</i> GUADALUPE FESCUE	G1 S1 C1	8	HIGH	Brewster, Culberson; Coahuila, Mexico
	<i>Forsellesia texensis</i> TEXAS GREASE BUSH	G1 S1 C2	11	Need to relocate	Uvalde and Val Verde (H)
X	<i>Fryxellia pygmaea</i> SMALL FRYXELL WORT	G1 SH C2	10	Need to relocate	west Texas (H; county unknown); Coahuila, Mexico
X	<i>Gaillardia aestivalis</i> var <i>winkleri</i> WHITE FIREWHEEL	G5T1 S1 C2	12	MEDIUM Need to relocate	Hardin
	<i>Galium corellii</i> CLIFF BEDSTRAW	G2 S1 C2	11	LOW	Brewster, Val Verde; Coahuila, Mexico
X	<i>Genistidium dumosum</i> BRUSH-PEA	G1 S1 C2	10	MEDIUM - HIGH	Brewster; Coahuila, Mexico
	<i>Hedeoma pilosum</i> OLD BLUE PENNYROYAL	G1 SH C2	11	Need to relocate	Brewster (H)

X	<i>Matelea radiata</i> FALFURRIAS ANGLEPOD (MILK VINE)	G1S1 C2	11	LOW Need to relocate	Brooks (H), Hidalgo (H), Starr (?)
X	<i>Matelea texensis</i> TEXAS MILK VINE	G1 S1 C2	8	HIGH	Brewster
X	<i>Mirabilis collina</i> SANDHILL FOUR-O'CLOCK	G2QS2 C2	11	3B	Anderson, Austin (?), Cherokee (H), Lamar(?), Morris(?), Red River (?), San Augustine(?), Smith, Waller (?), Wood
X	<i>Nolina arenicola</i> SAND SACAHUESTA	G2Q S2 C2	11	MEDIUM	Culberson, El Paso (?) and Hudspeth
	<i>Oenothera pilosella</i> ssp <i>sessilis</i> GRAND PRAIRIE EVENING PRIMROSE	G5T2 SH C2	na	Need to relocate	Galveston (H); AR, LA
X	<i>Opuntia arenaria</i> SAND PRICKLY-PEAR	G2 S2 C2	2	HIGH	El Paso, Hudspeth (H); NM; Chihuahua, Mexico
X	<i>Opuntia aureispina</i> GOLDEN-SPINE PRICKLY-PEAR	G1 S1 C2	11	MEDIUM	Brewster
X	<i>Opuntia engelmannii</i> var <i>flexospina</i> FEW-SPINE ENGELMANN'S PRICKLY-PEAR	G5T1 S1 C2	12	LOW Need to relocate	Starr, Webb (H), Zapata
X	<i>Opuntia imbricata</i> var <i>argentea</i> SILVER CHOLLA	G5T1 S1 C2	12	MEDIUM	Brewster
	<i>Osmorhiza mexicana</i> ssp <i>bipatriata</i> LIVERMORE SWEET-CICELY	G4T1 S1 C2	12	Need to relocate	Jeff Davis; Coahuila, Nuevo Leon, Mexico
X	<i>Ostrya chisosensis</i> BIG BEND HOP-HORNBEAM	G2S1 C2	11	MEDIUM	Brewster; northern Mexico
X	<i>Oxypolis ternata</i> THREELEAF COWBANE	G3? S1 C2		MEDIUM	Hardin, Tyler (?), FL, GA, MS, NC, SC
X	<i>Paronychia congesta</i> BUSHY WHITLOW-WORT	G1 S1 C2	11	HIGH	Jim Hogg
	<i>Paronychia maccartii</i> MCCART'S WHITLOW-WORT	G1 S1 C2	11	LOW Need to relocate	Webb
X	<i>Paronychia wilkinsonii</i> WILKINSON'S WHITLOW- WORT	G2 S2 C2	11	MEDIUM	Brewster; Chihuahua, Coahuila, Mexico
	<i>Pediocactus papyracanthus</i> PAPER-SPINED CACTUS	G2G3S1 C2	8	Need to relocate	Hudspeth, AZ, NM
X	<i>Pediomelum humile</i> RYDBERG'S SCURFPEA	G2 S1 C2	11	HIGH	Val Verde; Coahuila, Mexico
	<i>Pediomelum pentaphyllum</i> THREE-NERVE SCURFPEA	G1SH C2	5	Need to relocate	Presidio (H); NM (H); Chihuahua, Mexico
X	<i>Penstemon alamosensis</i> ALAMO BEARD TONGUE	G2 S1 C2	8	MEDIUM	El Paso, NM
	<i>Perityle bisetosa</i> var <i>bisetosa</i> TWO-BRISTLE ROCK-DAISY	G2T1 S1 C2	12	Need to relocate	Brewster, Pecos
	<i>Perityle bisetosa</i> var <i>scalaris</i> STAIRSTEP TWO-BRISTLE ROCK-DAISY	G2T1 S1 C2	12	LOW	Brewster



X	<i>Perityle huecoensis</i> HUECO ROCK-DAISY	G1S1 C2	5	HIGH	El Paso
	<i>Perityle vitreomontana</i> GLASS MOUNTAINS ROCK-DAISY	G1 S1 C2	11	LOW	Brewster
	<i>Perityle warnockii</i> WARNOCK'S RIVER ROCK-DAISY	G1S1 C2	11	Need to relocate	Val Verde
	<i>Phacelia pallida</i> PALE PHACELIA	G2S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Mexico
X	<i>Philadelphus ernestii</i> CANYON MOCK-ORANGE	G2S2 C2	8	MEDIUM	Blanco, Comal, Hays, Kendall, Travis
	<i>Phyllanthus ericoides</i> HEATHER LEAF-FLOWER	G2 S1 C2	11	LOW	Brewster, Terrell; Coahuila, Mexico
	<i>Physostegia correllii</i> CORRELL'S FALSE DRAGON-HEAD	G2 S2 C2	11	LOW Need to relocate	Bexar (H) Galveston, Montgomery (H), Travis, Val Verde, Zapata; LA; Coahuila, Durango, Nuevo Leon, and Sonora, Mexico
	<i>Physostegia longisepala</i> LONG-SEPALED FALSE DRAGON-HEAD	G2G3 S2 C2	na	LOW	Hardin, Jasper, Newton, Orange, Tyler; LA
	<i>Poa strictiramea</i> DESERT MOUNTAINS BLUE GRASS	G3 S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Durango, Nuevo Leon, Zacatecas, Mexico
X	<i>Polemonium pauciflorum</i> ssp <i>hincleyi</i> HINCKLEY'S JACOB'S LADDER	G3 T1Q C2	12	HIGH	Jeff Davis; AZ; Chihuahua Mexico
	<i>Polygala maravillasensis</i> MARAVILLAS MILKWORT	G2S1 C2	11	LOW	Brewster, Terrell, Coahuila, Mexico
X	<i>Prenanthes barbata</i> BARBED RATTLESNAKE-ROOT	G3S2 C2	na	LOW	Cass, Cherokee, Hardin, Jasper, Nacogdoches, Newton, Polk, Rusk, San Augustine, Shelby; AL, AR, GA, KY, LA, TN
	<i>Proboscidea spicata</i> MANY-FLOWERED UNICORN-PLANT	G1 S1 C2	11	Need to relocate	Brewster, Jeff Davis, Presidio; Coahuila, Mexico
X	<i>Psilactis heterocarpa</i> WELDER MACHAERANTHERA	G2 S2 C2		MEDIUM - LOW	Nueces, Kleberg, Refugio, San Patricio, and Victoria
	<i>Quercus boyntonii</i> BOYNTON'S OAK	GHQ SH C2	11	Need to relocate	Angelina (H); AL (H)
	<i>Quercus graciliformis</i> CHISOS OAK	G1 S1 C2	11	LOW	Brewster
	<i>Quercus tardifolia</i> LATELEAF OAK	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Rudbeckia scabrifolia</i> BOG CONEFLOWER	G2S2 C2	2	MEDIUM - HIGH	Angelina, Jasper, Newton, Sabine, Shelby; LA
X	<i>Salvia penstemonoides</i> BIG RED SAGE	G1G2 S1S2 C2	2	HIGH	Bandera, Bexar (H), Gillespie (H), Guadalupe (H), Kendall, Kerr, Real, Travis (I), Wilson (H)

	<i>Scirpus hallii</i> HALL'S BULRUSH	G2QS? C2	na	Need to relocate	Texas (county unknown); AL, GA, IA, IL, IN, KY, MA, MI, MO, NE, SC, WI
	<i>Scutellaria laevis</i> SMOOTH STEM SKULLCAP	G1 S1 C2	11	Need to relocate	Culberson, Hudspeth
	<i>Scutellaria thieretii</i> THIERET'S SKULLCAP	G2Q S1 C2	na	3B	Nueces; LA
	<i>Sedum robertsonianum</i> ROBERTS' STONECROP	G1Q S1 C2	11	Need to relocate	Brewster
	<i>Senna ripleiana</i> RIPLEY'S SENNA	G2 SH C2	11	Need to relocate	Brewster, Chihuahua Zacatecas, Mexico
	<i>Sesuvium trianthemoides</i> ROUGHSEED SEA-PURSLANE	G1 S1 C2	11	Need to relocate	Kenedy
X	<i>Silene subciliata</i> SCARLET CATCHFLY	G3 S3 C2	5	LOW	Hardin, Jasper, Jefferson (H), Liberty, Newton, Polk, Sabine, Shelby, Tyler; LA
X	<i>Streptanthus bracteatus</i> BRACTED TWISTFLOWER	G2 S2 C2	2	HIGH	Bandera, Caldwell (?), Comal, Medina, Real, Travis, Uvalde
X	<i>Streptanthus cutleri</i> CUTLER'S TWISTFLOWER	G2 S2 C2	11	MEDIUM	Brewster; Coahuila, Mexico
X	<i>Streptanthus sparsiflorus</i> SPARSELY-FLOWERED JEWELFLOWER	G2 S2 C2	11	MEDIUM	Culberson; NM
	<i>Styrax youngiae</i> YOUNG'S SNOWBELLS	G1 SH C2	11	Need to relocate	Jeff Davis (H); Coahuila and Nuevo Leon, Mexico
	<i>Suaeda duripes</i> HARDTOE SEEPWEED	GHQ SH C2	11	Need to relocate	Pecos (H) and/or Reeves (H)
	<i>Symphoricarpos guadalupensis</i> MCKITTRICK SNOWBERRY	G1 S1 C2	12	Need to relocate	Culberson
	<i>Talinum rugospermum</i> ROUGH-SEED FLAME FLOWER	G3G4 S1 C2	na	LOW	Anderson, Franklin, Houston, Limestone, Nacogdoches, Rusk, Smith, Upshur, and Wood; IA, IL, IN, KS, MN, NE, WI
X	<i>Thalictrum arkansanum</i> ARKANSAS MEADOW-RUE	G2Q S1 C2	11	HIGH	Bowie; Lamar, Red River, AR OK
X	<i>Thalictrum texanum</i> HOUSTON MEADOW-RUE	G2Q S2 C2	8	HIGH	Brazos, Harris (H), Waller
X	<i>Thelocactus bicolor</i> var <i>flavidispinus</i> STRAW SPINE GLORY OF TEXAS	G4T2 S2 C2	8	HIGH	Brewster Starr(?), Tamaulipas, Mexico
	<i>Thelypodium tenue</i> FRESNO CREEK THELYPODY	G1Q S1 C2	8	Need to relocate	Presidio
X	<i>Tillandsia baileyi</i> BAILEY'S BALLMOSS	G2 S2 C2	2	MEDIUM	Brooks (H), Cameron, Hidalgo, Jim Wells, Kenedy, Willacy, Tamaulipas, Mexico

X	<i>Trillium pusillum</i> var <i>texanum</i> TEXAS TRILLIUM	G3T2T3Q S2S3 C2	3	MEDIUM	Cass, Harrison, Houston (H), Nacogdoches, Panola (H), Rusk, Smith, and Wood (?), AR, LA
	<i>Valerianella texana</i> EDWARDS PLATEAU CORNSALAD	G2 S2 C2	8	LOW	Burnet, Gillespie, Llano
X	<i>Viola guadalupensis</i> GUADALUPE MOUNTAINS VIOLET	G1 S1 C2	5	MEDIUM	Culberson
X	<i>Xyris drummondii</i> DRUMMOND'S YELLOW-EYED GRASS	G3 S2 C2	na	LOW	Angelina, Jasper, Newton; AL, FL, GA, LA, MS
X	<i>Xyris scabrifolia</i> ROUGH-LEAF YELLOW-EYED GRASS	G2G3 S2 C2	na	LOW	Angelina, Jasper, Newton, Sabine; AL, FL, GA, LA, MS, NC
X	<i>Zanthoxylum parvum</i> SHINNERS' TICKLE-TONGUE	G1 S1 C2	11	HIGH	Brewster, Jeff Davis

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>REPTILES</b>			
<i>Cnemidophorus dixonii</i> GRAY-CHECKERED WHIPTAIL	G3G4Q S3S4 C2		MEDIUM
<i>Crotaphytus reticulatus</i> RETICULATE COLLARED LIZARD	G3 S2 C2		MEDIUM-HIGH
<i>Graptemys caglei</i> CAGLE'S MAP TURTLE	G3 S2 C1	5	HIGH
<i>Kinosternon hirtipes murrayi</i> CHIHUAHUA MUD TURTLE	G3T3 S1 C2	HIGH	HIGH
<i>Macrochelys temminckii</i> ALLIGATOR SNAPPING TURTLE	G3G4 S3 C2		HIGH
<i>Malaclemys terrapin littoralis</i> TEXAS DIAMONDBACK TERRAPIN	G5T3 S3 C2	HIGH	MEDIUM-HIGH
<i>Nerodia clarkii</i> GULF SALT MARSH SNAKE	G4Q S4 C2		HIGH
<i>Nerodia harteri harteri</i> BRAZOS WATER SNAKE	G2T2 S2 C2	LOW	MEDIUM-LOW
<i>Phrynosoma cornutum</i> TEXAS HORNED LIZARD	G5 S4 C2	MEDIUM	MEDIUM
<i>Pituophis melanoleucus ruthveni</i> LOUISIANA PINE SNAKE	G5T3 S2 C2		HIGH
<i>Sceloporus arenicolus</i> DUNES SAGEBRUSH LIZARD	G5T2 S2 C2		MEDIUM
<i>Thamnophis sirtalis annectens</i> TEXAS GARTER SNAKE	G5T3 S3 C2	MEDIUM	LOW

**Appendix B:**

**MONITORING PLANS FOR TEN SPECIES OF**

**AMPHIBIANS**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>AMPHIBIANS</b>			
<i>Eurycea neotenes</i> TEXAS SALAMANDER	G1 S1 C1	MEDIUM	HIGH
<i>Eurycea robusta</i> BLANCO BLIND SALAMANDER	G1 S1 C1	LOW	LOW
<i>Eurycea</i> sp 1 JOLLYVILLE PLATEAU SALAMANDER	G1 S1 C1	HIGH	HIGH
<i>Eurycea</i> sp 2 SALADO SPRINGS SALAMANDER	G1 S1 C1	HIGH	MEDIUM
<i>Eurycea</i> sp 5 GEORGETOWN SALAMANDER	G1 S1 C1	HIGH	HIGH
<i>Eurycea</i> sp 6 PEDERNALES RIVER SPRINGS SALAMANDER	G1 S1 C1		MEDIUM
<i>Eurycea</i> sp 7 EDWARDS PLATEAU SPRING SALAMANDER	G1G3Q S1S3 C1		MEDIUM
<i>Eurycea tridentifera</i> COMAL BLIND SALAMANDER	G1 S1 C1	MEDIUM	MEDIUM
<i>Notophthalmus meridionalis</i> BLACK-SPOTTED NEWT	G1 S1 C2		MEDIUM
<i>Siren intermedia</i> pop 1 LESSER SIREN (RIO GRANDE POPULATION)	G?Q S? C2		MEDIUM

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eurycea neotenes                      **Candidate Category:**      C1  
**Common Name:**      Texas salamander                      **Listing Rank:**  
**Range:**                      The Edwards Plateau - known from Bexar, and Kendall counties.                      **G/S Rank:**                      G1S1

**Known Occurrences:**      Springs, spring-runs, and subterranean waters. Obligately aquatic, with a few transforming populations in the far western portion of the range.

**Reasons for Concern:**      Limited distribution in sensitive aquatic habitat. It is believed to have low survivorship of young, may be highly susceptible to fish predation, the species does not occur in caves that support fish.

**Monitoring Objective:**      Obtain monthly relative abundance measures through time-constraint searches.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Monthly

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**      Caves, springs and spring runs, sample a minimum of 10% of known sites.

**Methodology:**              Time constraint searches, water quality measures, extensive field notes

**Field Equipment Needed:**      small nets, boots, thermometer

**Estimated Time/Staff for Monitoring:**      1 - 2 Days/Month; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or

define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Dr. David Hillis, UT; Paul Chippindale, UTA

**Recommendations:** Work with the staff from the USFWS to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eurycea robusta                      **Candidate Category:** C1  
**Common Name:** Blanco blind salamander              **Listing Rank:**  
**Range:**                      **G/S Rank:** G1S1

**Range:**                      Range unknown. Habitat is unknown. Subterranean waters associated with the Austin Chalk, the species inhabits underground streams and caves. Perhaps an abyssal species.

**Known Occurrences:**              Seen once in 1953. Known only from a fissure punched in the dry bed of the Blanco River just north of the I-35 bridge crossing in Hays County, Texas.

**Reasons for Concern:**              A narrow endemic with highly restricted range in sensitive aquatic habitat. Lowering of the water table, pollution? The current status is unknown.

**Monitoring Objective:**              Monitor for relative abundance

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**              Blanco River: near type locality

**Methodology:**                      Abundance and habitat quality. Check for effects of lowering water table and pollution. Find more populations.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine

appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Dr. David Hillis, UT; Paul Chippindale, UTA

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from the San Marcos River Foundation.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eurycea sp. 1                      **Candidate Category:** C1  
**Common Name:** Jollyville Plateau salamander                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Caves, springs and spring-runs associated with Bull, Cypress, and Long Hollow Creeks, Travis and Walnut Creek and possibly Brushy Creek in Williamson County, Texas

**Known Occurrences:** Forty-six occurrences. Caves, springs and spring-runs associated with Bull, Cypress, and Long Hollow Creeks, Travis County, Texas

**Reasons for Concern:** The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.

**Monitoring Objective:** Obtain monthly relative abundance measures through time-constraint searches.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monthly

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Caves, springs and spring-runs associated with Bull, Cypress, and Long Hollow Creeks, Travis County, Texas

**Methodology:** Time-constrained searches of available habitat, note water quality and habitat measurements

**Field Equipment Needed:** Boots, nets, thermometer

**Estimated Time/Staff for Monitoring:** 1- 2 Days/Month; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive

appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Mark Sanders Austin PARD; Dr. David Hillis, UT; and Paul Chippindale, UTA

**Recommendations:**

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Eurycea* sp. 2                      **Candidate Category:** C1  
**Common Name:** Salado Springs salamander                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** The Salado Springs system along Salado Creek, Bell County, Texas.

**Known Occurrences:** One occurrence. This species is known from Salado Springs system along Salado Creek in surface springs and subterranean waters.

**Reasons for Concern:** The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.

**Monitoring Objective:** Obtain monthly relative abundance measures through time-constraint searches.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monthly

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Salado Creek

**Methodology:** Time-constrained sampling, water quality and habitat measures.

**Field Equipment Needed:** Boots, nets, thermometer

**Estimated Time/Staff for Monitoring:** 1 Day/Month; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Dr. David Hillis, UT; Paul Chippindale, UTA

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eurycea sp. 5                      **Candidate Category:** C1  
**Common Name:** Georgetown salamander                      **Listing Rank:**  
**Range:** Surface springs and at least one cave in the San Gabriel River drainage system in Williamson County, Texas. Also Berry Creek and Cowan Creek.                      **G/S Rank:** G1S1

**Known Occurrences:** Eight occurrences. This species is known from the San Gabriel River drainage system in Williamson County, Texas

**Reasons for Concern:** The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.

**Monitoring Objective:** Obtain monthly relative abundance measures through time-constraint searches.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monthly

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** San Gabriel River drainage system in Williamson County, Texas

**Methodology:** Time-constrained sampling, note water quality and habitat measurements.

**Field Equipment Needed:** Boots, nets, thermometer.

**Estimated Time/Staff for Monitoring:** 1- 2 Days/Month; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design

or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Dr. David Hillis, UT; Paul Chippindale, UTA

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eurycea sp. 6                      **Candidate Category:** C1  
**Common Name:** Pedernales River Springs salamander   **Listing Rank:** G1S1  
**Range:** Gillespie and Travis Counties. The Pedernales River system  
**Known Occurrences:** Four occurrences. This species is known from Pedernales River Springs system  
**Reasons for Concern:** The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.  
**Monitoring Objective:** Obtain monthly relative abundance measures through time-constraint searches.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monthly  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Pedernales River Springs: Hammet's Crossing Spring, Cottonwood Spring; Trough Spring.  
**Methodology:** Time-constrained searches, note water quality and habitat measurements  
**Field Equipment Needed:** Boots, nets, thermometer  
**Estimated Time/Staff for Monitoring:** 1- 2 Days/Month; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD;

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Eurycea</u> sp. 7	<b>Candidate Category:</b>	C1
<b>Common Name:</b>	Edwards Plateau Spring salamander	<b>Listing Rank:</b>	
		<b>G/S Rank:</b>	G1G3Q S1S3
<b>Range:</b>	The Edwards Plateau Spring system		
<b>Known Occurrences:</b>	This species is known from Edwards Plateau Spring system.		
<b>Reasons for Concern:</b>	The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.		
<b>Monitoring Objective:</b>	Obtain monthly relative abundance measures through time-constraint searches.		
<b>Priority:</b>	MEDIUM PRIORITY		

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**PLAN**

**Monitoring Frequency/Season:** Monthly

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Edwards Plateau Spring

**Methodology:** Time-constrained sampling, note water quality and habitat measurements.

**Field Equipment Needed:** Boots, nets, water sampling equipment

**Estimated Time/Staff for Monitoring:** 1- 2 Days/Month; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Dr. David Hillis; Paul Chippindale, UTA

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Eurycea tridentifera* **Candidate Category:** C1  
**Listing Rank:**  
**Common Name:** Comal blind salamander **G/S Rank:** G1S1

**Range:** Endemic to the Cibolo Creek drainage system northwest of San Antonio in Bexar, Comal, and Kendall counties.

**Known Occurrences:** Eight occurrences. Occurs in the Cibolo Creek drainage system, Bexar, Comal, and Kendall counties, in slow to fast flowing subterranean waters. Southeast margin of Edwards Plateau of central Texas. Found in Honey Creek Cave and the nearby sinkhole caves on the flood plain of Cibolo Creek in Comal County and in Elm Springs Cave in Bexar County. The species is currently known from and restricted to the underground waters of limestone caves. The species occurs within the aphotic zones of shallow limestone caves with streams fed by phreatic groundwater.

**Reasons for Concern:** The limited distribution of this species in sensitive aquatic habitat is the primary reason for concern.

**Monitoring Objective:** Obtain monthly relative abundance measures through time-constraint searches.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monthly

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Cibolo Creek drainage system: Honey Creek Cave, Comal Co.

**Methodology:** Time-constrained searches. Note abundance, habitat quality, demographic analysis, look at predation, diet, and water quality requirements

**Field Equipment Needed:** Boots, nets, water quality monitoring equipment

**Estimated Time/Staff for Monitoring:** 2 Days/Month; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population

from one year to the next will be considered significant. Note that there may be a delayed reactions to the population due to various unknown influences that should also be taken into account when considering Red Flag conditions. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, TPWD; Andy Grubbs, Hays Consulting Services; Dr. David Hillis, UT; Paul Chippindale, UTA.

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Notophthalmus meridionalis                      **Candidate Category:** C2  
**Common Name:** black-spotted newt                                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Found in the coastal plains of South Texas, beginning about halfway down the coast and extending south to the Mexican border (Garrett and Barker, 1987). The species is recorded from Hidalgo, Cameron, Kleberg, Duval, Willacy, Aransas, Kenedy, Nueces, Bexar, Victoria and San Patricio counties. Many historic occurrences are no longer extant.

**Known Occurrences:** Twenty-seven occurrences. Habitat is unknown for terrestrial adults. Aquatic forms require quiet water, temporary pools with vegetation or without predatory fish. Adults, juveniles, and larvae inhabit permanent and temporary ponds, roadside ditches, and quiet stream pools. Usually found among submerged vegetation (e.g. Chara). Found under rocks and other shelter when ponds dry up. Eggs probably laid on submerged vegetation. May be found in resacas & bodies of water with firm bottoms and little or no vegetation. The absence of predatory fish is probably important in the latter case. Best located in the early spring after rains.

**Reasons for Concern:** The extensive habitat destruction and alteration in south Texas and northeast Mexico have had a severe impact on this species. The use of pesticides and herbicides throughout its range in Texas has probably had an adverse impact. Fresh water habitats of the kind used by the Black-spotted newt are very limited and threatened in south Texas.

**Monitoring Objective:** Obtain measure of relative abundance through surface samples noting presence/absence.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Cameron County: Laguna Atascosa NWR

**Methodology:** Surface samples, note presence/absence

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**

After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION****Resource Specialists:**

Andy Price, TPWD;

**Recommendations:**

Work with staff from the TPWD and the USFWS to monitor this species.

**Potential use of  
Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:**

Summer 1995

**Plan Approval Date:****Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Siren sp. 1                      **Candidate Category:** C2  
**Common Name:** South Texas siren (large form)    **Listing Rank:**  
**G/S Rank:** G?Q S?

**Range:** Taxonomic confusion makes clear delineation of this subspecies' range difficult. South Texas counties clearly within the range include Cameron, Hidalgo, Starr and Maverick. Dixon (1987) includes Dimmit, Zavala, Duval, Jim Wells, and Refugio to Kenedy Counties.

**Known Occurrences:** Twenty-nine occurrences. Permanent and semi-permanent bodies of water with relatively low salinity. Turbidity does not appear to be a limiting factor for the species and it can apparently occupy wetlands sympatrically with predatory fish if sufficient cover in the form of emergent vegetation is available. In the lower Rio Grande Valley, sirens prefer the headwaters of resacas over the lower reaches perhaps because of changes in water quality in the lower reaches.

**Reasons for Concern:** Wetland habitats of south Texas are largely being converted to other more profitable land uses. With the increase in agricultural activity in the Rio Grande Valley, increased pesticide use has followed. Return of irrigation waters may negatively impact freshwater habitats by increasing salinity. Development along resaca margins may lead to loss of emergent vegetation and increased dredging. Decreased vegetation may lead to increased predation while dredging may deny the sirens a substrate for aestivation during dry periods. Loss of wetlands due to development is also a serious threat. Requirements of irrigation districts to reduce margin vegetation (to improve water distribution) may decrease extent of suitable habitat.

**Monitoring Objective:** If taxonomic entity deserves further evaluation, delimit sites where monitoring of populations is likely to provide substantial data and begin trapping. Suggested Method: Use minnow-traps and PIT tags to determine demographic parameters.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, summer nights

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hidalgo County: Olmito Abandoned Hatchery (TPWD), Santa Ana NWR, LRGVNR Villa Nueva Tract and Bentsen-Rio Grande State Park. Check areas of virgin natural habitat where the species breeds.

**Methodology:** Potential habitat needs to be inventoried using deep seines and/or passive baited or unbaited traps. When population(s) are located use minnow-traps and PIT tags to determine demographic parameters.

**Field Equipment Needed:** Seines, minnow-traps, PIT tags

**Estimated Time/Staff for Monitoring:** 3-5 Days;2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, TPWD;

**Recommendations:** According to Andy Price there is possibly a new species in South Texas. There needs to be a status survey to clarify the taxonomy and distribution of all the species of sirens.

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**Appendix C:**

**MONITORING PLANS FOR TEN SPECIES OF**

**ARACHNIDS**

**LIST OF CANDIDATE SPECIES WITH MONITORING PLANS**

SCIENTIFIC NAME	STATUS	USFWS LEST PRI	MONIT PRIORITY
<b>ARACHNIDS</b>			
<i>Archeolarca guadalupensis</i> GUADALUPE CAVE PSEUDOSCORPION	G1 S1 C2	MEDIUM	LOW
<i>Cicurina bandida</i> BANDIT CAVE SPIDER	G1 S1 C2	MEDIUM	HIGH
<i>Cicurina baroni</i> ROBBER BARON CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina cueva</i> A CAVE SPIDER	G1 S1 C2	MEDIUM	HIGH
<i>Cicurina madla</i> MADLA'S CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina venii</i> VENI'S CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina vesper</i> VESPER CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Cicurina wartoni</i> WARTON'S CAVE SPIDER	G1 S1 C1	2	HIGH
<i>Neoleptoneta microps</i> GOVERNMENT CANYON CAVE SPIDER	G1 S1 C2	**Status survey recently completed	HIGH
<i>Texella cokendolphi</i> ROBBER BARON CAVE HARVETMAN	G1 S1 C2	**Status survey recently completed	HIGH

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Archeolarca guadalupensis      **Candidate Category:** C2  
**Common Name:** Guadalupe Cave pseudoscorpion      **Listing Rank:**  
**Range:** Culberson County, Texas. This pseudoscorpion is an obligate cave-dwelling species.      **G/S Rank:** G1S1

**Known Occurrences:** This species is known only from 7 specimens collected at the type locality of Lower Sloth Cave, Guadalupe Mountains National Park, Culberson County, Texas.

**Reasons for Concern:** This pseudoscorpion has a limited distribution and apparently is uncommon. The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. The main threat to this species is cave disturbance and over-collecting by cave biologists.

**Monitoring Objective:** Determine presence/absence of species, no collecting.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, to minimize impact to the species

**Monitoring Responsibility:** TPWD/Guadalupe Mountains National Park

**Monitoring Plan:**

**Site Description:** Culberson County: Lower Sloth Cave, Guadalupe Mountains National Park

**Methodology:** Site visit, noting presence/absences only no at-large collecting.

**Field Equipment Needed:** Caving equipment

**Estimated Time/Staff for Monitoring:** 3- 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality

should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Reddell

**Recommendations:** Work with the staff from Guadalupe Mountains NP to monitor this species. A status survey should be completed for this species.

**Potential use of  
Volunteers:** No volunteers should be utilized in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina bandida **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Bandit Cave spider **G/S Rank:** G1S1

**Range:** Travis, County. This spider is an obligate cave-dwelling species.

**Known Occurrences:** This spider is known from one cave

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Determine presence/absence of species, no collecting. May want to monitor for contaminants in the cave.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually for the species; Annually for contaminants, 4/year

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Travis County: Rollingwood, Bandit Cave

**Methodology:** Note presence/absence only, no collecting

**Field Equipment Needed:** Caving equipment

**Estimated Time/Staff for Monitoring:** 3 - 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality

should be addressed. If contaminant monitoring is undertaken, a designated level of contamination should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina baroni **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Robber Baron Cave spider **G/S Rank:** G1S1

**Range:** Bexar County, Texas. This spider is an obligate cave-dwelling species.

**Known Occurrences:** This species is known only from Robber Baron Cave, Bexar County, Texas

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. Determine presence/absence of species, no collecting

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Robber Baron Cave

**Methodology:** Note presence/absence only, no collecting

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. If contaminant monitoring is undertaken, a designated level of contamination should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina cueva                      **Candidate Category:** C2  
**Common Name:** a cave spider                      **Listing Rank:**  
**Range:** Travis County. This spider is an obligate cave-dwelling species.                      **G/S Rank:** G1S1

**Known Occurrences:** Known from in one cave in Travis County.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. Determine presence/absence of species, no collecting. May want to monitor the cave for contaminants.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, for species; Annually for contaminants, 4/year

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Travis County: Cave X

**Methodology:** Note presence/absence only, not at-large collecting. Monitoring for contaminants should be done annually on a quarterly basis.

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**

After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. If contaminant monitoring is undertaken, a designated level of contamination should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina madla **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Madla's Cave spider **G/S Rank:** G1S1

**Range:** Bexar County, Texas. This spider is an obligate cave-dwelling species.

**Known Occurrences:** This species is known only from Madla's Cave, Bexar County, Texas

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. Need access.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Madla's Cave

**Methodology:** Note presence/absence, no at-large sampling

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be

considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina venii                      **Candidate Category:** C2  
**Common Name:** Veni's Cave spider                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Bexar County, this spider is an obligate cave-dwelling species.

**Known Occurrences:** This spider is known only from Braken Bat Cave, Bexar County, Texas.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. Need access.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Braken Bat Cave

**Methodology:** Note presence/absence only, no at-large collecting

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be

considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Cicurina vespera*                      **Candidate Category:** C2  
**Common Name:** Vesper Cave spider                      **Listing Rank:**  
**Range:** Bexar County, this spider is an obligate cave-dwelling species.                      **G/S Rank:** G1S1

**Known Occurrences:** This spider is known only from Government Canyon Bat Cave, Bexar County, Texas.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Government Canyon State Park, Government Canyon Bat Cave

**Methodology:** Note presence/absence only, no at-large sampling

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted

presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the site staff from TPWD to monitor this species. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicurina wartoni                      **Candidate Category:** C1  
**Common Name:** Warton's Cave spider                      **Listing Rank:**  
**Range:** Travis County, this spider is an obligate cave-dwelling species.                      **G/S Rank:** G1S1

**Known Occurrences:** This spider is known only from Pickle Pit, Travis County.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. Monitor cave environment for any changes in vandalism or other human impacts.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Travis County: Pickle Pit

**Methodology:** Note presence/absence only, no at-large collecting

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered

significant. A closer look at the habitat quality should be addressed. If there is significant negative impact from human involvement notify the USFWS office immediately. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Neoleptoneta microps                      **Candidate Category:**      C2  
**Common Name:**                      Government Canyon Cave spider      **Listing Rank:**  
**Range:**                                      Bexar County, this spider is an obligate cave-dwelling species.      **G/S Rank:**                      G1S1

**Known Occurrences:**                      This spider is known only from Government Canyon Bat Cave, Bexar County, Texas.

**Reasons for Concern:**                      The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:**                      Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years.

**Priority:**                                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Biennially

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**  
**Site Description:**      Bexar County: Government Canyon State Park, Government Canyon Bat Cave

**Methodology:**                      Note Presence/absence only, no at-large sampling

**Field Equipment Needed:**      Cave equipment

**Estimated Time/Staff for Monitoring:**      1 - 2 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a decrease in the noted

presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the site staff from TPWD. A status survey should be completed for this species.

**Potential use of Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Texella cokendolpheri      **Candidate Category:** C2  
**Common Name:** Robber Baron Cave harvestman      **Listing Rank:**  
**Range:** Bexar County, this spider is an obligate cave-dwelling species.      **G/S Rank:** G1S1

**Known Occurrences:** This spider is known only from Robber Baron Cave, Bexar County, Texas.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Robber Baron Cave

**Methodology:** Note presence/absence, no at-large collecting, check other caves in the area if possible.

**Field Equipment Needed:** Cave equipment

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted

presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Cokendolpher

**Recommendations:** Work with the staff from TPWD. A status survey should be completed for this species.

**Potential use of  
Volunteers:** Possibly utilize cave biologists to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**Appendix D:**

**MONITORING PLANS FOR TWENTY-FIVE SPECIES  
OF**

**BIRDS**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>BIRDS</b>			
<i>Accipiter gentilis</i> NORTHERN GOSHAWK	G3 SA C2		LOW
<i>Aimophila aestivalis</i> BACHMAN'S SPARROW	G3 S3B C2		MEDIUM-HIGH
<i>Aimophila botteri texana</i> TEXAS BOTTER'S SPARROW	G4T4 S4B C2		MEDIUM
<i>Ammodramus bairdii</i> BAIRD'S SPARROW	G3 S2 C2		MEDIUM
<i>Ammodramus henslowii</i> HENSLOW'S SPARROW	G4 S2N,SXB C2		MEDIUM
<i>Arremonops rufivirgatus rufivirgatus</i> TEXAS (=SENNETT'S) OLIVE SPARROW	G5T3 S3B C2		LOW
<i>Athene cunicularia hypugea</i> WESTERN BURROWING OWL	G4TU S3B C2		LOW
<i>Buteo nitidus maximus</i> NORTHERN GRAY HAWK	G3G4T3T4 S3B C2		MEDIUM-HIGH
<i>Buteo regalis</i> FERRUGINOUS HAWK	G4 S3B,S4N C2		MEDIUM
<i>Charadrius alexandrinus</i> SNOWY PLOVER	G4 S4B C2		
<i>Charadrius alexandrinus nivosus</i> WESTERN SNOWY PLOVER	G4T3 S2B C2		MEDIUM-HIGH
<i>Charadrius alexandrinus tenuirostris</i> SOUTHEASTERN SNOWY PLOVER	G4T3 S2B C2		HIGH
<i>Charadrius montanus</i> MOUNTAIN PLOVER	G3 S2B C1		HIGH
<i>Chlidonias niger</i> BLACK TERN	G4 S4 C2		LOW
<i>Dendroica cerulea</i> CERULEAN WARBLER	G4 S3B C2		LOW-MEDIUM
<i>Egretta rufescens</i> REDDISH EGRET	G4 S4B C2		MEDIUM-HIGH
<i>Geothlypis trichas inasperata</i> BROWNSVILLE COMMON YELLOWTHROAT	G5T2 S1B C2		HIGH
<i>Icterus cucullatus cucullatus</i> MEXICAN HOODED ORIOLE	G5TU S4B C2		LOW-MEDIUM
<i>Icterus cucullatus senneri</i> SENNETT'S HOODED ORIOLE	G5TU S4B C2		LOW-MEDIUM
<i>Icterus griseicauda auduboni</i> AUDUBON'S ORIOLE	G5T4 S3B C2		LOW-MEDIUM
<i>Lanius ludovicianus</i> LOGGERHEAD SHRIKE	G4G5 S4S5B C2		MEDIUM-LOW

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Lanius ludovicianus migrans</i> MIGRANT LOGGERHEAD SHRIKE	G4G5T3T4 S2 C2		MEDIUM-LOW
<i>Lateralus jamaicensis</i> BLACK RAIL	G4? S2B C2		MEDIUM
<i>Parula pitrayumi nigriflora</i> TROPICAL PARULA	G5TU S3B C2		LOW
<i>Plegadis chihi</i> WHITE-FACED IBIS	G5 S4B C2		MEDIUM

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Accipiter gentilis **Candidate Category:** C2  
**Common Name:** Northern goshawk **Listing Rank:**  
**G/S Rank:** G3SA

**Range:** Winter visitor to the Trans-Pecos and the Panhandle

**Known Occurrences:** Rare winter visitor to the Trans-Pecos and the Panhandle, November to March

**Reasons for Concern:** It is probably adversely impacted by habitat reduction and destruction.

**Monitoring Objective:** Review Audubon Christmas bird counts for presence of this species.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, November - March

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Trans-Pecos and Panhandle

**Methodology:** A close review of Christmas bird counts need to be compiled for this species. If occurrences are noted, closer field investigations may be necessary. Also review Root, T: 1988. Atlas of wintering North American Birds: an analysis of Christmas Bird Count data. University of Chicago Press. Chicago.

**Field Equipment Needed:** Binoculars, spotting scope

**Estimated Time/Staff for Monitoring:** 1 week; 1 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management. The population may be responding to any changes in the prey base.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Work with the staff from the USFWS.

**Potential use of  
Volunteers:** Possibly utilize Audubon volunteers from the regions to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Aimophila aestivalis* **Candidate Category:** C2  
**Common Name:** Bachman's sparrow **Listing Rank:**  
**G/S Rank:** G3S3B

**Range:** The species winters in eastern Texas and along the gulf-coast, and from southeastern North Carolina south to Florida along the Atlantic coast. It is a resident of Texas and breeds from mid-April to late July at sea level to 750 feet (Oberholser, 1974). It is common to rare and local in wooded eastern quarter of the state, west to Cooke County and south to Harris County. Recorded from Cooke, Jasper, Orange, Chambers, San Jacinto and Harris counties. Residents who breed here probably migrate out.

**Known Occurrences:** No recorded occurrences. The species inhabits dry open woods of pine or oak with a ground cover of grass or scrub palmetto. It prefers open, park-like stands of tall pines with grass, flowers and scattered oaks and a few bushes. Abandoned fields and open woodlands of oak or pine with an undergrowth of scrub palmetto are especially favorite haunts (Whetmore, 1959). Also breeds in regenerated pine plantations up to five years, although this is an ephemeral habitat.

**Reasons for Concern:** This bird has a very limited Texas distribution. Although populations may be stable in Louisiana, Mississippi, and Arkansas, the species seems extirpated from Pennsylvania and Illinois, and has declined severely in Tennessee. The remaining states in its distribution consider the species to be "endangered" or "rare". Three possible causes for decline are: interaction with other birds, brood parasitism, loss of breeding habitat, and competitive interactions with other species. In particular, urbanization, fire suppression, overgrazing, and commercial logging practices that promote dense woody vegetation at the expense of lush herbaceous ground cover appear to be causes for habitat loss for this species. Breeding Bird Surveys indicate 90% of recorded birds in only 3 states (FL, GA, LA); low population density. Extirpated as breeder in much of ne. U.S. (USFWS, 1987).

**Monitoring Objective:** More accurate censuses, especially in red-cockaded woodpecker (RCW) stands. Relative abundance should be determined by playback. Habitat quality and incidence of nesting should be checked. Birds should also be monitored in winter to learn something about the winter ecology of the species.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Mid-April - July

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas, sites to be chosen

**Methodology:** Select sites will be monitored for nesting activity, count nests and/or singing males, may be able to coordinate with on-going research with the red-cockaded woodpecker.

**Field Equipment Needed:** Binoculars, tape players, bird tapes, mist nets, bands

**Estimated Time/Staff for Monitoring:** 2 - 4 Weeks; 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Will need a detailed study of the population dynamics of the species

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Aimophila botterii texana*                      **Candidate Category:** C2  
**Common Name:** Texas Botteri's sparrow                      **Listing Rank:**  
**G/S Rank:** G4T4S4B

**Range:** Range in Texas includes the lower Gulf Coast. The species breeds in early April to mid-July from sea level to 40 feet and has been recorded in the past to be fairly common locally from Kenedy County to the mouth of the Rio Grande (Oberholser, 1974). It is only casually observed north to Corpus Christi (Oberholser, 1974) although breeding has been confirmed for San Patricio County. During the winter there are periodic sightings in Cameron County (Oberholser, 1974). This species is peripheral in the U.S., with a mainly Mexican distribution.

**Known Occurrences:** Texas Botteri's Sparrow prefers coastal prairie habitats, savannahs and grasslands. This difficult to identify sparrow inhabits tall bunch grass within 20 miles of the Gulf of Mexico. Usually found in rank grass approximately one foot tall which grows between widely scattered mesquite and huisache brush. This sparrow favors salt-grass (*Spartina*) habitat with some yucca, prickly pear, acacia and mesquite (Terres, 1980).

**Reasons for Concern:** The bird is extremely habitat specific. Its preferred habitat is subject to exploitation, destruction and alteration. Although much of it has been destroyed, there remains habitat of excellent quality on the southeastern most portion of the King Ranch (Oberholser, 1974). Almost nothing is known of its whereabouts in winter.

**Monitoring Objective:** We need to find more populations. The birds are very hard to see and not easily identified when seen. A cryptic species, the male song is the best clue to identification.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, late April- May.

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Laguna Atascosa NWR or King Ranch with permission.

**Methodology:** Determine relative abundance through use of playback, census to be done when males are singing after spring rains. Also obtain habitat quality analysis.

**Field Equipment Needed:** Binoculars, tape players



**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:** Will need someone to positively identify this species.

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Ammodramus bairdii*      **Candidate Category:** C2  
**Common Name:** Baird's sparrow      **Listing Rank:**  
**G/S Rank:** G3S2

**Range:** In Texas this species has been encountered at scattered localities throughout the state. Nests in the northern Great Plains. Winters in northern Mexico, Arizona, New Mexico, Texas.

**Known Occurrences:** No recorded occurrences. Habitat includes grasslands, savanna areas, old fields, moist areas with relatively lush ground cover.

**Reasons for Concern:** This species has declined on its northern breeding grounds due to overgrazing and conversion of prairie lands to farmlands and the use of pesticides.

**Monitoring Objective:** Monitor levels of pesticide use in occupied habitats. Compile Winter bird counts to determine presence.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, spring

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:**

**Methodology:** Gather winter bird count information to determine presence. May follow-up with site visits to determine extent of wintering population(s).

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Be sure not to confuse this species with the Savanna Sparrow

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Ammodramus henslowii* **Candidate Category:** C2  
**Common Name:** Henslow's sparrow **Listing Rank:**  
**G/S Rank:** G4S2N, SXB

**Range:** Piney woods and the gulf coast prairies and marshes. Henslow's sparrow is a winter resident of Texas -- in East Texas from the Red River to the Coast and west as far as the Hill Country and Rolling Plains, south to Nueces County in non-breeding season.

**Known Occurrences:** Breeding-lush, wet meadows; less numerous in marsh borders or dry fields. Wintering- favor moist, grassy spots under open pineywoods; also in broomsedge or other grasses, usually where moist. Perhaps more than most tall grass prairie species, this sparrow requires rank grasslands. Damp open meadows; grass stands and weedy places in humid open or semi-open country; broomsedge fields and weedy patches.

**Reasons for Concern:** Population decline, and ultimate extinction of the Texas race (taxonomy questionable), is consistent with the decline of the coastal prairie, a trend responsible for the demise of a number of species dependent on this ecosystem.

**Monitoring Objective:** This species is reclusive. During the non-breeding season when the species is most likely to be found in Texas the species remains close to the ground and is reluctant to flush. The easily identified song is, of course, less frequently heard outside of the breeding season. Monitor the distribution and abundance of this species in relation to land use activities. Determine population trends by establishing known study sites and checking them on a regular basis.

**Priority:** **MEDIUM PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas, sites to be selected

**Methodology:** ??

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department

within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:** May be able to utilize Audubon volunteers.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Arremonops rufivirgatus rufivirgatus **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Texas Olive Sparrow **G/S Rank:** G5T3S3B

**Range:** Texas and Mexico. The Olive Sparrow ranges from southern Sinaloa and southern Texas south on the coasts of Mexico to Chiapas and the Yucatan Peninsula. The species is also found on the Pacific slope of Costa Rica. The subspecies rufivirgatus is resident in southern Texas (Kinney, Atascosa, and Nueces counties) south to eastern Coahuila and central Tamaulipas. In Texas, it breeds early in March to late September from sea level to 948 feet. It has been reported from Trans Pecos, Uvalde, Atascosa counties, throughout much of South Texas.

**Known Occurrences:** Spends most of its time on or near the ground in dense thickets, thorn scrub, mesquite, riparian brush (Oberholser, 1974); prefers dense thickets in Rio Grande delta, and optimum habitat is a tangle of thorny shrubs, including mesquite, Texas ebony, anacua, huisache and retama (Oberholser, 1974). Further north it may be found in stream side growth of cane briars, willow, ash and live oak.

**Reasons for Concern:** There has been a decline in the numbers of this species since 1933 (Oberholser, 1974). Much of the 20 million acres constituting the sole U.S. range of this bird has been subject to brush removal (Oberholser, 1974). Almost 98% of the Rio Grande delta has been cleared of brush. Moreover, over browsing by goats and cattle render thickets unsuitable (Oberholser, 1974). The species is, however, capable of occupying a variety of brush habitats.

**Monitoring Objective:** Determine relative abundance of this species, compile a general habitat analysis, and check for additional areas of suitable habitat. Although this species inhabits dense brush, it is typically not difficult to detect.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, March - June

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bentsen/Rio Grande SP, Falcon SP, Las Palomas WMA, Chaparral WMA, Choke Canyon State Park, Laguna Atascosa NWR, Santa Ana NWR.

**Methodology:** Determine relative abundance through use of playback tapes, compile a general habitat analysis and check for additional areas of suitable habitat

**Field Equipment Needed:** Binoculars, tape players,

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from Audubon to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Athene cunicularia hypugea      **Candidate Category:** C2  
**Common Name:** Western burrowing owl      **Listing Rank:**  
**G/S Rank:** G4TUS3B

**Range:** .Scattered throughout Texas except the Pineywoods. Prefers open, sparsely or short vegetation.

**Known Occurrences:** Brewster County. Rita Blanca National Grasslands.

**Reasons for Concern:** Conversion of suitable habitat to agriculture fields, shooting

**Monitoring Objective:**

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Breeding season

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Rita Blanca National Grasslands, and Lake Meredith National Recreation Area, prairie dog towns.

**Methodology:** Identify sites and count active burrows, gather breeding bird survey and Christmas Bird Count data.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,



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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Kevin Mote and Craig Farquar, TPWD

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize Audubon volunteers.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Buteo nitidus maximus                      **Candidate Category:** C2  
**Common Name:** Northern gray hawk                      **Listing Rank:**  
**G/S Rank:** G3G4T3T4 S2B

**Range:** In Texas, the bird is a rare fall and winter visitor to Rio Grande delta, Bentson Rio Grande, Hidalgo County. It is a possible breeder here, as there are 3 records in Webb County. The bird is a casual wanderer to the central coast up to Corpus Christi. It is seen also in the Trans Pecos, Brewster and Jeff Davis counties. This species used to be more frequent and even nested in Texas in the past, but now has become increasingly rare.

**Known Occurrences:** In Texas, it prefers mature woodlands of river valleys and semi-arid mesquite and scrub grasslands in the southwestern portion of the state (Oberholser, 1974). Also to be found in cottonwood and willows from Webb to Cameron counties in the Lower Rio Grande valley.

**Reasons for Concern:** According to Glinski (1988) this species probably resided historically in greater numbers in the relatively pristine subtropical thornscrub environment of southern Texas. It was probably adversely impacted by habitat reduction and destruction. It is now very rarely seen in Texas. The future of the Gray Hawk in the American southwest may largely depend upon preserving the mature cottonwood woodlands along rivers which are rapidly disappearing. As of the mid-1980's, the U.S. nesting population was only about 50 pairs, making it one of the three rarest North American Hawks.

**Monitoring Objective:** If found to be breeding in Webb County, monitor for breeding success. Review breeding bird surveys and Christmas bird counts for presence of this species. If possible, monitor pesticide contamination in potential prey and eggshells.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be chosen dependent of location of species.

**Methodology:** Webb County: Once population(s) are located, monitor for breeding activity and success. Other sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+? Days, 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Buteo regalis **Candidate Category:** C2  
**Common Name:** Ferruginous hawk **Listing Rank:**  
**G/S Rank:** G4S3B,S4N

**Range:** Regularly winters on the Texas coastal barrier islands and grasslands of the Trans-Pecos. Formerly nested east to Wilbarger and Shackelford Counties, and likely nested (or may still nest) in the Trans-Pecos and Panhandle.

**Known Occurrences:** Often nests where pinyon, juniper, and other tree species grade into more open grassland.

**Reasons for Concern:** Any reduction in availability of rodents and lagomorphs is likely to have an impact on this species. The species is also sensitive to human disturbance during the nesting period.

**Monitoring Objective:** Monitor productivity of any Texas nesting attempts. Determine annual variability in abundance of nesting and wintering population. Monitor extent of shooting mortality in areas of greatest occurrence. Monitor populations of lagomorphs and prairie dogs within habitat to determine management needs.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be determined once populations are located (Possibly Rita Blanca National Grasslands)

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Wintering sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+? Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant

or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the different regions to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Charadrius alexandrinus nivosus      **Candidate Category:** C2  
**Common Name:** Western snowy plover      **Listing Rank:**  
**G/S Rank:** G4T3S2B

**Range:** Breeding along the Texas coast was fairly common to uncommon from Galveston to the Rio Grande. Breeding, particularly along the upper coast, is thought to be much less common than previously suspected (T. Eubanks, personal communication). It is a rare and local breeder in and near the panhandle. Both races winter primarily along the coast.

**Known Occurrences:** Feeds on intertidal flats including mud, sand and algal flats. Also feeds on beaches. Roosts among beach wrack, among dunelets in washover passes, and among plants (*Salicornia*), ruts, and other microtopographic relief features on the bayside flats. May nest on beaches of Gulf or lakes, or on flats near foraging areas or along streams.

**Reasons for Concern:** Because most of our beaches are open to vehicular and pedestrian traffic, historic nesting areas of this species may be deleteriously impacted by disturbance, predation by unrestricted pets, or mortality from vehicular traffic. Loss of foraging habitat from development and channelization may also contribute to the decline of this species.

**Monitoring Objective:** Once nesting distribution is determined, monitor sites to insure no loss of nesting habitat. Monitor wintering population in conjunction with other shorebird monitoring efforts.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Galveston Bay, San Luis Pass

**Methodology:** Once breeding population(s) are located, monitor for breeding activity and success. Wintering sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Craig Farquar, Lee Elliott, TPWD

**Recommendations:** See Page, et al, 1995 Snowy Plover. Birds of North America, no. 154.

**Potential use of  
Volunteers:** Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Charadrius alexandrinus tenuirostris **Candidate Category:** C2  
**Common Name:** Southeastern snowy plover **Listing Rank:**  
**G/S Rank:** G4T3S2B

**Range:**

**Known Occurrences:**

**Reasons for Concern:**

**Monitoring Objective:**

**Priority:** PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:**

**Methodology:**

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Charadrius montanus      **Candidate Category:** C1  
**Common Name:** Mountain Plover      **Listing Rank:**  
**G/S Rank:** G3S2B

**Range:** Historically known to breed in Jeff Davis, Swisher, and Brewster Counties and probably nested in adjacent counties. One individual was sighted in Hartley Co. in June 1974, and a couple of breeding pairs are currently known from Jeff Davis Co.; known to winter along coastal and blackland prairies in plowed fields or disturbed, short-grass areas; probably migrate through Texas, utilizing freshly plowed fields; also may breed, spend winter in Mexico.

**Known Occurrences:** Expansive tracts of arid, short-grass prairie.

**Reasons for Concern:** Its number have decreased markedly due to range contraction and agricultural conversion of short grass prairie. Plains habitat being destroyed, with resulting decline in nesting habitat. Ecologically sensitive to farming on nesting habitat.

**Monitoring Objective:** Annually document presence of Mountain Plovers and obtain population estimates using local Audubon members. On known wintering sites, attempt to capture and band the flock to track long-term movements.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be chosen

**Methodology:** For breeding population(s), once located, monitor for breeding activity and success. Wintering sites will be monitored for presence. Attempt to complete a simultaneous count at all sites to estimate the wintering population. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+? Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the different regions to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chlidonias niger **Candidate Category:** C2  
**Common Name:** Black Tern **Listing Rank:**  
**G/S Rank:** G4S4

**Range:** Common summer resident (but does not breed) along coast, where it is seen throughout much of the year. Transient in eastern half of state and infrequently observed further west. Breeds in the northern temperate areas of North America (northern U. S. and Canada).

**Known Occurrences:** Seen over coastal prairies and Gulf waters, and around inland lakes, rivers and streams.

**Reasons for Concern:** Loss of nesting habitat in the upper mid-West has given cause for concern for the future well being of this species. Wetland loss and possibly exposure to agricultural chemicals are thought to be factors contributing to its decline.

**Monitoring Objective:** Once wintering populations have been identified, monitoring protocols may be needed to develop trend data.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be selected

**Methodology:** Once population(s) are located, monitor for presence during winter. Also monitor winter food sources. A close review of winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+ Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal

should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize regional Audubon volunteers to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dendroica cerulea **Candidate Category:** C2  
**Common Name:** Cerulean Warbler **Listing Rank:**  
**G/S Rank:** G4S3B

**Range:** Rare as a nesting species in NE Texas (records from Bowie, Dallas and Cooke Counties). Uncommon as a migrant in east Texas and Texas coast.

**Known Occurrences:** Nests in riverbank woodlands, bottomland hardwood forests, and swamps.

**Reasons for Concern:** Destruction of bottomland hardwood forests coupled with a 4% decline in the abundance of this species over the last 30 years.

**Monitoring Objective:** Monitor trends in annual productivity, and nest parasitism and nest predation rates. Monitor changes in the availability of bottomland hardwood forests, and other wetland forest communities. Monitor use of coastal woodlands as migration stop-over points by this species.

**Priority:** LOW - MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Fall

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Northeast Texas, sites to be selected.

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Note any nest parasitism and nest predation. Other breeding and wintering sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+? Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection.

provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Egretta rufescens **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Reddish Egret **G/S Rank:** G4S4B

**Range:** In Texas, the bird is resident along the coast (rare in winter on upper coast) including the Upper Texas Coast, the Coastal Bend and Lower Coast and slightly inland. Texas birds are somewhat migratory, and tend to move south in the winter.

**Known Occurrences:** The Reddish Egret inhabits shallow, open salt pans, mangrove swamps, coastal areas and tidal marshes. Sandy shoals, muddy banks, tidal flats, coastal marshes and narrow winding bays intermingled with mangrove islands represent optimal habitat. Bay systems are very important to this species. It prefers salt marshes to fresh. Only on rare occasions does the bird stray far from the immediate coastal areas—it prefers feeding in shallow saltwater areas rather than brackish or freshwater locations.

**Reasons for Concern:** Recent trends in population status are somewhat erratic, and loss of foraging habitat and impacts to nesting islands threaten this species. The species prefers shallow, saltwater habitats and these habitats are subject to modification from effects associated with dredging activities. These effects range from increased turbidity, in the case of open-bay dredge disposal, to direct loss of shallow water habitat when such habitats are filled or channelized. Certain development activities also lead to direct or indirect loss of important foraging habitat. Erosional forces lead to loss of islands needed by the species for nesting. Human disturbance of these islands, during the nesting season, may also lead to nest failure and population decline.

**Monitoring Objective:** Monitor population levels through continued support of colonial waterbird survey.

**Priority:** MEDIUM TO HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, Fall and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be selected

**Methodology:** Follow the methodology of the colonial waterbird survey, compile results from the survey, also compile breeding bird surveys and winter bird counts for this species.



**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3+? Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Geothlypis trichas insperata      **Candidate Category:** C2  
**Common Name:** Brownsville Common Yellowthroat      **Listing Rank:**  
G/S Rank: G5T2S1B

**Range:** Texas and Mexico. The species as a whole is widespread; however, the subspecies *insperata* has a very restricted range. The Brownsville Common Yellowthroat was a resident in the Rio Grande delta region below Brownsville, Texas. It winters from south Texas to northern Veracruz. In Texas, the breeding range of *insperata* ranges in altitude from near sea level to 250 feet. Specimens have been collected from Cameron, Hidalgo and Starr counties. Although formerly considered to be fairly common, they are becoming increasing rare.

**Known Occurrences:** Dense thickets and rank grass areas near ponds, marshes, and swamps. The species prefers cattail ponds, marshes and swamps. The species may nest on uplands or bottomlands, but usually in moist situations, preferring thickets on edges of woods, tangles of briars, marshes, swampy thickets, etc. Most common in damp resaca bottoms containing willows and giant needs.

**Reasons for Concern:** According to Oberholser (1974), of the 4 breeding subspecies *insperata* has been rare or extinct since 1951, if not earlier. Population size now estimated to be 100-150 pairs. Elimination of periodic flooding of resacas through construction of Falcon and other dams and associated flood control levees has led to loss of habitat. The gradual warming and drying of the Texas climate in the first half of the 20th century and the accelerating disturbance and destruction of the habitat may have been instrumental in reducing numbers (Oberholser, 1974). Increasing pollution of its breeding habitat plus augmentation in size of Bronzed Cowbird population also had adverse effects.

**Monitoring Objective:** Find population and estimate numbers of individuals present. Check for evidence of reproductive behavior. Do habitat analysis. Monitor impacts of cowbird parasitism.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - May

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Cameron County: National Audubon Society, Sabal Palm Sanctuary, and Hidalgo County: Anzalduas County Park, south of Mission, Texas. Laguna Atascosa NWR may also be a place to look for it.

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Note and monitor any cowbird parasitism. Compile a general habitat analysis. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 5+ Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:** Evaluate the taxonomic status of this subspecies and clarify its distribution in Texas.

**Potential use of Volunteers:** Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Icterus cucullatus cucullatus      **Candidate Category:** C2  
**Common Name:** Mexican Hooded Oriole      **Listing Rank:**  
**G/S Rank:** G5TUS4B

**Range:** This subspecies occurs in Texas along the Mexican border chiefly in the Del Rio region. The bird breeds at an altitudinal range of from 700 to 1,300 feet and specimens have been recorded from Terrell County and Val Verde County. One specimen was recorded from Brewster County which is apparently outside the breeding range for this subspecies, as Icterus cucullatus nelsoni, the Arizona Hooded Oriole, is the subspecies commonly found in this region. In Del Rio where there are still few cowbirds and no spraying of herbicides or defoliant, Hoodeds still nest (Oberholser 1974). Hooded orioles nest at Kickapoo Caverns State Park which straddles the Edwards and Kinney county line.

**Known Occurrences:** This historically has always been a widely distributed and adaptable species attracted to both the thickets of semi-arid country and the heavy timber of river bottoms and other moist areas (Pough, 1949). It was commonly found about ranches and towns favoring cottonwoods and sycamores growing along the streams (Terres, 1980).

**Reasons for Concern:** Anywhere there are cowbirds, bronzed or brown-headed, this oriole will suffer. The Mexican subspecies is not in as much jeopardy as sennetti.

**Monitoring Objective:** Monitor status and distribution.

**Priority:** LOW TO MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards County: Kickapoo Caverns State Park; Terrell County: Sites to be selected; Val Verde County: sites to be selected

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Note any presence of cowbirds and any predation or parasitism. A close review of breeding bird surveys need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Icterus cucullatus sennetti **Candidate Category:** C2  
**Common Name:** Sennett's Hooded Oriole **Listing Rank:**  
**G/S Rank:** G5TUS4B

**Range:** Sennett's Hooded Oriole is resident in Texas from southern Texas south along the Gulf Coastal Plain to southern Tamaulipas. It winters south to northern Guerrero and Morelos. Breeding in Texas occurs at sea level to 450 feet (Oberholser, 1974). Specimens collected northwest to Webb County, east to Kenedy County and south to Cameron counties (Oberholser, 1974), where it was known to be an uncommon to scarce breeding bird. Recent nesting records exist for Kenedy County (Arvin, pers. com., 1991). The subspecies winters from early October to mid-March and is scarce to casual in Rio Grande delta. Winter specimens from Hidalgo, Cameron and Nueces counties (Oberholser, 1974).

**Known Occurrences:** Riparian woodland, palm groves, mesquite, arid scrub, deciduous woodland, around human habitation, city parks, suburbs. Also occurs in live oak woodlands of Kenedy and surrounding counties.

**Reasons for Concern:** Habitat destruction and alteration combined with increased incidence of cowbird parasitism have continued to plague this species.

**Monitoring Objective:** Do a population estimate, habitat analysis, check for cowbird parasitism, check for reproductive activity.

**Priority:** LOW - MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, March - May, Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Cameron County: Sabal Palm Sanctuary, Laguna Atascosa National Wildlife Refuge, King Ranch (Norias and Encino Divisions).

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Note any cowbird parasitism or nest predation. Compile a general habitat analysis. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Icterus cucullatus audubonii **Candidate Category:** C2  
**Common Name:** Audubon's Oriole **Listing Rank:**  
**G/S Rank:** G5T4S3B

**Range:** Texas and Mexico. Audubon's Oriole ranges from Jalisco, Guerrero, Nuevo Leon, and south-central Texas south to northwestern Guatemala. In the past it was locally fairly common, in some years, to scarce from Laredo, Live Oak County and Beeville south to the Rio Grande. Reported from Val Verde, Webb, Zapata, Starr, Hidalgo, Cameron, Kenedy, Kleberg, Brooks, Jim Hogg, Jim Wells, Duval, McMullen and Live Oak counties.

**Known Occurrences:** This black and yellow oriole favors scrub, lowland thickets, mesquite, and pine-oak habitats. Tropical forest edges are sought out for nest sites south of the border. Prefers mesquite woods during the warmer months and may be found in evergreen trees, live oak, huisache and Texas ebony in the winter.

**Reasons for Concern:** Great decline in population after the 1920's due to habitat destruction and alteration--reduction of the mesquite and ebony woodlands of the delta being cleared for truck farms and livestock. Massive reduction in habitat. Cattle and growing cattle food opened up the way for the cowbird, especially the Bronzed Cowbird. Pesticide use has had an unknown effect on the status of this species.

**Monitoring Objective:** It will be important to try to understand why much suitable habitat remains unoccupied. Find a population. Check relative abundance, habitat quality and land-use change, check for cowbird parasitism, check for reproductive activity.

**Priority:** LOW - MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Late March - mid-July

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Suggested sites include: Santa Maria, Gabrielson, and Anzalduas Units of the Rio Grande Valley NWR, Santa Ana NWR, Laguna Atascosa NWR, Bentsen-Rio Grande State Park, Chaparral WMA, Las Palomas WMA, King Ranch, Salineno on the Rio Grande, La Copita Texas Agricultural Experiment Station, Choke Canyon State Park, Falcon Dam, and Kingsville

**Methodology:** Once population(s) are located and selected, monitor for breeding activity and success, note any cowbird parasitism. A close review of breeding bird surveys



and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:** Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lanius ludovicianus **Candidate Category:** C2  
**Common Name:** Loggerhead Shrike **Listing Rank:**  
**G/S Rank:** G4G5 S4S5B

**Range:**

**Known Occurrences:**

**Reasons for Concern:**

**Monitoring Objective:**

**Priority:** PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:**

**Methodology:**

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Work with TPWD staff

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lanius ludovicianus migrans **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Migrant Loggerhead Shrike **G/S Rank:** G4G5T3T4 S2

**Range:** This sub-species is known to breed only in Northeast Texas. Breeds at an altitudinal range between 250-300 feet (Oberholser, 1974). Two specimens were collected in breeding season from Ellis and Smith counties (Oberholser, 1974).

**Known Occurrences:** Open country - thinly wooded or scrubby land with clearings, meadows, pastures, old orchards and thickets along roadsides and hedge-rows; also found in altered habitats, such as cemeteries, rural parks and golf courses; power lines are choice perches, but a wide variety of trees, especially isolated snags are also used (Douglas, 1990). Nests are usually well-hidden in shrubs and short trees with dense crowns (Hunter, 1990).

**Reasons for Concern:** Declining almost everywhere (Yosef 1994), especially in the central U.S., despite a nesting success rate from 60 to 70%, which far exceeds that of most birds (Douglas, 1990). Many factors have been implicated, but precise reasons for the declines are not known, i.e., adverse alteration of summer and/or winter habitats, environmental contaminants, predation, human disturbance, interspecific competition, intraspecific competition between northern populations of Loggerheads and southern populations of Loggerheads on the wintering grounds (USFWS, 1991).

**Monitoring Objective:** The decline it has experienced suggest the need for statewide monitoring of the status of *Lanius ludovicianus ludovicianus*. In particular, we should be concerned about the distribution of shrikes in relation to various landuse practices. Several studies have suggested that the non-breeding grounds are of primary importance in studies designed to understand overall decline since breeding habitat carrying capacity seems generally unaffected. (Yosef and Grubbs 1994).

**Priority:** MEDIUM TO LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Northeast Texas; Ellis County: sites to be selected; Smith County: sites to be selected

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Other sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:** Work is needed to address the systematics of this species.

**Potential use of  
Volunteers:** Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Laterallus jamaicensis **Candidate Category:** C2  
**Common Name:** Black Rail **Listing Rank:**  
**G/S Rank:** G4?S2B

**Range:** In Texas, a rare transient in eastern third of state, away from the coast. Uncommon breeding resident along coast, more common on upper coast than central or lower coast.

**Known Occurrences:** Salt marsh (Spartina marsh touched only by the highest tide [Oberholser, 1974]) and occasionally along inland tidal creeks and marshes. This is a secretive species, reluctant to flush and most easily located by its distinctive call which it normally makes at night.

**Reasons for Concern:** Loss of wetland habitats to urbanization and industrialization and decline of water quality, especially along the upper coast, poses a serious threat to this marsh dependent species. Most aspects of biology of this species are unknown.

**Monitoring Objective:** Identify a few populations for annual monitoring to determine population trend. Gather data from all other existing data sources. Follow up on data gaps and refine distributional data. Data will provide improved habitat description for birds along the coast. Determine population levels in areas where species is known to occur. Determine any effects on reproductive biology from chemical agriculture.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Suggested sites include: Murphree WMA, Anahuac NWR, Brazoria NWR, Galveston Island, San Bernard NWR, Sea Rim SP, Guadalupe Delta WMA, Aransas NWR)

**Methodology:** Once population(s) are located, monitor for breeding activity and success. Other sites will be monitored for presence. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Parula pitiayumi nigrilora **Candidate Category:** C2  
**Common Name:** Tropical Parula **Listing Rank:**  
**G/S Rank:** G5TUS3B

**Range:** Texas and Mexico. The species ranges from eastern Sonora, southern Chihuahua, northern Coahuila, northern Nuevo Leon, and southern Texas south locally through Central America and South America to Peru, Bolivia, northern Argentina, Uruguay and southern Brazil. The bird has been recorded from Hidalgo, Kenedy, Cameron and Starr Counties. The species withdraws from northern limits of its range in the winter. This bird is now extremely rare in the U.S. Prior to 1951, there were breeding records in the Rio Grande delta. There have been sightings in live oaks of King Ranch in Kenedy County.

**Known Occurrences:** In Texas, the bird prefers thick woods of Texas ebony and anacua draped with epiphytic growth found near edges of lagoons or along dry river beds. It is a bird of the semi-tropical evergreen woodland in dense or open undergrowth, brush, and trees along edge of rivers and resacas. It prefers to stay in upper branches of trees. The best remaining delta habitat is in Hidalgo County. Also occurs in mature live oak woodlands.

**Reasons for Concern:** It appears to be threatened by habitat destruction, leading to nest parasitism by cowbirds, and exposure to pesticides. Its nesting habitat has declined significantly in Texas.

**Monitoring Objective:** It would be a good idea to institute a region wide cowbird trapping program (Arvin, Whitney, personal communication, 1991). Population estimate during breeding season, habitat analysis, determine changes in land-use practices, and especially incidence of Bronzed Cowbird parasitism.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Late March through May

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Suggested sites include: Santa Ana NWR, Gabrielson Unit of the Rio Valley NWR, Anzalduas Tract, Bentsen-Rio Grande State Park, King Ranch.

**Methodology:** Once population(s) are located and selected, monitor for breeding activity and success. Note any evidence of cowbird parasitism. Other sites will be monitored for presence. A close review of breeding bird surveys need to be compiled for this species.



**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Plegadis chihi **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** White-faced Ibis **G/S Rank:** G5S4B

**Range:** Principal range, the coastal regions of Texas, southwest Louisiana, mainland Mexico, including Michoacan, Veracruz and south to Peru, Bolivia, south Brazil, Chile and Argentina. During the winter there is a partial southward withdrawal from Texas and Louisiana. The breeding range may be expanding eastward. At one time it bred inland in Texas, but now is confined to near coast rookeries.

**Known Occurrences:** In Texas, the species frequents freshwater marshes, sloughs and irrigated rice fields to salt marshes, but will also attend brackish and saltwater habitats. The bird is currently confined to near-coastal rookeries in so-called "hog-wallow prairies". It rarely roosts in trees as does the Glossy Ibis, preferring to roost on low platforms of dead reed stems and rush piles amid heavy cover of marsh or swamp (Eckert, 1981). Occasionally it will roost in plain sight on mud banks or on projecting land spits in lakes or streams (Eckert, 1981). A protected cattail lake is prime nesting spot.

**Reasons for Concern:** Massive post-war pesticide application led to precipitous declines; the species appears to have recovered and stabilized only on upper coast. Declining in coastal rookeries throughout its range. Formerly more numerous. Pesticides and herbicides in rice fields impaired reproduction. Lethal concentrations of dieldrin found in nestlings. Draining of wetlands poses threat. Significant environmental deterioration poses a threat. Human disturbance on coastal rookery islands may disrupt nesting activity.

**Monitoring Objective:** Determine relative abundance, habitat quality, and nesting success. Support colonial waterbird survey.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Winter

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Eagle Lake (which is owned and operated by Lower Colorado River Authority), all other colonial waterbird colonies.

**Methodology:** Compile the colonial waterbird survey information for this species. On select populations, monitor for breeding activity and success. Determine relative

abundance and compile general habitat quality information. A close review of breeding bird surveys and winter bird counts need to be compiled for this species.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 2 - 3 Days/ Site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:**

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize Audubon volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**Appendix E:**

**MONITORING PLANS FOR ELEVEN SPECIES OF**

**CRUSTACEANS**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>CRUSTACEANS</b>			
<i>Gammarus hyalleoides</i> DIMINUTIVE AMPHIPOD	G1 S1 C2	HIGH	HIGH
<i>Gammarus peccus</i> PECOS AMPHIPOD	G1 S1 C2	HIGH	HIGH
<i>Palaemonetes antroorum</i> TEXAS CAVE SHRIMP	G1 S1 C2	MEDIUM	HIGH
<i>Stygobromus balconius</i> BALCONES CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus bifurcatus</i> BIFURCATED CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus dejectus</i> CASCADE CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus flagellatus</i> EZELL'S CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus hadenoecus</i> DEVIL'S SINKHOLE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus longipes</i> LONG-LEGGED CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH
<i>Stygobromus pecki</i> PECK'S CAVE AMPHIPOD	G1 S1 PE	2	HIGH
<i>Stygobromus reddelli</i> REDELL'S CAVE AMPHIPOD	G1 S1 C2	LOW	HIGH

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Gammarus hyalleoides      **Candidate Category:** C2  
**Common Name:** Diminutive amphipod      **Listing Rank:**  
**Range:** Jeff Davis County, Phantom Lake Cave Spring. This amphipod is associated with aquatic macrophytes (primarily *Chara*) in the spring-run. Specific habitat requirements are unknown.      **G/S Rank:** G1S1

**Known Occurrences:** This species is known only from Phantom Lake Cave Spring, Jeff Davis County, Texas. All occurrences of this species are in the developed waters of the Phantom Lake Spring outflow that lead through a cement-lined irrigation canal.

**Reasons for Concern:** The restricted range of this species and the potential for loss or reduction of springflows due to excessive pumping of groundwater place this species at significant risk of extirpation.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Jeff Davis County: Phantom Lake Cave Spring

**Methodology:** Surface sample using grab nets, Hess samplers or hand collecting.

**Field Equipment Needed:** Grab nets, hess nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information

gathered, a 20% decrease in total population from one year to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS .

**Recommendations:** Work with the staff from the U.S. Bureau of Reclamation (at Phantom), TPWD and the USFWS. Little is known about its biology. *Gammarus hyalelloides* belongs to a species-complex in western Texas-eastern New Mexico that requires further study to discern the inter-specific differences among the numerous species of this group that occur in the region.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in collecting samples of this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Gammarus pecos **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Pecos amphipod **G/S Rank:** G1S1

**Range:** Pecos County, Diamond Y Spring. Gammarus pecos is associated with mud substrates, woody debris, and aquatic macrophytes in Diamond Y Spring. However, its specific habitat requirements are unknown.

**Known Occurrences:** This species is known only from Diamond Y Spring, Pecos County, Texas.

**Reasons for Concern:** The habitats of this amphipod in the Leon Creek drainage are in an operational oil and gas field. Toxic run-off resulting from these operations represents a potentially serious threat to this species. Also, groundwater depletion may diminish springflows.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Pecos County: Diamond Y Springs

**Methodology:** Surface sample using grab nets, Hess samplers or hand collecting.

**Field Equipment Needed:** Grab nets, hess nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information



gathered, a 20% decrease in total population from one year to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS

**Recommendations:** Work with the staff from the Nature Conservancy to work on this monitoring. *Gammarus pecos* belongs to a species-complex in western Texas-eastern New Mexico that requires further study to discern the inter-specific differences among the numerous species of this group that occur in the region.

**Potential use of Volunteers:** Possibly utilize volunteers from the Nature Conservancy to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Palaemonetes antroorum      **Candidate Category:** C2  
**Common Name:** Texas cave shrimp      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Hays County. Subterranean waters of the Edwards Aquifer are the only known habitat for this species, but nothing is known about its specific habitat requirements.

**Known Occurrences:** This species is known only from Ezell's Cave in San Marcos, Hays County, Texas.

**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hays County: Edwards Aquifer

**Methodology:** At-large collecting in the cave(s) as well as using drift nets over the spring orifice(s) noting presence/absence. The population dynamics will be very difficult to quantify for this species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from the sampled

population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS

**Recommendations:** Work with the staff from the city of San Marcos to monitor this species and the general water quality

**Potential use of Volunteers:** Possibly utilize volunteers from San Marcos River Foundation to assist in collecting this species. *P. holthusi* also occurs in the aquifer and difficult to distinguish.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus balconis                      **Candidate Category:** C2  
**Common Name:** Balcones cave amphipod                      **Listing Rank:**  
**Range:** Edwards Aquifer, nothing is known about its specific habitat requirements.                      **G/S Rank:** G1S1

**Known Occurrences:** Subterranean waters of the Edwards Aquifer are the only known habitat for this species.

**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:** If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer:

**Methodology:** At-large collecting in the cave(s) as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from the sampled

population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus bifurcatus      **Candidate Category:** C2  
**Common Name:** Bifurcated cave amphipod      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Edwards Aquifer, nothing is known about its specific habitat requirements.

**Known Occurrences:** Subterranean waters of the Edwards Aquifer are the only known habitat for this species.

**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:** If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer:

**Methodology:** At-large collecting in the cave(s), as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from the sampled

population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from the city to assist in collecting samples. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus dejectus                      **Candidate Category:**                      C2  
**Common Name:** Cascade cave amphipod                      **Listing Rank:**  
**Range:** Edwards Aquifer, nothing is known about its specific habitat                      **G/S Rank:**                      G1S1  
requirements.  
**Known Occurrences:** Subterranean waters of the Edwards Aquifer are the only known  
habitat for this species.  
**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards  
Aquifer and possible contamination of groundwater from non-point  
sources.  
**Monitoring Objective:** If at all possible, collect at-large samples within a designated  
sampling area to determine presence within an area. Monitor water  
quality.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer:

**Methodology:** At-large collecting in the cave(s), as appropriate, as well as using  
drift nets over the spring orifices noting presence/absence. Very  
hard to quantify these species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more



extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus flagellatus                      **Candidate Category:**        C2  
**Listing Rank:**

**Common Name:**        Ezell's Cave amphipod                      **G/S Rank:**                      G1S1

**Range:**                      Hays County, subterranean waters of the Edwards Aquifer are the only known habitat for this species, but nothing is known about its specific habitat requirements.

**Known Occurrences:**        This species is known only from the Artesian Well at the Southwest Texas State University Aquatic Station, Ezell's Cave, Rattlesnake Cave, and San Marcos Springs, Hays County, Texas.

**Reasons for Concern:**        The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:**        If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**        Triennially

**Monitoring Responsibility:**            TPWD

**Monitoring Plan:**

**Site Description:**        **Hays County:** Ezell's Cave, Rattlesnake Cave and San Marcos Springs

**Methodology:**            At-large collecting in the cave(s), as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.

**Field Equipment Needed:**        Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:**        1- 2 Days; 2 staff

**Reporting Procedure:**            Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**            If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered,

a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Harland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from the city to assist in collecting samples. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus hadenoecus      **Candidate Category:** C2  
**Common Name:** Devil's sinkhole amphipod      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Edwards County, subterranean waters of the Edwards Aquifer are the only known habitat for this species, but nothing is known about its specific habitat requirements.

**Known Occurrences:** This endemic amphipod occurs only at Devil's Sinkhole, Edwards County, Texas.

**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:** If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards County: Devil's Sinkhole

**Methodology:** At-large collecting in the cave(s), as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus longipes                      **Candidate Category:** C2  
**Common Name:** Long-legged cave amphipod                      **Listing Rank:**  
**Range:** Edwards Aquifer, Texas, subterranean waters of the Edwards Aquifer are the only known habitat for this species, but nothing is known about its specific habitat requirements.                      **G/S Rank:** G1S1

**Known Occurrences:** This endemic amphipod occurs in the Edwards Aquifer.

**Reasons for Concern:** The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.

**Monitoring Objective:** If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer:

**Methodology:** At-large collecting in the cave(s), as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.

**Field Equipment Needed:** Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information

gathered, a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus pecki                      **Candidate Category:**        C1  
**Common Name:**        Peck's cave amphipod                      **Listing Rank:**  
**Range:**                      Edwards Aquifer, Texas, subterranean waters of the Edwards Aquifer are the only known habitat for this species, but nothing is known about its specific habitat requirements.  
**Known Occurrences:**        This endemic amphipod occurs in the Edwards Aquifer.  
**Reasons for Concern:**        The primary threats to this species are dewatering of the Edwards Aquifer and possible contamination of groundwater from non-point sources.  
**Monitoring Objective:**        If at all possible, collect at-large samples within a designated sampling area to determine presence within an area. Monitor water quality.  
**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Triennially  
**Monitoring Responsibility:**        TPWD  
**Monitoring Plan:**  
**Site Description:**        Edwards Aquifer:  
**Methodology:**            At-large collecting in the cave(s), as appropriate, as well as using drift nets over the spring orifices noting presence/absence. Very hard to quantify these species.  
**Field Equipment Needed:**    Drift nets, vials, labels, isopropyl alcohol  
**Estimated Time/Staff for Monitoring:**    1- 2 Days; 2 staff  
**Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:**        If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information



gathered, a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygobromus reddelli                      **Candidate Category:**      C2  
**Common Name:**      Reddell's cave amphipod                      **Listing Rank:**  
**Range:**                      Edwards Aquifer, Texas, subterranean waters of the Edwards                      **G/S Rank:**                      G1S1  
Aquifer are the only known habitat for this species, but nothing is  
known about its specific habitat requirements.

**Known Occurrences:**      This endemic amphipod occurs in the Edwards Aquifer.

**Reasons for Concern:**      The primary threats to this species are dewatering of the Edwards  
Aquifer and possible contamination of groundwater from non-point  
sources.

**Monitoring Objective:**      If at all possible, collect at-large samples within a designated  
sampling area to determine presence within an area. Monitor water  
quality.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Triennially

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**      Edwards Aquifer:

**Methodology:**              At-large collecting in the cave(s), as appropriate, as well as using  
drift nets over the spring orifices noting presence/absence. Very  
hard to quantify these species.

**Field Equipment Needed:**      Drift nets, vials, labels, isopropyl alcohol

**Estimated Time/Staff for Monitoring:**      1- 2 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:**              If the aquifer and/or spring-flow falls to a designated level, more  
extensive monitoring should occur. After baseline information

gathered, a decrease in the noted presence from the sampled population from one year to the next may be considered significant dependent on the species. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ruth Stanford, USFWS; Scott Harden; John Holsinger

**Recommendations:** Work with the staff from TPWD. Only two people able to ID this species, John Holsinger, who is retired, and Scott Harden, who would probably ID on contract.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**Appendix F:**

**MONITORING PLANS FOR TWENTY SPECIES OF**

**FISH**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USPWS LIST PRI	MONIT PRIORITY
<b>FISHES</b>			
<i>Campestris ornatum</i> MEXICAN STONEROLLER	G3 S1 C2	HIGH	LOW
<i>Cyprinops elongatus</i> BLUE SUCKER	G3 S3 C2		LOW
<i>Cyprinella proserpina</i> PROSERPINE SHINER	G3 S2 C2	HIGH	LOW
<i>Cyprinodon variegatus</i> CONCHOS PUFFFISH	G4 S1 C2	HIGH	MEDIUM
<i>Cyprinodon pecosensis</i> PECOS PUFFFISH	G1 S1 C1		HIGH
<i>Dionda diaboli</i> DEVIL'S RIVER MINNOW	G2 S1 C1	2	HIGH
<i>Etheostoma grahami</i> RIO GRANDE DARTER	G3 S2 C2	HIGH	LOW
<i>Gambusia affinis holbrooki</i> BLOTCHED GAMBUSIA	G4 SX C2	HIGH	LOW
<i>Hybognathus placatus</i> PLAINS MINNOW	G5 S4 C2		LOW
<i>Ictalurus lupus</i> HEADWATER CATFISH	G3 S2 C2	HIGH	MEDIUM
<i>Ictalurus sp 1</i> CHIHUAHUA CATFISH	G1G2 S1S2 C2	HIGH	?
<i>Macrhybopsis assevalis tetranemus</i> ARKANSAS RIVER SPECKLED CHUB	G5T5 S5 C2		LOW
<i>Micropterus treculi</i> GUADALUPE BASS	G3 S3 C2	MEDIUM	LOW
<i>Notropis bairdii</i> SMALLEYE SHINER	G2 S2 C2	MEDIUM	HIGH
<i>Notropis chihuahua</i> CHIHUAHUA SHINER	G3 S2 C2	HIGH	LOW
<i>Notropis jemezianus</i> RIO GRANDE SHINER	G3 S3 C2		LOW
<i>Notropis oxyrinchus</i> SHARPNOSE SHINER	G3 S3 C2	MEDIUM	HIGH
<i>Polyodon spathula</i> PADDLEFISH	G4 S3 C2		LOW
<i>Satan eurystomus</i> WIDEMOUTH BLINDCAT	G1 S1 C2	HIGH	MEDIUM

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Trogloglanis pattersoni</i> TOOTHLESS BLINDCAT	G1 S1 C2	HIGH	MEDIUM
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**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Campostoma ornatum                      **Candidate Category:**      C2  
**Common Name:** Mexican stoneroller                      **Listing Rank:**  
**G/S Rank:**                      G3S1

**Range:**                      Occurs in tributaries of the Rio Grande in the Big Bend region of Texas, west to Rio Sonora, Sonora, and south to Rio Aguanaval, Zacatecas in Mexico.

**Known Occurrences:**                      This Chihuahuan Desert region fish occurs primarily in clear, fast riffles, chutes and pools in small to medium-sized creeks with gravel or sand bottoms.

**Reasons for Concern:**                      Wide population fluctuations, restricted range, small number of known occurrences, channelization, reservoir construction or any other activity which modifies habitat. This species appears to have exacting habitat requirements. Introduction of exotic competitors and water diversions have been a problem.

**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. The distribution of this species in Texas should be further defined. Specific habitat requirements should be determined.

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually, spring or summer

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**      Tornillo Creek; Terlingua Creek and Cienega Creek

**Methodology:**              Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**      Seines

**Estimated Time/Staff for Monitoring:**      2 - 3 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Steve Platania, UNM; Bob Edwards, UT-Pan Am

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Cycorephus elongatus</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	Blue Sucker	<b>Listing Rank:</b>	
		<b>G/S Rank:</b>	G4S3
<b>Range:</b>	Broadly distributed in large rivers throughout the Mississippi basin. Occurs sparingly in the major rivers of Texas southward to the Rio Grande. Large rivers are the preferred habitat. The Blue sucker prefers channels and flowing pools with a moderate current but apparently will do well in at least some artificial impoundments. Preferred substrates usually consists of exposed bed-rock in combination with hard clay, sand and gravel. This species is not tolerant of highly turbid conditions.		
<b>Known Occurrences:</b>	The blue sucker is limited in our area to the largest rivers and lower parts of their major tributaries, from the Rio Grande in Mexico, Texas, and New Mexico, Red River in east Texas from the Piney Woods region to the Gulf Coast Marshes and Prairies.		
<b>Reasons for Concern:</b>	Dams may contribute to the decline of the species by preventing spawning migrations and inundating spawning areas. This species also may be sensitive to pollution and siltation.		
<b>Monitoring Objective:</b>	Sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.		
<b>Priority:</b>	LOW PRIORITY		

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Rio Grande River system; Red River system

**Methodology:** Sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Gill nets, electro-shocking

**Estimated Time/Staff for Monitoring:** 2 - 3 Days each river system; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Bob Edwards, UT-Pan Am; Randy Moss, River Studies Group

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from various "friends" river groups.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cyprinella proserpina                      **Candidate Category:**        C2  
**Common Name:**                      Proserpine Shiner                      **Listing Rank:**  
**Range:**                                      Devils and lower Pecos rivers, and Las Moras, Pinto, and San Felipe Creeks. The proserpine shiner prefers clear streams and occupies habitats varying from pools to swift channels and riffles.                      **G/S Rank:**                      G3S2

**Known Occurrences:**                      This species is only known from the Devils and lower Pecos rivers, and Las Moras, Pinto, and San Felipe Creeks. This shiner also occurs in Mexico.

**Reasons for Concern:**                      The limited distribution of this species is the primary reason for concern. Water development projects may represent a threat, but it appears to be ecologically plastic and fairly tolerant of a variety of extreme conditions.

**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**        Triennially

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**                      Devils and Lower Pecos Rivers

**Methodology:**                              Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**              Seines

**Estimated Time/Staff for Monitoring:**    1- 2 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust

monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Steve Platania, UNM; Bob Edwards, UT-Pan Am

**Recommendations:**

**Potential use of**

**Volunteers:** Possibly utilize volunteers from area River Foundations (if available) to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cyprinodon eximus **Candidate Category:** C2  
**Common Name:** Conchos Pupfish **Listing Rank:**  
**G/S Rank:** G4S1

**Range:** The Conchos pupfish is typically found in sloughs, backwaters and margins of larger streams, channels of creeks (in Mexico) and mouths of creeks which are tributary to larger rivers. It is rarely found in headsprings, though it appears to prefer clear flowing waters.

**Known Occurrences:** This species is known from the Devils River, Alamito Creek, and associated tributaries. Also, this pupfish is found in the Rio Conchos and Rio Sauz basins in Mexico.

**Reasons for Concern:** Small populations, declining stream flow, pollution.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality. Taxonomy needs to be clarified.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Devils River; Alamito Creek

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for

management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Tony Echele, OSU.

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cyprinodon pecosensis                      **Candidate Category:**                      C1  
**Common Name:**                      Pecos Pupfish                      **Listing Rank:**  
**G/S Rank:**                      G1S1

**Range:**                      This species was historically restricted to the Pecos River drainage of Texas and New Mexico. Saline waters of the Pecos River (historically) and cienegas are the preferred habitat type. This Chihuahuan Desert region fish occurs primarily in clear, fast riffles, chutes and pools in small to medium-sized creeks with gravel or sand bottoms (Lee et al., 1980). It prefers seasonal, tributary creeks at depths of 10 cm to 1 meter.

**Known Occurrences:**                      The only known genetically pure population remaining in Texas occurs in Salt Creek, a tributary of the Pecos River.

**Reasons for Concern:**                      Wide population fluctuations, restricted range, small number of known occurrences, channelization, reservoir construction or any other activity which causes a depletion of water supply. This species of fish appears to have exacting habitat requirements. Introduction of exotic competitors and water diversions have been a problem. It is considered to be wiped out by hybridization in Texas.

**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality. Monitoring should include checking the spread of the sheepshead minnow.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Three times per year

**Monitoring Responsibility:**                      TPWD

**Monitoring Plan:**

**Site Description:**                      Pecos River, Salt Creek, access needed

**Methodology:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**                      Seines

**Estimated Time/Staff for Monitoring:**                      2 - 3 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife

Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Tony Echelle, OSU

**Recommendations:** Work with the landowner to monitor the population in Salt Creek.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dionda diaboli **Candidate Category:** C1  
**Listing Rank:**  
**Common Name:** Devils River minnow **G/S Rank:** G2S1

**Range:** Restricted to the Devils River, San Felipe Creed and Sycamore Creek in Val Verde County. A historical population once occurred in Las Moras Creek, Kinney County, but it has since been extirpated.

**Known Occurrences:** This minnow only inhabits spring-runs having very high water quality.

**Reasons for Concern:** Limited range, decline of water flows, reservoir construction and pollution impact this species. The population in San Felipe Creek is threatened by urbanization as the entire creek is within housing areas thus posing an immediate threat there. Las Moras flows through Fort Clark guest ranch. Recreational use of the headsprings and dewatering of the creek are thought to be causes for extirpation of the species from this location.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Devils River

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT;

**Recommendations:** Work with the TNC to monitor the population in Devils River.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Etheostoma grahami                      **Candidate Category:**        C2  
**Common Name:**        Rio Grande Darter                      **Listing Rank:**  
**Range:**                      Pecos River, Rio Grande (between Pecos River and Sycamore Creek), Devils River, Dolan Creek, San Felipe Creek and Howard Springs (Val Verde County). In the state of Nuevo Leon, Mexico, it occurs in the Rio Salado and Rio San Juan drainages. This species prefers the free-flowing portions of streams.                      **G/S Rank:**                      G3S2

**Known Occurrences:**        Free-flowing portions of the lower Pecos River, Rio Grande (between Pecos River and Sycamore Creek), Devils River, Dolan Creek, San Felipe Creek and Howard Springs (Val Verde County).

**Reasons for Concern:**        Reservoir construction, declining stream flow, pollution, and reduction, or elimination of water flow are the primary threats. Their extremely limited range and low population estimates make this species especially vulnerable to local reductions in water flow.

**Monitoring Objective:**        Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Triennially

**Monitoring Responsibility:**        TPWD

**Monitoring Plan:**

**Site Description:**        Val Verde County: Devils River, Dolan Creek, San Felipe Creek and Howard Springs; lower Pecos River, Rio Grande (between Pecos River and Sycamore Creek),

**Methodology:**            Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**    Seines

**Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff

**Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**        After baseline information gathered, a 20% decrease in total population

from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Steve Platania, UNM; Bob Edwards, UT-Pan Am

**Recommendations:** Work with staff from the TPWD and the USFWS and The Nature Conservancy

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Gambusia senilis                      **Candidate Category:** C2  
**Common Name:** Blotched gambusia                      **Listing Rank:**  
**G/S Rank:** G4SX

**Range:** A population of this species once occurred in the Devils River, but was extirpated by the construction of Amistad reservoir. Populations are known to occur in Mexico in the Rio Conchos and tributaries.

**Known Occurrences:** Mexico in the Rio Conchos and tributaries. Streams are the preferred habitat. The blotched gambusia is usually collected in quiet, formerly weed-choked surface waters, although it appears to be tolerant of wide variations in temperature, chemical conditions, water flow, and clarity.

**Reasons for Concern:** Reservoir construction and exotic competition. The blotched gambusia has been extirpated from Texas. However, it apparently still occurs in Mexico in the Rio Conchos Basin.

**Monitoring Objective:** Once reintroduced, surface sample within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Devils River

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 3- Days; 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust

monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD;

**Recommendations:** Work with the personnel from Mexico.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Hybognathus placitus                      **Candidate Category:**        C2  
**Common Name:**        Plains minnow                      **Listing Rank:**  
**Range:**                      Colorado, Brazos and Red rivers.                      **G/S Rank:**                      G5S4  
**Known Occurrences:**        Known from the Colorado, Brazos and Red rivers.  
**Reasons for Concern:**        Unknown  
**Monitoring Objective:**        Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.  
**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Annually  
**Monitoring Responsibility:**        TPWD  
**Monitoring Plan:**  
    **Site Description:**        Colorado, Brazos, and Red rivers.  
    **Methodology:**            Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.  
    **Field Equipment Needed:**    Seines  
    **Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff  
    **Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:**        After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.  
**Location of Archived Data:**        Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD.

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Ictalurus lupus **Candidate Category:** C2  
**Common Name:** Headwater catfish **Listing Rank:**  
**G/S Rank:** G3S2

**Range:** Pecos and Rio Grande basins of Texas and New Mexico. Preferred habitats are small streams, but specific habitat requirements are unknown.

**Known Occurrences:** The headwater catfish is now known from the Pecos and Rio Grande basins of Texas and New Mexico. Historical records show this species was once distributed in streams throughout much of central Texas, but it has been extirpated from most of its range.

**Reasons for Concern:** Wide population fluctuations, restricted range, small number of known occurrences, channelization, reservoir construction or any other activity which modifies habitat. This species appears to have exacting habitat requirements. Introduction of exotic competitors and water diversions have been a problem.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Pecos and Rio Grande Rivers

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife

Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Robert Rush Miller, UHMZ

**Recommendations:** Work with the staff TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Ictalurus sp 1 **Candidate Category:** C2  
**Common Name:** Chihuahua catfish **Listing Rank:**  
**G/S Rank:** G1G2S1S2

**Range:** Rio Grande and Rio Conchos basins

**Known Occurrences:** In Texas, Rio Grande and Big Aguja Creek (Davis Mountains)

**Reasons for Concern:** Extirpation likely due to dewatering and stocking of channel catfish.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine occurrence(s) within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Rio Grande Basin

**Methodology:** Surface sampling within a designated sampling grids to determine occurrence(s) within an area.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT;

**Recommendations:** Work with the staff TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Macrhybopsis aestivalis tetranemus      **Candidate Category:** C2  
**Common Name:** Arkansas River speckled chub      **Listing Rank:**  
**G/S Rank:** G5T5S5

**Range:** This chub is distributed in Texas from the Red River southward to the Brazos River basin. Streams are the preferred habitat, but specific habitat requirements for this species are unknown.

**Known Occurrences:** Red River southward to the Brazos River basin.

**Reasons for Concern:** Present or threatened destruction, modification or curtailment of its habitat.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Red River southward to the Brazos River basin

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Bob Edwards, UT- Pan Am

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Micropterus treculi                      **Candidate Category:**            C2  
**Common Name:**            Guadalupe bass                      **Listing Rank:**  
**G/S Rank:**                      G3S3

**Range:**                      Widely distributed in streams throughout the Edwards Plateau. The fish was introduced into the Nueces River. Abundance diminishes as these streams cross the coastal plain.

**Known Occurrences:**            The Guadalupe bass prefers lotic habitats associated with large rocks, cypress roots, etc. It inhabits shallow, swift waters, often occurring in riffles or at the head of pools. The fish is usually found in waters with annual thermal fluctuations of 4-35 degrees C and not in thermally stable waters.

**Reasons for Concern:**            Genetic swamping from hybridization with smallmouth bass (*M. dolomieu*), water impoundment leading to a decrease in stream flows, habitat modification due to development, pollution, and deterioration of water quality.

**Monitoring Objective:**            Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Annually

**Monitoring Responsibility:**        TPWD

**Monitoring Plan:**

**Site Description:**            Streams in the Edwards Plateau

**Methodology:**                Surface sampling within a designated sampling grid to determine relative abundance within an area. Also monitor habitat quality and genetic integrity.

**Field Equipment Needed:**    Seines

**Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff

**Reporting Procedure:**            Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**            After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Notropis buccula                      **Candidate Category:** C2  
**Common Name:** smalleye shiner                      **Listing Rank:**  
**Range:**                      **G/S Rank:** G3S2

**Range:**                      Historically, it occurred throughout the Brazos River drainage, but the historic range has now been reduced by two-thirds. The species was introduced to the adjacent Colorado River drainage. Texas counties with historical records include Kent, Knox, Taylor, Bosque, McLennan, Falls, Brazos, Palo Pinto and Burleson.

**Known Occurrences:**                      In Texas, this species now is known only from the Brazos River drainage. The Brazos River and its tributaries are the primary habitat, but specific habitat requirements for this species are unknown. The smalleye shiner prefers the turbid waters of broad, sandy channels of the main stream, over a bottom consisting principally of shifting sand.

**Reasons for Concern:**                      There has been a significant decline in range of this species. There are several dams proposed on the Brazos and its tributaries which may adversely impact the remaining populations of this species. Smalleye shiners are intolerant of stream changes downstream from dams.

**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                      HIGH PRIORITY

---

**PLAN**

**Monitoring Frequency/Season:**      Annually

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**              Brazos River

**Methodology:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**      Seines

**Estimated Time/Staff for Monitoring:**      2 - 3 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population

from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; TPWD River Studies Group

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Notropis chihuahua                      **Candidate Category:**        C2  
**Common Name:**                      Chihuahua shiner                      **Listing Rank:**  
**Range:**                                      **G/S Rank:**                      G3S2

**Range:**                      The Chihuahua shiner occurs in small tributaries of the Rio Grande in the Big Bend area. It also is known from the Rio Conchos, Mexico. Clear, cool streams are the preferred habitat of the Chihuahua shiner where it is often found in pools with slight current, or riffles over a gravel or sand bottom where there is vegetation. Vegetation, if present, is usually *Potamogeton* or *Chara*.

**Known Occurrences:**                      Know from small tributaries of the Rio Grande in the Big Bend area. It also is known from the Rio Conchos, Mexico.

**Reasons for Concern:**                      Dewatering of streams and introductions of exotic species present the most serious threats to this species.

**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**        Annually

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**                      Rio Grande River and tributaries in Big Bend Region

**Methodology:**                              Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**              Seines

**Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust

monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Steve Platania, UNM

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Notropis jemezanus                      **Candidate Category:**        C2  
**Common Name:**                      Rio Grande shiner                      **Listing Rank:**  
**Range:**                                      Historically, this species occurred throughout the Rio Grande basin.  
The present distribution is highly fragmented throughout the basin.  
**Known Occurrences:**                      This shiner inhabits large, open, weed-less rivers or in large creeks with  
substrates of rubble, gravel and sand, often overlain with silt.  
**Reasons for Concern:**                      Habitat alterations may have significantly reduced the abundance of this  
species.  
**Monitoring Objective:**                      Surface sampling within a designated sampling grid to determine  
relative abundance within an area. Monitor habitat quality.  
**Priority:**                                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Annually  
**Monitoring Responsibility:**            TPWD  
**Monitoring Plan:**  
**Site Description:**                      Rio Grande Basin  
**Methodology:**                              Surface sampling within a designated sampling grid to determine  
relative abundance within an area. Monitor habitat quality.  
**Field Equipment Needed:**            Seines  
**Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff  
**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.  
**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population  
from one year to the next will be considered significant. In the event of  
significant or unacceptable decline, TPWD and Fish and Wildlife  
Service should be notified immediately. When decline is noted, a more  
comprehensive appraisal should be initiated to evaluate and adjust  
monitoring design or data collection, provide suggestions for  
management changes, or define research needed to determine  
appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Steve Platania, UNM

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Notropis oxyrhynchus                      **Candidate Category**                      C2  
**Common Name:** sharpnose shiner                      **Listing Rank:**  
**G/S Rank:**                      G3S3

**Range:** This species is known only from the Brazos River drainage. It appears to be generally distributed throughout the main river. The species was apparently introduced into the adjacent Colorado River drainage. Occurrences have been recorded from Knox, Foard, Palo Pinto and Baylor counties, but the historic range since has been reduced by two-thirds.

**Known Occurrences:** This species is known only from the Brazos River drainage. The specific habitat requirements of the sharpnose shiner are unknown. Its preferred habitat is a large turbid river with bottom consisting of a combination of sand, gravel and clay-mud.

**Reasons for Concern:** This species has a fairly narrow range.

**Monitoring Objective:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brazos River

**Methodology:** Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:** Seines

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Clark Hubbs, UT; Bob Edwards, UT-Pan Am

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Polyodon spathula                      **Candidate Category:**      C2  
**Common Name:**      paddlefish                                      **Listing Rank:**  
**Range:**                      Paddlefish have been reported from AL, AR, IA, IL, IN, KS, KY, LA, MN, MO, MS, MT, ND, NE, OH, OK, PA, SD, TN, TX, WI. In Texas, this species is found primarily in the large rivers of East Texas, including Red River tributaries, Sulphur River, Big Cypress Bayou, Sabine River, Neches/Angelina River, Trinity River, and San Jacinto River.                                      **G/S Rank:**                      G4S3

**Known Occurrences:**      Red River tributaries, Sulphur River, Big Cypress Bayou, Sabine River, Neches/Angelina River, Trinity River, and San Jacinto River. The primary habitat type is large slow-flowing rivers, but some populations have been reported from impoundments. Spawning occurs on clean gravel bars.

**Reasons for Concern:**      Impoundment, siltation and destruction of gravel bars impact this species.

**Monitoring Objective:**      Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Biennially

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**      Red River tributaries, Sulphur River, Big Cypress Bayou, Sabine River, Neches/Angelina River, Trinity River, and San Jacinto Rivers

**Methodology:**              Surface sampling within a designated sampling grid to determine relative abundance within an area. Monitor habitat quality.

**Field Equipment Needed:**      Seines

**Estimated Time/Staff for Monitoring:**      4 - 5 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population

from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, Ronnie Pittman, TPWD

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Satan eurystomus                      **Candidate Category:** C2  
**Common Name:** widemouth blindcat                      **Listing Rank:**  
**Range:**                      **G/S Rank:** G1S1

**Range:** Subterranean waters of the Edwards Aquifer, but specific habitat requirements are unknown. However, a water temperature of 27° C may be critical for this subterranean aquatic species. Wells with a temperature of 24o C just north of Bexar County have not yielded specimens.

**Known Occurrences:** This species is known only from the subterranean waters of the Edwards Aquifer, Bexar County, Central Texas. All known specimens of this species are from five artesian wells penetrating the San Antonio pool of the Edwards Aquifer, at depths of 305 to 582 meters in and near the city of San Antonio.

**Reasons for Concern:** The restricted range of this species, dewatering of the aquifer, deteriorating water quality, and pollution threaten the continued survival of this species..

**Monitoring Objective:** Due to the difficulties of sampling the habitat of this species monitoring may not be practical. Populations are presumed to be stable as long as the quality and quantity of the Edwards Aquifer are not compromised.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer

**Methodology:** Monitor water quality and quantity

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Glen Longley, EARDC

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Trogloglanis pattersoni **Candidate Category:** C2  
**Common Name:** toothless blindcat **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Subterranean waters of the Edwards Aquifer, but specific habitat requirements are unknown. However, a water temperature of 27° C may be critical for this subterranean aquatic species. Wells with a temperature of 24o C just north of Bexar County have not yielded specimens.

**Known Occurrences:** This species is known only from the subterranean waters of the Edwards Aquifer, Bexar County, Central Texas. All known specimens of this species are from five artesian wells penetrating the San Antonio pool of the Edwards Aquifer at depths of 305 to 582 meters in and near the city of San Antonio.

**Reasons for Concern:** The restricted range of this species, dewatering of the aquifer, deteriorating water quality, and pollution threaten the continued survival of this species..

**Monitoring Objective:** Due to the difficulties of sampling the habitat of this species monitoring may not be practical. Populations are presumed to be stable as long as the quality and quantity of the Edwards Aquifer are not compromised.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** NA

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Aquifer

**Methodology:** Monitor water quality and quantity

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, Gary Garrett, Andy Price, TPWD; Glen Longley, EARDC

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer/Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**Appendix G:**

**MONITORING PLANS FOR THIRTY-ONE SPECIES OF**

**INSECTS**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>INSECTS</b>			
<i>Adhemarius blanchardorum</i> BLANCHARDS' SPHINX MOTH	G1 S1 C2	MEDIUM	HIGH
<i>Anomala tibialis</i> TIBIAL SCARAB BEETLE	GH SH C2	MEDIUM	HIGH
<i>Agria balmorhea</i> BALMORHEA DAMSELFLY	G203 S2 C2		LOW
<i>Asaphomyia texanus</i> TEXAS ASAPHOMYIAN TABANID FLY	GH SH C2	MEDIUM	HIGH
<i>Austrotinodes</i> sp 1 TEXAS AUSTROTNODES CADDISFLY	G2 S2 C2	LOW	LOW
<i>Batrissodes venyivi</i> HELOTES MOLD BEETLE	G1 S1 C2	**Status Survey recently completed	HIGH
<i>Chimarra holzenthali</i> HOLZENTHAL'S PHILOPOTAMID CADDISFLY	G1 S1 C2		LOW
<i>Cicindela cazieri</i> CAZIER'S TIGER BEETLE	G1 S1 C2	HIGH	HIGH
<i>Cicindela chlorocephala smythi</i> SMYTH'S TIGER BEETLE	GH1H SH C2	HIGH	HIGH
<i>Cicindela nevadica olmosa</i> LOS OLMOS TIGER BEETLE	G5T2 S1S2 C2		LOW
<i>Cicindela nigrocoerulea subtropica</i> SUBTROPICAL BLUE-BLACK TIGER BEETLE	G5T2 SH C2	HIGH	LOW
<i>Cicindela obsolcta neojuvencilis</i> NEOJUVENILE TIGER BEETLE	G5T1 SH C2	HIGH	LOW
<i>Cicindela politula barbarannae</i> BARBARA ANN'S TIGER BEETLE	G5T1 S1 C2	HIGH	LOW
<i>Cicindela politula petrophila</i> GUADALUPE MOUNTAINS TIGER BEETLE	G5T2 S1 C2	HIGH	LOW
<i>Derocertes neomexicana</i> BONITA DIVING BEETLE	G1 S1 C2		LOW
<i>Eximaecris superbum</i> SUPERB GRASSHOPPER	GH SH 2	MEDIUM	HIGH



## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Haliplus texanus</i> EDWARDS AQUIFER WATER BEETLE	G1 S1 C2	LOW	HIGH
<i>Haliplus nitens</i> DISJUNCT CRAWLING WATER BEETLE	GH SH C2	LOW	HIGH
<i>Heterelmis comalensis</i> COMAL SPRINGS RIFFLE BEETLE	G1 S1 PE	2	MEDIUM
<i>Limnebius texanus</i> TEXAS MINUTE MOSS BEETLE	GH SH C2	MEDIUM	LOW
<i>Lordithon niger</i> BLACK LORDITHON ROVE BEETLE	GH SH C2		HIGH
<i>Macromia wabashensis</i> WABASH BELTED SKIMMER DRAGONFLY	G3Q SRF C2		HIGH
<i>Oxyethira florida</i> FLORIDA OXYETHIRAN MIRO CADDISFLY	G? S? C2		LOW
<i>Protoptila arcu</i> SAN MARCOS SADDLE-CASE CADDISFLY	G1 S1 C2	MEDIUM	LOW
<i>Protoptila balmorhea</i> BALMORHEA SADDLE-CASE CADDISFLY	G2 S1 C2		HIGH
<i>Rhadine infernalis</i> A GROUND BEETLE	G1 S1 C2	**Status Survey recently completed	HIGH
<i>Schinia isidiana</i> PHLOX MOTH	GU SH C2		LOW
<i>Somatochlora margarita</i> BIG THICKET EMERALD DRAGONFLY	G1G3 S1S3 C2	LOW	LOW
<i>Stallingsia maculosus</i> MACULATED MANFREDA SKIPPER BUTTERFLY	G2 S2 C2	MEDIUM	HIGH
<i>Strygoparus comalensis</i> COMAL SPRINGS DRYOPID BEETLE	G1 S1 PE	1	MEDIUM
<i>Taeniopteryx starki</i> LEON RIVER WINTER STONEFLY	G1 S1 C2	MEDIUM	HIGH

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Adhemarius blanchardorum      **Candidate Category:** C2  
**Common Name:** Blanchard's sphinx moth      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Brewster County, Texas. Adults of this species have been collected using UV-light. Larvae and larval food plants have not been determined.

**Known Occurrences:** This species has been collected only from Big Bend National Park, Panther Pass and Green Gulch, Chisos Mountains, Brewster County, Texas.

**Reasons for Concern:** This species apparently is rare and has a highly restricted range in Texas. Such restrictions make this species vulnerable to extirpation following habitat loss.

**Monitoring Objective:** Determine host plant and learn more about this species habitat requirements.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Bi - Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park (BIBE)

**Methodology:** Determine what the host plant is and determine if larvae is feeding on same, not known if they have a one year life cycle. May be able to determine the relative abundance of the adults.

**Field Equipment Needed:** General entomological collecting equipment

**Estimated Time/Staff for Monitoring:** 3- 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the general population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from Big Bend National Park, (BIBE) to monitor this species. D. Bowles knows of someone from Colorado who is working on this species, need to get the name from D.B.

**Potential use of  
Volunteers:** Trustworthy volunteers could be utilized to monitor host plant and/or look for occurrences of host plant throughout the Park.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Anomala tibialis                      **Candidate Category:**      C2  
**Common Name:**      tibial scarab                      **Listing Rank:**  
**G/S Rank:**                      GSHH

**Range:**                      This species is endemic to the Texas Gulf Coast, but the specific distribution is unknown. The preferred habitat for this beetle is presumed to be sandy areas behind dunes where it burrows under clumps of grass and other vegetation.

**Known Occurrences:**      This species is endemic to the Texas Gulf Coast.

**Reasons for Concern:**      Members of this species inhabit a small geographical range and are considered to be rare. As such, they are vulnerable to extirpation from various disturbances.

**Monitoring Objective:**      At-large collecting within a designated sampling area to determine presence within an area.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**  
**Site Description:**      Texas Gulf Coast

**Methodology:**              At-large collecting within a designated sampling area to determine presence within an area.

**Field Equipment Needed:**      Sieves, vials, forceps, alcohol

**Estimated Time/Staff for Monitoring:**      5 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ed Reilly, Texas A&M; Paul Skelly, Florida

**Recommendations:** Work with the staff from NPS and Texas A&M Entomology Department.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and/or NPS to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Argia baltmorhea **Candidate Category:** C2  
**Common Name:** Baltmorhea damselfly **Listing Rank:**  
**G/S Rank:** G2G3S2

**Range:** Reeves County, Texas and southward into Nuevo Leon, Mexico. It is now believed to have a much wider distribution.

**Known Occurrences:** This species is known from San Soloman Springs and associated irrigation canals in Reeves County, Texas and southward into Nuevo Leon, Mexico. The primary habitat is spring-runs, and small streams having high water quality. Streams tend to be rocky surrounded by arid countryside. However, specific habitat requirements are unknown.

**Reasons for Concern:** Anthropogenic disturbances to known habitats, especially excessive groundwater pumping may place this species in jeopardy of being extirpated.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Reeves County: San Solomon Springs

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area.

**Field Equipment Needed:** Nets

**Estimated Time/Staff for Monitoring:** 3 - 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** This species will likely be down listed to a 3C.

**Potential use of  
Volunteers:** No need to monitor at this time.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Asaphomyia texanus                      **Candidate Category:** C2  
**Common Name:** Texas asaphomyian tabanid fly              **Listing Rank:**  
**Range:**                      **G/S Rank:** GHSH

**Range:**                      Armstrong, Colorado, Goliad and Victoria County. The specific habitat type for this species is unknown, but most of the collection locations thus known are sandy areas (old dunes) among oak islands. Larvae of this species are probably terrestrial, and the adults probably feed on nectar rather than blood. Adults are about the size of a deer fly. Emergence likely is in May. The larvae of a related species that occurs in Florida also inhabits sandy areas of old dunes.

**Known Occurrences:**                      The type locality for this species is 1 mi. north of Weser off Highway 183, Goliad County, Texas. It also has been collected near Columbus in Colorado County, near Kenedy in Armstrong County, and in Victoria County. It was last collected in the 1960's. It is apparently very common in Mexico.

**Reasons for Concern:**                      This species has a limited distribution and populations apparently are small. As a result, this horse fly is vulnerable to extirpation from development and other assorted land management practices.

**Monitoring Objective:**                      At-large collecting within designated sampling areas to determine presence within an area.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**              Annually

**Monitoring Responsibility:**                      TPWD

**Monitoring Plan:**

**Site Description:**                      Armstrong, Colorado, Goliad and Victoria County: Sites to be selected

**Methodology:**                      At-large collecting within a designated sampling area to determine presence within an area, sweep flowers and vegetation using insect nets.

**Field Equipment Needed:**                      Aerial Nets, Vials

**Estimated Time/Staff for Monitoring:**                      3 - 5 Days; 2 staff



**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Jim Goodwin, Texas A&M

**Recommendations:** A status survey should be completed for this species.

**Potential use of  
Volunteers:** It is not a good species for volunteers to work on.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Austrotinodes texensis                      **Candidate Category:** C2  
**Common Name:** Texas austrotinodes caddisfly                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** This species has been collected from several streams and spring-runs of the southern Edwards Plateau region of Texas.

**Known Occurrences:** Edwards Plateau Streams. Streams having high water quality are the habitat for the larvae. Larvae are thought to burrow into the substrate of stream pools, but this has not been confirmed.

**Reasons for Concern:** Although fairly widespread in streams and spring-runs of the Edwards Plateau, this species is rare and as such is at risk of extirpation from decreased water quality and quantity.

**Monitoring Objective:** Known populations of this species should be periodically monitored for signs of decline.

**Priority:** MEDIUM PRIORITY

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**PLAN.**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards Plateau Region; sites to be selected

**Methodology:** At-large collecting within designated sampling areas to determine presence within an area. Monitor water quality.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline

is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Ollie Flint, Smithsonian

**Recommendations:** This species should be down listed to 3C

**Potential use of  
Volunteers:** No monitoring necessary at this time.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Batrisodes venyivi                      **Candidate Category:** C2  
**Common Name:** Helotes mold beetle                      **Listing Rank:**  
**Range:** Bexar County, this beetle is an obligate cave-dwelling species.                      **G/S Rank:** G1S1

**Known Occurrences:** This species is known only from Helotes Hilltop Cave and Christmas Cave in Bexar County, Texas.

**Reasons for Concern:** The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:** Existing populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Helotes Hilltop Cave and Christmas Cave

**Methodology:** At-large collecting within designated sampling areas to determine presence within an area.

**Field Equipment Needed:** Vials, forceps, caving equipment

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total

population from one sampling period to the next may be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Access may be an issue in monitoring this species.

**Potential use of  
Volunteers:** Not a good species for volunteers to assist with.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Cheumatopsyche flinti</u> = <u>C. comis</u>	<b>Candidate Category:</b>	3C
<b>Common Name:</b>	Flint's net-spinning caddisfly	<b>Listing Rank:</b>	
		<b>G/S Rank:</b>	G3S3

**Range:** Bandera, Hays, Uvalde and Val Verde Counties. The larvae of this species prefers riffle areas of high quality streams and spring-runs, but specific habitat requirements are unknown.

**Known Occurrences:** The type locality for this species is San Felipe Springs, Del Rio, Val Verde County. Additional collections have been made from the San Marcos River (Hays County), Medina River (Bandera County), and Sabinal River (Uvalde County), suggesting that this caddisfly has a broad distribution. This species appears to be restricted to streams and spring-runs of the eastern half of the Edwards Plateau.

**Reasons for Concern:** Any detrimental impacts to stream quality and quantity including non-point pollution, excessive groundwater pumping, siltation, and other anthropogenic disturbances would have a negative effect on *Cheumatopsyche flinti* and aquatic insects in general.

**Monitoring Objective:** Recent collections have shown this species to have a much broader distribution than previously thought. Additional survey work on caddisflies could show definitively that most populations of this species are stable. No monitoring is necessary at this time.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

<b>Site Description:</b>	<b>Bandera County:</b>	<b>Hays County:</b>	<b>Uvalde County:</b>	<b>Val Verde County:</b>
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**Methodology:**

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** This species is now 3C, no need to monitor.

**Potential use of  
Volunteers:** No need to monitor this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chimarra holzenthali **Candidate Category:** C2  
**Common Name:** Holzenthal's philopotamid caddisfly **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Anderson County; Louisiana. The general larval habitat is springs and small streams having high water quality, but specific habitat requirements are unknown.

**Known Occurrences:** The type locality for this caddisfly is Schoolhouse Spring, Jackson Parish, Louisiana. The only Texas record is from a small stream near Salmon in Anderson County from specimens collected in 1975.

**Reasons for Concern:** The highly restricted distribution of this species suggests that it could be easily extirpated due to anthropogenic disturbances.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Anderson County; Salmon

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area using uv-light traps for the adults

**Field Equipment Needed:** Uv-light traps, vials, labels, alcohol

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more



comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Volunteers possibly able to assist in obtaining samples of this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela cazieri                      **Candidate Category:** C2  
**Common Name:** Cazier's tiger beetle                      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Starr County, this is a terrestrial beetle, but its specific habitat requirements are unknown.

**Known Occurrences:** The type and only known locality for this species is near Rio Grande City, Starr County, Texas.

**Reasons for Concern:** This beetle was last collected in 1985, suggesting it to be quite rare. Accordingly, it may be vulnerable to loss of habitat from development and other land management practices.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Starr County:

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area using nets, aerial and sweep

**Field Equipment Needed:** Nets, aerial and sweep

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust

monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Volunteers not recommended for assisting with tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela chlorocephala smythi      **Candidate Category:** C2  
**Common Name:** Smyth's tiger beetle      **Listing Rank:**  
**G/S Rank:** GHTHSH

**Range:** This terrestrial species apparently prefers coastal areas, but specific habitat requirements are unknown.

**Known Occurrences:** The distribution of this species in Texas is uncertain. However, some experts feel it most likely occurs along coastal areas from Brownsville, Texas to Veracruz, Mexico.

**Reasons for Concern:** This species is thought to be extinct.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Coastal areas from Brownsville south

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area using sweep nets.

**Field Equipment Needed:** Sweep Nets

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for

management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Volunteers not recommended to assist with tiger beetles

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela nevadica olmosa      **Candidate Category:** C2  
**Common Name:** Los Olmos tiger beetle      **Listing Rank:**  
**G/S Rank:** G5T2S1S2

**Range:** Kenedy County; New Mexico. This is a terrestrial species, but its specific habitat requirements are unknown.

**Known Occurrences:** This species is known only from near Los Olmos, Kenedy County, Texas, and from near Tularosa and Organ, New Mexico. Such a broadly discontinuous distribution suggests that this species may occur in the interceding areas as well.

**Reasons for Concern:** The restricted distribution of this species in Texas and its apparent rarity suggests that it may be vulnerable to extirpation.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Kenedy County: Los Olmos

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area. In addition, the taxonomy of this species needs to be resolved.

**Field Equipment Needed:** Sweep nets

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife

Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Volunteers are not recommended to work with tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela nigrocoerulea subtropica      **Candidate Category:** C2  
**Common Name:** subtropical blue-black tiger beetle      **Listing Rank:**  
**Range:** Hidalgo County, Coahuila, Mexico. This is a terrestrial species, that  
probably prefers dry, open areas. However, specific habitat  
requirements are unknown.      **G/S Rank:** G5T2SH

**Known Occurrences:** This species is known only from Anzalduas Park, Hidalgo County,  
Texas, and from Coahuila, Mexico. Other reports have suggested that  
this species also may occur in the Big Bend area of Texas.

**Reasons for Concern:** This species is quite rare and has a restricted distribution making it  
vulnerable to extirpation.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine  
presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hidalgo County: Anzalduas Park

**Methodology:** At-large collecting within a designated sampling area to determine  
presence within an area. In addition, the taxonomic issues need to be  
resolved.

**Field Equipment Needed:** Sweep nets

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population  
from one year to the next will be considered significant. In the event of  
significant or unacceptable decline, TPWD and Fish and Wildlife



Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Not recommended for tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela obsoleta neojuvenilis      **Candidate Category:** C2  
**Common Name:** neojuvenile tiger beetle      **Listing Rank:**  
**G/S Rank:** G5T1SH

**Range:** This species has been reported to occur in New Mexico, Mexico, and western and southern Texas. This is a terrestrial species that prefers dry prairie among clumps of bunch grass, mesquite-covered land, and grassy meadows and hillsides. Related other subspecies have been collected elsewhere from near springs and streams while others prefer areas only wetted by rainfall.

**Known Occurrences:** This species has been reported to occur in New Mexico, Mexico, and western and southern Texas. The distribution of this particular subspecies in Texas is unclear.

**Reasons for Concern:** This subspecies is very rare and may be vulnerable to extirpation. It may be extinct.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Western and southern Texas

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area. In addition, the taxonomic issue needs to be resolved.

**Field Equipment Needed:** Sweep nets

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Not recommended for tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela politula barbarannae      **Candidate Category:**      C2  
**Common Name:**      Barbara Ann's tiger beetle      **Listing Rank:**  
**Range:**      Hudspeth County; Mexico. This subspecies prefers dry, open areas on      **G/S Rank:**      G5T1S1  
large exposed ledges of limestone above 5,000 feet. Specimens have  
been collected only in September.

**Known Occurrences:**      The type and only known locality of this subspecies is in the Hueco  
Mountains, Hudspeth County, Texas. It also may occur in Mexico.

**Reasons for Concern:**      Over-collecting from commercial trade may be jeopardizing this beetle.  
Another factor making this beetle vulnerable is its apparent small  
natural distribution and low population size.

**Monitoring Objective:**      At-large collecting within a designated sampling area to determine  
presence within an area.

**Priority:**      **LOW PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:**      Annually

**Monitoring Responsibility:**      TPWD

**Monitoring Plan:**  
**Site Description:**      Hudspeth County:

**Methodology:**      At-large collecting within a designated sampling area to determine  
presence within an area. In addition, the taxonomy needs to be  
resolved.

**Field Equipment Needed:**      Sweep nets

**Estimated Time/Staff for Monitoring:**      2 - 3 Days; 2 staff

**Reporting Procedure:**      Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:**      After baseline information gathered, a 20% decrease in total population  
from one year to the next will be considered significant. In the event of  
significant or unacceptable decline, TPWD and Fish and Wildlife

Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD.

**Potential use of  
Volunteers:** Not recommended for tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cicindela politula petrophila      **Candidate Category:** C2  
**Common Name:** Guadalupe Mountains tiger beetle      **Listing Rank:**  
**G/S Rank:** G5T2S1

**Range:** Culberson County; New Mexico. This subspecies appears to prefer limestone outcrops at elevations of approximately 1670 m to over 2470 m. An increase in elevation appears to be associated with concomitant darkening of color as specimens from the higher elevations tend to be blue and/or dark green, while those occurring at lower elevations are described as lighter and cupreous in color.

**Known Occurrences:** This subspecies is known only from the type locality of Guadalupe Mountains in Guadalupe Mountains National Park, Culberson County, Texas, and Eddy County, New Mexico. It occurs throughout much of the Guadalupe Mountains National Park.

**Reasons for Concern:** Over-collecting by the commercial trade industry may be jeopardizing this beetle. Another factor making these beetles vulnerable is their apparent small natural distribution and low numbers.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area. In addition, the taxonomy needs to be resolved.

**Field Equipment Needed:** Sweep nets

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife

Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD.

**Potential use of  
Volunteers:** Not recommended for tiger beetles.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Deronectes neomexicana*      **Candidate Category:** C2  
**Common Name:** Bonita diving beetle      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Brewster County; Lincoln County, New Mexico. The specific habitat of this aquatic beetle is unknown.

**Known Occurrences:** The only known collection records for this species are from 20 mi. south of Alpine, Brewster County, Texas [probably Calamity Creek at Hwy. 118 bridge], and from Bonita Creek, Lincoln County, New Mexico.

**Reasons for Concern:** This species has a restricted distribution and is uncommon suggesting that it may be at risk for extirpation.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Calamity Creek, 20 mi south of Alpine at Hwy 118 bridge.

**Methodology:** At-large collecting within a designated sampling area to determine presence/absence within an area using kick nets.

**Field Equipment Needed:** Kick nets, vials, labels, forceps, alcohol

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of



significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; Jim Ricarson, Sul Ross

**Recommendations:** Work with the staff from BBRNSA if possible, to assist in monitoring this species.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eximacris superbum                      **Candidate Category:**      C2  
**Common Name:**      superb grasshopper                      **Listing Rank:**  
**Range:**                      Willacy County. Collection data for the only two known specimens of      **G/S Rank:**                      GSHH  
this grasshopper shows that they were associated with low oak shoots  
near oak thickets in a region of loose sand.  
**Known Occurrences:**      Known only from near "Katherine" (no such town shown on available  
maps of county), Willacy County, Texas.  
**Reasons for Concern:**      This species is known only from two adult males collected in 1937  
suggesting it may be quite rare. Any development and other land  
management practices in Willacy County that destroys the habitat of  
this species may impact its existence.  
**Monitoring Objective:**      At-large collecting within a designated sampling area to determine  
presence within an area.  
**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually during August - September, initially  
**Monitoring Responsibility:**              TPWD  
**Monitoring Plan:**  
**Site Description:**      Willacy County: along highway-right-of-ways with appropriate habitat.  
**Methodology:**              At-large collecting within a designated sampling area to determine  
presence within an area using a sweep net along roadsides, dependent  
on what is found, may want to set up transects and sample along them.  
**Field Equipment Needed:**      Sweep nets, vials, labels, insect pins, storage boxes  
**Estimated Time/Staff for Monitoring:**      2 - 3 Days; 2 staff  
**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.  
**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total population  
from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Haideoporus texanus **Candidate Category:** C2  
**Common Name:** Edwards Aquifer diving beetle **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Hays and Comal Counties. This species is restricted to the subterranean waters of the Edwards Aquifer in Hays and Comal counties, Texas, but specific habitat requirements remain unknown.

**Known Occurrences:** This species occurs in subterranean waters of the Edwards Aquifer.

**Reasons for Concern:** This diving beetle has an extremely limited range. It is probably sensitive to any deterioration in water quality or the influx of toxicants into the aquifer. Excessive groundwater pumping is a major threat to this species' habitat.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Hays County: Edwards Aquifer; Comal County: Edwards Aquifer

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area using drift nets to collect at spring orifices.

**Field Equipment Needed:** Drift nets, vials, labels

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In

the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Haliphus nitens                      **Candidate Category:**      C2  
**Common Name:**      disjunct crawling water beetle      **Listing Rank:**  
**Range:**                      The Texas record may be in error.      **G/S Rank:**                      GSHH

**Known Occurrences:**

**Reasons for Concern:**

**Monitoring Objective:**      None at this time

**Priority:**                      MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually,

**Monitoring Responsibility:**      TPWD

**Monitoring Plan:**

**Site Description:**

**Methodology:**

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**      3 Days; 2 staff

**Reporting Procedure:**      Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:**      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**      Texas Natural Heritage Program, Texas Parks & Wildlife  
Department, 4200 Smith School Road, Austin, TX 78744; and

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; Sharon Jasper, A&M

**Recommendations:**

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Heterelmis comalensis      **Candidate Category:** PE  
**Common Name:** Comal Springs riffle beetle      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Comal and Hays County. This species seems to prefer riffle areas near the head of Comal Springs, but specific habitat requirements have yet to be determined.

**Known Occurrences:** Known from the upper spring-runs of Comal Springs, Comal County. A single specimen was collected at Spring Lake, San Marcos Springs, Hays County.

**Reasons for Concern:** The existence of this species is in immediate jeopardy due to the potential loss of flow at Comal Springs resulting from over pumping of the Edwards Aquifer.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Comal County: Comal Springs; Hays County: Spring Lake, San Marcos Springs

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area by taking benthic samples and using kick nets. Monitor surface flow and aquifer level as well.

**Field Equipment Needed:** Kick nets

**Estimated Time/Staff for Monitoring:** 1-2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more



extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD and the Parks and Recreation staff from the city of New Braunfels and San Marcos to assist in collecting this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Limnebius texanus                      **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Texas minute moss beetle                      **G/S Rank:** GSHH

**Range:** Culberson and Jeff Davis Counties. Specific habitat requirements of this aquatic species are unknown, but it probably prefers seeps and springs.

**Known Occurrences:** The type locality of this species is 2.5 mi. E. of Nickel Creek Station, Culberson County. Additional specimens were collected from Limpia Creek Canyon, Jeff Davis County. The only known specimens of this beetle were collected in September 1952.

**Reasons for Concern:** This species has a highly restricted range making it vulnerable to extirpation. Also, groundwater resources are in great demand in western Texas which could result in elimination of this species habitat.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, initially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Culberson County: 2.5 mi. E. of Nickel Creek Station; Jeff Davis County: Limpia Creek Canyon

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area. Look for specimens among moss and algae, will need expert for identification.

**Field Equipment Needed:** Vials, labels

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Very hard to collect

**Potential use of  
Volunteers:** Not a good project for volunteers.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lordithon niger                      **Candidate Category:**        C2  
**Common Name:**        Black lordithon rove beetle                      **Listing Rank:**  
**Range:**                      Dallas County. Other collections are known from MO, AR, CT, DC, GA, IL, KS, KY, MI, NY, NC, OH, PA, VA, WV, and Canada.                      **G/S Rank:**                      GSHH

**Known Occurrences:**        Dallas County. This is a terrestrial species, but specific habitat requirements are unknown. Other members of the genus primarily are found on fleshy fungi.

**Reasons for Concern:**        Most experts on staphylinids agree that this species is becoming increasingly rare throughout its range. The reasons for this are unclear, but elsewhere this species has been associated with virgin deciduous forests which are rapidly disappearing.

**Monitoring Objective:**        At-large collecting within a designated sampling area to determine presence within an area.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**    Annually

**Monitoring Responsibility:**        TPWD

**Monitoring Plan:**

**Site Description:**        Dallas County: check woodlots; Anderson County: check woodlots, Lennox Woods.

**Methodology:**            At-large collecting within a designated sampling area to determine presence within an area. Locate fungi and look for the presence/absence of the beetle. When located, have the fungi identified.

**Field Equipment Needed:**    Vials

**Estimated Time/Staff for Monitoring:**    2 - 3 Days; 2 staff

**Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**        After baseline information gathered, a 20% decrease in total population

from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Steve Ash, University of Kansas; Richard Lescher (knows fungi)

**Recommendations:** Work with the staff from TNC

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD/TNC to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Macromia wabashensis      **Candidate Category:** C2  
**Common Name:** Wabash belted skimmer      **Listing Rank:**  
**G/S Rank:** G3QSRF

**Range:** McLennan County. This species has been reported from Ohio and Indiana. This is an aquatic species, but the specific habitat type, if in Texas, is unknown. According to David Bowles, this species does not occur in Texas.

**Known Occurrences:** There is one occurrence recorded for Texas (McLennan County), but this record likely is in error given the other distributional records for the species.

**Reasons for Concern:** Some experts believe that the record for this species in Texas is in error. It probably is M. taeniolata. Others have suggested that it may be a hybrid of that species and M. pacifica. Reasons for concern are unknown.

**Monitoring Objective:** No need to monitor at this time.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** NA

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** McLennan County:

**Methodology:** NA

**Field Equipment Needed:** NA

**Estimated Time/Staff for Monitoring:** NA

**Reporting Procedure:** NA

**Red Flag Conditions:** No need to monitor in Texas.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:**

**Potential use of  
Volunteers:** No need to monitor

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Oxyethira florida **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Florida oxyethiran microcaddisfly **G/S Rank:** G?S?  
**Range:** The type and only known locality for this species is Miami, Dade County, Florida. This species probably does not occur in Texas.  
**Known Occurrences:** This species probably does not occur in Texas.  
**Reasons for Concern:** Unknown  
**Monitoring Objective:** No need to monitor.  
**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** NA  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** NA  
**Methodology:** NA  
**Field Equipment Needed:** NA  
**Estimated Time/Staff for Monitoring:** NA  
**Reporting Procedure:** No report necessary  
**Red Flag Conditions:** None, does not occur in Texas  
**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD



**Recommendations:**

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Proptila arca **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** San Marcos saddle-case caddisfly **G/S Rank:** G1S1

**Range:** Hays County. The San Marcos River habitat is a thermally stable, oxygen-saturated, swift-flowing stream. Larvae of *P. arca* appear to prefer rock substrate and woody debris on which they graze. Fine gravel and sand is required for constructing the larval case.

**Known Occurrences:** This species is restricted to the upper San Marcos River, Hays County and is fairly common.

**Reasons for Concern:** This species has a highly restricted range. Recreational activities through disturbance of the substrate and siltation, non-point pollution, and groundwater depletion that will diminish spring flow may have negative impacts on this species

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hays County: San Marcos River

**Methodology:** At-large collecting within a designated sampling area to determine relative abundance within an area.

**Field Equipment Needed:** Nets, vials

**Estimated Time/Staff for Monitoring:** 1 Day; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information

gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Recruit members from the River Foundation to monitor this species and the water quality.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Rhadine infernalis                      **Candidate Category:**                      C2  
**Common Name:**                      a ground beetle                      **Listing Rank:**  
**Range:**                      **G/S Rank:**                      G1S1

**Range:**                      All known members of the genus *Rhadine* are obligate cave-dwelling species.

**Known Occurrences:**                      This species is known from several caves in Bexar County, Texas, including Headquarters Cave, Madla's Cave, John Wagner Ranch Cave #3, Charcoal Creek Coon Cave, Christmas Cave, Isopit, Game Pasture Cave #1, Kamikazi Cricket Cave, King Toad Cave, Logan's Cave, Matke Cave, Robber's Cave, Scorpion Cave, and Three-fingers Cave.

**Reasons for Concern:**                      The continued existence of this species and other cave-dwelling species depends on the ecological stability of their cave environments. Threats to this stability include destruction and/or deterioration of habitat by commercial, residential, and road construction, filling of caves, loss of permeable cover, potential contamination from effluent, sewer leaks, non-point run-off, and pesticides. Predation and competition by red imported fire ants and cave vandalism also pose significant threats to the cave fauna.

**Monitoring Objective:**                      Populations of this species should be monitored for signs of decline, primarily from fire ants, at least every 2 years. At-large collecting within a designated sampling area to determine presence within an area.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Annually

**Monitoring Responsibility:**                      TPWD

**Monitoring Plan:**

**Site Description:**                      Bexar County: sites to be selected, access will be an issue.

**Methodology:**                      At-large collecting within a designated sampling area to determine presence within an area.

**Field Equipment Needed:**                      caving equipment, vials

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; James Reddell; Don Chandler

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize caving volunteers that are familiar with karst invertebrates.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Schinia indiana                      **Candidate Category:** C2  
**Common Name:** phlox moth                              **Listing Rank:**  
**G/S Rank:** GUSH

**Range:**                      The larval food plant elsewhere in this species range is *Phlox pilosa*.  
The larval food plant of this species likely will dictate its distribution.

**Known Occurrences:**                      The distribution of this species in Texas is unknown. It also has been  
found in MI, MN, WI, AR, IL, IN, NC, NE. According to Roy Kendall,  
this species does not occur in Texas.

**Reasons for Concern:**                      The apparent rarity of this species, especially in Texas, suggests that it  
is at risk of being extirpated.

**Monitoring Objective:**                      Need to locate the host plant of this species then look for occurrences  
of this species. The distribution of Phlox pilosa is in the eastern part of  
Texas to the southwest including the Edwards Plateau.

**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**              Site(s) to be located.

**Methodology:**                      Locate host plant and sample for larvae.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**      2 - 3 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      Once population(s) found, gather baseline information. This species  
may or may not need close monitoring. If so, a 20% decrease in total  
population from one sampling period to the next may be considered  
significant dependent on the species. In the event of significant or  
unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Somatochlora margarita      **Candidate Category:** C2  
**Common Name:** Big Thicket emerald dragonfly      **Listing Rank:**  
**G/S Rank:** G1G3S1S3

**Range:** San Augustine and San Jacinto Counties. Small, clear, sandy-bottomed spring-runs and streams are the preferred habitat of this species. However, the specific larval habitat requirements are unknown.

**Known Occurrences:** The type locality for this species is Big Creek, Sam Houston National Forest, County, Texas. It also is known from Sandy Creek, San Augustine County. The potential range of this species may encompass more than 10,000 square miles and four National Forests in Southeastern Texas

**Reasons for Concern:** This dragonfly has a limited distribution and a restricted habitat. Excessive clearcutting and other anthropogenic disturbances within its range may have an adverse impact on this species.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** San Jacinto County: Sam Houston National Forest; San Augustine County:

**Methodology:** Visual observation of the large dragonfly within a designated sampling area, if possible, locate larvae and describe.

**Field Equipment Needed:** Binoculars

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.



**Red Flag Conditions:**

After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION****Resource Specialists:**

David Bowles, TPWD; A status survey was completed in 1989.

**Recommendations:**

Work with the staff from TPWD

**Potential use of  
Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:**

Summer 1995

**Plan Approval Date:****Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stallingsia maculosus      **Candidate Category:** C2  
**Common Name:** maculated manfreda skipper      **Listing Rank:**  
**G/S Rank:** G2S2

**Range:** Bexar, Hidalgo, Karnes, Kinney, Nueces, Starr and Wilson counties, and from Nuevo Leon, Mexico. The habitat of this species consists of semi-arid areas, in association with its larval food plant Manfreda maculosa. Collections have been made in April, July through September, and November through December.

**Known Occurrences:** The type locality of this species is near Kingsville, Kleberg County, Texas. It also is known from Bexar, Hidalgo, Karnes, Kinney, Nueces, Starr and Wilson counties, and from Nuevo Leon, Mexico.

**Reasons for Concern:** Although this skipper is known from several locations, some have been destroyed through miscellaneous land development practices. However, during the 1950's populations were considered healthy. The larval food plant never seems to occur in large colonies.

**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April, July - September

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County:      Hidalgo County:      Karnes County:      Kinney County: Sites to be selected

**Methodology:** At-large collecting within a designated sampling area to determine presence within an area. These are day active, may be able to quantify habitat and count the number of visits to the host plant over a designated period of time.

**Field Equipment Needed:** Sweep nets, vials, labels

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species and locating host plants.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Stygoparnus comalensis      **Candidate Category:** PE  
**Common Name:** Comal springs dryopid beetle      **Listing Rank:**  
**Range:** Comal Springs      **G/S Rank:** G1S1  
**Known Occurrences:** Edwards Aquifer  
**Reasons for Concern:** Water draw-down  
**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually,  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Comal Spring  
**Methodology:** At-large collecting within a designated sampling area to determine presence within an area using drift nets.  
**Field Equipment Needed:** Drift nets  
**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine

appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Volunteers not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Taeniopteryx starki      **Candidate Category:** C2  
**Common Name:** Leon River winter stonefly      **Listing Rank:** G1S1  
**Range:** Coryell and Hamilton Counties. The most likely habitat for this species in the Leon River is riffle areas, but specific habitat requirements are unknown.  
**Known Occurrences:** The only known population of this species occurs in the Leon River in Coryell and Hamilton Counties.  
**Reasons for Concern:** This species has a highly restricted distribution making it vulnerable to extirpation from anthropogenic disturbances.  
**Monitoring Objective:** At-large collecting within a designated sampling area to determine presence within an area.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Coryell County: Leon River; Hamilton County: Leon River

**Methodology:** At-large collecting of adults within a designated sampling area to determine presence within an area. Collect larvae with kick-nets and Hess samplers.

**Field Equipment Needed:** Kick nets, Hess samplers, vials, labels, alcohol

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In

the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; Ken Stewart, University of North Texas; Riley Nelson, UT

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**Appendix H:**

**MONITORING PLANS FOR THIRTY-FIVE SPECIES  
OF**

**MAMMALS**



## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>MAMMALS</b>			
<i>Blarina hylophaga plumbea</i> ARANSAS SHORT-TAILED SHREW	G5T1Q S1 C2		MEDIUM
<i>Choronycteris mexicana</i> LONG-TONGUED BAT	G3G4 S1 C2		MEDIUM
<i>Conepatus leucurus texensis</i> GULF COAST HOG-NOSED SKUNK	G5T4? S2 C1		MEDIUM-HIGH
<i>Conepatus mesoleucus trimallestes</i> BIG THICKET HOG NOSED SKUNK	G5T2 S1 C2	MEDIUM	LOW
<i>Corynorhinus</i> (~Pteropus) <i>rafinesquii</i> EASTERN BIG-EARED BAT	G4 S3 C2		MEDIUM
<i>Cynomys ludocicimus arizonensis</i> ARIZONA BLACK-TAILED PRAIRIE DOG	G5T3 S3 C2		LOW
<i>Dipodomys elazari</i> TEXAS KANGAROO RAT	G2 S2 C2	LOW	HIGH
<i>Eudernia maculatum</i> SPOTTED BAT	G4 S2 C2		MEDIUM-LOW
<i>Eumops perotis californicus</i> CALIFORNIA MASTIFF BAT	G5T7 S3 C2		MEDIUM
<i>Geomys arenarius</i> DESERT POCKET GOPHER	G3 S2 C2		MEDIUM
<i>Geomys personatus maritimus</i> MARITIME POCKET GOPHER	G4T2 S2 C2		MEDIUM
<i>Geomys personatus snyderi</i> CARRIZO SPRINGS POCKET GOPHER	G4T1 S1 C2		MEDIUM
<i>Geomys texensis bakeri</i> FRIO POCKET GOPHER	G3T2 S2 C2	MEDIUM	MEDIUM
<i>Myotis austroriparius</i> SOUTHEASTERN MYOTIS	G4 S3 C2		MEDIUM
<i>Myotis ciliolabrum</i> WESTERN SMALL-FOOTED MYOTIS	G5 S3 C2		MEDIUM
<i>Myotis evotis</i> LONG-EARED MYOTIS	G5 SX C2		LOW
<i>Myotis lucifugus occultus</i> OCCULT OR ARIZONA LITTLE BROWN MYOTIS	G5T3T4 SA C2		LOW
<i>Myotis thysanodes</i> FRINGED MYOTIS	G5 S3 C2		LOW
<i>Myotis velifer</i> CAVE MYOTIS	G5 S4 C2		LOW
<i>Myotis volans</i> LONG-LEGGED MYOTIS	G5 S4 C2		LOW
<i>Myotis yumanensis</i> YUMA MYOTIS	G5 S4 C2		LOW

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

<i>Ondatra zibethicus ripensis</i> PECOS RIVER MUSKRAT	G5T? S2S3 C2	MEDIUM	LOW
<i>Oryzomys couesi aquaticus</i> COUES' RICE RAT	G5T3? S2 C2		LOW
<i>Peromyscus truei comanche</i> PALO DURO MOUSE	G5T2 S2 C2	LOW	MEDIUM-HIGH
<i>Scalopus aquaticus texanus</i> PRESIDIO MOLE	G5T1Q S3 C2	MEDIUM	LOW
<i>Sigmodon octorhynchus</i> YELLOW-NOSED COTTON RAT	G5 S3 C2		LOW
<i>Spilogale putorius interrupta</i> PLAINS SPOTTED SKUNK	G5T5 S3 C2		MEDIUM
<i>Sylvilagus floridanus robustus</i> DAVIS MOUNTAINS COTTONTAIL	G5T3 S3 C2	MEDIUM	MEDIUM
<i>Tamias canipes</i> GRAY-FOOTED CHIPMUNK	G3 S2S3 C2	LOW	MEDIUM
<i>Thomomys bottae guadalupensis</i> GUADALUPE SOUTHERN POCKET GOPHER	G5T2 S2 C2		MEDIUM
<i>Thomomys bottae limpiae</i> LIMPIA SOUTHERN POCKET GOPHER	G5T2 S2 C2	MEDIUM	MEDIUM
<i>Thomomys bottae texensis</i> LIMPIA CREEK POCKET GOPHER	G5T2 S2 C2	MEDIUM	MEDIUM
<i>Vulpes velox</i> SWIFT FOX	G5 S4 C1		HIGH
<i>Vulpes velox macrotis</i> KIT FOX	G5T5 S4 C1		MEDIUM
<i>Vulpes velox velox</i> SWIFT FOX	G5T4T5 S3? C1		HIGH

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Blarina brevicauda plumbea      **Candidate Category:** C2  
**Common Name:** Aransas short-tailed shrew      **Listing Rank:**  
**G/S Rank:** G5T3 S3

**Range:** Aransas County, (Aransas National Wildlife Refuge (ANWR)).

**Known Occurrences:** Occurs in grassy vegetation near post oak trees.

**Reasons for Concern:** Small size and isolated nature of populations; unknown potential impact of various management plans proposed for oak mottes at the refuge such as burning, clearing and grazing.

**Monitoring Objective:** Once a population is documented, periodically survey for presence and estimate population trend.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, March

**Monitoring Responsibility:** TPWD/ANWR

**Monitoring Plan:**

**Site Description:** Aransas County: Aransas National Wildlife Refuge

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 2 m intervals and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night). May need to switch to pitfall traps, provide each trap with cotton or wool to limit mortality.

**Field Equipment Needed:** Live traps, bait (sardines), flagging, gloves, cotton or wool.

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal

should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner; Lee Elliott, TPWD; George Baumgardner, TAMU

**Recommendations:** Work with the staff from the USFWS and TPWD.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Choeronycteris mexicana                      **Candidate Category:** C2  
**Common Name:** Mexican long-tongued bat                      **Listing Rank:**  
**Range:** Hidalgo County, (Santa Ana National Wildlife Refuge)                      **G/S Rank:** G2S1

**Known Occurrences:** Known only from Lower Rio Grande Valley; documented from Hidalgo County (Santa Ana National Wildlife Refuge), single record. Neotropical nectivorous species roosting in caves, mines, and large crevices found in deep canyons along the Rio Grande

**Reasons for Concern:** Caves in Mexico where this bat spends most of its time are subject to dynamiting.

**Monitoring Objective:** Locate and visit known roost sites periodically to determine presence and population estimate/trends.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, May - July

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hidalgo County: Santa Ana National Wildlife Refuge

**Methodology:** Locate and visit known roost sites periodically to determine presence and population estimate/trends. Visit twice a month for one year or during the summer months

**Field Equipment Needed:** Binoculars, data sheets, may need to mist net for positive identification, flashlights with a red filter.

**Estimated Time/Staff for Monitoring:** 2 Days/Mo ; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection,

provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Enlist monitoring assistance from the staff from Santa Ana National Wildlife Refuge.

**Potential use of Volunteers:** Possibly utilize volunteers from the Valley

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Conepatus leuconotus texensis      **Candidate Category:** C1  
**Common Name:** Gulf Coast hog-nosed skunk      **Listing Rank:**  
**G/S Rank:**      G5T?S?

**Range:** Aransas, Brooks, Cameron, Dewitt, Karnes, Kleberg, Nueces, San Patricio, and Webb Counties.

**Known Occurrences:** Known from nine counties, thorn woodland and riparian forest of rolling hills; also mesquite-brushland with semi-open grasslands.

**Reasons for Concern:** Although no threats are specifically known at this time, the coastal plain of south Texas has and will continue to be subject to habitat modification as a result of urban development, water use and agriculture.

**Monitoring Objective:** Once populations are located, determine population estimate. Taxonomy also needs to be resolved.

**Priority:**      **MEDIUM - HIGH PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Gulf coast counties

**Methodology:** Notify ADC and Predator Control offices and local fur trappers in each of the counties to determine population locations. Once populations are located and verified, monitor by spot lighting and track plates.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to

determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD; Jerry Dragoo, TAMU; Rodney Honeycutt

**Recommendations:** Work with the staff from Santa Ana NWR.

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Conepatus mesoleucus telmalestes*      **Candidate Category:** C2  
**Common Name:** Big Thicket hog-nosed skunk      **Listing Rank:**  
**G/S Rank:** G5T2 S1

**Range:** East Texas - Hardin, Liberty, San Jacinto, Harris, Waller and Montgomery Counties; probably extinct

**Known Occurrences:** Little is known about the habitat of this subspecies, but *C. mesoleucus* is found in rocky draws and canyons typical of the Edwards Plateau and Trans-Pecos

**Reasons for Concern:** Farming and urbanization have altered and reduced habitat, while hunting and trapping for pelts may have contributed to the decline. Many authorities are of the opinion that this taxon is extinct

**Monitoring Objective:** Map site location(s) if other individuals are captured and reported. Taxonomy needs to be resolved.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas, sites to be selected

**Methodology:** Notify ADC and Predator Control offices and local fur trappers in each of the counties to determine population locations. Once populations are located and verified, monitor by spot lighting and track plates.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to

determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD; Jerry Dragoo, TAMU

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Corynorhinus rafinesquii                      **Candidate Category:** C2  
**Common Name:** Rafinesque's big-eared bat                      **Listing Rank:**  
**G/S Rank:** G4S3

**Range:** Hardin, (Harrison?), Jasper, Liberty, Marion, Montgomery, Nacogdoches, Newton, Polk and Sabine Counties

**Known Occurrences:** Two known localities, Jasper and Liberty Counties. Historically, lowland pine and hardwood forests with large hollow trees.

**Reasons for Concern:** Degradation of roosting and feeding sites by commercial logging practices; habitat destruction in the form of clearing forests and adverse timber management practices in the piney wood habitat of east Texas; pesticides may also represent a threat to this insectivorous bat.

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas: Sites to be selected

**Methodology:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Field Equipment Needed:** Binoculars, mist nets, gloves, may need to net for positive identification.

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with the staff from TPWD.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cynomys ludovicianus arizonensis      **Candidate Category:** C2  
**Common Name:** Arizona black-tailed prairie dog      **Listing Rank:**  
**G/S Rank:** G5T3S3

**Range:** Brewster, Culberson, El Paso, Hudspeth, Pecos, Presidio, Reeves and Terrell Counties

**Known Occurrences:** This species is known from Short grasslands.

**Reasons for Concern:** Habitat alteration, including turning native prairie into cropland, pasture improvement and urban development and concerted elimination efforts

**Monitoring Objective:** Identify populations for periodic population estimates.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Select sites in West Texas

**Methodology:** Designate select populations to keep track of over time

**Field Equipment Needed:** Binoculars, spotting scope

**Estimated Time/Staff for Monitoring:** 1- 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dipodomys elator **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Texas kangaroo rat **G/S Rank:** G2S2

**Range:** North central Texas, Childress, Cottle, Hardeman, Wichita and Wilbarger Counties.

**Known Occurrences:** Forty-two known occurrences North central Texas; historically may have included 14 Texas and 3 Oklahoma counties, but presently are known from only Cottle (1985), Childress (1987), Hardeman (1990), Wichita (1990), and Wilbarger Counties (1990) of Texas. They occur on sandy loam surface soils containing some clay and which supports short grasses (buffalo grass) and small to medium sized mesquite.

**Reasons for Concern:** Destruction of mesquite-grassland; endemic subspecies restricted to a five county area and may be confined to a limited geologic substrate.

**Monitoring Objective:** Identify a subset of the kangaroo rat population (largest, smallest, easterly, westerly) to establish annual population trends using consistent methodologies; Investigate a technique that would relate population size with number of burrows/other variable; Visit each of the known populations periodically to monitor changes in activity.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually. 2 spotlight surveys at each site during each of the 4 seasons or 3 consecutive trap nights during each of the four seasons

**Monitoring Responsibility:** TPWD-Need access

**Monitoring Plan:**

**Site Description:** Private land, need access

**Methodology:** One of two levels of monitoring could be initiated based on funding and personnel availability. Level 1 addressing population trends, establish transect lines to be surveyed along roads on moonless nights. Data collected will be a population index of relative abundance consisting of the number of krats observed per distance traveled (a trap night is one trap set and left over night). Level 2 addresses demographic trends and is the preferable method, but requires private land access. Four grids measuring at least two hectares each would be established in prime habitat on the property. Traps will be placed in each grid at 20 m intervals and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. Kangaroo rats will be trapped, identified, then

permanently marked with microchip transponders. Data collected will include weight, age, and reproductive condition. Population densities can be estimated using a mark/recapture population model which may also provide survivorship and reproductive estimates. Level 2 will be initiated based on availability of funding to obtain the more expensive equipment.

**Field Equipment:** Level 1: Spotlight, car with odometer.  
Level 2: Sherman live-traps (400), mixed seed bait, capture bag, gloves, identification field guides, flagging, microchip transponders, transponder receiver, weighing scales, ruler/calipers

**Estimated Time/Staff for Monitoring:** 2 people for 3 nights/season per study area

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year. The report will include data from that year, and previous years to denote population trends.

**Red Flag Conditions:** Data will be collected for 4 years to obtain an average abundance index. In subsequent years, a 50% decrease in the average annual population index (Level 1) or density (Level 2) for 2 consecutive years will be considered significant. If Level 2 monitoring has been conducted, the demographic data will also be used to assess the significance of the decline. If the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Endangered Resources Branch, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Rd., Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bob Martin, McMurry University;

**Recommendations** Research Needs may include: Determine minimum viable population; Determine whether detrimental competition occurs between *D. elator*, *D. ordii*, or other sympatric rodent; Determine the effects of different grazing regimes on kangaroo rat populations; Determine the effects of pesticides on kangaroo rat populations; Determine how man-made alterations (dirt roads, fence lines, firebreaks) influence burrow construction and movement patterns.

**Potential use of Volunteers:** Because identifying rodent species with similar morphology will require extensive training, it would be best to use of volunteers who are willing to commit themselves to a minimum of one year. However, short term volunteers could help experienced staff/volunteers on a limited basis by recording data or opening and checking traps, which would reduce overall field time.

**Date for Review of Plan:** Fall 1995



**Plan Approval Date:**

**Date on Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Euderma maculatum **Candidate Category:** C2  
**Common Name:** spotted bat **Listing Rank:**  
**G/S Rank:** G4S2

**Range:** Trans-Pecos region of Texas

**Known Occurrences:** Known to be in Big Bend National Park, location not mapped. Habitat includes Ponderosa pine forests to desert scrub; habitat requirement appears to be limited to presence of broken canyon country or cliffs for roosting sites.

**Reasons for Concern:** Threats have not been specifically identified though a lack of study and inability of biologists to observe the bats contribute to the reasons for belief of the species rarity

**Monitoring Objective:** Visit historical and current roost sites periodically to determine presence and population estimate/trend.

**Priority:** MEDIUM - LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, early summer

**Monitoring Responsibility:** TPWD/Big Bend National Park

**Monitoring Plan:**

**Site Description:** West Texas, broken canyons and cliffs

**Methodology:** Visit historical and current roost sites periodically to determine presence and population estimate/trend.

**Field Equipment Needed:** Mist nets, gloves, binoculars, night vision devices, photo equipment

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD.

**Recommendations:** Work with TPWD staff in west Texas to locate additional new roost sites.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring and looking for additional site of this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eumops perotis californicus **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** greater western mastiff bat **G/S Rank:** G5T1S3

**Range:** Brewster, Presidio and Val Verde Counties; maybe along Rio Grande Canyon

**Known Occurrences:** 0 known occurrences. Habitat includes arid canyons; roosts in crevices in rock walls of desert canyons, old buildings, hollow trees; roost site must have clearance for a 3m fall by exiting bats.

**Reasons for Concern:** Extent of decline and specific causes have not been determined; Tipton, 1987, suggests the possibility that pesticide use and habitat loss are responsible.

**Monitoring Objective:** Locate and visit known roost sites periodically to determine presence and population estimate/trends.

**Priority:** **MEDIUM PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, early summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** West Texas, sites to be selected.

**Methodology:** Locate and visit known roost sites periodically to determine presence and population estimate/trends.

**Field Equipment Needed:** Binoculars, mist nets, gloves

**Estimated Time/Staff for Monitoring:** 2 - 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with staff from TPWD to locate potential roost sites.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Geomys arenarius **Candidate Category:** C2  
**Common Name:** desert pocket gopher **Listing Rank:**  
**G/S Rank:** G3S2

**Range:** El Paso and Hudspeth Counties

**Known Occurrences:** Known from 0 sites. Habitat includes cottonwood-willow association along the Rio Grande; common along irrigation ditches in the sandy river bottom area; they apparently cannot tolerate the clayey or gravelly soils characteristic of the other *Geomys* species.

**Reasons for Concern:** Small isolated population vulnerable to land use changes

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically; Develop a method of estimating population density and trends. Taxonomy needs to be clarified.

**Priority:** **MEDIUM PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, June - August

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** El Paso County

**Methodology:** Set up a grid-trapping system with live traps. Traps will be placed in each grid at 3 m intervals or as the mounds may indicate activity and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. It may be necessary to also try running the traps during the day. Individuals will be trapped, identified, measured, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Gopher live traps, bucket, gloves

**Estimated Time/Staff for Monitoring:** 4 Days; 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from

one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Geomys personatus maritimus      **Candidate Category:** C2  
**Common Name:** maritime pocket gopher      **Listing Rank:**  
**G/S Rank:** G4T2S2

**Range:** Nueces County

**Known Occurrences:** Known from 0 sites. Habitat includes sandy soils which are sufficiently moist to permit burrowing; it may inhabit isolated aeolian or alluvial sands along south Texas streams and rivers such as the Nueces and the Rio Grande in the sand sheet belt of Kenedy and Brooks counties

**Reasons for Concern:** Next to nothing is known about the Texas maritime pocket gopher. Urbanization of the greater Corpus Christi metropolitan area would be a palpable threat to the only known locality of this taxon.

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically; Develop a method of estimating population density and trends. Taxonomy needs to be clarified.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, early Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Nueces County

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 m intervals or as the mounds may indicate activity and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. It may be necessary to also try running the traps during the day. Individuals will be trapped, identified, measured, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Gopher live traps, bucket, gloves

**Estimated Time/Staff for Monitoring:** 4 Days, 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.



**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with the personnel from TPWD to assist in trapping these gophers.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Geomys personatus streckeri **Candidate Category:** C2  
**Common Name:** Carrizo Springs pocket gopher **Listing Rank:**  
**G/S Rank:** G4T1S1

**Range:** Dimmit County

**Known Occurrences:** Known from 0 sites. Habitat includes deep sandy soils, evidently absent from the silt loams of the flood plains of the Rio Grande or gravelly/stoney/ clayey soils (Davis 1974); uses roadsides. Pocket gopher activity apparent along roadside in areas of Antosa-Bobillo soil association in Dimmit County.

**Reasons for Concern:** Next to nothing is known about the status of the Carrizo Springs pocket gopher and potential threats to its survival have not been determined. Another rare endemic whose life history, population dynamics and biology are poorly known. Much of the appropriate habitat for this species has been converted to agricultural land use. Because the species has been relegated to highway rights-of-ways, mortality from vehicular traffic is probably common. Species is considered destructive and control measures are often deemed necessary

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically; Develop a method of estimating population density and trends. Taxonomy needs to be clarified.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring early summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Dimmit County

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 m intervals or as the mounds may indicate activity and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. It may be necessary to also try running the traps during the day. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Gopher live traps, bucket, gloves

**Estimated Time/Staff for Monitoring:** 4 Days; 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Geomys texensis bakeri                      **Candidate Category:** C2  
**Common Name:** Frio pocket gopher                      **Listing Rank:**  
**G/S Rank:** G3T2S2

**Range:** Uvalde, Medina and Zavala Counties

**Known Occurrences:** Known from 0 sites. Habitat includes well drained soil consisting of sandy surface layers with loam extending to as deep as 2m. (Atco Soil Association)

**Reasons for Concern:** Small isolated population vulnerable to land use changes

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically; Develop a method of estimating population density and trends. Taxonomy needs to be clarified.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring, early Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Uvalde County: sites to be selected; Medina County: sites to be selected; Zavala County: sites to be selected.

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 m intervals or as the mounds may indicate activity and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. It may be necessary to also try running the traps during the day. Individuals will be trapped, identified, measured, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Gopher live traps, bucket, gloves

**Estimated Time/Staff for Monitoring:** 4 Days; 2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Lee Elliott, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**  
**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis austroriparius      **Candidate Category:** C2  
**Common Name:** southeastern myotis      **Listing Rank:**  
**G/S Rank:** G4S3

**Range:** Bowie, Hardin, Liberty, Newton, Panola and Tyler Counties (Orange, Harris, Montgomery Counties have Public Health records, but identification not confirmed)

**Known Occurrences:** Known from six sites. Habitat includes historically, lowland pine and hardwood forests with large hollow trees; associated with ecological communities near water.

**Reasons for Concern:** Impacted by logging of bottomland hardwoods and by destruction of major cave roosting sites. This species is apparently declining over other parts of its range.

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring and early Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas, sites to be selected

**Methodology:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Field Equipment Needed:** Binoculars, mist nets, gloves

**Estimated Time/Staff for Monitoring:** 5 Nights/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD and the USFS to assist in monitoring.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis ciliolabrum **Candidate Category:** C2  
**Common Name:** western small-footed myotis **Listing Rank:**  
**G/S Rank:** G4S3

**Range:** Trans Pecos region, county records include: Armstrong, Brewster, Culberson, El Paso, Jeff Davis, Presidio, and Randall

**Known Occurrences:** Known from 0 sites. Habitat includes deserts, semi-deserts and mountains, roosting in crevices and cracks

**Reasons for Concern:** Little is known about this species, impacts of water degradation and pesticide use would have an impact on this species.

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Priority:** **MEDIUM PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, late Spring, early Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** West Texas, sites to be selected.

**Methodology:** Visit known roost sites periodically to determine presence and population estimate/trends; Contact East Texas Public Health facilities for information on locations of bats submitted for rabies testing.

**Field Equipment Needed:** Mist nets, gloves, Binoculars

**Estimated Time/Staff for Monitoring:** 5 Days/Nights/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to



determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis lucifugus occultus **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** occult or Arizona little brown myotis **G/S Rank:** G5T3T4 SA

**Range:** Species is known from only one specimen from Hudspeth County; species considered migrant/accidental

**Known Occurrences:** Known from one site.

**Reasons for Concern:** There have been no recent records of the presence of these bats in Texas

**Monitoring Objective:** Visit historical and current roost sites periodically to determine presence and population estimate/trends.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hudspeth County

**Methodology:** Visit historical and current roost sites periodically to determine presence and population estimate/trends.

**Field Equipment Needed:** Mist nets, gloves, binoculars

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/Nights/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis evotis **Candidate Category:** C2  
**Common Name:** long-eared myotis **Listing Rank:**  
**G/S Rank:** G5SX

**Range:**

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Little is known regarding this species.

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends.

**Priority:** **LOW PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:**

**Methodology:** Visit known roost sites periodically to determine presence and population estimate/trends.

**Field Equipment Needed:** Mist nets, gloves, binoculars

**Estimated Time/Staff for Monitoring:** 3- 5 Days/Nights/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD to monitor this species

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis thysanodes **Candidate Category:** C2  
**Common Name:** fringed myotis **G/S Rank:** G5S3  
**Listing Rank:**  
**Range:** Trans-Pecos region; Brewster, Crosby, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio Counties  
**Known Occurrences:** Known from 0 sites.  
**Reasons for Concern:** This cave dwelling species would be subject to cave and other roost site disturbances.  
**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends.  
**Priority:** **LOW PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, late Spring, early Summer  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** West Texas, sites to be selected  
**Methodology:** Visit known sites periodically to determine presence and population estimate/trends.  
**Field Equipment Needed:** Mist nets, gloves, binoculars  
**Estimated Time/Staff for Monitoring:** 3 - 5 Days/Nights/2 Staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200

Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,  
Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank  
Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**  
**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.  
Combine searching for West Texas bat species under one effort.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis velifer                      **Candidate Category:** C2  
**Common Name:** cave myotis                      **Listing Rank:**  
**Range:**                      **G/S Rank:**                      G5S4  
**Range:**                      Occurs over most of western Texas, South Texas, eastern portions of the panhandle and north-central Texas  
**Known Occurrences:**                      Known from three sites. It is a colonial, cave dwelling bat, occasionally found roosting with other species of bats  
**Reasons for Concern:**                      Susceptible to cave and roosting disturbances.  
**Monitoring Objective:**                      Visit known roost sites periodically to determine presence and population estimate/trends.  
**Priority:**                      LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Annually, late Spring, early Summer  
**Monitoring Responsibility:**                      TPWD  
**Monitoring Plan:**  
**Site Description:**                      Sites to be selected  
**Methodology:**                      Visit known roost sites periodically to determine presence and population estimate/trends.  
**Field Equipment Needed:**                      Mist nets, gloves, binoculars  
**Estimated Time/Staff for Monitoring:**                      3 - 5 Days/Nights/2 Staff  
**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.  
**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,



**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**  
**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis volans                      **Candidate Category:** C2  
**Common Name:** long-legged myotis                      **Listing Rank:**                      **G/S Rank:** G5S4

**Range:** Brewster, Culberson, Jeff Davis, Knox, and Presidio Counties

**Known Occurrences:** Known from 0 sites. Found primarily in the Trans-Pecos region in high, open woods and mountainous terrain. They prefer cliff crevices, hollow trees and buildings over caves.

**Reasons for Concern:** Little is known about this species in Texas

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends.

**Priority:**                      **LOW PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Annually, late Spring, early Summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be selected

**Methodology:** Visit known roost sites periodically to determine presence and population estimate/trends.

**Field Equipment Needed:** Mist nets, gloves, binoculars

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/Nights/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,

**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Myotis yumanensis                      **Candidate Category:** C2  
**Common Name:** Yuma myotis                                      **Listing Rank:**  
**G/S Rank:**                                      G5S4

**Range:** Occurs in southern Trans-Pecos and the Rio Grande Valley. County records include Brewster, El Paso, Jeff Davis, Pecos, Presidio, Starr and Val Verde Counties.

**Known Occurrences:** Known from 0 sites. Prefers lowland habitats, roosting in caves, abandoned mine tunnels and buildings

**Reasons for Concern:** Little is known about this species of bat.

**Monitoring Objective:** Visit known roost sites periodically to determine presence and population estimate/trends.

**Priority:**                                      **LOW PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:**     Annually, late Spring, early Summer

**Monitoring Responsibility:**        TPWD

**Monitoring Plan:**

**Site Description:**            Sites to be selected

**Methodology:**                Visit known roost sites periodically to determine presence and population estimate/trends.

**Field Equipment Needed:**    Mist nets, gloves, binoculars

**Estimated Time/Staff for Monitoring:**     5 - 7 Days/Nights/2 Staff

**Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**            After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD and Big Bend National Park to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species. Coordinate with other bat survey work in the regions.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Ondatra zibethicus ripensis      **Candidate Category:** C2  
**Common Name:** Pecos River muskrat      **Listing Rank:**  
**G/S Rank:** G5T3? S2S3?  
**Range:** Found along the Pecos River and its tributaries. County records include El Paso, Hudspeth, Pecos, Reeves and Val Verde Counties  
**Known Occurrences:** Known from 0 sites.  
**Reasons for Concern:** Habitat destruction, pesticide run-off from agriculture practices all impact this species as well as changes in desert riparian systems.  
**Monitoring Objective:** None at this time, need to relocate sites

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually in late autumn to winter (Sept - March)  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Pecos River  
**Methodology:** Once a population is located, count mounds and or live trap and tag for mark and recapture population estimates.  
**Field Equipment Needed:** Live traps, binoculars  
**Estimated Time/Staff for Monitoring:** 5 Days/2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Danny Sweptston, TPWD;

**Recommendations:**

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Oryzomys couesi aquaticus                      **Candidate Category:** C2  
**Common Name:** Coues' rice rat                      **G/S Rank:**                      **Listing Rank:** G5T3? S2

**Range:** Coastal South Texas, recorded from Cameron, Hidalgo, Kenedy, Starr and Willacy Counties.

**Known Occurrences:** Known from 0 sites. Prefers cattail-bulrush marshes and aquatic, grassy zones near resacas.

**Reasons for Concern:** Habitat destruction perhaps due to localized overgrazing, conversion to agriculture, urbanization and channelization of existing water courses.

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically; Develop a method of estimating population density and trends.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Hidalgo County:

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 2 - 4 m intervals and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data



collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Lee Elliott, TPWD;

**Recommendations:** Work with the TPWD personnel from Valley.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Peromyscus truei comanche **Candidate Category:** C2  
**Common Name:** Palo Duro mouse **Listing Rank:**  
**G/S Rank:** G5T3 S2

**Range:** Armstrong, Briscoe, and Randall Counties. Escarpment of the Llano Estacado; rocky slopes with juniper, brush and short grasses

**Known Occurrences:** Known from Palo Duro and Caprock Canyon State Parks; Tule, South Ceta, Palo Duro, and Los Lingos Canyons; private property near the towns of Claude, Canyon, Wayside, Tulia, Silverton, and Quitaque.

**Reasons for Concern:** The Palo Duro mouse is an endemic that is restricted to a particular vegetation type that may be subject to human alteration.

**Monitoring Objective:** Map the preferred habitat (using GIS methods) and identify populations and methods for a long-term periodical monitoring program, noting population trends and demography

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially-three consecutive trap nights during each of four seasons

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Briscoe County:** Caprock Canyons State Park; **Randall County:** Palo Duro State Park. There are several areas within both parks that contain potential habitat.

**Methodology:** Four grids measuring at least one hectare each will be permanently established in prime habitat in each state park (e.g. a total of 8 grids). Traps will be placed in each grid at 10 m intervals and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. One of two levels of monitoring could be initiated. Level 1 addresses population trends, individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night). Level 2 addresses demographic trends where individuals trapped will be permanently marked with microchip transponders, and data collected will include weight, age, and reproductive condition. Population densities can be estimated using a mark/recapture population model which may also provide survivorship and reproductive estimates. Level 2 will be initiated based on availability of funding to obtain the more expensive equipment.

**Field Equipment:** Level 1: Sherman live-traps (400 for each park), mixed seed bait, capture bag, gloves, identification field guides, flagging  
Level 2: Same as Level 1 but also including microchip transponders, transponder receiver, weighing scales, ruler/calipers

**Estimated Time/Staff for Monitoring:** 3 nights/season; 2 staff for each Park

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** Data will be collected for 4 years to obtain an average abundance index. In subsequent years, a 50% decrease in the average annual population index (Level 1) or density (Level 2) for 2 consecutive years will be considered significant. If Level 2 monitoring has been conducted, the demographic data will also be used to assess the significance of the decline. If the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Clyde Jones, Texas Tech University; Richard Manning - Southwest Texas State University

#### Recommendations

**Potential use of Volunteers:** Because identifying rodent species with similar morphology will require extensive training, it would be best to use of volunteers who are willing to commit themselves to a minimum of one year. However, short term volunteers could help experienced staff/volunteers on a limited bases by opening and checking traps, which would reduce overall field time.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date on Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Scalopus aquaticus texanus **Candidate Category:** C2  
**Common Name:** Presidio mole **Listing Rank:**  
**G/S Rank:** G5T1Q S1

**Range:** Presidio County, found in moist loamy or sandy soils; maybe the alluvial soils associated with the Rio Grande or at high elevations

**Known Occurrences:** Known from one site.

**Reasons for Concern:** The Presidio mole apparently has a narrowly restricted range in Texas, its biology, ecology and natural history are poorly known and specific potential threats to its survival have not been precisely identified.

**Monitoring Objective:** Map site location if other individuals are captured and reported.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Presidio County:

**Methodology:** Map site location if other individuals are captured and reported.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the regional personnel from TPWD.

**Potential use of**  
**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Sigmodon ochrognathus                      **Candidate Category:** C2  
**Common Name:** yellow-nosed cotton rat                      **Listing Rank:**  
**G/S Rank:** G5S3

**Range:** Brewster, Jeff Davis and Presidio counties; mostly captured at BBNP in the Chisos (Laguna Meadows). Found on dry rocky slopes of oak-pinyon-junipers and highland meadows of the desert southwest at elevations ranging from 1500-2500 meters.

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Restricted range makes this species vulnerable to changing land use practices, especially overgrazing.

**Monitoring Objective:** Identify two or three populations in Big Bend National Park and periodically estimate population size to determine trends.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park

**Methodology:** Identify two or three populations in Big Bend National Park and periodically estimate population size to determine trends. Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 m intervals and opened 1.5 hrs before sunset and checked 1 hr after sunrise the next morning. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from Big Bend National Park to ensure continuous monitoring of this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Spilogale putorius interrupta      **Candidate Category:** C2  
**Common Name:** Plains spotted skunk      **Listing Rank:**  
**G/S Rank:** G5T5 S3

**Range:** East of the Balcones Escarpment and westward through north-central Texas to the Panhandle as far south as Garza County. Found in wooded areas and tall-grass prairies, preferring rocky canyons and outcrops when such sites are available

**Known Occurrences:** Known from three sites.

**Reasons for Concern:** Direct and indirect pesticide poisoning; loss of habitat due to changing farming practices; competition from other insectivores (armadillos, striped skunks); predation from increasing populations of predators (great horned owls, coyotes, bobcats).

**Monitoring Objective:** Identify populations in different regions of its range and develop methods for monitoring.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be selected

**Methodology:** Identify populations in different regions of its range and develop methods for monitoring.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring



needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Homer, TPWD; Jerry Drago, TAMU

**Recommendations:** Work with the personnel from the Wildlife Division within TPWD to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Sylvilagus floridanus robustus      **Candidate Category:** C2  
**Common Name:** Davis Mountains cottontail      **Listing Rank:**  
**G/S Rank:** G5T3 S3

**Range:** West Texas including Culberson, Brewster, Jeff Davis, Pecos, Presidio, and Terrell Counties. Occurs in pinyon-oak-juniper and pine-fir associations from 1400-2400m elevation.

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Restricted range makes this species vulnerable to changing land use practices. Although historically populations were probably never very large, some grazing and brush clearing practices in the area may contribute to its rarity

**Monitoring Objective:** Identify populations within Guadalupe Mountain National Park, Big Bend National Park and Davis Mountains State Park to determine periodic population estimates and trends. Verify taxonomy.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, late spring, early summer

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park; Culberson County: Guadalupe Mountain National Park, Jeff Davis County: Davis Mountains State Park

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 5 m intervals and opened 2 hrs before sunset and checked 1 hr after sunrise the next morning. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, bags, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days at each site/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD and the National Park system to monitor the different populations of this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Tamias canipes **Candidate Category:** C2  
**Common Name:** gray-footed chipmunk **Listing Rank:**  
**G/S Rank:** G3S2S3

**Range:** Culberson County, Sierra Diablo and Guadalupe Mountains. Found at high elevations (1800-2500m), forest-dwelling occurring in dense stands of mixed timber and on brushy hillsides with rock crevices or downed logs along forest edges.

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Restricted range and ecological requirements make this species vulnerable to land use changes and overgrazing.

**Monitoring Objective:** Identify populations within Guadalupe Mountain National Park and determine periodic population estimates and trends.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park and the Sierra Diablo Wildlife Management Area

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 - 5 m intervals and run during the day. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets, bags, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive

appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from TPWD and the National Park Service to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thomomys bottae guadalupensis **Candidate Category:** C2  
**Common Name:** Guadalupe southern pocket gopher **Listing Rank:**  
**G/S Rank:** G5T2 S2

**Range:** Culberson County. Found at 1,400-2,500m elevations in shallow, rocky soil of the Guadalupe Mtns, often associated with lechuguilla, its preferred food plant.

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** This pocket gopher is dependent on its preferred food of *Agave lechuguilla* and is thus would be sensitive to the adverse effects of overgrazing, conversion of rangeland to improved pastures and agriculture and to trapping and poisoning control efforts.

**Monitoring Objective:** Periodically monitor population trends within Guadalupe National Park. Develop a method of estimating population density and trends. Verify taxonomy.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 - 5 m intervals. It may be necessary to try running the traps at night as well as during the day. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service

should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, TPWD

**Recommendations:** Work with the personnel from TPWD and the National Park system to monitor this species..

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thomomys bottae limpiaae      **Candidate Category:** C2  
**Common Name:** Limpia southern pocket gopher      **Listing Rank:**  
**G/S Rank:**      G5T2 S2

**Range:** Jeff Davis County. Found at 5000 feet and above in juniper and yellow-pine belts of the Davis Mountains, in the transition zone, and in at least the upper edge of the Sonoran desert region

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Endemic with a narrowly restricted range that is not under any form of special protection; of possible competition with the Yellow-faced pocket gopher (*Cratogeomys castanops*); changes in plant community conditions may have occurred that would be more favorable to the Yellow-faced pocket gopher.

1.  
**Monitoring Objective:** Identify largest populations for monitoring population trends periodically. Develop a method of estimating population density and trends.

**Priority:**      **MEDIUM PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Jeff Davis County

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 - 5 m intervals. It may be necessary to try running the traps at night as well as during the day. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of



significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with the personnel from the regional TPWD office.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thomomys bottae texensis **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Limpia Creek pocket gopher **G/S Rank:** G5T2 S2

**Range:** Jeff Davis County. Found at 5000 feet and above in juniper and yellow-pine belts of the Davis Mountains, in the transition zone, and in at least the upper edge of the Sonoran desert region

**Known Occurrences:** Known from 0 sites.

**Reasons for Concern:** Endemic with a narrowly restricted range that is not under any form of special protection; of possible competition with the yellow-faced pocket gopher (*Cratogeomys castanops*); grazing levels, may have caused changes in the environment leading to plant community conditions which may be more favorable to the yellow-faced pocket gopher.

**Monitoring Objective:** Identify largest populations for monitoring population trends periodically. Develop a method of estimating population density and trends. Verify taxonomy.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Jeff Davis County:

**Methodology:** Set up a grid trapping system with live traps. Traps will be placed in each grid at 3 - 5 m intervals. It may be necessary to try running the traps at night as well as during the day. Individuals will be trapped, identified, then promptly released at the site of capture. Data collected will be a population index of relative abundance consisting of the number of captures per 100 trap nights (a trap night is one trap set and left over night).

**Field Equipment Needed:** Live traps, buckets, gloves

**Estimated Time/Staff for Monitoring:** 3 - 5 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from

one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, Peggy Horner, TPWD;

**Recommendations:** Work with TPWD personnel from the region to monitor the gophers.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Vulpes velox **Candidate Category:** C2  
**Common Name:** swift fox **Listing Rank:**  
**G/S Rank:** G5 S4

**Range:** Western 1/3 of state, east to Menard County. Found in open deserts or grasslands; sparsely vegetated habitats.

**Known Occurrences:** Known from 45 sites.

**Reasons for Concern:** Population numbers have declined due to predator control efforts including trapping, poisoning and shooting aimed principally at other targets such as coyotes and wolves. Though their fur pelts are not highly prized, declines may also be due to adverse land use practices.

**Monitoring Objective:** Identify and map areas with existing populations and periodically estimate numbers.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sites to be selected

**Methodology:** Through spot-light census, estimate the population numbers.

**Field Equipment Needed:** Spot-lights

**Estimated Time/Staff for Monitoring:** 10 - 20 Days/2 Staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,  
Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank  
Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, Peggy Horner, Kevin Mote, TPWD

**Recommendations:** Work with the personnel from the Animal Damage Control to help gather information and data.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Vulpes velox macrotis **Candidate Category:** C2  
**Common Name:** kit fox **G/S Rank:** G5T5 S4  
**Listing Rank:**  
**Range:** Western 1/3 of state, east to Menard County. Found in open deserts or grasslands; sparsely vegetated habitats.  
**Known Occurrences:** Known from XX sites. 13  
**Reasons for Concern:** Population numbers have declined due to predator control efforts including trapping, poisoning and shooting aimed principally at other targets such as coyotes and wolves. Though their fur pelts are not highly prized, declines may also be due to adverse land use practices.  
**Monitoring Objective:** Identify and map areas with existing populations and periodically estimate numbers.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:**  
**Methodology:**  
**Field Equipment Needed:**  
**Estimated Time/Staff for Monitoring:**  
**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200

Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service,  
Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank  
Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Vulpes velox velox **Candidate Category:** C2  
**Common Name:** swift fox **Listing Rank:**  
**G/S Rank:** G5T5T4 S3?

**Range:** Western 1/3 of state, east to Menard County. Found in open deserts or grasslands; sparsely vegetated habitats.

**Known Occurrences:** Known from XX sites.

**Reasons for Concern:** Population numbers have declined due to predator control efforts including trapping, poisoning and shooting aimed principally at other targets such as coyotes and wolves. Though their fur pelts are not highly prized, declines may also be due to adverse land use practices.

**Monitoring Objective:** Identify and map areas with existing populations and periodically estimate numbers.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:**

**Methodology:**

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.



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Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank  
Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD;

**Recommendations:** Work with the personnel from TPWD.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Fall 1995

**Plan Approval Date:**

**Date of Implementation:**

**Appendix I:**

**MONITORING PLANS FOR EIGHTEEN SPECIES OF**

**MOLLUSKS**

**LIST OF CANDIDATE SPECIES WITH MONITORING PLANS**

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>MOLLUSKS</b>			
<i>Ashmunella pasonis</i> FRANKLIN MOUNTAIN WOOD SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Assiminea peccos</i> PECCOS ASSIMINEA SNAIL	G2 S1 C1		MEDIUM
<i>Cochliopa texana</i> PHANTOM CAVE SNAIL	G1 S1 C2	HIGH	HIGH
<i>Disconaias salinensis</i> SALINA MUCKET	G1 S1 C2	MEDIUM	HIGH
<i>Euchemotrema cheatumi</i> PALMETTO HILL SNAIL	G1 S1 C2		HIGH
<i>Fontelicella davisii</i> DAVIS SPRING SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Fontelicella metcalfi</i> METCALF SPRING SNAIL	G1 S1 C2	HIGH	HIGH
<i>Phreatodrobia imitata</i> MIMIC CAVE SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Polygyra hippocrepis</i> HORSESHOE LIPTOOTH	G1 S1 C2	MEDIUM	HIGH
<i>Popeanias popei</i> TEXAS HORNSHELL	G2 S2 C2		HIGH
<i>Potamilus amphichaenus</i> TEXAS HEELSPLIFTER	G1 S1 C2	HIGH	HIGH
<i>Quincuncina mitchelli</i> FALSE SPIKE MUSSEL	G2 S2 C2	MEDIUM	HIGH
<i>Sonorella metcalfi</i> FRANKLIN MOUNTAIN TALUS SNAIL	G1 S1 C2	MEDIUM	HIGH
<i>Truncilla cognata</i> MEXICAN FAWNSPOOT MUSSEL	G1 S1 C2	MEDIUM	HIGH
<i>Tryonia adamantina</i> DIAMOND Y SPRING SNAIL	G1 S1 C1	2	HIGH
<i>Tryonia brunei</i> BRUNE SPRING SNAIL	G1 S1 C2	HIGH	HIGH
<i>Tryonia cheatumi</i> PHANTOM LAKE TRYONIA	G1 S1 C2	HIGH	HIGH
<i>Tryonia stocktonensis</i> GONZALES SPRING SNAIL	G1 S1 C1	2	HIGH

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Assiminea pecos **Candidate Category:** C1  
**Listing Rank:**  
**Common Name:** Pecos assiminea snail **G/S Rank:** G2S1

**Range:** Pecos County, Texas, Diamond Y Spring, and Chaves County, New Mexico, also Coahuila, Mexico. It is found at the damp margins of the Diamond Y Draw for about 1 mile downstream from the Diamond Y Spring. This species is most consistently found on moist earth or under organic debris beside seepage or spring brooks beneath salt grass or sedges. They are never found beside standing water and only occasionally on exposed surfaces.

**Known Occurrences:** This semi-aquatic snail is known only from, Diamond Y Spring, Pecos County Texas; Chaves County, New Mexico; and Coahuila, Mexico. It is found at the damp margins of the Diamond Y Draw for about 1 mile downstream from the Diamond Y Spring.

**Reasons for Concern:** Restricted habitat, small population sizes and, reduced spring-flow. Habitats in the Leon Creek drainage are in an operational oil and gas field. Toxic run-off resulting from these operations represents a potentially serious threat to this species. Over pumping of groundwater resources resulting in diminished spring-flows are a significant threat to this species.

**Monitoring Objective:** Existing populations should be monitored at least every 2 years to see if populations are declining, or should be monitored immediately following any significant environmental disturbances such as petroleum spills in Diamond Y Spring.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, anytime of the year

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Pecos County: Diamond Y Spring

**Methodology:** At-large collecting, may be able to do relative abundance and/or presence/absence. Ideally, re-sample Richard Fullington's sample reaches. Note dampness and flow. If there is a petro spill, monitor

immediately.

**Field Equipment Needed:** Rubber boots, sampling vials, labels, forceps, alcohol, hand-held sieve

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from the Nature Conservancy to monitor this species and the two Tryonia species (*T. adamantina* and *T. stocktonensis*)

**Potential use of Volunteers:** Possibly utilize volunteers from TNC to assist in monitoring this species (It will not be possible to utilize them in monitoring the Tryonias, they are too minute).

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Disconaias salinasensis      **Candidate Category:** C2  
**Common Name:** Salina mucket mussel      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Val Verde County, Texas, in the Del Rio area. This freshwater mussel is known from the Río Grande system and southward into adjacent Mexico.

**Known Occurrences:** Living specimens were collected from the Río Grande near Del Rio in 1972. However, specific habitat characteristics are unknown.

**Reasons for Concern:** Water quality degradation and other anthropogenic disturbances to the Río Grande and its tributaries are undoubtedly having a negative impact on this species.

**Monitoring Objective:** Monitor for species abundance once a status survey has been completed.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Val Verde County: Del Rio area

**Methodology:** Use of divers sampling the mud banks using Hookah tubes. Heart of the Hills "Mussel team" already monitoring this species.

**Field Equipment Needed:** Diving equipment, hookah tubes, sampling bags

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in any population from one year to the next may be considered significant dependent on the species. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Bob Howells, Heart of the Hills Research Station

**Recommendations:** Work with the staff from Heart of the Hills to continue this monitoring.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Euchemotrema cheatumi      **Candidate Category:** C2  
**Common Name:** Palmetto pill snail      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Gonzales County, Texas, Palmetto State Park.

**Known Occurrences:** This snail is known only from the palmetto forest near the old CCC water tower at Palmetto State Park, Gonzales County, Texas. This is a terrestrial species that prefers damp areas among palmetto fronds.

**Reasons for Concern:** This species has a limited range and small population size making it vulnerable to extirpation from anthropogenic disturbances.

**Monitoring Objective:** Monitor for the presence and absence of this species.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Bi- to Triennially, to minimize impact to this species

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Gonzales County: Palmetto State Park

**Methodology:** A combination of at-large collecting and possibly establish line transects with 20 meter-square sample plots randomly distributed along the line transect, may not need to collect, merely note presence/absence. Monitor for any exotics that may be introduced.

**Field Equipment Needed:** Tape measures, rebar, flagging, square meter pvc

**Estimated Time/Staff for Monitoring:** 1 Day; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one sampling period to the next may be considered significant dependent on the species. In the event



of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from the State Park to assist monitoring this species.

**Potential use of  
Volunteers:** A good project for State Park volunteers to assist in monitoring this species, very easy to identify after minimal training.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Fontelicella davisii                      **Candidate Category:** C2  
**Listing Rank:**

**Common Name:** Davis County springsnail                      **G/S Rank:** G1S1

**Range:** This species is associated with perennial springs and spring-runs stemming from the Trinity Aquifer. It seems to prefer a pool-falls sequence tumbling among boulders with a soft mud over gravel bottom. This species is found among vegetation, often associated with Pisidium casertanum.

**Known Occurrences:** This hydrobioid snail is known only from tributary of Limpia Creek, and a spring near Spring Mountain, Jeff Davis County, Texas. It is located on private property, access is needed.

**Reasons for Concern:** Reductions in quantity and quality of habitat due to depleted groundwater resources and the restricted range of this species make it vulnerable to extirpation.

**Monitoring Objective:** Monitor for presence and absence of this species. Access is needed.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Jeff Davis County: Limpia Creek

**Methodology:** On private property, access will be difficult to obtain. Note presence/absence. Monitor habitat integrity.

**Field Equipment Needed:** Rubber boots

**Estimated Time/Staff for Monitoring:** 2- 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level,

more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD to monitor this species

**Potential use of  
Volunteers:** Possibly enlist the landowner to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Fontelicella metcalfi                      **Candidate Category:** C2  
**Common Name:** Presidio County spring snail              **Listing Rank:**  
**Range:** This species inhabits the outflow of Naegele Spring in fine mud among dense beds of watercress. It often is associated with Pisidium casertanum and Physella mexicana.  
**Known Occurrences:** This snail is known only from Naegele Springs, 5.3 miles north northwest of Ruidosa, Presidio County, Texas.  
**Reasons for Concern:** This species has a highly restricted distribution making it particularly vulnerable to extirpation.  
**Monitoring Objective:** Monitor for presence and absence of this species. Monitor overall water quality.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Presidio County: Naegele Springs

**Methodology:** Monitor water and habitat quality, watch for exotics. Note presence/absence

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered

significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD to monitor this species.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Phreatodrobia imitata                      **Candidate Category:** C2  
**Common Name:** Mimic cavesnail                              **Listing Rank:**  
**Range:** Bexar County. This snail is restricted to subterranean and                      **G/S Rank:** G1S1  
immediate surface waters of the Edwards Aquifer. Specific habitat  
requirements are unknown.  
**Known Occurrences:** This species is known only from Verstraeten Well and O. R.  
Mitchell Well stemming from the Edwards Aquifer in the Van Army  
Section of Bexar County, Texas.  
**Reasons for Concern:** The primary threats to this species are the de-watering of the  
Edwards Aquifer and possible contamination of groundwater from  
non-point sources.  
**Monitoring Objective:** Monitor well discharge, note presence and absence during different  
flow regimes.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Bexar County: Edwards Aquifer

**Methodology:** Monitor well discharge, note presence/absence during different flow  
regimes. Sample for species at other springs.

**Field Equipment Needed:** Ultra-fine drift nets, vials, labels, alcohol, forceps

**Estimated Time/Staff for Monitoring:** 1 - 2 Days; 1 - 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level,  
more extensive monitoring should occur. After baseline

information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from Bexar County to monitor this species. This species is very tiny, will need an ultra fine drift net to sample.

**Potential use of  
Volunteers:** Volunteers are not likely able to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Polygyra hippocrepis                      **Candidate Category:** C2  
**Common Name:** Horseshoe lipetooth                      **Listing Rank:**  
**Range:** Comal County, in the vicinity of New Braunfels, Comal County, Texas. The specific habitat requirements of this terrestrial snail are unknown. However, some specimens have been collected under rotting logs and bark.                      **G/S Rank:** G1S1

**Known Occurrences:** This snail is known only from two habitats in the vicinity of New Braunfels, Comal County, Texas. One location is at Landa Park near the springs and the other is approximately 5 mi north of this location.

**Reasons for Concern:** This species has a highly restricted distribution and it is considered to be extremely rare.

**Monitoring Objective:** Monitor for relative abundance along transect lines within an established sampling plot.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually/fall, after rains

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Comal County: New Braunfels

**Methodology:** Possibly set-up a permanent line transect, from that randomly select line intersects and sample for relative abundance along those lines.

**Field Equipment Needed:** Measuring tape, compass, random numbers table, metal tags, pin flags

**Estimated Time/Staff for Monitoring:** 1 Day; 1 - 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.



**Red Flag Conditions:**

After baseline information gathered, a 20% decrease in either of the two populations from one sampling period to the next may be considered significant dependent on the species. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD; Jane Deisler-Seno, Corpus Christi Museum of Science & History

**Recommendations:** Work with the staff from the City of New Braunfels to monitor this species.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Popenaias popei **Candidate Category:** C2  
**Listing Rank:**  
**Common Name:** Texas hornshell mussel **G/S Rank:** G2S2

**Range:** Eddy County, New Mexico, Val Verde County, Texas, and Mexico. The Rio Grande and its tributaries are the general habitat for this species, but specific habitat requirements are unknown.

**Known Occurrences:** This species occurs no further north than the Rio Grande drainage. It appears to be rare and restricted to the upper portions of the Rio Grande drainage in Texas and Mexico from the Pecos River to Falcon Breaks. Populations in the New Mexico portion of the Rio Grande may be extinct. In the late 1980s, fresh looking shells were found in the Black River, Eddy County, New Mexico. This species is quite rare in the lower Rio Grande. Modern records of living specimens of this species in the Rio Grande are restricted to reaches below Falcon Dam. Specimens collected from near the Brownsville area are in collections of the Corpus Christi Museum.

**Reasons for Concern:** Water quality degradation and other anthropogenic disturbances to the Rio Grande and its tributaries are undoubtedly having a negative impact on this species. A population at Fort Clark Springs, Las Moras Creek, near Brackettville, Kinney County, has disappeared due to the removal of aquatic vegetation. The native bivalve fauna of the lower portion of the Rio Grande have generally been affected by river impoundment, agricultural redistribution of water and water pollution. Use of propiconazole, a fungicide may have serious impacts on this species.

**Monitoring Objective:** Monitor for presence and absence of this species. Monitor overall water quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually,

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Val Verde County: along the Rio Grande

**Methodology:** Follow the methodology of the mussel team

**Field Equipment Needed:** Scuba gear, collecting equipment

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Jane Deisler-Seno, Corpus Christi Museum

**Recommendations:**

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Potamilus amphichaenus      **Candidate Category:** C2  
**Common Name:** Texas heelsplitter mussel      **Listing Rank:**  
**G/S Rank:** G1S1

**Range:** Sabine River Drainage. Large rivers of the Gulf Coastal Plain of Texas and Louisiana are the only known habitats for this species, but specific habitat requirements are unknown.

**Known Occurrences:** The Texas heelsplitter appears to occur in Texas only in the Sabine River drainage, although there are unverified reports of this taxon in the Brazos River. It also has been collected from western Louisiana. Only two living specimens of this species have been found in the past 15 years.

**Reasons for Concern:** General degradation of water quality in known habitats likely is having a negative effect on this species.

**Monitoring Objective:** Determine the presence/absence of this species along sample areas. Monitor water quality and surrounding habitat quality.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Sabine River Drainage

**Methodology:** Monitor for presence/absence, water quality and surrounding habitat quality. The taxonomy needs to be verified.

**Field Equipment Needed:** Diving equipment,

**Estimated Time/Staff for Monitoring:** 1-2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted

presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Quincuncina mitchelli      **Candidate Category:** C2  
**Common Name:** False spike mussel      **Listing Rank:**  
**G/S Rank:** G2S2

**Range:** Historic records for this species include several river systems in Central Texas. However, the specific distribution is unknown.

**Known Occurrences:** Streams in central Texas are the preferred habitat, but specific habitat requirements are unknown.

**Reasons for Concern:** De-watering of regional aquifers threaten stream flows, and other anthropogenic disturbances place this species at risk of being extirpated.

**Monitoring Objective:** Visit historic locations and search for the species, once found monitor for presence and absence. There are some taxonomic uncertainties associated with this species, including its relationship to several other taxa, that must be resolved.

**Priority:** HIGH PRIORITY - Need to relocate

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Central Texas Rivers

**Methodology:** Search for this species at historic locations, it may be extinct already. If found, note presence and absence.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be

considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bowles, TPWD

**Recommendations:** Work with the staff from TPWD to look for this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Truncilla cognata                      **Candidate Category:** C2  
**Common Name:** Mexican fawnsfoot mussel                      **Listing Rank:**  
**Range:**                      **G/S Rank:** G1S1

**Range:**                      The Mexican fawnsfoot mussel belongs to the Rio Grande biogeographical subprovince and occurs no further north than the Rio Grande drainage. The species also occurs in Mexico.

**Known Occurrences:**                      Streams are the preferred habitat, but specific habitat requirements are unknown.

**Reasons for Concern:**                      This endemic fresh water bivalve appears to be very rare and has a restricted distribution. Numerous anthropogenic disturbances to its habitats place it at risk of being extirpated.

**Monitoring Objective:**                      Monitor for population stability according to the protocols of the Mussel Team.

**Priority:**                      **HIGH PRIORITY**

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**PLAN**

**Monitoring Frequency/Season:**    Annually

**Monitoring Responsibility:**        TPWD

**Monitoring Plan:**

**Site Description:**    Streams in the Rio Grande Drainage

**Methodology:**        The mussel team is currently monitoring this species. Monitor according to the methodology of the Mussel Team.

**Field Equipment Needed:**    Scuba equipment

**Estimated Time/Staff for Monitoring:**    2 Days; 2 staff

**Reporting Procedure:**        Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**        After baseline information gathered, a 20% decrease in any of the populations from one sampling period to the next may be considered significant dependent on the species. In the



event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; Bob Howells, Heart of the Hills

**Recommendations:** Work with the staff from TPWD to monitor this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Tryonia adamantina                      **Candidate Category:** C1  
**Common Name:** Diamond Y Spring snail                      **Listing Rank:**  
**Range:** Pecos County, Texas. This species prefers localized seepage with no surface-water connection to the main stream. The characteristic habitat is muddy areas among sedges and cattails in more rapidly moving segments of the creek.                      **G/S Rank:** G1S1

**Known Occurrences:** This snail is found only known from the head of Diamond Y Spring downstream for about 1 mile, in Diamond Y Draw, in the lowest course of the Leon Creek tributary., Pecos County, Texas.

**Reasons for Concern:** The primary threats to this species are its restricted habitat, and small population size. The Leon Creek drainage is in an operational oil and gas field. Toxic run-off resulting from these operations represents a potentially serious threat to the biota of Diamond Y Spring. Dam building, stream alteration and the stocking of exotic fishes also may have detrimental effects.

**Monitoring Objective:** Existing populations should be monitored at least every 2 years to see if populations are declining, or should be monitored immediately following any significant environmental disturbances such as petroleum spills in Diamond Y Spring. Monitor for any changes in habitat quality.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially,

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Pecos County: Diamond Y Spring

**Methodology:** Monitor spring flow, ensuring no catastrophes, take core samples every two years.

**Field Equipment Needed:** Core sampler

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; A status survey was completed for this species in 1991; Richard Thorington.

**Recommendations:** Work with the staff from the Nature Conservancy to monitor water quality and this species.

**Potential use of Volunteers:** Not possible to utilize volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Tryonia stocktonensis      **Candidate Category:** C1  
**Listing Rank:**

**Common Name:** Gonzales Spring snail      **G/S Rank:** G1S1

**Range:** Pecos County. This species is most abundant in the soft mud along the spring's margin. Only one other species of snail, Physella mexicana, was found to be in association with the Gonzales Spring snail.

**Known Occurrences:** This snail is restricted to a single spring whose outflow is about 90 feet long, approximately 2 miles downstream from where Tryonia adamantina is found in the Diamond Y Spring drainage.

**Reasons for Concern:** The primary threats to this species are its restricted habitat, and small population size. Also, the Leon Creek drainage is in an operational oil and gas field. Toxic run-off resulting from these activities represent a potentially serious threat to the biota of Diamond Y Spring. Dam building, stream alteration and the stocking of exotic fishes also may have detrimental effects. Essentially the same concerns as those for the Diamond Y Spring snail.

**Monitoring Objective:** Existing populations should be monitored at least every 2 years to see if populations are declining, or should be monitored immediately following any significant environmental disturbances such as petroleum spills in Diamond Y Spring.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially,

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Pecos County: Diamond Y Spring

**Methodology:** Monitor water flow, note presence/absence of this species

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If the aquifer and/or spring-flow falls to a designated level, more extensive monitoring should occur. After baseline information gathered, a decrease in the noted presence from one sampling period to the next may be considered significant. A closer look at the habitat quality should be addressed. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** David Bowles, TPWD; A status survey was completed in 1991

**Recommendations:** Work with the staff from TNC to assist in monitoring this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and TNC to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**Appendix J:**

**MONITORING PLANS FOR ONE HUNDRED  
AND SIX SPECIES OF**

**PLANTS**

**\*LIST OF CANDIDATE SPECIES WITH MONITORING PLANS**

**\* X = Plans have been completed**

PLANS DONE	SCIENTIFIC NAME	STATUS	USFWS LIST PRI	PRIORITY	COUNTY OF OCCURRENCE
X	<b>FLAVIS</b> <i>Acleisanthes crassifolia</i> TEXAS TRUMPETS	G2S2 C2	8	MEDIUM	Kinney, Maverick, Val Verde; Coahuila, Mex
	<i>Agalinis auriculata</i> AURICULATE FALSE FOXGLOVE	G2SX C2	2	Other Region	Tarrant (X-presumed extirpated); AL, AR, IA, IL, IN, KS, MD, MI, MN, MO, MS, NE, OH, OK, PA, SC, TN, VA, WI, WV
X	<i>Agave glomeruliflora</i> CHISOS AGAVE	G2Q S2 C2	11	LOW	Brewster, Culberson, Hudspeth; Coahuila, Mex
	<i>Agrimonia incisa</i> INCISED GROOVEBUR	G3S1 C2	na	LOW	Angelina, Jasper; Sabine; AL, FL, GA, MS, NC, SC
X	<i>Amsonia tharpii</i> THARP'S BLUE-STAR	G1S1 C2	11	HIGH	Pecos, NM
	<i>Andrachne arida</i> TRANS-PECOS MAIDENBUSH	G1S1 C2	11	LOW Need to relocate	Presidio, Brewster; Chihuahua and Coahuila, Mexico
X	<i>Anemone edwardsiana</i> var. <i>petraea</i> EDGE FALLS ANEMONE	G3T1 S1 C2	12	MEDIUM	Bandera, Kendall
X	<i>Aquilegia chrysantha</i> var. <i>hinckleyana</i> HINCKLEY'S COLUMBINE	G4T1S1 C2	6	HIGH	Presidio
X	<i>Aquilegia longissima</i> LONG SPUR COLUMBINE	G3S2 C2	11	LOW	Brewster, Jeff, Davis, Presidio, Chihuahua, Coahuila, Nuevo Leon, Mexico
X	<i>Arenaria livermorensis</i> LIVERMORE SANDWORT	G1S1 C2	5	MEDIUM	Jeff Davis
X	<i>Argythamnia aporoides</i> HILL COUNTRY WILD MERCURY	G2S2 C2	11	MEDIUM	Blanco, Comal, Gillespie, Hays (H), Kendall (H), Kerr, Menard, Mills (H), Tom Green, Uvalde
X	<i>Aclepias prostrata</i> PROSTRATE MILKWEED	G1S1 C2	8	LOW	Starr, Zapata; Tamaulipas Mexico
	<i>Aster laevis</i> var. <i>guadalupeensis</i> GUADALUPE MOUNTAINS ASTER	G5T2Q51 C2	9	LOW	Culberson City; NM
X	<i>Aster paniculatus</i> ssp. <i>elliottii</i> var. <i>scaberrimus</i> ROUGH-STEM ASTER	G5T1S1 C1	3	MEDIUM	Anderson, Cherokee, Smith, Van Zandt, Wood
X	<i>Astragalus mollissimus</i> var. <i>marcius</i> WITHERED WOOLLY LOCO	G5T2S2 C2	12	LOW Need to relocate	Dallam, Jeff Davis (H), Presidio
X	<i>Batesimalva violacea</i> PURPLE GAY-MALLOW	G2 S1 C2	8	MEDIUM	Brewster, Coahuila and Nuevo Leon, Mexico
X	<i>Boerhaavia mathisiana</i> MATHIS SPIDERLING	G2 S1 C2	5	HIGH	Live Oak, San Patricio; San Luis Potosi and Tamaulipas, Mexico
X	<i>Bonania ovalifolia</i> BIGPOD BONAMIA	G1S1 C2	8	HIGH	Brewster County; Coahuila, Mexico
X	<i>Brickellia brachyphylla</i> var. <i>hinckleyi</i> HINCKLEY'S BRICKELLBUSH	G5T2 S2 C2	11	LOW	Brewster (H) and Jeff Davis
X	<i>Brickellia brachyphylla</i> var. <i>terlinguensis</i> TERLINGUA BRICKELLBUSH	G5TH SH C2	11	LOW Need to relocate	Brewster (H) Hudspeth (H)
X	<i>Brickellia viejaensis</i> SIERRA VIEJA BRICKELLBUSH	G1G2 S1S2 C2	11	LOW	Presidio
X	<i>Brongniartia minutifolia</i> LITTLE-LEAF BRONGNIARTIA	G2 S1 C2	11	MEDIUM	Brewster County; Chihuahua, Mexico

X	<i>Caesalpinia brachycarpa</i> BROADPOD RUSHPEA	G2 S2 C2	8	MEDIUM	Crockett (H), Edwards (H), Kinney, Llano (H), Sutton
	<i>Carex hystrix</i> TISSUE SEDGE	GSQ S4 C2	8	LOW taxonomy ?s	Bowie, Brazoria, Cass, Dallas (H), Denton, Houston, Lamar, Liberty, Madison, Morris, Polk, Red River, and Walker, AR, MS and OK
X	<i>Castilleja ciliata</i> FRINGED PAINTBRUSH	G1Q S1 C2	11	MEDIUM	Jeff Davis
X	<i>Castilleja elongata</i> TALL PAINTBRUSH	G1Q S1 C2	5	HIGH	Brewster
	<i>Cereus greggii</i> var <i>greggii</i> DESERT NIGHT-BLOOMING CEREUS	G3T2S2 C2	9	Need to relocate	Brewster, El Paso, Hudspeth (H), Jeff Davis, Pecos (H), Presidio, Terrell (H); AZ, NM; Chihuahua, Coahuila, Durango, Zacatecas, Mexico
X	<i>Chaetopappa hernheyi</i> MAT LEASTDAISY	G2 S2 C2	11	LOW	Culberson, Hudspeth; NM
X	<i>Chamaesyce chaetocalyx</i> var <i>triligulata</i> THREE-TONGUE SPURGE	G5T1 S1 C2	11	MEDIUM	Brewster, Randall (?); Coahuila Mexico
X	<i>Chamaesyce golondrina</i> SWALLOW SPURGE	G2 S2 C2	11	LOW Need to relocate	Brewster, Hudspeth, Presidio Counties; Chihuahua and Coahuila, Mexico
	<i>Chenopodium cycloides</i> SANDHILL GOOSEFOOT	G4 S3 C2		LOW	Andrews, Crane, Culberson, El Paso, Jeff Davis, Jones, Kent, Loving, Ward, Winkler, CO, KS, and NM
X	<i>Chloris texensis</i> TEXAS WINDMILL-GRASS	G2 S2 C2	8	HIGH	Brazoria, Brazos (H) Chambers, Galveston, Harris, Hidalgo (?), Nueces, and Refugio
X	<i>Chrysothamnus nauseosus</i> esp <i>texensis</i> QUADALUPE MOUNTAINS RABBITBRUSH	G5T2 S1 C2	12	MEDIUM	Culberson County; NM
	<i>Cleome multicaulis</i> MANYSTEM SPIDERFLOWER	G3 S1 C2	na	Need to relocate	Presidio County; AZ, CO, NM, WY; Chihuahua, Durango, Jalisco, Michoacan, Mexico
X	<i>Colubrina stricta</i> COMAL SNAKEWOOD	G2 S1 C2	11	HIGH	Comal (?), El Paso, Uvalde; Coahuila and Nuevo Leon Mexico
X	<i>Condalia hookeri</i> var <i>edwardsiana</i> EDWARDS PLATEAU CAPUL NEGRO	G5T1Q C2	12	LOW Need to relocate	Edwards
X	<i>Corcopsis intermedia</i> GOLDEN WAVE TICKSEED	G3S3 C2	na	LOW Need to relocate	Anderson, Cass, Cherokee, Franklin, Freestone, Harris, Harrison, Henderson, Houston, Leon, Nacogdoches (?), Trinity, Upshur, Wood (H); LA
X	<i>Coryphantha albicolumnaris</i> WHITE COLUMN	G2 S2 C2	2	LOW	Brewster, Pecos, Presidio; Chihuahua, Mexico
X	<i>Coryphantha chaffeyi</i> CHAPPEY'S CORY CACTUS	G2 S1 C2	11	MEDIUM	Brewster; Coahuila, San Luis Potosi, Zacatecas Mexico
X	<i>Coryphantha dasycantha</i> var <i>dasycantha</i> DENSE CORY CACTUS	G3T3 S2 C2	12	MEDIUM	Brewster, El Paso, Hudspeth, Jeff Davis, Pecos; NM(?); Chihuahua, Mexico
X	<i>Coryphantha duncanii</i> DUNCAN'S CORY CACTUS	G3 S1 C2	11	MEDIUM	Brewster, Presidio; NM
X	<i>Coryphantha hesteri</i> HESTER'S CORY CACTUS	G2 S2 C2	8	MEDIUM	Brewster, Pecos, Terrell
	<i>Coryphantha sulcata</i> var <i>nickelsiae</i> NICKEL'S CORY CACTUS	G4T2 SH C2	12	Need to relocate	Webb (H); Coahuila, Nuevo Leon, Tamaulipas, Mexico



X	<i>Crataegus wagneri</i> WARNER'S HAWTHORN	G2Q S2 C2	11	MEDIUM Need to relocate	Anderson, Cherokee, Freestone, Franklin, Houston, Morris, Panola, Smith (H), Upshur, Walker, Wood
X	<i>Croton alabamensis</i> var. <i>texensis</i> TEXAS CROTON	G3T1S1 C2	8	MEDIUM	Bell, Coryell, Travis
	<i>Oscuta attenuata</i> MARSHLEDER DODDER	G2 S2 C2	5	LOW	Cameron (H) Jackson (H) Liberty (H) Rains and Van Zandt; KS, OK
	<i>Cyperus cephalanthus</i> GIANT SHARPSTEM UMBRELLA SEDGE	G2Q SH X2	na	Need to relocate	Texas (H; county unknown); LA
X	<i>Cyperus grayioides</i> MOHLENBROCK'S UMBRELLA SEDGE	G3G4 S3 C2	na	LOW	Anderson, Angelina, Burleson, Colorado, Franklin, Freestone, Hardin, Henderson, Houston, Leon, Nacogdoches, Newton, Robertson, Rusk, San Augustine, Shelby, Smith, Tyler, Upshur, Van Zandt, Wood; AR, IL, LA, MO
X	<i>Cyperus oerousus</i> DUNE UMBRELLA SEDGE	G2 S2 C2	5	HIGH	Andrews, Ward, Winkler
X	<i>Cypripedium kentuckiense</i> SOUTHERN LADY'S-SLIPPER	G3 S1 C2	na	HIGH	Cass (?) Harrison, Nacogdoches, Newton (X), Sabine, and San Augustine; AL, AR, KY, LA, MS, OK, TN
X	<i>Dalea bartonii</i> COX'S DALEA	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Dalea reverchonii</i> COMANCHE PEAK PRAIRIE-CLOVER	G2 S2 C2	11	MEDIUM	Hood (X), Parker, Wise
X	<i>Dalea sabinalis</i> SABINAL PRAIRIE-CLOVER	G1 S1 C2	8	LOW Need to relocate	Bandera (H), Uvalde (H), and Val Verde
	<i>Desmodium lindheimeri</i> LINDHEIMER'S TICKSEED	G4 S1 C2	11	Need to relocate	Comal (?); Coahuila, Nuevo Leon, San Luis Potosi, Tamaulipas Mexico
X	<i>Draba standleyi</i> STANDLEY'S DRABA	G3 S1 C2	7	MEDIUM - LOW	Jeff Davis; AZ, NM; Coahuila, Mexico
X	<i>Behcandia</i> (Anthericum) <i>chandleri</i> LILA DE LOS LLANOS	G3Se C2	8	MEDIUM - LOW	Cameron, Kleberg, Nueces; Coahuila, Mexico (?)
	<i>Echinocereus chloranthus</i> var. <i>neocapillus</i> GOLDEN-SPINE HEDGEHOG CACTUS	G4T1 S1 C2	9	No Access	Brewster, Presidio
X	<i>Echinocereus papillosus</i> var. <i>angusticeps</i> SMALL PAPILLOSUS	G3T1 C2	3	HIGH Need to relocate	Hidalgo (H), Jim Hogg (?), Starr
	<i>Eleocharis brachycarpa</i> SHORT-FRUITED SPIKESEDGE	G1 SH C2		Need to relocate	South coastal Texas (H); (county unknown); Tamaulipas, Mexico
X	<i>Eleocharis cylindrica</i> CYLINDER SPIKESEDGE	G1 S1 C2	2	LOW Need to relocate	Lubbock (H), Presidio
	<i>Eleocharis wolffii</i> WOLF'S SPIKESEDGE	G4G5 S1 C2		LOW	Jefferson; AL, CO, LA, IL, IN, KS, LA, MN, MO, ND, NE, OH, OK, TN, WI; Alberta and Saskatchewan, Canada
X	<i>Erigeron mimogletes</i> SONORA FLEABANE	G2 S2 C2	8	MEDIUM	Brewster (H), Crockett (H) Edwards (H), Kerr, Real, Schleicher, Sutton, Uvalde, Val Verde (H); Coahuila, Mexico
X	<i>Eriocaulon koernickianum</i> SMALL-HEADED PIPEWORT	G2G3 S1 C2	11	MEDIUM - HIGH	Anderson, Brazos, Limestone, Leon (?), Tyler (H); AR, GA, OK

X	<i>Eriogonum suffruticosum</i> BUSHY WILD BUCKWHEAT	G2 S2 C2	11	LOW	Brewster, Pecos, Presidio
X	<i>Escobaria guadalupensis</i> GUADALUPE MOUNTAINS PINCUSHION CACTUS	G1 S1 C2	11	MEDIUM	Calhoun; NM
X	<i>Festuca ligulata</i> GUADALUPE FESCUE	G1 S1 C1	8	HIGH	Brewster, Culberson; Coahuila, Mexico
	<i>Rosselia texensis</i> TEXAS GREASE BUSH	G1 S1 C2	11	Need to relocate	Uvalde and Val Verde (H)
X	<i>Fryxellia pygmaea</i> SMALL FRYXELL WORT	G1 SH C2	10	Need to relocate	west Texas (H; county unknown); Coahuila, Mexico
X	<i>Gaillardia aestivalis</i> var <i>winkleri</i> WHITE FIREWHEEL	G5T1 S1 C2	12	MEDIUM Need to relocate	Hardin
X	<i>Galium corellii</i> CLIFF BEDSTRAW	G2 S1 C2	11	LOW	Brewster, Val Verde; Coahuila, Mexico
X	<i>Genistidium dumosum</i> BRUSH-PEA	G1 S1 C2	10	MEDIUM - HIGH	Brewster; Coahuila, Mexico
	<i>Hedeoma pinnatifidum</i> OLD BLUE PENNYROYAL	GH SH C2	11	Need to relocate	Brewster (H)
	<i>Hedyotis butlerwickiae</i> MARY'S BLUET	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Helianthus paradoxus</i> PUZZLE SUNFLOWER	G1S1 C1	2	HIGH	Pecos, Reeves; NM
X	<i>Helianthus praecox</i> ssp <i>hirtus</i> DIMMIT SUNFLOWER	G5T1Q51 C2		HIGH	Dimmit and Zapata (M)
X	<i>Hexalectris nitida</i> GLASS MOUNTAIN CORAL-ROOT	G3 S3 C2	11	LOW	Bandera, Brewster, Comal, Coryell, Dallas, Hays, Kendall, Pecos (H), Taylor, Travis; NM Coahuila, Mexico
X	<i>Hexalectris revoluta</i> CHISOS CORAL-ROOT	G1 S1 C2	11	LOW	Brewster, Culberson; Nuevo Leon, San Luis Potosi, Mexico
X	<i>Hexalectris warnockii</i> WARNOCK'S CORAL-ROOT	G2 S2 C2	7	LOW	Brewster, Dallas, Gillespie, Hays, Jeff Davis (H), Taylor, Terrell; AZ, NM
X	<i>Hibiscus dasycalyx</i> NECHES RIVER ROSE-MALLOW	G1 S1 C2	2	HIGH	Cherokee, Harrison, Houston, Trinity
X	<i>Isoetes lithophila</i> ROCK QUILLWORT	G2 S2 C2	8	MEDIUM	Burnet, Llano, Mason
X	<i>Justicia runyonii</i> RUNYON'S WATER-WILLOW	G2S2 C2	8	LOW	Brazoria (?), Cameron, Goliad (?), Hidalgo; Tamaulipas, Mexico
X	<i>Justicia wrightii</i> WRIGHT'S WATER-WILLOW	G2 S2 C2	8	Need to relocate	Brewster (H) Pecos, Val Verde; NM (?)
X	<i>Kalstroemia perennans</i> PERENNIAL CALTROP	G1 S1 C2	11	MEDIUM	Brewster, Presidio, Val Verde
X	<i>Lachnocaulon dignum</i> TINY BOG BUTTONS	G3 S1 C2	na	MEDIUM	Jasper, Newton; AL, FL, LA, MS
X	<i>Leavenworthia texana</i> TEXAS GOLDEN GLADE CRESS	G1 S1 C2	2	HIGH	Nacogdoches (I), Sabine, San Augustine
	<i>Lechea menalis</i> CHISOS PINWEED	G1Q S1 C2	11	Need to relocate	Brewster; Coahuila, Mexico
	<i>Leitneria floridana</i> CORKWOOD	G3G4 S1 C2		LOW	Brazoria, Chambers, Fort Bend, Jefferson; AL, AR, FL, GA, LA, MO
X	<i>Lepidospartum burgettii</i> GYPSUM SCALEBROOM	G2 S1 C2	8	MEDIUM	Hudspeth; NM

X	<i>Lesquerella thamnopbila</i> ZAPATA BLADDERPOD	G1 S1 C2	2	HIGH	Starr, Zapata
X	<i>Listris tenuis</i> SLENDER GAY-FEATHER	G2G3 S2S3 C2	8	MEDIUM	Angelina, Hardin, Jasper, Newton, Orange, Sabine, San Augustine, Tyler, LA (?)
X	<i>Lycium texanum</i> TEXAS WOLF-BERRY	G2 S2 C2	11	LOW Need to relocate	Brewster, Culberson, Hudspeth
X	<i>Machaeranthera aurea</i> HOUSTON MACHAERANTHERA	G2 S2 C2	2	HIGH	Galveston, Harris
X	<i>Manfreda longiflora</i> ST. JOSEPH'S STAFF	G2 S2 C2	5	MEDIUM	Cameron (H), Hidalgo, Starr, Tamaulipas, Mexico
X	<i>Marsilea radiata</i> FALFURRIAS ANGLEPOD (MILKVINE)	G1S1 C2	11	LOW Need to relocate	Brooks (H), Hidalgo (H), Starr (?)
X	<i>Marsilea texensis</i> TEXAS MILKVINE	G1 S1 C2	8	HIGH	Brewster
X	<i>Mirabilis collina</i> SANDHILL FOUR-O'CLOCK	G2Q2 C2	11	3B	Anderson, Austin (?), Cherokee (H), Lamar(?), Morris(?), Red River (?), San Augustine(?), Smith, Waller (?), Wood
X	<i>Notula arenicola</i> SAND SACAHIUSTA	G2Q S2 C2	11	MEDIUM	Culberson, El Paso (?) and Hudspeth
	<i>Oenothera pilosella</i> ssp <i>sessilis</i> GRAND PRAIRIE EVENING PREMROSE	G5T2 SH C2	na	Need to relocate	Galveston (H); AR, LA
X	<i>Opuntia arcanaria</i> SAND PRICKLY-PEAR	G2 S2 C2	2	HIGH	El Paso, Hudspeth (H); NM; Chihuahua, Mexico
X	<i>Opuntia aurispina</i> GOLDEN-SPINE PRICKLY-PEAR	G1 S1 C2	11	MEDIUM	Brewster
X	<i>Opuntia engelmannii</i> var <i>flexispina</i> PEW-SPINE ENGELMANN'S PRICKLY-PEAR	G5T1 S1 C2	12	LOW Need to relocate	Starr, Webb (H), Zapata
X	<i>Opuntia imbricata</i> var <i>argentea</i> SILVER CHOLLA	G5T1 S1 C2	12	MEDIUM	Brewster
X	<i>Osmorhiza mexicana</i> ssp <i>bipatriata</i> LIVERMORE SWEET-CICELY	G4T1 S1 C2	12	Need to relocate	Jeff Davis; Coahuila, Nuevo Leon, Mexico
X	<i>Ostrya chisosensis</i> BIG BEND HOP-HORNBEAM	G2S1 C2	11	MEDIUM	Brewster; northern Mexico
X	<i>Oxypolis ternata</i> THREELEAF COWBANE	G3? S1 C2		MEDIUM	Hardin, Tyler (?); FL, GA, MS, NC, SC
X	<i>Paronychia congesta</i> BUSHY WHITLOW-WORT	G1 S1 C2	11	HIGH	Jim Hogg
	<i>Paronychia maccartii</i> MCCART'S WHITLOW-WORT	G1 S1 C2	11	LOW Need to relocate	Webb
X	<i>Paronychia wilkinsonii</i> WILKINSON'S WHITLOW- WORT	G2 S2 C2	11	MEDIUM	Brewster; Chihuahua, Coahuila, Mexico
	<i>Pediocactus papposanthus</i> PAPER-SPINED CACTUS	G2G3S1 C2	8	Need to relocate	Hudspeth; AZ, NM
X	<i>Pediomelum humile</i> RYDBERG'S SCURFPEA	G2 S1 C2	11	HIGH	Val Verde; Coahuila, Mexico
	<i>Pediomelum pentaphyllum</i> THREE-NERVE SCURFPEA	G1SH C2	5	Need to relocate	Presidio (H); NM (H); Chihuahua, Mexico
X	<i>Penstemon alamosensis</i> ALAMO BEARD TONGUE	G2 S1 C2	8	MEDIUM	El Paso; NM

X	<i>Perityle biacetosa</i> var <i>biacetosa</i> TWO-BRISTLE ROCK-DAISY	GZT1 S1 C2	12	Need to relocate	Brewster, Pecos
	<i>Perityle biacetosa</i> var <i>acalariis</i> STAIRSTEP TWO-BRISTLE ROCK-DAISY	GZT1 S1 C2	12	LOW	Brewster
X	<i>Perityle huacocensis</i> HUBCO ROCK-DAISY	G1S1 C2	5	HIGH	El Paso
X	<i>Perityle vitreomontana</i> GLASS MOUNTAINS ROCK-DAISY	G1 S1 C2	11	LOW	Brewster
	<i>Perityle warnockii</i> WARNOCK'S RIVER ROCK-DAISY	G1S1 C2	11	Need to relocate	Val Verde
	<i>Phacelia pallida</i> PALE PHACELIA	G2S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Mexico
X	<i>Philadelphus erestii</i> CANYON MOCK-ORANGE	G2S2 C2	8	MEDIUM	Blanco, Comal, Hays, Kendall, Travis
X	<i>Phyllanthus ericoides</i> HEATHER LEAF-FLOWER	G2 S1 C2	11	LOW	Brewster, Terrell; Coahuila, Mexico
	<i>Physostegia correllii</i> CORRELL'S FALSE DRAGON-HEAD	G2 S2 C2	11	LOW Need to relocate	Bexar (H) Galveston, Montgomery (H), Travis, Val Verde, Zapata; LA; Coahuila, Durango, Nuevo Leon, and Sonora, Mexico
X	<i>Physostegia longisepala</i> LONG-SEPALED FALSE DRAGON-HEAD	G2G3 S2 C2	na	LOW	Hardin, Jasper, Newton, Orange, Tyler; LA
	<i>Poa strictiflora</i> DESERT MOUNTAINS BLUE GRASS	G3 S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Durango, Nuevo Leon, Zacatecas, Mexico
X	<i>Polemonium pauciflorum</i> ssp <i>hinckleyi</i> HINCKLEY'S JACOB'S LADDER	G3 T1Q C2	12	HIGH	Jeff Davis; AZ; Chihuahua Mexico
	<i>Polygala marvillensis</i> MARAVILLAS MILKWORT	G2S1 C2	11	LOW	Brewster, Terrell; Coahuila, Mexico
X	<i>Prenanthes barbata</i> BARBED RATTLESNAKE-ROOT	G3S2 C2	na	LOW	Cass, Cherokee, Hardin, Jasper, Nacogdoches, Newton, Polk, Rusk, San Augustine, Shelby; AL, AR, GA, KY, LA, TN
X	<i>Proboscidea spicata</i> MANY-FLOWERED UNICORN-PLANT	G1 S1 C2	11	Need to relocate	Brewster, Jeff Davis, Presidio; Coahuila, Mexico
X	<i>Psilactis heterocarpa</i> WELDER MACHAERANTHERA	G2 S2 C2		MEDIUM - LOW	Nueces, Kleberg, Refugio, San Patricio, and Victoria
	<i>Quercus boyntonii</i> BOYNTON'S OAK	GHQ SH C2	11	Need to relocate	Angelina (H); AL (H)
X	<i>Quercus graciliformis</i> CHISOS OAK	G1 S1 C2	11	LOW	Brewster
	<i>Quercus tardifolia</i> LATELEAF OAK	G1 S1 C2	11	Need to relocate	Brewster
X	<i>Rudbeckia scabrifolia</i> BOG CONEFLOWER	G2S2 C2	2	MEDIUM - HIGH	Angelina, Jasper, Newton, Sabine, Shelby; LA
X	<i>Salvia pentstemonoides</i> BIG RED SAGE	G1G2 S1S2 C2	2	HIGH	Bandera, Bexar (H), Gillespie (H), Guadalupe (H), Kendall, Kerr, Real, Travis (J), Wilson (H)
	<i>Scirpus hallii</i> HALL'S BULRUSH	G2QS? C2	na	Need to relocate	Texas (county unknown); AL, GA, IA, IL, IN, KY, MA, MI, MO, NE, SC, WI

X	<i>Scutellaria laevis</i> SMOOTH STEM SKULLCAP	G1 S1 C2	11	Need to relocate	Culberson, Hudspeth
	<i>Scutellaria thieretii</i> THIERET'S SKULLCAP	G2Q S1 C2	na	BB	Nueces; LA
	<i>Sedum robertsonianum</i> ROBERTS' STONECROP	G1Q S1 C2	11	Need to relocate	Brewster
	<i>Senna ripleyana</i> RIPLEY'S SENNA	G2 SH C2	11	Need to relocate	Brewster; Chihuahua Zacatecas, Mexico
	<i>Senecium trianthemoides</i> ROUGHSEED SEA-PURSLANE	G1 S1 C2	11	Need to relocate	Kenedy
X	<i>Silene subciliata</i> SCARLET CATCHFLY	G3 S3 C2	5	LOW	Hardin, Jasper, Jefferson (H), Liberty, Newton, Polk, Sabine, Shelby, Tyler, LA
X	<i>Streptanthus bracteatus</i> BRACTED TWISTFLOWER	G2 S2 C2	2	HIGH	Bandera, Caldwell (?), Comal, Medina, Real, Travis, Uvalde
X	<i>Streptanthus cutleri</i> CUTLER'S TWISTFLOWER	G2 S2 C2	11	MEDIUM	Brewster; Coahuila, Mexico
X	<i>Streptanthus sparsiflorus</i> SPARSELY-FLOWERED JEWELFLOWER	G2 S2 C2	11	MEDIUM	Culberson; NM
	<i>Styrax youngiae</i> YOUNG'S SNOWBELLS	G1 SH C2	11	Need to relocate	Jeff Davis (H); Coahuila and Nuevo Leon, Mexico
	<i>Suaeda oaripes</i> HARDTIE SEEPWEED	GHQ SH C2	11	Need to relocate	Pease (H) and/or Reeves (H)
	<i>Symphoricarpos guadalupensis</i> MCKITTRICK SNOWBERRY	G1 S1 C2	12	Need to relocate	Culberson
X	<i>Talinum rugospermum</i> ROUGH-SEED FLAME FLOWER	G3G4 S1 C2	na	LOW	Anderson, Franklin, Houston, Limestone, Nacogdoches, Rusk, Smith, Upshur, and Wood; IA, IL, IN, KS, MN, NE, WI
X	<i>Thalictrum arkansanum</i> ARKANSAS MEADOW-RUE	G2Q S1 C2	11	HIGH	Bowie; Lamar, Red River; AR OK
X	<i>Thalictrum texanum</i> HOUSTON MEADOW-RUE	G2Q S2 C2	8	HIGH	Brazos, Harris (H), Waller
X	<i>Thelocactus bicolor</i> var <i>flavidispinus</i> STRAW SPINE GLORY OF TEXAS	G4T2 S2 C2	8	HIGH	Brewster Starr(?); Tamaulipas, Mexico
	<i>Thelypodium tenue</i> FRESNO CREEK THELYPODY	G1Q S1 C2	8	Need to relocate	Presidio
X	<i>Tillandsia baileyi</i> BAILEY'S BALLMOSS	G2 S2 C2	2	MEDIUM	Brooks (H), Cameron, Hidalgo, Jim Wells, Kenedy, Willacy; Tamaulipas, Mexico
X	<i>Trillium pusillum</i> var <i>texanum</i> TEXAS TRILLIUM	G3T2T3Q S2S3 C2	3	MEDIUM	Cass, Harrison, Houston (H), Nacogdoches, Panola (H), Rusk, Smith, and Wood (?); AR, LA
	<i>Valerianella texana</i> EDWARDS PLATEAU CORNSALAD	G2 S2 C2	8	LOW	Burnet, Gillespie, Llano
X	<i>Viola guadalupensis</i> GUADALUPE MOUNTAINS VIOLET	G1 S1 C2	5	MEDIUM	Culberson
X	<i>Xyris drummondii</i> DRUMMOND'S YELLOW-EYED GRASS	G3 S2 C2	na	LOW	Angelina, Jasper, Newton; AL, FL, GA, LA, MS
X	<i>Xyris scabrifolia</i> ROUGH-LEAF YELLOW-EYED GRASS	G2G3 S2 C2	na	LOW	Angelina, Jasper, Newton, Sabine; AL, FL, GA, LA, MS, NC

X	Zanthoxylum parvum SHINNERS' TICKLE-TONGUE	G1 S1 C2	11	HIGH	Brewster, Jeff Davis
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**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Acleisanthes crassifolia                      **Candidate Category:** C2  
**Common Name:** Texas trumpets                                      **Listing Rank:** 8  
**Range:** Kinney, Maverick, and Val Verde Counties; Coahuila, Mexico                      **G/S Rank:** G2 S2

**Known Occurrences:** Seven occurrences

**Reasons for Concern:** Few populations, grazing, and highway maintenance

**Monitoring Objective:** Obtain a population count of plants of Acleisanthes crassifolia completed triennially.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, summer - fall, Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Kinney County: two of four sites along Hwy 277; Maverick County: Las Moras Creek on Hwy 277; Val Verde County: Carruthers Creek, two sites

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them. If populations are large, take a subset, count the number of chasmogamous versus cleistogamous flowers/fruits. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

Jackie Poole, Status Report, 1989.

**Recommendations:**

Work with the staff from the Texas Department of Transportation to monitor the populations. The populations fluctuates from year to year, may need to consider other conditions such as rainfall that may be impacting this species. If possible, we may want to establish exclosures to determine the effects of grazing and highway management practices.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:**

Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Agave glomeruliflora **Candidate Category:** C2  
**Common Name:** Chisos agave **Listing Rank:** 11  
**Range:** Brewster, Culberson and Hudspeth Counties; Coahuila, Mexico  
**G/S Rank:** G2QS2

**Known Occurrences:** Twelve occurrences

**Reasons for Concern:** Few populations, low numbers, susceptible to grazing of young plants.

**Monitoring Objective:** Obtain a population estimate of plants of Agave glomeruliflora completed triennially, note pollinators, look for additional populations, four sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, May

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park; Glass Mtns; Sibley Ranch; Culberson County: Guadalupe Mtn. National Park

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count or estimate the plants present (depending on the population), if possible tag them. Upon field investigation, estimate the number of flowering stalks. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 - 7 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Tom and Betty Alex, Big Bend NP; Liz Ecker, Wendy Hodgson, Desert Botanical Garden.

**Recommendations:** Work with the staff from Big Bend and Guadalupe National Parks to monitor the populations.

**Potential use of  
Volunteers:** Possibly utilize volunteers from BIBE, Guadalupe and TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Amsonia tharpii **Candidate Category:** C2  
**Common Name:** Tharp's blue-star **Listing Rank:** 11  
**Range:** Pecos County; New Mexico **G/S Rank:** G1S1

**Known Occurrences:** Two occurrences

**Reasons for Concern:** Few populations; only one site in Texas, some highway right-of-way maintenance activities would impact this species; sometimes out-competed in disturbed situations. The vast majority of this population is located in Texas adjacent to UT land which they recently fenced.

**Monitoring Objective:** Obtain a population count of Amsonia tharpii completed annually including selected measures of vigor, one site.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - May; Perennial

**Monitoring Responsibility:** TPWD;TxDOT;University of Texas-Austin

**Monitoring Plan:**

**Site Description:** Pecos County: McCamey turnoff IH 10, 67/385

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take the following measurements of vigor: number of stems; and total number of inflorescences. Note any pollination, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, Gena Janssen, TPWD; Chester Rowell, Status Report, Dec 1983; Bill Dunmire, New Mexico.

**Recommendations:** Work with the staff from the Highway Department to monitor and properly manage the population. Possibly work with the University of Texas-Austin Society for Conservation Biology Student Chapter to look for and monitor the population that occurs on their property. This population is currently being monitored with HROW but will end in 1995.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers or members from the UT-Austin Conservation Biology Chapter to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Anemone edwardsiana var. petraea      **Candidate Category:** C2  
**Common Name:** Edge Falls anemone      **Listing Rank:** 12  
**Range:** Bandera and Kendall Counties      **G/S Rank:** G3T1S1

**Known Occurrences:** Two occurrences.

**Reasons for Concern:** Two populations known, susceptible to pressures from recreational use; flooding and water diversion at one site, overgrazing, trampling and/or brush encroachment at another.

**Monitoring Objective:** Obtain a population count of Anemone edwardsiana var. petraea to be completed triennially, including detailed measures for each plant (see Methodology), two sites.

**Priority:** MEDIUM PRIORITY - Need to determine if good variety

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**PLAN**

**Monitoring Frequency/Season:** Triennially, February - May Monitor Annually through a phone call to site manager, site visit every three years.

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** **Bandera County:** Gunsight Mountain Ranch; **Kendall County:** Edge Falls.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. A sub-sample of the populations should be counted, take the following measurements of that sub-sample: an estimate of the number fruits/flowers. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or any other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, Bill Carr, TPWD; Sara Hoot.

**Recommendations:** Work with the staff from the Nature Conservancy to monitor population and to enlist the landowner in monitoring efforts. Coordinate monitoring efforts of other candidate species that occur on Gunsight Mountain Ranch.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TNC or members from the Native Plant Society (at the Bandera site) to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Aquilegia chrysantha var. hinckleyana      **Candidate Category:** C2  
**Common Name:** Hinckley columbine      **Listing Rank:** 6  
**G/S Rank:** G4T1 S1

**Range:** Presidio County

**Known Occurrences:** Species is known from a single canyon, Capote Canyon, located on private land. Approximately 500 plants at this site.

**Reasons for Concern:** Threats include diversion or impoundment of the creek which provides water to a portion of the population, also lowering of the water table which might cause springs supplying the creek to dry up. Need to determine who owns the land.

**Monitoring Objective:** Obtain a total population census of all plants of Aquilegia chrysantha var. hinckleyana, including detailed measures of vigor for each plant (see Methodology), located at Capote Falls, Presidio County, completed triennially.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially in March-April during peak bloom; blooms March through November; Perennial. Need to check water conditions and level on an annual basis, probably via a phone call.

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Presidio County; Capote Falls Canyon, located in the cooler, wetter spots in the canyon along seeps, springs or near falls. Private land, need access.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. The plants occur on seeping, more or less vertical cliff faces up to 100 feet high. Tagging individuals will be difficult, most work will need to be done using binoculars. Count the plants, for those that can be reached or a subset of the population, and take the following measurements for that subset: evidence of fruit and flowers. Note any herbivory, insect damage, reproductive activity or recruitment, approximate seedling count or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, binoculars.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Emily Lott, M.S. thesis, 1979; J. Jeff Clark, A. Michael Powell, Status Report 1983.

**Recommendations:** This site is privately owned, apparently the owners are not receptive to any type of access or monitoring. Access will be a problem. When monitoring is established, a regular, annual dialog with the landowners should be established to ensure there are no threats to the population.

**Potential use of Volunteers:** Possibly utilize volunteers from the Nature Conservancy, landowners and any regional TPWD volunteers in the area. Considerations include the long hike into the canyon, and fragile areas around the falls.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Aquilegia longissima **Candidate Category:** C2  
**Listing Rank:** 11  
**Common Name:** long spur columbine **G/S Rank:** G3 S2

**Range:** Brewster, Jeff Davis and Presidio Counties; Chihuahua, Coahuila and Nuevo Leon, Mexico

**Known Occurrences:** Eleven occurrences, only a few recently verified.

**Reasons for Concern:** Few, isolated populations; ground water depletion; habitat alteration or destruction from heavy livestock use; water diversion.

**Monitoring Objective:** Obtain a population count of Aquilegia longissima completed triennially at selected sites, including detailed measures for each plant (see Methodology), three to five sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - November; Perennial

**Monitoring Responsibility:** TPWD/BIBE/TNC

**Monitoring Plan:**

**Site Description:** **Brewster County:** Big Bend NP, Upper Maple Canyon; Upper pine Canyon; Cattail Falls; **Jeff Davis County:** one site (need to relocate previous known sites); **Presidio County:** relocate this site.

**Methodology:** Permanently delineate and describe the population areas. Ideally, a map of the population should be completed as baseline information. Count the plants (upon site visit, total count may not be possible, modify as necessary). Take the following measurements: number fruiting/flowering stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4+ Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; Emily Lott; Brook Milligan, NMSU

**Recommendations:** Work with the staff from Big Bend National Park to monitor the populations located on their property.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD and BIBE to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Arenaria livermorensis                      **Candidate Category:** C2  
**Common Name:** Livermore sandwort                      **Listing Rank:** 5  
**Range:** Jeff Davis County                      **G/S Rank:** G1S1

**Known Occurrences:** Three occurrences, all from Mt. Livermore.

**Reasons for Concern:** Two recently verified localities, road clearing could wipe out one population, there are low numbers of individuals and populations; highly localized geographically.

**Monitoring Objective:** Obtain a population count of plants of Arenaria livermorensis, including detailed measure of vigor for each plant (see Methodology), completed triennially at each site.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, August-October; Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Jeff Davis County: SW slope of Mt. Livermore, east and south of Baldy Peak. TNC-Land Steward Society Member, private ranch, access needed.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Upon site visit, it may be determined to take vigor measurements (number of flowers and fruits or length and width) for each plant. Note any herbivory, insect damage, recruitment, reproduction activity or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires, and close focus binoculars.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD.

**Recommendations:** Work with the staff from TNC to monitor the populations. Plants occur on rock faces, some of which are inaccessible except by viewing them through binoculars. Monitoring efforts may need to be modified.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TNC and the landowner to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Argythamnia aphoroides **Candidate Category:** C2  
**Listing Rank:** 11  
**Common Name:** Hill Country wild mercury **G/S Rank:** G2S2

**Range:** Blanco, Comal, Gillespie, Hays (Historical), Kendall (Historical), Kerr, Menard, Mills (Historical), Tom Green, and Uvalde Counties

**Known Occurrences:** Seventeen occurrences on record, five populations are recently observed.

**Reasons for Concern:** Known populations are in low numbers, four of five sites are on the highway right-of-way (HROW), the fifth is located in Garner State Park. Reproduction success unknown, pressures from mowing unknown.

**Monitoring Objective:** To obtain a total population count of all plants of Argythamnia aphoroides, including detailed measures of vigor for each plant (See Methodology) located at each of the five sites, two in Blanco County; one in Menard County one in Uvalde County, and one in Gillespie County, completed initially, monitoring frequency to be determined after site visit.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Monitor one time for baseline information than determine frequency after initial visit. April - May during flowering; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Blanco County: 1-HROW South side of US Rt 290, 2.05 road miles West of its junction with Co. Rd 204--6 plants located in 1991; 2-HROW East side of US Rt. 281, 5.0 road miles South of its junction with St. Rt. 962--ca. 35 plants seen in 1991. Menard County: HROW East side of R.M. 1311, 0.3 - 0.35 road miles south of center of low water crossing bridge over San Saba River--5 plants located in 1991. Gillespie County: HROW East side of R.M. 783, 5.75 road miles north of its junction with US Rt 290 at Harper--6 plants located in 1991. Uvalde County: Garner State Park, two populations, one on the lower third of south facing slope on the north side of the mouth of a small canyon behind (west of) the screened shelter area in the southern half of the park, the other is on the upper half of the north facing slope of the same canyon.

**Methodology:** Permanently delineate and describe each of the total population area. If possible mark boundaries using easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants and take the following measurements from each plant: number of primary and secondary stems; number of male and female flowers; fruits; and height. Note whether the plants are monoecious or dioecious, if there is any herbivory, insect damage, reproduction activity, seedling count or other conditions.

**Field Equipment Needed:** Measuring tapes, flagging/pin flags, stakes, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr and David Hernandez, TPWD; Marshall Johnston, Austin, Texas.

**Recommendations:** Work with the TPWD Park staff to assist with the monitoring in the State Park and to monitor any disturbance. Work with the Highway Department regarding management techniques and enlist their assistance in the monitoring effort. When possible, relocate some or all of the known occurrences as well as additional populations of this species.

**Potential use of Volunteers:** May be able to utilize Park volunteers. Volunteers will need to be able to distinguish between Argythamnia aphoroides and A. mercurialina.

**Date for Review of Plan:** Spring/Summer 1994

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Asclepias prostrata **Candidate Category:** C2  
**Common Name:** prostrate milkweed **Listing Rank:** 8  
**Range:** Starr and Zapata Counties; Tamaulipas, Mexico. **G/S Rank:** G1S1

**Known Occurrences:** Seven occurrences, primarily in Starr and Zapata Counties.

**Reasons for Concern:** Habitat destruction from agriculture and pasture improvement, also oil and gas exploration, development and transportation all destroy populations; also, invasive non-native plants shade out this low-growing species.

**Monitoring Objective:** Obtain a population count of Asclepias prostrata completed biennially including selected measures of vigor at five sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, spring; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Starr County: near Falcon State Park; north of Roma; Zapata County: south of Webb/Zapata Co. line; 23 mi. north of Roma; north of Arroyo del Tigre Grande.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take the following measurements for vigor: number of branches and length of branches recorded for each plant. Note any pollination, insect damage or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, ruler.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Noreen Damude and Jackie Poole, Status Report, 1990, Bill Carr, Gena Janssen, TPWD; Joe Ideker, Edinburg, Tx; Angela Brooks, USFWS.

**Recommendations:** Work with the staff from the Highway Department to monitor the populations. This monitoring can be completed in conjunction with monitoring Lesquerella thamnophila.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the State Park to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Aster puniceus ssp. elliottii var. scabricaulis  
**Common Name:** rough-stem aster

**Candidate Category:** C1  
**Listing Rank:** 3  
**G/S Rank:** G5T2Q S2

**Range:** Anderson, Cherokee, Smith, Van Zandt and Wood Counties.

**Known Occurrences:** Fifteen occurrences (Several of these are probably extirpated and several others have not been recently verified).

**Reasons for Concern:** Few known populations; all currently subject to right-of-way maintenance procedures; habitat subject to modification, alteration and destruction.

**Monitoring Objective:** Obtain a population count including detailed measures for each plant (see Methodology) of Aster puniceus ssp. elliottii var. scabricaulis to be completed annually at select sites. One site from each of the three counties to be selected upon field review of the sites. Additional sites to eventually include at least two non-highway right-of-way populations.

**Priority:** MEDIUM PRIORITY - Taxonomy not assured, need to verify with Guy Nesson.

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**PLAN**

**Monitoring Frequency/Season:** Annually, October; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Anderson County: one site; Van Zandt County: one site; Wood County: one site. Sites to be selected upon field review of the sites.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be estimated or counted dependent on the conditions. Those with populations  $\leq 100$  plants, take the following measures of vigor: number of primary and secondary stems; number of fruits and flowers; and height. For those populations  $> 100$  plants, randomly select a subset of the plants to take the above measures of vigor. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions. Additional non-highway right-of-way sites to be added as they become available.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, Gena Janssen, Mary Candee, TPWD; Kathryn Kennedy, USFWS; Wm. Mahler, Status Report, 1984.

**Recommendations:** Work with the staff from the State Railroad State Park and the Highway Department to monitor populations on the respective properties. Highway right-of-way monitoring in progress.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Astragalus mollissimus **Candidate Category:** C2  
var. marcidus **Listing Rank:** 12  
**Common Name:** withered wooly loco **G/S Rank:** G5T2 S2

**Range:** Dallam, Jeff Davis (historical) and Presidio Counties

**Known Occurrences:** Eleven occurrences.

**Reasons for Concern:** No populations recently observed, populations may depend on some sort of disturbance to maintain their seral stage status.

**Monitoring Objective:** Obtain a population estimate or count of individuals triennially, including selected measures of vigor, two to three sites if all relocated.

**Priority:** LOW PRIORITY - Need to relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, April - July Look for every three years, Access needs to be obtained.

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Jeff Davis County:** relocate population; **Presidio County:** relocate populations.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Inconspicuously tag and count the population. A sub-set of the population may need to be monitored depending on the field conditions, adjust as necessary. Note any herbivory, insect damage, pollination, recruitment, reproduction activity or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Dr. B.L. Turner, UT-Austin.

**Recommendations:** Combine monitoring efforts with other west Texas species that flower at this time.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Ayenia limitaris                      **Candidate Category:** E  
**Common Name:** Texas ayenia                      **Listing Rank:** 2  
**Range:** Cameron and Hidalgo Counties; Coahuila, Nuevo Leon and Tamaulipas, Mexico  
**Known Occurrences:** One known occurrence in Hidalgo County on property owned by the Methodist Church. Six plants known as of 1988. One plant known as of 1993. Twenty additional plants discovered by Joe Ideker recently. Status Report completed 1990, N. Damude and J. Poole.  
**Reasons for Concern:** Susceptible to habitat destruction and alteration due to agriculture, recreational and urban development. Species may be at risk by herbivores, pests, parasites and diseases. Justicia runyonii (C2) and Manihot walkerae (C1) occur in similar habitat.  
**Monitoring Objective:** To obtain a total population census of all plants of Ayenia limitaris including detailed measures of vigor for each individual plant (see Methodology) located at the Methodist Church Camp site, Hidalgo County, completed annually.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually in fall, September - October; Perennial  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Hidalgo County: Methodist Camp, 2.6 miles north of junction Hwy 281 and FM 1015 just south of Progresso; on the east side of the road, 0.4 miles north of the Llano Grand Lake; plants found in deep shade in the interior of the woods, Progresso and Mercedes USGS 7.5' quadrangle. Private land, need access.  
**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants or tag nearby, heartier species to ensure relocating the same plant(s) from year to year. Count the plants, take the following measurements for each plant: number of primary and secondary stems; number of fruits and flowers; height; and width. Note any herbivory, insect damage, reproduction activity, seedling count or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Angie Brooks, USFWS-Corpus Christi; Jim Everitt, USDA-Weslaco; Carmen Cristbol, Argentina; Joe Ideker, Edinburg, Texas; Gary Waggenerman, TPWD; Noreen Damude and Jackie Poole, Status Report 1990, TPWD.

**Recommendations:** Work with the staff from the Methodist Church Camp to ensure the protection of the remaining plant. Involve staff from the Rio Grande Valley National Wildlife Refuge system, either in monitoring and/or looking for additional populations of Ayenia limitaris. Further protection of this species may be necessary. If possible, search for additional populations in Mexico as well. Joe Ideker of the Native Plant project has been monitoring this species for the USFWS.

**Potential use of Volunteers:** Possibly utilize volunteers from the Methodist Church Camp and any regional TPWD volunteers in the area. Considerations include that this is the only known plant left in the United States.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Batesimalva violacea **Candidate Category:** C2  
**Listing Rank:** 8  
**Common Name:** purple gay-mallow **G/S Rank:** G2S1

**Range:** Brewster County; Coahuila and Nuevo Leon, Mexico.

**Known Occurrences:** Two occurrences, probably one population.

**Reasons for Concern:** In the U.S., known only from the population below the "Window" of Big Bend National Park; possible pollution or diminution of water source will affect this species.

**Monitoring Objective:** Obtain a population count of Batesimalva violacea completed biennially.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, October - November; Shrubby Perennial. Monitor water use frequently, if water use plan stable then monitoring can be dropped to triennially.

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park, below the "Window".

**Methodology:** Permanently delineate and describe the population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Each plant should be tagged and numbered. In addition, take the following measurements: number of fruits and flowers; and number of stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the

the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

J. Jeff Clark and A. Michael Powell, Status Report, 1983; Bill Carr and Jackie Poole, TPWD.

**Recommendations:**

Work with the staff from Big Bend National Park to monitor the population. To be monitored with Quercus graciliformis.

**Potential use of  
Volunteers:**

Possibly utilize volunteers from TPWD and BIBE to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**





**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Rafael Coral, New Mexico State University, Status Report, 1988; Sue Gardner and Ruth O'Brien, Corpus Christi Botanical Gardens, Status Survey Update, 1986; B.L. Turner, UT- Austin, Status Report, 1983; Jackie Poole, TPWD.

**Recommendations:** Work with the staff from TPWD, USFWS-Corpus Christi, and Corpus Christi Botanical Gardens to monitor the populations.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Bonamia ovalifolia                      **Candidate Category:** C2  
**Common Name:** bigpod bonamia                              **Listing Rank:** 8  
**Range:** Brewster County, Adjacent Mexico                      **G/S Rank:** G1S1

**Known Occurrences:** Two populations known in U.S., one located in Big Bend National Park (BIBE).

**Reasons for Concern:** Susceptible to landfall and/or flood damage along Rio Grande - Boquillas Canyon.

**Monitoring Objective:** We want a total population census of all plants of Bonamia ovalifolia, including measures of vigor for individual plants located at BIBE, Boquillas Canyon completed biennially.

**Priority:** HIGH PRIORITY\* Wait for status report to be completed to see what the recommendations are.

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**PLAN**

**Monitoring Frequency/Season:** Biennially in May during flowering, with visual check during the intervening years; Perennial

**Monitoring Responsibility:** Big Bend National Park (BIBE)/TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park, deep alluvial sands in canyon of the Rio Grande. Around the Sand Slide at the head of Boquillas Canyon and ca. 1/4 mile down canyon.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants, inconspicuously tag individual plants and take the following measurements for those tagged plants: number of primary and secondary stems; number of fruits and flowers; height; and width. Note any herbivory, insect damage, pollination, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; Big Bend National Park, National Park Service, Big Bend National Park, Tx 78934; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Mike Flemming, Betty Alex, site staff, Big Bend National Park; Lynda Pritchett-Kozak, Liz Ecker, Desert Botanical Garden, Phoenix; Daniel F. Austin, Department of Biological Sciences, Florida Atlantic University; Bonnie Amos, Angelo State University, completed the status report.

**Recommendations:** Continue following progress of efforts undertaken by the Desert Botanical Garden in Arizona. If time and staffing permit, a closer look at individual plants from year to year may be desirable including an annual count of flowers and fruits, especially noting any recruitment.

**Potential use of Volunteers:** May be able to utilize National Park Volunteers or possibly volunteers from Big Bend Ranch SNA and/or members of the Native Plant Society of Texas.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Brickellia brachyphylla var. hinckleyi                      **Candidate Category:** C2

**Common Name:** Hinckley's brickellbush                      **Listing Rank:** 11  
**G/S Rank:** GST2 S2

**Range:** Brewster (Historical), and Jeff Davis Counties

**Known Occurrences:** Seven occurrences

**Reasons for Concern:** Few occurrences, few individuals, limited range, susceptible to vacation home development, grazing pressures and road construction in the Davis Mountains area.

**Monitoring Objective:** Obtain a population count of Brickellia brachyphylla var. hinckleyi, including selected measures of vigor, completed triennially, one to two sites.

**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, July - October; Perennial. Look for every three years.

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Jeff Davis County: along Limpia Creek, Mt. Livermore, other site if relocated.

**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Take the following measures of vigor: height; number of flowering heads; and number of stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; Mike Powell, Sul Ross State University.

**Recommendations:** Work with staff from the Nature Conservancy to coordinate monitoring efforts with this C2 species and others that occur on this private property.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and TNC to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Brickellia brachyphylla  
var. terlinguensis **Candidate Category:** C2

**Common Name:** Terlingua brickellbush **Listing Rank:** 11  
**G/S Rank:** G5TH SH

**Range:** Brewster (Historical), and Hudspeth (Historical) Counties

**Known Occurrences:** No recent sightings, populations need to be relocated

**Reasons for Concern:** Few populations, none recently observed

**Monitoring Objective:** Obtain a population count of Brickellia brachyphylla var terlinguensis, including selected measures of vigor, completed triennially, populations need to be located.

**Priority:** LOW PRIORITY - need to relocate, then HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, July - October; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County, relocate population(s); Hudspeth County: relocate population(s).

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be inconspicuously tagged and counted. Take the following measures of vigor: height; number of flowering heads; number of stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Mike Powell, Sul Ross State University

**Recommendations:** Work with the staff from the National Park to relocate this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD and/or BIBE volunteers to assist in relocating and later monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Brickellia viejensis **Candidate Category:** C2  
**Common Name:** Sierra Vieja brickellbush **Listing Rank:** 11  
**Range:** Presidio County **G/S Rank:** G1G2 S1S2

**Known Occurrences:** Ten known occurrences

**Reasons for Concern:** Only one population recently observed, need to relocate this species.

**Monitoring Objective:** Relocate and obtain a population count of Brickellia viejensis completed triennially, including selected measures of vigor (see Methodology), relocate population.

**Priority:** LOW PRIORITY - need to relocate - then HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, September; Perennial. Look for every three years.

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Presidio County; Sierra Tierra Vieja, relocate population(s).

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the plants, take the following measures of vigor: height; number of stems and flowering heads. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires..

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Mike Powell, Sul Ross State University

**Recommendations:** Look for populations.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in relocating and monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Brongniartia minutifolia      **Candidate Category:** C2  
**Common Name:** little-leaf brongniartia      **Listing Rank:** 11  
**Range:** Brewster County; Chihuahua, Mexico      **G/S Rank:** G2S1

**Known Occurrences:** Six occurrences

**Reasons for Concern:** Few populations, low numbers of individuals.

**Monitoring Objective:** Obtain a population count and continue monitoring selected measures of vigor of plants of Brongniartia minutifolia annually, one site.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, June - August; shrub

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**  
**Site Description:** Brewster County: desert foothills south of the Chisos Mountains

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count and inconspicuously tag the plants. Take the following measures of vigor: height; and a count of the basal stems. Take a count of number's of flowers on a subset of flowering branches. Note any herbivory, insect damage, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Mike Fleming, BIBE.

**Recommendations:** Populations may currently be monitored by students at BIBE.

**Potential use of  
Volunteers:** Possibly utilize TPWD and/or BIBE volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Caesalpinia brachycarpa **Candidate Category:** C2  
**Common Name:** broadpod rushpea **Listing Rank:** 8  
**Range:** Crockett (Historical), Edwards (H), Kinney, Llano and Sutton Counties  
**Known Occurrences:** Eight recorded occurrences, three are from precisely known locations. These include two occurrences in Kinney County and one in Sutton County. Status Report completed in 1981, Wm. Mahler.  
**Reasons for Concern:** Limited distribution, known occurrences are along highway right-of-way.  
**Monitoring Objective:** Obtain an estimate of the populations at the three verified occurrences of Caesalpinia brachycarpa located in Kinney and Sutton Counties completed biennially. Where possible obtain a total population census.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, flowers April to June - Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Three verified locations in Kinney and Sutton Counties are to be monitored. Kinney Cty: 1-Southeast side of R.M. 334, 13.1 road miles west of junction with St Rt 55; 2- R.M. 334, 9.0 - 9.1 road miles northeast of junction with R.M. 674, northeast of Brackettville. Sutton Cty: 7.8 miles north of north access road of I-10 on east side of US 277 at old highway junction.

**Methodology:** Permanently delineate and describe each of the total population areas. Most sites will allow for a total population count. Where that is not feasible, the population should be sampled to estimate the total number of individuals within the population. To sample, a 100 meter tape will be placed within the population. Along this meter tape, ten 5m x 5m randomly placed quadrats will be randomly selected along either side of the tape. Total number of individuals will be counted within each quadrat. Where possible, take the following measurements: number of primary and secondary stems; number of fruits and flowers; and height. Note any herbivory, insect damage, reproduction activity, recruitment, or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20%

change in the density of Caesalpinia brachycarpa between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Quadrant (5m x 5m), measuring tapes-at least 4, pin flags, stakes, compass (s), random numbers table.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** William R. Carr and Jackie M. Poole, TPWD.

**Recommendations:** Work with the Highway Department regarding management methods and enlist staff to assist in the monitoring efforts.

**Potential use of Volunteers:** May be able to utilize regional TPWD volunteers for the annual monitoring.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Castilleja ciliata **Candidate Category:** C2  
**Common Name:** fringed paintbrush **Listing Rank:** 11  
**Range:** Jeff Davis County **G/S Rank:** G1Q S1

**Known Occurrences:** Five occurrences

**Reasons for Concern:** Very few occurrences, few individuals, restricted range, area susceptible to road building impacts; fire suppression

**Monitoring Objective:** Obtain a population count of Castilleja ciliata completed biennially, including selected measures of vigor, one site.

**Priority:** MEDIUM PRIORITY - Access Needed

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**PLAN**

**Monitoring Frequency/Season:** Biennially, June - October, Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Jeff Davis County: Mt. Livermore, private property, need access.

**Methodology:** Permanently delineate and describe each population. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count and inconspicuously tag the plants if the population is less than 50. Take the following measures of vigor: height; number of fruit and flowering stems. Note any herbivory, insect damage, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4-5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Jeff Clark, Mike Powell, Status Report, 1983; Mark Lockwood.

**Recommendations:** Additional populations need to be located, work with staff from TNC to assist monitoring this species. Known populations occur on private property, access is needed. Taxonomy needs clarification, utilize genetic techniques. Mark Lockwood needs to be present to verify species.

**Potential use of  
Volunteers:** Possibly utilize TNC and TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Castilleja elongata                      **Candidate Category:** C1  
**Common Name:** tall paintbrush                              **Listing Rank:** 5  
**Range:** Brewster County                                      **G/S Rank:** G2QS2

**Known Occurrences:** Nine occurrences all within Big Bend National Park (BIBE).

**Reasons for Concern:** Low numbers of individuals and populations; this may be a fire-dependent species in a fire-suppressed environment.

**Monitoring Objective:** Obtain a population estimate of Castilleja elongata completed annually.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, mid-August - September; Perennial

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park, Chisos Mountains.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The number of individuals within the population should be counted. Take the following measures of vigor: height; number of fruits and flowers. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Peter Scott, Louisiana State University; Donna Howell, Status Report, 1986; Denise Louie.

**Recommendations:** Work with the staff from the National Park to assist with monitoring the populations. Coordinate monitoring efforts with Festuca ligulata.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and BIBE to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chaetopappa hersheyi                      **Candidate Category:** C2  
**Common Name:** mat leasdaisy                                      **Listing Rank:** 11  
**Range:** Culberson and Hudspeth Counties; New Mexico  
**Known Occurrences:** Eight occurrences  
**Reasons for Concern:** Known from the Guadalupe Mountains, restricted to limestone boulders and cliff walls in deep mesic canyons; may require higher humidity than that available outside canyons, changes in water table would negatively impact this species.  
**Monitoring Objective:** Obtain a population estimate of Chaetopappa hersheyi to be completed triennially, including selected measures of vigor, three sites.  
**Priority:** LOW PRIORITY

**PLAN**

**Monitoring Frequency/Season:** Triennially, May; Perennial  
**Monitoring Responsibility:** TPWD/Guadalupe Mt. NP  
**Monitoring Plan:**  
**Site Description:** Culberson County: Guadalupe Mountains National Park, Mckittrick Ridge Trail; Hunter Peak; Bear Canyon Trail  
**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted or estimated depending on field conditions. Access to individual plants may be difficult, adjust field techniques as necessary. The measures of vigor should be adjusted dependent on field conditions, a sub-set of the population may be sufficient. Take the following measurements: number of plants flowering and fruiting; and number of flowering heads. Note any herbivory, insect damage, pollination reproduction activity, recruitment or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD.

**Recommendations:** Work with staff from Guadalupe Mountains National Park to assist in monitoring this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD or Park volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chamaesyce chaetocalyx var. triligulata      **Candidate Category:** C2  
**Common Name:** three-tongue spurge      **Listing Rank:** 11  
**Range:** Brewster, and Randall (No specimen) Counties; Coahuila, Mexico  
**Known Occurrences:** Three occurrences  
**Reasons for Concern:** Small numbers, limited distribution, human disturbance on park.  
**Monitoring Objective:** Obtain a population count of Chamaesyce chaetocalyx var. triligulata completed biennially including selected measures of vigor.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, April - September

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Boquillas Canyon, Big Bend National Park

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count and tag the plants. Modify as necessary as field conditions permit. Take the following measurements of vigor: number of basal stems; and total number of fruits and flowers. Note any pollination, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758..

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Denise Louie; Michael Powell and Dennis Miller, Status Report, July 1983; Mark Mayfield, UT Austin

**Recommendations:** Work with the staff from Big Bend National Park to coordinate the monitoring methodology and proper management of the population. According to JMP a college group may already be monitoring this species or they are surveying for it, need to contact Denise Louie for further information.

**Potential use of Volunteers:** Possibly utilize Park and TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS

**Scientific Name:** Chamaesyce golondrina **Candidate Category:** C2  
**Common Name:** swallow spurge **Listing Rank:** 11  
**Range:** Brewster, Hudspeth and Presidio Counties; Chihuahua and Coahuila, Mexico **G/S Rank:** G2S2

**Known Occurrences:** Six occurrences

**Reasons for Concern:** Occurs on alluvial soils which tend to be cultivated, susceptible to invasive non-natives

**Monitoring Objective:** Obtain a population count of Chamaesyce golondrina completed triennially, one to four sites if all relocated.

**Priority:** LOW PRIORITY - Relocate

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PLAN

**Monitoring Frequency/Season:** Triennially, July - October; Annual. Look for every three years

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend, Boquillas Canyon, other site(s) to be relocated; Hudspeth County: relocate; Presidio County: relocate

**Methodology:** Permanently delineate and describe the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Mark Mayfield, UT-Austin; Dennis Miller, Mike Powell, Status Report, June 1983.

**Recommendations:** Work with the staff from Big Bend NP to manage and monitor the population.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the Park or TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chloris texensis                      **Candidate Category:** C2  
**Common Name:** Texas windmill-grass                      **Listing Rank:** 8  
**Range:** Brazoria, Brazos (Historical), Chambers, Galveston, Harris, Hidalgo (?-questionable location or identity), Nueces and Refugio Counties.  
**Known Occurrences:** Twenty-nine occurrences, few recently verified.  
**Reasons for Concern:** Habitat destruction due to development, oil and gas production, pasture improvement all affect this species.  
**Monitoring Objective:** Obtain a population count of Chloris texensis completed annually at four sites. Other sites may be added.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Mid-June to mid August; Perennial  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Harris County: Rankin Road; northeast corner Spencer Hwy and Center St; Galveston County: Hwy 646, north of Dickerson; Calder Road and IH-45.  
**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The number of individuals within each population should be counted. Note any herbivory, insect damage, reproduction activity, recruitment or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the cause is related to management, management.

recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jay Wipff.

**Recommendations:** This species occurs with Machaeranthera aurea and Hymenoxys texana at the Cypress Rose Hill Road location, however, it is not flowering when either of these species are.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Colubrina stricta **Candidate Category:** C2  
**Common Name:** Comal snakewood **Listing Rank:** 11  
**Range:** Comal, and El Paso Counties; Coahuila and Nuevo Leon, Mexico  
**Known Occurrences:** Only one population is known in U.S., from Hueco Tanks State Park.  
**Reasons for Concern:** Low population numbers in Texas.  
**Monitoring Objective:** To obtain a total population census of all plants of Colubrina stricta including detailed measures of vigor for each individual plant (see Methodology) located at Hueco Tanks State Park site annually, adjust as necessary.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Initially Annually, adjust after field determination, in late spring or early summer during flowering; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** El Paso County: Hueco Mountains, south side of North Mountain, Hueco Tanks State Park.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: number of primary and secondary stems; number of fruits and flowers; height; and width. Note any herbivory, insect damage, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, flagging/pin flags, stakes, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline,

TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Marshall Johnston, Austin, Texas

**Recommendations:** Work with the TPWD site staff such as Kelly Bryant, to monitor any disturbance. Enlist site staff in the monitoring effort.

**Potential use of  
Volunteers:** May be able to utilize Park volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Chrysothamnus nauseosus **Candidate Category:** C2  
                                  ssp texensis **Listing Rank:** 12  
**Common Name:** Guadalupe Mountains rabbitbrush **G/S Rank:** GST2 S1

**Range:** Culberson County; New Mexico

**Known Occurrences:** Five occurrences.

**Reasons for Concern:** Few populations, status unknown in Texas

**Monitoring Objective:** Obtain a population count of plants of Chrysothamnus nauseosus ssp texensis completed triennially, note pollinators. Need to relocate populations.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, September - October; Perennial

**Monitoring Responsibility:** TPWD/Guadalupe Mt. NP

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park, relocate populations in Smith Spring Canyon; South McKittrick Canyon; Pine Springs; or Bartlett Peak.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Loran Anderson, Texas Tech

**Recommendations:** Work with the staff from Guadalupe Mountains National Park to monitor the populations.

**Potential use of  
Volunteers:** Possibly utilize volunteers from Guadalupe Mountains NP and TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Condalia hookeri var edwardsiana      **Candidate Category:** C2  
**Common Name:** Edwards Plateau capul negro      **Listing Rank:** 12  
**Range:** Edwards County      **G/S Rank:** G5T1Q S1

**Known Occurrences:** One occurrence

**Reasons for Concern:** One collection, no one has relocated, impacts of grazing unknown as well as response to chemical/mechanical brush control practices unknown.

**Monitoring Objective:** Obtain a population count of Condalia hookeri var edwardsiana completed triennially including selected measures of vigor, relocate population.

**Priority:** LOW PRIORITY -Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - August; Perennial shrub

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Edwards County: vicinity of Rock Springs (1944) Relocate

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count and tag the plants. Take the following measurements of vigor: height; number of stems; diameter of largest stem; and total number of fruits and flowers. If the population is too large, delineate a sub-sample and take the same measures as above. Modify as field conditions warrant. Note any herbivory, insect pollination, insect damage, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, Status Review, 1989; Marshall Johnston

**Recommendations:** Work with the staff from the Texas Agricultural Experiment Substation to monitor and properly manage the population.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**





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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Sidney McDaniel, W.C. Holmes, Status Review, 1981; Jason Singhurst; TPWD.

**Recommendations:** May want to spot check other localities for presence/absence and/or other populations that would be suitable to monitor.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995.

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Coryphantha albicolumnaria      **Candidate Category:** C2  
**Common Name:** white column cactus      **Listing Rank:** 2  
   **G/S Rank:** G2S2

**Range:** Brewster, Pecos and Presidio Counties; Chihuahua, Mexico.

**Known Occurrences:** Eighteen occurrences.

**Reasons for Concern:** Illegal cactus trade, few populations known.

**Monitoring Objective:** Obtain a population count of Coryphantha albicolumnaria completed triennially, including selected measures of vigor (see Methodology). Three sites.

**Priority:** LOW PRIORITY - May be delisted to a 3C

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**PLAN**

**Monitoring Frequency/Season:** Triennially, March - May; Perennial

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County; Terlingua sinkhole; Mariposa Mine road-two sites.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The number of individuals within each population should be counted. Take the following measures: height; and number of fruits and flowers. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Donna Howell, Status Report, 1986; Richard Worthington, UTEP, Status Report, 1994.

**Recommendations:** Occurs with Genistidium fumosum at the Route 170 site; not easy to identify, use Worthington's Status Report Key. Highway right-of-way monitoring in progress.

**Potential use of  
Volunteers:** Possibly utilize TPWD and Big Bend National Park volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS

Scientific Name: Coryphantha chaffeyi Candidate Category: C2  
Listing Rank: 11  
Common Name: Chaffey's cory cactus G/S Rank: G2 S1

Range: Brewster County; Coahuila, San Luis Potosi and Zacatecas, Mexico

Known Occurrences: Five occurrences

Reasons for Concern: Habitat destruction.

Monitoring Objective: Obtain a population count of Coryphantha chaffeyi completed annually at selected sites, including detailed measures for each plant (see Methodology).

Priority: MEDIUM PRIORITY

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PLAN

Monitoring Frequency/Season: Annually, June - November; Perennial

Monitoring Responsibility: TPWD/BIBE

Monitoring Plan:

Site Description: Brewster County: three sites, Big Bend National Park. If possible, locate additional monitoring sites off the park that represent different land use practices.

Methodology: Permanently delineate and describe the population areas. Ideally, a map of the population should be completed as baseline information. Count the plants (upon site visit, total count may not be possible, modify as necessary). Take the following measurements: stem diameter and height and number fruits/flowers. Note any herbivory, insect damage, pollination, or reproduction activity, including recruitment, or other conditions.

Field Equipment Needed: Measuring tapes, pin flags, stakes, metal tags/wires.

Estimated Time/Staff for Monitoring: 3-4 Days; 2 staff

Reporting Procedure: Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

Red Flag Conditions: After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Steve Brack, Ken Heil, Allen Zimmerman; Denise Louie.

**Recommendations:** Work with the staff from Big Bend National Park to coordinate monitoring the populations located on their property.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Coryphantha dasyacantha **Candidate Category:** C2  
var. dasyacantha **Listing Rank:** 12  
**Common Name:** dense cory cactus **G/S Rank:** G3T2 S2

**Range:** Brewster, El Paso (Historical), Hudspeth, Jeff Davis and Pecos Counties

**Known Occurrences:** Fifteen occurrences.

**Reasons for Concern:** Subject to collecting pressures, housing and road developments affect this species.

**Monitoring Objective:** Obtain a population count of Coryphantha dasyacantha var. dasyacantha completed annually including selected measures of vigor.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - July; Perennial

**Monitoring Responsibility:** TPWD and/or Big Bend National Park

**Monitoring Plan:**

**Site Description:** Brewster County: relocate populations, Big Bend National Park. If possible, locate additional monitoring sites off the park that represent various land use practices.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the population, take the following measures of vigor: height, diameter and number of flowers and fruits. Note any herbivory, insect damage, pollination, recruitment or reproduction activity or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

Mike Powell, Denny Miller, Allen Zimmerman

**Recommendations:**

Combine monitoring efforts with other west Texas species that flower at this time. Will need someone able to properly id this species

**Potential use of**

**Volunteers:**

Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:**

Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Coryphantha duncanii                      **Candidate Category:** C2  
**Common Name:** Duncan's cory cactus                      **Listing Rank:** .11  
**Range:** Brewster and Presidio Counties; New Mexico                      **G/S Rank:** G3S1

**Known Occurrences:** Seven occurrences

**Reasons for Concern:** Susceptible to pressures from recreational use and cactus trade.

**Monitoring Objective:** Obtain a population count of Coryphantha duncanii to be completed biennially.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, mid April - May

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park; Presidio County: Relocate the population.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the plants (upon site visit, total count may not be possible, modify as necessary). Take the following measurements: stem diameter and height and number fruits/flowers. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or any other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD, Denise Louie; Kenneth Heil, Status Report, August 1982; Ted Anderson, Desert Botanical Garden

**Recommendations:** Work with the staff from Big Bend National Park to coordinate the monitoring methodology and proper management of the population. May want to spot check other localities for presence/absence and/or other populations that would be suitable to monitor.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Denise Louie; Kenneth Heil, Edward Anderson, Status Report, August 1982; Gerald Raun, retired herpetologist from Angelo State is studying a population of this species, he is working out of the Chihuahuan Desert Research Institute with Denny Miller.

**Recommendations:** Work with the staff from Big Bend National Park to coordinate the monitoring methodology and proper management of the population.

**Potential use of Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Crataegus warneri                      **Candidate Category:** C2  
**Common Name:** Warner's hawthorn                      **Listing Rank:** 11  
**Range:** Anderson, Cherokee, Freestone, Houston, Morris, Panola, Smith  
(Historical), and Walker Counties                      **G/S Rank:** G2Q S2

**Known Occurrences:** Fourteen occurrences

**Reasons for Concern:** Habitat destruction for forestry, agriculture, industry and development.

**Monitoring Objective:** Obtain a population count of Crataegus warneri, including selected measures of vigor, completed triennially.

**Priority:** MEDIUM PRIORITY - Clarify taxonomic questions

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**PLAN**

**Monitoring Frequency/Season:** Triennially, July - September; Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**  
**Site Description:** Anderson County: Relocate at least 2 populations; Houston County: Augusta, relocate population.

**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Take the following measures: dbh or diameter of largest stem at one foot off the ground. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2-3 Days; 1-2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Jason Singhurst; William Mahler, Status Review 1985.

**Recommendations:** Work with East Texas Conservation groups to coordinate monitoring efforts with this C2 species and others that occur in this region. This species is very difficult to identify, will need someone capable to do so in order to locate this species.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Croton alabamensis  
var. texensis                      **Candidate Category:** C2  
**Listing Rank:** 8  
**G/S Rank:** G3T1 S1

**Common Name:** Texabama croton

**Range:** Bell, Coryell and Travis Counties

**Known Occurrences:** Fifteen occurrences

**Reasons for Concern:** Suburban development

**Monitoring Objective:** Obtain a population count of Croton alabamensis var. texensis completed triennially including selected measures of vigor.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, April - July; Perennial

**Monitoring Responsibility:** TPWD/Travis County/USFWS/DOD

**Monitoring Plan:**

**Site Description:** Coryell County: Ft Hood Military Reservation; Travis County: Post Oak Ridge. If possible, locate an additional site that is unlike the previous two sites.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count and tag the population, take the following measure of vigor: height. If field conditions warrant, a subset of the population may be necessary, modify as needed. Location may need to be recorded using GPS. Note any herbivory, insect damage, pollination, recruitment or reproduction activity or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Steve Ginzburg; and Sidney McDaniel, Status Report, February 1981.

**Recommendations:** There is questionable long-distance dispersal with this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD/ Travis County, Ft. Hood and/or USFWS to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cyperus grayioides                      **Candidate Category:** C2  
**Common Name:** Mohlenbrock's umbrella sedge      **Listing Rank:** na  
**Range:** Anderson, Angelina, Burleson, Colorado, Franklin, Freestone, Hardin, Henderson, Houston, Leon, Nacogdoches, Newton, Parker (? questionable locality or identification), Robertson, Rusk, San Augustine, Shelby, Smith, Tyler, Upshur, Van Zandt and Wood Counties; Illinois, Louisiana and Missouri.  
**Known Occurrences:** Forty two occurrences are known in Texas. Cyperus grayioides also occurs in Missouri, Illinois and Louisiana.  
**Reasons for Concern:** Reasons for concern include habitat alteration. The species may be susceptible to soil compaction and unknown affects of prescribed fire.  
**Monitoring Objective:** To obtain an estimate of at least three populations of Cyperus grayioides and to monitor the impacts of fire management on at least one site.  
**Priority:** LOW PRIORITY--May be down listed to a 3C, taxonomy needs to be determined.

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**PLAN**

**Monitoring Frequency/Season:** Triennially, in August during flowering; Perennial  
**Monitoring Responsibility:** TPWD/TNC (The Nature Conservancy)  
**Monitoring Plan:**  
**Site Description:** **Hardin County:** Roy E. Larson Sandylands Preserve, The Nature Conservancy-north side of F.M. 327, 3.6 miles west of its junction with St. Rt. 92 in Silsbee. **Hardin County:** Village Creek State Park, northeast and southeast of the barn. **Parker County:** Lake Mineral Wells State Park, west side of park, 100-1000 feet north of parking lot at equestrian campground.  
**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using easily recognizable landmarks, stakes and/or metal tags. Obtain an estimate of the populations at three of the localities of Cyperus grayioides located in Hardin and Parker Counties, annually.  
  
For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20%

change in the density of Cyperus grayioides between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, Pin Flags, Stakes, Metal tags/Wires

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, TPWD; Steve Orzell, Florida NHP.

**Recommendations:** Some feel this species should be re-categorized as 3C due to its widespread distribution in Texas. In Missouri, it is state listed endangered and the protection status of the 16 known sites on private property is uncertain. In Illinois it is state listed as threatened, with at least eight sites protected. One site is protected in Louisiana and eight sites protected in Texas. Staff at TNC's Sandylands Preserve may incorporate a study addressing the affects of fire on the populations of Cyperus grayioides. Additional sites that could be monitored include populations that occur on: private lands; Angelina National Forest; Engling Wildlife Management Area; Big Thicket National Preserve; Sabine National Forest and others along roadsides.

**Potential use of Volunteers:** May be able to utilize TPWD and TNC volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Cyperus onerosus</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	dune umbrella-sedge	<b>Listing Rank:</b>	5
		<b>G/S Rank:</b>	G2S2

**Range:** Andrews, Ward, and Winkler Counties

**Known Occurrences:** Nine recorded occurrences, four are from precisely known locations. These include two occurrences in Winkler County, one in Ward County, and one in Andrews County. Status Report completed in 1991, W.R. Carr.

**Reasons for Concern:** Occurs in an area where there is risk of oil spills and gas leaks; in addition, the effects of oil/gas drilling on the area hydrology is unknown. Potential loss of habitat from well drilling may occur. Wetlands are subject to use by grazing cattle, especially in the park. Stabilization of the dunes might allow for filling in of intradunal depressions and result in habitat loss.

**Monitoring Objective:** Obtain a total count if possible or an estimate of the populations at the four verified occurrences of Cyperus onerosus located in Andrews, Ward and Winkler Counties completed annually. See Recommendations.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, June-November - Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Andrews County:** 30 ft. east of fence line on southeast side of St. Rt. 115, 0.7 road miles northeast of junction with St. Rt 128, Sand Ranch-Need Access; **Ward County:** Monahans Sandhills State Park, north of Scrub Oak Picnic Area, west and south of Pumpjack Picnic Area, both sides of main park road; **Winkler County:** 1-north side of F.M. 874, from its junction with St. Rt. 115 to ca. 1 mile west of this junction; 2-northwest side of St. R. 115, 1.6-1.7 road miles along Hwy 115, frequent in moist sand margins of standing water of ponds between dunes.

**Methodology:** Permanently delineate and describe each of the total population areas. Most sites will allow for a total population count. Where that is not feasible, the population should be sampled to estimate the total number of individuals within the population. To sample, a 100 meter tape will be placed within the population. Along this meter tape, ten 5m x 5m randomly placed quadrats will be randomly placed along either side of the tape. Total number of individuals will be counted within each quadrat.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in

the density of Cyperus onerosus between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Rubber boots, 5m quadrant, measuring tapes-at least 4, pin flags, stakes, compass (s), random numbers table.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** William R. Carr, TPWD; Dr. Marshall Johnston; Dr. Barton Warnock; Dr. Chester Rowell, Dr. Richard Carter, Pat McNeal.

**Recommendations:** Preferred objective is to obtain an estimate of available habitat of Cyperus onerosus through the use of high resolution color infrared aerial photography. Appropriate habitat can be identified and verified via ground passes in a low flying helicopter, particularly over the State Park.

Additional monitoring effort should strongly address the affects the cattle have on the population. This would include establishing exclosures in different areas of the State Park. Work with the TPWD site staff to assist with the responsibility of monitoring the populations that occur on the state park. For populations that occur on highway right-of-way, work with the Highway Department to assist with the monitoring. Sites occurring on private land, work with the land owner to allow access and enable monitoring annually as well as oversee the sites throughout the year.

**Potential use of  
Volunteers:**

May be able to utilize Park volunteers for the annual monitoring as well as keeping an eye on the wetland habitat throughout the year.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cypripedium kentuckiense      **Candidate Category:** C2  
**Common Name:** southern lady's-slipper      **Listing Rank:** na  
    **G/S Rank:** G3S1

**Range:** Cass(?)\*, Harrison, Nacogdoches, Newton (X)\*, Sabine and San Augustine Counties; Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Oklahoma, Tennessee. \*?=questionable locality or identification; X=presumed extirpated

**Known Occurrences:** There are nine records for Cypripedium kentuckiense, four are verified records with low population numbers. Status Report completed, November 1985, Max Medley.

**Reasons for Concern:** Habitat destruction and disturbance affect this species.

**Monitoring Objective:** Obtain a total population census of all plants of Cypripedium kentuckiense, including detailed measures of vigor for each individual (see Methodology) located in Sabine and San Augustine County, completed annually.

**Priority:** HIGH PRIORITY

**PLAN**

**Monitoring Frequency/Season:** Annually in June-August; Perennial

**Monitoring Responsibility:** TPWD/Sabine National Forest/Angelina National Forest

**Monitoring Plan:**

**Site Description:** Sabine County, three occurrences, Sabine National Forest, Tenaha Ranger District, ca 0.3 miles north of FS Road 108 and 2 miles east of Black Ankle along tributary to Colorow Creek; 2-Sabine National Forest, Tenaha Ranger District, ca 3 miles north of Geneva, access on east by FM 330, then FS Road 198 to Cordrey Cemetery; 3-Sabine National Forest, Yellow Pine Ranger District, Indian Mounds Wilderness. San Augustine County, Angelina National Forest, Angelina Ranger District, east of FM 705 at a point 2 miles south of Tx 103 and 3.6 miles south of Macune, northwest of Pisgah Cemetery and east of Turkey Hill Wilderness.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: number of primary and secondary stems; number of fruits and flowers; and height. Note any herbivory, insect damage, recruitment or

other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Steve Orzell, Florida NHP; Max Medley, Status Report 1985.

**Recommendations:** Involve staff from the Forest Service in the monitoring efforts as well as searching for additional populations such as Rob Evans or Jason Singhurst.

**Potential use of Volunteers:** Possibly utilize regional TPWD volunteers in the area.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dalea bartonii                      **Candidate Category:** C2  
**Common Name:** Cox's dalea                      **Listing Rank:** 11  
**G/S Rank:** G1 S1

**Range:** Brewster County

**Known Occurrences:** No recent occurrences, population needs to be relocated

**Reasons for Concern:** No known populations.

**Monitoring Objective:** Obtain a population count of Dalea bartonii including selected measures of vigor, completed triennially. Access necessary and not likely.

**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, July - October; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County, relocate population

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Individuals should be identified and counted. Upon site visit possibly take the following measures of vigor: height and/or number of primary branches. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Donna Howell, Status Review, 1986.

**Recommendations:** Work with the landowners to relocate this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in relocating and later monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dalea reverchonii                      **Candidate Category:** C2  
**Common Name:** Comanche Peak prairie-clover              **Listing Rank:** 11  
**G/S Rank:** G2S2

**Range:** Hood (Presumed extirpated), Parker and Wise Counties

**Known Occurrences:** Twenty-one occurrences

**Reasons for Concern:** Urban and suburban development; recreational development of the Hood County site; overgrazing and agriculture.

**Monitoring Objective:** Obtain a population count of Dalea reverchonii including selected measures of vigor, completed biennially.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, June; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Parker County: upon county visit, select two - three sites; Wise County: upon county visit, select two sites

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Individuals should be identified, counted and tagged if possible, if field conditions warrant, take a subset of the population. Upon site visit take the following measures of vigor: height and/or number of primary branches. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Steve Orzell, Florida NHP; Bill Carr, TPWD; Wm Mahler, Status Report, July 1984

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in relocating and later monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Dalea sabinalis                      **Candidate Category:** C2  
**Common Name:** Sabinal prairie-clover                      **Listing Rank:** 8  
**Range:**                      Bandera (Historical), Uvalde (Historical), and Val Verde Counties.  
**Known Occurrences:**                      Four occurrences, none recently verified.  
**Reasons for Concern:**                      Apparently not seen since the '40's - populations to be relocated.  
**Monitoring Objective:**                      Obtain a population count of plants of Dalea sabinalis completed triennially if located.  
**Priority:**                      LOW PRIORITY (Until relocated, then HIGH PRIORITY)

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**PLAN**

**Monitoring Frequency/Season:**                      Triennially, Look for every three years, May - July; Perennial

**Monitoring Responsibility:**                      TPWD

**Monitoring Plan:**

**Site Description:**                      Val Verde County: one site--once relocated, south of Loma Alta.

**Methodology:**                      Once relocated--Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Note any herbivory, insect damage or other conditions.

**Field Equipment Needed:**                      Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:**                      3 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:**                      Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services

**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Wm. Mahler, Status Report, 1985.

**Recommendations:** Additional populations need to be located.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the State Park to assist in  
monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Draba standleyi                      **Candidate Category:** C2  
**Common Name:** Standley's draba                      **Listing Rank:** 8  
**Range:** Jeff Davis County; Arizona and New Mexico                      **G/S Rank:** G3 S1

**Known Occurrences:** Three occurrences

**Reasons for Concern:** Low populations, low numbers, need to locate additional populations of this species.

**Monitoring Objective:** Relocate and obtain a population count of Draba standleyi completed annually, including selected measures of vigor (see Methodology). Access is needed.

**Priority:** MEDIUM - LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, August - September; Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Jeff Davis County: East of Mt. Livermore, relocate population(s).

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the plants, take the following measures of vigor: height; number of fruits and flowers. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, rebar, metal tags, wire, and compass.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-3 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD

**Recommendations:** Look for additional populations. Access is needed.

**Potential use of  
Volunteers:** Possibly utilize TPWD & TNC volunteers to assist in locating and monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Echeandia chandleri                      **Candidate Category:** C2  
**Common Name:** lila de los llanos                      **Listing Rank:** 8  
**Range:** Cameron, Kleberg and Nueces Counties  
**Known Occurrences:** Known from 29 sites in south Texas, occurring on clay soils.  
**Reasons for Concern:** Development could extirpate the majority of the populations.  
**Monitoring Objective:** Obtain a population estimate of plants of Echeandia chandleri, completed annually located at five sites.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually in the fall, September - November, early morning, sunny days; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Cameron County: 1-north side of Hwy 4, Loma de la Estrella, 7.4 miles west of Boca Chica Beach; 2-just northwest of junction of Hwy 510 and 100, along 100 up to one mile southeast of this intersection; 3-Loma Pelona, Playa del Rio; Nueces County: 1-Saint James Cemetery; 2-north side of St Rt. 44, 100-1000 feet east of junction St Rt. 2, just west of Violet.

**Methodology:** Permanently delineate and describe each of the total population areas. The population should be sampled to estimate the total number of individuals within the population. To sample, a 50 to 100 meter tape (dependent on the habitat) will be placed within the population. If possible, establish a "permanent" transect location. Along this meter tape, ten 1m x 2m randomly placed quadrats will be randomly placed along either side of the tape, with the 1m edge along the tape. Total number of individuals will be counted within each quadrat. Note any herbivory, insect damage, pollination, recruitment, reproduction activity or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in the density of Echeandia chandleri, between any year, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD.

**Recommendations:** Work with USFWS staff from the Corpus Christi office and Laguna Atascosa National Wildlife Refuge to assist with the monitoring efforts, and possibly relocate and monitor the population that occurs on the Refuge. Verify the record for Green Island and work with Audubon staff to monitor this candidate and others that occur on the Island. Other site records of this species occur on property of unknown ownership.

**Potential use of Volunteers:** Possibly utilize volunteers from the Refuge, local community and TPWD volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Echinocereus papillosus var. angusticeps **Candidate Category:** C2  
**Common Name:** small papillosus cactus **Listing Rank:** 3  
**Range:** Hidalgo (Historical), Jim Hogg (?-questionable identification), and Starr Counties. **G/S Rank:** G3T1S1

**Known Occurrences:** Three occurrences, only one recently verified.

**Reasons for Concern:** Only one population currently known; habitat destruction or alteration due to agriculture and pasture improvements affect this species.

**Monitoring Objective:** Obtain a population count of Echinocereus papillosus var. angusticeps completed annually. One site.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - May; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Jim Hogg County: relocate this population; Starr County: La Reforma Training Area, Tx National Guard, private land.

**Methodology:** Permanently delineate and describe each population. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take the following measures of vigor: height; number of stems, number of fruits and flowers. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If

the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Allen Zimmerman

**Recommendations:** Additional populations need to be located, land owner contact will be necessary for the Starr County site.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eleocharis cylindrica                      **Candidate Category:** C2  
**Common Name:** cylinder spikesedge                      **Listing Rank:** 2  
**Range:** Lubbock (Historic) and Presidio Counties.                      **G/S Rank:** G1S1

**Known Occurrences:** Three occurrences, none recent.

**Reasons for Concern:** Habitat destruction or alteration due to hydrologic changes (stream diversion, lowering of water table), pasture improvement all affect this species. There is direct threat to plants from herbivory and trampling.

**Monitoring Objective:** Obtain a population count of Eleocharis cylindrica to be completed triennially, one site when relocated.

**Priority:** LOW PRIORITY -Need to Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - July; Rhizomatous Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Presidio County: east tributary of Capote Creek, Sierra Vieja Mountains.

**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Take the following measurements: number of flowering or fruiting stems. Note any herbivory, insect damage, pollination, reproduction activity recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If

the cause is related to management, management recommendations will be reviewed.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Dennis Miller, Status Report, 1984; Bill Carr, TPWD.

**Recommendations:** Populations need to be located and land owner contact needed.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Erigeron mimegletes                      **Candidate Category:** C2  
**Common Name:** bushy wild buckwheat                      **Listing Rank:** 12  
**Range:** Brewster (Historic), Crockett (Historic), Edwards (Historic), Kerr, Real, Schleicher, Sutton, Uvalde, and Val Verde (Historic) Counties; Coahuila, Mexico.  
**Known Occurrences:** Fourteen occurrences  
**Reasons for Concern:** Grazing pressures and habitat alteration  
**Monitoring Objective:** Obtain a population count of plants of Erigeron mimegletes completed annually, including selected measures of vigor.  
**Priority:** MEDIUM PRIORITY - Clarify Taxonomy question

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - June; Perennial  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Kerr County: State Route 187 and FM 39; Real County: Leakey and State Route 41 two sites. If possible, locate additional sites on private land that represent various land use practices.  
**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. If the population is too large, take a subset of the population and obtain the following measures of vigor: number of flowering heads. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.  
**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.  
**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable.

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; Guy Nesom; Toney Keeney

**Recommendations:** Listed populations need to be relocated. The description of this species in the Manual of the Vascular Plants of Texas (Correll & Johnston, 1970) has an error in length of ray florets, this needs to be checked.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eriocaulon koernickianum      **Candidate Category:** C2  
**Common Name:** small-headed pipewort      **Listing Rank:** 8  
**Range:** Anderson, Brazos, Limestone, Leon (Questionable identity), and Tyler (Historic) Counties; Arkansas, Georgia and Oklahoma  
**Known Occurrences:** Five occurrences  
**Reasons for Concern:** Low populations, few occurrences, risk of land development  
**Monitoring Objective:** Obtain a population count of Eriocaulon koernickianum completed annually, including selected measures of vigor (see Methodology). Access is needed.  
**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, spring, May - June, Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Anderson County: Engling WMA; Upon field investigations, locate at least one other monitoring site in another county; try to ensure representation of habitat types and risks to the population.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the plants, take the following measure of vigor: height. Take a subset of the population if field conditions warrant. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; Jason Singhurst; Gordon Uno; J. Gentry, R. Tyul, P. Riser, J. Crockett, Status Report, December 1978; Gary Tucker, Status Report, 1983; Linda Watson, Status Survey in Oklahoma, Dec 1989.

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Eriogonum suffruticosum      **Candidate Category:** C2  
**Common Name:** bushy wild buckwheat      **Listing Rank:** 12  
**G/S Rank:** G2S2

**Range:** Brewster, Pecos, and Presidio Counties

**Known Occurrences:** Ten occurrences

**Reasons for Concern:** Road building, dirt biking, grazing, and small acreage development all impact this species.

**Monitoring Objective:** Obtain a population count of plants of Eriogonum suffruticosum completed triennially, including selected measures of vigor.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, April - May; Perennial sub-shrub

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: two sites, Big Bend Ranch State Natural Area. If possible, locate 2 - 3 additional monitoring sites off the SNA that represent various land use practices.

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Tag and count the plants. Take the following measures of vigor: height; number of fruit and flower clusters. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jean Hardy; Jackie Poole, TPWD; Mike Powell and Jeff Clark, Status Review, December 1983.

**Recommendations:** Known populations need to be relocated.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Escobaria guadalupensis                      **Candidate Category:**                      C2  
**Common Name:**                      Guadalupe Mountains pincushion cactus                      **Listing Rank:**                      11  
**Range:**                      Culberson County                      **G/S Rank:**                      G1 S1

**Known Occurrences:**                      Two occurrences

**Reasons for Concern:**                      Few populations; possible collection pressures

**Monitoring Objective:**                      Obtain a population count of Escobaria guadalupensis completed biennially, including selected measures of vigor.

**Priority:**                      MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Biennially, April - May; Annual

**Monitoring Responsibility:**                      TPWD/Guadalupe Mountains National Park

**Monitoring Plan:**

**Site Description:**                      Culberson County: McKittrick Ridge Trail

**Methodology:**                      Permanently delineate and describe the population. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags that are discreetly located. Count the plants. Take the following measures of vigor: height; diameter and number of stems; and number of fruits and flowers. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:**                      Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:**                      3 Days; 2 staff

**Reporting Procedure:**                      Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Ken Heil, Steve Brack, Mike Powell, Allen Zimmerman.

**Recommendations:** Additional populations need to be located, work with staff from Guadalupe Mountains National Park (GMNP) to coordinate and assist in monitoring this species.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD, Status Report, 1989; Lynda Pritchett-Kozak and Liz Ecker, Desert Botanical Garden, Phoenix Arizona; Denise Louie

**Recommendations:** Work with the staff from BIBE to monitor the populations. Castilleja elongata also occurs in the Chisos Mountains and flowers at the same time. These two species should be monitored on the same trip.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and BIBE to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** *Festuca ligulata* **Candidate Category:** C1  
**Common Name:** Guadalupe Mountains fescue **Listing Rank:** 8  
**Range:** Brewster and Culberson Counties; Coahuila, Mexico.  
**Known Occurrences:** Two occurrences, one recent in Big Bend National Park (BIBE).  
**Reasons for Concern:** One known population, vulnerable to trampling along the trail by humans as well as domestic animals used by the trail crew and other trail maintenance activities.  
**Monitoring Objective:** Obtain a population count of *Festuca ligulata* completed annually, one site.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, August - September; Perennial  
**Monitoring Responsibility:** TPWD/BIBE  
**Monitoring Plan:**  
**Site Description:** Brewster County: Big Bend National Park, Chisos Mountains, lower Boot Springs.  
**Methodology:** Permanently delineate and describe the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted and number of fruiting/flowering stalks counted. Note any herbivory, insect damage, reproduction activity or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, compass  
**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department by August 1st of each year noting annual population and any changes/ shifts in sample area.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant unless it can be related to moisture conditions. If the cause is related to management, management recommendations will be reviewed.

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Fryxellia pygmaea</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	small fryxell wort	<b>Listing Rank:</b>	10
		<b>G/S Rank:</b>	G1 SH

**Range:** west Texas (Historical; county unknown); Coahuila, Mexico

**Known Occurrences:** One occurrence from 1854

**Reasons for Concern:** Two collections known; habitat alteration

**Monitoring Objective:** Relocate population, when found- obtain a count of Fryxellia pygmaea to be completed triennially, including selected measures of vigor.

**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, May - June. Look for every three years

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Unknown

**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Take the following measurements: number of fruits and flowers. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Bates; Paul Fryxell.

**Recommendations:** Texas populations need to be relocated. Visit site in Mexico to identify key habitat characteristics.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in relocating and eventually monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Gaillardia aestivalis var. winkleri **Candidate Category:** C2  
**Listing Rank:** 12  
**Common Name:** white firewheel **G/S Rank:** GST1S1

**Range:** Hardin County

**Known Occurrences:** Known from one county, eight records, four sites verified.

**Reasons for Concern:** Low numbers of populations and some types of disturbance could eliminate populations.

**Monitoring Objective:** Obtain a population count of plants of Gaillardia aestivalis var. winkleri, including detailed measures of vigor for each plant (see Methodology), completed annually at each of the four verified sites.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - October; Perennial

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Hardin County: 1-Northwest shoulder of McNelly Bridge Road, 0.4-0.5 road miles northeast of FM 420; 2-Roy E. Larsen Sandylands Preserve, along trails through uplands, 5 1/4 miles; 3-North side of FM 418, south of Dry Creek, 0.2 miles east of Village Creek; 4-Willard Lake Road and Village Creek Road, development east of Lumberton.

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: Number of fruits and flowers; and height. Note any herbivory, insect damage, reproduction activity, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Ike McWhorter, TNC

**Recommendations:** Work with the staff from the Nature Conservancy to monitor populations on the Sandylands Preserve.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from TNC and regional TPWD volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Helianthus praecox ssp. hirtus      **Candidate Category:** C2  
**Common Name:** Dimmit sunflower      **Listing Rank:**  
**Range:** Dimmit County      **G/S Rank:** G4T1QS1

**Known Occurrences:** One population is known in U.S. in the area of Carrizo Springs. Population of approximately 60-80 plants in 1987, approximately 10 plants in 1993. Also occurs with Carrizo Springs Pocket Gopher (C2).

**Reasons for Concern:** Only two known occurrences.

**Monitoring Objective:** To obtain a total population census of all plants of Helianthus praecox ssp. hirtus including detailed measures of vigor for each plant (see Methodology) located at the Carrizo Springs site, annually.

**Priority:** **HIGH PRIORITY** - there are taxonomic questions regarding this subspecies that need to be clarified.

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**PLAN**

**Monitoring Frequency/Season:** Annually, August, during flowering; Annual

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Dimmit County: Carrizo Springs, located in the middle of town in an overgrown field across from the ACCO feed building on FM 186. As of fall 1993, a community center and parking lot occupy the majority of the field. Small remnant patch remaining. Additional site discovered fall of 1993.

**Methodology:** Permanently delineate and describe the total population area and count individuals plants. If possible mark boundaries using easily recognizable landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: number of primary and secondary stems; number of fruits and flowers; and height. Note any herbivory, insect damage, reproductive activity, recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife

Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Loren Rieseberg, Indiana University, Department of Biology, Bloomington, Indiana; Angela Brooks, USFWS-Corpus Christi.

**Recommendations:** Status survey is being completed by BRIT. Work with the citizens of Carrizo Springs to raise their awareness of the unique plant they have in their town.

**Potential use of  
Volunteers:** May be able to utilize regional TPWD volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Genistidium dumosum                      **Candidate Category:** C2  
**Common Name:** brush-pea                                      **Listing Rank:** 10  
   **G/S Rank:** G1S1

**Range:** Brewster County; Coahuila, Mexico.

**Known Occurrences:** Three occurrences

**Reasons for Concern:** Low numbers, one population along highway susceptible to highway expansion and maintenance activities.

**Monitoring Objective:** Obtain a population count of plants of Genistidium dumosum completed triennially, including selected measures of vigor.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - September; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: nine miles east of Lajitas, south side of Highway 170

**Methodology:** Permanently delineate and describe the total population area. Ideally, a map of each population should be completed as baseline information. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants, take the following measures of vigor: height and number of flowers/fruits. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes; metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** J. Clark, A.M. Powell, Status Report, Dec 1982; Jackie Poole, TPWD, Status Report, Dec 1992; Liz Slauson, Desert Botanical Garden, Arizona.

**Recommendations:** Highway right-of-way monitoring completed, may be able to continue working with staff from the Highway Department to continue monitoring this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Helianthus paradoxus                      **Candidate Category:** C1  
**Common Name:** puzzle sunflower                      **Listing Rank:**  
**Range:** Pecos and Reeves Counties; New Mexico                      **G/S Rank:** G2S1

**Known Occurrences:** Eight occurrences

**Reasons for Concern:** Species susceptible to grazing pressures and adversely affected by the lowering of the water table from pumping of groundwater for irrigation purposes; also, hybridization with other annual sunflowers is a concern.

**Monitoring Objective:** Obtain a population count of plants of Helianthus paradoxus completed annually, one site.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, September; Annual

**Monitoring Responsibility:** TPWD/TNC

**Monitoring Plan:**

**Site Description:** Pecos County: Diamond Y Springs, TNC Preserve; highway right-of-way site.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants that occur within 26 - 5m x 10m<sup>2</sup> plots. Take the following measures of vigor: stem height, number of flowers. Note any herbivory, insect damage, recruitment, hybridization or other conditions. Set up a standardized photo point location or locations to encompass the population.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 2 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered

significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD, Status Report Update, 1992; Wagner and Sabo, Status Report, 1977; Dennis Miller et al, Status Report, 1982; Sivinski, Status Report, New Mexico, 1992; Bill Van Auken.

**Recommendations:** Work with the staff from TNC to monitor the populations.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TNC and the former landowner to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Hexalectris nitida                      **Candidate Category:** C2  
**Common Name:** Glass Mountain coral-root              **Listing Rank:** 11  
**Range:** Bandera, Brewster, Coryell, Dallas, Hays, Kendall, Pecos (Historical), Taylor  
and Travis Counties; Coahuila, Mexico; possibly New Mexico  
**Known Occurrences:** Twelve known occurrences, widely separated localities  
**Reasons for Concern:** Few individuals, fugitive.  
**Monitoring Objective:** Obtain a population count of plants of Hexalectris nitida, including  
detailed measures of vigor for each plant (see Methodology), completed  
triennially at selected sites.  
**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, August; Perennial  
**Monitoring Responsibility:** TPWD/NPS/USFWS  
**Monitoring Plan:**  
**Site Description:** Taylor County: Abilene State Recreation Area, dry gravelly areas  
south of county road, southern tip of the SRA; Brewster County: Big  
Bend National Park, Pine Canyon Trail and North side of Boot Canyon;  
Travis County: Post Oak Ridge Wildlife Refuge, Webster Tract.  
**Methodology:** Permanently delineate and describe each of the total population areas.  
If possible mark boundaries using stable, easily recognized landmarks,  
stakes and/or metal tags. Count the plants, take the following  
measurements for each plant: Number of fruits and flowers; and  
height. Note any herbivory, insect damage or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 1 Day at each site; 2-4 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total  
population from one year to the next will be considered  
significant. In the event of significant or unacceptable decline,  
TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD

**Recommendations:** Work with the staff from TPWD, the National Park and the National Wildlife Refuge to monitor populations on the respective properties. A more rigorous study regarding the life history of this species and that of H. warnockii should be undertaken at the State Recreation Area where these both occur. In time additional monitoring sites could be established at Fort Hood Military Reservation and Camp Barkley National Guard site as well as on private property.

**Potential use of Volunteers:** Possibly utilize volunteers from the National Park, National Wildlife Refuge, regional TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Hexalectris warnockii                      **Candidate Category:** C2  
**Common Name:** Warnock's coral-root                      **Listing Rank:** ?  
**Range:** Brewster, Dallas, Gillespie, Hays, Jeff Davis, Taylor and Terrell Counties;  
Arizona and New Mexico                      **G/S Rank:** G2S2

**Known Occurrences:** Fifteen known occurrences, widely separated localities

**Reasons for Concern:** Few individuals, fugitive.

**Monitoring Objective:** Obtain a population estimate of plants of Hexalectris warnockii, including detailed measures of vigor for each plant (see Methodology), completed triennially at selected sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - August; Perennial

**Monitoring Responsibility:** TPWD/NPS

**Monitoring Plan:**

**Site Description:** Taylor County: Abilene State Recreation Area, dry gravelly areas south of county road, southern tip of the SRA; Brewster County: Big Bend National Park, various locations.

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants, take the following measurements for each plant: Number of fruits and flowers; and height. Note any herbivory, insect damage or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 1 Day at each site, + 2 days travel to each site; 5-6 Days total; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, TPWD

**Recommendations:** Work with the staff from TPWD and the National Park to monitor populations on the respective properties. Ensure diverse habitats are represented in the various monitoring sites. A more rigorous study regarding the life history of this species and that of *H. nitida* should be undertaken at the State Recreation Area where these both occur. In time additional monitoring sites could be established at Camp Barkley National Guard site as well as monitoring populations that occur on private property.

**Potential use of Volunteers:** Possibly utilize volunteers from the National Park and regional TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Hibiscus dasycalyx                      **Candidate Category:** C2  
**Common Name:** Neches River rose-mallow                      **Listing Rank:** 2  
**Range:** Cherokee, Harrison, Houston, and Trinity Counties  
**Known Occurrences:** Seven occurrences  
**Reasons for Concern:** Few populations, those along roadways subject to disturbance of road building and maintenance activities; invasive non-natives; changes in hydrology; and impacts from utility line maintenance.  
**Monitoring Objective:** Obtain a population count of Hibiscus dasycalyx from two sites, completed annually including selected measures of vigor.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, August; Perennial

**Monitoring Responsibility:** TPWD/USFWS

**Monitoring Plan:**

**Site Description:** Houston County: southwest of Lovelady; Trinity County: roadside park, near Black Cat Lake, Tx 94.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Inconspicuously tag and count the plants. Take the following measurements of vigor: height, number of primary stems from the base; and total number of fruits and flowers. Note any pollination, insect damage, recruitment, hybridization or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Kathryn Kennedy and Jackie Poole, Status Report, 1990; Bill Carr, Genz Janssen, TPWD; Steve Orzell, Florida NHP; Michael Warnock, Sam Houston State University, Status Report; Jason Singhurst.

**Recommendations:** Work with the staff from the Highway Department to monitor the populations. Highway right-of-way monitoring in progress.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Isoetes lithophila **Candidate Category:** C2  
**Common Name:** rock quillwort **Listing Rank:** 8  
**G/S Rank:** G2S2

**Range:** Burnet, Llano and Mason Counties

**Known Occurrences:** Sixteen known occurrences.

**Reasons for Concern:** Occur in vernal pools, very susceptible to disturbance.

**Monitoring Objective:** Obtain a population survey of Isoetes lithophila completed annually at selected sites during the spring after sufficient rainfall. Flexibility is essential.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, April - June; Perennial

**Monitoring Responsibility:** TPWD/LCRA

**Monitoring Plan:**

**Site Description:** Burnet Count: Inks Lake State Park, three locations; LCRA tract JE-6, one location; Llano County: Enchanted Rock State Natural Area, two locations; LCRA tract JW-6, one, possibly two locations.

**Methodology:** Detailed maps showing precise locations of vernal pools will be necessary to permanently delineate and describe each of the seven+ population areas. The population should be surveyed to estimate the percent cover within the pool area circumscribed. Set-up photo point records for each pool, using a photo scale stick.

**Field Equipment Needed:** Measuring tapes, quadrats, camera, photo scale stick.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring

design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Chester Rowell, Status Report, 1983

**Recommendations:** Work with the staff from TPWD and the Lower Colorado River Authority to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from the two State Parks and LCRA volunteers to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Justicia runyonii      **Candidate Category:** C2  
**Common Name:** Runyon's water-willow      **Listing Rank:** 8  
   **G/S Rank:** G2S2

**Range:** Brazoria, Cameron, Goliad (?)\*, and Hidalgo County; Tamaulipas, Mexico  
   \*(?-questionable locality or identification)

**Known Occurrences:** Twenty-one occurrences, at least three extirpated.

**Reasons for Concern:** Populations could be extirpated by land clearing activities, and impacts of exotics could significantly out compete the remaining native stands.

**Monitoring Objective:** Obtain a population survey of Justicia runyonii, including detailed measures of vigor for each plant in the sample set (see Methodology), completed triennially at eight selected sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, September - November; Perennial

**Monitoring Responsibility:** TPWD/USFWS

**Monitoring Plan:**

**Site Description:** Cameron County: 1-Resaca de la Palma State Park, four locations; 2-USFWS, Thompson Road Brush Tract; 3-Sabal Palm Grove Sanctuary; Hidalgo County: 1-Santa Ana National Wildlife Refuge; 2-Las Palomas Wildlife Management Area.

**Methodology:** Permanently delineate and describe each of the eight population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. The population should be sampled to estimate the total number of individuals within the population. To sample, a 100 meter tape will be placed within the population. Along this meter tape, ten 5m x 5m quadrats will be randomly selected placed along either side of the tape. Total number of individuals will be counted within each quadrat. Take the following measurements: number of primary and secondary stems; number of fruits and flowers; and height. Note any herbivory, insect damage, reproduction activity, recruitment or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in the density of Justicia runyonii between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, 5m x 5m quadrat.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, Status Report, 1989; Mike Heep; Gary Waggerman; Rose Farmer; Jim Copeland

**Recommendations:** Work with the staff from TPWD, USFWS, and Audubon to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from the State Park, Wildlife Management Area, USFWS and Audubon members to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Justicia wrightii                      **Candidate Category:** C2  
**Common Name:** Wright's water-willow                      **Listing Rank:** 8  
**Range:** Brewster (Historical), Pecos, and Val Verde Counties                      **G/S Rank:** G2 S2

**Known Occurrences:** Seven occurrences

**Reasons for Concern:** No recent populations have been found, occur on areas of intense grazing pressures.

**Monitoring Objective:** Obtain a population count of plants of Justicia wrightii completed triennially after populations are relocated.

**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, April - May

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Pecos County:

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and if appropriate, tag them. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Work with the staff from TPWD to monitor the populations.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Kallstroemia perennans</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	perennial caltrop	<b>Listing Rank:</b>	11
		<b>G/S Rank:</b>	G1S1

**Range:** Brewster, Presidio and Val Verde Counties

**Known Occurrences:** Five occurrences

**Reasons for Concern:** Few populations, low number of individuals, ORVs

**Monitoring Objective:** Obtain a population count of plants of Kallstroemia perennans completed annually, including selected measures of vigor.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, August - October; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend Ranch SNA; Presidio County: 20 miles southeast of Redford along Hwy 170; Val Verde County: 21 miles west of Comstock on Hwy 90.

**Methodology:** Permanently delineate and describe the population area. Ideally, a map of each population should be completed as baseline information. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Tag and count the plants. Take the following measures of vigor: height and number of fruits and flowers. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 - 4 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Michael Powell

**Recommendations:** Site staff at Big Bend Ranch State Natural Area may be able to monitor this species on the SNA.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lachnocaulon digynum                      **Candidate Category:**                      C2  
**Common Name:**    tiny bog buttons                                      **Listing Rank:**                                      11  
**Range:**                      Jasper and Newton Counties; Alabama, Florida, Louisiana and Mississippi  
**Known Occurrences:**                      Three occurrences  
**Reasons for Concern:**                      Changes in the water table, grazing impacts on the habitat, fire suppression and clearcutting  
**Monitoring Objective:**                      Obtain a population count of Lachnocaulon digynum completed biennially, including selected measures of vigor.  
**Priority:**                                      MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Biennially, Perennial, Late Summer - Fall  
**Monitoring Responsibility:**                                      TPWD  
**Monitoring Plan:**  
**Site Description:**                      Jasper County: Little Rocky Nature Preserve; Newton County: two sites, Scrappin' Valley Wildlife and Research Area and McKinn Creek.  
**Methodology:**                                      Permanently delineate and describe the population. Ideally, a map of each population should be completed as baseline information. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags that are discreetly located. Count the plants. Adjust if necessary if field conditions warrant. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.  
**Field Equipment Needed:**                      Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:**                      3 Days; 2 staff  
**Reporting Procedure:**                                      Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:**                                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jason Singhurst, TPWD; Steve Orzell, FI NHP

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Leavenworthia texana                      **Candidate Category:** C2  
**Common Name:** Texas golden glade cress                      **Listing Rank:** 2  
**Range:** Nacogdoches (introduced), Sabine, and San Augustine Counties  
**Known Occurrences:** Eight occurrences  
**Reasons for Concern:** Few populations located along roadsides or grazed pastures, subject to road maintenance pressures and grazing.  
**Monitoring Objective:** Obtain a population count of Leavenworthia texana to be completed annually at three select sites, including detailed measures for each plant (see Methodology).  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, March; Annual  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Sabine County: Tx 21 south of Geneva; San Augustine County: east of San Augustine- two sites.  
**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted, taking the following measurements: number fruiting/flowering stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions. Access is needed.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Steve Orzell, Florida NHP; Wm Mahler; Johnnie Gentry, Jr. et al, Status Report, 1978; Elray Nixon; Robert George.

**Recommendations:** Work with landowners to enlist their assistance. This annual species may move some distance from year to year, the exact area of the population needs to be very well defined and some time should be spent each year searching for suitable habitat in the vicinity (approximately 1 mile radius) for other populations.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lepidospartum burgessii      **Candidate Category:** C2  
**Common Name:** gypsum scalebroom      **Listing Rank:** 8  
**G/S Rank:** G2 S1

**Range:**      Hudspeth County; New Mexico

**Known Occurrences:**      Six occurrences

**Reasons for Concern:**      Small range, substrate specific, few localities, low numbers as well as some grazing, off-road vehicles, and road building impact this species.

**Monitoring Objective:**      Obtain a count of Lepidospartum burgessii to be completed biennially, including selected measures of vigor.

**Priority:**      MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Biennially, Perennial, May - late Summer

**Monitoring Responsibility:**      TPWD/TNC/NPS

**Monitoring Plan:**

**Site Description:**      Hudspeth County: Dell City, two sites

**Methodology:**      Permanently delineate and describe the total population area. Ideally, a map of the population should be completed as baseline information. The population should be counted. Tag the plants. Take the following measures of vigor: number of flowering heads or clusters, height, and basal stem diameter. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:**      Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:**      3 Days; 2 staff

**Reporting Procedure:**      Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** R. Worthington; V. Davila, L. Higgins; C. Rowell, Status Report, Dec 1983; Laura Huennecke, NMSU Las Cruces has been monitoring this species in New Mexico and possibly in Texas.

**Recommendations:** Work with TNC and Guadalupe Mountains National Park staff to monitor this species. Contact Laura Huennecke, NMSU Las Cruces to discuss her work on this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD, Guadalupe Mountain National Park and/or TNC volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Lesquerella thamnophila                      **Candidate Category:** PE  
**Common Name:** Zapata bladderpod                                  **Listing Rank:** 2  
**Range:** Starr and Zapata Counties                                      **G/S Rank:** G1S1

**Known Occurrences:** Three populations are known in U.S., none known in Mexico.

**Reasons for Concern:** Susceptible to grazing, clearing and development. In 1985 there were approximately 6000 plants observed, in 1986 there were approximately 48, no count was made in 1988 but plants were observed. Fluctuation was due to drought.

**Monitoring Objective:** To obtain a total population census of all plants of Lesquerella thamnophila located at each of the three sites completed annually.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually in April during flowering; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Starr Cty.-Santa Margarita Ranch, 5 acres-private; Zapata Cty.- Tigre Chiquita, 10 acres-private and Tx DOT; Zapata Cty.-Falcon Lake West, 15 acres-private. Need site access.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using easily recognized landmarks, stakes and/or metal tags. Obtain a total count of individuals. Note any recruitment.

**Field Equipment Needed:** Measuring tapes, Flagging/pin flags, Stakes, Metal tags and Wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline,

TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Drs. Elizabeth Shaw and Reed Rollins, Department of Botany, Harvard University, Cambridge, MA

**Recommendations:** Work with the USFWS-Corpus Christi office, Rio Grande National Wildlife Refuge and TPWD Wildlife Division staff to look for additional populations in the Starr and Zapata County areas. Enlist site staff in the monitoring effort. Also work with the Tx DOT staff to take on the responsibility of monitoring on the highway right-of-way. This species is being proposed endangered.

**Potential use of Volunteers:** May be able to utilize TPWD volunteers from the Valley as well as from the Refuges.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Liatrix tenuis **Candidate Category:** C2  
**Common Name:** slender gay-feather **Listing Rank:** 8  
**G/S Rank:** G2G3 S2S3

**Range:** Angelina, Jasper, Newton, Sabine, San Augustine and Tyler Counties;  
Louisiana (questionable identification)

**Known Occurrences:** Thirty-four occurrences

**Reasons for Concern:** Fire suppression, habitat destruction.

**Monitoring Objective:** Obtain a population count of Liatrix tenuis completed biennially at selected sites. Four sites, additional sites may be added upon field investigation.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, June - August

**Monitoring Responsibility:** TPWD/USFS

**Monitoring Plan:**

**Site Description:** Angelina County: Tx 63, 12 miles south of Zavalla; Jasper County: Boykin Spring Recreation Area; Newton County: Sabine County line site; Sabine County: Sabine National Forest, Compartment 139.

**Methodology:** Permanently delineate and describe the population areas. Ideally, a map of the population should be completed as baseline information. Count the plants (upon site visit, total count may not be possible, modify as necessary). Measures of vigor may be taken, including: number of flowering stems. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, TPWD; Steve Orzell, Florida NHP; Rob Evans, USFS

**Recommendations:** Work with the staff from US Forest Service to monitor the populations located on their property. Species easily confused with other *Liatris* species, monitors must know the taxonomy well.

**Potential use of**

**Volunteers:** Possibly utilize volunteers from TPWD and USFS to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



needed to determine appropriate management.

**Location of Archived Data:**

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

Dr. David Wester, TTU has been monitoring Faskin Ranch, a low level radioactive waste authority site.

**Recommendations:**

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:**

Summer 1995

**Plan Approval Date:**

**Date of Implementation**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Lycium texanum</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	Texas wolf-berry	<b>Listing Rank:</b>	11
		<b>G/S Rank:</b>	G2 S2

**Range:** Brewster, Culberson and Hudspeth Counties

**Known Occurrences:** Seven occurrences

**Reasons for Concern:** Few known populations, low numbers, susceptible to disturbance.

**Monitoring Objective:** Obtain a population count of plants of Lycium texanum completed triennially, once relocated.

**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, July - October

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: south of Alpine; Culberson County: east of Van Horn; Hudspeth County: Sierra Blanca, Faskin Ranch

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Machaeranthera aurea                      **Candidate Category:** C2  
**Common Name:** Houston machaeranthera                      **Listing Rank:** 2  
**Range:** Galveston and Houston Counties                      **G/S Rank:** G2S2

**Known Occurrences:** Twenty-one occurrences are known. Twenty occurrences are known from Harris County, one from Galveston County (1974). Status Report completed in 1980.

**Reasons for Concern:** Located in urban Houston area, subject to urban expansion. Also occurs with Hymenoxys texana (LE) and Chloris texensis (C2).

**Monitoring Objective:** Obtain a total population census of at least six occurrences of plants of Machaeranthera aurea located in the Houston area, and the one occurrence in Galveston County completed annually.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, early to late October and November; Annual

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Harris County:** Six locations are to be monitored. Sites to be monitored need to be revisited to ensure populations still exist.  
**Galveston County:** One location in San Leon.

**Methodology:** Permanently delineate and describe the total population area and count individuals. If the monitoring personnel determine that the population is too large to easily perform a census in one day, the population should be sampled to estimate the total number of individuals within the population. To sample, a 100 meter tape will be placed within the population, (the transect to be permanently designated and described). Along this meter tape, ten 5m x 25m quadrats will be randomly placed along either side of the tape, with the 5m side on the tape. Total number of individuals will be counted within each quadrat.

For this estimate, obtain 90% confidence that the estimate is within 25% of the value of the population and be 90% sure of detecting a 20% change in the density of Machaeranthera aurea between any two years and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes-at least 4, pin flags, stakes, metal tags/wires, compass (s), random numbers table.

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Larry E. Brown, Houston Community College; Doug Williams; Greg Wieland, Mercer Arboretum; Kathy Nemecek, USFWS-Clear Lake

**Recommendations:** Work with the county highway maintenance staff to assist with the responsibility of monitoring on the populations that occur on the highway right-of-way.

**Potential use of Volunteers:** Houston area Native Plant Society members may be enlisted to help monitor as well as area TPWD volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Manfreda longiflora **Candidate Category:** C2

**Common Name:** Runyon's huaco

**Listing Rank:** 5

**G/S Rank:** G2S2

**Range:** Cameron (Historical), Hidalgo and Starr Counties

**Known Occurrences:** Nine occurrences in two counties, seven have been recently observed.

**Reasons for Concern:** Development could impact this species which is in low numbers and has few known populations; also potential collecting could impact this species.

**Monitoring Objective:** Obtain a population count of Manfreda longiflora completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, September; Perennial

**Monitoring Responsibility:** TPWD/USFWS

**Monitoring Plan:**

**Site Description:** **Hidalgo County:** two sites, one on Lower Rio Grande Valley National Wildlife Refuge; **Starr County:** five sites, LRGV NWR, highway-right-of-way, and private, (need access).

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: number of fruits and flowers; and height. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Noreen Damude and Jackie Poole, Status Report, 1990; Marshall Johnston

**Recommendations:** Work with the staff from TPWD and USFWS to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD and USFWS to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Matelea radiata                      **Candidate Category:** C2  
**Common Name:** Falfurrias milkvine                      **Listing Rank:** 11  
**Range:** Brooks (Historical), Hidalgo (Historical), and Starr (Questionable identification) Counties  
**Known Occurrences:** Two occurrences  
**Reasons for Concern:** Farming and pasture improvements  
**Monitoring Objective:** Obtain a population count of plants of Matelea radiata completed once population(s) are relocated and/or located.  
**Priority:** LOW PRIORITY - Relocate

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**PLAN**

**Monitoring Frequency/Season:** Triennially, June - July, Look for every three years;  
Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** Brooks County: Relocate 1909 population

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them at the base if possible. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Work with the staff from the local area to monitor the populations.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Matelea texensis **Candidate Category:** C2  
**Common Name:** Texas milkvine **Listing Rank:** 8  
**Range:** Brewster County **G/S Rank:** G1S1

**Known Occurrences:** Species is known from a single location south of Alpine on private property. Status Report, 1983, Brian Hanks and A. Michael Powell.

**Reasons for Concern:** Single population presently extant. The highway population may be extinct due to the widening of Hwy 118 in the early 1980's. No other sites are listed in the database however, other populations apparently occur on private property.

**Monitoring Objective:** We want a total population census of all plants of Matelea texensis, including detailed measures of vigor for each individual plant (see Methodology) completed annually, providing access is granted on at least one site.

**Priority:** HIGH PRIORITY.

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**PLAN**

**Monitoring Frequency/Season:** Annually in August; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: extant population occurred in igneous soil along highway, alt. 4,650 ft. Other site(s) location unknown.

**Methodology:** Permanently delineate and describe the total population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Take the following measurements of the plants: an annual count of flowers and fruits, and number of primary and secondary stems, and basal stem diameter. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Barton Warnock; Brian G. Hanks & Michael Powell, Status Report 1983.

**Recommendations:** Need to search for additional populations.

**Potential use of  
Volunteers:** Possibly utilize regional TPWD volunteers in the area.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Nolina arenicola                      **Candidate Category:** C2  
**Common Name:** sand sacahuista                      **Listing Rank:** 11  
**Range:** Culberson, El Paso (Questionable identification), and Hudspeth Counties  
**Known Occurrences:** Eight occurrences  
**Reasons for Concern:** Sheep and goat grazing on inflorescences and pasture improvements.  
**Monitoring Objective:** Obtain a population count of plants of Nolina arenicola completed annually with selected measures of vigor.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, May - June  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** Culberson County: Highway right-of-way; Hudspeth County: Guadalupe Mtns NP. If possible, locate additional monitoring sites that represent additional land use practices.  
**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them. Take selected measures of vigor: number of inflorescences. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.  
**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.  
**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole and Gena Janssen, Mary Candee, TPWD

**Recommendations:** Work with the staff from Guadalupe Mountains National Park to coordinate and monitor the population in Hudspeth County and the Highway Dept to monitor the HROW. This will require taxonomic skill.

**Potential use of  
Volunteers:** Possibly utilize volunteers from Guadalupe Mountains NP and TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Opuntia arenaria                      **Candidate Category:** C2  
**Common Name:** sand prickly-pear                      **Listing Rank:** 2  
**Range:** El Paso and Hudspeth (historical) Counties; New Mexico; Chihuahua, Mexico  
**Known Occurrences:** Six occurrences in Texas  
**Reasons for Concern:** Habitat destruction from development impact this species. Potential growth as a result of the free trade agreement may greatly impact this species.  
**Monitoring Objective:** Obtain a population count of Opuntia arenaria completed annually, one site.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, May - June; Perennial  
**Monitoring Responsibility:** TPWD  
**Monitoring Plan:**  
**Site Description:** El Paso: I-10, N. Mesa.  
**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. Count the population. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Sabo, Status Report, 1981; Richard Worthington, UTEP.

**Recommendations:** Work with the staff from the Highway Department and/or Richard Worthington to assist in monitoring and managing for this species.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Opuntia auresispina</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	golden-spine prickly-pear	<b>Listing Rank:</b>	11
		<b>G/S Rank:</b>	G1 S1
<b>Range:</b>	Brewster County		
<b>Known Occurrences:</b>	One occurrence		
<b>Reasons for Concern:</b>	Only one population, low numbers		
<b>Monitoring Objective:</b>	Obtain a population count of plants of <u>Opuntia auresispina</u> completed triennially.		
<b>Priority:</b>	MEDIUM PRIORITY		

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**PLAN**

**Monitoring Frequency/Season:** Triennially

**Monitoring Responsibility:** TPWD/Big Bend National Park

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park

**Methodology:** Permanently delineate and describe the population area. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Ken Heil, Steve Brack

**Recommendations:** Work with the staff from Big Bend National Park to monitor the populations. May require some taxonomic skill.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**





adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Phil Clayton.

**Recommendations:** Coordinate monitoring efforts with other species in the valley.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Opuntia imbricata var. argentea      **Candidate Category:** C2  
**Common Name:** silver cholla      **Listing Rank:** 12  
**Range:** Brewster County      **G/S Rank:** G5T1S1

**Known Occurrences:** Four occurrences

**Reasons for Concern:** Known only from a few locations, may be potential for illegal collecting.

**Monitoring Objective:** Obtain a population count of Opuntia imbricata var. argentea completed biennially.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially; Perennial, June -July

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park, two sites, Rooney's Place and Mariscal Mine Ruins. If at all possible, locate another population under different land use practices off the park, providing access is allowed, and monitor.

**Methodology:** Permanently delineate and describe the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be tagged and counted or estimated. Take the following measures of vigor: height, number of joints, and number of flowers and fruits. Note any herbivory, insect damage, pollination or reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable

decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; Denise Louie, BIBE

**Recommendations:** Work with staff from Big Bend National Park to coordinate monitoring this species.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring cacti is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Ostrya chisosensis                      **Candidate Category:** C2  
**Common Name:** Big Bend hop-hornbeam                      **Listing Rank:** 11  
**Range:** Brewster County; northern Mexico                      **G/S Rank:** G2S1

**Known Occurrences:** Five occurrences, only one recently verified in Big Bend National Park (BIBE).

**Reasons for Concern:** Low population numbers

**Monitoring Objective:** Obtain a population count of Ostrya chisosensis completed every three years.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, May - June

**Monitoring Responsibility:** TPWD/BIBE

**Monitoring Plan:**

**Site Description:** Brewster County, Chisos Mountains, Boot Spring, Emory Peak Trail below the Pinnacles.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be tagged and counted. Measure dbh and note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, calipers, and dbh tape.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

**Recommendations:** Work with the staff from the National Park to monitor this species.

**Potential use of**

**Volunteers:**

Possibly utilize TPWD and/or BIBE volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Oxypolis ternata                      **Candidate Category:** C2  
**Common Name:** threeleaf cowbane                      **Listing Rank:**  
**Range:** Hardin and Tyler (Questionable identification) Counties; Florida, Georgia, Mississippi, North Carolina, South Carolina                      **G/S Rank:** G3? S1

**Known Occurrences:** Two occurrences

**Reasons for Concern:** Only two populations have been found

**Monitoring Objective:** Obtain a population count of plants of Oxypolis ternata completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually; Perennial from tubers, late Summer - early Fall?

**Monitoring Responsibility:** TPWD/USFS

**Monitoring Plan:**

**Site Description:** Hardin County: Big Thicket

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Tag and count the plants. Modify as necessary. Take the following measures of vigor: height and number of fruiting and flowering clusters. Note any herbivory, insect damage, reproduction activity, including recruitment, or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### **REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Rob Evans, USFS; Geraldine Watson

**Recommendations:** Work with the staff from TPWD and the US Forest Service to monitor the populations.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and the Forest Service to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**





appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Noreen Damude and Jackie Poole, Status Report, 1990, Gena Janssen, TPWD.

**Recommendations:** Look for additional populations. Monitoring in progress for this species.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Paronychia wilkinsonii                      **Candidate Category:** C2  
**Common Name:** Wilkinson's whitlow-wort                      **Listing Rank:** 11  
**Range:** Brewster County; Chihuahua and Coahuila, Mexico                      **G/S Rank:** G2 S2

**Known Occurrences:** Six occurrences

**Reasons for Concern:** Few known populations, low numbers, may be substrate specific

**Monitoring Objective:** Obtain a population count of plants of Paronychia wilkinsonii completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually; Perennial; April - ?

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: one to two sites near Marathon

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take selected measures of vigor: height, length, and width. Upon site visit, it may be determined to count the number of stems or the height and width of the largest stem. Modify as necessary. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD

**Recommendations:** The Highway right-of-way monitoring project has been completed.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation**



**Location of Archived Data:** management.  
Texas Natural Heritage Program, Texas Parks & Wildlife  
Department, 4200 Smith School Road, Austin, TX 78744; and  
U.S. Fish and Wildlife Service, Ecological Services Office, 611  
East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, Gena Janssen, Sylvestre Sorrola, Mary Candee, TPWD.

**Recommendations:** Work with the city of Del Rio, San Felipe Country Club and Texas Department of Transportation to monitor populations on respective properties. Track individuals through time to better understand responses to drought. Monitoring in progress at this site.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Penstemon alamosensis      **Candidate Category:** C2  
**Common Name:** Alamo beardtongue      **Listing Rank:** 8  
**G/S Rank:** G2 S1

**Range:** El Paso County; New Mexico

**Known Occurrences:** Two occurrences

**Reasons for Concern:** Low numbers and few populations, susceptible to grazing

**Monitoring Objective:** Obtain a population count of plants of Penstemon alamosensis completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually; Perennial, late April - May

**Monitoring Responsibility:** TPWD/DOD(Ft. Bliss)

**Monitoring Plan:**

**Site Description:** El Paso County: Ft. Bliss, two sites

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and tag them at the base if possible. Take the following measures of vigor: height, number of primary stems, number of flowers and fruits. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

Richard Worthington; R. Spellenberg, Status Report, May 1981; Sandra Limerick

**Recommendations:**

Work with the staff from Ft. Bliss to monitor this species on their land.

**Potential use of  
Volunteers:**

Possibly utilize volunteers from TPWD and/or Ft. Bliss to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Perityle huecoensis **Candidate Category:** C2  
**Common Name:** Hueco rock-daisy **Listing Rank:** 5  
**Range:** El Paso County **G/S Rank:** G1S1

**Known Occurrences:** One population is known in U.S. in North Hueco Mountains.

**Reasons for Concern:** Susceptible to disturbance, and only one known location of this species.

**Monitoring Objective:** To obtain a total population census of all plants of Perityle huecoensis located at the Hueco Mountains site, Canyons 4 and 5 completed biennially.

**Priority:** HIGH PRIORITY.

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**PLAN**

**Monitoring Frequency/Season:** Biennially in September during flowering; Perennial

**Monitoring Responsibility:** Ft. Bliss Military Reservation-Dept. of Defense-Conservation Agreement with USFWS

**Monitoring Plan:**

**Site Description:** El Paso County: Hueco Mountains, 2.5 miles east of Nations East Well and approximately 3 miles west of Hueco Tanks State Historical Park, area primarily within and at the southeast corner of Fort Bliss Military Reservation. Canyons 4 and 5 hold the three sub-populations of Perityle huecoensis, canyon 5, near the mouth of the canyon on the East side with a north exposure (70 plants in 1991); back of the canyon (367 plants in 1991); canyon 4, on north cliff exposure (21 plants in 1991).

**Methodology:** Permanently delineate and describe the total population area and count individuals plants. If possible mark boundaries using easily recognizable landmarks, stakes and/or metal tags. In some cases it may be necessary to scan for and count individuals using binoculars. Note any reproductive activity or recruitment.

**Field Equipment Needed:** Binoculars, measuring tapes, pin flags, stakes, metal tags/wires

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758; Department of Defense-Fort Bliss Military Reservation, Ft. Bliss, TX.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Richard Worthington, The University of Texas at El Paso, Department of Biological Sciences; Kevin von Finger; A. Michael Powell, Sul Ross State University, Department of Biology; Rafael Corral.

**Recommendations:** Work with the staff from Ft. Bliss Military Reservation. They are contracting a small mammal research project through Texas Tech (S. Demaris) to assess potential impact of military tank operations on the arroyos. Also, a wildfire went through the area in 1993 and it would be interesting to determine any affects it had on the populations of *P. huecoensis* based on Richard Worthington's baseline data.

**Potential use of Volunteers:** TPWD park volunteers, personnel from Ft. Bliss Military Reservation and graduate and undergraduate students from Sul Ross State University may be available for monitoring.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Philadelphus ernestii                      **Candidate Category:** C2  
**Common Name:** canyon mock orange                      **Listing Rank:** 8  
**Range:** Blanco, Comal, Hays, Kendall and Travis Counties  
**Known Occurrences:** Known from 12 sites in Texas.  
**Reasons for Concern:** Limited occurrences and potential disturbance could affect the populations.  
**Monitoring Objective:** Obtain a population estimate of plants of Philadelphus ernestii completed biennially located at six sites.  
**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially during flowering in April, with visual check during the intervening years; Deciduous shrub

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Blanco County:** Pedernales State Park, Bee Creek; **Comal County:** South side of Guadalupe River, ca 0.7-0.8 river miles west of "first" crossing on River Road; **Hays County:** Stream below Dead Man's Hole; **Kendall County:** along Curry Creek, above and below Edge Falls, 5 miles south of Kendalia--Need Access; **Travis County:** 1-West Bull Creek and 2-Hamilton Pool.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be sampled to estimate the total number of individuals within the population. To sample, one or more 50 to 100 meter transect lines (dependent on the habitat) will be placed within the population. If possible, establish a "permanent" transect location. Along the line-intercept meter tape, total number of stems will be counted along the intercept. Note any herbivory, insect damage, pollination or reproduction activity, recruitment or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in the density of Philadelphus ernestii between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3-4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole and Bill Carr, TPWD; Wm Mahler, Status Report, 1981

**Recommendations:** Work with staff from Pedernales Falls State Park, Hamilton Pool County Park and the Nature Conservancy to monitor the populations of Philadelphus ernestii.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD, TNC and those from Hamilton Pool County Park to assist with the monitoring.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:** \_\_\_\_\_ **Date of Implementation:** \_\_\_\_\_



**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Barton Warnock, Alpine; Michael Powell, Sul Ross State University; Jackie Poole, TPWD.

**Recommendations:** Work with Nature Conservancy staff in monitoring this species and other candidates that are located on this ranch.

**Potential use of Volunteers:** Possibly utilize volunteers from the Nature Conservancy.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Prenanthes barbata **Candidate Category:** C2  
**Common Name:** barbed rattlesnake root **Listing Rank:** na  
**Range:** Cass, Cherokee, Hardin, Jasper, Nacogdoches Newton, Polk, Rusk, San Augustine and Shelby Counties; Alabama, Arkansas, Georgia, Kentucky, Louisiana and Tennessee. **G/S Rank:** G3S2

**Known Occurrences:** Known from eight occurrences, two that have been recently verified.

**Reasons for Concern:** Only two verified occurrences along highway right-of-way, susceptible to disturbance which could extirpate the populations.

**Monitoring Objective:** We want a population count of plants of Prenanthes barbata, including detailed measure of vigor for each plant (see Methodology), completed triennially at each of the two verified sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, October; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Shelby County:** Sabine National Forest, ca. 1.5 miles north of Texas 147 and 1279 junction, on east side of Texas 147, Tenaha Road, Compartment 51; **Nacogdoches County:** State Rt. 21, 100 yards west of Bayou Loco, 0.4 miles east of County Rd 829.

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. If possible, inconspicuously tag individual plants. Count the plants, take the following measurements for each plant: number of fruits and flowers and height. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, Pin Flags, Stakes, Metal Tags/Wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, TPWD; Steve Orzell, Florida NHP; Rob Evans, USFS, Lufkin

**Recommendations:** Work with the staff from the Highway Department to monitor populations and ensure proper management techniques are followed.

**Potential use of  
Volunteers:** Possibly utilize regional TPWD volunteers.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Psilactis heterocarpa                      **Candidate Category:** C2  
**Common Name:** Welder machaeranthera                      **Listing Rank:**  
**Range:** Nueces, Refugio, San Patricio and Victoria Counties                      **G/S Rank:** G1S1

**Known Occurrences:** Nineteen known occurrences, twelve have been recently relocated, mostly from Refugio County.

**Reasons for Concern:** Limited distribution and habitat alteration

**Monitoring Objective:** Obtain a population count of plants of Psilactis heterocarpa completed Biennially at selected sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, October; Annual

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** **Refugio County:** four sites north and northeast of Refugio, two sites south and southeast of Refugio, two sites west of St Rt. 35; **San Patricio:** Welder Wildlife Foundation; **Victoria:** U.S Route 77, northwest side, 0.4 road miles north of FM 445, south end of county.

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide

suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, TPWD; Steve Orzell, Florida NHP

**Recommendations:** Work with the staff from the Welder Wildlife Foundation and the Highway Department to monitor populations on their property with additional research on grazing affects on this species to be conducted by Welder.

**Potential use of  
Volunteers:** Possibly utilize regional TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Rudbeckia scabrifolia **Candidate Category:** C2  
**Common Name:** bog coneflower **Listing Rank:** 2  
**Range:** Angelina, Jasper, Newton, Sabine and Shelby Counties; Louisiana  
**G/S Rank:** G2S2

**Known Occurrences:** Thirty-two occurrences known.

**Reasons for Concern:** Alteration of hydrology or impact to recharge area of seepage-bogs; grazing; fire exclusion or alteration of fire frequency; other logging activities.

**Monitoring Objective:** Obtain a population estimate of plants of Rudbeckia scabrifolia completed annually at selected sites-target 5 sites.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, June; Perennial

**Monitoring Responsibility:** TPWD/US Forest Service

**Monitoring Plan:**

**Site Description:** Choose representative sites from both large and small populations from each of the counties of occurrence, sites to include, pristine as well as disturbed sites.

**Methodology:** Permanently delineate and describe each of the total population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Estimate the number of plants through minimal impact on the environment. Exact methods to be determined on-site. Note any herbivory, insect damage, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 4-5 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified

immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Harland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Steve Orzell, Florida NHP; Rob Evans, USFS; Larry Brown, Houston Community College

**Recommendations:** Work with the staff from TPWD and the National Forest to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from the National Forest Service and regional TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, Gena Janssen, TPWD

**Recommendations:** Work with the staff from TPWD to monitor populations on the State Park. Highway right-of-way monitoring in progress.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the State Park to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Silene subciliata **Candidate Category:** C2  
**Listing Rank:** 5  
**Common Name:** scarlet catchfly **G/S Rank:** G3S3

**Range:** Hardin, Jasper, Jefferson (Historical), Liberty, Newton, Polk, Sabine, Shelby and Tyler County; Louisiana

**Known Occurrences:** Forty-nine occurrences.

**Reasons for Concern:** Habitat destruction or alteration through fire suppression, pine plantations and exotic species affect this species.

**Monitoring Objective:** Obtain a population survey of Silene subciliata completed biennially at four to eight selected sites. Sites to be selected upon field investigation. At the Sandylands site, address the affects prescribed burns have on the population.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Biennially, August-October; perennial

**Monitoring Responsibility:** TPWD/USFS/TNC

**Monitoring Plan:**

**Site Description:** **Hardin County:** Roy E. Larson Sandylands Preserve; Village Creek State Park; **Polk County:** Big Thicket National Preserve; **Sabine County:** Sabine National Forest. Sites to be selected upon field investigation.

**Methodology:** Permanently delineate and describe each of the selected population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Note any herbivory, insect damage or other conditions. At Sandylands, address populations that occur in burned verses unburned areas, set up plots in each with different fire regimes and determine best quantitative measurements to be taken.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 1 Day each county; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Bill Carr, Status Report, 1991; Steve Orzell, Florida NHP; Rob Evans, USFS; Ike McWhorter; Jason Singhurst.

**Recommendations:** Work with the staff from TPWD, USFS, and the Nature Conservancy of Texas to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from the State Park, USFS and TNC to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Streptanthus bracteatus                      **Candidate Category:** C2  
**Common Name:** bracted twistflower                      **Listing Rank:** 2  
**Range:**                      **G/S Rank:** G2S2  
Bandera, Caldwell (questionable locality), Comal, Medina, Real, Travis and Uvalde Counties

**Known Occurrences:**                      Twenty-two occurrences, primarily in Travis and Medina Counties

**Reasons for Concern:**                      Few, small populations that fluctuate radically due to climate; also susceptible to browsing and development.

**Monitoring Objective:**                      Obtain a population estimate of Streptanthus bracteatus to be completed annually at select sites, including detailed measures for each plant (see Methodology). Three sites within each, Travis and Medina counties are to be selected upon field investigation. Total sites, seven.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      Annually, May; Annual

**Monitoring Responsibility:**                      TPWD/City of Austin

**Monitoring Plan:**

**Site Description:**                      **Travis County:** three sites; **Medina County:** three sites. **Uvalde County:** Garner State Park. Sites to be selected upon field investigation.

**Methodology:**                      Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted. Where possible, take the following measurements: height; and number of fruits and flowers. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:**                      Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:**                      7-8 Days; 2-4 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** David Zippin, UT graduate student working on PhD; Noreen Damude, Jackie Poole, TPWD, Status Report, 1990

**Recommendations:** Work with the staff from TPWD and the City of Austin to monitor populations on the respective properties.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD and the City of Austin to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Streptanthus cutleri                      **Candidate Category:** C2  
**Common Name:** Cutler's twistflower                      **Listing Rank:** 3  
**Range:** Brewster County; Coahuila, Mexico                      **G/S Rank:** G2S2

**Known Occurrences:** Thirteen occurrences, few recently verified

**Reasons for Concern:** Susceptible to browsing or grazing pressures.

**Monitoring Objective:** Obtain a population count from several populations of Streptanthus cutleri completed annually, including selected measures of vigor. Populations to be located, two to four sites to be selected.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, February - March; Annual

**Monitoring Responsibility:** TPWD; BIBE (Big Bend National Park)

**Monitoring Plan:**

**Site Description:** Brewster County: Big Bend National Park and Black Gap Wildlife Management Area.

**Methodology:** Permanently delineate and describe each population. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take the following measures of vigor: height; number of fruits and flowers. Note any herbivory, pollinators, insect damage, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and

adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD.

**Recommendations:** Additional populations need to be located, work with staff from Black Gap and Big Bend National Park to assist monitoring this species. This annual species may move some distance from year to year, the exact area of the population needs to be very well defined and some time should be spent each year searching for suitable habitat in the vicinity (approximately 1 mile radius) for other populations.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Streptanthus sparsiflorus      **Candidate Category:** C2  
**Common Name:** sparsely-flowered jewelflower      **Listing Rank:** 11  
**Range:** Culberson County; New Mexico      **G/S Rank:** G2 S2

**Known Occurrences:** Nine occurrences

**Reasons for Concern:** Few populations, very sensitive to browsing pressure

**Monitoring Objective:** Obtain a population count of plants of Streptanthus sparsiflorus completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, May - June

**Monitoring Responsibility:** TPWD/Guadalupe Mountains National Park

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park, three sites. If possible, locate a monitoring site off the park that would represent other land use practices.

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take the following measures of vigor: height, and number of flowers and fruit, size of fruits and flowers should also be noted. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, TPWD; Larry Higgins; David Zippin, UT Austin

**Recommendations:** Work with the staff from Guadalupe Mountains National Park to monitor the populations. Populations are known to vary from year to year.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and/or GMNP to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thalictrum arkansanum                      **Candidate Category:** C2  
**Common Name:** Arkansas meadow-rue                      **Listing Rank:** 11  
**Range:** Bowie, Lamar and Red River Counties; Arkansas and Oklahoma  
**Known Occurrences:** Six occurrences, Lennox Woods site is the largest population in the tri-state range of this species.  
**Reasons for Concern:** Habitat destruction or alteration due to hydrologic changes such as diversions or reservoirs would significantly impact the habitat of this species as well as habitat clearing.  
**Monitoring Objective:** Obtain a population estimate of Thalictrum arkansanum completed annually, two sites.  
**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, spring; Perennial  
**Monitoring Responsibility:** TPWD/TNC  
**Monitoring Plan:**  
**Site Description:** Red River County: Lennox Woods Preserve; Tx-DOT highway right-of-way.  
**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.  
**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.  
**Estimated Time/Staff for Monitoring:** 3 Days; 2-4 staff  
**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.  
**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:**

Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:**

Bill Carr, Jackie Poole, TPWD; Roger Sanders, BRIT

**Recommendations:**

Work with the staff from TPWD and The Nature Conservancy to monitor populations on the respective properties.

**Potential use of**

**Volunteers:**

Possibly utilize volunteers from TPWD and TNC to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thalictrum texanum                      **Candidate Category:** C2  
**Common Name:** Houston meadow-rue                      **Listing Rank:** 8  
**Range:** Brazos, Harris (Historical) and Waller Counties                      **G/S Rank:** G2QS2

**Known Occurrences:** Seven occurrences, two populations recently observed.

**Reasons for Concern:** Low numbers, habitat destruction.

**Monitoring Objective:** Obtain a population count of Thalictrum texanum completed annually, two sites.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, Spring; Perennial

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** **Brazos County:** Lick Creek County Park, southeast of College Station;  
**Waller County:** small roadside park along hwy 90, ca 0.5 miles west of Brookshire.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be counted. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management

changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Bill Carr, TPWD; Jason Singhurst.

**Recommendations:** Work with the staff from TPWD and Brazos County park staff to monitor populations on the respective properties.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thelocactus bicolor var. flavidispinus      **Candidate Category:** C2

**Common Name:** straw-spine glory-of-Texas      **Listing Rank:** 8  
**G/S Rank:** G4T2 S2

**Range:** Brewster and Starr (?-questionable identification or locality) Counties;  
Tamaulipas, Mexico

**Known Occurrences:** Fourteen occurrences, one recent

**Reasons for Concern:** Collecting pressures affect this species.

**Monitoring Objective:** Obtain a population count of Thelocactus bicolor var. flavidispinus  
to be completed annually, including selected measures of vigor, one  
site. Access is needed.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, March

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brewster County: 3.3 miles south of junction US 90 and 3855 in  
Marathon.

**Methodology:** Permanently delineate and describe the total population area.  
Ideally, a map of the population should be completed as baseline  
information. The population should be counted. Take the following  
measurements: stem diameter; and number of fruits and flowers.  
Note any herbivory, insect damage, pollination, reproduction activity,  
recruitment or other conditions. Need access.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires, ruler

**Estimated Time/Staff for Monitoring:** 2-3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife  
Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total  
population from one year to the next will be considered  
significant. In the event of significant or unacceptable  
decline, TPWD and Fish and Wildlife Service should be

notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Edward Anderson, Status Report, 1982, Desert Botanical Garden; Jackie Poole and David Hernandez, TPWD.

**Recommendations:** Additional populations need to be located. Highway right-of-way monitoring in progress.

**Potential use of  
Volunteers:** Possibly utilize TPWD volunteers to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 611 East 6th Street, Room 407, Austin, TX 78701.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Jackie Poole, Gena Janssen, Mary Candee, TPWD.

**Recommendations:** Work with the staff from the Highway Department to manage and monitor the population. Highway right-of-way monitoring in progress.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Trillium pusillum var. texanum      **Candidate Category:**      C2  
**Common Name:** Texas trillium                              **Listing Rank:**                              3  
**Range:**                              **G/S Rank:**                              G3T2T3Q S2S3

**Range:**                              Cass, Harrison, Houston (Historic), Nacogdoches, Panola (Historic), Rusk, Smith, and Wood (Questionable identification) Counties; Arkansas, Louisiana

**Known Occurrences:**                              Thirteen occurrences

**Reasons for Concern:**                              Habitat destruction (clear-cutting, pine plantations); upstream disturbance may bury plants in sand and habitat alteration. It is considered very collectible by wildflower enthusiasts.

**Monitoring Objective:**                              Obtain a population count of plants of Trillium pusillum var. texanum completed annually with selected measures of vigor.

**Priority:**                              MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually, March - May, Perennial

**Monitoring Responsibility:**              TPWD

**Monitoring Plan:**

**Site Description:**              Cass County: Linden; Harrison County: one site; Nacogdoches County: FM 1087 and US 59; Smith County: one site; Rusk County: Hwy 322 and Dogwood Creek

**Methodology:**                      Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants. Take selected measures of vigor: number of flowering plants and an estimate of juvenile plants. Upon site visit a subset of the population may be necessary to monitor instead. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:**      Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:**      3 Days; 2 staff

**Reporting Procedure:**              Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**              After baseline information gathered, a 20% decrease in total

population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jason Singhurst; Wm Mahler, Status Report, August, 1983; Elray Nixon, Robert Kral and John Freeman

**Recommendations:**

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring this species is not recommended.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Viola guadalupensis                      **Candidate Category:** C2  
**Common Name:** Guadalupe Mountains violet              **Listing Rank:** 5  
**Range:** Culberson County                                      **G/S Rank:** G1 S1

**Known Occurrences:** One occurrence

**Reasons for Concern:** Only one population, low numbers

**Monitoring Objective:** Obtain a population count of plants of Viola guadalupensis completed annually.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually; Perennial, March - May

**Monitoring Responsibility:** TPWD/Guadalupe Mountains National Park

**Monitoring Plan:**

**Site Description:** Culberson County: Guadalupe Mountains National Park

**Methodology:** Permanently delineate and describe each of the population areas. If possible mark boundaries using stable, easily recognized landmarks, stakes and/or metal tags. Count the plants and take selected measures of vigor: number of fruits and flowers. Note any herbivory, insect pollination, reproduction activity, recruitment, damage or other conditions.

**Field Equipment Needed:** Measuring tapes; flagging/pin flags, metal tags and wires.

**Estimated Time/Staff for Monitoring:** 3 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by or to Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research

needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Michael Powell, SRSC; B. Wauer, GMNP

**Recommendations:** Work with the staff from Guadalupe Mountains National Park to monitor the populations.

**Potential use of  
Volunteers:** Enlisting volunteers with monitoring this one known population is not recommended-it might introduce unnecessary risk to the species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Xyris drummondii **Candidate Category:** C2  
**Listing Rank:** na  
**Common Name:** Drummond's yellow-eyed grass **G/S Rank:** G3S2

**Range:** Angelina, Jasper and Newton County; Alabama, Florida, Georgia, Louisiana and Mississippi

**Known Occurrences:** Fourteen occurrences in three counties.

**Reasons for Concern:** Disturbance to seepage-bogs, changes in water table, and fire suppression could affect this species habitat.

**Monitoring Objective:** Obtain a population estimate of Xyris drummondii completed triennially at selected sites. Three to nine sites to be selected upon field investigation.

**Priority:** LOW PRIORITY - May be down listed to 3C

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**PLAN**

**Monitoring Frequency/Season:** Triennially, Mid-June to mid August; Perennial

**Monitoring Responsibility:** TPWD/USFS

**Monitoring Plan:**

**Site Description:** Angelina County: one - three sites; Jasper County, one - three sites; Newton County: one - three sites. Sites to be selected upon field investigation

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be sampled to estimate the total number of individuals within the population. To sample, a large macro plot should be established (dependent on the habitat) within the population. If possible, establish a "permanent" plot location. Within this plot, count the plants. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in the density of Xyris drummondii between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 5 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Steve Orzell, Florida NHP; Robert Kral, Tennessee; Rob Evans USFS.

**Recommendations:** Work with the staff from the US Forest Service to monitor populations on their properties.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD and USFS to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Xyris scabrifolia **Candidate Category:** C2  
**Listing Rank:** na  
**Common Name:** Rough-leaf yellow-eyed grass **G/S Rank:** G2G3S2

**Range:** Angelina, Jasper, Newton and Sabine Counties; Alabama, Florida, Georgia, Louisiana and Mississippi

**Known Occurrences:** Thirty-four occurrences.

**Reasons for Concern:** Disturbance of hillside seepage-bogs, changes in hydrology, fire suppression, and/or grazing would negatively impact this species.

**Monitoring Objective:** Obtain a population estimate of Xyris scabrifolia completed triennially at selected sites. Four to ten sites to be selected upon field investigation.

**Priority:** LOW PRIORITY - May be down-listed to 3C

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**PLAN**

**Monitoring Frequency/Season:** Triennially, Late July - early September; Perennial

**Monitoring Responsibility:** TPWD/USFS

**Monitoring Plan:**

**Site Description:** Angelina County: one - three sites; Jasper County, one - three sites; Newton County: one - three sites; Sabine County; one site. Sites to be selected upon field investigation.

**Methodology:** Permanently delineate and describe each of the total population areas. Ideally, a map of each population should be completed as baseline information. The population should be sampled to estimate the total number of individuals within the population. To sample, a large macro plot should be established (dependent on the habitat) within the population. If possible, establish a "permanent" plot location. Within this plot, count the plants. Note any herbivory, insect damage, pollination, reproduction activity, recruitment or other conditions.

For the population estimate, maintain 90% confidence that the estimate is within 25% of the population, be 90% sure of detecting a 20% change in the density of Xyris scabrifolia between any two years, and be willing to accept a False-Change error rate of 0.10.

**Field Equipment Needed:** Measuring tapes, pin flags, stakes, metal tags/wires.

**Estimated Time/Staff for Monitoring:** 5 Days; 2-4 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Steve Orzell, Florida NHP; Robert Kral.

**Recommendations:** Work with the staff from the US Forest Service to monitor populations on their properties. This monitoring can be completed in conjunction with monitoring of Xyris drummondii and Rudbeckia scabrifolia; Both species of Xyris are difficult to distinguish, and experts in taxonomy of this species will need to oversee the monitoring.

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD and USFWS to assist in monitoring this species.

**Date for Review of Plan:** Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Jackie Poole, TPWD; A. Michael Powell, Department of Biology, Sul Ross State University; Liz Ecker, Wendy Hodgson and Linda Pritchett-Kozak, Desert Botanical Garden, Phoenix; Barton Warnock, Alpine, TX; Julia Larke, Jim Weedin-former graduate students, Sul Ross State University.

**Recommendations:** Work with representatives from Sul Ross to possibly assist and/or take on the biennial monitoring at the Pig Pen site. Other sites needing verification include: Tricky Gap, Ezra's Bedground and Wild Rose Pass. Need access to the Timber Mountain site.

**Potential use of  
Volunteers:** Graduate and undergraduate students may be recruited for assistance.

**Date for Review of Plan:** Spring/Summer 1994

**Plan Approval Date:**

**Date of Implementation:**



**Appendix K:**

**MONITORING PLANS FOR TEN SPECIES OF**

**REPTILES**

## LIST OF CANDIDATE SPECIES WITH MONITORING PLANS

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	MONIT PRIORITY
<b>REPTILES</b>			
<i>Cnemidophorus dixoni</i> GRAY-CHECKERED WHIPTAIL	G3G4Q S3S4 C2		MEDIUM
<i>Crotaphytus reticulatus</i> RETICULATE COLLARED LIZARD	G3 S2 C2		MEDIUM- HIGH
<i>Graptemys caglei</i> CAGLE'S MAP TURTLE	G3 S2 C1	5	HIGH
<i>Kinostemon hirtipes murrayi</i> CHIHUAHUAN MUD TURTLE	G3T3 S1 C2	HIGH	HIGH
<i>Macrochelys temminckii</i> ALLIGATOR SNAPPING TURTLE	G3G4 S3 C2		HIGH
<i>Malaclemys terrapin littoralis</i> TEXAS DIAMONDBACK TERRAPIN	G5T3 S3 C2	HIGH	MEDIUM- HIGH
<i>Nerodia clarkii</i> GULF SALTMARSH SNAKE	G4Q S4 C2		HIGH
<i>Nerodia harteri harteri</i> BRAZOS WATER SNAKE	G2T2 S2 C2	LOW	MEDIUM- LOW
<i>Phrynosoma cornutum</i> TEXAS HORNED LIZARD	G5 S4 C2	MEDIUM	MEDIUM
<i>Pituophis melanoleucus ruthveni</i> LOUISIANA PINE SNAKE	G5T3 S2 C2		HIGH
<i>Sceloporus arenicolus</i> DUNES SAGEBRUSH LIZARD	G5T2 S2 C2		MEDIUM
<i>Thamnophis sirtalis annectens</i> TEXAS GARTER SNAKE	G5T3 S3 C2	MEDIUM	LOW

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Cnemidophorus dixonii      **Candidate Category:** C2  
**Common Name:** gray-checked whiptail      **Listing Rank:**  
**Range:** New Mexico and Texas, Presidio County      **G/S Rank:** G3G4QS3S4

**Known Occurrences:** Unknown occurrences. It prefers rocky soils in desert shrublands and degraded grasslands on alluvial benches, canyon bottoms and the lower southwestern slopes of the Chinati Mountains between 909 and 1515 m.

**Reasons for Concern:** Highly restricted range

**Monitoring Objective:** Intensively monitor through mark and recapture methods over a two week period in the spring.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually, for two weeks in April - May (Again in fall if possible)

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Presidio County: Locate a population to study

**Methodology:** Mark and recapture using pit-traps; obtain weather data, insect sampling; vegetation sampling, noting cover type, plant diversity etc.

**Field Equipment Needed:** Drift fences, pit traps, clippers, nets, jars, envelopes, weather collection instruments

**Estimated Time/Staff for Monitoring:** 2 Weeks/possibly spring and fall; 2+ staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; James Dixon

**Recommendations:**

**Potential use of  
Volunteers:** Possibly utilize volunteers from Sul Ross graduate program to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Crotaphytus reticulatus      **Candidate Category:** C2  
**Common Name:** reticulate collared lizard      **Listing Rank:**  
**G/S Rank:** G3S2

**Range:** From McMullen County, south and west. Dimmit, Duval, Hidalgo, Frio, Maverick, McMullen, Starr, Uvalde, Webb, and Zapata counties. South Texas and portions of Tamaulipas, Nuevo Leon and Coahuila.

**Known Occurrences:** X known occurrences. McMullen County. Thorn brush desert of the Tamaulipan biotic province. Prefers rolling terrain characterized by shallow gravel soils.

**Reasons for Concern:** Possible brush clearing practices may have led to elimination of the species from some grazing lands. Few individuals have been collected from partially cleared land. Loss of brush habitats from south Texas is a threat to the continued existence of this species as it is for many other species. Oil and gas development and coal production may also lead to loss of significant areas of habitat.

**Monitoring Objective:** Determine population density and distribution through capture, mark and release.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually,

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**  
**Site Description:** McMullen County: Chaparral Wildlife Management Area

**Methodology:** Hand capture using a noose, mark and release/1 week at each site

**Field Equipment Needed:** Noose, collecting bags, marking materials

**Estimated Time/Staff for Monitoring:** 1 Week/site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more

comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; James Dixon, TAMU; James Judd

**Recommendations:** Involve Department biologists at Chaparral Wildlife Management Area.

**Potential use of  
Volunteers:**

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Graptemys caglei                      **Candidate Category:** C1  
**Common Name:** Cagle's map turtle                      **Listing Rank:**  
**Range:**                      **G/S Rank:** G3S3

**Range:**                      Endemic to the Guadalupe River system of Central Texas. Robust populations between Victoria and Seguin, scattered populations upstream.

**Known Occurrences:**                      Nine known occurrences. Found in free-flowing reaches and shallow impoundments with unimproved banks, abundant emergent snags, rocks and other basking sites, and frequent gravel bars.

**Reasons for Concern:**                      Habitat destruction (reservoir construction, diversion of in-stream flow needs); commercial exploitation; fire ants.

**Monitoring Objective:**                      Quarterly document presence of Cagle's map turtles throughout the range through surface sampling. Also, monitor annual inflow regime.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**                      April through the summer

**Monitoring Responsibility:**                      TPWD

**Monitoring Plan:**

**Site Description:**                      Guadalupe River: various sites along the river

**Methodology:**                      Sample for one week each quarter throughout the year/markings and recapture following F. Killebrew's methodology.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:**                      7 Days/Quarter; 2 staff

**Reporting Procedure:**                      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**                      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine

appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Flavius Killebrew, WTAMU; Francis Rose, SWTSU; David Hanes, San Antonio

**Recommendations:** Work with the staff from Guadalupe River State Park/Honey Creek

**Potential use of  
Volunteers:** Work with volunteers from the state park.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Kinosternon hirtipes murrayi      **Candidate Category:** C2  
**Common Name:** Chihuahuan mud turtle      **Listing Rank:**  
**G/S Rank:** G3T3S1

**Range:** Alamito Creek drainage, Presidio County.

**Known Occurrences:** Nine known occurrences. This species is known from Alamito Creek drainage, Presidio County in streams and spring-fed stock tanks.

**Reasons for Concern:** Habitat alteration (dewatering, pollution), landowner antagonism.

**Monitoring Objective:** Semi-Annually document presence of Chihuahuan mud turtles at known sites through mark and recapture methods. Determine flow regimes and inflow needs of springs and creeks of the Alamito Creek system.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Semi-Annually, one week in the spring and fall

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Presidio County: Cienega Creek, BBRsNA, sample other sites as access is permitted

**Methodology:** One week, intensive sampling using baited hoop nets, mark and recapture.

**Field Equipment Needed:** Hoop nets, bait

**Estimated Time/Staff for Monitoring:** 4-8 Days/spring and fall; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of the last field work for the year.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU; Dennie Miller, CDRI

**Recommendations:** Work with the staff from TPWD Big Bend Ranch State Natural Area

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Macrolemys temminckii      **Candidate Category:** C2  
**Common Name:** Alligator snapping turtle      **Listing Rank:**  
**G/S Rank:** G13G4S3

**Range:** Found throughout the eastern portion of the state, records from East Texas include Harris, Harrison, Anderson, Panola, Marion and Rusk counties. (Texas distribution -- piney woods, oak woods and prairies, blackland prairies, and the gulf coast prairies and marshes). Central and Southeastern U.S., including Arkansas, Alabama, Florida, Georgia, Illinois, Indiana, Kentucky, Kansas, Louisiana, Missouri, Oklahoma, Tennessee and Texas.

**Known Occurrences:** Four known occurrences. This large aquatic turtle is an inhabitant of deep fresh water (Garrett and Barker, 1987). It may occasionally enter brackish waters, but is most at home in deep rivers, lakes and large streams with muddy bottoms (Garrett and Barker, 1987).

**Reasons for Concern:** Demands for its meat, reservoir construction, channelization of streams and rivers, placement of dredge spoil on river banks, recreational use of riverbanks and sandbars, removal of tree snags (that provide habitat for prey), and water pollution.

**Monitoring Objective:** Because it stays just below the water surface or partially buried in the mud during the day, the species is difficult to spot. Difficulty in field monitoring is further increased due to the species wide range. Any sightings or incidence of catches or illegal harvesting should be recorded. Surveys need to be conducted to determine locations, population trends and number and distribution of occurrences.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** East Texas: Toledo Bend; Angelina River system; Tyler, private hunting club; Caddo Lake

**Methodology:** At-large sampling, possible survey area fishermen and commercial fishermen.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 4 - 5 Days/each site; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** If sufficient baseline information is gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU; USFWS Region 4

**Recommendations:** Work with the staff from TPWD sites in East Texas

**Potential use of Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Malaclemys terrapin **Candidate Category:** C2  
littoralis **Listing Rank:**  
**Common Name:** Texas diamondback terrapin **G/S Rank:** G5T3S3

**Range:** Twenty-five known occurrences. Louisiana and Texas - along the Gulf Coast from the state's eastern border south to Corpus Christi; records from Aransas, Refugio, Calhoun, Jackson, Victoria, Brazoria, Galveston, Chambers, Harris, Nueces, San Patricio and Orange Counties

**Known Occurrences:** The species prefers brackish and salt water marshes, sloughs, lagoons and tidal flats (Garrett and Barker, 1987).

**Reasons for Concern:** Numbers unknown, the species may be declining due to habitat alteration and incidental take. This species is becoming rare in Texas due to over-harvesting as it is increasingly exploited as a food resource. It may suffer losses due to incidental catch by commercial fishermen (particularly crabbers). Loss of estuary wetlands to development may be detrimental to populations of this species as well as those of several other asterion dependent species. Declining water quality and limited freshwater inflows also poses a significant threat.

**Monitoring Objective:** Once locations of populations are established, population estimates can be made and populations can be monitored on a semi-annual basis to determine trends. Monitoring sites may be chosen on the basis of perceived impacts from the various threats. Monitoring will include capture, mark and release and track individuals.

**Priority:** MEDIUM - HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Semi-Annually - spring and fall, for one week each

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** along the Gulf Coast; sites to be selected

**Methodology:** One week in the spring and fall, intensively trapping to mark and recapture.

**Field Equipment Needed:** Turtle traps, pit tags

**Estimated Time/Staff for Monitoring:** 14 Days/Spring & Fall; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife

Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Lee Elliott, TPWD; Rich Seigel, NE La State Un.

**Recommendations:** Monitoring of this species could be done in conjunction with studies on *Nerodia clarkii*. Work with the staff from TPWD and Aransas National Wildlife Refuge to monitor the candidate species in the area.

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Nerodia clarkii                      **Candidate Category:**      C2  
**Common Name:**      Gulf saltmarsh snake                      **Listing Rank:**  
**Range:**                      The Gulf Coast from Sabine Pass to Baffin Bay; eastward to Florida and Cuba.                      **G/S Rank:**                      G4Q S4

**Known Occurrences:**      Fourteen known occurrences. This species is known from along the Gulf coast in salt marshes.

**Reasons for Concern:**      Affected by pollution and habitat modification.

**Monitoring Objective:**      Annually document presence of Gulf saltmarsh snakes at known sites through capture, mark and release. Assess degree and rate of habitat modification.

**Priority:**                      HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:**      Annually, one week period

**Monitoring Responsibility:**      TPWD

**Monitoring Plan:**

**Site Description:**      Salt marshes along the Gulf Coast: sites to be chosen

**Methodology:**      Using minnow traps, mark and recapture using pit tags, take morphological measurements

**Field Equipment Needed:**      Minnow traps, PIT tags

**Estimated Time/Staff for Monitoring:**      7 Days; 2 staff

**Reporting Procedure:**      Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:**      After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU; Lee Elliott, TPWD

**Recommendations:** Work with the staff from TPWD

**Potential use of  
Volunteers:** Possibly utilize volunteers from TPWD to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Nerodia harteri harteri      **Candidate Category:** C2  
**Common Name:** Brazos water snake      **Listing Rank:**  
**G/S Rank:** G2T2S2

**Range:** Deadman and Paint Creek tributaries of the Clear Fork of the Brazos River downstream to Brazos Point on the Brazos River proper. The distribution is discontinuous.

**Known Occurrences:** Six known occurrences. Occurs in rivers and streams with shallow riffles and rapids with rocky cover, dirt banks, rocky shorelines, woody vegetation near the rivers and streams, adequate flow regimes (both continuous and periodic flushing flows), and access to an adequate fish prey base.

**Reasons for Concern:** Habitat alteration and destruction (reservoir construction, diversion/cessation of in-stream flows, pollution); population fragmentation; landowner antagonism.

**Monitoring Objective:** Annually document presence of Brazos Water Snake at known sites noting abundance through time-constrained sampling. Coordinate efforts with existing Texas Watch volunteer program.

**Priority:** MEDIUM - LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Brazos River

**Methodology:** Annually monitor known populations noting abundance through time-constrained sampling. Note habitat quality, when possible look at diet, and water quality.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 5 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of

significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU; Norm Scott, USFWS

**Recommendations:**

**Potential use of**

**Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

<b>Scientific Name:</b>	<u>Phrynosoma cornutum</u>	<b>Candidate Category:</b>	C2
<b>Common Name:</b>	Texas horned lizard	<b>Listing Rank:</b>	
		<b>G/S Rank:</b>	G5S4

**Range:** Central Kansas southward through Texas, and from the Missouri/Oklahoma border westward to the southeastern corner of Arizona; southward in Mexico east of the Sierra Madre Occidental to eastern Durango, and eastward across Zacatecas and San Luis Potosi to the border between Tamaulipas and Veracruz along the coast of the Gulf of Mexico. The natural eastern boundary of the species' range may never be known with certainty; it has been widely introduced throughout most of the United States for at least 115 years, and there are established populations in Florida and South Carolina.

**Known Occurrences:** Eight recorded occurrences. A wide variety of open deserts and grasslands, shortgrass prairie, and shrublands on sandy to gravelly soils from sea level to 1830 m.

**Reasons for Concern:** Habitat alteration and destruction (landscape - scale land - use changes such as agriculture and urbanization); indiscriminate use of pesticides; fire ants; commercial utilization.

**Monitoring Objective:** Annually document presence of Texas horned lizards at known sites through a standardized survey process. Continue to encourage public response to horned lizard survey questionnaire.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Chaparral WMA, continue research efforts; Matador WMA

**Methodology:** Standardize survey methodology; set-up permanent plots and mark population using toe-clip method. Repeat status survey annually or biennially.

**Field Equipment Needed:**

**Estimated Time/Staff for Monitoring:** 6 Days; 2 staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive

appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Wendy Donaldson, UT; Jim Dixon TAMU; HLCS

**Recommendations:** Work with the Horned Lizard Conservation Society to complete the annual surveys

**Potential use of Volunteers:** Possibly utilize the volunteers from the Horned Lizard Conservation Society to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Pituophis melanoleucus **Candidate Category:** C2  
ruthveni **Listing Rank:**  
**Common Name:** Louisiana pine snake **G/S Rank:** G5T3S2

**Range:** Angela, Cherokee, Grimes, Hardin, Houston, Jasper, Nacogdoches, Newton, Polk, Trinity, Tyler, Walker, and Wood counties in eastern Texas and western Louisiana.

**Known Occurrences:** Ten known occurrences from thirteen counties in east Texas in pine woods and savanna.

**Reasons for Concern:** Alteration or loss of native conifer habitat from logging, cultivation and urbanization.

**Monitoring Objective:** Annually document presence of Louisiana Pine Snakes at known sites.

**Priority:** HIGH PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Annually,

**Monitoring Responsibility:** TPWD/USFS

**Monitoring Plan:**

**Site Description:** Sites to be chosen

**Methodology:** Set-up drift fences and pit-fall traps. May want to look at the distribution of gophers and soil type.

**Field Equipment Needed:** drift fences, pit-fall traps, pit tags

**Estimated Time/Staff for Monitoring:** 7 - 14 Days/2+ Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

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Department, 4200 Smith School Road, Austin, TX 78744; and  
U.S. Fish and Wildlife Service, Ecological Services Office, 10711  
Burnet Road, Suite 200, Harland Bank Bldg, Austin, TX 78758.

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Craig Rudoph, USFS

**Recommendations:** Work with the personnel from US Forest Service.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this  
species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**

**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Sceloporus arenicolus      **Candidate Category:** C2  
**Common Name:** dunes sagebrush lizard      **Listing Rank:**  
**G/S Rank:** G5T2S2

**Range:** Andrews, Crane, Ward, and Winkler counties.

**Known Occurrences:** Six known occurrences from four counties in active sand dunes with shin oak (*Quercus havardii*).

**Reasons for Concern:** Habitat destruction (clearing and de-stabilization of dunes)

**Monitoring Objective:** Semi-annually document presence of dunes sagebrush lizards at known sites.

**Priority:** MEDIUM PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Semi-Annually, Spring and Fall

**Monitoring Responsibility:** TPWD

**Monitoring Plan:**

**Site Description:** Monahans Sandhills State Park

**Methodology:** Array trap system, mark and recapture, note specific habitat requirements, sample insect abundance, vegetation, etc. Species may be sensitive to habitat manipulation.

**Field Equipment Needed:** drift fences, pit traps, sweep nets

**Estimated Time/Staff for Monitoring:** 14 Days/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and

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**REVIEW/RECOMMENDATIONS/IMPLEMENTATION**

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU

**Recommendations:** Work with the personnel from TPWD State Park

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this  
species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:**

**Date of Implementation:**



**MONITORING PLAN FOR  
CANDIDATE SPECIES  
TEXAS**

**Scientific Name:** Thamnophis sirtalis **Candidate Category:** C2  
annectens **Listing Rank:**  
**Common Name:** Texas garter snake **G/S Rank:** G5T3S3

**Range:** Texas and Kansas. This seldom encountered garter snake occurs in central Texas. Common in certain places along the Balcones Escarpment. Sporadic elsewhere. Prefers marshy, flooded pasture lands or meadows, particularly in spring where there is abundant prey such as cricket and chorus frogs (Tennant, 1985). The species is also found in grassy or brushy cover near ponds and streams as well as riparian canyon habitat at the eastern edge of the Edwards Plateau. Throughout range, inhabits virtually any type of wet or moist habitat. However, habitat preference exhibits rather pronounced regional differences (e.g. east vs. west). Irrigation canals and riparian-corridor farmlands in west; marshy, flooded pasture land, grassy or brushy borders of permanent bodies of water; coastal salt marshes.

**Known Occurrences:** Twenty-eight known occurrences. They have been recorded from Taylor, McLennan, Motley?, Palo Pinto, Travis, Williamson, Wise, Bell, Bastrop, Bosque, Llano, Burnet, San Saba, Hill, Hood, Navarro, Tarrant, Archer, Collin, Dallas, Ellis, Denton, Bexar, Brazoria, Matagorda, Hays, Austin, Rand? counties.

**Reasons for Concern:** Habitat destruction or modification, other factors unknown.

**Monitoring Objective:** Triennially document presence of Texas garter snakes at known sites.

**Priority:** LOW PRIORITY

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**PLAN**

**Monitoring Frequency/Season:** Triennially, One week, Spring and Fall

**Monitoring Responsibility:** TPWD/USFWS-Arlington

**Monitoring Plan:**

**Site Description:** Site(s) to be chosen

**Methodology:** Drift fences, funnel traps set up in a secure area, mark and recapture

**Field Equipment Needed:** Drift Fences, funnel traps

**Estimated Time/Staff for Monitoring:** 14 Days/2 Staff

**Reporting Procedure:** Annual Report submitted by Texas Parks and Wildlife Department within 60 days upon completion of field work.

**Red Flag Conditions:** After baseline information gathered, a 20% decrease in total population from one year to the next will be considered significant. In the event of significant or unacceptable decline, TPWD and Fish and Wildlife Service should be notified immediately. When decline is noted, a more comprehensive appraisal should be initiated to evaluate and adjust monitoring design or data collection, provide suggestions for management changes, or define research needed to determine appropriate management.

**Location of Archived Data:** Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, TX 78744; and U.S. Fish and Wildlife Service, Ecological Services Office, 10711 Burnet Road, Suite 200, Hartland Bank Bldg, Austin, TX 78758.

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#### REVIEW/RECOMMENDATIONS/IMPLEMENTATION

**Resource Specialists:** Andy Price, TPWD; Jim Dixon, TAMU; Carl Lieb, UTEP

**Recommendations:** Work with the personnel from US Fish & Wildlife Service.

**Potential use of  
Volunteers:** Possibly utilize volunteers from the region to assist in monitoring this species.

**Date for Review of Plan:** Summer 1995

**Plan Approval Date:** **Date of Implementation:**

**Appendix L:**

**CANDIDATE SPECIES MONITORING  
STATUS OVERVIEW**

**- PLANTS**

### Candidate Species Monitoring Status Overview

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	PRIORITY	COUNTY OF OCCURRENCE	RESPON. PARTY	MONIT MO.	# SITES	DAYS/STAFF	MONIT LEVEL	IMPLMT. DATE	REMARKS
<b>PLANTS</b> <i>Acleisanthes crassifolia</i> TEXAS TRUMPETS	G2S2 C2	8	MEDIUM	Kinney, Maverick, Val Verde; Coahuila, Mex	TPWD	Triennially					
<i>Agalinis auriculata</i> AURICULATE FALSE FOXGLOVE	G2SX C2	2	Other Region	Tarrant (X-presumed extirpated); AL, AR, IA, IL, IN, KS, MD, MI, MN, MO, MS, NJ, OH, OK, PA, SC, TN, VA, WI, WV	TPWD						Possibly another Region to monitor
<i>Agave glomeruliflora</i> CHISOS AGAVE	G2Q S2 C2	11	LOW	Brewster, Culberson, Hudspeth; Coahuila, Mex	BIBE/Sul Ross	May Triennially	4	3 - 7 2	3		
<i>Agrimonia incisa</i> INCISED GROOVBUR	G3S1 C2	na	LOW	Angelina, Jasper; Sabine; AL, FL, GA, MS, NC, SC	Forest Service	Biennially					
<i>Ambrosia cheiranthifolia</i> SOUTH TEXAS RAGWEED	G2S2 E	5	HIGH	Cameron (Historical), Jim Wells, Kleberg, & Nueces; Tamaulipas, Mexico	TPWD, USFWS-CC						Highway right-of-way monitoring in progress.
<i>Amsonia tharpii</i> THARP'S BLUE-STAR	G1S1 C2	11	HIGH	Pecos, NM	TPWD	April-May	1	2 2	3		Highway right-of-way monitoring in progress.
<i>Andrachne arida</i> TRANS-PECOS MAIDENBUSH	G1S1 C2	11	LOW Need to relocate	Presidio, Brewster; Chihuahua and Coahuila, Mexico	TPWD	Triennially					
<i>Anemone edwardsiana</i> var. <i>petraea</i> EDGE FALLS ANEMONE	G3T1 S1 C2	12	MEDIUM	Bandera, Kendall	TNC/TLSS	Feb - May Triennially	2	2 2	3		Access is needed
<i>Aquilegia chrysantha</i> var. <i>hinckleyana</i> HINCKLEY'S COLUMBINE	G4T1S1 C2	6	HIGH	Presidio	TNC/TLSS	March-April Triennially	1	3 2	3		Access is needed
<i>Aquilegia longissima</i> LONG SPUR COLUMBINE	G3S2 C2	11	LOW	Brewster, Jeff, Davis, Presidio, Chihuahua, Coahuila, Nuevo Leon, Mexico	BIBE/TPWD	June -Nov Triennially	3-5	4 2	3		Relocate previous known sites
<i>Arenaria livermorensis</i> LIVERMORE SANDWORT	G1S1 C2	5	MEDIUM	Jeff Davis	TNC/TLSS	Aug - Oct Triennially	2	3 2	3		
<i>Argythamnia aphoroides</i> HILL COUNTRY WILD MERCURY	G2S2 C2	11	MEDIUM	Blanco, Comal, Gillespie, Hays (H), Kendall (H), Kerr, Menard, Mills (H), Tom Green, Uvalde	TPWD	April - May	5	2 2	3		Obtain baseline information, determine frequency after initial visit
<i>Armoracia aquatica</i> LAKE CRESS	G4S1 C2		3C	Tyler, IN,KY,MI,MO,NC,OK,SC,TN	Other State						
<i>Asclepias prostrata</i> PROSTRATE MILKWEED	G1S1 C2	8	LOW	Starr, Zapata; Tamaulipas Mexico	TNC/TLSS	Spring Biennially	5	3 2	3		Highway right-of-way monitoring in progress.
<i>Aster puniceus</i> ssp. <i>elliottii</i> var. <i>scabricaulis</i> ROUGH-STEM ASTER	G5T1S1 C1	3	MEDIUM	Anderson, Cherokee, Smith, Van Zandt, Wood	TPWD	October	3+	3 2	3		Highway right-of-way monitoring in progress. Taxonomy not assured

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10/31/95

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<i>Astragalus mollissimus</i> var <i>marcidus</i> WITHERED WOOLLY LOCO	G5T2S2 C2	12	LOW Need to relocate	Dallam, Jeff Davis (H), Presidio	TPWD	April - July	2-3	3 2	3		Relocate Jeff Davis population
<i>Batesimalva violacea</i> PURPLE GAY-MALLOW	G2 S1 C2	8	MEDIUM	Brewster, Coahuila and Nuevo Leon, Mexico	BIBE/TPWD	Oct - Nov Triennially	1	3 2	3		
<i>Boerhavia mathisiana</i> MATHIS SPIDERLING	G2 S1 C2	5	HIGH	Live Oak, San Patricio; San Luis Potosi and Tamaulipas, Mexico		May - Aug	4	2 2	3		
<i>Bonamia ovalifolia</i> BIGPOD BONAMIA	G1S1 C2	8	HIGH	Brewster County; Coahuila, Mexico	BIBE	May	1	3 2	3		
<i>Brickellia brachyphylla</i> var <i>hinckleyi</i> HINCKLEY'S BRICKELLBUSH	G5T2 S2 C2	11	LOW	Brewster (H) and Jeff Davis	TPWD/ TNC	July - Oct Triennially	1-2	3 2	3		Access is needed
<i>Brickellia brachyphylla</i> var <i>terlinguensis</i> TERLINGUA BRICKELLBUSH	G5TH SH C2	11	LOW Need to relocate	Brewster (H) Hudspeth (H)	TPWD	July - Oct Triennially	?	3 2	3		LOW- Need to relocate populations then HIGH PRIORITY
<i>Brickellia viejensis</i> SIERRA VIEJA BRICKELLBUSH	G1G2 S1S2 C2	11	LOW	Presidio	TPWD	Sept Triennially	?	5 2	3		LOW- Need to relocate populations then HIGH PRIORITY
<i>Brongniartia minutifolia</i> LITTLE-LEAF BRONGNIARTIA	G2 S1 C2	11	MEDIUM	Brewster County; Chihuahua, Mexico	TPWD/ BIBE	June - Aug	1	3 2	3		
<i>Caesalpinia brachycarpa</i> BROADPOD RUSHPEA	G2 S2 C2	8	MEDIUM	Crockett (H), Edwards (H), Kinney, Llano (H), Sutton	TPWD	April - June Biennially	3	3 2	2		
<i>Carex hyalina</i> TISSUE SEDGE	G5Q S4 C2	8	LOW taxonomy ?'s	Bowie, Brazoria, Cass, Dallas (H), Denton, Houston, Lamar, Liberty, Madison, Morris, Polk, Red River, and Walker; AR, MS and OK		Triennially					Possibly other Region or Other states to monitor this species
<i>Castilleja ciliata</i> FRINGED PAINTBRUSH	G1Q S1 C2	11	MEDIUM	Jeff Davis	TNC/TPWD	June - Oct Biennially		4-5 2	3		Access is needed.
<i>Castilleja elongata</i> TALL PAINTBRUSH	G1Q S1 C2	5	HIGH	Brewster	TPWD/ BIBE	Mid Aug - Sept	1	3 2	3		

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<i>Cereus greggii</i> var <i>greggii</i> DESERT NIGHT-BLOOMING CEREUS	G3T2S2 C2	9	Need to relocate	Brewster, El Paso, Hudspeth (H), Jeff Davis, Pecos (H), Presidio, Terrell (H); AZ, NM; Chihuahua, Coahuila, Durango, Zacatecas, Mexico							
<i>Chaetopappa hersheyi</i> MAT LEASTDAISY	G2 S2 C2	11	LOW	Culberson, Hudspeth; NM	Guad Mtns NPS/TPWD	May Triennially	3	3 2	3		
<i>Chamaesyce chaetocalyx</i> var <i>triligulata</i> THREE-TONGUE SPURGE	G5T1 S1 C2	11	MEDIUM	Brewster, Randall (?); Coahuila Mexico	BIBE	Biennially					
<i>Chamaesyce golondrina</i> SWALLOW SPURGE	G2 S2 C2	11	LOW Need to relocate	Brewster, Hudspeth, Presidio Counties; Chihuahua and Coahuila, Mexico	TPWD	July - Oct Triennially	1-4	5 2	3		Need to relocate popultions in Brewster, Hudspeth and Presidio Counties.
<i>Chenopodium cycloides</i> SANDHILL GOOSEFOOT	G4 S3 C2		LOW	Andrews, Crane, Culberson, El Paso, Jeff Davis, Jones, Kent, Loving, Ward, Winkler; CO, KS, and NM							
<i>Chloris texensis</i> TEXAS WINDMILL-GRASS	G2 S2 C2	8	HIGH	Brazoria, Brazos (H) Chambers, Galveston, Harris, Hidalgo (?), Nueces, and Refugio	USFWS-CL	Mid. June - Mid August	4	3 2	3		
<i>Chrysothamnus nauseosus</i> ssp <i>texensis</i> GUADALUPE MOUNTAINS RABBITBRUSH	G5T2 S1 C2	12	MEDIUM	Culberson County; NM	TPWD/ Guad.Mtn NPS	Sept - Oct Triennially		3 2	3		Every 2 years - Biennially
<i>Cleome multicaulis</i> MANYSTEM SPIDERFLOWER	G3 S1 C2	na	Need to relocate	Presidio County; AZ, CO, NM, WY; Chihuahua, Durango, Jalisco, Michoacan, Mexico	Other Region						
<i>Colubrina stricta</i> COMAL SNAKEWOOD	G2 S1 C2	11	HIGH	Comal (?), El Paso, Uvalde; Coahuila and Nuevo Leon Mexico	TPWD	May Biennially	1	3 2	3		Every 2 years - Biennially
<i>Condalia hookeri</i> var <i>edwardsiana</i> EDWARDS PLATEAU CAPUL NEGRO	G5T1Q C2	12	LOW Need to relocate	Edwards	TPWD	March - May Triennially		2 2			Every 2 years - Biennially Need to relocate
<i>Coreopsis intermedia</i> GOLDEN WAVE TICKSEED	G3S3 C2	na	LOW Need to relocate	Anderson, Cass, Cherokee, Franklin, Freestone, Harris, Harrison, Henderson, Houston, Leon, Nacogdoches (?), Trinity, Upshur, Wood (H); LA	TPWD	Feb - May					

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<i>Coryphantha albicolumnaria</i> WHITE COLUMN	G2 S2 C2	2	LOW	Brewster, Pecos, Presidio; Chihuahua, Mexico	TPWD	March - May	3	3 2	3		Highway right-of-way monitoring in progress.
<i>Coryphantha chaffeyi</i> CHAFFEY'S CORY CACTUS	G2 S1 C2	11	MEDIUM	Brewster; Coahuila, San Luis Potosi, Zacatecas Mexico	BIBE						
<i>Coryphantha dasyacantha</i> var <i>dasyacantha</i> DENSE CORY CACTUS	G3T3 S2 C2	12	MEDIUM	Brewster, El Paso, Hudspeth, Jeff Davis, Pecos; NM(?); Chihuahua, Mexico	TPWD	Biennially					
<i>Coryphantha duncanii</i> DUNCAN'S CORY CACTUS	G3 S1 C2	11	MEDIUM	Brewster, Presidio; NM	BIBE	Biennially					
<i>Coryphantha hesteri</i> HESTER'S CORY CACTUS	G2 S2 C2	8	MEDIUM	Brewster, Pecos, Terrell	TPWD	Biennially					Highway right-of-way monitoring in progress.
<i>Coryphantha sulcata</i> var <i>nickelsiae</i> NICKEL'S CORY CACTUS	G4T2 SH C2	12	Need to relocate	Webb (H); Coahuila, Nuevo Leon, Tamaulipas, Mexico							
<i>Crataegus warneri</i> WARNER'S HAWTHORN	G2Q S2 C2	11	MEDIUM Need to relocate	Anderson, Cherokee, Freestone, Franklin, Houston, Morris, Panola, Smith (H), Upshur, Walker, Wood	TPWD	Triennially					
<i>Croton alabamensis</i> var <i>texensis</i> TEXABAMA CROTON	G3T1S1 C2	8	MEDIUM	Bell, Coryell, Travis		Triennially					
<i>Cuscuta attenuata</i> MARSHELDER DODDER	G2 S2 C2	5	LOW	Cameron (H) Jackson (H) Liberty (H) Rains and Van Zandt; KS, OK		Triennially					
<i>Cyperus cephalanthus</i> GIANT SHARPSTEM UMBRELLA SEDGE	G2Q SH X2	na	Need to relocate	Texas (H; county unknown); LA							
<i>Cyperus grayioides</i> MOHLENBROCK'S UMBRELLA SEDGE	G3G4 S3 C2	na	LOW	Anderson, Angelina, Burtleson, Colorado, Franklin, Freestone, Hardin, Henderson, Houston, Leon, Nacogdoches, Newton, Robertson, Rusk, San Augustine, Shelby, Smith, Tyler, Upshur, Van Zandt, Wood; AR, IL, LA, MO	TPWD/ TNC	Aug Triennially	3	3 2	2		
<i>Cyperus onerosus</i> DUNE UMBRELLA SEDGE	G2 S2 C2	5	HIGH	Andrews, Ward, Winkler	TPWD	June - Nov	4	3 2	1-3		

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Cypripedium kentuckiense SOUTHERN LADY'S-SLIPPER	G3 S1 C2	na	HIGH	Cass (?) Harrison, Nacogdoches, Newton (X), Sabine, and San Augustine; AL, AR, KY, LA, MS, OK, TN	TPWD/ USFS	June - Aug	4	3 2	3		
Dalea bartonii COX'S DALEA	G1 S1 C2	11	Need to relocate	Brewster	TPWD						
Dalea reverchonii COMANCHE PEAK PRAIRIE-CLOVER	G2 S2 C2	11	MEDIUM	Hood (X), Parker, Wise	USFWS-FW	Biennially					
Dalea sabinalis SABINAL PRAIRIE-CLOVER	G1 S1 C2	8	LOW Need to relocate	Bandera (H), Uvalde (H), and Val Verde	TPWD	May - July Triennially	1	3 2			Need to relocate first
Desmodium lindheimeri LINDHEIMER'S TICKSEED	G4 S1 C2	11	Need to relocate	Comal (?); Coahuila, Nuevo Leon, San Luis Potosi, Tamaulipas Mexico	TPWD						
Draba standleyi STANDLEY'S DRABA	G3 S1 C2	?	MEDIUM - LOW	Jeff Davis; AZ, NM; Coahuila, Mexico							
Echeandia (Anthericum) chandleri LILA DE LOS LLANOS	G3Se C2	8	MEDIUM - LOW	Cameron, Kleberg, Nueces; Coahuila, Mexico (?)	TPWD/ USFWS	Sept-Nov, early morning	5	4 2	2		
Echinocereus chloranthus var neocapillus GOLDEN-SPINE HEDGEHOG CACTUS	G4T1 S1 C2	9	No Access	Brewster, Presidio	TPWD	Triennially					
Echinocereus papillosus var angusticeps SMALL PAPILLOSUS	G3T1 C2	3	HIGH Need to relocate	Hidalgo (H), Jim Hogg (?), Starr	TPWD	April - May	1	2 2	3		One population to be relocated
Eleocharis brachycarpa SHORT-FRUITED SPIKESEDGE	G1 SH C2		Need to relocate	South coastal Texas (H); (county unknown); Tamaulipas, Mexico	TPWD						
Eleocharis cylindrica CYLINDER SPIKESEDGE	G1 S1 C2	2	LOW Need to relocate	Lubbock (H), Presidio	TPWD	June - July Triennially	1	3 2	3		
Eleocharis wolfii WOLF'S SPIKESEDGE	G4G5 S1 C2		LOW	Jefferson; AL, CO, IA, IL, IN, KS, LA, MN, MO, ND, NE, OH, OK, TN, WI; Alberta and Saskatchewan, Canada							

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<i>Erigeron mimegletes</i> SONORA FLEABANE	G2 S2 C2	8	MEDIUM	Brewster (H), Crockett (H) Edwards (H), Kerr, Real, Schleicher, Sutton, Uvalde, Val Verde (H); Coahuila, Mexico	TPWD						
<i>Eriocaulon koernickianum</i> SMALL-HEADED PIPEWORT	G2G3 S1 C2	11	MEDIUM - HIGH	Anderson, Brazos, Limestone, Leon (?), Tyler (H); AR, GA, OK	OR						
<i>Eriogonum suffruticosum</i> BUSHY WILD BUCKWHEAT	G2 S2 C2	11	LOW	Brewster, Pecos, Presidio	TPWD	Triennially					
<i>Escobaria guadalupensis</i> GUADALUPE MOUNTAINS PINCUSHION CACTUS	G1 S1 C2	11	MEDIUM	Culberson; NM	Guad Mtn NPS	Biennially					
<i>Festuca ligulata</i> GUADALUPE FESCUE	G1 S1 C1	8	HIGH	Brewster, Culberson; Coahuila, Mexico	BIBE/ TPWD	Aug - Sept	1	3 2	3		Monitoring in progress
<i>Forsellesia texensis</i> TEXAS GREASE BUSH	G1 S1 C2	11	Need to relocate	Uvalde and Val Verde (H)							
<i>Fryxellia pygmaea</i> SMALL FRYXELL WORT	G1 SH C2	10	Need to relocate	west Texas (H; county unknown); Coahuila, Mexico	TPWD						
<i>Gaillardia aestivalis</i> var <i>winkleri</i> WHITE FIREWHEEL	G5T1 S1 C2	12	MEDIUM Need to relocate	Hardin	TNC	April - Oct	4	3 2	3		
<i>Galium corellii</i> CLIFF BEDSTRAW	G2 S1 C2	11	LOW	Brewster, Val Verde; Coahuila, Mexico	BIBE	Triennially					
<i>Genistidium dumosum</i> BRUSH-PEA	G1 S1C2	10	MEDIUM - HIGH	Brewster; Coahuila, Mexico	TPWD	Triennially					Highway right-of-way monitoring in progress.
<i>Hedeoma pilosum</i> OLD BLUE PENNYROYAL	GH SH C2	11	Need to relocate	Brewster (H)							
<i>Hedyotis butterwickiae</i> MARY'S BLUET	G1 S1 C2	11	Need to relocate	Brewster	TNC						
<i>Helianthus paradoxus</i> PUZZLE SUNFLOWER	G1S1 C1	2	HIGH	Pecos, Reeves; NM	TNC	August - Sept		2 2	3		Highway right-of-way monitoring in progress.
<i>Helianthus praecox</i> ssp <i>hirtus</i> DIMMIT SUNFLOWER	G5T1QS1 C2		HIGH	Dimmit and Zapata (M)	TNC	August	1-2	3 1-2	3		BRIT doing status survey. Known population reduced 10/93.

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Hexalectris nitida GLASS MOUNTAIN CORAL-ROOT	G3 S3 C2	11	LOW	Bandera, Brewster, Comal, Coryell, Dallas, Hays, Kendall, Pecos (H), Taylor, Travis; NM Coahuila, Mexico	BIBE	August Triennially	3-4	3 2	3		
Hexalectris revoluta CHISOS CORAL-ROOT	G1 S1 C2	11	LOW	Brewster, Culberson; Nuevo Leon, San Luis Potosi, Mexico	BIBE	Triennially					
Hexalectris warnockii WARNOCK'S CORAL-ROOT	G2 S2 C2	?	LOW	Brewster, Dallas, Gillespie, Hays, Jeff Davis (H), Taylor, Terrell; AZ, NM	TPWD/NPS	June - August Triennially	2+	3 2	3		Very difficult to monitor, specific study at Abilene SRA a possibility
Hibiscus dasycalyx NECHES RIVER ROSE-MALLOW	G1 S1 C2	2	HIGH	Cherokee, Harrison, Houston, Trinity	TPWD	August	2	3 2	4		Highway right-of-way monitoring in progress.
Isoetes lithophila ROCK QUILLWORT	G2 S2 C2	8	MEDIUM	Burnet, Llano, Mason	TPWD	April - June	5	3 2	1		
Justicia runyonii RUNYON'S WATER-WILLOW	G2S2 C2	8	LOW	Brazoria (?), Cameron, Goliad (?), Hidalgo; Tamaulipas, Mexico	USFWS ??	Sept - Nov Triennially	8	4 2	3		
Justicia wrightii WRIGHT'S WATER-WILLOW	G2 S2 C2	8	Need to relocate	Brewster (H) Pecos, Val Verde; NM (?)	TPWD						
Kalstroemia perennans PERENNIAL CALTROP	G1 S1 C2	11	MEDIUM	Brewster, Presidio, Val Verde	TPWD	Annually					
Lactinocaulon digynum TINY BOG BUTTONS	G3 S1 C2	na	MEDIUM	Jasper, Newton; AL, FL, LA, MS	Possibly other state/ region	Biennially late summer - early fall	3	3 2	3		
Leavenworthia texana TEXAS GOLDEN GLADE CRESS	G1 S1 C2	2	HIGH	Nacogdoches (I), Sabine, San Augustine	TPWD	March	3	3 2	3		
Lechea mensalis CHISOS PINWEED	G1Q S1 C2	11	Need to relocate	Brewster; Coahuila, Mexico	BIBE						
Leinoceria floridana CORKWOOD	G3G4 S1 C2		LOW	Brazoria, Chambers, Fort Bend, Jefferson; AL, AR, FL, GA, LA, MO							
Lepidospartum burgessii GYPSUM SCALEBROOM	G2 S1 C2	8	MEDIUM	Hudspeth; NM	TNC/GMNP	Biennially May - late summer	2	3 2	3		
Lesquerella thamnophila ZAPATA BLADDERPOD	G1 S1 C2	2	HIGH	Starr, Zapata	TPWD	April	3	2 2	2-3		Highway right-of-way monitoring in progress.

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10/31/95

### Candidate Species Monitoring Status Overview

SCIENTIFIC NAME	STATUS	USFWS LIST PRI	PRIORITY	COUNTY OF OCCURRENCE	RESPON. PARTY	MONIT MO.	# SITES	DAYS/ STAFF	MONIT LEVEL	IMPLMT. DATE	REMARKS
<i>Liatris tenuis</i> SLENDER GAY-FEATHER	G2G3 S2S3 C2	8	MEDIUM	Angelina, Hardin, Jasper, Newton, Orange, Sabine, San Augustine, Tyler, LA (?)	USFS/ TPWD	June - August Biennially	4+	3 2	3		
<i>Lycium texanum</i> TEXAS WOLF-BERRY	G2 S2 C2	11	LOW Need to relocate	Brewster, Culberson, Hudspeth	TPWD						
<i>Machaeranthera aurea</i> HOUSTON MACHAERANTHERA	G2 S2 C2	2	HIGH	Galveston, Harris	USFWS-CL	October - Nov	7	3 2	2		
<i>Manfreda longiflora</i> ST. JOSEPH'S STAFF	G2 S2 C2	5	MEDIUM	Cameron (H), Hidalgo, Starr; Tamaulipas, Mexico	USFWS-LRV	Sept	7	4 2	3		
<i>Matelea radiata</i> FALFURRIAS ANGLEPOD (MILKVINE)	G1S1 C2	11	LOW Need to relocate	Brooks (H), Hidalgo (H), Starr (?)	TPWD						
<i>Matelea texensis</i> TEXAS MILKVINE	G1 S1 C2	8	HIGH	Brewster	TPWD	June - August	?	3 2	2-3		Access is needed. Need to relocate.
<i>Nolina arenicola</i> SAND SACAHUISTA	G2Q S2 C2	11	MEDIUM	Culberson, El Paso (?) and Hudspeth	TPWD						Highway right-of-way monitoring in progress.
<i>Oenothera pilosella</i> ssp <i>sessilis</i> GRAND PRAIRIE EVENING PRIMROSE	G5T2 SH C2	na	Need to relocate	Galveston (H); AR, LA	Possibly other state/ region						
<i>Opuntia arenaria</i> SAND PRICKLY-PEAR	G2 S2 C2	2	HIGH	El Paso, Hudspeth (H); NM; Chihuahua, Mexico	Possibly other state/ region	May - June	1	2-3 2	3		
<i>Opuntia aureispina</i> GOLDEN-SPINE PRICKLY-PEAR	G1 S1 C2	11	MEDIUM	Brewster	BIBE						
<i>Opuntia engelmannii</i> var <i>flexospina</i> FEW-SPINE ENGELMANN'S PRICKLY-PEAR	G5T1 S1 C2	12	LOW Need to relocate	Starr, Webb (H), Zapata	TPWD	April - June Triennially	1	2 1	3		
<i>Opuntia imbricata</i> var <i>argentea</i> SILVER CHOLLA	G5T1 S1 C2	12	MEDIUM	Brewster	BIBE	Biennially June - July	2	3 2	3		
<i>Osmorhiza mexicana</i> ssp <i>bipatriata</i> LIVERMORE SWEET-CICELY	G4T1 S1 C2	12	Need to relocate	Jeff Davis; Coahuila, Nuevo Leon, Mexico	TNC						
<i>Ostrya chisosensis</i> BIG BEND HOP-HORNBEAM	G2S1 C2	11	MEDIUM	Brewster; northern Mexico	BIBE/ TPWD	May - June Triennially	1	3 2	3		Every three years
<i>Oxypolis ternata</i> THREELEAF COWBANE	G3? S1 C2		MEDIUM	Hardin, Tyler (?); FL, GA, MS, NC, SC	TPWD/SUFS	Annually late summer - early fall	1-2	3 2	3		

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<i>Paronychia congesta</i> BUSHY WHITLOW-WORT	G1 S1 C2	11	HIGH	Jim Hogg	TNC/ TPWD	Annually June	2	2 2	3		Monitoring in progress
<i>Paronychia maccartii</i> MCCART'S WHITLOW-WORT	G1 S1 C2	11	LOW Need to relocate	Webb	TPWD						
<i>Paronychia wilkinsonii</i> WILKINSON'S WHITLOW-WORT	G2 S2 C2	11	MEDIUM	Brewster; Chihuahua, Coahuila, Mexico	TPWD	Annually April - ?	1-2	4 2	3		Highway right-of-way monitoring in progress.
<i>Pediocactus papyracanthus</i> PAPER-SPINED CACTUS	G2G3S1 C2	8	Need to relocate	Hudspeth; AZ, NM	Possibly other state/ region						
<i>Pediomelum humile</i> RYDBERG'S SCURFPEA	G2 S1 C2	11	HIGH	Val Verde; Coahuila, Mexico	TPWD	April - May	1	2 2	3		Highway right-of-way monitoring in progress.
<i>Pediomelum pentaphyllum</i> THREE-NERVE SCURFPEA	G1SH C2	5	Need to relocate	Presidio (H); NM (H); Chihuahua, Mexico	TPWD						
<i>Penstemon alamosensis</i> ALAMO BEARD TONGUE	G2 S1 C2	8	MEDIUM	El Paso; NM	TPWD/DOD	Annually late April - May	2	3 2	3		Ft. Bliss
<i>Perityle bisetosa</i> var <i>bisetosa</i> TWO-BRISTLE ROCK-DAISY	G2T1 S1 C2	12	Need to relocate	Brewster, Pecos	TPWD						
<i>Perityle bisetosa</i> var <i>scalaris</i> STAIRSTEP TWO-BRISTLE ROCK-DAISY	G2T1 S1 C2	12	LOW	Brewster	TPWD						
<i>Perityle huecoensis</i> HUECO ROCK-DAISY	G1S1 C2	5	HIGH	El Paso	TPWD	Sept Biennially	2	3 2	1		Conservation Agreement with Ft. Bliss
<i>Perityle vitreomontana</i> GLASS MOUNTAINS ROCK-DAISY	G1 S1 C2	11	LOW	Brewster	TNC						
<i>Perityle warnockii</i> WARNOCK'S RIVER ROCK-DAISY	G1S1 C2	11	Need to relocate	Val Verde	TPWD						
<i>Phacelia pallida</i> PALE PHACELIA	G2S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Mexico	TPWD						
<i>Phitadelphus ernestii</i> CANYON MOCK-ORANGE	G2S2 C2	8	MEDIUM	Blanco, Comal, Hays, Kendall, Travis	TNC/TPWD	April	6	3 2	2		
<i>Phyllanthus ericoides</i> HEATHER LEAF-FLOWER	G2 S1 C2	11	LOW	Brewster, Terrell; Coahuila, Mexico	TPWD						

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<i>Physostegia correllii</i> CORRELL'S FALSE DRAGON-HEAD	G2 S2 C2	11	LOW Need to relocate	Bexar (H) Galveston, Montgomery (H), Travis, Val Verde, Zapata; LA; Coahuila, Durango, Nuevo Leon, and Sonora, Mexico	Possibly other state/ region						
<i>Physostegia longisepala</i> LONG-SEPALED FALSE DRAGON-HEAD	G2G3 S2 C2	na	LOW	Hardin, Jasper, Newton, Orange, Tyler; LA	Possibly other state/ region						
<i>Poa strictiramea</i> DESERT MOUNTAINS BLUE GRASS	G3 S1 C2	11	Need to relocate	Brewster; Chihuahua, Coahuila Durango, Nuevo Leon, Zacatecas, Mexico							
<i>Polemonium pauciflorum</i> ssp <i>hinckleyi</i> HINCKLEY'S JACOB'S LADDER	G3 T1Q C2	12	HIGH	Jeff Davis; AZ; Chihuahua Mexico	TPWD/TNC	July - August Biennially	1	3 2	2-3		Access is needed-TNC--TLSS property
<i>Polygala maravillasensis</i> MARAVILLAS MILKWORT	G2S1 C2	11	LOW	Brewster, Terrell; Coahuila, Mexico							
<i>Prenanthes barbata</i> BARBED RATTLESNAKE-ROOT	G3S2 C2	na	LOW	Cass, Cherokee, Hardin, Jasper, Nacogdoches, Newton, Polk, Rusk, San Augustine, Shelby; AL, AR, GA, KY, LA, TN	TPWD	Oct Triennially	2	3 2	3		
<i>Proboscidea spicata</i> MANY-FLOWERED UNICORN-PLANT	G1 S1 C2	11	Need to relocate	Brewster, Jeff Davis, Presidio; Coahuila, Mexico	TPWD						
<i>Psilactis heterocarpa</i> WELDER MACHAERANTHERA	G2 S2 C2		MEDIUM - LOW	Nueces, Kleberg, Refugio, San Patricio, and Victoria	TPWD	Oct Biennially	3 - 6	4 2	2		
<i>Quercus boyntonii</i> BOYNTON'S OAK	GHQ SH C2	11	Need to relocate	Angelina (H); AL (H)	TPWD						
<i>Quercus graciliformis</i> CHISOS OAK	G1 S1 C2	11	LOW	Brewster	BIBE	Triennially					
<i>Quercus tardifolia</i> LATELEAF OAK	G1 S1 C2	11	Need to relocate	Brewster	BIBE						
<i>Rudbeckia scabrifolia</i> BOG CONEFLOWER	G2S2 C2	2	MEDIUM - HIGH	Angelina, Jasper, Newton, Sabine, Shelby; LA	USFS	June	5	4 2	2--3		
<i>Salvia penstemonoides</i> BIG RED SAGE	G1G2 S1S2 C2	2	HIGH	Bandera, Bexar (H), Gillespie (H), Guadalupe (H), Kendall, Kerr, Real, Travis (I), Wilson (H)	TPWD	June - Oct	5+	3 2	3		Highway right-of-way monitoring in progress.

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<i>Scirpus hallii</i> HALL'S BULRUSH	G2QS? C2	na	Need to relocate	Texas (county unknown); AL, GA, IA, IL, IN, KY, MA, MI, MO, NE, SC, WI	Possibly other state/ region						
<i>Scutellaria laevis</i> SMOOTH STEM SKULLCAP	G1 S1 C2	11	Need to relocate	Culberson, Hudspeth	TPWD						
<i>Scutellaria thieretii</i> THIERET'S SKULLCAP	G2Q S1 C2	na	3B	Nueces; LA							
<i>Sedum robertsianum</i> ROBERTS' STONECROP	G1Q S1 C2	11	Need to relocate	Brewster	BIBE						
<i>Senna ripleyana</i> RIPLEY'S SENNA	G2 SH C2	11	Need to relocate	Brewster; Chihuahua Zacatecas, Mexico							
<i>Sesuvium trianthemoides</i> ROUGHSEED SEA-PURSLANE	G1 S1 C2	11	Need to relocate	Kenedy	TPWD						
<i>Silene subciliata</i> SCARLET CATCHFLY	G3 S3 C2	5	LOW	Hardin, Jasper, Jefferson (H), Liberty, Newton, Polk, Sabine, Shelby, Tyler; LA	USFS/ TPWD/ TNC	August - Oct Biennially	4-8	3 2	3		
<i>Streptanthus bracteatus</i> BRACTED TWISTFLOWER	G2 S2 C2	2	HIGH	Bandera, Caldwell (?), Comal, Medina, Real, Travis, Uvalde	TPWD	May	7	7-8 2	3		
<i>Streptanthus cutleri</i> CUTLER'S TWISTFLOWER	G2 S2 C2	11	MEDIUM	Brewster; Coahuila, Mexico	BIBE/TPWD	Feb - March	2-4	3 2	3		
<i>Streptanthus sparsiflorus</i> SPARSELY-FLOWERED JEWELFLOWER	G2 S2 C2	11	MEDIUM	Culberson; NM	Guad Mtn NPS	Annually					
<i>Styrax youngiae</i> YOUNG'S SNOWBELLS	G1 SH C2	11	Need to relocate	Jeff Davis (H); Coahuila and Nuevo Leon, Mexico	TPWD						
<i>Suaeda duripes</i> HARDTOE SEEPWEED	GHQ SH C2	11	Need to relocate	Pecos (H) and/or Reeves (H)	TPWD						
<i>Symphoricarpos guadalupensis</i> MCKITTRICK SNWBERRY	G1 S1 C2	12	Need to relocate	Culberson	Guad MNP						
<i>Talinum rugospermum</i> ROUGH-SEED FLAME FLOWER	G3G4 S1 C2	na	LOW	Anderson, Franklin, Houston, Limestone, Nacogdoches, Rusk, Smith, Upshur, and Wood; IA, IL, IN, KS, MN, NE, WI	Possibly other state/ region	Triennially					

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<i>Thalictrum arkansanum</i> ARKANSAS MEADOW-RUE	G2Q S1 C2	11	HIGH	Bowie; Lamar, Red River; AR OK	TPWD/TNC/Other state	Spring	2	3 2	3		
<i>Thalictrum texanum</i> HOUSTON MEADOW-RUE	G2Q S2 C2	8	HIGH	Brazos, Harris (H), Waller	TPWD	Spring	2	2 2	3		
<i>Thelocactus bicolor</i> var <i>flavidispinus</i> STRAW SPINE GLORY OF TEXAS	G4T2 S2 C2	8	HIGH	Brewster Starr(?); Tamaulipas, Mexico	TPWD	March	1	2-3 2	3		Highway right-of-way monitoring in progress.
<i>Thelypodium tenue</i> FRESNO CREEK THELYPODY	G1Q S1 C2	8		Presidio	TPWD						
<i>Tillandsia baileyi</i> BAILEY'S BALLMOSS	G2 S2 C2	2	MEDIUM	Brooks (H), Cameron, Hidalgo, Jim Wells, Kenedy, Willacy; Tamaulipas, Mexico	TPWD	October	3	2 2	3		Highway right-of-way monitoring in progress.
<i>Trillium pusillum</i> var <i>texanum</i> TEXAS TRILLIUM	G3T2T3Q S2S3 C2	3	MEDIUM	Cass, Harrison, Houston (H), Nacogdoches, Panola (H), Rusk, Smith, and Wood (?); AR, LA	TPWD	Annually					
<i>Valerianella texana</i> EDWARDS PLATEAU CORNSALAD	G2 S2 C2	8	LOW	Burnet, Gillespie, Llano	TPWD						
<i>Viola guadalupensis</i> GUADALUPE MOUNTAINS VIOLET	G1 S1 C2	5	MEDIUM	Culberson	Guadalupe MNP	Annually March - May	1	3 2	3		
<i>Xyris drummondii</i> DRUMMOND'S YELLOW-EYED GRASS	G3 S2 C2	na	LOW	Angelina, Jasper, Newton; AL, FL, GA, LA, MS	TPWD/ USFS	Mid June - Mid August Triennially	3-9	5 2	3		
<i>Xyris scabrifolia</i> ROUGH-LEAF YELLOW-EYED GRASS	G2G3 S2 C2	na	LOW	Angelina, Jasper, Newton, Sabine; AL, FL, GA, LA, MS, NC	TPWD/ USFS	Late July - Early September Triennially	4-10	5 2	2		
<i>Zanthoxylum parvum</i> SHINNERS' TICKLE-TONGUE	G1 S1 C2	11	HIGH	Brewster, Jeff Davis	TPWD	April Triennially	1	3 2	3		Access is needed. Biennially

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