Section 6 Report Review

Attachment to letter dated August 13, 2001

Project: Expanded Capacity for Rare Resource Education and Outreach

Final or interim report? Final

Job #: WER 05 (Job 76)

Reviewer's Station: Austin Fish and Wildlife Service

Lead station was contacted and concurs with the following comments:
___ Yes ___ No _X_ Not applicable (reviewer is from lead station)

Report: _X_ is acceptable as is

_____ is acceptable as is for an interim report, but the following comments are made for future reference

____ needs revision (listed below)

Comments: (Note to commenter: If you make comments directly on a copy of the report, write legibly and dark so comments will reproduce well when photocopied.)

The materials produced will be very helpful to a wide variety of educators teaching rare and endangered species concepts. Would suggest that Texas Parks and Wildlife forward a complete set of the notebooks and video to each U.S. Fish and Wildlife Service office for their files and use. Only one set was provided for review.

FINAL REPORT

As Required By

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E-1-12

Endangered and Threatened Species Conservation

Project Number WER~~08~~46 (76): Expanded Capacity for Rare Resource Education and Outreach

Prepared By:
Ann Miller

TEXAS PARKS & WILDLIFE

Andrew Sansom
Executive Director

John Herron
Program Director, Wildlife Diversity

Gary Graham
Division Director, Wildlife

June 1, 2001

FINAL REPORT

STATE: Texas **GRANT NUMBER:** E-1-12

GRANT TITLE: Endangered and Threatened Species Conservation

REPORTING PERIOD: September 1, 1996 through August 31, 2000

PROJECT NUMBER: WER05 (76)

PROJECT TITLE: Expanded Capacity for Rare Resource Education and Outreach.

OBJECTIVE: To develop curricula and key education products that will complement and build on Section 6 research and inventory projects already completed or in production.

Prepared by: Ann Miller **Date:** June 1, 2001

Approved by: _____ **Date:** July 16, 2001
Federal Aid Coordinator

Section 6 Final Report

Executive Summary

The purpose of this Section 6 project was to develop new educational opportunities and outreach products to complement and build on knowledge derived from Section 6 projects already completed or in production. Work from this project has resulted in:

1. A state-wide series of workshops for educators called, Rare and WILD Texas.
2. Curriculum for an "Outdoor Classroom" program that will provide teachers with field investigations for their students and opportunities to learn about conservation of Texas' rare plants and animals
3. Video about Texas' rare species compiled from segments of past "Texas Parks and Wildlife" shows aired on PBS stations

Materials for each of the above are enclosed.

The total of 30 workshops were presented within the time of this grant, with a total of 536 participants at the workshops. The State Board of Educator Certification approved the Rare and WILD Texas workshops for continuing education credits for teachers. The Texas Environmental Education Advisory Committee also approved the workshop for its environmental education credits, making this workshop very desirable to teachers. The workshop activities were also correlated to the Texas Essential Knowledge and Skills for science and social studies.

Participants at the workshops demonstrated and received a set of seven activities to help them teach their students about rare Texas wildlife. In addition, they received a Rare Texas Wildlife Bingo game and a Jeopardy game designed by our staff as well as regional packets designed to focus on specific rare species in different parts of the state. Participants also purchased videos ("The Web" and "Ecoregions of Texas"), Rare Texas Wildlife Trading Cards, and the "Endangered and Threatened Species of Texas" poster at their replacement cost. Since May of 2000, participants have also received the free mini poster, "Rare Beauties of Texas" that appeared in the Texas Parks and Wildlife magazine. Participants of future workshops will also be able to purchase the new video, "Texas Treasure: Portraits of Rare Texas Plants and Wildlife."

With limited publicity, the Rare and WILD Texas Essay and Poster Contest (in its second year) drew more than 50 entries. Prizes were awarded in each category. Winning entries may be seen at our web site:

http://www.tpwd.state.tx.us/nature/education/rare_wild

In order to tie many of our projects together under one program easily identified by our constituents, curriculum developed and adapted for the "Outdoor Classroom" program as described in our original proposal, has been marketed as Texas Nature Trackers Field Investigations. These activities help teachers prepare students for monitoring projects and provide background information about threats to Texas wildlife.

In addition to preparing the curriculum, our staff designed teacher workshops to present these field investigations to teachers. The workshops received State Board of Educator

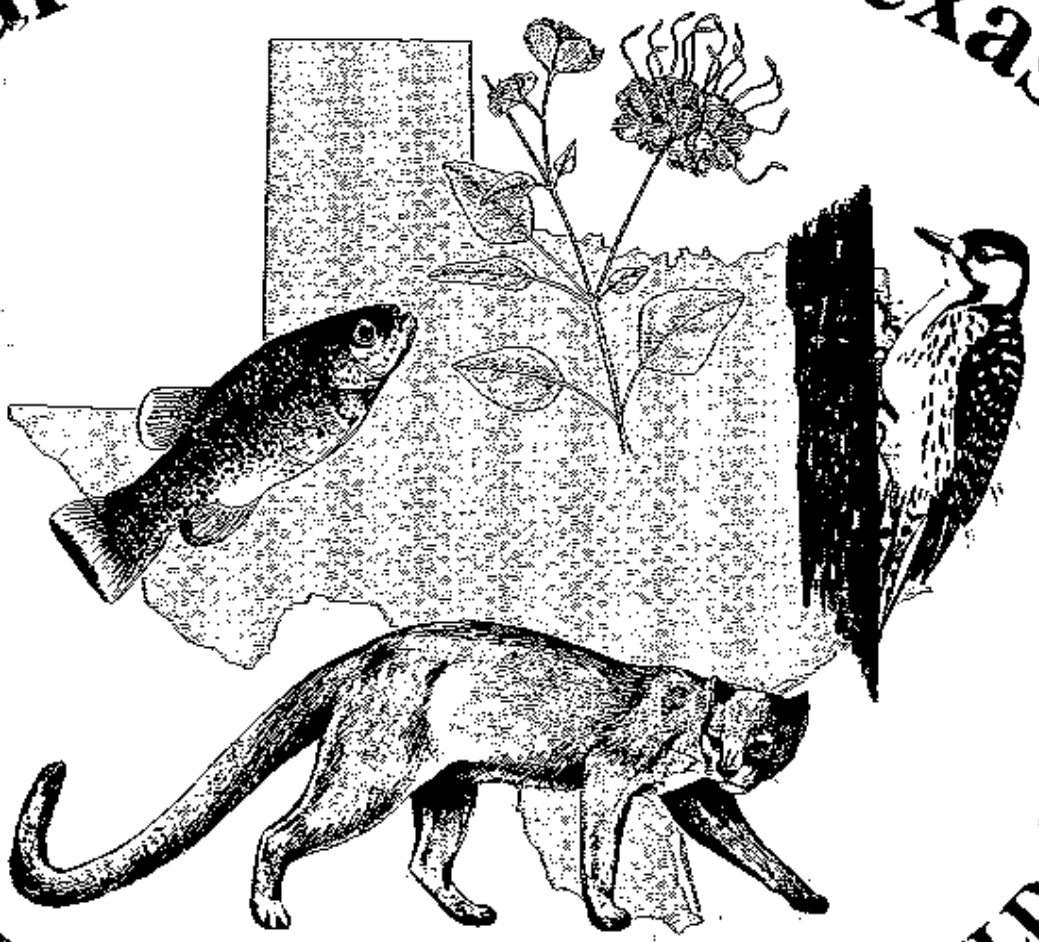
Certification approval to give teachers continuing education credits for attendance. In addition, staff applied for and received permission to offer a special Texas Nature Trackers workshop to teachers working towards gifted and talented education credits. The curriculum has also been correlated with the Texas Essential Knowledge and Skills for science and social studies.

In the past 2 years, five 4 to 6-hour teacher workshops have been presented, with training provided to over 90 educators, some of whom elect to participate in more than one monitoring project. Staff is continuing to refine and improve both the curriculum and the workshop presentations as field-testing and feedback from teachers indicates the need for change. Dates are already being set for Texas Nature Trackers workshops for 2001.

The video, *Texas Treasure: Portraits of Rare Texas Plants and Wildlife*, has been completed. The video is 34 minutes long and introduces viewers to over a dozen rare Texas species. In addition, the video describes habitats and threats to each species as well as management techniques being used to help each species. The video emphasizes positive ways citizens protect and restore species and habitats on their own properties. Written materials for classroom use are being prepared to accompany the video, with distribution beginning in December, 2000. The video will be publicized to teachers via workshops, our web site, conferences, and several different environmental education newsletters. We will also distribute it to Texas Parks and Wildlife staff across the state for use in their outreach presentations.

#76

Rare and WILD Texas



A Texas Supplement to Project WILD

Prepared by
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Rare and WILD Texas

(An Adaptation of ***Oh, Deer!*** from **Project WILD***)

OBJECTIVES

Students will be able to:

1) define what it means for a plant or animal to be endangered or threatened,
2) identify and name a number of Texas endangered and threatened species,
3) describe factors which may cause species to decline and become endangered, and
4) discuss why we should care about endangered and threatened species.

METHOD

Students play the roles of endangered/threatened animals and plants, habitat components, and threats to survival in an active physical activity.

BACKGROUND

An endangered species is a plant or animal that is in danger of becoming extinct. Extinction is the complete dying out of a plant or animal species. A threatened species is one that is likely to become endangered in the future.

Extinction is sometimes a natural process. The dinosaurs, the wooly mammoth, and many species of plants are gone. Why should we care about endangered species today? Because only recently have we begun to realize how one species can dramatically influence the rate of disappearance of other species. It was not until the 20th century that we began to recognize that man could cause the loss of large numbers of species. Prior to 1900, three species were known to have disappeared from Texas. From 1901 to 1958, another four species were extirpated (no longer exist in Texas). Since 1959, an alarming ten species or subspecies are known to have become extinct in Texas. Of the above 17 species, six are extinct worldwide. Today, species such as the Attwater's Prairie Chicken hang on the brink of extinction.

There are several explanations for species' rarity. Some species are naturally rare. Overharvesting caused the decline of the Kemp's Ridley Sea Turtle and the extinction of the Passenger Pigeon. Others, such as the Brown Pelican and Peregrine Falcon, are endangered because of the effects of pollutants in the environment. The introduction of non-native species contributed to the decline of the Pecos Pupfish, along with several other fish species. However, the vast majority of rare species in Texas are disappearing because their habitat is disappearing.

Why save endangered species? Why should we care? One reason is that all species may at some point have a practical usefulness to people. There are many species whose potential scientific, medical, economic, and agricultural benefits are unknown. It was a fungus that gave us penicillin, and certain plants have yielded substances used in drugs to treat heart disease, cancer, and other serious illnesses. Texas wild-rice is closely related to other wild-rice species used as food crops. Each species which goes extinct carries with it all of its undiscovered value to people.

A less tangible reason for preserving species is for their aesthetic value. Many people value the opportunity to view a rare species or simply value the knowledge that such noble creatures as the Bald Eagle exist. In some cases this intangible value actually translates into economic value. The majestic Whooping Crane is the tallest bird in North America. Each year, over 50,000 people visit the Aransas National Wildlife Refuge on the Texas coast, the whoopers' only native wintering area. A survey of visitor expenditures indicates that the local economic impact of the Whooping Crane may total several million dollars.

A third reason for species conservation is that the extinction of species often represents much more than the loss of one species. In some cases, interdependencies between species means that the extinction of one species can jeopardize the balance of the ecosystem. For example, the extirpation of the Black-footed Ferret may have contributed to problems managing prairie dog populations. In other cases, the demise of species may signal trouble affecting the whole natural community. The decline of species high in the food web due to pesticide contamination, such as the Bald Eagle or the Peregrine Falcon, provide a stark example of how endangered species can warn of threats to people.

Finally, some would argue for the preservation of species simply upon ethical grounds. Many people believe that every creature, after adapting for thousands or even millions of years to a constantly changing environment, has an intrinsic right to exist. They believe that human-caused extinction is not only shortsighted, but wrong.

The following table (pages 7-14) describes all federally-listed endangered and threatened plants and animals of Texas, along with their ecoregion of occurrence, habitat requirements, and threats or reasons for decline. A map of the ecoregions of Texas is presented on page 15.

MATERIALS

Area large enough for students to run (i.e. playing field or gym),
Black line drawings of threats to survival (pages 16-18),
Masking tape or round colored stickers,
Drawings or photos of endangered and threatened animals and plants (optional),
Color photos of the habitats for each species (optional).

Rare and WILD Texas
(An Adaptation of Oh, Deer! from *Project WILD)**

PROCEDURES

1. This activity is an adaptation of "Oh Deer!" (found in the Project WILD activity guide), except that the students become an endangered or threatened animal instead of deer. Follow the "Oh Deer!" procedures to demonstrate how individual animals either survive or die depending on whether their habitat needs are met.

VARIATIONS

These variations of the basic activity can be used to teach students about the various threats and reasons for decline in Texas's endangered and threatened wildlife:

1. **Urban Development:** At the beginning of a round, give some of the "habitat elements" a picture (see black lines) representing urban development (houses, stores, and factories). Record the number of animals that die because their habitat elements (food, water, shelter) has been replaced by urban development. As more houses and stores replace habitat elements, do more animals die? Reiterate that the animal cannot survive without **food, water, shelter, and space in a suitable arrangement.** Animals such as the Attwater's Prairie Chicken, Ocelot, Golden-cheeked Warbler or the cave invertebrates are good choices to demonstrate how urbanization has resulted in loss of habitat and species decline.

2. **Pesticide Contamination:** After the "habitat elements" have chosen their symbols, place a small piece of masking tape or a colored sticker in the palm of one or more of the "food" symbols. The tape or sticker represents food contaminated with pesticide. When the animal returns to the other side with the contaminated food, it "dies" without reproducing. Both the animal and food element must return to the habitat to recycle (become habitat elements). This variation can be used to demonstrate the improper use of pesticides and the effects of dangerous pesticides such as DDT. Birds such as the Bald Eagle, Peregrine Falcon, or Brown Pelican are good examples of endangered and threatened animals affected by pesticide contamination.

3. **Water Pollution:** Place the masking tape or sticker in the palm of one or more of the "water" symbols. This indicates that pollutants, such as pesticides, trash, motor oil, toxic chemicals, etc. have entered the water systems. When the animal returns to the other side with the contaminated water, it "dies" without reproducing. Both the animal and the water element must return to the habitat to recycle. Fish (Fountain Darter, Comanche Springs Pupfish, Pecos Gambusia), amphibians (Barton Springs Salamander, San Marcos Salamander, Texas Blind Salamander), or sea turtles (ingest plastic trash and die) are good examples to use with this variation.

4. **Loss of Spring Habitat:** Let the students who are animals become the desert spring fishes of west Texas (Comanche Springs Pupfish, Leon Springs Pupfish, Pecos Gambusia, Big Bend

Gambusia) or the animals that depend on the San Marcos and Comal spring systems of central Texas (Fountain Darter, San Marcos Salamander, Texas Blind Salamander). Without letting the animals know (while backs are turned), give the habitat elements a drawing or symbol (see black lines) representing a dry spring. When a spring ceases to flow, there is a complete loss of habitat (food, water, shelter) for the endangered fishes or salamanders who depend on that spring system. The animals die when the spring goes dry. This demonstrates what could happen to spring-dependent aquatic species if spring systems cease to flow due to overuse of groundwater by people.

Because certain plants, such as the endangered Texas wild-rice, also depend on clear, clean spring water, loss of spring habitat also affects rare plants. In this activity, let half the students be wild-rice plants growing in the San Marcos River. The "plants" can scatter themselves throughout the playing field. The remaining students become "spring water" flowing freely throughout the playing field. Problems for the plants begin when there is a prolonged drought. People continue to use the groundwater, but there is no rain to replace what is used. The springs dry up and the students representing "water" leave the playing field. Soon all the wild-rice plants die (the "plants" also leave the field). Luckily, biologists have maintained a small refugium (protected nursery where endangered plants are grown) for the Texas wild-rice. The next year rainfall is plentiful and fortunately the springs begin to flow again. The "water" returns to the playing field. Several students, designated as biologists, begin replanting wild-rice plants (obtained from the refugium located near the playing field) into the spring-fed river habitat. As long as the water continues to flow clean and clear, the wild-rice plants continue to reproduce and increase in number.

5. **Illegal Shooting or Poaching:** Select one or more "shooters" or "poachers" and have them stand in one location on the side of the playing field (see diagram on page 19). Place a hoola hoop on the ground beside each poacher. Inside the hoola hoop place 10 to 20 paper wads to be used as "bullets". Since poachers do not follow rules or game laws as legitimate hunters do, explain to the poachers that they can "kill" as many animals as they want to by hitting the animals with paper wads. Poachers can move throughout the playing field. However, they can only shoot one "bullet" at a time, and must return to the hoola hoop after each shot to get another bullet. Poachers can either harvest the dead animals or leave them to recycle into the habitat. When the round begins, poachers can begin "killing" animals as they move toward the habitat elements. Overharvest, poaching, and illegal shooting of animals such as the Eskimo Curlew, Whooping Crane or Kemp's Ridley Sea Turtle are good examples to use when demonstrating this threat. In fact, as recently as 1991, a female Whooping Crane was illegally shot by a vandal as she migrated northward through Texas. The nesting beach of the Kemp's Ridley in Mexico is regularly patrolled to prevent poachers from killing turtles to sell the meat or eggs.

6. **Habitat Alteration:** Choose one student to be a bulldozer (brush clearing), timber harvester (loss of pine habitat), or tractor and plow (conversion of habitat to cropland). Begin the round as usual. Ask the students to turn and face each other **but not move**. While both lines

remain stationary, the bulldozer, timber harvester, or tractor and plow will move through the habitat removing one or more food or shelter elements. When the machines are finished altering the habitat, let the animals move toward the habitat elements. Did some of them die as a result of the brush cover or timber being removed? Before each round, have the "equipment" move through the habitat. Remind the students that habitat alteration which removes necessary food and cover is a major reason for animals becoming endangered or threatened. The Red-cockaded Woodpecker (timber harvest); Black-capped Vireo, Golden-cheeked Warbler, or Ocelot (brush clearing); or Attwater's Prairie Chicken, Ocelot, or Jaguarundi (tractor and plow) are good examples that demonstrate this threat.

7. **Introduction of Non-Native Species:** In this activity, the students become fish and habitat elements. Have the students face each other. Select one student to be a fisherman and have him/her stand at the side of the playing field. Then select three to seven students to be non-native fishes in the fisherman's bait bucket. Have the non-native fish stand by the fisherman. Identify each non-native fish with a colored card or sticker. Explain that after a long day of fishing, this fisherman has decided to "release" the non-native fish from his bait bucket into the stream. After release, the non-native fish "swim" to join the endangered fishes. Have the students turn their backs and begin the round as usual. The non-native fish move toward the same habitat elements being sought by the endangered native fishes. Were some of the native fish outcompeted by the non-native introduced fish?

8. **Threats to Endangered Plants:** For this variation, the basic activity is modified to address the non-mobile nature of plants. To do this, we assume the "threats" can move but the endangered plants cannot. Most of the students become individual plants in a population, while a few students play the role of threats to the plants survival. The threats could include a "bulldozer", "mower", or "tractor and plow" to represent habitat loss and alteration, or "plant collectors" removing so many individuals from the population that the plants can no longer successfully reproduce. Set up the playing field with clumps of endangered plants growing in suitable habitats (see diagram). Decide on a species and an appropriate threat from the table. For habitat loss, blindfold the "bulldozer", "mower", or "tractor and plow" and have them walk across the playing field. When the machines run into a clump of plants, that population is destroyed. To demonstrate the threat of plant collection, let the "plant collectors" move through the populations of endangered plants removing as many plants as they can in 30 seconds. The collectors must take one plant at a time back to the starting line.

When the rounds are over, ask the students to describe what happened to the plant populations. What could have been done to avoid destroying the endangered plants? Start the round again, only this time employ a "planner" to direct the "bulldozer" or "tractor" so that the rare plants survive. Have the "planner" pace off the distance and determine the direction of each plant in relation to the location of the "bulldozer" or to a designated corner of the playing field. You may want to limit these calculations to two or three plants or plant clumps and have the "planner" record his calculations or drawings on a data sheet. Once the equipment operators know the exact locations of each plant, they can avoid destroying the endangered plants and their habitat.

To demonstrate the threat of overgrazing by livestock and/or deer, have about one-third of the students stand outside the playing field. These students represent grazing or browsing animals (deer, cattle, goats). The rest of the students are endangered plants (Texas snowbells would be a good example since it is readily eaten by deer). Explain that each goat or deer can enter the playing field, eat one plant, and return to the starting line with the consumed plant. Continue to increase the number of grazing animals in relation to plants until all the plants have been eaten.

Because fire is an important component of many ecosystems, some plants depend on periodic fire to survive. For example, periodic fires maintain the open pine forests favorable for the growth of Texas trailing phlox, an endangered plant. To demonstrate the importance of periodic natural fires in maintaining populations of certain rare plants, divide the students into three equal groups. Group 1 will be the rare plants scattered about the playing field. The "rare plants" hold their arms up like leaves absorbing the sunlight. Give each member of Group 2 a drawing of a fire flame (see black lines). Group 3 will represent the "fire fighters" whose job it is to put out the fire. In the first round, the "fires" will try to make it across the playing field without being caught by the "fire fighters". If most of the "fires" make it across, the plant population will survive. However, if most of the fire group is caught and extinguished by the "fire fighters", the plants will die (dead plants must leave the playing field).

EVALUATION

1. Define endangered species; threatened species.
2. Define "limiting factors". Give three examples.
3. Name three endangered species which occur in Texas and the reasons these species have become endangered.
4. Name two reasons we should care about endangered and threatened species.

Age: Grades 3-8
Subjects: Science, Math, Social Studies, Physical Education
Skills: application, comparing similarities and differences, description, discussion, generalization, kinesthetic concept development, observation, psychomotor development
Duration: 30 to 45 minutes
Group Size: 15 and larger recommended
Setting: indoors or outdoors, large area for running needed
Key Vocabulary: endangered species, limiting factors, population, ecosystem, threats to survival, extinct, extirpated

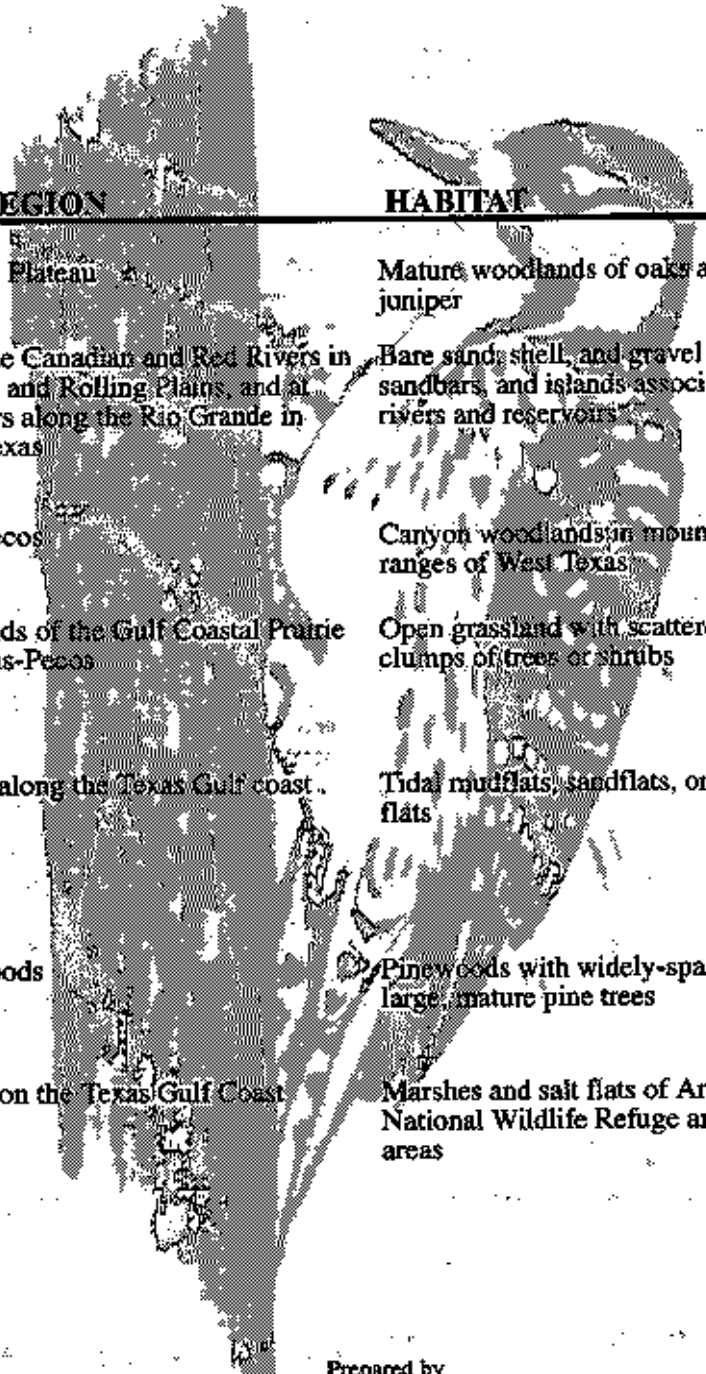
Educator's Guide to Endangered and Threatened Animals of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Greater Long-nosed Bat	E	Trans-Pecos	High desert regions of Big Bend National Park	• Harvest of agave plants to make liquor • Vulnerable to disturbance at the roost site
Jaguarundi	E	South Texas Brush Country	Dense, thorny, low brush	• Clearing of brush habitat
Ocelot	E	South Texas Brush Country	Dense, thorny, low brush	• Clearing of brush habitat
American Peregrine Falcon	E	Trans-Pecos	Nest on high cliff ledges	• Reproductive failure due to pesticide contamination
Attwater's Prairie Chicken	E	Gulf Coast Prairies	Tall grass coastal prairie	• Loss and decline of tallgrass prairie habitat
Bald Eagle	T	Breeding populations occur in the eastern half of Texas; Wintering eagles occur in suitable habitat throughout Texas	Breeding - In Texas, along river systems or lakeshores with large, tall trees Wintering - mostly near large lakes and reservoirs	• Reproductive failure due to pesticide contamination • Human disturbance in some areas • Loss of nesting habitat
Black-capped Vireo	E	Edwards Plateau	Semi-open rangelands with a diversity of low growing shrubs	• Clearing of shrublands • Overbrowsing by deer and/or livestock • Cowbird parasitism
Eastern Brown Pelican	E	Along the Texas Gulf coast	Offshore islands, spoil islands, and mudbanks	• Reproductive failure due to pesticide contamination • Disturbance at nesting islands
Eskimo Curlew	E	Migrated through the grasslands of central Texas	Migrated from the Arctic tundra breeding grounds to the Pampas grasslands of Argentina. They used the tallgrass prairies of Texas and the midwest during migrations.	• Loss of North American tallgrass prairie habitat • Unrestricted harvest by market hunters during late 1800's

E - Federally-listed as Endangered
T - Federally-listed as Threatened

Prepared by
Endangered Resources Branch
Texas Parks and Wildlife Department

Endangered and Threatened Animals of Texas



SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Golden-cheeked Warbler	E	Edwards Plateau	Mature woodlands of oaks and Ashe juniper	• Clearing of woodland habitat
Interior Least Tern	E	Along the Canadian and Red Rivers in the High and Rolling Plains, and at reservoirs along the Rio Grande in South Texas	Bare sand, shell, and gravel beaches, sandbars, and islands associated with rivers and reservoirs	• Loss of nesting habitat due to alteration of the major river systems of the midwest • Human disturbance along inland rivers
Mexican Spotted Owl	T	Trans-Pecos	Canyon woodlands in mountain ranges of West Texas	• Loss of old-growth forest habitat
Northern Aplomado Falcon	E	Grasslands of the Gulf Coastal Prairie and Trans-Pecos	Open grassland with scattered clumps of trees or shrubs	• Loss of grassland habitat due to brush encroachment • Conversion of rangeland to cropland • Pesticide contamination
Piping Plover	T	Winters along the Texas Gulf coast	Tidal mudflats, sandflats, or algal flats	• Loss and alteration of breeding habitat on the Great Lakes and along inland rivers in the midwest • Industrial and urban expansion along the Texas Gulf Coast
Red-cockaded Woodpecker	E	Pineywoods	Pinewoods with widely-spaced, large, mature pine trees	• Loss of large, mature pines • Lack of prescribed fire to maintain open pinewoods
Whooping Crane	E	Winters on the Texas Gulf Coast	Marshes and salt flats of Aransas National Wildlife Refuge and nearby areas	• Human disturbance, accidental shooting and loss of wetland breeding habitat • Threat of oil spills along the Texas coast

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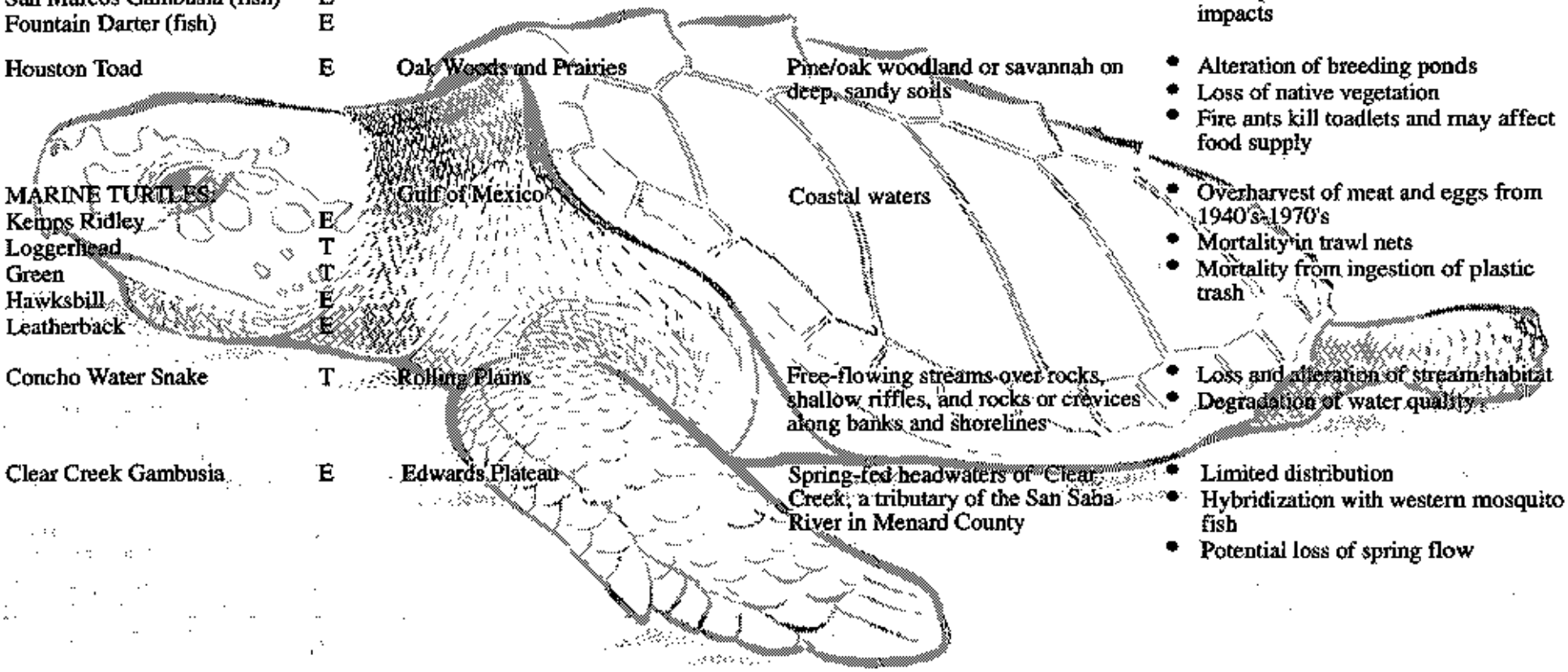
Endangered and Threatened Animals of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
EDWARDS AQUIFER SPECIES:		Edwards Plateau	Spring-fed waters of the San Marcos and Comal rivers in central Texas	• Potential loss of spring flow due to overuse of aquifer water • Increased urbanization leading to water pollution and other human impacts
San Marcos Salamander	T			
Texas Blind Salamander	E			
San Marcos Gambusia (fish)	E			
Fountain Darter (fish)	E			
Houston Toad	E	Oak Woods and Prairies	Pine/oak woodland or savannah on deep, sandy soils	• Alteration of breeding ponds • Loss of native vegetation • Fire ants kill toadlets and may affect food supply
MARINE TURTLES:		Gulf of Mexico	Coastal waters	• Overharvest of meat and eggs from 1940's-1970's • Mortality in trawl nets • Mortality from ingestion of plastic trash
Kemps Ridley	E			
Loggerhead	T			
Green	T			
Hawksbill	E			
Leatherback	E			
Concho Water Snake	T	Rolling Plains	Free-flowing streams over rocks, shallow riffles, and rocks or crevices along banks and shorelines	• Loss and alteration of stream habitat • Degradation of water quality
Clear Creek Gambusia	E	Edwards Plateau	Spring-fed headwaters of Clear Creek, a tributary of the San Saba River in Menard County	• Limited distribution • Hybridization with western mosquito fish • Potential loss of spring flow



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Texas Parks and Wildlife Department

Endangered and Threatened Animals of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
DESERT SPRING FISHES:		Trans-Pecos	Spring fed desert wetlands and streams	• Loss of spring flows • Competition with introduced fishes • Hybridization with introduced fishes
Comanche Springs Pupfish	E			
Leon Springs Pupfish	E			
Pecos Gambusia	E			
Big Bend Gambusia	E			
KARST INVERTEBRATES:		Edwards Plateau, Travis and Williamson Counties	Limestone caves, sinkholes and fractures	• Filling and collapse of caves and alteration of drainage patterns • Contamination by pollutants • Human disturbance • Fire ants
Bee Creek Cave Harvestman	E			
Bone Cave Harvestman	E			
Tooth Cave Pseudoscorpion	E			
Tooth Cave Spider	E			
Tooth Cave Ground Beetle	E			
Kretschmarr Cave Mold Beetle	E			
Coffin Cave Mold Beetle	E			

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Prepared by
Endangered Resources Branch
Texas Parks and Wildlife Department

Educator's Guide to Endangered and Threatened Plants of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Texas snowbells	E	Edwards Plateau	Limestone ledges or cliff faces along perennial streams	• Overbrowsing of seedlings by deer, exotics and domestic animals.
Texas wild-rice	E	Edwards Plateau (only in upper three miles of San Marcos River)	San Marcos River; clear, constant temperature, spring-fed water	• Potential loss of spring flow • Invasion of exotics (giant rams horn snail, nutria, elephant ears, hydrilla) • High recreational use • Run off pollution • Multiple dams
Tobusch fishhook cactus	E	Edwards Plateau	Ashe juniper/oak rangelands on rocky alkaline soils	• Collection • Predation by cactus moth larva • Habitat alteration
Blacklace cactus	E	Gulf Costal Prairies	Grasslands or mesquite-invaded grasslands	• Agricultural clearing • Oil industry activities
Texas prairie dawn	E	Gulf Costal Prairies	Poorly drained, sparsely vegetated areas ("slickspots") at the base of mima (or pimple) mounds in open grasslands	• Loss of coastal prairie habitat • Urbanization
Slender rush-pea	E	Gulf Costal Prairies	Grasslands or mesquite-invaded grasslands	• Agricultural clearing • Oil industry activities
South Texas ambrosia	E	Gulf Coastal Prairies	Grasslands often with mesquite invading	• Agricultural clearing • Oil industry activities
Large-fruited sand verbena	E	Oak Woods and Prairies	Openings within oak woodland on deep, dynamic sands	• Possibly always rare • Oil industry activities • Loss of native vegetation

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Prepared by
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Texas Parks and Wildlife Department

Endangered and Threatened Plants of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Navasota ladies'-tresses	E	Oak Woods and Prairies	Associated with openings and drainages in post oak woodlands	• Coal mining • Urbanization
Texas trailing phlox	E	Pineywoods	Deep sandy soils of longleaf pine woodlands	• Suppression of fire • Logging
White bladderpod	E	Pineywoods (only in one county)	Occurs within natural openings of pine-oak woodlands usually on glades over Weeks Formation ironstone/glaveonite on alkaline soils	• Possibly always rare • Narrow range of soils • Conversion of natural habitat
Texas poppy-mallow	E	Rolling Plains	Within grasslands or open oak/ mesquite woodlands, usually on deep Tivoli sands.	• Sand mining • Loss and alteration of habitat • Oil and gas development
Ashy dogweed	E	South Texas Brush Country	Found in mesquite grassland openings of thorny shrublands on deep, sandy soils	• Loss of native rangeland habitat • Possibly always limited distribution
Johnston's frankenia	E	South Texas Brush Country	Saline rocky hillsides or saline clay loam flats within openings of thorny shrublands	• Loss of native rangeland habitat • Narrow range of soils
Star cactus	E	South Texas Brush Country (only one population in Texas)	Openings of thorny shrublands on rocky clay loam soils	• Collection • Limited distribution • Loss of native rangeland habitat
Texas ayenia	E	South Texas Brush Country	Subtropical woodlands on alluvial deposits on flood plains and terraces of the Rio Grande	• Agricultural clearing • Urbanization

E - Federally-listed as Endangered
T - Federally-listed as Threatened

Prepared by
Endangered Resources Branch
Texas Parks and Wildlife Department

Endangered and Threatened Plants of Texas

SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Walker's manioc	E	South Texas Brush Country	Found in openings of thorny shrublands on sandy loam soils	• Loss of native rangeland habitat
Bunched cory cactus	T	Trans-Pecos	Rocky slopes, ledges and flats in the Chihuahuan Desert on limestone	• Collection
Chisos hedgehog cactus	T	Trans-Pecos (only in Big Bend National Park)	Open shrublands on gravelly flat alluvial fan deposits	• Collection • Habitat loss • Limited distribution
Davis green pitaya	E	Trans-Pecos (only in vicinity of Marathon)	Rocky hillsides of novaculite (a particular kind of rock) outcrops with sparse vegetation	• Collection • Restricted to novaculite outcrops • Possibly always rare
Hinckley's oak	T	Trans-Pecos	Found along arid limestone slopes at mid-elevations in Chihuahuan Desert	• Climatic change (possibly a relict species) • Evidence from fossil pack rat middens indicates that this species was more common 10,000 years ago when the climate was more mesic (wet)
Little Aguja pondweed	E	Trans-Pecos	Known to occur only within quiet seepage pools in Little Aguja Creek in the Davis Mountains	• Possibly always rare • Potential water diversion, over allocation of water
Lloyd's mariposa cactus	T	Trans-Pecos	In full sun on limestone outcrops or rocky, alkaline soils on slopes or mesas	• Collection • Habitat loss and alteration
Nellie cory cactus	E	Trans-Pecos (only in vicinity of Marathon)	Rocky hillsides of novaculite (a particular kind of rock) outcrops with sparse vegetation	• Collection • Limited Distribution

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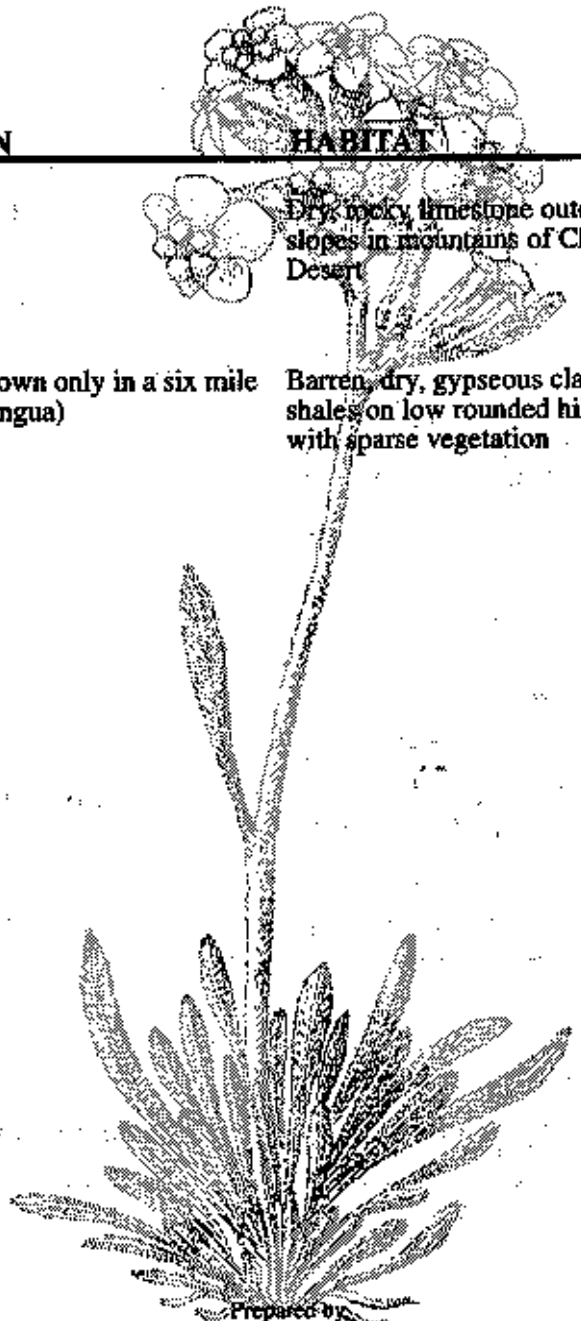
SPECIES		ECOREGION	HABITAT	PRESUMED THREATS/REASONS FOR DECLINE
Sneed pincushion cactus	E	Trans-Pecos	Dry, rocky limestone outcrops, on slopes in mountains of Chihuahuan Desert	• Collection • Habitat loss
Terlingua Creek cat's-eye	E	Trans-Pecos (known only in a six mile radius near Terlingua)	Barren, dry, gypseous clay or chalky shales on low rounded hills and slopes with sparse vegetation	• Habitat loss and alteration • Limited distribution



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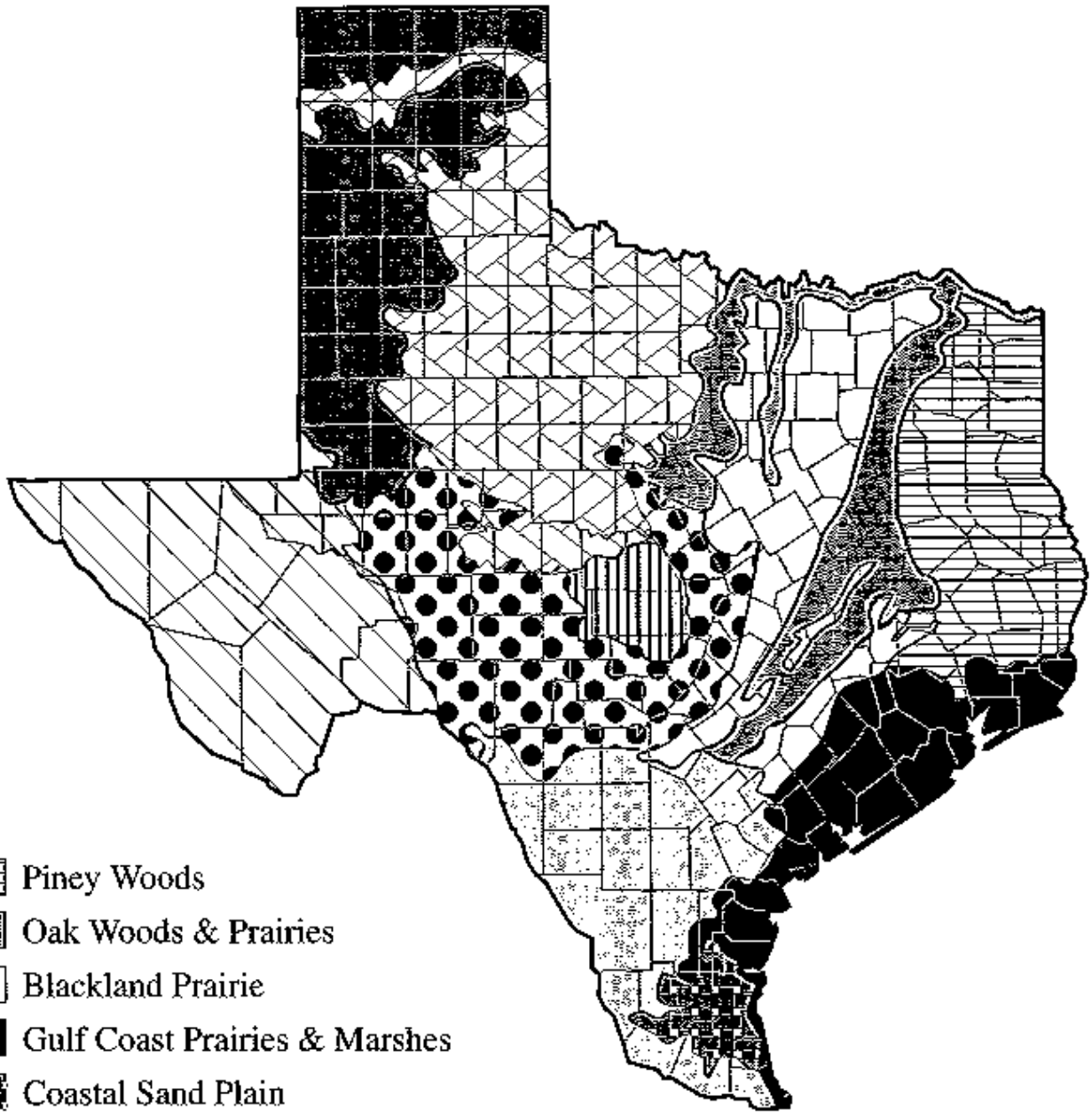
Ecoregions of Texas

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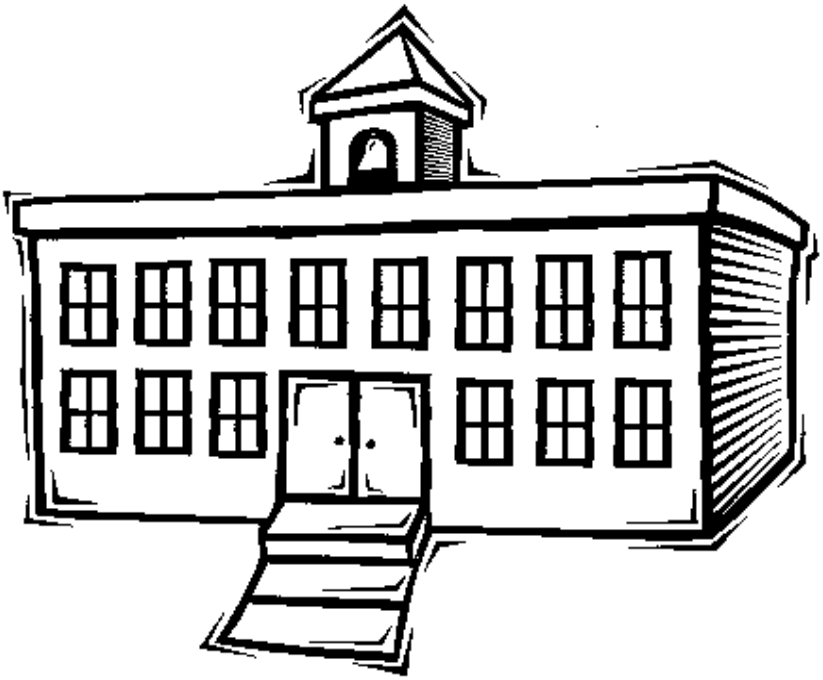
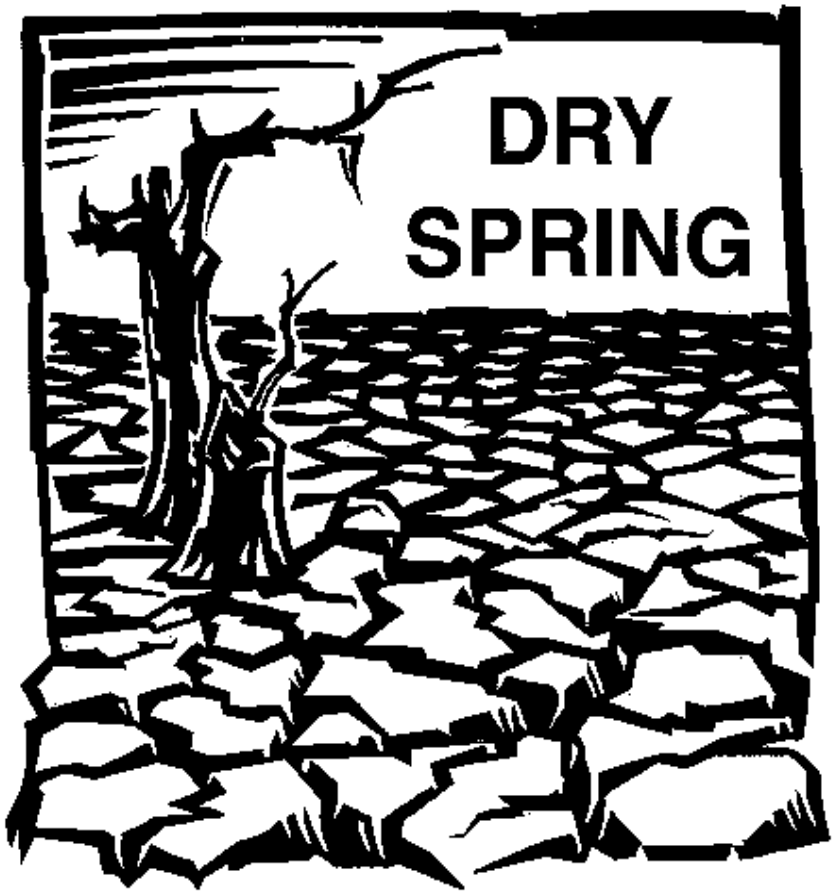
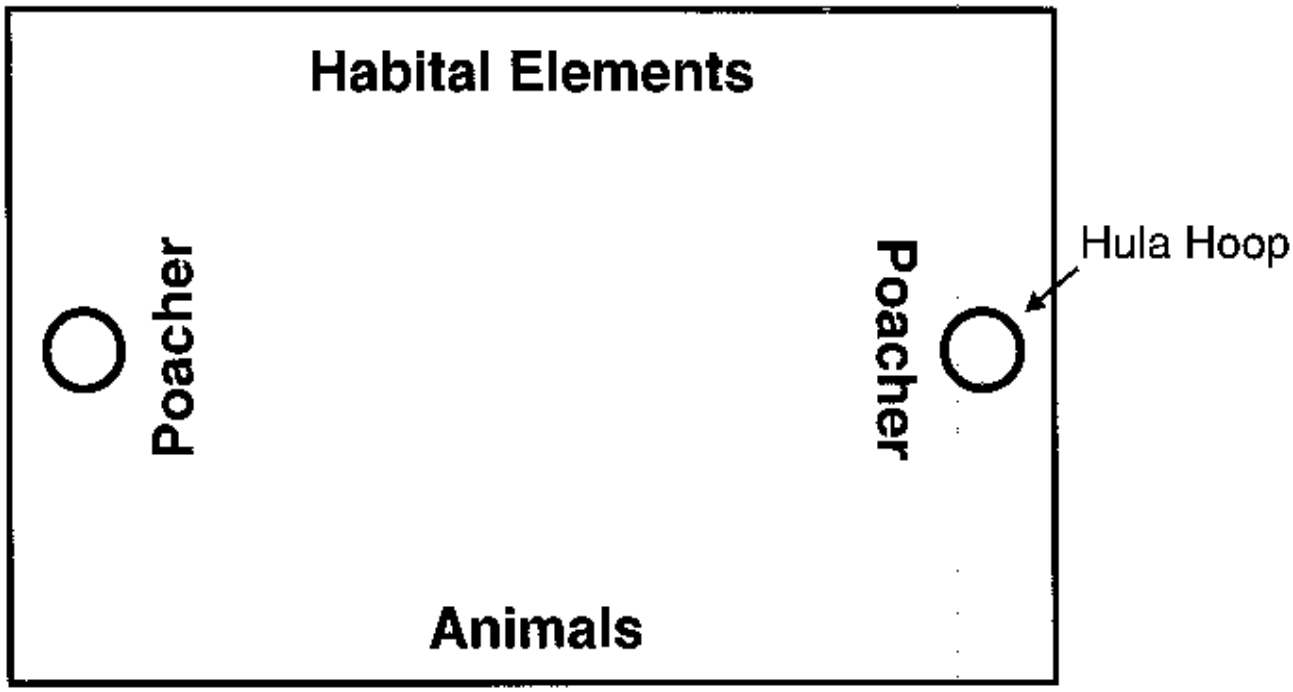
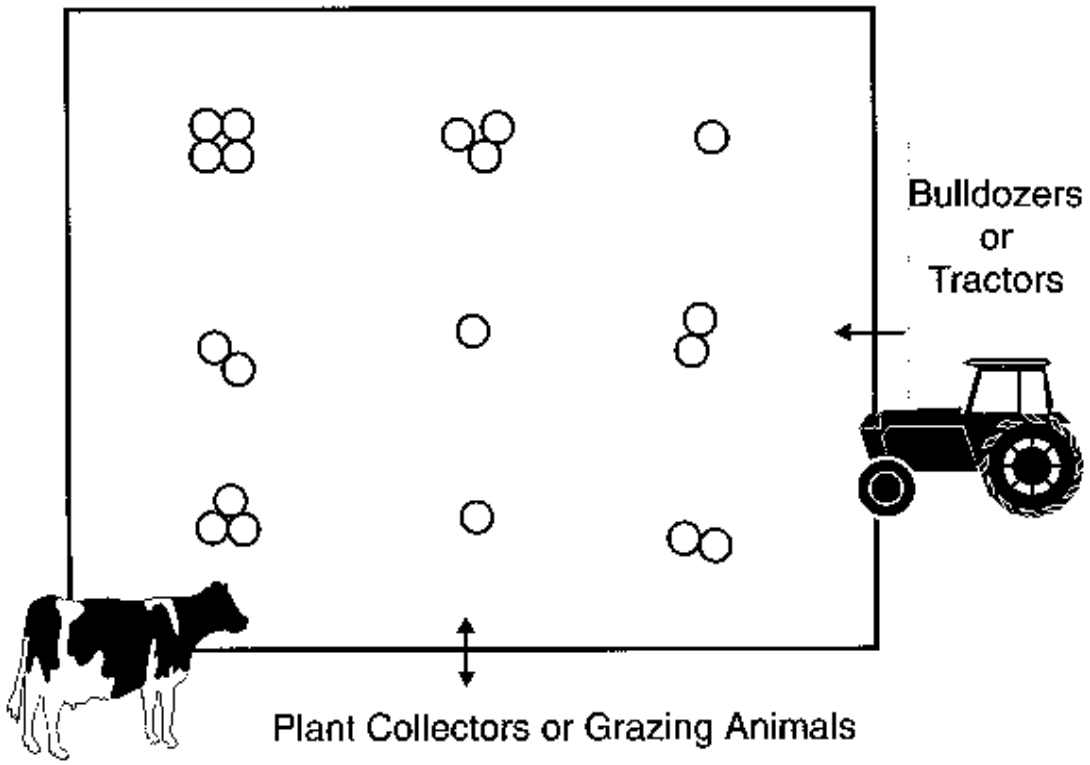



DRY
SPRING

Playing Field for Illegal Shooting or Poaching



Playing Field for Endangered Plants



Rare and WILD Texas

(An Adaptation of Oh, Deer! from *Project WILD*®)

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