



Texas Wildlife Action Plan

Summary Report

February 2006



TEXAS
PARKS &
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The following represents an abbreviated summary of the Texas Wildlife Action Plan.

The complete plan is available online:

www.tpwd.state.tx.us/business/grants/wildlife/cwcs







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Fleming



A Popular Mandate:



Public Opinion Research

Research shows that people in Texas and across the United States care deeply about wildlife and the natural environment. Surveys have also proven that citizens strongly support government funding to protect wildlife species and the lands and waters they inhabit.

In a general population survey of Texans for the report “Texas Parks and Wildlife for the 21st Century,”¹ researchers found that “Eighty-four percent support more TPWD funding for managing and conserving fish and wildlife populations.” Wildlife and habitats connected to water resources are particularly valued, with researchers noting “One hundred percent felt it was very important or somewhat important that Texas’ water resources are safe and protected. Ninety-three percent stated this was very important while seven percent stated it was somewhat important.”

¹ *Responsive Management*
Texas Tech University,
March 2001

State Wildlife Grants: Congress Acts To Face A Longstanding Problem

Early in this decade, the U.S. Congress took a historic step toward funding a traditionally less emphasized yet important wildlife conservation mission. Since 2001, the State Wildlife Grants (SWG) program has provided more than \$366 million to states across the nation, including \$18.3 million for Texas.

For many decades, game animal conservation has been comparatively well-funded through hunting and fishing license sales and federal excise taxes on hunting and fishing equipment. In 1938, Congress created the Pittman-Robertson/Wildlife Restoration federal aid program. In 1950, federal lawmakers followed up with the similar Dingell-Johnson/Sport Fish Restoration program. Since then, federal tax funds administered by these grant programs have provided \$9.5 billion for state-based wildlife conservation. This highly successful effort has made possible the restoration of deer, turkey, game fish and a host of other game species, many of which have since come back from severe depletion to record abundance.

In the 21st century, Congress has again made history by creating the State Wildlife Grants program, earmarking funds to conserve nongame animals that are not typically hunted or fished. The idea is to “keep common species common” by proactively identifying problems and solutions before species become rare. This can avoid the need to list species as threatened or endangered, producing more effective and less costly solutions long-term.

The SWG grants are one outgrowth of a grass roots movement that swept across America in the 1990s. The Teaming With Wildlife coalition linked nonprofit environmental and conservation groups, government agencies, private industry and many others in an effort to secure a new source of funding for nongame wildlife. Today, this coalition is still seeking creative ways to fund important wildlife needs.



Texas Horned Lizard



The Texas Wildlife Action Plan

The U.S. Fish and Wildlife Service, which administers SWG grants, directed each state to prepare a Comprehensive Wildlife Conservation Strategy to be completed in 2006. The Texas Wildlife Action Plan is required for Texas to continue to receive millions of dollars per year in federal State Wildlife Grants funding.

State Wildlife Action Plans are being created to conserve wildlife and natural places, enhancing our own quality of life. Thus, supporting state plans benefits the health of wildlife and people. As communities grow, state wildlife plans will help fulfill our responsibility to conserve wildlife and the places they live for future generations.

State plans will eventually be merged to create a national plan, which will have the benefit of local, state, and federal government and non-government partner knowledge and participation.

The upshot is that State Wildlife Grants are not only addressing unmet wildlife conservation needs, they are also leading to a new era of coordinated strategic planning to better identify problems and solutions on a regional and nationwide basis.

Success Stories In Texas: State Wildlife Grants Projects

Although some important new areas are proposed for State Wildlife Grants funding in the future, a review of projects funded to date illustrates what SWG looks like on the ground. Since 2001, more than 30 SWG projects have been launched in Texas. Several examples are profiled briefly below. Dollar figures indicate federal costs.

Wildlife Diversity Science, \$3,181,442 - Evaluate population trends, management needs and recommendations for nongame and rare wildlife, including strategies to reverse nongame declines so these species do not become threatened or endangered. Coordinate with state and national groups, conduct 20 nongame research projects per year.

Wildlife Technical Guidance and Assistance in Urban Areas of Texas, \$2,221,907 - Provide technical assistance to create or protect habitat and urban wildlife. Benefits include protection of urban streams and wetlands; increased landscaping with native plants by homeowners, corporations, and other land managers; open space management that provides habitat for urban wildlife.

Marine Monitoring, \$ 1,318,293 - Expand monitoring programs to obtain data needed to effectively manage marine resources on an ongoing basis. Benefits include improved management of marine species of concern in the waters of coastal Texas, including commercially important oyster and shrimp populations, recreationally important finfish, and rare sea turtles.

Texas Lesser Prairie Chicken Initiative, Distribution of Swift Foxes in Texas, \$307,913 - Shown here in a combined total, these two grants both involve conserving short-grass prairie habitat in Northwestern Texas, benefiting many other game, nongame and rare species. Both employ team approaches to bring together private landowners, environmentalists and government biologists.

Borderlands/International Program, \$300,525 - Create a Borderlands/International Program for natural resource management along the Texas-Mexico border. Benefits include increased public support for wildlife conservation along the border and improved working relationships and coordination between Texas biologists and their counterparts in Mexico.

New Texas Joint Ventures, \$274,825 - Create two new Joint Ventures in Texas (Central Texas Oaks and Prairies Joint Venture and Rio Grande Corridor Joint Venture), building on the success of three longstanding JVs in the Playa Lakes region and in coastal Texas. Benefits include establishing a network of partners to implement “all-bird” conservation in each region.

Planning & Investigations to Address Toxic Golden Alga (*Prymnesium parvum*), \$618,838 - Study historic fish kills related to naturally-occurring golden alga blooms. Develop an accurate method to detect *P. parvum* before it reaches toxic levels. Three major research studies are being developed in coordination with state and federal agencies and university researchers.



Texas Nongame: Unique Biodiversity, Broad Benefits

Texas is one of the most ecologically diverse states in the union. According to NatureServe's 2002 States of the Union: Ranking America's Biodiversity, Texas is second only to California in terms of its biodiversity. Texas has the nation's highest number of birds and reptiles and the second highest number of plants and mammals. Much of the state's biodiversity is due to sheer size. Texas covers approximately 267,000 square miles of land and inland waters and lies adjacent to four states, Mexico and the Gulf of Mexico, which lines 367 miles of the Texas coast. There are 10 Texas ecoregions, ranging from the Pineywoods of East Texas to the deserts and mountains of West Texas, each of which harbor unique types of wildlife not found in other regions.

Texas species are as diverse as the landscape. The state has approximately 6,000 species of plants, and greater than 425 of those species are endemics that occur nowhere else. More than 600 bird species have been identified and there are 258 fish species and 184 known mammals, including marine species that inhabit Texas' coastal waters. It is estimated that there are approximately 30,000 insect species in Texas that take up residence in every conceivable habitat, including rocky outcroppings, pitcher plant bogs and on individual species of plants.

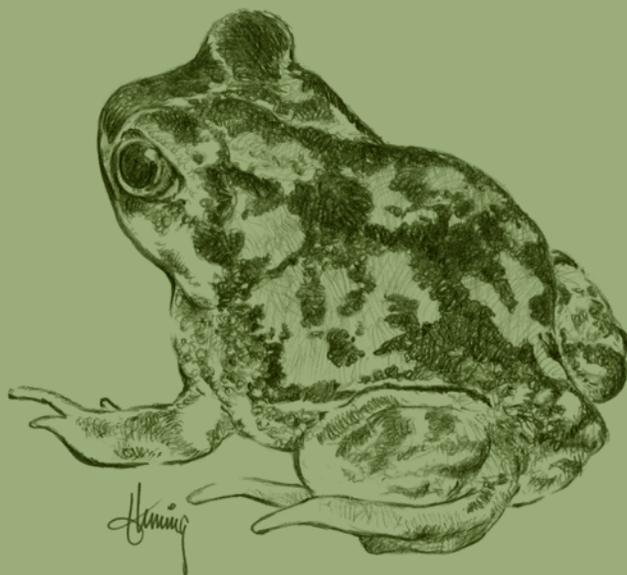
Overall, Texas has tens of thousands of species that fall under the loose-fitting title "nongame." These species are vital to the ecology of Texas. To help track and manage many of them, Texas has one of the nation's strongest Wildlife Diversity programs. In addition to our Wildlife Diversity biologists, Texas also has the largest Urban Wildlife program in the country. With 80 percent of the Texas' population living in or around the major cities of Texas, it is imperative to bring conservation to the city. The Texas Parks and Wildlife Department Urban Wildlife program does this by offering landowner workshops, volunteer opportunities and technical guidance to urbanites, absentee landowners, youth and conservation organizations. In addition to its Wildlife Diversity staff, TPWD also has field Wildlife Biologists who provide technical guidance on wildlife management, assistance in regulatory programs and educational opportunities primarily to ranchers and other rural landowners.

The State Wildlife Grants program has offered states like Texas a consistent source of funding to secure a bright future for Texas wildlife and the people who enjoy nature and the outdoors.

The Texas Wildlife Action Plan will conserve wildlife and natural places, enhancing human health and quality of life. Also, as communities grow, the plan will help fulfill our responsibility to conserve wildlife and habitat for future generations.



Unique Biodiversity



“Overall, Texas has tens of thousands of species that fall under the loose-fitting title ‘nongame.’ These species are vital to the ecology of Texas.”

Partners Behind the Plan

To ensure a diversity of opinions and representation within the Texas Wildlife Action Plan, the Texas Parks and Wildlife Department and Texas State University hosted the 2004 Wildlife Diversity Conference at the university campus in San Marcos. This conference brought together a diverse group of professional biologists and interested organizations to provide a forum for dissemination of current biological information and create a workable structure on which to draft the action plan. Some 150 professionals from state and federal agencies and non-governmental organizations from inside and outside Texas attended at least one day of the event.

After the conference, working groups were formed as a way to involve partners and gain information to draft the plan. Working groups were species-based and consisted of a mammal group, bird group, herptile group, terrestrial invertebrate group and an aquatic group. The aquatic group combined inland/freshwater specialists as well as coastal/saline specialists. Working groups included many of the most highly regarded scientists in the state.

The public was also engaged through a series of meetings held across the state in 2005. For the first time, TPWD partnered with urban zoos on a statewide basis to provide settings for discussions about the future of native Texas wildlife. Meetings were held in Austin, Houston, Dallas, Waco, Lufkin, San Antonio, Abilene, Lubbock, El Paso, Brownsville and Corpus Christi. Of these 11 locations, eight were sponsored by American Zoo and Aquarium Association accredited zoos and aquariums. While many zoos are known for exotic species, most also work with species native to their region and engage in strong conservation efforts concerning native fauna.

A Web site (www.tpwd.state.tx.us/grants/cwcs) was created to provide a way for anyone to see the various sections of plan and its maps and charts, plus the PowerPoint presentation developed for the meetings. Web visitors could also comment about the plan online in English or Spanish.



Statewide Conservation Priorities

Mapping the State - Currently, Texas conservation biology planners are using vegetation data that are outdated and not specific enough. It is important that we reevaluate the current status of our vegetation data and begin to “remap” the state using the most current and applicable technology. Because of the large financial cost of the mapping project, we should begin regionally and follow with a statewide biological survey. It may be necessary to subcontract much of this to regional Texas universities that have the needed personnel and resources. Mapping goals and objectives are to establish permanent or semi-permanent data collection points that would be used to collect vegetative data for ground-truthing aerial map data; make these points available for the biological survey of Texas; work directly with private landowners to create maps and assist with inventories; develop partnerships for improved information sharing and coordination of conservation actions among cooperating organizations and stakeholders; map at 1:24,000 scale remaining natural and semi-natural vegetation in selected areas of the state of Texas in contiguous blocks of 500 or more acres; and facilitate species-specific conservation and recovery through development of mapping products for conservation planning and delineation of recovery focus areas for affected species.

Statewide Biological Inventory and Monitoring for Herptiles, Invertebrates and Mammals - Currently in Texas there is a limited knowledge of the status of many of our terrestrial species. It is critical that we take steps to develop coordinated and ground-truthed information concerning native species in order to know where to focus conservation actions on our collective species of concern and create efficient and cost-effective budgets. Spatial and geo-referenced vegetation data are critical to Texas’ inventory and monitoring programs for species of concern. While migratory bird species typically have solid monitoring efforts already in place, herptile, mammalian and terrestrial invertebrates have very limited sources of consistent monitoring. It is imperative that we work with other states, private landowners and other conservation organization to follow the mapping project with a biological survey of the state.

Data Collection, Management and Sharing - Because of the critical nature of the statewide mapping project and the statewide biological survey, data management must be considered as we plan to move forward. Texas Parks and Wildlife Department and NatureServe maintain a database of information concerning nongame species. TPWD refers to this as the



Statewide Conservation Priorities

Natural Diversity Database (NDD), which allows the department to collect information on species and habitat and convey those data through reporting options or in mapping formats. This information can be used to make decisions on conservation of nongame species and habitats by TPWD biologists and partners as advised by the TPWD Land and Water Resources Conservation and Recreation Plan. In addition, the NDD also incorporates functions that allow for the prioritization of specific conservation sites or lands. Once identified, appropriate conservation organizations could be notified of potential partners with which they might negotiate conservation easements, purchase of development rights or fee-simple purchase of property. The property could then be maintained for wildlife by appropriate conservation organizations, land trusts or simply held by the private landowners for the benefit of wildlife. Data collected and shared in this way provide numerous conservation and management opportunities for private landowners, stakeholders and government wildlife and habitat management agencies.

Support Conservation Easements, Purchase of Development Rights and Land Acquisition - The land trust community in Texas is growing and the organizations associated with the Texas Land Trust Council are working toward the goal of protecting Texas lands. It is important that TPWD and other conservation organizations maintain positive relationships with these groups and support their efforts to maintain conservation easements, purchase of development rights and fee-simple purchase and management of land for the benefit of wildlife, habitat, water quality and outdoor recreation opportunities. Land trusts are uniquely positioned to affect conservation in Texas by protecting land and allowing access to that land for research and management. TPWD can sponsor research and management activities and work to advise individual land trusts on which areas or specific properties would be most useful to conserve and what species inhabit that range or vegetation community. The diversity database should be used to assist with this advisory role. By using the database as well as personnel or other resources to support these decisions, TPWD can have an affect on the easement and acquisition process without having to maintain additional properties and/or acquire new tracts of land. This should not, however, restrain TPWD or other conservation organizations from acquiring new land.

Install and Support Texas All-Bird Joint Ventures - Currently, Texas has five all-bird joint ventures operating within the state. Joint ventures are comprised of individuals, corporations, conservation organizations and local, state and federal agencies. Concerned with conserving migratory birds and their habitats, partners come together to

Statewide Conservation Priorities

accomplish collectively what is often difficult or impossible to do individually. Historically, joint ventures focused on wetland habitats and their importance to waterfowl under the umbrella of the North American Waterfowl Management Plan. In recent years joint ventures in Texas have broadened their focus to include all birds and promotion and advancement of integrated bird conservation.

- * The Lower Mississippi Valley Joint Venture encompasses 22 million acres in portions of 10 states and including East Texas. This is a self-directed, non-regulatory private, state, federal conservation partnership that exists for the purpose of implementing the goals and objectives of national and international bird conservation plans within the Lower Mississippi Valley region.
- * The Playa Lakes Joint Venture's mission is to conserve playa lakes, other wetlands and associated landscapes through partnerships for the benefit of birds, other wildlife and people. The joint venture works in portions of six states - Colorado, Kansas, Nebraska, New Mexico, Oklahoma and Texas.
- * The Gulf Coast Joint Venture is a regionally based, biologically driven, landscape oriented partnership for the delivery of habitat conservation important to priority bird species within the JV region. The Gulf Coast Joint Venture partnership is composed of individuals, conservation organizations and state and federal agencies concerned with conserving migratory birds and their habitats along the western U.S. Gulf of Mexico from Brownsville in South Texas to Mobile Bay in Alabama.
- * The Rio Grande Joint Venture is the most recent addition to the joint venture network in Texas. Primary goals and objectives have not been established. It is imperative that the joint venture is supported and funded to begin the process of conserving bird species and habitat along the Rio Grande corridor.
- * The Central Texas Joint Venture is also currently in the planning stages. Once this organization is on course and functioning, Texas will have joint ventures delivering integrated bird habitat conservation throughout the whole state.

Statewide Conservation Priorities

Monitor Bays and Estuaries -

Texas Parks and Wildlife Department currently maintains an excellent program to monitor the bays and estuaries of Texas. This system should be continued since it allows for the early response of TPWD to threats to the habitat and species in those areas.

Monitor Rivers - Biological integrity is a primary concern for Texas rivers. Rivers must be monitored to determine trends that will allow for quick response when species health is compromised. It is also imperative that rivers be

monitored for the encroachment of exotic plant and animal species that could threaten native species. If exotic species are monitored carefully, a quick response will be an option during periods of increased pressure on native species. In addition to monitoring species, it is important that an emphasis be placed on restoration of riparian and aquatic habitats. Many rivers and streams have been compromised over the last several decades due to human disturbance of aquatic ecosystems. Disturbances should be mitigated through a series of prioritized projects that aim to significantly rehabilitate river habitat back to its natural state.

Ensure Water Availability for Wildlife - The TPWD Land and Water Resources Conservation and Recreation Plan has identified several methods to contribute to the improvement of water quality and quantity throughout the state. These should be enacted and maintained indefinitely. It is imperative that TPWD and our partners ensure that water consumption and use by the citizens of Texas does not diminish the quality and quantity of water required directly and indirectly by fish and wildlife populations. Conservation and monitoring efforts should allow water use by people and wildlife.

Support Urban Wildlife Biology - Texas has one of the largest and most successful Urban Wildlife Biology programs in the country. More than 80 percent of Texans now live in urban areas. For conservation actions to be a success, all Texans should have opportunities to learn about and be a part of the process. Urban Wildlife Biologists help provide these opportunities as well as conduct research, provide technical assistance, offer information on native landscaping and habitat, develop school yard habitats and develop landowner workshops. This benefits people that live in the city and who have limited chances to visit a state park or Wildlife Management Area. It



Texas Bays
and Estuaries

Statewide Conservation Priorities

also reaches important new audiences, including the growing number of absentee landowners who live in cities but own land in the country, plus longtime property owners changing from agriculture to wildlife use (1-d-1 property tax valuation) and are eager to provide habitat for wildlife on their acreage. The TPWD Urban Wildlife Biology program should also be promoted outside Texas. Several other states have expressed a desire to start a similar program and should be able to use the Texas model as a rough template.

Protect Wetlands - Wetlands provide many economic and ecological benefits, including flood control, improved water quality, harvestable products and habitat for our abundant fish, shellfish and wildlife resources. But, Texas wetlands are disappearing. Approximately half of Texas' historic wetlands acreage has been converted to cropland and urban development. Although wetlands issues are at times controversial, broad support exists among diverse interests on many aspects of wetlands conservation and public responsibility. The Texas Wetlands Conservation Plan, initiated in April 1994, focuses on non-regulatory, voluntary approaches to conserving Texas wetlands. However, the wetlands plan is nearly 10 years old and needs to be updated because of changes in technology and shifts in conservation priorities. To this end, a state wetlands planner should be funded to monitor wetlands throughout the state and update the plan. The wetlands plan seeks to enhance the ability of private landowners to use existing incentive programs and other land use options through outreach and technical assistance, develop and encourage land management options that provide an economic incentive for conserving existing wetlands or restoring former ones and coordinate regional wetlands conservation efforts.

Study and Protect Caves and Associated Habitats - Texas enjoys a rich yet poorly known cave fauna. Over 1,000 terrestrial and 150 aquatic species have been recorded, many from only one or a few caves in Texas and nowhere else. The most remarkable aquatic fauna in the United States exists in the vast underground Balcones Fault Zone of the Edwards Aquifer in Central Texas. Sampling of cave, well, spring and interstitial habitats has resulted in the discovery of at least 50 species in this aquatic ecosystem in past decades. The Balcones Fault Zone is also one of the fastest developing urban regions in Texas. The potential conflict between rapid urban growth and subterranean biodiversity along the Balcones Fault Zone is exemplified by Tooth Cave west of Austin. Tooth Cave has 64 species, the greatest biological diversity of any cave in Texas. Five are protected under the federal Endangered Species Act. Only large cave systems like Mammoth Cave (with well over 300 miles of passages) have more species, yet Tooth Cave is only 166 feet long. This clearly illustrates the likelihood of continuing conflicts

Statewide Conservation Priorities

between urban development, allocation of water resources and small subterranean enclaves of diversity in this region. Increasing our knowledge of Texas' cave fauna is vital to proper stewardship and management. TPWD should form a long term partnership with the Texas Speleological Survey, the professionals who study caves and their fauna and flora. Numerous Texas caves have yet to be biologically inventoried.

Promote Conservation Partnerships - Perhaps the most critical role that TPWD can play in the future of Texas conservation is the role of facilitator and partner. Without a strong list of willing partners that are interested in putting their money and other resources toward focused conservation, the Texas Wildlife Action Plan will be an ineffective document. Texas Parks and Wildlife Department can not effectively conduct the business of conservation with existing resources. Projects such as the creation of a Texas Conservation Directory containing a list of contacts to link one conservation organization to another would start the facilitation process. Biologists need a contact system that allows them to gain support for local and regional projects without being frustrated by spending valuable time searching unsuccessfully through the directories of individual organizations and depending serendipitous contacts. This information should be updated yearly and placed on the Internet for easy access through simple search functions. Other forms of facilitation could apply and TPWD must take the lead on this process, showing good faith to other organizations. This is not to say that TPWD must lead all ventures or be the larger benefactor for all projects; however TPWD should lend support to ensure that conservation goals are met and quality projects are funded and completed. This role is critical to meeting the goals of this strategy as well as the goals of our partnering organizations.

Partnerships with Mexico - One of the most pressing partnership needs is to continue and expand joint conservation projects with Mexico, especially the four northeast states of Tamaulipas, Nuevo Leon, Coahuila and Chihuahua. Unlike other states in the U.S., Texas shares a border of over 1,250 miles with these four Mexican states. This border cuts across numerous ecoregions with their variety of habitats beginning with the tropical mouth of the Rio Grande to the Chihuahuan Desert at El Paso. What happens to the south directly affects the overall viability of wildlife species shared by both nations. New opportunities for collaboration emerged in late 2004 when President Vicente Fox announced plans to decentralize the management of resident wildlife species to the border states in northern Mexico. Texas Parks and Wildlife Department and the new state wildlife agencies in the neighboring states met in early 2005 to develop an action plan for cooperation. Current conservation actions, to cite only a few

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examples, include partnering with Universidad Autónoma de Nuevo León to conduct cooperative research projects on the conservation status of endangered species of birds to enable TPWD and the USFWS to consider downlisting or delisting species, supporting bobcat research in Mexico to estimate population densities which will assist Mexico in determining whether to support delisting the bobcat from CITES Appendix II, working on the conservation and restoration of an ecologically significant wildlife corridor from the lower end of Falcon Reservoir on the Rio Grande to Sierra Picachos in Mexico, and drafting a Texas-Northeast Mexico Strategic Plan for White-winged Dove. Needed conservation actions include research on the population status of threatened and endangered mammals, birds, reptiles and amphibians, fish and invertebrates that occur along the border. This involves surveying known sites, finding new sites and monitoring the species on both sides of the border, especially in northeastern Mexico, to gather base-line genetic data and to determine phylogeographic relationships of species.

Increase Support for Conservation on Private Lands - Double lands under Wildlife Management Plans to 28 million acres. Increase percentages of WMP's in high priority ecoregions identified in the TPWD Land and Water Conservation and Recreation Plan (South Texas, Gulf Coast and Blackland Prairies). Increase percentage of ecoregion under WMP's in the High Plains, Pineywoods and Cross Timbers where lowest percentages currently exist. Increase WMP's focused on high priority habitats (native prairies, riparian areas) identified in this Plan and for priority wildlife species (priority birds, bighorn sheep, white-tailed deer, lesser prairie chickens, pronghorn, mule deer and quail). Support the establishment of a purchase of development rights program in Texas consistent with TPWD's mission.

Improve Science and Data Collection - Undertake an independent programmatic peer review and establish a systematic review process for all scientific and conservation programs, including review, assessment and monitoring functions for fish and wildlife populations. Develop an integrated GIS database of fish and other aquatic species, wildlife, and water data to assure that decisions are based on sound science and the best available data. Annually develop Internet accessible data and analytical capability as well as provisions for continuous updating and coordination with other state agencies to access pertinent data. Complete formal agreements with state and federal resource agencies where necessary. Expand partner efforts with private landowners to improve water quality and quantity through watershed management and conserve important wildlife habitat.

Landscape Threats and Challenges

Changing Demands on Land Resources - Human population growth and resulting land fragmentation, or the division of single ownership properties into two or more parcels, have had profound effects on the Texas landscape. Land conversion changes natural habitats, which can threaten the viability of those habitats and sustainability of wildlife populations. For example, Texas A&M's *Fragmented Lands: Changing Land Ownership in Texas* report found that the conversion of rural land to urban use in Texas exceeded 2.6 million acres from 1982 to 1997. Such changes will increase pressures on natural resources throughout the state, especially near growing metropolitan areas.



Introduced Species in Terrestrial Environments - Non-native plant and animal species introduced into the state can displace native species, threaten habitat integrity and profoundly alter the landscape. For example, Chinese tallow has invaded woodlands and coastal prairies and, left unchecked, changes these diverse habitats into virtual monocultures. Introduced grass species can create monocultures devoid of quality wildlife forage and of limited useful habitat for young ground nesting birds. For some ground dwelling birds like quail, these dense turf-type grasses cannot be traversed, which fragments their habitats. Imported red fire ants in eastern Texas have had profound, if not fully understood, adverse impacts on many wildlife species.

Noxious Brush and Invasive Plant Species - Undesirable or noxious brush, woody and invasive plant species such as salt cedar, Chinese tallow, Chinaberry, Ligustrum spp., K-R bluestem (aka Mediterranean bluestem), Japanese honeysuckle, and giant reed absorb vast quantities of water and provide little or no forage for wildlife or livestock. Many of these plant species are present in excessive quantities on rangelands in Texas today. Through improved range management techniques, they can be significantly reduced or controlled to benefit water quality and quantity as well as wildlife habitat.

Overgrazing and Fire Suppression - Improper grazing and fire suppression have contributed to a drastic alteration of the historic landscape. Improper grazing results in soil erosion, decreased diversity in forage and cover for nesting as well as other needs of wildlife. In addition, fire suppression has caused native grasslands, savannahs and open woodlands to become overgrown with thickets of woody species.

Limited Understanding of Complex Natural Systems - Research is a critical component of natural resource conservation. Without reliable knowledge and rigorous scientific inquiry, scientists cannot make informed conservation decisions. For instance, some principles of wildlife ecology, such as the early research of edge effects on wildlife, have since been found to inadequately describe natural systems. The decision making process at TPWD must remain grounded in the best science available to assure that policy development, regulatory action and resource management are accurate and effective.





Ecosystem Management

“For many years the management and conservation of wildlife species has focused on the individual animal or population of interest. In recent years, wildlife biologists have begun to de-emphasize this ‘single-species’ approach.”

Texas Priority Species List

For many years the management and conservation of wildlife species has focused on the individual animal or population of interest. In recent years, wildlife biologists have begun to de-emphasize this “single-species” approach. The emerging preference is an ecosystem management approach that focuses on habitat types that sustain diverse species. For example, restoring shortgrass prairie habitat in the Texas Panhandle benefits a wide-range of species, from popular game animals such as quail to rare species such as the swift fox. However, the identification and study of particular species is still useful, and one of the federal requirements for the Texas Wildlife Action Plan was to create and prioritize a list of species of concern.

The plan lists wildlife species in five major groups: birds, mammals, herptiles, aquatic species and terrestrial invertebrates. After reviewing all species found within Texas, those considered “priority species” were chosen, listed in the appropriate wildlife group, then ranked as a low, medium or high priority conservation need.

High priority species were those determined to be in the greatest need of conservation. These consisted of threatened or endangered populations, species in significant decline or populations at high risk for decline. Disjunct or isolated populations that could be highly impacted by catastrophic events may also have qualified as high priority.

Medium priority species were deemed to be declining or at-risk but not in critical need of immediate support. These species may be declining at a significant rate; however, population size is still estimated to be substantial.

Species of lowest priority were typically more stable; however the populations may be vulnerable to decline. Low risk species may also have been species for which the working groups required more information on and could not completely assess but did not wish to abandon. These species may be at-risk, but could require more research and knowledge to establish their true status. Low risk species may also have less vulnerable populations in other states or in Mexico.

Examples of species connected with habitat types for each Texas ecoregion are provided below in the sections on regional conservation. Complete lists and information for all species are in the complete Texas Wildlife Action Plan.

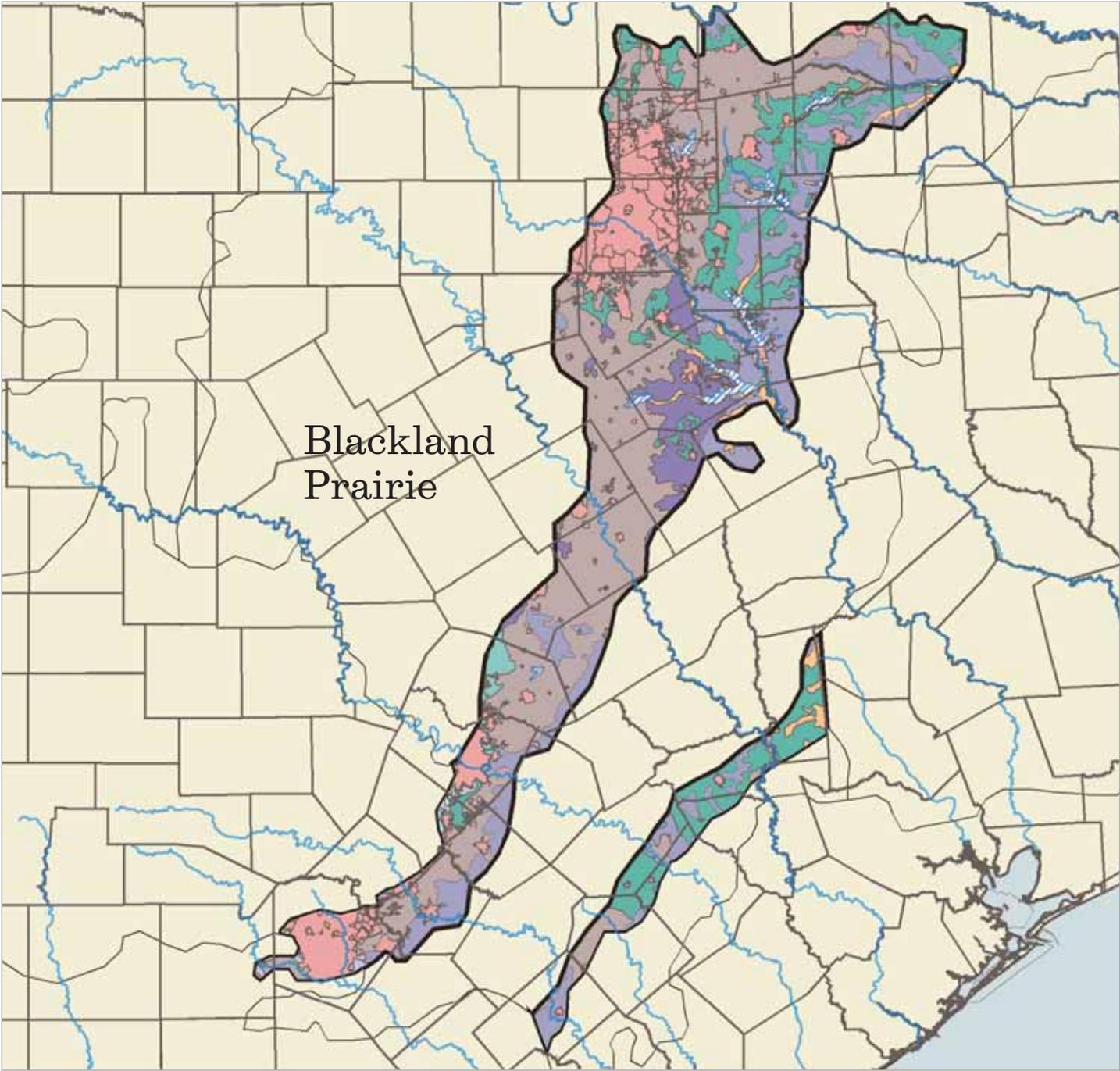
Regional Conservation: High Priority Ecoregions

Blackland Prairie - This is the most severely altered of Texas' ecoregions, since most of the historic Blackland Prairie has been converted for cropland or urban development. Less than one percent of the Blackland Prairie remains in an uncultivated state. This amounts to only an estimated 5,000 acres remaining in its historic condition in terms of plant species. Also, only a small percentage of public and non-profit conservation land and private properties are operated under wildlife management plans. All habitats in this ecoregion are threatened by rapid population growth and accompanying conversion to urban areas and pastureland, fragmentation and decreased land parcel size. It ranks lowest in number of rare plant species and seventh in number of endemics, but all four native Blackland Prairie grass communities are rare. The region is an important stopover habitat for migrant songbirds and wintering raptors, but many tall grass prairie birds have declined drastically due to land conversion and fragmentation. Priority actions include protection and restoration of remnant prairies.



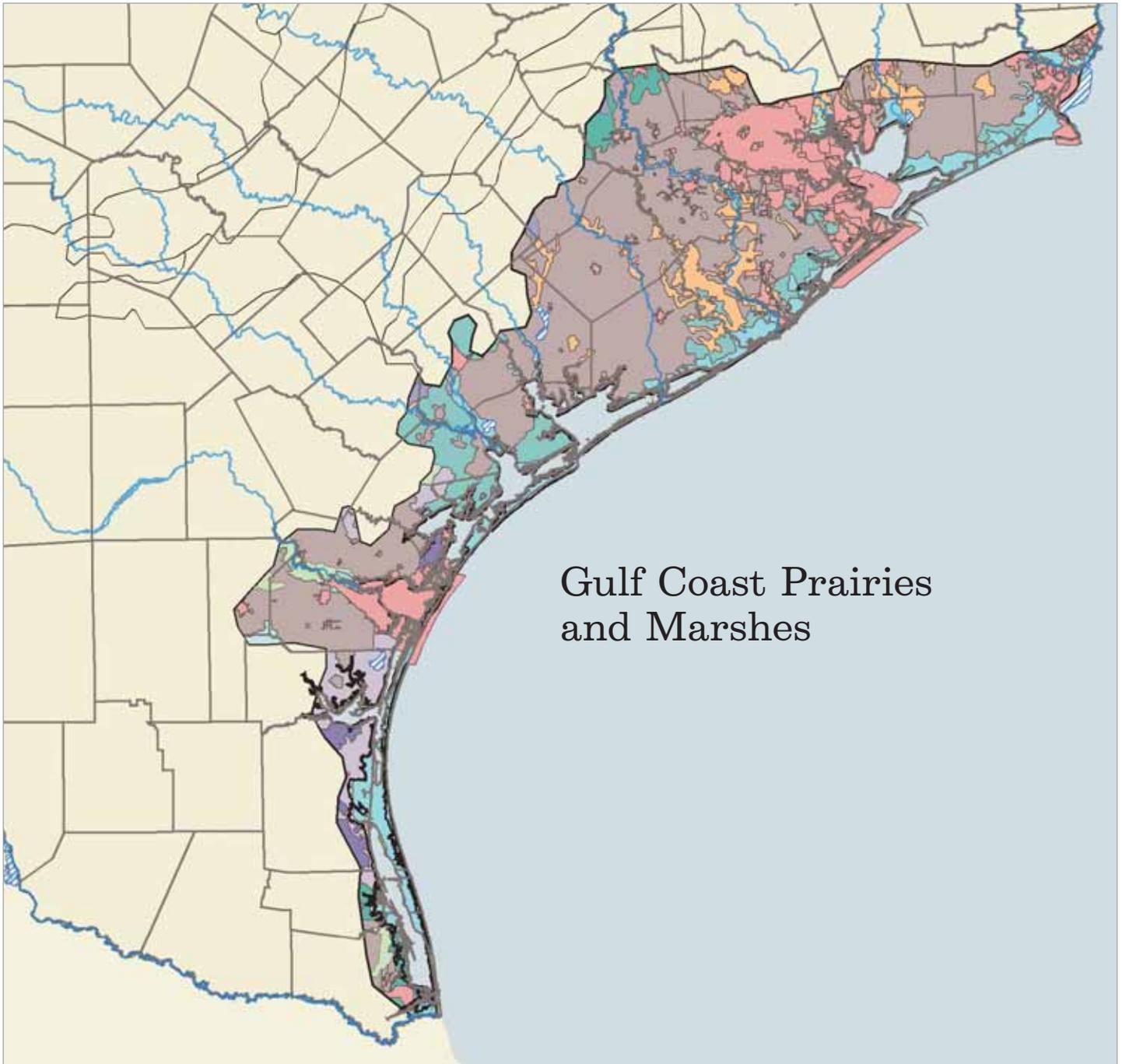
Example Species - The Field Sparrow

(*Spizella pusilla*) is abundant now, but to the extent that it relies on Blackland Prairie, it and other species could eventually be imperiled through threats to the ecoregion's habitat. This bird inhabits grassland and pastures of native and introduced grasses, parkland and woodland mosaic habitats in this ecoregion. Some threats to the habitat that supports it include improper livestock grazing, urbanization and urban sprawl, erosion, fencing, reservoirs and dams, land use changes such as draining or filling and invasive plants and animals. Recommended actions to conserve it include: continue technical guidance for landowners to promote improved agricultural practices such as light, rotational proper grazing; conduct education and encourage policies to limit negative development impacts; prevent erosion (especially along streamside riparian zones and through wooded buffers between uplands and wetlands); prevent landscape fragmentation; restore or protect remaining quality habitat areas, and minimize human disturbance.



-  Reservoir
-  Urban
-  Cropland
-  Parkland
-  Grassland
-  Forest
-  Other Native & Introduced Grasses
-  Woodland, Forest & Grassland Mosaic
-  Parkland Woodland Mosaic





Gulf Coast Prairies and Marshes

-  Reservoir
-  Brushland
-  Marsh Barrier Island
-  Parkland Woodland Mosaic
-  Urban
-  Cropland
-  Other Native & Introduced Grasses
-  Grassland
-  Forest
-  Parkland



Regional Conservation: High Priority Ecoregions

Gulf Coast Prairies and Marshes - Overall, this ecoregion ranked relatively high in conserved status second only to the Trans-Pecos ecoregion, although conservation efforts are not evenly distributed across the region. Coastal marshes and barrier islands are relatively well conserved, whereas inland prairies, coastal woodlands and some beach habitats are not. Increased population growth and associated development along the coast have fragmented land, converted prairies, changed river flows, decreased water quality and increased sediment loads and pollutants within marsh and estuarine systems. The region ranked high in rare plant species and endemism including five rare plant communities. All of the region's 24 rare plants occur inland where the conserved status is lowest. Rare animals include the Attwater's Prairie Chicken, Whooping Crane, Aplomado Falcon, White-tailed Hawk, Gulf Coast hog-nosed and eastern spotted skunks, all of which need attention, as do many bird species that depend on this important migratory stopover area. Protection efforts should focus on inland prairies and coastal woodlands, although many beach areas and mud flats need additional protection.



Example Species - The Whooping Crane

(*Grus americana*) is a critically imperiled bird on the federal endangered species list. It is found in estuaries and tributaries and barrier island marshes, primarily at the Aransas National Wildlife Refuge. Although there are only close to 200 birds in the wild, population numbers have inched steadily upward in recent decades because of careful monitoring and protection of the birds and its habitat. The bird is important for local economies. University studies have shown Whooping Crane tourism generates millions of dollars per year for nearby Rockport and surrounding towns. Some of the threats to the habitat that supports these birds include agricultural practices, urbanization and urban sprawl, navigation related and beach erosion, fencing, land use changes such as draining or filling, invasive species, brush eradication and fire suppression. Recommended actions to conserve it include improved agricultural practices such as proper grazing, conduct research and education, encourage policies to limit negative development impacts, prevent erosion (especially along streamside riparian zones and through wooded buffers between uplands and wetlands), prevent landscape fragmentation, restore or protect remaining quality habitat areas and minimize human disturbance.

Regional Conservation: High Priority Ecoregions

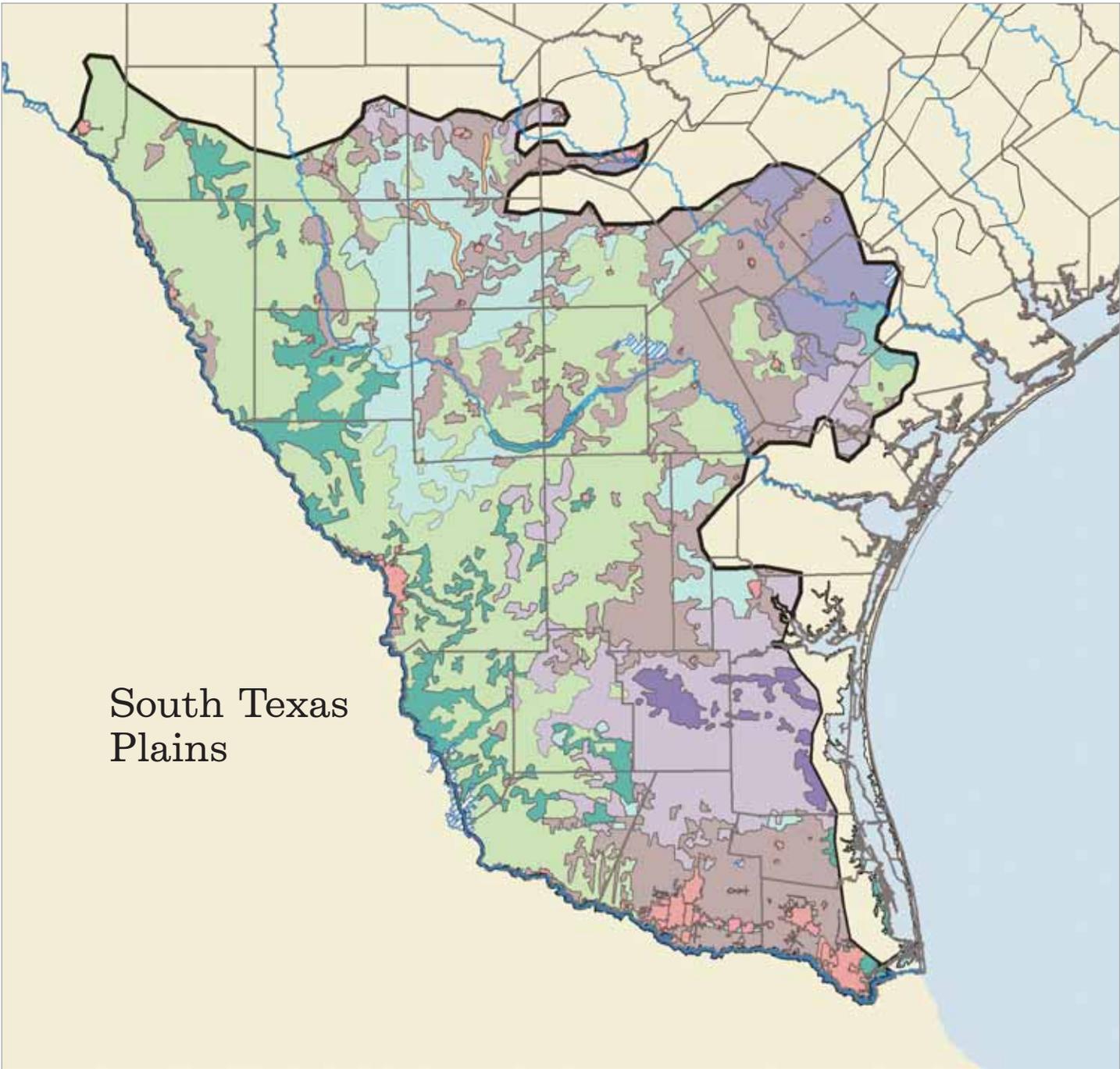
South Texas Plains - This ecoregion consists mostly of level to rolling terrain characterized by dense brush. Little of the brush country is conserved on public lands, but a relatively high percentage is in large stable ownerships and operated under wildlife management plans. Much of the high quality brush habitat that still exists in the Lower Rio Grande Valley is in public ownership, but it is insufficient to sustain many of the region's threatened plants, animals and communities. Threats are concentrated in the valley due to the expanding human population, fragmentation, conversion to croplands, urban development, insufficient river flow and introduction of exotic plants. Rare plant communities include the Texas ebony-anacua, Texas palmetto and Texas ebony-snake-eyes assemblages. Rare species include Walker's manioc, star cactus, Texas ayenia and Zapata bladderpod. In terms of animals, the valley has particularly rich bird and butterfly faunas as well as the endangered ocelot and jaguarundi. The remaining fragments of brush in the valley should be protected and corridors between these habitats should be protected and restored.

Example Species - The ocelot

(*Leopardus pardalis*) is on the federal endangered species list and there are only about 80 to 120 individuals in Texas (1993 estimate), but it is more common south of the border so its overall ranking in the Texas Wildlife Action Plan is "apparently secure-uncommon but not rare." The decline of this small wild cat in Texas parallels the loss of its preferred habitat, dense thorny scrublands of South Texas "brush"-more than 90 percent of the original native habitat in the Lower Rio Grande Valley has been replaced by agricultural or urban development. Problems facing the ocelot and the habitat that supports it and other wildlife include construction of buildings, roads and structures; urbanization and urban sprawl, inhibited dispersal due to habitat fragmentation from highways, ag fields and other human development; human disturbance from factors like noise, foot traffic and garbage; invasive disease; lack of scientific knowledge or unpublished data; lack of protection and a naturally limited range. Recommended conservation actions include protect and replant thornscrub habitat, conduct research and education, encourage policies to limit negative development impacts, improve water quality by restoring upstream habitat, use Geographic Information Systems models to plan cooperative habitat restoration, and minimize human disturbance.

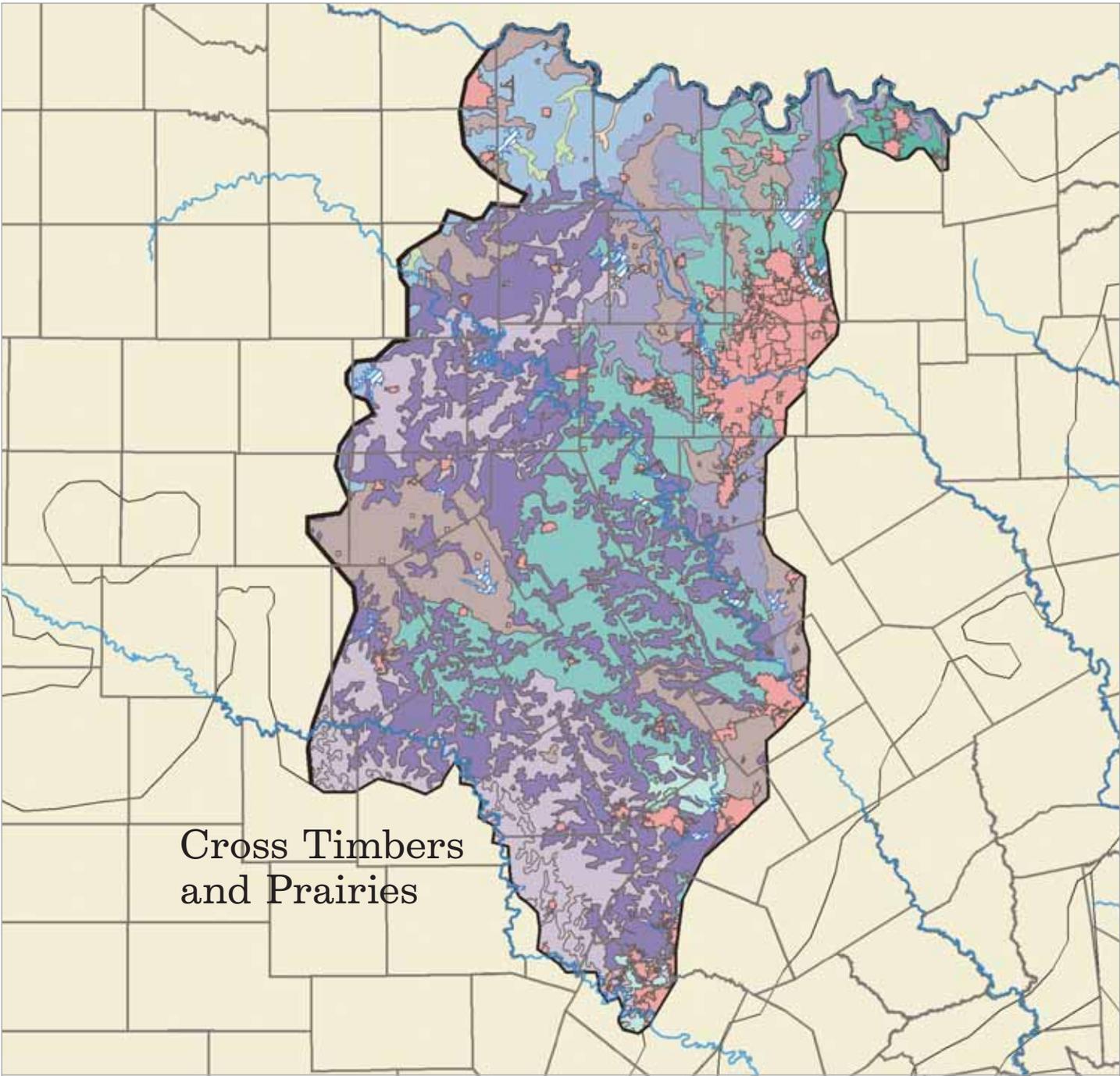


South Texas Plains



- Reservoir
- Forest
- Shrubland
- Urban
- Cropland
- Other Native & Introduced Grasses
- Woodland, Forest & Grassland Mosaic
- Parkland
- Woodland
- Parkland Woodland Mosaic





Cross Timbers and Prairies

-  Reservoir
-  Woodland
-  Shrubland
-  Brushland
-  Urban
-  Cropland
-  Other Native & Introduced Grasses
-  Grassland
-  Woodland, Forest & Grassland Mosaic
-  Parkland
-  Parkland Woodland Mosaic



Regional Conservation: Secondary Priority Ecoregions

Cross Timbers and Prairies - This ecoregion has little public land, few private preserves and a low percentage of private land under wildlife management plans. Threats include fragmentation and land conversion of prairies, forests and savannahs, mesquite invasion of degraded grasslands and proliferation of exotic grasses. Rivers and streams have been altered by an extensive reservoir system. Hundreds of miles of riparian, or river, forests have been inundated and downstream flows reduced. Most ground nesting birds, grassland mammals, amphibians and egg-laying reptiles are also threatened by fire ant invasion. This ecoregion harbors only one rare plant and has relatively low endemism. Patches of Blackland Prairie grasslands within the Cross Timbers are made up of threatened communities similar to those described for that ecoregion. Regarding rare animals, the region provides nesting habitat for the federally endangered black-capped vireo and the golden-cheeked warbler. Priority actions include protecting the ecoregion's prairies, woodlands and remaining river corridors.

Example Species - The Loggerhead Shrike

(*Lanius ludovicianus*) is widespread and abundant now, but it and other species could eventually be imperiled through threats to the ecoregion's habitat. The bird has a distinctive habit of impaling prey such as large insects and rodents on thorns or barbed wire before eating it. It is part of a suite of species that rely on grassland prairies. Some threats to the habitat that supports it include improper livestock grazing, urbanization and urban sprawl, erosion, fencing, land use changes such as draining or filling, invasive plants and animals, and brush eradication. Recommended actions to conserve it include: continue technical guidance for landowners to promote improved agricultural practices such as light, rotational proper grazing; fund research on shrike distribution, migration and behavior; continue to study the possible effects on migrating birds of proposed wind power projects along the Gulf Coast; conduct education and encourage polices to limit negative development impacts; prevent erosion (especially along streamside riparian zones and through wooded buffers between uplands and wetlands); prevent landscape fragmentation; and restore or protect remaining quality habitat areas.



Regional Conservation: Secondary Priority Ecoregions

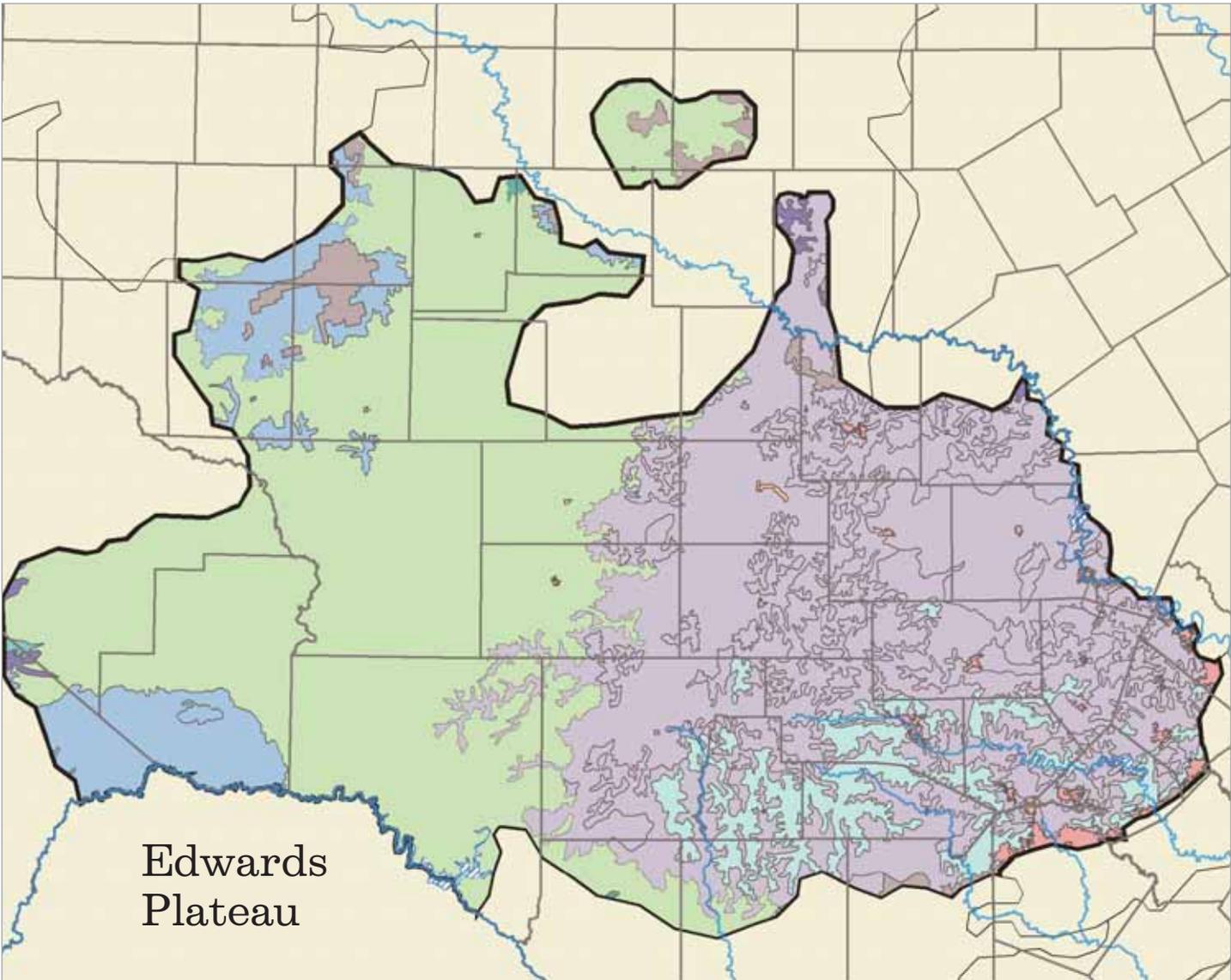
Edwards Plateau - Despite a small amount of public and non-profit conservation land, the region has a relatively high percentage of private land managed under wildlife management plans. Projected population growth and subdivisions of large tracts of land are high, particularly in the eastern portion where intense development and fragmentation threatens the biodiversity and the region's unique hydrology. Regarding plants, the Edwards Plateau is internationally recognized for its unique flora and its karst (cave) systems. It has the highest plant endemism of any ecoregion in the state and ranks third in number of rare plants. Of the 29 plant communities found here, three occur nowhere else in Texas and two are found nowhere else in the world. In terms of rare animals, karst habitats support many species of salamanders and cave insects, many of which are restricted to only a few sites. This is the state's most important ecoregion for herpetological and invertebrate species due to high endemism, sensitive habitats and intense threats. The endangered Black-capped Vireo and Golden-cheeked Warbler are the two bird species of greatest concern. Public and private conservation priorities include protecting the sheltered canyons, springs, caves and river systems that are home to most of the biological diversity. Another priority is conserving relatively intact grasslands and maintaining sufficient old growth juniper habitat for the Golden-cheeked Warbler, especially in the western Hill Country.

Example Species - The Golden-cheeked Warbler



(*Dendroica chrysoparia*) is an endangered songbird at high risk of extinction due to a very restricted range. Its requisite habitat is dense, mature stands of Ashe juniper (cedar) mixed with hardwood trees. The bird hatches young in Central Texas in spring, making nests from fine cedar bark strips. Some threats to the habitat that supports it include improper livestock grazing, urbanization and urban sprawl, utility development, erosion, habitat

fragmentation caused by fencing and reservoirs and dams, deforestation, gravel mining, invasive plants and animals, and brush eradication and fire suppression. Recommended actions to conserve it include continued technical guidance to encourage proper grazing, conduct education and encourage polices to limit negative development impacts, prevent erosion (such as through wooded buffers between uplands and wetlands), prevent landscape fragmentation, and support invasive species research and control.

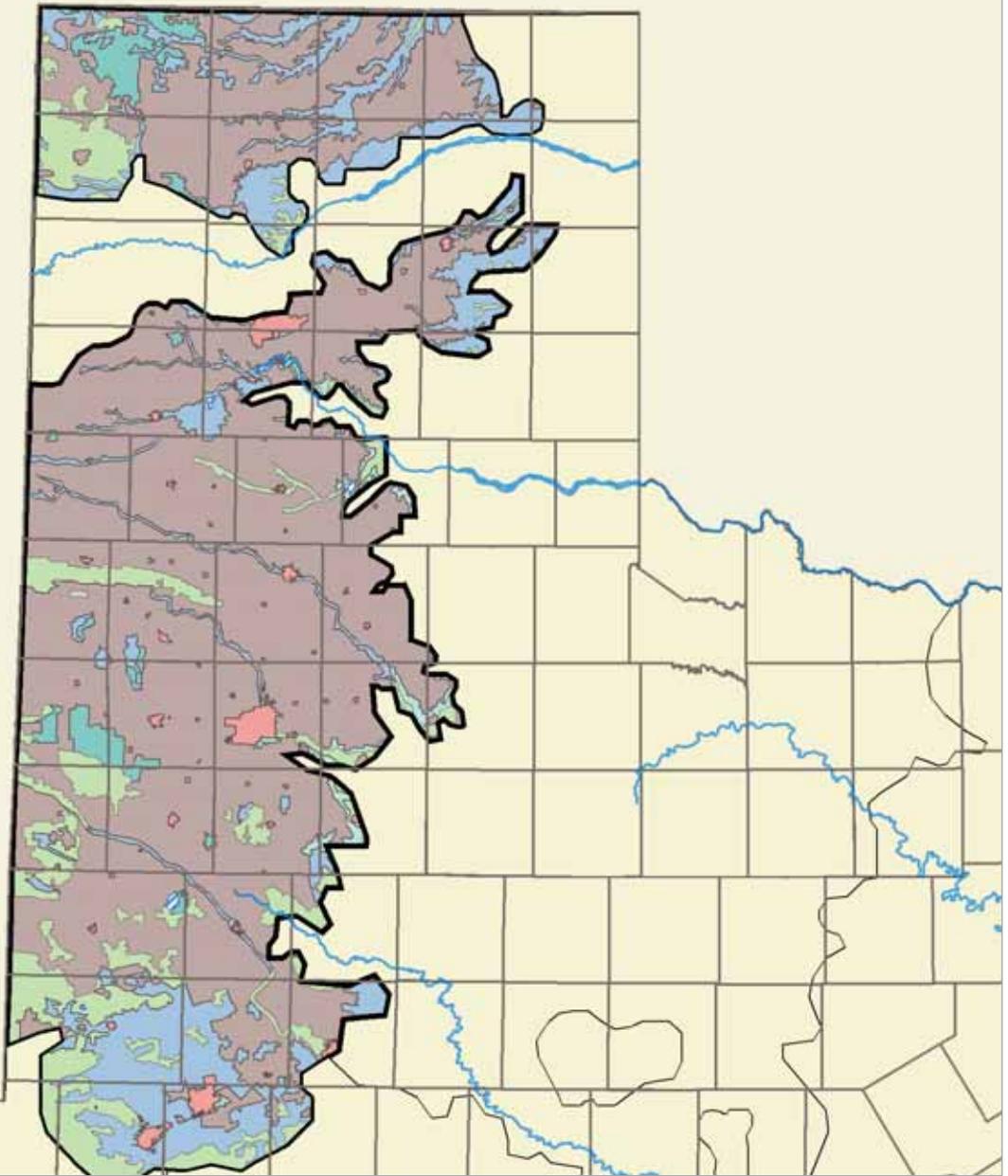


Edwards Plateau

-  Reservoir
-  Shrubland
-  Brushland
-  Urban
-  Cropland
-  Forest
-  Parkland
-  Woodland
-  Parkland Woodland Mosaic



High Plains



-  Reservoir
-  Shrubland
-  Brushland
-  Urban
-  Cropland
-  Grassland



Regional Conservation: Secondary Priority Ecoregions

High Plains - This ecoregion is the least conserved, with a low percentage of public and non-profit conserved land and land under wildlife management plans. It has experienced a high rate of conversion to crops, but a considerable portion of it is now enrolled in the USDA's Conservation Reserve Program, affording higher conservation value than cropland. Threats include fragmentation and land management practices that are harmful to species such as lesser prairie chickens. Other threats include the damming of springs, streams and rivers, the draining and conversion of playa lakes and surface mining. Plant endemism is low, but there are two rare species, five endemics and several distinct plant communities. Birds of concern in this region include the Ferruginous and Swainson's Hawks, Burrowing Owl, Mountain Plover and High Plains Lesser Prairie Chicken. The black-tailed prairie dog, swift fox and pronghorn need conservation attention as well. Priority actions include increasing the percentage of conserved land to support several important game species and threatened animals.

Example Species - The Lesser Prairie Chicken

(*Tympanuchus pallidicinctus*) is a prime example of the many species the Texas Wildlife Action Plan in intended to aid proactively before more costly and restrictive management actions are needed. The bird is currently not listed as threatened or endangered, but it is identified in the plan as at moderate risk of extinction with relatively few populations. A working group team of government scientists, environmentalists, landowners, agriculture interests and others is working to protect the bird and its habitat in hope that federal threatened or endangered listing will not be necessary. There is currently a Texas hunting season for the bird, although it is short and limited. Birding tours to view the bird now bring sustainable income to some ranchers, particularly near Canadian in the eastern Panhandle. Hunting and nature tourism thus provide opportunities for increased landowner cooperation to restore and protect the shortgrass prairie habitat that sustains this bird along with rare animals like the swift fox, game animals such as quail and many other species. Threats to this bird and its habitat include agricultural development into intensive cropland, urbanization and urban sprawl, erosion, habitat fragmentation caused by fencing, land-use changes such as draining or filling, invasive species, brush eradication, fire suppression, and brood parasitism by other species. Recommended actions to conserve it include continued technical guidance to encourage improved agricultural practices, conduct education and encourage policies to limit negative development impacts, prevent erosion (such as through wooded buffers between uplands and wetlands), prevent landscape fragmentation, support invasive species research and control and continue to facilitate broad coalitions (including environmental and agricultural interests) to support environmentally favorable policies.



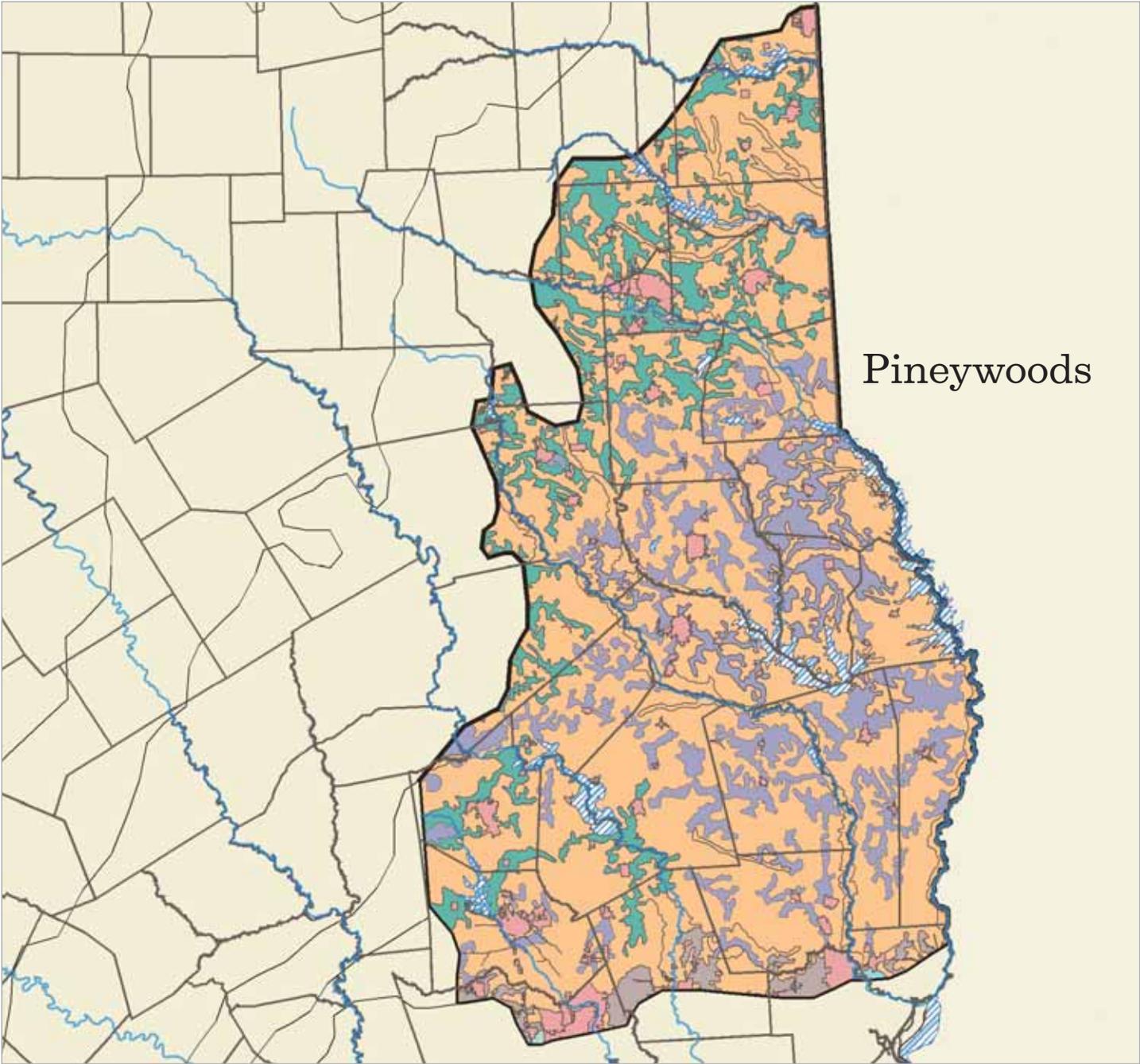
Regional Conservation: Secondary Priority Ecoregions

Pineywoods - This ecoregion has a relatively high percentage of publicly owned land and land under wildlife management plans. However, the northern half of the ecoregion is not well conserved and has unique habitats and rare species of plants and reptiles. Primary threats are fragmentation and land conversion. Much of the longleaf pine and hardwood forest habitats have been converted to loblolly pine plantations, which have limited conservation value. The consolidation of timber interests around the country has led to sales of large timber tracts in East Texas which may be converted to other uses. Fire suppression, fire ant and Chinese tallow invasion are also threats. Much of the best remaining bottomland hardwood habitat is threatened by potential reservoir construction. Plant endemism ranks relatively low, though the region supports 22 rare species and 27 endemics. The longleaf pine savannahs have been reduced from approximately 1.5 million acres historically to 50,000 acres today. Many of the acid seeps and pitcher plant bogs have been converted for other uses. The federal and state listed Houston toad exists in a confined area located in the spatially separated Pineywoods habitat in Bastrop County known as the Lost Pines. Regarding rare animals, the Gulf Coast Prairies and Marshes and Pineywoods ecoregions share one of the world's most diverse and highly threatened mussel populations. Reptiles of concern include the Louisiana pine snake, alligator snapping turtle and timber rattlesnake. In general amphibians are declining. Birds of concern are the Red-cockaded Woodpecker, Bachman's Sparrow and other grassland savannah nesters and winterers. The endangered Louisiana black bear may be attempting to naturally recolonize the area and the conservation of bottomland forests is critical to its return. Longleaf pine savannahs and other unique plant communities, including bogs, hardwood slope forests and baygalls, should be preserved and restored wherever possible. Conservation and restoration of remaining bottomland hardwood habitats, such as those in the San Bernard River Basin, is also important for many wildlife species.

Example Species - The Red-cockaded Woodpecker

(*Picoides borealis*) is on the federal endangered species list, although positive steps to restore and provide habitat and work cooperatively with forest landowners have improved its status in recent decades. The plan identifies it at moderate risk of extinction due to its restricted range. The open forests with big, old pine trees upon which it relies for nesting and foraging have largely been replaced by forests with younger, smaller pines. Some threats to the habitat that supports it include improper livestock grazing, urbanization and urban sprawl, utility development, erosion, habitat fragmentation caused by fencing and reservoirs and dams, deforestation, land-use changes such as draining and filling, gravel mining, invasive plants and animals, brush eradication and fire suppression. Recommended actions to conserve it include continued technical guidance to encourage proper grazing, conduct education and encourage policies to limit negative development impacts, prevent erosion (such as through wooded buffers between uplands and wetlands), prevent landscape fragmentation, continue to provide incentives and guidance for landowners to voluntarily protect and restore habitat, support invasive species research and control and encourage forest management practices such as uneven-aged management and single tree selection harvest that maintain southern pine stands in and open, park-like structure.

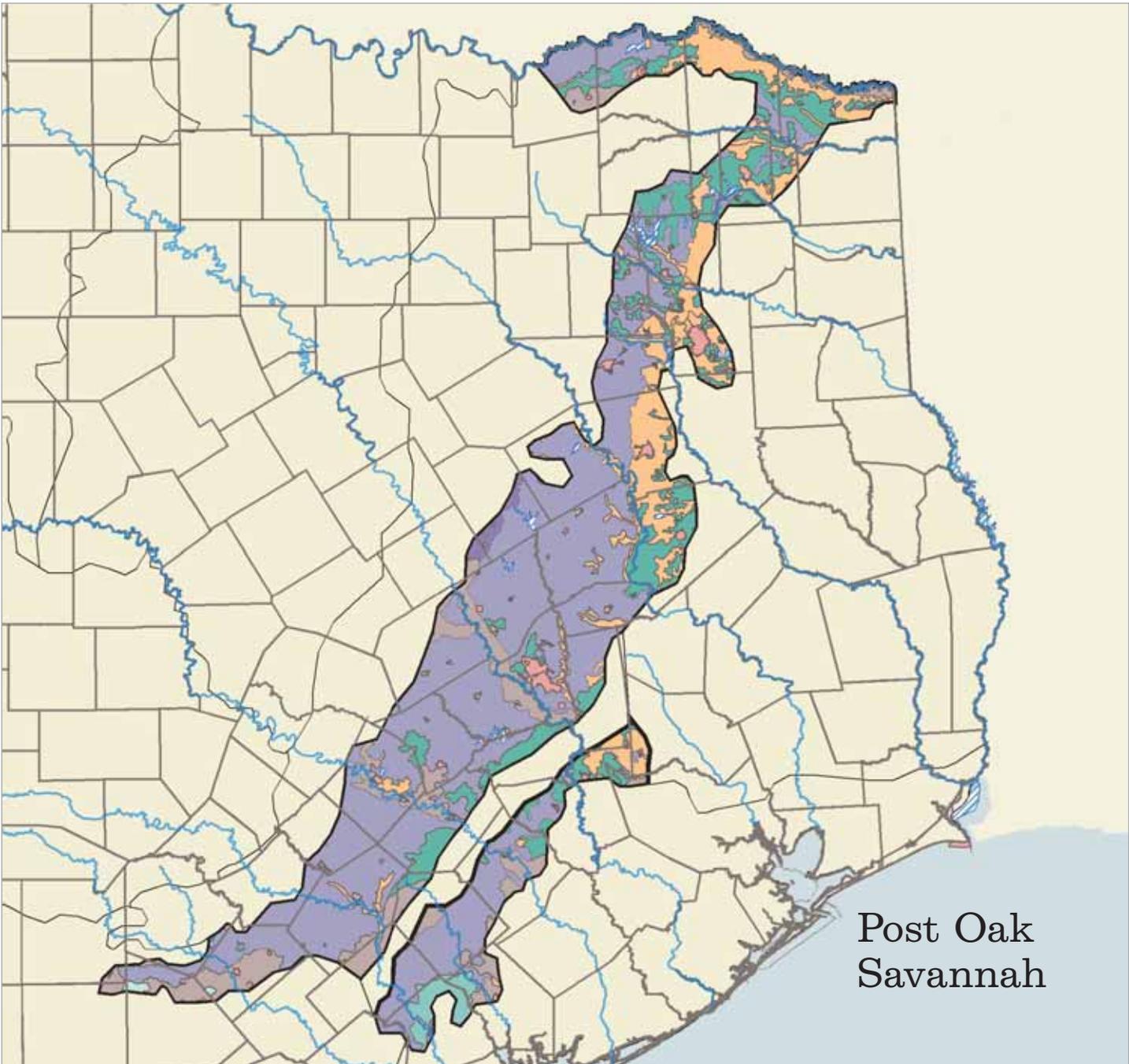




Pineywoods

- Reservoir
- Woodland, Forest & Grassland Mosaic
- Forest
- Natural Lake
- Urban
- Cropland
- Other Native & Introduced Grasses





Post Oak Savannah

-  Reservoir
-  Forest
-  Urban
-  Grassland
-  Cropland
-  Other Native & Introduced Grasses
-  Woodland, Forest & Grassland Mosaic
-  Parkland Woodland Mosaic



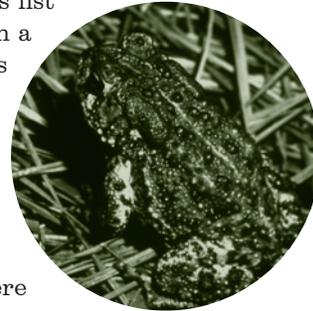
Regional Conservation: Tertiary Priority Ecoregions

Post Oak Savannah - This region has only a small percentage of public or non-profit conservation land. Primary threats are fragmentation and land conversion, especially from the damming of springs, streams and rivers. Other threats include fire ant infestation and fire suppression in both oak savannahs and pitcher plant bogs. Plant endemism in this ecoregion ranks lower than others, though the area supports 17 rare species and 65 endemics. Many highly specialized plant habitats such as blowout sandhills, clay-pan savannahs, pitcher plant bogs, Catahoula and Oakville sandstone outcrops, chalk glades and limestone prairies support numerous rare plants which are not found on public land. Regarding rare animals, Example Species include the Loggerhead Shrike, Painted Bunting, spotted skunk and Brazos water snake. Conservation efforts in this region should focus on areas that support many unique species and communities such as mesic hardwood woodlands, bogs, sandhills and bottomland hardwoods.

Example Species - The Houston toad

(Bufo houstonensis) is on the federal endangered species list and is identified in the plan as critically imperiled with a very high risk of extinction due to extreme rarity. This terrestrial amphibian lives in the deep sandy soils of the “Lost Pines” area, a unique habitat within the Post Oak Savannah ecoregion. As with other wildlife species of concern, habitat loss and alteration are the most serious threats facing the Houston toad.

Alteration of the natural wetlands for urban and agricultural uses has eliminated its breeding sites. There has been some progress to protect toad habitat in recent years by organizing regional conservation involving local governments and landowners working cooperatively with biologists. Some threats to the habitat that supports the toad include urbanization and urban sprawl, modification of natural plant and animal communities that support it, utility development, inhibited dispersal due to habitat fragmentation, reduced genetic variability and gene flow and hybridization, vegetation disturbance, deforestation and tree harvesting, land-use changes such as draining or filling, ground water pumping and pollution such as oil or chemical spills and contaminated water discharges. Recommended actions to conserve it include research of local species distributions and movements to develop site planning alternatives, conduct education and encourage policies to limit negative urban development impacts; improve water quality by improving upstream habitat and provide technical guidance to landowners about downstream issues, continue to monitor U.S. Army Corps of Engineers section 404 (wetland development) permit applications and comment on biological impacts, use Geographic Information Systems models to plan cooperative habitat restoration, and minimize human disturbance.



Regional Conservation: Tertiary Priority Ecoregions

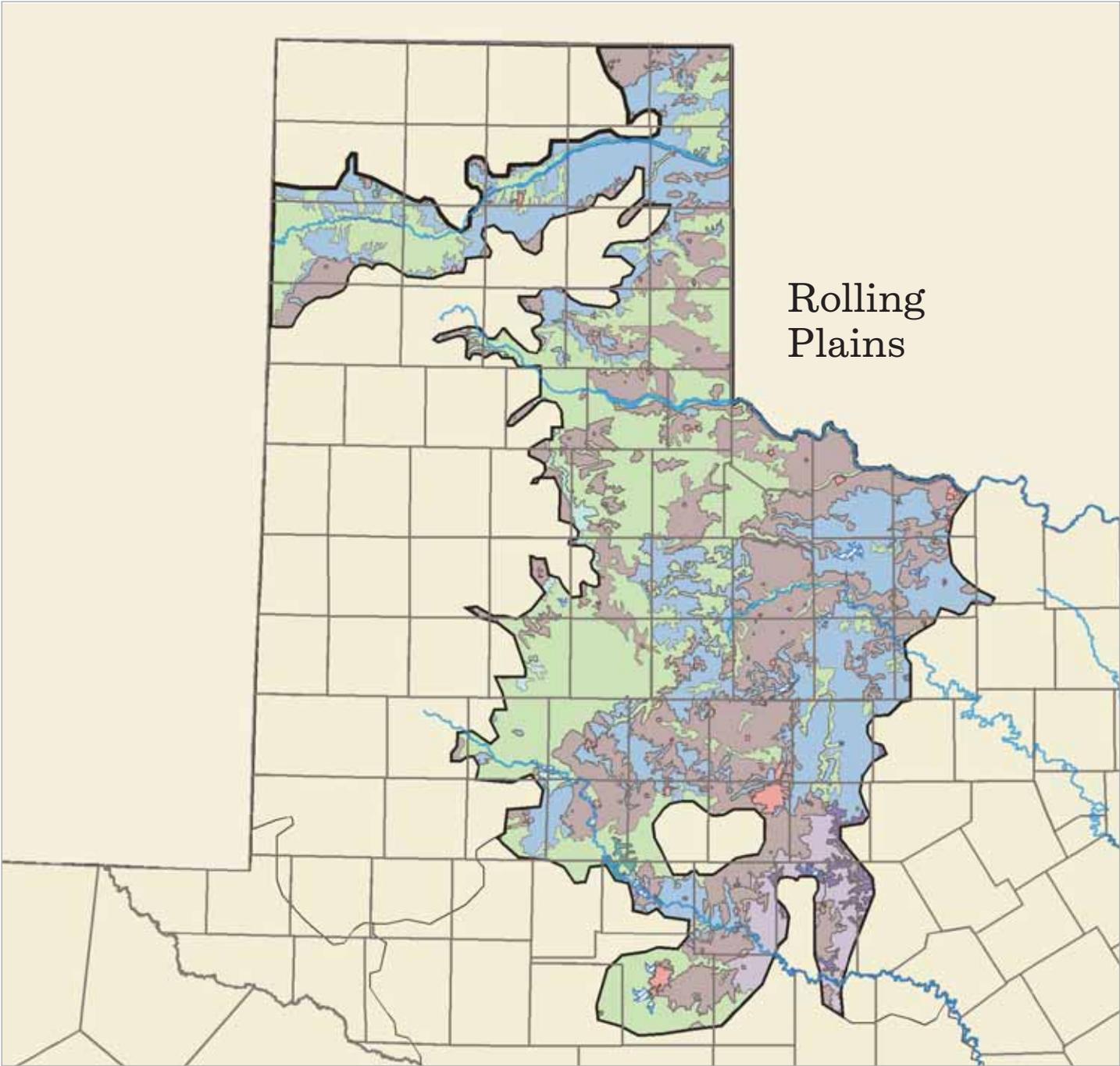
Rolling Plains - The ecoregion has a relatively small amount of public and non-profit conservation land and a medium percentage of land under wildlife management plans. Threats include land fragmentation and conversion. Also, exotic species such as salt cedar exist along many miles of riverbank. The only rare plant endemic to this region, the Texas poppy-mallow, is associated with the mesquite grasslands and Havard shin oak communities. Regarding rare animals, low forests on limestone out-pockets are important habitat for the endangered Black-capped Vireo. Both the federally listed Concho and Brazos water snakes occur here. The state listed Texas kangaroo rat also survives in this region. This region is a prime candidate for restoration efforts and many species would benefit from restoration of grasslands and riparian forests. Protection of the Texas poppy-mallow and high quality examples of communities such as Havard oak-tallgrass, sandsage-midgrass and cottonwood-tallgrass grasslands and woodlands are also important.

Example Species- The black-tailed prairie dog

(*Cynomys ludovicianus*) has been a recent candidate for federal threatened species listing, although the Texas Wildlife Action Plan identifies it as widespread and abundant. To proactively address concerns about the species and preclude the need to list it, a working group team of government scientists, environmentalists, landowners, agriculture interests and others produced the Texas Black-tailed Prairie Dog Conservation and Management Plan in 2004. Plan goals include efforts to determine the current population size of prairie dogs in Texas, establish a long-term monitoring program, develop education and outreach and management options and guidelines to conserve prairie dogs at sustainable levels, and establish a research program to facilitate long-term viability. Some threats to the prairie dog include improper livestock grazing, construction of roads and structures, oil and gas development, urbanization, utility development, inhibited dispersal due to habitat fragmentation, reduced genetic variability and gene flow and hybridization, pet trade collection, target practice, land-use changes such as draining and filling, popular perception of the species as a destructive pest, and road kills. Recommended actions to conserve it include continued technical guidance to encourage proper grazing, work with government and private organizations to promote landowner incentives to voluntarily protect and restore habitat, use Geographic Information Systems models to plan cooperative habitat restoration, continue to facilitate broad coalitions (including environmental and agricultural interests) to support environmentally favorable policies and work with state, federal and local governments to fund systematically checking for suitable habitat locations and move the data to a common location such as NatureServe.



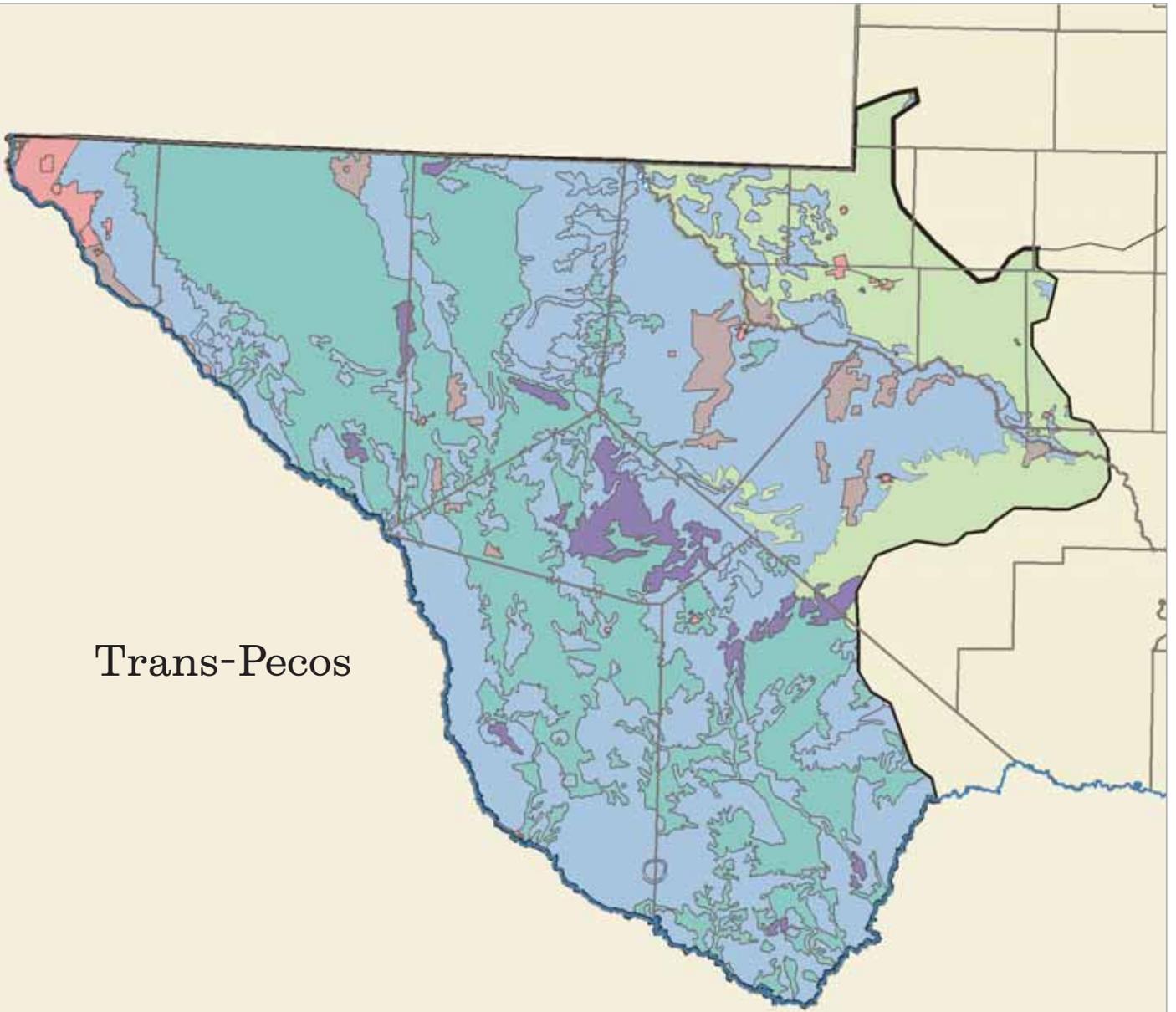
Rolling Plains



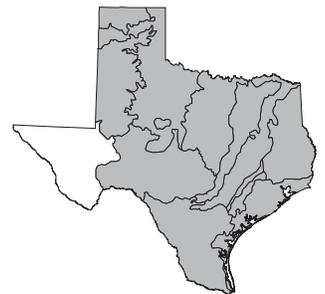
-  Reservoir
-  Parkland
-  Woodland
-  Shrubland
-  Brushland
-  Urban
-  Cropland
-  Native & Introduced Grasses
-  Parkland Woodland Mosaic



Trans-Pecos



-  Reservoir
-  Brushland
-  Shrubland
-  Grassland
-  Urban
-  Cropland
-  Parkland Woodland Mosaic



Regional Conservation: Tertiary Priority Ecoregions

Trans-Pecos - This is the most conserved of all ecoregions, but conserved lands are not evenly distributed. The desert grasslands of the region are poorly conserved, as are much of the forests along the Rio Grande and plant communities around springs. Threats are the lowest of any ecoregion but include persistent drought and groundwater withdrawals that have damaged many existing spring-associated communities. Expansion of human activities in the El Paso region will negatively impact habitats in the surrounding areas. Botanically, the region is one of Texas' richest and most unique. Approximately one of every 12 plant species occur nowhere else in Texas. The Trans-Pecos supports three times the number of rare plants than any other region. Much of the banks of the Rio Grande are choked with salt cedar, making the protection of the rare patches of cottonwood-willow and velvet ash-willow communities important. Many springs and their associated ciénegas and creeks once contained numerous rare plants, but most have dried out. Of the few springs that remain, only three are permanently conserved. Where animals are concerned, this region has the highest percentage of vertebrate species of concern. The bird, mammal and insect faunas are rich and unique. Rare birds include the Golden Eagle, Common Black Hawk, Elf and Flammulated Owls, Peregrine Falcon, Montezuma Quail and others. Mammals include the black-tailed prairie dog, kit fox, desert bighorn, pronghorn, Mexican black bear and hooded skunk. This is by far the most herpetologically diverse ecoregion. Species of concern include the Chihuahuan mud turtle and the dunes sagebrush lizard. Additional conservation actions are needed to protect the high desert grasslands, spring communities and riparian woodlands along the Rio Grande.

Example Species- The Aplomado Falcon



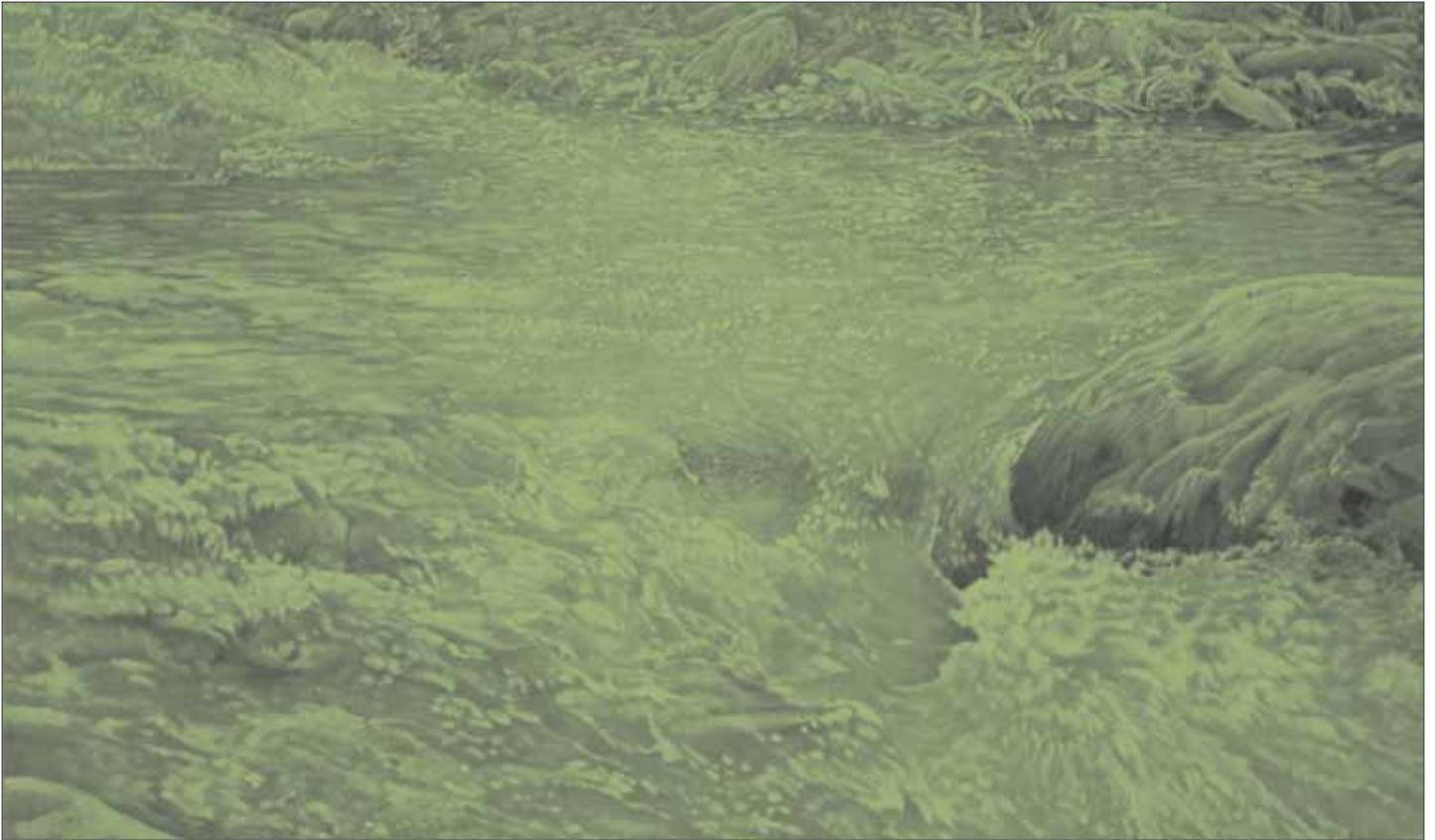
(*Falco femoralis*) is identified in the plan as uncommon but not rare in the arid grasslands of this ecoregion, with some cause for long-term concern. Some threats to it include urbanization and urban sprawl, mortality from collisions with structures, erosion, habitat fragmentation caused by fencing, land use changes such as draining or filling, invasive plants and animals, brush eradication, fire suppression, brood parasitism and road kills.

Recommended actions to conserve it include continued technical guidance to encourage proper grazing, encourage policies to limit negative development impacts, make every effort to see that oil/gas and wind power development proceed with as little impact as possible on native wildlife, prevent erosion (such as through wooded buffers between uplands and wetlands), prevent landscape fragmentation, and provide education through technical guidance, field days, literature, and SWG grants for challenge cost-share with the Natural Resource Conservation Service for the wetland reserve program, riparian buffers and other federal Farm Bill practices on private land.

Threats to Rivers, Springs and Aquifers

Texas has nearly 200,000 miles of streams and rivers and approximately 1.7 million acres of reservoirs and public water impoundments which provide habitat for the state's diverse fish and wildlife species. Scientists recognize 258 fish species that inhabit fresh water for at least a part of their lives. TPWD estimates that 25 percent of native freshwater fish species are of conservation concern or already extirpated. In the 15 major river basins, watercourses range from wide, shallow and sandy prairie rivers, clear, spring-fed streams, to slow-moving bayous with extensive hardwood bottomlands. Many of the state's rivers and streams originate from Texas freshwater springs. These springs support unique habitats with species found nowhere else in the world. Both the river and stream systems provide water for reservoirs, which range in size from less than one acre to the 185,000 acre Toledo Bend Reservoir. In addition, aquifers underlie much of the state and provide groundwater for people, springs and wildlife. Threats to freshwater resources include:

Reduced Water Quality - Point source and nonpoint source pollution threaten native fish and wildlife species that rely on clean water. Water that will not support fish and wildlife will not support human needs either. In the next decade, pollutant concentrations in rivers and streams may increase to a point where they have a detrimental effect on aquatic life including low oxygen, harmful algal growth and fish kills.



A Conservation Concern

“TPWD estimates that 25 percent of native freshwater fish species are of conservation concern or already extirpated.”

Reduced Water Quantity - As the population grows and water demands increase, water flow in rivers and streams, or instream flow, may decrease. Decreased or altered water quantity will affect the ecosystems, habitats and wildlife that depend on the natural flow regime of the stream or river. For example, groundwater withdrawals, reservoir operations and water diversions make rivers, streams and springs and the fish and wildlife resource they support exceptionally vulnerable to the effects of drought.

Reservoir Construction - TPWD recognizes that reservoirs are necessary to store water for human water consumption, flood control and hydropower generation and to provide public freshwater recreational opportunities. However, reservoir development significantly alters the stream and river systems as well as the bay and estuary systems downstream. Direct impacts of reservoir construction are caused by inundation of the land which displaces wildlife and causes the loss of terrestrial, wetland, riverine, riparian and bottomland hardwood habitat types. Indirect impacts include reduction and/or alteration of downstream riverine, estuarine, riparian, wetland and bottomland hardwood habitat types which harm species that depend on them.

Introduced Species - Exotic plant and animal species that are introduced either by design or by accident can cause unintended harmful consequences. Exotic species may become invasive, spreading rapidly, displacing native species and threatening community relationships that are necessary to sustain the aquatic environment. Eighteen non-native fish species have been documented in Texas as well as a number of snail and bi-valve species. Some have had an extremely negative impact on native fish communities. Further, great effort and financial resources have been expended to control invasive aquatic plants such as water hyacinth, hydrilla and giant salvinia, which have negatively affected native freshwater communities.



Water
Hyacinth

Freshwater Conservation Priorities

Maintain or Improve Water Quality - Work to assure water quality needs are met in all streams, rivers, reservoirs and coastal systems. Continue to collaborate with the Texas Commission on Environmental Quality (TCEQ) and other regulatory agencies to promote the conservation of water quality in streams and rivers. Support efforts to integrate biological and physical habitat data into water quality standards. Conduct research and evaluate water quality concerns in Texas' freshwater and coastal water resources.

Maintain Adequate Water Quantity - Implement and update tiered instream flow study priorities. Complete instream flow studies at the basin and subbasin level in coordination with TCEQ and Texas Water Development Board (TWDB). Site-specific assessments will also be required to address specific water development projects. Design studies to assist in regional water planning and water rights decision making.

Strategies for Meeting Water Conservation Needs - Implement freshwater inflow and instream flow studies' recommendations. Support amending the Texas Water Code to better recognize instream uses (instream flows, freshwater inflows to bays and estuaries, water quality, fish and wildlife resources, aesthetics and recreation) as beneficial uses when appropriating state water to ensure water is available for the health of fish and wildlife. Work with regulators, regional water planning groups and stakeholders to develop state and regional water plans that protect the needs of fish and wildlife by incorporating flow regimes adequate for aquatic systems. Work with regulators, permit holders and stakeholders on water rights permits to protect the needs of fish and wildlife by incorporating special conditions that adequately protect aquatic systems. Encourage the conversion or transfer of existing unused water rights to the Texas Water Trust to protect instream uses. When a water right is converted to a different use, sold or transferred out of basin, those actions should include permit conditions to mitigate detrimental impacts and ensure flows necessary to maintain the health of fish and wildlife. Encourage private landowners to use a watershed management approach to increase water

Freshwater Conservation Priorities

quantity and quality in rivers and streams to increase freshwater inflows to the bays and estuaries. Incorporate the goal of watershed management and improving water quality and quantity into all Wildlife Management Plans (WMP). Texas Parks and Wildlife Department, Texas Department of Agriculture, Texas Agricultural Extension Service, river authorities and other organizations shall work to fund projects that increase water yields while protecting or improving wildlife habitat.

Protect Texas Springs and Wetlands - Fully implement the Texas Wetlands Conservation Plan. Ensure that future legislation affecting groundwater also protects springs and other beneficial uses for wildlife. TPWD shall participate in the Groundwater Availability Models effort being directed by TWDB and advocate that these models be used to manage groundwater pumping to minimize impacts to springs and other surface water features. Encourage groundwater districts to implement management practices that protect springs and spring habitats in their plans.

Improve Outreach and Education - Increase efforts to produce public education materials that discuss the importance of river, spring, reservoir, wetland, bay and estuary conservation. Encourage anglers and boaters to increase their role as conservationists. Assist local communities in planning and education programs that promote water conservation for fish and wildlife. Work with schools to integrate water resource and conservation information into their curriculum.

Reduce User Conflicts - Provide education and communication with all user groups concerning recreational impacts on water resources.

Increase Knowledge and Understanding of Aquatic Ecosystems - Base conservation decisions that impact fish and wildlife resources on the best science available. Prioritize waterways that are important for conservation. Develop and refine tools for analyzing aquatic systems and develop new conservation strategies like the Texas Wildlife Action Plan. Identify river and stream segments most at risk from over appropriation. Increase our understanding of biological resources present in Texas rivers, streams, springs and reservoir systems. Make historical reports and associated data available for research to document long term changes to flora and fauna of rivers and streams. Improve monitoring and research on aquatic species or groups suspected to be declining or whose status is unknown. Research and monitor bay and estuary systems. Determine freshwater inflows and nutrient and sediment loading regimes to tidal streams.

Freshwater Conservation Priorities

Manage Exotic Species - Prevent the introduction of potentially harmful, nonnative fish, shellfish and aquatic plants into freshwater and marine environments through education and regulations. Implement the Texas Aquatic Vegetation Management Plan created by TPWD in partnership with river authorities and others.



**Exotic Invasive:
Northern snakehead**
(Courtesy USGS)

Maintain Sufficient Water Quality and Quantity to Support the Needs of Fish and Wildlife - In conjunction with Texas Commission on Environmental Quality and Texas Water Development Board, complete instream flow studies to determine the quantity and timing of water and flow regime necessary to support a sound ecological environment in rivers and streams. Work with TCEQ and TWDB and with each of the 16 water planning regions over the next two state water planning cycles in 2006 and 2011 to incorporate fish, wildlife and recreation needs into each regional plan and the state water plan. Encourage the conversion or transfer of existing unused water rights to the Texas Water Trust to protect instream uses. Work with landowners, river authorities and regulatory entities on a watershed management approach, including range and habitat management practices, to improving water quality and quantity. Work with appropriate agencies to develop and implement nutrient, habitat and biological criteria for state waters (rivers and estuaries) to protect the health and productivity of those waters. During each of the subsequent triennial reviews (2006 and 2009) TPWD will work with affected stakeholders to assure the water quality standards increasingly incorporate biological information conducive to the management of fish and wildlife resources.

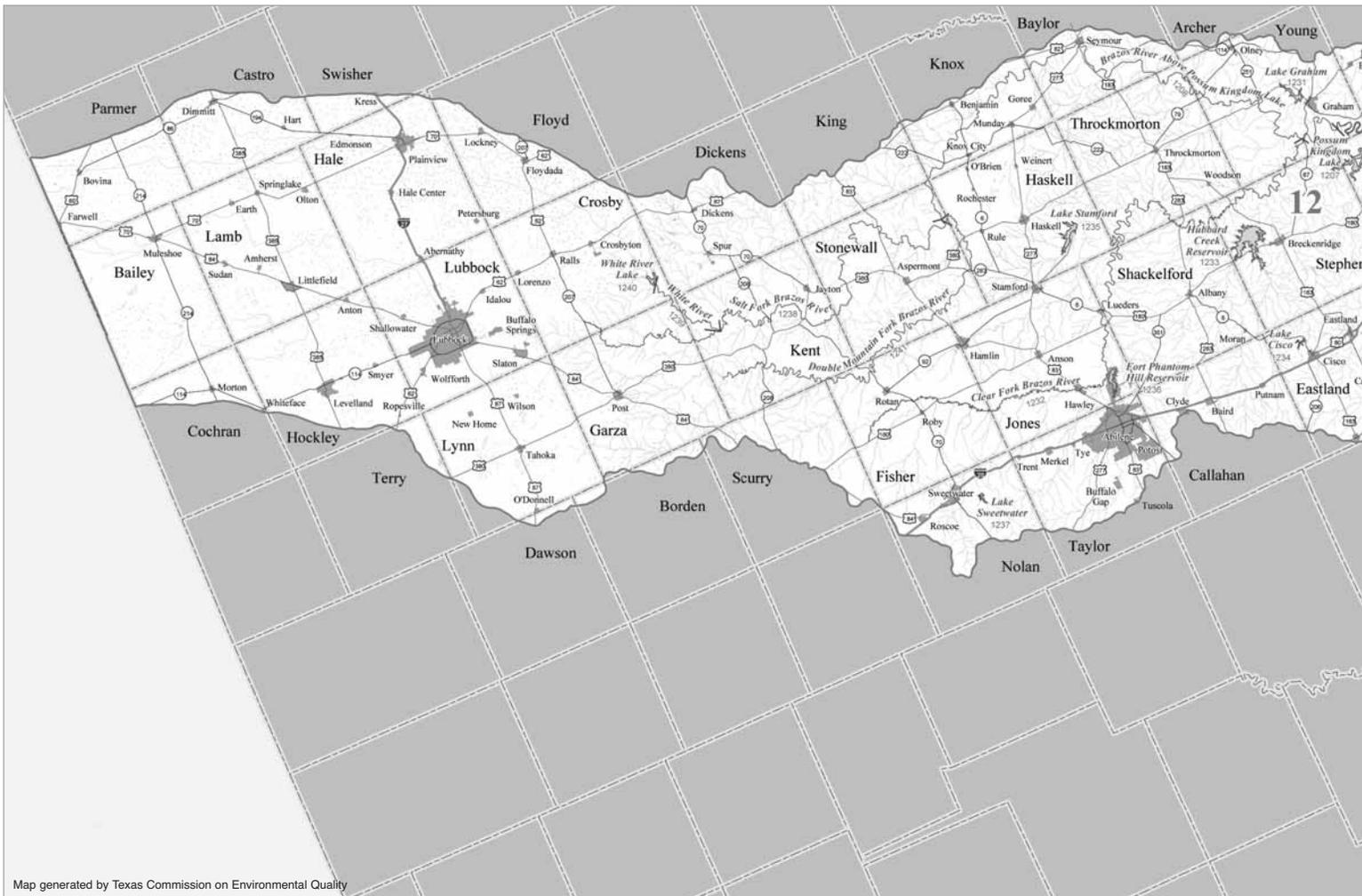


Long-term Conservation Priority



Texas River Basins

Texas is a river-dominated landscape. Like veins and arteries that carry nourishment through the human body, rivers and streams are the lifeblood of the Texas ecology. Not only fish and aquatic creatures, but upland and terrestrial wildlife and people all depend on river watersheds and the lakes, estuaries and bays into which they flow. Below are brief distillations of conditions for the 16 major Texas river basins. Providing good water quality and quantity for people and fish and wildlife is the number one long-term conservation priority in Texas. Identifying instream flow needs (water flowing in rivers) and inflow needs (water flowing into bays and estuaries) and making sure we meet these needs are key concerns for almost every river basin. Monitoring fish and wildlife and habitat conditions in rivers and streams, investigating fish kills and working with water planners on development projects that affect wildlife are also priority recommendations for almost every basin. Complete information, including listings of priority fish and wildlife species for each basin, threats to rivers and streams and recommendations to address them, and information on tributaries, lakes and reservoirs is in the full Texas Wildlife Action Plan.

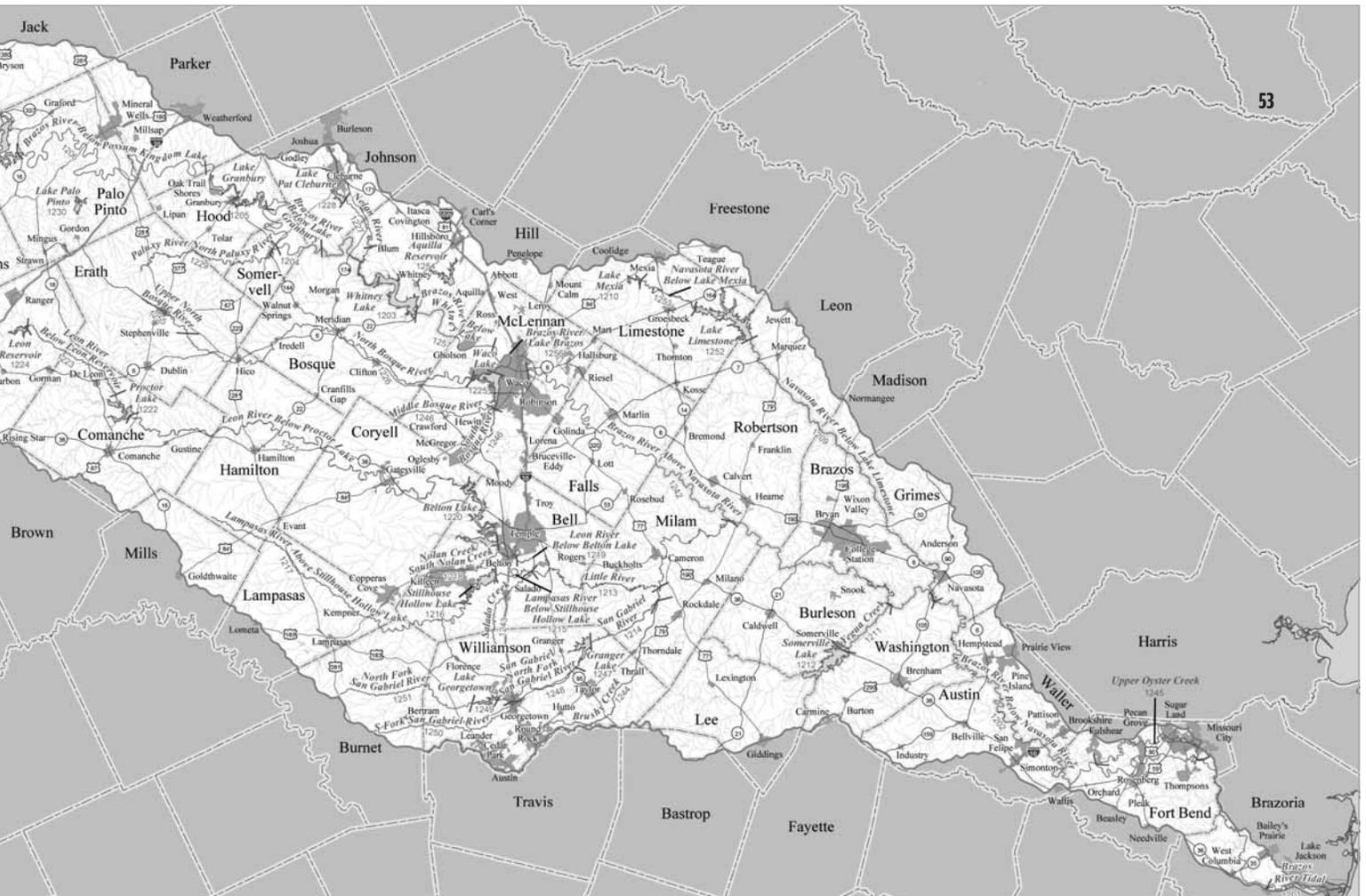


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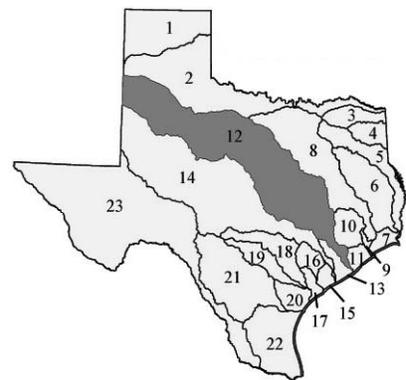
Brazos River Basin - Within Texas, the Brazos River has a total basin drainage area of 42,800 square miles and it is 840 miles long. It begins in eastern New Mexico and northwest Texas and flows southeasterly to the Gulf of Mexico. Nearly 3.3 million people live within the Brazos basin. There are 52 water body segments listed as impaired on the 2004 draft 303(d) list according to the Texas Commission on Environmental Quality. These impairments include bacteria, low dissolved oxygen, toxicity to aquatic organisms, chlorides, total dissolved solids, sulfate and high and low pH. The Brazos G Regional Water Planning Group describes natural salt pollution as a serious and widespread water quality problem in the region, which includes the entire middle basin and portions of the upper basin. The proposed Brushy Creek Reservoir and Wheeler Branch off-channel Reservoir are among the water management strategies



Brazos River



recommended by the regional water planning group to address future water needs. Population is expected to exceed 3.3 million people by 2060, and projected increases in water demand for human use have put the Brazos system on Tier 1 (highest priority) status for completion of instream flow studies. Golden alga (*Prymnesium parvum*) blooms and fish kills have occurred in the river and reservoirs from Lubbock to downstream from Lake Whitney. The need for coordination and cooperation between the various regulatory and resource agencies is very important for developing research efforts and any future management plans or actions dealing with this toxic alga. Texas Parks and Wildlife Department has identified several reaches of the main stem Brazos and 14 tributaries as ecologically significant stream segments. These exhibit exceptional ecological characteristics including high water quality, exceptional aquatic life, high aesthetic value, presence of threatened or endangered species, or valuable riparian habitats. Further study of such stream reaches would provide much needed data enabling more effective conservation of these important resources.

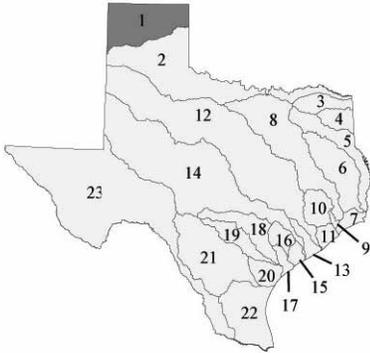


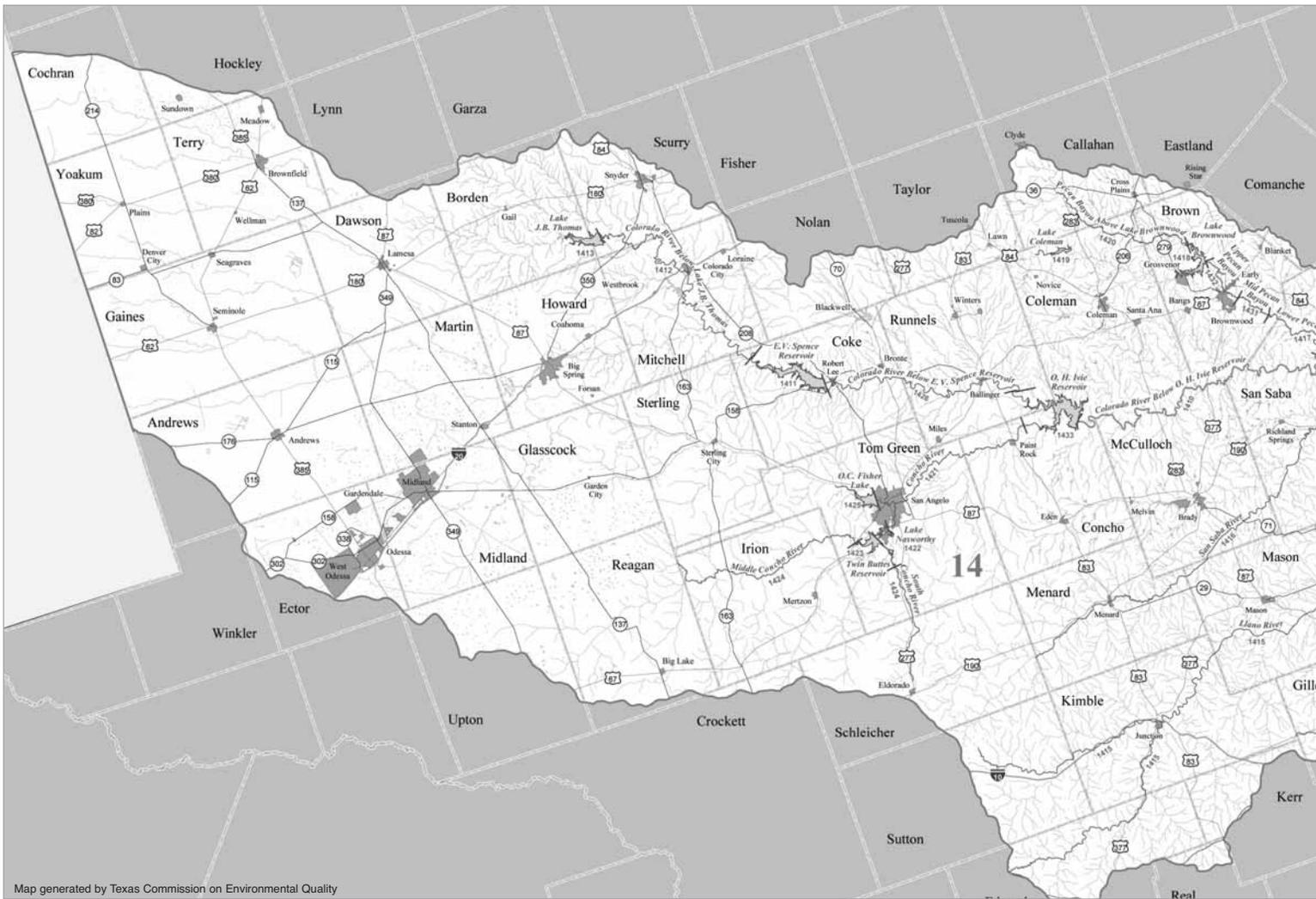
Texas River Basins

Canadian River Basin - The Canadian River headwaters begin in northeastern New Mexico and bisect the northern Panhandle and is part of the Arkansas River drainage. The Texas portion of the Canadian River basin is 200 miles long and covers 12,700 square miles. It is wide, shallow and sandy-bottomed with seasonal fluctuations in streamflow and harsh water quality conditions especially in hot summer months. Land use in the Texas portion of the Canadian River watershed is predominantly irrigated, dryland farming and cattle ranching. The Ogallala Aquifer is the primary source of water for the region and is being over-drafted to meet irrigation and municipal demands leading to long-term regional declines in water levels. Plans to export significant amounts of groundwater out of the basin have been recently proposed. Four water body segments are listed as impaired for bacteria and depressed dissolved oxygen, mercury in walleye, total dissolved solids and low dissolved oxygen. Threats and constraints to water supply in the Canadian Basin are related to surface water and groundwater sources. Groundwater development in the Canadian basin has been extensive and is projected to continue given the increasing demand for irrigation and municipal water. Major reservoirs on the Canadian in Texas and New Mexico have significantly altered flow regimes and contributed to fragmenting once contiguous riverine habitat. Riverine habitat fragmentation coupled with changes in flow regimes have contributed to the decline of prairie stream fishes in the Arkansas drainage system. In 1998, the USFWS listed the Arkansas River shiner (*Notropis girardi*) as threatened. Most water used in the Basin is supplied from aquifers such as the Ogallala, making aquifer depletion a potentially major constraint on water sources in the region. The Federal listing of species like the Arkansas River shiner has the potential to affect water resource projects and other activities. Potential contamination of groundwater may be associated with oil-field practices. Agricultural and other practices may have contributed to elevated nitrates in groundwater and surface water. Chloride control projects may lead to changes in flow regime and water quality. The high salinity of much of the area's water resources is largely due to natural salt deposits and brine disposal in oil production. Fish kills have occurred in the stilling basin downstream of Lake Meredith as a result of golden alga blooms. The Canadian River Basin in Texas has experienced drought conditions since the mid 1990s. The Panhandle (Region A) Regional Water Planning Group expects population to exceed 540,000 people by 2060. Regional water planning efforts recommends improvements in irrigated agriculture (e.g., low-energy precision application), enhanced precipitation and additional well-fields for meeting future supplies. Brush control has also been studied and proposed for the watershed upstream of Lake Meredith. Brush control, theoretically, could increase base flows but may lead to changes in stream bank vegetation and erosion processes. Increased silt loads from erosion could affect the suitability of riverine habitat, invertebrate production and fish survival especially in egg and larval stages.



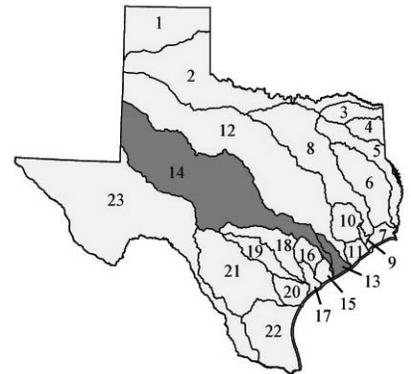
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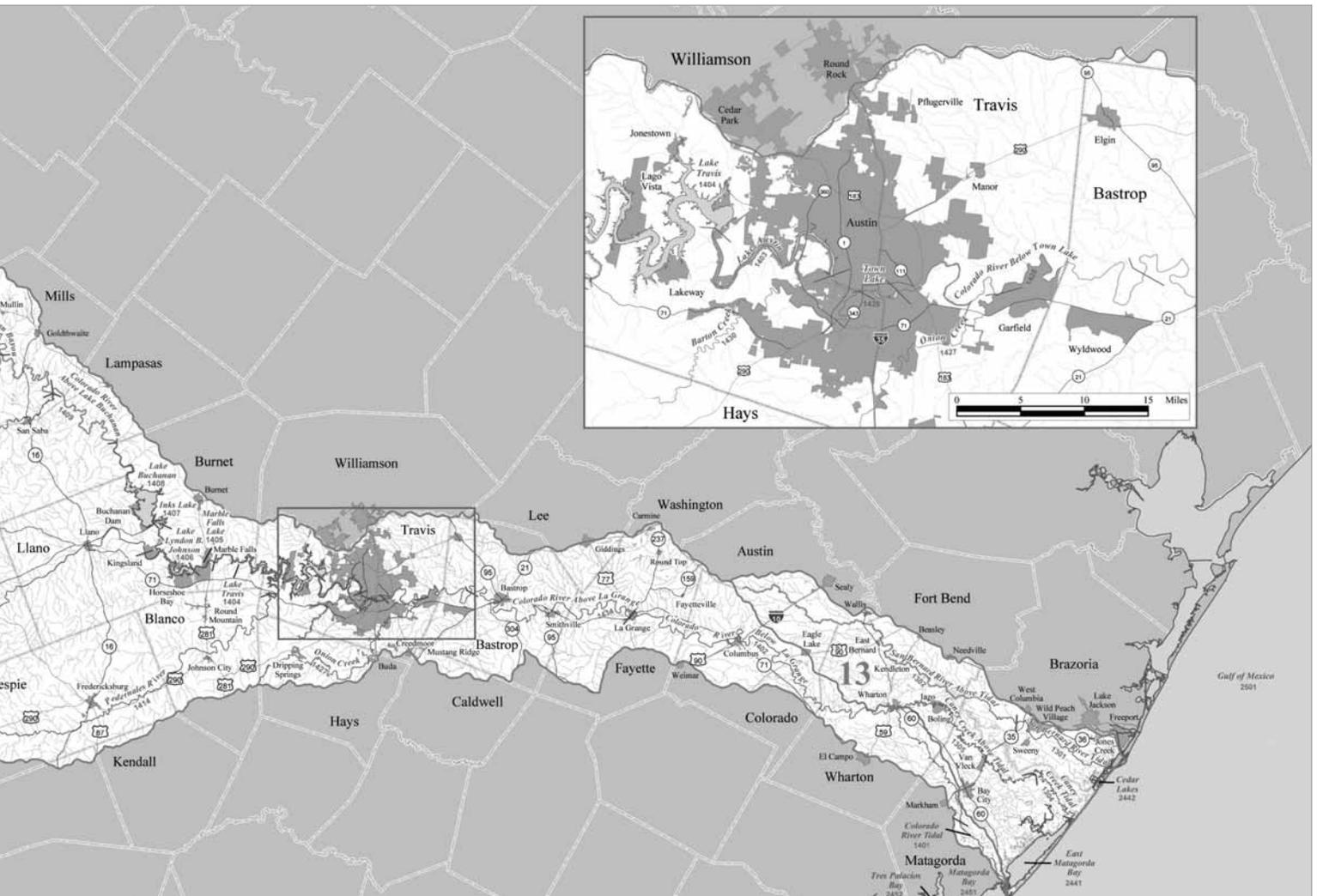




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Colorado River Basin - The basin originates in eastern New Mexico and runs southeasterly to the Gulf of Mexico. The total watershed area is 42,318 square miles. The river becomes a defined channel in Dawson County, Texas and flows approximately 900 miles into Matagorda Bay. The TCEQ has divided the Colorado River and its tributaries into 34 classified water quality segments. Nine of these are listed as impaired. O.C. Fisher Lake and the Colorado River downstream of E.V. Spence Reservoir are listed due to high dissolved solids and several streams in the urbanized Austin area are listed due to elevated bacterial levels or low dissolved oxygen levels. There are 15 major reservoirs on the Colorado River and its tributaries. Riverine habitat on the Colorado River has been substantially modified by reservoir construction and operation. All of the major reservoirs within the basin are operated as water supplies; the Highland Lakes and Lake Austin also include hydropower operations. The Colorado River and its tributaries support several threatened and endangered aquatic species. E.V. Spence and O.H. Ivy reservoirs have substantially modified flow regimes in the upper Colorado River; both are required to release water to maintain instream habitat for the Concho River water snake (*Nerodia paucimaculata*), a federally threatened species. In addition to the Concho River water snake, the endangered Clear





Creek gambusia (*Gambusia heterochir*) and Barton Springs salamander (*Eurycea sosorum*) are endemic to Clear Creek Springs in the San Saba watershed and the Barton Springs complex in Austin, respectively. Hydropower operations are a significant issue in the Colorado River main stem immediately downstream of Austin. All of the LCRA's reservoirs (Buchanan, Inks, L.B.J., Marble Falls and Travis) and Lake Austin are operated for hydropower and water supply operations. The LCRA operates the reservoirs to meet peak electrical demand; consequently there are substantial daily fluctuations in water levels immediately downstream of Austin. Kills have occurred in and near the river from near Colorado City downstream to the city of Bend as a result of toxic golden alga blooms. The Lower Colorado River Regional Water Planning Region (Region K) encompasses the lower portion of the Colorado River basin. Population growth is expected to exceed 2.7 million people by 2060. The Lower Colorado River Authority and the San Antonio Water System are exploring the feasibility of developing 330,000 acre-feet of water through irrigation conservation and capture of "excess and unused" river flows in the Colorado River. Developed water would be used to address water needs in the lower river basin and the City of San Antonio. The six-year study period began in 2004 and will determine whether the project benefits both regions without harming the Colorado River or Matagorda Bay.

Texas River Basins

Cypress Creek Basin -

The Cypress Creek basin originates in northeast Texas and drains an area of 2,812 square miles. The landscape consists of rolling wooded hills and broad, frequently flooded and densely vegetated stream bottoms. Big Cypress Creek's extensive floodplain is marked by numerous sloughs, oxbows



Caddo Lake

and other wetlands that trap water and sediment following flood events, forming important wetland habitat. Land uses in the basin include: woodlands (66%), agriculture (28%), urban (5.5%) and water (4.3%). Three water body segments are listed as impaired. Various areas of Caddo Lake are listed for low dissolved oxygen, mercury in largemouth bass and freshwater drum and low pH. Caddo Lake also suffers from pollution of heavy metals and organic chemicals from multiple sources. In the past, this has even led to warnings to limit the consumption of large fish. Big Cypress Creek below Lake O' the Pines is listed for mercury in fish tissue, lead (chronic) in water, low pH and low DO. Large multi-purpose (flood control and water supply) reservoirs constructed on Big Cypress include Lake O' the Pines and Bob Sandlin. Lake O' the Pines has dramatically altered flow regimes downstream in Big Cypress Creek. Most notable is that pre-dam flows included peak flows exceeding 57,000 cubic feet per second while post-dam peak flows rarely exceed 3,000 cfs; variation in peak flows has been dramatically reduced. Low flows during the historically dry periods have noticeably increased following dam construction. Resulting physical effects on riverine and floodplain habitat have altered fish spawning and foraging habitat and potentially eliminated spawning cues for fishes. The paddlefish (*Polyodon spathula*) has been greatly reduced in abundance and distribution throughout its range including the Cypress basin. Oil drilling and chicken farming are presumed to have negatively impacted mussel populations. Other factors, such as nutrient and contaminant loading, logging and drainage and conversion of the watershed to agriculture or residential development, have altered the system. Exotic species such as hydrilla and water hyacinth are abundant. No major water development projects that affect the Cypress basin were identified in the 2002 State Water Plan. Black Cypress and Little Cypress reservoirs have been proposed in past water plans; Little Cypress, on Little Cypress Creek, was recommended as a unique reservoir site. Potential hydropower issues could develop for Lake O' the Pines.

Texas River Basins

Sulphur River Basin - The Sulphur River is formed in east Delta County by the union of its North and South forks and flows eastward into the Red River in Arkansas. The basin is 150 miles long (straight-line distance) and within Texas drains 3,558 square miles. Approximately 75 miles of the main stem are in Texas, flowing through heavily timbered woods where little or no current is present. Land use in the Sulphur River Basin is 17.6% cropland, 23.9% timber and 54.3% pasture. Urban areas include Texarkana, Commerce and Sulphur Springs. Four water body segments are listed as impaired. These include the river's two major reservoirs, Wright Patman and Jim Chapman, and the Upper South Sulphur River for high pH and low dissolved oxygen and White Oak Creek for low dissolved oxygen. Several additional reservoirs have been proposed. The Region C Water Planning Group, which includes the Dallas-Fort Worth Metroplex, has recommended Marvin Nichols I Reservoir be constructed to help meet the region's water demand. Alternative projects are Marvin Nichols II and George Parkhouse I and II. As proposed, Marvin Nichols I would inundate or otherwise impact downstream portions of a 94,252-acre tract identified by the U.S. Fish and Wildlife Service as a Priority 1 preservation site that contains habitat of high value to waterfowl and other wildlife. This proposed project is estimated to inundate more than 45,000 acres of forested habitat, including more than 30,000 acres of bottomland hardwoods, a critical yet vanishing wildlife habitat type. A reach of the Sulphur River downstream of the proposed site has previously been identified by TPWD as a "Significant Stream Segment" based on a wetland habitat mitigation site managed by TPWD as the White Oak Creek Wildlife Management Area. This area could be negatively impacted by altered flow regimes as a result of reservoir operations. Construction of the proposed reservoir would eliminate or reduce habitat for six state-threatened, flow-dependent fish species: the creek chubsucker, western sand darter, blue sucker, blackside darter, paddlefish and shovelnose sturgeon as well as several other species of aquatic and terrestrial animals. An alternate project, Marvin Nichols II, would inundate or otherwise impact downstream portions of a 27,990-acre tract identified by USFWS as a Priority 1 preservation site and the White Oak Creek WMA, which was placed in a federal conservation easement as a result of mitigation for habitat lost to construction of Jim Chapman Reservoir. Construction of this proposed reservoir would eliminate or reduce habitat for two state-threatened, flow-dependent fish species: creek chubsucker and paddlefish. George Parkhouse I and II could also negatively affect bottomland hardwood habitat. Reservoir construction could eliminate or reduce habitat for three state-threatened, flow-dependent fish species: creek chubsucker, blackside darter and paddlefish.

Lamar

Fannin

Paris
Reno
Blossom
Detroit
Deport
Bogat

Delta

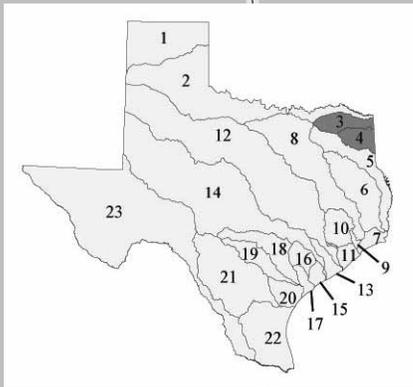
Franklin

Leonard

Hunt

Hopkins

Wood



Red River



3

4

Texas River Basins

Guadalupe River Basin - Rising from its North and South forks in Kerr County, the spring-fed river flows eastward into Kendall and Comal counties and then turns south to the Gulf of Mexico. Its total length is approximately 250 miles, with a total basin drainage area of 6,070 square miles. The upper reaches of the Guadalupe River meander through limestone bluffs and attract great numbers of water enthusiasts. The aquatic and riparian habitats support an exceptionally diverse assemblage of invertebrates, fish, birds, mammals and plants. From Kendall to Comal County the Guadalupe River is one of the most scenic stretches of river in Texas. From Canyon Dam to Interstate Highway 35 the Guadalupe River in Comal County is considered one of the finest white-water stretches in the State. The river along this stretch is being subjected to development, with many subdivisions becoming evident; however, many natural areas can still be found. The flow here is largely controlled by water releases from Canyon Dam. The lower reach contains extensive freshwater and estuarine wetlands, including the Guadalupe Delta Wildlife Management Area, one of the largest wetland reserve projects in the United States at almost 6,000 acres. Overall, the basin is characterized by generally high water quality. However, seven water body segments are listed as impaired due to low dissolved oxygen and/or high bacteria counts. The population in the South Central Texas regional water planning area (Region L), which includes all but the uppermost reach of the Guadalupe River in Kerr County, is projected to double between 2000 and 2060, reaching more than four million people. The Lower Guadalupe Water Supply Project was included in the 2002 State Water Plan to provide an additional source of water to meet future needs. Project components included diversion of water at a point downstream of the confluence with the San Antonio River as well as additional groundwater pumping primarily from the Gulf Cost Aquifer System. A number of technical and environmental studies have been initiated regarding the project.



Guadalupe
River

Texas River Basins

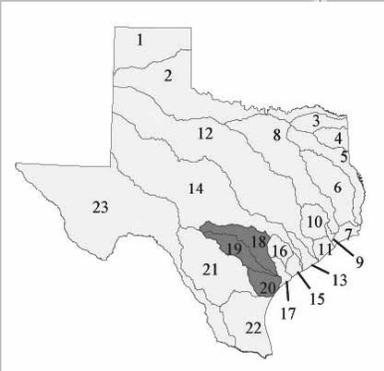
San Antonio River Basin -

The river originates in Brackenridge Park in San Antonio and flows southeastward for approximately 180 miles to a confluence with the Guadalupe River near San Antonio Bay. Total basin drainage area is 4,180 square miles. The upper San Antonio River Basin is mainly intermittent hill country streams and flood control channels. The main stem



San Antonio
Riverwalk

has its beginning in large springs within San Antonio. In the city's downtown, the river has been developed into a river walk area which attracts many tourists. South of San Antonio, the watershed undergoes a dramatic transformation as the river leaves its concrete lined channels and regains a more natural condition. Historically, water quality in the basin has been relatively poor, particularly during periods of low flow. In recent years, advanced waste treatment has been instituted at the three major City of San Antonio wastewater treatment plants and a former facility has been eliminated. As a result, dissolved oxygen levels in the river have increased substantially and aquatic life has been enhanced. However, a few water quality problems remain. Seven water body segments are listed as impaired for low dissolved oxygen and elevated fecal coliform bacteria. PCB's were detected in fish tissue collected from the lower reach of Leon Creek. The population in the South Central Texas Regional (Region L) Water Planning Area, which includes all but the uppermost reach of the San Antonio River Basin (the upper reach of the Medina River upstream of Medina Lake in Bandera County), is projected to double between 2000 and 2060, reaching more than 4 million people. The Lower Guadalupe Water Supply Project has been approved for inclusion in the state water plan by Region L to provide an additional source of water to meet future needs. Components of the project include diversion of water at a point on the Lower Guadalupe River downstream of the confluence of the San Antonio River as well as additional groundwater pumping primarily from the Gulf Coast Aquifer System.

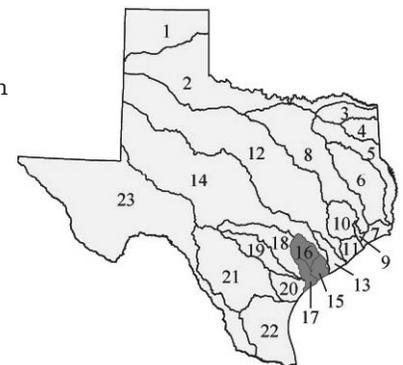


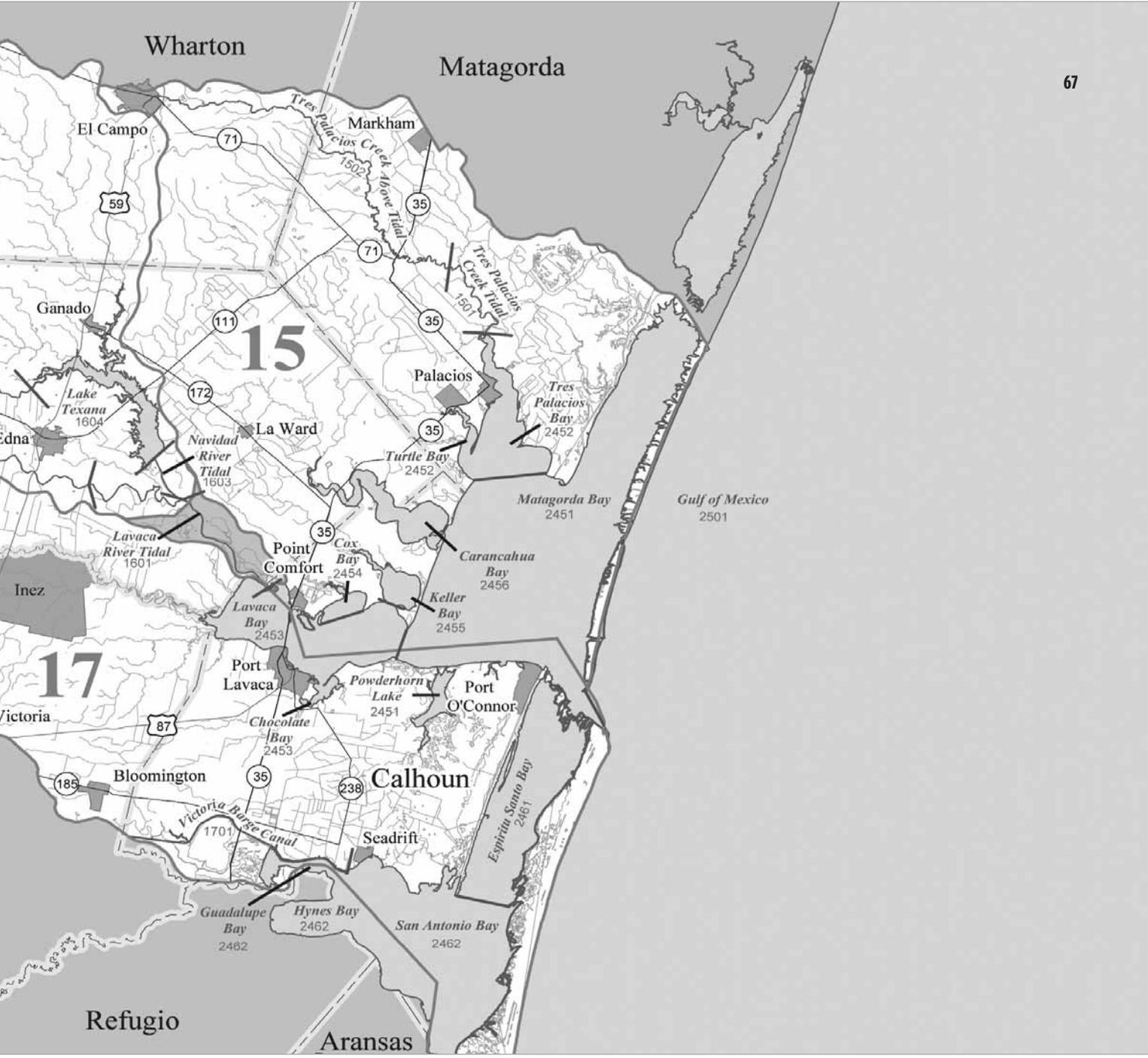




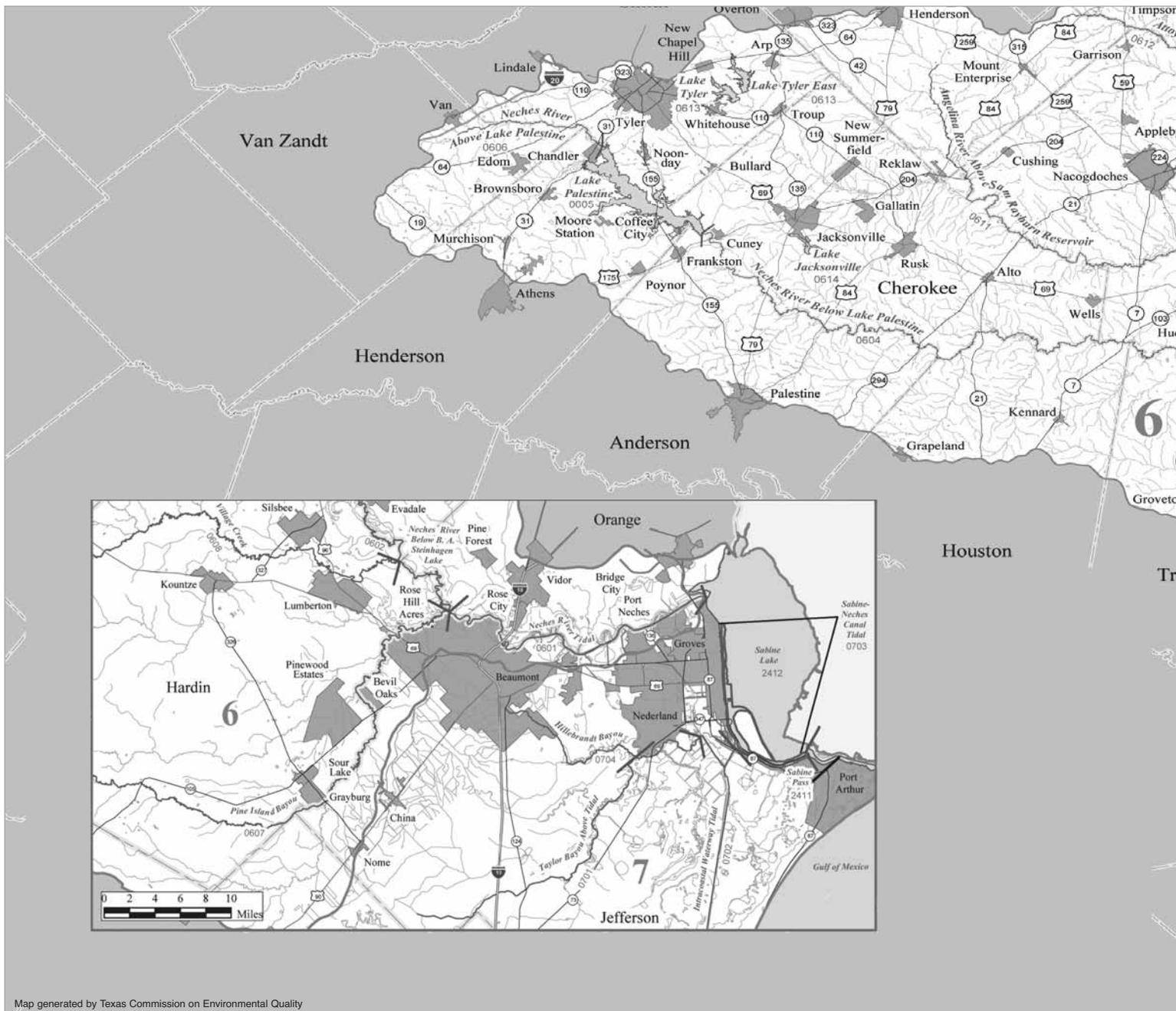
Map generated by Texas Commission on Environmental Quality

Lavaca River Basin - The Lavaca River lies on the coastal prairie north of the San Antonio-Matagorda bay area. Headwaters originate in southern Fayette County and flow through Lavaca and Jackson counties into Lavaca Bay. The Navidad River and its tributaries drain approximately 60% of the basin. The basin drainage area is 2,309 square miles. Land use is primarily for ranching and the production of oil and gas from the numerous oilfields along its banks. One of the basin's five major water body segments is listed as impaired due to low dissolved oxygen. Lake Texana Reservoir is the only major reservoir in



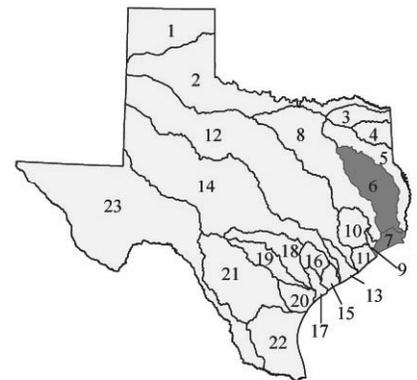


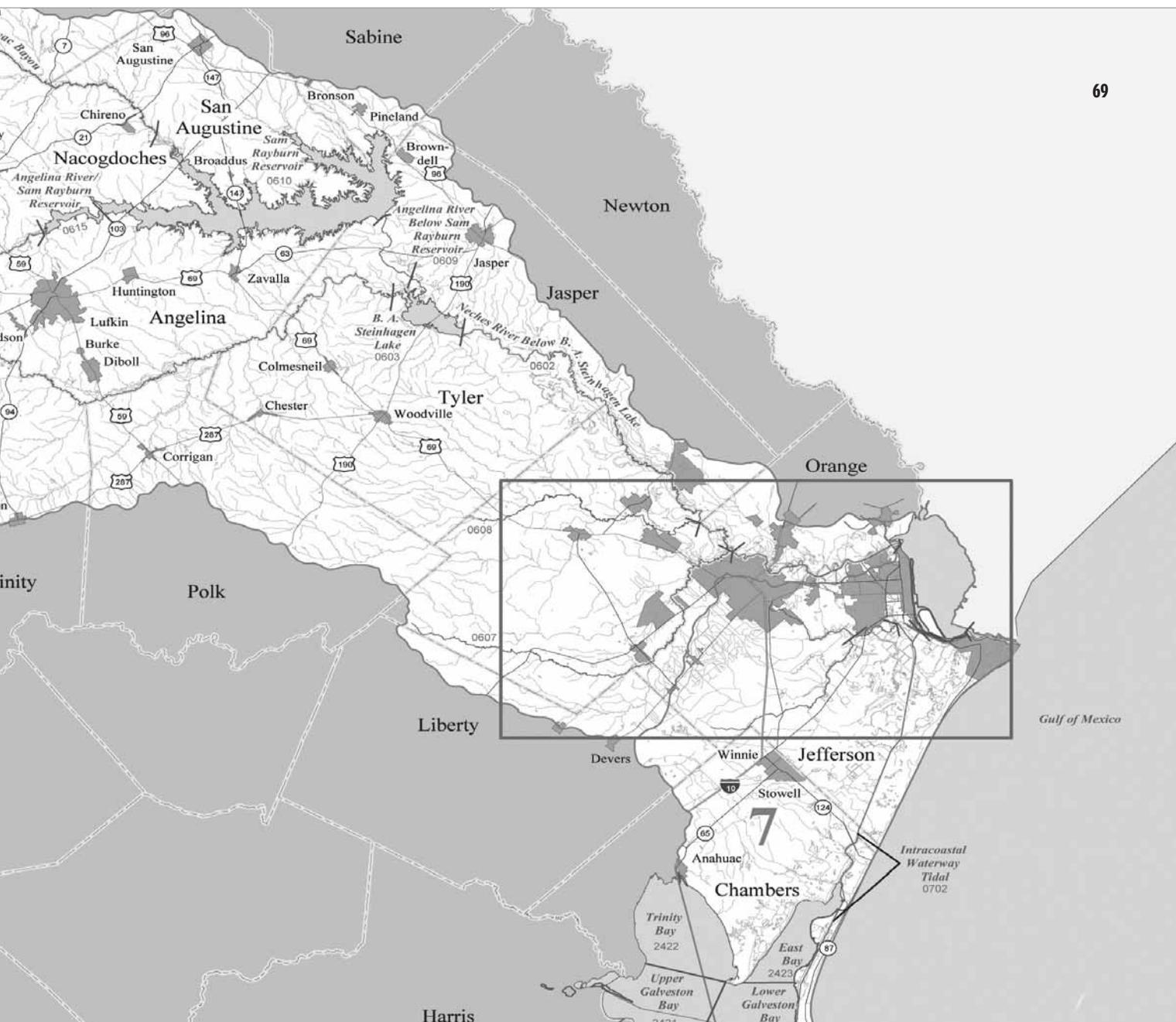
the basin. Potential water development and transfer from Lake Texana to meet urban water needs poses a risk to bay and estuary inflows, which are critical to coastal fisheries resources. Population growth in the Lavaca Regional Water Planning Region (Region P) planning area is not expected to be significant with a 3% increase forecast for 2060. No major reservoir construction is proposed within the current planning horizon but the Palmetto Bend II proposed reservoir site was recommended for designation as a unique reservoir site.



Map generated by Texas Commission on Environmental Quality

Neches River Basin - The Neches River originates in Van Zandt County, flowing southeastward through East Texas to Sabine Lake, where it joins the Sabine River before flowing into the Gulf of Mexico. The Neches River basin is located entirely within Texas and has an approximate total area of 10,011 square miles and a total length of 416 miles. Abundant rainfall over the entire basin results in a flow near the Gulf of approximately six million acre-feet per year. The upper reaches of the Neches are scenic and an abundance of wildlife can be sighted on the banks. The river is typically wide, free-flowing and has maintained much of its natural character. There are 32 water body segments listed as impaired for bacteria, low dissolved oxygen, mercury in fish tissue, low pH, lead in water, zinc in water, aluminum in water and impaired fish communities. The East Texas Regional Water Planning Group encompasses the Neches basin and small portions of adjacent basins. Human population in the planning region is expected to increase from 1,011,317 in the year 2000 to 1,482,448 in 2060. Water demand





is predicted to increase during the same period from 704,320 acre-feet to 1,261,320 acre-feet. A proposed water supply reservoir, Lake Columbia, is planned and is in the permitting phase. If constructed, it will inundate 10,000 acres on Mud Creek, a tributary of the Neches near Jacksonville. Another proposed reservoir discussed during the current round of regional water planning is the Fastrill Reservoir site on the upper Neches River. In addition to basin wide concerns about water supplies for human uses and instream flow needs for aquatic life, the TPWD has identified several reaches of the Neches main stem and 24 tributary segments as ecologically significant stream segments. These stream segments exhibit exceptional ecological characteristics including high water quality, exceptional aquatic life, high aesthetic value, presence of threatened or endangered species, or valuable riparian habitats. Issues of particular concern for conservation in East Texas include loss of wetlands and bottomland hardwood forest, mercury accumulation in aquatic food chains and better understanding and protection of the Big Thicket, an area with unusually rich species diversity.

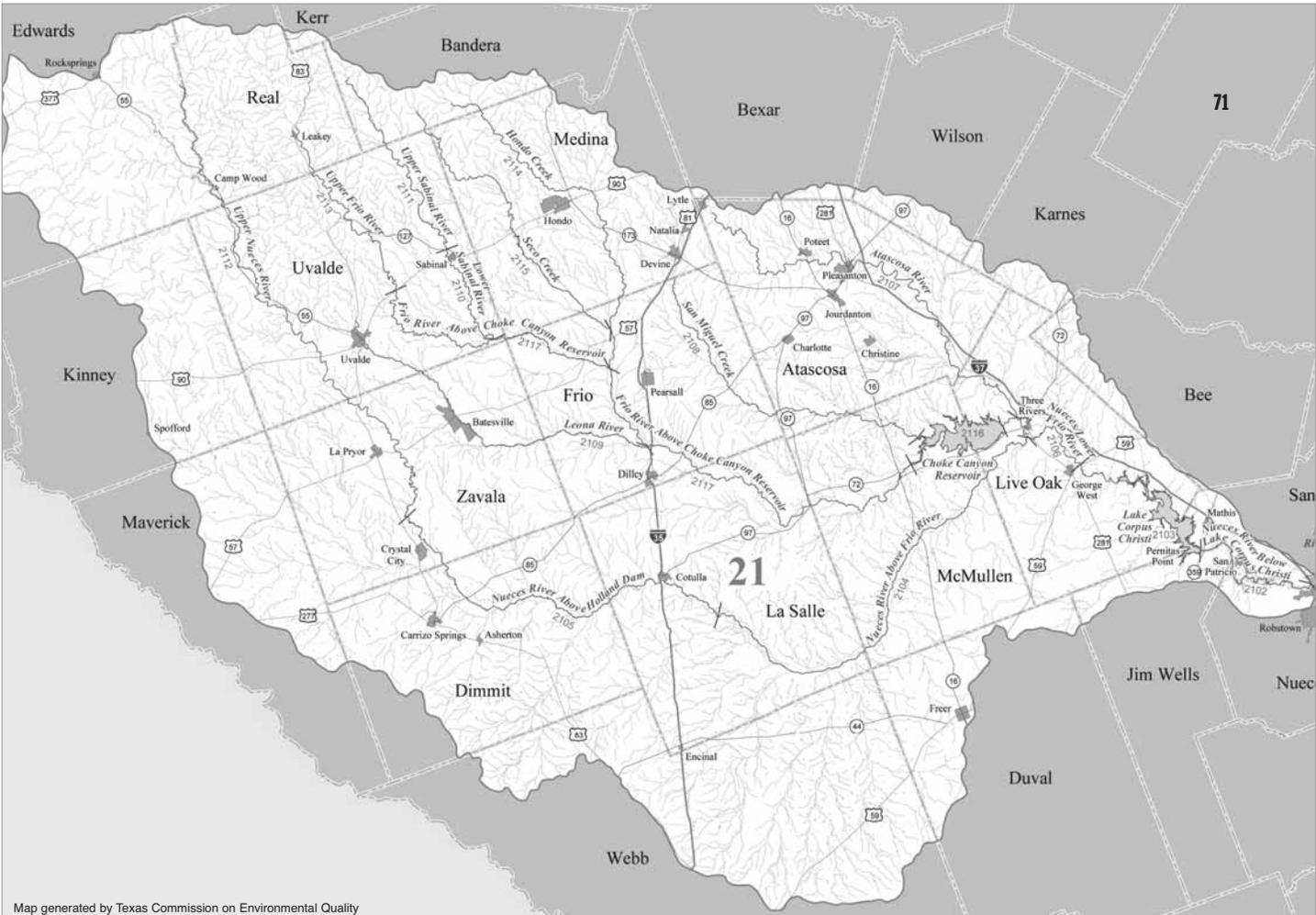
Texas River Basins

Nueces River Basin - The Nueces River basin has its origins north and west of Uvalde and Hondo and traverses southeast to enter Nueces Bay. The basin is approximately 315 miles long and the major fork is the Frio River, which joins the Nueces in Live Oak County. The drainage area of the basin is 16,950 square miles and occurs entirely in Texas. Upper basin streamflow is sustained by numerous springs in the Nueces, West Nueces,

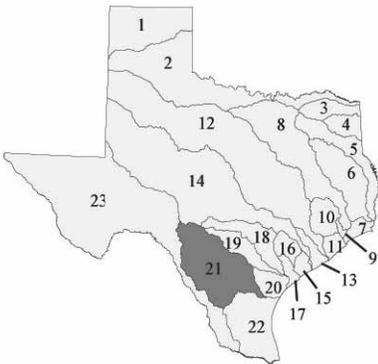


Leakey Springs,
Frio River

Leona, Frio and Sabinal rivers. Approximately 60% of the recharge water in the Edwards Aquifer comes from this portion of the basin as it crosses the Balcones Fault Zone. The middle portion of the basin, which extends to within 60 miles of the Gulf Coast is characterized by a low, rolling, chaparral thicketed plain known as “Brush County.” Here the Nueces River and its tributaries depend on runoff events and local precipitation for flows. Zero flow periods are frequent during which only perennial pools remain. More than 80% of this portion is used for cattle ranching and hunting, with some areas also farmed. The lower portion, within a 60-mile corridor adjacent to the Gulf Coast, was historically covered with grasses and prickly pear; however, a significant portion has been converted for cultivation leaving only a narrow belt of marsh. Oil production, chemical plants, refineries, shipping, military bases, seafood production and coastal recreation characterize the Coastal Bend. Nueces River flows have profound impacts on the environmental and social well-being of this region. Six of 17 major water body segments are listed as impaired due to low dissolved oxygen, high bacterial levels, high nitrate levels and total suspended solids. In addition to impaired water body segments, population in the Region N Coastal Bend Water Planning Regions is projected to exceed 880,000 people by 2060. No major reservoir construction is proposed within the current planning horizon. The U.S. Army Corps of Engineers is conducting a basin feasibility study to determine if proposed water supply projects can be constructed while enhancing natural resources such as spring flows at Comal and San Marcos Springs and freshwater inflows to the Nueces Estuary. Various stream segments within the upper basin are considered ecologically significant.

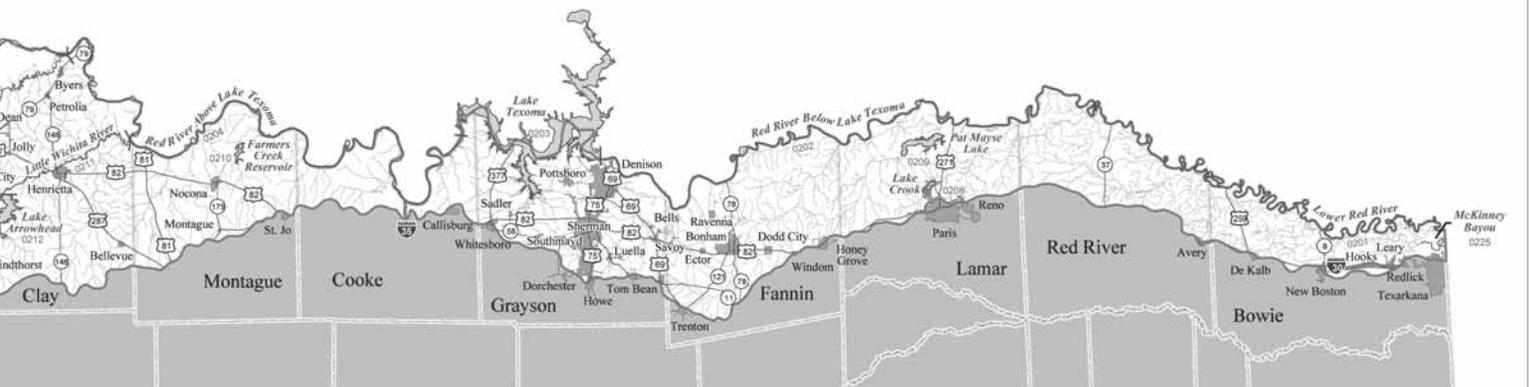


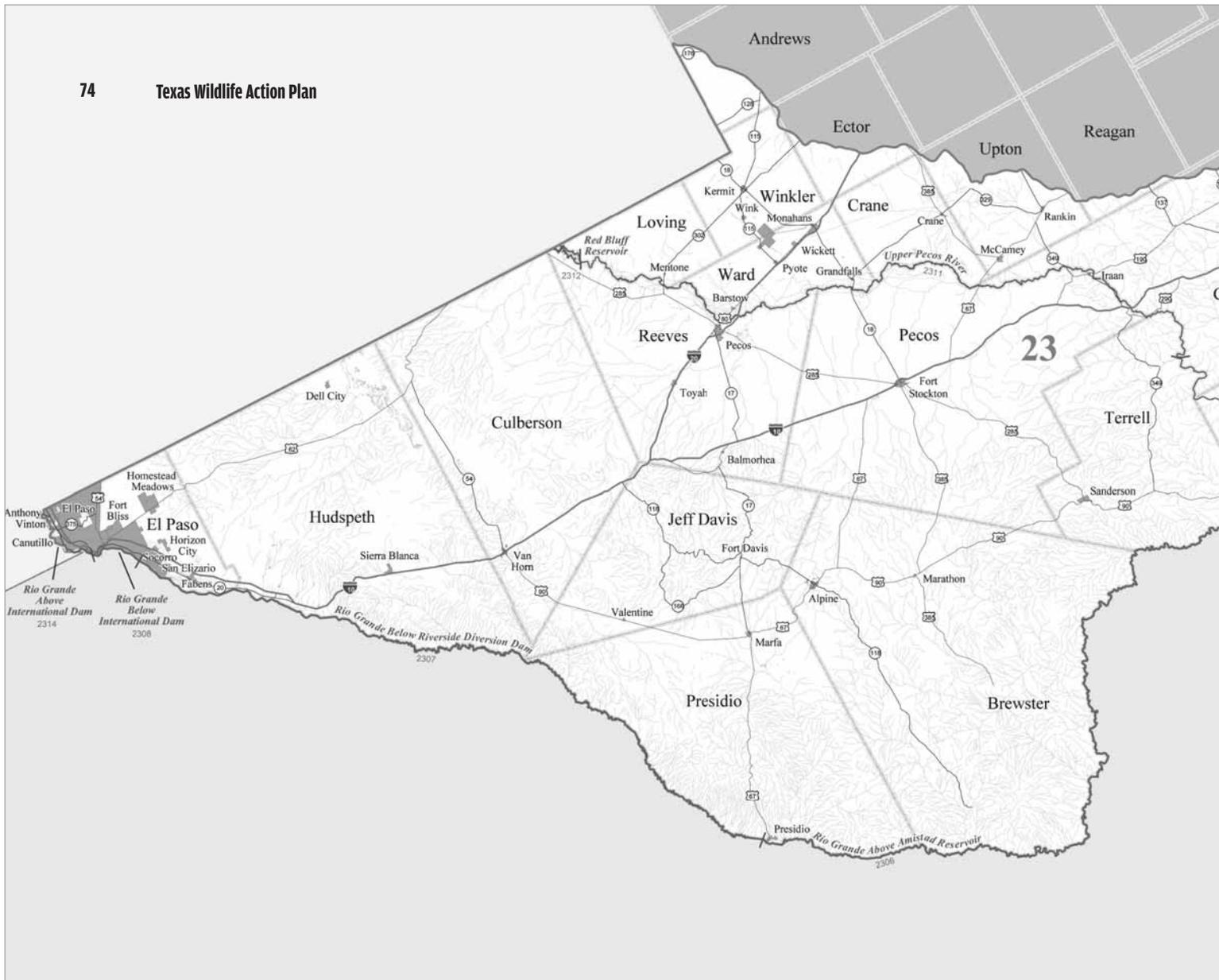
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Texas River Basins

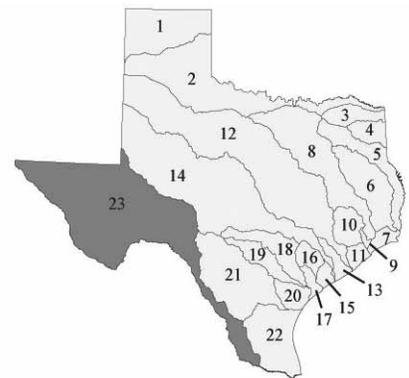
include aquifer depletions due to pumping exceeding recharge; contamination of surface water and groundwater; and drought related shortages for both surface water and groundwater. Potential groundwater contamination may supersede water quantity as a consideration in evaluating the amount of water available for use. Water development in the Red River basin has been significant. Major and minor reservoirs are present on forks and tributaries throughout the basin, altering the flow regime and water quality of riverine systems. The proposed Lower Bois d'Arc Reservoir was recommended for construction in the 2002 State Water Plan by the Region C Water Planning group to supply water to the North Texas Municipal Water District. The Region B Regional Water Planning Area includes a portion of the Red River Basin. Population in this Region is expected to exceed 220,000 people by 2060. Reallocation of hydropower storage at Lake Texoma to municipal storage and diversion may lead to modified streamflows downstream. Export of water out of the basin may further modify streamflows. A federal chloride control project in the Wichita River watershed is currently being planned to reduce the chloride load entering Lake Kemp and Diversion Lake. Resource agencies identified several concerns with the chloride control project, including impacts to prairie stream ecosystems, impaired reservoir sport fisheries, elevated selenium concentrations and associated contaminant-based impacts, increased chance of golden alga fish kills and impaired operations at the Dundee State Fish Hatchery. Future brush control is also an element of the chloride control project which could impact stream habitat. Parts of the project (e.g. Truscott Brine Lake) have been in operation for two decades but other parts are only partially constructed or have not been begun. If completed and proven effective, the scope of chloride control could be significantly expanded in the future to include other portions of the basin. Golden alga blooms and fish kills have occurred from Lake Baylor in Childress County to midlake in the High Port Marina area of Lake Texoma. The City of Wichita Falls obtained a permit to discharge brine reject into the Wichita River from a reverse osmosis plant (desalinization); TPWD is assessing the effects of this brine discharge.

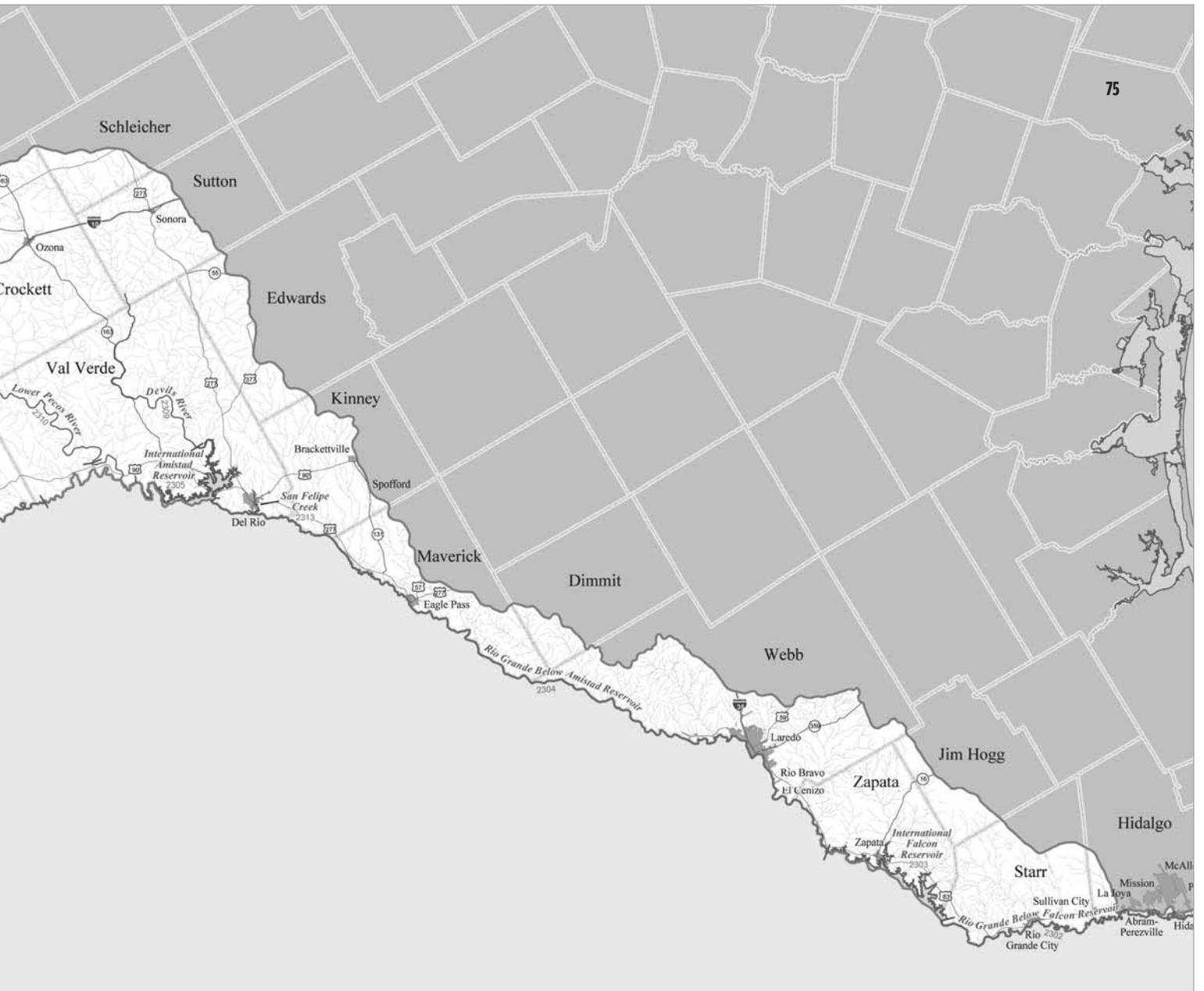




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Rio Grande Basin - The Rio Grande originates in the San Juan Mountains of southern Colorado and flows southward through New Mexico to the Gulf of Mexico. Its total length is approximately 1,896 miles, with approximately 1,248 miles comprising the southern border of Texas. The drainage area of the entire basin covers three U.S. (Colorado, New Mexico and Texas) and four Mexican (Chihuahua, Coahuila, Nuevo Leon and Tamaulipas) states. Texas portions of the basin account for 48,259 square miles. The river dwindles to nearly zero flow by the time it reaches Presidio in the Big Bend and does not flow again in earnest until the Río Conchos of Mexico joins the Rio





Grande near Presidio. Downstream of Presidio the Rio Grande flows into the canyon lands of Big Bend National Park. A 191.2-mile protected strip of the American bank called Rio Grande Wild and Scenic River begins in Big Bend National Park and runs downstream. Cattle ranches and farms with broad open valleys typify the Lower Rio Grande Valley downstream of Laredo, where the river becomes meandering and tropical, with fertile citrus groves. The river terminates in a delta at the Gulf of Mexico, although several times in recent years river flow has diminished so much that flow into the Gulf has ceased for weeks or months at a time. The importance of the Rio Grande as a water supply and as an international boundary poses an environmental challenge in protecting its water quantity

Texas River Basins

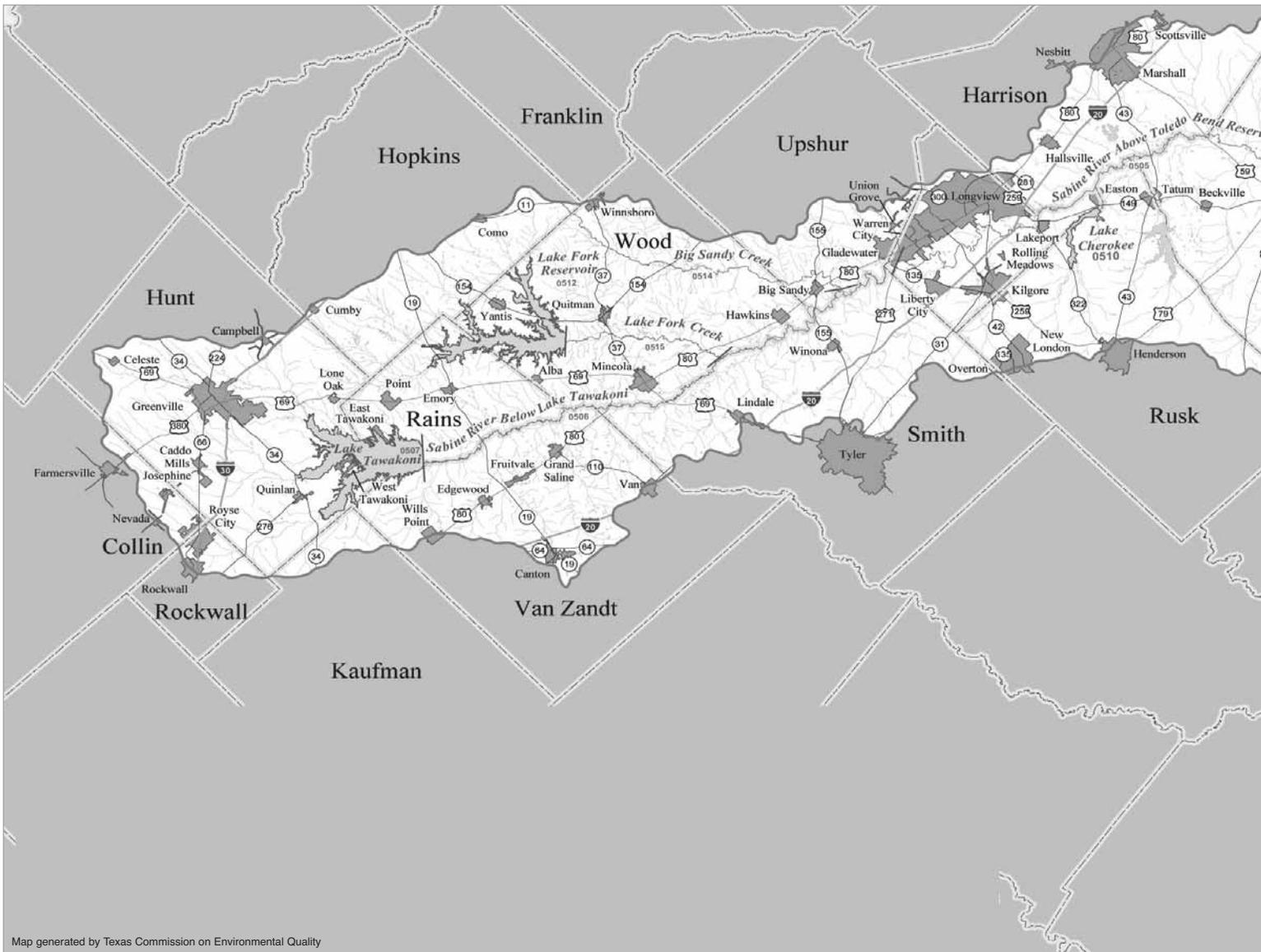
and quality. From Falcon Dam downstream to the mouth of the Rio Grande, the Lower Rio Grande Valley National Wildlife Refuge is one of the most biologically diverse refuges in the continental United States. The area is home to many species of birds not seen elsewhere in the United States and is also one of the last natural refuges in Texas for wild cats such as the endangered ocelot and jaguarundi. Five of 14 major water body segments are listed as impaired for high bacteria levels, chronic toxicity in water to aquatic organisms, total dissolved solids and elevated chloride levels. In addition to the five impaired water bodies, water development throughout the basin has altered natural flow regimes drastically. In many areas this has caused the encroachment of invasive riparian species such as salt cedar and giant cane, which in turn have reduced water flows through uptake and evapotranspiration. The water quality of the Rio Grande Basin has been studied extensively in recent years to assess concentrations of salts, conventional pollutants, and toxins. Data indicate increasing levels of fecal coliform as an indicator of declining water quality. However, through the construction of new wastewater treatment facilities in Nuevo Laredo, as well as active programs for wastewater treatment improvements administered by the Border Environmental Cooperation Commission, these influences are not considered to be of long-term significance. Wastewater treatment plant expansions should be encouraged in the colonias to improve the quality of water that is discharged into the river. Untreated or poorly treated discharges from inadequate wastewater treatment facilities primarily in Mexico, is the principal source for fecal coliform bacteria contamination. A secondary source is from nonpoint source pollution on both sides of the river, including poorly constructed or malfunctioning septic and sewage collection systems and improperly managed animal wastes. Although frequently identified as a concern, nutrient levels do not commonly represent a threat to human health, nor have they supported excessive aquatic plant growth or caused widespread low dissolved oxygen levels. The entire length of the Pecos River has been subject to kills from toxic golden alga blooms. The Arroyo Colorado and the Brownsville Ship Channel both discharge into the Laguna Madre near the northern border of Willacy County. Use of the water in the Arroyo Colorado for municipal, industrial and/or irrigation purposes is severely limited because of the poor water quality conditions that exist there. While population in the Rio Grande Region has increased rapidly since 1980, total reported water use over this period has actually decreased. Reported water use in 1996 was approximately 25% less than was reported in 1980, and there has been a steady trend towards decreasing irrigation water use and a more pronounced increase in municipal water use. In addition to the impaired stream segments, water development has been extensive and is projected to

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continue given increasing urbanization especially in the lower Rio Grande. The combined 2060 populations of the Far West (E), Plateau (J) and Rio Grande (M) water planning regions are projected to exceed four million people. Not only is water supply an issue within these planning regions but so also is sewage discharge. In many areas untreated or poorly treated effluent is discharged into the river. Concerns exist that remaining springs will be negatively impacted by increased groundwater pumping. The 2002 State Water Plan recommends the Brownsville Weir be built on the Lower Rio Grande to meet projected regional water needs. No new water rights applications are pending as the basin is fully appropriated. Various stream segments (e.g., Devils River) are considered ecologically significant, exhibiting high water quality, exceptional aquatic life, high aesthetic value, presence of threatened or endangered species, or valuable riparian habitats. Further study of such stream reaches would provide much needed data enabling more effective conservation of those resources.

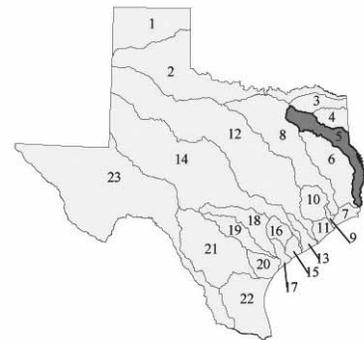


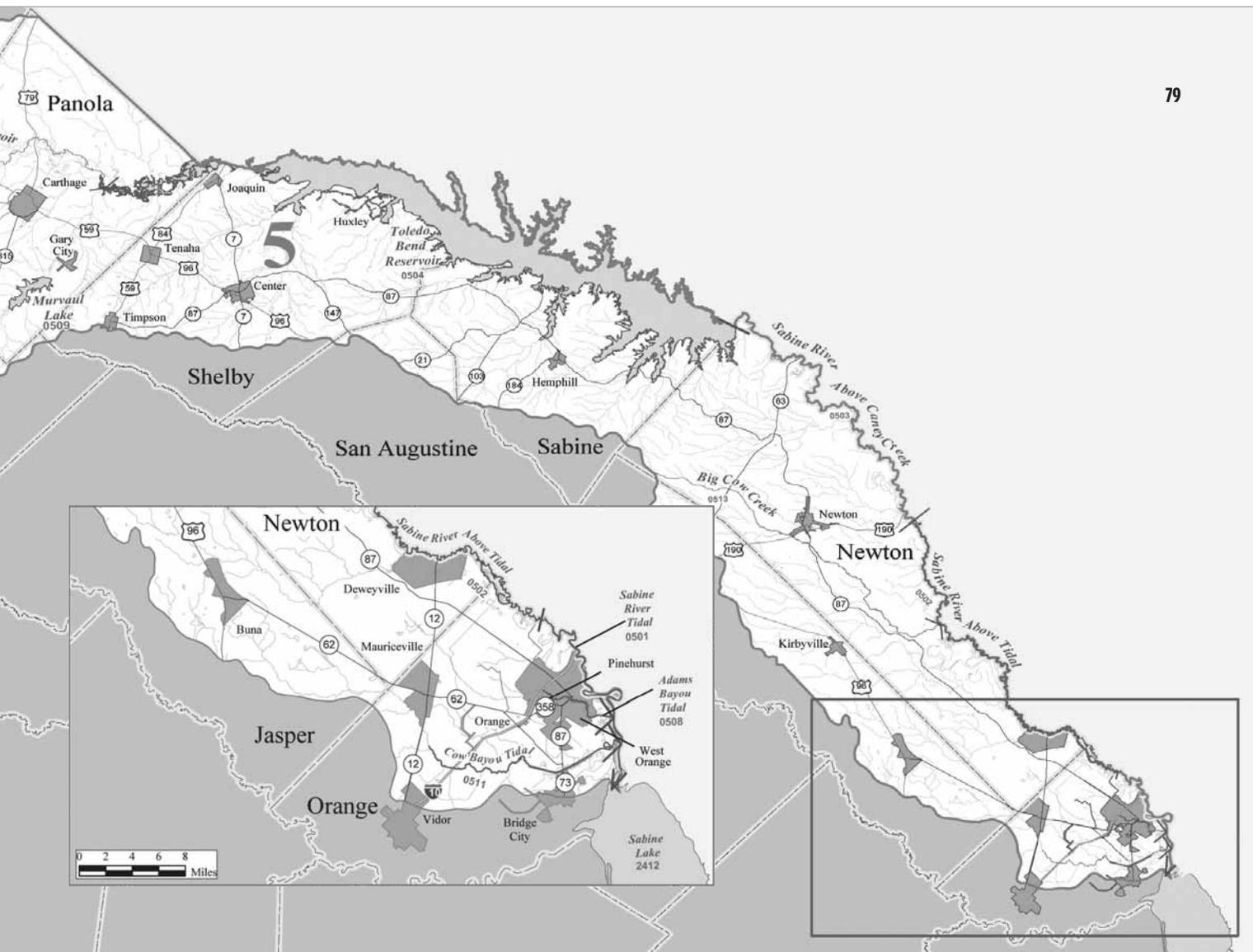
Rio Grande,
Big Bend Region



Map generated by Texas Commission on Environmental Quality

Sabine River Basin - The Sabine River begins in northeast Texas near Greenville and flows south marking the Texas-Louisiana border before flowing into the Gulf of Mexico. The river is 360 miles long and has the largest volume of water discharged at its mouth (approximately 6.8 million acre-feet) of any Texas river. Total drainage area of the Sabine River basin is 9,756 square miles; the Texas portion drains 7,426 square miles. It is characterized by high rainfall and moves through low rolling, forested hills and wide, timbered floodplains. During the late 19th and early 20th centuries the middle Sabine River basin was the site of intensive logging. The growth of the oil industry, in the last century, led to the development of the Beaumont-Port Arthur-Orange metropolitan area as a major site for oil refining, processing and shipping. Three large reservoirs (more than 100,000 acre feet) have been constructed in the basin. Toledo Bend Reservoir is the largest in the state. It is located on the Texas and Louisiana border and controls the lower Sabine River.





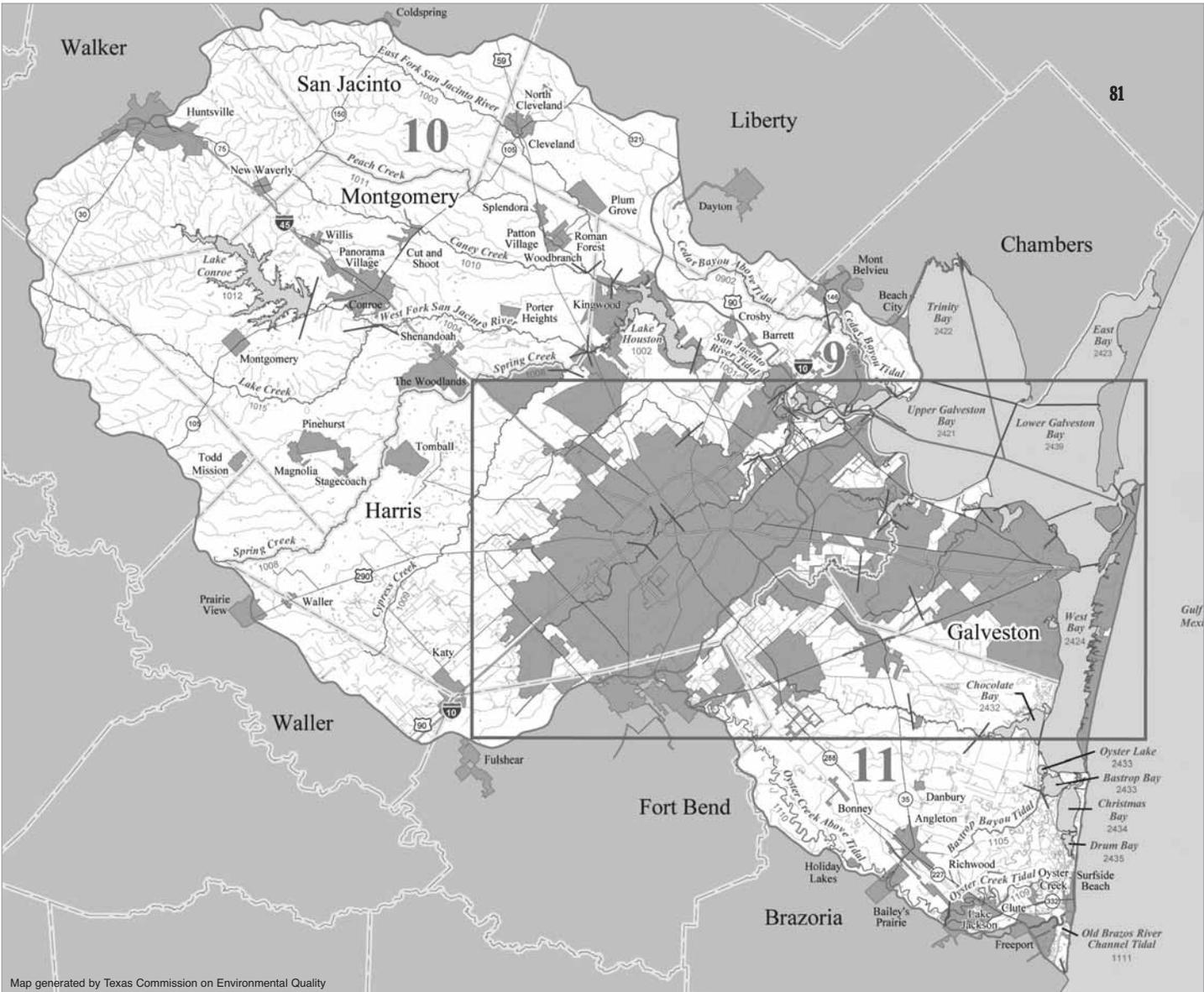
Lake Tawakoni is a water storage reservoir which largely controls the upper river. Lake Fork Reservoir sustains a renowned trophy bass fishery. The Sabine River Authority of Texas manages water quality in the basin and owns and operates these three large reservoirs. Over 115,000 acre-feet of water was exported out of the basin in 1990. Demands to export more water are expected to increase given the population growth of cities such as Dallas-Fort Worth and Houston and the abundant water resources and storage capacity in the Sabine basin. In addition to potential exports, Prairie Creek Reservoir was recommended for construction in the 2002 State Water Plan. Hydropower re-licensing will be an issue in the near future at Toledo Bend; the Federal Energy Regulatory Commission hydropower license for Toledo Bend Reservoir expires in 2013. The Sabine River Authority has a water rights permit application pending at TCEQ for an additional 293,000 acre-feet diversion from Toledo Bend Reservoir.

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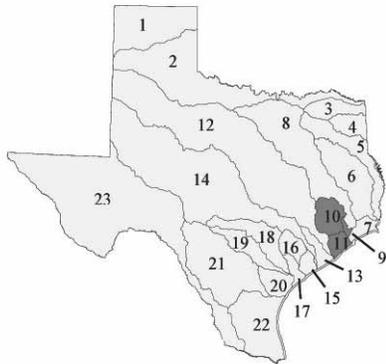
San Jacinto River Basin - The San Jacinto River begins in its East and West Forks in San Jacinto and Walker counties, traversing easterly. The two forks then flow into northeastern Harris County, where they merge to form the main stem. The basin is 70 miles long and drains 5,600 square miles. The East and West forks merge in the upper end of Lake Houston, after which the river joins the Houston Ship Channel and then empties into Galveston Bay. The West Fork is dammed in Montgomery County, creating Lake Conroe. Both forks have limited flows of water and recreational use depends upon sufficient rainfall. The main stem is infeasible as a recreational waterway. The terrain represents gently rolling topography with forests to the north, sloping toward the southeast into the flat coastal plains. It flows through pine and hardwood bottomlands as it makes its way toward the Gulf of Mexico. More than 1.5 million people reside in the basin, primarily in Harris County. More than 40 water body segments are listed as impaired, mostly for bacteria, though several are listed for contaminants in shellfish and fish tissue. Among the contaminants are PCB's, chlordane, dieldrin, dioxin and heptachlor epoxide. Aside from these water quality problems, a major conveyance of water has been proposed that would run from the Trinity River to Luce Bayou, a tributary to Lake Houston. That project will require site-specific evaluations. Luce Bayou is an ecologically significant stream. Rectification of eight miles of stream would create a very significant impact. Significant bottomland forest, an important habitat type, is present along the creek. Luce Bayou is one of the region's few streams that remain relatively unimpacted by urban development. Increased streamflow may impact the stream detrimentally as well as cause erosion.

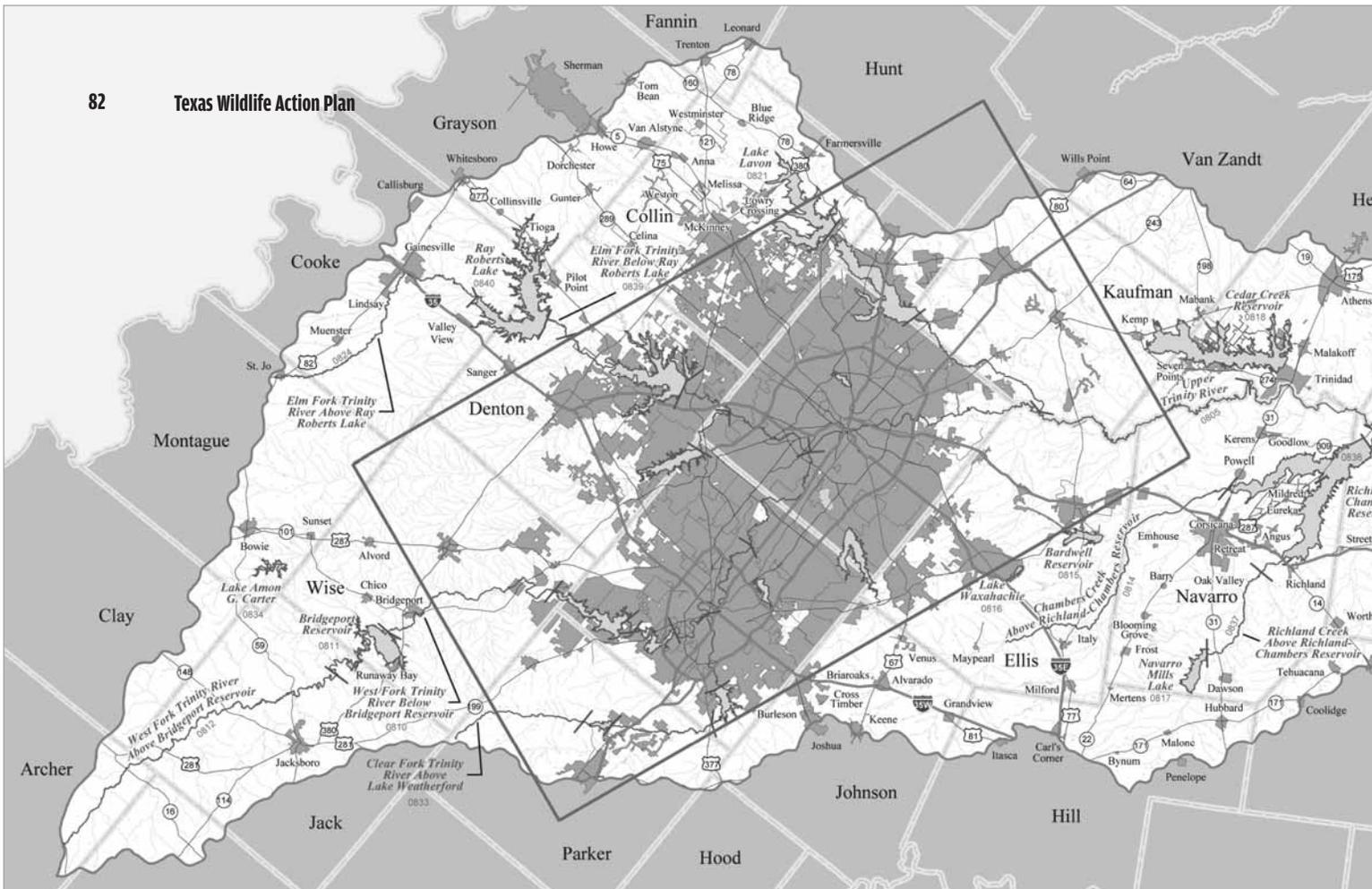


Hardwood
Bottomland

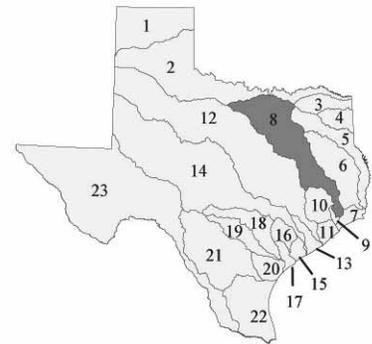


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Trinity River Basin - The Trinity River has its beginnings in four forks, the East Fork in Grayson County, the Elm Fork in Montague County, the West Fork in Archer County and the Clear Fork in Parker County. The main stem begins at the junction of the Elm and West forks in Dallas. The entire length of the Trinity totals 550 miles, most of which can be used for recreation. The drainage area of the basin is 17,969 square miles and occurs entirely in Texas. Land use in the Trinity basin is 57% agricultural, 25% forest and wetlands, 10% rangeland and 5% urban. Significant water development has occurred in the basin, with 14 major reservoirs and conservation storage of 6.9 million acre-feet. Approximately 3.5 million people are served by eight major wastewater treatment plants operated by the Trinity River Authority which include Dallas, Fort Worth, Garland and the North Texas Municipal Water District with discharges of more than 500 million gallons per day of treated effluent. Sixteen water body segments are listed as impaired for not meeting the state water quality standard for bacteria, low dissolved oxygen concentrations and PCB's in fish tissue. In addition to the 16 impaired water body segments, water development in the Trinity basin has been extensive and is projected to continue given the increasing urbanization within the upper basin. Population in water planning region C, which includes the upper Trinity basin, is projected to more than double between 2000 and 2060, reaching more than thirteen million people. Major





Education and Outreach

Surveys prove Texans strongly value natural resources and opportunities for outdoor recreation and environmental education. However, the growing urbanization of our state is continually eroding public involvement in wildlife and habitat issues that are traditionally rural. In a state where more than 90 percent of the landscape is privately owned, the role of individual citizens and landowners is critical. In 2003, TPWD staff and the Outreach and Education Advisory Committee that includes outside experts examined the agency's existing conservation education efforts and developed a new strategic plan, Take Care of Texas! Goals and objectives include:

Provide conservation education and interpretive opportunities consistent with the Department's mission that enhance the state's economic vitality, sustain its natural resources, and connect Texans to the outdoors. Action items include urban wildlife technical guidance for city officials, community leaders, school officials and citizens on topics including native habitat restoration, conservation development, open space management and ecologically sensitive landscaping; nature tourism technical guidance for private landowners and communities to develop conservation-based wildlife viewing opportunities that generate tourism economic. A priority need is expanded training workshops and educational products for community leaders and landowners designed to increase conserved acres of native aquatic and terrestrial habitats.

Increase public awareness and understanding of the benefits of conservation, especially the importance of active management of Texas' private and public lands, water, wildlife and historical resources. Action items include supporting the Project WILD teacher training supplemental curriculum of hands-on activities to teach ecology, wildlife management and environmental concepts; expand Wild about Texas

issue-based community programs, information and activities related to regional Texas habitats and wildlife, and promoting the Wildlife Interpretive Program to improve the quality and quantity of interpretive services to the public by providing planning, design and production services to wildlife division staff, particularly those on Wildlife Management Areas. Priority needs include increased regional community programs and training on issues related to habitats and species of concern for community leaders, volunteer organizations, and youth.

Target new and diverse audiences to involve more people in TPWD's mission, especially those from urban areas. Action items include supporting the Urban Outreach Program specialists in the Dallas and Houston metropolitan areas to help community-based organizations create outdoors programming; support the proven Becoming an Outdoors Woman and newer Becoming an Outdoors-Family programs offering weekend workshops that introduce women and families to outdoor skills and recreation; expand funding for TPWD Community Outdoor Outreach Program (CO-OP) matching grants to local governments and non-profit, non-political organizations to introduce under-served youth to outdoor recreation and hands-on environmental education. Priority needs include better coordination of training and volunteer opportunities for community partners, youth and volunteers to include habitat and wildlife messages in community programs and service projects.

Promote public awareness and responsible participation in outdoor recreation, especially hunting, fishing and nature tourism and to foster an appreciation of natural, cultural and historical resources. Action items include supporting the State Parks Interpretive Program to offer site-based education and training; recruit Angler Education volunteer instructors to train youth in basic fishing and aquatic stewardship, support TPWD educational centers such as Sea Center Texas, Texas Freshwater Fisheries Center, Parrie Haynes Ranch, Sheldon Lake Learning Center, World Birding Center and Barton Warnock Environmental Education Center; fund TPWD Communications tools such as *Texas Parks & Wildlife* magazine, PBS television series, video news reports, and outreach to mainstream and targeted news media to continue to inform the public and extend the reach of agency programs. Priority needs include a continued infusion of habitat information in recreation programs with messaging, signage, training equipment and participation in related program activities for new and existing outdoor recreationists.



Encourage cost-effective partnerships with other state agencies, universities, local, state and national conservation organizations, private landowners and citizens to coordinate and leverage outreach, education and interpretation efforts.

Action items include supporting the Texas Master Naturalists network of chapters around the state that train volunteers who provide education, outreach and service for the beneficial management of natural resources in local communities; continue the Great Texas Birding Classic partnership with the Gulf Coast Bird Observatory to coordinate an annual birdwatching tournament along the Texas coast to provide recreational opportunities for adults and youth and raise dollars for on-the-ground bird conservation projects; and promote Project WILD to universities, zoos, and nature centers to train educators about habitat and wildlife management. Priority needs include training programs and program materials related to regional activities that address habitats and species of concern for community volunteers and wildlife watchers.

Regularly evaluate outreach, education and interpretation programs. Action items include Program Charters that TPWD requires for all education and outreach programs detailing goals, objectives and evaluation measures, including a formal review to ensure consistency and effective contribution to the TPWD mission, solid partnerships, lack of service duplication and cost-efficiency. Priority Needs include formal training in best practices, evaluation methods and actual program evaluation support to develop well-defined program goals and objectives that measure effectiveness in imparting understanding and fostering action related to habitats and wildlife of concern.



Nature Tourism

Interest in nature tourism is growing in Texas as rural communities look for ways to diversify local economies and landowners look for ways to diversify ranch income.

Activities such as birdwatching, photography, backpacking, horseback riding, mountain biking, wildlife viewing and canoeing are increasingly popular as urban residents and visitors strive to connect with the outdoors. From a conservation standpoint, nature-based tourism provides financial incentives for local communities and landowners to conserve wildlife habitats upon which the industry depends. Conservation action needs include:

- * Continue to work cooperatively with other organizations providing technical guidance to landowners and communities both one-on-one and in workshop settings.
- * Develop a nature tourism certification program for public and private landowners and nature tourist destinations. This would give additional incentives for tourism providers to conserve and restore native habitat. Also, tourists visiting Texas would be able to research destinations based on requirements met or exceeded by certified locations.
- * Develop workshops as needed in areas of the state that have landowners and communities interested in nature tourism. These should follow proven formats, contain the top subjects from previous workshops and be marketed widely through all of TPWD's partners to reach the widest audiences possible.
- * Fund habitat acquisition or restoration through the Great Texas Birding Classic to benefit migratory birds and other native species. With additional funding, TPWD would be able to contribute to the habitat projects funded through our partnership with the Gulf Coast Bird Observatory.

Urban Wildlife

Some counties are growing faster than others, but regardless, effective planning and concentrated development are needed to combat suburban sprawl and loss of wildlife habitat. Open spaces such as fields, forests and riparian corridors within the urban/suburban environment are crucial for populations of development-sensitive wildlife species. Open spaces filter pollutants from the air and water, conserve water and soil, supply habitat for pollinators and the plants that require them for reproduction and furnish places for wildlife breeding, foraging, travel and cover. As urban populations often seem “disconnected” from nature, people may not always perceive that wildlife or habitat losses are critical threats that could impact them directly. However, the same environmental degradation that threatens wildlife populations can degrade drinking water supplies, air quality or other factors of immediate interest to city dwellers. For these reasons, it is increasingly important that natural resource management agencies work proactively with citizens, developers and local governments in urban and urbanizing areas.

Urban Technical Guidance - In the urban areas of Texas, there is a tremendous need for technical expertise regarding function and management of local ecosystems, habitats and associated wildlife species. This includes two subcategories: site-specific and policy-oriented technical guidance. Two examples of site-specific guidance are the Fort Worth Nature Center and Refuge and River Legacy Park in Arlington, city parks that have made natural resource management a priority by conserving habitat integrity and educating the public through guided hikes and programs about the environment. Policy-oriented guidance encourages municipalities, citizens and developers to become better stewards of our natural resources. For example, the North Central Texas Council of Governments recently developed a policy for integrated stormwater management (iSWM) among all municipalities in the Dallas/Fort Worth region. By getting involved in crafting this regional policy, the Urban Program has directed the way the region will design and maintain stormwater wetlands, repair degraded streams, eliminate non-point source pollutants and reduce stormwater generation. Priority conservation actions include expanding the Urban Program's regional policy influence by training Urban Biologists to better understand engineering, landscape architecture and regional planning so they can present ecological concepts in terms relevant for those professions.

Working With Developers - Developers lack training in natural resource management though they make many decisions that impact the land. The Urban Program currently works with cooperative developers by providing site-specific technical guidance so that development is directed into the most suitable locations while conserving the best habitats (conservation subdivision design). The undeveloped acres are then placed under conservation easement and permanently maintained as open space. In the Austin area, the Ladybird Johnson Wildflower Research Center has partnered with various agencies to present a conservation development conference for the last several years. Flower Mound north of Fort Worth has done the same. Priority conservation actions include more conferences to promote the concept. However, there is a statewide need to define exactly what it entails. The Urban Program should facilitate and promote the push to create guidelines. Also, the concept of conservation development has so far been limited to upper income housing developments. The Urban Program should seek ways to apply conservation development concepts to more affordably priced projects.

Nuisance Wildlife - Though most nuisance wildlife issues may not relate directly to a conservation concern, Texas' efforts to solve nuisance wildlife problems are critical to improving the perception of urban wildlife in general. Coyotes and overpopulated deer in some urban and suburban areas are prime examples. Wildlife species that can be compatible with human development include bats, foxes, raccoons, opossums, squirrels, deer, pigeons, starlings, house sparrows, Canada geese and chimney swifts, among others. Many wildlife damage problems can be addressed by changing the perceptions and expectations of homeowners with regards to living with wildlife. Although nuisance wildlife issues are primarily handled by another agency (Texas Wildlife Services) as well as private business, the Urban Program coordinates with these players to ensure that the methods and educational messages are acceptable and consistent. For example, Urban Biologists are working with the City of Lewisville to develop an educational program to encourage beneficial wildlife while also creating a system of municipal responses to observed nuisance behaviors of targeted species. City staff will work with citizens to monitor and report human/wildlife encounters that are categorized and ranked. A series of "trigger" behaviors (such as coyotes taking pets) will be outlined and corresponding municipal action will be proactive in nature and designed to stop current behaviors as well as prevent the appearance of more aggressive trigger behaviors. Priority conservation actions include research to determine the most effective behavioral modification methods to employ for each species of concern. Additionally, standard recommendations need to be developed based on research as it becomes available.



Municipal Ordinances - Municipal rules such as landscape ordinances, tree preservation ordinances and subdivision regulations are often written by people with limited training in natural resource management. As a result, policies often promote the use of exotic plant species while mandating the elimination of native species and habitats. To address this, the Urban Program promotes the use of native plants as well as the concept of designing urban spaces around natural habitats. Priority conservation actions here include expanding influence on local ordinances and policies and continuing to promote regionally appropriate native landscaping. Additionally, cities would benefit from standardized template ordinances that have been written for them.

Urban Education and Outreach - Schools in Texas urban areas are hesitant to bus kids off-site for environmental studies. Therefore there's a need for schools to have outdoor classrooms on site for the students to study local habitats and wildlife. The Urban Program offers assistance ranging from one-on-one guidance with a single school to several schools attending a schoolyard habitat workshop. As part of this effort, Houston Urban Biologists have written a manual entitled "Creating a School Habitat" which has led to creation of many school habitats statewide. Priority conservation actions include updating and reprinting the "Creating a School Habitat" manual as well as expanding the number of workshops offered. Native landscape promotion is another key area, since the landscape/nursery industry as well as the average homeowner has a tremendous impact on the vegetation in local landscapes. The historical trend has been to promote exotic plants, so that native plant communities are systematically replaced by predominantly exotic species and habitat is lost. To address this problem, TPWD's Texas Wildscapes Backyard Wildlife Habitat Program encourages businesses and homeowners to provide food, water and shelter in their yard and certifies those who do so. As part of this effort, TPWD produced a book entitled Texas Wildscapes: Gardening for Wildlife and conducts Wildscapes workshops and creates demonstration gardens across the state. Priority conservation actions include converting the information in the Texas Wildscapes book into an interactive application. Absentee landowners are a growing, important audience. Historically, land ownership in Texas was dominated by large ranches with the owner living in close contact with the property. The current trend is for urbanites living in Dallas, Houston, San Antonio and other cities to own property in rural Texas. To address the needs of these landowners, the Urban Program conducts landowner workshops in the major urban areas. Priority conservation actions include expanding the workshop effort as well as developing materials such as CD ROMS or DVDs specifically tailored to these new land. For the general public, Urban Biologists rely heavily on news media to engage the masses with a general message. For audiences with some interest in natural resources (garden clubs, scout groups, civic organizations, etc.), Urban Biologists deliver presentations along general wildlife themes (Bats are Beneficial, Landscaping for Wildlife, etc.). Urban Biologists also offer volunteer training programs such as Texas Master Naturalists and Texas Nature Trackers.

Monitoring and Adaptive Management

Monitoring wildlife populations and habitats is essential to know whether conservation goals are being met. Monitoring also allows for adaptive management, in which goals and objectives can be maintained or amended based on feedback from monitoring efforts. TPWD has for many years monitored a number of different species and habitats, but it is important that the department and its partners work together to spread limited resources over more issues of concern. Priority actions include:

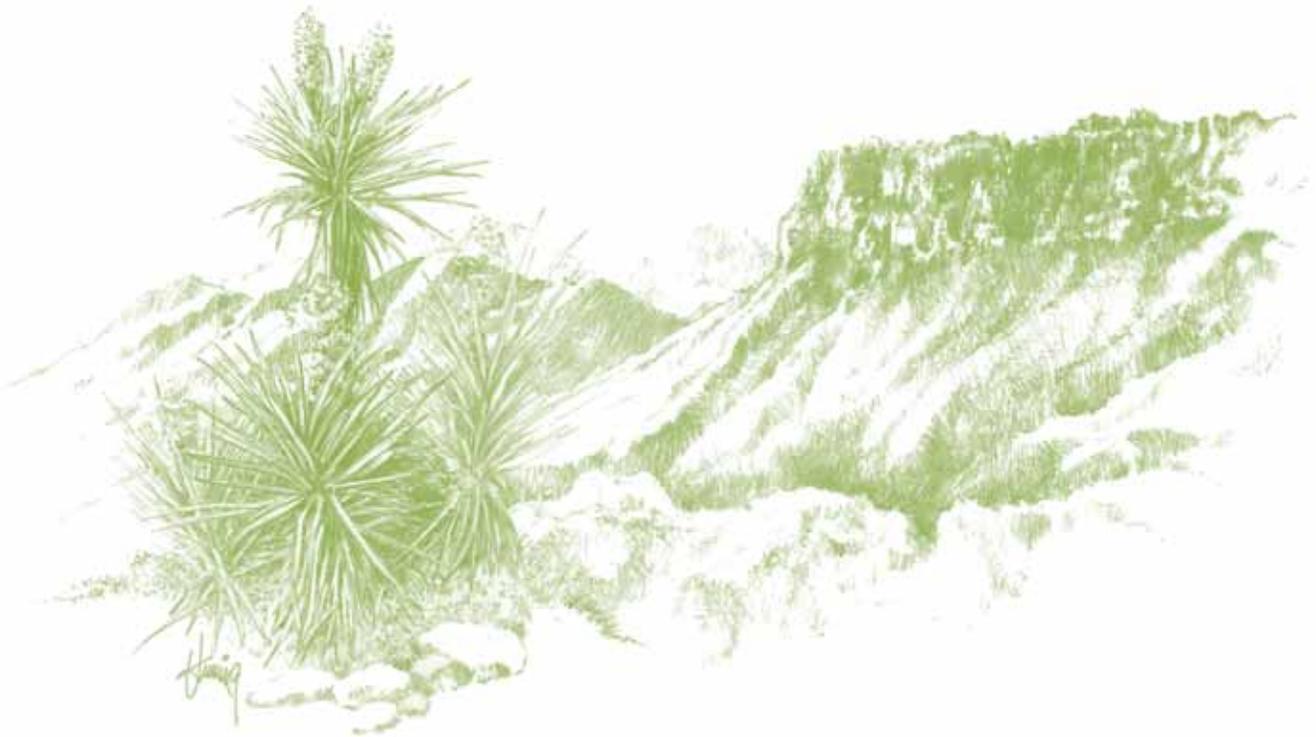
- * Make a commitment to improve monitoring of aquatic and terrestrial animals and their habitats.
- * Ensure that all monitoring contributes to adaptive management by exploring the causes for trends and alternative scenarios that could reverse unfavorable trends.
- * Ensure that all monitoring protocols are sound and data collected are statistically useful in order to guarantee their appropriateness to be included in the Natural Diversity Database (NDD).
- * Implement monitoring strategies that integrate habitat and population monitoring. Monitoring habitat alone will rarely be sufficient for adaptive management because habitat relationships are not well understood and may not be predictable.
- * Recognize that monitoring will exist at different scales. Coordinate across ecological and administrative scales, with emphasis on the role of various regions.

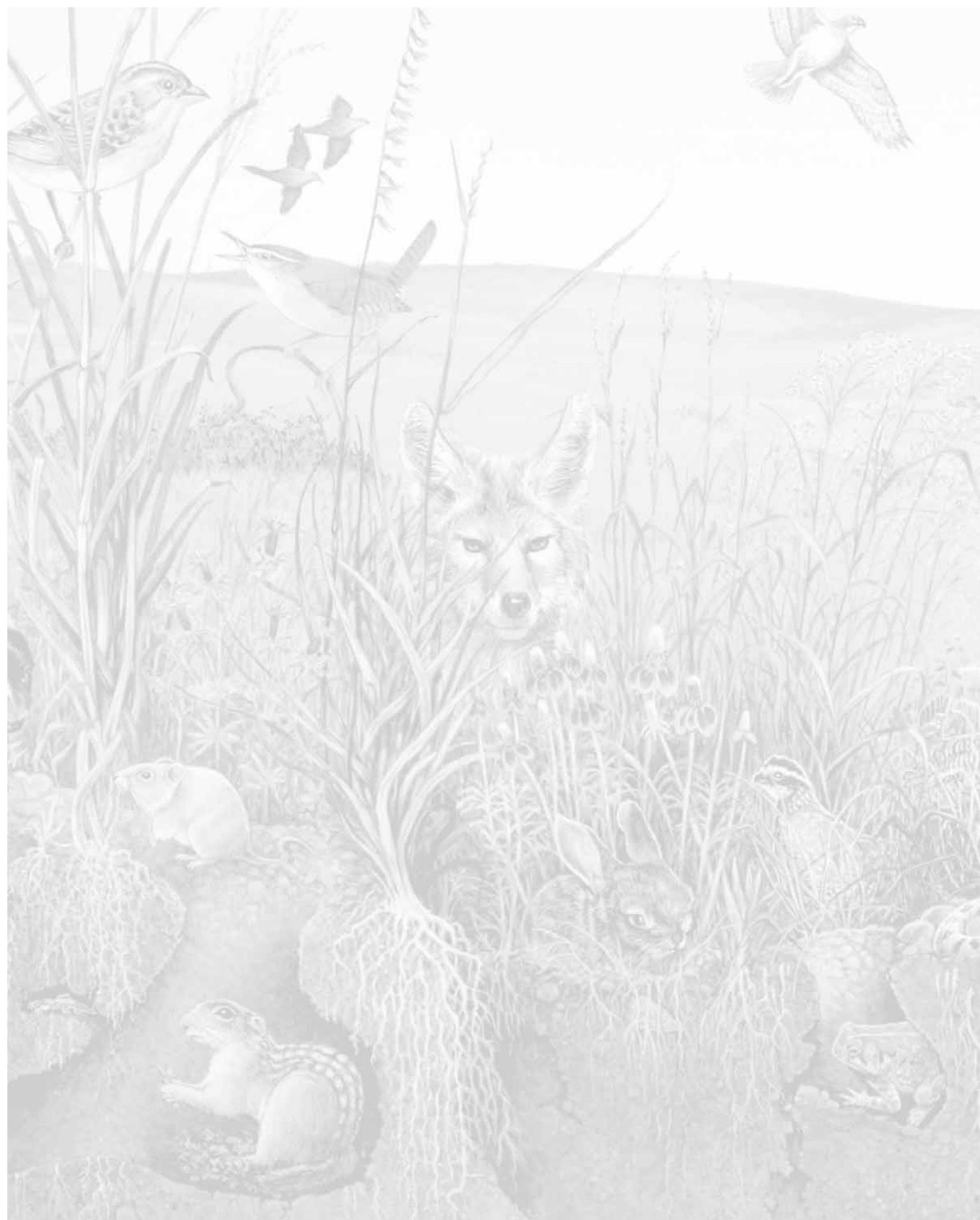
- * Use partnerships and interagency coordination to accomplish and accelerate monitoring objectives, and establish appropriate roles for other agencies, organizations and private landowners. With proper coordination, all data can be collected into the NDD and adaptive management can take place by creating a better decision making process that all partners can agree on.
- * Provide adequate staffing, skills and funding structures to accomplish monitoring objectives.
- * Adopt and integrate the three types of monitoring. These include Context Monitoring of a broad array of ecosystem components at multiple scales without specific reference to influences of ongoing management, Targeted Monitoring of the condition and response to management of species and habitats of concern, and Cause-and-Effect Monitoring that investigates the mechanisms that underlie habitat and species responses to management and other factors.
- * Use sound ecological principles and risk assessment to prioritize and design monitoring activities.
- * Ensure that individuals and teams responsible for monitoring development and oversight have appropriate skills.



State Wildlife Grants To Texas Partners

In addition to use of State Wildlife Grants to fund TPWD programs, the department employs a grant proposal system to fund research or on-the-ground conservation by outside groups. Agency employees are encouraged to seek outside partners to assist with and/or help finance certain projects. A significant portion of the money spent in Texas from the State Wildlife Grants program can thus be used in support of or in direct partnership with state and national non-governmental conservation entities, universities and other partners. There is also the potential for TPWD to set aside funds for “pass through” grants to allow universities or conservation organizations to submit grant proposals directly to the State Wildlife Grants administrator for evaluation and possible funding. By doing this, the group submitting the grant would not need to work with TPWD personnel and could submit without a “sponsor” staff member, which could increase the number of organizations that would seek funding.









4200 Smith School Road * Austin, Texas 78744
www.tpwd.state.tx.us

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