



# TEXAS CONSERVATION ACTION PLAN

## Texas Blackland Prairies

### ECOREGION HANDBOOK August 2012



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See links on Texas Parks and Wildlife Department’s Texas Conservation Action Plan 2012 website

<http://www.tpwd.state.tx.us/landwater/land/tcap/>

or the Wildlife Diversity Program website

[http://www.tpwd.state.tx.us/huntwild/wild/wildlife\\_diversity/](http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/)

for additional references and supporting documents related to this handbook.

*“Action that grows out of urgency, frustration, or even determination is missing a critical ingredient. For action to be effective, for action to be meaningful, it must also grow out of respect and a deep sense of connection to the things and people that surround us.” – Orion Magazine Editors, March/April 2011*

## SUMMARY

The Texas Blackland Prairies (TBPR) Handbook is one of the Texas Conservation Action Plan (TCAP) thirteen handbooks, available on the Texas Parks and Wildlife Department’s Texas Conservation Action Plan website<sup>1</sup>:

- an **Overview** – background information about how this Plan came about and was revised;
- a **Statewide/Multi-region handbook** – broad resource concerns and opportunities; and
- 10 other ecoregion handbooks like this one for different areas of Texas with more local information.

This handbook provides insight into specific TBPR resources and conservation issues, including a list of Species of Greatest Conservation Need (SGCN), rare communities, and important habitats that support these unique features. The TBPR handbook also presents a compiled list of issues – things that prevent us from doing our best conservation work here – and proposed solutions or actions. Throughout this document, there are resources – web links, programs, incentives, and contacts – to help you participate in implementation and learn more about the natural resources this region of Texas has to offer.

**The TCAP TBPR Ecoregion Handbook takes advantage of many different perspectives to understand local changes and identify actions that will reduce threats to specific natural resources: SGCN, rare communities and the habitats on which they rely.** The Plan aims to ensure that we are able to share our natural heritage with future generations of Texans and that they understand what we did to make *progress* toward that goal.

It’s important to prioritize where we need to work to the degree that we can: human and financial resources are limited, certain issues demand more immediate resolution, and some species and habitats are simply more in need. The TCAP 2012 taps into a broad network of conservation service providers, natural resources managers, alliances and working groups, policy makers, stakeholders and the public to define **what’s at risk, what issues are most important, where we need to work, how to best engage the right partners to solve the problems, and what to do.**

This handbook is divided into sections to guide priority setting and actions:

- resources at risk - SGCN, rare communities, and the habitats on which they rely;
- issues that are most important, which could benefit from targeted stakeholder involvement; and
- conservation actions to benefit resources and make progress toward solving issues.

Certain resources also have a statewide context – riparian areas, grasslands – and additional actions at that level are proposed in the Statewide/Multi-region handbook. For more information about how content was developed for all handbooks of the Action Plan, please see the Overview handbook.

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<sup>1</sup> TPWD. 2012. Texas Conservation Action Plan – all handbooks and supporting documents can be found online at <http://www.tpwd.state.tx.us/landwater/land/tcap/>

## HOW TO GET INVOLVED

This handbook contains a list of partners and programs that provide conservation services and/or information in this area. Additionally, certain conservation actions at the end of this handbook may help you connect with partners working on specific issues.

There are many wonderful, energetic public and private conservation providers in Texas who have active volunteer networks, strategic needs, and programs. For more information, check the Natural Resource Conservation Programs and Services for Texas Landowners.<sup>2</sup> In addition, work with the Texas Land Trust Council to find a local lands and waters conservation organization near you:  
<http://www.texaslandtrustcouncil.org/>

If you have questions about the TCAP content and cannot find what you need on the TPWD Texas Conservation Action Plan website or in one of the handbooks,<sup>3</sup> please contact the TCAP Coordinator at the TPWD Headquarters in Austin, Texas:

Phone (512) 389-4800

Email [tcap@tpwd.state.tx.us](mailto:tcap@tpwd.state.tx.us)

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<sup>2</sup> TPWD. 2007 Natural Resource Conservation Programs and Services for Texas Landowners.  
[http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_bk\\_w7000\\_1198.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_w7000_1198.pdf)

<sup>3</sup> TPWD. 2012. Texas Conservation Action Plan – all handbooks and supporting documents can be found at this website: <http://www.tpwd.state.tx.us/landwater/land/tcap/>

## OVERVIEW

The Texas Blackland Prairies ecoregion is perhaps the most critically threatened in the state. Isolated within our borders, this region stretches 300 miles from near the Oklahoma border to near San Antonio, and in a disjunct band referred to as the Fayette Prairie east of the Eastern Central Texas Plains (Post Oak Savanna).<sup>4</sup> It lies along one of the most development-intensive areas in Texas – the IH-35 corridor which stretches through Dallas, Waco, Temple, Austin (eastern portions), San Marcos, New Braunfels, and San Antonio. Gently rolling to mostly flat, this region is easily developed and has few barriers to development like the adjacent ecoregions which require clearing, leveling, and geotechnical work.

Historically, the region was a vast tallgrass prairie of little bluestem, big bluestem, yellow Indiangrass, tall dropseed, eastern gamagrass and many forbs, such as asters, clovers, and black-eyed susan which supported wide-ranging abundant herds of Bison and pronghorn, greater prairie chickens, and even ocelot. Almost the entire prairie has now been converted to other uses – estimates are that only only 5,000 widely scattered acres in small tracts remain of the original 12 million acres of the region – that's less than one-tenth of one percent! Crosscutting this prairie were dense meandering bands of riparian hardwoods (primarily bur oak, Shumard oak, sugar hackberry, elm, ash, eastern cottonwood, and pecan) along broad floodplains. Headwaters of several east Texas rivers begin here; three of Texas' largest river systems – the Trinity, Brazos and Colorado – traverse this region; and many tributaries of nearly every major system feeding the Gulf of Mexico originate in or cross the Prairies. This wealth of water and ease of access have attracted many reservoir construction projects over the last 100 years.

While “prairie” conjures images of uniform, vast grasslands, the region's soils and geology – chalk, claystone, marl, shale, and sandstone – create some very interesting and diverse plant communities. Gilgai microtopography and mima mounds are found here. Described as “black velvet” when freshly plowed and moistened from a good rain, true blackland soils are deep, dark, calcareous deposits renowned for their high productivity. Scientists believe the richness of the prairie soils is derived from the abundant invertebrate fauna and fungal flora found in the soils themselves. What is special and unique about this ecosystem today are the grassland communities themselves. While woodlands, woodland-grassland mosaic, and bottomland hardwoods also are important in this region, the prairies are the most unique and rare features.

Wetlands in this region are also incredibly important - few are the typical natural ponded wetland, but rather are oxbows of the Trinity River and low-lying ephemeral “wet prairie.” Most are considered “nonjurisdictional” or “isolated” and are not considered for avoidance or protection. Many wet prairie areas have been drained for agricultural fields, development and mosquito control. At the juncture of the Prairies and the Balcones Escarpment at San Marcos and New Braunfels, large springs sourced by waters collected over the Edwards Plateau host a suite of endemic imperiled invertebrates, fishes, and plants, where they begin major tributaries to coastal bay-bound rivers, providing important freshwater inflows to estuary systems which support Whooping Cranes.

Mostly, Blackland Prairie is now devoted to cropland, pasture, rangeland, and urban uses. Crops include cotton, grain sorghum, corn, small grains, and hay. This ecoregion contains a higher percent of cropland than adjacent regions, although much of the land has been recently converted to urban, suburban, and

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<sup>4</sup> Griffith, G. 2010. Level III North American Terrestrial Ecoregions: United States Descriptions. Prepared for the North American Commission for Environmental Cooperation ([www.cec.org](http://www.cec.org)), version May 11, 2010. Corvallis, Oregon.

Griffith, G.E., S.A. Bryce, J.M. Omernik, J.A. Comstock, A.C. Rogers, B. Harrison, S.L. Hatch and D. Bezanson. 2007. Ecoregions of Texas. R.S. Geological Survey, Reston VA. [http://www.epa.gov/wed/pages/ecoregions/tx\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/tx_eco.htm) (accessed May 2009).

industrial uses. Loss of productive prime farmland and rangelands are a concern as many of these sites are surrogate SGCN habitat (e.g. agricultural field use by Mountain Plover). Unconverted prairies are typically used for hay production by private landowners who help to stimulate grassland production without harming diversity and health.<sup>5</sup>

Table 1 crosswalks this ecoregion with other conservation planning units.<sup>6</sup>

Figure 1 illustrates the location and extent of this ecoregion in Texas.

Table 2 documents the Ecological Drainage Units (EDU) and Hydrologic Units (“HUC 8”, finer scale watersheds within EDUs), major reservoirs, and Ecologically Significant Stream Segments<sup>7</sup> (ESSS) which occur in this area.

Figure 2 shows those EDUs, HUC8s and ESSS by ecoregion.

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<sup>5</sup> Bezanson and Wolfe 2001

<sup>6</sup> For more information about planning boundaries, see the Overview handbook on the TCAP 2012 website <http://www.tpwd.state.tx.us/landwater/land/tcap/>

<sup>7</sup> TPWD. 2002/2005. *Ecologically Significant Stream Segments*.

[http://www.tpwd.state.tx.us/landwater/water/environconcerns/water\\_quality/sigsegs/](http://www.tpwd.state.tx.us/landwater/water/environconcerns/water_quality/sigsegs/)

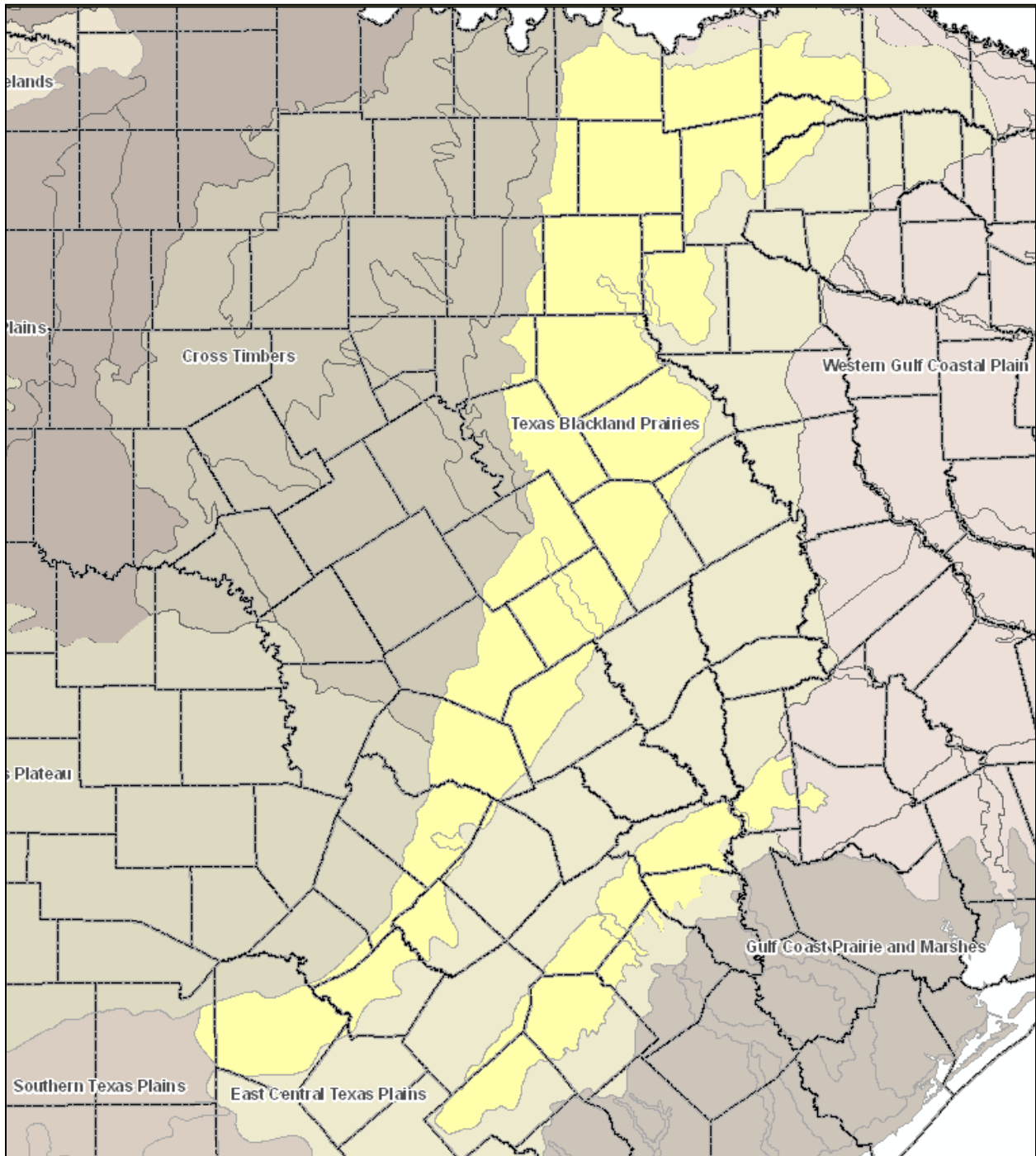
**Table 1. Crosswalk of TBPR Ecoregion with Other Conservation Plan Units**

Note Table is formatted 8-1/2" x 11" landscape orientation; see also Ecoregions map on TCAP 2012 website.

2012 TCAP	2005 TXWAP (Gould 1960)	The Nature Conservancy Terrestrial Ecoregions (1999)	Ecological Drainage Units (Watersheds) From the National Fish Habitat Action Plan <i>TX = Southeast Aquatic Resources Partnership and Desert Fish Habitat Partnership (AFWA 2006, Fish Habitat Partnership 2009, Esselman, et.al. 2010)</i>	All Bird Joint Ventures (JV) and Bird Conservation Regions (BCR) (NABSCI-US 2004, USFWS 2009a)	Landscape Conservation Cooperatives (LCC) (USFWS 2009b)	2010 TPWD Land & Water Plan Strategic Regions (TPWD 2010)	Major Land Resource Regions and Areas (MLRA) (NRCS 2006)	Natural Regions of Texas (LBJ School of Public Policy 1978)
Texas Blackland Prairies (TBPR)	Blackland Prairie	Cross Timbers and Southern Tallgrass Prairie (32)	Brazos River – Prairie Colorado River – Ed Plateau Guadalupe – San Antonio Lower Brazos Lower Trinity Lower Colorado Lower Red Sabine – Neches Upper Red Upper Trinity	Oaks and Prairies JV Oaks and Prairies BCR	Gulf Coast Prairie	Guadalupe – San Antonio (4) Colorado Lower (5b) Brazos Lower (6b) Brazos Upper (6a) Trinity – San Jacinto (7) Deep East Texas (8) Northeast Texas (9) Plains Rivers (10)	Southwestern Prairies Cotton and Forage Region: East Cross Timbers (84C), Texas Blackland Prairie Northern (86A), Texas Blackland Prairie South (86B) Southwest Plateaus and Plains Range and Cotton Region: Northern Rio Grande Plain (83A)	Blackland Prairie

**Figure 1. TBPR Ecoregion with County Boundaries**

Texas Blackland Prairies ecoregion in yellow (note disjunct portion of ecoregion southeast)





**Table 2. TBPR EDUs with ESSS and Reservoirs**

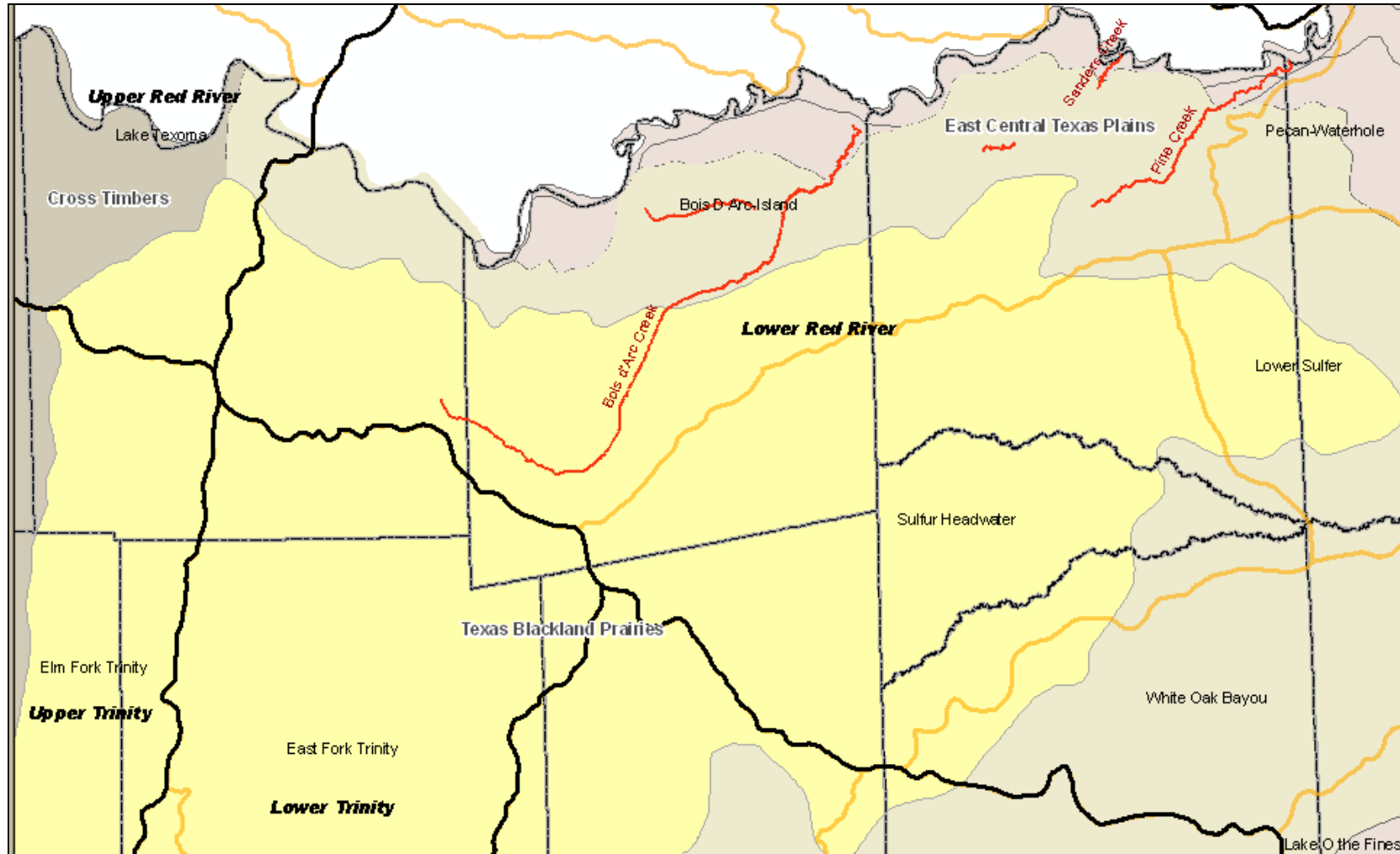
<b>ECOLOGICAL DRAINAGE UNIT SubBasin (HUC 8)</b>	<i>Ecologically Significant Stream Segment TPWD 2002, w/updates 2005</i>	<b>Lakes and Reservoirs</b>
<b>UPPER RED RIVER</b>		
Lake Texoma		
<b>LOWER RED RIVER</b>		
Bois d'Arc - Island	Bois d'Arc Creek	Valley Lake
Sulphur Headwater		Cooper City/Big Creek, Cooper Lake
Lower Sulphur		
<b>SABINE - NECHES</b>		
Upper Sabine		Greenville City Lake
Lake Fork		
<b>UPPER TRINITY</b>		
Elm Fork Trinity		Lewisville Lake, North Lake
Lower West Fork Trinity		Mountain Creek Lake, Lake Joe Pool
<b>LOWER TRINITY</b>		
Chambers		Lake Waxahachie, Bardwell Lake, Lake Halbert, Richland - Chambers Reservoir
East Fork Trinity		Lavon Lake, Lake Ray Hubbard
Upper Trinity		White Rock Lake
Richland		Navarro Mills Lake, Richland - Chambers Reservoir
Lower Trinity - Tehuacana		
West Fork San Jacinto	Lake Creek	
Cedar		New Terrell City Lake, Cedar Creek Reservoir
<b>BRAZOS RIVER - PRAIRIE</b>		
Middle Brazos - Lake Whitney		Aquilla Lake, Tradinghouse Creek Reservoir, Lake Creek Lake
<b>LOWER BRAZOS RIVER</b>		
Navasota		Lake Mexia
Lower Brazos - Little Brazos	Cow Bayou	
Little	Little River	
Lower Brazos		
San Gabriel	Willis Creek, San Gabriel River	Granger Lake
<b>COLORADO RIVER - EDWARDS PLATEAU</b>		
Austin - Travis Lakes	Colorado River, Onion Creek	Town Lake (Ladybird Lake)

<b>LOWER COLORADO RIVER</b>		
Lower Colorado - Cummins	Colorado River, Cummins Creek	Lake Walter E. Long, Cedar Creek (Fayette) Reservoir
Lower Colorado		
<b>GUADALUPE - SAN ANTONIO</b>		
San Marcos	Comal River, San Marcos River	
Middle Guadalupe	Guadalupe River, Geronimo Creek	Lake Dunlap
Cibolo		
Upper San Antonio		Olmos Reservoir, Calaveras Lake, Braunig Lake
Medina		
Lower San Antonio		
Lavaca		
Navidad		

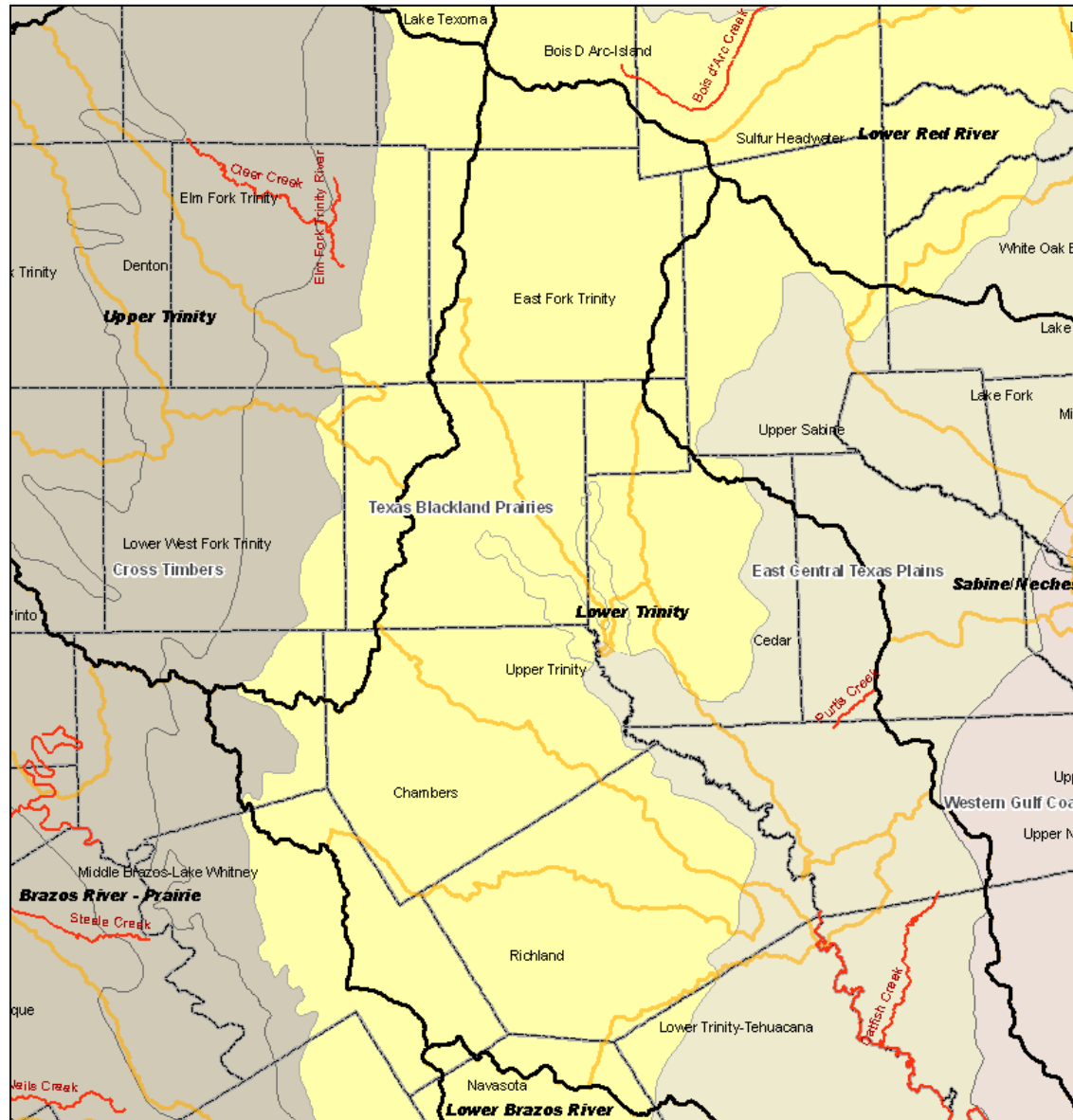
Note: Ecologically Significant Stream Segments and Reservoirs which occur in the Subbasin (HUC 8) but not in the ECOREGION are not included in this table. There may be other significant stream resources mentioned in the Priority Habitats section

**Figure 2. TBPR EDUs, HUC 8s, and ESSS – 6 maps**

Upper Red River and Lower Red River EDUs black outline, HUC 8s orange outline, ESSS red lines

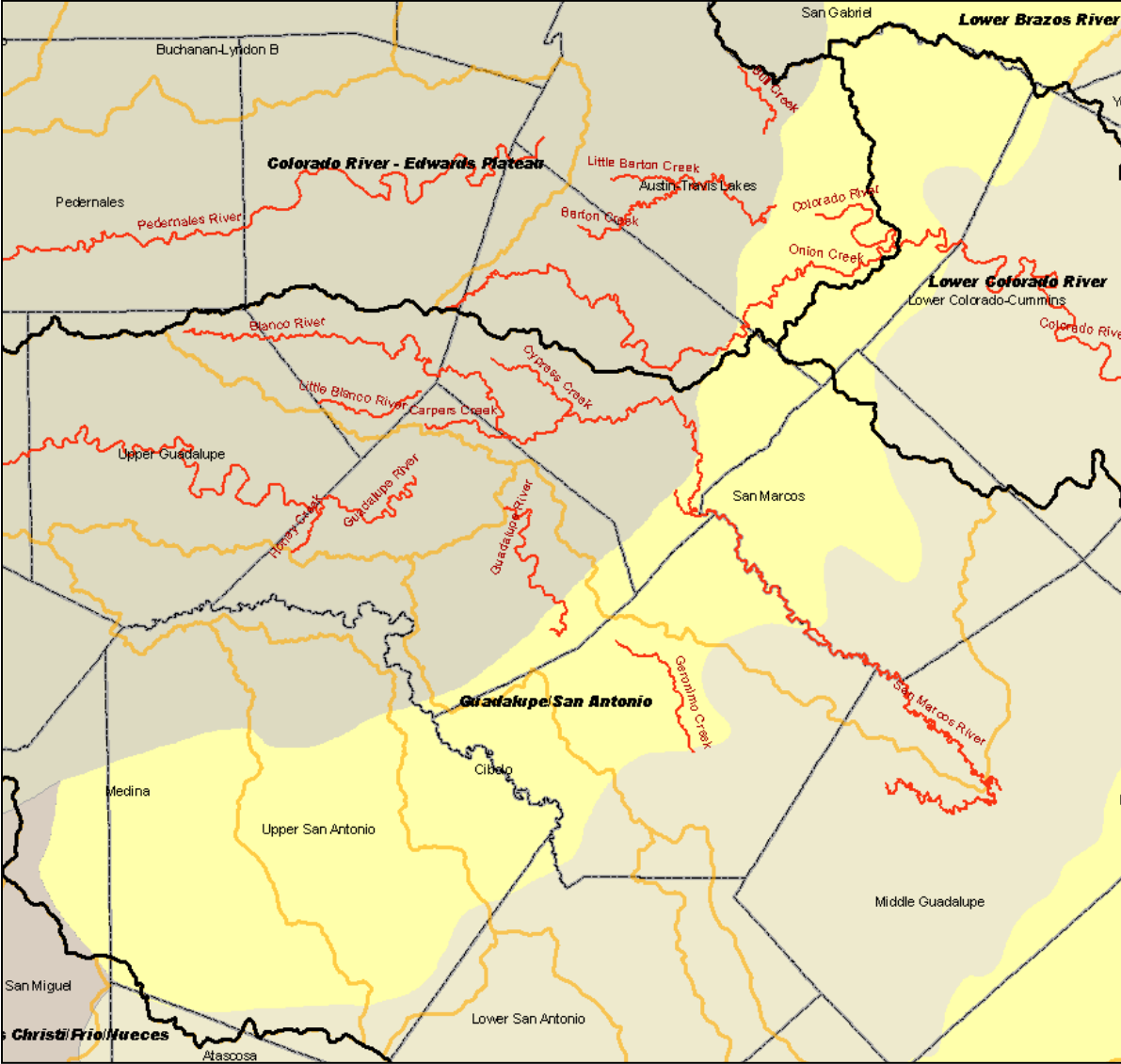


Upper Trinity and Lower Trinity EDUs black outline, HUC 8s orange outline, ESSS red lines

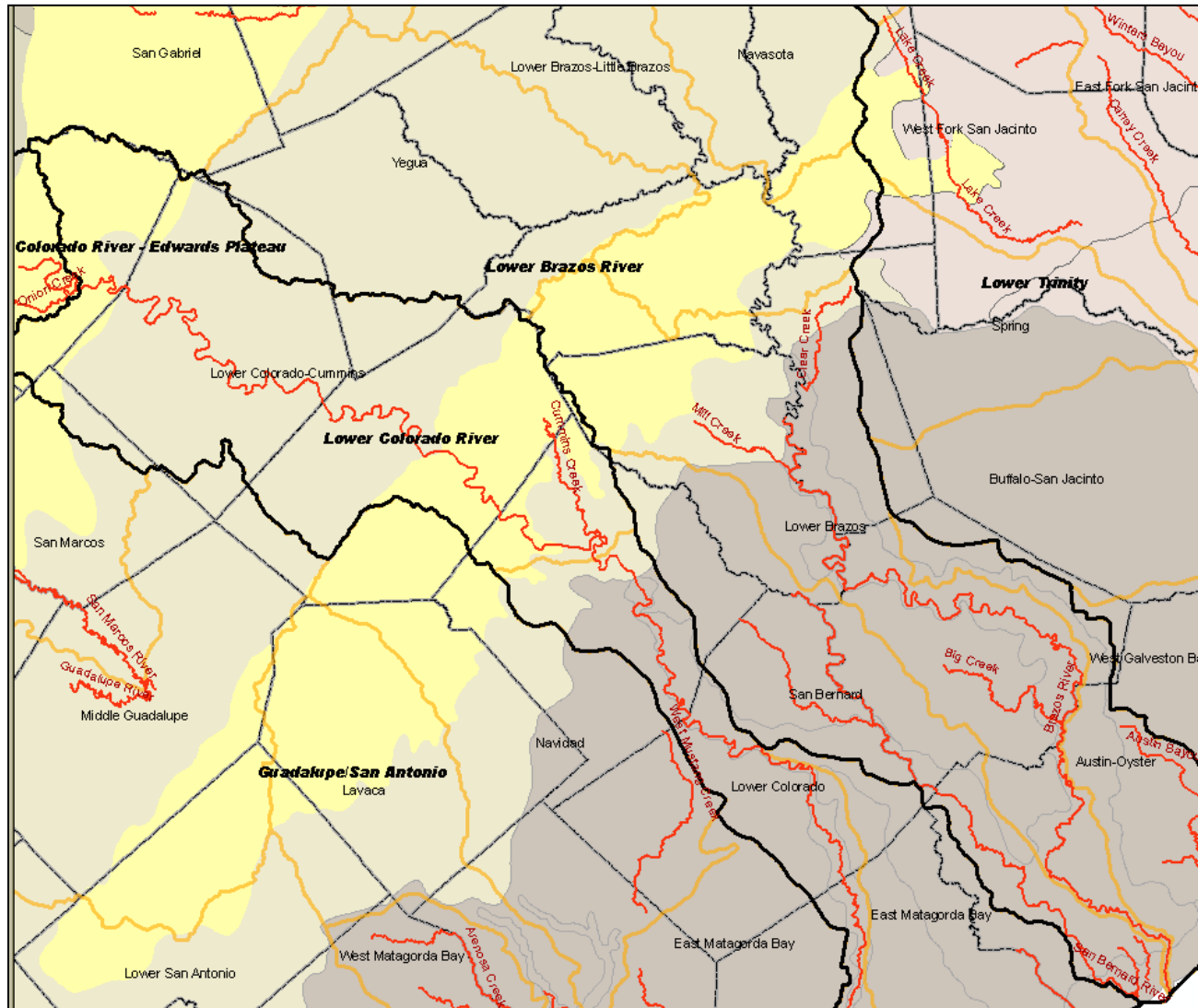




Colorado River – Edwards Plateau, Lower Colorado River, and Guadalupe/San Antonio EDUs black outline, HUC 8s orange outline, ESSS red lines



Lower Brazos River, Lower Colorado River, and Guadalupe/San Antonio EDUs black outline, HUC 8s orange outline, ESSS red lines



Note: other important stream segments may be mentioned in the Priority Habitats section

## RARE SPECIES AND COMMUNITIES

While most conservation work is done at the habitat level to address issues and threats, Action Plans' stated primary purpose is to improve and sustain *species'* populations and prevent the need to list species as federally or state threatened or endangered.<sup>8</sup> The Species of Greatest Conservation Need (SGCN) list, one of the Eight Required Elements in all states' Action Plans, is the foundation for the habitat- and issues- based actions in the Plan. In Texas, we've also identified Rare Communities for this planning process. For more information about how the SGCN and Rare Communities lists were developed, including the changes from the 2005 list, see the Overview Handbook.<sup>9</sup>

Species and rare communities included in the 2012 TCAP Final SGCN and Rare Communities lists are supported by current science, peer-reviewed references and/or other dependable, accessible source documentation, and expert opinion.<sup>10</sup> Each species has a NatureServe calculated state and global conservation rank, which accounts for abundance, stability and threats.<sup>11</sup> Additionally, several species have federal<sup>12</sup> and/or state<sup>13</sup> listing (endangered, threatened, candidate) status. See the key to conservation status and listing ranks<sup>14</sup> on the TPWD TCAP 2012 website.

The revised lists for TCAP 2012 are substantial and representative of conservation targets needing attention in this Plan and are sorted into the following categories:

Mammals	Birds
Reptiles and Amphibians	Freshwater Fishes
Invertebrates	Plants
Plant Communities	

Both the SGCN and Rare Communities Lists are on the TCAP 2012 website as large-but-sortable Microsoft Excel files: <http://www.tpwd.state.tx.us/landwater/land/tcap/sgcn.phtml>

Once you open this webpage, you can choose to look at the SGCN or Rare Communities lists. In each workbook, the first bottom tab is the complete final statewide compiled list, with habitat information and additional references where available; **each ecoregion tab in the workbook provides an excerpt of the statewide list, sorted to contain just the ecoregion's species or communities.**

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<sup>8</sup> Association of Fish and Wildlife Agencies. 2011. State Wildlife Action Plans. <http://www.wildlifeactionplans.org/>

<sup>9</sup> TPWD. 2012. Texas Conservation Action Plan: Overview Handbook.

[http://www.tpwd.state.tx.us/landwater/land/tcap/documents/tcap\\_draft\\_overview.pdf](http://www.tpwd.state.tx.us/landwater/land/tcap/documents/tcap_draft_overview.pdf)

<sup>10</sup> TPWD. 2012. Texas Conservation Action Plan: Species of Greatest Conservation Need List and Rare Communities Lists. <http://www.tpwd.state.tx.us/landwater/land/tcap/sgcn.phtml>

<sup>11</sup> NatureServe. 2011. A network connecting science and conservation (online resources). <http://www.natureserve.org/explorer> (accessed 2011).

<sup>12</sup> USFWS. 2011. Endangered Species List, by state and county.

<http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm> (accessed 2011).

<sup>13</sup> TPWD. 2011. State Listed Species.

[http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered\\_species](http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species) (accessed 2011)

<sup>14</sup> TPWD. 2011. Texas Conservation Action Plan: Key to Conservation Status and Listing Ranks.

[http://www.tpwd.state.tx.us/landwater/land/tcap/documents/species\\_key\\_tcap\\_2011.pdf](http://www.tpwd.state.tx.us/landwater/land/tcap/documents/species_key_tcap_2011.pdf)



## PRIORITY HABITATS

Nationally, an SGCN list forms a basis for every Action Plan; however, *species* conservation cannot be successful without defining the *lands and waters species need to survive and thrive*. If it was only important to know about individuals or even populations, we could put representatives in zoos or herbaria or other curated collections and that would be enough; but, it's not .... **It's important to conserve populations in the context in which they thrive, to the best of their abilities, where they can contribute to and benefit from the systems in which they live.**

Broad habitat categories were developed to organize all ecoregional handbooks.<sup>15</sup>

See also the Statewide/Multi-region handbook for habitats that are of broader importance – shared with many other regions and/or other states or nations (e.g. riparian or migratory species' habitats as a general category).

See documentation for *Ecoregions of Texas* and the *Texas Ecological Mapping Systems Project*.<sup>16</sup>

Priority habitats in these ecoregions which support SGCN were identified through workshops, surveys and other ecologists' and/or literature and are listed in Table 3.

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<sup>15</sup> TPWD. 2011. Texas Conservation Action Plan: Broad Habitat Category Definitions.

[http://www.tpwd.state.tx.us/landwater/land/tcap/documents/habitat\\_categories\\_tcap\\_2011.pdf](http://www.tpwd.state.tx.us/landwater/land/tcap/documents/habitat_categories_tcap_2011.pdf)

<sup>16</sup> Griffith, G. 2010. Level III North American Terrestrial Ecoregions: United States Descriptions. Prepared for the North American Commission for Environmental Cooperation ([www.cec.org](http://www.cec.org)), version May 11, 2010. Corvallis, Oregon.

Griffith, G.E., S.A. Bryce, J.M. Omernik, J.A. Comstock, A.C. Rogers, B. Harrison, S.L. Hatch and D. Bezanson. 2007. Ecoregions of Texas. R.S. Geological Survey, Reston VA. [http://www.epa.gov/wed/pages/ecoregions/tx\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/tx_eco.htm) (accessed May 2009).

TPWD, Missouri Resources Assessment Partnership, and Texas Natural Resources Information Service. In progress, 2005 – 2012. Ecological Systems Classification and Mapping Project <http://www.tpwd.state.tx.us/landwater/land/maps/gis/tescp/index.phtml> (accessed 2010). Austin TX.

**Table 3. TBPR Priority Habitats**

Note Table is formatted 8-1/2" x 11" landscape orientation

GENERAL HABITAT TYPES	TEXAS BLACKLAND PRAIRIES (TBPR)	TBPR Ecological Systems
NATURAL AND SEMI-NATURAL TYPES	<i>Habitats in this column were identified in the workshop and surveys (April 2011); additions were made by editor to riverine and cultural aquatic</i>	<i>NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications for Ecological Systems of Texas' Blackland Prairies. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 08 October 2009.</i>
Barren/Sparse Vegetation	Barrens	Southeastern Coastal Plain Cliff
Desert Scrub	Dense southern brush – mixed, diverse; primarily south of San Antonio, intergrades with South Texas Plains ecoregion	Tamaulipan Mixed Deciduous Thornscrub
Grassland	eastern gamagrass-switchgrass-yellow Indiangrass-Maximilian sunflower prairie little bluestem-Indiangrass-big bluestem prairie silveanus dropseed-mead sedge Austin Chalk outcrop herbaceous little bluestem - sideoats grama herbaceous silver bluestem-dropseed-Texas wintergrass	Texas Blackland Tallgrass Prairie
Shrubland	Headwater drainage shrublands Mesquite-granjeno shrublands swale shrublands	Edwards Plateau Limestone Shrubland

GENERAL HABITAT TYPES	TEXAS BLACKLAND PRAIRIES (TBPR)	TBPR Ecological Systems
Savanna/Open Woodland	Osage-Elm-Locust-Hackberry Elm-Hackberry Mature Mesquite Savanna Oak Savanna (limited) chalk glades	Edwards Plateau Limestone Savanna and Woodland
Woodland	Headwater drainage woodlands Swale woodlands Mesic slope mixed woodland Post oak-blackjack oak woodland Pecan-Shumard Oak-Hackberry-Bur Oak	East-Central Texas Plains Post Oak Savanna and Woodland Edwards Plateau Dry-Mesic Slope Forest and Woodland
Forest <i>See also Riparian and Wetlands</i>	Mesic slope mixed forest	Crosstimbers Oak Forest and Woodland
Riparian	periodically flooded or subirrigated floodplain woodlands (oak, juniper) and gallery forests (sycamore, cypress, elm) associated with the Lower Red, Sabine-Neches (and headwaters), upper segments of the Lower Trinity, upper sections of the Lower Brazos, headwaters of Lavaca and the Guadalupe Rivers and tributaries; important areas include bottomland hardwood forests	Edwards Plateau Floodplain Edwards Plateau Riparian Southeastern Great Plains Floodplain Forest Southeastern Great Plains Riparian Forest West Gulf Coastal Plain Large River Floodplain Forest West Gulf Coastal Plain Small Stream and River Forest

GENERAL HABITAT TYPES	TEXAS BLACKLAND PRAIRIES (TBPR)	TBPR Ecological Systems
Riverine	Instream habitats of the watersheds which intersect this ecoregion  Sulphur River, Middle Sulphur River, Caddo Creek  Ecologically Significant Stream Segments - Bois d'Arc Creek, Lake Creek, Cow Bayou, Little River, Willis Creek, San Gabriel River, Onion Creek, Colorado River, Cummins Creek, Comal River, San Marcos River, Guadalupe River, Geronimo Creek	NA
Lacustrine  <i>See also Cultural Aquatic</i>	oxbow lakes of the Trinity River	NA
Freshwater Wetland	springs, seeps	NA
Aquifer	Trinity , (outcrop, subcrop), Edwards BFZ, Carrizo – Wilcox (outcrop, subcrop)	
CULTURAL TYPES	<i>habitats in this column must support SGCN or rare communities to be considered in this plan</i>	
Agricultural		NA
Developed		NA
<i>Urban, Suburban, Rural</i>	urban forests	NA
<i>Rights of Way</i>	Pipeline and transmission line ROWs can provide suitable areas for native prairie	NA

GENERAL HABITAT TYPES	TEXAS BLACKLAND PRAIRIES (TBPR)	TBPR Ecological Systems
Cultural Aquatic	<p>Reservoirs: Valley Lake, Cooper City/Big Creek, Cooper Lake, Greenville City, Lewisville, North, Mountain Creek, Joe Pool, Waxahachie, Bardwell, Halbert, Richland - Chambers, Lavon, Ray Hubbard, White Rock, Navarro Mills, New Terrell City, Cedar Creek, Aquilla, Tradinghouse Creek, Lake Creek, Mexia, Granger, Town (Ladybird), Walter E. Long, Cedar Creek (Fayette), Dunlap, Olmos, Calaveras, Braunig</p> <p><i>Check ecoregion boundaries re Lake Tawakoni and Bonham</i></p>	NA

## ISSUES

There are **activities and conditions** which may negatively affect the SGCN populations, rare communities, and the habitats on which they depend in this region. These issues can include **direct or indirect harm** (e.g. inappropriate mining reclamation which uses non-native vegetation or indirectly provides an opportunity for non-native invasive vegetation, streambed gravel mining that directly removes spawning habitat and/or indirectly creates poor water quality downstream) **plus basic “gaps” that prevent us from acting most effectively** (e.g. lack of information, lack of coordination to share current data, incompatible practices among land managers, lack of funding). For information about how this list was developed, see the Overview Handbook and the descriptions of the broad issue categories.<sup>17</sup>

**Habitat fragmentation and habitat loss, including open-space land conversion,** are always going to be broad issues that need to be addressed, at various scales – local, regional, statewide, interstate, and international. These are such broad categories and, depending on the scale of the problem, these three issues can be symptoms or causes of many other issues. These three issues are not specifically included in the Issues list, although they may be implied in many of the categories presented.

The issues covered in the TBPR Ecoregion Handbook in Table 4 attempt to present more of the specific causes of SGCN, rare communities, and habitats’ decline, providing appropriate context to help target our actions, identified later in this handbook. Several of the habitat types in this handbook are also considered priority habitats in the Statewide/Multi-region handbook.

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<sup>17</sup> TPWD. 2012. Texas Conservation Action Plan: Broad Issues Categories  
[http://www.tpwd.state.tx.us/landwater/land/tcap/documents/broad\\_issues\\_categories.pdf](http://www.tpwd.state.tx.us/landwater/land/tcap/documents/broad_issues_categories.pdf)

**Table 4. TBPR Priority Issues**

Table is formatted 11" x 17" landscape orientation

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Invasive Species		
Non-native Plant	<p>This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban landscaping impact natural resources outside of their boundaries: non-native invasive plants sold in nursery trade (e.g. ligustrum, chinaberry, nandina, <i>Scabiosa atropurpurea</i>, Chinese tallow and tree of heaven) are highly aggressive colonizers and escape cultivation easily.</p> <p>Primarily sodforming introduced grasses like Bermuda grass</p> <p>Others: Bahiagrass, Johnsongrass</p> <p>Aquatic invasives – giant salvinia, water hyacinth</p>	<p>Urban areas harbor numerous invasive species – Chinese tallow, kudzu, ligustrum, chinaberry, tree of heaven -- that are installed in residential and municipal landscapes, allowed to escape and spread into nearby wildlands and all points downstream (once in waterways, these infestations can spread as far as the floodwater will carry them within the water system and into adjacent areas).</p> <p>Non-native grass dominated areas have claimed millions of acres of native prairie throughout Texas and are a leading cause of steep population declines for wildlife dependent on native grasslands (e.g. bobwhite quail, dickcissel, loggerhead shrike, scissor-tailed flycatcher, many types of pollinating insects, and the plants which in turn depend on these). More than 97% of the native grasslands of the U.S. have been lost, primarily to agricultural conversion; therefore, grassland birds are among our nation's fastest declining species, yet only 2% of all U.S. grassland is both publicly owned and managed primarily for conservation. Four grassland species have 5% or less of their distribution on public lands: breeding Dickcissels, Scissor-tailed Flycatchers, and Eastern Meadowlarks, and wintering Harris's Sparrows; across the nation, 48% of grassland-breeding bird species are of conservation concern, including four with endangered populations. <i>For more detail see North American Bird Conservation Initiative, U.S. Committee, 2011. The State of the Birds 2011 Report on Public Lands and Waters. U.S. Department of Interior: Washington, DC. 48 pages.</i></p> <p>From pollinators to birds of prey, all prairie dependent species experience population declines. Prairie birds that nest and forage on the ground do not have suitable nesting, travel lanes, thermal cover, foraging, brooding, loafing, screening, or escape cover within introduced grass areas. The Houston toad, a species on the brink of extinction, cannot travel more than 50 feet into Bermudagrass stands. Invertebrate abundance, important for breeding bird fecundity, has been shown to be lower on introduced grass sites compared to native grass areas. Breeding birds have been shown to select native prairie sites more than introduced grass sites for nesting.</p> <p>The majority of non-native grasses for livestock forage are often managed as monocultures - ecological deserts, not functioning ecosystems - and require annual fertilization to maintain productivity. Annual applications of fertilizer and herbicide become incorporated into rainwater runoff, leading to significant water quality issues. In addition to terrestrial and aquatic wildlife benefits, pasture conversion back to native grasslands reap public benefits through improved water quality, groundwater recharge, carbon sequestration, erosion control, outdoor education, and recreational opportunities. Most prairie restoration projects in this area require extensive treatment to remove these two invasive grass species before native planting can begin.</p>
Non-native Animal	<p>This ecoregion intersects three of the five most populous metropolitan areas in Texas. Suburban and suburban/rural interfaces with natural areas especially impact natural resources: feral pets.</p> <p>FERAL HOGS</p> <p>Red Imported Fire Ants (RIFA)</p> <p>introduced fishes and mollusks - freshwater springs, streams and marshes</p> <p>Baitfish released by anglers and "aquarium dumping" by hobbyists</p> <p>House sparrows, starlings</p>	<p>Free ranging pets (cats, dogs as individuals and as packs) are introduced predators which primarily adversely affect small mammals, small reptiles, and birds; in packs, can also adversely affect larger mammals and ground-nesting birds; also contribute pathogens and diseases. It is estimated that 60-100 million feral cats reside in the US and another 60 million pet cats are allowed to roam outside. "Neuter and release" programs only address fecundity in a limited way, and do not address the impact to natural resources. The number of birds predated by feral cats in the U.S. is annually is more than 1 Billion; numerous SGCN are affected. The IUCN ranks feral cats as one of the world's worst invasive species. (see The Wildlife Society, Wildlife Professional publication, Spring (March) 2011, Vol. 5 No. 1).</p> <p>Feral hogs decimate important and fragile habitats (e.g. springs, seeps, riparian areas, wetlands), degrade instream water quality, change topography and runoff/collection patterns, and decrease hardwood seedling viability (rooted up, eaten) and vegetation community composition. Can be particularly detrimental to some prairie plants which are intolerant to soil disturbance. Hogs also decimate new restoration sites, making recovery expensive or even untenable.</p> <p>RIFA are a predator to all ground-nesting and some shrub-nesting birds, small mammals, reptiles and amphibians; RIFA will invade and destroy/eat a nest of eggs and/or young</p> <p>Within streams, zebra mussels compete with native freshwater mussels, many of which are listed as state threatened. May also be gill parasites on certain fishes, unknown if they adversely affect any SGCN freshwater fishes. Small mouth bass are voracious non-native predators taking a toll on smaller fishes in these systems. Non-native baitfish and aquarium species releases compete with native fishes in many habitats and can be very detrimental if they are predacious.</p>

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Native Problematic	Native shrub (e.g. mesquite, whitebrush, yaupon, juniper) or "brush" encroachment into prairie systems Brown-headed cowbird (BHCb) Native tree planting favored over prairie restoration and maintenance	Mesquite and juniper invasion of prairies/grasslands throughout ecoregion, yaupon invasion in pine-oak woodlands, whitebrush invasion in woodlands and grasslands to the south. <i>See grassland bird decline notes in "Nonnative Plant" above.</i> Native brush invasion, where these species should not naturally occur or in abundances that are out of balance with the native communities, degrades grassland suitability and hardwood regeneration potential. BHCb have proliferated with increased habitat fragmentation and widespread farm and ranch use, congregating in livestock feeding areas. Brown-headed cowbirds are common during breeding bird surveys. Urban, suburban and suburban/rural (ranchettes, hobby farms) value trees more highly than native tall grass prairie in development review and permitting processes, site remediation following construction, and in private area landscaping; areas of tall grasses are perceived as "weedy" and "unkept", so city ordinances, Home Owners Associations, Neighborhood Associations, and open space managers often discourage the growth of tall grasses. Some sites have sponsored tree planting events even in remnant prairie sites.
Pests, Parasites, Pathogens		
Pathogens	Oak wilt, Oak decline Chinquapin wilt	The key woody plant communities in this ecoregion are hardwood dependent – oak savanna, oak woodlands, and bottomland hardwoods – all potentially affected by the wilt and decline pathogens.
Parasite	Fountain Darter Gill Parasite	Found in rare fountain darter, this parasite can cause mortality of the fish through gill degradation; unknown thresholds or triggers and unknown whether gill parasites are known in other spring-dependent rare SGCN fishes.
Power Development and Transmission		
Wind Power	Wind generation tower <u>siting</u> ("wind farms") is not an issue in this ecoregion; however, many of the migrants that pass through this ecoregion encounter wind turbines in central and north Texas – it is a concern that needs to be addressed	<i>See north and central Texas ecoregion handbooks and the Statewide Handbook</i>
Hydro (Dam and Reservoir)	There are many dams and hydropower facilities in this and adjacent ecoregions, to the Coast; operations impact downstream aquatic and riparian communities	<i>See also Water Development, Management and Distribution below</i>
Coal-fired plants	Texas has 40 coal-fired generators at 20 locations, totaling 21,240 megawatts (MW) of capacity. Nine new coal fired plants proposed in Texas, three online since this Plan was last updated; several in this ecoregion	Primary concern with coal fired plants in any location, including this ecoregion, is surface and/or groundwater consumption. Footprint of power plant and adjacent reservoir is direct loss of terrestrial habitat. If the water cooling pond is a dammed natural waterway, then it contributes to loss of instream flows for aquatic SGCN and riparian communities; if cooling pond is a stand-alone feature, water must still be drawn from existing water budgets which currently do not adequately account for fish and wildlife needs. Coal fired plants are also a source of evaporative loss from the water system – towers and open ponds
Transmission	New development and expansion of existing lines/corridors construction of new power infrastructure corridors to meet urban user needs, maintenance and operations maintaining clear right-of-way for vehicle clearance/access, prevention of line and tower danger	In this ecoregion, the impacts are primarily due to nonnative reseeding post-construction, no reclamation after construction (allowing any invasive plant to colonize disturbed area) and/or maintenance. Broad, long, linear fragmentation of all habitat types. During route selection, environmental considerations are given secondary consideration to agricultural and developed areas. Contributes to edge through interior habitats (woodlands, riparian zones) in the same way as oil/gas pipelines causing potential for greater predator and invasive species access. While some of these facilities are compatible with grassland and prairie communities in this ecoregion (with the exception of areas which support prairie chickens), these pathways are not required to reclaim or maintain cleared areas with native seed or plant sources. Mowing and trimming activities during bird breeding seasons or migratory events adversely impact species success; inappropriate seasonal oak trimming can contribute to oak wilt, oak decline; "brushhogging" borders leaves splintered, jagged cuts and adjacent vegetation communities vulnerable to disease and infestations (oak wilt, oak decline, Chinquapin wilt, others). Transmission lines can be strike hazards for Whooping Cranes and raptors during migration.
Distribution	Development to power grid and retail users: construction of new power infrastructure corridors to meet urban user needs	See comments above for Transmission lines. Migratory bird strikes are more prevalent with distribution facilities than transmission facilities; more careful site selection is important to avoid or minimize impacts when near the coast, along waterways, adjacent to wetlands and throughout the flyway.
Biofuels	Row Crop (primarily corn for ethanol), Switchgrass, other Herbaceous	Loss of native grasslands, productive diverse farmland and rangelands which provide habitats for insects, grassland birds, small mammals, reptiles, and the animals, like shrikes and hawks, that feed on them. See comments for grassland bird declines under "Invasive Species" above.



General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
	Rangeland, existing cropland, and other open grasslands converted to fast production, monotypic biofuel production	Because these crops are not food sources, chemicals used for pest and weed control and fast growth fertilizers can be used; stormwater or irrigation runoff or overspray into adjacent wildlands from these applications are potentially hazardous to native habitats and in particular native insects.
Oil and Natural Gas Production and Delivery		
Extraction	Hydraulic fracturing, or “fracking”, is rapidly expanding in this and adjacent ecoregions	Hydraulic fracturing is a controversial method of extraction involving large amounts of a water and chemicals mixture pumped into underground strata to release gas which can be converted to various fuels. The concern lies in groundwater contamination, geologic instability, and fracking mixture disposal all of which may adversely affect groundwater dependent and aquatic SGCN.
Delivery	Pipelines for oil and natural gas delivery cross the area; long, linear cleared swaths through rangelands, native habitats	See comments above for Electrical Transmission and Distribution. Pipeline facilities in particular, because they cannot or do not “span” wetland features, have a greater impact to wetlands and riparian areas than transmission or distribution lines, especially those which are not jurisdictionally protected (isolated bogs, seeps, springs); little to no native reclamation is required. These openings create opportunity for enhanced predator access to interior woodlands, invasive species (many thrive in disturbed sites) in all traversed habitats, and microclimate changes that dry water features.
Lack of Reclamation	reclamation standards vary, requirements limited	Reclamation not required back to NATIVE vegetation (invasive species allowed to colonize or are directly planted for soil stabilization) Sites are also not required to restore lost wetland features if these were determined to be nonjurisdictional or isolated wetlands Sites not required to restore the full complement of desired ecological condition that was removed during construction or operations. See also comments under “Invasive Species” for grassland bird impacts above.
Mining		
Sand and Gravel - upland and riverine	Occurs in upland sites as well as along and within streams and rivers	lack of reclamation; mining off of water courses do not go through TPWD review for potential natural resources impacts. Not all are required to have stormwater pollution prevention facilities or plans (acreage threshold)
Lignite	Upland sites and drainages affected	loss of vegetation and water resources (dewatering, stream diversion, ponding, wetland fill) during construction and operation over large landscape and long periods of time; complete loss of soil microorganism integrity Environmental review late in process to avoid or minimize impacts, no input into reclamation review or evaluation Reclamation not back to desired ecological conditions (tied to productivity levels in a certain time frame, short, 5-year window for “recovery”), so companies use fast-growing species, not necessarily native seed or plant source materials, usually monotypic instead of diverse natural community
Communications Infrastructure		
Cell and other communication towers	towers need to be limited in height and lit to minimize bird strikes (bird-friendly)	Species impacted by towers include all nocturnal migrants including Yellow-billed Cuckoo, Painted Bunting, Summer Tanager, and other species. In rare instances kills totalling thousands of Longspurs have been found around towers.
Transportation		
road and bridge construction (new)	This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban impacts to conservation activities and natural resources even outside of these “boundaries” are particularly relevant. There are several issues, one of which is transportation improvements and new construction	Trans Texas Corridor 35: expansion of IH-35 and creation of new auxiliary facilities such as Loop 9 around Dallas, SH-130 around Austin, other surface improvements to existing facilities to widen and upgrade capacity between the Ports of Corpus Christi and Brownsville up to Dallas and Texarkana. While some of these facilities have been completed since the last Action Plan was written, several additional facilities are planned and programmed in Regional Transportation Plans. Texas Department of Transportation coordinates with TPWD regarding potential natural resources impacts to listed species; however, during construction and mitigation there is little accommodation for sensitive habitats unless those features are federally protected (federally listed species habitat, critical habitat, jurisdictional wetlands). State-listed species habitats, SGCN, rare communities and the habitats on which they rely are for the most part unprotected. The transportation improvements proposed under regional upgrades of existing facilities and new construction may create barriers to fish and wildlife resources’ daily and seasonal movements through armored culverts and concreted drainageways, vectors and opportunities for nonnative species invasions, water quality impacts through stormwater runoff, loss of nonjurisdictional wetlands, and important riparian, bottomland, prairie and savanna habitats that are not protected under regulation. In addition to these larger facilities, local connection transportation projects may also contribute to the same kinds of losses and may require even less coordination regarding environmental impacts from planning to implementation if no federal money is used. Mitigation for these large primary and smaller connector projects typically does not replace ecological function where it is lost. Nonnative invasive grasses are used in reclamation, nonnative trees are planted in sites where prairie is the desired ecological condition, and riparian areas are allowed to recolonize without

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		direct restoration to prevent invasive species. See comments under "Invasive Species" above.
right of way maintenance	maintaining clear right-of-way for vehicle clearance/access, minimizing fire danger, and maintaining driver visibility	<p>mowing, trimming timing (season, frequency) inhibit natural regeneration of prairie plants and don't provide key habitats (tall grass prairie structure, seedheads) at best times of year to accommodate prairie animal and insect needs</p> <p>Most roadside are reseeded after construction with nonnative species or plant materials and regular maintenance activities also provide additional ground disturbance favorable to invasives; see comments under "Invasive Species" above regarding grasses and grassland birds.</p> <p>herbicide application</p> <p>some rare plants are known only from sites in ROW; these are not always adequately protected as staff changes occur, management plans are filed away, information not passed through entire chain of command - needs better communication in some places</p>
Land & Water Mgmt: FARM	See also Water Development section	
Conversion	Cultivation of remaining prairie remnants Conversion of wet prairie	<p>Prairie remnants are few, far between and relatively small landscapes. This is one of the most threatened habitat types in Texas. Conversion is difficult to overcome, even with resources (see "Invasive Species" section above). Aside from the loss of native seed and plant sources, soil horizon disturbance creates unfavorable conditions for some species ever recovering. Chemicals may be latent.</p> <p>More than 97% of the native grasslands of the U.S. have been lost, primarily to agricultural conversion; therefore, grassland birds are among our nation's fastest declining species, yet only 2% of all U.S. grassland is both publicly owned and managed primarily for conservation. Four grassland species have 5% or less of their distribution on public lands: breeding Dickcissels, Scissor-tailed Flycatchers, and Eastern Meadowlarks, and wintering Harris's Sparrows; across the nation, 48% of grassland-breeding bird species are of conservation concern, including four with endangered populations. For more detail see <i>North American Bird Conservation Initiative, U.S. Committee, 2011. The State of the Birds 2011 Report on Public Lands and Waters. U.S. Department of Interior: Washington, DC. 48 pages.</i></p> <p>Wet prairie areas are all but gone; a few remnants remain along the Trinity River, but few if any are present in the uplands. As these ephemeral wetlands have disappeared, so have a number of native amphibian species although this is not well-documented in published literature as these sites were not well known outside of local resources prior to their conversion.</p>
"Clean" and intensive agricultural practices	<p>Little to no field border habitat</p> <p>Herbicide use</p> <p>Intensive haying practices</p> <p>Indiscriminate pesticide use, especially adjacent to or within overspray area of native grasslands, rangelands, woodlands</p>	<p>Agricultural field borders benefit agricultural practices in wind barriers and filtering field runoff; however, they are also very beneficial to SGCN and rare communities (perennial bunchgrasses, woodland and grassland birds, migratory birds, pollinators) by providing cover, seeds and insects</p> <p>Herbicide use reduces herbaceous resources necessary for breeding birds. Pesticides reduce high protein insect forage for grassland birds and affect all insects in the community, including pollinators. Not much is understood about the collapse of certain pollinators. Overspray can decrease or completely wipe out native insect fauna, important pollinators in native grassland and prairie systems</p> <p>Haying practices are commonly detrimental to many SGCN and the rare prairie communities. In the short term, ground-nesting birds are directly impacted through nest destruction or removal of nesting cover during the breeding seasons. In the long term, the historical climax tallgrass community composed of the big 4 grasses is replaced by low quality habitat and forage. Haying generally starts in early spring to remove cool season grass production. This takes place before offspring are mobile and ground nesting birds have fledged young. Often, the structure necessary to nest is removed before migratory birds arrive or residents initiate nesting activities. Repeated haying takes place throughout the growing season on numerous properties, large and small. Undoubtedly, many pastures are hayed only to retain open space agriculture tax valuation. Haying mines fields of nutrients and often costs more than it yields. Also, repeated haying at the same time every year reduces little bluestem, switchgrass, big bluestem, indiagrass and eastern gamagrass that are required components of prairie wildlife habitat. Haying in the late summer and fall removes herbaceous structure for winter migrants. Thus, thermal and escape cover is unavailable for most overwintering species. That said, some winter migrants (plovers, hawks) find these cleared areas for resting favorable to invaded grasslands, woodlands or riparian areas; so, some may serve a purpose. Overall, however, the bottom line is that over utilization of herbaceous resources through mechanical cutting or non rotational, overstocked grazing has and continues to be a negative factor causing declines of SGCN.</p>
Lack of soil and water management/conservation practices	<p>Chemical-laden (pesticide, herbicide, fertilizer) irrigation water runoff</p> <p>Lack of streamside management zones</p>	<p>Insufficient stormwater controls between agricultural production and waterways (or dry drainages that lead to waterways during rain events) adverse lead to chemical impacts to sensitive aquatic insects, freshwater mussels, riparian invertebrates, freshwater fishes, amphibians, and eventually bay and estuary systems – invertebrates, fishes, and birds.</p> <p>Streamside Management Zones are important buffers between agricultural practices and aquatic impacts, and these riparian areas serve as important habitats in their own right for many forest and woodland dependent SGCN. Riparian and floodplains are frequently cleared for agricultural production because they are relatively flat, have access to water, and soils are productive. Many SGCN breeding birds, river margin fishes, and amphibians rely on intact riparian areas.</p>
Landowner/land management	Conservation Reserve Program, other Farm Bill Conservation Title	Native grasslands are a key ecosystem in this ecoregion; land management and restoration assistance in this region typically centers on brush removal and

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
incentive programs working at cross-purposes	incentives, Farm Bureau and Farm Service Agency programs, and technical guidance on wildlife issues from private individuals as well as TPWD resource specialists may work at crosspurposes inappropriate herbicide application for mesquite control Farm Bill programs not competitive (conservation vs. ethanol) Farm Bill penalty insufficient to deter short term conversion	grass planting. Unfortunately, brush removal is not always recommended on sites where this practice is appropriate (may be too steep, highly erodible, or not enough cover remaining to retain ground) and nonnative grasses are recommended for reseeding, farmland to pasture conversion, and even “restoration.” Additionally, certain herbicides recommended may not be appropriate for all sites and may cause more harm to aquatic surface and groundwater resources than benefits to terrestrial systems. See also grassland conservation comments under “Invasive Species” above. See <i>Biofuel</i> section Using Farm Bill programs can be one of the best tools to engage private landowners in longterm conservation practices; however, must be market-competitive and contract-savvy to be effective as a conservation tool.
Unsustainable irrigation	See also <i>Groundwater Planning and Distribution</i>	Many of the irrigation practices from approximately San Marcos south in this ecoregion draw from aquifer-sourced freshwater stream resources of the Edwards Plateau. Because these areas tap the aquifers recharged by the Plateau and surface artesian expressions in the Plateau support rare species with waters also from that same source, these uses are sometimes in conflict. See Edwards Aquifer Recovery Implementation Plan at <a href="http://earip.org/">http://earip.org/</a> for more background
Clearing and loss of important natural sites/habitats	Local surface water development: small impoundments on tributary creeks, streams, springs, seeps to form stock tanks, ponds, private lakes	Similar to reservoir development on mainstem rivers, negative impacts caused by impoundments on creeks and springs are just at a smaller scale: loss of instream habitats, loss of wetlands, loss of riparian habitats and natural floodways. The replacement value – still deeper water for flowing waters, pond for stream – is not ecologically synonymous. This may be more of an issue in the emerging “urban/suburban” areas. See grassland comments in “Cross Purposes” above See grassland and wet prairie comments in “Conversion” above
Economy – Farm	Market forces incompatible with natural resources conservation incentives	Recently, small grain crops have been replaced by cotton and corn due to demand and market prices. Relative to many other land uses, row crops are more compatible with managing for grassland birds and could be enhanced more easily than introduced grass pastures or overgrazed pastures. However, low adoption rates for practices and programs that benefit natural resources and SGCN need exist for our area relative to other parts of the Texas and other states, such as Kansas and Nebraska. Farm Bill Conservation Title programs and other landowner conservation incentive programs are not competitive, monetarily, with values gained from other land uses.
Land & Water Mgmt: RANCH	See also Water Development section	
Landowner/land management incentive programs working at cross-purposes	Conservation Reserve Program, other Farm Bill Conservation Title incentives, Farm Bureau and Farm Service Agency programs, and technical guidance on wildlife issues from private individuals as well as TPWD resource specialists may work at crosspurposes inappropriate herbicide application for mesquite control single-objective management such as all-game, all-livestock, all-recreation incentive programs, technical guidance, and management assistance "menu" is pre-limited for the landowner in the first contact, landowner should be able to choose from a full menu of land and water management options Landowners do not have a one-stop shop to choose best management practices for their site, for their goals	Native grasslands are a key ecosystem in this ecoregion; land management and restoration assistance in this region typically centers on brush removal and grass planting. Unfortunately, brush removal is not always recommended on sites where this practice is appropriate (may be too steep, highly erodible, or not enough cover remaining to retain ground) and nonnative grasses are recommended for reseeding, farmland to pasture conversion, and even “restoration.” Additionally, certain herbicides recommended may not be appropriate for all sites and may cause more harm to aquatic surface and groundwater resources than benefits to terrestrial systems. Monoculture (nonnative grassland conversion) or monospecific (e.g. all-deer) management regardless of desired ecological condition of individual sites – not every management approach is appropriate for every site. Ranching with associated livestock grazing can be beneficial to SGCN. Many variables effect the pros and cons of each ranching operation. Need site-specific assessment and recommendations which include a community-approach to fish and wildlife resource management, including SGCN and rare communities in management plans Streamside Management Zones (riparian conservation, riparian BMPs) need to be a priority in landowner incentive programs See also grassland conservation comments under “Invasive Species” above.
Fire suppression and lack of or inappropriate application of Rx fire	reduced or no efficacy of applied fire - scale of application does not match ecological need managing wildfire (more Rx burning needed to reduce the risk of wildfires)	Native prairie plant and wildlife species are adapted to periodic fire disturbance and its effects are necessary to create the habitat requirements of many species. During a small window of time, prairies are often invaded by woody shrubs, leading to further changes in water infiltration, herbaceous cover, and erosion. Additionally, annual wildflower and grass species’ production is often lost without disturbance due to dense, matted perennial herbaceous cover and ground litter. Furthermore, habitat suitability for many prairie-dependent wildlife species will significantly decline because they rely on disturbance to create their habitat requirements. Fire can increase plant diversity, create weedy areas for upland birds and ungulates, maintain wildlife cover requirements (i.e. nest, escape, brood, fawn, and thermal), produce nutritious regrowth for ungulates, enhance structural diversity, maintain or set back successional stages, increase forbs, alter insect type and abundance, prevent woody invasion, alter the distribution of ungulates, reduce the risk of wildfire, increase nutrient cycling and microbial activity, improve forage characteristics for grazers, browsers and foragers. The lack of fire and excessive grazing during drought has

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		<p>resulted in mesquite and juniper encroachment in many areas.</p> <p>Prescribed fire, in lieu of natural wildfires, is a key component in a healthy grassland system to maintain species diversity (some prairie species are fire dependent for regeneration), reduce the invasives, and mimic natural processes under which many of these species evolved. Smaller land holdings, even if fire is applied, cannot mimic the landscape scale fires that are needed for system function and maintenance. Additionally, there is some research to indicate that timing, periodicity, and seasonality of current applications is out of sync with natural cycles (summer, more intense, less frequent) which can adversely affect grassland communities. Rx fire is also not the “tool of choice” although it most closely mimics the natural system as many landowners do not have the capacity to apply this tool.</p>
Incompatible stocking practices	<p>In some areas, working lands are still recovering from historic uses, out-of-date stocking and grazing practices (prior to soil, native vegetation, and water conservation knowledge we have today) on the advice of county tax appraisers rather than range scientists or ecologists</p> <p>Livestock allowed free range in wetlands, riparian zones, and creeks/streams</p> <p>historic and/or current range-intensive livestock operations “continuous” even if rotational; out of sync with land capacity</p> <p>landowners may not be aware of potential benefits of wildlife valuation for recovery, rest, or native habitat conversion</p> <p>non-native hoofstock for hunting operations</p>	<p>Promotes conversion of native grassland to non-native (Bermuda, other sod-forming grasses)</p> <p>Intensive grazing degrades native plant communities and contributes to the need to supplemental feed livestock, which then introduces exotic seedstock into remaining native plant communities</p> <p>Concentrated supplemental feeding of livestock herds attract large numbers of brown-headed cowbirds which are parasitic nesters to a number of SGCN birds.</p> <p>Livestock can be one of the best tools for wildlife management on native grasslands. Native prairie under long-term conservation easements often lacks the proper disturbance regimes necessary to produce suitable habitat conditions for resident and migratory wildlife. In the absence of grazing, habitat structure, namely bare ground, is largely unavailable on highly productive blackland soil types. Grazing increases bare ground foraging and traveling habitat. Also, sunlight reaching bare mineral soil will promote annual forb production released from perennial canopy cover competition. However, grazing can be a double-edge sword when managing for SGCN – terrestrial and aquatic. Many ranches with cattle operations are utilizing non rotational, year-round livestock grazing. Additionally, stocking rates are often above the carrying capacity of the land. Therefore, the most palatable grasses (i.e. Indiangrass, little bluestem, big bluestem) decrease and are replaced by increasers that do not provide equitable wildlife habitat. Tallgrass communities will transition to a midgrass-dominated community under the stresses of improper grazing management. The first species to decrease in dominance will be the most palatable and/or least grazing tolerant grasses and forbs (e.g. switchgrass, Indiangrass, big bluestem, and Engelmann’s daisy). These species that decrease under this grazing regime provide required habitat for grassland wildlife. As improper grazing management continues, little bluestem will decrease and midgrasses such as silver bluestem and sideoats grama will increase in composition. Stocking rates are generally 3 times higher than what is recommended. Subsequently, herbaceous species composition, diversity and structure become inadequate for productive wildlife habitat. Tall bunchgrasses are eliminated under this scenario and this lack of suitable nesting cover is the one of the most ubiquitous limiting factors in grassland bird production across the blackland prairie. Rotational grazing systems are more sustainable for forage production and wildlife populations. Properly implemented rotational grazing creates structural and floral diversity relative to year round grazing and allows rangelands to rest, mimicking historical patterns of disturbance. The bottom line is that over utilization of herbaceous resources through mechanical cutting or non rotational, overstocked grazing has and continues to be a negative factor causing declines of SGCN.</p>
Clearing and loss of important natural sites/habitats	<p>conversion of native grasslands to nonnative “improved” pastures</p> <p>riparian and floodplain clearing for livestock watering access</p> <p>Small impoundments on tributary creeks, streams, springs, seeps to form stock tanks, ponds, private lakes.</p>	<p>See grassland conservation comments under “Invasive Species” above</p> <p>In this region, many sites are cleared to the river or creek margins to allow for livestock watering access, maximum forage production, and/or recreational/viewshed access. Riparian loss is a strong contributor to the decline of riparian and aquatic SGCN (poor water quality, higher water temperatures, more evaporative losses) and land loss due to bank instability.</p> <p>Impoundments: similar to reservoir development on mainstem rivers, negative impacts caused by impoundments on creeks and springs are just at a smaller scale: loss of instream habitats, loss of wetlands, loss of riparian habitats and natural floodways. The replacement value – still deeper water for flowing waters, pond for stream – is not ecologically synonymous. This may be more of an issue in the emerging “urban/suburban” areas.</p>
Lack of soil management and conservation practices	<p>lack of soil conservation (vegetation conservation/restoration) along stream courses (Streamside Management Zones, Streamside Best Management Practices/Buffers)</p> <p>Overgrazing (see above)</p> <p>“Clean Pastures”</p>	<p>Hydrology and streamside vegetation are altered, soil and vegetation is lost in upland areas, water quality is degraded through sediment-laden runoff; dealing with historical and contemporary issues, need, in some instances, different approaches for recovery/restoration</p> <p>Similar to clean farming, clean pastures are a widespread problem for species with long term population declines. This practice looks as if all tall grasses, beneficial bunchgrasses, and every woody species which could provide cover have been removed. Desired ecological condition, even in prairies, has dense diverse woody species in the drainages and deeper swales. A mixture of woody brush, vines, and trees along fencerows, drainages, and scattered around fields is paramount for many SGCN. Streamside management zones, retaining riparian forest, are often not a consideration within cattle and hay pastures. Scattered woody growth provides escape cover, thermal cover, loafing areas, nesting substrates, foraging areas, and display areas for SGCN. Increased structural diversity equals increased wildlife species diversity or a higher return of species per unit area. In times of drought, woody cover may be the only structure available.</p>
Subdivision of larger lands into smaller parcels (“ranchettes”)	<p>Ownership changes in values, approaches to management (not always a detriment to conservation practices)</p> <p>Subdivided lands create many more land management philosophies,</p>	<p>While not all land subdivision is necessarily a negative event for conservation, subdivision typically brings with it very diverse land ownership styles and objectives, increased potential for feral animal and escaped non-native landscaping, additional surface and groundwater demands on regional resources, and loss of habitat for homesite development and “ponds”</p>

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
	approaches in one area	Landowners bring their vision of manicured and “tamed” landscaping to suburban and rural areas, overcutting native prairie, removing brush and woodlands from drainages, clearing fencelines, and installing turf grasses. Typically, these sites also apply fertilizers and herbicides at unspecified rates, causing issues in riparian areas and aquatic habitats from runoff. Forage production is not a consideration in these locations. Most of these sites are too small to qualify for technical assistance or landowner incentives. Outreach, technical guidance and incentive programs have a more difficult time serving this constituency because the effort and resources required are multiplied, but no more service resources (people, time, money) are available. Additionally, it is difficult to provide conservation services that are of value to the ecological needs of the area with many fractured landscapes and objectives. Some tools (e.g. RX fire) and incentive programs are not available for use at smaller scales or cannot be effective to improve conservation values.
Land & Water Mgmt: Municipal	See also Water Development section	This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban impacts to conservation activities and natural resources even outside of these “boundaries” is particularly relevant.
Parkland management	Opens space, park lands, water quality lands, Habitat Conservation Plan preserves and set asides, and recreation lands within or adjacent to urban areas have unique management challenges.	<p>All of these greenspaces within an urban context may have potential to function as stepping stones (woodland mottes) or pathways (riparian areas) during migration; additionally, some of the larger spaces could function as connections between/among natural landscapes outside of the city limits, demonstration areas to connect urban populations with natural area conservation concepts (what prairie is, how we impact it, how it serves that particular population with ecological services, particular regional conservation actions that would benefit specific habitat, species, communities).</p> <p>Parklands throughout the region appear to value trees and nonnative grass installations (e.g. Bermuda) even in low intensity use areas (those sites not used as ball fields, soccer fields, picnic grounds) over tallgrass prairie. See comments under “Invasive Species” above. Areas of tall grasses are perceived as “weedy” and “unkept”, so city practices often discourage the growth of tall grasses; by demonstration, the urban public is disconnected from their native land type and the values those habitats provide.</p> <p>Additionally, natural wetland areas are not valued in these parkland contexts as they are perceived to be mosquito producers.</p>
Lack of Zoning and Planning Sprawl and Conversion	Throughout this and adjacent ecoregions, urban expansion, sprawl, and suburban development into the outlying counties to escape city jurisdictions is an evergrowing issue. Most of this area is part of many of the emerging communities, identified in the Texas State Forest Resources Strategy	<p>Metropolitan Planning Organizations, Councils of Government, Regional Transportation authorities, and other planning entities which encompass emerging and outlying communities rarely consider fish and wildlife resources, rare communities and habitats as part of their constraints process. Additionally, more of a burden is placed on county resources to deal with environmental issues outside of city jurisdictions in many of these areas; however counties rarely have such authority to require stormwater pollution prevention, flood control projects, appropriate road development, conservation of nonjurisdictional wetlands, open space planning, or water or other conservation measures from developers. And, even those authorities which have this ability rarely use it during planning processes to set aside, plan around, or plan to mitigate for areas important to fish and wildlife resources – floodplains and riparian areas (intact and those with restoration potential), prairies and other grasslands, wetlands of all kinds.</p> <p>Urban sprawl, bedroom communities, suburban commuter communities all continue to contribute to prairie loss, woodland clearing, filling non-jurisdictional wetlands, and degradation of instream and stream-adjacent habitats from water quality and quantity impacts. This is not just an issue for fish and wildlife resources, but also for prime farmland and rangeland in these areas.</p> <p>From 1982 to 1997, the conversion of rural land to urban use in Texas was reported to exceed 2.6 million acres. Prior to urban development, these lands had wildlife habitat management and restoration potential. Zoning current agricultural or ranching lands for future commercial or municipal use removes the opportunity to restore these lands to functional habitats and contributes to their disconnection/fragmentation.</p>
Water Demands	<p>Dallas – Fort Worth and emerging areas (Tyler, Temple, Waco)</p> <p>San Antonio and emerging areas</p> <p>Houston</p> <p>See also <i>Groundwater Planning and Distribution</i></p>	<p>These growing metropolitan areas and their outlying emerging communities continue to seek water resources outside of their basins (e.g. see State Water Plan proposed reservoirs): reservoir development, interbasin transfers, groundwater development and pipelines. Reservoirs proposed by communities in this region have adverse consequences to some significant natural resources in other ecoregions (e.g. Neches River, Trinity River, Colorado River, and others).</p> <p>Water costs are related to what ratepayers will pay and not related to the water development impacts – mitigation for resource loss under reservoirs, to groundwater, and to estuaries, is insufficient and rates do not replace ecological values. Locally, urban policies, including HOAs and Neighborhood Associations, are not encouraging conversion to native, drought-tolerant landscaping; irrigating introduced grasses uses high volumes of water.</p> <p>Some of the municipal water sources from approximately San Marcos south in this ecoregion draw from aquifer-sourced freshwater stream resources of the Edwards Plateau. All of San Antonio’s water comes from that source. Because these areas tap the aquifers recharged over the Plateau and surface artesian expressions in the Plateau support rare species with waters also from that same source, these uses are sometimes in conflict. See Edwards Aquifer Recovery Implementation Plan at <a href="http://earip.org/">http://earip.org/</a> for more background</p> <p>See also the WATER sections in this document and in the Statewide handbook</p>
Land & Water Mgmt: Conservation & Recreation		
Restoration Barriers	Lack of locally adapted seed/cultivar sources	Lack of native seed and plant material sources for blackland prairie restoration within the savanna: species adapted to low pH sandier soils need to be made

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		available commercially at affordable prices (e.g. broomsedge where forage is not a consideration, as it is the backbone of good quail and grassland bird habitat in the southeast); species such as splitbeard bluestem, pinehill bluestem or cultivars of the big 4 prairie grasses that are adapted to local ecotypes need to be collected and increased at plant material centers.
Inadequate/Inappropriate Management	Prescribed fire Nonnative Species	This ecoregion intersects three of the five most populous metropolitan areas in Texas. Prescribed fire is difficult to apply in the urban/wildland interface due to public perception, limited resources for outreach, and suspension of recreation services during peak burning periods. See significance of Rx fire to restoration in this region in the comments for "Fire suppression" in Ranch above. Regional conservation service providers do not have enough RX fire certified leaders and teams to provide this as a landowner incentive service, even if the demand could be enhanced  Unlike farming or ranching lands, many conservation lands lack active management. For example, lands enrolled in CRP within the blackland prairie are not burned, grazed, disked, or shredded following BMPs. This lack of disturbance lowers the quality and suitability of the habitat for wildlife. Additionally, recreation lands are typically not primarily managed for conservation and staff are limited in ability/capacity to restore sites, apply management. See also comments in "Invasive Species" and "Municipal" (parklands) above.
Inappropriate Recreational Uses	ORV use in sensitive areas (stream beds, wet soils of all types, drainages)	Water quality degradation, instream habitat loss (substrates disrupted or lost), riparian loss, slope vegetation loss or impact, human disturbance in nesting or roosting areas
Paucity of Conservation Lands	Lack of conservation lands – public or private – for certain habitat types at a meaningful scale, longterm	In this ecoregion, and in the East Central Texas Plains (Post Oak Savanna) adjacent, lack of lands managed for conservation of key habitat types – tall grass prairie, riparian corridors and bottomland hardwoods, wetlands with rare communities – at scale/duration that is meaningful for longterm sustainability and resiliency of these community types
Not all "public" or "managed" lands are "conservation" lands	Recreation at cross purposes with conservation needs	While most public lands in this region are managed for recreation compatible with wildlife and fisheries resources, some improvements could be made to trails and recreation facilities to prevent soil erosion and water quality impacts, vegetation loss (especially near water resources), reduce human disturbance in roosting or breeding areas
Lack of long-range conservation planning and cohesive land conservation/management strategies in each ecoregion	Lack of ecological connectivity between/among existing public and private conservation lands: land and water trusts, NGO preserves and conservation easements, Habitat Conservation Plan lands, wildlife managed lands for conservation, parks and wildlife management areas	While fee-title or easement protections "fenceline to fenceline" are not necessarily needed in this region, largescale conservation benefits could be realized by mapping existing conservation lands and practices, reviewing opportunities to share resources and improve land management through shared guidance, and identifying landowners and sites which could benefit landscape and conservation management connectivity in the long term through landowner incentive programs – riparian, prairie.
Water Development, Management and Distribution	SEE ALSO STATEWIDE HANDBOOK – connectivity between surface and groundwater issues	
Surface Water Planning	This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban impacts to conservation activities and natural resources even outside of these "boundaries" is particularly relevant. There are several issues, one of which is surface water demand, use, development and distribution – all addressed through various water planning processes. Natural resources not well-defined or required as a "constraint" in Regional Water Planning (RWP) processes	Natural resource professionals, both terrestrial and aquatic, are not consistently involved in RWP processes  Large municipalities' demands in this region are affecting surface and groundwater development outside of the region/basin. Regional water planning efforts which include Dallas are looking at reservoir solutions in the adjacent ecoregions. Some of the municipal and irrigation water sources from approximately San Marcos south in this ecoregion draw from aquifer-sourced freshwater stream resources originating on the Edwards Plateau. <b>All</b> of San Antonio's water comes from that source. Because these areas tap the aquifers recharged over the Plateau and surface artesian expressions in the Plateau support rare species with waters also from that same source, these uses are sometimes in conflict. See Edwards Aquifer Recovery Implementation Plan at <a href="http://earip.org/">http://earip.org/</a> for more background  TMDL recommendations need to consider fish and wildlife resources needs as well  Instream flow recommendations need to be stepped out from headwaters to estuaries to influence all regional water planning processes  Overallocation/dewatering and damming of region's principle rivers  See also <i>Reservoir Construction</i> and <i>Groundwater Planning</i> below.

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Reservoir Construction and Operation (ties in with Surface Water Planning above)	<p>Creation of new and modification (expansion) of existing reservoirs; At least five large reservoir sites in this region in the 2007 State Water Plan, all on important regional resource streams; creation of new and modification (expansion) of existing reservoirs</p> <p>Unregulated small stream impoundments on private lands</p> <p>Timing/Periodicity/Intensity of Water Releases releases are unnaturally intense, in the "wrong" season to mimic natural flooding processes, and change water chemistry and sediment load in all areas downstream, to the estuaries</p> <p>Shoreline development - vegetation removal to water's edge for viewshed, recreational access; hardening and armoring banks (bulkheading), on-site septic leakage or non-compliance, development on steep sites.</p> <p>Invasive species</p>	<p>Reservoir construction: Several streams in this region are of high quality (Ecologically Significant); riparian zones (some are ancient gallery forests, rare communities) are important to instream aquatic and stream-adjacent SGCN habitats; ES and high quality riparian are rarely considered during site selection for new reservoirs or operations. These areas support SGCN and rare communities, contribute high quality water to reservoirs and downstream segments. Reservoir construction and operation creates a barrier to SGCN movement, completely inundates important and irreplaceable riparian zones, spring systems, and instream habitats.</p> <p>Impoundments: similar to reservoir development on mainstem rivers, negative impacts caused by impoundments on creeks and springs are just at a smaller scale: loss of instream habitats, loss of wetlands, loss of riparian habitats and natural floodways. The replacement value – still deeper water for flowing waters, pond for stream – is not ecologically synonymous. This may be more of an issue in the emerging “urban/suburban” areas.</p> <p>Unnatural hydrograph from reservoir operations/dam releases scours instream and stream-adjacent habitats, shifts vegetation communities out of sync with other riparian communities where flooding is more "natural", rare communities and instream SGCN (invertebrates and fishes) cannot "rely" on the seasonal changes under which they evolved and decline</p> <p>Shoreline Development: In addition to the loss of instream and riparian habitat following inundation, the now-“riparian” and upland habitats surrounding the lake edge is at risk from development. In this region, these habitats were usually cliff edges, recharge features, upland shrubland, canyonlands – many of these sites support SGCN and rare communities. Regional reservoir managers do not reserve much in the way of “setback” from the inundation pool level in their easements. This allows residential development (water withdrawals and septic installation), bulkheading shorelines, clearing and “landscaping” to the water’s edge. These lakeside activities contribute fertilizers and other chemicals (e.g. boat gas/oil), untreated or poorly treated human waste (some lake authorities actually have permitting programs to manage/reduce this factor, but not all), and sedimentation to the lake, which eventually impacts in-lake and downstream habitats. Typically, residential development in these areas is also a vector for invasive aquatic and terrestrial plants and feral pets. See Invasive species section above.</p>
Flood Control	Changes to natural stream courses to block or convey floodwaters	Levees, bank armoring, culverts all remove instream and stream adjacent habitats, contribute to unnatural sediment and nutrient loading downstream and to estuaries
Groundwater Planning and Distribution	<p>Not all aquifers in the region are addressed by current groundwater conservation districts; in those, the rule of first capture is the “management plan”</p> <p>Groundwater districts in this region are political subdivisions, not aligned necessarily with aquifer boundaries</p> <p>Extraction: groundwater pumping without full accounting for natural resources as a "use"</p>	<p>This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban impacts to conservation activities and natural resources even outside of these “boundaries” is particularly relevant. There are several issues, one of which is groundwater demand, use, development and distribution – all addressed through various water planning processes. Some of the municipal and irrigation water sources from approximately San Marcos south in this ecoregion draw from aquifer-sourced freshwater stream resources originating on the Edwards Plateau. <b>All</b> of San Antonio’s water comes from that source. Because these areas tap the aquifers recharged over the Plateau and surface artesian expressions in the Plateau support rare species with waters also from that same source, these uses are sometimes in conflict. See Edwards Aquifer Recovery Implementation Plan at <a href="http://earip.org/">http://earip.org/</a> for more background</p> <p>Aquifers continue to drop and several segments are unmanaged. In unmanaged areas, groundwater conservation districts would allow management for conservation, preservation, recharging, and prevention of waste of groundwater resources. SGCN and rare communities needs are not addressed in most groundwater management planning efforts. SEE STATEWIDE HANDBOOK FOR MORE DISCUSSION/ACTIONS.</p> <p>Subirrigated, instream and stream-adjacent and isolated habitats which rely on groundwater are adversely affected by dry conditions, some of which are permanently impacted after drought periods; overpumping lowers water table and and changes instream and wetland conditions such as temperature, oxygen availability, and other nutrient and chemical factors on which aquatic life relies</p> <p>In some instances, a significantly low water level can decrease and degrade aquifer recharge capacity ("drying out the sponge " at certain levels within the aquifer can affect the flow quantity and quality into the aquifer from recharge events)</p>
Other Water Source Developments and Technologies	<p>Interbasin Transfers (Surface and Groundwater)</p> <p>Reuse</p> <p>Water Treatment Wetlands</p>	<p>Interbasin transfers are a significant concern with several of the large urban areas in Texas seeking water outside of their basins</p> <p>Water Reuse reduces available water at any particular time (needs to account for instream flows) and can change the chemistry (temperature, oxygen, and other characteristics) from the discharge.</p> <p>While a useful tool and potentially a benefit to some wildlife and fish resources, Water Treatment Wetlands are not typically managed as natural systems (e.g. vegetation homogenous, not natural habitats for local wetland dependent SGCN)</p>
Lack of Information & Resources	One response stated this is an issue, but did not provide additional information	
Many SGCN in this region lack updated status or any information from which to	Without full accounting of species distributions, habitat needs, and range, it is difficult to make accurate management recommendations, apply landowner incentive programs for best	<p><i>Information and Research Needs by SGCN – SEE ACTION SECTION</i></p> <ul style="list-style-type: none"> <li>▪ <i>Black Bear</i> see Black Bear Management Plan 2005-2015 <a href="http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_pl_w7000_1046.pdf">http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_pl_w7000_1046.pdf</a></li> </ul>

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
determine status, recovery, or management	conservation benefit	<ul style="list-style-type: none"> <li>▪ <i>Rafinesque's big-eared bat</i> and <i>Southeastern myotis</i>– determine potential for new roost locations</li> <li>▪ <i>Eastern spotted skunk</i> – survey to determine status</li> <li>▪ <i>Houston Toad</i> – survey in historic range</li> <li>▪ <i>Texas Horned Lizards</i> – identify areas of suitable habitat and survey to determine status in these areas; coordinate with RIFA evaluation/survey to determine impact</li> <li>▪ <i>Amphibian and Reptiles</i>: need status update on all of these, including Timber Rattlesnake, Alligator Snapping Turtle, Softshell turtles.</li> <li>▪ <i>eastern gamagrass-switchgrass-yellow Indiangrass-Maximilian sunflower (G1/G2) and little bluestem-Indiangrass-big bluestem (G1/G2) prairie types</i> – survey and revisit database accounts to ensure data is relevant and up to date.</li> <li>▪ <i>Painted Bunting, Scissor-tailed Flycatcher</i> – large % of global breeding population, need to identify and publish Best Management Practices; also evaluate STF use of urban areas (sink populations? Reasons for expansion into these areas? Management needs?)</li> <li>▪ <i>Bachman's Sparrow</i> – Increase survey efforts along western edge of range to identify boundary and suitable occupied habitat, such as within Red River County</li> <li>▪ Freshwater Mussels – Continue documentation of distribution and status for all SGCN mussels, identify areas where most impacted and by what, craft management plans</li> </ul>
Lack of Processing <i>Existing Data</i>	Where census, survey, records and collections are documented, this information is frequently not forwarded to centralized collection databases (Texas Natural Diversity Database, Texas Natural History Database, Texas Fishes databases) OR if it is forwarded to these entities, there are inadequate staff or other resources to enter the data in a timely way.	<p>Species and rare communities information is key to be able to detect trends and causes for upward or downward shifts.</p> <p>Without this information, it is difficult to focus or prioritize management objectives or share information with private landowners about the importance of some sites, populations or communities. Sharing this information with landowners is crucial as most of Texas is privately owned and conservation must occur with their stewardship help.</p> <p>If we don't know where important priorities lie, we cannot effectively use the resources we have to reverse downward trends, recover and delist species, and ensure that we are making conservation progress.</p>
Best Management Practices	Best Management Practices need to be regularly reviewed and updated; more effectively distributed to targeted audiences who can implement them in crucial areas	In this region, primarily riparian and streamside buffer zones, wetland and wetsoil, and stormwater pollution prevention BMPs need review and distribution
Urban information about natural resources benefits	This ecoregion intersects three of the five most populous metropolitan areas in Texas. Urban/suburban impacts to conservation activities and natural resources even outside of these "boundaries" is particularly relevant. Outreach and education efforts in some instances are not targeted to particular urban audiences to <u>effectively</u> make a difference in regional conservation issues.	<p>See also Land and Water Management – Municipal and Actions proposed for Urban Planning efforts.</p> <p>Urban audiences in this region need specific programs about the value and natural heritage of native prairies and grasslands, drainages and floodplains, aquifers and surface water quality and quantity, stormwater pollution prevention, and impacts outside of this region's water planning efforts on other areas ("walk a mile in their shoes").</p>
Inadequate Policies, Rules, Enforcement		
Voluntary Mitigation	Little guidance or incentive exists for voluntary mitigation of important, unregulated resources	Prairies/grasslands, isolated wetlands, riparian zones and drainages do not require mitigation in most instances; however, these are crucial habitats to SGCN and rare communities in this region. Guidelines and encouragement to use them are needed in advance planning stages of all development projects.
Ineffectual Mitigation	Mitigation can be haphazard and an afterthought, rather than part of the advance planning process	Piecemeal mitigation and mitigation after development has made impacts is ineffectual for ecological restitution. It would be helpful to have large areas identified where mitigation dollars would best be spent to offset particular types of impacts in the region: wetlands, water diversions, prairie loss, riparian loss. A network of potential areas in a north-south trajectory in the region may be most helpful to create "stepping stone" prairie connectivity, but sites should be large enough to function sustainably. Mitigation banking could be another type of landowner incentive.
Wildlife Tax Valuation	Lack of regionally specific guidance template	A continuing trend is the growing number of new to the land, absentee landowners purchasing small acreage for recreation within the blackland prairie ecoregion. Many of the landowners are converting from primarily Ag use under the 1-D-1 Open Space Tax Valuation to primarily Wildlife Use. Requirements for converting to Wildlife Tax Valuation include the implementation of a wildlife management plan that includes at least 3 out of 7 management practices. TPWD endorsed regionally specific guidance would be helpful as a starting point. The department should consider developing Wildlife Tax Valuation plans tailored to each ecoregion's priority actions.
Non-jurisdictional Wetlands	Loss of and impact to "non-jurisdictional" wetlands and jurisdictional wetlands on non-federal, non-state lands and projects (lack of awareness, no regulatory nexus or enforcement opportunity for	private lake/stock pond construction, control structures, fill and conversion for agriculture and other development, mining: bogs, seeps, marshes, forested wetlands, and other intermittent and perennial waterways affected;



General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
	protection on these sites)	
Sand and gravel mining	Lack of stormwater pollution prevention Lack of reclamation	lack of reclamation; permitting process does not adequately allow environmental review to require avoidance, minimization or mitigation of impacts to instream and stream-adjacent habitats (riparian, sand hills, and uplands); mining off of water courses do not go through TPWD review for potential natural resources impacts. Not all are required to have stormwater pollution prevention facilities or plans (acreage threshold)
Lignite and other surface mining in the region	Lack of Reclamation appropriate to the desired ecological condition of the site	lack of reclamation or reclamation that does not require native seed and plant materials in context with desired ecological condition; permitting process does not adequately allow environmental review to require avoidance, minimization or mitigation of impacts to instream and stream-adjacent habitats (riparian, sand hills, and uplands); Not all are required to have stormwater pollution prevention facilities or plans (acreage threshold)
Other Cross-Cutting Issues		
Climate Change	isolated habitats are more at risk than others: wetlands, grasslands Riparian habitats and instream habitats may also be at risk	See CLIMATE CHANGE SECTION in Statewide handbook Climate change models, GIS analysis of land conversion and change overtime, species specific information, community-specific information all needed Even without regionally specific models, other predictive models have shown that grasslands and wetlands may experience significant shifts in vegetation communities which would affect all SGCN dependent on these already-diminished habitat types.
Economics	Working Lands	See Statewide Handbook for more discussion on this issue Landowner incentives cannot compete currently with market forces; market forces in some areas do not support large acreage ownership without intensive use

## CONSERVATION ACTIONS

*“Like the resource it seeks to protect, wildlife conservation must be dynamic, changing as conditions change, seeking always to become more effective.” – Rachel Carson*

To make conservation progress, we need to work with the information we have, document our progress, share lessons learned, and adapt our approach when necessary. Conservation actions in this handbook are aimed at reducing the negative effects of issues that affect SGCN, rare communities and their habitats at various scales. Broad actions categories are defined to help organize handbooks. For information about how the Actions framework was developed and for definitions of Action categories, see the *Overview Handbook*.<sup>18</sup>

Actions proposed for the TBPR ecoregion (Table 5) state what we need to work on, where, and why (what problem we can solve with that action). Actions lay out how that work contributes to a specific desired effect –progress and success.

It is important to acknowledge that one conservation action typically does not solve one conservation problem. There may be several actions employed over time to achieve a conservation goal. In some instances, defining the conservation goal *is* the action – for some things, we don’t yet know enough to define what successful conservation looks like for that SGCN population, rare community, or habitat.

It has become increasingly important to determine if the work we do is actually leading to the overall conservation outcomes we desire – **restoration, recovery, sustainability, and resiliency**. As conservation practitioners, we can use milestones (or intermediate results) and reporting to communicate our progress and leverage future conservation action, partnerships, policy changes, and funding.

From project inception, well-crafted monitoring and evaluation (cost effective, answers key questions) informs management and allows conservation practitioners to “course-correct” as necessary for effective conservation.<sup>19</sup> With the need for Action Plans to take advantage of several “pots of conservation money,” the people we serve and those who govern private and public conservation funds demand reporting, transparency, and *demonstration* that projects are *positively impacting the conservation of species and habitats*. To get beyond reporting that money was spent and projects were done, AFWA TWW convened a committee in 2009 to craft “effectiveness measures” for the conservation actions across all Plans. A toolkit for classifying and measuring conservation action effectiveness was produced in 2011, approved by AFWA TWW Executive Committee comprised of state

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<sup>18</sup> TPWD. 2011. Texas Conservation Action Plan: Broad Action Category Definitions.

[http://www.tpwd.state.tx.us/landwater/land/tcap/documents/action\\_categories\\_tcap\\_2011.pdf](http://www.tpwd.state.tx.us/landwater/land/tcap/documents/action_categories_tcap_2011.pdf)

The category “*Data Collection, Analysis, and Management*” meets Action Plan Required Element 3 – “priority research and survey”. Many of the proposed actions include a monitoring component (Action Plan Required Element 5) and all actions are encouraged to follow the Effectiveness Measures to assist with adaptive management.

<sup>19</sup> Conservation Measures Partnership. 2010. [http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP\\_Open\\_Standards\\_Version\\_2.0.pdf](http://www.conservationmeasures.org/wp-content/uploads/2010/04/CMP_Open_Standards_Version_2.0.pdf)

Salzer, D. and N. Salafsky. 2006. Allocating resources between taking action, assessing status, and measuring effectiveness of conservation actions. *Natural Areas Journal* 26(3): 310-316.

fish and wildlife agency directors and others.<sup>20</sup> These measures will be an important part of moving the plans and conservation forward.

With this revision, the TCAP becomes more involved in a national movement to track conservation actions and progress across local, state, regional and national levels. As with the 2005 Plan, actions presented in this edition vary in detail, scale, and duration; however, this edition encourages the use of the incremental measures of success for conservation projects' development, implementation, and tracking. To that end, the toolkit in *Measuring the Effectiveness of State Wildlife Grants*<sup>21</sup> is **strongly recommended** to define conservation projects, target audiences and partners, identify desired step-wise intermediate results, and collect the “right” data to report our conservation achievements.

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<sup>20</sup> Association of Fish and Wildlife Agencies Teaming with Wildlife. Measuring the Effectiveness of State Wildlife Grants (conservation actions). 2011. <http://www.fishwildlife.org/files/TWW-Effectiveness-Measures-FULL-Report-Appendices.pdf>

<sup>21</sup> Same as above

**Table 5. TBPR Conservation Actions**

Note: Table is formatted 11" x 17", landscape orientation – SEE ALL OF THE EFFECTIVENESS MEASURES FOR EACH OF THE OVERALL ACTIONS TO ESTABLISH FINER DETAIL IN PROJECT IMPLEMENTATION

Conservation Action
Invasive Species
Work with private landowners and conservation partners to minimize feral hog populations through hunting and trapping (aerial shooting is not a good technique in this area given the amount of closed canopy). Provide technical guidance and educational programs about the impact and management of feral hogs to benefit ground nesting birds, small mammals, aquatic species. Evaluate technical guidance programs with effectiveness measures.
Promote the use of native grasses in landowner incentive programs for wildlife and fish resource improvement (e.g. Farm Bill, SWG, LIP, and others). Sod-forming exotic grasses and cultivars should not be used in any restoration project, much less those with state or federal dollars, as these are known to be detrimental to native habitats and the wildlife on which they depend. A restoration guide to suitable native grasses for this ecoregion, local sources for native seed and stock, and techniques would be immensely useful to a wide variety of conservation service providers, landowners, and recreation land operators. Promote conversion of nonnative grasses to site appropriate desired ecological conditions especially on lands adjacent to sites already managing for conservation objectives (land trust properties, WMAs, State Parks, some Wildlife Cooperatives and Wildlife Management Plan holders, preserves, sanctuaries, etc.).
Conservation practice providers need to identify a suite of plant species for each priority habitat type which can be promoted with one voice to plant materials centers and commercial distributors. Engage Master Naturalists, Native Plants Society of Texas, Native Prairies Association, land trust and NGO volunteers in coordinated/targeted seed and material collection. Assess success of these programs and the use and success of the materials over time to determine if this is an effective approach or whether on-site or nearby collection on a project-by-project basis is more effective (conservation and costs).
Provide workshops for landscape design and installation service providers, local and "big box" nurseries' producers and buyers, city planning boards for landscaping, managers for urban parks and recreation sites, Home Owners Associations, Texas Master Gardener classes, and garden clubs:  <i>in areas upstream and adjacent to high priority streams and water courses, conservation projects and wildlands</i> to deter the promotion or use of Chinese tallow, Chinaberry, Tree of heaven, Japanese honeysuckle, and state-prohibited species. Encourage these plant users to adopt a stream segment for nonnative plant removal and restoration under the guidance of a local ecologist. Follow the outreach effectiveness measures to determine if the workshops are successful in targeted areas to slow or prevent the spread of these very detrimental invaders  <i>in areas with a high concentration of oak wilt or oak decline vulnerable species and a lot of tree trimming activity</i> (urban areas, parklands) to deter the inappropriate timing or disposal of oak trimming to slow/prevent the spread of this disease. Document areas of oak wilt or oak decline with the Texas Forest Service to help them concentrate their outreach and incentive programs on this front (see also <i>Power Development</i> below)
Provide site appropriate brush removal advice and project implementation to restore native grasslands and savanna, retain intact riparian areas, and protect wetlands and outcrop features. Promote use of site-appropriate methods – herbicides or mechanical – to preserve water quality and prevent soil erosion and invasive grass colonization. Document and share site-appropriate restoration and maintenance plans for the benefit of other conservation practitioners – document what works and what does not in specific site types. In some instances, grassland/prairie restoration through brush control in native to mostly native sites is more economical than non-native pasture grass removal and reseeding. Use the effectiveness measures for Direct Management (Stewardship) to assess the efficacy and benefits to SGCN and rare communities.
Intensify outreach and public education efforts especially near boat ramps and high-traffic fishing tournament areas to reduce or prevent the introduction of aquatic invasives – plants, mollusks and baitfishes. Highly isolated and vulnerable aquatic SGCN in this region would be severely threatened (more so than they are currently) by such introductions. Identify effectiveness measures for this outreach effort and document progress.
Target outreach for red imported fire ant (RIFA) proper identification (not confused with other beneficial ant species) and control in conjunction with other habitat restoration recommendations, especially where grassland bird, native prairie, amphibians and smaller ground-dwelling SGCN are the conservation targets.
Pests, Parasites, Pathogens
See oak wilt actions in Invasive Species, Power Development and Transmission, and Transportation sections
Power Development and Transmission
In areas with a high concentration of oak wilt or oak decline, vulnerable species and/or a lot of tree trimming activity (e.g. ROW) deter the inappropriate timing or disposal of oak trimmings to slow/prevent the spread of this disease. Follow Texas Forest Service Guidelines for tree trimming timing, cut treatment, equipment protocols and trimming disposal. Avoid the use of brush-hogging vertically to trim back ROW edges. Document areas of oak wilt, oak decline with the Texas Forest Service to help them concentrate their outreach and incentive programs on this front
Work with Transmission Line and Distribution Line ROW developers and maintenance plans to promote: <ul style="list-style-type: none"> <li>• use of native grasses and avoidance of all wet areas</li> <li>• stream and wetland buffers of existing native vegetation</li> <li>• active eradication of non-native species</li> <li>• conservation of riparian areas, all wetlands and wet areas</li> <li>• seasonally-sensitive maintenance to avoid impacts to ground-nesting and migratory birds</li> </ul> Where possible, emphasize restoration of the desired ecological condition after construction.
Oil and Natural Gas Production and Delivery (see also <i>Lack of Information</i> section below)

Conservation Action
<p>Work with oil and gas ROW developers and maintenance plans to promote:</p> <ul style="list-style-type: none"> <li>• use of native grasses and avoidance of all wet areas</li> <li>• stream and wetland buffers of existing native vegetation</li> <li>• active eradication of non-native species</li> <li>• conservation of riparian areas, all wetlands and wet areas</li> <li>• seasonally-sensitive maintenance to avoid impacts to ground-nesting and migratory birds</li> </ul> <p>Where possible, emphasize restoration of the desired ecological condition after construction.</p>
Mining
<p>Work with mining operations developers, maintenance plans, and remediation contractors to promote:</p> <ul style="list-style-type: none"> <li>• use of native grasses and avoidance of all wet areas</li> <li>• stream and wetland buffers of existing native vegetation</li> <li>• active eradication of non-native species</li> <li>• conservation of riparian areas, all wetlands and wet areas</li> <li>• seasonally-sensitive maintenance to avoid impacts to ground-nesting and migratory birds</li> </ul> <p>Emphasize restoration of the desired ecological condition in remediation efforts.</p>
Transportation
<p>In areas with a high concentration of oak wilt or oak decline, vulnerable species and/or a lot of tree trimming activity (e.g. ROW) deter the inappropriate timing or disposal of oak trimmings to slow/prevent the spread of this disease. Follow Texas Forest Service Guidelines for tree trimming timing, cut treatment, equipment protocols and trimming disposal. Avoid the use of brush-hogging vertically to trim back ROW edges. Document areas of oak wilt or oak decline with the Texas Forest Service to help them concentrate their outreach and incentive programs on this front</p>
<p>Provide TXDOT with native grass species lists, seed sources and restoration technique guides to encourage use of natives in ROW remediation following construction and restoration if the opportunities for conversion arise. Native grasses have improved drought tolerance and are adapted to Texas' soils and climates. Economic analysis comparing introduced grass to native grass in a commercial cow-calf production system has estimated greater returns for native grasses when fertilizer costs are \$40- 50 per acre. Native grass seeding also requires less water inputs which would reduce remediation costs.</p>
<p>Provide outreach to landowners adjacent to TXDOT ROW in areas where TXDOT has implemented native restoration (native grasses used) or conservation (rare plant protection plans, maintenance plans to protect rare communities or features) to support SGCN recovery or protection to further understanding of these important resources and their site-appropriate management, reduce landowner maintenance in these areas, and promote SGCN recovery. Use outreach effectiveness measures to document progress.</p>
<p>Identify specific areas for TXDOT Districts, county road managers, power delivery providers, and oil/gas pipeline managers to improve right-of way (ROW) restoration and management:</p> <ul style="list-style-type: none"> <li>▪ Post construction, restore sites with native seed sources and materials</li> <li>▪ Remove invasive species and restore tallgrasses on existing ROW</li> <li>▪ Terms of easement need to include native prairie restoration and management (landowner cannot convert these areas to nonnative grasses for grazing)</li> <li>▪ On roadways, enforce public right of way (prevention of private maintenance, overmowing, clearing)</li> <li>▪ When mowing along roadways, mow approximately 15 feet from the shoulder within undeveloped areas</li> <li>▪ In areas beyond 15 feet and on ROW through rural lands (Tlines, distribution lines, pipelines), do not mow between April and October in order to allow ground nesting birds to produce and native prairie plants to seed out.; mow on a 4-year cycle at an 8-inch height (if roadway, both sides of the road are not mowed in the same year, saves significant dollars for mowing costs and reduces accidents).</li> <li>▪ Provide interpretive signage re these practices and outreach to neighboring properties so this can serve as a demonstration.</li> <li>▪ Identify monitoring sites which can serve as mitigation as long as information is shared through a public database and conservation practice networks.</li> </ul>
Land & Water Mgmt: FARM
<p>A North Carolina State University study of linear and block field borders on 24 farms found that quail populations almost doubled on farms where 2-3 percent of the cropland edge was allowed to go fallow. It also found that blocks of fallow habitat (one quarter acre to 6 acres in size) produced twice the number of quail as narrow (10-foot) linear field borders. While this study targeted quail production, other SGCN grassland birds, small mammals, reptiles, some plants and insects would also benefit from these practices:</p> <ul style="list-style-type: none"> <li>• Leave brushy or grassy borders around fields. These borders can help with erosion and if left un-mowed can provide nesting areas</li> <li>• Leave jagged edges on fields. Fields with straight edges appear to provide less habitat</li> <li>• Preserve or restore woody draws (cover in draws will re-establish naturally if left unplowed or un-mowed; invasive nonnative plants should be removed).</li> <li>• Alternating crops in the same field is an excellent way to reduce erosion and build soil fertility. Planting row crops followed by wheat or other small grains the next year provides habitat diversity for quail. Planting legumes or grass every third or fourth year is a good rotation for soil conservation and SGCN.</li> <li>• Remove dense sod-forming monoculture grasses. Thick mats of grass hinder movement and make feeding difficult. Native warm-season grasses, properly managed, provide cover and food. Mixing legumes with grasses improves habitat for young quail.</li> </ul>

Conservation Action
Farmland “rest” incentives should promote the installation of native grasses and forbs which are more beneficial to SGCN in this region. Where possible, especially if adjacent to currently managed conservation lands, more permanent conservation options should be incentivized and documented.
Land & Water Mgmt: RANCH
Promote the use of native grasses in landowner incentive programs for wildlife and fish resource improvement (e.g. Farm Bill, SWG, LIP, and others). Sod-forming exotic grasses and cultivars should not be used in any restoration or improvement project as these are known to be detrimental to native habitats and the wildlife on which they depend. Properly managed native grasses do not require annual fertilization; highly palatable native grasses (i.e. Yellow Indiangrass, Little Bluestem, Big Bluestem, Switchgrass, and Eastern Gammagrass) provide high protein levels required for livestock and hay production. These factors make native grasses a sustainable option for Texas’ rangeland and SGCN benefits. Native grasses have improved drought tolerance and are adapted to Texas’ soils and climates. Economic analysis comparing introduced grass to native grass in a commercial cow-calf production system has estimated greater returns for native grasses when fertilizer costs are \$40- 50 per acre. In addition to terrestrial and aquatic wildlife benefits, pasture conversion back to native grasslands reap public benefits through improved water quality, groundwater recharge, carbon sequestration, erosion control, outdoor education, and recreational opportunities. A restoration guide to suitable native grasses for this ecoregion, local sources for native seed and stock, and techniques would be immensely useful to a wide variety of conservation service providers, landowners, and recreation land operators. Promote conversion of nonnative grasses to site appropriate desired ecological conditions especially on lands adjacent to sites already managing for conservation objectives (land trust properties, WMAs, State Parks, some Wildlife Cooperatives and Wildlife Management Plan holders, preserves, etc.).
Control native brush invasion, where these species should not naturally occur or in abundances that are out of balance within the native communities, degrades grassland suitability and hardwood regeneration potential. Most of these “infestations” can be controlled by a restoration plan including prescribed fire or some kind of mechanical/chemical brush treatment, then a maintenance plan to mimic natural processes if the sites are large enough to function as a system on their own.
Provide site appropriate brush removal advice and project implementation to restore native grasslands and savanna, retain intact riparian areas, and protect wetlands and outcrop features. Promote use of site-appropriate methods – herbicides or mechanical – to preserve water quality and prevent soil erosion and invasive grass colonization. Document and share site-appropriate restoration and maintenance plans for the benefit of other conservation practitioners – document what works and what does not in specific site types. In some instances, prairie restoration to control brush is more economical than non-native pasture conversion back to native grasses. Use the effectiveness measures for Direct Management (Stewardship) to assess the efficacy and benefits to SGCN and rare communities.
Conservation assistance programs (Farm Bill Conservation Title, USFWS Partners Program, Grazing Lands Conservation Initiative, TPWD Landowner Incentive Program) to private landowners are one of our best tools to engage working lands, active stewardship, and best practices for SGCN and rare communities improvement and resiliency. Some criteria and/or targeted actions are recommended in this region: <ul style="list-style-type: none"> <li>▪ Improve agricultural field borders and farming practices to benefit grassland wildlife, soil and water resources – retain perennial bunchgrasses, forbs and woody fencerows;</li> <li>▪ reduce “clean farming” and “clean pasture” practices with alternative management to benefit migratory birds and pollinators, retain fallow areas, islands and edges of native vegetation;</li> <li>▪ encourage (or require if receiving state or federal funds) streamside management zones</li> <li>▪ where adjacent to natural areas or native prairie, provide technical guidance on less toxic methods to control pests, weeds</li> <li>▪ incorporate SGCN fish and wildlife habitat values and recommendations in rotational grazing system recommendations (Grazing Lands Conservation Initiative)</li> <li>▪ Work with NRCS to locate CRP and CP-33 cooperators that are due for mid-management practices to which could be identified for dove leases</li> </ul> See recommendation about market analysis
Landowner Incentive and Education Priorities: <ul style="list-style-type: none"> <li>▪ Identify key areas for the restoration and protection of blackland prairie (e.g. see priority areas for northern bobwhites and other grassland birds have been identified by biologist working in the blackland prairie at <a href="http://www.bringbackbobwhites.org/">http://www.bringbackbobwhites.org/</a>), riparian buffers and streamside management zones, water quality with the greatest potential for longterm ecological desired condition, connectivity to best managed areas, and connectivity in a network of managed lands (public and private) throughout the region (these are areas for your target audiences)</li> <li>▪ Conservation easements – specify management (prescribed burn every 2-3 years, rotational grazing, patch burn grazing, field borders, streamside management zone protection, or share cropping) and monitoring targets/frequency/reporting</li> <li>▪ Prescribed fire or brush management – large sites or cooperatives with willingness to commit to appropriate term management (one burn without followup wastes resources)</li> <li>▪ Management Plans – in addition to landowner objectives, review opportunities for SGCN and rare community habitat conservation; data collection; and monitoring (see effectiveness comments)</li> <li>▪ Riparian Conservation and Restoration – Ecologically Significant Stream Segments to their headwaters, streams and rivers with groundwater interconnectivity, undammed stretches with direct contribution to estuaries</li> <li>▪ Other conservation instruments – Safe Harbor Agreements, Candidate Conservation Agreements, others – to dispel myths about regulatory constraints. Showcase specific studies and examples from the region (or adjacent ecoregions) for better relationship building. Document through conservation practice and partner surveys over the course of three to five years whether the workshops increase opportunities for these tools to be used and the SPECIFIC barriers to their use</li> <li>▪ Urban/suburban landowners – specific programs which can connect urban users of resources to native wildland resource conservation efforts outside of urban areas to maximize conservation benefits; if in schools, create curricula for others to deliver.</li> </ul> Monitoring of key species (to be identified) must be a part of these projects. Information about methods, short and longterm success (or failure) need to be shared through conservation networks.
Host local and absentee landowner workshop series related to SGCN and habitat “target areas” (see Effectiveness Measures for training and technical guidance), add a focus module on conservation instruments – Safe Harbor Agreements, Candidate Conservation Agreements, conservation easements – to dispel myths about regulatory constraints and promote benefits in preventing the need to list and promoting recovery. Showcase specific studies and examples from the region (or adjacent ecoregions) for better relationship building. Document through conservation practice and partner surveys over the course of three to five years whether the workshops increase opportunities for these tools to be used and the SPECIFIC barriers to their use. Share lessons learned in an annual conference through the Land Trust community.
Land & Water Mgmt: Municipal
Focus outreach to core urban (Dallas to San Antonio) Metropolitan Planning Organizations, Councils of Government, Regional Transportation authorities, and other planning entities which encompass emerging and outlying communities to address consideration of SGCN, rare communities and habitats (primarily native tallgrass prairies, riparian areas to floodplain extents and all wetland features) as part of their first-round constraints process in development, zoning, and permitting. Support counties authority to require

Conservation Action
stormwater pollution prevention, floodplain buyouts, appropriate road development, conservation of nonjurisdictional wetlands, open space planning, or water or other conservation measures from developers.
Encourage remediation and open space sites to focus on native grasslands restoration. More public grasslands, especially those in urban “demonstration” areas at a large enough scale to be ecologically viable should be promoted.
<p>Conservation service providers and ecologists need to engage with urban biologists to convey conservation needs and priorities to urban planning efforts through Metropolitan Planning Organizations, Councils of Government, Regional Transportation Authorities, Parks Boards, Counties, and others in current and emerging urban areas. Every conservation organization cannot attend every meeting (see the recommendations above about surface and groundwater advisory roles). Key issues may be:</p> <ul style="list-style-type: none"> <li>▪ Park and open space planning for habitat connectivity (daily and seasonal movements), riparian and streamside protection, water quality protection, floodplain set asides, mitigation banks for in-jurisdiction projects</li> <li>▪ Water quality protection through stormwater pollution prevention plans and facilities even where not required by regulation, leaving natural floodways intact rather than armoring</li> <li>▪ Prairie conservation and mowing practices</li> <li>▪ Water conservation practices</li> <li>▪ Invasive species prevention and removal in public land, rights of way, planned developments (e.g. encourage native plant use in new housing areas, incentives for landscape conversion to natives especially in areas near waterways)</li> <li>▪ Collaboration with counties for environmental protections (stormwater, invasive species, reclamation, dumping, other?)</li> <li>▪ Tax incentives or disincentives for open land conversion, restoration, conservation planning</li> </ul> <p>Identify sources of volunteers and/or funding which could help municipalities employ conservation practices.</p> <p>As with any outreach program, these efforts need to have reporting objectives and monitoring of sorts to determine effectiveness, share lessons learned and hone approaches for future and emerging areas which will be experiencing these issues in the future.</p>
Land & Water Mgmt: Conservation & Recreation
This ecoregion lacks ecologically sustainable, publicly accessible, functional native grasslands “connected” throughout the region. While fenceline to fenceline connections are not feasible, large grassland conservation and restoration sites are needed to form a series of tallgrass prairie and rare wetland sites for imperiled grassland birds and rare wetland communities. This is a highly imperiled habitat type and permanent conservation lands are desperately needed. While sites do not need to be publicly owned, consistent conservation plans and management are needed for highest ecological function and longterm recovery/resiliency. Grassland bird conservation should be a higher priority on public grasslands with multiple uses.
<p>Work with Texas land trusts and other public and private lands partners (e.g. North Texas Prairie Coalition) to identify blackland prairie priority conservation areas for long-term rotating and/or perpetual conservation that have high native prairie species diversity, are large functional blocks which could be networked for system function, could serve as a seed source for local restoration projects, are adjacent to existing managed conservation lands (e.g. The Nature Conservancy’s (TNC) Clymer Meadow Preserve, TNC’s Tridens Prairie, TPWD’s Cooper WMA, TNC’s Mathews Prairie, City of Paris’ Gambill’s Goose Refuge, Peters Prairie in Collin County, Lehman’s Prairie, Wieting Prairie, Drews Prairie, TNC Lindhart Prairie, Camp Maxey, Simpson Prairie, or Smiley-Woodfin). Restoration sites on agricultural lands need to be identified and networked to existing conservation lands to enhance the sustainability of the restoration and the resiliency of the intact prairies. Given the regional growth and pace of development, conservation easements need to be high priority; area from Camp Maxey alongside the western edge of Paris and traveling east toward the TNC Clymer Meadow Preserve as a priority for conservation because many remnants already under conservation are present and use by SGCN birds is documented.</p> <p>High priority bird species conservation goals using Oaks and Prairies BCR information on current population estimates, percent global population, research on area sensitivity or acreage required for minimum viable populations, daily metabolic requirements for breeding and wintering species, ranges of seed/insect (kilocalorie etc.) production per acre made available from various prairie types, generation of grassland bird use days (similar to duck use days), land use changes over time, and population trend data is our best first estimate for a conservation acreage target; starting point: 240,000 acres per year for the next 10 years).</p> <p>Regional conservation targets: eastern gamagrass-switchgrass-yellow Indiangrass-Maximilian sunflower (G1/G2) and little bluestem-Indiangrass-big bluestem (G1/G2) prairie types, which would support Eastern Meadowlark (High, G5,S5), Henslow’s Sparrow (High, G4, S2/3), Northern Bobwhite (High, G5, S4), Northern Harrier (High, G5,S4), Loggerhead shrike (Medium G5,S4), Painted Bunting (Medium G5, S4), Dickcissel (Low, G5, S4), Grasshopper Sparrow (Low, G5, S3), Lark Sparrow (Low, G5, S4), Scissor-tailed Flycatcher (Low, G5, S3), Sedge Wren (Low, G5, S4), Bachman’s Sparrow (High, G3, S3), Field Sparrow (Low, G5, S5), Cassin’s Sparrow (Medium, G5, S4), Rufous-crowned Sparrow (Low, G5, S4), Bell’s vireo (Low, G5, S3), Black-capped Vireo (High, G2G3, S2, FE, SE), Bewick’s Wren (Medium, G5, S5), Eastern Spotted Skunk (Medium, G4T, S4 ), Texas Horned Lizard (High, G4, S4, ST), Western Slender Glass Lizard, and Ornate Box Turtle (High, G5,S5).</p> <p>Other criteria may be for geographical locations within 1 hour of urban hours so they could serve as locations for education, outreach or demonstration. See urban recommendations.</p>
Establish a regional <i>public lands</i> management experience cooperative to identify restoration needs and sites, invasive species removal priorities, trail development and recreation planning improvement, and management practice improvement opportunities. Work together to pursue restoration funding and volunteers to share (e.g. burn teams, burn trailers/equipment, trail teams, riparian restoration teams, go in together on equipment and/or plant materials, schedule) among priority projects to benefit SGCN and rare communities, improve water quality, and provide demonstration areas for public and private landowner outreach. <i>See also public lands management recommendations in the Statewide Handbook.</i>
Water Development, Management and Distribution



## Conservation Action

See <http://www.twdb.state.tx.us/wrpi/rwp/map.asp> for a current map of Regional Water Planning Groups that intersect this ecoregion.

Surface water management is a key issue in this ecoregion, which covers many municipalities and watersheds, feeding many of our coastal estuaries. Identify a coalition or natural resources advisory group of terrestrial and aquatic ecologists across natural resources management entities for the ecoregion by basin. Craft SPECIFIC recommendations based on available science and regionally specific information about terrestrial and aquatic concerns, groundwater – surface water connections and environmental flow needs for fish and wildlife (including estuarine health), sensitive and unique areas to avoid reservoir development, opportunities for water quality improvement (see TMDL recommendation) to conserve SGCN and rare communities and priority habitats related to surface water management. Support the conversion or transfer of existing unused water rights to the Texas Water Trust to protect instream uses. Develop a means to aid in funding the transfer of unused water rights to TWT. Study current water use and rates paid in large urban areas, versus the cost of longterm ecological loss from reservoirs or other water development projects. Convey the findings to regional surface water planning groups and make recommendations for changes to accommodate realistic mitigation. Water usage rates should have incremental cost increases to curb waste of water resources. Additional recommendations for accurate and complete water accounting would be useful for all planning processes. Given small budgets for time and travel, elect a spokesperson (or rotating spokesperson) to attend and participate in Regional Surface Water Planning meetings and convey the group's recommendations.

See <http://www.twdb.state.tx.us/gwrd/gcd/gcdhome.htm> for a current map of Groundwater Planning Districts that intersect this ecoregion

Groundwater management is a key issue in this ecoregion, which covers many municipalities and watersheds, related to surface waters which contribute to our coastal estuaries.

Support the establishment of groundwater conservation district(s) that align most closely with the aquifer boundaries and use areas in and out of these basins to support management for conservation, preservation, recharging, and prevention of waste of groundwater resources. Continue to support and contribute to the processes and outcomes of the Edwards Aquifer Regional Implementation Plan which affects environmental water flows upstream of and through in this region. See the following reports (and subsequent reports, processes that are currently evolving in 2011: <http://earip.org/EcoRest/12-11-09%20Ecosystem%20Restoration%20Subcommittee%20Report%20Final.pdf> and <http://earip.org/EcoRest/12-11-09%20San%20Marcos%20River%20Restoration%20Options%20Report.pdf>

Identify a coalition or natural resources advisory group of terrestrial and aquatic ecologists across natural resources management entities for the ecoregion by aquifer. Craft SPECIFIC recommendations based on available science and regionally specific information about terrestrial and aquatic concerns, groundwater-surface water connection for environmental flow needs for fish and wildlife (including estuarine health), sensitive and unique areas which may be adversely affected by groundwater withdrawals to conserve SGCN and rare communities and priority habitats related to groundwater management. Additional recommendations for accurate and complete water accounting would be useful for all planning processes. Given small budgets for time and travel, elect a spokesperson (or rotating spokesperson) to attend and participate in Regional Surface Water Planning meetings and convey the group's recommendations. Evaluate the effectiveness of this activity and share lessons learned in other regions which could benefit from this experience..

### Lack of Information & Resources

Little is documented in scientific publications about the potential or specific effects of "fracking" on surface or groundwater resources, although this is a fast-growing area of concern. More published information is needed, specifically about the effects to SGCN aquatic resources dependent on groundwater, springs and seeps, and wetlands in this area. From that information, collaborative work is needed among ecologists and extraction companies to prevent and minimize the adverse effects to habitats and SGCN which depend on them. Documentation is key.

Conservation practice providers need to identify a suite of native plant species for each priority habitat type which can be promoted with one voice to plant materials centers and commercial distributors. Engage Master Naturalists, Native Plants Society of Texas, Native Prairies Association, land trust and NGO volunteers in coordinated/targeted seed and material collection. Assess success of these programs and the use and success of the materials over time to determine if this is an effective approach or whether on-site or nearby collection on a project-by-project basis is more effective (conservation and costs).

Form multi-partner working group(s) to establish scientifically sound best management practices for **prescribed fire application** for the ecoregion (timing/season, period/duration, intensity, parameters for RX) for the restoration of prairie grasslands

Work with Rx fire technical experts and SGCN/rare communities experts to identify concerns, barriers, and solutions. Explore the barriers to applying this tool on private lands and make recommendations to overcome these barriers (policy? Targeted outreach? Technical workshops? Where are the most important areas, audiences?).

Review existing successful practices: The Western Navarro County Bobwhite Quail Restoration Initiative and Red River County Eastern Turkey Coop are both models for deployment of a fire initiative within the blackland prairie. Landowners enrolled in programs such as CRP, PUB, EQIP or WHIP that have native prairie habitats would be prime candidates for prescribed burn management. The FWS, NBCI, NRCS, NPAT, TPWD, NWTF, TFS, TNC, and OPJV are organizations tackling this issue within parts of the state. Funding needs to be directed towards this initiative.

Identify key SGCN from a variety of taxa and rare communities in the recommendations for monitoring to determine effectiveness of the applied practices. Identify the data repository for this monitoring information so that practitioners can share lessons learned. *See note at end of table about conservation effectiveness tracking.*

Form multi-partner working group(s) to establish scientifically sound best management practices for **chemical/mechanical brush control** for the ecoregion and specific watersheds. Work with brush control technical experts and SGCN/rare communities experts to identify concerns, barriers, and solutions. Identify key SGCN from a variety of taxa and rare communities to monitor to determine effectiveness of the applied practices. Identify the data repository for this monitoring information so that practitioners can share lessons learned. *See note at end of table about conservation effectiveness tracking.*

Form multi-partner working group(s) to establish scientifically sound best management practices for **riparian restoration**, including timing, water needs, reasonable recommendations for initial planting diversity, ways to encourage full complement of desired ecological condition of community, how to prevent or control specific invasives without negatively impacting restoration, locally sourced seed and plant materials for the ecoregion (and finer scales if needed). Work with riparian restoration technical experts and SGCN/rare communities experts to identify concerns, barriers, and solutions. Identify key SGCN from a variety of taxa and rare communities to monitor to determine effectiveness of the applied practices. Identify the data repository for this monitoring information so that practitioners can share lessons learned. *See note at end of table about conservation effectiveness tracking.*



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Work with the Native Prairies Association's ongoing current effort to identify scientifically sound best management practices for **different types of prairie restoration**, including timing, water needs, reasonable recommendations for initial planting diversity, ways to encourage full complement of desired ecological condition of community, how to prevent or control specific invasives without negatively impacting restoration, locally sourced seed and plant materials for the ecoregion (and finer scales if needed). Work with prairie restoration technical experts and SGCN/rare communities experts to identify concerns, barriers, and solutions. Identify key SGCN from a variety of taxa and rare communities to monitor to determine effectiveness of the applied practices. Identify the data repository for this monitoring information so that practitioners can share lessons learned. *See note at end of table about conservation effectiveness tracking.*

Technical Guidance FOR/WITH Conservation Service Providers (Audubon, NRCS, TPWD, TNC, NPAT, NPSOT, FWS, NWTF, OPJV and NBCI ) specific to the issues and resources of this region:

- Land conservation tools: conservation easements, Purchase of Development Rights, fee title, donations, mitigation banking, Safe Harbor, Candidate Conservation Agreements, Candidate Conservation Agreements with Assurances, stewardship/management incentive programs; include how priorities for action are determined, which are most successful and why, best practices – timelines, documentation, monitoring; lessons learned; and how to measure effectiveness of the tool used.
- Wildlife Tax Valuation – benefits, best practices to benefit SGCN and priority habitats; barriers to implementation and lessons learned to overcome barriers; monitoring recommendations
- Landowner Education: how to deliver the best message, what kinds of tools and support landowners expect, how to select and target your audience, levels of response based on type of outreach, how to measure effectiveness and application of the training, costs-benefit analysis, lessons learned.
- Prescribed Fire: technical training requirements, time, and costs for an effective program; how to develop a program and what partner resources are available; how to engage private landowners in Rx fire application; how to best deal with urban – wildland interface issues (what stakeholders need to be involved); how to generate interest in burn cooperatives to enhance the scale of fire application; lessons learned over time in this region; how to measure effectiveness of Rx Fire application (site specific and programmatically).
- Brush Management: where appropriate/inappropriate, current state of the science and practice, best tools for certain soils/substrates and brush species, how to develop a program and roll it out to private landowners, potential partners; lessons learned over time in this region; how to measure effectiveness of brush treatment application (site specific and programmatically).
- Same kinds of training programs for prairie restoration and riparian restoration. See Best Management Practice development recommendation above.

Identify a host website to share ecoregional practitioner (not novice, not landowner, but professional) cross-training opportunities for RX fire, stream rehabilitation, reintroductions, brush management, GIS and corridor identification, other ...

Create a multi-disciplinary ecology committee to identify three to five years of highest priority **research projects** (actual projects, not just concepts) that can be rolled out to universities and colleges to collect the information most needed at the PRACTICAL level for management and conservation improvement on the ground. Identify the data repository for results so that practice can be shared and lessons learned. *See note at end of table about conservation effectiveness tracking.* Many SGCN in this region lack distribution and POPULATION status information; more information and cooperation from private landowners may reduce the risk of listing, enhance recovery options, and contribute to conservation of many sensitive habitats just through awareness and documentation. Some of the priorities discussed for this plan include (some are shared with and cross over into ECPL ecoregion):

*Black Bear* see Black Bear Management Plan 2005-2015 [http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd\\_pl\\_w7000\\_1046.pdf](http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_pl_w7000_1046.pdf)

*Rafinesque's big-eared bat* and *Southeastern myotis* – continue monitoring roosts and identify new roosts. Support long-term conservation of bottomland hardwoods. Increase awareness among forest managers and owners. Promote BMPs for species among stakeholders. Retain large hollow trees, such as blackgum and water tupelos. Identify protect roosts in artificial structures. Support WRP and similar programs. Perform hardwood restoration.

*Eastern spotted skunk* – determine status

*Houston Toad* – Continue release at suitable sites and monitor survival. Develop BMPs for raise and release. Identify new conservation lands for release. Implement long-term conservation within critical habitat areas. Work with Farm Bill to implement beneficial practices on suitable lands. Continue monitoring known and identify new locations. Survey more private lands. Cooperative efforts.

*Texas Horned Lizards* – raise awareness of beneficial native ants. Combat indiscriminate use of pesticides and buildup within ecosystems. Support native prairie restoration and long-term conservation efforts in areas of suitable habitat. Identify existing populations. Identify expansive suitable habitats under conservation for release and on landowner cooperators.

*Amphibian and Reptiles*: Survey private landowner cooperators to update data sets and monitor populations; work with law enforcement to monitor the effectiveness of commercial turtle harvest regulations

*Timber Rattlesnake*: Limit road construction near and within suitable habitats. Utilize strategies similar to black bear and bottomland hardwood bat spp. for habitat conservation. Implement awareness campaign to landowners and public lands in occupied habitat. Limit human related mortality. Increase data gathering.

*Alligator Snapping Turtle* – Status determination and key locations. Raise awareness among outdoor users.

*eastern gamagrass-switchgrass-yellow Indiangrass-Maximilian sunflower (G1/G2) and little bluestem-Indiangrass-big bluestem (G1/G2) prairie types* – Monitor and update sightings. Revisit database accounts to ensure data is relevant and up to date. Promote long-term conservation. Harvest seeds and utilize for local restorations and/or send to plant materials centers for field trials and increasing production.

*Painted Buntings* – large % of global breeding population. I feel that most of breeding habitat has either too much brush or not enough brush. Individuals are found within dense growth along drainages and edges, but appear to prefer diverse woody mottes made of multiple woody vines, shrubs, trees that offer structural diversity from the ground up. A snag for a singing perch in the middle is the cherry on top. Intensive farming and grazing. Pesticide use around ag areas. Increase SMZs within pasturelands.

*Scissor-tailed Flycatcher* – large % of global breeding population. I have concern about these birds utilizing commercial and residential lands. I commonly observe individuals foraging around gas stations and other areas where toxins or pesticide use is common. Individuals could be in sink habitats. Pesticide use around ag areas. Increase fencerows, SMZs, scattered brush within pasturelands.

*Bachman's Sparrow* – short-leaf pine savanna restoration in northeast Texas could increase suitable habitat. Start initiative similar to longleaf alliance. Build off Lennox woods project area. Increase use of prescribed burns on private lands. Increase survey efforts along western edge of range to identify boundary and suitable occupied habitat, such as within Red River County. Promote BMPs within forest management agencies and industries.

*Northern Bobwhite, Dickcissel, Eastern Meadowlark, LeConte's Sparrow, Short-eared Owl, Loggerhead Shrike, Northern Harrier, Swainson's Hawk, Henslows Sparrow* – Time is of the essence. Prairie restoration, conservation and management. Promote rotational

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grazing, fallow fields, delay haying on some fields until after breeding season.

*Interior Least Tern* – new reservoirs could be engineered to provide small island habitat at varying reservoir levels. The islands would surface during lower water levels in the summer so that they would be devoid of vegetation.

*Swainson's Warbler, Kentucky Warbler, Louisiana Waterthrush, Prothonotary Warbler* – Reduce water consumption in the urban areas that leads to destruction of bottomland hardwoods for reservoir development. Identify high priority conservation areas for bottomland hardwoods. More conservation lands protecting intact bottomland hardwoods are needed in northeast Texas. Promote BMPs for this habitat among agencies and cooperators.

Freshwater Mussels – Additional distribution and habitat requirements information are needed to identify instream flow standards, recommendations for water conservation areas, sites to protect from reservoir development, outreach and activities to prevent zebra mussel spread, greater water quality protections in mussel watersheds to prevent pollution and sedimentation

**Other Cross-Cutting Issues**

Climate Change: This issue is not widely explored in Texas and downscaled models are lacking at the ecoregion level; future work should concentrate on modeling potential adverse effects to rare habitats (in this region, native grasslands, wetlands and riparian areas) to begin to address management and resiliency needs. It is known from other efforts that climate change will likely exacerbate existing conservation problems, so many of the solution proposed above may help provide resiliency, until more definitive information can be modeled:

Acquisition and restoration of native grasslands are critical to provide larger habitat patches and movement corridors for bird population sustainability, especially in the face of climate change.

Form a working group with adjacent Texas Blackland Prairie and Gulf Coastal Prairies and Marshes aquatic and terrestrial ecologists to identify river rehabilitation goals in/adjacent to undammed stretches below last impoundment to the estuaries to evaluate/implement instream flow recommendations; improve the quality, timing, and seasonality of releases, improve riparian restoration, and increase connectivity to improve resilience to climate

Determine market values that are driving agricultural conversion (biofuels? crop prices?), livestock production, hunting and other recreation, and land subdivision in this region. Craft a recommendation to landowner incentive program providers that can be used to index conservation practice incentives in ecoregions. Monitor whether this approach was effective to change the conservation program values AND landowner participation in those programs before & after the change.

NOTE: Almost all of these actions would benefit from more regular cooperation among conservation practitioners in the region. A share-site for conservation practice would be a useful tool. See Statewide/Multi-region handbook AND the Effectiveness Measures report's evaluation of existing conservation practice sharing tools (Appendix IV). This will go a long way toward landscape-level planning and shared priorities.

