



TEXAS CONSERVATION ACTION PLAN

Cross Timbers DRAFT ECOREGION HANDBOOK JUNE 2011

Note: text in red in this document will be revised between June 10 Public Comment Draft and the final USFWS-approved document. THIS IS A SUMMARY of the HANDBOOK; more background information will be added.

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See links on Texas Parks and Wildlife Department’s [Texas Conservation Action Plan 2011 Website](#) for additional references and supporting documents cited in 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 Cross Timbers (CRTB) 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](#):

- 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 **CRTB** 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 **CRTB** 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 CRTB 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 2011 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.

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](#) (TPWD 2007).

If you have questions about the TCAP content and cannot find what you need on the TPWD TCAP 2011 website or in one of the handbooks, please contact the TCAP Coordinator at the TPWD Headquarters in Austin, Texas:

Phone (512) 389-4800

Email [Texas Conservation Action Plan Coordinator](#)

NOTE this email link for questions and implementation participation will be live AFTER the Public Comment period to ensure that we get all public comment through the posted survey on the

[Texas Conservation Action Plan website](#)

OVERVIEW

A one-page description of this ecoregion is being developed during the public comment period. For more information about the ecoregion's features during this time, please review Griffith (2010) and Griffith et. al. (2007).¹

Table 1 crosswalks this ecoregion with other conservation planning units.²

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), and **Ecologically Significant Stream Segments**³ (ESSS) which occur in this area.

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

¹ Griffith, G. 2010. Level III North American Terrestrial Ecoregions: United States Descriptions. Prepared for the North American Commission for Environmental Cooperation (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 (accessed May 2009).

² For more information about planning boundaries, see the Overview handbook on the TCAP 2011 website <http://www.tpwd.state.tx.us/landwater/land/tcap/>

³ TPWD. 2002/2005. *Ecologically Significant Stream Segments*.

http://www.tpwd.state.tx.us/landwater/water/environconcerns/water_quality/sigsegs/

Table 1. Crosswalk of CRTB Ecoregion with Other Conservation Plan Units

Note Table is formatted 8-1/2" x 11" landscape orientation; see also Ecoregions map on TCAP 2011 website.

| 2011 TCAP | 2005 TXWAP Gould 1960 | The Nature Conservancy Terrestrial Ecoregions 1999 | Ecological Drainage Units (Watersheds) National Fish Habitat Action Plan <i>TX = Southeast Aquatic Resources Partnership and Desert Fish Habitat Partnership</i> AFWA 2006 Fish Habitat Partnership 2009 Esselman et.al. 2010 | 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 |
|----------------------|----------------------------|--|---|---|--|--|---|--|
| Cross Timbers (CRTB) | Cross Timbers and Prairies | Cross Timbers and Southern Tallgrass Prairie (32) | Brazos River – Prairie Lower Brazos River Colorado River – Ed Plateau Upper Red River Upper Trinity Lower Trinity | Oaks and Prairies JV Oaks and Prairies BCR Edwards Plateau BCR | Gulf Coast Prairie | Colorado Upper (5a) Colorado Lower (5b) Brazos Upper (6a) Trinity – San Jacinto (7) Plains Rivers (10) | Central Great Plains Winter Wheat and Range Region: <i>Central Red Rolling Prairies (80A), Texas North Central Prairies (80B)</i> Southwestern Prairies Cotton and Forage Region: <i>West Cross Timbers (84B), East Cross Timbers (84C), Grand Prairie (85)</i> Southwest Plateaus and Plains Range and Cotton Region: <i>Edwards Plateau Eastern (81C)</i> | Oak Woods and Prairies and Blackland Prairie |

Figure 1. CRTB Ecoregion with County Boundaries

Cross Timbers ecoregion in pale green

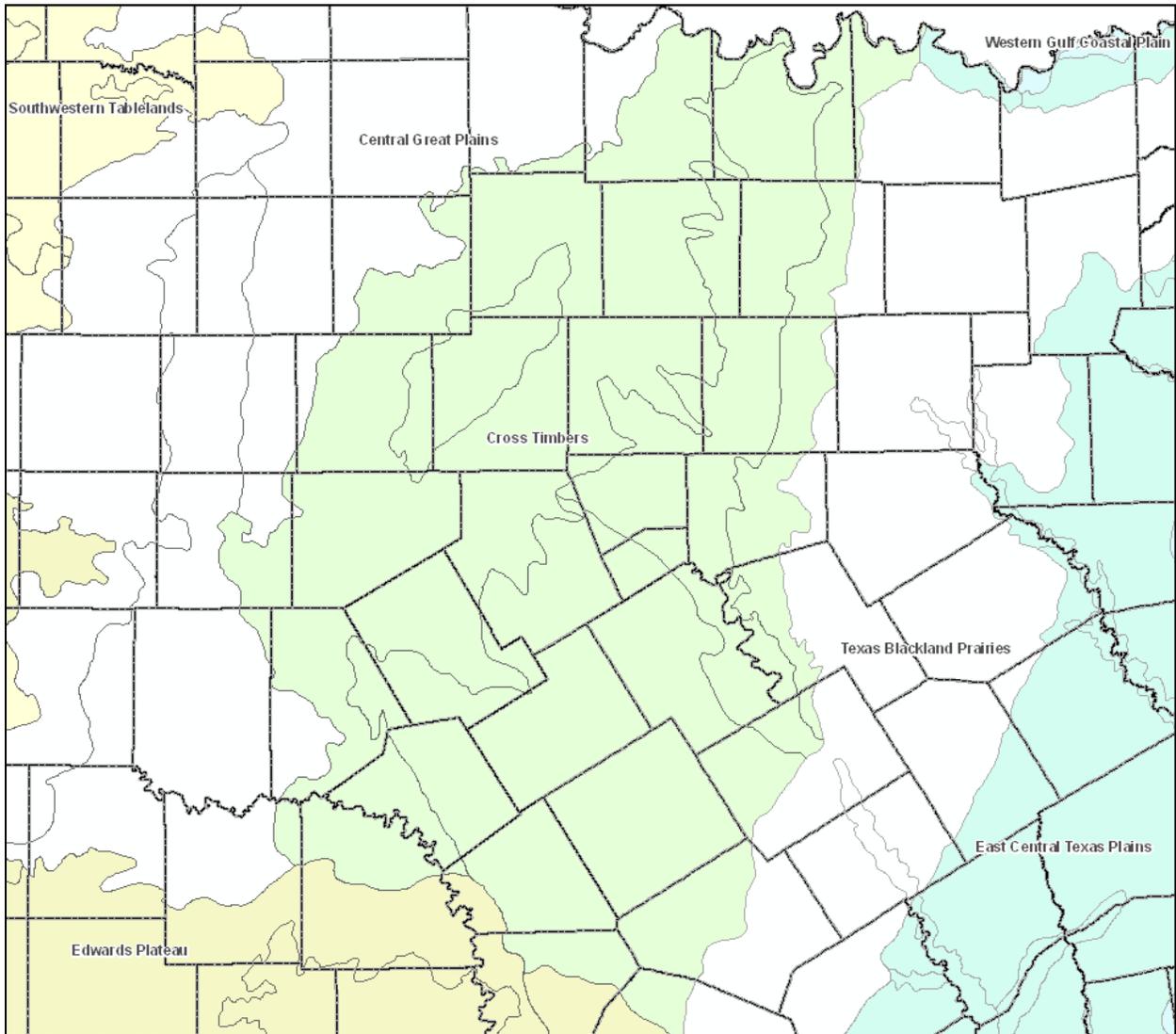


Table 2. CRTB EDUs with Ecologically Significant Stream Segments and Reservoirs

| ECOLOGICAL DRAINAGE UNIT SubBasin (HUC 8) | <i>Ecologically Significant Stream Segment TPWD 2002, w/updates 2005</i> | Lakes and Reservoirs |
|--|--|--|
| UPPER RED RIVER | | |
| Farmers - Mud | | Lake Nocona, Hubert H. Moss Lake |
| Lake Texoma | | Lake Texoma |
| UPPER TRINITY | | |
| Upper West Fork Trinity | Lost Creek | Lost Creek Reservoir, Lake Amon G. Carter, Lake Bridgeport, Eagle Mountain Lake |
| Denton | | Grapevine Lake |
| Elm Fork Trinity | Clear Creek, Elm Fork Trinity River | Lake Kiowa, Lake Ray Roberts, Lewisville Lake |
| Lower West Fork Trinity | | Lake Worth, Lake Weatherford, Benbrook Lake, Lake Arlington |
| LOWER TRINITY | | |
| Chambers | | |
| BRAZOS RIVER - PRAIRIE | | |
| Middle Brazos - Millers | | |
| Lower Clear Fork Brazos | | |
| Hubbard | | Hubbard Creek Reservoir, Lake Daniel, Lake Cisco |
| Middle Brazos - Palo Pinto | Brazos River | Lake Graham/Lake Eddleman, Possum Kingdom Lake, Lake Mineral Wells, Lake Palo Pinto, Lake Granbury |
| Middle Brazos - Lake Whitney | Paluxy River, Brazos River, Steele Creek | Squaw Creek Reservoir, Lake Pat Cleburne, Lake Whitney, Aquilla Lake |
| North Bosque | Nells Creek | Lake Waco |
| Bosque | | Lake Waco |
| Leon | Colony Creek | Lake Leon, Proctor Lake, Belton Lake |
| Cowhouse | | Belton Lake |
| Lampasas | Rocky Creek | Stillhouse Hollow Lake |

Continued next page

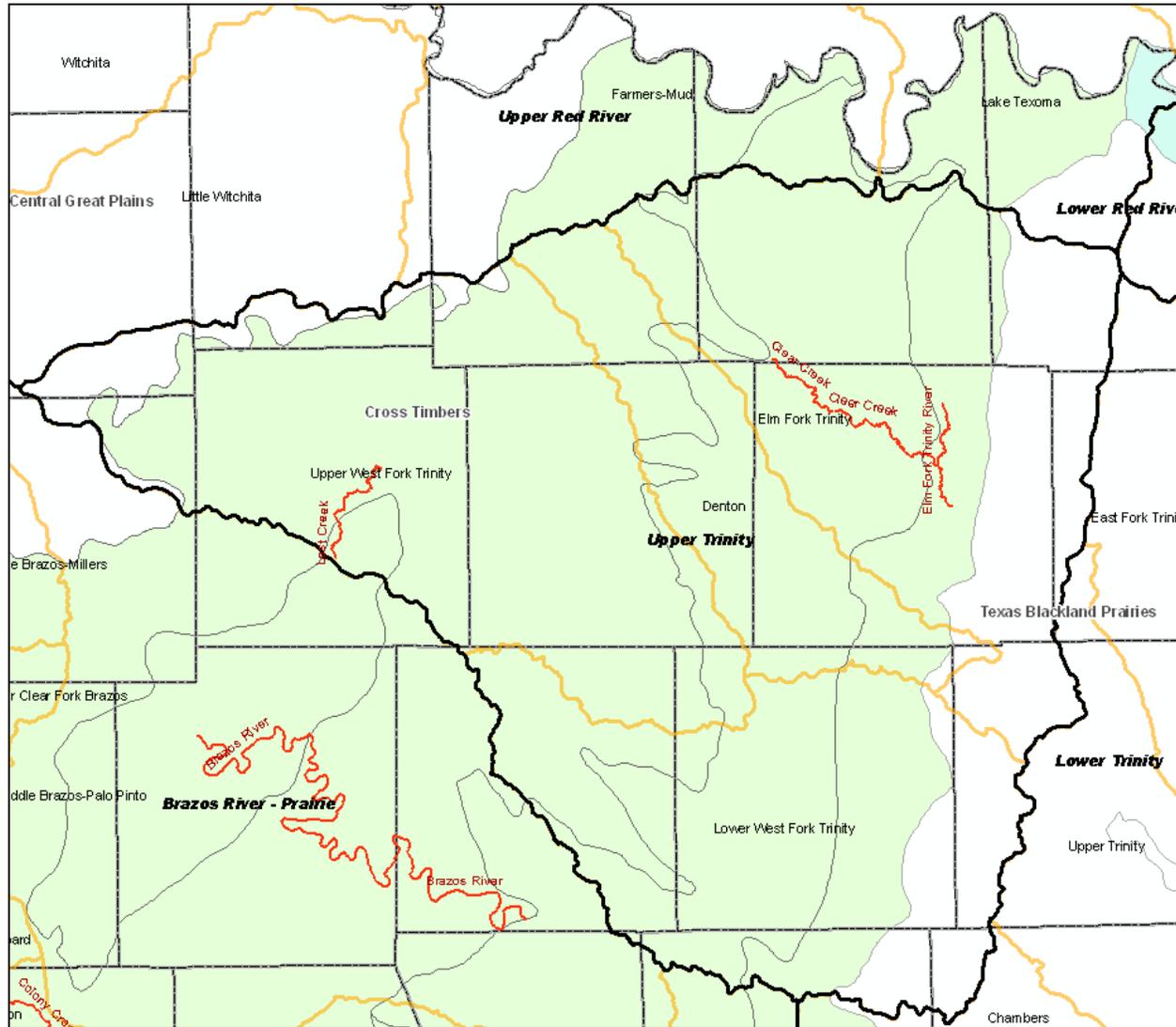
Table 2. continued

| ECOLOGICAL DRAINAGE UNIT SubBasin (HUC 8) | <i>Ecologically Significant Stream Segment TPWD 2002, w/updates 2005</i> | Lakes and Reservoirs |
|--|--|-------------------------------|
| LOWER BRAZOS RIVER | | |
| San Gabriel | Oatmeal Creek, Willis Creek, San Gabriel River | Lake Georgetown, Granger Lake |
| COLORADO RIVER - EDWARDS PLATEAU | | |
| Middle Colorado | Colorado River | |
| Jim Ned | | Lake Brownwood |
| Pecan Bayou | | Lake Brownwood |
| San Saba | | |
| Buchanan - Lyndon B | Colorado River | |

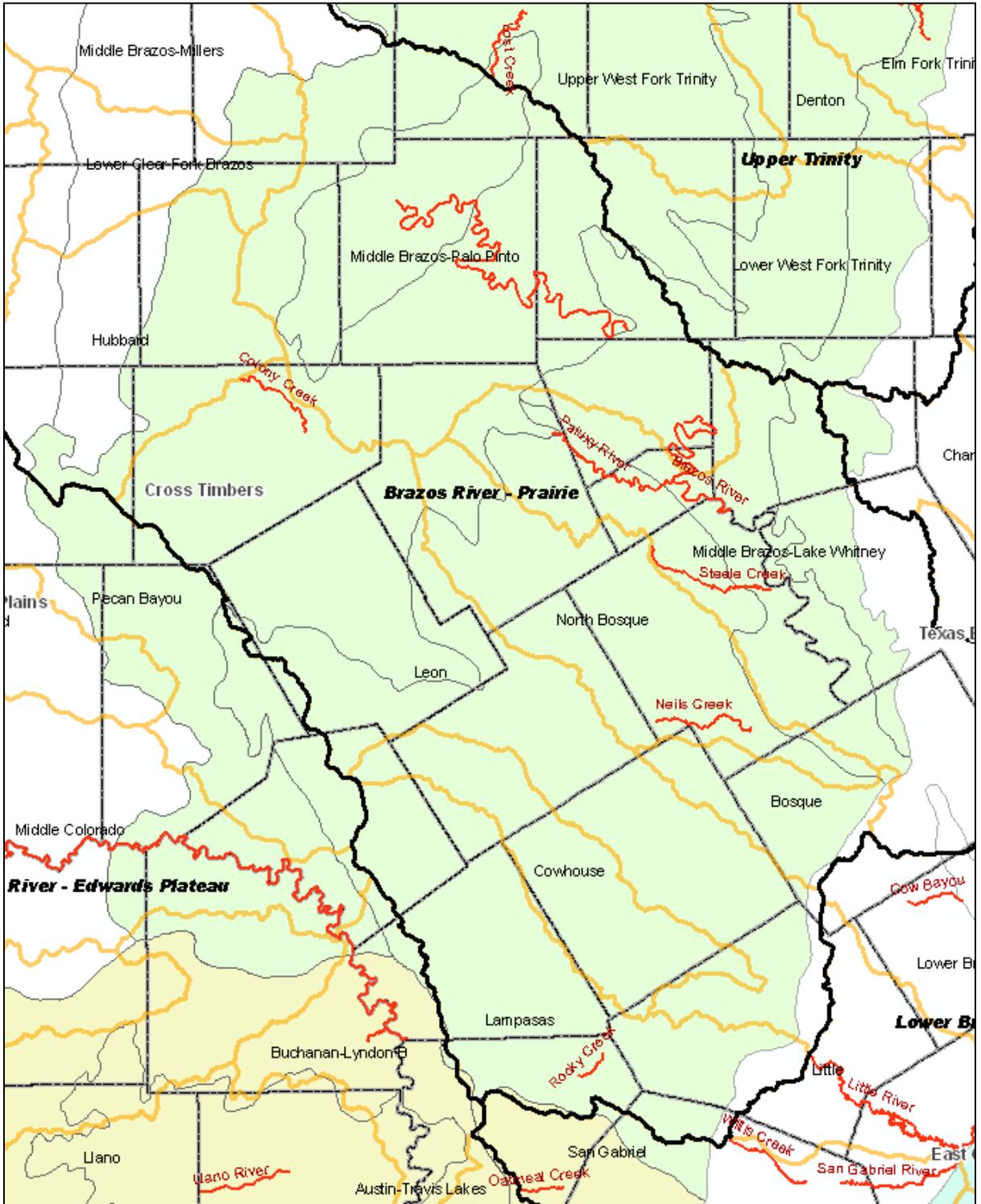
Note: Ecologically Significant Stream Segments and Reservoirs which occur in the Subbasin (HUC 8) but not in the ECOREGION are not included in this table. There may be other significant stream resources mentioned in the Priority Habitats section

Figure 2. CRTB EDUs, HUC 8s, and ESSS – 2 maps

Upper Red River and Upper Trinity EDUs in black outline, HUC8s in orange outline, ESSS red line



Brazos River Prairie and Colorado River Edwards Plateau EDUs in black outline, HUC8s 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. 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](#). Species and rare communities included in the [2011 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. The revised lists for TCAP 2011 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 | |

Other categories are listed on the full statewide list, but are not applicable in this ecoregion: Bay and Estuary Fishes, Marine Fishes, Marine Reptiles, and Marine Mammals

Each species has a [NatureServe](#) calculated state and global [conservation rank](#), which accounts for abundance, stability and threats. Additionally, several species have [federal](#) and/or [state](#) listing (endangered, threatened, candidate) status. See the [key to conservation and listing ranks](#) on the TPWD [TCAP 2011 website](#).

Table 3. CRTB Species of Greatest Conservation Need (SGCN)

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

More information is available in the SGCN table online.

| Scientific Name | Common Name | Status | | Abundance Ranking | |
|---------------------------------|---------------------------------------|---------|-------|-------------------|---------|
| | | Federal | State | Global | State |
| MAMMALS | | | | | |
| <i>Conepatus leuconotus</i> | Hog-nosed skunk | | | G5 | S4 |
| <i>Mustela frenata</i> | Long-tailed weasel | | | G5 | S5 |
| <i>Myotis velifer</i> | Cave myotis | | | G5 | S4 |
| <i>Puma concolor</i> | Mountain lion | | | G5 | S2 |
| <i>Spilogale putorius</i> | Eastern spotted skunk | | | G4T | S4 |
| <i>Tadarida brasiliensis</i> | Brazilian free-tailed bat | | | G5 | S5 |
| <i>Taxidea taxus</i> | American badger | | | G5 | S5 |
| <i>Dipodomys elator</i> | Texas kangaroo rat | | T | G1G2 | S2 |
| <i>Lutra canadensis</i> | River otter | | | G5 | S4 |
| <i>Neovison vison</i> | Mink | | | G5 | S4 |
| <i>Sylvilagus aquaticus</i> | Swamp rabbit | | | G5 | S5 |
| BIRDS | | | | | |
| <i>Anas acuta</i> | Northern Pintail | | | G5 | S3B,S5N |
| <i>Colinus virginianus</i> | Northern Bobwhite | | | G5 | S4B |
| <i>Ictinia mississippiensis</i> | Mississippi Kite | | | G5 | S4B |
| <i>Circus cyaneus</i> | Northern Harrier | | | G5 | S2B,S3N |
| <i>Buteo swainsoni</i> | Swainson's Hawk | | | G5 | S4B |
| <i>Athene cunicularia</i> | Burrowing Owl | | | G4 | S3B |
| <i>Asio flammeus</i> | Short-eared Owl | | | G5 | S4N |
| <i>Tyrannus forficatus</i> | Scissor-tailed Flycatcher | | | G5 | S3B |
| <i>Lanius ludovicianus</i> | Loggerhead Shrike | | | G4 | S4B |
| <i>Aimophila cassinii</i> | Cassin's Sparrow | | | G5 | S4B |
| <i>Spizella pusilla</i> | Field Sparrow | | | G5 | S5B |
| <i>Ammodramus savannarum</i> | Grasshopper Sparrow | | | G5 | S3B |
| <i>Chondestes grammacus</i> | Lark Sparrow | | | G5 | S4B |
| <i>Calcarius mccownii</i> | McCown's Longspur | | | G4 | S4 |
| <i>Spiza americana</i> | Dickcissel | | | G5 | S4B |
| <i>Sturnella magna</i> | Eastern Meadowlark | | | G5 | S5B |
| <i>Icterus spurius</i> | Orchard Oriole | | | G5 | S4B |
| <i>Tympanuchus cupido</i> | Greater Prairie-Chicken (Interior) | | | G4 | S1B |
| <i>Meleagris gallopavo</i> | Wild Turkey | | | G5 | S5B |

| Scientific Name | Common Name | Status | | Abundance Ranking | |
|-----------------------------------|---------------------------------|---------|-------|-------------------|---------|
| | | Federal | State | Global | State |
| <i>Egretta thula</i> | Snowy Egret | | | G5 | S5B |
| <i>Egretta caerulea</i> | Little Blue Heron | | | G5 | S5B |
| <i>Butorides virescens</i> | Green Heron | | | G5 | S5B |
| <i>Haliaeetus leucocephalus</i> | Bald Eagle | | | G5 | S3B,S3N |
| <i>Buteo lineatus</i> | Red-shouldered Hawk | | | G5 | S4B |
| <i>Pluvialis dominica</i> | American Golden-Plover | | | G5 | S3 |
| <i>Sternula antillarum</i> | Least Tern | LE* | E* | G4 | S3B |
| <i>Caprimulgus carolinensis</i> | Chuck-will's-widow | | | G5 | S3S4B |
| <i>Melanerpes erythrocephalus</i> | Red-headed Woodpecker | | | G5 | S3B |
| <i>Vireo bellii</i> | Bell's Vireo | | | G5 | S3B |
| <i>Vireo atricapilla</i> | Black-capped Vireo | LE | E | G3 | S2B |
| <i>Poecile carolinensis</i> | Carolina Chickadee | | | G5 | S5B |
| <i>Anthus spragueii</i> | Sprague's Pipit | C | | G4 | S3N |
| <i>Dendroica chrysoparia</i> | Golden-cheeked Warbler | LE | E | G2 | S2B |
| <i>Aimophila ruficeps</i> | Rufous-crowned Sparrow | | | G5 | S4B |
| <i>Ammodramus leconteii</i> | Le Conte's Sparrow | | | | |
| <i>Zonotrichia querula</i> | Harris's Sparrow | | | G5 | S4 |
| <i>Piranga rubra</i> | Summer Tanager | | | G5 | S5B |
| <i>Passerina ciris</i> | Painted Bunting | | | G5 | S4B |
| REPTILES & AMPHIBIANS | | | | | |
| <i>Anaxyrus (Bufo) woodhousii</i> | Woodhouse's toad | | | G5 | SU |
| <i>Apalone mutica</i> | smooth softshell turtle | | | | |
| <i>Cheylydra serpentina</i> | Common snapping turtle | | | | |
| <i>Crotalus atrox</i> | Western diamondback rattlesnake | | | | S4 |
| <i>Heterodon nasicus</i> | Western hognosed snake | | | | |
| <i>Phrynosoma cornutum</i> | Texas horned lizard | | T | G4G5 | S4 |
| <i>Sistrurus catenatus</i> | massasagua | | | | |
| <i>Terrapene ornata</i> | Ornate box turtle | | | G5 | S3 |
| <i>Trachemys scripta</i> | Red-eared slider | | | | |
| <i>Crotalus horridus</i> | Timber (Canebrake) Rattlesnake | | T | G4 | S4 |
| <i>Eurycea chisolmensis</i> | Salado Springs salamander | C | | G1 | S1 |
| <i>Eurycea naufragia</i> | Georgetown Salamander | C | | G1 | S1 |
| <i>Graptemys versa</i> | Texas map turtle | | | G4 | SU |
| <i>Macrochelys temminckii</i> | alligator snapping turtle | | T | G3G4 | S3 |
| <i>Nerodia harteri</i> | Brazos Water Snake | | T | | S1 |

| Scientific Name | Common Name | Status | | Abundance Ranking | |
|---|--|---------|-------|-------------------|-------|
| | | Federal | State | Global | State |
| <i>Pseudacris streckeri</i> | Strecker's Chorus Frog | | | G5 | S3 |
| <i>Thamnophis sirtalis</i> | Common Garter Snake (Eastern/Texas/ New Mexico) | | | G5 | S2 |
| FRESHWATER FISHES | | | | | |
| <i>Anguilla rostrata</i> | American eel | | | G4 | S5 |
| <i>Cycleptus elongatus</i> | Blue sucker | | T | G3G4 | S3 |
| <i>Hiodon alosoides</i> | Goldeye | | | | |
| <i>Ictalurus lupus</i> | Headwater catfish | | | G3 | S2 |
| <i>Macryhbopsis storeriana</i> | Silver chub | | | | |
| <i>Micropterus treculii</i> | Guadalupe bass | | | G3 | S3 |
| <i>Notropis bairdi</i> | Red River shiner | | | | |
| <i>Notropis oxyrhynchus</i> | Sharpnose shiner | C | | G3 | S3 |
| <i>Notropis potteri</i> | Chub shiner | | T | G4 | S3 |
| <i>Polyodon spathula</i> | Paddlefish | | T | G4 | S3 |
| INVERTEBRATES | | | | | |
| <i>Bombus pensylvanicus</i> | American bumblebee | | | GU | SU* |
| <i>Amblycorypha uhleri</i> | A katydid | | | G2G3* | S2?* |
| <i>Arethaea ambulator</i> | A katydid | | | G2G3* | S2?* |
| <i>Pleurobema riddellii</i> | Louisiana pigtoe | | T | G1G2 | S1 |
| <i>Pogonomyrmex comanche</i> | Comanche harvester ant | | | G2G3* | S2* |
| <i>Potamilus amphichaenus</i> | Texas heelsplitter | | T | G1G2 | S1 |
| <i>Quadrula aurea</i> | Golden orb | | T | G1 | S2* |
| <i>Quadrula houstonensis</i> | Smooth pimpleback | | T | G2 | S1S2* |
| <i>Quadrula mitchelli</i> | False Spike | | T | GH | SH |
| <i>Taeniopteryx starki</i> | Texas willowfly | | | G1 | S1 |
| <i>Truncilla macrodon</i> | Texas fawnsfoot | | T | G2Q | S1* |
| PLANTS | | | | | |
| <i>Agalinis auriculata</i> | earleaf false foxglove | | | G3 | SH |
| <i>Agalinis densiflora</i> | Osage Plains false foxglove | | | G3 | S2 |
| <i>Argythamnia apheroides</i> | Hill Country wild-mercury | | | G2G3 | S2S3 |
| <i>Carex edwardsiana</i> | canyon sedge | | | G3G4S3S4 | S3S4 |
| <i>Carex shinneryi</i> | Shinner's sedge | | | G3? | S2 |
| <i>Clematis texensis</i> | scarlet leather-flower | | | G3G4 | S3S4 |
| <i>Croton alabamensis</i> var. <i>texensis</i> | Texabama croton | | | G3T2 | S2 |
| <i>Cuscuta exaltata</i> | tree dodder | | | G3 | S3 |
| <i>Dalea reverchonii</i> | Comanche Peak prairie- clover | | | G2 | S2 |

| Scientific Name | Common Name | Status | | Abundance Ranking | |
|--|----------------------------|---------|-------|-------------------|-------|
| | | Federal | State | Global | State |
| <i>Echinacea atrorubens</i> | Topeka purple-coneflower | | | G3 | S3 |
| <i>Festuca versuta</i> | Texas fescue | | | G3 | S3 |
| <i>Gaura triangulata</i> | prairie butterfly-weed | | | G3G4 | S3 |
| <i>Hexalectris nitida</i> | Glass Mountains coral-root | | | G3 | S3 |
| <i>Ipomoea shumardiana</i> | Shumard's morning glory | | | G2G3 | S1 |
| <i>Liatris glandulosa</i> | glandular gay-feather | | | G3 | S3 |
| <i>Oenothera coryi</i> | Cory's Evening-primrose | | | G3 | S3 |
| <i>Pediomelum cyphocalyx</i> | turnip-root scurfpea | | | G3G4 | S3S4 |
| <i>Pediomelum reverchonii</i> | Reverchon's curfpea | | | G3 | S3 |
| <i>Physaria engelmannii</i> | Engelmann's bladderpod | | | G3 | S3 |
| <i>Prunus minutiflora</i> | Texas almond | | | G3G4 | S3S4 |
| <i>Schoenoplectus hallii</i> | Hall's baby bulrush | | | G2G3 | S1 |
| <i>Senecio quaylei</i> | Quayle's butterweed | | | G1Q | S1 |
| <i>Styrax platanifolius subsp. platanifolius</i> | sycamore-leaf snowbell | | | G3T3 | S3 |
| <i>Valerianella stenocarpa</i> | bigflower cornsalad | | | G3 | S3 |
| <i>Yucca necopina</i> | Glen Rose yucca | | | G1G2 | S1S2 |

Table 4. CRTB Rare Communities

Note Table is formatted 11" X 17", more information is available on the Rare Communities table posted on the website.

| Global Rank | State Rank | COMMON_NAME | GLOBAL_NAME | TRANSLATED_NAME | ECOLOGICAL SYSTEM_NAME | KNOWN COUNTIES | Endemic | KNOWN PROTECTED AREAS |
|-------------|------------|--|--|---|---|--|---------|---|
| G2G3 | S2S3 | Little Bluestem - Sideoats Grama - Texas Needlegrass Herbaceous Vegetation | Schizachyrium scoparium - Bouteloua curtipendula - Nassella leucotricha Herbaceous Vegetation | Little Bluestem - Sideoats Grama - Texas Needlegrass Herbaceous Vegetation | Edwards Plateau Limestone Savanna and Woodland CES303.660 | Bell, Brown, Burnet, Callahan, Coleman, Comanche, Coryell, Eastland, Hamilton, Lampasas, Mills, and Williamson | Y | Ft. Hood (DoD) and Muse WMA (TPWD) |
| G2 | S2 | Edwards Plateau Grotto | Adiantum capillus-veneris - (Thelypteris ovata var. lindheimeri, Thelypteris kunthii) Herbaceous Vegetation | Southern Maidenhair - (Lindheimer's Maidenhair, Kunth's Maidenhair) Herbaceous Vegetation | Edwards Plateau Mesic Canyon CES303.038 | Bandera, Bell, Bexar, Blanco, Hays, Comal, Kendall, Medina, Kerr, Travis, Uvalde, and Williamson | Y | Balcones Canyonland Preserve (USFWS), Hamilton Pool (Travis County Parks), Lost Maples SNA (TPWD) and Love Creek Preserve (TNC) |
| G2 | S2 | American Sycamore - Arizona Walnut Woodland | Platanus occidentalis - Juglans major Woodland | Sycamore - Arizona Walnut Woodland | Edwards Plateau Floodplain CES303.651 | Bandera, Bell, Burnet, Comal, Gillespie, Hays, Kendall, Kinney, Kerr, Kimble, Lampasas, Real, Travis, and Williamson | Y | Bull Creek and Barton Creek Parks (City of Austin), Hill Country SNA (Bandera), Kerr WMA (TPWD), Lost Maples SNA (TPWD), Love Creek Preserve (TNC), and South Llano River State Park (TPWD) |
| G2 | S2 | Little Bluestem - (Yellow Indiangrass) - Tall Dropseed - Cusp Gayfeather Herbaceous Vegetation | Schizachyrium scoparium - (Sorghastrum nutans) - Sporobolus compositus var. compositus - Liatris mucronata Herbaceous Vegetation | | Ecological System: Southeastern Great Plains Tallgrass Prairie CES205.685 | Bell, Brown, Burnet, Callahan, Coleman, Comanche, Coryell, Eastland, Hamilton, Lampasas, Mills, and Williamson | | |
| G1G2 | S1S2 | Vertisol Blackland Prairie | Schizachyrium scoparium - Sorghastrum nutans - Andropogon gerardii - Bifora americana Vertisol Herbaceous Vegetation | Little Bluestem - Yellow Indiangrass - Big Bluestem - Prairie Bishop Vertisol Herbaceous Vegetation | Texas Blackland Tallgrass Prairie CES205.684 | Austin, Bastrop, Bell, Brazos, Burleson, Collin, Colorado, Dallas, Ellis, Fannin, Falls, Fayette, Franklin, Freestone, Grayson, Grimes, Hays, Hill, Hunt, Kaufman, Lamar, Lavaca, Lee, Leon, Limestone, Mc McLennan, Navarro, Robertson, Rockwall, Titus, Travis, Washington, and Williams | Y | Clymer Meadow Preserve (TNC), Leonhardt Prairie (TNC), Parkhill Prairie (Collin County Park), Kachina Prairie (TLC), Peters Prairie (NPAT), Riesel Prairie Preserve (NPAT) |
| G1 | S1 | Eastern Gammagrass - Tall Dropseed Herbaceous Vegetation | Tripsacum dactyloides - Sporobolus compositus var. compositus Herbaceous Vegetation | Eastern Gammagrass - Tall Dropseed Herbaceous Vegetation | Texas Blackland Tallgrass Prairie CES205.684 | Austin, Bastrop, Bell, Brazos, Burleson, Collin, Colorado, Dallas, Ellis, Fannin, Falls, Fayette, Franklin, Freestone, Grayson, Grimes, Hays, Hill, Hunt, Kaufman, Lamar, Lavaca, Lee, Leon, Limestone, Mc McLennan, Navarro, Robertson, Rockwall, Titus, Travis, Washington, and Williams | N | No documented protected areas |

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.

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 also [Ecoregions of Texas](#) (report is near the bottom of webpage; Griffith et. al. 2007), [Ecological Mapping Systems Project](#) (TPWD et. al. *in progress*), and the [National Fish Habitat Action Plan](#)

Table 5. CRTB Priority Habitats

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

| GENERAL HABITAT TYPES | CROSS TIMBERS (CRTB) | CRTB Ecological Systems |
|---|--|---|
| NATURAL AND SEMI-NATURAL TYPES | <i>Habitats in this column were identified in the workshop; 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' Cross Timbers. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 08 October 2009.</i> |
| Barren/Sparse Vegetation <i>See also Caves/Karst</i> | Limestone cliffs Loosely consolidated sands Other specific barren geologies?? | Edwards Plateau Cliff Southeastern Coastal Plain Cliff |
| Grassland | Midgrass prairie (e.g. Henrietta, Grand) Shortgrass prairie | Central Mixedgrass Prairie Southeastern Great Plains Tallgrass Prairie Texas Blackland Tallgrass Prairie Western Great Plains Sand Prairie |
| Shrubland | Shinoak shrubland | Edwards Plateau Limestone Shrubland Western Great Plains Sandhill Steppe |
| Savanna/Open Woodland | post oak-blackjack oak woodland/savanna mesquite woodlands | Edwards Plateau Limestone Savanna and Woodland |
| Woodland | Oak/hardwood-juniper woodland Post oak - blackjack oak woodland | Edwards Plateau Dry-Mesic Slope Forest and Woodland |
| Forest <i>See also Riparian and Wetlands</i> | Oak/hardwood – juniper mature forest | Crosstimbers Oak Forest and Woodland Edwards Plateau Mesic Canyon |
| Riparian | periodically flooded or subirrigated floodplain woodlands (oak, juniper) and forest (oak, elm, ...) associated with the central Red (TX-OK), upper Trinity, middle Brazos, and northeastern Colorado Rivers and their tributaries midstream sand and gravel bars | Edwards Plateau Floodplain Edwards Plateau Riparian Southeastern Great Plains Floodplain Forest Southeastern Great Plains Riparian Forest |

| GENERAL HABITAT TYPES | CROSS TIMBERS (CRTB) | CRTB Ecological Systems |
|--|---|-------------------------|
| Riverine | Instream habitats of the watersheds which intersect this ecoregion (see EDU Workbook) Ecologically Significant Stream Segments - Lost Creek, Clear Creek, Elm Fork Trinity River, Brazos River, Paluxy River, Steele Creek, Nells Creek, Colony Creek, Rocky Creek, Oatmeal Creek, Willis Creek, San Gabriel River, Colorado River | NA |
| Lacustrine <i>See also Cultural Aquatic</i> | oxbow lakes of the ... system | NA |
| Freshwater Wetland | springs and seeps shallow (12 - 18") natural wetlands - do these have a specific vegetation community? | NA |
| Saltwater Wetland | Headwater saline springs | NA |
| Estuary/Estuarine | NA | NA |
| Coastal | NA | NA |
| Marine | NA | NA |
| Aquifer | Trinity and Trinity Outcrop | NA |
| Caves/Karst | Crevices and karst features Caves sinkholes? | NA |

Table

| GENERAL HABITAT TYPES | CROSS TIMBERS (CRTB) | CRTB Ecological Systems |
|-----------------------------|--|-------------------------|
| 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> | Green roofs (is this a habitat type important to SGCN? If so, which ones?) Bridges, culverts (bats) - can we be more specific about special locations? | NA |
| <i>Industrial</i> | mines | NA |
| <i>Rights of Way</i> | | NA |
| Cultural Aquatic | Reservoirs: Nocona, Hubert H. Moss, Texoma, Lost Creek, Amon G. Carter, Bridgeport, Eagle Mountain, Grapevine, Kiowa, Ray Roberts, Lewisville, Worth, Weatherford, Benbrook, Arlington, Hubbard Creek, Daniel, Cisco, Graham/Eddleman, Possum Kingdom, Mineral Wells, Palo Pinto, Granbury, Squaw Creek, Pat Cleburne, Whitney, Aquilla, Waco, Leon, Proctor, Belton, Stillhouse Hollow, Georgetown, Granger, Brownwood Stockponds (for which SGCN - migratory waterfowl? Cranes? other? can we be more specific - are these managed for wildlife?) | NA |
| ARTIFICIAL REFUGIA | | |
| Created mitigation wetlands | moist soil units, important for waterfowl | NA |

Texas shares its border with four states – New Mexico, Oklahoma, Arkansas, and Louisiana. CRTB shares a its northern border with Oklahoma. **Table 6** identifies habitat priorities which have been identified in the Oklahoma Wildlife Action Plan which may be adjacent to the CRTB. Every adjacent state’s Action Plan mentions the importance of **intact native riparian zones** and **floodplains, high quality instream habitats, wetlands** of all types, and **native grasslands**. These habitat types are also found in the CRTB and are priorities for conservation in this ecoregion. See Statewide/Multi-region handbook for broadscale Conservation Actions for these priorities.

Table 6. Shared Habitat Priorities with Adjacent State – Oklahoma

| Adjacent States | Ecoregions Shared with Texas | Habitat Priorities Shared with CRTB Texas ⁴ |
|----------------------------------|---|---|
| Oklahoma (OK) | High Plains Southwestern Tablelands Central Great Plain Cross Timbers East Central Texas Plain Western Gulf Coastal Plain | springs and other wetlands mixed grass prairie ephemeral and perennial tributaries and mainstem of the Red River, and associated riparian zones and floodplains tall grass prairie oak woodlands and savanna bottomland forests TX – OK HUC 8 at moderate risk: Farmers-Mud TX – OK HUC 8 at very high risk: Lake Texoma |

⁴ Priorities were determined by reviewing the state’s Action Plan online (Oklahoma Comprehensive Wildlife Conservation Strategy. 2006. <http://www.wildlifedepartment.com/CWCS.htm>) and the National Fish Habitat Risk Assessment Viewer online (NBII and USGS. 2011. http://fishhabitat.org/index.php?option=com_content&view=category&layout=blog&id=42&Itemid=61).

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](#).

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 **CRTB** Ecoregion Handbook 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.

Table 7. CRTB Priority Issues Affecting Conservation

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>Salt cedar/tamarisk (<i>Tamarix spp.</i>) (primarily on the western edge of the region)</p> <p>Cultivated and Old World grasses (e.g. King Ranch (KR) bluestem, Bermuda grass)</p> <p>Tree of heaven, Japanese honeysuckle</p> <p>golden alga (see also <i>Native Problematic Species</i>; it is not conclusively known whether golden alga is native or non-native)</p> | <p>Salt cedar affects water use, monotypic stands, and outcompetes native riparian vegetation (cottonwood, sycamore) at all seral stages and canopy levels; salt cedar line the banks of the Rio Grande in the Big Bend reach, armoring the banks and contributing significantly to channel incision and narrowing, which reduces the diversity and quality of habitat for aquatic species</p> <p>Prairie pockets and woodland edges are adversely affected by non-native and sod-forming grasses (introduced as improved pastures or naturally expansive), a substantial threat to grassland-dependent species (e.g. grassland-obligate birds)</p> <p>Urban/suburban landscaping introduction primarily in riparian zones: ligustrum, chinaberry, Nanina, tree of heaven, and Japanese honeysuckle</p> <p>Non-native plant invasion may also contribute to loss of native pollinators (e.g. honey bee, moths, hummingbirds, others) and the animals which rely on insect fauna now changed by these invasions</p> <p>Toxic algal blooms in what water body in this ecoregion may adversely impact what SGCN directly in this region?</p> <p>Non-native aquatic plants are a significant threat in this area, predominantly in reservoirs and upper reaches of reservoirs where rivers enter the waterbody (what noxious aquatic plants specifically are a threat in this region to SGCN?)</p> |
| Non-native Animal | <p>feral and/or free-ranging "pets" (mostly urban/suburban issue, where interfacing with wildland or openspace)</p> <p>FERAL HOGS</p> <p>Introduced ungulates for hunting (more of an issue in the southern part of the ecoregion)</p> <p>introduced fishes and mollusks - freshwater springs, streams and marshes</p> <p>Red Imported Fire Ants (RIFA)</p> | <p>Free ranging pets are introduced predators which adversely affect small mammals, small reptiles, and birds; also contribute pathogens and diseases</p> <p>Feral hogs decimate important and fragile habitats (e.g. springs, seeps, riparian areas, swale depressional wetlands), degrade instream water quality, and decrease hardwood seedling viability (rooted up, eaten)</p> <p>Non-native hoofstock introduced into our systems alter and destroy habitat, compete with native small mammals and ungulates for food, and are disease vectors which can affect native ungulates and domestic livestock</p> <p>Within streams, nonnative species compete with natives, and are a predation risk (e.g. small mouth bass are voracious non-native predators)</p> <p>Bait fish releases ("minnows") can cause problematic congeneric hybridization (e.g. <i>Gambusia</i> sp.)</p> <p>Zebra mussels have been detected in which waterways in this ecoregion and are a potential significant threat to native freshwater mussels, several of which are already listed by the state as threatened</p> <p>RIFA are a reproductive menace to all ground-nesting and some shrub-nesting birds, including BCVI, small mammals, reptiles and amphibians; RIFA will invade and destroy/eat a nest of eggs and/or young</p> |
| Native Problematic | <p>Native shrub (e.g. juniper, mesquite, whitebrush, yaupon, prickly pear) or "brush" encroachment into prairie systems and understory in mature savanna systems</p> <p>Golden alga (see also <i>Non-native Invasive Species</i>; it is not conclusively known whether golden alga is native or non-native)</p> <p>Brown-headed cowbird</p> | <p>Invasive native brush/trees are a significant threat to prairie-obligate birds, where grassland/prairie habitats are desired ecological condition in this region (mostly along western edge adjacent to CGPL ecoregion): habitat availability decreased and degraded for prairie nesting birds</p> <p>Toxic algal blooms in what water body in this ecoregion may adversely impact what SGCN directly in this region?</p> <p>brood parasites on several threatened and endangered species (black-capped vireo, other woodland and shrubland bird species)</p> |
| Pests, Parasites, Pathogens | | |
| Pathogens | <p>White-nose Syndrome (WNS)</p> <p>Oak wilt and oak decline</p> <p>West Nile virus</p> | <p>WNS affects hibernating bats and is spread through human (we think) and bat vectors, through cave visitation. Mortality is high; prevention and overall cause is unknown. Caves, karst and potentially some human structures that serve as bat hibernacula may be vulnerable.</p> <p>Oak wilt and oak decline adversely affect hardwoods in this ecoregion, contributing to declines in hardwood diversity, suitable woodland songbird nesting areas, and forage for native browsing animals</p> <p>how does west nile virus affect sgcn?</p> |
| Power Development and Transmission | | |

| General Issue | Ecoregion Issue Identified in Workshops (2010) and Surveys (2011) | Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011) |
|--|--|---|
| Wind Generation | See also full discussion in Statewide Handbook Competitive Renewable Energy Zones (CREZ): eastern edge of the Central CREZ Turbine operations | While this ecoregion does not have the high intensity wind potential that western, central and south Texas (including the Gulf) have, one of the CREZ has been mapped into the westernmost edge of this ecoregion, where topography (higher ridges) and less dense vegetation may provide opportunities for higher winds and development. This area is within migration corridors for raptors, neotropical migrants, stopover habitats for Whooping Cranes). Wind turbine operation causes barotraumas in bats and birds, and has resulted in direct strikes to some larger birds (raptors, primarily; and larger flocks of migrants) during operations In some areas the network of maintenance and access roads can be a hazard to fossorial SGCN if not appropriately cited, or if speeds are not controlled in these areas Black-capped vireo habitat and open grasslands on the western edge of the CRTB are vulnerable. deep footings may impact karst in certain areas |
| Hydro (Dam and Reservoir) | | <i>see also Water Development, Management and Distribution</i> |
| Biofuels | Row Crop, Switchgrass, Herbaceous "Biofuel production" was mentioned as an issue in the workshop; however, no specifics (what kind) were given - needs more info | native rangeland, few open grasslands converted to croplands (monotypic stands of switchgrass and others); some native oak woodlands and shrublands converted to switchgrass or fast-growing timber production for "whole tree utilization" |
| Transmission | New development and expansion of existing lines/corridors construction of new power infrastructure corridors to meet urban user needs, from CREZ and non-CREZ west Texas and Panhandle wind generation projects to north Texas urban areas (Fort Worth, Dallas) maintenance and operations maintaining clear right-of-way for vehicle clearance/access, prevention of line and tower danger | directly takes habitat and species during construction (loss), degrades adjacent habitat (creates edge, removes contributing nutrients or can contribute to adverse stormwater runoff into karst, creates opportunities for oak wilt/oak decline and other invasive species), and may hinder movement (daily or seasonal) for animals and birds that are more dependent on interior woodland habitats (do not tolerate edge); creates greater opportunities for brown-headed cowbird parasitism and predation when not placed near or on natural edges (instead of cutting through large intact blocks, could route to areas already affected by edge) mowing, trimming (permanent vegetation conversion from woodland to grassland); in some instances, herbicide application or hydraulic fluid spills from maintenance equipment may threaten karst features Strike hazard for Whooping Crane in certain areas along typical migratory pathways and near open waters |
| Distribution | Development to power grid and retail users: construction of new power infrastructure corridors to meet urban user needs | mowing, trimming (permanent vegetation conversion from woodland to grassland); in some instances, herbicide application or hydraulic fluid spills from maintenance equipment may threaten karst features directly takes habitat and species during construction (loss), degrades adjacent habitat (fragmentation), and may hinder movement (daily or seasonal) |
| Oil and Natural Gas Production and Delivery | | |
| Seismic exploration | surface and subsurface impacts - linear networked vegetation clearing and soil disturbance, vibration and "explosive" disturbance | habitat loss (clearing transects for lines) and no required precautions or reclamation to prevent invasive species introductions (pathogens, plants) vector for invasive species (plant) introductions from equipment and opportunistic colonization in wake of habitat clearing and no reclamation disruption of daily and seasonal activities for fossorial animals (small mammals, reptiles, ground-foraging and ground-nesting birds) |
| Traditional extraction site development and operation, including pumping and pad sites, gathering stations, transmission/delivery facilities (distribution lines, roadway) | on-site spill potential salt water injection wells flaring road networks | limited ground and surface waters (cieneegas, swale wetlands, others) highly sensitive to change/contamination are at risk from chemical, drilling material, and oil spills and groundwater contamination caused by salt water injection flaring increases acid deposition which affects http://www.esa.org/education_diversity/pdfDocs/aciddeposition.pdf - not sure how this directly affects SGCN or habitats? Extraction operations cause clearing, road networks, pad sites, and large mechanical infrastructure(s) which contribute to direct habitat loss, direct and indirect habitat fragmentation, direct mortality from vehicles and operations, and noise/light disturbance (e.g. sand dunes west of Odessa, dunes sagebrush lizard is threatened by these operations and road mortality; nocturnal birds and bats can be adversely impacted by the light and noise pollution; road networks, constant traffic and noise, and mechanical infrastructure interrupts seasonal and daily movements, foraging and mating behaviors of some mammals, reptiles, and birds; small geographically limited populations of desert plants fragmented or lost). |
| Hydraulic fracturing ("fracking or frac-ing") "shale gas" extraction | This ecoregion is underlain with Barnett Shale, which is one of the shale gas formations most targeted (at the moment) for extraction by frac-ing. http://www.energyindustryphotos.com/shale_gas_map_shale_basins.htm Requires deeply injected chemical liquid which fractures substrates and releases gas for capture and delivery: potential groundwater risks, potential | Groundwater (Trinity and Trinity Outcrop Aquifers) and its surface expression in seeps, springs are extremely important habitats in this ecoregion (e.g. LIST SPECIES); groundwater contamination could cause total loss of isolated aquatic populations, adversely affect vegetation that depends on water quantity and quality at springheads, seeps, riparian areas, and instream. Contamination also poses a risk to human and livestock water sources. Fracturing activities may also adversely affect the recharge capacity of porous rock layers and networked karst features. |

| General Issue | Ecoregion Issue Identified in Workshops (2010) and Surveys (2011) | Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011) |
|--|--|--|
| | chemical spill risks, geologic destabilization | |
| Lack of Reclamation | reclamation standards vary, requirements limited unmonitored/unregulated decay of obsolete production sites - toxic chemicals in soils and leftover equipment, decaying equipment | Reclamation not required back to NATIVE vegetation (invasive species allowed to colonize or are directly planted for soil stabilization) |
| Mining | | |
| Sand and Gravel - upland and riverine | sand and gravel mining along and within streams and rivers | adverse effects to water quality in the upper Brazos and ... need locations of registered S&G mines where this is an issue (not all mines are a problem?) need map of sand and gravel mines in TX loss of riparian habitats for instream and adjacent mining, sedimentation in streams contributes to loss and degradation of instream habitats |
| Caliche | caliche - small scale on ranches, large scale for county roads | typically for road base, unreclaimed sites, complete/permanent loss of surface communities |
| Communications Infrastructure | | |
| Transportation | | |
| road and bridge construction (new) | Large transportation projects are planned for this area (State Transportation Plan) to address burgeoning population growth in and around Fort Worth/Dallas metroplex | Little consideration is given to habitat connectivity and fragmentation in these projects during planning; only regulatory processes with a federal nexus impact how facilities are eventually developed, still with limitations on environmental consideration (jurisdictional wetlands, federally listed species and their habitats). Larger highway corridors have already fragmented rural working lands and created a disruption in habitat continuity; in many instances, the ROW is the only conduit under or along the highway to reconnect these lands and these are not typically designed with wildlife movement in mind (small mammals, reptiles and amphibians, fishes typically suffer the greatest disconnection) Revegetation post-construction or post-improvement is typically not with native seed or plant materials; this creates vectors for non-native species introductions into adjacent native habitats and/or disconnected habitats for species more specifically reliant on native flora and the insect fauna supported by those native plants. |
| right of way maintenance | maintaining clear right-of-way for vehicle clearance/access, minimizing fire danger, and maintaining driver visibility | mowing, trimming (permanent fragmentation, erosion) herbicide application 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 |
| Land & Water Mgmt: FARM | See also Water Development section | |
| Lack of soil and water management and conservation practices | Incompatible fertilizer, herbicide, fungicide or pesticide applications; chemical- and sediment-laden irrigation water runoff | adverse impacts to sensitive aquatic insects and other invertebrates, fishes, and amphibians |
| Lack of soil and water management and conservation practices | Concentrated Animal Feeding Operations (CAFOs) | intense concentrations of animals - feces, antibiotics, pesticides are all elements in runoff from many of these sites, if they do not have stormwater controls in place for catchment, filtration, and/or water treatment prior to release back to land and water environments; adversely affects water quality (chemicals, sediment loading which adversely affects instream life) and vegetation communities along stream catchments (over-enrichment can lead to complete loss of riparian and unbalance instream vegetation to favor noxious plants or alga) |
| Cultivation and loss of of natural sites/habitats | Conversion TO or FROM pecan orchards? | if TO pecan: loss of native bottomland hardwood diversity and floodplain forests for monotypic pecan production if FROM pecan: loss of native pecan bottomland?? |
| Land & Water Mgmt: RANCH | See also Water Development section | |

| General Issue | Ecoregion Issue Identified in Workshops (2010) and Surveys (2011) | Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011) |
|--|--|--|
| Incompatible stocking practices | 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) non-native hoofstock for hunting operations | 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) and introduced competition from non-natives degrades grassland and prairie habitats in the woodland matrix; also can contribute to adverse water quality and quantity in some areas with sensitive aquatic invertebrates and fishes |
| Landowner/land management incentive programs working at cross-purposes | single-objective management such as all-game, all-livestock, all-recreation incentive programs, technical guidance, and management assistance from all providers could be offered with a more complete menu of land and water management options, which includes SGCN and rare communities' needs inappropriate juniper or other brush management on slopes or canyons (see also statewide handbook re brush management) Landowners do not have a one-stop shop to review best management practices for their site, for their goals | single species or single habitat management does not promote diverse or productive habitat values and full-system management |
| Land ownership | Near larger urban areas in Texas, ranch subdivision is a constant issue for the conservation service provider. | Multiple landowners more difficult to target with a conservation incentives than one single larger landowner Each landowner has a different goals for their land Fragmentation of larger habitats and landscapes more likely Large-patch habitat dependencies are adversely affected; land management is more resource- and time-intensive and recovery "starts" at different points SEE ALSO STATEWIDE HANDBOOK FOR THIS ISSUE and ACTIONS |
| Fencing | high game fencing | High game fencing reduces genetic viability in all species inside the fence (depending on construction), fences in non-natives and can degrade natural habitats quickly without VERY intensive management to control hogs and other destructive non-natives, makes management of a public resource onerous on the landowner, requires intensive planning and is not suitable for most wildlife species or the longterm financial condition of most ranches |
| Land Management Practices | Fire suppression (or just the lack of fire in the system, whether suppressed or not) | Without fire in these habitats, grassland to shrubland or closed canopy woodland conversion (aforestation) with less of a natural mosaic important to species which co-evolved in this system While some portions of this ecoregion (primarily canyons, karst outcrops, and riparian areas) are supposed to be closed canopy mature woodlands which eventually grow to naturally suppress understory, most upland habitats in this region require fire or some kind of disturbance to prevent thicketed understory and encourage the natural mosaic of woodland – grassland and allow for mature forest regeneration. |
| Clearing and loss of important natural sites/habitats | Springs, seeps, other wetlands and smaller streams altered (dammed, pumped) for stock uses, domestic use | Changes vegetation community, hydrology, and aquatic species habitats in these areas |
| Land & Water Mgmt: Municipal | See also Water Development section | |
| Lack of Zoning and Planning | Planning efforts are minimal, rarely regional; this entire region is affected by the sprawling urban/suburban growth – direct water use, future water needs, continuous loss of habitat outside of urban jurisdictions, inadequate stormwater pollution prevention | Water: Outlying areas and rural areas with water are targeted to supply municipal needs in other basins (see WATER DEVELOPMENT below) Land: Urban sprawl and little regulation on development type contributes to all land habitat loss, impervious cover and runoff (degradation of water quality) |
| Land & Water Mgmt: Conservation & Recreation | | |
| Inadequate/Inappropriate Management | managing wildfire (more Rx burning needed to reduce the risk of wildfires) | |
| Inappropriate Recreational Uses | ORV use in sensitive areas (stream beds, steep slopes) | Adverse water quality effects through direct disturbance, soil erosion, fuel/oil spills, and degradation/loss of vegetation communities and aquatic habitats |
| Not all "public" or "managed" lands are "conservation" lands | | 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, vegetation loss |
| Lack of connectivity between public lands managed for conservation | | |

| General Issue | Ecoregion Issue Identified in Workshops (2010) and Surveys (2011) | Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011) |
|---|--|---|
| Lack of long-range conservation planning and cohesive land conservation/management strategies in each ecoregion | conversion to tax-producing entities (e.g. City, USACE divesting recreation lands or open space to generate revenue) | Larger "open space" or parkland sites which have historically functioned as stepping stones for migrants through urban areas or water quality protection sold for revenue generation; these may have conservation values that are not protected in the sale through conservation easement or other development-limiting title attachments |
| Water Development, Management and Distribution | SEE ALSO STATEWIDE HANDBOOK | |
| Surface Water Planning | Natural resources not well-defined or required as a "constraint" in Regional Water Planning (RWP) processes; natural resource professionals are not consistently involved in RWP processes Large municipalities' demands are the primary driving force in surface and groundwater planning Several new reservoirs are planned in ecoregion to address growing urban population water needs; Many natural resource "constraints" are not considered in the planning or site selection process New water line construction not considered in planning or operational impacts/costs to resources | Many urban water users are disconnected from the impact their water use has on the environment and local ecology; where they could save water; how much they use on a daily basis; safety of water re-use; etc. - needs campaign in large urban areas especially where urban water needs may contribute to new reservoir development and large losses in intact native instream and terrestrial habitats. MUST MAKE CONNECTIONS BETWEEN URBAN USE AND IMPACTS TO NATURAL SYSTEMS. Selected new reservoir sites (State Water Plan 2007 and see also the TCAP Statewide Issues handbook) will contribute to direct loss (permanent over-canopy inundation/flooding) of bottomland hardwood forests, riparian areas important as migratory flyways, shallow stream and wetland habitats Reservoirs proposed on the Brazos may adversely affect sharpnose and smalleye shiner |
| Reservoir Construction and Operation | Timing/Periodicity/Intensity of Water Releases releases are unnaturally intense and short duration in the "wrong" season to mimic natural flooding processes – all larger rivers in this region | Altered flooding regime (timing, periodicity, amounts) that adversely affects flood-dependent riparian and aquatic systems Unnatural hydrograph scours instream and stream-adjacent habitats, shifts vegetation communities out of sync with other riparian communities where flooding is more "natural", vegetation communities and instream animal (invert, fishes, etc.) cannot "rely" on the seasonal changes under which they evolved. |
| Groundwater Planning and Distribution | Groundwater districts are political subdivisions, not aligned necessarily with aquifer boundaries Extraction: groundwater pumping without full accounting for natural resources as a "use" | physical changes to karst, springs (water amount and quality) adversely impact some species' thresholds for survival and/or sustainable life history (reproduction, foraging, resting); subirrigated and instream aquatic habitats and riparian zones require groundwater reaching the stream (flow, depth, substrate changes, adjacent riparian habitat changes from dry conditions) and changes in instream water conditions such as temperature, oxygen availability, and other nutrient and chemical factors (such as the age of water source that comes from the aquifer) decreased and degraded aquifer recharge capacity ("drying out the sponge or seive" at certain levels within the aquifer can affect the flow quantity and quality into the aquifer from recharge events) |
| Other Water Source Developments and Technologies | Interbasin Transfers (Surface and Groundwater) Municipal demands on water and potential for well field development for commercial export out of the region or to the largest municipalities | Most of this is addressed at the statewide level; are there specific resources affected in this region?? |
| Interbasin Transfers (Surface and Groundwater) | lack of accounting for instream flow in each basin, timing and amount of withdrawals for transfer | water chemistry is different among basins and "sharing" water can change the chemistry in both systems, potentially adversely affecting tolerances of sensitive aquatic species; instream flows (water quantity) are altered in both systems |
| Desalination and Chloride Removal Operations | Salt-laden surface waters are extracted, treated mechanically and chemically to create fresh (non-salt) water for human consumption and agricultural uses; brine is repatriated to stream | Water loss out of surface system, changes chemical composition of water in upper Brazos, brine disposal and surface water loss changes water quantity and quality downstream of these operations, adversely affecting instream and stream-adjacent species/communities |
| Lack of Information & Resources | | |
| Lack of CRTB vegetation community and species information | Not much is fully understood about the Cross Timbers desired ecological condition | Vegetation communities will be mapped through the Texas Ecological Systems Mapping Project and this will contribute to greater understanding of the terrestrial habitats; however, little is known about SGCN distribution and/or needs from these vegetation types. Need more information on instream flow and water quality thresholds for aquatic SGCN (mussels, fishes, insects). |

| General Issue | Ecoregion Issue Identified in Workshops (2010) and Surveys (2011) | Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011) |
|---|---|--|
| Lack of Processing <i>Existing</i> Data | Where census, survey, records and collections are documented, little is done with the data to detect trends and causes for upward or downward shifts. | 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. |
| Best Management Practices | Inadequate understanding or availability of ecologically-based or widely-accepted conservation Best Management Practices | Especially important in areas where flooding and fire processes have been interrupted and not replaced through human intervention or active management; also need better distribution of ecologically appropriate riparian practices. |
| Inadequate Policies, Rules, Enforcement | | |
| Poaching, Permitting Avoidance and Violations | Insufficient opportunities for law enforcement for non-game issues Baitfishing Small Mammal and Reptile "hunting" | Several small fish species in river and stream systems of this ecoregion are rare; indiscriminate bait fish harvesting may impact these rare species How does small mammal or reptile hunting adversely affect SGCN? |
| Wetland Jurisdiction | Loss of and impact to "non-jurisdictional" wetlands and other waters | Isolated wetlands are not protected under USACE regulatory processes; these are important habitats for migratory waterfowl, bog and seep communities and other SGCN SEE STATEWIDE ISSUES HANDBOOK ALSO |
| Other Cross-Cutting Issues | | |
| Climate Change | Native vegetation shifts Pollinator shifts and losses Phenology shifts | Potential shifts from or to grassland communities, loss of shrublands and woodlands potential; Need better modeling information |
| | Economics Ranch | Landowner incentives cannot compete currently with market forces; market forces in some areas cannot support continued large ranch ownership SEE STATEWIDE ISSUES HANDBOOK |

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*.⁵

Actions proposed for the **CRTB** Ecoregion ([Table 8](#)) 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 (CMP 2007, Salzer and Salafsky 2006). 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 fish and wildlife agency directors and others. 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](#) (AFWA TWW, 2011) is **strongly recommended** to define projects, target audiences and partners, identify desired step-wise intermediate results, and collect the “right” data to report our conservation achievements.

⁵ 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).

Table 8. CRTB 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 | Direct Mgmt of Natural Resources | Species Restoration | Creation of New Habitat | Acquisition, Easement, or Lease | Land Use Planning | Training, Technical Assistance | Data Collection, Analysis, Management | Conservation Area Designation | Education, Targeted Outreach | Environm Review | Mgmt Planning |
|---|----------------------------------|---------------------|-------------------------|---------------------------------|-------------------|--------------------------------|---------------------------------------|-------------------------------|------------------------------|-----------------|---------------|
| Initiate a Conservation Area Designation Incentive Program for landowners to protect wetlands – especially springs, seeps, bogs, and other isolated wetlands – from livestock access, restore surrounding wetland fringe vegetation, and contribute data about the location and condition of these incredibly important and sensitive resources. | | | | | | | | | | | |
| Identify the top keystone regulated species (e.g. for each broad habitat type most affected by development – wetlands, shrublands, ...) in the ecoregion for which one or two large scale mitigation banks could be the most beneficial to the most SGCN. Identify through the Texas Ecological Systems Mapping Project where these habitat types may best occur and provide landowner incentives to participate in these areas. Depending on success of the mitigation bank concept, determine best targeted effective outreach to developers who would or could use this tool. | | | | | | | | | | | |
| 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 particular habitat types and the mosaic desired in the region; focus on longterm health and sustainability of desired ecological conditions (plant communities); work with Rx fire technical experts AND rare species experts to identify concerns, barriers, and solutions. Monitor keystone SGCN grassland birds, reptiles, and insect(s) to determine effectiveness of the applied practices | | | | | | | | | | | |
| Form multi-partner working group(s) to establish scientifically sound best management practices for chemical/mechanical brush control for the ecoregion and specific watersheds; identify where this tool is appropriate and be specific about where it is not | | | | | | | | | | | |
| Form multi-partner working group(s) to write scientifically sound regionally specific 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). Share widely through landowner incentive program networks. | | | | | | | | | | | |

| Conservation Action | Direct Mgmt of Natural Resources | Species Restoration | Creation of New Habitat | Acquisition, Easement, or Lease | Land Use Planning | Training, Technical Assistance | Data Collection, Analysis, Management | Conservation Area Designation | Education, Targeted Outreach | Environm Review | Mgmt Planning |
|---|----------------------------------|---------------------|-------------------------|---------------------------------|-------------------|--------------------------------|---------------------------------------|-------------------------------|------------------------------|-----------------|---------------|
| 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. | | | | | | | | | | | |
| Conduct professional level cross-agency/org training opportunities for SGCN-related RX fire, stream rehabilitation, brush management, GIS and corridor identification, other ... USE THE EFFECTIVENESS MEASURES to determine effectiveness and application rates of these trainings Identify a host website to share professional practices | | | | | | | | | | | |
| Conservation easements and landowner incentive programs are the best instruments for landowner participation in this region. Landowners with intact, healthy CRTB mosaic habitats of woodlands/grasslands with restoration potential for little investment, riparian corridors along Ecologically Significant Stream Segments (and to their headwaters), and/or springs should be first-eligible. 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 (see Statewide/Multi-region Issues handbook – Information Actions section). | | | | | | | | | | | |
| Work with willing landowners <i>especially adjacent to and in corridors between</i> well-managed public lands to restore and manage riparian communities in large single-ownership or smaller acreage cooperatives – opportunities to connect/improve historically fragmented management | | | | | | | | | | | |
| Work with the transportation and urban planning entities in the Fort Worth – Dallas metroplex and emerging communities to reduce human-induced pollution risks, increase water conservation in the high to very high risk HUC 12 watersheds identified by the National Fish Habitat Action Plan Identify specific measures that can be implemented and establish monitoring to determine if outreach and coordination with planning entities is effective | | | | | | | | | | | |
| Work with the transportation and urban planning entities in the Fort Worth – Dallas metroplex and emerging communities to identify the best open space and parkland connectivity through and around these areas to benefit migratory species, riparian connectivity, prairie preservation, and water quality. Identify Best Management Practices for these corridors or stepping stones. | | | | | | | | | | | |

| Conservation Action | Direct Mgmt of Natural Resources | Species Restoration | Creation of New Habitat | Acquisition, Easement, or Lease | Land Use Planning | Training, Technical Assistance | Data Collection, Analysis, Management | Conservation Area Designation | Education, Targeted Outreach | Environm Review | Mgmt Planning |
|---|----------------------------------|---------------------|-------------------------|---------------------------------|-------------------|--------------------------------|---------------------------------------|-------------------------------|------------------------------|-----------------|---------------|
| <p>Many small mammal, insect, reptiles and amphibians in this region lack distribution and POPULATION status information. This lack of information can contribute to “false rarity” determinations.</p> <p>Document more information about these species specific habitat needs, identification of these habitat types through the Texas Ecological Systems Mapping Project, and conservation incentives to private landowners in these areas to reduce the risk of listing, enhance recovery options, and contribute to conservation of many sensitive habitats just through awareness and documentation.</p> | | | | | | | | | | | |
| <p>Information Needs (Specific)</p> <ul style="list-style-type: none"> ▪ Mapping the most invasive species in the region, to determine priority areas for control and restoration ▪ Presence and status of the following species (why these in particular?) <ul style="list-style-type: none"> ○ • Research on effects of managed flows (dam construction and dam releases) in the watersheds with Ecologically Significant Stream Segments, including sediment dynamics and water quality to what management or recommendation end – be specific | | | | | | | | | | | |
| <p>River rehabilitation in/adjacent to identified stretches of the insert specific stream segments: recommendations for instream flow, quality and intensity management; riparian restoration; and specific work to increase resiliency to climate change</p> | | | | | | | | | | | |
| <p>Climate change models and effects on grassland – woodland mosaic habitats, riparian areas, and springs/groundwater resources</p> | | | | | | | | | | | |
| <p>Host landowner workshops on 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</p> <p>Identify the best SGCN targets for these tools</p> | | | | | | | | | | | |

| Conservation Action | Direct Mgmt of Natural Resources | Species Restoration | Creation of New Habitat | Acquisition, Easement, or Lease | Land Use Planning | Training, Technical Assistance | Data Collection, Analysis, Management | Conservation Area Designation | Education, Targeted Outreach | Environm Review | Mgmt Planning |
|---|----------------------------------|---------------------|-------------------------|---------------------------------|-------------------|--------------------------------|---------------------------------------|-------------------------------|------------------------------|-----------------|---------------|
| <p>Improve Environmental Review and Consultation for voluntary practices (wind, communications, transportation):</p> <p>Create mapped zones of sensitive areas (raptor migration corridors, proximity to colonial habitats, rare plant communities, SGCN distributions) using the Texas Ecological Systems Mapping Project to share with developers upon request to encourage better siting</p> <p>Identify timing and intensity of barotraumas and impact hazards from wind turbines and encourage wind generation companies to modify practices</p> <p>Identify non-compliant communications towers and provide incentives to bring into compliance (lighting, height); outreach to communications companies about the local hazards of communication towers and recommendations to improve practice to improve conditions for all nocturnal migrants</p> | | | | | | | | | | | |
| <p>Determine market values that are driving livestock production, hunting and other recreation, and land sales 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.</p> | | | | | | | | | | | |
| <p>Identify the barriers to RX fire application to significant grassland restoration areas. Make management recommendations (timing, season, periodicity) to overcome barriers AND match more natural fire episode timing. Craft TARGETD outreach plans to overcome these barriers and work with landowners in core grassland restoration and recovery areas to benefit grassland birds, small mammals and reptiles. Select a few keystone species for monitoring in these areas – see above.</p> | | | | | | | | | | | |
| <p>Work with private landowners and conservation partners to minimize feral hog populations through aerial shooting, hunting, and trapping. Provide technical guidance and educational programs about the impact and management of feral hogs to benefit ground nesting birds, small mammals, aquatic species</p> | | | | | | | | | | | |
| <p>Where wildlife and fisheries management are not the primary objective and where livestock production is the primary objective, refer landowners to partners who can assist them with best management practices for rotational and site-appropriate grazing management</p> | | | | | | | | | | | |

| Conservation Action | Direct Mgmt of Natural Resources | Species Restoration | Creation of New Habitat | Acquisition, Easement, or Lease | Land Use Planning | Training, Technical Assistance | Data Collection, Analysis, Management | Conservation Area Designation | Education, Targeted Outreach | Environm Review | Mgmt Planning |
|--|----------------------------------|---------------------|-------------------------|---------------------------------|-------------------|--------------------------------|---------------------------------------|-------------------------------|------------------------------|-----------------|---------------|
| Species Restoration: <ul style="list-style-type: none"> Identify the specific potential, need, and connectivity to other populations for reintroduction of pronghorn and/or horned lizard in this ecoregion (is this the best ecoregion for these efforts? Are these the best species to spend limited reintroduction resources on in this ecoregion? Why?) | | | | | | | | | | | |

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.

CONSERVATION PARTNERS AND PROGRAMS

This section to be developed following all Actions, prior to USFWS review in August 2011

RESOURCES AND REFERENCES

Resources and References will be finalized after the handbook has been completely drafted. These and other resources will be compiled into one large document on the website after USFWS review.

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