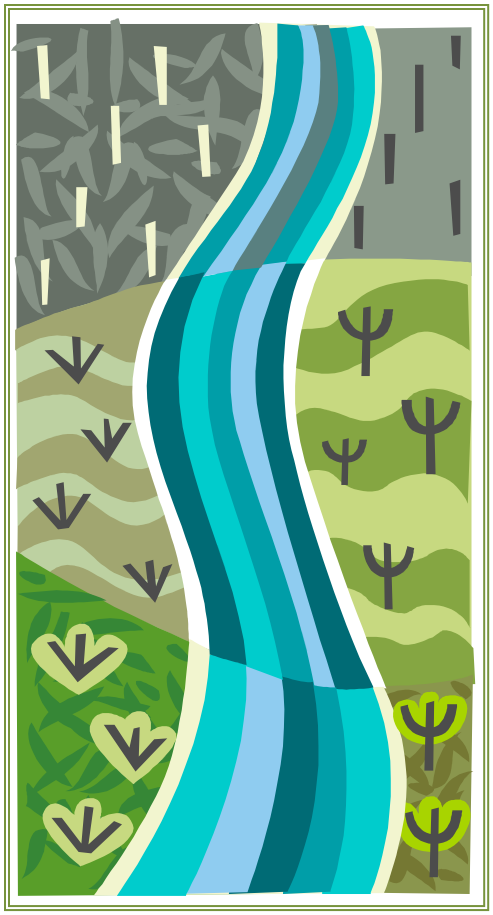

TEXAS CONSERVATION ACTION PLAN

South Texas Plains

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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PWD insert number when approved

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See links on Texas Parks and Wildlife Department's Texas Conservation Action Plan 2011 Web Page 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 South Texas Plains (STPL) 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 STPL 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 STPL 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 STPL 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 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 STPL 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.

2010 TCAP *	**2005 TXWAP** (Gould 1960)	**The Nature Conservancy** Terrestrial Ecoregions (1999)	**Ecological Drainage Units** (*Watersheds*) From the **National Fish Habitat Action Plan** *TX = Southeast Aquatic Resources Partnership and Desert Fish Habitat Partnership* (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)
Southern Texas Plains (STPL)	South Texas Plains	Tamaulipan Thorn Scrub (30)	Corpus Christi – Frio – Nueces Guadalupe – San Antonio Laguna Madre Lower Rio Grande/Bravo	Rio Grande JV Gulf Coast JV Tamaulipan Brushlands BCR	Gulf Coast Prairie	Trans Pecos – Rio Grande (1) South Texas Rio Grande (2) Nueces Coastal Bend (3)	Southwest Plateaus and Plains Range and Cotton Region: Edwards Plateau Western (81A), Northern Rio Grande Plain (83A), Western Rio Grande Plain (83B), Central Rio Grande Plain (83C), Lower Rio Grande Plain (83D)	South Texas Brush Country

Figure 1. STPL Ecoregion with County Boundaries
South Texas Plains ecoregion in yellow

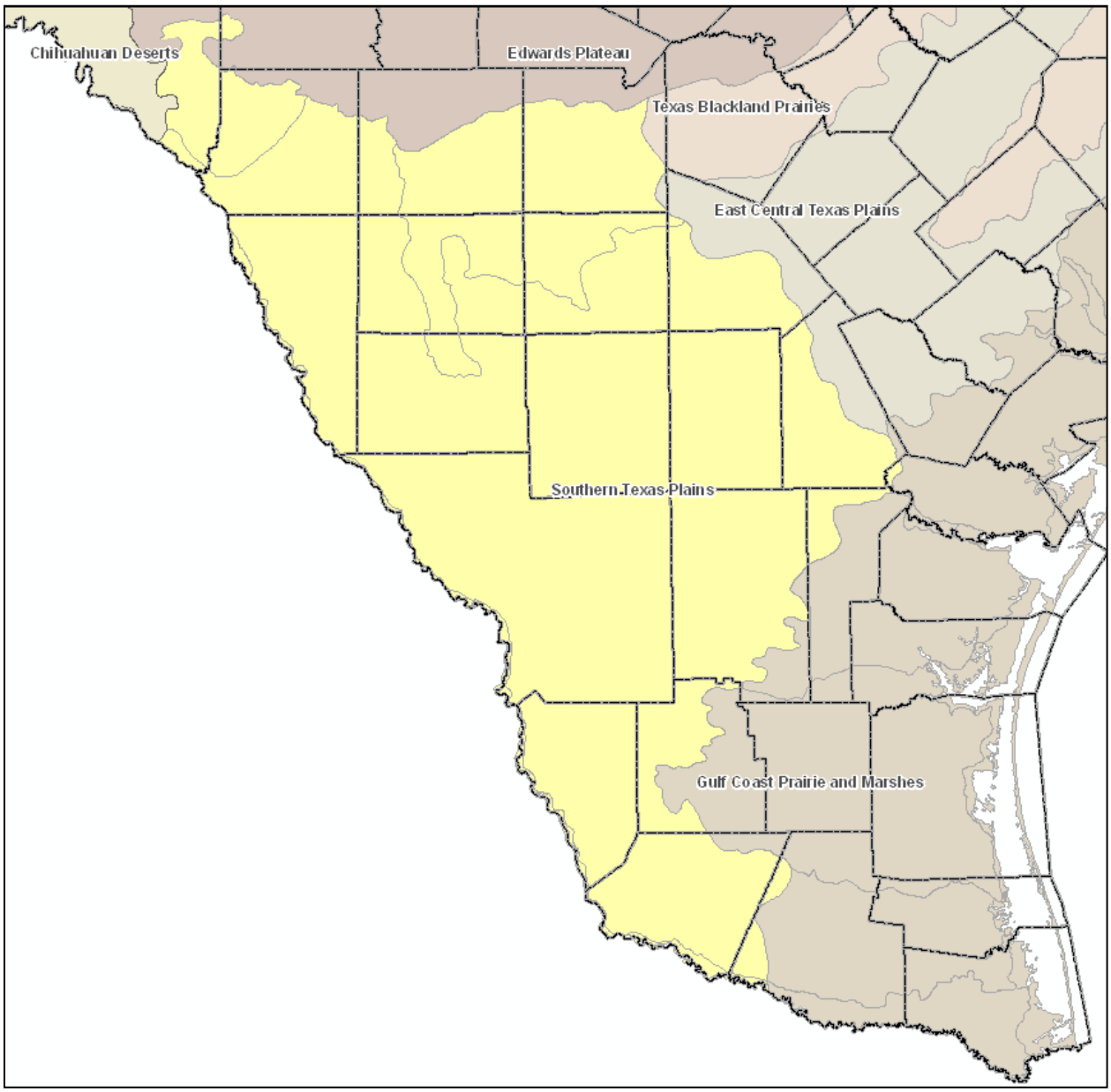


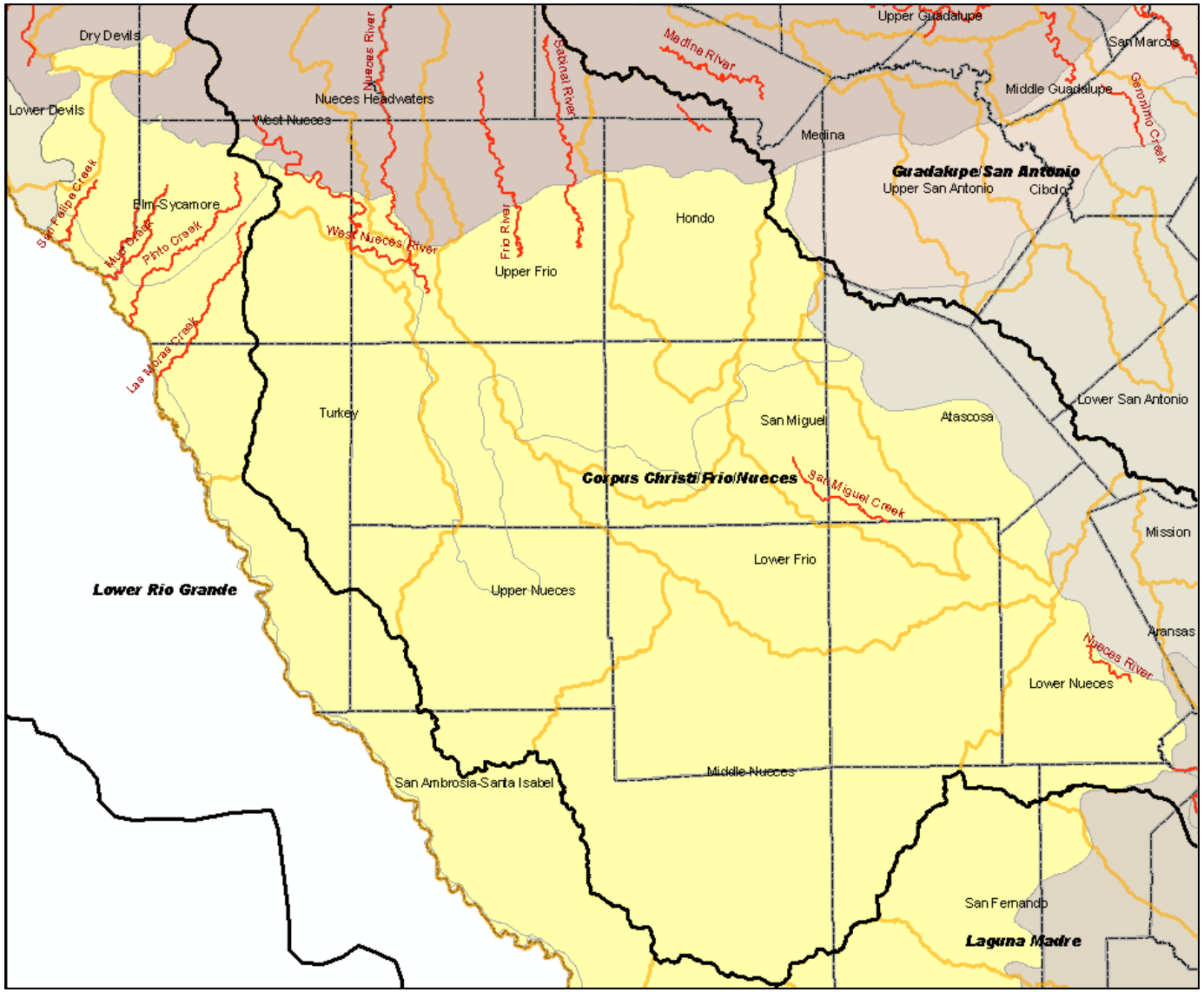
Table 2. STPL EDUs with Ecologically Signifcant Stream Segments and Reservoirs

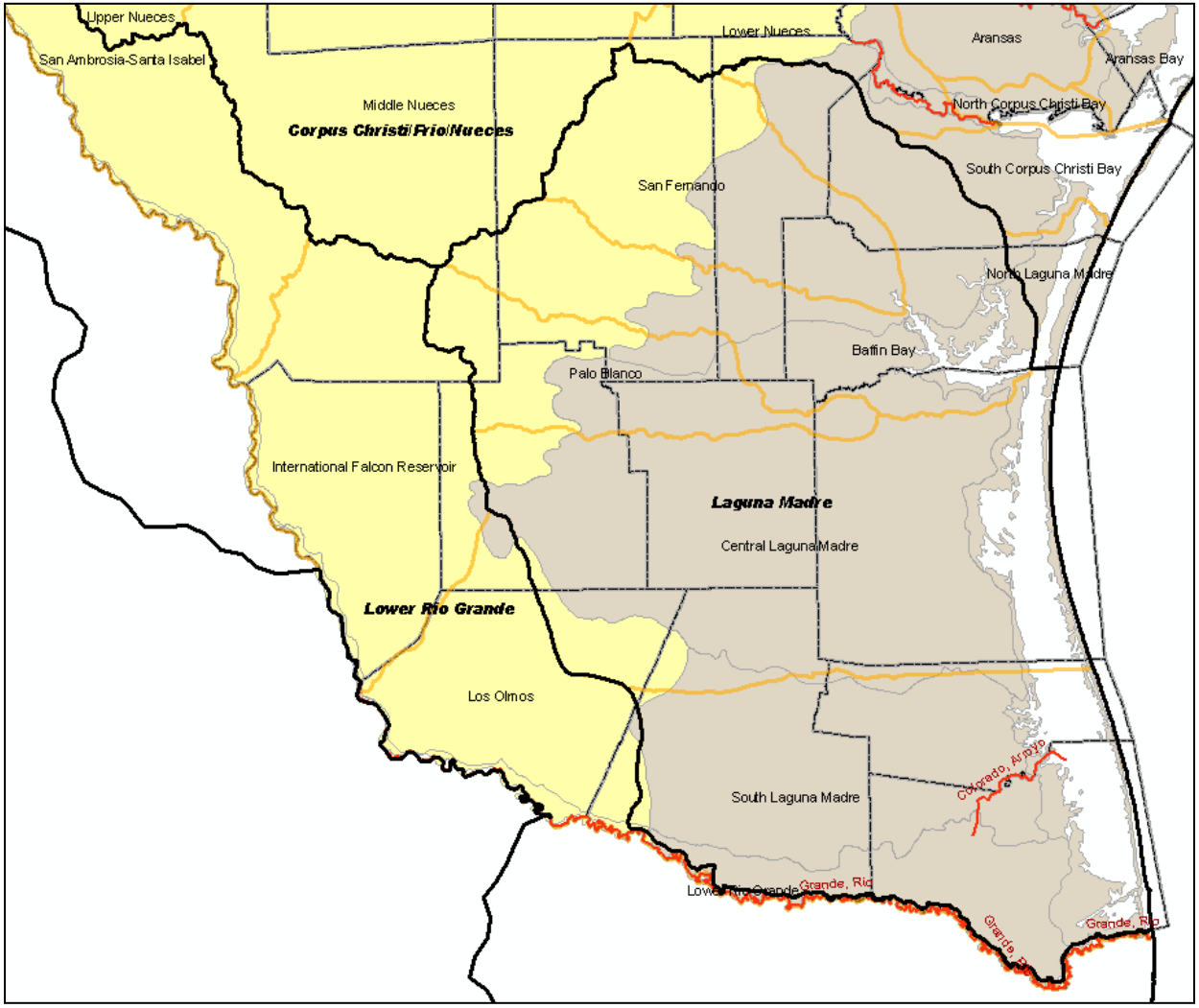
ECOLOGICAL DRAINAGE UNIT SubBasin (HUC 8)	*Ecologically Significant Stream Segment TPWD 2002, w/updates 2005*	**Lakes and Reservoirs**
GUADALUPE - SAN ANTONIO		
Medina		
CORPUS CHRISTI - FRIO - NUECES		
Lower Nueces	Nueces River	Lake Corpus Christi
Atascosa		
West Nueces	West Nueces River	
Nueces Headwaters	Nueces River	
Upper Nueces	Nueces River	Upper Nueces Lake
Upper Frio	Frio River, Sabinal River	
Hondo		
Turkey		
Middle Nueces		
Lower Frio		Choke Canyon Reservoir
San Miguel	San Miguel Creek	
LOWER RIO GRANDE/BRAVO		
Lower Devils		Amistad Reservoir
Elm-Sycamore	San Felipe Creek,Sycamore Creek, Mud Creek, Pinto Creek, Las Moras Creek	
Dry Devils		
San Ambrosia - Santa Isabel		Casa Blanca Lake
International Falcon Reservoir		Falcon Reservoir
Los Olmos	Rio Grande/Bravo, below Falcon Reservoir	Falcon Reservoir

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. STPL EDUs, HUC 8s, and ESSS – 2 maps

Corpus Christi/Frio/Nueces and upper reaches of the Lower Rio Grande EDUs blackoutline, 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. 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
- Reptiles and Amphibians
- Invertebrates
- Plant Communities
- Birds
- Freshwater Fishes
- Plants

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. STPL 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					
Lasiurus ega	Southern yellow bat		T	G5	S1
Oryzomys couesi aquaticus	Coues rice rat		T	G5T3?	S2
Scalopus aquaticus	Eastern mole			G5	S5
Mustela frenata	Long-tailed weasel			G5	S5
Myotis velifer	Cave myotis			G5	S4
Puma concolor	Mountain lion			G5	S2
Spilogale putorius	Eastern spotted skunk			G4T	S4
Tadarida brasiliensis	Brazilian free-tailed bat			G5	S5
Taxidea taxus	American badger			G5	S5
Conepatus leuconotus	Hog-nosed skunk			G5	S4
Antrozous pallidus	Pallid bat			G5	S5
Spilogale gracilis	Western spotted skunk			G5	S5
Geomys texensis bakeri	Frio pocket gopher			G2QT2	S2
Mormoops megalophylla	Ghost-faced bat			G4	S2
Nasua narica	White-nosed coati		T	G5	S2?
Geomys attwateri	Attwater's pocket gopher			G4	S4
Neovison vison	Mink			G5	S4
Notisorex crawfordii	Desert shrew			G5	S4
Nyctinomops macrotis	Big free-tailed bat			G5	S3
Chaetodipus nelsoni	Nelson's pocket mouse			G5	S?
Dipodomys ordii parvabullatus	Ord's kangaroo rat			G5	S4
Geomys personatus davisi	Texas (Davis') pocket gopher			G4T2	S2
Geomys streckeri	Strecker's pocket gopher			G4T1	S1
Herpailurus yaguarondi	Jaguarundi	LE	E	G4	S1
Leopardus pardalis	Ocelot	LE	E	G4	S1
BIRDS					
Parula pitiayumi	Tropical Parula		T	G5	S3B
Colinus virginianus	Northern Bobwhite			G5	S4B
Circus cyaneus	Northern Harrier			G5	S2B,S3N
Tyrannus forficatus	Scissor-tailed Flycatcher			G5	S3B
Lanius ludovicianus	Loggerhead Shrike			G4	S4B
Spizella pusilla	Field Sparrow			G5	S5B

Scientific Name	Common Name	Status		Abundance Ranking	
		Federal	State	Global	State
Ammodramus savannarum	Grasshopper Sparrow			G5	S3B
Chondestes grammacus	Lark Sparrow			G5	S4B
Spiza americana	Dickcissel			G5	S4B
Sturnella magna	Eastern Meadowlark			G5	S5B
Icterus spurius	Orchard Oriole			G5	S4B
Meleagris gallopavo	Wild Turkey			G5	S5B
Buteo lineatus	Red-shouldered Hawk			G5	S4B
Vireo bellii	Bell's Vireo			G5	S3B
Anthus spragueii	Sprague's Pipit	C		G4	S3N
Piranga rubra	Summer Tanager			G5	S5B
Passerina ciris	Painted Bunting			G5	S4B
Aimophila cassinii	Cassin's Sparrow			G5	S4B
Parabuteo unicinctus	Harris's Hawk			G5	S3B
Buteogallus anthracinus	Common Black-Hawk		T	G4G5	S2B
Anas acuta	Northern Pintail			G5	S3B,S5N
Sternula antillarum	Least Tern	LE*	E*	G4	S3B
Buteo swainsoni	Swainson's Hawk			G5	S4B
Athene cunicularia	Burrowing Owl			G4	S3B
Callipepla squamata	Scaled Quail			G5	S4B
Charadrius montanus	Mountain Plover	PT		G3	S2
Anas fulvigula	Mottled Duck			G4	S4B
Chondrohierax uncinatus	Hook-billed Kite			G4	S2
Buteo nitidus	Gray Hawk		T	G5	S2B
Aratinga holochlora	Green Parakeet			G3	S3
Amazona viridigenalis	Red-crowned Parrot			G2	S2
Glaucidium brasilianum	Ferruginous Pygmy-Owl		T	G5	S3B
Camptostoma imberbe	Northern Beardless-Tyrannulet		T	G5	S3B
REPTILES & AMPHIBIANS					
Cheylydra serpentina	Common snapping turtle				
Crotalus atrox	Western diamondback rattlesnake				S4
Heterodon nasicus	Western hognosed snake				
Phrynosoma cornutum	Texas horned lizard		T	G4G5	S4
Terrapene ornata	Ornate box turtle			G5	S3
Trachemys scripta	Red-eared slider				
Apalone spinifera	spiny softshell turtle				

Scientific Name	Common Name	Status		Abundance Ranking	
		Federal	State	Global	State
Sistrurus catenatus	massasagua				
Drymarchon corais	Indigo Snake			G5T4	S4
Gopherus berlandieri	Texas tortoise		T	G4	S2*
Holbrookia maculata propinqua	Eastern earless lizard				SX
Coniophanes imperialis	black-striped Snake		T	G4G5	S2
Crotaphytus reticulatus	Reticulated collared lizard		T	G3	S2
Holbrookia lacerata subcaudalis	Southern earless lizard				
Hypopachus variolosus	sheep frog		T	G5	S2
Leptodactylus fragilis	white-lipped Frog		T	G5	S1
Leptodeira septentrionalis septentrionalis	northern cat-eyed snake		T	G5T5	S2
Notophthalmus meridionalis	black-spotted Newt		T	G1	S1 or S2?
Pseudemys gorzugi	Rio Grande cooter				S2
Rena dulcis	Texas blind snake				
Rhinophrynus dorsalis	Mexican burrowing toad		T	G5	S2
Siren sp.	Rio Grande Siren (large form)		T	GNRQ	S2
Tantilla atriceps	Mexican blackhead snake				
FRESHWATER FISHES					
Anguilla rostrata	American eel			G4	S5
Ictalurus lupus	Headwater catfish			G3	S2
Cyprinella lepida	Plateau shiner			G1G2	S1S2
Cyprinella proserpina	Proserpine shiner		T	G3	S2
Cyprinella sp.	Nueces river shiner			G1G2Q	S1S2
Cyprinodon eximius ssp	Devils River pupfish				
Dionda argentosa	Manantial roundnose minnow			G2	S2
Dionda diaboli	Devils River minnow	LT	T	G1	S1
Dionda serena	Nueces roundnose minnow			G2	S2
Etheostoma grahami	Rio Grande darter		T	G2G3	S2
Atractosteus spatula	alligator gar				
Cycleptus sp.	(na)				
Gambusia clarkhubbsi	San Felipe gambusia		T	G1	S1
Gambusia senilis	Blotched gambusia		T	G3G4	SX
Hybognathus amarus	Rio Grande silvery minnow	LE	E	G1G2	SX
Notropis amabilis	Texas shiner				
Notropis braytoni	Tamaulipas shiner				
Notropis jemezanus	Rio Grande shiner				

Scientific Name	Common Name	Status		Abundance Ranking	
		Federal	State	Global	State
Rhinichthys cataractae	Longnose dace				
INVERTEBRATES					
Heterelmis sp.	Devils River Springs riffle beetle			G1*	S1*
Neocylloepus boeseli	Texas minute moss beetle			G1G2*	S1*
Bombus pensylvanicus	American bumblebee			GU	SU*
Quadrula aurea	Golden orb		T	G1	S2*
Austrotinodes texensis	Texas Austrotinodes caddisfly			G2	S2
Bombus sonorus	Sonoran bumblebee			GU	SU*
Caenis arwini	A mayfly			G1G3	S2?*
Megachile parksi	a leaf-cutting bee			G1*	S1*
Stallingsia maculosus	Manfreda giant-skipper			G1G2	S1S2
Andrena scotoptera	A mining bee			G1*	S1*
Aphonopelma moderatum	Rio Grande gold tarantula			G2G3*	S2?*
Arethaea phantasma	Rio Grande Thread-legged katydid			G2?*	S2?*
Argia rhoadsi	Golden-winged dancer			G2G3	S2?*
Cicindela cazieri	Cazier's tiger beetle			G2	S2
Cincindela cazieri	Cazier's tiger beetle			G2	S2
Coelioxys piercei	a bee			G1*	S1*
Colletes saritensis	A cellophane bee			G1*	S1*
Conocephalus resacensis	Brownsville meadow katydid			G2?*	S2?*
Decinea percosius	Percosius skipper			G1G3	S1S3*
Dendrocephalus acacioidea	Acacia fairy shrimp			G1	S1*
Dichopetala gladiator	Gladiator short-winged katydid			G2?*	S2?*
Euglandina texasiana	Glossy wolfsnail			G1G2	S1S2*
Gomphus gonzalezi	Tamaulipan clubtail			G2	S2*
Latineosus cibola	a mayfly			G1G2	S1?*
Microcentrum minus	Texas angle-wing			G1?*	S1?*
Pediodectes daedelus	Daedelus sheildback katydid			G1?*	S1?*
Pediodectes mitchelli	Mitchell's sheildback katydid			G1?*	S1?*
Pediodectes pratti	Pratt's sheildback katydid			G1?*	S1?*
Perdita fraticincta	A mining bee			G1*	S1*
Perdita tricincta	A mining bee			G1*	S1*
Popenaias popeii	Texas hornshell	C	T	G1	S1
Potamilus metnecktayi	Salina mucket		T	G1	S1
Praticolella candida	white scrubsnail			G2	S2*

Scientific Name	Common Name	Status		Abundance Ranking	
		Federal	State	Global	State
Praticolella trimatris	Hidalgo scrubsnail			G2	S2*
Procambarus nueces	Nueces crayfish			G1	S1
PLANTS					
Cuscuta exaltata	tree dodder			G3	S3
Euphorbia peplidion	low spurge			G3	S3
Oenothera cordata	heartleaf evening-primrose			G3	S3
Prunus texana	Texas peachbush			G3G4	S3S4
Prunus minutiflora	Texas almond			G3G4	S3S4
Selenia jonesii	Jones' selenia			G3	S3
Astragalus reflexus	Texas milk vetch			G3	S3
Bauhinia lunarioides	Anacacho orchid			G3	S1
Desmanthus reticulatus	net-leaf bundleflower			G3	S3
Gilia ludens	South Texas gilia			G3	S3
Houstonia parviflora	Greenman's bluet			G3	S3
Matelea sagittifolia	arrowleaf milkvine			G3	S3
Coreopsis nuecensis	crown tickseed			G3	S3
Paronychia setacea	bristle nailwort			G3	S3
Pseudognaphalium austrotexanum	South Texas false cudweed			G3	S3
Thelesperma burridgeanum	Burridge greenthread			G3	S3
Heteranthera mexicana	Mexican mud-plantain			G2G3	S1
Acleisanthes crassifolia	Texas trumpets			G2	S2
Acleisanthes wrightii	Wright's trumpets			G2	S2
Adelia vaseyi	Vasey's adelia			G3	S3
Argythamnia argyraea	silvery wild-mercury			G2	S2
Asclepias prostrata	prostrate milkweed			G1G2	S1S2
Astrophytum asterias	star cactus	LE	E	G2S1	S1S2
Atriplex klebergorum	Kleberg saltbush			G2	S2
Caesalpinia phyllanthoides	South Texas rushpea			G2	S1
Calliandra biflora	two-flower stick-pea			G3	S3
Cardiospermum dissectum	Chihuahua balloon-vine			G2G3	S3
Coryphantha macromeris var. runyonii	Runyon's cory cactus			G5T2T3	S2S3
Coryphantha nickelsiae	Nickel's cory cactus			G2	SH
Echinocereus papillosus	yellow-flowered alicoche			G3	S3
Echinocereus reichenbachii subsp. fitchii	Fitch's hedgehog cactus			G5T3	S3
Echinocereus reichenbachii	black lace cactus	LE	E	G5T1Q	S1

Scientific Name	Common Name	Status		Abundance Ranking	
		Federal	State	Global	State
var. albertii					
Eriogonum greggii	Gregg's wild-buckwheat			G2	S1
Frankenia johnstonii	Johnston's frankenia	LE-PDL	E	G3	S3
Gaura villosa ssp. parksii	woolly butterfly-weed			G5T3	S3
Helianthus praecox subsp. hirtus	Dimmit sunflower			G4T2Q	S2
Hoffmannseggia drummondii	Drummond's rushpea			G3	S3
Hoffmannseggia tenella	slender rushpea	LE	E	G1S1	S1
Houstonia correllii	Correll's bluet			G1	S1
Houstonia croftiae	Croft's bluet			G3	S3
Lenophyllum texanum	Texas stonecrop			G3	S3
Manfreda longiflora	St. Joseph's staff			G2	S2
Manfreda sileri	Siler's huaco			G3	S3
Manihot walkerae	Walker's manioc	LE	E	G2	S1
Matelea brevicoronata	shortcrown milkvine			G3	S3
Matelea radiata	Falfurrias milkvine			GH	SH
Paronychia congesta	bushy whitlow-wort	C		G1	S1
Paronychia maccartii	McCart's whitlow-wort			G1	S1
Pediomelum humile	Rydberg's scurfpea			G1	S1
Phyllanthus abnormis var. riograndensis	sand sheet leaf-flower			G5T3	S3
Physaria thamnophila	Zapata bladderpod	LE	E	G1	S1
Polanisia erosa subsp. breviglandulosa	South Texas yellow clammyweed			G5T3T4	S3S4B
Pomaria austrotexana	stinking rushpea			G3	S3
Selenia grandis	large selenia			G3	S3
Tetraneuris turneri	Billie's bitterweed			G3	S3
Thelypodiopsis shinnersii	Shinner's rocket			G2	S2
Thymophylla tephroleuca	ashy dogweed	LE	E	G2	S2
Tillandsia baileyi	Bailey's ballmoss			G2G3	S2
Tradescantia buckleyi	Buckley's spiderwort			G3	S3
Wissadula parvifolia	small-leaved yellow velvet-leaf			G1	S1
Yeatesia platystegia	Texas shrimp-plant			G3G4	S3S4
Zephyranthes jonesii	Jones's rainlilly			G3	S3

Table 4. STPL 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	ECOLOGICAL SYSTEM_NAME	KNOWN COUNTIES	Endemic	KNOWN PROTECTED AREAS
G1G2	S1S2	Sugarberry - Cedar Elm - (Rio Grande Ash) / Pigeonberry - Crucita Forest	Celtis laevigata - Ulmus crassifolia - (Fraxinus berlandieriana) / Rivina humilis - Chromolaena odorata Forest	Tamaulipan Floodplain CES301.990	Brooks, Cameron, Hidalgo, Kenedy, Nueces, Jim Wells, Kleberg, and Willacy	N	Lower Rio Grande and Santa Anna NWR (USFWS)
G1	S1	Tamaulipan Maritime Shrubland [B16]	Citharexylum berlandieri - Yucca treculeana - Ebenopsis ebano - Phaulothamnus spinescens Shrubland	South Texas Lomas CES301.462	Cameron and Hidalgo	N	Laguna Atascosa NWR & Lower Rio Grande NWR (USFWS)
G1	S1	Texas Ebony Resaca Forest	Ebenopsis ebano - Ehretia anacua / Condalia hookeri Forest	Tamaulipan Floodplain CES301.990	Cameron and Hidalgo	N	Las Palomas NWR, Lower Rio Grande NWR, and Santa Ana NWR (USFWS)
G1G2	S1S2	Curly-mesquite - Sideoats Grama - Buffalo Grass - Texas Wintergrass Herbaceous Vegetation	Hilaria belangeri - Bouteloua curtipendula - Buchloe dactyloides-Nasella leucotricha- Herbaceous Vegetation	Texas-Louisiana Coastal Prairie CES203.550	Nueces, Kleberg, and Jim Wells	N	No protected areas (Robstown, TX area)
G2G3	S2S3	Shoregrass Herbaceous Vegetation	Monanthochloe littoralis Herbaceous Vegetation	Central and Upper Texas Coast Salt and Brackish Tidal Marsh CES203.473	Aransas, Brazoria, Brooks, Calhoun, Cameron, Chambers, Galveston, Gonzales, Hidalgo, Kenedy, Kleberg, Matagorda, Nueces, Refugio, San Patricio, and Willacy	N	Anahuac NWR (USFWS), Aransas NWR (USFS), Brazoria NWR (USFWS); Candy Abshier WMA (TPWD), Mad Island Preserve (TNC), Mad Island WMA (TPWD), San Benard Brazoria NWR (USFWS), Mustang Island SP (TPWD), Matagorda WMA (TPWD), and Padre Island National Seashore (NPS)..
G2	S2	Coastal Mesquite / Cactus Woodland	Prosopis glandulosa / Acanthocereus tetragonus Woodland	Tamaulipan Mixed Deciduous Thornscrub CES301.983	Cameron, Kleberg, Webb, and Willacy	N	No documented protected areas
G2G3	S2	Tamaulipan Mesquite Brushland	Prosopis glandulosa var. glandulosa / (Celtis pallida, Phaulothamnus spinescens, Ziziphus obtusifolia var. obtusifolia) Woodland	Tamaulipan Mixed Deciduous Thornscrub CES301.983	Cameron and Hidalgo	N	Lower Rio Grande NWR, and Santa Ana NWR (USFWS)
G2G3	S2S3	Seaside Bluestem - Brownseed Crowngrass Texas Sand Sheet Herbaceous Vegetation	Schizachyrium littorale - Paspalum plicatulum Texas Sand Sheet Herbaceous Vegetation	South Texas Sand Sheet Grassland CES301.538	Brooks, Hidalgo, Kenedy, Kleberg, Jim Hogg, Starr, and Willacy	Y	No documented protected areas
G2	S2	Cenizo - Mejorana - Redbrush Lippia Shrubland	Leucophyllum frutescens - Salvia ballotiflora - Lippia graveolens Shrubland	Tamaulipan Calcareous Thornscrub CES301.983	Hidalgo, Starr, and Val Verde	N	Amistad NWR (USFWS)
G2G3	S2	Lower Rio Bravo/Rio Grande Riparian Willow Shrubland	Salix interior / Phragmites australis Temporarily Flooded Shrubland	Tamaulipan Floodplain CES301.990	Cameron, Hidalgo, and Starr	N	Bentsen-Rio Grande State Park (TPWD), Las Palomas NWR, Lower Rio Grande NWR, and Santa Ana NWR

Global Rank	State Rank	COMMON_NAME	GLOBAL_NAME	ECOLOGICAL SYSTEM_NAME	KNOWN COUNTIES	Endemic	KNOWN PROTECTED AREAS
							(USFWS)
G2G3	S2S3	Lower Rio Grande Valley Black Willow Forest	Salix nigra - Celtis laevigata var. laevigata / Baccharis neglecta Forest	Tamaulipan Floodplain CES301.990	Cameron, Hidalgo, Kenedy, Kleberg, and Starr, Webb, and Zapata	Y	Bentsen-Rio Grande State Park (TPWD), Las Palomas NWR, Lower Rio Grande NWR, and Santa Ana NWR (USFWS)
G2	S2	Texas Ebony - Snake Eyes Shrubland [B16]	Ebenopsis ebano - Phaulothamnus spinescens Shrubland	South Texas Lomas CES301.462	Brooks, Cameron, Hidalgo, Jim Hogg, Jim Wells, Kenedy, Kleberg, McMullen. Starr, Webb, Willacy, and Zapata	N	Lower Rio Grande NWR, (USFWS) and Los Palomas WMA (TPWD)
G2G3	S1	Chaparro-Prieto - Cenizo - Guapilla Shrubland	Acacia rigidula - Leucophyllum frutescens - Hechtia glomerata Shrubland	Tamaulipan Calcareous Thornscrub CES301.983	Starr and Zapata	N	No documented protected areas
G1	S1	Saladillo - Amargosa - Common Goldenweed / Curly-mesquite Shrubland	Varilla texana - Castela erecta ssp. texana - Isocoma coronopifolia / Hilaria belangeri Shrubland	Tamaulipan Mixed Deciduous Thornscrub CES301.983	Starr, Webb, and Zapata	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. STPL Priority Habitats

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

GENERAL HABITAT TYPES	SOUTH TEXAS PLAINS (STPL)	STPL Ecological Systems
NATURAL AND SEMI-NATURAL TYPES	*Habitats in this column were identified in the workshop; additions were made by editor to riverine and cultural aquatic*	*NatureServe. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications for Ecological Systems of Texas' South Texas Plains. NatureServe Central Databases. Arlington, VA. U.S.A. Data current as of 08 October 2009.*
Barren/Sparse Vegetation	inland live dune fields caliche outcroppings escarpments: bordas, rocky cliffs and ledges along the Rio Grande upland saline barrens gravel ridges	
Desert Scrub	*See shrubland category for thornscrub*	Chihuahuan Creosotebush Desert Scrub Chihuahuan Succulent Desert Scrub
Grassland	Mid grass and short grass prairies Saline flats with gulf cordgrass communities **South Texas Sandsheet Grassland is actually in the GCPM ecoregion; it is included in both STPL and GCPM ecoregions' habitat types for this exercise as some practitioners are more familiar calling it a "south Texas" ecotype.*	South Texas Sand Sheet Grassland* Tamaulipan Caliche Grassland Tamaulipan Clay Grassland Tamaulipan Savanna Grassland Tamaulipan Tallgrass Grassland Texas Blackland Tallgrass Prairie Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (mixed upland and wetland)
Shrubland	thorn shrubland – taller shrublands with shorter scrub-shrub; coastal scrub, lomas, south texas plains shrubland	Chihuahuan Mixed Desert and Thornscrub Tamaulipan Calcareous Thornscrub Tamaulipan Mixed Deciduous Thornscrub
Savanna/Open Woodland	Mesquite savanna oak savanna	Edwards Plateau Limestone Savanna and Woodland

GENERAL HABITAT TYPES	SOUTH TEXAS PLAINS (STPL)	STPL Ecological Systems
Woodland	upland woodland (anacua, ebony, hackberry – adjacent to and related to riparian, but not stream edge; out of the floodplain, e.g. near Santa Rosa)	Edwards Plateau Dry-Mesic Slope Forest and Woodland
Riparian	periodically flooded or wet floodplains tributary ravines and creekside shrubland hackberry, elm, ash, oak pecan oak, elm, walnut, ebony, anacua	Edwards Plateau Floodplain Edwards Plateau Riparian Southeastern Great Plains Floodplain Forest Southeastern Great Plains Riparian Forest Tamaulipan Arroyo Shrubland Tamaulipan Floodplain
Riverine	Instream habitats of the watersheds which intersect this ecoregion (see EDU Workbook) Ecologically Significant Stream Segments - Nueces River, West Nueces River, Frio River, Sabinal River, San Miguel Creek, San Felipe Creek, Sycamore Creek, Mud Creek, Pinto Creek, Las Moras Creek, Rio Grande/Rio Bravo below Falcon Reservoir	NA
Lacustrine *See also* Cultural Aquatic	Resacas (oxbow lakes)	NA
Freshwater Wetland		Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (mixed upland and wetland)
CULTURAL TYPES	*habitats in this column must support SGCN or rare communities to be considered in this plan*	
Agricultural	Turf farms and other agricultural row crop fields	NA
Developed		NA
Urban/Suburban/Rural	Del Rio and Laredo: urban and suburban forest	NA

GENERAL HABITAT TYPES	SOUTH TEXAS PLAINS (STPL)	STPL Ecological Systems
Industrial		NA
Rights of Way		NA
Cultural Aquatic	Reservoirs: Corpus Christi, Upper Nueces, Choke Canyon, Amistad, Casa Blanca, Falcon	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.

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 STPL 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 6. STPL 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	Salt cedar/tamarisk (*Tamarix spp*.), Giant reed/river cane (*Arundo donax*) Cultivated and Old World grasses (e.g. KR bluestem, guineagrass, Old World bluestems, buffelgrass, Lehman'sn lovegrass, Natalgrass) golden alga (see also *Native Problematic Species*; it is not conclusively known whether golden alga is native or non-native) Water hyacinth, water lettuce, Eurasian water milfoil, giant salvinia, hydrilla	Salt cedar affects water use, monotypic stands, and outcompetes native riparian vegetation (cottonwood, sycamore) at all seral stages and canopy levels; salt cedar and *Arundo* armor the banks and contributing significantly to channel incision and narrowing, which reduces the diversity and quality of habitat for aquatic species Non-native grasses either as improved pastures or naturally expansive, established in many areas, detrimental in shrubland habitats as an increased fire risk (most of the south Texas native shrublands where shrublands are the desired ecological condition have not evolved with fire); nonnative grasses decrease suitable habitat for grassland obligate birds . Buffelgrass forms a dense monoculture which out-competes rare plants such as star cactus and further threatens rare plant populations in highway right-of-way. 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 Toxic algal blooms in Lake Balmorhea may adversely impact Comanche Springs pupfish; also known in Pecos River
Non-native Animal	feral and/or free-ranging "pets" FERAL HOGS Brown-headed cowbirds Introduced ungulates for hunting introduced fishes and mollusks - freshwater springs, streams and marshes grasscarp (how does this species adversely affect SGCN?), armored catfish	Free ranging pets – cats and dogs - are introduced predators which adversely affect small mammals, small reptiles, and birds; also contribute pathogens and diseases to native wildlife Feral hogs also 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) Aoudad, axis, and other large ungulates releasd for hunting alter and destroy habitat through scraping, overbrowsing, and overgrazing; they compete with native herbivorous small mammals and ungulates for food, and are disease vectors which can affect native ungulates and domestic livestock Bait fish releases ("minnows") can cause problematic congeneric hybridization (e.g. *Gambusia* sp.); aquarium hobbyist releases contribute to predation, disease, and competition, primarily impacting smaller aquatic SGCN
Native Problematic	Native shrub (e.g. baccharis, mesquite, whitebrush) or "brush" encroachment into grassland systems Tanglehead grass Golden alga (see also *Non-native Invasive Species*; it is not conclusively known whether golden alga is native or non-native)	Invasive native brush/trees are a significant threat to in areas where the desired ecological condition is grassland. Grassland-obligate birds habitat availability and quality for nesting declines, trees provide perches for raptors (predators) which also decrease grassland bird, small mammal and reptile success How is tanglehead grass an issue for SGCN? Toxic blooms in what water body may adversely impact what species
Pests, Parasites, Pathogens		
Pests	Cactus moth (*Cactoblastis cactorum*)	*Cactoblastis cactorum* has been used a biological control for prickly pears (*Opuntia* spp.) in areas where prickly pears are non-native; however, introductions to the Caribbean have led to the moth's appearance along the eastern Gulf Coast of the US and potentially the moths could arrive in Texas and Mexico. The loss of biodiversity, habitat, forage, agricultural products, and the nursery industry could be substantial.
Pathogens	White-nose Syndrome (WNS) West Nile virus	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. west nile has been suggested as an factor in the global decline of the Tamaulipas Crow

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Power Development and Transmission		
Wind Generation	Wind tower siting is more prevalent in other areas adjacent to this ecoregion – CHIH and the GCPM Are there any current or known planned tower developments in this ecoregion?	
Solar or PV (photovoltaic) array siting	High potential for solar energy development in this region	Array siting, with the network of maintenance and access roads, can take up hundreds of acres. Impacts shortgrass mesa and other open lowland grassland communities and may contribute to brush clearing in potentially important corridor areas for ocelots and other brush-dependent species Once installed, the array blocks sun needed for photosynthesis and recovery of vegetation communities; plant and plant community protections are insufficient to trigger environmental coordination in this industry; and maintenance activities may include herbicide or mowing which diminishes the habitat suitability for many ground species (grassland birds, small mammals and reptiles, insects).
Hydro (Dam and Reservoir)	Operations at Falcon Reservoir http://www.ibwc.state.gov/Organization/Operations/Field_Offices/Falcon.html	See *Water Development, Management and Distribution*
Biofuels	Row Crop, Switchgrass, Herbaceous: native rangeland and agricultural fields converted to intensive use croplands (monotypic stands of switchgrass and others) Algae "farms": High amounts of water used/processed, untreated or minimally treated wastewater discharges, site conversion	Biofuel production operations can use different herbicides for weed control, fertilizers and pesticides for growth enhancement, because these are not food crops. Runoff from these operations into ephemeral or perennial aquatic systems can contribute to species and habitat degradation. Short term rotations lead to increased harvesting, less fallow field. Loss of native open grassland birds' habitats for foraging, nesting, and shelter -- Baird's Sparrow (winter), Eastern Meadowlark, Long-billed Curlew, and Cassin's Sparrow Lowlying area and "flats" habitat loss from conversion to farming operation, groundwater pumping which contributes to lowered or drying of springs and spring-dependent aquatic systems, wastewater discharges can create unhealthy to intolerable water chemistry for SGCN
Transmission	New development and expansion of existing lines/corridors construction of new power infrastructure corridors to meet urban user needs, from CREZ generation projects in this region to central TX loads maintenance and operations maintaining clear right-of-way for vehicle clearance/access, prevention of line and tower danger	Broad, long. Linear fragementation of all habitat types, least compatible with riparian areas and native brushlands. During route selection, environmental considerations are given secondary consideration to agricultural and developed areas. Contributes to edge through interior habitats, in the same way that oil and gas pipelines and road networks causing potential for increased predator and nest parasitism access. While some of these facilities could be compatible with grassland communities, most are not required to reclaim to native vegetation with native seed or plant materials, which provides greater opportunity for invasive species introductions (either deliberate or opportunistic). Maintenance typically is intolerant of brush development, tall trees (riparian areas) Hinders daily and seasonal movements of species which avoid open areas adjacent to remaining shrublands Transmission lines can be a strike hazard for Whooping Cranes migrating to and from the coast
Distribution	Development to power grid and retail users: construction of new power infrastructure corridors to meet urban user needs	mowing, trimming (permanent fragmentation, erosion) herbicide application directly takes habitat and species during construction (loss), degrades adjacent habitat (fragmentation), and may hinder movement (daily or seasonal)

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		migratory bird strikes are more prevalent with distribution facilities than transmission; more careful site selection is important to minimize or avoid impacts near the coast, along waterways, and adjacent to wetlands throughout the migratory flyways of the region.
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 and fragmentation in arid lands that do not recover quickly vector for invasive species (plant) inntroductions 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 corridor clearing/maintenance and road networks	Limited ground and surface waters (resacas, wetlands, ephemeral swale wetlands, others) are highly sensitive to change/contamination 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? Broad, long. Linear fragementation of all habitat types, least compatible with wetlands, riparian areas and native brushlands. During route selection, environmental considerations are given secondary consideration to agricultural and developed areas. Contributes to edge through interior habitats, in the same way that transmission lines and road networks cause potential for increased predator and nest parasitism access. While some of these facilities could be compatible with grassland communities, most are not required to reclaim to native vegetation with native seed or plant materials, which provides greater opportunity for invasive species introductions (either deliberate or opportunistic). Maintenance typically is intolerant of brush development, tall trees (riparian areas) Hinders daily and seasonal movements of species which avoid open areas adjacent to remaining shrublands Active oil and gas operations contribute to road mortality of small mammals and reptiles; noise/light disturbance which adversely affects nocturnal birds, bats and migratory birds, traffic and mechanical infrastructure interrupt seasonal and daily movements, foraging and mating behaviors of some mammals, reptiles, and birds; small geographically limited populations of aridland plants fragmented or lost.
Hydraulic fracturing ("fracking") or "shale gas" extraction	http://www.energyindustryphotos.com/shale_gas_map_shale_basins.htm deeply injected chemical liquid which fractures substrates and releases gas for capture and delivery: potential groundwater risks, potential chemical spill risks, geologic destabilization	Eagle Ford Shale: Drilling permits in the Eagle Ford — a 24-county South Texas shale play — hit 1,010 in 2010, up from 94 permits in 2009 and 26 in 2008 according to state data. In the first four months of 2011 alone, 743 permits have already been issued. Groundwater and its surface expression in seeps, springs and cienegas are extremely important habitats in this ecoregion (e.g. LIST SPECIES); groundwater contamination could cause total loss of spring-dependent 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.
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	sand and gravel mining along and within streams and rivers	http://www.tshaonline.org/handbook/online/articles/gpm01 -- need map of sand and gravel mines in TX

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
riverine		loss of riparian habitat, sedimentation in streams contributes to loss and degradation of instream habitats
Other regional mining?		
Communications Infrastructure		
Cell and other communication towers	towers need to be limited in height and lit to minimize bird strikes (bird-friendly)	Communications towers are a serious issue with nocturnal migrants in the area. Towers kill numbers of noctural migrant songbirds including Painted Bunting, Orchard Oriole, and warblers.
Transportation		
road and bridge construction (new)	This ecoregion is an important port of entry for goods and services from/to/through Mexico, requiring upgrade to existing and new transportation facilities.	Three National Highway System Congressional High Priority Corridors (http://www.fahwa.dot.gov/planning/nhs/hipricorridors/hpcor.html) have been identified to/from Laredo to points northwest, north and east through Texas, which may involve upgrade to existing highways and surface connecting roadway and/or new construction. Texas Department of Transportation coordinates with TPWD regarding potential natural resources impacts to listed species; however, 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 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, vectors and opportunities for nonnative species invasions, water quality impacts through stormwater runoff; loss of nonjurisdictional wetlands, riparian, thornscrub/brush, and grassland habitats that are not protected under regulation. In addition to these larger facilties, 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.
right of way maintenance	maintaining clear right-of-way for vehicle clearance/access, minimizing fire danger, and maintaining driver visibility	mowing, trimming timing (season, frequency) inhibit natural regeneration of native grassland plants and don't provide key habitats (tall grass prairie structure, seedheads) at best times of year to accommodate prairie animal and insect needs Most roadsides are reseeded after construction with nonnative species or plant materials and regular maintenance activities also provide additional ground disturbance favorable to invasives 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
Border Security		
Roads, Levees	Network of roads and levees which are routinely dragged, driven, and monitored	Very little natural habitat remains in the Valley and along the Rio Grande/Rio Bravo corridor. Roads and levees are installed parallel and adjacent to the river corridor. These surface changes impede natural surface runoff, contribute to localized erosion issues, and degrade water quality. Roads are routinely dragged to be able to detect foot and other trespass traffic, creating soil disturbance and repeat vehicle traffic which contributes to road mortality of small reptiles, mammals, ground birds. Light is installed on these sites and disturbs natural daily and seasonal movements, foraging for some species.
Border Wall	Built environment – structure, monitoring stations, roads - adjacent to the river along certain segments of the border to prevent illegal traffic crossing	The Rio Grande is an important corridor and habitat connection between Mexico and Texas. We share management of the water quality and quantity and species do not abide the political boundary. Unlike in the Chihuahuan Desert ecoregion, collaboration on natural resources conservation has been less of a focus than collaboration on economic development and settlement. Built next to the Rio Grande, the wall removes important riparian and brush habitats for breeding birds and species which use these corridors for daily and seasonal movements, provides opportunities for invasive plant colonization (no reclaimation of cleared areas even to native grasses), impedes daily and seasonal movements for many species which are intolerant of travel in open areas … the wall itself is a

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		barrier to species' movements on the ground and through vegetation.
Land & Water Mgmt: FARM	See also Water Development section	
Clearing and Loss of Important Habitats	Conversion of riparian, floodplain, and some upland sites (if irrigated) to agricultural production (row crop, orchard)	Intact floodplain habitat remnants are few, far between and relatively small landscapes. This may be on of the most threatened habitat types in the region. Conversion is difficult to revert, even with resources. Aside from the loss of native seed and plant sources, soil horizon disturbance and dewatering creates unfavorable conditions for some species ever recovering. Chemicals may be latent..
Lack of soil and water management and conservation practices	chemical-laden irrigation water runoff	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. 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.
Unsustainable irrigation	Timing of water use is incompatible with surface water retention in many important features	Fluctuations in resaca level, river, and wetlands adversely affects fish and aquatic insect health by exposure to higher water temperature and lower dissolved oxygen
Land & Water Mgmt: RANCH	See also Water Development section	
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) on the advice of county tax appraisers rather than range scientists or ecologists historic and/or current range-intensive livestock operations "continuous" even if rotational; out of sync with land capacity landowners may not be aware of potential benefits of wildlife valuation for recovery, rest, or native habitat conversion non-native hoofstock for hunting operations	Stocking practices which are incompatible with the carrying capacities of native rangeland promote conversion of native grassland to non-native grasses, removal of important brush cover even in drainages and swales, the need for supplemental feeding which contributes to invasive species introductions and concentrates animals (which can in turn contribute to brownheaded cowbird parasitism on many nesting birds). Overstocking and degraded grass and brushlands can contribute to an overabundance and "invasion" of some native species, like mesquite. Grazing can be a helpful tool in grasslands restoration in certain areas and in capacity with the native vegetation.
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 "menu" is pre-limited without letting the landowner choose from a full menu of land and water conservation options Landowners do not have a one-stop shop to choose best management practices for their site, for their goals	Ranching with associated livestock grazing can be beneficial to some SGCN in this region, especially if dependent on grasslands. 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. Landowners need direct access to some of this information with technical guidance to help them apply it. Cross-purposes: some programs recommend non-native grasses and complete brush removal for site improvements; could better improve all habitat values with recommendations for native seed mixes and plant materials, appropriate rotational grazing Streamside Management Zones , appropriate habitat management in and adjacent to drainages, wetlands protection need to be a priority in landowner incentive programs
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

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Clearing and loss of important natural sites/habitats	Springs, swales, drainages, resacas, riverside and native brush habitats altered for stock uses	Many of the SGCN in this region are reliant on the aquatic or aquatic adjacent habitats and/or dense thornscrub brush that only occurs in this and the adjacent GCPM ecoregion to some extent. These habitats are difficult and costly to restore, once lost.
Lack of soil management and conservation practices	lack of soil conservation (vegetation conservation/restoration) along stream courses and on grazing lands, soil erosion	Altered flows and removal of vegetation adjacent to water features contributes to erosion, degraded water quality, and evaporative loss. Several SGCN are dependent on aquatic and stream-adjacent habitats in this region.
Subdivision of larger lands into smaller parcels ("ranchettes")	Ranch economics contribute to the need to sell and/or subdivide Ownership changes in values, approaches to management (not always a detriment to conservation practices) Subdivided lands create many more land management philosophies, approaches in one area	While not all land subdivision is necessarily a negative event for conservation, subdivision typically brings with it very diverse land ownership styles and objectives, more cross-fencing, 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” Some formerly urban or absentee landowners bring their vision of manicured and “tamed” landscaping to suburban and rural areas, overcutting native grasslands, removing important brush and woodlands, 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, restoration) and incentive programs are not available for use at smaller scales or cannot be effective to improve conservation values.
Fire suppression and lack of or inappropriate application of Rx fire	reduced or no efficacy of applied fire - scale or location of application does not match ecological need	Native grassland communities and related 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, grasslands are often invaded by woody shrubs, leading to further changes in water infiltration, herbaceous cover, and erosion. Additionally, some 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 grassland-dependent wildlife species will significantly decline because they rely on disturbance to create their habitat requirements..The lack of fire in appropriate sites (not appropriate on every landscape in this region) and excessive grazing during drought has resulted in brush encroachment in many areas.
Land & Water Mgmt: Municipal	See also Water Development section	
Lack of Zoning and Planning	Planning efforts are rarely regional; if regional, rarely include conservation values looking forward unless they related to economic drivers	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), brushlands, grasslands, wetlands of all kinds. Urban sprawl, “bedroom” suburban commuter communities all continue to contribute to wildland habitat loss, brush loss especially in drainages/floodways, 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 ranchland in these areas. 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

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		for future commercial or municipal use removes the opportunity to restore these lands to functional habitats and contributes to their disconnection/fragmentation.
Urban Greenspace Management	Tree protection, floodplain protection, wetland protection	In this region, urban greenspace management provides critical stepping stones for migratory species from the Coast to points north. Intact floodplains, riparian areas, wetlands/resacas, and "urban forests" contribute some very important landscapes that, if lost, would sever some aerial, terrestrial, and aquatic fish & wildlife corridors.
Land & Water Mgmt: Conservation & Recreation		
Inadequate/Inappropriate Management	Inability to manage with conservation tools or to restore to natural communities Lack of information that other land stewards have access to Frequently not included in land manager opportunities	The land stewardship community provides technical training opportunities in various forms to a wide variety of practitioners; however, parkland managers are not frequently included in these discussions as they primarily deal with recreational issues. These are all related and there are opportunities to learn from all land managers. Recreation lands managers typically have to deal with more of the urban-wildland interface issues (trespass, feral cats, vandalism) rather than spending resources on habitat restoration or management. Additionally, some tools may be limited in their utility – discomfort or public concern about applying prescribed fire near urban areas, cutting down trees (even if those are nonnative and will be replaced with natives) Public users intolerant of less manicured areas – mowing, brush clearing, and herbicide applications to remove "undesirable" vegetation near recreation sites
Inappropriate Recreational Uses	Whle most public lands in this region are managed for recreation compatible with wildlife and fisheries resources, some improvements could be made	ORV use in sensitive areas (stream beds, dunes on private sites) Trails and recreation facilities sited too close to waterways or overlooks, in riparian areas or floodplains and contribute to soil erosion, vegetation loss
Lack of connectivity between public lands managed for conservation	disconnected landscapes which need attention to enhance ecological function	While there has been a greater emphasis in the last several years to identify intact remaining habitat in this region for ecotourism and "connect" the values of these properties for economic purposes, this region still lacks some important ecological functionality which could be improved by connectivity (stepping stones for migratory birds, corridors for terrestrial wildlife movement, riparian restoration to improve continuous habitat suitability for freshwater fishes)
Lack of long-range conservation planning and cohesive land conservation/management strategies in each ecoregion		
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 This region also must consider International Surface Water Planning Overallocation and dewatering of region's principle rivers	Natural flows from the Rio Concho (Mexico) into the Rio Bravo/Rio Grande through the Chihuahuan Desert ecoregion and into the South Texas Plains ecoregion diminishes significantly to and through Falcon Reservoir. Diversion, overallocated use, and lack of compliance with withdrawal agreements have adversely impacted flow and quality for instream and stream-adjacent habitats – native riparian habitats are quickly disappearing and restoration is not an option without instream flow protection. Both surface water and groundwater use for agriculture and municipalities in the U.S. and Mexico (Rio Conchos) has reduced the amount of water present in rivers, creeks, and springs. Instream flow recommendations need to be stepped out from headwaters to estuaries to influence regional water planning processes Urban/suburban impacts to conservation activities and natural resources even outside of urban jurisdictional boundaries is particularly relevant: surface water demand, use, development and distribution – all addressed through various water planning

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
		processes. **Natural resource professionals, both terrestrial and aquatic, need to be consistently involved in RWP processes** TMDL recommendations need to consider fish and wildlife resources needs as well See also *Reservoir Construction & Operation* next box and *interbasin Transfe*r below
Reservoir Construction and Operation	Creation of new and modification (expansion) of existing reservoirs Unregulated small stream impoundments on private lands Invasive species Shoreline development - vegetation removal for viewshed, recreational access; hardening and armoring banks 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	At least one new reservoir proposed in the Texas State Water Plan 2007: Nueces Off Channel – construction, impoundment, and operations would adversely affect an Ecologically Significant Stream Segment (see Figure 2, map 2) Unnatural hydrograph for dam operations 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. Reservoirs and adjacent flooded river areas are also attractions for development – impacts to aquatic habitats and shorelines from bulkheading, invasive landscaping and boat introductions (hydrilla, zebra mussels), clearing to water's edge, on-site septic leakage or non-compliance, development on steep sites, erosion. Small impoundments on private lands lack regulation: damming and inundating these areas removes drainage vegetation, contributes to erosion from shoreline clearing (or excessive livestock concentration), block contributions of freshwater to larger stream systems
Groundwater Planning and Distribution	Not all aquifers have groundwater districts; groundwater districts are political subdivisions, not aligned necessarily with aquifer boundaries Extraction: groundwater pumping without full accounting for natural resources as a "use"	This ecoregion's groundwater resources are in demand from agricultural and residential practices within the ecoregion and outside of the region. Groundwater demand, use, additional development and distribution are all issues. Aquifers continue to drop and not all are managed through districts, which can manage for conservation, recharge, and waste prevention. SGCN and rare communities needs are not addressed in most groundwater planning efforts – see also Statewide Handbook
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	Metropolitan areas outside of the region may contribute to reservoir and groundwater development in this region. Those external drivers are not considering the impact to fish and wildlife resources in this basin during their planning processes.
Lack of Information & Resources		
Survey data for SGCN and Rare Communities	Lack of data means erring on the side of "rarity" to protect values and species which are not yet completely understood, but for which declines have been documented locally; in many cases, the protection is warranted. Lack of data also means that we lack the ability to guide landowner incentives to areas of most need to recover species faster or prevent their decline in the first place.	Categories in this region most needing information to accurately assess status: ▪ Riparian and grassland birds ▪ Small mammals ▪ Cross-border and migratory animals ▪ Reptiles and amphibians ▪ Wetland dependent species ▪ Pollinators for rare plants and communities Predator control without biological standards or supporting management: It is unknown whether predator control activities are affecting the stability of SGCN populations or their contribution to natural system function. Predator control efforts cannot be declared "insufficiently regulated" or "underreported" as limited information is available to assess the stability of these populations. Community-based solutions will need to be devised based on a full and accurate accounting of these populations and their effects on the natural systems and ranching communities in which they range. May have adverse effects on other SGCN including black bears and smaller mammals such as skunks, foxes, bobcats, rare cats

General Issue	Ecoregion Issue Identified in Workshops (2010) and Surveys (2011)	Description of Adverse Effects Identified in Workshops (2010) and Surveys (2011)
Information Sharing	Lack of targeted and/or ethnically-specific outreach	Cultural impacts on wildlife and fisheries resources occur all across Texas. Because we are a diverse state, our conservation messages need to be targeted to deliver meaningful information to the people who can best help us alleviate stressors.
Inadequate Policies, Rules, Enforcement		
	Poaching, Permitting Avoidance and Violations insufficient law enforcement (not enough people or fiscal resources or both) or unclear jurisdiction	illegal take of raptors by local chicken raisers needs greater education and enforcement, this particularly impacts Harris's Hawks. Red-crowned and Green Parakeets have no formal protection though one is proposed as a candidate for listing; these species need protection from nest robbers
	Unregulated or Inadequately Regulated Harvesting	Several predatory species (e.g. coyote, bobcat, mountain lion) are routinely trapped, hunted and killed in the region.It is unknown whether predator control activities are affecting the stability of these populations or their contribution to natural system function. Predator control efforts cannot be declared "insufficiently regulated" or "underreported" as limited information is available to assess the stability of these populations. Community-based solutions need to be devised based on a full and accurate accounting of these populations and their effects on the natural systems and ranching communities in which they range.
	Water Quality Measures	Lack of stormwater pollution prevention facilities and out of compliance water and wastewater discharges contribute significantly to water quality issues in this region (and the Valley in the GCPM).
	Loss of and impact to "non-jurisdictional" wetlands and other waters	
Other Cross-Cutting Issues		
Climate Change	highly localized and intrinsically rare species will have few options to adapt as habitats shift, change, or disappear with climate change in this region; options for transplanting or translocation are few to none as many of these habitats are edaphically specialized in the region.	From what we know now, riparian areas, wetlands, native grasslands and shrublands may be most affected in this region. These are all very important habitats for SGCN and rare communities, in addition to their importance as migratory pathways/stopovers/stepping stones for
Economics	Working Lands vs Conservation Incentive economics	Landowner incentives cannotcompete 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*.[4]

Actions proposed for the STPL Ecoregion (Table __) 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.

[4] 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 7. STPL 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
Surface water management is a key issue in this ecoregion, which covers many municipalities and watersheds, feeding the Laguna Madre coastal estuary. Identify a coalition or natural resources advisory group of terrestrial and aquatic ecologists across natural resources management entities for the ecoregion. Craft SPECIFIC recommendations based on available science and regionally specific information about terrestrial and aquatic concerns, instream flow needs for fish and wildlife (including estuarine health), sensitive and unique areas to avoid reservoir development, opportunities for water quality improvement (see TMDL recommendations) 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. 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.										
Reservoir Management Work with International Boundary Waters Commission, appropriate state and federal officials, Falcon Reservoir operators, local municipalities, irrigation users, and ecologists with specific knowledge of flood-affected and flow-affected Rio Grande/Rio Bravo species to manage instream flows above and below Falcon Reservoir, including flood releases to mimic natural river system flushing, decrease invasive aquatic species, and support estuary health in Laguna Madre.											

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
Groundwater management is a key issue in this ecoregion, which covers many municipalities and watersheds, related to surface waters and adjacent municipal needs (San Antonio, Corpus) 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. 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 instream 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..											

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
Work with Texas land trusts and other public and private lands partners to identify Tamaulipan thornscrub, riparian, and wetland priority conservation areas for long-term rotating and/or perpetual conservation that have directly benefit SGCN and rare communities, water quality and estuaries downstream, have high native plant and community diversity, are large functional blocks which could be networked to benefit seasonal and daily movements of SGCN, could serve as a seed source for local restoration projects, are adjacent to existing managed conservation lands (World Birding Center sites, USFWS National Wildlife Refuges, TNC preserves, TPWD Wildlife Management Areas and Parks). Restoration sites on agricultural lands need to be identified and networked to existing conservation lands to enhance the sustainability of the restoration efforts and self-sustaining resiliency in the face of climate change. Given the regional growth and pace of development, conservation easements, Purchase of Development Rights program implementation, contributions to Texas Water Trust, and other perpetual management agreements need to be high priority. High priority bird species conservation goals using Rio Grande Joint Venture 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 for the next 10 years. Another criteria may be for geographical locations within 1 hour of urban boundaries so they could serve as locations for education, outreach or demonstration. See urban recommendations.											
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).											

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
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: Improve agricultural field borders and farming practices to benefit brushland wildlife, soil and water resourdes – retain perennial bunchgrasses, forbs and woody fencerows; 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; encourage (or require if receiving state or federal funds) streamside protection and or management zones where adajacent to natural areas, provide technical guidance on less toxic methods to control pests, weeds incorporate SGCN fish and wildlife habitat values and recommendations in rotational grazing system recommendations (Grazing Lands Conservation Initiative) and wildlife management plans (TPWD Technical Guidance) See recommendation about market analysis											
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 in appropriate areas (not areas where desired ecological condition is brushland or riparian corridors 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: FWS, NBCI, NRCS, NPAT, TPWD, NWTF, TFS, TNC, and JVs are organizations tackling this issue within parts of the state. 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.*											

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
Form multi-partner working group(s) to establish scientifically sound best management practices for **riparian restoration** for the ecoregion and Mexico, 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. Share recommendations and case practices with partners managing conservation targets across the border. 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 **thornscrub restoration** for the ecoregion and Mexico (timing/season, period/duration, intensity, parameters for RX) for the restoration of prairie grasslands in appropriate areas (not areas where desired ecological condition is brushland or riparian corridors Work with thornscrub restoration and management 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?). Share recommendations and case practices with partners managing conservation targets across the border. Review existing successful practices: FWS, NBCI, NRCS, NPAT, TPWD, NWTF, TFS, TNC, and JVs are organizations tackling this issue within parts of the state. 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.*											

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Establish a regional *lands* management experience cooperative to identify restoration needs and sites for connectivity, 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. *See also public lands management recommendations in the Statewide Handbook.*											
Support the completion of land acquisition efforts for Lower Rio Grande Valley and Laguna Atascosa national wildlife refuges Acquire land south of the border fence/wall to create a wildlife/habitat corridor that would be safe from future development. Restore appropriate habitat on acquired farmlands within the wildlife/habitat corridor along the Rio Grande in the LRGV Identify landowner incentive areas for connections from the Rio Grande to the Laguna Atascosa area and from the Rio Grande south to the Laguna Madre and Sierra Picachos.The priorities on the Rio Grande include Starr and Zapata counties. restoration and revegetation of sites along the Rio Grande and in desired corridor areas in Cameron, Hidalgo, and Willacy counties, with priority on connectivity between forested areas											
Species Restoration: Work with public and private landowners, existing incentive tools, and regulatory assurances to re-establish an Aplomado Falcon population in Cameron and Willacy counties											
Determine market values that are driving agricultural conversion (biofuels? crop prices? Urban growth?), 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											

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
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.											
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 collegest 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.*											
Climate Change Climate change models and effects on grasslands, shrublands, riparian areas, and springs/groundwater resources Form a working group with adjacent ecoregions' 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											

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
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: Post construction, restore sites with native seed sources and materials Remove invasive species and restore tallgrasses on existing ROW Terms of easement need to include native grassland or shrubland restoration and management (landownwer cannot convert these areas to nonnative grasses for grazing) On roadways, enforce public right of way (prevention of private maintenance, overmowing, clearing) Formalize a mowing management plan by roadway to protect rare plant populations, rare communities, prevent nonnative species invasion and promote native grassland development. Attach it to conservation practice website tracking. Identify monitoring sites which can serve as mitigation as long as information is shared through a public database and conservation practice 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
Technical Guidance FOR/WITH Conservation Service Providers (Audubon, NRCS, TPWD, TNC, NPAT, NPSOT, FWS, NWTF,RGJV and NBCI) specific to the issues and resources of this region: Land conservation tools: conservation easements, 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 thornscrub and riparian restoration. See Best Management Practice development recommendations 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											

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
Landowner Incentive and Education Priorities: Identify key areas for the restoration and protection of Tamaulipan thornscrub, riparian zones and floodplains, 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) 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 Prescribed fire or brush management – large sites or cooperatives with willingness to commit to appropriate term management (one burn without followup wastes resources) Management Plans – in addition to landowner objectives, review opportunities for SGCN and rare community habitat conservation; data collection; and monitoring (see effectiveness comments) Riparian Conservation and Restoration – Ecologically Significant Stream Segments to their headwaters, streams and rivers with groundwater interconnectivity, undammed stretches with direct contribution to estuaries 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 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; in this region, translated materials in Spanish would be very helpful to share in the Valley and across the border. 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.											

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
Conservation service providers and ecologists need to engage with urban biologists to convey SPECIFIC 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). Issues below are a starting point, but regional specifics need to be identified – where, what partners, who's the audience, timelines, outcomes: Park and open space planning for habitat connectivity (daily and seasonal movements), urban forest and dead snag protection, riparian and streamside protection, water quality protection, floodplain set asides, mitigation banks for in-jurisidiction projects Water quality protection through stormwater pollution prevention plans and facilities even where not required by regulation, leaving natural floodways intact rather than armoring Mowing and park maintenance practices which promote quality priority habitats identified in this plan Water conservation practices in urban areas to help restore instream flows and better water quality under TMDL recommendations Invasive species prevention and removal – plants and animals, including feral pets -- 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) Collaboration with counties for environmental protections (stormwater, invasive species, reclamation, dumping, other?) Tax incentives or disincentives for open land conversion, restoration, conservation planning Identify sources of volunteers and/or funding which could help municipalities employ conservation practices. 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.											

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.

Association of Fish and Wildlife Agencies (AFWA). 2006. National Fish Habitat Action Plan. http://www.fishhabitat.org/documents/plan/National_Fish_Habitat_Action_Plan.pdf (accessed November 2009).

——— Teaming with Wildlife (TWW). 2011. Measuring the Effectiveness of State Wildlife Grants (*conservation actions*) Final Report. http://www.fishwildlife.org/files/Effectiveness-Measures-Report_2011.pdf

Baydack, R.K., H. Campa III, and J.B. Haufler (eds.). 1999. Practical approaches to the conservation of biological diversity. Island Press, Washington D.C. and Covelo CA. 313 pp.

CEC. 2011. http://www.cec.org/atlas/ .

Conservation Measures Partnership. 2007. Open Standards for the Practice of Conservation (accessed 2009 – 2011).

Diamond, D.D. *n.d.* "Grasslands" *in* Handbook of Texas Online (http://www.tshaonline.org/handbook/online/articles/gqg01), accessed April 26, 2011. Published by the Texas State Historical Association

Esselman, P.C., D.M. Infante, L. Wang, D. Wu, A. Cooper, and W.W. Taylor. 2010. An initial assessment of relative landscape disturbance levels for river fish habitats of the conterminous United States. http://www.nbii.gov/far/nfhap/data/NFHAP_Initial_Assessment_Report_Esselman_etal_2010.pdf (accessed 2010 – 2011).

Gelbard, J.L. 2003. Grasslands at a Crossroads: Protecting and Enhancing Resilience to Climate Change *in* Buying Time: A User's Manual. http://assets.panda.org/downloads/buyingtime.pdf (World Wildlife Federation) (accessed April 2011).

Gould, F.W., G.O. Hoffman, and C.A. Rechenthin. 1960. Vegetational Areas of Texas. Texas Agricultural Experiment Station Leaflet 492. Texas A&M University, College Station TX. http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_mp_e0100_1070ac_24.pdf (accessed October 2008).

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).

Hayes, P.T. 1964. Geology of the Guadalupe Mountains. Geological Survey Professional Paper 446. U.S. Geological Survey. 68 pages. http://www.nps.gov/history/history/online_books/cave/446/contents.htm (accessed 2011).

Hill, Carol. 2000. Overview of the geologic history of cave development in the Guadalupe Mountains, New Mexico. Journal of Cave and Karst Studies, August 2000 pgs. 60-71. http://www.caves.org/pub/journal/PDF/V62/v62n2-Hill.pdf (accessed 2011).

International Union for the Conservation of Nature and Natural Resources (IUCN), Species Survival Commission. 2008. Strategic planning for species conservation: an overview. Version 1.0. Gland, Switzerland: IUCN. 22pp.

——— and the Conservation Measures Partnership 2008a. IUCN – Conservation Measures Partnership Standard Classification of Conservation Threats (accessed 2010).

———. 2008b. IUCN-Conservation Measures Partnership's Standard Classification of Conservation Actions (accessed 2010).

LBJ School of Public Affairs. 1978. Preserving Texas' Natural Heritage. Policy Research Project Report 31. University of Texas at Austin, Austin TX.

National Council on Science and the Environment. 2010. Our Nation's Wildlife Habitats: completing an integrated system for conserving habitat values and benefits in a changing world (accessed 2010).

National Fish Habitat Partnership. 2009. Fish Habitat Partnerships (map). http://fishhabitat.org/images/M_images/New_NFHAP_Maps_2009/nfhap_fhp_and_cand_map09_1.pdf (accessed November 2009). Produced October 2009, revised as part of the National Fish Habitat Action Plan.

National Park Service. n.d.Guadalupe Mountains National Park: Geology. http://www.nps.gov/archive/gumo/gumo/geology.htm (accessed 2011).

National Park Service. 2011. Guadalupe Mountains National Park: History – People and Places. http://www.nps.gov/gumo/historyculture/people.htm (accessed 2011).

National Research Council. 2002. Riparian Areas: Functions and Strategies for Management. Committee on Riparian Zone Functioning and Strategies for Management. National Acadamies Press. 428 pgs.

Natural Resources Conservation Service (NRCS). 1996. Riparian Areas Environmental Uniqueness, Functions, and Values. RCA Issue Brief #11 (August 1996) http://www.nrcs.usda.gov/technical/rca/ib11text.html (accessed 2011)

———. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. ftp://ftp-fc.sc.egov.usda.gov/NSSC/Ag_Handbook_296_low.pdf (accessed November 2009). Produced by the US Department of Agriculture NRCS, Handbook 296.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application], s.v. "Texas". Version 7.1, last updated February 6, 2009. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer (accessed: July 22, 2009).

North American Bird Conservation Initiative (NABCI-US). 2004. Bird Conservation Regions (BCRs) (interactive map). http://www.nabci-us.org/map.html (accessed October 2009).

Pimental, D. 2007. ENVIRONMENTAL AND ECONOMIC COSTS OF VERTEBRATE SPECIES INVASIONS INTO THE UNITED STATES in Managing Vertebrate Invasive Species, University of Nebraska USDA National Wildlife Research Center Symposia, Lincoln NB. http://digitalcommons.unl.edu/nwrcinvasive/38 (accessed 2010).

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.

Sanderson, E.W., K.H. Redford, A. Vedder, P.B. Coppolillo, and S.E. Ward. 2002. A conceptual model for conservation planning based on landscape species requirements. Landscape and Urban Planning 58:41-56.

State Energy Conservation Office (SECO). 2009. Texas Renewable Portfolio Standard. http://www.seco.cpa.state.tx.us/re_rps-portfolio.htm (accessed July 2009). Texas Comptroller of Public Accounts, Austin TX.

Teaming with Wildlife. 2007. Dedicated Federal Funding for Wildlife. http://www.teaming.com/funding/wcrp_funding.html (accessed December 2010).

Texas A&M University. 2011. Groundwater Information. http://texaswater.tamu.edu/groundwater/717 (accessed April 2011)

Texas Parks and Wildlife Department (TPWD). 2005a. Texas Comprehensive Wildlife Conservation Strategy 2005 – 2010. http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_pl_w7000_1187a/ (accessed 26 May 2009).

———. 2005b. Land & Water Resources Conservation and Recreation Plan. http://www.tpwd.state.tx.us/publications/pwdpubs/pwd_pl_e0100_0867/ (accessed May 2009).

———. 2009. Endangered and threatened species list (last modified May 15, 2009, 8:27 a.m.). http://www.tpwd.state.tx.us/huntwild/wild/species/endang/index.phtml (accessed July 2009).

———. 2010. Land & Water Resources Conservation and Recreation Plan. http://www.tpwd.state.tx.us/publications/nonpwdpubs/land_and_water_plan/ (accessed January 2010).

———. in progress. Plant Conservation Strategy. Austin, TX.

——— and Texas Natural Resources Information Service (TNRIS). In progress, 2005 – 2012. Ecological Systems Classification and Mapping Project (accessed 2010). Austin TX.

TPWD. http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_bk_p4000_0038.pdf

TPWD. 2004. http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_br_w7000_0306.pdf

TPWD. 2005. Eds. http://www.tpwd.state.tx.us/huntwild/wild/birding/migration/

The Nature Conservancy (TNC). 1999. TNC Ecoregions and Divisions of the Lower 48 United States (map). http://gis.tnc.org/data/MapbookWebsite/getimage.php?id=9 (accessed December 2009).

——— and World Wildlife Fund (WWF). 2006. Standards for Ecoregional Assessments and Biodiversity Visions (January 26, 2006). http://conserveonline.org/workspaces/cbdgateway/era/index_html (accessed 15 April 2009). The Nature Conservancy, Arlington VA.

U.S. Fish and Wildlife Service (USFWS). 2000. Eight Required Elements of State Wildlife Action Plans. FY 2001 Commerce, Justice, State and Related Agencies Appropriations Act. PL 106-553, codified USC 16(2000) 669(c). http://www.fws.gov/r5fedaid/swg/TWW%20Working%20Group/3)%20Eight%20Elements.pdf (accessed 2009).

———. 2006. National Advisory Acceptance Team (NAAT) Comprehensive Wildlife Conservation Strategy Review Summary for Texas. Received by TPWD, 14 February 2006.

———. 2007 Administrative Guidelines for State Wildlife Grants (effective January 1, 2007). FWS/AWSR-FA: 027804. http://wsfrprograms.fws.gov/subpages/toolkitfiles/swg2007.pdf (accessed 2009). Issued October 18, 2006.

——— 2009a. U.S. Joint Ventures (map). (Division of Bird Habitat Conservation). http://www.fws.gov/birdhabitat/JointVentures/Map.shtm (accessed October 2009).

———. 2009b. Proposed Landscape Conservation Cooperatives FY2010, Coterminous United States (map). http://www.fws.gov/science/SHC/pdf/FWS_LCC_48.pdf (accessed December 2009). Produced by IRTM, Denver CO, December 2009.

———. 2009c. Federally listed candidate, threatened and endangered species in Texas. http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm (accessed July 2009).

———. 2009d. Species reports, s.v. "candidates". http://ecos.fws.gov/tess_public/pub/SpeciesReport.do?listingType=C&mapstatus=1 (accessed July 2009).

———. 2009e. A System for Mapping Riparian Areas in the Western United States. 42 pgs. Division of Habitat and Resource Conservation, Branch of Resource Mapping and Support. Arlington, VA.

——— and Association of Fish and Wildlife Agencies (AFWA). 2007. Guidance for Wildlife Action Plan (Comprehensive Wildlife Conservation Strategy) Review and Revisions. http://wsfrprograms.fws.gov/subpages/toolkitfiles/NAATgde.pdf (accessed 2009). Issued July 12, 2007.

U. S. Geological Survey (USGS). 1991. Data Standard: Codes for the Identification of Hydrologic Units in the United States and the Caribbean Outlying Areas. U.S. Geological Survey Circular 878-A.

Williams, J.E., C.A. Wood, and M.P. Dombeck, eds. 1997. Watershed Restoration: Principles and Practices. American Fisheries Society, Bethesda, MD.