

Note: Table is formatted 11" x 17", landscape orientation. **Specific Issues and Impacts** are discussed in the Statewide/Multi-region and Ecoregion handbooks; not all issues are "problems" in all areas.

General Issue	Description of Impacts <i>Specific Issues will be explained more fully in each handbook if relevant</i>	Examples <i>These are just a few examples. See handbooks for more detail.</i>
Invasive Species	Non-native invasive and native problematic terrestrial and aquatic species which invade natural sites and compete for resources (food, water, space, pollinators, shelter, colonization or breeding areas, etc.) to the exclusion of native, healthy species, communities and systems	<u>Non-native</u> : salt cedar, zebra mussels, Chinese tallow, Old World grasses, exotic ungulates, feral pigs <u>Native problematic</u> : mesquite or juniper invading grassland sites where naturally they should not occur, under-harvested over-productive native wildlife, predacious introduced game fishes, golden alga (<i>Prymnesium parvum</i>)
Pests, Parasites, Pathogens	Disease vectors, voracious destructive feeders, or species which take nutrients to the detriment of the host species; in many instances, the issues presented for this plan are pests, parasites, or pathogens out of their native element and invasive OR are out of balance with their natural host due to exacerbating factors (some not well understood) and only recently problematic.	<u>Pests</u> : <i>Cactoblastus</i> moth on prickly pear <u>Parasites</u> : <i>Haemonchus</i> in pronghorn <u>Pathogens</u> : White-nose Syndrome (WNS) fungus on bats
Introduced Genetic Material	Genetic material which competes with native genetic material and can dilute population genetics, long-term population health, and may threatened a species with permanent hybridization or extinction	Congeneric introduced fishes such as some <i>Gambusia</i> sp. Non-local varieties (cultivar) vegetation and seed sources used in restoration Genetically modified insects for integrated pest management
Power Development and Transmission	<p>Power Development and Generation</p> <p><u>Wind</u>: turbine siting on high ridges in migratory bird corridors can cause direct mortality; operations near bird and bat flight and feeding can cause barotrauma</p> <p><u>Solar or PV array</u>: large areas of vegetation removal and ongoing "bare ground" maintenance, some with high water use</p> <p><u>Coal fired plant</u>: water use; emissions which may contribute to climate change</p> <p><u>Nuclear plant</u>: water use</p> <p><u>Hydroelectric Dam</u>: frequency, seasonality, and amount of water released through/over dam out of sync with naturally occurring flows and floods adversely affecting instream habitats and fauna, plus river-adjacent vegetation (see also <i>Water Development, Management and Distribution</i>); barriers to aquatic species passage and/or dispersal</p> <p><u>Biofuels/Biomass Crops</u>: conversion of diverse native habitats to expansive monotypic stands, some with copious water usage</p> <p>Power Delivery/Transmission and Operations</p> <p><u>Substation</u>: large acreage footprint of impervious cover which can collect water and attract small birds, mammals, reptiles and amphibians to potential electrocution hazard</p> <p><u>Transmission and Distribution Lines</u>: New or upgrade to existing towers/poles, lines and road networks from many types of generation sources and substations are required to serve Texas growing population. Long, linear wide clearings cross-country primarily through undeveloped areas: fragments large blocks of habitat, creates edge opportunities for parasites and predators, habitat loss and invasive species opportunities related to ongoing maintenance</p>	<p><i>See Ecoregion Handbooks for more specifics.</i></p> <p><u>Wind</u>: turbine "farms"; Competitive Renewable Energy Zones (CREZ) targeting certain areas with high wind potential in the High Plains, west and central Texas, plus the potential for non-CREZ sites in the Gulf of Mexico and elsewhere.</p> <p><u>Biofuels</u>: certain row crops, switchgrass, other herbaceous monocultures, "whole tree" utilization, algae</p> <p><i>Power Generation in Texas does not include tidal or wave generation as this power type has not been an issue in the Gulf of Mexico.</i></p> <p><u>Transmission and Distribution</u> line development through areas of karst, aquatic, or undeveloped habitat blocks; typically, natural resources are not considered a primary constraint to routing or development.</p>

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Oil and Natural Gas Production and Delivery	<p>Because these industries are evident in many ecoregions, there are different impacts to different habitats from desert grasslands to marine and coastal environments. Many of these habitats do not recover quickly or ever, without intensive appropriate reclamation.</p> <p>In addition to direct species and habitat loss and habitat fragmentation, activities may have secondary adverse effects such as invasive species introductions, disruption of daily and seasonal activities for fossorial animals (small mammals, reptiles, ground-foraging and ground-nesting birds), light and noise during night operations which impact daily bat foraging and seasonal bird migrations, mortality from road network traffic, potential and realized impacts to water resources from spills, extraction chemicals, saltwater injection and a lack of knowledge about the drilling material or equipment behaviors in certain substrates, acid deposition from flaring, and resource contamination or mortality from lack of appropriate spill response.</p>	<p>Production: seismic exploration; extraction site development and operations (including roadways, pumping and pad sites); hydraulic fracturing (“fracing” or “fracking”); offshore marine rig placement and operations.</p> <p>Transmission/Delivery and Storage: network of gathering stations, marine to coastal and interior pipelines; salt domes</p> <p>Reclamation: lack of site-appropriate recovery with native seed or vegetation sources, establishment timeframes, or stewardship through recovery period</p>
Mining	<p>Extractive use of naturally occurring materials for building materials, road base, commercial and industrial uses, power production, and other uses. Excludes oil and gas – separate category – see above.</p> <p>Aside from direct removal of some substrates important to species and habitat health (riparian cover, gravel in and adjacent to streams, coastal sands and oyster beds), may include impacts to surface and groundwater resources’ quality (lack of stormwater controls, substrate disturbance increases turbidity, wastewater and other chemical discharge or spills) and amounts/flow (unregulated uses, diversions and dewatering for direct use in mining operations). Equipment may also create spill hazards.</p> <p>Reclamation insufficient to recover area to pre-mining habitat quality and usefulness for species; impacts include invasive species, soil horizon disturbance causing change in soil chemistry, and water loss.</p>	<p>Sand and Gravel – upland and river</p> <p>Coastal Sands,</p> <p>Caliche</p> <p>Gypsum</p> <p>Bentonite</p> <p>Lignite</p> <p>Oyster Shell</p>
Timber Production and Management	<p>Many timber operations replace native species- and age-diverse stands with monotypic single-aged stands which provide lower quality or unsuitable habitat for some wildlife species. Inconsistent application of existing or incompatible/inadequate voluntary Forestry Best Management Practices (BMPs) contribute to the degradation of terrestrial and aquatic natural resources in and adjacent to such timber production areas. Recent changes in timber company ownership have, in some instances, shifted stewardship goals and opportunities, natural resources investment potential, and fragmented remaining stands. Timber managed on public lands and private lands can be managed to accommodate many terrestrial and aquatic wildlife needs, while still being profitable.</p>	<p>Voluntary BMP application on approximately 92% of Texas’ estimated 12 million acres of timberland, primarily on individual/family forest lands, TIMOs (timber investment management organizations) and REITs (real estate investment trusts)</p> <p>Whole tree utilization “biofuel” farms</p> <p>Short-term fast-growth timber for pulp and other processed wood products at the expense of the potential in slower-growth natural timber-producing systems (e.g. shortleaf and longleaf pine savanna)</p> <p>Complete removal of bottomland hardwood systems replaced with commercial timber and other agriculture operations</p>
Communications Infrastructure	<p>Most communications infrastructure impacts are minimal and/or go through some kind of environmental review for impacts to species; however, line installation typically follows road right-of-way and these areas may not receive full coordination (assumed to be impacted already). Industry is not required to reclaim construction sites with native vegetation or back to pre-construction condition, contributing to invasive species and direct habitat loss. Towers can cause bird mortality and confusion during migration.</p>	<p>Radio masts, antennas/aerials, telecommunications towers (cell, television, other)</p> <p>Distribution lines, including fiber optic, cable – above and below ground</p>
Transportation	<p>Transportation infrastructure serves an ever-growing demand to convey goods and services to urban centers, commercial points of trade, and all sites in-between. Without better planning, design and mitigation, new and expanded infrastructure contributes directly to terrestrial, aquatic, coastal and marine habitat loss, fragmentation, disruption of daily and seasonal movements, species mortality due to strikes or inappropriate passages, invasive species, stormwater runoff and water quality degradation.</p>	<p>New and existing roads, bridges over waterways, and associated right-of-way</p> <p>Navigation channels (e.g. Sabine-Neches or the Gulf Intracoastal Water Way)</p> <p>Ever-increasingly large and more frequent shipping vessels</p>

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<p>Water Development, Management and Distribution/Use</p>	<p>Water planning and use have been, are and always will be hot topics in Texas. Both surface and ground water resources support SGCN and important habitats, from springs to riparian zones to bays and estuaries. Most waters in Texas are managed by political boundaries –Water Planning Regions, counties, River Authorities, Groundwater Districts – and natural resources are not first and foremost in the decisions made by these entities or the processes they employ.</p> <p>With the exception of sole source drinking water aquifers and jurisdictional wetlands, few waters have clear conservation frameworks; and, even those two categories have limitations in regulation, compliance and enforcement which potentially adversely affect them and the SGCN which rely on them.</p> <p>From identification of important sites to planning the use of water resources in Texas, there are opportunities for more comprehensive and inclusive consideration of natural resources needs, which would go a long way to providing water for the needs of people and wildlife.</p>	<p><u>Surface Water Planning and Distribution</u>: 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</p> <p><u>Reservoir Construction and Operation</u>: Site selection on ecologically important waterways (e.g. Neches); development "footprint" for dam, reservoir, operations and human development around the site contributes to other natural resources management issues (effluent releases, feral animals, direct loss of habitat through building or inundation); Timing/Periodicity/Intensity of Water Releases from Dam do not match with natural flooding or flow regimes; ineffective or insufficient mitigation (cannot "replace" bottomland hardwoods); water quality and quantity impacts <i>in</i> reservoir.</p> <p><u>Ground Water Planning and Distribution</u>: Groundwater Districting applied by political boundary, rather than aquifer boundary; therefore some aquifers have several districts, some have none. Few regional or state natural resources professionals with wildlife and fisheries management involved in planning or management decisions. Lack of complete and consistent extraction accounting (regulated and unregulated, permitted and unpermitted, what's available v. what's extracted) across political boundaries</p> <p><u>Other Water Source Developments, Technologies, and Strategies</u></p> <p>Interbasin Transfers (both surface and groundwater), desalination and chloride removal operations, treatment wetlands, water conservation measures and outreach, subsidized use and cost structures for water customers</p> <p>"Desired Future Condition" frequently does not consider "Desired Ecological Condition"</p>
<p>Land and Water Management – FARM</p>	<p>This issue refers to working lands in agricultural production – cultivated, cleared, non-timber, non-rangeland, primarily for the purposes of food [row crop, orchard, vineyard, or concentrated animal feeding operation (CAFO)]. <i>Biofuel, timber, and range livestock production are covered under other categories.</i></p> <p>Land ownership fragmentation is an issue in both farming and ranching; however for most wildlife and fish resources, smaller, more-diversified farms appear to be better than larger commercial operations. With farms, what we do on the land appears to be more important in conservation than how large the site is.</p> <p>Incentive programs for farming landowners are in some areas incompatible with wildlife conservation goals, and may also be insufficiently funded to compete with agricultural incomes.</p> <p>Inappropriate fertilizer, herbicide, fungicide or pesticide application, feeding and manure containment/disposal, and lack of stormwater controls combine to adversely affect terrestrial and aquatic natural systems. Runoff from these areas can contribute to impaired water quality, aquatic life impacts, and riparian zone loss.</p> <p>Unsustainable irrigation practices exacerbate poor surface and groundwater management, depletion, and loss.</p> <p>Loss of natural sites to cultivation is also an issue; but conversely loss of agricultural sites (which provide wildlife habitat for some SGCN) to urban development is also an issue.</p>	<p>Large industrial farm and feedlot operations typically take more land out of habitat potential, except for those species which rely on ag lands during migration (some hawk, mountain plover), because the emphasis is on maximizing profit rather than the diverse uses of a family site (woodlot, recreation, hunting, heritage) which may contribute to habitat values.</p> <p>Landowner/land management soil and water conservation programs may incentivize inappropriate fencerow/windrow planting, brush removal, and water development: invasive and non-native grasses are promoted, brush removal may not be appropriately implemented, and water development may include damming natural creeks and springs, drilling groundwater wells</p> <p>Incentives for farmland operators to retain wildlife and fisheries habitats frequently do not encourage long term, permanent, or reliable beneficial actions in "regional conservation accounting" because management and conversion incentives are insufficient overall and not responsive enough to compete with cyclic ag market fluctuations.</p> <p>CAFOs and croplands without adequate stormwater runoff controls on certain topographies allow excess nutrients and chemicals to runoff into area waterways</p> <p>Herbicide or pesticide overspray from farm management may adversely impact adjacent native habitats and species, in particular amphibians and invertebrates</p>

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Land and Water Management – RANCH	<p>This issue refers to working lands in range-based livestock production – partially or wholly managed for livestock forage for sheep, goats, cattle, and exotic hoofstock. <i>Biofuel, timber, rowcrop, orchard, vineyard, and CAFO production are covered under other categories.</i></p> <p>Land ownership fragmentation is an issue in both farming and ranching. Larger contiguous ranches with diverse, well-managed native grazing and browsing forage tend to provide better benefits to wildlife and fish resources. Smaller fragmented sites typically imply more development, diverse goals/intentions, and various levels of management capacity, not all favorable to wild resources. Loss of natural sites to clearing for ranching operations is an issue; but conversely loss of larger range sites which can provide wildlife habitat for some SGCN to urban/suburban development is also a big conservation issue.</p> <p>Some incentive programs (e.g. reseeding, replanting) and alternative incomes (e.g. mineral development, hunting operations) for ranch/range landowners are in <i>some areas</i> are incompatible with wildlife conservation goals</p> <p>Some incentive programs (e.g. riparian buffers, wildlife habitat development and long-term set-asides, conservation easements) may be insufficiently funded to compete with livestock incomes, may not be advertised enough or structured in a way to be compatible with landowner needs, or conservation practitioners need more training to implement them well.</p> <p>Poor historic or currently unsustainable grazing or wildlife management practices exacerbate non-native and native invasive species, slow natural vegetation recovery, ability to apply current beneficial land practices, and poor surface and groundwater management.</p>	<p>Subdivision of larger ranches into smaller parcels, many without enough acreage <i>by themselves</i> to contribute meaningfully to regional conservation needs or qualify for available incentives for wildlife or fisheries conservation actions</p> <p>Incompatible stocking practices – too many animal units for the native forage to support dictated by tax structure not an agricultural professional; not enough or inappropriate recovery or vegetation management on historically overgrazed sites; or insufficiently managed or unmanaged exotic hoofstock (whether intentionally introduced or not, for hunting and other recreation), unmanaged private and public wildlife resources behind high game fences</p> <p>Promotion of exotic grasses for livestock forage</p> <p>Brush clearing and other vegetation removal on inappropriate or sensitive sites (headwaters, canyons, riparian areas) without regard to slope, aspect, vegetation community potential, and recovery objectives</p> <p>Some water resource development – damming natural waterways, springs, seeps; pond construction and stocking in inappropriate sites where altered hydrology and/or invasive species can be a problem for native species.</p> <p>Fire suppression and lack of site-appropriate, well-planned/managed prescribed fire</p>
Land and Water Management – MUNICIPAL, LOCAL GOVERNMENT, URBAN/SUBURBAN, DEVELOPED AREAS	<p>Impacts associated with this issue are typically assumed to be direct loss of native habitats to clearing and pavement – housing, shopping, industrial, commercial, waste disposal, etc. While these are real impacts, the indirect and cumulative effects of development are far-reaching.</p> <p>Urban and suburban populations have different views about land management and different impacts on the remaining open space within their borders as well as the resources outside of those jurisdictions.</p> <p>Growing populations’ water use and needs, effluent releases, impervious cover and stormwater controls, non-attainment status (clean Air Act quality requirements and thresholds), zoning and planning related to controlling “sprawl” and setting aside open space (type, quality, location) all affect natural resources in and around these areas.</p>	<p>Lack of zoning and planning can contribute to urban “sprawl” which affects how much habitat is directly lost to housing, transportation corridors, and other infrastructure development, as well as indirectly potentially affecting air quality in more vehicle miles traveled.</p> <p>Impervious cover and inadequate stormwater controls adversely affect surface and groundwater resources and the species dependent on these resources.</p> <p>Rivers, creeks, and streams in urban areas are typically manipulated and/or “armored” to convey floodwaters faster, removing important riparian and instream habitats and depleting natural water quality controls.</p> <p>Populations’ water needs contribute to loss and degradation of aquatic, riparian and upland habitats in areas where new reservoirs are proposed for water supply; water quality issues where wastewater effluent treatment systems are insufficient prior to release to native waters</p> <p>Permitting thresholds typically are insufficient to trigger adequate mitigation for most developments, especially those which impact nonjurisdictional wetlands and unregulated habitats like prairies, riparian zones, bottomlands, native shrublands, mature forests</p> <p>Diminishing availability of Potential Conservation Opportunities</p>
Land and Water Management – RECREATION AND CONSERVATION	<p>Not all “public” or “managed” lands have identified explicit conservation objectives or ways to contribute to conservation goals in the region. Lack of long-range conservation planning and/or collaboration among land managers in the region may prevent full conservation potential of these sites.</p> <p>Lack of information about site-appropriate management (resource and/or region specific best practices) may not be readily available to or affordable by all public and private open space managers.</p> <p>Some recreation and/or conservation lands are limited in their management by adjacent land uses</p>	<p>Lack of invasive species knowledge, mapping, control and/or eradication practices</p> <p>Inappropriate recreational uses or locations for those uses near sensitive resources – driving in springfed substrates, horseback or mountain biking activities near aquatic resources or highly erodible slopes, fishing too close to nesting islands, human disturbance near rookeries or bat maternity colonies</p> <p>Best Management Practices may not be known for some resources</p> <p>Lack of connectivity among public lands and/or private lands known to be managed for conservation</p> <p>Natural Areas needing management near housing developments may have unique challenges with feral animals, fear of prescribed fire, “protection” vs. “management” perceptions</p> <p>Land managers in one ecoregion or area of an ecoregion may not be aware of all conservation or recreation lands (e.g. land trusts and other privately held sites in a network of public lands) although they could benefit from pooling their expertise, interest and resources.</p>

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Border Protection	Border security structures and operations cause direct habitat loss through clearing along the Rio Grande/Rio Bravo and create barriers to daily and seasonal movements of riparian-dependent, ground-dwelling and/or large-ranging- mammals, reptiles, and birds; can create a barrier to genetic diversity and fragment larger stable populations into smaller unstable populations; create opportunities for artificially enhanced predation; contributes to direct roadway mortality; and accelerates soil loss and degrades water quality.	Border fence Extensive network of roadways and levees Grading and dragging Night operations Human disturbance
Lack of Information and Resources	In many instances, little is known about SGCN and their habitats distribution, needs, or causes for decline. This is because Texas is predominantly privately-held and very little research occurs on private lands. Additionally, the data which is available to conservation planners may be widespread across many sources, not all of which are known (decentralized) and not all of which are compatible (different data standards). And, there is some data which may be publicly held, but cannot be shared. Additionally, on the public side, an increasingly urban population with urban-centric thinking may be unaware of some of the issues in their region, how those issues are important at a personal level, and how to participate in the solution. Outreach and education has not always targeted the “right audience with the right message” to achieve conservation results specific to an area.	Lack of Data (amount, type) Insufficient or ineffectual data sharing among natural resources professionals "Public" (individual, community) disconnection from natural resources Inadequate understanding of available or widely-accepted conservation Best Management Practices Lack of targeted and/or ethnically-specific outreach
Inadequate Policies, Guidelines, Rules or Regulations, and lack of Enforcement of Existing Rules and Regulations	Voluntary guidelines or voluntary compliance can be a helpful conservation lever, if appropriately developed, rolled out with intention, and applied. While regulation is not always the answer to a conservation issue, it can be helpful in cases where voluntary compliance or voluntary guidelines have proven to be insufficient, where a need can be documented. Regulation, best management practices, permitting, and guidelines for various types of wildlife management, collection or harvest; aquatic resources protection; and water development and distribution have <i>in some areas</i> not been applied effectively due to lack of funding, or enforcement resources, lack of understanding or clear benefits, or lack of political will. Some regulations are simply insufficient to deal with emerging conservation issues or problems that have come to light in regulatory loopholes	Poaching, Permitting Avoidance and Violations, sale of prohibited species, insufficient lists of prohibited species Unregulated or inadequately regulated wetlands (e.g. non-jurisdictional, isolated) Out of date Best Management Practices which have not incorporated the latest defensible science or appear to be arbitrary in setting thresholds Lack of community-based natural resources management and enforcement partnerships See also <i>Water Development, Management and Distribution/Use</i>
Human Disturbance	This is the direct disturbance/harassment of wildlife or fish resources which can adversely affect their breeding, feeding or sheltering abilities.	Off-road vehicle use in streams, Approaching wildlife too closely in breeding or resting areas (e.g. rookeries, hibernacula, nesting colonies on barrier and spoil islands) which can cause flushing, leaving eggs or young vulnerable to predators, or waking during hibernation, which uses valuable stored resources Using non-targeted means of take or harvest (e.g. bycatch, indiscriminate substances into crevices) which can affect an entire system’s worth of species and may adversely affect future habitat suitability in that area
Other Broad Cross-Cutting Issues	Several issues affect many of the other previously mentioned issues, either in our ability to understand or act.	<u>Economy</u> – working lands markets; public support for conservation through bonds, referendums, public program funding; and, cyclicly available grant funding – drives much of what we can do to protect resources and how we engage willing partners to affect conservation on a meaningful scale. <u>Population growth, urbanization, and shifting demographics</u> affect where we need to work, how to deliver the conservation message, and what partners might be best to help tackle a problem. <u>Climate change</u> is one of the emerging conservation issues which may affect many resources across the state – sea level rise, ocean acidification, temperature and precipitation shifts, further isolation and change of already isolated habitats or species. <u>Episodic Natural and Man-made Disasters</u> such as tornadoes, hurricanes, flooding and large oil spills have an impact on natural resources as they do on human resources; our ability to understand the impact potential, long-term change, and the resiliency of natural systems is important to deal with these as they occur.

In addition to workshops and surveys: AFWA 2006, CTE 2011, ICOET 1996 – 2009, NWF and LSCSC 2011, SECO 2009, TFS 2011, USDA ERS 2007, USDA ERS 2011; see also compiled **TCAP Resources and References (to be added after public comment)** online.