Sustainable Development

In 2004 The Nature Conservancy (TNC) created a Conservation Area Plan for the Blanco River basin. This plan identified elements of concern including the status of riparian forests, habitats within canyon systems, upland grasslands, savannas, and shrublands. Habitat preservation for endangered and threatened species is also of concern. The following species living in the Blanco River basin are among those listed as endangered or threatened:

- Golden-cheeked warbler
- Black-capped vireo
- Speckled chub
- Texas shiner
- Guadalupe bass
- Cagle's map turtle
- Headwater catfish
- Swamp rabbit
- Texas horned lizard
- Granite spiderwort

Reported basin stresses were residential development and resulting habitat losses, excessive wildlife herbivory, unsustainable grazing practices, and incompatible fire management[1].

Vulnerability Assessment

The TNC's 2004 Conservation Area Plan for the Blanco River Basin assessed biodiversity health for the basin by ranking each element, and aggregating the ranks to provide a biodiversity health rank.

The viability assessment was based on size, condition, and landscape context. Size is the area or abundance of an element. Condition is derived from the composition, structure, and biotic interactions. Landscape context integrates salient environmental processes with habitat connectivity across the element landscape. In order to evaluate current viability, measurable criteria were used to determine each desired future viability rank and were based on achievable changes. Where the factors of size, condition, and landscape context were fair or poor, active restoration or enhancement measures may be warranted. Viability ranks were qualitative and categories are ecologically defined as follows:

- **Very Good** = optimal viability: ecologically at a self-sustaining level, requiring few if any active measures to guarantee long-term (100 years) viability.

- **Good** = minimally acceptable: functioning within limits of natural variation; possibly requires some measures to ensure long-term (100 years) viability.

[1] The Nature Conservancy (TNC) 2004. Conservation Area Plan for the Blanco River Basin. Unpublished.

- **Fair** = unacceptable viability: impaired functioning outside of acceptable limits of variation and requires active measures to reduce risks of serious degradation.

- **Poor** = dangerous: outside the natural range of variation, lack of active measures for an extended period will make restoration or preventing extirpation practically impossible.

According to the Conservation Area Plan results, the biodiversity health rank for Blanco River (Table 20) has been rated as acceptably viable (good). Three conservation elements were "fair" overall and are viewed as recoverable.

Table 20 TNC Blanco River Basin Viability Summary.

Conservation Element	Size	Condition	Landscape Context	Overall Rank
Rivers and Streams	NA	Good	Good	Good
Springs and Seeps	NA	Good	Good-Very Good	Good
Riparian Forests & Floodplains	Fair	Fair	Fair	Fair
Mesic Slopes	Good	Fair	Very Good	Good
Upland Communities	Fair	Fair	Fair	Fair
Overall site viability (biodiversity health)				***Good***

Threat Assessment

TNC evaluated threats impacting conservation elements. Stresses were defined as threats and their sources were identified. A *stress* could be chemical pollutants in a stream and their *source* would then be industrial discharge high in contaminants. Stress and source ranks help elucidate the factors influencing each element and, subsequently, the necessary conservation strategies.

Critical threats, ranked "very high," jeopardize multiple conservation elements or affect at least one element and necessitate immediate conservation strategies. Threat analysis serves as a prioritization guideline. Three critical threats are home development, unsustainable groundwater and surface water withdrawal, and excessive wildlife herbivory. Two threats with moderate rankings are ecologically incompatible vegetation management and industrial development, shown below (table 21).

Table 21 Summary threats assessment.

Threats Across Systems	Rivers and Streams	Springs and Seeps	Riparian Forests and	Mesic Canyon	Upland Communitie	Blanco River Heritage	Rural and Village	Sustainable Hill Country	Overall Threat Rank
Unsustainable groundwater or surface water withdrawal*	High	High	Low	-	-	Low	Med.	Low	**High**
Excessive Wildlife Herbivory*	-	-	High	High	High	-	-	-	**High**
Unsustainable vegetation management (excludes fire)	-	-	-	Med.	Med.	-	-	-	**Medium**
Commercial/industrial development/management	Low	-	-	Low	Med.	Med.	High	Low	**Medium**
Development of roads or utilities	-	Low	High	Med.	Med.	-	Med.	-	**Medium**
Unsustainable grazing practices	Med.	Med.	-	Med.	High	-	-	-	**Medium**
Incompatible fire management	-	Low	-	Med.	High	-	-	-	**Medium**
Mechanical clearing of forest understory	Med.	-	High	-	-	-	Low	-	**Medium**
Increased impervious cover	High	Med.	Med.	-	-	-	-	-	**Medium**
Excessive herbicide, pesticide, fertilizer use	High	Low	-	-	-	-	-	-	**Medium**
Dams and ponds	High	-	Low	-	-	-	-	-	**Medium**
Invasive/alien species	Low	-	Med.	Med.	Med.	-	-	-	**Medium**
Threat Status for Targets and Site	High	Med.	High	High	High	Low	High	Low	**High**

*Critical threats

Excessive Wildlife Herbivory

Commonly introduced species are axis deer *(Cervus axis*), and feral hogs (*Sus scrofa*). Hogs disturb ecosystems by rooting and damage can be significant for plant species in sensitive areas such as springs. White-tailed deer are the primary browsing species across the area and have contributed to altered species composition and vegetation structure. Deer surveys by the Texas Parks and Wildlife Department (TPWD) indicate densities in Blanco and Hays County of 160 to 170 deer per 1,000 acres.

The recommended density is 66 deer per 1,000 acres[2]. The overabundance of deer in these counties may be due to human-provided food sources (feed and landscaping), a reduction of hunting (due to development), and aversion among hunters and landowners to harvest does.

Incompatible Vegetation Management

Potentially harmful land management techniques found were incompatible grazing and fire suppression. Other harmful human activities were the creation of extensive trails and roads in sensitive riparian forests, large-scale removal of brush and juniper, and installations of wildlife feeders. All these activities may result in fragmented habitat, as well as changes in vegetation species composition and animal distribution and numbers.

Commercial and Industrial Development

The geographic scope and rate of development are expected to increase dramatically over the next 10 years. The ecological concerns of development can be ameliorated by improvements in design and scale of development. Construction away from environmentally sensitive areas, building structures and parking areas that minimize habitat loss and reduce impervious cover mitigate many concerns. Industries requiring discharge into river bodies could have deleterious effects on aquatic species and water quality.

Unsustainable Grazing Practices

Livestock production in the area includes cattle, sheep and goat ranching. Historically, bison (*Bison bison*) are thought to have grazed Hill Country ranges seasonally, while white-tailed deer browsed year-round. Today, domestic livestock fill the niche formerly occupied by bison and share resources with native and imported deer. Grazing practices are highly variable across the basin. Some ranges are in excellent condition with high levels of biodiversity while others have been converted to grass production. These contain little biodiversity or resources for wildlife foraging. Overstocked properties are neither productive nor diverse.

Incompatible Fire Management

Lightning-strike fires frequently were natural disturbance events occurring in a highly variable pattern depending on topography and fuel loads. Occasional disturbance or a heterogeneous landscape, both of which fire can produce, may be important for maintenance of some species and vegetation communities. The advent of ranching in the 1800s introduced fire suppression. Along with decreasing fuel loads that resulted from increased herbivory by domestic animals, the vegetation structure and species composition in many upland plant communities have affected.

[2] Armstrong, W. E. and E. L. Young. 2000. White-tailed Deer Management in the Texas Hill Country. Texas Parks and Wildlife. Austin, TX.

Reintroduction of fire to select areas may prove an effective management tool, particularly for black-capped vireo management.

Mechanical Clearing of Forest Understory

Homeowners often strip out midstory shrubs, trees and vines of riparian forests to create a European park-like setting. At best, this leaves grasses, low-growing forbs, and overstory trees. This reduces available food and shelter for native birds and mammals and also alters the hydrological regime of streams and rivers.

Increased Impervious Cover

Impervious cover is the hard surfaces of asphalt and concrete used for roads, parking lots, driveways, and sidewalks. These surfaces alter the velocity, amount, and entry location of rainwater returning into the ground or to streams and rivers. Additionally, this water often gathers oil, grease, and other contaminants, depositing them into waterways.

Unsustainable Fertilizer, Pesticide, Herbicide Use

Aquatic systems are threatened by overuse of fertilizers and pesticides. Fertilizers increase nitrogen levels in water contributing to unnatural growth of aquatic plants. Pesticides and herbicides may directly kill aquatic organisms, or may stress biota by changing water chemistry or even body chemistry within individuals. The main source of fertilizer and chemical runoff is likely suburban and urban properties. Fertilizer, pesticide and herbicide run-off from homes and schools has been shown to be higher per acre than on many farms.

Dams and Ponds

Along the Blanco River and its tributaries are low-water dams that change hydrology and sediment loading. Most dams in the area are small structures constructed by landowners to provide residential or recreational water. Excessive sedimentation may destroy fish and macroinvertebrate habitat and smother fauna. Heavy metals and other contaminants are concentrated in front of dams and released *en masse* during catastrophic flood events. Small dams may also contribute to localized eutrophication by concentrating fertilizers and domestic duck excrement. Small ornamental ponds into which river water is diverted may have little impact on rivers and streams, but their cumulative effects have not been examined.

Invasive and Exotic Species

There are few problematic exotic grasses in the basin that have proven difficult to eradicate. The most serious is King Ranch bluestem that occupies grasslands on shallow soils of ridgetops and

the deeper soils of floodplains. Another species is bermudagrass (*Cynodon dactylon*), which occupies pastures on deep soils. Kleberg bluestem (*Dichanthium annulatum*) and silky bluestem (*Dichanthium sericeum*) may also be present. Exotic shrub and tree species include giant reed (*Arundo donax*), castor bean (*Ricinus communis*), chinaberry (*Melia azedarach*), and Chinese tallow (*Sapium sebiferum*).

The most controversial invasive plant here is a native species: Ashe juniper. This tree has expanded its dominance due to a combination of fire suppression, historic heavy grazing, and a period of increased rainfall. Controversy centers on how much juniper is too much, since this species is necessary for endangered golden-cheeked warblers. Ashe juniper has also been named the cause for depleting groundwater stores at a watershed scale[3]. This claim has not been substantiated to the satisfaction of all biologists[4,5].

[3] Texas Water Development Board. 2002. Water for Texas. 2002 State Water Plan. Texas Water Development Board, Austin, Texas.
[4] Walker, J. W., W. A. Dugas, F. C. Baird, S. T. Bednarz, R. S. Muttiah, and R. A. Hicks. 1998. Site selection for publicly funded brush control to enhance water yield. Proc. 25th Water for Texas Conference. "Water Planning Strategies for Senate Bill 1." Texas Water Resources Institute. TAMUS. Austin, Texas.
[5] Wilcox, B. P. 2002. Shrub Control and Streamflow on Rangelands: A Process Based Viewpoint. Journal of Range Management. 55:318-326.