Conservation Area Plan

for the

Blanco River

October 2004

The Nature Conservancy

SAVING THE LAST GREAT PLACES ON EARTH

Table of Contents

Tables and Figures

Conservation Area Description

Ecoregion: Edwards Plateau

County/State: Hays, Blanco, Comal, Kendall Counties, Texas

Acreage: 114,063 ha (281,856 ac)

Preserves and Public Lands: Blanco State Park, Texas Parks and Wildlife Department

Planning Team Members (these are attendees—for the list of invitees, see Appendix G)

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Executive Summary

Figure 1. Edwards Plateau ecoregion

With its cypress-shaded rivers, wooded limestone hills, luxuriant spring wildflowers, and water-carved caverns, the Hill Country is one of our state's greatest natural treasures. This Central Texas ecoregion, also known as the Edwards Plateau (Figure 1), encompasses more than 93,240 square kilometers (36,000 square miles). The Hill Country is home to many plants and animals both common and rare, including 81 plant and 67 animal species with global rankings from "very rare" to "critically imperiled".

Of course, people live here too. Seven counties in the Hill Country ranked among the top 100 fastest-growing counties in the country between 1990 and 2000, according to the U.S. Census Bureau. Much of this burgeoning growth is over the Edwards and Trinity Aquifers, bringing to the fore the urgent need for careful land-use planning in order to avoid future water contamination and shortages. Many Hill Country rivers stand to be affected by this growth, not least among them the Blanco (which sits atop the Trinity Aquifer). This river has few major tributaries and lies in a fairly undeveloped basin; as such, it is one of Texas' more pristine river systems. The Blanco River has its headwaters at springs in Kendall County, and then flows through Blanco and Hays counties to end at the San Marcos River. This 140-kilometer (87-mile) river supports a breathtaking array of aquatic and terrestrial life, in addition to being a special place in the heart of many Texans. Water from the Blanco ultimately reaches the Guadalupe River and the Gulf of Mexico. This means its influence is seen for hundreds of miles, all the way to our coastal estuaries.

Figure 2. Blanco River basin

Because of the biological importance of this area, and the immediate and impending pressures it faces, the Conservancy has joined others already working to conserve the natural heritage within the river basin (Figure 2). Through local partnerships, The Nature Conservancy is committed to helping human communities find ways to live productively and sustainably in this delicate environment, while conserving the diverse native plants and animals that depend on this scenic landscape. The Nature Conservancy will partner with public, private and commercial interests to:

- Encourage sustainable use of groundwater and surface water in the Blanco River basin
- Promote building practices that minimize habitat loss, fragmentation, and degradation
- Remove technical roadblocks to ecologically sustainable land management
- Retain the area's rich natural and cultural heritage, along with a sustainable economy

The Planning Process for Blanco River

The Nature Conservancy of Texas completed the draft ecoregional assessment for the Edwards Plateau (Figure 1, Appendix A) in 2003. The portfolio of conservation areas (places with high biodiversity) established by this assessment included areas surrounding the Blanco River, and led the Conservancy to establish a Blanco River project. Geographically, the Blanco River basin, which essentially defines the project boundary, encompasses or intersects six of these ecoregional conservation areas, areas of high biodiversity that may also be at risk for serious degradation (Appendix A). The Nature Conservancy was not alone, or first, in recognizing the significance of this part of the Hill Country. Local residents have been collaborating in various ways for years to retain their way of life and their natural resources, working mainly within small grass roots organizations. The Conservancy felt that we could add to the work ongoing here, and set out to begin exploring ways to further advance conservation in the area. The Conservancy works with the philosophy that effective conservation should benefit not just natural resources, but also the human communities that have a stake in those resources, and that our work should enhance rather than detract from local communities. Likewise, we recognize and appreciate the history of sound land stewardship and the achievements of other conservation groups that precede our entrance into this area.

Thus, the first logical step in our project exploration was to initiate a dialogue with community members, to learn what their priorities were, to determine what goals were shared among various interest groups, and to hear what the community thought the Conservancy could do to add to the conservation picture in the Blanco River watershed. We began by inviting over 30 stakeholder representatives (Appendix G) to a two-day meeting, during which the group delved into the aforementioned issues. The next step in the planning process integrated members of this first "community team" with biologists to form a "technical team." The technical team conducted a science-based conservation needs assessment based on conservation and lifestyle priorities identified by the community team. The results of these two meetings were shared with the larger river basin community as a draft of this conservation plan. The draft was revised based on input from all these teams and groups, and now stands as the blueprint which will guide our work and partnerships.

This conservation plan represents the beginning of our conversations and collaboration with local residents. While it is the result of extensive consultation, we realize that we have not yet reached all the interested individuals in this area. A large part of our ongoing outreach work will revolve around that challenge, and our interactions with community members will continue to inform and influence how we work to help conserve the Blanco River watershed. We wish to thank all the people who devoted so much of their time to this planning project. This plan belongs to you.

I. Conservation Planning[1]

The Nature Conservancy's mission is to conserve a set of places that will ensure the long-term survival of all native life and natural communities—not just those that are threatened. We call these places conservation areas.[2] We plan to protect networks of conservation areas across large landscapes defined by their distinct climate, geology and native species. We call these large areas ecoregions. Using our collaborative, science-based approach to conservation, The Nature Conservancy, along with our partners, first creates biodiversity assessments for each ecoregion. We then develop conservation plans for each high priority conservation area in the ecoregion. These conservation area plans form a blueprint that guides the Conservancy's actions.

There are five steps in The Nature Conservancy's ecoregional assessment process:

- **Identifying Conservation Elements.** Ecoregional planning teams made up of Conservancy staff and partners identify the species, natural communities and ecosystems in a given ecoregion and select as conservation elements those that best capture its biodiversity.
- **Gathering Information.** The teams gather data about the conservation elements, such as location and species viability.
- **Setting Goals.** The team sets goals for each conservation element. Setting goals involves determining how much of a particular element (number of populations, acreage) is needed to ensure its long-term survival and how elements need to be distributed across the landscape.
- **Assessing Viability.** The team assesses the viability of each conservation element and identifies the healthiest examples of each element.
- **Assembling Portfolios.** All this information is used to design a network of conservation areas that, if protected, will ensure the preservation of biodiversity in the ecoregion.

The Conservancy uses conservation area plans to develop site-specific conservation strategies and prepare for taking action and measuring success. These plans follow the "5-S Framework":

- **Systems.** The conservation area planning team identifies the conservation elements for the area. This is done using element lists developed during ecoregional planning and modifying the lists to include site-specific conservation elements.
- **Stresses.** The team determines how conservation elements are compromised, such as by habitat reduction or fragmentation, or changes in the number of species in a grassland.
- **Sources.** The team then identifies and ranks the causes, or sources, of stress for each element. The analysis of stresses and sources together make up the threat assessment.
- **Strategies.** An important step in the process is finding practical, cooperative ways to mitigate or eliminate the identified threats and enhance biodiversity.
- **Success.** Each plan outlines methods for assessing our effectiveness in reducing threats and improving biodiversity--by monitoring progress toward established conservation goals.
- An understanding of the cultural, political and economic situation behind the threats is essential for developing sound strategies. This human context is often referred to as the sixth "S."

[1] From Conservation by Design (The Nature Conservancy, 1996)
[2] For definitions of terminology used in the plan, see the Glossary.

II. Conservation Area Overview

What is a Conservation Area?

A conservation area is an area, large or small, that is, or has the potential to be, an ecologically functional system. Ecologically functional means that it supports all the plant and animal species native to the area and that sustaining ecological processes (e.g., hydrologic cycles) are occurring. Conservation areas are thus defined primarily as biological units. The boundary of the Blanco River project defines the ecological system that the Conservancy and its partners used in selecting conservation elements and in assessing conservation needs. The nature and scope of on-the-ground work will be based on this conservation assessment, but also on feasibility and a respect for the needs and desires of local communities.

Biological Overview

The Blanco River conservation area spans 114,063 ha (281,846 ac) in the Edwards Plateau ecoregion. The conservation area overlaps at part or all of six conservation areas identified as biodiversity hot spots in the ecoregional assessments (The Nature Conservancy 2004, Appendix A). The conservation area boundary is based on these ecoregional hotspots but essentially mirrors the river basin; it was delineated by the community planning team to capture key elements of biodiversity and to reflect the ecological realities and influences within the landscape.

The source of the Blanco River are springs in northeastern Kendall County, and the river is fed by numerous additional springs and seeps that discharge variably along the 140-km (87-mi) stretch of riffles, runs and pools. The river flows through Blanco and Hays counties and ends at the San Marcos River, inside the city of San Marcos. The Blanco River is part of the Guadalupe River basin and has a drainage area of over 1,036 km^2 (400 mi^2). Two major tributaries, Callahan Branch and Flat Creek, join the main fork of the river in Blanco County; and the Little Blanco River flows into the mainstem in Hays County. Cypress Creek, another major tributary, begins at Jacob's Well (a spring) and joins the river at Wimberley. Cypress Creek and Jacob's Well are well-known and loved, as are other distinctive natural features that charm locals and visitors. Among these features are the Narrows, an area of steep limestone cliffs in western Hays County through which the river squeezes, and the Devil's Backbone and Blue Hole, both near Wimberley. Another defining feature of the area is the karstic nature of the geology. "Karst" refers to the irregular nature of the limestone strata, which is permeated by streams and riddled with sinks, caves, and other subterranean passages that constitute part of the complex recharge system within the aquifer.

The bed of the Blanco and its tributaries are mostly limestone bedrock, which because of regular seasonal flooding, supports little aquatic vegetation. However, the riparian forests along the Blanco River provide welcome shade under sugarberry (*Celtis laevigata*), cedar elm (*Ulmus crassifolia*), bur oak (*Quercus macrocarpa*), willow (*Salix gooddingi, S. nigra*), sycamore (*Platanus occidentalis*), and cottonwood (*Poplar* spp*).* Dry uplands support smaller trees on their shallower soils. Here are found varying amounts of cedar, or Ashe juniper (*Juniperus Ashei*), oaks (*Q. buckleyi, sinuata, pungens, fusiformis*), persimmon (*Diospyros texana*), and mountain laurel (*Sophora secundiflora*), interspersed in a highly variable pattern with little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), and non-native King Ranch bluestem (*Bothriochloa ischaemum*). Between these low and high areas lie mesic canyon forests, with Ashe juniper, Texas oaks (*Q. buckleyi*), Texas ash (*Fraxinus texensis*) and cedar elm.

These diverse habitats support a variety of species of conservation concern. Some notable terrestrial species are canyon mock-orange (*Philadelphus ernestii*), and sycamore-leaved snowbell (*Styrax platanifolius* ssp. *platanifolius*), swamp rabbit (*Sylvilagus aquaticus*), and breeding populations of federally endangered black-capped vireo (*Vireo atricapilla*), and golden-cheeked warbler (*Dendroica chrysoparia)*. Aquatic species of conservation interest include several endemic and peripheral species, such as the Blanco River springs salamander (*Eurycea pterophila*), Texas blind salamander (*Eurycea rathbuni*), Texas shiner (*Notropis amabilis*), Guadalupe roundnose minnow (*Dionda* sp. 1), and the state fish, Guadalupe bass (*Micropterus treculi)*.

While this is a popular recreation spot, there is relatively little publicly accessible land. There are various small city and county parks in the conservation area, but no federally-managed lands, and only one state park. Blanco State Park is just 42 ha (105 ac) along the river in Blanco**.** The park was opened in 1934, and original park developments were made by the Civilian Conservation Corps. The public may camp, swim, picnic, fish and boat there.

Demographics

The conservation area occurs primarily in Blanco and Hays Counties (Appendix A). There are two metropolitan areas near the site, Austin and San Marcos, which comprise the Austin-San Marcos Metropolitan Statistical Area (United States Census Bureau 2002). Population density in Blanco County is 12 persons per square mile and in Hays about 144, compared to the statewide average of 80 persons per square mile (United States Census Bureau 2002). Total population for Blanco and Hays Counties are 8,767 and 105,115 (2001 estimate, United States Census Bureau 2002).[3] The current resident population figures represents an increase of about 41% and 49% (Blanco and Hays County, respectively) from 1990 to 2000, compared to the average 23% population increase for the state (United States Census Bureau 2002). These figures do not reflect the growing number of homeowners who use their property as a weekend retreat and retain residence status elsewhere. As of 2000, estimates of part-time residences (housing units that were not primary residences) were about 730 in Blanco County and 2,233 in Hays County (U.S. Census Bureau 2002).

About 25% of Blanco and Hays County residents are under 18 years of age (United States Census Bureau 2002). In Blanco and Hays, respectively, about 17% and 8% of the residents are 65 or older (United States Census Bureau 2002). The Blanco County population is about 82% white, non-Hispanic, about 15% Hispanic, 0.7% African-American and 0.6% Native American (United States Census Bureau 2002). The Hays County population is about 65% white, non-Hispanic, about 30% Hispanic, 4% African-American and 0.7% Native American (United States Census Bureau 2002).

[3] Figures for Hays County are heavily influenced by Austin and San Marcos. Excluding San Marcos (47,333), the Hays County population within the conservation area is about 38,000 (United States Census Bureau 2002).

Unemployment rates in Blanco and Hays Counties in 2003 were 3.8% and 5.6%, respectively, compared to the statewide average of 6.8% (Texas Workforce Commission 2004). Median household income in Blanco and Hays, respectively, is $39,369 and $45,006, compared to $39,927 statewide (1999 model-based estimate, United States Census Bureau 2002). An estimated 11% and 15% of Blanco and Hays County residents live below poverty level, close to the statewide rate of 15% (1999 model-based estimates, United States Census Bureau 2002).

About 81% of Blanco County residents possess a high school degree or GED, compared to 85% in Hays County (United States Census Bureau 2002). In the two counties, about 22% and 31% of residents (Blanco and Hays, respectively) have a college degree (United States Census Bureau 2002). Statewide, about 75% of the adult population has a high school diploma or GED, and about 23% of Texas's adults hold college degrees. (United States Census Bureau 2002).

Land Use

Historically this area was used for cattle, sheep, and goat ranching; and row crop agriculture. By about 1900, the settlers' lack of familiarity with Hill Country ecology (particularly the fickle rainfall patterns and slow plant growth compared to eastern lands from which most came) had led to overgrazing in many areas. The degradation of native grasslands, along with a period of wet years, is thought by many to have contributed to widespread soil erosion and woody plant encroachment, particularly cedar, or Ashe juniper. This change made the land less profitable for ranching and farming. Today, lowered land productivity and changes in the livestock market have led to a general decline of livestock production in the area, and an increasing percentage of the income generated on these lands is from hunting leases. To add variety to the available white-tailed deer (*Odocoileus virginianus*), exotic game animals have been introduced for hunting, with mixed results from an economic and ecological perspective. Other past and continuing uses in the area are primarily recreational in nature, including fishing, swimming, and canoeing.

III. Conservation Elements

Introduction

As the first step in its conservation planning process, the Conservancy evaluates conservation needs at an ecoregional scale (The Nature Conservancy 2000a, 2000b). Scientists and land managers develop portfolios of conservation areas for each ecoregion. These portfolios represent the full distribution and diversity of conservation elements—native species, natural communities, and ecological systems—within each ecoregion. Typically, conservation elements are rare in part or all of their range, or fairly common but decreasing in viability. Because conservation elements are usually at or below optimum numbers, part of the ecoregional planning process involves establishing goals for their number and distribution across the ecoregion (The Nature Conservancy 2000b). The planning work that the Conservancy does at the local (conservation area) level must serve two main purposes: (1) help us reach the biological goals set out in the ecoregional plan, and (2) address any biological, socio-cultural, economic, or political issues unique to the conservation area.

The Nature Conservancy's methodology allows selection of conservation elements at various scales (e.g., species, guild, community) but for purposes of feasible implementation, limits the number of elements in a conservation area plan to eight. Because the conservation area contains far more than eight elements of conservation interest, the team took care to choose conservation elements at a coarse enough scale to encompass the diverse guilds and species of concern. This effort produced a list of five natural communities and three socio-culturally important features:

- **Rivers and Streams**
- **Springs and Seeps**
- **Riparian Forests and Floodplains**
- **Mesic Canyon System**
- **Upland Grasslands, Savannas and Shrublands**
- **Blanco Natural Heritage Sites**
- **Rural and Village Ambience**
- **Sustainable Hill Country Economy**

To address key features within and across these systems, plant and animal species and vegetation communities were nested under most of the broader conservation elements (Table 1). *Nested elements* are imperiled, ecologically linked to a conservation element, and can be conserved via strategies designed for that conservation element (The Nature Conservancy 2000a). All nested elements are also conservation elements for this conservation area in the Edwards Plateau ecoregional assessment unless otherwise indicated.

Description of Conservation Elements

Rivers and Streams

This element refers primarily to the Blanco River, but also includes major and minor tributaries such as the Little Blanco River and Cypress Creek (Appendix A). The Blanco River exhibits a complex hydrogeology, largely a product of its highly fractured bed and underlying karst aquifer. The river is characterized by fast flowing stretches with riffle and pool habitat, which go frequently underground and re-appear yards or miles downstream. Subsurface fissures and springs contribute to the high variability of the stream channel. There is less vegetation here than in some nearby rivers like the San Marcos, largely because the limestone riverbed and pattern of scouring floods prevent significant sediment build-up. The exception is found near man-made dams, which collect sediment upstream, and which support very different aquatic communities than found along most free-flowing stretches of the river and tributaries. While, characteristic native plants are few, native animals are abundant. Obligate invertebrates are not well known, although the Conservancy is currently supporting inventory work through Texas State University at San Marcos (see Appendix F for first-year results). Characteristic vertebrate species already documented include the Blanco River springs salamander and Cagle's map turtle (*Graptemys caglei*) (Table 1). Fishes are likewise being studied, and many species are already documented (Appendix F). In addition to cataloguing aquatic species, sound management of the river basin will require a greater understanding of river hydrology and watershed function, especially recharge and flow patterns. This is a research priority.

Springs and Seeps

This conservation element includes small to large springs and seeps throughout the conservation area. Most known occurrences are associated with the Blanco River or its tributaries, although numerous undocumented surface discharge points undoubtedly exist. Notable large springs (with a large surface pool) include Jacob's Well, Blue Hole, and Fern Spring. Springs and seeps are important not only as contributors to stream and riverflow, but also as habitat for specialized aquatic species—and as special places which add to the area's natural heritage and allure. Known spring species include the Guadalupe roundnose minnow, Blanco River springs salamander, and the Comal Springs dryopid beetle (*Stygoparnus comalensis).* The aforementioned surveys (see rivers and streams) also cover springs and seeps, and are expected to add considerably to the list of known spring-associated species.

Riparian Forests and Floodplains

The riparian forest system encompasses natural communities along the streams and rivers within the conservation area. Floodplains extend from unforested stream edges outward to the lower slopes of hills and mesic canyons. Characteristic forest vegetation includes numerous trees, such as pecan (*Carya illinoensis*), sugarberry, net-leaf hackberry (*Celtis reticulata*), Texas persimmon, green ash (*Fraxinus pennsylvanica*), Arizona ash (*Fraxinus velutina*), walnut (*Juglans sp.*), sycamore, Eastern cottonwood (*Populus deltoides*), Texas oak (*Quercus buckleyi*), Shumard oak (*Q. shumardii*), plateau live oak (*.Q fusiformis*), black willow (*Salix nigra*), baldcypress (*Taxodium distichum*), and cedar elm (Baccus and Wallace 1997). Understory species include false indigo (*Amorpha fruticosa*), wooly bumelia (*Bumelia* *lanuginosa*), roughleaf dogwood (*Cornus drummondii*), possumhaw (*Ilex decidua*), waferash (*Ptelea trifoliata*), Carolina buckthorn (*Rhamnus caroliniana*), peppervine (*Amphelopsis arborea*), dewberry (*Rubus trivialis*), greenbriar (*Smilax bona-nox*), poison ivy (*Toxicodendron radicans*), and mustang grape (*Vitis mustangensis*) (Baccus and Wallace 1997). Herbaceous understory species tend to be common forbs and grasses such as giant ragweed (*Ambrosia trifida*), creek oats (*Chasmanthium latifolium*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), frostweed (*Verbesina virginica*), cattail (*Typha latifolia*), western ironweed (*Vernonia baldwinii*), sedges (*Carex sp.*), and spiny cocklebur (*Xanthium spinosum*) (Baccus and Wallace 1997). Numerous invasive non-natives are also found here: bermudagrass (*Cynodon dactylon*), giant reed (*Arundo donax*), castorbean (*Ricinus communis*), Japanese honeysuckle (*Lonicera japonica*), wax-leaf ligustrum (*Ligustrum lucidum*), and chinaberry (*Melia azedarach*) (Baccus and Wallace 1997). Swamp rabbits are uncommonly found here, usually where understory vegetation is diverse and abundant.

Table 1. Nested elements

Common Name	Scientific Name	Heritage Rank	Springs & Seeps	Rivers & Streams	Riparian Forests & Floodplains	Mesic Canyon Slopes	Upland Communities	Blanco Natural Heritage Sites
Birds								
Bell's vireo	*Vireo bellii*	G5S 3B PS			X			X
Black-capped vireo	*Vireo atricapilla*	G2G3 S2B LE					X	X
Golden-cheeked warbler	*Dendroica chrysoparia*	G2 S2B LE			X	X	X	X
Painted bunting	*Passerina ciris*	G5 S4B					X	
Dickcissel	*Spiza americana*	G5 S4B					X	
Rufous-crowned sparrow	*Aimophila ruficeps*	G5 S4B				X	X	
Cassin's sparrow	*Aimophila cassinii*	G5 S4B					X	
Aquatic Obligates								
speckled chub	*Macrhbopsis marconus*	G3G4 S3S4	X	X[1]				
Texas shiner (stream flow indicator species)	*Notropis amabilis*	G4 S4		X				
Guadalupe roundnose minnow	*Dionda* sp.1	G4 S4	X	X[2]				X
American eel	*Anguilla rostrata*	G5 S5		X				
Orangethroat darter	*Etheostoma spectabile*	G5 S4		X				X
Headwater catfish	*Ictalarus lupus*	G3 S2 X?		(X)				
Comal Springs dryopid beetle	*Stygoparnus comalensis*	G1G2 S1 LE	X					X
Texas blind salamander	*Eurycea rathbuni*	G1G3Q S1S3	X					X
Guadalupe bass	*Micropterus treculi*	G3 S3		X				
Blanco River springs salamander	*Eurycea pterophila*	G2 S2	X	X				X
Cagle's map turtle	*Graptemys caglei*	G3 S3 C		X				
Texas blind salamander	*Eurycea rathbuni*	G1 S1 LE	X					X
Terrestrial Fauna								
Swamp rabbit	*Sylvilagus aquaticus*	G5 S5			X			

Common Name	Scientific Name	Heritage Rank	Springs & Seeps	Rivers & Streams	Riparian Forests & Floodplains	Mesic Canyon Slopes	Upland Communities	Blanco Natural Heritage Sites
Cliff chirping frog	*Eleutherodactylus marnockii*	G5 S5			X	X		
Eastern barking frog	*Eleutherodactylus augusti latrans*	G4 T4			X	X		
Texas horned lizard	*Phrynosoma cornutum*	G4G5 S4					X	
Western slimy salamander (confirmed in Comal County)	*Plethodon albagula*[3]	G5 S4			X	X		
Plants								
Giant helleborne	*Epipactis gigantea*	G3G4 S3	X	X				X
Glass Mountain coral-root	*Hexalectris nitida*	G3 S3			X	X		
Granite spiderwort	*Tradescantia pedicellata*	G2Q S2			X	X	X	
Leafy brickell-bush	*Brickellia dentata*	G3 S3		X				
Canyon mock-orange	*Philadelphus ernestii*	G2 S2			X	X		X
Purple-spike coralroot	*Hexalectris warnockii*	G2 S2			X	X	X	
Scarlet virgin's-bower	*Clematis texensis*	G4			X	X	X	
Sycamore-leaved snowbell	*Styrax platanifolius*	G3 S3			X	X		
Texas amorpha	*Amorpha roemeriana*	G3 S3				X?		
Texas barberry	*Mahonia swaseyi*	G3 S3					X	
Texas fescue	*Festuca versuta*	G5 S3					X	
Tobusch fishhook cactus	*Sclerocactus brevihamatus* ssp. *Tobuschii*	G5 S3					X	
Narrow-leaf brickell-bush	*Brickellia eupatorioides* var. *gracillima*	G5 T3		X				
Heller's false-gromwell	*Onosmodium helleri*	G3 S3			X			

[1]In Blanco River and San Marcos River
[2]Confirmed in Little Blanco, maybe Cypress Creek and other runs and springs
[3]There is not agreement among taxonomists as to whether *Plethodon albagula* is a conspecific or a true species. NatureServe (2004) does not recognize *P. albagula* as a species; however, Texas Natural Heritage does. We have followed the latter convention to retain consistency with local partners.

Mesic Canyons

Upslope from riparian forests lie moderately dry, or mesic, canyons. Canyon vegetation transitions gradually from the riparian forests, and many tree and shrub species are similar; however, moisture-loving species like sycamore, ash, sugarberry, baldcypress, cottonwood, and willow are absent here. Mesic canyons on the site are home to hardwood-dominated forests of Texas ash (*Fraxinus texensis*) and cedar elm. These canyons are used by numerous fauna, notable among them neotropical migratory birds such as rufous-crowned sparrow (*Aimophila ruficeps*) and golden-cheeked warbler (Table 1). Because of their relative inaccessibility, these canyons have been less altered than perhaps other conservation elements. However, high deer numbers and the resulting browse pressure has altered vegetation structure and, in some locales, species composition, particularly in the understory layer.

Upland Grasslands, Savannas and Shrublands

Edwards limestone uplands are found on the Upper Glen Rose formation limestone that characterizes the ecoregion. These uplands are covered by a mosaic of grasslands, savannas, and shrublands, with a few scattered, closed-canopy woodlands. These communities can be considered different states of a non-equilibrium system (Wiens 1984, Westoby et al. 1989, Jackson and Bartolome 2002, Briske et al. 2003) rather than distinct vegetation communities. The distribution and relative abundance of these states or stages within the system are influenced largely by disturbance history (e.g., fire) and weather-related factors (e.g., drought). In general, areas subjected to more frequent natural disturbance (other than heavy wildlife or livestock herbivory) tend to be have more herbaceous and less woody cover than areas that have not been disturbed. It should also be noted that severe grazing or browsing can alter plant species composition and vegetation structure, thus influencing the effect of natural disturbance such as fire. Such complex interactions contribute to the large variability within this system.

Within these communities, the graminoid assemblage contains non-native King Ranch bluestem, which was seeded for pastures in the past. Dominant grassland species in the absence of KR bluestem are little bluestem and Indiangrass. Savannas are also characterized by plateau live oak and Ashe juniper, grading into live oak/juniper woodlands on rocky slopes and areas with a history of fire suppression. Shrublands are characterized by shin oak (*Q. sinuata* var. *breviloba*), Texas persimmon, mountain laurel, and agarita (*Berberis trifoliata*).

Blanco Natural Heritage Sites[*]

This element includes the amenities and ambience of favorite local sites like Blue Hole, Jacob's Well, Little Arkansas (all springs), Halifax Cave, and Devil's Backbone (a scenic ridge). This element overlaps others in some cases (e.g., springs and seeps), and as such will be subsumed within those elements as appropriate for the viability and threats assessments (section IV). Because framing natural heritage sites solely in a biological context did not fully describe their importance to stakeholders, these special places were separated to help highlight their cultural, recreational, economic and aesthetic benefits. While the Conservancy's focus will be to ensure the ecological viability of these special places, doing so will also protect their socio-economic and aesthetic value.

*Rural and Village Ambience**

This conservation element, while including natural resources as a component, emphasizes a cultural conservation priority. Its explicit listing seeks to capture the desire of local stakeholders to retain the rural feel of the area and small-town quality of life that help make this area a desirable place to live. The Conservancy may not work directly to preserve the ambience of the Blanco River area, but by helping to maintain the ecological integrity of the biological elements, it is our belief that we will contribute toward preservation of the area's ambience.

[*] *Not solely biological elements, but reflecting community priorities*

Sustainable Hill Country Economy*

Like the previous two conservation elements, a sustainable economy encompasses biological features or values while focusing attention on the human need for a robust local economy. This element includes, but is not limited to, agriculture, recreation-based business, nature tourism, and hunting. It also extends to businesses such as retail, real estate, development, service industry and other enterprises that, while perhaps not directly dependent on natural resources, have the potential to degrade them. Stakeholders felt strongly that the case should be made for fostering an economy that was sustainable both from a financial and an ecological perspective—not only because of personal values, but because so many local enterprises depend on the continued viability of natural resources.

IV. Assessing Conservation Challenges

Viability and Threats

Identifying elements of conservation concern is a preliminary step in planning for conservation action. The next step is to examine the *viability* of conservation elements and the *biodiversity health* of the area as a whole, as well as the effect of any *threats* acting at the site. *Viability* is the likelihood that an element will persist long-term. *Biodiversity health* is the aggregation of the viability of all conservation elements, the likelihood that the conservation area will remain an ecologically functional landscape over time (The Nature Conservancy 2000a). *Threats* are conditions or activities that negatively affect conservation elements, either directly or indirectly. Threats, viability and biodiversity health are examined within a ten-year time frame, using current conditions and trends. Assessments should be completed during the initial planning process and every three to five years thereafter, each time projecting ten years ahead.

Viability Assessment

To assess biodiversity health, the viability of each element is evaluated, ranked, and the ranks aggregated to provide a biodiversity health rank for the conservation area (for methodology and rank definitions, see Appendix C). Briefly, the assessment of viability is based on three criteria: *size, condition*, and *landscape context*. *Size* is a measure of the area or abundance of an element's occurrence. *Condition* is an integrated measure of the composition, structure, and biotic interactions that characterize its occurrence. *Landscape context* is an integrated measure of the dominant environmental regimes and processes that establish and maintain the element, and habitat connectivity across the landscape. When the planning team evaluates current viability, they also determine measurable criteria for each viability rank (Appendix C) and set a desired future viability rank (Appendix C), which is based on desired and achievable changes in the three criteria. Desired viability ranks are used to form the overall viability goal for each conservation element (section V). For simplicity, viability ranks are given qualitative categories; however, each category has a specific ecological meaning:

- **Very Good** = optimal viability: the factor[4] is functioning at an ecologically sustainable level, and requires little or no human intervention to ensure long-term (100 years) viability.
- **Good** = minimum acceptable viability: the factor is functioning within its range of natural variation; it may require some human intervention to ensure long-term (100 years) viability.
- **Fair** = unacceptable viability: the factor lies outside of its range of natural variation and requires human intervention. If unchecked, the element will be vulnerable to serious degradation.
- **Poor** = extreme danger: factor is well outside the natural range of variation, and allowing the element to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.

Ultimately, the Conservancy's mission is to have all elements receive a good or very good rank for each aspect of viability, and overall (Table 2). Currently, the biodiversity health rank for Blanco River is "good, " or acceptably viable (Table 2). Three conservation elements received

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[4] factor: the particular aspect of size, condition, or landscape context that, if altered, diminishes viability of a conservation element.

"fair" overall viability ranks, meaning they are outside the range of natural variation, but recoverable. ***All fair-ranked elements merit immediate conservation attention***. Where individual viability factors (size, condition, landscape context) for an element are fair or poor, restoration or enhancement measures may also be warranted. Conservation goals and strategies (section V) will focus, in part on actions that will raise viability ranks to "good" (The Nature Conservancy 2000a). Appendix C lays out the criteria and benchmarks used to evaluate viability for each element; those interested in the point-by-point biological justification for the rankings in Table 2 are encouraged to read this section in detail.

Table 2. Current 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
Natural Heritage Sites*	NA	NA	Good	Good
Rural and Village Ambience*	NA	Very Good	NA	Very Good
Sustainable Economy*	NA	Fair	NA	Fair
Overall site viability (biodiversity health)				***Good***

*not solely biologically-based elements

Threat Assessment

A threat assessment is the identification, evaluation, and ranking of threats that affect conservation elements (for further methodology, see Appendix D). Threats are composed of *stresses* and *sources*. A *stress* is a process or event with direct negative consequences for the conservation element (e.g., chemical pollutants in a stream). The *source* of a stress is the action or entity that produces that stress (e.g., industrial discharge high in contaminants). The planning team must identify and rank stresses and sources for each conservation element. A conservation element's stress and source ranks are analyzed together to provide an overall threat rank for each element and source (Table 3). Stress and source ranks help elucidate the factors influencing each element and subsequently, the necessary conservation strategies. One important part of the threat assessment is the determination of critical threats. Critical threats are highly ranked threats that jeopardize multiple conservation elements or threats that affect at least one element and are ranked "very high." ***Critical threats necessitate development of immediate conservation strategies***. Several critical threats acting at a conservation area usually indicate that the site is highly or very highly threatened. The threats analysis serves as a prioritization guideline; it does not limit conservation action to critical threats and highly imperiled conservation elements.

Across the conservation area, there are three critical threats: home development, unsustainable groundwater and surface water withdrawal, and excessive wildlife herbivory. There were two threats that received only moderate rankings but may deserve further evaluation: ecologically incompatible vegetation management, and commercial/industrial development. The planning team had less knowledge about the current or potential effects of these activities and felt threat ranks might change given additional data.

Table 3. Summary threats assessment

Threats Across Systems	Rivers and Streams	Springs and Seeps	Riparian Forests and Floodplains	Mesic Canyon Slopes	Upland Communities	Blanco River Heritage Sites	Rural and Village Ambience	Sustainable Hill Country Economy	Overall Threat Rank
Home development*	-	-	High	Med.	High	Low	High	Med.	**High**
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**
Unsustainable recreational pressure	Low	Low	-	-	-	Low	High	Low	**Medium**
Invasive/alien species	Low	-	Med.	Med.	Med.	-	-	-	**Medium**
Ecologically incompatible waste management	Med.	Low	-	-	-	-	-	-	**Low**
Ecologically incompatible growth policies	-	-	-	-	-	-	-	Low	**Low**
Threat Status for Targets and Site	High	Med.	High	High	High	Low	High	Low	**High**

*Critical threats

**The team had low confidence in their level of knowledge and felt these sources might currently be more severe than shown here, and/or that these sources had the potential to quickly become critical threats. In either case, the threats bear close tracking.

HOME DEVELOPMENT

The Hill Country is a prime weekend and retirement location in Texas, and increasing numbers of commuters are building homes here as well. As populations in Blanco and Hays County explode over the next ten to fifty years (United States Census Bureau 2002), so will home building. New home construction is well underway and expected to increase exponentially, especially in the eastern portion of the conservation area. Typical construction of single family homes results in varying amounts of habitat degradation, fragmentation, and loss. The siting of houses may exacerbate the problem: for instance, preferred homesites tend to be near water or along ridge tops and other vistas, both of which are often more ecologically delicate areas. While single homes can impact the conservation elements, subdivisions are probably a greater concern. Subdivision development alters habitats on a greater scale, and contributes to problems not necessarily posed by one or a few homes.

In addition to the houses themselves come related threats, or sources, that stress natural systems. The most salient of these are 1) an increase in impervious cover, 2) development of roads and infrastructure, 3) a shift from natural vegetation to lawns and other suburban landscape designs (mechanical clearing, invasive/non-native species), 4) excessive water use, and 5) the introduction of chemicals and other contaminants into natural systems (herbicides, pesticides, fertilizers). These threats are not exclusive to home development. Thus, for clarity, they were classified as threats in their own right and are discussed below. Some of these problems can be alleviated by careful planning before construction and by deed restrictions or voluntary compliance with best management practices such as conservative use of chemicals on lawns and gardens. Other threats may be mitigated through ecologically sensitive design and construction of subdivisions and homes.

UNSUSTAINABLE GROUNDWATER OR SURFACE WATER WITHDRAWAL

There is not as yet an adequate understanding of the hydrologic function and capacity within the Blanco River basin; as such, a definitive figure or scenario for sustainable water use in this area is not available. The planning team based the ranking of this threat on information from the Texas Water Development Board (2002), the Edwards Aquifer Authority (2003), and other limited data on local waters and recharge features (Wimberley Valley Watershed Association 2003). This information suggests little disparity between available water and projected populations over the next 20 years or more, from a pure municipal supply standpoint (Texas Water Development Board 2002). However, some feel that the hydrologic regime required to sustain aquatic life will not persist in the face of currently projected use. Likewise, the excellent water quality now enjoyed by area residents may decline noticeably without changes in land use, water use, and wastewater treatment practices. While it is not the aim of the Conservancy or polled stakeholders to stop population growth, there are steps that can be taken to protect water quality and use water more conservatively. Many of these measures can be voluntarily adopted by individuals. Other practices can be advantageous for municipalities (e.g., reducing line loss, offering incentives for low-water use construction or rainwater harvesting systems).

EXCESSIVE WILDLIFE HERBIVORY

Common exotic ungulates[5] here include blackbuck antelope (*Antilope cervicapra*), axis deer (*Cervus axis*), and feral hogs (*Sus scrofa*). Hogs affect systems more through rooting, wallowing and other physical disturbance than plant consumption, although physical damage can be significant for certain plant species or sensitive areas (e.g., springs). Exotic deer and

[5] cloven-toed mammals.

antelope numbers in Blanco and Hays counties are lower than in many parts of the Hill Country; therefore, white-tailed deer are the primary browsing species across the site. Deer, as browsers, mainly affect shrubs and trees, though they can put considerable seasonal pressure on forbs as well. White-tailed deer have contributed to altered species composition and vegetation structure in many locales. Texas Parks and Wildlife Department deer surveys indicate deer density in Blanco and Hays County are about 170 and 160 deer per 1,000 acres, respectively (or 1.7 and 1.6 deer per 10 acres). Recommended density is less than half those figures: about 66 deer per 1,000 acres (1 deer per 15 acres) (Armstrong and Young 2002). This recommendation takes exotic ungulate numbers into account to a small degree and discounts domestic livestock. The overabundance of deer in these counties are thought to be a result of additional human-provided food sources (feed and landscaping), a reduction in the number of acres subject to hunting (due to development), and a persistent aversion among hunters and landowners to harvest sufficient numbers of does.

Medium Threats

INCOMPATIBLE VEGETATION MANAGEMENT

Some potentially harmful land management techniques were singled out in the threat assessment (e.g., incompatible grazing, fire suppression). The remaining activities of concern were grouped within this more general category. These activities include creation of extensive trail and road networks in sensitive habitats (e.g., riparian forests), large-scale removal of brush and juniper from naturally woody areas, and high-density installations of wildlife feeders. All these activities may fragment habitat, change plant species composition and structure, and directly or indirectly affect animal distribution and numbers.

COMMERCIAL AND INDUSTRIAL DEVELOPMENT

Currently, most commercial and industrial development in the area is localized around Wimberley; however, the pace and geographic scope are expected to increase dramatically over the next ten years. The biggest ecological concerns regarding such development relate to design and scale of development. Siting of construction away from environmentally sensitive areas, and building structures and parking areas that minimize habitat loss, impervious cover, and hydrologic alteration will mitigate many problems. Certain industry may not be appropriate for some parts of the river basin: for instance, enterprises that require discharge into river bodies could have deleterious effects on aquatic species and water quality.

The other aspect of this development relates to socio-cultural conservation concerns: rural and village ambience, and a sustainable local economy. Commercial and industrial growth that occurs with little regard for the character and culture of this area has the potential to significantly impact the quality of life valued by local residents.

UNSUSTAINABLE GRAZING PRACTICES

Livestock production in the conservation area includes cattle, sheep and goat ranching, with perhaps more small-lot goat production in the eastern portion and more cattle ranching to the west. Thus, the term “grazing,” as used here, includes browsing by goats and sheep. 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 deer. Because deer and domestic livestock are managed differently, the planning team excluded wildlife herbivory from the category of grazing practices (see above).

Grazing practices are highly variable across the area. Consequently, some ranges are in excellent condition, with high biodiversity. Others have been managed mainly for grass production, and are productive but not very biodiverse. Some properties are overstocked and, as a result, neither productive nor biodiverse. Still other lands are under conservative management now but continue to suffer from historic heavy use or overgrazing; recovery of some of these areas may prove difficult, particularly if there has been significant loss of topsoil. Matching the duration and intensity of grazing with plant physiology and climatic conditions is key to maintaining and enhancing biodiversity in this landscape.

INCOMPATIBLE FIRE MANAGEMENT

Historically, lightning-strike fires were a natural disturbance event in the area, occurring in a highly variable pattern depending on topography, fuel loads, and chance. Riparian forests generally would be too wet to carry a significant fire, and mesic canyons too steep. In the absence of suppression, floodplains and uplands, with their flat terrain and high natural fuel loads, probably have an infrequent natural fire regime (7-9 year fire return interval). Periodic fires may have helped maintain grassland and savanna conditions in these areas by reducing woody canopy cover. However, with the advent of ranching and residence, dating to the 1800s, fire suppression was increasingly practiced in this and all parts of the Hill Country. Suppression, along with decreasing fuel loads that resulted from increased herbivory (by animals domestic and wild) and other land use changes, have affected the vegetation structure and species composition in many upland plant communities. Occasional disturbance or a heterogeneous landscape, both of which fire can produce, may be important for maintenance of some species and vegetation communities. Reintroduction of fire to select areas may prove an effective management tool, particularly for black-capped vireo management. This will of course, have to occur only in areas and in ways that do not pose a risk to life or private property, which will limit the use of fire to less-developed sites in the river basin.

DEVELOPMENT OF ROADS AND INFRASTRUCTURE

Development of roads and related infrastructure is arguably similar to an increase in impervious cover, insofar as it alters hydrology at multiple scales and contributes to run-off contaminants. However, it has a greater impact on riparian forests and floodplains, as these are generally favored locations for road construction. Also, the building of roads is often a precursor to one of the critical threats, home development.

MECHANICAL CLEARING OF FOREST UNDERSTORY

This threat applies primarily to riparian forests, where homeowners often strip out midstory shrubs, trees and vines to create a European park-like setting. At best this leaves grasses, low-growing forbs, and overstory trees; in more extreme cases, forbs are also removed. Not only does this reduce available food and shelter for native birds and mammals, it also alters the hydrologic regime of streams and rivers.

INCREASED IMPERVIOUS COVER

Impervious cover includes hard surfaces such as asphalt and concrete, which are used for roads, parking lots, driveways, and sidewalks, all the trappings of standard development. These surfaces alter the velocity, amount, and entry location of rainwater returning to the ground or to streams and rivers. Additionally, this water often picks up oil, grease, and other residue on its way. Impervious cover has already been associated with home development and road construction; it also is a part of commercial development (e.g., big box retail centers: large buildings and large parking lots).

UNSUSTAINABLE FERTILIZER, PESTICIDE, HERBICIDE USE

This threat is of most concern in relation to aquatic systems. Fertilizers can increase nitrogen levels in water and can contribute to unnatural growth of aquatic plants, which in turn changes water chemistry (especially dissolved oxygen levels) and may harm fauna. Pesticides and herbicides may directly kill aquatic fauna, or may place more indirect stresses on biota by changing water chemistry or even body chemistry within individuals. While many people associate the use of chemicals with row-crop agriculture, the main source of fertilizer and chemical runoff here is probably 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; furthermore, there is not much row crop agriculture near waterways in the area.

DAMS AND PONDS

Most dams along the Blanco and its tributaries are low-water or sill dams, which may have little ecological impact. On the other hand, localized changes in hydrology and sediment are obvious near dams; these and related changes may have as-yet unrecognized impacts on native fauna (Bonner, Pers. Comm.). Most dams in the area are small structures constructed by landowners to provide residential or recreational water. These low dams rob downstream reaches of needed sediment and may contribute to excessive sedimentation upstream. Excessive sedimentation may destroy fish and microinvertebrate habitat, and may kill fauna by smothering (Arsufi, Pers. Comm.). Also, 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, domestic duck excrement, and the like in impoundments. The ponds identified in this category are small ornamental ponds into which river water may diverted by a landowner without a permit. Individually, these small ponds have little impact on rivers and streams, but cumulative effects have not been examined.

INVASIVE AND EXOTIC SPECIES

There are only a few problematic exotic grass species in the area, but those few have proven nearly impossible to eradicate to date. The most serious problem is King Ranch bluestem, which can occupy most habitats, from grasslands on shallow soils of ridgetops to deeper soils of floodplains and creek terraces. A second problematic species is bermudagrass (*Cynodon dactylon*), which occurs mostly where planted in pastures on deep soils. King Ranch bluestem and bermudagrass are so common that control efforts are likely to be outside of the Conservancy's capacity in the immediate future. Kleberg bluestem (*Dichanthium annulatum*) and silky bluestem (*Dichanthium sericeum*) may also be present. These are abundant on the

South Texas Plains and have been documented with increasing regularity on the Edwards Plateau. Exotic shrub and tree species of concern include giant reed (*Arundo donax*), castor bean (*Ricinus communis*), chinaberry (*Melia azedarach*), and chinese tallow (*Sapium sebiferum*). Perhaps the most controversial invasive plant here is a native: Ashe juniper. This tree has expanded its dominance across the site, due perhaps to a combination of fire suppression, historic heavy grazing, and a period of wet years, which together created conditions that favored woody plant establishment over herbaceous species. The controversy centers largely around how much juniper is too much, since this species is necessary for endangered golden-cheeked warblers, and is used by other wildlife as well. Recently, Ashe juniper (cedar) has also been blamed for unnecessarily depleting groundwater stores at a watershed scale (Texas Water Development Board 2002); this claim has not been substantiated to the satisfaction of all biologists (Walker et al. 1998, Wilcox 2002, Wilcox et al. 2003).

INCOMPATIBLE RECREATIONAL USE

This threat covers recreational activity along rivers, streams, trails, and near springs that leads to habitat degradation. Most popular recreational spots are fairly closely managed to prevent major problems. As the number of recreationists increases, pressure may also increase.

Low Threats

1. **Incompatible Wastewater Treatment:** There are two small treatment plants in the area, near the Village of Wimberley and near Blanco. When flow in the river is maintained, discharge from this plant is not especially problematic. Residential septic systems may impact water quality, particularly as they age. Alternative technologies for waste treatment exist, and mitigation of this threat should involve active outreach to homeowners and septic professionals.

2. **Unsustainable Growth Policies:** zoning, planning and the like that do not protect the vitality of natural resources upon which many businesses are based, and/or that do not protect the interests of small local businesses.

V. Conservation Action: Goals and Strategies

Introduction

The conservation *goals* are the end toward which the Conservancy and its partners will be working, the broad accomplishments that the planning team felt defined a successful conservation project here. Underneath each goal are nested related *desired future conditions*. Desired future conditions were developed from our assessment of viability and threats for each conservation element, and generally reflect the conditions identified as necessary to sustain conservation elements over the long term (Table 3, Appendix C). These desired future conditions function as our benchmarks along the path to our goals. This is a large landscape, and the conservation needs are diverse and complex; therefore attainment of the many of the desired future conditions may be outside the scope of the Conservancy's capacity at this time. Because this document outlines what we hope will be an evolving project, including new partnerships, all desired future conditions are identified. By doing this, we will have at the ready the full array of conservation priorities, in the event that new opportunities for collaborative conservation can be found. Additionally, many other groups are already working for conservation here, and one or more of them may be better suited to address certain desired future conditions than is the Conservancy. To be forthright about what the Conservancy can commit to now, we have separately listed our conservation *initiatives* and *strategies*, the steps that we will take toward the four conservation goals.

Goals and Desired Future Conditions

Based on the viability and threats assessments, the top priority conservation needs center around enhancing viability of the conservation elements that are outside their natural range of variability ("fair") and/or that are at high threat for degradation (Table 4). Both tasks can be accomplished primarily by mitigating the three critical threats. Because some lower-ranked threats are closely related to critical threats and can be addressed with little extra effort, goals and strategies have been expanded when appropriate to include related threats. For example, several strategies involve increasing the ability of landowners to employ sustainable land management practices: this is an adjunct to managing wildlife herbivory, and helps landowners who so desire to keep their ranches out of development (by improving profitability).

Table 4. Summary of top conservation needs

Conservation Element	Viability Rank	Threat Rank	Critical Threats		
			Water Extraction, etc.	Wildlife Herbivory	Home Development*
Rivers and Streams	Good	High	X		
Springs and Seeps	Good	Medium	X		
Riparian Forests & Floodplains	Fair	High	X	X	X
Mesic Slopes	Good	High		X	X
Upland Communities	Fair	High		X	X
Natural Heritage Sites	Good	Low	X		X
Rural and Village Ambience	Very Good	High	X		X
Sustainable Economy	Fair	Low	X		X

*Home development as defined here includes associated pressures such as roads and infrastructure, etc. (see Threats Assessment for details and rationale).

1. Sustainable Water Use

<u>Goal 1</u>: Ecologically sustainable use of groundwater and surface water in the Blanco River basin is the norm.

<u>Desired Future Conditions</u>

a) As of 2020, species composition, hydrology, and chemistry of rivers, streams, and major area springs remains within the natural range of variability[3].

b) From 2004-2015, there is no extirpation of native fish species from the Blanco River or its tributaries.

c) From 2010-2020, water use in the area remains within levels defined as ecologically sustainable by the relevant Blanco River valley water availability models (to be created).

2. Sustainable Land Management

<u>Goal 2</u>: Private lands management is conducted in such a way as to allow maintenance or recovery of diverse native plant and animal communities in riparian forests, floodplains, canyons, and uplands.

<u>Desired Future Conditions</u>

a) By 2015, the average width of riparian forests exceeds 20 meters on each side of streams and rivers, and total area of functional riparian areas along the mainstem is at least 560 ha[6] and along tributaries at least 2,000 ha In addition, patch size, patch frequency, and vertical and horizontal vegetation structure is within the natural range of variation[4] by 2020.

b) By 2015, there are at least 16,188 ha[7] (40,000 ac) of ecologically viable upland grasslands, savannas, and shrublands, and at least 8,903 ha[5] (22,000 ac) of viable mesic canyon forests in the conservation area, all with sustainable vegetation structure and species composition, and in a mosaic of seral stages that support characteristic migratory and resident fauna.

c) By 2019, wild ungulate numbers are such that vegetation structure and species composition in riparian forests and floodplains, canyon forests, and upland communities is within the natural range of variation[8], supporting native resident and migratory wildlife.

3. Environmentally Sensitive Development

<u>Goal 3</u>: Ecologically sustainable building is the norm in the conservation area, especially practices that minimize habitat loss, habitat fragmentation, impervious cover, and unsustainable water use.

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[6] width of 20 m. per side, along 140 km of river
[7] As determined from the viability assessment, Appendix C.
[8] See Appendix C, Viability Benchmarks, for the parameters that define "natural variation" for each system.

Desired Future Condition

a) Between 2008 and 2012, at least 2% of residential and commercial development initiated is "eco-friendly" (i.e., utilizing methods that minimize land fragmentation and maximize water use efficiency and recharge to the aquifer). At least 30% of development initiated after 2012 has eco-friendly components.

4. Natural and Cultural Heritage

Goal 4: The Blanco River conservation area continues to be known as a place with a rich natural and cultural heritage and a strong conservation ethic, which the Conservancy helps promote.

Desired Future Conditions

a) By 2007, The Nature Conservancy is recognized locally as a constructive partner in helping to preserve the natural resources that make the Blanco River area special.

b) By 2008, the Conservancy's Blanco River project staff are considered and used as a valuable resource for information on and sustainable management of rivers, streams, springs, and riparian habitats.

Philosophy Behind Strategy Selection

The stakeholder planning teams identified numerous effective strategies which relate to the above goals, more than any one group could accomplish.[9] From these brainstormed ideas, Conservancy staff selected a short list of actions to work towards or initiate in the next five years. These strategies constitute the workplan that frames the Conservancy's day-to-day work here, including partnership building, fundraising, and biological and programmatic monitoring. This conservation area plan will undergo periodic review to assess progress made. During these reviews, the planning team will assign additional strategies as needed. Conservancy staff responsible for this project used a set of guiding principles and criteria in selecting strategies. These were that strategies must:

- **be highly effective in abating critical threats or enhancing viability;**
- **be acceptable to a strong majority of stakeholders;**
- **be collaborative; and create win-win solutions to ecological challenges;**
- **fill unmet or under-served needs;**
- **leverage the Conservancy's input through others; and**
- **fall within the Conservancy's projected capacity in the next five years.**

[9] For a the full list of proposed conservation strategies contact the Blanco River Project Office: 512-847-0790.

Conservation Initiatives and Strategies

The delineation of conservation goals and desired future conditions represents the conservation ideal. From this optimal endpoint, the planning team carefully considered what was feasible for the Conservancy and partners to accomplish under current or projected conditions. This analysis formed the basis for our short-term strategic actions (Appendix E). While these actions may not in every case lead directly to goal achievement, the team judged them to be the most efficacious actions currently possible. The strategies and strategic actions selected can be grouped into four topical areas corresponding to the four conservation goals. These can be thought of as the major project initiatives and are as follows: **1) sustainable water use, 2) sustainable land management, 3) environmentally sensitive development, and information and education**. Short-term strategies under these initiatives are below; more specific short-term actions are in Appendix E.

Initiative 1: Sustainable Water Use

1. **Watershed Function**: Collaborate with other stakeholders to find funding for Groundwater Conservation Districts and others to research the limits and function of the watershed (especially recharge function, flow paths, and a river basin groundwater availability model).

2. **Water Conservation**: Collect and synthesize information and case studies (especially costs/savings, and construction specifications) on rainwater collection and other water conservation practices that can be used by individuals. Take this information to homeowners and builders, to build support and create a market. Biggest initial efforts should be information on retrofitting homes with collection systems.

3. **Aquatic Resource Management**: Collaborate on a landowner publication for riparian zone management practices for Edwards Plateau, to serve urban, suburban, and rural landowners.

Initiative 2: Sustainable Land Management

1. **Ecologically Sustainable Deer Management**: In consultation with Texas Parks and Wildlife Department, develop a message about the importance of not feeding deer and of managed hunting in maintaining a healthy herd and habitat and reducing property damage. Proactively engage landowners, homeowners, developers with this message.

2. **Sustainable Vegetation Management**: a) Establish an active, hands-on outreach program that engages landowners one-on-one with people who can help them implement innovative management and restoration practices. b) By 2008, establish at least one land management demonstration project with a cooperating private landowner to use for outreach.

3. **Sustainable Fire Management**: Through technical and hands-on assistance, and/or partnerships, make use of prescribed fire more common in the area, with a goal of a 7-9 year fire return interval on most upland sites.

Initiative 3: Environmentally Sensitive Development

1. **Sustainable Building**: Obtain funding and contract for a modeling study to examine the costs and benefits of various sustainable (and low-water use) residential development scenarios. Use the results to enhance understanding and acceptance of low-impact development principles among developers, landowners and the public.

Initiative 4: Natural and Cultural Heritage

1. **Information Clearinghouse**: Compile currently available conservation-related information from all relevant sources and make accessible to public at the Blanco River project office in Blanco and via the project web site. As appropriate and needed, create new material that helps promote and preserve the area's land ethic.

Conclusion and Next Steps

The conservation area plan is not a static document. Members of the planning team will reassess the plan annually and the conservation vision, goals, and priority strategies after about five years to ensure they are still appropriate and feasible (The Nature Conservancy 2000a). Also, in about five years, a team will reassess project capacity and the viability of conservation elements. When the plan is revised, we will incorporate additional long-term strategies. Long-term strategies will be based on accomplishments made during the first years of the project and upon the changing needs and conditions across the conservation area. These steps will help ensure that the Conservancy uses its resources most effectively, and that our actions are in concert with our goals in the ecoregion and the organization, as well as with the needs of partners and local residents.

Using this planning process, The Nature Conservancy of Texas and the planning team members have made great strides in understanding the natural systems and the biological, social, and economic needs in the conservation area. However, this is just the beginning of the conservation work needed here. Working with partners on multiple fronts, the Conservancy will strive to be a contributing member of the local community and to help sustain the ecological integrity of the Blanco River in perpetuity.

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Glossary

biodiversity: the variety of life forms and ecological systems, the genetic variability they contain and the ecological processes that maintain them.

compatible: (as in *ecologically compatible*): having a benign influence on wildlife or habitat, or on conservation efforts.

community, ecological community,: an interdependent assemblage of plant and animal species.

conservation element: A species, guild, community or assemblage of communities that has been selected as a priority for conservation action.

conservation area: specific area that the Conservancy is interested in maintaining. Conservation areas may be a few acres large, up to thousands of acres. These areas should support or have the potential to support species or communities of conservation interest (alternative term: *site*).

conservation status: a federal or state legal designation usually indicating some degree of threat or imperilment.

ecoregion: a relatively large area of land and water characterized by similar climate, vegetation and geology, and other ecological and environmental patterns.

element: see *conservation element*.

endangered: legal term, meaning at immediate risk of extinction, and probably unable to survive without direct human intervention. Indicates the species has been listed on federal or state endangered species list.

endemic: found nowhere else, unique to a place.

functional landscape: a large area that maintains many species and their supporting ecological processes.

hectare: metric land unit, equal to 2.47 acres.

mesic: pertaining to conditions of medium moisture supply

meter: fundamental measure of length in the metric system; 1 meter equals 3.28 feet

riparian: streamside or riverside habitat, often forested or wooded.

sustainable: allowing the continued use and viability of natural resources.

system: a collection of interdependent living and non-living elements and the natural processes that maintain them.

threatened: legal term; a species that is 1) abundant in parts of its range but declining in overall numbers and at risk of extinction, or 2) present in low numbers across its range and at risk of extinction. Indicates the species has been listed on federal or state threatened species list.

Appendices

Appendix A: Maps

Map 1: Blanco River Conservation Area: Location

Map 2: Blanco River Conservation Area: Project Boundary

Appendix B: Heritage Ranking System and Federal/State Status Symbols

Deciphering Heritage Ranks

The conservation rank of an element within a given area is designated by a G (Global), N (National) or S (State) as appropriate and followed by a rank number, 1 to 5. Species of conservation concern usually are those with global (G-ranks) ranks of 1-3; however, some species with higher global ranks may be of conservation concern in a particular area due to national, state, or local conditions. The heritage rank numbers have the following meaning:

1 = critically imperiled, less than 6 known occurrences of the species
2 = imperiled, 6-20 known occurrences
3 = vulnerable to extirpation or extinction, 21-100 known occurrences; species very rare and local throughout its range or found locally (even abundantly) in a restricted range
4 = apparently secure, though may be quite rare in parts of its range; over 100 known occurrences
5 = demonstrably widespread, abundant, and secure, though may be quite rare in parts of its range

Rank numbers may be combined when there is uncertainty over the status (e.g., an element may be given an G-rank of G2G3, indicating global status is somewhere between imperiled and vulnerable).

Other Rank Symbols

Q = Questionable taxonomy that may reduce conservation priority
? = Inexact numeric rank. May also be seen as a combination of numbers (G2G3).
G? = unasssessed global rank
R = reported, not yet ranked
X = presumed extirpated
H = historic

Rank Criteria, Relationship to Other Status Designations

Ranking is a qualitative process, with multiple factors going into rank decisions. For species elements, the following factors are applied: 1) total number and condition of occurrences (sighting/records) of that species, 2) population size, 3) range extent and area of occupancy, 4) short and long-term trends in the first three factors, 5) threats to the element, and 6) fragility of the element.

Heritage Ranks are often, but not always, comparable to statuses assigned by government agencies. For instance, the Heritage subnational ranking for an endangered species may not be S1. For this reason, Federal and State statuses are also given for species of conservation concern when possible.

Federal and State Listing

The system used to indicate the status of a species is as follows:

C = candidate species for federal imperiled status
PT = proposed for listing as federally threatened
PE = proposed for listing as federally endangered
LT = federally threatened
LE = federally endangered
ST = state threatened
SE = state endangered

For more information or to find heritage ranks for species and ecological communities, visit the NatureServe website: http://www.natureserve.org/

Appendix C: Biodiversity Health and Viability Ranking

The viability of the selected conservation elements should be assigned a rank using a four-level scale. The **viability ranking system** uses simple categorical ranks, as follows:

- **Very Good** = optimal viability: the factoris functioning at an ecologically sustainable level, and requires little or no human intervention to ensure long-term (100 years) viability.
- **Good** = minimum acceptable viability: the factor is functioning within its range of natural variation; it may require some human intervention to ensure long-term (100 years) viability.
- **Fair** = unacceptable viability: the factor lies outside of its range of natural variation and requires human intervention. If unchecked, the element will be vulnerable to serious degradation.
- **Poor** = extreme danger: factor is well outside the natural range of variation, and allowing the element to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.

The assessment of viability is based on 3 viability criteria:

Size is a measure of the area or abundance of the conservation element's occurrence. For ecological systems and communities, size is simply a measure of the occurrence's geographic coverage. For species, size takes into account the area of occupancy and number of individuals. Minimum area needed to ensure survival or re-establishment of an element after natural disturbance is another aspect of size.

Condition is an integrated measure of the composition, structure, and biotic interactions that characterize the occurrence. This includes factors such as reproduction, age structure, biological composition (e.g., presence of native versus exotic species; presence of characteristic patch types for ecological systems), structure (e.g., canopy, understory, and groundcover in a forested community), and biotic interactions (e.g., levels of competition, predation, and disease).

Landscape context is an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element occurrence, and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbance. Connectivity includes such factors as species elements having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and system, and the ability of any element to respond to environmental change through dispersal, migration, or re-colonization.

Viability Ranks: Details and Parameters

Rivers and Streams

Size: Not a key ecological attribute

Condition key attributes: relative abundance of native aquatic vertebrates and invertebrates, also in relation to non-natives.

Landscape Context key ecological attributes: hydrologic regime (peak/low flows, flood events), connectivity/migration barriers.

Table C1. Rivers and streams-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	*NA*	*NA*
Condition	Good	Good
Landscape Context	Good (low confidence)	Good-Very Good

Table C1a. Viability benchmarks for rivers and streams

Rank	Condition		Landscape Context*
Very Good	*Data not available for this category. Monitoring of species composition over time may provide some idea of optimal assemblage structure.*		Flows at USGS gage in Wimberley are within the mean measured from 1934 to 2003 (on file at San Antonio field office). No impediments (dams) altering river hydrology
Good	Family/species	% of assemblage	Flows at USGS gage in Wimberley are comparable to natural or historic records, mean monthly flows < 20 cfs not to occur more than once every 4th year over a long-term record. (historic records from 1934 to 2003). Few impediments (dams) altering river hydrology.
	Family Centrarchidae	< 5.0	
	Pimephales vigilax	< 1.0	
	Notropis amabilis	> 15	
	Notropis volucellus	> 2.5	
	Campostoma anomalum	> 1.6	
	Etheostoma spectabile	> 2	
Fair	Family/species	% of assemblage	Flows at USGS gage in Wimberley: extended flows in driest and warmest months (July through September) below 10 cfs.
	Family Centrarchidae	5 - 30	
	Pimephales vigilax	1 - 10	
	Notropis amabilis	9 - 15	
	Notropis volucellus	0.1 - 2.5	
	Campostoma anomalum	0.1 - 1.6	

	Etheostoma spectabile	0.1 - 2	
Poor	Family/species	% of assemblage	Flows at USGS gage in Wimberley: no flow at Wimberly gage for a period long enough to lead to extirpation of some or many aquatic species (We don't know how long this period would be).
	Family Centrarchidae	> 30	
	Pimephales vigilax	> 10	
	Notropis amabilis	< 9	
	Notropis volucellus	0	
	Campostoma anomalum	0	
	Etheostoma spectabile	0	
Notes	*Based on data provided by Dr. Tim Bonner, TSU San Marcos* *Still need comparable benchmarks for invertebrates from Tom Arsufi. Should get these after year 2 data are collected.*		** Percent of historical flow regime intact is a gross estimation based on USGS flow records—getting field validation from TSU, Al Groeger et al.*

Springs and Seeps

<u>Size:</u> Not a key ecological attribute

<u>Condition key attributes</u>: native species presence (indicator species: *Eurycea petronilla*—sensitive to pollution and currently monitored by TPWD's Lee Ann Linam at Jacob's Well), and water chemistry (indicators: dissolved oxygen, conductivity, temperature and pH measured at Jacob's Well at a minimum and at other 3 major, representative springs if possible-- Fern Bank Spring, John Knoxx Blue Hole, and a fourth spring TBD [along the Little Blanco R. in Kendall County]).

<u>Landscape Context key attribute</u>: precipitation, hydrological flow, groundwater level. Indicators: surface discharge/spring outflow—critical threshold trigger is cessation of flow from Jacob's Well, Fern Bank Spring, John Knoxx Blue Hole, and a fourth spring TBD (along the Little Blanco R. in Kendall County). Ultimately, we desire monitoring at all four of these locations. For the interim, the only monitoring being done is at Jacob's Well. While not ideal, until funding is secured, we will extrapolate Jacob's Well data as best we can to other springs.

Table C2. Springs and seeps-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	*NA*	*NA*
Condition	Good	Good-Very Good
Landscape Context	Good	Good

Table C2a. Viability Benchmarks for Springs and Seeps

Rank	Condition	Landscape Context
Very Good	1. Catch rate for Eurycea petronilla <10 min/salamander (when cfs ≥ 5) 2. When cfs ≥ 5, DO ≥ 5, conductivity is 570-1000, pH = 7, temp > 16° and < 22° C	Greater than 10 cfs discharge at any one reading at Jacob's Well[1] spring through fall*
Good	1. Catch rate for Eurycea petronilla 10-20 min/salamander (when cfs ≥ 5) 2. When cfs ≥ 5, DO ≥ 5, conductivity is 570-1000, pH = 7, temp > 16° and < 22° C	5-10 cfs discharge at any one reading at Jacob's Well[1] spring through fall*
Fair	1. Catch rate for Eurycea petronilla > 20 min/salamander (when cfs ≥ 5) 2. When cfs ≥ 5, DO 3-4, conductivity is 1100-1200, pH = 4.5 or 8, temp < 16° or > 22° C	0-4 cfs discharge at any one reading at Jacob's Well[1] spring through fall*
Poor	1. No Eurycea petronilla caught (when cfs ≥ 5) 2. When cfs ≥ 5, DO < 3, conductivity is 1500, pH < 4.5 or > 8, temp < 16° or > 22° C	0 cfs discharge for more than 2 months at Jacob's Well[1] spring through fall* (We aren't sure this is poor, but we would suspect the element might be in danger at this point. Cessation of discharge may be more important for Cypress Creek than Jacob's Well—but no one is monitoring the creek currently)
Notes	*1. Catch rates are based on Lee Ann Linam's data* *2. Water chemistry parameters based on needs of native fishes, as per T Arsuffi and T Bonner* *Need to know how water pumping may affect chemistry—data being collected across two years at Jacob;s Well may help—though want the 3 additional sites ideally.*	[1]*Additional springs will be added to monitoring list when capacity allows: comparable springs that can be used to extrapolate conditions along the length of the river—Jacob's Well, John Knoxx Blue Hole, Fern Spring, and one TBD near/along the Little Blanco River* *These are rather gross numbers and based on preliminary monitoring that has been done at Jacob's Well, along with a few known discharge levels seen during past drought events. Moderate confidence in hypotheses.* *Need to get baseline data at the 4 springs and compare it with Jacob's Well data when/if we get monitoring equipment at other springs. Estimate of cost of monitoring each spring as is done now at Jacob's Well (for landscape context and condition parameters, excluding salamanders) is $40,000 annually.*

Riparian Forests and Floodplains

Size key ecological attributes/indicators: acreage, width of forest on either side of rivers/streams. (Floodplain size not considered key, since this is defined by topography and soil moisture—and not under threat of significant loss per se.)

Condition key attributes: horizontal and vertical structure (herbaceous, midstory, canopy).

Landscape Context key attributes: seasonal flooding--especially for sycamore recruitment—(indicator: we won't track unless a major river alteration occurs that changes hydrology), connectivity, patch distribution for forests (indicator: swamp rabbits are one of most limiting characteristic species for which we have good data, so we use their hypothesized max dispersal distance: 2-3 mi. Also, frequency of patches is important. Use Baccus and Wallace to get figures)

Table C3. Riparian forests and floodplains-viability rankings

Attribute Category	**Current Rank**	**Desired Future Rank**
Size	Fair (low end)	Good
Condition	Fair (low to medium confidence, think there are about 30% sites without appropriate structure. Also, most sites have numerous native species but fall short because of the number of non-natives)	Very Good
Landscape Context	Fair	Good

Table C3a. Viability benchmarks for riparian forests and floodplains

Rank	Size	Condition	Landscape Context
Very Good	Across the site, there is an average 30-50 m. of riparian forest on each side of rivers/streams and at least 1500 ha of forest	1. At < 1 m height there is at least 35% herbaceous canopy cover; mid-level vegetation present (saplings, understory species, some canopy species), and 40-70% closed canopy (need incomplete canopy to promote dense understory growth as per Baccus and Wallace, 1997)—with some open purchase for flycatchers and similar species. 2. At least 16 native tree species per ha, at least 6 native shrub species, at least 8 native herbaceous species, and at least 3 vines.* 0-1 non-natives	Forest and floodplain occurrences within 2 miles of each other. At least 80% of riparian forest patches are at least 30 m. x 8 km in size.

Rank	Size	Condition	Landscape Context
Good	Across the site, there is an average 20-30 m. of riparian forest on each side of rivers/streams and at least 800 ha of forest	1. At < 1 m height there is at least 35% herbaceous canopy cover; mid-level vegetation present (saplings, understory species, some canopy species), and 40-70% closed canopy (need incomplete canopy to promote dense understory growth as per Baccus and Wallace, 1997)—with some open purchase for flycatchers and similar species. 2. At least 16 native tree species per ha, at least 6 native shrub species, at least 8 native herbaceous species, and at least 3 vines.* 2-3 non-natives	Forest and floodplain occurrences within 3 miles of each other. At least 80% of riparian forest patches are at least 30 m. x 5 km in size.
Fair	Across the site, there is an average 10-20 m. of riparian forest on each side of rivers/streams and not less than 600 ha of forest	1. No horizontal structure present on 30-60% of sites 2. 8-15 native tree species per ha, 3-5 native shrub species, 5-8 native herbaceous species, and at least 2 vines.* 3- 6 non-natives.	At least 80% of forest and floodplain occurrences within 3 miles of each other. About 50% of riparian forest patches are at least 10 m. x 4 km., but less than 30 m x 5 km in size.
Poor	Across the site, there is an average 0-10 m. of riparian forest on each side of rivers/streams and less than 400 ha of forest total	1. No horizontal or vertical structure >60% of sites 2. Fewer than 5 native tree species per ha, fewer than 4 native shrub species, and fewer than 5 native herbaceous species, and 0-1 vine species.* More than 6 non-natives	More than 60% of forest and floodplain occurrences are more than 3 miles from each other. At least 70% of riparian forest patches are less than 10 m. x 0.5 km in size.
Notes	*Width estimates are based on consultation with J. Baccus and on Baccus and Wallace (1997). Width estimates reflect areas considered adequate swamp rabbit habitat: this species has been found in the area in patches large enough to provide escape areas and to recover from flood events (in general, it appears to have more restrictive habitat requirements than many other riparian and floodplain species—hence its use as an indicator).* *Estimate that there is potential for ≤ 2000 ha of riparian forests here, as per J. Baccus and known miles of river (> 100 mi)*	**These ratios are approximate: a diverse tree canopy coupled with little or no diversity in the understory, for example, may still be considered Fair to Poor. Refer to Baccus and Wallace (1997) for species composition.* *Note: Baccus and Wallace (1997) documented many non-native plants. It is unlikely one would see many sites without at least some of these: Japanese honeysuckle (Lonicera japonica), wax-leaf ligustrum (Ligustrum lucidum), bermudagrass (Cynodon dactylon), castorbean (Ricinus communis), chinaberry (Melia azedarach)* *Unanswered question: mock-orange and snowbell aren't present in these areas—is this because of overbrowsing?*	*Figures based on dispersal distance for swamp rabbits and patch size data from Baccus and Wallace (1997).*

Mesic Canyon Slopes

Size key ecological attribute/indicator: acreage

Condition key attributes: plant species composition and vegetation structure (number of hardwood species, Texas oak seedling density)

Landscape Context key attributes: connectivity and patch size

Table C4. Mesic canyon slopes-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	Good	Very Good
Condition	Fair	Good
Landscape Context	Very Good (based on analysis of deBoer's data conducted by Lee Elliott, (TNC), we have 23,877 ha (59,000 ac) of habitat in the conservation area. Still need analysis to determine how much of this is on slopes).	Very Good

Table C4a. Viability benchmarks for mesic canyon slopes

Rank	Size	Condition	Landscape Context
Very Good	> 9,106 ha (22,500 ac)	> 80% canopy closure, > 5 hardwood species @ > 3m. height, mature J. Ashei and Q. buckleyi present; Q buckleyi density is 20 stems/m.[2]	Patches of golden-cheeked warbler habitat* are at least 4,300 ha (10,625 ac) (contiguous or comprised in patches > 25 ha and within 2 km.** of each other) and > 60% contain mesic canyon slope patches of at least 8 ha
Good	3,035-9,00 ha (7,500-22,500 ac)	65-80% canopy closure, 3-5 hardwood species @ > 3 m. height, mature J. Ashei and Q. buckleyi present; Q buckleyi density is 10-20 stems/m.[2]	Patches of golden-cheeked warbler habitat* are 3,237-4,000 ha(8,000-9,884 ac) of connected habitat (contiguous or comprised in patches > 25 ha and within 2 km.** of each other) and > 60% contain mesic canyon slope patches of at least 8 ha
Fair	2,024-3,035 ha (5,000-7,500 ac)	50-65% canopy closure, 3-5 hardwood species @ > 3 m. height, mature J. Ashei density > 1/10 acres; Q buckleyi density is 5-10 stems/m.[2]	Patches of golden-cheeked warbler habitat* are 2,000-2,500 ha (4,941-6,177 ac) of connected habitat contiguous or comprised in patches > 25 ha and within 2 km.* of each other), and > 60% contain mesic canyon slope patches of at least 8 ha Also, must have at least 1,500 ha restorable habitat available w/in 2 km
Poor	< 405 ha (1,000 ac)	> 80% canopy closure, < 3 hardwood species @ > 3 m. height, mature J. Ashei < 1/10 acres; Q buckleyi density	Patches of golden-cheeked warbler habitat* are < 500 ha (1,235 ac) of connected habitat, contiguous or comprised in patches > 25 ha and within 2 km.* of each other), and > 60% contain mesic

Rank	Size	Condition	Landscape Context
		is 0-5 stems/m.[2]	canyon slope patches of at least 8 ha Also, less than 1,500 ha restorable habitat available w/in 2 km.
Notes	*Size based on requirements for golden-cheeked warblers (20 pairs/100 acres in good habitat: assume sub-optimal habitat here, and some habitat acreage needs met in riparian forests—also on deBoer (2002)*	*Using golden-cheeked warbler requirements from TPWD brochure; recognizing that we can have good habitat for warblers in Q. buckleyi/J. Ashei only.*	**Patches are as defined and mapped in deBoer (2002). This study examined in detail the available GCW habitat across the conservation area, as delineated by vegetation community. Thus, habitat included mesic slopes and upland woodlands in a single unit. Here, we have attempted to account for that and also to account for a minimum patch size needed for mesic slope vegetation communities.* ***2 km = GCW dispersal distance* *N.B. 4,300 ha ideal acreage based on PVA for golden-cheeked warbler—habitat needed to ensure population viability for 100 years at <5% chance of extinction (USFWS 1996). USFWS states need 4,300 to 13,152 ha*

Upland Grasslands, Savannas, and Shrublands

Size key ecological attribute/indicator: acreage, as required by most limiting nested element, black-capped vireos

Condition key attributes: number of mammal species, native herbaceous understory, overstory canopy, % bare ground, bunchgrass cover, soil depth, soil chemistry (all but last two are indicators)

Landscape Context key attributes: habitat mosaic—distribution of seral stages across landscape

Table C5. Upland grasslands, shrublands, savannas-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	Fair	Good
Condition	Fair	Good
Landscape Context	Fair	Very Good

Table C5a. Viability benchmarks for upland grasslands, savannas, and shrublands

Rank	Size	Condition	Landscape Context
Very Good	> 12,141 ha (30,000 ac) of each: 1) grasslands/savanna and 2) shrublands	1. For grasslands/savannas: 0-20% overstory, 5-15% bare ground (0-5% unlikely & could actually be detrimental), > 50% bunchgrass, 0% non-native species in 0.25 $m.^2$, > 10 herbaceous species in 0.25 $m.^2$, small mammal diversity such that we see > 5 species/500 trap nights; harvest mice present. 2. For shrublands: 50-60% shrub cover < 2 m. tall, < 10% canopy cover, > 7 shrub species, juniper cover at shrub stage present	Fire return interval sufficiently short to keep uplands in mosaic of grasslands, savannas, and shrublands with appropriate species composition and structure, probably 5-7 years. (see comments)
Good	4,047-12,141 ha (10,000-30,000 ac) of each: grasslands/savanna and shrublands	1. For grasslands/savannas: 20-30% overstory, 15-30% bare ground, 30-50% bunchgrass, 0% non-native species in 0.25 $m.^2$, 7-10 herbaceous species in 0.25 $m.^2$, small mammal diversity such that we see 2-5 species/500 trap nights, cotton rat present. 2. For shrublands: 40-50% shrub cover < 2 m. tall, < 10% canopy cover, 5-7 shrub species	Fire return interval sufficiently short to keep uplands in mosaic of grasslands, savannas, and shrublands with appropriate species composition and structure, probably 7-9 years
Fair	2,024-4,047 ha (5,000-10,000 ac) of each: grasslands/savanna and shrublands	1. For grasslands/savannas: 30-50% overstory, 30-50% bare ground, 10-30% bunchgrass, 5-25% non-native species in 0.25 $m.^2$, 3-5 herbaceous species in 0.25 $m.^2$, small mammal diversity such that we see 0-2 species/500 trap nights. 2. For shrublands: 20-40% shrub cover < 2 m. tall, 4-5 shrub species	Fire return interval outside of natural range to a degree that fails to keep uplands in mosaic of grasslands, savannas, and shrublands with appropriate species composition and structure, probably 10-12 years
Poor	< 2,024 ha (5,000 ac) of each: grasslands/savanna and shrublands	1. For grasslands/savannas: > 50% overstory, > 50% bare ground, < 10% bunchgrass, > 25% non-native species in 0.25 $m.^2$, < 3 herbaceous species in 0.25 $m.^2$, small mammal diversity such that we see 0 species/500 trap nights. 2. For shrublands: 10-20% shrub cover < 2 m. tall, 1-3 shrub species	Fire return interval outside of natural range to a degree that leads to a loss of one component of the uplands mosaic of grasslands, savannas, and shrublands, probably > 15 years

Rank	Size	Condition	Landscape Context
Notes	*Based on sustainable population of 1000 pairs, which need 10-30 acres/pair (10 for optimal habitat, 30 for lesser quality).*	*1. Improved pasture grasses are main non-natives in herbaceous layer.* *2. Juniper encroachment and persimmon.* *3. Condition parameters based on data from Dr. John Baccus, TSU SM*	*5-9 year fire return interval needed for maintenance of landscape context, and probably condition too. Likely will have to simulate this disturbance in many areas because of land use patterns.* *Because a) fire return interval will be difficult to track across the whole site, and b) its effect on habitat condition is what we are interested in, we will measure this attribute indirectly via community size, species composition, and vegetation structure.*

Rural and Village Ambience

Rural and Village Ambience Condition key attributes: open space, low-rise development, minimal traffic congestions (indicators: low-rise development, traffic congestion)

Table C6. Rural and village ambience-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	*NA*	*NA*
Condition	Very Good	Very Good
Landscape Context	*NA*	*NA*

Table C6a. Viability benchmarks for rural and village ambience

Rank	Condition
Very Good	No buildings over two stories high in area, no "big-box" construction in area, no traffic sitting through more than one light cycle.
Good	No buildings over two stories high in area, no traffic sitting through more than one light cycle.
Fair	No buildings over three stories high in area, no traffic sitting through more than one light cycle.
Poor	Buildings over three stories high in area, and traffic sitting through more than one light cycle.

Blanco Natural Heritage Sites

<u>Landscape Context key attributes:</u> cultural, recreational, aesthetic contribution (indicators: presence, community access and satisfaction)

Table C7. Blanco natural heritage sites-viability rankings

Attribute Category	Current Rank	Desired Future Rank
Size	*NA*	*NA*
Condition	*NA*	*NA*
Landscape Context	Good	Very Good

Table C7a. Viability benchmarks for Blanco natural heritage sites

Rank	Landscape Context
Very Good	No decline in quality of recreational experience at Jacob's Well, Blue Hole, and Cypress Spring, no loss of flow
Good	Decline in quality of recreational experience at no more than one of the following: Jacob's Well, Blue Hole, and Cypress Spring, but no loss of use or flow.
Fair	Loss of use or flow in one of the following: Jacob's Well, Blue Hole, and Cypress Spring.
Poor	Loss of use or flow in Jacob's Well, Blue Hole, and Cypress Spring

Sustainable Hill Country Economy

<u>Sustainable Economy Condition key attributes</u>: personal income and ecological integrity combined (indicator: income levels maintained without causing a loss of viability for conservation elements)

Table C8. Sustainable Hill Country economy-Viability Rankings

Attribute Category	Current Rank	Desired Future Rank
Size	*NA*	*NA*
Condition	Fair (poverty level 11-15%, but there has been a decline in element ranks)	Good
Landscape Context	*NA*	*NA*

Table C8a. Viability benchmarks for sustainable Hill Country economy

Rank	Condition
Very Good	No more than 5% of residents below poverty level,* and no decrease in viability ranks of biological conservation elements (from the date of last evaluation) as a result of income-generating activity
Good	No more than 15% of residents below poverty level,* and no decrease in viability ranks of biological conservation elements (from the date of last evaluation) as a result of income-generating activity
Fair	More than 15% of residents below poverty level,* and/or any decrease in viability rank of two or more biological conservation elements (from the date of last evaluation) as a result of income-generating activity
Poor	More than 20% of residents below poverty level,* and/or viability ranks of three or more biological conservation elements falls to "Poor" as a result of income-generating activity
Notes	**statewide average is 15% below poverty level.*

Appendix D: Threat Ranking Guidelines

Threats are composed of stresses and sources of stress (or sources). A stress is defined as a process or event with direct negative consequences on the conservation element (e.g., alteration of water flow into a marsh). The source of stress is the action or entity that produces a stress (e.g., channel building). The planning team must identify and rank the stresses and sources for each of the conservation elements. Guidelines for selection and ranking of stresses and sources are below.

The stress ranks and source ranks for individual elements 1) help elucidate the factors influencing that element and subsequently, the necessary conservation strategies, and 2) contribute to the analysis of threats for the conservation area. A conservation element's stress and source rankings are analyzed together via computer to provide threat ranks for the element. Once element threat ranks have been generated, the threat ranks are further examined via computer to assess threat ranks across elements and for the conservation area as a whole.

Stress Ranking

Severity of Damage -- what level of damage can reasonably be expected within 10 years under current circumstances (given the continuation of the existing management/conservation situation)	
Very High	The stress is likely to *destroy or eliminate* the conservation element over some portion of the element's occurrence at the conservation area
High	The stress is likely to *seriously degrade* the conservation element over some portion of the element's occurrence at the conservation area
Medium	The stress is likely to *moderately degrade* the conservation element over some portion of the element's occurrence at the conservation area
Low	The stress is likely to *only slightly impair* the conservation element over some portion of the element's occurrence at the conservation area

Scope of Damage – what is the geographic scope of impact on the conservation element at the conservation area that can reasonably be expected within 10 years under current circumstances (given the continuation of the existing situation)	
Very High	The stress is likely to be *very widespread or pervasive in its scope*, and affect the conservation element *throughout the element's occurrences* at the conservation area
High	The stress is likely to be *widespread in its scope*, and affect the conservation element at *many of its locations* at the conservation area
Medium	The stress is likely to be *localized in its scope*, and affect the conservation element at *some of the element's locations* at the conservation area
Low	The stress is likely to be *very localized in its scope*, and affect the conservation element at a *limited portion of the element's location* at the conservation area

Stress Ranking Chart

Severity	Scope			
	Very High	**High**	**Medium**	**Low**
Very High	Very High	High	Medium	Low
High	High	High	Medium	Low
Medium	Medium	Medium	Medium	Low
Low	Low	Low	Low	-

Source Ranking

Contribution -- Expected contribution of the source, acting alone, to the full expression of a stress (as determined in the stress assessment) under current circumstances (i.e., given the continuation of the existing management/conservation situation)	
Very High	The source is a *very large* contributor of the particular stress
High	The source is a *large* contributor of the particular stress
Medium	The source is a *moderate* contributor of the particular stress
Low	The source is a *low* contributor of the particular stress

Irreversibility – Difficulty of reversing the impact from the projected Source of Stress; also an inverse measure of the source's responsiveness to corrective action	
Very High	Impact of the projected stress from the source, for all intents and purposes, is not reversible (e.g., wetland converted to shopping center)
High	Impact of the projected stress from the source is reversible, but not practically affordable (e.g., wetland converted to agriculture)
Medium	Impact of the projected stress from the source is reversible with a reasonable commitment of additional resources (e.g., ditching and draining of wetland)
Low	Impact of the projected stress from the source is easily reversible at relatively low cost (e.g., ORVs trespassing in wetland)

Source Ranking Chart

Irreversibility	Contribution			
	Very High	High	Medium	Low
Very High	Very High	High	High	Medium
High	Very High	High	Medium	Medium
Medium	High	Medium	Medium	Low
Low	Medium	Medium	Low	Low

Appendix E: Benefits and Applicability of Specific Strategic Actions

Initiative, strategy	Strategic Action	Threats Addressed	Goal(s)	Comments, Rationale for Selection
2.1	Collaborate with other stakeholders to find funding to research the limits and function of the watershed (especially recharge function, flow paths, and a river basin groundwater availability model.	Water extraction and related	1	*This information is critical for establishing science-based action steps, and must be obtained before we can determine appropriate actions regarding sustainable water use.*
2.1, 2.2, 2.3	Collect, synthesize, and promote information on rainwater collection especially--and other water conservation practices.	Water extraction and related, Develop't	1, 3	*This specific project was selected from a huge array of possibilities because it received much interest among stakeholders, the team anticipated it could be highly effective, and no other group has had the time/resources to promote the idea.*
2.1, 2.2, 2.3, 4.1	Collaborate on a landowner publication for riparian zone management practices for Edwards Plateau.	Water extraction and related	1, 4	*Unmet need: to focus attention on these important landscape features.*
2.3	Develop and promote a message about importance of not feeding deer and of managed hunting as necessary actions to maintain a healthy herd and reduce habitat degradation/property damage.	Wildlife herbivory	2	*Focus on new residents, new landowners and new housing developments (prevention being more effective than correction). Primary goal is to prevent overabundance of deer in newly developing areas.*
3.1	Establish an active, hands-on outreach program that engages landowners one-on-one for innovative management and restoration practices.	Land Mgt, Fire Suppress., Grazing, etc.	2, 4	*Teaching and assistance on the ground*
2.1, 2.2, 2.3	By 2008, establish at least 1 sustainable land management demonstration project to use for outreach.	Land Mgt, Fire, Grazing, etc.	4	*A place on the ground, where we can show people results of land management efforts*
2.3	Through technical assistance and/or partnerships, make use of prescribed fire more common in conservation area, with a goal of a 7-9 year fire return interval on most upland sites.	Fire Suppress.	2, 4	*An empty niche that the Conservancy is well-suited to fill. Land management agencies have fluctuating mandates to assist with private lands burning & other NGOs do not have resources/expertise to lead the effort.*
3.1	Contract a study to examine the costs and benefits of various sustainable, low-impact residential development scenarios. Use the results to encourage low-impact developments.	Water extraction and related, Development	1, 3	*This strategy, while fairly narrowly focused, was judged to have excellent leverage potential for a problem that is very difficult to solve in a way that benefits all stakeholders.*
4.1	Compile or create conservation information and disseminate to public.	All threats	1-4	*Unfilled niche, on which stakeholders wanted the Conservancy to work. Unlike outreach, this is a passive sharing of info.*

Shaded threats are critical threats

Appendix F: Fish and Invertebrates Collected in the Blanco River Basin

Table F1. Fish collected from the Blanco River, 2004

Scientific Name	Common Name
Moxostoma congestum	gray redhorse
Lepomis auritus	redbreast sunfish
Lepomis cyanellus	green sunfish
Lepomis gulosus	warmouth
Lepomis macrochirus	bluegill
Lepomis megalotis	longear sunfish
Lepomis microlophus	red ear sunfish
Lepomis punctatus	redspotted sunfish
Micropterus dolomeiu	smallmouth bass
Micropterus salmoides	largemouth bass
Micropterus treculi	Guadalupe bass
Astyanax mexicanus	mexican tetra
Cichlosoma cyanoguttatum	Rio Grande cichlid
Campostoma anomalum	central stoneroller
Cyprinella venusta	blacktail shiner
Cyprinus carpio	common carp
Dionda episcopa	roundnose minnow
Macrhybopsis marconis	burrhead chub
Notropis amabilis	Texas shiner
Notropis stramineus	sand shiner
Notropis volucellus	mimic shiner
Pimephales promelas	fathead minnow
Pimephales vigilax	bullhead minnow
Fundulus notatus	blackstripe topminnow
Ameiurus natalis	yellow bullhead
Ictalurus punctatus	channel catfish
Etheostoma spectabile	orangethroat darter
Percina carbonaria	Texas logperch
Percina sciera	dusky darter
Gambusia affinis	mosquitofish

Ref. T. Bonner, Texas State University, unpublished data.

Table F2. Invertebrates collected from the Blanco River, 2004

Order	*Family*	*Genus*
Ephemeroptera	Ephemeridae	
	Tricorythidae	Tricorythodes
		Leptohyphes
	Caenidae	Caenis
	Heptageniidae	Stenonema
	Isonychiidae	Isonychia
	Leptophlebiidae	Neochoroterpes
		Paraleptophlebia
		Thraulodes
		Choroterpes
		Traverella
	Baetidae	Fallceon
		Procloeon
		Camelobaetidius
		Paracloeodes
		Baetodes
		Centroptilum
		Barbaetis
		Callibaetis
		Apobaetis
Plecoptera	Perlidae	Perlesta (Banks)
Trichoptera	Philopotamidae	Chimarra
		Dolophilodes
	Polycentropodidae	Polycentropus
		Polyplectropus
	Glossosomatidae	Anagapetus
	Hydroptilidae	Hydroptila
		Hydroptila (pupae)
		Ochrotrichia
		Oxyethira
		Neotrichia
		Mayatrichia
		Unknown pupae
	Hydropsychidae	Cheumatopsyche
		Hydropsyche
	Leptoceridae	Mystacides
		Oecetis
		Nectopsyche
	Helicopsychidae	Helicopsyche
	Hydrobiosidae	Atopysche
	Limnephilidae	
	Calamoceratidae	
Odonata	Calopterygidae	Calopteryx
		Hetaerina
	Coenagrionidae	Argia
		Enallagma
		Amphiagrion
	Lestidae	Archilestes
		Lestes

	Gomphidae	Phyllogomphoides
		Erpetogomphus
	Libellulidae	Nannothemis
	Corduliidae	Epitheca
		Macromia
	Aeshnidae	
Coleoptera	Elmidae	Macrelmis (adult & larvae)
		Neoelmis (adult & larvae)
		Stenelmis (adult & larvae)
		Microcylloepus (adult & larvae)
		Rhizelmis (adult & larvae)
		Dubiraphia (adult & larvae)
		Cylloepus (adult & larvae)
		Heterelmis (adult & larvae)
		Narpus (adult & larvae)
	Dryopidae	Postelichus (adult & larvae)
		Helichus (adult & larvae)
	Lutrochidae	Lutrochus (adult & larvae)
	Gyrinidae	
	Haliplidae	Peltodytes (adult & larvae)
	Dytiscidae	Celina (adult & larvae)
	Hydrophilidae	Hydrobius (adult & larvae)
		Berosus (adult & larvae)
	Psephenidae	Ectopria (adult & larvae)
Diptera	Chironomidae	
	Simuliidae	
	Tabanidae	
	Stratiomyidae	
	Culicidae	
	Ceratopogonidae	
	Tipulidae	
	Empididae	
Hemiptera	Corixidae	Trichocorixa (Kirkaldy)
	Belostomatidae	
	Naucoridae	Ambrysus (Stal)
		Cryphocricos
	Pleidae	
	Notonectidae	
	Veliidae	Rhagovelia (Mayr)
	Mesoveliidae	
	Gerridae	Metrobates (Uhler)
		Trepobates (Uhler)
	Macroveliidae	Macrovelia (Uhler)
Megaloptera	Corydalidae	Corydalus
Lepidoptera	Pyralidae	
Phylum	*Class*	*Order*
Annelida	Oligochaeta	
	Hirudinea	
	Branchiobdellida	

Sub-class	*Order*	*Sub-order*
Acari	Acariformes	Hydrachnida (Hydracarina)
Class	*Sub-class*	*Family*
Pelecypoda (Bivalvia)	Paleoheterodonta	Unionidae
	Heterodonta	Corbiculiidae
Class	*Order*	*Family*
Gastropoda	Mesogastropoda (Prosobranchs)	Thiaridae
		Pilidae
		Viviparidae
		Pleuroceridae
	Limnophila (Pulmonata)	Lymnaeidae
		Planorbidae
		Physidae
		Ancylidae
Sub-phylum	*Class*	*Order*
Crustacea	Malacostraca	Mysidacea
		Isopoda
		Amphipoda
	Decapoda	Palaemonidae
		Cambaridae
	Ostracoda	Podocopida
	Branchiopoda	Anostraca
		Notostraca
		Conchostraca
		Cladocera
	Maxillopoda	Copepoda (sub-class)
		Branchiura (sub-class)
	Phylum	*Class*
Other	Nematamorpha	
	Nematoda	
	Platyhelminthes	Turbellaria

Ref. D. Pendergrass, unpublished data.

Appendix G: Invitees for Blanco River Planning Meeting(s)

Name	Organization, Interest/Affiliation
1. Gary Amaon	The Nature Conservancy
2. John Baccus	Texas State University San Marcos
3. David Baker	Wimberley Valley Watershed Association
4. Tim Bonner	Texas State University San Marcos
5. Kent Butler	University of Texas
6. Sally Caldwell	Texas State University San Marcos
7. Bill Carr	The Nature Conservancy
8. Don Casey	Texas Farm Bureau
9. George Cofer	Hill Country Conservancy
10. Linda Cooper	Wimberley Water Supply
11. Alan Craft	Resident
12. Joe Day	Cypress Creek Conservation Association
13. Lee Elliott	The Nature Conservancy
14. Bobby Fenton	Texas Parks and Wildlife, retired
15. Ron Fieseler	Blanco-Pedernales Groundwater Conservation District
16. Bruce Frederick	Wimberley Chamber of Commerce
17. Al Groeger	Texas State University San Marcos
18. Eddie & Dorothy Gumbert	Residents
19. Bill Guthrie	Judge, Blanco County Commissioners Court
20. Jack Hollon	Hays Trinity Groundwater Conservation District
21. Peter Holt	Resident
22. Marshall Jennings	Edwards Aquifer Research and Data Center
23. Steve Jester	The Nature Conservancy
24. Bill Johnson	Resident
25. Steve Klepfer	Mayor, Village of Wimberley
26. Lee Ann Linam	Texas Parks and Wildlife Department
27. Charles & Susan McCord	Residents
28. Doyle Mosier	Texas Council on Environmental Quality
29. Larissa Pittman	Blanco Chamber of Commerce
30. Jim Powers	Judge, Hays County Commissioners Court
31. Terry Rodgers	Blanco State Park, Texas Parks and Wildlife Department
32. Jim Rodrigue	Mayor, City of Blanco
33. Patrick Rose	Texas House of Representatives
34. Richard Salmon	Hays County, Grants Administration
35. Andy Sansom	Institute for Sustainable Water Resources
36. Severne Smith	Resident
37. Janet Thome	Guadalupe-Blanco River Authority and Gaudalupe-Blanco River Trust
38. Carrie Thompson	U.S. Fish and Wildlife Service
39. Terry Turney	Texas Parks and Wildlife Department
40. James Vaughan	Texas State University San Marcos/University of Texas
41. Todd Votteler	Guadalupe-Blanco River Authority and Gaudalupe-Blanco River Trust
42. Peter Way	Resident
43. Scott Way	Resident
44. Cedric Wenger	Resident
45. Bill West	Guadalupe Blanco River Authority
46. Christina Williams	U.S. Fish and Wildlife Service

*Shaded invitees did not attend planning meetings.