

**Leona River
Recreational Use Attainability Analysis**

Prepared for:

**Texas State Soil and Water Conservation Board
Project 11-50**

Prepared by:

**Jeff Stroebel
Anne McFarland**

**Texas Institute for Applied Environmental Research
Tarleton State University
Stephenville, Texas**

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For more information about this document or any other document TIAER produces, send email to info@tiaer.tarleton.edu.

Authors

Jeff Stroebel, research associate, TIAER, jstroeb@tiaer.tarleton.edu

Anne McFarland, senior research scientist, TIAER, mcfarla@tiaer.tarleton.edu

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CHAPTER 1

INTRODUCTION

Problem Statement

The Leona River (Segment 2109) stretches 91 miles from the crossing of U.S. 83 just north of Uvalde, Texas through the City of Uvalde in Uvalde County and the City of Batesville in Zavala County to its confluence with the Frio River about six miles north of Dilley in Frio County (Figure 1-1). Water quality within the Leona River meets most assessment criteria and screening levels set by the Texas Commission on Environmental Quality (TCEQ), but bacteria and nitrate concentrations are elevated (TCEQ, 2011a). The Texas Water Quality Inventory first noted concerns for nitrates along Segment 2109 in 2002. In 2006, Segment 2109 was first included on the Texas 303(d) List as impaired for contact recreation due to elevated bacteria concentrations (TCEQ, 2007).

The Leona River has a designated use for primary contact recreation based on the *Texas Surface Water Quality Standards* (TSWQS; TCEQ, 2010a). The 2010 Texas Water Quality Inventory is based on two categories of recreation use, contact and noncontact. In June 2010, the TCEQ adopted revisions to the TSWQS that expanded the designation of contact recreation into three categories (primary contact recreation, secondary contact recreation 1, and secondary contact recreation 2) based on varying degrees of interaction with the water, while maintaining a fourth category of noncontact recreation. These revisions were codified in the Texas Administrative Code (TAC), Title 30 Chapter 307 and became effective as a state rule on July 22, 2010 (TCEQ, 2010a). As a result of these revisions to the TSWQS, waterbodies listed as impaired based on bacteria for contact recreation may undergo a standards review to determine if primary contact recreation is appropriate or if a revision to the use category for recreation should be considered.

The TSWQS specifies a use attainability analysis (UAAs) to evaluate the designated uses of a waterbody. To identify and assign attainable uses and criteria to individual waterbodies, UAAs evaluate the physical, chemical, biological, and economic factors affecting attainment of a waterbody use (40 Code of Federal Regulations §131.10(g)). A recreational use attainability analysis (RUAA) is a specific type of UAA focused on determining the appropriate recreational use category of a waterbody, the findings of which are presented within this report for the Leona River.

Objectives

The objective of this report is to present the findings of a Comprehensive RUAA for the Leona River following the Texas Commission on Environmental Quality (TCEQ) May 2009 *Procedures for a Comprehensive RUAA and a Basic RUAA Survey* (TCEQ, 2009). The Leona River is comprised of three assessment units (AUs) defined by TCEQ (2010b) within Segment 2109. A total of 34 field survey sites were selected for the study. All field surveys were performed by staff of the Texas Institute for Applied Environmental Research (TIAER) under a TSSWCB-approved Quality Assurance Project Plan (QAPP; TIAER, 2012).

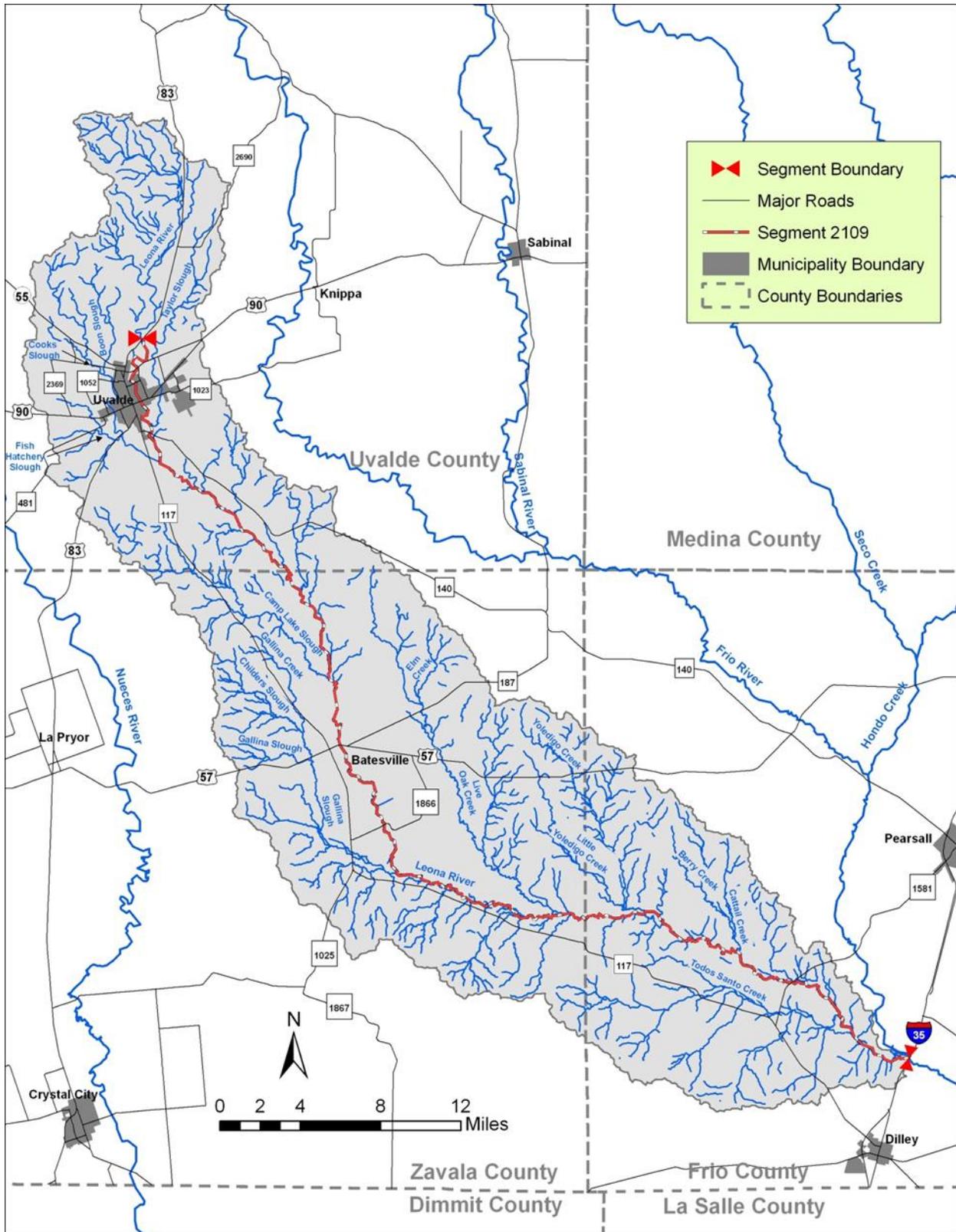


Figure 1-1 Map of Leona River watershed, Segment 2109.

Stakeholder and Agency Involvement

The TSSWCB and its collaborating entities maintain an inclusive public participation process. From the inception of this project, the project team sought to ensure that stakeholders were informed and involved. The Nueces River Authority (NRA), in cooperation with TIAER, provided coordination for public participation in this project.

Input from the NRA, Texas Parks and Wildlife Department regional staff, TCEQ regional staff, TSSWCB, the Nueces-Frio-Sabinal Soil and Water Conservation District, Winter Garden Soil and Water Conservation District, Frio Soil and Water Conservation District, and other local agencies was solicited as well as input from watershed stakeholders on the need for the RUAA (see Contact Information Form available on the project website noted at the end of this section). The involvement of stakeholders is recognized as the key source of information about the river segment of interest and in conducting an RUAA, which can lead to improvement in the selection of survey sites.

Two meetings with state agencies, river authority representatives, local officials, and stakeholders were held to give an overview of water quality issues within the Leona watershed and to obtain comments on proposed survey sites prior to field data collection. These public meetings were used to solicit input from all interested parties within the study area.

The first meeting targeted local and state agencies as well as stakeholders in an effort to inform them of the assessment of water quality within the Leona River and the need for an RUAA. This meeting was held in Uvalde, Texas on July 28, 2011.

A technical meeting focusing specifically on the RUAA was held in Uvalde, Texas on January 19, 2012. At this meeting input was sought on the proposed survey sites for the Leona River RUAA. Because there were some very large gaps between proposed survey sites, access to additional sites was solicited from stakeholders, as large portions of the Leona River are accessible only through private property.

On July 19, 2012, a Progress Update meeting was held to provide a summary of activities conducted to date on the RUAA of the Leona River. This meeting was held to discuss findings from the initial RUAA field survey completed in May 2012. Stakeholders posed several questions regarding how recreational use could be assessed given current dry conditions. The importance of interviews in providing feedback on past recreational use was emphasized by TIAER and the NRA. Interview forms were made available at this meeting as well as through the project website. TIAER and NRA staff also solicited interviews from watershed stakeholders. While interviews were obtained from a number of individuals within the watershed, landowners with riverfront property were specifically targeted for interviews at the meeting and also via direct phone calls.

A final stakeholder meeting occurred on January 24, 2013 in Uvalde, Texas during which findings of both field surveys, the historical review, and interviews were presented. The next steps of the RUAA were also discussed at this meeting and feedback from stakeholders was solicited. Some stakeholders expressed concerns with regard to how best management practices to control bacteria would be implemented and if only permitted sources would be impacted,

assuming decreases need to occur. There was also some questioning of the timeframe during which interviewees indicated the occurrence of recreation, i.e., some people thought most recreational activities on the Leona River had occurred prior to November 28, 1975. TIAER responded that when interviews were conducted an effort was made to document the timeframe when recreation occurred and individuals were informed of the timeframe of interest. At the meeting, stakeholders were told that they would be notified when a draft of the report is available for public review and comment. The draft report will be made available via the project website and if hard copies are desired, individuals have been asked to notify TIAER or the NRA.

Watershed stakeholders were invited to attend the public meetings through mailed invitations, public announcements (TCEQ and TSSWCB webpages), and individual phone calls.

Information on past meetings for this RUAA, including minutes, presentations, and other information, can be found on the project website <http://www.leonariver.org/>.

CHAPTER 2

STUDY AREA

Description of Leona River

The Leona River watershed covers about 429,000 acres and includes the cities of Uvalde (estimated population 16,000) and Batesville (estimated population 1,100). The upper reaches of the Leona River include Hoag Dam south of Uvalde by the Fort Inge Historical Park and two Public Law 566 (PL566) reservoirs north of the City of Uvalde (Figure 2-1). The Leona River is fairly well delineated in its upper portion, although some tributary channels in areas are difficult to define as water sometimes flows underground while crossing limestones associated with the Balcones Fault Zone (BFZ). The BFZ is associated with the Edwards Aquifer and underlies most of the Leona watershed within Uvalde County (George, et al., 2011). These porous or fractured limestones of the BFZ are a conduit for recharge of the Edwards Aquifer, and when groundwater levels are high, springs feed the streamflow of the Leona River. Several groups of springs have been noted along the Leona River in Uvalde County (Brune, 1975), but these springs can be difficult to locate as they often flow beneath the surface of the river or do not flow when extended dry conditions occur due to lowering aquifer water levels. While the upper third of the Leona River watershed largely overlays the Edwards Aquifer, the lower two-thirds overlays the Carizo-Wilcox Aquifer (George, et al., 2011). The Carizo-Wilcox Aquifer is predominantly composed of sand locally interbedded with gravel, silt, clay, and lignite, so percolation of surface water into groundwater is slower than within the region of the Edwards Aquifer (Ashworth and Hopkins, 1995). Along its lower reaches, the Leona River flows through fairly flat terrain and often appears only as shallow depressions as it nears its confluence with the Frio River.

The flow type for the Leona River is defined by TCEQ in the TSWQS as perennial, which means it generally flows throughout the year (TCEQ, 2010a), although drought conditions have left much of the Leona River dry during recent years. Designated uses for Segment 2109 are primary contact recreation, general use, and fish consumption with an assumed high aquatic life use. This classified segment was first listed on the 2006 Texas 303(d) List and every subsequent 303(d) List due to excessive bacteria, specifically the geometric mean *E. coli* concentration of assessment data. There is also concern due to exceedance of the nutrient screening level for nitrates. A review of historical water quality data and a more detailed presentation of watershed characteristics for Leona River is presented in the report, *Historical Review of Hydrology and Water Quality Data for Leona River Segment 2109* (McFarland, 2013 in draft).

The Leona River is part of the Southern Texas Plains Ecoregion (level III; Griffith et al., 2007), which was once covered with grassland and savanna vegetation, while much of the landscape is now dominated by thorny brush, such as mesquite (*Prosopis glandulosa*). As part of the Southern Texas Plains, the Leona watershed falls within the Northern Nueces Alluvial Plains (level IV ecoregion), which differs from much of the Southern Texas Plains by having a higher annual precipitation (generally 22 to 28 inches) and deeper soils. Large parts of the watershed are rangeland with honey mesquite, plateau live oak (*Quercus fusiformis*), guajillo (*Acacia berlandieri*), and blackbrush (*Acacia rigidula*) as dominant woody species.

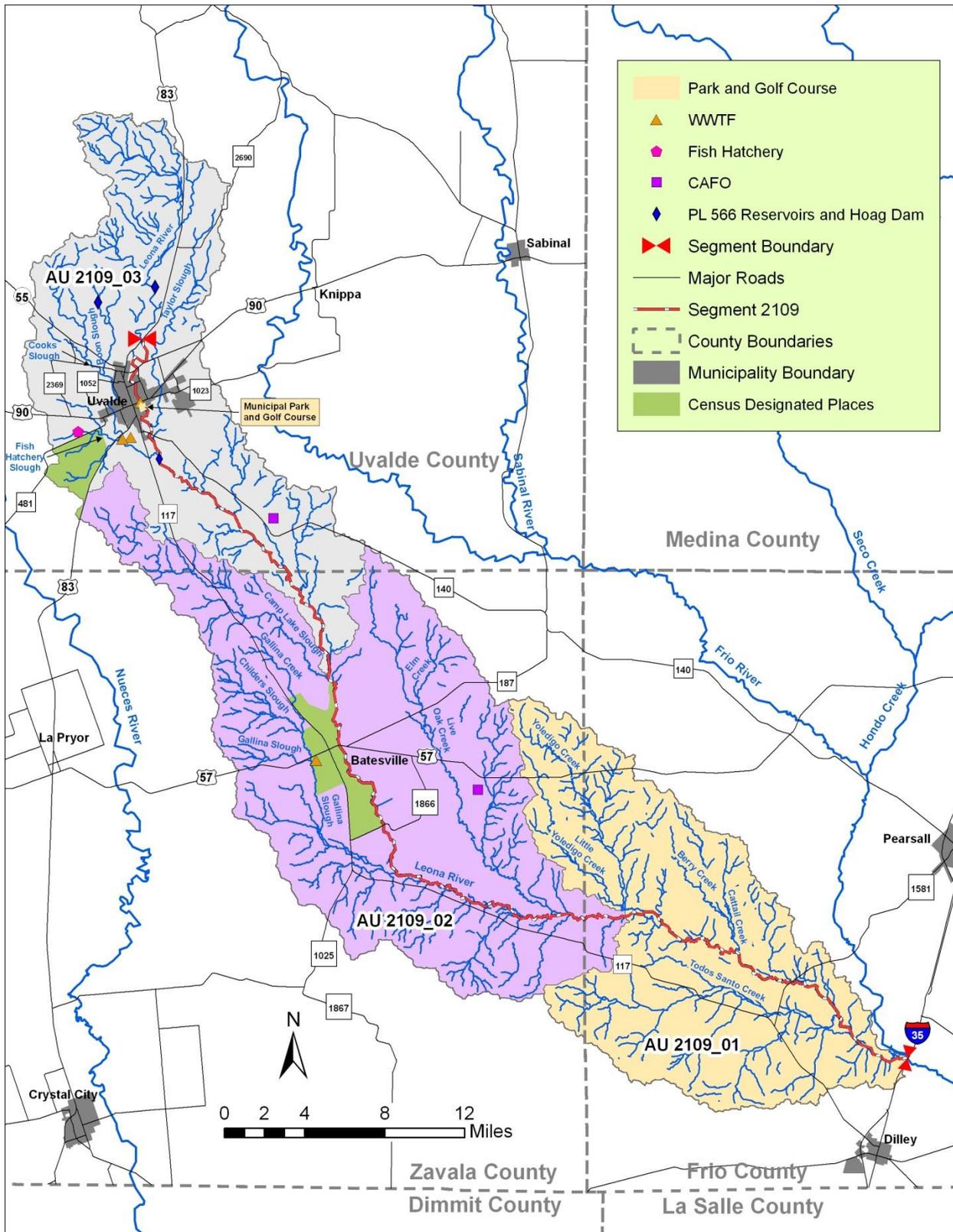


Figure 2-1 Major features throughout the Leona River watershed.

The riparian area of the Leona River is largely forested with live oak (*Quercus virginiana*), cedar elm (*Ulmus crassifolia*), Texas persimmon (*Diospyros texana*), hackberry (*Celtis* sp.), pecan (*Carya illinoensis*), and Mexican ash (*Fraxinus berlandieriana*) as the dominant species (Wood and Wood, 1989).

The Leona River watershed is largely rural with cropland and pastureland as major land uses. Wheat (*Triticum* sp.), sorghum (*Sorghum bicolor*), cotton (*Gossypium* sp.), vegetables, and corn (*Zea mays*) are among the leading crops in all three counties (USDA, 2012). Frio County is distinct from Uvalde and Zavala Counties in that peanut (*Arachis hypogaea*) production is also a major crop. Most cropland areas are irrigated, and with the production of winter vegetables, Frio and Zavala Counties are included in what is commonly referred to as the Winter Garden Region of south Texas (Odintz, 2012). Large amounts of land in all three counties are also used as pasture for hay or grazing of primarily beef cattle, although sheep production is also prominent in Uvalde County. Another notable feature in the upper portion of the watershed is the U.S. Fish and Wildlife Service National Fish Hatchery located in Uvalde, Texas (Figure 2-1), which raises imperiled fishes, such as the fountain darter (*Etheostoma fonticola*), Comanche Springs pupfish (*Cyprinodon elegans*), and Devils River minnow (*Cryprinodon elegans*).

Regulated Sources

Potential sources of fecal pollution, as measured by indicator bacteria *E. coli*, can be divided into two primary categories: *regulated* and *unregulated*. Pollution sources that are regulated have permits issued by TCEQ under the Texas Pollutant Discharge Elimination System (TPDES) and/or by the USEPA under the National Pollutant Discharge Elimination System (NPDES) and are generally point sources. Examples of regulated sources include domestic wastewater treatment facility (WWTF) discharges; stormwater discharges from industries, construction, and municipal separate storm sewer systems (MS4s) of cities; and concentrated animal feeding operations (CAFOs). These various regulated sources are required to have either an individual permit that is specific for each facility or a general permit for operation.

Wastewater Treatment Facilities

There are two permitted WWTFs located within Segment 2109, the City of Uvalde and the Batesville Water Supply Corporation (WSC). A third permitted discharge represents flush water from the U.S. Fish and Wildlife Service National Fish Hatchery in Uvalde (Figure 2-1). A vegetable processing plant operated by TAFMI, Inc (previously Agrilink Foods) located north of Uvalde had a permit to discharge processing wastewater via land irrigation, but according to TCEQ records queried on February 7, 2012, this operation no longer has an active permit, thus, it is not included in Figure 2-1.

The City of Uvalde WWTF has three outfalls permitted for a total average daily flow of 0.97 million gallon per day (MGD). Outfall 001 is located at the facility south of the City and discharges into a series of ponds developed as wetlands (Figure 2-2), which then flow into Cooks Slough, a tributary of the Leona River. A portion of the effluent is generally diverted and piped to Outfall 002, which discharges directly into the Leona River at a point within the Uvalde City Park (Figure 2-3). Of the effluent diverted to the Uvalde City Park, a small portion is often pumped into a holding pond for use as irrigation water on the Municipal Golf Course. Based on a review of discharge records, Outfall 003 for the City of Uvalde is seldom used but is located near the facility and directly discharges into Cooks Slough, bypassing the wetland ponds.

Discharge records for 2007-2011 indicate an average discharge of 0.39 MGD for all three outfalls with 28% of discharge going through Outfall 001, 66% through Outfall 002, and 6% through Outfall 003 (USEPA, 2012).



Figure 2-2 Uvalde WWTF wetland ponds that feed into Cooks Slough. Photo taken November 22, 2011.

According to the City of Uvalde WWTF permit (No. WQ0010306001, TX0023094), it is an activated sludge process plant operated in an extended aeration mode. Treatment units include bar screen, aeration basins, final clarifiers, sludge digester, chlorine contact chamber, and dechlorination chamber. Sludge generated from the treatment facility is hauled by a registered transporter and disposed of at a TCEQ authorized land application site or landfill. Two permit violations were found on record for the City of Uvalde WWTF. In March, May, and June 2006, the Uvalde WWTF failed to comply with permitted effluent limitations for total suspended solids (TSS) and was fined. In March and April 2010, the Uvalde WWTF failed to comply with permitted ammonia effluent limitations. Both these enforcement actions have been resolved.

The Batesville WSC WWTF is a pond system that includes four stabilization lagoons in series (No. WQ0014394001, TX0125385). As of December 2011, only one of the four lagoons in the series had filled. Evaporation is the primary means of effluent removal from the lagoons (Figure 2-4), and based on a records review of available data through December 2011, no discharges and, thus, no sampling had been reported. According to the permit amendment issued December 16, 2011, no sludge has been removed from the pond system. If sludge is removed it is to be disposed of at a TCEQ authorized land application site or co-disposal landfill. If a discharge were to occur from the Batesville pond system, it would flow into Gallina Slough, a major tributary of the Leona River located in AU 2109_02. The permitted discharge for the Batesville WWTF is 0.184 MGD.

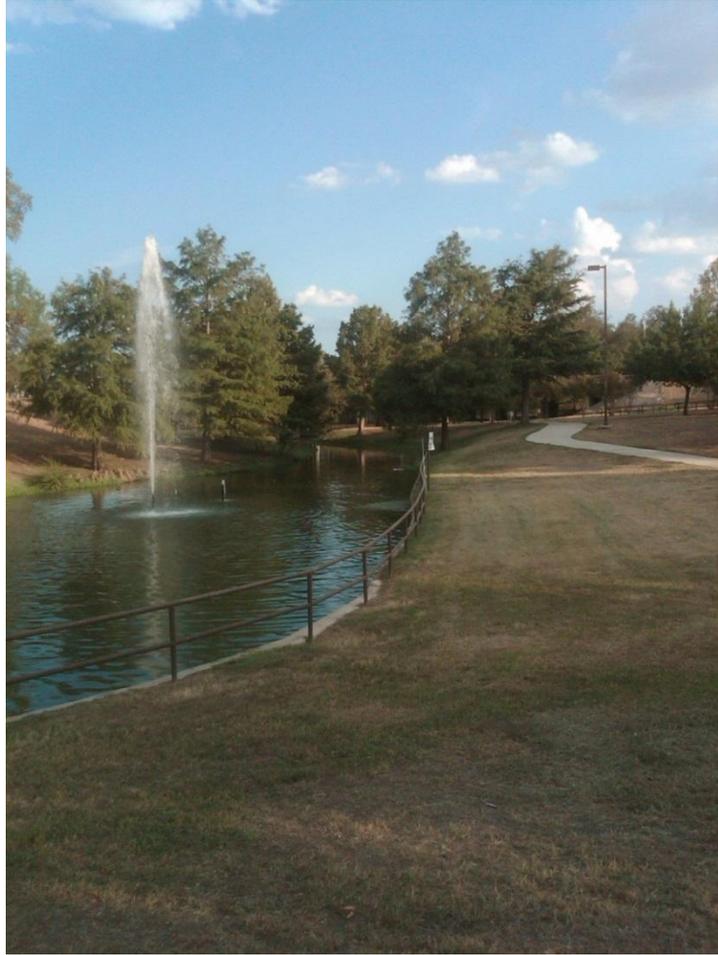


Figure 2-3 Uvalde WWTF discharge location with the Uvalde City Park. Photo taken September 28, 2011.



Figure 2-4 Batesville WWTF effluent holding ponds 1 and 2. Photos taken March 9, 2011.

The only other permitted discharge facility is the U.S. Fish and Wildlife Service National Fish Hatchery in Uvalde (No. WQ0014394001, TXG130017), which discharges flush water intermittently into Fish Hatchery Slough, a tributary of the Leona River west of Uvalde in AU 2109_03. The National Fish Hatchery is permitted under a Level II General permit authorization, which requires less than 30 days per year of discharge and limitations on aquatic animal production. Records for 2008-2011 indicate an average discharge of 0.84 MGD (EPA, 2012).

Regulated Stormwater

The TPDES and the NPDES Municipal Separate Storm Sewer (MS4) Phase I and II rules require municipalities and certain other entities in urban areas to obtain permits for their stormwater systems. Phase I permits are individual permits for large and medium sized communities with populations exceeding 100,000, whereas Phase II permits are for smaller communities that are located within an “Urbanized Area”. An “Urbanized Area” is defined by the U.S. Census Bureau as an area with populations greater than 50,000 and with an overall population density of at least 1,000 people per square mile. The City of Uvalde has a total population of 15,751 based on 2010 population estimates from U.S. Census Bureau (Texas State Data Center, 2011) and is not considered to be located in an urbanized area based on population density, thus, the City of Uvalde is not required to obtain a permit for their stormwater system. A separate population estimate of 2,171 is provided for the subdivision area, Uvalde Estates (Figure 2-1), which is located southwest of the City of Uvalde and is considered a census-designated place (CDP). A CDP is a statistical geographic entity representing closely settled, unincorporated communities that are locally recognized and identified by name. These CDPs are the statistical equivalents of incorporated places, with the primary differences being the lack of both a legally-defined boundary and an active, functioning governmental structure, chartered by the state and administered by elected officials (Federal Register, 2008). The City of Batesville is unincorporated and has a population estimate of 1,068 based on the 2010 Census data.

Concentrated Animal Feeding Operations

There are currently two permitted concentrated animal feeding operations (CAFO) located within Segment 2109 (Figure 2-1). The Chaparral Cattle Feedlot is located south of Uvalde in AU 2109_03 and the Live Oak Feedlot located southeast of Batesville within the watershed of Liveoak Creek in AU 2109_02. The Live Oak Feedlot is permitted for 8,000 head of beef cattle, while the Chaparral Cattle Feedlot is permitted for 10,000 head of beef cattle. A query of the TCEQ water quality permit database conducted on February 7, 2012 indicated no violations for either facility. These CAFOs have zero discharge permits for wastewaters and manure.

Permitted Land Application of Sewage and Septage Sludge

A query of the TCEQ database for registered land application sites indicated no currently registered land application sites in Uvalde, Zavala, or Frio Counties that receive Class B sewage sludge or septage sludge. The City of Uvalde has had a registered beneficial land-use site for sludge disposal located outside of Uvalde about 0.9 miles west of the cross-section of FM 117 and FM 140, adjacent to the south side of FM 140, but the permit (WQ0004610000) for this location is inactive.

Potential Unregulated Sources

Unregulated sources are typically nonpoint source in nature, meaning the pollution originates from multiple diffuse locations and is usually carried to surface waters by rainfall runoff, and the sources generally are not regulated by permit under the TPDES and NPDES. Potential unregulated sources include wildlife (mammals and birds), large exotics, unmanaged feral animals (e.g., feral hogs), on-site sewage facilities (OSSFs), pets, and livestock. Sources observed during the RUAA surveys are specifically noted within the results.

Non-Permitted Agricultural Activities and Domesticated Animals

Activities such as livestock grazing close to waterbodies and agricultural use of manure as fertilizer, can contribute *E. coli* to nearby waterbodies. Livestock statistics were obtained from United States Department of Agriculture (USDA) National Agricultural Statistics Service website (USDA, 2012). These statistics indicated large numbers of beef cattle in all three counties of the watershed and fairly large numbers of goats and sheep in Uvalde County. It should be noted that the livestock numbers obtained by the USDA represent the number of livestock present at the time the survey was conducted, and those numbers likely change throughout the year due to economic factors and environmental conditions (e.g., market values, drought, etc.). These livestock statistics represent the entirety of for each county. To represent estimates of livestock numbers within the Leona watershed, available data from USDA surveys conducted between 1997 and 2012 were averaged and then adjusted based on the percent of each county that lies within the Leona watershed (Table 2-1). The Leona watershed comprises only a relatively small portion of each county that is only 13 percent of Uvalde County, 23 percent of Zavala County, and 15 percent of Frio County.

Table 2-1 Estimated livestock numbers within the Leona watershed based on statistics for Uvalde, Zavala, and Frio Counties adjusted for the percent of the county within the watershed. (Source USDA, 2007; 2002; 1997).

County	Year	Cattle & Calves (all beef)	All Goats	All Sheep	Horses and Ponies	Mules, Burros & Donkeys	Hogs
Frio	2007	51,411	1,519	98	991	89	133
	2002	57,554	594	D	624	31	127
	1997	72,220	944	D	525	20	518
Uvalde	2007	52,366	25,805	10,050	1,095	422	120
	2002	64,325	30,649	22,243	1,181	91	314
	1997	67,064	64,287	32,841	1,116	219	1,565
Zavala	2007	66,641	6,718	70	399	20	D
	2002	55,034	6,779	435	385	D	D
	1997	40,139	2,302	D	264	-	D
Leona Watershed	Avg 1997-2007	58,528	15,511	10,956	731	127	463

- Estimated livestock numbers for Leona River watershed derived as a direct proportion of the watershed area within each county; 13 percent of Uvalde County, 23 percent of Zavala County, and 15 percent of Frio County.
- D = cannot be disclosed, "-" = not available

Domestic pets are another unregulated source of *E. coli* bacteria, particularly dogs, because storm runoff often carries these wastes into streams (EPA, 2009). Assuming a rough estimate of 1 dog per household and about 7,000 households within the Leona watershed based on 2010 census population data (about 20,000 individuals and 3 individuals per household), there are potentially about 7,000 dogs within the Leona River watershed. Other domestic animals, such as outdoor cats, also will contribute, but the number of cats is difficult to estimate as in many rural areas, domestic cats are often feral.

Wildlife and Large Exotics

E. coli bacteria are common inhabitants of the intestines of all warm blooded animals, including wildlife, such as deer, raccoons, and birds. With access to the stream channel, direct deposition of animal waste can be a concentrated source of bacteria loading to a waterbody. Fecal bacteria from wildlife are also deposited onto land surfaces, where it may be washed into nearby streams by rainfall runoff. There are a large number of game ranches within the Leona watershed containing native deer and exotics, such as aoudad, axis deer, and blackbuck antelope. Population density estimates obtained from Texas Parks and Wildlife (TPWD) for 2011 indicate 17.4 deer per 1,000 acres for the South Texas Plains Ecoregion.

Feral Hogs

While feral hogs are not natural wildlife, they are an invasive, unmanaged species found throughout Texas that contributes bacteria to streams in a manner similar to native wildlife. Feral hogs are noted for moving in groups along waterways, and particularly in times of drought will congregate near perennial water sources to drink and wallow. Feral hogs are classified by TPWD as unprotected, exotic, non-game animals (Taylor, 2003). Although found throughout much of Texas, there is a scarcity of data on feral hog densities in Texas. Studies in comparable bottomland habitats indicate typical densities of nearly 30 hogs per square mile (Tate, 1984 and Hone, 1988). Signs of feral hogs were encountered at several of the RUAA survey sites as noted in the field survey results.

Failing On-Site Sewage Facilities

Septic systems or OSSFs are often used in rural areas that do not have the ability to connect to a central wastewater collection system. While the specific numbers of OSSFs could not be determined, since records have only been required since 1989, based on rough estimates from county health inspectors within Uvalde, Zavala, and Frio Counties, at least 600 to 1,000 households are on septic systems within the Leona watershed that have been installed since 1989. While inspectors were unwilling to speculate as to a failure rate for these systems within the watershed area, the major soils types in all three counties are noted for potentially severe septic problems. The fractured limestone in the headwaters can also lead to the discharge of septic waste into groundwater if OSSFs are improperly installed or failed to be maintained.

Historical Information on Recreational Use

A review of historical information was performed regarding recreational water uses for the Leona River. The review considered the time period of November 28, 1975 to the present, in accordance with 40 CFR Part 131 (EPA standards regulation). Government offices, libraries,

historical societies, newspapers, and universities were searched and contacted in addition to generic internet searches. The following is a summary of the review and searches.

Government Sources:

City of Uvalde

<http://www.uvaldetx.com/>

Nothing significant was found.

Texas Parks and Wildlife

Warden Javier Fuentes Phone: (830) 591-4806

Game Warden Javier Fuentes stated in a phone interview on January 11, 2012 that he had only infrequently witnessed recreation occurring on or in the Leona River. According to Mr. Fuentes the most common type of recreation was fishing from the banks of the river.

Historical Society Sources:

Uvalde Historical Commission

William Dillahunty Phone: (830) 591-6804

Explored various links and online texts. Nothing significant was found.

Spoke with William Dillahunty on January 11, 2012. During the phone interview Mr. Dillahunty stated that the Leona River had been used for recreational activities including swimming and fishing, but he was aware of these activities occurring only prior to the time frame of the study (November 28, 1975).

Library Sources:

Uvalde Library

El Progreso Memorial Library

<http://www.elprogreso.org/>

Phone: (830) 278-2017

Explored various links and online texts. Nothing significant was found.

Visited the library and conducted a search of archives with librarian about records of recreational use on the Leona River. Nothing significant was found.

Newspaper Sources:

Uvalde Leader-News

<http://www.uvaldeleadernews.com/>

Phone: (325) 641-3119

An article was found from December 23, 2004, showing young children on a field trip to the Leona River. The children were there learning about aquatic species and the source of the river from underground springs and appeared to be wading about ankle deep in the water.

Internet Searches:

The Handbook of Texas Online

<http://www.tshaonline.org/>

Searched the handbook by river name. Nothing significant was found.

Family Old Photos

<http://www.familyoldphotos.com/tx/coll/brownwood>

Nothing significant was found.

TxGenWeb

<http://www.rootsweb.ancestry.com/~txbrown/>

Nothing significant was found.

The Edwards Aquifer Website

<http://www.edwardsaquifer.net/leona.html>

The website gives a brief summary of the history of the river and its source. The website also displays pictures of people on the bank of the river and two young boys with fishing equipment.

CHAPTER 3

STUDY METHODOLOGY

Survey Methodology

The following text provides details of the data collection activities designed to obtain the necessary field-related information for a RUAA. A Comprehensive RUAA was conducted for the Leona River classified Segment 2109. The major field components of a Comprehensive RUAA are summarized as the following:

- Site reconnaissance (completed May 2012)
- Site selection (completed May 2012)
- Field surveys (Survey 1: May 22-26, 2012; Survey 2: July 17-21, 2012)

The first two components, site reconnaissance and site selection, did not constitute formal data collection activities requiring an approved QAPP. These two components, however, were critical to the success of data collection activities under the last bullet; the field surveys, which included various field activities (e.g., streamflow measurement) covered by a TSSWCB approved QAPP (TIAER, 2012).

Site Reconnaissance and Site Selection Strategy

The site reconnaissance was conducted prior to performing field survey activities. The reconnaissance had the purpose of collecting background information and selecting appropriate sites for the field survey. To the degree possible, site reconnaissance was coordinated with watershed stakeholders in an effort to increase local landowner interest in water quality issues of the Leona River.

The site selection process took into account locations along the Leona River that were accessible to the public, had the highest potential for recreational use, and had TCEQ monitoring stations where historical data may have been previously collected. The site selection process also considered parks and bridge crossings along the river, as well as access through private lands adjacent to the river. Public access to the Leona River is generally limited to road crossings, parks within the City of Uvalde and the unincorporated community of Batesville, and through the Fort Inge Historical Park located south of Uvalde, which is operated by the Uvalde Historical Commission and open only on weekends and for special events.

Of note, the Leona River is not accessible upstream and downstream even at some public road crossings due to the presence of high game fences. County Road 4440 in assessment unit 01 (AU01) is an example of such a road crossing where high game fences make the Leona inaccessible even though there is a public road crossing. Landowners on either side of CR 4440 were contacted, but permission to access the Leona River via these private properties could not be obtained. Also, while identified on some maps as County Roads, some such roads now have private road designations (e.g., CR 4515 is indicated to cross the Leona River in AU01, but this is now a private road where it crosses the river).

Much of the access along the Leona River is only via private property, the majority of which is held in fairly large land holdings, often bordered by high game fences. Landowners throughout the watershed with river front property were contacted regarding access to the Leona River for potential RUAA sites, and a public meeting was held on January 19, 2012, in Uvalde to discuss the upcoming RUAA and proposed sites. Although several landowners allowed access to their property for the RUAA field surveys, there are several large gaps between stations where access is only via private property and to which landowners have denied or not permitted access.

In order for the number of sites selected to adhere to the guidelines in the May 2009 procedures for performing a RUAA (TCEQ, 2009), wherein it states “In general, choose three (3) sites per every five (5) miles of stream,” it was determined that 34 sites would be sufficient. Map reconnaissance and a ground survey of the study area yielded 15 locations that could provide public access, which were associated with parks or road crossings, and 19 sites accessible only via private property (Table 3-1). The rural nature of much of the watershed and the limited number of road crossings along large stretches of the river made accessibility of the stream challenging. Landowner cooperation was essential in gaining access to much of the Leona River for the RUAA field surveys.

The following information was compiled using Geographic Information System (GIS) based tools prior to, during, and immediately following the site reconnaissance:

- The location of areas along the segment that were accessible to the public and had the highest potential for recreational use (see Figure 3-1);
- The location of wastewater treatment facility outfalls and other potential point sources (see Figure 3-1);
- The hydrologic characteristics, such as stream type, streamflow, hydrologic alterations, etc. (see Figure 3-1, and McFarland and Adams, 2012); and
- The location of proposed sites for data collection following TCEQ guidance (TCEQ, 2009).

On January 19, 2012, TIAER presented a list of proposed RUAA sites to an aggregate of state and local agencies including TCEQ, TSSWCB, NRA, TPWD, City of Uvalde, and others. The final RUAA sites noted in Figure 3-1 and Table 3-1 reflect the results of input received following the meeting. Site selection was also greatly aided by efforts of the NRA in soliciting the cooperating of landowners for this project.

On May 21, 2012, TSSWCB received confirmation that TCEQ staff concur that an adequate number and spatial density of sites was selected to adhere to the RUAA guidelines.

Survey Site Descriptions

The location and general description of each RUAA site is provided in Table 3-1. Specific descriptions of each site are provided in Chapters 4-6 with the presentation of results for each of the three assessment units identified for Segment 2109 of the Leona River.

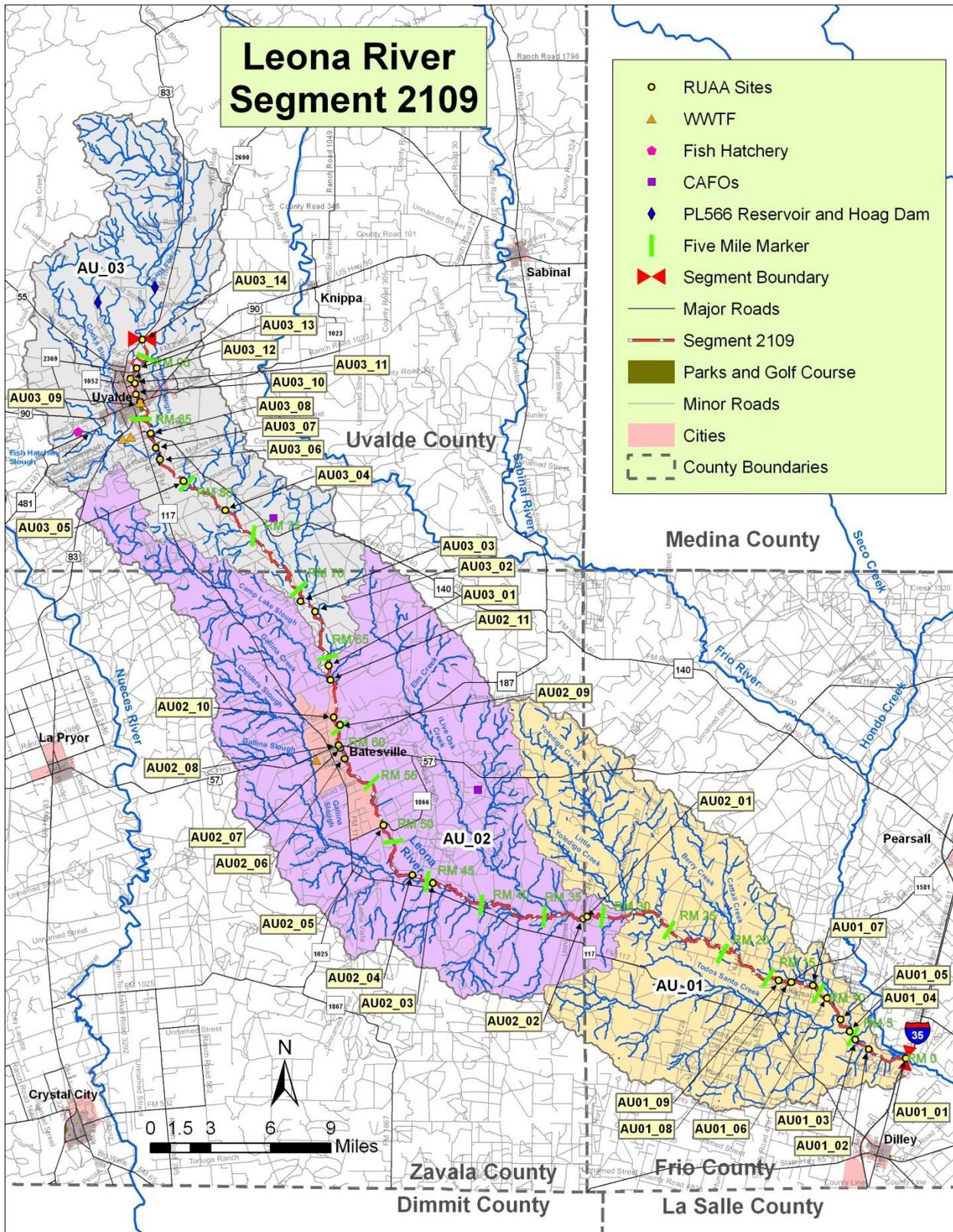


Figure 3-1 Map of Leona River, Segment 2109, RUA survey sites.

Table 3-1 Location and description of RUAA monitoring sites. Sites are listed in downstream to upstream order along the segment.

TCEQ ID (if collocated)	Site ID	Site Description	Latitude (NAD83)	Longitude (NAD83)	Estimated Distance to Previous Station (miles) ^a	Estimated Distance from Upper Segment Boundary (miles) ^a	Estimated Distance from Lower Segment Boundary (miles) ^a	Private or Public Access	Private Access Landowner Approved
---	---	[SEGMENT & AU01 lower boundary at confluence with Frio River]	---	---	---	91.04	0.00	---	---
---	AU01_01	Leona River near the confluence of the Leona River with the Frio River	28.738116	-99.146804	0.11	90.93	0.11	Private	Yes
21044	AU01_02	Leona River about 3.5 river miles above the confluence with the Frio River	28.744411	-99.177144	3.40	87.53	3.51	Private	Yes
---	AU01_03	Leona River about 4.7 river miles above the confluence with the Frio River	28.751352	-99.188358	1.18	86.35	4.69	Private	Yes
---	AU01_04	Leona River about 5.6 river miles above the confluence with the Frio River	28.757464	-99.192778	0.94	85.41	5.63	Private	Yes
---	AU01_05	Leona River below confluence of Todos Santo Creek	28.765985	-99.200515	1.66	83.75	7.29	Private	Yes
---	AU01_06	Leona River about 9.2 river miles above the confluence with the Frio River	28.781534	-99.211765	1.92	81.83	9.21	Private	Yes
---	AU01_07	Leona River about 11 river miles above the confluence with the Frio River	28.790568	-99.223338	1.87	79.96	11.08	Private	Yes
12985	AU01_08	Leona River at FM 1581	28.793011	-99.241125	2.20	77.76	13.28	Public	---
---	AU01_09	Leona River west of FM 1581	28.794222	-99.251737	0.83	76.93	14.11	Private	Yes
---	---	[AU01 upper / AU02 lower boundary at confluence of Yoledigo Creek]	---	---	15.46	61.47	29.57	---	---
12986	AU02_01	Leona River at Loma Vista Road (CR 4757)	28.840500	-99.407627	1.76	59.71	31.33	Public	---

^a Distances were digitally estimated using the measuring tool in ArcGIS 9.3 with the 2010 NAIP 1-m DOQQs and the NHD stream layer as reference guides.

TCEQ ID (if collocated)	Site ID	Site Description	Latitude (NAD83)	Longitude (NAD83)	Estimated Distance to Previous Station (miles) ^a	Estimated Distance from Upper Segment Boundary (miles) ^a	Estimated Distance from Lower Segment Boundary (miles) ^a	Private or Public Access	Private Access Landowner Approved
---	AU02_02	Leona River upstream of the crossing of Loma Vista Road (CR 4757)	28.838630	-99.412623	0.36	59.35	31.69	Private	Yes
---	AU02_03	Leona River about 7 river miles downstream of crossing with FM 1866	28.863979	-99.536055	12.82	46.53	44.51	Private	Yes
---	AU02_04	Leona River below the confluence of Gallina Slough	28.869597	-99.553249	1.86	44.67	46.37	Private	Yes
21064	AU02_05	Leona River on FM 1866 above the confluence of Gallina Slough	28.905851	-99.577419	5.06	39.61	51.43	Public	---
---	AU02_06	Leona River in Batesville off of Ramos Street	28.953705	-99.609648	6.65	32.96	58.08	Private	Yes
---	AU02_07	Leona River within Batesville City Park	28.961607	-99.61863	0.70	32.26	58.78	Public	---
12987	AU02_08	Leona River at US 57 near Batesville	28.963631	-99.614258	0.17	32.09	58.95	Public	---
---	AU02_09	Leona River about 1.3 river miles upstream of the crossing of US 57	28.978310	-99.613280	1.27	30.82	60.22	Private	Yes
---	AU02_10	Leona River near dam in park area off CR 1011	28.983649	-99.618600	0.91	29.91	61.13	Public	---
* ^b	AU02_11	Leona River at low water crossing off CR 1005B; just below confluence of Camp Lake Slough	29.010794	--99.621517	2.51	27.40	63.64	Public	---
---	---	[AU02 upper / AU03 lower boundary at confluence of Camp Lake Slough]	---	---	0.80	27.29	63.75	---	---

^b TCEQ station 21066 is within 300 meters upstream of AU02_11, but the two sites were not considered collocated, because station 21066 is located above the confluence of Camp Lake Slough and the crossing of CR 1005B is below the confluence of Camp Lake Slough. TCEQ station 21066 was not considered as a separate RUAA site, because of the close proximity of RUAA site AU03_01. RUAA site AU03_01 (above the confluence with Camp Lake Slough) is within a mile of this location.

TCEQ ID (if collocated)	Site ID	Site Description	Latitude (NAD83)	Longitude (NAD83)	Estimated Distance to Previous Station (miles) ^a	Estimated Distance from Upper Segment Boundary (miles) ^a	Estimated Distance from Lower Segment Boundary (miles) ^a	Private or Public Access	Private Access Landowner Approved
---	AU03_01	Leona River about 0.9 river miles upstream of CR 1005B (about 0.8 river miles above the confluence of Camp Lake Slough)	29.021247	-99.623040	0.11	26.49	64.55	Private	Yes
---	AU03_02	Leona River about 4.4 river miles upstream of CR 1005B (about 4.3 river miles above the confluence of Camp Lake Slough)	29.060589	-99.634597	3.53	22.96	68.08	Private	Yes
---	AU03_03	Leona River about 5.4 river miles upstream of CR 1005B (about 5.3 river miles above the confluence of Camp Lake Slough)	29.067696	-99.646576	1.00	21.96	69.08	Private	Yes
---	AU03_04	Leona River about 3 river miles downstream of USGS gaging station 08204005	29.133371	-99.709184	8.17	13.79	77.25	Private	Yes
12988	AU03_05	Leona River SE of Uvalde at USGS gaging station 08204005	29.153347	-99.740833	3.09	10.70	80.34	Private	Yes
12989	AU03_06	Leona River at Hoag Dam on Fort Inge, below confluence of Cooks Slough	29.170088	-99.763183	2.00	8.70	82.34	Limited Public ^c	Yes
---	AU03_07	Leona River on Fort Inge above dam and above the confluence with Cooks Slough	29.178120	-99.766815	0.66	8.04	83.00	Limited Public ^c	Yes
12990	AU03_08	Leona River at FM 140	29.188787	-99.770980	1.01	7.03	84.01	Public	---
12992	AU03_09	Leona River at US 90 West in Uvalde	29.211790	-99.779766	2.27	4.76	86.28	Public	---
---	AU03_10	Leona River within Uvalde off Leona St	29.217066	-99.783475	0.43	4.33	86.71	Public	---
---	AU03_11	Leona River within Uvalde off Studer St	29.22523	-99.784254	0.59	3.74	87.30	Public	---

^c Fort Inge is open only on weekends from 8 a.m. to 8 p.m. and on special occasions for public access.

TCEQ ID (if collocated)	Site ID	Site Description	Latitude (NAD83)	Longitude (NAD83)	Estimated Distance to Previous Station (miles) ^a	Estimated Distance from Upper Segment Boundary (miles) ^a	Estimated Distance from Lower Segment Boundary (miles) ^a	Private or Public Access	Private Access Landowner Approved
---	AU03_12	Leona River within Uvalde off Rio St	29.228436	-99.788050	0.47	3.27	87.77	Private	Yes
---	AU03_13	Leona River at crossing of FM 2369	29.235905	-99.782799	0.61	2.66	88.38	Public	---
---	AU03_14	Leona River at US 83 north of Uvalde [SEGMENT & AU03 upper boundary at US 83]	29.256881	-99.778394	2.66	0.00	91.04	Public	---

Field Survey Data Collection Activities

As specified in the procedures for a Comprehensive RUAA (TCEQ, 2009), two separate field surveys occurred, one in May and one in July, during the warm season (air temperature greater than or equal to 70°F or 21°C) when human recreational activities were most likely to occur (March - October). Ideally, field surveys were to be conducted when stream flow conditions were normal. However, due to extended extreme drought conditions, low flow conditions were encountered during the May 2012 survey and in July 2012 many of the stream sites were dry as the drought conditions continued through the summer of 2012. Precipitation records for 30 days prior to each survey are presented in Tables 3-2 and 3-3.

Data collection activities for each of the two field surveys included the following activities at each RUAA site:

- Measurement of instantaneous streamflow,
- Measurement of average depth at thalweg,
- Measurement of depths, lengths, and widths of substantial pools,
- Reporting of observational/anecdotal data required on the RUAA field forms,
- Measurement of air and water temperature, and
- Photographing any signs of recreation and site conditions including upstream, downstream, left bank, and right bank photos at the top, middle, and bottom transects.

Instantaneous Streamflow Measurements

Instantaneous water velocity was measured at each station using the most applicable tool. The collection of velocity measurements under wadeable stream conditions was performed using either a SonTek Flow Tracker™ Acoustic Doppler Velocimeter or a Teledyne RDI StreamPro™ Acoustic Doppler Current Profiler (ADCP). Velocity measurements followed protocols outlined in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment and Tissue* (2008). TIAER personnel used the stream flow measurement form developed by TIAER, which follows standard guidance and provides the information needed for a RUAA (TCEQ, 2008; 2009).

Average Depth at Thalweg and Substantial Pool Depths

Determination of thalweg and substantial pool depths is applicable to contact recreation use determination for intermittent and perennial freshwaters according to TCEQ (2008). The thalweg is defined as the deepest depth of a transect perpendicular to the stream channel.

As instructed in the RUAA procedures manual (TCEQ, 2009), a 300-m reach at each station was evaluated to determine average depth at the thalweg. Eleven transects at 30-m intervals were established in the 300-m stream reach bracketing each station. Each reach surveyed was oriented downstream to up, the 0-m transect was always set as the most downstream and the 300-m transect as the most upstream.

Table 3-2 Rainfall records for the National Weather Service stations near and within the Leona watershed for 30 days prior to the first RUAA survey. (Survey dates are highlighted in gray shades)

RUAA 1st Survey Conducted 22-26 May2012	DERBY 1 S TX US GHCND: USC000412417 (in.)	LA PRYOR TX US GHCND: USC00414920 (in.)	HWY 57 Farm GHCND: US1TXZV0002 (in.)	Pearsall 10.2 NW, TX US GHCND: US1TXFR0001 (in.)	Pearsall 7.9 NNW, TX US, GHCND: US1TXFR0002 (in.)	Crystal City 0.5 ESE, TX US GHCND: US1TXZV0015 (in.)	Uvalde 0.1 WSW, TX US GHCND: US1TXUV0023 (in.)
22-Apr-2012	0	0	0	0	0	0	0
23-Apr-2012	0	0	0	0	0	0	0
24-Apr-2012	0	0	0	0	0	0	0
25-Apr-2012	0	0	0	0	0	0	0
26-Apr-2012	0	0	0	0	0	0	0
27-Apr-2012	0	0	0	0	0	0	0
28-Apr-2012	0	0	0	0	0	0	0
29-Apr-2012	0	0	0	0	0	0	0
30-Apr-2012	0.03	0	0	0	0	0	0
1-May-2012	0.05	0.07	0	0	0	0	0.8
2-May-2012	0	0	0	0	0	0	0
3-May-2012	0	0	0	0	0	0	0
4-May-2012	0	0	0	0	0	0.06	0.07
5-May-2012	0	0	0	0	0	0	0
6-May-2012	0	0	0	0	0	0	0
7-May-2012	0	0	0	0	0	0	0
8-May-2012	0.63	1.42	0	1.15	0.84	0.56	0.25
9-May-2012	1.08	1.13	3.50	1.75	0.95	0.65	1.02
10-May-2012	0	0	0.80	0	0	0.11	0.03
11-May-2012	2.63	1.13	0	1.33	0.65	2.18	0.69
12-May-2012	1.17	0	0	0	0	0	0

RUAA 1st Survey Conducted 22-26 May2012	DERBY 1 S TX US GHCND: USC000412417 (in.)	LA PRYOR TX US GHCND: USC00414920 (in.)	HWY 57 Farm GHCND: US1TXZV0002 (in.)	Pearsall 10.2 NW, TX US GHCND: US1TXFR0001 (in.)	Pearsall 7.9 NNW, TX US, GHCND: US1TXFR0002 (in.)	Crystal City 0.5 ESE, TX US GHCND: US1TXZV0015 (in.)	Uvalde 0.1 WSW, TX US GHCND: US1TXUV0023 (in.)
13-May-2012	0.40	0	0	0	0	0	0
14-May-2012	0	0	0	0	0	0	0.08
15-May-2012	0	0.55	0	0.55	0.75	1.35	0.42
16-May-2012	0	0.08	0	0	0	0.05	0.17
17-May-2012	0	0	0	0	0	0	0
18-May-2012	0	0	0	0	0	0	0
19-May-2012	0	0	0	0	0	0	0
20-May-2012	0	0	0	0	0	0	0
21-May-2012	0	0	0	0	0	0	0
22-May-2012	0	0	0	0	0	0	0
23-May-2012	0	0	0	0	0	0	0
24-May-2012	0	0	0	0	0	0	0
25-May-2012	0	0	0	0	0	0	0
26-May-2012	0	0	0	0	0	0	0

Table 3-3 Rainfall records for the National Weather Service stations near and within the Leona watershed for 30 days prior to the second RUAA survey. (Survey dates are highlighted in gray shades)

RUAA 2nd Survey Conducted 16-21 July 2012	DERBY 1 S TX US GHCND: USC000412417 (in.)	LA PRYOR TX US GHCND: USC00414920 (in.)	HWY 57 Farm GHCND: US1TXZV0002 (in.)	Pearsall 10.2 NW, TX US GHCND: US1TXFR0001 (in.)	Pearsall 7.9 NNW, TX US, GHCND: US1TXFR0002 (in.)	Crystal City 0.5 ESE, TX US GHCND: US1TXZV0015 (in.)	Uvalde 0.1 WSW, TX US GHCND: US1TXUV0023 (in.)
16-Jun-2012	0	0	0	0	0	0	0
17-Jun-2012	0	0	0	0	0	0	0.09
18-Jun-2012	0	0	0	0	0	0	0
19-Jun-2012	0	0	0	0	0	0	0
20-Jun-2012	0	0	0	0	0	0	0
21-Jun-2012	0	0	0	0	0	0	0
22-Jun-2012	0	0	0	0.11	0	0.1	0
23-Jun-2012	0	0	0	0	0	0	0
24-Jun-2012	0	0	0	0	0	0	0
25-Jun-2012	0	0	0	0	0	0	0
26-Jun-2012	0	0	0	0	0	0	0
27-Jun-2012	0	0.10	0	0	0	0	0
28-Jun-2012	0	0	0	0	0	0	0
29-Jun-2012	0	0	0	0	0	0	0.78
30-Jun-2012	0	0	0	0	0	0	0.10
1-Jul-2012	0	0.01	0	0.05	0.28	0	0.34
2-Jul-2012	0.45	0.02	0	0.45	0.12	0	2.44
3-Jul-2012	0	0	0	0	0	0	0.14
4-Jul-2012	0	0	0	0	0	0	0.02
5-Jul-2012	0	0	0	0	0	0	0
6-Jul-2012	0	0	0	0	0	0	0
7-Jul-2012	0	0	0	0	0	0	0
8-Jul-2012	0	0	0	0	0	0	0
9-Jul-2012	0	0	0	0	0	0	0.41
10-Jul-2012	0	0.01	0	0.45	1.04	0	0.24
11-Jul-2012	0	0.96	0	0.64	0.93	0	0

RUAA 2nd Survey Conducted 16-21 July 2012	DERBY 1 S TX US GHCND: USC000412417 (in.)	LA PRYOR TX US GHCND: USC00414920 (in.)	HWY 57 Farm GHCND: US1TXZV0002 (in.)	Pearsall 10.2 NW, TX US GHCND: US1TXFR0001 (in.)	Pearsall 7.9 NNW, TX US, GHCND: US1TXFR0002 (in.)	Crystal City 0.5 ESE, TX US GHCND: US1TXZV0015 (in.)	Uvalde 0.1 WSW, TX US GHCND: US1TXUV0023 (in.)
12-Jul-2012	0	1.23	0	0.05	0.05	0.81	0
13-Jul-2012	0.23	0	0	0	0	0	0
14-Jul-2012	0	0	0	0	0	0	0
15-Jul-2012	0	0	0	1.58	0.08	0	0
16-Jul-2012	0.72	0.56	0	0.49	0.13	0	0
17-Jul-2012	0	0	0	0	0	0	0
18-Jul-2012	0	0	0	0	0	0	0
19-Jul-2012	0	0.13	0.2	0.20	0.23	0.17	0
20-Jul-2012	0	0	0	0	0	0.03	0
21-Jul-2012	0	0	0	0	0	0	0

Determination of the thalweg in both wadeable and non-wadeable streams was determined as described in the RUAA Procedures (TCEQ, 2009), Section E – Item 1 Wadeable Streams and Item 2 Non-wadeable Streams.

Measuring each transect was accomplished, where wadeable, using a surveyor's rod to measure depth. At some locations, where water depth did not allow wading, or submerged obstructions created unsafe situations, a depth of greater than (>) the deepest measurable depth was reported.

Observational /Anecdotal Data

Anecdotal information was recorded on field data sheets during all surveys using the field data sheets from the TSSWCB-approved QAPP.

Types of observational and anecdotal records included, but were not limited to, the following:

- channel flow status,
- stream type (e.g., ephemeral, intermittent, etc.),
- streamflow,
- general weather conditions (cloud cover/rain), including 30-day conditions and antecedent rainfall record,
- substrate type,
- accessibility, and
- anecdotal information related to observed human contact activities.

Air and Water Temperature Measurements

Water temperature, in degrees Celsius (°C), was measured using a 600 XLM YSI multiprobe and a 650 MDS data logger. Air temperature was measured by a handheld thermometer in °C. Both instruments were checked against a NTIS certified thermometer on a routine basis.

Photographs

TIAER staff created photographic records of each site during the site surveys. Photographs included an upstream view, left and right bank views, downstream view (as described in the Field Data Sheets), and any evidence of observed uses or indications of human use, hydrologic modifications, etc. Photographs were intended to clearly depict the entire channel and were taken specifically at the top, middle, and bottom transects for the reach. Any items of interest, e.g., obstructions, were also photographed. Photographs were used to document evidence of recreational use (e.g., fishing tackle) and actual recreation. Photographs were also used to document a lack of use (e.g., dry creek beds) or impediments to recreational use. In addition as part of the overall project, photographs were also taken to indicate potential bacteria sources to the waterbody. All photographs were cataloged in a manner that indicates the site location, date, view orientation, and what is being shown and are provided electronically on the project website <http://www.leonariver.org/>. Selected photos representative of each site are provided as photogroups associated with Chapters 4, 5, and 6, which contain the results for each of the three AUs along Segment 2109.

CHAPTER 4

ASSESSMENT UNIT 2109_01

Assessment Unit Characterization

The Leona River AU 2109_01 stretches about 30 miles from the downstream end of the segment at the confluence with the Frio River to the confluence with Yolidigo Creek (Figure 4-1). AU 2109_01 is located in Frio and Zavala Counties and nine sites were evaluated in AU 2109_01 for the RUAA field surveys. Reconnaissance of this section of the river yielded only two public road crossings, one at CR 4440 and the other at Farm to Market Road 1581. The one on CR 4440 lacked sufficient distance (300 m) of public right-of-way to perform an RUAA field survey. High game fences were present on both sides of CR 4440 and while landowners on both sides of the road were contacted, access to these private properties was denied. Another road, CR 4515, appeared to cross the Leona River, but at this location, CR 4515 is now a private road. With assistance from the NRA, TIAER was able to gain landowner cooperation to secure a RUAA site at this private road crossing as well as seven other sites, which had access only via private lands. The ninth site was the public road crossing at FM 1581.

The landscape of AU 2109_01 is dominated by thorny brush including mesquite, blackbrush, and Acacia. The riparian zone is largely forested with live oak, hackberry, and elm. Large, multi-acre ranches comprise most of the lands adjacent to the Leona along the entire length of AU01. The stream in AU 2109_01 is natural in appearance with fairly steep banks at most locations with dense riparian vegetation. The dominant substrate at each site visited was mud and clay, although in areas sand or cobble was encountered. Wading within the stream was often challenging due to fallen branches and logs that were difficult to see through murky water. Even when dry, piles of fallen trees and branches were obstructions that had to be carefully traversed.

As discussed in Chapter 2, there are no permitted outfalls within AU 2109_01.

Additional Information

The review of historical information and climatic conditions are found in Chapter 2. Precipitation conditions prior to each survey are presented in Tables 3-2 and 3-3.

Survey Site Descriptions

Nine sampling sites were located in AU 2109_01 (Figure 4-1). Although 17 sampling sites were sought, only three landowners were willing to offer access through their properties. One site was chosen at a public road crossing that did not require permission for access to the river. Several large ranches that border the Leona River in this AU were approached about the RUAA survey, but opted not to participate. These eight privately controlled sites were selected to provide physical characterization of the Leona River in areas between public access points. Entrances to sites on private lands were limited by fences and locked gates and were often several meters to kilometers from the stream. The site located at the public crossing provided easy access to the stream. RUAA surveys were performed in May and July of 2012 at these locations. A brief description of each site follows.

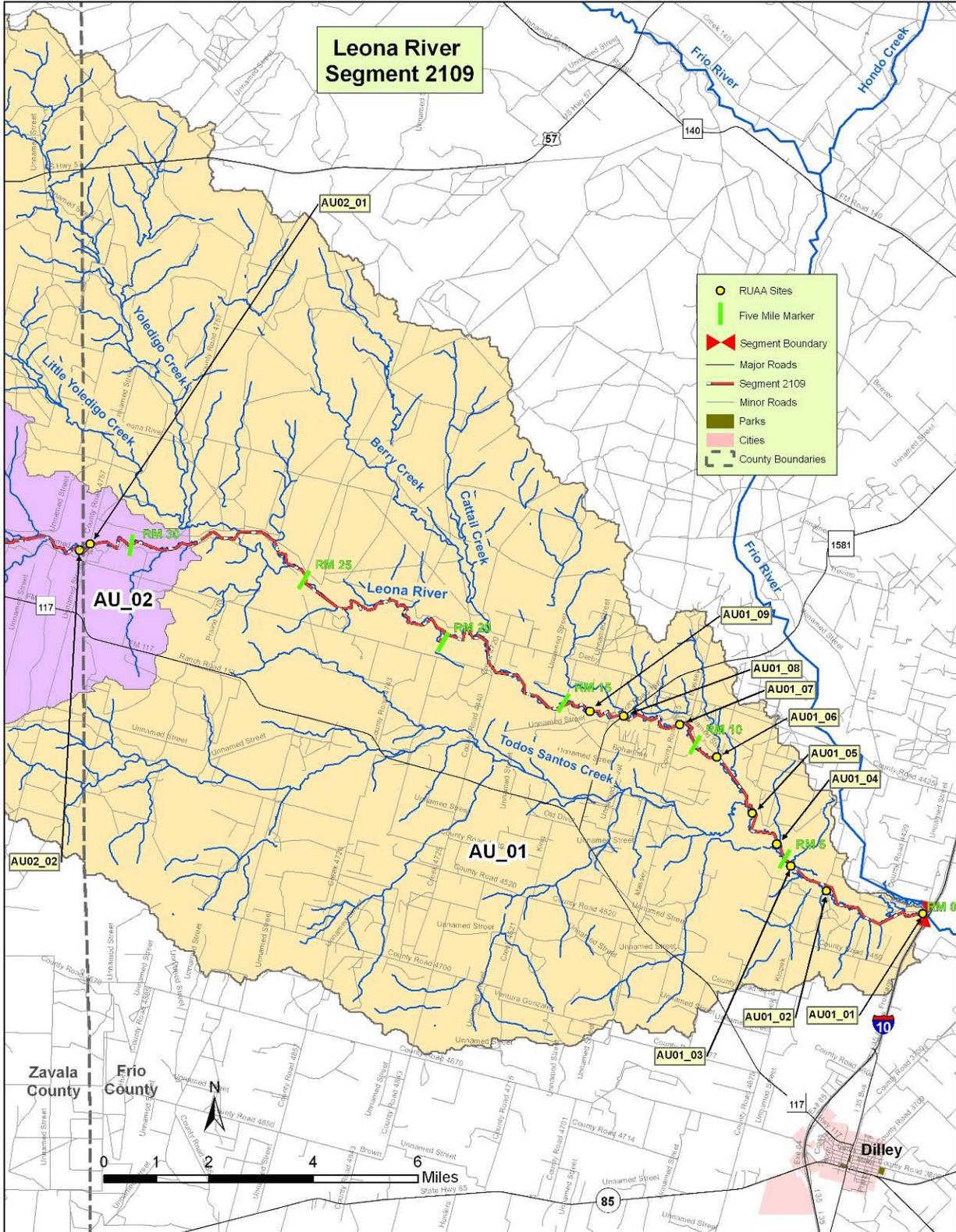


Figure 4-1 Leona River AU 2109_01 showing RUA sites

TIAER Site AU01_01 is located near the confluence of the Leona River with the Frio River in Frio County. This property was only accessible via a locked gate and entry required landowner permission. This site was selected because of local landowner cooperation and information from the site would aid in characterization of AU 2109_01.

TIAER Site AU01_02 (TCEQ Station 21044) is located on the Leona River approximately 3.5 river miles above its confluence with the Frio River in Frio County. This property was only accessible via a locked gate and entry required landowner permission. This site was selected because of local landowner cooperation and information from the site would aid in characterization of AU 2109_01.

TIAER Site AU01_03 is located on the Leona River approximately 4.7 river miles above its confluence with the Frio River in Frio County. This property was only accessible through private lands via a locked gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

TIAER Site AU01_04 is located on the Leona River approximately 5.6 river miles above its confluence with the Frio River in Frio County. This property was only accessible through private lands via a locked gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

TIAER Site AU1_05 is located on the Leona River below the confluence of Todos Santos Creek in Frio County. This property was only accessible through private lands via a locked gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

TIAER Site AU01_06 is located on the Leona River approximately 9.2 river miles above its confluence with the Frio River in Frio County. This property was only accessible through private lands via a locked gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

TIAER Site AU01_07 is located on the Leona River approximately 11 river miles above its confluence with the Frio River in Frio County. County Road 4514 formerly crossed the river, but is now a private road at this location. This property was only accessible through private lands via a locked gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

TIAER Site AU01_08 (TCEQ Station 12985) is located on the Leona River at Farm to Market Road 1581 in Frio County. This site is accessible from a bridge and was selected because of the public accessibility from the bridge to the river.

TIAER Site AU01_09 is located on the Leona River approximately 0.8 miles west of site AU01_08 in Frio County. This property was only accessible through private lands via a locked

gate and entry required landowner permission. This site was selected because of landowner cooperation and the site provided opportunity for characterization of AU 2109_01.

Results and Discussions

General Description of Stream and Survey Sites AU2109_01

The RUAA surveys for AU 2109_01 were conducted on May 22-26 and July 17-21, 2012. The surveys and associated interviews were performed on weekdays, weekends, or holidays, at opportune times to observe recreational activities in and around AU 2109_01 of the Leona River. In addition to site survey visits, sites that could afford public access were visited and photographed to catalogue recreational activity, or the lack of, during morning or afternoon of weekend hours.

Surveys conducted in AU 2109_01 were conducted during varying air and water temperatures as show in Table 4-1. Air temperatures during both surveys were above 21°C (70°C) indicated by the RUAA guidance as warm enough to promote recreational activities.

Table 4-2 indicates the appearance of the stream channel and corridor at each site.

Table 4-3 shows the average thalweg depth for each site during each RUAA survey and an average for the AU. Access (public or private) to each site and level of effort to access the stream from the bank at each site is also provided in Table 4-3.

Table 4-4 shows the maximum, minimum, and average widths at each site for each survey. The observed flow and total discharge is also listed in this table for each site per survey. Stream aesthetics and wildlife observations are reported in Table 4-5 for each site and survey. In general, the majority of observed tracks and fecal droppings reported in Table 4-5 were wildlife in origin. Feral hog feces were the dominant dropping observed at all sites. Tracks included feral hogs, raccoon, deer, and rarely birds. Observed trash was predominantly small plastics. No evidence of major dumping was observed. Trash at most locations was rarely observed, and when observed appeared to have washed in during high flow periods.

Physical Description of Site AU01_01

The Leona River at Site AU01_01 was visited on May 23 and July 18, 2012. This site was accessible off of Interstate Highway 35 north of Dilley, Texas in Frio County only through private lands that were enclosed by a high game fence and locked. Access was granted from the landowner and TIAER personnel walked approximately 100 meters from the gate to access this site on the Leona River. Access was achieved by traversing the bank at a pipe culvert low water crossing. The substrate was primarily mud/clay and riparian vegetation comprised of forest (Table 4-2). Photogroup 4-1 depicts access and the general appearance of the stream at this site for each trip.

Table 4-1 Temperatures measured at each site along AU 2109_01.

Site Number	May 22 -26, 2012		July 17 - 21, 2012	
	Air Temp (°C)	Water Temp (°C)	Air Temp (°C)	Water Temp (°C)
AU01_01	28.3	26.2	29.4	No Water
AU01_02	31.1	28.8	30.0	No Water
AU01_03	32.2	28.2	30.0	27.0
AU01_04	28.9	25.1	30.0	No Water
AU01_05	29.4	No Water	30.0	No Water
AU01_06	37.2	No Water	26.7	No Water
AU01_07	39.4	No Water	27.2	No Water
AU01_08	37.0	No Water	27.2	No Water
AU01_09	37.2	No Water	29.4	No Water

Table 4-2 Stream Channel and corridor appearance for each site sampled along AU 2109_01.

Site Number	Streambank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings
AU01_01	Right	Natural	Mud/Clay	Forest	Large	No	Native
	Left				Large		Native
AU01_02	Right	Natural	Mud/Clay	Shrub with herbaceous marsh	Large	No	Native
	Left				Large		Native
AU01_03	Right	Natural	Mud/Clay	Shrubs	Large	No	Native
	Left				Large		Native
AU01_04	Right	Natural	Mud/Clay	Shrubs	Large	No	Native
	Left				Large		Native
AU01_05	Right	Natural	Mud/Clay	Forest	Large	No	Native
	Left				Large		Native
AU01_06	Right	Natural	Sand	Forest	Large	No	Native
	Left				Large		Native
AU01_07	Right	Natural	Cobble	Forest	Large	No	Native
	Left				Large		Native
AU01_08	Right	Natural	Mud/Clay	Forest	Large	No	Native
	Left				Large		Native
AU01_09	Right	Natural	Cobble	Forest	Large	No	Native
	Left				Large		Native

Table 4-3 Thalweg depth, stream flow type, and site accessibility during the two surveys of AU2109_01 . Stream flow type represents TCEQ descriptions (TCEQ, 2010b).

Assessment Unit (AU)	Length (miles)	# of Sites	# of Recreational Areas in AU	Avg. Thalweg Depth (m) for Assessment Unit		Stream Flow Type	General Access	Bank Access
				22 – 26 May 2012	17 – 21 July 2012			
AU 2109_01	29.6	9	0	0.21	0.01	Perennial	—	—
Site	Segment length (m)	# of Transects	# of Recreational Areas at Site	Avg. Thalweg Depth (m) by Site		Stream Flow Type	General Access	Bank Access
				22 – 26 May 2012	17 – 21 July 2012			
AU01_01	300	11	0	0.57	0.00	Perennial	Private	ME
AU01_02	300	11	0	0.23	0.00		Private	E
AU01_03	300	11	0	0.67	0.06		Private	E
AU01_04	300	11	0	0.38	0.00		Private	MD
AU01_05	300	11	0	0.00	0.00		Private	ME
AU01_06	300	11	0	0.00	0.00		Private	MD
AU01_07	300	11	0	0.00	0.00		Private	MD
AU01_08	300	11	0	0.00	0.00		Public	E
AU01_09	300	11	0	0.00	0.00		Private	MD

E = Easy, ME = Moderately Easy, MD = Moderately Difficult, D = Difficult

Table 4-4 Description of surveyed stream sites along AU 2109_01

Assessment Unit	Date	Site Number	Maximum width (m)	Minimum width (m)	Average Width (m)	Total Discharge (cfs)	Observed Flow
2109 AU_01	May 22 - 26, 2012	AU01_01	12.2	1.1	9.4	0	No Flow
		AU01_02	103	0.39	4.2	<0.1	Low
		AU01_03	13.2	9.4	11.2	0	No Flow
		AU01_04	9	3.5	6	0	No Flow
		AU01_05	0	0	0	0	Dry
		AU01_06	0	0	0	0	Dry
		AU01_07	0	0	0	0	Dry
		AU01_08	0	0	0	0	Dry
		AU01_09	0	0	0	0	Dry
	July 17 – 21, 2012	AU01_01	0	0	0	0	Dry
		AU01_02	0	0	0	0	Dry
		AU01_03	4	0	3	0	No Flow
		AU01_04	0	0	0	0	Dry
		AU01_05	0	0	0	0	Dry
		AU01_06	0	0	0	0	Dry
		AU01_07	0	0	0	0	Dry
		AU01_08	0	0	0	0	Dry
		AU01_09	0	0	0	0	Dry

Table 4-5 Stream aesthetics and wildlife observations along AU 2109_01. (From Field Data Sheet – Sect. F)

Station	Survey Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
AU01_01	23 May 2012	C	R	N	Brown	Fine sediments	Clear	SP snakes	N	N	tracks/fecal	R	R	R
	18 July 2012	A	A	N	No Water	No Water	No Water	SP snakes	N	N	tracks	R	R	N
AU01_02	23 May 2012	Ab	E	N	Brown	Fine sediments	Scum	SP snakes	N	N	tracks/fecal	R	R	N
	18 July 2012	A	A	N	No Water	No water	No Water	SP snakes	N	N	N	R	R	N
AU01_03	23 May 2012	Ab	R	N	Brown	Fine sediments	Scum	N	SP	N	tracks/fecal	N	N	N
	18 July 2012	A	C	N	Black	Sludge	Not reported	SP snakes	N	N	tracks/fecal	N	N	N
AU01_04	23 May 2012	A	A	N	Black	Fine sediments	Clear	N	N	MP hogs	tracks/fecal	N	N	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
AU01_05	23 May 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
AU01_06	23 May 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	R	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	C	N

Station	Survey Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
AU01_07	23 May 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	R	C	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	C	N
AU01_08	23 May 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	R	R	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	R	R	N
AU01_09	23 May 2012	A	A	N	No Water	No Water	No Water	SP snakes	N	SP	tracks	N	N	N
	18 July 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	N	N

A = absent, R = rare, C = common, Ab = abundant, N = none, SP = slight presence, MP = moderate presence, LP = large presence

Site AU1_01 was wadeable for the entire 300-m reach length. During the May 23 survey, depth measurements were collected at each 30-m transect. Wading was made difficult by the presence of obstructions and fallen branches and logs, which were difficult to see through the murky water. A fishing bobber was observed during the first survey, but appeared to have washed in from upstream. During the July 18 survey, the stream was dry. Photogroup 4-2 depicts wading in the stream during the first survey and streambank access during both surveys.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Photogroup 4-3 illustrates the water color, general appearance and clarity of the water surface during the first survey and the dry streambed and obstructions during the second survey at Site AU01_01.

Physical Description of Site AU01_02

The Leona River at Site AU01_02 was visited on May 23 and July 18, 2012. This site was accessible from a private gate off of County Road 4450 north of Dilley, Texas in Frio County. The landowner of Site AU01_01 is also the landowner of sites AU01_02 through AU01_05 and allowed TIAER personnel access to these stream locations. Site AU01_02 was located 1.2 miles from the locked entrance gate. TIAER personnel drove through additional gates along pasture roads to reach the site. Once at the site, access to the stream was easy due to the presence of a concrete box culvert located at the 270-m transect of the survey reach. The upper 30 meters of the reach contained a large playa and was not truly representative of the entire reach. TIAER personnel surveyed only 30 meters of the playa and worked downstream in the more defined channel. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-4 depicts the culvert used for access and typical setting of Site AU01_02.

During both surveys, Site AU01_02 was wadeable for the entire length of the reach, although water was only observed during the survey on May 23, 2012. Several obstructions, primarily log jams with one rock obstruction, were encountered throughout the reach along as well as dense vegetation. Photogroup 4-5 depicts obstructions and the density of vegetation in the stream channel at AU01_02.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Photogroup 4-6 depicts water color and clarity of surface as encountered in May 2012.

Physical Description of Site AU01_03

The Leona River at Site AU01_03 was monitored on May 23 and July 18, 2012. This station, like station AU01_02, was accessible only through private land that was high game fenced, gated and locked north of Dilley, Texas in Frio County. At the river, access to the water is easy due to low banks at several locations along the reach. The entry point became the 150-m transect, and measurements were conducted 150-m upstream and 150-m downstream of this location. Table 4-2 describes the stream channel and riparian zone

appearance of this site. Photogroup 4-7 depicts the access and general appearance of the stream during both surveys.

The surveyed reach at Site AU01_03 was wadeable for the entire 300-m and water was present the entire length during the survey on May 23, 2012. Water was only present in the lower half of the reach during the survey on July 18, 2012. Although entry into the stream was easy, navigating the stream was treacherous due to the number of logs and branches along the bottom of the stream. Several obstructions were observed throughout the reach. Photogroup 4-8 depicts the obstructions encountered during both surveys as well as dense vegetation along the banks of the stream.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Photogroup 4-9 illustrates the water color and surface clarity of the water at AU01_03 during both surveys.

Physical Description of Site AU01_04

The Leona River at Site AU01_04 was surveyed on May 23 and July 18, 2012. This station, like stations AU01_01, AU01_02 and AU01_03, was accessible only through private land that was high game fenced, gated and locked north of Dilley, Texas in Frio County. The site was located more than 1.2 miles behind the locked gate through several gates along pasture roads. At this location, the stream is fenced off with a barbed wire fence, which TIAER personnel had to cross, and then traverse a steep slope with dense vegetation to reach the stream. As at Site AU01_03, the entry point became the 150-m transect and measurements were conducted 150 m upstream and 150 m downstream of this location. There was no other sign of any access point to the river along the remainder of the 300-m reach. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-10 depicts the access and general appearance of the stream at Site AU01_04.

Site AU01_04 was waded, but not easily wadeable, for the entire 300-m reach during the May 23 survey. During the July 18 survey the stream was dry, but traversing the dry streambed was just as challenging due to the dense vegetation and fallen logs. Obstructions were encountered during both surveys comprised of log jams. Photogroup 4-11 depicts obstructions and dense vegetation observed during both surveys at Site AU01_04.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Photogroup 4-12 depicts water color and clarity of the surface during the May 23 survey.

Physical Description of Site AU01_05

The Leona River at Site AU01_05 was monitored on May 23 and July 18, 2012. This station, like stations AU01_01, AU01_02, AU01_03 and AU01_04, was accessible only through private land that was high game fenced, gated and locked north of Dilley, Texas

in Frio County. The site was located more than 1.2 miles behind the locked gate through several gates along pasture roads. At this location, like station AU01_04, the stream is fenced off with a barbed wire fence that TIAER personnel had to cross. The banks of the stream were steep, but due to a lack of vegetation, access to the stream was moderately easy. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-13 depicts the steep banks, access and general appearance of the stream.

The surveyed reach at Site AU01_05 was walked without the presence of water on both the May 23 and July 18 surveys. The substrate was dried mud and clay, which made for moderately easy walking when vegetation was not too dense. Fallen trees and piles of fallen branches were encountered during both of the surveys as obstructions. Photogroup 4-14 depicts obstructions and stream vegetation at Site AU01_05.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU01_06

The Leona River at Site AU01_06 was monitored on May 23 and July 18, 2012. This site, located in Frio County, was accessible only through private lands that were fenced, gated, and locked. Access from County Road 4515 is gated and locked and once on the property, one must drive approximately one mile along a pasture road to get to the site. Once at the access point, the bank exhibited dense vegetation, but was not very steep. The entry point became the 150-m transect, and measurements were conducted 150 meters upstream and downstream of this location. A bridge was located near the 0-m transect that had an old, handmade deer feeder hanging from underneath, but there were no other signs of any utilization of the stream, i.e., footpaths or remnants of fishing. Table 4-2 describes the stream channel and riparian zone appearance of this site. During both surveys, Site AU01_06 was dry. Photogroup 4-15 depicts the general appearance of the stream channel during both surveys.

Site AU01_06 was traversable for its entire 300-m length during both surveys, although a few obstructions were encountered during both surveys at various points along the reach. Photogroup 4-16 depicts obstructions and the bridge with hanging deer feeder encountered at Site AU01_06.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU01_07

The Leona River at Site AU01_07 was surveyed on May 23 and July 18, 2012. AU01_07 is owned by the same landowner as Site AU01_06 in Frio County and was accessible only through private lands that were fenced, gated, and locked. Access from

County Road 4515 is gated and locked, and with landowner permission, TIAER personnel drove approximately one-half mile along a pasture road to reach the site. This site was at one time a County Road, which crossed the Leona River, but the County Road had been closed down due to a drowning that had occurred at the site some time prior to our survey, according to the landowner. In interviews, it was confirmed that a drowning had occurred in the mid-1980s. The closed low water crossing at the site allowed for the only easy access point into the stream and became the 300-m transect as TIAER personnel worked downstream from this point. The banks were moderately steep and dense vegetation hampered access to the bank at most locations. There were no signs of any utilization of the stream, i.e. footpaths or remnants of fishing, in this reach. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-17 depicts bank access and general appearance of stream at AU01_07.

The surveyed reach at Site AU01_07 was wadeable for the entire 300-m reach during both surveys due to the lack of water. The cobble bottom was sufficiently firm as to not impede walking, although dense vegetation was periodically encountered in the stream channel. During both surveys, obstructions were encountered as was small garbage consisting of bottles, cans, and tires. Photogroup 4-18 depicts the cobble bottom of the stream, obstructions, and trash encountered at Site AU01_07.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU01_08

The Leona River at Site AU01_08 was visited on May 23 and July 18, 2012. Access is possible from the Farm to Market Road 1581 bridge crossing just north of Divot, Texas in Frio County. Access to the river was gained by stepping over the bridge railing and traversing the steep concrete apron of the bridge. The bridge location became the 300-m transect with TIAER personnel surveying 300 meters downstream of this location. There were no signs of footpaths or any other human activities for the entire length of the 300-m reach. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-19 depicts a view from underneath the FM 1581 bridge and the general appearance of the river at Site AU01_08.

The surveyed reach at Site AU01_08 was dry the entire 300-meter length during both the May 23 and July 18 surveys. Walking the mud/clay bottom of the stream was easy due to the lack of water during both surveys. Dense vegetation was encountered at a few locations along the reach as were stream obstructions of fallen trees and piles of branches. Other than a fishing bobber observed at one of the obstructions, there were no signs of any utilization of the stream in this reach. The fishing bobber was believed to have washed in from upstream. Photogroup 4-20 depicts dense vegetation, obstructions encountered and the fishing bobber at Site AU01_08.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey

Physical Description of Site AU01_09

The Leona River at Site AU01_09 was visited on May 23 and July 18, 2012. This site, located in Frio County, was accessible only through private lands that were fenced, gated, and locked. Access from Farm to Market Road 1581 is gated and locked, and once on the property, one must drive approximately one mile along a pasture road to get to the site. There were no signs of footpaths or any other human activities for the entire length of the 300-m reach. While crossing the property to the site location, a potential camping site with the startings of a dock were observed that were below the surveyed reach. The landowner stated that construction had started several years earlier, but he had never completed the project due to unforeseen family problems. Table 4-2 describes the stream channel and riparian zone appearance of this site. Photogroup 4-21 depicts the general appearance of the river at Site AU01_09.

The surveyed reach at Site AU01_09 was dry during both the May 23 and July 18 surveys. The lack of water and dense vegetation along with cobble substrate for the channel bottom made walking the stream fairly easy for the entire 300 meters. Other than the entry point at the 0-m transect and the left bank near the 150-m transect, steep banks made access to the stream moderately difficult. There were no obstructions encountered during either of the surveys and no trash in the stream or along the banks was observed.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 4-3, 4-4, and 4-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Activities: Observed and Interviewed

During the RUAA surveys conducted on May 23 and July 18, 2012, field personnel visited the sites during times and days when recreational activities were apt to be observed. Interviews and observations at privately owned sites were conducted with landowners generally after the field surveys were completed. For the publicly accessible site, it was visited additionally during the weekend in an attempt to observe recreational activities, but none were seen and no people were encountered.

Evidence of wildlife activity was observed at all nine sites during both surveys. Evidence included the observance of fecal droppings and tracks, with a few sightings of deer and feral hogs. In addition, several hog wallows were observed while conducting the surveys. Photogroup 4-22 depicts some of the evidence of wildlife observed during the two surveys.

All but one of the selected sites was on private properties with controlled, limited access. No water-related activities, either primary or secondary, were observed on either survey. With the exception of the fishing bobbers observed at sites AU01_01 and AU01_08, no

other evidence of secondary contact recreation was recorded. Photogroup 4-23 shows the two observations of fishing bobbers.

Interviews performed in AU 2109_01 were conducted with landowners who cooperated with TIAER personnel in providing access to selected sites. Additionally, landowners within the watershed who did not have land bordering the Leona River or chose not to participate by allowing access, generally provided interviews when given the opportunity.

The property owner at Sites AU01_01, AU01_02, AU01_03, AU01_04, and AU01_05 stated that currently hunting was the only type of recreation in the river due to the lack of water. However, when water was present in the 1970's and 1980's, family members and occasionally ranch guests would fish, but not very often. He further stated that any form of boating along the river would be a waste of time due to all of the obstructions in the stream.

The landowner for Sites AU01_06 and AU01_07 indicated that several years ago, 1980's and 1990's, he and his family would go to the low water crossing at AU01_07 and wade in the water. Typically, there was only water present for a few days after a rainfall event, but family would take advantage of the flowing water and wade in the stream and sometimes fish. Currently, the river is dry and has not flowed in years and is only used for hunting purposes. A separate interview of the landowner's daughter confirmed all that her father had stated.

The landowner at Site AU01_09 stated that he and his family frequently recreated in the stream. Forms of recreation included wading, swimming, fishing, and boating. His family had three tracts of land adjoining one another, and they would put a small boat in on the upper property and float down the river to his property. He had even started building a dock along the stream near his hunting cabin, while the river was dry, but problems had arisen and construction of the dock had been halted.

A landowner located along the Leona River at the County Road 4440 bridge crossing chose not to allow TIAER personnel access to his property, but did provide information for an interview. He stated that hunting was the only form of recreation that he or his family did along the river. He had observed people sometimes fishing near the bridge crossing on County Road 4440, but he would ask them to leave since they would typically be on his property. He also stated that he observed persons fishing at the Site AU01_08 bridge crossing on FM 1581, although it was very infrequent.

Another landowner located between sites AU01_05 and AU01_06 provided information stating that when water was present, his family would wade and swim in the Leona River along his property. He further stated that fishing and hunting also occurred. It had been probably over ten years since any recreation had occurred.

Another person, from the Pearsall area, stated that when she was young, in the 1970's and early 1980's, she would go swimming and wading in the water at Site AU01_07. That was when it was a publicly accessible location. According to her, many people would

recreate at this location, and it was a popular site for younger school aged kids. In either 1984 or 1985, a young boy drown in the pipe culverts at the road crossing and the road was subsequently closed. The landowner of Site AU01_07 stated the same story, but was unsure of the exact year when this drowning occurred.

Copies of all of interviews conducted along Leona River AU 2109_01 are available electronically and provided on the project website (<http://www.leonariver.org/>).

Summary

RUAA surveys were conducted at nine sites in Assessment Unit 2109_01 on May 23, and July 18, 2012. Copies of all field data sheets and transect pictures from each survey are provided electronically on the project website, <http://www.leonariver.org/>.

The Leona River in AU2109_01 flows primarily through privately owned properties of substantial acreages. Public access is limited to two road crossings (CR 4440 and FM 1581), and the right-of-way on CR 4440 was very limited due to high game fences on either side. Fences, locked gates, steep banks, and dense vegetation all combine to limit access to the river in this segment. In the channel, fallen trees and log piles were often encountered obstructions. No aquatic recreational activities were observed by TIAER field staff during the surveys, with the exception of two fishing bobbers observed at sites AU01_01 and Site AU01_08. The bobbers were suspected to have washed in from upstream, but with the reports of fishing from the interviews, it is possible that they did not wash in from upstream. The individuals interviewed in AU 2109_01 were all property owners within the Leona River watershed, most with land directly along the river. Fishing and hunting occur throughout the watershed while swimming, wading, and boating were generally more site specific. All of the persons interviewed stated that it had been years since any form of recreation had occurred due to the lack of water. These activities are summarized in Table 4-6 and Figure 4-2.

Table 4-6 Summary of recreational activities noted in interviews for AU 2109_01. Activities are listed as the number of times personal use, observed use, or heard of use was documented from interviews for a given location or the whole assessment unit. No recreational activities were observed during field surveys or site visits.

Site name	Swim	Wade		Hunt	Fish	Boat , Canoe, Kayak
		Adult	Children			
AU01_01				1, 1, 1	1, 1, 1	
AU01_02				1, 1, 1	1, 1, 1	
AU01_03				1, 1, 1	1, 1, 1	
AU01_04				1, 1, 1	1, 1, 1	
AU01_05				1, 1, 1	1, 1, 1	
AU01_06						
AU01_07	2, 2, 0	2, 1, 0	2, 1, 0	1, 0, 0	2, 2, 0	0, 0, 1
AU01_08						
AU01_09	1, 0, 0	1, 0, 0	1, 0, 0		1, 0, 0	1, 0, 0
General AU	1, 0, 1	1, 0, 1	1, 0, 1	1, 0, 1	1, 2, 1	
Totals	4, 2, 1	4, 1, 1	4, 1, 1	7, 5, 6	9, 9, 6	1, 0, 1

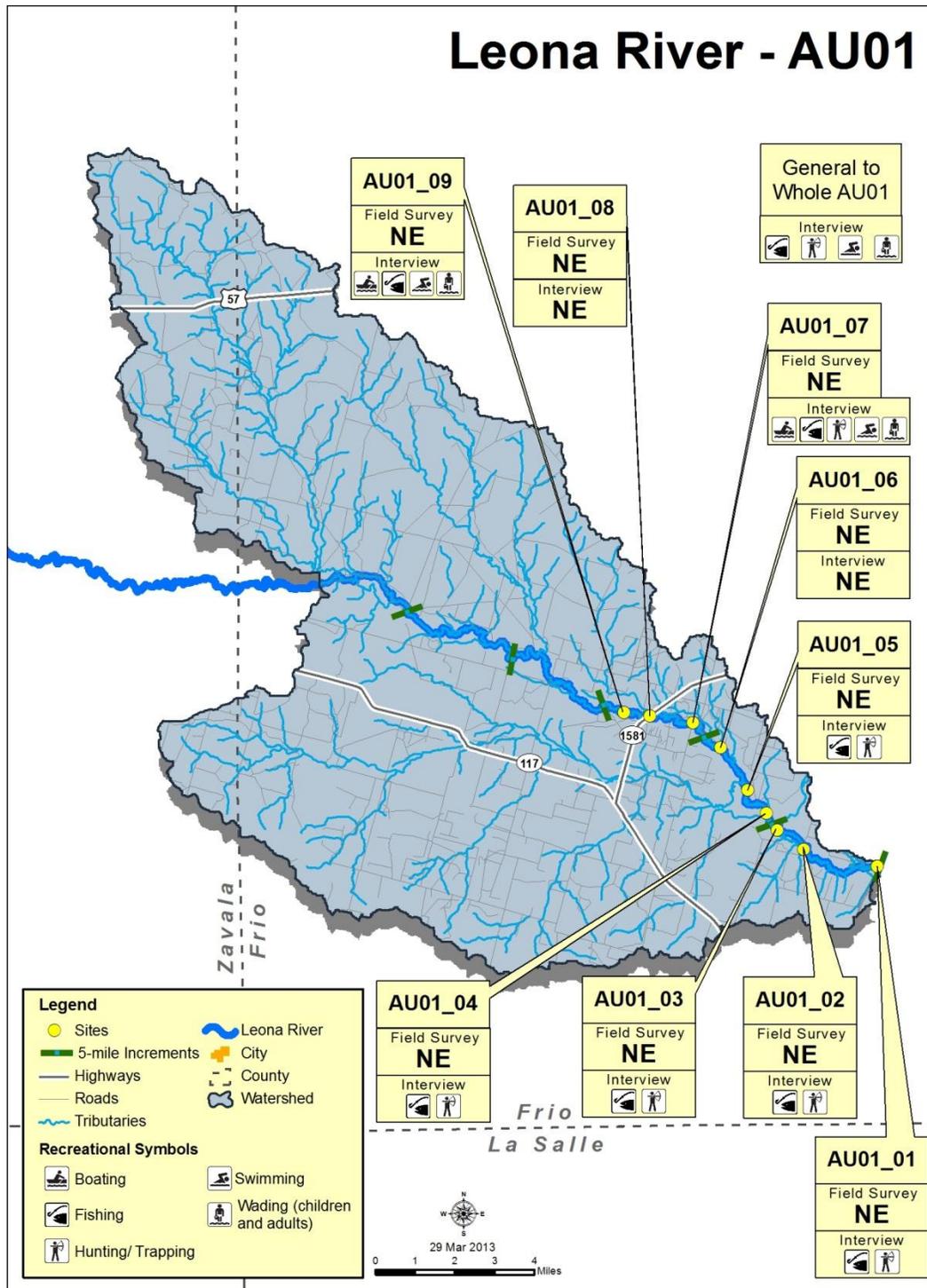


Figure 4-2 Summary of activities from field surveys and interviews in AU 2109_01. NE indicates not encountered.

CHAPTER 5

ASSESSMENT UNIT 2109_02

Assessment Unit Characterization

AU 2109_02 of the Leona River runs about 34 miles from the confluence with Yolidigo Creek upstream to the confluence with Camp Lake Slough (Figure 5-1). AU 2109_02 crosses portions of Frio and Zavala Counties. Reconnaissance of this section of the river yielded six publicly accessible locations. With assistance from the NRA, TIAER was able to gain landowner cooperation, as needed, at all six of the public sites and five additional sites that had private access only.

The area around the lower end of the AU is similar in land cover to the watershed of AU2109_01 with native rangeland dominated by thorny brush species covering much of the landscape. Towards Batesville, Texas, cropland and improved pasture are more common with large areas of irrigated farmland. As in AU 2109_01, most of the property along the river is controlled by large ranch properties; many owned by absentee landowners. Similar to AU 2109_01, access to the river through some of these properties was denied. The river within AU 2109_02 is natural in appearance with shrubs and trees along its corridor. Mud/Clay is the dominant substrate though in a few areas bedrock was encountered. The river was moderately easy to access along the lower portion of this AU, but difficult in locations due to very steep banks and large piles of debris comprised of fallen trees and branches.

No permitted facilities directly discharge into the Leona River within AU 2109_02 (see Figure 5-1). There is one WWTF, the Batesville WSC, which discharges into Gallina Slough, a major tributary of the Leona River. There is also one CAFO within the subwatershed of Liveoak Creek.

Additional information on land use and permitted facilities with AU 2109_02 has been previously presented in Chapter 2. Precipitation conditions prior to each survey are presented in Tables 3-2 and 3-3.

Additional Information

The review of historical information and climatic conditions are found in Chapter 2.

Survey Site Descriptions

Twenty sites were sought for this AU but only a limited number of landowners granted permission for access to their property. With the cooperating landowners and publicly accessible locations, TIAER was able to establish 11 survey sites within AU 2109_02 (Figure 5-1). RUAA surveys were performed twice in 2012 at each of these 11 sites.

TIAER Site AU02_01 (TCEQ Station 12986) is located on the Leona River at Loma Vista Road (CR 4757) northwest of Divot, Texas and southeast of Batesville, Texas. Although the site was easy to access and was publicly accessible, landowner permission was required to conduct the 300-meter survey reach.

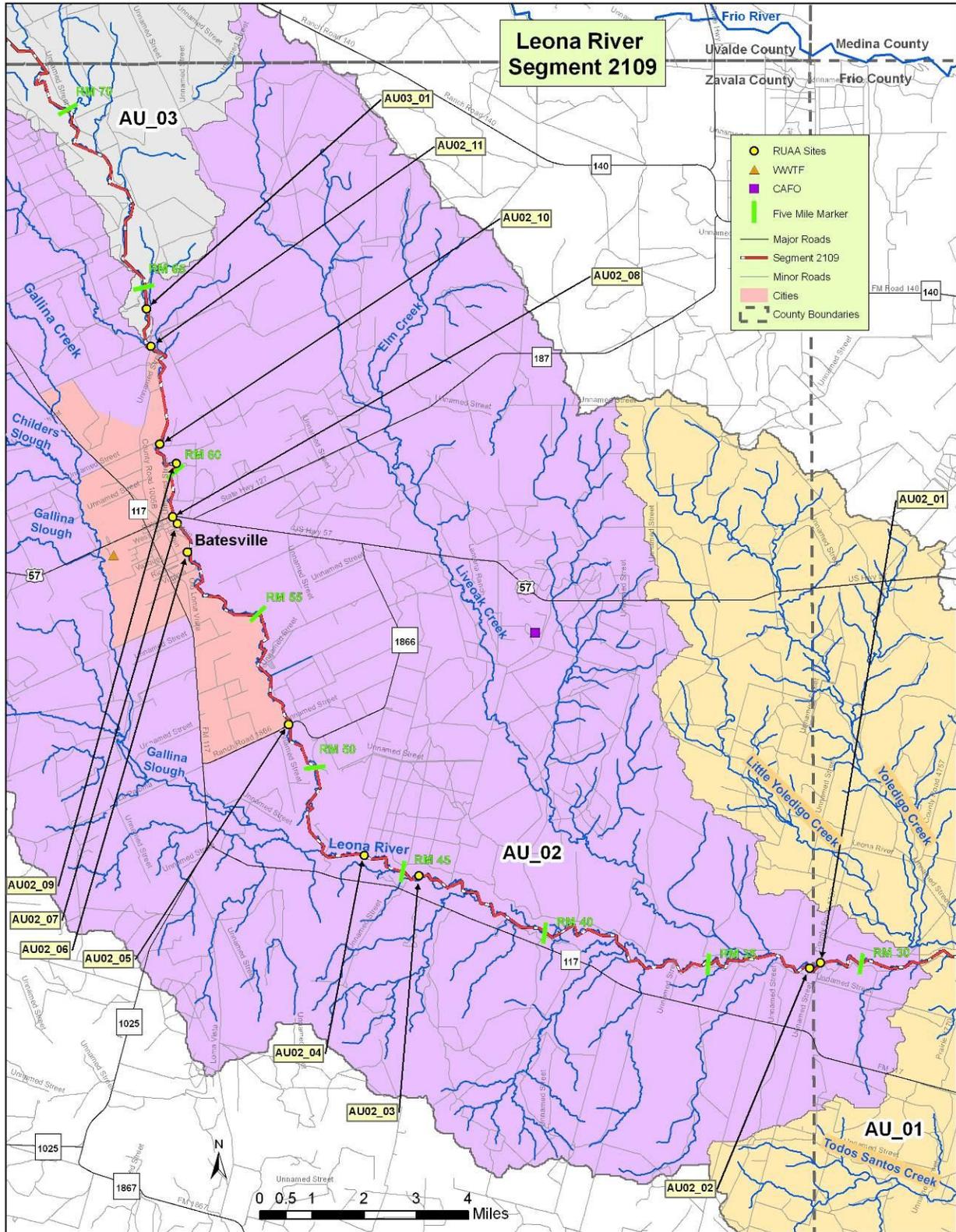


Figure 5-1 Leona River AU 2109_02 showing RUAA sites

TIAER Site AU02_02 is located approximately 0.4 miles upstream of the crossing on the Leona River and Loma Vista Road. This site was only accessible through private lands and required landowner permission. This site was selected because the local landowner opted to cooperate in the project and information from the site provided characterization of the river.

TIAER Site AU02_03 is located about seven river miles downstream of the crossing with Farm to Market Road 1866 on the Leona River south of Batesville, Texas, and almost 13 river miles upstream of Site AU02_02. This location was only accessible through private lands and required landowner permission. This site was selected because the local landowner opted to cooperate in the project and information from the site provided characterization of the river.

TIAER Site AU02_04 is located on the Leona River below the confluence with Gallina Slough and almost two river miles above Site AU02_03. This site and Site AU02_03 are owned by the same landowner. Due to the difficulty in finding enough cooperating landowners, two sites were established with this one landowner. Site AU02_03 was established on the eastern boundary of his property and Site AU02_04 was established on the western boundary of his property. This site was selected because the local landowner opted to cooperate in the project, and information from the site provided characterization of the river.

TIAER Site AU02_05 (TCEQ Station 21064) is located on the Leona River on the crossing with Farm to Market Road 1866, north of the confluence with Gallina Slough. Although this was a publicly accessible location, landowner permission was obtained to conduct the survey 300 meters downstream on private property. This site was selected because of the potential of public access and the local landowner opted to cooperate in the project. Information from the site provided characterization of the river.

TIAER Site AU02_06 is located at the Leona River in Batesville, Texas off of Ramos Street. This site is only accessible through private land and required landowner permission. This site was selected because it was in a residential area, which might allow more people to consider accessing the river, and the local landowner opted to cooperate in the project and information from the site provided characterization of the river.

TIAER Site AU02_07 is located at the Leona River in the Batesville City Park. This site is difficult to access and not likely to be publically used, because the banks are very steep and densely vegetated and a tall chain link fence separates the park from the river. This site was identified because it is a potential point of public access. Information from the site provided characterization of the river.

TIAER Site AU02_08 (TCEQ Station 12987) is located at the Leona River and US Highway 57 in Batesville, Texas. This site is accessible from the US Highway 57 right-of-way. This site was identified because of the potential for public access. Landowner permission was granted to TIAER personnel to conduct the survey 300 meters upstream of the bridge crossing. Information from the site provided characterization of the river.

TIAER Site AU02_09 is located on the Leona River approximately 1.3 river miles upstream of Site AU02_08. This location was only accessible through private lands and required landowner

permission. The site was selected because the local landowner opted to cooperate in the project and information from the site provided characterization of the river.

TIAER Site AU02_10 is located on the Leona River near off of County Road 1011 (also known as the River Route Road) in an area referred to as the Leona Park Dam by locals. This site is about two miles upstream of US Highway 57, north of Batesville, Texas. This site was identified because of the potential for public access, although landowner permission was granted to conduct the survey 300 meters downstream of the dam. Information from the site provided characterization of the river.

TIAER Site AU02_11 is located on the Leona River at the low water crossing off of County Road 1005B, just below the confluence with Camp Lake Slough. This site was identified because of the potential for public access, although landowner permission was obtained to conduct the survey 300 meters downstream of the crossing. Information from the site provided characterization of the river.

Results and Discussions

General Description of Stream and Survey Sites in AU 2109_02

The RUAA surveys were conducted in AU 2109_02 on May 23-24, July 17-18, and July 31, 2012. In July 2012, the survey was broken into two separate time periods, because the landowner associated with Sites AU02_03 and AU02_04 requested a different survey date than was scheduled for the rest of the segment. The surveys and associated interviews were performed on weekdays, weekends, or holidays, at opportune times to observe recreational activities in and around AU 2109_02 of the Leona River. In addition to site survey visits, sites that could afford public access were visited and photographed to catalogue recreational activity, or the lack of, during morning or afternoon of weekend days.

Surveys conducted in AU 2109_02 were conducted during varying air and water temperatures as show in Table 5-1. Air temperatures during both surveys were above 21°C (70°C) indicated by the RUAA guidance as warm enough to promote recreational activities.

Table 5-2 displays the appearance of the stream channel and corridor at each site.

Table 5-3 shows the average thalweg depth for each reach and site during each of the RUAA surveys. Access (public or private) to each site and level of effort to access the stream from the bank at each site is also provided in Table 5-3.

Table 5-4 shows the maximum, minimum, and average widths at each site for each survey. The observed flow and total discharge is also listed for each site per survey. Stream aesthetics and wildlife observations are reported in Table 5-5. In general, the majority of observed tracks and fecal droppings reported in Table 5-5 are wildlife in origin. Tracks included birds, raccoon, deer, and feral hogs. Observed trash was predominantly plastics and was more common at the publically accessible locations associated with road crossings or parks. No evidence of major dumping was observed. Trash on private lands, which was rarely observed, appeared to have washed in during high flow periods.

Table 5-1 Temperatures measured at each site along AU 2109_02

Assessment Unit	Station Number	May 23-24, 2012		July 17-18, 2012	
		Air Temp (°C)	Water Temp (°C)	Air Temp (°C)	Water Temp (°C)
AU2109_02	AU02_01	37.0	28.5	27.2	No Water
	AU02_02	37.0	28.2	27.2	No Water
	AU02_03	23.3	22.6	26.1*	No Water
	AU02_04	22.8	22.8	26.1*	No Water
	AU02_05	23.3	No Water	29.4	No Water
	AU02_06	22.8	No Water	33.3	No Water
	AU02_07	25.0	No Water	29.4	No Water
	AU02_08	25.0	No Water	29.4	No Water
	AU02_09	28.3	No Water	32.7	No Water
	AU02_10	27.2	No Water	33.3	No Water
	AU02_11	31.7	No Water	34.4	No Water

*Sites were surveyed on July 31, 2012

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Table 5-2 Stream Channel and corridor assessment per site sampled along AU 2109_02.

Assessment Unit	Station Number	Streambank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings
AU 2109_02	AU02_01	Right	Natural	Mud/Clay	Shrubs	Large	No	Native Rangeland
		Left				Large		Native Rangeland
	AU02_02	Right	Natural	Mud/Clay	Shrubs with Trees	Large	No	Native Rangeland
		Left				Large		Native Rangeland
	AU02_03	Right	Natural	Mud/Clay	Shrubs with Trees	Large	No	Native Rangeland
		Left				Large		Native Rangeland
	AU02_04	Right	Natural	Mud/Clay	Trees	Large	No	Native Rangeland
		Left				Large		Native Rangeland
	AU02_05	Right	Natural	Mud/Clay	Trees	Large	No	Cropland
		Left				Large		Improved Pasture
	AU02_06	Right	Natural	Bedrock	Shrubs with Trees	Large	Yes	Native Rangeland
		Left				Large		Native Rangeland
	AU02_07	Right	Natural	Mud/Clay	Urban (City Park)	Large	No	Urban
		Left			Shrubs with Trees	Small		Native Rangeland
	AU02_08	Right	Natural	Mud/Clay	Shrubs	Large	No	Native Rangeland
		Left				Large		Native Rangeland
	AU02_09	Right	Natural	Mud/Clay	Trees	Large	No	Cropland
		Left				Large		Native Rangeland
	AU02_10	Right	Natural	Bedrock	Shrubs	Large	Yes	Improved Pasture
		Left			Trees	Large		Native Rangeland
	AU02_11	Right	Natural	Mud/Clay	Trees	Large	No	Cropland
		Left				Large		Improved Pasture

Table 5-3 Thalweg depth, stream flow type, and site accessibility during the two surveys of AU2109_02 . Stream flow type represents TCEQ descriptions (TCEQ, 2010b).

Assessment Unit (AU)	Length (miles)	# of Stations	# of Recreational Areas in AU	Avg. Thalweg Depth (m) for Assessment Unit		Stream Flow Type	General Access	Bank Access
				May 23-24, 2012	July 17-18, 2012			
2109_02	34.2	11	2	0.07	0.00	Perennial	—	—
Station Name	Segment length (m)	# of Transects	# of Recreational Areas at Site	Avg. Thalweg Depth (m) by Site		Stream Flow Type	General Access	Bank Access
				May 23-24, 2012	July 17-18, 2012			
AU02_01	300	11	0	0.00	0.00	Perennial	Public	ME
AU02_02	300	11	0	0.68	0.00		Private	ME
AU02_03	300	11	0	0.02	0.00*		Private	ME
AU02_04	300	11	0	0.02	0.00*		Private	ME
AU02_05	300	11	0	0.00	0.00		Public	E
AU02_06	300	11	0	0.00	0.00		Private	D
AU02_07	300	11	1	0.00	0.00		Public	D
AU02_08	300	11	0	0.00	0.00		Public	E
AU02_09	300	11	0	0.06	0.00		Private	MD
AU02_10	300	11	1	0.00	0.00		Public	MD
AU02_11	300	11	0	0.00	0.00		Public	ME

*Sites were surveyed on July 31, 2012

E = Easy, ME = Moderately Easy, MD = Moderately Difficult, D = Difficult

Table 5-4 Description of surveyed streams in the Leona River Watershed, AU 2109_02.

Assessment Unit	Date	Station Number	Maximum width (m)	Minimum Width (m)	Average Width (m)	Total Discharge (Q) (cfs)	Observed Flow
AU 2109_02	May 23-24, 2012	AU02_01	9.2	0	0	0	No Flow
		AU02_02	12	0	7.4	0	No Flow
		AU02_03	3.55	0	0	0	No Flow
		AU02_04	4.6	0	0	0	No Flow
		AU02_05	0	0	0	0	Dry
		AU02_06	0	0	0	0	Dry
		AU02_07	0	0	0	0	Dry
		AU02_08	0	0	0	0	Dry
		AU02_09	3.25	0	0	0	No Flow
		AU02_10	0	0	0	0	Dry
		AU02_11	0	0	0	0	Dry
	July 17-18, 2012	AU02_01 ^a	0	0	0	0	Dry
		AU02_02 ^a	0	0	0	0	Dry
		AU02_03	0	0	0	0	Dry
		AU02_04	0	0	0	0	Dry
		AU02_05 ^a	0	0	0	0	Dry
		AU02_06	0	0	0	0	Dry
		AU02_07	0	0	0	0	Dry
		AU02_08	0	0	0	0	Dry
		AU02_09	0	0	0	0	Dry
		AU02_10 ^a	0	0	0	0	Dry
AU02_11	0	0	0	0	Dry		

a. Abbreviated surveys documenting conditions at the access point were conducted in July 2012 at Sites AU02_01, AU02_05, and AU02_10 due to safety concerns. Because Site AU02_02 was accessed from the same entry point as AU02_01, Site AU02_02 was not surveyed in July 2012.

Table 5-5 Stream aesthetics and wildlife observations in the Leona River Watershed, AU 2109_02. (From Field Data Sheet – Sect. F)

Station	Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
AU02_01	May 23, 2012	A	A	N	Clear	Fine sediments	Clear	N	N	N	tracks	R	C	R
	July 18, 2012 ^a	A	A	N	No Water	No Water	No Water	N	N	N	tracks	R	C	R
AU02_02	May 23, 2012	A	A	N	Clear	Fine sediments	Clear	N	N	N	tracks	R	R	N
	July 18, 2012 ^a	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
AU02_03	May 23, 2012	A	R	R	Brown	Fine sediments	Clear	N	N	N	tracks/ fecal/ nests	N	R	N
	July 31, 2012	A	A	N	No Water	No Water	No Water	N	N	MP hogs	tracks	N	R	N
AU02_04	May 23, 2012	A	R	N	Brown	Fine sediments	Clear	N	N	MP hogs	tracks	N	R	N
	July 31, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/ fecal	N	R	N
AU02_05	May 24, 2012	A	A	N	No Water	No Water	No Water	N	SP	N	tracks/ fecal	R	C	N
	July 17, 2012 ^a	A	A	N	No Water	No Water	No Water	N	SP	N	tracks	R	C	N
AU02_06	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N

Station	Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
	July 17, 2012	A	A	R	No Water	No Water	No Water	N	N	N	tracks	N	R	N
AU02_07	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	SP rabbits	tracks	N	N	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	C
AU02_08	May 24, 2012	R	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	R	N
AU02_09	May 24, 2012	R	A	N	Clear	Fine sediments	Clear	N	N	N	tracks/fecal	R	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	R	R	N
AU02_10	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	SP	fecal	C	R	N
	July 17, 2012 ^a	A	A	N	No Water	No Water	No Water	N	N	N	fecal	C	R	C
AU02_11	May 24, 2012	R	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N

A = absent, R = rare, C = common, Ab = abundant, N = none, SP = slight presence, MP = moderate presence, LP = large presence, and NS= not surveyed

b. Abbreviated surveys documenting conditions at the access point were conducted in July 2012 at Sites AU02_01, AU02_05, and AU02_10 due to safety concerns. Because Site AU02_02 was accessed from the same entry point as AU02_01, Site AU02_02 was not surveyed in July 2012.

Physical Description of Site AU02_01

The Leona River at Site AU02_01 was monitored on May 23 and July 18, 2012. This site was accessible from Loma Vista Road, CR 4757, in Frio County. To get to the river, one must park on the right-of-way of CR 4757, and walk down the bar ditch to reach the stream. The landowner of the downstream property granted TIAER permission to walk on his property. It was determined that the road crossing would be the 300-m transect and personnel walked underneath the fence and worked downstream from this point. At the bank, it is relatively easy to step into the stream. A pool just less than 15 meters long and 9 meters wide was observed just below the 300-m transect and was the only water observed during the survey in May 2012. Other than the access described above, no other public access points were noted. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-1 illustrates the general appearance of the stream including the only pool of water observed just below the 300-m transect and the access from the county road.

Due to the lack of water, Site AU02_01 was wadeable for the entire 300-m reach. The clay bottom with a little bit of gravel made walking easy and only one log jam was encountered during the first survey in May 2012. The banks of the stream were fairly steep, but due to the lack of dense vegetation, traversing up and down the banks was moderately easy. Some locations were too steep and vegetated to allow for easy access. During the survey in May, a backpack was observed tied to a fallen tree. TIAER personnel did not investigate the contents of the backpack, but did take a picture. Photogroup 5-2 depicts banks of the stream, the one obstruction, and the backpack mentioned above.

The backpack observed at this location caused some concern to field personnel, not knowing the contents and based on previous observations of heavy border patrol activity in the area. Additional backpacks were observed at other sites, sometimes only one but up to as many as ten piled up underneath trees. After consultation with TSSWCB, it was decided that due to safety concerns, TIAER personnel would not walk the entire length of the reach during the second survey. A photograph was taken at the 300-m transect during the July survey showing that the pool there was much smaller in size than during the May survey (see Photogroup 5-3). It was assumed that the remainder of the stream was still dry during the July survey period.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Photogroup 5-3 depicts stream characteristics such as color and surface clarity.

Physical Description of Site AU02_02

The Leona River at Site AU02_02, upstream of Site AU02_01, is located in Zavala County and was visited on May 23 and July 18, 2012. This site was accessible only through privately owned lands that were fenced, gated, and locked. Permission was obtained from the landowner to conduct the survey, but access was only granted from the

same road crossing used for the survey of Site AU02_01. The landowner was an absentee landowner and did not want to make a special trip to unlock the gate and allow entry. TIAER personnel walked underneath the fence upstream from the road crossing until reaching the 0-m transect located approximately 1500 meters from CR 4757. There were several locations where the stream could be entered and exited, but there were also areas of steep banks with dense vegetation. Although there was no public access, walking from the road crossing up to the 0-m transect was easy due to the clay bottom and lack of water. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-4 illustrates the general appearance of the stream and banks.

Site AU02_02 was wadeable for the entire 300-m reach, and water depths were approximately 0.7 m on average for the survey in May 2012. Wading was relatively easy on the packed clay bottom, but log jams across the stream impeded walking at times. One of the obstructions encountered appeared to be man-made out of rocks and concrete. A rope swing was also encountered between the 60-m and 90-m transects, although the depth of water at the location was not deep enough to safely recreate. Photogroup 5-5 illustrates the obstructions and rope swing encountered at Site AU02_02.

As mentioned previously in the physical description of Site AU02_01, a backpack was encountered tied to a tree. Between the two RUAA surveys, while TIAER personnel were collecting routine water sampling, they observed persons being arrested by several border patrol agents and local sheriff officers at the road crossing used to gain entry to sites AU02_01 and AU02_02. Based on safety concerns and the largely dry weather conditions between the first and second surveys, TIAER personnel did not conduct the second survey in July 2012 at site AU02_02. Stream conditions were assumed to be fairly similar between the two survey periods, but less water was anticipated along this reach based on the July surveys of other locations along the river.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Photogroup 5-6 shows the water color, clarity, and lack of surface film found during the May survey.

Physical Description of Site AU02_03

The Leona River at Site AU02_03, located in Zavala County, was monitored on May 23 and July 31, 2012. This site was accessible only through privately owned lands that were fenced, gated, and locked. After meeting TIAER personnel at the entrance gate, the cooperating landowner in his truck proceeded to lead personnel along a pasture road with gullies, fallen trees, and other obstacles approximately 0.8 miles before finally reaching the site destination on the eastern edge of his property. Once at the site, TIAER personnel established the 0-m transect at the property boundary and proceeded to work upstream for 300 meters. There were several locations where the stream could be entered and exited, but there were also areas with steep banks; however, with careful maneuvering, one could enter the stream with moderate ease. There was no public access near this location. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-7 depicts general appearance of the stream and bank access.

Site AU02_03 was wadeable for the entire 300-m length with only a few puddles of water encountered with depths of 0.1 meters or less during the May 2012 survey and no water encountered during the July 2012 survey. The firm mud/clay bottom made walking easy, but log jams across the stream required circumventing via the bank at times. Photogroup 5-8 illustrates obstructions encountered.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Feral hogs were encountered during the second survey conducted in July 2012. Photogroup 5-9 depicts water color and stream clarity from the May survey.

Physical Description of Site AU2_04

The Leona River at Site AU02_04 was visited on May 23 and July 31, 2012. This site was owned by the same landowner of Site AU02_03 and is located in Zavala County. After meeting the cooperating landowner at the gate entrance, TIAER personnel drove approximately 1 mile along a pasture road with gulleys, fallen trees and other obstacles to reach the site near the western boundary of the property. The point of entry to the stream was a location, which at one time was a picnic location according to the landowner, so access to the stream was easy from this point. The 0-m transect was set at this entry point and personnel worked upstream 300 meters toward the western edge of the property. Bank access was moderately easy and footing was firm on the mud/clay bottom. There were several locations where the stream could be entered and exited. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-10 depicts the general appearance of Site AU02_04. Of note, when TIAER personnel drove through the pasture to this site in July, seismic crews in the area had removed the fallen trees and other objects from the road that were encountered in May and road accessibility was much improved.

Site AU02_04 was wadeable for the entire 300-m length with only a few pockets of water with depths less than 0.1 meters encountered by field personnel during the May 2012 survey. The only water observed during the second survey was beyond the 300 meter survey reach. Log jam obstructions were encountered during both surveys. Photogroup 5-11 illustrates the obstructions encountered during the surveys.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Photogroup 5-12 depicts water color and surface clarity.

Physical Description of Site AU02_05

The Leona River at Site AU02_05 was surveyed on May 24 and July 17, 2012. This site, located in Zavala County, is a publicly accessible location; however, due to insufficient right-of-way both upstream and downstream of the road crossing on FM 1866, private landowner permission was sought and granted, provided TIAER personnel stay in the

stream channel. The access point to the river at AU02_05 is a box culvert low water crossing with a concrete apron on both sides of the stream. The entry point became the 300-m transect as TIAER personnel worked 300 meters downstream based on landowner permission. Photogroup 5-13 depicts general appearance of stream and bank access.

No water was encountered along the reach at Site AU02_05 during the May survey. Although there was no water in the stream channel, traversing the entire 300 meter reach was still not easy. The dominant substrate was dried mud/clay and dense vegetation consisting of ragweed and poison ivy along the banks with overgrown vines across the stream channel made walking moderately difficult. At some points during the survey, field personnel were on hands and knees within the channel in an effort to get through vines that had grown thickly within and across the stream channel. Photogroup 5-14 illustrates the dense vegetation and obstructions encountered by TIAER personnel during the survey in May 2012.

During the survey in May 2012, TIAER field personnel encountered backpacks while walking the 300 meter reach. Based on safety concerns and the lack of water observed at this site during the May survey and the dry conditions between the May and July surveys, only pictures were collected during the second survey in July 2012 from the initial point of access. Photogroup 5-15, taken upstream and downstream of the 300-m transect in July, shows the dense vegetation along the banks and within the channel and the absence of water at this location.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively.

Physical Description of Site AU02_06

The Leona River at Site AU02_06 was visited on May 24 and July 17, 2012. This site was located on private property in Batesville, Texas in Zavala County. Permission was sought and granted to allow TIAER personnel to enter the stream behind the landowner's house. Rough, manmade steps had been carved out of the stream bank allowing for moderately easy access to the stream at one location along the reach. No other entry points to the stream were observed over the 300-meter reach. Stream banks were high and steep with dense vegetation making entry or exit from the stream very difficult other than at the 300-m transect. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-16 depicts the general appearance of the stream.

Site AU02_06 was wadeable for the entire 300-m length due to a lack of water during both surveys. Not even small pools were encountered during either survey. The bedrock bottom made for stable walking, but sometimes dense vegetation did challenge the progress of personnel. A crude small dam was observed at the 130-m transect and several obstructions were observed while surveying the reach. In addition, bulldozer tracks were observed down the left bank to the bottom of the stream near the 180-m transect. The tracks traveled downstream well beyond the 0-m transect. Photogroup 5-17 illustrates the obstructions encountered as well as some of the dozer tracks.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Water color and clarity could not be described or depicted, because no water was present during either survey.

Physical Description of Site AU02_07

The Leona River at Site AU02_07 was visited on May 24 and July 17, 2012. This site was located at the city park in Batesville, Texas in Zavala County. This site was at a publicly accessible location; however, a tall chain link fence was installed between the park facilities and the stream. There was a gate installed in the chain link fence to allow an entrance for city personnel to keep the grass mowed. The banks of the stream were so tall, steep, and densely vegetated that TIAER personnel were unable to enter the stream at this location. No entry points to the stream were observed over the 300-meter length of the reach. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-18 depicts the general appearance of the stream, lack of bank access and the chain link fence hindering access to the stream.

Because the banks were so steep and there was no access point, Site AU02_07 was surveyed from the top of the bank for the entire 300-m reach during both surveys. No water was observed during either survey; the occasional rock thrown down to the stream landed with a thud and not a splash. The dominant substrate was mud/clay based on what was occasionally observed through the vegetation and the sound of rocks when they hit the substrate. The city park facilities consisted of a baseball field, improved parking lot, a large covered pavilion for reunions or weddings, and typical playground equipment; i.e. swings, jungle gym, and see-saw. Photogroup 5-19 illustrates the city park facilities.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU02_08

The Leona River at Site AU02_08 was visited on May 24 and July 17, 2012. This site is located at the bridge crossing on US Highway 57 in Batesville, Texas in Zavala County. Although the bridge crossing was publicly accessible, insufficient right-of-way allowed for the full 300 meters of the reach to be surveyed. Based on the close proximity of this site to Site AU02_07, landowner permission was sought and granted to allow TIAER personnel access to the land upstream of the bridge crossing. Other than the entry at the bridge crossing, no other entrance to the stream was observed. Dense vegetation in the stream and along the banks made traversing the stream very challenging. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-20 depicts the access point at the bridge and the general appearance of the stream showing the density of vegetation.

Site AU02_08 was wadeable for the entire 300-m length due to the lack of water during both surveys. The dried mud/clay bottom made for stable walking, but the dense vegetation did challenge personnel for almost the entire length of the reach. One tree obstruction was observed during the second survey in July 2012. Other than the vegetation, no other obstructions were observed. Photogroup 5-21 illustrates the obstruction and density of vegetation encountered.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU02_09

The Leona River at Site AU02_09 was visited on May 24 and July 17, 2012. This site was located on private property off CR 1005 just north of Batesville, Texas in Zavala County. Permission was sought and granted to allow TIAER personnel entry to the property through a locked gate. TIAER personnel then travelled about 0.6 miles down a pasture road to the edge of a cultivated field. Due to a barbed wire fence, TIAER personnel had to walk about 150 yards from where they parked to reach the stream. Banks of the stream were steep and densely vegetated making entry or exit from the stream moderately difficult. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-22 depicts the general appearance of the stream.

Site AU02_09 was wadeable for the entire 300-m length. Only one pool was encountered during the May 2012 survey; dimensions were 55 meters long, 3 meters wide and less than 0.4 meters deep. No water was encountered during the July 2012 survey. Log obstructions were observed during both surveys and a backpack was also discovered along the bank on the July survey. The mud/clay bottom, with occasional pockets of gravel, made for stable walking, but the dense vegetation did challenge field personnel. Photogroup 5-23 illustrates the obstructions and backpack encountered while surveying the site.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Photogroup 5-24 depicts water color and water surface clarity encountered during the May 2012 survey.

Physical Description of Site AU02_10

The Leona River at Site AU02_10 was visited on May 24 and July 17, 2012. This site was at a publically accessible location just north of Batesville, Texas in Zavala County. Located off of CR 1011 (also referred to as the River Route Road), this site is at a large dam on the Leona River, known to local's as Leona Park Dam. The area upstream of this dam is labeled as the Old Comanche Company Irrigation Reservoir on some maps. The 300-m reach covered an area downstream of the dam with the dam serving as the 300-m transect. Although part of the surveyed 300-m reach was open to the public, some of the reach was on private property and landowner permission was obtained. Access to the

stream was easy at the 270-m transect off the parking area by the park. Dense vegetation and steep high banks make stream access moderately difficult at the other transect locations of the survey reach. No other entry points to the stream were observed over the 300 meter length of the reach. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-25 depicts general appearance of the stream and the dam.

Site AU02_10 was wadeable for the entire 300-m length due to the lack of water encountered during both surveys. The bedrock and cobble bottom made for stable walking, but stands of dense vegetation at times caused personnel to carefully select their travel route. The park at the site consisted of a few picnic tables underneath shade trees in a mowed and maintained area with a gravel road. The gravel road circles around the park area, to the dam, and then back out to CR 1005. A white wooden cross with a name is located along a barbed wire fence across from the dam. According to the landowner, there was a drowning some years back, and the cross was erected shortly after. Photogroup 5-26 illustrates the park area, dam and white cross observed at the site.

As with some of the previously discussed sites in this watershed, backpacks were encountered during the first survey at this site. Along with the stack of backpacks was also observed a broken fishing pole and a bobber. During the second survey, due to safety concerns and the lack of water anticipated due to the dry conditions between the May and July surveys, upstream and downstream pictures were only taken at the 300-m transect in July. Photogroup 5-27 shows the second survey photos and pictures of a stack of backpacks encountered.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Water color and clarity could not be described or depicted for this site as no water was encountered during either survey.

Physical Description of Site AU02_11

The Leona River at Site AU02_11 was visited on May 24 and July 17, 2012. This publicly accessible site was located at the low water crossing of CR 1005 north of Batesville, Texas in Zavala County. Although the site allows for public access, permission was sought and granted to allow TIAER personnel to enter the stream at the low water crossing and to work both upstream and downstream on private property to conduct the survey. No other entry points to the stream were observed over the 300-meter length of the reach. Banks of the stream were high and steep with dense vegetation making entry to or exit from the stream very difficult other than at the low water road crossing, which represented the 150-m transect. Table 5-2 describes the stream channel and riparian zone appearance of this site. Photogroup 5-28 depicts the public access point, general appearance of the stream and bank access.

Site AU02_11 was wadeable for the entire 300-m length due to the lack of water for both surveys. The cobble dominant bottom made for stable walking, but sometimes dense vegetation hindered the progress of field personnel. In addition to the dense vegetation, a

couple of log jam obstructions were observed. Two tires were seen near the 90-m transect. Evidence of feral hogs was also discovered in the form of feces. Photogroup 5-29 illustrates the dense vegetation, log jam obstructions, tires, and hog feces.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 5-3, 5-4, and 5-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Activities: Observed and Interviewed

During the RUAA surveys conducted in May and July, 2012, field personnel attempted to visit the publicly accessible sites during times and days when recreational activities were apt to be observed. Interviews and observations at privately owned sites were conducted with landowners generally after field surveys were completed. In most cases, informal conversations occurred during the scouting process in late 2009 and notes were made. Once a site was selected, there was very little contact with the landowners, so phone formal interviews were conducted to confirm and supplement information gathered during the initial contact.

Five of the eleven sites selected were on private properties with controlled, limited access. Only one of the eleven sites allowed for public accessibility for the entire length of the survey reach, Site AU02_07 in the Batesville City Park, although here access was hindered by a high fence between the park and the stream and steep stream banks. Five of the six publicly accessible sites had at least one location available for someone to recreate in the stream, usually at a road crossing, but not for any substantial distance without crossing a fence noting a private property boundary. No activities, either primary or secondary, were observed at any site during either visit during 2012.

A total of 24 interviews were collected from landowners and other persons with knowledge of any recreation within the AU02 watershed. All of the interviews resulted in some form of recreation having occurred on the Leona River since 1975. Types of recreation included fishing, hunting, swimming, boating, and wading by both children and adults. There was even one report of skiing and three reports of persons washing their cars in the river. All identified forms of recreation have occurred in the past, as the river is currently dry and has not been flowing substantially for a number of years.

The landowner at Site AU02_01 stated that he and his family have been fishing, swimming, boating, and wading in the stream from his property. He had even purchased some paddleboats for his kids to use when water was flowing. Fishing occurred frequently when water was present and camp outs occurred every two to three years. During these camp outs, family and friends would fish, swim, wade, and ride the paddleboats. He also stated that people would sometimes fish at the road crossing on CR 4757, and poachers would also hunt along the river when dry. He believes that the river ceased flowing because of over pumping of water wells in the Batesville area.

The landowner for Site AU02_02 stated that his property is used only for hunting and that the only time anyone would be near the river would be for hunting purposes.

The property owner for Sites AU02_03 and AU02_04 stated that he has no time for recreating on the river. He runs cattle on several different properties and is too busy. He did state that he has some friends that have a picnic area near Site AU02_04 and they visit usually around Easter time. They would come out, clean up an area, and camp out while fishing and playing in the water. They have not been out in several years due to the dry conditions of the stream.

The AU02_05 landowner chose not to participate in an interview.

The landowner at Site AU02_06 related that during his 50 years of living in the area he had recreated in the river, seen others recreate in the river, and heard of others recreating in the river. As a boy, he and his friends would come home from school, change clothes, get something to eat and then run to the river for an afternoon of water recreation. He recalls running along the bank and jumping into the river both on his property and also at Site AU02_10, Batesville Dam Park. When he married and had children, he would take his kids to the river behind his house to swim, wade, and fish. The substrate behind his house is bedrock with several outcroppings of rocks. He stated that the river, when flowing, was beautiful and peaceful. He further stated that the river quit flowing approximately two years ago. The last time he remembers any recreation occurring was in the late 1990's or early 2000's.

Since the property at Site AU02_07 is publicly accessible, there was no landowner to contact for an interview. Persons were encountered during site visits yielding two interviews. One woman, who was preparing for a wedding and reception at the pavilion of the city park, stated that she grew up in the area and had been there for well over 20 years. As a kid in the 1970's and 1980's, she and her brothers would play in a deep pool behind their house on the Leona River. They had a rope swing and would swim all the time. In addition, they would tube, raft, canoe, and fish in the river by their house and also at Site AU02_10, Batesville Dam Park. A young couple was also interviewed while walking their child in the park. They stated that they would wade and fish in the Leona River at different locations from Batesville all the way down to Dilley. Both of the interviews also stated that they had seen and heard of other people recreating in the river.

No one was interviewed at Site AU02_08, as no one was encountered on any visit.

The landowner at Site AU02_09 owns or leases property, site AU02_11 and AU03_01, along the Leona River. He shared that from the 1950's to the 1970's, when he lived in Batesville, he personally would swim, tube, fish, raft, boat, trap, hunt, and wade in the river as would his family. In addition, he saw and heard of others doing the same things. He stated that a dam north of Uvalde is the reason the Leona is not flowing now. With no flowing water, there are no recreational opportunities.

The landowner at Site AU02_10 shared information that was similar to the others. He swam and fished as a kid back in the 1960's, but no longer uses the stream. When the river flowed, he would see and hear of people (adults and kids) swimming, fishing, and wading in the river at the Batesville Dam Park. According to him, the river stopped flowing about three years ago, and all recreational activities stopped when that happened.

Additional interviews were collected from people in the Batesville area who may not have owned property on the Leona River, but did know of recreation occurring. Swimming and wading were the main forms of primary contact recreation reported. Fishing, boating, and hunting were forms of secondary recreation that were also identified. There were stories of people camping, picking plums, and even washing their cars along the river. Some of these stories happened well before the 1970's, but others more recently. From all of the interviews, the river has definitely been utilized for recreation. Only recently, due to the drought and lack of flowing water, has recreation ceased to occur according to the folks interviewed.

Copies of all of the interviews conducted along Leona River AU 2109_02 are available on the project website at <http://www.leonariver.org/>.

Summary

RUAA surveys were conducted at eleven sites in Assessment Unit 2109_02 on May 23-24, July 17-18, and July 31, 2012. Copies of all comprehensive interview forms, field data sheets, and transect pictures from each survey are available on the project website at <http://www.leonariver.org/>.

As observed in AU2109_01, the Leona River in AU2109_02 flows primarily through privately owned properties of substantial acreages. Public access is limited to the right-of-way at four road crossings, a park area off CR 1011, and the Batesville City Park. Fences, locked gates, steep banks, and dense vegetation all combine to limit access to the river in this approximately 34-mile long segment. No aquatic recreational activities were observed by TIAER field staff during the surveys in May and July 2012. The individuals interviewed in the AU02 were all either property owners on whose property we had permission to conduct the surveys or other citizens with knowledge of recreational activities occurring on the Leona River. Fishing, swimming, and wading were the primary recreational activities reported as occurring since 1975. In addition, all forms of boating, hunting, and trapping were also reported to have occurred. All of the interviews stated that no recreation has occurred since the river went dry several years ago. The survey information is summarized in Table 5-6 and Figure 5-2.

Table 5-6 Summary of recreational activities noted in interviews for AU 2109_02. Activities are listed as the number of times personal use, observed use, or heard of use was documented from interviews for a given location or the whole assessment unit. No recreational activities were observed during field surveys or site visits.

Site name	Swim	Wade		Hunt	Fish	Boat Canoe Kayak	Trap	Tube	Wash car	Ski
		Adult	Children							
AU02_01	1, 0, 0	1, 0, 0	1, 0, 0		1, 1, 0	1, 0, 0				
AU02_02										
AU02_03										
AU02_04	0, 1, 0	0, 1, 0	0, 1, 0		0, 1, 0					
AU02_05										
AU02_06	1, 1, 1	1, 1, 0	1, 1, 0		1, 1, 1	0, 1, 0				
AU02_07		1, 1, 1	1, 1, 1		1, 1, 1	1, 0, 0				
AU02_08										
AU02_09										
AU02_10	1, 3, 2	0, 3, 1	0, 3, 1	0, 1, 0	1, 3, 2		0, 1, 0			
AU02_11										
General AU	7, 6, 7	5, 6, 5	4, 6, 5	5, 4, 5	8, 7, 8	6, 8, 6	4, 3, 6	2, 3, 3	0, 1, 2	1, 1, 0
Totals	10, 11, 10	8, 12, 7	7, 12, 7	5, 5, 5	12, 14, 12	8, 9, 6	4, 4, 6	2, 3, 3	0, 1, 2	1, 1, 0

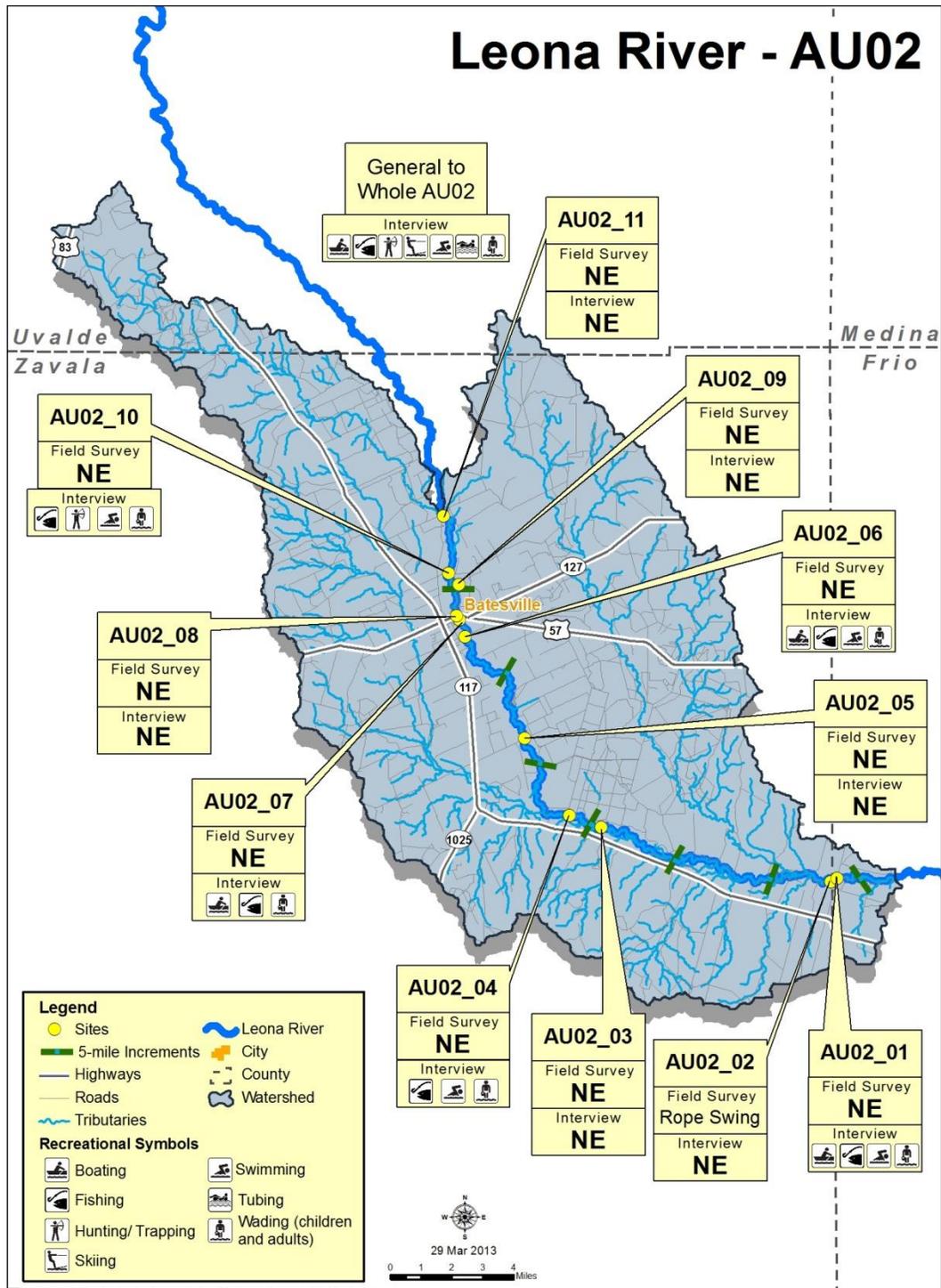


Figure 5-2 Summary of activities from field surveys and interviews in AU 2109_02. NE indicates not encountered.

CHAPTER 6

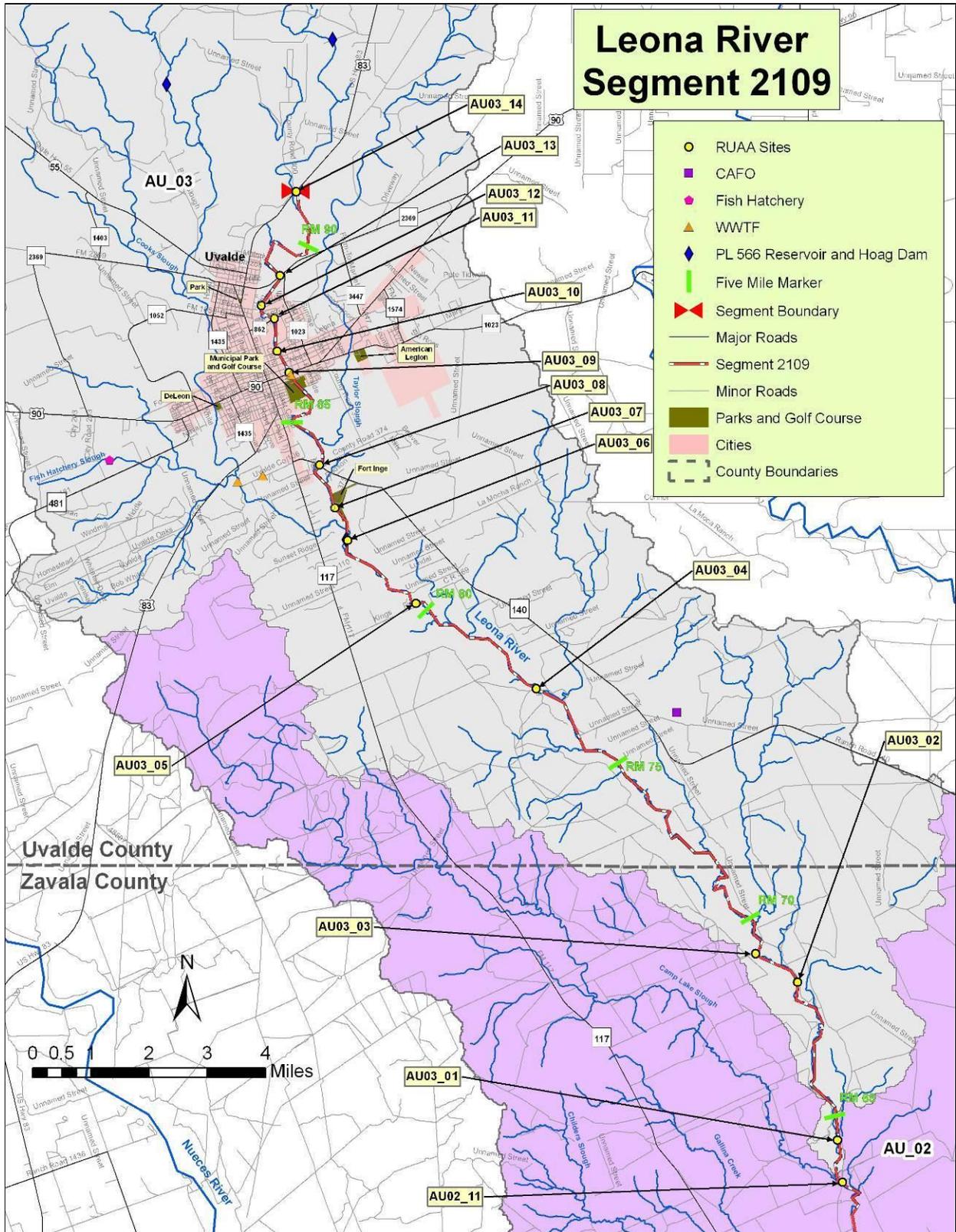
ASSESSMENT UNIT 2109_03

Assessment Unit Characterization

The Leona River AU 2109_03 is described as running from the confluence with Camp Lake Slough to the bridge crossing at US Highway 83 (Figure 6-1). AU 2109_03 is located Zavala County and Uvalde County. Because the Leona River goes directly through the City of Uvalde, the reconnaissance for this AU yielded a fair number of road crossings (10 total), which would allow public accessibility to the river. However, due to their close proximity to one another of some locations and the lack of accessibility to sufficient stream distance (300 m) at other locations, only five road crossing were selected as publically accessible RUAA survey sites. Three other publically accessible sites were selected within park areas including one site in the Uvalde City Park (AU3_09) and two within Fort Inge (AU03_06 and AU03_07), a historical park that is open to the public only on weekends and special occasions. The City of Uvalde was contacted and permission granted to conduct the RUAA survey within the Uvalde City Park. Fort Inge is operated by the Uvalde Historical Commission, which also granted permission for the RUAA survey to be conducted on its property. The Fort Inge Park, when not open to the public, is gated and locked.

Six sites with private access were listed to be surveyed. It should be noted that Site AU03_12, while within the City of Uvalde, was not located at a road crossing, but at the end of a cul-de-sac off Rio Street. The landowner was contacted and permission granted to cross private property to perform the RUAA survey at Site AU03_12. No fences or barriers impeded the public from entering the stream at Site AU03_12, but private property did have to be crossed. In addition to Site AU03_12, five other sites off private property were included as RUAA survey sites for AU03. Of note, while permission from the landowner for access to Site AU03_04 was initially obtained, this permission was rescinded when contacted just prior to the May survey, so while listed, no field data were collected at AU03_04. These private land sites were generally fenced, gated, and locked hindering access to the river to anyone other than those granted permission by the landowner.

Native rangeland is the dominant land cover in this portion of the Leona River, although hayfields, row crop fields, and some vegetable fields were observed. The majority of the land along the Leona River outside the City of Uvalde is comprised of large land holdings, often owned by individuals who do not live in the area. In AU 2109_03, banks are high and steep in the more downstream end and progressively get lower and less steep the further upstream you go. Most of AU 2109_03 is considered to be part of the recharge area for the Edwards Aquifer, so rains that fall within AU03, often quickly flow through fractured limestone into the groundwater table. There are also several sets of springs that have been identified in this reach of the Leona River, but according to local landowners and others familiar with the stream, these springs have not flowed in recent years due to the dry weather conditions. Further, the land use information on the AU 2109_03 watershed is provided in more detail in Chapter 2.



There are two permitted discharge facilities within AU_03, the City of Uvalde WWTF and the U.S. Fish and Wildlife Service National Fish Hatchery. As described in Chapter 2, the City of Uvalde WWTF has three outfalls. Outfalls 001 and 003 discharge into Cooks Slough, a tributary of the Leona River. Outfall 002 discharges directly into the Leona at a point within the Uvalde City Park. Of the effluent diverted to the Uvalde City Park, a small portion is often pumped into a holding pond for use as irrigation water on the Municipal Golf Course. The U.S. Fish and Wildlife Service National Fish Hatchery in Uvalde discharges flush water intermittently into Fish Hatchery Slough, a tributary of the Leona River.

Additional Information

The review of historical information and climatic conditions are found in Chapter 2. Precipitation conditions prior to each survey are presented in Tables 3-2 and 3-3.

Survey Site Descriptions

The three lowest sites in AU 2109_03 were located on in Zavala County on private property. The remaining eleven sites were located in Uvalde County and were comprised of private and publicly accessible land. A description of each site follows.

TIAER Site AU03_01 is located on the Leona River approximately 0.8 river miles above the confluence of Camp Lake Slough in Zavala County and about a mile upstream of the crossing with CR 1005B. This property was only accessible through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided further characterization of the river in AU 2109_03.

TIAER Site AU03_02 is located on the Leona River approximately 4.3 river miles above the confluence of Camp Lake Slough with the Leona River in Zavala County. This property was only accessible through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided further characterization of the river in AU 2109_03.

TIAER Site AU03_03 is located on the Leona River approximately 5.3 river miles above the confluence of Camp Lake Slough with the Leona River in Zavala County. This property was only accessible through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided further characterization of the river in AU 2109_03.

TIAER Site AU03_04 is located on the Leona River approximately 3 river miles downstream of United States Geological Survey (USGS) gaging station 08204005 in Uvalde County. This property was only accessible through private lands and required permission for entry. During reconnaissance of the watershed for potential survey sites, the landowner granted TIAER permission to use this location. Before the first survey in May 2012, contact was made with the landowner to make him aware of the upcoming trip. After further consideration, the landowner changed his mind and decided to deny TIAER field personnel access to his property. This site was not visited during either survey.

TIAER Site AU03_05 (TCEQ Station 12988) is located on the Leona River southeast of Uvalde at USGS gaging station 08204005 in Uvalde County. This property was only accessible

through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided further characterization of the river in AU 2109_03.

TIAER Site AU03_06 (TCEQ Station 12989) is located on the Leona River at Hoag Dam on Fort Inge below the confluence of Cooks Slough with the Leona River in Uvalde County. This property was only accessible through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided opportunities for characterization of the river in AU 2109_03.

TIAER Site AU03_07 is located on the Leona River above Hoag Dam and above the confluence of Cooks Slough with the Leona River in Uvalde County. This property was only accessible through private lands and required landowner permission for entry. This site was selected because the landowner opted to cooperate and the site provided for further characterization of the river in AU 2109_03.

TIAER Site AU03_08 (TCEQ Station 12990) is located on the Leona River at the crossing of Farm to Market Road 140 in Uvalde County. This site was selected because of the potential for public access to the stream. This location also provided an opportunity to characterize an additional portion of AU 2109_03.

TIAER Site AU03_09 (TCEQ Station 12992) is located on the Leona River at US 90 West at the city park in Uvalde, Texas in Uvalde County. This property is publicly accessible but permission was sought and granted from the City of Uvalde to conduct the RUAA surveys. Information from this site provided characterization of the stream in AU 2109_03.

TIAER Site AU03_10 is located on the Leona River in Uvalde, Texas off Leona Street in Uvalde County. This site was identified because of the potential of public access. Information from the site provided characterization of the river in AU 2109_03.

TIAER Site AU03_11 is located at Studer Street and the Leona River in Uvalde, Texas in Uvalde County. Due to the potential public access, particularly of children due to the proximity of nearby schools, this site was selected to provide characterization of the stream in AU2109_03.

TIAER Site AU03_12 is located at the end of Rio Street in Uvalde, Texas in Uvalde County. The site is located at the end of a cul-de-sac and although there are no fences, the land is privately owned. This site was selected because of the potential for public access to the stream, landowner cooperation, and it afforded yet another opportunity to characterize the river in AU 2109_03.

TIAER Site AU03_13 is located on the Leona River at the crossing with FM 2369 in Uvalde, Texas in Uvalde County. Although the streambed at this site is accessible from the crossing, fences on both the upstream and downstream sides of the crossing warranted obtaining landowner cooperation. With landowner cooperation, this site was selected because of the potential for public access to the stream and to further to characterize the river in AU 2109_03.

TIAER Site AU03_14 is located on the Leona River at the crossing of US 83 north of Uvalde in Uvalde County. Although the streambed at this site is accessible from the bridge, access to sufficient stream reach to allow RUAA surveys required landowner cooperation. A barbed wire fence must be crossed to access the needed 300-m section of river. This site was identified because of the potential for public access. Information from the site provided characterization of the stream in AU2109_03.

Results and Discussions

General Description of Stream and Survey Sites for AU 2107_03

The RUAA surveys were conducted in AU 2109_03 during the weeks of May 22-26, 2012 and July 17-21, 2012 at 13 of the 14 sites. As previously mentioned, the landowner at Site AU03_04 rescinded permission to access his property just prior to the May survey, so no field data were collected at this location. The surveys and associated interviews were performed on weekdays, weekends or holidays at opportune times to observe recreational activities in and around AU 2109_03 of the Leona River.

Surveys conducted in AU 2109_03 were conducted during varying air and water temperatures as show in Table 6-1. Air temperatures were during both surveys were above 21°C (70°C) indicated by the RUAA guidance as warm enough to promote recreational activities.

Table 6-1 Temperatures measured at each site along AU 2109_03

Assessment Unit	Site Number	May 22 - 26, 2012		July 17 - 21, 2012	
		Air Temp (°C)	Water Temp (°C)	Air Temp (°C)	Water Temp (°C)
AU2109_03	AU03_01	31.7	No Water	34.4	No Water
	AU03_02	34.4	No Water	26.1	No Water
	AU03_03	34.4	No Water	26.1	No Water
	AU03_04	NA ^a	NA	NA	NA
	AU03_05	35.0	No Water	32.2	No Water
	AU03_06	24.4	No Water	35.0	No Water
	AU03_07	24.4	26.2	34.4	29.9
	AU03_08	36.1	No Water	32.2	No Water
	AU03_09	36.1	31.6	28.3	21.8
	AU03_10	37.2	No Water	35.0	No Water
	AU03_11	36.1	32.7	36.0	No Water
	AU03_12	38.0	No Water	35.0	No Water
	AU03_13	35.6	24.5	37.2	34.1
	AU03_14	25.0	No Water	36.1	No Water

a. NA indicates not applicable. The landowner at Site A03_04 rescinded access to this site prior to the survey.

Table 6-2 displays the appearance of the stream channel and corridor at each site.

Table 6-3 shows the average thalweg depth for each reach and site during each of the RUAA surveys. Access (public or private) to each site and level of effort to access the stream from the streambank at each site is also provided in Table 6-3.

Table 6-4 shows the maximum, minimum, and average widths at each site for each survey. The observed flow and total discharge and also listed for each site per survey. Stream aesthetics and wildlife observations are reported in Table 6-5 for each site and survey. In general, the majority of observed tracks and fecal droppings reported in Table 6-5 are wildlife in origin. Tracks included birds, raccoon, deer, and feral hogs. Observed trash was predominantly plastics and was most common at bridge crossings, though no evidence of major dumping was observed. Trash on private lands, which was rarely observed, appeared to have washed in during high flow periods.

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Table 6-2 Stream channel and corridor assessment per site sampled along AU 2109_03.

Assessment Unit	Site Number	Streambank	Stream Channel Appearance	Dominant Substrate	Corridor Appearance	Riparian Size	Park	Landscape Surroundings
AU 2109_03	AU03_01	Right	Natural	Mud/Clay	Shrubs	Large	No	Native
		Left				Large		Native
	AU03_02	Right	Natural	Mud/Clay	Forest	Large	No	Native
		Left				Large		Native
	AU03_03	Right	Natural	Bedrock	Forest	Large	No	Native
		Left				Large		Native
	AU03_04	Right	NA ^a	NA	NA	NA	NA	NA
		Left				NA		NA
	AU03_05	Right	Natural	Cobble	Forest	Large	No	Native
		Left				Large		Cropland
	AU03_06	Right	Natural	Cobble/Bedrock	Shrubs	Large	Yes	Native
		Left				Large		Cropland
	AU03_07	Right	Natural	Mud/Clay	Shrubs	Large	Yes	Native
		Left				Large		Cropland
	AU03_08	Right	Natural	Silt	Shrubs	Large	No	Pasture
		Left				Large		Native
	AU03_09	Right	Lined Channel	Mud/Clay	Mowed/Maintained corridor, urban	Small	Yes	City Park
		Left				Small		Urban
	AU03_10	Right	Natural/Residential	Mud/Clay	Mowed/Maintained corridor, urban	Medium	No	Residential
		Left				Medium		Residential
AU03_11	Right	Natural/Residential	Mud/Clay	Mowed/Maintained corridor, urban	Medium	No	School	
	Left				Medium		Residential	
AU03_12	Right	Natural/Residential	Mud/Clay	Forest	Medium	No	Residential	
	Left			Shrubs	Medium		Residential	
AU03_13	Right	Natural	Bedrock	Shrubs	Medium	No	Native	
	Left				Large		Native	
AU03_14	Right	Natural	Mud/Clay	Shrubs	Large	No	Native	
	Left				Large		Native	

a. NA indicates not applicable. The landowner at Site A03_04 rescinded access to this site prior to the survey.

Table 6-3 Thalweg depth, stream flow type, and site accessibility during the two surveys of AU2109_03. Stream flow type represents TCEQ descriptions (TCEQ, 2010b).

Assessment Unit (AU)	Length (miles)	# of Stations	# of Recreational Areas in AU	Avg. Thalweg Depth (m) for Assessment Unit		Stream Flow Type	General Access	Bank Access
				May 22-26, 2012	July 17-21, 2012			
2109_03	27.3	14	3	>0.13	>0.12	Perennial	—	—
Station Name	Segment length (m)	# of Transects	# of Recreational Areas at Site	Avg. Thalweg Depth (m) by Site		Stream Flow Type	General Access	Bank Access
				May 22-26, 2012	July 17-21, 2012			
AU03_01	300	11	0	0.00	0.00	Perennial	Private	ME
AU03_02	300	11	0	0.00	0.00		Private	D
AU03_03	300	11	0	0.00	0.00		Private	D
AU03_04	NA ^a	NA	NA	NA	NA		NA	NA
AU03_05	300	11	0	0.00	0.00		Private	ME
AU03_06	300	11	1	0.00	0.00		Limited Public ^b	ME
AU03_07	300	11	1	0.50	0.52		Limited Public ^b	ME
AU03_08	300	11	0	0.00	0.00		Public	MD
AU03_09	300	11	1	>1.00	>1.00		Public	E
AU03_10	300	11	0	0.00	0.00		Public	E
AU03_11	300	11	0	0.05	0.08		Public	E
AU03_12	300	11	0	0.00	0.00		Private	E
AU03_13	300	11	0	>0.20	>0.11		Public	ME
AU03_11	300	11	0	0.00	0.00		Public	MD

For Sites AU03_09 and AU03_12, depths exceeded 1.0 meters. > was used for the overall thalweg calculations.

E = Easy, ME = Moderately Easy, MD = Moderately Difficult, D = Difficult

a. NA indicates not applicable. The landowner at Site A03_04 rescinded access to this site prior to the survey.

b. Sites AU03_06 and AU03_07 were located within the Fort Inge Historical Park, which is open to the public only on weekends and for special occasions.

Table 6-4 Description of surveyed streams in the Leona River Watershed, AU 2109_03.

Assessment Unit	Date	Site Number	Maximum width (m)	Minimum Width (m)	Average Width (m)	Total Discharge (Q) (cfs)	Observed Flow ¹
AU 2109_3	May 22 – 26, 2012	AU03_01	0	0	0	0	Dry
		AU03_02	0	0	0	0	Dry
		AU03_03	0	0	0	0	Dry
		AU03_04	NA ^a	NA	NA	NA	NA
		AU03_05	0	0	0	0	Dry
		AU03_06	0	0	0	0	Dry
		AU03_07	15.5	0	14.0	0	No Flow
		AU03_08	0	0	0	0	Dry
		AU03_09	23.0	2.8	13.0	0	No Flow
		AU03_10	0	0	0	0	Dry
		AU03_11	15.5	0	0	0	No Flow
		AU03_12	0	0	0	0	Dry
		AU03_12	44.5	0	0	0	No Flow
		AU03_14	0	0	0	0	Dry
	July 17 – 21, 2012	AU03_01	0	0	0	0	Dry
		AU03_02	0	0	0	0	Dry
		AU03_03	0	0	0	0	Dry
		AU03_04	NA	NA	NA	NA	NA
		AU03_05	0	0	0	0	Dry
		AU03_06	0	0	0	0	Dry
		AU03_07	14.0	0	11.5	0	No Flow
		AU03_08	0	0	0	0	Dry
		AU03_09	23.0	2.8	13.0	0	No Flow
		AU03_10	0	0	0	0	Dry
		AU03_11	13.0	0	0	0	Dry
		AU03_12	0	0	0	0	Dry
		AU03_12	44.5	0	0	0	No Flow
		AU03_14	0	0	0	0	Dry

a. NA indicates not applicable. The landowner at Site A03_04 rescinded access to this site prior to the survey.

Table 6-5 Stream aesthetics and wildlife observations in the Leona River Watershed, AU 2109_03. (From Field Data Sheet – Sect. F)

Station	Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
AU03_01	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	SP rabbits	tracks/fecal	N	N	N
AU03_02	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	MP rabbits/cattle	tracks	N	N	N
AU03_03	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	SP bobcat	tracks/fecal	R	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	R	R	N
AU03_04	NA ^a	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AU03_05	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	N	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	R	N
AU03_06	May 25, 2012	R	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	R	R	N
	July 17, 2012	R	A	N	No Water	No Water	No Water	N	N	N	fecal	R	C	R
AU03_07	May 25, 2012	R	A	N	Brown	Fine sediments	Clear	N	N	N	tracks/fecal	R	C	R
	July 17, 2012	A	R	N	Brown	Sludge	Clear	N	N	N	tracks	C	C	R
AU03_08	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N

Station	Date	Water Aesthetics						Wildlife Observations				Stream Garbage		
		Aquatic Vegetation	Algae Cover	Odor	Color	Bottom Deposit	Water Surface	Reptiles	Water Dependent Birds	Mammals	Evidence	Large in Channel	Small in Channel	Bank
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N
AU03_09	May 24, 2012	A	A	N	Green	Fine sediments	Clear	N	SP	SP ducks	tracks	N	N	N
	July 19, 2012	A	A	N	Brown	Fine sediments	Clear	N	MP	N	fecal	N	R	N
AU03_10	May 24, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks/fecal	N	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	N	R	N
AU03_11	May 22, 2012	Ab	R	R	Brown	Fine sediments	Scum	SP snakes	MP	N	fecal	N	R	R
	July 17, 2012	C	R	R	Brown	Fine sediments	Clear	N	SP	N	fecal	N	N	N
AU03_12	May 22, 2012	A	A	N	No Water	No Water	No Water	N	N	MP deer	tracks	R	N	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	SP deer	tracks	R	N	N
AU03_13	May 22, 2012	A	R	C	Green	Fine sediments	Scum	N	N	N	tracks	N	R	R
	July 17, 2012	A	A	N	Green	Fine sediments	Clear	N	N	SP deer	tracks/fecal	N	N	N
AU03_14	May 22, 2012	A	A	N	No Water	No Water	No Water	N	N	N	tracks	R	R	N
	July 17, 2012	A	A	N	No Water	No Water	No Water	N	N	SP deer	tracks	R	R	N

A = absent, R = rare, C = common, Ab = abundant, N = none, SP = slight presence, MP = moderate presence, LP = large presence; NA = not applicable

a. NA indicates not applicable. The landowner at Site A03_04 rescinded access to this site prior to the survey.

Physical Description of Site AU03_01

The Leona River at Site AU03_01 was surveyed on May 24 and July 17, 2012. This site, located in north of Batesville, Texas in Zavala County, was accessible only through privately owned lands that were fenced, gated, and locked. With landowner permission, TIAER personnel entered the locked gate and drove approximately 0.75 miles down a pasture road to reach the site. At the river, the bank was tall and steep, but due to the lack of dense vegetation at this transect, entry into the stream bed was moderately easy. The entry point TIAER field personnel used to access the stream was set as the 150-m transect. Other than the 150-m transect, there were very few locations where one could enter the stream without some difficulty. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-1 depicts the access and general appearance of the stream at Site AU03_01.

The surveyed reach at Site AU03_01 was wadeable for the entire 300-m reach during each visit due to the lack of water. Walking was easy due to the firm and dry clay substrate and the relatively low stature of vegetation within the stream channel. Due to the dry conditions, there were several fallen trees in the stream, but none were considered obstructions. One wildlife trail was observed near the 150-m transect. Hog and deer tracks were common sightings. Photogroup 6-2 depicts the stature of vegetation in the stream bed, fallen trees, and the wildlife trail encountered at Site AU03_01.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_02

The Leona River at Site AU03_02 was surveyed on May 24 and July 17, 2012. This site, located north of Batesville, Texas in Zavala County, was on private property approximately 3.5 miles behind three gates with the outside road gate being locked. Once permission for entry was sought and granted, TIAER personnel drove the pasture road, through brush and over cactus to reach the site. A barbed wire fence used to keep cattle from the stream was crossed and the steep vegetated bank had to be carefully traversed to avoid injury. Needless to say, access to the stream was definitely difficult. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-3 depicts the banks of the stream and general appearance of the stream at the site.

The reach at Site AU03_02 was wadeable for the entire length due to the lack of water. Although the vegetation was thick, following along the wildlife trails that appeared to be made primarily by feral hogs, made traversing the dry clay bottom relatively easy. Two obstructions, fallen trees, were encountered during the second survey. Photogroup 6-4 depicts the obstructions encountered and a hog track from the trail at Site AU03_02.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided

in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_03

The Leona River at Site AU04_03, north of Batesville, Texas in Zavala County, was visited on May 24 and July 17, 2012. This site, like Site AU03_02, was located on private property and landowner permission was required to conduct the surveys. With permission, TIAER personnel entered the property at the locked entrance gate and traveled approximately 3.5 miles through two additional gates and cropland to reach the site. Field personnel encountered a barbed wire fence used to keep cattle from the stream, but a gate allowed for access to the stream. One canoe and one flat bottom boat were observed outside the gate and, according to the landowner, were previously used to boat in the river. Although the gate made for easy entry to the stream bank, steep banks of karst limestone with numerous holes made entry into the stream difficult. A small dam at the entry point served as the 300m transect and personnel traveled downstream to complete the survey reach. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-5 depicts the observed boats, dam, and banks along the river.

The surveyed reach at Site AU03_03 was easily wadeable for the entire 300-m reach due to the lack of water. The bedrock bottom made walking easy and only one obstruction, a logjam at the 260-m transect, was encountered. At the 0-m transect, the substrate consisted primarily of mussel shells and a kid's swimming pool was observed at the 100-m transect. The vegetation in the streambed was dense in some locations, but for most of the reach, was easily navigable. Tracks and fecal droppings were common throughout the reach, and a bobcat was observed during the first survey. Photogroup 6-6 depicts the logjam, mussel shells, swimming pool, stream corridor, and vegetation along the streambed at Site AU03_03.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_04

The Leona River at Site AU03_04 was selected as a site to provide characterization of the stream. During reconnaissance of the watershed, landowner permission was sought and granted to conduct two RUAA surveys at this location. Before the first survey was conducted in May 2012, the ranch foreman was contacted about entry to the survey location. He stated that the landowner had had a change of heart and did not want to allow TIAER personnel access. TIAER personnel were unable to obtain landowner cooperation, so this site was not surveyed.

Physical Description of Site AU03_05

The Leona River at Site AU03_05 was monitored on May 24 and July 17, 2012. This site was accessible only through privately owned lands even though there were no fences,

gates, or locks. The property was located at a residence at the end of King's Lane, south of Uvalde, Texas in Uvalde County. With landowner permission, TIAER personnel walked across the lawn beside the house and were able to reach the stream to conduct the survey. This site also serves as a USGS gaging station, station 08204005. The banks in the lower half of the survey reach were short and densely vegetated, while the banks in the upper half of the reach were tall and steep with less vegetation. Two entry points, other than the one used by TIAER at the 150-m transect, were observed near the 300-m transect in the form of man-made walkways. There was no public access anywhere near this location, so these walkways were only readily accessible to the private landowners at these locations. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-7 depicts the points of entry observed and the stream banks of the stream at Site AU03_05.

The surveyed reach at Site AU03_05 was wadeable for the entire length of the reach due to the lack of water during both surveys. In the stream, the cobble bottom was firm, but walking could be challenging due to the density of vegetation in some locations. Vegetation in the stream was denser in the lower half of the reach than the upper. Only one log jam obstruction was encountered. The stream bed was also more narrow from the 0-m transect to the 150-m transect than from the 150-m transect to the 300-m transect. Fecal droppings and tracks were observed in the infrequent patches of mud and clay that occurred along the stream bottom. Photogroup 6-8 depicts cobble bottom, streambed vegetation, obstruction encountered, and the general stream appearance at Site AU03_05.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_06

The Leona River at Site AU03_06 was monitored on May 25 and July 17, 2012. This site was accessible only through privately owned lands that were fenced, gated, and locked. The property, just south of Uvalde, Texas in Uvalde County, serves as a historical park and opens to the public only during specific dates and times. The surveyed site was located at Hoag Dam, just below the confluence of Cooks Slough with the Leona River. There was a gravel road that paralleled the stream with several concrete picnic tables located along the left bank just off the road. Access to the stream was moderately easy with gently sloped banks on the left side of the stream by the road, although one had to be selective. The right side of the stream away from the road had steeper banks and was more densely vegetated. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-9 depicts Hoag Dam, stream banks with picnic tables, and general appearance of stream banks at Site AU03_06.

The surveyed reach at Site AU03_06 was wadeable for the entire length of the reach due to the lack of water during both surveys. The cobble bottom of the stream made for easy walking, although vegetation within the stream channel was sometimes irritating to walk through. No obstructions were encountered during either survey, other than the dam, just

above the 300-m transect. Photogroup 6-10 depicts the general appearance of the stream with the cobble bottom and vegetation at Site AU03_06.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_07

The Leona River at Site AU03_07 was surveyed on May 25 and July 17, 2012. This site was located on the same property as Site AU03_06, but was located above the confluence of Cooks Slough with the Leona River and above Hoag Dam. There were some historical buildings on the property and a gravel road that paralleled the stream along one bank. A concrete boat ramp served as the entry point for TIAER personnel and also the 60-m transect location. Although water was encountered, there was no flow observed in the stream. There was a definite break between pools just above the 300-m transect. During the second survey, TIAER personnel drove by the site the day before the actual survey and saw that the stream was completely dry. On the day of the survey, water was present and appeared to be flowing upstream. Cooks Slough was flowing and slowly filling the pool above Hoag Dam. The stream at this location was relatively wide, but was not very deep with depths averaging 0.50 meters during both surveys. As with Site AU03_06, the right streambank, away from the road, was steep and vegetated with no entry points observed in the reach. The left streambank, near the road, was much less steep and provided a few more options for entry into the stream. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-11 depicts the banks and general appearance of the stream at Site AU03_07.

The surveyed reach at Site AU03_07 was wadeable for its entire 300 meter length. In the stream, the bottom was mud/clay and walking was slow and methodical. A few partial obstructions in the form of fallen trees were encountered, but nothing completely blocking the entire width of the stream. Trash, in the form of tires, was observed near the 300-m transect. Occasionally, bottles, cans, and cups were observed along the edges of the stream. Wildlife tracks were observed along the edges of the stream and were identified as deer, hog, and raccoon. Potential for human recreation was evident as fishing bobbers, a broken fishing pole, and a fishing lure were observed over the length of the reach. Photogroup 6-12 and Photogroup 6-13 depict the obstructions, trash, wildlife tracks, and evidence of potential human recreation at Site AU03_07.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Photogroup 6-14 depicts stream color and water clarity at Site AU03_07. A surface scum of algae was noted on the water in portions of the reach.

Physical Description of Site AU03_08

The Leona River at Site AU03_08 was visited on May 24 and July 17, 2012. Access is possible from the FM Road 140 bridge crossing just south of Uvalde, Texas in Uvalde County. Although the site is publicly accessible, the highway right-of-way did not provide enough distance for the entire 300 meters required for the survey. No landowners were found from which to seek permission and no fences were encountered that inhibited the survey. TIAER personnel used the bridge crossing as the 0-m transect and worked upstream the required 300 meters to complete the survey. The banks of the stream were steep and heavily vegetated making access to the stream moderately difficult. The road provides the only public access to the stream along the reach surveyed. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-15 depicts the access and general bank appearance of Site AU03_08.

The surveyed reach at Site AU03_08 was wadeable for the entire 300 meters due to the lack of water, but dense vegetation made it challenging. A concrete dam was encountered near the 270-m transect. A walkway along the stream bank was observed behind one of the houses providing a potential point of access, but this was on private property and not available to the public. Other than the dam and dense vegetation, no other obstructions were encountered within the survey reach. Photogroup 6-16 depicts the dam and conditions in the streambed at Site AU03_08.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_09

The Leona River at Site AU03_09 was surveyed on May 24 and July 19, 2012. This site was located at the city park in Uvalde, Texas in Uvalde County. The City of Uvalde has constructed an impoundment on the stream and pumps water from the wastewater treatment plant to keep water flowing through the park year around. There is a walk/bike path around the impoundment with picnic tables, play structures for children, a basketball court, and a sand volleyball court all within close proximity to the stream. According to a city official, there is a city ordinance against utilizing the stream for recreation. There is no swimming or fishing allowed in the impoundment to avoid possible damage to the liner or the pipes, which operate two water aerators. A “No Fishing” sign is posted along the walk/bike path. Since entry into the stream was not allowed, only width measurements were collected at each transect of the stream. Depth measurements were collected at one location, the 150-m transect where a bridge crosses the stream. The stream riparian zones are mowed and maintained by city employees. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-17 depicts the general appearance of river and Photogroup 6-18 shows the amenities of the park at Site AU03_09 including the “No Fishing” sign.

Because of the city ordinance prohibiting wading, the surveyed reach at Site AU03_09 was not waded. The 0-m transect was set on the walk/bike path just below the water

impoundment of the park. Below the impoundment, the river returns to a more natural stream appearance. A trail along the left bank showed evidence of persons possibly utilizing this portion of the stream for recreation; probably fishing. There were many ducks observed on the water as well as the observance of a couple of nutria. Squirrels were the dominant wildlife observed during both surveys. Photogroup 6-19 depicts the footpath on the left bank at the 0-m transect and also ducks observed at Site AU03_09.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively.

Physical Description of Site AU03_10

The Leona River at Site AU03_10 was surveyed on May 24 and July 17, 2012. This site is located in a residential area of Uvalde, Texas in Uvalde County, just north of Site AU03_09 at the bridge crossing Leona Street. Access to the stream from the bridge crossing was easy due to low vegetation and very shallow, almost nonexistent banks throughout the reach. The channel appeared to be mowed periodically based on the height of the vegetation. There were no fences, barriers, or signs impeding or prohibiting one from entering the stream. Table 6-2 describes the stream channel and riparian zone appearance of this site. Photogroup 6-20 depicts the general appearance and accessibility of Site AU03_10.

The surveyed reach at Site AU03_10 was wadeable for its entire length due to the general lack of water during both surveys. One small puddle of water was encountered during the second survey at a bridge crossing just below the 0-m transect. There were no obstructions encountered during either survey. Tracks and fecal droppings were observed during both surveys. Photogroup 6-21 depicts the puddle of water at the bridge during the survey in July 2012, bank vegetation, and the relative close proximity of residences to the stream.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey within the surveyed reach.

Physical Description of Site AU03_11

The Leona River at Site AU03_11 was monitored on May 22 and July 17, 2012. This site lies at the bridge crossing of Studer Street, north of Site AU03_10, in Uvalde, Texas in Uvalde County. The property had no signs prohibiting the public from accessing the stream, although there was a cable type fence/barrier located at the Studer Street crossing that was easy to step across. This site, like Site AU03_10, is located in a residential area behind the Uvalde High School and Junior High School. One large pool was located at the 0-m transect and had a maximum depth of approximately 0.40 meters between both surveys. This pool averaged four meters in width and was greater than 50 meters long, traveling beyond the 0-m transect. This was the only water encountered during both

surveys. Access into the stream was easy as there were no banks to speak of along the stream at this location. The grassy corridor appeared to be mowed and maintained more frequently than the corridor at Site AU03_10. In order to capture the pool of water within the reach, TIAER established the Studer Street road crossing as the 300-m transect and worked downstream, encompassing the land behind the schools. This would also increase the possibility of catching someone recreating while leaving the school property. Table 6-2 lists the stream channel and riparian zone qualities observed at this site. Photogroup 6-22 depicts the pool and general appearance of the stream, including the cable fence/barrier at Site AU03_11.

The surveyed reach at Site AU03_11 was wadeable for its entire 300 meter length. Other than the pool at the 0-m transect, no water was encountered during the two field surveys. There were no obstructions encountered and only fecal droppings were observed within the reach.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity are shown in Photogroup 6-22 of the only pool encountered.

Physical Description of Site AU03_12

The Leona River at Site AU03_12 was monitored on May 22 and July 17, 2012. This site is located at the end of a cul-de-sac in a residential area of Uvalde, Texas in Uvalde County. The property was not fenced or gated but was privately owned and required landowner permission to conduct the survey. Parking at the end of the cul-de-sac, TIAER field personnel walked through the shrub dominated riparian zone into the stream. The dry stream did not have well defined banks and appeared more like a drainage area than a stream. There were tracks from some form of tractor between the 0-m transect and the 150-m transect during the first survey. During the second survey, field personnel observed that the tracks had been covered with a gravel road. The riparian vegetation on the right side of the stream was primarily large trees, while the left side of the stream riparian vegetation was primarily shrubs and smaller trees. The banks were low and gently sloping into the stream along the entire reach making access to the stream very easy from the bank. While this is privately owned land, there is nothing impeding public access to the river. Table 6-2 lists the stream channel and riparian zone qualities observed at this site. Photogroup 6-23 depicts the general appearance of Site AU03_12 and the tractor tracks turned gravel road.

The surveyed reach at Site AU03_12 was easily wadeable for its entire length due to the lack of water. No obstructions were encountered that impeded the survey within the boundaries of the property. The dried mud/clay bottom made for easy walking. Some form of drainage channel was observed at the 120-m transect and some dirt work in the stream channel was encountered in the same area. A trash pile was encountered at the 180-m transect, but otherwise, trash was rarely encountered. Because this site was in a residential area, the lack of trash observed in the stream channel was surprising. Deer were observed during both of the surveys and tracks were also seen, but no fecal

droppings. Photogroup 6-24 shows the dirt work and trash pile encountered and the proximity of nearby residences from the stream channel.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Physical Description of Site AU03_13

The Leona River at Site AU03_13 was monitored on May 22 and July 17, 2012. This site is located at the crossing of FM 2369 on the north side of Uvalde, Texas in Uvalde County, but the 300 m reach required for the survey was only accessible through private land. The property was fenced at the road crossing, but moderately easy to cross with landowner permission for entry. The Leona River at this property flows through native land comprised mainly of scrub brush. The banks are low and gently sloping into the stream along the entire reach making access to the stream very easy from the bank. The 300-m transect was set at the crossing at FM 2369, and TIAER personnel traveled downstream to complete the survey reach. There is no public access to the river at this site except at the right-of-way along FM 2369. Table 6-2 lists the stream channel and riparian zone qualities observed at this site. Photogroup 6-25 depicts the general appearance and access of Site AU03_13.

The surveyed reach at Site AU03_13 was wadeable for almost its entire length. One large pool at the 0-m transect had depths greater than 1.5 meters. Two additional smaller pools were encountered during the first survey in May and only one additional pool was observed during the second survey in July. The only obstructions were very large boulders encountered before the large pool at the end of the reach. Field personnel walked around these boulders to the pool rather than climbing over them. The bedrock stream bottom made for easy walking. Deer and rabbits were observed during only the second survey, while tracks and fecal dropping were found during both surveys. Although water was encountered during both surveys, neither time was water flowing. Photogroup 6-26 depicts the pools, boulders and tracks encountered during the surveys.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Photogroup 6-27 shows the water color and surface clarity in the large pool at the 0-m transect. Water color and surface clarity of the pools at the 150-m transect can be observed in the previously discussed Photogroup 6-26.

Physical Description of Site AU03_14

The Leona River at Site AU03_14 was monitored on May 22 and July 17, 2012. This site is at the upper boundary of Segment 2109 at the bridge crossing of US 83, north of Uvalde, Texas in Uvalde County. The 300-m reach required for the survey was only accessible through private land, which was fenced and required landowner permission for entry. Entry to the stream down the steep concrete apron of the bridge was moderately difficult, as well as traversing the dense vegetation and the property fence, which had

large debris piles across it. The 300-m transect was set at the bridge crossing, and TIAER personnel traversed the fence working downstream to complete the reach. The Leona River along this stretch was difficult to follow due to the large number of trees in the area and the poorly defined stream channel. The banks were low and gently sloping into the stream along the entire reach making access to the stream very easy from the bank. There was no public access to the river observed except at the right-of-way along US 83. Table 6-2 lists the stream channel and riparian zone qualities observed at this site. Photogroup 6-28 depicts the access and general appearance of Site AU03_14.

The surveyed reach at Site AU03_14 was wadeable for its entire length due to the lack of water. A pasture road was encountered at the 270-m transect that crossed the stream. No obstructions were encountered that impeded the survey within the boundaries of the property. Deer, hog, and raccoon tracks were observed during both surveys. Large channel garbage in the form of a tire was observed as was small garbage consisting of cups, bottles, and cans. Photogroup 6-29 depicts the road crossing at the 270-m transect, the tire observed, and some wildlife tracks.

Average thalweg depth, hydrographic parameters, and aesthetic appearance of the water and wildlife observations for the site during each survey have been previously provided in Tables 6-3, 6-4, and 6-5, respectively. Water color and clarity could not be described or depicted for this site as no water was present during either survey.

Activities: Observed and Interviewed

During each RUAA survey field personnel visited the publicly accessible sites during times and days when recreational activities were likely to occur. Interviews and observations at privately owned sites were conducted generally after the field surveys were completed. In most cases, informal conversations occurred during the scouting process in late 2011 and early 2012 and notes were made. Once a site was selected, there was very little contact with most landowners, so phone interviews were conducted to confirm and supplement information gathered during the initial contact.

No activities, either primary or secondary, were observed at any of the private or publically accessible sites in AU 2109_03 on either visit during 2012. At Site AU03_09, the city park in Uvalde, people were observed utilizing the playground equipment and the walk/bike path around the water impoundment on the Leona. Additionally, people were observed playing on the basketball and sand volleyball courts. All of these activities, however, were more than 25 meters away from the water. The closest possible form of recreation observed near the water was people feeding the ducks on the banks of the river.

Evidence of potential contact recreation was observed at some sites in the segment. A canoe and flat bottom boat were observed lying next to a fence at Site AU03_03. According to the landowner, the boats were used in the past to boat in the river. Fishing bobbers, lures and a broken fishing pole were observed at Site AU03_07, at Fort Inge.

Interviews were collected from landowners along the Leona and also from persons with knowledge of recreation occurring on the Leona. As previously stated, the landowners were consulted with during reconnaissance of the watershed about recreational activities, but were not formally interviewed at that time. Landowners were interviewed after completion of field surveys during a follow up phone conversation thanking them for their cooperation.

The landowner of Site AU03_01 provided information about recreational activities, but regrettably passed away before a formal interview was collected. From visiting with him, he stated that he used the stream primarily for fishing and hunting. He told stories of large fishing holes in the Leona on his stretch of property. Additionally, he observed and heard of people swimming and fishing along the Leona, particularly at the Batesville Dam Park in AU 2109_02. The person who now leases his property provided recreation information in the previous chapter of the report in AU 2109_02.

Sites AU03_02 and AU03_03 were owned by an absentee landowner. This site had the canoe and flat bottom boat, which he stated were used to float down the river years ago when the river flowed. This property had been in his family for many years, and they frequently used to recreate on the river. When water was present, fishing, swimming, and wading were common occurrences. Currently, the only thing they do is hunt on the property and run cattle.

The landowner for Site AU03_04 chose to not participate in the survey and an interview was not provided.

The landowner at Site AU03_05 was very informative. She stated that she and her family had swam, fished, and boated in the river her entire life. She learned a lot of lessons from her grandparents and parents while learning how to fish and swim in the Leona River behind her house. Stories of the water clarity and aquatic vegetation were interesting and almost unbelievable when looking at the current state of the river. She told of homemade diving boards, midnight swims, and even skinny dipping. She claimed that she, her parents, and aunts used the river for fishing until the river went dry several years ago. During our survey of her property, she did still have a pipe railed walkway leading down to the river at the back of her property.

Sites AU03_06 and AU03_07 were owned by a person who is also a member of the Uvalde Historical Commission. This property also serves as the historical park of Fort Inge. His interview revealed that he swam in the river as a youngster, back in the 1940's and 1950's and heard of others who did the same during the same time period. He stated that there has not been much recreation recently due to the lack of water.

No interview was collected for Site AU03_08 due to the inability to find a cooperating landowner.

Sites AU03_09 through AU03_11 were all publicly accessible so no landowner interviews were collected. Many interviews were collected from persons utilizing the

park and others who talked of recreation in the park area. Fishing was the primary form of recreation identified as occurring in the park. Swimming was spoken of in a few interviews. Based on the relatively new appearance of the water impoundment in the park, it is believed that the swimming and fishing primarily occurred before the water impoundment was constructed. Since the impoundment was built, there has been a city ordinance against swimming and fishing in the impoundment within the park.

The landowners for sites AU03_12 through AU03_14 all stated that there is never any water at those locations. They claim that their particular area of the Leona is part of the recharge zone for the Edwards Aquifer and the only time there is water is immediately after a large storm event, and then it only last for a few days at most. Hunting is the only form of recreation they state occurs on their property.

Of the additional interviews collected within the City of Uvalde, swimming and fishing were the primary forms of recreation identified. There was one interviewee who claimed to boat in the past at Fort Inge, Sites AU03_06 and AU03_07. Most of the interviewees spoke in generalities when asked for a specific site. They spoke of the Uvalde City Park and Fort Inge as the places where people used to go to swim and fish.

Copies of all of the interviews conducted along Leona River AU_03 by site are located on the project website <http://www.leonariver.org/>.

Summary

RUA field surveys for Segment 2109_AU03 were conducted at 13 of 14 sites on May 22 - 26 and July 17 - 21, 2012. At one site (AU03_04), the landowner rescinded permission to access his property just prior to the first field survey in May 2012. Copies of all comprehensive interview sheets, field data sheets, and transect pictures from each survey are located on the project website <http://www.leonariver.org/>.

No aquatic recreational activities (either primary or secondary) were observed by TIAER field staff during the surveys on 2012. Within the City of Uvalde, several areas did provide easy access to the river, including the Uvalde City Park. Within the Uvalde City Park, a city ordinance prohibits swimming, wading, and fishing, because these activities may cause damage to the impoundment liner at this location and also because the water within the river at the Uvalde City Park includes recycled wastewater from the Uvalde WWTF. Outside the City of Uvalde, fences, locked gates, and distance available to recreate at road crossings limited recreational opportunities along large sections of the Leona River. Within the Fort Inge Historical Park, no recreational activities were observed, but interviewees indicated that swimming, fishing, and boating had occurred at this location and access to the water was relatively easy. Information shared by landowners and other people within the segment revealed fishing, swimming, hunting, and some boating had occurred within this AU. These activities took place primarily at Sites AU03_06 and AU03_07 at Fort Inge and Site AU03_09, the Uvalde City Park. A summary of observed and interviewed activities by site are provided in Table 6-6 and Figure 6-2.

Table 6-6 Summary of recreational activities noted in interviews for AU 2109_03. Activities are listed as the number of times personal use, observed use, or heard of use was documented from interviews for a given location or the whole assessment unit. No recreational activities were observed during field surveys or site visits.

Site name	Swim	Wade		Hunt	Fish	Boat Canoe Kayak	Walk
		Adult	Children				
AU03_01				1, 0, 0	1, 0, 0		
AU03_02				1, 0, 0		1, 1, 0	
AU03_03	1, 0, 0	1, 0, 0	1, 0, 0	1, 0, 0	1, 1, 0	1, 1, 0	
AU03_04							
AU03_05	1, 1, 1				1, 1, 1	1, 1, 1	
AU03_06	0, 1, 1				2, 4, 4		
AU03_07	0, 1, 1				2, 4, 4		
AU03_08							
AU03_09	1, 2, 1				1, 3, 2	0, 1, 1	1, 0, 0
AU03_10							
AU03_11							
AU03_12				1, 0, 0			
AU03_13				1, 0, 0			
AU03_14				0, 1, 0			
Whole	2, 2, 0				4, 7, 9	0, 0, 1	
Totals	5, 7, 4	1, 0, 0	1, 0, 0	5, 1, 0	12, 20, 20	3, 4, 3	1, 0, 0

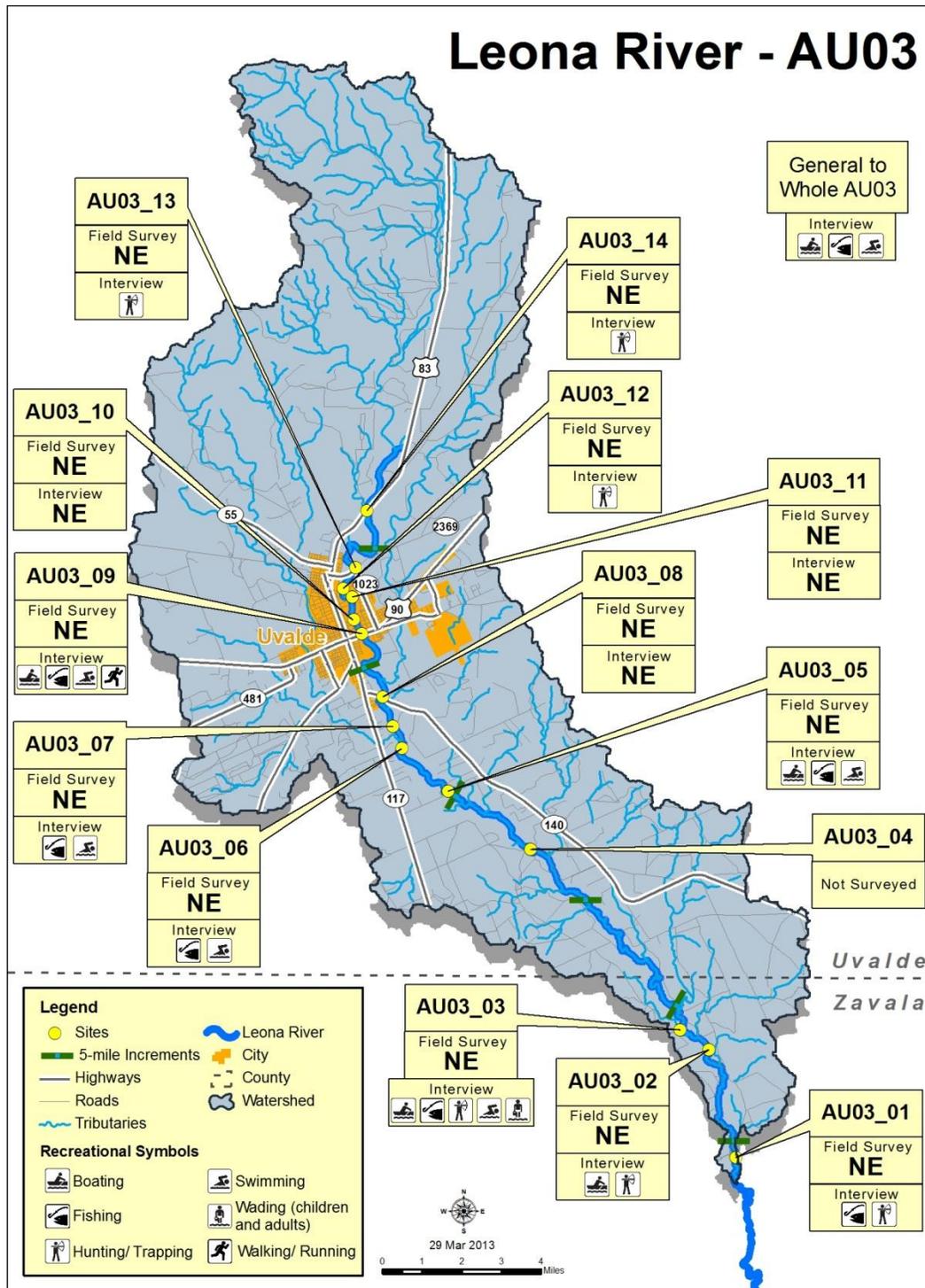


Figure 6-2 Summary of activities from field surveys and interviews in AU 2109_03. NE indicates not encountered.

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Chapter 4

Leona River AU2109_01 Photo Groups



Photogroup 4-1 Leona River Site AU01_01 depicting access and the general appearance of the stream. Top Left - 0-m transect, right bank view, May 2012; Top Right - 0-m transect, downstream view, July 2012; Middle Left – 150-m transect downstream view, May 2012; Middle Right – 150-m transect upstream view, July 2012; Bottom Left – 300-m transect upstream view, May 2012; Bottom Right – 300-m transect upstream view, July 2012.



Photogroup 4-2 Leona River Site AU01_01 depicting obstructions, field staff wading in the stream, and streambank access. (All individuals pictured are TIAER staff.) Top Left – obstruction 1, May 2012; Top Right – obstruction 2, May 2012; Middle Left – 0-m transect upstream view, May 2012; Middle Right – 150-m transect left bank view, July 2012; Bottom Left – 300-m transect, right bank view, July 2012; Bottom Right – 300-m transect downstream view, July 2012.



Photogroup 4-3 Leona River Site AU01_01 illustrating the water color, general appearance and clarity of the water surface and obstructions. (All individuals pictured are TIAER staff.) Top Left – 150-m transect upstream, May 2012; Top Right – 300-m transect downstream, May 2012; Middle Left – 300-m transect right bank view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 150-m transect downstream view, July 2012; Bottom Right – 270-m transect obstruction, July 2012.



Photogroup 4-4 Leona River Site AU01_02 depicting stream access and typical setting. (All individuals pictured are TIAER staff.) Top Left – 270-m transect culvert upstream view, July 2012; Top Right – 270-m transect culvert upstream, July 2012; Middle Left – 150-m transect downstream view, May 2012; Middle Right – 150-m transect downstream view, July 2012; Bottom – 300-m upstream view, July 2012.



Photogroup 4-5 Leona River Site AU01_02 depicting obstructions and density of vegetation in stream channel. (All individuals pictured are TIAER staff.) Top Left – obstruction 3, May 2012; Top Right – obstruction 4, May 2012; Middle Left – 150-m transect upstream view, May 2012; Middle Right – 0-m transect left bank view, July 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 150-m upstream view, July 2012.



Photogroup 4-6 Leona River Site AU01_02 depicting water color and clarity of surface. (All individuals pictured are TIAER staff.) Top Left – 150-m transect upstream view, May 2012; Top Right – 0-m transect downstream view, May 2012; Middle Left – 0-m transect upstream view, May 2012; Middle Right – 150-m transect downstream view, May 2012.



Photogroup 4-7 Leona River Site AU01_03 depicting stream access and general appearance of stream. (All individuals pictured are TIAER staff.) Top Left – 150-m transect right bank, May 2012; Top Right – 300-m transect upstream view, May 2012; Middle Left – 0-m transect right bank view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 300-m upstream view, July 2012.



Photogroup 4-8 Leona River Site AU01_03 depicting obstructions and dense vegetation. (All individuals pictured are TIAER staff.) Top Left – obstruction 1, May 2012; Top Right – obstruction 2, May 2012; Middle Left – 300-m transect left bank view, May 2012; Middle Right – 20-m obstruction, July 2012; Bottom Left – 180-m obstruction, July 2012; Bottom Right – 300-m left bank view, July 2012.



Photogroup 4-9 Leona River Site AU01_03 illustrating the water color and surface clarity of the water. (All individuals pictured are TIAER staff.) Top Left – 0-m transect upstream view, May 2012; Top Right – 0-m transect downstream view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 0-m transect downstream view, July 2012; Bottom Right – 300-m upstream view, July 2012.



Photogroup 4-10 Leona River Site AU01_04 depicting stream access and general appearance of the stream at AU01_04. (All individuals pictured are TIAER staff.) Top Left – 300-m transect right bank view, May 2012; Top Right – 150-m transect right bank view, May 2012; Middle Left – 0-m transect upstream view, May 2012; Middle Right – 0-m transect left bank view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 3000-m upstream view, July 2012.



Photogroup 4-11 Leona River Site AU01_04 depicting obstructions and dense vegetation. (All individuals pictured are TIAER staff.) Top Left – obstruction 1, May 2012; Top Right – obstruction 2, May 2012; Middle Left – obstruction 3, May 2012; Middle Right – 0-m transect downstream view, July 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 300-m downstream view, July 2012.



Photogroup 4-12 Leona River Site AU01_04 depicting water color and clarity of the surface. (All individuals pictured are TIAER staff.) Top Left – 150-m transect downstream view, May 2012; Top Right – 150-m transect upstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 300-m transect upstream view.



Photogroup 4-13 Leona River Site AU01_05 depicting steep banks, access and general appearance of stream. (All individuals pictured are TIAER staff.) Top Left – 0-m transect left bank view, May 2012; Top Right – 150-m transect downstream view, May 2012; Middle Left – 300-m transect right bank view, May 2012; Middle Right – 0-m transect right bank view, July 2012; Bottom Left – 0-m transect downstream view, July 2012; Bottom Right – 300-m downstream view, July 2012.



Photogroup 4-14 Leona River Site AU01_05 depicting obstructions and stream vegetation. (All individuals pictured are TIAER staff.) Top Left – obstruction 2, May 2012; Top Right – obstruction 3, May 2012; Middle Left – obstruction 4, May 2012; Middle Right – 0-m transect downstream view, May 2012; Bottom Left – 0-m transect upstream view, May 2012; Bottom Right – 300-m downstream view, May 2012.



Photogroup 4-15 Leona River Site AU01_06 depicting the general appearance of the stream channel. (All individuals pictured are TIAER staff.) Top Left – 0-m transect downstream view, May 2012; Top Right – 150-m transect upstream view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 150-m transect downstream view, July 2012; Bottom Right – 300-m downstream view, July 2012.



Photogroup 4-16 Leona River Site AU01_06 depicting obstructions and bridge with hanging deer feeder. (All individuals pictured are TIAER staff.) Top Left – obstruction 1, May 2012; Top Right – obstruction 3, May 2012; Bottom Left – obstruction 4, May 2012; Bottom Right – 0-m transect upstream, May 2012.



Photogroup 4-17 Leona River Site AU01_07 depicting access at low water crossing and general appearance of stream. (All individuals pictured are TIAER staff.) Top Left – 300-m transect left bank view, May 2012; Top Right – 0-m transect downstream view, May 2012; Middle Left – 150-m transect downstream view, May 2012; Middle Right – 300-m transect downstream view, May 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 150-m upstream view, July 2012.



Photogroup 4-18 Leona River Site AU01_07 depicting the cobble bottom, obstructions, and trash within the channel. (All individuals pictured are TIAER staff.) Top Left – 150-m transect downstream view, July 2012; Top Right – 300-m transect downstream view, July 2012; Middle Left – obstruction 1, May 2012; Middle Right – obstruction 2, May 2012; Bottom Center – trash pile, May 2012.



Photogroup 4-19 Leona River Site AU01_08 depicting a view from the FM 1581 bridge and the general appearance of the river. (All individuals pictured are TIAER staff.) Top Left – 300-m transect right bank view, May 2012; Top Right – 300-m transect left bank view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 0-m transect downstream view, July 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 150-m downstream view, July 2012.



Photogroup 4-20 Leona River Site AU01_08 depicting dense vegetation, obstructions encountered, and fishing bobber. (All individuals pictured are TIAER staff.) Top Left – 300-m transect downstream view, July 2012; Top Right – 300-m transect upstream view, July 2012; Middle Left – obstruction 1, May 2012; Middle Right – obstruction 2, May 2012; Bottom Left – 168-m obstruction May 2012; Bottom Right – bobber in brush pile, May 2012.



Photogroup 4-21 Leona River Site AU01_09 depicting the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left – 0-m transect downstream view, May 2012; Top Right – 150-m transect downstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 300-m upstream view, July 2012.



Photogroup 4-22 Hog wallows and trails as signs of wildlife found along AU 2109_01. (All individuals pictured are TIAER staff.) Top Left – Site AU01_02, May 2012; Top Right – Site AU01_06, May 2012; Middle Left – Site AU01_08, May 2012; Middle Right – Site AU01_05, July 2012; Bottom Left – Site AU01_05, July 2012; Bottom Right – Site AU01_06, July 2012.



Photogroup 4-23 Bobbers as signs of recreation found along AU 2109_01. (All individuals pictured are TIAER staff.) Top – Site AU01_01, May 2012; Bottom – Site AU01_08, July 2012.

Chapter 5

Leona River AU2109_02 Photo Groups



Photogroup 5-1 Leona River Site AU02_01 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 0-m transect downstream view, May 2012; Top Right - 0-m transect upstream view, May 2012; Middle Left - 150-m transect downstream view, May 2012; Middle Right - 150-m transect upstream view, May 2012; Bottom Left - 300-m transect downstream view, May 2012; Bottom Right - 300-m transect right bank, May 2012.



Photogroup 5-2 Leona River Site AU02_01 depicting stream banks, obstruction and a backpack encountered (All individuals pictured are TIAER staff.) Top Left – 0-m transect left bank, May 2012; Top Right – 0-m transect right bank, May 2012; Middle Left – 150-m transect left bank view, May 2012; Middle Right – 150-m transect right bank view, May 2012; Bottom Left – obstruction, May 2012; Bottom Right – backpack tied to log, May 2012.



Photogroup 5-3 Leona River Site AU02_01 illustrating pool conditions in May and July 2012. (All individuals pictured are TIAER staff.) Top – 300-m transect downstream view, May 2012; Bottom – 300-m transect location downstream view, July 2012.



Photogroup 5-4 Leona River Site AU02_02 depicting the general appearance of the stream. Top Left - 0-m transect downstream view, May 2012; Top Right - 0-m transect left bank view, May 2012; Middle Left – 0-m transect right bank view, May 2012; Middle Right – 150-m transect downstream view, May 2012; Bottom Left – 300-m transect downstream view, May 2012; Bottom Right – 300-m transect upstream view, May 2012.



Photogroup 5-5 Leona River Site AU02_02 depicting obstructions and rope swing encountered. Top Left - 150-m transect upstream view, May 2012; Top Right – obstruction 2, May 2012; Bottom Left – obstruction, May 2012; Bottom Right – rope swing over shallow pool, May 2012.



Photogroup 5-6 Leona River Site AU02_02 illustrating the water color, general appearance, and clarity of the water surface. (All individuals pictured are TIAER staff.) Top Left - 150-m transect left bank view, May 2012; Top Right - 150-m transect right bank view, May 2012; Bottom Left – 300-m transect, left bank view, May 2012; Bottom Right – 300-m transect downstream view, May 2012.



Photogroup 5-7 Leona River Site AU02_03 depicting access and the general appearance of the stream. Top Left - 150-m transect downstream view, May 2012; Top Right - 150-m transect upstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 0-m transect right bank view, July 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 5-8 Leona River Site AU02_03 depicting obstructions encountered. Top Left - 0-m transect downstream view, May 2012; Top Right - 150-m transect downstream view, July 2012; Bottom Left – 300-m transect, downstream view, July 2012; Bottom Right – obstruction, July 2012.



Photogroup 5-9 Leona River Site AU02_03 illustrating the water color, general appearance, and clarity of the water surface. (All individuals pictured are TIAER staff.) Top - 0-m transect upstream view, May 2012; Bottom – 300-m transect upstream view, May 2012.



Photogroup 5-10 Leona River Site AU02_04 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 150-m transect downstream view, May 2012; Top Right - 150-m transect upstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 0-m transect right bank view, July 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 300-m transect upstream view, July 2012.



Photogroup 5-11 Leona River Site AU02_04 depicting obstructions encountered. Top Left - 0-m transect downstream view, July 2012; Top Right - 150-m transect downstream view, July 2012; Bottom Left – 300-m transect downstream view, July 2012; Bottom Right – obstruction, May 2012.



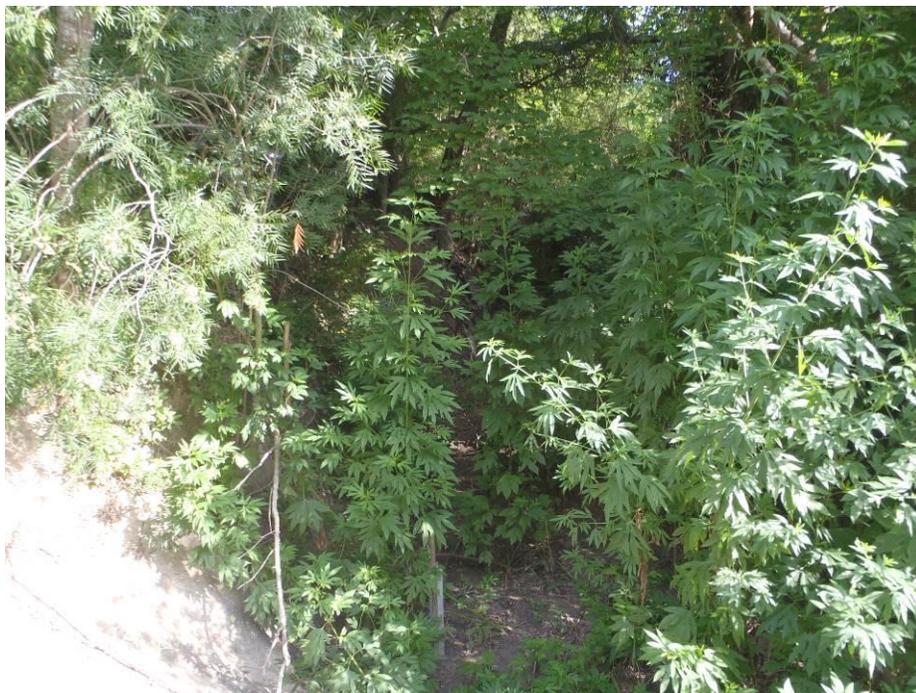
Photogroup 5-12 Leona River Site AU02_04 illustrating the water color, general appearance, and clarity of the water surface. Top - 0-m transect upstream view, May 2012; Bottom – 300-m transect upstream view, May 2012.



Photogroup 5-13 Leona River Site AU02_05 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 0-m transect downstream view, May 2012; Top Right - 150-m transect downstream view, May 2012; Middle Left – 150-m transect upstream view, May 2012; Middle Right – 300-m transect downstream view, May 2012; Bottom Left – 300-m right bank view, July 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 5-14 Leona River Site AU02_05 depicting obstructions encountered. (All individuals pictured are TIAER staff.) Top Left - 0-m transect left bank view, May 2012; Top Right - 0-m transect, right bank view, May 2012; Middle Left – 150-m transect left bank view, May 2012; Middle Right – 150-m transect right bank view, May 2012; Bottom Left – obstruction and red cooler, May 2012; Bottom Right – staff crawling through vines, May 2012.



Photogroup 5-15 Leona River Site AU02_05 illustrating dense vegetation and absence of water. Top - 300-m transect downstream view, July 2012; Bottom – 300-m transect upstream view, July 2012.



Photogroup 5-16 Leona River Site AU02_06 depicting the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 0-m transect upstream view, May 2012; Top Right - 150-m transect upstream view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 0-m transect downstream view, July 2012; Bottom Left – 150-m transect downstream view, July 2012; Bottom Right – 300-m transect downstream view, July 2012.



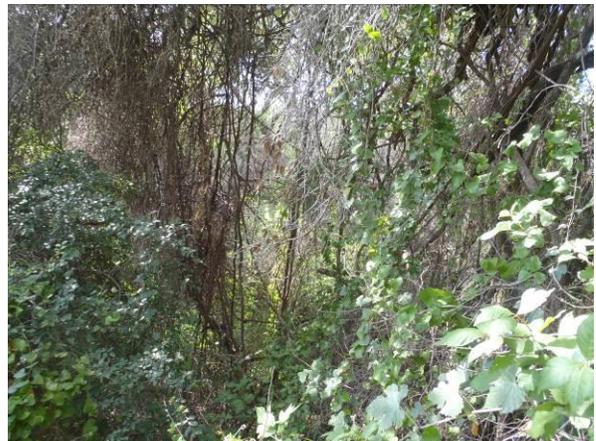
Photogroup 5-17 Leona River Site AU02_06 depicting small dam and obstructions encountered. Top Left – 135-m crude dam, July 2012; Top Right - obstruction, May 2012; Middle Left – 135-m obstruction, July 2012; Middle Right – 210-m obstruction, July 2012; Bottom – obstruction and dozer tracks, July 2012.



Photogroup 5-18 Leona River Site AU02_07 depicting access and the general appearance of the stream. Top Left - 0-m transect upstream view, July 2012; Top Right - 150-m transect downstream view, May 2012; Middle Left - 150-m transect upstream view, May 2012; Middle Right - 300-m transect downstream view, July 2012; Bottom Left - view of fence blocking access, July 2012; Bottom Right - second view of fence blocking access, July 2012.



Photogroup 5-19 Batesville park facilities near Leona River Site AU02_07. Top Left – baseball field, July 2012; Top Right – parking lot, July 2012; Middle Left – park pavilion, July 2012; Middle Right – playground, July 2012.



Photogroup 5-20 Leona River Site AU02_08 depicting access and the general appearance of the stream. Top Left - 0-m transect right bank view, May 2012; Top Right - 0-m transect left bank view, July 2012; Middle Left – 0-m transect downstream view, May 2012; Middle Right – 150-m transect downstream view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 300-m transect downstream view, May 2012.



Photogroup 5-21 Leona River Site AU02_08 depicting obstruction and dense vegetation encountered. Top Left – 245-m obstruction, July 2012; Top Right - 150-m transect left bank view, May 2012; Middle Left – 300-m transect left bank view, May 2012; Middle Right – 300-m transect right bank view, July 2012; Bottom – 150-m transect right bank view, July 2012.



Photogroup 5-22 Leona River Site AU02_09 depicting the general appearance of the stream. Top Left - 0-m transect upstream view, May 2012; Top Right - 300-m transect downstream view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom Left – 300-m transect downstream view, July 2012; Bottom Right – 300-m transect upstream view, July 2012.



Photogroup 5-23 Leona River Site AU02_09 depicting obstructions and backpack encountered. (All individuals pictured are TIAER staff.) Top Left – obstruction 1, May 2012; Top Right – obstruction 2, May 2012; Middle – backpack, July 2012.



Photogroup 5-24 Leona River Site AU02_09 illustrating the water color, general appearance, and clarity of the water surface. Top Left - 150-m transect upstream view, May 2012; Bottom – 150-m transect downstream view, May 2012.



Photogroup 5-25 Leona River Site AU02_10 depicting the general appearance of the stream and dam. (All individuals pictured are TIAER staff.) Top Left - 0-m transect downstream view, May 2012; Top Right - 0-m transect upstream view, May 2012; Middle Left – 150-m transect upstream view, May 2012; Middle Right – 300-m transect upstream view, May 2012; Bottom Left – 150-m transect left bank view, May 2012; Bottom Right – 300-m right bank view, May 2012.



Photogroup 5-26 Leona River Site AU02_10 depicting nearby park area, dam, and memorial cross. Top Left – view 1 park area, July 2012; Top Right – view 2 park area, July 2012; Middle Left – view 3 park area, July 2012; Middle Right – view dam within channel, July 2012; Bottom – cross noting drowning, July 2012.



Photogroup 5-27 Leona River Site AU02_10 dry conditions and backpacks observed in July 2012. Top Left - 300-m transect upstream view, July 2012; Top Right - 300-m transect, downstream view, July 2012; Middle – backpacks stowed in stream, July 2012.



Photogroup 5-28 Leona River Site AU02_11 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 150-m transect left bank view, May 2012; Top Right - 150-m transect right bank view, May 2012; Middle Left - 0-m transect downstream view, May 2012; Middle Right - 0-m transect upstream view, July 2012; Bottom Left - 300-m transect, upstream view, July 2012; Bottom Right - 300-m transect left bank view, July 2012.



Photogroup 5-29 Leona River Site AU02_11 depicting dense vegetation, log jam obstructions, tires, hog feces. Top Left - 300-m transect upstream view, May 2012; Top Right - 300-m transect right bank view, May 2012; Middle Left – obstruction 1, May 2012; Middle Right – obstruction 2, May 2012; Bottom Left – tires, July 2012; Bottom Right – feral hog feces, July 2012.

Chapter 6

Leona River AU2109_03 Photogroups



Photogroup 6-1 Leona River Site AU03_01 depicting the general appearance of the stream. Top Left - 0-m transect left bank view, May 2012; Top Right - 0-m transect right bank view, May 2012; Middle Left – 150-m transect left bank view, May 2012; Middle Right – 300-m transect right bank view, July 2012; Bottom Left – 0-m transect downstream view, July 2012; Bottom Right – 0-m transect upstream view, July 2012.



Photogroup 6-2 Leona River Site AU03_01 depicting vegetation in streambed, fallen tree, and wildlife trail. (All individuals pictured are TIAER staff.) Top Left - 300-m transect upstream view, July 2012; Top Right - 150-m transect upstream view, May 2012; Bottom Left – 150-m transect downstream view, May 2012; Bottom Right – wildlife trail, July 2012.



Photogroup 6-3 Leona River Site AU03_02 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 0-m transect upstream view, May 2012; Top Right - 150-m transect upstream view, May 2012; Middle Left – 300-m transect upstream view, May 2012; Middle Right – 150-m transect left bank view, July 2012; Bottom Left – 0-m transect left bank view, July 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 6-4 Leona River Site AU03_02 illustrating obstructions and signs of wildlife. (All individuals pictured are TIAER staff.) Top Left - 65-m obstruction, July 2012; Top Right - 270-m obstruction, July 2012; Bottom – hog tracks, May 2012.



Photogroup 6-5 Leona River Site AU03_03 depicting boats, dam, and stream banks. Top Left – canoes on stream bank view, May 2012; Top Right - 300-m transect upstream view, May 2012; Middle Left – 150-m transect left bank view, May 2012; Middle Right – 150-m transect right bank view, May 2012; Bottom Left – 300-m transect left bank view, July 2012; Bottom Right – 300-m transect right bank view, July 2012.



Photogroup 6-6 Leona River Site AU03_03 depicting logjam, mussel shells, kiddie pool, and stream channel conditions. (All individuals pictured are TIAER staff.) Top Left - 260-m logjam across channel, July 2012; Top Right – mussel shells on streambed bottom, May 2012; Middle Left – 100-m transect kiddie pool within debris, July 2012; Middle Right – 0-m transect downstream view, July 2012; Bottom Left – 0-m transect upstream view, July 2012; Bottom Right – 150-m transect upstream view, July 2012.



Photogroup 6-7 Leona River Site AU03_05 depicting points of entry and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 150-m transect right bank view, July 2012; Top Right – pipe walkway, May 2012; Middle Left – rock walkway, May 2012; Middle Right – 0-m transect left bank view, May 2012; Bottom Left – 300-m transect right bank view, July 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 6-8 Leona River Site AU03_05 depicting cobble bottom, streambed vegetation, obstruction, and general stream appearance. Top Left - 0-m transect downstream view, May 2012; Top Right - 0-m transect upstream view, May 2012; Middle Left – obstruction, May 2012; Middle Right – 150-m transect downstream view, May 2012; Bottom Left – 300-m transect downstream view, May 2012; Bottom Right – 300-m transect upstream view, May 2012.



Photogroup 6-9 Leona River Site AU03_06 depicting Hoag’s Dam, the stream banks with picnic tables, and channel banks. (All individuals pictured are TIAER staff.) Top Left - 300-m transect upstream view, July 2012; Top Right - 300-m transect view of Hoag’s Dam, May 2012; Middle Left – 150-m transect left bank view, July 2012; Middle Right – 150-m transect left bank view, July 2012; Bottom Left – 0-m transect left bank view, July 2012; Bottom Right – 150-m transect right bank view, July 2012.



Photogroup 6-10 Leona River Site AU03_06 depicting the general appearance of the stream. Top Left - 0-m transect downstream view, May 2012; Top Right - 150-m transect downstream view, May 2012; Middle Left – 150-m transect upstream view, May 2012; Middle Right – 0-m transect upstream view, July 2012; Bottom – 300-m transect, upstream view, July 2012.



Photogroup 6-11 Leona River Site AU03_07 depicting banks and the general appearance of the stream. Top Left - 0-m transect right bank view, May 2012; Top Right - 150-m transect left bank view, May 2012; Middle Left – 300-m transect right bank view, May 2012; Middle Right – 300-m transect left bank view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 0-m transect upstream view, July 2012.



Photogroup 6-12 Leona River Site AU03_07 depicting obstructions, trash, and wildlife tracks. (All individuals pictured are TIAER staff.) Top Left - obstruction, May 2012; Top Right - 210-m obstruction, July 2012; Middle Left – 240 obstruction, July 2012; Middle Right – tires in streambed view, May 2012; Bottom Left – beer can on concrete ledge, May 2012; Bottom Right – wildlife tracks, May 2012.



Photogroup 6-13 Leona River Site AU03_07 depicting wildlife tracks and signs of potential recreation. (All individuals pictured are TIAER staff.) Top Left – animal tracks, May 2012; Top Right - bobber, May 2012; Middle Left – bobber hanging in tree, May 2012; Middle Right – bobber on bank with trash, July 2012; Bottom – fishing line and lure, July 2012.



Photogroup 6-14 Leona River Site AU03_07 depicting water color and clarity. Top Left - 0-m transect downstream view, May 2012; Top Right - 150-m transect downstream view, July 2012; Middle – algal scum on water, July 2012.



Photogroup 6-15 Leona River Site AU03_08 depicting access and the general bank appearance. (All individuals pictured are TIAER staff.) Top Left - 0-m transect left bank view, May 2012; Top Right - 150-m transect left bank view, May 2012; Bottom Left – 300-m transect left bank view, May 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 6-16 Leona River Site AU03_08 depicting dam and streambed conditions. Top Left – concrete dam, May 2012; Top Right - 300-m transect downstream view, May 2012; Middle Left – 0-m transect upstream view, May 2012; Middle Right – 300-m transect upstream view, May 2012; Bottom Left – 150-m transect downstream view, July 2012; Bottom Right – 150-m transect upstream view, July 2012.



Photogroup 6-17 Leona River Site AU03_09 depicting access and the general appearance of the stream within the Uvalde City Park. Top Left - 0-m transect upstream view towards water impoundment within Uvalde City Park, May 2012; Top Right - 150-m transect downstream view, May 2012; Bottom Left – 150-m transect upstream view, May 2012; Bottom Right – 300-m transect upstream view, May 2012.



Photogroup 6-18 Leona River Site AU03_09 depicting amenities within the Uvalde City Park. Top Left - gazebo, May 2012; Top Right – sand volleyball court, May 2012; Middle Left – playground structure, May 2012; Middle Right – playground and picnic area, July 2012; Bottom Left – picnic area, July 2012, Bottom Right – No Fishing Sign (picture taken Sep. 2011).



Photogroup 6-19 Leona River Site AU03_09 depicting general appearance of the stream and access. Top Left - 0-m transect downstream view, May 2012; Top Right - 0-m transect left bank view with footpath, May 2012; Bottom Left – 150-m transect downstream view, July 2012; Bottom Right – 0-m transect upstream view, July 2012.



Photogroup 6-20 Leona River Site AU03_10 depicting access and the general appearance of the stream. (All individuals pictured are TIAER staff.) Top Left - 0-m transect upstream view, May 2012; Top Right - 150-m transect downstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 300-m transect upstream view, July 2012; Bottom Left – 150-m transect left bank view, July 2012; Bottom Right – 150-m transect right bank view, July 2012.



Photogroup 6-21 Leona River Site AU03_10 depicting puddle encountered in July, bank vegetation, and nearby residences. Top Left - 0-m transect downstream view, July 2012; Top Right - 0-m transect left bank view, July 2012; Bottom Left – 0-m transect right bank view, July 2012; Bottom Right – 300-m transect left bank view, July 2012.



Photogroup 6-22 Leona River Site AU03_11 depicting the pool encountered and the general appearance of the stream. Top Left - 0-m transect downstream view, July 2012; Top Right - 0-m transect upstream view, July 2012; Middle Left – 150-m transect downstream view, May 2012; Middle Right – 300-m transect downstream view, May 2012; Bottom Left – 150-m transect upstream view, May 2012; Bottom Right – 300-m transect right bank view, July 2012.



Photogroup 6-23 Leona River Site AU03_12 depicting access and the general appearance of the stream and tractor tracks in May and gravel road in July. Top Left - 150-m transect downstream view, May 2012; Top Right - 150-m transect upstream view, May 2012; Middle Left – 300-m transect downstream view, May 2012; Middle Right – 300-m transect upstream view, May 2012; Bottom Left – tractor tracks in streambed, May 2012; Bottom Right – gravel path in streambed, July 2012.



Photogroup 6-24 Leona River Site AU03_12 depicting dirt work, trash, and nearby residence. Top Left - 120-m drainage culvert, May 2012; Top Right - 120-m view of dirt work, May 2012; Middle Left – 120-m second view of dirt work, May 2012; Middle Right – 180-m trash pile, May 2012; Bottom – 0-m left bank view, July 2012.



Photogroup 6-25 Leona River Site AU03_13 depicting the general appearance of the stream and the stream access point. (All individuals pictured are TIAER staff.) Top Left - 0-m transect upstream view, May 2012; Top Right - 150-m transect left bank view, May 2012; Middle Left – 150-m transect right bank view, May 2012; Middle Right – 150-m transect downstream view, July 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 300-m transect downstream view, July 2012.



Photogroup 6-26 Leona River Site AU03_13 depicting pools, boulders, and wildlife tracks. Top Left - 0-m transect downstream view, July 2012; Top Right - 150-m transect downstream view, May 2012; Middle Left – 150-m transect upstream view, May 2012; Middle Right – rocks as obstruction, May 2012; Bottom Left – more rocks as obstruction, May 2012; Bottom Right – wildlife tracks, May 2012.



Photogroup 6-27 Leona River Site AU03_13 depicting water color and surface clarity. 0-m transect right bank view, May 2012.



Photogroup 6-28 Leona River Site AU03_14 depicting access and the general appearance of the stream. Top Left - 300-m transect right bank view, May 2012; Top Right - 0-m transect downstream view, May 2012; Middle Left – 0-m transect upstream view, July 2012; Middle Right – 150-m transect downstream view, May 2012; Bottom Left – 150-m transect upstream view, July 2012; Bottom Right – 300-m transect downstream view, July 2012.



Photogroup 6-29 Leona River Site AU03_14 depicting road across creek, tire, and wildlife tracks. Top Left - 270-m road view north, May 2012; Top Right - 270-m road view south, May 2012; Middle Left – tires along stream, May 2012; Middle Right – wildlife tracks, May 2012; Bottom – more wildlife tracks, May 2012.