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A SIGNIFICANT RANGE EXTENSION FOR THE TEXAS MAP TURTLE (*GRAPTEMYS VERSA*) AND THE INERTIA OF AN INCOMPLETE LITERATURE

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***Abstract.*—Defining the limits of a species' geographic distribution is fundamental to research in biogeography, ecology, and conservation biology. The Texas Map Turtle, *Graptemys versa*, is endemic to the Colorado River drainage in central Texas but has been incorrectly reported by several sources to be restricted to the part of the Colorado drainage located on the Edwards Plateau, northwest of the fault lines of the Balcones Escarpment. I conducted visual surveys of basking turtles, vouchered with photographs, which demonstrate that even statements that the species occurs mainly above the Balcones Escarpment are incorrect. I observed higher numbers and higher relative abundances within basking turtle assemblages throughout the five counties downstream of the Edwards Plateau, in over 400 river km of the Colorado, and an abundant population was observed just 48 river km from the river's mouth in coastal Matagorda County. Literature statements regarding restricted limits of freshwater turtle geographic ranges should be critically appraised for their accuracy. Surveys that are conducted beyond published range limits must also be detailed not just for new records but also for negative results, in order to enable future workers to properly evaluate statements about range limits.**

Key Words.—Balcones Escarpment; Colorado River; Edwards Plateau; range limits; relative abundance; Texas

INTRODUCTION

A basic activity in field biology is determining the range of occurrence for species. Knowledge of where species occur or do not occur allows for biogeographical and ecological inferences regarding geographical barriers and habitat characteristics that limit a species and is vitally important to formal recognition and management of imperiled species. Given adequate effort in locating species occurrences, field guides and other sources may include statements regarding the limits of a species' geographic range.

The map turtles and sawbacks (*Graptemys*) of eastern and central North America are 14 species of riverine freshwater turtles whose unique biogeography has generated close attention to questions of their geographic ranges: eight species are restricted to relatively small Gulf Coastal river drainages, one is restricted to the greater Mississippi River drainage, and three occur in 2–3 adjacent and relatively small Gulf Coastal drainages, thus only two species occur in more than three separate river drainages (Lindeman 2013). In addition, species of *Graptemys* have been the subject of conservation concern, primarily due to habitat alteration and exploitation in the pet trade (Buhlmann and Gibbons 1997). Two species (*G. flavimaculata* and *G. oculifera*) are federally protected in the United States as threatened species and a third (*G. geographica*) is federally protected in the Canadian portion of its range, while nine of the 14 species have been protected at the state level in one or more range states (Lindeman 2013).

Surprisingly, recent range extensions of *Graptemys* species are numerous in the literature. In tributaries of the Pearl River, new records for two drainage-endemic species, *G. oculifera* and *G. pearlensis*, have resulted in recent range extensions of 136 and 137 total river km, respectively (Lindeman 2013). The range of *G. ernsti* in the upper Conecuh River was similarly extended by 75 river km based on surveys conducted in 2012 (Lindeman 2013). First records of two Pascagoula drainage endemics, *G. flavimaculata* and *G. gibbonsi*, were reported for eight smaller tributaries for each species by Selman and Qualls (2009) and first records of *G. sabinensis* in five tributary bayous of the Mermentau River were reported by Ilgen et al. (2014). Altogether, more than 100 such new tributary records for various species of *Graptemys* were obtained between 1995 and 2012 (Lindeman 2013).

The present note details another example of a substantial range extension and provides a new perspective on the geographic extent of the Texas Map Turtle, *Graptemys versa*. To a far greater degree than any of the above examples, the present case involves overcoming an inertia created by numerous sources reporting a more restricted range for the species. The case thus illustrates the need for freshwater turtle conservation biologists to: (1) critically examine the basis for statements of range limits of species that are made in the literature; (2) search in regions of potentially suitable habitat for possible range extensions; and (3)

fully report negative search results so that future workers may properly distinguish between the limits of sampling effort and actual range limits.

Stejneger (1925) described *Graptemys versa* based on a holotype and seven paratypes (USNM 27473–80, MCZ 42346) that had been collected in 1900. The locality information was given as simply "Austin, Texas," presumably a reference to the Colorado River that flows through Austin, as all subsequent specimens of *G. versa* are from the Colorado and its tributaries in the state of Texas (Dixon 2000; Lindeman 2013). Smith and Buechner (1947) listed the species as the sole Texan turtle species that is endemic to the Edwards Plateau, a region demarcated to its southeast by the Balcones Escarpment, a series of geologic fault zones that bisect Austin in Travis County, Texas. The Edwards Plateau is characterized by clear, spring-fed tributaries of the Colorado that emanate from the underlying Edwards Aquifer. The endemic label for *G. versa* in Smith and Buechner (1947) was a curious assertion at the time of their writing, as an extensive review of specimen records (Lindeman 2013 and unpubl. data) shows that only five specimen localities could have been available to them: (1) the Austin type locality; (2) a small tributary creek in Burnet County (SMBU 7814); (3) the upper Llano drainage in Edwards County (FMNH 92145); (4) the San Saba River in San Saba County (SMBU 6676); and (5) the South Fork of the Concho River in Tom Green County (CAS 9701; see also Smith and Sanders 1952).

Downstream of the Balcones Escarpment, the Colorado flows toward its mouth on the Gulf of Mexico through the centers of five Texas counties: first Bastrop, then Fayette, Colorado, Wharton, and ultimately Matagorda. Specimens of *G. versa* were collected in Bastrop County in 1967 (TNHC 48250–63, 50130–31, 53898). Vogt (1981) mapped the Bastrop County site and stated that the species was "presumed to occur further downstream in the Colorado River" while acknowledging that there were no specimens from below Bastrop County. Subsequently, specimens were collected from two additional Bastrop County localities further downstream (AUM 29302 in 1980; USNM 299824 in 1985) and single localities in Fayette County (AUM 33589–93 and 33726 in 1991) and Colorado County (UTA 30146–59 in 1983; Dixon 2000; Lindeman 2013). Lamb et al. (1994) also listed a specimen from which a genetic sample was taken that was taken in Wharton County further downstream, but did not give an exact locality or specimen number.

In spite of specimen records for *G. versa* downstream of the Balcones Escarpment and Vogt's suggestion of a possibly extended downstream distribution, recent literature sources and several popular herpetological internet sites remain fixated upon the Edwards Plateau, calling it the primary or even the only area inhabited by *G. versa*. Ernst et al. (1994) described the species as "primarily restricted" to the Edwards Plateau but changed that to "endemic" in their second edition (Ernst and Lovich 2009). Together with the article by Smith and Buechner (1947), these sources influenced statements about the species' range in a study of its life history, "*endemic to the Colorado River drainage of the Edwards Plateau in central Texas*;" Lindeman 2005:378) and several websites devoted to Texas amphibians and reptiles, including species pages on the Animal Diversity Web ("only within the Edwards Plateau region;" 2013. Available from http://animaldiversity.ummz.umich.edu), the Herps of Texas ("along the Colorado River drainage in the Edwards Plateau region of central Texas;" 2013. Available from http://herpsoftexas.org), the Blair Society ("the Colorado drainage system in the Edwards Plateau;" 2013. Available from http://blairsociety.com), and the Wikipedia entry for the species ("in central Texas in the Colorado river drainage on the Edwards Plateau;" 2013. Available from http://en.wikipedia.org [All accessed 30 June 2013]. A Texas Parks and Wildlife Department pamphlet states that the species occurs in "the Colorado River and its drainages from the Central Texas Hill Country downstream past Columbus [Colorado County]," correctly summarizing the known distribution (Available from http://www.texasturtles.org [Accessed 3 January 2013]). The most recent description of geographic range for the species also placed the species as "primarily" ranging throughout the stream network of the upper Colorado on the Edwards Plateau, while also explicitly pointing out the specimen records that occur at five sites downstream of the Edwards Plateau, as described above (Lindeman 2013).

METHODS

On 17 and 18 March 2013 I conducted 17 basking turtle censuses at bridge crossings and other river access points in the five counties on the lower Colorado River, using Canon 18× image-stabilizer binoculars. Censuses were conducted between 1000 and 1800 and were point counts of turtles present during the time it took to scan available basking substrates. Voucher photographs of *G. versa* were procured when possible using a Nikon CoolPix 36× zoom camera mounted on a tripod. In order to compare sites from throughout the Colorado drainage, I use similar surveys conducted at sites on the Edwards Plateau on 27 and 29 July 1992 (n = 4), 13 May 1998 (n = 4), 10–13 March 2008 (n = 40), and 23 March 2013 (n = 3), as well as downriver sites in Bastrop County on 27 July 1992 (n = 1) and 9 March 2008 (n = 3). For comparisons of data from the Edwards Plateau with data from downriver sites, the majority of basking surveys on the plateau were thus from March 2008 (78%), while the majority of basking surveys downriver were from March 2013 (81%). All surveys were

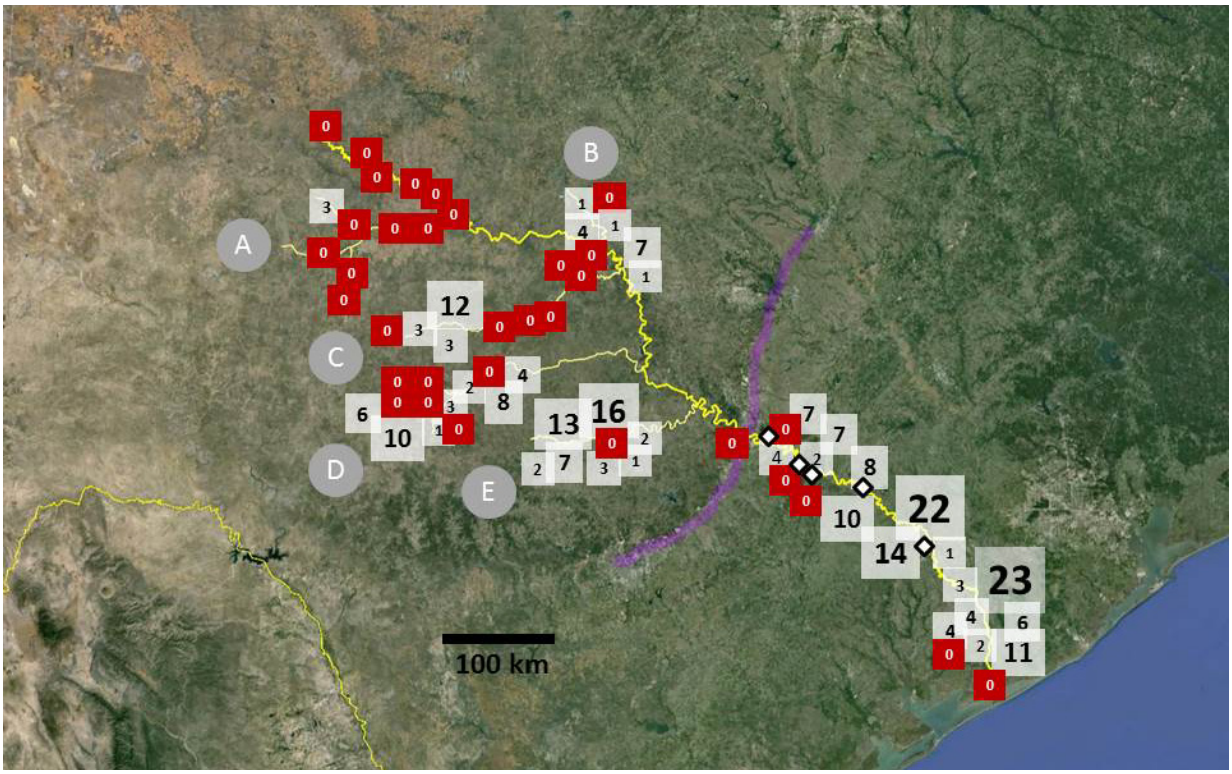

FIGURE 1. Satellite image showing sites surveyed and numbers of *Graptemys versa* seen in the Colorado River drainage of central Texas, with font size scaled to number seen and counts of zero *G. versa* highlighted in red-shaded boxes. The Balcones Escarpment (purple shading) separates Edwards Plateau sites from downriver sites. Localities for preserved specimen records downstream of the Balcones Escarpment that are discussed in the text are marked with diamonds. Major tributaries of the Colorado on the Edwards Plateau are A) the Concho River, B) Pecan Bayou, C) the San Saba River, D) the Llano River, and E) the Pedernales River.

conducted under warm, sunny conditions.

I compared the relative abundance of *G. versa* within the assemblage of basking turtles and percent of sites at which it was seen between Edwards Plateau sites and downriver sites using Chi-square tests for independence. I compared numbers of *G. versa* seen between Edwards Plateau sites and downriver sites, with separate analyses of all sites and sites at which the species was seen. I used a *t*-test if normality of the data was achieved via ln-transformation of the data (ln of x when zeroes were excluded from the data, ln of x + 1 when zeroes were included; normality assessed using Komogorov-Smirnov tests) or a Wilcoxon rank-sum test if transformation to normality was unsuccessful. All statistical analyses were conducted in S-PLUS 8 (Insightful Corp. 2007).

RESULTS

In March 2013, I observed *Graptemys versa* at 11 of 14 sites on the Colorado below the Balcones Escarpment (in 13 of 17 total counts, as I visited three sites both days; Fig. 1). I took voucher photographs at eight of these sites, including one or more sites in each of the five counties surveyed (Table 1). Numbers of *G. versa* seen in the 13 surveys in which I observed the species ranged from 1 to 23 (mean 8.6). Combining data from all years, sites below the escarpment had *G. versa* present in 16 of 21 surveys (76%), at 12 of 15 different sites (80%), in numbers ranging from 1 to 23 turtles (means 8.0 for surveys in which it was seen and 6.1 for all surveys). In contrast, at sites above the Balcones Escarpment on the Edwards Plateau, I saw *G. versa* during only 23 of 51 surveys (45%), at 19 of 43 total sites (44%), in numbers ranging from 1 to 16 turtles (means 4.9 for surveys in which it was seen and 2.2 for all surveys). Survey results are detailed in the Appendix.

Comparing sites above and below the Balcones Escarpment, *G. versa* was significantly more widespread downstream (proportion of surveys observed, $\chi^2 = 5.79$, df = 1, $P = 0.016$) as well as marginally nonsignificantly more abundant downstream ($t = 1.81$ for ln-transformed numbers of *G. versa*, df = 37, $P = 0.079$). The difference in numbers I saw above and below the Balcones Escarpment was highly significant when I included in the analysis sites where *G. versa* was not seen (Wilcoxon rank-sum test, $Z = 2.94$, $P = 0.0033$).

Relative abundance (*G. versa* as a proportion of all turtles seen basking) was also significantly greater downstream of the Balcones Escarpment (63%) than upstream at Edwards Plateau sites (25%, Table 2; $\chi^2 =$

TABLE 1. Voucher photos of *Graptemys versa* photographed downstream of the Edwards Plateau, arranged from upstream to downstream.

Catalog number	County	Access point	Nearest town
UF 172129	Bastrop	Hwy. 150 bridge	Bastrop
UF 172131	Fayette	Hwy. 71 bridge	La Grange
UF 172130	Fayette	Hwy. 71 Business bridge	La Grange
UF 170326	Colorado	Hwy. 71 Business bridge	Columbus
UF 170286	Wharton	FM 960 bridge	Glen Flora
UF 170316	Wharton	Hwy. 59 bridge	Wharton
UF 170311	Matagorda	Hwy. 35 bridge	Bay City
UF 170341	Matagorda	Matagorda Co. Birding Nature Center	Bay City

85.71, df = 1, $P < 0.0001$). The difference in relative abundance was primarily due to the Texas River Cooter (*Pseudemys texana*), which was the predominant turtle sighted on the Edwards Plateau but seen in far lower relative abundance downstream of the Balcones Escarpment (Table 2).

DISCUSSION

Graptemys versa not only occurs downstream of the Balcones Escarpment, below the Edwards Plateau, it occurs far downstream—nearly to the Gulf of Mexico in coastal Matagorda County, where 11 individuals were seen at a spot just 48 river km from the mouth of the Colorado, at the Matagorda County Birding Nature Center. Only one turtle, a Slider Turtle, *Trachemys scripta*, was seen at the one site surveyed further downstream, a bridge located 22 river km from the mouth. In addition, the previously little-recognized populations of *G. versa* in the first three counties downstream of the escarpment and the unrecognized populations farther downstream of them appear to be denser and more dominant within the turtle assemblage of the Colorado drainage than are the populations on the Edwards Plateau, meaning the downstream populations are clearly much more than mere waifs washed downstream during episodes of high water. An enormous component of the geographic range of *G. versa* has thus been at best underappreciated, and at worst completely ignored, by the literature sources and herpetological websites discussed in the Introduction.

Prior to the present study—and dating back more than two decades—museum specimen records had already established *G. versa* in approximately 282 river km of the Colorado below the Balcones Escarpment, into Colorado County near the town of Eagle Lake (Dixon 2000; Lindeman 2013). The total range extension established in the present study is 133 additional river km of the lower Colorado, thus any reference to the species as an Edwards Plateau endemic ignores over 400 river km of well-populated habitat. The reasons for a relative dearth of sampling for *G. versa* below the Balcones Escarpment are unclear, but may include the difficulty of catching *Graptemys* spp. in baited hoop nets, which are commonly used for sampling aquatic turtles (Plummer 1979; Vogt 2012), and the expense of expeditions involving boats, as well as the fact that high-magnification binoculars, spotting scopes, and photographic techniques have only been adopted relatively recently for documenting freshwater turtle occurrence (Lindeman 2013). Whatever the reason for the oversight in this case, the inertia generated by literature sources that describe the species' range as "endemic" or "primarily restricted" to the Edwards

TABLE 2. Numbers of turtles sighted in the Colorado River drainage above the Balcones Escarpment on the Edwards Plateau and downriver, with percentages for each column underneath each entry.

Species	Edwards Plateau	Downriver	Combined
Texas Map Turtle, *Graptemys versa*	113	128	241
	25%	63%	37%
Texas River Cooter, *Pseudemys texana*	321	37	358
	72%	18%	55%
Slider Turtle, *Trachemys scripta*	7	31	38
	2%	15%	6%
Spiny Softshell, *Apalone spinifera*	4	6	10
	1%	3%	2%

Plateau has had a strong impact on shaping statements in the literature and online sources.

In retrospect, it should not be considered at all surprising that *G. versa* ranges downstream in the Colorado well into coastal Matagorda County, because every other Gulf Coastal species in the genus *Graptemys* has been reported to range downstream into the most coastal or second most coastal county or parish of the rivers in which it occurs (see dot distribution maps in Lindeman 2013). For example, in the neighboring Guadalupe drainage, *Graptemys caglei*, a species with a dietary ecology similar to that of *G. versa* (Porter 1990; Lindeman 2006), occurs to within 71 river km of the Gulf of Mexico in Victoria County—and extensive populations of the species occur both above and below the Balcones Escarpment (Babitzke 1992; Killebrew et al., unpubl. report). The finding that downstream populations of *G. versa*, an ecologically similar species, appear to be denser than populations on the Edwards Plateau should likewise not be surprising. Gradients of increasing density with increasing width and depth of river channels from upstream to downstream localities and from minor tributaries to river mainstems is a common finding in abundance studies of species of *Graptemys* (Shively and Jackson 1985; Babitzke 1992; DonnerWright et al. 1999; Selman and Qualls 2009; Ilgen et al. 2014).

There have been prior cases in the *Graptemys* literature in which geologic fault zones have been proposed to represent range-limiting geographic barriers, which upon closer inspection have not been borne out. Tinkle (1959) suggested that the Fall Line, a fault zone separating upland from coastal plain segments of Gulf Coastal rivers, may limit the upstream distributions of *G. nigrinoda* in the Mobile Bay drainages and *G. barbouri* in the Apalachicola drainage. However, both of these species have since been found to range above the Fall Line, in the Cahaba and Flint rivers, respectively (Lindeman 2013). Far more promising as a potential range limiting factor is the distribution of prey resources, which may explain the common observation that broader-headed, mollusk-dependent species of *Graptemys* occur further upstream into narrower streams than narrower-headed congeners that feed on autochthonous prey communities dependent upon sunlight reaching surface waters (Shively and Jackson 1985).

Full understanding of a species' range is a necessity for assessment of its viability, its metapopulation dynamics, and deciding where to focus scarce conservation resources. The case history presented here, demonstrating long-term neglect of a large and apparently important segment of the geographic range of a range-restricted riverine turtle species, raises the question of how frequently freshwater turtle field biologists may have become entrained on incomplete descriptions of range limits in the literature, failing to search for a species beyond those limits. A statement that a species occurs in (or is endemic to) a particular region does not explicitly preclude its occurrence in other adjacent or nearby regions without further information; searches of peripheral regions may prove to be fruitful, as has been the case for numerous recent examples in the genus *Graptemys*. When searches are made in such peripheral habitats, perhaps leading to similar discoveries of areas of neglected range, it is also critically important that researchers detail the sites and extent of their unproductive searches (e.g., Selman and Qualls 2009; Rainwater et al. 2012). Only by doing so will researchers enable future workers to critically evaluate literature statements regarding the extent of a species' geographic range.

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APPENDIX. Details of surveys in Texas, including date, site, and turtles observed. (CR = Colorado River, PB = Pecan Bayou, CHR = Concho River, MCHR = middle Concho River, NCHR = North Concho River, SCHR = South Concho River, LOC = Live Oak Creek, PR = Pedernales River, WOC = White Oak Creek, LR = Llano River, NLR = North Llano River, SLR = South Llano River, SSR = San Saba River, EC = Elm Creek, L/SS = Lampasas/San Saba, RC = Rough Creek, BC = Barton Creek, MCBNC = Matagorda County Birding Nature Center, LBJMP = Lady Bird Johnson Municipal Park, LBJSHP = Lady Bird Johnson State Historical Park, RR1PA = Ranch Rd 1 (picnic area), TLRLD = Tierra Linda Ranch (Lowest dam), JCP = Junction city park, JCPAD = JCP above dam, JCPBD = JCP below dam, FM1674WC = FM 1674 western crossing, BTTCJ = Bridge to Texas Tech Center-Junction, BCP = Ballinger City Park, RR1031 = Ranch Rd. 1031, Hwy = Highway, H87E/277S = Hwy. H87E/277S).

						Turtles observed			
Date	**Position relative to Balcones Escarpment**	**County**	**Stream**	**Crossing or access point**	**Direction from nearest town**	***Graptemys versa***	***Pseudemys texana***	***Trachemys scripta***	***Apalone spinifera***
27 July 1992	Downstream	Bastrop	CR	FM 969	SE Utley		2		
9 March 2008	Downstream	Bastrop	CR	FM 969	SE Utley	7	2		
9 March 2008	Downstream	Bastrop	CR	Hwy. 71/21	Bastrop	7	5	1	
9 March 2008	Downstream	Bastrop	CR	Hwy. 95	Smithville	2	3		
17 March 2013	Downstream	Bastrop	CR	Hwy. 150	Bastrop	4	15	2	
17 March 2013	Downstream	Bastrop	CR	Hwy. 71	NE Smithville		2		
17 March 2013	Downstream	Bastrop	CR	Hwy. 95/230	Smithville		4		
17 March 2013	Downstream	Colorado	CR	FM 950	Garwood	3			
17 March 2013	Downstream	Colorado	CR	Hwy. 71 Bus.	N Columbus	22			1
17 March 2013	Downstream	Colorado	CR	Hwy. 90	E Columbus	14	1	2	
17 March 2013	Downstream	Colorado	CR	Hwy. 90 Alt.	W Eagle Lake	1			
17 March 2013	Downstream	Fayette	CR	Hwy. 71	W La Grange	10			
17 March 2013	Downstream	Fayette	CR	Hwy. 71 Bus.	W La Grange	8	2		
18 March 2013	Downstream	Matagorda	CR	FM 521	SW Wadsworth			1	
17 March 2013	Downstream	Matagorda	CR	Hwy. 35	W Bay City				
18 March 2013	Downstream	Matagorda	CR	Hwy. 35	W Bay City	2		1	
18 March 2013	Downstream	Matagorda	CR	MCBNC	W Bay City	11		6	1
17 March 2013	Downstream	Wharton	CR	FM 960	SW Glen Flora	23	1	7	2
18 March 2013	Downstream	Wharton	CR	FM 960	SW Glen Flora	6		3	
17 March 2013	Downstream	Wharton	CR	Hwy. 59	Wharton	4		4	1
18 March 2013	Downstream	Wharton	CR	Hwy. 59	Wharton	4		4	1
10 March 2008	Upstream	Brown	PB	FM 2126	SE Brownwood	1	2	3	
10 March 2008	Upstream	Brown	PB	Hwy. 67	NE Brownwood	4	18		
11 March 2008	Upstream	Coke	CR	Hwy. 158	Robert Lee				
11 March 2008	Upstream	Coke	CR	Hwy. 277	SE Robert Lee				
11 March 2008	Upstream	Concho	CHR	FM 381	S Lowake				
23 March 2013	Upstream	Gillespie	LOC	Hwy. 16	SW Fredericksburg				
13 March 2008	Upstream	Gillespie	LOC	LBJMP	SW Fredericksburg	13	97	1	
23 March 2013	Upstream	Gillespie	LOC	LBJMP	SW Fredericksburg	16	30	1	
13 March 2008	Upstream	Gillespie	PR	FM 1623	NE Stonewall	3			
23 March 2013	Upstream	Gillespie	PR	Hwy. 16	SW Fredericksburg	7	8		
13 March 2008	Upstream	Gillespie	PR	LBJSHP	E Stonewall	2	1		
13 March 2008	Upstream	Gillespie	PR	RR1PA	E Stonewall	1	6		3
13 March 2008	Upstream	Gillespie	WOC	TLRLD	N Kerrville	2	1		
11 March 2008	Upstream	Irion	MCHR	FM 853	SW Arden				
12 March 2008	Upstream	Kimble	LR	FM 385	Yates	2	1		
29 July 1992	Upstream	Kimble	LR	FM 385	NE Junction	8	4		

13 May 1998	Upstream	Kimble	LR	FM 385	NE Junction	4	1		
12 March 2008	Upstream	Kimble	LR	JCP	Junction	3	6		
13 March 2008	Upstream	Kimble	LR	JCP	Junction		4		
12 March 2008	Upstream	Kimble	N LR	FM1674WC	W Junction	6	6		
13 May 1998	Upstream	Kimble	S LR	BTTCJ	Junction		6		
12 March 2008	Upstream	Kimble	S LR	JCPAD	Junction	1	3		
13 March 2008	Upstream	Kimble	S LR	JCPAD	Junction		1		
13 May 1998	Upstream	Kimble	S LR	JCPBD	Junction		4		
12 March 2008	Upstream	Kimble	S LR	JCPBD	Junction		2		
13 March 2008	Upstream	Kimble	S LR	JCPBD	Junction	10	30		
29 July 1992	Upstream	L/SS	CR	FM 580	NW Bend	7	2		1
29 July 1992	Upstream	L/SS	CR	Hwy. 190	E San Saba	1	2		
12 March 2008	Upstream	Mason	LR	FM 1871	SW Mason				
12 March 2008	Upstream	McCulloch	SSR	Hwy. 87	S Brady	12	18		
12 March 2008	Upstream	Menard	SSR	FM 1311	NE Hext	3	9		
13 May 1998	Upstream	Menard	SSR	FM 1311	NE Hext	3			
12 March 2008	Upstream	Menard	SSR	FM 864	NE Ft. McKavett		6		
10 March 2008	Upstream	Mills	PB	FM 574	W Goldthwaite		6		
10 March 2008	Upstream	Mills	PB	FM 573	SW Mullin	1	5		
10 March 2008	Upstream	Mills/San Saba	CR	Co. Rd. 433	S Regency				
11 March 2008	Upstream	Mitchell	CR	Co. Rd. 343	S Lowe				
11 March 2008	Upstream	Runnels	CR	FM 2111	W Ballinger				
11 March 2008	Upstream	Runnels	CR	Hwy. 83	S Ballinger		3		
11 March 2008	Upstream	Runnels	EC	BCP	Ballinger		9	2	
10 March 2008	Upstream	San Saba	RC	FM 580	SE San Saba				
10 March 2008	Upstream	San Saba	RC	RR1031	SE San Saba				
10 March 2008	Upstream	San Saba	SSR	Co. Rd. 208	N Harkeyville				
10 March 2008	Upstream	San Saba	SSR	Co. Rd. 340	S Algeria				
10 March 2008	Upstream	San Saba	SSR	Co. Rd. 350	S Richland Springs				
12 March 2008	Upstream	Tom Green	CHR	H87E/277S	San Angelo		7		
11 March 2008	Upstream	Tom Green	NCHR	FM 2034	W Water Valley	3			
11 March 2008	Upstream	Tom Green	NCHR	FM 2288	San Angelo				
12 March 2008	Upstream	Tom Green	SCHR	Hwy. 110	Christoval				
12 March 2008	Upstream	Tom Green	SCHR	Hwy. 277	Christoval				
27 July 1992	Upstream	Travis	BC	Zilker Park	Austin		23		