Watershed: Lower Basin (Austin to Columbus)

Segments: 1402, 1402A, 1428, 1434

Water Bodies: Colorado River, Wilbarger Creek, Big Sandy Creek, Pin Oak Creek, Rabbs Creek, Cummins Creek, Cedar Creek, Buckners Creek, Decker Lake, Lake Bastrop, Lake Fayette

Population Centers: Manor, Elgin, Bastrop, Pflugerville, Round Rock, Smithville, Giddings, La Grange, and Columbus

Counties (all or portions of): Travis, Caldwell, Bastrop, Williamson, Lee, Fayette, Washington, Austin, Colorado

Ecoregion: Texas Blackland Prairies; East Central Texas Plains

Ecoregion Description:

- Texas Blackland Prairies – this is a disjunct ecological region distinguished from surrounding regions by its fine textured clayey soils and predominantly prairie potential natural vegetation. This region now contains a higher percent of cropland than adjacent regions, although much of the land has been recently converted to urban and industrial uses.
- East Central Texas Plains – Also called the Claypan Area, this region of irregular plains was originally covered by a post oak savanna vegetation, in contrast to the more open prairie-type regions to the north, south and west and the piney woods to the east. The bulk of this region is now used for pasture and range.

Climate:

- Texas Blackland Prairies – subtropical humid and annual precipitation averages about 33 inches with April and May the wetter months. Rainfall is fairly evenly distributed throughout the year, but periods of drought commonly occur in July and August.
- East Central Texas Plains – subtropical humid and annual precipitation averages about 39 inches with April the wettest month. Rainfall is fairly evenly distributed throughout the year, but dry periods commonly occur in July and January.

Land Uses: cropland with woodland forest

Soils:

- Texas Blackland Prairies – vertisols; dark grayish, deep, alkaline, clayey with low permeability. They are very hard when dry and very plastic when wet.
- East Central Texas Plains – dry alfisols; loose sandy material ranging from a few inches to two feet in thickness. The typical soil rests on heavy clays, predominantly red, which merge at a depth of several feet into lighter-textured and lighter-colored sandy clays underlain by stratified layers of clay and sand.

Permitted Discharges: 36

Permitted CAFOs: 10

Lower basinwatershed offers scenic views.

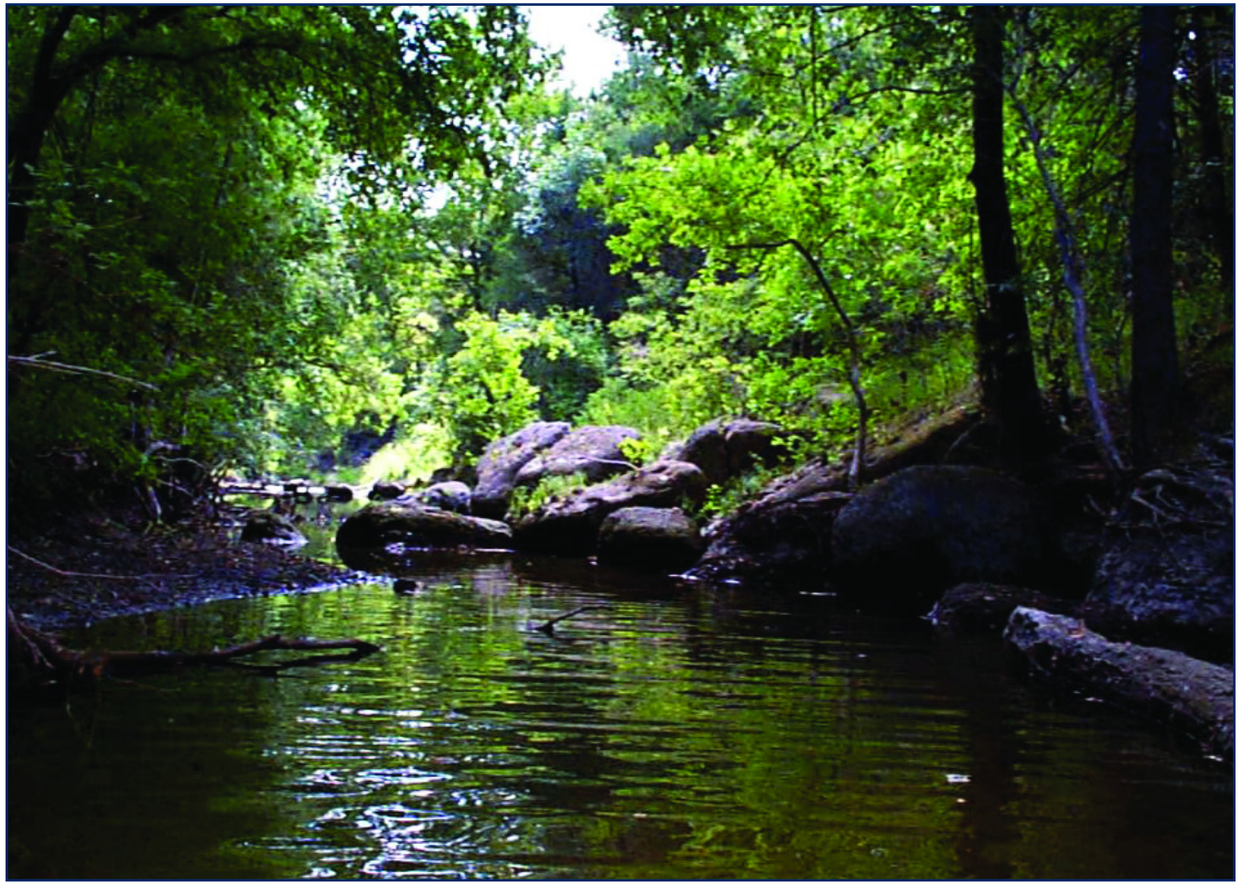


Fig. 15 - Lower Colorado River Watershed

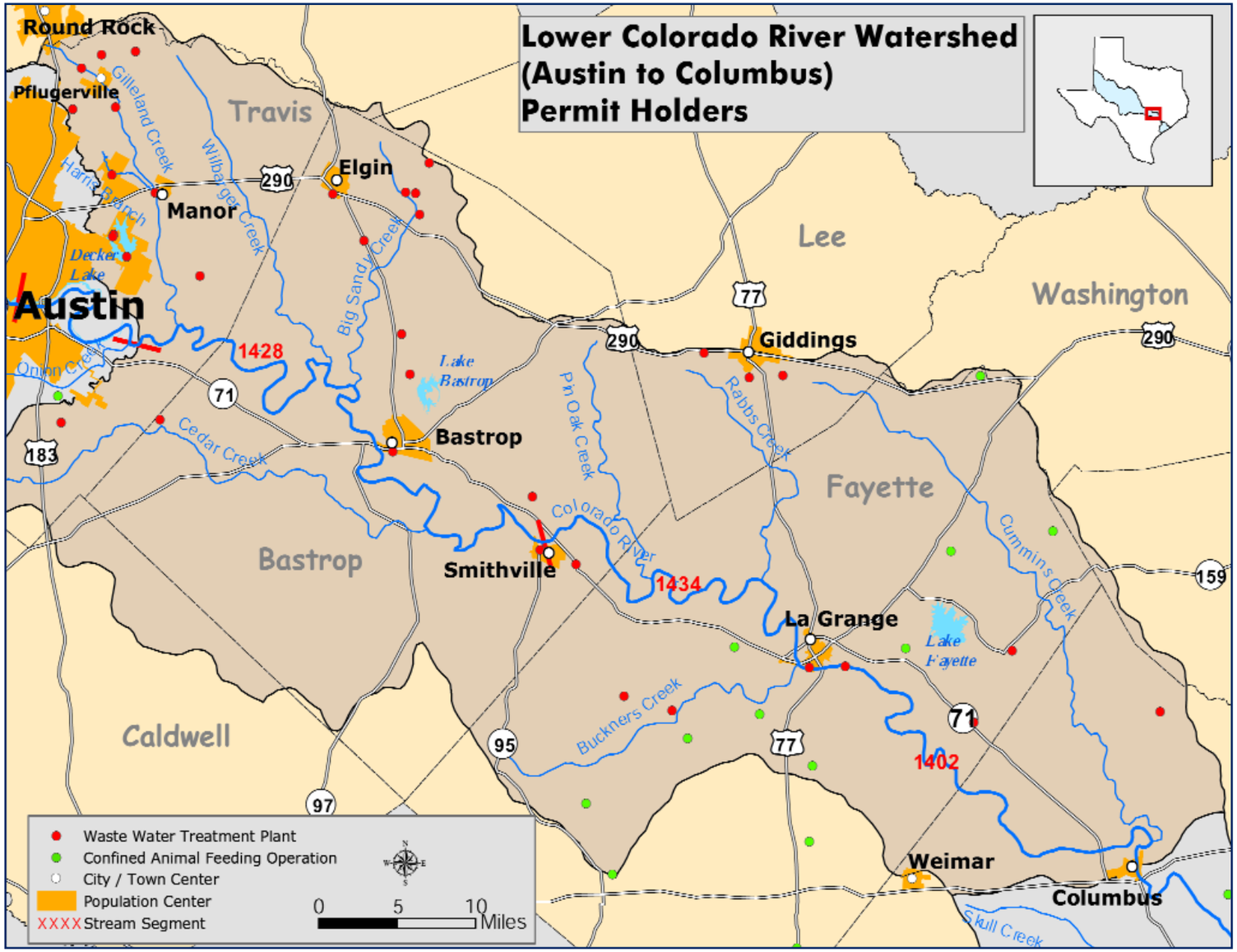


Table 9 - Trend Analysis Results for Lower Watershed and its Tributaries

		Time vs. Constituent							
					Nutrients				
Station	Description	DO	CI	Fecal	TP	NO_3-N	Ch a	Secchi	TSS
12466	C.R. Webbervile		↓		↓		N/A	N/A	
12235	Gilleland Crk FM969						N/A	N/A	
12462	C.R. Bastrop		↓		↓		N/A	N/A	
12457	C.R. Smithville		↓		↓		N/A	N/A	
12290	C.R. La Grange						N/A	N/A	
12249	Cummins Creek				↑	↑	N/A	N/A	

See Appendix A: Glossary on page 76 for definition of terms.

Trends in the Lower Basin

Five sampling locations were evaluated for trends in water quality in the lower basin. All are flowing river or stream sites. Two locations (Gilleland Creek and Cummins Creek) are tributaries of the Colorado River and three sites are located along the main stem of the Colorado River.

Regression analyses with flow were not carried out on this watershed because the main stem Colorado River is manipulated into a seasonal irrigation vs. nonirrigation pattern and tributary locations did not have a complete data set. Therefore, only constituent vs. time was analyzed.

Detailed results of the trend analysis are located in Table 9. Two stream segments within this watershed are reported on 1998 Clean Water Act 303(d) List as impaired. They are Gilleland Creek (1400; high bacteria) and the Colorado River below Town Lake (1428; high bacteria),

Four major events affected water quality in the Lower Basin watershed during the past 10 years. These events listed in chronological order are a "salt" spill from Natural Dam Lake (1986), South Austin Regional Wastewater facility coming online (1986), the Christmas flood (1991-92) and the October flood (1998).

Special Projects in the Lower Basin

Willow Creek Nutrient Loading Project

In 1993, LCRA received a Clean Water Act Section 319(h) grant from TCEQ (formerly TNRCC) to fund a project that demonstrated best management practices (BMP) for reducing agriculture runoff. USDA Natural Resource Conservation Service, the Texas Agriculture Extension Service and the Texas State Soil and Water Conservation Board were cooperating partners in the project. The project incorporated a TMDL approach to determine pollution removal targets, implement BMPs, and monitor and model the watershed to predict effectiveness of BMP's.

Soil testing was carried out representing 10,117 acres of cropland in the watershed. Fertilizer application rates were recommended based on the soil tests, ultimately lowering the amount of nitrogen and phosphorus being applied.

Modeling indicated that if watershed-scale BMPs were implemented, Willow Creek would see reductions of 36 percent sediment, 32 percent soluble phosphorus and 59 percent organic phosphorus.

By the time the project concluded in 1998, LCRA and its partners had sponsored 23 grower education events that resulted in 1,247 direct contacts with agricultural producers in the project area.

Smithville BMP outfall carries runoff water.

Smithville Best Management Practice Project

In 1992 the Texas Water Commission (now TCEQ) determined the segment of the Colorado River nearest the city of Smithville had elevated levels of nitrogen, phosphorous and bacteria. The contamination was most likely due to stormwater runoff from the city of Smithville. Then, in 1994, Smithville and LCRA applied for a Clean Water Act Section 319(h) funding for a nonpoint-source project to control stormwater runoff in the city. The project, which was administered by TCEQ (formerly TNRCC), had three objectives:

- Design, construct and monitor the performance of a stormwater control structure to improve both the quality of stormwater runoff and conveyance of runoff from a specific section of town.
- Perform an analysis of the citywide drainage condition and prepare a drainage master plan report containing alternatives and associated costs for addressing stormwater problems.
- Develop a video documenting the project to demonstrate a potential model approach on how other towns can address inadequate drainage systems and NPS pollution.

Monitoring of the BMP demonstrated it was effective at removing pollutants within the stormwater runoff. Nine storm events were monitored, composite samples were analyzed, and data was evaluated to determine the effectiveness of the BMP at reducing pollutant parameters of concern.

Monitoring indicated the BMP consistently reduced the concentration of pollutants, even though a majority of the storms were at or above the design capacity of the pond. the combination of improvements within this drainage basin appear to have reduced the rainfall to runoff ratio from 0.68 to 0.14.

Other drainage improvements within the subwatershed were implemented during the period of this grant. A separate grant was acquired from the Texas Department of Transportation to perform landscape improvements at the Highway 95/Loop 230 intersection just upstream of the BMP.

While providing pollutant load reductions, perhaps the best feature of the BMP and other improvements may be the aesthetic value to the city. The city has embraced these water quality improvements as an amenity, due to the landscape improvements made with the project.

Table 10 - Austin to Columbus Watershed Data Summary (continued on p. 30)

Segment	Year	Temperature (°C)	Dissolved Oxygen (mg/L)	pH (S.U.)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphorus (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	E. coli (cfu/dL)	Chlorophyll (µg/L)
Colorado River - Austin to Utley	1996	20.45	8.20	7.82	0.082	1.006	0.218	0.236	59.5	39.3	99	2.7
Segment 1428	1997	20.34	8.75	7.85	0.077	1.286	0.123	0.166	47.0	38.0	123	3.2
4 sites	1998	20.37	8.65	7.17	0.159	1.524	0.379	0.205	47.1	40.0	63	7.0
	1999	22.90	8.60	7.72	0.040	2.572	0.428	0.399	50.3	41.6	68	1.1
	2000	23.31	8.14	7.86	0.029	1.930	0.458	0.353	49.8	41.9	136	1.1
	Mean	**21.20**	**8.49**	**7.59**	**0.078**	**1.563**	**0.343**	**0.259**	**51.1**	**39.9**	**97**	**3.1**
	Benchmark	**35.00**	**6.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**1.00**	**1.00**	**5.700**	**17.500**	**16.000**	**20.600**	**0.0**	**0.0**	**15**	**3.2**
Onion Creek	1996	18.95	6.42	7.61	0.073	0.357	0.071	0.014	23.6	45.9	84	2.9
Segment 1427	1997	20.21	8.18	7.85	0.050	0.246	0.050	0.014	34.8	54.0	23	6.0
1 site	1998	21.58	7.59	7.01	0.348	0.495	0.175	0.036	29.6	49.2	37	6.2
	1999	24.67	9.98	7.90	0.027	0.023	0.040	0.010	51.3	66.0	10	1.4
	2000	20.35	10.24	7.91	0.020	0.348	0.095	0.020	19.6	34.4	830	3.0
	Mean	**20.92**	**8.26**	**7.48**	**0.121**	**0.307**	**0.096**	**0.019**	**30.7**	**49.3**	**58**	**4.3**
	Benchmark	**32.22**	**5.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**12.00**	**4.00**	**10.000**	**0.000**	**0.000**	**0.000**	**0.0**	**0.0**	**25**	**8.7**
Colorado River - Utley to La Grange	1996	22.51	8.20	8.16	0.076	1.799	0.362	0.317	59.7	43.1	48	2.3
	1997	20.78	9.36	8.05	0.052	1.559	0.453	0.197	50.7	45.6	76	29.0
Segment 1434	1998	18.90	9.66	7.93	0.085	1.217	0.218	0.129	49.4	45.2	92	4.0
3 sites	1999	24.82	9.14	8.09	0.025	4.267	0.707	0.660	58.8	53.8	16	2.7
	2000	22.37	8.67	8.02	0.035	1.836	0.572	0.359	52.0	44.6	66	1.1
	Mean	**22.10**	**8.92**	**8.06**	**0.052**	**2.165**	**0.493**	**0.346**	**54.6**	**46.3**	**50**	**8.0**
	Benchmark	**35.00**	**6.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**0.00**	**0.00**	**1.900**	**25.400**	**15.700**	**19.000**	**0.0**	**0.0**	**5**	**8.2**
Colorado River - Below La Grange	1996	23.32	7.33	8.19	0.078	1.615	0.365	0.279	63.3	45.0	130	2.6
	1997	19.89	8.36	7.98	0.050	1.090	0.430	0.118	48.5	42.4	126	23.8
Segment 1402	1998	23.33	8.17	7.95	0.124	1.172	0.292	0.169	50.7	43.8	84	11.2
1 site	1999	22.36	8.85	8.06	0.027	3.005	0.482	0.405	58.8	53.7	18	3.1
	2000	24.51	8.51	8.23	0.020	1.362	0.448	0.286	49.5	42.5	116	3.8
	Mean	**22.56**	**8.22**	**8.08**	**0.060**	**1.611**	**0.399**	**0.248**	**54.1**	**45.2**	**84**	**9.0**
	Benchmark	**35.00**	**5.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**0.00**	**0.00**	**5.000**	**13.000**	**0.000**	**8.700**	**0.0**	**0.0**	**17**	**17.4**

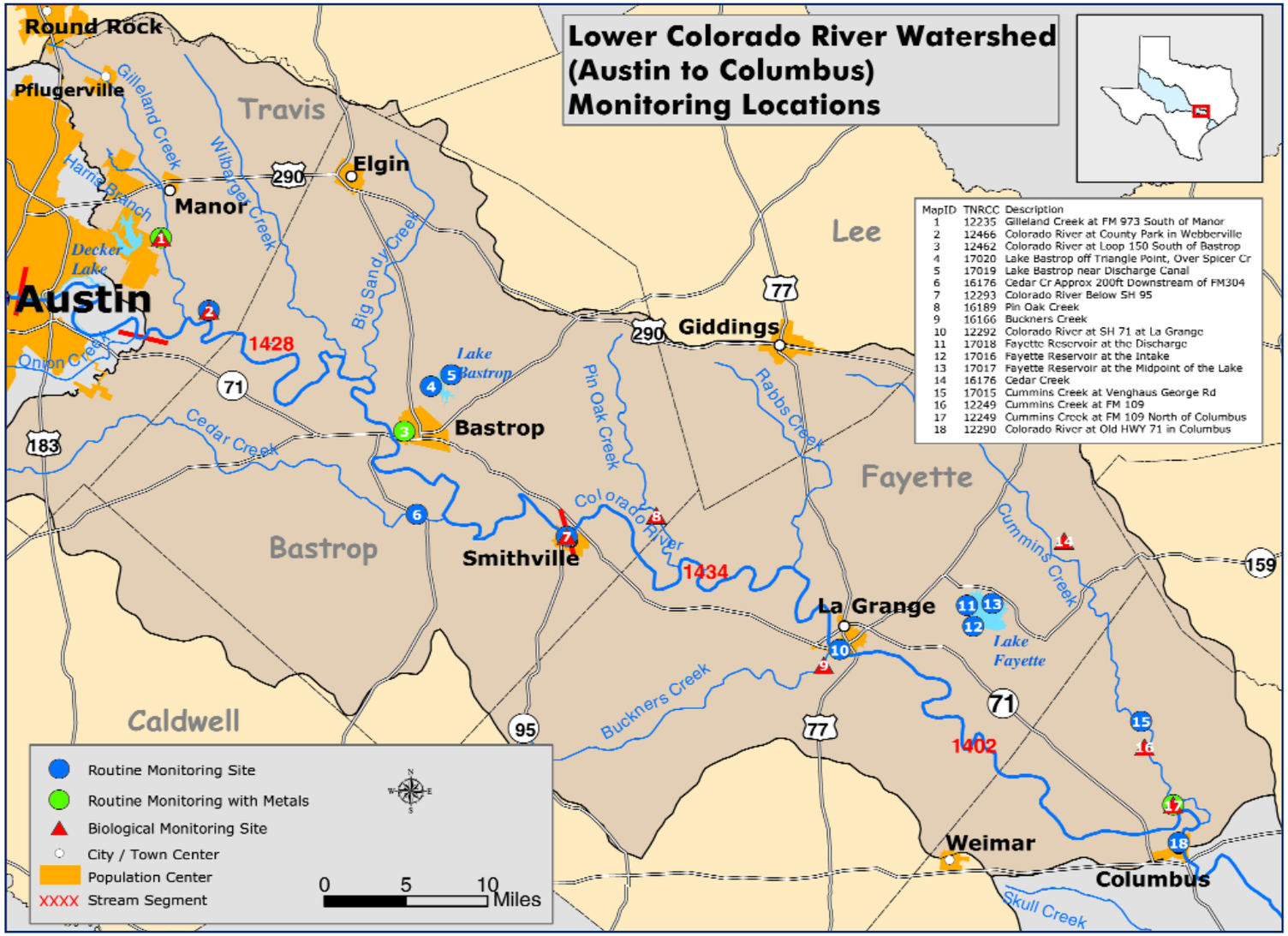
Mean - annual average value *Benchmark - state standard or threshold* *Violation Rate - percent of sample exceeded benchmark*

Table 10 - Austin to Columbus Watershed Data Summary (continued from p. 29)

Segment	Year	Temperature (ºC)	Dissolved Oxygen (mg/L)	pH (S.U.)	Ammonia (mg/L)	Nitrate + Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho Phosphorus (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	E. coli (cfu/dL)
Cummins Creek	1996	19.91	7.83	7.52	0.070	0.126	0.177	0.064	148.2	9.6	64	3.1
Unclassified Stream	1997	22.23	7.49	7.53	0.050	0.091	0.070	0.038	48.0	9.9	171	3.4
1 site	1998	23.65	8.33	7.31	0.203	0.079	0.110	0.027	133.4	12.1	117	7.8
	1999	22.20	9.09	7.76	0.025	0.023	0.040	0.015	100.9	9.2	12	0.6
	2000	23.22	8.94	7.69	0.020	0.068	0.091	0.026	134.9	8.8	25	0.9
	Mean	**22.16**	**8.32**	**7.54**	**0.079**	**0.080**	**0.106**	**0.035**	**113.6**	**10.0**	**55**	**3.3**
	Benchmark	**35.00**	**6.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**3.60**	**0.00**	**9.500**	**0.000**	**0.000**	**0.000**	**45.8**	**0.0**	**8**	**4.2**
Cedar Creek	1996	-	-	-	-	-	-	-	-	-	-	-
Unclassified Stream	1997	-	-	-	-	-	-	-	-	-	-	-
1 site	1998	-	-	-	-	-	-	-	-	-	-	-
	1999	19.05	7.94	7.47	0.025	0.030	0.040	0.010	56.0	137.8	13	1.1
	2000	20.17	5.69	7.24	0.202	0.204	0.187	0.022	41.5	99.7	69	3.8
	Mean	**19.67**	**6.69**	**7.33**	**0.124**	**0.127**	**0.121**	**0.017**	**47.9**	**116.6**	**33**	**2.6**
	Benchmark	**35.00**	**5.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**33.30**	**0.00**	**11.100**	**0.000**	**0.000**	**0.000**	**0.0**	**44.4**	**11**	**0.0**
Gilleland Creek	1996	17.14	8.21	7.93	0.078	1.475	0.472	0.417	127.7	64.6	122	1.4
Unclassified Stream	1997	17.94	8.86	8.13	0.065	3.140	0.180	0.180	93.7	64.1	172	2.1
1 site	1998	19.68	8.37	7.82	0.376	5.048	0.837	0.530	183.8	82.6	133	18.2
	1999	22.03	8.82	8.01	0.025	5.448	0.774	0.705	209.3	86.2	86	0.8
	2000	20.67	9.23	8.04	0.020	2.532	0.622	0.354	95.6	55.9	1292	1.1
	Mean	**19.21**	**8.66**	**7.97**	**0.124**	**3.449**	**0.647**	**0.426**	**139.2**	**70.0**	**202**	**5.5**
	Benchmark	**35.00**	**5.00**	**9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**100.0**	**100.0**	**126**	**11.6**
	Violation Rate	**0.00**	**0.00**	**0.00**	**9.500**	**62.500**	**25.000**	**33.300**	**58.3**	**8.3**	**24**	**5.0**

Mean - annual average value *Benchmark - state standard or threshold* *Violation Rate - percent of sample exceeded benchmark*

Fig. 16 - Lower Colorado River Watershed Monitoring Locations



Cummins Creek has diverse fish comminity.

Biological Monitoring in the Lower Region

Eight sites were sampled for biology in the lower basin. Four were located on smaller tributaries and four were located on the main stem of the Colorado River. Overall, the biological data indicates that water quality is good.

Fish and bug communities in the tributaries ranged from intermediate to exceptional. The benthic macroinvertebrate communities typically scored higher than fish. The most diverse and pollution-sensitive fish community occurred in Cummins Creek, which was changed to an exceptional aquatic life use. Dissolved oxygen was usually exceptional in these streams.

The main stem reach was historically heavily impacted by the city of Austin wastewater discharge. Monitoring indicates that the fish and bug communities have responded favorably to the improved conditions in the stream. Intermediate scores in the reach are more a function of difficulty of sampling in higher flow than impact from pollution. Dissolved oxygen in the main stem is typically exceptional – vastly improved from past conditions. Table 11 includes results from biological monitoring in the lower Colorado River basin.

Metals

Results for the Lower Basin Watershed dissolved metals in water sampling in August of 1998 is located in Appendix E on page 82.

Biological Monitoring is under way in Cummins Creek.

Table 11 - Results of Biological Monitoring in the Lower Basin (continued on p. 33)

Site	Date	Aquatic Life Use Fish	Aquatic Life Use Macroinvertebrates	Aquatic Life Use Dissolved Oxygen
Cummins Creek at FM 109	Sep-95	High	Exceptional	Exceptional
Cummins Creek at FM 109	Mar-96		Exceptional	Exceptional
Cummins Creek at FM 109	Jun-96	Intermediate	Exceptional	Exceptional
Cummins Creek at FM 109	Nov-96	High	Exceptional	Exceptional
Cummins Creek at FM 109	Apr-97	High	Exceptional	Exceptional
Cummins Creek at FM 109	Aug-97	Intermediate	High	-
Cummins Creek at FM 109	Mar-00	High	Intermediate	-
Cummins Creek at FM 109	Aug-00	High	High	-
Cummins Creek at FM 109	Apr-01	High/Exceptional	Intermediate	Exceptional
Cummins Creek at FM 109	Oct-01	High/Exceptional		Exceptional
Buckners Creek at FM 609	Oct-95	High	High	Exceptional
Buckners Creek at FM 609	Mar-96	Intermediate	High	Exceptional
Buckners Creek at FM 609	Jul-96		High	Exceptional
Buckners Creek at FM 609	Oct-96	Intermediate	Intermediate	Exceptional
Buckners Creek at FM 609	Aug-97	Intermediate	Exceptional	
Cedar Creek at FM 304	Sep-95	High	Exceptional	High
Cedar Creek at FM 304	Mar-96		Exceptional	Exceptional
Cedar Creek at FM 304	Jun-96	High		High
Cedar Creek at FM 304	Oct-96		Intermediate	Exceptional
Cedar Creek at FM 304	Apr-97	Intermediate	High	Exceptional
Cedar Creek at FM 304	Aug-97	Intermediate		
Gilleland Creek at Taylor Lane	Aug-95	Intermediate	High	Exceptional
Gilleland Creek at Taylor Lane	Mar-96	Intermediate	High	Exceptional
Gilleland Creek at Taylor Lane	Jun-96			Exceptional
Gilleland Creek at Taylor Lane	Oct-96	High	Exceptional	Exceptional
Gilleland Creek at Taylor Lane	Aug-97	Intermediate	Intermediate	

Table 11 - Results of Biological Surveys in the Lower Basin (continued from page 32)

Site	Date	Aquatic Life Use Fish	Aquatic Life Use Macroinvertebrates	Aquatic Life Use Dissolved Oxygen
Colorado River at Webberville	Mar-00	High	Intermediate	-
Colorado River at Webberville	Aug-00	Intermediate/High	High	-
Colorado River at Webberville	Mar-01	High	Intermediate	Exceptional
Colorado River at Webberville	-	-	-	-
Colorado River at La Grange	Mar-00	High	High	-
Colorado River at La Grange	Aug-00	Intermediate	-	-
Colorado River at Smithville	Mar-01	High	Intermediate	Exceptional
Colorado River at Smithville	Nov-01	High		-
Colorado River at Columbus	Mar-00	High	High	-
Colorado River at Columbus	Aug-00	Intermediate	-	-
Colorado River at Columbus	Mar-01	Intermediate	No Sample	Exceptional
Colorado River at Columbus	Nov-01	High		Exceptional