Watershed: Concho River

Segments: 1421, 1422, 1423, 1424, 1425

Water Bodies: Concho River (North, Middle and South), O. C. Fisher Reservoir, Lake Nasworthy, Twin Butte Reservoir

Population Centers: Sterling, San Angelo, Paint Rock, Eldorado

Counties: Upton, Midland, Glasscock, Howard, Sterling, Reagam, Irion, Crockett, Schleicher, Tom Green, Concho, Menard, Runnels, Coke

Ecoregion: 25, Western High Plains; 27, Central Great Plains; 30, Central Texas Plateau (Edwards Plateau)

Ecoregion Description:

- Western High Plains are higher and drier than the Central Great Plains to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains to the north, much of the Western High Plains comprises smooth to slightly irregular plains having a high percentage of cropland. Grama-buffalo grass is the potential natural vegetation in this region as compared to mostly wheatgrass-needlegrass to the north, Trans-Pecos shrub savanna to the south and taller grasses to the east. The northern boundary of this ecological region is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat.
- The Central Great Plains are slightly lower, receive more precipitation and are somewhat more irregular than the Western High Plains to the west. Once a grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland, the eastern boundary of the region marking the eastern limits of the major winter wheat growing area of the United States.
- Central Texas Plateau is largely a dissected plateau that is hillier in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. The region contains a sparse network of perennial streams, but they are relatively clear and cool compared to those of surrounding areas. Originally covered by juniper-oak savanna and mesquite-oak savanna, most of the region is used for grazing beef cattle, sheep, goats and wildlife. Hunting leases are a major source of income.

Climate:

- The Western High Plains have high winds, dry winters and low annual rainfall.
- The Central Great Plains have low humidity, wide ranges of temperature and precipitation, and frequent windstorms. Annual average precipitation is about 20 inches with May the wettest month. Although a substantial portion of this precipitation falls during the growing season, the amount and distribution is usually inadequate to ensure good crop yields.
- The Central Texas Plateau is subtropical, subhumid and annual precipitation averages about 24 inches, with May and September the wetter months. Although dry periods commonly occur in July and August, the driest months are November, December and January.

Land Use:

- Western High Plains are cropland, cropland with grazing land and irrigated agriculture.
- The Central Great Plains has cropland, cropland with grazing land and some vegetated agriculture.
- The Central Texas Plateau has open woodland grazed, forest and woodland grazed, some subhumid grassland and semiarid grazing land.

Soils:

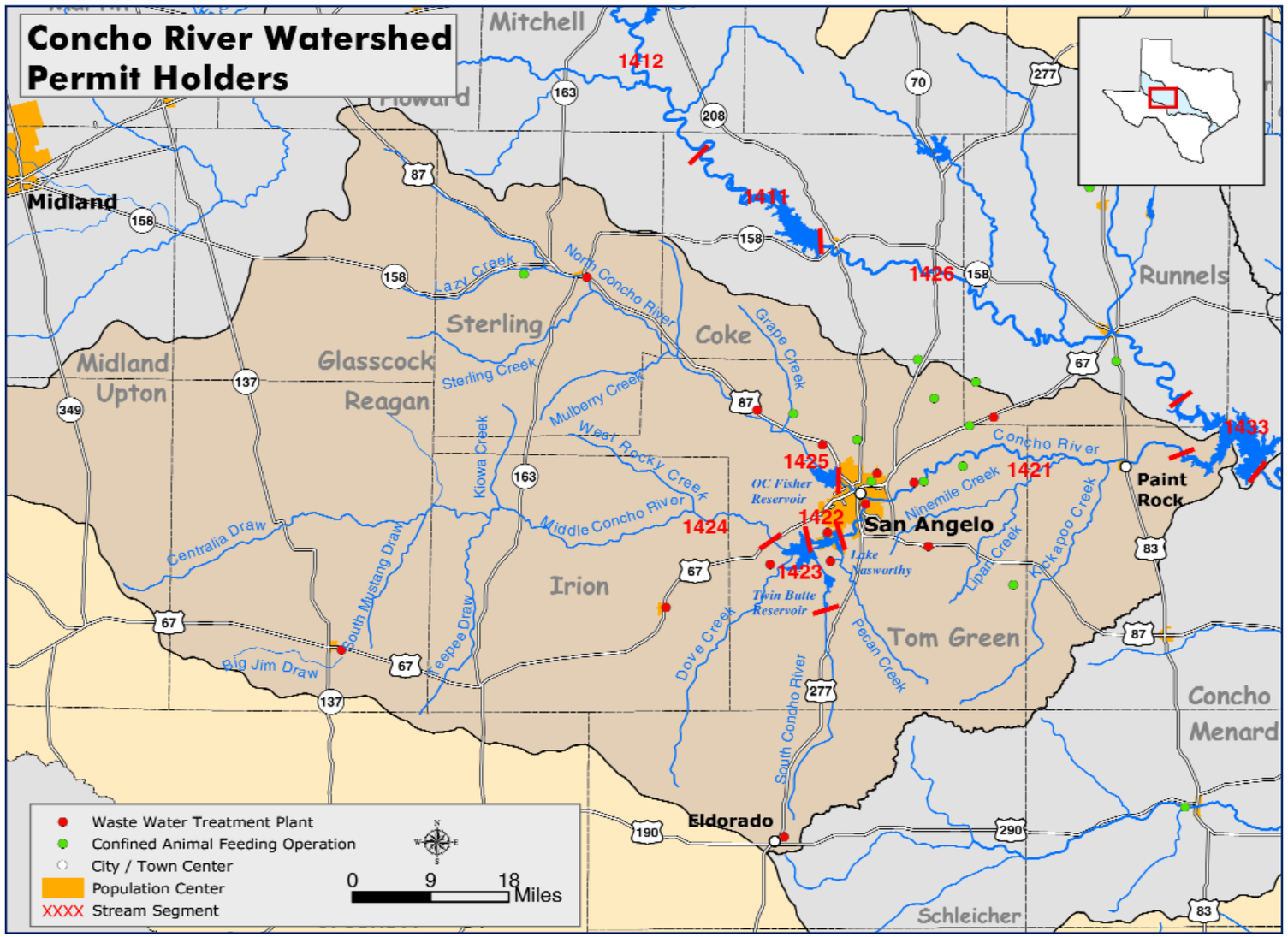
- The Western High Plains have dry mollisols. Upland soils are dark brown to reddish brown, mostly deep, neutral to calcareous clay and clay loams in the north to sandy loams and sands in the south. Caliche is present under many soils at various depths, especially on the Potter series.
- The Central Great Plains have dry mollisols and sandy soils, generally developed from unconsolidated beds of sands and clays under grasses with large quantities of organic matter deposited in the soil structure. However, due to the loose structure and coarse texture of many of the soils, the organic matter has largely leached out.
- The Central Texas Plateau has dry mollisols and thin reddish-brown, gravelly and stony, sandy loam prairie soils.

Permitted Discharges: 14

CAFOs: 9

San Angelo is the largest population center served by the Concho River Watershed.

Fig. 25 - Concho River Watershed



Trend Analyses for Segment 1421 – Concho River

The Concho River is listed as impaired in the Clean Water Act 303(d) list for exceeding TDS and sulfate standards. Seven of 12 sites were examined for TDS trends. Only one off-segment site (12257) contained enough data for analysis, and it showed no trend related to flow or time. The remaining six sites were on the main stem of the Concho. Five of the six sites showed a significant relationship to flow, but once flow effects were removed, no change over time was evident.

Seven sites were analyzed for trends of sulfate. The sites that did have enough data to conduct a trend analysis were all on the main stem of the river. Only one of these showed a relationship to flow (12405), but all showed a relationship to time. Sulfate is generally considered conservative and an integral component of TDS, so the disparity between the sulfate and TDS results is puzzling. This is explained by extremely high sulfate values early in the data set. These few values inflated the slope of the regression line, resulting in a questionable finding of significance.

Trend Analysis for Segment 1425 – O.C. Fisher Reservoir

This segment is listed in the 303(d) list for exceeding chloride standards. Only one site (12429) met the criteria for analysis, and no temporal trend was evident from the data analyzed.

Concho River Basin Special Projects

Lipan Aquifer Study

Nitrate concentrations in the Concho River at Paint Rock often exceed the drinking water standard of 10 mg/L. In 1994, UCRA conducted a CRP special study to identify the source of elevated nitrates. The study identified the Lipan Aquifer as a source of flow and nitrates to the Concho River near Paint Rock, citing that seeps and springs in the region provide connectivity between groundwater and surface water.

In 1997 and again in 1999, UCRA contracted the Lipan-Kickapoo Water Conservation District to sample water wells and trace groundwater contaminated with high nitrates. Data collected by the water conservation district confirmed influences from the aquifer on the Concho River. Elevated nitrates in the surface waters near Paint Rock exist largely due to natural conditions. There are no plans for remediation of elevated nitrates due to interaction of groundwater and surface water.

Sterling County Aerial Electromagnetic (AEM) Survey

The Aerial Electromagnetic (AEM) Survey project in Sterling County was designed to discover potential subsurface salinity plumes originating

from unplugged or inadequately plugged oil wells or other oil field brine sources. The study area includes a 50 square-mile area on Lacy creek near its confluence with the North Concho River. The project is funded through the Texas Water Development Board (TWDB) and the Sterling County Underground Water Conservation District. The research and report preparation is conducted by The University of Texas, Bureau of Economic Geology (BEG) in Austin.

BEG conducted ground surveys in early January 2001. Preliminary data indicated the area soil conditions were favorable for the planned work. The aerial portion of the project was completed in August 2001 and a draft report was published by the BEG in February 2002.

The draft report indicates promising results for the technology with layer-by-layer data available for soil conductance in 10 meter increments from the surface down to 300 meters. Detailed analysis of the data will be possible when the final report is completed in late 2002. Upon completion of this project, the UCRA will have a GIS system of the study area to include all of the reported data.

Nonpoint-source Pollution Projects in San Angelo

San Angelo receives approximately 20 inches of rain per year, often in the form of severe thunderstorms. The stormwater runoff often results in fish kills in the Concho River as pollutants are washed into the river. UCRA began addressing the city's NPS problems in the early 1990s by working with the City of San Angelo and securing Clean Water Act 319(h) grants from TCEQ (formerly TNRCC) to build structural BMP designed to filter out oil, grease, sediment and other pollutants found in urban runoff. Three projects have been initiated to improve NPS pollution in San Angelo.

Sediment is prevented from entering the Concho River.

The initial project was conducted by the UCRA on the North Concho River in 1995. It included a master plan for NPS mitigation, which contained examples of suggested structural and nonstructural BMPs, a description and water quality evaluation of the watershed, identification of possible BMPs within the watershed and a prioritized list of projects with design development and cost analysis.

The BMP selected for construction was located at Civic League Park adjacent to the river. It included a large, attractive gabion structure visible from the downtown area. A Citizens Advisory Committee was formed to make project decisions, educate the media and make public presentations. As a result, a local organization emerged, calling itself the Friends of the Concho River, and conducted considerable public education and outreach activities. These activities resulted in production of a video titled "A River Ran Thru It."

The second project included a dry pond and gabion structure in Santa Rita Park and a wet pond BMP in Brentwood Park. Both sites are located within the seven major watersheds contributing to urban runoff on the North Concho River and were identified by the original Citizen Advisory Committee as high priority. Construction at Santa Rita required considerable public involvement. Several neighborhood meetings were held at the construction site to educate concerned citizens on NPS issues and project details.

Monitoring has shown modest water quality improvements below the BMP at Santa Rita Park. The volume of stormwater runoff during larger events has overwhelmed this first structure on the upper portions of the subwatershed. Despite an inability to document any large decreases in pollutants through the BMP by laboratory testing, observations of settling and filtration areas of the structure reveal an large volume of materials removed.

The Brentwood Park BMP renovated an existing pond as a wet pond retention structure. Initial monitoring of the impoundment indicates 90 percent removal rates of BOD5, TSS and nutrients. Construction of the facilities was completed in August 2001.

The third NPS project is currently under way and involves construction of a large dry pond within a watershed that has been determined to be the highest contributor of NPS pollution to the North Concho River. The site chosen for construction will intercept stormwater immediately prior to discharge to the river. The City of San Angelo is currently involved in property acquisition and design for the project. It is expected that a major portion of the project will be under way prior to the end of the current fiscal year.

BMP outfall is on the Concho River in San Angelo

Brush Control Feasibility Studies

UCRA conducted a brush control feasibility study on the North Concho River watershed in 1998 and a feasibility study on the Concho and upper Colorado River basin in 2000. Both were initiated as a result of contracts with the Texas State Soil and Water Conservation Board. Feasibility studies indicated that brush control is a cost effective and efficient way to restore perennial waterways and increase yields to local reservoirs. As a result of the studies, the Legislature has funded a complete brush removal program on the North Concho and an initial phase removal program on the Concho and Upper Colorado.

The North Concho Brush Removal Project watershed is 950,000 acres. On-going drought and insect problems have created conditions that are inappropriate for aerial spraying of mesquite. As a result, only mechanical brush removal has been accomplished to date. Ninety-three contracts have been issued to treat 184,585 acres at a state cost of $7 million.

UCRA provides watershed monitoring to support the brush removal programs. Brush control monitoring involves surface water monitoring, groundwater monitoring and special studies as related to subbasin responses.

Table 23 - Concho River Basin Data Summary (continued on p. 62)

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)
Concho River	1996	20.60	8.65	7.99	0.075	5.683	0.059	0.019	495.0	236.0
Segment 1421	1997	18.52	8.68	7.95	0.095	7.835	0.060	0.012	463.0	268.0
9 Sites on Segment	1998	20.87	8.20	7.97	0.065	3.733	0.111	0.038	564.0	348.0
	1999	18.97	9.04	8.01	0.129	-	0.106	0.016	522.0	364.0
	2000	21.81	7.19	7.78	0.796	0.093	0.090	0.085	641.0	476.0
	Mean	**20.17**	**8.39**	**7.90**	**0.314**	**4.830**	**0.083**	**0.038**	**517.0**	**325.0**
	Benchmark	**32.22**	**5.00**	**6.5 - 9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**775.0**	**425.0**
	Violation Rate	**1.00**	**6.00**	**0.00**	**25.800**	**42.300**	**0.000**	**0.000**	**7.7**	**26.5**
Lake Nasworthy	1996	-	-	-	-	-	-	-	-	-
Segment 1422	1997	-	-	-	-	-	-	-	-	-
2 Sites on Segment	1998	22.30	7.80	8.10	0.050	-	0.105	-	134.0	53.0
	1999	8.35	11.05	8.48	0.090	-	0.045	0.030	312.0	99.0
	2000	19.06	8.26	8.26	0.111	-	0.068	0.145	397.0	111.0
	Mean	**18.86**	**8.34**	**8.26**	**0.098**	**-**	**0.063**	**0.122**	**347.0**	**101.0**
	Benchmark	**33.88**	**5.00**	**6.5 - 9.0**	**0.106**	**0.320**	**0.180**	**0.050**	**450.0**	**400.0**
	Violation Rate	**0.00**	**0.00**	**0.00**	**21.700**	**0.000**	**5.600**	**40.000**	**0.0**	**0.0**
Twin Buttes Reservoir	1996	-	-	-	-	-	-	-	-	-
Segment 1423	1997	-	-	-	-	-	-	-	-	-
2 Sites on Segment	1998	22.80	9.40	8.20	0.050	-	0.015	-	85.9	24.4
	1999	-	-	-	-	-	-	-	-	-
	2000	19.22	9.48	8.23	0.067	-	0.088	-	196.0	69.7
	Mean	**20.05**	**9.37**	**8.24**	**0.058**	**-**	**0.055**	**-**	**161.7**	**58.3**
	Benchmark	**32.22**	**5.00**	**6.5 - 9.0**	**0.106**	**0.320**	**0.180**	**0.050**	**200.0**	**100.0**
	Violation Rate	**0.00**	**0.00**	**0.00**	**8.300**	**0.000**	**0.000**	**0.000**	**25.0**	**16.7**
Middle/South Concho River	1996	19.63	8.10	7.90	0.030	1.410	0.023	0.010	35.0	13.0
Segment 1424	1997	17.85	7.73	7.85	0.037	1.400	0.013	0.010	33.0	9.0
1 Site on Segment	1998	18.53	9.08	7.78	0.040	-	0.010	-	33.0	11.0
	1999	16.96	7.76	8.02	0.050	-	0.030	-	34.0	10.0
	2000	22.55	8.30	7.65	0.050	-	0.050	-	37.0	11.0
	Mean	**18.63**	**8.16**	**7.87**	**0.041**	**1.405**	**0.023**	**0.010**	**34.0**	**11.0**
	Benchmark	**32.22**	**5.00**	**6.5 - 9.0**	**0.170**	**2.760**	**0.800**	**0.500**	**150.0**	**150.0**
	Violation Rate	**0.00**	**0.00**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**	**0.0**	**0.0**

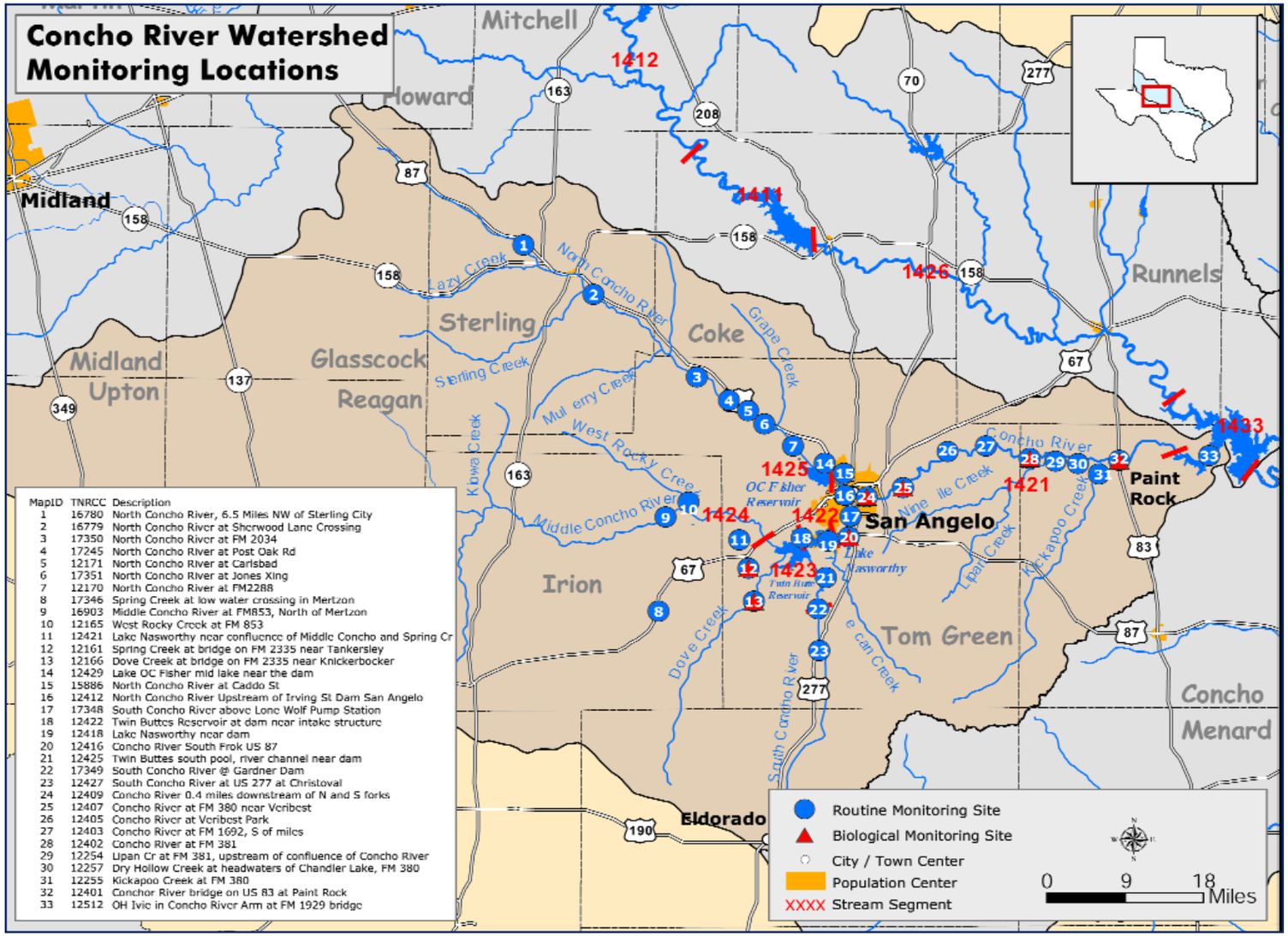
Mean - annual average value *Benchmark - state standard or threshold* *Violation Rate - percent of sample exceeded benchmark*

Table 283-Concho River Basin Data Summary (continued from p. 61)

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)
Lake O.C. Fisher	1996									
Segment 1425	1997									
1 Site on Segment	1998	22.80	5.70	8.10	0.130	-	0.045	0.050	312.0	126.0
	1999	25.66	7.70	8.35	0.050	-	0.120	-	376.0	124.0
	2000	17.69	8.01	8.12	0.430	-	0.147	0.010	300.0	85.0
	Mean	**20.32**	**7.64**	**8.17**	**0.279**	**-**	**0.110**	**0.023**	**320.0**	**102.0**
	Benchmark	**32.22**	**5.00**	**6.5 - 9.0**	**0.106**	**0.320**	**0.180**	**0.050**	**150.0**	**150.0**
	Violation Rate	**0.00**	**0.00**	**0.00**	**55.600**	**0.000**	**14.300**	**0.000**	**100.0**	**11.1**

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

Fig. 26 - Concho River Monitoring Locations



MapID	TNRCC	Description
1	16780	North Concho River, 6.5 Miles NW of Sterling City
2	16779	North Concho River at Sherwood Lane Crossing
3	17350	North Concho River at FM 2034
4	17245	North Concho River at Post Oak Rd
5	12171	North Concho River at Carlsbad
6	17351	North Concho River at Jones Xing
7	12170	North Concho River at FM2288
8	17346	Spring Creek at low water crossing in Mertzon
9	16903	Middle Concho River at FM853, North of Mertzon
10	12165	West Rocky Creek at FM 853
11	12421	Lake Nasworthy near confluence of Middle Concho and Spring Cr
12	12161	Spring Creek at bridge on FM 2335 near Tankersley
13	12166	Dove Creek at bridge on FM 2335 near Knickerbocker
14	12429	Lake OC Fisher mid lake near the dam
15	15886	North Concho River at Caddo St
16	12412	North Concho River Upstream of Irving St Dam San Angelo
17	17348	South Concho River above Lone Wolf Pump Station
18	12422	Twin Buttes Reservoir at dam near intake structure
19	12418	Lake Nasworthy near dam
20	12416	Concho River South Frok US 87
21	12425	Twin Buttes south pool, river channel near dam
22	17349	South Concho River @ Gardner Dam
23	12427	South Concho River at US 277 at Christoval
24	12409	Concho River 0.4 miles downstream of N and S forks
25	12407	Concho River at FM 380 near Veribest
26	12405	Concho River at Veribest Park
27	12403	Concho River at FM 1692, S of miles
28	12402	Concho River at FM 381
29	12254	Lipan Cr at FM 381, upstream of confluence of Concho River
30	12257	Dry Hollow Creek at headwaters of Chandler Lake, FM 380
31	12255	Kickapoo Creek at FM 380
32	12401	Conchor River bridge on US 83 at Paint Rock
33	12512	OH Ivie in Concho River Arm at FM 1929 bridge