

Basin Reach I is located on the main stem of the Canadian River and represents a watershed from the Texas-Oklahoma state-line upstream to the Sanford Dam on the Canadian River (Hemphill / Lipscomb Counties to Hutchinson / Carson Counties). There are two subwatersheds in this reach totaling 4,790 square miles of contributing drainage area in Texas and Oklahoma with 2,831 square miles in Texas, and one classified stream segment (0101). There are 36 permitted municipal and industrial discharges, 12 permitted solid waste disposal sites, four confined animal feeding areas, and approximately 164,252 persons within this basin reach.

There were seven water quality monitoring stations (4 routine and 3 systematic) that provided data for screening in this reach. The Authority conducted 66 monitoring events during this period and screened and analyzed 3,710 parameters. Four of the seven stations monitored exceeded the screening criteria for fecal coliform bacteria. One of these stations, Dixon Creek near the Canadian River (station 10016), is listed on the CWA §303(d) list of impaired water bodies for fecal coliform and low dissolved oxygen. The other stations, Rock Creek at state highway 136 (station 10025), Rock Creek at Electric City (10024) and Canadian River bridge at Plemons Road (10034) are all relatively close together. This area is utilized largely by local ranchers for livestock watering. The peak values observed appear to be originating from animal waste and runoff from pasture lands.

Dixon Creek at station 10016 reported one fish kill in 1998, cause unknown. This could have contributed to the low DO possibly due to decaying aquatic life. In July 2000, another low DO and elevated levels of fecal coliform were observed immediately following a flood event. The elevated levels of fecal coliform following a flood event is a common occurrence considering the agribusiness activities in the area. The extremely high temperatures are believed to be the cause of the depressed dissolved oxygen levels, probably immediately prior to the flood event.

The Rock Creek monitoring station (10025) has experienced several elevated levels of nitrate-nitrite. This station is located approximately one mile downstream of a nitrogen manufacturing plant near Borger in Hutchinson County. Although a direct correlation has not been established, monitoring will continue to accurately identify the cause of the increased levels.

Chart 1 depicts the fecal coliform densities observed in Rock Creek, Dixon Creek and the Canadian River in Hutchinson County. The group of box plots indicate the overall range of the values reported for each station over the last five years.

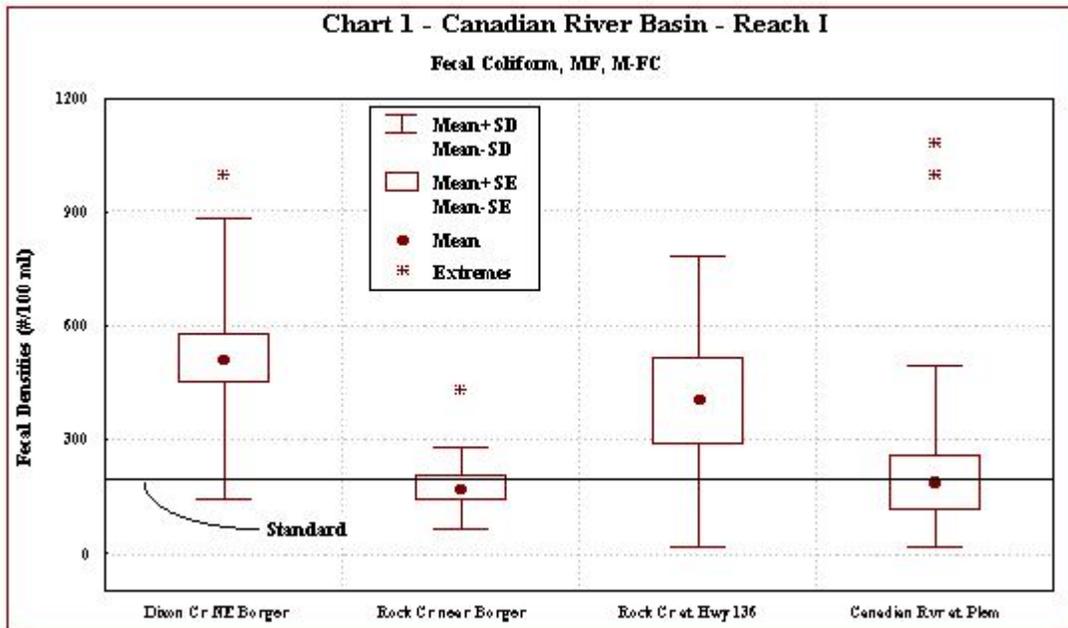
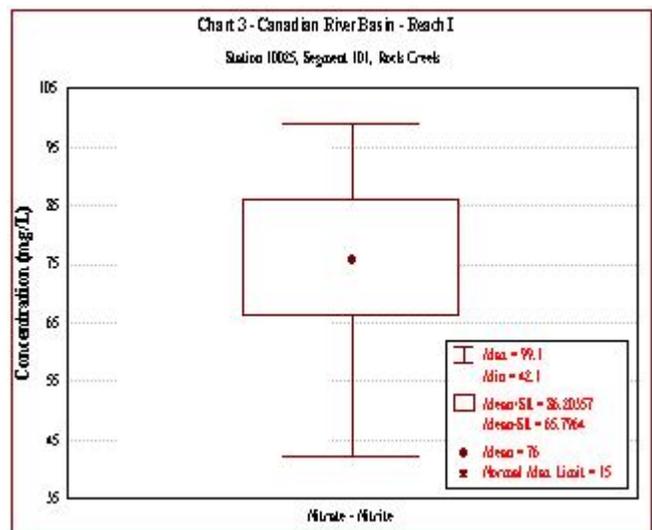
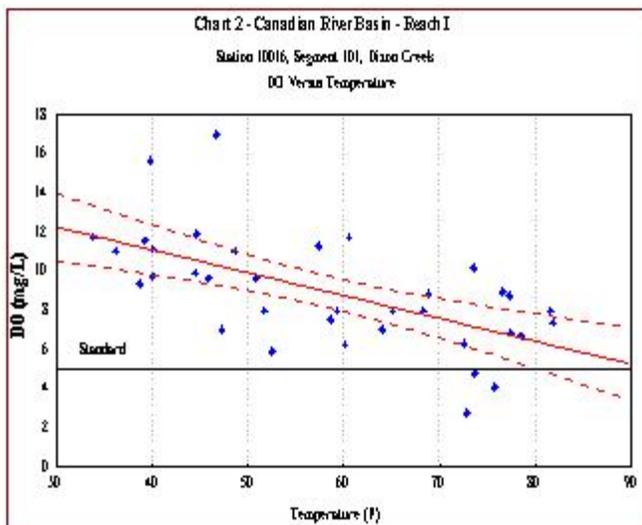
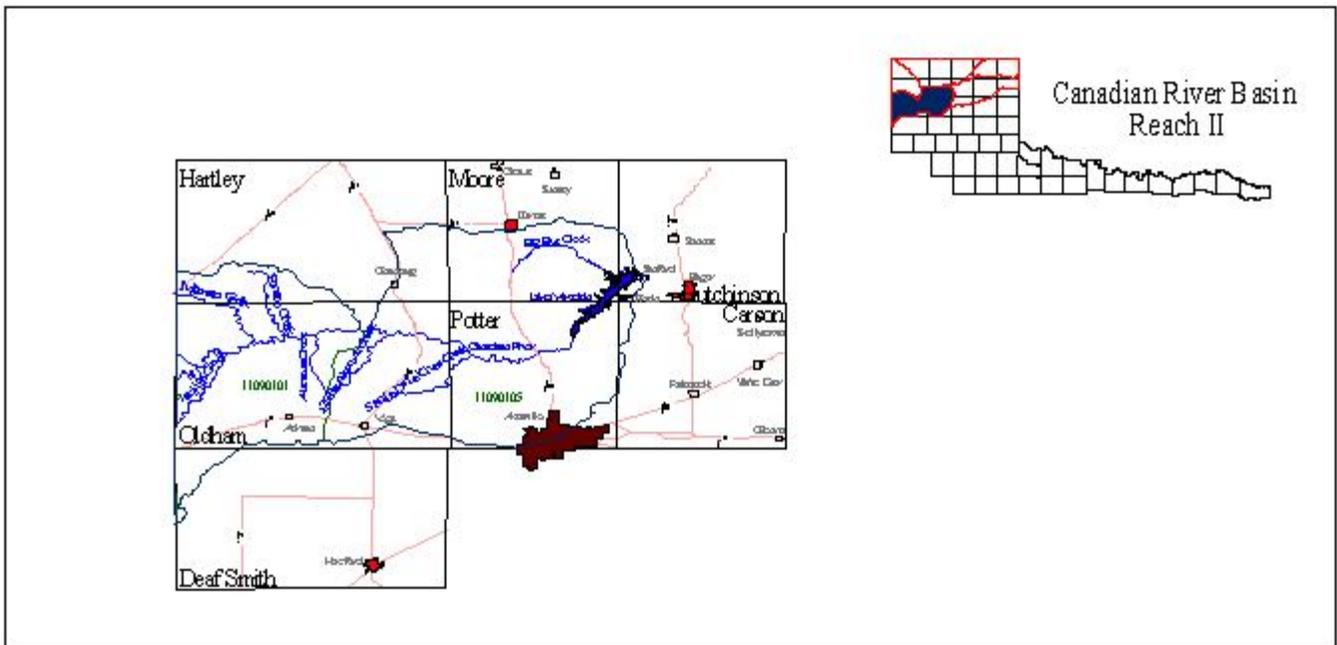


Chart 2 depicts the correlation between dissolved oxygen and temperature over time for station 10016 at Dixon Creek. Dixon Creek is included on the CWA §303(d) list for low DO. Note that only three values fall below the standard.

Chart 3 shows the abnormally high concentration of nitrate-nitrite observed during the latter part of the study period at station 10025 in Rock Creek near Borger, Texas. The elevated levels appear to be originating from an industrial manufacturing plant upstream of the monitoring stations. Further monitoring has been scheduled to identify the actual source of contamination and/or validate this assumption.



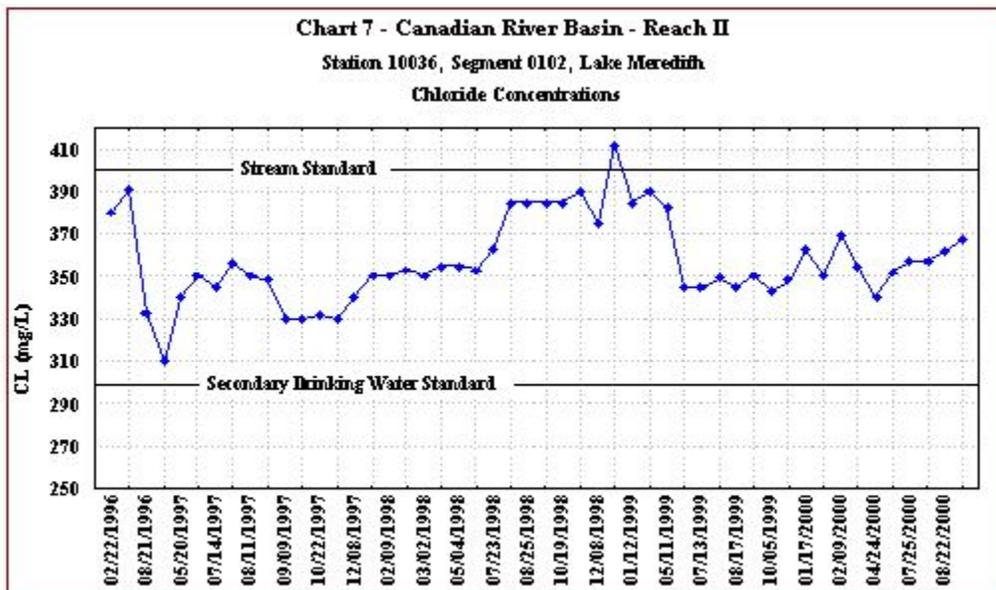
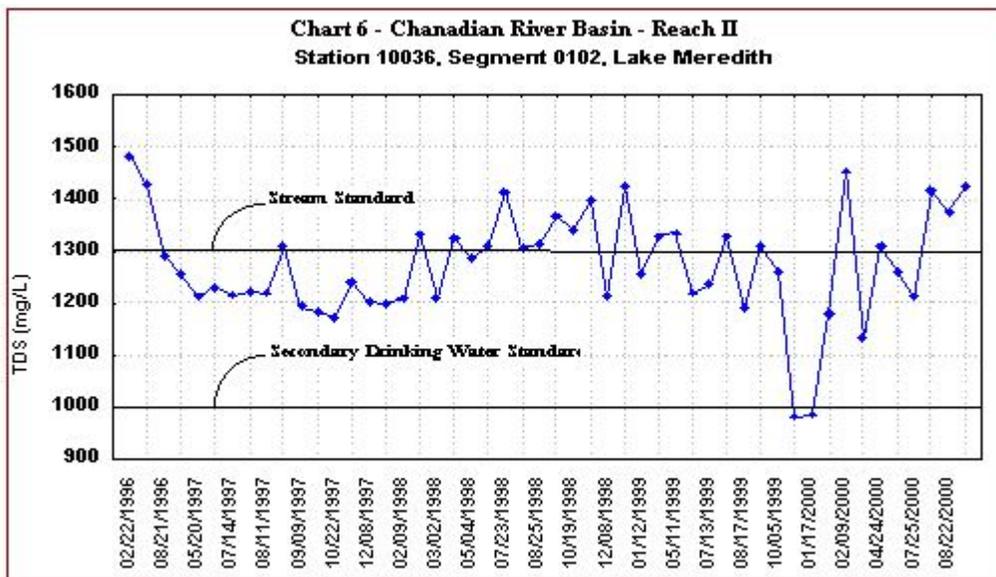
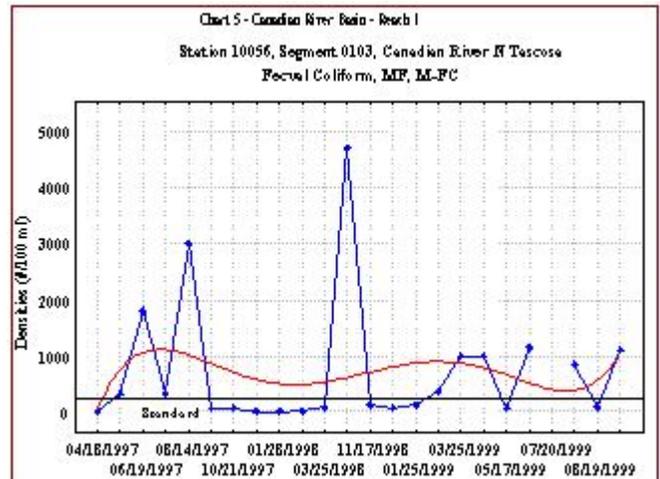
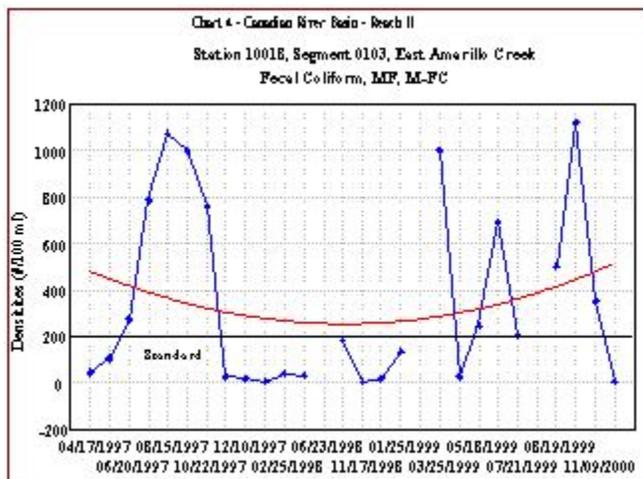


Basin Reach II represents the Canadian River main stem watershed from Sanford Dam upstream to the Texas-New Mexico state-line (Moore/Potter Counties to Oldham/Hartley Counties). Reach II contains two subwatersheds with 3,760 square miles of contributing drainage in Texas and New Mexico, 3,108 square miles in Texas, and two classified stream segments (0102 and 0103). There are 18 permitted municipal and industrial discharges, six permitted solid waste disposal sites, three confined animal feeding areas, 2,422 petroleum storage tanks and 144,931 persons within this reach.

There are 24 water quality monitoring stations (21 routine and 3 systematic) that provided data for screening. The Authority conducted 41 monitoring events during this period and 1,606 parameters were screened and analyzed. Of the constituents screened, fecal coliform is the only parameter that exceeded the screening criteria in this basin reach.

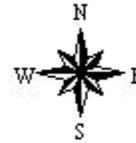
Station 10018 at East Amarillo Creek just north of Amarillo in segment 0103 and station 10056 on the Canadian River bridge north of Tascosa in segment 0103 both reported elevated levels of fecal coliform bacteria. These exceedances appear to be the result of storm water runoff of ranching and/or cattle raising activities. Livestock have access to both station locations and utilize the stream for watering. **Charts 4** and **5** depict the fecal coliform densities over time for each station. Other conventional parameters appeared to be within normal limits for this region.

Segment 0102 (Lake Meredith) is designated as a water supply, however, the current water quality does not meet secondary drinking water standards, which is the segment's primary use. According to the TNRCC's screening procedures for surface water quality standards, TDS and chloride levels did not exceed the standards set for Lake Meredith. However, it should be noted that the mean TDS levels often are very near the standard of 1,300 mg/L and have a tendency to exceed the standard during summer months or low lake levels. The TDS values show a direct correlation between lower lake levels and higher TDS concentrations. Dissolved solids, namely chlorides, continue to pose a major water quality issue in this segment due to the primary uses of the surface water impounded in Lake Meredith. **Charts 6** and **7** show a comparison between the surface water quality standard and drinking water standard for TDS and chloride levels over the period of record.

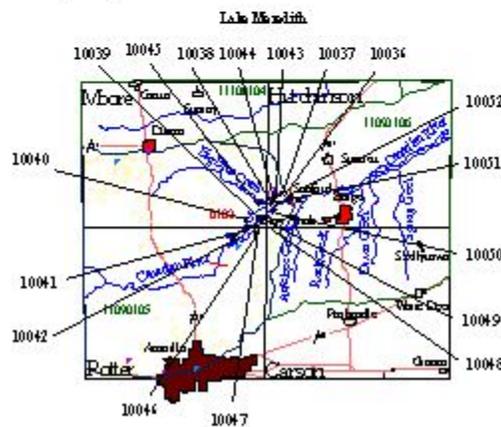
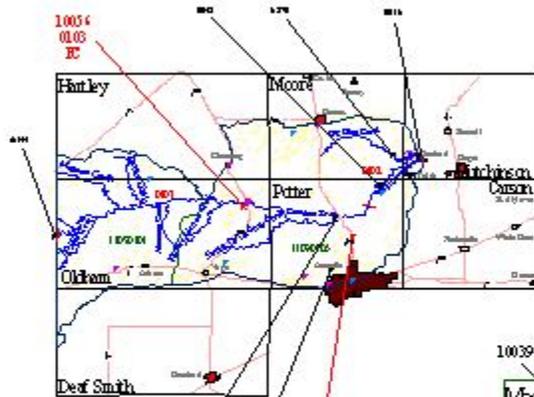


CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach II



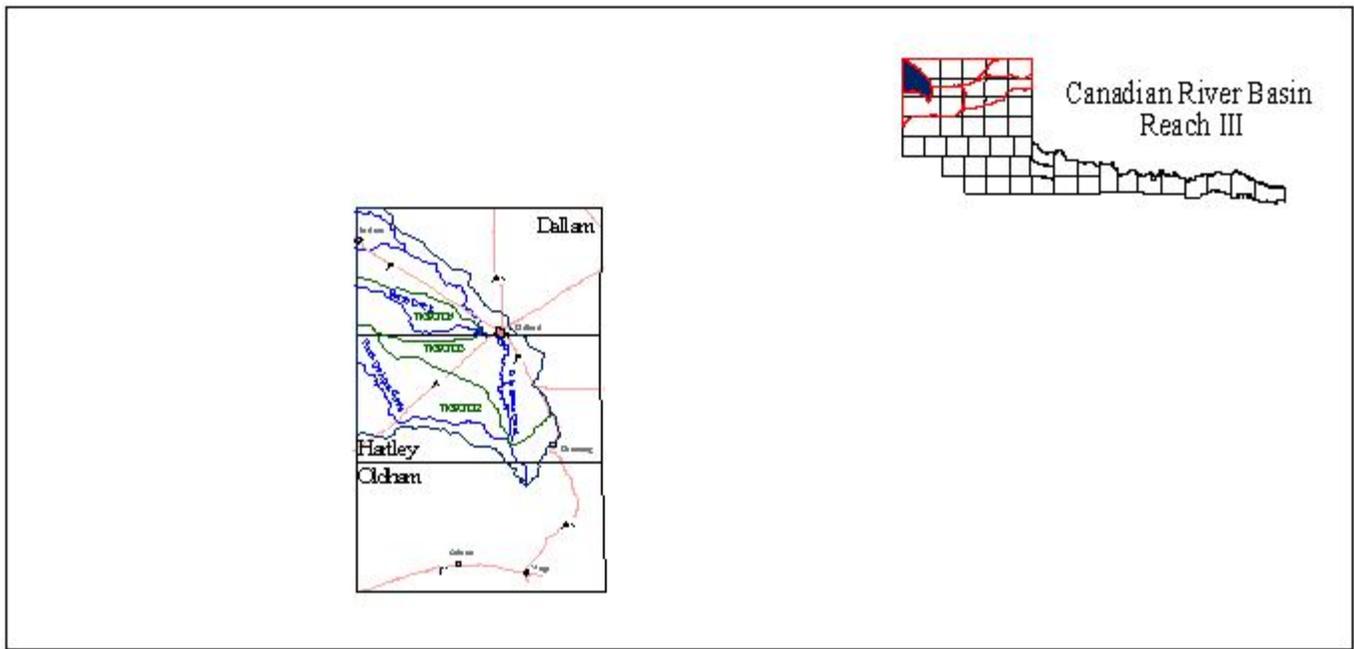
Symbolic notation associated with the charts

PH	Ability to Afford	MOH	MOH	MOH	MOH
D	City Size	MOH	MOH	MOH	MOH
C	City Type	MOH	MOH	MOH	MOH
DD	City Type	MOH	MOH	MOH	MOH
100	City Type	MOH	MOH	MOH	MOH
101	City Type	MOH	MOH	MOH	MOH
102	City Type	MOH	MOH	MOH	MOH
103	City Type	MOH	MOH	MOH	MOH
104	City Type	MOH	MOH	MOH	MOH
105	City Type	MOH	MOH	MOH	MOH
106	City Type	MOH	MOH	MOH	MOH
107	City Type	MOH	MOH	MOH	MOH
108	City Type	MOH	MOH	MOH	MOH
109	City Type	MOH	MOH	MOH	MOH
110	City Type	MOH	MOH	MOH	MOH

Legend: Symbols for water quality factors and infrastructure.

- Reach II Stations
- Parameters Including Secondary Chlorine
- 1000-10000 Line
- Solid Phase Chemical Reservoir
- Concentrated Annual Peaking Operations
- Signage
- Boundary
- Population
- 0-1000
- 1001-1005
- 1006-1008
- 1009-10010
- 10011-10015
- Hydrology Line Boundaries
- Course
- Highways
- Hydrology
- Concentrated Storage Tanks Area
- Groundwater Wells

Figure 2



Basin Reach III represents the Rita Blanca Creek watershed upstream to the Texas-New Mexico state-line on the west and the Texas-Oklahoma state-line on the north (Hartley County to Dallam County). The three subwatersheds contained in Reach III have 3,554 square miles of contributing drainage in Texas, New Mexico and Oklahoma with 1,527 square miles in Texas, and one classified stream segment (0105). There are 16 permitted municipal and industrial discharges, three permitted solid waste disposal sites, 16 confined animal feeding areas, about 131 petroleum storage tanks and approximately 8,612 persons in this reach.

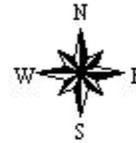
Although there were insufficient data to meet screening criteria, parameters evaluated continued to show a concern for total dissolved solids, fecal coliform and pH at station 10060 (Rita Blanca Lake) in segment 0105. Station 10003 (Punta de Agua) only showed two out of the twelve samples collected to exceed the stream standard for fecal coliform, which correlated with rainfall events. The elevated levels of fecal coliform appear to be the result of storm water runoff from agricultural areas.

This segment was placed on the CWA §303(d) list for TDS, fecal and pH. TDS and chloride concentrations in Rita Blanca Lake appear to be increasing over time. No apparent trends in nutrient levels have been observed with respect to ammonia-nitrogen, phosphorus-total or chlorophyll-*a*. The DO and pH data indicate that significant algal activity is present.

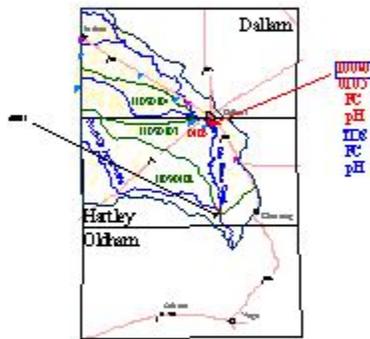
Rita Blanca Lake is designated for use as a high quality water fowl habitat and does not have any freshwater sources other than the wastewater discharge from the City of Dalhart (about 1.0 MGD) and normal rainfall within the area. Rita Blanca Lake is more comparable to that of a wetland than a free water body. Therefore, consideration should be given to reclassification of the water body, adjusting the water quality standard to match its natural characteristics and/or removing it from the CWA §303(d) list.

CANADIAN RIVER BASIN

FACTORS INFLUENCING WATER QUALITY



Reach III



Symbolic notation codes of the chart

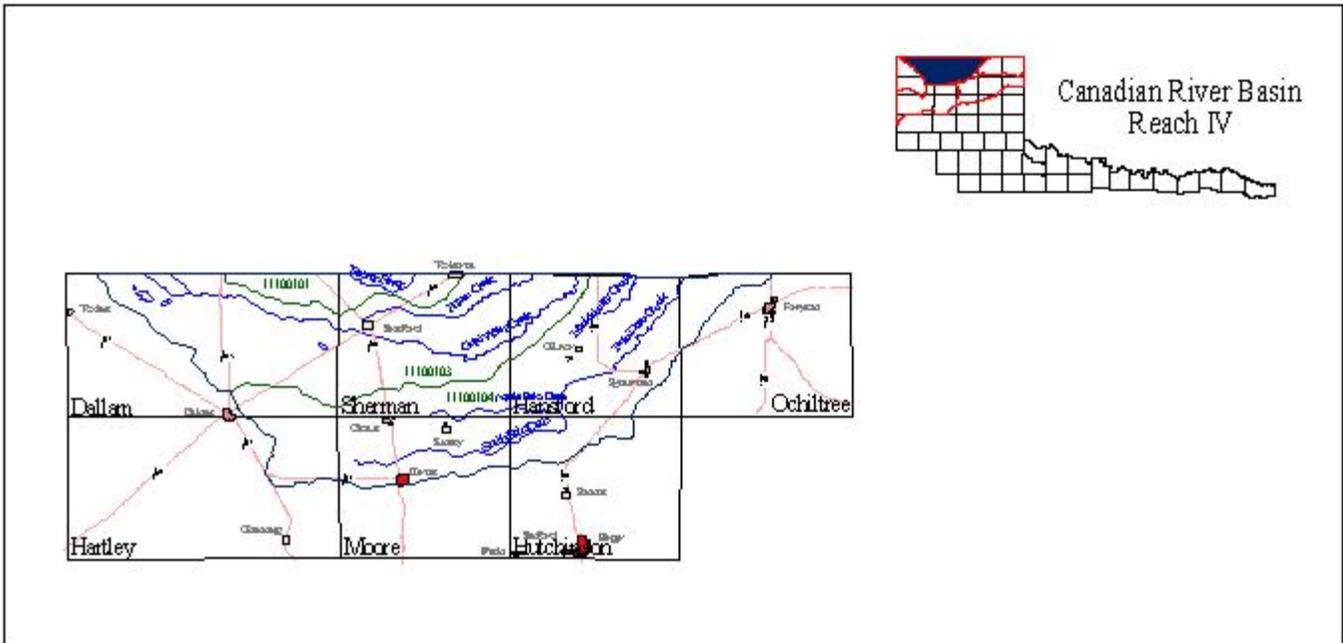
PH	Acidity or Alkalinity	NO3-NH3	Nitrate-Nitrite
D	Dissolved Oxygen	NO2-N	Nitrite-Nitrogen
C	Chlorophyllin	DO	Dissolved Oxygen
OD	Dissolved Oxygen	DO	Dissolved Oxygen
100	Total Dissolved Solids	Hg	Mercury
1P	Total Phosphorus	H	Hardness
Phg	Phosphorus, Dissolved	SD	Siltation
DO	Dissolved Oxygen	FC	Fecal Coliform
1	Total phosphorus	NO3-N	Nitrate-Nitrogen
2	Total Nitrogen	NO2-N	Nitrite-Nitrogen

Caution: Symbols within a quadrant may indicate one or more of the above. Multiple symbols are used to indicate multiple parameters.



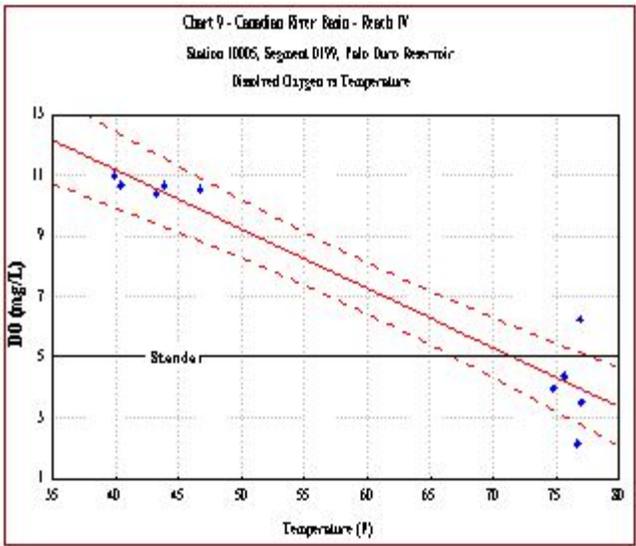
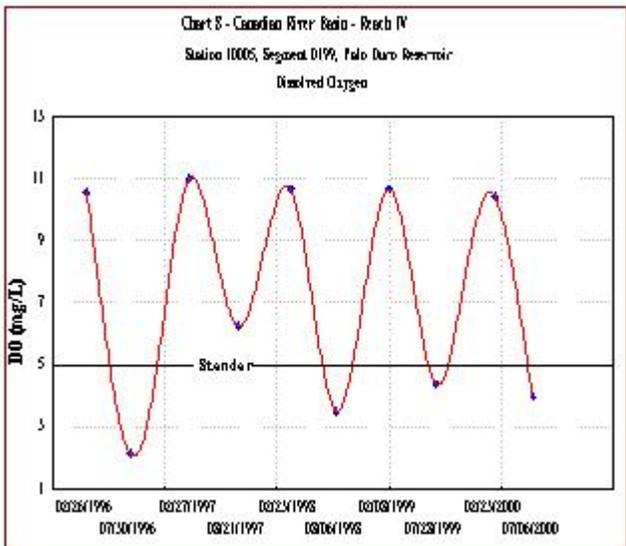
- Reach III Season
- Parameters Including Secondary Criteria
- 1000-10000 L/m³ L/m³
- Solid Phase Deposition
- Concentration Annual Peaking Operations
- Significance
- Boundary
- Population
- 0 - 100,000
- 100,000 - 1,000,000
- 1,000,000 - 10,000,000
- 10,000,000 - 100,000,000
- Hydrology: Line Boundaries
- Course
- Highways
- Hydrology
- Concentration Specific Tanks Area
- Groundwater Wells

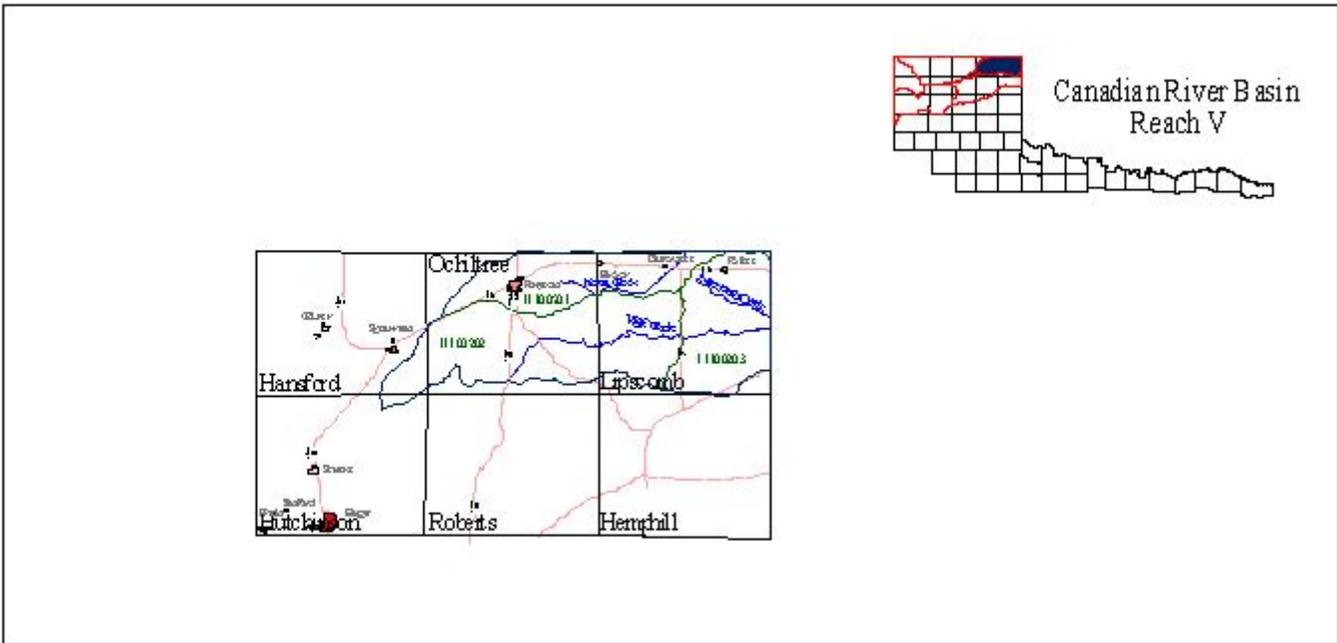
Figure 3



Reach IV represents the Palo Duro Creek watershed from the Texas-Oklahoma state-line upstream to its headwaters and portions of Coldwater Creek, Frisco Creek and Lower Beaver River located in Texas (Ochiltree/Hutchinson Counties to Dallam Counties). Reach IV also contains three subwatersheds with 6,520 square miles of contributing drainage in Texas, New Mexico and Oklahoma; 3,448 square miles in Texas. There are 26 permitted municipal and industrial discharges, eight permitted solid waste disposal sites, 26 confined animal feeding areas, about 530 petroleum storage tanks and approximately 59,428 persons in this reach.

One routine quality monitoring station provided data for screening in this reach, station 10005 (Palo Duro Reservoir). Palo Duro Reservoir is on the §303(d) list for occasional low dissolved oxygen (DO) levels, but only ten samples were collected over the period. **Charts 8 and 9** show that the DO swings correlate directly with seasonal changes and the warmer summer months resulting from naturally occurring conditions. All other conventional parameters appear to be within normal ranges for the region.





Reach V represents the Wolf, Mammoth and Kiowa Creek watersheds from the Texas-Oklahoma state-line upstream to the headwaters of each (Lipscomb to Hansford County). Reach V includes three subwatersheds with 3,589 square miles of contributing drainage in Texas and Oklahoma, with 1,617 square miles in Texas, and one classified stream segment (0104). There are ten permitted municipal and industrial discharges, six permitted solid waste disposal sites, 13 confined animal feeding areas, about 380 petroleum storage tanks, and approximately 34,357 persons in this reach. There are two routine water quality monitoring stations that provided data for screening in this reach. The Authority conducted 14 monitoring events and 628 parameters were screened and analyzed.

Of the constituents screened, fecal coliform was identified as the only parameter exceeding the screening criteria at station 10058 (Wolf Creek). Elevated levels of fecal and TDS appear to be the result of runoff of agricultural areas. Refer to **Charts 10** and **11** for details. Livestock have unlimited access to Wolf Creek and utilize it as a watering source. Only the occasional spike fecal levels correlated with runoff of pasture lands following a rainfall event. The other conventional parameters appeared to be within normal ranges for the region.

