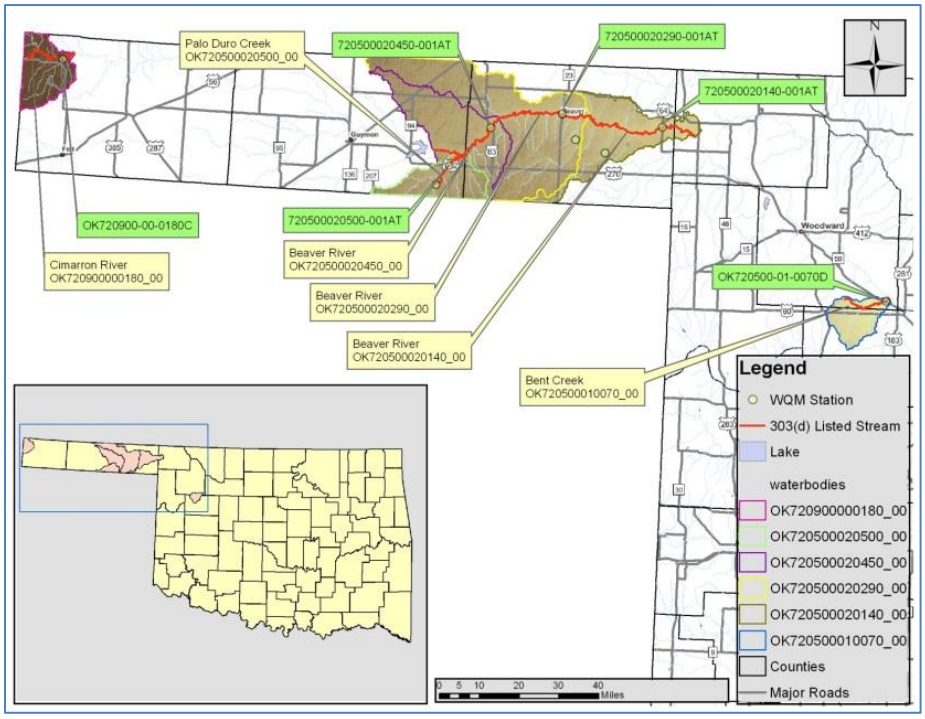
208 FACTSHEET FOR MINERAL TMDLs in the BEAVER RIVER STUDY AREA

Beaver River (OK720500020290_00) just north of Beaver.

(Photo courtesy of the National Weather Service)



Watershed:

The Beaver River TMDL Study Area is located in the northwestern portion of Oklahoma in the Upper Cimarron (USGS HUC 11040002), Middle Beaver (HUC 11100102), Palo Duro (HUC 11100104), Lower Beaver (HUC 11100201), and Middle North Canadian (HUC 11100301) watersheds. The Study Area covers portions of Beaver, Cimarron, Dewey, Harper, Texas, and Woodward counties.

Beneficial Uses in the Beaver River Study Area:

According to the Oklahoma Water Quality Standards, the designated beneficial uses for the waterbodies in the Beaver River Study Area are Aesthetics (AES), Agriculture (AG), Fish & Wildlife Propagation-Warm Water Aquatic Community Subcategory (WWAC), Fish Consumption (FISH), Primary Body Contact Recreation (PBCR), Public & Private Water Supply (PPWS), and High Quality Water (HQW). **Table 1** is the assessment from Oklahoma's 2012 Integrated Report on whether or not these waterbodies met their beneficial uses.

Table 1: Assessment of Beneficial Uses for Waterbodies in the Beaver River Study Area

Waterbody Name	WBID	HUC	AES	AG	WWAC	FISH	PBCR	PPWS	HQW
Bent Creek	OK720500010070_00	11100301	F	N	F	X	N	I	
Beaver River	OK720500020140_00	11100201	F	N	N	N	N		
Beaver River	OK720500020290_00	11100201 & 11100102	F	N	N	N	N		
Beaver River	OK720500020450_00	11100102	F	N	N	F	N		
Palo Duro Creek	OK720500020500_00	11100102 & 11100104	I	N	N	I	N	I	
Cimarron River	OK720900000180_00	11040001 & 11040002	I	N	N	X	N	I	√

F – Fully supporting that designated use; N – Not supporting that use; I – Insufficient information; X – Not assessed

Impaired Waterbodies in the Beaver River Study Area:

The designated beneficial use addressed in the Beaver River TMDL Study Area was Agriculture. Waterbodies that were indicated as impaired for chloride, sulfates, or total dissolved solids (TDS) on Oklahoma's 2012 303(d) list, are designated with an "**x**" in the half of **Table 2** with a dark blue header. Between 1999 – 2012, 347 mineral samples were collected for the waterbodies in the Study Area. These samples were examined to verify if these waterbodies were still impaired. The results of the data analyses are also summarized in **Table 2**. An "**x**" in the half of the table with the yellow header indicates that sampling data showed the waterbody to still be impaired for chloride, sulfates, or TDS. TMDLs were developed for these waterbodies. The "**x**" in red represents a waterbody that was found to be impaired when the water quality data was analyzed but that the waterbody had not been on the 2012 303(d) list as being impaired. That was the case with Palo Duro Creek (OK720500020500_00) which was found to be impaired for chloride when it was sampled. As a result, a TMDL for chloride for Palo Duro Creek was developed.

Table 2: Assessed Impairments and Actual Impairments in the Study Area

Waterbody Name	Waterbody Identification	Waterbody impairments from the 2012 303(d) List			TMDLs needed after sampling results analyzed		
		Chloride	Sulfates	TDS	Chloride	Sulfates	TDS
Bent Creek	OK720500010070_00		X			X	
Beaver River	OK720500020140_00	X			X		
Beaver River	OK720500020290_00	X	X	X	X	X	X
Beaver River	OK720500020450_00	X	X	X	X	X	X
Palo Duro Creek	OK720500020500_00		X	X	X	X	X
Cimarron River	OK720900000180_00		X			Delisted	

Possible Sources of Impairments:

Point sources - The point sources examined in the Beaver River Study Area were:

- **OPDES-regulated municipal and industrial wastewater treatment facilities (WWTF)** – There aren't any municipal or industrial OPDES-permitted facilities in the Study Area though there are three municipal and one industrial facilities which are located upstream in Texas in the Palo Duro Creek watershed. But permitted facilities in the impaired watersheds contribute insignificant pollutant loading of chlorides, sulfates and TDS.
- **OPDES regulated stormwater discharges** - Given the limited number of developed land within the impaired watersheds of the Study Area, urban runoff contributes insignificant pollutant loading of chlorides, sulfates and TDS. During high flow conditions, in-stream concentrations of minerals are lower because stormwater runoff provides dilution.
  - Municipal Separate Storm Sewer Systems (MS4s) - There aren't any in the Study Area.
  - Industrial Sites – Since facilities with a Multi-Sector General Permit (MSGP) aren't required to monitor for minerals, they are not considered as a point source for minerals.
    - Rock, Sand, and Gravel Quarries – Wastewater generated at quarries is regulated under DEQ General Permit OKG950000. But there aren't any quarries in the Study Area.
  - Construction Sites - Since construction sites are not required to monitor for minerals, they are not considered as a point source for minerals in the Study Area.

- **NPDES-regulated Animal Feeding Operations (AFOs)** –The Oklahoma Department of Agriculture, Food and Forestry (ODAFF) has been approved by EPA to issue NPDES permits in Oklahoma under what ODAFF calls the Agriculture Pollutant Discharge Elimination System (AgPDES). A CAFO is an animal feeding operation that confines and feeds 1,000 or more animal units for 45 days or more in a 12-month period. The CAFO Rules are designed to protect water quality through the use of Best Management Practices (BMPs). There are four CAFOs with 90,500 cattle in the Beaver River watershed. There are also 29 Swine Feeding Operations (SFOs) with 122,423 swine in the Study Area. SFOs must follow SFO rules and develop a Swine Waste Management Plan to prevent swine waste from being discharged into surface or groundwater. In the Beaver River Study Area, there weren't any Poultry Feeding Operations.

Nonpoint sources - The nonpoint sources examined in the Beaver River Study Area were:

- Local geological formations - Background concentrations of sulfate originate from drainage of geological formations and their high gypsum content.
- Groundwater - Groundwater flow can contribute minerals to receiving streams even under low flow conditions.
- Agricultural irrigation - Agricultural irrigation is not considered to be a major source for dissolved minerals in the Study Area.
- Oil and Gas Well Operations - In Oklahoma, the Oklahoma Corporation Commission regulates all oil & gas activities, including environmental rules.[1]
  - Soil farming sites - There aren't any soil farming sites in the Study Area.
  - Land Application - Land application activities can result in the buildup of mineral concentrations on the land surface which could be transported to receiving waters under some rainfall runoff conditions. There have been 274 permits for applying drilling waste on fields in the Study Area.
  - Produced water - In the Study Area, the highest level of **chloride** (169,215 mg/L) and **TDS** (274,383 mg/L) in underground injected wells with produced water was in the Beaver River (OK720500020290_00) watershed. The highest level of **sulfate** in produced water was 6,532 mg/L in an underground injected well in the Palo Duro Creek (OK720500020500_00) watershed.
  - Pits - There aren't any commercial pits in the Study Area.
  - Underground injection (Class II) wells - There are 152 underground injection wells in the Study Area.
  - Abandoned or improperly capped oil and gas wells
- Road salts – Given the limited number of paved roadways salted during winter storms within the impaired watersheds of the Study Area, roadway salts contribute insignificant pollutant loading of chlorides, sulfates and TDS.
- Production spills: A total of 16,906 fluid releases in Oklahoma were reported to the Corporation Commission from 1993 – 2003. Saltwater made up about 76% of the total volume of all spills. The quantified releases of saltwater had a median volume of 40 barrels.

For details about each of these sources and their impact on the impairment of waterbodies in the Study Area, consult the full Beaver River Mineral TMDL report at the following DEQ webpage: http://www.deq.state.ok.us/WQDnew/tmdl/index.html.

[1] Oklahoma Statutes (O.S.): 27A O.S. § 1-3-101 section E

TMDLs:

The TMDLs were calculated using load duration curves. Afterwards, 11 TMDLs (Table 3) were developed for the 5 impaired streams in the Beaver River Study Area. Table 3 shows the amount that each pollutant will need to be reduced [Percent Reduction Goal (PRG)] in order for that waterbody to meet water quality standards and its designated beneficial use for agriculture:

Table 3: Percent Reduction Goal Needed for Waterbody to Meet Water Quality Standards

Waterbody Name	Waterbody ID	These impairments must be reduced by the following amounts in bold in order to meet water quality standards.					
		Chloride – Single Sample	Chloride – Average	Sulfate – Single Sample	Sulfate - Average	TDS – Single Sample	TDS – Average
Bent Creek	OK720500010070_00			38.5	**40.3%**		
Beaver River	OK720500020140_00	**43.4%**	34.9				
Beaver River	OK720500020290_00	**66.0%**	59.6	**39.4%**	29.0	**54.4%**	50.9
Beaver River	OK720500020450_00	**77.9%**	77.9	**40.2%**	20.1	58.9	**64.5%**
Palo Duro Creek	OK720500020500_00	**59.4%**	50.2	**68.9%**	60.7	**63.6%**	55.1

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