

2011 Colorado River Basin Highlights Report

A Summary of Impaired Water Bodies in the Colorado River Basin



Prepared by Clean Rivers Program Partners:

Lower Colorado River Authority

Upper Colorado River Authority

Colorado River Municipal Water District

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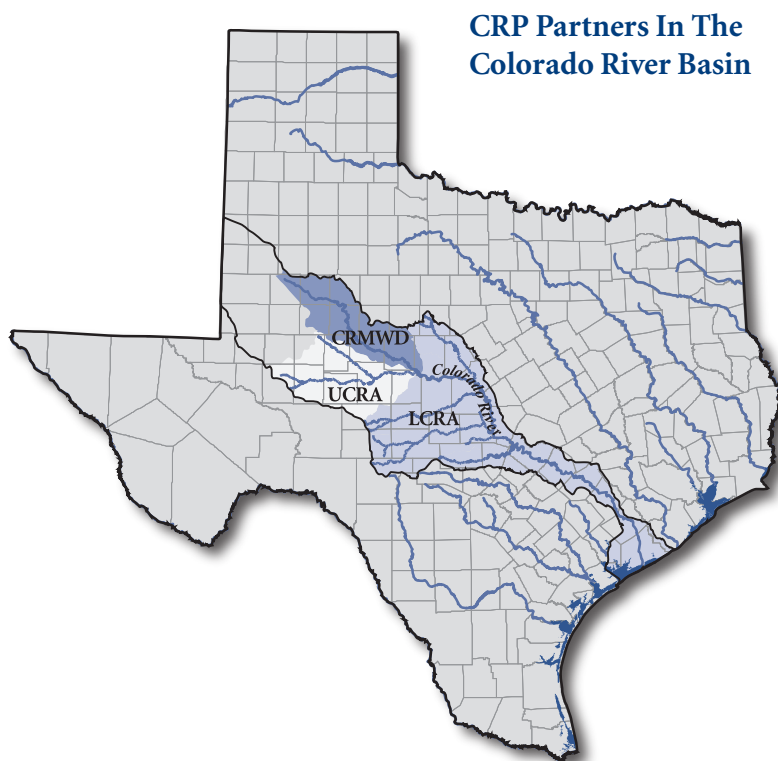
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Introduction

The Texas Clean Rivers Program (CRP) is a statewide coalition of water quality agencies that performs monitoring, assessment and public outreach on a watershed level. The goal of the program is to maintain and improve the quality of water in Texas through partnerships between the Texas Commission on Environmental Quality (TCEQ), river authorities, local governments, industry and citizens. The goal is accomplished through six objectives:

- Provide quality-assured data to TCEQ for use in water quality decision-making
- Identify and evaluate water quality issues
- Promote cooperative watershed planning
- Inform and engage stakeholders
- Ensure efficient use of public funds
- Adapt the program to emerging water quality issues

In the Colorado River basin, three regional entities are responsible for implementing the Clean Rivers Program: Lower Colorado River Authority (LCRA), Upper Colorado River Authority (UCRA) and Colorado River Municipal Water District (CRMWD). The City of Austin also contributes data and services to protect water quality and achieve CRP goals.



Collectively, the partners and TCEQ regional staff monitor over 200 sites in the Colorado River basin. TCEQ scientists use the monitoring data primarily to determine if water bodies meet Texas Surface Water Quality Standards. Every two years, TCEQ publishes the results of its statewide assessment in the Integrated Report for Clean Water Act Sections 305(b) and 303(d), a comprehensive report card for surface waters in the state. The most recent assessment, completed in 2010, found 24 water bodies in the Colorado River basin that are impaired (Table 1), meaning they do not support their designated uses (i.e. recreation, drinking water or habitat for aquatic life).

Table 1 - Impaired Water Bodies in the Colorado River Basin

Watershed	Segment	Water Body	County	Parameter(s)	Year Listed	Category	Action Taken Since the Initial Listing
Upper	1412	Colorado River below Lake J.B. Thomas	Mitchell and Howard	bacteria	2008	5c	Maintain monitoring
Upper	1412B	Beals Creek	Howard	bacteria	2010	5b	Monitoring frequency increased
				selenium in water	2010	5c	Monitoring frequency increased
Upper	1413	Lake J.B. Thomas	Borden and Scurry	chloride	2008	5c	Maintain monitoring
				TDS	2010	5c	Monitoring frequency increased
Concho River	1421	Concho River	Tom Green and Concho	dissolved oxygen	2008	5c	Watershed protection plan - implementation phase
				bacteria	2008	5c	Watershed protection plan - implementation phase
				impaired benthics	2002	5c	Watershed protection plan and US Geological Survey special study
Pecan Bayou	1431	Mid Pecan Bayou	Brown	bacteria	2006	5b	Ongoing study by Texas State Soil and Water Conservation Board
Lake Buchanan	1416	San Saba River	San Saba and Mills	bacteria	2008	5c	Maintain monitoring.
Lake Buchanan	1416A	Brady Creek	McCullough	dissolved oxygen	2004	5c	Watershed protection plan - development phase
Lake LBJ	1407A	Clear Creek	Burnet	Aluminum in water	2010	5c	Monitoring and remediation of source pollutant ongoing
				Sulfate	2010	5c	Monitoring and remediation of source pollutant ongoing
				TDS	2010	5c	Monitoring and remediation of source pollutant ongoing
				pH	2010	5c	Monitoring and remediation of source pollutant ongoing
Austin	1403A	Bull Creek	Travis	dissolved oxygen	2010	5c	New listing - no action taken
Austin	1403J	Spicewood tributary to Shoal Creek	Travis	bacteria	2002	5b	Monitoring frequency increased
Austin	1403K	Taylor Slough South	Travis	bacteria	2002	5b	Monitoring frequency increased
Austin	1403R	Westlake-Davenport tributary to Lake Austin	Travis	bacteria	2006	5b	Monitoring frequency increased
Austin	1427A	Slaughter Creek	Travis	impaired benthics	2002	5b	TCEQ plans a special study (UAA) in 2011.
Austin	1428	Colorado River below Town Lake	Travis and Bastrop	bacteria	2006	5c	Maintain monitoring
Austin	1428B	Walnut Creek	Travis	bacteria	2006	5b	Maintain monitoring
Austin	1429B	Eanes Creek	Travis	bacteria	1999	5b	Monitoring frequency increased
Austin	1429C	Waller Creek	Travis	impaired benthics	2002	5c	Monitoring postponed until construction of Waller Tunnel is complete
				bacteria	2004	5b	Monitoring frequency increased
Coastal	1304	Caney Creek Tidal	Matagorda	bacteria	2006	5c	Increased the number of sites monitored
Coastal	1304A	Linneville Bayou	Matagorda	bacteria	2010	5b	New listing - no action taken
Coastal	1305	Caney Creek above Tidal	Matagorda and Wharton	bacteria	2002	5b	Increased the number of sites monitored
				dissolved oxygen	1999	5b	TCEQ performed a special study (UAA) to determine if standards were appropriate. The upper portion of the creek was determined to be intermittent with a limited aquatic life use. Unless conditions change, Caney Creek should meet standards during the 2012 assessment.
Coastal	1501	Tres Palacios Creek Tidal	Matagorda	dissolved oxygen	1999	5b	Texas Parks and Wildlife performed a UAA and determined that DO may not be a suitable measure of aquatic life in tidally influenced systems. TCEQ Standards Team currently reviewing data to address.
				bacteria	2006	5a	Increased the number of sites monitored
Coastal	1401	Colorado River Tidal	Matagorda	bacteria	2006	5c	Maintain monitoring
Coastal	1402H	Skull Creek	Colorado	dissolved oxygen	2008	5b	maintain monitoring
				bacteria	2010	5b	New listing - no action taken

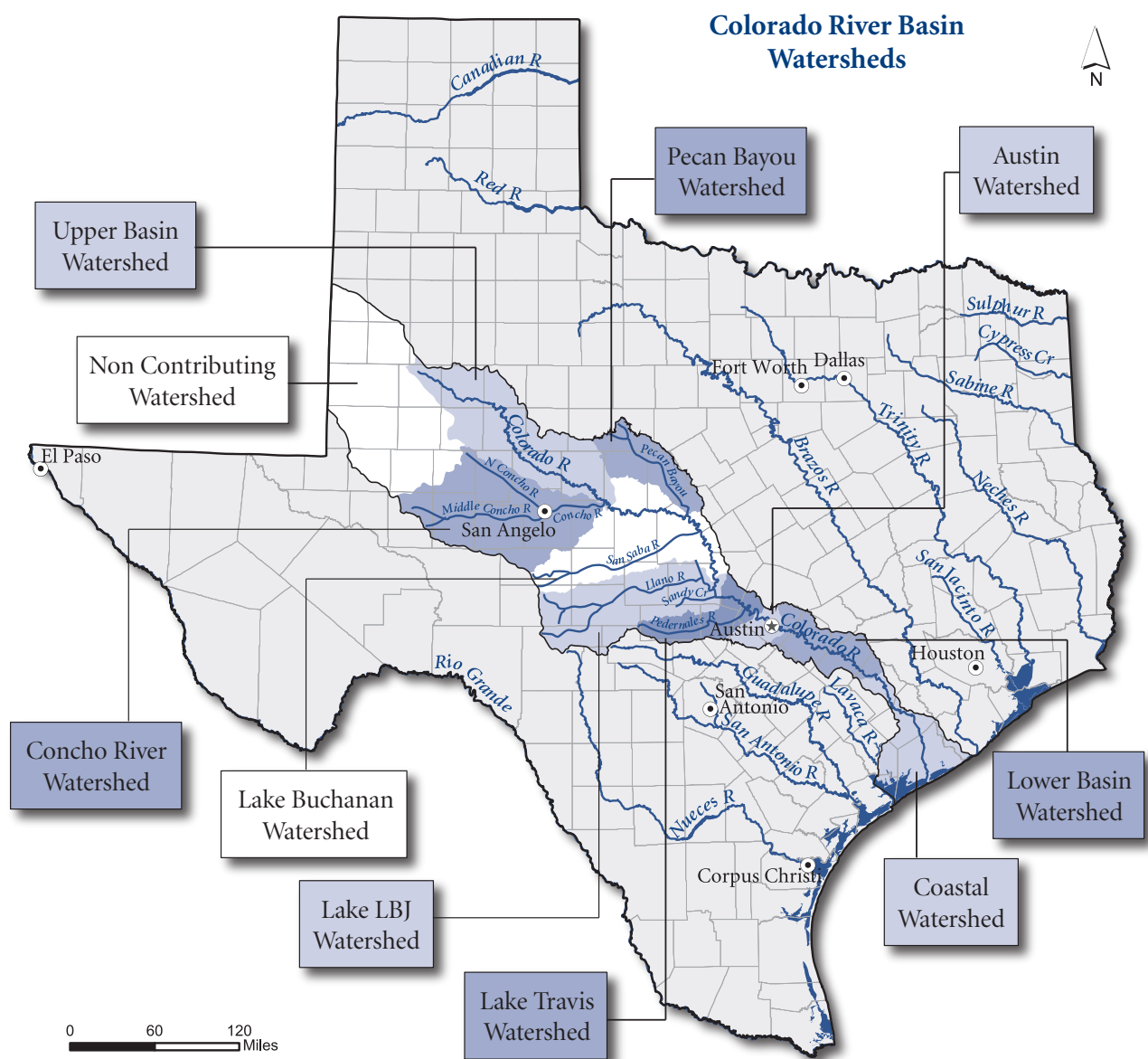
Category 5a - A TMDL is underway, scheduled, or will be scheduled.

Category 5b - A review of the water quality standards for this water body will be conducted before a TMDL is scheduled.

Category 5c - Additional data and information will be collected before a TMDL is scheduled.

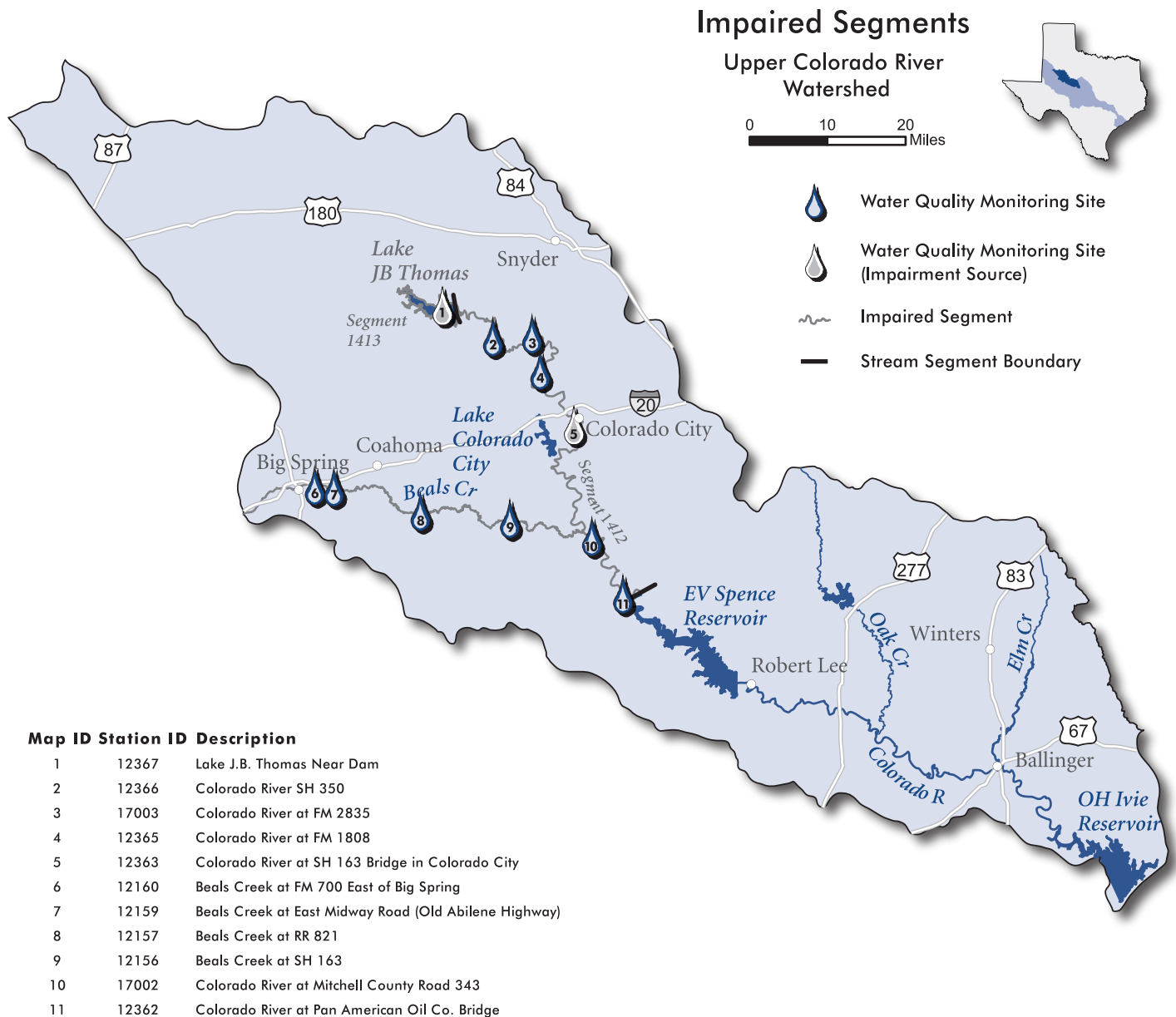
In an effort to characterize the impaired water bodies, the 2011 Basin Highlights Report (full document at <http://lcra.org/water/quality/crp/crpreports.html>) expounds on water quality data, discharge permits and other information obtained from monitoring personnel. This report summarizes potential sources of impairments and recommendations.

For the purposes of watershed management, the Colorado River basin is divided into nine watersheds. The impairments are delineated by segments, TCEQ-defined sections of a stream, river, lake or bay. The following summaries discuss impaired segments in the Colorado River basin by watershed.



Upper Colorado River Watershed

The upper Colorado River watershed is primarily rural farm and ranch land. Some soils in the watershed are characterized by high salt content due to geological deposits. Chloride levels in the water are typically higher than other parts of the state due to a combination of geological features and nonpoint source pollution caused by long-term oilfield activity. Problems from high chlorides are exacerbated by the presence of seeps, groundwater sources of saline water that can contaminate surface water.



Colorado River below Lake J.B. Thomas (Segment 1412)

Cause of Impairment: Elevated bacteria

Segment 1412 begins at the Lake J.B. Thomas Dam and ends 99 miles downstream at the confluence with Little Silver Creek. The stretch of the river is routinely monitored at 10 locations by CRMWD and TCEQ. The impairment for elevated levels of bacteria was first identified in 2008 based on data from site 12363, located near Colorado City.

Potential Sources of Impairment

Much of the contributing watershed for this segment consists of rangeland used for cattle grazing. The City of Colorado City (population, 4,300) is just upstream of Site 12363. Homes located along the Colorado River on the outskirts of the city may be connected to the city sewer system or to septic systems; either could be a source of bacteria. Runoff from the western portion of Colorado City, a prison farm facility, drains to the impaired site.

Recommendations

- Survey upstream of the monitoring site to identify potential sources of bacteria.
 - Communicate with TCEQ to see if a recreational use attainability analysis (RUAA), is appropriate.
- A RUAA is a site-specific study to determine the appropriate level of recreational use.

Beals Creek (Segment 1412B)

Causes of Impairment: Elevated bacteria and total selenium

Segment 1412B begins from the confluence with the Colorado River in Mitchell County and continues upstream to Big Spring. Land along the creek is used primarily for agriculture. Oil and gas production occur in the watershed.

Four sites have been routinely monitored in the creek. The impairments for bacteria and selenium were first identified in the 2010 assessment.

Potential Sources of Impairment

Potential sources of bacteria include failing wastewater lines or septic systems from homes and businesses in Big Spring. The City's wastewater plant also discharges treated effluent into Beals Creek.

Storm water runoff may be a source of bacteria and total selenium. An industrial section of the city and the municipal landfill are located immediately upstream of the monitoring sites. Another potential source of selenium is the local geology. Based on USGS and Texas Water Development Board data, moderate concentrations of selenium have been found in groundwater and soils in the area. CRMWD and TCEQ increased their monitoring for total selenium in 2011.

Recommendations

- Continue water quality monitoring.
- Communicate with TCEQ to determine if the stream is a candidate for an RUAA.

Lake J.B. Thomas (Segment 1413)

Causes of Impairment: Elevated levels of chlorides and dissolved solids

Lake J.B. Thomas is the westernmost impoundment on the Colorado River. It has historically maintained a fraction of its capacity due to extended drought in the region. The impairment based on dissolved solids was first identified by TCEQ in 2008. The chloride impairment was identified during the 2010 assessment.

Potential Sources of Impairment

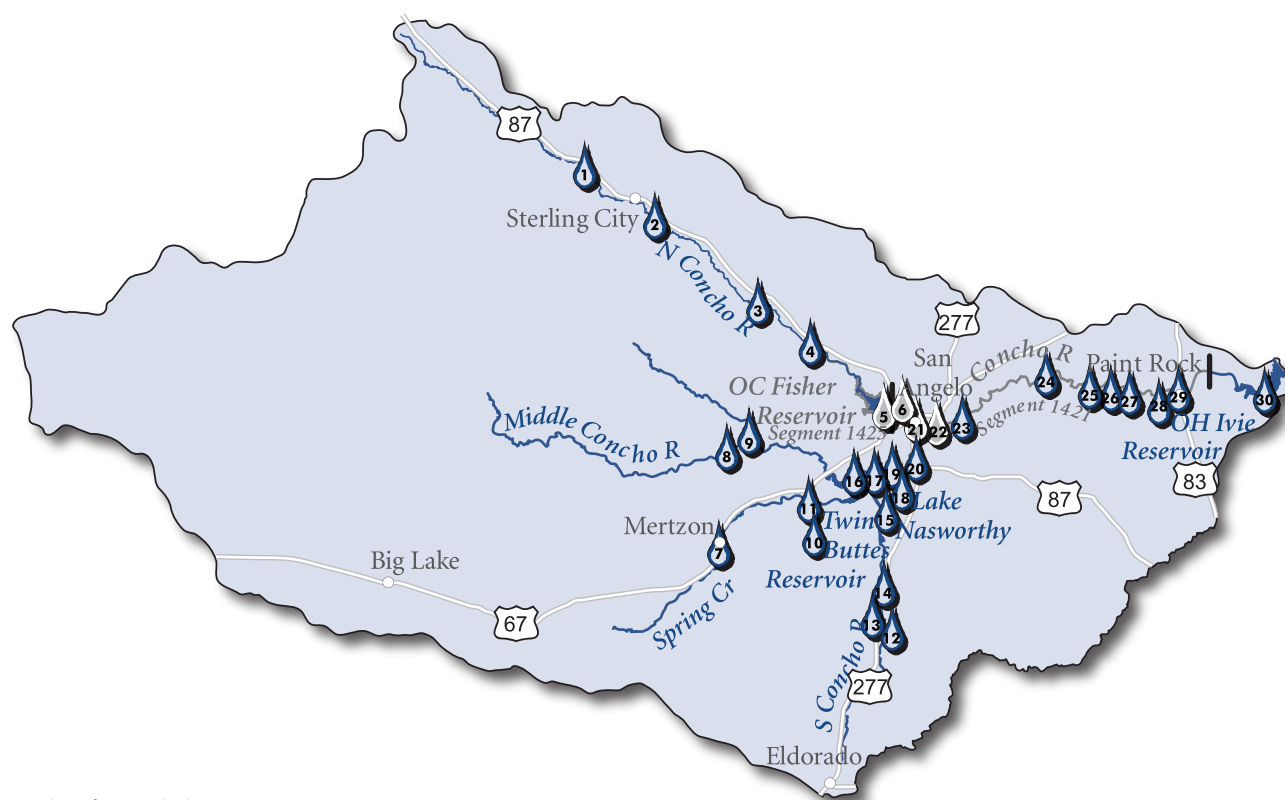
Excessive chloride and dissolved solids in the water is due to geology in the region and historical oil field activities. Saltwater seeps attributed to abandoned and improperly plugged oil wells are located around the lake shoreline. The seeps are monitored by CRMWD and the Texas Railroad Commission (RRC). The ongoing drought in the region has exacerbated the problem by accumulating minerals as water levels drop.

Recommendations

- Continue monitoring.
- Work with RRC on identifying wells that should be plugged.

Concho River Watershed

The Concho River Watershed is the largest watershed in the Colorado River basin. Above San Angelo (population 88,000), the North and Middle Concho rivers have limited flow. The South Concho River, also upstream of San Angelo, has excellent water quality because of large springs at the headwaters. In San Angelo, where the three forks of the Concho River converge, water quality is diminished due to nonpoint source urban runoff. Segment 1421 is approximately 64 miles long and is routinely monitored at 12 locations by UCRA, TCEQ and CRMWD.







Map ID	Station Id	Description
1	16780	North Concho River, 6.2mi NW of Sterling City on SH 87
2	16779	North Concho River at Sherwood Lane
3	17350	North Concho River at RR 2034 Southwest of Water Valley
4	12171	North Concho River at County Road Bridge 0.6 Mile Southwest of Carlsbad
5	12429	O.C. Fisher Reservoir Midlake
6	15886	North Concho River at Caddo St in San Angelo
7	17346	Spring Creek at Lake Avenue Crossing in Mertzson
8	16903	Middle Conch River at FM 853
9	12165	West Rocky Creek at FM 853
10	12166	Dove Creek at Bridge SE Bound on FM 2335
11	12161	Spring Creek downstream of FM 2335
12	18712	South Concho River 175 M downstream of Anson Spring
13	18711	Cold Creek upstream of confluence with South Concho R
14	12427	South Concho River downstream of US 277
15	12425	Twin Buttes Reservoir near Dam
16	12422	Twin Buttes Reservoir at Dam
17	12421	Lake Nasworthy Middle Cove
18	12419	Lake Nasworthy South Concho Arm
19	12418	Lake Nasworthy 40 M west of Dam Centerpoint
20	12416	Concho River South Fork at US 87
21	12412	North Concho River 20 M upstream of Irving Street Dam
22	12409	Concho River 235 M downstream of S Bell St
23	12407	Concho River at FM 380 near Veribest
24	12403	Concho River at FM 1692
25	12402	Concho River at FM 381
26	12254	Lipan Creek upstream of the Confluence of the Concho River
27	12257	Drivey Hollow Creek at headwaters of Chandler Lake
28	12255	Kickapoo Creek at FM 380
29	12401	Concho River Bridge on US 83 at Paint Rock
30	12512	O.H. Ivie Reservoir in Concho River Arm at FM 1929

Impaired Segments Concho River Watershed

0 10 20 Miles



-  Water Quality Monitoring Site
-  Water Quality Monitoring Site (Impairment Source)
-  Impaired Segment
-  Stream Segment Boundary

Concho River (Segment 1421)

Causes of Impairment: Poor biological community health, low dissolved oxygen and elevated bacteria

The impairments are located in the City of San Angelo where industrial, commercial and residential developments influence water quality. The biological impairment was identified in 2002 based on data from Site 12409. The impairment for low levels of dissolved oxygen and elevated bacteria were identified in 2008 based on data collected from sites 12412 and 15886.

UCRA used grant funds from EPA and TCEQ to develop a watershed protection plan (WPP) for the Concho River. The WPP resulted in three projects to address urban storm water runoff; development of a municipal stormwater ordinance for the City of San Angelo, a river dredging project and a bank stabilization project. The aquatic life use impairment was based on a limited amount of data collected in 1999 and 2000. Data collected by the US Geological Survey since the river was listed indicates that the waterbody does not meet the standard for high aquatic life use.

Potential Sources of Impairment

The most likely cause of impairments to the Concho River is urban nonpoint source runoff.

Recommendations

- Continue to collect bacteria samples to verify the contact recreation impairment in the 2012 assessment.
- Use recently collected USGS data to reassess aquatic life use attainment.
- Implement recommendations outlined in the Concho River WPP

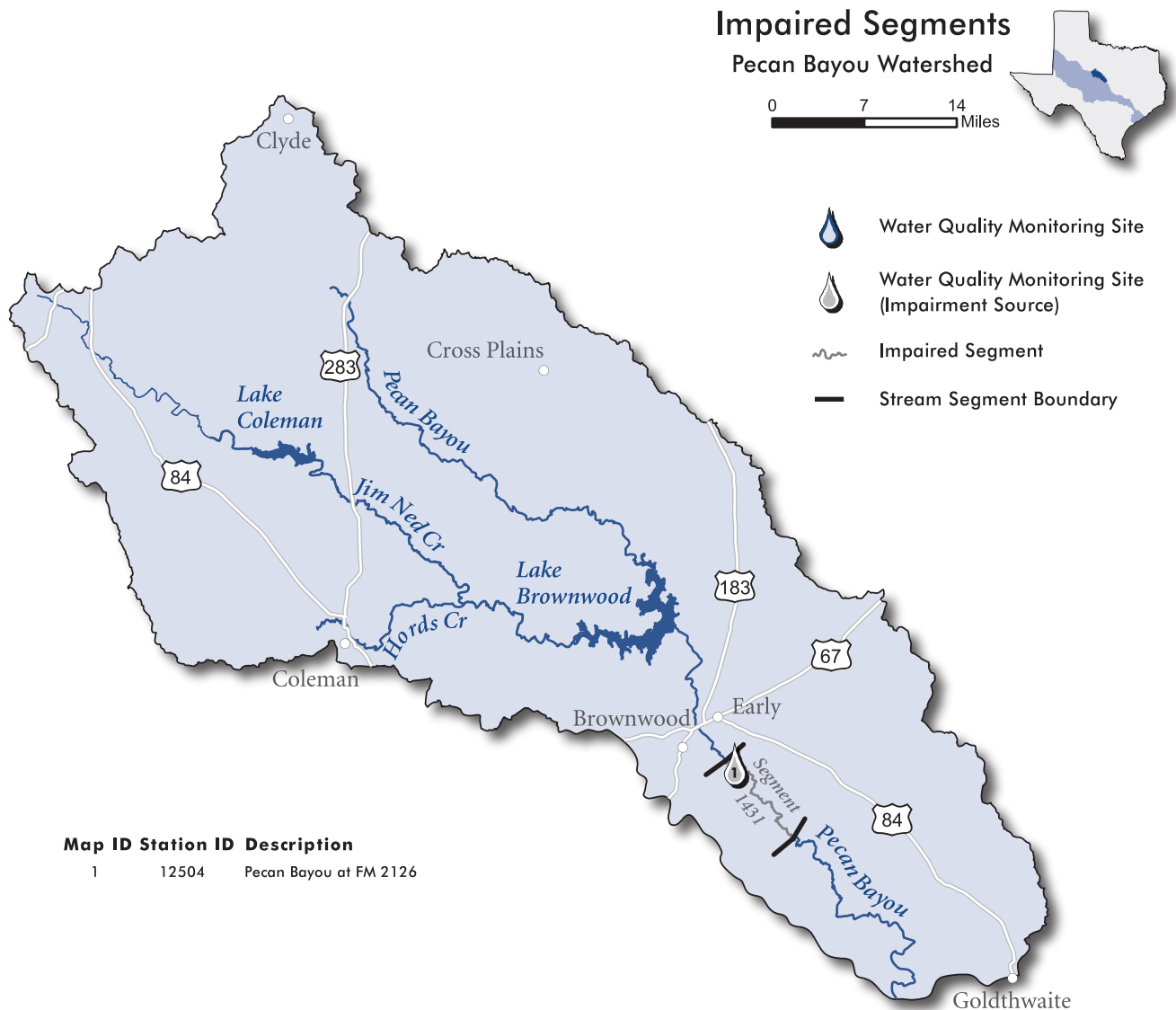


Photo by Chuck Brown

Concho River in San Angelo

Pecan Bayou Watershed

The watershed is largely rural and used primarily for agriculture. Pecan orchards, irrigated fields and livestock operations dot the landscape. TCEQ divided Pecan Bayou into six segments. The impaired segment, 1431, is located a short distance downstream of Brownwood (population 19,000).



Mid-Pecan Bayou (Segment 1431)

Cause of Impairment: Elevated bacteria

Segment 1431 begins just south of Brownwood. Immediately downstream of the city, the surrounding watershed is primarily used for hay pastures and row crops. The impairment, for elevated levels of bacteria, was first identified in 2008 based on data collected from Site 12504.

Potential Sources of Impairment

The City of Brownwood Wastewater Treatment Plant (WWTP) discharges treated effluent into Willis Creek about 1.5 miles upstream of the monitoring site. The WWTP is permitted to discharge 4.5 million gallons per day (MGD) and may be a source of bacteria. All storm water from the City of Brownwood drains to the monitoring site on Segment 1431. Urban runoff likely contributes to bacteria in the river during rain events.

A feedlot located approximately 2,000 feet downstream from the monitoring site irrigates wastewater near the bayou. It does not appear that the facility would contribute to bacteria levels at the monitoring site, but waste disposal/land application practices are unknown. Deer and feral hogs may be a source of fecal contamination and bacteria, but the extent of their influence could not be determined during this investigation.

A RUAA began in August 2010. Texas AgriLife Extension and Texas Institute for Applied Environmental Research are working under a grant from the Texas Soil and Water Conservation Board to complete the project by January 2012.

Recommendation

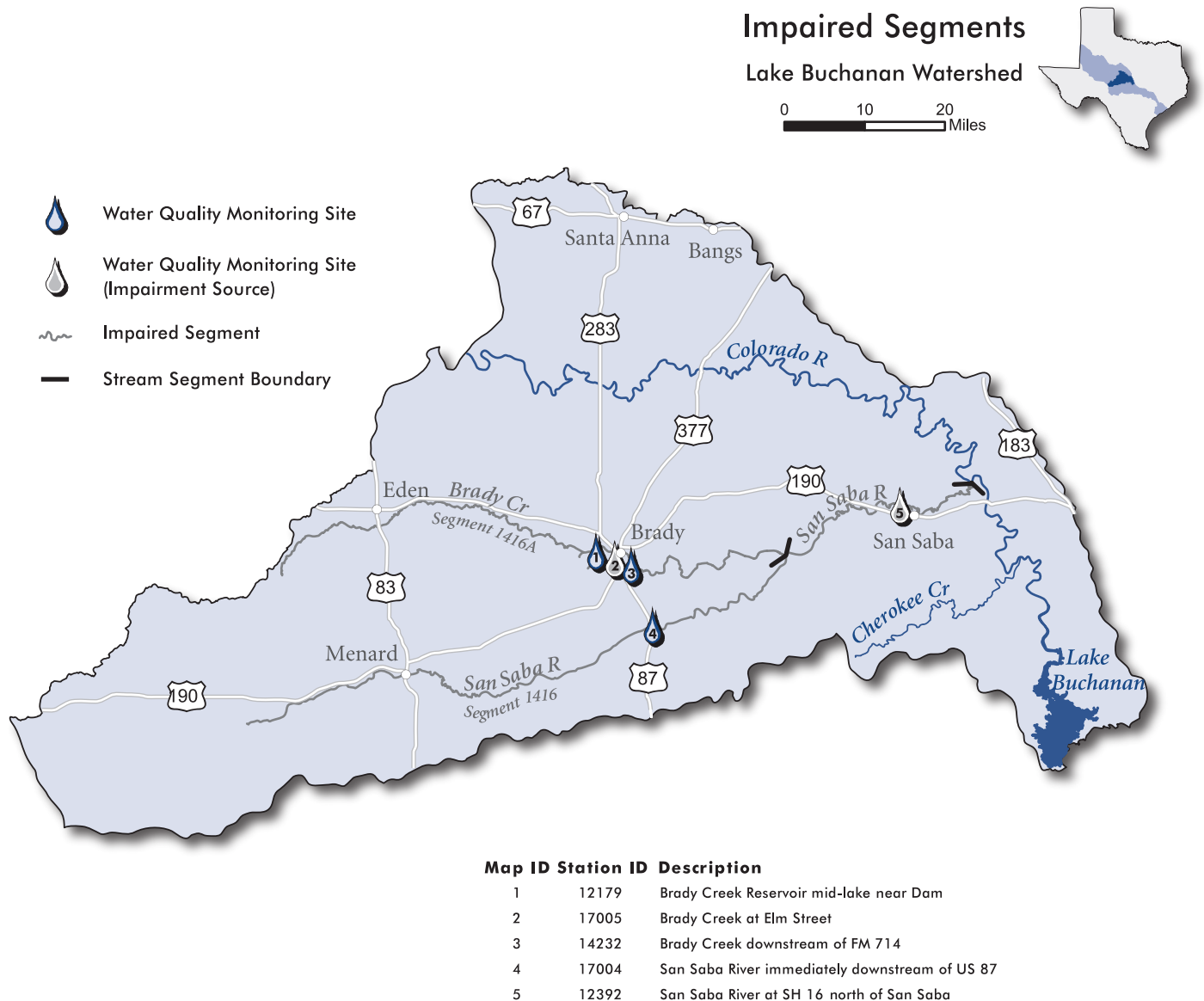
- Complete the RUAA



Pecan Bayou near Brownwood

Lake Buchanan Watershed

The Lake Buchanan watershed begins below the O.H. Ivie Reservoir Dam. The watershed is primarily rural, made up of ranches and farms. Population centers include the small towns of Brady, Eden and San Saba, which are in the San Saba River watershed. Dissolved solids found in the upper Colorado River watersheds are diluted by freshwater from Pecan Bayou, the San Saba River and small perennial tributaries in the Edwards Plateau ecoregion.



San Saba River (Segment 1416)

Cause of Impairment: Elevated bacteria

Segment 1416 begins at the confluence of the North and Middle forks of the San Saba River and ends 168 miles downstream at the confluence with the Colorado River. The impairment for elevated levels of bacteria was first identified in 2008 based on data collected from Site 12392. Data have been collected at the site since 1982.

Potential Sources of Impairment

Agriculture, wildlife and urban runoff may contribute bacteria to the river near Site 12392. The land immediately upstream of and surrounding the monitoring site is used to raise cattle, for hay production and for pecan orchards. Cattle that graze in the fields upstream of the monitoring site have access to the river as a water source and undoubtedly contribute waste to the stream. A cattle auction barn that has been cited by TCEQ for waste violations is located four miles upstream of Site 12392.

Recommendation

- Communicate with TCEQ and Texas State Soil and Water conservation Board to determine the potential to develop a watershed protection plan.

Brady Creek (Segment 1416A)

Cause of Impairment: Low dissolved oxygen

Brady Creek is a tributary of the San Saba River. In the upper portion of the 90-mile creek, flow is restricted by Brady Lake Dam and a series of flood control dams. Downstream of Brady Lake, flow is restricted again by a series of small dams in the town of Brady. Urban storm water runoff is problematic as it flows into the creek and settles in pools.

The impairment was first identified in 2004 based on data from Site 17005. Using nonpoint source grant funds from TCEQ and EPA, UCRA developed the Brady Creek Master Plan which identified and implemented projects to decrease the impact of stormwater runoff. UCRA recently received funding to expand the project and create the Brady Creek Watershed Protection Plan.

Potential Sources of Impairment

All storm water runoff from the City of Brady flows into Brady Creek. Urban runoff contributes nutrients which may stimulate algal blooms and periodic fish kills in the creek. During summer, low water dams along Brady Creek create stagnant pools where elevated nutrients contribute to algal blooms which result in extreme fluctuations of dissolved oxygen levels. Site 17005 is in such a pool.

Recommendation

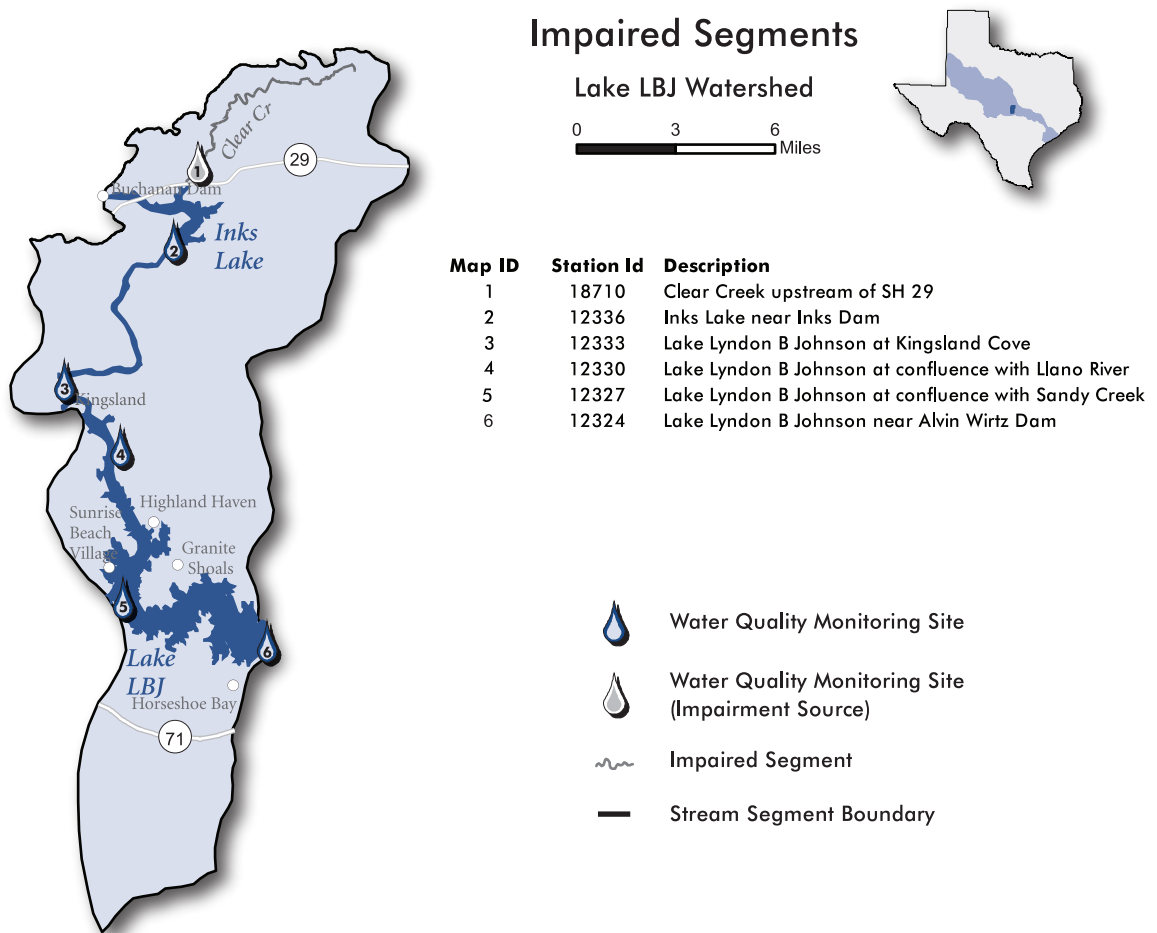
- Continue monitoring to determine if dissolved oxygen conditions have improved as a result of water quality improvement projects.



Brady Creek near the confluence with the San Saba River

Lake LBJ Watershed

The Clear Creek watershed is located on the northeast side of Inks Lake in Burnet County. The watershed is approximately thirteen square miles. It remains largely undeveloped with the exception of a former graphite mine that lies on the banks of Clear Creek.



Clear Creek (Segment 1407A)

Causes of Impairment: pH, total dissolved solids, sulfate and aluminum in water

Clear Creek begins near FM 2341 and ends 4.5 miles downstream at the confluence with Inks Lake. The impairments were first identified during the TCEQ 2010 assessment. LCRA has collected water quality data from Clear Creek since 2007.

Source of Impairment

Southwestern Graphite began mining at the site in 1915. The facility produced and refined graphite ore between 1915 and 1978. From 1978 and throughout the 80's, the site ceased ore extraction but continued to process graphite ore imported from other locations. The parent material that the graphite was extracted from now sits in a large tailings pile that covers over 23 acres on the bank of Clear Creek.

In 2000, Greensmiths, Inc. purchased the facility and began using reclaimed tailings materials to landscape golf courses. In 2004, LCRA worked with TCEQ and Greensmiths owner to find a solution and help secure a permit that would treat leachate on site and eliminate discharges to the stream. In 2010, Greensmiths engineered an industrial disposal plan to allow onsite treatment and eliminate discharges to the stream.

Recommendations

- Continue site visits after construction of treatment units at Greensmiths
- Continue monitoring at Site 18710



Clear Creek downstream of Greensmiths facility

Austin Watershed

The Austin watershed begins at the headwaters of Lake Austin where water is released from Lake Travis at Mansfield Dam. It consists of Lake Austin, Lady Bird Lake and the many tributaries that flow through Austin. With a population of more than 650,000, Austin is the most densely populated watershed in the Colorado River. It is also the location of one third of the impairments in the basin.

Most of the impairments in the Austin watershed are related to elevated levels of bacteria and low levels of dissolved oxygen.

Impaired Segments

Austin Watershed

0 2.5 5 Miles



Water Quality Monitoring Site



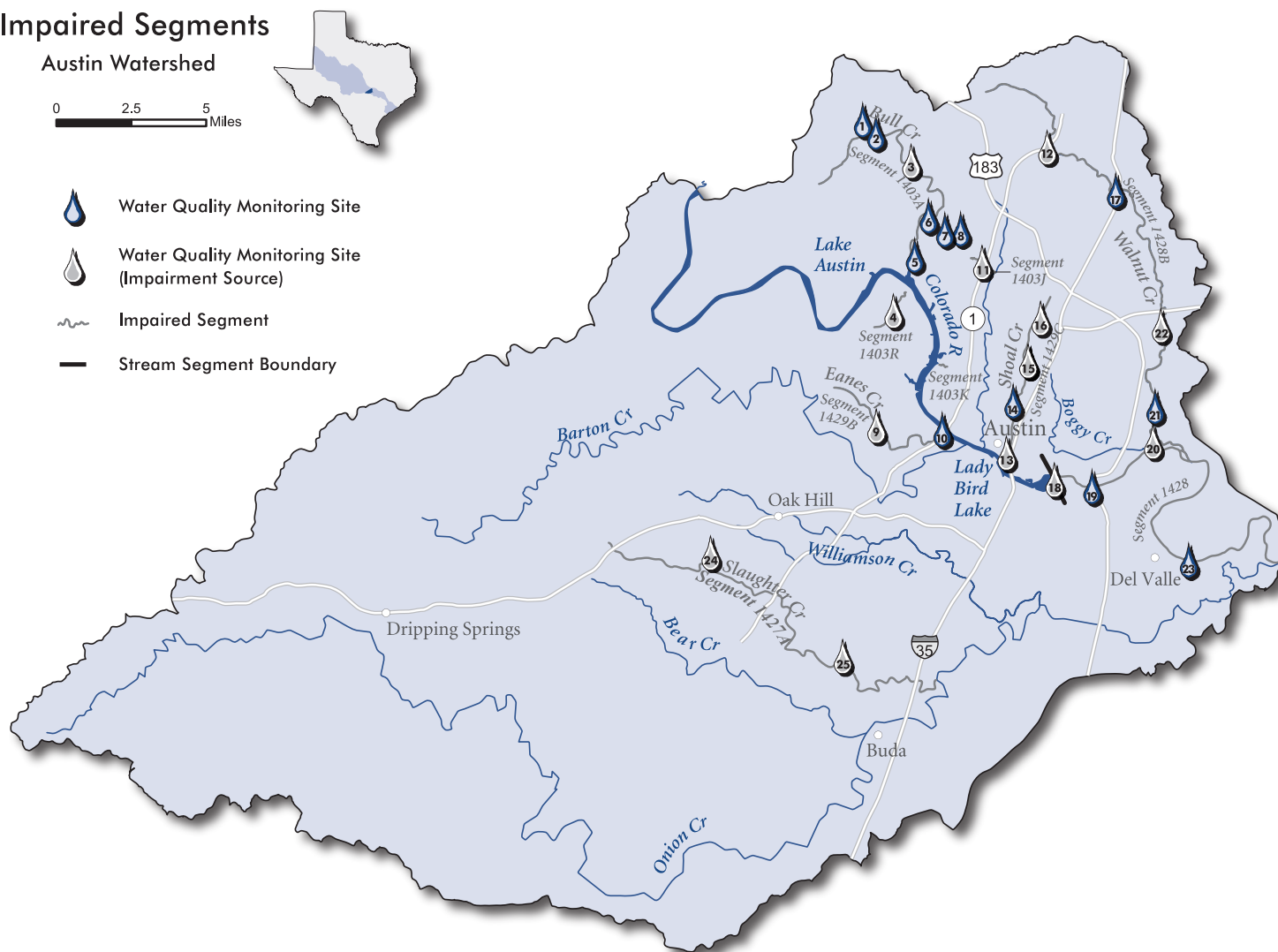
Water Quality Monitoring Site
(Impairment Source)



Impaired Segment



Stream Segment Boundary



Map ID Station ID Description

1	16320	Unnamed tributary to Bull Creek
2	16322	Bull Creek near the intersection of Syndham Drive & Corley Drive
3	12218	Bull Creek at Spicewood Springs Rd 5th County Road crossing
4	16310	Tributary immediately downstream of Westlake Drive
5	12215	Bull Creek at FM 2222 West of Lakewood Drive West of Austin
6	12216	Bull Creek at Loop 360 North of FM 2222 intersection
7	16309	Spring in Barrow Preserve at head of an unnamed tributary to Bull Creek
8	16308	Stillhouse Hollow Spring at the head of Stillhouse Hollow Creek
9	15963	Eanes Creek at Westlake High School
10	15964	Eanes Creek immediately upstream of confluence with Lady Bird Lake
11	16316	Spicewood tributary of Shoal Creek
12	17251	Walnut Creek immediately downstream of Loop 1 (Mopac Expwy)
13	12222	Waller Creek at 2nd Street

Map ID Station ID Description

14	15962	Waller Creek at 24th Street on UT Campus in Austin
15	16331	Waller Creek at Avenue H
16	12228	Waller Creek at Denson Avenue
17	15743	Walnut Creek at IH 35
18	12475	Colorado River below Longhorn Dam
19	12474	Colorado River Bridge On US 183 Southeast of Austin
20	12231	Walnut Creek at Southern Pacific RR South of FM 969
21	12232	Walnut Creek at FM 969 in East Austin
22	17469	Walnut Creek downstream of Old Manor Road
23	12469	Colorado River at FM 973 at Del Valle
24	12186	Slaughter Creek downstream of FM 1826
25	17964	Slaughter Creek downstream of FM 2304

Bull Creek (Segment 1403A)

Cause of Impairment: Low dissolved oxygen

Bull Creek is a tributary of Lake Austin. About 40 percent of the Bull Creek watershed has been developed for residential and commercial uses. The remaining 60 percent remains in a natural state. The creek is about 10 miles long and is monitored by the City of Austin, USGS and LCRA at seven sites.

Potential Sources of Impairment

The impairment was identified during the 2010 assessment based on 24-hour DO collected from Site 16322 in the uppermost reaches of the stream. The site is largely influenced by spring flows which typically contain little dissolved oxygen.

Recommendation

- Work with city staff and TCEQ to collect and submit more 24-hour DO data or other biological data for future assessment.

Spicewood tributary to Shoal Creek (Segment 1403J)

Cause of Impairment: Elevated bacteria

Segment 1403J is a small tributary of Shoal Creek, a tributary of Lady Bird Lake. It is a shallow, spring-fed stream a half mile long surrounded by mixed residential/commercial development. The impairment for elevated levels of bacteria was identified in 2002. In 2008 the City of Austin and TCEQ began an aggressive sample regime for Site 16316. The results confirmed that bacteria levels exceeded contact recreation standards.

Potential Sources of Impairment

The watershed is urbanized and the stream receives storm water runoff from roads, roof tops and parking lots. High bacteria counts, algae and sewage found at the site during monitoring indicate that wastewater infrastructure near the creek leak periodically.

Recommendations

- Evaluate wastewater collection infrastructure
- Survey the watershed to identify potential sources of bacteria.
- Communicate with TCEQ about the potential for a contact recreation use attainability analysis to help determine appropriate contact recreation use.

Taylor Slough South (Segment 1403K)

Cause of Impairment: Elevated bacteria levels

Taylor Slough is a tributary of Lake Austin. The one-mile stream is located in a dense urban landscape composed mostly of single-family residences. The monitoring site is located in Reed Park, a small municipal park. Sewer lines cross the creek at several locations in the watershed.

The impairment for bacteria was first identified in 2002 based on data collected during a rotational monitoring program. Because resources were allocated to other watersheds, no bacteria samples were collected between 2002 and 2007. In 2008, TCEQ and the City of Austin began sampling for bacteria monthly in an effort to verify the impairment.

Potential Sources of Impairment

The watershed is urbanized. The stream receives storm water runoff from roads, roof tops and parking lots. Uncollected pet waste may contribute to bacteria levels in the creek. Approximately 56,000 feet of wastewater lines are located within the watershed. Elevated nutrient concentrations found during monitoring indicate that wastewater lines may contribute to the impairment.

Recommendations

- Survey the watershed to identify potential sources of bacteria.
- Evaluate wastewater collection infrastructure in the watershed

Westlake-Davenport Tributary to Lake Austin (Segment 1403R)

Cause of Impairment: Elevated bacteria

The Westlake-Davenport tributary to Lake Austin is a small stream located in an urban watershed of clustered single-family residential housing. The creek flows through a greenbelt that provides riparian cover on either side. The impairment for elevated levels of bacteria was first identified in 2006. In 2008, TCEQ and the City of Austin began sampling for bacteria monthly in an effort to verify the impairment. Drought and low flows hampered much of the data collection efforts. However, data collected since the 2010 assessment indicate that the stream will meet contact recreation standards.

Potential Sources of Impairment

A wastewater line is located parallel to the stream and a lift station, located at Westlake Drive and Carry Back Lane, may be a source of bacteria.

Recommendation

- Continue monitoring at Site 16310 when flows allow to obtain a more robust dataset for future assessment by TCEQ.

Slaughter Creek (Segment 1427A)

Cause of Impairment: Poor biological community health

Located in southern Travis County, the Slaughter Creek watershed is approximately 31 square miles. The creek begins near SH 290 and ends about 17 miles downstream at the confluence with Onion Creek. A six-mile section of the creek near Loop 1 (MoPac) lies over the Edwards Aquifer recharge zone and this mid-reach portion of the creek does not flow under normal conditions.

While the Slaughter Creek watershed is urban, the riparian area surrounding the creek remains largely intact. The lower watershed consists primarily of densely clustered housing subdivisions. The upper watershed is less developed.

Segment 1427A was placed on the List of Impaired Waters in 2002 for not supporting a high aquatic life use due to an impaired invertebrate community. The impairment was based on two sampling events collected in 2001. A use attainability analysis was conducted by TCEQ in 2004. The findings were inconclusive due to drought conditions. TCEQ Water Quality Standards Team is slated to begin biological monitoring in FY 2011 in an effort to collect enough data to determine an appropriate aquatic life use.

Potential Sources of Impairment

The watershed is urbanized. Runoff from roads, roof tops and parking lots are a likely cause of the impairment. Also, wastewater lines and septic systems are located throughout the watershed.

Recommendation

- Complete scheduled UAA

Colorado River below Lady Bird Lake (Segment 1428)

Cause of Impairment: Elevated bacteria

Segment 1428, which begins at Longhorn Dam, is downstream of the most densely urbanized watershed in the Colorado River basin. The impairment for elevated levels of bacteria was first identified in 2006 based on data collected from Site 12475 at Longhorn Dam.

Potential Causes of Impairment

A likely cause of elevated bacteria was leaking wastewater lines. An eight-inch sewer line located on the south side of the river failed in 1988 and again 1994. Repairs to the lines were completed.

Recommendation

- Continue monitoring to verify improvements to water quality

Walnut Creek (Segment 1428B)

Cause of Impairment: Elevated bacteria

Walnut Creek is a tributary of the Colorado River just below Longhorn Dam. Its watershed is urban, composed mostly of residential housing and commercial uses. Six sites in the 20-mile creek are routinely monitored by the City of Austin. The impairment for elevated levels of bacteria was first identified in 2006 based on data from sites 12231, 17469 and 17251.

Potential Sources of Impairment

Wastewater collection infrastructure is located near the creek throughout the watershed. Leaking pipes may be a cause for elevated bacteria. Storm water runoff from urban sources may also contribute bacteria to the stream.

City of Austin has performed independent studies that attribute bacterial contamination to illicit discharges in the watershed.

Recommendations

- Evaluate wastewater collection infrastructure and septic systems in the watershed.
- Survey the creek to identify potential sources of bacteria.

Eanes Creek (Segment 1429B)

Cause of Impairment: Elevated bacteria

Eanes Creek is a tributary of Lady Bird Lake. It consists primarily of dense, clustered single-family residences, with some commercial development in the upper watershed. The creek is intermittent. Its lower portion lies over part of the Edwards Aquifer recharge zone.

The impairment for elevated levels of bacteria was first identified in 1999 based on data collected during a rotational monitoring program. Because resources were allocated to other watersheds, no bacteria samples were collected until 2008, when the City of Austin began monitoring the stream at Site 15964.

Potential Sources of Impairment

Leaking pipes from wastewater collection infrastructure and septic systems may be a source of elevated bacteria.

Recommendations

- When flows are sufficient, collect bacteria data from Site 15964.
- Communicate with TCEQ to determine if a RUAA is appropriate

Waller Creek (Segment 1429C)

Cause of Impairment: Poor biological community health and elevated bacteria

Waller Creek, a tributary of Lady Bird Lake, is in the most densely urbanized watershed in the Colorado River basin. It begins in north Austin and flows five miles through downtown. In some areas of town the creek flows through concrete-lined channels. Sewer lines cross the creek at many locations and storm water outlets drain runoff from downtown Austin into the creek. Signs of transients around Waller Creek are evident.

The impaired biological community was first noted in 2002 based on four monitoring events at Site 12222. More data are needed to confirm the impairment.

The impairment for bacteria was identified in 2004 from sites 12222, 16331 and 12228. In 2008, the City of Austin increased bacteria monitoring in Waller Creek to 12 times per year. The data indicate continued high bacteria levels. Monitoring stopped in 2010 in anticipation of the Waller Creek Tunnel, a downtown revitalization project that will impact the flow of the creek.

Potential Sources of Impairment

The elevated bacteria levels in Waller Creek may be attributed to pet and human waste, leaking wastewater infrastructure and storm water runoff. These sources contribute pollutants from multiple locations and in variable amounts making it difficult to track sources and loading.

Recommendations

- Reestablish monitoring and more intensive studies once the Waller Creek Tunnel Project is complete.
- Evaluate wastewater collection infrastructure in the watershed.



Bull Creek at the headwaters

Photo provided by The City of Austin.

Lower Colorado River Watershed

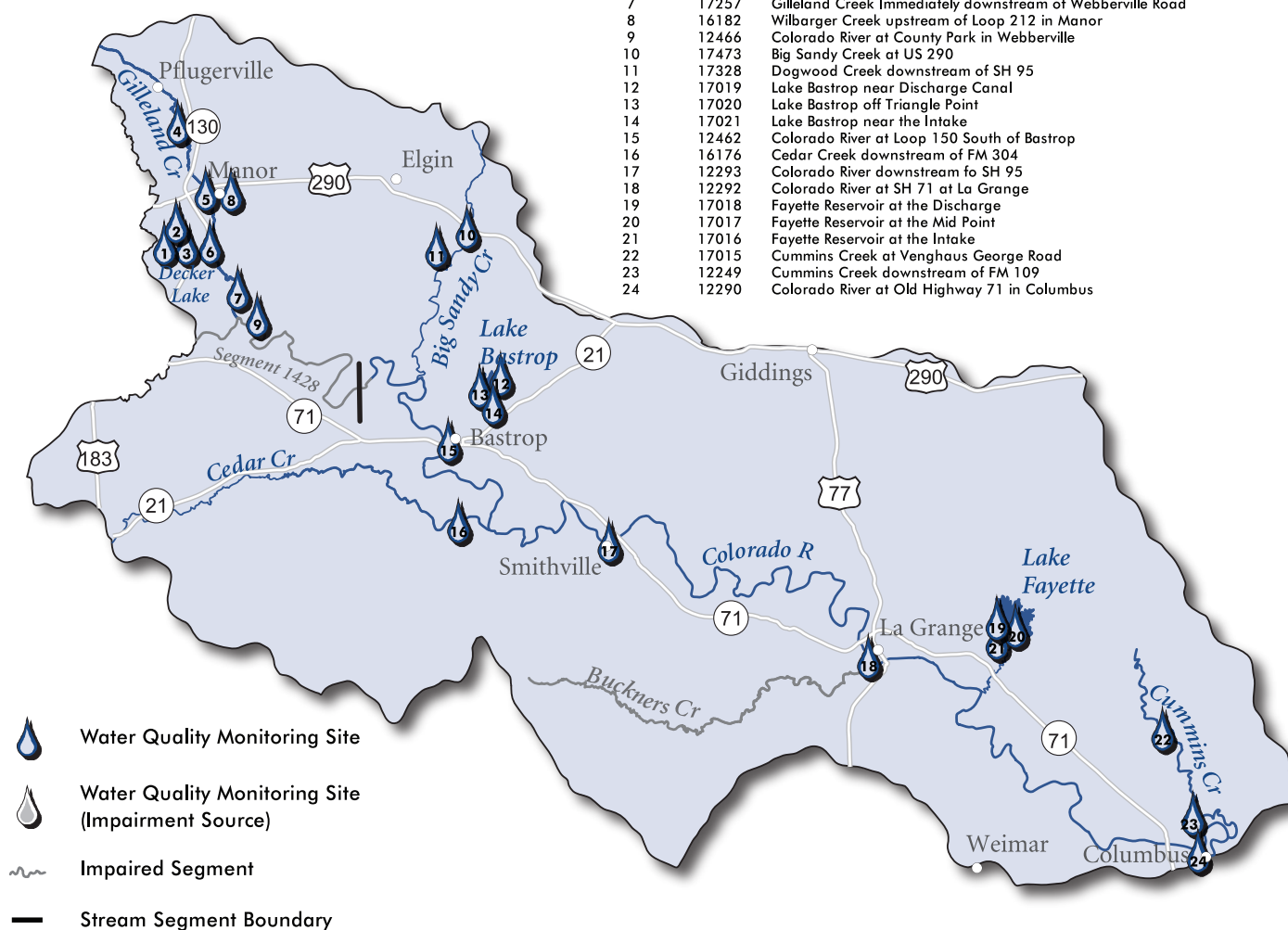
The lower Colorado River watershed encompasses 2,195 square miles between Austin and Columbus. It spans two ecoregions and the varying soils of the Blackland Prairies and the East Central Texas Plains influence water quality as the river flows toward the coast. Much of the watershed is rural, though water quality is influenced by Austin and other smaller cities located in basin.

Impaired Segments Lower Colorado River Watershed (Austin to Columbus)



0 6 12
Miles

Map ID	Station Id	Description
1	21022	Walter E. Long Lake Western Arm Mid-Lake
2	21023	Walter E. Long Lake Eastern Arm Mid-Lake
3	20161	Walter E. Long Lake near Dam
4	20474	Gilleland Creek at Low Water Crossing in Northeast Metropolitan Park
5	12236	Gilleland Creek at US 290 North of Manor
6	12235	Gilleland Creek at FM 973 South of Manor
7	17257	Gilleland Creek Immediately downstream of Webberville Road
8	16182	Wilbarger Creek upstream of Loop 212 in Manor
9	12466	Colorado River at County Park in Webberville
10	17473	Big Sandy Creek at US 290
11	17328	Dogwood Creek downstream of SH 95
12	17019	Lake Bastrop near Discharge Canal
13	17020	Lake Bastrop off Triangle Point
14	17021	Lake Bastrop near the Intake
15	12462	Colorado River at Loop 150 South of Bastrop
16	16176	Cedar Creek downstream of FM 304
17	12293	Colorado River downstream to SH 95
18	12292	Colorado River at SH 71 at La Grange
19	17018	Fayette Reservoir at the Discharge
20	17017	Fayette Reservoir at the Mid Point
21	17016	Fayette Reservoir at the Intake
22	17015	Cummins Creek at Venghaus George Road
23	12249	Cummins Creek downstream of FM 109
24	12290	Colorado River at Old Highway 71 in Columbus



Buckners Creek (Segment 1402C)

Cause of Impairment: Low dissolved oxygen

Buckners Creek is located on the south side of the Colorado River near La Grange. It begins Near Rosanky in Bastrop County and ends downstream at the confluence with the Colorado River. The stream, which is perennial, is approximately 26 miles long. The watershed is rural. Much of it has been cleared for pastures, but land along the riparian area surrounding the creek remains intermittently intact; particularly in the upper end of the watershed.

The impairment was first identified during the TCEQ 2010 assessment based on 24-hour dissolved oxygen data.

Potential Sources of Impairment

Decomposition of organic matter is a likely cause of low DO in the stream. However further study is necessary to isolate potential sources.

Recommendations

- Collect 24-hour data from site 16160
- Perform reconnaissance on the creek to help determine potential causes of low dissolved oxygen
- Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP.

Skull Creek (Segment 1402H)

Cause of Impairment: Low dissolved oxygen and elevated levels of bacteria

Skull Creek begins southwest of Columbus and ends 30 miles downstream at the confluence with the Colorado River. The watershed is rural, though much of the riparian area in the upper part of the watershed has been cleared for pastures. The riparian area in the lower watershed remains intact with the exception of gravel operations near the creek's intersection with US 90. The mines compose about 7.5 square miles of the watershed just above monitoring Site 16805.

The dissolved oxygen impairment was first identified during the TCEQ 2008 assessment based on 24-hour DO averages. Additional 24-hour data collected since the 2010 Integrated Report showed the stream still not meeting its presumed high aquatic life use. TCEQ completed a biological study

that found that the creek supports a diverse aquatic community despite chronic low dissolved oxygen levels and upstream gravel mines affect water clarity. Fish, macroinvertebrate and habitat samples indicate a high aquatic life use.

The bacteria impairment was first identified during the TCEQ 2010 assessment. Data collection on the creek continues.

Potential Sources of Impairment

Decomposition of organic matter coupled with sluggish flow regimes is a likely cause of low DO in the stream. Cattle, deer, feral hog and other wildlife may contribute bacteria to the creek as well. Further study is needed to determine sources of pollutants. Storm water runoff from gravel operations may influence the stream. According to TCEQ staff that monitors the creek, water is sometimes uncharacteristically cloudy. Further study is necessary to isolate potential sources and to determine if runoff from gravel mines is a factor in low dissolved oxygen or bacteria levels.

Recommendations

- Continue to collect data from site 16805.
- Add another monitoring site upstream of the gravel mines.
- Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP and RUAA.

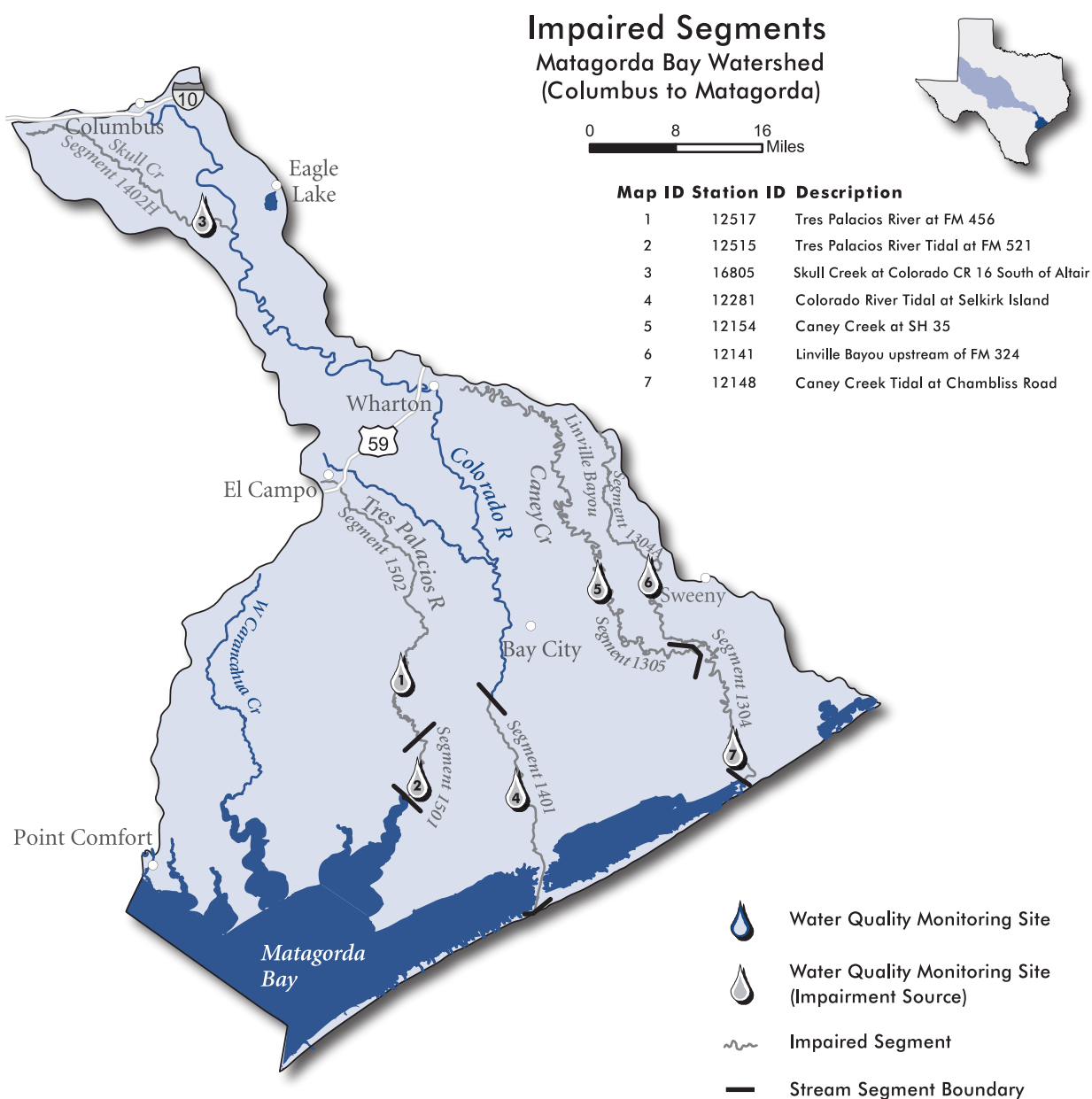


Buckners Creek

Colorado River Coastal Watershed

The Colorado River coastal watershed begins just downstream of the City of Columbus. It includes the Colorado River, which flows into West Matagorda Bay; Caney Creek, which flows into East Matagorda Bay; and the Tres Palacios River, which flows into Tres Palacios Bay. As each of the streams approaches the Texas coastline, fresh water mixes with tidally influenced waters to create unique ecosystems with diverse populations of freshwater and saltwater species.

Low levels of dissolved oxygen and elevated bacteria levels are pervasive throughout the watershed



Colorado River, Tidal (Segment 1401)

Cause of Impairment: Elevated bacteria

Segment 1401 begins downstream of Bay City. The watershed surrounding the 27-mile-long segment is rural and much of the land along the river is farmed. The impairment for elevated levels of bacteria was first identified in 2006 based on data collected from Site 12281. Data have been routinely collected from the site since 1982.

Potential Sources of Impairment

Two permitted facilities upstream of the monitoring site have a combined discharge of 2.9 MGD including treated domestic waste that may contribute bacteria to the stream. Septic systems in the subdivision upstream of the monitoring site may be a source of bacteria. Livestock and wildlife may be sources of bacteria, but more study is necessary to determine their influence.

Recommendations

- Communicate with TCEQ and Texas State Soil and Water Conservation Board to see the potential for a watershed protection plan.
- Continue communication with TCEQ to evaluate current EPA-approved Enterococcus methods and the criteria of 35.



Colorado River at Selkirk Island

Caney Creek, Tidal (Segment 1304)

Cause of Impairment: Elevated bacteria

Segment 1304 begins upstream of its confluence with Linnville Bayou and ends downstream at the intercoastal waterway. The 32-mile creek is a slow flowing, meandering stream with oxbow scars and sloughs along its riparian corridor. The impairment for elevated bacteria levels was first identified in 2006 based on data from Site 12148.

One permitted discharge was located on Linnville Bayou, a tributary of Caney Creek, during the period of record for the 2006 assessment. The facility stopped discharging in 2005.

Potential Sources of Impairment

Houses line both sides of the creek at the lower end of the segment. The town of Sargent, which historically consisted of vacation homes, has experienced an increase in permanent residents. Septic systems in the subdivision upstream of the monitoring site may be a source of bacteria, but more study is necessary to determine their influence. To help isolate potential sources of bacteria, LCRA began monitoring upstream of site 12148 in 2009. Initial monitoring at the new site yielded bacteria values within state standards.

Recommendations

- Continue monitoring at Sites 12148 and the new site 12849.
- Determine if there is local interest in developing a watershed protection plan and communicate results to TCEQ and Texas State Soil and Water Conservation Board.
- Continue communication with TCEQ and suggest a special study to evaluate current EPA-approved Enterococcus methods and the criteria 35.

Linnville Bayou (Segment 1304A)

Cause of Impairment: Elevated bacteria

Linnville Bayou is an intermittent, freshwater tributary of Caney Creek. The Linnville Bayou watershed is approximately 111 square miles and is typical of Texas' coastal prairies; flat with dark loamy clay soils. It begins just above SH 35 and ends about 34 miles downstream at the confluence with Caney Creek.

There is very little development in the watershed and houses near the stream are sparse. The land is primarily used for

row crop agriculture and ranching. Much of the riparian vegetation along the stream has been cleared.

The bacteria impairment was first identified by TCEQ during the 2010 assessment based on data collected between 2001 and 2007. TCEQ plans to resume monitoring the site in 2011.

Potential Sources of Impairment

Direct influence of agriculture and wildlife on water quality is unknown, but worth further investigation. With an average annual precipitation of 54 inches, runoff from agricultural land potentially contributes to bacteria levels.

Recommendations

- Reinstate routine water quality monitoring
- Work with TCEQ to determine if an RUAA is appropriate
- Communicate the issue with CRP steering committee members to seek local input on project potential.

Caney Creek above Tidal (Segment 1305)

Causes of Impairment: Low dissolved oxygen and elevated bacteria

The headwaters for Caney Creek are near the Wharton/Matagorda county line. Segment 1305 ends about 98 miles downstream at the confluence of Linnville Bayou. The majority of the land surrounding the segment is used for agriculture. There are two permitted dischargers and an egg farm that land applies manure located far upstream of the monitoring site.

The impairment for low levels of dissolved oxygen was first identified by TCEQ in 1999. The bacteria impairment was identified in 2002.

TCEQ performed a Use Attainability Analysis (UAA) to assess the aquatic life use and determine if the 5.0 mg/L dissolved oxygen standard was appropriate. The study found that a high aquatic life use criteria was met when measured by fish and bug collections. Appendix D of the Draft 2010 Texas Surface Water Quality Standards recommended site specific DO criteria for portions of the creek.

Under contract with TCEQ, the University of Houston at Clear Lake performed a RUAA to determine if contact recreation takes place on the stream. Approval and results of the study are pending.

Potential Sources of Impairment

Caney Creek is a meandering creek with oxbow lakes and natural dams that slow flow, creating pools of stagnant water and hindering aeration. The lack of aeration coupled with the breakdown of naturally occurring organics in the water may cause dissolved oxygen levels in the creek to frequently fall below the state standard of 5.0 mg/L.

Livestock and wildlife may be sources of bacteria, but more study is necessary to determine their influence.

Recommendation

- New seasonally-based standards aquatic life use are pending. Continue to collect data to determine if new standards are met.

Tres Palacios River, Tidal (Segment 1501)

Causes of Impairment: Low dissolved oxygen and elevated bacteria

The Tres Palacios River begins near the City of El Campo and ends 53 miles downstream at the mouth of Tres Palacios Bay. Segment 1501, the lower portion of the creek is eight miles long and begins at the confluence of Wilson Creek to Tres Palacios Bay.

Much of the land along the river is used for farming. A subdivision is located three miles upstream of the monitoring site, but there are no urban areas located in the segment.

The impairments for low dissolved oxygen and elevated levels of bacteria were identified in 1996 and 2006, respectively. Data resulting in the impairments came from Site 12515.

Potential Sources of Impairment

Septic systems in the subdivision upstream of the monitoring site may be a source of bacteria. Crop lands in the immediate watershed, livestock and wildlife may be sources of bacteria, but more study is necessary to determine their influence. A new monitoring site was added upstream of Site 12515 to help determine if bacteria are a localized problem.

Recommendations

- Continue to monitor and compare data from Site 12515 and the new site 20636
- Communicate with TCEQ to determine if a Total Maximum Daily Load project is appropriate.

Summary of Recommendations

Segment	Water Body	Parameter	Recommendations
1412	Colorado River below Lake J.B. Thomas	bacteria	<ul style="list-style-type: none"> Survey upstream of Site 12363 to identify potential sources of bacteria. Communicate with TCEQ to determine if the stream is a candidate for an RUAA.
1412B	Beals Creek	bacteria	<ul style="list-style-type: none"> Continue water quality monitoring.
		selenium in water	<ul style="list-style-type: none"> Communicate with TCEQ to determine if the stream is a candidate for an RUAA.
1413	Lake J.B. Thomas	chloride	<ul style="list-style-type: none"> Continue monitoring efforts to verify the impairment.
		TDS	<ul style="list-style-type: none"> Work with RRC on identifying well plugging candidates.
1421	Concho River	dissolved oxygen	<ul style="list-style-type: none"> Continue to collect bacteria to verify the contact recreation listing in 2010.
		bacteria	<ul style="list-style-type: none"> Use USGS biological data to reassess aquatic life use attainment.
		impaired benthics	<ul style="list-style-type: none"> Continue to implement BMP's outlined in the Concho River WPP.
1431	Mid Pecan Bayou	bacteria	<ul style="list-style-type: none"> Complete data collection for development of an appropriate aquatic life use designation. Complete the RUAA.
1416	San Saba River	bacteria	<ul style="list-style-type: none"> Communicate with TCEQ and Texas State Soil and Water Conservation Board to determine the rivers' suitability as a candidate for a WPP.
1416A	Brady Creek (unclassified)	dissolved oxygen	<ul style="list-style-type: none"> Because monitoring resources were moved from Site 17005 to Site 14232 (Fig. 51) in 2007, reestablish Site 17005 or another site in AU 02 to determine if dissolved oxygen conditions have improved in the assessment unit as a result of the WPP implementation. Or work with TCEQ staff to determine if data from Site 14232 can be used to delist.
1407A	Clear Creek	Aluminum in water	<ul style="list-style-type: none"> Continue site visits after construction of treatment units at Greensmith's
		Sulfate	<ul style="list-style-type: none"> Continue monitoring at Site 18710
		TDS	
		pH	
1403A	Bull Creek	dissolved oxygen	<ul style="list-style-type: none"> 24-hour diel monitoring should resume at Site 16322 in an effort to characterize DO levels in the system. COA should evaluate submitting benthic macroinvertebrate data to TCEQ as an in support of a UAA or ALM.
1403J	Spicewood tributary to Shoal Creek	bacteria	<ul style="list-style-type: none"> Evaluate wastewater collection infrastructure Survey the watershed to verify potential sources of bacteria. Recommend TCEQ rename the tributary under Segment 1429. Communicate with TCEQ about the potential to perform a contact recreation use attainability analysis to determine the appropriate contact recreation use of the water body.
1403K	Taylor Slough South	bacteria	<ul style="list-style-type: none"> Survey the watershed to verify potential sources of bacteria. Evaluate wastewater collection infrastructure.
1403R	Westlake-Davenport tributary to Lake Austin	bacteria	<ul style="list-style-type: none"> Continue to collect E.coli data when flows return.
1427A	Slaughter Creek	impaired benthics	<ul style="list-style-type: none"> Complete scheduled UAA
1428	Colorado River below Town Lake	bacteria	<ul style="list-style-type: none"> Bacteria values collected from Site 12474 are routinely less than the criteria of 126 MPN. Continue to monitor and reassess the segment in 2012.
1428B	Walnut Creek (unclassified)	bacteria	<ul style="list-style-type: none"> Evaluate the condition of OSSF near Site 17251. Evaluate wastewater collection infrastructure. Identify the source of water from the pipe above Site 17251. Survey the creek to verify potential sources of bacteria.
1429B	Eanes Creek (unclassified)	bacteria	<ul style="list-style-type: none"> Collect bacteria data when flow allows from Site 15964 to verify the impairment. Monitoring should continue to provide enough data for a full assessment in 2012. Communicate with TCEQ to determine if an RUAA is appropriate because of the creeks ephemeral nature downstream of the recharge zone, flowing only in response to runoff generating storm events
1429C	Waller Creek (unclassified)	impaired benthics	<ul style="list-style-type: none"> Evaluate wastewater collection infrastructure in the area, particularly in the upper portion of the watershed that will not be affected by the Waller Creek Tunnel project.
		bacteria	<ul style="list-style-type: none"> The Waller Creek Tunnel Project is a large storm water bypass tunnel being built by COA that will additionally pump and recirculate water from Lady Bird Lake down Waller Creek during non-storm conditions. The project is being designed to alter floodplain boundaries to allow for additional urban development and may improve water quality of the creek. Completion is scheduled for July 2014. Given the level of alteration of the stream, monitoring for assessment purposes should be postponed until the project is complete. More information is available at http://www.ci.austin.tx.us/wallercreek/wctp_home.htm. Once the Waller Creek Tunnel Project is complete, perform a UAA or ALA that includes fish, invertebrates, habitat and 24-hour Dissolved oxygen.
1402C	Buckners Creek	dissolved oxygen	<ul style="list-style-type: none"> Collect 24-hour data from site 16160 Perform reconnaissance on the creek to help determine potential causes of low dissolved oxygen Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP.
1304	Caney Creek Tidal	bacteria	<ul style="list-style-type: none"> Continue monitoring at sites 12148 and 12149. Determine if there is local interest in a WPP and communicate results to TCEQ and Texas State Soil and Water Conservation Board. Continue communication with TCEQ and suggest a special study to evaluate current EPA-approval Enterococcus methods and 35 MPN criteria.
1304A	Linneville Bayou	bacteria	<ul style="list-style-type: none"> Continue to monitor at Site 12141 Work with TCEQ to determine if an RUAA is appropriate Communicate the issue with CRP steering committee members to seek local input on project potential
1305	Caney Creek above Tidal	bacteria	<ul style="list-style-type: none"> Continue to collect data to determine if new standards are met.
		dissolved oxygen	<ul style="list-style-type: none"> New seasonally-based standards aquatic life use are pending.
1401	Colorado River Tidal	bacteria	<ul style="list-style-type: none"> Continue communication with TCEQ to evaluate current EPA-approved Enterococcus methods and 35 MPN criteria. Communicate with TCEQ and Texas State Soil and Water Conservation Board about potential for a WPP.
1402H	Skull Creek	dissolved oxygen	<ul style="list-style-type: none"> Continue to collect data from site 16805.
		bacteria	<ul style="list-style-type: none"> Add another monitoring site upstream of the gravel mines. Communicate with TCEQ and Texas Soil and Water Conservation Board to determine the potential for a WPP and RUAA.
1501	Tres Palacios Creek Tidal	dissolved oxygen	<ul style="list-style-type: none"> Continue to monitor and compare data from sites 20636 and 12515
		bacteria	<ul style="list-style-type: none"> Communicate with TCEQ to determine if standards are appropriate for aquatic life.

Next Steps

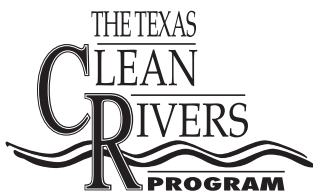
The information presented in the 2011 Basin Highlights Report goes beyond water quality data interpretation to investigate potential sources of water quality impairments. Assumptions were made based on best-available data from satellite imagery, permit information and interviews with people knowledgeable about the watersheds. While it is not a definitive response to water quality impairments the report will help determine how best to manage limited funding to protect the Colorado River.

The Colorado River Clean Rivers Program partners will use the information presented in the report to prioritize monitoring efforts and to help evaluate water bodies for special studies. CRP steering committee members will be an integral part of this process. If you would like to become a steering committee member, visit the public outreach section of the LCRA Web page at <http://www.lcra.org/water/quality/crp/> to learn how you can help guide water quality efforts in the Colorado River basin.

The 2011 Basin Highlights Report, A Summary of Impaired Water Bodies in the Colorado River Basin, is provided to the Texas Commission on Environmental Quality and the citizens of Texas to fulfill the requirements of the Colorado River Clean Rivers Program Contract. The report was compiled by staff from the Lower Colorado River Authority, Upper Colorado River Authority and the Colorado River Municipal Water District, who would like to thank the following CRP steering committee members for their continued support.

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