COLORADO RIVER BASIN HIGHLIGHTS REPORT

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2018

An update on Clean Rivers Program activities in the Colorado River Basin

PREPARED IN COOPERATION WITH
THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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INTRODUCTION

This report is an update on Clean Rivers Program (CRP) activities in the Colorado River basin in 2017. For detailed water quality information, see the 2017 Colorado River Basin Summary Report available at lcra.org.

CRP is a statewide water quality program that emphasizes monitoring, assessment and public outreach to protect Texas' surface water. The Texas Commission on Environmental Quality (TCEQ) administers the program along with 15 regional partners in their respective river basins. In the Colorado River basin, two organizations implement the program: the Lower Colorado River Authority (LCRA) and the Upper Colorado River Authority (UCRA). The City of Austin also contributes water quality data to help assess water quality in the Austin area (Figure 1).

PROGRAM UPDATE

In 1991, Texas lawmakers passed legislation to establish the Texas Clean Rivers Program. With the passage of Senate Bill 818 came funding from fees paid by municipal and industrial dischargers and water rights holders, such as LCRA. Today, CRP partners use the money from the annual fees to collect and assess water quality data and achieve other program objectives. The data is used to establish and assess attainment of water quality standards, set wastewater discharge permit limits and to evaluate physical, chemical, and biological characteristics of aquatic systems.

CRP long-term objectives:

- Provide quality-assured data to TCEQ for use in water quality decision-making.
- Identify and evaluate water quality issues.
- Promote cooperative watershed planning.
- Recommend management strategies.
- Inform and engage stakeholders (any individual or group who has interest in the water quality of the basin).
- Maintain efficient use of public funds.

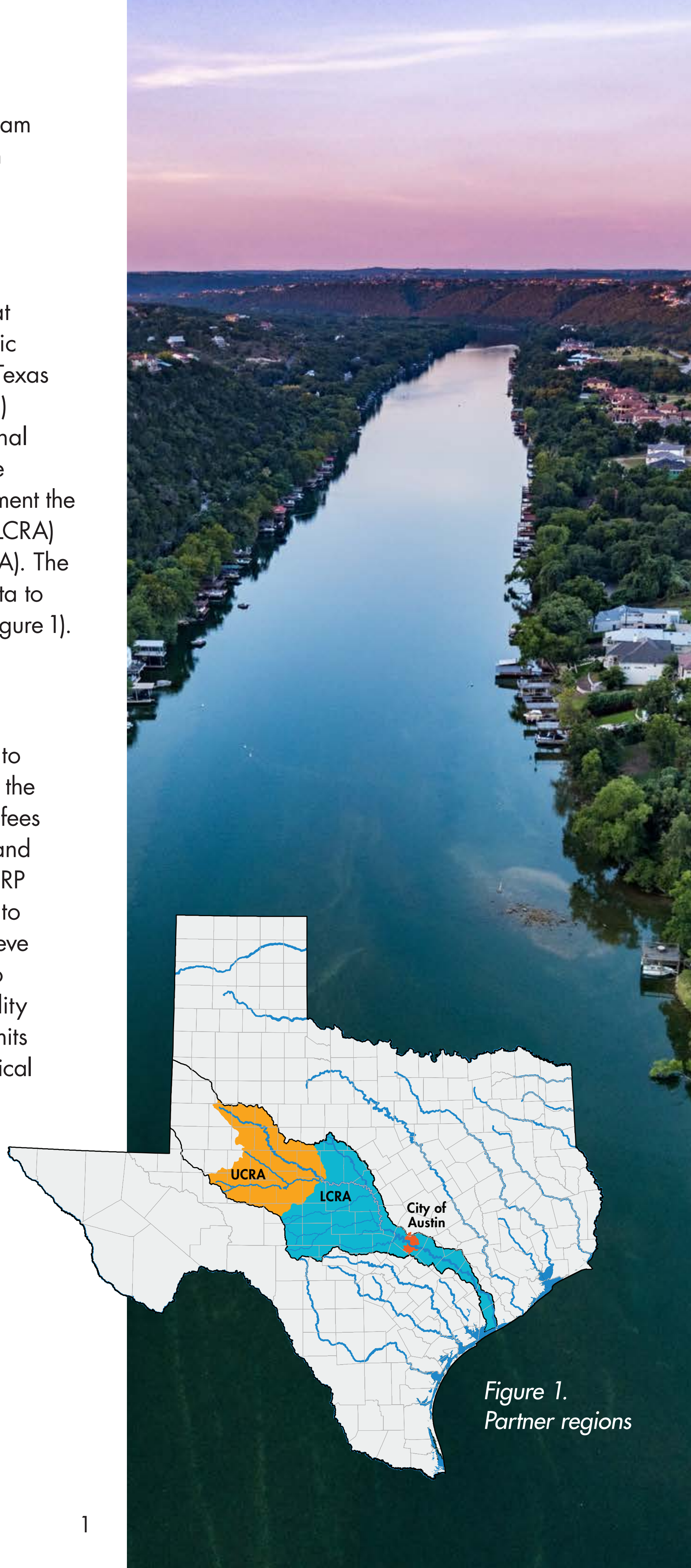


Figure 1. Partner regions

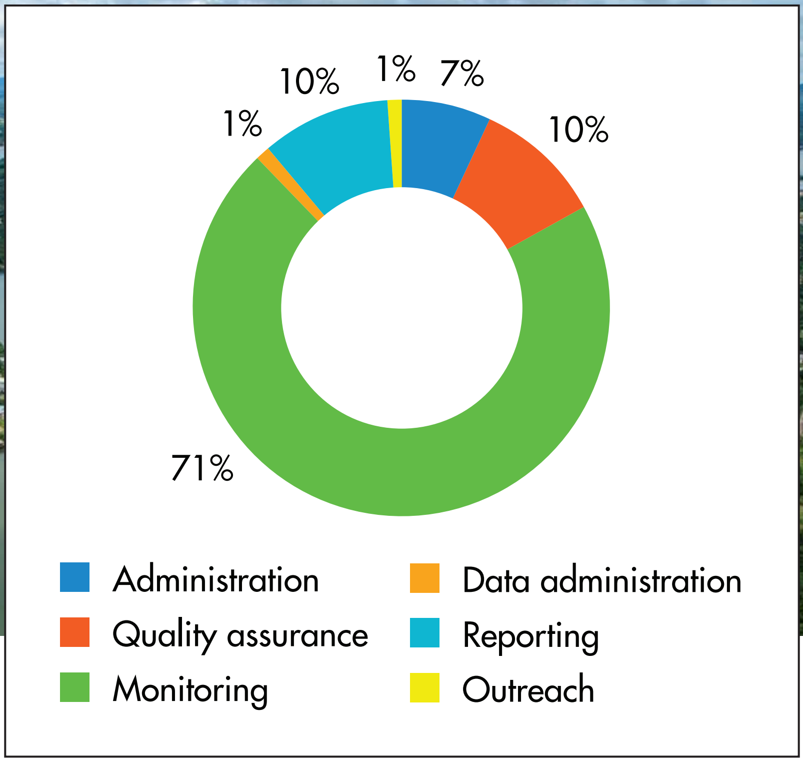


Figure 2. Funding distribution to CRP activities in the Colorado River Basin

In the 2016-2017 contract, TCEQ allocated $887,594 to the Colorado River basin for CRP, which was a combination of both state dollars and federal Clean Water Act Section 106 grant monies awarded to the Clean Rivers Program. UCRA received $261,664 (30 percent) of the funds in the contract to carry out CRP activities in the upper basin. For the current 2018-2019 contract, the Colorado River basin has been allocated $999,450. A large portion of these funds come from a federal 106 grant awarded to TCEQ and allocated to LCRA to conduct additional monitoring in the Highland Lakes, which will support a variety of data uses including water quality modeling efforts. The program continues to be cost-effective, with the majority of the funds used for water quality monitoring, assessment and reporting (Figure 2).

WATER QUALITY OVERVIEW

The upper Colorado River basin extends far into West Texas, a region that typically gets less than 20 inches of rain per year. Flows are intermittent in this region, with contributions from groundwater seeps. The seeps often contain high levels of dissolved solids, which come from dissolution of minerals in geologic formations. Oilfield activities also are a source of dissolved solids in the upper basin.

In the Concho River basin, dissolved solids are not as problematic because higher annual rainfall and major freshwater springs on the South Concho River help increase flows and dilute sources of dissolved solids. Downstream of San Angelo, nitrate levels in some streams are elevated. Sources of nitrates include the Lipan Aquifer, a natural source, and agricultural runoff from fertilizer and animal feeding operations.

The middle portion of the basin includes the Texas Hill Country. Steep terrain with limestone and granite bedrock in the Edwards Plateau give rise to clear, spring-fed perennial streams. The largest tributaries of the Colorado River – the San Saba, Llano and Pedernales rivers – dilute dissolved solids and suspended sediment. This region includes the Highland Lakes: Buchanan, Inks, LBJ, Marble Falls, Travis and Austin, as well as Lady Bird Lake in Austin. Several streams that flow into the Colorado River around Austin contain excessive amounts of *E. coli*, the bacteria used to determine waters' suitability for contact recreation. These bacteria levels have been attributed to faulty wastewater infrastructure, stormwater runoff and pet waste from urbanized areas.

In the lower basin, a radical transition in topography, soils and geology occurs. The Colorado River flows out of the steep canyons and shallow soils of the Hill Country, crosses the Balcones fault line in Austin, and then enters a region with deep clay soils and flat land known as the Blackland Prairie. From there it traverses through the Post Oak Woodlands and Savannas, then makes its way to the Gulf Coast Plains. In the lower region downstream of Austin, the water is less clear because of suspended solids from the clay and sandy loam soils. Flows are variable in this stretch of river. During March through October, LCRA may release water from the Highland Lakes for agricultural irrigation customers and to fulfill requirements of LCRA's Water Management Plan. These releases help dilute nutrient loads from City of Austin wastewater treatment facilities and provide water for wildlife.

In 2017, 173 sites in the Colorado River basin were monitored for water quality. LCRA monitored 59 of the sites; UCRA monitored 50; TCEQ monitored 30; and the City of Austin monitored 36. Some sites are monitored by more than one agency at different times of the year. For a complete monitoring schedule, visit cms.lcra.org.

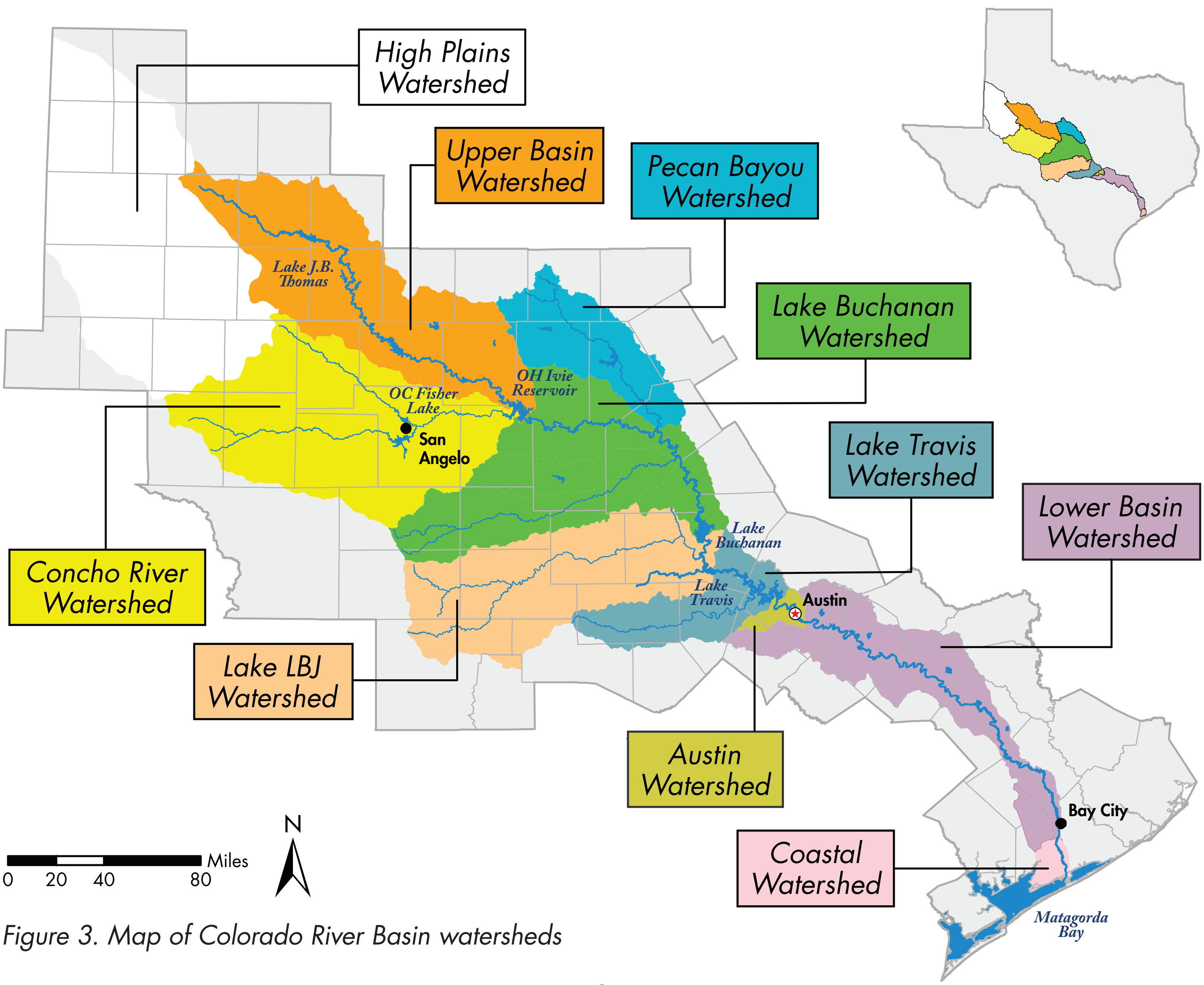


Figure 3. Map of Colorado River Basin watersheds

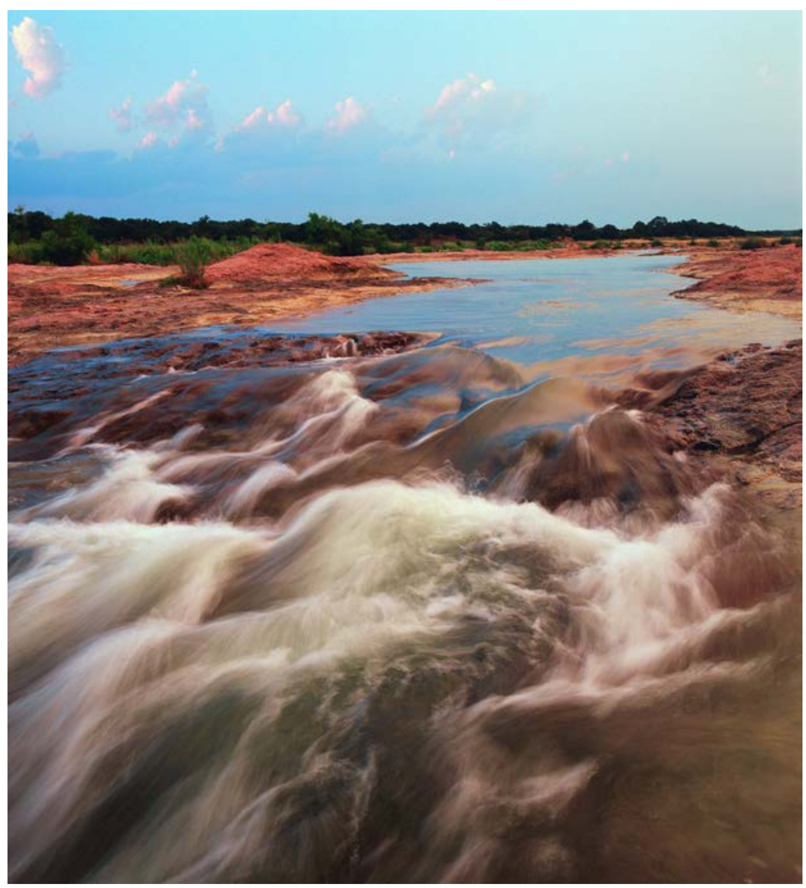
ONGOING WATER QUALITY PROJECTS

Upper Llano River Watershed Protection Plan

The upper Llano River watershed, composed of the North and South Llano rivers and the springs that feed them, supports several unique plant and animal communities and provides critical flows to the Llano and Colorado rivers, as well as the Highland Lakes. Aquifer withdrawals, invasive species encroachment, land fragmentation and loss of riparian habitat threaten the health of the watershed. In an effort to protect and maintain the ecological integrity of the Upper Llano River, the Texas Tech University Llano River Field Station (TTU-LRFS) and Texas Water Resources Institute (TWRI) are working with the Llano Watershed Alliance (LWA; formerly known as South Llano Watershed Alliance) and others to implement the Llano River Watershed Protection Plan (WPP), which was completed in May 2016. The Llano River WPP is funded through a federal Clean Water Act 319(h) grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency (EPA).

TTU-LRFS and TWRI work with the LWA to address the complexity of the watershed through an integrated assessment of the landscape condition, biotic health, chemical and physical parameters, and critical watershed functional attributes. Quarterly samples of field parameters, conventional parameters, and flow are taken at 14 main stem sites and six spring sites. Biological monitoring is conducted semi-annually at 14 river sites to assess the cumulative impact of pollutant loading on stream health and biological communities. The Llano River WPP identifies land use and cover, future needs, water yields from implementation of best management practices, priorities for invasive plant management, watershed education components, wildlife considerations, landowner cooperation, and several other priorities identified by the stakeholder group.

For more information on the Llano River WPP, visit llanoriver.org or contact Tyson Broad, watershed coordinator for the Texas Tech Llano River field station at 806-834-1170.



Llano River

Colorado River Environmental Models

The Highland Lakes provide water supply for more than 1 million people as well as businesses, industries, the environment and agriculture. They also offer recreational opportunities. Recognizing their importance to the region, TCEQ adopted the Watershed Protection Rules (described in Chapter 311 of the Texas Administrative Code, subchapters A, B, E and F) in 1986 to protect water quality. The rules, known as the discharge ban, prohibit new wastewater discharges into each of the Highland Lakes.

In an effort to assess and predict changes to water quality in the lakes, LCRA began the Colorado River Environmental Models project (CREMS) in 2006. CREMS uses the best available science to evaluate water quality issues, discern trends and predict the impacts of various decisions, actions, and future scenarios on the Highland Lakes. The first model was completed on Lake Travis in May 2009, followed by the other Highland Lakes. In 2012, the Lake Buchanan model was completed.

The CREMS model has been used to demonstrate the impact of different discharge scenarios and help establish wastewater permit limits in the Highland Lakes watersheds. LCRA will continue to use the CREMS models and work with communities in the Highland Lakes watershed to develop reasonable treatment options that are protective of water quality. Using additional funds provided through the EPA 106 grant funds, LCRA will conduct additional monitoring in the Highland Lakes during the 2018-2019 CRP contract to update and improve the CREMS models.

For more information on CREMS models, visit lcra.org/water/quality/models.html or contact LCRA Water Quality Manager Bryan Cook at 512-578-3258.

Lake Marble Falls

Lake Travis

Gilleland Creek Implementation Plan

The Gilleland Creek watershed is located in eastern Travis County and covers about 76 square miles. Land use in the watershed has been transitioning from agricultural to urban as the cities of Pflugerville, Round Rock, Manor and Austin expand. During dry weather, the creek is primarily composed of wastewater effluent from the seven permitted municipal wastewater treatment facilities in the watershed. Gilleland Creek was first listed as impaired for bacteria in 2004. In 2007, TCEQ adopted a Total Maximum Daily Load (TMDL) for bacteria in Gilleland Creek, and the EPA approved the TMDL in 2009. This established the maximum amount of bacteria the creek could accept and still met the state's standards for bacteria.

The second part of the TMDL process involved creating an Implementation Plan (I-Plan) that describes the strategy and activities TCEQ and watershed stakeholders will implement to improve water quality in the affected watershed. The original Gilleland Creek I-Plan was approved by TCEQ in 2011.

In fall 2016, after five years of implementation, stakeholders determined they would go through the process of updating the I-Plan in accordance with the adaptive management process. A planning team was formed with representatives from Travis County, LCRA, TCEQ, Texas AgriLife Extension Service, Texas Department of Transportation, Texas State Soil and Water Conservation Board, Windermere Utilities and the cities of Austin, Manor, Pflugerville, and Round Rock. The University of Texas Center for Public Policy Dispute Resolution facilitated the stakeholder's review. The goal of the I-Plan revision is to reduce bacteria concentrations in Gilleland Creek to levels that meet the contact recreation criterion defined in the Texas Surface Water Quality Standards.

The I-Plan update was completed in late 2017 and submitted to TCEQ on Nov. 16, 2017. Stakeholders will continue to meet annually to evaluate their progress. For more information, visit tceq.texas.gov/waterquality/tmdl/nav/69-gillelandcreekbacteria.

Gilleland Creek at Pfluger Park (upstream) in Pflugerville, April 2018. Photo credit: Dave Gage, Colorado River Watch Network volunteer.

Gilleland Creek at Pfluger Park (downstream) in Pflugerville, April 2018. Photo credit: Dave Gage, Colorado River Watch Network volunteer.

Brady Creek Watershed Protection Plan

The Brady Creek watershed, located in Concho, McCulloch and San Saba counties, is approximately 784 square miles. It is primarily rural, but includes the towns of Brady, Melvin and Eden. Water quality monitoring performed by UCRA in the early 2000s indicated persistently low levels of dissolved oxygen and resulted in the streams' placement on the 303(d) List, TCEQ's list of impaired water bodies.

In 2004, UCRA created the Brady Creek Master Plan, which was funded by an EPA 319(h) grant administered by TCEQ. The plan was an urban runoff abatement project and identified stormwater runoff and low flows as causes of the impairment. The plan implemented stormwater controls to lessen the impact of runoff into the creek. UCRA was awarded a contract for the development of a Brady Creek WPP in 2010. Unlike the Brady Creek Master Plan, which included only the area inside Brady's city limits, the WPP encompasses the entire watershed. In 2010, UCRA identified stakeholders and developed a monitoring plan. UCRA submitted a completed plan to TCEQ in 2014. It was approved in August 2016. The plan was the 10th to be approved in Texas, and the watershed was the second largest, in terms of area, to have a WPP in place at that time. The primary goal of the Brady Creek WPP is to restore water quality within impaired segments of Brady Creek and maintain the integrity of the remaining watershed.

Small channel dam installed in Brady Creek to increase dissolved oxygen. There are multiple perforations on the downstream slope of the dam that help to aerate the water during base flow conditions.

As a result of the approved plan, UCRA submitted a grant application for the first phase of an implementation project in 2016. UCRA was notified they had been awarded the grant in December 2016, and the contract was executed in September 2017. UCRA staff has submitted a Quality Assurance Project Plan and is awaiting approval from TCEQ.

For more information on the Brady Creek WPP, visit ucratx.org or contact UCRA Director of Operations Chuck Brown at 325-655-0565.

Gabion filter dam installed to capture pollutants during a rainfall runoff event in the Brady Creek watershed.

Native Freshwater Mussels

There are approximately 22 species of freshwater mussels that are native to the Colorado River basin. These native mussels burrow into the sediment of rivers and lakes where they fill an important niche in the aquatic ecosystem by filtering water and contributing to both aquatic and terrestrial food chains. They also have a unique life history – the larvae of freshwater mussels are parasites on certain fish species during their development. Mussels rely on adequate water quality and quantity in order to survive and thrive. The potential conservation needs of these mussel species have implications for water management in Texas.

Texas fawnsfoot from the Colorado River near Altair, TX

In 2011, the U.S. Fish and Wildlife Service (FWS) listed several mussel species known to occur in the Colorado River basin as candidates under the Endangered Species Act (ESA). Four of these species – Texas fawnsfoot, Texas fatmucket, Texas pimpleback and false spike – are currently under consideration, with an anticipated proposal listing decision in September 2018 and final listing decision in September 2019. A fifth Colorado River mussel species, the smooth pimpleback, is scheduled to be evaluated for a proposal listing under the ESA in fall 2020 and a final listing determination will be made in fall 2021.

Mussels from the Colorado River downstream of the confluence with the San Saba River. Photo credit: BIO-WEST, Inc.

For more information about the FWS listing decision for freshwater mussels in Texas, visit www.fws.gov/southwest/es/AustinTexas/ESA_Sp_Mussels.html.

Zebra Mussels

In 2017, invasive zebra mussels *(Dreissena polymorpha)* were first discovered in the Colorado River basin. The first mussel was found in the lower portion of Lake Travis in June 2017 by LCRA and Texas Parks and Wildlife Department (TPWD) biologists. LCRA and TPWD quickly expanded monitoring and outreach efforts and increased signage to alert boaters to the infestation. In August 2017, adult zebra mussels were found in Lake Austin. In early 2018, zebra mussels were discovered in Lady Bird Lake and in the Colorado River downstream of Longhorn Dam.

Zebra mussels have drastically changed ecosystems and caused hundreds of millions of dollars in damage to utilities in the northeast United States. Once established in a water body, zebra mussels have the potential to impact natural ecosystems by excessively filtering water and transferring nutrients from the water column to the lake bottom. They can also impact the recreation and utility industries, because they attach to hard surfaces such as docks, buoys, pumps and pipes.

In Texas, zebra mussels have not had as significant of an impact on the lakes where they have become established and have exhibited boom-bust cycles in growth. This is primarily because these invasive mussels are at the uppermost range of their temperature tolerance during the hot summer months in Texas. It is yet to be determined how zebra mussels will impact the Highland Lakes and the Colorado River.

Originally from Russia, zebra mussels arrived in the U.S. in 1988 in Lake St. Clair, Michigan as hitchhikers in ballast water of ships. They quickly spread though the Great Lakes and migrated down the Mississippi River. According to the U.S. Geological Survey, zebra mussels are now in 32 states. In April 2009, they were discovered in Lake Texoma in the Red River, and in Sister Grove Creek, in the Trinity River basin, later that year. They have since been discovered in multiple other lakes in Texas. Visit tpwd.texas/gov/huntwild/wild/species/exotic/zebramusselmap.phtml to see all of the locations in Texas where zebra mussels can be found.

Zebra mussels spread to lakes via incidental transport on or in boats. Once attached to a boat hull or trailer, the mussels can be transported to other water bodies by unsuspecting water recreationalists. Adult zebra mussels can live out of water for several days. Zebra mussel larvae are microscopic and "free-float" with currents. As such, they can pass through dams, pipelines, pumps and other infrastructure intact to migrate across river basins. Transport via boat live-wells also is well documented.

State regulations now require draining water from all boats and onboard receptacles when leaving or approaching public fresh waters to prevent the spread of zebra mussels. A "Clean Drain Dry" protocol for watercraft is the most effective means of preventing their spread. More information on this protocol can be found at tpwd.texas.gov/fishboat/boat/protect_water. TPWD also has developed an outreach campaign to educate the public and reduce incidental transport. Beginning in 2012 and continuing to present, LCRA partnered with TPWD to develop and distribute outreach materials specific to the Highland Lakes. LCRA staff have contacted marina owners and other lakeside businesses to educate them about zebra mussels. Brochures, posters and vinyl banners have been placed in parks and businesses throughout the Highland Lakes and Colorado River basin. Education efforts will continue in 2018 in hopes of preventing further infestations of reservoirs in the Colorado River basin and elsewhere in the state.

For more information about zebra mussels, visit lcra.org/zebramussels or contact LCRA Aquatic Biologist Stephen Davis at 512-578-2154.

Zebra mussel attached to a rock and a snail shell in the Colorado River just downstream of Longhorn Dam in Austin, April 2018.

Zebra mussels attach to substrate in the reservoir and can also grow on top of each other, forming large clumps.

TCEQ INTEGRATED REPORT

Assessment of Water Quality Data

Every two years, TCEQ evaluates water quality data collected from across the state that meets minimum quality assurance and quality control requirements. This data is compared to the Texas Surface Water Quality Standards (or to screening levels when no standards have been established) and publishes the results in the Texas Integrated Report of Surface Water Quality for the Clean Water Act Sections 305(b) and 303(d). The Integrated Report defines the status of each water body as one of the following:

1. **Meets or Supports** – At least 10 data points were available to assess, and the water body meets Texas Surface Water Quality Standards or supports the water body's designated use(s).
2. **Concern** – a) Sufficient data to perform a full assessment were not collected, but the limited data indicate standards are not met, b) sufficient data was collected, but the assessment shows there is at least one parameter near non-attainment of the standards, or c) standards have not yet been established, as is the case with nutrients. If standards have not been established, the data are compared to screening levels.
3. **Impaired** – Sufficient amount of data are available, and the water body does not meet state standards. TCEQ publishes impaired water bodies in the 303(d) List as part of the Integrated Report. The 303(d) List also includes water bodies that are impaired from previous assessments. There are water bodies labeled as "impaired" but are not on the 303(d) List, because they do not require the development of a Total Maximum Daily Load to address the impairment.

Water bodies either support their designated uses based on a comparison of monitoring data to the standards or they do not. In the simplest terms, if monitoring data indicate a water body fully supports its uses, then the water body meets the state standards and water quality is considered good. If water quality data indicate a concern status based on the above definition, resources are allocated to collect more data and verify the concern. If monitoring data indicate the water body does not support one or more of its designated uses, then it is said to be impaired and may have poor water quality. Impaired water bodies are placed on the TCEQ 303(d) List, which refers to the section of the Clean Water Act that requires states to identify impaired water bodies. See Figure 4 for a list of impaired waterways in the Colorado River basin.

The Draft 2014 Integrated Report was adopted by TCEQ on June 3, 2015. The EPA approved the 2014 Texas Integrated Report on Nov. 19, 2015. A Draft 2016 Integrated Report has been completed and has recently been released for public comment. The delay in approval by TCEQ and EPA has been due to issues over nutrient assessment.

Stakeholder Participation – Water Quality Advisory Committee

Clean Rivers Program activities are driven by local input from Water Quality Advisory Committee (WQAC) members throughout the basin. WQAC is an advisory committee that identifies and prioritizes local water quality concerns. It is made up of a diverse group of stakeholders, including land owners, farmers, the general public, non-governmental organizations, and state and federal agencies. Three WQAC meetings have been held in the basin in 2018. These meetings were held in San Angelo, Austin and Columbus.

WQAC meetings are open to the public. To learn how you can be involved in water quality efforts in the Colorado River basin, visit lcra.org/water/quality/texas-clean-rivers-program/pages/default.aspx.

Impaired

Segment	Water Body	Cause of Impairment
1402	Colorado River below La Grange	Bacteria
1402 C	Buckners Creek	Dissolved oxygen
1402 H	Skull Creek	Dissolved oxygen
1403	Lake Austin	Dissolved oxygen
1403 A	Bull Creek	Dissolved oxygen
1403 J	Spicewood Trib to Shoal Creek	Bacteria
1403 K	Taylor Slough South	Bacteria
1407 A	Clear Creek	Aluminum in water
1407 A	Clear Creek	pH
1407 A	Clear Creek	Nickel in water
1407 A	Clear Creek	Total dissolved solids
1407 A	Clear Creek	Sulfate
1407 A	Clear Creek	Zinc in water
1411	E.V. Spence	Chloride
1411	E.V. Spence	Sulfate
1411	E.V. Spence	Total dissolved solids
1412	Colorado River below Lake J.B. Thomas	Bacteria
1412 B	Beals Creek	Bacteria
1413	Lake J.B. Thomas	Total dissolved solids
1413	Lake J.B. Thomas	Chloride
1413	Lake J.B. Thomas	Sulfate
1416	San Saba River	Bacteria
1416A	Brady Creek	Dissolved oxygen
1421	Concho River	Dissolved oxygen
1421	Concho River	Bacteria
1425	O.C. Fisher Lake	Chloride
1425	O.C. Fisher Lake	Total dissolved solids
1426	Colorado River below E.V. Spence	Chloride
1426	Colorado River below E.V. Spence	Total dissolved solids
1427	Onion Creek	Sulfate
1427 A	Slaughter Creek	Biology
1428 B	Walnut Creek	Bacteria
1428 C	Gilleland Creek	Bacteria
1429 C	Waller Creek	Biology
1429 C	Waller Creek	Bacteria
1431	Pecan Bayou	Bacteria
1501	Tres Palacios River (Tidal)	Dissolved oxygen
1501	Tres Palacios River (Tidal)	Bacteria

Delisted

Segment	Water Body	Cause of Impairment
1401	Colorado River (Tidal)	Bacteria
1412 B	Beals Creek	Selenium in water

Figure 4. Impaired Water Bodies in the Colorado River basin according to the 2014 Texas Integrated Report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