TABLE OF CONTENTS – CHAPTER EIGHT

APPENDICES

CHAPTER 8.0: ADDITIONAL RECOMMENDATIONS (INCLUDING UNIQUE ECOLOGICAL STREAM SEGMENTS AND RESERVOIR SITES, LEGISLATIVE ISSUES, AND REGIONAL POLICY ISSUES)

8.1 SUMMARY OF POLICY RECOMMENDATIONS

The approved scope-of-work for the development of the SB 1 water plan for the Lower Colorado Region included a subtask to "prepare possible legislative, regulatory, and administrative recommendations." In this regard, the Lower Colorado Regional Water Planning Group (LCRWPG) established a Legislation and Policy Committee and charged it with the responsibility for coordinating a three-step process to:

- Identify, define, and screen policy issues
- Evaluate issues and policy options
- Develop recommendations for consideration by the LCRWPG

The following recommendations are offered by the Lower Colorado Regional Water Planning Group (LCRWPG) for consideration by the Texas Legislature, TWDB, TCEQ, other water planning regions and all stakeholders and participants in Texas' regional and state water planning efforts. Each policy includes background information, policy statement(s), and action(s) the LCRWPG recommends.

The LCRWPG utilized a three-year long intensive policy development process in the first planning cycle, and a comprehensive review in each subsequent planning cycle to produce these results. Only policies that have met with the consensus approval of the LCRWPG's diverse voting membership are recommended by the LCRWPG. These policies have undergone a multi-level development process with extensive planning group review.

It is the hope of the many contributors to this process that these recommendations will lead to public policies and processes that improve upon the already impressive methods Texas uses to accomplish water planning.

8.1.1 Management of Surface Water Resources: Inter-Basin Transfers and Model Linking

8.1.1.1 Background Information

Proposed inter-basin transfers (IBTs) must be managed carefully relative to impairment of existing water rights, consistency with the public welfare including the need for water, consistency with state and regional water supply planning, and environmental and water quality issues.

For permits related to inter-basin transfers, among other considerations, the economic and public welfare interests in the basin of origin must be considered. If it is determined that unacceptable impacts would occur to these interests as a result of the IBT, special provisions to ensure protection of these interests would be warranted. Business, industry, agriculture and other economically important water users developed originally as a result of water availability. Without some means of protecting these users, water transfers should be carefully considered, including their potential impact on the economy of the entire region.

Some identified strategies for dealing with water supply shortages may impact sustainability of groundwater, when development of surface water supplies could be utilized instead. This approach could result in long-term adverse consequences for the region. Likewise, further development or transfer of surface water supplies could be detrimental to groundwater recharge and similarly result in long-term adverse consequences to the region.

8.1.1.2 Policy Statements

8.1.1.2.1. Inter-Basin Transfers

It is essential that current water supplies be protected and preserved to meet water commitments within the basin. Inter-basin transfers (IBTs) should follow principles established by LCRWPG in the first planning cycle, and revised in each subsequent planning cycle, for transporting water outside of the region.

In addition to the required elements for obtaining an IBT permit from TCEQ, the following nine-point policy identifies the conceptual elements and guidelines for transporting water outside of the Lower Colorado Regional Water Planning Area (LCRWPA):

1. A cooperative regional water solution shall benefit each region.
2. The LCRWPA's water shortages shall be substantially reduced.
3. Proposed actions for inter-regional water transfers shall have minimal detrimental water quality, environmental, social, economic, and cultural impacts.
4. Regional water plans with exports of significant water resources shall provide for the improvement of lake recreation and tourism in the LCRWPA over what would occur without water exports.
5. Each region shall determine its own water management strategies to meet internal water shortages when those strategies involve internal water supplies and/or water demand management.
6. Cooperative regional solutions shall include consideration of alternatives to resolve conflicts over groundwater availability and should be consistent with LCRWPG's groundwater policies and the applicable rules of involved groundwater conservation districts.
7. Any water export from the Colorado River shall not be guaranteed on a permanent basis.
8. Any water export from the Colorado River shall make maximum use of flood or excess inflows below Austin and shall occur only after in-basin demands are met in the LCRWPA. Provisions and supporting technical reviews included in a draft permit to support this principle shall be reviewed by the Regional Water Planning Group to assure consistency with the planning process.
9. Any water export from the Colorado River shall comply with the LCRA's inter-basin water transfer policy.

8.1.1.2.2. Linking Groundwater and Surface Water Models

Future groundwater and surface water modeling development by the state's water permitting and planning agencies should include the ability to link such models to better integrate the effects of changes in the uses or availability of either groundwater or surface water on each other in varying conditions such as flood or drought. The ongoing study by Texas Water Development Board is an investigation of surface water-groundwater interaction along the lower Colorado River and is part of efforts to provide additional information to the adaptive management phase of the Senate Bill 3 e-flows process. This pilot study is an excellent example of an important step in developing some of the additional science needed to develop such linkages. Such linking of models may be more appropriate for specific areas where groundwater and surface water closely relate and interact, such as concentrations of base-flow springs or stream-based recharge. The LCRWPG supports the development of methodologies to utilize available empirical data from public and private sectors to calibrate both groundwater and surface water models.

8.1.1.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to:

1. Support State funding for linking groundwater and surface water models by the TWDB during the development of the next generation of Groundwater Availability Models/Water Availability Models (GAMs/WAMs) with a priority for specific areas where groundwater and surface water closely relate and interact, such as concentrations of base-flow springs or stream-based recharge. Encourage the validation and calibration of models with data and technical reviews available from the public and private sectors.

Texas Commission on Environmental Quality (TCEQ) – The LCRWPG encourages TCEQ to:

1. Include provisions in water right permits related to inter-basin transfers that protect the basin of origin. Obtain concurrence that draft permits are consistent with the regional water planning process.
2. Provide the Regional Water Planning Groups with technical review summaries including WAM runs for pending permits affecting the region to ensure consistency with the regional planning process.

8.1.2 Environmental – Instream Flows and Freshwater Inflows to Bays and Estuaries

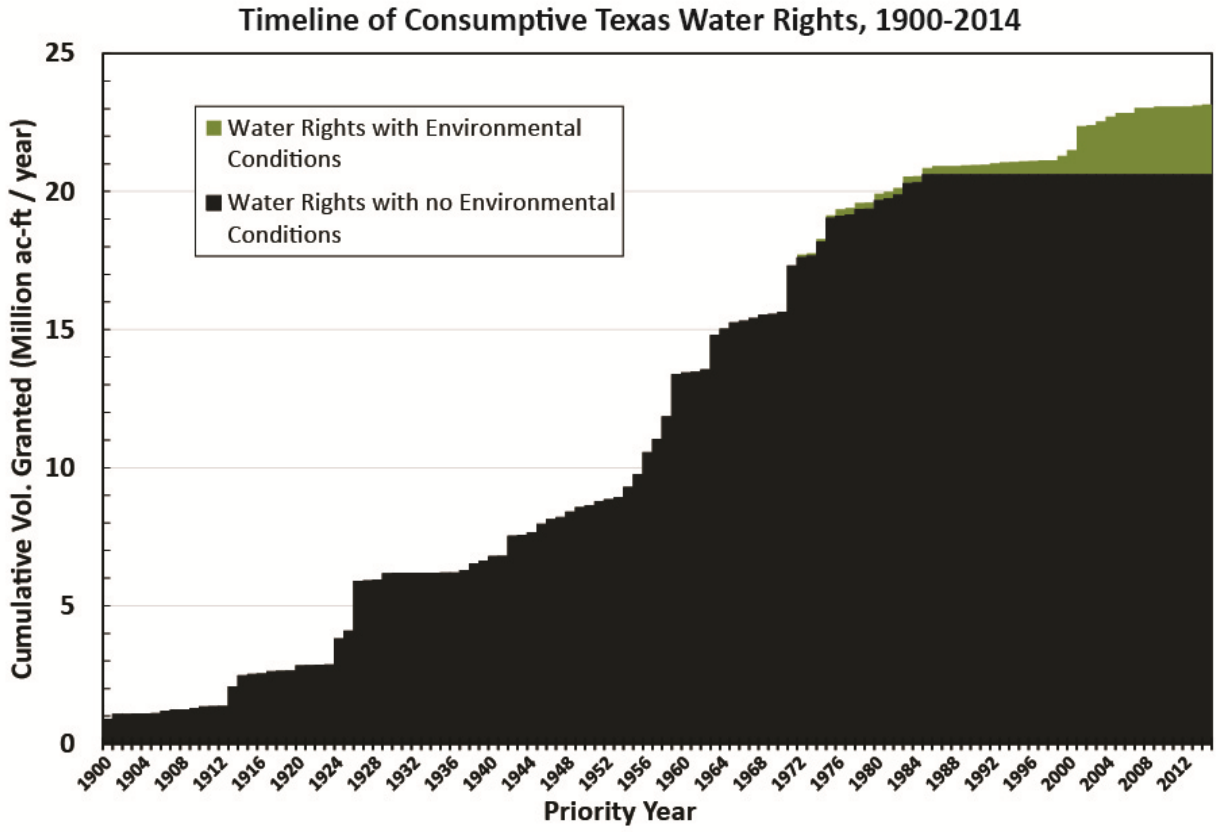
8.1.2.1 Background Information

Healthy and productive rivers, bays and coastal estuaries are the natural heritage of all Texans and support billions of dollars in economic activity annually. Texas' fish and wildlife resources need and deserve preservation and, in some cases, restoration.

Fortunately, a large percentage of surface water rights in Texas are currently not fully utilized, thereby resulting in, for the near-term, sufficient natural flows to provide for essential environmental needs during drought conditions. However, increasing utilization of existing water rights, as projected in the water plan, coupled with new water rights potentially threaten the availability of these essential environmental flows. In the Colorado River Basin, modeling undertaken in development of the LCRA Water Management Plan

predicts freshwater inflows not meeting the science-based targets with a repeat of historical precipitation patterns.

Total authorizations state-wide for consumptive use are approximately 22 million acre-feet of water per year and the vast majority of those authorizations were issued prior to 1985 without conditions to protect environmental flows. This creates a challenge that must be addressed in order to preserve Texas' fish and wildlife habitat.



Note: Hydropower, contracts, recreation and other non-consumptive water rights excluded. Rights before 1900 set to 1900.
Source: National Wildlife Federation analysis of data provided by the Texas Commission on Environmental Quality, May 2015.

8.1.2.2 Policy Statement

The LCRWPG supports the protection of instream flows and bay and estuary inflows at levels sufficient to protect native species throughout extended periods of drought at population levels that would enable the species to fully recover upon the return of normal weather conditions. During normal weather conditions, flows sufficient to ensure a healthy habitat for fish and wildlife should be assured. This requires addressing the specific water quality, flow rates and timing that are required to sustain a healthy and productive riparian and estuarine ecosystem as well as the physical form of the river such as deep pools, riffles, bluffs, terraces, and its vegetation, springs, and tributaries.

The LCRWPG recommends the following actions to accomplish environmental flow protection through the surface water permitting process by:

1. In areas where appropriating additional quantities of water could threaten the adequacy of environmental flows, permits for additional quantities of water should include environmental flow conditions consistent with the environmental flow standards adopted by TCEQ, including reasonable approaches for environmental flow protection to help achieve compliance with the flow standards, as well as strategy targets.

2. The environmental flow standards adopted by TCEQ are due for revision per statute. The state should ensure a prompt and robust revision process for environmental flow standards designed to produce science-based flow criteria with a goal of protecting a sound ecological environment.

3. In areas where predicted flows are not adequate to meet environmental flows standards, including strategy targets, adopted by TCEQ, the SB3 Basin and Bay Area Stakeholder Committees (BBASC) should identify strategies to ensure that the water needed to support a sound ecological environment for fish and wildlife is present in each river basin and bay system. In addition, the state should create a funding mechanism to assist with implementation of appropriate strategies to ensure environmental flows.

4. The state should aggressively seek the conversion of water rights to environmental uses through programs such as the voluntary sale or lease of water rights back to the state as a means of ensuring adequate flow conditions. These water rights should then be managed to provide for environmental flow protection.

5. Environmental flows should be considered as a use category in regional water planning. A State agency should change policy to address proactive measures to meet environmental demands where needed. A methodology for incorporating environmental flow needs into the RWP should be developed and recommended to the State legislature.

8.1.2.3 Actions Needed

Texas Legislature

- Provide funding for BBASC and Bay and Basin Area Expert Science Teams (BBEST) for a robust revision process for adopted environmental flow standards that produces science-based standards adequate to protect a sound ecological environment that include either the environmental flow set-asides called for by the 80th Texas Legislature through Senate Bill 3 or alternative approaches as identified by the BBASC.
- Appropriate funding to support further research and field studies dedicated to updated environmental flows standards and potential strategies to meet the standards.
- Appropriate funding to support the purchase and conversion of water rights to environmental uses through voluntary transactions.
- Further clarify the status of environmental flows as a use category as part of the regional water planning process.

Colorado and Lavaca Basin and Bay Area Stakeholder Committee

- Develop workplans to study and determine the most effective strategies to secure water to

meet environmental flow needs.
- Continue studying the river/bay systems and update environment flow standards when necessary and as new research and information becomes available.
- Identify strategies to meet environmental flow needs.

8.1.2.4 Timing and/or Conflicts

The initial SB3 standards-adoption process has been completed for the Colorado and Lavaca Rivers and Matagorda/Lavaca Bays. As part of the SB3 adaptive-management process, the BBASC has developed a workplan, although the Environmental Flows Advisory Group has not acted to approve it, and, consistent with the workplan, is continuing its work to identify and review scientific studies to increase their understanding of the Colorado and Lavaca Rivers and Matagorda Bay systems. It is now time for the BBASC to develop recommendations for revisions of the adopted standards, but funding is not available to provide the BBASC with science-based input from the BBEST.

8.1.3 Environmental – Sustainable Growth, Including Impacts of Growth

8.1.3.1 Background Information

Sacrifices and trade-offs are often necessary to meet a greater common good, and this seems particularly true of water planning. With finite water resources available, sacrifices are likely inevitable. As always, water planning in Texas assumes certain demands can and should be met.

The state has not examined the issue of whether current planning efforts encourage the development of water supply strategies and trade-offs between various water users to support what may be a level of growth that is unsustainable. For example, if mining aquifers reduces viability of the region's ecosystems, how should the state weigh these projected impacts against potential growth in water demand for cities and industries?

Business, industry, municipalities, agriculture and other economically important water users originally develop around water availability and its expected sustainability. Without some consideration of the impacts and provision of protections or adequate financial remuneration for these users, water transfers from one region to another may adversely affect the economy of the one region to benefit another area of the state.

8.1.3.2 Policy Statement

It is vital that the state assess sustainability of water-consuming growth patterns that regional water planning efforts potentially directly or indirectly support.

The LCRWPG recommends that efforts be made to understand and quantify the relationship between economic development and water supply sustainability. This effort, along with a willingness to have meaningful dialogue, could help lead to the creation of a responsible policy framework for truly sustainable water development and use in Texas.

The LCRWPG supports using education to address these concerns while the dialogue and policy development on sustainability takes shape. The LCRWPG strongly supports the proposed statewide Water

IQ public education campaign and is encouraged that this campaign is focused on responsible use of this valuable natural resource.

8.1.3.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to provide for a comprehensive water sustainability study to address:

- Relationships between water planning and economic growth
- Long-term sustainability of water supplies
- Combined impacts to all water users of fully implementing all region-recommended water management strategies
- Impact on long-term food security, for Texas and national-markets, due to the conversion of water currently used for agriculture to other uses, and the depletion over time of agricultural water supplies
- Best practice methods used by other states or nations to encourage sustainable economic growth and water use conservation and efficiencies by all users.

The LCRWPG further encourages the Legislature to fully fund the Water IQ public education program, adjusting the curriculum to include education on sustainability as presented in the above policy statement.

8.1.3.4 Timing and/or Conflicts

This is for immediate action by the Texas Legislature.

8.1.4 Groundwater

8.1.4.1 Background Information

Groundwater resources vary greatly across the state and regions, both in quantity and quality. The difficulties and problems inherent in managing these diverse resources have been delegated to locally organized Groundwater Conservation Districts (GCDs) which have been designated by the Legislature as the preferred method of groundwater management in Texas. These local governmental entities are responsible for management, conservation, preservation, protection, and enhancement of groundwater resources in their individual jurisdictions. GCDs vary from small, one or two person offices in single county districts to larger agencies covering multiple counties and employing a staff of twenty or more.

GCDs have been an integral part of the regional planning process and have provided valuable input on local aquifer characteristics, usage, and availability. This input has resulted in a clearer picture of the importance of groundwater in the State's future.

Groundwater is a major source of water in large portions of Texas. Planning efforts must ensure that this water supply will remain a long-term, viable option for consumption by local residents, agriculture, commercial, and other users. As most of the State's surface water resources are fully subscribed and new reservoir projects are limited and controversial, many are looking to groundwater projects to fill the need where demands exceed or are expected to exceed supplies. These areas are increasingly looking to strategies such as brackish groundwater desalination, aquifer storage and recovery, and importation of groundwater from less populated areas.

Each of the strategies have questions to be addressed and are not without controversy which underscores the need for more inclusive and coordinated planning efforts on the State, regional, and local levels in order to avoid long-term adverse consequences at either end of the supply line.

In HB 1763 (2005) the Legislature set forth a vehicle for accomplishing aquifer-wide management of the resource through Groundwater Management Area (GMA) adoption of Desired Future Conditions (DFCs) for each aquifer or portion of an aquifer underlying the GMA and are provided to the TWDB every five years. The TWDB uses the DFCs to provide the GCDs within the GMA with the Modeled Available Groundwater (MAG) for each relevant aquifer underlying the GMA. Regional water planning groups are obligated to use the calculated MAG volumes derived from the DFCs for the relevant aquifers as the amount of groundwater available for regional planning purposes. Other non-relevant aquifers do not require DFCs and therefore, available supply volumes for planning purposes will likely be determined by the planning groups using information provided by the GCDs.

The groundwater planning process under HB 1763 was substantially modified by SB 660 in 2011 to generally involve more public participation opportunity and a more rigorous consideration of DFCs. The new planning requirements, which are borne by the GCDs, are unfunded and may prove to be a difficult responsibility for GCDs, many of which have limited resources, to fulfill in a manner that is beneficial to the overall State water planning process. This concern coupled with the increased level of importance placed on the water availability estimates for determining eligibility for SWIFT funding may warrant special consideration.

The LCRWPG has reviewed a variety of groundwater policy issues. Some have been incorporated into other sections of this policy document. Ten issues and corresponding policy statements are discussed below.

8.1.4.2 Policy Statements

8.1.4.2.1. The Rule of Capture

Texas groundwater law is based on the Rule of Capture. The Rule of Capture is a tort rule of non-liability established in 1904 that allows the owner of the overlying property to pump or capture any amount of groundwater provided that it is not wasteful, malicious or does not cause subsidence. GCDs may modify the Rule of Capture by means of rule-making authority described in Texas Water Code Chapter 36. The LCRWPG's policy is to continue its support of GCDs and their ability to modify the Rule of Capture when and where appropriate.

8.1.4.2.2. Groundwater Ownership

The debate over groundwater ownership in Texas has been provided with some clarity from both the Legislature through the passing of SB 332 in 2011 and the Texas Supreme Court with the opinion issued in the *Edwards Aquifer Authority v. Day* case in 2012. In short, SB 332 recognized that a landowner has a property interest in groundwater in place subject to reasonable regulation by a GCD but also concluded that "unreasonable" regulation by a GCD may constitute a compensable taking of that property for public use. Similarly, the *Day* case affirmed the authority of the Edwards Aquifer Authority to limit pumping but also found that land ownership includes an interest in groundwater in place. The two events together validate the role of GCDs to manage groundwater but confirm that the landowner is entitled to compensation when regulation constitutes a taking of the property. These findings, however, provide little guidance on when

such regulation becomes a taking or how to determine the amount of compensation when a taking has occurred.

The LCRWPG recognizes the importance of managing the groundwater resources of the State and it is the LCRWPG's policy to support GCDs as the preferred method of groundwater management and their long-term financial and institutional stability to serve their statutory purpose.

8.1.4.2.3. Groundwater Management by GCDs

The LCRWPG supports local management of groundwater by GCDs as well as aquifer-wide planning and coordination between GCDs within GMAs. GCDs have been managing and regulating groundwater since the early 1950's and should be maintained as the State's preferred method of groundwater management and regulation.

The LCRWPG supports the establishment of GCDs by the most effective mechanism and configuration considering what is determined to be the option that is most reasonable, practical, effective, efficient and achievable. To this end, consideration should be given to the possibility of annexation of new areas into existing GCDs or consolidation of existing GCDs in an effort to optimize and enable more effective and efficient groundwater management provided that it is feasible and locally supported. New GCDs should continue to be delineated, established, and confirmed by local confirmation elections. The LCRWPG recognizes that GCDs are local governments that are confirmed by local elections, and it is the LCRWPG's policy that any such attempts to annex, consolidate existing GCDs, or other reorganization of GCDs must be referred to the local election process for validation or rejection.

8.1.4.2.4. DFCs and MAGs

The LCRWPG supports GMA-wide cooperation in management of groundwater resources including joint efforts among GCDs with shared relevant aquifers to establish and implement compatible rules and management plans to preserve the GMA-adopted DFCs. DFCs of adjacent GMAs for a shared aquifer should be compatible. While the DFC is the appropriate metric and management goal, the MAG should be given appropriate consideration as a management tool when establishing rules and making permitting decisions. Permitting decisions informed by the MAG and other relevant considerations should be followed by continuous and long-term aquifer monitoring of the actual aquifer conditions to ensure preservation of the DFC. The LCRWPG recommends that GCDs commit to long-term aquifer monitoring programs and data collection to refine the models and other analytical tools such that long-term effects of pumping can be more accurately predicted and factored into groundwater management decisions. Where DFCs are compromised as measured by actual aquifer conditions, the LCRWPG supports the use of mitigation plans or authority by GCDs to adjust permits as necessary.

The GMA planning process provides an opportunity to unify the legal and institutional disconnect between surface and groundwater management if DFCs are established where appropriate to refer to a surface water condition that is affected by groundwater pumping and management. The LCRWPG's policy encourages GMAs to establish such surface water-related DFCs (e.g. minimum springflows, baseflows, reservoir inflows, etc.) where appropriate.

8.1.4.2.5. Sustainability

The LCRWPG supports a sustainable approach to groundwater management in areas where such an approach is reasonably achievable. Sustainability is defined as balancing groundwater withdrawals with natural recharge and replenishment to maintain long-term stability in regional or local groundwater supplies. It is the LCRWPG's policy to look to GCDs within a given GMA to cooperate in determining the degree to which sustainability can be achieved.

8.1.4.2.6. Groundwater Marketing (e.g. Water Rights Leases, Sales, Transfers)

The LCRWPG's policy is to establish coordination between water marketing proposals with local GCDs and RWPGs and support the requirement that state agencies and private interests comply with all local GCD rules, state-certified groundwater management plans, and state and regional water plans.

8.1.4.2.7. Improving Groundwater Availability Data

The LCRWPG's policy is to encourage new funding sources for GCDs specific to data collection and storage methods that emphasize ease of public accessibility. The LCRWPG's policy is to support the funding needs of the TWDB for the maintenance and expansion of state-wide groundwater databases.

8.1.4.2.8. Funding and Technical Assistance for GMA Planning

The expanded process and additional complexity added to the GCD's joint-regional groundwater planning responsibilities through SB 660 in 2011 is influencing the planning area GMA's determination of certain aquifers as "non-relevant for regional planning purposes" in order to avoid extensive and costly reporting and public vetting processes. Further, the relevant aquifers with DFCs that are being proposed or continued will require GCD funds and resources to complete the more rigorous process that might otherwise be used to further develop the GAMs and planning tools. It is the LCRWPG's policy to encourage the TWDB to provide funding to facilitate GMA's role in determining groundwater availability estimates for Regional planning. Additionally, the LCRWPG supports funding for the TWDB to provide the technical assistance to the GMAs as required by SB 660.

8.1.4.2.9. MAG Peak Factors

MAG values were developed using groundwater availability models calibrated for long-term average, not drought of record, conditions. TWDB revised its planning rules to include a MAG Peak Factor that ensures regional water plans have the ability to fully reflect how GCDs anticipate managing groundwater production under drought conditions. The LCRWPG supports the limited use of the MAG Peak Factor when: 1) it is allowable under the policies of the local groundwater conservation district; 2) the relevant groundwater conservation district provides written consent to use the MAG Peak Factor; 3) TWDB Executive Administrator approves each MAG Peak Factor; 4) a technical basis for the use of MAG Peak Factor is provided; and, 5) the MAG Peak Factor will not prevent the groundwater district from managing groundwater resources to achieve the desired future conditions. The supported goal in this case would be to meet a temporary need through intermittent pumping of the aquifer with volumes greater than the MAG during drought that is offset by pumping in wetter (more typical) years that is expected to fall below the MAG. The LCRWPG does not support utilizing the MAG Peak Factor when such use could be expected to contribute to subsidence.

8.1.4.2.10. Utilization and Permitting of Brackish Water

The LCRWPG recognizes the value brackish water might have as a resource to meet the growing water needs in Texas and supports legislative actions that advance accessing this resource. The LCRWPG further believes that local groundwater conservation districts are the most logical and appropriate governmental body to regulate and permit wells targeting brackish water zones. Potential brackish water zones may be beyond the normal 'window' where computer modeling runs are performed to determine water availability. Additionally, recent legislation has mandated a 30-year duration for brackish water permits. Long-term and ongoing monitoring will be necessary to track potential impacts on water levels and water quality in the same or adjacent aquifers and for the potential effects of subsidence. In order to more efficiently accommodate the necessary studies and long-term monitoring, the bulk of the costs should be borne primarily by the applicant or by the TWDB.

8.1.4.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Texas Legislature to:

1. Sufficiently fund TWDB programs specifically related to GMA planning, groundwater conservation, protection, enhancement, groundwater availability modeling (including development/ review/ updating/ recalibration), technical assistance to GCDs and GMAs, and database management and accessibility. Specifically, funding should be provided to the TWDB to be allocated for GMAs for regional water planning in a manner similar to funding available to Regional Water Planning Groups; and
2. Confirm that the State has joint liability with GCDs when GCD decisions that are made to satisfy statutory groundwater management obligations are judged to be compensable takings. Such joint liability would require that the State contribute financially to the just compensation for the taking.

Texas Water Development Board – The LCRWPG encourages TWDB to:

1. Seek adequate funding for GMA planning, groundwater related programs, GAM needs, and technical assistance to GCDs and GMAs;
2. Continue assisting GCDs in their management planning, groundwater quantity and quality research, water conservation programs, and inter-agency cooperative database management efforts (such as the Texas Water Information Network); and

Groundwater Conservation Districts – The LCRWPG encourages GCDs to:

1. Work cooperatively with GMA and regional planning efforts; and
2. Continue to expand or develop groundwater research and database efforts in order to be the primary resource for groundwater data in their jurisdiction.

8.1.4.4 Timing and/or Conflicts

The 87th Session of the Texas Legislature will occur in 2021 and will be setting the budget for the following biennium which will have direct impacts on funding programs needed by the TWDB, GCDs, and RWPGs.

Groundwater planning through the GMA process has further developed into a process that assigns the responsibility for determining groundwater availability for planning purposes to GCDs. The importance of this role should be recognized through the implementation of the recommended actions in the 87th legislative session.

8.1.5 Potential Impacts to Agricultural and Rural Water Supplies

8.1.5.1 Background Information

Some water supply strategies feature transfers of water from rural to urban areas to meet projected urban growth in Texas. These strategies may not adequately assess the potential for harm to rural economies and rural culture. As former Texas Agriculture Commissioner Susan Combs once said, "We can't afford to dewater or leave behind rural Texas."

While compensation to select individuals may occur to facilitate water transfers from one region to another, the economic impacts of the transfer from one region may extend well beyond the individuals who are compensated and may result in negative impacts to others. In other cases, irrigators are often purchasers of water from water rights owners who may sell the water for other uses, thus limiting access to water for irrigated agriculture.

As previously stated, water transfers and water marketing must be carefully considered, and potentially utilized to help fund water conservation and efficiency projects.

In general, much of agriculture and rural Texas cannot afford water at the prices that some cities and industry will pay. Water pricing should be examined for its impact on the availability of water to meet projected needs for agriculture and rural Texas.

8.1.5.2 Policy Statement

The state should be careful that transfers of surface water or groundwater occur only after sufficient study and consideration of local supplies and economies that could be adversely affected, including mitigation opportunities and funding mechanisms.

8.1.5.3 Actions Needed

Texas Legislature – The LCRWPG encourages the Legislature to:

1. Strengthen GCDs' abilities to reasonably protect and preserve groundwater supplies for both present and future local uses.
2. Maintain water policies that protect basins of origin in interbasin transfers of surface water.
3. Require that TCEQ provide notice to regional water planning groups of pending water supply actions.
4. Support funding for rural community infrastructure and water supply planning for regional planning, emergency water connections and redundant drinking supplies.

Texas Commission on Environmental Quality – The LCRWPG encourages TCEQ to provide pertinent technical reviews and draft surface water permits to affected regional water planning groups to confirm consistency with regional water plans.

8.1.5.4 Timing and/or Conflicts

These recommendations should be implemented during the next legislative session.

8.1.6 Agricultural Water Conservation

8.1.6.1 Background Information

With finite water resources available to a growing Texas populace, it is necessary that all possible means of stretching those finite resources be explored and implemented. Agriculture, being the single largest water user group, represents the area where conservation may offer the most hope for freeing up substantial water supplies.

The profit margins of irrigated agriculture may not allow producers to invest in major water conservation measures without participation by others. The Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture administers a number of conservation programs that could be utilized and further optimized to enhance the likelihood of irrigators implementing water conserving practices.

The NRCS Environmental Quality Incentives Program (EQIP) is the NRCS' most likely platform for encouraging agricultural water conservation. Water quantity is a national and state priority of EQIP. EQIP funding is continually subject to Congressional appropriations that determine the program's viability on an annual basis.

The Texas State Soil and Water Conservation Board (TSSWCB) works in conjunction with local Soil and Water Conservation Districts (SWCDs) to encourage the wise and productive use of natural resources. The TSSWCB is the lead agency for planning, implementing, and managing coordinated natural resource conservation programs for preventing and abating agriculture and silviculture nonpoint sources of water pollution.

Through the TSSWCB Water Quality Management Plan Program (WQMP), farmers, ranchers, and silviculturalists receive technical and financial assistance to voluntarily conserve and protect natural resources. Participants receive assistance with conservation practices that address water quality, water quantity, and soil erosion while promoting the productivity of agricultural lands.

An opportunity exists for the development of public/private partnerships for the purpose of enhancing the sustainability of agricultural and environmental water supplies in ways that market forces may not otherwise provide. Using available marketing techniques, responsible corporate conservation sponsors can gain positive recognition for helping to accomplish meaningful agricultural conservation while supporting healthy riverine and estuarine habitats.

8.1.6.2 Policy Statement

The LCRWPG encourages agricultural water conservation as a method of stretching existing supplies by reducing agricultural demands in order to increase water availability to meet new and existing water demands. The LCRWPG further recognizes the need for public and private partnerships with irrigators to fund experimental, existing, and proven water conservation technology.

8.1.6.3 Actions Needed

United States Congress – The LCRWPG encourages that Congress sufficiently fund NRCS programs aimed at implementing known water conservation technology and at developing promising, new technology for water conservation.

Texas Water Development Board – The LCRWPG encourages TWDB to aid the NRCS State Conservationist in targeting water conservation program funding to projects that offer the most water conservation benefit for the state. The TWDB should also offer expert testimony to the Agriculture Committees of both the Senate and the House regarding the need and effectiveness of water conservation accomplished through EQIP in order to highlight the ongoing need for adequate NRCS EQIP funding. The LCRWPG further encourages TWDB to provide leadership in encouraging corporate sponsorship of agricultural water conservation initiatives.

Joint TCEQ, TWDB and Legislature – Develop water use metrics and efficiency standards and best management practices, including monitoring and delivery systems basin-wide.

Regional Planning Groups – The LCRWPG encourages all planning groups to adopt water plans that capitalize on the potential for partnering between water user groups to accomplish much needed water conservation in ways that share both the burdens and the benefits between water user groups.

8.1.6.4 Timing and/or Conflicts

Creative funding and implementation of water conservation is an ongoing responsibility for all water user groups and their constituents.

8.1.7 Municipal/Industrial Conservation

8.1.7.1 Consistent GPCD Methodology

8.1.7.1.1. Background Information

In its December 2008 report to the 81st Texas Legislature, the Texas Water Conservation Advisory Council (TWCAC) cautioned:

"The tendency of the media or individuals to use gallons per capita per day (GPCD) as a way to compare conservation efforts of communities is also problematic when the metric is not uniformly defined. Therefore, the Council has determined that it should be a priority to develop standard methodologies for water use metrics and water conservation metrics and definitions."

While various GPCD calculations, such as total daily average GPCD, can be a good measure for internal year-to-year comparisons within one water system, inconsistencies still exist in determining GPCD.

SB 181 was passed by the Legislature in 2011 to develop a consistent methodology for calculating GPCD. The TWDB and the TCEQ, with the assistance of the TWCAC, finalized the document, "Guidance and Methodology for Reporting on Water Conservation and Water Use," in December of 2012. It can be found on the TWDB and TCEQ web sites. While this document outlines a standard methodology for calculating GPCD, there are still inconsistencies in determining GPCD that could be further standardized to facilitate consistent and comparable GPCD.

8.1.7.1.2. Policy Statement

The LCRWPG supports the use of methodologies outlined in the December 2012 "Guidance and Methodology for Reporting on Water Conservation and Water Use" report, efforts to further standardize and facilitate GPCD calculations, and the study of other metrics to assess water use efficiency.

8.1.7.1.3. Actions Needed

Texas Legislature and TWDB – The LCRWPG encourages the continued support for efforts by the TWCAC to develop consistent methodology for calculating commercial, industrial, and institutional measurements that can successfully track water use and water savings over time for these water use sectors.

8.1.7.2 Consistent Water Savings Metrics

8.1.7.2.1. Background Information

The TWDB Report 362, Water Conservation Best Management Practices (BMP) Guide, revised May 2019, evaluated and recommended water use efficiency measures and provided guidance on how to determine water savings. Measures ranged from toilet and washing machine incentives to water loss reduction programs. Additional conservation strategies such as irrigation standard requirements, mandatory watering schedules, soil depth requirements, irrigation efficiency upgrades and other strategies have not been studied extensively to evaluate effective water savings. Many of the BMPs found in the 2004 report have been updated by TWCAC. These BMPs can be found at the Council's website www.savetexaswater.org. However, most of these measures do not include water savings estimates or metrics.

8.1.7.2.2. Policy Statement

The LCRWPG supports the development of consistent metrics to assess the amount of water saved per conservation measure or technique in order to track the success of conservation strategies. Recent efforts with tracking and measuring savings from academic institutions such as Texas A&M AgriLife Research and the Pecan Street public/private partnership should be supported by the State and local water entities.

8.1.7.2.3. Actions Needed

Texas Legislature and TWDB – The LCRWPG encourages the funding of research efforts to determine water savings and incorporate the information into current and future BMPs found on the Council website. This information should be aimed at providing water suppliers with useful information for developing and implementing conservation goals and successful management strategies.

8.1.7.3 Additional Financial Assistance to Reduce Water Loss

8.1.7.3.1. Background Information

In 2003, the 78th Texas Legislature enacted House Bill 3338 which requires all retail water suppliers to submit water loss audits to the TWDB. TWDB collected water loss audits for the years of 2005 and 2010 with response rates that were slightly more than 50 percent. However, that response rate percentage represents at least 75 percent of the water volume usage in Texas.

Since HB 3338 was enacted, the 82nd Texas Legislature (2011) passed House Bill 3090 which requires annual water loss audits from all retail public utilities receiving financial assistance from TWDB. The first of these annual reports were due May 1, 2013. The 83rd Texas Legislature enacted House Bill 857 (2013) which requires each retail public water utility with more than 3,300 connections to conduct a water audit annually to determine its water loss and to submit that audit to TWDB. The initial annual water audits were due May 1, 2014. A retail public water utility with 3,300 or less connections will continue to be required to conduct and submit a water audit once every five years computing the utility's system water loss during the preceding year.

Based on these audit reporting requirements, a historical record of water loss in the State is readily available on the TWDB web site. For the years 2010, 2014, and 2017, the average water loss in the State (both real and apparent) was 19.5%, 20.6%, 19.5%, respectively. For Region K, the 2010, 2014, and 2017, the average water loss was 17.1%, 18.4%, 20.6%, respectively, indicating an upward trend in water loss from 2010 to 2017.

The 83rd Texas Legislature also enacted House Bill 3605 (2013) that requires a retail public water utility that receives financial assistance from the Board to use a portion of that assistance—or any additional assistance provided by the Board—to mitigate the utility's system water loss if based on its water audit the water loss meets or exceeds a threshold to be established by Board rule.

8.1.7.3.2. Policy Statement

The LCRWPG recognizes that funding is now available through the SWIFT fund as well as the TWDB fund for loans for retail utility water loss projects.

8.1.7.3.3. Actions Needed

Texas Legislature and TWDB - should market the SWIFT funding for utility water loss projects. The funds would be used to replace aging or deteriorated pipe, to replace inaccurate or incorrectly sized water meters, to enhance leak detection efforts, or to implement a pressure reduction strategy if warranted.

8.1.7.4 Conservation Coordinators

8.1.7.4.1. Background Information

With the current state water plan depending so heavily on conservation to meet future water needs, it is essential that water conservation plans result in quantifiable savings. To that end, requiring a designated water conservation coordinator would increase accountability for the implementation of water conservation measures and the tracking of water savings.

8.1.7.4.2. Policy Statement

The LCRWPG supports the designation of a conservation coordinator by all public water suppliers with the responsibility for the implementation and monitoring of the conservation plan, tracking and reporting water savings to the State, and recommending further improvements to the plan. Responsibility could be assigned to a newly created position for this purpose, an existing position or employee of the water provider, or a shared water conservation coordinator contracted through several small water providers.

8.1.7.4.3. Actions Needed

TCEQ - The LCRWPG encourages the TCEQ to amend Title 30, Texas Administrative Code (TAC) Chapter 288, so that all public water suppliers required to have a conservation plan are also required to have a designated water conservation coordinator with the duties before mentioned.

8.1.7.5 Dedicated Conservation Funding

8.1.7.5.1. Background Information

Water conservation programs offered by water providers are typically funded on an annual basis from revenues received from water use. Unfortunately, the funding can vary yearly because water use is impacted by uncertain factors such as weather. Some providers have historically cut program funding during non-drought years, assuming that conservation is only needed for droughts. However, if conservation is to stretch existing water supply resources to meet future water demand, a reliable fund must be available to sustain and grow conservation programs.

Having a dedicated conservation fund would help water providers plan for multi-year conservation programs and pursue research opportunities to help further water conservation efforts. Dedicated financial support for conservation could be achieved by assessing a meter or account conservation fee, or through a set-aside of a certain percentage of the annual revenues, as seen with a number of water providers throughout Texas.

8.1.7.5.2. Policy Statement

The LCRWPG supports water providers having the ability to set up a dedicated funding stream for water conservation programs and projects.

8.1.7.5.3. Actions Needed

Encourage the State to adopt legislation that would allow water providers to set up a dedicated funding stream for water conservation.

8.1.8 Reuse (including basin-specific assessment of reuse potential and impacts)

8.1.8.1 Background Information

Water reuse typically can be divided into two types, direct and indirect. Direct reuse is when reclaimed water or treated effluent is pumped directly from a wastewater treatment plant to a place of use. Direct reuse for non-potable purposes is typically delivered through a “purple pipe” distribution system. Another type of reuse is the direct reuse of treated effluent for potable purposes or Direct Potable Reuse (DPR.) Through DPR treated effluent is piped directly to a water treatment plant for further treatment of potable standard, without the benefit of attenuation and retention time offered by an environmental buffer like a river or reservoir. DPR may be viable where other supplies are scarce, such as in drought conditions, or in other applications, provided that there are sufficient barriers in place to ensure that the output is of appropriate quality to minimize and mitigate for environmental impacts or risk to human health and safety. The TCEQ administers water quality requirements for direct reuse through its Chapter 210 rules. Indirect reuse is a method by which discharged effluent is conveyed to a point of use via the bed and banks of a watercourse.

Under most surface water rights, the full amount of water may be used and reused for the purposes and location of use provided for in the underlying water right without additional authorization. However, once this water is discharged to a stream, it becomes waters of the State, available for use by others. Specific authorization for indirect reuse must be obtained to convey discharged effluent for reuse at a downstream point of use.

In addition to the traditional protections against carriage losses, indirect reuse authorizations are subject to special conditions to protect downstream water rights that may have been granted in reliance on the flows remaining in the watercourse or to protect the environment.

Water reuse is an important water management strategy. TCEQ is the State's agency charged with regulatory processes related to this issue.

8.1.8.2 Policy Statement

LCRWPG supports reuse as a water management strategy, in accordance with State Law and SB 1. The Group recognizes that there are potentially complex issues associated with reuse. Therefore, LCRWPG will continue to examine reuse as a water management strategy in an effort to better understand potential long-term impacts. LCRWPG will continue to monitor legislative developments regarding reuse and will incorporate those developments into its deliberations and planning.

8.1.8.3 Actions Needed

Texas Commission on Environmental Quality – LCRWPG encourages TCEQ to continue its thorough review and approval processes for indirect reuse applications. It is through this application process that potential impacts, including environmental and water rights impacts, should be addressed.

The LCRWPG encourages TCEQ to develop standards and best management practices for Direct Potable Reuse projects to minimize and mitigate for any risk to the environment and human health and safety.

8.1.8.4 Timing and/or Conflicts

Consideration of reuse should be an integral part of the ongoing regional water planning process.

8.1.9 Brush Management

8.1.9.1 Background Information

Brush control has been widely recognized as an effective means of increasing water availability through the thinning or elimination of certain brush species that would otherwise uptake and transpire significant amounts of water. Brush control has the potential to conserve water lost to evapotranspiration, increase recharge to groundwater and aquifers, enhance spring and stream flows, restore native wildlife habitat by improving rangeland, improve livestock grazing distribution, aid in wildfire suppression by reducing hazardous fuels, and manage invasive species.

In recognition of these facts the Texas Legislature initiated the Texas Brush Control Program in 1985. The Program developed its first State Brush Control Plan in 1987. According to the 1987 Plan there were approximately 105 million acres of rangeland infested by brush, 32 million of which were considered dense. The 1987 Plan points out that pre-settlement Texas offered broad expanses of open prairie grasslands with

only modest tree and brush growth along water courses and rocky hills. Settlement brought fire control, fencing and intensive grazing practices that resulted in conditions that enabled the proliferation of brushy species suited to the barer, drier landscape that ensued.

In 2011 the 82nd Texas Legislature created the Water Supply Enhancement Program (WSEP) to replace the Texas Brush Control Program while furthering its objectives. The purpose of the WSEP was to increase available surface and ground water supplies through the selective control of brush species that are detrimental to water conservation. The WSEP was administered by the Texas State Soil and Water Conservation Board (TSSWCB) until August 31, 2019, at which point the funding for the program was not restored by the Legislature. In July 2014, the TSSWCB adopted its first State Water Supply Enhancement Plan. The TSSWCB collaborates with a range of agencies to identify watersheds across the state where it is feasible to implement brush control in order to enhance public water supplies. A brush control feasibility study was published in 2000 by the LCRA for the Pedernales River above Lake Travis (*Pedernales River Watershed Brush Control Assessment and Feasibility Study*, Lower Colorado River Authority, 2000). The TSSWCB uses a competitive grant process to allocate WSEP cost-share funds, giving priority to projects that balance the most critical water conservation need of municipal water user groups with the highest projected water yield from brush control. The TSSWCB then works through local soil and water conservation districts to develop 10-year resource management plans on properties enrolled in the WSEP in order to assist landowners in implementing brush control activities. Cost-share assistance is provided through the WSEP to landowners implementing their resource management plans.

According to the 2017 WSEP Annual Report, under this State Water Supply Enhancement Plan, during fiscal year 2017, 30,202 acres of brush control were incentivized across the state and are proposed to result in the conservation of 9,364 ac-ft of water at a cost of about $132.70 per ac-ft of water. In the Pedernales River watershed, since the Program started through fiscal year 2017, over 74,718 acres of brush have been treated by landowners.

8.1.9.2 Policy Statement

The LCRWPG supports brush control as an effective means of enhancing water supplies and encourages that all feasible means be utilized to maximize and target brush control efforts in watersheds that are experiencing below normal inflows to water supplies and which offer the greatest opportunity for helping to meet identified water supply shortages.

8.1.9.3 Actions Needed

1. The LCRWPG encourages the Texas State Soil and Water Conservation Board (TSSWCB) to request Water Supply Enhancement Plan (WSEP) brush control cost-share funding in an amount sufficient to accomplish the greatest water supply enhancement for areas that are experiencing the greatest percentage reduction from average of their water supply reservoir storage levels. The LCRWPG recognizes that the WSEP governing statute and agency rules currently limit the program to the Pedernales River watershed.
2. The LCRWPG encourages the Texas Legislature to reinstate and fund the WSEP sufficiently to accomplish significant water supply enhancement throughout the areas most negatively impacted by the invasion of brushy plants and more specifically those areas experiencing significant reduction from average of their water supply reservoir storage levels. Based on the economic analysis included in the published brush control feasibility study, just for the Pedernales River watershed, $23.6 million is needed to fully implement brush control on all acres identified for

treatment (*Pedernales River Watershed Brush Control Assessment and Feasibility Study*, Lower Colorado River Authority, 2000).

3. The LCRWPG encourages the TSSWCB to conduct brush control feasibility studies for the Lake Buchanan, Lake LBJ watersheds, and other watersheds in the region in order to estimate the potential water yield from brush control. Based on current WSEP governing statute and agency rules, completed feasibility studies for these watersheds would "open up" eligibility for WSEP cost-share funds to landowners in these watersheds.

8.1.9.4 Timing and/or Conflicts

We encourage that the Legislature bi-annually assess the effectiveness of the Water Supply Enhancement Plan (WSEP) and fund the program commensurate with its successes. We encourage the Texas State Soil and Water Conservation Board (TSSWCB) to annually prioritize its WSEP funding placement to target water supply concerns as noted above.

8.1.10 Inflows to Highland Lakes

8.1.10.1 Background Information

The Highland Lakes rely on inflows from contributing watersheds in maintaining regional water supply. Inflows to the Highland Lakes are produced when precipitation occurs in contributing watersheds in sufficient amounts to cause water to run off the land surface and accumulate as stream flows that are tributary to the Highland Lakes.

The Texas Water Development Board (TWDB) has undertaken two projects to evaluate rainfall-runoff trends in the Upper Colorado River Basin of Texas, including one site in the Region K area (the San Saba Watershed). In the August 2017 Phase I report (KRC, 2017, TWDB Contract #1600012011), it was noted that observed flows in the Upper Colorado River watershed declined at all study sites over the period 1940-2016. Declines at the majority of sites were attributed to historical water use and the construction of large upstream permitted reservoirs. Yet for some of the study sites (including those in the San Saba), observed flow declines exceeded the declines that would be attributed to permitted upstream withdrawals and reservoir storage.

Phase II of the study, which was finalized in September 2019 (TWDB Contract #1800012283), evaluated many potential causes for the reduced inflows identified in Phase I, and determined that for the San Saba watershed, the change was most likely a result of small pond usage and construction, though several potential factors were not able to be fully evaluated due to lack of data (e.g. groundwater pumping, noxious brush). A recent study that provides additional supporting information on the reduced inflows to the Highland Lakes has been published in the Texas Water Journal, Volume 11, Number 1, April 3, 2020. It is titled "Runoff Inflow Volumes to the Highland Lakes in Central Texas: Temporal Trends in Volumes and Relations between Volumes and Selected Climatic Indices" by Raymond M. Slade Jr.

To the extent there may be a decreasing trend in inflows to the Highland Lakes it would largely be accounted for in water supply planning models through updates of the historical naturalized flow data, such as the recent update through 2016. Understanding the physical basis and magnitude of any trends would provide useful information for planning for future water supply.

8.1.10.2 Policy Statement

Data demonstrating reduced inflows to Lakes Buchanan and Travis in recent years have shown that further investigation and analysis may be valuable in the Region K watersheds. Research focusing on the inflows to the lakes is needed to understand and quantify these observations, so that the results can provide meaningful input to regional water modeling and planning activities. Future water planning activities should consider the impacts of land use/land cover and small impoundment on streamflow, potentially by adjusting both surface water WAMs and groundwater GAMs to account for current river basin characteristics.

8.1.10.3 Actions Needed

The LCRWPG recommends the State continue to provide funding for studies to evaluate rainfall-runoff trends in the Upper Colorado River Basin. Further study should include elements recommended the Phase II study, including:

1. Develop a semi- or fully- distributed rainfall/runoff model of the study area watersheds, that would be able to simulate both surface runoff and subsurface infiltration processes. The model should account for the extent and water usage properties of the noxious brush common to each watershed.
2. Further comprehensive study of the potential impacts of noxious brush, likely though modeling and empirical study of results generated from recently completed and published paired watershed studies.
3. Additional small pond analysis, including expanding the analysis to the entire Colorado River watershed and defining drainage areas for the ponds to allow better quantification of the impact of each pond to its local portion of the watershed. This analysis should facilitate modeling the rainfall-runoff response for the flow network over time.
4. Modeling future temperature and precipitation scenarios as derived from Global Climate model data.

In addition, since the Phase II study was not able to obtain sufficient groundwater pumping data to evaluate its impact on streamflows, the LCRWPG recommends future studies include an analysis focusing on identifying and quantifying the potential streamflow impacts of groundwater pumping from alluvial wells.

The purpose of these recommended studies is to further quantify the impacts of land use/land cover, surface water-groundwater interaction, and small impoundments on inflows to the Highland Lakes.

8.1.10.4 Timing and/or Conflicts

Given the importance of accurate inflow data on water supply planning, analyses and evaluations should continue in order to provide data for more accurate hydrologic modeling and planning.

8.1.11 Coordination of Planning Cycles for Determination of Desired Future Conditions by GCDs and Generation of the Regional Water Plan by RWPGs

8.1.11.1 Background Information

In 2005, Texas legislation required groundwater conservation districts (GCDs) to work together within their particular groundwater management areas (GMAs) to determine the desired future conditions (DFCs) of their shared aquifer. These conditions were to be reviewed every five years starting in 2010. The information compiled by the districts through this coordinated effort would be supplied to the appropriate regional water planning group which would in turn eventually be rolled into the state water plan.

Unfortunately, the five-year cycle for assessing desired future conditions by GCDs by GMAs continues to run almost parallel to the regional water planning cycle. The most recent DFCs are finalized by the GMAs after the deadline for submittal to the RWPG. As a result, the RWPG must rely on potentially outdated information from GCDs during the assessment period. In 2013, legislation (SB 1282) pushed the DFC deadline back from September 2015 to May 2016; however, this did not remedy the timing problem.

8.1.11.2 Policy Statement

The LCRWPG recommends staggering the five-year cycles for determination of DFCs by GCDs and the Regional Water Planning Group (RWPG) such that MAG estimates are available for consideration by RWPGs in advance of the deadline for the technical memorandum when determining projected water supplies, demands, and needs. Both cycles require the involved entities to undergo considerable technical evaluation and public review before final approval.

8.1.11.3 Actions Needed

State GMAs – Each of the 16 groundwater management areas should review this proposal and submit recommendations in favor of or in opposition to the proposal.

Texas Legislature – Introduce legislation to alter the planning cycle for GCDs to derive DFCs within their assigned GMA so that finalized data can go into the regional water planning process in a timely and useful fashion. GCDs should not be burdened with a compressed cycle in order to accomplish this action.

8.1.11.4 Timing and/or Conflicts

This should be addressed in the next legislative session so it can go into effect prior to the next planning cycle.

8.1.12 Recommended Improvements to the Regional Planning Process (SB 1 - 75th Legislature)

The following eight recommendations have been developed by the LCRWPG in order to improve the ongoing regional water planning process:

1. The LCRWPG continues to support action by the State to provide for the integration of water quantity (supply) and water quality planning. Improvements have been made but more coordination is needed between TWDB and TCEQ, especially in the area of permitting for new water supply projects, in order to facilitate the implementation of key water management strategies. TWDB, TCEQ and other state, local, and federal entities are doing a good job of providing a clearinghouse

for infrastructure funding options through the Texas Water Infrastructure Coordination Committee (TWICC). TWDB and TCEQ should also work to coordinate the regional planning process with the Texas Clean Rivers Program, which is a partnership that uses a watershed management approach to identify and evaluate water quality issues. The RWPGs are considering water quality issues during this revision to the plan and continued coordination with the Texas Clean Rivers Program is desirable.

2. The LCRWPG supports action by the State to continue to fund programs for the collection of water data and groundwater availability information, which remains a critical need in the planning process. The State should provide adequate, continuous funding in order to improve the collection, development, monitoring, and dissemination of such water data.
3. The LCRWPG continues to support action by the State to provide assistance to the RWPGs with public information materials and administrative support.
4. The LCRWPG continues to support action by the State to provide for the opportunity to have improved representation of women and minorities on the RWPGs to ensure a true diversity of interests.
5. The LCRWPG supports action by the State to structure the planning process to include environmental needs in order to get a clear picture of the amount of available water resources for all users. Environmental needs and water supply strategies should be planned for just like Agricultural, Municipal, Industrial and other uses in the state.
6. The LCRWPG supports adequate and timely state funding for the regional water planning process. This funding is critical for the development of long-term, sustainable, environmentally protective and conservation-effective water management strategies as well as the collection of water data and groundwater availability information, including the refinement of modeling data, public information materials, and administrative assistance.
7. The LCRWPG recognizes the importance of the role of the GMA planning process in determining groundwater availability for planning purposes and supports providing the necessary resources and technical support to facilitate effective water planning.
8. The LCRPWG supports the Texas Open Meetings Act, which encourages participation by all interested parties in governmental decision making. All regional water planning group meeting and committee meeting agendas are posted 72 hours in advance of the meetings and are open to the public. Public inputs and concerns during all meetings are encouraged by including at least one item on each agenda for public participation/comment. Allowing participation by committee members through conference calling during the committee meetings only would facilitate the ability of members representing all of the various constituencies and areas (including remote and outlying areas) in the regional water planning group to contribute their insights to the recommendations presented to the entire regional water planning group. Under current rules, regional water planning group members in remote and outlying areas have more difficulty and face a higher bar for participation in committee meetings, including their time and expenses, due to their location. Allowing conference calling for committee meetings only would allow for greater inclusion and participation throughout the regional water planning process. The LCRWPG recommends that the State Legislature amend Section 16.053(h)(12) of the Texas Water Code to allow committees or subcommittees of a regional water planning group to include telephone conference calling by members of the committee and members of the public in order to allow full participation by those members in remote and outlying areas who are unduly burdened by travel requirements.

8.1.13 Radionuclides in the Hickory and Marble Falls Aquifers

The ***Region "K" Water Supply Plan for the Lower Colorado Regional Water Planning Group, Volume I, December 2000*** provided background information and a policy recommendation on the issues surrounding radionuclides in the Hickory and Marble Falls aquifers. The following is an update of the issues and policy recommendation.

EPA (U.S. Environmental Protection Agency) revised the federal radionuclides regulations, which had been in effect since 1977, effective in 2003. Radionuclides emit ionizing radiation, which can cause various kinds of cancers, depending on the type and concentration of radionuclide a person is exposed to via drinking water. These rules cover man-made and naturally occurring radionuclides in drinking water and include a first-time standard for uranium. EPA revised this regulation in accordance with the requirements of the 1986 Amendments to the SDWA (Safe Drinking Water Act) and the 1996 Amendments to SDWA. The statute calls for regulation of radionuclides and a review of regulations every six years. Additionally, according to the SDWA Amendments, the EPA must maintain or provide for greater protection of the health of persons when revising regulations. The EPA reviewed the most current health, occurrence, treatment, and analytical methods in revising these regulations to ensure that safe drinking water is protective of public health.

The TCEQ received an extension from EPA and then adopted the provisions of the Radionuclides Rule into the Texas Administrative Code in December 2004.

The concentration of radionuclide contaminants in the water entering the distribution system shall not exceed the following maximum contaminant levels: combined radium (radium isotopes No. 226 and No. 228) cannot exceed 5 picoCuries/liter (pCI/l); gross alpha-radiation emitters cannot exceed 15 pCI/l (not including radon and uranium); and effective December 8, 2003, 30 micrograms per liter (g/L) for uranium. The Texas rules states that MCLs (maximum contaminant levels) for beta particle and photon radioactivity from man-made radionuclides in drinking water in community water systems are equivalent to the MCLs under 40 Code of Federal Regulations (CFR) §141.66(d) as amended and adopted in the CFR through December 7, 2000, which was adopted by reference. The Texas Rule contains applicability, monitoring, reporting, and public notification requirements, and analytical requirements for radionuclide contaminants and compliance determination.

There are several water utilities currently providing water to the public from the Hickory and Marble Falls aquifers where radionuclide contaminates occur. These include some within Burnet County and San Saba County, within the Lower Colorado Region, as well as within seven counties in Region F, Mason, Brown, Coleman, Concho, McCulloch, Menard, and Kimble. Safe drinking water is a concern of these utilities. With Commission approval, utilities may be able to continue to use the water and/or bottled water on a temporary basis while they seek a long-term solution. Efforts have been made and/or are underway to develop alternative water sources or effective treatment and radioactive waste disposal. These small towns and water utilities have limited financial resources with which to treat the groundwater for municipal uses.

The LCRWPG recommends the State should provide adequate funding for alternative water supplies or for water treatment and radioactive waste disposal for those rural communities that may lose their water supply if such financial support is inadequate. In addition, State agencies should develop disposal procedures to provide for the safe handling of the radioactive wastes derived from the treatment processes.

8.1.14 Planning for Droughts Worse than the Drought of Record

8.1.14.1 Background Information

Taking action to address potential droughts worse than the drought of record (DWDR) events should be an integral part of risk management and developing water supply resiliency in water planning with a 50-year horizon. The 2016 Region K Water Plan, like most Regional Plans and the State Water Plan, was developed around hydrology associated with the 1950's drought. During the planning process for the 2016 Region K Plan, the Lower Colorado River was experiencing a significant drought. In the time after work was completed on the 2016 Region K Plan, the drought of the 2010's was declared to be a drought worse than the drought of record (DWDR) and supplanted the 1950's drought as the new drought of record for the Lower Colorado River Basin. The drought of the 2010's is now the benchmark for Region K planning purposes. The drought of the 1950's ended in 1957, and the drought of the 2010's began in 2007. This represents a 50-year span between the previous drought of record and the new drought of record, which coincides with the planning horizon.

From the 2017 State Water Plan:

- The plans are based on future conditions that would exist in the event of a recurrence of the worst recorded drought in Texas' history – known as the "drought of record" – a time when, generally, water supplies are the lowest and water demands are highest.
- The goal of the water planning process is to ensure that we have adequate water supplies in times of drought.
- Texas has a long history of drought, and there is no sign of that pattern changing; in fact, recent droughts remind us that more severe drought conditions could occur in the future.
- In the 2017 plan, **6 of the 16 regional planning groups indicated potential new droughts of record for their regions**[1], resulting in reduced estimates of existing surface water supplies. These weather assumptions, coupled with the fact that our state's population continues to boom, made this planning cycle the most challenging yet.

Planning for DWDR's is not currently a required part of the state or regional water planning framework. However, the Texas Water Development Board (TWDB) General Guidelines for Fifth Cycle of Regional Water Plan Development contain examples of measures for regional water planning groups (RWPGs) to use to address DWDR events. The Guidelines serve as a summary and augmentation of existing statutes and rules that govern regional and state water planning as described in Title 31 of the Texas Administrative Code (TAC) Chapters 355, 357, and 258. Two examples are identified in the Guidelines to help RWPGs address DWDR events[2]. Regions can request a variance to extend the hydrologic record to include "conditions that are worse than with the drought of record." Secondly, regions can request a variance to calculate reservoir safe yield. The Guidelines define reservoir safe yield as a modeling "modification to decrease the firm yield of a reservoir so that an identified annual volume is held in reserve in order to account for droughts worse than the drought of record." According to the 2016 Regional Plans, 7 of 16 regions[3] include safe yield modeling.

[1] 2017 State Water Plan, Section 3.6.2, Potential new drought of record periods reported for regions A, B, C, F, G, and K.

[2] TWDB Guidelines, April 2018, Section 3.6.2, See examples 3 and 4.

[3] 2016 Regional Plans for regions A, B, C, F, G, N, and O.

The hydrologic records used to develop the State and Regional plans are relatively short for the purposes of characterizing the worst possible drought conditions. Region K, like many other RWPGs, uses a hydrologic record that begins with 1940 for a total possible period of record of less than 100 years. Within that period of record, many short-term droughts have occurred as well as two longer drought of record events. Given the inherent nature of the regular drought and flood conditions that Texas is known for and the limited hydrologic data available for characterizing water availability extremes, it is important that the risks of future DWDR events be studied and that thoughtful consideration be given in the State and Regional Plans.

8.1.14.2 Policy Statements

The LCRWPG supports, as a minimum, the continued use of drought of record conditions as a baseline hydrologic benchmark in the planning process. It is essential that adequate water supplies are available through at least a repeat of the known historical worst conditions. However, the LCRWPG also recognizes that DWDR events are prudent to anticipate, as one was recently experienced in the Lower Colorado River watershed. Therefore, planning for future DWDR events should be an integral part of risk management and developing water supply resiliency in water planning, especially when considering the relatively short hydraulic record, projections for fast population growth, and increasing demands over the planning horizon.

The LCRWPG recommends the following:

- The State should provide funding for a study to:
    - identify the potential incremental impacts to the State's water resources for a range of DWDR events given the current planning process based on drought of record events,
    - recommend changes to the planning process to facilitate the development of water management strategies by RWPGs to address DWDR events, and
    - recommend methodologies for development of DWDR conditions for RWPGs to including in the planning process.
- Prior to the Sixth Cycle of Regional Water Planning, the TWDB should consider including in the Guidelines to RWPGs additional options and examples of variance requests to address DWDR planning.
- If appropriate, upon completion of the aforementioned study and prior to the Seventh Cycle of Regional Water Planning, the State should consider initiating a rulemaking process to amend TAC Title 31 Chapters 357 and 358 to incorporate planning for DWDR events and the associated water management strategies into the Regional and State Water Plans to improve risk management and the resiliency of future water supplies for the state.

8.1.14.3 Actions Needed

The Texas Legislature should provide funding to support a study regarding the potential impacts of DWDR events and, if appropriate, recommendations for incorporating DWDR event planning into the State and Regional Water Plans.

If appropriate, prior to the Sixth Cycle of Regional Water Planning, the TWDB should consider amending the Guidelines to the RWPGs to include additional options and examples of variance requests to address DWDR planning.

If appropriate, the State should consider amending title 31 Chapters 357 and 358 of the Texas Administrative Code to incorporate DWDR event planning in the Regional and State Water Plans.

8.1.14.4 Timing and/or Conflicts

Given the long time-frames associated with developing new water supplies or drought contingency measures sufficient to address DWDR events, the actions listed above should be taken immediately.

8.2 SUMMARY OF UNIQUE STREAM SEGMENT RECOMMENDATIONS

In accordance with the Texas Administrative Code 31 §357.8, RWPGs:

> *…may include in adopted regional water plans recommendations for all or parts of river and stream segments of unique ecological value located within the regional water planning area by preparing a recommendation package consisting of a physical description giving the location of the stream segment, maps, and photographs of the stream segment, and a site characterization of the stream segment documented by supporting literature and data.*

During the 2001 planning cycle, the LCRWPG reviewed information included in a list of Ecologically Significant Stream Segments within the Lower Colorado Regional Water Planning Area by Texas Parks and Wildlife (TPWD). From the information provided, the LCRWPG listed and provided background information on nine of the streams that were recommended by a subcommittee of the LCRWPG as warranting further study for potential designation as ecologically unique in the *2001 Region K Water Plan*. A tenth stream segment (Hamilton Creek) was added to this list as part of the *2006 Region K Water Plan*.

Within *Chapter 8* of the subsequent Region K Water Plans, the LCRWPG has continued to include the information on these ten streams and their recommendation for further study. No further study on any of the ten streams has taken place to date and no streams have been recommended by the LCRWPG for designation as "ecologically unique."

During the 2021 planning cycle, the Unique Stream Segments (USS) Committee met to discuss the history of the unique stream segment recommendation process the LCRWPG has gone through, and to determine what, if any, new actions needed to be taken.

The USS Committee developed recommendations for consideration by the full LCRWPG. The recommendations approved by the full LCRWPG at the April 24, 2019 Region K meeting include the following:

a. Before including in the Region K Water Plan any on-channel reservoir/dam water management strategies located on stream segments identified for further study for potential designation as ecologically unique in Chapter 8, Region K will conduct a higher level of additional screening, as defined by the LCRWPG, to determine potential ecological impacts. (Recommendation is not intended to include existing structures or diversion structures, recharge enhancement weirs, or flood control.)

b. The 2021 RWP will include a list of studies completed since 2000 relevant to segments listed in *Table 8A-1* in the 2016 RWP.

c. Recommend requesting sufficient funding from TWDB for the 2026 RWP to reevaluate stream segments based on criteria for potential identification as ecologically unique, using studies listed in *Action Item B*. Note that even if a reevaluated stream segment remains on the list of stream segments identified for further study for potential designation as ecologically unique in *Chapter 8*, or if stream segments are added to this list, the planning group, after weighing all considerations, may or may not choose to recommend the segments for designation as ecologically unique.

d. Request data from Region J and other relevant planning groups regarding any analysis of unintended consequences or other experiences resulting from unique stream segment designation.

e. Request a presentation from TWDB staff on 31 TAC §357.43 (b)(2) (see excerpt below) and how it has been implemented in regions with designated unique streams.

> *(2) For every river and stream segment that has been designated as a unique river or stream segment by the legislature, during a session that ends not less than one year before the required date of submittal of an adopted RWP to the Board or recommended as a unique river or stream segment in the RWP, the RWPG shall assess the impact of the RWP on these segments. The assessment shall be a quantitative analysis of the impact of the plan on the flows important to the river or stream segment, as determined by the RWPG, comparing current conditions to conditions with implementation of all recommended WMSs. The assessment shall also describe the impact of the plan on the unique features cited in the region's recommendation of that segment.*

As identified in item *b* above, a list of studies completed since 2000 relevant to relevant to the ten stream segments recommended for further study has been compiled and provided by TPWD staff and is included below. These studies will be considered in the next planning cycle in the reevaluation of stream segments for potential identification as ecologically unique, as described in item *c* above.

Acre, M. R. 2019. Assessing demography, habitat use, and flow regime effects on spawning migrations of Blue Sucker in the lower Colorado River, Texas. PhD Dissertation. Texas Tech University, Lubbock.

Bean, P. T., T. H. Bonner, and B. M. Littrell. 2007. Spatial and temporal patterns in the fish assemblage of the Blanco River, Texas. Texas Journal of Science 59:179-200.

Bendik N.F. 2017. Demographics, reproduction, growth, and abundance of Jollyville Plateau salamanders (*Eurycea tonkawae*). Ecol Evol. 7:5002–5015. https://doi.org/10.1002/ece3.3056

BIO-WEST, Inc. 2008. Lower Colorado River, Texas Instream Flow Guidelines - Colorado River Flow Relationships to Aquatic Habitat and State Threatened Species: Blue Sucker. Prepared for Lower Colorado River Authority and San Antonio Water System.

BIO-WEST, Inc. 2009. Assessment of Instream Flow Needs Associated with the Lometa Water System Diversion. Prepared for Lower Colorado River Authority

BIO-WEST, Inc. 2010. Assessment of Instream Flow Needs Associated with the Lometa Water System Diversion. Prepared for Lower Colorado River Authority and San Antonio Water System
.

Birdsong, T. W., G. P. Garrett, B. J. Labay, M. G. Bean, P. T. Bean, J. Botros, M. J. Casarez, A. E. Cohen, T. G. Heger, A. Kalmbach, D. A. Hendrickson, S. J. Magnelia, K. B. Mayes, M. E. McGarrity, R. McGillicuddy, M. M. Parker, and S. Robertson. 2019. Texas Native Fish Conservation Areas Network: strategic investments in restoration and preservation of freshwater fish diversity. Pages 183–229 *in* D. C. Dauwalter, T. W. Birdsong, and G. P. Garrett, editors. Multispecies and watershed approaches to freshwater fish conservation. American Fisheries Society, Symposium 91. Bethesda, Maryland.

Bonner, T., J. Duke, and BIO-WEST. 2017. Instream Flows Research and Validation Methodology Framework for the Colorado and Lavaca Rivers 2016-2017. Final report to the Texas Water Development Board for contract #1600012010. BIO-WEST, Inc., Round Rock, Texas. 73 p.

Broad, Tyson, Emily Seldomridge, Tom Arsuffi, and Kevin Wagner. 2016. Upper Llano River Watershed Protection Plan. Developed by the Upper Llano Watershed Coordination Committee. Texas Tech University, Lubbock and Texas Water Resources Institute, College Station. 178 p.

City of Austin. 2008. Lower Bull Creek District Park Contact Recreation Use Assessment. SR-08-02. Austin, Texas.

City of Austin. 2013. Major Amendment and Extension of the Habitat Conservation Plan for the Barton Springs Salamander (*Eurycea sosorum*) and the Austin Blind Salamander (*Eurycea waterlooensis*) to allow for the Operation and Maintenance of Barton Springs and Adjacent Springs. Austin, Texas.

Cohen, A. E., G. P. Garrett, M. J. Casarez, D. A. Hendrickson, B. J. Labay, T. Urban, J. Gentle, D. Wiley, and D. Walling. 2018. "Final Report: 'Conserving Texas Biodiversity: Status, Trends, and Conservation Planning for Fishes of Greatest Conservation Need' (Contract No. 459125 UTA14-001402)," Texas Parks and Wildlife Department through U.S. Fish and Wildlife Service State Wildlife Grant Program, grant TX T-106-1 (CFDA# 15.634), January, 362 pages.
https://doi.org/10.15781/T26M33M7Z

Colorado River BBEST (Colorado and Lavaca Rivers and Matagorda and Lavaca Bays Basin and Bay Expert Science Team). 2011. Environmental flow regime recommendations report. Final submission to the Colorado and Lavaca Rivers and Matagorda and Lavaca Bays Basin and Bay Area Stakeholder Committee, Environmental Flows Advisory Group, and Texas Commission on Environmental Quality, Austin, Texas.

Duncan, H., H. Perry and A. Richter. 2010. Bull Creek Update Report 2010. City of Austin Environmental Resource Management Division SR-10-17. Austin, Texas.

German, D., D. D. Diamond, L. F. Elliott, A. Treuer-Kuehn, K. Ludeke and J. Scott. 2009. Texas Ecological Systems Project Phase 1 Interpretive Booklet. Accompanies Ecological Systems GIS DataLayer. Texas Parks and Wildlife Department, Austin (internal document).

Groeschel J. R. 2013. Evaluations of growth and habitat use by Guadalupe Bass at a riverscape scale in the South Llano River, Texas. Master's thesis. Lubbock: Texas Tech University.

Groeschel-Taylor, J. R., S. Miyazono, T. B. Grabowski, and G. P. Garrett. 2019. Growth and habitat use of Guadalupe Bass in the South Llano River, Texas. Journal of Fish and Wildlife Management In-Press. https://doi.org/10.3996/022018-JFWM-015

Hassan-Williams, C. and T.H. Bonner. 2009. Texas Freshwater Fishes Website. Texas State University – San Marcos. http://www.bio.txstate.edu/~tbonner/txfishes/index.htm

Heitmuller, F. T. 2009. Downstream Trends of Alluvial Sediment Composition and Channel Adjustment in the Llano River Watershed, Central Texas, USA: The Roles of a Highly Variable Flow Regime and a Complex Lithology, Ph.D. Dissertation, University of Texas, Austin, TX. http://repositories.lib.utexas.edu/handle/2152/6900

Herrington, C. and M. Scoggins. 2008. Lower Bull Creek District Park contact recreation use assessment. SR08-02, City of Austin, TX.

Magnelia, S. J., K. B. Mayes, M. G. Bean, C. L. Loeffler and D. D. Bradsby. 2019. Four decades of conserving native fish in the Colorado River Watershed, Texas. Pages 269–292 *in* D. C. Dauwalter, T. W. Birdsong, and G. P. Garrett, editors. Multispecies and watershed approaches to freshwater fish conservation. American Fisheries Society, Symposium 91. Bethesda, Maryland.

Perkin, J. S., Z. R. Shattuck, P. T. Bean, T. H. Bonner, E. Saraeva, and T. B. Hardy. 2010. Movement and microhabitat associations of Guadalupe Bass in two Texas rivers. North American Journal of Fisheries Management 30(1):33–46. http://www-personal.k-state.edu/~jperkin/Publications/Perkin%20et%20al%202010%20M%20treculii.pdf

Perry, H. A. 2008. Bull Creek water quality, benthic macroinvertebrate and stream habitat survey 2008. City of Austin Balcones Canyonlands Preserve – Permit 08-004.

Poff, N. L. and J. K. H. Zimmerman. 2010. Ecological Responses to Altered Flow Regimes – a Literature Review to Inform the Science and Management of Environmental Flows: Freshwater Biology, v. 55, p. 194-205. http://rydberg.biology.colostate.edu/~poff/Public/poffpubs/Poff_Zimmerman_2010_FWB.pdf

U.S. Fish & Wildlife Service. 2005. Recovery plan for the Barton Springs Salamander, *Eurycea sosorum*. Albuquerque, NM.

U.S. Fish & Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Determination of Endangered Species Status for the Austin Blind Salamander and Threatened Species Status for the Jollyville Plateau Salamander Throughout Their Ranges; Final Rule. Federal Register, 78, 1–50.

No new unique ecological stream segments are recommended for further study by the LCRWPG for this planning cycle. The ten unique stream segment recommendations for further study from the *2006 Region K Plan*, which the LCRWPG continues to recommend for further study, can be found in *Appendix 8A*.

8.3 SUMMARY OF POTENTIAL SITES UNIQUELY SUITED FOR RESERVOIRS

In accordance with the Texas Administrative Code 31 §357.9, RWPGs:

> *…may recommend sites of unique value for construction of reservoirs by including descriptions of the sites, reasons for the unique designation, and expected beneficiaries of the water supply to be developed at the site.*

No potential reservoir sites were recommended for designation as unique by the LCRWPG in past planning cycles. No potential reservoir sites are recommended by the LCRWPG for this planning cycle.

APPENDIX 8A

UNIQUE STREAM SEGMENT RECOMMENDATIONS FOR FURTHER STUDY FROM THE 2006 REGION K PLAN

This section provides background information on the ten streams in the Lower Colorado Region identified and recommended by the Subcommittee (originally the first nine during the 2001 planning cycle and the tenth during the 2006 planning cycle) as warranting further study for consideration of designation as ecologically unique (*Table 8A.1*).

Table 8A.1 Stream Segments Identified for Further Study for Potential Designation as Ecologically Unique

Stream Segment	Location
Barton Springs segment of the Edwards Aquifer	Recharge stretches of Barton, Bear, Little Bear, Onion, Slaughter, and Williamson Creeks in Travis and Hays Counties
Bull Creek	From the confluence with Lake Austin upstream to its headwaters in Travis County
Colorado River	Within TCEQ classified Segments 1409 and 1410 including Gorman Creek in Burnet, Lampasas, and Mills Counties
Colorado River	TCEQ classified Segments 1428 and 1434 in Travis, Bastrop, and Fayette Counties
Colorado River	TCEQ classified Segment 1402 including Shaws Bend in Fayette, Colorado, Wharton, and Matagorda Counties
Cummins Creek	From the confluence with the Colorado River upstream to FM 159 in Fayette County
Llano River	TCEQ classified Segment 1415 from the confluence with Johnson Creek to CR 2768 near Castell in Llano County
Pedernales River	TCEQ classified Segment 1414 in Kimball, Gillespie, Blanco, and Travis Counties
Rocky Creek	From the confluence with the Lampasas River upstream to the union of North Rocky Creek and South Rocky Creek in Burnet County.
Hamilton Creek	From the outflow of Hamilton Springs to the confluence with the Colorado River.

8A.1 Barton Creek Within the TCEQ Classified Stream Segment 1430 From the Confluence With Town Lake in Travis County to FM 12 in Hays County

Barton Creek is the TCEQ classified stream Segment 1430 and extends from the confluence with Town Lake in Travis County to FM 12 in Hays County. The creek is in the Central Texas Plateau ecoregion and the watershed lies within the live oak-ashe juniper woods vegetation association. Water quality is generally good to exceptional, although coliform levels are occasionally elevated after storm events. Nitrite levels can also be high due to the influence of groundwater. Substrate is typically limestone bedrock with rubble, boulders, and gravel. The upper portions of the streams are generally intermittent, except in spring-fed reaches, which limits aquatic habitat. A comprehensive list of literature about the Barton Springs portion of the Edwards aquifer was prepared by the City of Austin in collaboration with the Austin History Center, and is available at http://www.ci.austin.tx.us/aquifer/. Barton Creek meets the following criteria for designation as ecologically unique:

- Riparian Conservation Area: the lower end of the stream is in the City of Austin's Zilker Park
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages; the stream

exhibits high dissolved oxygen (DO) concentrations and a diverse and complex benthic macroinvertebrate community

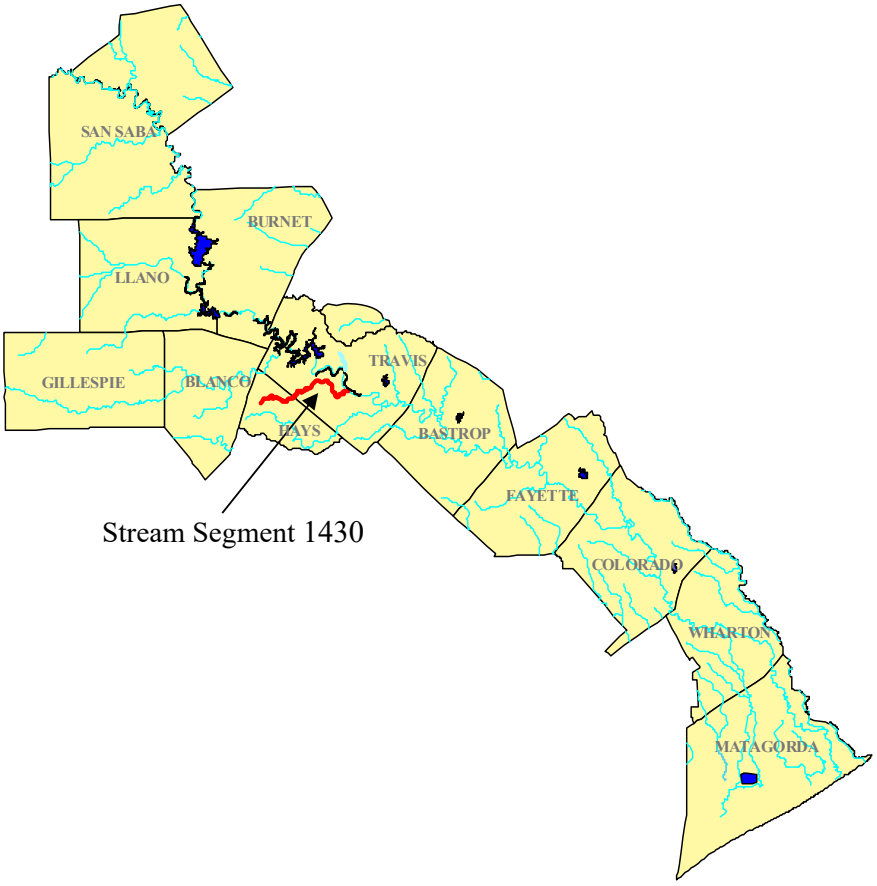
- Endangered/Threatened Species: the stream contains the only known population of the Barton Springs salamander (*Eurycea sosorum*), a federally listed endangered species

8A.2 Bull Creek From the Confluence With Lake Austin Upstream to its Headwaters

Bull Creek lies wholly within Travis County in the northwest portion of the City of Austin (*Figure 8.2*). The watershed for the stream is approximately 32 square miles in a rapidly developing area. The watershed is located on the eastern edge of the Texas Hill Country and immediately west of the Balcones Fault Zone. Numerous seeps and springs provide baseflow to Bull Creek. Water quality is generally good, although some degradation has occurred due to development. The Bull Creek watershed contains suitable habitat for a variety of rare and endangered species including the Golden-Cheeked Warbler (*Dendroica chrysoparia*), Black-Capped Vireo (*Vireo atricapillus*), Tooth Cave spider (*Neoleptoneta myopica*), Tooth Cave pseudoscorpion (*Tartarocreagris texana*), Bee Creek Cave harvestman (*Texella redelli*), Bone Cave harvestman (*Texella redelli*), Tooth Cave ground beetle (*Rhadine persephone*), Kretshcmarr Cave mold beetle (*Texamaurops reddeli*), and Jollyville Plateau salamander (*Eurycea* sp.). In addition, the watershed contains a very diverse flora. Bull Creek meets the following criteria for designation as ecologically unique:

- Biologic Function: nearly pristine stream with a largely intact riparian area
- Hydrologic Function: pervious cover and intact riparian zone reduce downstream flooding
- Riparian Conservation Area: Bull Creek Preserve
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: overall pristine nature gives the stream a high aesthetic value; stream has a diverse and complex benthic macroinvertebrate community, and an abundance and diversity of amphibians
- Endangered/Threatened Species: the stream contains a population of the Jollyville Plateau salamander (*Eurycea* sp.), a federally listed endangered species

Figure 8A.1: Location and Map of Barton Creek Stream Segment 1430



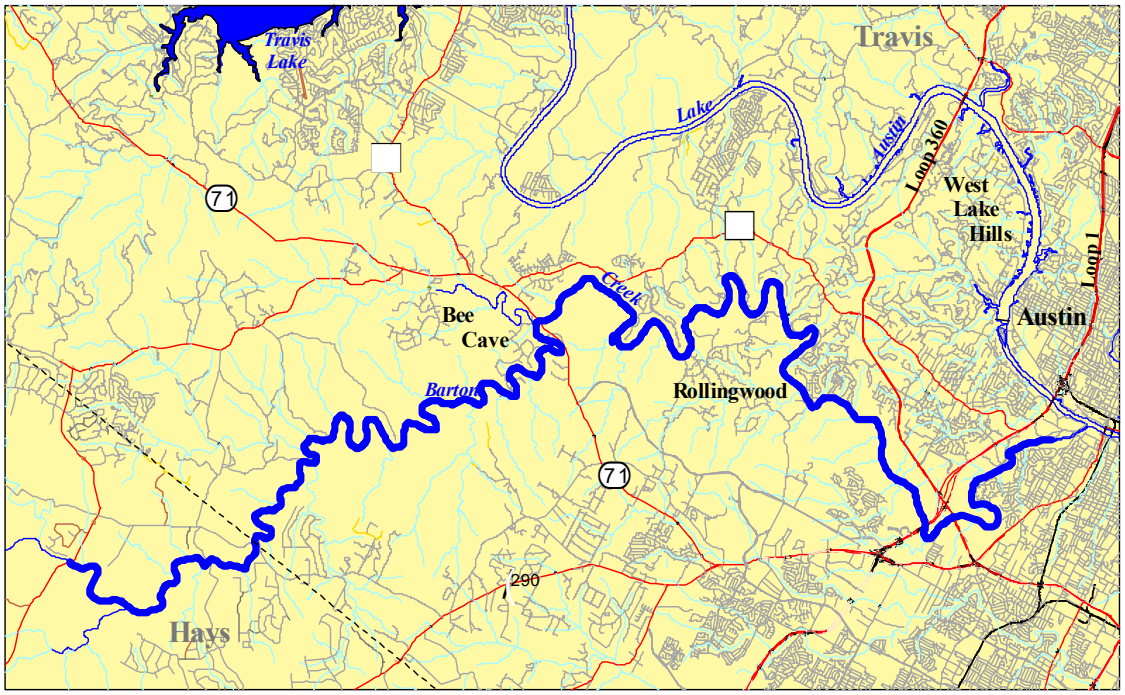
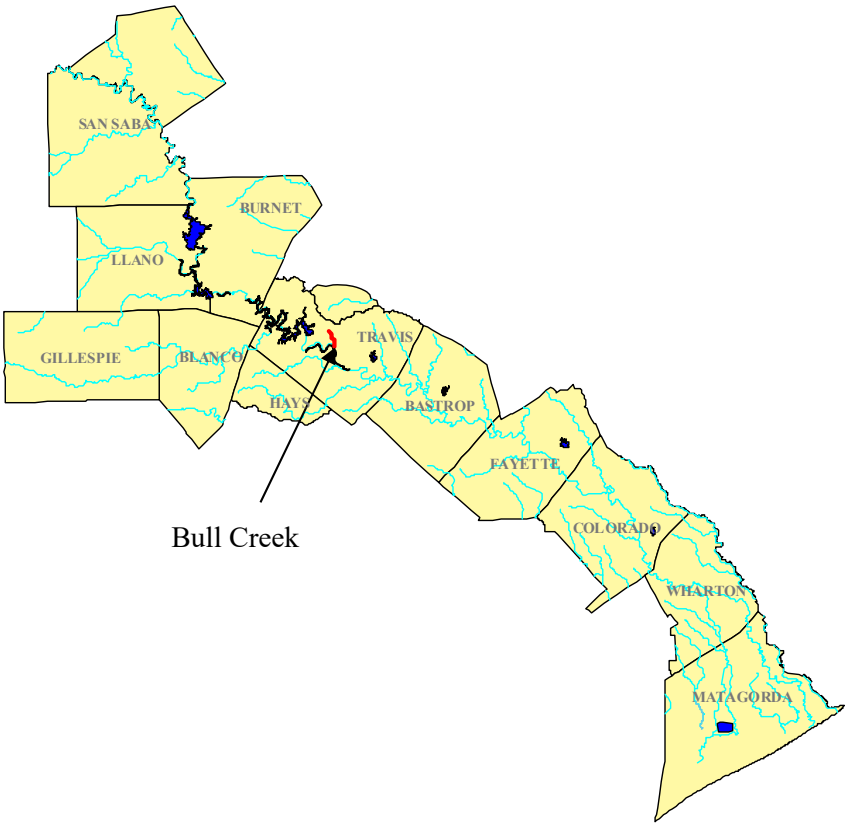
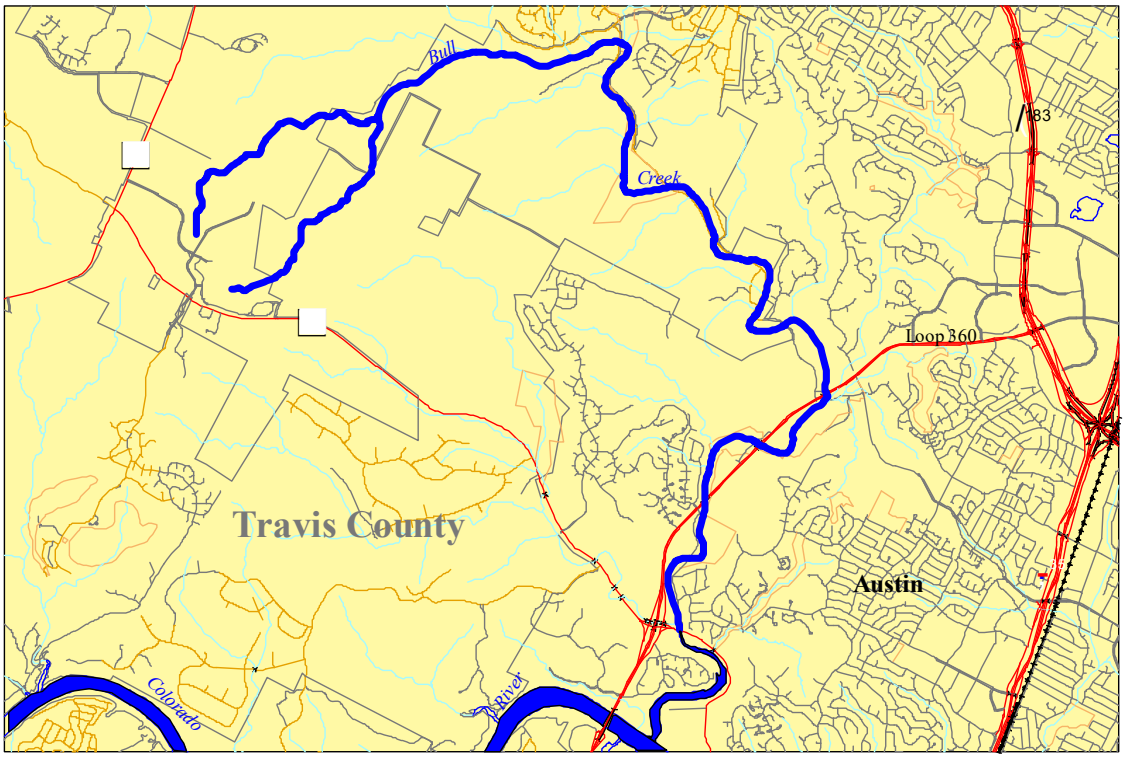


Figure 8A.2: Location of Bull Creek





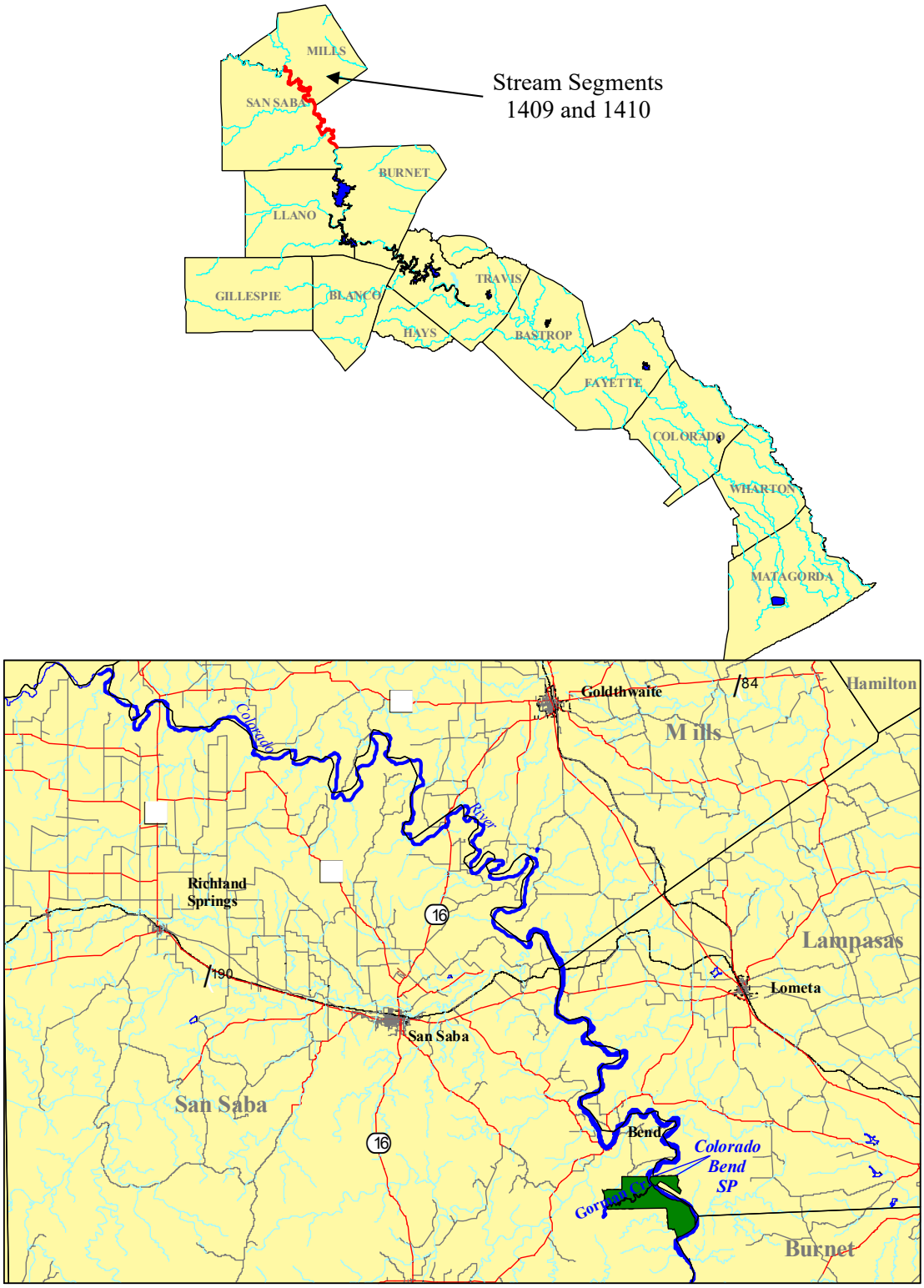
8A.3 Colorado River Within TCEQ Classified Stream Segments 1409 and 1410 Including Gorman Creek in Burnet, Lampasas, and Mills Counties

This segment consists primarily of the Colorado River upstream of Lake Buchanan to the Brown/San Saba/Mills county line, but also includes the Gorman Creek tributary (*Figure 8.3*). The stream segment is within the Central Texas Plateau ecoregion. Vegetation types common along the stream are mostly live oak-juniper parks. The river itself is wide and relatively shallow, flowing over a bed of limestone and gravel. A few stretches of small rapids exist on the upper part of this section down to the point where the backwaters of Lake Buchanan deepen the river and slow its flow.

Among the segment's scenic attributes are high limestone bluffs, vistas of rugged cedar-covered hills, and the existence of one of the most spectacular waterfalls in Texas. Gorman Falls is formed at the point where Gorman Creek tumbles into the Colorado River over a 75-foot-tall limestone bluff. The water coming from the creek is clear and cold, and many ferns and mosses grow on the slippery rocks and travertine deposits below the falls. The TCEQ identifies the segment as having a high aquatic life use. The National Park Service identified the segment for inclusion in the National Rivers Inventory based on the degree to which the river is free-flowing, the degree to which the river and corridor is undeveloped, and the outstanding natural and cultural characteristics of the river and its immediate environment. The segment meets the following criteria for designation as ecologically unique:

- Biologic Function: white bass spawning area
- Riparian Conservation Area: Colorado Bend State Park
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: exceptional aesthetic value
- Endangered/Threatened Species: Concho water snake (Nerodia paucimaculata), a federal and state listed endangered species, as well as the rare and endemic mollusks, Texas fawnfoot and Texas pimpleback

Figure 8A.3: Location of the Colorado River Within TCEQ Classified Stream Segments 1409 and 1410

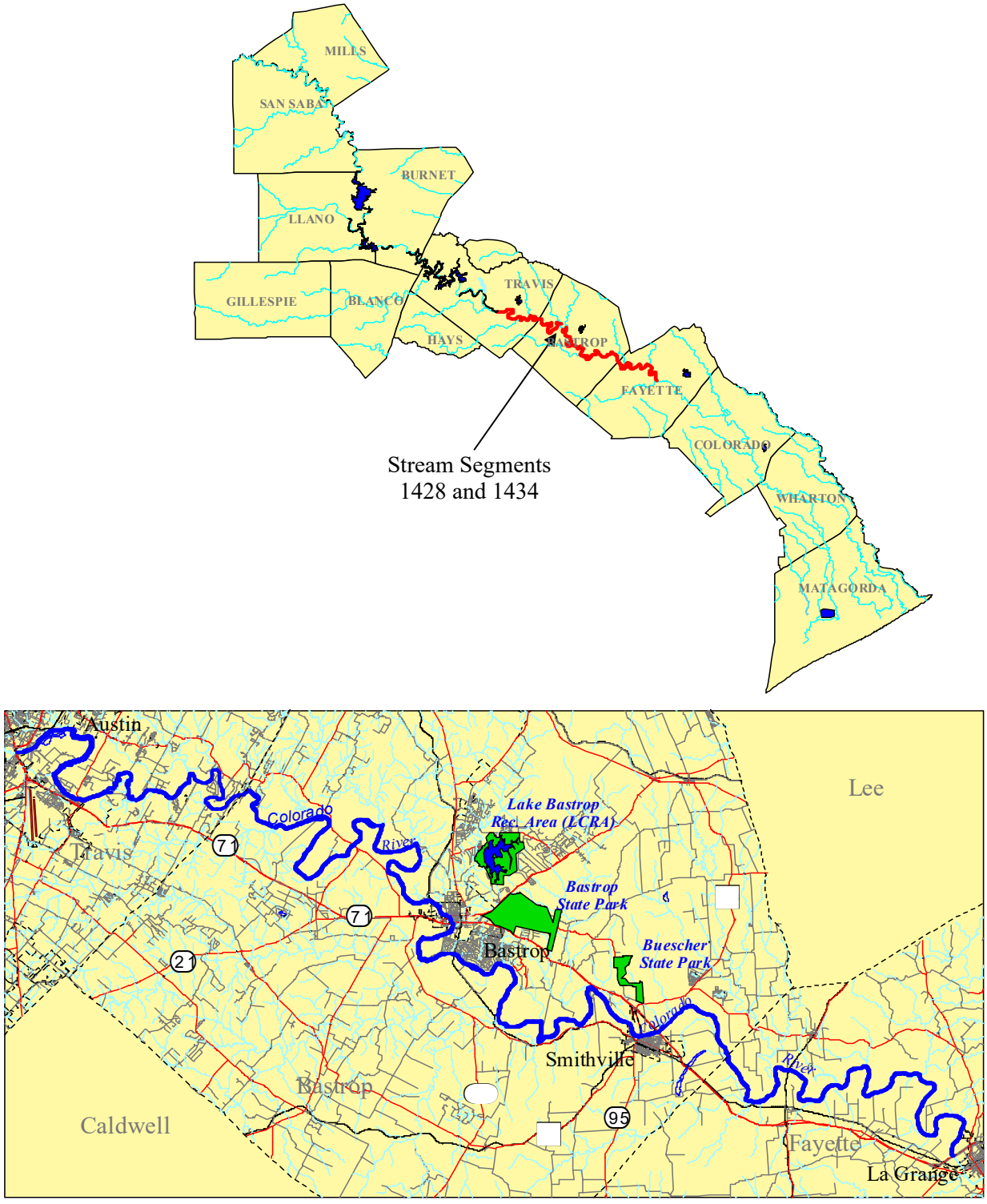


8A.4 Colorado River Within TCEQ Classified Stream Segments 1428 and 1434 in Travis, Bastrop, and Fayette Counties

The segment includes the Colorado River from a point 100 meters downstream of SH 71 in La Grange to Longhorn Dam in Austin and portions of Wilbarger, Big Sandy, Alum, and Cedar Creeks in Bastrop County (*Figure 8.4*). Extensive information about the segment in Bastrop County, submitted by the Bastrop County Environmental Network (BCEN), is presented in *Appendix 8B*. In general, water levels in the Colorado River are controlled by releases from Lake Travis and Lake Buchanan. Return flows from various sources, including the City of Austin, can be a significant contributor to instream flow during dry periods. Instream flows in the smaller creeks within Bastrop County originate from diffuse surface water runoff, groundwater contributions, and springs. The segment lies within the Texas Blackland Prairies ecoregion. Substrate in the streams is typically sand and/or gravel. Several reaches of the segment are characterized by rubble and boulder fields. The TCEQ has classified the mainstem river as supportive of exceptional aquatic life uses. Water quality is generally good although nutrient levels are often elevated. Water quality in the creeks is typically good but influenced by flow levels, land use patterns, and wastewater discharges. Cedar Creek contains an exceptional macroinvertebrate community and, based on the ichthyofauna, a high Index of Biotic Integrity rating. This portion of the Colorado River has a diverse fish community, including the state listed threatened blue sucker (*Cycleptus elongatus*). In addition, the state and federally listed endangered Houston toad (*Bufo houstonensis*) occurs in the area. The segment meets the following criteria for designation as ecologically unique:

- Biologic Function: undeveloped riverine habitat, part of the Central Flyway of migratory birds
- Hydrologic Function: extensive riparian zone attenuates flooding and improves water quality via filtration and soil stabilization; riparian and stream channels hydrologically connected to an alluvial aquifer and the Carrizo-Wilcox aquifer
- Riparian Conservation Area: McKinney Roughs Environmental Learning Center
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: exceptional aquatic life use
- Endangered/Threatened Species: blue sucker (*Cycleptus elongatus*), a state listed endangered species and the federal and state listed endangered Houston toad (*Bufo houstonensis)*

Figure 8A.4: Location of the Colorado River Within TCEQ Classified Stream Segments 1428 and 1434



8A.5 Colorado River Within the TCEQ Classified Stream Segment 1402 in Fayette, Colorado, Wharton, and Matagorda Counties

The segment extends from just downstream of the Missouri-Pacific Railroad trestle in Matagorda County to a point 100 meters downstream of SH 71 in La Grange, a distance of 150 miles (*Figure 8.5*). The segment lies within the Texas Blackland Prairies ecoregion and flows into the East Central Texas Plains ecoregion. Substrate varies from primarily gravel in the upper reaches of the segment to gravel/cobble riffles and extensive sand-dominated reaches downstream. Instream flow is largely dependent on upstream releases for rice irrigation but also receives contributions from the intervening watershed. The water quality of the segment is typically good and supports a high aquatic life use designation. Nutrient levels are elevated, but DO concentrations are typically higher than the minimum required to maintain a high aquatic life use designation. The fish community is generally diverse and includes the blue sucker (*Cycleptus elongatus*), a state listed endangered species. Although not contained in this report, additional information about the segment is available in feasibility studies performed by ECS Technical Services for the U.S. Department of the Interior, which includes the proposed Shaw's Bend Reservoir site in Colorado County. The segment meets the following criteria for designation as ecologically unique:

- Biologic Function: undeveloped riverine habitat, part of the Central Flyway of migratory birds
- Endangered/Threatened Species: blue sucker (*Cycleptus elongatus*), a state listed endangered species

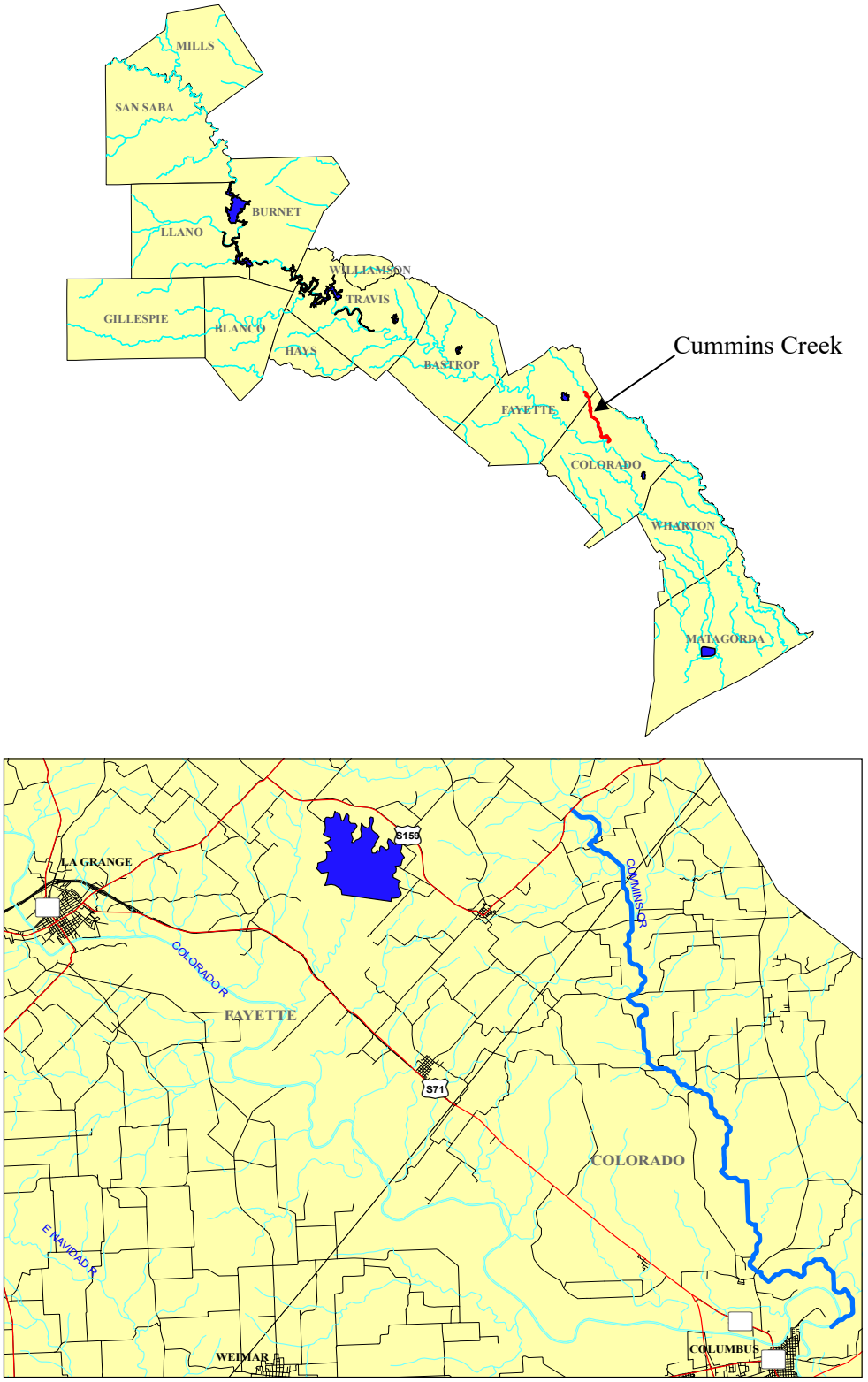
8A.6 Cummins Creek From the Confluence With the Colorado River in Colorado County Upstream to FM 159 in Fayette County

Cummins Creek lies within the Texas Blacklands Prairie ecoregion in Colorado and Fayette Counties (*Figure 8.6*). The stream is characterized by shallow to moderately deep pools, riffles, and occasional shallow runs. Substrate is predominantly fine sands with gravel and rubble in riffles and runs. Cummins Creek is within the post oak savannah vegetation region. The surrounding land use is mostly agricultural. Water quality is generally good, and the stream supports diverse macroinvertebrate and fish communities. The LCRA rated the creek, which has at least 27 species of fish as suitable for a high aquatic life use for fish. Among the fish species that have been collected in the stream is the Guadalupe bass (*Micropterus treculi*). Cummins Creek supports at least 28 species of aquatic macroinvertebrates. Several varieties of mayflies and caddisflies, which are considered intolerant of pollution, are present. Cummins Creek was rated an excellent aquatic life use category for macroinvertebrates based on work by the LCRA. The segment meets the following criteria for designation as ecologically unique:

- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages the stream
- Exhibits High Dissolved Oxygen Concentrations and a diverse and complex benthic macroinvertebrate community

Figure 8A.5: Location of the Colorado River Within the TCEQ Classified Stream Segment 1402

Figure 8A.6: Location of Cummins Creek



8A.7 Llano River Within the TCEQ Classified Stream Segment 1415 From the Confluence With Johnson Creek to County Road 2768 Near Castell in Llano County

The Llano River between the confluence with Johnson Creek and County Road (CR) 2768 in Llano County is part of TCEQ classified stream Segment 1415 (*Figure 8.7*). The Llano River is a spring-fed stream of the Edwards Plateau and is widely known for its scenic beauty. It is in the Central Texas Plateau ecoregion and is characterized by the live oak-mesquite parks vegetation type. Riparian vegetation includes elm, willow, sycamore, and salt-cedar. The stream has designated water uses for contact recreation, as a public water supply, and for high aquatic life uses. Among the fish found in the stream is the Guadalupe bass (*Micropterus treculi*). The substrate is composed of limestone bedrock and gravel. In addition, large boulders and slabs of granite and gneiss occur in the river. This section of the Llano River is widely known for the one-billion-year-old igneous and metamorphic rocks, which form the riverbed. The area is a part of the Llano Uplift, which is one of the most unique geologic features in Texas. Land use along the stream is generally rural and includes ranching and agriculture. The segment meets the following criteria for designation as ecologically unique:

- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: exceptional aesthetic value

8A.8 Pedernales River Within the TCEQ Classified Stream Segment 1414 in Kimball, Gillespie, Blanco, and Travis Counties

The Pedernales River from a point immediately upstream of the confluence of Fall Creek in Travis County upstream to FM 385 in Kimble County makes up the TCEQ classified stream Segment 1415 (*Figure 8.8*). Most of this segment lies within the LCRWPA. The Pedernales River in general has high water quality and supports a high aquatic life use. The stream is within the Central Texas Plateau ecoregion. Surrounding vegetation is characteristic of the live oak-ashe juniper parks and live oak-mesquite-ashe juniper parks vegetation regions. The river is spring-fed and free flowing, with many limestone outcroppings. The National Park Service identified the segment for inclusion in the National Rivers Inventory based on the degree to which the river is free flowing, the degree to which the river and corridor is undeveloped, and the outstanding natural and cultural characteristics of the river and its immediate environment. Bald cypress, red columbine, and native orchids are found adjacent to the river. Among the fish species that occur in the stream is the Guadalupe bass (*Micropterus treculi*). Other aquatic species typical of Hill Country spring-fed streams also inhabit the Pedernales River. Along the river are several state and national parks including Pedernales Falls State Park, LBJ State Park, and LBJ National Park. The segment meets the following criteria for designation as ecologically unique:

- Biologic Function: significant natural area
- Riparian Conservation Area: Pedernales Falls State Park, LBJ State Park, LBJ National Park, and Stonewall Park
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: exceptional aesthetic value

Figure 8A.7: Location of the Llano River From Johnson Creek Confluence to CR 2768

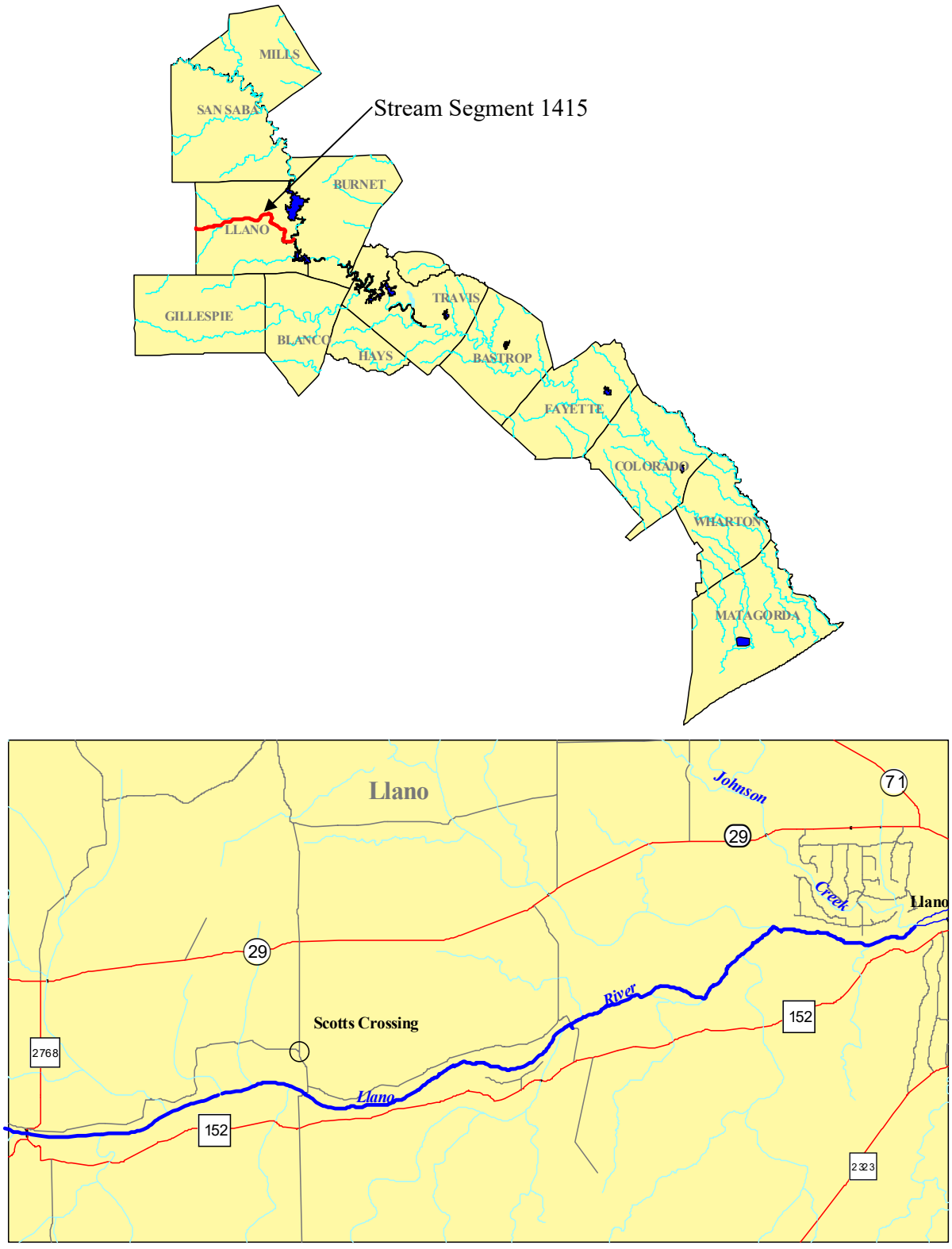
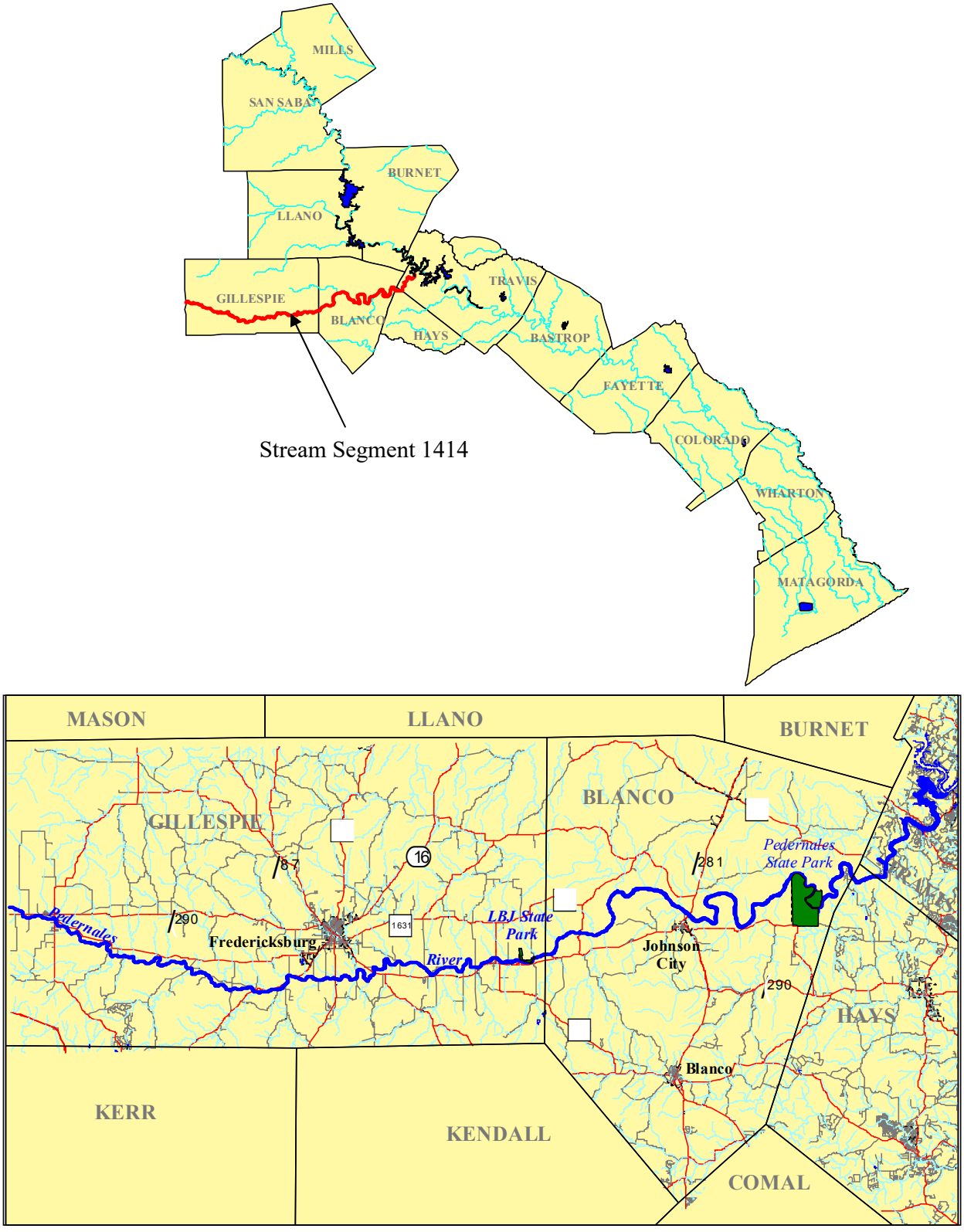


Figure 8A.8: Location of the Pedernales River Within the LCRWPA



8A.9 Rocky Creek From the Confluence With the Lampasas River Upstream to the Union of North Rocky Creek and South Rocky Creek in Burnet County

Rocky Creek lies within the Brazos River Basin in northeast Burnet County (*Figure 8.9*). The stream is approximately 6 miles long with a drainage area of 94 square miles. The stream is in the Central Texas Plateau ecoregion and within the oak-mesquite-juniper parks/woods vegetation association. The upper reach flows through the live oak-ashe juniper parks association. Long deep runs with numerous short riffles and occasional deep glides characterize the creek morphology. Limestone bedrock, gravel, and rubble are the dominant substrate types. In sampling for the Texas Aquatic Ecoregion Project, 54 species of aquatic invertebrates and 15 species of fish were collected. The segment meets the following criteria for designation as ecologically unique:

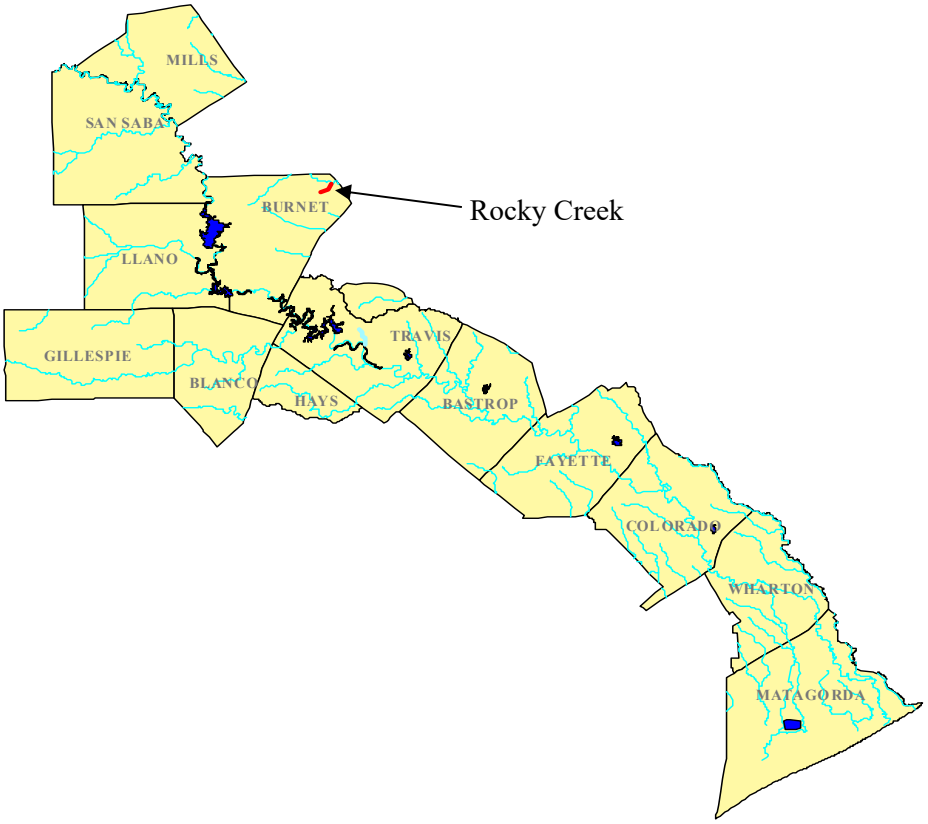
- High Water Quality/Exceptional Aquatic Life/High Aesthetic Value: the stream was selected as an ecoregion stream based on its physical attributes, water quality, and biological assemblages; the stream exhibits high DO concentrations and a diverse and complex fish and benthic macroinvertebrate community.

8A.10 Hamilton Creek From the Confluence With the Colorado River Upstream to the Outflow of Hamilton Springs in Burnet County

Hamilton Creek originates at Hamilton Springs in south central Burnet County 5 miles northwest of Burnet and flows south for 22 miles to its confluence with the Colorado River in TCEQ classified stream segment 1404 (*Figure 8.10*). The upper reaches of Hamilton Creek are intermittent with flow increasing downstream due to municipal discharges from the City of Burnet and other sources. The stream flows through the Edwards Plateau ecoregion, a region of limestone outcrops and a mixture of granitic and sandy soils. Throughout the Edwards Plateau live oak, shinnery oak, mesquite and juniper dominate the woody vegetation. There is a limited riparian cover adjacent to the stream. TCEQ identifies Hamilton Creek as Segment 1404A with water body uses for contact recreation and fish consumption with an intermediate aquatic life use.

Following the adoption of the Region K Water Supply Plan, the LCRWPG was made aware of a proposed open pit mine being considered in Burnet County adjacent to Hamilton Creek. Local residents in the area around Hamilton Creek came to the RWPG indicating that the pristine nature of the creek was unique and worthy of consideration as a Unique Steam Segment (USS). The hope was that such a designation would protect the creek from potential adverse impacts due to the proposed mining operation. The RWPG, on December 11, 2002, took action on this request by authorizing the issuance of a letter from the RWPG to the TCEQ and the LCRA expressing concerns about excessive water mining and non-point source pollution damage to the creek. At the February 12, 2003, RWPG meeting, the group approved the recommendation that Hamilton Creek, from the outflow of Hamilton Springs to the Colorado River, be designated as a USS and that the recommendation be submitted to a local legislator for consideration during the 78th Legislative Session. The designation of Hamilton Creek as a USS was not passed during the 78th Texas Legislative Sessions.

Figure 8A.9: Location of Rocky Creek in Burnet County



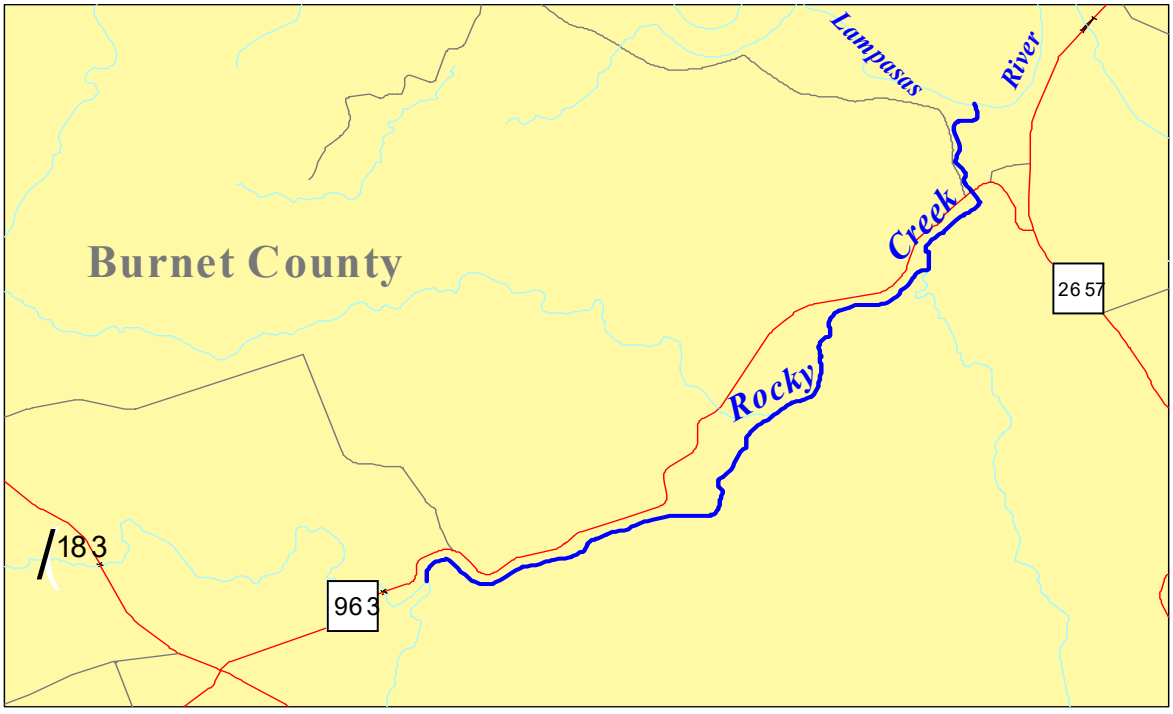
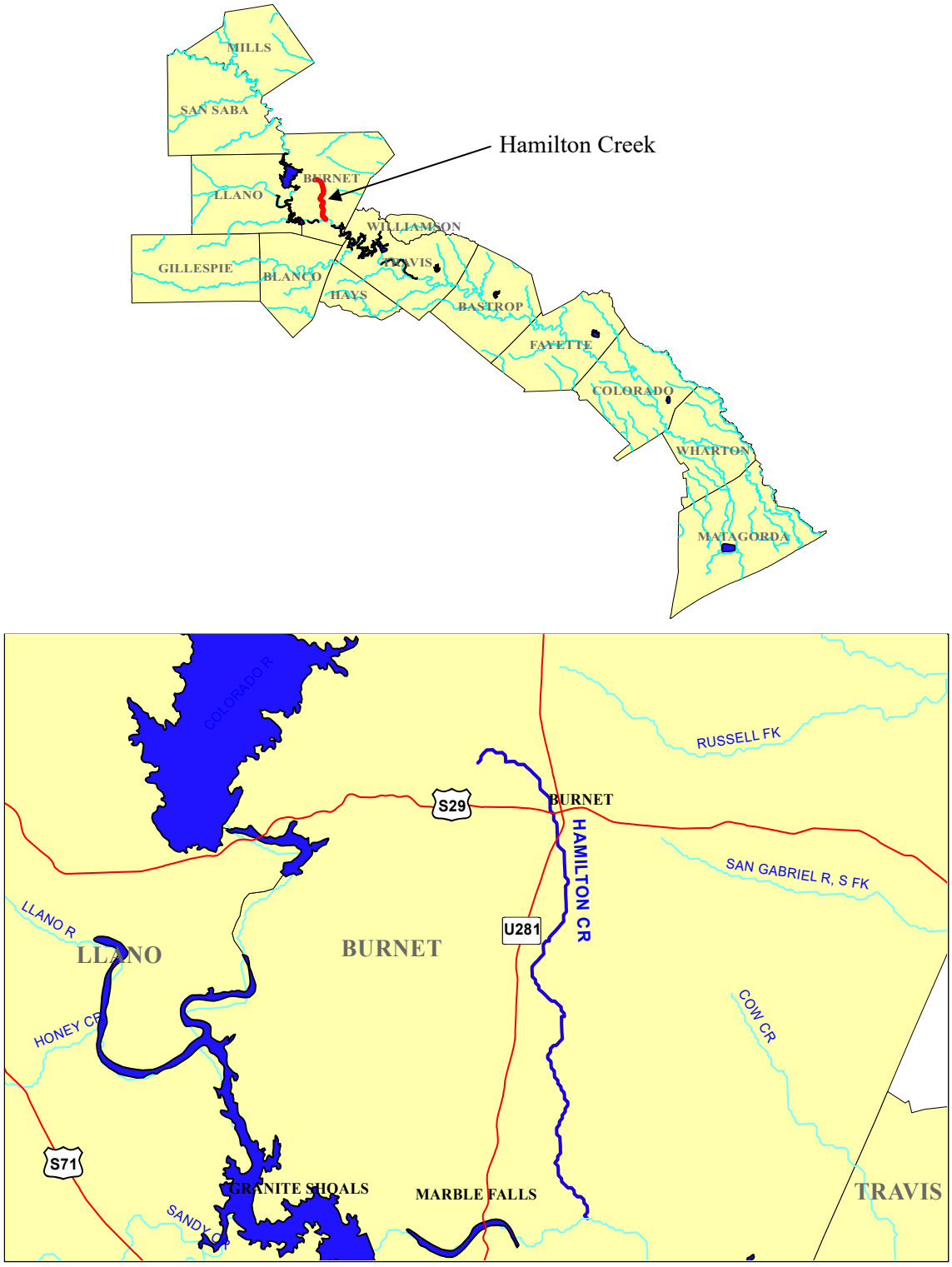


Figure 8A.10: Location of Hamilton Creek in Burnet County



8A.11 Conclusions and Recommendations

The protection intended to be provided by the designation of a river or stream segment as ecologically unique is to preclude a state agency or political subdivision of the state from financing the actual construction of a reservoir in a specific river or stream segment designated by the legislature as ecologically unique. In addition numerous programs presently exist to protect areas of special ecological significance. Since the LCRWPG currently has not recommended strategies for state financed reservoirs on any of the ten identified stream segments, and in the absence of additional environmental data, the LCRWPG takes no action at this time to designate these stream segments as ecologically unique. However, further study may be warranted in future Lower Colorado Regional Water Plans.