Environmental Stewardship
A Sustainable Ecosphere

January 7, 2015

Submitted by website and by hand

Kathy Alexander
Texas Commission on Environmental Quality
P.O. Box 13087, MC-160
Austin, Texas, 78711-3087

Re: LCRA Water Management Plan (WMP)

"Saving the water and the soil must start where the first raindrop falls."
Lyndon B. Johnson

Dear Ms. Alexander,

Management of the Colorado River basin in a manner that will sustainably provide for the human and environmental needs of the basin will require a broader and more ecologically sound platform. We will not progress into a sustainable future by simply amending and updating the current WMP using the same *old* principles. We must find, and agree upon, a new paradigm. In 2013 a working group convened with the specific objective of developing water planning and management principles[1] (Attachment 1). Environmental Stewardship (ES) is a signatory to the resulting principles that form the foundation of our comments herein. ES will attempt to show, through this letter and input throughout the remaining portion of this review process, that:

A1. External factors have had catastrophic impacts: The current drought has demonstrated that the current water management plan (WMP) has not adequately addressed several external factors[2] that have catastrophically impacted the basin, and, if left unchecked, will sabotage any attempt to meet the WMP's objectives unless likewise managed.

A2. The extent and severity of this drought is man-made: The drought has demonstrated that, though the lack of "normal" rainfall[3] has brought us to this condition, the extent and severity of the current drought is likely significantly worse than the drought-of-record due to man's management practices and unrealistic expectations[4] (some of which have been codified in law).

A3. Conjunctive management is needed: Future management practices will, of necessity, need to include conjunctive[5] management of the land, the surface waters, and the aquifers that intersect the basin.

A4. Environmental flows are *essential*: Future management practices must guarantee a solid base of environmental flows to meet critical subsistence and threshold flow needs of the river and bay[6]. Environmental flows are *essential* water demands.

To address these issues, Environmental Stewardship (ES) urges the TCEQ and LCRA to jointly provide the leadership necessary to recognize, understand and address the critical issues facing Central Texas and the basin by taking the following steps:

B1. Investigate rainfall trends: Do the investigative research necessary to confirm or refute the indicative rainfall data, and to estimate the inflows that would have been expected from the rainfall received in the upper basin without impediments to stream flows. Incorporate rainfall into the model used to manage the basin and link the model to predictive rainfall models.

B2. Investigate land use practices and trends: Do the investigative research to identify and quantify changes in land management practices in the upper basin that have impacted on freshwater inflows to the Highland Lakes. Identify land management practices that will reduce the severity of these impacts. Include the following: 1) brush and rangeland management, especially mesquite in and around streambeds, 2) small reservoirs and other rainwater catchment practices (rooftop and cisterns) that intercept rainfall, and 3) agricultural practices including irrigated crops such as cotton.

B3. Incorporate groundwater into the water management plan: Partner with, on a co-equal regulatory basis, groundwater conservation districts (GCD) throughout the basin to understand and quantify the impacts of groundwater pumping on surface water flow in the river systems. Work with GCDs to identify regulatory and management practices that will reduce the impact of groundwater pumping. Estimate the impacts of groundwater pumping in major aquifers and regions on future stream flow throughout the basin.

B4. Incorporate conjunctive practices into the water management plan: Work cooperatively with the Texas Water Development Board (TWDB) and Texas Parks and Wildlife Department (TPWD) to develop the information needed to understand the connections between surface and groundwater and the impacts associated with current management practices of one upon the other. Develop management practices to effectively and efficiently manage these resources while providing adequate environmental flows, especially *essential* flows during drought conditions.

B5. Guarantee *essential* environmental flows in the water management plan. *Subsistence* and *threshold* environmental flow levels have been established as the *essential* levels to provide a safety net for river and bay health during periods of low flow. These environmental flow levels are designed to maintain an "ecologically sound environment" by providing for the freshwater flows necessary to maintain the viability of the state's streams, rivers, bay and estuary systems and should be guaranteed by way of the water management plan.

A1. EXTERNAL FACTORS HAVE HAD CATASTROPHIC IMPACTS

I call your attention to a study recently released in the Texas Water Journal titled: "Observed trends in air temperature, precipitation, and water quality for Texas reservoirs: 1960-2010[7]". Here are some conclusions I have drawn from the report (Attachment 2) that apply to the Highland Lakes[8]:

1. The number of dry days in the watershed of these lakes has DECREASED. Thus there have been MORE WET DAYS.
2. There has been a DECREASE in precipitation intensity. Thus there have been fewer intense precipitation events that provide episodic high inflows.
3. There has been an INCREASE in average annual, summer and winter temperatures. Thus INCREASING evaporation and evapotranspiration.
4. There has been a DECREASE in the number of days below freezing, and an INCREASE in the coldest day temperatures.

When this information is considered along with the changing hydrology, which is resulting in decreased inflows to the Highland Lakes, a story emerges of man-made factors in the upper basin that have caused catastrophic impacts on stakeholders in the middle and lower basin, and that is about to be repeated in the lower basin.

National Weather Service data[9] for the region indicate that the 30-year average annual rainfall in the contributing watershed is up 7-20%. This is consistent with rainfall in San Angelo, in the middle of the contributing watershed (Attachment 3), where precipitation has increased about 28%[10] in the first six years of the current drought (2008-13) when compared to the first six years of the drought of record (1946-51).

Though it is getting hotter, rainfall in the contributing watershed is up significantly over the same drought-of-record period. Yet inflows to the lakes are significantly lower (-54%[11]) than for first six years of the drought-of-record (1946-57 compared to 2008-13). This drastic reduction in inflows has had *catastrophic* impacts on the Highland Lakes, the economy of the region, FIRM and interruptible customers, and the environment.

Simply stated, rainfall in the watershed is not being converted to inflows to the Highland Lakes. Rainfall, therefore, is not the entire problem, nor the ultimate solution to the challenge of managing the Highland Lakes system and the basin.

Brush Control Practices: Personal communications regarding changes in land use and management practices in the regions have led to the assertion that the lack of brush control in the region has lead to a dominance of mesquite in the landscape which captures and evapotransipires water before it can runoff or be adsorbed into the aquifers. The *Texas Land Trends*[12], by the Texas A&M Institute of Renewable Natural Resources (IRNR)[13] shows that there are three areas of the upper basin that have show major increase in land consolidation that extend across the basin.

Small surface-water impoundments: A recent study[14] titled "Effect of Small Surface Water Impoundments on Water Supply Reservoirs" looked at the effects of NRCS structures and small stock ponds in both reducing flows to the reservoirs and in reducing sediment loads to the reservoirs. The study included Lake Coleman in the Colorado River basin.

The study found that the effect of such structures was to reduce inflows to Lake Coleman by 12 to 28 percent, and firm yield by 20 to 40 percent. Looking at the effect of stock ponds alone in the Lake Coleman watershed, the reduction in inflows ranged from 13 to 17 percent, and in firm yield from 25 to 34 percent using two different assumptions about stock pond areal densities.

Irrigated Agriculture: It is evident by personal observations driving from Clovis, NM to San Angelo in October 2014 that irrigated cotton dominates the landscape (along with mesquite). Personal communications with persons living in another portion of the watershed indicates that other crops, such as hay, are also extensively irrigated.

Conclusion 1: Many things have changed in the watershed since the 1950s in addition to climate. The changes need to be identified and understood before we can find a solution to the changing hydrology. The rainfall and land use trends need to be further investigated to provide conclusive information regarding rainfall and the impact of land use on inflows to the Highland Lakes from the contributing watershed. The Texas Water Resources Institute has just published an issue dedicated to these issues[15].

A2. EXTENT AND SEVERITY OF CURRENT DROUGHT IS MAN-MADE

Right-sizing and Retro-fitting Water Treatment & Distribution Systems:

During the TCEQ SOAH Hearing,[16] held in regard to the LCRA's request for an Emergency Exemption from the WMP, it was revealed that residual chlorine levels in drinking water during low flow caused by implementing conservation measures was the basis for arguing the need for an emergency exemption to protect "public health and safety." One engineer testified that the treatment and distribution systems were designed to meet the growing peak-flow demands and were not designed for low flows during drought conditions. As a result, water in the pipes stagnated and chlorine levels dropped below drinking water standards. Part of the rationale for the need for an exemption was that it would take *years* to engineer and implement remedies for these problems.

It is unfortunate, but the net result of this oversight was that irrigators and the environment were required to bear the consequences of this man-made emergency.

Another discussion was about the need to lower intake structures in Lake Austin to accommodate lake levels and demand. The irony, again, was that several cities were going together to design *larger* intake structures rather than putting in structures that met the need of each user. Unfortunately, we might anticipate that, if these structures are in

place there may well be a similar need for emergency orders to enable them to operate these structures during low flow drought periods.

Conclusion 2: The combination of the above discussed oversights and the previously discussed changes in land management practices (A1) have resulted in low water levels in the Highland Lakes and problems with intake structures and distribution systems that have led to emergency conditions that could have been avoided. These and other such planning and management policies and practices need to be reviewed and amended to take into account the need to keep such systems operational during low-flow drought conservation periods.

A3. CONJUNCTIVE MANAGEMENT IS NEEDED

If the conditions described in A1 are found to have led to significant impacts on the extent and severity of drought in the basin, then there is direct evidence of the need to conjunctively manage the land, surface water and groundwater systems of the basin. Operating each system in an isolated "silo" has resulted in unanticipated, and unwanted impacts on the basin that were not considered in the previous WMP, and are not anticipated in the current WMP. Recognizing that these systems are intimately connected is the first step in managing the entire system for the benefit of the people, businesses, cities, and environment of the Colorado River basin and bay system. The "Highland Lakes" are not a "silo system" that can be managed without regard to the impact of its management on other systems "outside the silo", and likewise the impact of "other silos" on this system.

Conjunctive management will be complicated given the governance structures in our state. The first step must be to get the two regulatory entities working together: river authorities and groundwater conservation districts (GCD); in this case LCRA and multiple GCDs. Land use practices need to be included in the management strategy. Former President and Texas native Lyndon B. Johnson once said: “Saving the water and the soil must start where the first raindrop falls.” Land use is regulated closely within the territorial jurisdiction of cities, but is poorly regulated in unincorporated portions of counties. For purposes of managing land and water on a regional basis, it will likely be desirable to include regional water management groups (RWMG) in the planning and management process. With 95% of the land in the state privately owned, it is essential to develop a meaningful working relationship with the landowners and the state agencies associated with land management.

Conclusion 3: Conjunctive management is necessary, but will require decision-making outside the jurisdiction of the LCRA (except for systems managed wholly by LCRA). To manage at this level will require a management structure that enables multi-agency decision-making with individual implementation.

A4. ENVIRONMENTAL FLOWS ARE ESENTIAL

The TCEQ, in response to the recommendations of the Colorado and Lavaca Basin and Bay Area Stakeholder Committee (CL BBASC), established environmental flow standards for the Colorado River and Matagorda Bay. *Subsistence* and *threshold* environmental flow levels have been established as the *essential* levels to provide a safety net for river and bay health during periods of low flow. These environmental flow levels are designed to maintain an "*ecologically sound environment"* in recognition by the legislature that it is necessary to "*provide for the freshwater flows necessary to maintain the viability of the state's streams, rivers, bay and estuary systems."* In providing for environmental flows, the Legislature established that *"maintaining the biological soundness of the state's rivers, lakes, bays, and estuaries is of great importance to the public's economic health and general well-being.*"

Need for commitment by LCRA WMP to meet *essential* instream and freshwater inflow needs[17]

Most urgent concern: The current draft and amendments to the LCRA WMP[18] do not make a straightforward, unconditional commitment to meet *essential* environmental flow needs *in all months in all years*. The plan does not include the two statements below that were in the approved 2010 WMP:

"*Instream flow needs will be met by the release of stored water from Lakes Buchanan and Travis to maintain the daily river flows at no less than the critical instream flow needs in all years*.[19]" [emphasis added]

"*Critical inflow needs of 171,120 ac-ft./yr. will be met in all years with releases of stored water from Lakes Buchanan and Travis.*[20] "[emphasis added]

Though not stated in the text of the current draft WMP, Technical Papers A-3, A-4 and A-5, provided by the LCRA to TCEQ[21], demonstrate the operational intent that *subsistent instream flows be met in all months of all years*, and that *threshold freshwater inflows to the bay be met in all months of all years, with the proviso that, only storable inflows are released to the extent that they are available from that month's inflows*. To the degree that these technical papers are not legal guidelines, the WMP should reflect these same minimum standards and should make the same straightforward, unconditional commitments to *essential* environmental flows as in previous water management plans.

Conclusion 4: Past WMPs made a commitment to meet the *essential* environmental flow needs of the river and bay. The current plan should be no less committed to our rivers and bays as directed by the legislature. The 2010 management plan did not contain the *proviso* that exists in the technical papers. This proviso should be eliminated. The "look-back" concept developed, and accepted by the LCRA during the 2014 stakeholder process, should be fully implemented in the final approved WMP. Further, the "look-back" should be extended to two- or three- month look-back to provide a mechanism to ensure that the bay gets the safety-net level of freshwater inflows needed to maintain ecological health through drought

conditions. Certainly, if inflows were adequate in previous months to provide freshwater inflows to the bay, but those flows were not used for that purpose but rather stored, then those inflows should be available to meet the needs of the bay in future months.

Decoupling Environmental Flows from Ag Irrigation Interests

As adopted during the stakeholder process[22], there are times in the annual cycle when it is reasonable that environment and agricultural use of water be decoupled. As was brought out during the discussion, there are times when linked management is not justified. Linking the trigger for coming out of drought conditions during the seasons when water is never provided for agricultural use (October - March) is not logical and limits opportunities to enhance environmental flows by taking advantage of hydrological events below the Highland Lakes. The LCRA ran a "decoupled scenario[23]" that demonstrated that there are times when decoupling benefits environmental flows. However, the LCRA placed limits on these opportunities using caps that artificially limited water that was otherwise naturally available as storable inflows to the Highland Lakes. Likewise, the LCRA only decoupled environmental flows during non-agriculture irrigation periods.

Conclusion 5: Decoupling of environmental and Ag interests provides increased environmental flows that benefit both the river (instream flows) and the bay (freshwater inflows). Environmental flow legislation was intended to provide adequate flows to "*provide for the freshwater flows necessary to maintain the viability of the state's streams, rivers, bay and estuary systems."* The coupling of environmental and Ag interests is an arbitrary artifact of previous WMPs and is contrary to the intent of the Legislature. Environmental flows should be fully decoupled in the current WMP.

There is a drain hole in the river above Bastrop

There is empirical evidence that there is a drain hole in the Colorado River just above Bastrop that is connected to the Simsboro Aquifer (yes, the river and the aquifer are connected). According to an LCRA gain-loss study[24], the Colorado River is a "*losing stream*" in the segment where the river and the Simsboro aquifer intersect between Utley bridge and Fisherman's Park, in Bastrop County. In November 2008 the river was estimated to be losing 9 cubic feet per second or a loss of 6,516 ac-ft per year (see Table 19-1 from the report). Overall, the Colorado River below Austin has an estimated net gain of 145,000 to 170,000 ac-ft per year as it flows from Longhorn Dam to Matagorda Bay (error of study estimated to be +/- eight percent).

The LCRA and others have applied for Simsboro aquifer groundwater well permits in Bastrop and Lee counties requesting a total of 111,000 ac-ft per year[25]. Previous pumping of the Simsboro aquifer by Alcoa[26] at its mining site was in the range of 23,000 ac-ft/year from 1990 through 1999. Current pumping permitted by the Lost Pines GCD in the Simsboro Aquifer is about 75,000 ac-ft/yr.

The impact of the pumping described above by way of the apparent direct connection between the Colorado River and the Simsboro Aquifer could cause future losses from the

river to the aquifer to be significantly greater than the current estimated loss of about 6,500 ac-ft/yr. The impact of groundwater pumping of the Simsboro Aquifer on the Colorado River needs to be studied, quantified if possible, and managed.

Table 19-1. Estimates of groundwater contribution to the lower Colorado River.

Reach	Description	River miles	Water-bearing units	Larger aquifer	Median adjusted gain-loss (cubic feet per second)
#1	Austin-Bastrop	53.5	Simsboro	Carrizo-Wilcox	-9
#2	Bastrop-Smithville	24.8	Calvert Bluff, Carrizo, Queen City, Sparta	Carrizo-Wilcox, Queen City, Sparta	+59
#3	Smithville-LaGrange	36	Yegua-Jackson	Yegua-Jackson	-22
#4	LaGrange-Columbus	40.9	Catahoula, Oakville, Goliad	Gulf Coast	+81
#5	Columbus-Wharton	68.5	Goliad, Willis, Lissie	Gulf Coast	+10
#6	Wharton-Bay City	34.1	Lissie, Beaumont	Gulf Coast	+98
				Total Gain:	**+217**

ac-ft/yr
-6,516
42,714
-15,927
53,641
7,240
70,949
157,100 Net
200 144,793
235 170,132

Table 19-1 from LCRA Report (Saunders, Geoffrey P. June 2009)

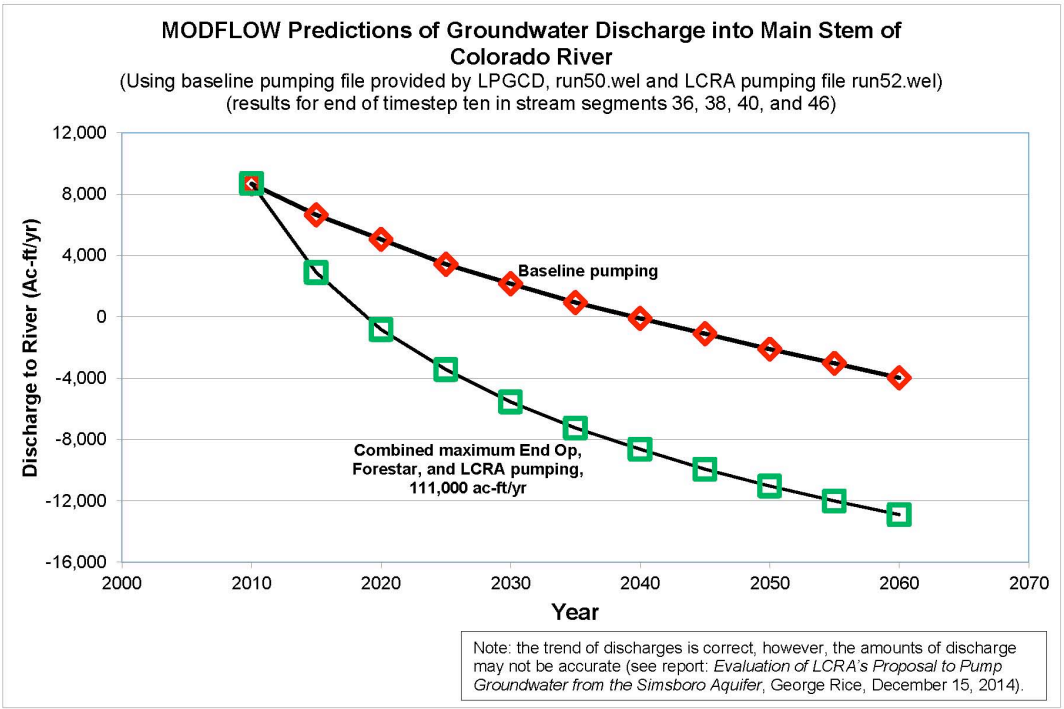
Environmental Stewardship, in connection with its efforts to inform the permitting process of the Lost Pines GCD and the desired future conditions process of Groundwater Management Area 12, contracted a groundwater hydrologist, George Rice, to evaluate the impacts of groundwater pumping. Environmental Stewardship hereby submits documentation[27] (Rice's LCRA Evaluation Report) and expert testimony[28] demonstrating that there is likely to be deleterious impacts on the aquifers associated with the Simsboro Aquifer and on the Colorado River and its tributaries resulting from groundwater pumping (Attachments 4 & 5). Study reports have also been provided to the District for the Forestar's[29], and End Op's[30] permitted and proposed pumping of the Simsboro Aquifer (Attachments 6 and 7).

Rice's LCRA Evaluation Report shows that groundwater modeling indicates that there will likely be impacts on baseflows (aquifer outflows) to the Colorado River and tributaries. Though modeling does not specifically predict quantity of impact, it does predict a trend toward decreasing the amount of groundwater discharges to surface waters. Increased pumping rates predict less discharge to the river when pumping is increased over baseline pumping rates. The greater the pumping rate on the aquifer, the less discharge to the river.

The model also predicts that distance from the river impacts rate of groundwater discharge to the river. Pumping close to the river has a greater impact on discharge of groundwater to the river than the same pumping rate has at a greater distance from the river. LCRA's wells are within 4 to 5 miles of the point where the Colorado River intersects the Simsboro Aquifer outcrop, and are a little less than 4 miles from the Colorado River at Fisherman's Park in Bastrop, TX. Rice's LCRA Evaluation study predicts that LCRA's pumping will decrease the discharge of groundwater to the Colorado River thereby reducing the amount of water flowing in the river.

Rice's LCRA Evaluation Report also estimates the combined impact of the Lost Pines GCD

baseline pumping (existing permitted pumping) and major new permits (LCRA, Forestar, and End Op) on aquifer outflows to the Colorado River. The combination of all existing and projected pumping within the district is predicted by the GAM model to have a *three-fold* impact in decreasing groundwater outflows to the river and tributaries over baseline pumping. The model predicts a trend where the Colorado River changes from a "gaining stream" to a "losing stream" within the 50 year planning cycle. The predicted trend and the shift to a losing stream have major implications for environmental flows (both instream and freshwater inflows) especially during drought conditions. Likewise the trend has major implications for Matagorda Bay as LCRA brings an off-channel reservoir on line in the lower basin. Again, though the model does not specifically predict quantitative impacts, the trend is clear and needs to be better understood as groundwater pumping is ramped up over the next decade.



Historical and Recent Gain-Loss Studies

The Colorado River gains water from the Carrizo-Wilcox and other aquifer formations as it passes through Bastrop and Fayette counties. Historical records and recent studies indicate that the Colorado River has been, and remains, a gaining river as it passes through the river segment associated with the Carrizo-Wilcox aquifer group. Low-flow studies conducted by the USGS in1918, and a flow-duration curve generated by Dutton, in 2003[31] indicate that these groundwater formations contribute approximately 25,000 acre-feet per year to the Colorado River.

More recently, the Lower Colorado River Authority (LCRA) conducted studies to assist in its management of water releases from the Highland Lakes to meet water rights and

environmental flows obligations. These studies include information on the gains/losses of the river as it flows through Bastrop County and provide additional quantification of the amount of base flow the river gains during dry periods like the one that has occurred over the past several years. In a study related to the LCRA Operations Project (Saunders, 2006[32]) the author concluded, "the lower Colorado River is a gaining stream that receives groundwater contributions from major and minor aquifers." Analysis of USGS data contained in the report, though inconclusive, shows a gain of about 50 cubic feet per second (cfs) in the reaches passing over the Carrizo-Wilcox between Utley and Smithville (about 99 acre-feet per day). Limited fieldwork in 2005 also suggested that the Colorado River has some stream flow gain from groundwater in these reaches.

The LCRA conducted a field investigation in November 2008 as a follow-up to above mentioned gain-loss studies (Saunders, 2009[33]; see Table 19-1 above). The study concluded "the total net gain to the Colorado River from the Carrizo-Wilcox aquifer in Bastrop County was estimated to be 30 cfs during the November 2008 low flow event. This compares to the USGS 1918 estimate of 36 cfs, and the LCRA estimate of 50 cfs in November 2005". Saunders further concluded

> "such contributions to the base flow from these sources can be important during critical low-flow conditions." *"A study of ground water-surface water interaction prepared as part of development of the Central Carrizo-Wilcox groundwater availability model (GAM) indicated that base-flow rates of rivers crossing the aquifer outcrop have not decreased over time, and seasonal variability in base flow for perennial streams may not fluctuate significantly (Dutton, et al., 2003). In addition, flow from bedrock aquifers through the alluvium to the river is a complicated system and deserves more understanding. As demands on ground water resources increase with future growth in the Central Texas region, ground water-surface water interactions may need to be periodically monitored to assess water availability in the decades to come."*

Conclusion 6: If one considers the apparent connection between the drain hole in the river above Bastrop in the lower basin, and the story of what has apparently happened to the river and inflows to the Highland Lakes in the upper basin, it becomes evident that the river is not being managed in a sustainable manner that will avoid dramatic problems in the future. We are in danger of impacting the river system below Austin in a similar manner as in the upper basin, resulting in a dramatic decrease in the contribution of groundwater outflows to the lower basin and inflows to Matagorda Bay. This situation will become even more critical as environmental flows to Matagorda Bay are held back by the LCRA approved Lane City Off-channel Reservoir Project. Ecologically speaking, a river is an ecological system and has to be managed on an ecological basis. The ecological service functions (the groundwater-surface water connection) of the river that provide FLOW have been severely reduced in the upper basin. **Environmental flows in both the upper basin, but critically now in the lower basin, must be guaranteed in the LCRA WMP**.

REVIEW OF COMMENTS PROVIDED TO THE LCRA

Management of the water resources of the Colorado River Basin and Matagorda Bay are critical to the future welfare of both the residents of Central Texas and the environment of the region. Both the TCEQ and LCRA have a challenging task to balance the many competing interests. In our August 18th letter[34] I provided comments and attached papers to draw the LCRA's attention to one aspect of the plan that we believe needs more consideration; the groundwater-surface water interaction between the Colorado River and the aquifers it intersects as it flows to the Gulf.

Attachment 1 to the August 18 letter, *Review of Groundwater-Surface Water Interactions between the Carrizo-Wilcox Aquifer Group and the Colorado River*, demonstrated the risks to the river from over-pumping the aquifers. The risks have hydrological, ecological, and political implications. Hydrologically the river is predicted to become a “losing stream” within the planning period (this in addition to the current "losing stream" status of the Simsboro segment). This will have ecological consequences related to both “instream flows” in the river, and “freshwater inflows” to Matagorda Bay.

Politically there is a concern that groundwater pumping takes water from the river that has been appropriated in surface water permits and may be stored in the Highland Lakes. The paper reviews work by Environmental Stewardship that demonstrates the potential for this concern. Using estimated outflows to the river, the TCEQ WAM RUN 3 model was used to estimate impacts on the river, and more specifically on surface water rights. This analysis did not, however, look at the impact of reduced outflows on the river over the 50-year planning period.

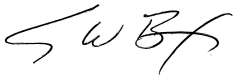
Environmental Stewardship recommended that a more thorough groundwater-surface water impact analysis be conducted as a part of the water management plan evaluation

Environmental Stewardship again urges the TCEQ to encourage the Texas Water Development Board (TWDB) or the Lower Colorado River Authority (LCRA) to collect base-flow gain/loss data to calibrate GAMs and WAMs. We have a *very rare* opportunity to conduct a gain-loss hydrologic study on the lower Colorado River during a period of *severe drought and historic low flow conditions* resulting from the curtailment of irrigation water for rice farming. The information collected as part of the study could be used to assist in the calibration of groundwater availability models.

In summary comments to the LCRA regarding the stakeholder process, ES[35] commented that: "[t]hough the stakeholder process has led to very minor improvements in attainment frequency for environmental flows; especially for the bays during drought conditions, the bay and estuaries are still at significant risk. Statistically, the model predicts that attainment of Threshold flows, the *essential* safety net for the bay, is only at 86% with a goal of 100%, and bay salinity is above the target of 27.5 ppt for 17 consecutive months during a repeat of the DOR. **An objective of the WMP is to "Provide threshold [flows to the bay] every month.[36]" This plan does not meet that objective. We must do better."**

Thank you for the opportunity to provide these comments and documents to support our concerns. We stand ready to assist the TCEQ in your evaluation and look forward to seeing a balanced result. Please contact me at 512-300-6609 or Steve.Box@att.net if you have questions.

Respectfully submitted,



Steve Box
Executive Director
Environmental Stewardship

cc: Paul Pape, Bastrop County Judge
Phil Wilson, LCRA General Manager
John Hofmann, LCRA EVP of Water
Kirk Watson, Senator District 14

Attachments:

Attachment 1. Water Planning and Management Principles: The Lakes, Rivers and Bays Group.
Attachment 2. "Observed trends in air temperature, precipitation, and water quality for Texas reservoirs: 1960-2010. With ES drawn overlays.
Attachment 3. Comparison of rainfall over the Highland Lakes (HL) watershed to inflows to the HL during current and drought-of-record (DOR).
Attachment 4. Rice, George. December 2014. Evaluation of LCRA's Proposal to Pump Groundwater from the Simsboro Aquifer (LCRA Evaluation Report).
Attachment 5. Rice, George. December 2014. Affidavit and express offer to make Mr. Rice available for cross examination before the Lost Pines GCD Board regarding LCRA Evaluation Report.
Attachment 6. Rice, George. December 14, 2013. Forestar's Proposal to Pump Groundwater from the Simsboro Aquifer
Attachment 7. Rice, George. July 20, 2014. Evaluation of End Op's Proposal to Pump Groundwater from the Simsboro Aquifer

Environmental Stewardship is a charitable nonprofit organization whose purposes are to meet current and future needs of the environment and its inhabitants by protecting and enhancing the earth's natural resources; to restore and sustain ecological services using scientific information; and to encourage public stewardship through environmental education and outreach. We are a Texas nonprofit 501(c) (3) charitable organization headquartered in Bastrop, Texas. For more information visit our website at http://www.environstewardship.org/.

REFERENCES:

[1] Water Planning and Management Principles. February 2014. The Lakes, Rivers, and Bays Group. **Endorsers of the Water Principles**: Brigid Shea, Travis County Commissioner, Bill Bunch, Save Our Springs Alliance, Jo Karr Tedder, Central Texas Water Coalition, Jennifer Walker, Sierra Club, David Foster, Clean Water Org., Paul Robbins, Austin Green Activist, Cindy Smiley, CTWC, Charles Flatten, Hill Country Alliance, Phil Cook, Bastrop, Dorothy Taylor, CTWC, Steve Box, Environmental Stewardship, Bastrop, Izzy Hauss, Hicks & Co. Environmental Services, Haythem Dawlett, Legend Communities, Inc., * Affiliations listed for informational purposes only and do not reflect any official position by that entity. 02.2014

[2] In the upper contributing zone: the impacts of the following on Highland Lake inflows: Lack of brush control, small surface water impoundments, agricultural use of groundwater for irrigation (especially cotton). In the cities: the impacts of

over-sizing water treatment and distribution systems such that they cannot be safely operated at reduced/drought flow levels without dropping below residual chlorine standards.

[3] Rainfall records and trends tend to indicate that rainfall over the contributing zone of the upper basin has been as much as 30% greater during the first six years of the current drought when compared to the same period in the DOR.

[4] We need to ask the question: Is it reasonable to expect that water supply will be adequate in drought and severe drought conditions to enable the supply and use of the same amount of water to FIRM customers as these customers receive during wet conditions. There needs to be a means of recognizing and supplying "essential needs" while reducing and/or eliminating non-essential uses. Unfortunately this expectation has been written into the adjudication orders that created the LCRA water management plan and the terms and conditions the LCRA must meet in managing FIRM vs interruptible water.

[5] Dictionary.com: conjunctive / adjective 1. joining; connective 2. joined 3. of or relating to conjunctions or their use 4. (logic) relating to, characterized by, or containing a conjunction noun 5. a less common word for conjunction (sense 3) Derived Forms conjunctively, adverb. Word Origin C15: from Late Latin conjunctīvus, from Latin conjungere to conjoin.

[6] Lacking such line-in-the-sand safety-net practices, the Colorado river will, like the Rio Grande and the western Colorado River, cease to flow to its bay and cease to be a sound ecological environment. The lack of freshwater inflows will bring dramatic ecological and economic impacts to the bay system and those who depend on the bay for a livelihood ... and on Texas heritage.

[7] Rodica Gelca, Katharine Hayhoe, and Ian Scott-Fleming. Observed trends in air temperature, precipitation, and water quality for Texas reservoirs: 1960-2010. Texas Water Resources Institute. Texas Water Journal, Volume 5, Number 1, pages 36-54. https://journals.tdl.org/twj/index.php/twj/issue/view/364/showToc Attachment 1 to this letter includes an overlay of reservoirs in the Highland Lake system to orient the maps to the Highland Lakes contributing zone.

[8] Lakes Buchanan, O.H. Ivie, E.V. Spence, and J.B. Thomas. The location of the lakes on the Colorado River in Figure 1 correlate with the latitude and longitude locations of these four lakes. (see Texas Reservoir Trends Supplement - LCR.pdf)

[9] Bruce Melton, PE. Historic Highland Lakes Drought Comparison. 2014. Climate Change Now Initiative, Austin, Texas. http://www.climatediscovery.com.

[10] Calculated by Environmental Stewardship from Melton data (see attachment HL_Rainfall_Inflow_Analysis14Sept14).

[11] Calculated by Environmental Stewardship from Melton data (see attachment HL_Rainfall_Inflow_Analysis14Sept14).

[12] Texas Land Trends published a new report in October, 2014 per its website: xlandtrends.org . The *Texas Land Trends* report is in its third publication. Previous reports have been single and comprehensive works. A change with the 2014 *Texas Land Trends* release is the development of a series of reports, rather than a single report released every five years, to better understand the status of Texas lands from the perspective of key issues (e.g., water, energy, etc.). This inaugural issue is focused on the five-year trends update of Texas rural working lands. Furthermore, part of the new 2014 *Texas Land Trends* report will include a completely redesigned interactive website to be launched later this year. Stay tuned for future updates from *Texas Land Trends*. Figure 8 shows a net increase in working lands or minor decrease in working lands across the upper basin. Figure 18 shows three areas across the basin with major increase in land consolidation. Figure 17 shows land fragmentation between the consolidation areas.

[13] Amy Buice and Kathy Wythe. 2014. "Tracking the Trends", txH2O Winter 2014 edition. Texas Water Resources Institute.

[14] R.J. Brandes Company. 2011. Effects of Small Surface Water Impoundments on Water Supply Reservoirs. TWDB Contract No. 0704830751. Final Report

[15] Preserving Private Lands Conserves Water. Stewardship starts where the first raindrop falls. http://twri.tamu.edu/publications/txh2o/winter-2014/conserving-private-lands-conserves-water/

[16] TCEQ SOAH Hearing. February 17, 2013. SWB notes from the meeting: The PRIMARY Public Health and Safety issue (other than fire protection) is the inability of the large water treatment and distribution systems to handle low flows from conservation, drought, and drought management practices because they are unable to maintain disinfecting CHLORINE LEVELs. As the witnesses for Firm Water Cooperative, Earl Foster with Lakeway MUD and Aron Archer with HDR, testified (and/or Greg Meszaros), they have engineered these larger water systems (Austin, Cedar Park, Leander, etc.) to meet peak demands and under low flow conditions they have problems with low chlorine residuals. These low chlorine residuals cause them to have to flush and waste the water in the lines and tanks. They are unable to keep "stagnant" water from developing in the systems since they were not designed to operate at such low flow rates. If I understand correctly, the term "stagnant" in this context means "water with residual chlorine levels below required drinking water standards." I suspect that "designed for peak demands" includes plans for growing populations during good times when water is plentiful. Though somewhat and artificial and human engineered problem, the problem none-the-less exists. So a point to be vigilant about in conservation advocacy and planning is to ensure that systems designs are right-sized to also operate under low flow conditions ... and/or are retrofitted.

[17] Quoted from ES letter to LCRA Board of Directors, August 18, 2014.

[18] And final draft and amendments submitted to TCEQ

[19] LCRA 2010 WMP as amended January 27, 2010, item (15) page P-4.

[20] LCRA 2010 WMP as amended January 27, 2010, item (16) page P-5.

[21] Technical Papers A-1 thru A-6 provided to TCEQ by LCRA on May 31, 2012
[22] LCRA moderated stakeholder meetings held August/September 2014.
[23] LCRA Model Run (D) 09-03-2014 Decoupled Scenario (1940-2013).
[24] Saunders, Geoffrey P. June 2009. Los Flow Gain-Loss Study of the Colorado River in Texas. Table 19-1 with calculations to convert cubic feet per second (cfs) to acre-feet per year.
[25] The LCRA is now completing 4 wells in the Simsboro to pump 10,000 ac-ft/yr. Forestar is completing wells to pump 12,000 ac-ft/yr (they have sued the District demanding a full 45,000 ac-ft/yr). End Op is still trying to get permits for 46,000 ac-ft/yr (originally requested 56,000 ac-ft/yr). The District has existing permits for about 55,000 ac-ft/yr (not including the above applications and permits). Combined permitted pumping in the Lost Pines District is about 75,000 ac-ft/yr. Blue Water in Post Oak Savannah is permitted for 71,000 in Burleson Co.
[26] Joe Cooper, General Manager, Lost Pines GCD. Personal communications and Excel spreadsheet below:

ALCOA Simsboro pumping reported to RRC (per RRC):

YR.	AFY
1990	23,340
1991	23,423
1992	23,330
1993	23,388
1994	23,378
1995	23,487
1996	23,905
1997	23,006
1998	23,245
1999	37,787
TOTAL	248,289

[27] Rice, George. December 2014. Evaluation of LCRA's Proposal to Pump Groundwater from the Simsboro Aquifer (LCRA Evaluation Report).
[28] Rice, George. December 2014. Affidavit and express offer to make Mr. Rice available for cross examination before the Lost Pines GCD Board regarding LCRA Evaluation Report.
[29] Rice, George. December 14, 2013. Forestar's Proposal to Pump Groundwater from the Simsboro Aquifer
[30] Rice, George. July 20, 2014. Evaluation of End Op's Proposal to Pump Groundwater from the Simsboro Aquifer
[31] Dutton, Alan R., Bob Harden, Jean-Philippe Nicot, and David O'Rourke. February 2003. Groundwater Availability Model for the Central Part of the Carrizo-Wilcox Aquifer in Texas, Appendix B – Surface Water- Groundwater Interaction in the Central Carrizo-Wilcox Aquifer.
[32] Saunders, Geoffrey P. 2006. Aquifers of the Gulf Coast of Texas. TWDB publication 365.
[33] Saunders, Geoffrey P. June 2009. Low-Flow Gain-Loss Study of the Colorado River in Bastrop County, Texas.
[34] ES letter to the LCRA Board of Directors dated August 18, 2014
[35] ES August 14, 2014 letter to the LCRA Water Operations Committee of the Board following the August/September stakeholder process.
[36] August 25, 2014 staff overview on the Water Availability Model (WAM), page 13, Environmental Flows 2012 Application, Bay and Estuary Inflows, - Provide threshold every month. http://www.lcra.org/water/water-supply/Documents/WAM-overview.pdf