**The Colorado River (Texas): Management with a Focus on Stakeholders**

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Water ownership in the State of Texas has been an important issue since as early as 1904 with the “Rule of Capture” that distinguished water rights. The central Texas area was severely prone to drought and flash-flooding in particular, causing many deaths. The control of flooding and the needs of a consistent flow to the coast for rice farming were crucial issues. Provide a steady water supply for central Texas was also very important. This paper will describe the Lower Colorado River Authority (LCRA) and the role played in these issues, as well as how the water from the Colorado River (within Texas) is distributed among the various stakeholders. A few of the different needs for water will also be discussed in order to give a better understanding of the idea behind the management of the Highland Lakes system, along with some current events pertaining to the Colorado and it’s management.

**Geography along the Lower Colorado**

The Colorado River spans the distance of 2,330 Kilometer (1450 miles) splitting through Texas and west through Utah, Arizona, and New Mexico. As the largest river that is wholly within Texas, the Colorado enters from the west through Dawson County in the central pan handle region and heads in a southeast direction until it reaches Matagorda Bay. The headwaters for the Texas portion of the Colorado River come from Rocky Mountain National Park in North central Colorado. This river spans approximately 600 miles within Texas. Long ago the Colorado was used by Native Americans for irrigation and food purposes. Today, that aspect has not changed much (minus the Natives) . The Colorado is used heavily enough that it currently fails to flow consistently through the Texas portion from its’ initial headwaters in the Rockies. Water diversion in New Mexico, Utah, Arizona and Colorado cause the river to run dry as it enters Texas. The terrain in the areas surrounding the Colorado (within Texas) is rough for the most part. Limestone rock commonly intertwines with the riparian landscapes. However, downstream of the Austin area is considered alluvial land and is used for agriculture, mainly rice farming.

The Lower Colorado River Basin consists of 10 different basins; Upper Basin, Pecan Bayou, Concho River, Lake LBJ, Austin, Lake Buchanan, Lake Travis, Matagorda, and the Lower Basin. The final basin is a noncontributing basin near the northwestern part of the Lower Colorado River Basin. This is the area just below the Colorado’s entrance into Texas. It is fortunate that there is no contribution from this basin as the area has several different industries, including natural gas and oil, and hazardous waste. The Colorado forms all or parts of county lines between San Saba, Coleman, Concho, McCulloch, Brown, Lampasas, and Mills. It also interacts with Borden, Scurry, Mitchel, Coke, Runnels, Burnet, Travis, Bastrop, Fayette, Colorado, Wharton, and Matagorda counties.

The first consistent stream flows for the Colorado within Texas are formed just before Lake Buchanan Dam, partially from the swelling of the lake. Most of the river from the Colorado is diverted from agriculture and other uses by the surrounding stakeholder-states. The LCRA has a water service are of 31 counties that are either partially or totally included. The Highland Lakes and preceding areas have a large content of gravel and limestone in the geology, leaving them flash-flood prone. Areas downstream of Longhorn Dam at Town Lake generally maintain flows (outside of intense drought) due to consistent releases from Longhorn Dam. These areas have been well controlled against flood damage since the formation of the Highland Lakes and Dam systems, and also have diverse plant and aquatic vegetation. The Bastrop and Fayette County areas have several unique limestone cliffs and areas along the Colorado where fossils have been discovered, within the cut banks of the river. This area has heavy vegetation and is popular for recreational use, as is the final stretch of the Colorado from La Grange to the Gulf of Mexico. The river is at a minimal pace here as it is wide and has sufficient water supply at all times for recreational needs.

The Highland Lakes are a crucial part of the Colorado River Basin System in Texas. The Damming of these lakes has proven effective at mitigating damage from flash-flooding in the highly populated, surrounding areas. Much of the topography north of the Austin area, including the Highland lakes, contains significant Karst Topography. The porosity and permeability of these limestone formations move water very rapidly when the water table is low and storm events occur, with the causation of the well-known “flash flood” events that are so common in central Texas. This topography also poses concern for non-point source pollution, as Karst formations can leach minerals from the soil, as well as lack the ability to mitigate pollution that may enter into the system. The dam at Lake Austin is the final dam of the Highland Lakes System and at the moment the final dam on the Colorado (See Current Events: Investing for the Future). This dam has a large amount of silt accumulating in it regularly because of its’ location as the final dam on the system. Lake Austin dam produces hydroelectric energy from the flow of the Lakes upstream of it. Several other lakes, The Inks, Johnson, and Marble falls reservoirs, produce power through the Buchanan Dam Spillway.

**History of Management Problem**

The Colorado is used largely in part to generate hydroelectric power. The ability to have a renewable source of free energy was likely the most important factor in managing the Colorado initially, beyond agricultural needs. Lake Travis and Lake Buchanan serve the purpose of providing water supply and also as flood control reservoirs within the Highland Lakes system. The two dams were constructed in the late 1930s and early 1940s. From this time period up until present, these lakes have seen large fluctuations, in response to extreme flood and drought situations. The lowest recorded level of Lake Buchanan was 983 feet mean sea level (msl) and Lake Travis recorded at 614 feet msl. The highest elevations ever recorded were in 1991; Lake Buchanan (1021.37 feet msl) and Lake Travis (710.4 feet msl). Over 80 percent of counties in Texas are currently experiencing drought, leaving the priority for proper water management at a very high level.

Operational management of the lakes has varied over time as well. In the initial years (1940s-50s) the dams’ major use was for hydroelectric power generation. With the development of fossil fuel electric generation stations, the LCRA began to consider hydroelectric power generation a secondary use to the water supply needs. The Final Judgment and Decree for LCRA’s water rights was that “… hydroelectric generation was subordinate to other uses except during shortages of electricity, and during other times to the extent that such releases will not impair LCRA’s ability to satisfy all existing and projected demands for water from Lakes Buchanan and Travis pursuant to all firm commitments and all non-firm, interruptible stored water commitments.”

**LCRA Water Management Plan**

The LCRA’s Water Management Plan (WMP) is derived from four main sources:

“1) The Final Order of Adjudication of the water rights of the Lower Colorado River Authority;

2) The Enabling Act of the Lower Colorado River Authority;

3) General Law of the State of Texas, particularly the Texas Water Code; and

4) The water policies of the Lower Colorado River Authority Board of Directors.”

Combined with each other, these authorities define and establish LCRA’s responsibility to develop and implement a WMP. It is worth noting that the final adjudication of LCRA’s water rights includes provisions that relate to the type of management used by the LCRA for the Highland Lakes and the Colorado River, above and below the Highland Lakes. These provisions direct the LCRA to submit a proposed WMP to the Texas Water Commission, a predecessor agency to the TCEQ.

There are 17 “Key Elements” to the LCRA’s Water Management Plan. I will focus on the elements that pertain to the different stakeholders’ water rights, as well as reduce and summarize some aspects of these elements.

**(1) Lakes Buchanan and Travis and the Colorado River will be managed together as a Single system for water supply purposes.**

**(2) LCRA will manage the system to maximize the beneficial use of water derived from inflows below the Highland Lakes.**

**(3) LCRA will manage the system to stretch and conserve the waters stored in Lakes Buchanan and Travis.**

**(5) Inflows should be passed through Lakes Buchanan and Travis to honor downstream senior water rights only when those rights cannot be satisfied by the flow in the river below the Highland Lakes.**

**(6) The firm, uninterruptible commitments of water from Lakes Buchanan and Travis should not exceed the Combined Firm Yield.**

**(7) The water from Lakes Buchanan and Travis will be available on an interruptible basis as long as LCRA’s ability to meet the demand for firm water is not impaired.**

**(9) Competing demands on the system include water quality matters, flood control, water supply, recreation and tourism, hydroelectric power, in stream flows and bays and estuaries.**

**(10) The Combined Firm Yield of Lakes Buchanan and Travis is determined to be 535, 812 acre-feet, including that portion allocated to O.H. Ivie Reservoir, which is owned and operated by the Colorado River Municipal Water District.**

**(11) “To supply existing firm water commitments, including commitments to the environment as proposed herein and the allocation of firm water to O. H. Ivie Reservoir…”**

**(12) LCRA’s Board of Directions has reserved 50,000 acre-feet of the remaining Combined Firm Yield of Lakes Buchanan and Travis for the future needs within LCRA’s 35-county water service area, particularly those areas now using ground water supplies that are becoming depleted or are of poor water quality.**

**(13) The four downstream irrigation operations (Gulf Coast, Lakeside, Garwood and Pierce Ranch) will have first priority for all the interruptible stored water in the annual allocation process to the extent of their Conservation Base acreage or Priority Allocation acreage, whichever applies.**

**(14)” In recognition of the importance of recreation and tourism demands, additional sales of interruptible stored water… No sales will occur if either lake is less than 94% of its maximum conservation capacity…”]**

**Stakeholders and Hierarchy**

Within the different stakeholders, those that are the largest also use the majority of the water. The LCRA holds the largest water rights, to use up to 1.5 million acre-feet per year from both Lake Travis and Buchanan. A few of the other large water rights holders (downstream of Lakes Buchanan and Travis) have priority dates earlier than those of the LCRA’s Highland Lakes’ permits, giving them seniority to the water rights of the LCRA. These rights are owned by the City of Austin, Corpus Christi (part of Garwood), LCRA for Pierce Ranch, and the LCRA’s Garwood, Lakeside, and Gulf Coast Irrigation operations. This seniority implies that any flows that need to be diverted for use under these rights must be passed through the Lakes for use downstream. Some of the larger water rights downstream also have the opposite situation with Lake Buchanan and Travis, where their junior priority dates make them subordinate to LCRA’s Highland Lakes’ permits. In 1999, Williamson County was added to the LCRA Highland Lakes WMP

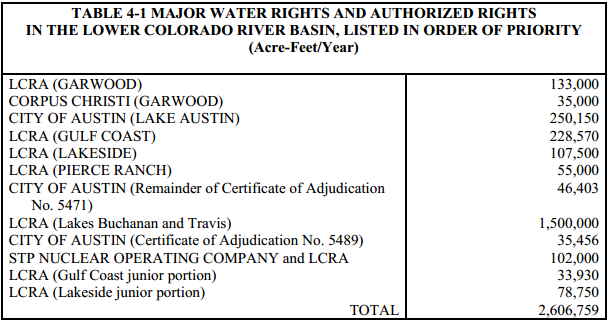


Figure 1

One of the more important concepts of the Dam Management Project (DMP) and of the LCRA’s water rights, along with the Water Management Project (WMP) and Texas Center for Environmental Quality (TCEQ) Commission’s Order, are the rules concerning drought contingency plans. The extent of the DMP is limited to the curving of the LCRA’s interruptible stored water supplies to insure that sufficient firm water demands are met through a “repetition of Drought record”. The DMP also discusses how the LCRA will provide water for necessary environmental flow needs. Firm water needs are only subject to curtailment if a determination is reached that the drought in effect is worse than the Drought of Record.

Another important factor that the LCRA takes into account is the recreational uses of the Highland Lakes, including fishing, boating, etc. In correlation with environmental needs, Interruptible water supplies from the lakes are limited in sales, and do not occur unless the lakes are near maximum capacity. The LCRA also attempts to fulfill its firm water commitments through natural in stream flows before releasing water from the Highland Lakes. There are over 110 contracts with the LCRA. Water commitments to the O.H. Ivie Reservoir help cover the environmental flow needs and maintain a more constant volume for the Highland Lakes. Interruptible stored water is also used for environmental flow regulation as well as rice irrigation. The LCRA has also reserved 50,000 acre-feet firm water for future uses, for which there will be many. It is worthy to note that the LCRA recognizes the supremacy of the State of Texas, through the TCEQ (or predecessor agencies for some rulings) as the ultimate authority for water resource management within the state.

**Current Event: Water Distribution**

As of March 2014 the Highland Lakes were at 38% capacity. On March 2, 2014 the TCEQ voted to cease water delivery to most of the rice farmers in the Lower Colorado River Basin for the third consecutive year. However the TCEQ failed to make a decision about reserving the Highland Lakes for the drinking water needs of Central Texans all year long from the usage of rice farmers on an “interruptible” basis. This implies that if significant rains occur later in the year, the LCRA could provide some water to rice farmers with water. Otherwise the LCRA may soon have to seek permission from the TCEQ to cut off farmers’ water supply, in approximately four months. The inconsistency in response has raised concerns over the security of the drinking water supply for Central Texas. Local officials are seeking for the TCEQ to provide long-term guidance to the LCRA so that the problem can be dealt with appropriately. In July, the same water supply issue will be raised as the farmers prepare their second rice crop. Much argument about the releases or holds on water for the rice farmers continues as it has for many years. From the perspective of the rice farmers, a second crop cannot be produced in a season unless a first crop is produced. More specifically, the root system that develops from the first crop must be in place to produce a second crop later in the year. Thus, the problem would seem to be already answered for the extent of the 2014 rice growing season, as the rice farmers did not receive water to grow their first crop (except in Garwood Irrigation District, who has a special contract with LCRA to receive water during cut-off periods) of the season. To be clear, some rice farming operations have water rights that are senior to the LCRA and receive their flows through the Highland Lakes system. However, most of these operations are under the land control of the LCRA and control some subset area of the Colorado River, e.g. LCRA (Highland Lakes), LCRA (Gulf Coast). These water rights are distributed to the operations through these other entities of the LCRA.

**Current Event: Investing for the Future**

On March 26, 2014, the LCRA Board of Directors approved a $17 million budget for the second phase of a new reservoir near the Texas coast, in Lane City (within Wharton County). This reservoir will significantly reduce demands on the Highland Lakes Systems, as the new reservoir is projected to add 90,000 acre-feet a year (a 15% increase) to the LCRA’s firm water supply. The total cost estimation by the LCRA is approximately $215 million with plans for completion in 2017. It benefits the central Texas area as well as the rice farmers and Industry near the coast, as they will have access to more consistent supply without needing to stress the Highland Lakes system along the Colorado. As the chart below describes, the flow rate in cubic feet per second reduces significantly as it approaches the Gulf of Mexico. The addition in Wharton should change the latter half of this analysis, if run again after completion of the dam.

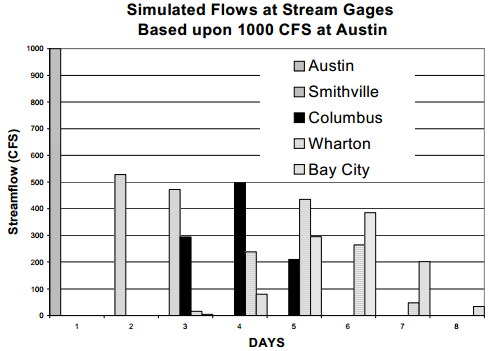


Figure 2

January 1941- December 1965

**Conclusion**

The importance and increasing demand for a consistent water supply in central Texas is being managed in concurrence with the needs of coastal irrigation and industrial users downstream by the LCRA. The WMP and creation of the Highland Lakes systems provides not only hydroelectric energy during the early conception years (secondary importance now), but also supplies water to maintain ecological needs for the area. Recreational opportunities involving water would be significantly reduced if not practically non-existent were it not for the creation of the lakes through dams. The Highland Lakes play a culturally significant role for many different age groups and hobbyists within Texas. With approximately 56% of the annual water usage for the Colorado and Highland Lakes System going to rice farming, it wouldn’t seem that the public’s best interest is necessarily the largest stakeholder, yet the LCRA and TCEQ appear to be mitigating the issues as best possible. The speed at which this process is taking place is another area of discussion altogether. However, the current dam project near the coast is projected to relieve stress on the Highland Lakes system and provide more reliability for coastal stakeholders’ water requirements, especially for those without senior water rights. With the current drought trends, global warming, and lake levels below forty percent, this dam is a welcome addition and will surely assist the LCRA’s current WMP for the Highland Lakes System and Colorado River within Texas.

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