LCRA
ENERGY • WATER • COMMUNITY SERVICES

August 15, 2007

Steve Box, Executive Director
Environmental Stewardship
P. O. Box 1423
Bastrop, TX 78602

Re: LSWP Draft Instream Flow Guidelines

Dear Mr. Box:

We appreciate your interest in the LCRA-SAWS Water Project and taking time to review and provide comments on the Draft Instream Flow Guidelines. This is in response to your July 10, 2007 letter. We ask that the reviewer please consider our responses within the context of a flow regime based upon the natural flow paradigm and updated biological data.

1. "Natural" conditions

Environmental Stewardship Comment:
Though the most recent major alteration with respect to flow regime of the lower Colorado River was the completion of Buchanan and Mansfield Dams, the urbanization, clearing, wood-cutting, and agricultural practices of the previous century likewise brought major alterations to the flow and ecology of the river. Though we understand the necessity of using a time period for which suitable data are available to fit the models and to be in agreement with current practices, it would seem more accurate to use a term other than "natural" to characterize this period since the pre-impoundment conditions were very different than those described by early explorers of this river basin (see attachment for descriptive account from early explorers and Mosier & Ray (1992) for a more in-depth account of the history of the river). We would recommend associating the term "Pre-Highland Lakes" with a term such as "transitional". Odum and Barrett (2005) include "domestic" or "human-designed and managed" as ecosystem types that are descriptive of the post-Highland Lakes conditions. Perhaps the Team can 1) find a term that bridges this gap and that is more informative to the public and 2) provide more descriptive information in sections 2.2 and 3.1.1 to inform and clarify regarding the historical "natural" condition of the river and region.

LSWP Response:
The project team agrees that the term "natural" does not truly reflect the pre-human condition of the lower Colorado River system. The intent of the Pre- and Post Highland lake comparison was to make a distinction between when major changes took place within the historical hydrological record. Our hydrological data goes back to 1898 and thus extending predictions beyond this point in history is not possible. We will explore the terminology question and re-evaluate the description in that section as to be more informative to the public.

Environmental Stewardship Comment:
The Monthly Flow Alterations graphs (2) on page 9 and the Habitat Duration graphs (3) on pages 49-50 clearly depict the "human-designed and managed" impacts on the lower Colorado River hydraulics (which are evidenced in the biology and water quality of the ecosystem). Shifting the Monthly Flow Alteration graph to show November – October on the x-axis would more clearly depict the two cross-over points where the managed system shifts from "under-watered" during the fall and winter months to "over-watered" during the irrigation season. These graphs also clearly depict the magnitude of the challenge we face if we are to bring "beneficial" uses in balance with "ecologically sound environmental" conditions in the lower Colorado River.

LSWP Response:
To simplify and be consistent, we will shift the x-axis on Figure 3.4 on page 9 to fit the calendar year (January through December). The current format is simply the Indicators of Hydrologic Alteration (IHA) software package default visual output.

Environmental Stewardship Comment:
The Habitat Duration graphs clearly show how the character of the river has been altered during the current post-impoundment period. With a significant loss of shallow pools, edge, backwater and riffles during the irrigation season, along with an increase in rapids, the ecological and aesthetic nature of the river changes considerably.

LSWP Response:
Comment noted.

2. Dissolved Oxygen Standard (5.0 mg/l vs. 6.0 mg/l)

Environmental Stewardship Comment:
Why was the DO criteria of 5.0 mg/l used throughout the river basin when Sections 1428 and 1434 (unique blue sucker habitat per Mosier & Ray) are designated for aquatic life use subcategory "Exceptional" with dissolved oxygen criterion of 6.0 mg/L. Would this make a difference in the subsistence flow recommendations for the Austin and Bastrop reaches? As discussed on page 53, "water quality exceedences are to be avoided" favoring a higher flow regime for the summer months. We would like to see subsistence flow recommendations based on the 6.0 mg/l Dissolved Oxygen criterion that is the regulatory standard for those segments of the river.

LSWP Response:
The goal of the instream flow guidelines is to provide a protective flow regime. Having that regime follow a more "natural" variability is scientifically accepted. In an unregulated river or natural regime, flows during the summer would typically be low, and subsequently, dissolved oxygen concentrations may be below 6.0 mg/L. From an aquatic health perspective, we conservatively chose 5.0 mg/L as the level to maintain. This level is still above what would have been experienced naturally, but with the addition of human influence we felt it an applicable guideline. By nature's design, an unregulated or natural river has extremes (high and low flow) both of which perform important functions which deviate substantially from "optimal" conditions. So, maintaining optimal conditions all the time is not advised from an ecological standpoint. Thus, the proposed instream flow guidelines do not apply the 6.0 mg/L DO exceptional aquatic life use standard during subsistence flow conditions. Further, the Science Review Panel has raised no concerns with 5.0 mg/L.

Environmental Stewardship Comment:
Likewise, the 6.0 mg/l DO standard should be applied in the water quality modeling in section 3.4. Under current regulatory standards, the results characterized in the last paragraph of p 36 and the statement on p 37 – "However, even under these extreme conditions, LSWP water quality monitoring predicts average and diel DO concentrations in the river will be acceptable [under the 5.0 mg/l DO standard] to meet the needs of the lower Colorado River aquatic community" – may not be supported for Sections 1428 and 1434 of the river [emphasis added].

LSWP Response:
Please see comment above.

3. Subsistence Flow Recommendations

Environmental Stewardship Comment:
It would appear that the subsistence flow recommendations are not as protective as the LCRA WMP. Mosier & Ray (p 47) determined that a critical flow of 500 cfs at Bastrop should be maintained from early March through May for successful spawning of the blue sucker. From the Percent of Maximum Habitat versus Simulated Discharge graph (Figure C6) it appears that 500 cfs flow provides ~100% of the spawning blue sucker habitat. To be equally as protective, the flow at Bastrop would need to provide the same percent of habitat as that provided by the Mosier & Ray study. Though it is difficult to interpolate with accuracy, using Figure C6 it would appear that the March, April, and May subsistence flow recommendations of 265, 178, and 266 would give habitat availability of ~90%, 80%, and 90% respectively (less protective). From Figure 4.6 these habitat availabilities would appear to correspond to exceedence levels of 60%, 80%, and 60% respectively. Somehow the "flow calculation tool" does not seem to give the same results as the habitat simulation studies. It appears that Mosier & Ray fortuitously recommended exactly the critical flow rate of 500 cfs that this study has estimated provides the maximum amount of habitat available at the Bastrop sampling site.

LSWP Response:
The intent of determining the instream flow requirements for the lower Colorado River was to use modern day, state-of-the art tools and updated biological data to develop a protective flow regime for the lower Colorado River. Having a flow regime with subsistence flow (developed with much updated biological data), two levels of base flow, two levels of pulse flow, and an overbanking recommendation is not less protective to the aquatic health of the lower Colorado River than the LCRA WMP.

Mosier and Ray (1992) developed critical flows at Bastrop that were recommended to be maintained from early March to May. The goal of those recommendations was to protect blue sucker spawning based on very limited blue sucker spawning data. The additional three years' of blue sucker spawning data we have collected via the LSWP study have allowed us to improve our understanding beyond that which was available to Mosier and Ray in 1992. We now know that February and March are the key months for blue sucker spawning. Mosier and Ray's recommendation of 500 cfs flow at Bastrop was based on observations of blue sucker spawning. However, Mosier and Ray did not identify or model spawning habitat. It is coincidence that our modeling indicates that a 500 cfs flow provides nearly 100% of the available blue sucker spawning habitat.

A goal of maintaining aquatic health in a river to provide optimal conditions (e.g. 100% spawning blue sucker habitat and 6.0 mg/L dissolved oxygen) at subsistence flows would eliminate any low end variability that nature would have provided, which, in turn, maintains and strengthens diversity. The more realistic historical values for blue sucker spawning habitat during periods of low-flow (i.e. subsistence conditions) would have been around 30%. While one could support an argument that 30% is protective at low flows, we used our professional judgment and doubled it to 60% during these periods (Page 59) because of our concern regarding recruitment. Within the context of the entire proposed flow regime, our proposal is at least as protective as the 500 cfs within the context of the LCRA WMP.

Environmental Stewardship Comment:
Mosier & Ray (p 37) confirmed earlier TPWD reports regarding the abundance of blue sucker in the segment from Utley to Bastrop and suggested that, "given the status of the blue sucker throughout most of its natural range, protection of this population should be a high priority". Mosier & Ray (p 39) found that the Eagle Lake study reach (corresponding to the Altair study site in the Columbus reach of this study) provided significant spawning habitat for the blue sucker. In their schedule of recommended flow (p 3) they superseded target flows in the Eagle Lake segment (Columbus Reach) with critical flows of 500 cfs for the months of March and April to

meet blue sucker spawning requirements (May flow was 820 cfs exceeding the critical flow recommendation). To provide instream flows no less protective than those included in the LCRA WMP the flows for the Bastrop and Columbus segments need to be adjusted to provide the same quantity and quality of habitat for spawning blue sucker.

LSWP Response:
Please see response above. February through March is the key period.

Environmental Stewardship Comment:
Likewise, the subsistence flow recommendations for August and September should be adjusted to give the same habitat availability as provided by 120 cfs, which appears to be about 70% from Figure C6 which corresponds to an exceedence level of ~85%.

LSWP Response:
Please see two previous responses.

Environmental Stewardship Comment:
Why was the Austin gage used for all low flow calculations (Table 4.7 p 58)? It seems more reasonable to use local gage data for these calculations. If it is not possible to use the local gages, it would seem reasonable to use an intermediate between the Austin and Columbus gages based on river miles from each gage. Mosier and Ray (p 25) provide a longitudinal profile of the Colorado River which gives a slope = 0.00026 between the Austin and Columbus gages which would likely be useful in making this interpolation.

LSWP Response:
We are currently exploring methods (i.e. drainage areas, etc.) that could be used to adjust the flows from the Austin gage to the Bastrop and Smithville reaches.

4. Base Flow Recommendations

Environmental Stewardship Comment:
The addition of DRY and AVERAGE base flow conditions is meaningful from both an environmental and flow regime management perspective for this region of Texas. It should fit well with the LCRA's Water Management Plan approach and provides for a more flexible range of operations. The 60% and 80% habitat exceedence limits need to be adjusted vis-à-vis the subsistence flow recommendations to be as protective as the current LCRA WMP.

To extend the logic from the subsistence flow recommendations to provide protection of the blue sucker habitat suggests that the spawning blue sucker habitat at the Utley and Altair sites be used to set the regime characteristics vis-à-vis the Bastrop and Columbus control points. For example the DRY base flow should improve on the maximum spawning blue sucker habitat at Utley by increasing percent habitat available from the ~ 90% that would be available at subsistence flow to 95-100% from Figure 4.6. Likewise, the Altair habitat should target 100% spawning blue sucker habitat which occurs at ~750 cfs (Figure C16). The AVERAGE base flow should seek to optimize the habitat available at all blue sucker spawning sites in the spring months of March, April and May.

LSWP Response:
Please refer to the flow regime and variability comments above. We welcome comments on how the 60% and 80% habitat exceedence values could be adjusted to improve the overall flow regime recommendations. We have recommended a regime that ensures variability that encompasses optimal conditions.

5. Riparian Habitat

Environmental Stewardship Comment:
The study team is on target with their comments in section 3.2.2. regarding the impacts of irrigation releases and land use practices on the lower Colorado River. A return to pre-Highland Dam flow regimes for subsistence and base flow conditions, along with favorable land management practices, would encourage restoration of the riparian habitats within the main channel of the lower Colorado River bringing restored ecological function along with restored ecological service ("stabilizing") benefits. We strongly encourage the adoption of a flow regime that encourages restoration of the riparian habitats.

LSWP Response:
Comment noted.

6. Sedimentation

Environmental Stewardship Comment:
Sedimentation is likely the single most deleterious impact of irrigation flow and land use practices on the lower Colorado River. The impact of sedimentation is evident on an ecological basis as described in section 3.3.2 (and elsewhere in the report) and on an aesthetic basis as experienced by those who fish, swim, and boat the river. Those who are familiar with the river know that water clarity (turbidity as measured by a transparency tube) decreases with the irrigation flows, and increases as flow levels subside, and improve dramatically as daily pulse flows due to hydroelectric generation subside. Local water quality monitoring in the Bastrop reach has detected water clarity to be in the range of 1-3 meters during moderate- to low-flow conditions.

The many benefits that might likely result from reducing the impact of sediment transport are clearly enumerated in the first paragraph on page 32. From an ecological perspective the more notable benefits would be the more gradually sloping banks and bars with increased emergent and herbaceous riparian vegetation, and aquatic habitat for marcroinvertebrates and fish. Likewise, as water quality increases (turbidity decreases) the growth of submerged vegetation would improve providing more cover and forage for sport fish.

From an aesthetic perspective, improved riparian habitat and gentler banks along with clear, clean water that is visibly inviting for fishing, swimming, and boating would increase the attractiveness of the river for nature tourism.

LSWP Response:
Comment noted.

7. Habitat duration curves

Environmental Stewardship Comment:
What is the statistical variability of the data presented in Table 4.6? More specifically, what is the range for the 95% exceedence levels for adult blue sucker spawning habitat at Austin, Bastrop and Smithville? Is 95% protective enough vis-à-vis the statistical variability?

LSWP Response:
Please refer to the figures and tables in Appendices D and E to examine the variability. The 95% habitat exceedence level was selected based on conversations with the Science Review Panel and international instream flow literature referenced on page 53 and 56. Only long-term monitoring can accurately answer the question whether it is protective enough. As discussed in Section 6.0, a long-term monitoring plan is under development.

8. Blue sucker stock

Environmental Stewardship Comment:
What is the condition of the blue sucker population in the river? Is there a healthy mix of age groups from very young to old that would indicate that there has been reproductive success in the river over the period since the LCRA WMP instream flow regime has been in place? Since blue suckers live from 9-30 years and the LCRA WMP instream flow regime became effective with the 1997 revisions that were approved by TCEQ in 1999, the instream flow regime has only been in effect for about 8 years. Did the blue sucker population sampled in this study show signs of improved reproductive success in these eight years of operations?

LSWP Response:
Currently, the adult population of blue suckers within the lower Colorado River is very strong. The length-weight relationship for the 30 individuals radio-tagged in 2004, clearly indicated that different age classes are present. However, no aging study has been conducted to date, so we are unable to answer your mix of age groups question. The inability to collect juveniles to date raises concerns as discussed in the report. The documentation of eggs the past two years and hatching success this year are both positives that should be explored further via long-term monitoring.

An evaluation of the effectiveness of the 1997 revision is difficult because, since 1999, LCRA has not operated at the critical levels contemplated by the WMP. Indeed, the higher summer time flows due to irrigation releases have always exceeded the LCRA WMP "critical" requirements during that period. Data collected for this study over the past three years has allowed us to gain more extensive knowledge about adult and spawning habitat requirements, migration patterns, eggs and hatching success, etc. All this information was used to assist in the draft LSWP instream flow guidelines.

9. Matagorda Bay Freshwater Inflow

Environmental Stewardship Comment:
As discussed in section 7.2, an important next step is to link this study with the inflow needs of the bay. In addition to the LSWP Matagorda Bay Health Evaluation (MBHE) study, it would appear prudent to also consider the results of the 2006 Matagorda Bay Freshwater Inflow Needs Study conducted jointly by the LCRA, TCEQ, TPWD and TWDB (unless those two studies are reconciled in the MBHE study).

LSWP Response:
It is the intent of the MBHE study to directly inform freshwater inflow criteria for Matagorda Bay and thus, will be considered in the linkage discussion. To the degree the MBHE study does not address these criteria, the linkage to FINS 2006 will be addressed.

Thanks again for your comments. Please let me know if you have additional questions or comments. I can be reached at (512) 473-3589.

Sincerely,

Leah Manning, P.E.
Program Manager
LCRA-SAWS Water Project

cc: Ed Oborny, Bio-West