April 29, 2010

Dr. Robert Gulley, Program Director
Edwards Aquifer Recovery Implementation Program

Delivered via email

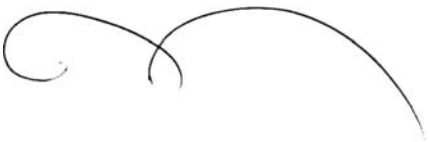
Re: Review of the BIO-WEST, Inc. report on drought of record flow regime development

Dear Dr. Gulley:

Per your request, attached are comments from various members of the Edwards Aquifer Area Expert Science Subcommittee on the technical memorandum titled ”Engineering Solutions—Biological Technical Services Drought of Record Flow Regime Development—Task 1” prepared by BIO-WEST, Inc. for the Edwards Aquifer Recovery Implementation Program. Note that this is a compilation of comments from members and in no way infers subcommittee consensus on the report. The subcommittee met on April 19, 2010, to discuss member comments. Because Ed Oborny was directly involved in the development of the report as an employee of BIO-WEST, Inc., he did not participate as a reviewer of the report.

Please let me know if you have any questions on this review.

Sincerely,



Robert E. Mace, Ph.D., P.G.
Chair, Edwards Aquifer Area Expert Science Subcommittee

Comments by members of the Edwards Aquifer Area Expert Science Subcommittee on the technical memorandum titled ”Engineering Solutions—Biological Technical Services Drought of Record Flow Regime Development—Task 1” prepared by BIO-WEST, Inc. for the Edwards Aquifer Recovery Implementation Program

Comment 1:

Need to clearly discuss the purpose and intent of the study early in the report. It’s unclear how this study is different from Expert Science Subcommittee’s 2009 report. Consider including the written charge (assignment from the EARIP or the contract) in the report. It is important for BIO-WEST to emphasize up front in the document that this is not a simulation of the drought of record, but BIO-WEST's recommended flow regimes to best permit the survival of the species during a severe drought. This flow regime assessment and recommendations are not a refinement or improvement of the Expert Science Subcommittee’s' document on the "j" charges, but BIO-WESTS’s interpretation of an appropriate flow regime for survival during a severe drought. Concerned that readers will interpret this report as the next phase of the biologists’ interpretation of what constitutes an adequate minimum flow.

Comment 2:

Although the need to provide a flow regime model similar to that of the drought of record (1947–1956) in order to begin determining methods of supplying sufficient water to protect the listed species during a similar event is understandable, the model flow regime presented in this report is not similar to the drought of record and would reduce Texas wild-rice to extremely low aerial coverage, requiring heroic as well as unpopular measures to maintain enough individuals to recover the species.

Comment 3:

The 10-year period selected for the drought of record is arbitrary. It may be justified but needs to be more fully assessed and vetted.

Comment 4:

The goal of the model flow regime does not seem to be survival in the wild, but mere survival with “potential” for recovery. This is fairly vague as is other wording in the document, such as “quality” habitat, “portion”, “most”, “some”, “deeper”. Such vagueness could allow for decreased survival and potential for recovery.

Comment 5:

Elucidate on the intended meaning of “portion of the species range,” a phase which appears first on page 5. In other words, does “species range” refer to pool area, water depth, stream reach, or all of the above?

Comment 6:

Qualify the conditions or clarify the extent of “recovery” intended by the phrase “potential for recovery.” For example, a characterization such as “recovery to pre-drought status” may be more appropriate.

Comment 7:

In comparing the BIO-WEST flow regime model with the drought of record, neither the Comal nor San Marcos models are representative of the drought of record. In the Comal model, peak flows are given as 120 cubic feet per second. In the recorded drought of record flows for Comal, flows of 120 cubic feet per second or less only occurred for a few days in 1952, mid-June 1954 to early November 1954, and early April 1955 through early April 1957. The model intermediate and low flows occurred for even briefer time periods. Thus, the 10-year BIO-WEST model presents a flow regime much lower than the drought of record. While the San Marcos model is better with respect to high flows and their frequency during the drought of record, the lowest monthly flows in the San Marcos model are lower than recorded data. Also, most of the model is 60 cubic feet per second or lower while recorded data shows flows of 60 cubic feet per second or less from late June 1956 to mid-October 1956. Again, the model presents a flow regime that is overall much lower than the actual drought of record.

Consider using a term other than “drought of record” and clarify what the drought/flow regime represents.

Comment 8:

The San Marcos model—four years of low and intermediate flows back to back—will not allow revival between peaks and will continue to stress Texas wild-rice.

Comment 9:

A major assumption concerning Texas wild-rice is missing from the list of assumptions. In order for Texas wild-rice to survive at these extremely low flows, plants will have to be both translocated and placed in refugia. Despite the fact that plants have been translocated in the past for various reasons, no or little data was recorded with the exception of the 2009 translocations. The 2009 data is very preliminary, and at least three years’ worth of data is normally required to measure success. Thus it is somewhat optimistic to assume that Texas wild-rice can be translocated successfully. Plus plants often have to be translocated multiple times as flows continue to decrease.

Comment 10:

As for removing plants from the wild and placing them in refugia, there is usually little space at the current two refugia. Plus both these refugia rely on water pumped from the Edwards Aquifer. To date the only plants grown in non-Edwards water died within a year. Also the seeds of Texas wild-rice are recalcitrant (that is, they cannot be stored by normal methods such as freezing or drying); other storage techniques are still in development.

All such activities will require a large commitment of personnel and money. To date the personnel involved with Texas wild-rice relocation have been U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department. Personnel from the National Seed Storage Lab and the Center for Plant Conservation have helped with genetic work and potential long-term storage material. However, during a drought similar to the flow regime model, numerous personnel would be required for translocation work and subsequent monitoring as well as additional equipment at present refugia, additional refugia, and additional personnel to staff the refugia. This increase in staffing and money needs to be built into the assumptions.

Comment 11:

Non-native species and recreational impacts will increase as flows decrease. In the past U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department have been the primary players in removal of non-native vegetation, whether through the removal of species such as water trumpet or floating mats of non-native vegetation. Routing recreation away from Texas wild-rice may be difficult.

Comment 12:

The assumptions about control of exotics is unrealistic and impossible to accomplish.

Comment 13:

Why was San Marcos habitat cut off at I-35? Some of the habitat below I-35 is deep at average flow and may provide good habitat at low flow.

Comment 14:

The eastern spillway of Spring Lake dam is good habitat for Texas wild-rice at most times. However, at very high flows, root mats of Texas wild-rice are often “peeled” off the substrate. While this area may be good habitat at low flows, a quick change to high flows such as during high rainfall events may damage plants. If boards have been removed at the west spillway, monitoring of weather conditions will be necessary to be protective of Texas wild-rice.

Comment 15:

While reduced winter flows in the model may be better for some species that are more temperature dependent, Texas wild-rice is more depth and flow dependent. Lower winter flows will allow less recovery for this species. Texas wild-rice reproduces spring through fall, thus higher spring flows are not necessarily needed for reproduction of Texas wild-rice. At present the mechanism that triggers reproduction in Texas wild-rice is not well understood. Also are spring flows always the high flows? There are many fall peaks due to hurricanes and other causes.

Comment 16:

The identification of the minimum ranges is justified, but needs additional assessment. There has been no consideration of actions (natural or anthropogenic) that may affect what these locations and ranges are. This could be considered during a future task.

Comment 17:

The author's designation of which species are the critical species during the period of drought may vary depending on critical ranges and conditions (such as temperature). This has been extensively discussed but should be clearly stated to insure that secondary species are not unduly threatened when minimum flow regimes are experienced.

Comment 18:

Although recognized, the effect of implementing an intensive management area on environmental factors such as temperature is not adequately addressed. The Expert Science Subcommittee recognized that water temperature, not flow, may be the critical factor in survival. This factor is not clearly recognized in the memo.

Comment 19:

How quickly vegetation, including Texas wild-rice, can colonize new habitat (without human intervention) is unknown at present. This is a major assumption that needs to be considered and quantified in the future.

Comment 20:

Define upfront what “Pulse year” means in terms of associated aquatic and/or habitat conditions. As is, the term is first mentioned atop page 6 with no explanation of what differentiates it from conditions assumed for those of “Low” and “Intermediate” years. It is not until discussions on pages 7 and 12 that this classification is associated with specific ranges in springflow (80 to 120 and 65 to 100 cubic feet per second for Comal and San Marcos springs, respectively).

Comment 21:

The flow numbers appear to be monthly flow averages, rather than a minimum flow number within the month. Task 2 (as described at the end of the report) will hopefully address the daily minimum flows issue.

Comment 22:

It may be difficult for MODFLOW and the simulation of engineered solutions to mimic the requested variable springflow. The model does not have this type of capability nor do engineered management strategies. We have a scale problem here: A flow regime at one scale and water management at another scale.

Comment 23:

How were the variable flow regimes in the various figures (1 through 5) developed? Further explanation as to the source of these flow regimes is needed.

Comment 24:

Suggest adding two more assumptions to the list on page 5:

- areas will be modified to maximize suitable habitat for the listed species at flow from 5 to 120 cubic feet per second in Landa Lake and 5 to 100 cubic feet per second in Spring Lake, this includes the reestablishment of several large stands of Texas wild rice in Spring Lake and
- mitigation and management activities will address predation and competition pressures associated with expansion of native non-spring run associated plant and animal populations during the drought of record period.

Comment 25:

Consider splitting the assumptions section (page 5) into three subsections: one for items associated with both springs, one for items relative to Comal Springs (such as the last bulleted item and that suggested for Landa Lake in the Comment above, and one for items specific to San Marcos Springs (including that suggested for Spring Lake above).

Comment 26:

…appears to be a comprehensive and well-written report…

Comment 27:

A large component of adaptive management will be needed to make these flows possible and to ensure survival of the species. The success of these flow regimes will require that the assumptions are all met and the identified threats in the j-charge report are under control.

Comment 28:

Figure 1 needs to have the cubic feet per second numbers added to the vertical axis**.**

Comment 29:

Consider adding two figures showing key features of the Comal and San Marcos spring/lake/river (riverine) environments; such would help uninformed readers follow discussions about habitats associated with the various “species ranges” associated with the recommended flow regimes for each spring.

Comment 30:

The memo clearly defines the task which is to develop a flow regime that would "ensure survival of the threatened and endangered species with the potential for recovery once the drought ends". The memo also clearly states that the objective of the flow regime is to "maintain quality habitat throughout a portion of the species range at all times" and "maintain reproduction of the species annually, at a minimum". The memo identifies the key species for Comal and San Marcos springs and locations of the minimum ranges required for survival.

Comment 31:

The recognition of inter- and intra-annual variations in flows is justified.

Comment 32:

Memorandum appears to accomplish its stated objectives, is well-composed, and appropriately qualified with assumptions.

Comment 33:

Table 1 for Comal Springs includes what may be a minor inconsistency in December of the second of two consecutive Low years. More specifically, a flow value of 85 cubic feet per second appears in Low years 2 and 7, but 75 cubic feet per second appears in year 10. First, is it biologically necessary to begin the Pulse in December rather than January? If the answer is "yes," then one should choose either 85 cubic feet per second or 75 cubic feet per second for December of the second of two consecutive Low years. If the answer is "no" or "uncertain," then it would be much simpler to use 55 cubic feet per second for December of all Low years.

Comment 34:

Consider showing annual flow averages in Tables 1 and 2.