September 3, 2010

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

Delivered via email

Re: Review of the BIO-WEST, Inc. presentation on environmental restoration and protection areas

Dear Dr. Gulley:

Per your request, attached are comments from members of the Edwards Aquifer Area Expert Science Subcommittee on the presentation titled ”Environmental Restoration and Protection Areas (ERPAs)” prepared by BIO-WEST, Inc. for the Edwards Aquifer Recovery Implementation Program. Ed Oborny of BIO-WEST, Inc. gave this presentation to the Edwards Aquifer Recovery Implementation Program group on July 28, 2010:

http://earip.tamu.edu/EARIPMeetings/Jul2710/07-28-10%20ERPAs%20Presentation%20(Bio-West).pdf

The subcommittee met on September 1, 2010, to hear and discuss the presentation. All members were able to attend the meeting. I instructed members to email me their comments by 8:00 AM September 3, 2010, to be included in this review. Because Ed Oborny was directly involved in the development of the work behind the presentation as an employee of BIO-WEST, Inc., he did not participate as a reviewer of the presentation.

Note that this is a compilation of comments from members and in no way infers subcommittee consensus on 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 presentation titled ”Environmental Restoration and Protection Areas (ERPAs)” prepared by BIO-WEST, Inc. for the Edwards Aquifer Recovery Implementation Program

Acronyms used in the comments:

cfs = cubic feet per second

EAA = Edwards Aquifer Authority

EARIP = Edwards Aquifer Recovery Implementation Program

ERPA = environmental restoration and protection area

HCP = habitat conservation plan

RIP = Recovery Implementation Program

TPWD = Texas Parks and Wildlife Department

TWR = Texas Wild Rice

Note that subcommittee members are listed in alphabetical order.

Rene Barker

After being exposed twice over the span of two consecutive days to Ed's slide presentation about his ERPA findings, I find nothing of significance to question. In fact, from my vantage point as a groundwater type, I find his concepts (mostly biological in nature) to be soundly conceived, adequately supported, and seemingly feasible.

My only words of caution stem from the fact that Ed's recommendations are based in part on output from other individuals' efforts, including bathymetric mapping and computer simulation. Although Ed identifies such links during his presentation, all recognized limitations and caveats associated with each link should be considered in their totality by those who ultimately decide the fate of Ed's recommendations.

Tom Brandt

I like the idea of trying to enhance Comal Springs riffle beetle habitat during low flow periods both in Spring run 3 and below the Landa Lake dam. I do not think lake water will provide what the Comal Springs riffle beetles need. If lake water would support the Comal Springs riffle beetle, it would already exist below Landa Lake in the many seeps that exist there. I feel that aquifer water will need to be used if the Comal Springs riffle beetle is going to profit from the pumping.

The creation of a research area within the old channel of the Comal River is a good idea. This area is protected from flooding so most studies conducted there will probably be able to be completed. Many river studies are lost because of floods and droughts. I feel that habitat should be created in both the Comal and San Marcos rivers. Building what Ed has proposed in the Comal River below Landa Lake dam will allow us to determined how successful we are in creating habitat. We can monitor survival rate of various transplanted aquatic plants and how fast fountain darters move into the created habitat.

Habitat restoration with plants should start at the headwaters and work downstream. I feel that habitat restoration should include non-native removal, native plant introduction, and stream bed modification. I feel all three approaches should be employed.

I have some reservations about the recirculation of river water upstream to enhance habitat for the fountain darter and other species. I am concerned about: the pump heating up the river water; the possibility of air being drawn into the pipeline and the discharged water being supersaturated with nitrogen; and the killing of organisms that are pulled into the pumps. I feel that the creation of the enhanced area will create worst conditions downstream of the pumps. Will the enhanced area result in higher darter survival with the increased loss of darters in the degraded area downstream of the pumps worked into the equation?

Charlie Kreitler

Ed Oborny presented an interesting feasibility study on the development of ERPA's. LBG-Guyton Associates, Bio-West and Espey presented a first cut at some of these engineering approaches for maintaining critical habitat in our study on spring augmentation to the EAA in 2004. Ed has done an excellent job on expanding on these topics in this most recent effort. These engineering approaches should be seriously considered by the RIP. The concept of diffusers for Riffle Beetles should definitely be pursued. The potential for this Spring Run #3 habitat to be in danger of "drying up" comes sooner than other habitats that may become critical as flows drop. Because of this, this approach needs to be evaluated earlier than some of the other suggested studies. The idea of establishing an experimental facility at the upper reach of the Old Channel to test various solutions for the different habitats (such as the diffusers at Spring Run #3) should be given a high priority.

Glenn Longley

I think Ed's ideas have a lot of merit and I support them. I would caution that consideration must be given to the fact that Hardy's models only consider a couple of factors in the river environment and are probably the best we can do at this time but they are models with large limitations and should therefore be used very conservatively.

Robert Mace

The ERPA concept and the research channels have merit. Some additional thought will have to be given to the source of recirculation water with respect to environmental parameters and potential impact to habitat and species at the intakes.

Mary Musick

I don't have comments on the concepts presented by Ed. The only question I had was in regards to potential fouling of the recirculation pipes and trickle outlets used to mimic spring flow. Ed did not seem to be concerned that any treatment of the water would be needed and indicated that problems would be worked out when the system is in operation.

Jackie Poole:

While I hope that dropping below the flow numbers recommended by the EARIP Science Subcommittee can be avoided through the concerted work of the EARIP and eventual HCP, I realize that despite the best plans, we may still get caught by an extreme drought and sent in a downward spiral that is not easily controlled. Thus it would be good to have a plan on how to help the species make it through such extreme low flows. Ed's proposed Environmental Restoration and Protection Areas presentation provided some good ideas and some ideas that need some research or refinements to determine their feasibility. I appreciate the emphasis that Ed placed on the ERPAs not being a replacement for a spring flow regime or as in situ refugia. As I see ERPAs they are areas or efforts to make the systems more resistant to an unavoidable catastrophic drought.

Restoration of native vegetation is a good practice. However, there should be some thought given, particularly in the San Marcos, as to the proportions of different species. Of course all non-native species should be removed, but equivalent native species should take their place. This may not always be Texas wild-rice. Using the Hardy model, the habitat suitability criteria developed for wild-rice using data from Poole and Bowles, and the Saunders et al. habitat suitability criteria for other aquatic plants as well as habitat suitability criteria that might need to be developed or updated, vegetation could be reintroduced to sites where it would be best suited. However, because the amount and location of suitable habitat changes with flow, it would be advisable to pick an average flow to use in the Hardy model. Flows that are too high (>170 cfs) or too low (<60 cfs) may lead to poor establishment of

transplanted material. The ideal locations would have good habitat suitability maintained across a variety of flows.

Another consideration in any restoration project is the source of the restoration material. If it is collected within the spring ecosystem, how will depletion of the natural populations be avoided? This would apply to material collected from the ecosystem to be propagated in cultivation as well. Also raising plants in cultivation for several generations can also lead to genetic drift, making the plants more adapted to cultivation conditions than natural conditions. Additionally, propagated material would have to be kept from diseases, pests, and invasive species. This problem is intensified if material from outside the ecosystem is used. Additionally, genetic differences might be contained in populations of a species from different locations. The more distant the location, the more likely it is for the populations to be different genetically and not adapted to the reintroduction habitat.

There is little documentation of successful reintroduction of Texas wild-rice or the other aquatic species. Work done by Power and Fonteyn, replacing elephant ears (Colocasia esculenta) with Texas wild-rice was a failure. Four other Texas wild-rice plantings done by Power have persisted but not increased. Power also threw 10,000 seeds off Spring Lake Dam in late summer 1996, resulting in 20 new stands, not exactly a high success rate. Mara Alexander has some Texas wild-rice transplant and restoration work which is in the early stages with no conclusive results yet. Robert Doyle has had limited success with some of the other aquatic species. Thus, at this point in time, we don't have a high success rate for restoration. It doesn't mean that we shouldn't try it, but we shouldn't rely on it just yet. Restoration should begin as soon as possible to determine how feasible it will be. The same recommendations apply to the Comal system as well. I do follow the logic Ed presents for which areas to restore in the Comal.

While I agree with the flow split management for the Comal, I'm not sure how essential it is for the San Marcos or how easily it would work. This needs to be investigated more, looking at heights of both dams and leakage through the dam itself as well as how well recreation in this area could be controlled.

Removal of decaying vegetation in the Comal would be a good practice as it would in be in Spring Lake. However, the main problem with decaying for Texas wild-rice comes in the form of the floating vegetation mats that collect on Texas wild-rice and block the light that the plant needs for photosynthesis. Also removal of the sediment island in Sewell Park would provide more habitat for Texas wild-rice.

In the Comal I think that the Spring Runs (1-3) are essential to maintain the genetic diversity of the Comal Springs riffle beetle. Since the spring runs begin to dry (at least at the surface) around 100 cfs, maintaining them during an extreme drought may be difficult. The suggested diffuser seems problematic on several counts. The water will be taken from Landa Lake but from where within the lake? Surface water may be too warm and bottom water may contain too much sediment, nutrients, and other substances that might be deleterious to the riffle beetle and salamanders (note: this salamander previously considered to be a new species is now thought to be the listed Texas Blind Salamander). Experimental work could be done at

the National Fish Hatchery and Technology Center to determine if lake water had deleterious effects on these species. If the riffle beetles and salamander "follow the water" (i.e. retreat into the aquifer as flows lower), would the beetles and the salamanders follow the water into the PVC diffuser? Or if the primary purpose of the diffuser is to wet the surface food, does this food somehow wash into the aquifer or will the organisms have to crawl out of the aquifer to obtain it? Certainly the observation well would help answer some questions about how the beetles behave during an extreme drought as well as during normal flows.

Although the fountain darter population in Landa Lake may be sufficient to sustain the Comal population through an extreme drought, maintaining a population in the Old Channel (via an ERPA) might be insurance against an unforeseen accident. Certainly replacing the native vegetation would be of benefit to the system. In slide 10 (the graph of fountain darter's relationship to vegetation) does CER refer to Ceratopteris thalictroides (non-native) or Ceratophyllum demersum (native)? Also, since algae and bryophytes contain the highest density of fountain darters but are easily lost in low flow, I'm not sure how optimal habitat will be maintained in this ERPA. While the creation of an experimental channel adjacent to the Old Channel could provide a research area somewhat closer to natural conditions, whether or not it could become riffle beetle habitat is uncertain. This concept is untried and should not be considered in any way as a substitute for the native populations. Recirculation of water from below the swimming pool back into the Old Channel above the pool (if I understand the map correctly) is a good idea as the pool water with its potentially unsuitable quality drains in the river below where the recirculation water would be drawn.

I agree with Ed's finding that barriers in Landa Lake to control temperature are not necessary.

Please be aware that the area mentioned for a San Marcos ERPA (east arm of river below Spring Lake dam) had no wild-rice in it from the earliest monitoring in 1976 until 1996 when a stand was planted by TPWD personnel. Also in the late summer of 1996 10,000 seeds were thrown off the dam with 20 new stands resulting. Although this area is obviously suitable for wild-rice, the genetics may be compromised (as the seeds were all from a few plants). This area would only be suitable for an ERPA if recreation can be totally excluded.

Although recreation control in selected areas is mentioned, there is no elaboration. In order to comment knowledgeably on this recommendation the locations of these areas and how recreation might be "controlled" needs to be provided.

Slide 32 shows a graph of Texas wild-rice aerial coverage from 1989 to 2009. While it is true that Texas wild-rice has more or less continuously increased in coverage, this is a simplistic picture of a much more complex situation. Most of the increase of Texas wild-rice has occurred in the upper river between Spring Lake Dam and Hopkins Street. Until Texas wild-rice was listed in 1978, the river in Sewell and City Parks was dredged. When TPWD began monitoring in 1989 there were few plants in this area but apparently much suitable habitat. Thus an increase in this area is not unexpected. It should be noted that TPWD data does show the beginning of a decline in 2008. However, downstream of Hopkins Street, Texas wild-rice coverage has declined. In particular, 25% of Texas wild-rice coverage occurred below Capes Dam previous to the flood of 1998. After the flood, this area has never recovered. Thus, the

range of Texas wild-rice has contracted although the total amount of coverage has increased (until 2008). Range contraction makes a species, especially a species with a single population, as vulnerable, if not more vulnerable, to threats as a loss of aerial coverage.

Slide 33 that refers to "actual occupied TWR area" or "occupied" is misleading. This is not area actually occupied by wild-rice. The "occupied" area was obtained by comparing the predicted "good" or "great" habitat to where wild-rice was found during Bio-West's fall 2009 monitoring. Thus "occupied" area is where predicted and the monitoring locations overlapped. A more reliable comparison would be to use monitoring data from a year with similar flows to the Hardy model, and then track the "good" and "great" stands through the various flows. Also the "good" and "great" stands could be tracked through 20 years of monitoring data to see which stands have persisted through the years.

The Hardy model only takes two parameters into account for Texas wild-rice: depth and flow. In the analysis that Mara Alexander and I did, using a suitability of >0.45, the Hardy model's predicted wild-rice habitat matched occupied locations 17% of the time above Rio Vista Dam and 9% of the time below Rio Vista Dam. Our analysis was based on monitoring data from 2001, the same year as data collected to run the Hardy 2001 model (which is currently the model used in the presentation). If the model is more or less 20% reliable at an "average" suitability (most of the wild-rice occurred in suitabilities of 0.45 or greater), perhaps other parameters need to be added to the model (substrate, associated vegetation, canopy cover, CO2 concentration, etc.). Perhaps the reason for wild-rice not occurring in the model's predicted suitable habitat has nothing to do with easily assessed habitat characteristics but is more reliant on competitive ability, dispersal mechanisms, pollen flow, etc. To assume that wild-rice could occupy all modeled suitable habitat is a leap of faith. As previously stated, restoration of Texas wild-rice is not yet successful and still fairly unproven.

Although I understand the use of 30 cfs for this study (the Hardy model is limited in the number for flow scenarios) it could be interpreted as implying that flows could be allowed to go this low. In my opinion no matter how much of the unoccupied but suitable habitat is replanted with wild-rice at 30 cfs or how much recreation is controlled, this would be a catastrophic, perhaps unrecoverable, loss for the species.