

DRAFT APPLICATION FOR A GRANT FROM THE TEXAS WATER DEVELOPMENT BOARD

**Texas Water Development Board
Research and Planning Fund Grants Management Division
P.O. Box 13231
1700 N. Congress Ave.
Austin, Texas 78711-3231**

I. General Information

a. Legal Name of Applicant

Edwards Aquifer Recovery Implementation Program (“EARIP”)

b. Legal Name of Each Participant

Aquifer Guardian in Urban Areas, Alamo Cement Company, Bexar County, Bexar Metropolitan Water District, Carol G. Patterson, City of Garden Ridge, City of New Braunfels, City of San Marcos, City of Victoria, CPS Energy, East Medina Special Utility District, Edwards Aquifer Authority (“EARIP”), Greater Edwards Aquifer Alliance, Greater San Antonio Chamber of Commerce, Guadalupe Basin Coalition, Guadalupe-Blanco River Authority, Guadalupe County Farm Bureau, John M. Donahue, Ph.D., Larry Hoffman, Nueces River Authority, New Braunfels Utilities, Rader Gilleland, Regional Clean Air and Water Association, San Antonio River Authority, San Antonio Water System, San Marcos River Foundation, South Central Texas Water Advisory Committee, South Texas Farm and Ranch Club, Texas Bass Federation, Texas Commission on Environmental Quality, Texas Department of Agriculture, Texas Living Waters Project, Texas Parks and Wildlife Department, Texas Water Development Board, Texas Wildlife Association, and Union Carbide Corporation

c. The applicant’s official representative with respect to this grant is:

Robert L. Gulley, Ph.D.
Edwards Aquifer Recovery Implementation Program
Texas A&M University Institute of Renewable Natural Resources
3355 Cherry Ridge Dr., Suite 212
San Antonio, Texas 78230
210-467-6575, ext 232 (W)
210-930-1753(F)
RLGulley@ag.tamu.edu

d. The application is not in response to a Request for Proposals in the Texas Register

e. Brief Description of the Research Proposal

The proposal seeks funding for a study to evaluate the impacts of different flow regimes and other factors on three federally listed species and their habitat in and below the Comal and San Marcos Springs. The three species are Texas wild rice (San Marcos Springs), Comal Springs riffle beetle (Comal Springs) and fountain darter (Comal and San Marcos Springs). The

study will develop conceptual models for key ecosystem processes and functions impacting these species, and evaluate the species flow and water quality needs of these species. The information will be used (1) by the Edwards Aquifer Recovery Implementation Program (“EARIP”) to develop recommendations to the EAA for withdrawal reduction levels and stages for critical period management and (2) potentially by the United States Fish and Wildlife Service (“FWS”) in developing an analytical approach for making the “take” and “jeopardy” determinations with regard to the future management of withdrawals from the Edwards Aquifer.

f. Location of the project

The research will be conducted at the River Systems Institute at Texas State University. The proposed project directly involves the region within the jurisdiction of the Edwards Aquifer Authority. It, however, also will provide model and data integration approaches to evaluating the impacts of aquifer withdrawals and flow regimes on habitat and aquatic species in other settings. Thus, the project has potential state-wide application.

g. Description of the plans for implementing the research results

Senate Bill 3 (“S.B. 3”) requires the EAA, Texas Commission on Environmental Quality, the Texas Parks and Wildlife Department, the Texas Department of Agriculture, the Texas Water Development Board and other stakeholders to prepare a plan by September 2012 that provides recommendations for withdrawal adjustments during critical periods to ensure that federally listed, threatened, and endangered species associated with the Edwards Aquifer and associated springs will be protected. S.B. 3 directs the EARIP to establish a science subcommittee to develop these recommendations and to submit them to the Steering Committee and stakeholders for their consideration.

The EARIP will provide the Science Subcommittee with the results of the proposed study to use in its development of recommendations regarding the withdrawal limitations. The EAA must document for the Legislature the extent to which it is considering and implementing the recommendations of the Subcommittee.

In addition, the project is designed so that it can be used by FWS in developing an analytical approach for making the “take” and “jeopardy” determinations with regard to the future management of withdrawals from the Edwards Aquifer.

h. A list of potential users and their possible involvement with the research

See supra at h and f.

i. Total proposed project cost:

\$254,939

j. Total grant funds requested from the Texas Water Development Board:

\$127,470

k. Applicant cash contribution

\$127,470

I. List source of cash contribution

While the Texas Legislature required that State, regional authorities and local governments participate in the EARIP, it did not provide any funds to support the RIP process or the participation of the agencies. Indeed, in S.B. 3 the Legislature directed the EARIP to “pursue cooperative and grant funding to the extent available from all state, federal, and other sources for eligible programs included in the cooperative agreement... .”¹

Initially, fourteen stakeholders pledged funds to support the project management function of the EARIP: EAA, San Antonio Water System, Guadalupe-Blanco River Authority, San Antonio River Authority, Texas Commission on Environmental Quality, Texas Department of Agriculture, Texas Parks and Wildlife Department, Bexar County, Bexar Metropolitan Water District, CPS Energy, City of Victoria, Nueces River Authority, City of San Marcos, and New Braunfels Utilities. Additional commitments for future funding have been received from many of these entities as well as from others including Regional Clean Air & Water, City of New Braunfels, City of San Marcos, Guadalupe Basin Coalition, Alamo Cement Company, Texas Living Waters Project, and the San Marcos River Foundation. These additional contributions will include the funds to cover the part of the project not funded through this proposal.

m. Identify the applicant in-kind contribution including source and description of in-kind services.

Texas Parks and Wildlife Department (“TPWD”) will be providing at no cost persons, including Kenneth Saunders and Jackie Poole, to work on the project. The Edwards Aquifer Authority will provide hydrologic expertise without cost to the project.

n. A list of potential sources and amounts of funding available for implementation of research results.

See supra at m.

o. Is the applicant an individual member of the Texas Water Development Board, a Board staff member, or a member of their immediate families.

The applicant is not an individual member of the Texas Water Development Board, a Board staff member, or a member of their immediate families. However, the TWDB was designated by Senate Bill 3 as a member of the Steering Committee for the EARIP and is participating in the EARIP through its representative, Weir Labatt.

II. Research Project Information

a. Explanation of why this research is needed.

The Edwards Aquifer is a unique groundwater resource, extending 180 miles from Brackettville in Kinney County to Kyle in Hays County. While it is the primary source of

¹ S.B. 3, § 1.26A d (2).

drinking water for over 2 million people in south central Texas and serves the domestic, agricultural, industrial and recreational needs of the area, it is also the sole-source of water for a unique system of aquatic life, including at least eight federally listed threatened and endangered species. The Edwards Aquifer is the source of the only two great springs remaining in Texas - the San Marcos and the Comal. These springs are home to the Fountain Darter, San Marcos Salamander, San Marcos Gambusia (believed to be extirpated), Texas Blind Salamander, Peck's Cave Amphipod, Comal Springs Dryopid and Riffle beetles and Texas wild rice. Comal and San Marcos Springs feed tributaries to the Guadalupe River.

In 1992, the Sierra Club filed a lawsuit under the Federal Endangered Species Act that resulted in the creation of the EAA. The Texas Legislature directed the EAA to regulate pumping from the aquifer, implement critical period management restrictions, and pursue measures to ensure minimum continuous springflows of the Comal and San Marcos Springs are maintained to protect endangered and threatened species to the extent required by federal law. Competing water needs, however, still provoke tensions within the region.

As a result, in late 2006, the United States Fish and Wildlife Service (FWS) brought together stakeholders from throughout the region to participate in a unique collaborative process to balance the needs of all those who rely on the waters of the Edwards. This process is referred to as the Edwards Aquifer Recovery Implementation Program ("EARIP"). In May 2007, in S.B. 3, the Texas Legislature directed the EAA and certain other state and municipal water agencies to participate in the EARIP and to prepare a FWS approved-Habitat Conservation Plan (HCP) by 2012 for managing the Aquifer to preserve the listed species at Comal and San Marcos Springs. The HCP must include withdrawal adjustments based on a combination of spring discharge rates of the San Marcos and Comal springs and levels at the J-17 and J-27 wells during critical periods, that, when combined with other appropriate mitigation, will ensure that federally listed species associated with the Edwards Aquifer will be protected. The proposed study will provide the basis for examining current withdrawal limitations and developing recommendations regarding withdrawal adjustments.

In addition, to obtain the HCP, the EARIP must prepare a draft federal Environmental Impact Statement to satisfy the requirements of the National Environmental Policy Act and to develop the biological information necessary for FWS to prepare a biological opinion regarding the impacts of the proposed actions on federally-listed species. The proposed study will provide essential information for these documents.

b. A detailed scope of work describing tasks and a time schedule for each.

This proposed project consists of an evaluation of the biological impacts of different flow regimes and other factors on three federally listed species: Texas wild rice (San Marcos Springs), Comal Springs riffle beetle (Comal Springs) and fountain darter (Comal and San Marcos Springs). These species are believed to be "sentinel" species with respect to the impacts of flow

regimes on other listed-species. This work will be carried out with the oversight and participation of USGS to ensure that the results can be utilized by FWS in the development of an approach to analyzing the effects of any management strategy as part of FWS' biological opinion regarding the possible HCP.

The project is broken down into five tasks:

1. Data review and synthesis
2. Development of conceptual model(s) for key ecosystem processes and functions
3. Preliminary evaluation of the three sentinel species' flow and water quality needs
4. Incorporation of other aquatic resources
5. Development of a draft technical summary

TASK 1: Data review and synthesis

A large body of knowledge currently exists on the physical, chemical, and ecological characteristics of the Comal and San Marcos River and Edwards Aquifer systems.² This information includes hydrodynamic models and water quality/temperature models, and physical habitat models for fountain darters, Texas wild rice, and the Comal Springs riffle beetle.³ Extensive data also exists for these systems for vegetation and aquatic resource monitoring. The various data, models, and technical evaluations for these systems will be reviewed. Where appropriate, existing physical, chemical, and ecological models will be updated to reflect the state of current knowledge based on the monitoring data/ studies completed since these initial modeling efforts on the Comal and San Marcos were undertaken. In addition, the monitoring data and new studies will be evaluated in terms of the use of this information to expand the assessments for aquatic resources other than the fountain darter, Texas wild rice, or the Comal Springs riffle beetle.

Task 2: Development of conceptual model(s)

² See, e.g., Poole, J. and D. E. Bowles, "Habitat characterization of Texas wild-rice (*Zizania texana* Hitchcock), an endangered aquatic macrophyte from the San Marcos River, TX, USA," *Aquatic Conservation: Marine and Freshwater Ecosystems* 9:291-302 (1999); Poole, J. M., "Historical distribution of Texas wild-rice (*Zizania texana*) from 1989 to 2001," (Final Section 6 report to U. S. Fish and Wildlife Service, Texas Parks and Wildlife Department, 2002); Ed Oborny, "Variable Flow Study – Seven Years of Monitoring and Applied Research," (prepared for the Edwards Aquifer Authority 2007).

³ See, e.g., Hardy, Bartsch, Stevens, and Connor, "Development and Application of an Instream Flow Assessment for the Fountain Darter (*Etheostoma fonticola*) in the Landa Lake and the Comal River System," (1999); Shoemaker, J. and T.B. Hardy, "Development and Application of an Instream Flow Assessment Framework for the fountain darter (*Etheostoma fonticola*) and Texas Wild-Rice (*Zizania texana*) in Spring Lake and in the San Marcos River System," (2004); Saunders, K.S., K.B. Mayes, T.A. Jurgensen, J.F. Trungale, L.J., Kleinsasser, K.Aziz, J.R. Fields, and R.E. Moss, "An Evaluation of Spring Flows to Support the Upper San Marcos River Spring System, Hays County, Texas," (Resource Protection Division, Texas Parks and Wildlife Department, 2001).

This task will focus on the evaluation of existing information reviewed under the first task by knowledgeable scientists and engineers familiar with the Edwards Aquifer and these river systems. The goal of this task is to develop conceptual models of the key ecosystem processes and functions that are critical to the life history needs of the target aquatic species being considered.

Conceptual models identify the cause and effect relationships between changes in ecosystem function or processes on target components of an ecosystem. In this instance, the initial focus would be on effects related to changes in stream flow (and water quality/temperature) on fountain darter, Texas wild rice, and Comal Springs riffle beetles. This is anticipated to take the form of physical habitat based metrics initially since these are readily available from previous studies conducted on the San Marcos and Comal Rivers. The existing models also have incorporated temperature based assessments for fountain darters. Alternative and complimentary modeling based on these physical, chemical, and biological models are also likely to be developed as part of the review, synthesis, and conceptual model development.

The outcome of this task will be the identification of the specific analytical approaches necessary to evaluate the flow dependent needs of the aquatic resources. This would include, where necessary, modification of existing modeling systems to meet these goals. This task will also include the development of the scientific rationale of how the analysis of the target species will address the needs of other resources where insufficient data may preclude more formal evaluations. The effort will also entail the evaluation of non-native species in these systems in light of their potential negative interactions with the native species as affected by particular flow regimes.

Task 3: Preliminary evaluation of the sentinel species' flow and water quality needs

This effort will focus on the application of the analytical and modeling approaches to the three target species in terms of their flow dependent responses with respect to ecosystem processes and function. The goal of this task is to identify the impacts of different flow regimes as well as defining the potential consequences of incremental reductions of flow. It is anticipated that this will examine the spatial and temporal distribution of the quantity and quality of physical habitat in the Comal and San Marcos Rivers as well as incorporating water quality factors such as temperature, turbidity, and dissolved oxygen. This will be accomplished through application of hydraulic simulations, biological model(s) simulations and integration of water quality modeling. This effort may also include the development of species and life stage specific biological response functions and/or updating of existing relationships developed by previous research in these river systems. The task will also focus on providing USGS with the necessary background to support its efforts to quantify the uncertainty in expected ecosystem response over these identified flow ranges.

Task 4: Incorporation of other aquatic resources

Where insufficient quantitative data exists to formally incorporate other native aquatic resources or non-native species, qualitative assessments will be undertaken to evaluate the potential implications of species interactions given the proposed flow regimes. This effort will include the evaluation of known life history traits in terms of flow dependent factors such as habitat use, depth, velocity, temperature, turbidity, and dissolved oxygen and their potential interactions with the target species. This may also include, where sufficient data exists, examination of both the spatial and temporal overlaps as a function of stream flows and include consideration of other factors such as predation risk and food source overlaps.

Task 5: Development of technical report

This step will focus on the development of the technical documentation of the assessment process. This will include documentation of the data/modeling reviews, model modifications where appropriate, methodologies employed, results of the assessments, and rationale for the selection of the proposed flow regime(s) or target flows. This material will be prepared in a format to directly support its use by the EARIP in the development of recommendations regarding withdrawal adjustment, recharge enhancement, augmentation of flows and other management options that might be utilized during critical periods. The report also will be prepared in a manner that provides FWS with information for FWS to develop an approach for evaluating “take” and “jeopardy” when it prepares a biological opinion regarding the impacts of the proposed action on federally-listed species.

Time Schedule

The following outlines the timeline for the specific tasks described above. In many cases, these efforts will overlap in sequence.

- | | |
|---|-----------------------------------|
| 1. Data review and synthesis | August 2008 thru November 2008 |
| 2. Development of conceptual model(s) | November 2008 thru February 2009 |
| 3. Preliminary evaluation of sentinel species’ flow and water quality needs | February 2008 thru June 2009 |
| 4. Incorporation of other aquatic resources | June 2009 thru September 2009 |
| 5. Development of technical report | September 2009 thru November 2009 |

c. A task and expense category budget

The project will be carried out under a contract between a contracting agent for the EARIP and Texas State University (“TSU”). The following is the budget for the project.

TASK BUDGET		
TASK	DESCRIPTION	AMOUNT

Task 1	Data review and synthesis	\$56,922
Task 2	Development of conceptual model(s)	\$69,321
Task 3	Preliminary evaluation of priority sentinel species flow and water quality needs	\$69,321
Task 4	Incorporation of other aquatic resources	\$33,909
Task 5	Development of technical report	\$25,466
TOTAL		\$254,939

EXPENSE BUDGET	
CATEGORY	TOTAL AMOUNT
A. Salaries and Wages	\$143,725
B. Fringe	\$33,908
C. Travel ⁴	\$22,199
D. Expendable Supplies	\$0
E. Subcontract Services	\$0
F. Communications	\$2,500
G. Reproduction	\$0
H. Overhead ⁵	\$52,939
TOTAL	\$254,939

All costs of the project will be paid on a time and expense basis. No salary, wages, or benefits are requested for any EAA, FWS, or TPWD personnel. The salary and benefits are the cost of Drs. Hardy, Bonner, and Mora, and Mr. Oborny. Drs. Hardy's, Bonner's, and Mora's compensation is based on the current salaries and benefits of these individuals at their respective universities and the estimated amount of time they will spend on the project. Mr. Oborny's time will be charged at the hourly rate Bio-West charges the EAA (\$110.67).

d. A list of products (reports, plans, or other products) that the Board will receive as a result of the research.

The deliverable for this proposal will be a report that includes an evaluation of existing data and models, documentation of the conceptual models developed under this grant to assist in the assessments, a summary of the impacts of different flow regimes and other actions on the three listed species.

e. A description of suggested project-monitoring procedures

N/A

⁴ Travel for Dr. Hardy (11 trips from Logan, Utah to San Marcos, Texas and associated cost of lodging, transportation and per diem for 7 weeks).

⁵ Texas State University at 26 percent. The overhead of Utah State University and Texas A&M University will be paid by Texas State University out of its overhead.

f. Qualifications and experience of project staff that are directly related to the project

1. Dr. Thomas B. Hardy

The project will be led by Dr. Thomas Hardy. Dr. Hardy and is currently Director of the Institute for Natural Systems Engineering (INSE) and Associate Director of the Utah Water Research Laboratory at Utah State University, and was the principal author on two studies on the impacts of in stream flows on the fountain darter at Comal and San Marcos Springs and the fountain darter at Comal Springs. Dr. Hardy also served on the National Academy of Sciences' National Research Council's panel that reviewed the Texas Parks and Wildlife's Instream Flow Program in 2005.⁶

Dr. Hardy holds a Ph.D. in Civil and Environmental Engineering and a M.S. in Aquatic Biology. He is a member and Certified Fisheries Scientist of the American Fisheries Society, the American Society of Civil Engineers, the American Society of Photogrammetry and Remote Sensing, the American Water Resources Association, the International Association for Hydraulic Research and the International Aquatic Modeling Group. He is on the Executive Committee of the International Aquatic Modeling Group, and a member of the Steering Committee of the Ecohydraulics Section of the International Association for Hydraulic Research.

A copy of Dr. Hardy's resume is attached.

2. Mr. Edmund Oborny

Mr. Oborny is the Fisheries Section Leader and a Principal at BIO-WEST, Inc. He specializes in aquatic ecology, threatened and endangered species, water quality, biological modeling, and instream flow issues and concepts. Mr. Oborny has a M.S. in Wildlife and Fisheries Sciences from Texas A&M University. Mr. Oborny is the Project Manager and Principal Aquatic Resources Investigator for the multi-discipline flows and water quality study for EAA that included research into the population dynamics of the fountain darter, Texas wild rice and Comal Springs riffle beetle. He also participated in a study of the distribution of the endangered Comal Springs riffle beetle. A copy of Mr. Oborny's resume is attached.

3. Mr. Kenneth S. Saunders

Mr. Saunders is a Natural Resources Specialist with the Texas Parks and Wildlife Department. He has a M.S. in Natural Resource Conservation from Texas A&M University. A copy of his resume is attached. Mr. Saunders was the Project Leader for the San Marcos River Instream Flow Study and participated in a population estimate of the fountain darter in the Comal River.

4. Ms. Jackie Poole

Ms. Poole is a botanist in the Wildlife Diversity Program of the Texas Parks and Wildlife

⁶ *The Science of Instream Flows: A Review of the Texas Instream Flow Program.*

Department. She has a M.A. in Botany from the University of Texas at Austin. She is an acknowledged expert. A copy of her resume is attached. Her numerous publications include numerous significant papers with respect to Texas Wild Rice.

5. Dr. Timothy H. Bonner

Dr. Bonner is the Director of the Aquatic Station at Texas State University. He has a Ph.D. in Fisheries Science from Texas Tech University. A copy of Dr. Bonner's resume is attached. Among his publications are papers on the effects of parasites and temperature on the fountain darter.

6. Dr. Miguel Mora

Dr. Miguel Mora is a Professor in the Department of Wildlife & Fisheries Sciences at Texas A&M University. He has a Ph.D. in Ecology from the University of California, Davis (UCD). His research interests is ecotoxicology. Dr. Mora is currently beginning work on a simplified model to study toxicity with respect to the fountain darter. A copy of Dr. Mora's resume is attached.

7. Tom Brandt

Tom Brandt has been with the U.S. Fish and Wildlife Service since 1979. Since 1999, he has been the Center Director and Research Fisheries Biologist at the National Fish Hatchery and Technology Center in San Marcos, Texas. He has a Ph.D. from Kansas State University, and a M.S. in Fisheries Science June 1974. He has published numerous papers regarding fish biology including several significant papers on the fountain darter. A copy of Dr. Brandt's resume is attached.

III. Written Assurances

The proposed water research does not duplicate previously completed or on-going research; implementation of research results will be diligently pursued; identification and involvement of potential users will be provided; and if a grant is awarded, will provide written evidence that local matching funds and in-kind services are available for the proposed research.