STATE OF TEXAS TWDB Contract No. 1600012010

COUNTY OF TRAVIS General Revenue
BIO-WEST, INC.

This Contract, (hereinafter "CONTRACT"), between the Texas Water Development Board (hereinafter "TWDB") and BIO-WEST, INC. (hereinafter "CONTRACTOR"), is composed of two parts, SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO THE STANDARD AGREEMENT and SECTION II. STANDARD AGREEMENT. The terms and conditions set forth in SECTION I will take precedence over terms and conditions in SECTION II.

SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT

ARTICLE I. DEFINITIONS

For the purposes of this CONTRACT, the following terms or phrases shall have the meaning ascribed therewith:

1. TWDB – The Texas Water Development Board, or its designated representative

2. CONTRACTOR – BIO-WEST, Inc.

3. EXECUTIVE ADMINISTRATOR – The Executive Administrator of the TWDB or a designated representative

4. PARTICIPANT(S) – BIO-WEST, Inc.

5. REQUIRED INTERLOCAL AGREEMENT(S) – n/a

6. RESEARCH PROJECT – Ecological indicators and habitat characterization in Colorado and Lavaca river basins

7. TWDB APPROVAL DATE – July 21, 2016

8. DEADLINE FOR CONTRACT EXECUTION – November 21, 2016

9. CONTRACT INITIATION DATE – July 21, 2016

10. STUDY COMPLETION DATE – August 15, 2017

11. CONTRACT EXPIRATION DATE – August 31, 2017

12. TOTAL STUDY COSTS – $160,000.00

13. TWDB SHARE OF THE TOTAL STUDY COSTS – the lesser of $160,000.00 or 100 percent of the total study costs or individual payment submission

14. LOCAL SHARE OF THE TOTAL STUDY COSTS – zero cash or zero percent of the total study costs or individual payment submission

15. PAYMENT SUBMISSION SCHEDULE – Monthly

16. OTHER SPECIAL CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT OF THIS CONTRACT –

A. **ARTICLE IV. COMPENSATION AND REIMBURSEMENT,** Item 2, Paragraph 2, shall be replaced as follows:

For all reimbursement billings including any subcontractor's expenses, the EXECUTIVE ADMINISTRATOR must have determined that the REQUIRED INTERLOCAL AGREEMENT(S) and contracts or agreements between the CONTRACTOR and the subcontractor are consistent with the terms of this CONTRACT. After the CONTRACTOR receives reimbursement from the TWDB, the CONTRACTOR will include proof of payment to their subcontractors with the next payment request submitted to TWDB.

B. **ARTICLE III. CONTRACT TERM, SCHEDULE, REORTS, AND OTHER PRODUCTS,** Item No. 7. Is deleted in its entirety.

SECTION II. STANDARD AGREEMENT

ARTICLE I. RECITALS

Whereas, on TWDB APPROVAL DATE, the TWDB considered providing the CONTRACTOR a grant to conduct a RESEARCH PROJECT;

Whereas, the CONTRACTOR and PARTICIPANT will commit the LOCAL SHARE OF THE TOTAL STUDY COSTS, if applicable, in cash and/or in-kind services to pay for the LOCAL SHARE OF THE TOTAL STUDY COSTS of this RESEARCH PROJECT;

Whereas, the CONTRACTOR is the entity who will act as administrator of the TWDB's research grant and will be responsible for the execution of this contract;

Whereas, on the TWDB APPROVAL DATE, the TWDB approved a research grant to CONTRACTOR;

Now, therefore, the TWDB and the CONTRACTOR, agree as follows:

ARTICLE II. PROJECT DESCRIPTION AND SERVICES TO BE PERFORMED

1. The TWDB enters into this CONTRACT pursuant to Water Code §§11.1491 and 16.058 as appropriate; Exhibit A, the original grant application, which is incorporated herein and made a permanent part of this CONTRACT; and this CONTRACT.

2. The CONTRACTOR will conduct a RESEARCH PROJECT, as delineated and described in Exhibit A, according to the Scope of Work contained in Exhibit B.

3. A progress report, including results to date, will be provided to the EXECUTIVE ADMINISTRATOR monthly, throughout the project. Special interim reports on special topics and/or results will be provided as appropriate. Instructions for the progress report are shown in Exhibit E, TWDB Guidelines for a Progress Report.

4. Within the first 60 days of the commencement of this CONTRACT, CONTRACTOR will consult with TWDB staff to prepare a list of entities that potentially may be affected by the results of this RESEARCH PROJECT. On the STUDY COMPLETION DATE, this list will be reviewed and updated by the CONTRACTOR and submitted to the TWDB with the draft final report.

ARTICLE III. CONTRACT TERM, SCHEDULE, REPORTS, AND OTHER PRODUCTS

1. The CONTRACTOR has until the DEADLINE FOR CONTRACT EXECUTION to execute this CONTRACT and to provide acceptable evidence of any REQUIRED INTERLOCAL AGREEMENT(S) and the Contractors' ability to

provide the LOCAL SHARE OF THE TOTAL STUDY COSTS, if applicable, to the EXECUTIVE ADMINISTRATOR for approval or the TWDB's SHARE OF THE TOTAL STUDY COSTS will be rescinded.

2. The term of this CONTRACT shall begin and the CONTRACTOR shall begin performing its obligations hereunder on the CONTRACT INITIATION DATE and shall expire on the CONTRACT EXPIRATION DATE. Delivery of an acceptable final report prior to the CONTRACT EXPIRATION DATE shall constitute completion of the terms of this CONTRACT.

3. The CONTRACTOR will complete the Scope of Work and will deliver four (4) double- sided copies of a draft final report to the EXECUTIVE ADMINISTRATOR no later than the STUDY COMPLETION DATE. The draft final report will include the scope of work; a description of the research performed; the methodology and materials used; any diagrams or graphics used to explain the procedures related to the study; any data collected; an electronic copy of any computer programs, maps, or models along with an operations manual and any sample data set(s) developed under the terms of this CONTRACT; analysis of the research results; conclusions and recommendations; a list of references, a Table of Contents, List of Figures, List of Tables, an Executive Summary, and any other pertinent information. All final reports should be prepared according to Exhibit D, Guidelines for Authors Submitting Contract Reports to the Texas Water Development Board. After a 30-day review period, the EXECUTIVE ADMINISTRATOR will return review comments to the CONTRACTOR.

4. The CONTRACTOR will consider incorporating comments from the EXECUTIVE ADMINISTRATOR and other commentors on the draft final report into a final report. The CONTRACTOR will include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final report. The CONTRACTOR will submit one (1) electronic copy of the entire final report in Portable Document Format (PDF) and five (5) bound double- sided copies of the final report to the EXECUTIVE ADMINISTRATOR no later than the sixty days (60) after the STUDY COMPLETION DATE.

5. The CONTRACTOR will submit one (1) electronic copy of any computer programs or models and an operations manual developed under the terms of this CONTRACT. In compliance with Texas Administrative Code Chapters 206 and 213 (related to Accessibility and Usability of State Web Sites), the digital copy of the final report will comply with the requirements and standards specified in statute. After a 30-day review period, the EXECUTIVE ADMINISTRATOR will either accept or reject the final report. If the final report is rejected, the rejection letter sent to the CONTRACTOR shall state the reasons for rejection and the steps the CONTRACTOR needs to take to have the final report accepted and the retainage released.

6. The CONTRACTOR will submit the most recent progress report with submittal of payments according to the PAYMENT SUBMISSION SCHEDULE. Progress reports shall be in written form and shall include a brief statement of the overall progress made since the last status report; a brief description of any problems that have been encountered during the previous reporting period that will affect the study, delay the

timely completion of any portion of this CONTRACT, inhibit the completion of or cause a change in any of the study's products or objectives; and a description of any action the CONTRACTOR plans to take to correct any problems that have been encountered.

7. The EXECUTIVE ADMINISTRATOR can extend the STUDY COMPLETION DATE and the CONTRACT EXPIRATION DATE upon written approval. The CONTRACTOR should notify the EXECUTIVE ADMINISTRATOR in writing within ten (10) working days prior to the STUDY COMPLETION DATE or thirty (30) days prior to the CONTRACT EXPIRATION DATE that the CONTRACTOR is requesting an extension to the respective dates.

ARTICLE IV. COMPENSATION AND REIMBURSEMENT

1. The TWDB agrees to compensate and reimburse the CONTRACTOR in a total amount not to exceed the TWDB's SHARE OF THE TOTAL STUDY COSTS for costs incurred and paid by the CONTRACTOR pursuant to performance of this CONTRACT. The CONTRACTOR will contribute local matching funds, if applicable, in sources and amounts defined as the LOCAL SHARE OF THE TOTAL STUDY COSTS. The TWDB shall reimburse the CONTRACTOR for one hundred percent (100%) of the TWDB's share of each invoice pending the CONTRACTOR's performance up to ninety percent (90%) of the total funding costs. Upon completion of a Final Report, and written acceptance of said Final Report by the EXECUTIVE ADMINISTRATOR, the TWDB shall pay the remaining ten percent (10%) to the CONTRACTOR upon submission of a final invoice.

2. The CONTRACTOR shall submit payments and documentation for reimbursement billing according to the PAYMENT SUBMISSION SCHEDULE and in accordance with the approved task and expense budgets contained in Exhibit C to this CONTRACT. The CONTRACTOR has budget flexibility within task and expense budget categories to the extent that the resulting change in amount in any one task or expense category does not exceed 35% of the total authorized amount by this CONTRACT for the task or category. Larger deviations shall require approval by EXECUTIVE ADMINISTRATOR or designee which will be documented through an Approved Budget Memorandum to the TWDB contract file. The CONTRACTOR will be required to provide written explanation for the overage and reallocation of the task and expense amount.

   For all reimbursement billings including any subcontractor's expenses, the EXECUTIVE ADMINISTRATOR must have determined that the REQUIRED INTERLOCAL AGREEMENT(S) and contracts or agreements between the CONTRACTOR and the subcontractor are consistent with the terms of this CONTRACT. The CONTRACTOR is fully responsible for paying all charges by subcontractors prior to reimbursement by the TWDB.

3. The CONTRACTOR and its subcontractors shall maintain satisfactory financial accounting documents and records, including copies of invoices and receipts, and

shall make them available for examination and audit by the EXECUTIVE ADMINISTRATOR. Accounting by the CONTRACTOR and its subcontractors shall be in a manner consistent with Generally Accepted Accounting Principles.

4. By executing this CONTRACT, the CONTRACTOR accepts the authority of the State Auditor's Office, under direction of the legislative audit committee, to conduct audits and investigations in connection with any and all state funds received pursuant to this contract. The CONTRACTOR shall comply with and cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the State Auditor with access to any information the State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any subcontract related to this CONTRACT that requires the subcontractor to submit to audits and investigation by the State Auditor's Office in connection with any and all state funds received pursuant to the subcontract.

5. The CONTRACTOR shall submit a progress report as described in Article II, Item 3 and the following documentation which documents the TOTAL STUDY COSTS for the reporting period even if the TOTAL STUDY COSTS are zero for reimbursement by the TWDB to the CONTRACTOR for the TWDB's SHARE OF THE TOTAL STUDY COSTS shall be submitted by the CONTRACTOR to the EXECUTIVE ADMINISTRATOR for reimbursement billing:

   A. Completed and Signed Payment Request Checklist which includes the following:
      (1) TWDB CONTRACT Number;
      (2) Billing period; beginning (date) to ending date;
      (3) Total Expenses for this period;
      (4) Total In-kind services;
      (5) Less LOCAL SHARE OF THE TOTAL STUDY COSTS for the billing period;
      (6) Total TWDB's SHARE OF THE TOTAL STUDY COSTS for the billing period;
      (7) Amount of retainage to be withheld for the billing period;
      (8) Total costs to be reimbursed by the TWDB for the billing period; and
      (9) Certification, signed by the CONTRACTOR's authorized representative, that the expenses submitted for the billing period are a true and correct representation of amounts paid for work performed directly related to this contract.

   B. For direct expenses incurred by the CONTRACTOR other than subcontracted work:
      (1) A spreadsheet showing the tasks that were performed; the percent and cost of each task completed; a total cost figure for each direct expense category including labor, fringe, overhead, travel, and other expenses such as communication and postage, technical and computer services, expendable supplies, printing and reproduction; and

(2) Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).

C. For direct expenses incurred by the CONTRACTOR for subcontracted work:
(1) Copies of invoices from the subcontractors to the CONTRACTOR;
(2) A spreadsheet showing the tasks that were performed; the percent and cost of each task completed; a total cost figure for each direct expense category including labor, fringe, overhead, travel, and other expenses such as communication and postage, technical and computer services, expendable supplies, printing and reproduction; and the total dollar amount due to the consultant; and
(3) Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).

D. For travel expenses for the CONTRACTOR and/or subcontractor(s) –
(1) Names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2015, Article IX, Part 5, as amended or superceded. Receipts required for lodging;
(2) Copies of invoices or tickets for transportation costs or, if not available, names, dates, and points of travel of individuals; and
(3) All other reimbursable travel expenses -- invoices or purchase vouchers showing reason for expense with receipts to evidence the amount incurred.

6. Incomplete requests will be returned to the CONTRACTOR if deficiencies are not resolved within ten (10) business days.

7. If for some reason the reimbursement request cannot be processed due to the need for an amendment to the CONTRACT, the CONTRACTOR will be required to resubmit the Payment Request Checklist dated after the execution of the amendment.

8. The CONTRACTOR is responsible for any food or entertainment expenses incurred by its own organization or that of its subcontractors, outside that of the travel expenses authorized and approved by the State of Texas under this CONTRACT.

9. A compliance report in accordance with Texas Administrative Code (TAC) Title 1, Part 5, Chapter 111, Subchapter B, Rule §111.14:, The CONTRACTOR shall maintain business records documenting its compliance with the approved Historically Underutilized Business subcontracting plan in the format prescribed by the Texas Procurement and Support Services (Exhibit F). The compliance reports must include payment information on all HUB and non-HUB subcontractors. Submittal of these monthly compliance reports is required as a condition of payment.

The TWDB will monitor the HUB subcontracting plan monthly to ensure the value of the subcontracts meets or exceeds the HUB subcontracting provisions specified in the contract. CONTRACTOR who fails to implement the HUB subcontracting plan in good faith will be reported to Texas Procurement and Support Services. The TWDB may revoke the contract for breach of contract and make a claim against the contractor.

ARTICLE V. INTELLECTUAL PROPERTY: OWNERSHIP, PUBLICATION, AND ACKNOWLEDGMENT

1. "Use" of a work product, whether a CONTRACTOR Works, a Subcontractor Works or otherwise, shall mean and include, without limitation hereby, any lawful use, copying or dissemination of the work product, or any lawful development, use, copying or dissemination of derivative works of the work product, in any media or forms, whether now known or later existing.

2. "No Compensation Obligation" shall mean there is no obligation on the part of one co-owner or licensee of a work, whether a CONTRACTOR Works, a Subcontractor Works or otherwise, to compensate other co-owners, licensees or licensors of the work for any use of the work by the using co-owner or licensee, including but not limited to compensation for or in the form of: royalties; co-owner or licensee accounting; sharing of revenues or profits among co-owners, licensees or licensors; or any other form of compensation to the other co-owners, licensees or licensors on account of any use of the work.

3. "Dissemination" shall include, without limitation hereby, any and all manner of: physical distribution; publication; broadcast; electronic transmission; internet streaming; posting on the Internet or world wide web; or any other form of communication, transmission, distribution, sending or providing, in any forms or formats, and in or using any media, whether now known or later existing.

4. The TWDB shall have an unlimited, unrestricted, perpetual, irrevocable, non-exclusive royalty-free right to access and receive in usable form and format, and to use all technical or other data or information developed by CONTRACTOR and Subcontractor in, or otherwise resulting from, the performance of services under this CONTRACT.

5. For purposes of this Article, "CONTRACTOR Works" are work products developed by CONTRACTOR and Subcontractor using funds provided under this CONTRACT or otherwise rendered in or related to the performance in whole or part of this CONTRACT, including but not limited to reports, drafts of reports, or other material, data, drawings, studies, analyses, notes, plans, computer programs and codes, or other work products, whether final or intermediate.

    a. It is agreed that all CONTRACTOR Works shall be the joint property of the TWDB and CONTRACTOR.

b. The parties hereby agree that, if recognized as such by applicable law, the CONTRACTOR Works are intended to and shall be works-made-for-hire with joint ownership between the TWDB and CONTRACTOR as such works are created in whole or part.

c. If the CONTRACTOR Works do not qualify as works-made-for-hire under applicable law, CONTRACTOR hereby conveys co-ownership of such works to the TWDB as they are created in whole or part. If present conveyance is ineffective under applicable law, CONTRACTOR agrees to convey a co-ownership interest of the CONTRACTOR Works to the TWDB after creation in whole or part of such works, and to provide written documentation of such conveyance upon request by the TWDB.

d. The TWDB and CONTRACTOR acknowledge that the copyright in and to a copyrightable CONTRACTOR Work subsists upon creation of the CONTRACTOR Work and its fixing in any tangible medium. CONTRACTOR or the TWDB may register the copyrights to such Works jointly in the names of the CONTRACTOR and the TWDB.

e. The TWDB and CONTRACTOR each shall have full and unrestricted rights to use a CONTRACTOR Work with No Compensation Obligation.

6. For purposes of this Article, "Subcontractor Works" include all work product developed in whole or part by or on behalf of Subcontractors engaged by CONTRACTOR to perform work for or on behalf of any CONTRACTOR under this CONTRACT (or by the Subcontractors' Subcontractors hereunder, and so on). CONTRACTOR shall secure in writing from any Subcontractors so engaged:

a. unlimited, unrestricted, perpetual, irrevocable, royalty-free rights of the TWDB (and, if desired, of CONTRACTOR) to access and receive, and to use, any and all technical or other data or information developed in or resulting from the performance of services under such engagement, with No Compensation Obligation; and either

b. assignment by the Subcontractor to the TWDB (and, if desired by them, jointly to the CONTRACTOR) of ownership (or joint ownership with the Subcontractor) of all Subcontractor Works, with No Compensation Obligation; or

c. grant by Subcontractor of a non-exclusive, unrestricted, unlimited, perpetual, irrevocable, world-wide, royalty-free license to the TWDB (and, if desired by them, the CONTRACTOR) to use any and all Subcontractor Works, including the right to sublicense use to third parties, with No Compensation Obligation.

7. No unauthorized patents. CONTRACTOR Works and Subcontractor Works or other

work product developed or created in the performance of this CONTRACT or otherwise using funds provided hereunder shall not be patented by CONTRACTOR or their Subcontractor unless the EXECUTIVE ADMINISTRATOR consents in writing to submission of an application for patent on such works; and provided that, unless otherwise agreed in writing, any application made for patent shall include and name the TWDB (and, as applicable and desired by them, CONTRACTOR) as co-owners of the patented work:

a. no patent granted shall in any way limit, or be used by CONTRACTOR or Subcontractor to limit or bar the TWDB's rights hereunder to access and receive in useable form and format, and right to use, any and all technical or other data or information developed in or resulting from performance pursuant to this CONTRACT or the use of funds provided hereunder; and

b. the TWDB (and, if applicable, the CONTRACTOR) shall have No Compensation Obligation to any other co-owners or licensees of any such patented work, unless otherwise expressly agreed in writing.

8. CONTRACTOR shall include terms and conditions in all contracts or other engagement agreements with any Subcontractors as are necessary to secure these rights and protections for the TWDB; and shall require that their Subcontractors include similar such terms and conditions in any contracts or other engagements with their Subcontractors. For the purposes of this section, "Subcontractors" includes independent contractors (including consultants) and also employees working outside the course and scope of employment.

9. Any work products subject to a TWDB copyright or joint copyright and produced or developed by the CONTRACTOR or their Subcontractor pursuant to this CONTRACT or using any funding provided by the TWDB may be reproduced in any media, forms or formats by the TWDB or CONTRACTOR at their own cost, and be disseminated in any medium, format or form by any party at its sole cost and in its sole discretion. CONTRACTOR may utilize such work products as they may deem appropriate, including Dissemination of such work products or parts thereof under their own name, provided that any TWDB copyright is noted on the materials.

10. The CONTRACTOR agrees to acknowledge the TWDB in any news releases or other publications relating to the work performed under this CONTRACT.

ARTICLE VI. AMENDMENT, TERMINATION, AND STOP ORDERS

1. This CONTRACT may be altered or amended by mutual written consent or terminated by the EXECUTIVE ADMINISTRATOR at any time by written notice to the CONTRACTOR. Upon receipt of such termination notice, the CONTRACTOR shall, unless the notice directs otherwise, immediately discontinue all work in connection with the performance of this CONTRACT and shall proceed to cancel promptly all existing orders insofar as such orders are chargeable to this CONTRACT. The CONTRACTOR

shall submit a statement showing in detail the work performed under this CONTRACT to the date of termination. The TWDB shall then pay the CONTRACTOR promptly that proportion of the prescribed fee, which applies to the work, actually performed under this CONTRACT, less all payments that have been previously made. Thereupon, copies of all work accomplished under this CONTRACT shall be delivered to the TWDB.

2. The EXECUTIVE ADMINISTRATOR may issue a Stop Work Order to the CONTRACTOR at any time. Upon receipt of such order, the CONTRACTOR shall discontinue all work under this CONTRACT and cancel all orders pursuant to this CONTRACT, unless the order directs otherwise. If the EXECUTIVE ADMINISTRATOR does not issue a Restart Order within 60 days after receipt by the CONTRACTOR of the Stop Work Order, the CONTRACTOR shall regard this CONTRACT terminated in accordance with the foregoing provisions.

ARTICLE VII. SUBCONTRACTS

Each Subcontract entered into to perform required work under this CONTRACT shall contain the following provisions:

a. a detailed budget estimate with specific cost details for each task or specific item of work to be performed by the Subcontractor and for each category of reimbursable expenses;

b. a clause stating that the Subcontract is subject to audit by the Texas State Auditor's Office and requiring the Subcontractor to cooperate with any request for information from the Texas State Auditor, as further described in Article X, Section 1, Paragraph D hereof;

c. a clause stating that payments under the Subcontract are contingent upon the appropriation of funds by the Texas Legislature, as further described in Article X, Section 1, Paragraph A hereof;

d. a clause stating that ownership of data, materials and work papers, in any media, that is gathered, compiled, adapted for use, or generated by the Subcontractor or the CONTRACTOR shall become data, materials and work owned by the TWDB and that Subcontractor shall have no proprietary rights in such data, materials and work papers, except as further described in Article V hereof;

e. a clause stating that Subcontractor shall keep timely and accurate books and records of accounts according to generally acceptable accounting principles as further described in Article X, Section 2, Paragraph H;

f. a clause stating that Subcontractor is solely responsible for securing all required licenses and permits from local, state and federal governmental entities and that Subcontractor is solely responsible for obtaining sufficient insurance in accordance with the general standards and practices of the industry or governmental entity; and

g. a clause stating that Subcontractor is an independent contractor and that the TWDB shall have no liability resulting from any failure of Subcontractor that results in breach of CONTRACT, property damage, personal injury or death.

ARTICLE VIII. LICENSES, PERMIT, AND INSURANCE

1. For the purpose of this CONTRACT, the CONTRACTOR will be considered an independent contractor and therefore solely responsible for liability resulting from negligent acts or omissions. The CONTRACTOR shall obtain all necessary insurance, in the judgment of the CONTRACTOR, to protect themselves, the TWDB, and employees and officials of the TWDB from liability arising out of this CONTRACT.

2. The CONTRACTOR shall be solely and entirely responsible for procuring all appropriate licenses and permits, which may be required by any competent authority for the CONTRACTOR to perform the subject work.

3. Indemnification. The CONTRACTOR shall indemnify and hold the TWDB and the State of Texas harmless, to the extent the CONTRACTOR may do so in accordance with state law, from any and all losses, damages, liability, or claims therefore, on account of personal injury, death, or property damage of any nature whatsoever caused by the CONTRACTOR, arising out of the activities and work conducted pursuant to this CONTRACT. The CONTRACTOR is solely responsible for liability arising out of its negligent acts or omissions during the performance of this CONTRACT.

ARTICLE IX. SEVERANCE PROVISIONS

Should any one or more provisions of this CONTRACT be held to be null, void, voidable, or for any reason whatsoever, of no force and effect, such provision(s) shall be construed as severable from the remainder of this CONTRACT and shall not affect the validity of all other provisions of this CONTRACT which shall remain of full force and effect.

ARTICLE X. GENERAL TERMS AND CONDITIONS

1. GENERAL TERMS.

   a. No Debt Against the State. This CONTRACT does not create any debt by or on behalf of the State of Texas and the TWDB. The TWDB's obligations under this CONTRACT are contingent upon the availability of appropriated funds and the continued legal authority of the TWDB to enter into this CONTRACT.

   b. Independent Contractor. Both parties hereto, in the performance of this contract, shall act in an individual capacity and not as agents, employees, partners, joint ventures or associates of one another. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purposes whatsoever.

c. Procurement Laws. The CONTRACTOR shall comply with applicable State of Texas procurement laws, rules and policies, including but not limited to competitive bidding and the Professional Services Procurement Act, Government Code, Chapter 2254, relating to contracting with persons whose services are within the scope of practice of: accountants, architects, landscape architects, land surveyors, medical doctors, optometrists, professional engineers, real estate appraisers, professional nurses, and certified public accountants.

d. Right to Audit. The CONTRACTOR and its Subcontractors shall maintain all financial accounting documents and records, including copies of all invoices and receipts for expenditures, relating to the work under this CONTRACT. CONTRACTOR shall make such documents and records available for examination and audit by the EXECUTIVE ADMINISTRATOR or any other authorized entity of the State of Texas. CONTRACTOR'S financial accounting documents and records shall be kept and maintained in accordance with generally accepted accounting principles. By executing this CONTRACT, the CONTRACTOR accepts the authority of the Texas State Auditor's Office to conduct audits and investigations in connection with all state funds received pursuant to this CONTRACT. The CONTRACTOR shall comply with directives from the Texas State Auditor and shall cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the Texas State Auditor with access to any information the Texas State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any Subcontract related to this CONTRACT that requires the Subcontractor to submit to audits and investigation by the State Auditor's Office in connection with all state funds received pursuant to the Subcontract.

e. Force Majeure. Unless otherwise provided, neither CONTRACTOR nor the TWDB nor any agency of the State of Texas, shall be liable to the other for any delay in, or failure of performance, of a requirement contained in this CONTRACT caused by force majeure. The existence of such causes of delay or failure shall extend the period of performance until after the causes of delay or failure have been removed provided the non-performing party exercises all reasonable due diligence to perform. Force majeure is defined as acts of God, war, strike, fires, explosions, or other causes that are beyond the reasonable control of either party and that by exercise of due foresight such party could not reasonably have been expected to avoid, and which, by the exercise of all reasonable due diligence, such party is unable to overcome. Each party must inform the other in writing with proof of receipt within two (2) business days of the existence of such force majeure or otherwise waive this right as a defense.

2. STANDARDS OF PERFORMANCE.

a. Personnel. CONTRACTOR shall assign only qualified personnel to perform the services required under this CONTRACT. CONTRACTOR shall be responsible for ensuring that any Subcontractor utilized shall also assign only qualified personnel. Qualified personnel are persons who are properly licensed to perform the work and who have sufficient knowledge, skills and ability to perform the tasks and services required herein according to the standards of performance and care for their trade or profession.

b. Professional Standards. CONTRACTOR shall provide the services and deliverables in accordance with applicable professional standards. CONTRACTOR represents and warrants that he is authorized to acquire Subcontractors with the requisite qualifications, experience, personnel and other resources to perform in the manner required by this CONTRACT.

c. Antitrust. CONTRACTOR represents and warrants that neither CONTRACTOR nor any firm, corporation, partnership, or institution represented by CONTRACTOR, or anyone acting for such firm, corporation, partnership, or institution has (1) violated the antitrust laws of the State of Texas under the Texas Business & Commerce Code, Chapter 15, of the federal antitrust laws; or (2) communicated directly or indirectly the proposal resulting in this CONTRACT to any competitor or other person engaged in such line of business during the procurement process for this CONTRACT.

d. Conflict of Interest. CONTRACTOR represents and warrants that CONTRACTOR has no actual or potential conflicts of interest in providing the deliverables required by this CONTRACT to the State of Texas and the TWDB. CONTRACTOR represents that the provision of services under this CONTRACT will not create an appearance of impropriety. CONTRACTOR also represents and warrants that, during the term of this CONTRACT, CONTRACTOR will immediately notify the TWDB, in writing, of any potential conflict of interest that could adversely affect the TWDB by creating the appearance of a conflict of interest.
CONTRACTOR represents and warrants that neither CONTRACTOR nor any person or entity that will participate financially in this CONTRACT has received compensation from the TWDB or any agency of the State of Texas for participation in the preparation of specifications for this CONTRACT.
CONTRACTOR represents and warrants that he has not given, offered to give, and does not intend to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor or service to any public servant in connection with this CONTRACT.

e. Interested Parties. All non-governmental CONTRACTORS are required to submit a Certificate of Interested Parties at the time the signed contract is submitted to the TWDB. The Certificate of Interested Parties (Form 1295) is a sworn statement by the contracting business entity and must be submitted even

if there is no interested party in the transaction. The Form 1295 and instructions for completing and submitting the form are available at: https://www.ethics.state.tx.us/tec/1295-Info.htm. The TWDB is prohibited from executing a contract unless the contracting business entity submits a completed Form 1295.

f. Proprietary and Confidential Information. CONTRACTOR warrants and represents that any information that is proprietary or confidential, and is received by CONTRACTOR from the TWDB or any governmental entity, shall not be disclosed to third parties without the written consent of the TWDB or applicable governmental entity, whose consent shall not be unreasonably withheld.

g. Public Information Act. CONTRACTOR acknowledges and agrees that all documents, in any media, generated in the performance of work conducted under this CONTRACT are subject to public disclosure under the Public Information Act, Government Code, Chapter 552. CONTRACTOR shall produce all documents upon request of the TWDB within two (2) business days when the documents are required to comply with a request for information under the Public Information Act.

h. Accurate and Timely Record Keeping. CONTRACTOR warrants and represents that he will keep timely, accurate and honest books and records relating to the work performed and the payments received under this CONTRACT according to generally accepted accounting standards. Further, CONTRACTOR agrees that he will create such books and records at or about the time the transaction reflected in the books and records occurs.

i. Dispute Resolution. The CONTRACTOR and the TWDB agree to make a good faith effort to resolve any dispute relating to the work required under this CONTRACT through negotiation and mediation as provided by Government Code, Chapter 2260 relating to resolution of certain contract claims against the state. The CONTRACTOR and the TWDB further agree that they shall attempt to use any method of alternative dispute resolution mutually agreed upon to resolve any dispute arising under this CONTRACT if this CONTRACT is not subject to Chapter 2260.

j. Contract Administration. The TWDB shall designate a project manager for this CONTRACT. The project manager will serve as the point of contact between the TWDB and CONTRACTOR. The TWDB's project manager shall supervise the TWDB's review of CONTRACTOR's technical work, deliverables, draft reports, the final report, payment requests, schedules, financial and budget administration, and similar matters. The project manager does not have any express or implied authority to vary the terms of the CONTRACT, amend the CONTRACT in any way or waive strict performance of the terms or conditions of the CONTRACT.

ARTICLE XI. CORRESPONDENCE

All correspondence between the parties shall be made to the following addresses:

For the **TWDB**:
Contract Issues:
Texas Water Development Board
Attention: Contract Administration
P.O. Box 13231
Austin, Texas 78711-3231
Email: contracts@twdb.texas.gov

Payment Request Submission:
Texas Water Development Board
Attention: Accounts Payable
P.O. Box 13231
Austin, Texas 78711-3231
Email: invoice@twdb.texas.gov

Physical Address:
Stephen F. Austin State Office Building
1700 N. Congress Avenue
Austin, Texas 78701

For the **CONTRACTOR:**
Contract Issues:
BIO-WEST, Inc.
1812 Central Commerce CT
Round Rock, TX 78664
Attn: Edmond L. Oborny
Email: eoborny@bio-west.com

Payment Request Submission:
BIO-WEST, Inc.
1812 Central Commerce CT
Round Rock, TX 78664
Attn: Edmond L. Oborny
Email: eoborny@bio-west.com

Physical Address:
BIO-WEST, Inc.
1812 Central Commerce CT
Round Rock, TX 78664

IN WITNESS WHEREOF, the parties have caused this CONTRACT to be duly executed in multiple originals.

TEXAS WATER DEVELOPMENT BOARD

Jeff Walker
Executive Administrator

Date: 9-28-16

BIO-WEST, Inc.

Edmund L. Oborny
Principal

Date: 9-26-16

EXHIBIT A

ORIGINAL GRANT APPLICATION

BIO-WEST, Inc.

1812 Central Commerce Court
Round Rock, Texas
78664-8546
Ph: 512.990.3954
Fx: 512.990.5153
www.bio-west.com

6 April 2016

Texas Water Development Board
1700 N. Congress Avenue
Austin, Texas 78701

RE: Statement of Qualifications (SOQ) for Texas Water Development Board (TWDB) Request for Qualifications (RFQ) No. 580-16-RFQ0022

Dear TWDB staff,

Enclosed please find BIO-WEST's SOQ related to the above referenced RFQ titled "Validation and Refinement of the Adopted Texas Commission on Environmental Quality Environmental Flow Standards for the Colorado and Lavaca Rivers." BIO-WEST has reassembled key members of our experienced project team who conducted the first round of environmental flow validation research in the Guadalupe/San Antonio and Brazos river drainages during 2014 and 2015. This team includes researchers from Texas State University, Baylor University, and scientists from BIO-WEST. We are excited to apply lessons learned from these basins toward addressing the Texas Environmental Flows Science Advisory Committee (SAC) recommendation of conducting environmental flow validation studies across multiple basins to maximize resources and consistency across the state.

In addition to being the only team to perform specific environmental flow validation studies relating to SB3 environmental flow standards, BIO-WEST has previously conducted a comprehensive instream flow study that established many of the environmental flow recommendations adopted in the standards within the lower Colorado basin. Due to the knowledge gained from previous work in the Colorado basin and experience with environmental flow validation research in other basins, we feel our team's qualifications provide the TWDB with a great opportunity for high quality science while maximizing resources.

We appreciate the opportunity to submit the attached SOQ and look forward to expanding this exciting research into the Colorado and Lavaca basins. If you have any questions or comments concerning our proposal, please contact me at your earliest convenience.

Sincerely,

Edmund L. Oborny, Jr.
Principal
ELO/eo

Enclosures

Environmental Analysis and Permitting

Environmental Engineering

Fisheries

Landscape Architecture

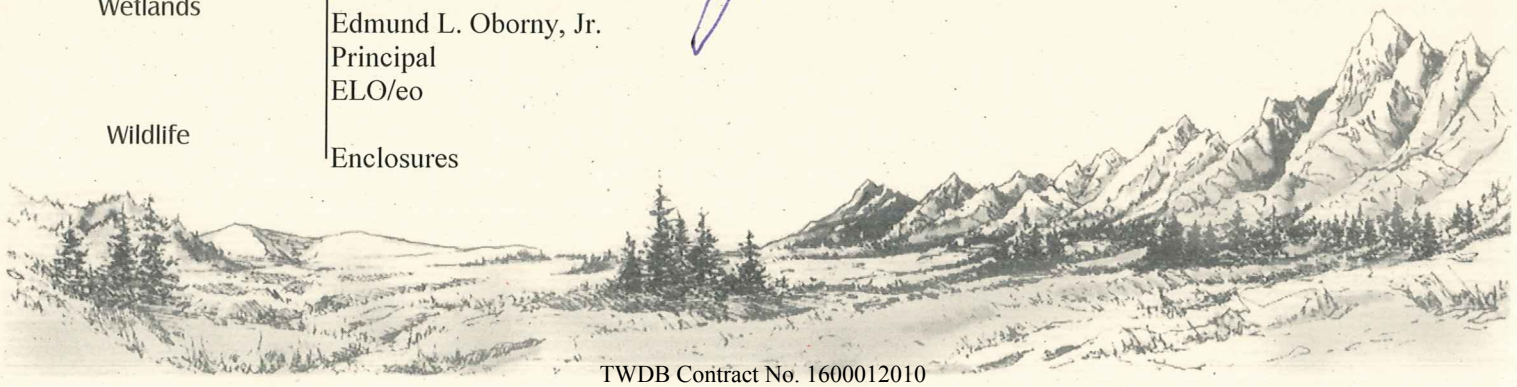
Resource Planning

Vegetation

Water Resources

Wetlands

Wildlife



CONTENT ITEM 1
EXECUTION OF STATEMENT OF QUALIFICATIONS
to the
REQUEST FOR QUALIFICATIONS

Company Name: BIO-WEST, Inc.

Address: 1812 Central Commerce CT
Round Rock, Tx 78664

Phone Number: 512-990-3954

E-Mail: eoborny@bio-west.com

I, Edmund L. Oborny, am the above-referenced company's representative and I am authorized to submit this response and sign future contract documents. By signing below, the representative certifies that if a Texas address is shown as the address, the respondent qualifies as a Texas Bidder as defined in 34 TAC Rule 20.32(68).

Authorized Signature

4-5-16
Date

Principal
Title:

CONTENT ITEM 2
COMPANY PROFILE SUMMARY AND HISTORY

(To be provided by Respondent)

Established in 1976, BIO-WEST, Inc. is a multi-discipline, environmental consulting firm with a permanent core staff of senior level scientists and an experienced support staff. The firm is a leader in environmental consulting and problem solving, and has earned a widely acknowledged reputation for providing objective, credible services and superior products to a wide variety of agencies, organizations, and private clients. BIO-WEST strives to maintain an outstanding reputation for fisheries, instream flow, freshwater inflow, coastal resources, and endangered species investigations throughout the United States.

Through previous instream flow work in the basin, BIO-WEST has extensive knowledge of the aquatic flora and fauna and ecological relationships of the Colorado River basin. In 2008, BIO-WEST completed a comprehensive instream flow study in the lower Colorado River as part of the LCRA/SAWS Water Project (LSWP). This study incorporated data on hydrology, biology (both aquatic and riparian), geomorphology, and water quality to generate instream flow guidelines for the lower Colorado River. Data, analysis, and recommendations from this study provided the basis for much of the BBEST/BBASC evaluations conducted as part of the Senate Bill 3 process in the lower Colorado River. Additionally, BIO-WEST has also conducted instream flow analyses in the upper Colorado basin above the Highland Lakes associated with LCRA's Lometa Water System.

The BIO-WEST project team will be led by Mr. Edmund L. Oborny, Jr. Mr. Oborny is an environmental flow specialist who has exemplary project management skills and extensive experience with instream flow studies and coastal sampling investigations along with technical expertise in fisheries. Mr. Oborny was the project lead on the LSWP instream flow study and has been highly involved with Texas environemntal flow issues ever since. Due to his experience and expertise in environmental flow issues, Mr. Oborny is a current member of the Texas Environmental Flows Science Advisory Committee.

The project team will also include Mr. Brad Littrell, a senior aquatic ecologist at BIO-WEST. Mr. Littrell is a recognized aquatic ecologist with extensive technical experience in fish, freshwater mussel, and instream flow research within Texas. His instream flow experience includes studies conducted in both the upper and lower Colorado River basin, as well as several other central Texas river basins. While at BIO-WEST, he has also worked on studies examining movement and migration of state-threatened Blue Sucker *Cycleptus elongatus* in the lower Colorado River, and has conducted multiple freshwater mussel surveys within the basin.

For this particular SOQ, BIO-WEST has reassembled key personnel from an experienced team of academic researchers who conducted similar environmental flow validation reasearch in the Guadalupe-San Antonio (GSA) and Brazos River basins in 2014/2015. Key members of this team and a summary of each member's pertinent experience are provided below.

Dr. Timothy H. Bonner: Professor of Biology (Texas State University)

Dr. Bonner is a Professor of Biology at Texas State University-San Marcos, specializing in instream flow theory, threatened and endangered fish ecology, aquatic biomonitoring, zoogeography of Texas fishes, and invasive aquatic organisms. He teaches Zoology, Ichthyology, Fisheries Management, and Multivariate Statistics, administers a research program generating over 70 peer-reviewed publications, has completed 3 PhD students and 35 MS students, and is currently advising 2 PhD students and 2 MS students. A major emphasis of his research program is directed towards riverine fish assemblages and the biology and ecology of native and non-native fishes and invertebrates. Dr. Bonner is a recognized fisheries expert who has conducted extensive sampling and analysis related to aquatic ecosystems throughout Texas. He currently serves as a member of the BBEST for Brazos River and Guadalupe/San Antonio/ Mission River Basins.

Dr. Jacquelyn Duke: Riparian Ecologist (Baylor University)

Dr. Duke is a Senior Lecturer in the Baylor Biology Department and contributing member of Baylor's Center for Reservoir and Aquatic Systems Research (CRASR) where she is the resident riparian specialist. Her work includes the response of riparian ecosystems to human-driven hydrologic alteration, hyporheic formation in the riparian zone, riparian productivity within wetlands and along reaches of different sizes, and the effects of small scale dams on downstream zones. Summarized below are Dr. Duke's current riparian-related appointments:

- Edwards Aquifer Habitat Conservation Plan (EAHCP) Science Committee
- Scientific Committee of the Southeast Aquatic Resource Partnership (SARP) Gulf Coast Prairie Landscape Conservation Cooperative Grant covering instream flow science across Arkansas, Louisiana, Oklahoma, and Texas.
- Board of Directors member for the Texas Riparian Association (TRA).

Resumes for each key team member are found in Section 3. For questions or additional information concerning this SOQ please contact:

Edmund L. Oborny, Jr.
Principal
BIO-WEST, Inc.
1812 Central Commerce Court
Round Rock, Texas 78664
Phone: 512/990-3954
Fax: 512/990-5153
Email: eoborny@bio-west.com

CONTENT ITEM 3
RESUMES OF INDIVIDUALS

(to be provided by Respondent)

Edmund Oborny, Senior Fisheries Biologist

BIO-WEST, Inc.

Mr. Oborny specializes in aquatic ecology, threatened and endangered species, water quality, biological modeling, and instream flow issues and concepts. He has 23 years of professional project experience, and is familiar with all levels of project management and complex study design. Mr. Oborny possesses technical expertise in fisheries biology, instream and environmental flow, water quality, ichthyology, aquatic ecology, and modeling. He has worked on many projects with endangered species components in Texas and the southwestern United States; prepared Environmental Impact Statements and other environmental documents; and participated in freshwater and coastal monitoring programs, water-quality investigations, instream flow analyses, radio-telemetry studies, and numerous other fishery- and water-related projects. Mr. Oborny currently serves as principal investigator for ecological investigations associated with the proposed Cedar Ridge Reservoir project on the Clear Fork of the Brazos River sponsored by the City of Abilene. He concurrently serves as principal investigator for instream flow and biological studies in the Brazos River basin relating to the development of the Brazos River Authority's water management plan. Mr. Oborny has also managed several large ecological- and water-resource projects and his experience and expertise with complex environmental issues is also illustrated by the number of professional appointments that he has received in the past 5 years. Mr. Oborny received an MS in wildlife and fisheries sciences from Texas A&M University and a BS in wildlife biology from Eastern New Mexico University.

A brief summary of Mr. Oborny's relevant experience is presented below.

BIO-WEST PROJECT WORK

Edwards Aquifer Bio-Monitoring, Comal and San Marcos Rivers
♦ **Project Manager / Principal Aquatic Resources Investigator**

This BIO-WEST project entails a multidiscipline, multiyear variable flow and water-quality study for the Edwards Aquifer Authority (EAA). This program has been incorporated into the long-term Bio-Monitoring associated with the Edwards Aquifer Recovery Implementation Program (EARIP) Habitat Conservation Plan (HCP). BIO-WEST is conducting applied research and monitoring of several threatened and endangered species in the spring-fed Comal and San Marcos Rivers in Texas. The HCP Bio-Monitoring incorporates comprehensive sampling and flow-dependent sampling that is conducted when the discharge in one or both of the rivers falls below (low-flow) or rises above (high-flow) specified "trigger" levels. implemented HCP measures. Under contract with EAA. Mr. Oborny manages and informs all aspects of this project. 2001–present.

EXPERIENCE

- instream flow analysis
- project management
- study design
- freshwater and coastal monitoring

SKILLS

- two-dimensional hydraulic modeling
- instream flow habitat modeling (PHABSIM, MesoHABSIM, and HSI)

PROFESSIONAL SOCIETIES

- 2003–2013: Desert Fishes Council
- 2000–2010: Texas Rivers and Reservoirs Management Society
- 2000–2013: American Fisheries Society
- 2007–2010: Ecological Society of America

EDUCATION

- 1993: MS wildlife and fisheries sciences (fisheries), Texas A&M University, College Station
- 1991: BS wildlife biology, Eastern New Mexico University, Portales

Brazos River Instream Flow Assistance, Brazos River Basin ♦ Project Manager / Principal Investigator

Mr. Oborny is project principal for instream flow planning and field activities associated with the Brazos River Authority Water Management Plan. This includes activities on the main stem and tributaries of the Brazos River throughout the basin and on streams throughout the Little River watershed. In conjunction with Brazos River Authority staff, BIO-WEST is conducting fish, macroinvertebrate, mussel, and riparian investigations in a manner consistent with Texas Instream Flow Program (TIFP) activities. Under contract with the Brazos River Authority. 2011–present.

Cedar Ridge Reservoir Study, Clear Fork of the Brazos River ♦ Project Manager / Principal Investigator

Mr. Oborny is leading a full-scale ecological evaluation of the proposed Cedar Ridge Reservoir to be located on the main stem of the Clear Fork of the Brazos River. The study objective is to conduct biological sampling and habitat modeling on the Clear Fork to assess potential impacts and benefits resulting from reservoir development and operation. Baseline biological data and fish habitat and endangered species modeling was conducted at multiple sites to aid in evaluating potential flow regimes and their relationships to the aquatic ecology of the Clear Fork. This study provides a solid baseline for establishing subsistence and base flow recommendations for this segment of stream, as well as providing a tool for assessing potential aquatic habitat enhancements via future reservoir operations. All biological data collected for this project will be incorporated into the Environmental Impact Statement to be prepared for the Cedar Ridge Reservoir project. Under contract with the City of Abilene. 2011–present.

San Antonio River Authority Instream Flow Planning Project ♦ Project Manager / Lead Biologist

Mr. Oborny is participating in instream flow planning activities at the San Antonio River Basin in Texas. Project activities have included completing an instream flow evaluation of the Salatrillo/Martinez Creeks watershed in northern Bexar County and completing a detailed instream flow assessment of the Lower San Antonio River in conjunction with the Texas Instream Flow Program (TIFP). Presently, BIO-WEST is working with the San Antonio River Authority on follow-up monitoring and applied research investigations involving seasonal use of habitat by indicator fish species and riparian zone research to examine the effects of lower San Antonio River pulse flows. Under contract with the San Antonio River Authority. 2006–present.

Lower Guadalupe River Instream Flow Study, Guadalupe River ♦ Project Manager / Principal Investigator

Mr. Oborny is leading a full-scale instream flow study for the Gonzales reach of the lower Guadalupe River in conjunction with Guadalupe-Blanco River Authority staff and interaction with the TIFP. The study objective is to characterize the flow-habitat and flow-ecological relationships in this reach to provide a means of assessing biological impacts/benefits of various flow regimes relative to the Mid-Basin and future projects. A comprehensive ecologically based tool generated from existing studies and field-gathered data will provide prediction capabilities necessary to evaluate a full flow regime on ecological components of the lower Guadalupe River within this reach. Under contract with the Guadalupe-Blanco River Authority. 2012–present.

Blue Sucker Tracking Study, Lower Sabine River ♦ Project Principal

Mr. Oborny is project principal for a radio-telemetry study of the blue sucker (*Cycleptus elongatus*), which is listed as a state-threatened species. BIO-WEST is working with Texas Parks and Wildlife Department (TPWD) fisheries biologists to characterize seasonal movements and habitat use of the blue sucker in the lower Sabine River through radio telemetry. The primary objectives of the study are to determine spawning locations by locating sexually mature adults, track movements during different seasons, and determine differential habitat use among varying life stages. Under contract with TPWD. 2012–2014.

Native Aquatic Vegetation Restoration, Comal Springs ♦ Project Principal / Principal Investigator

The EARIP process led to the development of the approved HCP for the Comal Springs and Comal River system (Comal system) in New Braunfels, Texas. In relation to the Comal system, the EARIP process and HCP identify a variety of options to improve and increase habitat for federally listed threatened and endangered species. Native aquatic vegetation restoration is a critical HCP measure that was implemented in 2013. Mr. Oborny is leading a project team with the overall goal of improving habitat conditions for the fountain darter (*Etheostoma fonticola*) in Landa Lake and the Old Channel. This goal will be achieved by increasing the amount of usable habitat and improving the quality of existing habitat in both project areas. Under contract with City of New Braunfels. 2013–present.

Gill Parasite Evaluation, Comal Springs ♦ Project Principal

As part of the EARIP HCP, a comprehensive gill parasite evaluation of the Comal River is being conducted by BIO-WEST. Mr. Oborny is project principal overseeing work that includes a system-wide survey to determine *Melanoides tuberculatus* (nonnative host snail) population densities and cercarial concentrations of *Centrocestus formosanus* (gill parasite). Additionally, methods for the reduction of the gill parasite in the Comal system are being tested for effectiveness and efficiency. Finally, a gill parasite monitoring and reduction program (if necessary) will be developed for implementation in subsequent years. Under contract with City of New Braunfels. 2013–present.

Trinity River Instream Flow Assistance, Trinity River ♦ Project Manager / Principal Investigator

Mr. Oborny is providing technical guidance to the Trinity River Authority (TRA) regarding instream flow activities they are conducting on the middle Trinity River. In conjunction with TRA staff and interaction with the TIFP, the study objective is to characterize the flow-habitat and flow-ecological relationships in this reach of the river to provide a means of assessing biological impacts/benefits of various flow regimes relative to existing conditions and future projects. Under contract with the TRA. 2012–present.

Owens Lake Groundwater Evaluation ♦ Project Manager

Under an agreement with the Los Angeles Department of Water and Power, Mr. Oborny is providing technical oversight as part of a blue ribbon science panel relative to the Owens Lake Groundwater Project. The purpose of the project is to evaluate the feasibility of plans to supply groundwater for dust control measures by analyzing hydrology, hydrogeology, geology, existing natural resources that depend on groundwater, possible impacts from groundwater withdrawals on these resources, and proposed methods to avoid or mitigate such impacts. Under contract with MWH Americas, Inc. 2009–present.

Gill Parasite Evaluation Pilot Study ♦ Project Manager

BIO-WEST conducted a pilot study to evaluate the effectiveness of host snail removal on the reduction of *Centrocestus formosanus* (gill parasite) in the Comal Springs system, New Braunfels, Texas. Mr. Oborny oversaw all aspects of project work. Under contract with the EARIP. 2010–2011.

Sabine Lake Marsh Sampling and Salinity Characterization ♦ Project Manager

BIO-WEST provided technical services to assist the National Wildlife Federation (NWF) with an evaluation of salinity conditions and marsh vegetation within and adjacent to Sabine Lake in Texas. The study was designed to document salinity conditions and resulting marsh vegetation types spatially within the complex marshes on the eastern side of Sabine Lake. An evaluation of salinity changes and gradients under differing freshwater inflow conditions was also conducted. Data collected during this effort provided a solid baseline to build on should additional resources become available and data on marsh biomass and/or juvenile organism utilization of these habitats be desired. Mr. Oborny provided project oversight and direction. Under contract with the NWF. 2010–2011.

BBASC Technical Support ♦ Project Manager

The Guadalupe, San Antonio, Mission, and Aransas Rivers and Mission, Copano, Aransas, and San Antonio Bays Basin and Bay Area Stakeholders Committee (GSA BBASC), in fulfilling its charge under the Texas Water Code, hired BIO-WEST to provide technical support to assist with evaluating recommendations of the Basin and Bay Expert Science Team (GSA BBEST). Under contract with HDR. 2011.

Lower Sabine River Fish Study ♦ Project Manager

BIO-WEST provided fisheries consulting services to the Sabine River Authorities of Texas and Louisiana in connection with the Toledo Bend Relicensing Project. The project area consisted of the Sabine River, which forms the boundary between the states of Texas and Louisiana, from Toledo Bend Dam to River Mile 64 downstream. The study objective was to provide a comprehensive review of the existing fisheries environment of the lower Sabine River downstream of Toledo Bend Dam and evaluate potential project operational influence on that downstream environment. Under contract with HDR Engineering (HDR)/DTA. 2009–2011.

Texas Department of Transportation Mussel Surveys ♦ Project Manager

BIO-WEST conducted Phase 1 habitat surveys for rare and state-listed freshwater mussel species and additional aquatic species at eight road crossings of perennial waters within the Texas Department of Transportation San Antonio Region. The surveys included the area from 100 meters upstream of bridges associated with waterway crossings to 300 meters downstream of the bridges. Mr. Oborny directed the project. Under contract with TRC Environmental Corporation. 2010.

Lower Colorado River Authority Unappropriated Flows Permit ♦ Project Manager

BIO-WEST provided technical assistance for the Lower Colorado River Authority's (LCRA) unappropriated flows permit application. The permit applied to waters in Austin, Texas. Under contract with Espey Consultants, Inc. 2008–2010.

Eastern Sierra Streams Peer Review ♦ Project Manager

Mr. Oborny conducted a third-party review of fisheries, benthic macroinvertebrate, and instream flow data and reports dealing with Eastern Sierra stream conditions and management as well as provided an independent review and prepared written documentation for and critiques of materials provided by the client. The documentation summarized the results and rationale of BIO-WEST's review of data and reports. Specifically, Mr. Oborny provided comments on the recommendations for ongoing stream maintenance and restoration efforts proposed by others. Under contract with MWH Americas, Inc. 2009–2010.

Texas Department of Transportation Spur 53 Highway Expansion ♦ Project Manager

BIO-WEST provided an analysis of stream modifications and associated habitats for the Spur 53 highway expansion project for the Texas Department of Transportation in San Antonio, Texas. Under contract with Zara Environmental, LLC. 2010.

Waterfowl / Wildlife Comprehensive Study and Long-Term Monitoring ♦ Project Principal

BIO-WEST participated in a comprehensive assessment of potential impacts/benefits to waterfowl and wildlife in south-central Texas for the LCRA/SAWS water supply project (WSP). A regional concern was raised regarding potential impacts to the local economies of Colorado, Wharton, and Matagorda Counties from wildlife (primarily waterfowl) changes associated with the WSP. Anticipated decreases in rice production—with or without the WSP—would likely have had an impact on wildlife including waterfowl populations, such as ducks and geese. BIO-WEST evaluated associated impacts/benefits to waterfowl populations and developed alternatives to the WSP. BIO-WEST's evaluation was accomplished by (1) establishing existing conditions in respect to land use and wildlife utilization, (2) determining socioeconomic contributions related to waterfowl and wildlife, (3) evaluating proposed off-channel storage facilities, and (4) assessing WSP proposed agricultural strategies. Mr. Oborny served as project principal and oversaw the project. Under contract with LCRA. 2007–2009.

Colorado River Flow Relationships to Aquatic Habitat and State-Threatened Blue Sucker Species ♦ Project Manager

Mr. Oborny was the project manager for an instream flow study that (1) developed hydraulic modeling tools and (2) determined habitat-use criteria for fish in the lower Colorado River, Texas, to assess potential changes in habitat availability under various water-release strategies. The study involved sampling all life stages of the state-threatened blue sucker including telemetry tracking of 30 tagged adults. Mr. Oborny supervised all aspects of project work including meetings, presentations, data collection, hydraulic and habitat modeling, sediment-transport and riparian analyses, and dissemination of results; oversaw model evaluation and interpretation; and was instrumental in the development of instream flow criteria for the lower Colorado River. Under contract with the LCRA. 2004–2008.

Matagorda Bay Health Evaluation ♦ Project Manager/Senior Fisheries Biologist

Mr. Oborny provided managerial and biological services for the habitat component of the Matagorda Bay Health Evaluation (MBHE) that was conducted as part of the LCRA/San Antonio Water System (SAWS) water project. The habitat component of the MBHE provided an assessment of existing habitat conditions within the project area and allowed for the comparison of habitat conditions between different freshwater, inflow scenarios through hydrodynamic salinity modeling. The habitat assessment generated a model in GIS format based on a series of relationships between biota and the physical and chemical environment of Matagorda Bay. Output from the habitat model was provided both in tabular form (detailing the aerial

extent of output) and in spatial form (with the potential to be integrated or correlated with other spatial information and analyzed based on location of interest). Under contract with LCRA. 2004–2008.

Bernalillo to Alameda Bridge River Restoration ♦ Senior Fisheries Biologist

BIO-WEST was contracted to provide technical expertise to the US Bureau of Reclamation (Reclamation) project team on several components of a multifaceted restoration effort on 10 miles of the middle Rio Grande in New Mexico. Mr. Oborny's responsibilities included assembling and presenting existing southwestern willow flycatcher (*Empidonax traillii extimus*) and Rio Grande silvery minnow (*Hybognathus amarus*) data, evaluating methods for creating a two-dimensional model of existing conditions, reviewing existing information on endangered species, and presenting potential benefits of creating a two-dimensional model for quantifying hydraulic conditions and endangered species habitat at selected index sites. Under contract with Reclamation. 2003–2005.

Lake Sam Rayburn Aquatic Surveys ♦ Project Principal

This large-scale effort entailed providing technical assistance to a client who needed to gain understanding of water, sediment, and fish-tissue chemistry; water and sediment toxicity; fish, wildlife, and aquatic-habitat conditions; and implications of studies and proposed actions related to operations at a paper mill in east Texas. Mr. Oborny conducted field sampling; analyzed water and sediment chemistry, water and sediment toxicity, and fish and macroinvertebrate communities using the Texas Commission on Environmental Quality methodology for Receiving Water Assessments and Use Attainability Analysis; and designed the comprehensive sampling effort to evaluate fish and habitat conditions in the Angelina River, Sam Rayburn Reservoir, and surrounding watersheds. Under contract with the Conservation Coalition. 2002–2005.

Provo River Flow Study ♦ Assistant Project Manager / Principal Aquatic Resources Investigator

This BIO-WEST study was designed to determine the effects of alternative flow regimes to the middle and lower sections of the Provo River, Utah, and the remaining portions of its riparian corridor. The project area encompassed approximately 30 miles of the Provo River and its riparian ecosystem from Jordanelle Dam to Utah Lake. The objective of the project was to collect field data and develop modeling capabilities for use in the characterization of flow-channel processes and flow-ecological relationships (within the Provo River and its riverine ecosystem). The results of this study provided modeling and prediction capabilities necessary to evaluate the effects of alternative flow regimes on ecological components (including the endangered June sucker [*Chasmistes liorus*]) throughout the annual hydrologic cycle and helped predict how aquatic habitat and recruitment of riparian vegetation would likely change over time. Mr. Oborny assisted with managing and informing all project-related activities. Under contract with the Utah Reclamation Mitigation and Conservation Commission. 2002–2004.

Comal Springs Riffle Beetle and Fountain Darter Laboratory Studies ♦ Principal Investigator / Project Manager

After the Comal Springs riffle beetle habitat and population evaluation, BIO-WEST raised questions about responses to changes in springflow, both laterally and vertically, and studied concerns regarding changes in the laboratory. Mr. Oborny managed laboratory studies and participated in project development including narrowing study foci to address specific questions and assisting with designing the laboratory setup. BIO-WEST also raised questions about the response of fountain darter reproduction to diel fluctuations in temperature that are observed in the wild, but not addressed in previous laboratory studies. Mr. Oborny worked closely with Dr. Tim Bonner of Southwest Texas State University, who was instrumental in earlier

studies, and other BIO-WEST personnel to develop the project, analyze results, and prepare a detailed executive summary. Under contract with EAA. 2002.

Spring Lake Dam Reconstruction Effort ♦ Principal Investigator / Project Manager

BIO-WEST performed monitoring and manual displacement of threatened and endangered species that were subject to potential impacts caused by reconstruction activities on a dam impounding Spring Lake on the San Marcos River. Monitoring included surveying the endangered fountain darter and threatened San Marcos salamander (*Eurycea nana*) and mapping Texas wild-rice (*Zizania texana*) populations. Fountain darter and San Marcos salamander populations were displaced immediately prior to power-washing and rip-rap placement. Periodic spot-checks and reconstruction monitoring efforts were conducted to ensure that efforts were being made to limit impacts on these populations. Mr. Oborny was responsible for overall project management. Under contract with Texas State University. 2001–2002.

Comal Springs Riffle Beetle Habitat and Population Evaluation ♦ Principal Investigator / Project Manager

BIO-WEST conducted an intensive search effort for the endangered Comal Springs riffle beetle (*Heterelmis comalensis*) and documented an extension of the known range of species in Comal Springs. Mr. Oborny coordinated field crews of two to three biologists who searched spring habitats along the Landa Lake shoreline (along spring-run habitat) and in several locations where springs were evident within the lake to find populations of species outside of the known range. Mr. Oborny performed quantitative measurements to examine the relative densities of the Comal Springs riffle beetle and a similar riffle beetle species where populations of the former were found. The range extension of this species was developed into a manuscript for submission to a peer-reviewed journal. Under contract with EAA. 2001.

OFFICES AND APPOINTMENTS

Texas Environmental Flows Science Advisory Committee ♦ Advisory Committee Member

Serves on the Texas Environmental Flows Science Advisory Committee, which is appointed by the Texas Environmental Flows Advisory Group of the Texas State Legislature. Responsible for providing objective, scientific advice on issues relating to the science of environmental flow protection, as well as developing recommendations that will ensure consistent use of flow methodologies and environmental flow programs. 2009–present.

Third-Party Independent Review of Mono Basin Stream Ecosystem Flows Recommendations ♦ Instream Flows Science Expert

Mr. Oborny was selected, along with three other nationally recognized instream flow experts, to conduct an independent, third-party review of 12 years of fisheries, geomorphology, and riparian monitoring conducted in the Mono Basin, California, for the establishment of instream flow recommendations. 2009.

Edwards Aquifer Recovery Implementation Program ♦ Science Subcommittee Member

Appointed by the EARIP Steering Committee to be a voting member of the Science Subcommittee, which is responsible for addressing science-based questions/charges set forth by the Texas Legislature. Charges focus on the determination of flow requirements for federally listed endangered and threatened species of the Edwards Aquifer and Comal and San Marcos Springs. 2008–2011.

Southern Edwards Aquifer Species Recovery Team ♦ Team Member

Appointed by the Regional Director of the US Fish and Wildlife Service (USFWS) to be part of the Southern Edwards Aquifer Species Recovery Team. The objective of the team is to update and revise a Recovery Plan for seven federally listed endangered species and one federally listed threatened species in the Comal and San Marcos Springs ecosystems and in Edwards Aquifer. 2008–present.

The Biological Working Group of Spring Valley, Nevada ♦ Special Consultant

Retained to assist with (1) developing a multiyear, multifaceted monitoring plan to further the understanding of groundwater-influenced ecosystem dynamics and (2) tracking biotic-community responses to SNWA's groundwater withdrawal from the Spring Valley Hydrographic Basin in east-central Nevada. The monitoring plan was the result of a stipulated agreement between SNWA and four US Department of the Interior bureaus: the Bureau of Indian Affairs, the Bureau of Land Management, USFWS, and the National Park Service. 2007–present.

The Blue Ribbon Science Advisory Panel of Owens Valley, California ♦ Panel Member (Aquatic Resources)

Appointed to the Blue Ribbon Science Advisory Panel to analyze hydrology, hydrogeology, geology, and existing natural resources that depend on groundwater within Owens Valley, California, relative to proposed projects. The panel will perform an assessment of possible impacts from groundwater withdrawals on resources and evaluate proposed methods to avoid or mitigate impacts. 2009–present.

PUBLICATIONS / PRESENTATIONS

Opdyke, D. R., E.L. Oborny, S.K. Vaugh, and K.B. Mayes 2014. Texas environmental flow standards and the hydrology-based environmental flow regime methodology, Hydrological Sciences Journal, DOI:10.1080/02626667.2014.892600.

Johnson, M.S., A. Bolick, M. Alexander, D. Huffman, E.L. Oborny, and A. Monroe. 2012. Fluctuations in densities of the invasive parasite *Centrocestus formosanus* (Trematoda: Heterophyidae) in the Comal River, Comal County, Texas, USA. Journal of Parasitology 98(1):111–116.

McDonald, D.L., T.H. Bonner, E.L. Oborny, and T.M. Brandt. 2007. Effects of fluctuating temperatures and gill parasites on reproduction of the fountain darter, *Etheostoma fonticola*. Journal of Freshwater Ecology 22(2):311–318.

Oborny, E.L., et al. [BIO-WEST]. 2015. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the Comal Springs/River aquatic ecosystem. 2001–2014 Annual Reports. Prepared for Edwards Aquifer Authority.

Oborny, E.L., et al. [BIO-WEST]. 2015. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the San Marcos Springs/River aquatic ecosystem. 2001–2014 Annual Reports. Prepared for Edwards Aquifer Authority.

Oborny, E.L., et al. [BIO-WEST]. 2011. Instream flow study of the lower San Antonio River and lower Cibolo Creek. interim progress report and instream flow recommendations. Texas Instream Flow Program and San Antonio River Authority.

Oborny, E.L., et al. [BIO-WEST]. 2008. Colorado River flow relationships to aquatic habitat and state threatened species: blue sucker - instream flow guidelines. Prepared for the Lower Colorado River Authority and San Antonio Water System.

Oborny, E.L., et al. [Matagorda Bay Health Evaluation Scientists]. 2008. Matagorda Bay inflow criteria. Matagorda Bay health evaluation: final report. Prepared for the Lower Colorado River Authority and San Antonio Water System.

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Oborny, E.L., et al. [BIO-WEST]. 2007. Variable flow study: seven years of monitoring and applied research. Comprehensive and critical period monitoring program to evaluate the effects of variable flow on biological resources in the Comal Springs/River aquatic ecosystem. Prepared for Edwards Aquifer Authority.

Oborny, E.L., et al. [BIO-WEST]. 2006. Colorado River flow relationships to aquatic habitat and state threatened species: blue sucker - 2006 data activities report. Prepared for the Lower Colorado River Authority and San Antonio Water System.

Oborny, E.L., et al. [BIO-WEST]. 2006. Matagorda Bay health evaluation habitat assessment: 2006 progress report. Prepared for the Lower Colorado River Authority and San Antonio Water System.

Oborny, E.L., et al. [BIO-WEST]. 2005. Colorado River flow relationships to aquatic habitat and state threatened species: blue sucker - 2005 data activities report. Prepared for the Lower Colorado River Authority and San Antonio Water System.

Oborny, E.L., et al. [BIO-WEST]. 2005. Matagorda Bay health evaluation habitat assessment: progress report. Prepared for the Lower Colorado River Authority and San Antonio Water System.

Oborny, E.L., et al. [BIO-WEST]. 2003. Provo River flow study, Deer Creek Reservoir to Utah Lake: flow-habitat and flow-ecological relationships within the riverine ecosystem - aquatic habitat, riparian vegetation, recreational uses, fluvial processes. Prepared for the Utah Reclamation Mitigation and Conservation Commission, Salt Lake City, Utah.

Oborny, E.L., et al. [BIO-WEST]. 2003. Provo River flow study, Jordanelle to Deer Creek: flow-habitat and flow-ecological relationships within the riverine ecosystem - aquatic habitat, riparian vegetation, recreational uses, fluvial processes. Prepared for the Utah Reclamation Mitigation and Conservation Commission, Salt Lake City, Utah.

Oborny, E.L., et al. [BIO-WEST]. 2002. Comal Springs riffle beetle habitat and population evaluation. Prepared for Edwards Aquifer Authority.

Oborny, E.L., et al. [BIO-WEST]. 2002. Comal Springs riffle beetle laboratory study: evaluation under variable flow conditions. Final report prepared for Edwards Aquifer Authority, San Antonio, Texas.

Oborny, E.L., et al. [BIO-WEST]. 2002. Fountain darter laboratory study: reproductive response to parasites and temperature fluctuations. Executive summary prepared for Edwards Aquifer Authority, San Antonio, Texas.

Oborny, E.L. 2003. LCRA/SAWS water project specific study plan: Colorado River flow relationships to aquatic habitat. Prepared for the Lower Colorado River Authority.

Oborny, E.L. 2003. LCRA/SAWS water project specific study plan - state threatened species: blue sucker. Prepared for the Lower Colorado River Authority.

Oborny, E.L. 2001. Environmental and ecological data gaps analysis for future projects along the Lower Colorado River: general overview.

Oborny, E.L. 1999. Environmental studies recommendations associated with future projects on the Lower Colorado River. Prepared for the Lower Colorado River Authority, Job. No. 449637.

Oborny, E.L. 1997. Evaluation of fish assemblages in the Houston Bayou System. In papers presented at the 14th Annual Gulf Coast Environmental Management Symposium, Pasadena, Texas.

Oborny, E.L., and B. Gearhart. 2000. Underwater remote-sensing survey and biological sampling: channel to Smith Point, Galveston Bay, Texas. Prepared for the US Army Corps of Engineers, Galveston District, Document No. 000081.

Oborny, E.L., and P. Jensen. 1999. Thermal effects assessment: Bastrop Reservoir. Prepared for GenTex Power Corporation, Document No. 990923.

SPECIAL TRAINING AND CERTIFICATION

2009	Stream Temperature Modeling - IF 312, US Geological Survey (USGS) Mid-continent Ecological Science Center
2003	Two-Dimensional Hydraulic Modeling of Complex Waterways with SMS Training
2000	Applied River Geomorphology and Biotechnical Engineering for Fisheries Biologists, American Fisheries Society
1998	Using the Computer Based Physical Habitat Simulation System - IF 310, USGS Mid-continent Ecological Science Center
1997	Theory and Concepts of the IFIM - IF 250, USGS Biological Resources Division
1997	Water Surface Profiling and Floodplain Analysis Seminar featuring HEC-RAS (Haestad Methods)
1996	GIS, Internet, and Fish & Wildlife Microcomputer Applications Course, American Fisheries Society
1994–1999	Mine, Safety, and Health Administration Training Certificate
1989	PADI Open Water SCUBA Diver Certification

Brad M. Littrell, Aquatic Ecologist

BIO-WEST, Inc.

Mr. Littrell has over 15 years of professional experience in aquatic ecology with a particularly strong background in research, monitoring, and management of Texas fisheries. He is adept at a wide range of aquatic sampling techniques for adult and larval fishes, freshwater mussels, and aquatic macroinvertebrates. In addition to his ecological expertise, Mr. Littrell is an experienced project manager familiar with all phases of the process from project development/study design through data collection, analysis, and report preparation. While at BIO-WEST, he has played a key role in monitoring and research related to the Federally-endangered Fountain Darter (*Etheostoma fonticola*) as part of the Edwards Aquifer Habitat Conservation Plan, studying migration and habitat requirements of state-threatened Blue Sucker (*Cycleptus elongatus*) on multiple river systems, leading surveys for state-threatened freshwater mussels, conducting fish habitat modeling for instream flow assessments on a variety of systems, and conducting general aquatic surveys throughout the southern and western United States. Mr. Littrell has considerable experience with fish movement/migration studies using a variety of fish tagging technologies including acoustic, radio, Passive Integrated Transponder (PIT), and Visual Implant Elastomer (VIE) tags. He is well-versed in multivariate analysis of ecological data, instream-flow analysis using both microhabitat- and mesohabitat-scale modeling approaches, generation and implementation of habitat suitability criteria, and a variety of other data-analysis techniques commonly used in fisheries science. Mr. Littrell has prepared numerous proposals, technical reports, and peer-reviewed manuscripts. He has also given a variety of technical and scientific presentations, some of which have earned him awards. Mr. Littrell holds a BS in aquatic biology from Southwest Texas State University and an MS in aquatic biology from Texas State University–San Marcos.

BIO-WEST PROJECT WORK

Fountain Darter Movement Study ♦ Aquatic Ecologist

Mr. Littrell was involved in all phases of this applied research study to analyze movement patterns of Federally-endangered Fountain Darters as habitat deteriorates under low-springflow conditions. Over 2,000 individual Fountain Darters in the headwaters of the Comal River were marked with fluorescent Visual Implant Elastomer (VIE) tags and monitored using nighttime visual SCUBA surveys with the aid of a specially-designed underwater ultraviolet light. Movement data from this study were used to parameterize an ecological model to predict changes in Fountain Darter populations under future flow scenarios. Under contract with the Edwards Aquifer Authority (EAA). 2014.

EXPERIENCE

- freshwater fish and mussel ecology
- movement/migration studies
- instream-flow studies
- mussel research

SKILLS

- instream flow analysis using microhabitat- and mesohabitat-scale modeling approaches
- multivariate analysis of complex ecological datasets
- fish habitat analysis and generation of habitat suitability criteria using multiple methods

AWARDS, HONORS, MEMBERSHIPS

- 2003–present: American Fisheries Society, Texas Chapter
- 2014: American Fisheries Society, Texas Chapter - Outstanding Fisheries Worker of the Year for Management
- 2012: American Fisheries Society, Texas Chapter - Best Professional Presentation Award
- 2007: American Fisheries Society, Texas Chapter - Outstanding Fisheries Worker Award for a Fisheries Student

EDUCATION

- 2006: MS aquatic biology, Texas State University–San Marcos
- 2002: BS aquatic biology, Southwest Texas State University

Gill Parasite Monitoring and Research ♦ Aquatic Ecologist

This multi-year study seeks to collect additional data on an exotic gill parasite (*Centrocestus formosanus*) which impacts the Federally-endangered Fountain Darter. Data are also being collected on distribution and abundance of an exotic snail (*Melanoides tuberculatus*) which is a host for the gill parasite. Temporal and spatial patterns in host snail and drifting parasite densities are being analyzed and potential control measures are being explored to generate a long-term parasite management plan. Mr. Littrell has been involved in study design, project management, data collection, analysis, and report preparation as part of this ongoing study. Under contract with City of New Braunfels through the Edwards Aquifer Habitat Conservation Plan (EAHCP). 2013–present.

Guadalupe River Instream Flow Study ♦ Aquatic Ecologist

BIO-WEST is conducting a comprehensive multi-faceted instream flow analysis at a site on the Guadalupe River near Gonzales, Texas. Fish habitat modeling, freshwater mussel habitat requirements and water quality analysis are being examined to aid in generating subsistence and base flow recommendations. Data on riparian community recruitment, connectivity of ecologically important off-channel habitats, and macroinvertebrate community dynamics are being analyzed to assist in determination of pulse flow recommendations. Mr. Littrell is involved in all phases of this project from study design to project management and report preparation. Under contract with the Guadalupe-Blanco River Authority (GBRA). 2012 –present.

Sabine River Blue Sucker Movement and Migration Study ♦ Aquatic Ecologist

The purpose of this study was to examine movement and migration of state-threatened Blue Sucker in the Lower Sabine River, Texas. Fifty-four adult and two juvenile Blue Suckers were tagged with Combined Acoustic/Radio Transmitters (CART) or smaller radio-only tags and movement was monitored for approximately one year. Eight Submersible Ultrasonic Receivers (SURs) were deployed at various locations along the river and mobile tracking was also conducted via boat and airplane. Mr. Littrell was involved in fish capture, tagging, SUR deployment, and report preparation as part of this study. Under contract with Texas Parks and Wildlife Department (TPWD). 2012-2013.

Habitat Modeling and Instream Flow Analysis for Cedar Ridge Reservoir ♦ Aquatic Ecologist

BIO-WEST is conducting fish habitat modeling and instream flow analysis at several sites related to the proposed Cedar Ridge Reservoir near Abilene, Texas. Mr. Littrell is responsible for collecting bathymetric, hydraulic, and fish habitat data at four sites. He is also generating a Digital Terrain Model and resulting computational mesh, modeling flow dynamics using River2D software, and generating habitat suitability criteria. Results of fish habitat modeling will be presented in a comprehensive report. Under contract with HDR, Inc. 2011–present.

Lower San Antonio River Basin Instream Flow Study ♦ Aquatic Ecologist

This project, which is conducted in cooperation with the Texas Instream Flow Program (TIFP), involves analyzing instream flow at five sites within the lower San Antonio River basin to establish environmental flow recommendations for the basin. Analysis includes fish habitat modeling, freshwater mussel studies, water-quality modeling, sediment transport analysis, and riparian flow linkages. Mr. Littrell is involved with and has been crucial to fish habitat sampling, mussel sampling, habitat suitability criteria generation, and

report preparation. Under contract with the San Antonio River Authority (SARA), in cooperation with TIFP. 2008–present.

Biomonitoring of the Comal and San Marcos Rivers ♦ Aquatic Ecologist

Mr. Littrell has been highly involved in this multi-year project to examine the effects of variable flows on the threatened and endangered species and water quality of the San Marcos and Comal Rivers ecosystems. He is conducting seasonal drop-netting collections to examine changes in density, abundance, and size-class distribution of Federally-endangered Fountain Darter, and analyzing spatial data on aquatic vegetation coverage to monitor Fountain Darter habitat. Mr. Littrell also leads seasonal dip netting efforts to efficiently monitor trends in fountain darter populations without destroying critical habitat. He is also involved in snorkel surveys to monitor abundance of rare salamanders in spring run habitats. Mr. Littrell collaborates with other BIO-WEST personnel, including the project manager, to analyze data and generate concise annual reports of findings. Under contract with the Edwards Aquifer Authority (EAA). 2005–present.

Brackenridge Park Ecological Study ♦ Project Manager/Aquatic Ecologist

Mr. Littrell was the project manager for this extensive biological inventory of Brackenridge Park in San Antonio, Texas. Project work included surveying small and medium mammals, birds, herpetofauna, and vegetation; sampling fish and macroinvertebrates; analyzing water quality; and conducting geomorphic analyses. Mr. Littrell was involved with fieldwork relating to all aspects of the project, and was responsible for analysis and report preparation. Under contract with Brackenridge Park Conservancy (BPC). 2011–2012.

Aquatic Ecology Survey of the Green River, Utah ♦ Aquatic Ecologist

BIO-WEST performed a four-season ecological study at five sites on Utah's Green River. The objective of project work was to characterize aquatic vegetation, fish, benthic invertebrate, and plankton communities, as well as general water quality at each site in the study area, which included a portion of the Green River that potentially harbors Bonytail Chub (*Gila elegans*), Humpback Chub (*Gila cypha*), Colorado Pikeminnow (*Ptychocheilus lucius*) , and Razorback Sucker (*Xyrauchen texanus*), all Federally-endangered species. Sites were selected to establish baseline data for the proposed construction of an off-channel nuclear power plant. Mr. Littrell's responsibilities included river boat navigation, fish sampling, macroinvertebrate collection, zooplankton sampling, general vegetative analysis, water-quality analysis, and reporting. Under contract with Enercon Services, Inc. 2011–2012.

Environmental Flows Analysis Relating to Brazos River Authority's Water Management Plan ♦ Aquatic Ecologist

The purpose of this project is to conduct environmental flow studies in support of the Brazos River Authority's Water Management Plan. Mr. Littrell's responsibilities include completing fish habitat sampling, freshwater mussel sampling, and analyses at several sites throughout the Brazos River basin, Texas. Under contract with Espey Consultants, Inc. 2011–present.

Lower Sabine River Fishery Study ♦ Aquatic Ecologist

BIO-WEST conducted fishery resource sampling on the lower Sabine River in support of the Toledo Bend Project Federal Energy Regulatory Commission relicensing process. The goal of this study was to provide

fisheries resource data to support further analysis of project effects and Aquatic Life Use attainment by the Aquatic Resource Working Group. This large study involved seasonal fish sampling at 10 sites on the lower Sabine River using a variety of sampling techniques including seines, day and night electrofishing, gill nets, and hoop nets. Additionally, species-specific sampling was conducted to target two species of concern: American Eel (*Anguilla rostrata*) and Blue Sucker. Custom-built eel ramp traps were used to sample American Eels. Mr. Littrell contributed to fieldwork and report preparation activities for this comprehensive multiyear evaluation. Under contract with Sabine River Authority (SRA) of Texas. 2010–2011.

Fish and Bathymetric Surveys at Buffalo National River ♦ Project Manager/Aquatic Ecologist

Mr. Littrell was the project manager for this project. Fish community and bathymetric surveys were conducted on two ponds at the Cedar Glade Area of the Buffalo National River in Newton County, Arkansas. Project work was done in support of an Environmental Assessment being prepared for the National Park Service (NPS), which intended to convert these previously unused ponds into handicap-accessible youth fishing ponds. Under contract with Pathfinder Environmental, LLC. 2011.

Survey of Aquatic Resources ♦ Aquatic Ecologist

Mr. Littrell managed a team of biologists during a year-long survey of aquatic resources in and around a potential energy facility in Victoria County, Texas. Fish and benthic macroinvertebrate surveys were conducted seasonally from several locations on the potential facility site. Additionally, electrofishing, larval fish sampling, benthic macroinvertebrate sampling, and water-quality sampling were conducted at several locations on the nearby Guadalupe River and associated canals on a monthly or bimonthly basis. Mr. Littrell identified all larval fish collected and managed data analysis and report preparation portions of this multifaceted project. Under contract with Tetra Tech, NUS. 2008.

San Antonio River Instream-Flow Planning ♦ Aquatic Ecologist

Mr. Littrell participated in field sampling, data analysis, and report preparation for this project to develop instream-flow criteria for the lower San Antonio River and Martinez Creek in south-central Texas. Project work involved conducting fish sampling using a variety of methods including boat and barge electrofishing, backpack electrofishing, gill netting, and seining. Detailed habitat measurements were taken in each fish-sampling location to assess the relationships between fish abundance and habitat variables such as depth, velocity, substrate, and cover. Under contract with the San Antonio River Authority (SARA). 2008.

Colorado River Flow Relationships to Aquatic Habitat and State-Threatened Species ♦ Aquatic Ecologist

Project work entailed intensive data collection, analysis, and reporting as part of a multifaceted instream-flow study on the lower Colorado River in Texas. Mr. Littrell was involved with data collection and analysis for the site topography, substrate mapping, and biological portions of the study. He also managed a team of biologists and technicians overseeing site selection and data collection for the fish guild and biological validation portions of the study (fishes were sampled using a backpack electrofisher and seines to identify relationships between depth, velocity, and species abundance). In addition, Mr. Littrell completed life-history studies of the state-threatened blue sucker, including a telemetry study to examine movement and migration patterns. Under contract with the Lower Colorado River Authority (LCRA). 2005–2008.

Lake Mead Razorback Sucker Study, Nevada and Arizona ♦ Aquatic Ecologist

BIO-WEST is using a variety of sampling techniques to study the life history and population dynamics of endangered razorback sucker in Lake Mead. This study involves trammel netting to collect adults, night lighting to capture larvae, using sonic-telemetry techniques (e.g., passive integrated transponder tagging) to determine movements and habitat use, and developing aging techniques to nonlethally age fish (fin rays). Under contract with the Southern Nevada Water Authority and U.S. Bureau of Reclamation, in cooperation with the Nevada Division of Wildlife, NPS, U.S. Fish and Wildlife Service, and others. 2008–present.

San Juan Colorado Pikeminnow Monitoring ♦ Aquatic Ecologist

This BIO-WEST project entails a large-scale investigation that will identify factors that may contribute to the success or failure of Colorado pikeminnow stocking efforts in the San Juan River, New Mexico and Utah. Experiments have been designed to maximize retention and survival based on continued data collection during monitoring. Under contract with San Juan River Recovery Implementation Program. 2006–2008.

Hamilton Creek Aquatic Assessment ♦ Aquatic Ecologist

Mr. Littrell participated in a Biological Assessment of Hamilton Creek in Travis County, Texas. His field duties included sampling and identifying fish using a backpack electrofisher and seines, aquatic-macroinvertebrate sampling with an Ekman dredge and D-frame net, and completing detailed habitat measurements. Mr. Littrell aided other BIO-WEST personnel in data analysis, including Index of Biological Integrity Calculations and report preparation. Under contract with Travis County. 2008.

Matagorda Bay Health Evaluation ♦ Aquatic Ecologist

The purpose of this BIO-WEST project was to identify the freshwater-inflow needs of the Matagorda Bay ecosystem. Mr. Littrell's responsibilities included identifying species in the laboratory and measuring preserved throw-net samples collected from numerous sites in and around Matagorda Bay, Texas. These samples commonly contained juvenile and adult fishes, as well as estuarine macroinvertebrates. Through project work, Mr. Littrell gained considerable experience identifying fish, shrimp, and crabs of the Texas Gulf Coast. Under contract with the Lower Colorado River Authority (LCRA). 2007–2008.

Squaw Creek Reservoir Characterization Study ♦ Aquatic Ecologist

Mr. Littrell collected data and prepared a report for this characterization study of the Squaw Creek Reservoir ecosystem. Data were collected on fish assemblage, water quality, planktonic structure, and benthic invertebrate communities both within and immediately below the reservoir, which is a source of cooling water for a large power plant. Under contract with Enercon Services, Inc. 2007.

PREVIOUS PROFESSIONAL EXPERIENCE

Texas Commission on Environmental Quality, Austin ♦ Intern

Assisted with review, monitoring, and quality control of monthly operating reports for surface water and public drinking water systems in Texas. 2005.

Texas State University–San Marcos ♦ Instructional Assistant

Prepared lectures, quizzes, and practicals for a weekly ichthyology and intermediate zoology laboratory. Instructed students in anatomy and species identification. 2004–2005.

Southwest Texas State University, San Marcos ♦ Research Assistant

Conducted laboratory research to determine food habits of and general life-history information for headwater catfish (*Ictalurus lupus*) and examined reproductive ecology and diet of the Texas shiner (*Notropis amabilis*). Conducted field research to quantify the spatial and temporal distribution of fishes in the Blanco River basin. 2003–2004.

U.S. Fish and Wildlife Service, San Marcos National Fish Hatchery and Technology Center, Texas ♦ Fishery Biologist

Reared and shipped Federally endangered fountain darters for use in a toxicity study and assisted with maintaining refugia and general hatchery activities. 2003.

Southwest Texas State University, San Marcos ♦ Undergraduate Research Assistant

Conducted a radio-telemetry study on 24 tagged grass carp (*Ctenopharyngodon idella*) to determine movement patterns within and percent emigration from Lake Austin, Texas. 2002.

Texas Parks and Wildlife Department, Lake Texoma Fisheries Station, Denison ♦ Summer Intern

Conducted various fisheries management activities including angler-creel surveys, gill netting, electrofishing, fishing education programs, habitat-enhancement projects, water-chemistry tests, and data entry. Also collected and examined largemouth bass (*Micropterus salmoides*) for a state-wide largemouth bass virus study. 1999–2000.

PUBLICATIONS / PRESENTATIONS

Littrell, B. M., J. J. Jackson, E. L. Oborny, and K. G. Ostrand. 2015. Movement of federally endangered Fountain Darters *Etheostoma fonticola* during low spring flows. Texas Chapter American Fisheries Society 2015 Annual Meeting. Tyler, Texas. (oral presentation)

Randklev, C. R., E. Tsakiris, R. G. Howells, J. Groce, M. S. Johnson, J. Bergmann, C. Robertson, A. Blair, B. Littrell, and N. Johnson. 2013. Distribution of extant populations of *Quadrula mitchelli* (false spike). Ellipsaria 15(3):18-21.

Littrell, B. M., M. S. Johnson, M. Alexander, and E. Oborny. 2012. Effectiveness of host snail removal in the Comal River, Texas, and its ability to reduce cercariae densities of the invasive gill parasite *Centrocestus formosanus*. Texas Chapter of the American Fisheries Society 2012 Annual Meeting. Galveston, Texas. (oral presentation)

Littrell, B. M., E. Oborny, K. Mayes, G. Linam, C. Robertson, and D. Geeslin. 2011. Developing fish habitat suitability criteria for the lower San Antonio River basin. Texas Chapter of the American Fisheries Society 2011 Annual Meeting. San Marcos, Texas. (oral presentation)

Bean, P. T., T. H. Bonner, and B. M. Littrell. 2007. Spatial and temporal patterns in the fish assemblage of the Blanco River, Texas. Texas Journal of Science 59(3):179–200.

Littrell, B. M., D. J. Lutz-Carrillo, T. H. Bonner, and L. T. Fries. 2007. Status of an introgressed Guadalupe bass population in a central Texas stream. North American Journal of Fisheries Management 27:785–791.

Littrell, B., T. Bonner, D. Lutz-Carrillo, and L. Fries. 2006. Status of an introgressed Guadalupe bass population in a central Texas stream. Southern Division of the American Fisheries Society 2006 Spring Meeting. San Antonio, Texas. (oral presentation)

Littrell, B., and T. H. Bonner. 2005. Can invasiveness of native cyprinids be predicted from life history traits? Texas Chapter of the American Fisheries Society Annual Meeting. Grapevine, Texas. (oral presentation)

Littrell, B., and T. H. Bonner. 2004. Identifying attributes of native invaders. American Fisheries Society Annual Meeting. Madison, Wisconsin. (oral presentation)

Littrell, B. M., C. Thomas, C. S. Williams, and T. H. Bonner. 2003. Gut content analysis of the headwater catfish *Ictalurus lupus* from two west Texas streams. Texas Journal of Science 55(4):323–328.

Thomas, C., B. Littrell, J. Watson, and T. H. Bonner. 2003. Gut analyses of the headwater catfish from Independence and Dolan Creeks. Southwestern Association of Naturalists Annual Meeting. Oklahoma City, Oklahoma. (oral presentation)

SPECIAL TRAINING AND CERTIFICATION

2007 MesoHABSIM Instream Data Collection and Modeling Course, Rushing Rivers Institute, Amherst, Massachusetts

Timothy H. Bonner

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Texas State University
San Marcos, Texas 78666

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Website: http://www.bio.txstate.edu/contacts/faculty/timothy-bonner.html

EDUCATION:

Texas Tech University -- May 2000
Doctor of Philosophy, Fisheries Science
Secondary emphasis: Statistics
Major Advisor: Dr. Gene R. Wilde
Dissertation Title: Habitat use and reproductive ecology of the Arkansas River shiner and peppered chub in the Canadian River, New Mexico and Texas.

Texas State University- San Marcos -- August 1996
Master of Science, Biology
Minor: Aquatic Biology
Major Advisors: Drs. Thomas M. Brandt and Bobby G. Whiteside
Thesis Title: The effects of temperature on egg production and early life stages of the endangered fountain darter.

Texas A&M University -- May 1992
Bachelor of Science, Wildlife and Fisheries Science
Option: Fisheries Science

PROFESSIONAL EXPERIENCE

Professor, Department of Biology, Texas State University (2012 – present)

Director, Aquatic Station, Department of Biology, Texas State University (2007 – 2012)

Associate Professor, Department of Biology, Texas State University (2007 – 2012)

Assistant Professor, Department of Biology, Texas State University (2001 – 2007)

Assistant Professor, Department of Biology, Northwestern State University (2000 – 2001)

Other:
Postdoctoral Research Associate, Texas Tech University (2000)
Research and Teaching Assistant, Texas Tech University (1996-2000)
Research and Teaching Assistant, Texas State University (1994-1996)
Experimental Biological Aide, Oregon Department of Fish and Wildlife (1992-1993)

PUBLICATIONS

Craig, C. A. and T. H. Bonner. In review. Historical and contemporary perspectives of an urban fish community related to stream rehabilitation efforts. Urban Ecosystems

Clark, M. K., K. G. Ostrand, and T. H. Bonner. In review. Feasibility of piscine predator control within a headwater spring fish community. North American Journal of Fisheries Management.

Craig, C. A., B. M. Littrell, and T. H. Bonner. In review. Population status and life history attributes of the Texas shiner *Notropis amabilis*. American Midland Naturalist.

Dautreuil, V. L. E., C. A. Craig, and T. H. Bonner. In review. Persistence of *Etheostoma parvipinne* (Goldstripe Darter) in a single tributary within a drainage on the periphery of its range. Southeastern Naturalist.

Ruppel, D. S., C. R. Vaughn, H. T. Nichols, and T. H. Bonner. In review. Validating an instream flow recommendation using larval fish diets. Environmental Management.

Cook-Hildreth, C., T. H. Bonner, D. G. Huffman. Accepted. Reproductive biology of an exotic suckermouth armored catfish (Loricariidae) in the San Marcos River, Hays Co., Texas, with observations on environmental triggers. Bioinvasion Records.

69. Craig, C.A., K. A. Kollaus, K. P. K. Behen, and T.H. Bonner. 2016. Relationships among spring flow, habitats, and fishes within evolutionary refugia of the Edwards Plateau. Ecosphere.

68. McDonald, D. L., T. H. Bonner, P. D. Cason, B. W. Bumguardner, and S. Bonnot. 2016. Cold weather simulation on hatchery propagated premetamorphic larvae and postmetamorphic juvenile Southern Flounder. Journal of Applied Aquaculture.

67. Robertson, S. M, T. H. Bonner, and J. N. Fries. 2016. Effects of habitat utilization on the reproduction of two imperiled, sympatric *Dionda* (Cyprinidae) in the Rio Grande Basin, Texas. American Midland Naturalists 175:222-232.

66. Perkin, J. S. and T. H. Bonner. 2016. Historical changes in fish assemblage composition following water quality improvement in the mainstem Trinity River of Texas. Rivers Research and Application 32:85-99.

65. Phillips, M. B. and T.H. Bonner. 2015. Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico. Marine Pollution Bulletin 100:264-269.

64. Labay, B. J., D. A. Hendrickson, A. E. Cohen, T. H. Bonner, R. S. King, L. Kleinsasser, G. Linam, and K. W. Winemiller. 2015. Can species distribution models aid bioassessment when reference sites are lacking? Tests based on freshwater fishes. Environmental Management 56:835-846.

63. Craig, C. A., C. R. Vaughn, D. S. Ruppel, and T. H. Bonner. 2015. Occurrence of Brown Bullhead in Texas. Southeastern Naturalist 14:35-37.

62. Diaz, P, J. N. Fries, T. H. Bonner, M. Alexander, W. H. Nowlin. 2015. Mesohabitat associations of the threatened San Marcos salamander (*Eurycea nana*) across its geographic range. Aquatic Conservation: Marine and Freshwater Ecosystems 25:307-321.

61. Curtis, S. G., J. S. Perkin, P. T. Bean, M. S. Sullivan, and T. H. Bonner. 2015. Guadalupe bass *Micropterus treculii* (Valliant & Boucourt, 1874). Pages 55-60 *in* M. D. Tringali, J. M. Long, T. W. Birdsong, and M. S. Allen, editors. Black bass diversity: multidisciplinary science for conservation. American Fisheries Society, Symposium 82, Bethesda, Maryland.

60. Kollaus, K. A., K. P. K. Behen, T. C. Heard, T. B. Hardy, and T. H. Bonner. 2015. Influence of urbanization on a karst terrain stream and fish community. Urban Ecosystem 18:293-320.

59. Nichols, H. T. and T. H. Bonner. 2014. First record and habitat associations of *Spongilla cenota* (Class Demospongiae) within streams of the Edwards Plateau. Southwestern Naturalist 59: 465-470.

58. Becker, J. C., K. J. Rodibaugh, B. J. Labay, T. H. Bonner, Y. Zhang, and W. H. Nowlin. 2014. Influence of land use and physiographic gradients on nutrients in a Gulf Slope (USA) river system. Freshwater Science 33:731-744.

57. Henn, M., H. T. Nichols, Y. Zhang, and T. H. Bonner. 2014. Effect of artificial light on the drift of aquatic insects in urban central Texas streams. Journal of Freshwater Ecology 29:307-318. Editor's Choice Article

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ONLINE PUBLICATIONS:

Hassan-Williams, C., C. L. Thomas, and T. H. Bonner. 2008. Identification and information for Texas fishes. (http://txstate.fishesoftexas.org/)

GRANTS/CONTRACTS

Mercury levels in fish caught in the Gulf of Mexico and the risk to human health. 2015 – 2016. Texas State University-Research Enhancement. J. Dutton and T. Bonner. $16,000.

Prairie Chub. Texas State Comptroller. 2015. T. Bonner and N. Martin. $120,000.

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SB III Work Plan—Validating Instream Flow recommendations and Standards: Brazos River Basin. 2014. Texas Water Development Board. Co-PI with BioWest, K. Winemiller (TAMU), G. Guillen (UH-Clearlake), and B. Brooks and J. Duke (Baylor). $300,000

SB III Work Plan—Validating Instream Flow recommendations and Standards: Guadalupe River and San Antonio River Basin. 2014. Texas Water Development Board. Co-PI with BioWest and SARA. $230,000

San Marcos and Comal Rivers Habitat Conservation Plan—Biological Monitoring. 2014 - 2019. Edwards Aquifer Authority.. Co-PI with Ed Oborny (BIO-WEST, Inc.), Robert Doyle (Baylor), and ZARA Environmental. $2,080,000

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San Marcos and Comal Rivers Habitat Conservation Plan—EcoModel. 2013 – 2015. Edwards Aquifer Authority. Co-PI with Ed Oborny (BIO-WEST, Inc), George Ward (University of Texas), Bill Grant and Rose Wang (Texas A&M), Robert Doyle (Baylor), Todd Swannack (USACE-Engineer Research and Development Center), Thom Hardy (Texas State U). $930,350

Survey for two rare shiners and documentation of the fish community structure and habitat associations among perennial streams at Camp Wolters. 2013. Texas Army National Guard. $10,000

Lake Marble Falls Bridge Demolition. 2013. Archer-Western Construction and BioWest. $28,000.

Movement and habitat use of Guadalupe Bass in the upper San Antonio River. 2013. National Fish and Wildlife Foundation and SARA, Bring Back the Natives Program. $22,000

Focal larval fish species distribution and habitat use in the San Antonio River. 2012-13. Texas Parks and Wildlife. $320,000

Project Flowing Waters, GK-12 Program. 2008 - 2012. National Science Foundation. Co-PI with J. Westerlund, W. Nowlin, and R. Earl. $2,700,000

Spatial and temporal patterns in the biological communities and instream habitats of the Llano River. 2011. Texas Parks and Wildlife. $100,000

Development of watershed best management practices for the conservation of Tx Aquatic Ecosystems. 2010. Texas Parks and Wildlife. $93,250

Monitoring of Biological Communities in the San Marcos River watershed. 2010. ARRA and River Systems Institute. Co-PI with B. Schwartz, W. Nowlin, and T. Hardy. $600,000

Reproduction and life history of Devils River minnow. 2009. Section 6. US Fish and Wildlife Service. $38,900

Ecological Values and Ecosystem Services of Watersheds in the Lower Rio Grande River. 2009. US Department of Agriculture and Rivers Systems Institute. Co-principal investigator with W. Nowlin and Thom Hardy. $85,000

Effects of fish passage on Threatened and Endangered aquatic species in Texas. 2009. US Fish and Wildlife Service. $70,000

Introgressive status, population genetic structure, and microhabitat use of the Guadalupe Bass, *Micropterus treculii*. 2008. Texas Parks and Wildlife. $94,500

Habitat associations of Devils River minnow in the upper Devils River. 2007. US Fish and Wildlife Service. $22,000.

Constructing a Biological Gradient model for the lower Brazos River. 2007. Environmental Protection Agency. $12,000

Ecological values of watersheds in the lower Brazos River Brazos River. 2007. Houston Endowment, Texas River Systems Institute, and The Nature Conservancy of Texas. Co-PI with W. Nowlin, Y. Zhang, and V. Lopes. $300,000

Spatial and temporal trends in macroinvertebrate community in a tailrace fisheries. 2007. Guadalupe Trout Unlimited. $30,000

Spatial and temporal patterns in the Pedernales River fish assemblages. 2007. Texas River Systems Institute and Nature Conservancy. $30,000

Historical trends in fish assemblage occurrence and abundance in the Trinity River and Guadalupe River systems. 2006. Texas Water Development Board. $30,000

Diet analysis of the exotic suckermouth catfish in the San Marcos River. 2006. US Fish and Wildlife Service. Co-principal investigator with W. Nowlin. $5,000

Sources and pathways of energy and nutrients supporting the Rio Grande biotic community. 2006. US Department of Agriculture and Rivers Systems Institute. Co-principal investigator with W. Nowlin. $93,000

Historical trends in fish assemblage occurrence and abundance in three Texas river systems. 2006. Texas Water Development Board. Co-principal investigator with V. Lopes. $59,000

Ecological characterization of the Rio Grande fish assemblages in the Big Bend and Lower Canyon areas. 2005. U.S. Department of Agriculture and Rivers Systems Institute. Principal investigator. $80,764

Stream biomonitoring at Peason Ridge during construction phase of new battle areas. 2004. US Army. Co-principal investigator with L. Williams, Ohio State University. $200,197

Blanco River Assessment Study. 2003 - 2004. The Nature Conservancy of Texas and International Institute of Sustainable Water Resources. Co-principal investigator with five others from Texas State University- Department of Biology and Geography. $175,000

Response of oxbow lake biota to hydrologic exchanges with the Brazos River channel. 2003 - 2004. Texas Water Development Board. Co-principal investigator with K. Winemiller and F. Gelwick, Texas A&M University. $100,000

Interactive effects of physical parameters, site, and season on the fishes of Independence Creek—Conservation by Design. 2004. The Nature Conservancy of Texas. Co-principal investigator with Jackie Watson (graduate student). $3,000

Development of a Biomonitoring Program for Fort Polk and Peason Ridge Wildlife Management Area, Louisiana. 2003. US Army. Co-principal investigator with L. Williams, Ohio State University. $124,447

Stream biomonitoring at Peason Ridge, Fork Polk, Louisiana. 2003. US Army. Co-principal investigator with L. Williams, Ohio State University. $60,000

Species composition and habitat use of fishes in Caroline Springs and Independence Creek, a tributary of the Pecos River. 2002. Texas Parks and Wildlife, The Nature Conservancy of Texas. Principal investigator. $4,600

Movement and habitat selection of grass carp in the lower Colorado River. 2002. Lower Colorado River Authority. Co-principal investigator with T. Arsuffi, Texas State. $21,000

Effects of fluctuating temperatures on egg production of the endangered fountain darter. 2001. Edward's Aquifer Authority / Biowest. Principal investigator. $16,000

Temporal and spatial trends in fish assemblage structures in streams of east Texas and Louisiana. 2001. National Fish and Wildlife Foundation. Co-principal investigator with L. Williams, Ohio State University. $18,000

Movement of grass carp in the lower Rio Grande River (TX). 2001. Texas Parks and Wildlife Department. Co-principal investigator with T. Arsuffi, Texas State. $30,000

Temporal and spatial trends in fish assemblage structures and habitat associates in three headwater streams, Peason Ridge WMA, Fort Polk, Louisiana. 2001. U.S. Army. Principal investigator. $18,000

Habitat use and ecology of the Arkansas River shiner and speckled chub in the Canadian River, New Mexico and Texas. 1998. U.S. Bureau of Reclamation. Co-principal investigator with G. Wilde, Texas Tech University. $55,000

PROFESSIONAL PRESENTATIONS (last five years)

Phillips, M. B. and T. H. Bonner. 2015. The occurrence and amount of microplastics ingested by fishes in watersheds of the Gulf of Mexico. American Fisheries Society-Portland OR (oral presentation)

Nichols, H., K. Ostrand, and T. Bonner. 2015. Discharge and habitat mediated effects on Fountain Darter reproduction. American Fisheries Society-Portland OR (oral presentation)

Ruppel, D, E. Cowles, B. Littrell, and T. H. Bonner. 2015. Validation of environmental flow regimes in Brazos, Guadalupe, and San Antonio rivers. American Fisheries Society-Portland OR (oral presentation)

Clark, M. K. and T. H. Bonner. 2015. Effects of predation on Fountain Darters under low flow conditions. American Fisheries Society-Portland OR (oral presentation)

Ruppel, D., C. Vaughn, H. Nichols, and T. Bonner. 2015. Validation of an instream flow recommendation using larval fish diets. American Fisheries Society-Portland OR (oral presentation)

Scanes, C., Ruppel, B. Littrell, and T. Bonner. 2015. Fish community and habitat assessments within an urbanzied spring-fed stream of the Edwards Plateau. American Fisheries Society-Portland OR (poster presentation)

Craig, C.A., K. A. Kollaus, K. P. K. Behen, and T.H. Bonner. 2015. Relationships among spring flow, habitats, and fishes within evolutionary refugia of the Edwards Plateau. American Fisheries Society-Portland OR (oral presentation)

McDonald, D. L., T. H. Bonner, P. D. Cason, B. W. Bumguardner, and S. Bonnot. 2015. Cold weather simulation on hatchery propagated premetamorphic larvae and postmetamorphic juvenile Southern Flounder. American Fisheries Society-Portland OR (oral presentation)

Scanes, C. M., D. Ruppel, B. Littrell, and T. H. Bonner. 2015. Fish community and habitat assessments within an urbanized spring-fed stream. Southwestern Association of Naturalists. San Diego, CA (poster presentation)

Cowles, E. S., D. S. Ruppel, B. Littrell, and T. H. Bonner. 2015. Validation of environmental flow regimes in Brazos, Guadalupe, and San Antonio rivers. Southwestern Association of Naturalists. San Diego, CA (poster presentation)

Clark, M. K. and T. H. Bonner. 2015. Effects of predation on Fountain Darters under low flow conditions. Southwestern Association of Naturalists. San Diego, CA (oral presentation)

Craig C., T.H. Bonner, K. Kollaus, K Behen. 2015. Relationship Between Spring Flow and Spring Fish Communities. Southwestern Association of Naturalists. San Diego, California. (Oral presentation)

Ruppel, D., C. Vaughn, H. Nichols, and T. Bonner. 2015. Validation of an instream flow recommendation using larval fish diets. Southwestern Association of Naturalists. San Diego, California. (Oral presentation)

Craig C., T.H. Bonner. 2015. Impacts of Urbanization on Spring Fish Communities. Southwestern Association of Naturalists. San Diego, California. (Oral presentation)

Phillips, M. B. and T. H. Bonner. 2015. The occurrence and amount of microplastics ingested by fishes in watersheds of the Gulf of Mexico. Southwestern Association of Naturalists. San Diego, CA (oral presentation)

Nichols, H., K. Ostrand, and T. Bonner. 2015. Discharge and habitat mediated effects on Fountain Darter reproduction. Southwestern Association of Naturalists. San Diego, California. (Oral presentation)

Craig, C. A.,S, K. A. Kollaus, K. P. K. Behen, and T. H. Bonner. 2014. Relationships Between Spring Run Discharge and Spring-associated Fishes in the Karst Edwards Plateau Region. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Phillips, M. B., and T. H. Bonner. 2014. The Occurrence and Amount of Microplastics Ingested by Fish in the Watersheds of the Gulf of Mexico. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Ruppel, D. S., C. Vaughn, A. Grubh, S. McMillan, G. Linam, and T. H. Bonner. 2014. Diets of Larval Fishes Between Slack Water Habitats During the Day and Swift Water Habitats at Night. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Sullivan, M. L., Y. Zhang, and T. H. Bonner. 2014. An Investigation into the Nutritional Value of Aquatic versus Terrestrial Prey for Freshwater Fishes. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Vaughn, C., D. Ruppel, A. Grubh, S. McMillan, G. Linam, and T. H. Bonner. 2014. Validating Environmental Flow Recommendations with Regards to CPOM, Macroinvertebrates, and Larval Fish Drift in the Lower Guadalupe and San Antonio Rivers. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Henn, M., H. Nichols, Y. Zhang, and T. H. Bonner. 2014. Effect of Artificial Light on the Drift of Aquatic Insects in Urban Central Texas Streams. Texas Chapter of the American Fisheries Society. Pottsboro (oral presentation)

Nichols, H. T., and T. H. Bonner. 2014. First Record and Habitat Associations of *Spongilla cenota* (Class Demospongiae) within Streams of the Edwards Plateau, Texas, USA. Texas Chapter of the American Fisheries Society. Pottsboro (poster presentation)

Labay, B. J., D. A. Hendrickson, A. E. Cohen, T. H. Bonner, R. King, L. Kleinsasser, G. Linam, K. Winemiller. 2013. Toward bioassessment without reference sites using species distribution modeling. Southwestern Association of Naturalists. McNeese State University (poster presentation)

Linam, G. W., S. Magnelia, T. H. Bonner, S. McMillan, C. A. Craig, E. Moran, S. Lusk, and R. Ranft. 2013. Re-establishment of Guadalupe bass in two central Texas rivers. Southern Division of the American Fisheries Society. Nashville (oral presentation)

Curtis, S. G., K. P. Behen, and T. H. Bonner. 2013. Effects of a declining hydrograph on instream habitats and fish communities in a semi-arid karstic stream. Southern Division of the American Fisheries Society. Nashville (oral presentation)

Vaughn, C., D. Ruppel, A. Grubh, S. McMillan, G. Linam, and T. H. Bonner. 2013. Effects of base flow and high flow pulses on drifting CPOM, macroinvertebrates, and larval fishes. Southern Division of the American Fisheries Society. Nashville (poster presentation)

Eaton, V., S. Curtis, and T. H. Bonner. 2013. Assessment of wildfire effects on fishes of the Texas gulf slope drainages using a conceptual framework. Southern Division of the American Fisheries Society. Nashville (poster presentation)

Kollaus, K. A., K. P. K. Behen, T. B. Hardy, T. C. Heard, and T. H. Bonner. 2013. Influence of water temperature on fish distributions within a Texas spring-fed stream. Texas Chapter of the American Fisheries Society. Lake Conroe (oral presentation)

Eaton, V., K. Ridenour, S. Curtis, and T. H. Bonner. 2013. Conceptual framework to assess the effects of wildland fire on fishes of the Texas Gulf Slope Drainages. Texas Chapter of the American Fisheries Society. Lake Conroe (oral presentation)

Curtis, S. G., K. P. Behen, and T. H. Bonner. 2013. Instream habitat and biological responses to low flow conditions in a semi-arid karstic stream. Texas Chapter of the American Fisheries Society. Lake Conroe (oral presentation)

Perkin, J. S., Z. R. Shattuck, J. E. Gerkin, and T. H. Bonner. 2013. Stream fragmentation and drought legacy determine distribution of Burrhead Chub in subtropical streams. Texas Chapter of the American Fisheries Society. Lake Conroe (oral presentation)

Vaughn, C., D. Ruppel, A. Grubh, S. McMillan, G. Linam, and T. H. Bonner. 2013. Effects of base flow and high flow pulses on drifting CPOM, macroinvertebrates, and larval fishes. Texas Chapter of the American Fisheries Society. Lake Conroe (poster presentation)

Sullivan, M., Y. Zhang, T. H. Bonner. 2012. Variation in cyprinid feeding habits mediated by habitat and morphology. American Fisheries Society. St. Paul (oral presentation)

Eaton, V. K. Ridenour, S. G. Curtis, T. H. Bonner. 2012. Conceptual framework to assess the effects of wildland fire and fire suppression tactics on aquatic communities. Texas Chapter of the American Fisheries Society. Galveston (poster presentation)

Behen, K. P. K., S. G. Curtis, M. L. Sullivan, and T. H. Bonner. 2012. Influences of bioenergetics on the habitat associations of two Texas darters. Texas Chapter of the American Fisheries Society. Galveston (poster presentation)

Labay, B.J., D. A. Hendrickson, A. E. Cohen, T. H. Bonner, and L.J. Kleinsasser. 2012. Exploring the potential of species distribution models for bioassessment without reference sites. Texas Chapter of the American Fisheries Society. Galveston (poster presentation)

Sullivan, M. L., Y. Zhang, and T. H. Bonner. 2012. Terrestrial subsidies in the diet of stream fishes of the USA: comparisons among taxa and morphology. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Behen, K. P. K., S. G. Curtis, K. A. Kollaus, T. B. Hardy, and T. H. Bonner. 2012. Effects of recreational activities on the spatial and temporal trends in habitat associations for the fish assemblage of the San Marcos River. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Curtis, S. G., K. P. K. Behen, and T. H. Bonner. 2012. Effects of groundwater and spring influenced communities on downstream riverine assemblages in the Llano River. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Perkin, J. S., N. Dammeyer, and T. H. Bonner. 2012. Long-term changes in water quality and fish assemblage composition in the Trinity River, Texas. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Kollaus, K. A., K. P. K. Behen, T. B. Hardy, T. C. Heard, J. M. Tenant, and T. H. Bonner. 2012. Influence of watershed and instream alterations on the upper San Marcos River fish assemblage. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Bean, P. T., D. Lutz-Carrillo, and T. H. Bonner. 2012. Population genetic structure of the Guadalupe bass. Texas Chapter of the American Fisheries Society. Galveston (oral presentation)

Bonner, T. and R. Maxwell. 2011. Patterns of endemics and species richness in fishes of the western gulf slope. American Fisheries Society. Seattle (oral presentation)

Hardy, T.B., W.H. Nowlin, B. Schwartz, and T. Bonner. 2011. San Marcos Observing System: Integrating Physical, Chemical, and Biological Data at High Resolution Spatial and Temporal Scales. American Fisheries Society. Seattle (poster presentation)

McMillan, S., T. Bonner, W. Nowlin, and J. Fries. 2011. Reproductive ecology of two sympatric cyprinids in the Rio Grande basin, Texas. American Fisheries Society. Seattle (oral presentation)

Hardy, T, W. Nowlin, B. Schwartz, and T. Bonner. 2011. San Marcos River Observing System. American Fisheries Society. Seattle (oral presentation)

Bean, P., D. Lutz-Carrillo, and T. Bonner. 2011. Population genetic structure of the Guadalupe bass *Micropterus treculii*. American Fisheries Society. Seattle (oral presentation)

Behen, K., K. Kollaus, T. Hardy, T. Bonner. 2011. Spatial and temporal trends in habitat associations of the fish community in Spring Lake and the headwaters of the San Marcos River. American Fisheries Society. Seattle (poster presentation)

Curtis, S., K. Kollaus, T. Bonner. 2011. Spatial and temporal trends in habitat associations of the fishes in the Llano River, Texas. American Fisheries Society. Seattle (poster presentation)

Bean, P., W. Nowlin, and T. Bonner. 2011. Trophic ecology of the Guadalupe bass *Micropterus treculii*. American Fisheries Society. Seattle (poster presentation)

Abuzeineh, A.A., W. H. Nowlin, A. Smith, T. C. Heard, and T. H. Bonner. 2011. Organic matter sources supporting communities of an arid and semi-arid riverine system: The lower Rio Grande drainage. Ecological Society of America, Austin, TX (oral presentation)

Kollaus, KA, J. S. Perkin, R. A. Myers, and T. H. Bonner. 2011. Feeding ecology of introduced smallmouth bass in the Devils River, Texas. Texas Chapter AFS Meeting. San Marcos (oral presentation)

McMillan, S. M., J. N. Fries, and T. H. Bonner. 2011. Reproductive and trophic ecology of two sympatrically occuring cyrpinids in the Rio Grande Basin. Texas Chapter AFS Meeting. San Marcos (oral presentation)

Perkin, J. S., Z. R. Shattuck, and T. H. Bonner. 2011. Life history aspects of a relict ironcolor shiner population in a novel spring environment. Texas Chapter AFS Meeting. San Marcos (oral presentation)

Bonner, T. H. and R. J. Maxwell. 2011. Patterns of endemism and species richness of fishes of the western gulf slope. Texas Chapter AFS Meeting. San Marcos (oral presentation)

STUDENT SUPERVISION (Major advisor):

38. **Harlan T. Nichols** (BS Texas State University). 2015. Spring flow and habitat-mediated effects on reproductive effort of the Fountain Darter. M. S. Thesis.

37. **Myranda K. Clark** (BS Missouri State University). 2015. Testing of trophic cascade within a headwater spring community: implications for water quantity management. M. S. Thesis.
- current position: Fish Biologist, Florida Fish and Wildlife Conservation Commission, Cedar Keys.

36. **Cody A. Craig** (BS Texas Tech University). 2014. Relationship between base flow magnitude and spring fish communities. M. S. Thesis
- current position: Ph.D. – Aquatic Resources Program, Texas State University

35. **Melissa B. Phillips** (BA University of Leeds). 2014. Occurrence and amount of microplastics ingested by fishes in watersheds of the Gulf of Mexico. M. S. Thesis

34. **Christopher R. Vaughn** (BS Texas A&M University). 2014. Validating environmental flow recommendations: drifting coarse particulate matter, macroinvertebrates, and larval fishes. M. S. Thesis.
- current position: Aquatic Biologist. San Antonio River Authority.

33. **David S. Ruppel** (BS Northern Michigan University). 2014. Flow and current velocity mediated diets of larval fishes. M. S. Thesis.
- current position: Ph.D. – Aquatic Resources Program, Texas State University

32. **Virginia E. Dautreuil** (BS Virginia Tech University). 2013. Conceptual framework to assess the effects of wildfire on aquatic systems of the semi- arid and arid regions of the western gulf slope drainages. M. S. Thesis.
- current position: Forest Supervisor; Martha's Vineyard and Nantucket, Massachusetts Department of Conservation and Recreation

31. **Kenneth P. K. Behen** (BS University of Washington). 2013. Influence of connectivity and habitat on fishes of the upper San Marcos River. M.S. Thesis.
- current position: Fisheries Biologist, Washington Department of Fish and Wildlife

30. **Monika J. Henn** (BS University of Virginia). 2013. Effects of artificial light on the drift of macroinvertebrates in urban central Texas streams. M.S. Thesis (Co-advisor with Dr. Y. Zhang).
- current position: Analyst. Urban Land Institute, Greenprint Center for Building Performance. New York.

29. **Mario L. Sullivan** (BS Colorado State, MS Western Kentucky State). 2013. The role of terrestrial subsidies in fish communities with a particular focus upon cyprinids. Ph.D. Dissertation (Co-advisor with Dr. Y. Zhang).
- current position: Central Arizona College

28. **Preston T. Bean** (BS Texas Tech University; MS Texas State University). 2012. Introgressive status, population genetic structure, phylogeographic history and individual-level resource specialization of the Guadalupe bass *Micropterus treculii*. Ph.D. Dissertation.
- current position: Research Biologist, Texas Parks and Wildlife

27. **Robert J. Maxwell** (BS Texas State University). 2012. Patterns of endemism and species richness of fishes of the western gulf slope. M.S. Thesis.
- current position: Fisheries Biologist, Louisiana Department of Wildlife and Fisheries

26. **Stephen Curtis** (BS Texas A&M University). 2012. Effects of dry baseflow conditions in a declining hydrograph on instream habitats and fish communities in a semi-arid karstic stream. M.S. Thesis.
- current position: Fisheries Biologist, University of Houston-Clear Lake; Environmental Institute of Houston

25. **Sarah McMillan** (BS Texas State University). 2011. Reproductive and feeding ecology of two sympatric *Dionda* (Cyprinidae) in the Rio Grande basin, Texas. M.S. Thesis.
- current position: Fisheries Biologist, Texas Parks and Wildlife-Inland Fisheries, San Marcos

24. **Tom Ryan** (BS Texas A&M University). 2011. Short term effects of military fog oil on fish. M.S. Thesis

- position: River Systems Institute, Texas State University and USFWS-San Marcos Aquatic Research Center; currently unknown.

23. **Casey S. Williams** (BS Northwestern State University; MS Texas State University). 2011. Life history characteristics and larval drift patterns of obligate riverine species in the Lower Brazos River, Texas. Ph.D. Dissertation.
- current position: Associate Professor, Valley City State University, North Dakota

22. **Nathan Dammeyer** (BS Purdue University). 2010. Movement patterns of *Etheostoma fonticola* in a headwater stream. M.S. Thesis
- current position: National Park Service, Virginia

21. **Benjamin Labay** (BS University of Texas). 2010. The influence of land use, zoogeographic history, and physical habitat on fish community diversity in the lower Brazos watershed. M.S. Thesis
- current position: UT Memorial Museum Ichthyology Collection

20. **Zachary Shattuck** (BS Colorado State University). 2010. Spatiotemporal patterns of fish and aquatic insects in an urbanized watershed of Central Texas. M.S. Thesis
- current position: Native Species Coordinator; Montana Fish, Wildlife, and Parks.

19. **Clara Folb** (BS Ohio State University). 2010. Reproductive seasons and life histories of three Texas *Percina* (Actinopterygii). M.S. Thesis
- current position: Pursuing health services specialty degree.

18. **Kristy Kollaus** (BS Texas State University). 2009. Fish assemblage structure and habitat associations in a Texas spring-fed river. M.S. Thesis
- current position: Fisheries Biologist, Meadows Center, Texas State University

17. **Josh Perkin** (BS Texas State University). 2009. Historical composition and long-term trends of fish assemblages in two Texas rivers and microhabitat associations and movement of Guadalupe bass *Micropterus treculii* in the Pedernales and South Llano rivers. M.S. Thesis.
- current position: Assistant Professor, Tennessee Tech University

16. **Tom Heard** (BS Texas State University). 2008. Spatial and temporal patterns in a Chihuahua Desert fish assemblage. M.S. Thesis.
- current position: Fisheries Biologist, Meadows Center, Texas State University

15. **Megan Bean** (BS Texas State University). 2008. Occurrence and impact of the giant Asian tapeworm in the Rio Grande drainage. M. S. Thesis
- current position: Texas Parks and Wildlife-Inland Fisheries, Mountain Home

14. **Katrina Cohen** (BS University of Texas). 2008. Gut content and stable isotope analysis of exotic suckermouth catfishes (*Hypostomus*) in the San Marcos River, Texas: A concern for spring endemics? M. S. Thesis
- Position: Ph.D., University of Texas-Arlington

13. **Becca Marfurt Fordham** (BS Southwestern University). 2008. Habitat associations of macroinvertebrates in the Big Bend Reach of the Rio Grande. M. S. Thesis
- Current position: Oklahoma Department of Environmental Quality

12. **Dennis Runyan** (BS Texas A&M University). 2007. Fish assemblage changes in Gulf Slope drainages; an historical perspective. M. S. Thesis
- Current position: Fish Biologist, Alan Plummer Associates, Austin.

11. **Rex Tyrone** (BS University of Washington-Wilmington). 2007. Effects of upland timber harvest and road construction on headwater stream fish assemblages in a southeastern forest. M. S. Thesis
- Position: Fish Biologist, US Geological Survey, Washington. Current position unknown.

10. **Preston Bean** (BS Texas Tech University). 2007. Spatial and temporal patterns in the fish assemblage of the Blanco River, Texas *and* Reproductive ecology and diet of the gray redhorse. M. S. Thesis.
- Current position. Research Biologist, Texas Parks and Wildlife.

9. **Dave Pendergrass** (BA Covenant College). 2006. Macroinvertebrate assemblage in the Blanco River basin. M. S. Thesis.
- Current position: Research Scientist, Texas Institute for Applied Environmental Research; Tarleton State University.

8. **Jackie Watson** (BS Texas State University). 2006. Patterns and habitat associations of a desert spring fish assemblage and responses to a large-scale flood. M. S. Thesis
- Current position: Fish Biologist, Utah Division of Wildlife Resources, Provo.

7. **Brad Littrell** (BS Texas State University). 2006. Can invasiveness of native cyprinids be predicted from life history traits? *and* Status of an introgressed Guadalupe bass population in a central Texas stream. M.S. Thesis.
- Current position: Fisheries Biologist, Bio-West, Inc., Austin, Texas

6. **Julie Hulbert** (BS Trinity University). 2005. Morphology, meristic counts, and melanophore description for *Dionda diaboli* (Cyprinidae) during development. M.S. Thesis.
- Position: Director, Education Center, City of San Marcos. Currently in the health care profession.

5. **Tracy R. Leavy** (BS Long Island University). 2004. Relationships among swimming ability, habitat use, and morphology of freshwater fishes in Texas and Louisiana. M.S. Thesis.
- Position: Fish and habitat biologist, US Fish and Wildlife Service, Washington State. Currently in the health care profession.

4. **Dijar Lutz-Carrillo** (BS University of Texas). 2004. The use of microsatellite DNA to identify largemouth bass subspecies. M.S. Thesis, Co-advisor with C. Nice.
- Current position: Geneticist, Texas Parks and Wildlife Department, San Marcos

3. **Dusty McDonald** (BS Schreiner College). 2003. Effects of fluctuating temperatures on egg production of the endangered fountain darter. M.S. Thesis.
- Current position: Fisheries Biologist, Texas Parks and Wildlife Department, Perry R. Bass Marine Fisheries Research Station, Palacios

2. **Casey S. Williams** (BS Northwestern State University). 2003. Cyprinid assemblage structure along physical, longitudinal, and seasonal gradients and life history and reproductive ecology of the sabine shiner. M.S. Thesis.
- Current position: Assistant Professor, Valley City State University, North Dakota

1. **Chad Thomas** (BS Texas State University). 2001. Effects of smallmouth bass on habitat associations of selected preys species of the Devils River (TX). M.S. Thesis.
- Current position: Risk Management; Texas State University

In progress:
- Cody Craig (BS Texas Tech, MS Texas State U.) TBD
- Nicky Hahn (BS Louisiana Tech) TBD
- Dave Ruppel (BS Northern Michigan, MS Texas State U.) Validating instream flow recommendations
- Cory Scanes (BS Texas State University) Historical and contemporary community structure of Comal River fish community

HONORS/AWARDS/SERVICE (2002 – 2015):

Reviewer: Journal of Fish Biology, Comparative Parasitology, Aquatic Ecology, BioScience, Biological Invasions, Fisheries, Canadian Journal of Fisheries and Aquatic Sciences, Environmental Biology of Fishes, Fishery Bulletin, Southeastern Naturalist, North American Journal of Fisheries Management, Transactions of the American Fisheries Society, Ecology of Freshwater Fishes, American Midland Naturalist, Southwestern Naturalist, North American Journal of Aquaculture, Hydrobiologia, Copeia, Texas Journal of Science, Lakes and

Reservoirs, Desert Fishes Council Symposium, Southeastern Fish and Wildlife Agencies, Journal of the Arkansas Academy of Science, Great Plains Research

Favorite Professor. 2002, 2014, 2015 Texas State University. Alpha Chi National Honor Scholarship Society

Advisor: TxState Aquatic Biology Society (2006 – current)

Organizer and weighmaster: Port Mansfield Chamber of Commerce Fishing Tournament (2003 – current). Tournament to generate college scholarships for Port Mansfield and area students.

Advisor: TxState BassCats--Tournament Fishing club (2009 – 2012)

Inland Fisheries Advisory Board. Texas Parks and Wildlife (2009 – 2014)

Brazos River Bays Basin Expert Science Team (2011 – 2012)

Guadalupe River Bays Basin Expert Science Team (2010 – 2011)

Chair, Awards Committee, Southern Division of the American Fisheries Society (2008- 2013)

Editorial Committee. Southeastern Fish and Wildlife Agencies (2008)

President. Texas Chapter of the American Fisheries Society (2008)

Presidential Award for Scholarly Activity. Texas State University (2007)

Texas State University Foundations of Excellence Award (2006)

Board of Directors, San Marcos River Foundation (2004 - 2006)

Co-Chair, Program Committee. 2006 Southern Division of the American Fisheries Society meeting

Editorial Committee Chair. Texas Chapter of the American Fisheries Society (2002 – 2005)

Outstanding Fisheries Worker of 2004 in Education. Texas Chapter of the American Fisheries Society

Jacquelyn R. Duke
Curriculum Vitae

Personal

Address:	Biology Department Baylor University One Bear Place #97388 Waco, TX 76798
Phone:	(254) 710-2215
E-mail:	Jacquelyn_Duke@baylor.edu
Fax:	(254) 710-2215
Website:	http://www.baylor.edu/biology/

Research/Teaching Interests

Research: I am deeply interested in human impacts on global processes, and my research has always involved water because of its importance to maintaining life. My research focus is the riparian zone and its relationship with stream and hyporheic flow through time. Using multidisciplinary methods including dendroecology, geographic information systems (GIS) spatial analysis, field research and ecosystems modeling I have investigated riparian zones in various ways. Previous/current work includes the response of downstream riparian ecosystems to flood control dam-induced hydrologic alteration, hyporheic formation in the riparian zone, riparian productivity within wetlands and along both perennial and intermittent streams.

Teaching: My desire is to teach both students who have chosen science as their vocational field as well as those students who traditionally have had an aversion to the natural sciences. I feel that in addition to training future generations of scientists to contribute to the body of science, we also have a responsibility to educate future generations of our society who make choices that directly affect the scientific community. I have spent the past fourteen years helping students from elementary to college level develop a personal appreciation for and understanding of the natural sciences. My current focus has been in developing curricula in human-centered biology, hydrology and ecology.

Educational Experience

Ph.D. Biology, May 2006 Emphasis in Ecohydrology and Stream Ecology Baylor University. Waco, TX. GPA: 4.0
M.A. Biology, 2002 Baylor University. Waco, TX. GPA: 4.0
B.S. Biology, Chemistry Minor, Honors Program 1998 California State University Stanislaus (CSUS). Turlock, CA. Magna Cum Laude, GPA: 3.7

Professional Experience

- Contributing Researcher - Center for Reservoir and Aquatic Systems Research (CRASR) at Baylor University. 2006-Present.
- Senior Lecturer, Baylor University Biology Department Fall 2013 – Present. Teaching duties include:
  - BIO 1401-01 *Current Issues in Human Biology*; BIO 1401-H1 *Current Issues in Human Biology for Honors Students*; BIO 1403-01 *Exploring the Living World*; BIO1306 *Modern Concepts of Bioscience*; BIO3100 *Seminars in Biology*; BIO 3103 *Ecology; BIO3303 Ecology Lab;* Individual study hours in dendrochronology research, for juniors/seniors.
- Lecturer, Baylor University Biology Department. Fall 2006 – Summer 2013. Teaching duties included:
  - BIO 1401-01 *Current Issues in Human Biology*; BIO 1401-H1 *Current Issues in Human Biology for Honors Students*; BIO 1403-01 *Exploring the Living World*; BIO1306 *Modern Concepts of Bioscience*; BIO3100 *Seminars in Biology*; FAS1407 *Society and Ecology*; BIC 2437/2447 *Natural World I and II;* BIO 3103 *Ecology; BIO 3303 Ecology Lab;* Individual study hours in dendrochronology research, for juniors/seniors.
- Faculty Curriculum Developer, Marsh Madness Program, a part of the Gear-Up Grant. Created a year-long student activity for the Waco Wetlands. Presented to Waco ISD teachers, and assisted in the training of teachers, staff and volunteers. Summer 2007
- Adjunct Lecturer in BIO 1401 "General Biology", Baylor Univ. Biology Department. Fall 2005-Spring 2006. Course used in Baylor SACS accreditation analysis/development. Spring 2006.
- Adjunct Lecturer in GEO 4387 "Intro to GIS", Baylor Univ. Geology Department. Fall 2006
- Adjunct Lecturer in BIC 2437 "Natural World" series, Baylor Univ. Honors College- BIC Program. Fall 2006-Spring 2007
- Research Assistant in Spatial Ecology Lab, Baylor Univ. Summer 2005
- Graduate Teaching Assistant in BIO 1401 "General Biology" and BIO 1105 "Modern Concepts of Bioscience", Baylor Univ. Fall 2000-Spring 2006
- Graduate Student Association Biology Department Representative, Baylor Univ.. Assisted in obtaining insurance benefits for graduate TA's. 2001–2002
- Adjunct Laboratory Instructor of CHEM 1100 "Principles of Chemistry I", CSUS. Fall 1999
- Consultant for CSUS Chemistry Dept. Obtained $40,000 grant for HPLC equip. 1998-2000
- Student Assistant in CHEM 1100 and CHEM 1110 "Principles of Chemistry I and II", CSUS. 1996-1998
- "Fun with Science" Program Representative, Lawrence Livermore National Laboratory. Demonstrated the wonders of science to elementary and middle school students. 1993–1995
- Volunteer, Stanislaus County Environmental Resource Department. Location and removal of abandoned hazardous tanks. Summer 1995

Publications

Duke J.R. 2015. Chapter 6: Riparian Vegetation. In *Eds.* Hardy, T., N. Davis. Texas Riparian Areas. Texas A&M University Press, USA. 230 pp.

Bonner, T., **Duke, J.R.**, Guillen, G., Winemiller, K., Bio-West. 2015. Instream Flows Research and Validation Methodology Framework and Brazos Estuary Characterization. Brazos River and Associate Bay and Estuary System. Texas Water Development Board. 202 pgs. Sept. 24, 2015. DOI: http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1400011722%20BIO-WEST.pdf

Bonner, T., **Duke, J.R.**, Bio-West, San Antonio River Authority. 2015. Instream Flows Research and Validation Methodology Framework. Guadalupe, San Antonio, Mission, and Aransas Rivers and Mission, Copano, Aransas, and San Antonio Bays Basin. Texas Water Development Board. 187 pgs. Sept 24, 2015. DOI: https://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1400011709_instream.pdf

Duke J.R. and M.M. Davis. 2014. Chapter 11: Woody Riparian Vegetation. In *Eds.* Davis, M., S. Brewer (eds.). Gulf Coast Prairie Landscape Conservation Cooperative Regional Hypotheses of Ecological Responses to Flow Alteration. A product of the GCP LCC Flow-Ecology Hypotheses Committee, a part of the Southeastern Aquatic Resources Partnership (SARP) Instream Flow Project. Online: http://southeastaquatics.net/sarps-programs/sifn/instream-flow-resources/regional-flow-ecology-hypotheses/regional-flow-ecology-relationships

Wentzel, M., Hardy, T., Davis, N., Phillips, J., Jacob, J., **Duke, J.R.**, Nelle, S. 2013. Texas Riparian Areas. **TWDB** Contract #1004831142 http://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1004831142_TexasRiparianAreas.pdf

Duke, J.R. 2011. Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos, in Central/South Texas. Texas Water Development Board Report. 116 pp. http://www.twdb.state.tx.us/publications/reports/contracted_reports/doc/100011020_Riparian.pdf

Duke, J.R. 2010. *Hands-On Biology – Revised Edition* Laboratory manual for non-science-majors biology students. *Stipes Publishing*, Champaigne, IL. 149 pp.

Duke, J.R. 2008. *Hands-On Biology* Laboratory manual for non-science-majors biology students. *Stipes Publishing*, Champaigne, IL. 149 pp.

Duke, J.R., J.D. White, S. Prochnow, L. Zygo, P.M. Allen, R.S. Muttiah. 2007. The Use of Remote Sensing and Modeling to Detect Small Dam Influences on Land-cover Changes Along Downstream Riparian Zones. *International Journal of Ecohydrology and Hydrobiology* 7:281-293.

Duke, J.R., J.D. White, P.M. Allen, R.S. Muttiah. 2007. Riparian Influence on Hyporheic-zone Formation Downstream of a Small Dam in the Blackland Prairie Region of Texas. *Hydrological Processes* 21:141-150. DOI: 10.1002/hyp.6228.

van de Geve1, S., Finkelstein, S., Lenhartzen, V., Carr, D.W., Wienert, M., **Duke, J.R.**, Achterhof, D., Kasson, M.T., Bissey, L., Kelly, D., Maxwell, S. 2006. Field sampling and dendrochronological techniques in mixed conifer forests: A comparative study of Ponderosa State Park and French Creek Road, central Idaho. *15th Annual North American Dendroecological Fieldweek (NADEF) Final Report*. pp12-28.

Publications *Cont'd*

Duke, J.R., J.D. White, P.M. Allen, R.S. Muttiah. 2004. Riparian Influence of Hydrologic Fluxes Downstream of a Small-Scale Dam (Abstract). UCOWR/NIWR Conf Proceedings: *Allocating Water: Economics & Environment* Portland, OR, July 2004.

Muttiah, R.S., J.D. White, **J.R. Duke**, P.M. Allen. 2004. Estimation of Source Water to Cedar Elm in a Central Texas Riparian Ecosystem. *Hydrological Processes* 19: 475-491. DOI: 10.1002/hyp.5545.

Duke, J.R., J.D. White, P.M. Allen, R.S. Muttiah. 2002. Impacts of flood impoundments on water balances of downstream riparian corridors. *Ground Water/Surface Water Interactions. AWRA Conference Proceedings, Journal of the American Water Resources Association* TPS-02-2:417-422.

Duke, J.R., J.D. White, P.M. Allen. 2002. Rapid Risk Assessment of Watersheds and Dams Using GIS and Modeling. *Texas Water Resources Institute Technical Report* SR 2002-002:1-9.

Duke, J.R., H.G. Hamilton. 1998. Nitrate Ion Contamination in Central California Rural Well Water. (Abstract) 34th ACS Pacific Conference on Chemistry and Spectroscopy. *American Chemical Society*. 1998:33.

(In preparation for publication)

Duke, J. R. (in preparation). Ecological Investigations laboratory manual for non-science-majors ecology students.

Fellowships/ Awards/ Faculty Development

- Small World Initiative Pilot Program Co-Partner with Diane Hartman, Baylor University. In collaboration with Yale University (http://cst.yale.edu/swi) as part of the Small World Initiative Pilot Partners (SWIPPs) we developed a pilot, inquiry-based research agenda for motivated freshman and sophomore students in a search for antibiotic-producing soil bacteria. Spring 2014.
- Nominated as riparian specialist to Scientific Committee of the Edwards Aquifer Habitat Conservation Plan (EAHCP) in San Marcos, TX. Selected 8/12.
- Nominated as the riparian representative to the Scientific Committee of the Southeast Aquatic Resource Partnership (SARP) Gulf Coast Prairie Landscape Conservation Cooperative Grant, covering instream flow science across Oklahoma, Texas and Louisiana. Selected 9/12.
- Named a National Academies Education Fellow in the Life Sciences, via attendance and completion of HHMI Mountain West Summer Institute: a weeklong faculty development teaching workshop. Boulder, CO. July 30-Aug 4, 2012.
- Nominated by Basin and Bay Area Stakeholder Committee members to the Brazos River basin and Bay Area Expert Science Team (BBEST). Spring 2011.
- Hosted visiting scholar, Dr. Hanbo Zhang, Chair, Department of Biology, Yunnan University, Kunming, China. Dr. Zhang sat through my courses and I worked with him on developing interactive techniques I use in courses to incorporate into his own teaching. Spring 2011.
- Participant in "New Media as a Platform for Integrative Learning" Spring Seminar in the Academy for Teaching Learning (ATL), Baylor University. The semester-long seminar studied a new approach to faculty development centered on a shared exploration of the interdisciplinary intellectual history of the networked information age. Spring 2010.

Fellowships/ Awards/ Faculty Development *Cont'd*

- Gave a podcast interview highlighting faculty opportunities through Teacher Development Grants. Interview featured in ATL's "Learning @ Baylor" series that aims to increase awareness of faculty development activities. Fall 2009.
- Summer Faculty Institute Participant. Summer 2008.
- Teaching Commons Reading Group. Co-leader with Chris Hansen/Digital and Film Media. Fall 2007.
- Teaching/Research Fellowship with stipend and tuition remission, Baylor University. Recipient six years: 2000-2006
- One of 14 academic researchers nation-wide invited to AWRA National Water Policy Dialogue, Washington, DC. Fall 2002
- Jack & Norma Jean Folmar Research Award, Baylor Univ. Recipient three yrs: 2003 – 2005
- Rogers Scholar, Honors Program's highest achievement award with tuition/book/living expenses award, CSUS, Turlock, CA. Recipient two years: 1996-1998
- Winner, CSUS Campus-wide Student Scholars Day Competition, Turlock, CA. Spring 1998
- Recipient of Scholarship for Students Researching Environmental Issues, Calaveras Big Trees Association, Arnold, CA. Spring 1996

Research Projects with Students

Dendrochronology research with Biology Student Victoria Rose – Honors Thesis Oversight. Fall 2015 – Present.

12 various-majors undergraduate students - Biology. "Small World Initiative: Crowdsourcing the Discovery of Antibiotics" Fall 2015.

Honors Thesis Committee Member for project: "Avicenna's Canon of Medicine: Influences and Implications" by Tyler Heldreth, Biology Major. Fall 2014.

12 various-majors undergraduate students - Biology. "Small World Initiative: Crowdsourcing the Discovery of Antibiotics" Fall 2014.

15 various-majors undergraduate students - Biology. "Small World Initiative: Crowdsourcing the Discovery of Antibiotics" Spring 2014.

Brittany Weldon – BS Biochemistry. "Scientific Teaching in the Biological Sciences." Fall 2012.

Stephanie Wong – MS Geology. (2012) – "Using geospatial analysis to quantify a dynamic, heterogeneous alluvial aquifer" Committee member and co-researcher Fall 2009– 2012.

Claire Gubernator – BS Biology. "Chronological History of a Baylor Campus *Carya Illinoinensis*". Spring 2012.

Hallie Raymond – BA University Scholars (2015) - "Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos". Research Advisor Fall 2010-Spring 2011.

Sarah Stoner – BA Social Work (2013) - "Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos". Research Advisor Fall 2010-Spring 2011.

Emily Fong – BS Biology (2010) - "Riparian Tree Growth Responses to River Flow Along the North Bosque River Upstream of Lake Waco". Research Advisor Fall 2008–Spring 2010.

Research Projects with Students *Cont'd*

Kody Hernandez– BS Biology (2010) - "Riparian Tree Growth Responses to River Flow Along the North Bosque River Upstream of Lake Waco". Research Advisor Fall 2008–Spring 2010.

Flavio Salinas – BS Biology (2010) - "Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos". Research Advisor Summer 2011.

Cynthia Woods– BS Biology (2010) - "Riparian Tree Growth Responses to River Flow Along the North Bosque River Upstream of Lake Waco". Research Advisor Fall 2008-Spring 2009.

Grants/Contracts

- Consultant Subcontractor with Bio-West on Texas Water Development Board Grant **($23,450)**. Project: Instream Flows Research and Validation Methodology Framework and Brazos Estuary Characterization. Brazos River and Associate Bay and Estuary System. Contract #1400011772. Status: Awarded 7/2014, Completed 10/2015.
- Consultant Subcontractor with Bio-West on Texas Water Development Board Grant **($23,450)**. Project: Instream Flows Research and Validation Methodology Framework for Guadalupe, San Antonio, Mission, and Aransas Rivers and Mission, Copano, Aransas, and San Antonio Bays Basin. Contract #1400011709. Status: Awarded 7/2014, Completed 10/2015.
- University Research Committee (URC) Grant **($4,500**). Funding of project: "Small World Initiative: Crowdsourcing the Discovery of Antibiotics" Baylor University, Dec 2013-May 2014. Status: Completed.
- Texas State University **($8,500**). Project: Co-author of book, *Texas Riparians*. Approved/Awarded May 2011. Status: completed 3/13. Book in publication – May 2014.
- Texas Water Development Board (**$13,000**). Project: Extension of Contract #1000011020, "Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos, in Central/South Texas". Approved November 2009; Awarded April 2011. Status: completed 9/11.
- Texas Water Development Board (**$70,000**). Project: Contract #1000011020, "Riparian Productivity in Relation to Stream Dynamics Along Two Rivers: San Antonio and Brazos, in Central/South Texas". Approved November 2009; Awarded March 2010. Status: completed 3/11.
- University Research Committee (URC) Grant **($4,500**). Funding of project: "Riparian Forest Basal (Tree Diameter) Growth Response to River Flow Along an Impounded River in Central Texas". Baylor University, June 2009-May 2010. Status: completed 5/10.
- Teaching Development Grant **($1,500**). Grant funded attendance to *Engaging Science, Advancing Learning: General Education, Majors, and the New Global Century* conference in Providence, RI. Baylor University, Fall 2008.

Presentations/Professional Meetings

"Instream Flows Research and Validation Methodology Framework and Brazos Estuary Characterization. Brazos River and Associate Bay and Estuary System" J. Duke, E. Oborny, T. Bonner, K. Winemiller. Brazos River Authority BBASC Meeting. October 1, 2015.

"Instream Flows Research and Validation Methodology Framework for the Guadalupe, San Antonio, Mission, and Aransas Rivers and Mission, Copano, Aransas, and San Antonio Bays Basin" J. Duke, E. Oborny, T. Bonner. GSA BBASC Meeting. September 30, 2015.

"A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." Summer Faculty Institute. Jun 1, 2015.

"The Road to Discovering New Antibiotics" D. Natividad, K. Curtis, Z. Afsarm, Faculty Mentors: D. Hartman and J. Duke *URSA Scholars Week* Poster Presentation. Baylor University. March 30-April 2, 2015.

"The Antibiotic Potential of Soil Microbes" A. Hargett-Granato, Z. Lakhani, A, Shankar. Faculty Mentors: D. Hartman and J. Duke *URSA Scholars Week* Poster Presentation. Baylor University. March 30-April 2, 2015.

"Search for Antibiotics in Cave Microbes" A. Kubena, A. MacDonald, P. Sairam, Faculty Mentors: D. Hartman and J. Duke *URSA Scholars Week* Poster Presentation. Baylor University. March 30-April 2, 2015.

"A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." Summer Faculty Institute. June, 2014.

"Riparian Restoration in Growing Municipalities" Workshop Facilitator as a TRA representative. A Workshop within the *Southwest Stream Restoration Conference*. San Antonio, TX. May 2014.

"Escaping the ESKAPE" Poster Presentation. E. Andersen; Faculty Mentors: J. Duke and D. Hartman. Poster Presentation. *American Society for Microbiology Annual Meeting*, Boston, MA. May 18-20, 2014.

"Investigating Soil Microbes for Antibiotics" Poster Presentation. S. Garcia; Faculty Mentors: J. Duke and D. Hartman. *Spring Meeting of the Texas Branch of the American Society for Micobiology*. New Braunfels, TX. April 3-5, 2014.

"Escaping the ESKAPE" Poster Presentation. S. Sanghera, B. Patel, E. Andersen; Faculty Mentors: J. Duke and D. Hartman. *Spring Meeting of the Texas Branch of the American Society for Micobiology*. New Braunfels, TX. April 3-5, 2014

"The Unearthing of New Antibiotics Produced by Soil Microbes" S. Armstrong, S. Marshall, S. Zar; Faculty Mentors: J. Duke and D. Hartman. *URSA Scholars Week* Poster Presentation. Baylor University. March 31-April 4, 2014.

"Escaping the ESKAPE" S. Sanghera, B. Patel, E. Andersen; Faculty Mentors: J. Duke and D. Hartman. *URSA Scholars Week* Poster Presentation. Baylor University. March 31-April 4, 2014.

"Investigating Soil Microbes for Antibiotics" S. Garcia, M. Jacobs, T. Pham, A. Staples; Faculty Mentors: J. Duke and D. Hartman. *URSA Scholars Week* Poster Presentation. Baylor University. March 31-April 4, 2014.

"Road to Discovering New Antibiotics" O. Pandya, J. McNicoll, P. Pungwe; Faculty Mentors: J. Duke and D. Hartman. *URSA Scholars Week P*oster Presentation. Baylor University. March 31-April 4, 2014.

Presentations/Professional Meetings *Cont'd*

"A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." Summer Faculty Institute. June, 2013.

"Outside the Zone: Why We Are All Advocates of Ecology" Invited Plenary Speaker at TXSER/TRA Joint Annual Meeting. Junction, TX. November 2013.

"Actively Engaging Students in Learning Science" A workshop within Baylor's *Seminars for Excellence in Teaching SET* Series for graduate students and faculty development. Sept. 2012

"Riparian Wetlands" *World Wetlands Day Conference*. City of Waco and Baylor University. February 11, 2011.

"Riparian Tree Growth Responses to River Flow Along the North Bosque River Upstream of Lake Waco" *URSA Scholars Week.* Co-authored with E. Fong and K. Hernandez. Baylor University. March 22-26, 2010.

"Using $\square O^{18}$ Stable Isotopes to Model Riparian Zone Source Water in Altered Stream Systems" *Annual Central Texas Ecological and Earth Science Meeting.* Co-authored with J. White. Austin, TX, November 2008.

"The Use of SWAT Modeling to Detect Small-Dam Influences on Hydrological Modifications in Downstream Reaches" AWRA 2008 Spring Specialty Conf: GIS & Water Resources V. San Mateo, CA, March 2008.

"Using remote sensing and modeling to detect small dam influences on land-use changes in downstream riparian zones" *90th Annual Ecological Society of America (ESA) Meeting*. Memphis, TN, August 2006.

"Field Sampling and Dendro-chronological Techniques in Mixed Conifer Forests: A Comparative Study of Ponderosa State Park and French Creek Road, Central Idaho" *15th Annual North American Dendroecological Fieldweek (NADEF).* McCall, ID, June 2005

"Remote Sensing of Compositional and Structural Changes in an the Riparian Zone of an Impounded Stream Network" TRRMS Conference: *Research on Texas Rivers and Reservoirs* Waco, TX, May 2005

"Riparian Influence of Hydrologic Fluctuations Downstream of a Small-Scale Dam" UCOWR/NIWR Conf *Allocating Water: Econ and Environment* Portland, OR, July 2004

"Riparian Response to Hydrologic Flux in the Downstream Reach of an Impounded 2nd Order Stream" Texas Academy of Science *2004 Annual Meeting* Kerrville, TX, March 2004

Participant in AWRA National Water Policy Dialogue, 2002 (by invitation only). Co-contributor of report to President Bush and Congressional Members on water resource crises. Washington, DC Spring 2003

"PL-566 Riparian Zone Water Dynamics from Hydrometric and Isotopic Measurements" *Integrated Biological System Conference* San Antonio, TX, April 2003

"Impacts of Flood Impoundments on Water Balances of Downstream Riparian Corridors" American Water Resources Association Conference *Ground Water/Surface Water Interactions* Keystone, CO, July 2002

"Nitrate Ion Contamination in Central California Rural Well Water" *34th Annual Western Regional American Chemical Society (ACS)* San Francisco, CA, October 1998

"Nitrate and Pesticide Contamination in California Central Valley Drinking Water" *CSUS Student Scholars Day Competition (1st Place).* Turlock, CA March 1998

Professional Memberships and Service

2013-Present	Science Committee Member (via nomination and selection) to the Edwards Aquifer Habitat Conservation Plan (EAHCP) in San Marcos, TX.
2013-Present	At Large Board of Directors Member (via nomination and election) – Texas Riparian Association (TRA).
2015-Present	Member of Women in Science and Stem (WISE) Baylor Group.
2014	Peer reviewer (Editor's Selection) for Manuscript ID ECO-14-0092 entitled "Linking riparian woody communities and fluviomorphological characteristics in a regulated gravel-bed river (Piave River - Northern Italy)." *Ecohydrology*.
2013-Present	Member – Texas Society for Ecological Restoration (TXSER).
2006-Present	Chapter reviewer for numerous biology textbooks.
2013-2014	Scientific Committee Member (via nomination and selection) to the Southeast Aquatic Resource Partnership (SARP) Gulf Coast Prairie Landscape Conservation Cooperative Grant, covering instream flow science across Oklahoma, Texas and Louisiana.
2012-Present	Honorary Member of French Champ d;Asile Archeological Group; scientific consultant and researcher of excavated Trinity River artifacts. Liberty, TX.

Service within the Baylor Community

2009-Present	Member, Biology Undergraduate Committee. Biology Dept., Baylor Univ.
2010-Present	Member, Curriculum Action Committee. Baylor University.
2016	Committee Member to Advancing Liberal Education Outcomes in Core Colloquia. Headed by Associate Deans Burleson and Nordt.
Summer 2015	Summer Faculty Institute Presentation and Dialogue with attendendees on "A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." Jun 1, 2015.
2015-2016	Faculty Mentor to a peer (T. Brown) in Environmental Studies, per the Chair's request.
2015	Committee Member to Advancing Liberal Education Outcomes in Core Colloquia. Headed by Associate Deans Burleson and Nordt.
Fall 2015	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Enhancing the Teaching Role at Baylor"
Spring 2015	Presented/Led discussion of *The Lecturer Notebook,* as part of the Lecturer Mentoring Program. March 2014.
Fall 2015	Presented/Led discussion of *The Lecturer Notebook,* as part of the Lecturer Mentoring Program. September 2015.
Fall 2015	Invitation to Excellence Dinner – Biology Faculty Representative.
2015	Creation of Vision Documents for Core Courses in Biology.
2014	Summer Faculty Institute Presentation and Dialogue with attendees on "A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." June, 2014.
Fall 2014	Committee Member to Advancing Liberal Education Outcomes in Core Colloquia. Headed by Associate Deans Burleson and Nordt.
Fall 2014	Invitation to Excellence Dinner – Biology Faculty Representative.
Fall 2014	Fall Davidson Award Bio Rep, meeting with parents and clean up crew.
Fall 2014	Presented/Led discussion of *The Lecturer Notebook,* as part of the Lecturer Mentoring Program. September 2014.

Service within the Baylor Community *Cont'd*

Fall 2014	Guest Presenter at the BURST Brown Bag Lunch. Speaking to students about research opportunities. October 2014.
Fall 2014	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Enhancing the Teaching Role at Baylor"
Spring 2014	Presented/Led discussion of *The Lecturer Notebook*, as part of the Lecturer Mentoring Program. March 2014.
Spring 2014	Member, BU Outstanding GTA Selection Committee; College of Arts and Sciences.
Fall 2013	Invitation to Excellence dinner – Biology Faculty Representative.
Fall 2013	*Invitation to Excellence* Faculty Facilitator for All-day Saturday science activity.
2015	Summer Faculty Institute Presentation and Dialogue with attendendees on "A Reminder of 'Coinherence': An Examination of Researching and Publishing (and getting grants) while Teaching a Lecturer's Load." June, 2015.
Fall 2013	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Enhancing the Teaching Role at Baylor"
Fall 2013	Led discussion of *The Lecturer Notebook*, as part of the Lecturer Mentoring Program. October 2013.
Spring 2013	Presented/Led discussion of *The Lecturer Notebook*, as part of the Lecturer Mentoring Program. March 2013.
Spring 2013	Faculty Panelist for a discussion on what it means to be a faculty member in Dr. Laine Scales' *Teaching and Learning in Higher Education* graduate course. April 2013.
Fall 2012	*Invitation to Excellence* Faculty Facilitator for All-day Saturday science activity.
Fall 2012	Committee Member, BU Graduate School PReparing Our Future Faculty (PROFF) Mock Interview session. Conducting mock interviews and providing feedback. Nov. 13, 2012.
Fall 2012	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Enhancing the Teaching Role at Baylor"
2011-2013	Member, Cornelia Marschall Smith Award Selection Committee
2012-2015	Faculty Sponsor for *Breathe Hope* a cystic-fibrosis awareness organization at Baylor University.
2007-2015	Faculty Sponsor for *Students for Organ Donation* at Baylor University.
2012-2015	Faculty Partner, Baylor University North Russell Dorm, mentoring ~50 students in the upper-level-students' living facilities. Various activities throughout the semester.
2011-2012	Faculty Partner, Baylor University Dawson Dorm, mentoring ~50 students in the upper-level-students' living facilities. Various activities throughout the semester.
Spring 2012	Invitation to Excellence dinner – Biology/Honors Representative. January 2012.
2009-2011	Faculty Partner, Baylor University Brooks Flats Dorm, mentoring ~50 students in the upper-level-students' living facilities.
Fall 2011	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Research Opportunities for Lecturers"

Service within the Baylor Community *Cont'd*

Fall 2011	Invited Presenter to incoming graduate students, speaking on "Graduate Students in the Sciences". Fall Graduate Student Orientation. Breakout session co-led with Kenneth Wilkins. Baylor University, August 2010.
Spring 2011	Host to visiting scholar, Dr. Hanbo Zhang, Chair, Department of Biology, Yunnan University, Kunming, China. Dr. Zhang sat through my courses and I worked with him on developing interactive techniques I use in courses to incorporate into his own teaching.
Spring 2011	Invited Presenter, 1st Annual Faculty Variety Show. Sponsored by Students Against Slave Trading – Baylor University. Common Grounds Coffee House, Waco, TX. April 2011.
Fall 2010	Invited Presenter to incoming graduate students, speaking on "Graduate Students in the Sciences". Fall Graduate Student Orientation. Breakout session co-led with Kenneth Wilkins. Baylor University, August 2010.
Fall 2009	Invited Presenter to incoming faculty lecturers at the Fall Faculty Orientation, speaking on "Research Opportunities for Lecturers"
Fall 2009	Invited Presenter to incoming graduate students, speaking on "Graduate Students in the Sciences". Fall Graduate Student Orientation. Breakout session co-led with Kenneth Wilkins. Baylor University, August 2009.
2006-2008	Faculty Partner, Baylor University Collins Dorm, mentoring ~50 students in the female dorm.
2007-2009	Member, Biology Safety Committee. Biology Dept. Baylor Univ.
Fall 07, 08	Invited Presenter to incoming Graduate Teaching Assistants at the Fall Graduate Student Orientation, speaking on "How to Be an Effective GTA"
Fall 08, 09	Baylor Greeter, for incoming freshmen.
Sp & Fall 08	Invited Presenter, *Seminars for Excellence in Teaching* Workshop "Teaching in the Sciences" for Baylor faculty and graduate teaching assistants.
Spring 2008	Host, Payap University's Vice President for Academic Affairs, Dr. Sompan Wongdee from Thailand for in-classroom visits and out-of-classroom discussions on effective teaching methods in science courses.
Spring 2008	Ad-Hoc Committee Member, C.111 lab design and implementation
Spring 2008	Ad-Hoc Committee Member, interviewing for the Director of the newly-formed Academy for Teaching and Learning (ATL) at Baylor University.
2006-2007	Participant, newly-formed Baylor Teaching Commons small group community - for Baylor teachers interested in sharing effective teaching ideas.
Summer 2006	Assistant, SACS Accreditation Committee in developing science curriculum standards and criteria for student success.
Fall 2003	Co-Organizer, Operation Christmas Child Shoebox Ministry as a Baylor University Biology Department Service Activity. Collected and shipped 112 gift boxes to children around the world.
2001-2002	Representative, Graduate Student Association Biology Department. Assisted in obtaining insurance benefits for graduate TA's.

Community Service Outside of Baylor

Fall 2015	Training Session on Forest Ecology for the Master Naturalist Program – Waco Branch. Co-led with Joseph White. September 2015.
2008-Present	Member, Science Fair Committee. Live Oak Classical School. Waco, Tx.
2012-Present	Family S.E.R.V.E. volunteer. Serve with Waco Community Development, cleaning and beautifying neighborhoods in downtown Waco.
2009-Present	Volunteer, Acorn Society – concessions stands, etc. volunteering with Live Oak Classical School in Waco, TX.
2010-Present	Leader, Adult Couples Lifegroup. Co-leader with spouse, David Achterhof. Greeter. Greeter - welcome visitors and direct families. Harris Creek Baptist Church. McGregor, TX.
Fall 2012	Volunteer, Mission Waco. Mission Waco Toy Store. Mission Waco, TX.
Spring 2011	Member, Community Pastor Search Committee. Harris Creek Baptist Church, McGregor, TX.
Fall 2011	Invited Speaker, Live Oak Classical School Parent Education Night. Speaking on teaching excellence and the harmonization of science and religion in a Christian School.
Fall 2011	Volunteer, Church Under the Bridge Christmas Service. Mission Waco, TX.
Fall 2011	Volunteer, Mission Waco Toy Store. Mission Waco, TX.
2008-2009	Judge, Central Texas Science & Engineering Fair (CTSEF) Regional Science Fair, Waco, TX.
2009-2010	Leader, 5th and 6th Grade "Club 56". Harris Creek Baptist Church, McGregor, TX.
2008-2011	Texas Master Naturalist. Working as a volunteer for community education of nature and natural areas.
2006-2010	Coach, girls' volleyball leagues, Woodway Family Center, Woodway, TX
2006-2010	Coach, girls' basketball leagues, Woodway Family Center, Woodway, TX
Fall 2009	Volunteer, Mission Waco Toy Store. Mission Waco, TX.
2008-2010	Judge, Science Fair, Midway Middle School and Live Oak Classical School.
2008-2009	Band Backers Member, Volunteer work at concessions, etc. Chaperoning high school band members at home and away games. Midway High School, Waco, TX.
2004-2008	Member, Saturday Night Ministry Team, Highland Baptist Church, Waco, TX.
2003-2007	Group Leader, Kindergarten through 2nd Grade AWANA children's program, Highland Baptist Church, Waco, TX.
2003-2006	Volunteer, Mexico home-building missions. Construction of five family homes, and ministering to the needs of an impoverished community. Ciudad Acuna, Mexico
2006-2007	Member, Midway I.S.D. Title I Program Parent Involvement Committee. Assisted the district in making decisions on how Title I federal funding is allocated to ensure maximum student success in education. Waco, TX.
Recurring	Judge, Science Fair: Judging local school science fair competitions, and mentoring junior scientists. Tutor: college and high school science students.

CONTENT ITEM 4
HISTORICALLY UNDERUTILIZED BUSINESSES SUBCONTRACTING PLAN

Please see SECTION IV, GENERAL INFORMATION, 4.1.B, Item 4

All HUB Subcontracting Plan Forms must be completed and submitted with the Response.

The forms are entitled and can be found at:
http://comptroller.texas.gov/procurement/prog/hub/hub-subcontracting-plan/

HUB Subcontracting Plan Form
HUB Subcontracting Plan Form, SECTION 2 continuation sheet
HUB Subcontracting Plan Good Faith Effort - Method A (Attachment A)
HUB Subcontracting Plan Good Faith Effort - Method B (Attachment B)
HUB Subcontracting Opportunity Notification Form

HUB Subcontracting Plan (HSP)

In accordance with Texas Gov't Code §2161.252, the contracting agency has determined that subcontracting opportunities are probable under this contract. Therefore, all respondents, including State of Texas certified Historically Underutilized Businesses (HUBs) must complete and submit this State of Texas HUB Subcontracting Plan (HSP) with their response to the bid requisition (solicitation).

NOTE: Responses that do not include a completed HSP shall be rejected pursuant to Texas Gov't Code §2161.252(b).

The HUB Program promotes equal business opportunities for economically disadvantaged persons to contract with the State of Texas in accordance with the goals specified in the 2009 State of Texas Disparity Study. The statewide HUB goals defined in 34 Texas Administrative Code (TAC) §20.13 are:

- ***11.2 percent for heavy construction other than building contracts,***
- ***21.1 percent for all building construction, including general contractors and operative builders' contracts,***
- ***32.9 percent for all special trade construction contracts,***
- ***23.7 percent for professional services contracts,***
- ***26.0 percent for all other services contracts, and***
- ***21.1 percent for commodities contracts.***

- - Agency Special Instructions/Additional Requirements - -

*In accordance with 34 TAC §20.14(d)(1)(D)(iii), a respondent (prime contractor) may demonstrate good faith effort to utilize Texas certified HUBs for its subcontracting opportunities if the total value of the respondent's subcontracts with Texas certified HUBs meets or exceeds the statewide HUB goal or the agency specific HUB goal, whichever is higher. When a respondent uses this method to demonstrate good faith effort, the respondent must identify the HUBs with which it will subcontract. If using existing contracts with Texas certified HUBs to satisfy this requirement, only the aggregate percentage of the contracts expected to be subcontracted to HUBs with which the respondent **does not** have a **continuous contract*** in place for **more than five (5) years** shall qualify for meeting the HUB goal. This limitation is designed to encourage vendor rotation as recommended by the 2009 Texas Disparity Study.*

SECTION-1 RESPONDENT AND REQUISITION INFORMATION

a. Respondent (Company) Name: BIO-WEST, Inc. State of Texas VID #: 1-87-03193070

Point of Contact: Edmund L. Oborny, Jr. Phone #: 512-990-3954

E-mail Address: eoborny@bio-west.com Fax #: 512-990-5153

b. Is your company a State of Texas certified HUB? ☐ - Yes ☑ - No

c. Requisition #: 580-16-RFQ0022 Bid Open Date: 03/23/2016 (mm/dd/yyyy)

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

SECTION 2: RESPONDENT'S SUBCONTRACTING INTENTIONS

After dividing the contract work into reasonable lots or portions to the extent consistent with prudent industry practices, and taking into consideration the scope of work to be performed under the proposed contract, including all potential subcontracting opportunities, the respondent must determine what portions of work, **including contracted staffing, goods, services, transportation and delivery will be subcontracted.** Note: In accordance with 34 TAC §20.11, a "Subcontractor" means a person who contracts with a prime contractor to work, to supply commodities, or to contribute toward completing work for a governmental entity.

a. Check the appropriate box (Yes or No) that identifies your subcontracting intentions:

☑ - ***Yes***, I will be subcontracting portions of the contract. (If ***Yes***, complete Item b of this SECTION and continue to Item c of this SECTION.)

☐ - ***No***, I will not be subcontracting any portion of the contract, and I will be fulfilling the entire contract with my own resources, including employees, goods, services, transportation and delivery. (If ***No***, continue to SECTION 3 and SECTION 4.)

b. List all the portions of work (subcontracting opportunities) you will subcontract. Also, based on the total value of the contract, identify the percentages of the contract you expect to award to Texas certified HUBs, and the percentage of the contract you expect to award to vendors that are not a Texas certified HUB (i.e., Non-HUB).

Item #	Subcontracting Opportunity Description	HUBs		Non-HUBs
		Percentage of the contract expected to be subcontracted to HUBs with which you do not have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to HUBs with which you have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to non-HUBs.
1	Validate Environmental Flow Standards	%	%	22%
2		%	%	%
3		%	%	%
4		%	%	%
5		%	%	%
6		%	%	%
7		%	%	%
8		%	%	%
9		%	%	%
10		%	%	%
11		%	%	%
12		%	%	%
13		%	%	%
14		%	%	%
15		%	%	%
	Aggregate percentages of the contract expected to be subcontracted:	%	%	22%

(Note: If you have more than fifteen subcontracting opportunities, a continuation sheet is available online at http://window.state.tx.us/procurement/prog/hub/hub-subcontracting-plan/).

c. Check the appropriate box (Yes or No) that indicates whether you will be using **only** Texas certified HUBs to perform **all** of the subcontracting opportunities you listed in SECTION 2, Item b.

☐ - ***Yes*** (If ***Yes***, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed.)

☑ - ***No*** (If ***No***, continue to Item d, of this SECTION.)

d. Check the appropriate box (Yes or No) that indicates whether the aggregate expected percentage of the contract you will subcontract **with Texas certified HUBs** with which you **do not** have a **continuous contract*** in place with for **more than five (5) years**, **meets or exceeds** the HUB goal the contracting agency identified on page 1 in the "**Agency Special Instructions/Additional Requirements.**"

☐ - ***Yes*** (If ***Yes***, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed.)

☑ - ***No*** (If ***No***, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method B (Attachment B)" for **each** of the subcontracting opportunities you listed.)

***Continuous Contract**: Any existing written agreement (including any renewals that are exercised) between a prime contractor and a HUB vendor, where the HUB vendor provides the prime contractor with goods or service, to include transportation and delivery under the same contract for a specified period of time. The frequency the HUB vendor is utilized or paid during the term of the contract is not relevant to whether the contract is considered continuous. Two or more contracts that run concurrently or overlap one another for different periods of time are considered by CPA to be individual contracts rather than renewals or extensions to the original contract. In such situations the prime contractor and HUB vendor are entering (have entered) into "new" contracts.*

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

SECTION-2 RESPONDENT's SUBCONTRACTING INTENTIONS (CONTINUATION SHEET)

This page can be used as a continuation sheet to the HSP Form's page 2, Section 2, Item b. Continue listing the portions of work (subcontracting opportunities) you will subcontract. Also, based on the total value of the contract, identify the percentages of the contract you expect to award to Texas certified HUBs, and the percentage of the contract you expect to award to vendors that are not a Texas certified HUB (i.e., Non-HUB).

Item #	Subcontracting Opportunity Description	HUBs		Non-HUBs
		Percentage of the contract expected to be subcontracted to HUBs with which you do not have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to HUBs with which you have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to non-HUBs.
16		%	%	%
17		%	%	%
18		%	%	%
19		%	%	%
20		%	%	%
21		%	%	%
22		%	%	%
23		%	%	%
24		%	%	%
25		%	%	%
26		%	%	%
27		%	%	%
28		%	%	%
29		%	%	%
30		%	%	%
31		%	%	%
32		%	%	%
33		%	%	%
34		%	%	%
35		%	%	%
36		%	%	%
37		%	%	%
38		%	%	%
39		%	%	%
40		%	%	%
41		%	%	%
42		%	%	%
43		%	%	%
Aggregate percentages of the contract expected to be subcontracted:		%	%	%

Continuous Contract: Any existing written agreement (including any renewals that are exercised) between a prime contractor and a HUB vendor, where the HUB vendor provides the prime contractor with goods or service, to include transportation and delivery under the same contract for a specified period of time. The frequency the HUB vendor is utilized or paid during the term of the contract is not relevant to whether the contract is considered continuous. Two or more contracts that run concurrently or overlap one another for different periods of time are considered by CPA to be individual contracts rather than renewals or extensions to the original contract. In such situations the prime contractor and HUB vendor are entering (have entered) into "new" contracts.

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

SECTION-3 SELF PERFORMING JUSTIFICATION (If you responded "No" to SECTION 2, Item a, you must complete this SECTION and continue to SECTION 4.)

If you responded "No" to SECTION 2, Item a, in the space provided below **explain how** your company will perform the entire contract with its own employees, supplies, materials and/or equipment, to include transportation and delivery.

SECTION-4: AFFIRMATION

As evidenced by my signature below, I affirm that I am an authorized representative of the respondent listed in SECTION 1, and that the information and supporting documentation submitted with the HSP is true and correct. Respondent understands and agrees that, if awarded any portion of the requisition:

- The respondent will provide notice as soon as practical to all the subcontractors (HUBs and Non-HUBs) of their selection as a subcontractor for the awarded contract. The notice must specify at a minimum the contracting agency's name and its point of contact for the contract, the contract award number, the subcontracting opportunity they (the subcontractor) will perform, the approximate dollar value of the subcontracting opportunity and the expected percentage of the total contract that the subcontracting opportunity represents. A copy of the notice required by this section must also be provided to the contracting agency's point of contact for the contract no later than ten (10) working days after the contract is awarded.
- The respondent must submit monthly compliance reports (Prime Contractor Progress Assessment Report – PAR) to the contracting agency, verifying its compliance with the HSP, including the use of and expenditures made to its subcontractors (HUBs and Non-HUBs). (The PAR is available at http://www.window.state.tx.us/procurement/prog/hub/hub-forms/progressassessmentrpt.xls).
- The respondent must seek approval from the contracting agency prior to making any modifications to its HSP, including the hiring of additional or different subcontractors and the termination of a subcontractor the respondent identified in its HSP. If the HSP is modified without the contracting agency's prior approval, respondent may be subject to any and all enforcement remedies available under the contract or otherwise available by law, up to and including debarment from all state contracting.
- The respondent must, upon request, allow the contracting agency to perform on-site reviews of the company's headquarters and/or work-site where services are being performed and must provide documentation regarding staffing and other resources.

Signature	Printed Name	Title	Date (mm/dd/yyyy)
	Edmond L. Oborny Jr	Principal	4-6-2016

Reminder:

- If you responded "**Yes**" to **SECTION 2, Items c or d**, you must complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed in SECTION 2, Item b.
- If you responded "**No**" **SECTION 2, Items c and d,** you must complete an "HSP Good Faith Effort - Method B (Attachment B)" for **each** of the subcontracting opportunities you listed in SECTION 2, Item b.

HSP Good Faith Effort - Method A (Attachment A)

Rev. 09/15

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

IMPORTANT: If you responded "*Yes*" to **SECTION 2, Items c** or **d** of the completed HSP form, you must submit a completed "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed in **SECTION 2, Item b** of the completed HSP form. You may photo-copy this page or download the form at http://window.state.tx.us/procurement/prog/hub/hub-forms/hub-sbcont-plan-gfe-achm-a.pdf

SECTION A-1: SUBCONTRACTING OPPORTUNITY

Enter the item number and description of the subcontracting opportunity you listed in SECTION 2, Item b, of the completed HSP form for which you are completing the attachment.

Item Number: _____ **Description:** ____________________

SECTION A-2: SUBCONTRACTOR SELECTION

List the subcontractor(s) you selected to perform the subcontracting opportunity you listed above in SECTION A-1. Also identify whether they are a Texas certified HUB and their Texas Vendor Identification (VID) Number or federal Employer Identification Number (EIN), the approximate dollar value of the work to be subcontracted, and the expected percentage of work to be subcontracted. When searching for Texas certified HUBs and verifying their HUB status, ensure that you use the State of Texas' Centralized Master Bidders List (CMBL) - Historically Underutilized Business (HUB) Directory Search located at http://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp. HUB status code "**A**" signifies that the company is a Texas certified HUB.

Company Name	Texas certified HUB	Texas VID or federal EIN Do not enter Social Security Numbers. If you do not know their VID / EIN, leave their VID / EIN field blank.	Approximate Dollar Amount	Expected Percentage of Contract
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%

REMINDER: As specified in SECTION 4 of the completed HSP form, if you (respondent) are awarded any portion of the requisition, you are required to provide notice as soon as practical to all the subcontractors (HUBs and Non-HUBs) of their selection as a subcontractor. The notice must specify at a minimum the contracting agency's name and its point of contact for the contract, the contract award number, the subcontracting opportunity they (the subcontractor) will perform, the approximate dollar value of the subcontracting opportunity and the expected percentage of the total contract that the subcontracting opportunity represents. A copy of the notice required by this section must also be provided to the contracting agency's point of contact for the contract no later than ten (10) working days after the contract is awarded.

HSP Good Faith Effort - Method B (Attachment B)

Rev. 09/15

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

IMPORTANT: If you responded "***No***" to **SECTION 2, Items c** and **d** of the completed HSP form, you must submit a completed "HSP Good Faith Effort - Method B (Attachment B)" for **each** of the subcontracting opportunities you listed in **SECTION 2, Item b** of the completed HSP form. You may photo-copy this page or download the form at http://window.state.tx.us/procurement/prog/hub/hub-forms/hub-sbcont-plan-gfe-achm-b.pdf.

SECTION B-1: SUBCONTRACTING OPPORTUNITY

Enter the item number and description of the subcontracting opportunity you listed in SECTION 2, Item b, of the completed HSP form for which you are completing the attachment.

Item Number: 1 **Description:** Validate Environmental Flow Standards

SECTION B 2: MENTOR PROTÉGÉ PROGRAM

If respondent is participating as a Mentor in a State of Texas Mentor Protégé Program, submitting its Protégé (Protégé must be a State of Texas certified HUB) as a subcontractor to perform the subcontracting opportunity listed in **SECTION B-1**, constitutes a good faith effort to subcontract with a Texas certified HUB towards that specific portion of work.

Check the appropriate box (Yes or No) that indicates whether you will be subcontracting the portion of work you listed in SECTION B-1 to your Protégé.

☐ - **Yes** (If ***Yes***, continue to SECTION B-4.)

☑ - **No / Not Applicable** (If ***No*** or ***Not Applicable***, continue to SECTION B-3 and SECTION B-4.)

SECTION B 3: NOTIFICATION OF SUBCONTRACTING OPPORTUNITY

When completing this section you MUST comply with items **a, b, c and d**, thereby demonstrating your Good Faith Effort of having notified Texas certified HUBs and trade organizations or development centers about the subcontracting opportunity you listed in SECTION B-1. Your notice should include the scope of work, information regarding the location to review plans and specifications, bonding and insurance requirements, required qualifications, and identify a contact person. When sending notice of your subcontracting opportunity, you are encouraged to use the attached HUB Subcontracting Opportunity Notice form, which is also available online at http://www.window.state.tx.us/procurement/prog/hub/hub-subcontracting-plan.

Retain supporting documentation (i.e., certified letter, fax, e-mail) demonstrating evidence of your good faith effort to notify the Texas certified HUBs and trade organizations or development centers. Also, be mindful that a working day is considered a normal business day of a state agency, not including weekends, federal or state holidays, or days the agency is declared closed by its executive officer. The initial day the subcontracting opportunity notice is sent/provided to the HUBs and to the trade organizations or development centers is considered to be "day zero" and does not count as one of the seven (7) working days.

a. Provide written notification of the subcontracting opportunity you listed in SECTION B-1, to three (3) or more Texas certified HUBs. Unless the contracting agency specified a different time period, you must allow the HUBs at least seven (7) working days to respond to the notice prior to you submitting your bid response to the contracting agency. When searching for Texas certified HUBs and verifying their HUB status, ensure that you use the State of Texas' Centralized Master Bidders List (CMBL) - Historically Underutilized Business (HUB) Directory Search located at http://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp. HUB status code "**A**" signifies that the company is a Texas certified HUB.

b. List the **three (3) Texas certified HUBs** you notified regarding the subcontracting opportunity you listed in SECTION B-1. Include the company's Texas Vendor Identification (VID) Number, the date you sent notice to that company, and indicate whether it was responsive or non-responsive to your subcontracting opportunity notice.

Company Name	Texas VID (Do not enter Social Security Numbers.)	Date Notice Sent (mm/dd/yyyy)	Did the HUB Respond?
ACE ENVIRONMENTAL	1200660492500	03/25/2016	☐ - Yes ☑ - No
AD ENVIRONMENTAL SERVICES, LLC	1760812017000	03/25/2016	☐ - Yes ☑ - No
BENCHMARK ENVIRONMENTAL CONSULTANTS	1752368104100	03/25/2016	☐ - Yes ☑ - No

c. Provide written notification of the subcontracting opportunity you listed in SECTION B-1 to two (2) or more trade organizations or development centers in Texas to assist in identifying potential HUBs by disseminating the subcontracting opportunity to their members/participants. Unless the contracting agency specified a different time period, you must provide your subcontracting opportunity notice to trade organizations or development centers at least seven (7) working days prior to submitting your bid response to the contracting agency. A list of trade organizations and development centers that have expressed an interest in receiving notices of subcontracting opportunities is available on the Statewide HUB Program's webpage at http://www.window.state.tx.us/procurement/prog/hub/mwb-links-1/.

d. List **two (2) trade organizations or development centers** you notified regarding the subcontracting opportunity you listed in SECTION B-1. Include the date when you sent notice to it and indicate if it accepted or rejected your notice.

Trade Organizations or Development Centers	Date Notice Sent (mm/dd/yyyy)	Was the Notice Accepted?
Women©s Business Enterprise Alliance	03/25/2016	☑ - Yes ☐ - No
Texas Association of Mexican American Chambers of Commerce	03/25/2016	☑ - Yes ☐ - No

HSP Good Faith Effort - Method B (Attachment B) Cont.

Rev. 09/15

Enter your company's name here: BIO-WEST, Inc. Requisition #: 580-16-RFQ0022

SECTION B-4: SUBCONTRACTOR SELECTION

Enter the item number and description of the subcontracting opportunity you listed in **SECTION 2, Item b,** of the completed HSP form for which you are completing the attachment.

a. Enter the item number and description of the subcontracting opportunity for which you are completing this Attachment B continuation page.

Item Number: 1 **Description:** Validate Environmental Flow Standards

b. List the subcontractor(s) you selected to perform the subcontracting opportunity you listed in **SECTION B-1**. Also identify whether they are a Texas certified HUB and their Texas Vendor Identification (VID) Number or federal Emplioyer Identification Number (EIN), the approximate dollar value of the work to be subcontracted, and the expected percentage of work to be subcontracted. When searching for Texas certified HUBs and verifying their HUB status, ensure that you use the State of Texas' Centralized Master Bidders List (CMBL) - Historically Underutilized Business (HUB) Directory Search located at http://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp. HUB status code "**A**" signifies that the company is a Texas certified HUB.

Company Name	Texas certified HUB	Texas VID or federal EIN Do not enter Social Security Numbers. If you do not know their VID / EIN, leave their VID / EIN field blank.	Approximate Dollar Amount	Expected Percentage of Contract
Texas State University	☐ - Yes ☑ - No		$ 25,000.00	16%
Baylor University	☐ - Yes ☑ - No		$ 10,000.00	6%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%

c. If any of the subcontractors you have selected to perform the subcontracting opportunity you listed in **SECTION B-1** is **not** a Texas certified HUB, provide written justification for your selection process (attach additional page if necessary):

All subcontractors selected have highly specialized expertise in validation of environmental flow standards. Each subcontractor has performed similar work in the recent past and maintain high levels of education in both instream flow and freshwater inflow science.

REMINDER: As specified in SECTION 4 of the completed HSP form, if you (respondent) are awarded any portion of the requisition, you are required to provide notice as soon as practical to **all** the subcontractors (HUBs and Non-HUBs) of their selection as a subcontractor. The notice must specify at a minimum the contracting agency's name and its point of contact for the contract, the contract award number, the subcontracting opportunity it (the subcontractor) will perform, the approximate dollar value of the subcontracting opportunity and the expected percentage of the total contract that the subcontracting opportunity represents. A copy of the notice required by this section must also be provided to the contracting agency's point of contact for the contract no later than ten (10) working days after the contract is awarded.

CONTENT ITEM 5
OWNERSHIP OF BUSINESS ENTITY
Name(s) and Social Security Number(s) of Each Person with at least 25 Percent Ownership of the Business Entity Submitting the RFQ
(if applicable)

NOT Applicable
Name

Social Security Number

Name

Social Security Number

Name

Social Security Number

Name

Social Security Number

CONTENT ITEM 6
TECHNICAL APPROACH
(if applicable)

BIO-WEST, Inc. Project Team
Technical Approach

TEXAS WATER DEVELOPMENT BOARD
REQUEST FOR QUALIFICATIONS NO. 580-16-RFQ0022
FOR
VALIDATION OR REFINEMENT OF THE ADOPTED
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
ENVIRONMENTAL FLOW STANDARDS FOR THE
COLORADO AND LAVACA RIVERS

Exhibit B
Scope of Work

Technical Approach

Studies proposed below are designed to build upon previous instream flow validation work conducted by this project team for the Guadalupe-San Antonio and Brazos river basins during 2014/2015. Purposes of 2014/2015 applied research were to develop hypotheses about community-flow relationships via an Expert Workshop and subsequent preliminary field investigations, to prioritize and select hypotheses for subsequent testing via a second Expert Workshop, and to test predicted abiotic and biotic responses to flow recommendations and standards during a one-year period of field observations. Instream abiotic and biotic responses to flow tiers (*i.e.*, subsistence flows, base flows, and 4/season [4-per season], 3/season, 2/season, 1/season, and 1/year pulses) were tested at multiple stream and river sites within both the Brazos and Guadalupe/San Antonio river drainages, multiple riparian zones within the Brazos and Guadalupe-San Antonio drainages, multiple Guadalupe-San Antonio drainage floodplain lakes, and multiple sites within the Brazos estuary. The results of this work are summarized in two final reports titled "*Instream Flows Research and Validation Methodology Framework and Brazos Estuary Characterization*" and "*Instream Flows Research and Validation Methodology Framework: Guadalupe, San Antonio, Mission, and Aransas Rivers and Mission, Copano, Aransas, and San Antonio Bays Basin*" which were submitted to the Texas Water Development Board (TWDB) in September 2015.

Our technical approach for the expansion of this work into the Colorado and Lavaca river basins builds off recommendations in the reports mentioned above and consists of five tasks that follow a sequenced process. The initial focus of the project consists of three expert panel/stakeholder workshops which will correspond with workshops in other basins to maximize efficiency and provide guidance to the overall project. Continued hypothesis refinement and development will be based on results from the first study and potential data gaps of purported mechanisms and relationships established in the literature. Similar to the first round, hypothesis selection for the second wave of sampling will be based on value of the response variable in indicating sound ecological environments, response variable sensitivity to changes among flow tiers, and applicability for incorporation into the validation framework initiated during the first study. Following this important initial stage, implementation of field observations will then occur through spring 2017. This data collection phase will involve implementing an experimental design to test selected hypotheses with adequate replication at select locations in the river basins outlined above.

Similar to the previous studies, hypotheses will be tested among flow tiers as provided by nature. However, at a minimum, data collection will occur once from each selected site during each season, regardless of flow tier. Following data collection, and in conjunction with advice from the Expert Panel Workshops, the objective is to complete the validation methodology embarked upon during the original study and provide the Basin and Bay Area Stakeholder Committee groups within each basin with a working tool for Texas Commission on Environmental Quality standards evaluation.

Task 1: Project Management / Meetings

Description of Work: Project management, contracting, task coordination, and internal and external communication are included in this category. Internal meetings will consist of monthly face-to-face

project team meetings or conference calls and a minimum of four progress meetings directly with the TWDB staff. It is possible that meetings with the TWDB will be combined into the project team monthly events, if practical. External communication of progress with the stakeholders will be handled through workshops described in Task 2.

Key Assumptions:

- Monthly (12) internal project team meetings
- Four (4) meetings with TWDB Staff and Management

Deliverables: Monthly Progress Letter Reports with invoices

Task 2: Expert Panel/Stakeholder Workshops, Hypothesis Selection, Validation Methodology Development

Description of Work: Three individual workshops are proposed over the study period. To maximize efficient use of resources, whenever possible, workshops will be held in conjunction with similar workshops related to the Guadalupe-San Antonio or Brazos basins. An invite will be sent to all participants of the 2014 workshops conducted for the original project as well as similar groups within the Colorado and Lavaca basins. This will include but not be limited to all Basin and Bay Area Expert Science Team members (that participated in the Senate Bill 3 environmental flows process across the state) along with delegated scientists from academia, the Texas Instream Flow Program and other resource agency scientists (Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, TWDB), as appropriate. Stakeholders will be encouraged to attend but will not be asked to participate directly in hypothesis selection or the experimental design process. Stakeholders will be asked to participate in guidance on the applicability and use of the validation methodology.

Workshop 1: The initial workshop will be conducted soon after the formal award of a contract with the intent of discussing the original studies, introducing the validation methodology, and soliciting feedback on other considerations for inclusion in focused applied research and long-term monitoring. Prior to this workshop, the BIO-WEST project team will develop a list of proposed parameters, sites, hypotheses, etc. to stimulate discussions, the results of which will guide data collection activities. Experimental design will be developed along with appropriate statistics for testing, proposed site locations, and numbers and timing of samples to be taken. Discussion and incorporation of ideas aimed at strengthening the scientific validity of the validation approach as well as gaging and establishing Basin and Bay Area Stakeholder Committee support will be important during this early phase. The resulting product of the first expert panel workshop will be a list of hypotheses for testing including descriptions of relevant parameters, flow tiers, sites, and statistical analyses. Within the Colorado/Lavaca basins site selection will conform to the following criteria: two sites in the Colorado River basin upstream of the Highland Lakes, two sites in the Lavaca River basin, and one site on a major tributary downstream from the Highland Lakes. Following the initial workshop, a brief memorandum will be generated and circulated amongst participants for them to continue formulating ideas during the data collection phase.

Workshop 2: A second expert panel/stakeholder workshop is recommended approximately six months to one year into the process to finalize the validation methodology. Following this workshop, a formal memorandum will be prepared that documents the methodology.

Workshop 3: A third and final workshop will be held upon completion of data collection and validation methodology development but prior to submittal of the draft report to TWDB. The purpose of this workshop will be to present results to stakeholders, and gather additional input from the scientific community on interpretation and application of the validation methodology prior to finalizing the technical report.

Key Assumption: The contract will be in place in time to support the necessary timeline for this project. Initiating an expert panel workshop in late summer 2016 is imperative to allow for maximum length of data collection during the brief study period.

Deliverables:

- Final Methodology Development Memorandum to TWDB - April 2017.

Task 3: Fieldwork - Hypothesis Testing

Description of Work: Once hypotheses are selected and experimental designs established, field observations will be taken from summer 2016 through spring 2017. To capture a wide range of flow magnitudes, aquatic and riparian sites will be selected throughout the basins as specified above.

Aquatics: Focused applied research for the aquatic component will build off the extensive work conducted in 2014/2015. Hypotheses to test and parameters to sample will be based on the results of the original study, professional judgment of the project team, and guidance provided at the first expert panel workshop. Extensive aquatic monitoring is proposed during this next round of sampling for two reasons: (1) aquatic community responses to a specific flow tier were variable, per the initial years' worth of data; additional collections (and, consequently, a larger number of replicates and greater statistical power) should help to control the variability for the flow tiers quantified to date, and (2) sample size of several flow tiers (*e.g.*, subsistence, 4/season, 3/season) were insufficient. Given that more samples at a site would help control variability, we propose potentially reducing the total number of sites surveyed but increasing the frequency of collections. Increased sampling frequency at fewer sites could also provide the resolution necessary to assess the mechanistic relationship between flow tiers and aquatic community responses. In addition, other habitat types (i.e., deep pools, deep runs, and backwater habitats) could be monitored at a site to help elucidate macroinvertebrate and fish movement patterns following a flow pulse (*e.g.*, fish displaced from riffle but only moved a short distance downstream into a flow refuge habitat).

Riparian: Riparian data in the Colorado and Lavaca basins will be collected in a similar fashion to previous research conducted in the Guadalupe-San Antonio and Brazos basins, and will consist of monitoring seedling, sapling, and mature trees along established surveyed transects at each site. Data on survival and abundance of various life stages for select indicator species will be examined in relation to inundation levels from pulse flow events and other pertinent environmental variables to establish ecological linkages to flow events. One limitation of the original study was the extremely truncated time period, compounded with severe flooding at the conclusion of the field window that prevented the study time period from spanning across the summer season. As such, little could be said about the summer season, and the flows within. Sites within the Colorado and Lavaca basins will provide additional geographic coverage which will hopefully lessen the impact of site-specific flow conditions on data collection. The actual sites selected will be discussed and determined at the initial expert panel workshop.

Other Parameters: Based on the proposed activities described above the project team has built in flexibility to incorporate up to two additional sampling components should they be determined practical and valuable to validation methodology development. Should these additional components be incorporated, the project team would simply scale back the above described efforts to make resources available to perform the additional tasks.

Key Assumption: Climatic and flow conditions observed over the 12 month period will be sufficient to assess hypotheses selected at multiple locations.

Internal Deliverable: Data to support Task 4 - data reduction and analysis task.

Task 4: Data Reduction and Analysis

Description of Work: Upon data collection, the project team will reduce and analyze all physical and biological data collected as per the established schedule of activities. Study results will be presented in context of the *a priori* predictions for the parameters selected. Task 3 results will inform two main objectives. The first is to inform and refine validation methodologies with the goal of having a scientifically defensible approach for testing Texas Commission on Environmental Quality environmental flow standards (Task 2). The second is to provide the Colorado/Lavaca Basin and Bay Area Stakeholder Committee with information on how application of these methodologies either validated or suggested refinement for existing Texas Commission on Environmental Quality flow standards at select sites.

Internal Deliverable: Analysis to support Task 2 and Task 5 reporting.

Task 5 – Draft / Final Project Report

Description of Work: Upon completion of data analyses, the project team will prepare a Draft and Final Project Report. Included in the Project Report will be a:

- Summary of meetings;
- Synopsis of the three expert panel workshops;
- Description of methods, analysis and results of field activities;
- Description of validation methodology development;
- Recommendations to the Basin and Bay Area Stakeholder Committee on potential ways to use the provided information;
- Observations on potential state-wide application; and
- Potential future recommendations moving forward.

EXHIBIT C

TASK AND EXPENSE BUDGETS

TASK BUDGET

TASK	DESCRIPTION	TWDB AMOUNT
TASK 1	Project Management and Meetings	$8,400.00
TASK 2	Expert Panel/Stakeholder Workshops	12,000.00
TASK 3	Fieldwork - Hypothesis Testing	96,000.00
TASK 4	Data Reduction and Analysis	31,600.00
TASK 5	Draft and Final Project Report	12,000.00
Total		**$160,000.00**

EXPENSE BUDGET

CATEGORY	TWDB AMOUNT
Salaries and Wages[1]	$34,463.70
Fringe[2]	27,777.75
Travel[3]	7,250.00
Other Expenses[4]	4,250.00
Subcontract Expenses	40,000.00
Overhead[5]	32,106.38
Profit	14,152.17
TOTAL	**$160,000.00**

[1] Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this CONTRACT.

[2] Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, workers' compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.

[3] Travel is limited to the maximum amounts authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2015, Article IX, Part 5, as amended or superseded

[4] Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.

[5] Overhead is defined as the costs incurred in maintaining a place of business and performing professional services similar to those specified in this CONTRACT

EXHIBIT D

GUIDELINES FOR AUTHORS SUBMITTING CONTRACT REPORTS TO THE TEXAS WATER DEVELOPMENT BOARD

1.0 Introduction

The purpose of this document is to describe the required format of contract reports submitted to the Texas Water Development Board (TWDB). Our reason for standardizing the format of contract reports is to provide our customers a consistent, and therefore familiar, format for contract reports (which we post online for public access). Another reason for standardizing the format is so that we can more easily turn a contract report into a TWDB numbered report if we so choose. Remember that your report will not only be seen by TWDB staff, but also by any person interested in the results of your study. A professional and high quality report will reflect well on you, your employer, and the TWDB.

Available upon request, we will provide a Microsoft Word template (used to write these instructions) that gives the fonts, spacing, and other specifications for the headings and text of the report. Please follow this template as closely as possible.

2.0 Formatting your report

The TWDB format is designed for simplicity. For example, we use Times New Roman for all text. We use 12 point, single-spaced text, left justification for paragraph text, 18 point bold for first-level headings, and 14 point bold for second-level headings. Page numbers are centered at the bottom of the page. Other than page numbers, please refrain from adding content to the document header or footer. Page setup should use one-inch margins on all four sides.

2.1 Text

The best way to format your document is to use the styles described and embedded in the template document (Authors_Template.dot) that is available on request from the TWDB. To use the Authors_Template.dot file, open it in Word (make sure *.dot is listed under Files of type) and save it as a .doc file. Advanced users can add the .dot file to their computers as a template. Make sure the formatting bar is on the desktop (to open, go to View→Toolbars→Formatting) or, to view all of the formatting at once, go to Format→Styles and Formatting and select Available Styles from the dropdown box at the bottom of the window. The formatting in the template document provides styles (such as font type, spacing, and indents) for each piece of your report. Each style is named to describe what it should be used for (for example, style names include Chapter Title, Body Text, Heading 1, References, and Figure or Table Caption). As you add to your report, use the dropdown list on the Formatting Toolbar or the list in the Styles and Formatting window to adjust the text to the correct style. The Authors_Template.dot file shows and lists the specifications for each style.

2.1.1 Title

Give your report a title that gives the reader an idea of the topic of your report but is not terribly long. In addition to the general subject (for example, "Droughts"), you may include a few additional words to describe a place, methodology, or other detail focused on throughout the paper (for example, "Droughts in the High Plains of Texas" or "Evaluating the effects of drought using groundwater flow modeling"). Please capitalize only the first letter of each word except 'minor' words such as 'and' and 'of'. Never use all caps.

Use headings to help the reader follow you through the main sections of your report and to make it easier for readers to skim through your report to find sections that might be the most interesting or useful to them. The text of the report should include an executive summary and sections outlined in 4.4 of Attachment 1. Headings for up to five levels of subdivision are provided in the template; however, we suggest not using more than three or four levels of subdivision except where absolutely necessary. Please avoid stacked headings (for example, a Heading 1 followed immediately by a Heading 2), and capitalize only the first letter of headings or words where appropriate—never use all caps.

2.2 Figures and photographs

To publish professional-looking graphics, **we need all originals to be saved at 300 dots-per-inch** (dpi) and in grayscale, if possible, or in the CMYK color format if color is necessary. Excessive use of color, especially color graphics that do not also work in grayscale, will prevent us from publishing your report as a TWDB numbered report (color reproduction costs can be prohibitive). Preferred file formats for your original graphics are Adobe Illustrator (.ai), Photoshop (.psd), EPS with .tiff preview, .jpg, .png, or .tiff files. Refrain from using low resolution .jpg or .gif files. Internet images at 72 dpi are unacceptable for use in reports.

All graphics shall be submitted in two forms:

1. Inserted into the Microsoft Word document before you submit your report. Ideally, inserted graphics should be centered on the page. Format the picture to downsize to 6 inches wide if necessary. Please do not upsize a graphic in Word.
2. Saved in one of the formats listed above.

2.2.1 Other graphics specifications

It is easiest to design your figures separately and add them in after the text of your report is more or less complete. Graphics should remain within the 1-inch page margins of the template (6.5 inches maximum graphic width). Be sure that the graphics (as well as tables) are numbered in the same order that they are mentioned in the text. Figures should appear embedded in the report after being called out in the text. Also, remember to include a caption for each graphic in Word, not as part of the graphic. We are not able to edit or format figure captions that are part of the figure. For figures and photographs, the caption should appear below the graphic. For tables, the caption should appear above.

2.2.2 Creating publication-quality graphics

When designing a graphic, make sure that the graphic (1) emphasizes the important information and does not show unnecessary data, lines, or labels; (2) includes the needed support material for the reader to understand what you are showing; and (3) is readable (see Figures 1 and 2 for examples). Edward R. Tufte's books on presenting information (Tufte, 1983; 1990; 1997) are great references on good graphic design. Figures 1 through 3 are examples of properly formatted, easy to understand graphics. Do not include fonts that are less than 6 points.

For good-looking graphics, the resolution needs to be high enough to provide a clear image at the size you make them within the report. In general, 300 dpi will make a clear image—200 dpi is a minimum. Try to create your figures at the same size they will be in the report, as resizing them in Word greatly reduces image quality. Photographs taken with at least a two-megapixel camera (if using digital) and with good contrast will make the best images. Save the original, and then adjust color levels and size in

a renamed image copy. Print a draft copy of your report to double-check that your figures and photographs have clear lines and show all the features that you want them to have.

Figures and photographs should be in grayscale. Color greatly adds to the cost of printing, so we are trying to keep it to a minimum. Also remember that your report may be photocopied, scanned, or downloaded and printed in black and white. For this reason, you should use symbols or patterns, or make sure that colors print as different shades in black and white. All interval or ratio data (data measuring continuous phenomena, with each color representing an equal interval) need to be displayed in a graded scale of a single color (Figure 3). This way your figures will be useful even as a photocopy.

If you need help with your graphics or have questions, please contact the TWDB graphics department at (512) 936-0129.

2.2.3 Using other people's graphics

Figures and photographs (and tables) need to be your own unless you have written permission from the publisher that allows us to reprint them (we will need a copy of this permission for our records). Avoid using any figures or photographs taken off the Internet or from newspapers or magazines—these sources are difficult to cite, and it is often time-consuming and expensive to gain permission to reproduce them.

2.3 Tables

Tables should be created in Microsoft Word (see Table 1). Tables should include a minimal amount of outlining or bold font to emphasize headings, totals, or other important points. Tables should be numbered separately from figures, and captions should appear above the text of the table.

Table 1: A sample table. Note caption above table.

			Table text heading*					
Table text	1940	1950	1960	1970	1980	1990	2000	%GW
Table text	15	441	340	926	196	522	83	97.4
Table text	64	944	626	173	356	171	516	99.9
Total	79	1385	966	1099	552	693	599	

* A footnote should look like this using 10 point Times New Roman.
%GW = percent groundwater
Be sure to describe any abbreviations or symbols, and, unlike in this table, be sure to note the units!

3.0 Units

Measurements should be in English units. Metric units may be included in parentheses after the English units.

All units of geologic time should conform to the most recent geologic timescale (Gradstein and others, 2004). A summary of this timescale is available from the International Commission on Stratigraphy's website at http://stratigraphy.org/chus.pdf.

4.0 Citations and references

It is important to give credit where credit is due. Therefore, be sure to use the appropriate citations and include references in your paper.

4.1 In-text citations

Each piece of information you use in your report that comes from an outside source must be cited within the text using the author's last name and the year of publication. If there are two authors, list the last name of each followed by the year, and if there are more than two authors, list the last name of the first author followed by "and others" and the year. For example: the end of the Jurassic Period occurred approximately 145.5 million years ago (Gradstein and others, 2004).

4.2 References

All sources that are cited within the report should be listed at the end of the paper under the heading References. The references should follow the guidelines in "Suggestions to Authors of the Reports of the United States Geological Survey" (Hansen, 1991). These are available online at http://www.nwrc.usgs.gov/lib/lib_sta.html (a link to the chapter "Preparing references for Survey reports," p. 234-241, is found here). Several examples of complete reference citations are listed at the end of these guidelines. Be sure that any citations that appear in tables or figures are included in the reference list. Also, before submitting the report, please check that all the citations in the report are included in the reference list and all references in the reference list are cited in the report. If at all possible, avoid web-based citations. These materials are often transient and therefore useless to future readers.

5.0 Submitting your report

Before you submit your report, proofread it. Look for spelling and grammatical errors. Also, check to see that you have structured the headings, paragraphs, and sentences in your paper so that it is easy to follow and understand (imagine you are a reader who does not already know the information you are presenting!).

6.0 Conclusions

Following the instructions above and providing accurate and readable text, tables, figures, and citations will help to make your report useful to readers. Scientists may read your report, as well as water planners, utility providers, and interested citizens. If your report successfully conveys accurate scientific information and explanations to these readers, we can help to create more informed decisions about the use, development, and management of water in the state.

7.0 Acknowledgments

Be sure to acknowledge the people and entities that assisted you in your study and report. For example: We would like to thank the Keck Geology Consortium, the American Society of Civil Engineers, and the Texas Bar CLE for providing examples to use in developing these guidelines. In addition, we appreciate Mike Parcher for providing information on how to create publication-quality graphics, Shirley Wade for creating the data used in sample Figure 1, and Ian Jones for providing sample Figure 3.

8.0 References

Gradstein, F.M., J.G. Ogg, and A.G. Smith, eds., 2005, A geologic time scale 2004: Cambridge, Cambridge University Press, 610 p.

Hansen, W.R., ed., 1991, Suggestions to authors of the reports of the United States Geological Survey (7th ed.): Washington, D.C., U.S. Government Printing Office, 289 p.

Tufte, E. R., 1983, The visual display of quantitative information: Cheshire, C.T., Graphics Press, 197 p.

Tufte, E. R., 1990, Envisioning information: Cheshire, C.T., Graphics Press, 126 p.

Tufte, E. R., 1997, Visual explanations: Cheshire, C.T., Graphics Press, 156 p.

9.0 Examples of references

Arroyo, J. A., and Mullican, III, W. F., 2004, Desalination: *in* Mace, R. E., Angle, E. S., and Mullican, W. F., III, editors, Aquifers of the Edwards Plateau: Texas Water Development Board Report 360, p. 293-302.

Bates, R. L., and Jackson, J. A., 1984, Dictionary of geological terms: Anchor Press/Doubleday, Garden City, New York, 571 p.

Blandford, T. N., Blazer, D. J., Calhoun, K. C., Dutton, A. R., Naing, T., Reedy, R. C., and Scanlon, B. R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico– Numerical simulations through 2050: contract report by Daniel B. Stephens and Associates, Inc., and the Bureau of Economic Geology, The University of Texas at Austin to the Texas Water Development Board, variably paginated.

Fenneman, N. M., 1931, Physiography of Western United States (1st edition): New York, McGraw-Hill, 534 p.

Hubert, M., 1999, Senate Bill 1–The first big bold step toward meeting Texas's future water needs: Texas Tech Law Review, v. 30, no. 1, p. 53-70.

Kunianski, E. L., 1989, Precipitation, streamflow, and baseflow in West-Central Texas, December 1974 through March 1977: U. S. Geological Survey Water-Resources Investigations Report 89-4208, 2 sheets.

Mace, R. E., Chowdhury, A. H., Anaya, R., and Way, S.-C., 2000, A numerical groundwater flow model of the Upper and Middle Trinity aquifer, Hill Country area: Texas Water Development Board Open File Report 00-02, 62 p.

Maclay, R. W., and Land, L. F., 1988, Simulation of flow in the Edwards aquifer, San Antonio Region, Texas, and refinements of storage and flow concepts: U. S. Geological Survey Water-Supply Paper 2336, 48 p.

For more examples of references, see p. 239-241 of "Suggestions to Authors of the Reports of the United States Geological Survey" at http://www.nwrc.usgs.gov/lib/lib_sta.html.

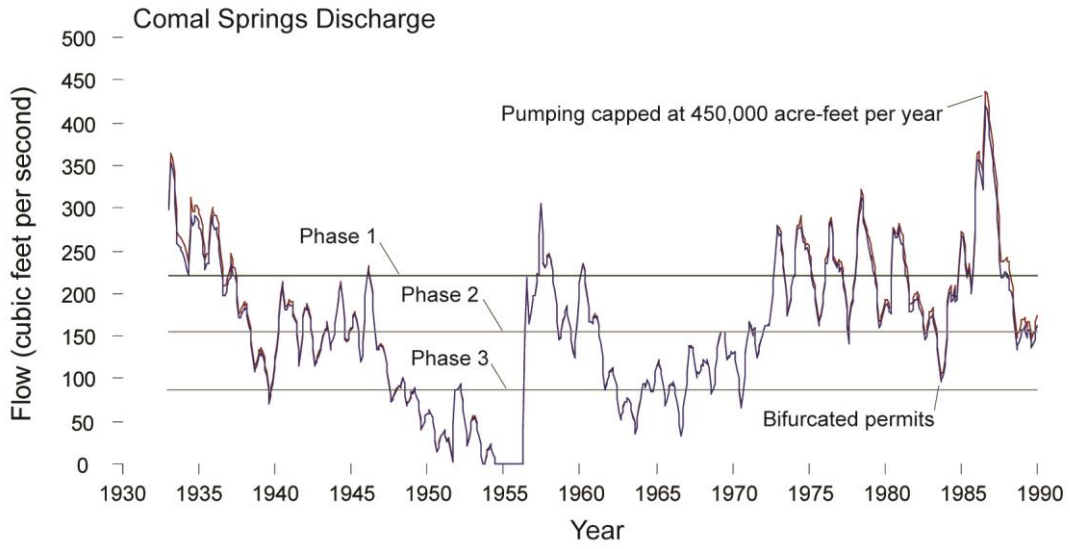

Figure 1. A sample figure showing only the information needed to help the reader understand the data. Font size for figure callouts or labels should never be less than 6 point.

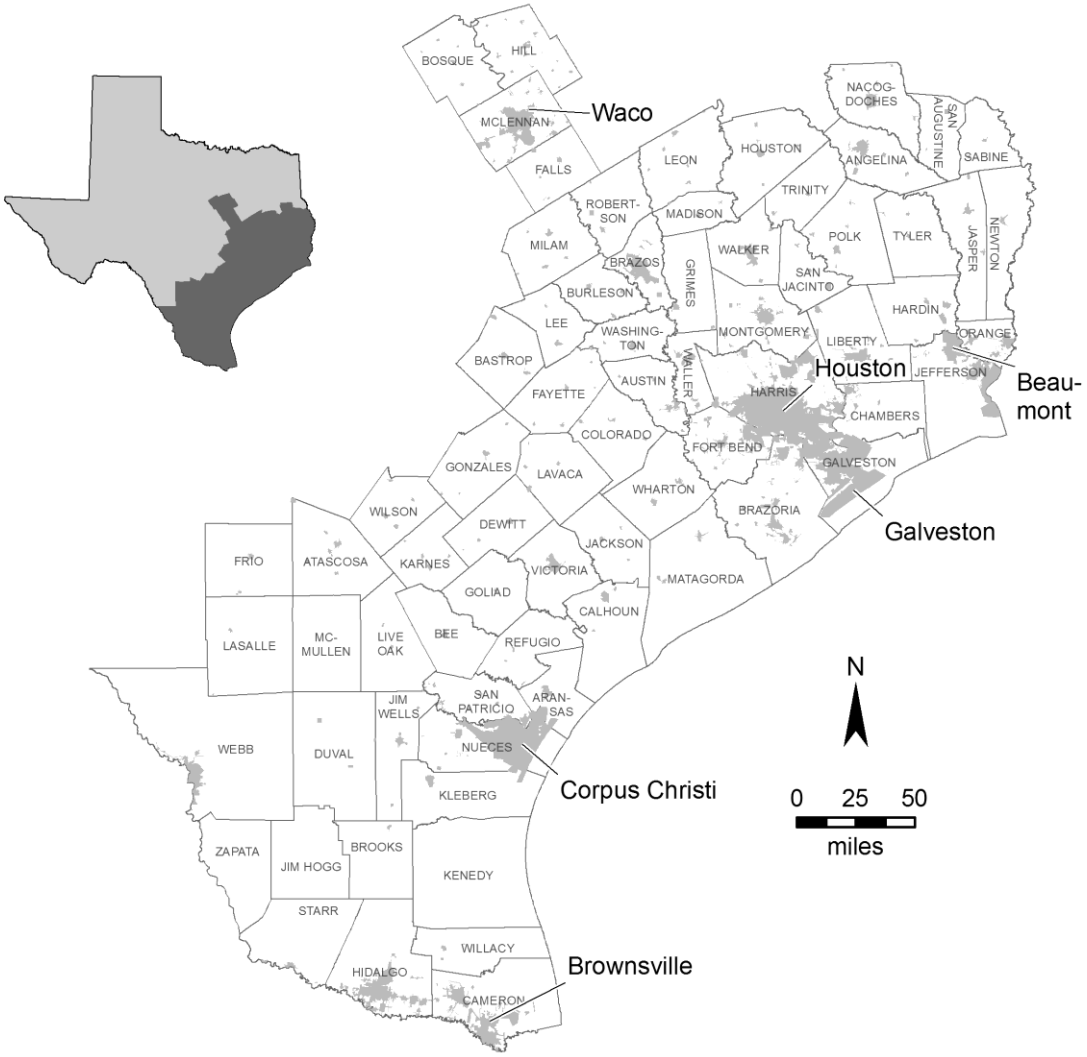

Figure 2. A sample subject area map, giving the reader enough information to understand the location being discussed in this conference. For map figures, be sure to include a north arrow to orient the reader, a scale, and, if needed, a submap that places the figure in greater geographic context. Be sure that text is readable and that any citations listed on the figure or in the figure caption are included in the reference list. Font size should never be less than 6 pt.

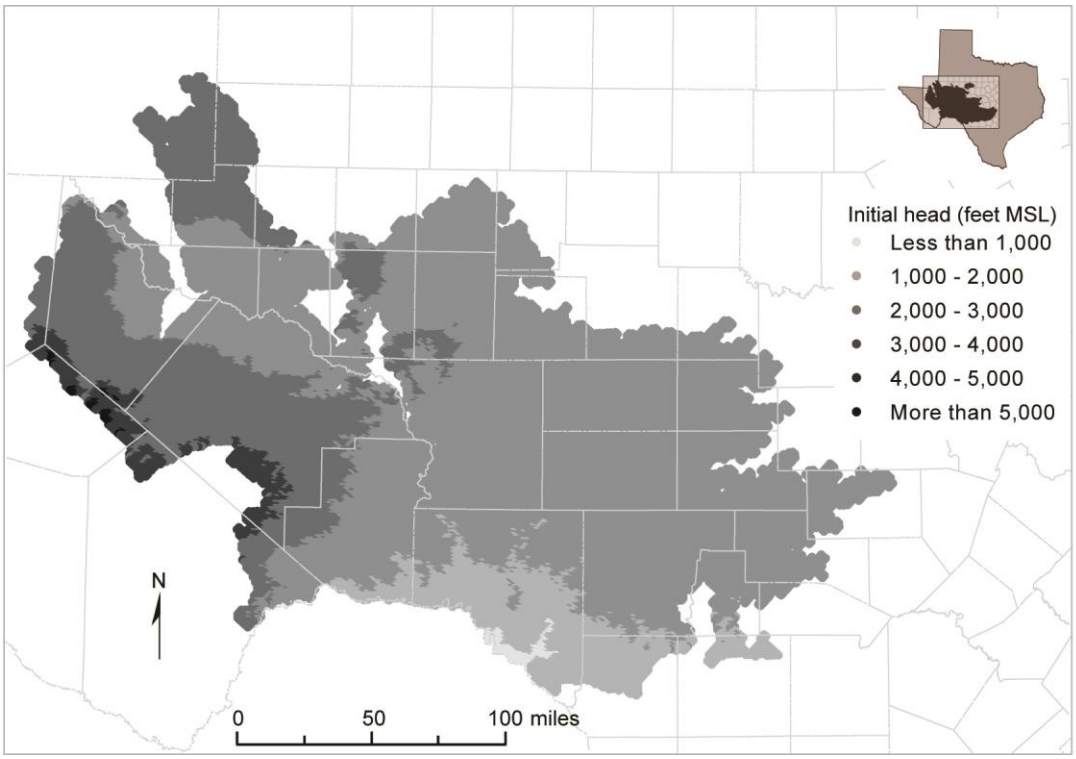

Figure 3. Initial hydraulic heads used in model simulations for layer 1. Note the use of grayscale shading to show differences.

EXHIBIT E
TWDB Guidelines for a Progress Report

Texas Water Development Board Contractors are required by their contracts to provide Progress Reports usually with the submission of an invoice/payment request.

The progress report should contain the following standard elements:

- Date: Date the memo is sent
- To: Name and position of the reader
- From: Name and position of the writer

Subject: TWDB Contract Number and a clear phrase that focuses the reader's attention on the subject of the memo

Work Completed: *(The next section of a progress report explains what work has been done during the reporting period. Specify the dates of the reporting period and use active voice verbs to give the impression that you or you and your team have been busy) For Example:*

Task 1: Completed 3 draft chapters and all appendices. Met with sub consultants on their chapters.
Task 2: Completed sample collection throughout river reach.
Task 3: No work completed in reporting period.

Problems:
If the reader is likely to be interested in the glitches you have encountered along the way, mention the problems you have encountered and explain how you have solved them. If there are problems you have not yet been able to solve, explain your strategy for solving them and give tell the reader when you think you will have them solved.

EXHIBIT F

HUB SUBCONRACTING PLAN PROGRESS ASSESSMENT REPORT

Use current form located at:
http://www.window.state.tx.us/procurement/prog/hub/hub-forms/