

Final Project Report

Biological Study of San Antonio Bay

TGLO Contract # 13-150-000-7240 w/ Texas Water Development Board (TWDB)

TWDB Contract # 1300011545 w/ TGLO

TWDB Subcontract # 1300011546 w/ University of Texas-Center for Research in Water Resources

Provide a brief description of the project goal(s) (include location of the property if land acquisition).

The purpose of this project was to continue to study the interactions of ecology and hydrology in San Antonio Bay (Guadalupe Estuary, Texas), building on work completed by the 2007 State CIAP Phase 1 project *Biological Study of San Antonio Bay*. In Phase 2, the Texas Water Development Board (TWDB) determined the relationship between multiple external factors (*i.e.*, inflow, salinity, and turbidity) and the health and abundance of several key species in San Antonio Bay. This project also extended salinity-hydrology analyses conducted in Phase 1 by examining the effect of alternate scenarios of inflows (*e.g.*, extended drought, drought preceded by high inflow, extended high inflows, *etc.*) on the response of bay salinity. Antecedent conditions within the bay play an important role in how the estuarine system responds to periods of drought or high inflows. One of the major questions confronting the management of San Antonio Bay is the effect of freshwater inflow on the ecology of this estuarine system. This project accomplished major steps toward answering this question through the following tasks

1. Use the historic time-series of hydrology and salinity (compiled in Phase 1) to employ mathematical depictions of seasonal pulses of inflows or freshets and recorded long-term droughts to evaluate and quantify the response of salinity given differing antecedent conditions under various scenarios of inflow events.
2. Assemble a historic time-series of turbidity which was not conducted under Phase 1, as measured by several proxy parameters, and analyze its association with the inflow and salinity information that was compiled and analyzed in Phase 1.
3. Perform multivariate statistical analyses of the abundance of several key species based upon the results of Tasks 1 and 2 above.
4. Prepare a final, comprehensive project report.

Identify whether the original goal(s) of the project was met or, if not, why the goal(s) was modified.

The larger goal of this project was to provide a framework to assess how San Antonio Bay may be impacted by external factors, most notably changes in freshwater inflow. This goal was met by completing the above list of tasks which improved scientific knowledge and understanding of the environmental needs that are crucial to sustaining coastal resources in the San Antonio Bay system. Separate technical reports were provided for each objective, in addition to a final comprehensive report that combined all task reports and summarized the overall conclusions.

CIAP Project Closeout

This project provided a report on the *Salinity and Salinity Response in San Antonio Bay* (Deliverable 1) which described the salinity gradient zone present when freshwater inflow is brought into juxtaposition with seawater, the various factors that bring seawater into the estuary (tidal variation, wind stress, and density current), and the physiography of San Antonio Bay. Statistical analyses then were performed to quantify the relationship between inflow and salinity in San Antonio Bay. This project also provided a report on the *Suspended Sediment and Turbidity in San Antonio Bay* (Deliverable 2) which served to document the acquisition and compilation of a digital database of turbidity and several proxy parameters. Also, the project produced the *Biological Data and Implications for Patent Species Populations in San Antonio Bay* (Deliverable 3) which summarized the biological data employed in the study, delineated the equipment used when taking observations, described the organization and processing of the data, and presented features of the species populations exhibited or implied by the data. Finally all reports were combined into a single, comprehensive technical report titled, *San Antonio Bay: The Ecosystem and its Hydrographic Forcing*. Together, these reports provide readers with a wealth of information about the response of biological species to several external forcings in San Antonio Bay, thus allowing stakeholders and resource managers to synthesize the various factors for better management of this ecosystem.

Summarize all significant project milestones, including dates for each action.

- A contract between the Texas General Land Office (TGLO) and the Texas Water Development Board (TWDB) was executed on October 23, 2012.
- A contract between the TWDB and University of Texas at Austin's Center for Research in Water Resources (UT-CRWR) was executed on November 15, 2012.
- On October 3, 2013, the due date for Task 1 was extended to December 31, 2013.
- A revised supplemental memorandum, *Technical Memorandum on Turbidity and Suspended Solids*, was submitted on November 21, 2013.
- On November 26, 2013, the due dates for Tasks 2a and 3a were extended to align with task deliverables.
- Deliverable #1, a report *Salinity and Salinity Response in San Antonio Bay* was submitted, January 8, 2014.
- On March 14, 2014, the due dates for Tasks 3a, 3b and Deliverable #3 were extended to June 30, 2015.
- On April 22, 2014, the due dates for Tasks 2b and Deliverable #2 were extended to August 31, 2014.
- A supplemental memorandum, *San Antonio Bay Data Set Report: DuPont Project*, was submitted on July 9, 2014.

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- On July 10, 2014, the due dates for Tasks 2a, 2b, and Deliverable #2 were extended to November 30, 2014.
- On November 7, 2014, the due dates for Tasks 2a, 2b, and Deliverable #2 were extended to January 31, 2015.
- Deliverable #2, a report *Suspended Sediment and Turbidity in San Antonio Bay* was submitted, February 16, 2015.
- On April 2, 2015, a no-cost time extension and budget modification was submitted to request a contract extension to October 31, 2016, with adjusted due dates for Tasks 3a, 3b, 4a, 4b and Deliverables #3, #4, and #5 and was approved by TGLO.
- On July 23, 2015, the TWDB Board of Directors approved to amend the budget, timeline, and scope of work for the subcontract with UT-CRWR.
- On August 27, 2015, the amendment was executed.
- A supplemental memorandum, *San Antonio Bay Data Set Report*, describing the biological and water chemistry data collections was submitted on December 10, 2015.
- On April 20, 2016, the due dates for Task 3b and Deliverable #3 were extended from April 30, 2016 to June 30, 2016 and from May 31, 2016 to July 31, 2016, respectively.
- Deliverable #3, a draft report *Biological Data and Implications for Patent Species Populations in San Antonio Bay* was submitted, October 31, 2016.
- Deliverable #4, a draft final comprehensive report, *Responses of Key Elements of the Ecosystem of San Antonio Bay to External Forcing* was submitted, October 31, 2016.
- A revised version of Deliverable #3, *Biological Data and Implications for Patent Species Populations in San Antonio Bay*, was submitted, January 31, 2017.
- A revised and renamed final version of Deliverable #4, *San Antonio Bay: The Ecosystem and its Hydrographic Forcing*, was submitted, January 31, 2017.
- A total of 46 monthly progress reports, three supplemental technical memorandums, five deliverables, including this final project report, have been submitted since October 2012.

List work products completed and deliverable submittal dates (if applicable).

Deliverable #1: Report *Salinity and Salinity Response in San Antonio Bay*, submitted January 8, 2014. File name: Deliverable 1_131500007240_SanAntonioBaySalinity.pdf

Deliverable #2: Report *Suspended Sediment and Turbidity in San Antonio Bay*, submitted February 16, 2015. File name: Deliverable 2_131500007240_Turbidity_draft.pdf

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Deliverable #3: Report *Biological Data and Implications for Patent Species Populations in San Antonio Bay* submitted, October 31, 2016. A revised version was submitted January 31, 2017.

File name: Deliverable 3_131500007240_EstuarineSpeciesData-Revised.pdf

Deliverable #4: Draft final comprehensive report *Responses of Key Elements of the Ecosystem of San Antonio Bay to External Forcing* submitted, October 31, 2016. A final revised and renamed version, *San Antonio Bay: The Ecosystem and its Hydrographic Forcing*, submitted January 31, 2017.

File name: Deliverable 4_131500007240_FinalComprehensiveReport-Revised.pdf

Identify any problems or obstacles encountered and remedial action taken (if any).

The Principal Investigator suffered several serious illnesses/hospitalizations throughout the project which delayed progress on the project during the project period and resulted in the submission of a “draft” version of the final comprehensive report (deliverable #4) on October 31, 2016. With the submission of this report, all deliverables and project requirements have been submitted in final form.

Additional project delays were associated with the unexpected acquisition of biological and water chemistry data, particularly data that represented conditions during the historic 1950s drought-of-record, which was not known to be available at the start of the project. The inclusion and documentation of these data sets are important to the overall understanding of the San Antonio Bay ecosystem.

Include digital photos and any material that promotes your project success (news articles, flyers, etc.).

No promotional materials have been generated at this time.

Identify any equipment that was purchased using CIAP funds. Provide model and serial numbers.

No equipment was purchased with CIAP funds

Attach all outstanding deliverables.

CIAP Project Closeout

Total Project Cost (ALL FUNDING SOURCES): \$310,000

Final reports are required to contain a budget breakdown for each budget category. List budget amounts for ONLY the CIAP portion of the project funded under this contract.

Federal Budget

	Original CIAP Budget	Total expenses	Remaining* CIAP Budget
Salaries (Personnel)	\$ <u>7,355.03</u>	\$ <u>7,355.03</u>	\$ <u>0.00</u>
Fringe Benefits	\$ <u>1,541.62</u>	\$ <u>1,541.62</u>	\$ <u>0.00</u>
Travel	\$ _____	\$ _____	\$ _____
Equipment	\$ _____	\$ _____	\$ _____
Supplies	\$ _____	\$ _____	\$ _____
Contractual Services	\$ <u>300,000.00</u>	\$ <u>299,922.89</u>	\$ <u>77.11</u>
Construction	\$ _____	\$ _____	\$ _____
Land Acquisition	\$ _____	\$ _____	\$ _____
Other	\$ _____	\$ _____	\$ _____
Subtotal	\$ <u>308,896.65</u>	\$ <u>308,819.54</u>	\$ <u>77.11</u>
Indirect Costs	\$ <u>1,103.35</u>	\$ <u>1,103.35</u>	\$ <u>0.00</u>
Total	\$ <u>310,000.00</u>	\$ <u>309,922.89</u>	\$ <u>77.11</u>

*All reimbursements should be complete. Upon submittal of Final Project Report and project closeout, any remaining funds are surplus and no longer accessible to the project.

 Funds being returned \$ 77.11
 Funds are not being returned.