

The State of the Bay: A Characterization of the Galveston Bay Ecosystem, 4th Edition

Executive Summary

stateofgalvbay.org

Edited by HARC GTRI

November 14, 2020

Overview

The State of the Bay: A Characterization of the Galveston Bay Ecosystem, 4th Edition (State of the Bay) was sponsored by Texas Commission on Environmental Quality's (TCEQ) Galveston Bay Estuary Program (GBEP) as a resource for historical context and up-to-date analysis of the conditions in and around Galveston Bay (Figure 1). The State of the Bay combines a legacy of monitoring with data analysis, visualization tools, maps, success stories, and a database of GBEP supported projects to serve as a comprehensive reference for scientists, managers, and decision makers. The State of the Bay is reviewed and created through the collaboration and support of stakeholders and partners who are experts in their fields working on, in and around Galveston Bay. The goal of the State of the Bay is to provide summarized information to facilitate and improve management of Galveston Bay through the Galveston Bay Plan, GBEP's Comprehensive Conservation and Management Plan.



Figure 1. Screen shot of the Bay and Public Health section of the State of the Bay, 4th Edition website stateofgalvbay.org.

The 4th edition of the State of the Bay includes analyses based on monitoring data collected through December 2017. In some cases, included datasets may be older due to quality assurance review processes and/or data availability at the time of analysis.

The State of the Bay, 4th Edition is a successor of the 3rd Edition which was released via CD and web-based PDFs. Updates to the 4th Edition include an online interactive format that is easily accessible and searchable, with interactive maps and graphs. The sections (Figure 2) were modified from previous chapters of the State of the Bay, 3rd Edition to include updated data through 2017 and cross-referenced priorities with the new Galveston Bay Plan, 2nd Edition. Freshwater Inflows and Invasive Species were covered in previous editions but are now expanded under their own, dedicated sections in response to their importance and relevance to the Galveston Bay Plan (Figure 2).

Each section includes in-depth discussion and is color coded to illustrate relationships with four plan priorities of the 2018 Galveston Bay Plan, 2nd Edition.

State of the Bay color key:

Ensure Safe Human and Aquatic Life Use
Engage Communities
Protect and Sustain Living Resources
Inform Science-Based Decision Making

Overview
The Galveston Bay Plan
Overview of Galveston Bay
Past Human Role
Present Human Role

Water, Sediment and Health
Water and Sediment Quality
The Bay and Public Health
Freshwater Inflows

Living Resources
Key Habitats
Fish & Wildlife
Invasive Species

Data, Maps and Stories
Data Viewer
Map Gallery
Success Stories
GBEP Projects
Bibliography

Figure 2. State of the Bay, 4th Edition website sections.

By migrating the State of the Bay, 4th Edition into a fully online format, select maps and graphs in each section are linked to an interactive Map Gallery and Data Visualization Tool to allow stakeholders to optimize their understanding and use of the data. Success Stories that highlight actions supported by

GBEP are the focus of *State of the Bay: A Spotlight on GBEP Success* story map. A searchable Project Database (GBEP Projects) contains details of projects funded by GBEP from 2005 to 2020. A full, searchable bibliography for the State of the Bay is also provided.

The State of the Bay, 4th Edition provides updated presentation and analysis of over 50 quality assured state, federal and local datasets that have been incorporated into the text of the 10 sections. The content of the State of the Bay, 4th Edition has undergone rigorous review by GBEP stakeholders who are scientists, conservationists, natural resource managers and experts in their fields of study.

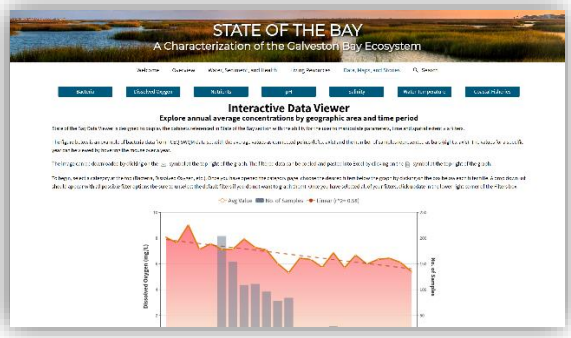

Figure 3. Data Viewer landing page https://sotb.harcresearch.org/data-maps-and-stories/data-viewer.



Figure 4. Interactive Data Viewer for bacteria.

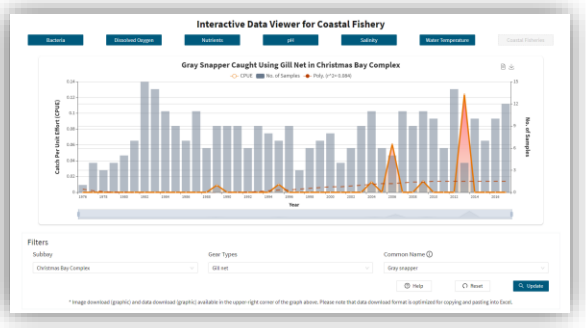

Figure 5. Interactive Data Viewer for coastal fisheries data.

Data Viewer

To facilitate the use and understanding of data by stakeholders, a Data Viewer has been added to the State of the Bay, 4th Edition that includes: TCEQ Surface Water Quality Monitoring System and Texas Parks and Wildlife Department Coastal Fisheries data. These data are available bay-wide and are often requested by stakeholders. From the Data Viewer, users can choose one of seven data categories: bacteria, dissolved oxygen, nutrients, pH, salinity, water temperature, and coastal fisheries. A tutorial will automatically pop-up to guide the user through the features of the Data Viewer (Figure 3). From there, users can filter data by whole watershed or bay, subwatershed or subbay, stream types, parameters, and seasons, as well as gear type and species for coastal fisheries data (Figures 4 and 5). Annual averages are displayed for the full time period of record and the parameter values. The number of samples collected in each year are also visible. A regression line and R^2 value is provided: linear regressions are used for water quality data (Figure 4) and polynomial regressions are used for coastal fisheries data (Figure 5). The graph created by the user can be downloaded as an image and the data can be copied and pasted as a text file.

Map Gallery

Maps provide important spatial reference as well as geographically referenced data for the Galveston Bay system. Maps are used throughout the State of the Bay, 4th Edition. In many cases, a link below the map images within the text of a section can be clicked to access an interactive map, allowing the user to explore the map data by zooming in and out and changing the area displayed. A searchable Map Gallery can be used to view the interactive maps found within the sections of the State of the Bay, 4th Edition (Figure 6). The maps can be viewed through the Map Gallery application or ArcGIS online without requiring a password or purchase of ArcGIS software.

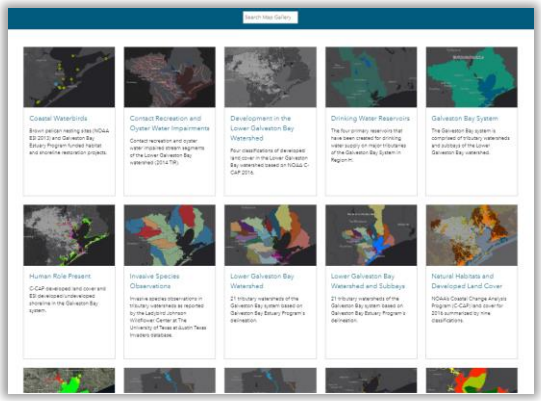

Figure 6. Searchable map gallery for all interactive maps featured in the State of the Bay.

Success Stories

Successful projects and Galveston Bay Plan, 2nd Edition implementation outcomes supported by GBEP are shared using the ArcGIS story map format, which allows for narrative text and figures to be presented along with ArcGIS map layers. In the *State of the Bay: A Spotlight on GBEP Success* **Overview**, GBEP, its purpose, the Galveston Bay Council, and subcommittees are introduced. The **Project Database** is comprised of a list of GBEP-supported projects funded from 2005-2020. The database is searchable by year awarded, contract number, program area, watershed and subbay, or keyword. **Watershed Protection Planning** (WPP) includes a map of the TCEQ-supported WPP subwatersheds for the state, as well as two non-TCEQ WPPs in the Galveston Bay watershed, and links to the websites for eight WPPs (Figure 7, top left). **Exploration Green** is a former golf course converted into a stormwater wetland in the Clear Creek watershed that successfully captured 100 million gallons of water from bayous and spared approximately 150 homes from flooding during Hurricane Harvey (Figure 7, top right). **Brown Pelican** highlights the successful recovery of the endangered species in the Galveston Bay system. The map also includes National Oceanic and Atmospheric Administration (NOAA)-identified nesting sites for various species of coastal waterbirds, along with habitat and shoreline restoration projects supported by GBEP (Figure 7, bottom left). **Invasive Species** provides an interactive map of subwatersheds of Galveston Bay with the number of invasive species reported in each, along with links to more information in the GBEP-supported field guide: *The Quiet Invasion: A guide to the invasive species of the Galveston Bay area* (galvbayinvasives.org) (Figure 7, bottom right).

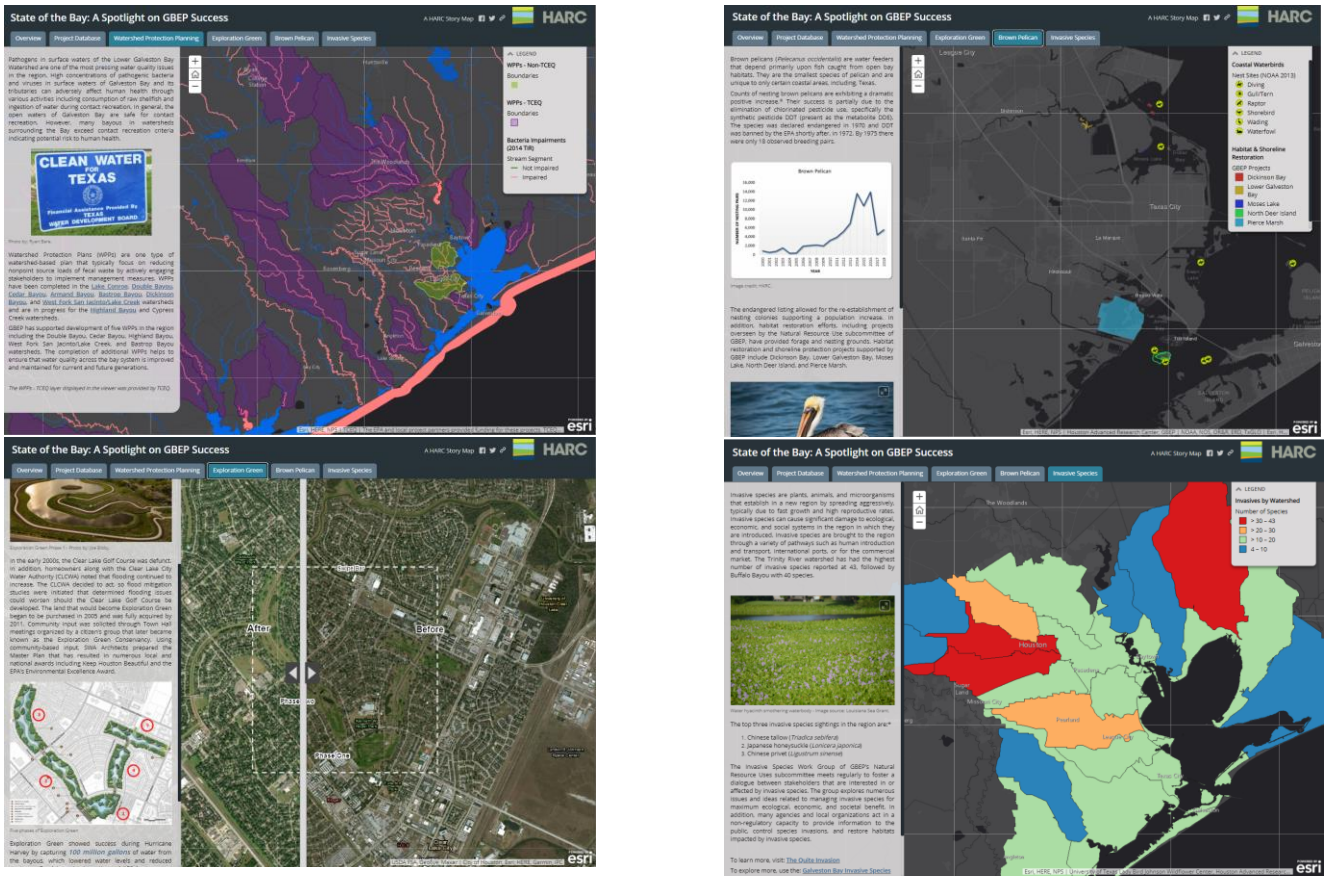

Figure 7. Featured tabs from the success stories story map, *State of the Bay: A Spotlight on GBEP Success*: Watershed Protection Planning (top left), Exploration Green (top right), Brown Pelican (bottom left), and Invasive Species (bottom right).

GBEP Projects

A direct link to the GBEP Project Database (also included in Success Stories) is listed to provide stakeholders with searchable access to GBEP-supported projects dating back to 2005. Information such as title, contract number, year awarded, contractor, program area (GBEP subcommittee), and watershed/subbay are also provided (Figure 8).

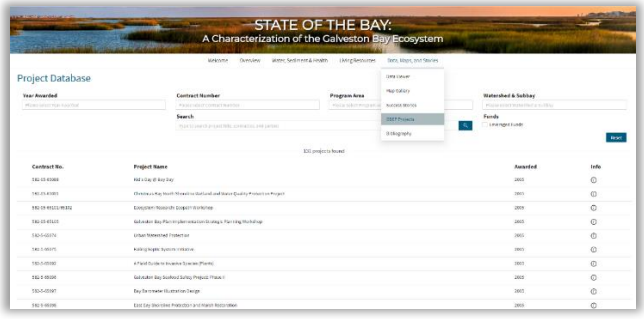

Figure 8. The searchable GBEP Project Database is accessible from the main website menu as well as Success Stories.

Additional New Features

One of the benefits to the new website format of the State of the Bay, 4th Edition, is the ability to provide improved access and navigability for users.

- Responsive design format that changes to fit the available width of the user's browser.
- Tables, figures, and graphs that can be clicked to view a larger version in a separate browser window.
- Links to interactive map versions of the map images included in each section.
- Links under graphs that can be viewed, manipulated, and downloaded by stakeholders in the data viewer.
- Ability to quickly link to related content within the State of the Bay website, as well as other websites and projects.
- A subsection navigation index list on the right-hand margin of each section that allows for quick access in an outline format.
- Subsection direct links to make the content within each section easier to share. The symbol appears next to major subsection headers to provide a copy and paste link (Figure 9).
- A searchable bibliography for the entire website on one page.
- Full website search capability (Figure 10).
- Updated photographs throughout, including many from local photographers (Figures 11, 12).

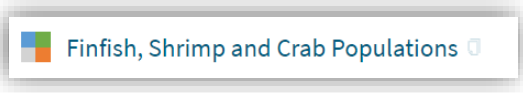

Figure 9. Example of subheading with Galveston Bay Plan cross-walk color code on left and direct link symbol on the right.

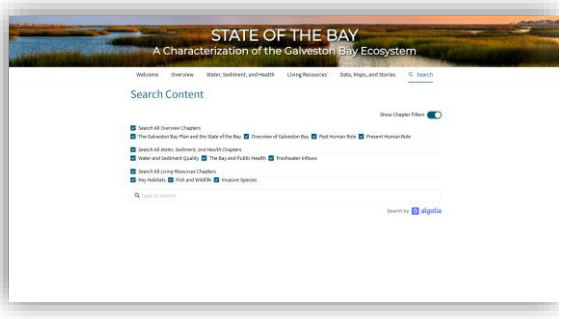

Figure 10. Full website search with filters.



Figure 11. Image from stateofgalvbay.org (Photo by: Daniel Thibodeaux ©| Daniel Ray Photo.)



Figure 12. Image from stateofgalvbay.org (Photo by: Woody Woodrow, USFWS)