

# A WATER QUALITY PROTECTION PLAN FOR SARASOTA BAY

Prepared for  
Sarasota Bay Estuary Program

February 2025



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# EXECUTIVE SUMMARY

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A 2014 study to estimate the economic value of Sarasota Bay’s natural resources concluded that the Bay contributes \$11.8 billion locally and \$57.9 billion regionally to Florida’s economy (Hindsley and Morgan 2014). Despite its substantial economic value, Sarasota Bay and the southern estuaries in Sarasota County were also entering a degraded period for water quality. Long-term water-quality monitoring data demonstrated increasing trends in total nitrogen concentrations, increased phytoplankton concentrations, recurring harmful algal blooms, and by 2018, an approximate 30% decline in seagrass coverage in Roberts, Little Sarasota, and Blackburn Bays. A combination of anthropogenic and natural factors contributed to this deleterious condition; these factors included higher-than-average rainfall and wastewater infrastructure failures that resulted in the cumulative release of over 1 billion gallons of nutrient-rich effluent from wastewater treatment plants that were not treating up to advanced wastewater treatment (AWT) standards. (Effluent meeting AWT standards has substantially lower levels of nitrogen and phosphorus than non-AWT effluent.) Under the State of Florida’s Grizzle-Figg Act, non-AWT effluent cannot be directly discharged into Sarasota Bay or its tributaries (Florida Statute 403.086).

A strong and persistent red tide event between 2016 and 2018 negatively affected wildlife populations to the point that a state of emergency was declared to remove dead fish from southwest Florida beaches and coastal waters. Wildlife populations that were already devastated by red tide lost critical habitat as seagrass acreage declined by over 1,000 acres in upper Sarasota Bay in the areas adjacent to Longbar Point. At the time, the estuaries of the Sarasota Bay Estuary Program (SBEP) had not officially been declared Impaired by the Florida Department of Environmental Protection (DEP); however, it was evident from SBEP analysis that these waters would be listed as being in violation of the Clean Water Act water quality standards as of the next listing cycle. This period between 2013 and 2019 is termed the “Degraded Period” for water quality within this document.

In response, SBEP and its local government partners began to focus heavily on laying the foundation for identifying pollutant reduction goals to bring the waterbodies back into compliance with their designated use. This stakeholder-led effort funded by the SBEP included updating pollutant loading models that had been previously used in watershed management plans for the area and compiling data necessary to understand the relationship between watershed pollutants and estuarine response. In addition, Sarasota County underwent a major initiative to improve existing wastewater infrastructure, resulting in a dramatic reduction in noncompliant effluent discharges. In total, local government partners have committed to spending over \$900 million to upgrade wastewater and stormwater infrastructure over the next 5 to 10 years (SBEP 2021). In response, water quality in Sarasota Bay began to improve from 2020 to 2023, despite episodic events that negatively affected bay health (Tomasko 2023).

At the time of publication of this report, previously Impaired portions of Sarasota Bay have been Delisted by DEP, indicating that all of the open waters of Sarasota Bay have been in compliance with their respective criteria for the last three consecutive years. This Delisting means that local stakeholders are no longer under legal obligation to reduce pollutant loads under the requirements associated with the Clean Water Act or its implementation under Florida law. However, any deterioration in water quality in these waters may result in future listings by DEP, which would initiate additional requirements to reduce pollutant loads.

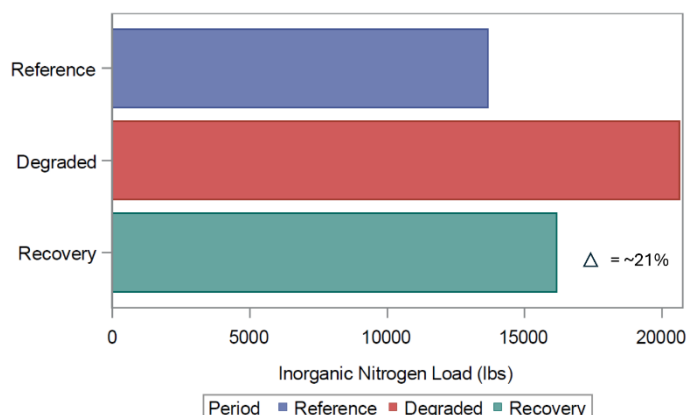
Instead of a binary pass/fail approach used by DEP, SBEP has created a Water Quality Protection Plan (WQPP) for the estuaries covered by the SBEP (this document). The WQPP is specifically crafted to identify measures necessary for the long-term protection of Sarasota Bay. It capitalizes on the existing SBEP management structure by leveraging existing interlocal agreements to bring local stakeholders together under its Water Quality Consortium to proactively identify risks and opportunities to control nutrient pollution wherever possible and thereby provide assurance that local governments are doing their part to manage bay health. The WQPP includes estimates of future pollutant loadings, identifies planned and/or future stormwater retrofit and/or wastewater upgrade projects and their estimated pollutant load reductions, and provides a flexible decision support framework to address results of ecosystem monitoring in a much more expedited fashion than DEP’s 303d listing cycle. Highlights of the WQPP are presented below.

**Identification of a Reference Period, Degraded Period, and Recovery Period.** The SBEP has developed an Ecosystem Health Report Card (Report Card), which examines four indicators of estuarine condition: total nitrogen concentrations, chlorophyll *a* concentrations, biannual seagrass acreage estimates, and the macroalgal cover at several dozen transects across the bay ([SBEP 2024](#)). Scores range from 1 (poor) to 4 (good). As part of the development of the Report Card, the SBEP identified a Reference Period (2006–2012), a Degraded Period (2013–2019) and a Recovery Period (2020–2022). The WQPP uses these designations to compare outputs of the pollutant loading model and determine the pollutant load reductions necessary to maintain healthy water quality conditions in the estuaries. The Report Card scores for 2023 are shown here for completeness but the modeling period only extends through 2022.

SBEP Ecosystem Health Report Card

Year	Palma Sola	Upper Bay	Roberts	Little Sarasota	Blackburn
2006	3.67	3.50	3.50	3.75	3.75
2007	3.00	3.25	4.00	3.75	3.75
2008	3.67	3.00	3.00	3.25	3.25
2009	3.67	3.25	3.25	3.50	3.00
2010	3.67	3.50	3.00	2.75	2.75
2011	4.00	3.50	3.00	2.75	2.50
2012	3.00	3.25	3.25	3.00	3.00
2013	3.67	3.00	2.50	2.00	2.00
2014	4.00	3.50	2.50	2.25	2.25
2015	3.67	2.75	2.00	2.00	2.00
2016	3.67	2.75	1.75	1.75	2.25
2017	3.67	2.75	2.00	2.00	2.00
2018	4.00	2.25	2.00	1.25	1.75
2019	4.00	2.75	3.25	1.50	1.50
2020	4.00	3.00	3.00	2.25	2.00
2021	3.75	3.75	3.75	2.75	3.00
2022	4.00	3.25	2.75	2.25	2.75
2023	3.75	3.50	3.50	3.00	3.25

**Development of a state-of-the-art pollutant loading model.** A major component of the development of the WQPP has been updating the pollutant loading model to reflect best estimates of actual pollutant loadings, including point sources and nonpoint sources of pollution from direct runoff, base flow (i.e., surficial groundwater), septic tank systems, irrigation, and atmospheric deposition. A major upgrade to this model was incorporating actual volumes and concentrations of reclaimed water distribution throughout the watershed as well as estimating the inorganic fraction of nitrogen and phosphorus for all sources including reclaimed and noncompliant effluent (i.e., spills). Sarasota Bay has the



highest hydrologic load of the SBEP Bay segments due to the extent of the open bay, which captures the direct deposition of rainfall. The highest total nitrogen loads occur in Roberts Bay, which accounts for approximately 43% of the total nitrogen load to the combined estuaries of the SBEP. Approximately 50% of the total load for both nitrogen and phosphorus was in inorganic form across Sarasota Bay.

While a substantial percentage of the total inorganic load came from runoff, most runoff delivers a low concentration/high volume load to the bay. Conversely, the observed noncompliant effluent was loaded with higher concentrations of inorganic nitrogen, and in some cases was associated with large volumes of water, reducing dilution capacity within the stream and delivering more easily accessible forms of nutrients to the estuary that could accelerate primary production. Improvements in water quality in the southern SBEP Bays (where the impairments were observed appear to be associated with an approximately 21% reduction in inorganic nitrogen from a combination of improvements in: control of reclaimed water from non-AWT wastewater treatment plants; spills of non-AWT effluent, and loads from septic tank systems.

**Predicting future pollutant loadings.** Since Sarasota Bay has now returned to a healthier condition that meets its designated use criteria, the focus of this study shifted to estimating the potential effects of future development and urbanization in these watersheds with an increased understanding of how different sources of nutrient pollution can disproportionately affect estuarine health. Pollutant loading model inputs were adjusted to reflect a built-out scenario for the watershed. This built-out scenario estimated 30 years of population growth by converting all developable lands (i.e., those not already developed or in conservation) to medium-density residential development, converting all wastewater treatment facilities to AWT, eliminating all septic tank systems, and eliminating any noncompliant effluent releases. The model was then run over the existing period-of-record hydrology and the loads were compared.

The “Future” loading scenario resulted in predicted increased hydrologic loads in every watershed due to increases in impervious surfaces from increased development. However, the differences were watershed dependent, with the Roberts Bay watershed reflecting very little change in hydrologic load relative to the other segments because there is little room for additional development in this highly urbanized watershed. Differences in total nitrogen load were also watershed dependent under the Future condition; there were predicted increases in nitrogen load for Palma Sola and Sarasota Bays, while small decreases in nitrogen load were predicted for the southern SBEP Bays due to elimination of septic tank systems, noncompliant effluent discharges, and the conversion of reclaimed water to AWT standards.

In general, the projected increases in loads that would be caused by converting undeveloped land to medium-density residential were offset by improvements in stormwater management (i.e., best management practices) and treating wastewater to AWT standards. Therefore, while the hydrologic loads would be expected to increase, this would not necessarily translate to increased nitrogen loads. One information gap in this analysis is how the increased volume of wastewater from high-rise development is factored into the total volumetric load. The current analysis assumes that the combination of increased levels of treatment (to AWT levels), increased wet weather storage capacity for reclaimed water, and backup deep well injection facilities will remain a viable and proven method of reducing reclaimed water loads to the SBEP Bays.

**Protecting bay health for the future.** All of the previously Impaired segments of Sarasota Bay are currently Delisted for nutrients, according to DEP; however, there is no guarantee that future assessments could not once again determine that the SBEP Bays are Impaired. The Biennial DEP listing cycle is a relatively new feature of DEP's 303d assessment, and some waterbodies that are near their water quality thresholds may vacillate between Impaired and Unimpaired conditions under these assessments. This WQPP establishes the foundation for a more systematic local management framework through which local stakeholders, scientists, and natural resource managers can collaborate on a consistent, routine basis to identify and prioritize management practices to control nutrient pollution to Sarasota Bay. Annual meetings of the SBEP Water Quality Consortium (WQC) should be held where results of the Report Card, the evaluation of water quality data relative to established numeric nutrient criteria, and an update to the action plan database of nutrient load reduction projects are presented. These meetings demonstrate commitments to protection strategies that are important to maintain the health of Sarasota Bay and give stakeholders opportunities to communicate the results of their work. Regular meetings of the SBEP WQC would complement the existing management frameworks of both the SBEP and the stakeholders and integrate many aspects of individualized watershed management plans into a single forum to identify actionable strategies to protect bay health.

A decision framework has been constructed to guide management decisions based on the outcomes of these meetings. It is recognized within this framework that a single annual exceedance or degradation of water quality would not necessarily be considered deleterious to the health of Sarasota Bay as natural variability is important for understanding the resilience of estuarine ecosystems to pollution. While the Plan emphasizes strategies and actions to protect the health of Sarasota Bay, the Plan also recognizes that natural climatological variation is a critical driver of estuarine conditions in these systems. Depending on the outcomes of these assessments, there may be cases where observed results require a special update of the pollutant loading model outside of its routine five-year run. Examples might be extreme rainfall events such as those recently experienced in 2024, when three hurricanes affected the area. Higher than expected water quality results for two consecutive years or a significant scientific advancement or policy change affecting nutrient removal efficiencies are other examples of when a special update of the model may be requested.

SBEP plays an integral role in working with all regional stakeholders to integrate science and policy into actionable efforts to protect Sarasota Bay. This WQPP is intended to galvanize those efforts to reduce pollution by the many individual stakeholders with nutrient loads to Sarasota Bay into a singular management strategy with a nexus between pass/fail regulatory criteria and providing reasonable assurance that local stakeholders are properly managing their watersheds to maintain full aquatic use of precious economic and ecology resources of Sarasota Bay of the SBEP.

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# Acronyms and Other Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
ARP	alternative restoration plan
AWT	advanced wastewater treatment
BMP	best management practice
DEP	Florida Department of Environmental Protection
EMC	event mean concentration
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FIM	Fisheries-Independent Monitoring
ICW	Intracoastal Waterway
IWR	Impaired Waters Rule
mg/L	milligrams per liter
NEXRAD	Next Generation Weather Radar
NNC	numeric nutrient criteria
NPDES	National Pollutant Discharge Elimination System
OFW	Outstanding Florida Water
PFAS	polyfluoroalkyl substances
Plan	A Water Quality Protection Plan for Sarasota Bay
RAP	reasonable assurance plan
Report Card	ecosystem health report card
SBEP	Sarasota Bay Estuary Program
SIMPLE	Spatially Integrated Model for Pollutant Loading Estimates
SWFWMD	Southwest Florida Water Management District
TMDL	total maximum daily load
WIN	Water Information Network
WQC	Water Quality Consortium
WQPP	water quality protection plan
WWTF	wastewater treatment facility

# CHAPTER 1

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## Background

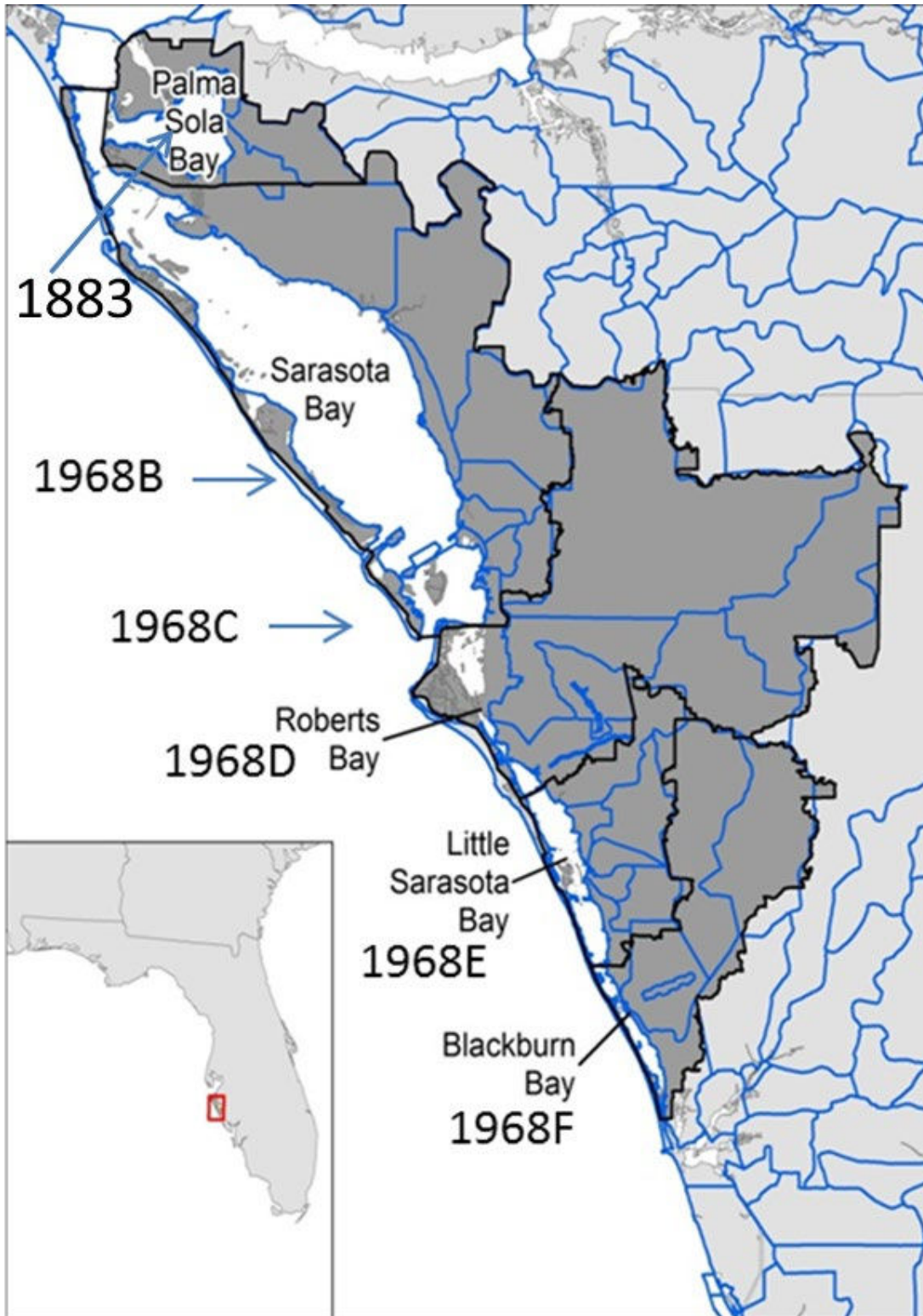
### 1.1 Purpose

In 2022, the Florida Department of Environmental Protection (DEP) classified several estuarine waterbodies in Sarasota County as “Impaired” because they exceeded chlorophyll *a* water quality standards. These waterbodies included the southern portion of Sarasota Bay, Roberts Bay, Little Sarasota Bay, and Blackburn Bay. DEP’s Impaired designation requires that pollutant load reductions be specified for these waters, either through the development of a total maximum daily load (TMDL) or an alternative restoration plan (ARP) sanctioned by DEP.

The Sarasota Bay Estuary Program (SBEP) has been actively tracking water quality trends over time and, along with its partners, became interested in developing a reasonable assurance plan (RAP; a type of ARP) to identify protective limits on nutrient pollution and identify projects to reduce nutrient loads to Sarasota, Roberts, Little Sarasota, and Blackburn Bays (referred to collectively in this document as the SBEP “Bays”).

This document also includes Palma Sola Bay and the northern portion of Sarasota Bay (located in Manatee County) in its evaluation to fully encompass the waters and waterbodies within the SBEP. Sarasota, Roberts, Little Sarasota, Blackburn, and Palma Sola Bays are referred to collectively in this document as the SBEP Bays. The waterbody ID numbers and locations of the SBEP Bays are shown in **Figure 1**.

Water quality conditions within the SBEP Bays have varied significantly over the past 30 years of routine monitoring, due in part to major events that have impacted these waterbodies and their watersheds. Several harmful algal bloom events have occurred, including a prolonged event between 2016 and 2018 (Janicki Environmental 2021). In addition, a red tide event in 2021 associated with an industrial nutrient pollution spill in Tampa Bay impacted the northern portion of the area shown in Figure 1 (Beck et al. 2022; Morrison et al. 2023; Tomasko 2023). Finally, wastewater infrastructure failures between 2010 and 2019 resulted in the noncompliant release of more than 1 billion gallons of non-advanced wastewater treatment (AWT) effluent into the SBEP Bays. The nutrient concentration in these spills was estimated to average as much as 15 milligrams per liter (mg/L) of total nitrogen (the AWT standard is 3 mg/L) and consisted mainly of inorganic nitrate-nitrogen, which is readily available for uptake by primary producing organisms (e.g., algae) in estuarine environments. However, recent upgrades to the wastewater infrastructure have drastically reduced the frequency and magnitude of these noncompliant releases since 2019. These issues are discussed further later in this document.



**Figure 1**  
Location of Bay Segments and Waterbody IDs (blue lines) in the Sarasota Bay Estuary Program

In 2024, DEP performed another assessment of water quality in the SBEP Bays and determined the previously listed bays were no longer Impaired for the water quality parameters for which they were listed in 2022. DEP’s “Delisting” process requires that the waterbodies be in compliance with the applicable numeric nutrient criteria (NNC) for 3 consecutive years. All bays met their criteria for chlorophyll *a* and nitrogen and were therefore officially Delisted as of August 16th, 2024.

Based on DEP’s assessment, pollutant load reductions are no longer required to achieve “Restoration” and a RAP is no longer necessary; however, the SBEP remains concerned that water quality could be degraded in the future without actions to ensure that the improvements made to reduce nutrient loadings to the SBEP Bays are maintained. Therefore, the SBEP Policy Board has approved the continued efforts to develop a plan to protect these waters through the development of a water quality protection plan (WQPP), which is one of six key elements listed under the U.S. Environmental Protection Agency’s (EPA’s) long-term vision for assessment, restoration, and protection under the federal Clean Water Act (EPA 2022). A WQPP is similar to a RAP but without obligations to codify pollutant-reduction goals or binding obligations to develop projects to reduce nutrient loadings within specific timeframes. This plan—A Water Quality Protection Plan for Sarasota Bay (Plan)—identifies approaches, planning priorities, and anticipated schedules to maintain pollutant loadings to protect the SBEP Bays against future degradation in the face of population growth and sea level rise. Should the waters of the SBEP Plan area become Impaired again, this Plan will serve as a foundation for quickly codifying a RAP that has legally binding agreements to reduce pollutant loadings to the SBEP Bays.

## 1.2 What Is a WQPP?

A WQPP is a type of watershed plan that is specifically developed to protect the designated use of a healthy waterbody; this Plan is different from a TMDL or a RAP, both of which focus on reducing nutrient loads to restore water quality in Impaired waters. Early regulatory watershed planning efforts by EPA and DEP primarily focused on restoring Impaired waters, and much of the key EPA guidance on development of watershed plans dates back to guidance for the federal Clean Water Act Section 319 nonpoint source program’s funding guidelines. Those guidelines identified nine minimum elements required for a restoration program to be eligible for federal funding. However, both the Clean Water Act<sup>1</sup> and EPA<sup>2</sup> have acknowledged the importance of protecting healthy waters from impairment, and these nine elements have been incorporated into subsequent broader EPA guidance on effective watershed plan development that also applies to healthy waters. Such EPA documents include the Handbook for Developing Watershed Plans to Restore and Protect Our Waters (the Handbook) (EPA 2008) and A Quick Guide to Developing Watershed Plans to Restore and Protect Our Waters (EPA 2013b). EPA guidance specifically recognizes that the overall watershed planning and implementation steps are similar for healthy and Impaired waters. As such, all watershed plans (basin management action plans, ARPs, RAPs, and WQPPs) are expected to address the nine elements of an effective watershed plan listed in Section 1.4 of this Plan.

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- 1 The objective of the federal Clean Water Act is to “restore and **maintain** the chemical, physical, and biological integrity of the nation’s waters” (emphasis added).
  - 2 Protection is one of the six objectives of EPA’s A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program (EPA 2013a).

### 1.3 How are WQPPs Different from a Regulatory Requirement?

Regulatory required pollutant load reduction goals, such as a TMDL, are characterized by the following requirements:

- Must determine the allowable loading that would result in compliance with established water quality standards.
- Must include detailed allocations to sources.
- Must identify proposed restoration actions.
- Must be submitted to DEP (and subsequently EPA) for their approval.
- Must be adopted by Secretarial Order, which makes them fully enforceable for both point sources (National Pollutant Discharge Elimination System [NPDES] wastewater and stormwater) and nonpoint sources.

In contrast, a WQPP does not have to include allocations to individual sources of nutrients, does not have to be submitted to either DEP or EPA for approval, and does not have to be adopted by Secretarial Order. Of course, these attributes of a WQPP could be considered drawbacks if they permitted the SBEP Bays to become Impaired again. For that reason, the SBEP has directed this Plan to include all the fundamental elements of a RAP other than those involving any requirement or obligation to reduce nutrient loads under a regulatory framework. In this way, if the SBEP Bays were to become Impaired again in future assessments, this Plan would contain most of the fundamental elements of a RAP and could therefore be easily converted into the regulatory framework of a RAP

The remainder of this Plan defines the necessary elements of a WQPP for the SBEP Bays.

### 1.4 What Are the Nine Elements of an Effective Watershed Plan?

The nine elements of an effective watershed plan include:

1. **Identification of Causes and Sources of Pollution:** This element involves identifying the specific pollutants that may threaten the health of the waterbody and their sources within the watershed.
2. **Estimation of Existing Pollutant Loads and Healthy/Maximum Load:** This element requires quantification of the existing pollutant loads to the watershed, establishment of a water quality target or goal, and an estimate of the maximum load of the pollutants that will maintain healthy waters such that water quality standards will continue to be met.
3. **Identification of Management Practices/Projects Needed to Maintain Loading:** This element identifies the management practices or water quality projects that will be implemented to maintain the pollutant load below levels that would cause impairment. These practices may be needed to offset increased loads due to growth in the basin or changes in pollutant loading due to climate change.
4. **Estimation of Technical and Financial Resources Needed:** This element assesses the technical and financial resources necessary to implement the WQPP successfully. This includes considering funding, personnel, and technical expertise.

5. **Description of Stakeholder Outreach Efforts and Resultant Partnerships:** For this element, the document should describe efforts to raise public awareness and encourage community participation. It should also list the participating local governments, state agencies, nonprofits, and community members. Collaborative efforts are particularly important for a WQPP because compliance with the document is voluntary.
6. **Development of a Project Schedule:** This element should include a detailed schedule for the projects identified in the plan. The schedule should account for the need for sufficient projects to be completed each year to offset the increases in nutrient loading expected from growth.
7. **Description of Interim Milestones:** This element is generally intended to ensure that long-term restoration plans are making reasonable progress toward attainment of water quality standards. In this case, interim milestones are needed to ensure progress on specific long-term projects to protect against future loads that may result in a degradation of water quality.
8. **Identification of Criteria/Targets to be Used to Assess Plan Effectiveness:** This element establishes a readily measurable water quality target to determine plan effectiveness. In this case, the SBEP Ecosystem Health Report Card, which incorporates total nitrogen, chlorophyll *a*, submerged aquatic vegetation, and macroalgae targets (see Section 3.2), will be used, in addition to established numeric nutrient criteria (NNC) to monitor Plan effectiveness.
9. **Development of a Monitoring Plan:** This element describes the water quality monitoring plan that will be used to measure effectiveness of the plan, including details of monitored parameters, monitoring locations, monitoring frequencies, and monitoring entities.

Fortunately, many of these elements have long been established in the SBEP Bays area. The SBEP and its partners have long used an established pollutant loading model to estimate pollutant loads to the estuary and have developed watershed management plans for all five waterbodies. In addition, SBEP and its partners have a long-standing and robust water quality monitoring program and established evidence that the estuarine health in these waterbodies are generally limited by nitrogen pollution though it is accepted that controlling both nitrogen and phosphorus is the most effective way to maintain ecosystem health in these systems.

The remainder of this Plan is organized as follows:

- Chapter 2: Describes the general watershed and estuarine characteristics of the SBEP Bays.
- Chapter 3: Outlines the existing water quality criteria and thresholds by which waters of the SBEP are evaluated by regulatory authorities.
- Chapter 4: Describes the local ecological and water quality goals.
- Chapter 5: Identifies the pollutant loading model currently used throughout the waters of the SBEP.
- Chapter 6: Identifies the pollutant loading targets for the SBEP Bays.
- Chapter 7: Outlines the ongoing and proposed management actions to protect the SBEP Bays.
- Chapter 8: Identifies procedures and reporting intervals.
- Chapter 9: Identifies commitments from responsible entities and frameworks necessary to protect water quality against future growth.

# CHAPTER 2

## Watershed and Estuarine Characteristics

### 2.1 General Watershed Characteristics

Together, the SBEP Bays constitute an estuary of national significance, and each bay is listed as an Outstanding Florida Water (OFW). Of the SBEP Bays, Sarasota Bay and Roberts Bay have the largest watersheds (39,872 and 40,942 acres, respectively). Sarasota Bay’s open water area is substantially larger than any other bay segment; at 10,489 acres, Sarasota Bay has more open water than the other four bays combined (Table 1).

**TABLE 1.**  
**WATERSHED AND OPEN WATER ACREAGE OF THE SBEP BAYS**

<b>Watershed</b>	<b>Watershed (acres)</b>	<b>Open Water (acres)</b>	<b>Watershed-to-Open-Water Ratio (approx.)</b>
<b>Palma Sola Bay</b>	6,587	3,215	2:1
<b>Sarasota Bay</b>	39,872	10,489	4:1
<b>Roberts Bay</b>	40,942	1,224	33:1
<b>Little Sarasota Bay</b>	8,580	1,948	4:1
<b>Blackburn Bay</b>	14,572	725	20:1

NOTE: SBEP = Sarasota Bay Estuary Program.

Jurisdictions within these watersheds include the City of Bradenton, the City of Sarasota, and the barrier island town of Longboat Key, as well as unincorporated areas of Manatee and Sarasota counties such as Osprey, Nokomis, and Siesta Key. The general watershed characteristics of each bay (i.e., the Plan Area) are presented in the following sections, ordered from north to south.

#### 2.1.1 Palma Sola Bay

Palma Sola Bay is the northernmost of the SBEP Bays; it is located between the barrier island of Anna Maria and the City of Bradenton and connects to Sarasota Bay via Anna Maria Sound. Analysis of the 2020 land use coverage from the Southwest Florida Water Management District (SWFWMD) identified that ca. three-quarters of the watershed is considered urban and built up (48.15) while 6% was classified as agriculture with the remaining 18% as natural (Khan Boupna, 2024, pers. Comm.). The City of Cortez is located southeast of Palma Sola Bay. It is one of the last commercial fishing villages in Florida and on the National Register of Historic Places. Manatee County’s Robinson Preserve is to the north of Palma Sola Bay. The bay’s seagrass exhibits a relatively stable coverage trend and the bay was not listed as Impaired when the more southern SBEP Bays were listed as part of the 2021 DEP assessment.

## 2.1.2 Sarasota Bay

The Sarasota Bay watershed once consisted of an expanse of pine flatwoods and other upland systems, numerous wetlands, and marshy tributaries that slowly drained into the bay. These native natural systems provided habitat, aided flood control, and improved water quality. Many of these natural systems were altered and degraded by urban and agricultural development over the past 100 years, resulting in major changes in the watershed. Today, the watershed is highly developed, with residential, commercial and industrial land uses. The highly urbanized landscape consists of many older neighborhoods built prior to the development of stormwater regulations and therefore these areas provide only minimal stormwater retention or detention. Only about 10% of the watershed is undeveloped, which significantly affects water quality, water quantity, habitat, and flooding risks (JEA and Janicki Environmental 2012a).

Sarasota Bay is bounded by the mainland on the east, and Manasota, Longboat Key, and Lido Key on the west. Tidal mixing with the Gulf of Mexico occurs through three major passes: Longboat Pass, New Pass, and Big Pass. The bay also has four major tributaries: Cedar Hammock and Bowlees Creek in Manatee County, and Whitaker Bayou and Hudson Bayou in Sarasota County. Together, these four tributaries drain most of the 80-square-mile watershed (JEA and Janicki Environmental 2012a). Sarasota Bay has a watershed-to-open-water ratio of approximately 4:1 (Table 1).

## 2.1.3 Roberts Bay

The Roberts Bay watershed is in the northwest portion of Sarasota County. Most of the watershed's 40,942 acres are located in Sarasota County; however, approximately 300 acres of the northernmost portion of the Phillippi Creek basin are located in Manatee County. The receiving waterbody for Roberts Bay is approximately 1,224 acres, yielding a 33:1 watershed-to-open-water ratio (Table 1). This ratio is high for waterbodies in the area. Other estuaries in southwest Florida outside of the SBEP vary between approximately 12:1 (Charlotte Harbor) and approximately 6:1 (Tampa Bay) (JEA and Janicki Environmental 2010).

The majority of the Roberts Bay watershed consists of medium-density residential development (two to five dwelling units per acre) and has been significantly impacted by anthropogenic activities (JEA and Janicki Environmental 2010). Impacts include alterations to surface water hydrology from channelization of natural streams; reduction of natural surface water storage; and degradation to water quality from stormwater runoff, historical wastewater plant discharges, septic system effluent, and conversion of natural watershed habitat to agriculture and urban land uses.

## 2.1.4 Little Sarasota Bay

Located on the west-central coast of Florida, the Little Sarasota Bay watershed is central to the communities of Unincorporated Sarasota County, Osprey, Siesta Key, and Casey Key. The watershed spans approximately 16 square miles of the west-central coast of Sarasota County and includes five named tributaries (Elligraw Bayou, Holiday Bayou, Clower Creek, Catfish Creek, and North Creek), two barrier islands (Siesta Key and Casey Key), and a portion of the mainland that drains directly to the bay. The Little Sarasota Bay watershed is bounded by the Roberts Bay watershed to the north, Interstate 75 to the east, and Blackburn Point to the south. Little Sarasota Bay is bounded to the west by the barrier islands of Siesta Key and Casey Key. These keys were historically separated by a natural inlet to the Gulf

of Mexico known as Midnight Pass, but between the 1960s and 1980s, several natural and anthropogenic factors resulted in the growth of a narrow strip of sandy beach that closed the pass and connected the two keys. Hurricanes Helene and Milton in 2024 have now reopened this pass, at least temporarily.

The Little Sarasota Bay watershed is relatively flat and much of the watershed has been altered, leaving only isolated natural and conservation areas that provide infiltration and habitat for many threatened and endangered native species. Much of the watershed lies within an area designated by the SWFWMD as the Southern Water Use Caution Area. Little Sarasota Bay is classified as an Estuary of National Significance, SWFWMD Surface Water Improvement and Management Priority waterbody, and an OFW. It is a highly urbanized watershed (only about 17% is undeveloped), consisting of a lot of older neighborhoods that provide only minimal stormwater retention or detention, especially in the coastal area. Untreated runoff contributes sediment and pollutants to Little Sarasota Bay and its tributaries. Despite the urban nature of much of the watershed, some areas of land remain undeveloped, particularly in the Catfish Creek and North Creek Basins. Average rainfall in the watershed is 53 inches per year (JEA and Janicki Environmental 2012b).

### 2.1.5 Blackburn Bay

Located on the west-central coast of Florida, the Blackburn Bay watershed spans almost 24 square miles of unincorporated Sarasota County and consists of Blackburn Bay, Dryman Bay, one major tributary (South Creek), and the barrier island of Casey Key. The Blackburn Bay watershed extends from Clark Road in the north to Albee Road in the south. The watershed is bordered by the Little Sarasota Bay watershed to the north, the Cow Pen Slough watershed to the east, and Lyons Bay to the south. Blackburn Bay itself, including the portion known as Dryman Bay, extends from the Blackburn Point Road Bridge south to the Albee Road Bridge, a distance of about 4 miles. The bay is bounded to the west by the barrier island of Casey Key and to the east on the mainland by the neighborhoods of North Venice and Laurel (JEA and Janicki Environmental 2012b).

The Blackburn Bay watershed lies within an SWFWMD-classified Southern Water Use Caution Area and the bay has been designated as an OFW. The watershed is relatively flat and has an average rainfall of 53 inches per year. The ratio of the watershed to the estuary open water (Table 1) is approximately 20:1, which is one of the higher ratios in the region. This high ratio means that there is more freshwater inflow and associated pollutants reaching the waterbody than in systems with a lower ratio. Thus, the waterbody may be affected more by watershed processes than by internal cycling (JEA and Janicki Environmental 2012b).

Surface water runoff flows across the watershed terrain through ditches, storm drains, creeks, and wetlands, and eventually into the bay. Untreated runoff contributes sediment and pollutants to South Creek and Blackburn Bay (JEA and Janicki Environmental 2012b).

To reach the Gulf of Mexico, water in Blackburn Bay must either flow south and out Venice Inlet or north through Little Sarasota Bay (and now, at least temporarily Midnight Pass), or up through Roberts Bay, and Sarasota Bay to Big Sarasota Pass. Tidal circulation in Blackburn Bay is forced by tides at Venice Inlet and the Intracoastal Waterway (ICW), which runs through the middle of the bay. These narrow flow paths are relatively shallow except for the deeper ICW channel. The ICW enhances circulation and flushing, and reduces retention time of water in the bay, which reduces the accumulation of pollutants.

Blackburn Bay has relatively good circulation and water quality because of its proximity to Venice Inlet (JEA and Janicki Environmental 2012b).

## 2.2 Trends in Bay Health

### 2.2.1 SBEP Ecosystem Health Report Card

The SBEP has developed a method to track conditions within the SBEP Bays, the Ecosystem Health Report Card (Report Card), which examines four indicators of estuarine condition: total nitrogen concentrations, chlorophyll *a* concentrations, seagrass acreage, and the extent of macroalgal cover at established seagrass transects. Each indicator provides a different perspective on ecosystem health, and combining the scores of these individual indicators provides an index of the eutrophication status in the SBEP Bays. The Report Card is updated annually, and details of the calculations can be found on the SBEP webpage at <https://sarasotabay.org/our-estuaries/report-card/> (SBEP 2024).

To create the Report Card, annual scores are calculated and compared to the Reference Period condition, defined as 2006–2012, when water quality and seagrass coverage was generally good across all bay segments. During that time, seagrass coverage increased, water quality was meeting its designated use with respect to nutrients and chlorophyll *a*, and macroalgae cover was relatively low. Score values range from 1 to 4. On the low end of the scale, 1 represents poor outcomes (a “D” grade) with respect to ecosystem health compared to the Reference Period. On the high end of the scale, 4 represents positive ecosystem conditions (and an “A” grade) relative to the Reference Period. The most recent Report Card graphic is presented in Figure 2 and displays the results for each year since 2006. The year column in Figure 2 is also color coded to represent the Reference Period (2006–2012), the Degraded Period (2013–2019), and the Recovery Period (2020–2022). The Report Card scores for 2023 are shown here for completeness but the modeling period only extends through 2022.

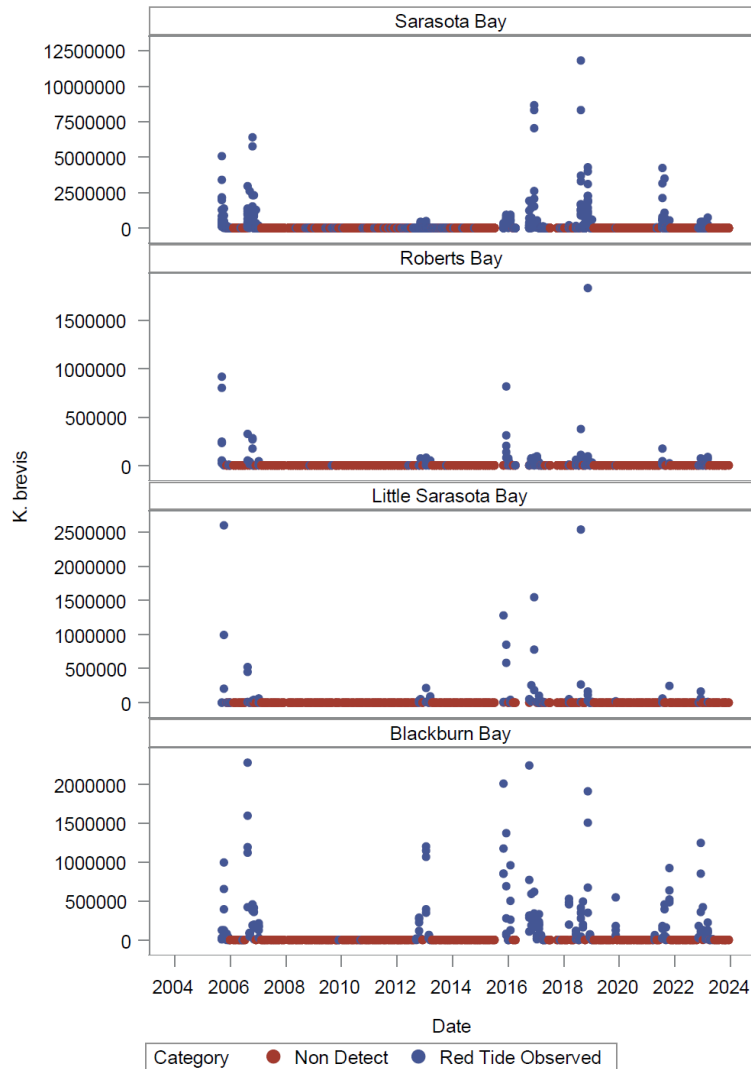
Year	Palma Sola	Upper Bay	Roberts	Little Sarasota	Blackburn
2006	3.67	3.50	3.50	3.75	3.75
2007	3.00	3.25	4.00	3.75	3.75
2008	3.67	3.00	3.00	3.25	3.25
2009	3.67	3.25	3.25	3.50	3.00
2010	3.67	3.50	3.00	2.75	2.75
2011	4.00	3.50	3.00	2.75	2.50
2012	3.00	3.25	3.25	3.00	3.00
2013	3.67	3.00	2.50	2.00	2.00
2014	4.00	3.50	2.50	2.25	2.25
2015	3.67	2.75	2.00	2.00	2.00
2016	3.67	2.75	1.75	1.75	2.25
2017	3.67	2.75	2.00	2.00	2.00
2018	4.00	2.25	2.00	1.25	1.75
2019	4.00	2.75	3.25	1.50	1.50
2020	4.00	3.00	3.00	2.25	2.00
2021	3.75	3.75	3.75	2.75	3.00
2022	4.00	3.25	2.75	2.25	2.75
2023	3.75	3.50	3.50	3.00	3.25

**Figure 2**  
Sarasota Bay Ecosystem Health Report Card

The SBEP recognizes that there are other factors that also play a role in the health of our bays, including red tide, bacterial contamination, and emerging contaminants such as microplastics and polyfluoroalkyl substances (PFAS). These indicators are currently not factored into the Report Card; however, some data are collected that can provide additional insights into the health of the SBEP Bays.

## 2.2.2 Harmful Algal Blooms

In southwest Florida, the harmful algal bloom known as red tide is caused by the dinoflagellate *Karenia brevis* (Davis 1948). Red tides have repeatedly occurred in the SBEP Bays and have, at times, caused large fish kill events that fuel a negative feedback loop that can reduce dissolved oxygen and free up nutrients to be taken up by macroalgae that can in turn smother seagrasses. Mote Marine Laboratory has routinely collected *K. brevis* data since 2006, though some gaps exist in the timeseries. Analysis conducted in preparation for this Plan (Janicki Environmental 2021) identified several occasions when *K. brevis* blooms were present in some parts of the SBEP Bay segments (Figure 3), including in 2006, late 2012, early 2013, late 2015, early 2016, 2018, 2021, and 2022. However, the intensity and duration of these blooms were more apparent between 2015 and 2019 during the Degraded Period. Further investigation suggested that these blooms can affect measured chlorophyll *a* concentrations that are used to assess compliance with state water quality standards (Janicki Environmental 2021).



**Figure 3**

Timeseries Plot of *K. brevis* Counts (cells/liter) from Routine Monthly Sampling in each of the SBEP Bays within Sarasota County

### 2.2.3 Active Areas of Research

The SBEP and the local scientific community have several ongoing active areas of research to understand relationships between nutrients and ecosystem health and develop solutions to remediate these effects. The SBEP has enhanced monitoring of macroalgal communities (including Chlorophyta and Rhodophyta “drift algae”), as well as the blue-green algae *Dapis pleurocapsa*, which can become toxic to wildlife and humans at high concentrations. All of these algae types can, with excessive overgrowth, lead to adverse conditions in the estuaries by blocking light to seagrass communities and depleting oxygen concentrations in the water when decomposing. In addition, routine fisheries monitoring occurs in the open bay estuarine systems; Mote Marine Laboratory conducts specialized research on fisheries habitats in tidal creeks and has a long-term dataset on dolphin populations in Sarasota Bay. Furthermore, several agencies are actively conducting research on methods to mitigate red tide blooms, along with general burgeoning

interest in quantifying the concentration and effects of microplastics and emerging contaminants in the environment. A wealth of information on scientific research, data, and the status and trends of many of these ancillary research topics in Sarasota County can be found by visiting the Sarasota County Water Atlas online at <https://sarasota.wateratlas.usf.edu/>.

## CHAPTER 3

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# State of Florida Water Quality Criteria and Thresholds

DEP is tasked with enforcing Section 303(d) of the federal Clean Water Act for the state; DEP uses a process called the Watershed Management Approach to implement the 303(d) program. Rule 62-302.530 (47)(b), Florida Administrative Code (F.A.C.) states that, “*in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.*” The overarching DEP goal of this narrative criteria is to “*manage nutrients in surface water and groundwater at loadings or concentrations that result in protection and maintenance of healthy, well-balanced aquatic communities.*” Specifically with respect to evaluating compliance with the 303(d) program, DEP evaluates water quality data reported to its Water Information Network (WIN) every 2 years to determine whether waterbodies are meeting their designated use under Chapter 62-303, also known as the Impaired Waters Rule (IWR). The following sections describe the listing process and current status as it pertains to evaluation of waterbodies within the Plan Area.

### 3.1 State Water Quality Assessments

The IWR categorizes waterbodies into one of the following categories:

- Category 1 – Not Impaired (attains all uses)
- Category 2 – Meets standards, not Impaired
- Category 3 – Insufficient data
- Category 4 – Does not meet standards, but a TMDL is not needed or is complete (this includes a “Study List”)
- Category 5 – Does not meet standards and is considered “Impaired”

A waterbody in Category 5 is Impaired if it fails one or more water quality criterion and will remain on the verified list until it meets one of the following criteria:

- The waterbody meets the criteria for all parameters for which it was listed for 3 consecutive years (delisted and moved to Category 2).
- A TMDL is developed determining the required load reductions to meet the criteria (delisted and moved to Category 4A).
- A restoration plan is put in place to bring the waterbody into compliance (moved to Category 4B or 4E).

The State of Florida has replaced many of the pertinent criteria used to develop older EPA TMDLs used as part of the 1998 303(d) list. The Trophic Status Index is no longer used for estuaries in Florida; NNC have replaced the Trophic Status Index as applicable water quality standards for the SBEP Bays. New criteria for fresh and marine waters for dissolved oxygen have also been adopted. In addition, total coliform and fecal coliform are no longer recognized in Florida as fecal indicator bacteria except in Class 2 waters and will no longer be evaluated by DEP. New bacteriological indicators have been adopted including *Escherichia coli* (*E. coli*) in freshwaters and *Enterococci* in marine/estuarine waters. Therefore, while the EPA TMDLs are not technically invalidated, they are now principally obsolete.

## 3.2 Currently Applicable Regulatory Water Quality Criteria

In 2014, DEP derived numeric interpretations of its narrative criteria for nutrients and published those values for the open bay estuaries of the SBEP in rule 62.302.532(c), F.A.C. These criteria are dependent on the type and class of the waterbody being assessed, as described in the subsections on currently applicable criteria. The NNC adopted by DEP and approved by EPA for the SBEP Bays—the focus of this Plan—are listed in Table 2. The NNC are based on a reference period approach to establish the chlorophyll *a* thresholds, in combination with a stressor-response relationship developed between chlorophyll *a* concentrations and total nitrogen concentrations to define the total nitrogen concentration that would prevent a chlorophyll threshold exceedance, on average.

**TABLE 2.**  
**NUMERIC NUTRIENT CRITERIA APPLICABLE BY WATERBODY TYPE**

Estuaries			
Waterbody	Total Nitrogen	Total Phosphorus	Chlorophyll <i>a</i>
Palma Sola Bay	0.93 mg/L as AGM	0.26 mg/L as AGM	11.8 µg/L as annual mean
Sarasota Bay	See paragraph 62-302.532(1)(i), F.A.C.	0.19 mg/L as AGM	6.1 µg/L as annual mean
Roberts Bay	0.54 mg/L as AGM	0.23 mg/L as AGM	11.0 µg/L as annual mean
Little Sarasota Bay	0.60 mg/L as AGM	0.21 mg/L as AGM	10.4 µg/L as annual mean
Blackburn Bay	0.43 mg/L as AGM	0.21 mg/L as AGM	8.2 µg/L as annual mean

NOTES: µg/L = micrograms per liter; AGM = annual geometric mean; F.A.C. = Florida Administrative Code; mg/L = milligrams per liter.

The criteria applicable to the freshwater portions of the watershed, including lakes and streams, were based on regionally based reference site conditions. The criteria for lakes are dependent on long-term color and calcium carbonate concentrations relative to outcomes of chlorophyll *a* evaluations (Table 3).

**TABLE 3.**  
**CURRENTLY APPLICABLE WATER QUALITY STANDARDS FOR FRESHWATER LAKES AND STREAMS**

Waterbody Description	Total Nitrogen		Total Phosphorus		Chlorophyll <i>a</i>
<b>Streams</b>					
West Central	1.65 mg/L as AGM		0.49mg/L as AGM		20 µg/L as AGM
<b>Lakes</b>					
	If Chl > 20	If Chl < 20	If Chl > 20	If Chl < 20	
≥ 40 platinum cobalt units	1.27 mg/L as AGM	2.23 mg/L as AGM	0.05 mg/L as AGM	0.16 mg/L as AGM	20 µg/L as AGM
≤ 40 platinum cobalt units ≥ 20 mg/L CaCO <sub>3</sub>	1.05 mg/L as AGM	1.91 mg/L as AGM	0.03 mg/L as AGM	0.09 mg/L as AGM	20 µg/L as AGM
≤ 40 platinum cobalt units ≤ 20 mg/L CaCO <sub>3</sub>	0.51 mg/L as AGM	0.93 mg/L as AGM	0.01 mg/L as AGM	0.03 mg/L as AGM	6 µg/L as AGM

NOTES: µg/L = micrograms per liter; AGM = annual geometric mean; CaCO<sub>3</sub> = calcium carbonate; Chl = chlorophyll *a*; mg/L = milligrams per liter.

Dissolved oxygen criteria were changed from evaluating concentrations (i.e., mg/L) to evaluating dissolved oxygen percent saturation to account for the effects of temperature on the ability of water to hold oxygen. The criteria for fecal indicator bacteria were also revised to reflect advances in the understanding of sources and indicators of human pathogens. These criteria (shown in Table 4) are dependent on whether the waterbody is predominantly fresh or predominantly marine.

**TABLE 4.**  
**APPLICABLE DISSOLVED OXYGEN AND FECAL INDICATOR BACTERIA BY WATERBODY TYPE**

Waterbody Type	DO % Saturation	<i>E. coli</i>	<i>Enterococci</i>	Fecal Coliform*
<b>Freshwater Streams</b>	No more than 10% daily average values below 38%.	MPN or MF counts shall not exceed the TPTV of 410 in 10% or more of the samples during any 30-day period.	n/a	n/a
<b>Estuary and Marine (tidal) Streams</b>	No more than 10% daily average values below 42%.	n/a	MPN or MF counts shall not exceed the TPTV of 130 in 10% or more of the samples during any 30-day period.	n/a
<b>Class 2 Shellfish Harvesting</b>	n/a	n/a	n/a	MPN or MF counts shall not exceed a median value of 14 with not more than 10% of the samples exceeding the TPTV of 43 (for MPN) or 31 (for MF), nor exceed 800 on any one day.

NOTES: DO = dissolved oxygen; MF = Membrane Filtration; MPN = Most Probable Number; TPTV = 10% threshold value  
\*Fecal coliform bacteria now only apply to shellfish harvesting criteria

### 3.3 DEP 2020 Biennial Assessment

DEP conducted the 2020 Biennial Assessment based on the IWR Run 60 database using data collected from January 1, 2013, through June 30, 2020. These biennial assessments are typically approved by the DEP Secretary 18 to 24 months after the end of the period of record. This means information collected for an assessment becomes official generally within 2 years of the defined assessment period. The 2020 assessment (which became official in 2022) used the updated NNC, fecal indicator bacteria, and dissolved oxygen criteria that were in place as of October 17, 2016, as previously described.

The 2020 assessment for estuarine waters resulted in a number of waterbodies that failed one or more water quality criteria and as a result were listed as Impaired (Table 5). The Impaired designation identifies those waters requiring the development of a TMDL or an ARP, such as a RAP or pollution reduction plan. As mentioned, the 2020 assessment placed the four estuarine bay segments (SBEP Bays) on the Impaired list for failing the appropriate chlorophyll *a* criterion, which is the basis of this Plan. Bacterial impairments are provided here for completeness, but are not addressed by this Plan.

**TABLE 5.**  
**SBEP ESTUARINE WATERS DEEMED IMPAIRED BY DEP AS PART OF THE 2020 BIENNIAL ASSESSMENT**

WBID	Waterbody	Waterbody Type	Waterbody Class	Parameter Group	Parameter
1968F	Blackburn Bay	Estuary	3M	Nutrients	Nutrients (chlorophyll <i>a</i> )
1896	Bowlees Creek	Estuary	3M	Bacteria	<i>Enterococci</i>
				Nutrients	Nutrients (chlorophyll <i>a</i> )
1868	Direct runoff to bay	Estuary	2	Bacteria	Fecal coliform (SEAS classification)
1953	Hudson Bayou (tidal)	Estuary	3M	Bacteria	Fecal coliform
				Dissolved oxygen	Dissolved oxygen (% saturation)
1968E	Little Sarasota Bay	Estuary	3M	Nutrients	Nutrients (chlorophyll <i>a</i> )
1984A	North Creek (tidal)	Estuary	3M	Bacteria	<i>Enterococci</i>
				Dissolved oxygen	Dissolved oxygen (% saturation)
				Nutrients	Nutrients (chlorophyll <i>a</i> )
1947	Philippi Creek (tidal)	Estuary	3M	Bacteria	<i>Enterococci</i>
1968D	Roberts Bay	Estuary	3M	Nutrients	Nutrients (chlorophyll <i>a</i> )
1968B	Sarasota Bay	Estuary	2	Bacteria	Fecal coliform (SEAS classification)
1968C	Sarasota Bay	Estuary	2	Nutrients	Nutrients (chlorophyll <i>a</i> )
1885A	West Cedar Hammock	Estuary	3M	Bacteria	<i>Enterococci</i>
1936	Whitaker Bayou (tidal)	Estuary	3M	Bacteria	<i>Enterococci</i>
				Dissolved oxygen	Dissolved oxygen (% saturation)
				Nutrients	Nutrients (chlorophyll <i>a</i> )

NOTES: DEP = Florida Department of Environmental Protection; SBEP = Sarasota Bay Estuary Program; SEAS = Shellfish Environmental Assessment Section ; WBID = waterbody ID.

The results for the 2020 assessment for lakes and streams that resulted in an Impaired designation are provided in Table 6. These waters were mostly streams with bacterial or nutrient impairment designations.

**TABLE 6.**  
**VERIFIED IMPAIRED LIST BASED ON 2020 DEP ASSESSMENT FOR LAKES AND STREAMS**

WBID	Waterbody	Waterbody Type	Waterbody Class	Parameter Group	Parameter
1971	Clark Lake	Lake	3F	Bacteria	<i>Escherichia coli</i>
				Nutrients	Nutrients (chlorophyll a)
				Nutrients	Nutrients (total nitrogen)
				Nutrients	Nutrients (total phosphorus)
1971A	Clark Lake Drainage	Stream	3F	Bacteria	<i>Escherichia coli</i>
1975A	Clower Creek	Stream	3F	Bacteria	<i>Escherichia coli</i>
1953A	Drain to Hudson Bayou	Stream	3F	Bacteria	<i>Escherichia coli</i>
				Nutrients	Nutrients (macrophytes)
1975B	Matheny Creek	Stream	3F	Bacteria	<i>Escherichia coli</i>
				Nutrients	Nutrients (macrophytes)
1941	Philippi Creek Tributary	Stream	3F	Bacteria	<i>Escherichia coli</i>
				Bacteria	<i>Escherichia coli</i>
				Nutrients	Nutrients (macrophytes)
				Nutrients	Nutrients (total nitrogen)
1937	Philippi Creek	Stream	3F	Bacteria	<i>Escherichia coli</i>
				Nutrients	Nutrients (macrophytes)
1975	Tributary to Elligraw Bayou	Stream	3F	Nutrients	Nutrients (chlorophyll a)
1936A	Walker Creek	Stream	3F	Bacteria	<i>Escherichia coli</i>

NOTES: DEP = Florida Department of Environmental Protection; WBID = waterbody ID.

The waters placed on the study list are those that do not meet the appropriate criteria, but more information is needed before listing them as Impaired (Table 7). These listings typically include waterbodies that exceed dissolved oxygen criteria. In the case of dissolved oxygen, this is usually because a causative pollutant has not been identified. For exceedances of the new fecal indicator bacteria criteria, this is usually because there have not been enough samples collected. These waterbodies will not be placed on the EPA 303(d) list as Impaired until further analysis is conducted.

**TABLE 7.**  
**SBEP WATERS PLACED ON THE STUDY LIST BY DEP AS PART OF THE 2020 BIENNIAL ASSESSMENT**

WBID	Waterbody	Waterbody Type	Waterbody Class	Parameter Group	Parameter
1947	Philippi Creek (tidal)	Estuary	3M	Dissolved oxygen	(% saturation)
1982A	South Creek	Estuary	3M	Dissolved oxygen	(% saturation)
1975A	Clower Creek	Stream	3F	Dissolved oxygen	(% saturation)
1953A	Drain to Hudson Bayou	Stream	3F	Dissolved oxygen	(% saturation)

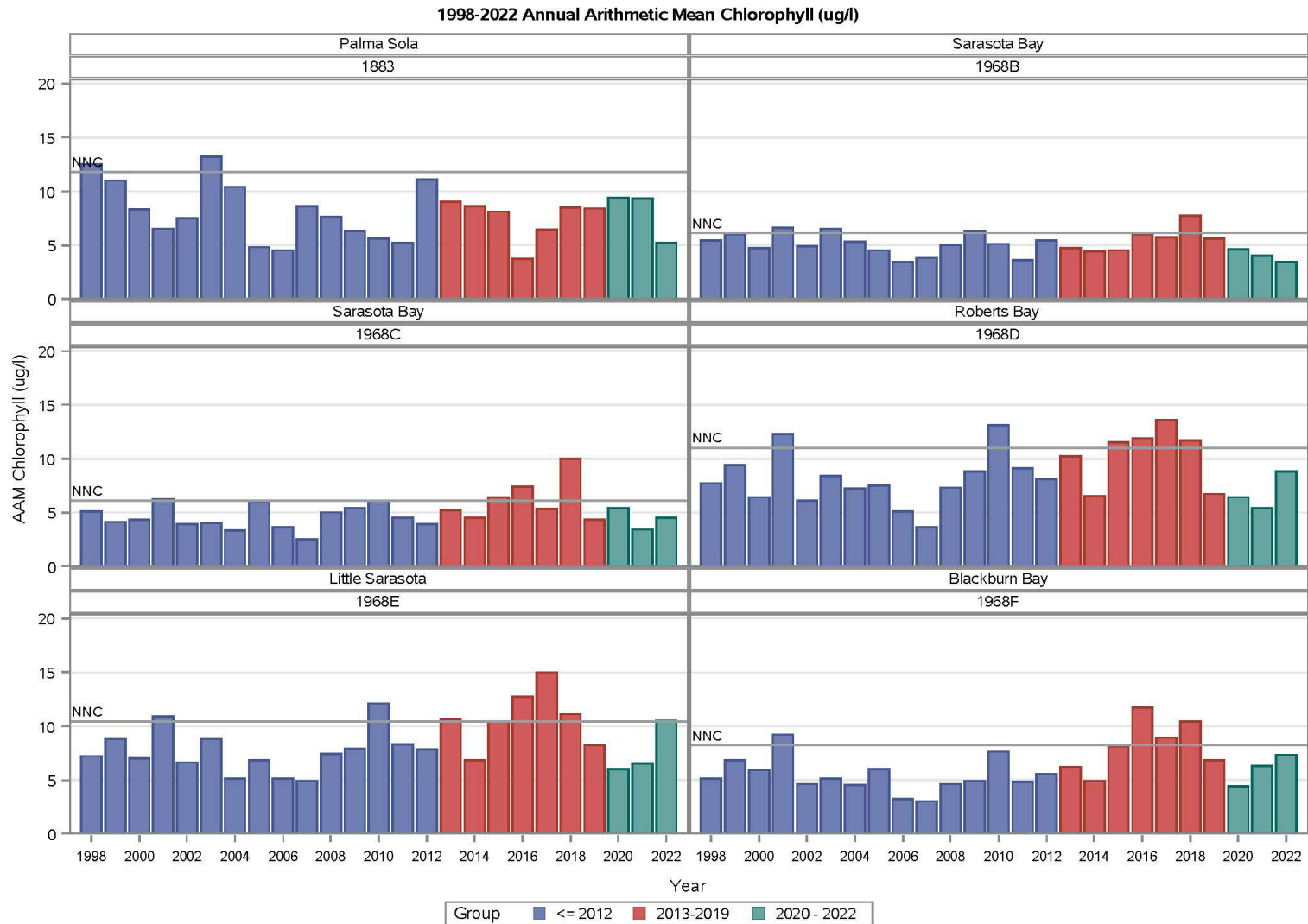
WBID	Waterbody	Waterbody Type	Waterbody Class	Parameter Group	Parameter
1975B	Matheny Creek	Stream	3F	Dissolved oxygen	(% saturation)
1984AB	North Creek	Stream	3F	Dissolved oxygen	(% saturation)
1941	Philippi Creek Tributary	Stream	3F	Dissolved oxygen	(% saturation)
1982	South Creek	Stream	3F	Dissolved oxygen	(% saturation)
				Bacteria	<i>Escherichia coli</i>
1975	Tributary to Elligraw Bayou	Stream	3F	Dissolved oxygen	(% saturation)

NOTES: DEP = Florida Department of Environmental Protection; SBEP = Sarasota Bay Estuary Program; WBID = waterbody ID.

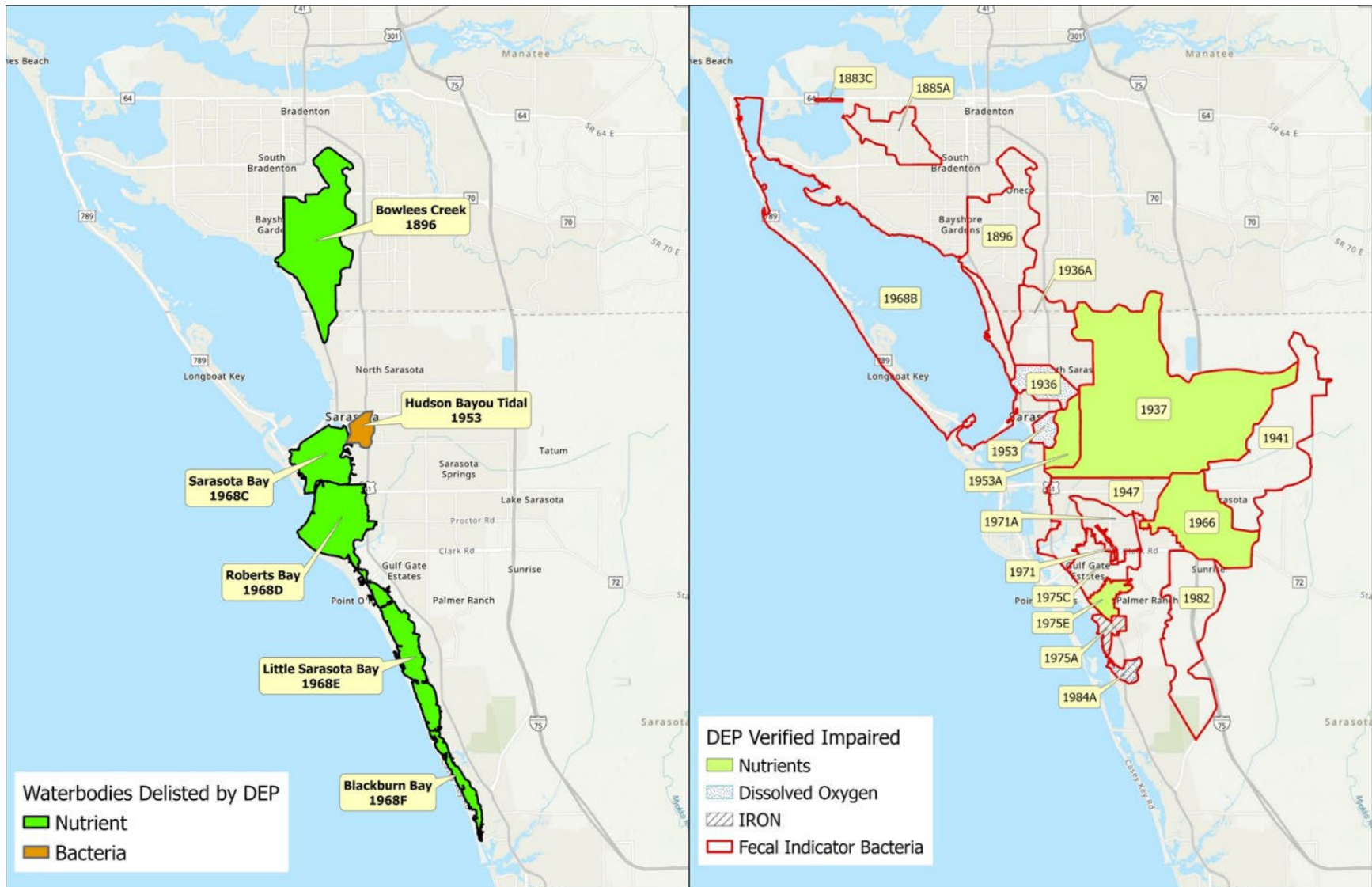
### 3.4 DEP 2022 Biennial Assessment

As stated previously, this Plan was enacted based on the 2020 Biennial Assessment (referred to by DEP as the 2020–2022 assessment). However, DEP released their latest assessment (as of August 2024), the 2022-2024 Biennial Assessment, which delisted all the SBEP Bay segments that were listed in the 2020 assessment. Delisting occurs when a waterbody meets its criteria for the most recent three consecutive years of the evaluation. The 2022 assessment was conducted by DEP based on the water quality data from IWR Run 64 for the period between January 1, 2015, through June 30, 2022. This list was adopted by the DEP Secretary on August 16, 2024. Key changes include the delisting of the estuarine segments in Sarasota, Roberts, Little Sarasota, and Blackburn Bays for nutrients based on chlorophyll *a* exceedances. These Delistings occurred because the waterbodies met their respective chlorophyll *a* criteria for the last 3 years, as shown in the plots of Figure 4.

The Delisted waterbody IDs for the 2022 assessment are shown in Figure 5 (left), along with those waters that remain on the Verified Impaired list for any regulated water quality parameter (Figure 5 right) in the watershed. A full accounting of the DEP 2022 assessment for the SBEP is provided in Appendix A.



**Figure 4**  
Annual Arithmetic Average for Chlorophyll a Concentrations by DEP Waterbody ID, 1998–2022



**Figure 5**  
 DEP Waterbody Delistings (left) and Waters Listed as Impaired (right) based on the 2022 Biennial Assessment

### 3.5 EPA TOTAL MAXIMUM DAILY LOADS

There are waterbodies within the Plan Area for which EPA has established TMDLs (Table 8). Currently, DEP does not recognize these EPA-designated TMDLs due to the process by which the impairment was determined. If DEP itself were to determine a waterbody was Impaired, DEP would determine its own TMDL for each waterbody that would replace the EPA TMDL.

**TABLE 8.**  
**OLD EPA TOTAL MAXIMUM DAILY LOADS**

Waterbody	WBID	Waterbody Type	Waterbody Class	Parameter Group	Parameter
Philippi Creek	1937	Stream	3F	Nutrients	Phosphorus (total)
Clark Lake	1971	Lake	3F	Nutrients	Phosphorus (total)
Elligraw Bayou	1975	Estuary	3M	Nutrients	Nitrogen (total)
Clowers Creek Estuary	1975A	Estuary	3M	Pathogens	Fecal coliform
South Creek	1982A	Estuary	3M	Nutrients	Nitrogen (total)
Catfish Creek (tidal)	1984	Estuary	3M	Nutrients	Nitrogen (total)

NOTES: EPA = U.S. Environmental Protection Agency; WBID = waterbody ID.

## CHAPTER 4

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# Description of the Ecological and Water Quality Goals

Most of the waters in the area covered by this Plan (the “Plan Area”) are classified by DEP as Class III waters, which is a designated use defined in the Florida Administrative Code as “fish consumption; recreation; and propagation and maintenance of a healthy, well-balanced population of fish and wildlife.” This classification is also considered “aquatic life use support.” However, portions of the Plan Area include Class II waters, which are designated for “shellfish propagation and harvesting.” While the Class II designation involves the potential for shellfish harvesting according to DEP, this is largely due to a disconnect between the Florida Department of Agriculture and Consumer Services (FDACS) and DEP designations. The FDACS classification system includes the following “use” designations: approved, conditionally approved, restricted, conditionally restricted, prohibited, and unclassified. In the case of Sarasota Bay, waters west of the ICW have been classified by FDACS as conditionally approved for shellfish harvesting, while the waters east of the ICW have been classified as prohibited. However, the conditionally approved waters in Sarasota Bay are closed year-round for administrative purposes and no shellfish harvesting actually occurs in the bay. Despite this, DEP maintains these waters as Class II waterbodies with more restrictive criteria for fecal coliform.

This Plan is not focused on fecal coliform impairments and given that the remaining criteria are identical for both Class II and Class III waters, this Plan focuses on the protection of the Class III uses. These designated uses remain under threat given the potential for increasing nutrients that can further increase nutrient loading and algal growth. Excess nutrients have the potential to impact all Class III uses including fish consumption, recreation, and propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Harmful algal blooms can produce toxins that make fish unsafe to eat and disproportionately affect certain species, upsetting a healthy and balanced population of fish and wildlife. Non-toxic algal blooms can reduce recreation even when toxins are not present and can impact other aquatic life use support by increasing biological oxygen demand, decreasing dissolved oxygen and/or decreasing light transmission to the bottom, which can impact seagrasses.

### 4.1 Resources of Concern and Key Ecological Indicators

The resources of concern in the Plan Area have been well defined in the SBEP Comprehensive Conservation and Management Plan (SBEP 2022 and references therein) and include vast areas of seagrass beds and substantial fish habitat that supports both recreational and commercial fisheries. Water quality conditions in the SBEP Bays provide overriding controls on the success of both of these valued ecosystem resources, are easily quantified, and therefore serve as key ecological indicators of ecosystem health.

### 4.1.1 Seagrass

Two seagrass monitoring efforts routinely evaluate Sarasota County seagrasses. First, the SWFWMD conducts biennial aerial surveys designed to calculate areal extents of seagrass. This program has been conducted since 1988 and is expected to continue as currently implemented for the foreseeable future. Second, the Eyes on Seagrass Program is a biannual citizen science event in partnership with Florida Sea Grant, Mote Marine Laboratory, and Sarasota and Manatee counties to measure macroalgae and seagrass coverage. The program was expanded from Charlotte Harbor to cover Sarasota Bay in 2021 in response to a data gap in macroalgae monitoring. During a sampling window in April and July, participants travel to various locations throughout Sarasota Bay to collect information on macroalgae and seagrass coverage. Between 2006 and 2021, Sarasota County staff supplemented the SWFWMD surveys by conducting seagrass surveys using both fixed transects and random point surveys; however, they did not extend into Manatee County. Details of the seagrass monitoring efforts are provided in the *Sarasota Bay Estuary Program Comprehensive Conservation and Management Plan 2022 Update* (SBEP 2022).

### 4.1.2 Macroalgae

The Sarasota County seagrass data also includes information on seagrass species composition; drift and attached macroalgae prevalence and abundance; and epiphyte load at approximately 40 fixed and 120 random sampling locations annually, which are used in the SBEP Report Card.

### 4.1.3 Nekton

Nekton (fish and crustacean) data are collected under contract to the SBEP by the Florida Fish and Wildlife Conservation Commission Fisheries-Independent Monitoring (FIM) Program. The program has routinely sampled the open bay estuaries of the SBEP every other month since 2009 using a multi-gear approach. A detailed description of methodologies employed in Sarasota Bay may be found in the Task 2 technical memorandum, as well as MacDonald et al. (2015) and the FIM Program Procedure Manual (FWC-FWRI 2012).

### 4.1.4 Water Quality

Sarasota and Manatee counties have long-standing water quality monitoring programs in place that cover the entire Plan Area and report their data to DEP's WIN. Because this Plan is related to a regulatory assessment, the WIN database is considered the principal data source for planning purposes. The primary water quality parameters include nutrients, chlorophyll *a*, in situ parameters (e.g., dissolved oxygen, salinity, and temperature), and fecal indicator bacteria.

### 4.1.5 Red Tide (*Karenia brevis*)

Mote Marine Laboratory is the contracting laboratory for Sarasota County and has performed routine water quality data collection since 1996, including collecting information on red tide (*K. brevis*)—information that is not reported to WIN. The SBEP Bays experienced a significant and harmful red tide algal bloom between November 2017 and February 2019. The effort to identify *K. brevis* in routine water quality samples by Mote Marine Laboratory was voluntary, and there are some small gaps in the available data; however, the data are publicly available and were obtained for analysis from the Sarasota County Water Atlas, available online at <https://sarasota.wateratlas.usf.edu/>.

## 4.2 Water Quality Targets and Thresholds

The existing NNC were established based on a period of time when conditions in the SBEP Bays were conducive to a healthy ecosystem. Since that time, a period of degraded water quality was observed from 2013 to 2019, followed by a period of recovery in water quality from 2020 to 2022. During the Degraded Period, DEP water quality criteria for chlorophyll *a* and total nitrogen within the SBEP waterbodies were exceeded, resulting in the impairment listing. Water quality improved during the Recovery Period to the point where DEP delisted all SBEP waterbodies. Given that water quality has improved since 2020 and that the established water quality standards are now being met, the existing water quality standards are thought to be generally sufficient to protect against future impairments. Therefore, the existing criteria are recommended as the water quality thresholds for the Plan. Further, the new Report Card integrates additional indicators of ecosystem health (e.g., macroalgae) that complement existing water quality standards and provide a more comprehensive assessment of ecosystem health. Finally, the analysis conducted as part of this Plan has resulted in several recommendations provided later in this document to control specific types of pollution (e.g., inorganic nitrogen loads, as opposed to solely total nitrogen) that can disproportionately affect the ecosystem balance in the systems that are susceptible to nutrient pollution.

# CHAPTER 5

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## Pollutant Load Modeling

### 5.1 Background

A major component of this effort was updating an existing pollutant loading model, the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE), to evaluate the potential increase in nitrogen loading from projected future growth in the Plan Area. The model was originally developed and implemented by Jones Edmunds and Associates to fulfill an NPDES municipal separate storm sewer systems permit requirement for Sarasota County (JEA 2005). That version of the model, SIMPLE-Seasonal, provided seasonal and annual loads based on annual rainfall estimates. To align the model outputs to Sarasota County’s water quality monitoring programs, SIMPLE was subsequently upgraded to provide monthly estimates from spatially explicit rainfall with the addition of Next Generation Weather Radar (NEXRAD) rainfall estimates. This updated version—the SIMPLE-Monthly model (subsequently referred to herein as SIMPLE)—was used to develop the Sarasota County watershed management plans for Roberts Bay (JEA and Janicki Environmental 2010), Little Sarasota and Blackburn Bays (JEA and Janicki Environmental 2012b), and Sarasota Bay (JEA and Janicki Environmental 2012a). SIMPLE was also expanded into the portion of Manatee County that drains to Sarasota Bay and Palma Sola Bay to support development of nutrient targets and thresholds for SBEP estuarine waters (Janicki Environmental 2011). Since these plans were developed, SIMPLE has been used to update several of Sarasota County’s watershed management plans and support the development of other watershed plans throughout Florida, including Curlew Creek, the City of Dunedin, and the City of West Palm Beach. The model was also used in Walton County to evaluate loadings to the rare coastal dune lakes located there (JEA 2018), and most pertinent to this project, SIMPLE was recently accepted by DEP and EPA as a valid model to estimate nutrient loadings for the Mosquito Lagoon RAP (JEA and Janicki Environmental 2019).

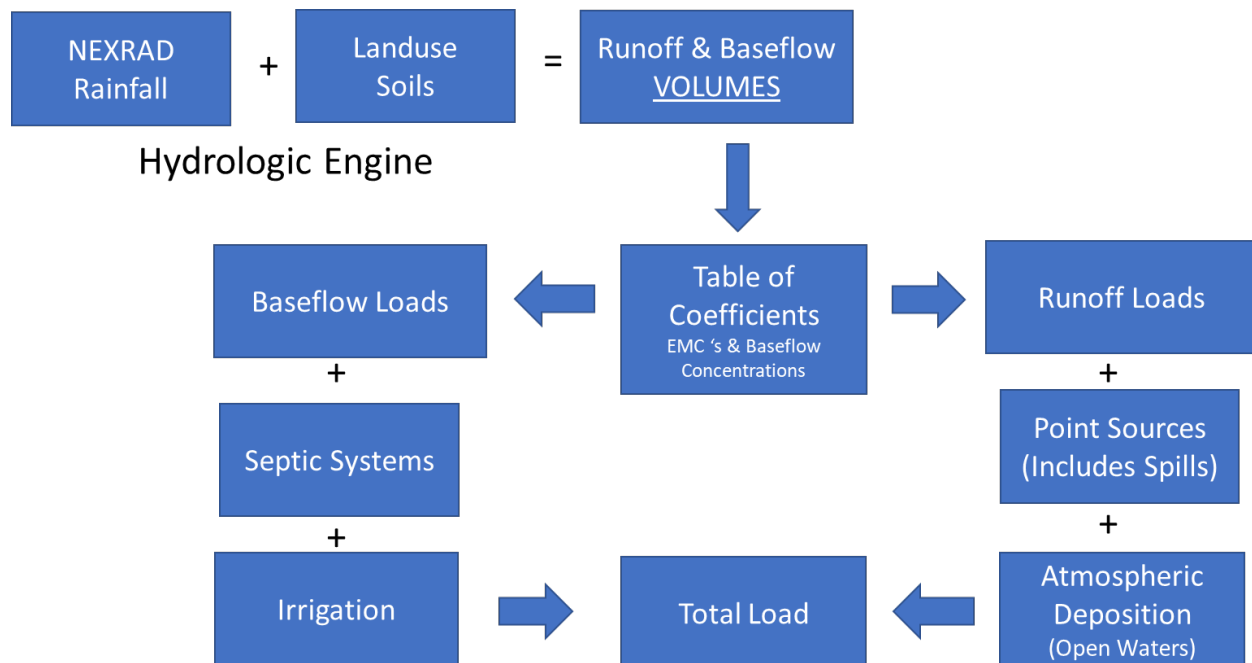
SIMPLE is spatially explicit and temporally dynamic such that loading estimates can be aggregated over different spatial and temporal scales. SIMPLE includes a seasonal component to capture monthly variation in pollutant loads and is date-stamped to allow for the inclusion of management actions such as best management practices (BMPs) and expansion of reclaimed water service areas. The model is capable of estimating total forms of nutrients (e.g., total nitrogen and total phosphorus), as well as inorganic nutrients, suspended solids, dissolved solids, biochemical oxygen demand, and some metal contaminants. The loads are partitioned by source including direct runoff, base flow (i.e., surficial groundwater), point sources, septic, irrigation, and atmospheric deposition. Detailed information regarding the construction of SIMPLE can be found in the *Sarasota County Pollutant Loading Model Development (W552) Design Report* (JEA 2009a) and the associated calibration report (JEA 2009b).

Several enhancements have been made to the model over time, both to improve efficiency in the calculations within the model architecture and to include more information as it has become available. In

fact, one of the major advantages of using SIMPLE is the ease of updating it as new information becomes available. To support this Plan, the Manatee and Sarasota County model input data were updated to a common period of record (1995–2022), model parameterizations were reviewed, and the model was used to estimate nonpoint nutrient loads from all of the watersheds in Manatee and Sarasota counties that drain to SBEP waters using a common, updated, and unified model architecture. The current configuration of SIMPLE monthly is provided in Figure 6.

SIMPLE was updated as part of Phase 1 of this Plan, which brought the model up to date through 2019. This included the implementation of a reclaimed water module that used meter readings to more accurately account for the volume of reclaimed water distribution, and an update of rainfall, land use, and BMP layers used to identify stormwater improvement projects throughout the SBEP watersheds. Details regarding the Phase 1 update can be found in *Sarasota Bay Estuary Program Water Quality Assessment and Pollutant Loading Model Update* (JEA and Janicki Environmental 2021)

For Phase 2, the model was updated through 2022 to cover the period beyond the Recovery Period proposed by the SBEP. This period also includes the period when the waterbodies came back into compliance with the appropriate NNC. The following sections describe the effort to update the model through 2022.



**Figure 6**  
Schematic of SIMPLE Pollutant Loading Model Sources. Note, EMC = Event Mean Concentration.

## 5.2 Principal Nutrient Loading Sources

The open bay estuaries of Sarasota Bay are nitrogen limited, suggesting nitrogen loads have the greatest potential to adversely affect water quality and ecosystem health in Sarasota Bay. Based on a pollutant loading model run between 1995 and 2019, runoff (i.e., stormwater) accounts for between 61% and 74%

of the nitrogen load, dependent on which waterbody is evaluated (Table 9). Meanwhile, baseflow contributes between 15% and 20% of the nitrogen load (Janicki Environmental 2021).

Septic systems contribute a larger percentage of the nitrogen load in Roberts and Little Sarasota Bays than in other bay segments, but all are under 13% of the nitrogen load. Atmospheric deposition contributed the highest percentage to the nitrogen load in Sarasota Bay and Palma Sola Bay, which have the largest open water areas relative to watershed area. Reclaimed and point source loads were 5% or less of the load to all segments over the full period of record. The inorganic fraction was typically about 40% of the total nitrogen (Janicki Environmental 2021). Table 9 shows nitrogen loads by source for each of the SBEP Bays.

**TABLE 9.**  
**PERCENT OF THE TOTAL NITROGEN LOADS FOR EACH SBEP BAY SEGMENT BY SOURCE**

Total Nitrogen Segment	Source (% of Segment Total)						
	Atmospheric Deposition	Baseflow	Point	Reclaimed	Runoff	Septic	Spills
Palma Sola Bay	8	17	0	4	68	2	0
Sarasota Bay	13	15	5	2	63	2	0
Roberts Bay	0	19	4	1	62	12	1
Little Sarasota Bay	4	20	0	4	64	8	0
Blackburn Bay	1	19	0	2	74	3	0

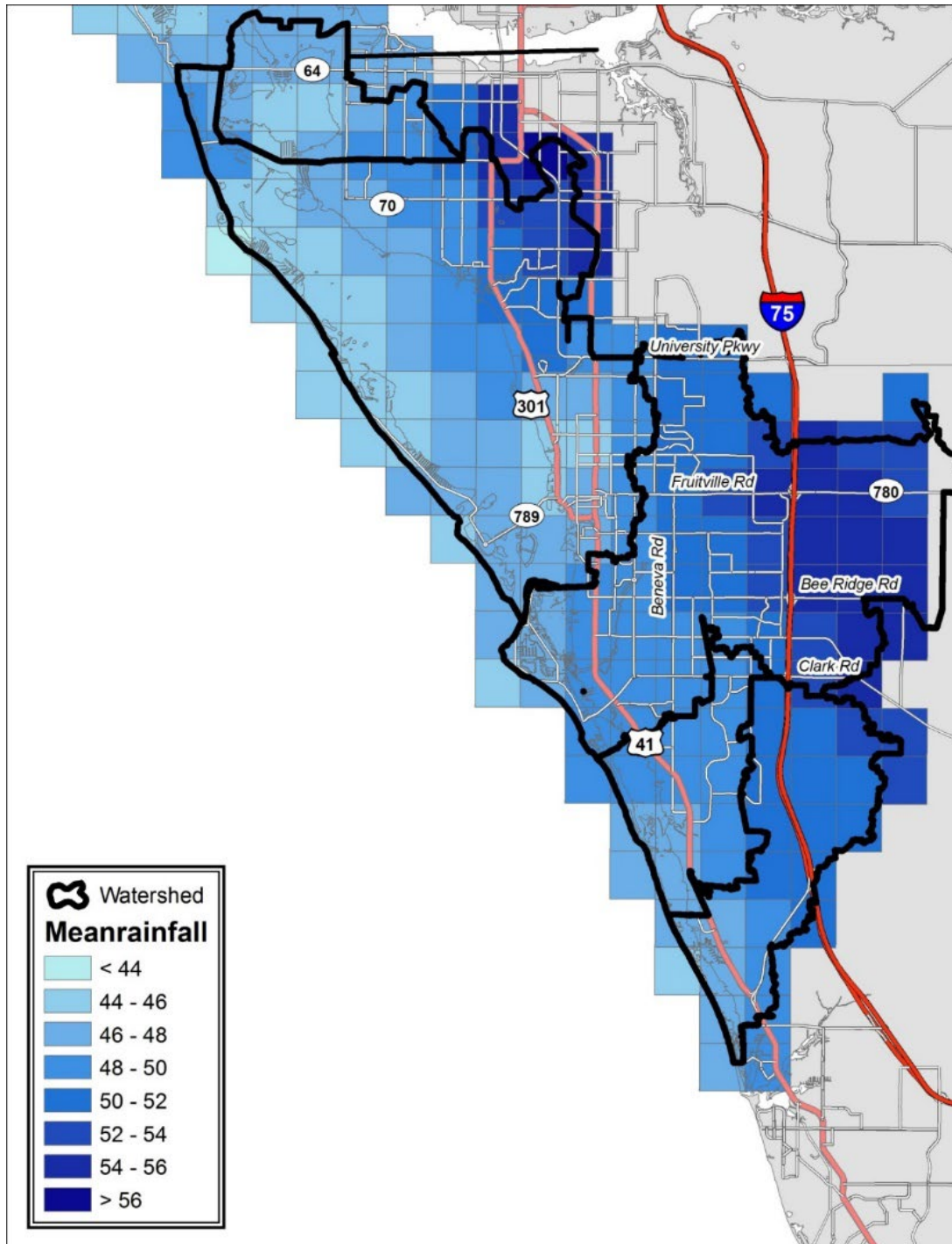
NOTES: SBEP = Sarasota Bay Estuary Program.

## 5.2.1 Hydrologic Engine

The primary driver of pollutant loading is the hydrologic load from precipitation, which is expressed as direct runoff or baseflow loads. SIMPLE uses a hydrologic engine for estimating the hydrologic load and was developed to use spatially explicit daily rainfall data to simulate the interaction between infiltration, evapotranspiration, and groundwater flow and leakage from the surficial aquifer, and use the derived information to evaluate the water budget of a watershed on a daily time-step. The primary inputs to the hydrologic engine are NEXRAD rainfall estimates (Figure 7) by SWFWMD and evapotranspiration estimates derived by the U.S. Geological Survey. Fortunately, both datasets are reported at the same spatial scale and referenced to the same grid so there is no need to interpolate between the two.

Due to the complexity of the hydrologic calculations required, the hydrologic engine is run prior to the pollutant loading calculations. The hydrologic engine calculates the daily runoff and baseflow volumes for each possible pixel, land use, and soil type combination. The daily values are then summed by the calendar month. Results are stored in a hydrologic lookup table for each pixel, land use, and soil combination with the units of cubic feet/square feet. When the loading model is run, the actual area of the pixel/land use/soil combination is then multiplied by the volume in the table. This preprocessing saves time as there are 15 possible land use categories and four soil types in the SBEP Bays area. The methodology for determining the direct runoff volumes follows a modified version of the methodology outlined in *Urban Hydrology for Small Watersheds* (NRCS 1986), which incorporates a separate value for

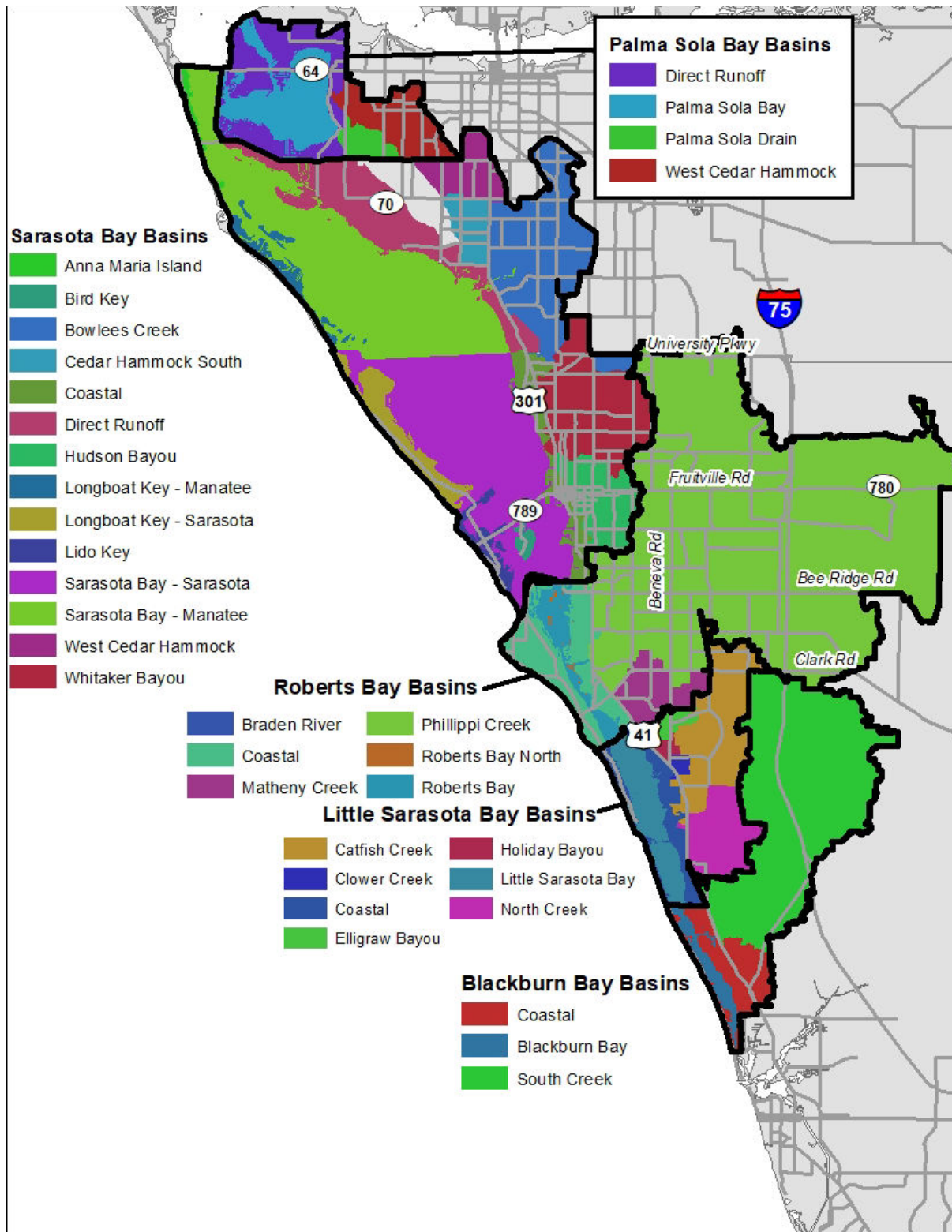
directly connected impervious areas. For baseflow, or surficial aquifer flow, the model uses the Forchheimer equation found in the EPA’s Storm Water Management Model (Rossman and Huber 2015).



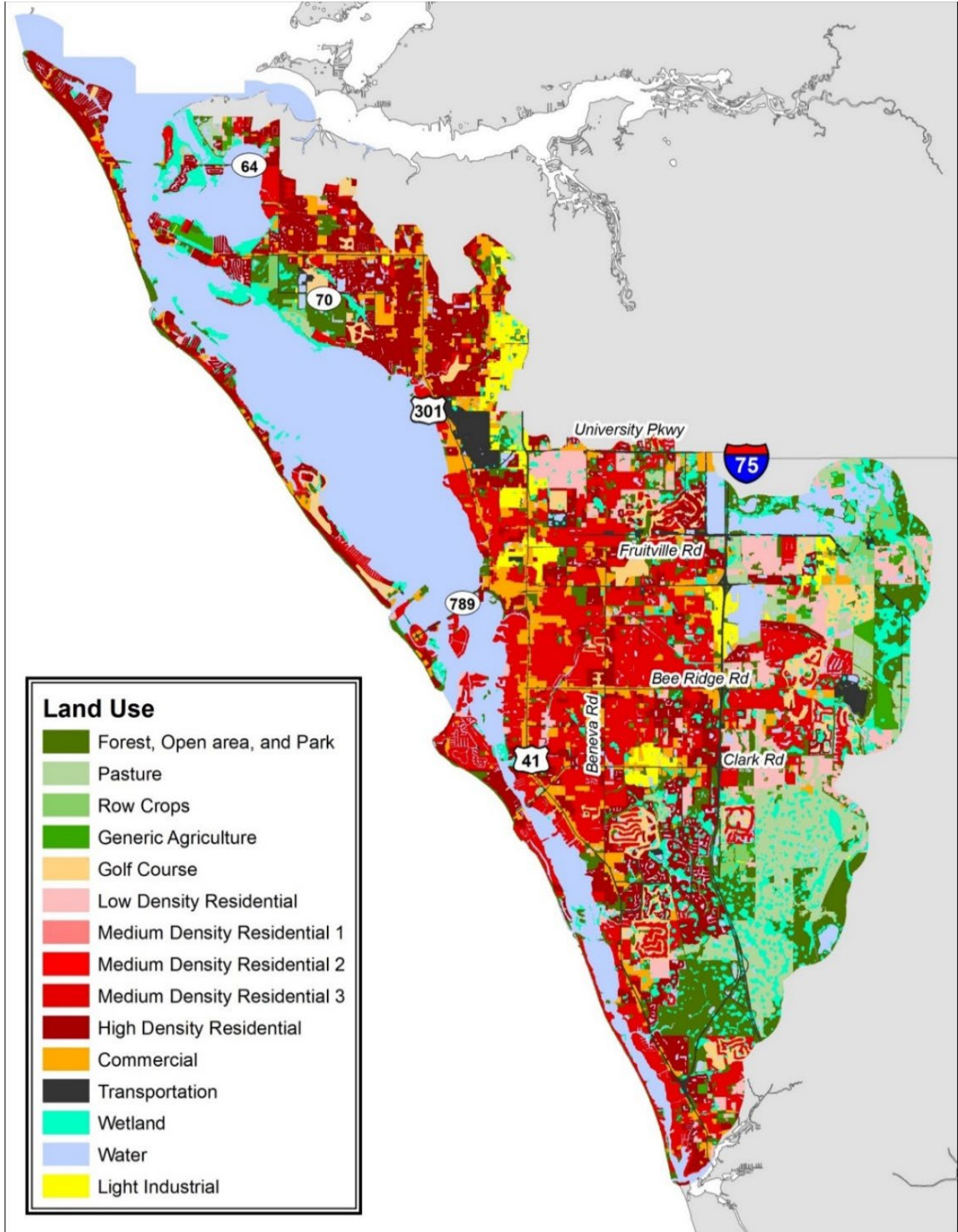
**Figure 7**  
Mean Annual Rainfall Derived from NEXRAD Estimates Used in SIMPLE Modeling, 1995–2022

The spatial resolution of the hydrologic load estimation defines the minimum spatial unit used to estimate pollutant loadings. For this Plan, these spatial resolutions were based on the stormwater catchments provided by Sarasota County (Sherry Phillips-Smith 2021, pers. comm.) combined with a basin file for Manatee County (Figure 8). These sources provide a proper scale to identify areas in need of possible management actions. The loading estimates can be spatially aggregated to represent a number of spatial scales. For this Plan, the loading estimates are reported at the catchment, basin, and watershed scales.

The land use layer used in modeling for this Plan was derived from an overlay of the SWFWMD land use features. Because SIMPLE is temporally enabled, changes in land use can be expressed over time (i.e., 1995–2020). For example, an area once forested could be cleared for pasture, which could then be further developed into a medium-density residential development. The model could track the changes in loadings from those land use changes over time. Figure 9 presents the 2020 land uses in the Plan Area.



**Figure 8**  
SBEP Basins Used in SIMPLE Modeling



**Figure 9**  
Major Land Use Categories used in SIMPLE Modeling for 2020

## 5.2.2 Runoff/Baseflow Loads

The runoff/baseflow module requires the basin, soils, NEXRAD pixels, and time-stamped land use and BMP feature classes, along with lookup tables from the hydrologic engine and concentration data. For this effort, all input layers were updated for the Plan Area through 2022.

The hydrologic loads from the hydrologic engine are combined with the appropriate land use event mean concentrations (EMCs) (Table 10) and baseflow concentrations (Table 11) to calculate the runoff and baseflow loads. As described in the model report for runoff loads (JEA 2005), EMC lookup tables are predominantly based on those used in the Watershed Management Model (CDM 1993) and were supplemented as needed with the EMCs for pollutant runoff from wetlands that was taken from the Lemon Bay Model (ERD 2004) for biological oxygen demand, total suspended solids, total phosphorus, and total nitrogen.

**TABLE 10.**  
**EVENT MEAN CONCENTRATIONS FOR DIRECT RUNOFF LOADING ESTIMATION**

Description	TP (mg/L)	DP (mg/L)	TKN (mg/L)	NO <sub>2</sub> +NO <sub>3</sub> (mg/L)	NH <sub>3</sub> (mg/L)	TN (mg/L)
Forest, open area, and parks	0.055	0.02	0.92	0.23	0.22	1.15
Pasture	0.616	0.23	2.79	0.68	0.67	3.47
Row crops	0.593	0.22	2.12	0.53	0.51	2.65
Generic agriculture	0.431	0.16	2.23	0.56	0.54	2.79
Golf course	1.13	0.42	2.99	0.75	0.72	3.74
Low-density residential	0.191	0.08	1.29	0.32	0.31	1.61
Medium-density residential	0.327	0.13	1.66	0.41	0.4	2.07
High-density residential	0.52	0.25	1.86	0.46	0.45	2.32
Commercial	0.345	0.23	2.16	0.24	0.52	2.4
Transportation	0.22	0.15	1.47	0.17	0.35	1.64
Wetland	0.09	0.06	0.73	0.71	0.18	1.44
Water	0.17	0.12	0.5	0.48	0.12	0.98
Bay	0	0	0	0	0	0
Light industrial	0.26	0.17	1.08	0.12	0.26	1.2

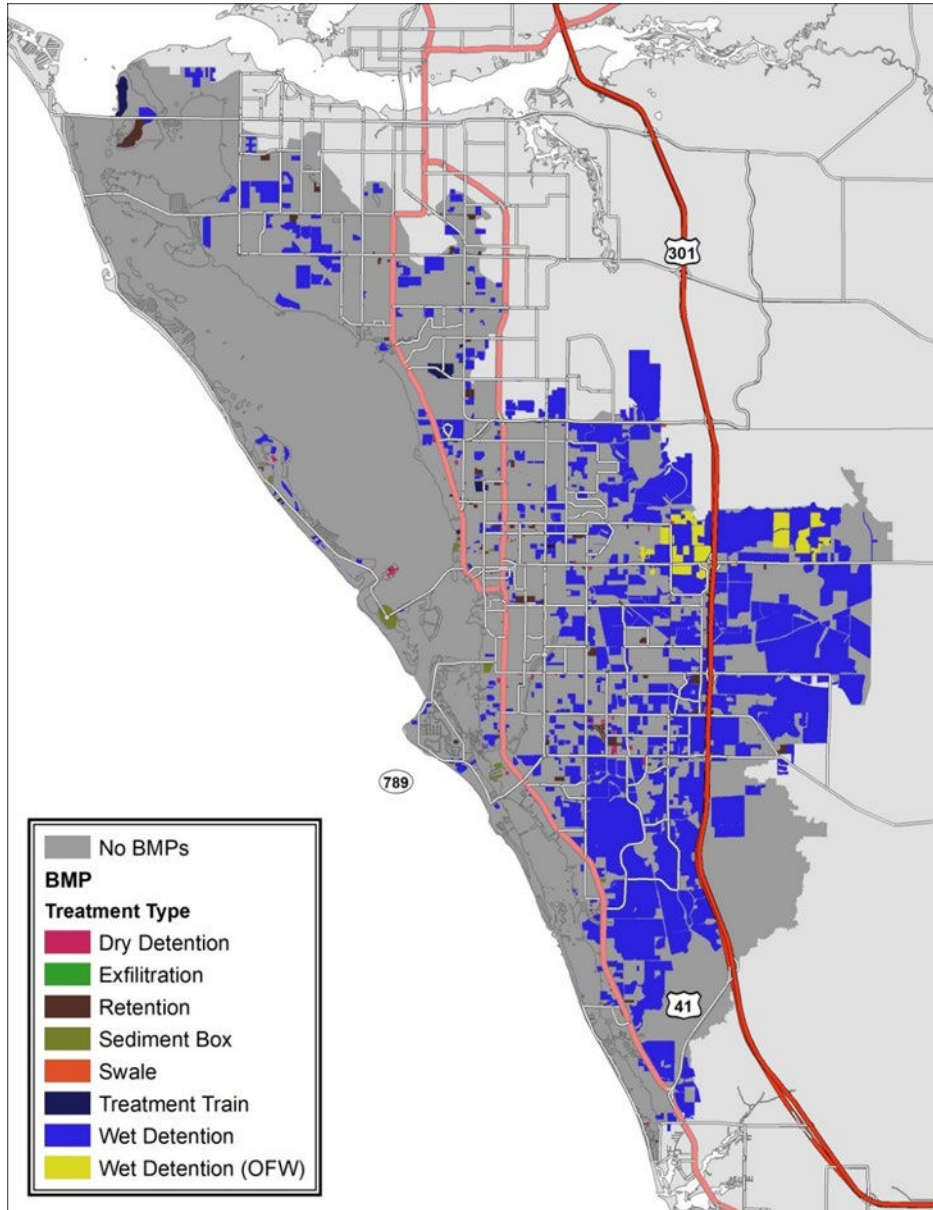
NOTES: DP = dissolved phosphorus; mg/L = milligrams per liter; NH<sub>3</sub> = ammonia; NO<sub>2</sub> = nitrogen dioxide; NO<sub>3</sub> = nitrate; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TP = total phosphorus.

**TABLE 11.**  
**BASEFLOW LOADING CONCENTRATIONS**

TP (mg/L)	DP (mg/L)	TKN (mg/L)	NO <sub>2</sub> +NO <sub>3</sub> (mg/L)	NH <sub>3</sub> (mg/L)	TN (mg/L)
0.2	0.05	0.7	0.05	0.1	0.75

NOTES: DP = dissolved phosphorus; mg/L = milligrams per liter; NH<sub>3</sub> = ammonia; NO<sub>2</sub> = nitrogen dioxide; NO<sub>3</sub> = nitrate; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TP = total phosphorus.

For the model, a structural BMP feature class that identifies BMPs by type and location was updated through 2022 (Figure 10). The majority of the BMPs exist as stormwater detention ponds. Table 12 identifies the specific percent-removal efficiency associated with each BMP for use in reducing the pollutant load. These efficiencies assume that the BMPs are maintained and operated as designed. Also represented in the model are additional BMPs whose removal efficiencies are constant across all parameters including retention, exfiltration, and retention facilities for discharges to OFWs with removal efficiencies of 90%, 90%, and 99%, respectively. The removal efficiencies listed are relatively standard around the state.



**Figure 10**  
Known Existing BMPs within the Plan Area

**TABLE 12.**  
**POLLUTANT REMOVAL EFFICIENCIES USED WITHIN SIMPLE AS PERCENT REDUCTIONS**

BMP Type	TP	DP	TKN	NO <sub>2</sub> +NO <sub>3</sub>	NH <sub>3</sub>	TN
Wet detention	60%	70%	30%	70%	70%	35%
Wet detention OFW	70%	80%	35%	80%	75%	40%
Dry detention	25%	25%	15%	15%	15%	15%
Baffle box	30%	30%	10%	10%	10%	10%
Swale	35%	35%	25%	25%	25%	25%

NOTES: BMP = best management practice; DP = dissolved phosphorus; NH<sub>3</sub> = ammonia; NO<sub>2</sub> = nitrogen dioxide; NO<sub>3</sub> = nitrate; OFW = Outstanding Florida Water; TKN = total Kjeldahl nitrogen; TN = total nitrogen; TP = total phosphorus.

For baseflow loads, the infiltrated volume from the vadose zone become part of the saturated groundwater module (JEA 2005). The Dupuit-Forchheimer equation was chosen because it has wide application in predicting surficial aquifer groundwater flow. This equation is one of the options used in the original stormwater modeling for Sarasota Bay (CDM 1993) and is well documented.

### 5.2.3 Point Sources

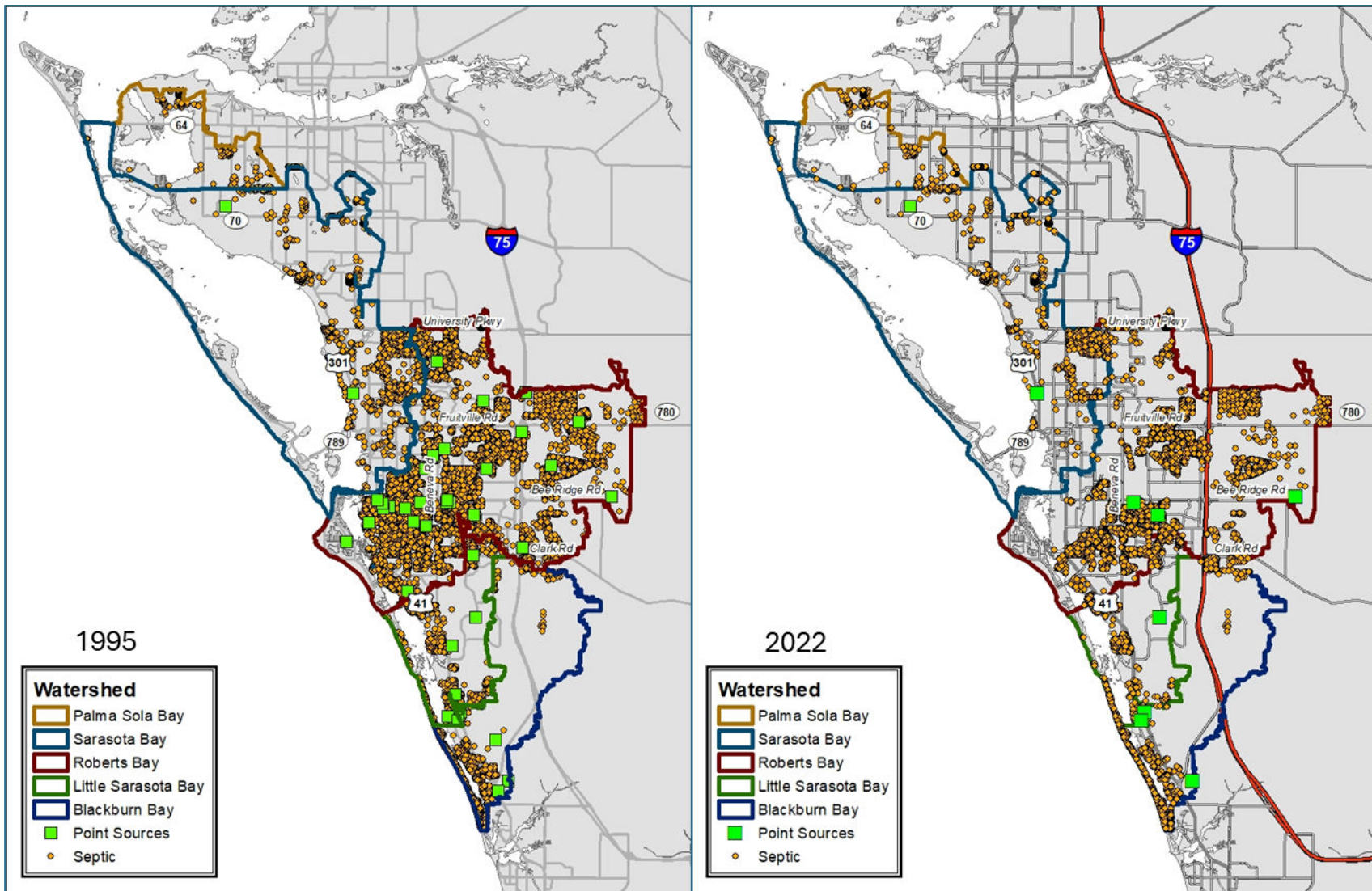
Point source loads include any permitted discharges from wastewater treatment facilities (WWTFs), effluent disposal from package plants, and any accidental spills reported to DEP. For accidental releases, the reported location and date of a release is used to attribute the load to the proper basin and month/year.

DEP provided the input for this module for those nondelegated wastewater facilities in Manatee and Sarasota Counties. Sarasota County provided the data for the delegated package plants within the County; the County continues to consolidate package plants.

Where data are missing, either permitted values or long-term means are used. Each record includes a monthly time-stamp to track loads temporally. The point source module requires the basin, point source, and noncompliance feature classes, as well as lookup tables of flows and concentrations. Figure 11 presents the location of point sources within the Plan Area.

### 5.2.4 Septic Systems

As with other layers, the septic feature class records have a year-built field that activates the calculation of a load from that location. This feature class also has a field to stop load calculations in the case a parcel is converted to central sewer. With an aggressive septic-to-sewer conversion program, these time-stamp features are key to tracking this loading source as can be seen by the difference in septic and point sources between the start and end of the modeling period (Figure 11). The septic module assumes that 100 gallons per person per day are produced, and that 2.5 persons are served by each residential system. Other factors that affect the loads are the date the systems went into service, the distance from a waterbody, and whether the flow path of the surficial groundwater might be intercepted by a BMP such as a wet detention pond. Sarasota County's septic-to-sewer program has been going through a reprioritization to expand it beyond the original Phillippi Creek Septic System Replacement Program resulting in a lull in the conversion process.



**Figure 11**  
Locations of Point Sources and Septic Systems Used for the SIMPLE Modeling as of 1995 (left) and 2022 (right)

## 5.2.5 Atmospheric Deposition

Atmospheric deposition (i.e., wet+dry fall) represents the direct load to waterbodies. Only total nitrogen and total phosphorus are calculated through this module, and loads are only generated for the open bay segments (i.e., direct deposition to the water surface). The nitrogen load is based on information from the National Atmospheric Deposition Program site at the Verna Wellfield (FL41) located in eastern Sarasota County. Based on the relationships between nitrogen and phosphorus loads as determined for Tampa Bay (Poor 2002), atmospheric phosphorus loads are then estimated.

## 5.2.6 Reclaimed Water Irrigation

The reclaimed water irrigation module was developed to more accurately represent the distribution of reclaimed water nutrient loadings in a spatially explicit manner. Since the inception of SIMPLE, new information has become available regarding where reclaimed water is applied (Figure 12) and at what volume, as well as the concentrations from the water reclamation facilities through monthly discharge monitoring reports. The utility providers monitor the volume of reclaimed water delivered to customers through meter billing records. These records are used to provide better estimates of the distribution of reclaimed water within each SBEP basin. This use of empirical data was a major upgrade to previous versions of SIMPLE, which relied on published application rates and the assumption of AWT effluent concentrations.

Through this update, we worked with the staff of Manatee County to obtain better spatial data regarding the areas using reuse water from the County's reclaimed water system. These data cover the period from 2009 to 2022.



**Figure 12**  
Reuse Water Application Areas Used in SIMPLE Modeling

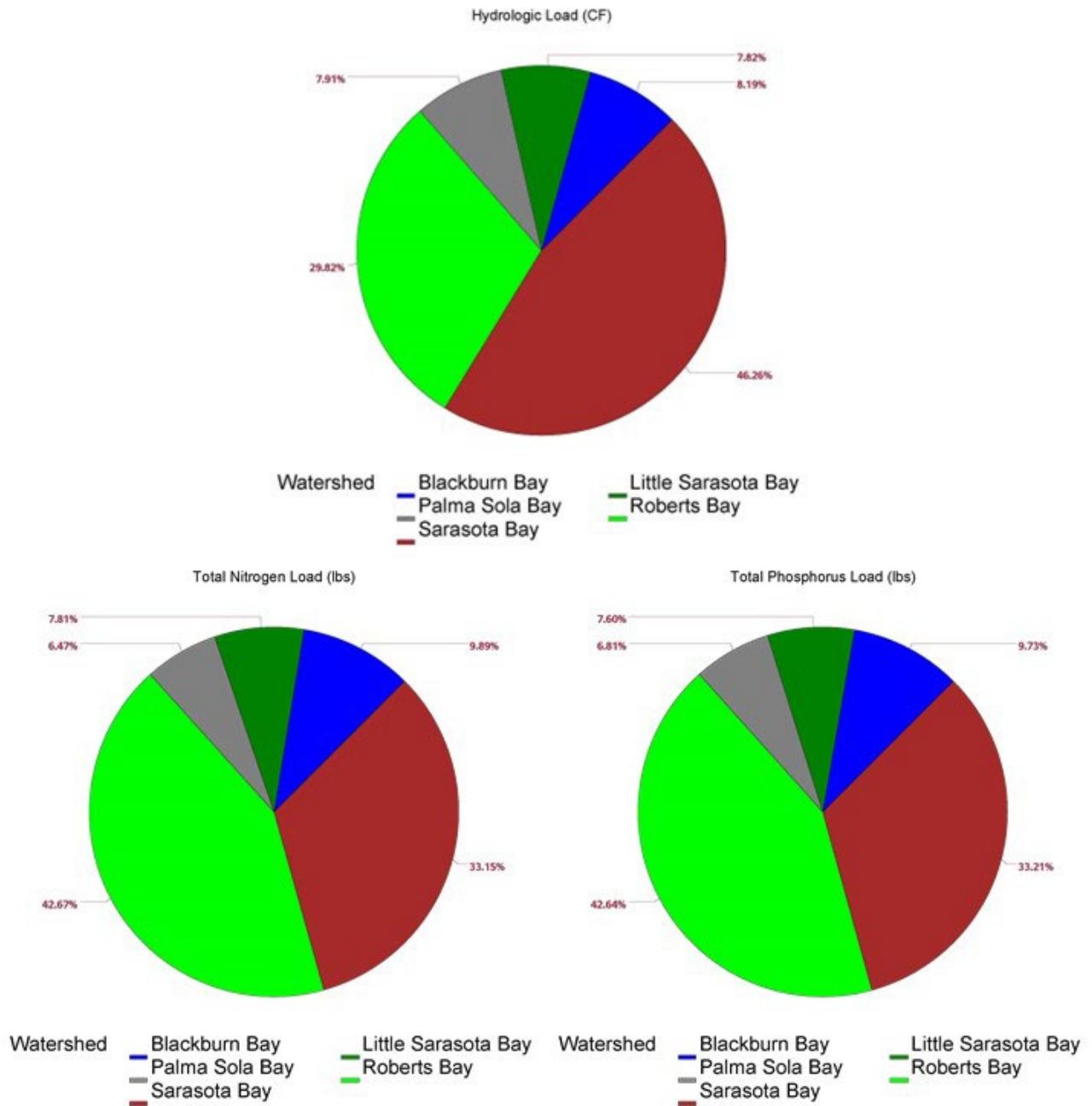
### 5.3 Model Results – Existing Conditions

In this section, pollutant loads are presented at various spatial and temporal resolutions for existing conditions between 1995 and 2022. First, an overview of the pollutant loading estimates is provided for the SBEP watersheds across the full period of record (1995–2022) to describe source apportionment and general comparisons of the loads among watersheds. This is followed by a breakdown of the loading sources for each watershed. Intra-annual statistics are then presented to evaluate the relative contribution of sources within a year. Next, the loads are partitioned into 5-year blocks and the percentage contributions of the total load for each source are provided. Finally, a comparison of inorganic versus organic nutrient loads is provided to evaluate differences in these constituents among sources and over time.

Total phosphorus and total nitrogen results are used to illustrate the summary of the pollutant loading model. Other pollutant model output including all forms of nitrogen, biological and chemical oxygen demand, fecal coliform, and total suspended solids is provided in Appendix B.

### 5.3.1 Watershed Loads

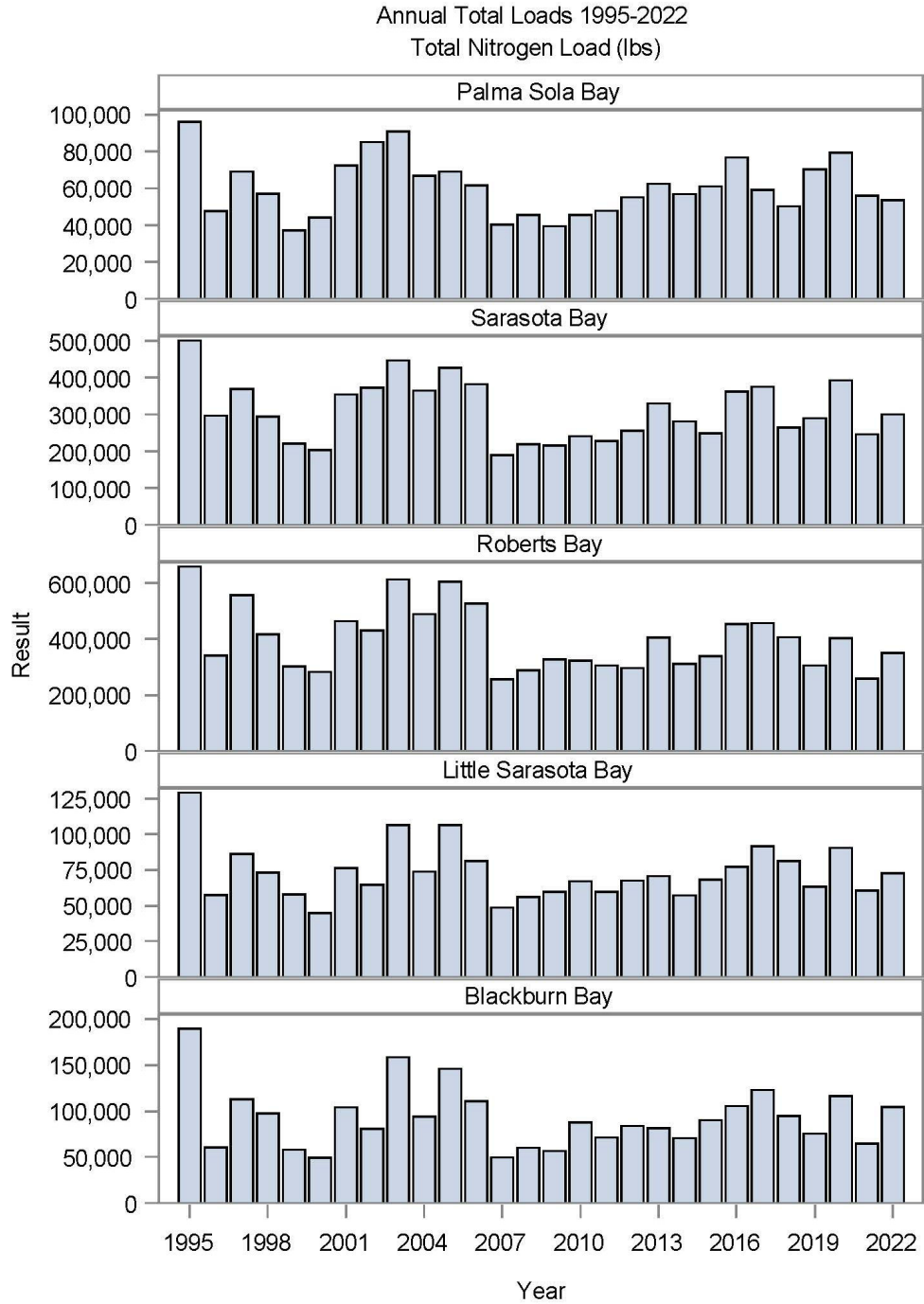
To provide a general overview of the distribution of loads throughout the Plan Area, the percent distribution of the hydrologic, total nitrogen, and total phosphorus loads between 1995 and 2022 are presented in Figure 13. As shown, Sarasota Bay has the highest hydrologic load of the bay segments due to the extent of the open bay, which captures direct deposition of rainfall. The highest total nitrogen loads occur in Roberts Bay watershed, which delivers approximately 43% of the total nitrogen load to the SBEP estuaries. Meanwhile, the Sarasota Bay watershed delivers approximately 33% of the total nitrogen load to the Plan Area. The distribution of total phosphorus loads was similar to that of total nitrogen.



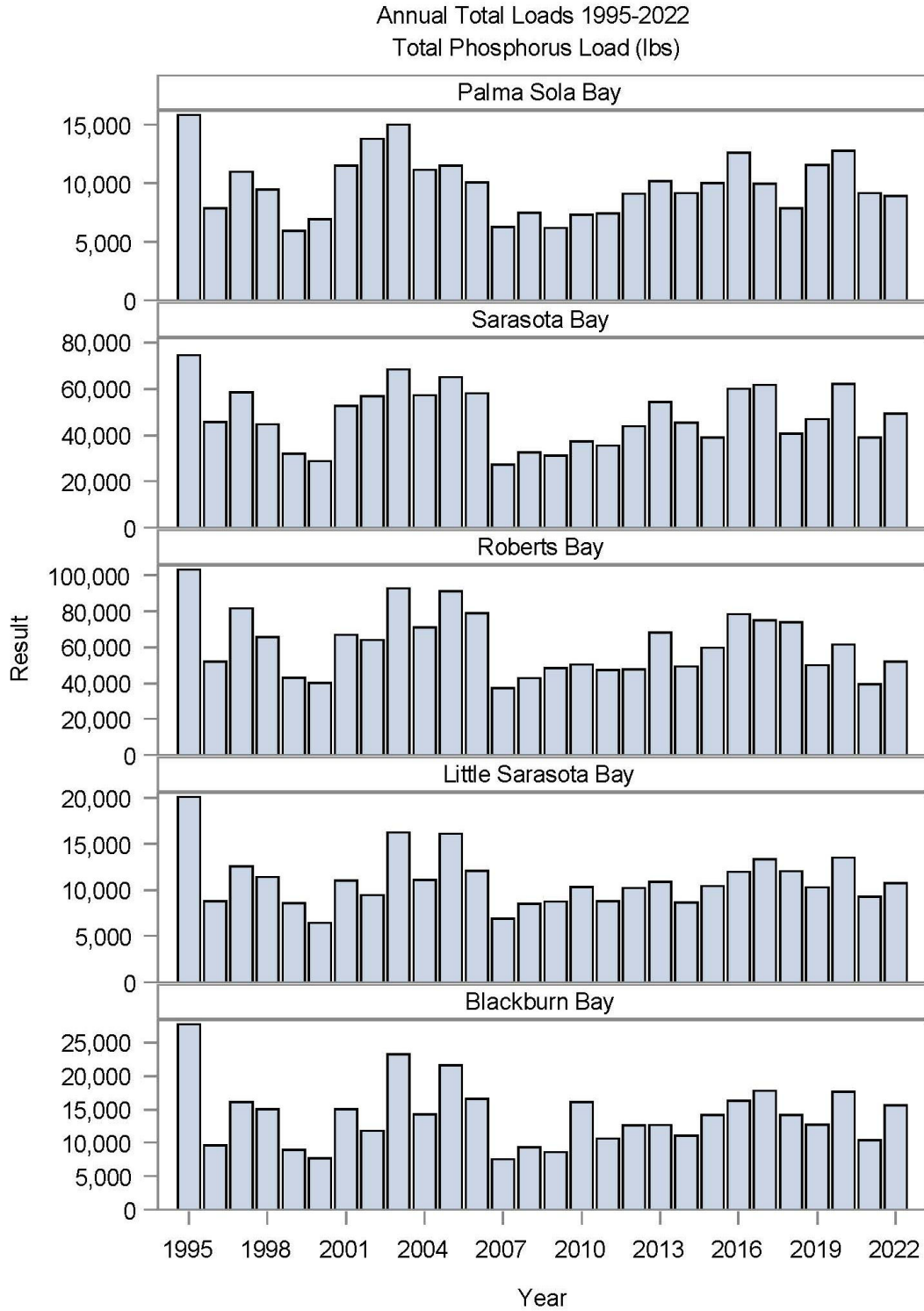
**Figure 13**  
 Percent Contribution of Each Watershed to the Total Hydrologic (top), Total Nitrogen (bottom left), and Total Phosphorus (bottom right) Loads Throughout the Plan Area

### 5.3.2 Total Annual Loads

Timeseries plots of the total nitrogen and total phosphorus loads by bay segment are provided in Figure 14 and Figure 15, respectively. The segments displayed a consistent temporal pattern for each nutrient, suggesting that the variation in loads is principally a function of the rainfall and the subsequent hydrologic load generated in the watershed.



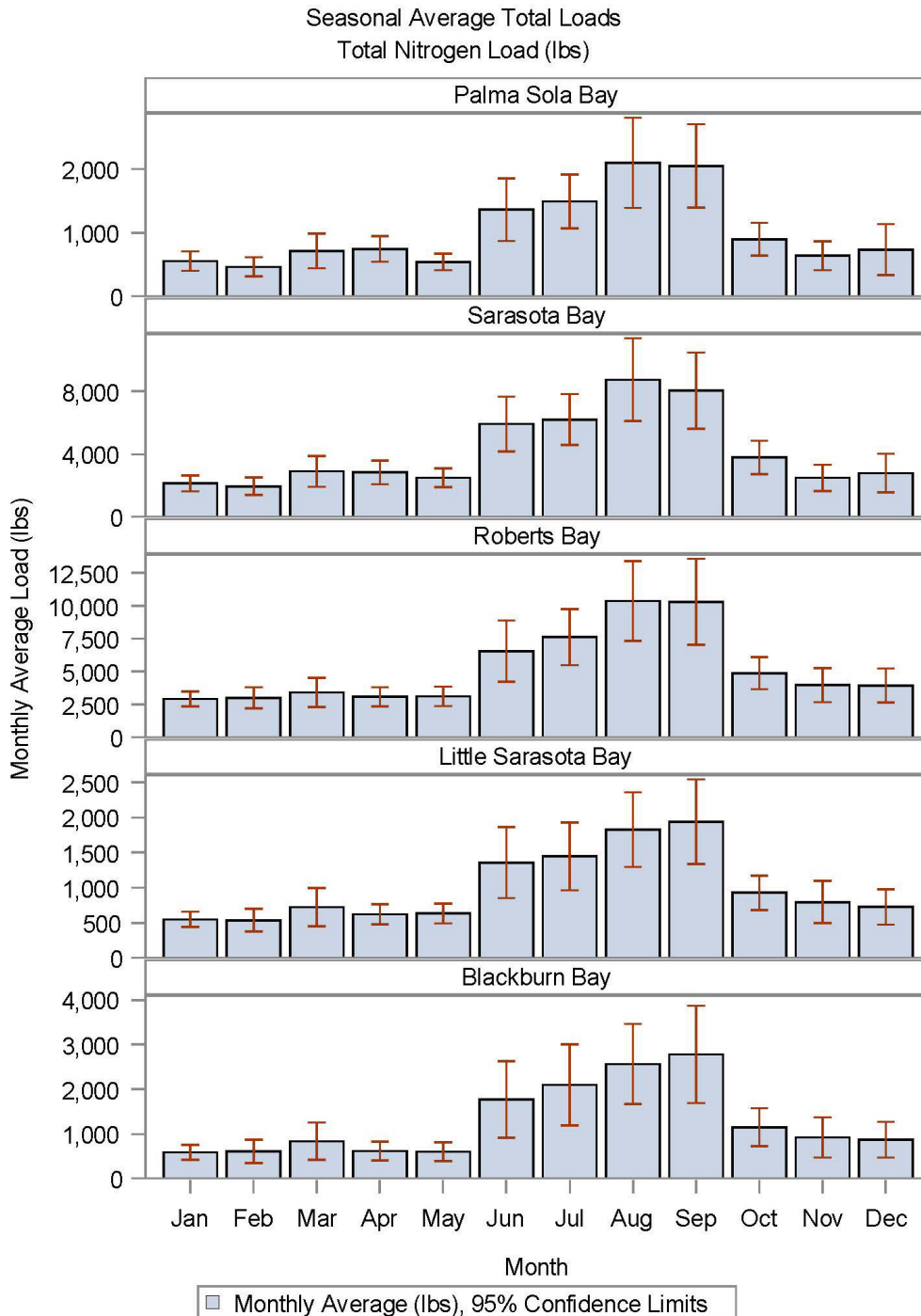
**Figure 14**  
Segment-Specific Annual Total Nitrogen Loads, 1995–2022



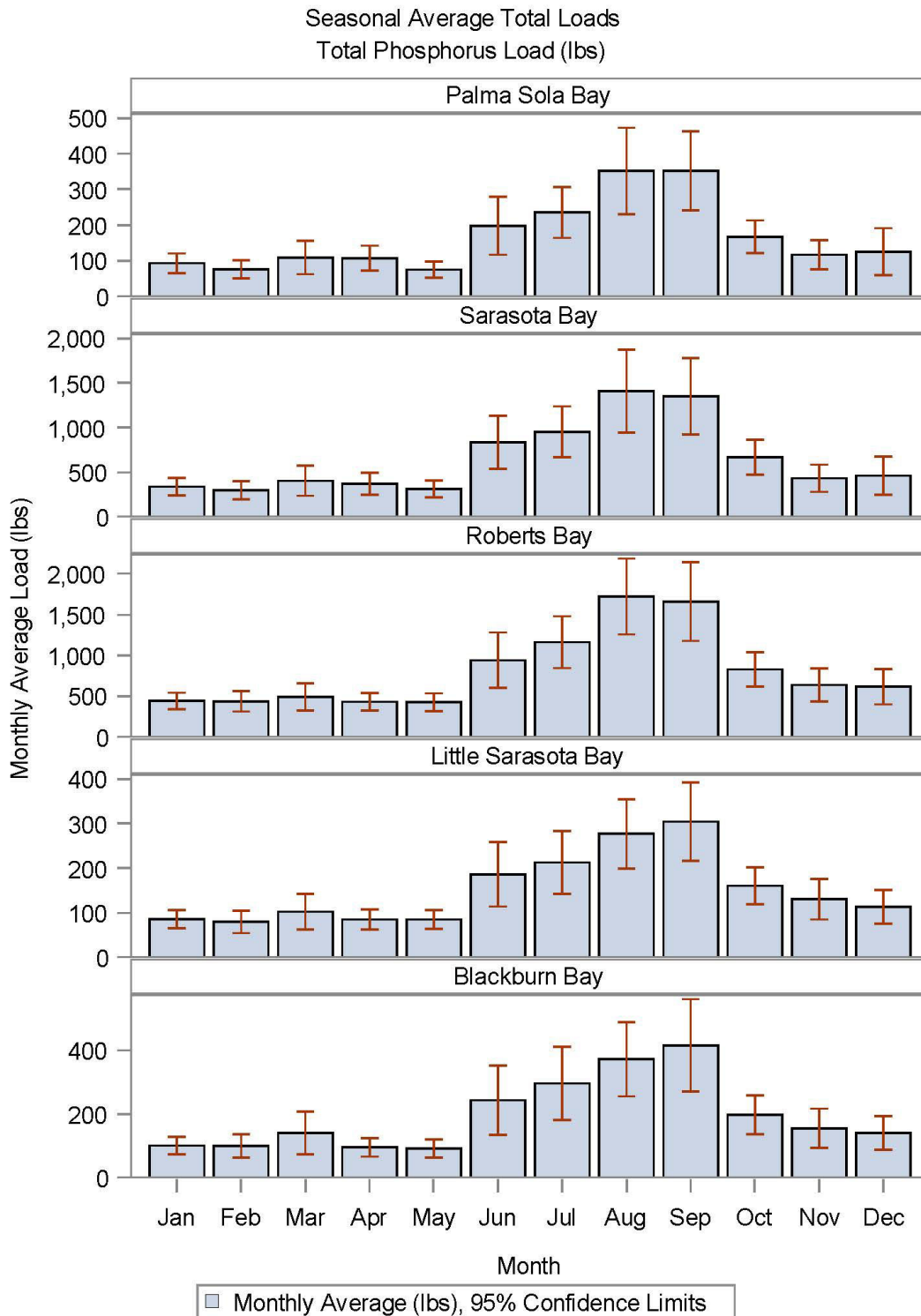
**Figure 15**  
Segment-Specific Annual Total Phosphorus Loads, 1995–2022

### 5.3.3 Seasonal Distributions (Intra-annual Loads)

Seasonal plots of loadings support the assertion that the variation in loads is principally a function of rainfall and the subsequent hydrologic load generated within the watershed, as total nitrogen and total phosphorus loads are higher during the summer wet season (Figure 16 and Figure 17, respectively).



**Figure 16**  
Segment-Specific Monthly Average Total Nitrogen Loads, 1995–2022



**Figure 17**  
Segment-Specific Monthly Average Total Phosphorus Loads, 1995–2022

### 5.3.4 Source Apportionment

The predominant source of both total nitrogen and total phosphorus across the SBEP Bays was runoff (Table 13 and Table 14), which accounted for more than half of the total nitrogen and total phosphorus loads in each watershed. The second-most dominant source was baseflow. Septic systems contributed a greater percentage of the total nitrogen load to Little Sarasota and Blackburn Bays, while atmospheric deposition contributed a higher percentage of total nitrogen to Sarasota and Palma Sola Bays. Reclaimed loads were equal to or less than 5% of the total nitrogen and total phosphorus loads to all segments over the full period of record. However, the relative contribution of these sources did change over time (see Table 15, Table 16, and Figure 18 below) and certain nutrient sources may be more important drivers of estuarine responses than others.

**TABLE 13.**  
**PERCENT OF THE TOTAL NITROGEN LOADS FOR EACH SBEP BAY SEGMENT BY SOURCE**

Total Nitrogen		Source (% of Segment Total)					
Segment	Atmospheric Deposition	Baseflow	Point	Reclaimed	Runoff	Septic	Spills
Palma Sola Bay	8%	17%	0%	4%	68%	2%	0%
Sarasota Bay	13%	15%	5%	2%	63%	2%	0%
Roberts Bay	0%	19%	4%	1%	62%	12%	1%
Little Sarasota Bay	4%	20%	0%	4%	64%	8%	0%
Blackburn Bay	1%	19%	0%	2%	74%	3%	0%

NOTE: SBEP = Sarasota Bay Estuary Program.

**TABLE 14.**  
**PERCENT OF THE TOTAL PHOSPHORUS LOADS FOR EACH SBEP BAY SEGMENT BY SOURCE**

Total Phosphorus		Source (% of Segment Total)					
Segment	Atmospheric Deposition	Baseflow	Point	Reclaimed	Runoff	Septic	Spills
Palma Sola Bay	1%	27%	0%	4%	68%	0%	0%
Sarasota Bay	1%	26%	3%	2%	68%	0%	0%
Roberts Bay	0%	33%	6%	1%	55%	2%	2%
Little Sarasota Bay	0%	34%	0%	5%	58%	1%	0%
Blackburn Bay	0%	33%	0%	3%	63%	1%	1%

NOTE: SBEP = Sarasota Bay Estuary Program.

To illustrate the changes in relative source load contribution over time, the full model period of record was divided into 5-year blocks and percentages of the total load were calculated (Table 15, Table 16, and Figure 18). The major contributing total nitrogen and total phosphorus loading sources (baseflow and runoff) were relatively consistent over time, collectively comprising at least 70% (total nitrogen) to 80% (total phosphorus) of the total load for all segments in any 5-year time period. However, point source load contributions for both total nitrogen and total phosphorus have declined over time in Sarasota and Roberts

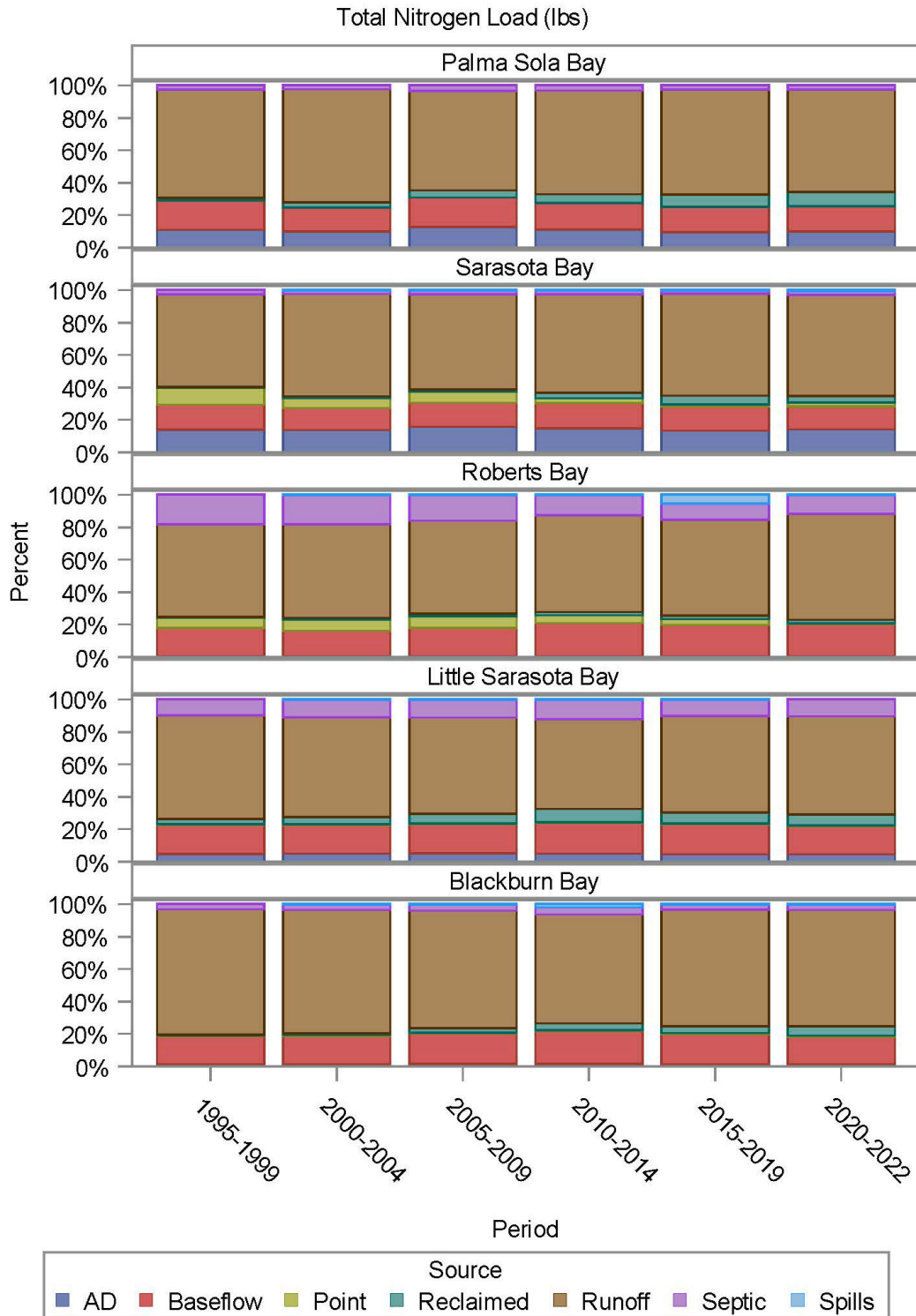
Bays. There has been a decrease in the percentage contribution from septic systems in the Roberts Bay watershed as a function of septic-to-sewer conversion implementation. Also evident is an increase in reclaimed loads in all but Roberts Bay, as the volume of reclaimed water distributed to customers in these watersheds has increased, particularly since 2008.

**TABLE 15.**  
**PERCENT DISTRIBUTION FOR TOTAL NITROGEN LOADS BY SOURCE FOR 5-YEAR BLOCKS WITHIN THE MODEL PERIOD**

Total Nitrogen %		Source						
		Atmospheric Deposition	Baseflow	Point	Reclaimed	Runoff	Septic	Spills
Segment	Period							
<b>Palma Sola Bay</b>	1995–1999	9%	19%	0%	1%	69%	2%	0%
	2000–2004	8%	16%	0%	2%	72%	2%	0%
	2005–2009	10%	19%	0%	3%	65%	3%	0%
	2010–2014	9%	17%	0%	4%	67%	3%	0%
	2015–2019	8%	16%	0%	6%	67%	2%	0%
	2020–2022	8%	17%	0%	7%	66%	2%	0%
<b>Sarasota Bay</b>	1995–1999	12%	16%	9%	0%	60%	2%	0%
	2000–2004	12%	14%	6%	1%	65%	2%	0%
	2005–2009	14%	15%	6%	1%	61%	2%	0%
	2010–2014	13%	16%	3%	3%	63%	2%	0%
	2015–2019	12%	16%	1%	5%	64%	2%	0%
	2020–2022	13%	15%	2%	3%	64%	2%	1%
<b>Roberts Bay</b>	1995–1999	0%	19%	5%	1%	61%	14%	0%
	2000–2004	0%	17%	6%	1%	62%	15%	0%
	2005–2009	1%	19%	6%	1%	61%	13%	0%
	2010–2014	0%	22%	4%	2%	62%	10%	0%
	2015–2019	0%	21%	3%	2%	61%	8%	4%
	2020–2022	1%	21%	1%	2%	67%	9%	0%
<b>Little Sarasota Bay</b>	1995–1999	3%	20%	0%	2%	68%	7%	0%
	2000–2004	4%	20%	0%	3%	66%	8%	0%
	2005–2009	4%	20%	0%	4%	64%	8%	0%
	2010–2014	4%	22%	0%	6%	59%	9%	0%
	2015–2019	3%	21%	0%	5%	63%	8%	0%
	2020–2022	3%	19%	0%	5%	64%	8%	0%
<b>Blackburn Bay</b>	1995–1999	1%	18%	0%	0%	78%	2%	0%
	2000–2004	1%	18%	0%	1%	77%	3%	0%
	2005–2009	1%	19%	0%	2%	73%	3%	0%
	2010–2014	1%	22%	0%	3%	68%	4%	2%
	2015–2019	1%	20%	0%	3%	72%	3%	0%
	2020–2022	1%	18%	0%	5%	72%	3%	0%

**TABLE 16.**  
**PERCENT DISTRIBUTION FOR TOTAL PHOSPHORUS LOADS BY SOURCE FOR 5-YEAR BLOCKS WITHIN THE MODEL PERIOD**

Total Phosphorus %		Source						
Segment	Period	Atmospheric Deposition	Baseflow	Point	Reclaimed	Runoff	Septic	Spills
<b>Palma Sola Bay</b>	1995–1999	1%	30%	0%	1%	68%	0%	0%
	2000–2004	1%	25%	0%	2%	72%	0%	0%
	2005–2009	1%	30%	0%	3%	65%	0%	0%
	2010–2014	1%	28%	0%	4%	67%	0%	0%
	2015–2019	1%	26%	0%	6%	67%	0%	0%
	2020–2022	1%	27%	0%	7%	65%	0%	0%
<b>Sarasota Bay</b>	1995–1999	1%	27%	6%	0%	65%	0%	0%
	2000–2004	1%	24%	2%	1%	72%	0%	0%
	2005–2009	2%	26%	2%	1%	68%	0%	0%
	2010–2014	1%	26%	4%	3%	65%	0%	0%
	2015–2019	1%	26%	1%	5%	67%	0%	0%
	2020–2022	1%	25%	2%	3%	67%	0%	1%
<b>Roberts Bay</b>	1995–1999	0%	32%	8%	0%	57%	3%	0%
	2000–2004	0%	30%	8%	1%	59%	3%	0%
	2005–2009	0%	33%	7%	1%	56%	2%	0%
	2010–2014	0%	36%	7%	1%	53%	2%	1%
	2015–2019	0%	33%	4%	1%	49%	1%	11%
	2020–2022	0%	37%	0%	2%	59%	2%	0%
<b>Little Sarasota Bay</b>	1995–1999	0%	32%	0%	3%	63%	1%	0%
	2000–2004	0%	34%	0%	4%	59%	1%	0%
	2005–2009	0%	35%	0%	6%	57%	2%	0%
	2010–2014	0%	37%	1%	8%	53%	2%	0%
	2015–2019	0%	36%	0%	7%	55%	1%	0%
	2020–2022	0%	34%	0%	7%	57%	1%	0%
<b>Blackburn Bay</b>	1995–1999	0%	30%	0%	0%	69%	1%	0%
	2000–2004	0%	31%	0%	1%	67%	1%	0%
	2005–2009	0%	33%	0%	3%	62%	1%	0%
	2010–2014	0%	35%	0%	4%	55%	1%	4%
	2015–2019	0%	35%	0%	5%	59%	1%	0%
	2020–2022	0%	32%	0%	7%	60%	1%	0%



NOTE: AD = Atmospheric Deposition.

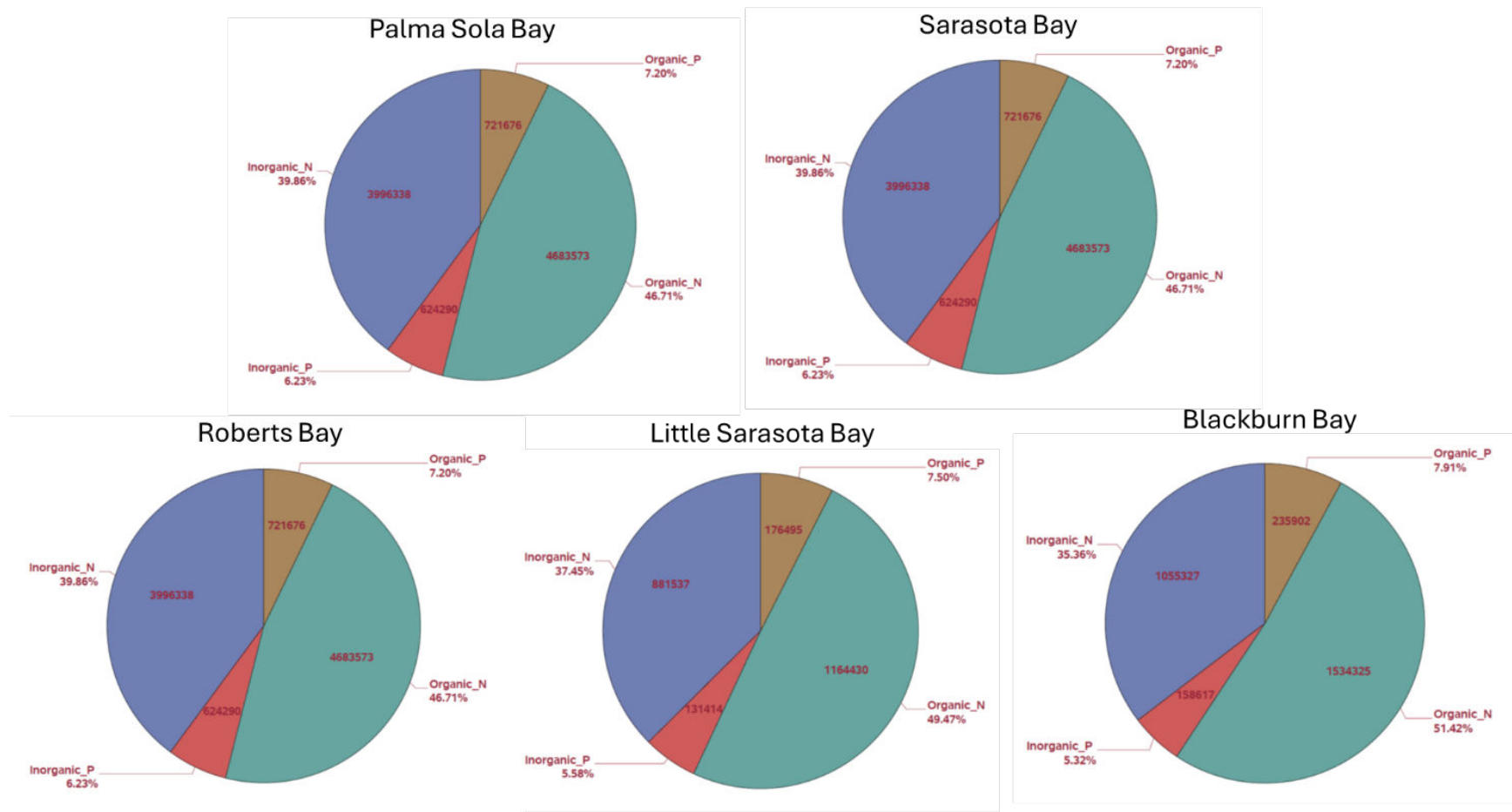
**Figure 18**

Percent Distribution for Total Nitrogen Loads by Source for 5-year Blocks within the Model Period

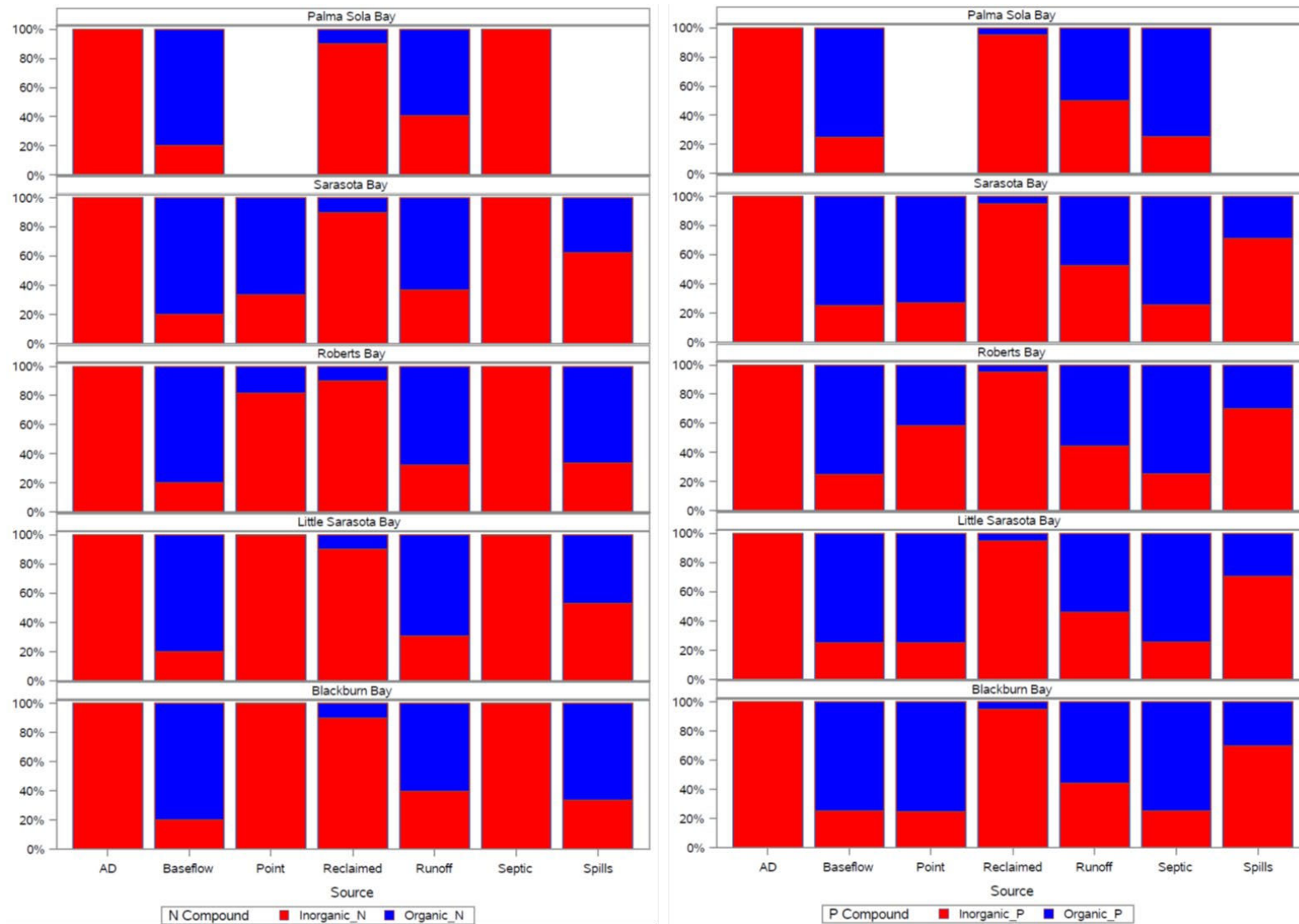
### 5.3.5 Inorganic Versus Organic Nutrient Loads

The principal nutrients modeled by SIMPLE were total nitrogen and total phosphorus. Total nitrogen loads represented over 85% of the total nutrient load to each of the SBEP Bays while phosphorus represented almost all of the remaining 15% (Figure 19). Approximately 50% of the total load for both nitrogen and phosphorus was in inorganic form; however, the relative distribution of organic and inorganic loads by source (Figure 20) is quite variable. SIMPLE considers atmospheric deposition loads as 100% inorganic for both nitrogen and phosphorus, while septic nitrogen loads are considered 100% ammonia and septic phosphorus loads are considered approximately 50% inorganic phosphorus. Baseflow and runoff load proportions are based off of EMCs as described above. However, SIMPLE typically reports loads for the remaining sources (i.e., reclaimed, point sources, and spills) as total nutrient loads rather than breaking them down into organic and inorganic fractions since those proportions tend to be site specific. To estimate the true inorganic fractions, actual water quality sampling results or the type of spill (raw wastewater vs. reclaimed water) were used where available to apply inorganic and organic fractions to these sources as a post hoc evaluation to derive the estimated true inorganic fractions from the typical SIMPLE model output.

The timeseries of annual post-processed total inorganic nitrogen loads resulting from this exercise for the combined southern SBEP Bays (Figure 21) depicts the lack of spills since 2019 as well as the increased loads associated with reclaimed use and spills during the Degraded Period on the estimated total inorganic load. As of 2022, inorganic loads in Roberts Bay are below the Reference Period average while Little Sarasota and Blackburn Bays have exhibited a slight increasing trend over time (Figure 22). The increased distribution of reuse water in Little Sarasota and Blackburn Bays accounts for this increasing trend in these waterbodies, which bears monitoring; however, the mass of inorganic nitrogen delivered by Little Sarasota and Blackburn Bays is only approximately 25% of the Roberts Bay inorganic nitrogen load.

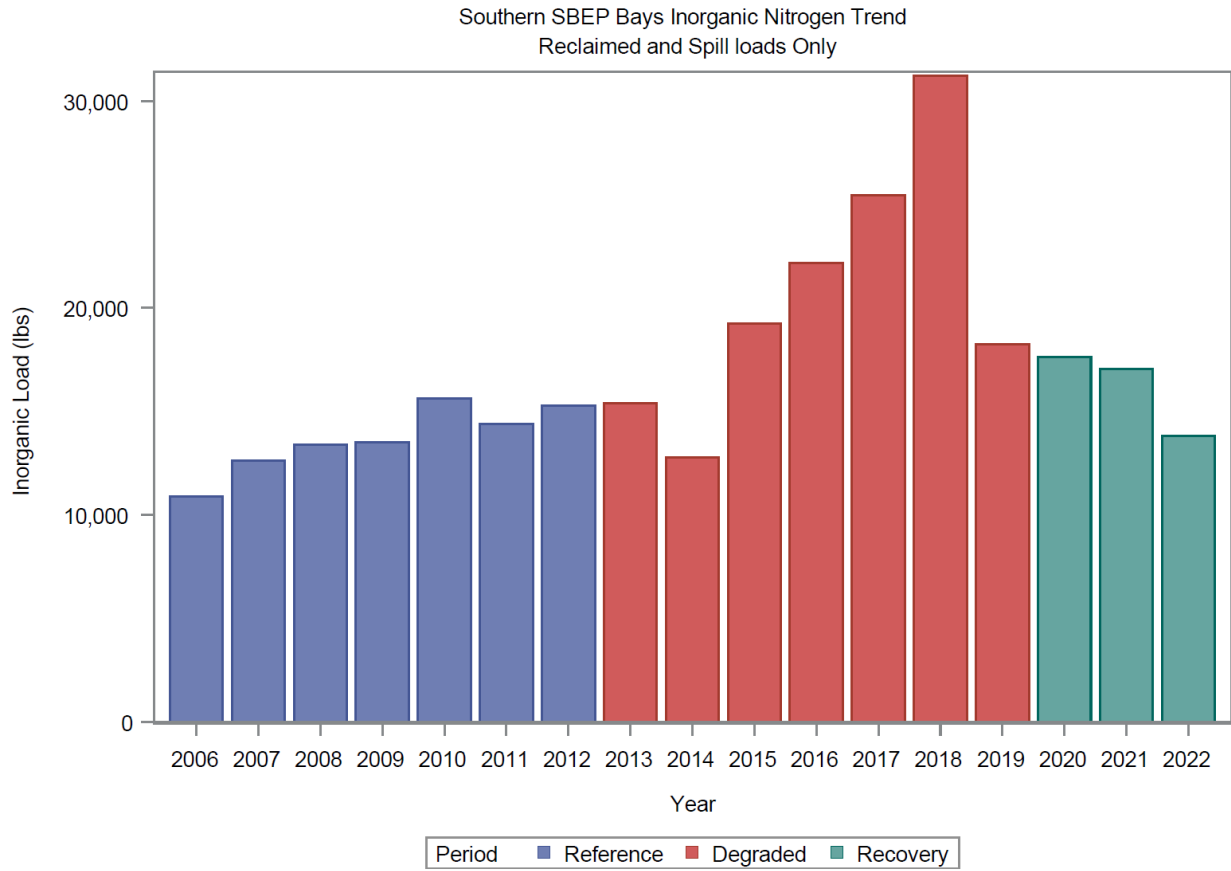


**Figure 19**  
 Distribution of Average Percent of Total Nutrient Load Categorized by Organic and Inorganic Loads



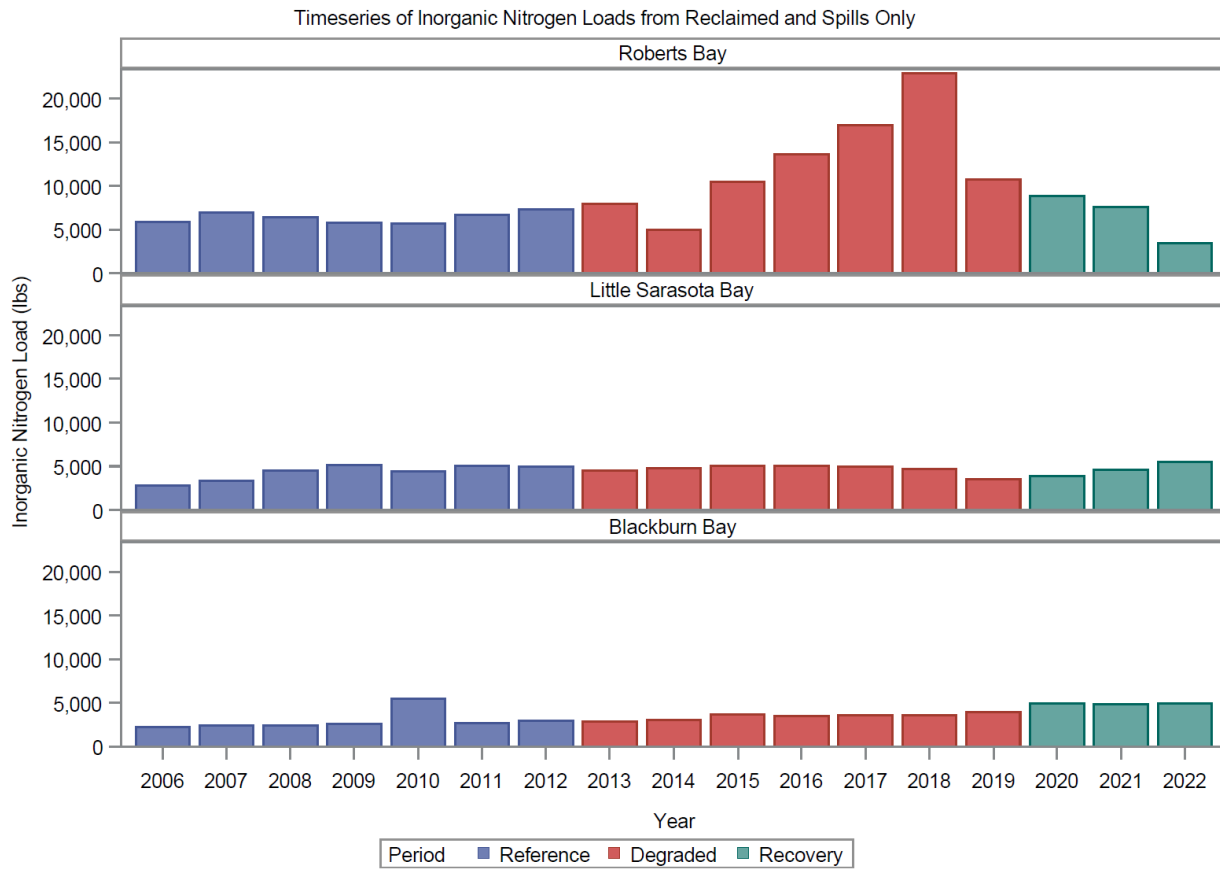
**Figure 20**

Percentage of Average Inorganic and Organic Nitrogen (left) and Phosphorus (right) by Source, based on Model Loadings for SIMPLE, 1995–2022



**Figure 21**

Timeseries Plots of Total Inorganic Nitrogen Load from Reclaimed Water and Spills for Roberts, Little Sarasota, and Blackburn Bays Combined, 2006–2022

**Figure 22**

Timeseries of Total Inorganic Nitrogen Loads by Segment for Roberts, Little Sarasota, and Blackburn Bays, 2006–2022

## 5.4 Model Setup for Future Loading Scenario

Another major component of this Plan was to develop future loading estimates that could be used to estimate expected nutrient loading under a “Future” land use scenario. To develop the Future loading estimates, SIMPLE was used (described in Section 5.1), but the inputs were adjusted to reflect a build-out of the watershed. This built-out scenario estimated 30 years of population growth by converting all developable lands (i.e., those not already developed or in conservation) to medium-density residential development, converting all WWTFs to AWT facilities, eliminating all septic systems, and eliminating any noncompliant effluent releases. The rainfall patterns over the existing model run were used to predict the effects of these hypothetical changes on pollutant loading. Detailed information on adjustments for each source is provided in the following subsections.

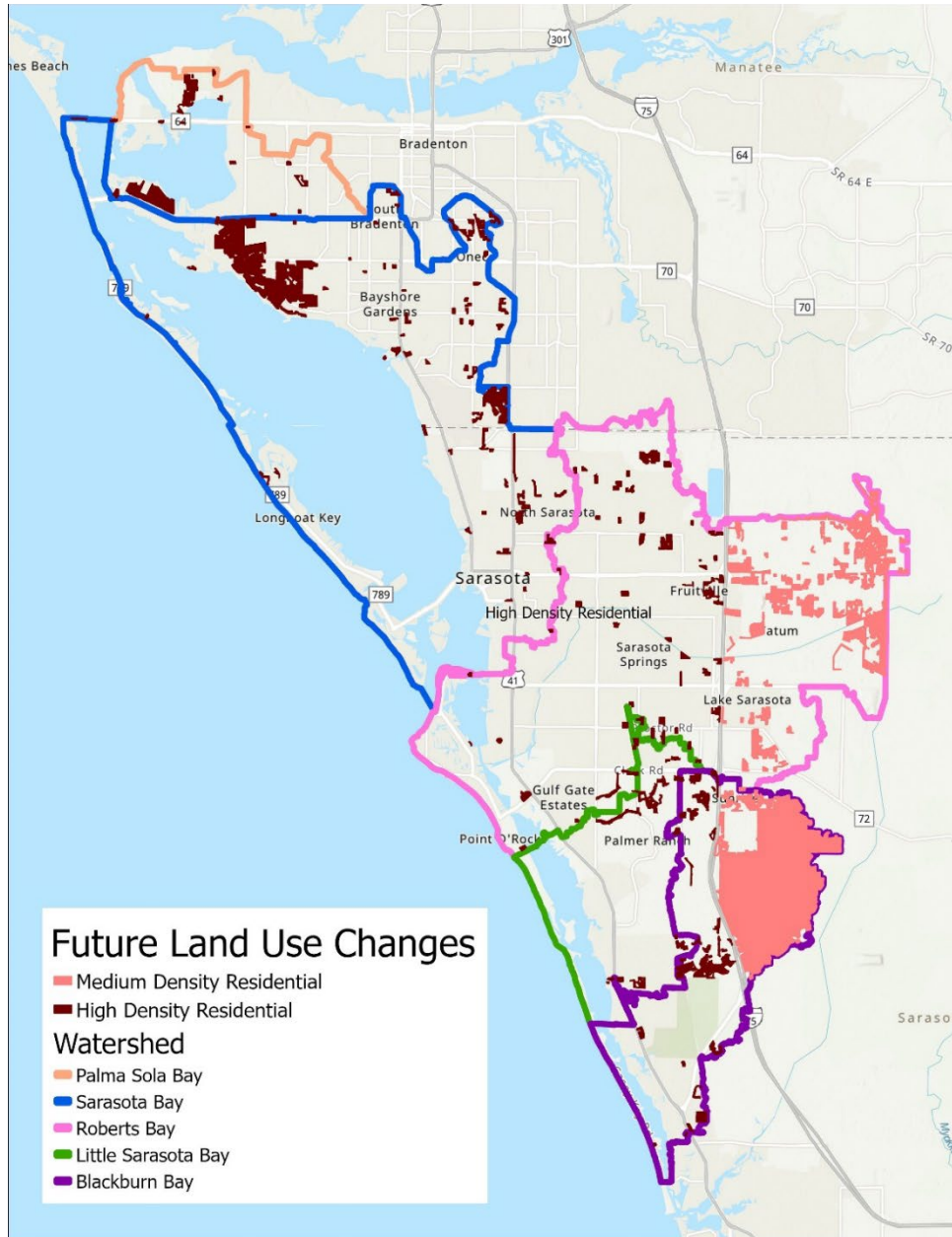
### 5.4.1 Hydrology

Despite efforts to model the future climate conditions regarding the spatial and temporal variation in rainfall, it was decided to use the existing model’s 27-year period of record of monthly rainfalls to derive future runoff, baseflow, and atmospheric loads. That period of record includes droughts, average years,

wet years, and tropical systems, thereby providing a representative record for comparing baseline and future loads.

### 5.4.2 Land Use

The land use layer was adjusted to account for future development of agricultural and open lands. To account for these changes, large rural or agricultural tracts that were outside of urban areas and that were not already held in conservation were converted to medium-density residential with wet detention. Undeveloped open lands within the urban areas were converted to high-density residential (Figure 23).



**Figure 23**  
Future Land Use Changes Based on the Conversion of Rural, Agricultural and Open Lands

The acreage of lands converted to residential development varied by watershed (Table 17). In addition, for all areas, it was assumed that runoff would be held and treated by wet detention BMPs and these areas would receive reuse water in the future.

**TABLE 17.**  
**ACRES OF LAND USE CONVERSION BY WATERSHED**

<b>Watershed</b>	<b>Land Use</b>	<b>Area (acres)</b>
Palma Sola Bay	High-density residential	399
Sarasota Bay	High-density residential	1,843
Roberts Bay	Medium-density residential	2,197
Little Sarasota Bay	High-density residential	203
Blackburn Bay	Medium-density residential	4,701
	High-density residential	467

### 5.4.3 Reuse Water

Several assumptions were necessary to estimate the effects of future reuse application, including area applied, concentration, and application rate. To accomplish this, all of the lands converted to medium- and high-density residential to represent the built-out condition were assumed to receive reuse water from their respective suppliers. Sarasota County has committed to converting their WWTFs to AWT facilities. This would significantly reduce the nutrient concentrations of their reuse product that would be distributed. To account for this upgrade, the nutrient concentration of reuse water for AWT facilities was set to 2 mg/L for total nitrogen and 1 mg/L for total phosphorus for the Future loading scenario. Smaller WWTFs (mostly in Manatee County) without known plans to convert to AWT were set at 9 mg/L for total nitrogen and 1 mg/L for total phosphorus. Finally, the rate at which reuse water was applied was estimated based on the existing application rate expanded to new areas. Using the existing application rate (estimated as a monthly unit area volume) allowed for the application pattern of the existing condition to be replicated and expanded to all new reuse areas.

### 5.4.4 Wastewater/Septic Systems

Local governments are committed to eliminating discharges of noncompliant effluent from WWTFs to the SBEP Bays. Sarasota County been working to incorporate approximately 140 small, delegated wastewater plants (generally less than 0.5 million gallons per day) into their central collection system. Currently, there are still about a dozen in operation (Conservation Foundation of the Gulf Coast, 2020). We assume in the future, all these plants will be connected to the central collection systems. Because of these assumptions, there will no longer be point source loads contributing as part of the Future loading scenario. Sarasota County also continues to plan for the connection of septic systems to central sewer. Because of this, the Future scenario assumed all septic systems would be converted to central sewer, thus eliminating system loads.

### 5.4.5 Uncertainties

The Future loading scenario acknowledges uncertainty in how effects of climate change including changes in air and water temperature, rainfall patterns, sea level rise, and resulting changes in salinity regimes in these estuaries might affect estuarine health. It was not possible within the construct of this effort to account for potential climate change effects. Therefore, this Future condition might represent an underestimate of what is needed to protect the SBEP Bays if climate change has a compounding deleterious effect on estuarine health.

## 5.5 Model Results for Future Loading Scenario

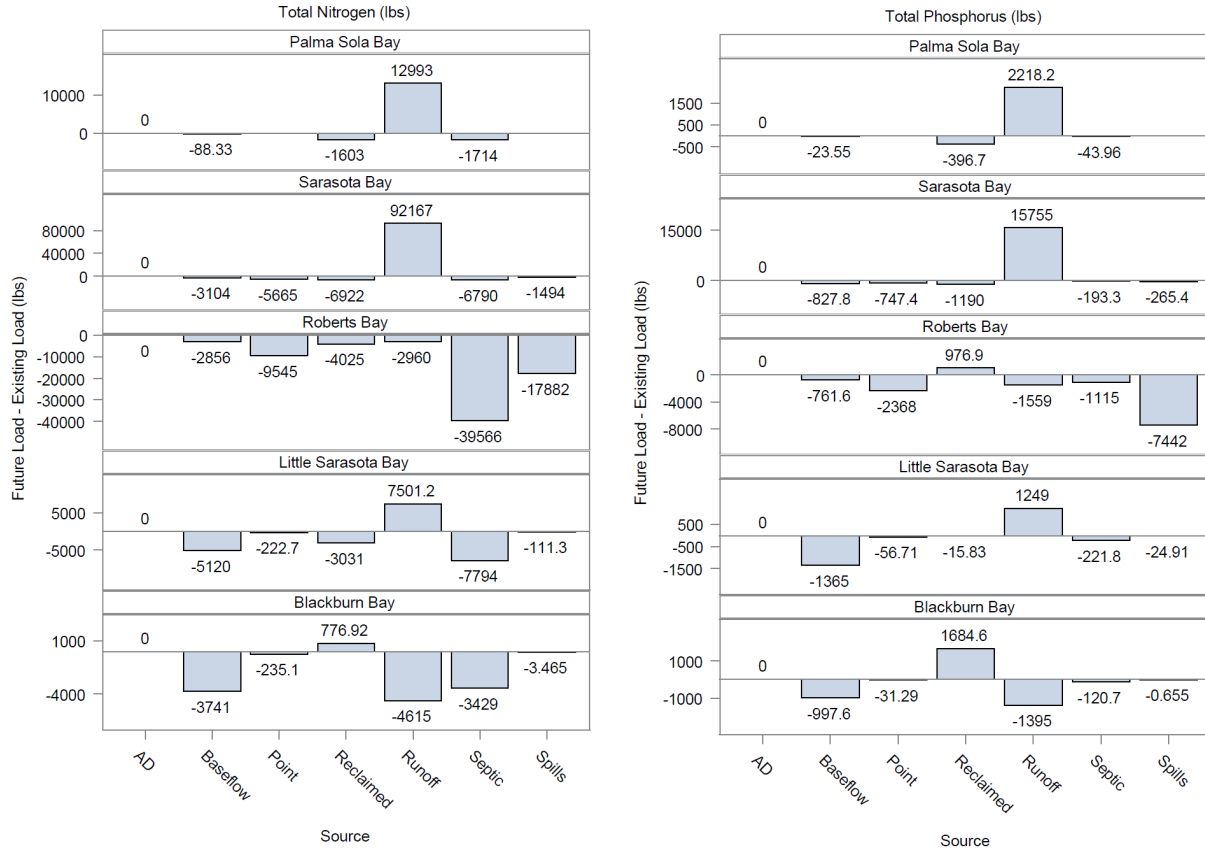
The Future loading scenario resulted in predicted increased hydrologic loads in every watershed as expected as a result of increased impervious surface associated with land use changes to a more developed landscape (Figure 24: left). However, the differences were watershed dependent, with Roberts Bay watershed reflecting very little change in hydrologic load relative to the other segments due to the little anticipated development of this watershed in the future and some reduction in Future hydrologic loads from the removal of septic systems. Differences in total nitrogen load (Figure 24: right) were more watershed dependent, with increases in load predicted for Palma Sola and Sarasota Bays and small decreases in nutrient loads predicted in the southern Bays as eliminating septic systems and other noncompliant effluent and increasing treatment of reclaimed water to AWT standards resulted in a net decrease in total nitrogen loads for the Future scenario.



**Figure 24**  
Timeseries of predicted Existing (blue) and Future (red) hydrologic (left) and total nitrogen (right) loads

The load increases in Palma Sola and Sarasota Bays were due to converting all currently undeveloped lands to high-density residential. This change resulted in the application of higher total nitrogen EMCs as a major portion of the area went from forest, open areas, and parks with a total nitrogen EMC of 1.15 mg/L to high-density residential with a total nitrogen EMC of 2.32 mg/L. The increased EMCs, coupled with the increase in impervious surface and therefore runoff, increases the load of nitrogen and phosphorus in those areas (Figure 25). This comparison is based on the last 7 years of data (2015–2022) for the Existing condition, which was the basis for the latest DEP assessment. Restricting the comparison to the most recent 7 years also minimizes the confounding effects of changes in land use early on in the timeseries when estimating the current loads, while averaging out the effects of individual year comparisons.

In Roberts Bay, the reduction in load associated with septic tank removal far outweighed all other changes in loadings between the Future and Existing conditions. In Little Sarasota and Blackburn Bays, reductions in runoff, septic, and baseflow loads outweighed increases in reclaimed loads. While it might seem counterintuitive that runoff loads decrease with increased impervious surface associated with development, the combination of a lower total nitrogen EMC for medium-density residential (2.07 mg/L) than that for pasture (3.47 mg/L), coupled with the application of BMPs to those developed lands in the Future loading scenario, resulted in a net reduction in total nitrogen loads in runoff to these southern SBEP Bays even though hydrologic loads for these sources increased. Phosphorus loads generally mirrored patterns observed for total nitrogen loads.



NOTE: Negative values indicate less loading in the Future scenario.

**Figure 25**

Difference in Total Nitrogen (left) and Total Phosphorus (right) between Future and Existing Load Scenarios, 2015–2022

## CHAPTER 6

# Identifying Pollutant Loading Targets to Protect Against Future Impacts

The following sections describe the logic for adopting pollutant loading targets to protect ecosystem health in the SBEP Bays, based on the results of the analysis described above.

### 6.1 Water Quality Concentration Targets

Existing water quality targets have demonstrated their effectiveness in protecting the SBEP Bays. When the established NNC for the lower bays were exceeded more than once in a 3-year period (as evaluated under the IWR), DEP deemed the SBEP Bays in Sarasota County to be Impaired; the water quality in these bays was demonstrably poorer when in noncompliance with the NNC than when in compliance. The SBEP Report Card results supported this assessment, which included a more complete assessment of estuarine health than water quality alone. A comparison of the NNC and the Report Card thresholds are presented in Table 18.

**TABLE 18.**  
**COMPARISON OF NUMERIC NUTRIENT CRITERIA AND SBEP REPORT CARD VALUES**  
**FOR TOTAL NITROGEN AND CHLOROPHYLL A**

Waterbody	Total Nitrogen	Chlorophyll a
Palma Sola Bay	0.93 mg/L NNC as AGM <i>0.64 mg/L: SBEP AGM</i>	11.8 µg/L NNC as annual mean <i>9.72 µg/L SBEP AGM</i>
Sarasota Bay	See paragraph 62-302.532(1)(i), F.A.C. <i>0.37: SBEP AGM</i>	6.1 µg/L NNC as annual mean <i>4.35: SBEP AGM</i>
Roberts Bay	0.54 mg/L NNC as AGM <i>0.47 mg/L: SBEP AGM</i>	11.0 µg/L NNC as annual mean <i>6.93 µg/L: SBEP AGM</i>
Little Sarasota Bay	0.60 mg/L NNC as AGM <i>0.51 mg/L: SBEP AGM</i>	10.4 µg/L NNC as annual mean <i>6.94 µg/L: SBEP AGM</i>
Blackburn Bay	0.43 mg/L NNC as AGM <i>0.36 mg/L: SBEP AGM</i>	8.2 µg/L NNC as annual mean <i>4.55 µg/L: SBEP AGM</i>

NOTES: µg/L = micrograms per liter; AGM = annual geometric mean; F.A.C. = Florida Administrative Code; mg/L = milligrams per liter; NNC = numeric nutrient criteria; SBEP = Sarasota Bay Estuary Program.  
SBEP thresholds are shown in italics.

The Sarasota Bay NNC for total nitrogen was developed based on a multiple linear regression model that included water color as a covariate, which has proven problematic to implement as the color method used by Manatee County has changed. Potential alternative criteria that may be recommended as a result of this

Plan include the previous efforts to develop alternative numeric total nitrogen criteria (Janicki Environmental 2019) which recommended 0.44 mg/L based on DEP’s Healthy Estuaries approach, or 0.49 mg/L based on a stressor-response mixed effects modeling approach, or the SBEP Report Card threshold of 0.37 mg/L. It should be noted that the Report Card values tend to be lower than the NNC and were not developed to be regulatory standards. For example, a value exceeding the threshold gets a Report Card score of 2, which is coded “yellow” and is associated with an indicator of concern; this would be a trigger for determining if management actions are necessary. The decision on whether to recommend alternative criteria for Sarasota Bay should be processed through the SBEP Water Quality Consortium (WQC) and, if approved, can be adopted through DEP’s Triennial Review process.

## 6.2 Pollutant Loading Targets

Given the totality of information above, the Bay segment specific Recovery Period averages of the annual loads for each bay are proposed as the pollutant loading targets. Targets are what the Plan hopes to achieve as a goal, but exceedance of the targets does not necessarily mean that there is an adverse effect on estuarine health. Recall that Palma Sola and Sarasota Bays were not deemed Impaired for water quality despite other indicators of estuarine health (e.g., seagrass, macroalgal cover, and protracted red tide events) that suggested potentially deleterious conditions during the Degraded Period. The protracted red tide events, as well as the effects of Hurricane Irma, cannot be discounted as potential additional stressors to these systems. Because all SBEP Bays are currently meeting their designated use, the pollutant loading model target loads for these Bays are proposed to be the average Recovery Period loads as defined in Table 19. These targets should not be exceeded under normal hydrologic conditions. Implementation of these loading targets are described in detail in Chapter 9 as part of the decision framework to guide management actions for water quality results associated with this Plan.

**TABLE 19.**  
**PROPOSED ANNUAL TOTAL NUTRIENT TARGET LOADS FOR TOTAL NITROGEN AND**  
**TOTAL PHOSPHORUS IN POUNDS PER YEAR**

<b>Segment</b>	<b>Total Nitrogen (lbs)</b>	<b>Total Phosphorus (lbs)</b>
Palma Sola Bay	62,861	10,284
Sarasota Bay	313,257	49,996
Roberts Bay	336,882	50,875
Little Sarasota Bay	74,437	11,162
Backburn Bay	94,972	14,517

## 6.3 Protecting Against Future Impacts

The Future loading scenario relied on expectations that all projects associated with future development would be achieved. For example, it is safe to assume that all future land use development will include some kind of BMP as part of permit requirements for new development. Similarly, Sarasota County is committed to going to AWT with no discharges throughout the County in coming decades, which our analysis shows would have a significant impact on inorganic nitrogen loads to the SBEP Bays. The analysis of the Future condition illuminated the potential future threat of development for each type of

pollutant loading and suggested that improving treatment of wastewater through AWT, septic-to-sewer conversion, and including BMPs with new development can offset the effects of population growth in some areas. However, the assumption that all septic tanks will be eliminated is somewhat tenuous, as this is an expensive and time-consuming upgrade that some residents remain opposed to in some areas. Septic tank removal contributed significantly to the nutrient load reduction predicted in the Future condition and should be prioritized along with going to AWT for reclaimed water to reduce nutrient loadings to the SBEP Bays.

# CHAPTER 7

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## Ongoing and Proposed Management Actions

### 7.1 Summary of Pollutant Load Reductions Projects

Plan stakeholders have a long history of protecting Sarasota Bay’s estuaries. While much of the early work focused on flood protection, some projects have included water quality improvement as both Manatee and Sarasota Counties have had NPDES permits for stormwater discharge since the early 1990s. Most recently, work has focused on creating regional stormwater facilities like the Celery Fields, which treats water for a large portion of the Roberts Bay watershed and which has become a habitat for all types of birds. Other projects such as the Hudson Bayou project near Sarasota High School and the Bobby Jones Golf Course project treat stormwater and create native habitat for local flora and fauna.

Perhaps the most significant contributions to the protection of the SBEP Bays were due to improving wastewater management. Starting in the early 2000s, Sarasota County began an effort to remove approximately 14,000 septic systems from the Phillippi Creek Basin to restore a waterway posted as a “no contact” waterbody. The program continues, and Sarasota County has expanded its planning efforts to include all unincorporated areas within the County. In 2017, Manatee County upgraded its Southwest Regional Water Reclamation Facility to a process that reduces total nitrogen to below 8.5 mg/L. Manatee County also increased its reuse storage capabilities, which reduces its need to dispose of its WWTF discharges to surface waters. The City of Sarasota converted its WWTF to an AWT facility, reducing the nitrogen concentration of its effluent to under 2 mg/L. The City also increased its portfolio of reuse customers such as Lakewood Ranch, and increased its deep well injection capacity to cease surface water discharges to Sarasota Bay through Whitaker Bayou. Since 2008, Sarasota County has removed three surface water discharges from the watershed: Gulf Gate WWTF, South Gate WWTF, and Siesta Key Utilities. Sarasota County has also committed to convert their two water reclamation facilities within the SBEP watersheds to AWT and increase their deep well disposal capacity to prevent the discharge of excess treated reuse water during the rainy season.

### 7.2 Future Load Reductions

A goal of this Plan is to “hold the line” at the threshold loads which are proposed based on the system recovery and health observed during recent Recovery Period; therefore, there may be a future need to reduce loads. Changes in climate (e.g., increased frequency and/or intensity of rainfall) or changes in financial markets that may delay already planned projects may need to be offset by reducing nutrient loads to the estuary. Fortunately, many of the stakeholders continue to develop plans to reduce nutrient loads, alleviate flooding, and restore natural habitat. As part of this Plan, all currently known projects that have associated nutrient load reductions have been compiled into a Project Portal Database. Currently there are 114 conceptual plans in the portal (Appendix C), which amount to a reduction in total nitrogen

by 15,729 pounds per year and a reduction in total phosphorus by 3,805 pounds per year. A small subset of those projects is shown in Table 20.

**TABLE 20.**  
**EXAMPLE OF PROJECTS IN THE PROJECT PORTAL DATABASE**

<b>Watershed</b>	<b>Basin</b>	<b>Project Name</b>	<b>Total Suspended Solids Removal Estimate (lbs/yr)</b>	<b>Total phosphorus Removal Estimate (lbs/yr)</b>	<b>Total Nitrogen Removal Estimate (lbs/yr)</b>	<b>Sediment Removal Estimate (yd<sup>3</sup>/yr)</b>	<b>Project Description</b>	<b>Estimated Cost</b>
Sarasota Bay	Sarasota Bay Coastal	City of Sarasota WWTF		Varies	Varies		The City of Sarasota has made the commitment to eliminate the wet weather surface water discharge in Whitaker Bayou.	
Sarasot Roberts Little Sarasota Blackburn Bays	All Sarasota Basins	Sarasota County upgrade to AWT at all Water Reclamation Facilities		Varies	Varies		Sarasota County has made the commitment to upgrade all of their water reclamation facilities to advanced wastewater treatment and improving the capacity to dispose of excess effluent via deep well injection or as reclaimed water. To date, they have increased the capacity of the deep well at the Bee Ridge WRF, created an interconnect between Bee Ridge WRF and the Central County Utilities WRF and is currently working on increasing the capacity and upgrading the Bee Ridge WRF. Future work include the conversion of the Central County Utilities WRF. This work will reduce the nitrogen concentration of the County's reclaimed water from around 12 mg/L to < 3 mg/L.	
Roberts Bay	Phillippi Creek	Phillippi Creek Main Restoration	4,800	678	2,955	40	Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, the removal of a historic dam, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$19,799,003
Roberts Bay	Phillippi Creek	Phillippi Creek E. Tributaries	28,200	650	850	13,600	Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$3,546,472
Little Sarasota Bay	Catfish Creek	Catfish Creek Stream Restoration	15,514	62	236	755	Objectives of this project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes a sediment dissipator and reintroducing native vegetation.	\$1,388,892
Little Sarasota Bay	South Creek	Tamiami Trail Diversion	20,428	159	580		This site is on the east side of Tamiami Trail between Giotto and Gulf Avenue. Sarasota County pump station 25 is on the north side of this site and pumps wastewater from various lift stations to treatment plants north and south of the site. The area south of the pump station has open grassy areas and scattered pockets of trees and vegetation. Untreated stormwater runoff from the north and east appears to drain to the Tamiami Trail drainage system, which consists of grassed swales and culverts. This system discharges to the bay. This project includes creating a diversion, and constructing a treatment train that includes bioswales, a treatment wetland, and a wet detention pond.	\$253,969

NOTES: lbs/yr = pounds per year; yd<sup>3</sup>/yr = cubic yards per year.

The portal can be queried by watershed, or if needed, by a specific basin within a watershed to create a list of nutrient load reduction projects. It is anticipated that this portal will be routinely updated as part of the water quality consortium to track progress in managing pollutant loads in the future.

### 7.3 Funding Sources

Building the projects described in Section 7.2 will require substantial investment, both financial and in terms of personnel. Funding sources include general funds and stormwater utility funds from the stakeholders. Additional funds will likely be needed in order to see many of these projects through construction. Table 21 lists the more consistently available options for obtaining external funding for water-related projects in Florida.

**TABLE 21.**  
**GENERAL FUNDING SOURCES AVAILABLE FOR WATER-RELATED PROJECTS**

<b>Funding Source</b>	<b>Administering Entity</b>	<b>Types of Work Funded</b>	<b>Considerations</b>
RESTORE/RECOVER	NOAA	Coastal flood protection and infrastructure, natural resources and ecosystems, state parks and tourism, and infrastructure and economic development	Projects must be selected via a public engagement process to ensure community involvement and support
EPA Section 319	EPA/DEP	Nonpoint source protection and restoration	Funded by EPA and administered by DEP
Water Infrastructure Finance and Innovation Act	EPA	Provides long-term, low-cost loans for significant water infrastructure projects	Projects typically need to cost \$20 million or more to be eligible for WIFIA assistance
State Revolving Fund	DEP	Low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects	Varies by fund type
Water Quality Improvement Grant Program	DEP	Water quality	This Program covers multiple grants that vary from year to year
Resilient Florida Grant Program	DEP	Mostly for protection against threats such as flooding	Planning grants provide 100% funding and Implementation grants provide up to 50% project cost
State Appropriations Requests	Florida Legislature	Wide range	Requires sponsorship
Cooperative Funding Initiative	SWFWMD	This program allows local governments to share costs for projects that assist in creating sustainable water resources, provide flood protection, and enhance conservation efforts	Annual application process with highly variable funding
Gulf of Mexico Alliance	Self	Research and mitigation, with emphasis on community education/interaction	Funding is provided by partnered corporations, and as such funding priorities vary with each corporation
Mitigation	FDEM/FEMA	Multiple grants primarily aimed at flood protection	Varies by grant type

<b>Funding Source</b>	<b>Administering Entity</b>	<b>Types of Work Funded</b>	<b>Considerations</b>
Community Development Block Grant	HUD/FDEO	Develop viable urban communities by providing decent housing and a suitable living environment and expanding economic opportunities	Varies by grant type
Natural Resources Conservation Services Grants	Natural Resources Conservation Service	A variety of grants and programs aimed at promoting conservation and improving natural resources	Varies by grant type
Hazard Mitigation Grant Program	FEMA	Provides funding for mitigation projects to reduce disaster risk	Rolling application process
FCT Grants	Florida Communities Trust	Assists communities with protecting natural resources, providing recreational opportunities and preserving Florida's traditional working waterfronts	Usually focused on land acquisition
Partnership grants	Sarasota Bay Estuary Program	Offers grants to Florida citizens, organizations, businesses, government agencies, schools, colleges and universities who are implementing activities that support the objectives outlined in the Comprehensive Conservation and Management Plan to protect and improve the ecological integrity of the greater SBEP watershed	Projects vary greatly in scope and scale, and are usually funded in cooperation with other sources
National Coastal Wetlands Conservation Grants Program	U.S. Fish and Wildlife Service	Provides grants to protect, restore, and enhance coastal wetlands	Can also be used to acquire property or easements
HUD grants	HUD	Varies by year	Green and Resilient Retrofit Program Elements is an example from Fiscal Year 2023

NOTES: DEP = Florida Department of Environmental Protection; EPA = U.S. Environmental Protection Agency; FDEMA = Florida Division of Emergency Management; FDEO = Florida Department of Economic Opportunity; FEMA = Federal Emergency Management Agency; HUD = U.S. Department of Housing and Urban Development; NOAA = National Oceanic and Atmospheric Administration; SWFWMD = Southwest Florida Water Management District; WIFIA = Water Infrastructure Finance and Innovation Act.

## **CHAPTER 8**

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# **Procedures for Monitoring, Compliance, Assessment, and Reporting**

Effective watershed management includes consistent routine monitoring, assessment, reporting, and adaptive management. The following sections outline the proposed elements necessary to maintain the recommendations of this Plan as an actionable process. The SBEP WQC is recommended as the appropriate venue to vet the results of the evaluations proposed below. The SBEP WQC is a forum of stakeholders who require this information to remain engaged in proactive watershed management planning activities as responsible entities for nutrient loadings to the SBEP Bays. A decision framework for action based on the recommendations below is presented in Chapter 9.

## **8.1 Monitoring**

### **8.1.1 Water Quality**

Manatee and Sarasota Counties currently share the responsibility of monitoring Sarasota Bay. Manatee County monitors Palma Sola Bay while the rest of the segments are sampled by Sarasota County. The Counties collect the samples either directly, or via contractors, and upload the data to DEP's WIN data repository for analysis and as part of State water quality assessments. It is recommended that these routine water quality monitoring programs continue as currently implemented since all compliance related water quality reporting is based on this sampling frequency. In addition, continued watershed water quality monitoring, including samples in the tidal creeks discharging to the SBEP Bays, should be continued and bolstered where feasible.

### **8.1.2 Seagrass and Macroalgae**

Two seagrass monitoring efforts routinely evaluated to determine the health of seagrasses in the SBEP Bays should be continued. The SWFWMD biennial aerial surveys designed to calculate areal extents of seagrass are expected to continue for the foreseeable future. The biannual Eyes on Seagrass Program data collection efforts provide valuable additional information to supplement the areal extent estimates by estimating percent cover of both seagrasses and macroalgae as well as other indicators of seagrass health. This information is invaluable to the SBEP Report Card and therefore should be supported.

### **8.1.3 Fisheries**

The SBEP contracts for bimonthly fish population surveys in all of the SBEP Bays. While there are no currently specified ecosystem indicators constructed using these data, the SBEP intends to continue to support fisheries research at some level as part of its 5-year plan.

## **8.2 Compliance Assessment and Reporting Intervals**

### **8.2.1 Numeric Nutrient Criteria**

Each year, the annual arithmetic average chlorophyll *a* concentrations and annual geometric average total nitrogen concentrations should be compared to their respective SBEP Bay segment specific DEP water quality criteria.

### **8.2.2 Ecosystem Health Report Card**

Each year, individual metrics of the Report Card should be calculated and compared to their respective criteria. This includes results not only for water quality but also for seagrass and macroalgae information necessary to complete the Report Card integrated score.

### **8.2.3 Noncompliant Effluent**

Each year, noncompliant effluent releases (i.e., spills) reported to DEP should be summarized by location, frequency, and magnitude. The contribution of inorganic nitrogen to the total nutrient load can be estimated and should be reported.

### **8.2.4 Projects List**

Each year, a running list of nutrient load reduction projects in the watersheds to the SBEP Bays should be updated to reflect current status. The associated anticipated or realized load reductions can be quantified to track progress in reducing nutrient loads to the SBEP Bays.

### **8.2.5 Pollutant Loading Estimates**

Each year, Sarasota County uses SIMPLE to meet NPDES reporting requirements. These estimates can also be used to report total nutrient loads to the SBEP Bays; however, because Manatee County does not use SIMPLE for NPDES reporting requirements, reporting the total loads to Sarasota and Palma Sola Bays may be more complicated.

# CHAPTER 9

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## Commitment to Plan Implementation

### 9.1 Responsible Entities

This Plan serves as a guiding document to complement existing management paradigms already in place to protect the SBEP Bays through both interlocal agreements of the SBEP as well as the Sarasota and Manatee County Comprehensive Plans. Key to effective implementation of this Plan is the SBEP WQC made up of stakeholders who contribute nutrient loads to the SBEP Bays as well as other interested parties dedicated to the protection of ecological condition in the bays. The WQC provides a nexus between the management and policy aspects of both the SBEP and the Counties to help guide decision making specifically with respect to reducing nutrient loads to the SBEP Bays. It is imperative to note that this Plan does not require nutrient load reductions but that key stakeholders are nevertheless considered “responsible entities” since they generate a nutrient load to the SBEP Bays.

### 9.2 Management Framework

Annual meetings of the SBEP WQC should be held where results of the Report Card, evaluation of water quality data relative to established numeric nutrient criteria, and an update to the action plan database of nutrient load reduction projects are presented. These meetings demonstrate commitments to protection strategies that are important to maintain the health of the SBEP Bays and allow stakeholders opportunities to communicate about results of their work. Regular meetings of the SBEP WQC complement the existing management frameworks of both the SBEP and the Counties and integrate many aspects of individualized watershed management plans into a single forum to identify actionable strategies to protect the health of the SBEP Bays.

### 9.3 Decision Framework for Protecting Water Quality

**NNC Evaluation:** DEP’s Biennial Assessment is conducted every 2 years but tends to lag behind the data by approximately 2 years prior to being signed by the DEP Secretary. However, the WIN data are continuously updated, and the process has improved to the point that by April, the previous year’s data are typically fully populated and available for download from WIN. Therefore, a compliance assessment should be conducted each April to compare the previous year’s data, replicating DEP’s IWR assessment.

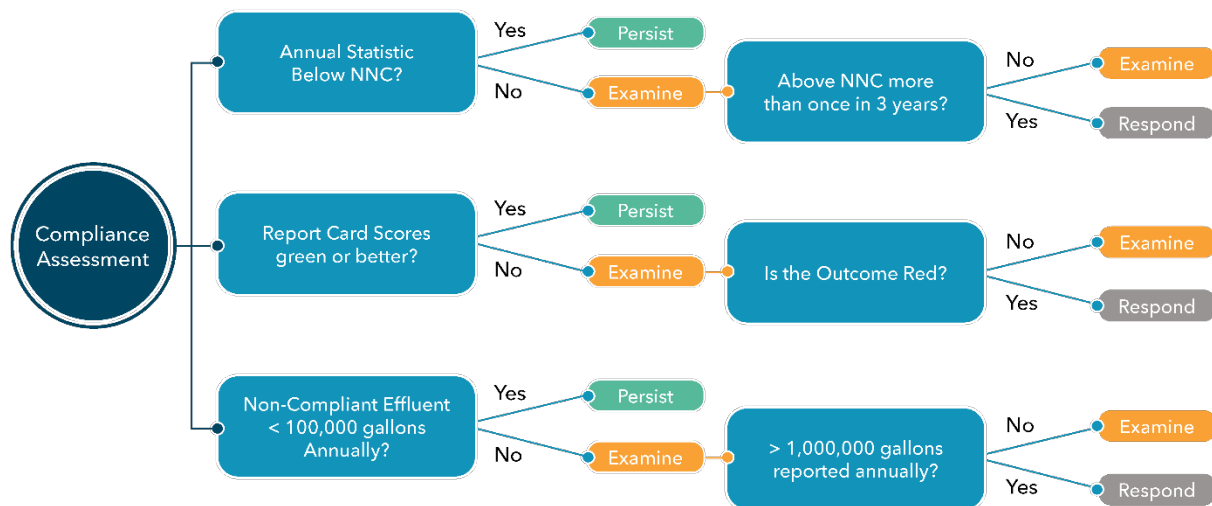
**Ecosystem Health Report Card:** The SBEP Report Card also uses WIN data to calculate two of the four metrics used to develop the overall report card scores. Each year by April, the previous year’s data should be available to calculate the Report Card scores, which should be reported at the same time as the NNC evaluation.

**Projects Database:** Expected nutrient load reduction projects implemented or anticipated to be completed within the next year should be included in the master project database associated with this project and presented at the SBEP WQC meeting each year.

**Pollutant Loading Model Updates:** The pollutant loading model used in this Plan is also used for Sarasota County NPDES reporting and is therefore scheduled to be updated routinely (i.e., every 5 years). Once updated, the pollutant loading model estimates for total nitrogen and phosphorus should be compared to the Recovery Period loads and reported to the SBEP WQC. Any loads above the target loads presented in Chapter 6 should be evaluated in the context of natural variability in hydrologic loads and if not explained by hydrologic variation should be investigated to determine potential anthropogenic sources.

**Noncompliant Effluent:** All wastewater spills must be reported to DEP. Each year, the total amount of noncompliant effluent reported to DEP should be calculated by watershed and reported to the SBEP WQC.

Annual meetings of the SBEP WQC are an appropriate place to review this information and discuss potential decisions that need to be made to protect the health of the SBEP Bays. A decision framework graphic (Figure 26) has been created to assist in guiding the path to appropriate potential management actions. Threshold values have been established for each watershed to evaluate the annual results of the NNC evaluation (below NNC), SBEP Report Card (green or better), and noncompliant effluent reports less than 100,000 gallons annually) to develop decision criteria to guide management actions. A narrative description of the outcomes for each element of the decision framework, along with proposed responses to those outcomes, is provided in Table 22.



**Figure 26**  
A Decision Framework for the Water Quality Plan For Sarasota Bay

**TABLE 22.**  
**DECISION FRAMEWORK RESPONSE TABLE**

<b>Evaluation</b>	<b>Outcome</b>	<b>Response</b>
NNC	Green	Persist in monitoring the health of the SBEP Bays.
	Orange	Investigate potential causes of exceedance. Examine frequency, magnitude, and seasonality of individual sample excursions of the criteria to determine potential causes. Evaluate outcomes in the context of other metrics.
	Gray	Prepare for DEP listing. Identify potential nutrient load reduction projects that would have immediate impacts on water quality. Coordinate with DEP about need to convert this Plan to a RAP or ARP.
Ecosystem Health Report Card	Green	Persist in monitoring the health of the SBEP Bays.
	Orange	Investigate potential causes of caution scores. Identify if a single specific metric within the report card is causing the caution score. Evaluate outcomes in the context of other metrics.
	Gray	Identify potential nutrient load reduction projects that would have immediate impacts on water quality and/or specific outcome resulting in poor Report Card score.
Noncompliant Effluent	Green	Persist in monitoring the health of the SBEP Bays.
	Orange	Identify localized source of noncompliant effluent and potential solutions.
	Gray	Identify remedial actions to reduce noncompliant effluent. Coordinate with WQC to identify short and long-term solutions.
<p>NOTES: ARP = alternative restoration plan; DEP = Florida Department of Environmental Protection; NNC = numeric nutrient criteria; RAP = reasonable assurance plan; SBEP = Sarasota Bay Estuary Program; WQC = Water Quality Consortium.</p>		

It is recognized within this framework that a single annual exceedance or degradation of water quality is not necessarily considered as deleterious to the health of the SBEP Bays, as natural variability is an important aspect of understanding the resilience of estuarine ecosystems to sources of pollution. While the Plan emphasizes strategies and actions to protect the health of the SBEP Bays, the Plan also recognizes that natural climatological variation is a critical driver of estuarine condition in these systems. Depending on outcomes of these assessments, there may be cases where observed results require a special update of the pollutant loading model, outside of its routine 5-year run. Examples might be extreme rainfall events such as those recently experienced in 2024 with three hurricanes affecting the area. Higher than expected NNC results for two consecutive years, or a significant scientific advancement or policy change affecting nutrient removal efficiencies, are other examples of when a special update of the model may be requested.

The SBEP plays an integral role in working with all regional stakeholders to integrate science and policy into actionable efforts to protect the SBEP Bays. This water quality protection plan is intended to galvanize those efforts to reduce pollution by the many individual stakeholders with nutrient loads to the SBEP Bays into a singular management strategy with a nexus between pass/fail regulatory criteria and providing reasonable assurance that local stakeholders are properly managing their watersheds to maintain full aquatic use of the precious economic and ecological resources of the SBEP Bays.

## CHAPTER 10

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**Appendix A**

**DEP 2022 303d List Assessment for WBIDs of the Sarasota Bay  
Estuary Program**

**TABLE A-1  
IMPAIRED WATERS**

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
1	3	05-1272	Sarasota Bay - Peace - Myakka	Sarasota Bay	Manatee	1883C	Palma Sola South	Beach	3M		Bacteria (Beach Advisories)		< 21 days of beach advisories	Medium	2009			PP = Not impaired; VP = Impaired. The waterbody segment exceeded the 21 day beach closures, advisories, or warnings in 2003 with 142 days as per IWR Rule 62-303.360(1)(c)
20-22	3	22-1008	Sarasota Bay - Peace - Myakka	Sarasota Bay	Manatee	1885A	West Cedar Hammock	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		33/36	33/36	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1009	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota, Manatee	1896	Bowlees Creek	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		30/34	30/34	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
2	3	10-0176	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1936	Whitaker Bayou (Tidal)	Estuary	3M		Dissolved Oxygen	Total Nitrogen, Total Phosphorus, Biochemical Oxygen Demand	≥ 4.0 mg/L	High			7/16	Impaired with total nitrogen, total phosphorus and biochemical oxygen demand identified as the causative pollutants.
20-22	3	22-1012	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1936	Whitaker Bayou (Tidal)	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		22/31	44/65	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments	
																			to the Verified List and the department is requesting EPA add it to the 303(d) List.
2	3	10-0179	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1936	Whitaker Bayou (Tidal)	Estuary	3M	Nutrients	Nutrients (Chlorophyll-a)		≤ 11 µg/L	High			2008 (39.0 µg/l)	This waterbody is impaired because annual average Chl-a values exceeded 11 µg/l in 2008. Nitrogen is the limiting nutrient based on the TN/TP ratio median of 4.11 mg/L (n=14).	
20-22	3	22-1013	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota, Manatee	1936A	Walker Creek	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		32/35	68/71	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.	
20-22	3	22-1014	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1937	Philippi Creek	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		288/400	499/672	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.	
20-22	3	22-1015	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1937	Philippi Creek	Stream	3F		Nutrients (Macrophytes)		LVS C of C ≥ 2.5 and LVS FLEPPC ≤ 25%	Medium		05/08/2013: Avg CofC - 0.9, FLEPPC - 68% 05/08/2014: Avg CofC - 0.8, FLEPPC - 68% 09/19/2016: Avg CofC - 1.3,	05/08/2013: Avg CofC - 0.9, FLEPPC - 68% 05/08/2014: Avg CofC - 0.8, FLEPPC - 68% 09/19/2016: Avg CofC - 1.3,	This waterbody is impaired for this parameter based on failing linear vegetation surveys with an average C of C score < 2.5 and FLEPPC percent coverage of > 25%. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.	

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
																FLEPPC - 78%	FLEPPC - 78%	
20-22	3	22-1018	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1941	Philippe Creek Tributary	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		11/21	11/21	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1021	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1947	Philippi Creek (Tidal)	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		20/23	46/53	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
2	3	10-0182	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1953	Hudson Bayou Tidal	Estuary	3M		Dissolved Oxygen	Biochemical Oxygen Demand	≥ 4.0 mg/L	Medium			11/21	Impaired with biochemical oxygen demand identified as the causative pollutant.
22-24	3	24-0886	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1953	Hudson Bayou Tidal	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		No Data	5/5	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. Fewer than twenty samples can be used to identify a waterbody as impaired if there are at least five exceedances, per 62-303.390(2)(f) F.A.C. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
20-22	3	22-1023	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1953A	Drain to Hudson Bayou	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		50/63	109/127	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1024	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1953A	Drain to Hudson Bayou	Stream	3F		Nutrients (Macrophytes)		LVS C of C ≥ 2.5 and LVS FLEPPC ≤ 25%	Medium		No Data	06/18/2018 : Avg CofC - 0.7, FLEPPC - 75% 09/20/2018 : Avg CofC - 0.6, FLEPPC - 74% 04/02/2019 : Avg CofC - 1.4, FLEPPC - 54%	This waterbody is impaired for this parameter based on failing linear vegetation surveys with an average C of C score < 2.5 and FLEPPC percent coverage of > 25%. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1027	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1966	Philippe Creek Tributary	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		13/20	21/36	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
3	3	16-0674	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1966	Philippe Creek Tributary	Stream	3F		Nutrients (Macrophytes)		LVS C of C ≥ 2.5 and LVS FLEPPC ≤ 25%	Medium			05/08/2013 : Avg CofC - 0.9, FLEPPC - 63.49% 12/03/2013 : Avg CofC - 0.35, FLEPPC - 82.35%	This waterbody is impaired for this parameter based on failing linear vegetation survey results. This parameter is being added to the 303(d) List.

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
20-22	3	22-1028	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1966	Philippe Creek Tributary	Stream	3F		Nutrients (Total Nitrogen)		AGM ≤ 1.65 mg/L	Medium		AGM 2016 (1.47 mg/L) 2017 (1.05 mg/L)	AGM 2016 (1.47 mg/L) 2017 (1.05 mg/L) 2018 (2.54 mg/L) 2019 (1.90 mg/L)	This waterbody is impaired for this parameter. The annual geometric means exceeded the nutrient threshold more than once in a three year period, and there is biological evidence indicating non-attainment of the designated use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
2	3	10-0187	Sarasota Bay - Peace - Myakka	Sarasota Bay	Manatee, Sarasota	1968B	Sarasota Bay	Estuary	2		Fecal Coliform (SEAS Classification)		Exceeds Shellfish Environmental Assessment Section (SEAS) thresholds	Low				Listed based on shellfish harvesting classification of prohibited by Shellfish Environmental Assessment Section (SEAS) of the Department of Agriculture.
20-22	3	22-1033	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1971	Clark Lake	Lake	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		9/23	19/51	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1034	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1971	Clark Lake	Lake	3F		Nutrients (Chlorophyll-a)		AGM ≤ 20 µg/L	Medium		AGM 2016 (81 µg/L) 2017 (90 µg/L)	AGM 2016 (81 µg/L) 2017 (90 µg/L) 2018 (162 µg/L) 2019 (164 µg/L)	This waterbody is impaired for this parameter. The annual geometric means exceeded the nutrient criteria for a high color lake more than once in a three year period. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1035	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1971	Clark Lake	Lake	3F		Nutrients (Total Nitrogen)		Chl-a AGM ≤ 20 µg/L, TN AGM ≤ 2.23 mg/L; If Chl-a has insufficient or	Medium		AGM 2016 (3.32 mg/L) 2017 (3.40 mg/L)	AGM 2016 (3.32 mg/L) 2017 (3.40 mg/L)	This waterbody is impaired for this parameter. The annual geometric means exceeded the nutrient criteria for a high color

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
													No Data to calculate AGM or if Chl-a AGM > 20 µg/L, TN AGM ≤ 1.27 mg/L				2018 (3.80 mg/L) 2019 (3.69 mg/L)	lake more than once in a three year period. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1036	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1971	Clark Lake	Lake	3F		Nutrients (Total Phosphorus)		Chl-a AGM ≤ 20 µg/L, TP AGM ≤ 0.49 mg/L; If Chl-a has insufficient or No Data to calculate AGM or if Chl-a AGM > 20 µg/L, TP AGM ≤ 0.05 mg/L	Medium		AGM 2016 (0.14 mg/L) 2017 (0.16 mg/L)	AGM 2016 (0.14 mg/L) 2017 (0.16 mg/L) 2018 (0.19 mg/L) 2019 (0.09 mg/L)	This waterbody is impaired for this parameter. The annual geometric means exceeded the nutrient criteria for a high color lake more than once in a three year period. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1037	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1971A	Clark Lake Drainage	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		32/49	59/79	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
20-22	3	22-1038	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1975A	Clower Creek	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		16/32	42/59	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
3	3	16-0680	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1975A	Clowers Creek Estuary	Estuary	3M		Iron		≤ 0.3 mg/L	Medium			17/17	This waterbody is impaired for this parameter based on the number of exceedances for the sample size. Fewer than twenty samples can be used to identify a waterbody as impaired if

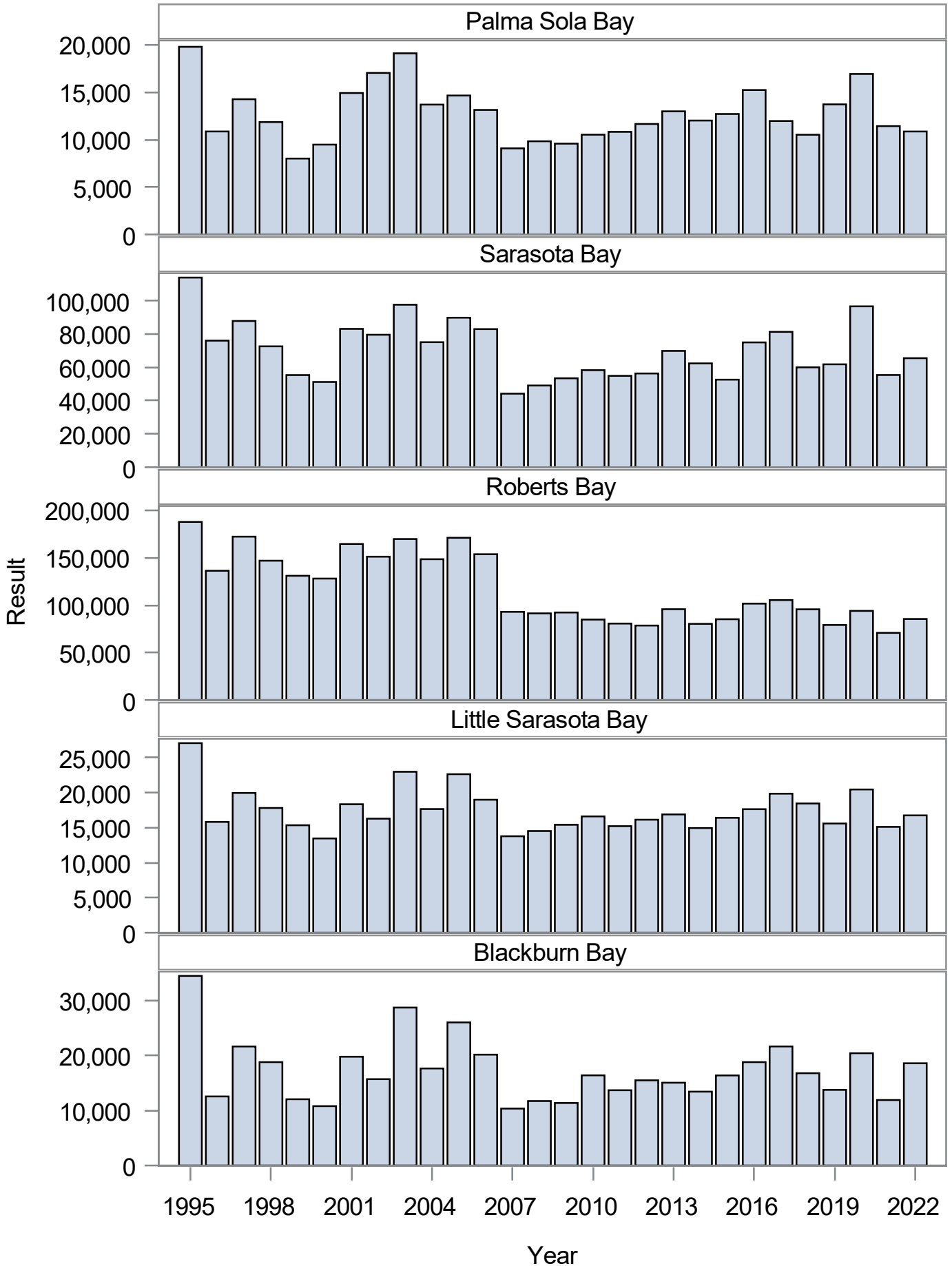
Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
																		there are at least five exceedances, per Rule 62-303.420(7)(a) F.A.C. This parameter is being added to the 303(d) List.
22-24	3	24-0888	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1975C	Matheny Creek	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		56/119	81/174	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
22-24	3	24-0889	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1975E	Elligraw Bayou	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		8/56	17/84	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been identified using land use. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
22-24	3	24-0890	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1975E	Elligraw Bayou	Stream	3F		Nutrients (Chlorophyll-a)		AGM ≤ 20 µg/L; > 3.2 to 20 µg/L is a site specific interpretation	Medium		AGM 2010 (23 µg/L) 2011 (18.8 µg/L) 2012 (20 µg/L) 2013 (12.8 µg/L) 2014 (12.3 µg/L) 2015 (14.8 µg/L) 2016 (9.5 µg/L) 2017 (15.4 µg/L) 2018 (18.2 µg/L) 2019 (23 µg/L)	AGM 2015 (14.8 µg/L) 2016 (9.5 µg/L) 2017 (15.4 µg/L) 2018 (18.2 µg/L) 2019 (23 µg/L) 2020 (25 µg/L) 2021 (13.4 µg/L)	This waterbody is impaired for this parameter because the annual geometric means exceeded the nutrient threshold of 20 µg/L more than once in a three year period. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.

Cycle	Group	OGC Case Number	Group Name	Planning Unit	County (-ies)	WBID	Water Segment Name	Water-body Type	Water-body Class <sup>1</sup>	1998 303(d) Parameters of Concern	Parameters Assessed Using the Impaired Waters Rule (IWR)	Dissolved Oxygen/Biology Pollutant of Concern	Concentration of Criterion or Threshold Not Met	Priority for TMDL Development <sup>3</sup>	Projected Year For TMDL Development <sup>3</sup>	Planning Period Assessment Data <sup>7</sup>	Verified Period Assessment Data <sup>8</sup>	Comments
22-24	3	24-0891	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1982	South Creek	Stream	3F		Escherichia coli		≤ 410 Counts / 100 mL	High		12/66	16/104	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added to the Verified List and will remain on the 303(d) List.
2	3	10-0201	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1984A	North Creek (Tidal)	Estuary	3M		Dissolved Oxygen	Total Nitrogen, Total Phosphorus, Biochemical Oxygen Demand	≥ 4.0 mg/L	Medium			15/19	Impaired with total nitrogen, total phosphorus and biochemical oxygen demand identified as the causative pollutants.
20-22	3	22-1041	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1984A	North Creek (Tidal)	Estuary	3M		Enterococci		≤ 130 Counts / 100 mL	High		31/31	69/70	This waterbody is impaired for this parameter based on the number of exceedances for the sample size and anthropogenic sources have been confirmed using genetic marker and chemical tracer data. This parameter is being added to the Verified List and the department is requesting EPA add it to the 303(d) List.
2	3	10-0202	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1984A	North Creek (Tidal)	Estuary	3M		Iron		≤ 0.3 mg/L	Medium			18/18	Impairment for iron is due in part to naturally occurring groundwater inputs, however this WBID is included in a groundwater analysis report and the Department retained iron on the verified list because the Department could not eliminate possible anthropogenic sources.
2	3	10-0204	Sarasota Bay - Peace - Myakka	Sarasota Bay	Sarasota	1984A	North Creek (Tidal)	Estuary	3M	Nutrients	Nutrients (Chlorophyll-a)		≤ 11 µg/L	High			2008 (14.9 µg/l)	This waterbody is impaired because annual average Chl-a values exceeded 11 µg/l in 2008. Nitrogen is the limiting nutrient based on the TN/TP ratio median of 6.63 mg/L (n=18).

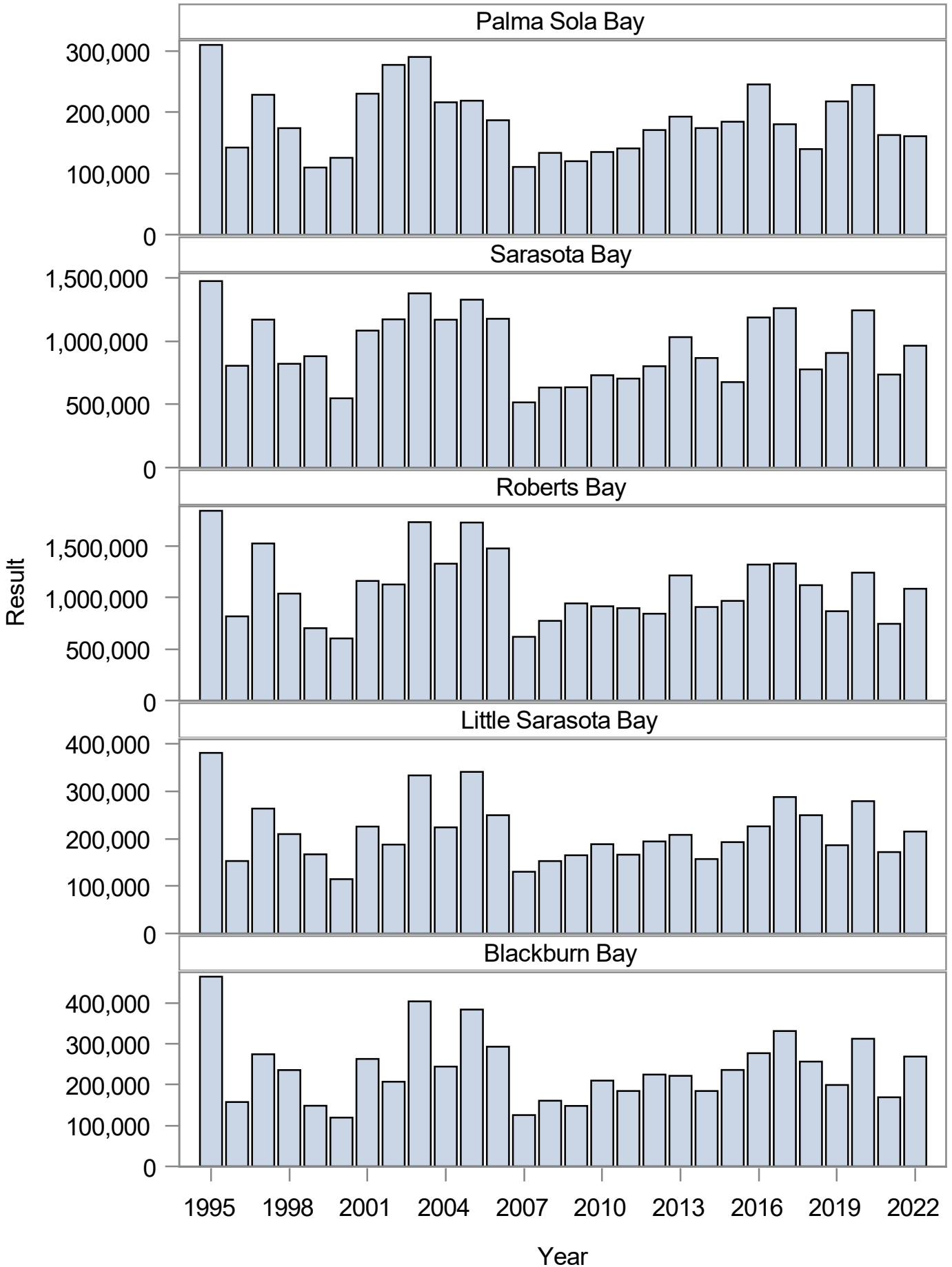
## **APPENDIX B**

### **Total Annual Loads for the SIMPLE Model Existing Condition Run**

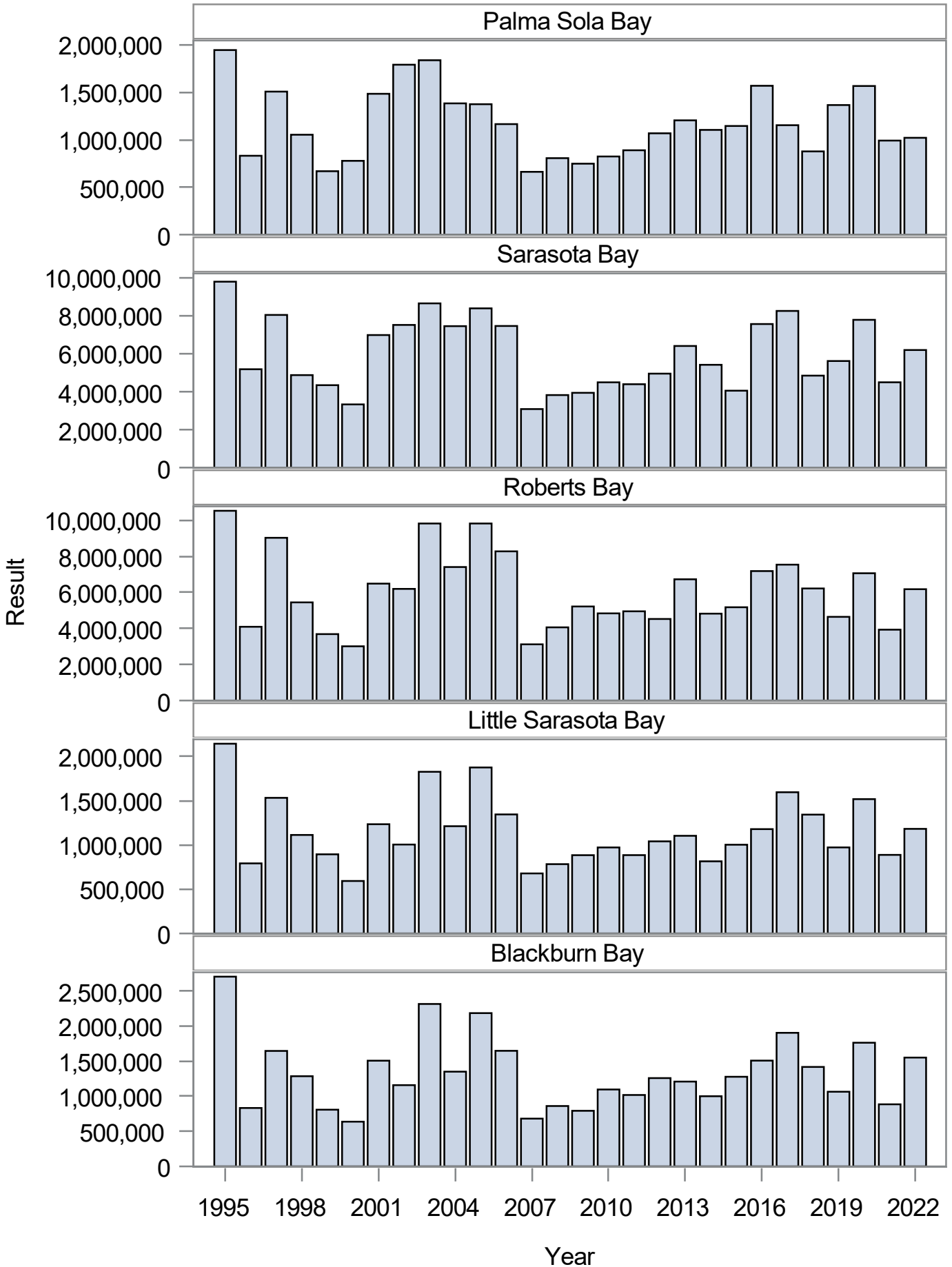
Annual Total Loads 1995-2022  
Ammonia Load (lbs)



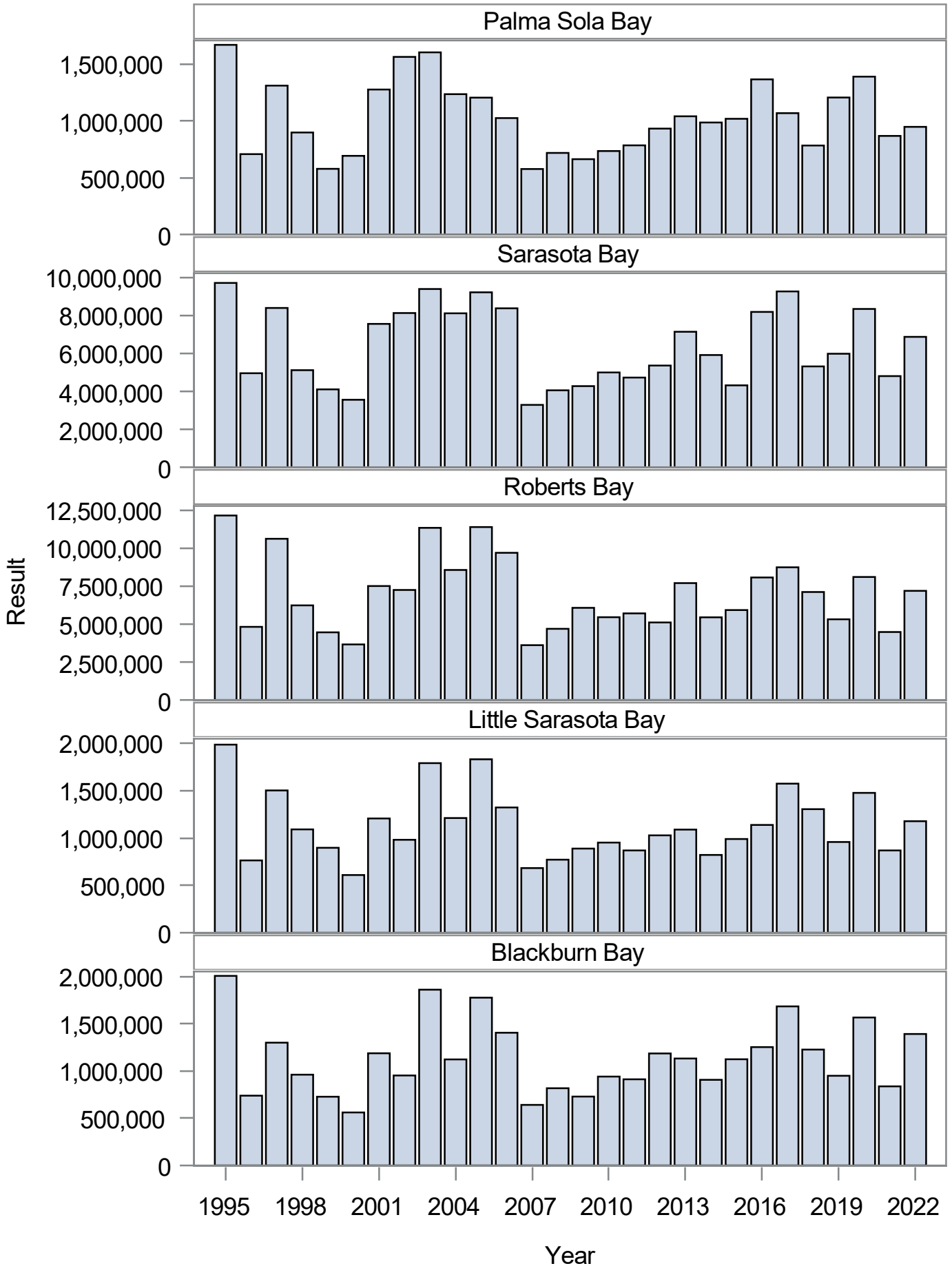
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)



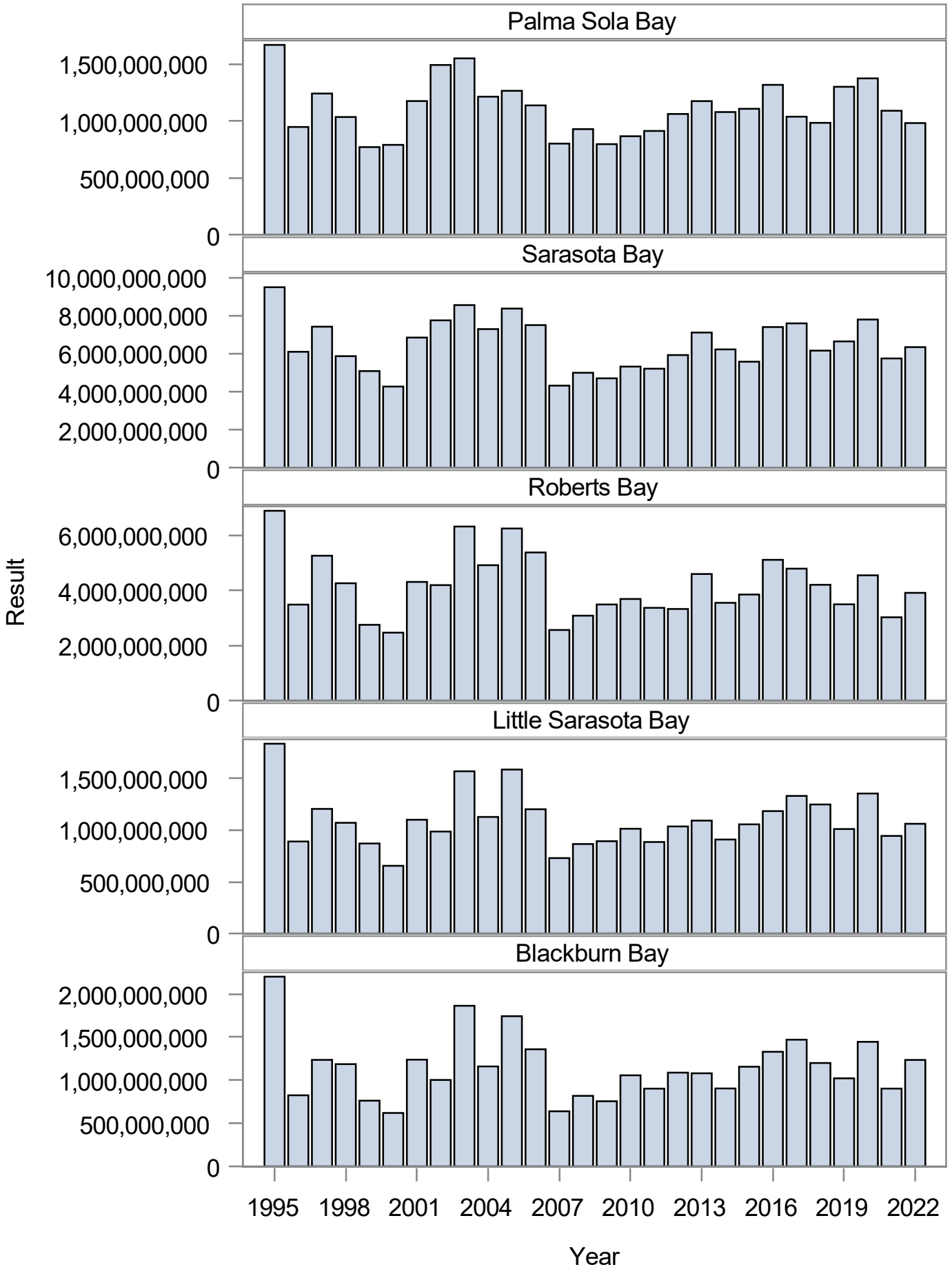
Annual Total Loads 1995-2022  
Chemical Oxygen Demand Load (lbs)



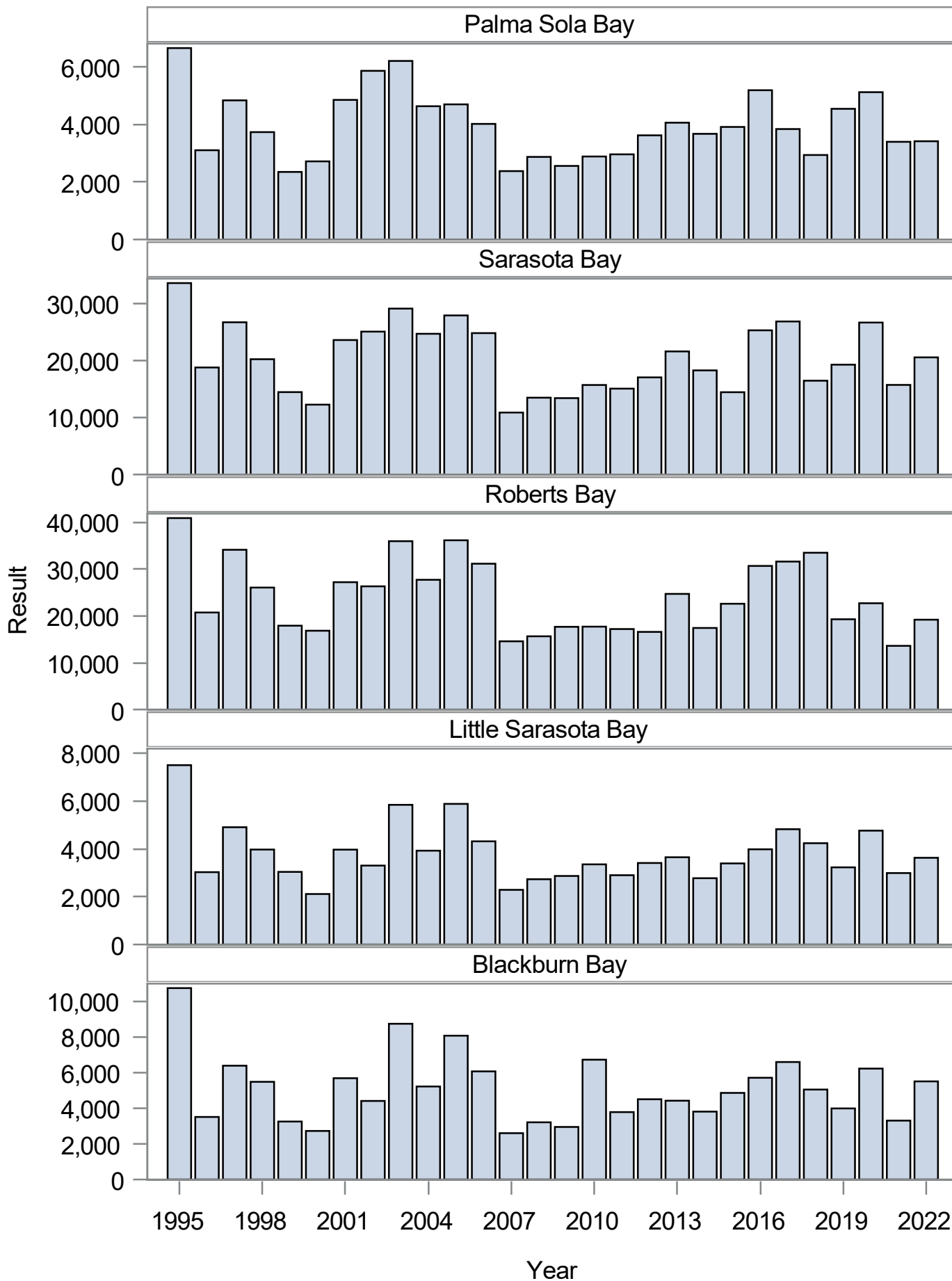
Annual Total Loads 1995-2022  
Fecal Coliform Load (#)



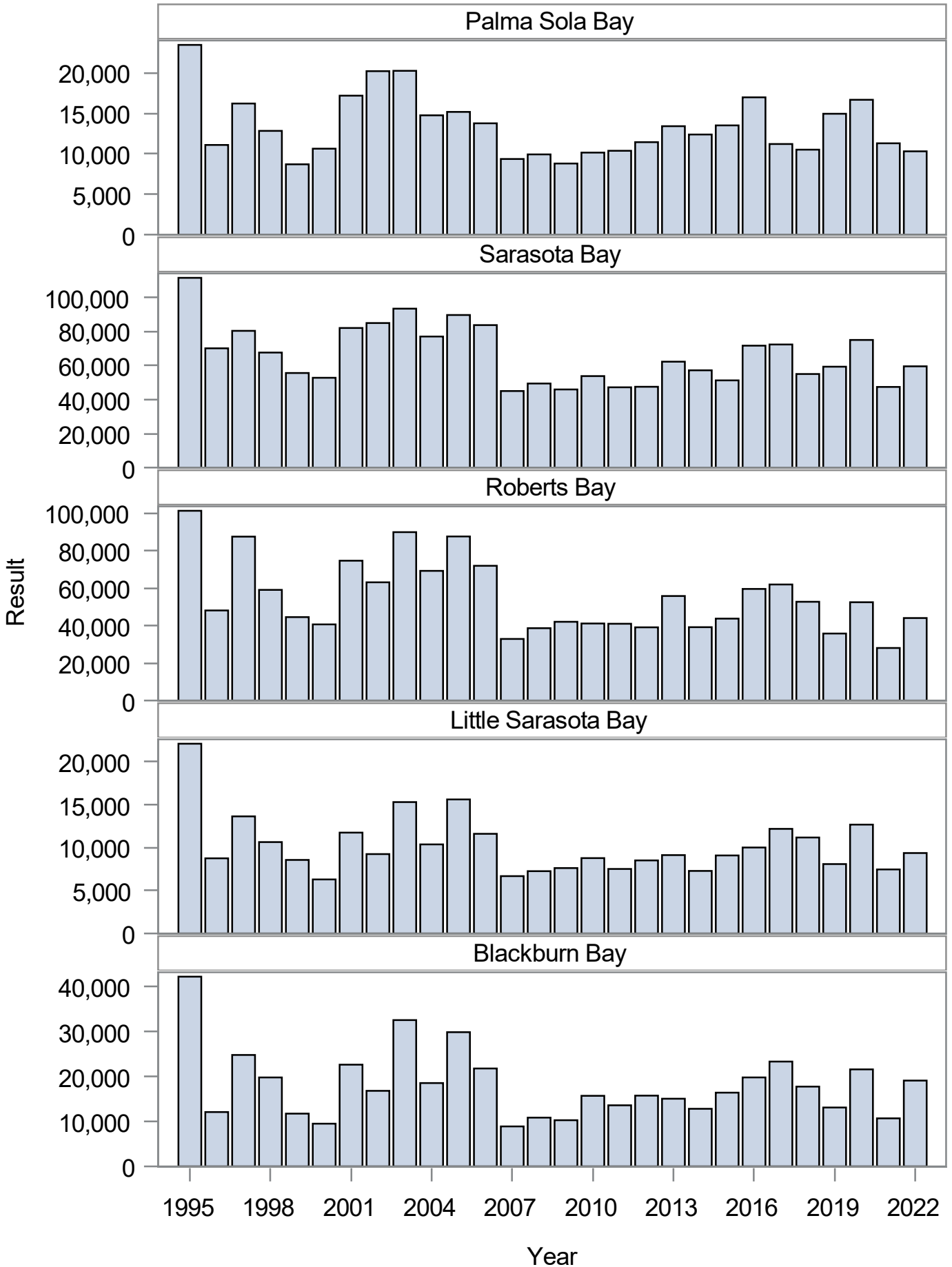
Annual Total Loads 1995-2022  
Hydrologic Load (CF)



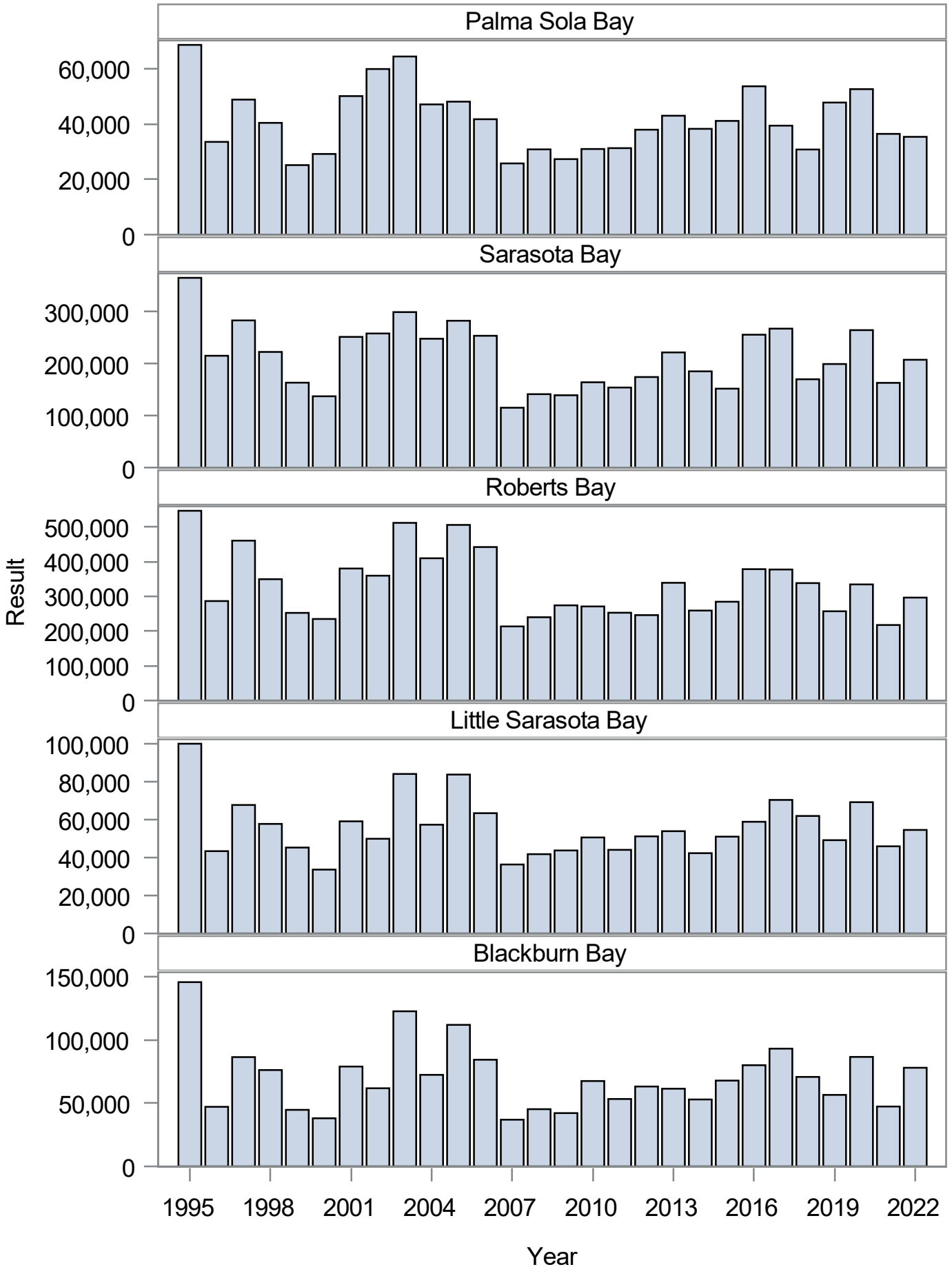
Annual Total Loads 1995-2022  
Inorganic Phosphorus Load (lbs)



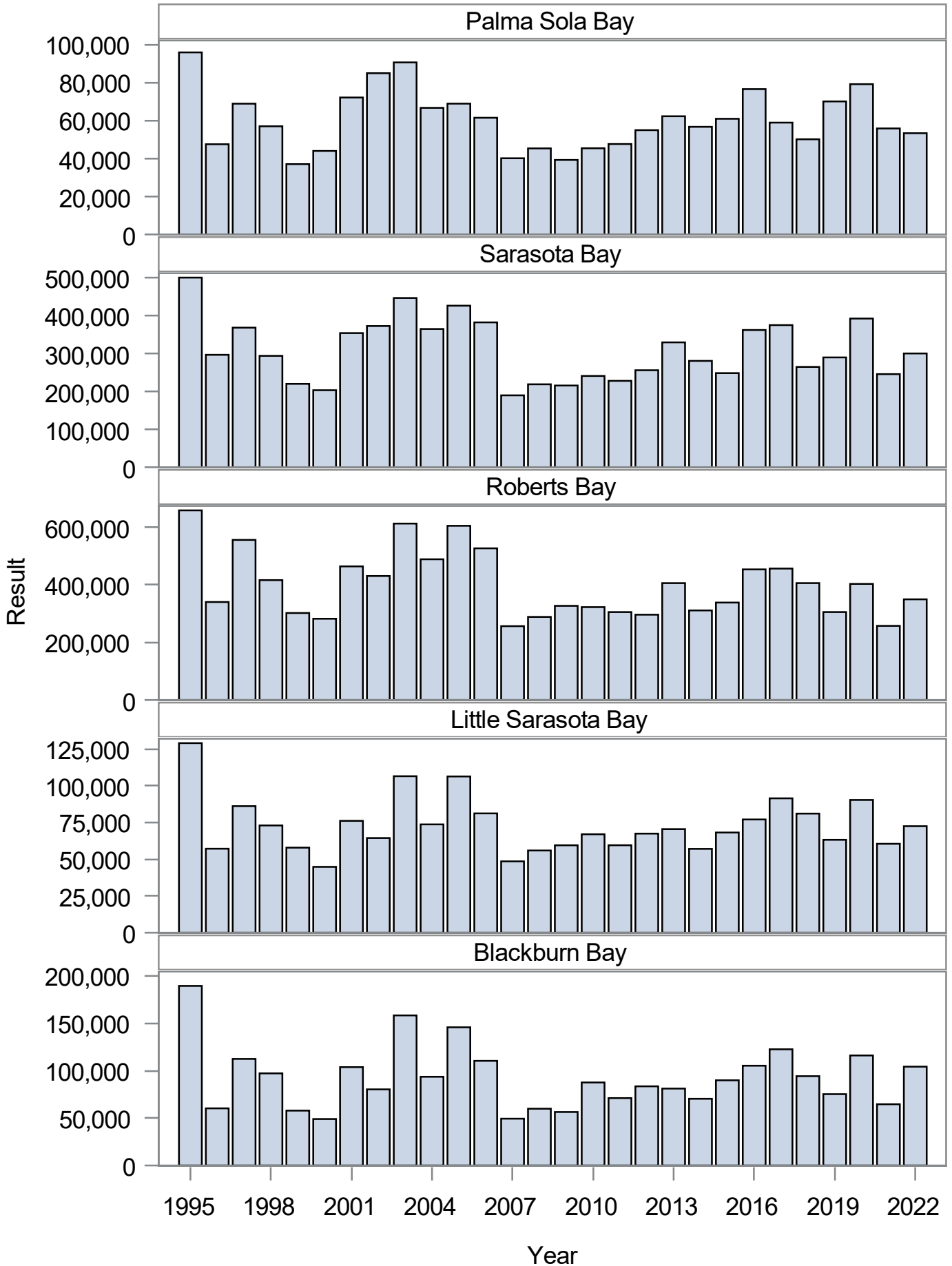
Annual Total Loads 1995-2022  
Nitrate-Nitrite Load (lbs)



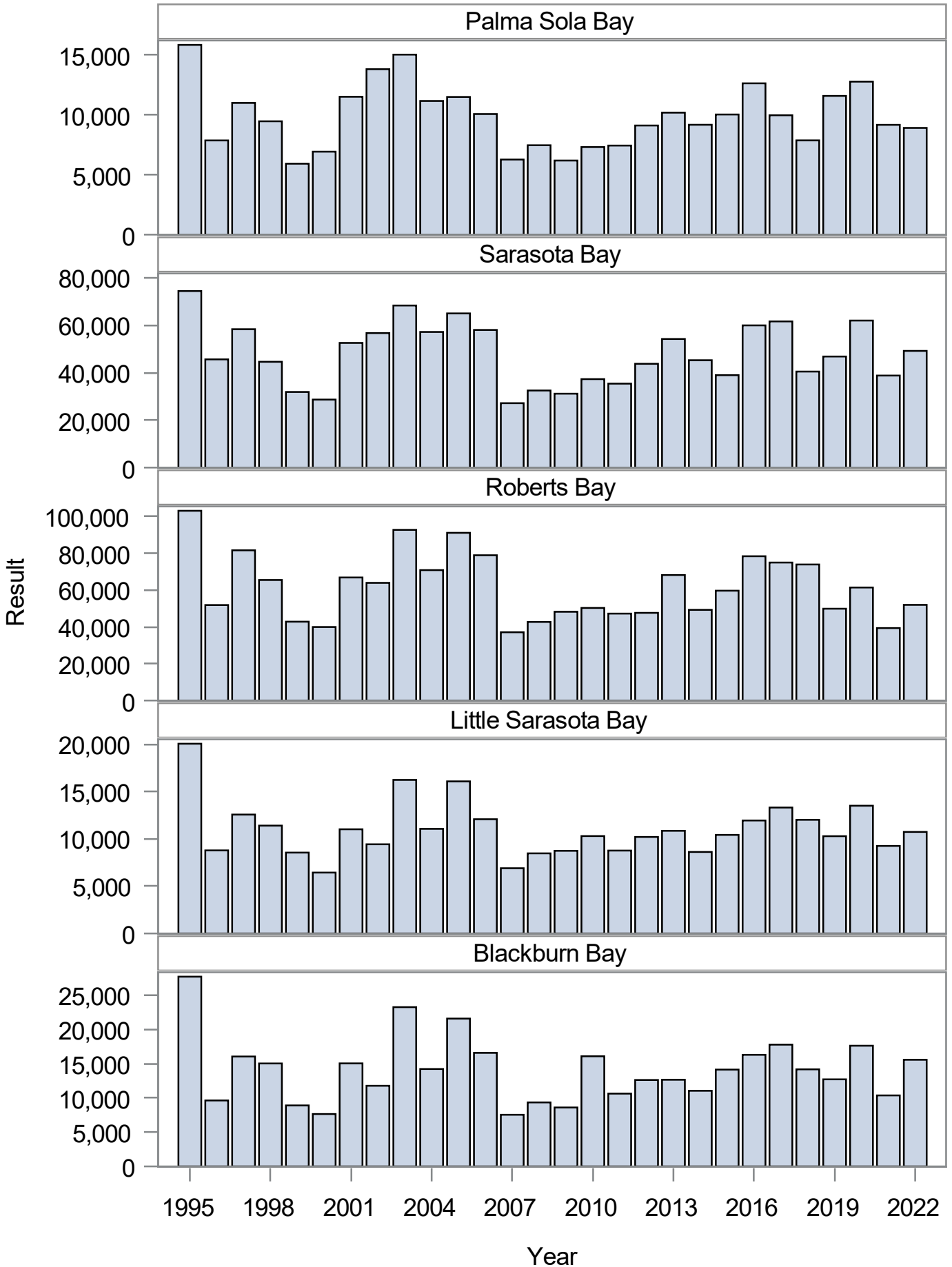
Annual Total Loads 1995-2022  
 Total Kjeldahl Nitrogen Load(lbs)



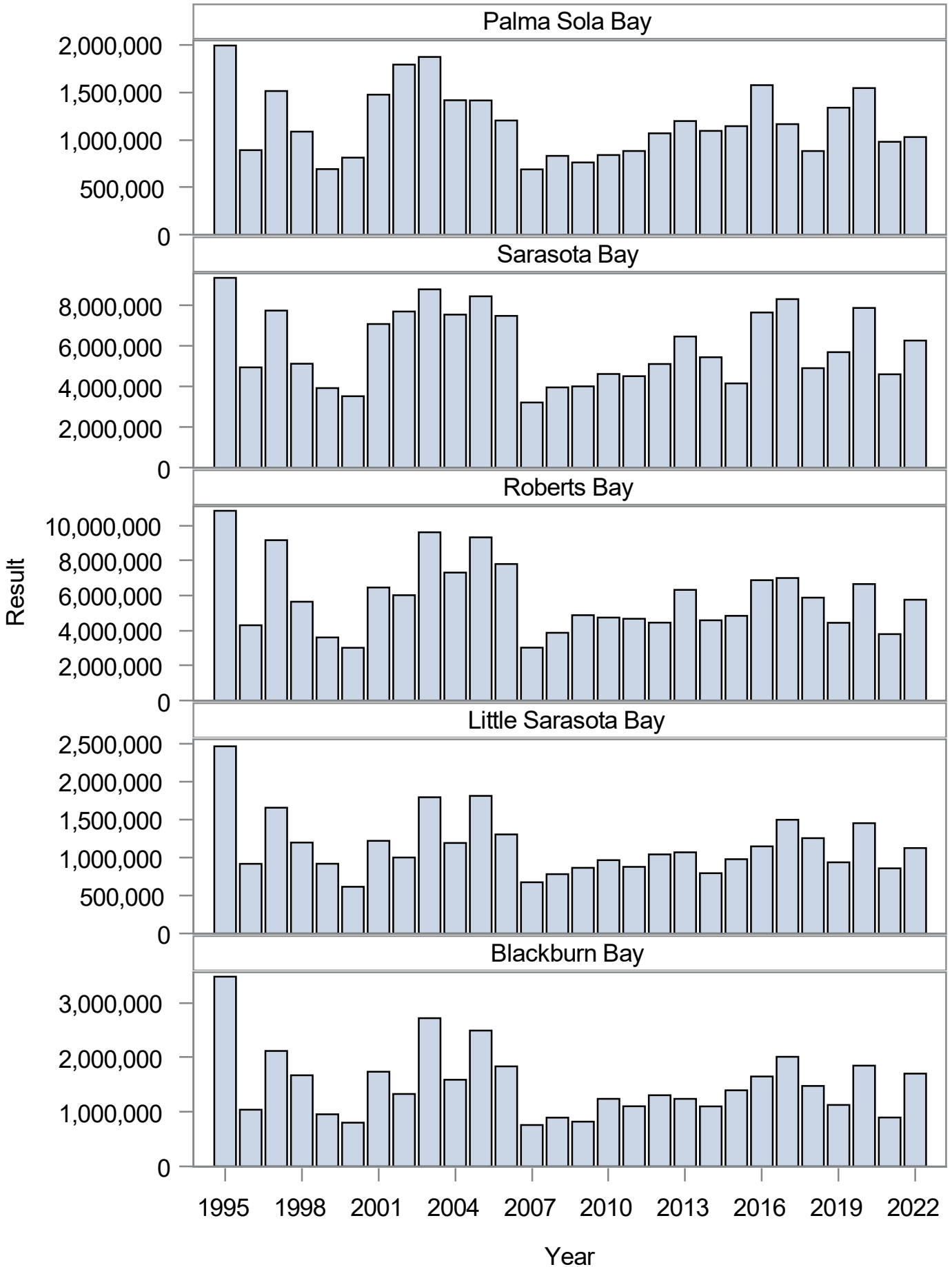
Annual Total Loads 1995-2022  
Total Nitrogen Load (lbs)



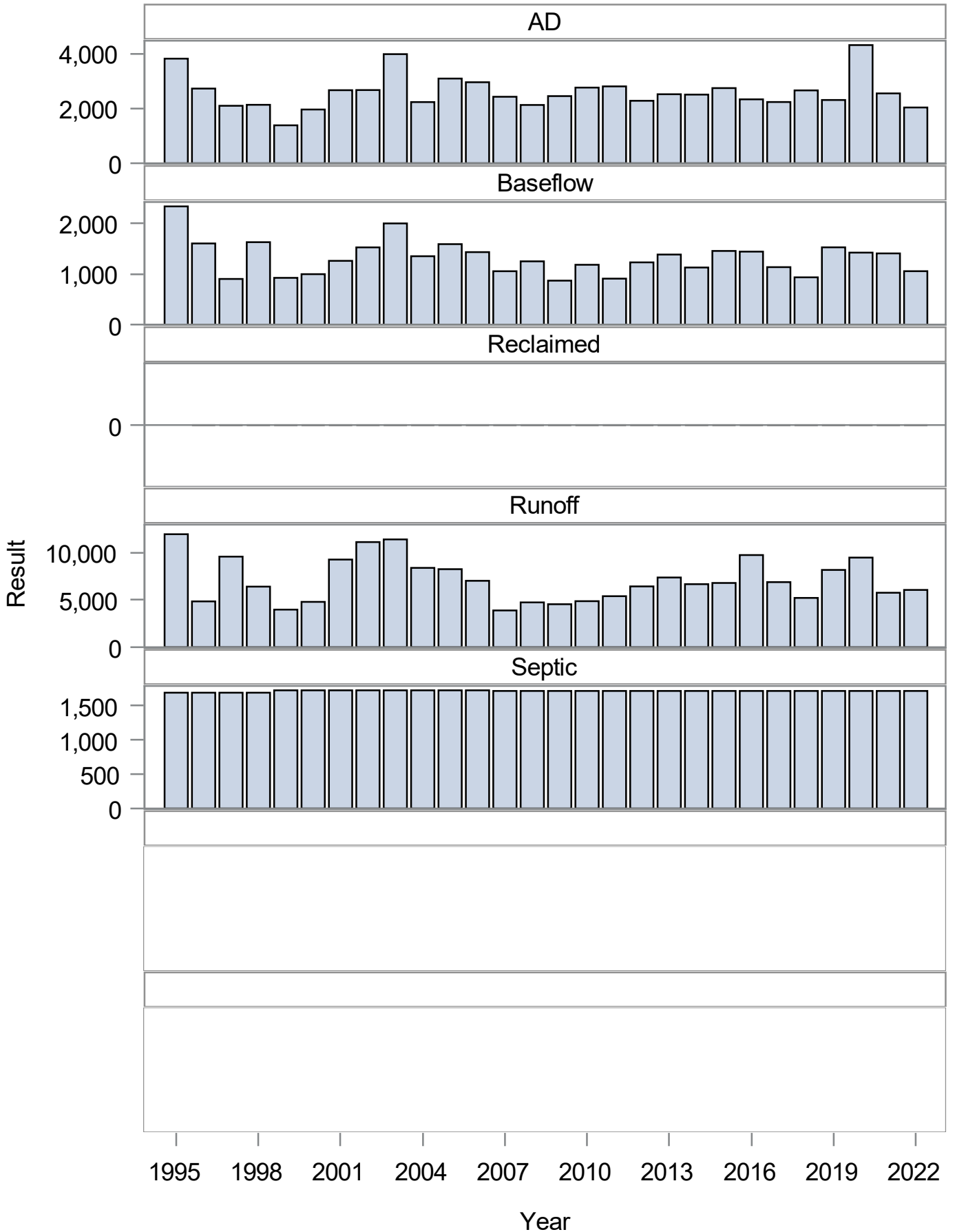
Annual Total Loads 1995-2022  
Total Phosphorus Load (lbs)



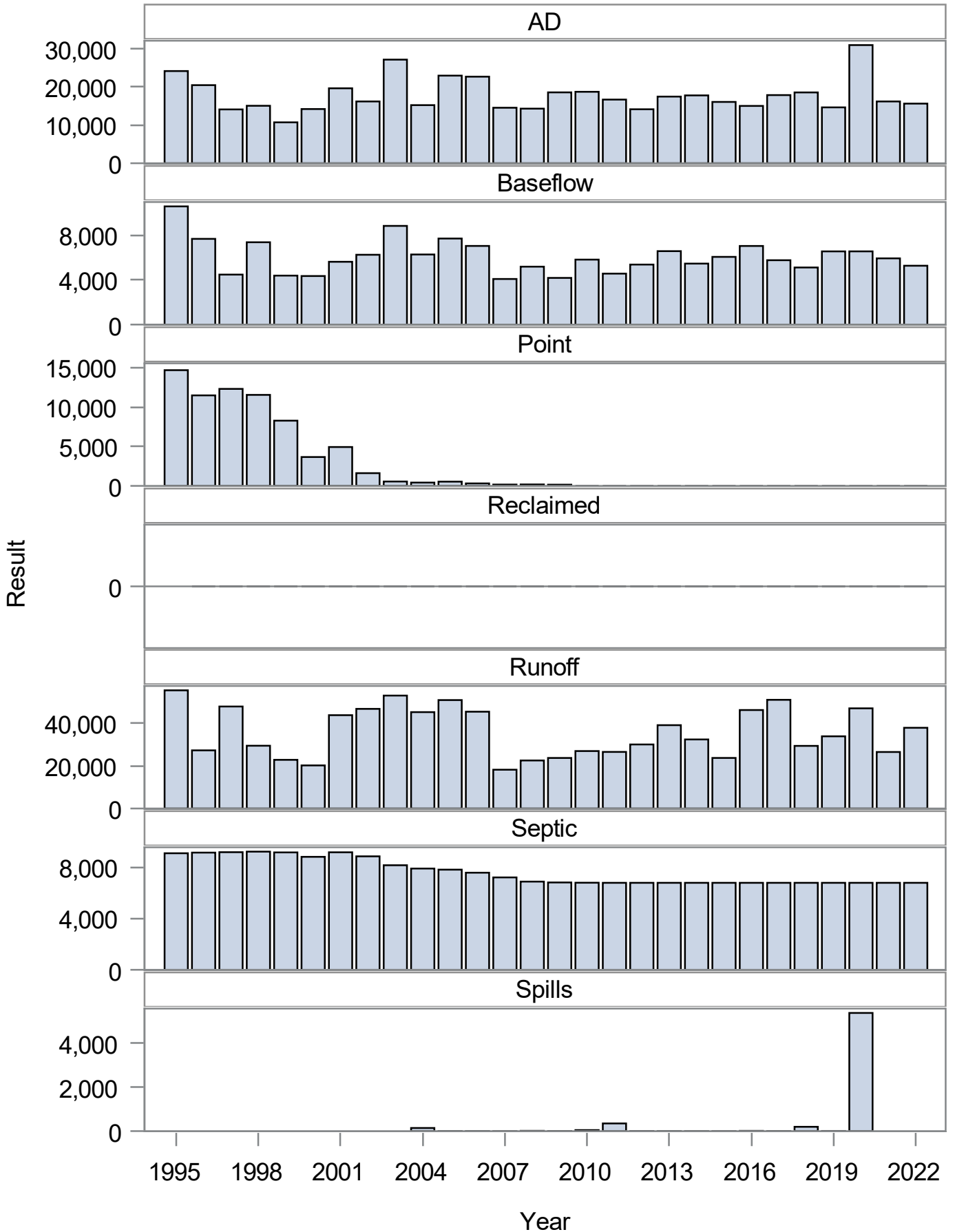
Annual Total Loads 1995-2022  
Total Suspended Solids Load (lbs)



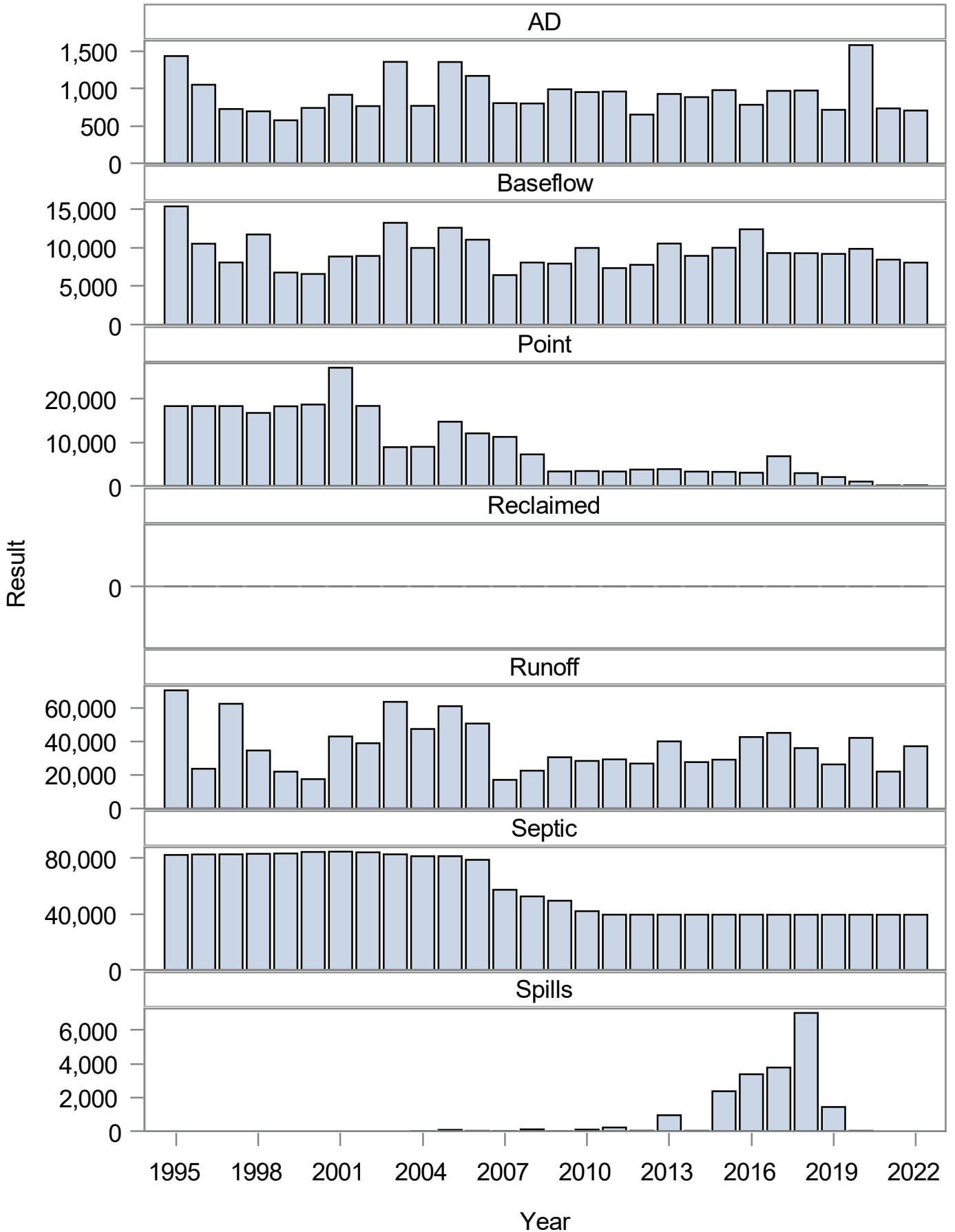
Annual Total Loads 1995-2022  
Ammonia Load (lbs)  
Palma Sola Bay



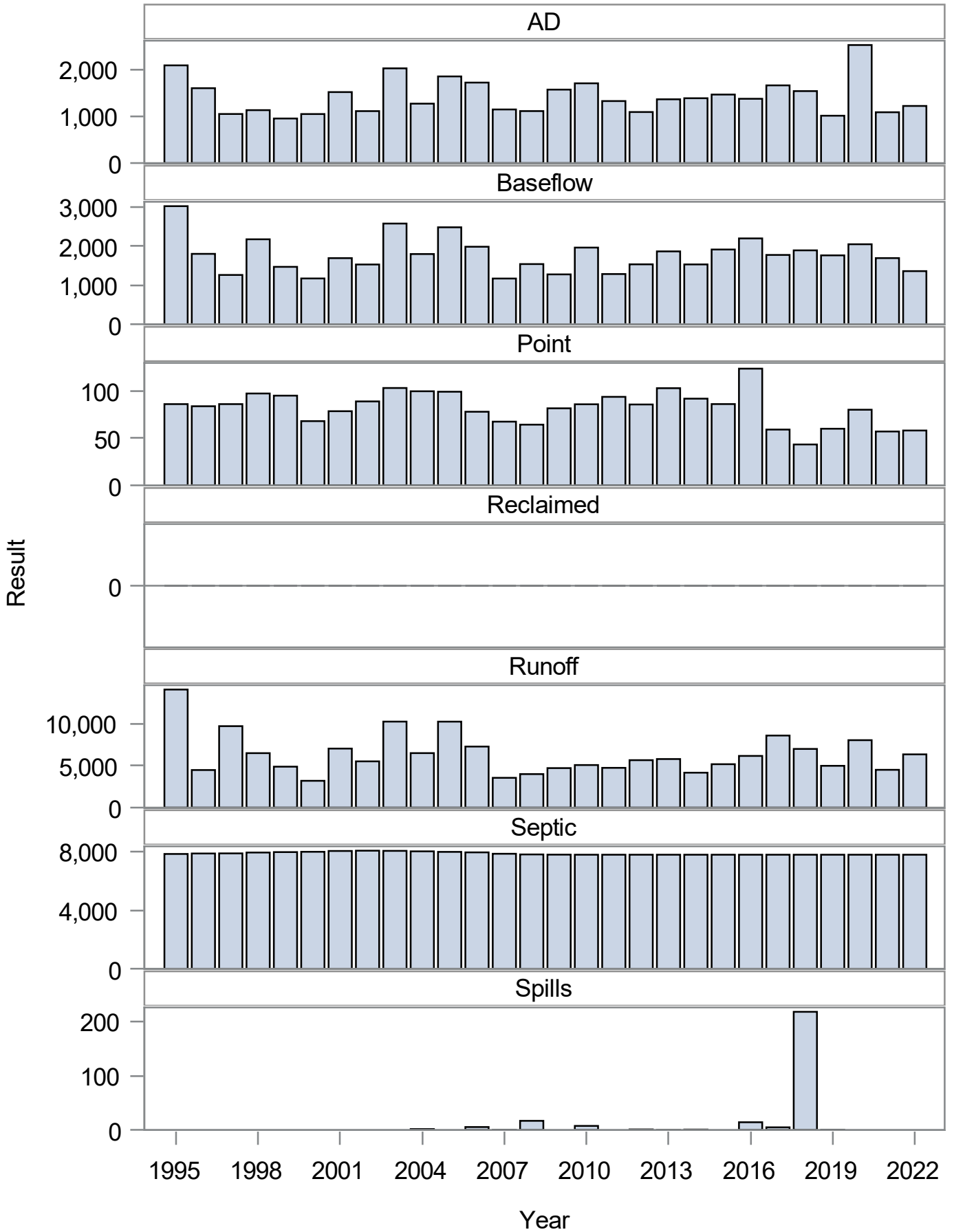
Annual Total Loads 1995-2022  
 Ammonia Load (lbs)  
 Sarasota Bay



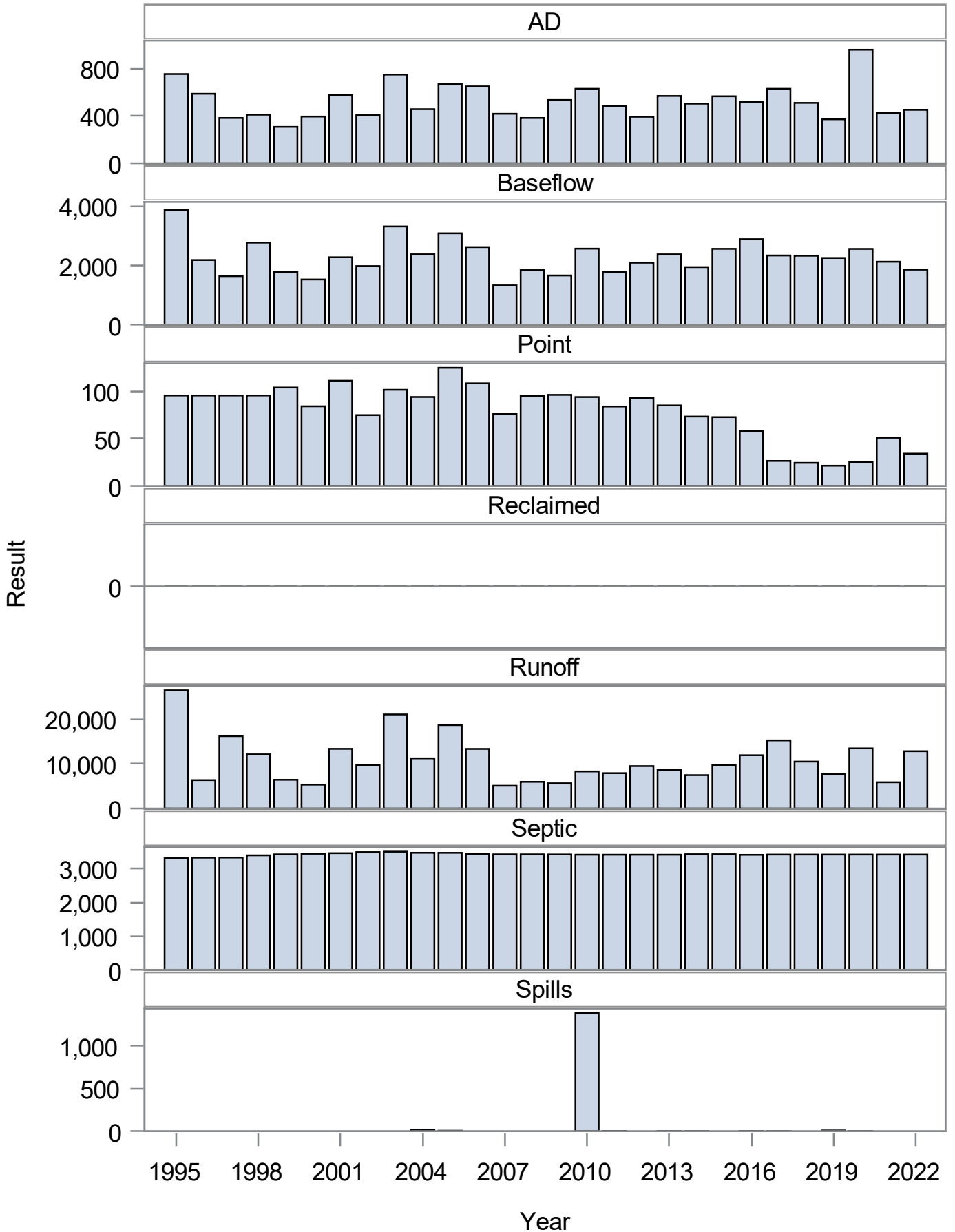
Annual Total Loads 1995-2022  
 Ammonia Load (lbs)  
 Roberts Bay



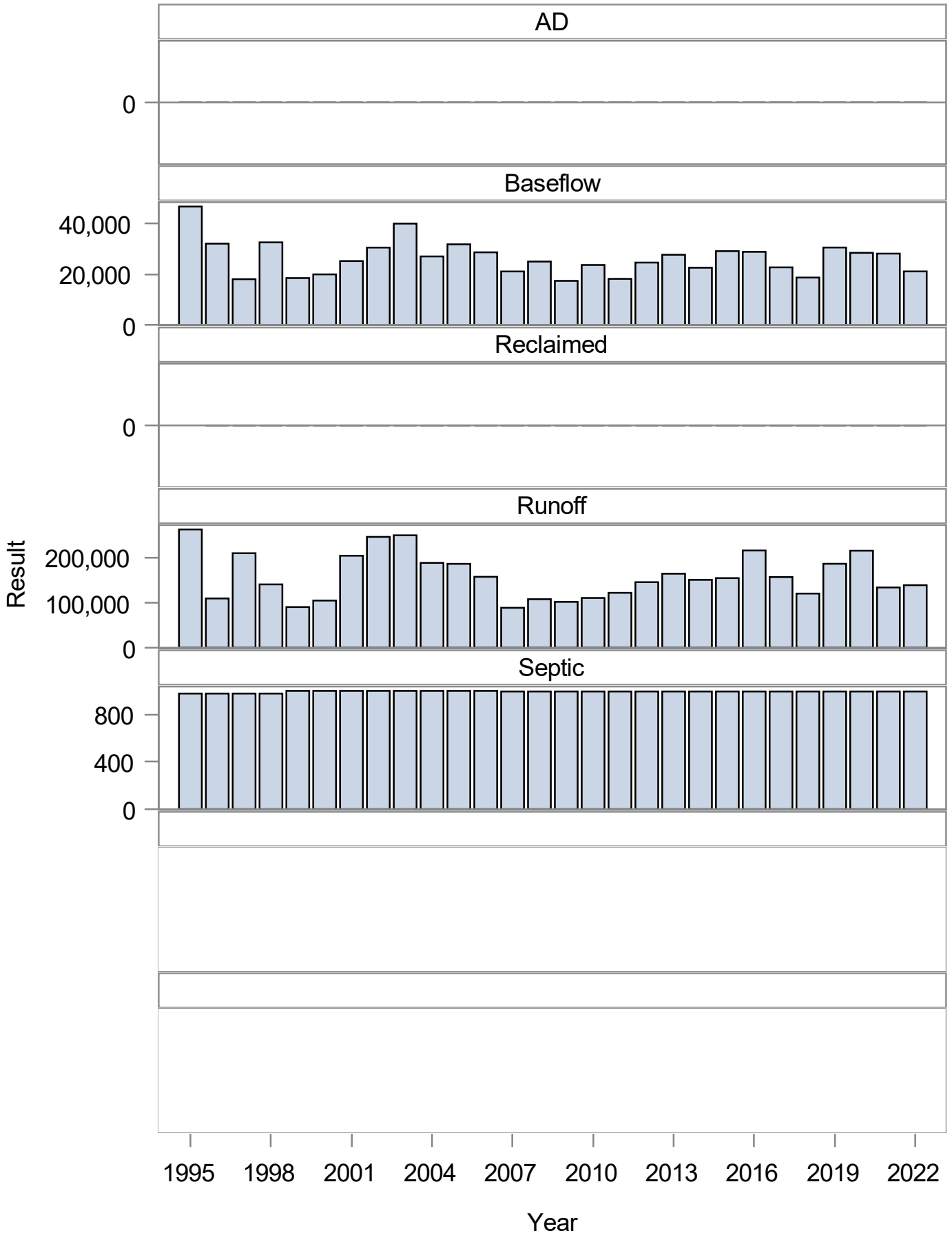
Annual Total Loads 1995-2022  
 Ammonia Load (lbs)  
 Little Sarasota Bay



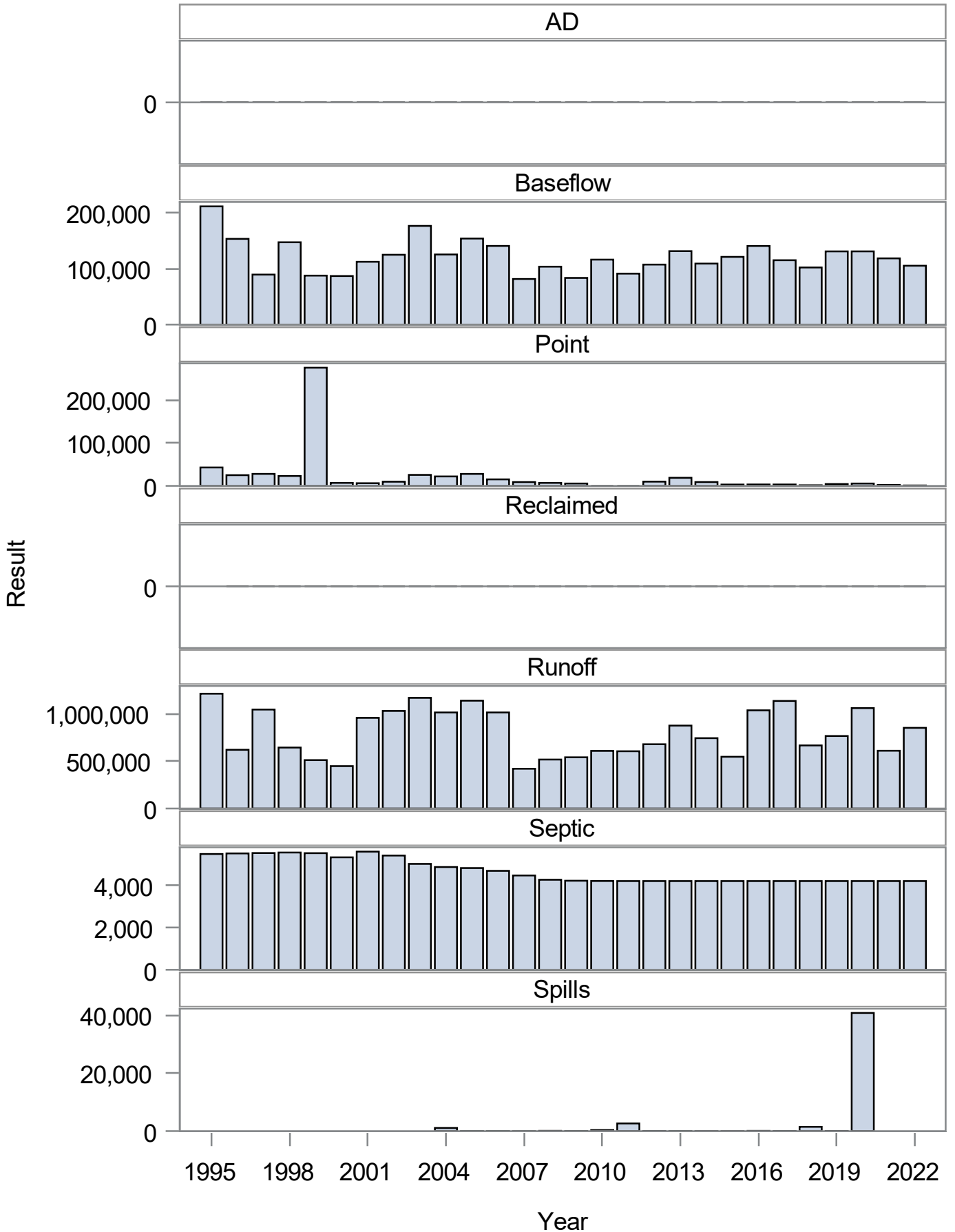
Annual Total Loads 1995-2022  
 Ammonia Load (lbs)  
 Blackburn Bay



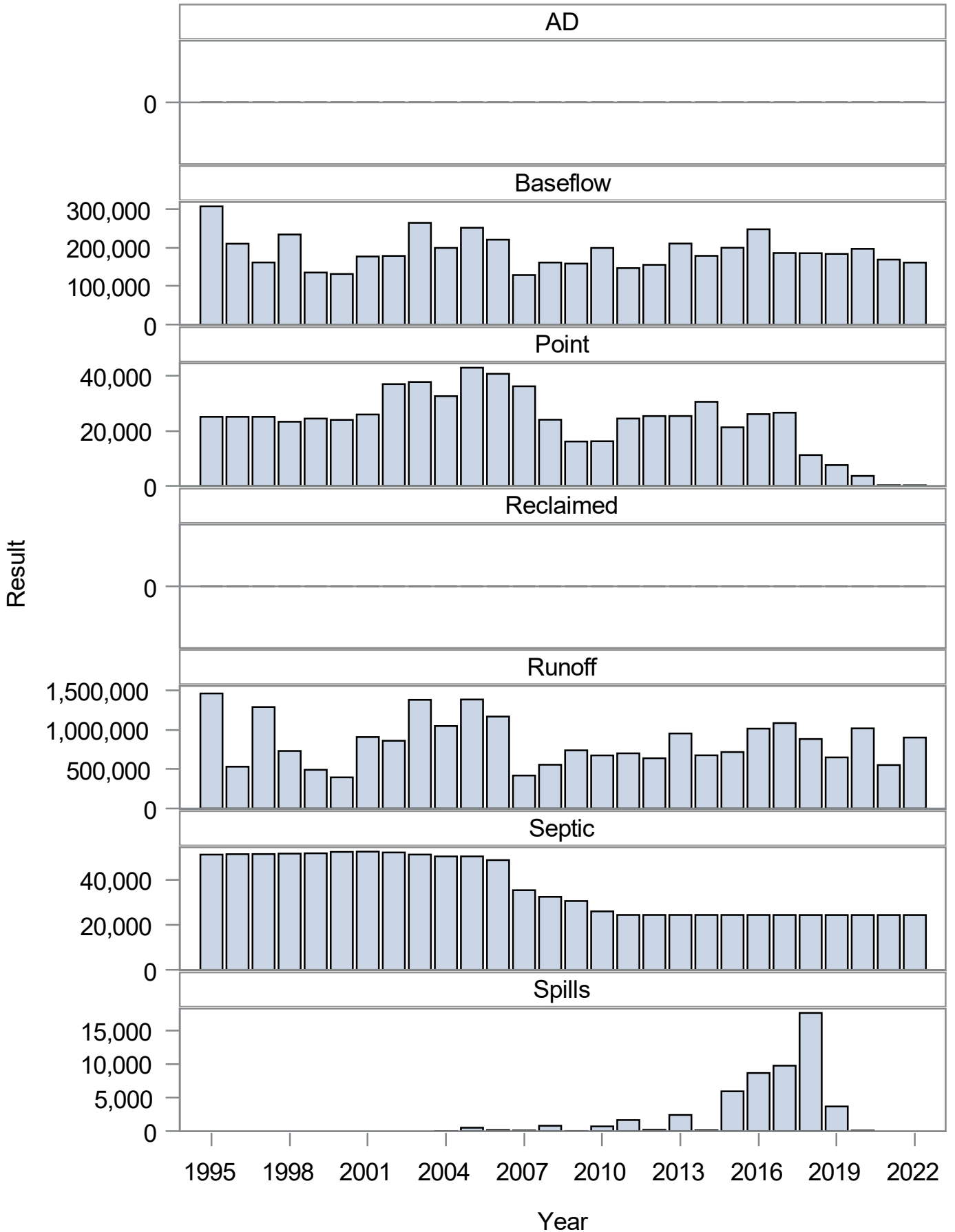
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)  
 Palma Sola Bay



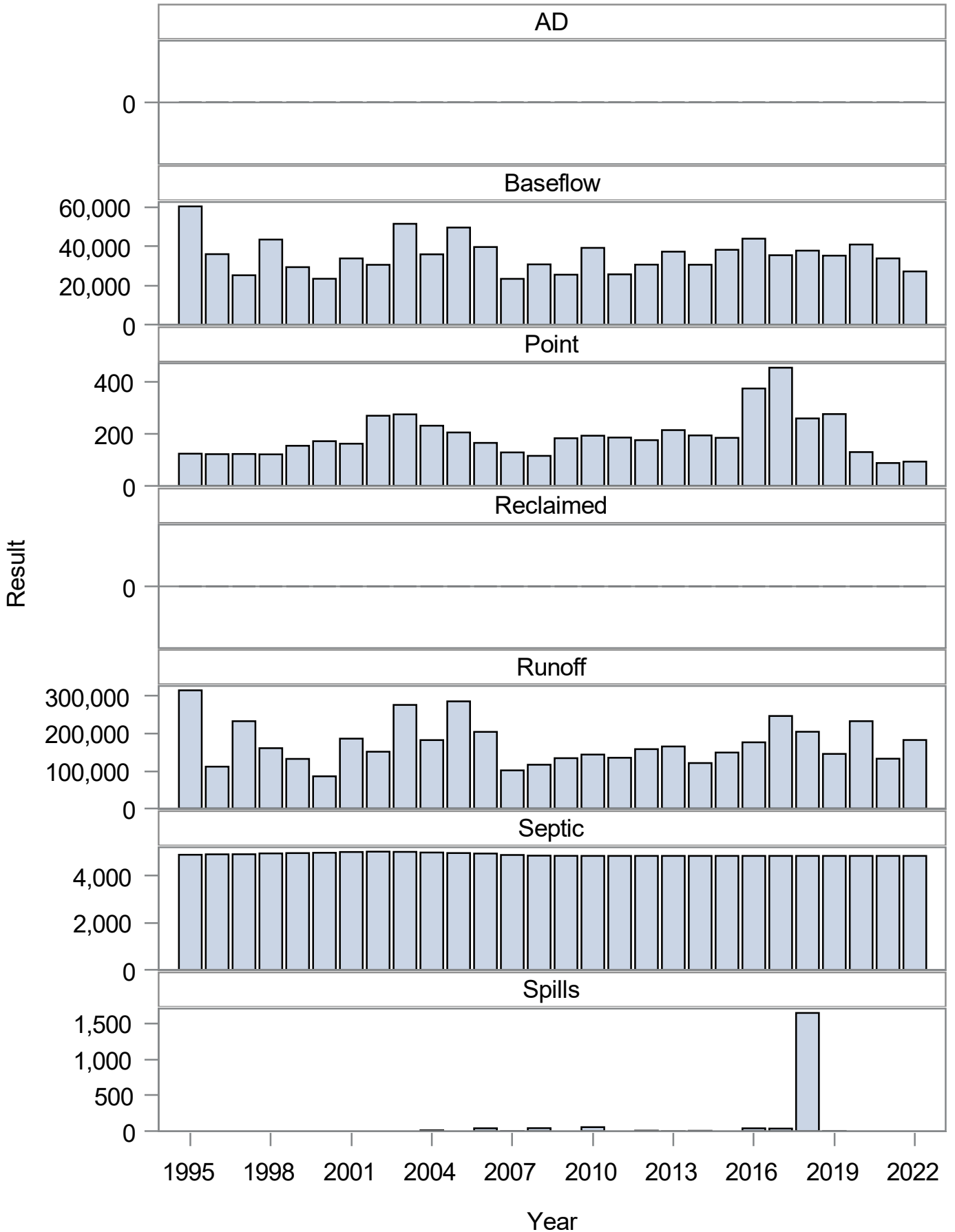
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)  
 Sarasota Bay



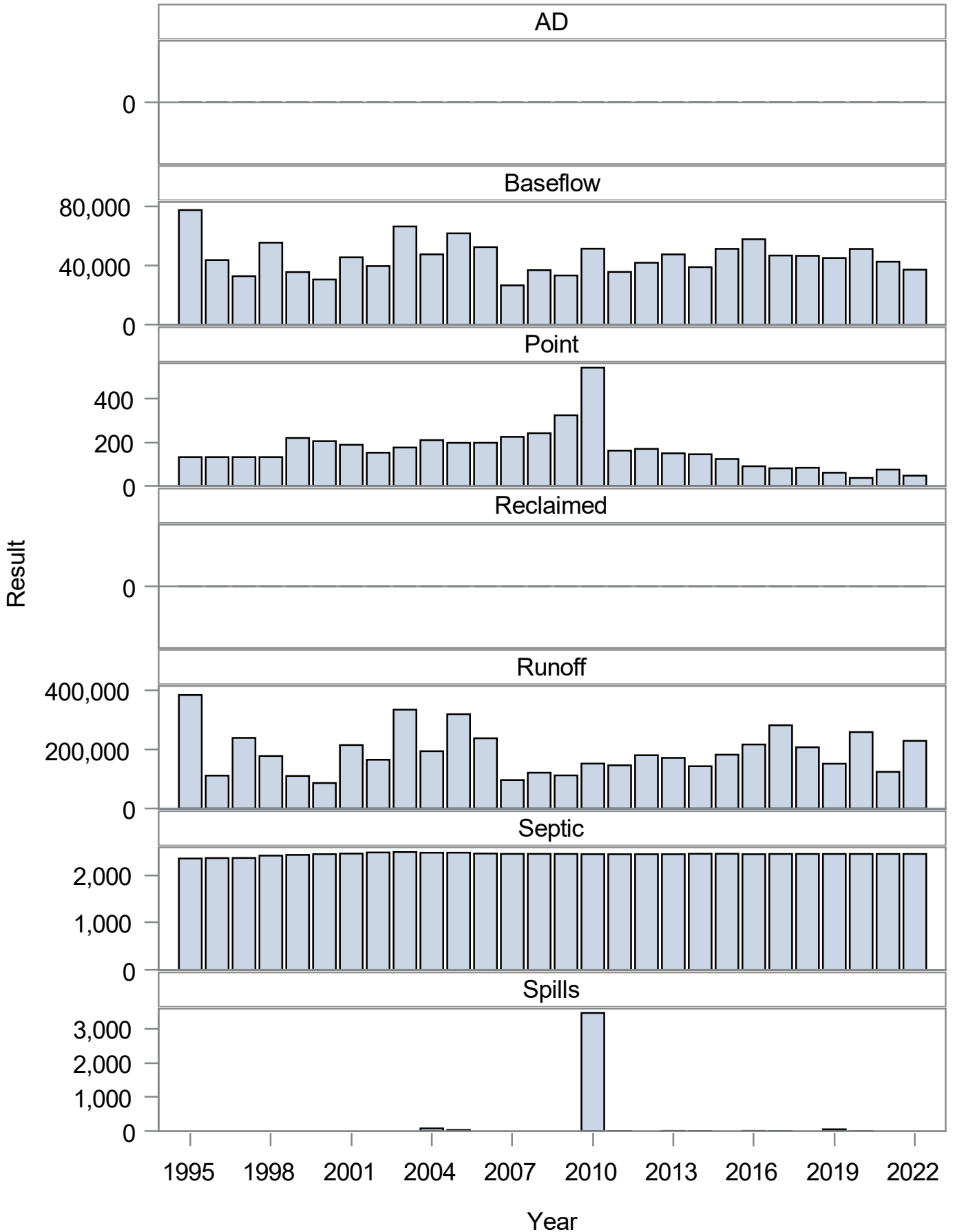
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)  
 Roberts Bay



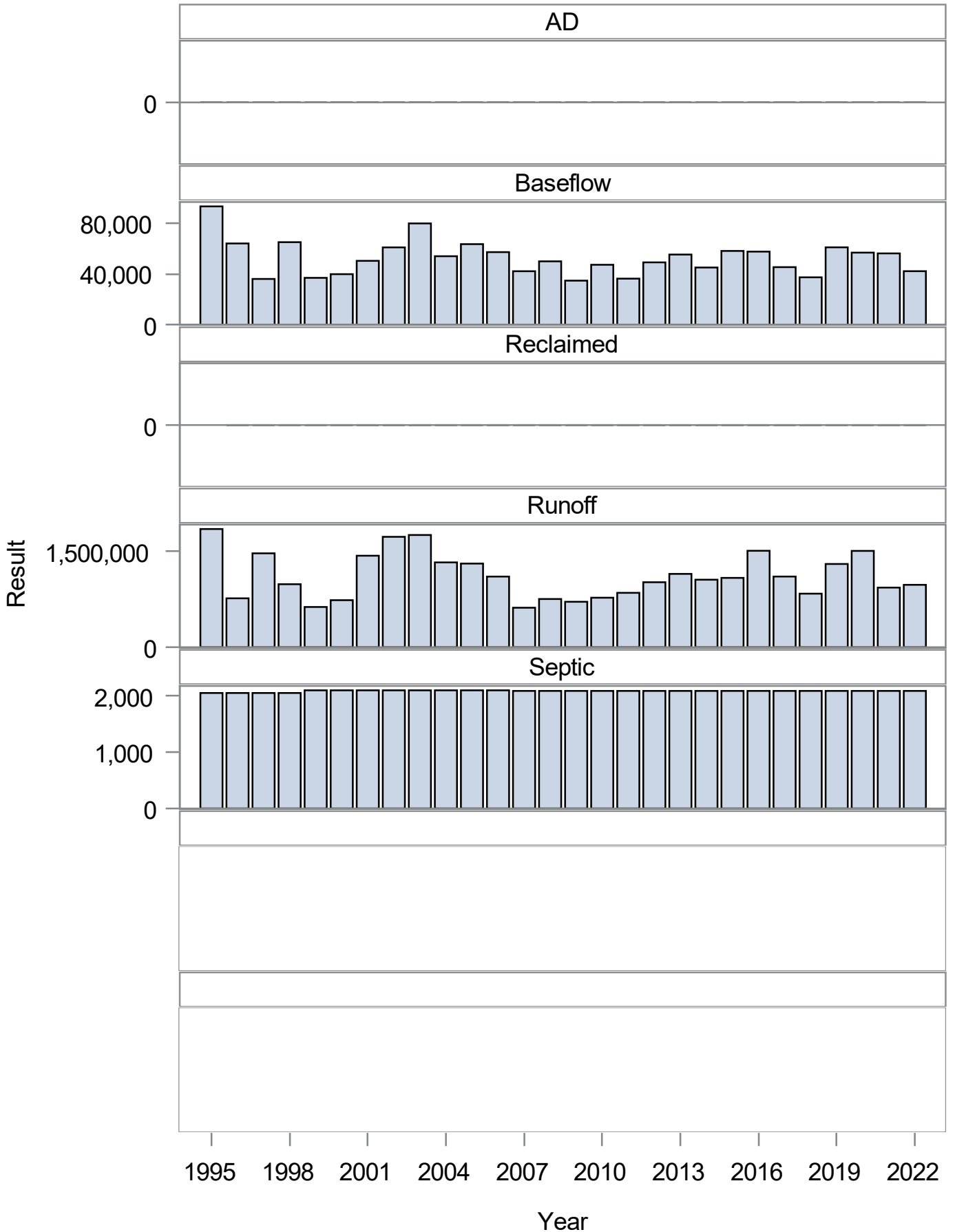
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)  
 Little Sarasota Bay



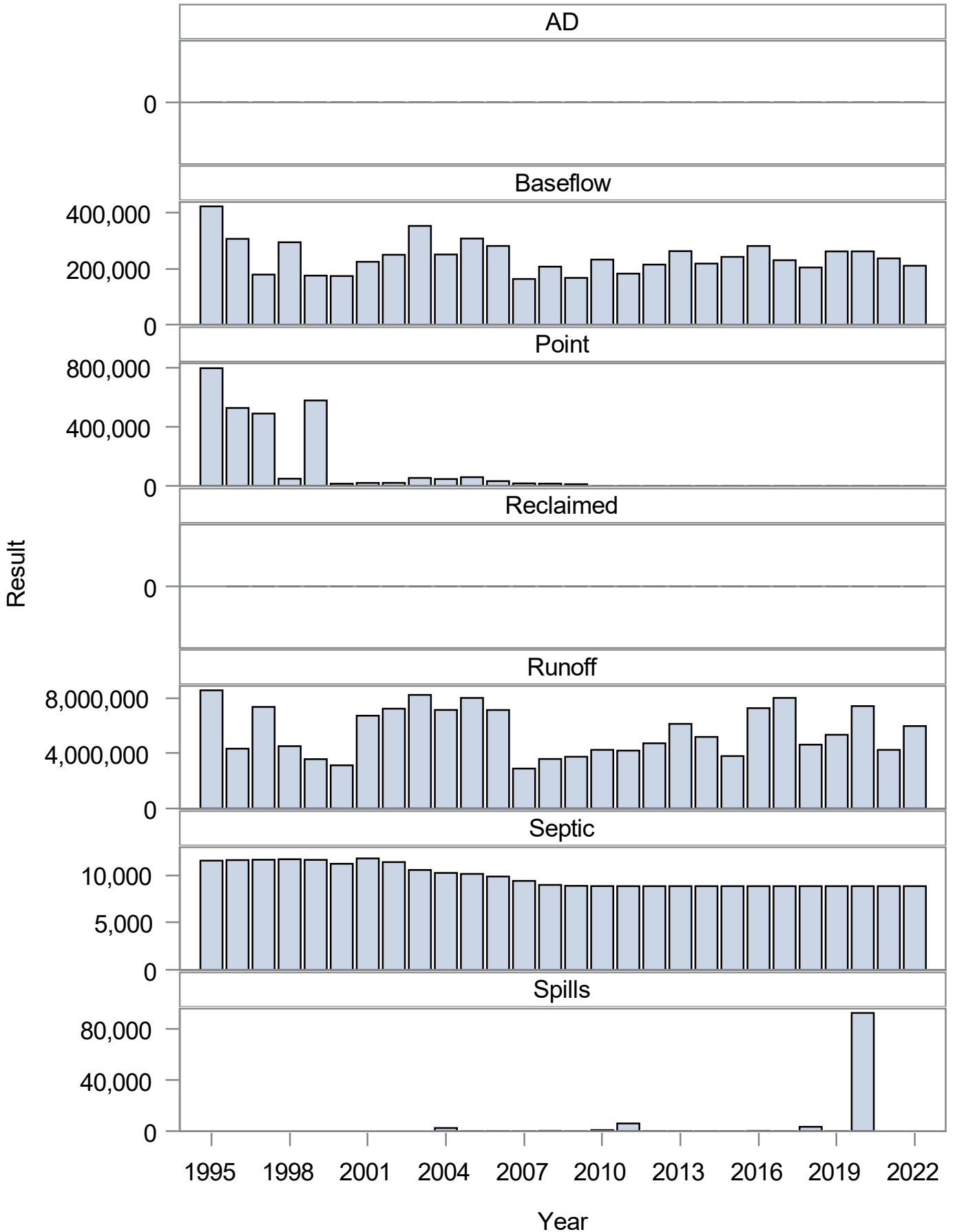
Annual Total Loads 1995-2022  
 Biological Oxygen Demand Load (lbs)  
 Blackburn Bay



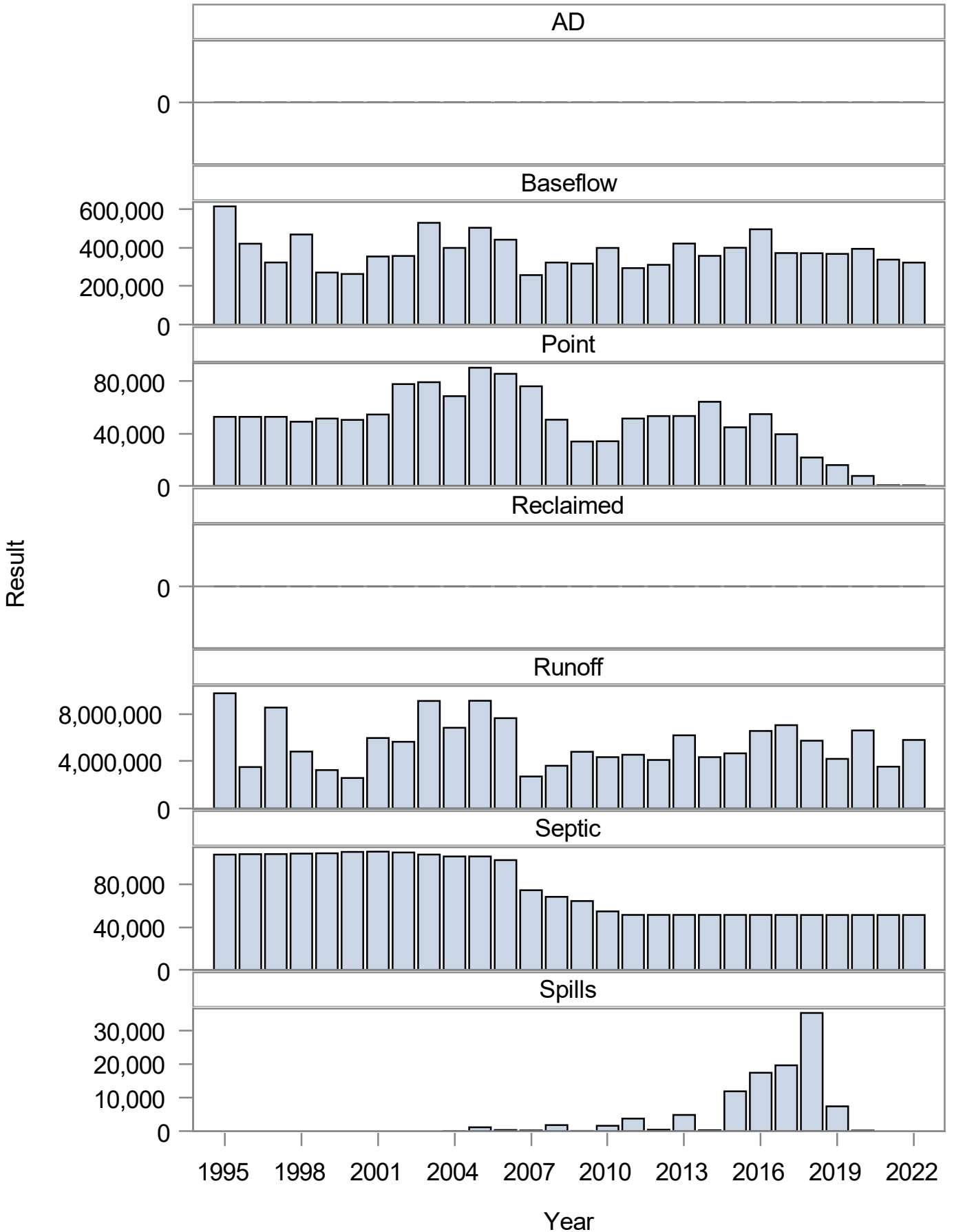
Annual Total Loads 1995-2022  
 Chemical Oxygen Demand Load (lbs)  
 Palma Sola Bay



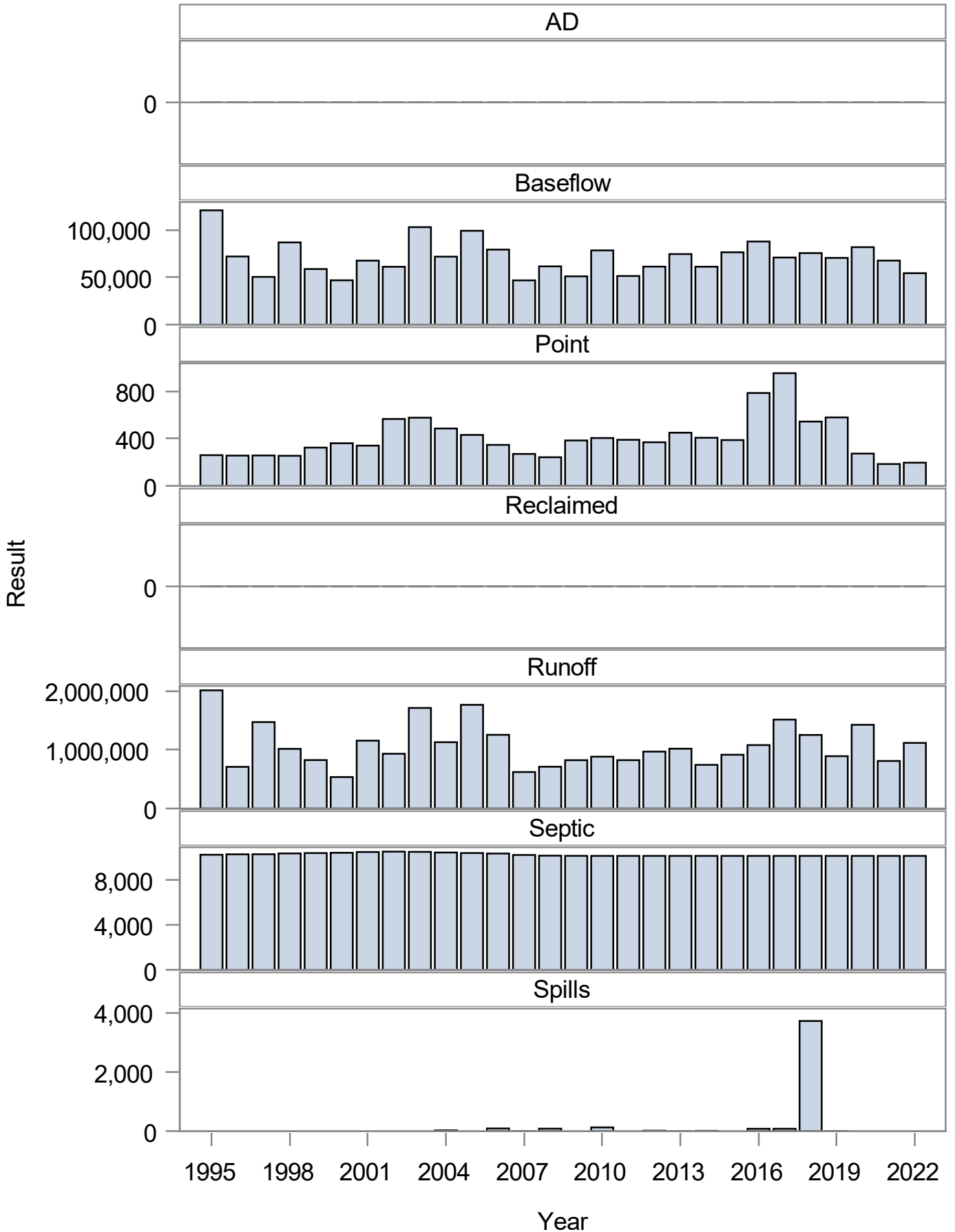
Annual Total Loads 1995-2022  
 Chemical Oxygen Demand Load (lbs)  
 Sarasota Bay



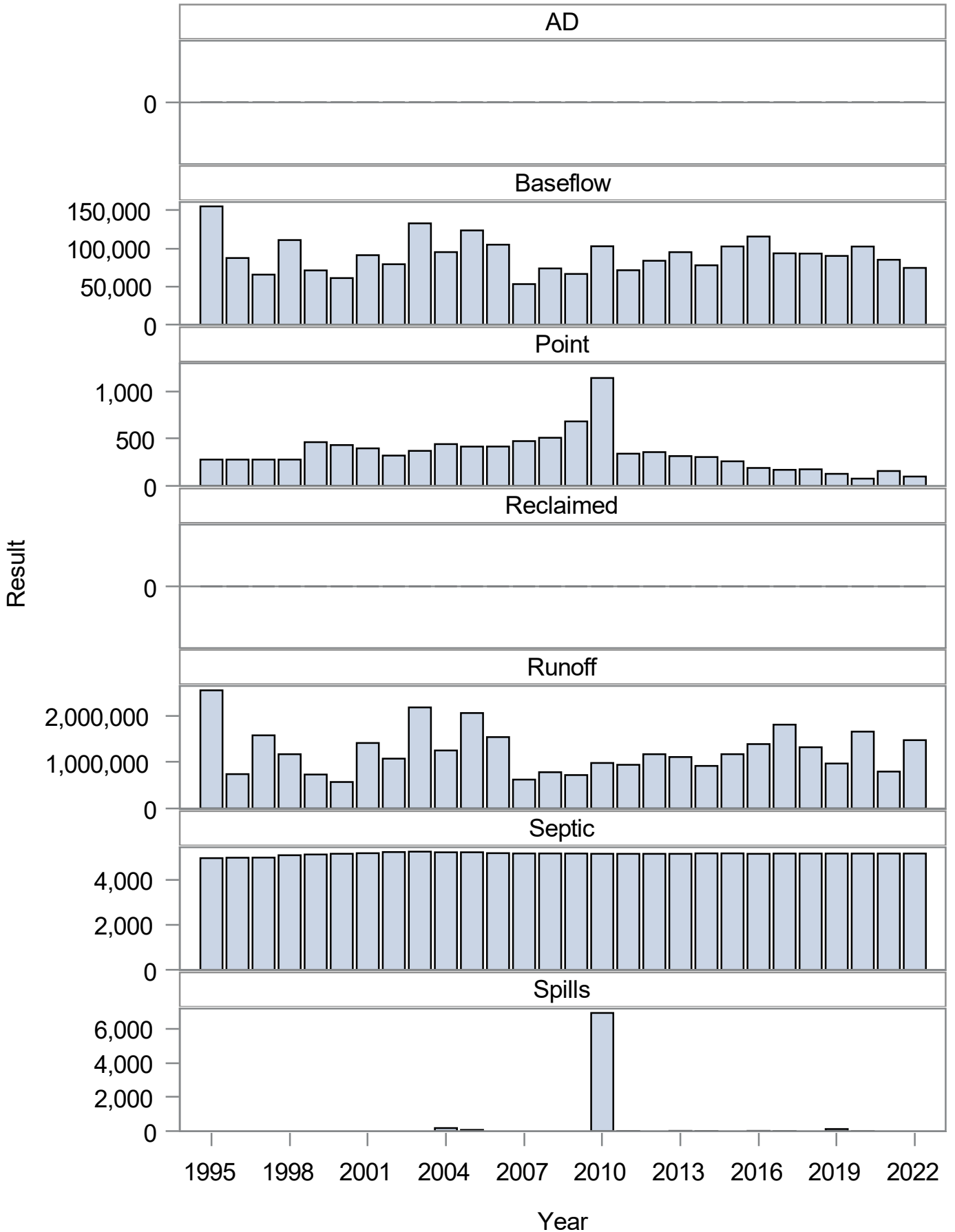
Annual Total Loads 1995-2022  
 Chemical Oxygen Demand Load (lbs)  
 Roberts Bay



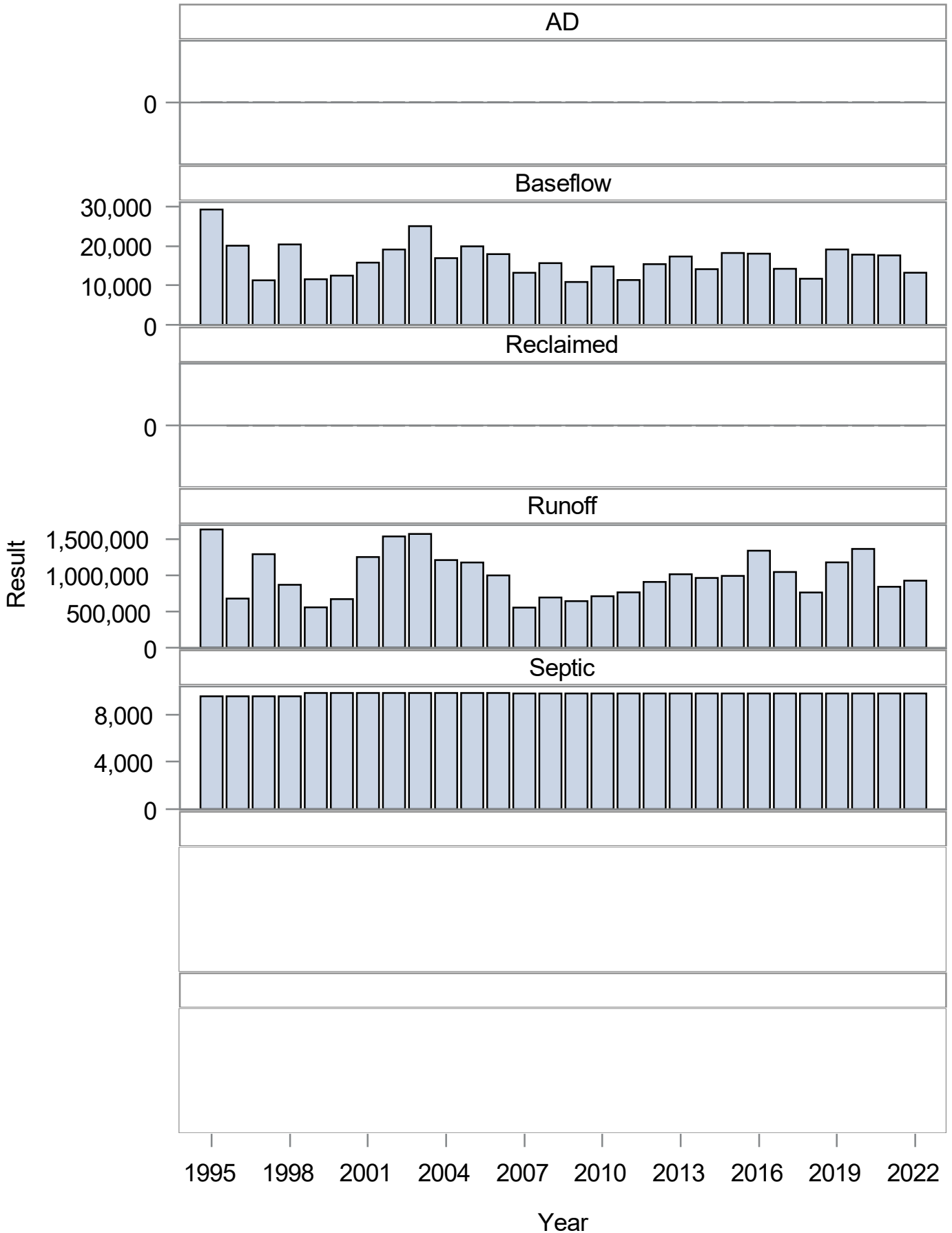
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 Chemical Oxygen Demand Load (lbs)  
 Little Sarasota Bay



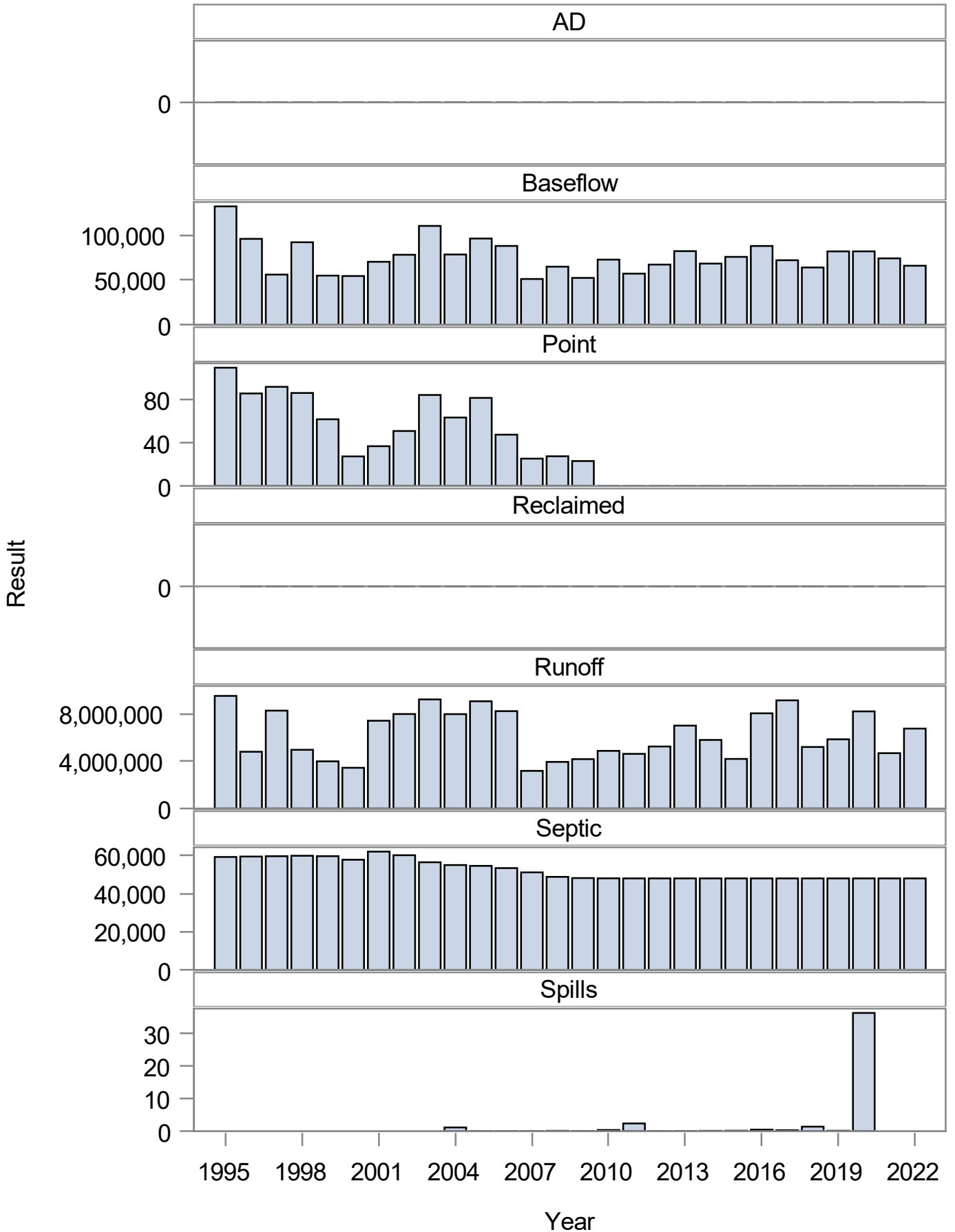
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 Chemical Oxygen Demand Load (lbs)  
 Blackburn Bay



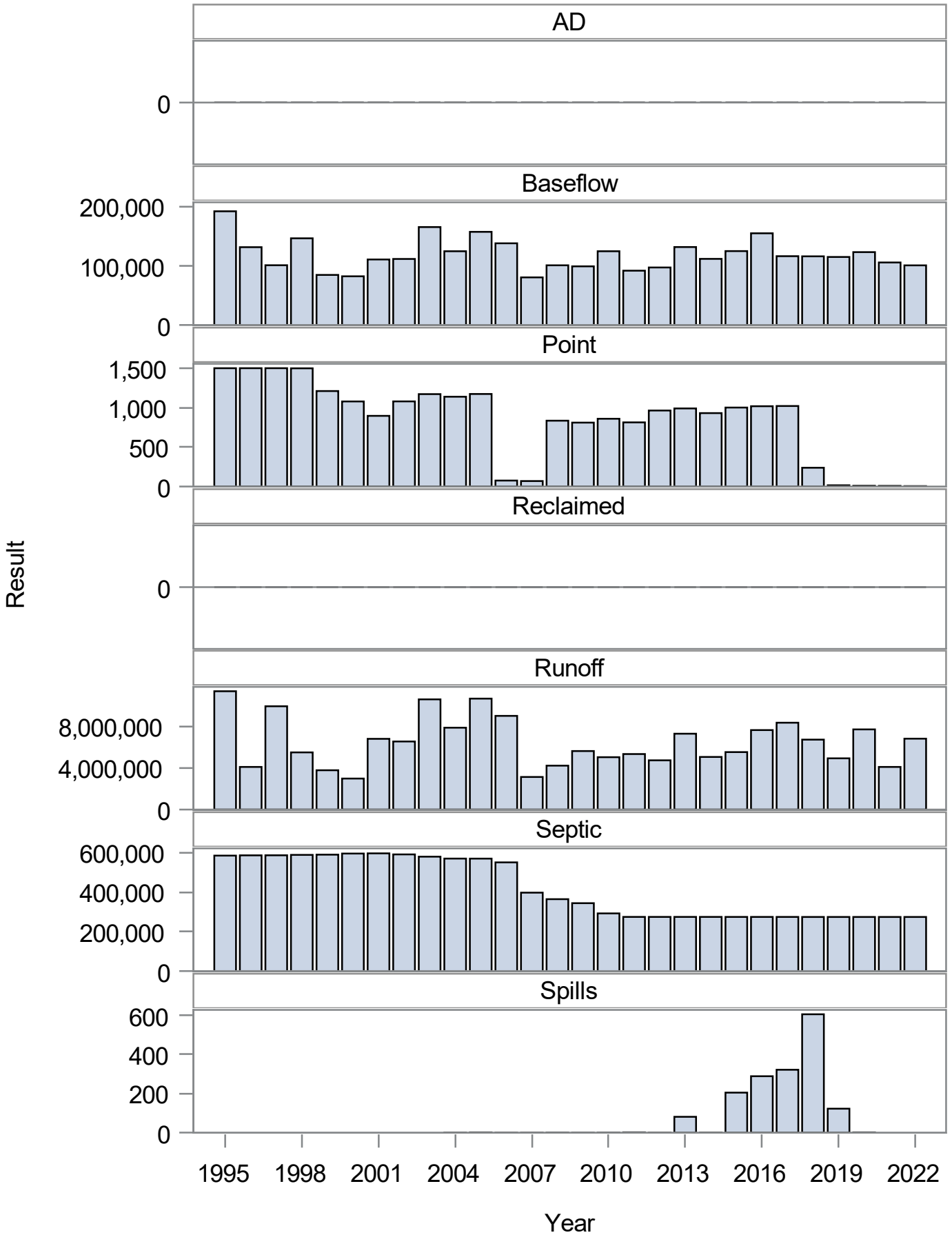
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 Fecal Coliform Load (#)  
 Palma Sola Bay



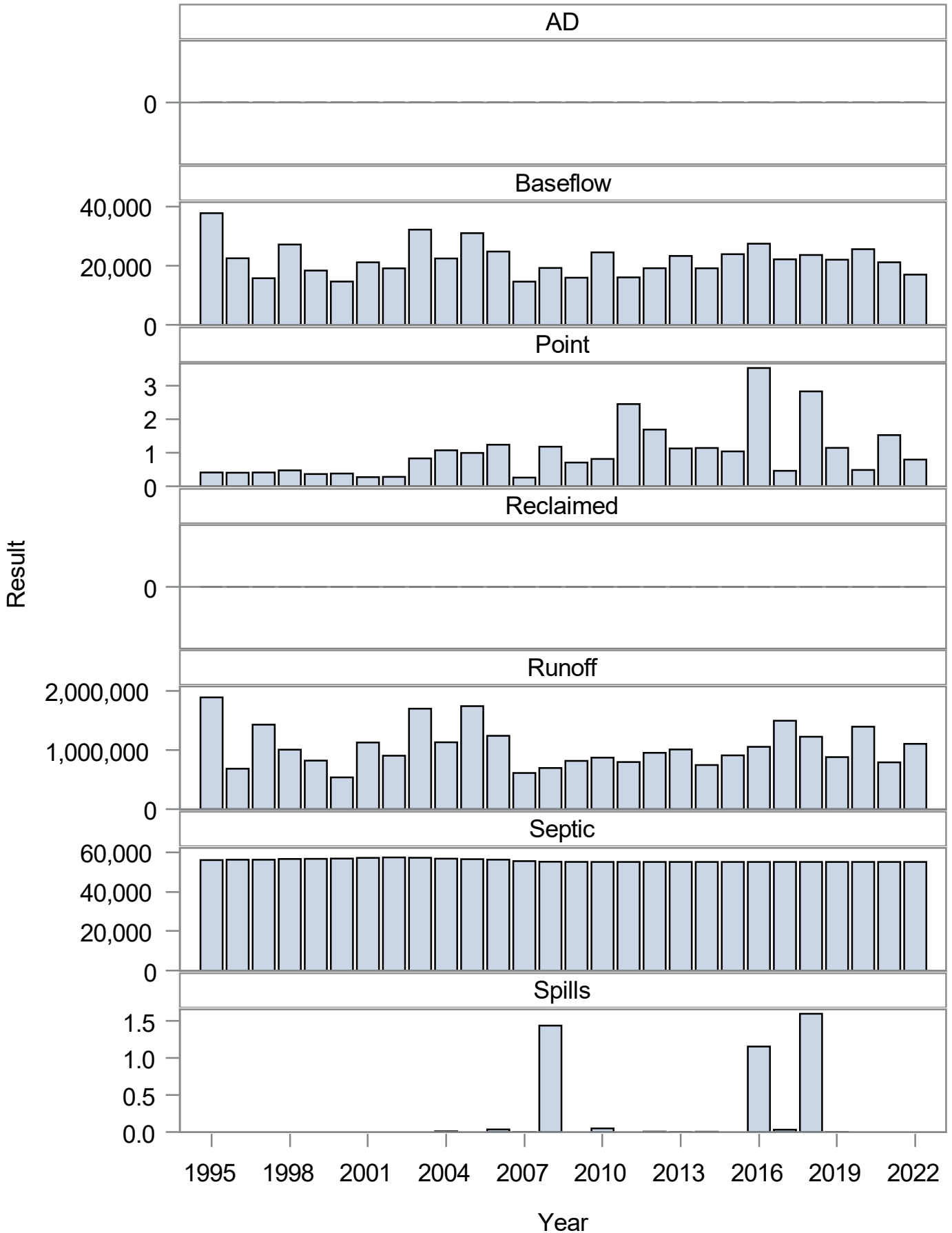
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 Fecal Coliform Load (#)  
 Sarasota Bay



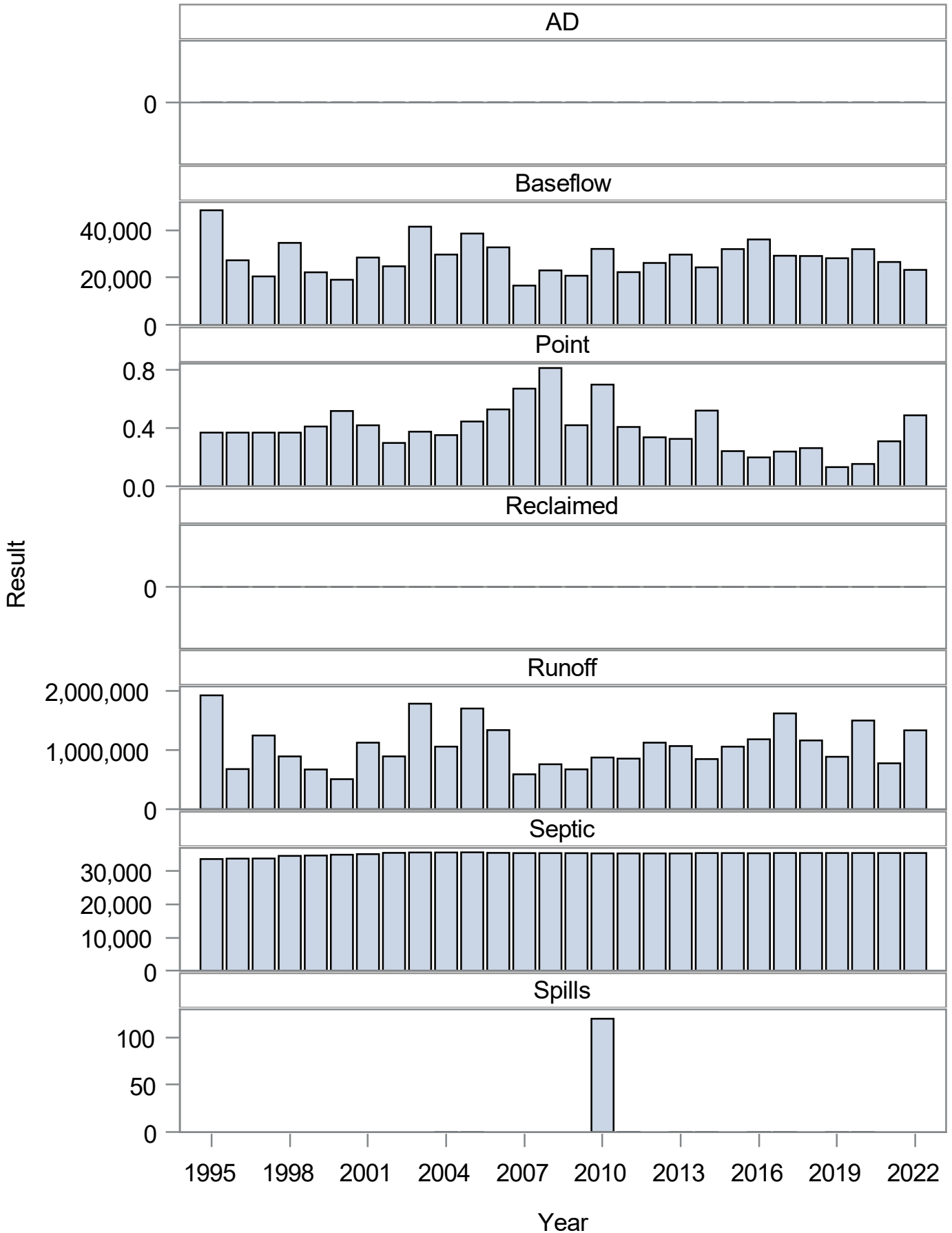
Annual Total Loads 1995-2022  
 Fecal Coliform Load (#)  
 Roberts Bay



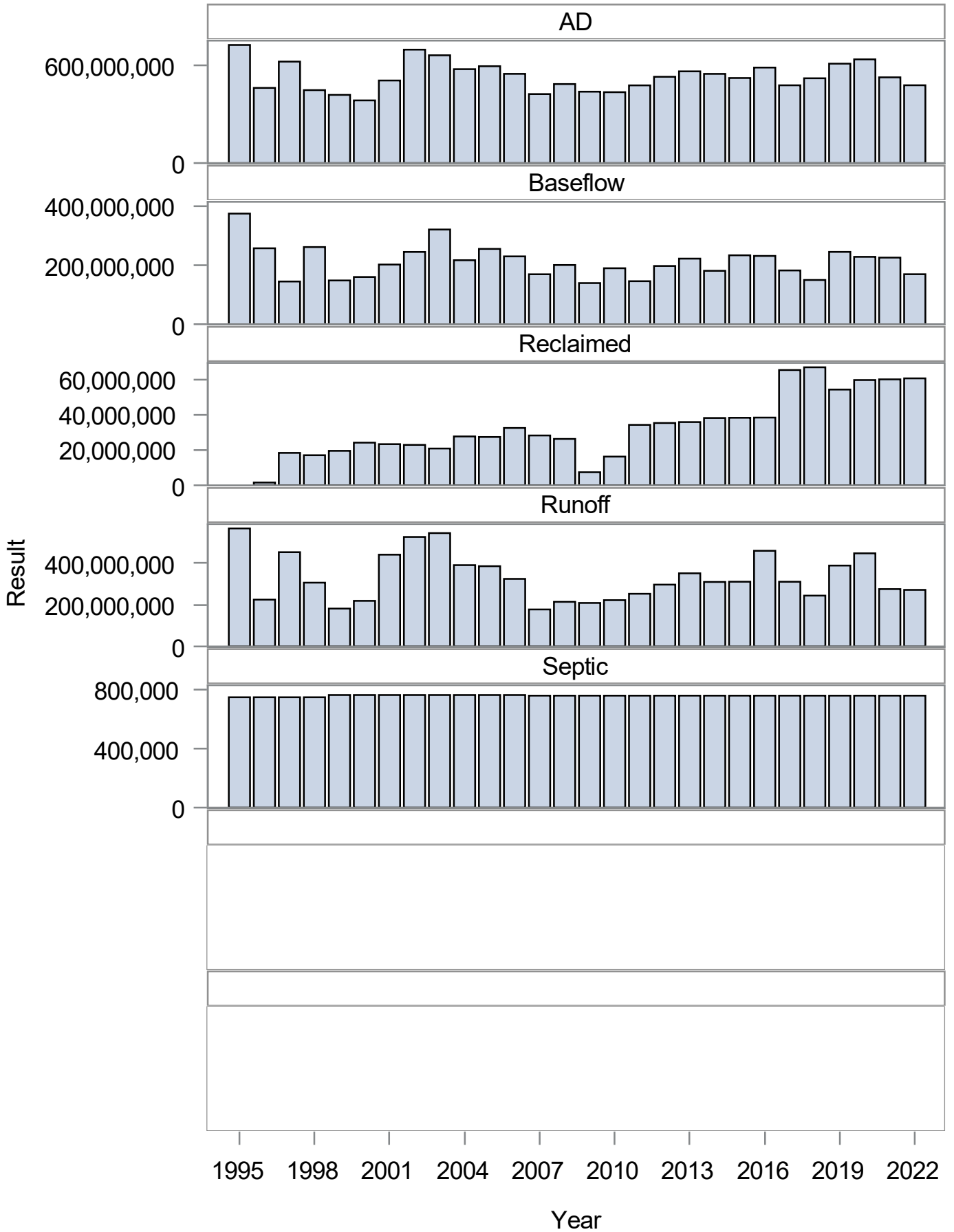
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 Fecal Coliform Load (#)  
 Little Sarasota Bay



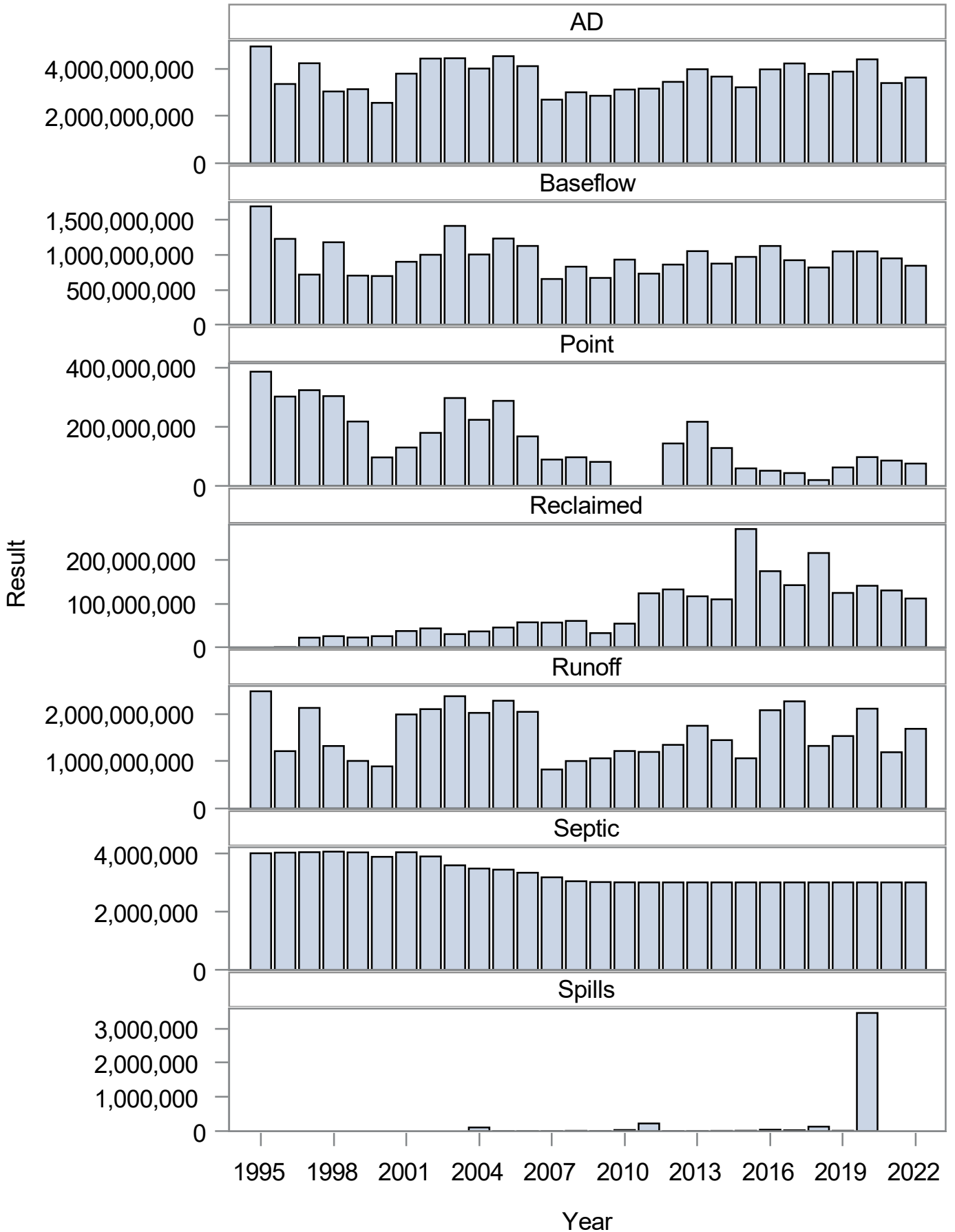
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 Fecal Coliform Load (#)  
 Blackburn Bay



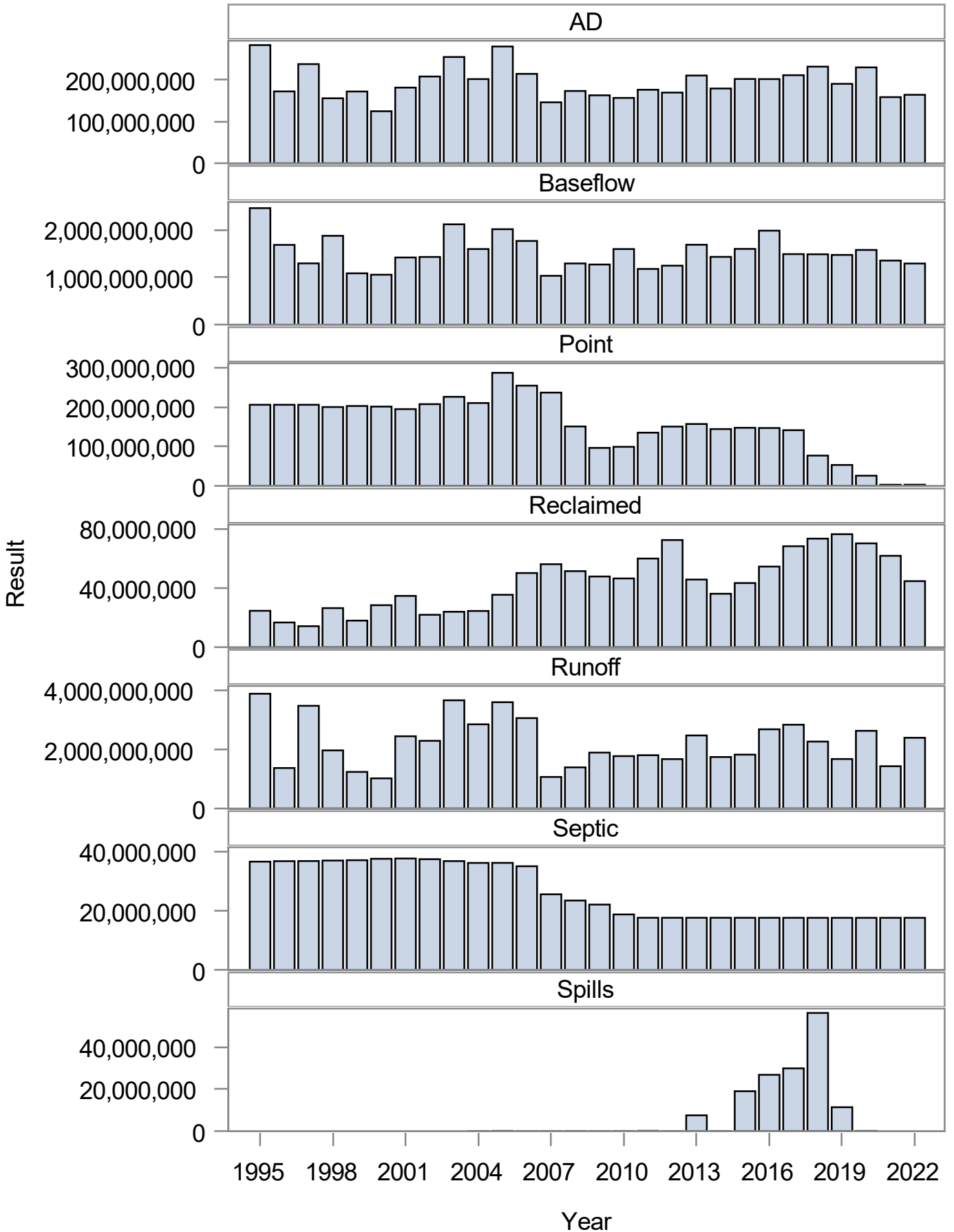
Annual Total Loads 1995-2022  
 Hydrologic Load (CF)  
 Palma Sola Bay



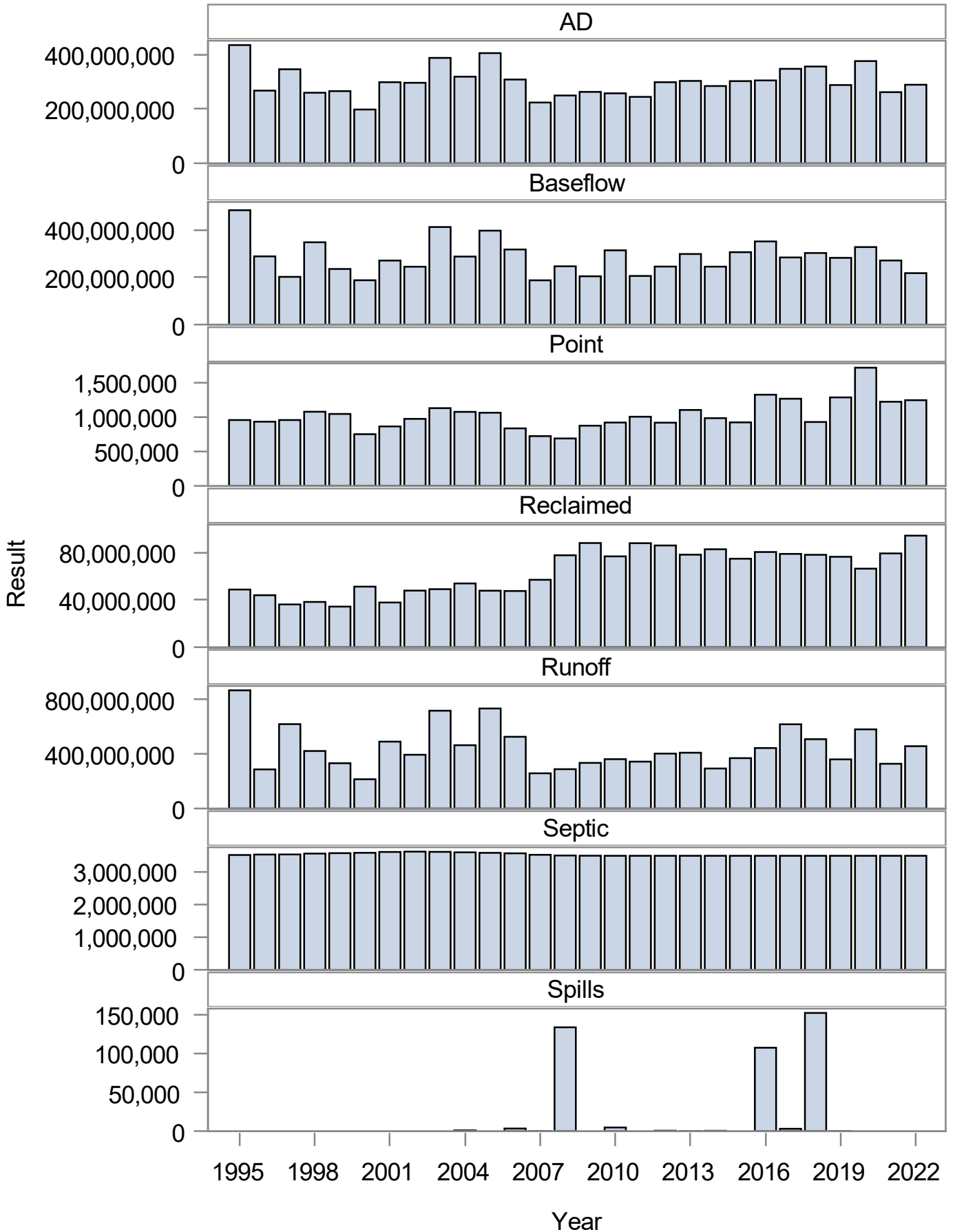
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 Hydrologic Load (CF)  
 Sarasota Bay



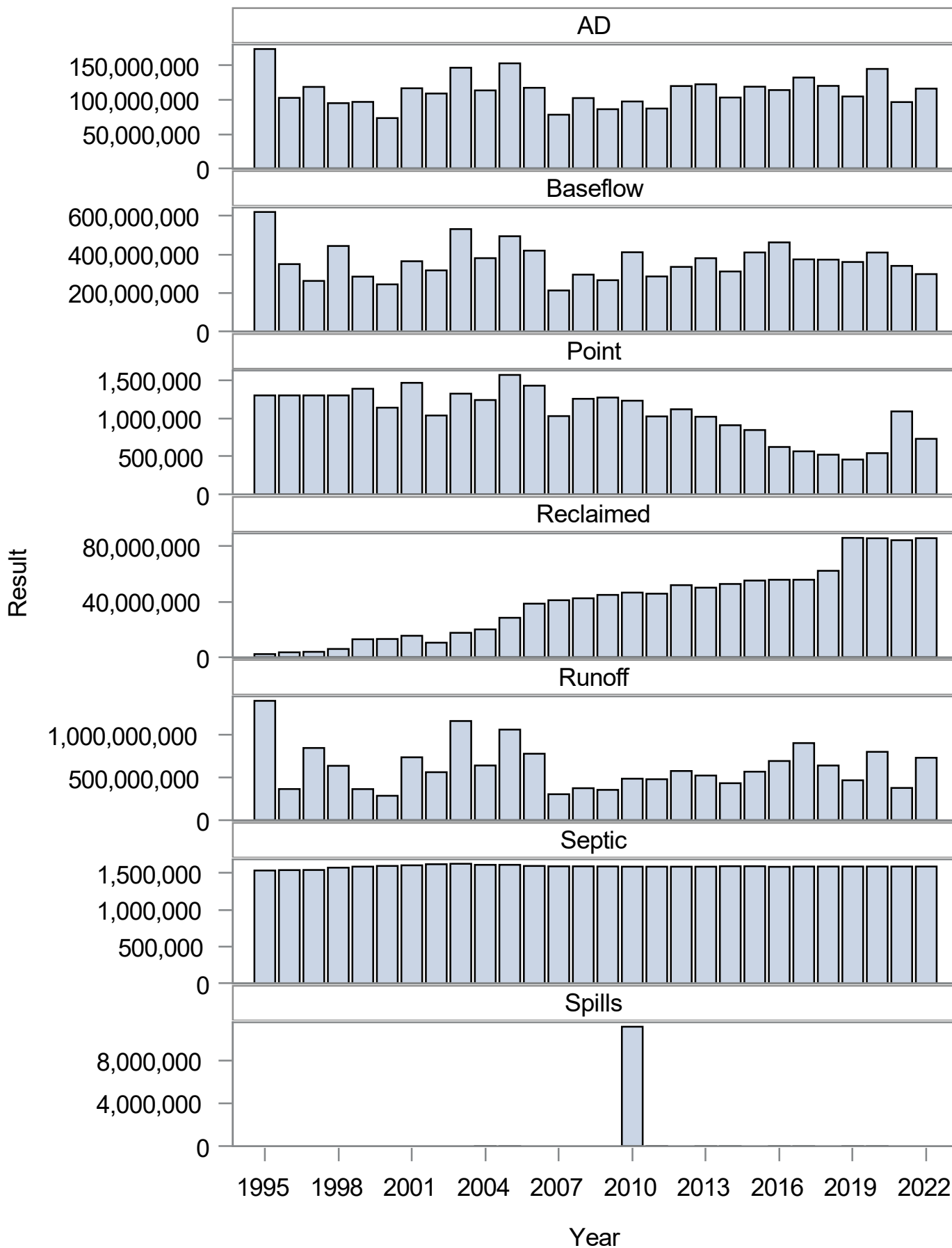
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Hydrologic Load (CF)  
Roberts Bay



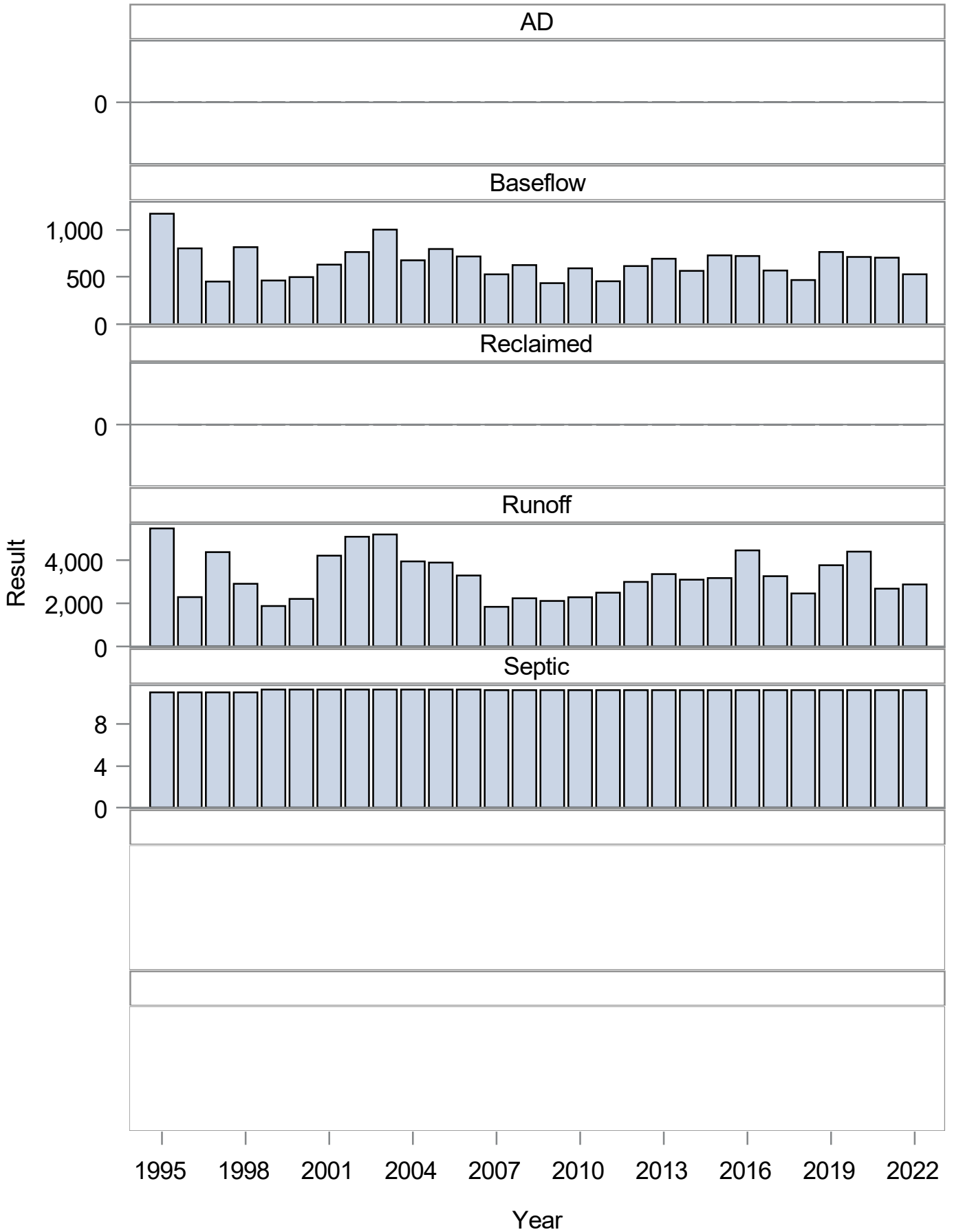
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 Hydrologic Load (CF)  
 Little Sarasota Bay



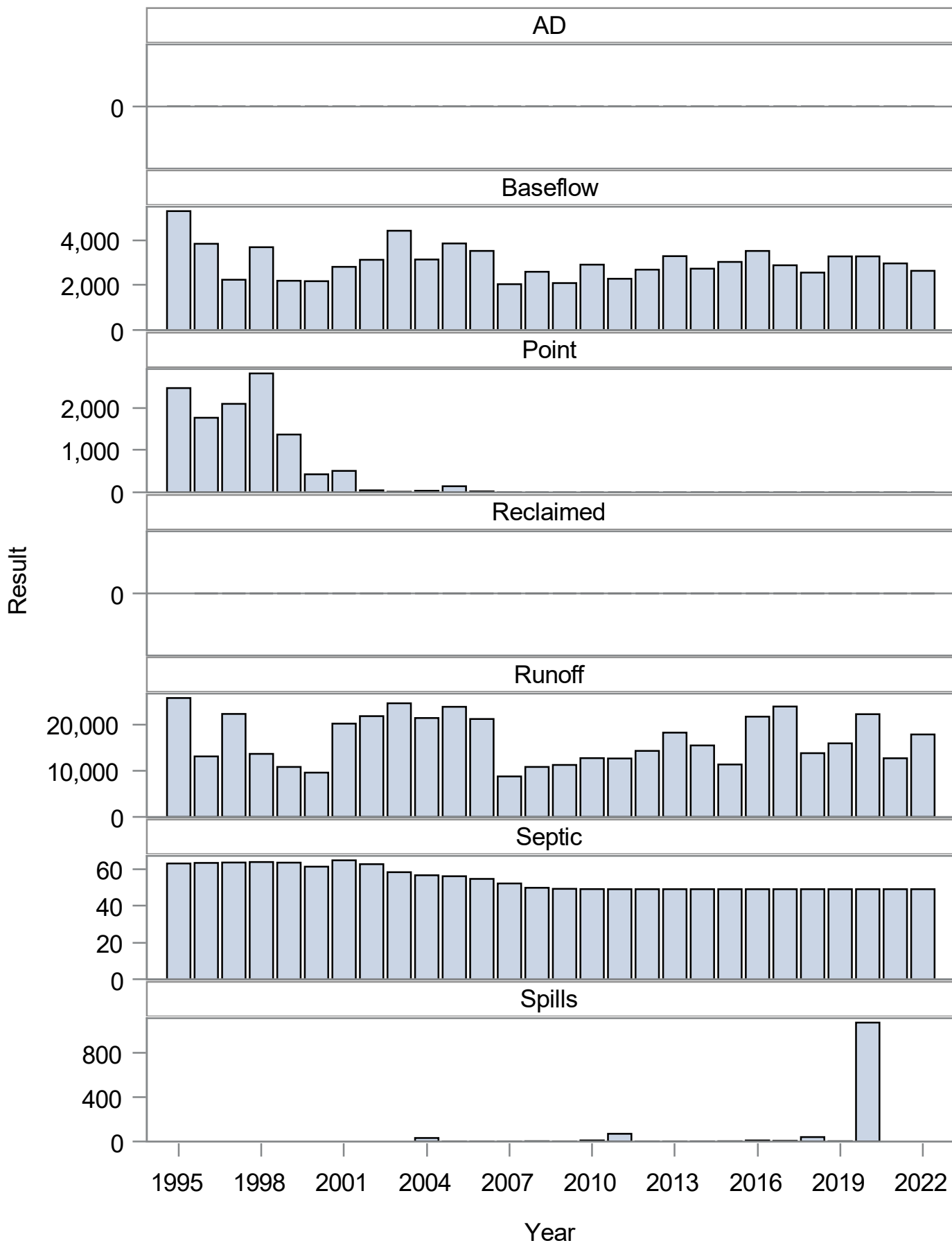
Annual Total Loads 1995-2022  
 Hydrologic Load (CF)  
 Blackburn Bay



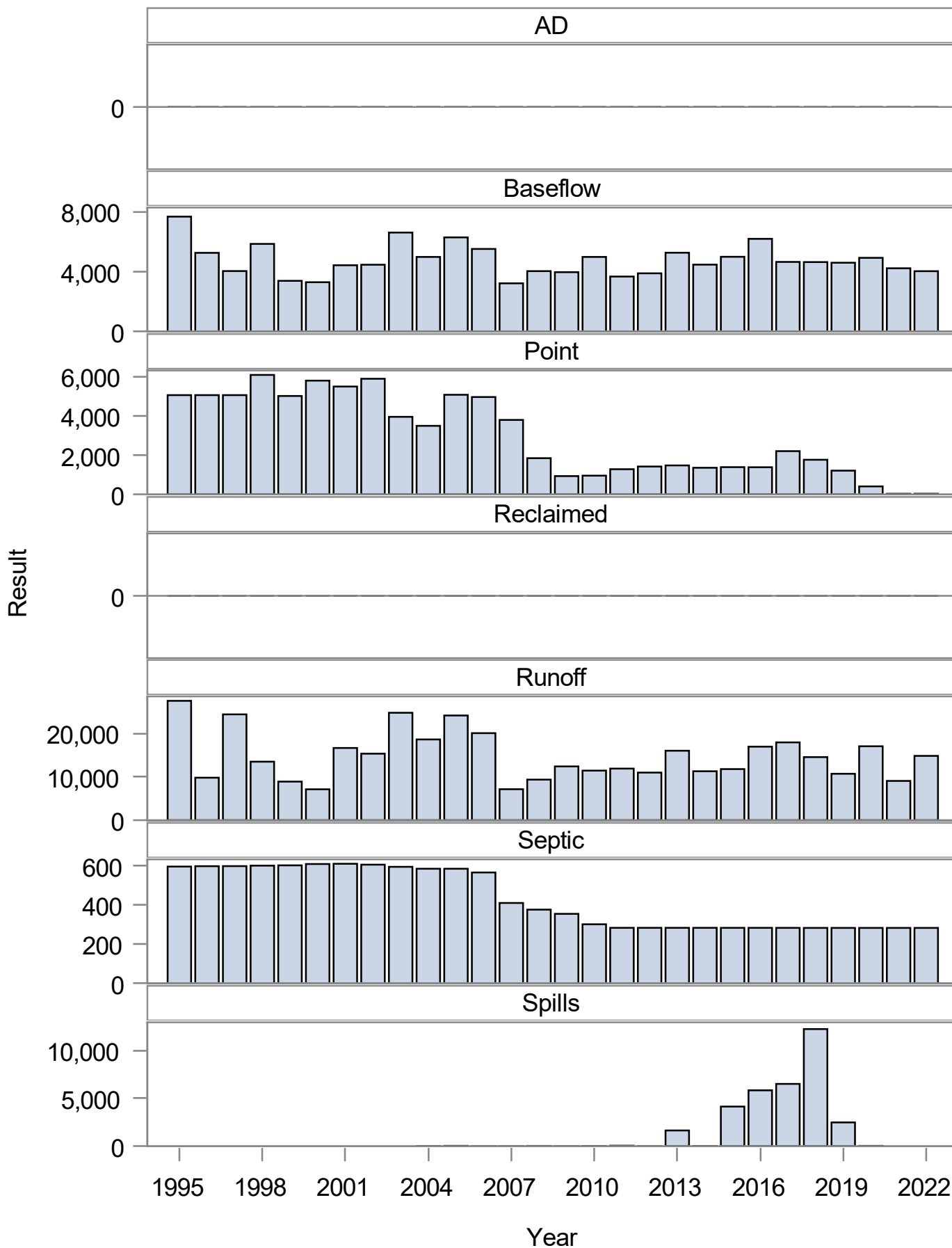
Annual Total Loads 1995-2022  
Inorganic Phosphorus Load (lbs)  
Palma Sola Bay



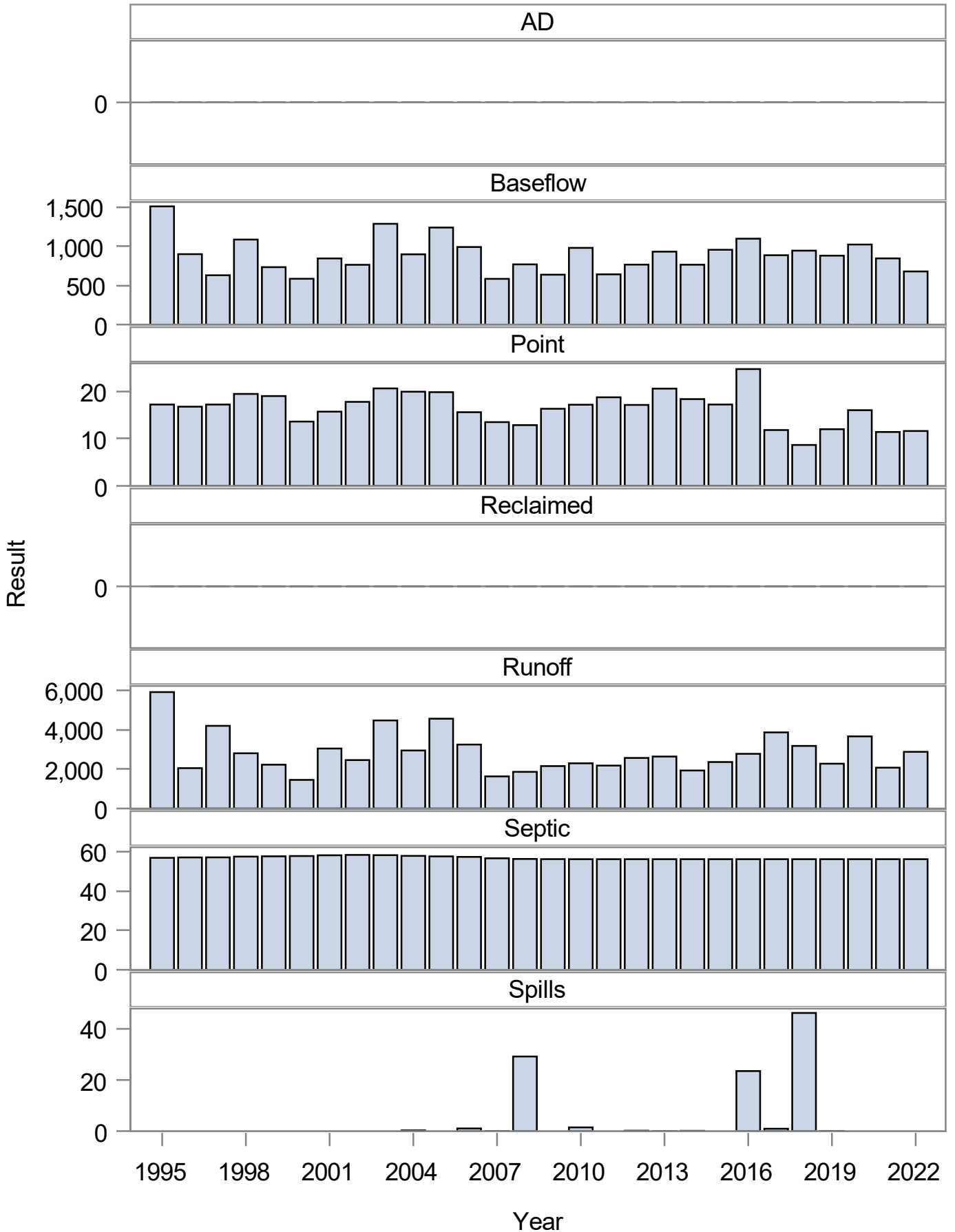
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 Inorganic Phosphorus Load (lbs)  
 Sarasota Bay



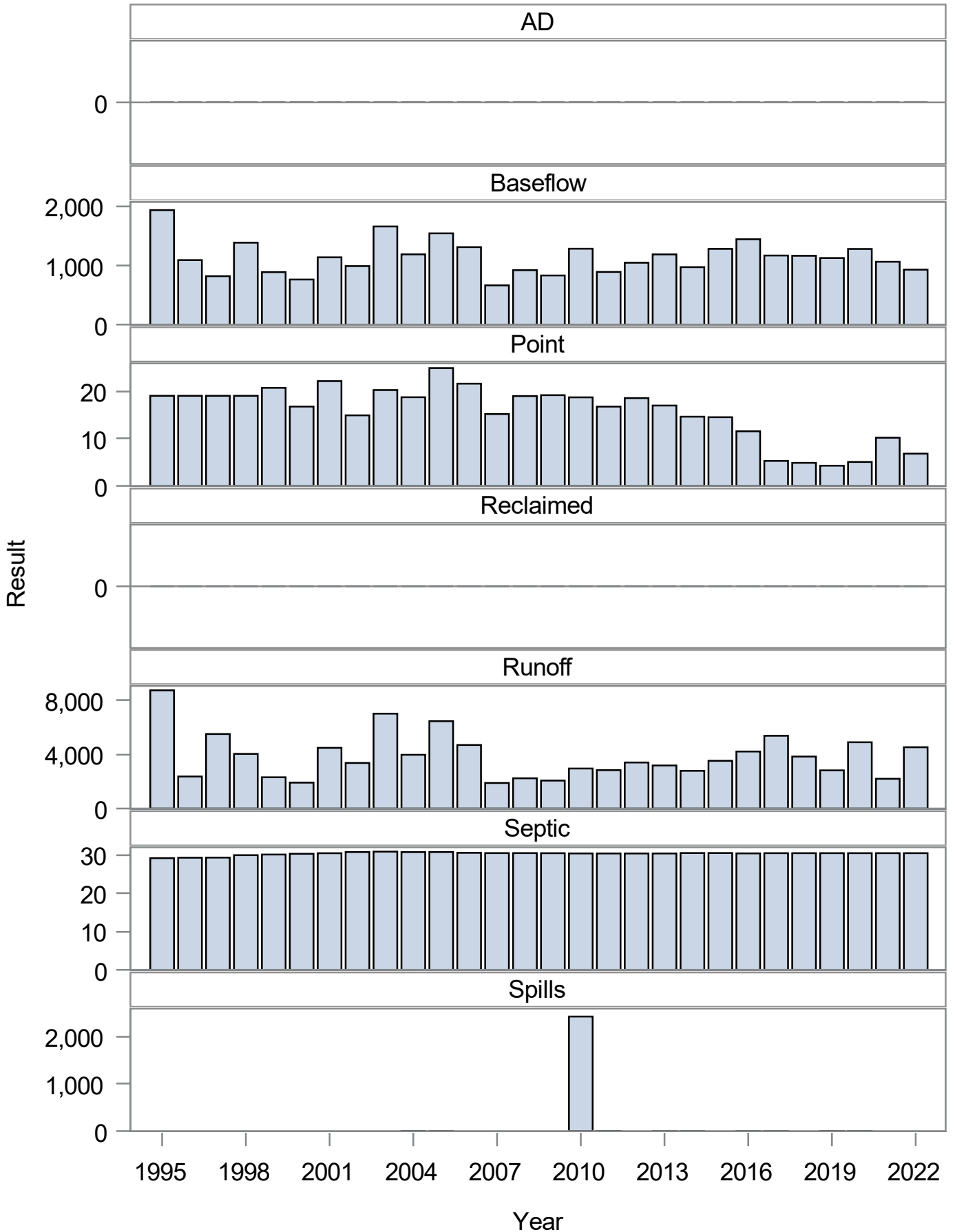
Annual Total Loads 1995-2022  
 Inorganic Phosphorus Load (lbs)  
 Roberts Bay



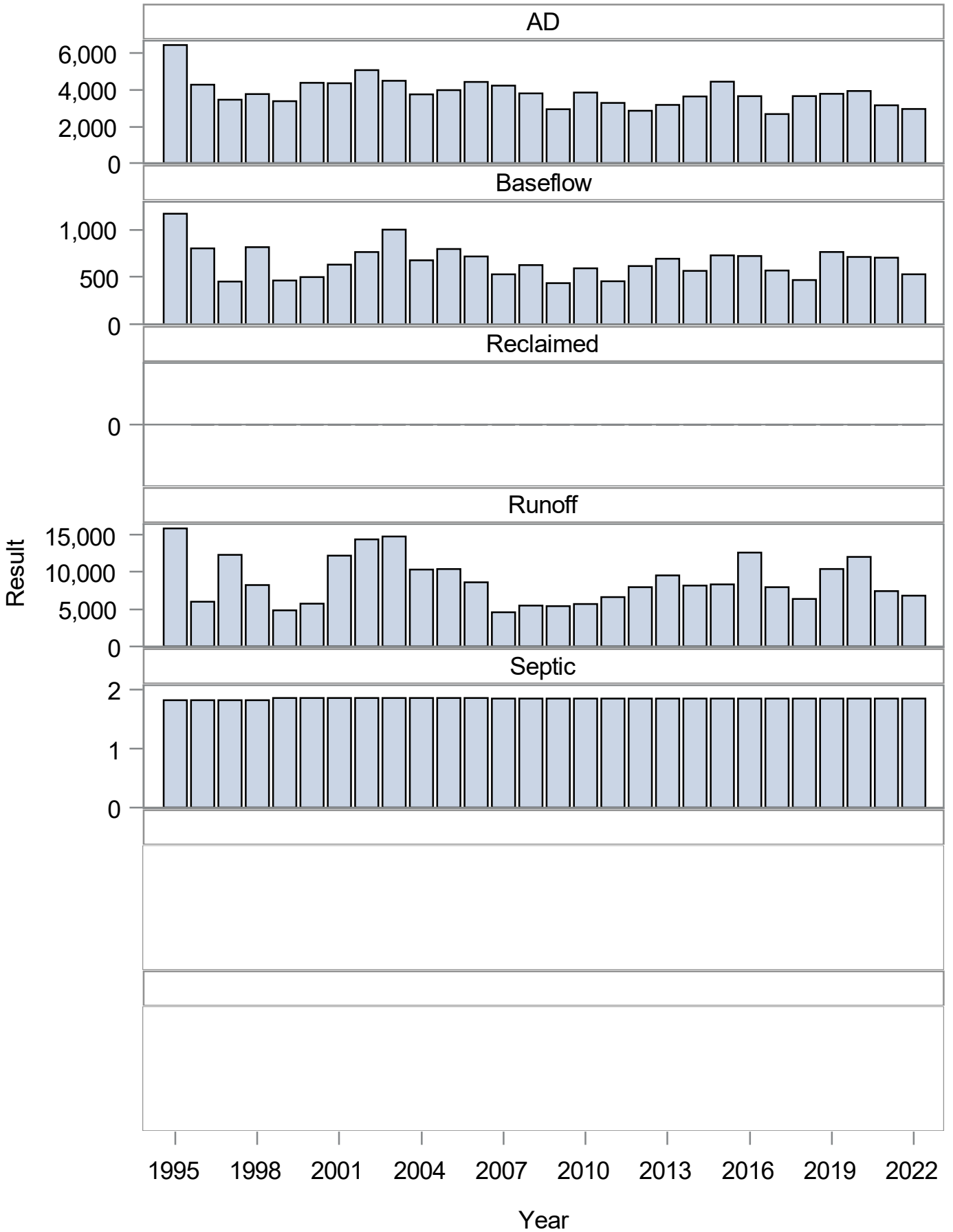
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 Inorganic Phosphorus Load (lbs)  
 Little Sarasota Bay



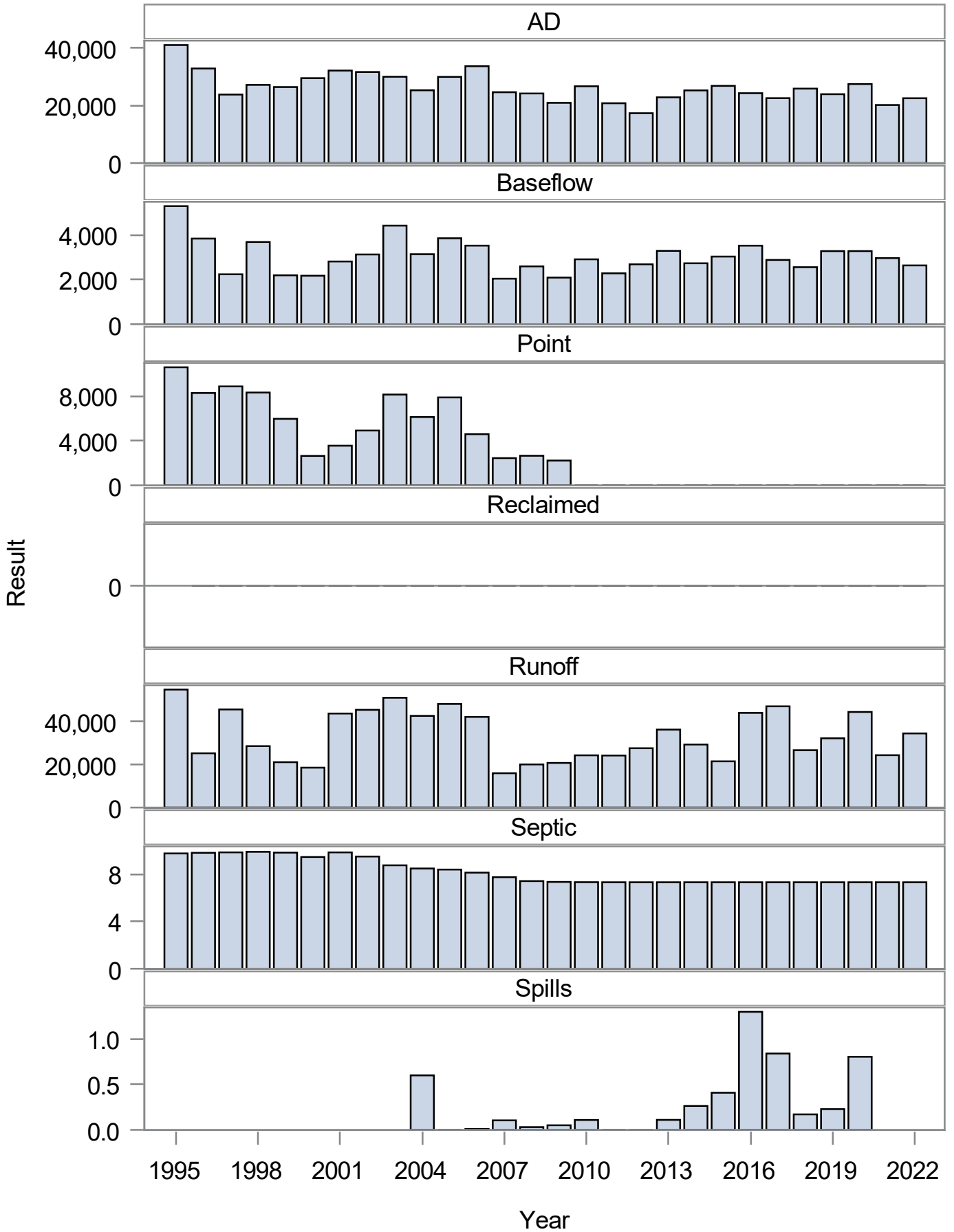
Annual Total Loads 1995-2022  
 Inorganic Phosphorus Load (lbs)  
 Blackburn Bay



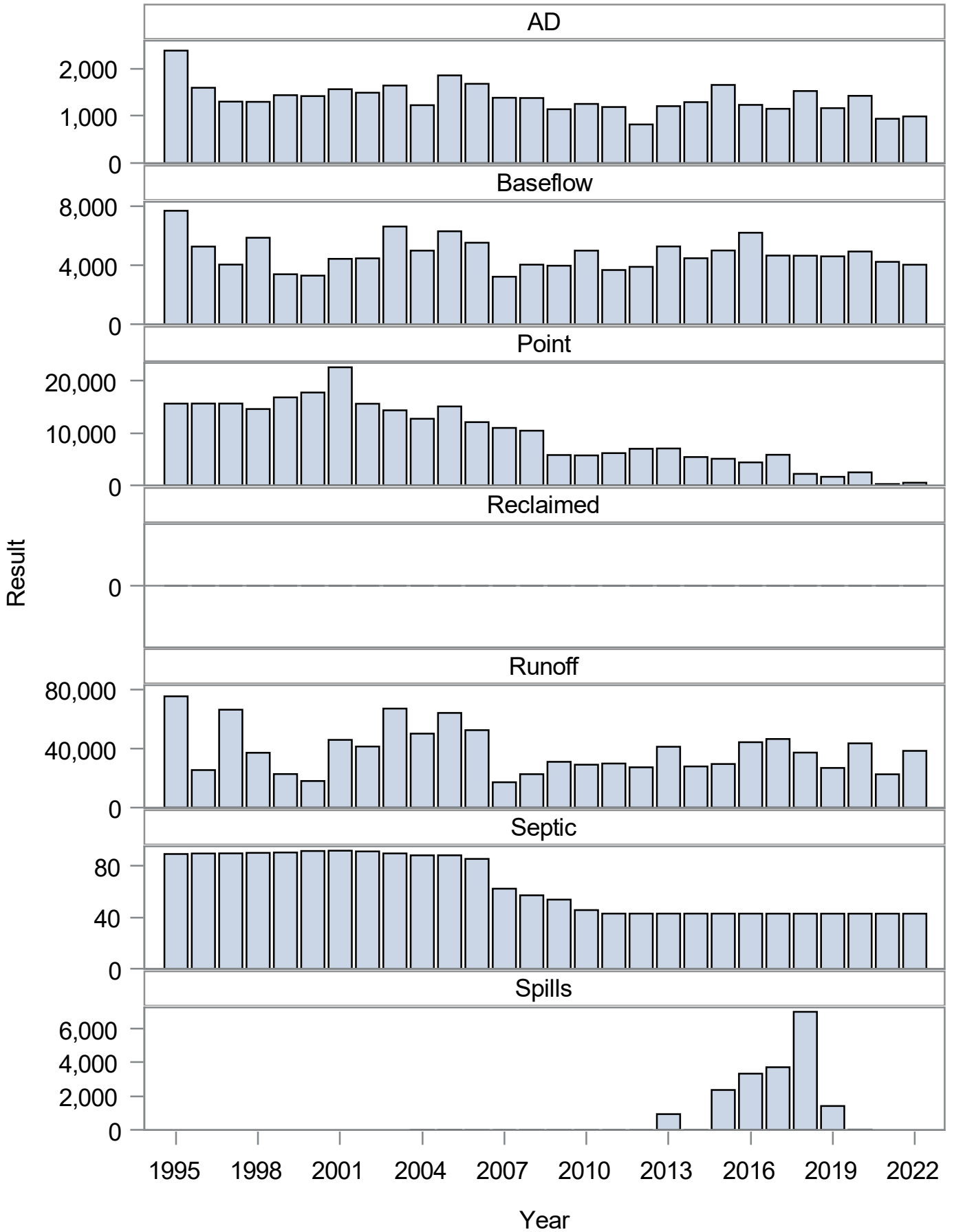
Annual Total Loads 1995-2022  
 Nitrate-Nitrite Load (lbs)  
 Palma Sola Bay



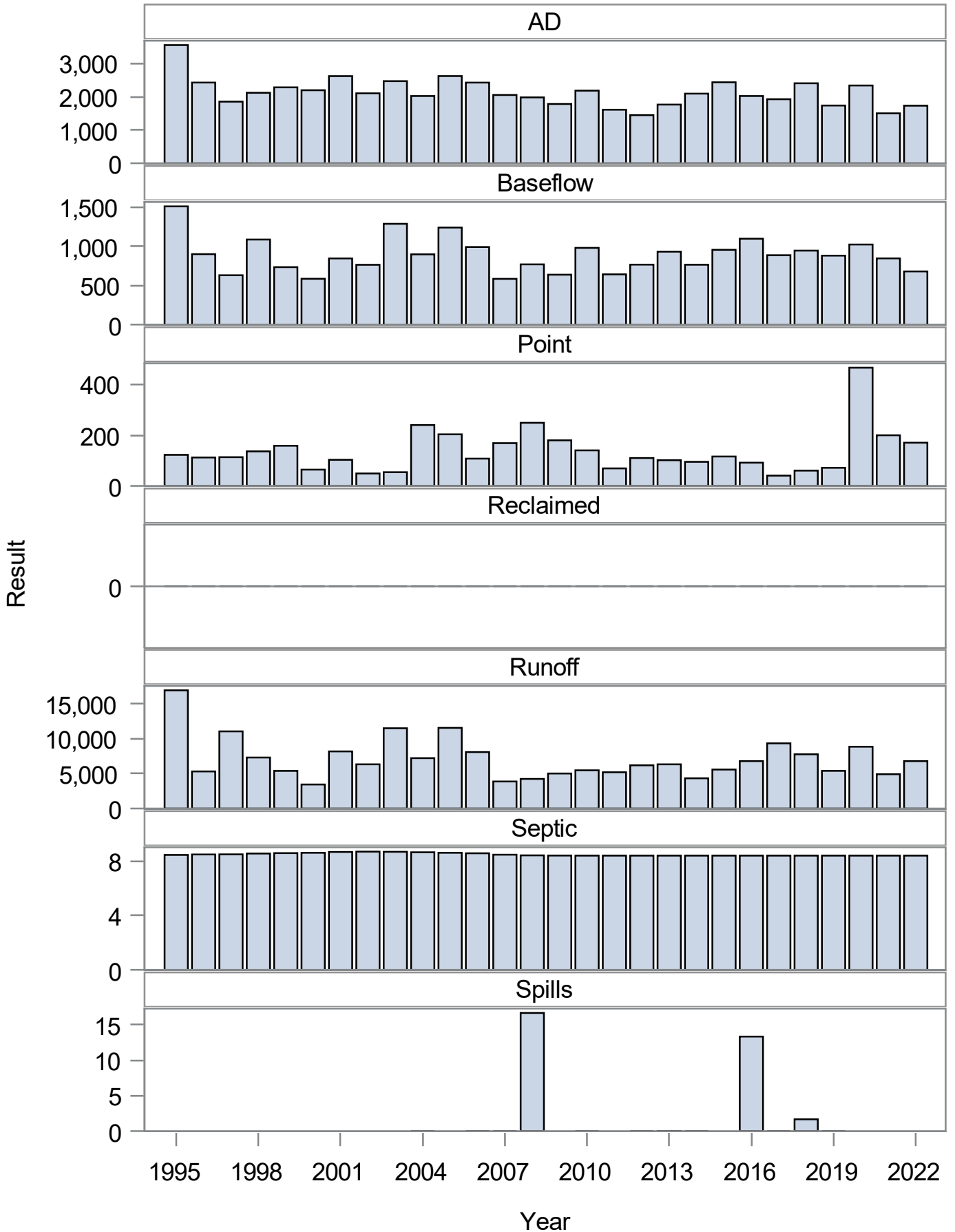
Annual Total Loads 1995-2022  
 Nitrate-Nitrite Load (lbs)  
 Sarasota Bay



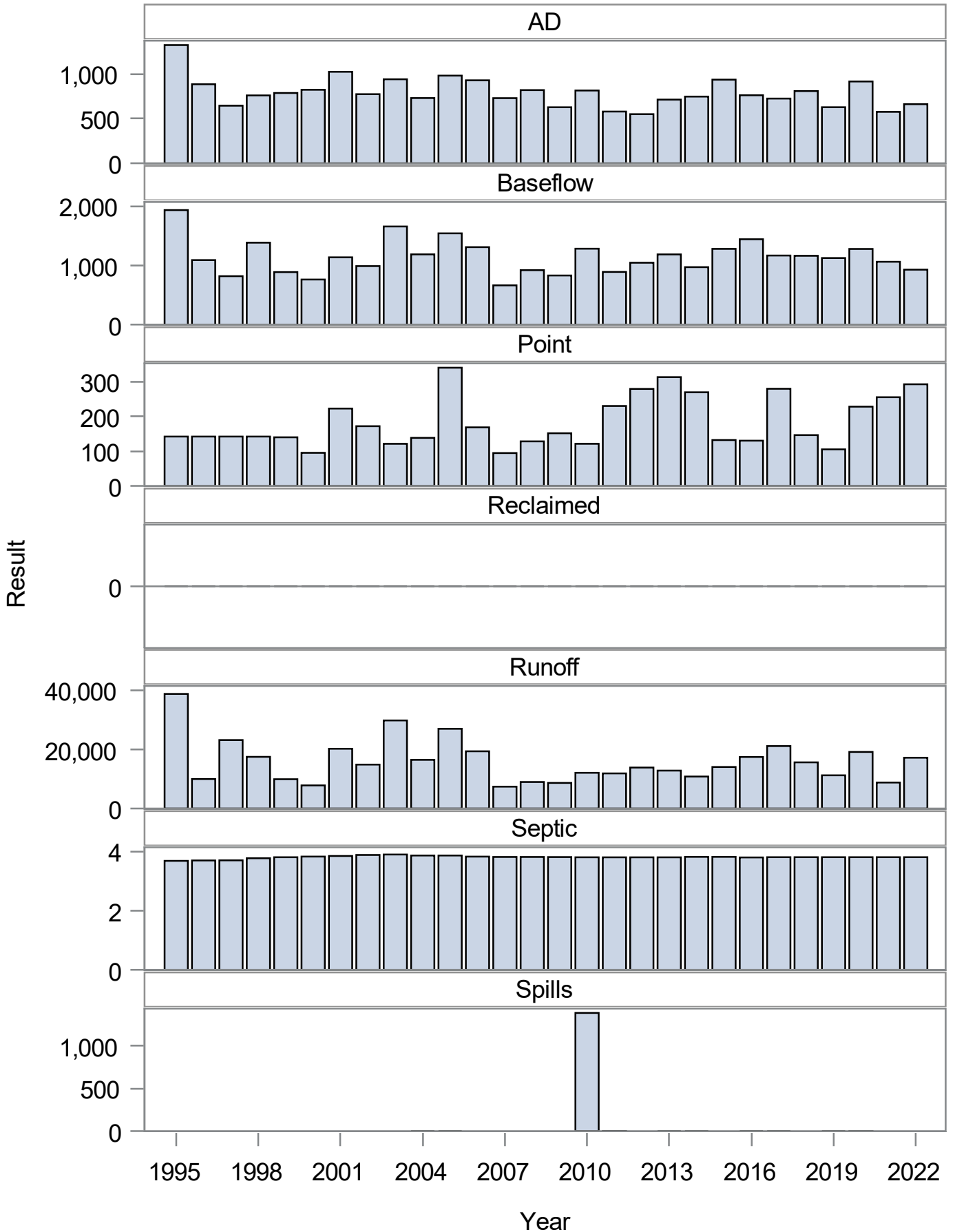
Annual Total Loads 1995-2022  
Nitrate-Nitrite Load (lbs)  
Roberts Bay



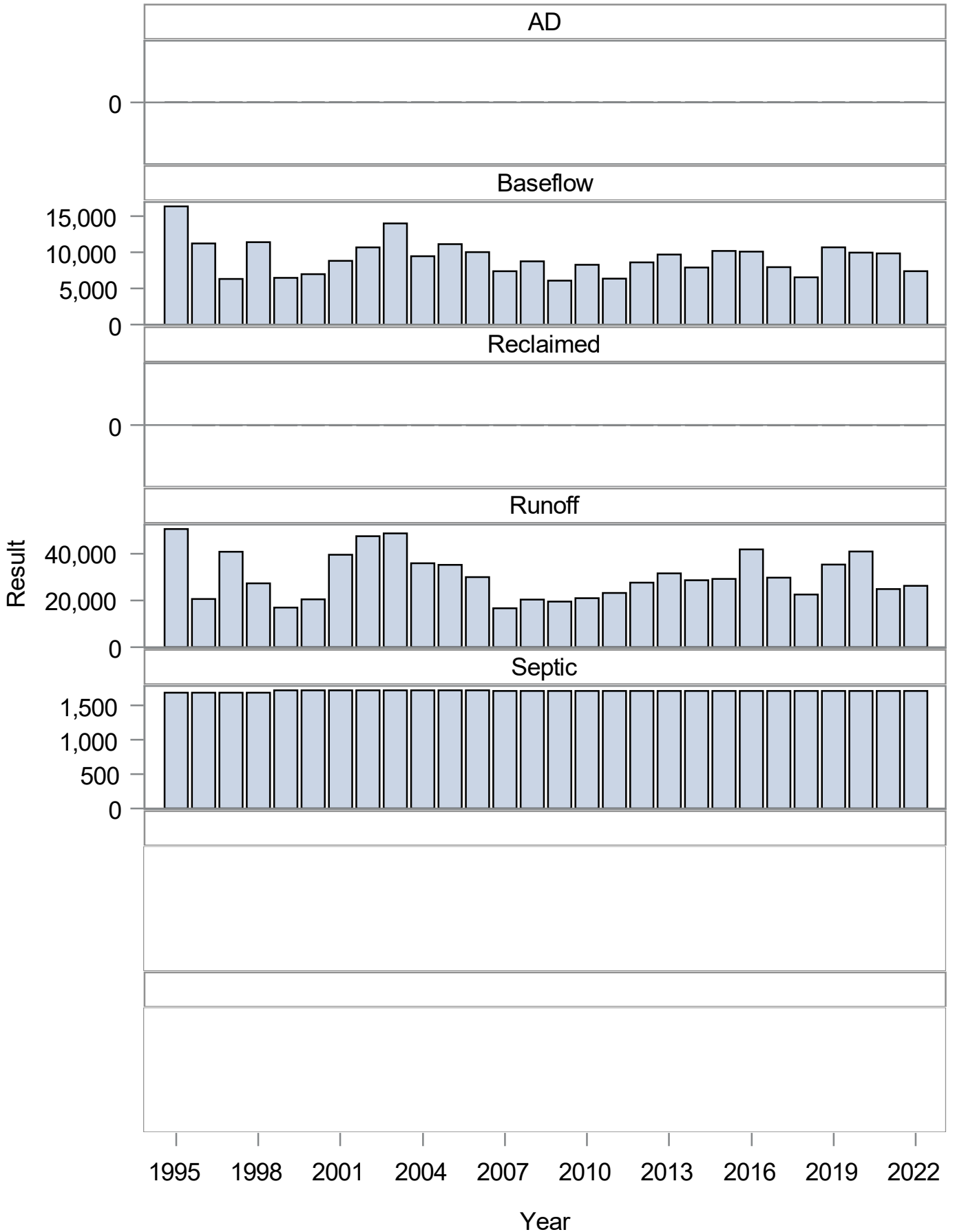
Annual Total Loads 1995-2022  
 Nitrate-Nitrite Load (lbs)  
 Little Sarasota Bay



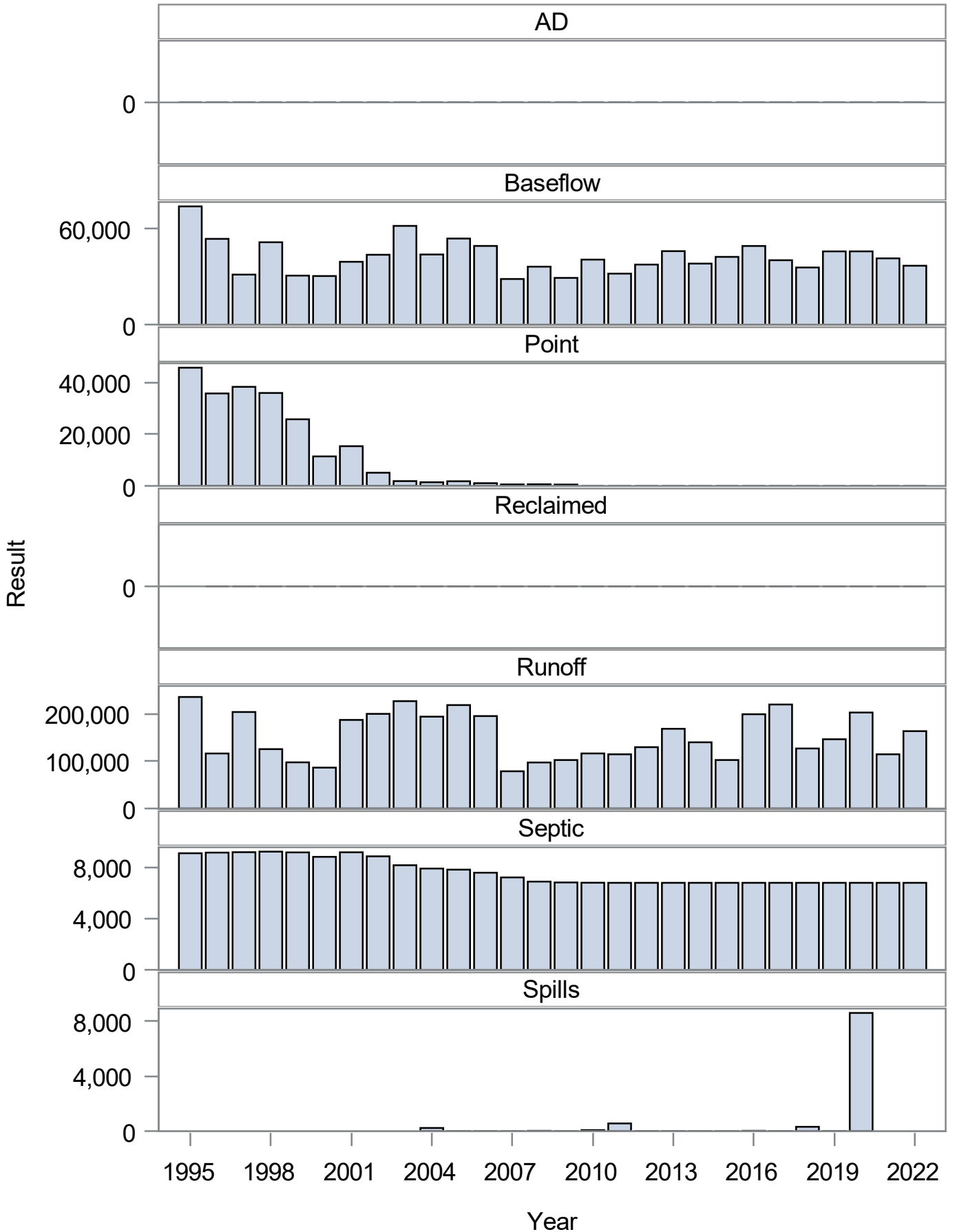
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 Nitrate-Nitrite Load (lbs)  
 Blackburn Bay



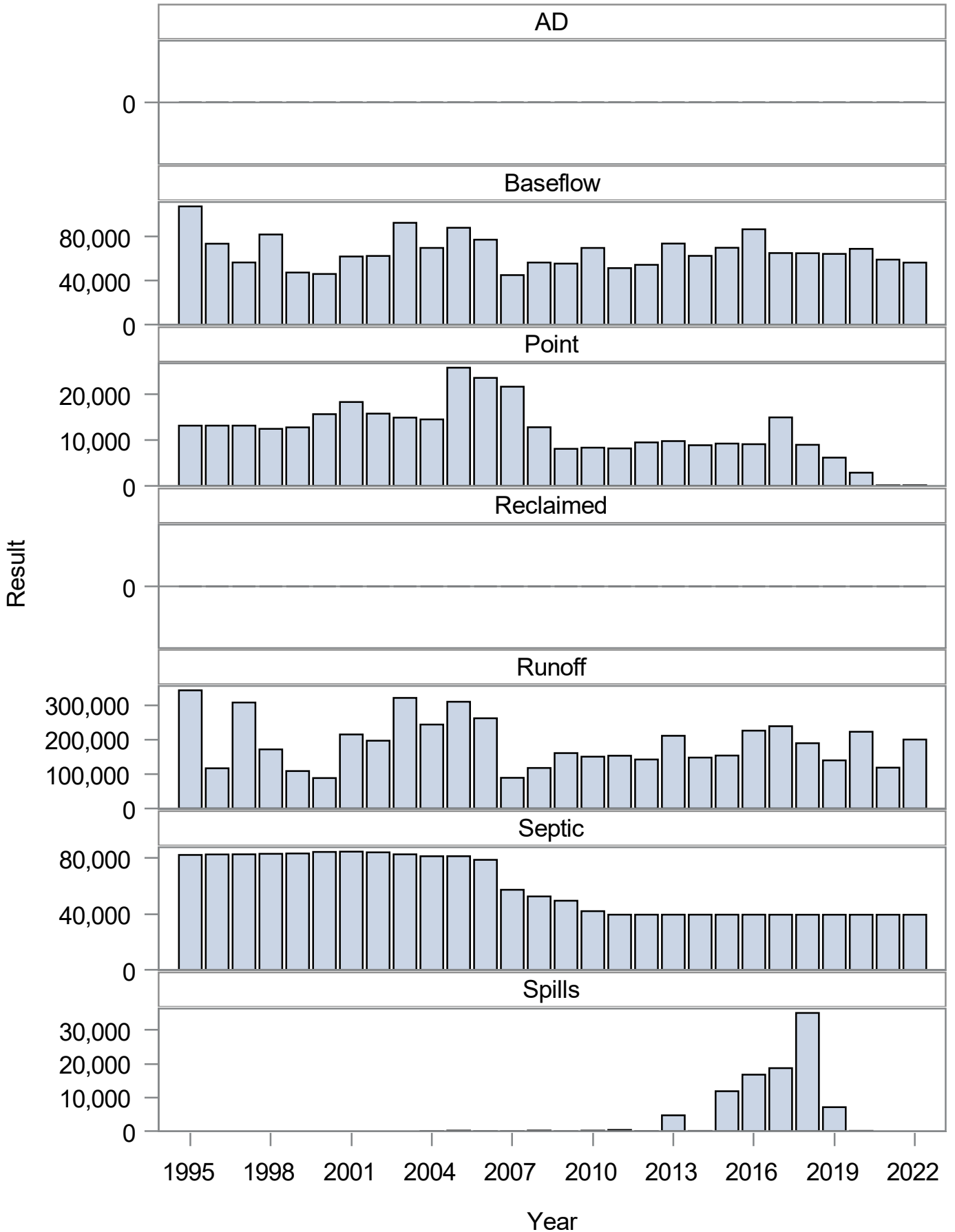
Annual Total Loads 1995-2022  
Total Kjeldahl Nitrogen Load(lbs)  
Palma Sola Bay



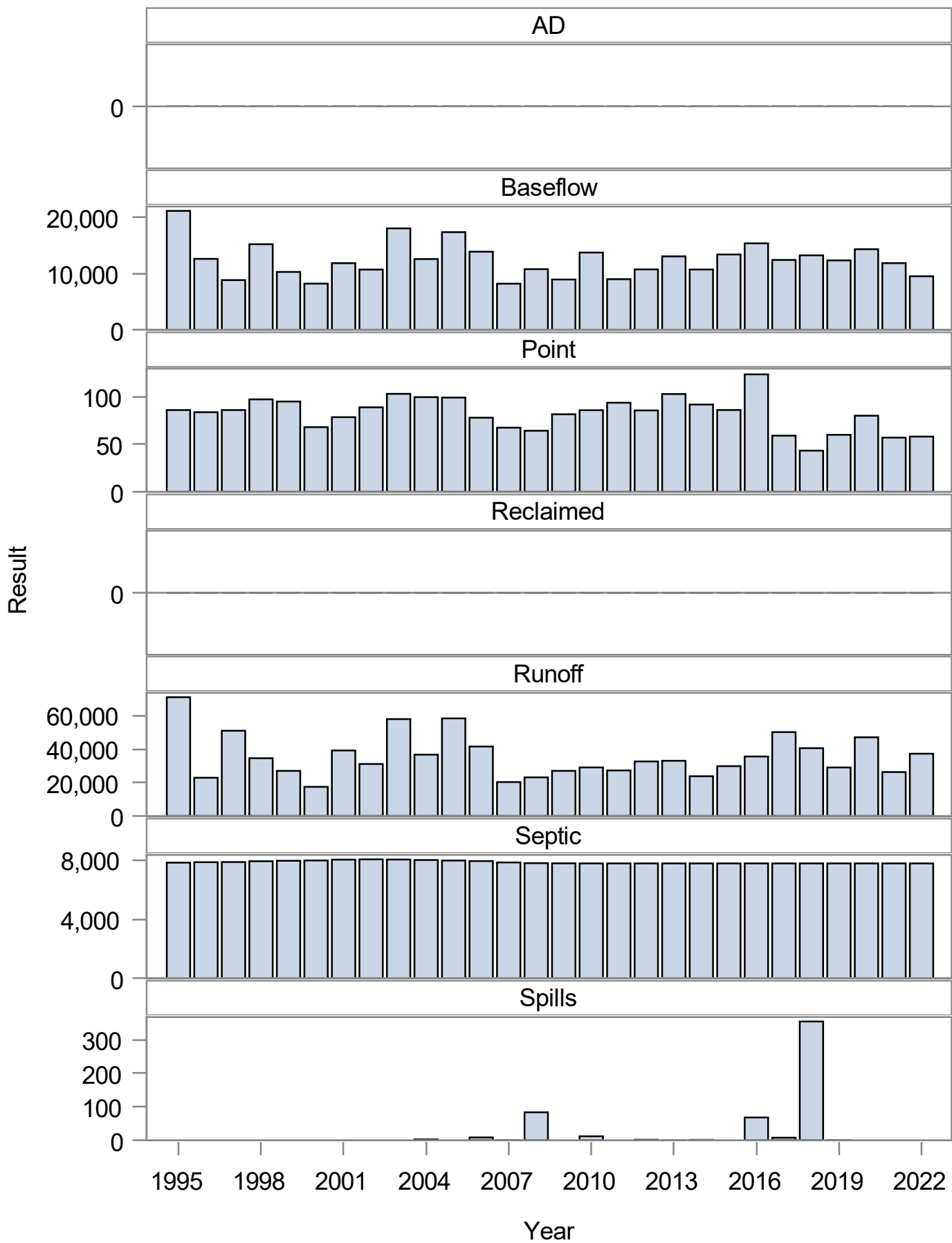
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 Total Kjeldahl Nitrogen Load(lbs)  
 Sarasota Bay



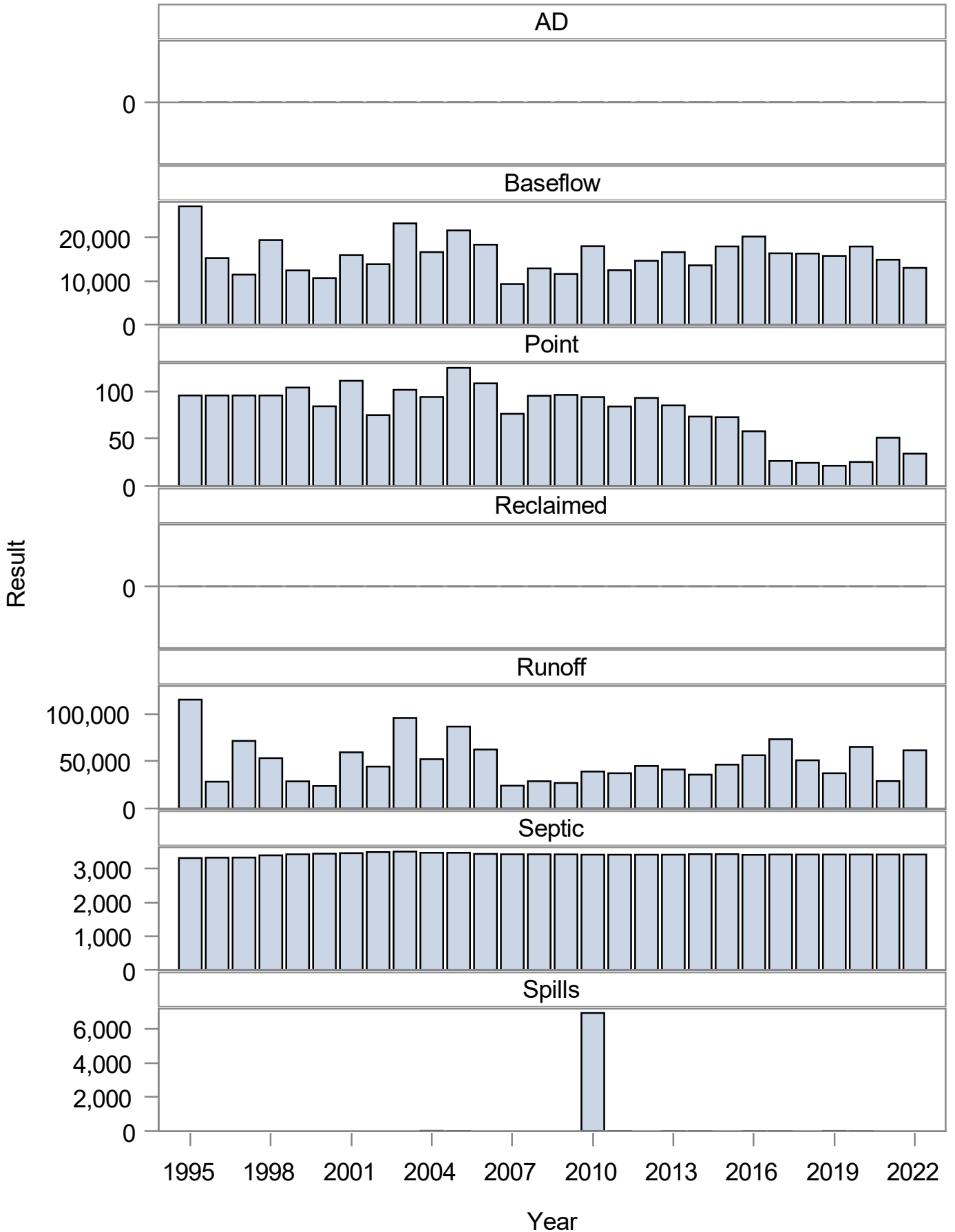
Annual Total Loads 1995-2022  
 Total Kjeldahl Nitrogen Load(lbs)  
 Roberts Bay



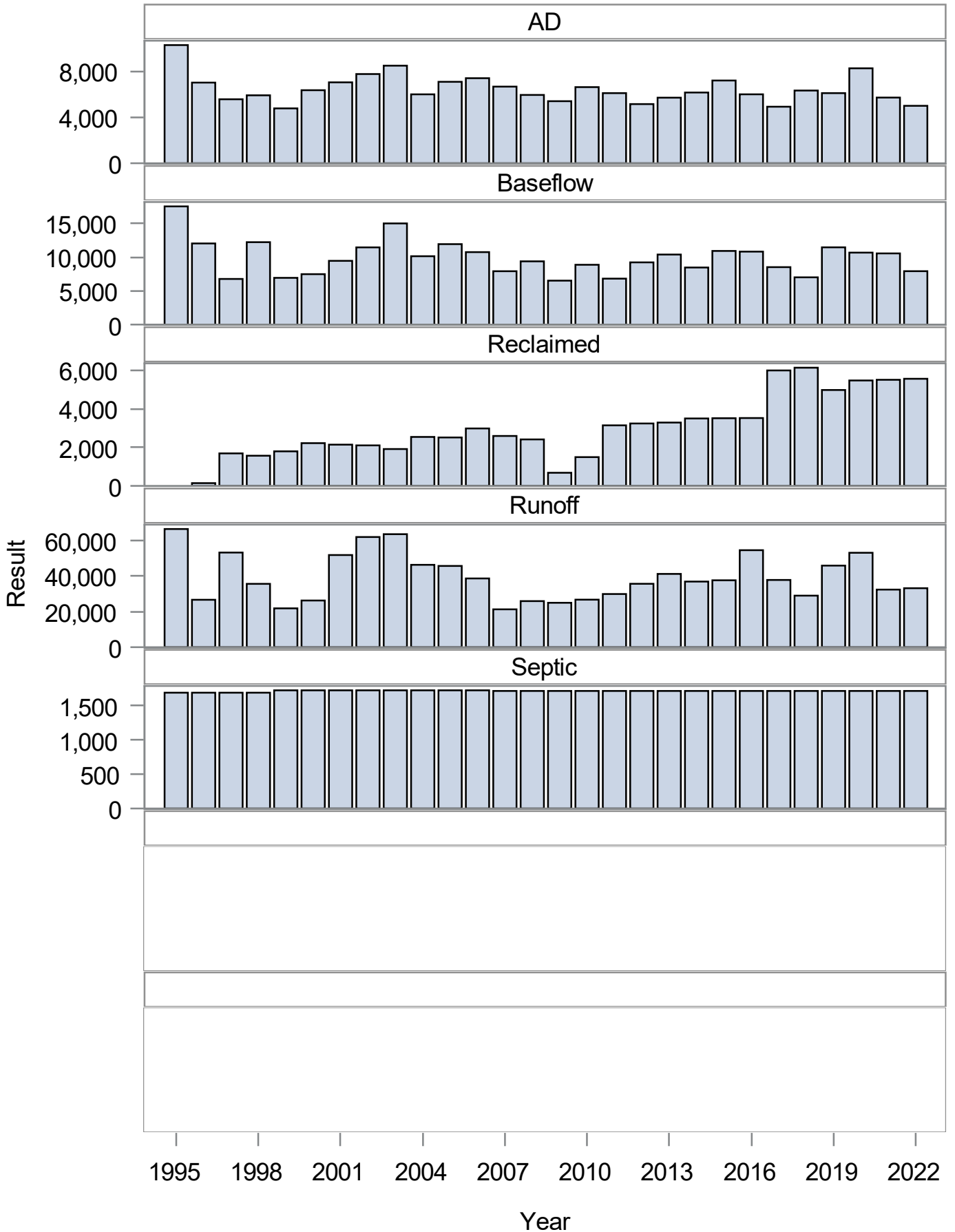
Annual Total Loads 1995-2022  
 Total Kjeldahl Nitrogen Load(lbs)  
 Little Sarasota Bay



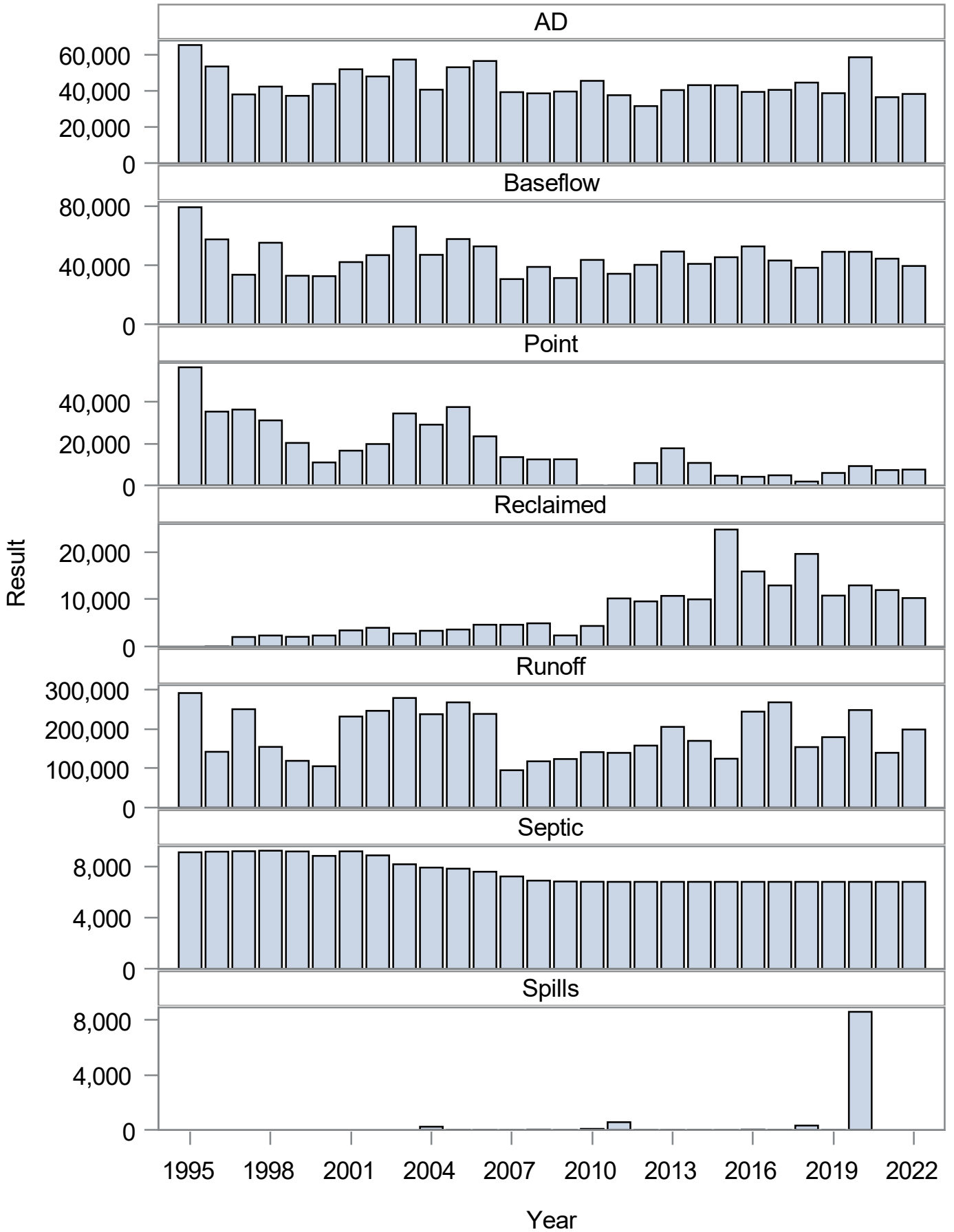
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 Total Kjeldahl Nitrogen Load(lbs)  
 Blackburn Bay



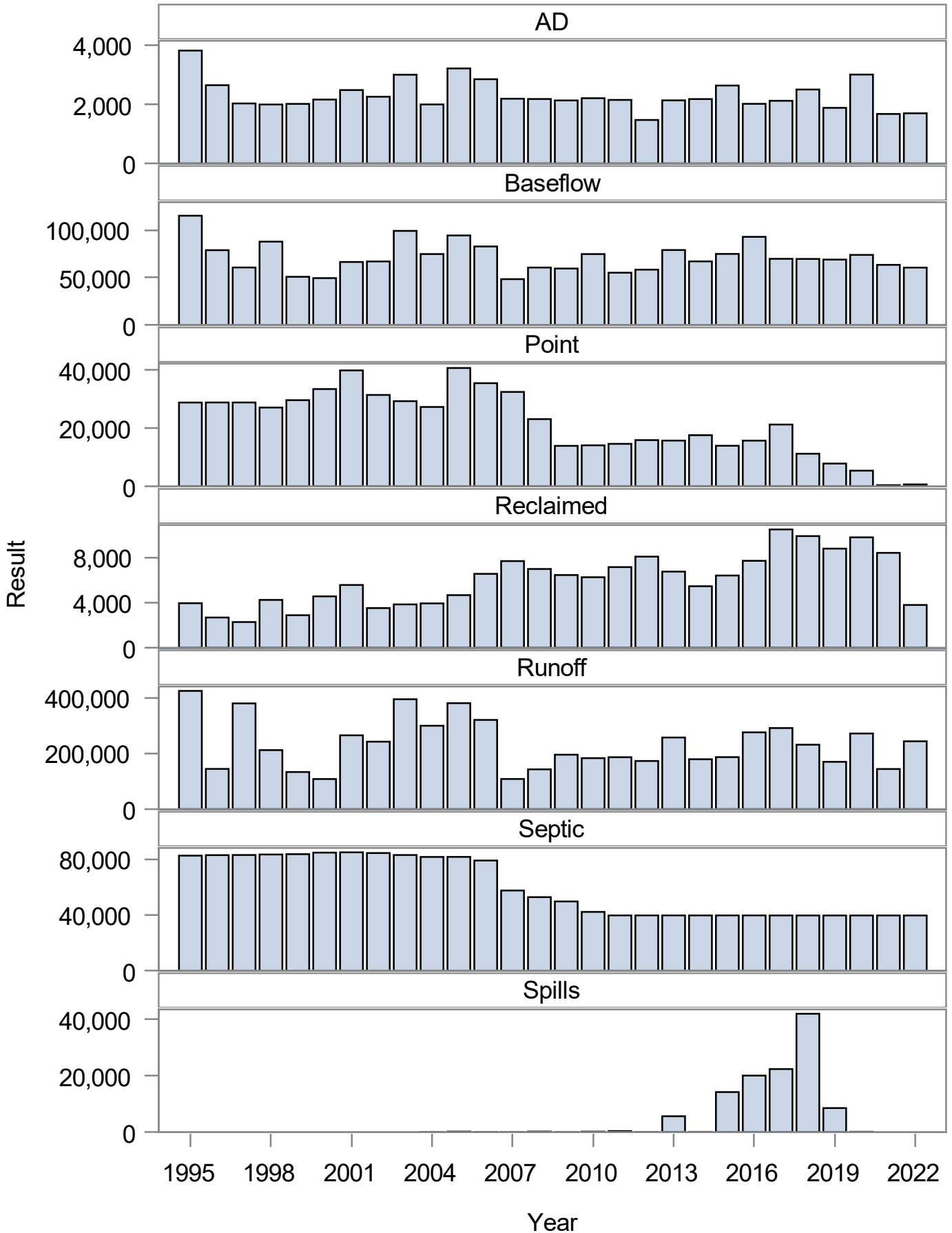
Annual Total Loads 1995-2022  
Total Nitrogen Load (lbs)  
Palma Sola Bay



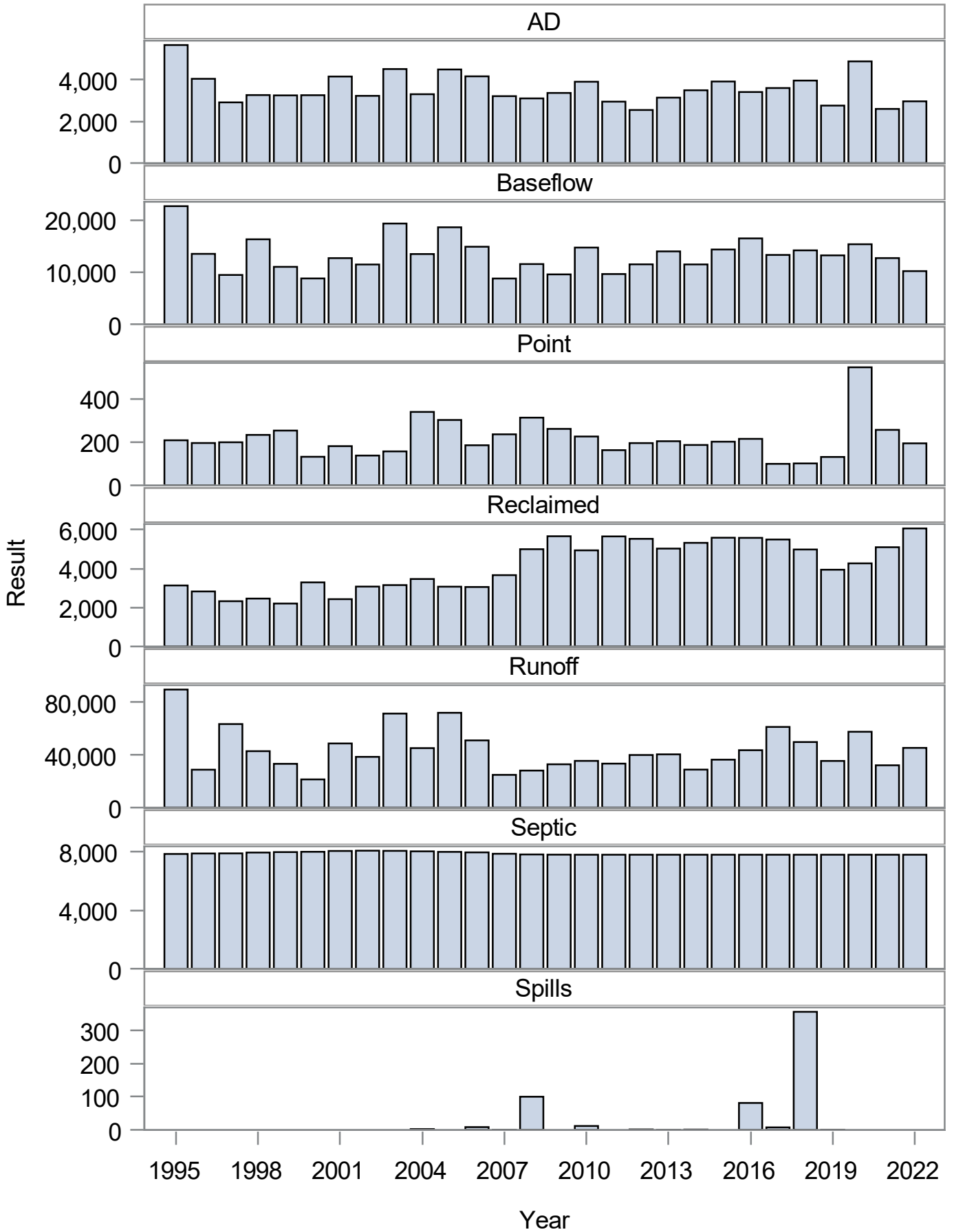
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 Total Nitrogen Load (lbs)  
 Sarasota Bay



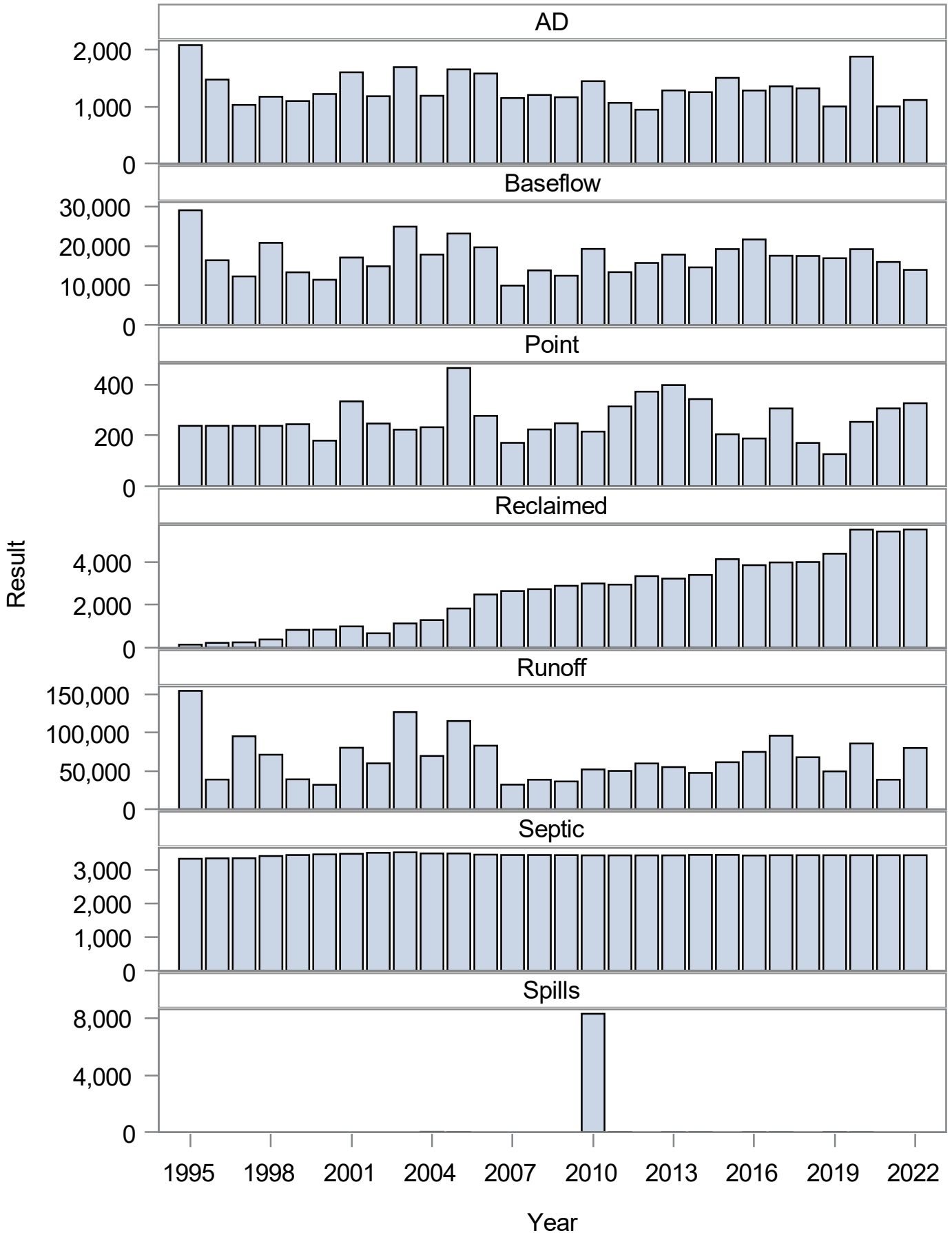
Annual Total Loads 1995-2022  
 Total Nitrogen Load (lbs)  
 Roberts Bay



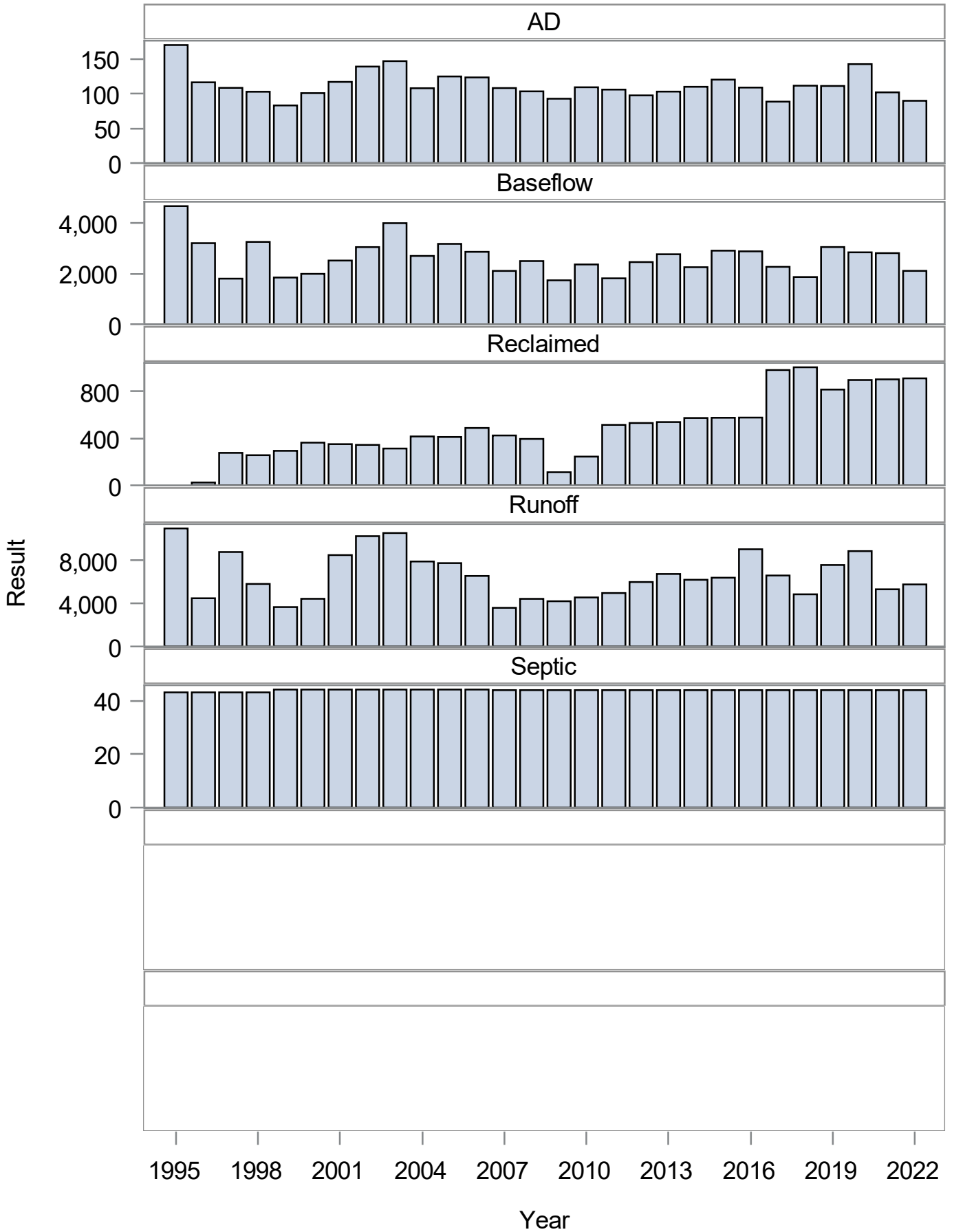
Annual Total Loads 1995-2022  
 Total Nitrogen Load (lbs)  
 Little Sarasota Bay



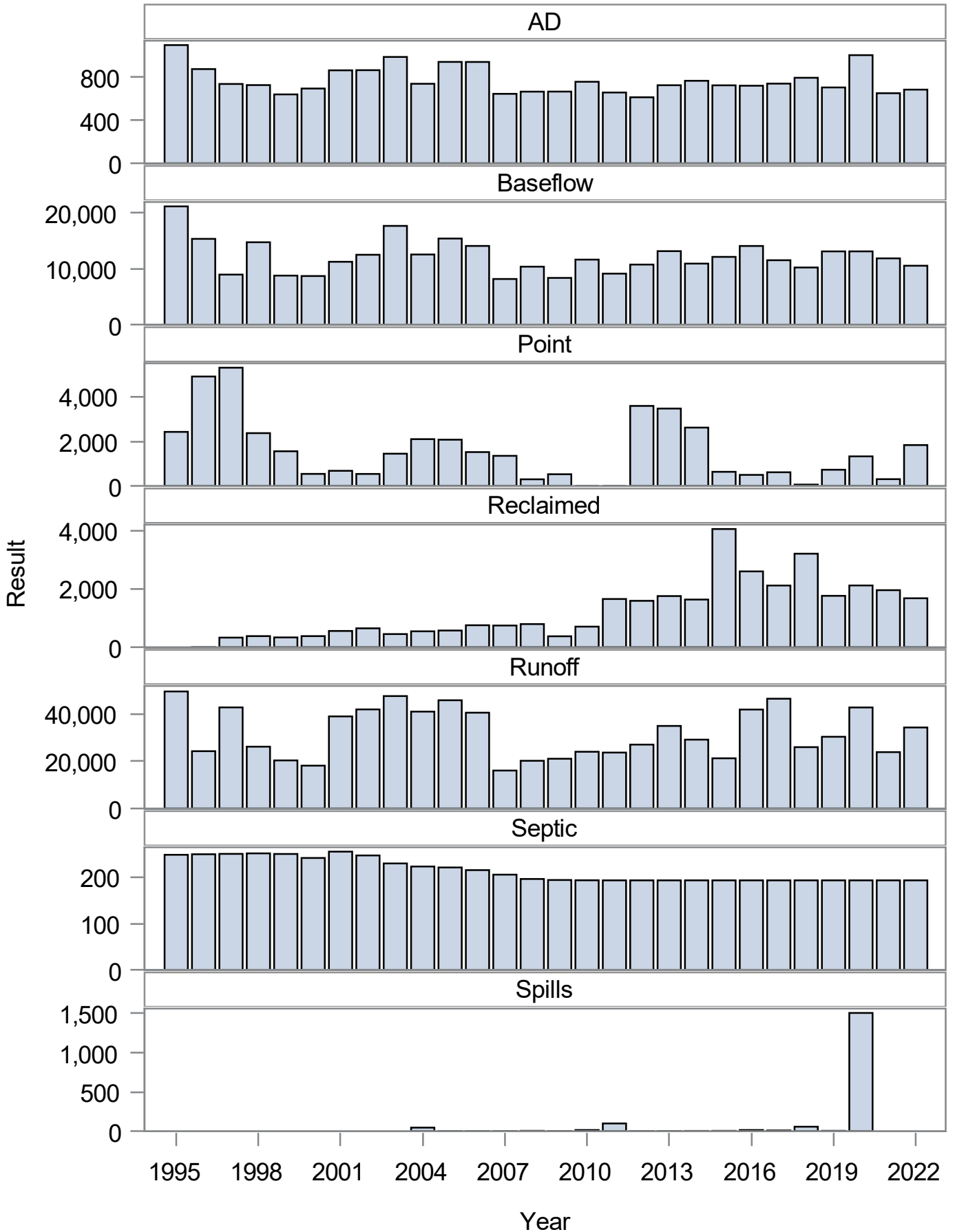
Annual Total Loads 1995-2022  
 Total Nitrogen Load (lbs)  
 Blackburn Bay



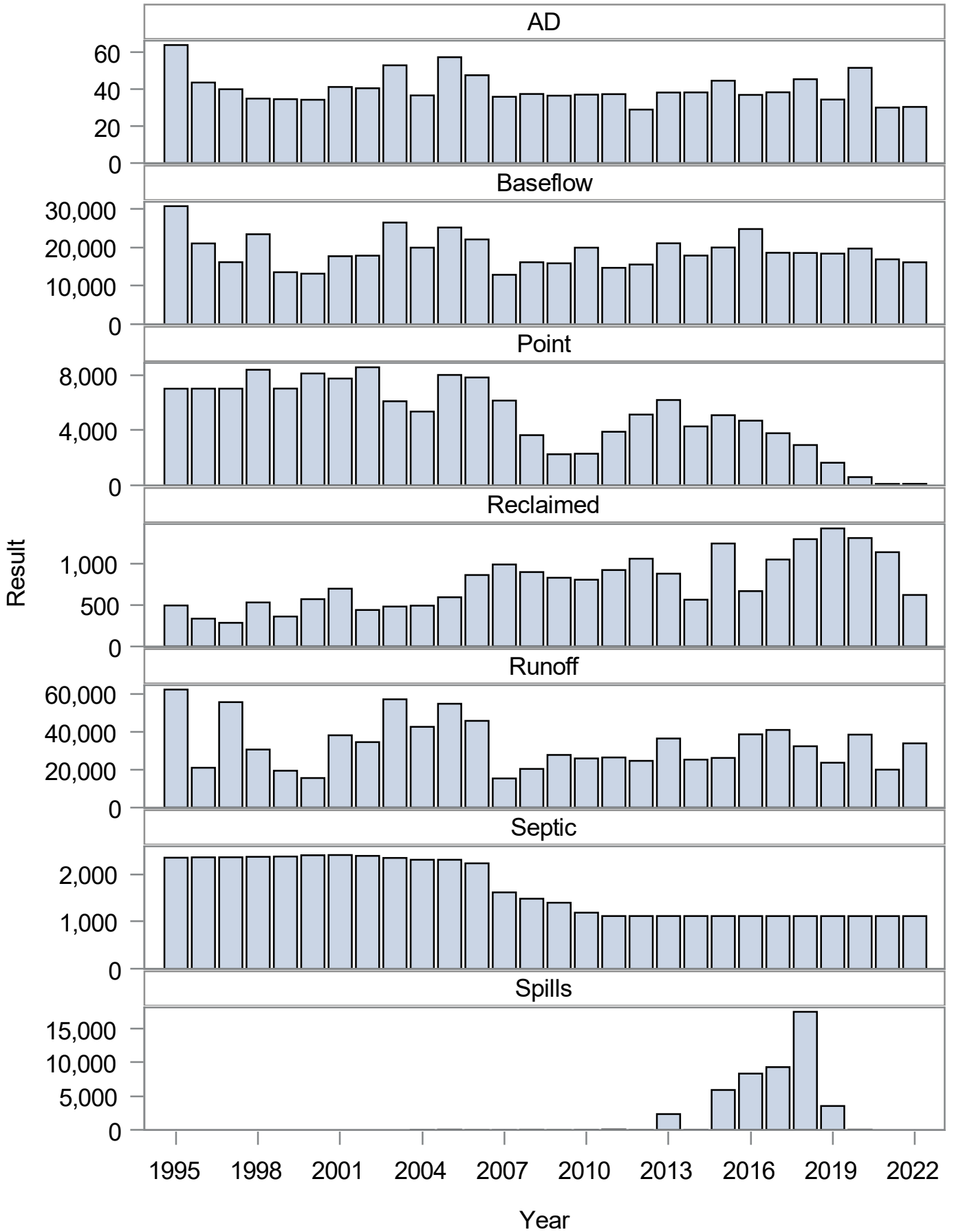
Annual Total Loads 1995-2022  
 Total Phosphorus Load (lbs)  
 Palma Sola Bay



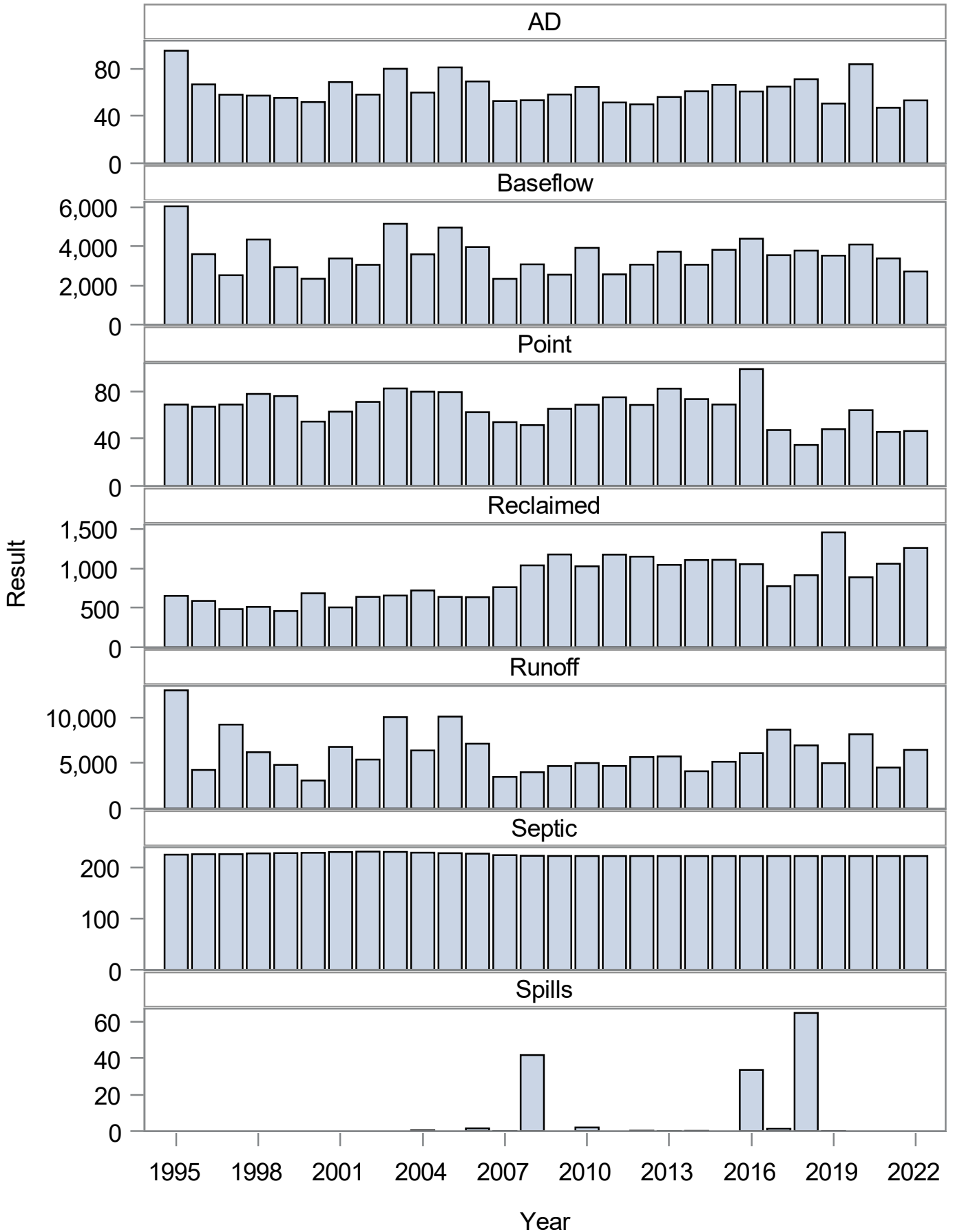
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 Total Phosphorus Load (lbs)  
 Sarasota Bay



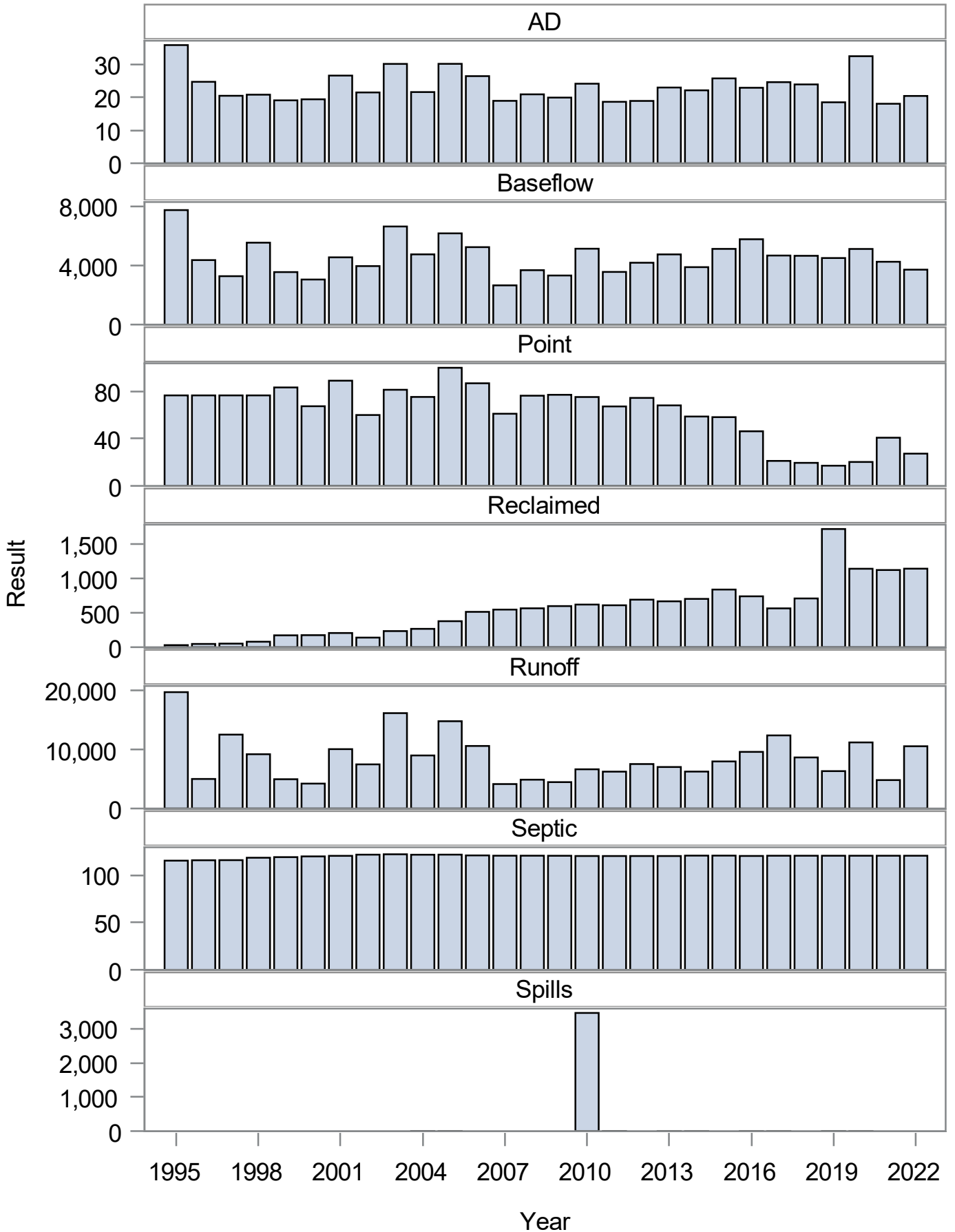
Annual Total Loads 1995-2022  
 Total Phosphorus Load (lbs)  
 Roberts Bay



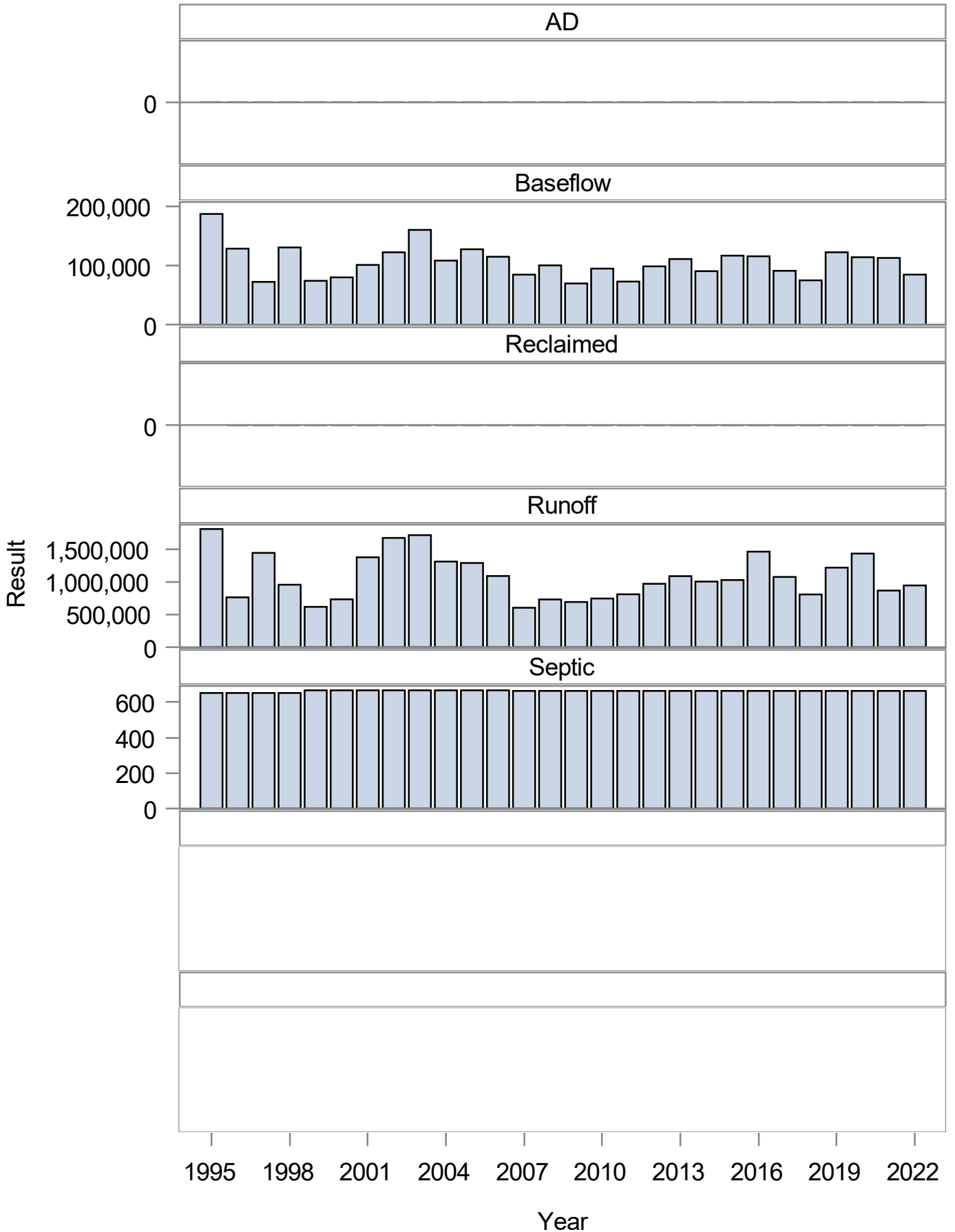
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 Total Phosphorus Load (lbs)  
 Little Sarasota Bay



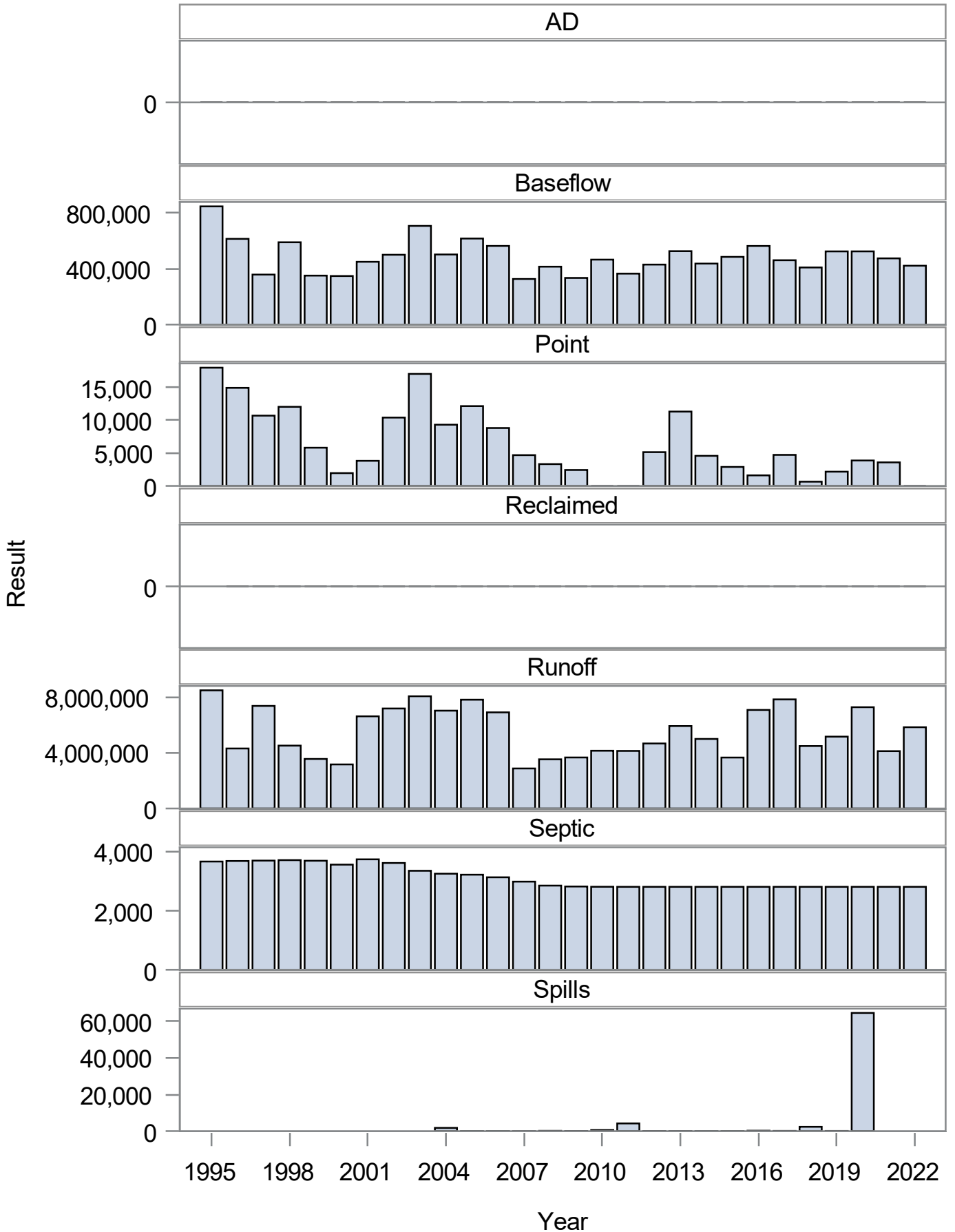
Annual Total Loads 1995-2022  
 Total Phosphorus Load (lbs)  
 Blackburn Bay



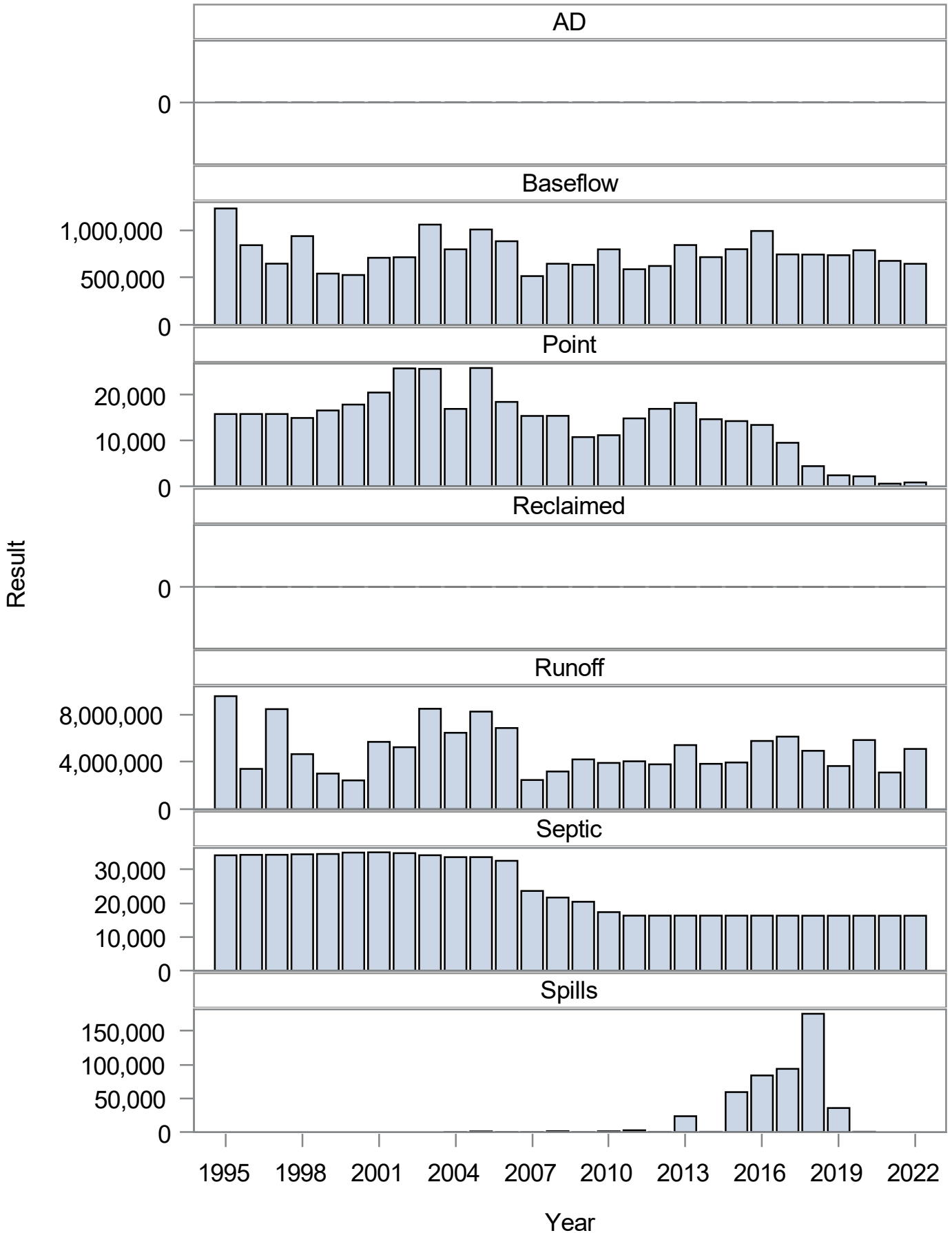
Annual Total Loads 1995-2022  
 Total Suspended Solids Load (lbs)  
 Palma Sola Bay



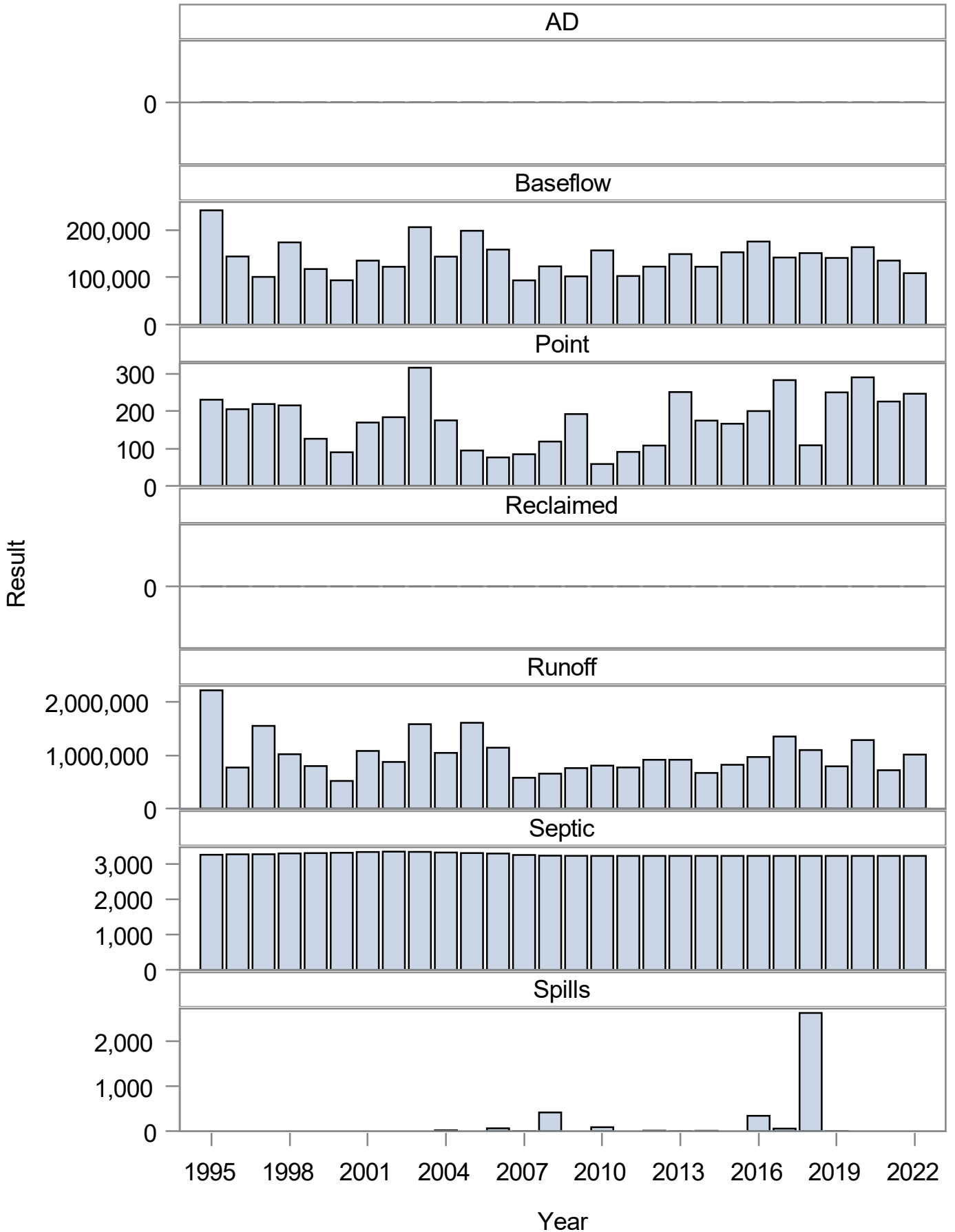
Annual Total Loads 1995-2022  
 Total Suspended Solids Load (lbs)  
 Sarasota Bay



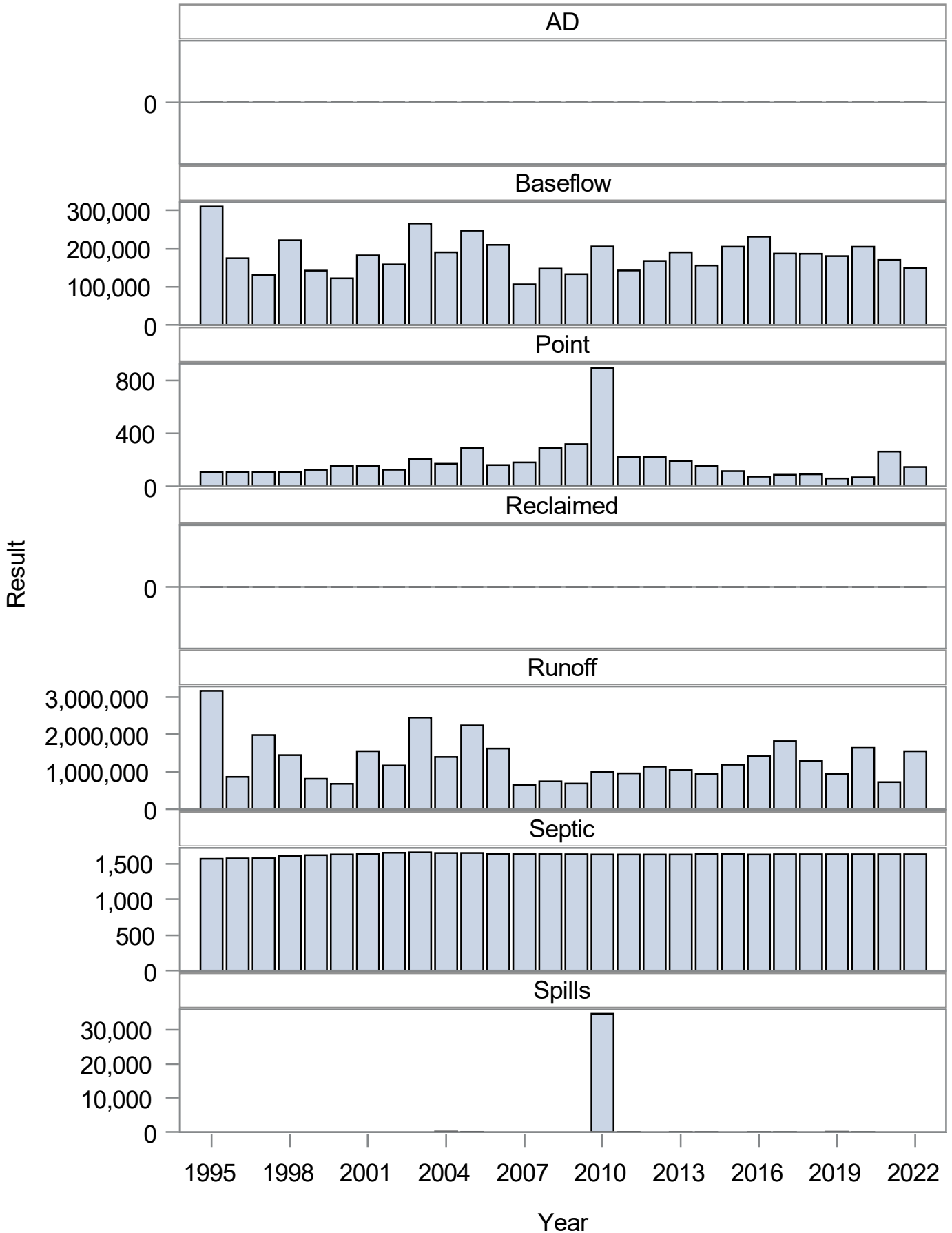
Annual Total Loads 1995-2022  
 Total Suspended Solids Load (lbs)  
 Roberts Bay



Annual Total Loads 1995-2022  
 Total Suspended Solids Load (lbs)  
 Little Sarasota Bay



Annual Total Loads 1995-2022  
 Total Suspended Solids Load (lbs)  
 Blackburn Bay



## **Appendix C**

### **List of Projects in the Project Portal Database**

**TABLE C-1  
PROJECT PORTAL DATABASE**

<b>Watershed</b>	<b>Basin</b>	<b>Project Name</b>	<b>TSS Removal Estimate (lbs/yr)</b>	<b>Total phosphorus Removal Estimate (lbs/yr)</b>	<b>Total Nitrogen Removal Estimate (lbs/yr)</b>	<b>Sediment Removal Estimate (yd3/yr)</b>	<b>Project Description</b>	<b>2022 Estimated Cost (\$)</b>
Sarasota Bay	Whitaker Bayou	Tri-Par Whitaker Bayou		1,163	6,619		The Tri-Par Area has historic long-standing flooding located within Whitaker Bayou basin at two main confluences (Canal/Trib A and Trib A/B). The area includes high nutrient loading due to the age and intensity of land-use (commercial/industrial). This project involves a channel retrofit with a floodplain bench and weirs for storage and pollutant removal, the addition of a dry retention area, and the addition of a nutrient separating baffle box.	\$3,787,767
Roberts Bay North	Phillippi Creek	Phillippi Creek Main Restoration	4800	678	2955	40	Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, the removal of a historic dam, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$19,799,003
Sarasota Bay	Phillippi Creek	Bee Ridge Rd. and Beneva Rd. – Phillippi Creek		229	908		Bee Ridge Road is an evacuation route with existing street flooding. The stormwater ponds in the Forest Lakes subdivision have experienced significant sediment loading throughout the years. This project involves installing low flow weirs, removing excess sediment from a stormwater facility, and adding a baffle box.	\$2,776,060
Roberts Bay North	Phillippi Creek	Phillippi Creek E Tributaries	28,200	650	850	13,600	Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$3,546,472
Sarasota Bay	Sarasota Bay Coastal	US-41 and 10th Street – Coastal		215	711		A large part of the intensely urbanized downtown core drains directly into the bay at the 10th Street boat ramp. Largely untreated stormwater with a few BMPs is found in this area. There is also a flood level of service deficiency on part of the roadway. This project involves installing a sediment sump and low flow weirs, as well as pervious pavement and a rain garden in a County owned parking lot.	\$2,972,626
Little Sarasota Bay	South Creek	Tamiami Trail Diversion	20,428	159	580		This site is on the east side of Tamiami Trail between Giotto and Gulf Avenue. Sarasota County pump station 25 is on the north side of this site and pumps wastewater from various lift stations to treatment plants north and south of the site. The area south of the pump station has open grassed areas and scattered pockets of trees and vegetation. Untreated stormwater runoff from the north and east appears to drain to the Tamiami Trail drainage system, which consists of grassed swales and culverts. This system discharges to the Bay. This project includes creating a diversion, and constructing a treatment train that includes bioswales, a treatment wetland, and a wet detention pond.	\$253,969
Sarasota Bay	Sarasota Bay Coastal	US-41 and Proctor Road – Coastal		102	506		Runoff at this site currently flows through the Landings pond system with little BMPs directly into the Bay, resulting in high nutrient loading. This portion of US-41 has also experienced flooding in the past. The area is primarily developed residential, although there is a commercial corridor along the arterial roadways. This project includes removing excess sediment from a stormwater pond and installing a nutrient separating baffle box.	\$328,676
Roberts Bay North	Phillippi Creek	Forest Lakes Golf Club			356		This project involves converting existing wet detention ponds into stormwater harvesting ponds for the golf course irrigation. It may also be possible to use Phillippi Creek west of the golf course as an additional water source. The contributing area is approximately 100 acres.	\$1,386,580
Little Sarasota Bay	Catfish Creek	Catfish Creek Stream Restoration	15514	62	236	755	Objectives of this project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes a sediment dissipator and reintroducing native vegetation.	\$1,388,892
Sarasota Bay	Sarasota Bay Coastal	Bayfront Parking Lot	14,958	12	217		This site is adjacent to Sarasota Bay along the west side of Bayfront Dr near Ringling Blvd. Untreated stormwater from Bayfront Dr and the parking lot flows through curb inlets and gates to several pipes that discharge into Sarasota Bay. Large pipes also discharge untreated runoff from the highly developed area to the east. Additionally, stakeholders have expressed concern about the amount of garbage and debris that comes out of the outfalls. This project includes converting the parking lot to pervious pavement, installing baffle boxes, grate baskets, and curb cuts, installing ash tray stands, and creating motorcycle and fuel-efficient car parking.	\$1,289,429

Watershed	Basin	Project Name	TSS Removal Estimate (lbs/yr)	Total phosphorus Removal Estimate (lbs/yr)	Total Nitrogen Removal Estimate (lbs/yr)	Sediment Removal Estimate (yd3/yr)	Project Description	2022 Estimated Cost (\$)
Sarasota Bay	Sarasota Bay Coastal	Bee Ridge Rd. and US-41 – Coastal		26	204		Bee Ridge Road is an evacuation route with existing street flooding. The neighborhoods were built in the 1940's-1960's without extensive stormwater BMP's. The system outfalls have been improved over the years (strainers to catch vegetation), but the improvements are not adequate to remove nutrients from the high pollutant loading area. This project includes increasing the capacity of the drainage system, modifying an existing stormwater strainer box, installing a nutrient separating baffle box, and retrofitting 2.45 acres of parking lot with pervious pavement.	\$3,694,233
Sarasota Bay	Whitaker Bayou	Whitaker Canal at Leonard Reid Ave	4355	35	157	1400	Objectives of this project include bank stabilization efforts and construction of a vegetated buffer to address erosion and reduce contaminants to channel. This project includes installing a sediment sump, creating a roadside bioswale that drains to the channel, and installing gutter bubblers or cisterns to reduce erosion and sedimentation.	\$242,192
Sarasota Bay	Sarasota Bay Coastal	Sarasota Memorial Hospital and US-41 – Coastal		14	112		Existing street flooding in the Harbor Acres subdivision is a function of tidal influence as well as being downstream from a dense commercial development with minimal stormwater infrastructure. The drainage within this subbasin drains from the natural ridge (US-41) to the Bay through the existing neighborhoods. This project includes installing a baffle box, increasing the capacity of the drainage system, and installing one-way check valves on outfall pipes.	\$2,463,173
Sarasota Bay	Whitaker Bayou	Martin Luther King Jr. Way and Orange Ave. – Whitaker Bayou		13	106		This site is a contributing area to Whitaker Bayou Tributary C with a history of structure flooding and no water quality management systems. Nutrient loading is primarily due to the age and intensity of land-use as well as land-use types (residential). This project includes increasing the capacity of the drainage system and adding a baffle box.	\$1,242,021
Sarasota Bay	Hudson Bayou	Sarasota High School at Hatton Street	11,208	93	105	21,574	Objectives of this project include bank stabilization efforts and channel widening to reduce erosion and to reduce flow velocities. This project includes the addition of a sediment sump, wetland creation, and planting native species.	\$471,839
Roberts Bay North	Matheny Creek Basin	Matheny Creek Denham Lateral	1,950	15	93		This site is between Gulf Gate Drive and Bispham Road, east of US 41. The northwest corner of St Thomas More Catholic Church is adjacent to a hardened tributary that flows into the Denham Acres Lateral (DHL) channel. This site has undeveloped area for an offline treatment system to treat flow originally to the east. A mobile home community occupies approximately 24 acres west of the DHL channel. The community does not have any stormwater treatment facilities. The project is composed of multiple elements and will need partnerships between the County and private landowners to be successful. This project includes constructing a wet and dry detention pond, facilitating cistern use, and installing a bioswale.	\$776,001
Sarasota Bay	Whitaker Bayou	Orange Avenue	14,045	77	90	85	Objectives of this project include creation of a diversion and stormwater pond to improve water quality before it discharges to the bay. This project includes planting native vegetation, installation of a sediment sump, and the addition of park features (benches, walkway).	\$289,939
Roberts Bay North	Phillippi Creek	Youth Athletic Complex			82		This project involves converting the existing water feature into a stormwater harvest pond to collect and store irrigation water for the complex.	\$622,684
Roberts Bay North	Phillippi Creek	Ashton Catchment	1,000	5	75		This 50-acre drainage area contains a wetland surrounded by a medium-density residential property. A channel conveying flow from the area is at the southern end of the wetland. Objectives of this project include adding a low flow weir and enhancing the channel to provide stormwater treatment and improve water quality.	\$151,972
Sarasota Bay	Sarasota Bay Coastal	Payne Park	9,228	66	74		Objectives of this project include wetland and pond buffer enhancements and creating a treatment wetland to improve water quality and reduce erosion and sedimentation. This project includes planting pond edges and littoral zones, enhancing wetland buffers, and planting trees near treatment wetland.	\$207,568
Roberts Bay North	Phillippi Creek	Palms Funeral Home and Memorial Park			68		This project involves converting an existing pond into a stormwater harvesting pond for onsite irrigation.	\$512,403
Sarasota Bay	Hudson Bayou	Arlington Park	6,487	54	61		Objectives of this project include wetland and pond edge enhancement and creation of a treatment wetland to address untreated stormwater and improve water quality. This project includes the installation of aquatic buffers and littoral shelf, removal of invasive vegetation and planting of native desirable species, and the addition of park features (benches).	\$106,497

Watershed	Basin	Project Name	TSS Removal Estimate (lbs/yr)	Total phosphorus Removal Estimate (lbs/yr)	Total Nitrogen Removal Estimate (lbs/yr)	Sediment Removal Estimate (yd3/yr)	Project Description	2022 Estimated Cost (\$)
Sarasota Bay	Sarasota Bay Coastal	Downtown - Coastal		10	61		This project site is in a highly urbanized, mostly impervious area in the City of Sarasota that drains directly to Sarasota Bay through more than 20 outfalls. This is a challenging location due to the small amount of land available for traditional stormwater BMP's . The existing ponds are tidally influenced. There is a linear open space buffer that exists between downtown and the bay, however, the open space is used often for civic and public events. This project includes installing a nutrient separating baffle box with an up-flow filter and installing denitrification trenches with media.	\$1,104,700
Roberts Bay North	Matheny Creek Basin	Matheny Creek Cedar Cove Project	1,550	15	55		The area for proposed improvements drains to Cedar Cove with little treatment. Residents report sediment flows out of a culvert into the cove. The highly developed area limits the use of traditional stormwater BMPs. The project is composed of multiple elements and will need cooperative effort and partnership between the County and private landowners to be successful. This project includes installing cisterns, constructing a stormwater pond with a sediment removal structure, and developing a stormwater treatment system for a nearby car dealership.	\$453,228
Roberts Bay North	Phillippi Creek	Riverbluff Parkway LID Retrofit	1,200	10	55		This project involves installing biofiltration swales, and cisterns to collect and store irrigation water.	\$238,045
Little Sarasota Bay	South Creek	Donut Lake (Sorrento East) County parcel	1,617	12	51		This site is an approximately 6-acre parcel in the Sorrento East neighborhood. This property was a wastewater treatment facility until the late 1980's or early 1900's. The central pond is circular and surrounded by a berm while the second pond is shallow, approximately 70 feet wide, and surrounds the interior pond berm. Little to no wetland vegetation is present in these ponds. There is a stormwater collection system for this neighborhood. This project includes creating a treatment wetland and enhancing uplands to provide treatment to stormwater and improve wildlife habitat.	\$307,220
Little Sarasota Bay	Elligraw Bayou	Elligraw Bayou at Tuckerstown Road	4,256	11	50		The site of this project is an upstream portion of Elligraw Creek that serves as a stormwater pond that receives runoff from multiple streets, resulting in high turbidity and an abundance of floating algal mats. The objectives of this project include improving stormwater treatment to improve water quality and reduce sedimentation. This project involves adding a new diversion structure, in-stream enhancements, adding a trail, creating a treatment wetland, and installing a littoral shelf.	\$136,732
Sarasota Bay	Walker Creek	Booker High School			35		Booker High School is adjacent to parcels owned by the Sarasota County School Board. The off-site parcels contain an extensive stormwater system that currently discharges through a series of ponds before discharging through a pipe network south and west to Whitaker Bayou. The school parcel discharges through several storm drain collection systems via open channels and pipe networks to the south and then west to Whitaker Bayou. This project includes converting the ponds on the east parcel to stormwater-harvesting ponds with some water quality components, re-directing the majority of the site runoff to the ponds for storage and irrigation use, and the installation of low impact development options such as cisterns, rain barrels, and pervious pavement.	\$4,351,519
Sarasota Bay	Sarasota Bay Coastal	Bayfront Park and Marina South	1,564	24	31		This site is narrow and slopes down from the northwest toward Gulf Stream Avenue. The area is grassed and has several large trees. Untreated stormwater runoff flows into a major stormwater inlet at the northwest corner of the site and curb inlets around the site. This runoff discharges into the Bay. This project includes construction of a bioswale, creating a stormwater diversion, and creating curb cuts.	\$176,012
Roberts Bay North	Phillippi Creek	Tuttle Ave America Drive	950	10	28	40	This highly developed area has limited space available for traditional stormwater BMPs. Both commercial and residential properties line the canals. The project is composed of multiple elements to increase the removal of sediment before it enters the system. The runoff from this area shows the greatest amount of total suspended solids in within the watershed. This project involves planting mangroves and installing riprap for bank stabilization, installing a baffle box, adding a stormwater treatment system, and adding bioswales.	\$299,910
Roberts Bay North	Elligraw Bayou	Prew Academy			27		This project involves converting the existing wet detention pond into a stormwater harvesting pond to collect and store irrigation water.	\$244,770
Little Sarasota Bay	South Creek	Pine View School	238	1	19		This project involves installing cisterns, permeable pavers, rain barrels, and a stormwater harvesting pond for onsite irrigation.	\$2,615,597

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Sarasota Bay	Whitaker Bayou	Orange Avenue Park	1,343	5	18		Orange Avenue Park is a city-owned, county-operated park at the northeast corner of 18th Street and Orange Avenue. It is a small community park within walking distance to neighborhoods and has a basketball court, playground, and picnic areas. Stormwater runoff from this site has increased from historical conditions and the site is irrigated by potable water. This project includes installing a stormwater pond, irrigating the park with harvested stormwater, and installing a public education kiosk.	\$131,977
Little Sarasota Bay	Elligraw Bayou	Ashton Elementary School	499	1	16		Ashton Elementary is on a 21-acre campus with a large amount of directly connected impervious area. This project involves installing cisterns, rain barrels, using a nearby stormwater harvesting pond for storage, installing permeable pavers, and installing educational signage.	\$1,800,951
Little Sarasota Bay	Elligraw Bayou	Sarasota Middle School	324	1	16		Sarasota Middle School is situated in an area with the highest change in direct runoff from historical conditions. This project involves installing cisterns, permeable pavers, and rain barrels, and converting existing ponds into stormwater harvesting ponds for onsite irrigation.	\$2,096,138
Little Sarasota Bay	South Creek	Sorrento Shores - Montana Ave	347	3	15		This site is an approximately 1-acre, undeveloped parcel consisting of 2-3 vacant lots located within the Sorrento Shores neighborhood. There are no stormwater treatment facilities in this highly dense neighborhood and all stormwater discharges directly into the South Creek tributary. The objective of this project is to provide stormwater treatment to improve water quality and reduce sedimentation. This project involves installing stormwater structures, creation of a bioretention area, upland enhancement, removal of exotic vegetation and planting of native desirable species, and the addition of park features (picnic tables).	\$122,481
Sarasota Bay	Sarasota Bay Coastal	US-41 and Highland - Coastal		3	15		This site features an older, highly impervious corridor with little treatment and high nutrient loading. This area also has a flood level of service deficiency on a portion of the roadway. This project includes converting sand filters to biosorption activated media (BAM) and modifying an underground treatment facility.	\$21,400
Roberts Bay North	Phillippi Creek	Locklear Park			14		This project involves converting the existing wet detention ponds into stormwater harvesting ponds to detect and store irrigation water.	\$281,082
Sarasota Bay	Sarasota Bay Coastal	Bayfront Park and Marina North	2,505	13	14		This project area is a grassed buffer between Bayfront Drive and the businesses and residences in downtown Sarasota. The stormwater inventory shows underground infrastructure discharging untreated stormwater directly into the Bay. This site also has a public restroom at the south end and a curb inlet unusually positioned in the center of the parcel. This project includes creating a wetland detention pond, creating a stormwater diversion, installing additional pipes, retrofitting a curb inlet as a pond outfall, and creating curb cuts.	\$158,730
Sarasota Bay	Lido Key	Ken Thompson Park	294	1	11		Ken Thompson Park is a 92-acre waterfront park on city Island that is City-owned and County-operated. The park has boardwalks through mangroves, tidal marsh restoration areas, and features a boat ramp, kayak launch, fishing pier, playground, bait shop, and restrooms. Stormwater runoff in the area has increased from historical conditions. The southwest portion of the park is irrigated by potable water. Large buildings exist on site which would be ideal for capturing rainfall via green roofs, cisterns, or rain barrels. Buildings on the west portion of the site are leased to Mote Laboratories and others. This project includes installing cisterns, rain barrels, and green roofs, replacing a parking lot with pervious pavement, and installing a public education kiosk.	\$1,132,747
Sarasota Bay	Hudson Bayou	Hudson Bayou Oak Street Canal	1,148	2	9		Objectives of this project include bank stabilization efforts to improve water quality and reduce further erosion and sedimentation. This project includes removing invasive vegetation, planting desirable native species, and installation of large woody material in narrow portions of the stream to trap sediments, provide additional structural habitat, and provide foraging and refugia for fish species.	\$42,363
Little Sarasota Bay	North Creek	Bay Street Park	373	3	9		This project involves evaluating the site for evidence of a historic landfill, enhancing an onsite wetland and a portion of uplands, extending a pedestrian trail, and adding a boardwalk.	\$269,108

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Sarasota Bay	Hudson Bayou	Hudson Bayou North Branch	213	2	9		This site includes the Sarasota County Administration building and parking lots. Runoff from the south parking lot flows through a rock-lined retention swale that runs the length of the lot on the south side of Morrill Street and into a large outfall at the northwest corner. The outfall connects to a pipe that discharges to Hudson Bayou. Untreated runoff from Morrill Street and the north parking lot flows into the Ringling Boulevard drainage system. In addition to the runoff from the parking lot, a steady flow of water from the cooling system in the County building is also being discharged to the Ringling Boulevard system. This project includes converting the existing swale to a planted bioswale, raising the elevation in the control structure, installing curb cuts, and installing cisterns on the building.	\$67,716
Sarasota Bay	Sarasota Bay Coastal	Bay Haven Elementary School			4		This site is at Bay Haven Elementary School, just west of US 41 and south of Patterson Drive. This is an appropriate site for cisterns as there are large buildings on site and the school currently irrigates its grounds using potable water. Runoff volumes at the site are slightly higher than historical conditions, and the area is not served by reclaimed lines. This project includes installing cisterns for irrigation use.	\$103,431
Sarasota Bay	Whitaker Bayou	Martin Luther King Park	50		1		Martin Luther King Park is on the southwest corner of Dr. Martin Luther King Jr. Way and Coconut Avenue. This small neighborhood park features picnic areas and a restroom. Whitaker Bayou runs along the west boundary of the park. Stormwater runoff in the area has increased from historical conditions and drains untreated directly to Whitaker Bayou. This project includes installing green roofs and rain barrels and replacing the parking lot with pervious pavement.	\$239,632
Sarasota Bay	Walker Creek	Robert Taylor Community Complex			1		Robert Taylor Community Complex is a historical community center with a 13-acre campus at the southwest corner of US 301 and Myrtle Street. The complex houses a 44,000 square-foot facility which features indoor and outdoor amenities such as a fitness center, childcare, computer lab, recording studio, aquatic center, amphitheater, and basketball courts. This project includes installing rain barrels and/or cisterns and a public education kiosk.	\$98,823
Roberts Bay North	Phillippi Creek	Pinecraft Park - Phillippi Creek (add to Main)					Objectives of this overall project include bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project involves planting a littoral shelf and wetland buffer enhancement.	\$2,474,595
Roberts Bay North	Roberts Bay North Coastal	Camino Real					Model simulations for the 100- and 25-year storm events reveal flooding for one residential structure at 4021 Camino Real. This structure is listed in the FEMA repetitive-losses database. No other structures in the area are inundated, and roadway flooding is minimal—less than 2 inches for the 100-year event. Area runoff is collected through a series of grate inlets along the east side of Camino Real and discharges west, under Camino Real, through a cross-drain to a small ditch. The ditch connects to an 18-inch culvert under Red Rock Way. Flow continues west through a series of pipes and swales and discharges into Roberts Bay North. This project includes increasing the capacity of an existing cross-drain and installing an additional pipe.	
Roberts Bay North	Phillippi Creek	Sediment Sump RB 2					Construction plans available	
Roberts Bay North	Phillippi Creek	Sediment Sump RB 3					construction completed	
Roberts Bay North	Phillippi Creek	Sediment Sump RB 4					Construction plans available	
Roberts Bay North	Phillippi Creek	Sediment Sump RB 5					construction completed	
Sarasota Bay	Phillippi Creek	Flooding complaints Debrecen Road, Boleyn Road, and Palmer Blvd					Received complaints about flooding and problems in areas south of the Founders Club along Debrecen Road, Boleyn Road, and Palmer Blvd. No project proposed at this time.	
Sarasota Bay	Phillippi Creek	Poor drainage 2101 Huntington Ave. N, Sarasota					Citizen called August 2020 about poor drainage. Streets in this area lack ditches or pipes and landscape is flat resulting in standing water. Improvements would help the community.	

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Little Sarasota Bay	Little Sarasota Bay Coastal	Benjamin Franklin Dr.					The objective of this project is to increase the capacity of the drainage system along Benjamin Franklin Drive from Thoreau Drive to Cleveland Drive. This project includes installing new and replacement pipes, installing new local collection systems, and adding a pond.	\$3,566,057
Little Sarasota Bay	Elligraw Bayou	Gypsy Street Pond					The Gypsy Street pond project site is an approximately 6-acre site at the southwest corner of McIntosh Road and Gypsy Street. The site has an open space area partially irrigated with potable water and a large pond onsite. Reclaimed lines are not present in this area. This location has high direct runoff volumes. This project includes converting an existing pond to a stormwater harvesting pond.	\$27,906
Sarasota Bay	Hudson Bayou	Pelican Dr.					This project involves upsizing a stormwater pond and piping, the addition of curb inlets, and the creation of ponds.	\$2,262,816
Sarasota Bay	Sarasota Bay Coastal	Westway / Morningside Dr.					This project addresses structure and street flooding along Westway Drive and Morningside Drive in Sarasota. Runoff from approximately 21 acres drains through the existing system consisting of a series of curb inlets and pipes along the neighborhood streets. The runoff is collected and discharged through pipes along Westway Drive. This project involves increasing the capacity of the drainage system and adding an additional outfall.	\$561,179
Little Sarasota Bay	Catfish Creek	Vamo Way Pond Stormwater harvesting					This site is in the Catfish Creek basin south of Vamo Way and east of Amethyst Lane. The pond is near a small subdivision that uses potable water for irrigation. The stormwater inventory and the County ICPR model indicate that the pond discharges to Catfish Creek via a drop structure. This area has a higher level of runoff than historical conditions.	\$34,946
Sarasota Bay	Sarasota Bay Coastal	Bayshore Circle					Runoff from approximately 56.5 acres drains through these existing systems consisting of a series of roadside grate and curb inlets and pipes routed along neighborhood streets. Model simulations for the 100-, 25-, 10-, 5-, and 2.33-year storm events show neighborhood street flooding exceeding allowable depths along Bayshore Circle, Indiana Lane, and Tennessee Lane for all storm events. This project addresses flooding and level of service deficiencies in the area by increasing the capacity of the drainage system along Bayshore Circle and adding a second outfall.	\$839,212
Little Sarasota Bay	Phillippi Creek	Swifton Villas and SCPU Water Pump Station 3					This area is in the Little Sarasota Bay Watershed with flooding impacts to a condominium and a county pump station (parcels 0088122001 & 0088050003). Complaints of flood water entering structures and parking areas were received. Problems occur with as little as two inches of rain. Public Utilities would like a "stormwater engineering solution" such as removing the trees and diverting the water to the pond. No project proposed at this time.	\$250,000
Roberts Bay North	Roberts Bay North Coastal	The Landings Option 1					Project improves capacity of Peregrine stormwater vault outfall pipe system and widens pond control weir.	\$748,568
Roberts Bay North	Roberts Bay North Coastal	The Landings Option 2					This project involves increasing the capacity of the Peregrine stormwater vault outfall pipe system, increasing the capacity of pond outfall pipes, and widening a pond control weir.	\$779,290
Roberts Bay North	Phillippi Creek	Urfer Family Park					There are two on-site ponds within this 55-acre County park. This project involves restoring a cattle pond to an emergent marsh wetland, removing exotic species in both ponds, and planting native vegetation.	\$422,295
Sarasota Bay	Cooper Creek	Cooper Creek Basin nitrogen removal BMP					County is required to remove 8.2 tons per year of nitrogen from the basin as authorized by the Water Quality Based Effluent Limitation issued by FDEP in 2010. Tampa Bay funding may be available. No project concept at present.	\$250,000
Roberts Bay North	Phillippi Creek	West Clark Lake	750	10			West Clark Lake is on the verified list of impaired waterbodies for nutrients. This project includes constructing a maintenance buffer, adding control structures, altering the flow path of the discharge from the lake, and constructing a sediment sump.	\$180,215
Roberts Bay North	Roberts Bay North Coastal	Sorrento South - Cavalini and Dante Drive					This project involves increasing the capacity of the drainage system and outfall.	\$279,341
Roberts Bay North	Phillippi Creek	North County/Phillippi Creek Stormwater Water Quality Program					This program would support water quality improvements in the area.	\$6,000,000

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Roberts Bay North	All	Roberts Bay North Watershed Sediment Management - Construction					Would include projects intended to improve water quality by reducing nutrient loads to Phillippi Creek, a total maximum daily load waterbody. Projects may include stormwater retrofits, bank stabilization, and the creation of sediment sumps intended to be continually maintained to remove sediment and associated nutrients. This project will improve water quality in a priority waterbody and is eligible for state and federal grants. Reduced pollutant loading benefits the environment and the community.	\$4,642,848
Sarasota Bay	Whitaker Bayou	North Water Tower Park					This project involves installing bioswales and conveyance improvements to provide water quality and flood control benefits.	\$1,537,500
Sarasota Bay	Whitaker Bayou	Whitaker Tributary C Improvements					Project involves conveyance improvements (channels / pipes) along Whitaker Bayou Tributary C and the storage facility adjacent to Main Whitaker Bayou.	\$10,250,000
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 1					Study done to determine impacts of increased impervious area on the existing stormwater system	\$2,127,121
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 2					Study done to determine impacts of increased impervious area on the existing stormwater system	\$7,786,444
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 3					Study done to determine impacts of increased impervious area on the existing stormwater system	\$24,011,863
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 4					Study done to determine impacts of increased impervious area on the existing stormwater system	\$7,751,522
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 5					Study done to determine impacts of increased impervious area on the existing stormwater system	\$36,679,629
Sarasota Bay	Sarasota Bay coastal	Harbor Acres Alternative 6					Study done to determine impacts of increased impervious area on the existing stormwater system	\$36,984,523
Sarasota Bay	Whitaker Bayou	Project Area 2 + Purchase					This project includes active management of the water surface level to increase storage capacity in the stormwater ponds along with the purchase of 47 properties at risk of flooding.	\$9,801,653
Sarasota Bay	Whitaker Bayou	North Gillespie Park				460	This project focuses on a channel that runs east-west, north of 10th Street. The banks on the north and south side have loose sand and are eroded. Multiple pipes are discharging to the stream without signs of erosion control or water quality treatment. This project includes bank stabilization efforts and installing a sediment sump to reduce erosion & flow and promote settling of sediment.	\$132,745
Little Sarasota Bay	Little Sarasota Bay Coastal	Rita Street and Vamo area drainage improvements					Received complaints about continual neighborhood flooding. Platted in 1924 without easements or elevations. No designated swales along rear lot lines (unless newer construction).	
Sarasota Bay	Sarasota Bay Coastal	Bayshore, 40th St.					This project involves increasing the capacity of the drainage system and adding a second outfall.	\$281,875
Sarasota Bay	Sarasota Bay Coastal	Bayshore, 45th St.					This project involves increasing the capacity of the drainage system and adding a second outfall.	\$410,000
Roberts Bay North	Catfish Creek	Sarah Avenue Drainage Improvements					This project includes the installation of new stormwater pipe and connection to existing stormwater infrastructure to alleviate nuisance flooding on private property.	\$156,600
Sarasota Bay	Whitaker Bayou	Project Area 2					Project includes active management of water surface level to increase storage capacity in the stormwater ponds.	\$1,960,802
Sarasota Bay	Whitaker Bayou	Project Area 5					Conveyance improvements and creation of a stormwater storage facility	\$4,749,120
Sarasota Bay	Whitaker Bayou	Project Area 5 + Purchase					This project includes conveyance improvements and the creation of a stormwater storage facility, along with the purchase of 27 properties at risk of flooding.	\$8,708,371
Sarasota Bay	Whitaker Bayou	Project Area 9					This project includes creating a stormwater storage facility, redirecting flow into the new facility, and constructing a discharge pipe.	\$8,574,361
Sarasota Bay	Whitaker Bayou	Project Area 9 + Purchase					This project includes creating a stormwater storage facility, redirecting flow into the new facility, and constructing a discharge pipe, along with the purchase of 38 properties at risk of flooding.	\$15,151,147
Sarasota Bay	Whitaker Bayou	ALT_Master					Includes Project Area 2, Project Area 5, & Project Area 9 improvements as a wholistic approach to reduce flood risk for Whitaker Bayou	\$15,284,283

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Sarasota Bay	Whitaker Bayou	Alt_Master + Purchase					Includes Project Area 2, Project Area 5, & Project Area 9 improvements as a holistic approach to reduce flood risk for Whitaker Bayou along with the purchase of 15 properties	\$17,622,954
Sarasota Bay	Whitaker Bayou	Old Bradenton / US-41					This project includes increasing the capacity of the drainage system, adding curb inlets, upsizing piping, and adding an additional outfall.	\$512,500
Roberts Bay North	Phillippi Creek	Flower Streets					This project involves adding drainage infrastructure, connecting to existing drainage, and replacing existing structures and pipes.	\$1,025,000.00
Sarasota Bay	Hudson Bayou	12th Street Treatment Pond					This project involves upsizing a pond on site.	\$102,500
Sarasota Bay	Sarasota Bay Coastal	Gillespie Park					Gillespie Park is a 10-acre park that is City-owned and County-operated. Stormwater runoff in the area has increased from historical conditions and although the park does not irrigate with potable water, adjacent residents do and this could be an opportunity to partner with them to reduce local demands on potable water. Buildings and a large stormwater pond are on site which could be used to capture rainfall before it leaves the site. This project includes installing rain barrels and/or green roofs, converting the existing pond to a stormwater-harvesting pond, and installing a public education kiosk.	\$41,347
Sarasota Bay	Whitaker Bayou	Leonard Reid Stormwater Pipe Replacement - Construction					Replacement of a failing corrugated metal pipe under a bridge crossing. The bridge and pipe have been rated as structurally deficient and recommended for replacement. When constructed (date unknown), fill was placed around the pipe and under the bridge. Recent bridge inspections have identified pipe failures that are creating holes on the surface adjacent to the roadway.	\$550,000
Sarasota Bay	Sarasota Bay Coastal	Bird Key					This project includes installing additional curb inlets and upsizing drainage piping.	\$10,250,000
Sarasota Bay	Sarasota Bay Coastal	Higel Avenue					This project includes increasing the capacity of the drainage system by replacing and upsizing drainage inlets and piping	\$3,587,500
Sarasota Bay	Sarasota Bay Coastal	Bayshore Rd.					This project involves increasing the capacity of the drainage system and adding a second outfall.	\$768,750
Sarasota Bay	Sarasota Bay Coastal	Seagrape Dr.					This project involves adding drainage infrastructure, installing outfalls, and connecting to existing drainage.	\$3,587,500
Sarasota Bay	Sarasota Bay Coastal	Faubel St.					This project involves adding drainage infrastructure, installing outfalls, and connecting to existing drainage.	\$3,587,500
Sarasota Bay	Hudson Bayou	7th & 8th Street					This project includes adding drainage infrastructure, connecting to existing drainage, and replacing existing structures & pipes.	\$768,750
Roberts Bay North	Roberts Bay North Coastal	Bay Road north side drainage 41 to bay					This site contains a large metal pipe in poor condition. County also interested in sidewalk in same location.	\$787,969
Sarasota Bay	Whitaker Bayou	Northgate Drainage Improvement					suggested by Bob Laura 6-22-20. No project proposed at this time.	
Roberts Bay North	Phillippi Creek	Circus Hammock					Circus Hammock is an approximately 5-acre County park that fronts 17th Street and is adjacent to the northeast corner of Bobby Jones Golf Course. The center of the park has a large mixed hardwood wetland. The County is currently removing Brazilian Pepper and other exotic species from a relatively deep ditch on the south side of the park. This project includes raising the elevation of the trail road to natural grade, removing exotic species, and planting native vegetation.	\$142,558
Sarasota Bay	Phillippi Creek	Sarasota Springs					This project involves the rehabilitation of existing Stormwater infrastructure. CCTV 18,819 line-feet of pipe, line 3,482 line-feet of 15 to 60 corrugated metal pipe and inspect 450 manholes.	\$916,000
Roberts Bay North	Phillippi Creek Coastal	River Ridge Oxbow					River Ridge oxbow is an approximately 4-acre remnant oxbow of Phillippi Creek. The segment north of the River Ridge Way bridge is almost completely filled with sediment and terrestrial vegetation. Currently County maintenance staff annually sprays herbicide on all plants growing in the oxbow. This project includes rehabilitating the oxbow to an emergent marsh by removing accumulated sediment and planting native vegetation.	\$10,519,720

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Little Sarasota Bay	Elligraw Bayou	Elligraw Bayou Muck Removal and Shoreline Stabilization					Muck removal and shoreline stabilization	
Sarasota Bay	Sarasota Bay Coastal	Stickney Point – Coastal					This site is in a neighborhood that experiences street flooding associated with stormwater runoff and tidal influences. The area has minimal stormwater treatment with most of the drainage discharging directly into the waterway. This project includes increasing the capacity of the drainage system, installing one-way check valves on outfall pipes, and installing a concrete flume to channel water towards an outfall pipe.	\$186,115
Sarasota Bay	Sarasota Bay Coastal	Faubel Street – Coastal					The northern end of Siesta Key in the City of Sarasota experiences regular flooding on the roadway during the wet season. The area needs to have upgrades completed to the stormwater system to ensure that the drainage is treated and discharged – instead of attenuating in the roadway and infiltrating the sanitary system infrastructure. This project includes re-grading the roadway to allow stormwater to flow through a saltwater marsh area before draining into the Bay.	\$37,334
Roberts Bay North	Phillippi Creek	Phillippi Creek Central Tributaries					Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$9,202,234
Roberts Bay North	Phillippi Creek	Phillippi Creek NW Tributaries					Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$37,684,488
Roberts Bay North	Phillippi Creek	Phillippi Creek NE Tributaries					Objectives of overall project include stream restoration and bank stabilization efforts to improve water quality, reduce downstream nutrient load, reduce further erosion and sedimentation, reduce maintenance cost, and improve natural systems within the stormwater conveyance and adjacent floodplain. This project includes the addition of riprap, aquatic buffers, the removal of a historic dam, installation of a sediment sump, improvements to drainage ditches, and a dry pond.	\$25,202,420
Little Sarasota Bay	Little Sarasota Bay Coastal	Sorrento Havana Heights					Runoff from Sorrento Bayside, Sorrento Shore neighborhood to the west, Havana Heights neighborhood to the south, and Tamiami Trail to the east, all drains to a pond between Sorrento Drive and Montana Avenue. This pond has an outfall under Sorrento Drive that discharges to the north and directly into South Creek. Model simulations for the 100-, 25-, 10-, 5- and 2.33-year storm events show flooding on neighborhood streets in the area of interest exceeding the allowable road level of service depths. This Project addresses structure and street flooding by expanding an existing pond and replacing an outfall pipe with a concrete box culvert under Sorrento Dr.	\$149,893
Little Sarasota Bay	Little Sarasota Bay Coastal	Avenue A Improvements Option 2					Model simulations for the 100-, 25-, 10-, and 5-year storm events reveal flooding for one residential structure along Avenue A in the Havener Trailer Park and excessive flood depths along Avenue A. The objective of this project is to address structure and roadway flooding along Avenue A. This project includes adding an additional outfall pipe to the Avenue A system.	\$427,486
Sarasota Bay	Sarasota Bay Coastal	City of Sarasota WWTF					The City of Sarasota has made the commitment to eliminate the wet weather surface water discharge in Whitaker Bayou.	
Sarasot Roberts Little Sarasota Blackburn Bays	All Sarasota Basins	Sarasota County upgrade to AWT at all Water Reclamation Facilities					Sarasota County has made the commitment to upgrade all of their water reclamation facilities to advanced wastewater treatment and improving the capacity to dispose of excess effluent via deep well injection or as reclaimed water. To date, they have increased the capacity of the deep well at the Bee Ridge WRF, created an interconnect between Bee Ridge WRF and the Central County Utilities WRF and is currently working on increasing the capacity and upgrading the Bee Ridge WRF. Future work include the conversion of the Central County Utilities WRF. This work will reduce the nitrogen concentration of the County's reclaimed water from around 12 mg/L to < 3 mg/L.	