PINELLAS COUNTY
SURFACE WATER QUALITY
MONITORING AND ASSESSMENT
2024 ANNUAL REPORT

Pinellas County Division of Environmental Management

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1.0 Introduction

Since October 1990, Pinellas County's Public Works Department Division of Environmental Management (PCDEM) has monitored surface water quality in four lakes, nine coastal receiving water areas, and the majority of the County's 52 drainage basins. In January 2003, a revised monitoring program (Janicki, 2003) was implemented to provide better geographical coverage of County waters and to provide more statistically defensible results in comparison to the original (1990–2002) program. The current ambient water quality monitoring program consists of two types of sample sites: fixed "land run" sites and stratified random "probabilistic" open water sites.

As required in the Pinellas County MS4 permit, Part V.B.3, this report provides a summary of the water quality monitoring and assessment program in Pinellas County for 2024 and discusses the 2024 water quality data as well as trends over time. In the fall of 2024, two major hurricanes impacted Pinellas County. Two periods of water quality monitoring were conducted post-storm, and results are included in this report. The immediate water quality impacts of the storms do not appear to be significant, based on the 2024 results, although some stream sites were physically altered by storm debris and bank erosion.

More than half of the streams sampled in 2024 exceeded the total phosphorus (TP) and fecal indicator bacteria criteria, and approximately half of the streams had low dissolved oxygen (DO). Most streams passed the total nitrogen (TN) criterion. All of the coastal strata attained TN, TP, chlorophyll-a (Chl-a), and dissolved oxygen criteria in 2024 with the exception of Cross Bayou (W5), which is an improvement from previous years.

This report also presents the long-term trends from 2015 to present, a ten-year timeframe. Long-term trend analyses were performed for each waterbody that has a minimum of 60 observations over at least seven years (the required minimum amount of data for the trend analysis). The trends over this most recent ten-year period indicate stable conditions (no significant increasing or decreasing trend) for most parameters at most stream sites; however, there are many streams that exhibit significantly increasing TP concentrations. Conversely, all of the coastal strata have long-term decreasing TP concentrations.

All of the western coastal waters exhibited significantly high TN concentrations from 2017 through 2022, which has resulted in those waterbodies currently being on the verified impaired list; however, TN has returned to lower levels in 2023 and 2024, and the trends are no longer increasing. Many of the western areas have significant decreasing trends for Chl-a. For the eastern coastal waters, TN was elevated in 2021, which contributed to a statistically significant increasing long-term trend in TN in the northernmost Old Tampa Bay and Largo Inlet strata. Three of the four Old Tampa Bay strata have significant increasing turbidity and total suspended solids (TSS) trends. Environmental challenges in the past few years like the Piney Point emergency discharge, red tide events, and *Pyrodinium* blooms may still be influencing the observed coastal trends in addition to the 2024 storms.

2.0 Methodology

Field sample collections and measurements are carried out according to Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOPs) (FDEP, 2017) and PCDEM SOPs (PCDEM, 2022). PCDEM sampling consists of fixed "land run" sites as well as randomly selected "probabilistic" sites for open water bay regions and two large lakes.

2.1 - Open Water Strata and Monitoring Sites

The water quality of the bays surrounding Pinellas County and the two largest lakes are monitored using a stratified random monitoring program designed for the PCDEM by Janicki Environmental, Inc. (Janicki, 2003). This monitoring program has a probabilistic design consisting of an Environmental Protection Agency (EPA) Environmental Monitoring Assessment Program (EMAP)-based element and a stratified random element. The EMAP-based design element consists of overlaying hexagonal grids on strata (water body segments) and randomly selecting a sample location within each grid. This allows for estimating surface area for water quality conditions within each stratum. The stratified random element allows for statistical methods to be used to estimate population means and confidence limits for water quality metrics. Samples collected using this method are used to assess status and trends in County receiving water bodies.

Lake Tarpon, Lake Seminole, and the marine waters along the shores of Pinellas County have been subdivided into 19 strata (Figure 1). East and west coast reporting units were selected based on the location of causeways, bridges, and the Tampa Bay Estuary Program boundaries (Pribble et al., 1999). West coast strata extend from the mainland shoreline to the eastern shore of the barrier islands, and east coast strata extend from the mainland shore to approximately the middle of Tampa Bay. Lake Seminole is stratified geographically into a northern and southern lobe to ensure that an equal number of samples are collected in each lobe. Lake Tarpon comprises a single monitoring stratum. The strata E6 and E7, which are receiving waters for the City of St. Petersburg in Middle Tampa Bay, have been monitored by the City of St. Petersburg since 2014, so no data in those areas is presented here.

Sites were originally sampled nine times per year, but in 2008, the fixed sampling was reduced to eight times a year. Monitoring occurs over four dry season (October through early June) sample periods, during which sites are visited every 50.75 days, and four wet season (June through September) sample periods of 40.5 days. Four sites are selected randomly each monitoring period within each of the strata for a total of 32 samples per stratum per year. In addition, two temporal units, morning and afternoon, are considered each day of sampling, and the order of visitation (i.e., morning vs. afternoon) within each stratum is randomized. The eastern strata sample effort is further stratified by depth, with 6 sample sites randomly selected from waters greater than 2 meters deep and 26 sites randomly selected from waters less than 2 meters deep. If a primary sampling site cannot be used for

some reason (i.e., too shallow), sets of randomly selected secondary and tertiary sites are available as alternates.

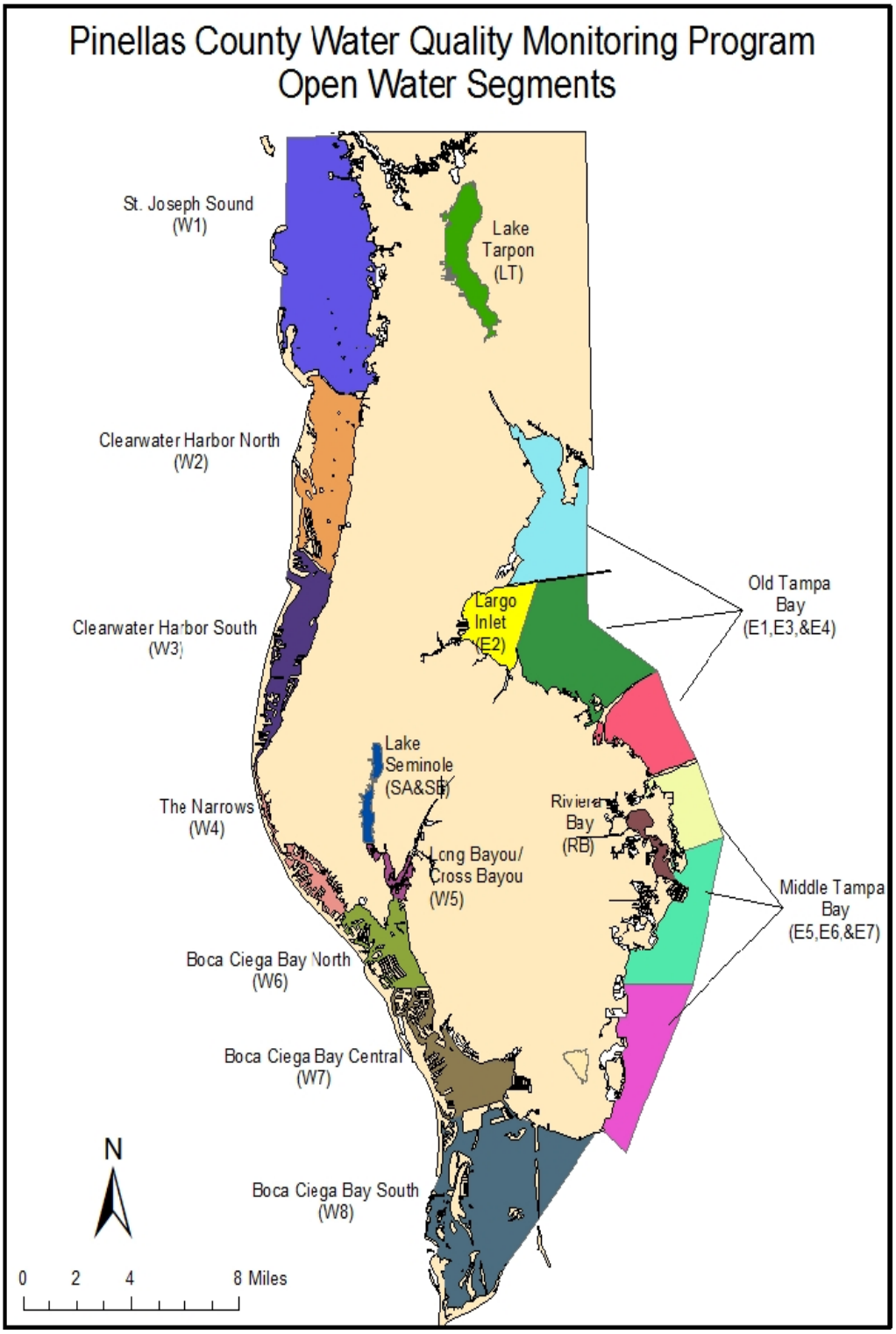

Figure 1. Pinellas County open water monitoring strata.

2.2 - Land Basin and Site Locations

The second monitoring type is a set of fixed land-based sites in streams, ditches, canals, and the Anclote River (Figure 2 and Table 1). Lake Chautauqua and Alligator Lake are also monitored as fixed sites. Water quality samples and flow data are collected each sample period on the same random schedule determined for the open water program and are used to assess the condition of the waterway and to estimate nutrient and sediment loads from these waterways to receiving waterbodies.

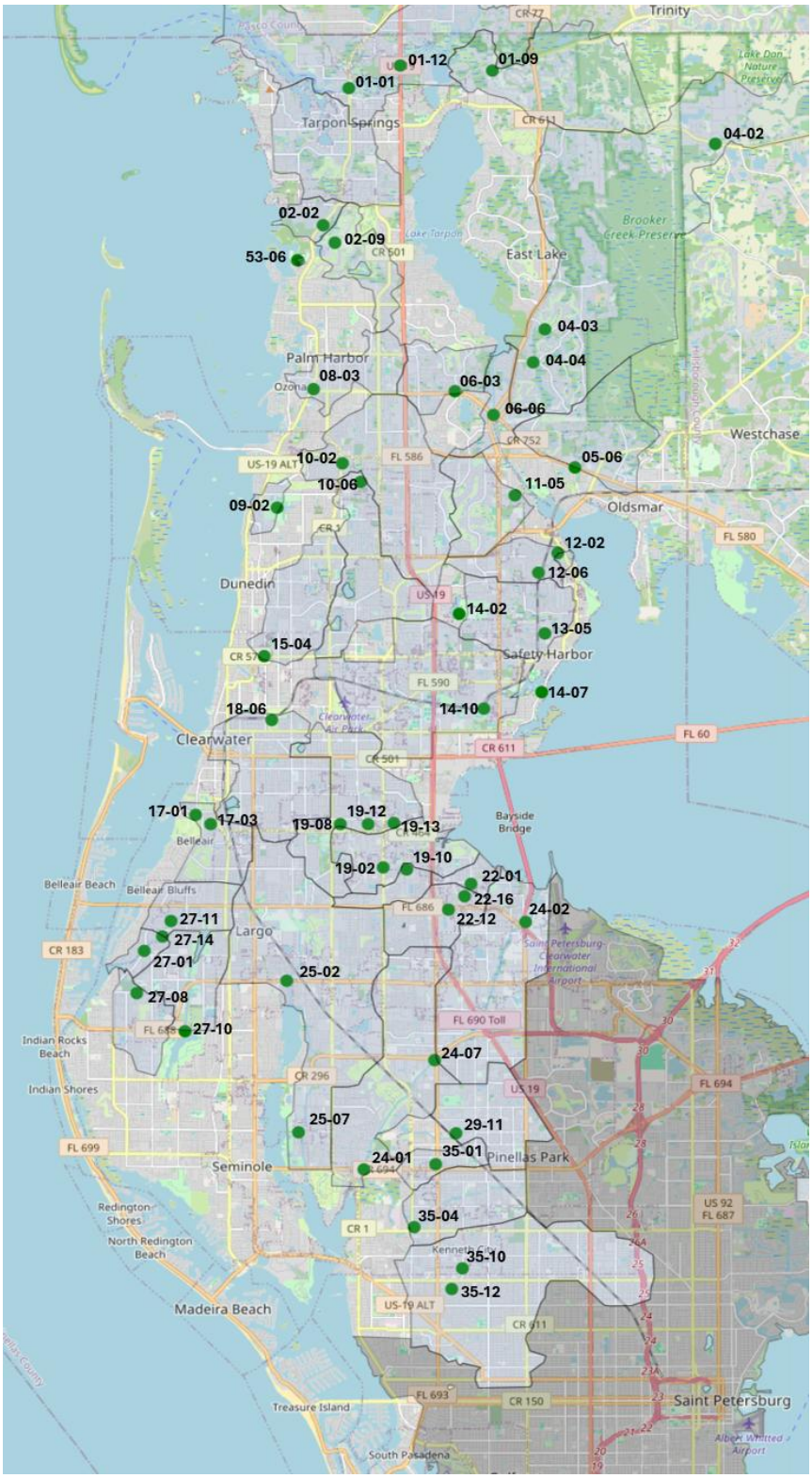

Figure 2. Pinellas County fixed monitoring sites, as indicated by green dots. City of St. Petersburg jurisdiction is the gray area.

The County is composed of 52 watersheds. Most of the watersheds, excluding the 11 watersheds solely in St. Petersburg's jurisdiction, contain at least one fixed monitoring station near the final discharge point of the tributary or watershed and just upstream of tidal influence. Fifty ambient sites were included in the land runs in 2024. Land run sites are grouped by proximity, with typically between six and eight sites sampled on a single day, including both ambient sites and special project sites (not included in this report). Nine sites are in lakes or tidally influenced areas in which measurement of flow is not possible, so only water quality data were collected. At all other sites, both water quality data and flow data were collected. USGS continuous volume discharge data are available for 12 sites. Another 12 sites have continuous volume discharge data available from Hydrologic Data Collection, Inc (HDI). County staff manually measured flow at the time of sample collection at all remaining sites.

Table 1. Fixed "land run" sites. Sites in a land run are sampled on a single day.

Land Run	Site ID	Site Name
LR1	01-01	Anclote River
	01-12	Anclote River
	01-09	Hollin Creek
	02-02	Klosterman
	02-09	Klosterman
	04-02	Brooker Creek
	04-03	Brooker Creek
	04-04	Brooker Creek
LR2	08-03	Bee Branch/Smith Creek
	09-02	Cedar Creek
	10-02	Curlew Creek
	10-06	Jerry Creek
	15-04	Spring Branch
	18-06	Stevenson Creek
	53-06	Wall Springs
LR3	05-06	Moccasin Creek
	06-03	Cow Branch
	06-06	Tarpon Outfall
	11-05	Briar Creek
	12-02	North Bishop
	12-04	South Bishop
	13-05	Mullet Creek
	14-02	Lake Chautauqua
LR4	14-07	Alligator Lake
	14-10	Alligator Creek
	19-02	Allens Creek
	19-08	Allens Creek
	19-10	Allens Creek
	19-12	Allens Creek
	19-13	Allens Creek
LR5	24-01	Cross Bayou
	24-07	Cross Bayou
	35-01	Pinellas Park Ditch #5
	35-04	Bonn Creek
	35-10	Joes Creek
	35-12	Miles Creek
LR6	22-01	Long Branch
	22-12	Long Branch
	22-16	Long Branch
	24-02	Cross Bayou
	25-02	Seminole Bypass
	25-07	Seminole Bypass
	29-11	Pinellas Park Ditch #1
LR7	17-01	Rattlesnake Creek
	17-03	Rattlesnake Creek
	27-01	McKay Creek
	27-08	Church Creek
	27-10	McKay Creek
	27-11	McKay Creek
	27-14	McKay Creek

2.3 - Field Measurements and Sample Collection

For all sites, in-situ physical parameters including temperature, pH, dissolved oxygen, conductivity, salinity, and depth are measured using YSI DSS multiprobe units. Surface readings are taken at a depth of 0.2 meters (m) from the surface. If the total water column depth is greater than 1.0 m, data are recorded both at the surface and near bottom (approximately 0.2 m from bottom).

Water samples are collected for analysis by the Pinellas County Utilities Department Laboratory. For both fixed land sites and open water strata sites, most water samples are collected via bottle immersion ("grabs") at 0.2 m from the surface. For a few land sites which are too deep at mid-channel, water samples are collected using a horizontally-oriented Alpha™ bottle water sampler as described in the PCDEM SOPs. For open water sites, a secchi disk is used to measure water clarity to the nearest tenth of a meter.

For stream sites, flow data is obtained either by download of data from continuous flow loggers or by manual measurement by PCDEM staff on the day of water sample collection. Flow data measurements are collected by PCDEM staff using a modification of the US Geological Survey's (USGS) stream flow methodology with a Marsh McBirney Model 2000 Flow-Mate®. Continuous flow data is collected at either real-time USGS continuous flow monitoring locations or HDI data logging continuous flow monitoring locations. Water quality samples are not collected if flow is not detectable.

2.4 - Laboratory Methods

Water samples are delivered to the Pinellas County Utilities Laboratory (PCUL) within six hours of sample collection at any given site. The PCUL, a National Environmental Laboratory Accreditation Conference (NELAC) certified lab, performs most sample analyses. If needed, Pace Analytical (formerly E-lab) or Advanced Environmental Laboratories, Inc. (AEL), both NELAC certified laboratories, may provide analysis services for this program. The laboratories follow analysis protocol from:

Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. Revised March 1983.

Standard Methods for the Examination of Water and Wastewater, 21st Edition. APHA, WEF, AWWA, 2012

2.5 - Parameter Descriptions

The following is a list of water quality metrics assessed in the sample program. Unless otherwise specified, these parameters are assessed at each site every monitoring period.

Alkalinity: (measured in lakes only) Alkalinity is a measure of the capacity of water to neutralize acids and is reported in units of milligrams per liter (mg/L) $CaCO_3$. Water samples contain alkaline chemicals like carbonates, bicarbonates, and hydroxides that neutralize acid and buffer water against pH changes. Total alkalinity is measured by adding acid to a

water sample until the water sample pH reaches a standard, accepted pH endpoint. At this standard pH, all alkaline chemicals are neutralized by the acid.

Aluminum: (measured in Lake Seminole and Seminole Bypass Canal only) Dissolved aluminum is measured in streams and lakes treated with alum, an aluminum chemical, to remove nutrients. Water samples are filtered so only dissolved aluminum is measured. Dissolved aluminum is expressed in mg/L units.

BOD5: (measured only in freshwater, every other monitoring period) Five-day biochemical oxygen demand is the quantity of dissolved oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five days at 20°C, expressed in mg/L.

Chlorophyll-a, corrected for pheophytin: Water column chlorophyll-a (Chl-a) concentrations are a measure of the quantity or biomass of planktonic algae or phytoplankton in a water body. Excessive nutrient loadings into a water body can result in high phytoplankton biomass conditions known as algae blooms. High algal biomass can greatly reduce water clarity, which in turn may limit the growth and distribution of desirable bottom vegetation such as seagrasses and can seriously degrade the aesthetic quality of a water body. In addition, persistent conditions of high algae biomass often result in die-off, sinking, and decay of the algae in water bodies. Decaying matter consumes oxygen and may result in fish kills. Chl-a is measured in micrograms per liter (µg/L). The values used for assessment are "corrected for pheophytin," as determined using Standard Method 10200H. Pheophytin is a chlorophyll degradation product which can lead to overestimates of Chl-a if not corrected for in the analysis methods.

Color: (measured only in lakes) Color is a measure of dissolved inorganic and organic substances in a water sample. Color is measured in platinum-cobalt units (PCU).

Conductivity: Conductivity is a measure of water's capability to pass electrical flow. This ability is directly related to the concentration of ions in the water such as dissolved salts and inorganic materials like chlorides, sulfides, and carbonate compounds. Conductivity is measured in millisiemens per centimeter (mS/cm).

Dissolved Oxygen: Dissolved oxygen (DO), measured in mg/L and percent saturation, strongly influences where organisms live. Oxygen enters the aquatic environment from the atmosphere (wind, waves, direct diffusion), plant photosynthesis, and mixing and diffusion from more oxygenated water masses. A physical property of water is that the solubility of oxygen is greater in cold water than in warm water; therefore, less oxygen can be dissolved in water as water temperature increases. Biological factors such as increased metabolic rates and oxygen uptake rates of aquatic organisms may further reduce DO levels. Since biological oxygen uptake is often the greatest in bottom waters compared to surface waters, the first signs of an oxygen stressed water body are usually observed as low bottom water DO levels. Such conditions may result in isolated or widespread fish kills.

Enterococcus: (measured only in tidally influenced waters that experience salinity greater than 2.7 ppt) Enterococci, indicators of water column pathogens, are found in intestinal

tracts of animals and humans. Its presence can be natural or from an anthropogenic source like a sewage spill. Enterococcus is expressed as most probable number (MPN)/100mL.

Escherichia coli: (measured only in waters with salinity less than 2.7 ppt) *Escherichia coli* (*E. coli*), indicators of water column pathogens, are found in intestinal tracts of animals and humans. Its presence can be natural or from an anthropogenic source like a sewage spill. *E. coli* is expressed in MPN/100mL.

Flow: (measured only at fixed land sites without an USGS or HDI continuous flow station and not at lakes) Width and depth data are collected to estimate cross sectional areas of channels. Water velocity is measured on-site using a flowmeter. The flow is then calculated in cubic feet per second (cfs). Flow volume is combined with water quality parameter concentrations to estimate loadings for total nitrogen, total phosphorus, and total suspended solids.

Nutrients: Nutrients are chemical elements that sustain life and promote growth. Total phosphorus (TP), total nitrogen (TN), nitrate-nitrite (NOx), total Kjeldahl nitrogen (TKN), ammonia (NH_3), and orthophosphate (OP) are common constituents used to assess nutrients in water. They are all measured in mg/L. TN, calculated by summing lab reported values of NOx and TKN, and TP are the primary nutrient parameters used to assess water health. Waters containing few nutrients cannot support a large plant community and will not attract animal life, as there will not be a source of food. An overabundance or imbalance of nutrients can cause algae blooms, which may produce toxins and lead to decreased DO in the water. The water clarity from such nutrient-induced algae blooms can also limit water column light transparency, which may limit available light necessary for desirable submerged aquatic vegetation to grow.

pH: pH is measured on a scale from 0 (acidic) to 14 (basic), with 7.0 considered neutral. If pH is too high or low, aquatic organisms will not be able to live. Additionally, pH can affect the solubility and toxicity of chemicals and heavy metals in water.

Salinity: Salinity is a measure of the total amount of dissolved solids in seawater and is measured in parts per thousand (ppt). Sodium and chloride make up 86% of sea salts, with sulfur, magnesium, potassium, and calcium accounting for 13%. Salinities in Pinellas County generally vary between 0 ppt (freshwater) and 33 ppt. Salinity is affected by precipitation, evaporation, freshwater inputs, springs, and mixing with other water masses such as the Gulf or streams.

Secchi Depth: The Secchi disk is a black and white circular disk used to measure water clarity. The depth at which the disk is no longer visible is recorded to the nearest tenth of a meter.

Total Suspended Solids: Totals suspended solids (TSS) are the amount of particulate material in the water including algae, sediments, and microorganisms. TSS is measured in mg/L. TSS affects the amount of light that can penetrate the water column and thus is part of what determines where plants grow. Increases in TSS can be caused by algae blooms,

increased runoff into a system, erosion, and by resuspension of bottom sediments in shallow areas.

Turbidity: Turbidity is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted. It is an indication of water clarity and is measured in nephelometric turbidity units (NTU).

In addition to measuring these water quality parameters, Pinellas County has conducted **biological monitoring** at certain sites twice a year on alternate years since 2014. Sites in the Springs Coast Basin (west side of the County) are monitored in even years, and those in the Tampa Bay Basin (east side of the County) are monitored in odd years. This monitoring uses FDEP methods in order to determine the following:

- **SCI**: The Stream Condition Index (SCI) is a composite macroinvertebrate index for use in flowing streams. Sampling consists of 20 dipnet sweeps of the most productive habitats found in a 100 m stretch of a stream. Organisms collected in these sweeps are preserved and brought back to the PCDEM laboratory for processing, and data generated from the taxonomy and relative abundance of these organisms is used to calculate ten biological metrics, each of which has been shown to respond predictably to human disturbance. These scores are then summed to obtain an overall score of biological health. A balanced macroinvertebrate community is attained if the average score of at least two temporally independent SCIs, performed at representative locations and times, is 40 or higher, with neither of the two most recent SCI scores less than 35.
- **HA**: A Habitat Assessment (HA) is performed concurrently with each SCI collection. Eight attributes known to have potential effects on stream biota are rated to produce a score between 8 and 160, with a higher score indicating less human disturbance. Parameters examined include substrate diversity, substrate availability, water velocity, habitat smothering, artificial channelization, bank stability, riparian buffer zone width, and riparian zone vegetation quality.
- **RPS**: A Rapid Periphyton Survey (RPS) measures the relative abundance of algae growing on stream substrates within the 100 m observed area. Nine observations are made every 10 meters which include presence or absence of algae and average length of algae if present. If less than 25% of the algae is longer than 6 mm, flora is considered balanced.
- **LVS**: The Linear Vegetation Survey (LVS) for flowing streams documents the plant community in the 100 m stream reach. The average sensitivity, measured by the Coefficient of Conservatism (COC), of the plant community is calculated based on species ecological tolerance to environmental changes. If the average sensitivity is greater than or equal to 2.5, the plant community is in balance. The percentage of invasive exotics is also noted, with a balanced plant community being less than 25% of the plants being invasive. Two separate floral evaluations are required for assessment, and the assessment is considered unresolved if both evaluations do not agree (i.e., one passes or has no plants but the other fails).

- **LVI**: The Lake Vegetation Index (LVI) is a multi-metric tool which assesses lake health based on the plant community structure. The field method involves dividing a lake into 12 units and identifying plants to the lowest possible taxonomic level in four of the 12 units. Plants are identified in each unit by performing a visual boat "drive by" and by a transect approach. A frotus (a two-sided aquatic weed rake) is deployed a minimum of five times along the transect to assess the presence of submersed aquatic plants. Data generated on the presence of species is used to calculate four biological metrics, each of which has been shown to respond to human disturbance: native taxa, invasive taxa, sensitive taxa, and dominant coefficient of conservatism (COC). A lake is considered impaired if the average of all LVI scores is less than 43.

3.0 Analysis and Discussion of Results

PCDEM submits water quality results at least twice a year to the FDEP through the Watershed Information Network (WIN) to support assessment of official impairment or attainment of water quality standards. Pinellas County also uses this data internally to determine status and trends of County waters and monitor the effects of certain projects on water quality through time. In 2024, the Pinellas County Water Quality Dashboard was created, where Pinellas County data can now be viewed and accessed.

3.1 - Determination of Wet and Dry Seasons

Annual rainfall and wet and dry seasons for the period of record were determined using rainfall data from the Southwest Florida Water Management District. The annual dry season is from January through May and from October through December. The annual wet season is from June through September. Rainfall by month is summarized for 2003 through 2024 in Figure 3.

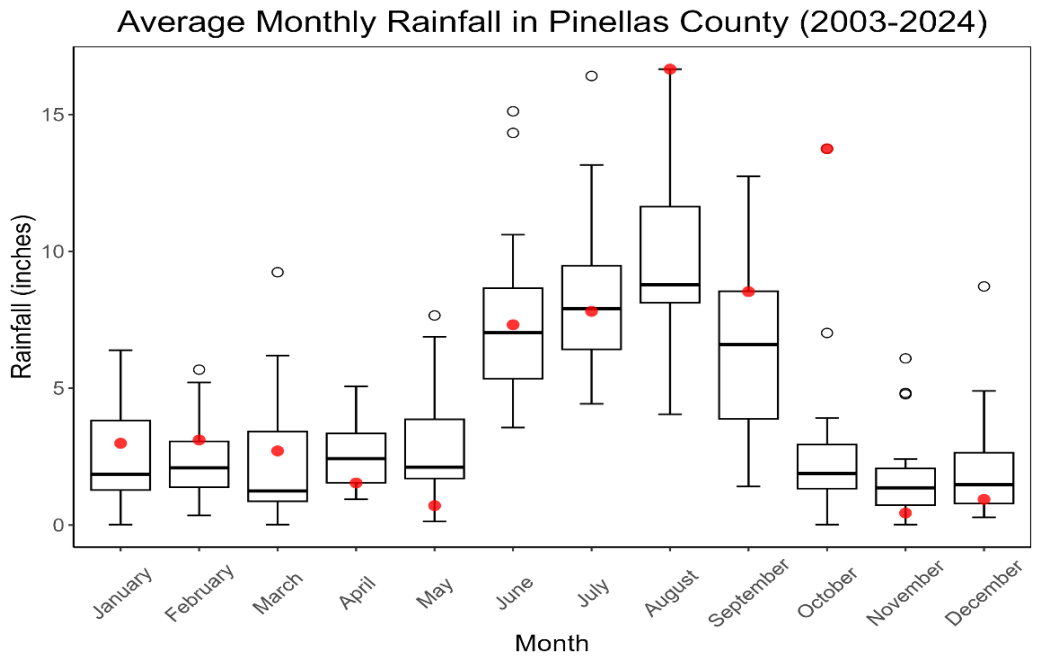

Figure 3. Average monthly rainfall total for Pinellas County from 2003 through 2024 (from Southwest Florida Water Management District data). The red dots are the 2024 monthly totals.

Annual rainfall as well as wet and dry season rainfall totals are summarized for 2003 through 2024 in Figure 4. 2024 was a wetter year on average, with seven of the 12 months having rainfall above the historic median (Fig. 3). Both August and October had significantly high amounts of precipitation due to Tropical Storm Debby and Hurricane Milton, respectively.

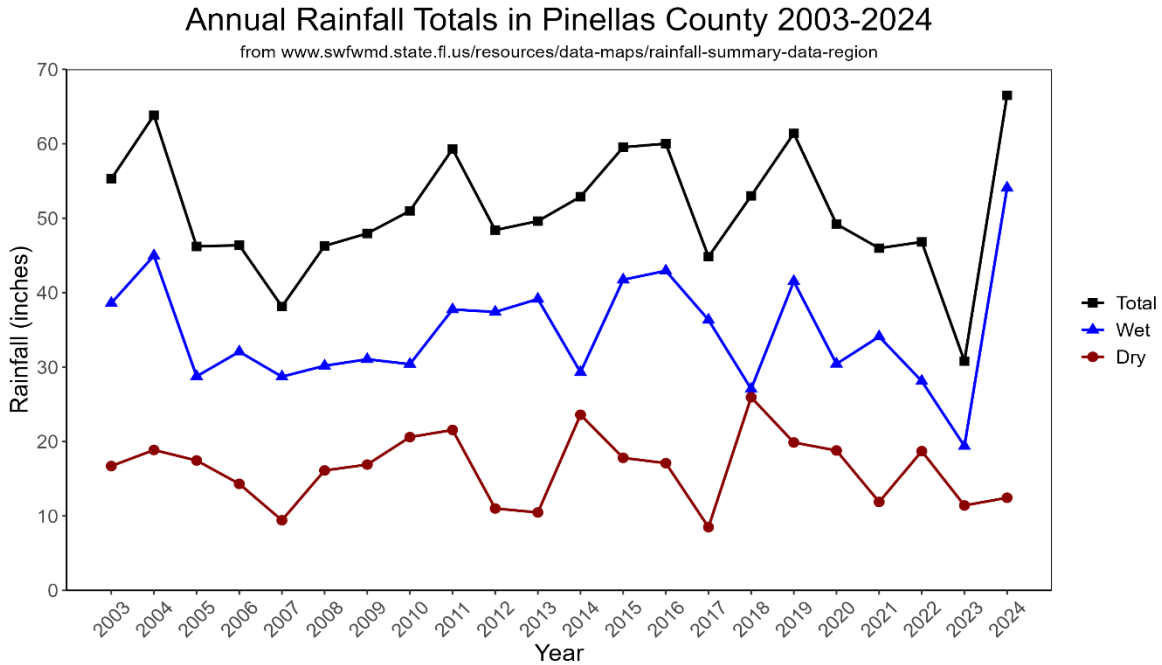

Figure 4. Annual total, dry season, and wet season weighted rainfall for Pinellas County from Southwest Florida Water Management District data (2003 to 2024).

3.2 - Long-Term Water Quality Concentration Trend Analysis (2015-2024)

Long-term trend analyses are performed for sites with at least 60 data points from 2015 through 2024 (Janicki, 2014). The core statistical test used to determine long-term trends is the seasonal Kendall Tau Test for Trend. The "seasonal" aspect of the test is defined by the eight sampling periods currently used by Pinellas County for conducting routine monitoring. A multi-step process is used to implement the Kendall Tau trend test, as summarized in the following paragraphs.

In the first step of each trend analysis, a time series plot of the raw time series is prepared for the period of record. In the second step of the trend analysis, the distribution of values for each sampling period is provided to describe the variability within and across seasons over all years. A complete set of univariate statistics is calculated, and a figure provides a valuable overall view of the seasonality of the data. In the third step of the analysis, a correlation analysis is performed for each seasonal value, the previous season's value, two seasons prior, etc., until correlation statistics have been calculated for all previous seasons up to 15 seasons prior. A table of these values is provided in the output. In the fourth step of the analysis, a determination is made as to whether seasonality exists in the time series of data.

If the data are determined to be seasonal, then the data are adjusted for season by subtracting the median seasonal value from each data point. The season-adjusted data are then applied to a Kendall Tau test which determines the slope of the time series of data and p-values for various data conditions. The next step is to test the data for autocorrelation in a similar fashion used to identify seasonality. In the first phase of this analysis, the season-adjusted data are de-trended by removing the effects of the slope identified. In the next step of the analysis, the season-adjusted and de-trended data are prepared in the form of a correlogram to test for the presence of autocorrelation in the time series. If the 1-season lag or the 2-season lag are significantly correlated with the present values, then the data are identified as auto-correlated and an adjustment is made to the p-value. In the final step of each trend analysis, the appropriate p-value (corrected for auto-correlation if necessary), significance assessment (based on alpha=0.05), slope, autocorrelation assessment (present/absent), and seasonality assessment (present/absent) of the trend analysis are compiled to provide a result for each parameter for each site/stratum.

Some of the monitoring sites did not have sufficient data to perform the trend analysis due to changes in site locations. A minimum of seven years of data (60 data points) is required. Table 2 shows the results of long-term trend analyses for select parameters for the fixed land run sites. Overall, water quality at most stream sites has remained stable over time. Significant increasing trends are seen at 14% of long-term sites for TN, at 33% of sites for TP, and at 28% of sites for turbidity.

Table 2. Long-term trends analysis results for select parameters for fixed land run sites based on data collected 2015-2024. Increasing or decreasing indicates a statistically significant trend (p<0.10), with dark red cells indicating a larger magnitude trend (p<0.05).

Site Name	Station	TN	TP	DO (% Sat)	Chl-a	TSS	Turb
Anclote River	01-01	No Trend	Decreasing	No Trend	No Trend	No Trend	No Trend
Anclote River	01-08	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Hollin Creek	01-09	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Klosterman Creek	02-02	No Trend	No Trend	No Trend	No Trend	Increasing	**Increasing**
Brooker Creek	04-03	No Trend	No Trend	No Trend	No Trend	No Trend	Increasing
Cow Branch	06-03	No Trend	Increasing	No Trend	No Trend	No Trend	Increasing
Bee Branch	08-03	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Cedar Creek	09-02	No Trend	No Trend	No Trend	No Trend	**Increasing**	Increasing
Curlew Creek	10-02	Increasing	No Trend	No Trend	No Trend	No Trend	No Trend
Jerry Branch	10-06	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Briar Creek	11-05	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Bishop Creek	12-04	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Mullet Creek	13-05	Increasing	No Trend	No Trend	No Trend	No Trend	Increasing
Alligator Creek	14-10	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Spring Branch Creek	15-04	Increasing	Increasing	No Trend	No Trend	**Increasing**	**Increasing**
Rattlesnake Creek	17-01	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Rattlesnake Creek	17-03	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Stevenson Creek	18-06	Increasing	Increasing	Decreasing	Increasing	Increasing	**Increasing**
Allen Creek	19-02	No Trend	Decreasing	No Trend	No Trend	No Trend	No Trend
Allen Creek	19-08	Increasing	No Trend	Increasing	No Trend	No Trend	Increasing
Allen Creek	19-10	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Allen Creek	19-12	No Trend	Increasing	No Trend	No Trend	Increasing	Increasing
Long Branch Creek	22-01	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Long Branch Creek	22-12	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Long Branch Creek	22-16	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
S. Cross Bayou Canal	24-01	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
N. Cross Bayou Canal	24-02	No Trend	Decreasing	No Trend	No Trend	No Trend	No Trend
S. Cross Bayou Canal	24-07	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Seminole Bypass Canal	25-07	No Trend	Increasing	No Trend	No Trend	No Trend	No Trend
Church Creek	27-08	Decreasing	Increasing	Decreasing	Decreasing	No Trend	No Trend
McKay Creek	27-09	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
McKay Creek	27-10	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
McKay Creek	27-11	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Pinellas Park Ditch	29-11	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Joes Creek	35-10	No Trend	No Trend	No Trend	No Trend	No Trend	Increasing
Miles Creek	35-12	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend

Table 3 shows the long-term trends for the coastal strata and lakes. Only the two most northern areas of Old Tampa Bay have significantly increasing TN, which is an improvement from past years. Most of Old Tampa Bay strata have increasing TSS and turbidity. TP and Chl-a show stable or improving trends in all of the coastal strata. Lake Chautauqua exhibited stable trends for most parameters, with DO improving. Alligator Lake shows mostly worsening trends. The north lobe of Lake Seminole has mostly improving trends, and the south lobe is stable.

Table 3. Long-term trends analysis results for select parameters for open water strata and lakes based on data collected 2015-2024. Increasing or decreasing indicates a statistically significant trend (p<0.10), with dark red cells indicating a larger magnitude trend (p<0.05).

Site Name	Station	TN	TP	DO (% Sat)	Chl-a	TSS	Turb
Old Tampa Bay	E1	Increasing	Decreasing	Decreasing	No Trend	No Trend	No Trend
Old Tampa Bay	E2	Increasing	Decreasing	No Trend	No Trend	Increasing	Increasing
Old Tampa Bay	E3	No Trend	Decreasing	No Trend	No Trend	Increasing	Increasing
Old Tampa Bay	E4	No Trend	Decreasing	No Trend	Decreasing	Increasing	Increasing
Middle Tampa Bay	E5	No Trend	Decreasing	No Trend	Decreasing	No Trend	No Trend
Riviera Bay	RB	No Trend	Decreasing	Decreasing	Decreasing	No Trend	No Trend
St. Joseph Sound	W1	No Trend	Decreasing	No Trend	Decreasing	No Trend	No Trend
Clearwater Harbor North	W2	No Trend	No Trend	No Trend	Decreasing	No Trend	No Trend
Clearwater Harbor South	W3	No Trend	Decreasing	No Trend	No Trend	No Trend	No Trend
The Narrows	W4	No Trend	Decreasing	No Trend	No Trend	No Trend	No Trend
Long Bayou/Cross Bayou	W5	No Trend	No Trend	Decreasing	No Trend	No Trend	No Trend
Boca Ciega Bay North	W6	No Trend	Decreasing	No Trend	Decreasing	No Trend	No Trend
Boca Ciega Bay Central	W7	No Trend	No Trend	No Trend	Decreasing	No Trend	No Trend
Boca Ciega Bay South	W8	No Trend	Decreasing		Decreasing	No Trend	No Trend
Lake Tarpon	LT	Increasing	No Trend	No Trend	No Trend	Increasing	Increasing
Lake Seminole North	SA	Decreasing	Decreasing	Decreasing	Decreasing	Decreasing	No Trend
Lake Seminole South	SB	No Trend	No Trend	No Trend	No Trend	No Trend	No Trend
Lake Chautauqua	14-02	No Trend	No Trend	Increasing	No Trend	No Trend	No Trend
Alligator Lake	14-07	Increasing	Increasing	No Trend	**Increasing**	**Increasing**	**Increasing**

3.3 – 2024 Water Quality Standards Results

Monitoring sites were also analyzed to determine attainment based on State water quality standards. Data from sites monitored within a single waterbody identification basin (WBID) are combined to determine water quality status for each WBID. The results for each WBID based only on data collected in 2024 are given in Table 4. Official impairment or attainment of the water quality standards is based on at least three years and up to seven years of data and may include data from multiple sources, so the "pass/fail" in this table does not necessarily indicate impairment as determined by the FDEP Impaired Waters Rule assessment.

Based on data collected only in 2024 by PCDEM, most stream WBIDs were not meeting at least one water quality criterion, with TP and bacteria being the most common problems: 86% of sites passed TN criteria, 89% passed Chl-a criteria, and 51% passed DO criteria; however, only 37% passed the TP criterion and 43% passed the bacteria criteria. Tidal streams were more likely than freshwater streams to exceed the TP, DO, and bacteria criteria in 2024, and none of the freshwater streams exceeded the Chl-a criterion for 2024.

Table 4. Results of application of water quality criteria using only 2024 PCDEM data for each stream WBID. The bacteria results are based on Enterococcus for tidal sites and E. coli for freshwater sites.

WBID	Tidal?	Site(s)	Name	TN	TP	DO (%Sat)	Chl-a	Bacteria
1440	X	01-01, -12	Anclote River	Pass	Pass	Pass	Pass	Pass
1475		01-09	Hollin Creek	Pass	Fail	Fail	Pass	Pass
1508	X	02-02	Klosterman Creek	Fail	Fail	Fail	Fail	Fail
1508A		02-09	Klosterman Creek	Fail	Fail	Fail	Pass	Pass
1474		04-02, -03, -04	Brooker Creek	Pass	Pass	Fail	Pass	Pass
1530A		05-06	Moccasin Creek	Fail	Fail	Pass	Pass	Pass
1529		06-03	Cow Branch	Pass	Pass	Pass	Pass	Fail
1541B		06-06	Tarpon Outfall Canal	Pass	Pass	Fail	Pass	Pass
1527B		08-03	Bee Branch	Pass	Fail	Pass	Pass	Fail
1556	X	09-02	Cedar Creek	Pass	Fail	Fail	Fail	Fail
1538A		10-02	Curlew Creek	Fail	Fail	Pass	Pass	Fail
1550		10-06	Jerry Creek	Pass	Fail	Pass	Pass	Fail
1541C		11-05	Briar Creek	Pass	Fail	Pass	Pass	Fail
1569	X	12-02	North Bishop Creek	Pass	Fail	Pass	Pass	Fail
1569A		12-04	South Bishop Creek	Pass	Pass	Pass	Pass	Fail
1575A		13-05	Mullet Creek	Pass	Fail	Pass	Pass	Pass
1574		14-10	Alligator Creek	Pass	Fail	Fail	Pass	Pass
1567B		15-04	Spring Branch	Pass	Fail	Fail	Pass	Fail
1614		17-01, -03	Rattlesnake Creek	Pass	Fail	Pass	Pass	Fail
1567C		18-06	Stevenson Creek	Pass	Fail	Fail	Pass	Fail
1604	X	19-02	Allens Creek	Pass	Fail	Fail	Fail	Fail
1604B		19-08, -10, -12, -13	Allens Creek	Pass	Fail	Pass	Pass	Fail
1627B	X	22-01	Longbranch Creek	Pass	Fail	Fail	Pass	Fail
1627		22-12, -16	Longbranch Creek	Pass	Fail	Fail	Pass	Pass
1641	X	24-01, -07	South Cross Bayou	Pass	Fail	Fail	Fail	Fail
1625	X	24-02	North Cross Bayou	Pass	Fail	Fail	Pass	Fail
1618D		25-02, -07	Seminole Bypass Canal	Pass	Pass	Fail	Pass	Pass
1633	X	27-01, -14	McKay Creek	Pass	Fail	Pass	Pass	Fail
1643		27-08	Church Creek	Pass	Pass	Pass	Pass	Fail
1633B		27-10, -11	McKay Creek	Pass	Pass	Pass	Pass	Pass
1662A		29-11	PPD #1	Pass	Pass	Pass	Pass	Pass
1668B		35-01	PPD #5	Pass	Pass	Pass	Pass	Pass
1668D		35-04	Bonn Creek	Pass	Pass	Pass	Pass	Fail
1668A		35-10, -12	Joes Creek	Pass	Pass	Fail	Pass	Pass
1512B	X	53-06	Wall Springs	Fail	Pass	Fail	Pass	Pass

The 2024 results for each open water area and lakes are in Table 5. Again, official FDEP impairment or attainment of the water quality standards is based on at least three years and up to seven years of data, so the "pass/fail" in this table does not necessarily indicate impairment as determined by the FDEP Impaired Waters Rule assessment. With the exception of Long Bayou/Cross Bayou, all of the open water coastal strata met the TN, TP, DO, and Chl-a criteria in 2024.

Of the lakes, only Lake Chautauqua attained the Chl-a criterion in 2024. Additionally, the south lobe of Lake Seminole did not attain the TN criterion, Alligator Lake did not meet TP, and Lake Chautauqua did not attain DO in 2024.

Table 5. Results of application of water quality criteria using only 2024 PCDEM data for open water strata and lakes.

Site	Name	TN	TP	DO (%Sat)	Chl-a
W1	St. Joseph Sound	Pass	Pass	Pass	Pass
W2	Clearwater Harbor North	Pass	Pass	Pass	Pass
W3	Clearwater Harbor South	Pass	Pass	Pass	Pass
W4	The Narrows	Pass	Pass	Pass	Pass
W5	Long Bayou/Cross Bayou	Fail	Pass	Fail	Fail
W6	Boca Ciega North	Pass	Pass	Pass	Pass
W7	Boca Ciega Central	Pass	Pass	Pass	Pass
W8	Boca Ciega South	Pass	Pass	Pass	Pass
E1	Old Tampa Bay	Pass	Pass	Pass	Pass
E2	Largo Inlet	Pass	Pass	Pass	Pass
E3	Old Tampa Bay	Pass	Pass	Pass	Pass
E4	Old Tampa Bay	Pass	Pass	Pass	Pass
E5	Middle Tampa Bay	Pass	Pass	Pass	Pass
RB	Riviera Bay	Pass	Pass	Pass	Pass
SA	Seminole Lake, North Lobe	Pass	Pass	Pass	Fail
SB	Seminole Lake, South Lobe	Fail	Pass	Pass	Fail
LT	Lake Tarpon	Pass	Pass	Pass	Fail
14-02	Lake Chautauqua	Pass	Pass	Fail	Pass
14-07	Alligator Lake	Pass	Fail	Pass	Fail

Appendix 1 at the end of this report provides the 2024 means, geometric means for TN and TP, and medians for each land run site, for each coastal strata, and for the four lakes which are monitored as part of the ambient program.

3.4 - Biological Monitoring

Due to the hurricanes in fall of 2024, streams were only assessed once in 2024, in the spring. As described in the methodology section, only the Springs Coast basins (west side of the County) were sampled in 2024. Results for the nine Pinellas County streams sampled in 2024 are summarized in Table 6. Jerry Branch was not sampled at all in 2024 due to construction in the stream. Hollin Creek was assessed, but no macroinvertebrates were collected due to elevated salinity (so no SCI score). Five lakes were assessed using the Lake Vegetative Index (LVI) methodology in 2024, as summarized in Table 7. Taylor Lake was not assessed in 2024 due to low water level in association with weir wall repair.

Habitat Assessment

Scores may vary from sampling event to sampling event. In the current round of sampling, no streams had optimal habitat scores, five streams scored in the sub-optimal (81-120) category, and four were in the marginal category (41-80).

Stream Condition Index

Four streams have SCI scores that are currently passing the criteria: Hollin, Curlew, Stevenson, and McKay Creeks. To pass the SCI criteria, average SCI (of temporally independent scores) must be 40 or higher, with neither of the most recent two SCI scores below 35. Bee Branch, Spring Branch, Rattlesnake, Church, and Joes Creeks are in the impaired category.

Floral Measures

All WBIDs sampled in 2024 complied with the NNC criteria for RPS (filamentous algae < 25%) except Bee Branch. Five streams are currently passing the NNC criteria for sensitive plants and nuisance exotics, with less than 25% invasive exotic species present and a COC greater than or equal to 2.5.

Table 6. Results of 2024 biological monitoring in streams. Green cells indicate scores that pass criteria, and red cells indicate failing scores. NP denotes no aquatic plants. For the Habitat Score column, green=optimal, blue=sub-optimal, yellow=marginal.

Site ID	Station Name	WBID	Sample Date	SCI Score	Average SCI	Habitat Score	RPS (%)	Sensitivity (COC)	Nuisance Exotics
01-09	Hollin Creek	1475	12/6/2017	52	49	107	0	NP	NP
			11/2/2018	45		105	0	NP	NP
			3/26/2020	44		96	14	NP	NP
			1/12/2021	66		121	0	NP	NP
			11/9/2022	40		112	0	NP	NP
			4/30/2024	*No score*		101	0	NP	NP
08-03	Bee Branch	1527B	2/10/2016	33	36	76	1	0.91	66.7

Site ID	Station Name	WBID	Sample Date	SCI Score	Average SCI	Habitat Score	RPS (%)	Sensitivity (COC)	Nuisance Exotics
			4/11/2017	28		76	0	1.7	37.8
			2/1/2018	44		81	4	1.29	57.1
			10/26/2018	26		80	0	NP	NP
			2/19/2020	39		89	11	NP	NP
			9/30/2020	47		99	1	0	100
			12/9/2022	34		91	0	NP	NP
			4/30/2024	34		97	41	2.27	41.1
10-02	Curlew Creek	1538A	4/10/2016	47	44	94	0	NP	NP
			11/16/2016	37		92	2	NP	NP
			2/16/2018	51		95	0	NP	NP
			11/30/2018	34		77	0	NP	NP
			3/27/2020	48		70	0	NP	NP
			11/24/2020	43		93	0	NP	NP
			11/8/2022	43		75	0	3.2	0
			5/2/2024	46		86	0	NP	NP
15-04	Spring Branch	1567B	3/9/2016	41	30	78	0	NP	NP
			11/30/2016	21		74	0	NP	NP
			5/22/2018	22		107	4.4	NP	NP
			1/10/2019	31		96	0	NP	NP
			3/10/2021	35		89	0	NP	NP
			5/9/2024	27		47	0	NP	NP
17-01	Rattlesnake Creek	1614	4/26/2016	46	30	91	0	0	100
			10/19/2016	41		77	5	0	100
			4/3/2018	28		97	0	NP	NP
			11/16/2018	18		92	0	NP	NP
			3/27/2020	31		85	0	NP	NP
			10/8/2020	20		73	0	NP	NP
			12/2/2022	23		87	0	NP	NP
			5/10/2024	17		83	0	NP	NP
18-06	Stevenson Creek	1567C	2/17/2016	60	46	80	10	0.58	80.9
			11/9/2016	50		76	0	0.16	96
			3/27/2018	48		87	4.9	1.3	62.5
			10/29/2018	44		86	6.2	0.53	80
			2/13/2020	36		88	0	1.2	35
			11/5/2020	41		72	2	0.67	80

Site ID	Station Name	WBID	Sample Date	SCI Score	Average SCI	Habitat Score	RPS (%)	Sensitivity (COC)	Nuisance Exotics
			12/2/2022	43		58	0	0	100
			5/9/2024	45		55	0	0.35	82.6
27-08	Church Creek	1643	3/9/2016	52	39	105	0	NP	NP
			11/23/2016	25		77	0	NP	NP
			2/22/2018	47		116	4.8	NP	NP
			2/8/2019	39		120	7.9	NP	NP
			3/27/2020	31		116	0	NP	NP
			12/14/2020	38		122	0	NP	NP
			3/9/2022	45		115	0	NP	NP
			11/30/2022	42		114	0	0	100
			5/6/2024	28		108	0	NP	NP
27-11	McKay Creek	1633B	1/26/2016	38	43	68	0	NP	NP
			10/5/2016	40		91	5	1.45	59.2
			2/20/2018	49		89	13	0.03	96.8
			10/22/2018	47		88	0	0.25	75
			3/27/2020	42		79	0	0.61	71.4
			12/11/2020	49		91	0	0.37	75
			3/9/2022	50		77	0	0	100
			11/30/2022	39		77	0	1.72	82.4
			5/6/2024	36		67	0	0.7	90
35-10	Joes Creek	1668A	2/23/2016	30	37	53	33	2.4	25.9
			12/7/2016	54		71	8	2	25
			2/27/2018	39		68	14	1.54	47.9
			1/4/2019	33		63	19.2	1.21	52.9
			3/4/2020	30		58	6	1.83	51
			12/10/2020	43		72	2	0	100
			12/2/2022	27		64	0	2	75
			5/10/2024	40		75	0	0.77	68

Lake Vegetation Index

As shown in Table 7, only Alligator Lake had LVI scores consistently in the impaired range. Lakes Seminole and Walsingham had lower LVIs in 2024, but the average scores pass.

Table 7. LVI results of 2024 lake monitoring. Scores greater than 43 are passing.

Lake Name	WBID	Sample Date	LVI Score	Average LVI
Tarpon	1486A	8/10/2016	35	**43**
		8/25/2017	42	
		9/6/2019	43	
		7/16/2020	34	
		6/9/2021	45	
		8/23/2022	50	
		8/11/2023	43	
		6/18/2024	51	
Alligator	1574A	9/28/2016	9	**13**
		8/4/2017	11	
		10/1/2019	17	
		6/25/2020	16	
		7/16/2021	7	
		7/15/2022	8	
		10/16/2023	15	
		6/14/2024	21	
Chautauqua	1603D	7/27/2016	65	**62**
		8/11/2017	67	
		8/9/2019	64	
		8/14/2020	57	
		5/20/2021	62	
		7/27/2022	52	
		7/2/2023	67	
		9/13/2024	61	

Lake Name	WBID	Sample Date	LVI Score	Average LVI
Walsingham	1650	7/7/2016	55	**51**
		7/21/2017	58	
		8/7/2019	68	
		8/27/2020	50	
		6/4/2021	53	
		8/16/2022	45	
		7/26/2023	46	
		6/24/2024	36	
Seminole	1668D	7/6/2016	57	**44**
		8/18/2017	57	
		9/20/2019	48	
		8/26/2020	29	
		7/13/2021	51	
		8/26/2022	32	
		8/3/2023	39	
		6/20/2024	39	

3.5 - Summary of Monitoring Results by Basin

Table 8 gives a basin-by-basin synopsis of the results described in the previous sections as well as discussing impairment according to the Impaired Waters Rule (FAC 62-302 and 303), which considers data over a seven-year window. As described in section 3.2 of this report, long-term trend analyses require a minimum of seven years and 60 data points, so not all sites have been sampled for a long enough time or with enough frequency to meet this requirement.

Table 8. Individual basin summary for the period of record based on the long-term trend results and 2024 results presented in Tables 2 through 7.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
1	Anclote River	TARPON SPRINGS, 40%; UNINCORPORATED, 60%	Long-term trend analyses indicate improving TP and all other parameters stable over the past 10 years. A 4e "Ongoing Restoration Activities" plan has been written which describes activities in the watershed to address the current Chl-a, TN, and bacteria impairments. Chl-a, TN, TP, DO, and bacteria values met criteria in 2024.
1	Hollin Creek	UNINCORPORATED, 100%	This subbasin comprises the upper portion of the Pinellas County portion of the Anclote River watershed. Long-term trend analyses show stable water quality for all parameters. The waterbody is impaired for *E. coli*. DO and TP did not attain the criteria for 2024, but other parameters did. There is a healthy biological and floral community.
2	Klosterman Bayou	TARPON SPRINGS, 11.32%; UNINCORPORATED, 88.68%	Long-term trend analyses for this basin indicate significantly increasing turbidity and TSS. Both tidal and freshwater portions of the stream did not pass criteria for TN, TP, or DO. The downstream site did not meet Chl-a or bacteria criteria in 2024. This waterbody is impaired for nutrients (DO, Chl-a, TN, TP) and bacteria.
4	Brooker Creek	OLDSMAR, 9.77%; UNINCORPORATED, 90.23%	Long-term trend analyses show increasing turbidity but stable values for other parameters. This stream did not attain the criterion for DO in 2024. The waterbody is impaired for *E. coli*. There is a healthy biological and floral community in this stream.
5	Moccasin Creek	OLDSMAR, 75.95%; UNINCORPORATED, 24.05%	There is insufficient data to perform the long-term trend analyses for this basin due to no flow on many sampling dates. The tidal portion of this stream is impaired for DO, chl-a, and bacteria. 2024 data indicated elevated TN and TP in the freshwater segment.
6	Cow Branch/ South Creek	CLEARWATER, 3.81%; OLDSMAR, 5.56%; UNINCORPORATED, 90.64%	Long-term trend analyses indicate increasing TP and turbidity but stable concentrations for other parameters. The stream is impaired for bacteria but passing other criteria. In 2024, only bacteria was elevated above criteria. The biological community did not pass criteria, and there was an overabundance of attached algae in the stream in 2023.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
6	Lake Tarpon Outfall Canal	Clearwater Safety Harbor Oldsmar Unincorporated	There is insufficient data to perform the long-term trend analyses for this basin due to no flow on many sampling dates. This waterbody did not attain the criterion for DO in 2024.
8	Bee Branch/ Smith Creek	DUNEDIN, 10.50%; UNINCORPORATED, 89.50%	Long-term trend analyses indicate stability of all parameters. The stream is currently impaired for nutrients (TP), bacteria, biology, and macrophytes; however, 2024 data resulted in TN, DO, and Chl-a averages that pass criteria. TP and bacteria in 2024 did not meet criteria. The floral score also did not meet the criterion.
9	Cedar Creek	DUNEDIN, 98.51%; UNINCORPORATED, 1.49%	Long-term trend analyses indicate significantly increasing turbidity and TSS, with all other parameters stable. The tidal portion of the stream is currently impaired for nutrients (Chl-a), DO, and bacteria. Average TN in 2024 passed the criterion, but TP, chl-a, DO, and bacteria did not pass criteria. A Bacteria Pollution Control Plan is being implemented by the City of Dunedin which should improve water quality.
10	Curlew Creek	CLEARWATER, 21.06%; DUNEDIN, 24.71%; UNINCORPORATED, 54.23%	Long-term trend analyses indicate increasing TN but no trends for other parameters. TN, TP, and bacteria exceeded criteria in 2024. The stream is impaired for bacteria. The most recent biological and vegetation monitoring resulted in passing SCI and floral scores, although habitat is suboptimal.
10	Jerry Branch	DUNEDIN, 32%; CLEARWATER, 28%; UNINCORPORATED, 40%	Long-term trend analyses indicate no trends in any parameter. This stream is currently impaired for bacteria. TP and bacteria were elevated in 2024, and the waterbody is on the study list for nutrients. The 2022 biological assessment indicated a healthy macroinvertebrate and flora community, although the habitat is suboptimal. No biological collections occurred in 2024 due to construction instream.
11	Briar Creek/ Possum Branch	CLEARWATER, 56.01%; OLDSMAR, 19.25%; SAFETY HARBOR, 21.94%; UNINCORPORATED, 2.80%	Long-term trend analyses show no trends, so stable water quality for all parameters. The stream is currently impaired for nutrients (TP and biology) and bacteria. In 2024, TP and bacteria were above the criterion. The biological community had a very low score and marginal habitat, although it passed the floral criteria.
12	Bishop Creek	CLEARWATER, 26.49%; SAFETY HARBOR, 60.50%; UNINCORPORATED, 13.00%	Long-term trend analyses show stable water quality at both the North site and the South site. The tidal portion of the stream is impaired for bacteria, and the freshwater portion is impaired for nutrients (TP, macrophytes, and biology) and bacteria. 2024 data

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
	Bishop Cr, continued		indicate passing Chl-a, DO, and TN values, but TP is exceeding criteria at the north site. Bacteria is not attaining at either site. The macroinvertebrate and floral communities were not attaining criteria, although the SCI score improved in 2023. A Bacteria Pollution Control Plan was developed for both tidal and freshwater portions of the stream by the cities of Clearwater and Safety Harbor, which will help guide improvement activities.
13	Mullet Creek	CLEARWATER, 24.36%; SAFETY HARBOR, 63.18%; UNINCORPORATED, 12.46%	Long-term trend analyses indicate increasing TN and turbidity. The stream is currently impaired for nutrients (TP and biology), dissolved oxygen, and bacteria. TP was elevated in 2024. No biological collections occurred in 2023 due to construction upstream.
14	Alligator Creek and Lake	CLEARWATER, 66.28%; SAFETY HARBOR, 5.46%; UNINCORPORATED, 28.26%	Long-term trend analyses indicate increasing TP and stable conditions for other parameters. The lake shows an increasing trend for TN, TP, Chl-a, turbidity, and TSS. The lake is currently impaired for nutrients based on high TP and Chl-a and poor plant community (LVI) scores. The stream is currently not impaired, but TP was elevated for both the stream and the lake in 2024, and the stream had low DO in 2024. Biological sampling resulted in passing SCI but failing floral scores in 2023. A Bacterial Pollution Control Plan has been developed for both tidal and freshwater portions of the stream by the City of Clearwater.
14	Lake Chautauqua	CLEARWATER, 94%; UNINCORPORATED, 6%	Lake Chautauqua is attaining all water quality standards. It showed a significant improving trend in DO, although DO was low in 2024. There are stable long-term trends for all other parameters. It has a healthy vegetative community.
15	Spring Branch	CLEARWATER, 30.54%; DUNEDIN, 61.82%; UNINCORPORATED, 7.64%	Long-term trend analyses show increasing TN, TP, TSS, and turbidity. The stream is currently impaired for nutrients (TP, biology, Chl-a), DO, and bacteria. 2024 data indicate elevated TP and low DO. The biological community is impaired, but improved in 2021, and the plant community is healthy. Biological monitoring in 2024 resulted in a low SCI score due to excessive debris clogging the stream.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
17	Rattlesnake Creek	BELLEAIR, 38.76%; BELLEAIR BLUFFS, 4.05%; CLEARWATER, 36.62%; LARGO, 10.44%; UNINCORPORATED, 10.13%	Long-term trend analyses show significantly increasing TP concentrations. The stream is currently impaired for bacteria, and 2024 average TP and bacteria exceeded criteria for both sites. The biological community is impaired, although the plant community was passing criteria in 2024.
18	Stevenson Creek	CLEARWATER, 83.22%; LARGO, 2.14%; UNINCORPORATED, 14.64%	The tidal portion of the stream is currently impaired for bacteria, and the freshwater portion is impaired for bacteria and nutrients due to TP, DO, and macrophytes. Long-term trend analyses show worsening of all parameters in the freshwater portion. Average TP and bacteria in 2024 were elevated, and DO was not attaining the criterion. The most recent biological monitoring resulted in passing SCI scores; however, the plant community is impaired.
19	Allens Creek	CLEARWATER, 34.41%; LARGO, 36.07%; UNINCORPORATED, 29.52%	Long-term trend analyses indicate stable concentrations at one of four sites. Two of the freshwater sites had significantly increasing turbidity, one site had increasing TN, and another site had increasing TP. The tidal site has decreasing TP. Currently, the tidal portion of the stream is impaired for nutrients (Chl-a), DO, and bacteria. The freshwater portion is impaired for bacteria and nutrients (biology, macrophytes, TP). In 2024, the fresh segment had elevated TP and bacteria. The tidal segment did not attain DO or Chl-a. The macroinvertebrate community was passing but the floral community was not attaining criteria when last sampled.
22	Long Branch	LARGO, 63.13%; UNINCORPORATED, 36.87%	Long-term trend analyses indicate increasing at all sites. The tidal portion is currently impaired for bacteria, and the 2024 average TP and bacteria were elevated and DO was low. The freshwater portion of the stream is currently impaired for DO, nutrients (Chl-a, TP, biology, macrophytes), and bacteria. 2024 data showed low DO and high TP in the fresh segment. A TMDL Implementation Plan and Bacteria Pollution Control Plan have been written for this basin, which should help address these impairments.
23	Roosevelt Creek	LARGO, 0.08%; PINELLAS PARK, 20.14%; ST PETERSBURG, 51.85%; UNINCORPORATED, 27.93%	Currently, monitoring has been suspended on this site until completion of a salinity barrier removal project.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
24	Cross Bayou	LARGO, 21.03%; PINELLAS PARK, 34.13%; SEMINOLE, 1.34%; UNINCORPORATED, 43.50%	Long-term trend analyses indicate significantly decreasing TP concentrations at the north site, and all other parameters stable. Currently, South Cross Bayou is impaired for nutrients (Chl-a), DO, and bacteria. North Cross Bayou is currently impaired bacteria. In 2024, DO, TP, and bacteria did not meet criteria in North or South Cross Bayou. Chl-a did not meet in South Cross Bayou.
25	Seminole Bypass Canal/ Starkey Road	CLEARWATER, 0.03%; LARGO, 48.16%; PINELLAS PARK, 1.83%; SEMINOLE, 9.17%; UNINCORPORATED, 40.81%	Long-term trend analyses indicate increasing TP and all other parameters are stable. The canal is currently impaired for nutrients (Chl-a). In 2024, TN, TP, chl-a, and bacteria passed criteria. Activities detailed in the Lake Seminole Reasonable Assurance Plan are expected to continue to improve water quality in the canal.
27	McKay Creek	BELLEAIR BLUFFS, 3.12%; LARGO, 46.29%; SEMINOLE, 8.01%; UNINCORPORATED, 42.57%	Long-term trend analyses indicate generally stable water quality. The tidal portion is impaired for bacteria. The freshwater portion of the stream is currently impaired for bacteria and macrophytes. 2024 values passed for TN, DO, and Chl-a for the tidal site, and all parameters met criteria in the freshwater segment. The macroinvertebrate community met criteria in 2024, but the floral community did not.
27	Church Creek	LARGO, 66%; UNINCORPORATED, 34%	Long-term trend analyses indicate decreasing TN and Chl-a but increasing TP and worsening DO. The stream is currently impaired for bacteria. TN, TP, Chl-a, and DO averages attained criteria in 2024. The biological community is not passing criteria, although the plant community is attaining criteria.
29	Pinellas Park Ditch #1	PINELLAS PARK, 100%	All parameters were stable in the long-term analyses. This waterbody is currently impaired for bacteria. Chl-a, TN, TP, DO, and bacteria averages attained criteria in 2024.
35	Joes Creek	KENNETH CITY, 5.25%; PINELLAS PARK, 14.88%; ST PETERSBURG, 41.86%; UNINCORPORATED, 38.02%	Long-term trend analyses indicate increasing turbidity. Miles Creek, a tributary to Joes, has stable water quality trends. The biological and floral communities have declined and are now impaired. In 2024, Bonn and Joes Creek attained nutrient criteria. Bonn is impaired for bacteria, and Joes is impaired for DO. Pinellas Park Ditch 5 attained criteria for TN, TP, Chl-a, and DO in 2024. The macroinvertebrate and floral communities did not pass criteria in 2024. This watershed has a TMDL Implementation Plan and a Bacteria Pollution Control Plan, which will help guide water quality improvement activities.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
E1	Old Tampa Bay	Clearwater Oldsmar, Safety Harbor, Unincorporated	Long-term trend analyses indicate significantly increasing TN concentrations and worsening DO but decreasing TP. TN, TP, Chl-a, and DO criteria were met for 2024, but this basin is currently impaired for Chl-a.
E2	Old Tampa Bay	Clearwater, Largo, Unincorporated	Long-term trend analyses indicate increasing TN, TSS, and turbidity but decreasing TP. TN, TP, Chl-a, and DO criteria were met for 2024, but this basin is currently impaired for Chl-a.
E3	Old Tampa Bay	Unincorporated	Long-term trend analyses indicate significantly increasing TSS and turbidity concentrations but decreasing TP. 2024 results indicate that TN, TP, Chl-a, and DO criteria are being met, but this basin is currently impaired for Chl-a.
E4	Old Tampa Bay	Unincorporated	Long-term trend analyses indicate significantly increasing TSS and turbidity concentrations but decreasing TP and Chl-a. TN, TP, Chl-a, and DO criteria are being met for 2024.
E5	Middle Tampa Bay	Unincorporated	Long-term trend analyses indicate decreasing TP and Chl-a. 2024 results indicate that TN, TP, Chl-a, and DO criteria are being met.
RB	Riviera Bay	Unincorporated	Long-term trend analyses indicate decreasing TP and Chl-a but worsening DO. 2024 results indicate that TN, TP, Chl-a, and DO criteria are being met.
LT	Lake Tarpon	Tarpon Springs, Unincorporated	Long-term trend analyses indicate generally stable water quality, but TN, TSS, and turbidity were increasing. In 2024, TN, TP, DO, and Chl-a all met criteria, and the LVI passed. The lake is currently impaired for biology based on vegetation surveys as well as nutrients due to Chl-a. The County has completed a water quality study for the lake which suggests that the default Chl-a criteria may not be appropriate for this lake. The County has developed site-specific alternative criteria (SSAC), which have been submitted to FDEP for consideration.
SA/SB	Lake Seminole	Seminole, Unincorporated	Long-term trend analyses indicate significantly decreasing TN, TP, Chl-a, and TSS but worsening DO in the northern (SA) portion of the lake. The southern lobe (SB) shows no trend for any parameter. The lake is impaired for TN, TP, and Chl-a. In 2024, Chl-a and TN were elevated in the south and Chl-a was elevated in the north. The 2024 LVI score did not attain the criterion.

Basin/Stratum Number	Basin Name	Municipality % of Area	Analysis
W1	St Joseph Sound	Dunedin, Tarpon Springs, Unincorporated	Long-term trend analyses indicate decreasing TP and Chl-a. This stratum is currently impaired for nutrients (TN), but all nutrients met criteria in 2024.
W2	Clearwater Harbor North	Clearwater Dunedin	Long-term trend analyses indicate decreasing Chl-a. This stratum is currently impaired for nutrients (TN), but all nutrients met criteria in 2024.
W3	Clearwater Harbor South	Belleair, Belleair Beach, Belleair Bluffs, Clearwater, Indian Rocks Beach, Largo, Unincorporated	Long-term trend analyses indicate decreasing TP. This stratum is currently impaired for nutrients (TN), but all nutrients met criteria in 2024.
W4	The Narrows	N Redington Beach, Madeira Beach, Redington Beach, Redington Shores, Unincorporated	Long-term trend analyses indicate decreasing TP. This segment represents a very constricted area of the Intracoastal, which has very poor flushing. This waterbody is currently impaired for nutrients (Chl-a), but all nutrients met criteria in 2024..
W5	Long Bayou / Cross Bayou	Seminole, Unincorporated	Long-term trend analyses indicate worsening DO but no trend in other parameters. This waterbody is currently impaired for nutrients (TN and Chl-a), and both TN and Chl-a were above criteria in 2024.
W6	Boca Ciega Bay (North)	Madeira Beach, Treasure Island, Unincorporated	Long-term trend analyses indicate decreasing TP and Chl-a. This stratum is currently impaired for nutrients (Chl-a), but all nutrients met criteria in 2024.
W7	Boca Ciega Bay (Central)	Gulfport, St Pete Beach, South Pasadena, Treasure Island, Unincorporated	Long-term trend analyses indicate decreasing Chl-a over the past 10 years. All nutrients met criteria in 2024.
W8	Boca Ciega Bay (South)	St Pete Beach, Unincorporated	Long-term trend analyses indicate decreasing TP and Chl-a. All nutrients met criteria in 2024.

4.0 Conclusion

4.1 - Program Strengths

Pinellas County is committed to reducing stormwater pollution from its municipal separate storm sewer system. The Pinellas County Surface Water Management Plan (SWMP) has been in effect since the early 1990's, prior to the inception of the first Non-Point Source Discharge Elimination System (NPDES) Permit in 1997. The SWMP has historically included a Capital Improvement Program funded by the Penny for Pinellas (one percent sales tax) since 1990. The Capital Improvement Program has funded many drainage and water quality projects over the years.

Additionally, two Bacteria Pollution Control Plans, two Total Maximum Daily Load (TMDL) Implementation Plans, four 4e ongoing Restoration Activities Plans, and Reasonable Assurance Plans (RAPs) for Lake Seminole and Tampa Bay lay out recommended activities which should reduce nutrient loads into County waterbodies. As the recommendations in these documents continue to be implemented and further studies help guide necessary adaptations to best management practices and target hotspots to address, water quality should improve.

Watershed management plans have been created for most basins in the County, and many of the older plans are now being updated. A nitrogen source tracking study is in progress to examine nutrient sources in St Joseph Sound and Clearwater Harbor for the next two years. These studies will guide implementation of projects to reduce nutrient loadings in a targeted way.

4.2 - TMDL Implementation Updates

The McKay Creek watershed was the County's highest priority TMDL watershed for the 2018 - 2023 permit cycle. Previous focal TMDL watersheds were Joe's Creek and Long Branch Creek. Each of these watersheds have a TMDL Implementation Plan, and Joe's and Long Branch also have Bacteria Pollution Control Plans, written during the last permit cycle. Tables 9, 10, and 11 describe some of the activities that have been implemented or are ongoing to address the Joe's Creek, Long Branch Creek, and McKay Creek TMDLs.

Table 9. Status of TMDL implementation activities for Joes Creek in 2024.

Partner	BMP Type	Progress	Load Reduction Estimate
Pinellas County	Stormwater pipe/structure cleanouts	Repaired, replaced, cleaned out 8,148 linear feet of storm pipes and drains, removed 185 cy of debris; inspected 280 structures and cleaned out 16 structures, removed 11 cy debris; repaired/replaced 28 structures	103 kg TN; 63 kg TP
	Stormwater pond maintenance	Maintained 34 stormwater facilities covering 836 acres; removed 130 cy debris	92 kg TN; 56 kg TP
	Ditch maintenance	Inspected 38,991 linear feet of ditches, sprayed vegetation and cleaned out 474,300 linear feet of ditches (manual and mechanical) and removed 2,030 cy of debris and trash	53 kg TN; 33 kg TP
	Street sweeping	A total of 630 miles swept; 246 cy of debris removed	144 kg TN; 92 kg TP
	Stream Restoration Project (4.6 miles)	In design.	
	Phase 2 Stormwater and Habitat Improvements Project	In design.	
	Fertilizer/landscape management	Ongoing inspections and enforcement of fertilizer ordinance	
	Outreach/education	Ongoing attendance at public events and schools	
St Petersburg	See St Petersburg's report		
Kenneth City	See Kenneth City's report		

Table 10. Status of TMDL implementation activities for Long Branch Creek in 2024.

Partner	BMP Type	Progress	Load Reduction Estimate
Pinellas County	Ditch maintenance	Cleaned out 19,763 linear feet of ditches (manual and mechanical) and removed 578 cy of debris and trash	408 kg TN; 251 kg TP
	Stormwater pipe/structure cleanouts	Repaired, replaced, cleaned out 3,509 linear feet of storm pipes and drains, removed 20 cy of debris; cleaned out 307 structures and repaired/replaced 6 structures, removed 118 cy of material	97 kg TN; 60 kg TP
	Stormwater pond maintenance	Maintained 5 stormwater facilities covering 160 acres; removed 15 cy of debris	11 kg TN; 7 kg TP
	Street sweeping	Sweeping arterial roads 12 times a year and local roads 10 times a year; total of 179 miles swept and removed 43 cubic yards of material	25 kg TP, 16 kg TP
	Fertilizer/landscape management	Ongoing inspections and enforcement of fertilizer ordinance	
	Outreach/education	Ongoing attendance at public events and schools	
	New projects	TBD after new bridge constructed at Whitney Rd.	
Largo	See Largo's report		

Table 11. Status of TMDL implementation activities for McKay Creek in 2024.

Partner	BMP Type	Progress	Load Reduction Estimate
Pinellas County	Ditch maintenance	Inspected 41,091 linear feet; cleaned out 5,887 linear feet of ditches (manual and mechanical) and removed 8,743 cubic yards of debris and trash	6,773 kg TN; 3,791 kg TP
	Stormwater pipe/structure cleanouts	Inspected 145 pipe locations, cleaned out 4,328 linear feet of storm pipes, and removed 23 cubic yards of material; inspected 160 structures, cleaned out 4 structures and repaired 3 structures; removed 18 cubic yards of material	29 kg TN; 18 kg TP
	Street sweeping	A total of 647 miles swept and removed 235 cubic yards of material	138 kg TN; 88 kg TP
	Fertilizer/landscape management	Ongoing inspections and enforcement of fertilizer ordinance; proactive landscape management inspections	
	Outreach/education	Ongoing attendance at public events and schools	
	New projects	6 water quality projects are being considered for construction in the next 10 years, mostly focused on stormwater pond expansion	
Largo	See Largo's report		
Seminole	See Seminole's report		
Belleair Bluffs	See Belleair Bluffs' report		

4.2 - Summary

Long-term analysis of the last ten years of Pinellas County data indicates that the significant increase in TN concentration in County coastal waters observed over the last five years was halted in 2023, and concentrations in the past two years have returned to lower levels more in line with historical results. The coastal increases from 2017 through 2022 could have been influenced by red tide and other events that occurred in the past few years. The tropical storm and two hurricanes that impacted the County in 2024 did not seem to significantly affect the results in the last months of 2024, at least in the short-term, although many streams experienced erosion and damage to channels from debris which could have an impact on water quality in 2025.

Pinellas County will continue to monitor its waters regularly to ensure identification of potential risks to the environment and to track progress toward maintaining and improving the health of the streams, lakes, and bays. The County is committed to continued and increased implementation of structural and non-structural BMPs as part of the Pinellas County SWMP in coming years.

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Appendices

Appendix 1- 2024 Summary Statistics for Monitoring Sites

Summary statistics for fixed land run sites for 2024. The first number in each column is the mean and is followed by the median in the next row. Additionally, geometric means are given for TN and TP after the semicolon on the top row for each site. "n" indicates the number of samples collected in 2024 for that site.

Site	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% saturation)	Total Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate+ Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)	Chl-a (µg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	Enterococci (MPN/100 mL)	E. coli (MPN/100 mL)
01-01	5.111	69.800	0.667; 0.627	0.634	0.044	0.033	0.046; 0.032	0.020	3.314	3.571	1.600	54.000	NA
(n=7)	4.950	72.700	0.570	0.550	0.030	0.020	0.020	0.010	2.600	4.000	1.500	62.500	
01-09	3.333	39.892	1.373; 1.335	1.272	0.160	0.102	0.172; 0.166	0.095	4.167	3.833	2.350	NA	378.200
(n=6)	3.455	42.450	1.310	1.225	0.185	0.110	0.185	0.090	2.400	4.000	2.700		346.000
01-12	5.397	72.036	0.687; 0.640	0.654	0.050	0.033	0.056; 0.043	0.024	3.986	4.000	2.057	74.500	NA
(n=7)	5.480	71.950	0.540	0.530	0.070	0.020	0.040	0.010	2.400	4.000	2.000	52.000	
02-02	4.696	57.300	1.771; 1.727	1.646	0.144	0.126	0.383; 0.361	0.221	37.629	12.571	6.571	4456.833	NA
(n=7)	3.910	51.900	1.600	1.570	0.160	0.030	0.300	0.190	30.700	8.000	4.800	2115.000	
02-09	4.424	54.720	3.384; 3.269	2.088	0.398	1.296	0.902; 0.871	0.734	24.080	4.200	2.580	NA	435.000
(n=5)	4.610	59.000	3.500	2.190	0.370	1.230	0.900	0.730	17.000	4.000	2.200		396.000
04-02	2.533	28.567	1.137; 1.126	1.120	0.080	0.017	0.057; 0.055	0.020	1.367	1.333	1.267	NA	463.000
(n=3)	1.400	17.700	1.120	1.100	0.100	0.020	0.060	0.020	1.100	1.000	1.300		463.000
04-03	3.393	39.100	1.213; 1.199	1.197	0.035	0.017	0.088; 0.070	0.030	2.900	3.167	3.117	NA	355.400
(n=6)	3.050	37.800	1.195	1.185	0.015	0.015	0.065	0.020	2.200	1.500	1.600		132.000
04-04	2.780	33.200	1.508; 1.495	1.456	0.106	0.052	0.108; 0.102	0.040	5.480	3.200	2.780	NA	1410.750
(n=5)	2.770	34.200	1.440	1.410	0.060	0.030	0.110	0.040	2.700	3.000	2.000		1511.500
05-06	5.123	59.633	1.832; 1.756	1.800	0.160	0.032	0.327; 0.279	0.095	15.800	21.000	8.750	NA	240.500
(n=6)	4.635	57.650	1.755	1.745	0.135	0.030	0.260	0.040	5.000	12.000	6.300		124.000
06-03	7.179	80.714	0.754; 0.735	0.640	0.021	0.114	0.120; 0.112	0.104	2.957	8.000	2.357	NA	592.857
(n=7)	6.760	84.300	0.780	0.550	0.010	0.100	0.130	0.120	1.500	4.000	1.900		450.000
06-06	5.214	61.471	1.019; 1.004	0.951	0.033	0.067	0.073; 0.062	0.014	14.686	3.714	2.114	NA	59.429
(n=7)	4.980	66.650	1.030	0.880	0.010	0.010	0.050	0.010	15.200	4.000	1.900		45.000
08-03	6.861	80.650	1.232; 1.195	0.755	0.029	0.477	0.169; 0.164	0.138	1.350	1.375	1.394	NA	875.250
(n=8)	6.960	83.400	1.215	0.795	0.025	0.405	0.175	0.145	1.500	1.000	1.150		849.000
09-02	4.415	53.743	1.116; 1.105	0.989	0.136	0.127	0.220; 0.208	0.129	16.271	5.857	4.514	5259.143	NA
(n=7)	5.050	57.700	1.080	1.000	0.120	0.080	0.200	0.110	16.600	5.000	4.300	706.000	
10-02	6.522	77.537	2.044; 1.856	1.126	0.354	0.917	0.198; 0.192	0.144	3.312	4.125	2.712	NA	913.125
(n=8)	6.325	79.650	1.730	0.935	0.225	0.755	0.190	0.130	2.100	2.500	2.450		819.500
10-06	7.250	80.450	1.083; 1.066	0.795	0.082	0.287	0.145; 0.135	0.095	4.300	3.500	2.900	NA	870.750
(n=4)	7.150	81.850	1.010	0.730	0.065	0.285	0.115	0.080	2.400	3.000	2.350		421.500
11-05	7.323	86.700	0.953; 0.945	0.752	0.018	0.202	0.187; 0.180	0.125	2.300	3.833	2.667	NA	915.167
(n=6)	7.125	89.000	0.930	0.735	0.015	0.205	0.195	0.140	2.100	3.500	2.700		547.500
12-02	5.908	69.760	0.900; 0.884	0.784	0.064	0.116	0.314; 0.312	0.202	8.840	8.600	4.160	1097.000	NA
(n=5)	5.590	71.700	0.910	0.780	0.050	0.110	0.300	0.200	7.100	7.000	4.400	1110.000	
12-06	8.055	86.050	0.625; 0.566	0.345	0.030	0.280	0.090; 0.089	0.055	0.500	1.000	1.400	NA	819.000
(n=2)	8.055	86.050	0.625	0.345	0.030	0.280	0.090	0.055	0.500	1.000	1.400		819.000

Site	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% saturation)	Total Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate+ Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)	Chl-a (µg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	Enterococci (MPN/100 mL)	E. coli (MPN/100 mL)
13-05	5.801	67.329	0.863; 0.857	0.736	0.043	0.127	0.137; 0.125	0.081	12.957	8.714	3.186	NA	281.714
(n=7)	4.880	63.200	0.890	0.770	0.040	0.140	0.150	0.090	8.700	5.000	3.200		134.000
14-02	6.418	76.656	0.815; 0.814	0.805	0.040	0.010	0.014; 0.013	0.010	5.487	1.750	1.231	NA	21.375
(n=8)	7.000	80.375	0.825	0.815	0.010	0.010	0.010	0.010	6.450	2.000	1.200		16.500
14-07	6.990	81.737	1.076; 1.066	1.050	0.013	0.026	0.187; 0.186	0.080	36.400	11.000	6.071	NA	424.429
(n=8)	6.607	85.075	1.100	1.090	0.010	0.010	0.180	0.080	40.400	11.000	6.400		26.000
14-10	6.000	69.457	0.916; 0.850	0.820	0.071	0.096	0.173; 0.149	0.110	16.171	5.857	2.907	NA	485.571
(n=7)	6.770	82.000	0.780	0.700	0.040	0.120	0.160	0.100	7.600	4.000	1.500		52.000
15-04	4.126	49.125	1.331; 1.300	1.119	0.141	0.212	0.347; 0.317	0.225	6.450	11.000	5.013	NA	1675.250
(n=8)	4.270	52.350	1.300	1.035	0.155	0.225	0.285	0.155	3.200	8.000	4.900		382.500
17-01	7.374	87.150	1.345; 1.328	0.710	0.052	0.635	0.297; 0.289	0.254	3.150	1.375	1.650	NA	798.857
(n=8)	6.980	83.550	1.350	0.720	0.060	0.660	0.285	0.245	1.500	1.000	1.250		526.000
17-03	5.428	64.537	1.299; 1.275	0.864	0.133	0.435	0.304; 0.290	0.240	8.113	2.125	1.906	NA	2684.286
(n=8)	5.510	64.500	1.255	0.865	0.145	0.380	0.300	0.230	3.950	1.500	1.500		1860.000
18-06	4.647	55.388	1.040; 1.018	0.884	0.089	0.156	0.231; 0.210	0.161	12.312	4.125	2.425	NA	1822.875
(n=8)	5.095	58.050	1.045	0.795	0.080	0.160	0.160	0.115	7.950	3.500	1.850		491.000
19-02	5.336	69.706	0.771; 0.740	0.733	0.021	0.039	0.141; 0.126	0.058	26.062	9.125	3.575	913.000	NA
(n=8)	4.790	70.450	0.665	0.655	0.010	0.010	0.115	0.035	14.650	7.000	3.200	86.000	
19-08	6.959	85.800	1.676; 1.529	0.569	0.036	1.107	0.173; 0.171	0.136	3.188	2.500	2.244	NA	489.375
(n=8)	6.745	86.200	1.805	0.545	0.035	1.170	0.170	0.135	1.100	2.000	1.250		425.500
19-10	4.452	52.800	0.942; 0.926	0.725	0.120	0.217	0.277; 0.270	0.125	2.075	3.625	5.112	NA	1512.125
(n=8)	4.275	53.250	0.925	0.665	0.100	0.250	0.270	0.130	1.450	3.000	5.100		421.500
19-12	6.600	79.312	0.890; 0.849	0.619	0.079	0.271	0.219; 0.207	0.169	4.200	3.125	2.169	NA	1727.125
(n=8)	6.490	79.200	0.795	0.610	0.070	0.245	0.185	0.140	3.150	3.000	2.400		398.000
19-13	5.699	69.713	0.993; 0.987	0.833	0.110	0.160	0.128; 0.123	0.069	13.750	4.375	2.212	NA	3406.250
(n=8)	5.365	67.900	1.005	0.815	0.090	0.135	0.120	0.060	5.450	4.000	2.100		932.000
22-01	2.863	33.571	0.983; 0.944	0.760	0.149	0.223	0.159; 0.144	0.097	1.200	1.286	2.143	2057.429	NA
(n=7)	2.620	31.700	1.060	0.720	0.050	0.240	0.130	0.070	1.000	1.000	2.100	2190.000	
22-12	2.024	24.925	1.201; 1.123	1.174	0.415	0.028	0.244; 0.221	0.122	6.475	6.500	5.425	NA	563.125
(n=8)	1.620	20.350	1.340	1.320	0.475	0.015	0.255	0.110	4.500	5.500	4.750		409.000
22-16	1.845	21.275	1.026; 0.968	0.930	0.293	0.096	0.191; 0.169	0.091	2.525	4.125	3.450	NA	490.500
(n=8)	1.665	22.000	1.175	0.955	0.200	0.055	0.170	0.055	1.750	3.500	3.200		412.500
24-01	4.478	57.114	1.013; 1.001	0.870	0.077	0.143	0.151; 0.144	0.081	16.786	6.571	3.400	986.857	NA
(n=7)	4.130	51.850	0.970	0.810	0.050	0.160	0.140	0.080	16.500	5.000	3.200	160.000	
24-02	4.136	54.600	1.154; 1.115	0.819	0.116	0.335	0.125; 0.118	0.073	11.450	5.625	2.987	3323.125	NA
(n=8)	3.953	51.300	1.170	0.795	0.130	0.235	0.120	0.075	4.700	5.000	3.050	285.500	

Site	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% saturation)	Total Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate+ Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)	Chl-a (µg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	Enterococci (MPN/100 mL)	E. coli (MPN/100 mL)
24-07	4.124	46.840	1.380; 1.370	1.222	0.194	0.158	0.176; 0.158	0.098	43.660	7.400	5.220	1514.400	NA
(n=5)	3.690	48.600	1.300	1.110	0.140	0.150	0.170	0.110	11.700	5.000	3.800	545.000	
25-02	5.802	70.121	1.035; 0.973	0.905	0.022	0.130	0.095; 0.086	0.028	28.033	6.667	2.500	NA	94.167
(n=7)	5.860	73.450	1.175	0.995	0.015	0.145	0.095	0.025	30.500	6.000	2.300		100.500
25-07	4.425	54.963	0.917; 0.908	0.890	0.107	0.027	0.090; 0.084	0.041	10.457	2.571	1.879	NA	11.571
(n=8)	3.850	48.900	0.960	0.910	0.100	0.020	0.080	0.030	13.600	3.000	1.900		13.000
27-01	4.568	64.800	0.877; 0.842	0.713	0.067	0.164	0.133; 0.129	0.096	9.557	8.143	3.929	601.714	NA
(n=7)	4.435	59.100	0.830	0.720	0.060	0.060	0.140	0.110	7.100	6.000	3.600	441.000	NA
27-08	6.751	78.525	1.155; 1.130	0.627	0.030	0.527	0.120; 0.109	0.089	0.925	1.625	1.363	NA	1757.143
(n=8)	6.485	80.300	1.150	0.615	0.025	0.525	0.100	0.070	0.800	1.500	1.200		1340.000
27-10	5.197	66.320	0.642; 0.638	0.628	0.018	0.014	0.024; 0.022	0.012	7.500	1.800	1.130	NA	4.200
(n=6)	5.270	72.100	0.670	0.650	0.010	0.010	0.020	0.010	4.500	2.000	1.200		3.000
27-11	8.964	107.888	0.860; 0.754	0.699	0.055	0.161	0.241; 0.232	0.166	7.150	8.750	3.625	NA	1257.571
(n=8)	9.375	105.200	0.720	0.450	0.020	0.170	0.265	0.175	2.450	2.000	1.175		759.000
27-14	5.374	65.714	0.930; 0.917	0.734	0.077	0.196	0.214; 0.206	0.140	11.329	6.857	3.900	422.000	NA
(n=7)	4.910	63.400	0.870	0.640	0.050	0.150	0.190	0.140	5.700	3.000	3.000	422.000	
29-11	8.566	102.062	0.839; 0.807	0.767	0.056	0.071	0.089; 0.071	0.037	2.038	4.125	2.450	NA	629.875
(n=8)	8.650	90.350	0.915	0.795	0.035	0.015	0.075	0.035	1.500	2.000	2.300		383.000
35-01	6.276	74.880	0.888; 0.885	0.792	0.068	0.096	0.082; 0.078	0.028	8.560	7.200	5.620	NA	272.600
(n=5)	5.550	67.300	0.910	0.790	0.040	0.090	0.060	0.010	7.100	5.000	4.500		250.000
35-04	5.918	69.800	0.888; 0.851	0.756	0.041	0.131	0.107; 0.085	0.042	14.575	3.750	2.638	NA	807.750
(n=8)	5.710	71.250	0.845	0.685	0.030	0.110	0.070	0.040	3.300	2.500	2.050		437.500
35-10	5.004	59.650	0.843; 0.840	0.666	0.091	0.176	0.079; 0.077	0.021	8.150	3.375	3.075	NA	217.000
(n=8)	5.405	65.500	0.855	0.680	0.095	0.140	0.075	0.020	7.400	2.500	3.200		169.500
35-12	3.272	38.225	0.891; 0.870	0.652	0.075	0.239	0.089; 0.080	0.039	4.088	3.250	3.388	NA	314.375
(n=8)	3.835	46.700	0.855	0.615	0.055	0.270	0.075	0.035	3.200	3.000	2.700		233.000
53-06	2.982	37.281	4.062; 4.026	0.274	0.030	3.789	0.089; 0.088	0.075	2.587	1.375	0.644	50.000	NA
(n=8)	2.600	32.850	3.905	0.280	0.015	3.625	0.090	0.075	1.800	1.000	0.625	52.000	

Summary statistics for coastal strata for 2023. The first number in each column is the mean and is followed by the median in the next row. Additionally, geometric means are given for TN and TP after the semicolon on the top row for each stratum. "n" indicates the number of samples collected in 2024 for that stratum.

Site	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% saturation)	Total Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ammonia (mg/L)	Nitrate+ Nitrite (mg/L)	Total Phosphorus (mg/L)	Ortho-phosphate (mg/L)	Chl-a (µg/L)	Total Suspended Solids (mg/L)	Turbidity (NTU)	Enterococci (MPN/100 mL)	E. coli (MPN/100 mL)
E1	6.560	88.779	0.639; 0.622	0.629	0.017	0.010	0.066; 0.059	0.023	8.659	8.875	2.945	NA	NA
(n=32)	6.381	89.643	0.573	0.562	0.010	0.010	0.052	0.018	5.850	9.500	2.850		
E2	6.233	83.574	0.646; 0.641	0.636	0.015	0.010	0.071; 0.062	0.028	8.547	8.938	3.072	NA	NA
(n=32)	6.046	83.737	0.646	0.636	0.011	0.010	0.075	0.019	6.675	8.125	2.487		
E3	7.021	96.759	0.551; 0.537	0.540	0.032	0.010	0.048; 0.044	0.018	5.385	8.594	2.067	NA	NA
(n=32)	6.861	97.621	0.519	0.509	0.012	0.010	0.042	0.015	3.714	8.000	1.987		
E4	6.533	89.793	0.530; 0.524	0.520	0.012	0.010	0.048; 0.043	0.020	5.134	9.625	1.906	NA	NA
(n=32)	6.208	87.475	0.538	0.526	0.011	0.010	0.049	0.016	4.737	8.500	1.850		
E5	7.121	101.442	0.459; 0.456	0.449	0.016	0.010	0.057	0.036	4.034	5.469	1.183	NA	NA
(n=32)	6.282	94.787	0.465	0.454	0.014	0.010	0.057	0.035	3.487	4.750	1.175		
LT	7.050	84.900	1.236; 1.224	1.188	0.018	0.048	0.033; 0.033	0.010	25.746	9.719	4.111	NA	4.385
(n=31)	7.043	85.638	1.225	1.179	0.012	0.010	0.034	0.010	28.113	11.000	4.121		2.000
RB	6.249	88.038	0.550; 0.544	0.540	0.015	0.010	0.081; 0.033	0.051	5.853	7.312	1.667	NA	NA
(n=32)	6.707	91.673	0.540	0.530	0.011	0.010	0.075	0.052	5.600	5.625	1.544		
SA	7.209	90.762	1.455; 1.436	1.445	0.012	0.010	0.053; 0.051	0.010	33.792	16.250	7.850	NA	29.833
(n=12)	7.740	94.525	1.475	1.465	0.010	0.010	0.050	0.010	37.075	16.500	7.350		18.750
SB	6.809	85.485	1.772; 1.743	1.748	0.012	0.010	0.060; 0.059	0.010	40.775	19.500	9.250	NA	59.000
(n=12)	7.535	97.700	1.705	1.695	0.010	0.010	0.058	0.010	39.350	19.000	9.700		45.000
W1	6.691	96.066	0.418; 0.415	0.407	0.015	0.011	0.015; 0.014	0.010	1.914	4.615	1.684	NA	NA
(n=31)	6.472	99.062	0.406	0.396	0.010	0.010	0.011	0.010	1.587	4.500	1.469		
W2	6.553	95.129	0.441; 0.436	0.431	0.014	0.010	0.016; 0.014	0.010	3.909	8.469	2.788	NA	NA
(n=32)	6.492	98.127	0.429	0.419	0.010	0.010	0.011	0.010	3.250	7.500	2.162		
W3	6.550	95.594	0.442; 0.435	0.432	0.014	0.010	0.019; 0.018	0.010	5.531	10.625	3.012	NA	NA
(n=32)	6.174	96.912	0.460	0.450	0.012	0.010	0.018	0.010	5.213	9.500	3.000		
W4	6.212	90.104	0.516; 0.509	0.506	0.016	0.010	0.042; 0.041	0.010	7.825	14.786	4.625	NA	NA
(n=32)	5.450	90.271	0.522	0.512	0.010	0.010	0.040	0.010	8.325	9.000	4.325		
W5	5.577	73.338	0.989; 0.936	0.870	0.074	0.119	0.116; 0.111	0.050	13.078	10.375	4.260	NA	NA
(n=31)	5.891	77.663	0.870	0.824	0.049	0.080	0.101	0.045	14.025	11.375	3.888		
W6	5.979	86.594	0.449; 0.445	0.439	0.017	0.010	0.027; 0.026	0.010	5.654	11.964	4.043	NA	NA
(n=32)	5.459	90.043	0.463	0.453	0.010	0.010	0.025	0.010	5.725	10.000	3.650		
W7	6.866	99.417	0.438; 0.425	0.428	0.012	0.010	0.025; 0.023	0.010	5.681	7.500	2.517	NA	NA
(n=32)	6.749	100.912	0.479	0.469	0.010	0.010	0.026	0.010	4.125	7.000	2.263		
W8	6.682	96.347	0.416; 0.407	0.406	0.012	0.010	0.032; 0.030	0.015	3.488	5.844	1.817	NA	NA
(n=32)	6.774	97.250	0.431	0.421	0.010	0.010	0.031	0.012	2.487	5.250	1.794		