Marco Island, Florida

2020

Water Quality Status Report

3.18.21

Eugene Wordehoff

eugene_wordehoff@yahoo.com

Water Quality Status Report

Table of Contents

1. Summary
2. Water Quality Trends
3. Descriptive Statistics - TN
4. Definitions
5. Water Sample Data
6. Sampling Concepts

1. Summary

Key Findings

- Total Nitrogen (TN) for Marco Island exceeds FDEP standard for the full year 2020
  - Marco TN = 0.57 mg/L as AGM
  - Rookery Bay TN Standard = 0.30 mg/L as AGM

- Other impairment tendencies are showing up
  - Total Phosphorus (TP) exceeded FDEP standard during five (5) months in 2020
  - PH is trending to upper limit of 8.5
  - Chlorophyll-a exceeded FDEP standard (1) month in 2020

- Key sample results changed significantly from IIIQ20 to IVQ20, coincident with lab change
  - 40% reduction in TN
  - 43% reduction in TKN
  - 60% reduction in TP
  - 35% reduction in DO SAT %

- (32) statistical outliers distort analytical results

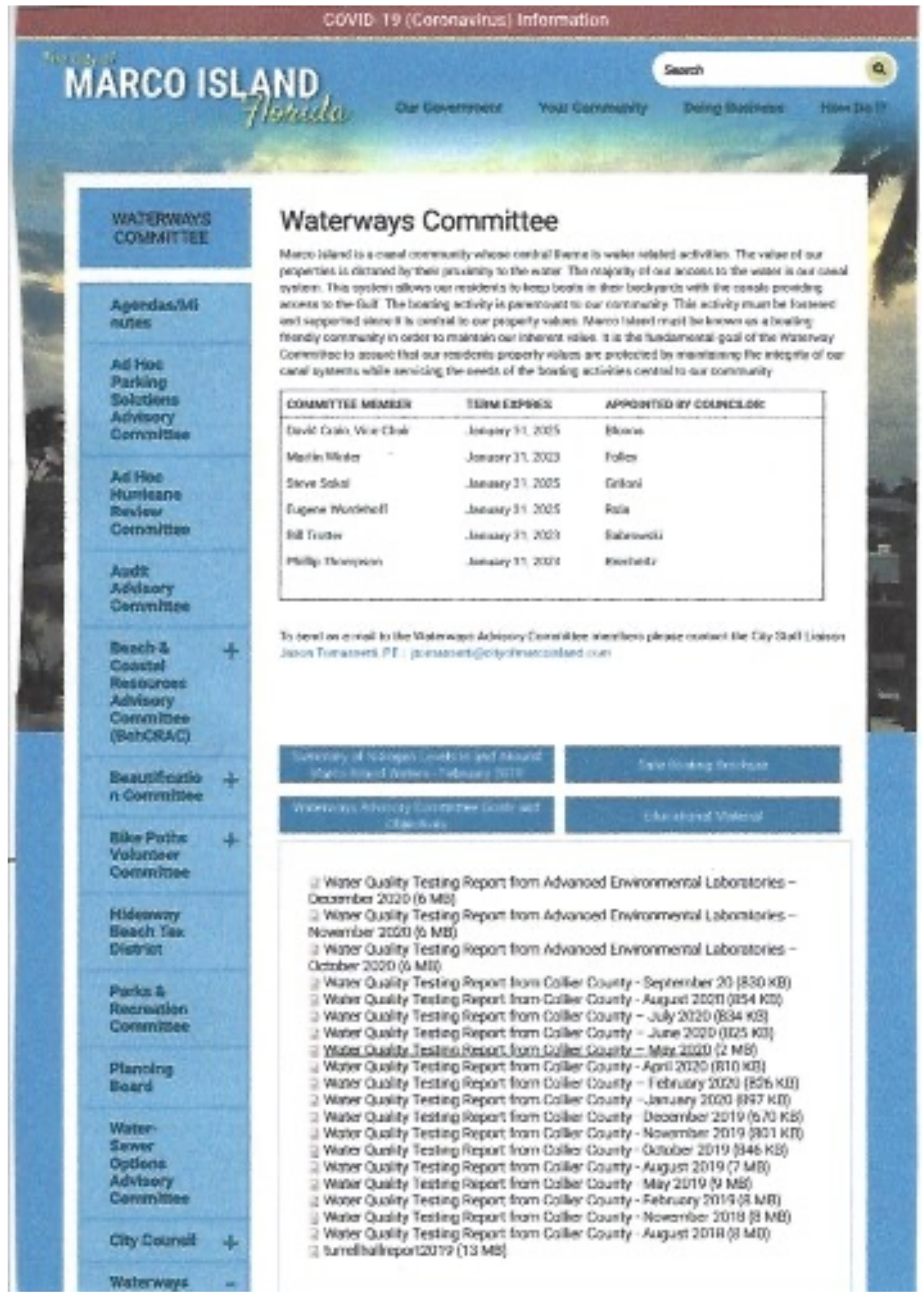
2020 Water Quality Status

Parameter	TN	TP	Chlorophyll a
FDEP NNC Standard	< 0.3	< 0.046	< 4.9
Units	mg/L as AGM	mg/L as AGM	ug/Las AGM
Marco Island	0.57	0.033	4.3
Basin 1	0.55	0.022	3.4
Basin 2	0.52	0.029	3.5
Basin 3	0.57	0.026	4.6
Basin 4	0.63	0.049	4.6
Basin 5	0.61	0.025	3.3

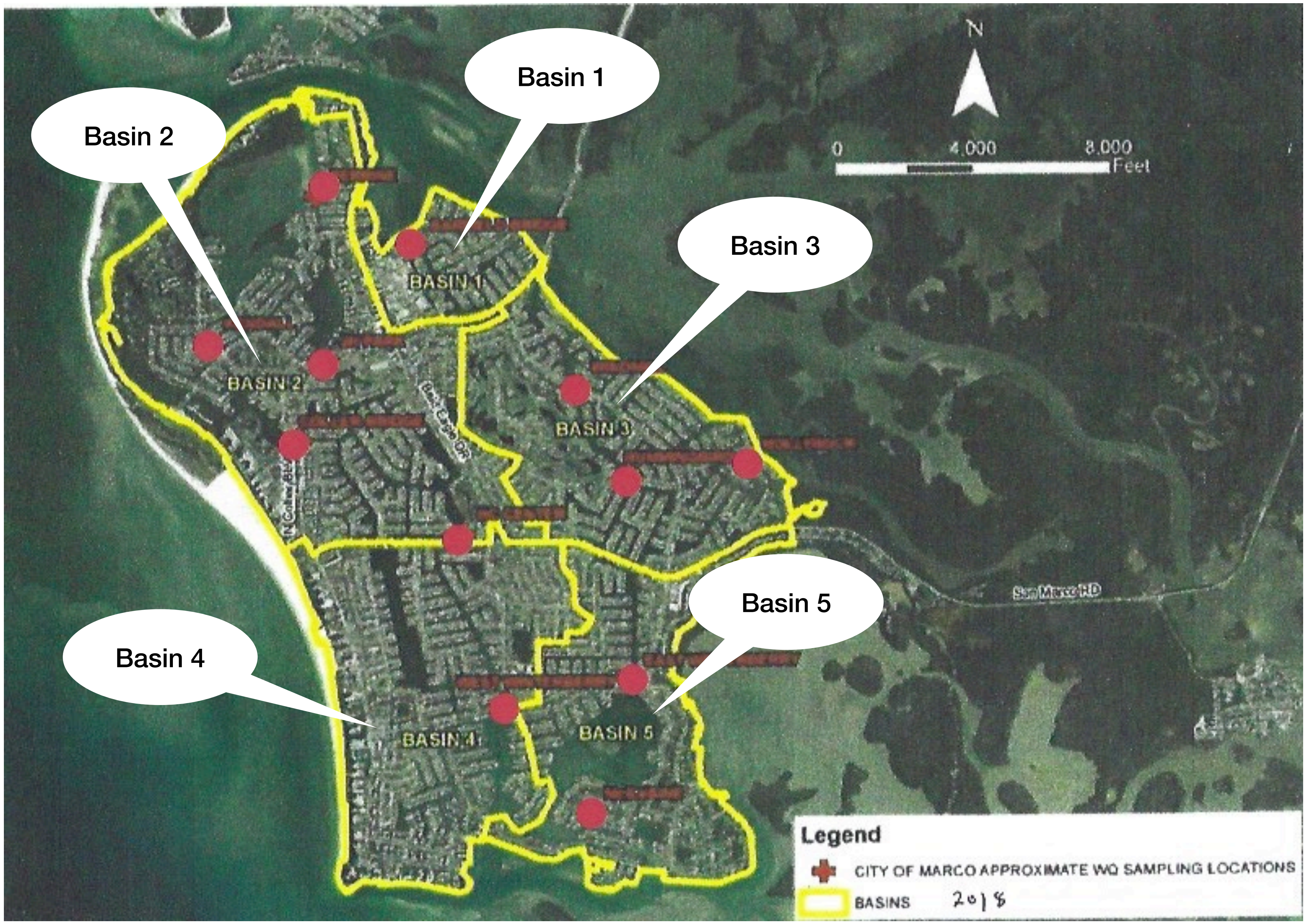
AGM = ANNUAL GEOMETRIC MEAN

Marco Island Total Nitrogen (TN) exceeds FDEP standard for 2020

Data Source: City of Marco Island



(14) sampling locations across (5) basins



Source: Turrell, Hall & Associates, 2019, Figure 4: Water Quality Monitoring Stations

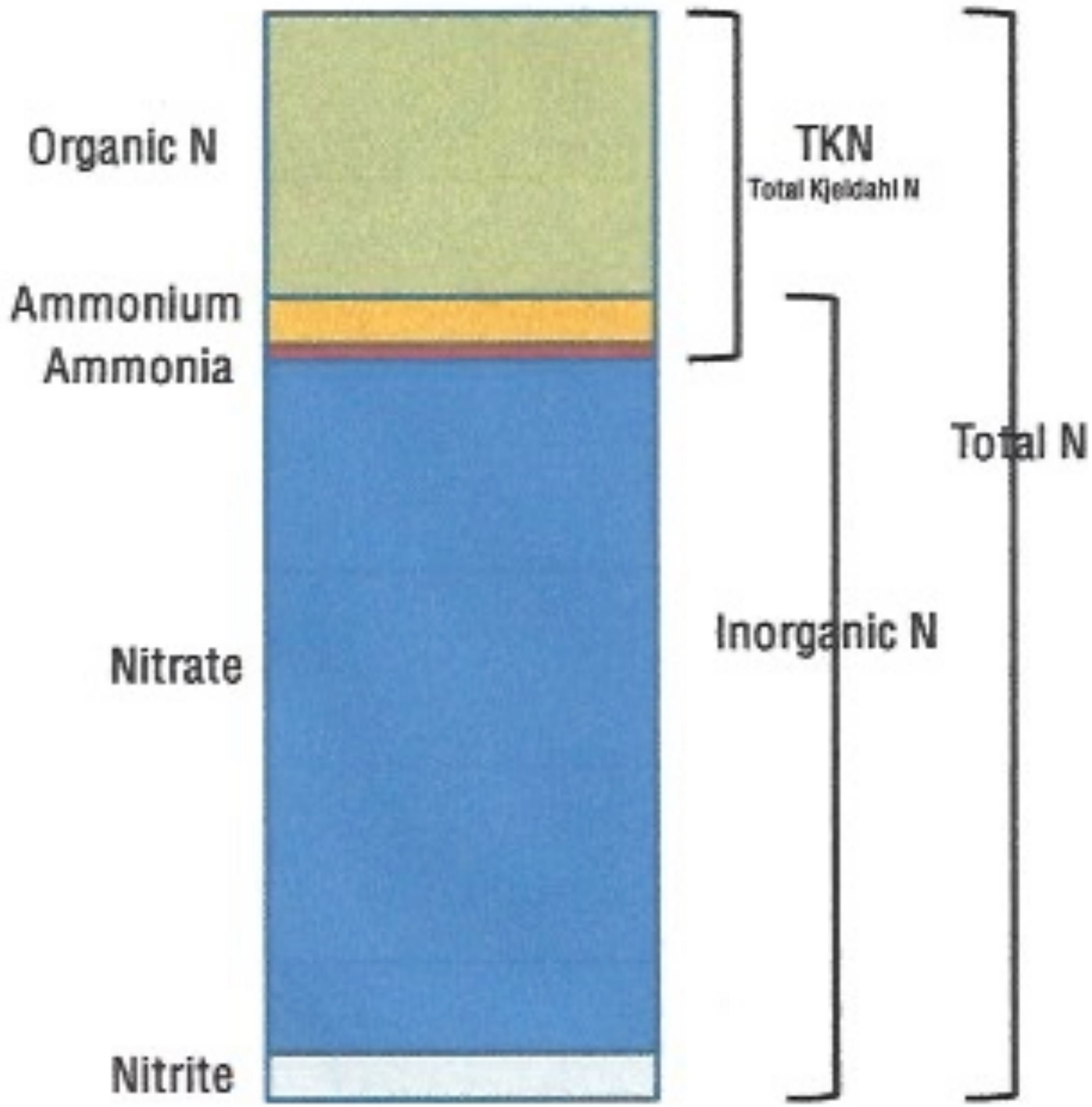
(17) Parameters are measured

Parameter	Why measured
Total Nitrogen	High levels of TN lead to low levels of DO and fish mortality
Total Phosphorus	High levels to TP lead to eutrophication
Chlorophyll a	Promotes growth of algae
DO SAT %	Low oxygen levels lead to fish mortality
DO	Low oxygen levels lead to fish mortality
Enterococcus	Disease causing bacteria
PH	Fish mortality
Turbidity	Cause lakes to fill in
TKN	Indicative of pollution
Pheophytin	
Conductivity	Indirect measure of water quality
Secchi Depth	Reflection of overall water quality
Salinity	High salinity is unsuitable for shellfish
Temperature	High temperature less to low oxygen solubility and fish mortality
Nitrate	“Blue Baby” syndrome
N+N	Combination of Nitrate and Nitrite
Nitrite	Indicates fertilizer and sewage pollution

2. Water Quality Trends

NITROGEN

The relationship between TN and TKN

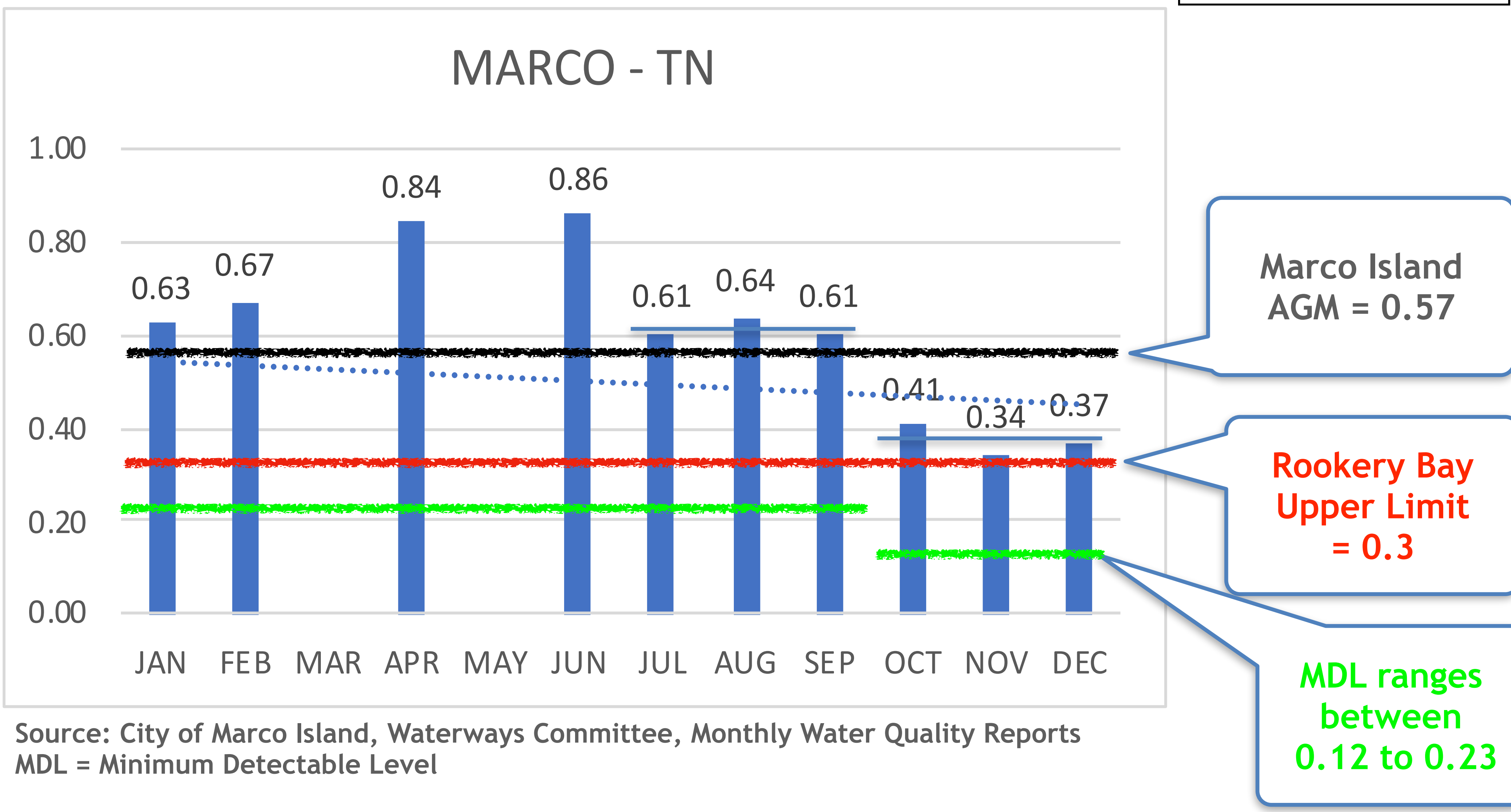


Total Nitrogen (TN)

Total Nitrogen (TN) is the sum of nitrate-nitrogen (NO3-N), nitrite-nitrogen (NO2-N), ammonia-nitrogen (NH3-N) and organically bonded nitrogen

TN = TKN + NO2 + NO3

Excess nitrogen may lead to low levels of dissolved oxygen and negatively alter plant life and organisms

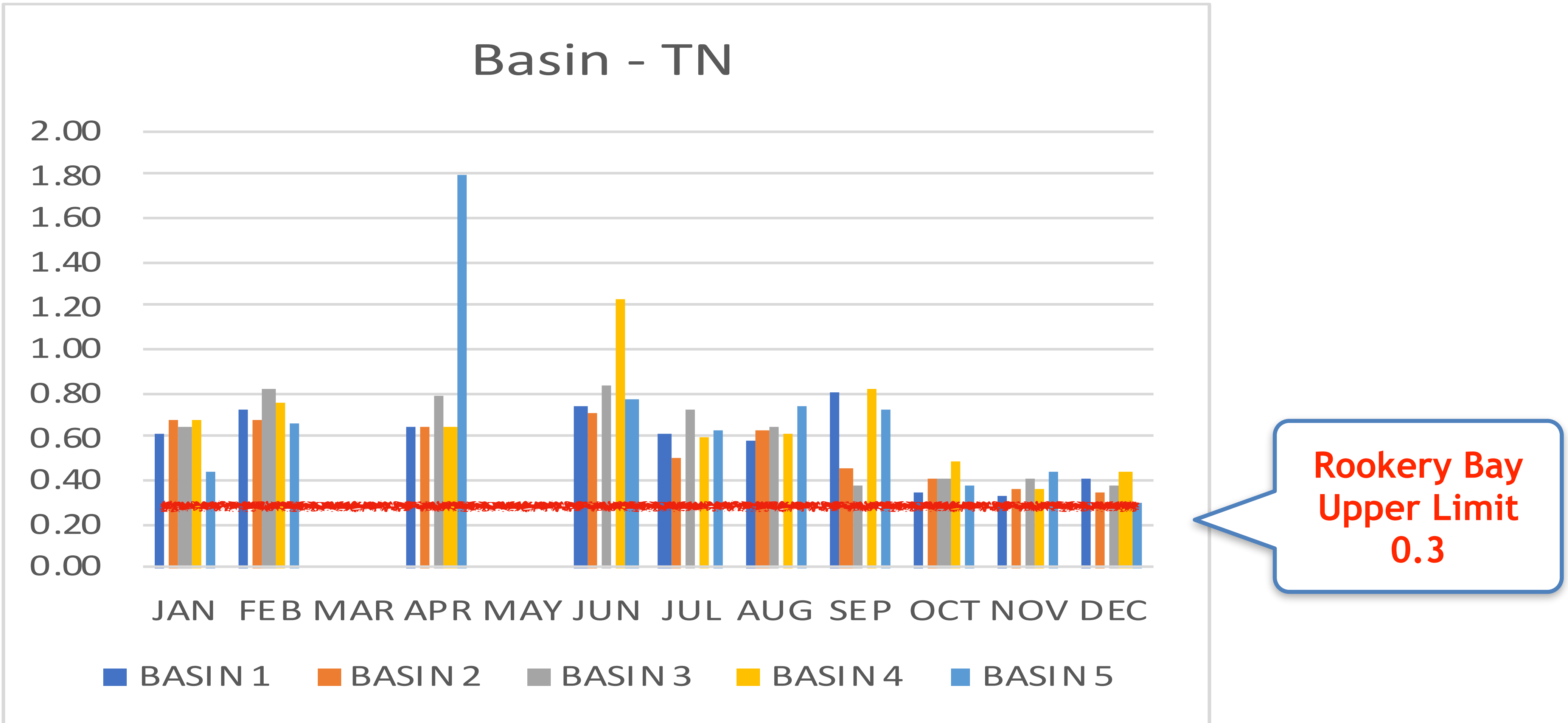


POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

40% reduction from IIIQ20 to IVQ20

Total Nitrogen (TN) - by Basin

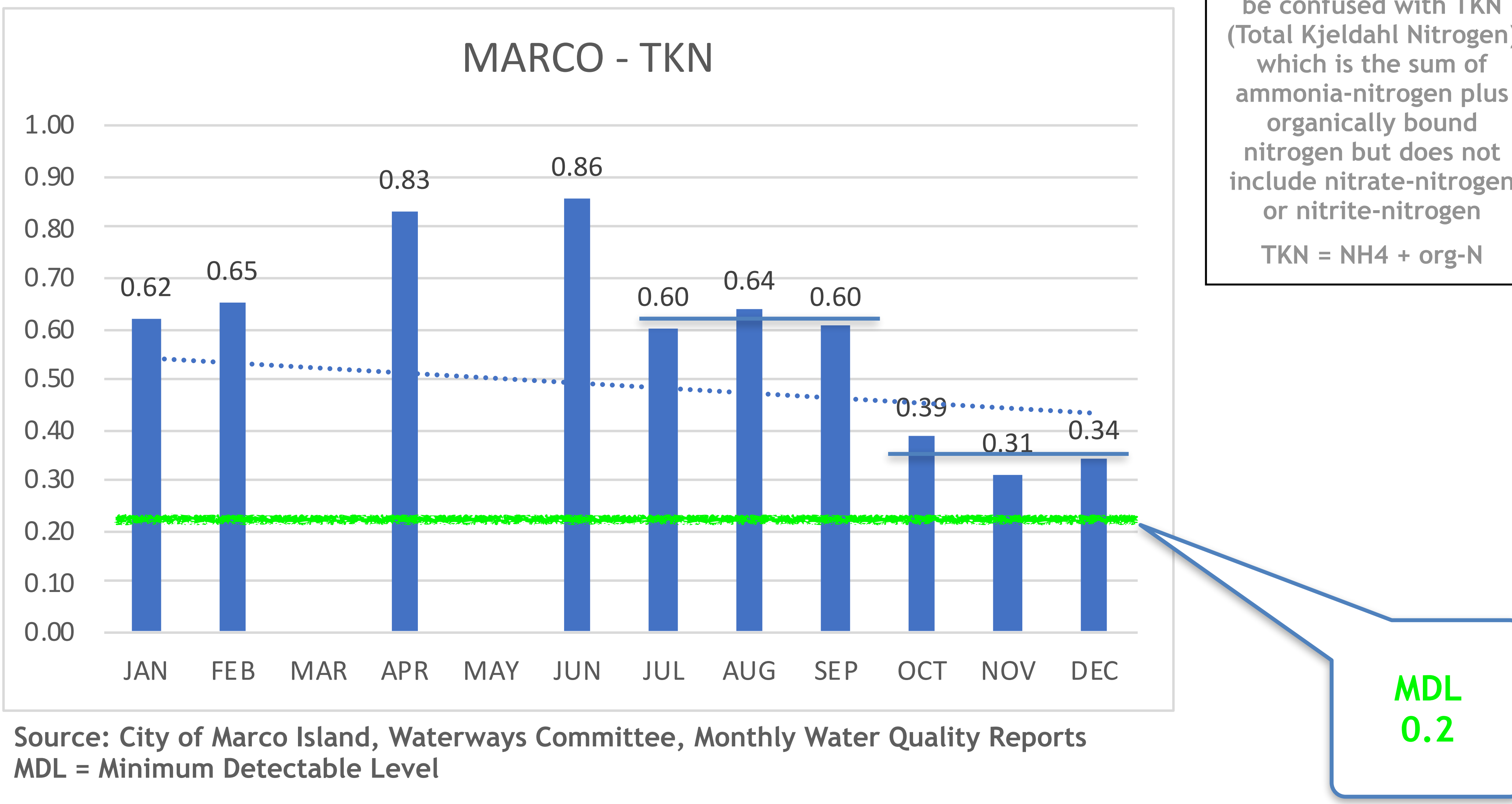


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Outliers can give false impairment signals

Total Kjeldahl Nitrogen (TKN)

TKN may be found useful in assessing water with possible sewage contamination.



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

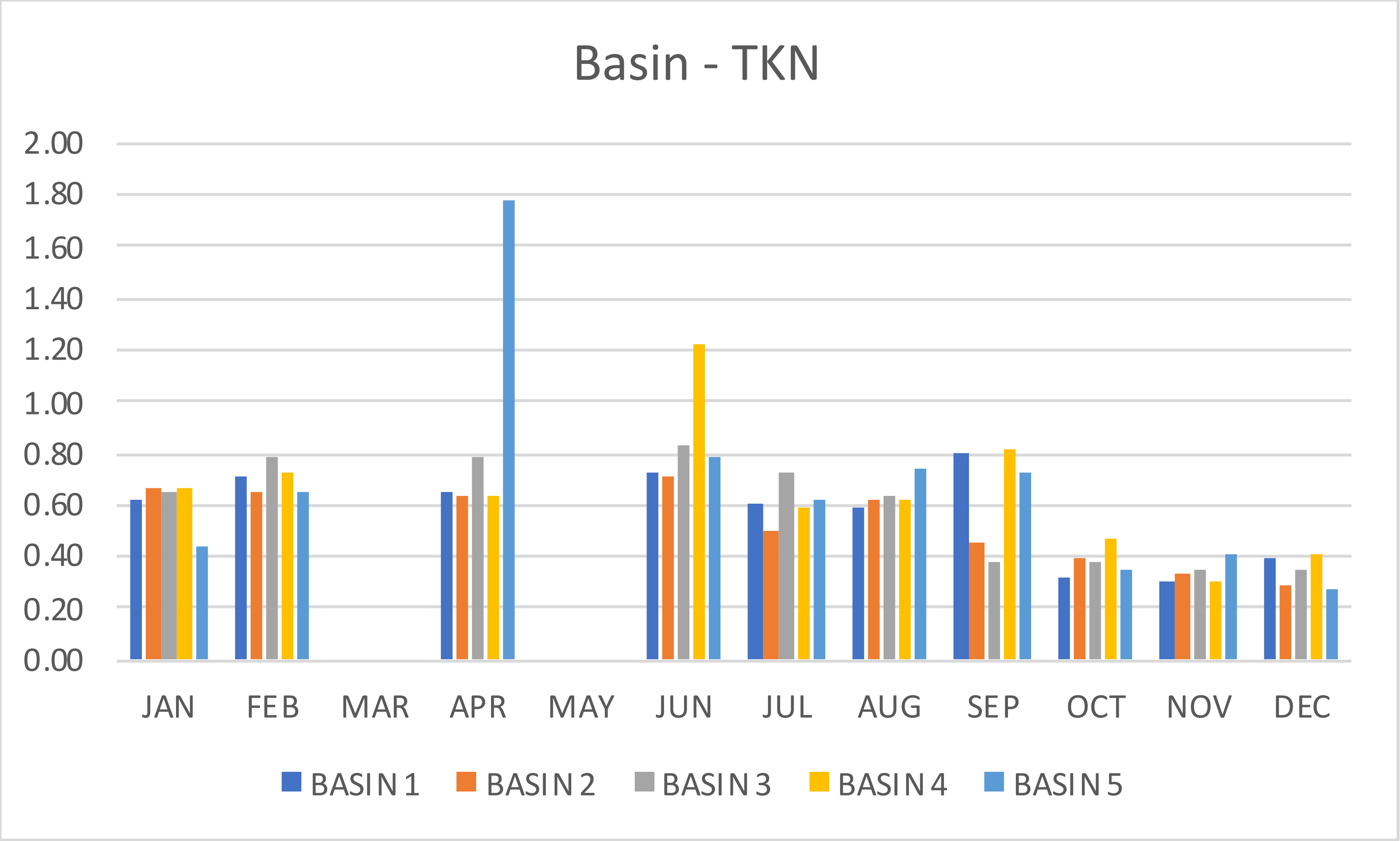
Total Nitrogen should not be confused with TKN (Total Kjeldahl Nitrogen) which is the sum of ammonia-nitrogen plus organically bound nitrogen but does not include nitrate-nitrogen or nitrite-nitrogen

TKN = NH4 + org-N

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

43% reduction from IIIQ20 to IVQ20 - No limits associated with TKN

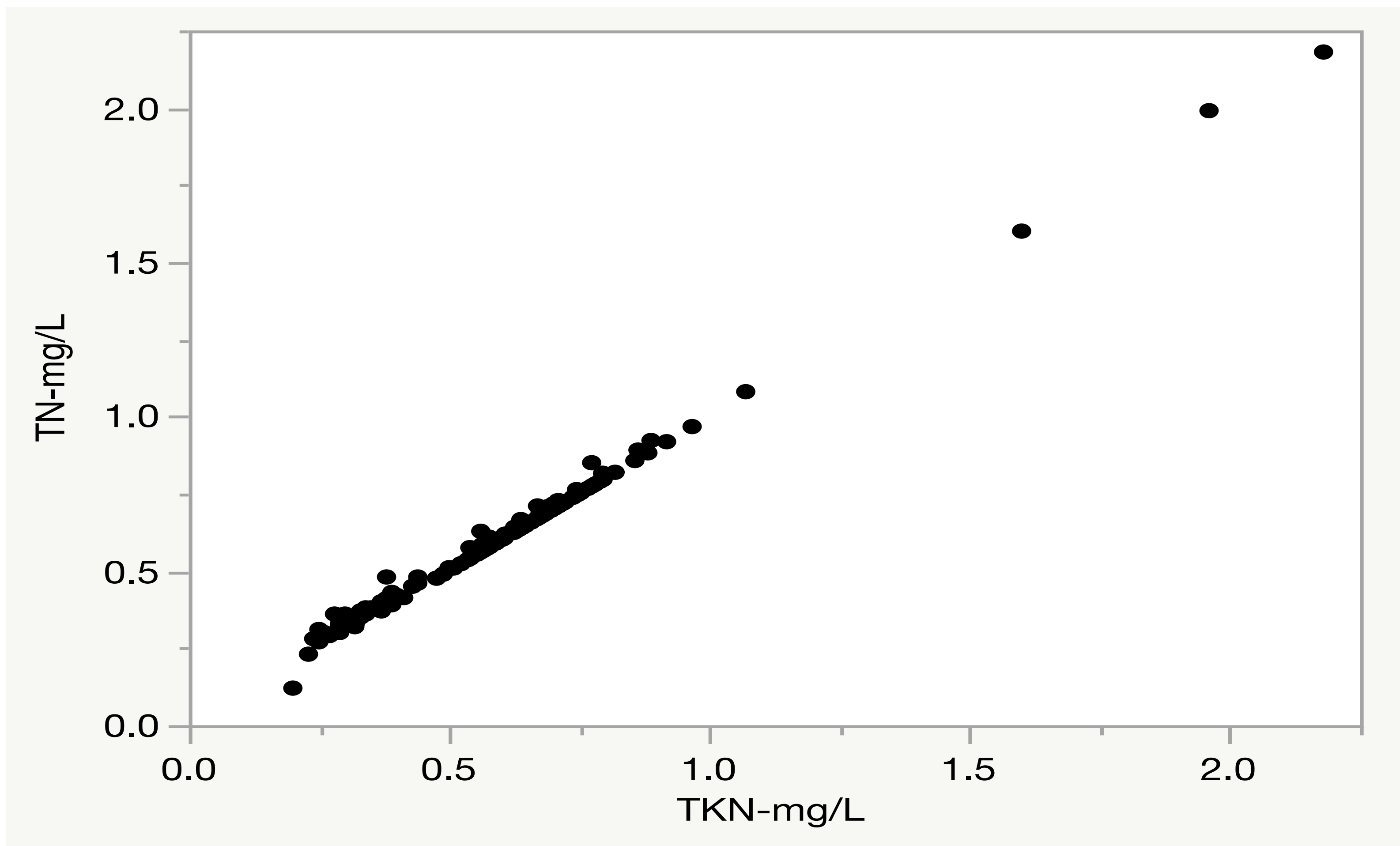
Total Kjeldahl Nitrogen (TKN) - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Outliers can give false impairment signals

Bivariate Fit of TN By TKN

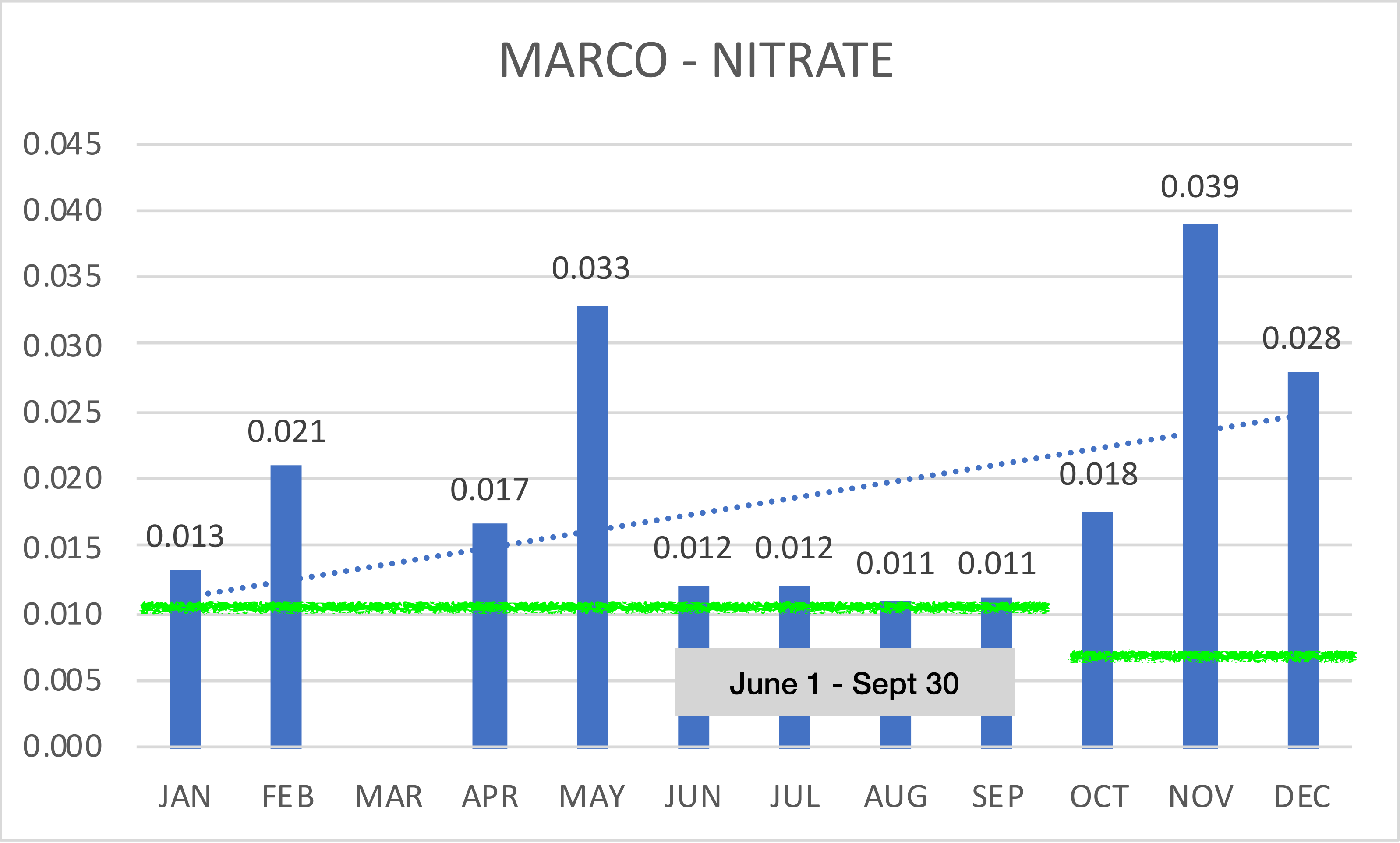


TN and TKN are highly correlated

Nitrate

Relatively little of the nitrate found in natural waters is of mineral origin, most coming from organic and inorganic sources, the former including waste discharges and the latter composing chiefly artificial fertilizers.

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

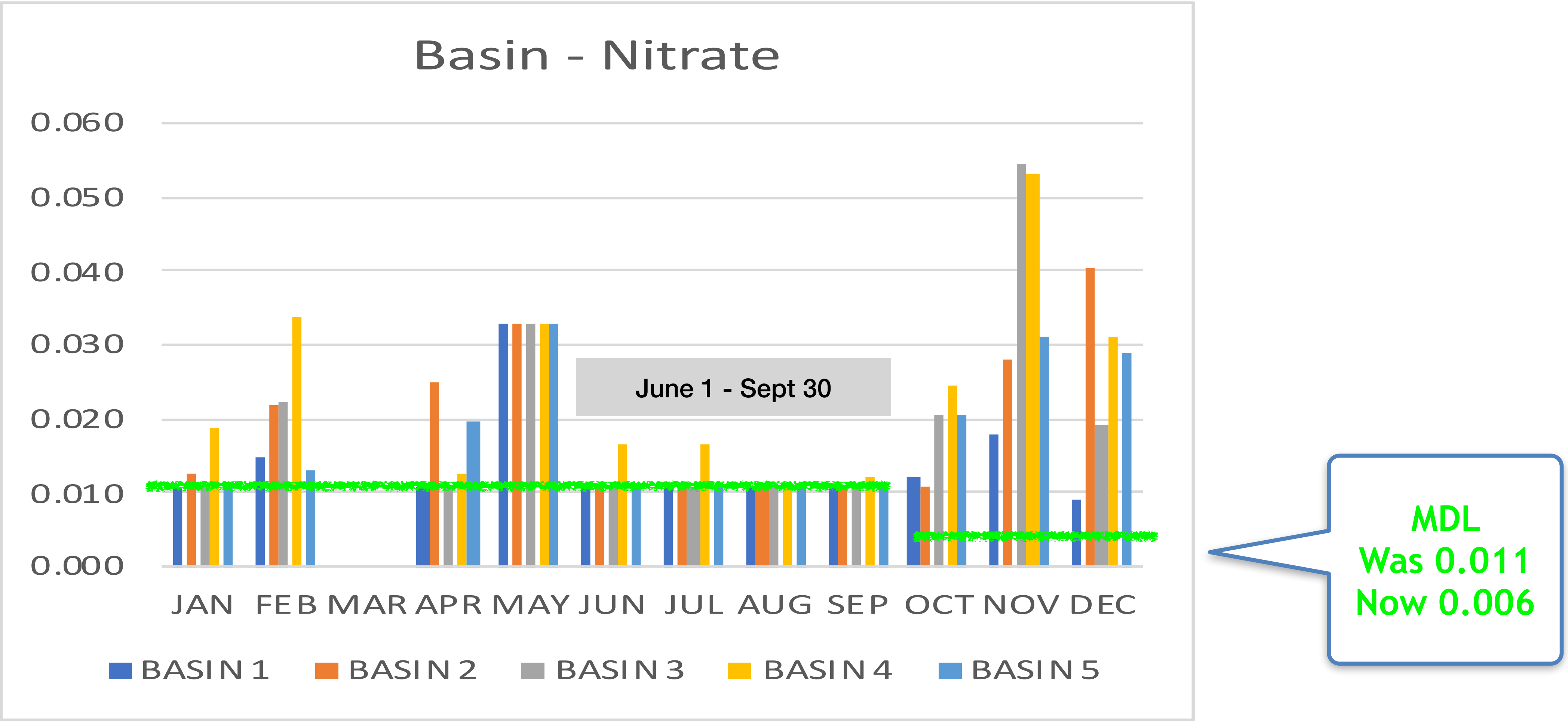


MDL
Was 0.011
Now 0.006

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

Aug-Sep Could not detect Nitrate

Nitrate - by Basin



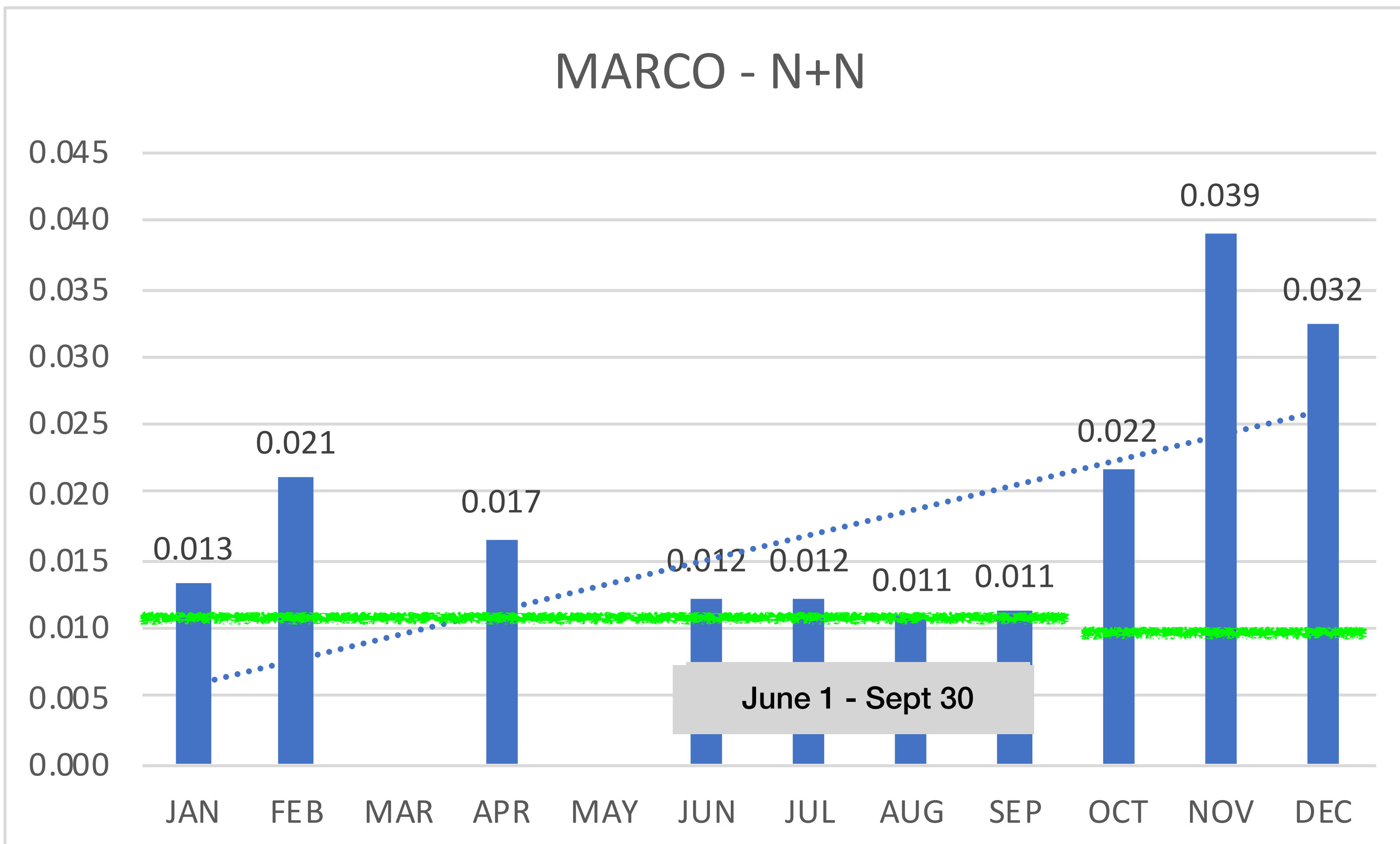
Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

Summer readings are "MDL" - could not detect parameter

May readings above MDL, yet all the same?

Nitrate+Nitrite (N+N)

Nitrate + Nitrite



POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

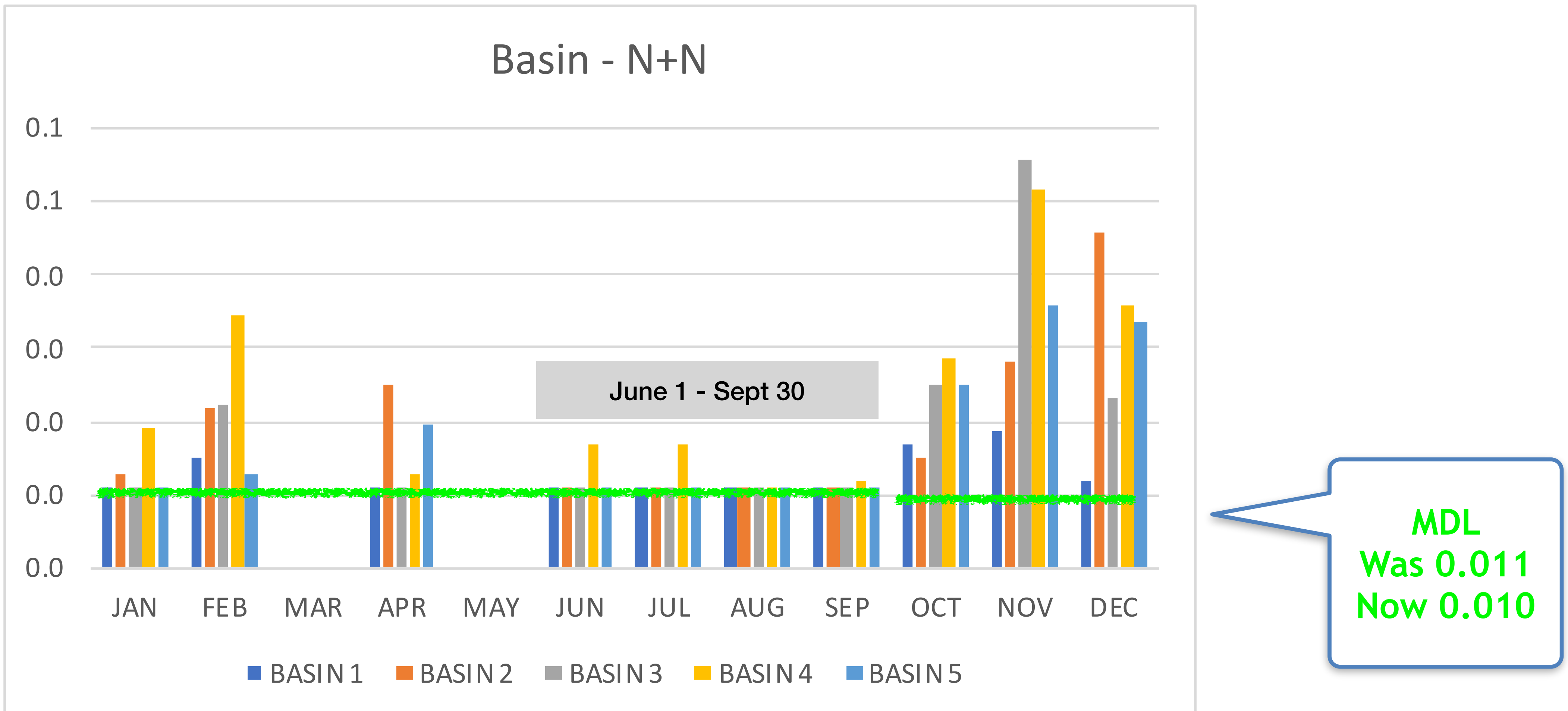
MDL
Was 0.011
Now 0.010

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

280% increase from IIIQ20 to IVQ20

N+N not detectable JUL-AUG-SEP

Nitrate+Nitrite (N+N) - by Basin

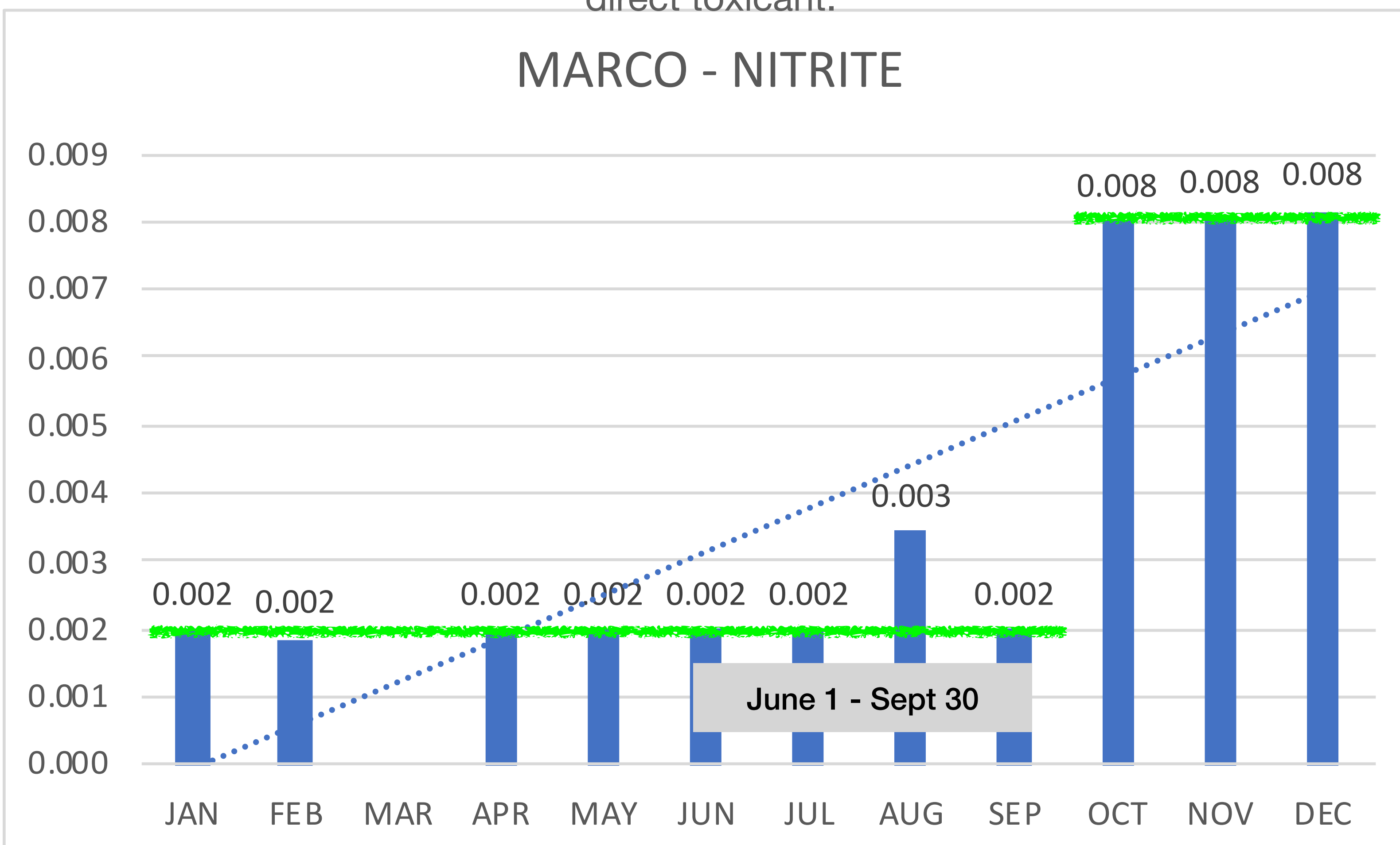


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

Summer readings are “MDL” - could not detect parameter

Nitrite

The significance of nitrite is mainly as an indicator of possible sewage pollution rather than as a hazard itself, although it is nitiite rather than nitrate which is the direct toxicant.



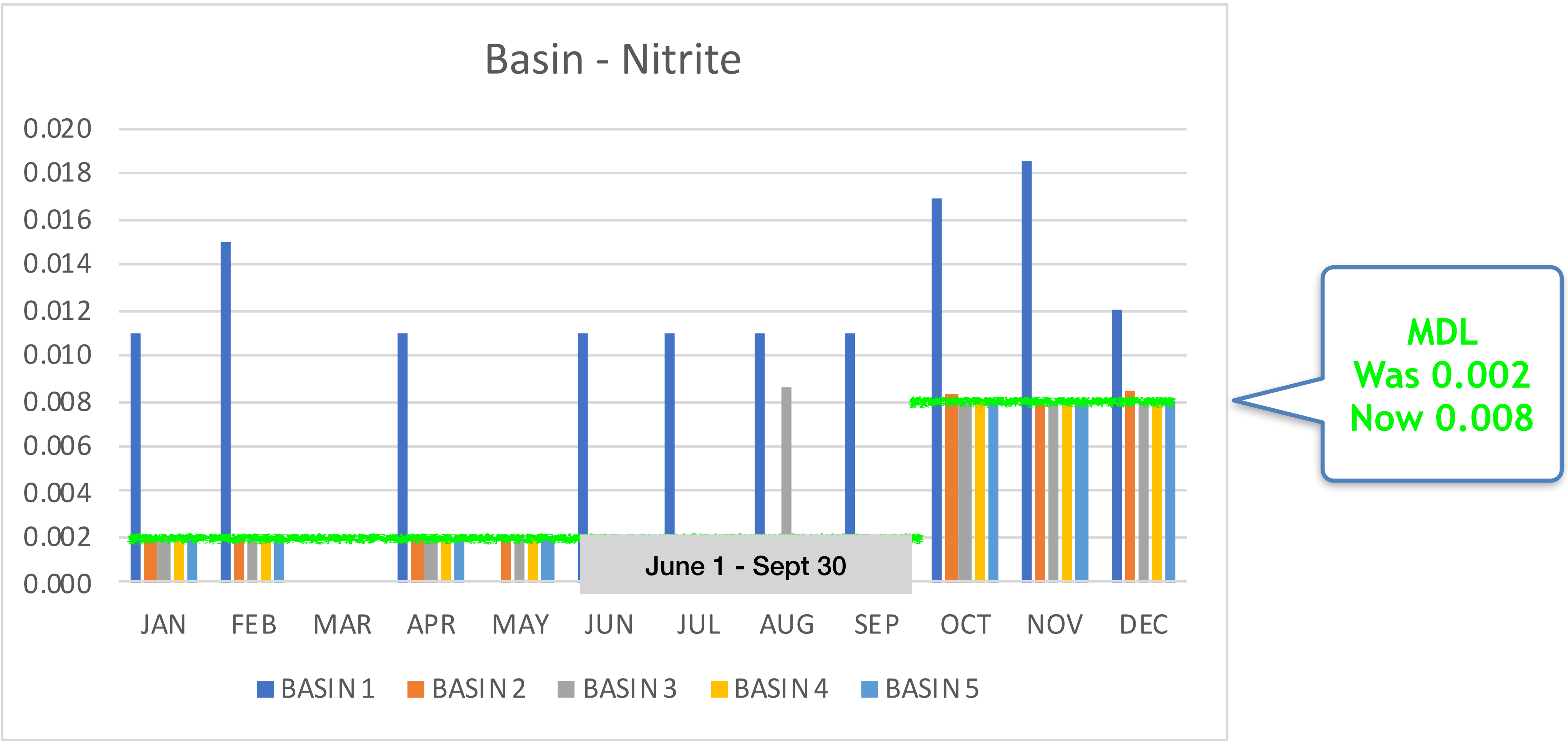
MDL
Was 0.002
Now 0.008

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

Nitrite NOT DETECTABLE in Marco waterways?

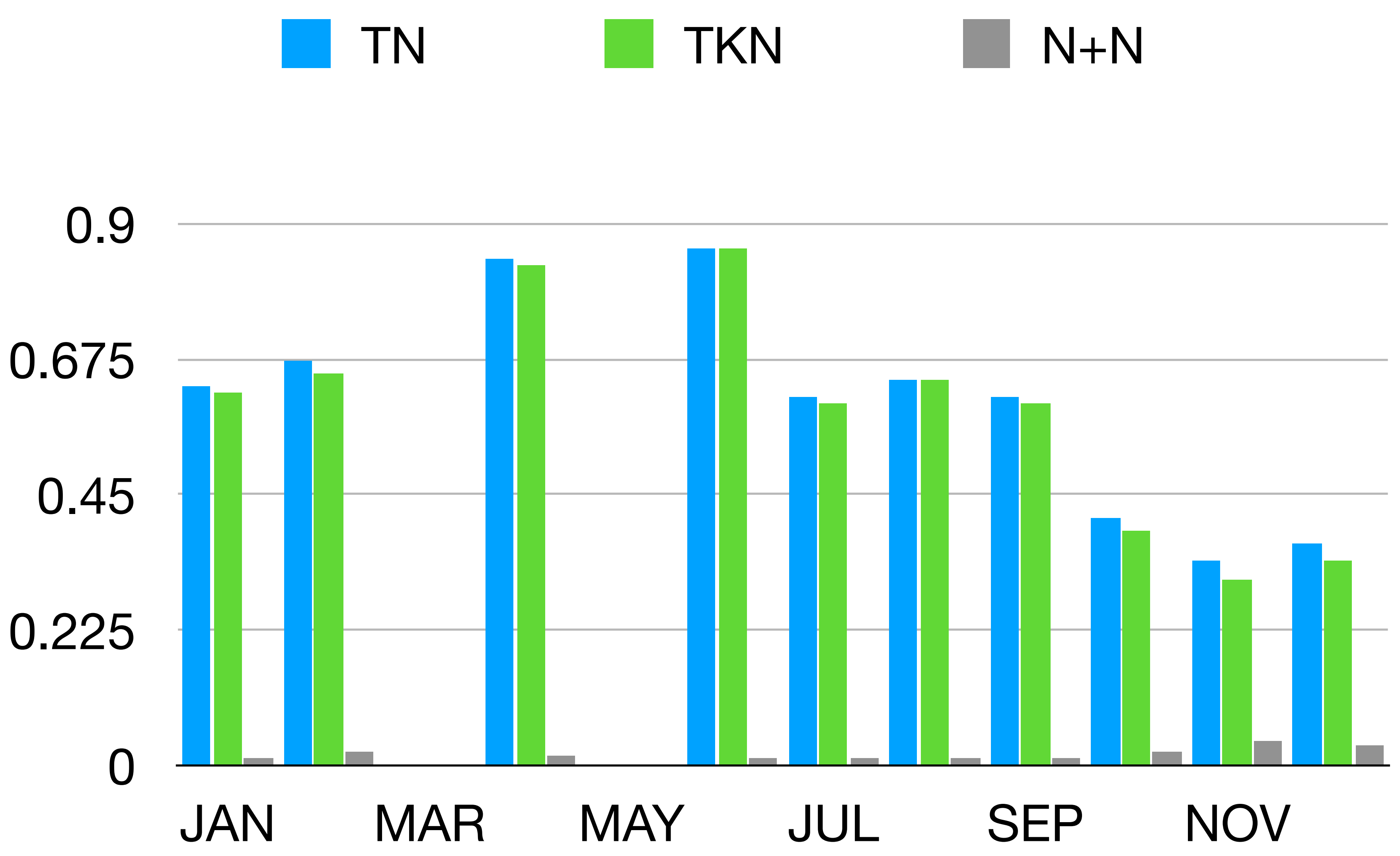
Nitrite - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

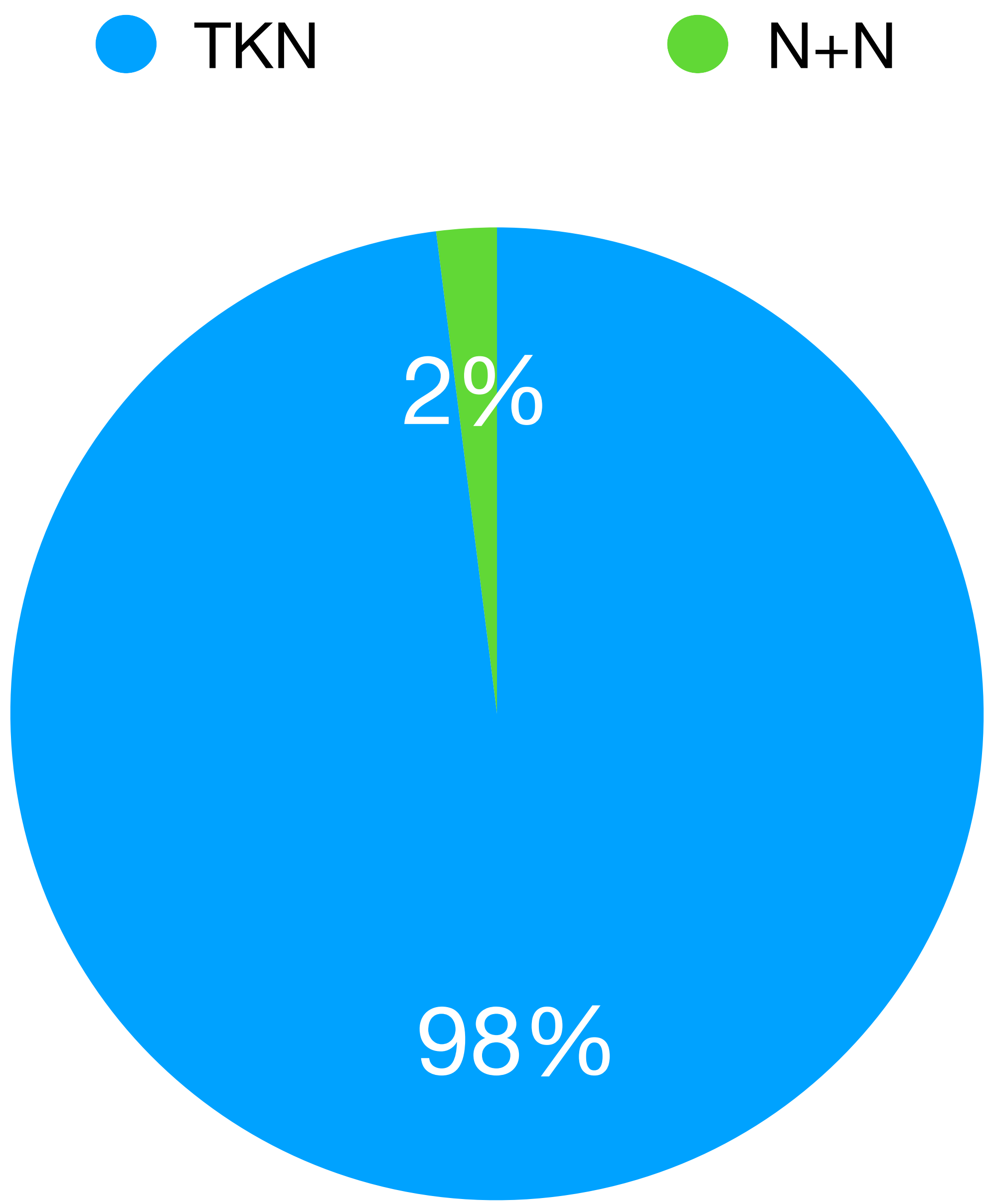
What is happening in Basin 1 that drives Nitrite up?

TN = TKN + Nitrate + Nitrite



TKN contributes 98% to TN
Nitrate + Nitrite contribuite 2% to TN

Marco Waterways - TN Main Component is TKN



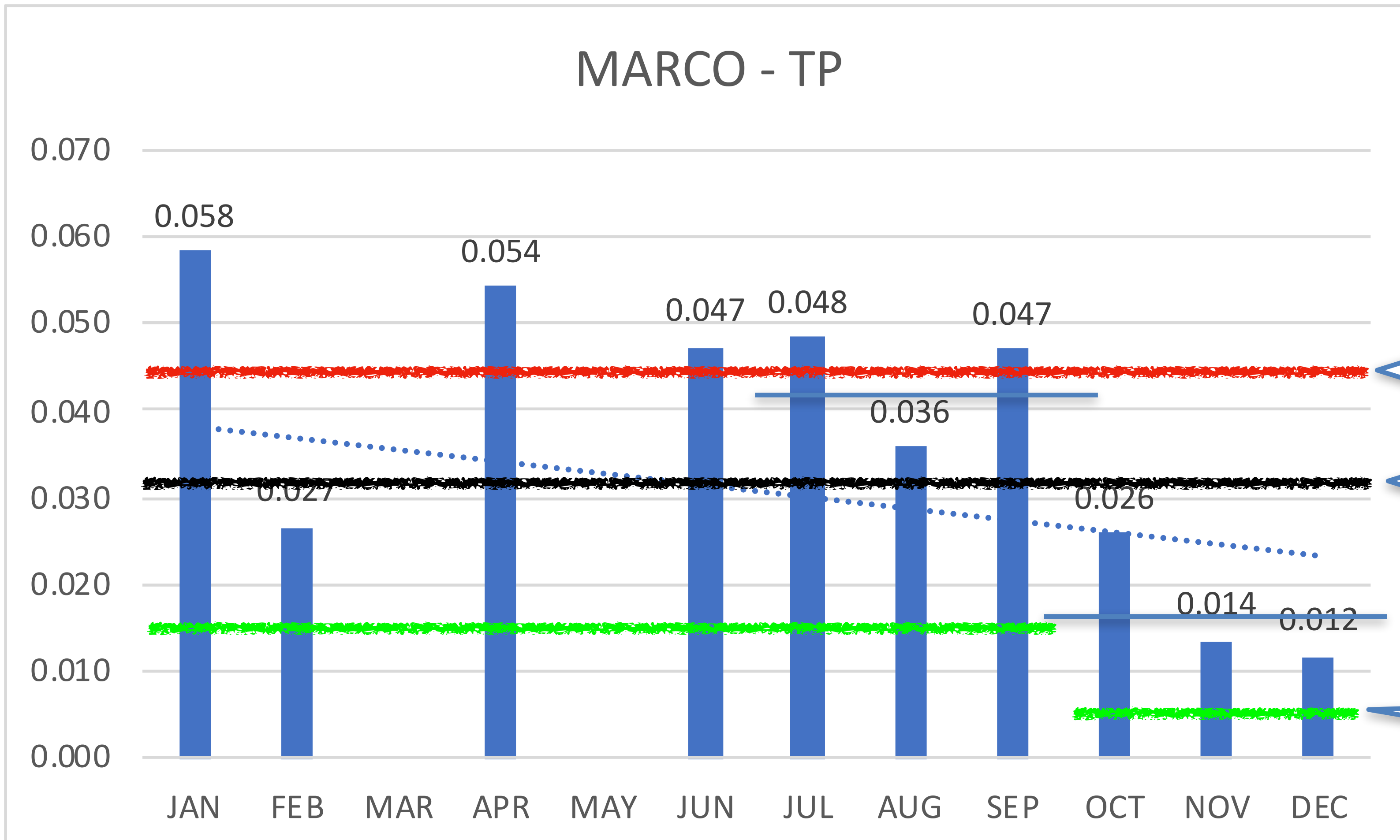
TKN contributes 98% to TN in Marco Waterways

Nitrate + Nitrite contribuite 2% to TN

PHOSPHOROUS

Total Phosphorous (TP)

One of the most meaningful parameters in the assessment of eutrophication, the process by which a body of water becomes overly enriched with minerals and nutrients which induce the excessive growth of algae



Rookery Bay Upper Limit 0.046

Marco Island AGM = 0.033

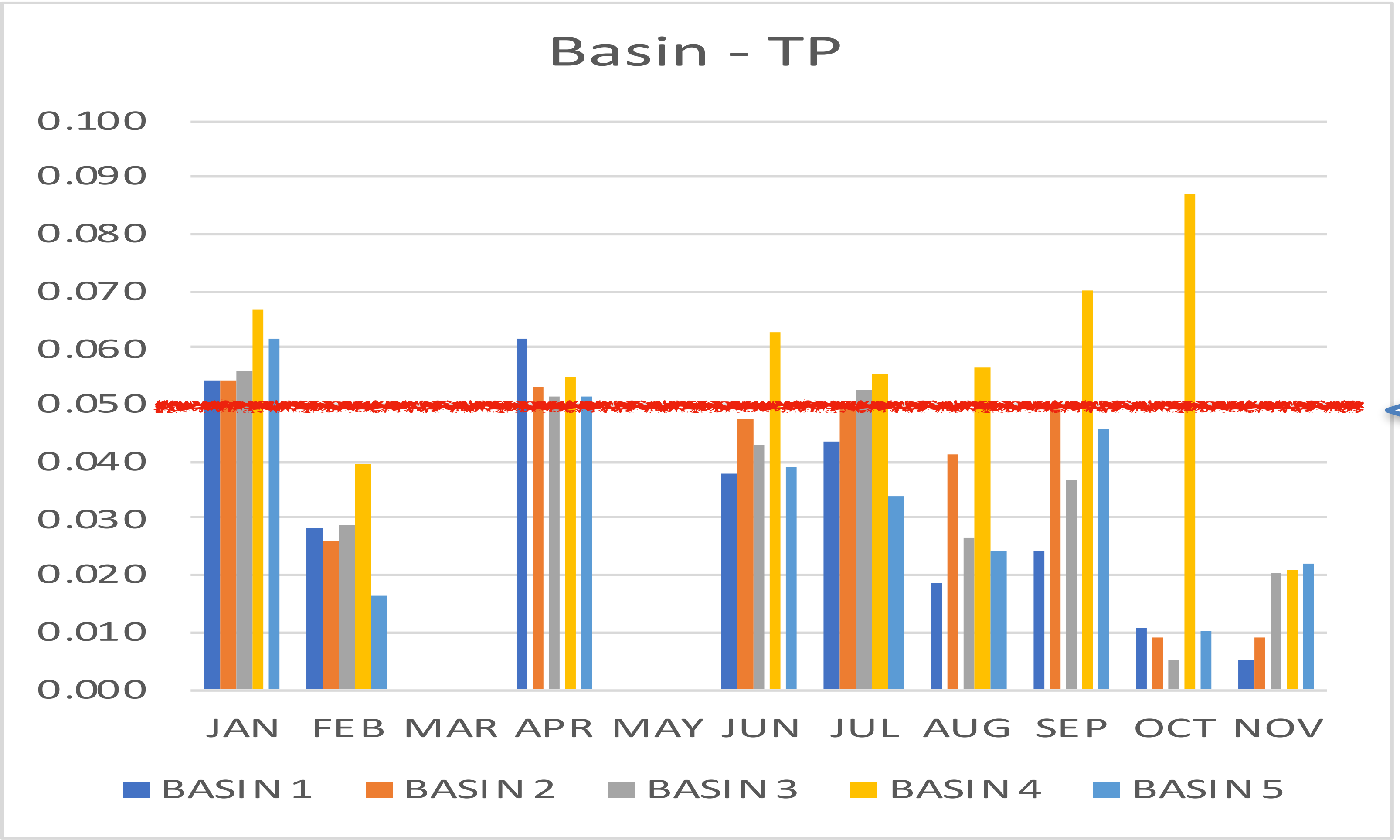
MDL varies 0.005 to 0.014

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

60% reduction from IIIQ20 to IVQ20

Total Phosphorus (TP) - by Basin



Rookery Bay Upper Limit 0.046

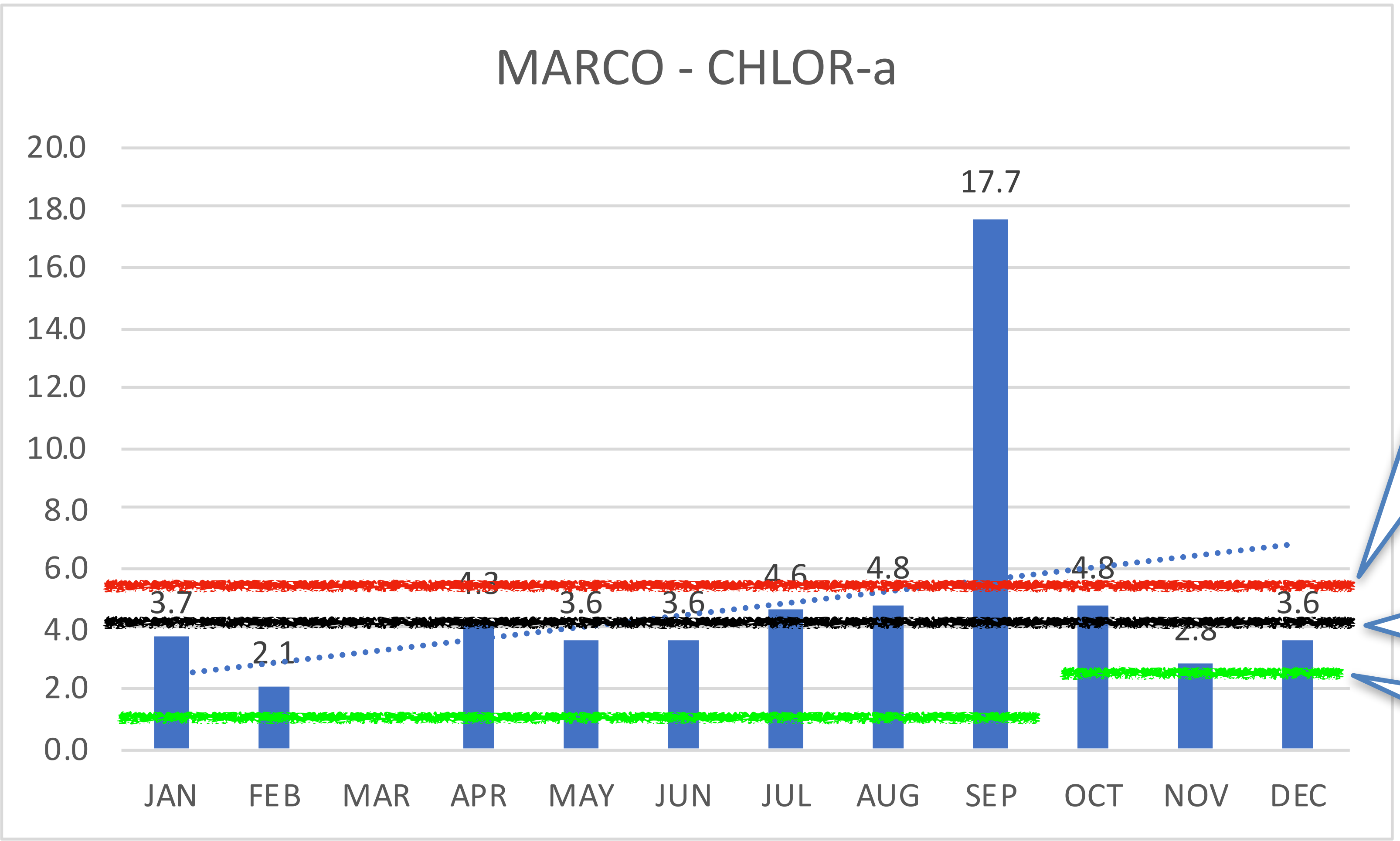
Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

What is happening in Basin 4 that drives Phosphorous up?

CHLOROPHYLL-a

Chlorophyll-a

Chlorophyl is perhaps the single most important parameter in the assessment of water quality. Excessive nutrient presence promotes the growth of algae which in overabundance cause serious environmental problems



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Rookery Bay Upper Limit 4.9

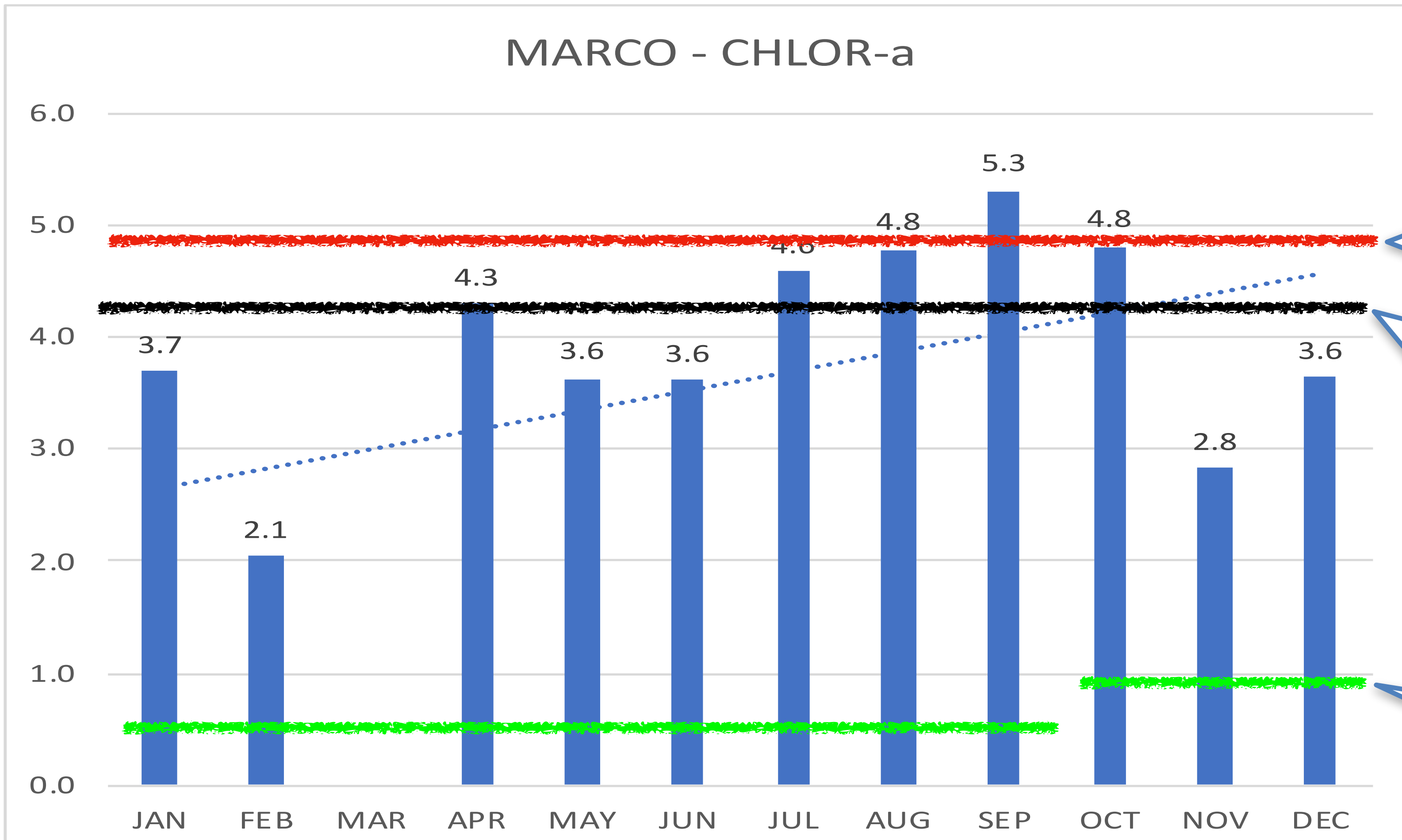
Marco Island AGM = 4.3

MDL was 1.0, now 2.5

Outliers can conceal impairment signals

Chlorophyll-a (no outlier)

Chlorophyl is perhaps the single most important parameter in the assessment of water quality. Excessive nutrient presence promotes the growth of algae which in overabundance cause serious environmental problems



Rookery Bay Upper Limit 4.9

Marco Island AGM = 4.3

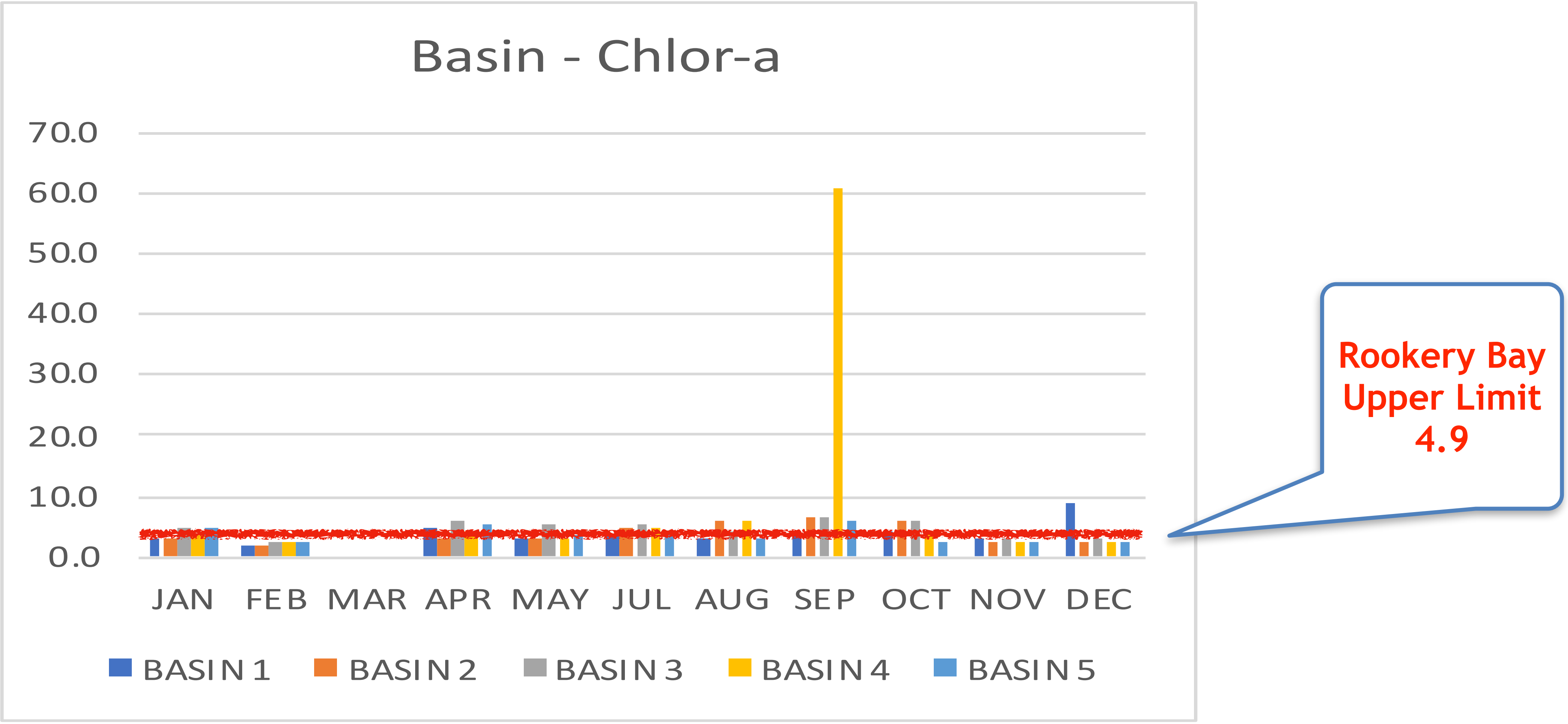
MDL was 1.0, now 2.5

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

CHL-a shows upward trend

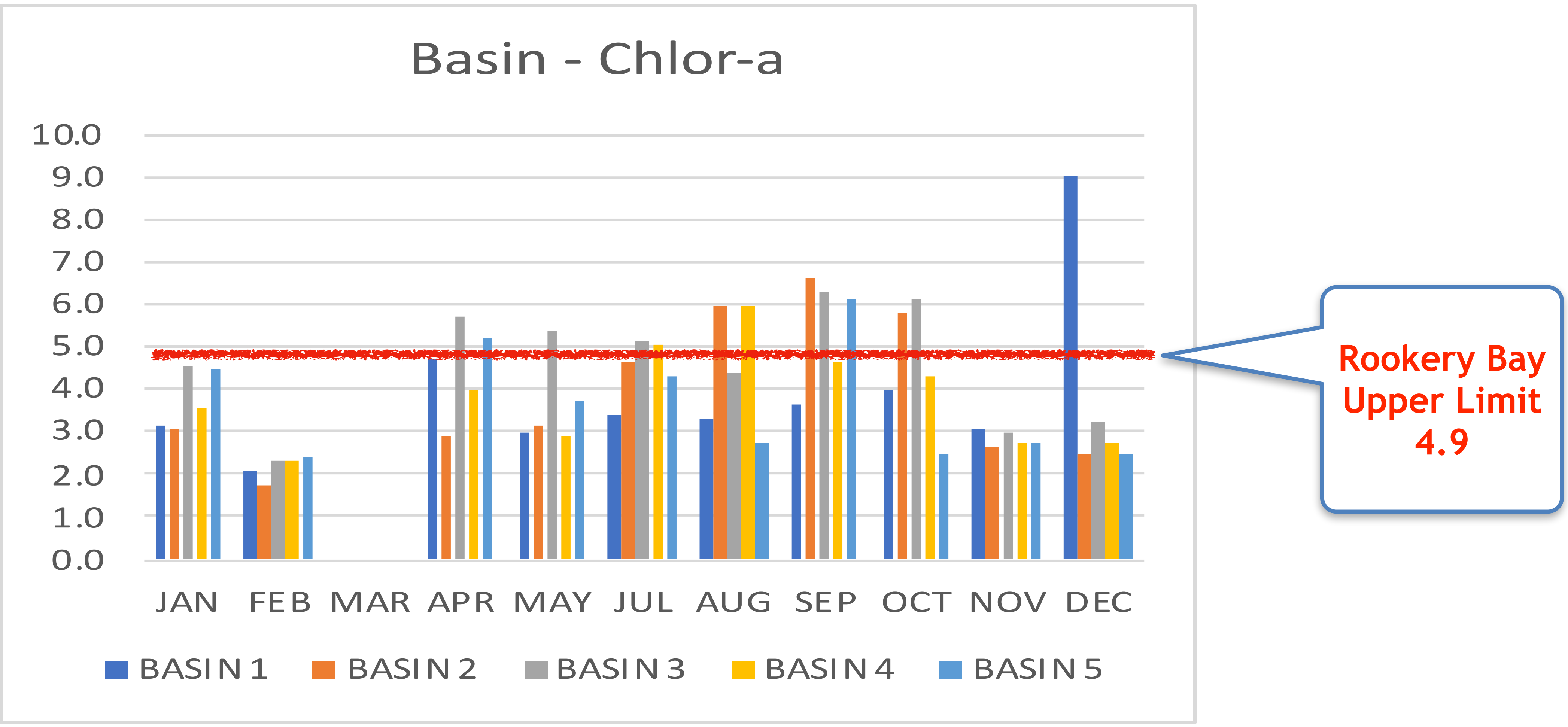
Chlorophyll-a - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Outliers can conceal impairment signals

Chlorophyll-a - by Basin (no outlier)



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Outliers can conceal impairment signals

WATER CLARITY PARAMETERS

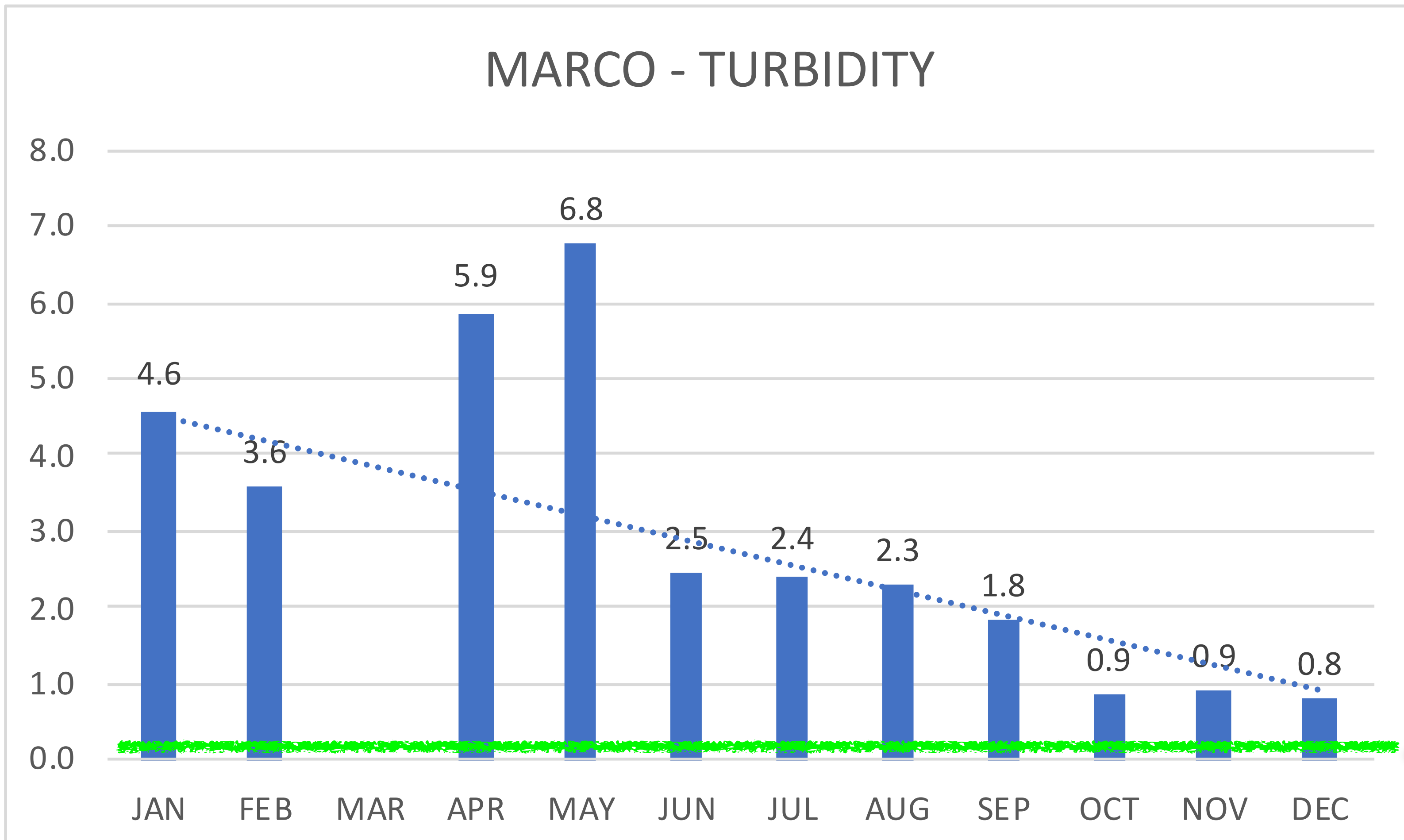
- TURBIDITY
- SECCHI DEPTH
- TOTAL SUSPENDED SOLIDS (TSS) - not measured
- COLOR - not measured

Source: Cardno, “Status of Naples Bay Water Clarity: 2005-2014” July 2016

Turbidity

Turbidity arises from the presence of finely divided solids. High concentrations of particulate matter affect light penetration and ecological productivity, recreational values, and habitat quality, and cause lakes to fill in faster.

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

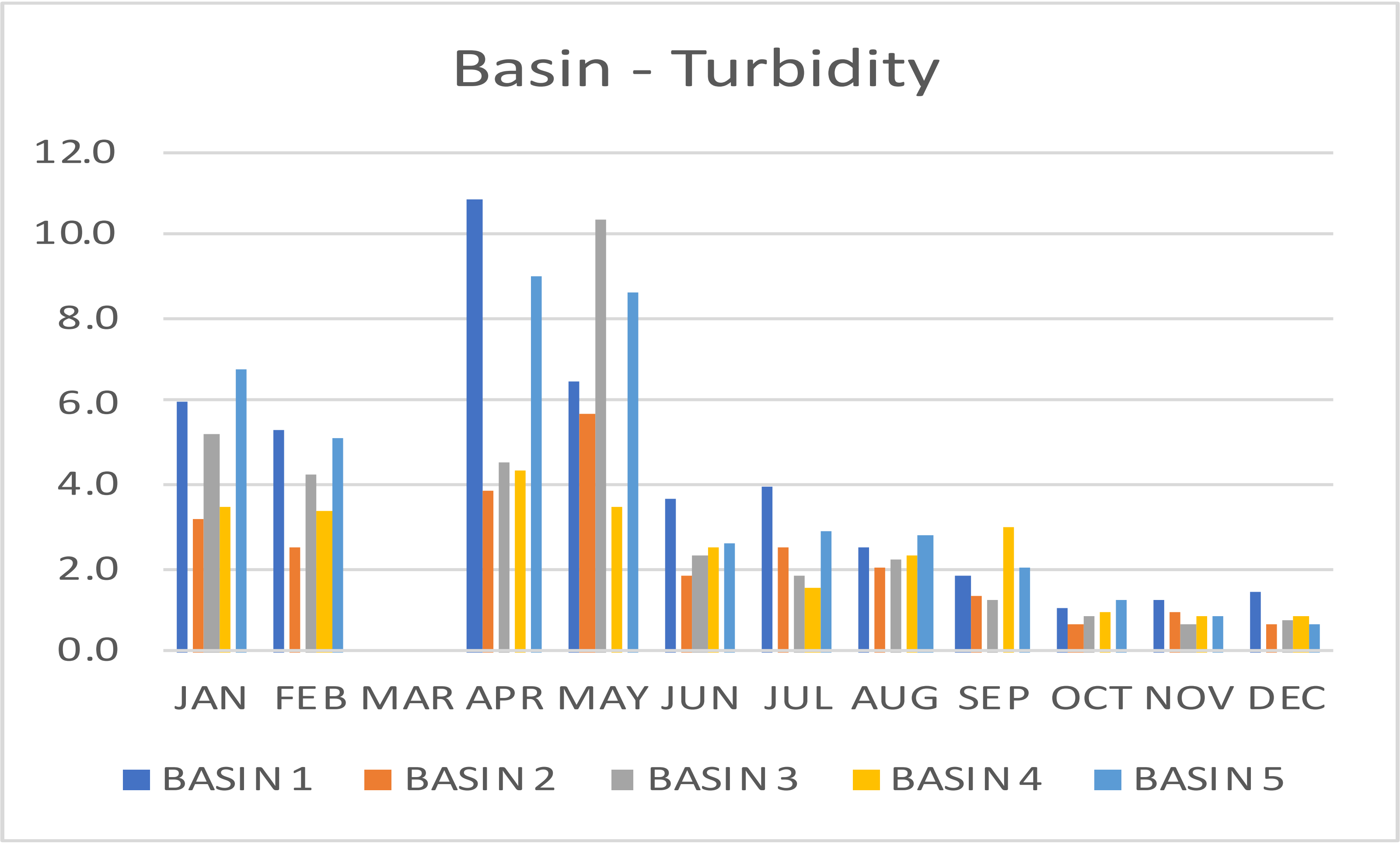


MDL
0.1

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

80% reduction from Jan-20 to Dec-20

Turbidity - by Basin

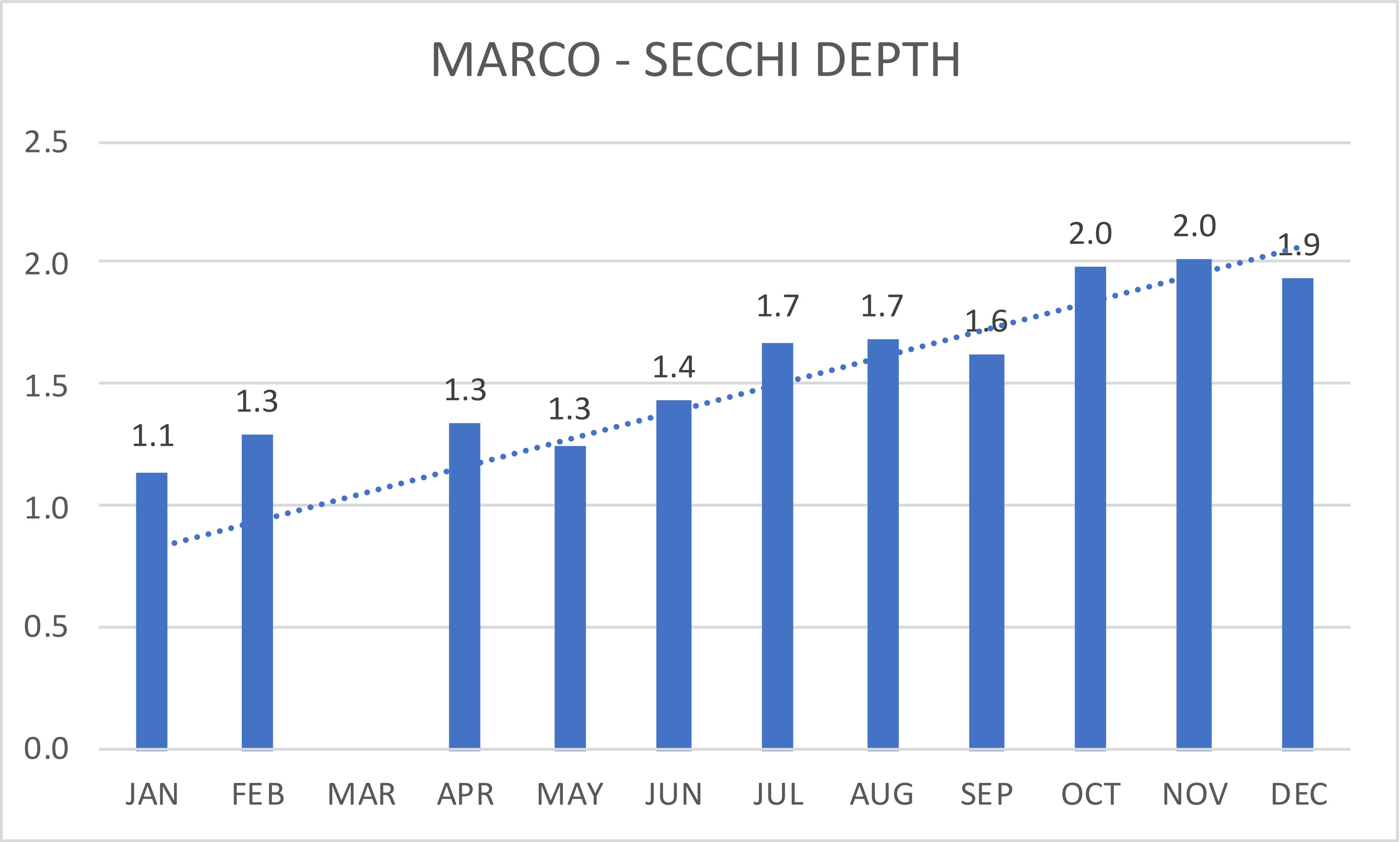


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Turbidity trending down

Secchi Depth

This parameter gives and indication of the presence or absence of suspended matter, living or inert, and hence it is a reflection of the overall quality of the water. It is used widely to assess the abundance of algae.

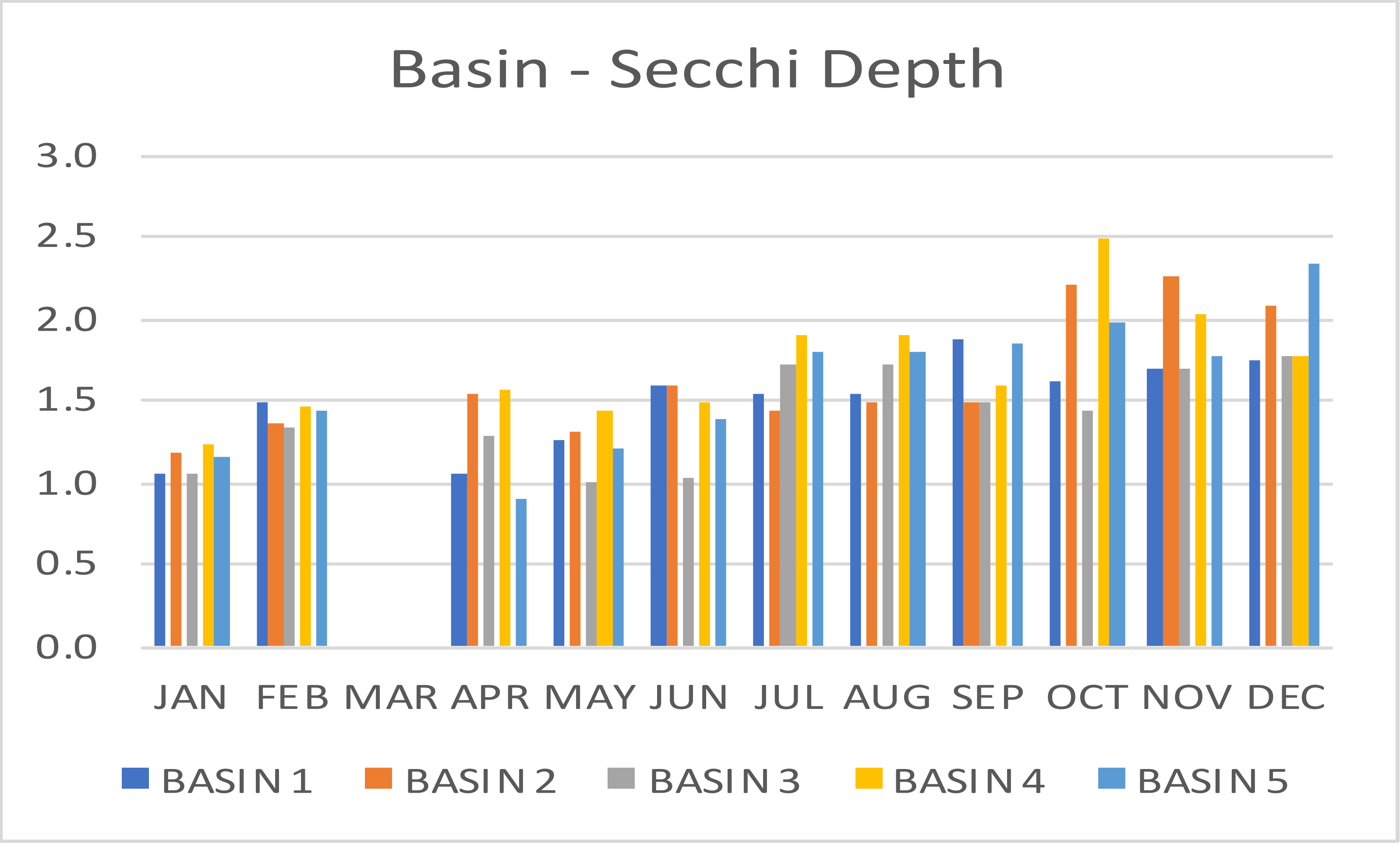


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Secchi Depth increasing

Secchi Depth - by Basin



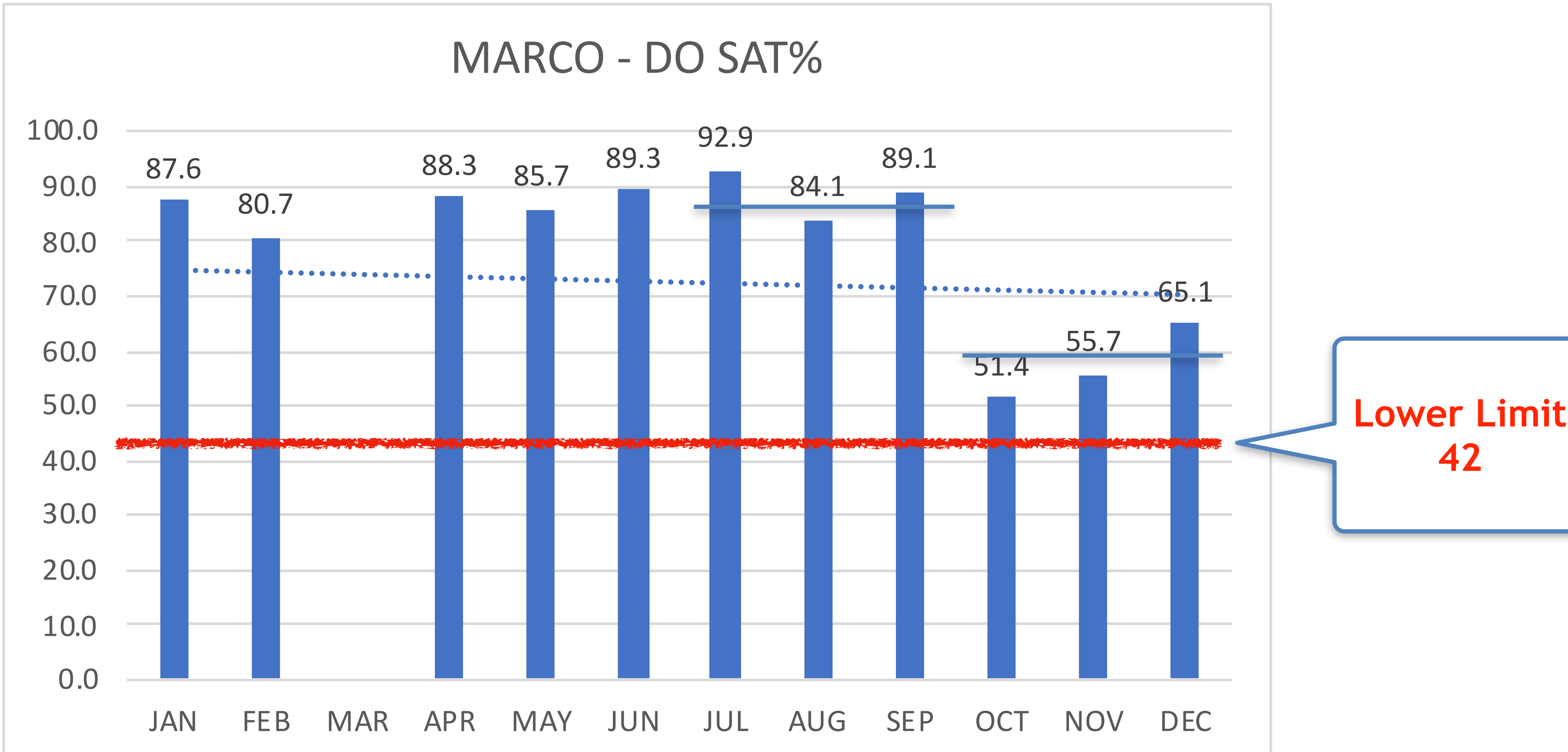
Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Secchi depth increasing across basins

OTHER PARAMETERS

Dissolved Oxygen (DO) Saturation %

The prime requirements for DO arise in connection with fish life. DO is a measure of how much oxygen is dissolved in the water.

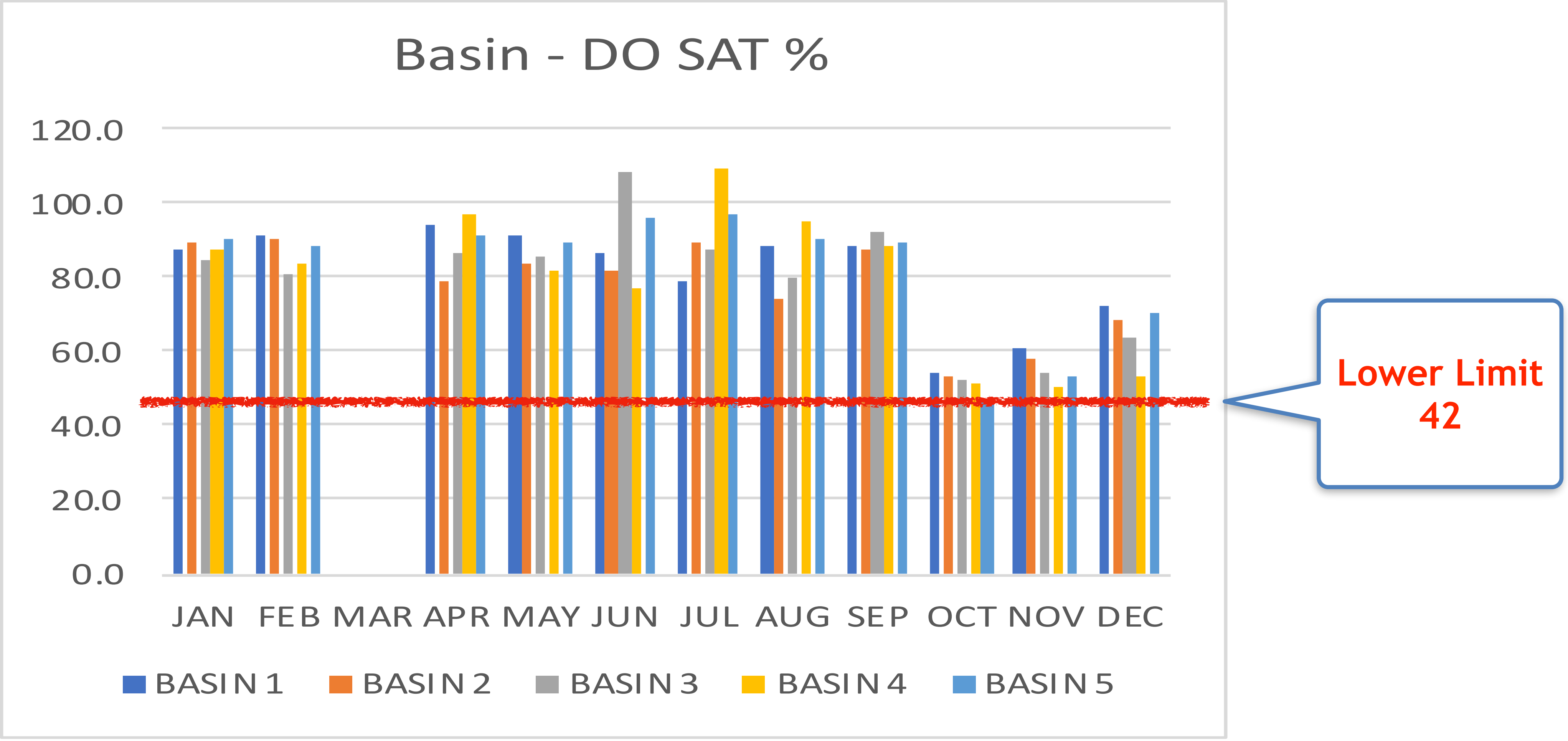


POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

35% reduction from IIIQ20 to IVQ20

Dissolved Oxygen (DO) Saturation % - by Basin

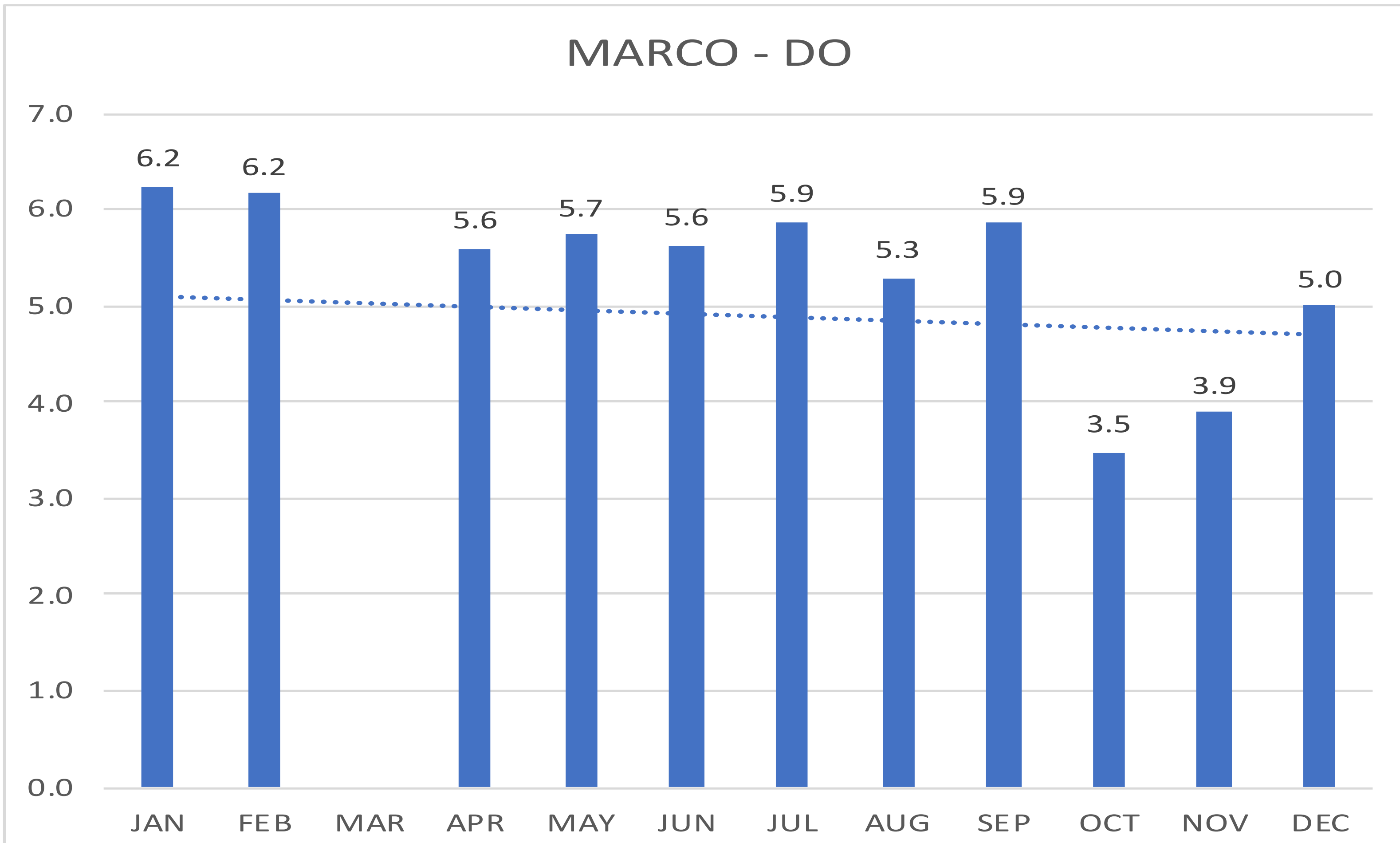


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Some variability basin to basin

Dissolved Oxygen (DO)

The prime requirements for DO arise in connection with fish life. DO is a measure of how much oxygen is dissolved in the water.

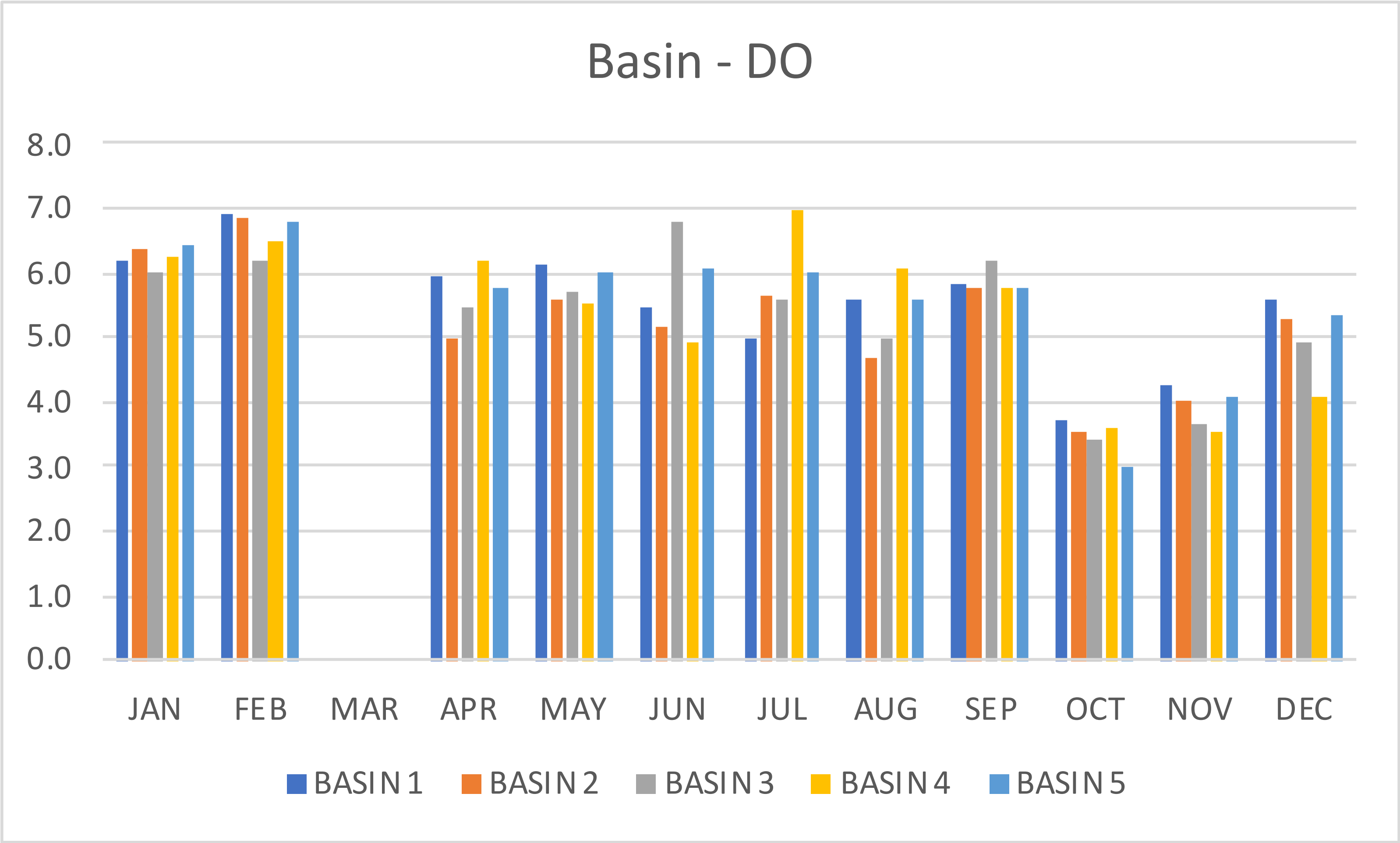


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

DO decreasing

Dissolved Oxygen (DO) - by Basin

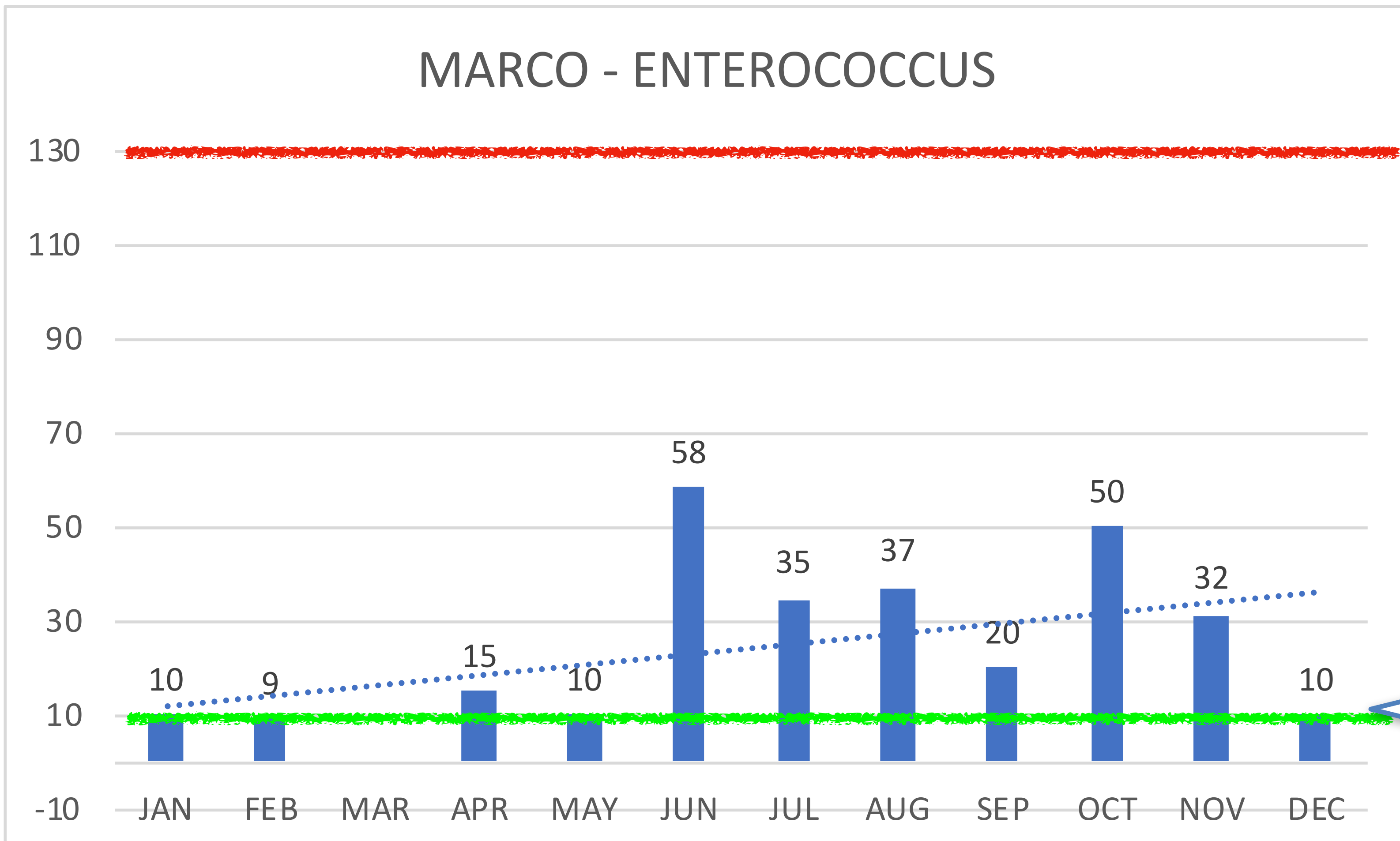


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

DO increasing

Enterococcus

These organisms originate in feces, both animal and human.



Upper Limit
130

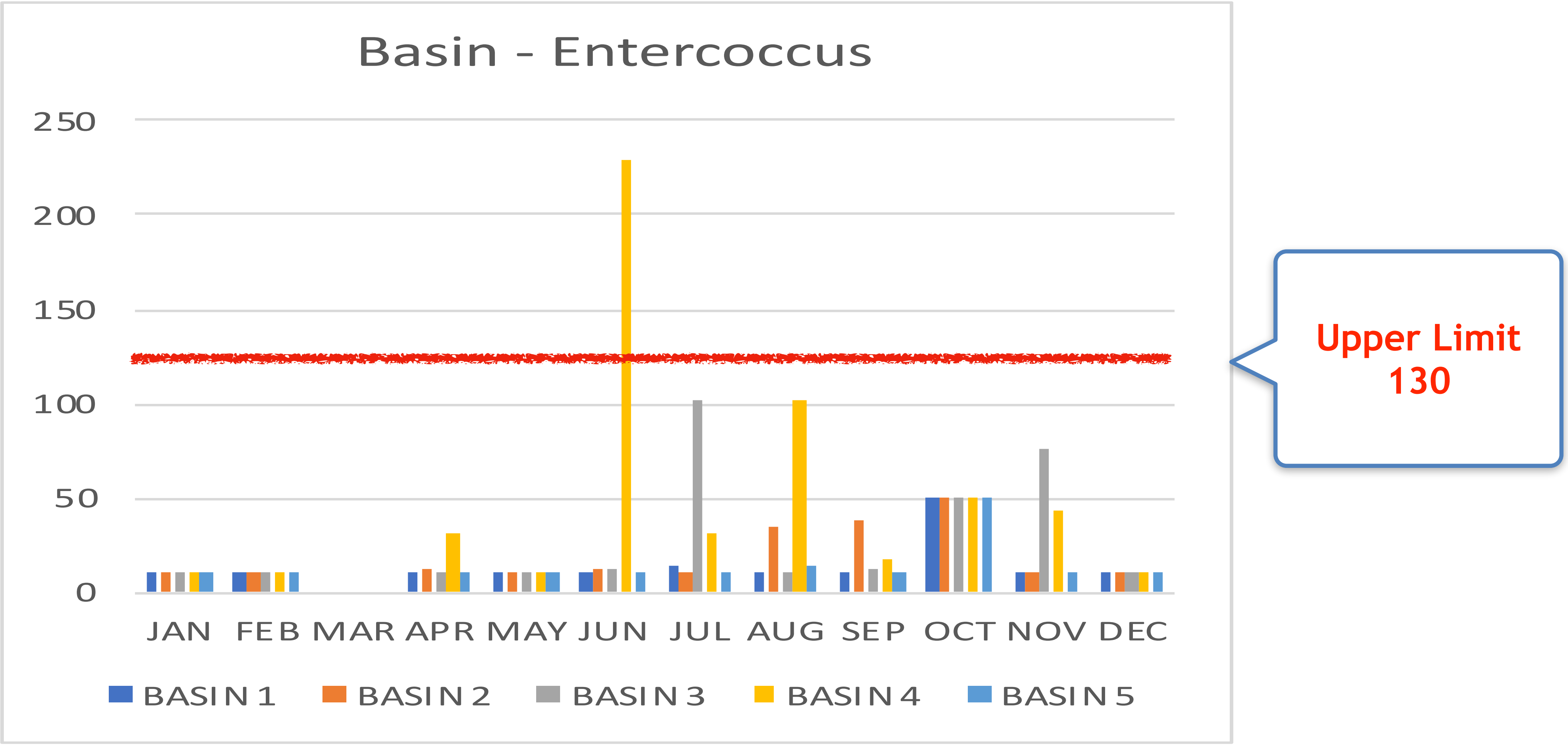
MDL
10

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

Enterococcus increasing but appears under control

Enterococcus - by Basin

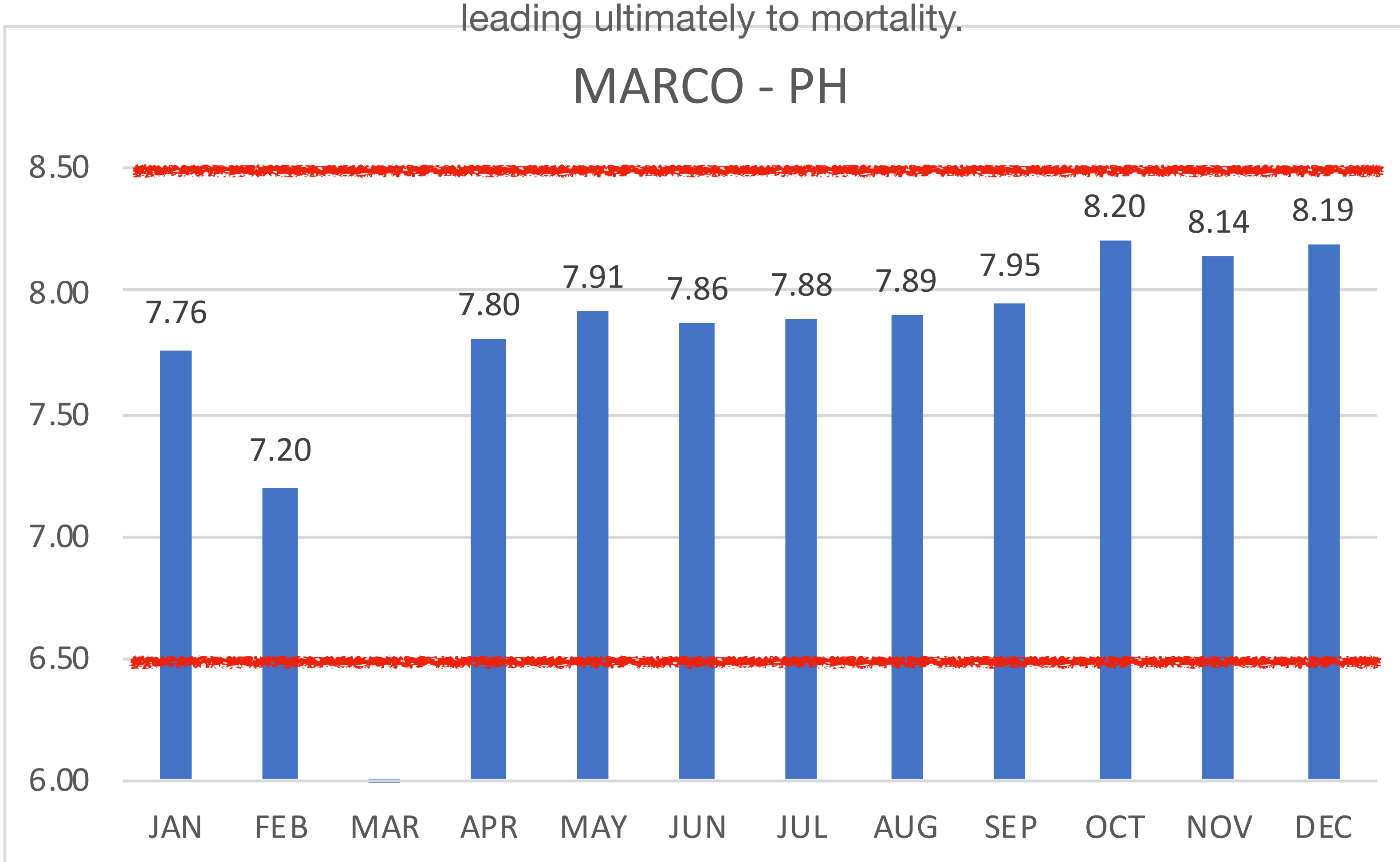


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Outliers can give false impairment signals

PH

PH is a quantitative measure of the acidity or basicity of aqueous or other liquid solutionsThe effect of PH on fish is also an important consideration and values which depart increasingly from the normal levels will have a marked effect on fish, leading ultimately to mortality.



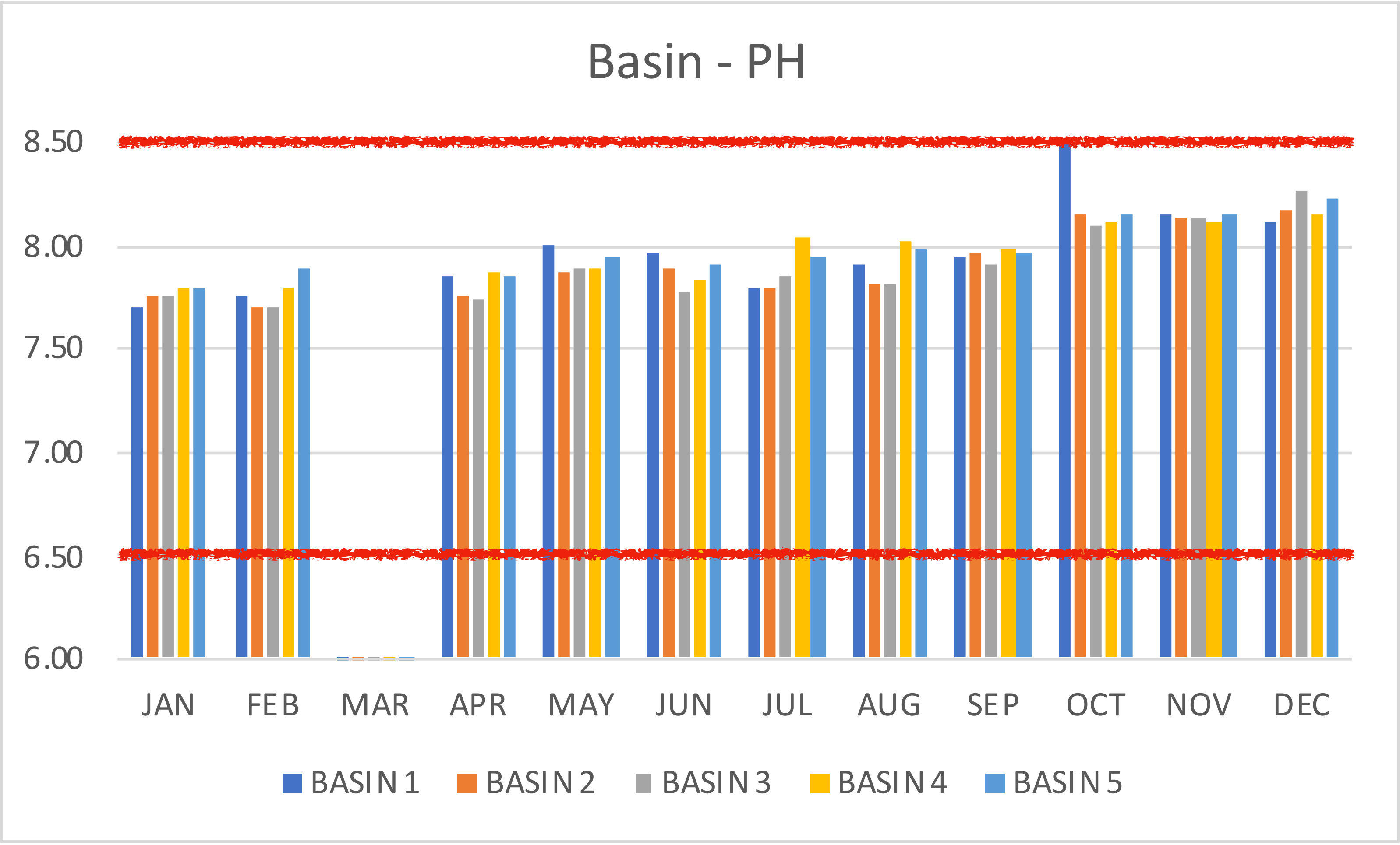
Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Limits
6.5 - 8.5

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

PH trending to upper limit of 8.5

PH - by Basin



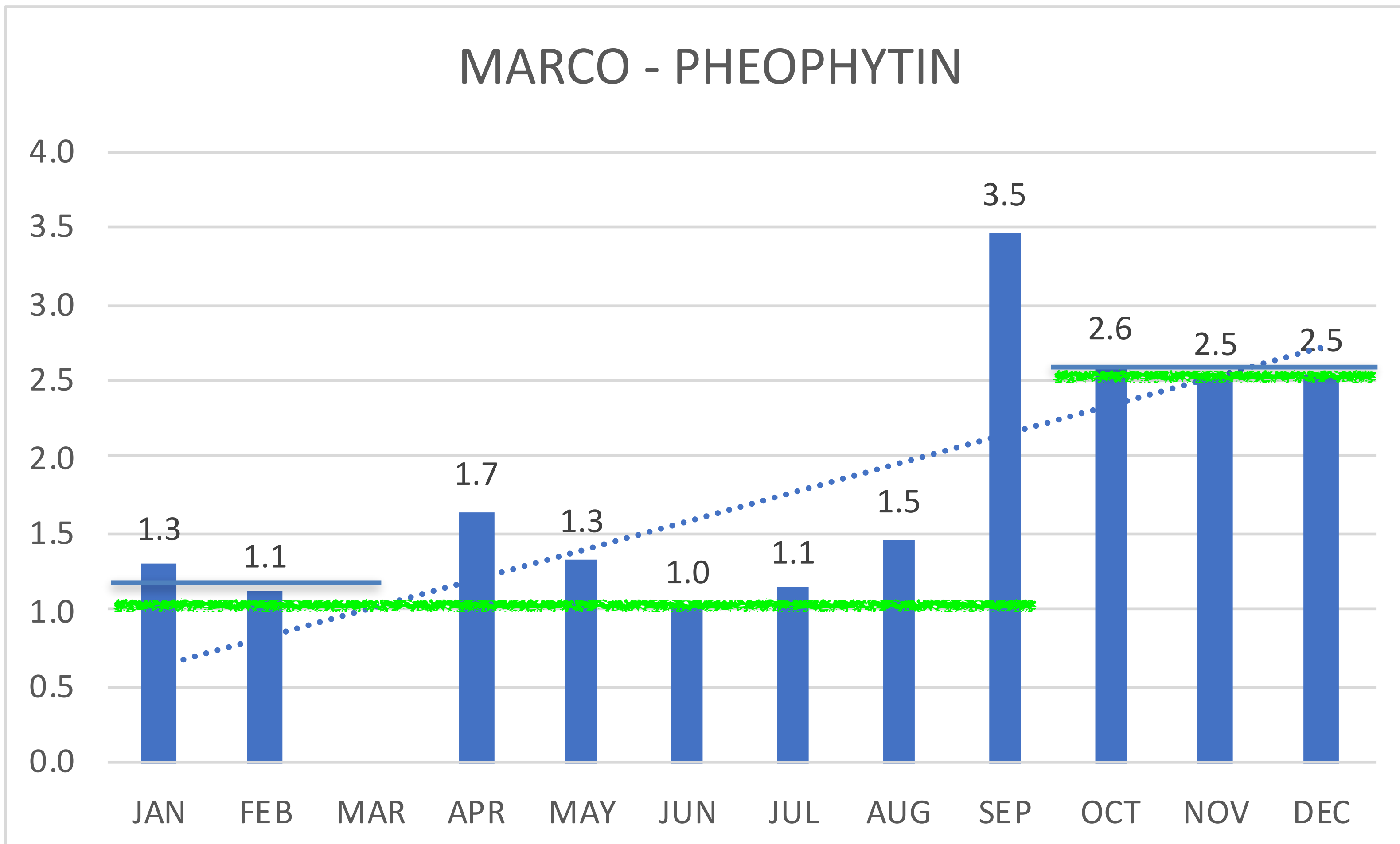
Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Limits
6.5 - 8.5

PH increasing across all basins

Pheophytin

Pheophytin is a chemical compound that serves as the first electron carrier intermediate in the electron transfer pathway of Photosystem II in plants, and the type II photosynthetic reaction center found in purple bacteria.



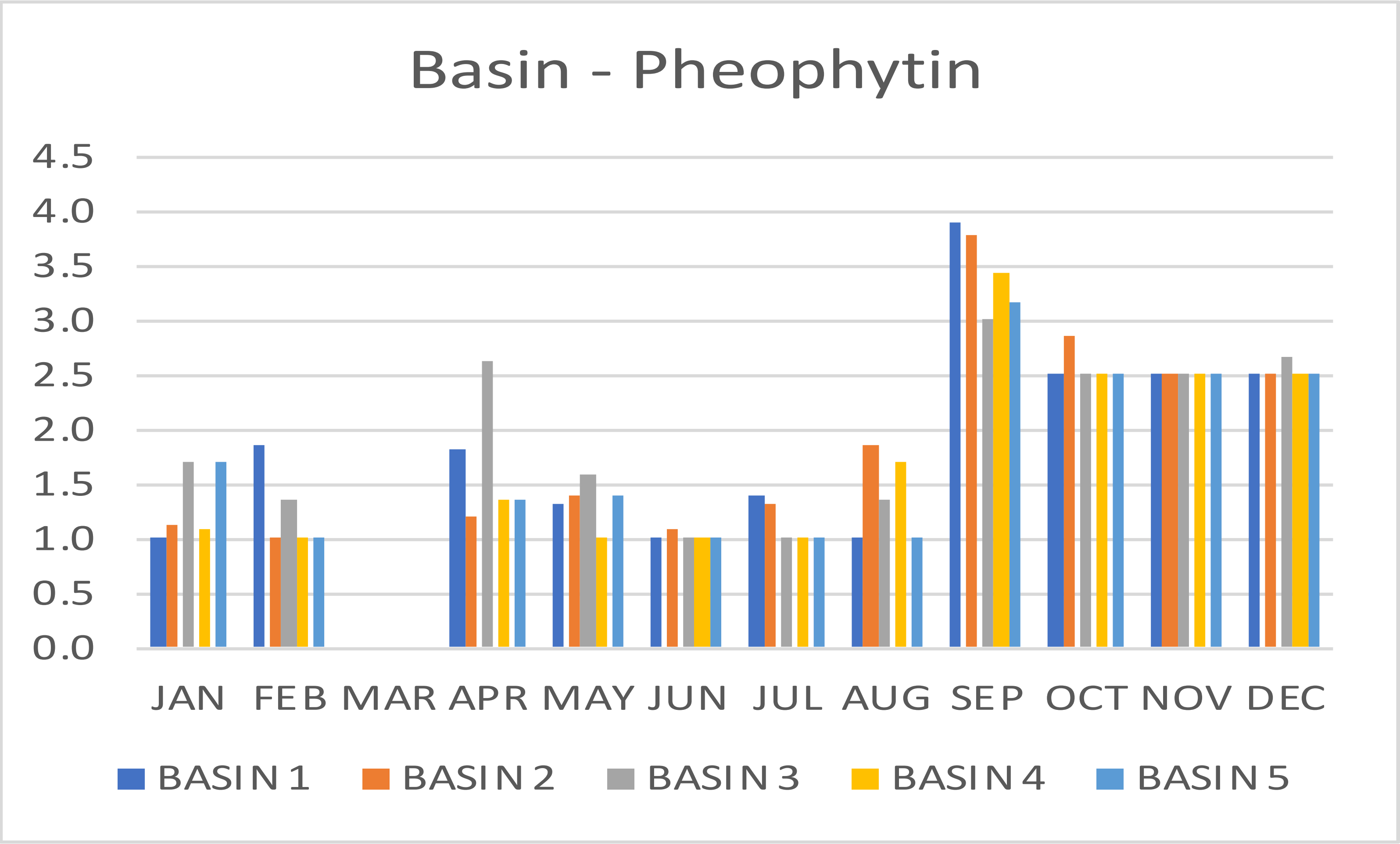
MDL
Was 1.0
Now 2.5

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports
MDL = Minimum Detectable Level

100% increase from IQ20 to IVQ20 — due to higher MDL

Pheophytin - by Basin

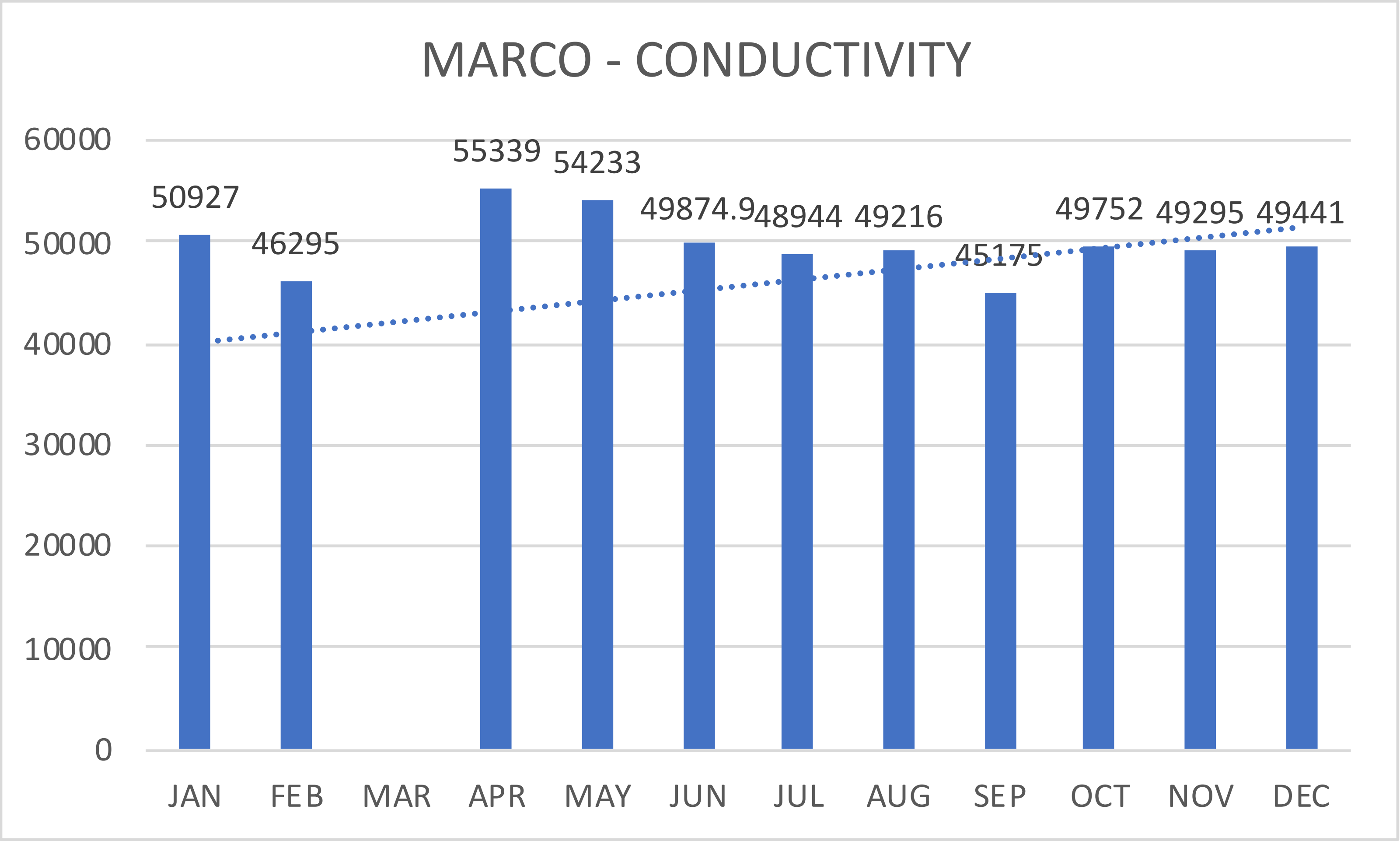


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

The “consistency” is due to measurements being so low - MDL is used

Conductivity

Conductivity is an invaluable indicator of the range into which hardness and alkalinity values are likely to fall and also of the order of the dissolved solids content of the water.

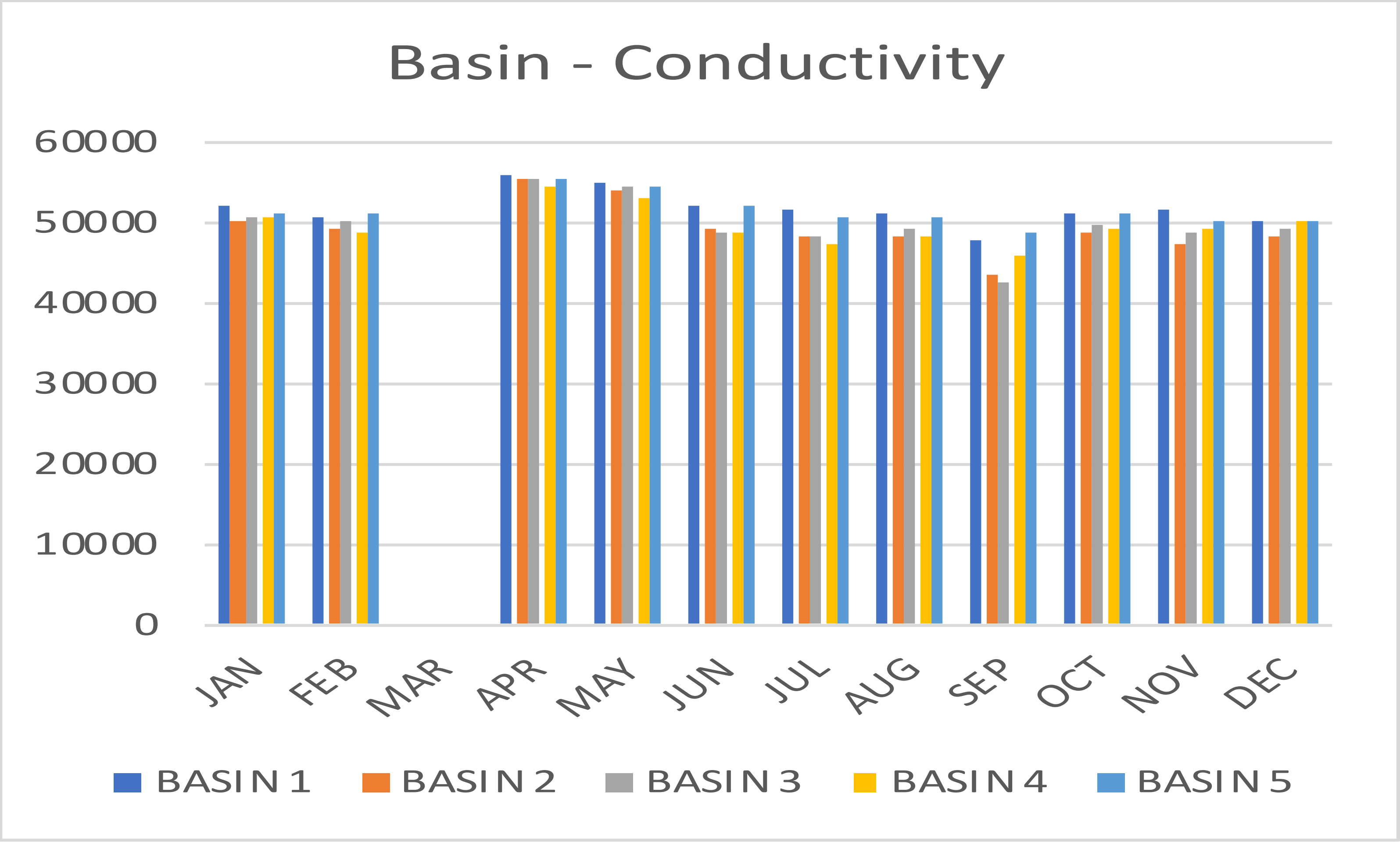


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Conductivity increasing slightly

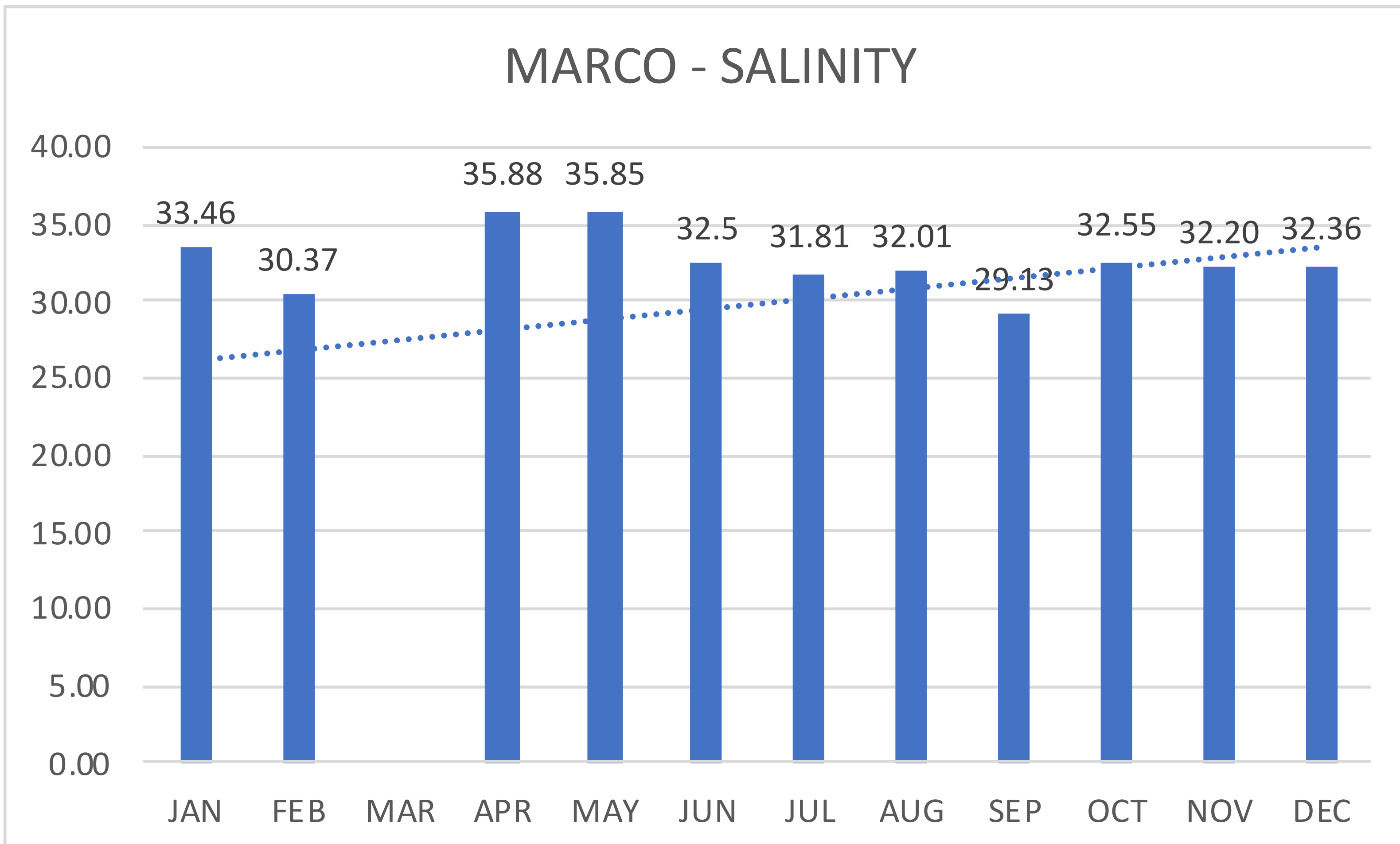
Conductivity - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Salinity

This specific parameter is of interest only in tidal waters where there may be infiltration of seawater. The presence of a high salt content may render a water unsuitable for shellfish.

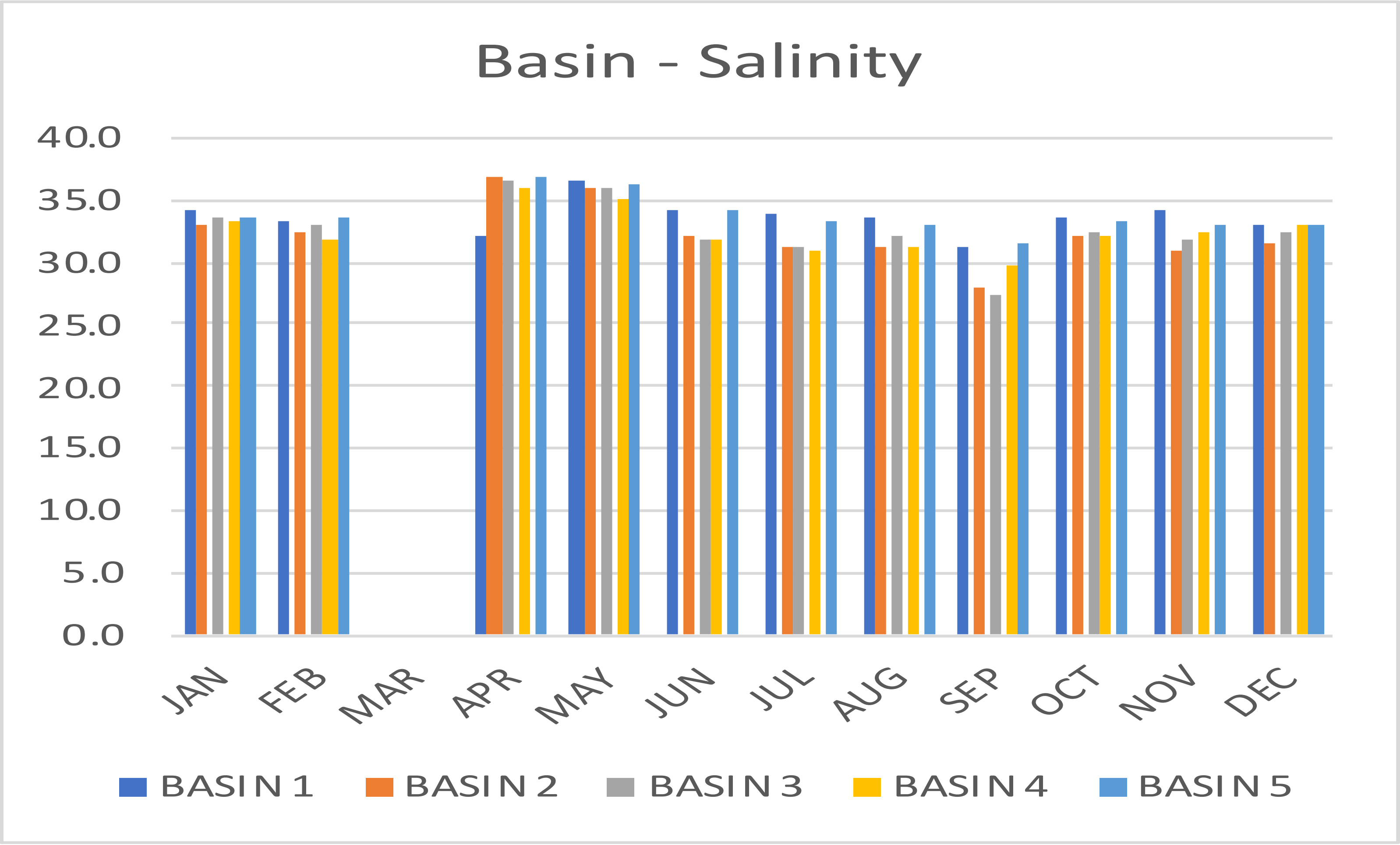


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Salinity increasing

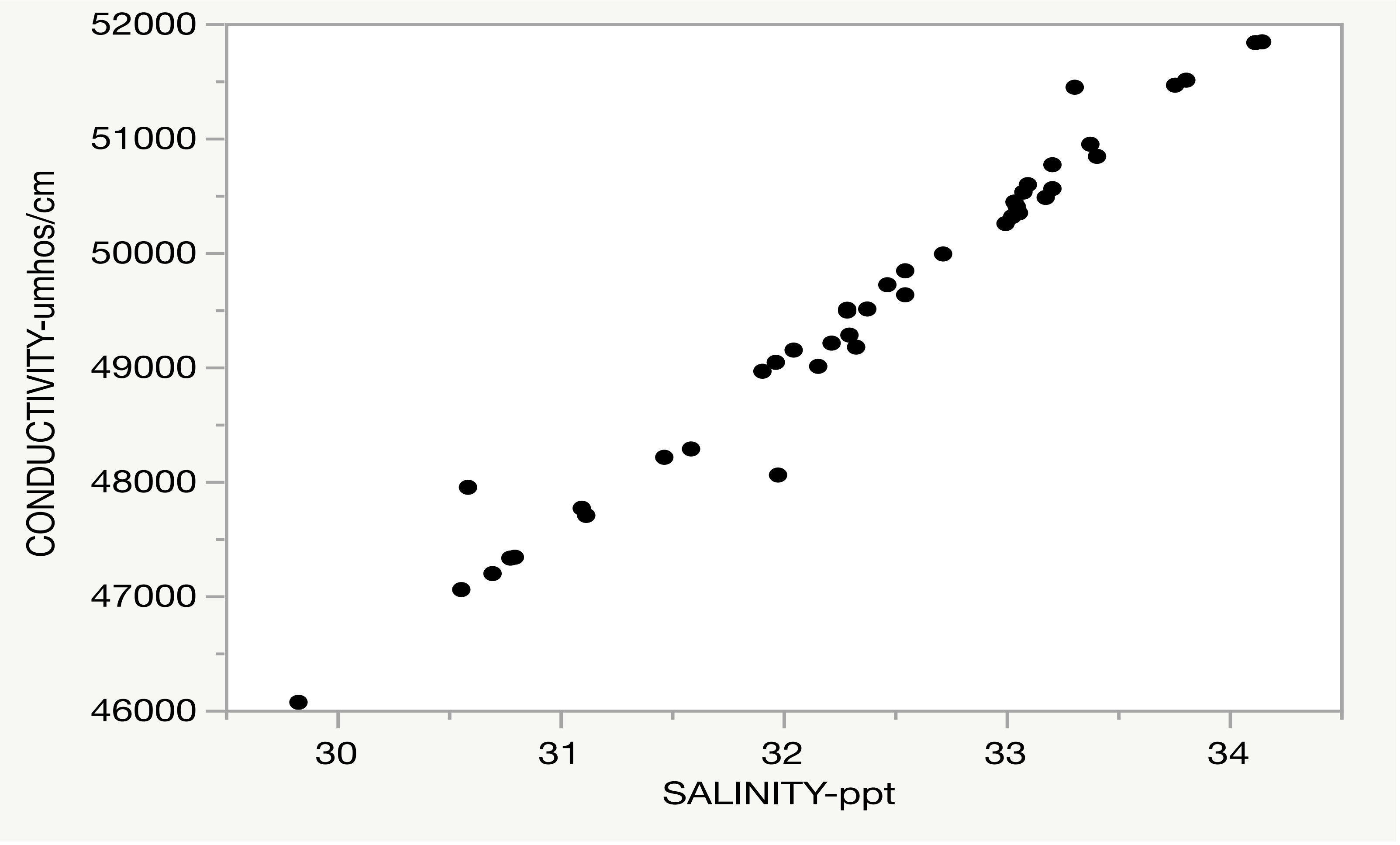
Salinity - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Salinity increasing across all basins

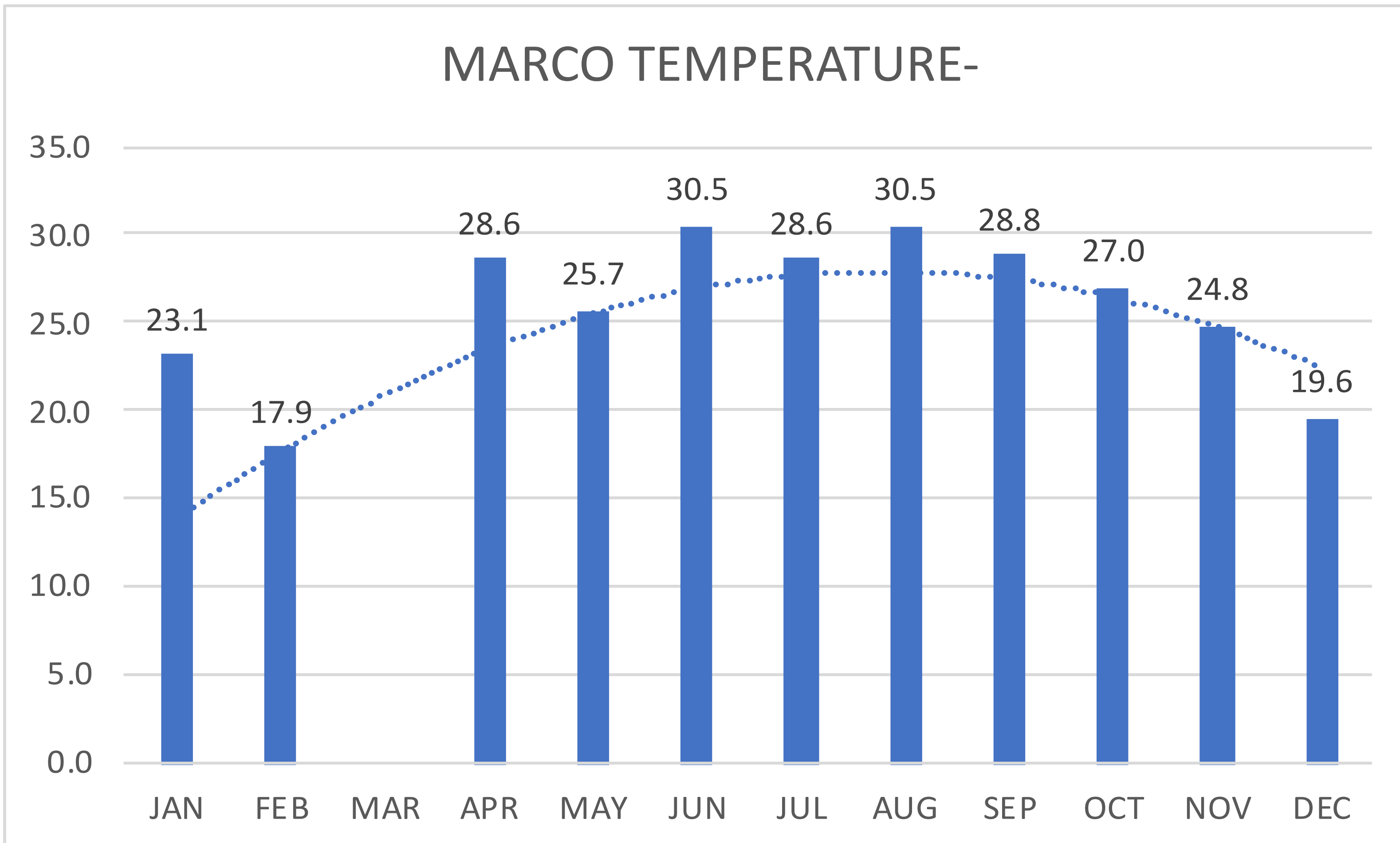
Bivariate Fit of CONDUCTIVITY By SALINITY



Conductivity and Salinity are highly correlated

Temperature

A most important factor with temperature is that some key constituents of a water either change their form or alter their concentration when temperature changes. The primary interest in the temperature of surface waters is due to the inverse relationship between it and oxygen solubility.

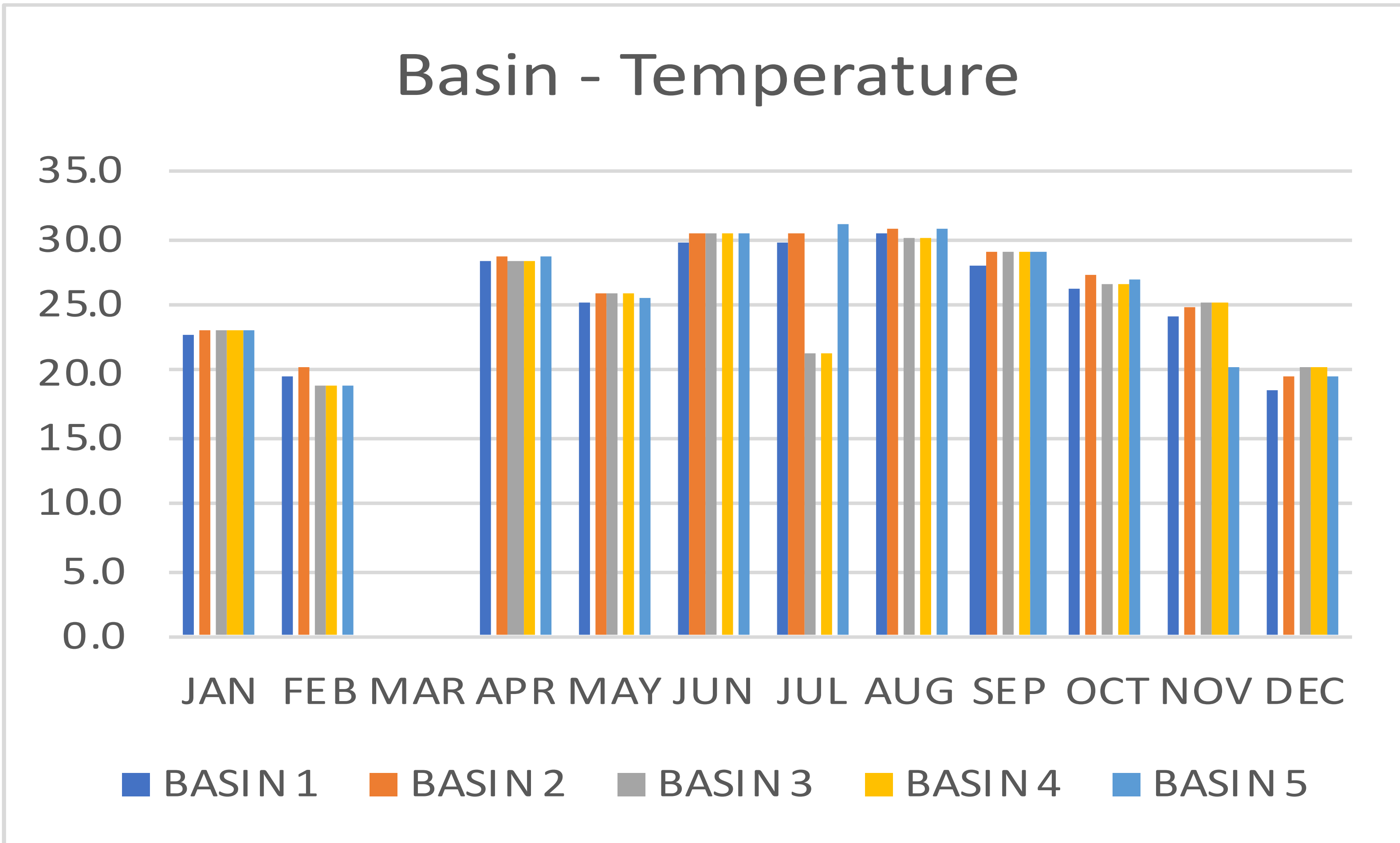


Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

POSITIVE TREND	
NEUTRAL	
NEGATIVE TREND	
NOT SURE	

Seasonal effect

Temperature - by Basin



Source: City of Marco Island, Waterways Committee, Monthly Water Quality Reports

Seasonal effect

3. Descriptive Statistics

TN

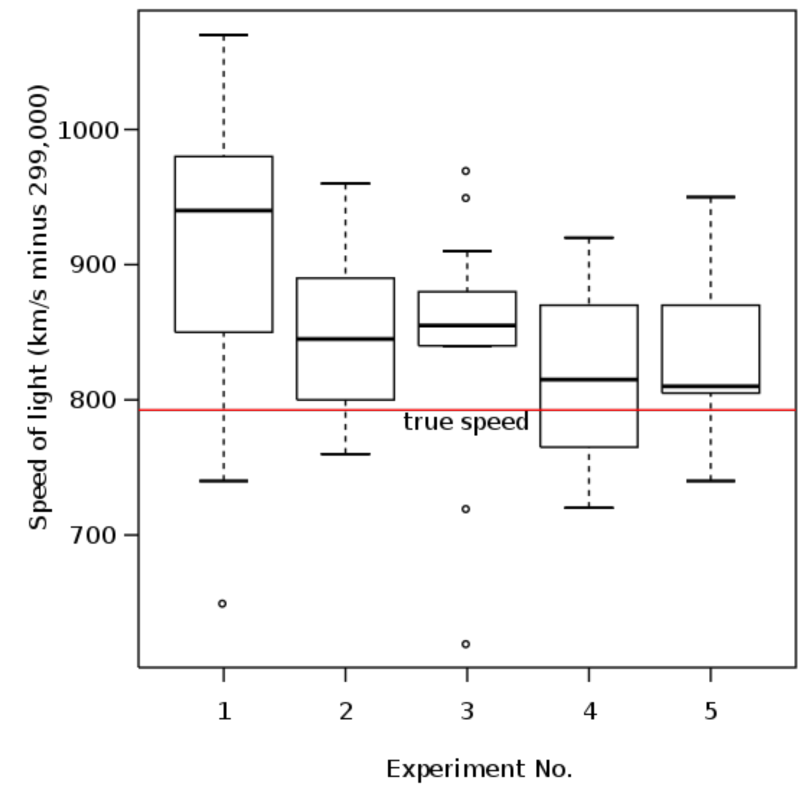
Box Plot

A box plot is a method for graphically depicting groups of numerical data through their quartiles.

Box plots may also have lines extending from the boxes (whiskers) indicating variability outside the upper and lower quartiles, hence the terms box-and-whisker plot and box-and-whisker diagram.

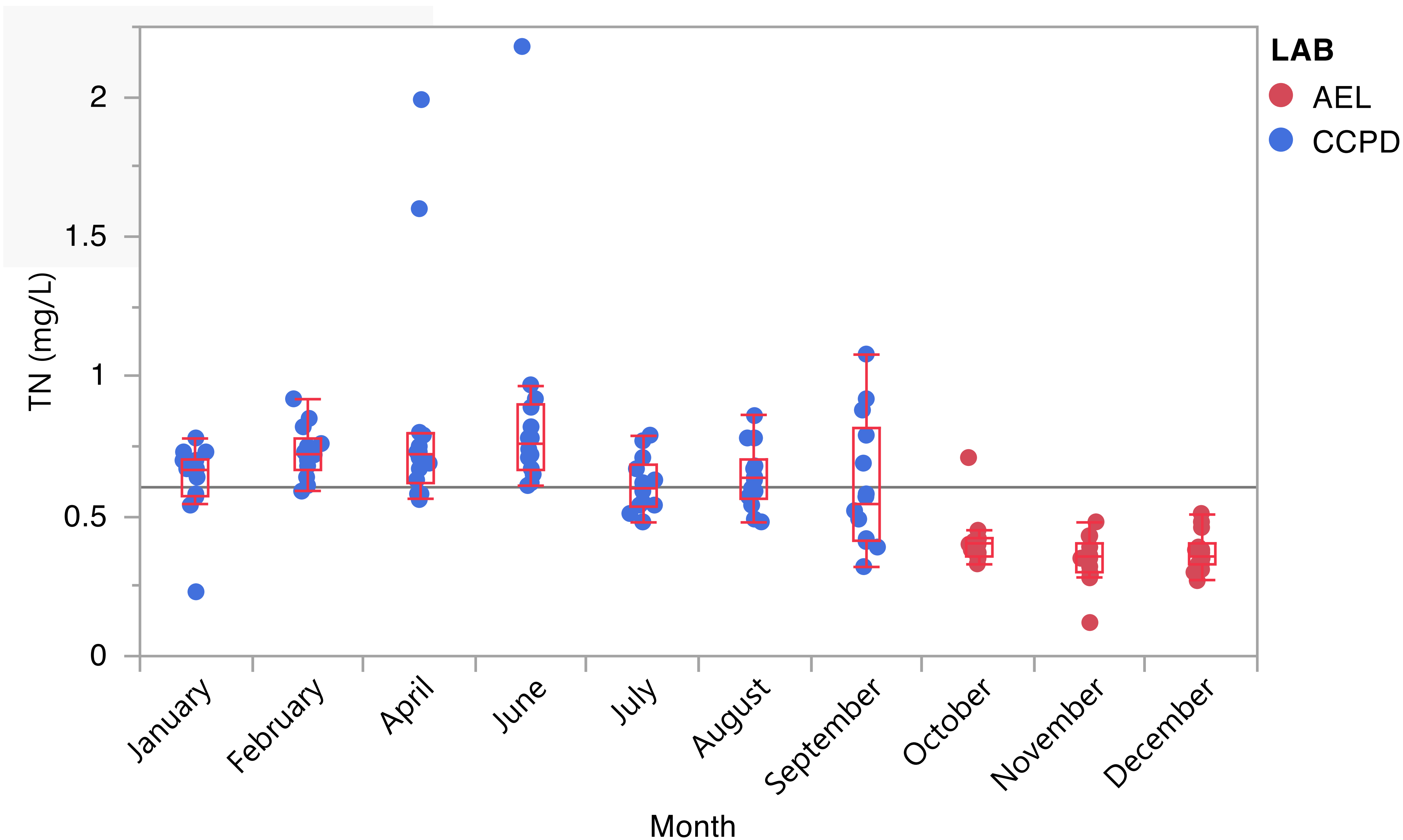
Outliers may be plotted as individual points.

Box plots received their name from the box in the middle.

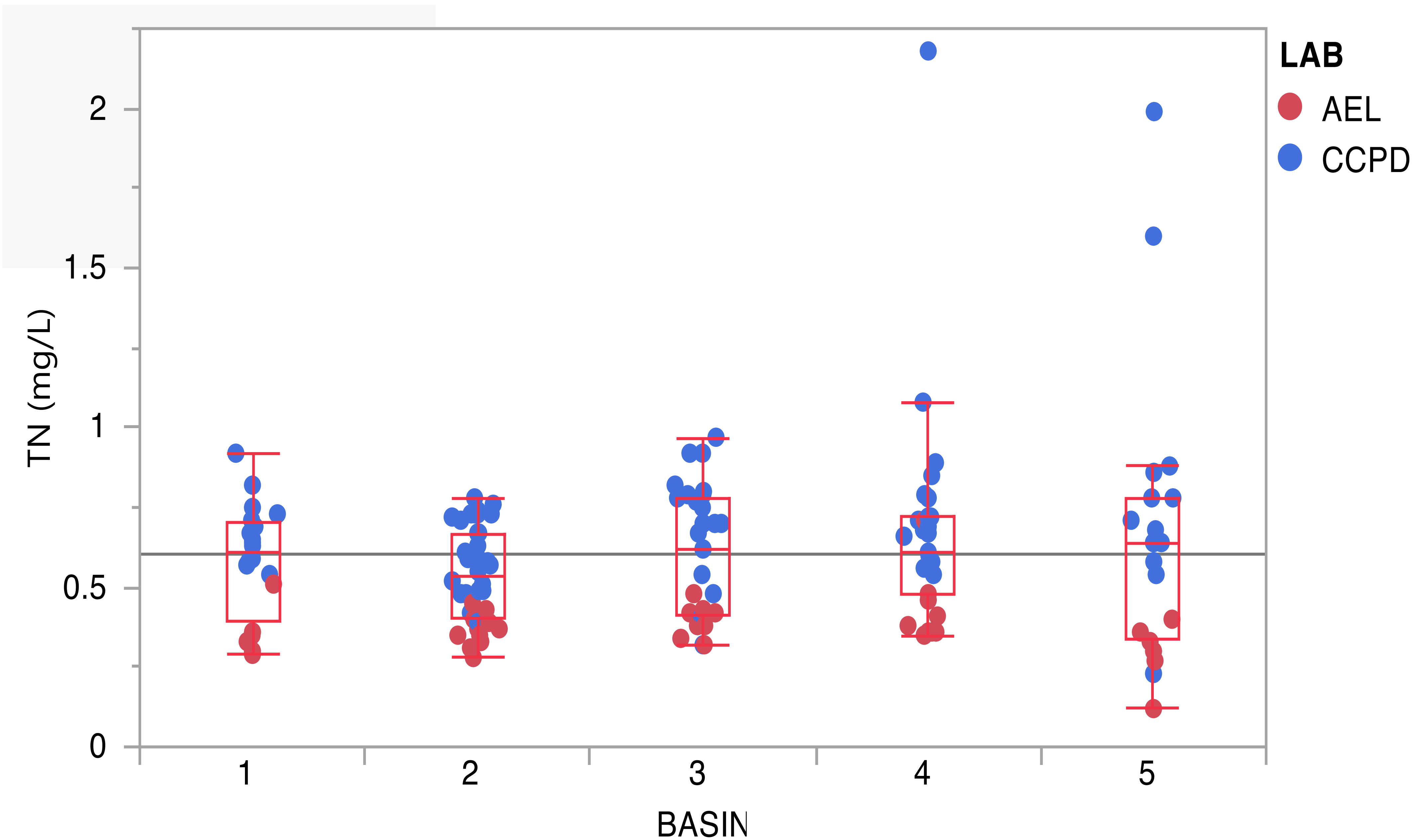


Box plot of data from the Michelson–Morley experiment

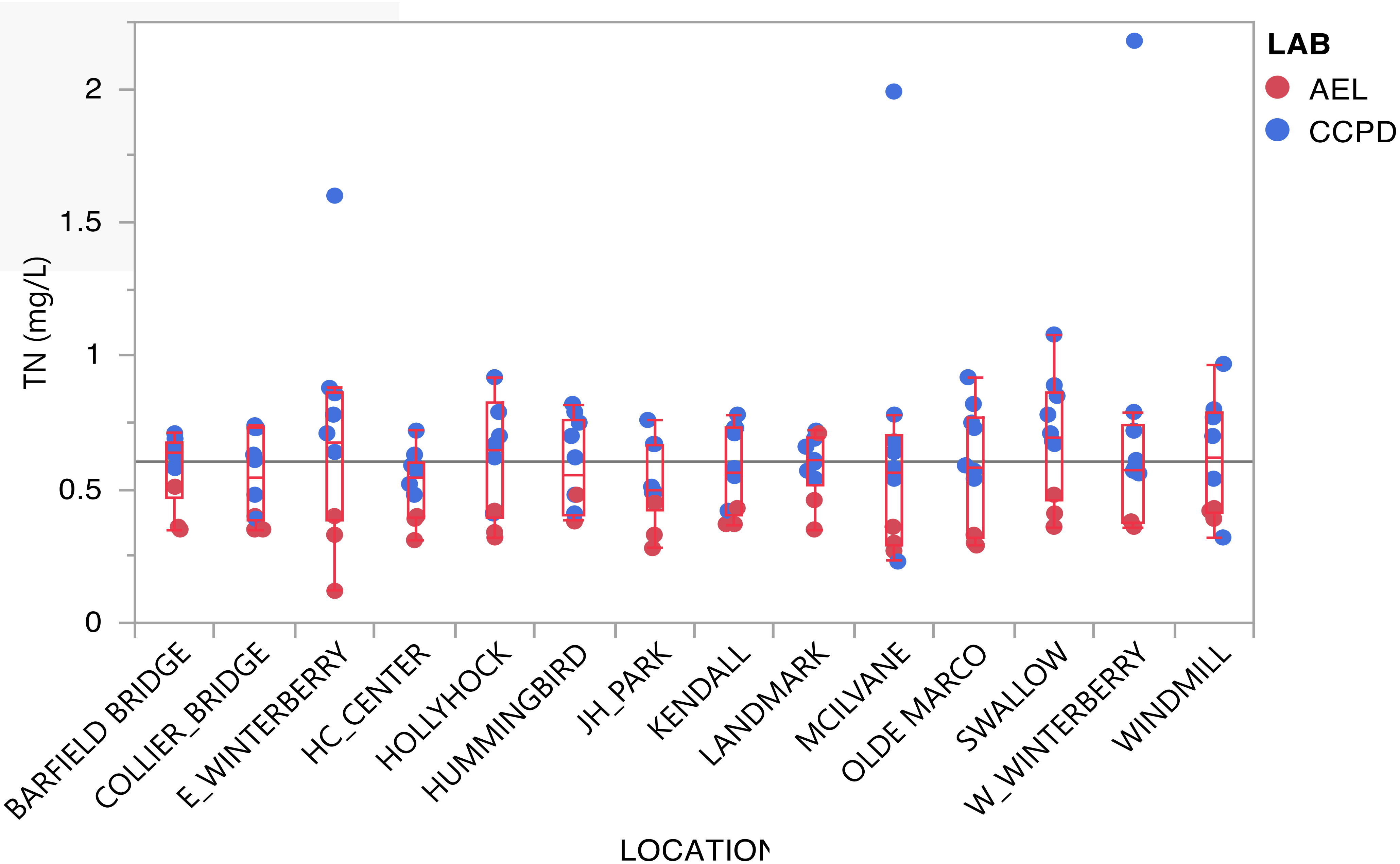
2020 Marco TN (mg/L) By MONTH



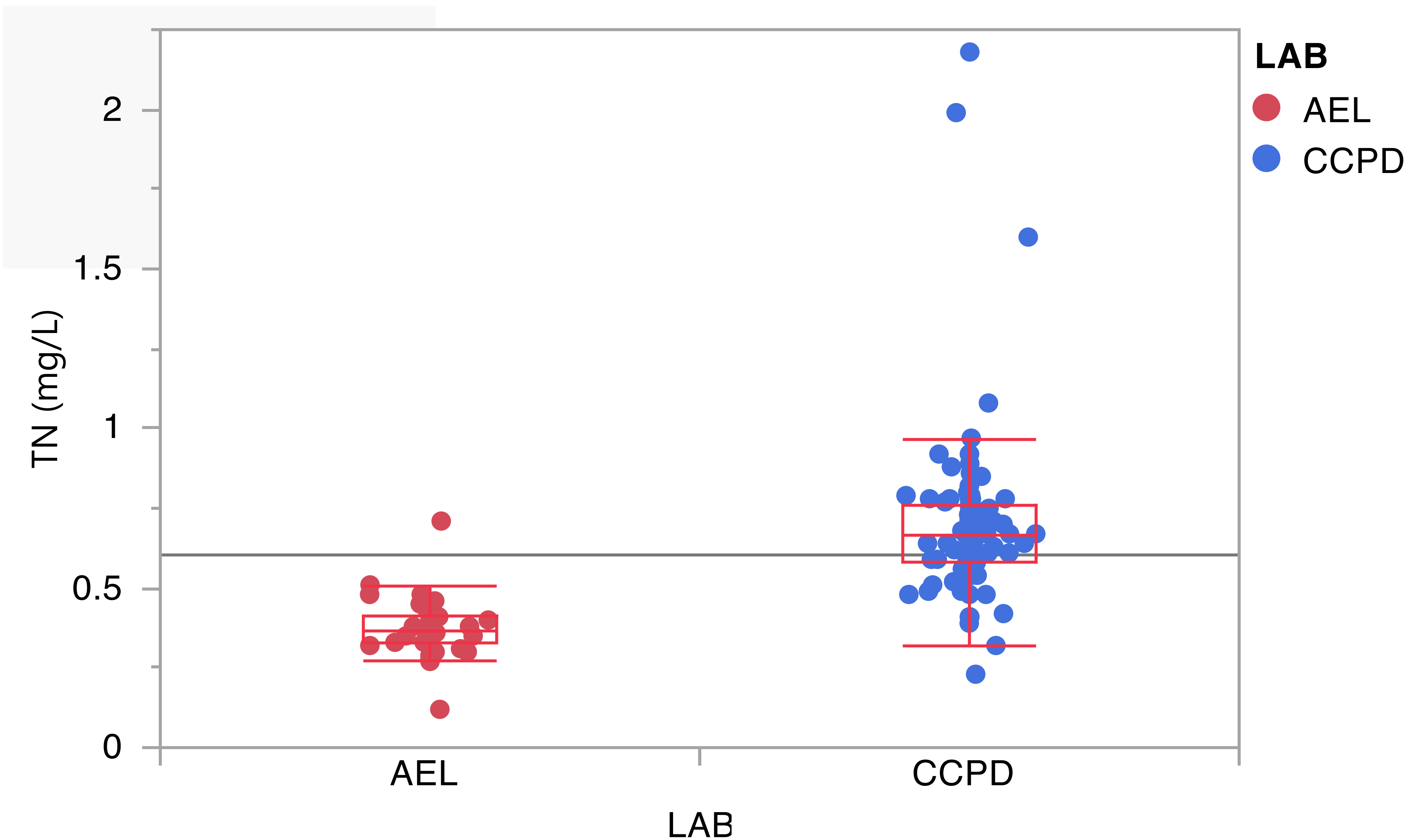
2020 Marco TN (mg/L) By BASIN



2020 Marco TN (mg/L) By LOCATION



2020 Marco TN (mg/L) By LAB



4. Definitions

Big Cypress Basin

Source: https://www.sfwmd.gov/who-we-are/bcb

The Big Cypress Basin Board and Big Cypress Basin Service Center manage a network of 143.6 miles of primary canals, 35 water control structures and three back pumps providing flood control during the wet season and protecting regional water supplies and environmental resources from over-drainage during the dry season. The basin includes Collier County and part of Monroe County.

The Florida Legislature established the South Florida Water Management District to manage and protect water resources in our region. The District's work fits broadly into four categories.

Flood control has been part of the District's mission since it was created by the Legislature as the Central and Southern Florida Flood Control District in 1949. Throughout the year, Operations and Maintenance staff oversee approximately 2,200 miles of canals and 2,100 miles of levees/berms, 84 pump stations, 778 water control structures and weirs and 621 project culverts.

Water supply planning is essential to meet the growing demand on limited water resources of 8.7 million residents, millions of visitors, businesses and the environment. The District is addressing future needs by developing five distinct regional water supply plans and promoting water conservation and the use of alternative water supplies.

Water quality improvement efforts are removing excess nutrients that have altered South Florida's ecosystems. Vast constructed wetlands known as Stormwater Treatment Areas, combined with agricultural and urban Best Management Practices, have dramatically reduced phosphorus levels in the Everglades over the last two decades.

Finally, numerous ecosystem restoration projects are being planned, built and operated to protect and preserve South Florida's unique ecosystems, including the Everglades, the Kissimmee River, Lake Okeechobee and a diverse array of coastal watersheds. The most prominent of these efforts is the Comprehensive Everglades Restoration Plan, a 50-50 partnership between the State of Florida and the federal government to restore, protect and preserve the greater Everglades ecosystem

Chlorophyl-a

Source: Wikipedia

Chlorophyll a is a specific form of chlorophyll used in oxygenic photosynthesis. It absorbs most energy from wavelengths of violet-blue and orange-red light, and it is a poor absorber of green and near-green portions of the spectrum. Chlorophyll does not reflect light but chlorophyll-containing tissues appear green because green light, diffusively reflected by structures like cell walls, becomes enriched in the reflected light. This photosynthetic pigment is essential for photosynthesis in eukaryotes, cyanobacteria and prochlorophytes because of its role as primary electron donor in the electron transport chain. Chlorophyll a also transfers resonance energy in the antenna complex, ending in the reaction center where specific chlorophylls P680 and P700 are located.

Chlorophyll

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

Chlorophyll is perhaps the single most important parameter in the assessment of the water quality of lakes, particularly in regard to their trophic quality (i.e. whether or not, or to what degree, they are enriched due to the presence of nutrients such as phosphorus and - to a much lesser extent - nitrogen in the form of nitrate). Excessive nutrient presence in lakes promotes the growth of algae which in overabundance cause serious environmental problems.

In over-enriched - eutrophic - lakes "algal blooms" can occur. These are surface accumulations of cyanobacteria (formerly classified as blue-green algae), i.e. dense masses of algae which can be swept by the winds into bays or along the lake shore (where they can decay, causing further problems), and which can seriously disrupt the dissolved oxygen regime.

In day time, when conditions are bright or sunny, the algae will carry out photosynthesis, consuming carbon dioxide and releasing oxygen to the waterbody. In darkness, however, the algae respire, consuming dissolved oxygen the levels of which may become critically low - low enough, in fact, to cause fish mortality.

Cyanobacterial and algal material can release trace organic components which can cause severe problems on two main accounts. First, the compounds released by cyanobacteria can prove toxic to animals ingesting the water in which they are present. It has been necessary in some instances for local authorities to warn the public not to walk dogs along affected lakeshores or to allow them access to the water.

Second, in cases where algae are present they can give rise to taste and odor problems if the water is used as drinking water source. One characteristic of waters affected by algal presence is a musty taste or odor. The tastes and odors are much more pronounced if the water is chlorinated prior to distribution as drinking water. In some instances the severity of the taste and odor has been such that temporary closure of the supply was needed.

Conductivity

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

Also referred to as electrical conductivity and, not wholly accurately, as specific conductance, the conductivity of a water is an expression of its ability to conduct an electric current. As this property is related to the ionic content of the sample which is in turn a function of the dissolved (ionisable) solids concentration, the relevance of easily performed conductivity measurements is apparent.

In itself conductivity is a property of little interest to a water analyst but it is an invaluable indicator of the range into which hardness and alkalinity values are likely to fall, and also of the order of the dissolved solids content of the water. While a certain proportion of the dissolved solids (for example, those which are of vegetable origin) will not be ionised (and hence will not be reflected in the conductivity figures) for many surface waters the following approximation will apply: Conductivity (µS/cm) x 2/3 = Total Dissolved Solids (mg/l).

It is important to note that there is an interrelationship between conductivity and temperature, the former increasing with temperature at a rate of some 2 per cent per degree C rise. There is a regrettable lack of uniformity in the terms in which conductivity is reported. Some UK methods manuals report the results at 20°C while the standard US reference manual uses 25°C. A difference of 10 percent can therefore arise depending on how the results are quoted. An error of this magnitude could not be tolerated, especially where conductivity readings are being used to estimate salinity.

Correlation

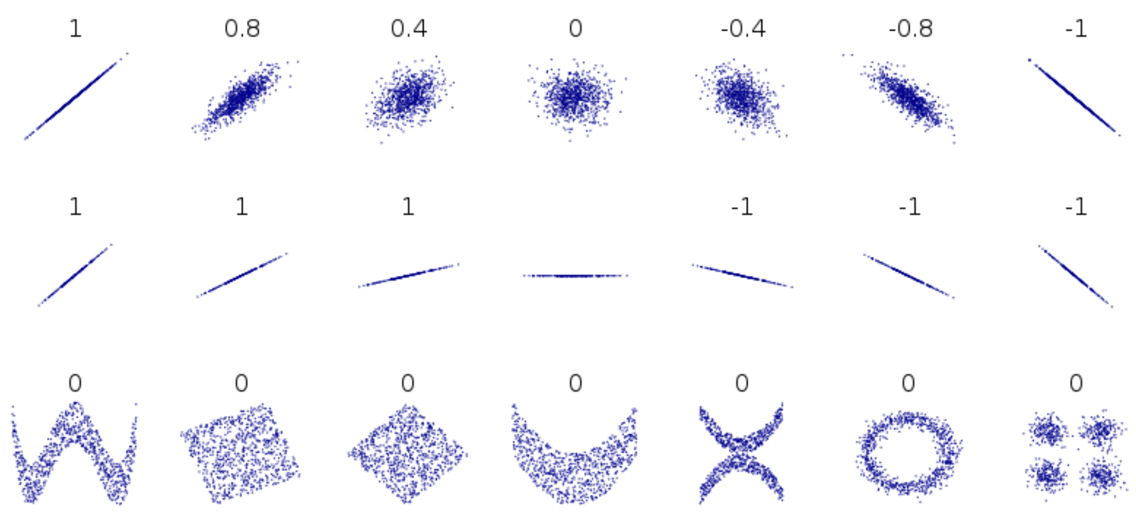
Correlation or dependence is any statistical relationship, whether causal or not, between two random variables. In the broadest sense correlation is any statistical association, though it commonly refers to the degree to which a pair of variables are linearly related.

Familiar examples of dependent phenomena include the correlation between the height of parents and their offspring.

Correlations are useful because they can indicate a predictive relationship that can be exploited in practice.

For example, an electrical utility may produce less power on a mild day based on the correlation between electricity demand and weather. In this example, there is a causal relationship, because extreme weather causes people to use more electricity for heating or cooling. However, in general, the presence of a correlation is not sufficient to infer the presence of a causal relationship (i.e., correlation does not imply causation).

Essentially, correlation is the measure of how two or more variables are related to one another.



Several sets of (x, y) points, with the Pearson correlation coefficient of x and y for each set. The correlation reflects the noisiness and direction of a linear relationship (top row), but not the slope of that relationship (middle), nor many aspects of nonlinear relationships (bottom). N.B.: the figure in the center has a slope of 0 but in that case the correlation coefficient is undefined because the variance of Y is zero.

DBHydro

Source: https://www.sfwmd.gov/science-data/dbhydro

DBHYDRO is the South Florida Water Management District's corporate environmental database that stores hydrologic, meteorologic, hydrogeologic and water quality data. This database is the source of historical and up-to-date environmental data for the 16-county region covered by the District.

The DBHYDRO Browser allows you to search DBHYDRO, using one or more criteria, and to generate a summary of the data from the available period of record. You can then select data sets of interest and have the time series data dynamically displayed on your screen in tables or graphs. You can also download data to your computer for later use.

DBHYDRO Training: Through a series of succinct videos, participants will learn how the District collects data, what types of data are available, and the best ways to search the database. You can get started at:

www.sfwmd.gov/dbhydrotraining

Dissolved Oxygen (DO)

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

The prime requirements for DO arise in connection with fish life and it is generally true that if water quality is suitable for fish it will also meet the criteria for most if not all other beneficial uses and be of good ecological status, as required. The cardinal point about the solubility of oxygen in water is that it has an inverse relationship with temperature.

The consequence is that the actual concentrations of DO in a river will be lowest in summertime when it is usually the case that the risk of damage to a water supply source or of environmental pollution is greatest, especially in areas developed as tourist centers or where such farming operations as silage-making are carried on.

Source: USGS

Dissolved oxygen (DO) is a measure of how much oxygen is dissolved in the water - the amount of oxygen available to living aquatic organisms. The amount of dissolved oxygen in a stream or lake can tell us a lot about its water quality.

Although water molecules contain an oxygen atom, this oxygen is not what is needed by aquatic organisms living in natural waters. A small amount of oxygen, up to about ten molecules of oxygen per million of water, is actually dissolved in water. Oxygen enters a stream mainly from the atmosphere and, in areas where groundwater discharge into streams is a large portion of streamflow, from groundwater discharge. This dissolved oxygen is breathed by fish and zooplankton and is needed by them to survive.

Rapidly moving water, such as in a mountain stream or large river, tends to contain a lot of dissolved oxygen, whereas stagnant water contains less. Bacteria in water can consume oxygen as organic matter decays. Thus, excess organic material in lakes and rivers can cause eutrophic conditions, which is an oxygen-deficient situation that can cause a water body to "die." Aquatic life can have a hard time in stagnant water that has a lot of rotting, organic material in it, especially in summer (the concentration of dissolved oxygen is inversely related to water temperature), when dissolved-oxygen levels are at a seasonal low. Water near the surface of the lake– the epilimnion– is too warm for them, while water near the bottom–the hypolimnion– has too little oxygen. Conditions may become especially serious during a period of hot, calm weather, resulting in the loss of many fish. You may have heard about summertime fish kills in local lakes that likely result from this problem.

Enterococci

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

These organisms originate in feces, both animal and human. Despite their having some pathogenic properties, their main use is as an indicator of fecal pollution and, as they can be reliably and easily determined, their estimation is useful in clarifying the position in waters which show no E. coli but large numbers of coliform bacteria as a group. One of the more relevant members of this group is Streptococcus faecalis.

While the measurement of fecal streptococci has been recommended as a source of valuable supplementary information on surface water quality, particularly in combination with data from fecal coliform assays, it should be remembered that a limitation on the use of fecal streptococci is their shorter survival time in the aquatic environment.

Enterococcus

Source: Wikipedia

Enterococcus is a large genus of lactic acid bacteria of the phylum Firmicutes. Enterococci are gram-positive cocci that often occur in pairs (diplococci) or short chains, and are difficult to distinguish from streptococci on physical characteristics alone.[4] Two species are common commensal organisms in the intestines of humans: E. faecalis (90–95%) and E. faecium (5–10%). Rare clusters of infections occur with other species, including E. casseliflavus, E. gallinarum, and E. raffinosus

Estuary

Source: Wikipedia

An estuary is a partially enclosed coastal body of brackish water with one or more rivers or streams flowing into it, and with a free connection to the open sea.

Estuaries form a transition zone between river environments and maritime environments known as ecotone. Estuaries are subject both to marine influences such as tides, waves, and the influx of saline water and to riverine influences such as flows of freshwater and sediment. The mixing of seawater and freshwater provides high levels of nutrients both in the water column and in sediment, making estuaries among the most productive natural habitats in the world.

Most existing estuaries formed during the Holocene epoch with the flooding of river-eroded or glacially scoured valleys when the sea level began to rise about 10,000–12,000 years ago. Estuaries are typically classified according to their geomorphological features or to water-circulation patterns. They can have many different names, such as bays, harbors, lagoons, inlets, or sounds, although some of these water bodies do not strictly meet the above definition of an estuary and could be fully saline.

Many estuaries suffer degeneration from a variety of factors including soil erosion, deforestation, overgrazing, overfishing and the filling of wetlands. Eutrophication may lead to excessive nutrients from sewage and animal wastes; pollutants including heavy metals, polychlorinated biphenyls, radionuclides and hydrocarbons from sewage inputs; and diking or damming for flood control or water diversion.

Eutrophication

Source: Wikipedia

Eutrophication (from Greek eutrophos, “well-nourished"), dystrophication or hypertrophication, is the process by which a body of water becomes overly enriched with minerals and nutrients which induce excessive growth of algae. This process may result in oxygen depletion of the water body after the bacterial degradation of the algae. One example is an "algal bloom" or great increase of phytoplankton in a pond, lake, river or coastal zone as a response to increased levels of nutrients.

Eutrophication is often induced by the discharge of nitrate or phosphate-containing detergents, fertilizers, or sewage into an aquatic system. Lake eutrophication has become a global problem of water pollution. Chlorophyll-a, total nitrogen, total phosphorus, biological or chemical oxygen demand and secchi depth are the main indicators to evaluate lake eutrophication level.

Green Tide [Harmful Algal Bloom]

Source: Wikipedia

A harmful algal bloom (HAB) contains organisms (usually algae, hence the name) that can severely lower oxygen levels in natural waters, killing organisms in marine or fresh waters. Some HABs are associated with algae-produced toxins. Blooms can last from a few days to many months. After the bloom dies, the microbes which decompose the dead algae use up even more of the oxygen (generating a "dead zone"), which can create fish die-offs. When these zones of depleted oxygen cover a large area for an extended period of time neither fish nor plants are able to survive.

HABs are induced by eutrophication: an overabundance of nutrients in the water. The two most common nutrients are fixed nitrogen (nitrates, ammonia, urea) and phosphate. These nutrients are emitted by agriculture, other industries, excessive fertilizer use in urban/suburban areas and associated urban runoff. Higher water temperature and low circulation are contributing factors. HABs can cause significant harm to animals, the environment and economies. They have been increasing in size and frequency worldwide, a fact that many experts attribute to global climate change. The U.S. National Oceanic and Atmospheric Administration (NOAA) predicts more harmful blooms in the Pacific Ocean.

MS4 Permit

Source: https://www.colliercountyfl.gov/your-government/divisions-s-z/stormwater-management/stormwater-pollution-prevention-npdes-permits/ms4

The U.S. Environmental Protection Agency requires Collier County to operate its storm sewer system in a manner that controls pollution flowing into waters of the State.

Collier County's stormwater collection system (called a Municipal Separate Storm Sewer System, or MS4) is covered under an NPDES Phase II MS4 Stormwater Permit (Permit ID FLR04E037). Elements of the Permit require the County to have a "Stormwater Management Program" (SWMP) that reasonably attempts to prevent pollution from entering the stormwater collection system from non-point sources.

Elements of the NPDES SWMP cover 6 Minimum Control Measures (MCM). Each MCM has Best Management Practices (BMP) with measurable goals, schedule for implementation and completion.An outline of the NPDES MS4 SWMP is available here.The Florida Department of Environmental Protection (FDEP) administers this program in Florida under 62-624 F.A.C

Nitrate

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

Relatively little of the nitrate found in natural waters is of mineral origin, most coming from organic and inorganic sources, the former including waste discharges and the latter comprising chiefly artificial fertilizers. However, bacterial oxidation and fixing of nitrogen by plants can both produce nitrate.

Interest is centered on nitrate concentrations for various reasons. Most importantly, high nitrate levels in waters to be used for drinking will render them hazardous to infants as they induce the "blue baby" syndrome (methaemoglobinaemia). The nitrate itself is not a direct toxicant but is a health hazard because of its conversion to nitrite which reacts with blood hemoglobin to cause methaemoglobinaemia.

Of increasing importance is the degree to which fertilizer run-off can contribute to eutrophication problems in lakes. Sewage is rich in nitrogenous matter which through bacterial action may ultimately appear in the aquatic environment as nitrate. Hence, the presence of nitrate in ground waters, for example, is cause for suspicion of past sewage pollution or of excess levels of fertilizers or manure slurries spread on land. (High nitrite levels would indicate more recent pollution as nitrite is an intermediate stage in the ammonia-to-nitrate oxidation).

In rivers high levels of nitrate are more likely to indicate significant run-off from agricultural land than anything else and the parameter is not of primary importance per se. However, it should be noted that there is a general tendency for nitrate concentrations in rivers to increase as a result of enhanced nutrient run-off; this may ultimately lessen their utility as potential sources of public water supply. Nitrite concentrations in rivers are rarely more than 1 - 2 per cent of the nitrate level so that it may therefore be acceptable to carry out the analytically convenient determination of nitrate + nitrite at the same time. This determination is correctly referred to as total oxidized nitrogen.

Nitrite

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

Nitrite exists normally in very low concentrations and even in waste treatment plant effluents levels are relatively low, principally because the nitrogen will tend to exist in the more reduced (ammonia; NH3) or more oxidized (nitrate; NO3) forms.

Because nitrite is an intermediate in the oxidization of ammonia to nitrate, because such oxidation can proceed in soil, and because sewage is a rich source of ammonia nitrogen, waters which show any appreciable amounts of nitrite are regarded as being of highly questionable quality. Levels in unpolluted waters are normally low, below 0.03 mg/l NC)2. Values greater than this may indicate sewage pollution.

The significance of nitrite (at the low levels often found in surface waters) is mainly as an indicator of possible sewage pollution rather than as a hazard itself although, as mentioned above under "Nitrate" (q.v.), it is nitrite rather than nitrate which is the direct toxicant. There is, accordingly, a stricter limit for nitrite in drinking waters. In addition, nitrites can give rise to the presence of nitrosamines by reaction with organic compounds and there may be carcinogenic effects.

NNC

Source: https://floridadep.gov/dear/water-quality-standards/content/numeric-nutrient-criteria-development

For many decades Florida has had a narrative nutrient water quality criterion (NNC) in place to protect Florida's waters against nutrient over-enrichment. In 2009, the department initiated rulemaking and, by 2011, adopted what would be the first set of statewide numeric nutrient standards for Florida's waters. By 2015, almost all of the remaining waters in Florida have numeric nutrient standards.

The vast majority of Florida's freshwater streams, lakes and springs are covered by numeric interpretations of the nutrient criterion, and only wetlands (except for the Everglades Protection Area) and South Florida canals are not covered by numeric nutrient criteria. Non-perennial streams, man-made or physically altered canals/ditches with poor habitat used primarily as water conveyances for flood control, irrigation, etc., and tidal creeks may also be solely covered by the narrative criterion once properly documented as meeting one of the exclusions for the definition of a stream.

The Florida coastline is separated into estuary and coastal segments. Numeric nutrient criteria are established for all estuary segments, including criteria for total nitrogen, total phosphorus, and chlorophyll a. For open ocean coastal waters, numeric criteria are established for chlorophyll a that are derived from satellite remote sensing techniques.

Numeric Nutrient Standards:

- Lakes, Streams, and Spring Vents - Rule 62-302.531
- Estuaries and Coastal Segments - Rule 62-302.532
- Everglades Protection Area - Rule 62-302.540
- Surface Water Quality Standards - Chapter 62-302, F.A.C.
- Identification of Impaired Surface Waters - Chapter 62-303, F.A.C.

PH

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

By definition pH is the negative logarithm of the hydrogen ion concentration of a solution and it is thus a measure of whether the liquid is acid or alkaline. The pH scale (derived from the ionisation constant of water) ranges from 0 (very acid) to 14 (very alkaline). The range of natural pH in fresh waters extends from around 4.5, for acid, peaty upland waters, to over 10.0 in waters where there is intense photosynthetic activity by algae. However, the most frequently encountered range is 6.5-8.5.

In waters with low dissolved solids, which consequently have a low buffering capacity (i.e. low internal resistance to pH change), changes in pH induced by external causes may be quite dramatic. Extremes of pH can affect the palatability of a water but the corrosive effect on distribution systems is a more urgent problem. The effect of pH on fish is also an important consideration and values which depart increasingly from the normally found levels will have a more and more marked effect on fish, leading ultimately to mortality. The range of pH suitable for fisheries is considered to be 5.0-9.0, though 6.5-8.5 is preferable.

Pheophytin

Source: Wikipedia

Pheophytin or phaeophytin (abbreviated Pheo) is a chemical compound that serves as the first electron carrier intermediate in the electron transfer pathway of Photosystem II (PS II) in plants, and the type II photosynthetic reaction center (RC P870) found in purple bacteria. In both PS II and RC P870, light drives electrons from the reaction center through pheophytin, which then passes the electrons to a quinone (QA) in RC P870 and RC P680. The overall mechanisms, roles, and purposes of the pheophytin molecules in the two transport chains are analogous to each other.

Pollution

Source: Wikipedia

Water pollution is the contamination of water bodies, usually as a result of human activities. Water bodies include for example lakes, rivers, oceans, aquifers and groundwater. Water pollution results when contaminants are introduced into the natural environment. For example, releasing inadequately treated wastewater into natural water bodies can lead to degradation of aquatic ecosystems. In turn, this can lead to public health problems for people living downstream. They may use the same polluted river water for drinking or bathing or irrigation. Water pollution is the leading worldwide cause of death and disease, e.g. due to water-borne diseases.

Water pollution can be classified as surface water or groundwater pollution. Marine pollution and nutrient pollution are subsets of water pollution. Sources of water pollution are either point sources or non-point sources. Point sources have one identifiable cause of the pollution, such as a storm drain or a wastewater treatment plant. Non-point sources are more diffuse, such as agricultural runoff. Pollution is the result of the cumulative effect over time. All plants and organisms living in or being exposed to polluted water bodies can be impacted. The effects can damage individual species and impact the natural biological communities they are part of.

The causes of water pollution include a wide range of chemicals and pathogens as well as physical parameters. Contaminants may include organic and inorganic substances. Elevated temperatures can also lead to polluted water. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. Elevated water temperatures decrease oxygen levels, which can kill fish and alter food chain composition, reduce species biodiversity, and foster invasion by new thermophilic species.

Water pollution is measured by analysing water samples. Physical, chemical and biological tests can be conducted. Control of water pollution requires appropriate infrastructure and management plans. The infrastructure may include wastewater treatment plants. Sewage treatment plants and industrial wastewater treatment plants are usually required to protect water bodies from untreated wastewater. Agricultural wastewater treatment for farms, and erosion control at construction sites can also help prevent water pollution. Nature-based solutions are another approach to prevent water pollution. Effective control of urban runoff includes reducing speed and quantity of flow. In the United States, best management practices for water pollution include approaches to reduce the quantity of water and improve water quality.

Red Tide

Source: Wikipedia

Red tide is a common name for algal blooms, which are large concentrations of aquatic microorganisms, such as protozoans and unicellular algae (e.g. dinoflagellates and diatoms).[citation needed] The upwelling of nutrients from the sea floor, often following massive storms, provides for the algae and triggers bloom events. Harmful algal blooms can occur worldwide, and natural cycles can vary regionally.

The growth and persistence of an algal bloom depends on wind direction and strength, temperature, nutrients, and salinity. Red tide species can be found in oceans, bays, and estuaries, but they cannot thrive in freshwater environments. Certain species of phytoplankton and dinoflagellates like Gonyaulax found in red tides contain photosynthetic pigments that vary in color from brown to red. These organisms undergo such rapid multiplication that they make the sea appear red. When the algae are present in high concentrations, the water may appear to be discolored or murky. The most conspicuous effects of red tides are the associated wildlife mortalities and harmful human exposure. The production of natural toxins such as brevetoxins and ichthyotoxins are harmful to marine life. Effects of red tides can worsen locally due to wind driven Langmuir circulation and their biological effects.

Rookery Bay NERR

Source: https://rookerybay.org

Rookery Bay National Estuarine Research Reserve stretches across 110,000 acres of pristine mangrove forest, uplands and protected waters, encompassing 40% of Collier County coastline. The Reserve is committed to preservation through research, education, and land protection.

The Research Department monitors water, weather, and wildlife to detect short-term events and long-term change. Like watchdogs for wildlife and wild places, researchers can detect differences before they become problems for the environment, community, or local businesses.

The Education Department coordinates programming at the Rookery Bay Environmental Learning Center for all ages. Reserve educators help schoolchildren on field trips as well as Rookery Bay Environmental Learning Center visitors understand the role they play in preserving this unique coastal environment.

Reserve resource managers work closely with all sectors here at the Reserve including research, education, and coastal training program teams to provide a strong science to management connection. Insuring that science is leading the way for innovative natural resource management is crucial to adapting to constantly changing ecological systems. Additionally, Reserve staff work hand-in-hand with contractors and volunteers to further protect habitat and sustain native biodiversity. Resource management team activities include land acquisition, habitat and hydrologic stranding response, prescribed fire and cultural resource monitoring.

The Coastal Training Program provides science-based information, training, and tools to individuals who make professional decisions that affect coastal resources. We serve as a forum for Southwest Florida professionals working to resolve environmental issues of local significance. A range of services are available and are aimed at a wide variety of professionals.

Salinity

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

This specific parameter is of interest only in tidal waters or in other surface waters where there may be infiltration of seawater. The presence of a high salt content (the greater constituent of which is chloride, q.v.) may render a water unsuitable for domestic, agricultural or industrial use, or may affect its suitability for shellfish.

Full seawater is 35 parts per thousand salinity, about 35,000 mg/l Cl.

Secchi Depth

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

This parameter gives an indication of the presence or absence of suspended matter, living or inert, and hence it is a reflection of the overall quality of a water. However, it must be remembered that the presence of any undesirable substances in solution will not be indicated by transparency.

It is expressed as the maximum depth in meters at which it is possible to distinguish the markings of a Secchi disc, and it is widely used in studies on lakes to assess the abundance of algae. The parameter is also determined in bathing waters as a check on aesthetic suitability.

SFWMD

Source: https://www.sfwmd.gov/who-we-are

The South Florida Water Management District is a regional governmental agency that manages the water resources in the southern half of the state, covering 16 counties from Orlando to the Florida Keys and serving a population of 8.7 million residents.

It is the oldest and largest of the state's five water management districts. Created in 1949, the agency is responsible for managing and protecting water resources of South Florida by balancing and improving flood control, water supply, water quality and natural systems.

A key initiative is restoration of the Everglades – the largest environmental restoration project in the nation's history. The District is also working to improve the Kissimmee River and its floodplain, Lake Okeechobee and South Florida's coastal estuaries.

Flood control has been part of the District's mission since it was created by the Legislature as the Central and Southern Florida Flood Control District in 1949. Throughout the year, Operations and Maintenance staff oversee approximately 2,200 miles of canals and 2,100 miles of levees/berms, 84 pump stations, 778 water control structures and weirs and 621 project culverts.

Water supply planning is essential to meet the growing demand on limited water resources of 8.7 million residents, millions of visitors, businesses and the environment. The District is addressing future needs by developing five distinct regional water supply plans and promoting water conservation and the use of alternative water supplies.

Water quality improvement efforts are removing excess nutrients that have altered South Florida's ecosystems. Vast constructed wetlands known as Stormwater Treatment Areas, combined with agricultural and urban Best Management Practices, have dramatically reduced phosphorus levels in the Everglades over the last two decades.

Finally, numerous ecosystem restoration projects are being planned, built and operated to protect and preserve South Florida's unique ecosystems, including the Everglades, the Kissimmee River, Lake Okeechobee and a diverse array of coastal watersheds. The most prominent of these efforts is the Comprehensive Everglades Restoration Plan, a 50-50 partnership between the State of Florida and the federal government to restore, protect and preserve the greater Everglades ecosystem.

Total Nitrogen

Source: US EPA

Total Nitrogen is an essential nutrient for plants and animals. However, an excess amount of nitrogen in a waterway may lead to low levels of dissolved oxygen and negatively alter various plant life and organisms. Sources of nitrogen include: wastewater treatment plants, runoff from fertilized lawns and croplands, failing septic systems, runoff from animal manure and storage areas, and industrial discharges that contain corrosion inhibitors.

There are three forms of nitrogen that are commonly measured in water bodies: ammonia, nitrates and nitrites. Total nitrogen is the sum of total kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite. It can be derived by monitoring for organic nitrogen compounds, free-ammonia, and nitrate-nitrite individually and adding the components together. An acceptable range of total nitrogen is 2 mg/L to 6 mg/L, though it is recommended to check tribal, state, or federal standards for an adequate comparison of your data.

TN = TKN + NITRATE + NITRITE

Total Phosphorus

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

This is the most complete determination of the element phosphorus, irrespective of the compounds in which it is actually present in the water. All forms of phosphorus are converted to soluble orthophosphate which is the species detected by the chemical reaction used in the analysis.

It has been the practice in lake investigations to determine total phosphorus as one of the most meaningful parameters in the assessment of eutrophication but there is a difficulty in that not all the phosphorus measured under test conditions may be effectively available in the environment to promote algal growth. Orthophosphate is thus determined frequently as well. An advantage of this parameter is that it is a total one: it is thus subject to less ambiguity of interpretation than other phosphorus parameters.

Turbidity

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

Turbidity in water arises from the presence of very finely divided solids (which are not filtrable by routine methods). The existence of turbidity in water will affect its acceptability to consumers and it will also affect markedly its utility in certain industries. The particles forming the turbidity may also interfere with the treat-ability of waters and in the case of the disinfection process the consequences could be grave.

As turbidity can be caused by sewage matter in a water there is a risk that pathogenic organisms could be shielded by the turbidity particles and hence escape the action of the disinfectant.

Source: USGS

Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms.

High concentrations of particulate matter affect light penetration and ecological productivity, recreational values, and habitat quality, and cause lakes to fill in faster. In streams, increased sedimentation and siltation can occur, which can result in harm to habitat areas for fish and other aquatic life. Particles also provide attachment places for other pollutants, notably metals and bacteria. For this reason, turbidity readings can be used as an indicator of potential pollution in a water body.

Temperature

Source: Parameters of Water Quality, Interpretation and Standards, EPA, Ireland

The natural variation in temperature found in Irish surface waters is of the order of 25°C - from freezing point to a summer maximum of around 25°C in occasional years. Thermal pollution would, of course, alter the position, possibly very significantly. The effect of temperature, and especially changes in temperature, on living organisms can be critical and the subject is a very wide and complex one. Where biochemical reactions are concerned, as in the uptake of oxygen by bacteria, a rise of 10°C in temperature leads to an approximate doubling of the rate of reaction. Conversely, such reactions are retarded by cooling, hence the recommendation often made that waters be cooled to 4°C in the interval between sampling and analysis.

Another most important factor is that some key constituents of a water either change their form (as in the ionisation of ammonia) or alter their concentration (as with dissolved oxygen) when temperature changes. In fact, the primary interest in the temperature of surface waters is due to the inverse relationship between it and oxygen solubility.

However, elevated temperatures and, more importantly, steep temperature gradients can have directly harmful effects on fish. It is for the latter reason that changes in temperature are subject to limits.

TKN

Source: Typical Water Quality Values for Florida's Lakes, Streams, and Estuaries, Joe Hand, 2004

Total Kjeldahl nitrogen (TKN) is the analytical method used to measure the amount of organic nitrogen from plant and animal matter in a water sample. TKN is the combination of ammonia and organic nitrogen. Organic nitrogen includes such materials as proteins, peptides, nucleic acids, urea, and numerous synthetic organic compounds.

The Kjeldahl method breaks down the proteins and other organic substances in a water sample using sulfuric acid, in the presence of other catalysts. The nitrogen present is converted to ammonium sulphate, which is then measured by a titration or a colorimetric method.

TMDL

Source: Wikipedia

A total maximum daily load (TMDL) is a regulatory term in the U.S. Clean Water Act, describing a plan for restoring impaired waters that identifies the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.

The Clean Water Act requires states to compile lists of water bodies that do not fully support beneficial uses such as aquatic life, fisheries, drinking water, recreation, industry, or agriculture; and to prioritize those water bodies for TMDL development. These inventories are known as "303(d) lists" and characterize waters as fully supporting, impaired, or in some cases threatened for beneficial uses.

Calculating the TMDL for any given body of water involves the combination of factors that contribute to the problem of nutrient concentrated runoff. Bodies of water are tested for contaminants based on their intended use. Each body of water is tested similarly but designated with a different TMDL. Drinking water reservoirs are designated differently from areas for public swimming and water bodies intended for fishing are designated differently from water located in wildlife conservation areas. The size of the water body also is taken into consideration when TMDL calculating is undertaken.

The larger the body of water, the greater the amounts of contaminants can be present and still maintain a margin of safety. The margin of safety (MOS) is numeric estimate included in the TMDL calculation, sometimes 10% of the TMDL, intended to allow a safety buffer between the calculated TMDL and the actual load that will allow the water body to meet its beneficial use (since the natural world is complex and several variables may alter future conditions). TMDL is the end product of all point and non-point source pollutants of a single contaminant. Pollutants that originate from a point source are given allowable levels of contaminants to be discharged; this is the waste load allocation (WLA). Non-point source pollutants are also calculated into the TMDL equation with load allocation (LA).

The calculation of a TMDL is as follows: TMDL = WLA + LA + MOS, where WLA is the waste load allocation for point sources.

The natural background load for a pollutant may be imprecisely understood. Industrial dischargers, farmers, land developers, municipalities, natural resource agencies, and other watershed stakeholders each have a vested interest in the outcome.

USGS

Source: Wikipedia

The United States Geological Survey (USGS, formerly simply Geological Survey) is a scientific agency of the United States government. The scientists of the USGS study the landscape of the United States, it’s natural resources, and the natural hazards that threaten it. The organization's work spans the disciplines of biology, geography, geology, and hydrology.

The USGS is a fact-finding research organization with no regulatory responsibility. The USGS is a bureau of the United States Department of the Interior; it is that department's sole scientific agency. The USGS employs approximately 8,670 people and is headquartered in Reston, Virginia. The USGS also has major offices near Lakewood, Colorado, at the Denver Federal Center, and Menlo Park, California.

The current motto of the USGS, in use since August 1997, is "science for a changing world”. The agency's previous slogan, adopted on the occasion of its hundredth anniversary, was "Earth Science in the Public Service".

5. Water Sample Data

Marco Summary 2020

MARC	**2020**																		**MARC**
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS	ALL	METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.1	1.5	50927	87.6	6.2	33.46	23.1	7.76	10	3.7	1.3	**0.63**	4.6	0.62	**0.058**	0.013	0.013	0.002
FEB		1.3	1.6	46295	80.7	6.2	30.37	17.9	7.20	9	2.1	1.1	**0.67**	3.6	0.65	0.027	0.021	0.021	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		1.3	1.9	55339	88.3	5.6	35.88	28.6	7.80	15	4.3	1.7	**0.84**	5.9	0.83	**0.054**	0.017	0.017	0.002
MAY		1.3	1.7	54233	85.7	5.7	35.85	25.7	7.91	10	3.6	1.3	0.00	6.8	0.00	0.000	0.033	0.000	0.002
JUN		1.4	1.9	49874.9	89.3	5.6	32.5	30.5	7.86	58.4	3.6	1.0	**0.86**	2.5	0.86	**0.047**	0.012	0.012	0.002
JUL		1.7	1.9	48944	92.9	5.9	31.81	28.6	7.88	35	4.6	1.1	**0.61**	2.4	0.60	**0.048**	0.012	0.012	0.002
AUG		1.7	2.3	49216	84.1	5.3	32.01	30.5	7.89	37	4.8	1.5	**0.64**	2.3	0.64	0.036	0.011	0.011	0.003
SEP		1.6	2.2	45175	89.1	5.9	29.13	28.8	7.95	20	**17.7**	3.5	**0.61**	1.8	0.60	**0.047**	0.011	0.011	0.002
OCT		2.0	2.1	49752	51.4	3.5	32.55	27.0	8.20	50	4.8	2.6	**0.41**	0.9	0.39	0.026	0.018	0.022	0.008
NOV		2.0	2.2	49295	55.7	3.9	32.20	24.8	8.14	32	2.8	2.5	**0.34**	0.9	0.31	0.014	0.039	0.039	0.008
DEC		1.9	2.1	49441	65.1	5.0	32.36	19.6	8.19	10	3.6	2.5	**0.37**	0.8	0.34	0.012	0.028	0.032	0.008
MARC	**AVERA**	**2.0**	**2.1**	**50141**	**79.1**	**4.1**	**32.37**	**23.8**	**7.89**	**26**	**5.1**	**1.8**	**0.57**	**2.9**	**0.56**	**0.036**	**0.020**	**0.020**	**0.004**
	AGM										**4.3**		**0.57**			**0.033**			

Basin 1 Summary 2020

BASIN	2020																		BASIN
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.1	1.4	51968	87.2	6.2	34.23	22.8	7.70	10	3.2	1.0	0.62	6.0	0.62	0.054	0.011	0.011	0.002
FEB		1.5	1.8	50682	91.3	6.9	33.31	19.5	7.75	10	2.1	1.9	0.73	5.4	0.72	0.028	0.015	0.015	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		1.1	1.7	56050	93.9	6.0	32.13	28.3	7.85	10	4.7	1.8	0.65	10.9	0.65	0.062	0.011	0.011	0.002
MAY		1.3	1.7	55097	91.4	6.2	36.51	25.3	8.00	10	3.0	1.3		6.5			0.033		0.002
JUN		1.6	2.1	52171	86.3	5.4	34.20	29.8	7.96	10	1.7	1.0	0.73	3.7	0.73	0.038	0.011	0.011	0.002
JUL		1.6	1.9	51629	79.3	5.0	33.80	29.8	7.81	15	3.4	1.4	0.61	4.0	0.61	0.044	0.011	0.011	0.002
AUG		1.6	2.1	51313	88.8	5.6	33.55	30.4	7.91	10	3.3	1.0	0.59	2.5	0.59	0.019	0.011	0.011	0.002
SEP		1.9	2.1	47967	88.7	5.8	31.18	28.1	7.95	10	3.7	3.9	0.80	1.9	0.80	0.025	0.011	0.011	0.002
OCT		1.6	1.8	51222	53.8	3.7	33.60	26.3	8.68	50	4.0	2.5	0.34	1.0	0.33	0.011	0.012	0.017	0.008
NOV		1.7	2.1	51834	60.9	4.3	34.14	24.1	8.16	10	3.1	2.5	0.33	1.2	0.31	0.005	0.018	0.019	0.008
DEC		1.8	2.3	50090	72.5	5.6	32.88	18.6	8.12	10	9.0	2.5	0.41	1.4	0.40	0.007	0.009	0.012	0.008
BASIN	AVERA	1.7	2.0	51930	74.5	4.5	33.54	23.0	7.32	13	3.4	1.7	0.58	4.0	0.57	0.029	0.013	0.013	0.004
	AGM										3.4		0.55			0.022			

Basin 2 Summary 2020

BASIN	**2020**																		**BASIN**
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.2	1.5	50366	89.4	6.4	33.04	23.2	7.75	10	3.1	1.1	**0.67**	3.2	0.67	**0.055**	0.013	0.013	0.002
FEB		1.4	1.9	49449	90.8	6.8	32.41	20.2	7.70	10	1.7	1.0	**0.67**	2.5	0.65	0.026	0.022	0.022	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		1.6	2.1	55638	78.8	5.0	36.81	28.7	7.75	13	2.9	1.2	**0.65**	3.9	0.64	**0.053**	0.025	0.025	0.002
MAY		1.3	2.1	54195	83.8	5.6	35.82	25.8	7.88	10	3.2	1.4		5.7			0.033	0.000	0.002
JUN		1.6	2.3	49146	81.7	5.2	31.96	30.4	7.89	13	2.7	1.1	**0.71**	1.9	0.71	**0.048**	0.011	0.011	0.002
JUL		1.5	2.1	48181	89.5	5.7	31.25	30.6	7.80	10	4.6	1.3	**0.50**	2.5	0.50	**0.049**	0.011	0.011	0.002
AUG		1.5	2.0	48160	74.2	4.7	31.23	30.9	7.82	35	**6.0**	1.9	**0.62**	2.0	0.62	0.042	0.011	0.011	0.002
SEP		1.5	2.1	43392	87.2	5.7	27.84	29.2	7.97	38	**6.7**	3.8	**0.46**	1.3	0.45	**0.049**	0.011	0.011	0.002
OCT		2.2	2.3	48913	52.9	3.5	32.06	27.3	8.15	50	**5.8**	2.9	**0.41**	0.6	0.39	0.009	0.011	0.015	0.008
NOV		2.3	2.4	47402	58.0	4.0	30.85	24.7	8.13	10	2.7	2.5	**0.36**	0.9	0.33	0.009	0.028	0.028	0.008
DEC		2.1	2.3	48263	68.9	5.3	31.35	19.7	8.17	10	2.5	2.5	**0.34**	0.6	0.30	0.012	0.041	0.046	0.009
BASIN	**AVERA**	**2.2**	**2.3**	**49254**	**71.2**	**4.3**	**31.42**	**23.9**	**7.25**	**17**	**3.5**	**1.7**	**0.54**	**2.3**	**0.53**	**0.035**	**0.018**	**0.019**	**0.004**
	AGM										**3.5**		**0.52**			**0.029**			

Basin 3 Summary 2020

BASIN	**2020**																		**BASIN**
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.1	1.5	50890	84.3	6.0	33.43	23.3	7.77	10	4.6	1.7	**0.65**	5.2	0.65	0.056	0.011	0.011	0.002
FEB		1.3	1.7	50267	80.5	6.2	33.01	19.0	7.70	10	2.3	1.3	**0.81**	4.2	0.79	0.029	0.022	0.022	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		1.3	1.6	55394	86.7	5.5	36.63	28.9	7.73	10	**5.7**	2.6	**0.78**	4.6	0.78	0.052	0.011	0.011	0.002
MAY		1.0	1.6	54515	85.8	5.7	36.06	25.9	7.90	10	**5.4**	1.6		10.4			0.033		0.002
JUN		1.0	1.7	48864	108.9	6.8	31.72	31.3	7.77	13	**7.2**	1.0	**0.84**	2.3	0.84	0.043	0.011	0.011	0.002
JUL		1.7	2.5	48239	87.8	5.6	31.29	30.6	7.85	102	**5.1**	1.0	**0.73**	1.8	0.72	0.053	0.011	0.011	0.002
AUG		1.7	2.4	49296	79.5	5.0	32.06	30.5	7.81	10	4.4	1.3	**0.64**	2.2	0.64	0.026	0.011	0.011	0.009
SEP		1.5	2.2	42683	92.4	6.2	27.35	28.4	7.90	13	**6.3**	3.0	**0.38**	1.2	0.38	0.037	0.011	0.011	0.002
OCT		1.4	1.4	49678	52.0	3.4	32.44	27.4	8.09	50	**6.1**	2.5	**0.41**	0.8	0.38	0.005	0.020	0.025	0.008
NOV		1.7	1.9	48829	54.1	3.7	31.92	25.0	8.13	77	3.0	2.5	**0.41**	0.6	0.35	0.020	0.055	0.056	0.008
DEC		1.8	1.8	49288	63.6	4.9	32.31	19.2	8.26	10	3.3	2.7	**0.37**	0.7	0.35	0.008	0.019	0.023	0.008
BASIN	**AVERA**	**1.6**	**1.7**	**49643**	**73.0**	**4.0**	**32.22**	**23.9**	**7.24**	**26**	**4.4**	**1.8**	**0.60**	**3.1**	**0.59**	**0.033**	**0.018**	**0.019**	**0.004**
	AGM										**4.6**		**0.57**			**0.026**			

Basin 4 Summary 2020

BASIN	2020																		BASIN
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.2	1.9	50838	87.1	6.2	33.39	23.0	7.80	10	3.5	1.1	**0.67**	3.4	0.66	**0.067**	0.019	0.019	0.002
FEB		1.5	2.1	48662	83.9	6.5	31.84	18.8	7.80	10	2.3	1.0	**0.76**	3.3	0.73	0.039	0.034	0.034	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		1.6	2.1	54330	96.7	6.2	35.85	28.3	7.87	31	3.9	1.4	**0.65**	4.3	0.64	**0.055**	0.013	0.013	0.002
MAY		1.4	1.9	53214	82.0	5.5	35.09	25.8	7.90	10	2.9	1.0		3.5			0.033		0.002
JUN		1.5	1.9	48785	77.1	4.9	31.70	30.4	7.83	**229**	3.5	1.0	**1.23**	2.5	1.22	**0.063**	0.017	0.017	0.002
JUL		1.9	2.1	47543	109.1	7.0	30.79	21.5	8.04	31	**5.0**	1.0	**0.60**	1.5	0.60	**0.056**	0.017	0.017	0.002
AUG		1.9	2.4	48157	94.9	6.1	31.25	30.1	8.01	101	**6.0**	1.7	**0.62**	2.3	0.62	**0.057**	0.011	0.011	0.002
SEP		1.6	2.2	45917	88.2	5.8	29.66	29.0	7.98	17	**60.8**	3.4	**0.81**	3.0	0.81	**0.070**	0.012	0.012	0.002
OCT		2.5	2.6	49139	50.9	3.6	32.05	26.5	8.11	50	4.3	2.5	**0.49**	0.9	0.46	**0.087**	0.025	0.029	0.008
NOV		2.0	2.2	49507	50.4	3.5	32.36	25.1	8.12	43	2.7	2.5	**0.36**	0.8	0.30	0.021	0.053	0.052	0.008
DEC		1.8	2.0	50085	53.3	4.1	32.91	20.4	8.15	10	2.7	2.5	**0.44**	0.8	0.41	0.022	0.031	0.036	0.008
BASIN	**AVERA**	**2.1**	**2.3**	**49631**	**72.8**	**3.7**	**32.44**	**24.0**	**7.30**	**45**	**8.1**	**1.6**	**0.66**	**2.4**	**0.65**	**0.054**	**0.022**	**0.024**	**0.004**
	AGM										**4.6**		**0.63**			**0.049**			

Basin 5 Summary 2020

BASIN	**2020**																		**BASIN**
LOCATI		SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
JAN		1.2	1.3	51197	90.4	6.4	33.66	23.3	7.80	10	4.5	1.7	**0.44**	6.8	0.44	**0.062**	0.011	0.011	0.002
FEB		1.5	1.6	51012	88.6	6.8	33.56	19.1	7.90	10	2.4	1.0	**0.66**	5.2	0.65	0.017	0.013	0.013	0.002
MAR		0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
APR		0.9	1.9	55458	91.4	5.8	36.69	28.5	7.85	10	**5.2**	1.4	**1.80**	9.1	1.78	**0.052**	0.020	0.020	0.002
MAY		1.2	1.7	54551	89.6	6.0	36.10	25.5	7.95	10	3.8	1.4		8.7			0.033		0.002
JUN		1.4	1.4	52189	96.5	6.0	34.20	30.3	7.92	10	2.2	1.0	**0.78**	2.6	0.78	0.039	0.011	0.011	0.002
JUL		1.8	2.8	50944	96.9	6.0	33.26	31.0	7.94	10	4.3	1.0	**0.63**	2.9	0.63	0.034	0.011	0.011	0.002
AUG		1.8	2.9	50704	89.9	5.6	33.09	30.7	7.99	15	2.8	1.0	**0.75**	2.8	0.75	0.025	0.011	0.011	0.002
SEP		1.9	2.8	48574	89.6	5.8	31.57	29.2	7.96	10	**6.2**	3.2	**0.73**	2.0	0.73	**0.046**	0.011	0.011	0.002
OCT		2.0	2.2	50991	46.2	3.0	33.42	27.1	8.15	50	2.5	2.5	**0.38**	1.2	0.36	0.010	0.021	0.025	0.008
NOV		1.8	2.0	50085	53.3	4.1	32.91	20.4	8.15	10	2.7	2.5	**0.44**	0.8	0.41	0.022	0.031	0.036	0.008
DEC		2.4	2.6	50410	70.2	5.3	33.12	19.5	8.24	10	2.5	2.5	**0.30**	0.6	0.27	0.006	0.029	0.034	0.008
BASIN	**AVERA**	**2.0**	**2.3**	**51545**	**75.2**	**4.1**	**33.15**	**22.3**	**7.32**	**13**	**3.2**	**1.6**	**0.69**	**3.9**	**0.68**	**0.031**	**0.017**	**0.018**	**0.004**
	AGM										**3.3**		**0.61**			**0.025**			

January Summary 2020

JANUA	**2020**																			**JANUA**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/m3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.23	0.1	0.23	0.032	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.0	1.7	51952	88.5	6.3	34.22	22.9	7.80	10	4.0	1.0	0.67	5.5	0.67	0.051	0.011	0.011	0.002
OLDE	1	1.1	1.1	51984	85.8	6.1	34.24	22.7	7.60	10	2.3	1.0	0.57	6.4	0.57	0.057	0.011	0.011	0.002
BASIN	**AVG**	**1.1**	**1.4**	**51968**	**87.2**	**6.2**	**34.23**	**22.8**	**7.70**	**10**	**3.2**	**1.0**	**0.62**	**6.0**	**0.62**	**0.054**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.0	2.1	50692	87.9	6.3	33.28	23.2	7.80	10	3.1	1.0	0.67	3.2	0.67	0.053	0.011	0.011	0.002
KENDA	2	0.6	0.6	50446	88.4	6.3	33.09	23.6	7.80	10	3.2	1.4	0.73	5.7	0.73	0.057	0.011	0.011	0.002
COLLIE	2	1.4	1.4	50207	94.0	6.7	32.92	23.2	7.80	10	3.4	1.1	0.73	2.2	0.71	0.055	0.018	0.018	0.002
HC_CE	2	1.7	1.7	50119	87.3	6.3	32.87	22.9	7.60	10	2.5	1.0	0.57	1.7	0.57	0.053	0.011	0.011	0.002
BASIN	**AVG**	**1.2**	**1.5**	**50366**	**89.4**	**6.4**	**33.04**	**23.2**	**7.75**	**10**	**3.1**	**1.1**	**0.67**	**3.2**	**0.67**	**0.055**	**0.013**	**0.013**	**0.002**
HOLLY	3	1.0	1.0	51594	76.0	5.4	33.94	23.6	7.70	10	5.4	1.9	0.70	7.5	0.70	0.067	0.011	0.011	0.002
HUMMI	3	1.0	1.0	50242	88.6	6.3	32.95	23.1	7.80	10	3.6	1.0	0.70	2.2	0.70	0.054	0.011	0.011	0.002
WINDM	3	1.2	2.5	50835	88.3	6.3	33.39	23.3	7.80	10	4.7	2.2	0.54	5.9	0.54	0.047	0.011	0.011	0.002
BASIN	**AVG**	**1.1**	**1.5**	**50890**	**84.3**	**6.0**	**33.43**	**23.3**	**7.77**	**10**	**4.6**	**1.7**	**0.65**	**5.2**	**0.65**	**0.056**	**0.011**	**0.011**	**0.002**
LANDM	4	1.2	1.2	50816	97.2	6.9	33.37	23.1	7.80	10	2.1	1.0	0.66	0.8	0.66	0.061	0.011	0.011	0.002
SWALL	4	1.2	1.3	50346	77.1	5.5	33.03	23.0	7.80	10	4.1	1.0	0.78	3.5	0.78	0.061	0.011	0.011	0.002
W_WIN	4	1.3	3.1	51353	87.0	6.2	33.78	22.8	7.80	10	4.4	1.2	0.58	6.0	0.54	0.078	0.035	0.035	0.002
BASIN	**AVG**	**1.2**	**1.9**	**50838**	**87.1**	**6.2**	**33.39**	**23.0**	**7.80**	**10**	**3.5**	**1.1**	**0.67**	**3.4**	**0.66**	**0.067**	**0.019**	**0.019**	**0.002**
E_WINT	5	1.3	1.4	50863	96.1	6.8	33.40	23.6	7.80	10	4.5	1.0	0.64	5.0	0.64	0.054	0.011	0.011	0.002
MCILVA	5	1.0	1.2	51531	84.7	6.0	33.91	22.9	7.80	10	4.5	2.4	0.23	8.6	0.23	0.069	0.011	0.011	0.002
BASIN	**AVG**	**1.2**	**1.3**	**51197**	**90.4**	**6.4**	**33.66**	**23.3**	**7.80**	**10**	**4.5**	**1.7**	**0.44**	**6.8**	**0.44**	**0.062**	**0.011**	**0.011**	**0.002**
	SUM	16.0	21.3	712980	1226.9	87.4	468.39	323.9	108.70	140	51.8	18.2	8.76	64.2	8.70	0.817	0.185	0.185	0.028
JANUA	**AVG**	**1.1**	**1.5**	**50927**	**87.6**	**6.2**	**33.46**	**23.1**	**7.76**	**10**	**3.7**	**1.3**	**0.63**	**4.6**	**0.62**	**0.058**	**0.013**	**0.013**	**0.002**

Source: Collier County Pollution Control, 2/10/20

February Summary 2020

FEBRU	2020																		FEBRU
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.23	0.1	0.23	0.014	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.6	1.9	50221	87.9	6.6	32.97	20.4	7.70	10	2.5	2.7	0.71	4.7	0.69	0.031	0.019	0.019	0.002
OLDE	1	1.4	1.6	51142	94.6	7.3	33.65	18.6	7.80	10	1.6	1.0	0.75	6.0	0.75	0.025	0.011	0.011	0.002
BASIN	**AVG**	**1.5**	**1.8**	**50682**	**91.3**	**6.9**	**33.31**	**19.5**	**7.75**	**10**	**2.1**	**1.9**	**0.73**	**5.4**	**0.72**	**0.028**	**0.015**	**0.015**	**0.002**
JH_PAR	2	1.7	3.8	49834	86.1	6.5	32.69	19.9	7.80	10	1.0	1.0	0.76	3.4	0.75	0.024	0.018	0.018	0.002
KENDA	2	0.9	0.9	50127	87.9	6.6	32.90	20.0	7.70	10	1.5	1.0	0.73	3.7	0.71	0.030	0.016	0.016	0.002
COLLIE	2	1.3	1.3	48762	101.4	7.6	31.90	20.7	7.70	10	2.0	1.0	0.61	1.7	0.58	0.031	0.032	0.032	0.002
HC_CE	2	1.6	1.6	49071	87.7	6.6	32.13	20.0	7.60	10	2.4	1.0	0.59	1.0	0.56	0.018	0.021	0.021	0.002
BASIN	**AVG**	**1.4**	**1.9**	**49449**	**90.8**	**6.8**	**32.41**	**20.2**	**7.70**	**10**	**1.7**	**1.0**	**0.67**	**2.5**	**0.65**	**0.026**	**0.022**	**0.022**	**0.002**
HOLLY	3	1.3	1.3	50681	69.4	5.3	33.31	19.1	7.60	10	1.3	1.0	0.92	4.7	0.89	0.039	0.034	0.034	0.002
HUMMI	3	1.4	1.4	49536	87.8	6.8	32.47	19.1	7.80	10	3.3	2.0	0.82	2.6	0.80	0.018	0.021	0.021	0.002
WINDM	3	1.3	2.5	50585	84.4	6.5	33.24	18.7	7.70	10	2.3	1.0	0.70	5.4	0.69	0.029	0.012	0.012	0.002
BASIN	**AVG**	**1.3**	**1.7**	**50267**	**80.5**	**6.2**	**33.01**	**19.0**	**7.70**	**10**	**2.3**	**1.3**	**0.81**	**4.2**	**0.79**	**0.029**	**0.022**	**0.022**	**0.002**
LANDM	4	1.8	1.8	50614	100.8	7.7	33.26	19.2	7.90	10	4.6	1.0	0.72	1.5	0.72	0.039	0.011	0.011	0.002
SWALL	4	1.2	1.8	44608	67.1	5.4	28.89	17.7	7.70	10	1.2	1.0	0.85	4.6	0.77	0.058	0.074	0.076	0.002
W_WIN	4	1.4	2.8	50764	83.7	6.4	33.37	19.4	7.80	10	1.2	1.0	0.72	3.9	0.70	0.021	0.016	0.016	0.002
BASIN	**AVG**	**1.5**	**2.1**	**48662**	**83.9**	**6.5**	**31.84**	**18.8**	**7.80**	**10**	**2.3**	**1.0**	**0.76**	**3.3**	**0.73**	**0.039**	**0.034**	**0.034**	**0.002**
E_WINT	5	1.7	1.7	50665	83.3	6.4	33.30	19.3	7.90	10	2.2	1.0	0.64	3.2	0.63	0.016	0.015	0.015	0.002
MCILVA	5	1.2	1.4	51358	93.9	7.2	33.81	18.9	7.90	10	2.6	1.0	0.68	7.1	0.68	0.017	0.011	0.011	0.002
BASIN	**AVG**	**1.5**	**1.6**	**51012**	**88.6**	**6.8**	**33.56**	**19.1**	**7.90**	**10**	**2.4**	**1.0**	**0.66**	**5.2**	**0.65**	**0.017**	**0.013**	**0.013**	**0.002**
	SUM	18.1	22.0	648134	1129.9	86.4	425.20	251.1	100.80	130	28.7	15.7	9.42	50.1	9.16	0.372	0.293	0.295	0.026
FEBRU	**AVG**	**1.3**	**1.6**	**46295**	**80.7**	**6.2**	**30.37**	**17.9**	**7.20**	**9**	**2.1**	**1.1**	**0.67**	**3.6**	**0.65**	**0.027**	**0.021**	**0.021**	**0.002**

Source: Collier County Pollution Control, 3/11/20

March Summary 2020

MARC	**2020**																		**MARC**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL																			
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
OLDE	1	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
BASIN	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
JH_PAR	2	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
KENDA	2	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
COLLIE	2	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
HC_CE	2	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
BASIN	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
HOLLY	3	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
HUMMI	3	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
WINDM	3	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
BASIN	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
LANDM	4	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
SWALL	4	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
W_WIN	4	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
BASIN	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
E_WINT	5	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
MCILVA	5	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
BASIN	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**
	SUM	0.0	0.0	0	0.0	0.0	0.00	0.0	0.00	0	0.0	0.0	0.00	0.0	0.00	0.000	0.000	0.000	0.000
MARC	**AVG**	**0.0**	**0.0**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0**	**0.0**	**0.0**	**0.00**	**0.0**	**0.00**	**0.000**	**0.000**	**0.000**	**0.000**

No March samples were analyzed

April Summary 2020

APRIL	2020																		APRIL
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.20	0.1	0.20	0.014	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.3	1.8	55757	101.5	6.4	26.90	28.6	7.90	10	4.0	1.5	0.58	5.7	0.58	0.046	0.011	0.011	0.002
OLDE	1	0.8	1.6	56343	86.2	5.5	37.36	28.0	7.80	10	5.4	2.1	0.73	16.0	0.73	0.077	0.011	0.011	0.002
BASIN	**AVG**	**1.1**	**1.7**	**56050**	**93.9**	**6.0**	**32.13**	**28.3**	**7.85**	**10**	**4.7**	**1.8**	**0.65**	**10.9**	**0.65**	**0.062**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.2	3.5	55786	82.4	5.2	36.93	28.5	7.80	20	3.4	1.0	0.67	6.3	0.67	0.056	0.011	0.011	0.002
KENDA	2	1.4	1.4	55751	85.3	5.4	36.89	28.8	7.80	10	3.2	1.0	0.58	4.3	0.58	0.045	0.011	0.011	0.002
COLLIE	2	1.9	1.9	55522	71.3	4.5	36.73	28.6	7.70	10	2.5	1.0	0.73	2.7	0.73	0.057	0.011	0.011	0.002
HC_CE	2	1.7	1.7	55494	76.0	4.8	36.70	28.8	7.70	10	2.5	1.8	0.63	2.2	0.56	0.055	0.067	0.067	0.002
BASIN	**AVG**	**1.6**	**2.1**	**55638**	**78.8**	**5.0**	**36.81**	**28.7**	**7.75**	**13**	**2.9**	**1.2**	**0.65**	**3.9**	**0.64**	**0.053**	**0.025**	**0.025**	**0.002**
HOLLY	3	1.3	1.3	56008	91.1	5.7	37.08	29.1	7.70	10	7.6	3.0	0.79	2.7	0.79	0.056	0.011	0.011	0.002
HUMMI	3	1.3	1.3	54910	85.0	5.4	36.26	29.0	7.70	10	3.7	3.4	0.75	3.9	0.75	0.051	0.011	0.011	0.002
WINDM	3	1.3	2.1	55265	84.1	5.3	36.54	28.7	7.80	10	5.7	1.5	0.80	7.1	0.80	0.048	0.011	0.011	0.002
BASIN	**AVG**	**1.3**	**1.6**	**55394**	**86.7**	**5.5**	**36.63**	**28.9**	**7.73**	**10**	**5.7**	**2.6**	**0.78**	**4.6**	**0.78**	**0.052**	**0.011**	**0.011**	**0.002**
LANDM	4	2.0	2.0	53176	99.2	6.4	35.00	27.9	7.90	74	3.9	1.0	0.69	3.1	0.68	0.069	0.014	0.014	0.002
SWALL	4	1.2	1.9	54630	103.7	6.6	36.06	28.8	7.90	10	4.9	1.0	0.71	2.8	0.69	0.040	0.013	0.013	0.002
W_WIN	4	1.5	2.5	55185	87.1	5.6	36.49	28.3	7.80	10	3.0	2.1	0.56	7.1	0.56	0.055	0.011	0.011	0.002
BASIN	**AVG**	**1.6**	**2.1**	**54330**	**96.7**	**6.2**	**35.85**	**28.3**	**7.87**	**31**	**3.9**	**1.4**	**0.65**	**4.3**	**0.64**	**0.055**	**0.013**	**0.013**	**0.002**
E_WINT	5	1.3	1.8	55136	95.9	6.1	36.43	29.0	7.90	10	6.5	1.1	1.60	6.1	1.60	0.050	0.011	0.011	0.002
MCILVA	5	0.5	2.0	55779	86.8	5.6	36.94	28.0	7.80	10	3.9	1.6	1.99	12.0	1.96	0.053	0.028	0.028	0.002
BASIN	**AVG**	**0.9**	**1.9**	**55458**	**91.4**	**5.8**	**36.69**	**28.5**	**7.85**	**10**	**5.2**	**1.4**	**1.80**	**9.1**	**1.78**	**0.052**	**0.020**	**0.020**	**0.002**
	SUM	18.7	26.8	774742	1235.6	78.5	502.31	400.1	109.20	214	60.2	23.1	11.80	82.0	11.68	0.758	0.232	0.232	0.028
APRIL	**AVG**	**1.3**	**1.9**	**55339**	**88.3**	**5.6**	**35.88**	**28.6**	**7.80**	**15**	**4.3**	**1.7**	**0.84**	**5.9**	**0.83**	**0.054**	**0.017**	**0.017**	**0.002**

Source: Collier County Pollution Control, 4/30/20

May Summary 2020

MAY	**2020**																		**MAY**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0		0.1			0.033		0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.1	1.8	55081	91.7	6.2	36.49	25.3	8.00	10	4.0	1.6		7.2			0.033		0.002
OLDE	1	1.4	1.6	55113	91.0	6.1	36.52	25.2	8.00	10	2.0	1.0		5.8			0.033		0.002
BASIN	**AVG**	**1.3**	**1.7**	**55097**	**91.4**	**6.2**	**36.51**	**25.3**	**8.00**	**10**	**3.0**	**1.3**		**6.5**			**0.033**		**0.002**
JH_PAR	2	1.4	4.0	54566	91.8	6.1	36.10	25.8	7.90	10	3.3	1.0		6.0			0.033		0.002
KENDA	2	1.0	1.0	54558	82.5	5.6	36.10	25.4	7.90	10	5.1	1.3		8.0			0.033		0.002
COLLIE	2	1.1	1.4	53775	78.8	5.3	35.50	26.0	7.90	10	3.1	1.3		7.1			0.033		0.002
HC_CE	2	1.8	1.8	53882	82.0	5.5	35.59	25.8	7.80	10	1.1	2.0		1.8			0.033		0.002
BASIN	**AVG**	**1.3**	**2.1**	**54195**	**83.8**	**5.6**	**35.82**	**25.8**	**7.88**	**10**	**3.2**	**1.4**		**5.7**			**0.033**		**0.002**
HOLLY	3	1.0	1.3	54791	81.4	5.4	36.26	25.9	7.90	10	7.4	2.8		7.4			0.033		0.002
HUMMI	3	1.2	1.4	53978	89.3	5.9	35.65	26.1	7.90	10	5.0	1.0		6.7			0.033		0.002
WINDM	3	0.8	2.0	54776	86.7	5.8	36.26	25.7	7.90	10	3.7	1.0		17.0			0.033		0.002
BASIN	**AVG**	**1.0**	**1.6**	**54515**	**85.8**	**5.7**	**36.06**	**25.9**	**7.90**	**10**	**5.4**	**1.6**		**10.4**			**0.033**		**0.002**
LANDM	4	1.8	1.8	53148	77.7	5.2	35.04	25.8	7.90	10	3.5	1.0		1.3			0.033		0.002
SWALL	4	1.4	2.0	51897	81.7	5.5	34.12	25.8	7.90	10	3.5	1.0		2.3			0.033		0.002
W_WIN	4	1.1		54598	86.6	5.8	36.12	25.8	7.90	10	1.7	1.0		6.8			0.033		0.002
BASIN	**AVG**	**1.4**	**1.9**	**53214**	**82.0**	**5.5**	**35.09**	**25.8**	**7.90**	**10**	**2.9**	**1.0**		**3.5**			**0.033**		**0.002**
E_WINT	5	0.9	1.9	54546	86.1	5.8	36.09	25.6	7.90	10	4.9	1.8		13.0			0.033		0.002
MCILVA	5	1.5	1.5	54556	93.0	6.3	36.10	25.4	8.00	10	2.6	1.0		4.3			0.033		0.002
BASIN	**AVG**	**1.2**	**1.7**	**54551**	**89.6**	**6.0**	**36.10**	**25.5**	**7.95**	**10**	**3.8**	**1.4**		**8.7**			**0.033**		**0.002**
	SUM	17.5	23.5	759265	1200.3	80.4	501.94	359.6	110.80	140	50.9	18.8		94.7			0.462		0.028
MAY	**AVG**	**1.3**	**1.7**	**54233**	**85.7**	**5.7**	**35.85**	**25.7**	**7.91**	**10**	**3.6**	**1.3**		**6.8**			**0.033**		**0.002**

Source: Collier County Pollution Control, 6/17/20

June Summary 2020

JUNE	**2020**																		**JUNE**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.20	0.1	0.20	0.007	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.4	2.2	52556	92.8	5.8	34.47	30.3	7.96	10	1.7	1.0	0.65	3.9	0.65	0.036	0.011	0.011	0.002
OLDE	1	1.8	2.0	51786	79.7	5.1	33.93	29.3	7.96	10	1.7	1.0	0.82	3.5	0.82	0.040	0.011	0.011	0.002
BASIN	**AVG**	**1.6**	**2.1**	**52171**	**86.3**	**5.4**	**34.20**	**29.8**	**7.96**	**10**	**1.7**	**1.0**	**0.73**	**3.7**	**0.73**	**0.038**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.5	4.3	50333	83.4	5.3	32.83	30.2	7.93	10	3.0	1.0	0.67	2.4	0.67	0.046	0.011	0.011	0.002
KENDA	2	1.2	1.2	49878	77.6	4.9	32.49	30.6	7.89	10	2.1	1.0	0.71	2.6	0.71	0.048	0.011	0.011	0.002
COLLIE	2	1.6	1.6	48237	83.0	5.3	31.29	30.6	7.88	20	1.0	1.2	0.74	1.6	0.74	0.043	0.011	0.011	0.002
HC_CE	2	2.1	2.1	48135	82.6	5.3	31.23	30.0	7.84	10	4.8	1.1	0.72	0.8	0.72	0.053	0.011	0.011	0.002
BASIN	**AVG**	**1.6**	**2.3**	**49146**	**81.7**	**5.2**	**31.96**	**30.4**	**7.89**	**13**	**2.7**	**1.1**	**0.71**	**1.9**	**0.71**	**0.048**	**0.011**	**0.011**	**0.002**
HOLLY	3	1.1	1.4	50170	98.0	6.0	32.66	31.8	7.75	20	7.2	1.0	0.92	2.9	0.92	0.040	0.011	0.011	0.002
HUMMI	3	1.0	1.2	47990	109.5	6.9	31.09	31.1	7.78	10	4.0	1.0	0.62	1.5	0.62	0.032	0.011	0.011	0.002
WINDM	3	1.0	2.4	48432	119.1	7.5	31.42	31.0	7.79	10	10.3	1.0	0.97	2.6	0.97	0.057	0.011	0.011	0.002
BASIN	**AVG**	**1.0**	**1.7**	**48864**	**108.9**	**6.8**	**31.72**	**31.3**	**7.77**	**13**	**7.2**	**1.0**	**0.84**	**2.3**	**0.84**	**0.043**	**0.011**	**0.011**	**0.002**
LANDM	4	2.1	2.1	47241	104.1	6.7	30.58	30.1	7.95	10	1.9	1.0	0.61	0.7	0.61	0.043	0.011	0.011	0.002
SWALL	4	0.8	1.3	49504	26.4	1.7	32.20	31.0	7.58	668	4.1	1.0	0.89	5.5	0.86	0.102	0.028	0.028	0.002
W_WIN	4	1.6	2.4	49609	100.8	6.4	32.31	30.1	7.95	10	4.5	1.0	2.18	1.2	2.18	0.043	0.011	0.011	0.002
BASIN	**AVG**	**1.5**	**1.9**	**48785**	**77.1**	**4.9**	**31.70**	**30.4**	**7.83**	**229**	**3.5**	**1.0**	**1.23**	**2.5**	**1.22**	**0.063**	**0.017**	**0.017**	**0.002**
E_WINT	5	1.4	1.4	51212	99.3	6.2	33.47	30.4	7.89	10	2.8	1.0	0.78	2.7	0.78	0.050	0.011	0.011	0.002
MCILVA	5	1.4	1.4	53166	93.7	5.9	34.92	30.1	7.94	10	1.6	1.0	0.78	2.5	0.78	0.028	0.011	0.011	0.002
BASIN	**AVG**	**1.4**	**1.4**	**52189**	**96.5**	**6.0**	**34.20**	**30.3**	**7.92**	**10**	**2.2**	**1.0**	**0.78**	**2.6**	**0.78**	**0.039**	**0.011**	**0.011**	**0.002**
	SUM	20.0	27.0	698249	1250.0	78.8	454.89	426.6	110.09	818	50.7	14.3	12.05	34.4	12.02	0.661	0.171	0.171	0.028
JUNE	**AVG**	**1.4**	**1.9**	**49875**	**89.3**	**5.6**	**32.49**	**30.5**	**7.86**	**58**	**3.6**	**1.0**	**0.86**	**2.5**	**0.86**	**0.047**	**0.012**	**0.012**	**0.002**

Source: Collier County Pollution Control, 7/22/20

July Summary 2020

JULY	**2020**																			**JULY**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.20	0.1	0.20	0.014	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.7	2.4	50891	83.0	5.2	33.24	30.1	7.82	10	4.6	1.0	0.63	3.6	0.63	0.051	0.011	0.011	0.002
OLDE	1	1.4	1.4	52367	75.6	4.8	34.35	29.5	7.79	20	2.2	1.8	0.59	4.3	0.59	0.036	0.011	0.011	0.002
BASIN	**AVG**	**1.6**	**1.9**	**51629**	**79.3**	**5.0**	**33.80**	**29.8**	**7.81**	**15**	**3.4**	**1.4**	**0.61**	**4.0**	**0.61**	**0.044**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.3	3.9	49138	87.0	5.5	31.95	30.4	7.77	10	4.8	1.3	0.51	3.9	0.51	0.043	0.011	0.011	0.002
KENDA	2	1.0	1.0	48535	81.0	5.1	31.50	30.6	7.77	10	3.1	1.9	0.55	3.2	0.55	0.048	0.011	0.011	0.002
COLLIE	2	1.7	1.7	47270	88.8	5.7	30.59	30.6	7.81	10	4.1	1.0	0.48	1.4	0.48	0.049	0.011	0.011	0.002
HC_CE	2	1.8	1.8	47779	101.2	6.4	30.95	30.7	7.85	10	6.5	1.0	0.48	1.5	0.48	0.057	0.011	0.011	0.002
BASIN	**AVG**	**1.5**	**2.1**	**48181**	**89.5**	**5.7**	**31.25**	**30.6**	**7.80**	**10**	**4.6**	**1.3**	**0.50**	**2.5**	**0.50**	**0.049**	**0.011**	**0.011**	**0.002**
HOLLY	3	1.8	1.8	49008	77.5	4.9	31.85	30.6	7.80	285	3.4	1.0	0.62	1.6	0.61	0.054	0.011	0.011	0.002
HUMMI	3	1.9	1.9	47932	97.4	6.2	31.06	30.8	7.88	10	6.4	1.0	0.79	1.1	0.79	0.045	0.011	0.011	0.002
WINDM	3	1.5	3.8	47776	88.4	5.6	30.96	30.3	7.87	10	5.5	1.0	0.77	2.7	0.77	0.059	0.011	0.011	0.002
BASIN	**AVG**	**1.7**	**2.5**	**48239**	**87.8**	**5.6**	**31.29**	**30.6**	**7.85**	**102**	**5.1**	**1.0**	**0.73**	**1.8**	**0.72**	**0.053**	**0.011**	**0.011**	**0.002**
LANDM	4	2.1	2.1	46283	117.4	7.6	29.89	29.9	8.17	41	5.0	1.0	0.54	0.9	0.54	0.064	0.011	0.011	0.002
SWALL	4	2.1	2.1	46706	97.4	6.2	30.17	3.8	7.87	41	4.7	1.0	0.67	1.6	0.64	0.056	0.028	0.028	0.002
W_WIN	4	1.5		49639	112.4	7.1	32.30	30.9	8.07	10	5.4	1.0	0.61	2.1	0.61	0.047	0.011	0.011	0.002
BASIN	**AVG**	**1.9**	**2.1**	**47543**	**109.1**	**7.0**	**30.79**	**21.5**	**8.04**	**31**	**5.0**	**1.0**	**0.60**	**1.5**	**0.60**	**0.056**	**0.017**	**0.017**	**0.002**
E_WINT	5	1.9		49932	98.9	6.2	32.50	31.3	7.93	10	5.7	1.0	0.71	1.2	0.71	0.031	0.011	0.011	0.002
MCILVA	5	1.7	2.8	51955	94.8	5.9	34.01	30.7	7.95	10	2.9	1.0	0.54	4.6	0.54	0.037	0.011	0.011	0.002
BASIN	**AVG**	**1.8**	**2.8**	**50944**	**96.9**	**6.0**	**33.26**	**31.0**	**7.94**	**10**	**4.3**	**1.0**	**0.63**	**2.9**	**0.63**	**0.034**	**0.011**	**0.011**	**0.002**
	SUM	23.4	26.7	685211	1300.8	82.4	445.32	400.2	110.35	487	64.3	16.0	8.48	33.7	8.44	0.677	0.171	0.171	0.028
JULY	**AVG**	**1.7**	**1.9**	**48944**	**92.9**	**5.9**	**31.81**	**28.6**	**7.88**	**35**	**4.6**	**1.1**	**0.61**	**2.4**	**0.60**	**0.048**	**0.012**	**0.012**	**0.002**

Source: Collier County Pollution Control, 9/2/20

August Summary 2020

AUGUS	2020																		AUGUS
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.20	0.1	0.20	0.014	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.5	2.6	50664	94.8	5.9	33.06	30.7	7.90	10	2.9	1.0	0.64	2.8	0.64	0.022	0.011	0.011	0.002
OLDE	1	1.6	1.6	51961	82.7	5.2	34.04	30.0	7.91	10	3.7	1.0	0.54	2.2	0.54	0.015	0.011	0.011	0.002
BASIN	**AVG**	**1.6**	**2.1**	**51313**	**88.8**	**5.6**	**33.55**	**30.4**	**7.91**	**10**	**3.3**	**1.0**	**0.59**	**2.5**	**0.59**	**0.019**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.7	3.1	48337	80.8	5.1	31.36	30.7	7.87	10	5.0	1.3	0.49	1.8	0.49	0.033	0.011	0.011	0.002
KENDA	2	1.0	1.0	48408	79.4	5.0	31.41	30.8	7.83	10	4.8	3.3	0.78	3.1	0.78	0.044	0.011	0.011	0.002
COLLIE	2	1.9	1.9	47778	67.6	4.3	30.95	30.9	7.77	109	3.0	1.3	0.63	1.2	0.63	0.044	0.011	0.011	0.002
HC_CE	2	1.4	2.0	48115	68.9	4.3	31.19	31.0	7.79	10	11.1	1.5	0.59	1.9	0.59	0.045	0.011	0.011	0.002
BASIN	**AVG**	**1.5**	**2.0**	**48160**	**74.2**	**4.7**	**31.23**	**30.9**	**7.82**	**35**	**6.0**	**1.9**	**0.62**	**2.0**	**0.62**	**0.042**	**0.011**	**0.011**	**0.002**
HOLLY	3	1.8	1.8	49759	79.4	5.0	32.40	30.5	7.80	10	4.8	1.4	0.67	2.2	0.67	0.018	0.011	0.011	0.022
HUMMI	3	1.8	1.8	48916	74.9	4.7	31.78	30.6	7.81	10	3.5	1.0	0.48	1.7	0.48	0.032	0.011	0.011	0.002
WINDM	3	1.6	3.7	49212	84.3	5.3	32.01	30.4	7.83	10	4.8	1.6	0.78	2.8	0.78	0.029	0.011	0.011	0.002
BASIN	**AVG**	**1.7**	**2.4**	**49296**	**79.5**	**5.0**	**32.06**	**30.5**	**7.81**	**10**	**4.4**	**1.3**	**0.64**	**2.2**	**0.64**	**0.026**	**0.011**	**0.011**	**0.009**
LANDM	4	1.9	1.9	46390	101.1	6.5	29.98	29.7	8.05	173	4.9	3.1	0.60	3.1	0.60	0.098	0.011	0.011	0.002
SWALL	4	1.8	1.8	47398	98.2	6.3	30.71	29.7	8.00	121	5.2	1.0	0.68	1.3	0.68	0.042	0.011	0.011	0.002
W_WIN	4	2.0	3.6	50684	85.5	5.3	33.07	30.8	7.99	10	7.8	1.0	0.57	2.6	0.57	0.030	0.011	0.011	0.002
BASIN	**AVG**	**1.9**	**2.4**	**48157**	**94.9**	**6.1**	**31.25**	**30.1**	**8.01**	**101**	**6.0**	**1.7**	**0.62**	**2.3**	**0.62**	**0.057**	**0.011**	**0.011**	**0.002**
E_WINT	5	2.0	2.8	50622	88.3	5.5	33.02	31.1	7.97	20	1.6	1.0	0.86	2.2	0.86	0.024	0.011	0.011	0.002
MCILVA	5	1.6	3.0	50786	91.5	5.8	33.16	30.3	8.00	10	3.9	1.0	0.64	3.3	0.64	0.025	0.011	0.011	0.002
BASIN	**AVG**	**1.8**	**2.9**	**50704**	**89.9**	**5.6**	**33.09**	**30.7**	**7.99**	**15**	**2.8**	**1.0**	**0.75**	**2.8**	**0.75**	**0.025**	**0.011**	**0.011**	**0.002**
	SUM	23.6	32.6	689030	1177.4	74.2	448.14	427.2	110.52	523	67.0	20.5	8.93	32.2	8.93	0.501	0.154	0.154	0.048
AUGUS	**AVG**	**1.7**	**2.3**	**49216**	**84.1**	**5.3**	**32.01**	**30.5**	**7.89**	**37**	**4.8**	**1.5**	**0.64**	**2.3**	**0.64**	**0.036**	**0.011**	**0.011**	**0.003**

Source: Collier County Pollution Control, 9/28/20

September Summary 2020

SEPTE	2020																		SEPTE
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	1.0	1.0	0.20	0.1	0.20	0.014	0.011	0.011	0.002
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.9	2.3	47026	91.3	6.0	30.48	28.5	7.92	10	3.3	6.0	0.69	1.5	0.69	0.022	0.011	0.011	0.002
OLDE	1	1.9	1.9	48907	86.1	5.7	31.87	27.6	7.98	10	4.0	1.8	0.92	2.2	0.92	0.027	0.011	0.011	0.002
BASIN	**AVG**	1.9	2.1	**47967**	**88.7**	**5.8**	**31.18**	**28.1**	**7.95**	**10**	**3.7**	**3.9**	**0.80**	**1.9**	**0.80**	**0.025**	**0.011**	**0.011**	**0.002**
JH_PAR	2	1.9	4.2	44089	86.1	5.7	28.34	29.1	7.97	20	7.3	3.2	0.49	1.3	0.49	0.045	0.011	0.011	0.002
KENDA	2	1.0	1.0	44037	91.4	6.0	28.30	29.2	7.97	110	5.3	6.8	0.42	2.0	0.42	0.056	0.011	0.011	0.002
COLLIE	2	1.4	1.4	42727	87.0	5.8	27.36	29.2	7.98	10	5.8	1.4	0.39	1.0	0.38	0.047	0.011	0.011	0.002
HC_CE	2	1.7	1.7	42715	84.1	5.6	27.35	29.1	7.94	10	8.2	3.7	0.52	0.9	0.52	0.048	0.011	0.011	0.002
BASIN	**AVG**	1.5	2.1	**43392**	**87.2**	**5.7**	**27.84**	**29.2**	**7.97**	**38**	**6.7**	**3.8**	**0.46**	**1.3**	**0.45**	**0.049**	**0.011**	**0.011**	**0.002**
HOLLY	3	1.4	1.4	44057	85.6	5.8	28.35	27.8	7.85	10	4.5	1.9	0.41	1.4	0.41	0.039	0.011	0.011	0.002
HUMMI	3	1.4	1.4	41858	94.1	6.3	26.75	28.7	7.93	10	6.7	2.5	0.41	1.0	0.41	0.030	0.011	0.011	0.002
WINDM	3	1.7	3.7	42133	97.5	6.5	26.95	28.8	7.93	20	7.6	4.6	0.32	1.2	0.32	0.041	0.011	0.011	0.002
BASIN	**AVG**	1.5	2.2	**42683**	**92.4**	**6.2**	**27.35**	**28.4**	**7.90**	**13**	**6.3**	**3.0**	**0.38**	**1.2**	**0.38**	**0.037**	**0.011**	**0.011**	**0.002**
LANDM	4	1.5	1.5	46516	89.2	5.8	30.09	28.9	7.96	31	4.2	1.7	0.57	0.9	0.57	0.048	0.011	0.011	0.002
SWALL	4	1.3	1.6	44349	84.7	5.6	28.53	28.9	8.02	10	173.0	6.3	1.08	6.9	1.07	0.125	0.014	0.014	0.002
W_WIN	4	2.0	3.5	46885	90.8	5.9	30.35	29.2	7.95	10	5.1	2.3	0.79	1.2	0.79	0.038	0.011	0.011	0.002
BASIN	**AVG**	1.6	2.2	**45917**	**88.2**	**5.8**	**29.66**	**29.0**	**7.98**	**17**	**60.8**	**3.4**	**0.81**	**3.0**	**0.81**	**0.070**	**0.012**	**0.012**	**0.002**
E_WINT	5	1.7	2.5	47263	95.9	6.2	30.61	29.7	7.93	10	9.7	2.6	0.88	1.6	0.88	0.056	0.011	0.011	0.002
MCILVA	5	2.0	3.0	49884	83.3	5.4	32.53	28.6	7.99	10	2.6	3.7	0.58	2.4	0.58	0.036	0.011	0.011	0.002
BASIN	**AVG**	1.9	2.8	**48574**	**89.6**	**5.8**	**31.57**	**29.2**	**7.96**	**10**	**6.2**	**3.2**	**0.73**	**2.0**	**0.73**	**0.046**	**0.011**	**0.011**	**0.002**
	SUM	22.7	31.0	632446	1247.1	82.1	407.86	403.3	111.32	281	247.3	48.5	8.47	25.4	8.45	0.658	0.157	0.157	0.028
SEPTE	**AVG**	**1.6**	**2.2**	**45175**	**89.1**	**5.9**	**29.13**	**28.8**	**7.95**	**20**	**17.7**	**3.5**	**0.61**	**1.8**	**0.60**	**0.047**	**0.011**	**0.011**	**0.002**

Source: Collier County Pollution Control, 10/16/20

October Summary 2020

OCTOB	2020																		OCTOB
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										50	2.5	2.5	0.20	0.1	0.20	0.005	0.006	0.010	0.008
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.7	2.0	50942	55.0	3.8	33.38	26.4	9.13	50	4.0	2.5	0.35	1.2	0.33	0.005	0.018	0.024	0.008
OLDE	1	1.5	1.7	51502	52.5	3.6	33.81	26.2	8.22	50	4.0	2.5	0.33	0.9	0.32	0.016	0.006	0.010	0.008
BASIN	**AVG**	**1.6**	**1.8**	**51222**	**53.8**	**3.7**	**33.60**	**26.3**	**8.68**	**50**	**4.0**	**2.5**	**0.34**	**1.0**	**0.33**	**0.011**	**0.012**	**0.017**	**0.008**
JH_PAR	2	2.1	2.3	49500	58.2	4.0	32.29	27.1	8.15	50	7.2	2.5	0.45	0.8	0.43	0.018	0.013	0.022	0.009
KENDA	2	2.8	2.8	48958	53.2	3.7	31.91	27.3	8.20	50	4.8	2.5	0.37	0.6	0.37	0.009	0.006	0.010	0.008
COLLIE	2	2.2	2.2	48051	55.6	3.5	31.98	27.2	8.11	50	5.6	2.5	0.40	0.4	0.38	0.005	0.010	0.013	0.008
HC_CE	2	1.8	1.8	49143	44.4	2.9	32.05	27.4	8.12	50	5.6	3.9	0.40	0.6	0.38	0.005	0.014	0.016	0.008
BASIN	**AVG**	**2.2**	**2.3**	**48913**	**52.9**	**3.5**	**32.06**	**27.3**	**8.15**	**50**	**5.8**	**2.9**	**0.41**	**0.6**	**0.39**	**0.009**	**0.011**	**0.015**	**0.008**
HOLLY	3	1.4	1.4	49836	55.3	3.8	32.55	27.4	8.05	50	7.2	2.5	0.42	0.9	0.39	0.005	0.022	0.026	0.008
HUMMI	3	1.4	1.4	49484	47.2	3.0	32.29	27.8	8.11	50	4.8	2.5	0.38	0.6	0.36	0.005	0.021	0.026	0.008
WINDM	3	1.5	1.5	49714	53.4	3.5	32.47	27.0	8.11	50	6.4	2.5	0.42	1.0	0.40	0.005	0.018	0.023	0.008
BASIN	**AVG**	**1.4**	**1.4**	**49678**	**52.0**	**3.4**	**32.44**	**27.4**	**8.09**	**50**	**6.1**	**2.5**	**0.41**	**0.8**	**0.38**	**0.005**	**0.020**	**0.025**	**0.008**
LANDM	4	1.8	1.8	50589	37.8	2.5	33.10	27.7	8.02	50	3.2	2.5	0.71	0.9	0.67	0.148	0.030	0.037	0.008
SWALL	4	1.8	1.8	46065	57.7	3.8	29.83	26.2	8.20	50	4.0	2.5	0.41	1.1	0.38	0.005	0.025	0.028	0.008
W_WIN	4	3.8	4.3	50763	57.2	4.6	33.21	25.7	8.12	50	5.6	2.5	0.36	0.7	0.34	0.108	0.019	0.021	0.008
BASIN	**AVG**	**2.5**	**2.6**	**49139**	**50.9**	**3.6**	**32.05**	**26.5**	**8.11**	**50**	**4.3**	**2.5**	**0.49**	**0.9**	**0.46**	**0.087**	**0.025**	**0.029**	**0.008**
E_WINT	5	2.6	2.9	50524	44.3	2.8	33.08	27.3	8.12	50	2.5	2.5	0.40	1.0	0.37	0.014	0.023	0.028	0.008
MCILVA	5	1.4	1.5	51458	48.1	3.2	33.76	26.9	8.17	50	2.5	2.5	0.36	1.4	0.34	0.006	0.018	0.022	0.008
BASIN	**AVG**	**2.0**	**2.2**	**50991**	**46.2**	**3.0**	**33.42**	**27.1**	**8.15**	**50**	**2.5**	**2.5**	**0.38**	**1.2**	**0.36**	**0.010**	**0.021**	**0.025**	**0.008**
	SUM	27.8	29.3	696529	719.9	48.7	455.71	377.6	114.83	650	67.4	36.4	5.31	11.2	5.03	0.336	0.230	0.284	0.104
OCTOB	**AVG**	**2.0**	**2.1**	**49752**	**51.4**	**3.5**	**32.55**	**27.0**	**8.20**	**50**	**4.8**	**2.6**	**0.41**	**0.9**	**0.39**	**0.026**	**0.018**	**0.022**	**0.008**

Source: Advanced Environmental Laboratories, November 18, 2020

November Summary 2020

NOVE	2020																		NOVE
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	2.5	2.5	0.12	0.1	0.20	0.005	0.006	0.010	0.008
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	1.6	2.0	51830	66.8	4.8	34.12	24.0	8.10	10	3.6	2.5	0.36	1.2	0.34	0.005	0.019	0.021	0.008
OLDE	1	1.8	2.1	51837	55.0	3.8	34.15	24.2	8.21	10	2.5	2.5	0.29	1.2	0.27	0.005	0.017	0.016	0.008
BASIN	**AVG**	**1.7**	**2.1**	**51834**	**60.9**	**4.3**	**34.14**	**24.1**	**8.16**	**10**	**3.1**	**2.5**	**0.33**	**1.2**	**0.31**	**0.005**	**0.018**	**0.019**	**0.008**
JH_PAR	2	2.9	3.1	47761	66.3	4.4	31.10	24.5	8.14	10	3.2	2.5	0.28	0.5	0.24	0.005	0.037	0.037	0.008
KENDA	2	1.5	1.5	47333	53.1	3.6	30.80	24.8	8.11	10	2.5	2.5	0.43	1.4	0.39	0.018	0.032	0.035	0.008
COLLIE	2	2.8	3.0	47325	52.2	3.7	30.78	24.9	8.12	10	2.5	2.5	0.35	1.1	0.33	0.008	0.021	0.020	0.008
HC_CE	2	1.8	1.8	47190	60.5	4.5	30.70	24.7	8.16	10	2.5	2.5	0.39	0.5	0.37	0.005	0.023	0.021	0.008
BASIN	**AVG**	**2.3**	**2.4**	**47402**	**58.0**	**4.0**	**30.85**	**24.7**	**8.13**	**10**	**2.7**	**2.5**	**0.36**	**0.9**	**0.33**	**0.009**	**0.028**	**0.028**	**0.008**
HOLLY	3	1.8	1.8	50437	51.4	3.5	33.04	24.9	8.13	10	2.5	2.5	0.32	0.7	0.29	0.020	0.033	0.029	0.008
HUMMI	3	1.7	1.7	47050	53.5	3.6	30.56	25.2	8.09	201	2.5	2.5	0.48	0.4	0.38	0.025	0.091	0.096	0.008
WINDM	3	1.6	2.1	49001	57.3	3.9	32.16	24.8	8.16	20	4.0	2.5	0.43	0.9	0.39	0.016	0.040	0.042	0.008
BASIN	**AVG**	**1.7**	**1.9**	**48829**	**54.1**	**3.7**	**31.92**	**25.0**	**8.13**	**77**	**3.0**	**2.5**	**0.41**	**0.6**	**0.35**	**0.020**	**0.055**	**0.056**	**0.008**
LANDM	4	2.5	2.5	49983	54.6	3.7	32.72	25.2	8.20	10	3.2	2.5	0.35	0.3	0.33	0.011	0.022	0.021	0.008
SWALL	4	2.0	2.4	49036	37.6	2.8	31.97	25.2	7.94	110	2.5	2.5	0.36	1.0	0.30	0.032	0.059	0.060	0.008
W_WIN	4	1.6	1.6	49502	59.1	4.1	32.38	24.8	8.21	10	2.5	2.5	0.36	1.1	0.28	0.020	0.078	0.074	0.008
BASIN	**AVG**	**2.0**	**2.2**	**49507**	**50.4**	**3.5**	**32.36**	**25.1**	**8.12**	**43**	**2.7**	**2.5**	**0.36**	**0.8**	**0.30**	**0.021**	**0.053**	**0.052**	**0.008**
E_WINT	5	2.4	3.0	50398	59.9	4.2	33.05	24.9	8.18	10	3.2	2.5	0.12	1.0	0.20	0.011	0.034	0.042	0.009
MCILVA	5	2.2	2.2	51440	52.8	4.0	33.31	24.7	8.24	10	2.5	2.5	0.30	1.3	0.26	0.008	0.040	0.033	0.008
BASIN	**AVG**	**2.3**	**2.6**	**50919**	**56.4**	**4.1**	**33.18**	**24.8**	**8.21**	**10**	**2.9**	**2.5**	**0.21**	**1.1**	**0.23**	**0.010**	**0.037**	**0.038**	**0.009**
	SUM	28.2	30.8	690123	780.1	54.5	450.84	346.8	113.99	441	39.7	35.0	4.82	12.5	4.37	0.189	0.546	0.547	0.113
NOVE	**AVG**	**2.0**	**2.2**	**49295**	**55.7**	**3.9**	**32.20**	**24.8**	**8.14**	**32**	**2.8**	**2.5**	**0.34**	**0.9**	**0.31**	**0.014**	**0.039**	**0.039**	**0.008**

Source: Advanced Environmental Laboratories, December 9, 2020

December Summary 2020

DECEM	**2020**																		**DECEM**
LOCATI	BASIN	SECCHI	DEPTH	CONDU	DO SAT	DO	SALINI	T	PH	ENTER	CHLOR-	PHEOP	TN	TURBID	TKN	TP	NITRAT	N+N	NITRIT
UNITS		METER	METER	umhos/	%	mg/L	ppt	C	SU	MPN/	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
MDL										10	2.5	2.5	0.12		0.20	0.005	0.006	0.010	0.008
ACCEP					> 42				6.5-8.5	< 130	< 4.9		< 0.3			< 0.046			
BARFIE	1	2.0	2.5	49626	74.7	5.7	32.55	18.7	8.03	10	**10.0**	2.5	**0.51**	1.4	0.50	0.009	0.012	0.014	0.008
OLDE	1	1.5	2.0	50554	70.3	5.4	33.21	18.4	8.21	10	**8.0**	2.5	**0.30**	1.4	0.29	0.005	0.006	0.010	0.008
BASIN	**AVG**	**1.8**	**2.3**	**50090**	**72.5**	**5.6**	**32.88**	**18.6**	**8.12**	**10**	**9.0**	**2.5**	**0.41**	**1.4**	**0.40**	**0.007**	**0.009**	**0.012**	**0.008**
JH_PAR	2	2.5	2.8	49204	81.2	6.2	32.22	19.3	8.19	10	2.5	2.5	**0.33**	0.4	0.30	0.006	0.035	0.039	0.008
KENDA	2	1.5	1.5	48206	64.8	5.0	31.47	20.1	8.18	10	2.5	2.5	**0.37**	0.4	0.33	0.018	0.036	0.040	0.008
COLLIE	2	2.8	3.2	47944	62.7	4.8	30.59	19.9	8.14	10	2.5	2.5	**0.35**	1.0	0.30	0.020	0.042	0.046	0.008
HC_CE	2	1.5	1.5	47698	66.9	5.2	31.12	19.6	8.18	10	2.5	2.5	**0.31**	0.6	0.25	0.005	0.049	0.059	0.010
BASIN	**AVG**	**2.1**	**2.3**	**48263**	**68.9**	**5.3**	**31.35**	**19.7**	**8.17**	**10**	**2.5**	**2.5**	**0.34**	**0.6**	**0.30**	**0.012**	**0.041**	**0.046**	**0.009**
HOLLY	3	1.7	1.7	50310	67.2	5.2	33.03	18.9	8.32	10	2.5	2.5	**0.34**	0.7	0.32	0.009	0.021	0.025	0.008
HUMMI	3	1.6	1.6	48279	63.2	4.9	31.59	19.5	8.17	10	2.5	2.5	**0.38**	0.7	0.34	0.009	0.031	0.035	0.008
WINDM	3	2.0	2.0	49274	60.4	4.7	32.30	19.3	8.29	10	4.8	3.0	**0.39**	0.8	0.39	0.005	0.006	0.010	0.008
BASIN	**AVG**	**1.8**	**1.8**	**49288**	**63.6**	**4.9**	**32.31**	**19.2**	**8.26**	**10**	**3.3**	**2.7**	**0.37**	**0.7**	**0.35**	**0.008**	**0.019**	**0.023**	**0.008**
LANDM	4	2.2	2.2	50836	44.6	3.3	33.41	20.7	8.15	10	3.2	2.5	**0.46**	0.5	0.44	0.025	0.021	0.024	0.008
SWALL	4	1.5	2.2	49169	49.0	3.7	32.33	20.6	8.12	10	2.5	2.5	**0.48**	1.1	0.44	0.037	0.042	0.046	0.008
W_WIN	4	1.6	1.6	50249	66.4	5.2	33.00	19.8	8.18	10	2.5	2.5	**0.38**	0.9	0.35	0.005	0.031	0.037	0.008
BASIN	**AVG**	**1.8**	**2.0**	**50085**	**53.3**	**4.1**	**32.91**	**20.4**	**8.15**	**10**	**2.7**	**2.5**	**0.44**	**0.8**	**0.41**	**0.022**	**0.031**	**0.036**	**0.008**
E_WINT	5	2.5	2.9	50342	70.8	5.5	33.06	19.6	8.23	10	2.5	2.5	**0.33**	0.6	0.29	0.005	0.034	0.039	0.008
MCILVA	5	2.2	2.2	50477	69.6	5.2	33.18	19.4	8.24	10	2.5	2.5	**0.27**	0.7	0.25	0.006	0.024	0.028	0.008
BASIN	**AVG**	**2.4**	**2.6**	**50410**	**70.2**	**5.3**	**33.12**	**19.5**	**8.24**	**10**	**2.5**	**2.5**	**0.30**	**0.6**	**0.27**	**0.006**	**0.029**	**0.034**	**0.008**
	SUM	27.1	29.9	692168	911.8	70.0	453.06	273.8	114.63	140	51.0	35.5	5.20	11.2	4.79	0.164	0.390	0.452	0.114
DECEM	**AVG**	**1.9**	**2.1**	**49441**	**65.1**	**5.0**	**32.36**	**19.6**	**8.19**	**10**	**3.6**	**2.5**	**0.37**	**0.8**	**0.34**	**0.012**	**0.028**	**0.032**	**0.008**

Source: Advanced Environmental Laboratories, December 22, 2020

MDL by Month 2020

	ENTEROCOCC	CHLOR-A	PHEOPHYTIN	TN	TURBIDITY	TKN	TP	NITRATE (N)	N+N	NITRITE (N)
	MPN/100 ml	mg/mg3	mg/m3	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
	MDL	MDL	MDL	MDL	MDL	MDL	MDL	MDL	MDL	MDL
JAN	10	1.000	1.000	0.230	0.100	0.230	0.032	0.011	0.011	0.002
FEB	10	1.000	1.000	0.230	0.100	0.230	0.014	0.011	0.011	0.002
MAR										
APR	10	1.000	1.000	0.200	0.100	0.200	0.014	0.011	0.011	0.002
MAY	10	1.000	1.000		0.100			0.033		0.002
JUN	10	1.000	1.000	0.200	0.100	0.200	0.007	0.011	0.011	0.002
JUL	10	1.000	1.000	0.200	0.100	0.200	0.014	0.011	0.011	0.002
AUG	10	1.000	1.000	0.200	0.100	0.200	0.014	0.011	0.011	0.002
SEP	10	1.000	1.000	0.200	0.100	0.200	0.014	0.011	0.011	0.002
OCT	50	2.500	2.500	0.200	0.100	0.200	0.005	0.006	0.010	0.008
NOV	10	2.500	2.500	0.120	0.100	0.200	0.005	0.006	0.010	0.008
DEC	10	2.500	2.500	0.120		0.200	0.005	0.006	0.010	0.008

When lab could not detect parameter, they used the "Minimum Detectable Level (MDL)"

Are labs using different equipment each month for sampling?

6. Sampling Concepts

Annual Geometric Mean (AGM)

- Most data: The arithmetic mean is the sum of a collection of numbers divided by the count of the numbers:

$$AVG = (x_1 + x_2 + \ldots + x_n)/n$$

- Regulatory requirement: The geometric mean indicates the central tendency of a set of numbers by using the product of their values, defined as the nth root of the product of n numbers:

$$GM = (x_1 x_2 \ldots x_n)^{1/n}$$

- A comparison of the two approaches shows:

X1	X2	AVG	GM
1.0	1.0	1.0	1.0
1.0	0.8	0.9	0.9
1.0	0.6	0.8	0.8
1.0	0.4	0.7	0.6
1.0	0.2	0.6	0.4
1.0	0	0.5	0.0

- The GM measurement diverges from AVG as the samples diverge and the GM calculation collapses entirely when any single $x_n = 0$

Minimum Detectable Level (MDL)

- What do we enter when we can't "get a reading"? Lab currently enters MDL = 0.12 mg/L for TN
- Alternative approaches include simple deletion or substitution (*)
  - Let TN = 0.0 mg/l
  - Let TN = MDL of lab = 0.12 mg/L
  - Let TN = (1/2) MDL = 0.06 mg/L
- Parameter of zero (0) will collapse the AGM calculation - so we see DBHydro entries of small numbers near zero ~ 0.05

(*) Source: Liya Fu, You-Gan Wang, "Statistical Tools for Analyzing Water Quality Data", 2012

Outliers

- Outliers distort the database and make it difficult to see trends
- (32) statistical outliers seen in the 2020 database
- An outlier can be the source of a “false” impairment
- However, Outliers may actually be valid results
- Treatment of outliers swings the evaluation of impairment

Thank You!