LAKEWATCH Report for Bal Harbor in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Charlotte Harbor Proper		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Bal Harbor
Latitude	26.8913
Longitude	-82.0661
Water Body Type	Estuary
Period of Record (year)	2009 to 2016

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Long-Term Data Summary Estuary: Definitions

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- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
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- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	98 - 176	145 (8)
Total Nitrogen (µg/L)	500 - 713	610 (8)
Chlorophyll- uncorrected (µg/L)	3.2 - 14.4	5.6 (8)
Secchi (ft)	3.4 - 3.4	3.4 (8)
Secchi (m)	1.0 - 1.0	1.0 (8)
Color (Pt-Co Units)	11 -30	23 (7)
Specific Conductance (µS/cm@25 C)	17000 - 36000	30607 (4)
Salinity (ppt)	10 - 22	19 (4)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for Bal Harbor in Charlotte County
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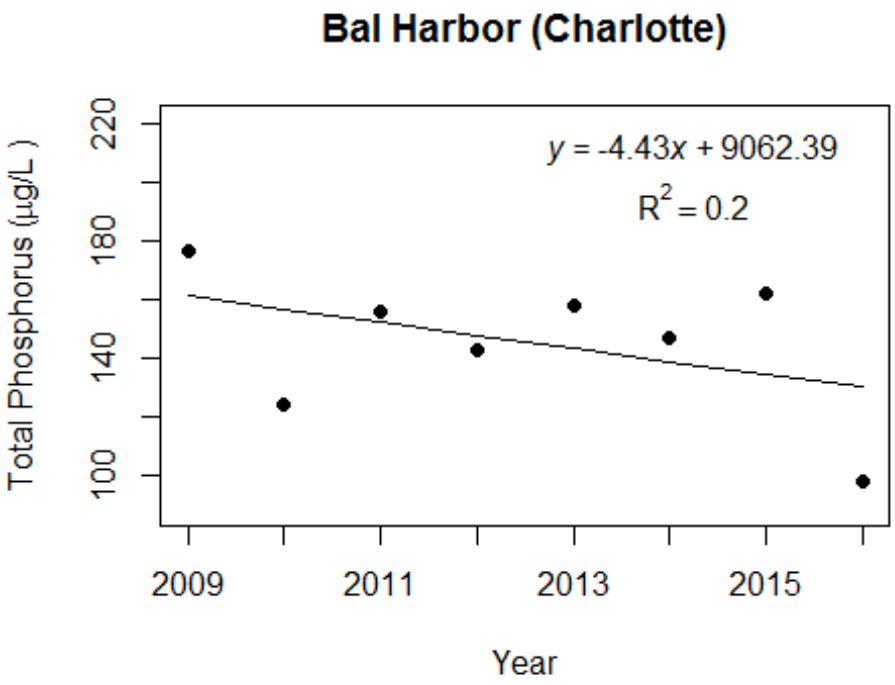
Trend Analyses Estuary

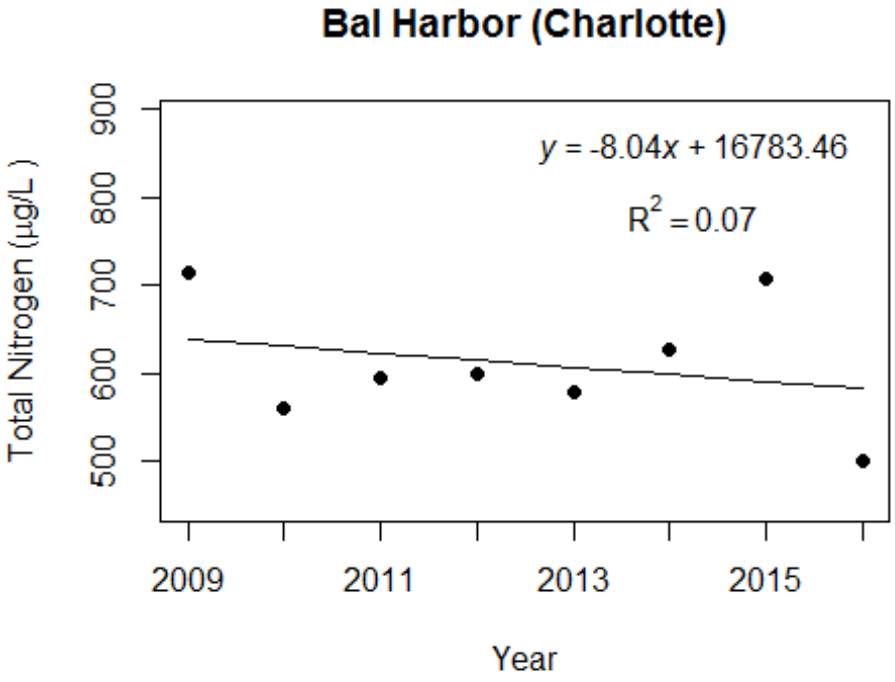
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

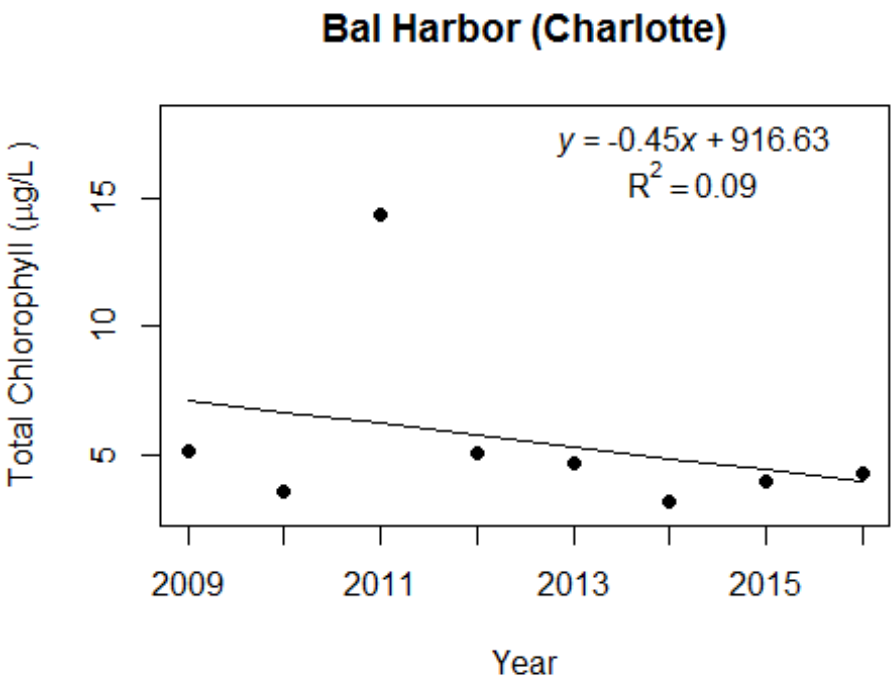
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

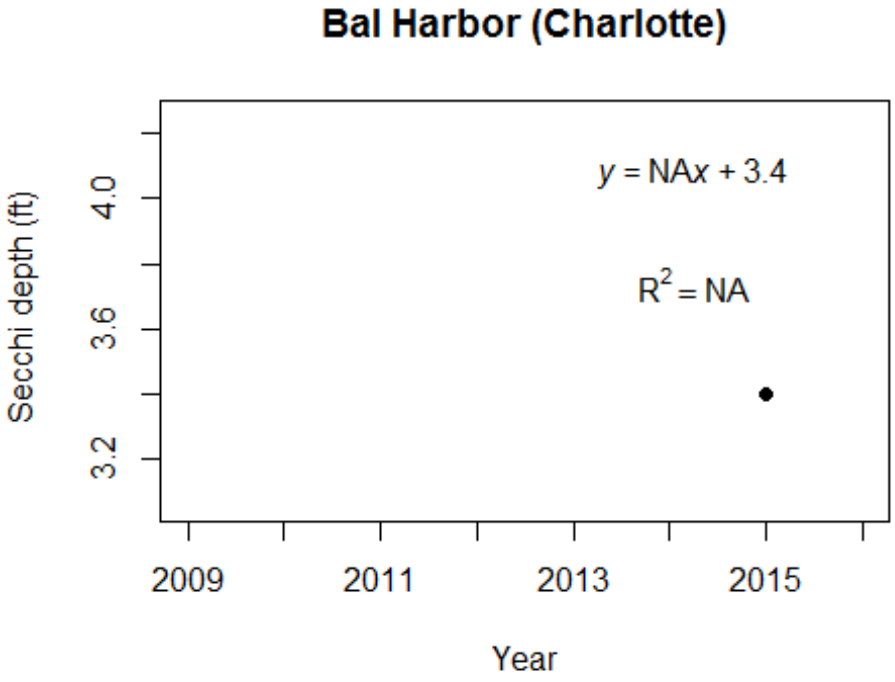
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	8	8	8	8
Intercept (a)	9062	16783	917	3
Slope (b)	-4.43	-8.04	-0.45	
Coefficient of Determination (R^2)	0.20	0.07	0.09	
Probability of Significance (p)	0.27	0.51	0.46	
Potential Trend	No Trend	No Trend	No Trend	

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Bal Harbor in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Bal Harbor (Charlotte)
y = -4.43x + 9062.39
R2 = 0.2
Total Phosphorus (µg/L)
100
140
180
220
2009
2011
2013
2015
Year


Bal Harbor (Charlotte)
y = -8.04x + 16783.46
R2 = 0.07
Total Nitrogen (µg/L)
500
600
700
800
900
2009
2011
2013
2015
Year


Bal Harbor (Charlotte)
y = -0.45x + 916.63
R2 = 0.09
Total Chlorophyll (µg/L)
5
10
15
2009
2011
2013
2015
Year


Bal Harbor (Charlotte)
y = NAx + 3.4
R2 = NA
Secchi depth (ft)
3.2
3.6
4.0
2009
2011
2013
2015
Year

LAKEWATCH Report for Breakers in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

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The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Tidal Peace River		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

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- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
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- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Breakers
Latitude	26.9249
Longitude	-82.0646
Water Body Type	Estuary
Period of Record (year)	2009 to 2016

LAKEWATCH Report for Breakers in Charlotte County
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Long-Term Data Summary Estuary: Definitions

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- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
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- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	169 - 281	201 (8)
Total Nitrogen (µg/L)	656 - 943	809 (8)
Chlorophyll- uncorrected (µg/L)	4.5 - 10.5	8.1 (8)
Secchi (ft)	2.8 - 3.3	2.9 (8)
Secchi (m)	0.9 - 1.0	0.9 (8)
Color (Pt-Co Units)	13 -49	32 (7)
Specific Conductance (µS/cm@25 C)	10000 - 32000	24063 (4)
Salinity (ppt)	6 - 20	15 (4)

Coastal Trophic State

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Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

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Trend Analyses Estuary

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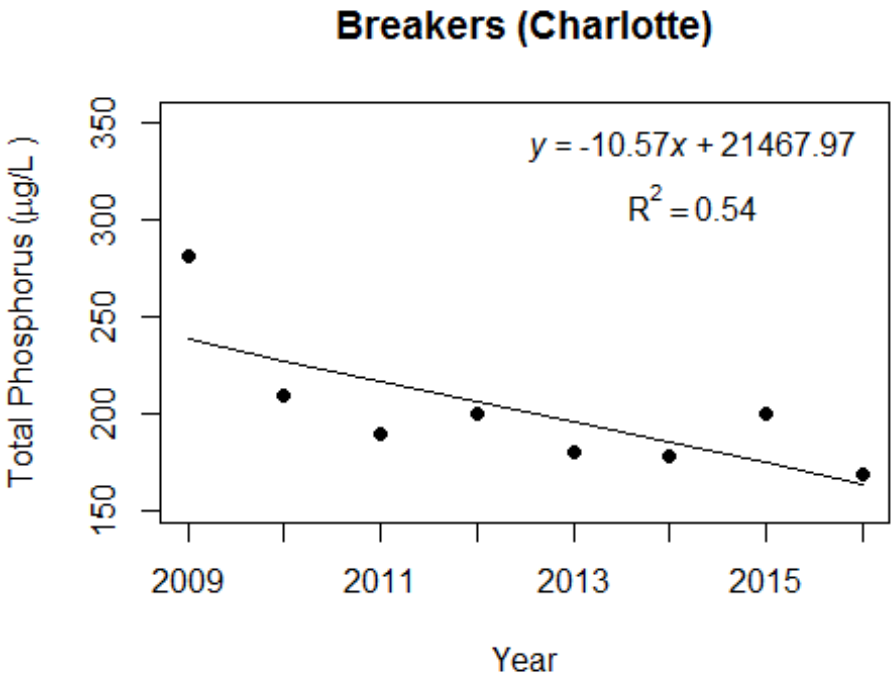
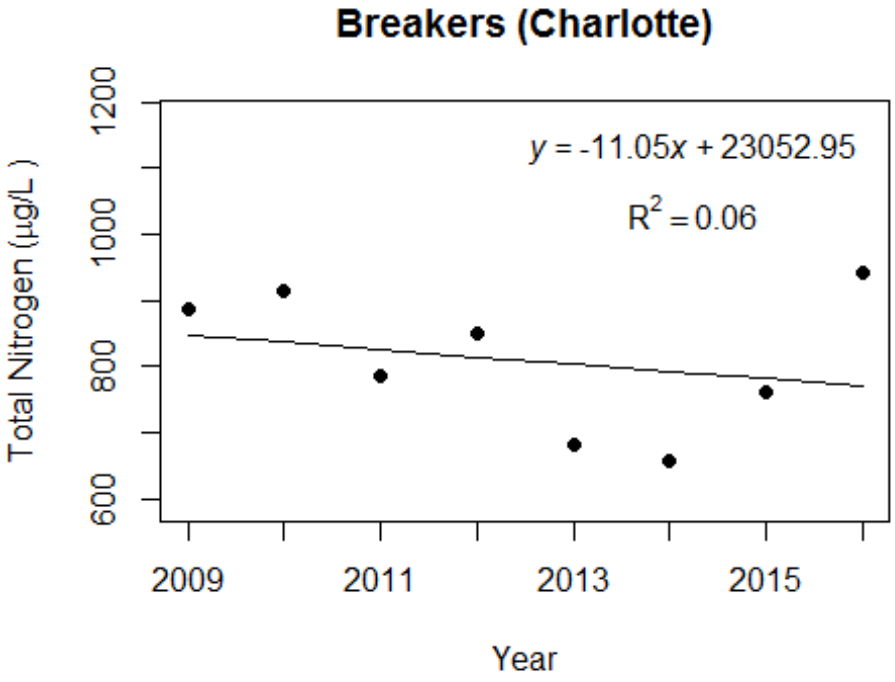
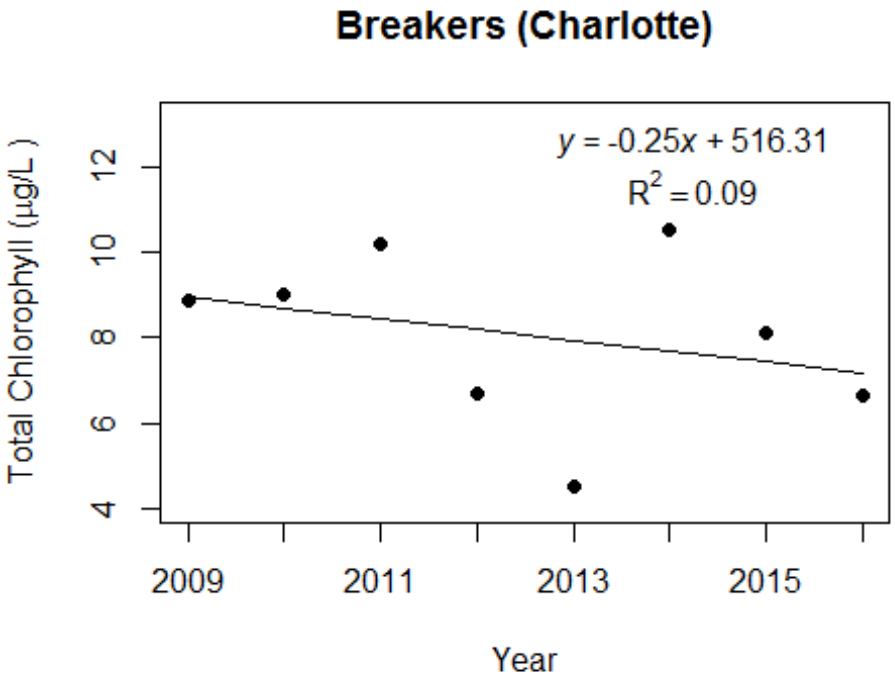
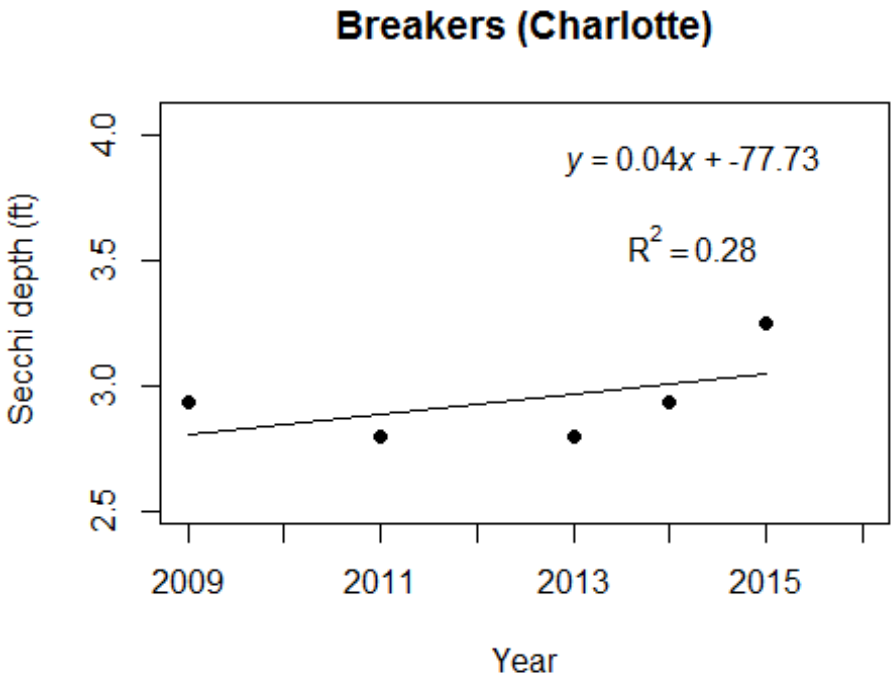
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	8	8	8	8
Intercept (a)	21468	23053	516	-78
Slope (b)	-10.57	-11.05	-0.25	0.04
Coefficient of Determination (R^2)	0.54	0.07	0.09	0.28
Probability of Significance (p)	0.04	0.54	0.46	0.36
Potential Trend	Decreasing	No Trend	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Breakers in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Breakers (Charlotte)
y = -10.57x + 21467.97
R2 = 0.54
Total Phosphorus (µg/L)
150
200
250
300
350
2009
2011
2013
2015
Year


Breakers (Charlotte)
y = -11.05x + 23052.95
R2 = 0.06
Total Nitrogen (µg/L)
600
800
1000
1200
2009
2011
2013
2015
Year


Breakers (Charlotte)
y = -0.25x + 516.31
R2 = 0.09
Total Chlorophyll (µg/L)
4
6
8
10
12
2009
2011
2013
2015
Year


Breakers (Charlotte)
y = 0.04x + -77.73
R2 = 0.28
Secchi depth (ft)
2.5
3.0
3.5
4.0
2009
2011
2013
2015
Year

LAKEWATCH Report for Candia in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

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Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Charlotte Harbor Proper		

Base File Data: Definitions

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- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Candia
Latitude	26.8969
Longitude	-82.0443
Water Body Type	Estuary
Period of Record (year)	2009 to 2016

LAKEWATCH Report for Candia in Charlotte County
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Long-Term Data Summary Estuary: Definitions

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Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	66 - 135	87 (8)
Total Nitrogen (µg/L)	505 - 929	675 (8)
Chlorophyll- uncorrected (µg/L)	4.3 - 11.7	6.6 (8)
Secchi (ft)	3.8 - 4.4	4.0 (8)
Secchi (m)	1.2 - 1.3	1.2 (8)
Color (Pt-Co Units)	18 -43	27 (7)
Specific Conductance (µS/cm@25 C)	2843 - 25143	17121 (3)
Salinity (ppt)	16 - 19	17 (2)

Coastal Trophic State

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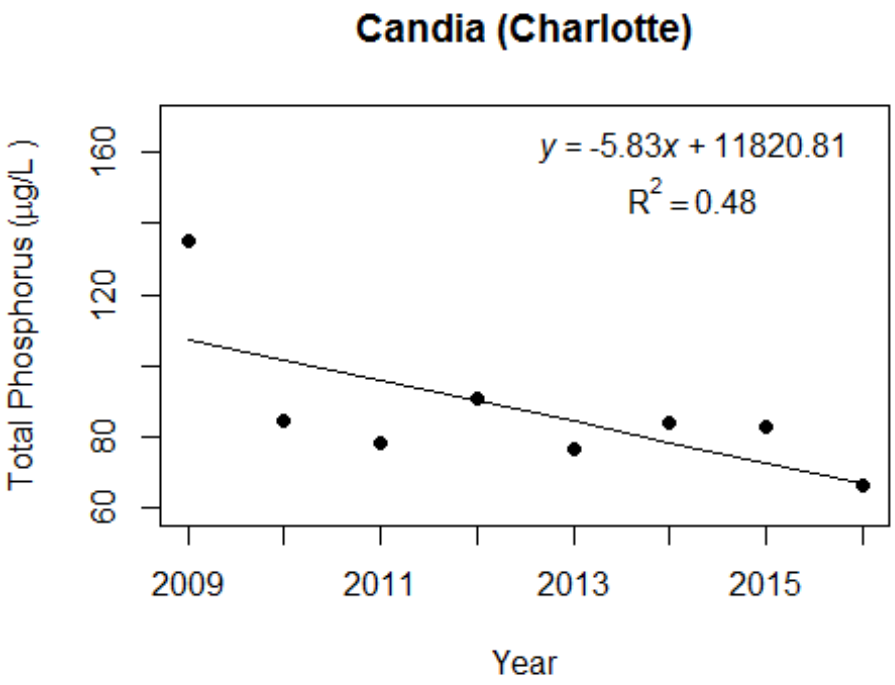
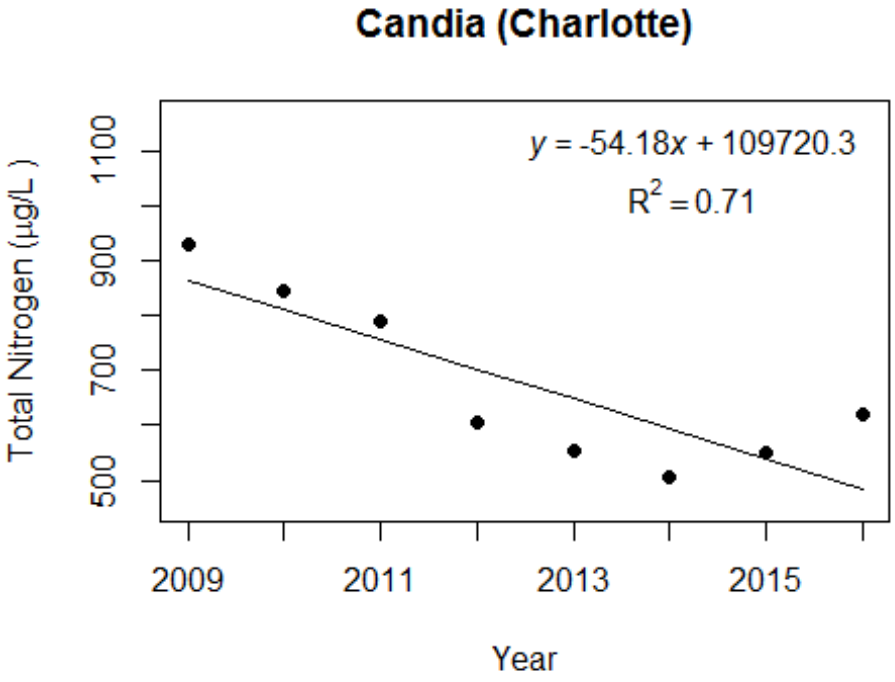
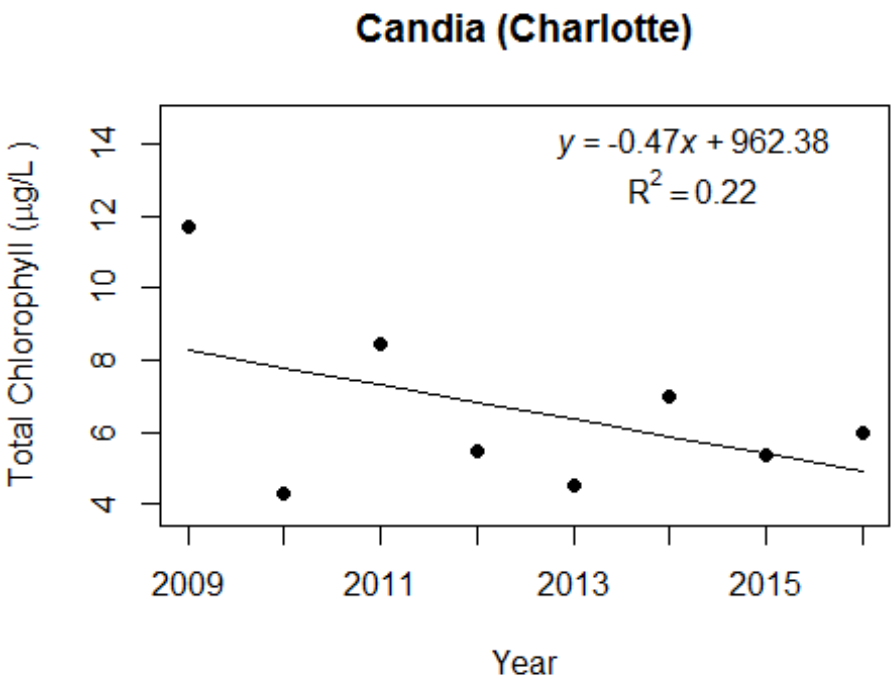
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

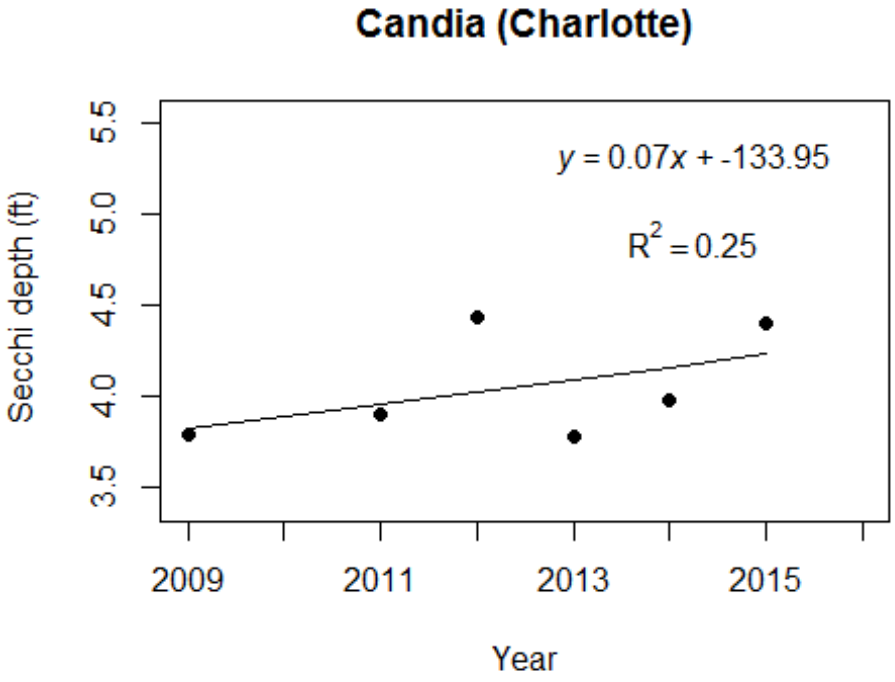
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	8	8	8	8
Intercept (a)	11821	109720	962	-134
Slope (b)	-5.83	-54.18	-0.47	0.07
Coefficient of Determination (R^2)	0.48	0.71	0.22	0.25
Probability of Significance (p)	0.06	0.01	0.24	0.31
Potential Trend	No Trend	Decreasing	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Candia in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Candia (Charlotte)
y = -5.83x + 11820.81
R2 = 0.48
Total Phosphorus (µg/L)
60
80
120
160
2009
2011
2013
2015
Year


Candia (Charlotte)
y = -54.18x + 109720.3
R2 = 0.71
Total Nitrogen (µg/L)
500
700
900
1100
2009
2011
2013
2015
Year


Candia (Charlotte)
y = -0.47x + 962.38
R2 = 0.22
Total Chlorophyll (µg/L)
4
6
8
10
12
14
2009
2011
2013
2015
Year


Candia (Charlotte)
y = 0.07x + -133.95
R2 = 0.25
Secchi depth (ft)
3.5
4.0
4.5
5.0
5.5
2009
2011
2013
2015
Year

LAKEWATCH Report for Colony Point in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Charlotte Harbor Proper		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Colony Point
Latitude	26.9098
Longitude	-82.0868
Water Body Type	Estuary
Period of Record (year)	2009 to 2014

LAKEWATCH Report for Colony Point in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	106 - 203	153 (6)
Total Nitrogen (µg/L)	405 - 841	625 (6)
Chlorophyll- uncorrected (µg/L)	4.7 - 8.2	6.6 (6)
Secchi (ft)	3.2 - 5.0	4.0 (6)
Secchi (m)	1.0 - 1.5	1.2 (6)
Color (Pt-Co Units)	15 -45	29 (5)
Specific Conductance (µS/cm@25 C)	32000 - 32000	32000 (1)
Salinity (ppt)	20 - 20	20 (1)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for Colony Point in Charlotte County
Using Data Downloaded 10/17/2016

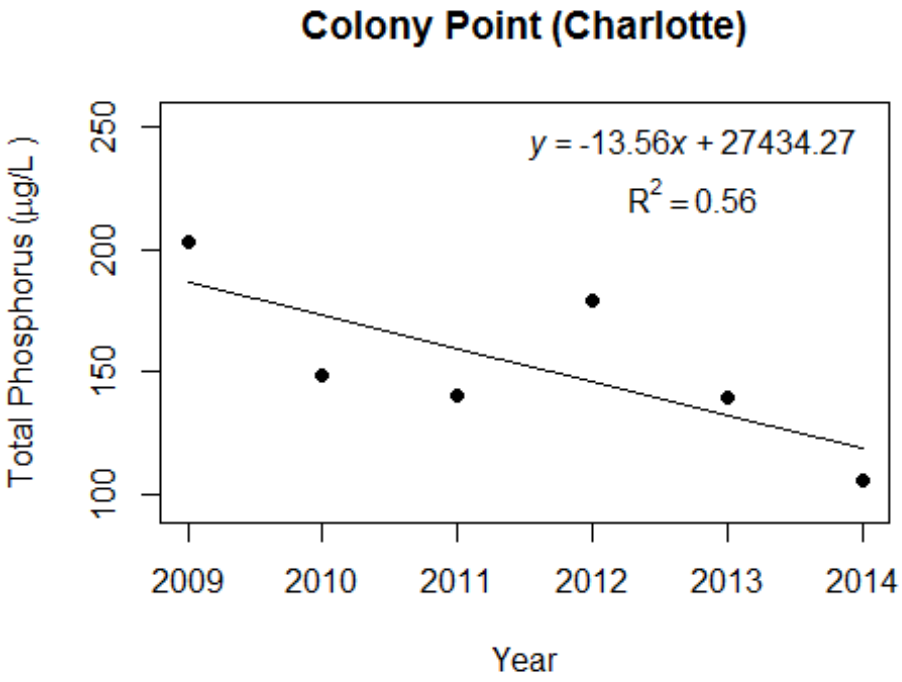
Trend Analyses Estuary

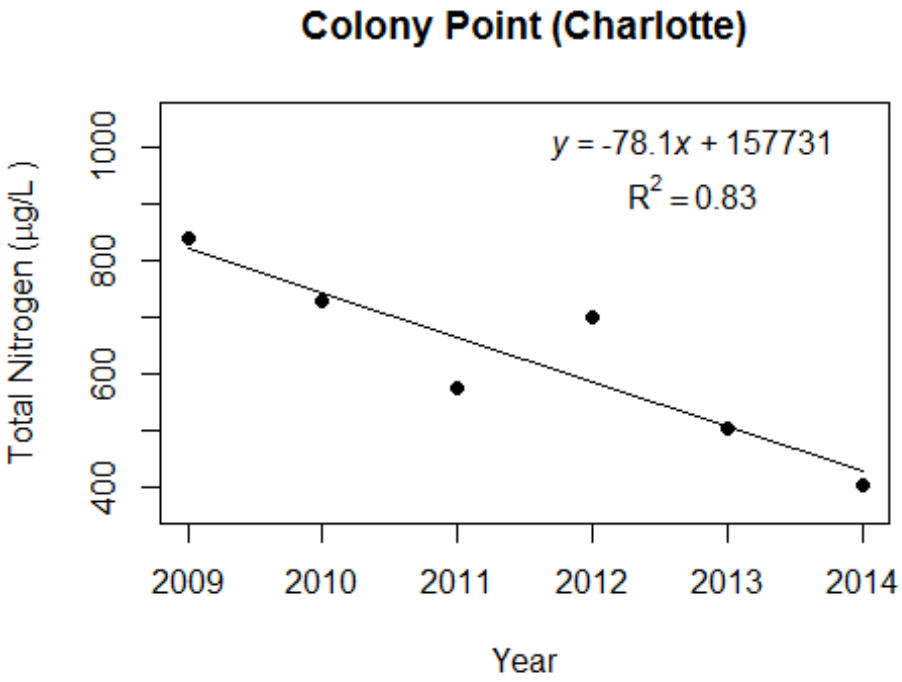
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

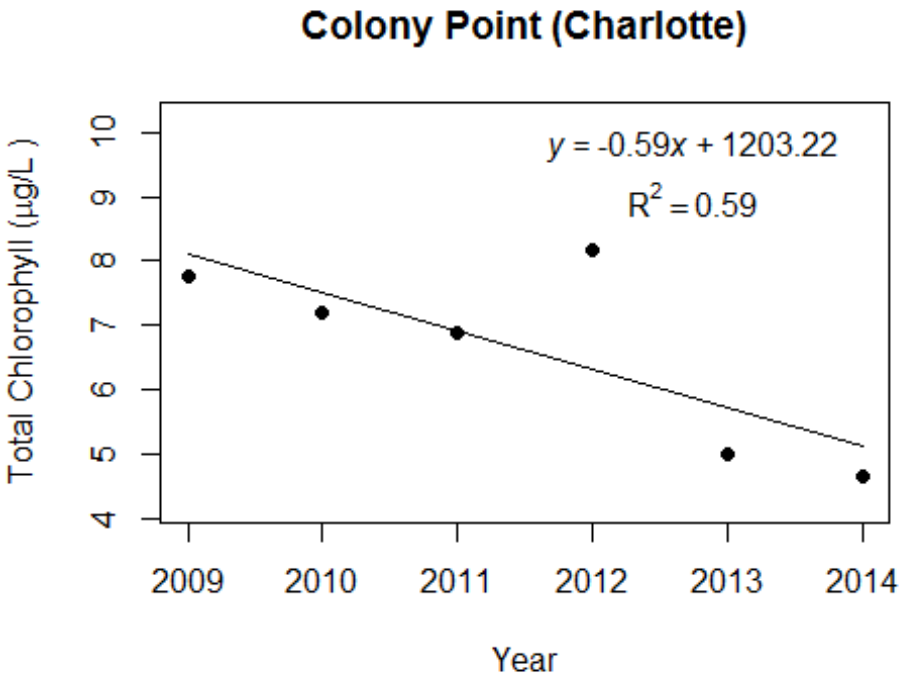
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

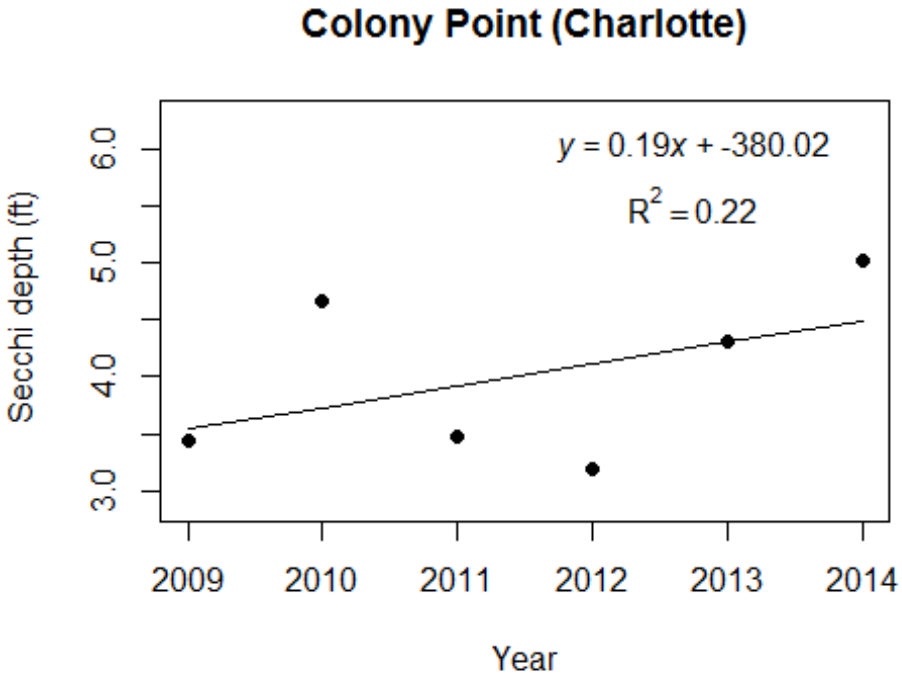
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	6	6	6	6
Intercept (a)	27434	157731	1203	-380
Slope (b)	-13.56	-78.10	-0.59	0.19
Coefficient of Determination (R^2)	0.56	0.83	0.59	0.22
Probability of Significance (p)	0.09	0.01	0.08	0.35
Potential Trend	No Trend	Decreasing	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Colony Point in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Colony Point (Charlotte)
y = -13.56x + 27434.27
R2 = 0.56
Total Phosphorus (µg/L)
100
150
200
250
2009
2010
2011
2012
2013
2014
Year


Colony Point (Charlotte)
y = -78.1x + 157731
R2 = 0.83
Total Nitrogen (µg/L)
400
600
800
1000
2009
2010
2011
2012
2013
2014
Year


Colony Point (Charlotte)
y = -0.59x + 1203.22
R2 = 0.59
Total Chlorophyll (µg/L)
4
5
6
7
8
9
10
2009
2010
2011
2012
2013
2014
Year


Colony Point (Charlotte)
y = 0.19x + -380.02
R2 = 0.22
Secchi depth (ft)
3.0
4.0
5.0
6.0
2009
2010
2011
2012
2013
2014
Year

LAKEWATCH Report for LC-1 in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Lower Lemon Bay		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	LC-1
Latitude	26.8806
Longitude	-82.3081
Water Body Type	Estuary
Period of Record (year)	2011 to 2016

LAKEWATCH Report for LC-1 in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	190 - 362	266 (6)
Total Nitrogen (µg/L)	1242 - 1976	1675 (6)
Chlorophyll- uncorrected (µg/L)	127.0 - 222.6	177.9 (6)
Secchi (ft)	1.0 - 2.0	1.4 (6)
Secchi (m)	0.3 - 0.6	0.4 (6)
Color (Pt-Co Units)	54 -122	80 (5)
Specific Conductance (µS/cm@25 C)	13488 - 38667	27507 (5)
Salinity (ppt)	11 - 25	19 (5)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for LC-1 in Charlotte County
Using Data Downloaded 10/17/2016

Trend Analyses Estuary

The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

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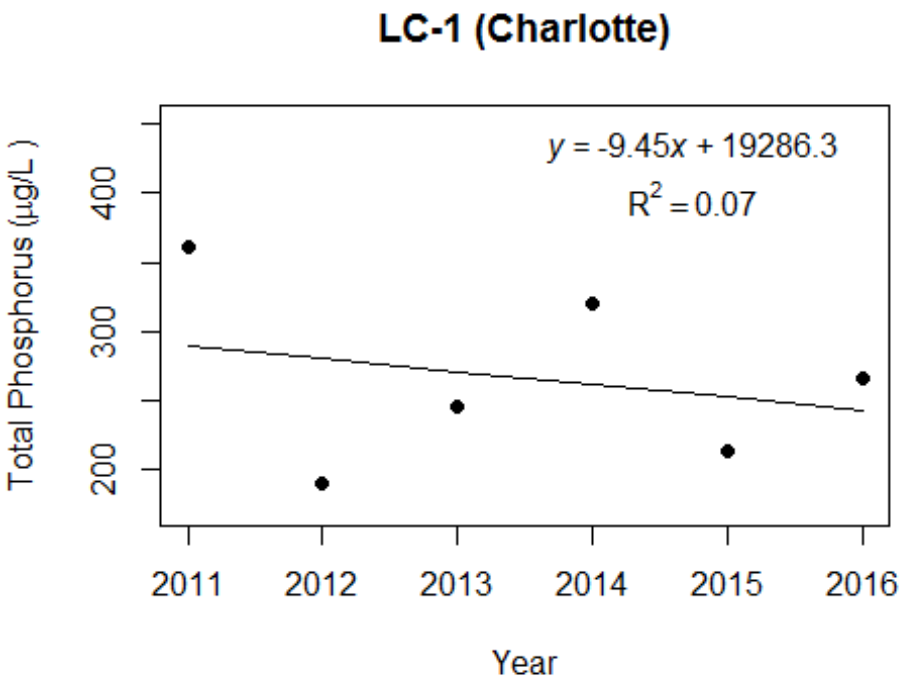
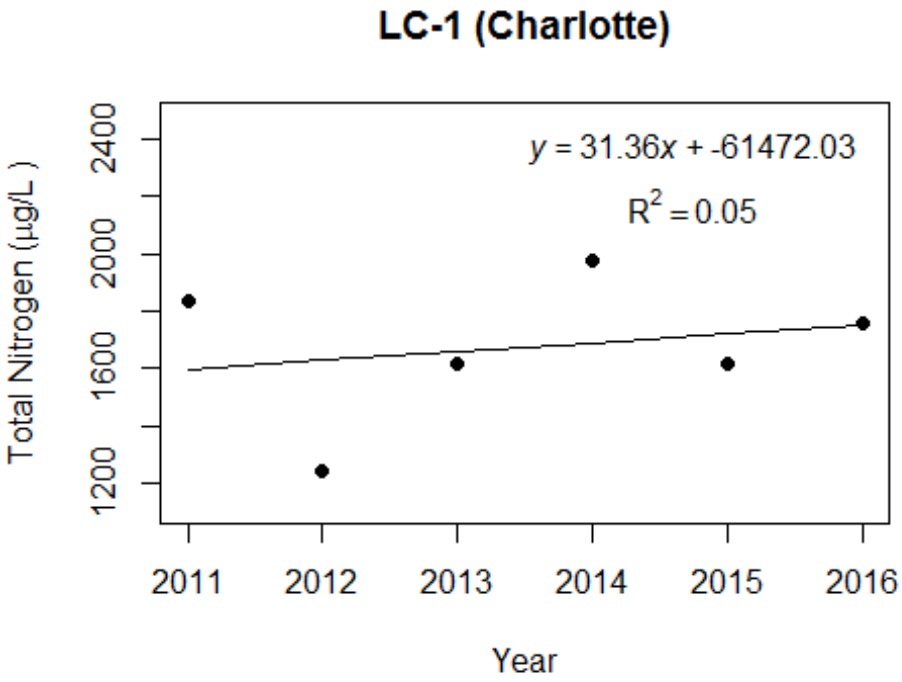
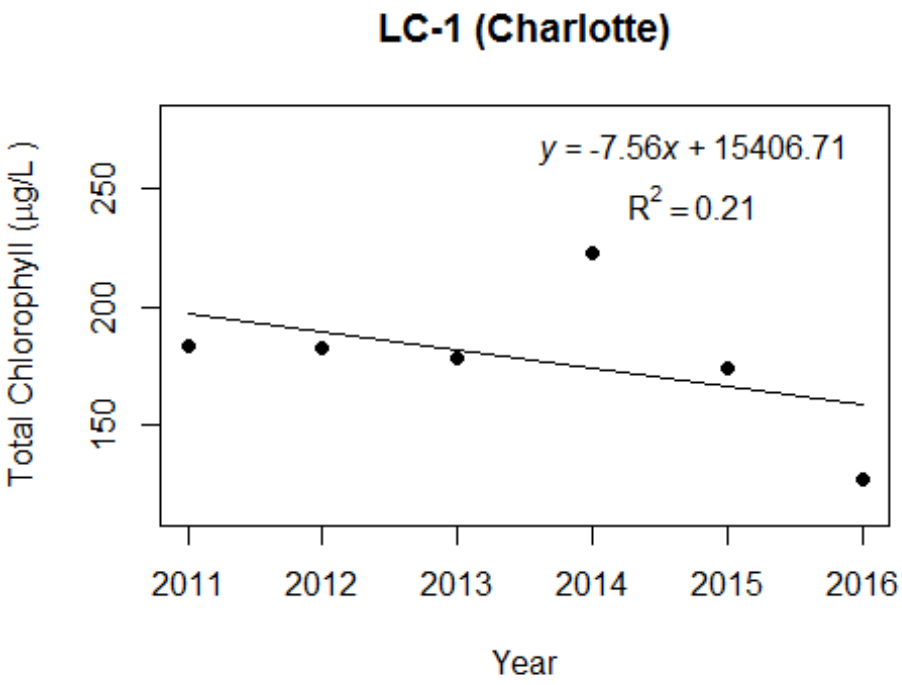
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

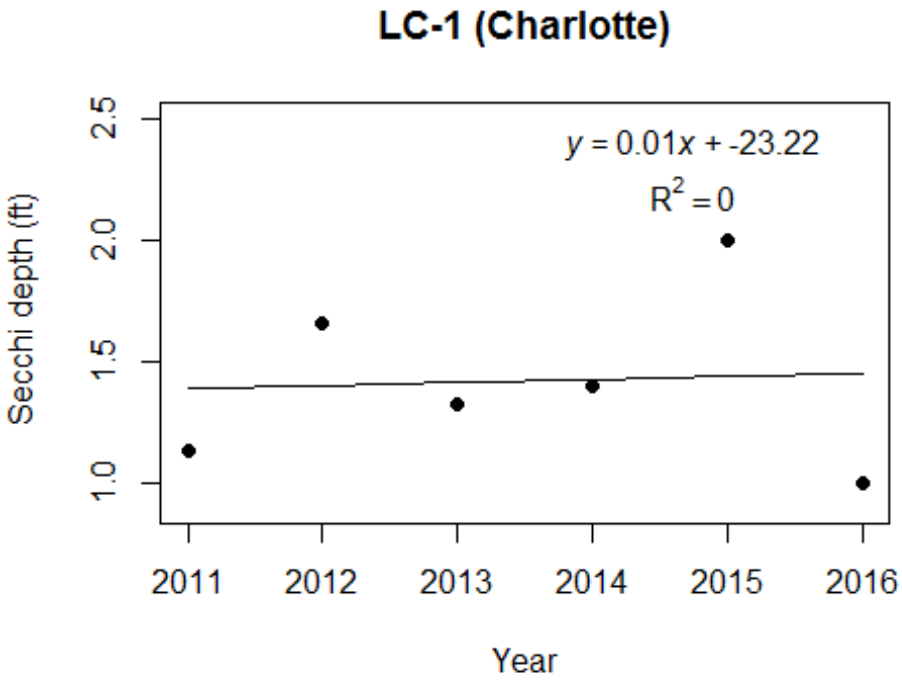
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	6	6	6	6
Intercept (a)	19286	-61472	15407	-23
Slope (b)	-9.45	31.36	-7.56	0.01
Coefficient of Determination (R^2)	0.07	0.05	0.21	0.00
Probability of Significance (p)	0.60	0.66	0.35	0.91
Potential Trend	No Trend	No Trend	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for LC-1 in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


LC-1 (Charlotte)
y = -9.45x + 19286.3
R2 = 0.07
Total Phosphorus (µg/L)
200
300
400
2011
2012
2013
2014
2015
2016
Year


LC-1 (Charlotte)
y = 31.36x + -61472.03
R2 = 0.05
Total Nitrogen (µg/L)
1200
1600
2000
2400
2011
2012
2013
2014
2015
2016
Year


LC-1 (Charlotte)
y = -7.56x + 15406.71
R2 = 0.21
Total Chlorophyll (µg/L)
150
200
250
2011
2012
2013
2014
2015
2016
Year


LC-1 (Charlotte)
y = 0.01x + -23.22
R2 = 0
Secchi depth (ft)
1.0
1.5
2.0
2.5
2011
2012
2013
2014
2015
2016
Year

LAKEWATCH Report for LC-2 in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Lower Lemon Bay		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	LC-2
Latitude	26.8789
Longitude	-82.3084
Water Body Type	Estuary
Period of Record (year)	2011 to 2016

LAKEWATCH Report for LC-2 in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	160 - 300	215 (6)
Total Nitrogen (µg/L)	1165 - 1683	1439 (6)
Chlorophyll- uncorrected (µg/L)	51.8 - 127.8	93.8 (6)
Secchi (ft)	2.0 - 4.0	2.9 (6)
Secchi (m)	0.6 - 1.2	0.9 (6)
Color (Pt-Co Units)	52 -110	79 (6)
Specific Conductance (µS/cm@25 C)	23000 - 41667	32944 (6)
Salinity (ppt)	14 - 26	20 (6)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for LC-2 in Charlotte County
Using Data Downloaded 10/17/2016

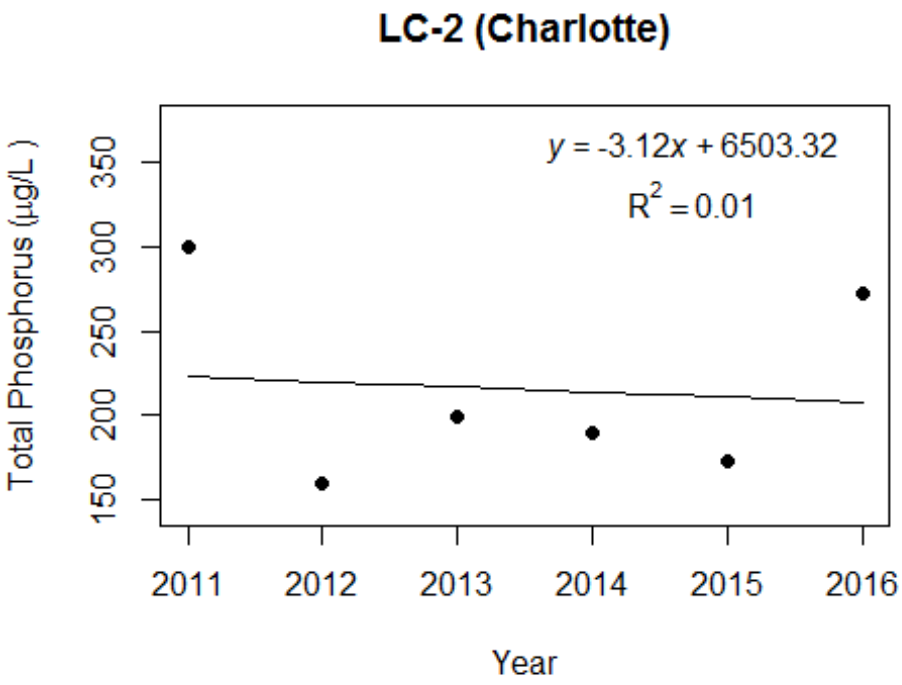
Trend Analyses Estuary

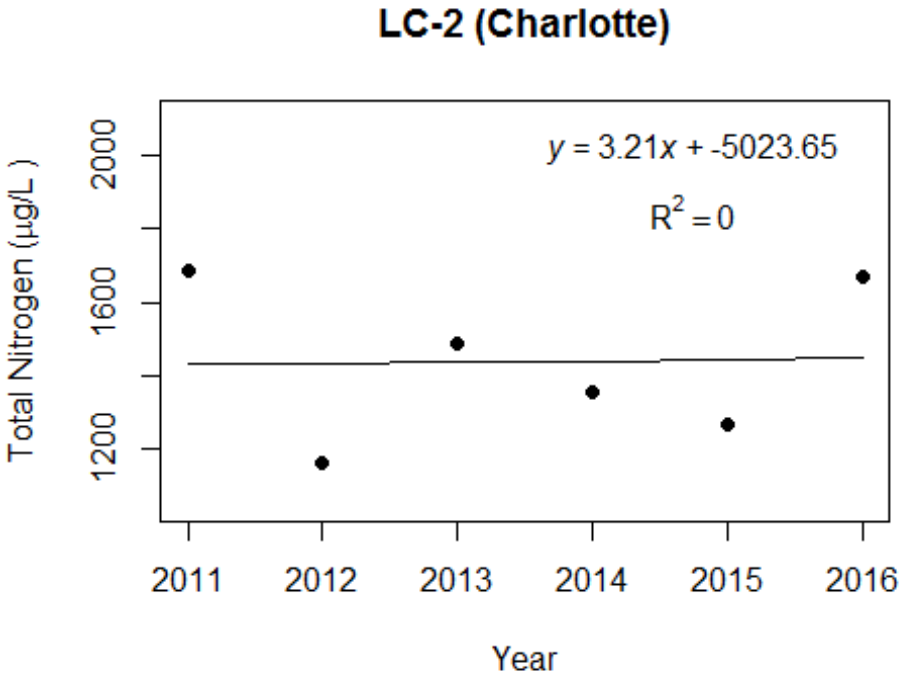
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

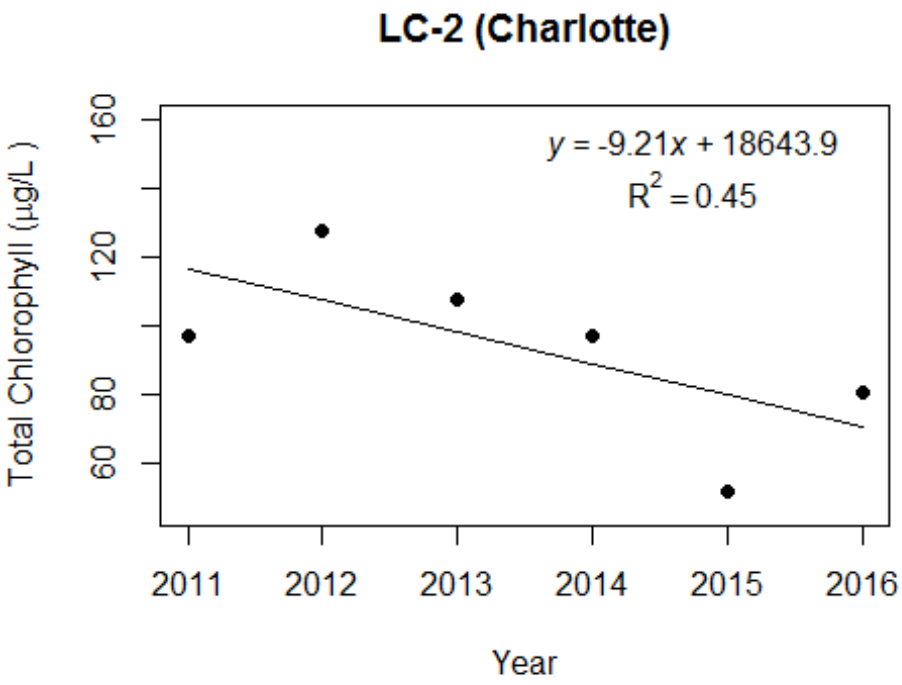
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

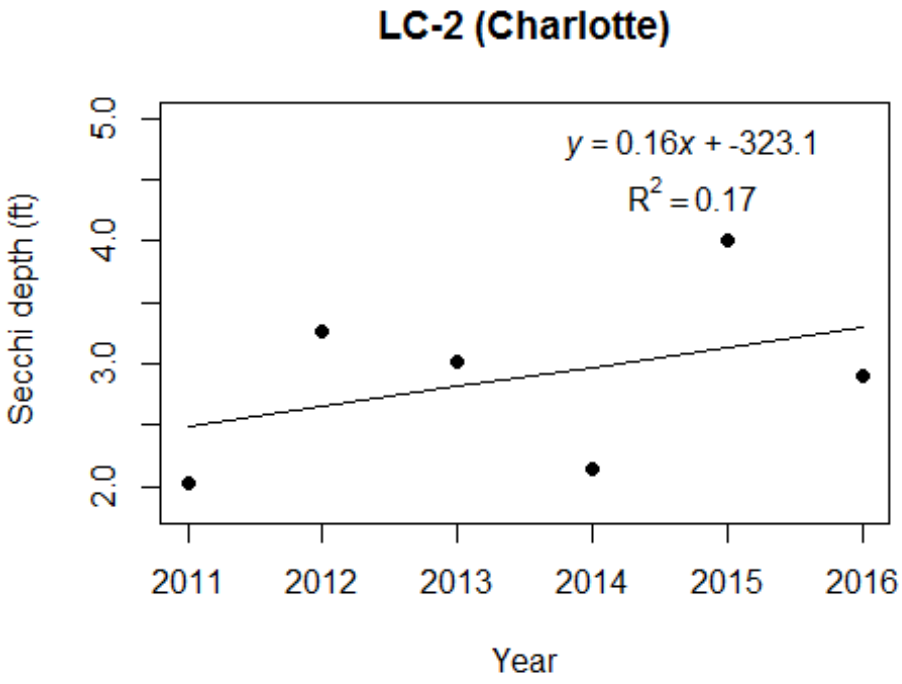
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	6	6	6	6
Intercept (a)	6503	-5024	18644	-323
Slope (b)	-3.12	3.21	-9.21	0.16
Coefficient of Determination (R^2)	0.01	0.00	0.45	0.17
Probability of Significance (p)	0.85	0.96	0.15	0.41
Potential Trend	No Trend	No Trend	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for LC-2 in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


LC-2 (Charlotte)
y = -3.12x + 6503.32
R2 = 0.01
Total Phosphorus (µg/L)
150
200
250
300
350
2011
2012
2013
2014
2015
2016
Year


LC-2 (Charlotte)
y = 3.21x + -5023.65
R2 = 0
Total Nitrogen (µg/L)
1200
1600
2000
2011
2012
2013
2014
2015
2016
Year


LC-2 (Charlotte)
y = -9.21x + 18643.9
R2 = 0.45
Total Chlorophyll (µg/L)
60
80
120
160
2011
2012
2013
2014
2015
2016
Year


LC-2 (Charlotte)
y = 0.16x + -323.1
R2 = 0.17
Secchi depth (ft)
2.0
3.0
4.0
5.0
2011
2012
2013
2014
2015
2016
Year

LAKEWATCH Report for LC-3 in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Lower Lemon Bay		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	LC-3
Latitude	26.878
Longitude	-82.308
Water Body Type	Estuary
Period of Record (year)	2011 to 2016

LAKEWATCH Report for LC-3 in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	218 - 408	297 (6)
Total Nitrogen (µg/L)	1527 - 2540	1876 (6)
Chlorophyll- uncorrected (µg/L)	72.2 - 272.6	153.3 (6)
Secchi (ft)	1.3 - 2.3	1.8 (6)
Secchi (m)	0.4 - 0.7	0.5 (6)
Color (Pt-Co Units)	68 -115	81 (6)
Specific Conductance (µS/cm@25 C)	27571 - 35500	31762 (6)
Salinity (ppt)	18 - 22	20 (6)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for LC-3 in Charlotte County
Using Data Downloaded 10/17/2016

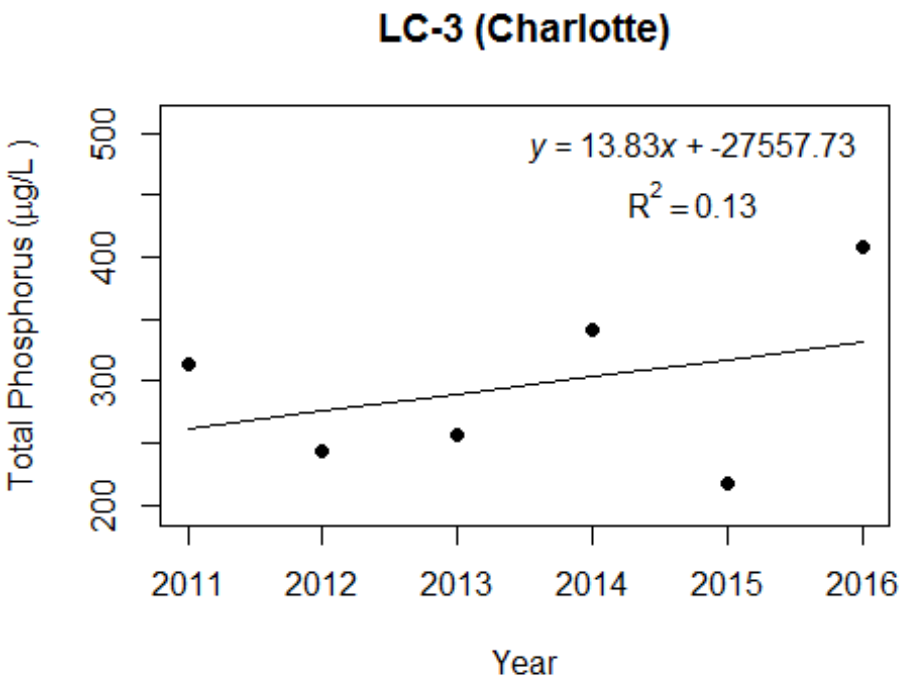
Trend Analyses Estuary

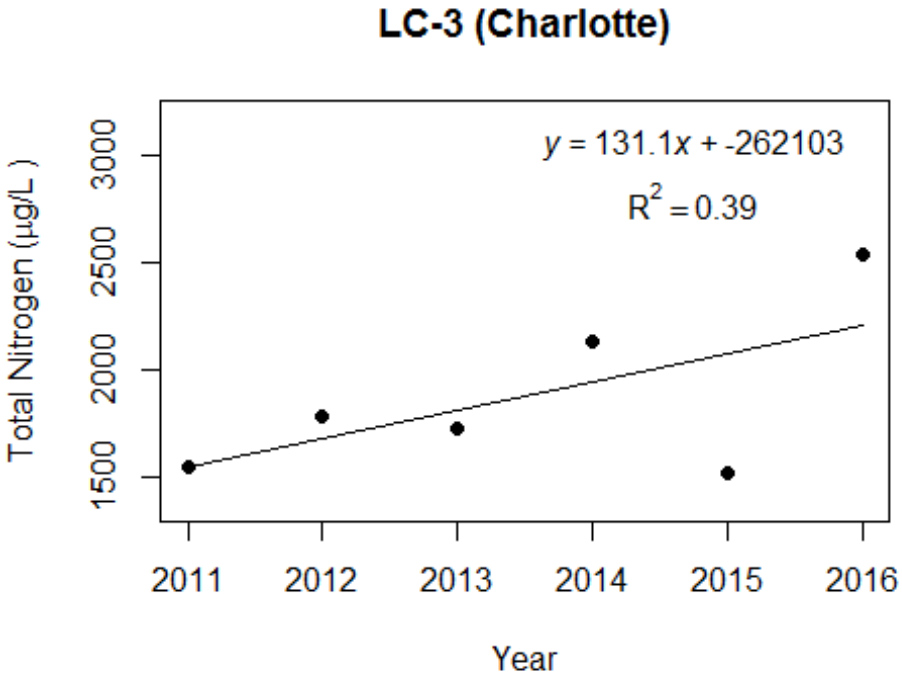
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

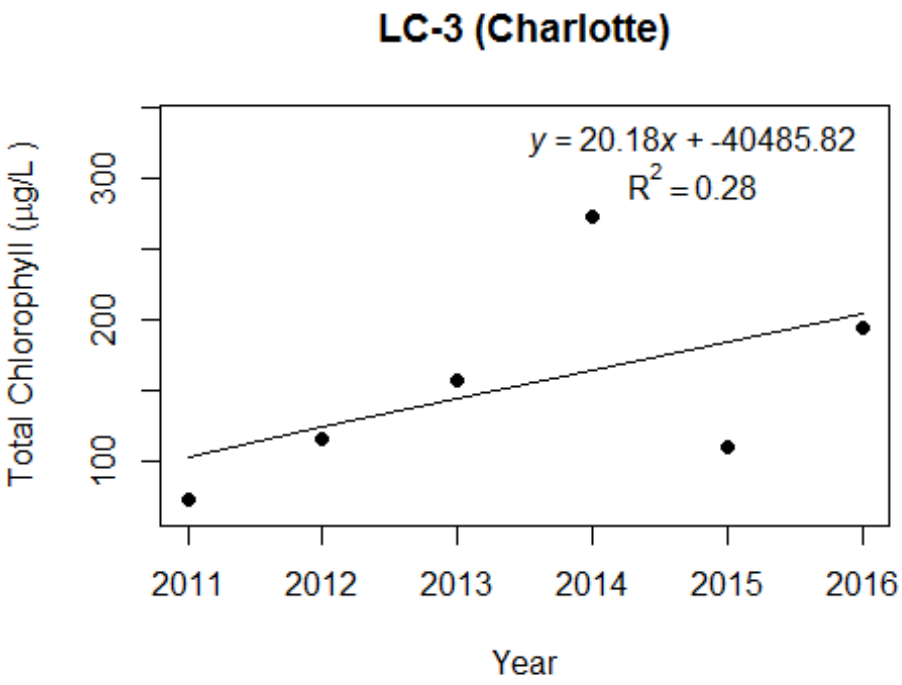
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

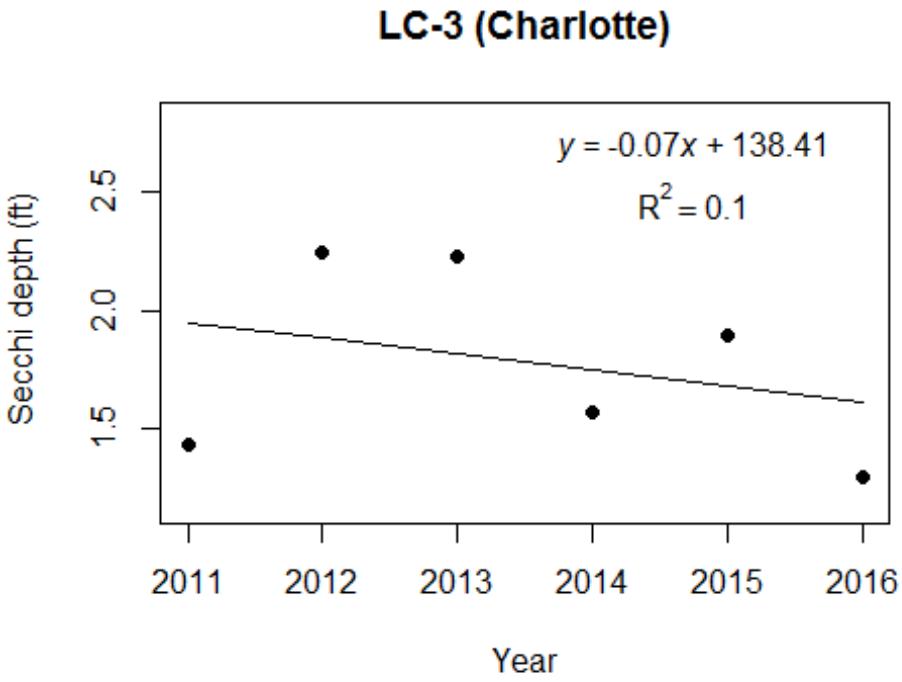
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	6	6	6	6
Intercept (a)	-27558	-262103	-40486	138
Slope (b)	13.83	131.10	20.18	-0.07
Coefficient of Determination (R^2)	0.13	0.39	0.28	0.10
Probability of Significance (p)	0.48	0.18	0.29	0.55
Potential Trend	No Trend	No Trend	No Trend	No Trend

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for LC-3 in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


LC-3 (Charlotte)
y = 13.83x + -27557.73
R2 = 0.13
Total Phosphorus (µg/L)
200
300
400
500
2011
2012
2013
2014
2015
2016
Year


LC-3 (Charlotte)
y = 131.1x + -262103
R2 = 0.39
Total Nitrogen (µg/L)
1500
2000
2500
3000
2011
2012
2013
2014
2015
2016
Year


LC-3 (Charlotte)
y = 20.18x + -40485.82
R2 = 0.28
Total Chlorophyll (µg/L)
100
200
300
2011
2012
2013
2014
2015
2016
Year


LC-3 (Charlotte)
y = -0.07x + 138.41
R2 = 0.1
Secchi depth (ft)
1.5
2.0
2.5
2011
2012
2013
2014
2015
2016
Year

LAKEWATCH Report for Monaco in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Charlotte Harbor Proper		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Monaco
Latitude	26.8825
Longitude	-82.0286
Water Body Type	Estuary
Period of Record (year)	2009 to 2014

LAKEWATCH Report for Monaco in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	91 - 157	115 (6)
Total Nitrogen (µg/L)	656 - 1300	869 (6)
Chlorophyll- uncorrected (µg/L)	8.8 - 17.4	14.3 (6)
Secchi (ft)	2.3 - 2.7	2.5 (6)
Secchi (m)	0.7 - 0.8	0.8 (6)
Color (Pt-Co Units)	21 -48	29 (5)
Specific Conductance (µS/cm@25 C)	3063 - 24714	13889 (2)
Salinity (ppt)	15 - 15	15 (1)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for Monaco in Charlotte County
Using Data Downloaded 10/17/2016

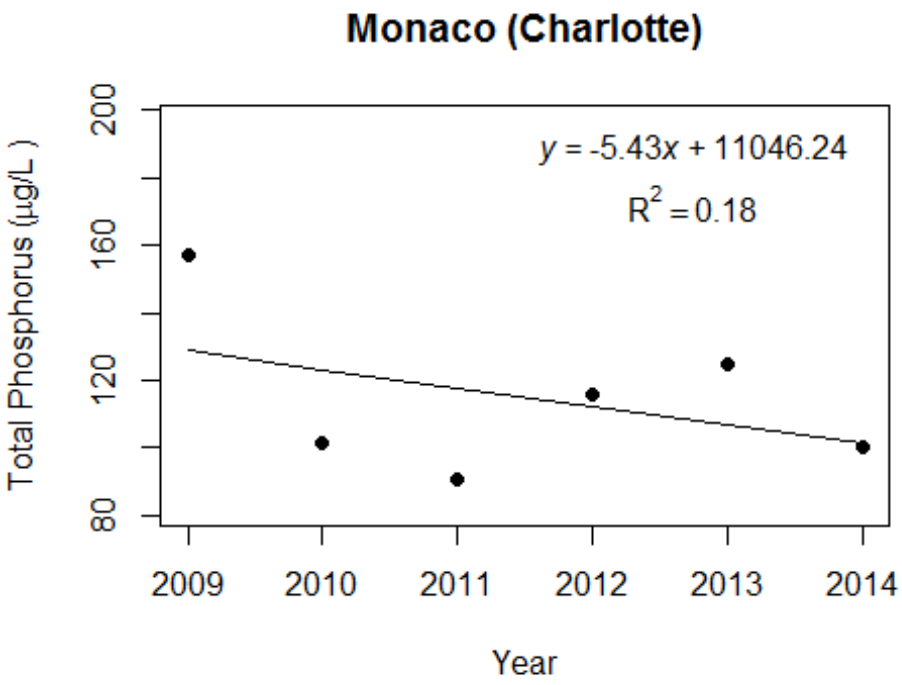
Trend Analyses Estuary

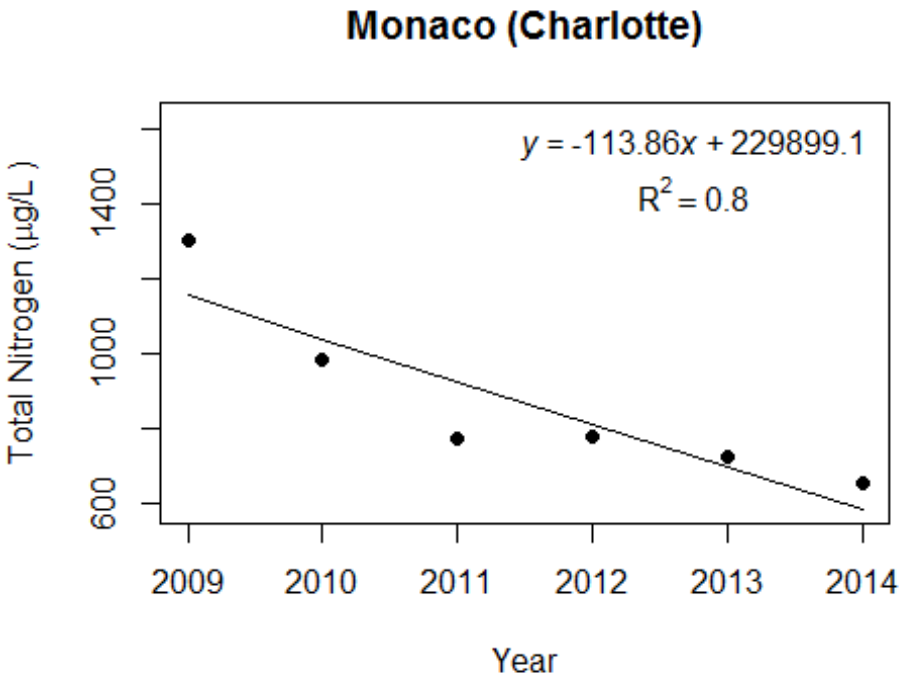
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

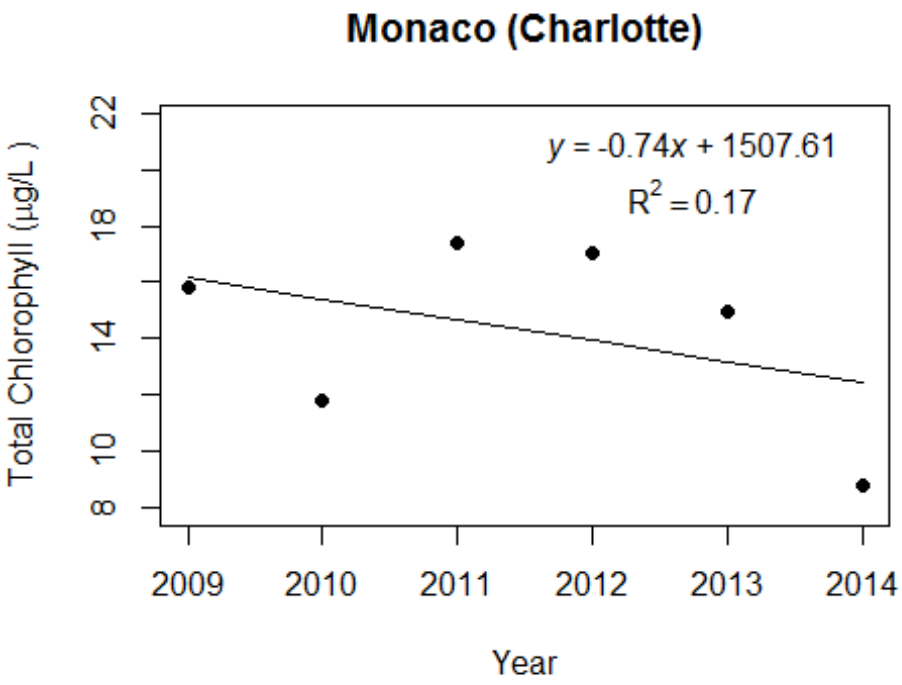
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

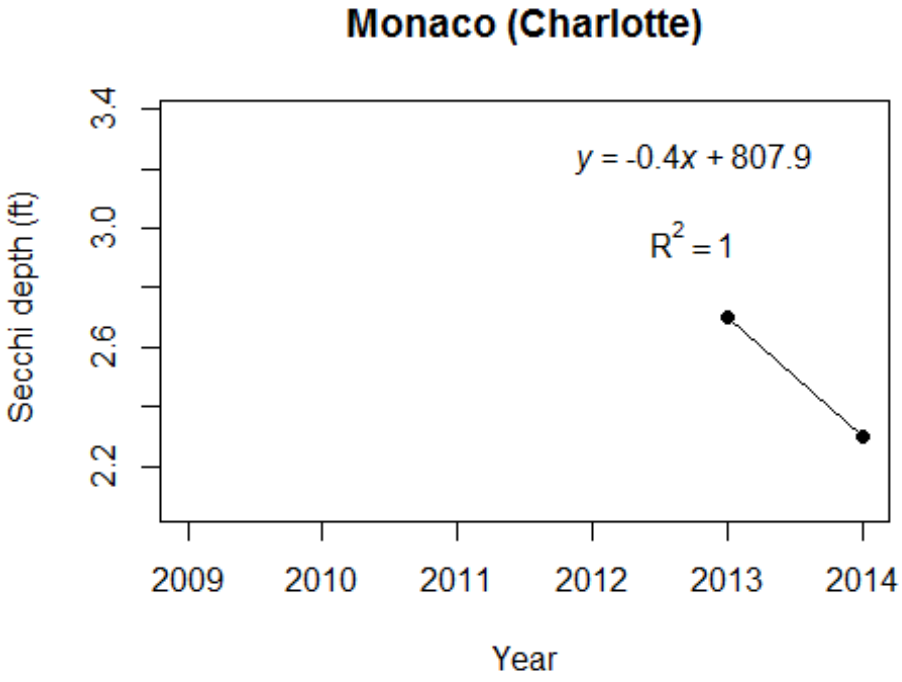
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	6	6	6	6
Intercept (a)	11046	229899	1508	808
Slope (b)	-5.43	-113.86	-0.74	-0.40
Coefficient of Determination (R^2)	0.18	0.80	0.17	1.00
Probability of Significance (p)	0.40	0.02	0.41	
Potential Trend	No Trend	Decreasing	No Trend	

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Monaco in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Monaco (Charlotte)
y = -5.43x + 11046.24
R2 = 0.18
Total Phosphorus (µg/L)
80
120
160
200
2009
2010
2011
2012
2013
2014
Year


Monaco (Charlotte)
y = -113.86x + 229899.1
R2 = 0.8
Total Nitrogen (µg/L)
600
1000
1400
2009
2010
2011
2012
2013
2014
Year


Monaco (Charlotte)
y = -0.74x + 1507.61
R2 = 0.17
Total Chlorophyll (µg/L)
8
10
14
18
22
2009
2010
2011
2012
2013
2014
Year


Monaco (Charlotte)
y = -0.4x + 807.9
R2 = 1
Secchi depth (ft)
2.2
2.6
3.0
3.4
2009
2010
2011
2012
2013
2014
Year

LAKEWATCH Report for Nature Park in Charlotte County
Using Data Downloaded 10/17/2016

Introduction Estuary

For many decades Florida has had a narrative nutrient water quality criterion in place to protect Florida's waters against nutrient over-enrichment. In 2009, the Florida Department of Environmental Protection (FDEP) 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 (see for Florida Department of Environmental Regulation Nutrient Criteria's for: Estuaries and coastal segments: http://www.dep.state.fl.us/water/wqssp/nutrients/index.htm).

The near shore Florida coastline is separated into estuary and estuary segments within the estuary. Deeper coastal waters are separated into coastal nutrient regions and coastal nutrient segments within the regions. 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 is derived from satellite remote sensing techniques. For those locations without defined segments there are narrative nutrient criteria (e.g., Florida Keys Halo Zone).

The maps defining individual estuaries and coastal segments can be found at: https://www.flrules.org/Gateway/reference.asp?No=Ref-05420.
The individual nutrient criteria can be found at:
https://www.flrules.org/gateway/ruleNo.asp?id=62-302.532
Estuary lies in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment
Charlotte Harbor/Estero Bay	Charlotte Harbor Proper		

Base File Data: Definitions

The long-term data summary will include the following parameters listed with a definition after each one:

- **County**: Name of county in which the estuary resides.
- **Name**: Estuary name that LAKEWATCH uses for the system.
- **Latitude and Longitude**: Coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: Four different types of systems; lakes, estuaries, streams and springs.
- **Period of Record (year)**: Years an estuary has been in the LAKEWATCH program.

County	Charlotte
Name	Nature Park
Latitude	26.9089
Longitude	-82.0667
Water Body Type	Estuary
Period of Record (year)	2009 to 2016

LAKEWATCH Report for Nature Park in Charlotte County
Using Data Downloaded 10/17/2016

Long-Term Data Summary Estuary: Definitions

The following long-term data are the primary trophic state parameters collected by LAKEWATCH volunteers and classification variables color and specific conductance (LAKEWATCH recently began analyzing samples quarterly for color and specific conductance):

- **Total Phosphorus (µg/L)**: The nutrient most often limiting growth of plant/algae in Florida's fresh and saltwater environments.
- **Total Nitrogen (µg/L)**: Another nutrient needed for aquatic plant/algae growth but only limiting when nitrogen to phosphorus ratios are generally less than 10.
- **Chlorophyll-uncorrected (µg/L)**: Chlorophyll concentrations are used to measure relative abundances of open water algal population.
- **Secchi (ft), Secchi (m)**: Secchi measurements are estimates of water clarity (how far one can see into the water) and are listed with English and metric units.
- **Color (Pt-Co Units)**: LAKEWATCH measures true color, which is the color of the water after particles have been filter out.
- **Specific Conductance (µS/cm@25°C), Salinity (ppt)**: Measurement of the ability of water to conduct electricity and can be used to estimate the amount of dissolve materials in water.

Long-Term Data Summary Estuary: Data

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	85 - 142	117 (8)
Total Nitrogen (µg/L)	530 - 752	647 (8)
Chlorophyll- uncorrected (µg/L)	2.1 - 19.8	5.6 (8)
Secchi (ft)	5.4 - 5.4	5.4 (8)
Secchi (m)	1.6 - 1.6	1.6 (8)
Color (Pt-Co Units)	17 -39	25 (7)
Specific Conductance (µS/cm@25 C)	9000 - 30750	21313 (4)
Salinity (ppt)	5 - 19	13 (4)

Coastal Trophic State

Trophic status is a measure of a systems biological productivity and LAKEWATCH uses total chlorophyll averages as a trophic state measure. Since the total chlorophyll measurement indicates how much algae is actually present in a water body, it is the most direct indicator of biological productivity. For freshwater lakes, LAKEWATCH uses the trophic state classification criteria proposed by Forsberg and Ryding (1980). LAKEWATCH staff sampled coastal systems around all of Florida (Hoyer et al. 2002) and discovered that chlorophyll concentrations are significantly less for the same amount of algae than freshwater lakes. Thus, to classify trophic status of coastal waters using similar classification terminology LAKEWATCH provided the table below accounting for the chlorophyll differences reported by Hoyer et al. (2002).

Trophic Status	Freshwater Chlorophyll (µg/L) (Forsberg and Ryding 1980)	Coastal Chlorophyll (µg/L) (Hoyer et al. 2002)
Oligotrophic	< 3.0	< 0.5
Mesotrophic	3.0 - 7.0	0.5 - 1.8
Eutrophic	7.0 - 40.0	1.8 – 12.4
Hypereutrophic	> 40.0	> 12.4

Hoyer, M. V., T. K. Frazer, S. K. Notestein and D. E. Canfield, Jr. 2002. Nutrient, chlorophyll, and water clarity relationships in Florida's nearshore coastal waters with comparisons to freshwater lakes. Canadian Journal of Fisheries and Aquatic Sciences 59:1-8.

LAKEWATCH Report for Nature Park in Charlotte County
Using Data Downloaded 10/17/2016

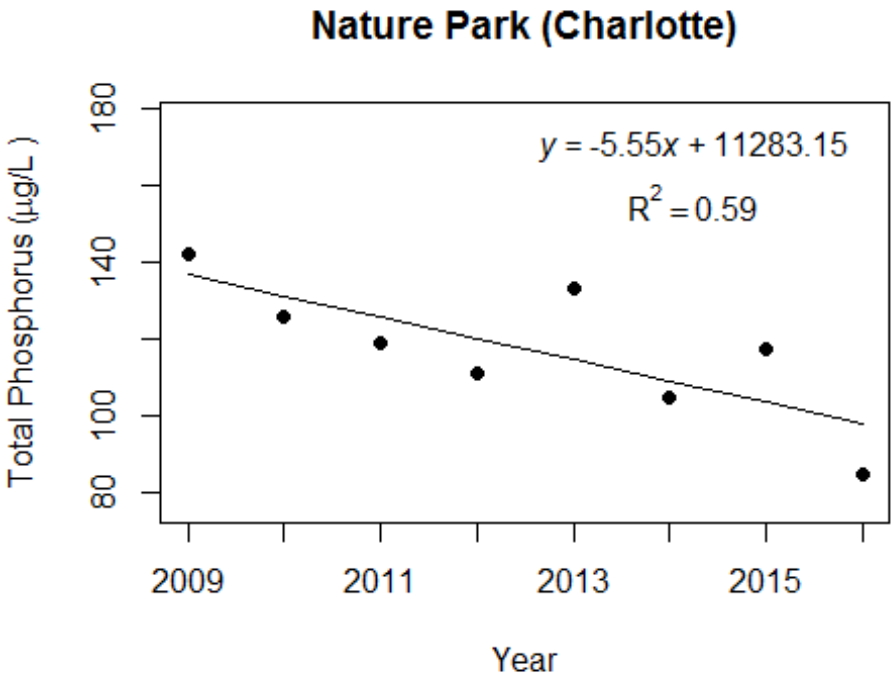
Trend Analyses Estuary

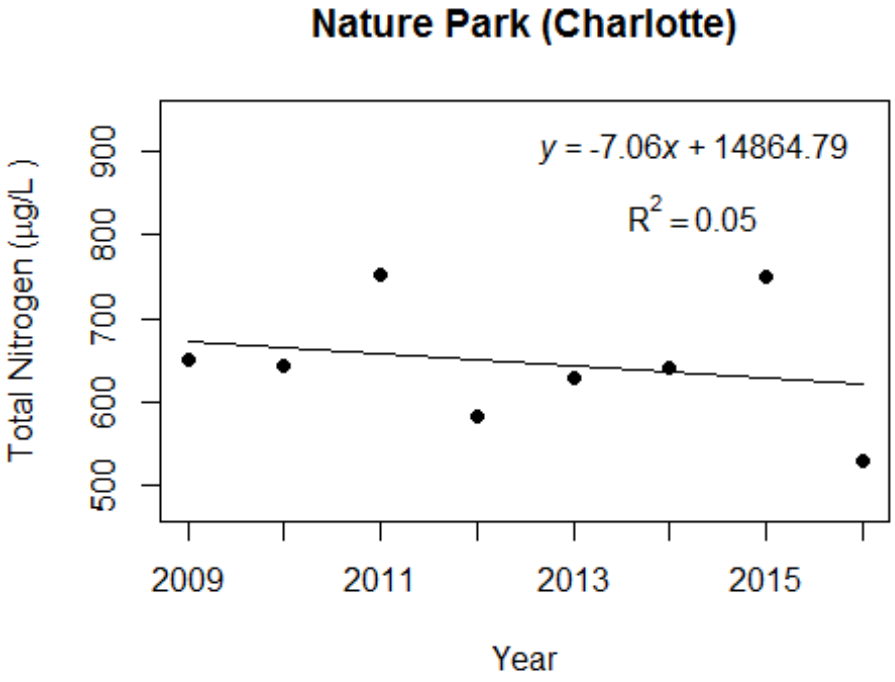
The following data are for linear regression statistics derived by plotting annual average total phosphorus, total nitrogen, chlorophyll, and Secchi data by year of data collection. Linear regression analysis is a common statistical approach used to determine if significant trends are occurring over time. These analyses define statistics based on the best fit line drawn through the data after plotting them with year on the horizontal line (x-axis) and the data value on the vertical line (y-axis). Figure 2 shows example plots with linear regression statistic of lakes that show significant total phosphorus increases, decreases and no change over time. The statistics that are listed include the following:

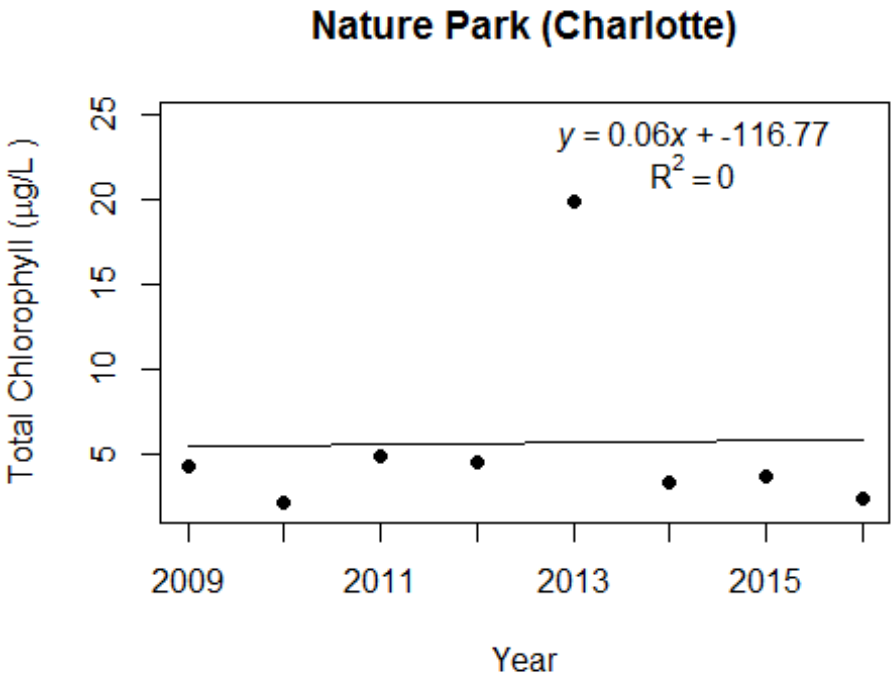
- **Number of years (n):** This is simply the number of years of data that were used to calculate annual means.
- **Intercept (a):** This is the value on the y-axis that the fitted line would cross if the x-axis where zero.
- **Slope (b):** This is the rate at which the fitted line increases (positive number) or decreases (negative number).
- **Coefficient of determination (R^2):** This value is an indication of how much variance above and below the fitted line there is in the data. This values ranges from 0 to 1. A high value means a tight fit and a low value means a loose fit.
- **Probability of Significance (p):** For most statistical analyses a p-value of less than 0.05 means the statistic is significant and analyses with p-values greater than 0.05 are not significant.

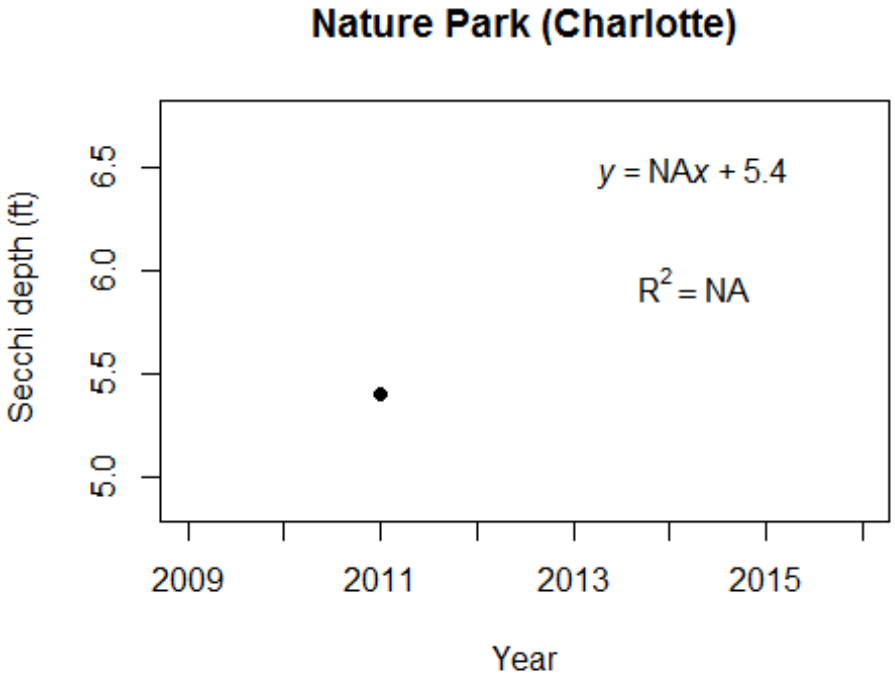
Statistic	Total Phosphorus	Total Nitrogen	Chlorophyll	Secchi
Number of Years (n)	8	8	8	8
Intercept (a)	11283	14865	-117	5
Slope (b)	-5.55	-7.06	0.06	
Coefficient of Determination (R^2)	0.59	0.05	0.00	
Probability of Significance (p)	0.03	0.59	0.95	
Potential Trend	Decreasing	No Trend	No Trend	

The following graphs on the next two pages are trend analyses examining regression between year and annual means of total phosphorus, total nitrogen, chlorophyll, and Secchi depth for Nature Park in Charlotte County. If there are no plots then there is less than five years of data, which is not enough for the analysis.


Nature Park (Charlotte)
y = -5.55x + 11283.15
R2 = 0.59
Total Phosphorus (µg/L)
80
100
140
180
2009
2011
2013
2015
Year


Nature Park (Charlotte)
y = -7.06x + 14864.79
R2 = 0.05
Total Nitrogen (µg/L)
500
600
700
800
900
2009
2011
2013
2015
Year


Nature Park (Charlotte)
y = 0.06x + -116.77
R2 = 0
Total Chlorophyll (µg/L)
5
10
15
20
25
2009
2011
2013
2015
Year


Nature Park (Charlotte)
y = NAx + 5.4
R2 = NA
Secchi depth (ft)
5.0
5.5
6.0
6.5
2009
2011
2013
2015
Year