LAKEWATCH Report for Sugarloaf F-2 by Monroe County Using Data Downloaded 10/6/2015

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 phosphorus, total nitrogen, and chlorophyll a. For open ocean coastal waters, numeric criteria are established for chlorophyll a that are 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
Sugarloaf F-2 is found in the following location:

Estuary	Estuary Segment	Coastal Nutrient Region	Coastal Nutrient Segment

Base File Data

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

- **County**: Name of county in which the water body resides.
- **Name**: Water body name that LAKEWATCH uses for the system. Many water bodies historically have had multiple names and LAKEWATCH has tried to use the first names that appear on original county maps (State of Florida Department of Transportation).
- **Latitude and Longitude**: These are the coordinates identifying the exact location of station 1 for each system.
- **Water Body Type**: LAKEWATCH samples four different types of systems; lakes, streams, estuaries and springs.
- **Period of Record (years)**: Period of record is the year a water body entered the program through the year of the last recorded data.

County	Monroe
Name	Sugarloaf F-2
Latitude	24.63706
Longitude	-81.56442
Water Body Type	Estuary
Period of Record (years)	1999 - 2015

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Data Summary Estuary

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 (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)**: Measurement of the ability of water to conduct electricity, which can be used to estimate the amount of dissolve materials in water (**Salinity (ppt)**).

Parameter	Minimum and Maximum Annual Means	Mean of Annual Means (Sampling years)
Total Phosphorus (µg/L)	3 - 10	6 (16)
Total Nitrogen (µg/L)	223 - 460	323 (16)
Chlorophyll (µg/L)	0.0 - 0.5	0.2 (16)
Secchi (ft)	9.5 - 11.3	10.4 (2)
Secchi (m)	2.9 - 3.4	3.2 (2.0)
Color (Pt-Co Units)	5 - 8	6 (13)

Specific Conductance (µS/cm@25 C)	37000 - 54333	49885 (13)
Salinity (ppt)	23.0 - 33.9	31.1 (13)

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.

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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)	16	16	16	2
Intercept (a)	-389	-9431	10	
Slope (b)	0.20	4.86	-0.00	
Coefficient of Determination (R^2)	0.34	0.22	0.02	
Probability of Significance (p)	0.02	0.07	0.63	
Potential Trend	Increasing	No Trend	No Trend	

Examples of Trend Analyses Below

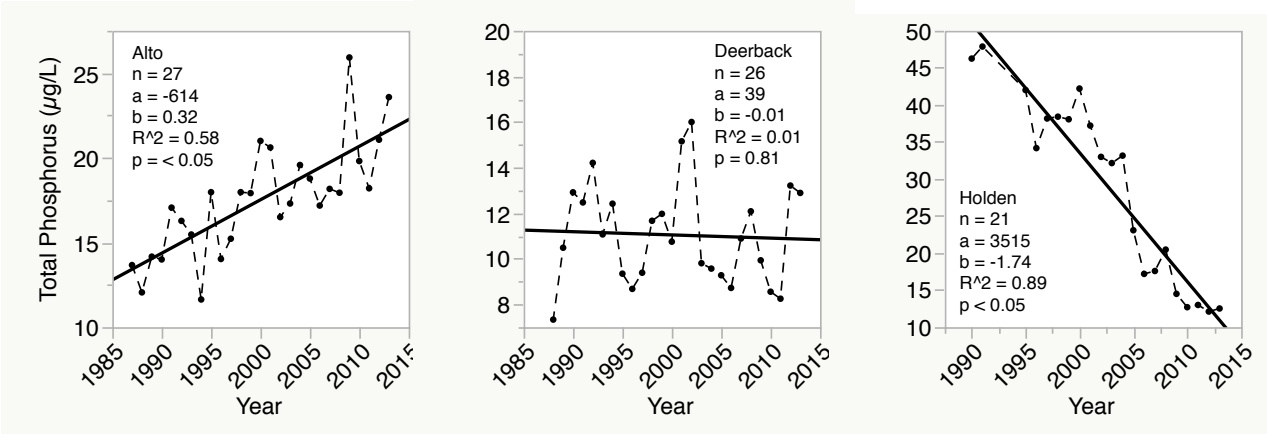

Figure 2. Examples of lakes with potential increasing trend (Alto), no significant change (Deerback) and decreasing trends (Holden).

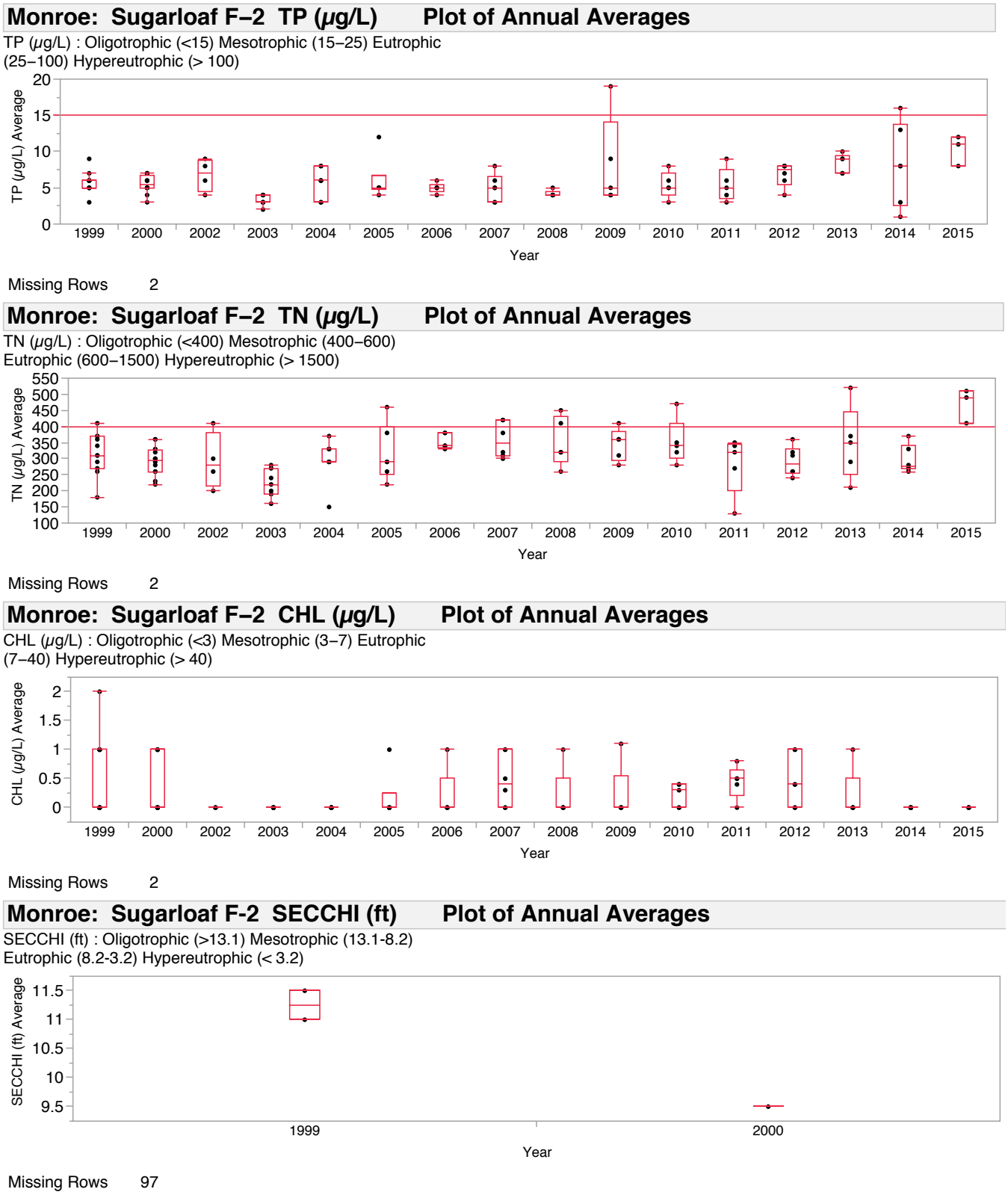

Figure 3. Plots of annual averages for total phosphorus, total nitrogen, total chlorophyll and Secchi disk visibility in Sugarloaf F-2 / Monroe County.