AFTER IMPLEMENTATION OF

ALL COMPREHENSIVE EVERGLADES RESTORATION PLAN [CERP]

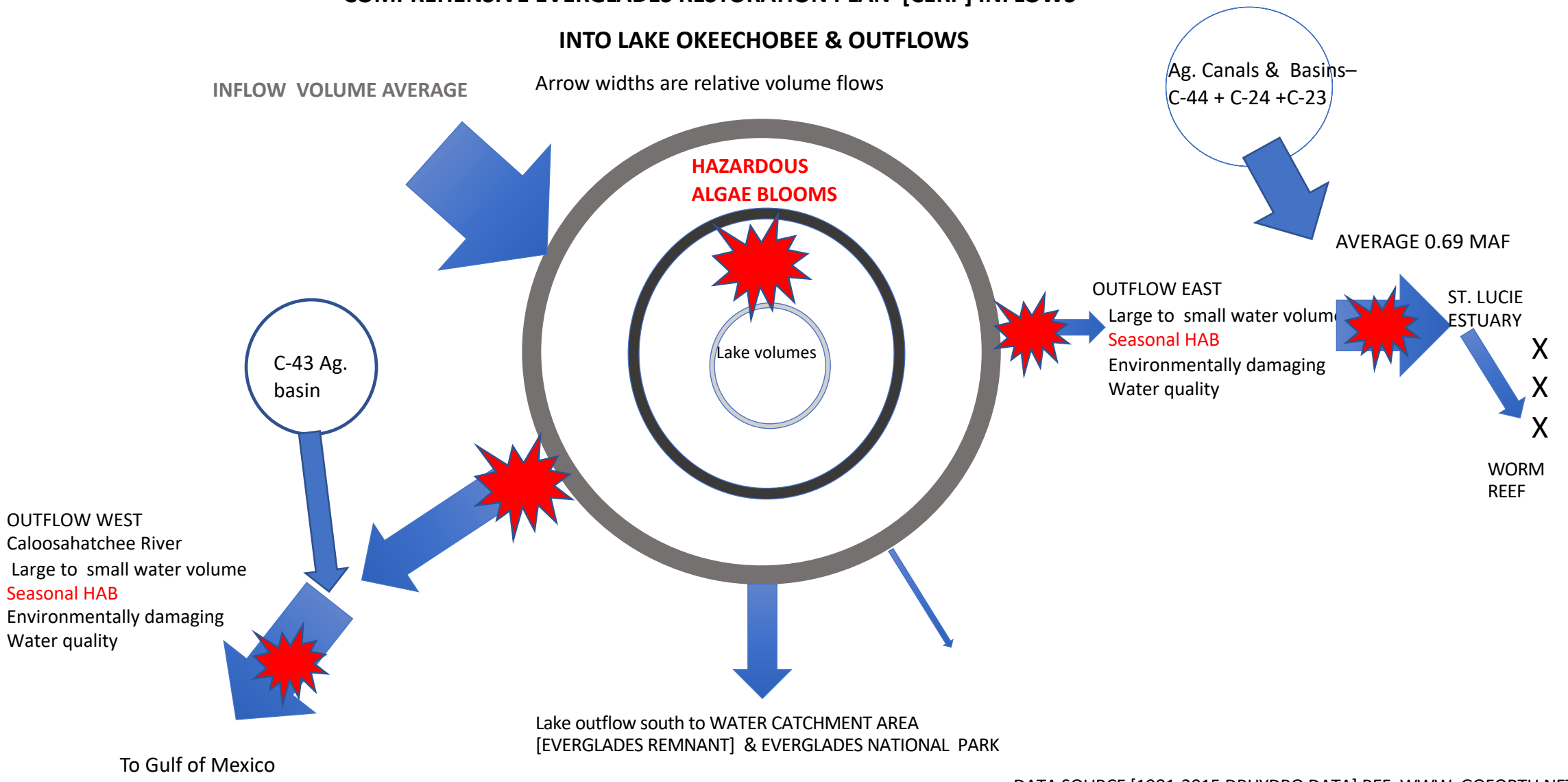
EVERGLADES AGRICULTURE AREA RESERVOIR [2030?]

LAKE OKEECHOBEE SYSTEM OPERATING MANAGEMENT [LOSOM] 2023

POLLUTED DISCHARGES FROM LAKE OKEECHOBEE WILL MOST LIKELY CONTINUE

BUT AT LESS VOLUMES

1981 -2015 WITH EVERGLADES AGRICULTURAL AREA [EAA] RESERVOIR & COMPREHENSIVE EVERGLADES RESTORATION PLAN [CERP] INFLOWS INTO LAKE OKEECHOBEE & OUTFLOWS



DATA SOURCE [1981-2015 DBHYDRO DATA] REF. WWW. GOFORTH.NET
Joseph L. Gilio responsible for errors and omissions from source

LAKE OKEECHOBEE'S WATER QUALITY HISTORY 1972-2020

METRIC	DESCRIPTION	START	END	TSI DIRECTION	% change
TSI.CHL	TROPHIC "TEMPERATURE"	58	55	DECREASE	5
TSI. TP	TOTAL PHOSPHORUS	53	80	INCREASE	50
TSI. TN	TOTAL NITROGEN	62	59	DECREASE	5
TSI.SD	SECCHI DISK DEPTH	70	80	INCREASE	14

A 48-year summary of lake Okeechobee's open water [pelagic zone] denoting significant changes in initial water quality results [1972-2020].
TSI is the trophic state index parameter that permits extraction of signals from noise data. Secchi increase means more water column mud reducing
The trophic "temperature" or "health" of Lake Okeechobee. Denoting poorer lake "health" over the data period of record.
From JL Gilio's presentation at the University of Florida's eighth annual water conference ,February , 2022.

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TOTAL PHOSPHORUS [TP] IS BELIEVED TO BE THE MAJOR NUTRIENT THAT CAUSES HAB'S.

IN THE NEXT SLIDE MONTHLY TP NOISE IS HIGH, HURRICANE ACTIVITY PEAKS EVIDENT YET A STATISTICAL 95% RELIABILITY IS ESTABLISHED DUE TO LARGE SAMPLE SIZE OF 495.

FEDERAL LEGAL SETTLEMENT WITH FLORIDA SET TP MAXIMUM AT 10 PPB ANNUAL GEOMETRIC MEAN BEFORE LAKE OKEECHOBEE WATER IS ALLOWED TO ENTER EVERGLADES NATIONAL PARK TO THE SOUTH.

TP INCREASE IN OPEN WATER [PELAGIC ZONE] IS A LINEAR INCREASE OVER 48-YEARS

THERE IS EVIDENCE THAT TOTAL NITROGEN TO TOTAL PHOSPHORUS RATIO [TN/TP] MAY BE MORE IMPORTANT THAN TP ALONE. WORLDWIDE TN/TP VALUES UNDER 10 CORRELATE WITH HAB'S. LAKE OKEECHOBEE'S TN/TP CHANGED FROM 19 IN 1972 TO 5 IN 2020 OR 0.2 X SMALLER EVERY YEAR SINCE 1972.

The world average TN/TP ratio is 15/1 with a FLORIDA WATCH range from ≥ 10/1 to ≥ 17/1. Lake scientists finds increasing evidence that shallow, large surface area lakes like Lake Okeechobee have phytoplankton production regulated by a combination of nitrogen **and** phosphorus. Wind stirred muck in the water column adds another complicating factor. There remains much to understand on the dynamics of Lake Okeechobee's ecology.

LORI Task #1. EXAMPLE

LAKE OKEECHOBEE LONG-TERM PELAGIC AVERAGE
TOTAL PHOSPHATE 1972-2020
STA. L001, L004, L006, L007, L008

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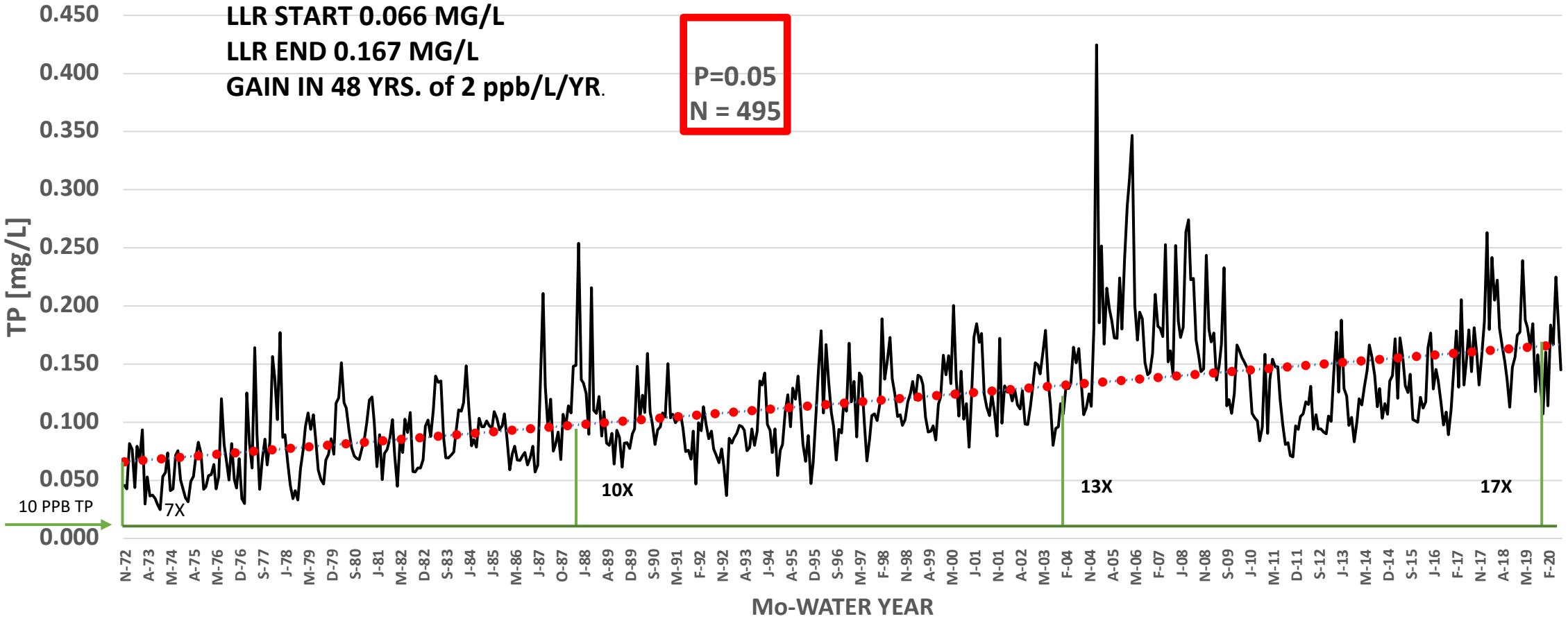
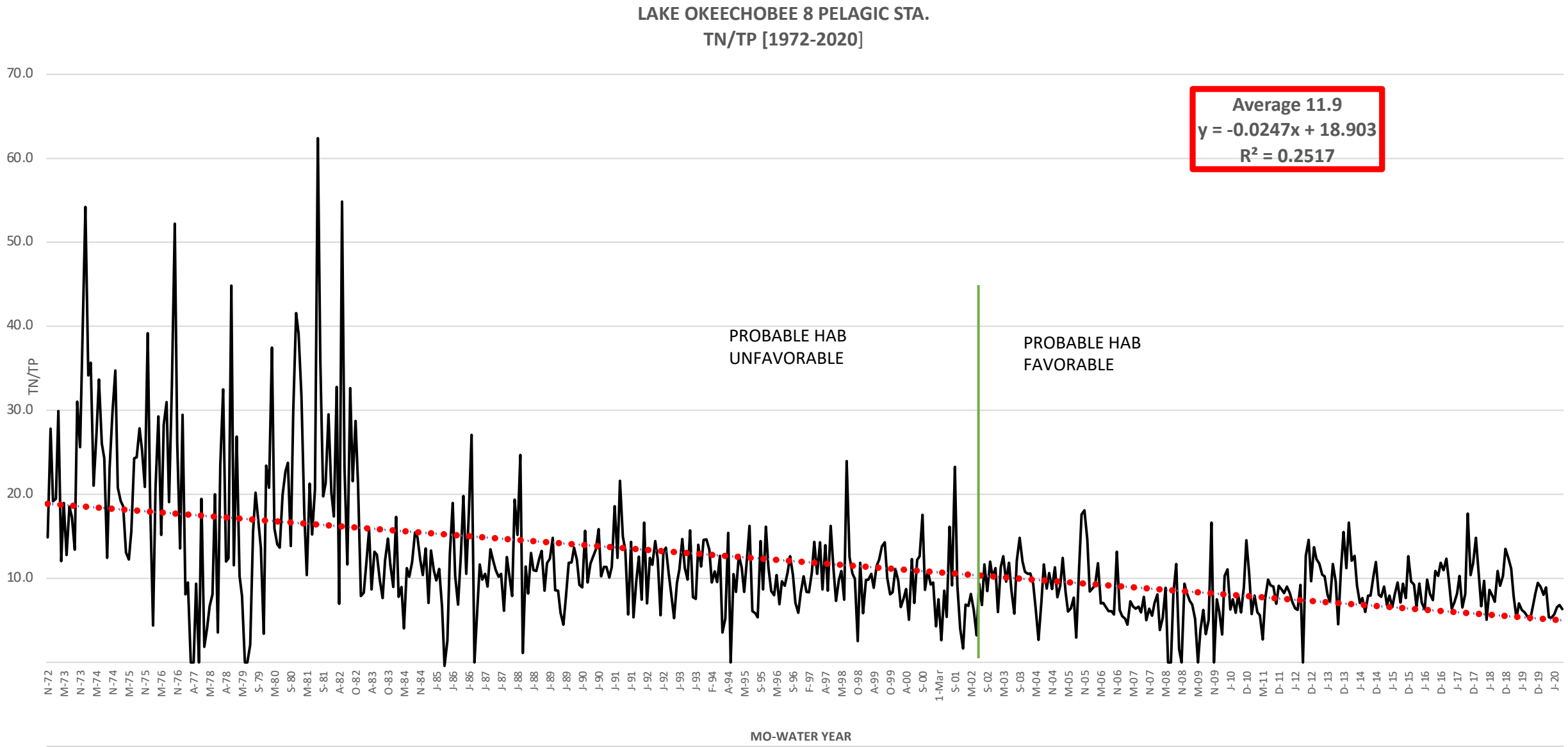


AVERGING ALL 5 PELAGIC STATIONS RETAINS THE HIGH VARIANCE AND ALLOWS A 48 YR. LLR READOUT OF A GAIN OF 0.002 MG/L /YR. OR ITS EQUIVALENT 2 ppb/L/YR. FEDERAL MAXIMUM LIMIT OF 10 PPB[0.010 MG/L] FOR LAKE OKEECHOBEE WATER TO ENTER EVERGLADES NATIONAL PARK. MULTIPLES OF LIMIT INCREASES IN TIME.


LAKE OKEECHOBEE 8 PELAGIC STA.
TN/TP [1972-2020]
Average 11.9
y = -0.0247x + 18.903
R² = 0.2517
PROBABLE HAB
UNFAVORABLE
PROBABLE HAB
FAVORABLE
TN/TP
70.0
60.0
50.0
40.0
30.0
20.0
10.0
N-72 M-73 N-73 M-74 N-74 M-75 N-75 M-76 N-76 A-77 M-78 A-78 M-79 S-79 M-80 S-80 M-81 S-81 A-82 O-82 A-83 O-83 M-84 N-84 J-85 J-86 J-86 J-87 J-87 J-88 J-88 J-89 J-89 J-90 J-90 J-91 J-91 J-92 J-92 J-93 J-93 F-94 A-94 M-95 S-95 M-96 S-96 F-97 A-97 M-98 O-98 A-99 O-99 A-00 S-00 1-Mar S-01 M-02 S-02 M-03 S-03 M-04 N-04 M-05 N-05 M-06 N-06 M-07 N-07 M-08 N-08 M-09 N-09 J-10 D-10 M-11 D-11 J-12 D-12 J-13 D-13 J-14 D-14 J-15 D-15 J-16 D-16 J-17 D-17 J-18 D-18 J-19 D-19 J-20
MO-WATER YEAR

PRE-LORI PARTIAL BASELINE AS OF FEB. 2022.

The next slide summarizes the professional presentation of JL Gilio to the 8th annual water conference at the University of Florida, Feb, 2022

Fig. A proves that the open water pelagic zone of Lake Okeechobee has increased concentration at 2.1 ppb/liter/yr. over a period of 48 years.

Fig B. Is the trophic “temperature “ of Lake Okeechobee over 48-yrs. in the pelagic zone. Trophic “temperature” is LORI’s simple term to say that the making of microscopic plants , the phytoplankton at the base of the food web of the lake is reducing in time. This reduces almost all other parts of the lake’s bass, bream and crappie production. A higher trophic “temperature” means more food in the web for bass, bream and crappie and other animals.

Fig. C shows an increase in the suspended mud in the water column measured with the Secchi disk. The disk measures photosynthetic light energy’s depth of penetration into the lake’s water column. Less light penetration is less phytoplankton plant growth. It has been reduced by half in the 48 yr. measured period. This correlates with the decrease in phytoplankton food for the fish and other creatures of the lake.

Fig. D. shows the decrease in Total Nitrogen [TN] from 1,800 ppb [1,800 ug/l] in 1972 to 1,300 ppb [1,300 ug/l] in 2020, A 38% decrease. Dividing TN by TP for the same stations and same months creates the TN/TP ratio plot shown in previous slide.

LORI TASK # 1 EXAMPLE DRAFT

DRAFT PRELIMINARY RESULTS OF LAKE OKEECHOBEE'S PELAGIC POLLUTION LEVELS

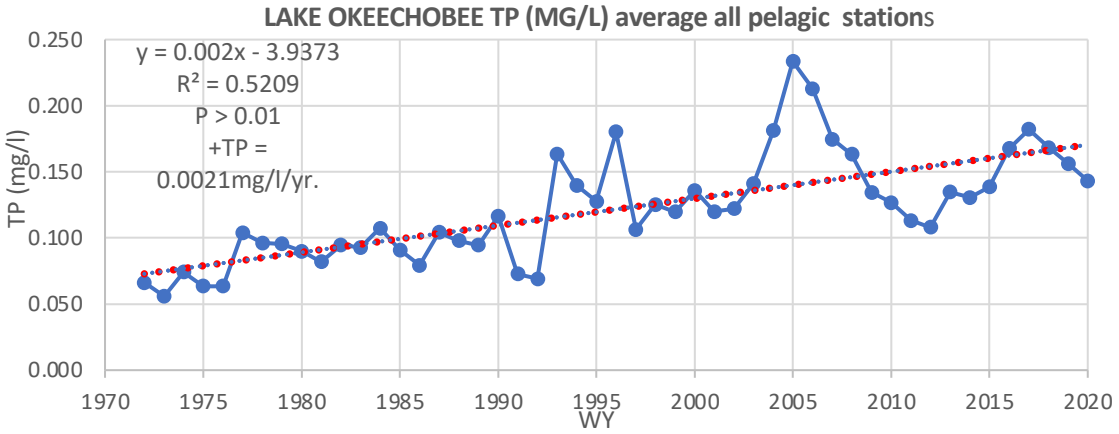


Figure A. Combined station data L001, L004, L006, L007 and L008. This linear regression indicates a significant increase of TP over a 48-yr. POR ($p > 0.001$) Arrows denote 4 major hurricanes, Andrew (1992), Francis & Jean (2004) and Wilma (2005 WY is Apr.1 to Mar.31.

TROPHIC "TEMPERATURE " OF LAKE OKEECHOBEE HAS DECREASED SINCE 1972

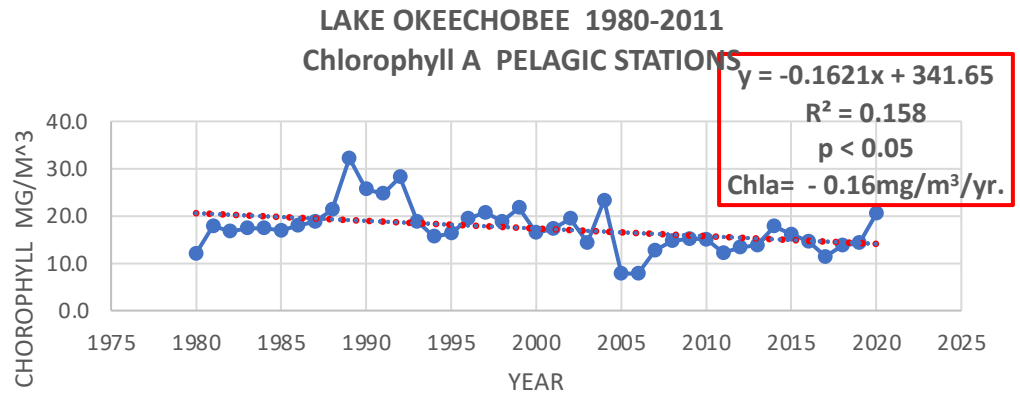


Figure B. Chlorophyll a -corrected DBHYDRO data results from all pelagic zone stations given in reflects a 31 yr. POR decrease at p= 0.10. Arrows denote 4 major hurricanes, Andrew (1992), Francis & Jean (2004) and Wilma (2005).

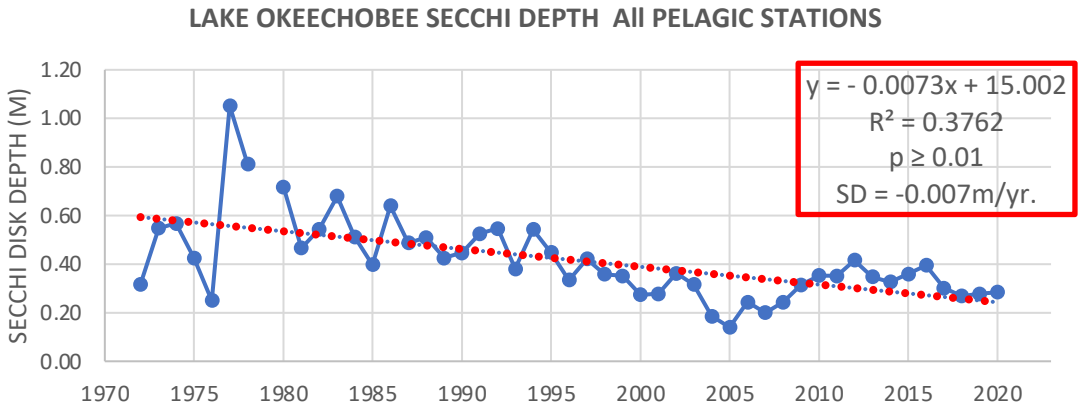


Figure C. Combined station data L001, L004, L006, L007 and L008 denotes increased Mud in water column of lake. Smaller depth means less light penetration, more mud.

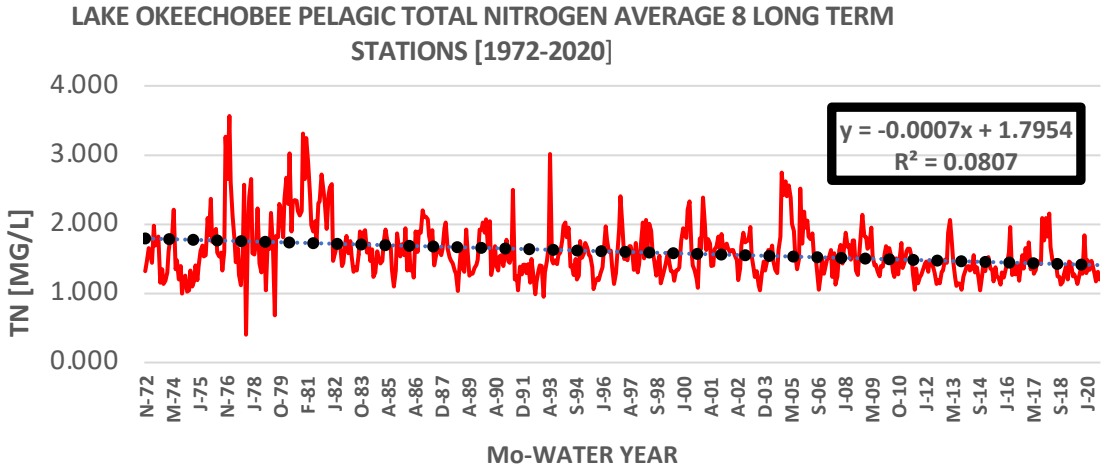


Figure D. Shows the loss pf TN over 48 yrs. in the open pelagic water of Lake Okeechobee.

WHAT DO THESE PRE-LORI RESEARCH RESULTS TELL US ABOUT THE FUTURE CONDITION OF LAKE OKEECHOBEE AND LAKE OKEECHOBEE RESTORATION INITIATIVE'S ROLE ?

TOTAL PHOSPHORUS [TP], A PHYTOPLANKTON NUTRIENT IS INCREASING IN THE WATER COLUMN AT 2.1 PARTS PER BILLION [2.1 PPB]/LITER/YEAR]. OVER THE 1972-2020 PERIOD OF RECORD [POR]. THE FOLLOWING TOTAL PHOSPHORUS AMOUNTS LISTED BELOW ARE CURRENTLY BEST ESTIMATES OF :

TOTAL PELAGIC ZONE INCREASE OF 270 METRIC TONS [MT] TP [600,000 LBS.] FOR THE 48-YR POR.
OR ANNUALLY OF < 5.7MT TP/YR [< 13,000 LBS./YR] INCREASE IN THE PELAGIC WATER COLUMN.
IT IS **HIGHLY LIKELY** THAT TOTAL PHOSPHORUS WILL CONTINUE TO INCREASE INTO THE FUTURE.

THE SECCHI READING OVER THE SAME POR DECREASED BY 54% [13/24] FROM 0.6 M [24 INCHES] TO 0.28 M [11 INCHES]. IT IS **HIGHLY LIKELY** THAT THIS TREND WILL CONTINUE. SECCHI DEPTH TIMES 3 IS THE WATER DEPTH LIMIT FOR PHYTOPLANKTON AND SUBMERGENT AQUATIC VEGETATION [SAV] TO MULTIPLY AND GROW. THIS SECCHI TREND REDUCES BOTH MICROSCOPIC FOOD WEB BASIS AND SAV OF THE LAKE. THIS SECCHI VALUE IS FOR ~ 60% OF THE LAKE'S SURFACE WATER. LITTORAL AND MARSH ZONE ALSO MAKE PHYTOPLANKTON AND DETRITUS FOOD FOR THE LAKE'S FOOD WEB. BOTH ARE SCHEDULED FOR FUTURE ANALYSIS BY LAKE OKEECHOBEE RESTORATION INITIATIVE.

THE RESULT OF LIGHT DECREASE REACHING INTO THE WATER COLUMN IS SHOWN IN THE CHLOROPHYLL A PLOT. THIS MEASURES THE GREEN CHEMICAL THAT ACTUALLY MAKES GLUCOSE AS FOOD FOR THE PHYTOPLANKTON TO GROW IN NUMBER AND SIZE AS THE FOOD WEB BASIS. LIGHT PENETRATION IS SO LOW IN THE PELAGIC ZONE THAT NO SAV'S SURVIVE TODAY COMPARED TO PAST TIMES. PHYTOPLANKTON DECREASE IS SMALL BUT SCIENTIFICALLY SIGNIFICANT AT 0.16 MG/1000 LITERS/YR. TRANSFERING CHLOROPHYLL A INTO ACTUAL PHYTOPLANKTON WEIGHT NEEDS FUTURE WORK BY LAKE OKEECHOBEE RESTORATION INITIATIVE. A **FUTURE DECREASE IN PHYTOPLANKTON REDUCES** THE LAKE'S CARNIVOR FISH POPULATION [BASS, BREAM AND CRAPPIE] IN SIZE AND NUMBERS.

THE COMPLEXITY OF LAKE OKEECHOBEE'S ECOLOGY IS EVIDENT FROM STATISTICAL STUDY. CHLOROPHYLL A DECREASE CORRELATES WITH THE SECCHI DISK DECREASE AS EXPECTED. BUT, THAT CORRELATION [R] IS ONLY 0.37 SO THAT ONLY 14% OF THE CHLOROPHYLL A REDUCTION IS EXPLANABLE TO LESS LIGHT ENERGY PENETRATION . LAKE OKEECHOBEE RESTORATION INITIATIVE WILL ATTEMPT TO LEARN **HOW MUCH LESS FOOD WAS, IS AND WILL BE PRODUCED IN LAKE OKEECHOBEE WITHOUT A CHANGE IN THE WATER COLUMN MUD CONTENT**. A POLLUTED LAKE OF HIGH AND INCREASING PHOSPHORUS IS EXPECTED TO HAVE A CORRESPONDING HIGHER PHYTOPLANKTON [FOOD WEB] BASIS BUT IT DOES NOT OCCUR IN LAKE OKEECHOBEE. RECENT TOXIC BLUE-GREEN ALGAE SUMMER BLOOMS MAY HAVE BEEN MISSED IN SAMPLYING BUT ARE SMALL IN NUMBER COMPARED TO THE POR.

MANY LAKE SCIENTISTS BELIEVE THAT MUCK REMOVAL WILL CLEAR UP THE LAKE'S TURBIDITY, INCREASE PHYTOPLANKTON POPULATION AND INCREASE CARNIVOROUS FISH SIZE AND NUMBERS. YET LORI IS CONCERNED THAT MUCK REMOVAL ONLY WILL RESULT IN RAPID RESTORATION OF THE EXISTING "MOLASSES-LIKE " THAT IS CONTINUALLY WIND STIRRED. LAKE OKEECHOBEE RESTORATION INITIATIVE WILL RESEARCH THESE ISSUES AS AN ACOE $100 MILLION MUCK REMOVAL HAS BEEN APPROVED FOR 2023. LAKE OKEECHOBEE RESTORATION INITIATIVE EFFORTS WILL BE TO ASSIST THAT SUCH PUBLIC MONEY EXPENDITURE HAS A GREATER CHANCE OF SUCCESS FOR IMPROVING LAKE OKEECHOBEE.