Alabama Department of Environmental Management

Yellow River Basin

Rivers and Reservoirs Monitoring Program

Lake Jackson
Intensive Basin Survey 2014

JACC-1: Approximate center of the lake (Covington Co 30.99290/-86.32470).

BACKGROUND

The Alabama Department of Environmental Management (ADEM) began monitoring lake water quality statewide in 1985, followed by a second statewide survey in 1989. In 1990, the Reservoir Water Quality Monitoring Program [now known as the Rivers and Reservoirs Monitoring Program (RRMP)] was initiated by ADEM.

The current objectives of this program are to provide data that can be used to assess current water quality conditions, identify trends in water quality conditions and to develop Total Maximum Daily Loads (TMDLs) and water quality criteria. Descriptions of all RRMP monitoring activities are available in ADEM's 2012 Monitoring Strategy (ADEM 2012).

In 2014, ADEM monitored Lake Jackson as part of the intensive basin assessment of the Yellow River under the RRMP. This site was selected as representative of the lake. The purpose of this report is to summarize data collected in Lake Jackson (JACC-1) during the 2014 growing season (Apr-Oct). Monthly and/or mean concentrations of nutrients [total nitrogen (TN); total phosphorus (TP)], algal biomass/ productivity [chlorophyll *a* (chl *a*); algal growth potential testing (AGPT)], sediment [total suspended solids (TSS)], and trophic state [Carlson's trophic state index (TSI)] from 2014 were compared to ADEM's historical data and established criteria.

A consumption advisory was issued by the Alabama Department of Public Health in 2010 for mercury in fish collected from Lake Jackson. As a result, Lake Jackson is listed on the 2014 Alabama's Clean Water Act (CWA) §303(d) list of impaired waters for not meeting its water use classification.

Figure 1. Photo of Lake Jackson at JACC-1.

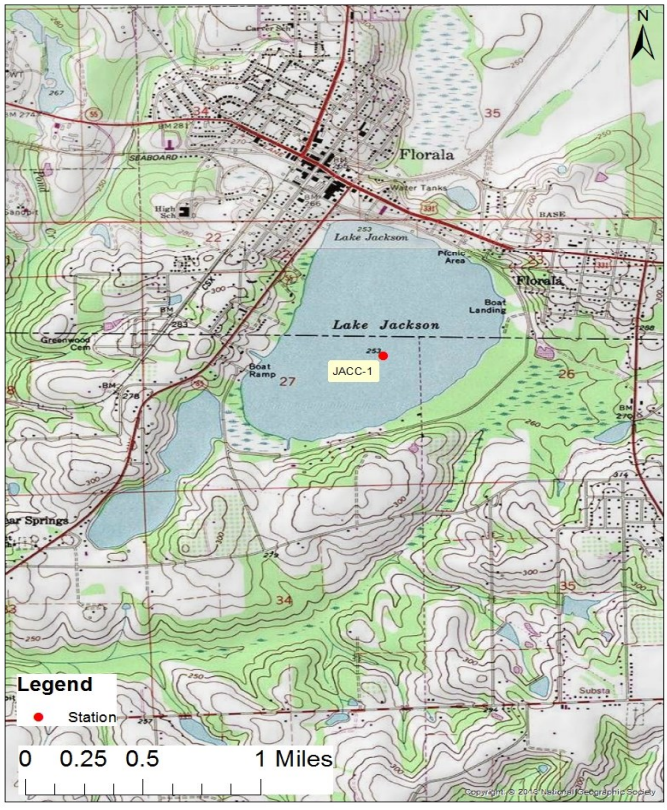


Figure 2. Map of Lake Jackson. There are no permitted facilities within the watershed (Table 1).

WATERSHED CHARACTERISTICS

Watershed land uses are summarized in Table 1. Lake Jackson is classified as a *Swimming/Fish & Wildlife (S/F&W)* lake located in the Southern Pine Plains and Hills ecoregion (65f). Based on the 2006 National Land Cover Dataset, land use within the 2 mi^2 watershed is open water (34%), hay/pasture, and open space (Fig. 3). As of January 28, 2016, ADEM had issued no NPDES permits within the watershed.

SITE DESCRIPTION

Lake Jackson is a clear, naturally formed lake located on the Alabama Florida border. It is approximately 350 acres in size with abundant aquatic vegetation. Lake Jackson has a mean bottom depth of 2.3 m (Table 2) at the sampling location.

METHODS

Water quality assessments were conducted at monthly intervals, April-October. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operating Procedures (ADEM 2014), Surface Water Quality Assurance Project Plan (ADEM 2012), and Quality Management Plan (ADEM 2013).

Mean growing season TN, TP, chl *a*, and TSS were calculated to evaluate water quality conditions. Monthly concentrations of these parameters were graphed with ADEM's previously collected data to help interpret the 2014 results. Carlson's TSI was calculated from the corrected chl *a* concentrations.

Table 1: Summary of Watershed **JACC-1**

Basin		Yellow R
Drainage Area (mi^2)		2
Ecoregion[a]		65f
% Land use		
Open Water		34%
Developed	Open Space	14%
	Low Intensity	5%
	Medium Intensity	1%
	High Intensity	<1%
Forest	Deciduous Forest	4%
	Evergreen Forest	7%
	Mixed Forest	3%
Shrub/Scrub		5%
Hay/Pasture		16%
Cultivated Crops		2%
Wetlands	Woody	10%
# NPDES outfalls[b]	TOTAL	0

a. Southern Pine Plains and Hills

b. # NPDES outfalls downloaded from ADEM's NPDES Management System database, Jan 28, 2016.

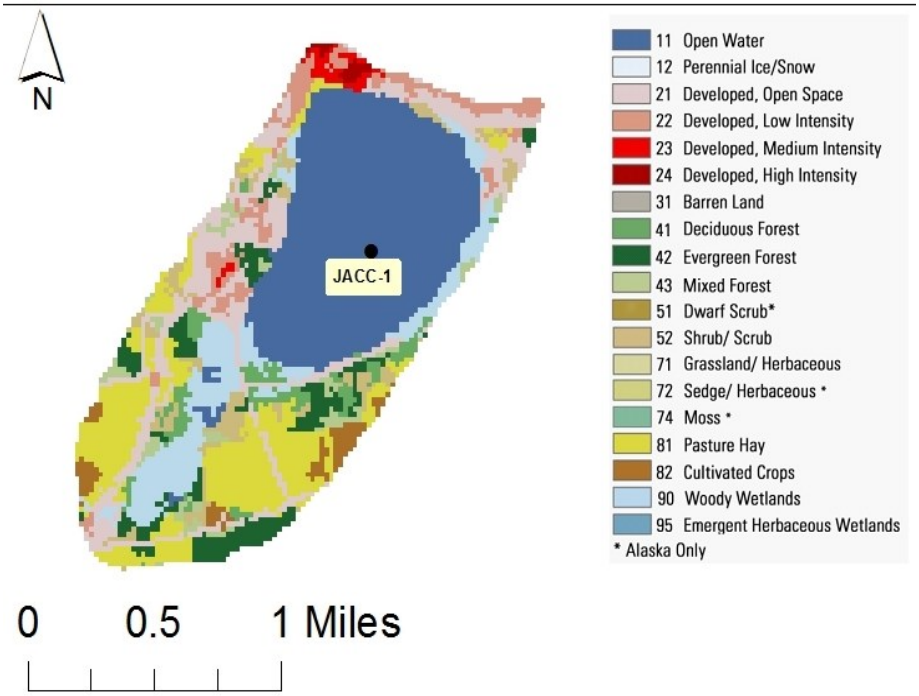


Figure 3. Land use within the Lake Jackson watershed at JACC-1.

RESULTS

The following discussion of results is limited to those parameters which directly affect trophic status or parameters which have established criteria. Results of all water chemistry analyses are presented in Table 2.

The mean growing season TN value increased in 2014 from 2012 (Fig. 4). Monthly TN concentrations were similar Apr-Oct but has generally declined since 2002..

The mean growing season TP concentration increased slightly in 2014 from 2012 (Fig. 4). Monthly TP concentrations peaked in September.

In 2014, the growing season mean chl *a* value was higher than 2012 (Fig. 4). Monthly chl *a* concentrations were highest in June.

Mean TSI in 2014 rose to mesotrophic conditions after showing a decline 2007-2012. Monthly TSI in Lake Jackson was mostly oligotrophic but reached eutrophic conditions in June (Fig. 4).

The mean growing season TSS value was higher in 2014 than 2012 (Fig. 5). Monthly TSS concentrations were highest in May and July.

AGPT results show that Lake Jackson was phosphorus limited in 2014 (Table 3). The mean maximum standing crop (MSC) value was 3.46 mg/L, which is below the 5.0 m/L value that Raschke and Schultz (1987) defined as protective of reservoir and lake systems.

DO concentrations were above the ADEM criteria limit of 5.0 mg/L at 5.0 ft (1.5 m) for the 2014 sampling season (ADEM 2010) (Fig. 6).

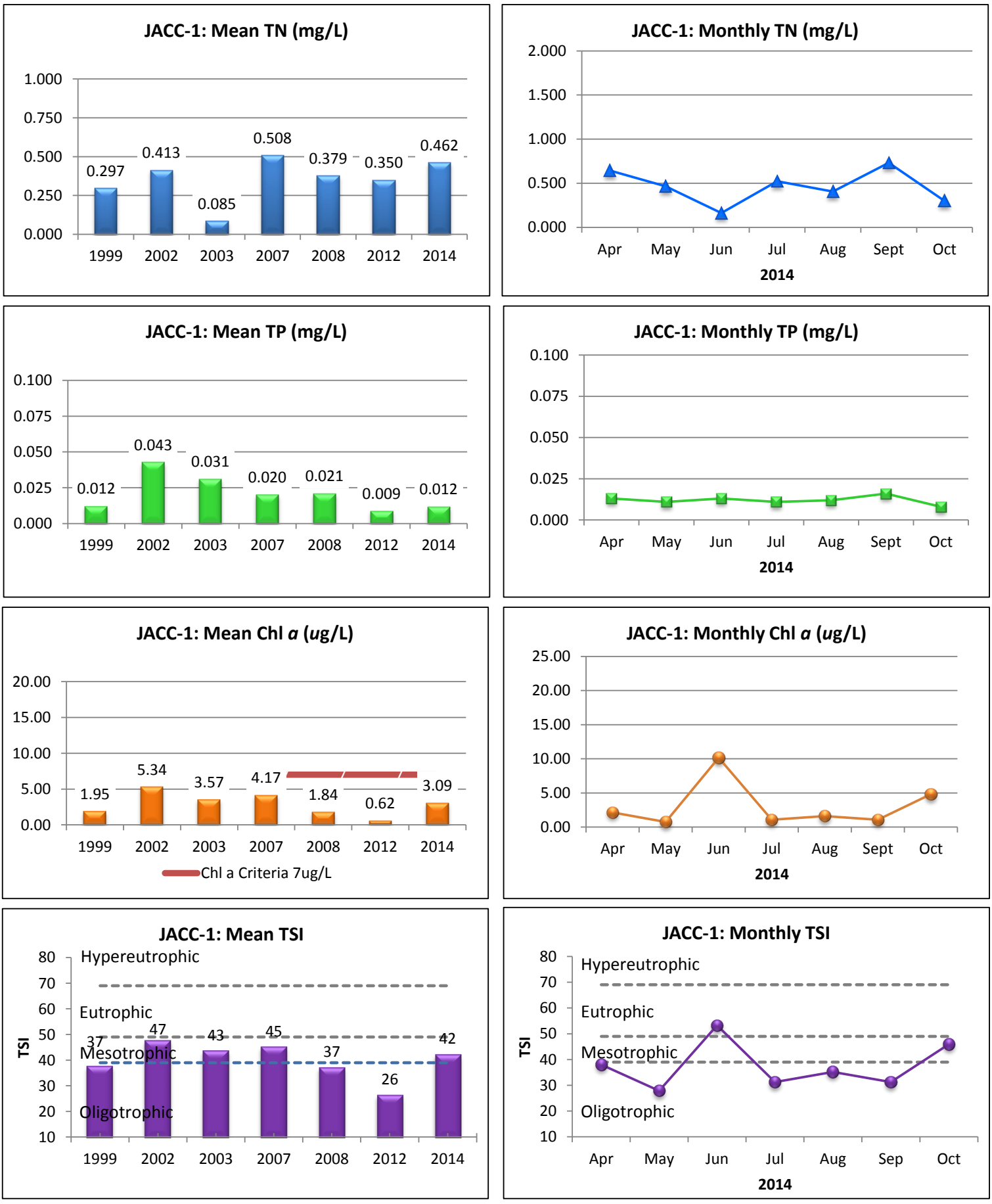
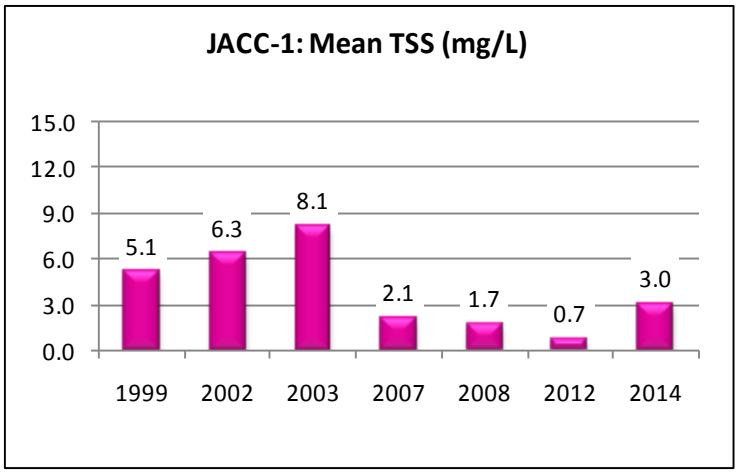


Figure 4. Mean growing season (2003-2015) and monthly (April-October, 2015) TN, TP, chl *a* and TSI measured in Lake Jackson. Vertical axis ranges are set to maximum values reservoir-wide for comparability between embayment reports within the same reservoir.



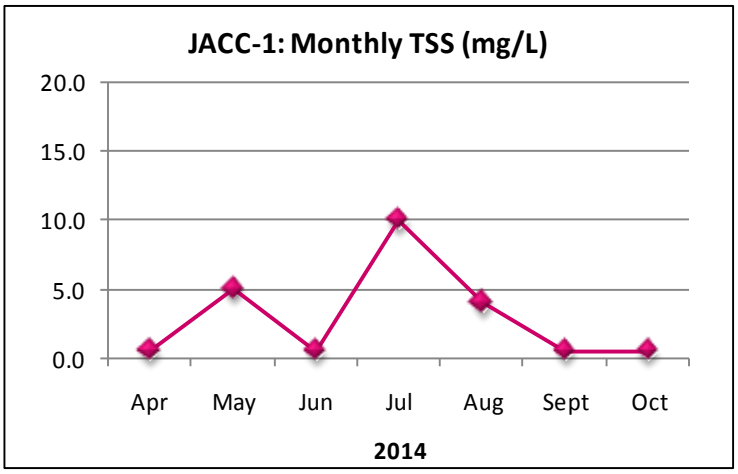


Figure 5. Mean growing season and monthly TSS measured in Lake Jackson.

Table 2. Summary of water quality data collected April-October, 2014. Minimum (Min) and maximum (Max) values calculated using minimum detection limits. Median (Med), mean, and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

JACC-1	N		Min	Max	Med	Mean	SD
Physical							
Turbidity (NTU)	8		0.6	2.6	1.5	1.6	0.6
Total Dissolved Solids (mg/L)	7	<	1.0	30.0	11.0	13.4	11.7
Total Suspended Solids (mg/L)	7	<	1.0	10.0	0.5	3.0	3.6
Hardness (mg/L)	4		5.4	7.6	6.8	6.6	1.0
Alkalinity (mg/L)	7		3.6	6.3	5.8	5.4	1.0
Photic Zone (m)	7		3.50	3.90	3.80	3.73	0.16
Secchi (m)	7		2.32	3.72	3.20	3.22	0.46
Bottom Depth (m)	8		3.5	3.9	3.8	3.7	0.2
Chemical							
Ammonia Nitrogen (mg/L)[J]	7	<	0.006	0.073	0.003	0.025	0.033
Nitrate+Nitrite Nitrogen (mg/L)[J]	7	<	0.001	0.003	0.002	0.001	0.000
Total Kjeldahl Nitrogen (mg/L)	7		0.161	0.732	0.463	0.460	0.196
Total Nitrogen (mg/L)[J]	7	<	0.162	0.732	0.464	0.462	0.195
Dissolved Reactive Phosphorus (mg/L)[J]	7	<	0.002	0.003	0.002	0.002	0.001
Total Phosphorus (mg/L)	7		0.008	0.016	0.012	0.012	0.002
CBOD-5 (mg/L)	7	<	2.0	2.0	1.0	1.0	0.0
Chlorides (mg/L)	7		2.2	2.7	2.3	2.3	0.2
Biological							
Chlorophyll a (ug/L)	7		0.76	10.15	1.60	3.09	3.40
E. coli (col/100mL)[J]	5	<	1	2	1	1	1

J= one or more of the values is an estimate; N= # samples.

Table 3. Algal growth potential test results (expressed as mean MSC) dry weights of *Selenastrum capricornutum* in mg/L) and limiting nutrient status. MSC values below 5 mg/L are considered to be protective in reservoirs and lakes (Raschke and Schultz 1987).

JACC-1	MSC	Limiting Nutrient
6/22/1999	1.52	PHOSPHORUS
7/27/1999	2.03	PHOSPHORUS
8/24/1999	1.45	NONE
9/2/2008	2.49	NONE
8/27/2014	3.46	PHOSPHORUS

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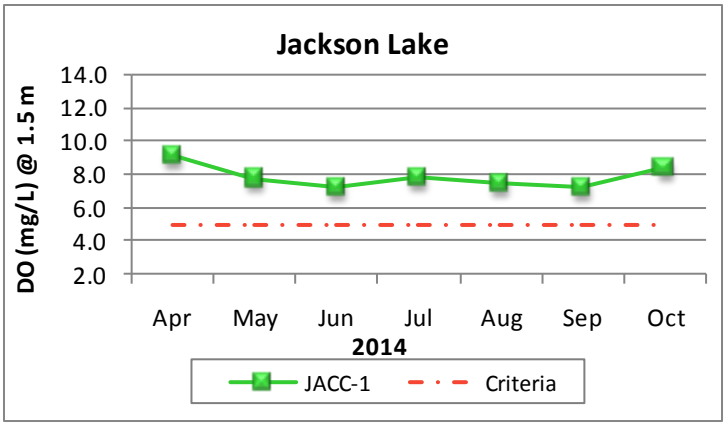

Figure 6. Monthly DO concentrations at 1.5 m (5 ft) for Lake Jackson collected April-October 2014. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth.

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