

Cypress Creek Embayment Pickwick Reservoir Intensive Basin Survey 2015

PICL-1: Cypress Creek approx 0.5 mi upstream of AL Hwy 20 (Lauderdale Co 34.78814/-87.69709)

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 2015, ADEM monitored the Cypress Creek tributary embayment of Pickwick Reservoir as part of the basin assessment of the Tennessee River under the RRMP. This site was selected using historical data and previous assessments. The purpose of this report is to summarize data collected in the Cypress Creek embayment (PICL-1) during the 2015 growing season (Apr-Oct). This is the fourth basin assessment of the Tennessee River since ADEM began sampling. Monthly and/or mean concentrations of nutrients [total nitrogen (TN); total phosphorus (TP)], algal biomass/productivity [chlorophyll *a* (chl *a*)], sediment [total suspended solids (TSS)], and trophic state [Carlson’s trophic state index (TSI)] from 2015 were compared to ADEM’s historic data and established criteria.



Figure 1. Photo of Cypress Creek at PICL-1

WATERSHED CHARACTERISTICS

Watershed land uses are summarized in Table 1. Cypress Creek is classified as a *Public Water Supply /Fish & Wildlife (PWS/F&W)* stream located in the Eastern Highland Rim ecoregion (71g). Based on the 2006 National Land Cover Dataset, land use within the 214 mi² watershed is a mixture of agriculture, forest and urban (Fig. 3). As of January 28, 2016, ADEM has issued a total of 64 NPDES permits within the watershed. Twenty-four of those permits are located within 10 mi of the station (Fig. 2).

SITE DESCRIPTION

The Cypress Creek embayment at PICL-1 is located just west of Florence, AL and flows in the Tennessee River at river mile 255. Cypress Creek has a mean bottom depth of 3.8 m (Table 2) at the sampling location, and is just upstream of the McFarland Park fishing pier.

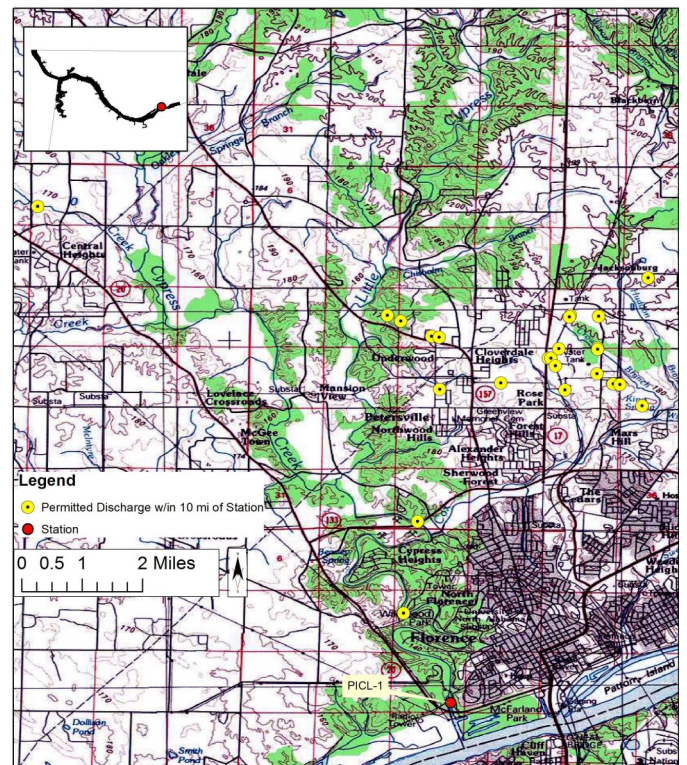


Figure 2. Map of Cypress Creek embayment of Pickwick Reservoir. Though additional permitted facilities may occur in the watershed (Table 1), only those discharges within 10 miles upstream of the station are displayed on the map.

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 2015), Surface Water Quality Assurance Project Plan (ADEM 2012), and Quality Management Plan (ADEM 2013).

Mean growing season TN, TP, chl *a*, TSI, 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 2015 results. Carlson’s TSI was calculated from the corrected chl

Table 1: Summary of Watershed PICL-1

Basin		Tennessee R
Drainage Area (mi ²)		214
Ecoregion ^a		71g
% Land use		
Open Water		<1%
Developed	Open Space	8%
	Low Intensity	3%
Medium Intensity	High Intensity	<1%
	Barren Land	<1%
Forest	Deciduous Forest	30%
	Evergreen Forest	4%
	Mixed Forest	2%
Shrub/Scrub		11%
Herbaceous		2%
Hay/Pasture		25%
Cultivated Crops		11%
Wetlands	Woody	3%
	Emergent Herb.	<1%
# NPDES Permits ^b TOTAL		64
Construction Stormwater		32
Mining		0
Small Mining		0
Industrial General		28
Industrial Individual		1
No Exposure		0
Municipal		1
Underground Injection Control		2

a. Eastern Highland Rim

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

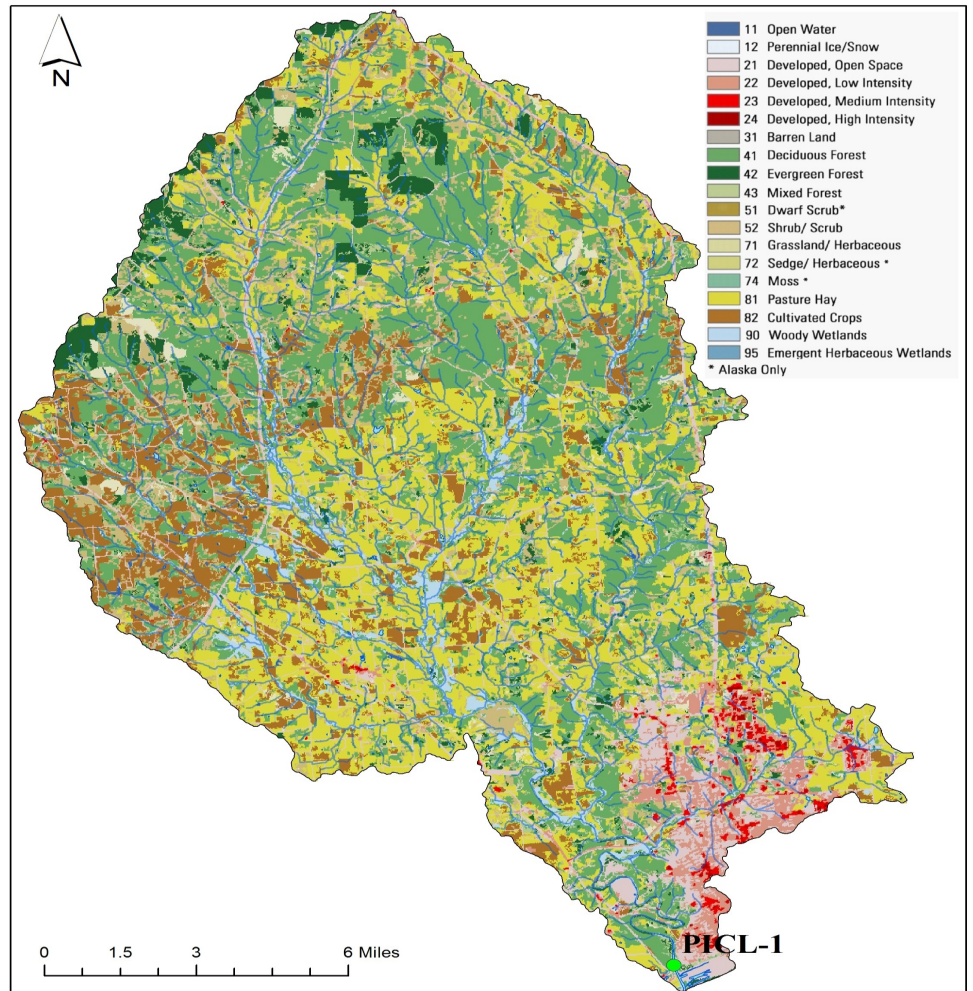


Figure 3. Land use within the Cypress Creek watershed at PICL-1.

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 axis ranges of the graphs in Fig. 4–5 were set to maximum values reservoir-wide so all embayment reports on the same reservoir could be compared.

In 2015, the growing season mean TN was higher than in 2013. The monthly TN concentration was highest in July (Fig. 4).

The growing season mean TP increased a small amount in concentration from 2013 to 2015. The monthly TP concentration was highest in April (Fig. 4).

The growing season mean chl *a* value was lower than 2013 and higher than 2009 (Fig. 4). Monthly chl *a* concentrations peaked in September.

Mean TSI was mesotrophic in 2015. Monthly TSI in Cypress Creek reached eutrophic conditions in September and was oligotrophic all other months (Fig. 4).

The mean growing season TSS value was higher in 2015 than 2013 (Fig. 5). Highest monthly TSS concentrations occurred in June.

The DO concentrations in the PICL-1 station remained above the ADEM criteria limit of 5.0 mg/l at 5.0 ft (1.5 m) in all months (ADEM Admin. Code R. 335-6-10-.09) (Fig. 6).

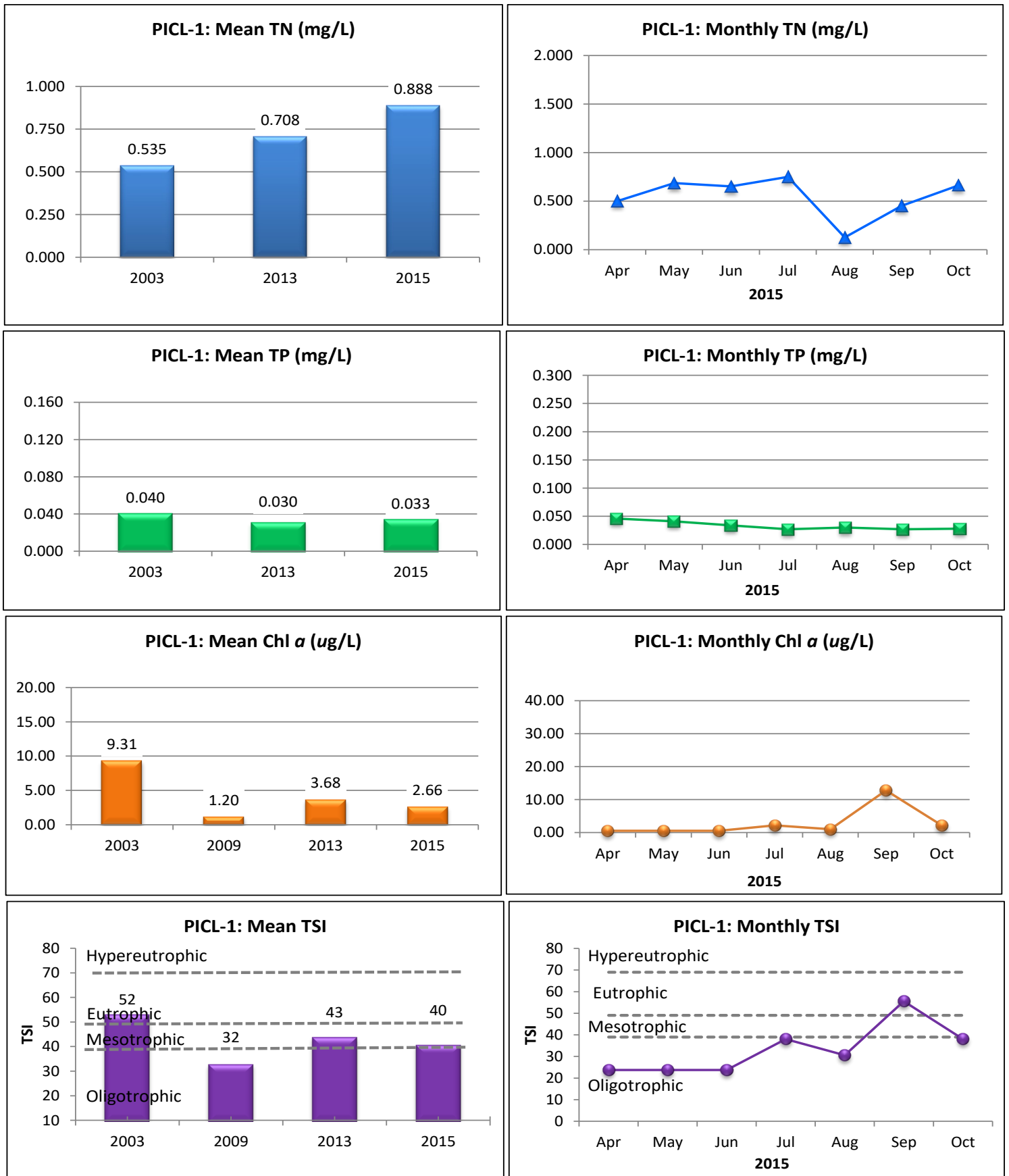


Figure 4. Mean growing season (2003-2015) and monthly (April-October, 2015) chl *a*, TSI, and TSS measured in the Cypress Creek embayment of Pickwick Reservoir. Vertical axis ranges are set to maximum values reservoir-wide for comparability between embayment reports within the same reservoir. 2009 mean TN and mean TP data did not meet ADEM QA standards and are not included.

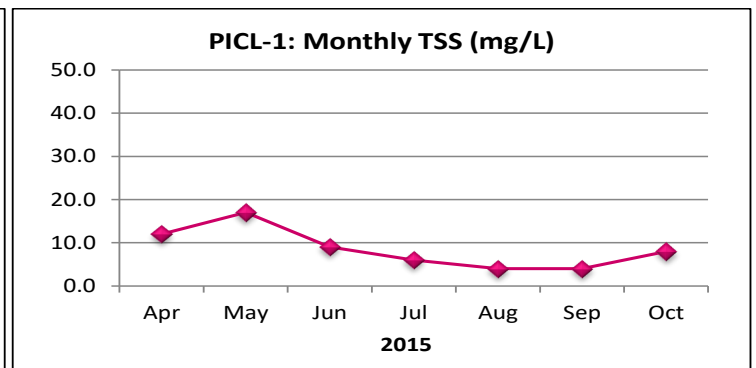
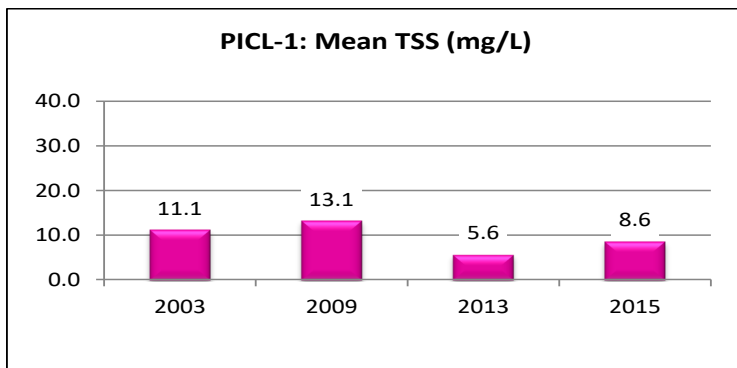


Figure 5. Mean growing season and monthly TSS measured in the Cypress Creek embayment of Pickwick Reservoir.

Table 2. Summary of water quality data collected April-October, 2015. 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.

PICL-1	N	Min	Max	Med	Mean	SD
Physical						
Turbidity (NTU)	7	4.9	13.8	7.9	8.8	3.2
Total Dissolved Solids (mg/L)	7	54.0	90.0	80.0	76.6	11.8
Total Suspended Solids (mg/L)	7	4.0	17.0	8.0	8.6	4.7
Hardness (mg/L)	4	29.8	79.7	59.4	57.0	20.8
Alkalinity (mg/L)	7	25.8	75.7	62.6	59.3	16.2
Photic Zone (m)	7	2.70	13.80	3.30	4.74	4.01
Secchi (m)	6	0.26	1.34	1.00	0.93	0.37
Bottom Depth (m)	7	2.7	4.8	3.6	3.8	0.8
Chemical						
Ammonia Nitrogen (mg/L)	7	0.022	0.215	0.043	0.080	0.082
Nitrate+Nitrite Nitrogen (mg/L)	7	0.358	0.594	0.438	0.454	0.082
Total Kjeldahl Nitrogen (mg/L)	7	< 0.064	0.669	0.428	0.435	0.229
Total Nitrogen (mg/L)	7	< 0.626	1.107	0.890	0.888	0.176
Dis Reactive Phosphorus (mg/L) ^J	7	0.006	0.019	0.013	0.013	0.005
Total Phosphorus (mg/L)	7	0.027	0.046	0.030	0.033	0.008
CBOD-5 (mg/L) ^J	7	< 2.0	2.5	1.0	1.2	0.6
Chlorides (mg/L)	7	2.3	3.6	3.2	3.0	0.5
Biological						
Chlorophyll a (mg/m ³)	7	< 0.10	12.80	0.50	2.66	4.55
E. coli (MPN/DL) ^J	3	11	2,420	17	816	1,389

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

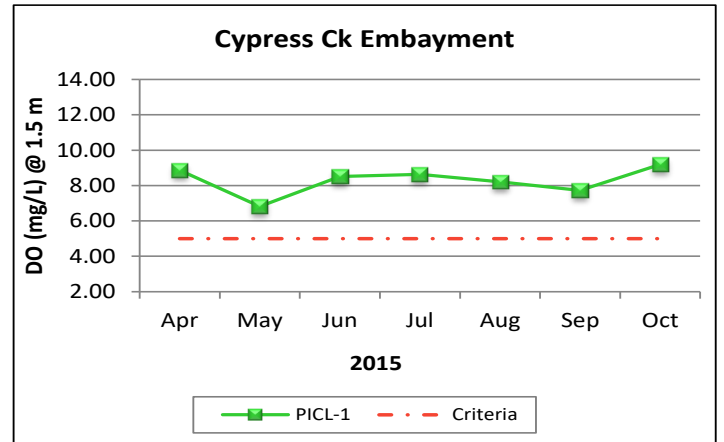


Figure 6. Monthly DO concentrations at 1.5 m (5 ft) for Cypress Creek embayment station of Pickwick Reservoir collected April-October 2015. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/L at this depth.

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