# Study for the Ongoing Assessment of Water Quality in B. Everett Jordan Lake: 2019 Results

**Purpose:**

The objective of this study is to evaluate progress in reducing nutrient and nutrient-related pollution in B. Everett Jordan Lake (WS-IV,B;NSW,CA), as required by the Jordan Lake water supply nutrient strategy (15A NCAC 02B.0262) (i.e. the "Jordan Lake Rules"). This report summarizes results of samples collected in 2019.

**Methods:**

The detailed Jordan Lake study plan can be found following the URL at the end of this document. A total of nine monitoring stations that represent the three lake management areas (Upper New Hope, Lower New Hope, and Haw River) were sampled in Jordan Lake during 2019. All stations were sampled monthly throughout the year. Chemical samples were collected as a composite from the photic zone and analyzed for total phosphorus (TP), total nitrogen (TN), ammonia ($NH_3$), nitrate + nitrite ($NO_3+NO_2$), total Kjeldahl nitrogen (TKN), turbidity, and chlorophyll *a* (chla). Duplicate samples were collected at one station per sampling event on a rotating schedule for quality control. Physical measurements of dissolved oxygen (DO), temperature, pH, and conductivity were collected through the water column in one-meter (m) increments with a multiparameter sonde. Surface readings (0.15m) for physical parameters were used in data analysis.

**Results:**

One-year summary results are presented by station for the three management areas: Upper New Hope (Figure 1), Lower New Hope (Figure 2), and Haw River Arm (Figure 3). The tables display annual mean, minimum, and maximum concentrations for TP (mg/L), TN (mg/L), chla (µg/L), and turbidity (NTU), DO (mg/L), and pH (s.u.). Data summaries are calculated from 12 sampling events (n) for all sites. Chemical samples were not analyzed for total Kjeldahl nitrogen (TKN) and nitrate + nitrite ($NO_3+NO_2$) at any sites for the month of June due to contamination issues at the processing lab. This is reflected by the sample size (n) of 11 for total nitrogen (TN). Percent exceedance of state fresh surface water quality standards is shown for each station. Exceedance is defined by chla >40 ug/L; turbidity >25 NTU; DO <4 mg/L; pH >9 or <6 s.u. All nitrate + nitrite and ammonia data below analytical detection limit (< 0.02 mg/L) were quantified as 0.01 mg/L to calculate TN values.

| CPF086C | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.08 | 1.12 | 59.8 | 15.9 | 10.0 | 8.1 |
| Min | 0.05 | 0.79 | 27.0 | 10.0 | 7.7 | 7.1 |
| Max | 0.13 | 1.47 | 90.0 | 26.0 | 12.6 | 9.2 |
| *n>Standard* | | | *10* | *2* | *0* | *1* |
| *% Exceedance* | | | *83.3%* | *16.7%* | *0.0%* | *8.3%* |
| *% Confidence* | | | *100.0%* | *65.9%* | *N/A* | *28.2%* |

| CPF081A1C | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.09 | 0.12 | 72.1 | 17.4 | 10.0 | 8.0 |
| Min | 0.06 | 0.04 | 31.0 | 11.0 | 7.7 | 6.4 |
| Max | 0.12 | 0.42 | 176.0 | 32.0 | 12.5 | 9.2 |
| *n>Standard* | | | *10* | *1* | *0* | *1* |
| *% Exceedance* | | | *83.3%* | *8.3%* | *0.0%* | *8.3%* |
| *% Confidence* | | | *100.0%* | *28.24%* | *N/A* | *28.24%* |

| CPF086F | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.08 | 1.08 | 64.3 | 13.5 | 9.8 | 7.9 |
| Min | 0.06 | 0.89 | 23.0 | 8.4 | 6.0 | 7.2 |
| Max | 0.10 | 1.52 | 100.0 | 19.0 | 12.5 | 9.5 |
| *n>Standard* | | | *9* | *0* | *0* | *1* |
| *% Exceedance* | | | *75.0%* | *0.0%* | *0.0%* | *8.3%* |
| *% Confidence* | | | *100.0%* | *N/A* | *N/A* | *28.2%* |
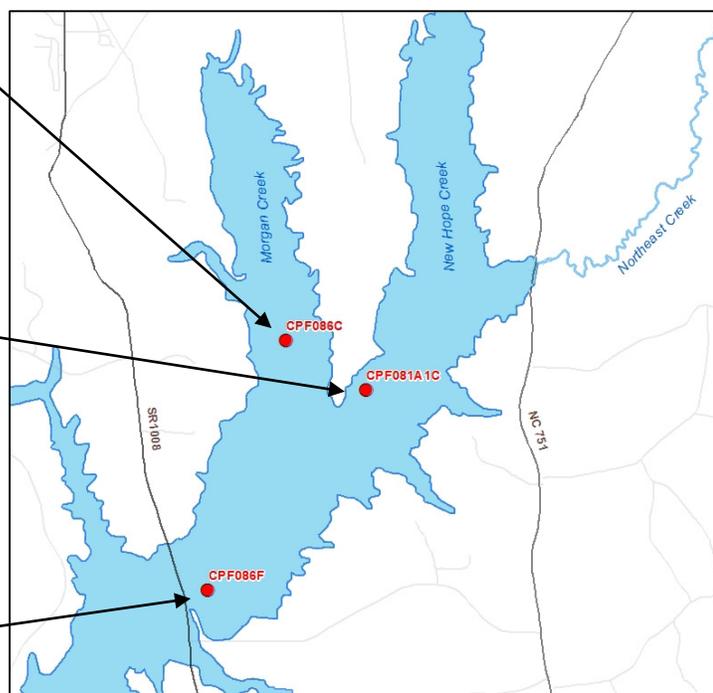


*Figure 1. Upper New Hope Section of Jordan Lake*
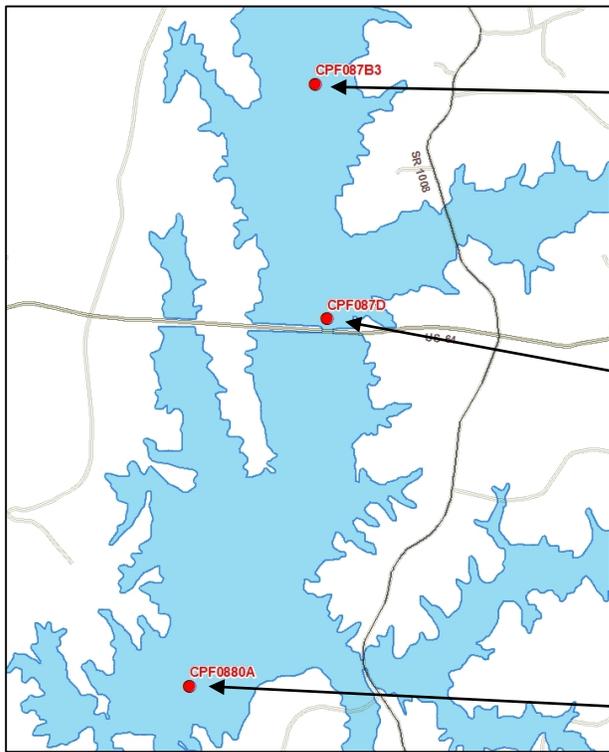
Figure 2. Lower New Hope Section of Jordan Lake

| CPF087B3 | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.05 | 0.86 | 43.8 | 7.5 | 9.6 | 7.8 |
| Min | 0.04 | 0.69 | 22.0 | 4.6 | 6.6 | 7.2 |
| Max | 0.06 | 1.06 | 76.0 | 12.0 | 12.4 | 9.4 |
| n>Standard | | | 6 | 0 | 0 | 1 |
| % Exceedance | | | 50.0% | 0.0% | 0.0% | 8.3% |
| % Confidence | | | 99.9% | N/A | N/A | 28.2% |

| CPF087D | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.04 | 0.88 | 34.1 | 6.9 | 9.3 | 7.7 |
| Min | 0.03 | 0.62 | 19.0 | 4.2 | 6.6 | 7.0 |
| Max | 0.06 | 1.18 | 64.0 | 9.3 | 12.7 | 9.3 |
| n>Standard | | | 3 | 0 | 0 | 1 |
| % Exceedance | | | 25% | 0% | 0% | 8.3% |
| % Confidence | | | 88.9% | N/A | N/A | 28.2% |

| CPF0880A | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.10 | 0.89 | 33.3 | 7.5 | 9.2 | 7.7 |
| Min | 0.05 | 0.66 | 18.0 | 4.3 | 5.0 | 7.1 |
| Max | 0.18 | 1.28 | 81.0 | 13.0 | 12.4 | 9.3 |
| n>Standard | | | 1 | 0 | 0 | 2 |
| % Exceedance | | | 8.3% | 0% | 0% | 16.7% |
| % Confidence | | | 28.2% | N/A | N/A | 65.9% |
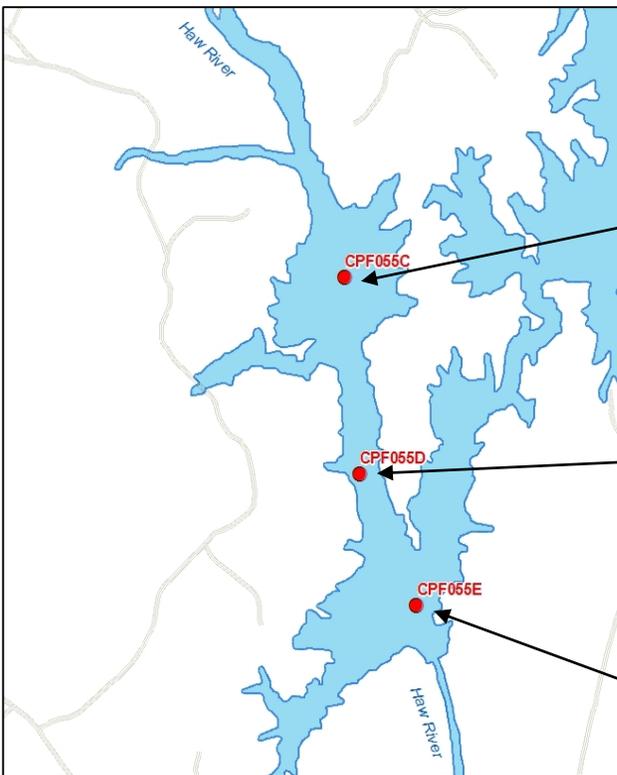


Figure 3. Haw River Arm of Jordan Lake

| CPF055C | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.10 | 1.22 | 29.9 | 22.8 | 10.5 | 7.8 |
| Min | 0.05 | 1.01 | 5.4 | 5.9 | 8.3 | 5.9 |
| Max | 0.18 | 1.46 | 61.0 | 70.0 | 12.6 | 9.5 |
| n>Standard | | | 5 | 4 | 0 | 2 |
| % Exceedance | | | 41.2% | 33.3% | 0% | 16.7% |
| % Confidence | | | 99.6% | 97.4% | N/A | 65.9% |

| CPF055D | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.09 | 1.21 | 27.6 | 18.3 | 9.6 | 7.6 |
| Min | 0.05 | 1.00 | 8.2 | 4.5 | 5.9 | 6.7 |
| Max | 0.17 | 1.54 | 47.0 | 60.0 | 11.8 | 9.5 |
| n>Standard | | | 2 | 1 | 0 | 2 |
| % Exceedance | | | 16.7% | 8.3% | 0% | 16.7% |
| % Confidence | | | 65.9% | 28.2% | N/A | 65.9% |

| CPF055E | | | | | | |
|---|---|---|---|---|---|---|
| | TP | TN | Chla | Turbidity | DO | pH |
| n | 12 | 11 | 12 | 12 | 12 | 12 |
| Mean | 0.07 | 1.11 | 28.6 | 12.8 | 9.4 | 7.7 |
| Min | 0.04 | 0.80 | 9.9 | 4.9 | 5.6 | 7.0 |
| Max | 0.12 | 1.61 | 49.0 | 32.0 | 11.5 | 9.3 |
| n>Standard | | | 1 | 1 | 0 | 2 |
| % Exceedance | | | 8.3% | 8.3% | 0% | 16.7% |
| % Confidence | | | 28.2% | 28.2% | N/A | 65.9% |