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June 30, 2020

***VIA ELECTRONIC FILING***

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Draft Downstream Aquatic Habitat Report

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). On April 12, 2019, FERC issued its Study Plan Determination1 (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com. The final Downstream Aquatic Habitat Study Plan required Alabama Power to complete the Draft Downstream Aquatic Habitat Report (Draft Report) by June 2020, included as Attachment 1. Please note that all Geographic Information System (GIS) Shapefiles and Hydrologic Engineering Center's River Analysis System (HEC-RAS) model outputs will be filed with the final Downstream Aquatic Habitat Report in April 2021.

This filing also includes the stakeholder consultation for this study beginning May 2019 through June 2020 (Attachment 2). Stakeholders have until August 1, 2020 to submit their comments to Alabama Power on the Draft Report. Comments should be sent directly to harrisrelicensing@southernco.com.

Stakeholders may access this Draft Report on FERC's website (http://www.ferc.gov) and it is also available on the Project relicensing website at www.harrisrelicensing.com.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment 1 – Draft Downstream Aquatic Habitat Report
Attachment 2 – Downstream Aquatic Habitat Consultation Record (May 2019-June 2020)

cc: Harris Action Team 3 Stakeholder List

Attachment 1

Draft Downstream Aquatic Habitat Report

# DRAFT
# DOWNSTREAM AQUATIC HABITAT STUDY REPORT

**R. L. HARRIS PROJECT**
FERC NO. 2628


***Prepared by:***

**KLEINSCHMIDT ASSOCIATES**
**HOOVER, ALABAMA**


***Prepared for:***

**ALABAMA POWER COMPANY**
**BIRMINGHAM, ALABAMA**

JUNE 2020

**DRAFT**
**DOWNSTREAM AQUATIC HABITAT STUDY REPORT**

**R.L. HARRIS PROJECT**
**FERC NO. 2628**

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**DOWNSTREAM AQUATIC HABITAT STUDY REPORT**

**R.L. HARRIS PROJECT**
**FERC NO. 2628**

# 1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Hydroelectric Project (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission) (FERC Project No. 2628). The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources.

Alabama Power began operating the Harris Project in 1983. Initially, the Harris Project operated in peaking mode with no intermittent flows between peaks. Agencies and non-governmental organizations requested that Alabama Power modify operations to potentially enhance downstream aquatic habitat. In 2005, based on recommendations developed in cooperation with stakeholders, Alabama Power implemented a pulsing scheme for releases from Harris Dam known as the Green Plan (Kleinschmidt 2018a). The purpose of the Green Plan was to reduce the effects of peaking operations on the aquatic community downstream. Although Green Plan operations are not required by the existing license, Alabama Power has operated Harris Dam according to its guidelines since 2005.

Commonly used acronyms that may appear in this draft report are included in Appendix A.

## 1.1 STUDY BACKGROUND

Monitoring conducted since initiation of the Green Plan has indicated a positive fish community response due to increased shoal habitat availability (Irwin et al. 2011); however, there is little existing information characterizing the extent that the Green Plan has enhanced the aquatic habitat from Harris Dam downstream through Horseshoe Bend.

During the October 19, 2017 issue identification workshop, several stakeholders noted Tallapoosa River downstream flows and water temperature as potential issues at the Harris Project. On November 13, 2018, Alabama Power filed ten proposed study plans for the Harris Project, including a study plan for downstream aquatic habitat. FERC issued a Study Plan

Determination on April 12, 2019, which included FERC staff recommendations. Alabama Power incorporated FERC’s recommendations and filed the Final Study Plans with FERC on May 13, 2019.

The goal of this study is to develop a model that describes the relationship between Green Plan operations and aquatic habitat. Originally, Alabama Power intened to use this model to analyze the effects of downstream release alternatives on aquatic habitat in Phase 2 of the Downstream Release Alternatives Study, in which Alabama Power proposed to model Pre-Green Plan operations, a continuous minimum flow of 150 cfs continuous minimum flow, and an alternative/modified Green Plan (i.e., changing the time of day in which Green Plan pulses are released). However, in an effort to provide information to stakeholders earlier in the process, the Pre-Green Plan operations alternative and the 150 cfs continuous minimum flow alternative were modeled and the results included in this report.

This draft report was prepared to support the relicensing process and to fulfill the requirements of the FERC-approved Downstream Aquatic Habitat Study Plan.

# 2.0 METHODS

## 2.1 MESOHABITAT ANALYSIS

A desktop analysis of the types of available habitat in the Tallapoosa River was conducted using Geographic Information Systems (GIS) and aerial imagery from the U.S. Department of Agriculture National Agriculture Imagery Program (NAIP). A polygon shapefile of the Tallapoosa River from Harris Dam through Horseshoe Bend was obtained from the U.S. Geological Survey's (USGS) national hydrography dataset. The polygon was divided and classified into the following habitat categories:

- Riffle/Shoal: shallow, moderate velocity, turbulent, high gradient, moderate to large substrates (cobble/gravel)
- Run: shallow, moderate to high velocity, turbulent, chutes and eddies present, high gradient, large substrates, or bedrock
- Pool: deep, low velocity, well defined hydraulic control at outlet

Habitat characterizations were verified with field observations obtained during water level monitoring and discharge measurement events. Results were depicted graphically using GIS, and quantitatively summarized in tabular format.

## 2.2 WATER LEVEL MONITORING

Alabama Power deployed 20 water level/temperature loggers ("loggers" or "level loggers") (Onset U20L-04) within a 48-mile reach of the Tallapoosa River from Harris Dam through Horseshoe Bend to Irwin Shoals beginning in April 2019[1] (Figure 2-1). Although Irwin Shoals is located roughly 4.5 miles downstream of the FERC-approved geographic scope of this study[2] (Harris Dam through Horseshoe Bend), a level logger was deployed at that location, and channel profile data was gathered downstream to Jaybird Landing. The level loggers were set to record measurements at 15-minute intervals, and were deployed on the river bottom in protective, vented PVC tubes, attached to a weight via steel cable, and tethered to a tree on the streambank or other in-river structure, when available. A separate logger was deployed near Harris Dam to record ambient (barometric) pressure, which was used to convert the pressure readings from the

[1] Loggers were initially targeted for installation in fall 2018, though high river flows from fall 2018 through spring 2019 prevented installation until April 2019.

[2] The geographic scope is also referred to herein as "study area".

water level loggers into water depth using the manufacturer's software (HOBOware Pro version 3.7.14).

Data was downloaded from level loggers in the field twice between April 2019 and April 2020 to prevent the loggers from reaching their data storage capacity. On one occasion, malfunctioning equipment caused faulty data transfers and portions of data were lost from four level loggers (logger numbers 12, 14, 18, 20) (Figure 2-1). Therefore, 4 of the 20 loggers, including the logger at Irwin Shoals, did not provide continuous, 15-minute data through April 2020 and were omitted from this analysis. However, water level fluctuation and temperature results are provided from Harris Dam through Horseshoe Bend, consistent with the geographic scope of the study plan. Data collected by all level loggers is provided in Appendix B.

## 2.3 CHANNEL PROFILE DATA COLLECTION

Two methods were used to collect channel profile data. In areas with sufficient depth for boating, a Global Positional System (GPS)/Global Navigation Satellite System (GNSS) rover antenna (Trimble R10) mounted above an 200 kHz echosounder (CEE-LINE, CEE Hydrosystems) was mounted to a kayak and used to collect river bottom elevations at 1-second intervals as the surveyor paddled in a path across the river channel perpendicular to the flow.

In areas where there was insufficient depth for boating, the GPS/GNSS rover antenna was mounted on a 2-meter survey rod and river bottom elevations were collected manually at approximately 10-foot intervals in a path across the river channel perpendicular to the flow. The average horizontal and vertical accuracy of these survey data was 0.08 feet and 0.15 feet, respectively.

## 2.4 MODELING

A detailed description of the Hydrologic Engineering Center River Analysis System (HEC-RAS) model is provided in the Operating Curve Change Feasibility Analysis Phase 1 Report and the Downstream Release Alternatives Phase 1 Report[3]. To briefly summarize, an existing HEC-RAS

[3] The Operating Curve Change Feasibility Analysis Phase 1 Report and the Downstream Release Alternatives Phase 1 Report are available on the R.L. Harris Hydroelectric Project Relicensing Website: http://www.harrisrelicensing.com.

model for the Tallapoosa River[4] was updated using data from 2018 Light Detection and Ranging (LiDAR) data/imagery and 2019 bathymetric surveys. A total of 120 bathymetric cross sections between Wadley and the Martin reservoir were surveyed and incorporated into the HEC-RAS model.

Based on analysis of the unimpaired flow dataset, 2001 was selected as a “normal” water year as inflows to the Harris Project were closest to the median, and hourly flow data was available for that year. Since 2001 pre-dated Green Plan implementation, hourly discharge records for Harris Dam were used to model the Pre-Green Plan scenario. The Green Plan scenario was created by applying existing Green Plan rules to the Pre-Green Plan releases. The 150 cubic feet per second (cfs) continuous minimum flow scenario was created by amending the Pre-Green Plan scenario such that no hourly interval had less than a 150 cfs discharge from Harris Dam. Lateral inflow hydrographs were developed based on U.S. Geological Survey (USGS) gauge data for 2001 from the Wadley and Horseshoe Bend sites to represent tributary inputs.

The HEC-RAS model was used to simulate river conditions between Harris Dam and Jaybird Landing. Hourly outputs of wetted perimeter[5] and water surface elevation from model simulations of Pre-Green Plan, Green Plan, and 150 cfs continuous minimum flow were analyzed to determine and compare hourly, daily, and seasonal trends.

[4] The geographic scope of this study is the Tallapoosa River below Harris Dam through Horseshoe Bend. The model was developed to run simulations from Harris Dam to Jaybird Landing (approximately river mile 88) which represents the point where Lake Martin begins.

[5] Wetted perimeter is the portion of the river bed and banks that is in contact with the water in the channel. More detail on wetted perimeter is included in Section 3.3.

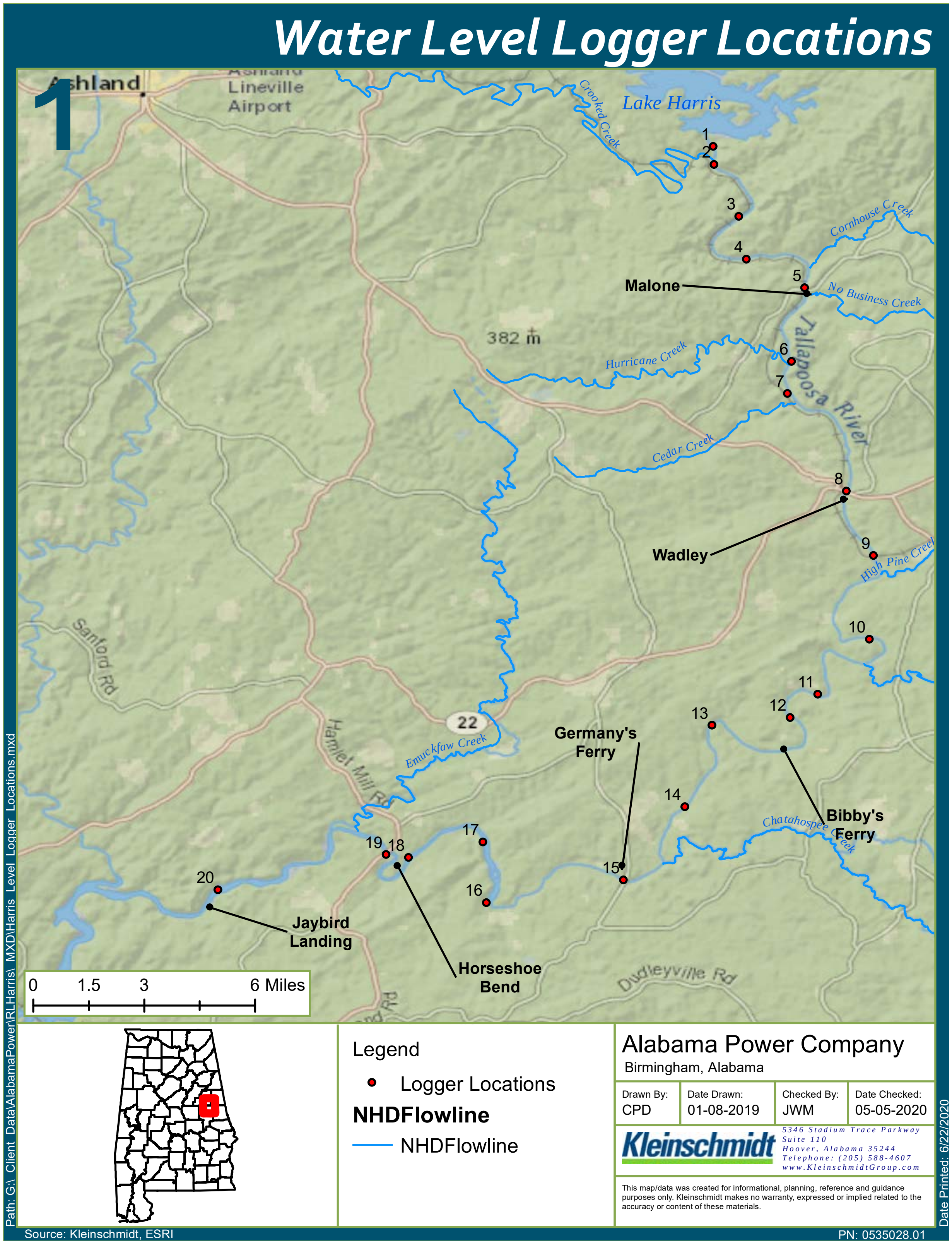



**FIGURE 2-1 WATER LEVEL LOGGER LOCATIONS**

# 3.0 RESULTS

## 3.1 MESOHABITAT ANALYSIS

The desktop mesohabitat analysis indicated that the Tallapoosa River from Harris Dam to Jaybird Landing is comprised of approximately 47 percent pool (366.3 hectare (ha)), 44 percent riffle/shoal (343 ha), and 10 percent run habitat (74.7 ha) (Table 3-1). Pools were the most abundant habitat type in the Malone (Harris Dam to Malone), Bibby's Ferry (Wadley to Bibby's Ferry), Germany's Ferry (Bibby's Ferry to Germany's Ferry), and Horseshoe Bend (Germany's Ferry to Horseshoe Bend) reaches. Riffles/shoals were the most abundant habitat type in the Wadley (Malone to Wadley) and Jaybird Landing (Horseshoe Bend to Jaybird Landing) reaches, where the density of riffle/shoal habitat was two to four times higher than the other reaches (Figure 3-1). Figure 3-2 provides aerial views of mesohabitat classification.

**TABLE 3-1 SUMMARY OF MESOHABITAT ANALYSIS RESULTS**

| | Habitat Type | | | | | |
|---|---|---|---|---|---|---|
| | Pool | | Riffle/Shoal | | Run | |
| **Reach** | **ha** | **%** | **ha** | **%** | **ha** | **%** |
| Malone | 50.7 | 46% | 31.3 | 28% | 28.7 | 26% |
| Wadley | 20.4 | 17% | 91.9 | 77% | 7.5 | 6% |
| Bibby's Ferry | 86.3 | 55% | 50.1 | 32% | 19.1 | 12% |
| Germany's Ferry | 60.3 | 57% | 35.9 | 34% | 10.0 | 9% |
| Horseshoe Bend | 60.7 | 75% | 18.9 | 23% | 1.1 | 1% |
| Jaybird Landing | 87.9 | 42% | 114.8 | 54% | 8.2 | 4% |
| **Study Area Grand Total (ha)** | **366.3** | | **343.0** | | **74.7** | |
| **Study Area Percent of Total** | **46.7%** | | **43.8%** | | **9.5%** | |

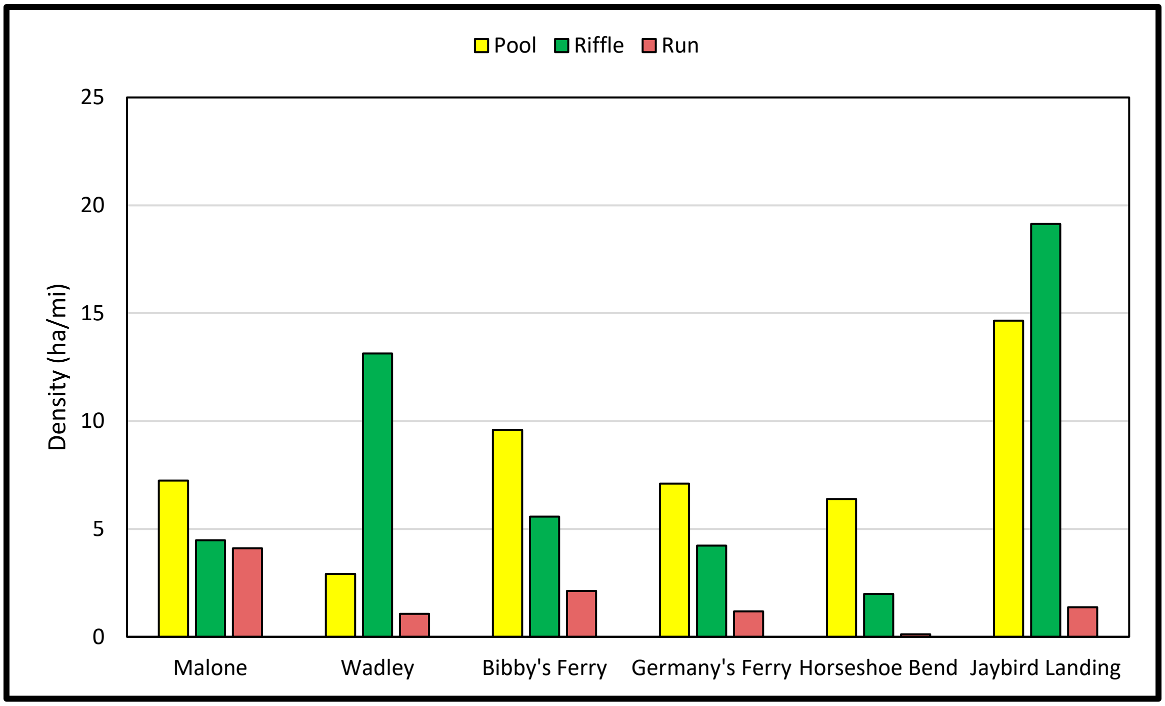



**FIGURE 3-1 DENSITY OF MESOHABITAT TYPES BY REACH**

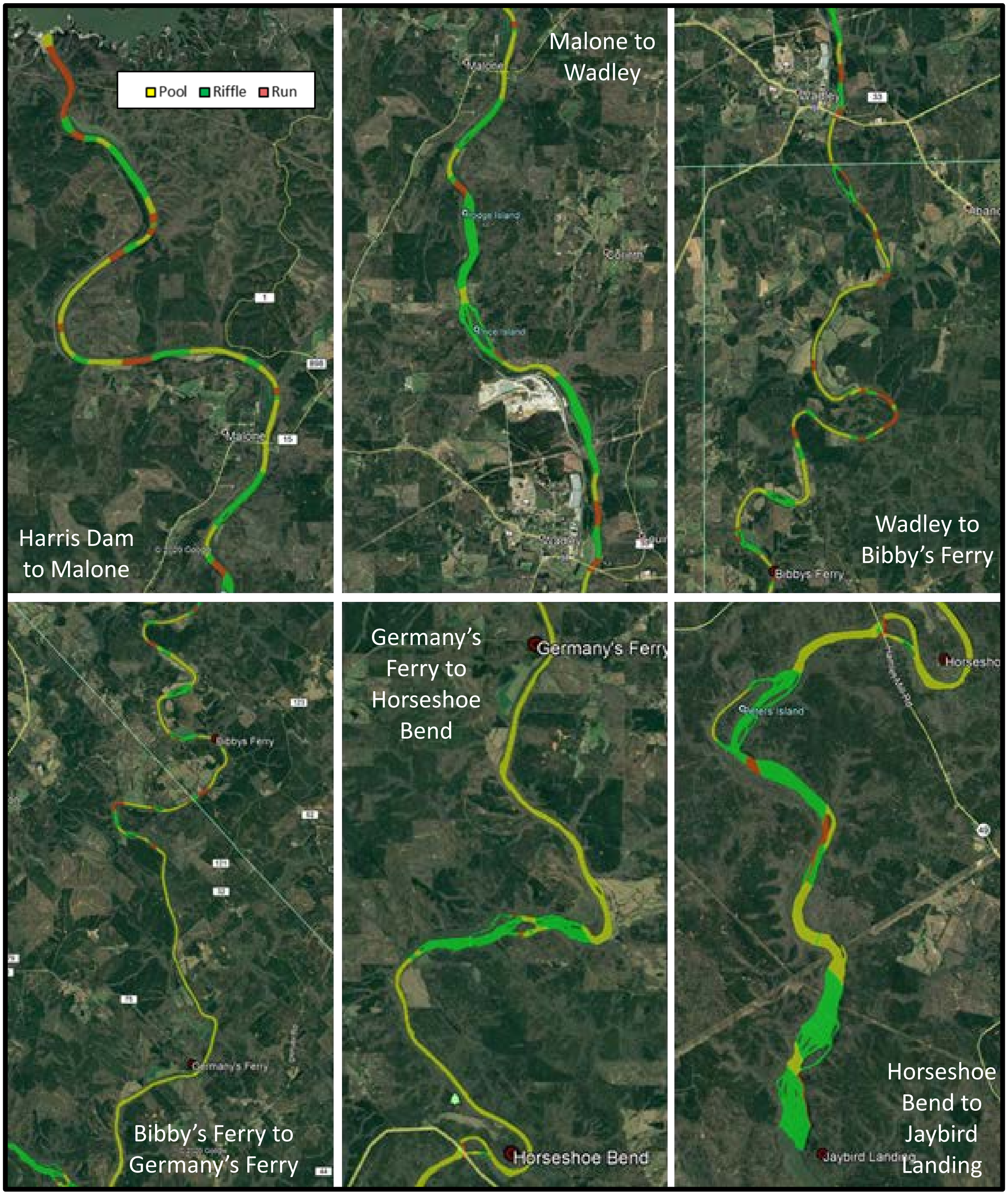



**FIGURE 3-2 AERIAL VIEWS OF MESOHABITAT CLASSIFICATIONS BY REACH**

## 3.2 WATER LEVEL AND TEMPERATURE

### 3.2.1 STUDY PERIOD HYDROLOGY AND CLIMATE

River flow between May 2019 and April 2020, as measured at the USGS Wadley gauge (Site No. 02414500; USGS 2020), ranged from a maximum of 20,900 cfs (February 13-14, 2020) to a minimum of 181 cfs (September 27, 2019). River flows during August and September 2019 were significantly lower than long-term (1984-2017) averages, and significantly higher in January to March 2020 (Figure 3-3).

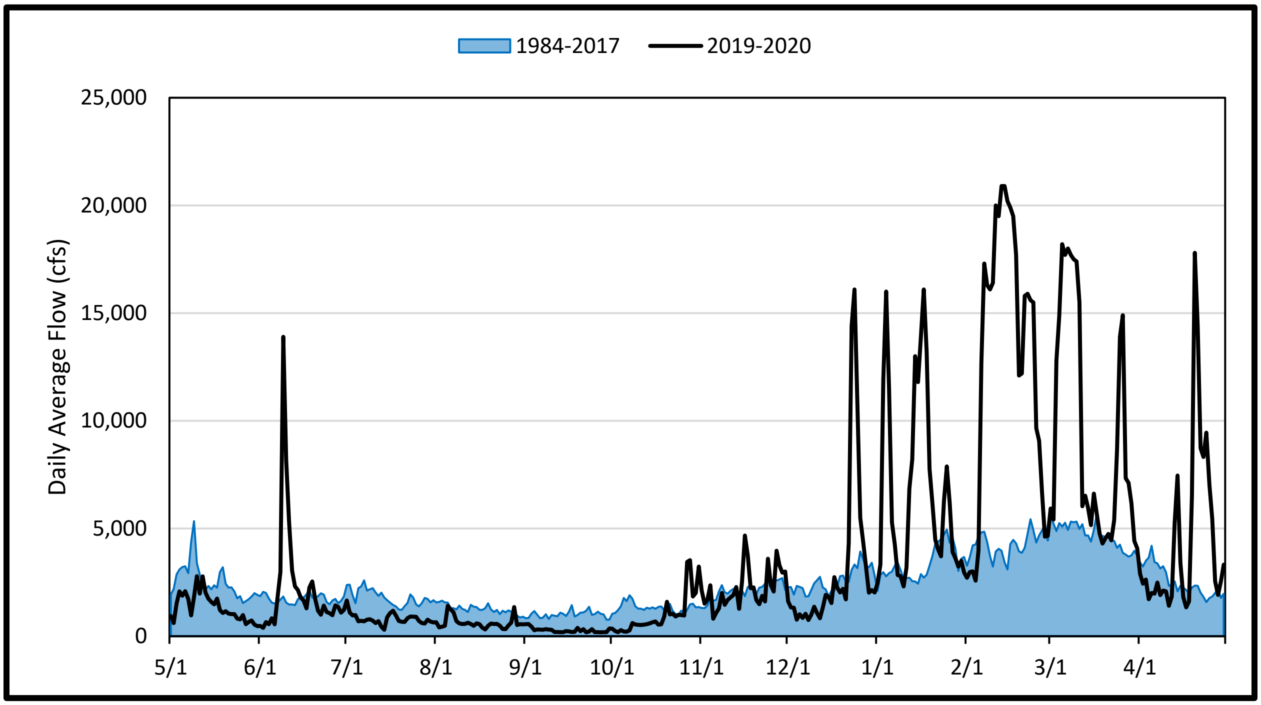



**FIGURE 3-3 LONG-TERM AND 2019-2020 DAILY AVERAGE RIVER FLOW AT WADLEY**

Air temperatures between May 2019 and April 2020, as measured at Alexander City, AL (Station USC00010160; NOAA 2020), ranged from a maximum of 38.3 °C (101 °F; September 18, 2019) to a minimum of -7.8 °C (18 °F; November 13, 2019). Average air temperatures from May 2019 to April 2020 were generally slightly warmer than 30-year normals, with the exception of November 2019 being slightly cooler (Figure 3-4).

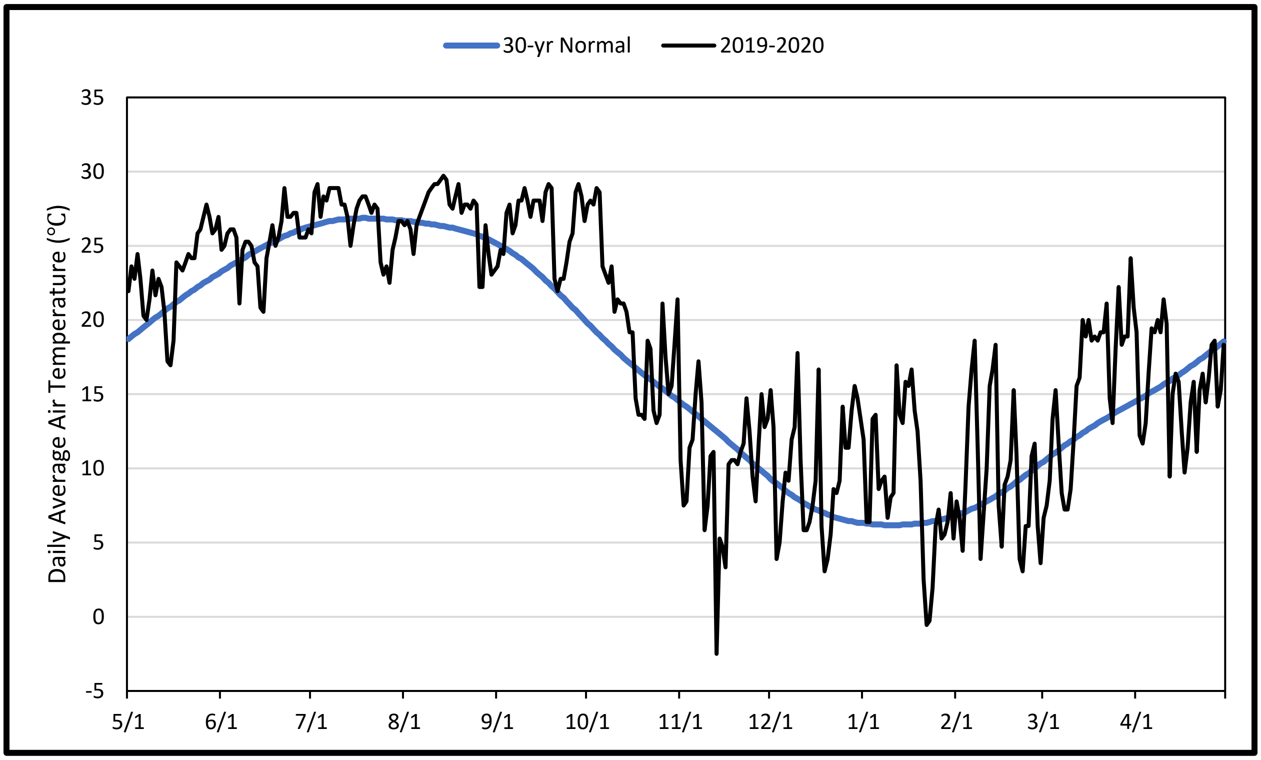



**FIGURE 3-4 30-YEAR NORMAL AND 2019-2020 AIR TEMPERATURES**

### 3.2.2 STUDY AREA HYDROGRAPHY

The 604-sq mi drainage area for the Tallapoosa River between Harris Dam and Horseshoe Bend includes 23 named tributaries. Five of these tributaries, Crooked Creek, Cornhouse Creek, High Pine Creek, Chikasanoxee Creek, and Chatahospee Creek, drain 71 percent (428 sq mi) of this area. Table 3-2 provides a summary of the location and drainage area of all 23 named tributaries within the study area.

Figure 3-5 provides a graphical depiction of the mean river bed elevation for the Tallapoosa River from Harris Dam to Horseshoe Bend based on bathymetry data developed for the HEC-RAS model. Within this study area, the elevation of the river bed decreases approximately 3.5 feet per mile. The reach between Malone and Wadley had the highest bed slope (5.5 feet per mile) and the reach between Bibby's Ferry and Germany's Ferry had the lowest bed slope (1.7 feet per mile).

**TABLE 3-2 SUMMARY OF STUDY AREA TRIBUTARY LOCATIONS AND DRAINAGE AREAS**

| Reach | Tributary | Miles Below Dam | Drainage Area (sq mi) | % Study Area Drainage Area |
|---|---|---|---|---|
| **Malone** | Crooked Creek | 0.8 | 98.3 | 16.3% |
| | Dewberry Branch | 5.8 | 1.3 | 0.2% |
| | Cornhouse Creek | 6.5 | 56.0 | 9.3% |
| | UT[1]/Direct Runoff | | 10.3 | 1.7% |
| | **Reach Total** | | **166.0** | **27.5%** |
| **Wadley** | No Business Creek | 7.3 | 6.0 | 1.0% |
| | Hurricane Creek | 9.5 | 14.8 | 2.4% |
| | Price Branch | 10 | 0.9 | 0.1% |
| | Cedar Creek | 10.7 | 10.6 | 1.7% |
| | Hillabeehago Branch | 11.7 | 2.0 | 0.3% |
| | Beaverdam Creek | 12.8 | 12.5 | 2.1% |
| | Carlisle Branch | 13.6 | 1.2 | 0.2% |
| | UT/Direct Runoff | | 7.6 | 1.3% |
| | **Reach Total** | | **55.5** | **9.2%** |
| **Bibby's Ferry** | Hutton Creek | 14.1 | 10.4 | 1.7% |
| | Rocky Branch | 14.7 | 1.2 | 0.2% |
| | High Pine Creek | 16.4 | 78.7 | 13.0% |
| | Laney Creek | 18.4 | 4.7 | 0.8% |
| | Chikasanoxee Creek | 20.7 | 76.1 | 12.6% |
| | UT/Direct Runoff | | 14.0 | 2.3% |
| | **Reach Total** | | **185.0** | **31%** |
| **Germany's Ferry** | Hodnett Mill Creek | 27.8 | 9.2 | 1.5% |
| | Galloway Creek | 31 | 7.0 | 1.2% |
| | Chatahospee Creek | 32.4 | 118.8 | 19.7% |
| | County Line Creek | 32.6 | 15.7 | 2.6% |
| | UT/Direct Runoff | | 10.3 | 1.7% |
| | **Reach Total** | | **161.0** | **26.7%** |
| **Horseshoe Bend** | Soapstone Creek | 36 | 1.6 | 0.3% |
| | Miller Creek | 37 | 4.8 | 0.8% |
| | Eagle Creek | 38.5 | 6.5 | 1.1% |
| | Sweetwater Creek | 39.5 | 3.6 | 0.6% |
| | UT/Direct Runoff | | 20.7 | 3.4% |
| | **Reach Total** | | **37.0** | **6.1%** |
| | **Study Area Total** | | **604** | |

[1] Unnamed Tributaries

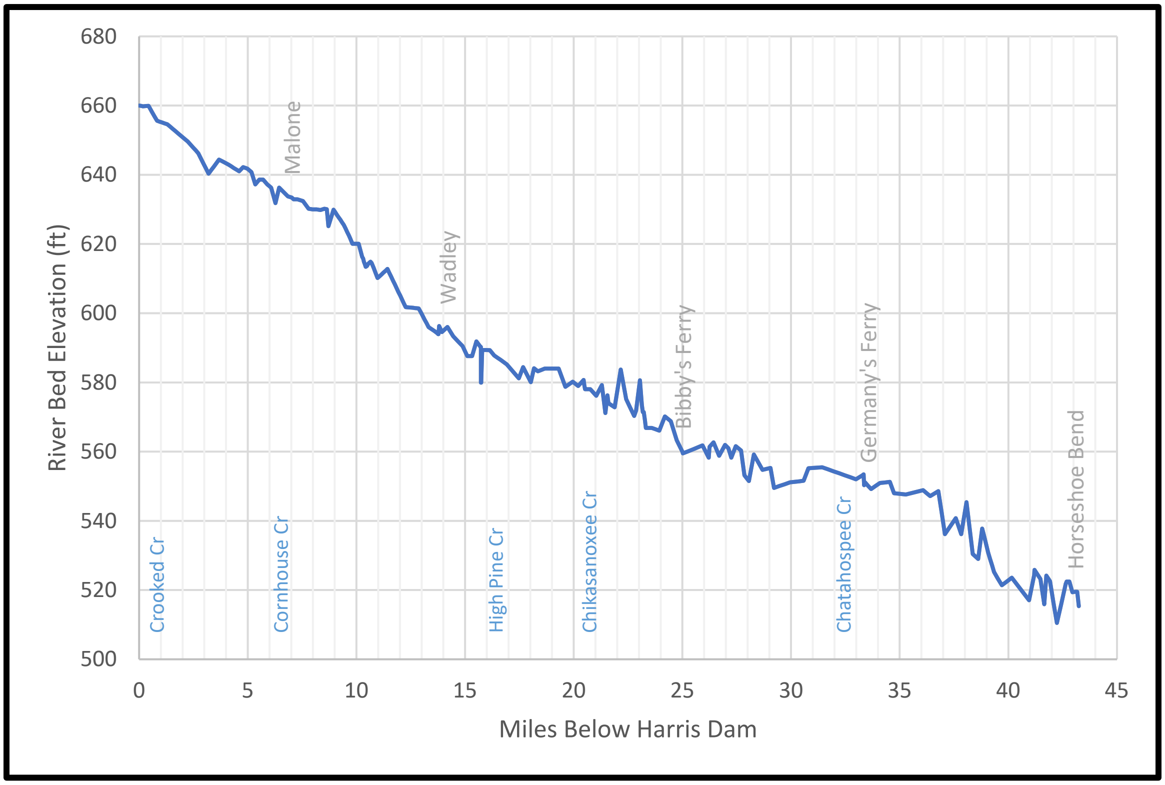



**FIGURE 3-5 TALLAPOOSA RIVER BED ELEVATION PROFILE**

### 3.2.3 WATER LEVEL

Water level logger data were analyzed to determine the magnitude of fluctuations at daily and hourly intervals. The difference between the maximum and minimum water levels was calculated for each day between May 1, 2019 and April 30, 2020. Average daily water level fluctuations ranged from 5.0 ft to 0.9 feet and decreased as the flows attenuated with increasing distance from Harris Dam (Figure 3-6; Table 3-3). The difference between the maximum and minimum water level for each hour was calculated for each day between May 1, 2019 and April 30, 2020. Average hourly water level fluctuations ranged from 0.48 ft to 0.06 ft and again decreased as the flows attenuated with increasing distance from Harris Dam (Figure 3-7; Table 3-4).

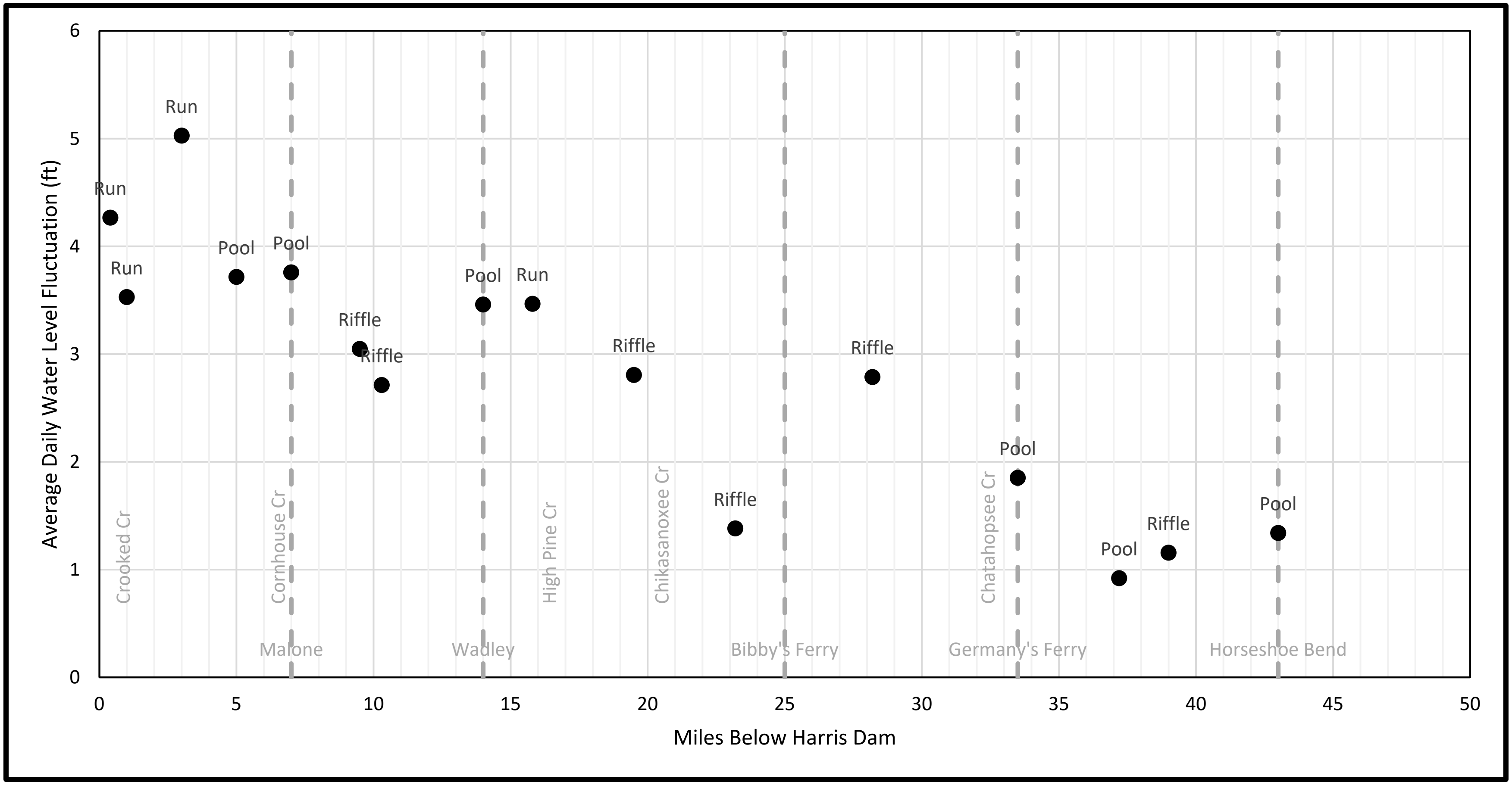



**FIGURE 3-6 AVERAGE DAILY WATER LEVEL FLUCTUATION FROM MAY 2019 TO APRIL 2020**

**TABLE 3-3 SUMMARY OF DAILY WATER LEVEL FLUCTUATIONS**

| Reach | Miles Below Harris Dam | Mesohabitat Type | Mean (ft) | Minimum (ft) | Maximum (ft) | 25th Percentile (ft) | 75th Percentile (ft) |
|---|---|---|---|---|---|---|---|
| Malone | 0.4 | Run | 4.3 | 0.1 | 8.4 | 4.5 | 4.8 |
| | 1.0 | Run | 3.5 | 0.1 | 8.1 | 3.6 | 4.0 |
| | 3.0 | Run | 5.0 | 0.1 | 12.6 | 4.3 | 6.3 |
| | 5.0 | Pool | 3.7 | 0.1 | 9.5 | 3.1 | 4.6 |
| | 7.0 | Pool | 3.8 | 0.1 | 10.1 | 2.6 | 5.0 |
| Wadley | 9.5 | Riffle | 3.0 | 0.1 | 8.3 | 2.2 | 3.9 |
| | 10.3 | Riffle | 2.7 | 0.1 | 7.3 | 2.0 | 3.5 |
| | 14.0 | Pool | 3.5 | 0.1 | 10.6 | 2.2 | 4.7 |
| Bibby's Ferry | 15.8 | Run | 3.5 | 0.2 | 13.6 | 1.6 | 4.9 |
| | 19.5 | Riffle | 2.8 | 0.2 | 12.1 | 1.3 | 3.9 |
| | 23.2 | Riffle | 1.4 | 0.1 | 6.6 | 0.8 | 1.8 |
| Germany's Ferry | 28.2 | Riffle | 2.8 | 0.1 | 13.7 | 1.3 | 3.9 |
| | 33.5 | Pool | 1.9 | 0.1 | 9.5 | 0.7 | 2.7 |
| Horseshoe Bend | 37.2 | Pool | 0.9 | 0.1 | 4.0 | 0.4 | 1.3 |
| | 39.0 | Riffle | 1.2 | 0.1 | 5.8 | 0.5 | 1.6 |
| | 43.0 | Pool | 1.3 | 0.1 | 5.6 | 0.5 | 1.9 |

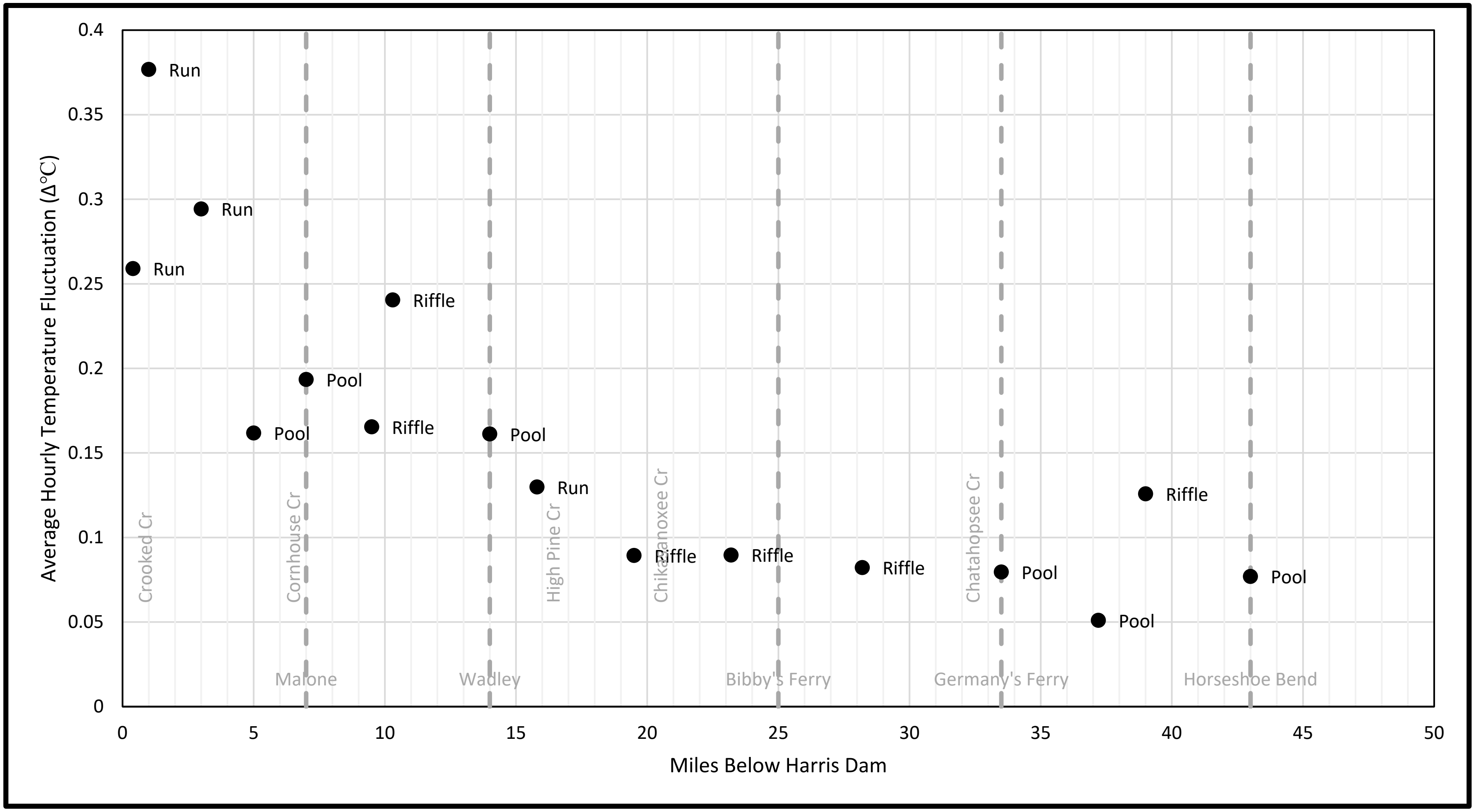



**FIGURE 3-7 AVERAGE HOURLY WATER LEVEL FLUCTUATION FROM MAY 2019 TO APRIL 2020**

**TABLE 3-4 SUMMARY OF HOURLY WATER LEVEL FLUCTUATIONS**

| Reach | Miles Below Harris Dam | Mesohabitat Type | Mean (ft) | Minimum (ft) | Maximum (ft) | 25th Percentile (ft) | 75th Percentile (ft) |
|---|---|---|---|---|---|---|---|
| Malone | 0.4 | Run | 0.45 | 0.00 | 6.00 | 0.01 | 0.14 |
| | 1.0 | Run | 0.48 | 0.00 | 5.40 | 0.01 | 0.14 |
| | 3.0 | Run | 0.48 | 0.00 | 5.15 | 0.02 | 0.78 |
| | 5.0 | Pool | 0.40 | 0.00 | 4.38 | 0.05 | 0.45 |
| | 7.0 | Pool | 0.38 | 0.00 | 5.08 | 0.05 | 0.45 |
| Wadley | 9.5 | Riffle | 0.27 | 0.00 | 3.87 | 0.04 | 0.31 |
| | 10.3 | Riffle | 0.27 | 0.00 | 4.00 | 0.05 | 0.27 |
| | 14.0 | Pool | 0.29 | 0.00 | 4.67 | 0.05 | 0.35 |
| Bibby's Ferry | 15.8 | Run | 0.28 | 0.00 | 4.82 | 0.05 | 0.31 |
| | 19.5 | Riffle | 0.21 | 0.00 | 3.09 | 0.05 | 0.25 |
| | 23.2 | Riffle | 0.10 | 0.00 | 1.24 | 0.03 | 0.12 |
| Germany's Ferry | 28.2 | Riffle | 0.20 | 0.00 | 2.80 | 0.05 | 0.23 |
| | 33.5 | Pool | 0.12 | 0.00 | 1.56 | 0.03 | 0.16 |
| Horseshoe Bend | 37.2 | Pool | 0.06 | 0.00 | 2.02 | 0.02 | 0.08 |
| | 39.0 | Riffle | 0.08 | 0.00 | 0.96 | 0.02 | 0.10 |
| | 43.0 | Pool | 0.09 | 0.00 | 1.12 | 0.02 | 0.11 |

### 3.2.4 WATER TEMPERATURE

Water level logger data were aggregated by month and location to depict the annual trend for the May 1, 2019 through April 30, 2020 monitoring period. Water temperatures were generally highest in July through September and lowest in December through February. Water temperatures generally increased with increasing distance from Harris Dam (Figure 3-8). Water temperature data were analyzed to determine how water temperatures fluctuate at daily and hourly intervals. The difference between the maximum and minimum water temperature was calculated for each day and each hour between May 1, 2019 and April 30, 2020. Average daily water temperature fluctuations ranged from 4.1 to 1.0 ℃ and decreased with increasing distance from Harris Dam (Figure 3-9; Table 3-5). Average hourly water temperature fluctuations ranged from 0.38 to 0.05 ℃ and decreased with increasing distance from Harris Dam (Figure 3-10; Table 3-6).

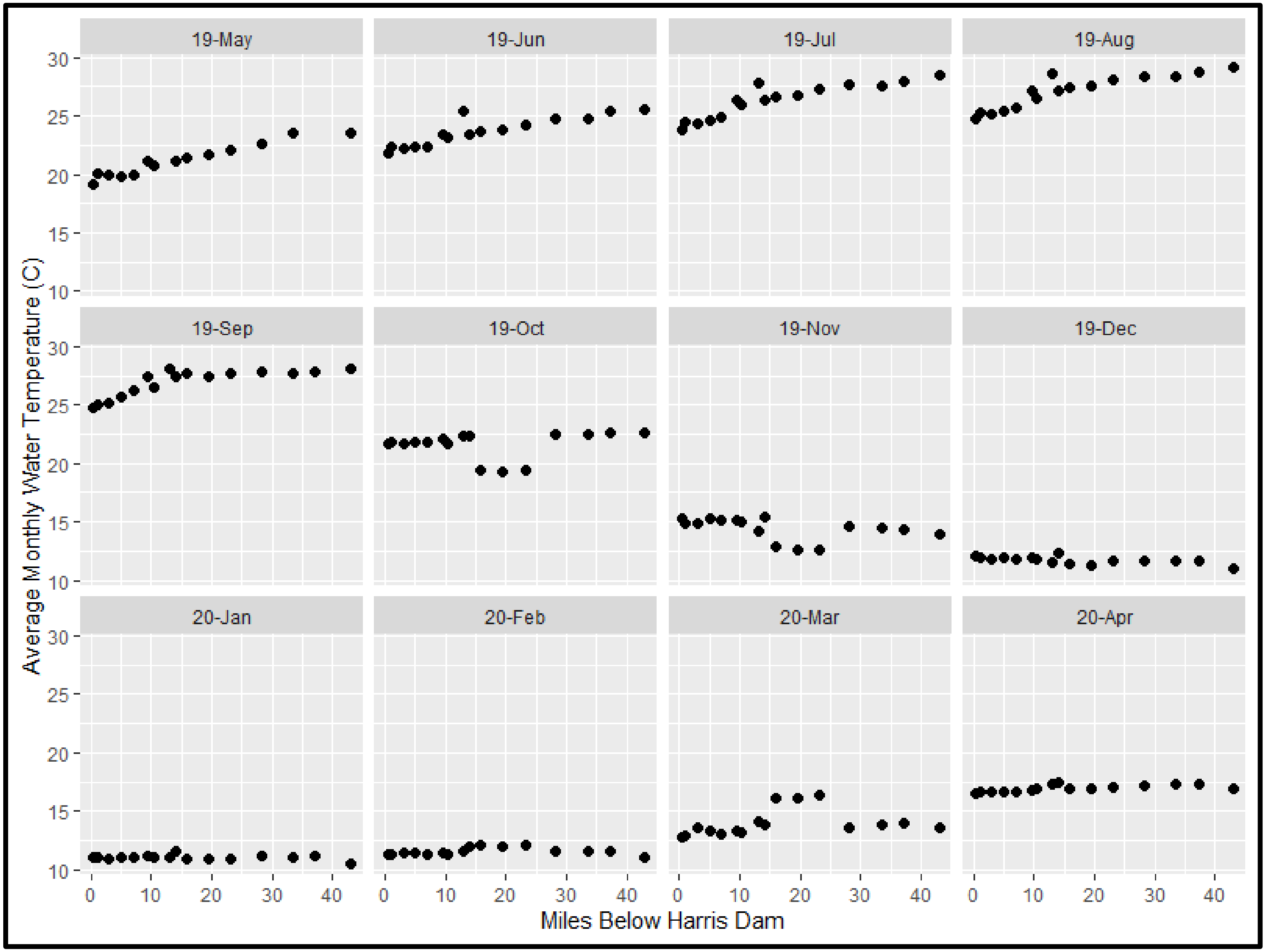



**FIGURE 3-8 MONTHLY AVERAGE WATER TEMPERATURE FROM MAY 2019 – APRIL 2020**

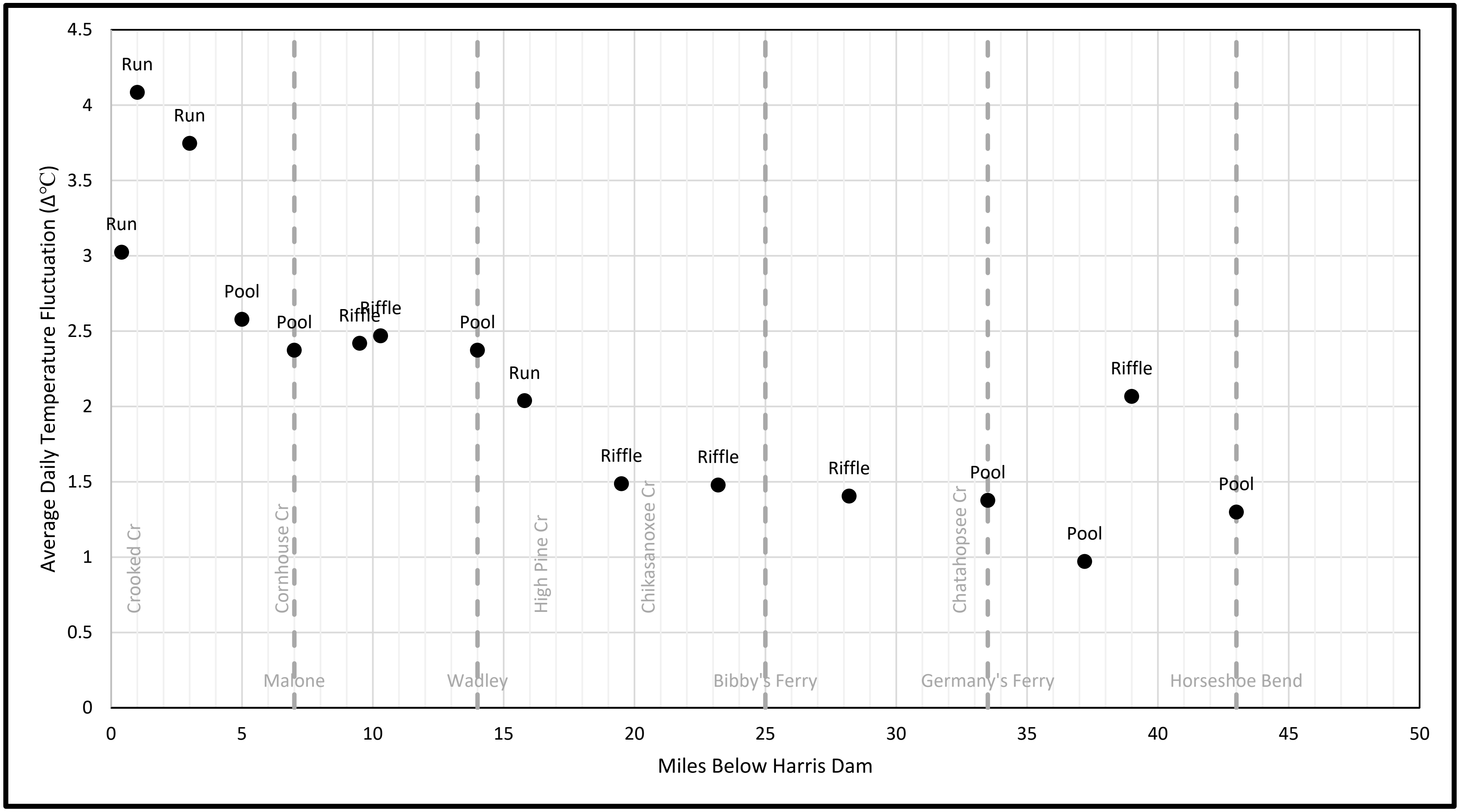



**FIGURE 3-9 AVERAGE DAILY WATER TEMPERATURE FLUCTUATION FROM MAY 2019 TO APRIL 2020**

**TABLE 3-5 SUMMARY OF DAILY WATER TEMPERATURE FLUCTUATIONS**

| Reach | Miles Below Harris Dam | Mesohabitat Type | Mean (°C) | Minimum (°C) | Maximum (°C) | 25th Percentile (°C) | 75th Percentile (°C) |
|---|---|---|---|---|---|---|---|
| Malone | 0.4 | Run | 3.0 | 0.1 | 7.3 | 1.8 | 4.2 |
| | 1.0 | Run | 4.1 | 0.1 | 8.8 | 2.4 | 5.6 |
| | 3.0 | Run | 3.7 | 0.1 | 8.7 | 1.8 | 5.4 |
| | 5.0 | Pool | 2.6 | 0.0 | 6.3 | 1.4 | 3.8 |
| | 7.0 | Pool | 2.4 | 0.2 | 5.1 | 1.6 | 3.8 |
| Wadley | 9.5 | Riffle | 2.4 | 0.1 | 5.1 | 1.4 | 3.4 |
| | 10.3 | Riffle | 2.5 | 0.1 | 6.5 | 1.2 | 3.6 |
| | 14.0 | Pool | 2.4 | 0.2 | 5.1 | 1.4 | 3.4 |
| Bibby's Ferry | 15.8 | Run | 2.0 | 0.2 | 5.0 | 1.1 | 3.0 |
| | 19.5 | Riffle | 1.5 | 0.2 | 4.5 | 1.1 | 1.8 |
| | 23.2 | Riffle | 1.5 | 0.2 | 5.1 | 1.0 | 1.9 |
| Germany's Ferry | 28.2 | Riffle | 1.4 | 0.1 | 3.6 | 0.9 | 1.9 |
| | 33.5 | Pool | 1.4 | 0.2 | 3.9 | 1.0 | 1.7 |
| Horseshoe Bend | 37.2 | Pool | 1.0 | 0.2 | 3.9 | 0.7 | 1.2 |
| | 39.0 | Riffle | 2.1 | 0.3 | 6.5 | 1.0 | 2.8 |
| | 43.0 | Pool | 1.3 | 0.2 | 3.2 | 0.9 | 1.6 |

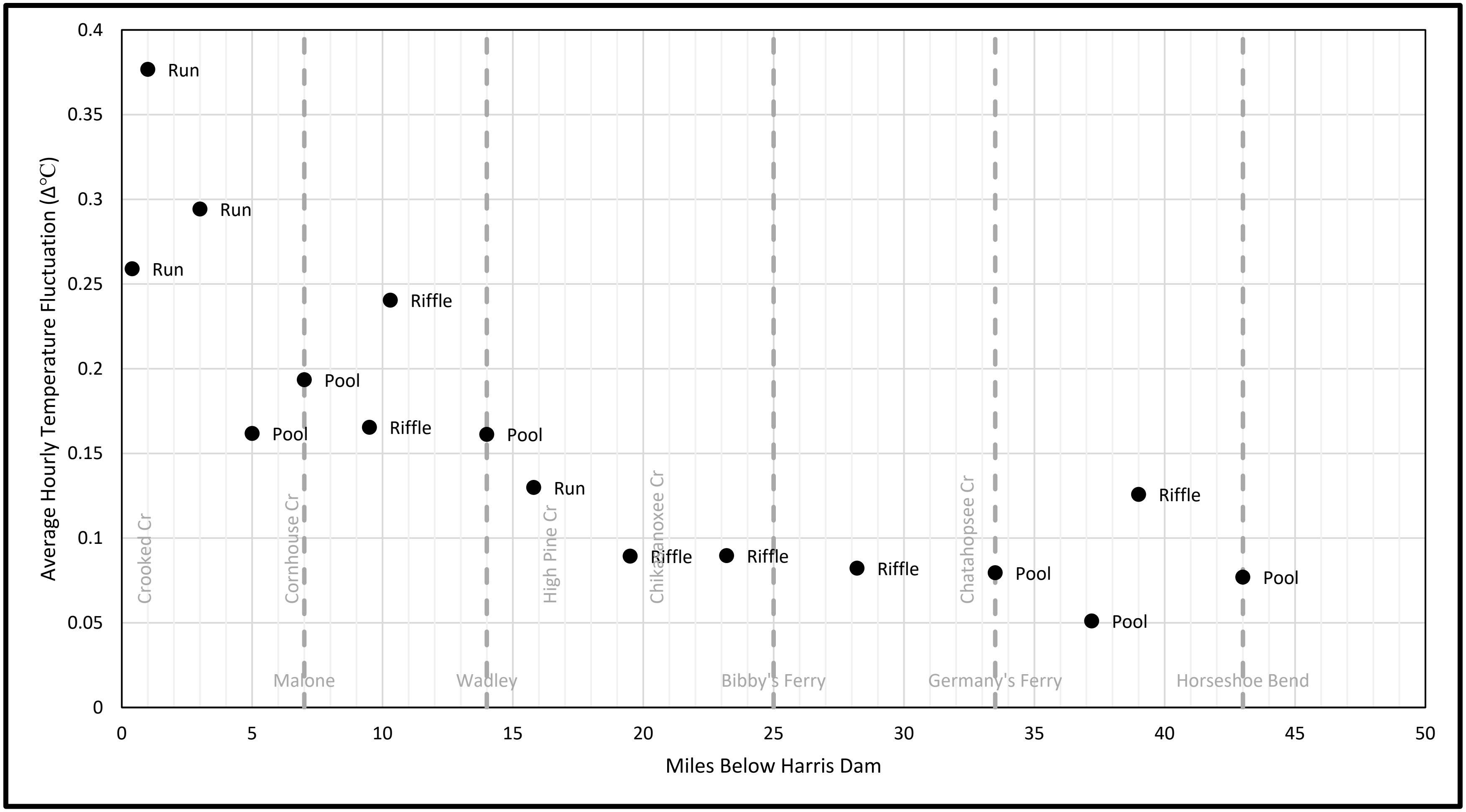



**FIGURE 3-10 AVERAGE HOURLY TEMPERATURE FLUCTUATION FROM MAY 2019 TO APRIL 2020**

**TABLE 3-6 SUMMARY OF HOURLY WATER TEMPERATURE FLUCTUATIONS**

| Reach | Miles Below Harris Dam | Mesohabitat Type | Mean (°C) | Minimum (°C) | Maximum (°C) | 25th Percentile (°C) | 75th Percentile (°C) |
|---|---|---|---|---|---|---|---|
| Malone | 0.4 | Run | 0.26 | 0.00 | 5.68 | 0.00 | 0.29 |
| | 1.0 | Run | 0.38 | 0.00 | 6.90 | 0.00 | 0.38 |
| | 3.0 | Run | 0.29 | 0.00 | 5.70 | 0.10 | 0.29 |
| | 5.0 | Pool | 0.16 | 0.00 | 3.40 | 0.00 | 0.19 |
| | 7.0 | Pool | 0.19 | 0.00 | 4.20 | 0.00 | 0.20 |
| Wadley | 9.5 | Riffle | 0.17 | 0.00 | 2.57 | 0.00 | 0.20 |
| | 10.3 | Riffle | 0.24 | 0.00 | 3.78 | 0.10 | 0.29 |
| | 14.0 | Pool | 0.16 | 0.00 | 3.10 | 0.00 | 0.20 |
| Bibby's Ferry | 15.8 | Run | 0.13 | 0.00 | 1.29 | 0.00 | 0.19 |
| | 19.5 | Riffle | 0.09 | 0.00 | 4.12 | 0.00 | 0.10 |
| | 23.2 | Riffle | 0.09 | 0.00 | 1.18 | 0.00 | 0.10 |
| Germany's Ferry | 28.2 | Riffle | 0.08 | 0.00 | 1.15 | 0.00 | 0.10 |
| | 33.5 | Pool | 0.08 | 0.00 | 0.79 | 0.00 | 0.10 |
| Horseshoe Bend | 37.2 | Pool | 0.05 | 0.00 | 1.14 | 0.00 | 0.10 |
| | 39.0 | Riffle | 0.13 | 0.00 | 2.03 | 0.00 | 0.20 |
| | 43.0 | Pool | 0.08 | 0.00 | 0.80 | 0.00 | 0.10 |

## 3.3 WETTED PERIMETER

Detailed hourly outputs of wetted perimeter from HEC-RAS model runs of Pre-Green Plan, Green Plan, and 150 cfs continuous minimum flow operational scenarios were analyzed and compared. Habitat duration was analyzed by calculating the percent of time a wetted perimeter value was exceeded for each width increment between the maximum and minimum value for selected model cross sections. An example of the calculation and interpretation of this analysis is provided below.

| Wetted Perimeter (ft) |
|---|
| 1 |
| 1.5 |
| 2 |
| 6 |
| 4 |
| 1 |
| 3 |
| 8 |
| 2 |
| 3 |

| Bins (ft) | Count | Exceedence |
|---|---|---|
| > 0 | 10 | 100% |
| > 1 | 8 | 80% |
| > 2 | 5 | 50% |
| > 3 | 3 | 30% |
| > 4 | 2 | 20% |
| > 5 | 2 | 20% |
| > 6 | 1 | 10% |
| > 7 | 1 | 10% |
| > 8 | 0 | 0% |

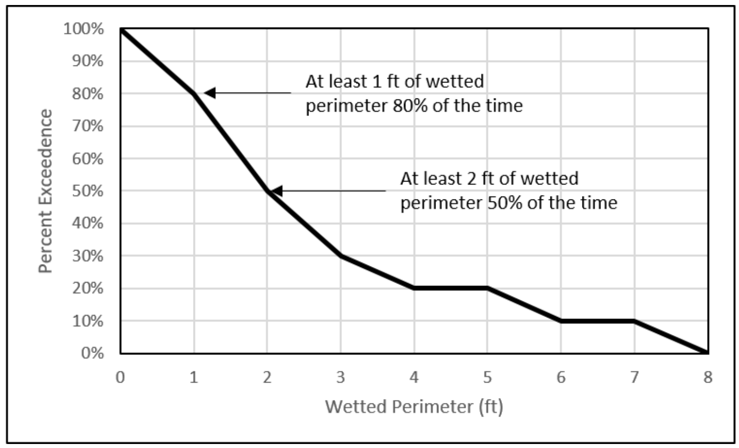



**FIGURE 3-11 EXAMPLE OF WETTED PERIMETER DURATION CALCULATION**

Results of these analyses are presented in Figure 3-12 and Figure 3-13. Compared to the Pre-Green Plan scenario, the Green Plan scenario shows modest increases in wetted perimeter at cross sections near the dam (0.25 – 2 miles downstream), with little appreciable difference further downstream. Compared to the Green Plan scenario, the 150 cfs continuous minimum flow scenario shows an increase in wetted perimeter that becomes smaller with increasing distance from the dam. Comparisons for cross sections greater than 23 miles downstream of Harris Dam (near Bibby's Ferry) are not presented as there was no difference in habitat duration curves for the three downstream release alternatives.

Seasonal differences in wetted perimeter between the three operational scenarios were examined by aggregating hourly HEC-RAS outputs by season, where:

- Winter = December, January, and February;
- Spring = March, April and May;
- Summer = June, July, and August; and;
- Fall = September, October, and November.

Box plots of seasonal analyses are presented in Figure 3-14 and Figure 3-15. Similar to the habitat duration results, seasonal analysis shows modest increases in median wetted perimeter at cross sections near the dam (0.25 – 2 miles downstream), especially during fall, with little appreciable difference further downstream. Compared to the Green Plan scenario, the 150 cfs minimum flow scenario shows an increase in wetted perimeter at cross sections near the dam, especially in fall, but only small increases at cross sections greater than 23 miles downstream of the dam.

The amount of daily wetted perimeter fluctuation and the difference between the maximum and minimum value for each day was determined for each operational scenario. Box plots depicting seasonal daily wetted perimeter fluctuations are presented in Figure 3-16 and Figure 3-17. Results indicate slightly smaller daily fluctuations under the Green Plan scenario compared to the Pre-Green Plan. The 150 cfs minimum flow had smaller daily fluctuations compared to the Green Plan. At distances greater than 23 miles downstream of the dam, there were no differences in seasonal daily wetted perimeter fluctuations.

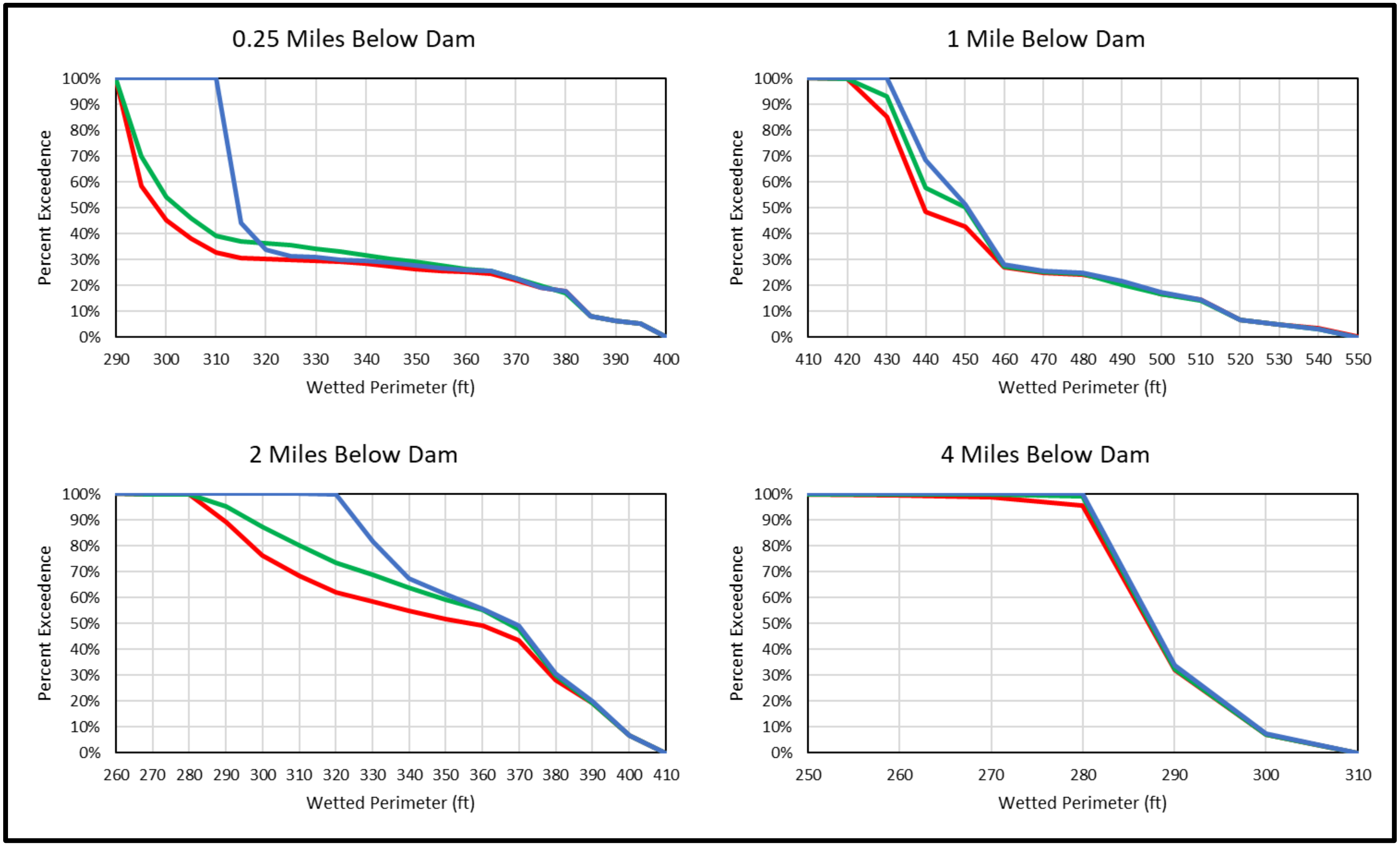



**FIGURE 3-12 WETTED PERIMETER DURATION PLOTS OF PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 0.25 TO 4 MILES BELOW HARRIS DAM**

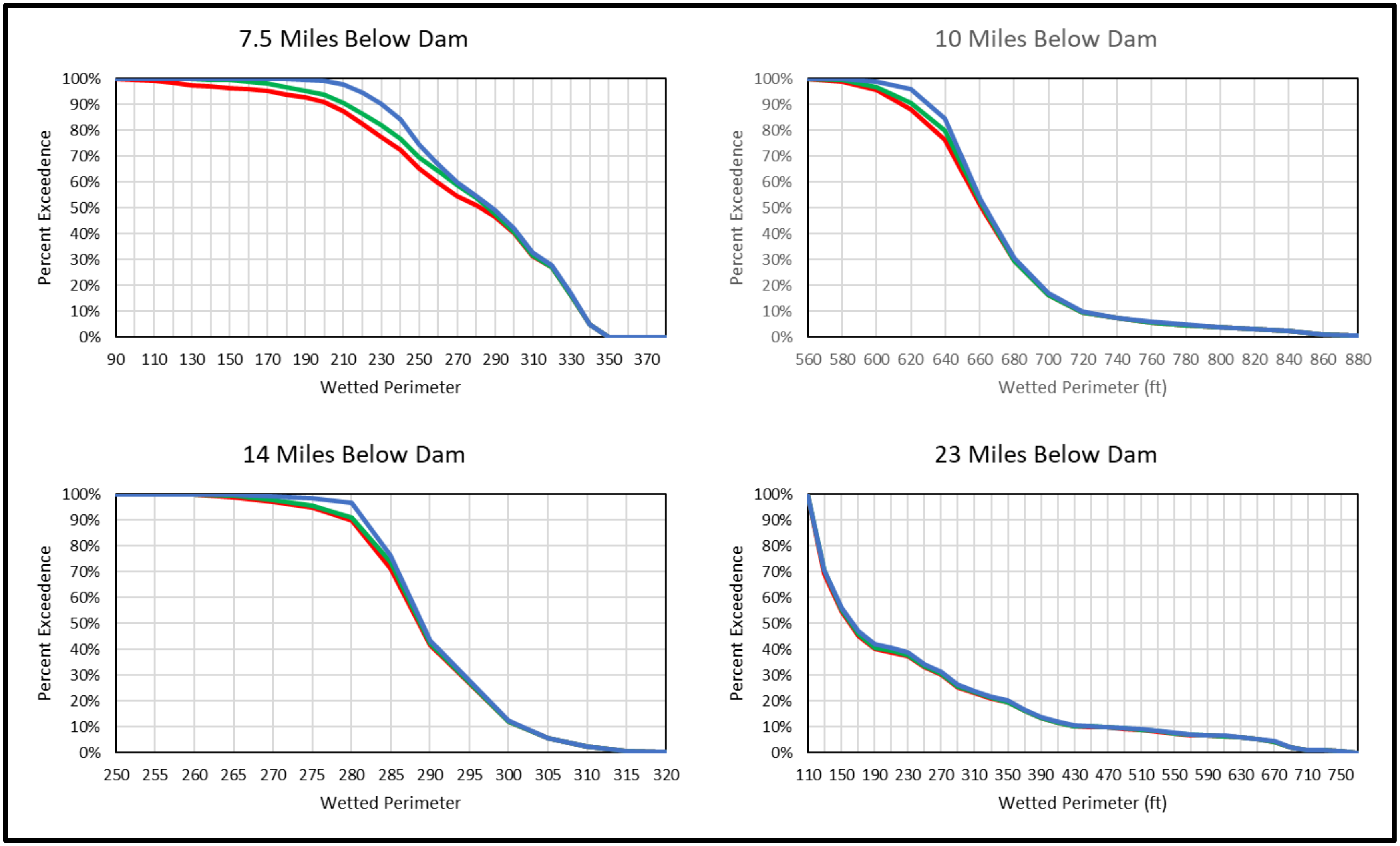



**FIGURE 3-13 WETTED PERIMETER DURATION PLOTS OF PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 7.5 TO 23 MILES BELOW HARRIS DAM**

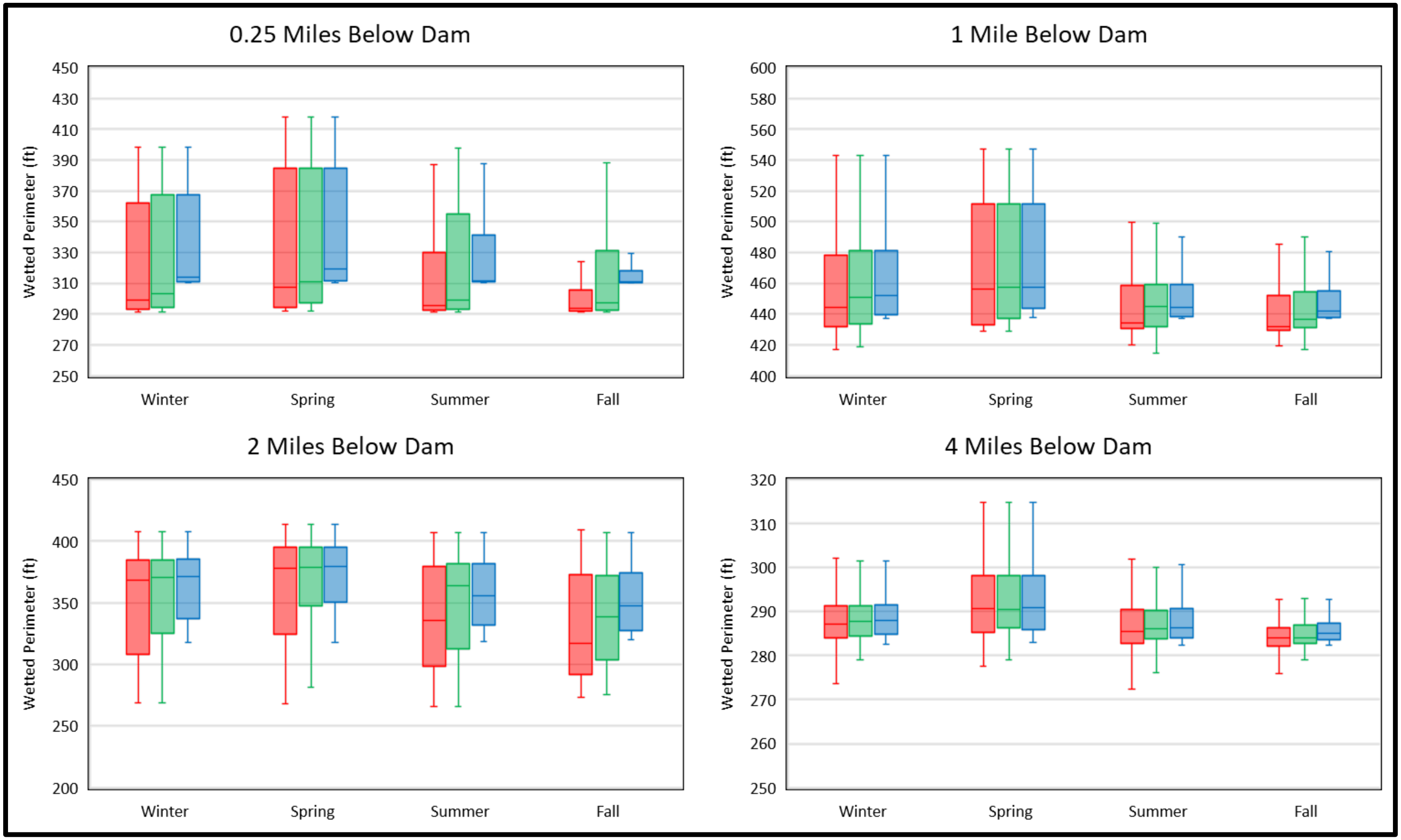



**FIGURE 3-14 BOX PLOTS OF SEASONAL WETTED PERIMETER FOR PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 0.25 TO 4 MILES BELOW HARRIS DAM**

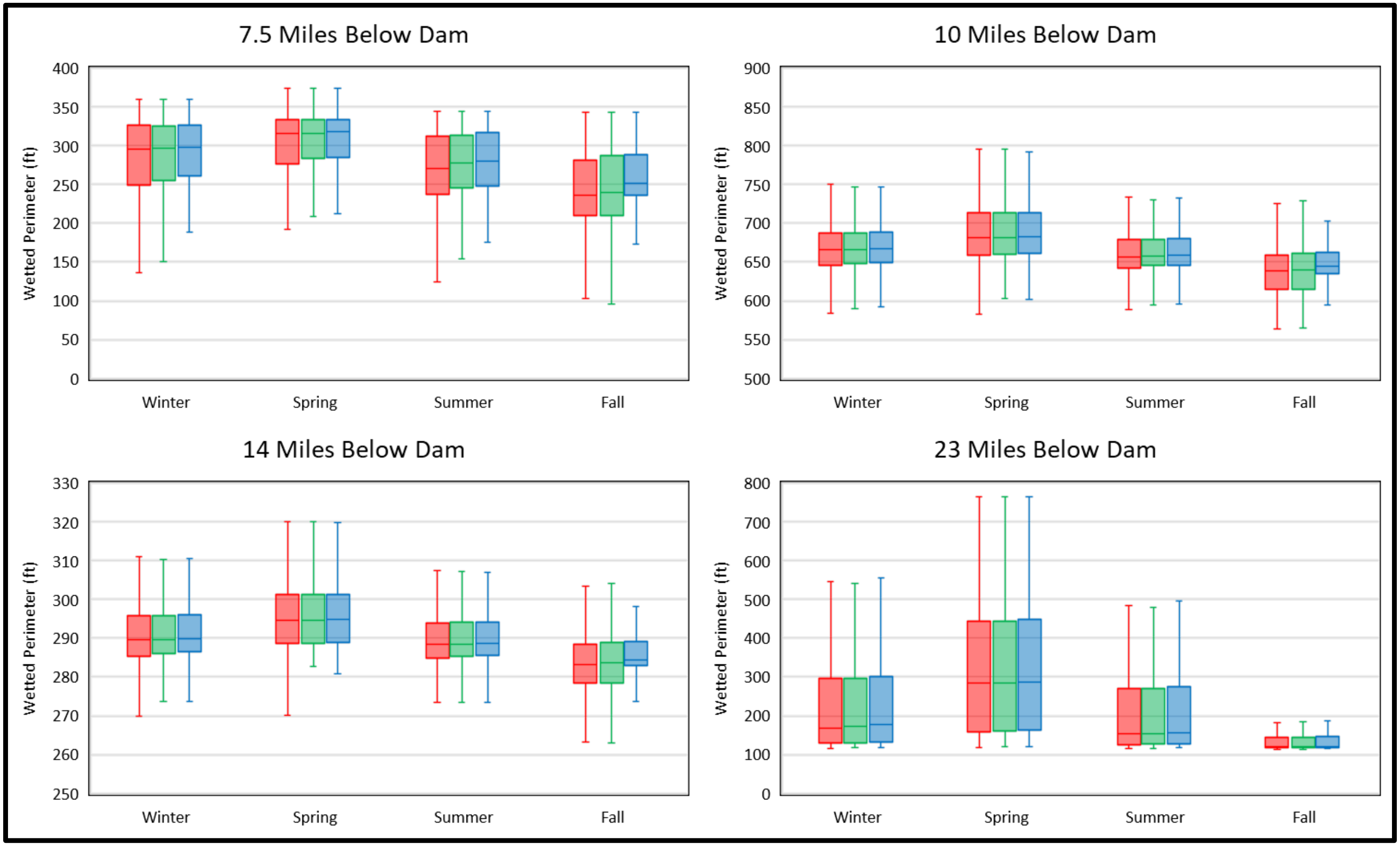



**FIGURE 3-15 BOX PLOTS OF SEASONAL WETTED PERIMETER FOR PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 7.5 TO 23 MILES BELOW HARRIS DAM**

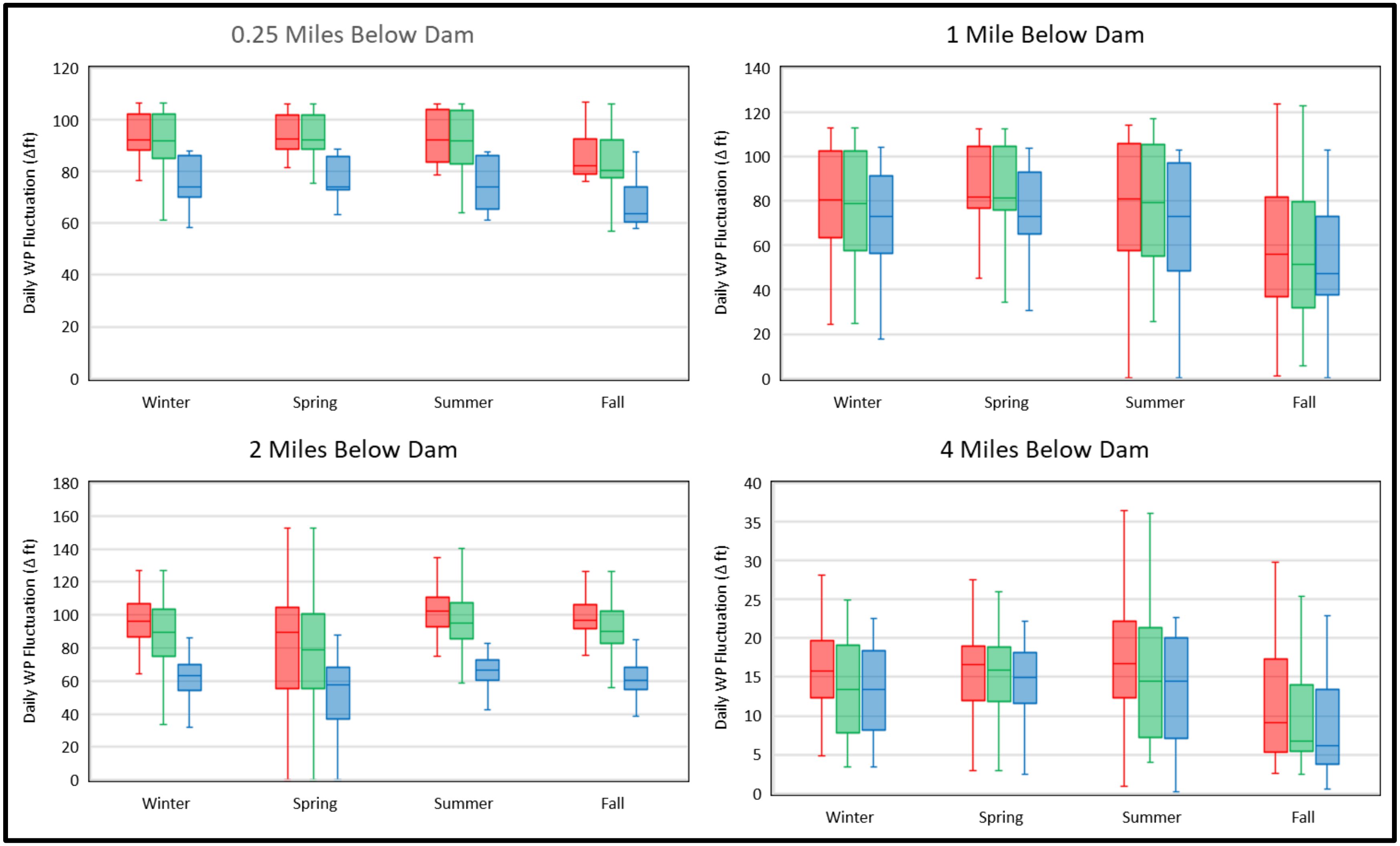



**FIGURE 3-16 BOX PLOTS OF DAILY WETTED PERIMETER FLUCTUATIONS BY SEASON FOR PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 0.25 TO 4 MILES BELOW HARRIS DAM**

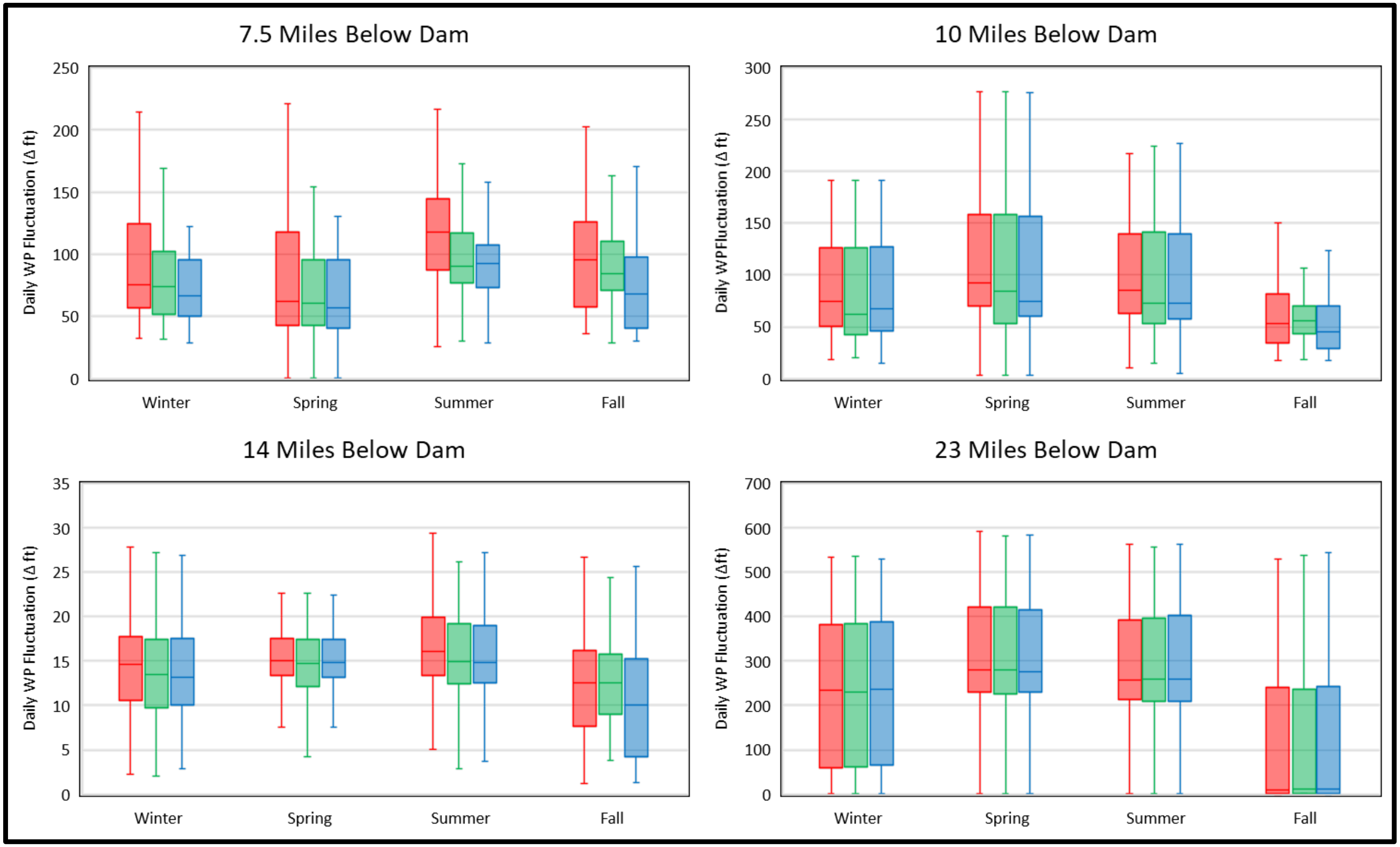



**FIGURE 3-17 BOX PLOTS OF DAILY WETTED PERIMETER FLUCTUATION BY SEASON FOR PRE-GREEN PLAN (RED), GREEN PLAN (GREEN), AND 150 CFS MINIMUM FLOW (BLUE) FROM 7.5 TO 23 MILES BELOW HARRIS DAM**

# 4.0 DISCUSSION AND CONCLUSION

The goal of this study was to describe the relationship between Harris Project operations and aquatic habitat in the Tallapoosa River from Harris Dam downstream through Horseshoe Bend.

This goal was accomplished by analyzing mesohabitat types, measuring water level and temperature at varying distances below the dam, collecting bathymetric measurements of the river bed, and simulating Pre-Green Plan, Green Plan, and 150 cfs continuous minimum flow operating scenarios.

Mesohabitat analysis revealed that pools and riffles/shoals are the predominant habitat types within the study area. A large concentration of riffle/shoal habitat is present in the Tallapoosa River between Malone and Wadley, compared to other reaches.

Water level logger data collected between May 2019 and April 2020 provided insight into the frequency and magnitude of water level fluctuations at varying distances from the dam. Results indicate that, on average, the largest daily water level fluctuations occur in the first seven miles below Harris Dam. Average daily water level fluctuations decreased in a relatively linear trend downstream through Horseshoe Bend. Average hourly water level fluctuations followed a similar trend.

Water temperature data collected between May 2019 and April 2020 provided insight into the frequency and magnitude of water temperature fluctuations at varying distances from the dam. Results indicate that the largest daily water temperature fluctuations occur in the first seven miles below Harris Dam. Average daily and hourly water temperature fluctuations decreased according to a relatively linear trend in the downstream direction through Horseshoe Bend.

When considering the results, it is important to note that the data includes the effects of inflows from numerous tributaries within the study area. These inflows, especially during localized or widespread storm events, could have considerable effects on water level and temperature at individual monitoring sites, depending on the magnitude and duration of the storm/high flow event. It is also worth noting that river flows during August and September of 2019, typically the warmest months of the year, were well below normal which could have resulted in greater daily and hourly temperature fluctuations than normal.

Analysis of HEC-RAS simulation outputs show relatively small differences in wetted perimeter duration between Pre-Green and Green Plan operations. The 150 continuous minimum flow scenario showed increases in wetted perimeter duration compared to the Pre-Green Plan and Green Plan scenarios. Analysis of daily wetted perimeter fluctuations revealed similar trends. Differences in wetted perimeter duration and daily fluctuations between the three operating scenarios were indistinguishable at distances greater than 23 miles downstream of Harris Dam. Alabama Power will use the HEC-RAS model developed in this study to evaluate impacts to aquatic habitat from other operational scenarios in Phase 2 of the Downstream Release Alternatives Study.

# 5.0 REFERENCES

Alabama Power. 2018. R.L. Harris Hydroelectric Project Pre-Application Document FERC No. 2626. Alabama Power Company, Birmingham, AL.

# APPENDIX A

# ACRONYMS AND ABBREVIATIONS

## Acronyms and Abbreviations

### *A*

| | |
|---|---|
| A&I | Agricultural and Industrial |
| ACFWRU | Alabama Cooperative Fish and Wildlife Research Unit |
| ACF | Apalachicola-Chattahoochee-Flint (River Basin) |
| ACT | Alabama-Coosa-Tallapoosa (River Basin) |
| ADCNR | Alabama Department of Conservation and Natural Resources |
| ADECA | Alabama Department of Economic and Community Affairs |
| ADEM | Alabama Department of Environmental Management |
| ADROP | Alabama-ACT Drought Response Operations Plan |
| AHC | Alabama Historical Commission |
| Alabama Power | Alabama Power Company |
| AMP | Adaptive Management Plan |
| ALNHP | Alabama Natural Heritage Program |
| APE | Area of Potential Effects |
| ARA | Alabama Rivers Alliance |
| ASSF | Alabama State Site File |
| ATV | All-Terrain Vehicle |
| AWIC | Alabama Water Improvement Commission |
| AWW | Alabama Water Watch |

### *B*

| | |
|---|---|
| BA | Biological Assessment |
| B.A.S.S. | Bass Anglers Sportsmen Society |
| BCC | Birds of Conservation Concern |
| BLM | U.S. Bureau of Land Management |
| BOD | Biological Oxygen Demand |

### *C*

| | |
|---|---|
| °C | Degrees Celsius or Centrigrade |
| CEII | Critical Energy Infrastructure Information |
| CFR | Code of Federal Regulation |
| cfs | Cubic Feet per Second |
| cfu | Colony Forming Unit |
| CLEAR | Community Livability for the East Alabama Region |
| CPUE | Catch-per-unit-effort |
| CWA | Clean Water Act |

## *D*

| | |
|---|---|
| DEM | Digital Elevation Model |
| DIL | Drought Intensity Level |
| DO | Dissolved Oxygen |
| dsf | day-second-feet |

## *E*

| | |
|---|---|
| EAP | Emergency Action Plan |
| ECOS | Environmental Conservation Online System |
| EFDC | Environmental Fluid Dynamics Code |
| EFH | Essential Fish Habitat |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |

## *F*

| | |
|---|---|
| °F | Degrees Fahrenheit |
| ft | Feet |
| F&W | Fish and Wildlife |
| FEMA | Federal Emergency Management Agency |
| FERC | Federal Energy Regulatory Commission |
| FNU | Formazin Nephelometric Unit |
| FOIA | Freedom of Information Act |
| FPA | Federal Power Act |

## *G*

| | |
|---|---|
| GCN | Greatest Conservation Need |
| GIS | Geographic Information System |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning Systems |
| GSA | Geological Survey of Alabama |

## *H*

| | |
|---|---|
| Harris Project | R.L. Harris Hydroelectric Project |
| HAT | Harris Action Team |
| HEC | Hydrologic Engineering Center |
| HEC-DSSVue | HEC-Data Storage System and Viewer |
| HEC-FFA | HEC-Flood Frequency Analysis |
| HEC-RAS | HEC-River Analysis System |
| HEC-ResSim | HEC-Reservoir System Simulation Model |
| HEC-SSP | HEC-Statistical Software Package |

| | |
|---|---|
| HDSS | High Definition Stream Survey |
| hp | Horsepower |
| HPMP | Historic Properties Management Plan |
| HPUE | Harvest-per-unit-effort |
| HSB | Horseshoe Bend National Military Park |

## *I*

| | |
|---|---|
| IBI | Index of Biological Integrity |
| IDP | Inadvertent Discovery Plan |
| IIC | Intercompany Interchange Contract |
| IVM | Integrated Vegetation Management |
| ILP | Integrated Licensing Process |
| IPaC | Information Planning and Conservation |
| ISR | Initial Study Report |

## *J*

| | |
|---|---|
| JTU | Jackson Turbidity Units |

## *K*

| | |
|---|---|
| kV | Kilovolt |
| kva | Kilovolt-amp |
| kHz | Kilohertz |

## *L*

| | |
|---|---|
| LIDAR | Light Detection and Ranging |
| LWF | Limited Warm-water Fishery |
| LWPOA | Lake Wedowee Property Owners’ Association |

## *M*

| | |
|---|---|
| m | Meter |
| $m^3$ | Cubic Meter |
| M&I | Municipal and Industrial |
| mg/L | Milligrams per liter |
| ml | Milliliter |
| mgd | Million Gallons per Day |
| µg/L | Microgram per liter |
| µs/cm | Microsiemens per centimeter |
| $mi^2$ | Square Miles |
| MOU | Memorandum of Understanding |

| | |
|---|---|
| MPN | Most Probable Number |
| MRLC | Multi-Resolution Land Characteristics |
| msl | Mean Sea Level |
| MW | Megawatt |
| MWh | Megawatt Hour |

***N***

| | |
|---|---|
| n | Number of Samples |
| NEPA | National Environmental Policy Act |
| NGO | Non-governmental Organization |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanographic and Atmospheric Administration |
| NOI | Notice of Intent |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | National Park Service |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NTU | Nephelometric Turbidity Unit |
| NWI | National Wetlands Inventory |

***O***

| | |
|---|---|
| OAR | Office of Archaeological Resources |
| OAW | Outstanding Alabama Water |
| ORV | Off-road Vehicle |
| OWR | Office of Water Resources |

***P***

| | |
|---|---|
| PA | Programmatic Agreement |
| PAD | Pre-Application Document |
| PDF | Portable Document Format |
| pH | Potential of Hydrogen |
| PID | Preliminary Information Document |
| PLP | Preliminary Licensing Proposal |
| Project | R.L. Harris Hydroelectric Project |
| PUB | Palustrine Unconsolidated Bottom |
| PURPA | Public Utility Regulatory Policies Act |
| PWC | Personal Watercraft |
| PWS | Public Water Supply |

***Q***

| | |
|---|---|
| QA/QC | Quality Assurance/Quality Control |

***R***

| | |
|---|---|
| RM | River Mile |
| RTE | Rare, Threatened and Endangered |
| RV | Recreational Vehicle |

***S***

| | |
|---|---|
| S | Swimming |
| SCORP | State Comprehensive Outdoor Recreation Plan |
| SCP | Shoreline Compliance Program |
| SD1 | Scoping Document 1 |
| SH | Shellfish Harvesting |
| SHPO | State Historic Preservation Office |
| Skyline WMA | James D. Martin-Skyline Wildlife Management Area |
| SMP | Shoreline Management Plan |
| SU | Standard Units |

***T***

| | |
|---|---|
| T&E | Threatened and Endangered |
| TCP | Traditional Cultural Properties |
| TMDL | Total Maximum Daily Load |
| TNC | The Nature Conservancy |
| TRB | Tallapoosa River Basin |
| TSI | Trophic State Index |
| TSS | Total Suspended Soils |
| TVA | Tennessee Valley Authority |

***U***

| | |
|---|---|
| USDA | U.S. Department of Agriculture |
| USGS | U.S. Geological Survey |
| USACE | U.S. Army Corps of Engineers |
| USFWS | U.S. Fish and Wildlife Service |

***W***

| | |
|---|---|
| WCM | Water Control Manual |
| WMA | Wildlife Management Area |
| WMP | Wildlife Management Plan |
| WQC | Water Quality Certification |

# APPENDIX B

## LEVEL LOGGER DATA
## (ATTACHED IN MICROSOFT EXCEL SPREADSHEET FORMAT)

Attachment 2

Downstream Aquatic Habitat Consultation Record

(May 2019-June 2020)

**HAT 3 Stakeholder Meeting Summary**
**March 20, 2019**
**10 am to 2 pm**
**E. W. Shell Fisheries Center, Auburn, AL**

**Participants:**
Taconya Goar – Alabama Department of Conservation of Natural Resources
Mike Holley – Alabama Department of Conservation of Natural Resources
Nick Nichols – Alabama Department of Conservation of Natural Resources
Angie Anderegg – Alabama Power
Jeff Baker – Alabama Power
Jason Carlee – Alabama Power
Keith Chandler – Alabama Power
Steve Krotzer – Alabama Power
Tina Mills – Alabama Power
Curt Chaffin – Alabama Rivers Alliance
Kristie Coffman – Auburn University
Dennis Devries – Auburn University
Elise Irwin – Auburn University
Ehlana Stell – Auburn University
Russell Wright – Auburn University
Matt and Ann Campbell – Alabama Water Watch
Leslie Allen – Balch and Bingham
Jim Hancock – Balch and Bingham
Colin Dinken – Kleinschmidt
Amanda Fleming – Kleinschmidt
Jason Moak – Kleinschmidt

**Action Items:**

- Alabama Power will continue to conduct relicensing studies and provide periodic updates to Harris Action Team (HAT) members.
- Kleinschmidt will add Matt and Ann Campbell (Alabama Water Watch (AWW)) to the email stakeholder database.

**Notes:**
The following is a summary of the March 20, 2019 Harris Action Team (HAT) 3 meeting. The presentations from the meeting are included in Attachment A.

**Introduction – Angie Anderegg (Alabama Power)**
Angie gave an introduction, a safety moment, and the status of the Alabama Power R.L. Harris Project (Project) relicensing process. Alabama Power filed Study Plans in November 2018 and comments were made during and following the December 2018 study plan meeting. Revised Study Plans were filed March 13, 2019. The FERC will issue their decision on the Study Plans on April 13, 2019.

**Aquatic Resources – Jason Moak (Kleinschmidt)**
Jason discussed the goal, geographic scope, and components of the Aquatic Resources Study, including temperature requirements of fish, an assessment of temperature data from both

regulated and unregulated reaches of the river, and fish community surveys by both wadeable (30+2 method) and boat-mounted methods. Jason explained that recent weather events and high flows have delayed field work, which will continue in the spring. Results of the 2017 and 2018 fish surveys at Heflin, Malone, and Wadley were similar to results reported over the past 14 years. The majority of specimens sampled were species of minnows and sunfish. Next, Jason explained that the Alabama Department of Environmental Management (ADEM) was looking to develop a standardized procedure for non-wadeable areas similar to the 30+2 method used in wadeable reaches. Jeff Baker (Alabama Power) noted that fish were sampled at Wadley and Horseshoe Bend using boat-mounted electrofishing in summer of 2018. Some species found in these areas are not typically seen in wadeable areas. Jason explained that Horseshoe Bend yielded twice as many fish as Wadley. Matt Campbell asked if dissolved oxygen or other water quality factors at Horseshoe Bend could have affected those results. Jason replied that it is hard to determine, as monitors are not present in these locations yet and these were individual sampling events; multiple sampling events may have reduced variation between the two sites.

**Aquatic Resources Study Continued –** Dr. Dennis Devries, Dr. Russell Wright, and Ehlana Stell (Auburn University)

Dr. Devries discussed the research objectives. The first objective is to review relevant research to determine temperature tolerances and limits of Redbreast Sunfish, Tallapoosa Bass, and Channel Catfish. Dr. Devries explained that there is little temperature data available for the Redbreast Sunfish and Tallapoosa Bass species; however, Spotted Bass data could possibly be used as surrogate data for Tallapoosa Bass. There is more temperature data available for Channel Catfish than Redbreast Sunfish and Tallapoosa Bass, but much of this is applied to pond settings, and may not be applicable to riverine habitat.

Dr. Wright then explained bioenergetics and how temperature is involved. Many bioenergetic components are temperature dependent. Bioenergetics will be used in this study to assess the effects of Harris Dam operations on fish growth and stress. Dr. Wright explained the components of bioenergetics models and how results may be used in predicting growth. Dr. Wright explained the limitations to the bioenergetics model: (1) there is currently no model for Redbreast Sunfish or Tallapoosa Bass (although one could possibly be generated using similar species such as Bluegill Sunfish and Spotted Bass), (2) the current model for Channel Catfish is derived from pond systems instead of riverine systems, and (3) in the current model code, temperature and activity operate on a daily time step, so a model using a sub-daily timestep may be necessary.

Ehlana described the temperature data provided by Alabama Power to Auburn University. Minimum, maximum, and mean temperature data were presented by location (tailrace, Malone, and Wadley) and compared pre- and post-Green Plan conditions from 2000-2019. Ehlana displayed histograms depicting daily temperature range (daily maximum – daily minimum) for each location and noted that the occurrence of daily temperature ranges of 10° C or greater was extremely rare. Jason explained that water is drawn into the forebay around 30 feet below the surface at full pool and may be pulled from shallower depths depending on the number of turbines that are running. Ehlana said that in winter, reservoir waters are not stratified and there would not be a large temperature difference between surface and deeper waters. Dr. Wright stated that presently, the temperature difference may be only a few degrees. Taconya Goar (Alabama Department of Conservation and Natural Resources (ADCNR)) stated that some variability may be missed when using daily data instead of hourly data. Dr. Wright said daily mean temperatures were calculated from hourly measurements, and the daily fluctuation were calculated as the difference between the maximum and minimum hourly reading for each day. Jason noted that some additional analysis may be performed to determine the magnitude and frequency of sub-daily temperature fluctuations (e.g. 1-hr, 2-hr, etc). Matt Campbell asked about the effects of turbidity on fish. Jason noted that excess turbidity could result from bank erosion or sediment contributions from tributaries and described the elements of the Harris Erosion and Sedimentation Study. Jason explained that Auburn's 2018 fish sampling in the fall and winter did not occur due to high flow conditions, and sampling would likely begin in April 2019. Matt Campbell asked about shoal lilies (or Cahaba lilies). Jason replied that while we are aware of the presence of lilies at Irwin Shoals, stakeholders have not indicated an issue that would require a study.

**Downstream Release Alternatives – Jason Moak (Kleinschmidt)**

Jason discussed the goal, geographic scope, and components of the Downstream Aquatic Habitat Study, including mesohabitat analysis (desktop analysis of the types of available habitat), installation of water level loggers at 20 sites between Harris Dam through Horseshoe Bend, and the use of the HEC-RAS model to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoals and shallow-water habitat. The mesohabitat was evaluated using GIS to classify reaches of the Tallapoosa River downstream of Harris Dam as pools, riffles, or runs. Some stretches were easy to classify using aerial imagery. Jason explained that the classifications may be improved with information gathered during field work. The mesohabitat type was summarized by reach: Malone, Wadley, Bibby's Ferry, Germany Ferry, Horseshoe Bend, and Irwin Shoals. Jason explained that level logger locations were chosen based on the need to space them out evenly along the river and to incorporate data from pools, riffles, and runs. Lake Harris will begin filling on April 1, potentially opening a window of flows in which level loggers can be deployed. Jason anticipates collecting one year of data and will download data from the loggers on a regular basis. Taconya asked if ADEM was measuring turbidity and Jason noted ADEM did gather some turbidity data every few years dating back 15-20 years, which would be used as a component in the Harris Water Quality Study. Keith Chandler (Alabama Power) said Alabama Power would incorporate any turbidity data from ADEM according to the Water Quality Study Plan.

Jason explained the HEC-RAS model. It is based on transects crossing the river (cross sections) and the topographic profile. Alabama Power collected bathymetric data from the upper reach (Harris Dam to Wadley) in the 2000s. Alabama Power also conducted a depth survey of the thalweg (center of the river channel) to provide data for the HEC-RAS model during its development in the 2000s.  However, many model cross-sections downstream of Wadley were interpolated and were not actual bathymetric profiles. Jason presented examples of transects with good and poor bathymetry data and noted the importance of accurate data when evaluating wetted habitat. As a result, Alabama Power will be collecting additional bathymetric data. Some bathymetry data was collected during level logger deployment in fall 2018. Jason showed a figure displaying the slope of the river and the water depth. Dr. Wright commented that it appears flow rate will negatively correlate with depth. Jason explained that this study is trying to quantify the amount and persistence of wetted habitat and to compare present conditions with possible alternatives. Jason stated that the Downstream Release Alternatives Study will review current operations and several possible alternatives: no change (baseline), a continuous minimum flow of 150 cubic feet per second (cfs), or a modified Green Plan (changing the timing of releases).

The group then embarked on a walking tour of the laboratory facilities, including views of the swimming chambers and static respirometry labs. The meeting adjourned at 2:00 pm.

# R.L. Harris Project Relicensing

# HAT 3 – Aquatic and Wildlife Resources

March 20, 2018

HARRIS DAM
RELICENSING

# Safety Moment

## In case of an emergency…..

- Designee will contact 911
- Exit locations
- Designated meeting area
- Location of AED

HARRIS DAM
RELICENSING

# Meeting Agenda

- Process Update

- Aquatic Resources Study
  - Fall Wadeable Fish Survey Update
  - Temperature Data Analysis

- LUNCH

- Downstream Aquatic Habitat Study
  - Draft Mesohabitat Analysis
  - Level Logger Deployment Update
  - HEC-RAS Model Development

- Research Lab Tour

HARRIS DAM RELICENSING

# Process Update

March 13 - Revised Study Plans Filed

April 12 - FERC Study Plan Determination

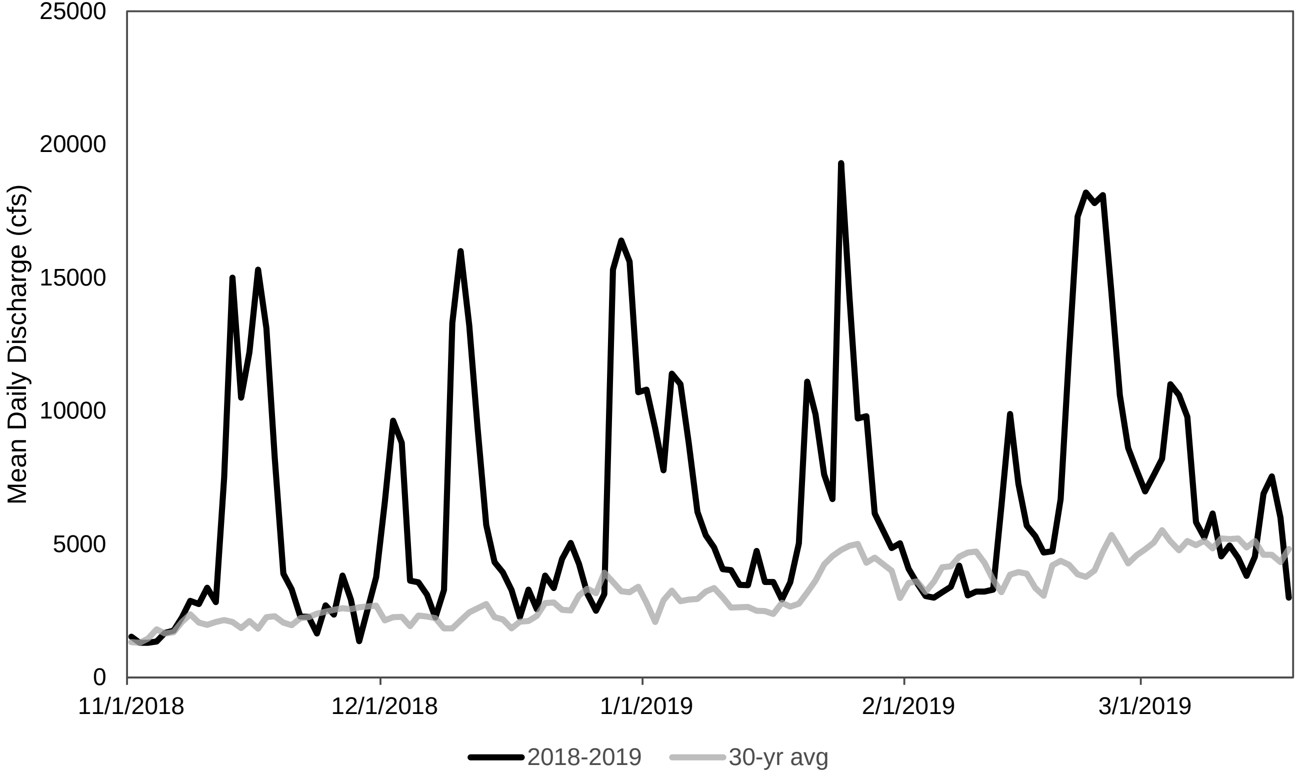
Summer/Fall 2019 – Various HAT meetings

# Aquatic Resources Study

**Goal**
Evaluate the effects of the Harris Project on aquatic resources.

**Geographic Scope**
Harris Reservoir, the Tallapoosa River downstream of Harris Dam through Horseshoe Bend, and in selected unregulated reference streams.

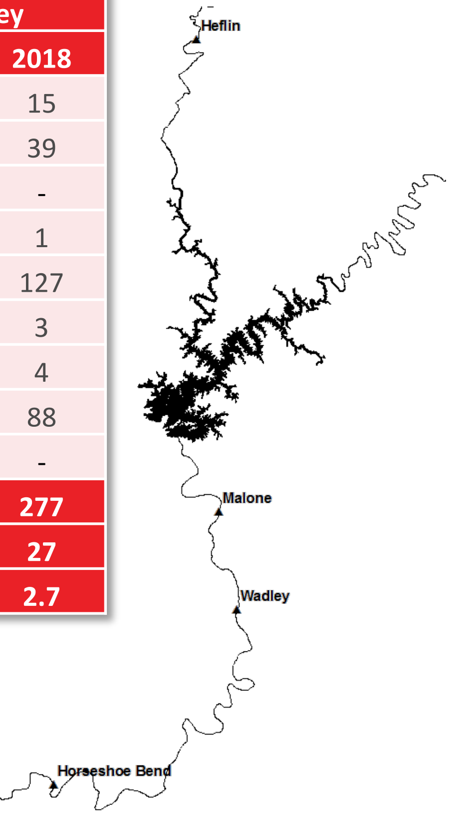
**Study Components**
- Desktop Assessment of Aquatic Resources
- Downstream Fish Population Research
  - Fish Temperature Requirements
  - Assessment of Temperature Data from Regulated and Unregulated Reaches
  - Fish Community Surveys
    - Wadeable standardized (30+2) sampling
    - Boat Electrofishing
  - Bioenergetics Modeling



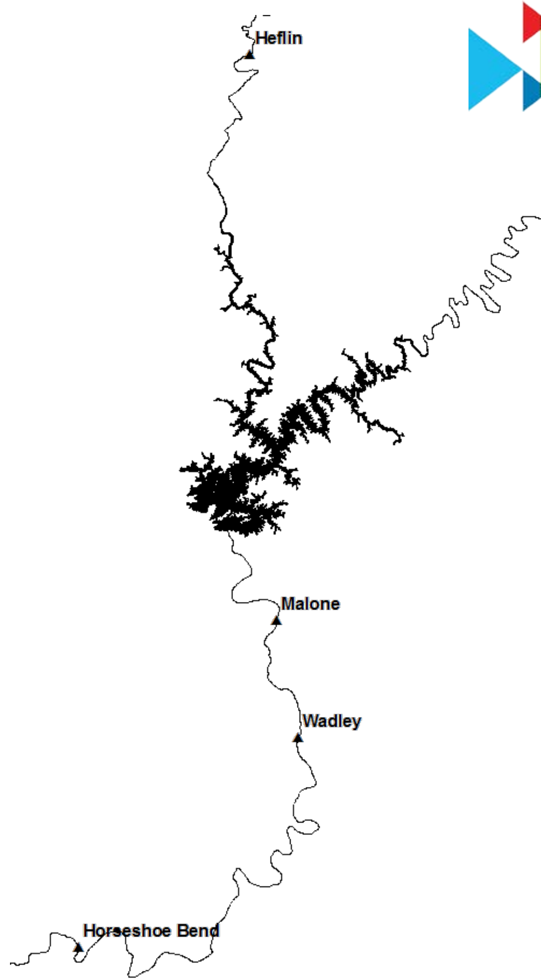
Mean Daily Discharge (cfs)
25000
20000
15000
10000
5000
0
11/1/2018
12/1/2018
1/1/2019
2/1/2019
3/1/2019
2018-2019
30-yr avg

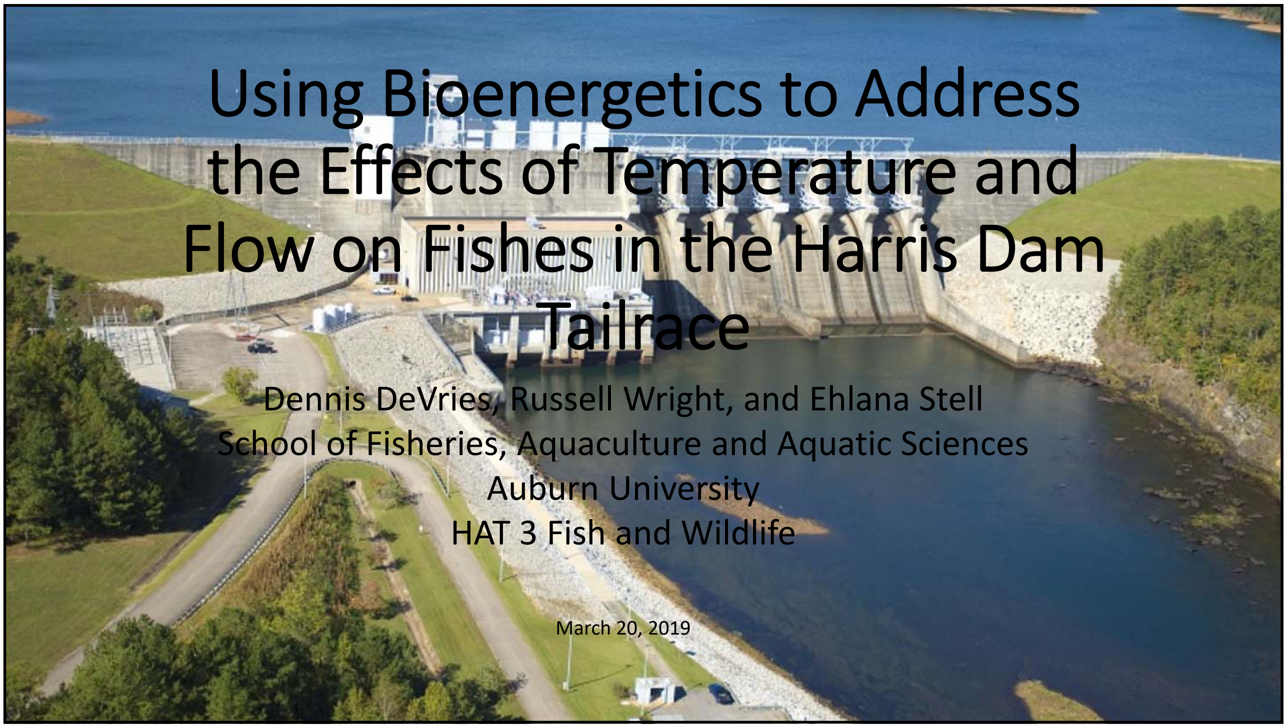
# 2017 & 2018 Fish Survey Results

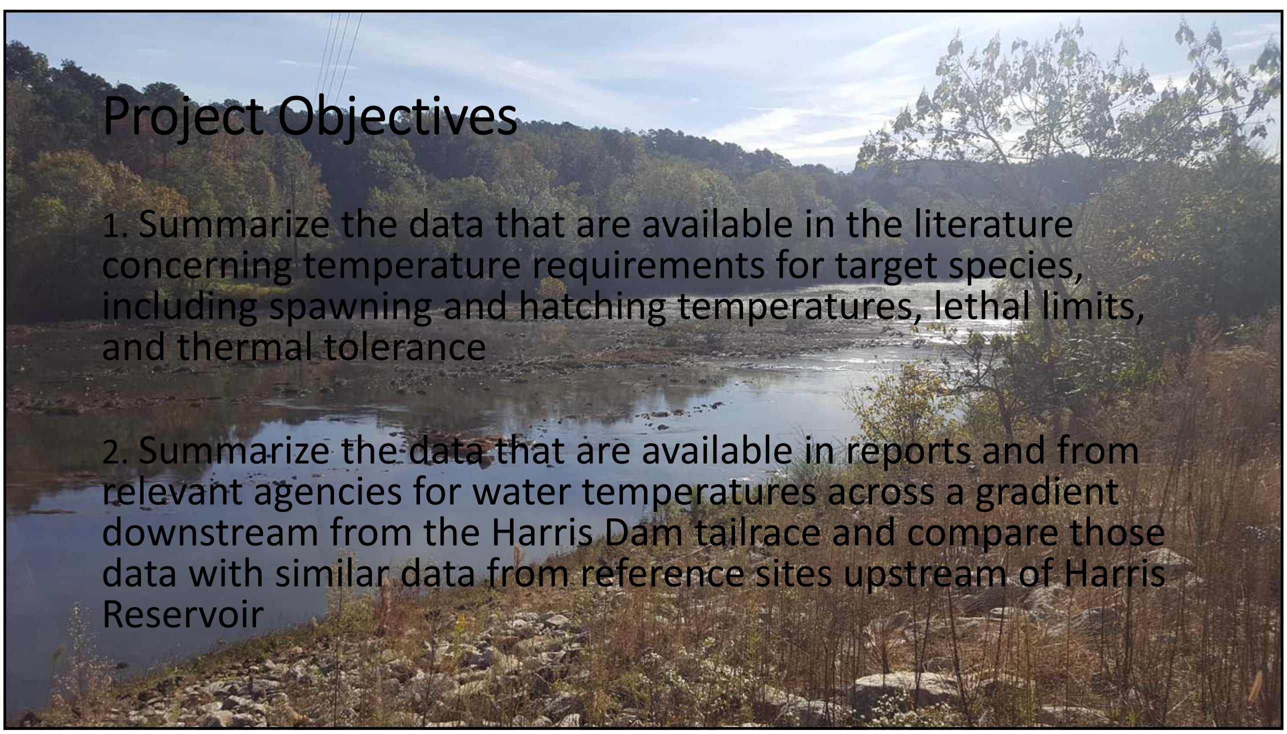
| Family | Heflin | | Malone | | Wadley | |
|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 |
| Catostomidae | 28 | 19 | 14 | 23 | 16 | 15 |
| Centrarchidae | 95 | 51 | 45 | 22 | 97 | 39 |
| Clupeidae | - | - | 1 | - | - | - |
| Cottidae | 2 | 1 | - | - | - | 1 |
| Cyprinidae | 207 | 121 | 61 | 91 | 41 | 127 |
| Fundulidae | 23 | 6 | 2 | 1 | 2 | 3 |
| Ictaluridae | 8 | 4 | 6 | 1 | 5 | 4 |
| Percidae | 242 | 124 | 153 | 174 | 80 | 88 |
| Poeciliidae | 5 | - | - | - | - | - |
| **Total Individuals** | **610** | **326** | **282** | **312** | **241** | **277** |
| **# Taxa** | **31** | **26** | **19** | **18** | **20** | **27** |
| **Diversity (H')** | **2.8** | **2.6** | **2.3** | **2.2** | **2.5** | **2.7** |



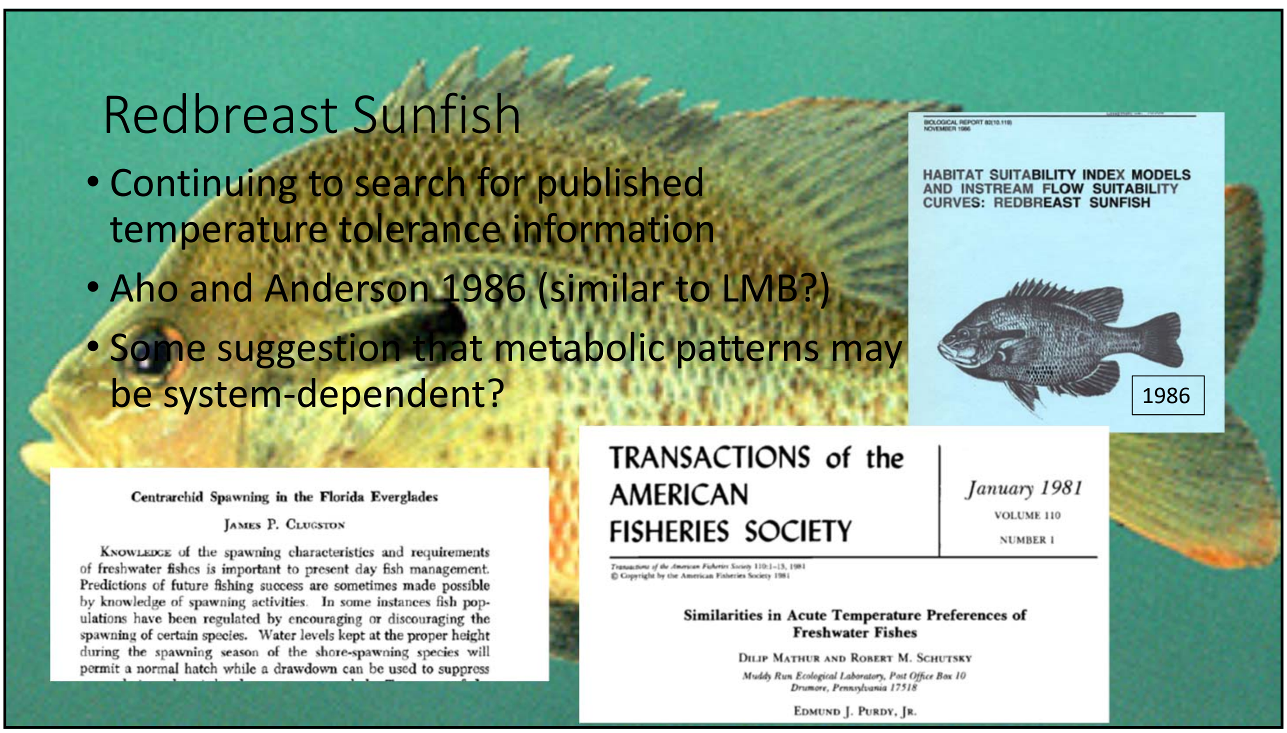
| Family | Common Name | Wadley | Horseshoe Bend |
|---|---|---|---|
| Clupeidae | Gizzard Shad | - | 1 |
| Cyprinidae | Alabama Shiner | 5 | 31 |
| | Blacktail Shiner | 11 | 15 |
| | Common Carp | 11 | 9 |
| | Grass Carp | - | 3 |
| | Silverstripe Shiner | 10 | 29 |
| | Striped Shiner | 3 | - |
| | Tallapoosa Shiner | 1 | 1 |
| Catostomidae | Alabama Hogsucker | 1 | 6 |
| | Black Redhorse | 1 | 6 |
| | Blacktail Redhorse | 33 | 49 |
| | Golden Redhorse | - | 1 |
| | Largescale Stoneroller | 8 | - |
| | River Redhorse | - | 2 |
| Ictaluridae | Blue Catfish | - | 8 |
| | Channel Catfish | 2 | 17 |
| | Flathead Catfish | - | 3 |
| Fundulidae | Blackspotted Topminnow | 3 | 1 |
| Centrarchidae | Alabama Bass | 13 | 81 |
| | Black Crappie | 3 | - |
| | Bluegill | 33 | 21 |
| | Lepomis sp. Hybrid | 1 | - |
| | Green Sunfish | - | 5 |
| | Largemouth Bass | 3 | |
| | Redbreast Sunfish | 51 | 150 |
| | Redear Sunfish | 1 | 4 |
| | Shadow Bass | 11 | 18 |
| | Tallapoosa Bass | 4 | 16 |
| Percidae | Bronze Darter | 1 | 5 |
| | Lipstick Darter | 1 | - |
| | Muscadine Darter | 2 | 1 |
| | Speckled Darter | 1 | - |
| | Tallapoosa Darter | 1 | - |
| | # Individuals | 215 | 483 |
| | # Taxa | 26 | 26 |




Using Bioenergetics to Address the Effects of Temperature and Flow on Fishes in the Harris Dam Tailrace
Dennis DeVries, Russell Wright, and Ehlana Stell
School of Fisheries, Aquaculture and Aquatic Sciences
Auburn University
HAT 3 Fish and Wildlife
March 20, 2019

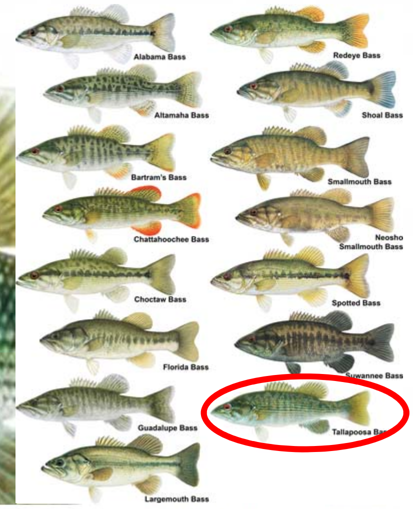

Project Objectives
1. Summarize the data that are available in the literature concerning temperature requirements for target species, including spawning and hatching temperatures, lethal limits, and thermal tolerance
2. Summarize the data that are available in reports and from relevant agencies for water temperatures across a gradient downstream from the Harris Dam tailrace and compare those data with similar data from reference sites upstream of Harris Reservoir

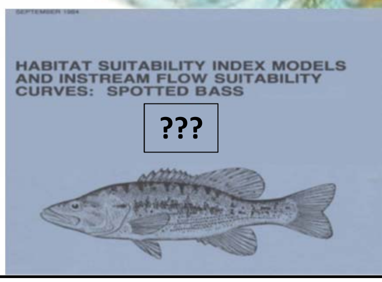

Objective 1: Temperature Requirements
• Reviewed published literature, grey literature reports, agency reports, theses/dissertations, etc. for information on target and related species
• Redbreast Sunfish
• Tallapoosa Bass
• Channel Catfish


Redbreast Sunfish
• Continuing to search for published temperature tolerance information
• Aho and Anderson 1986 (similar to LMB?)
• Some suggestion that metabolic patterns may be system-dependent?
BIOLOGICAL REPORT 82(10.119)
NOVEMBER 1986
HABITAT SUITABILITY INDEX MODELS AND INSTREAM FLOW SUITABILITY CURVES: REDBREAST SUNFISH
1986
Centrarchid Spawning in the Florida Everglades
JAMES P. CLUGSTON
KNOWLEDGE of the spawning characteristics and requirements of freshwater fishes is important to present day fish management. Predictions of future fishing success are sometimes made possible by knowledge of spawning activities. In some instances fish populations have been regulated by encouraging or discouraging the spawning of certain species. Water levels kept at the proper height during the spawning season of the shore-spawning species will permit a normal hatch while a drawdown can be used to suppress
TRANSACTIONS of the AMERICAN FISHERIES SOCIETY
January 1981
VOLUME 110
NUMBER 1
Transactions of the American Fisheries Society 110:1–13, 1981
© Copyright by the American Fisheries Society 1981
Similarities in Acute Temperature Preferences of Freshwater Fishes
DILIP MATHUR AND ROBERT M. SCHUTSKY
Muddy Run Ecological Laboratory, Post Office Box 10
Drumore, Pennsylvania 17518
EDMUND J. PURDY, JR.

# Tallapoosa Bass

- Type of Redeye Bass/
  - white ring along fins
- no data available? Maybe for spotted/Alabama bass?




*Zootaxa* 3635 (4): 379–401
www.mapress.com/zootaxa/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http://zoobank.org/urn:lsid:zoobank.org:pub:24644FAD-EC6C-4D1F-AD1C-6B48B3BEE8B1

**Diversity within the Redeye Bass, *Micropterus coosae* (Perciformes: Centrarchidae) species group, with descriptions of four new species**

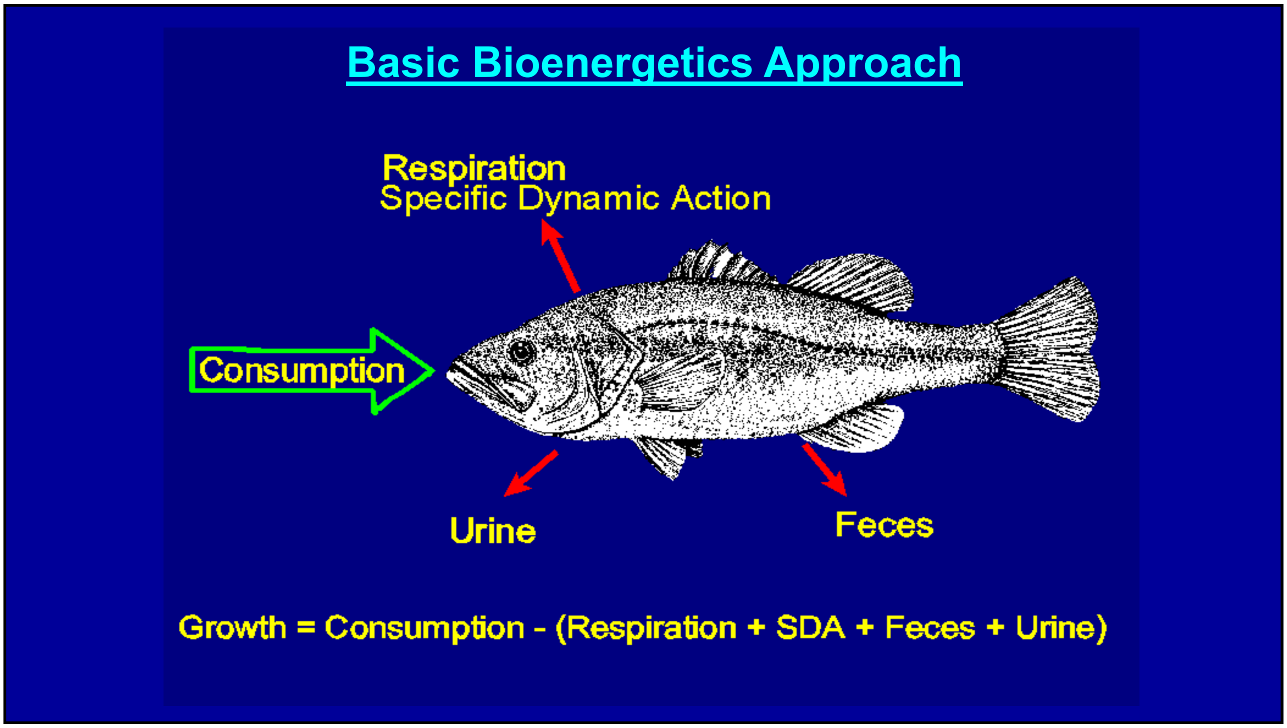
WINSTON H. BAKER[1], REBECCA E. BLANTON[2,4] & CAROL E. JOHNSTON[3]
[1]910 Lindsey Place, Alexander City, Alabama 35010, USA. E-mail: whlrbaker@earthlink.net

# Channel Catfish

- Some data available, but most are for pond fish


**Table 4.** Estimated physiological parameter values of channel catfish used as inputs to the Hewett & Johnson (1992) model

| Parameters | Definition | Value | Reference |
|---|---|---|---|
| | **Consumption** | | |
| CA | Intercept Cmax | 0.33 | Cuenco *et al.* (1985), Andrews *et al.* (1 |
| CB | Slope | −0.33 | Cuenco *et al.* (1985) |
| CQ | Temperature dependent coefficient | 2.3 | Andrews & Matsuda (1975) |
| CTO | Optimum temperature | 31°C | |
| | | 30°C | Andrews & Stickney (1972) |
| | | 30–32°C | Gammon (1973; large adult) |
| CTM | Maximum temperature | 37°C | |
| | Acclimation temperature (=26) | 36.6°C | Allen & Strawn (1968) |
| | Indiana maximum temperature | 37.8°C | Proffitt & Brenda (1971) |
| | Lethal | 36°C | Jobling (1981) |




## Uses of Bioenergetics Models

- evaluation of stocking
- nutrient recycling
- contaminant accumulation
- aquaculture
- exploring evolutionary influences

8

## Uses of Bioenergetics Models

- evaluation of stocking
- nutrient recycling
- contaminant accumulation
- aquaculture
- exploring evolutionary influences
- habitat effects on growth
- effects of environmental stress

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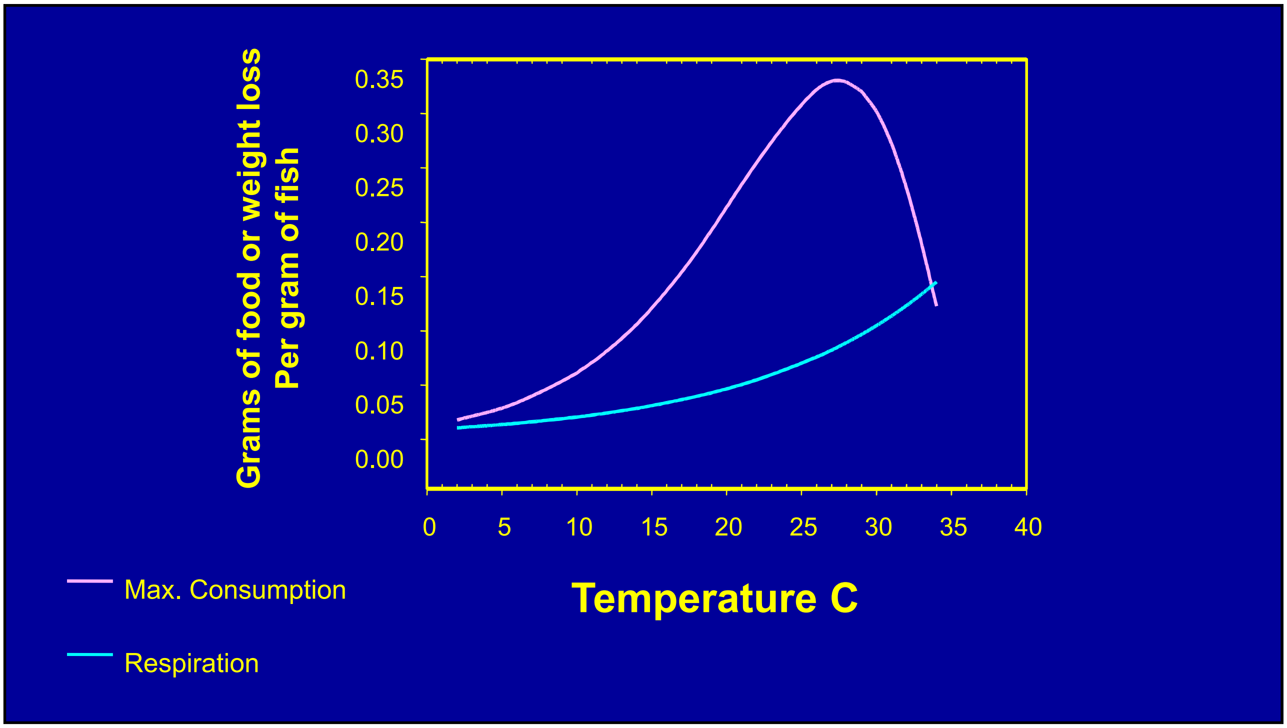
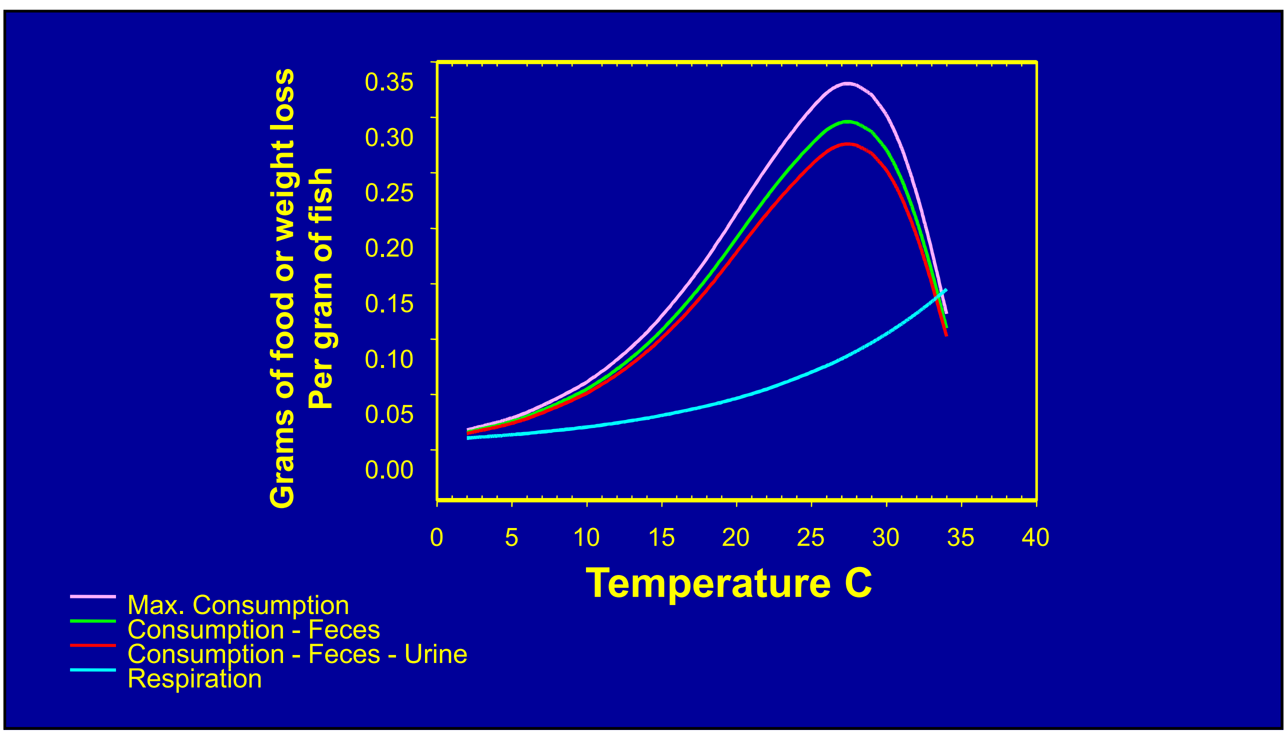
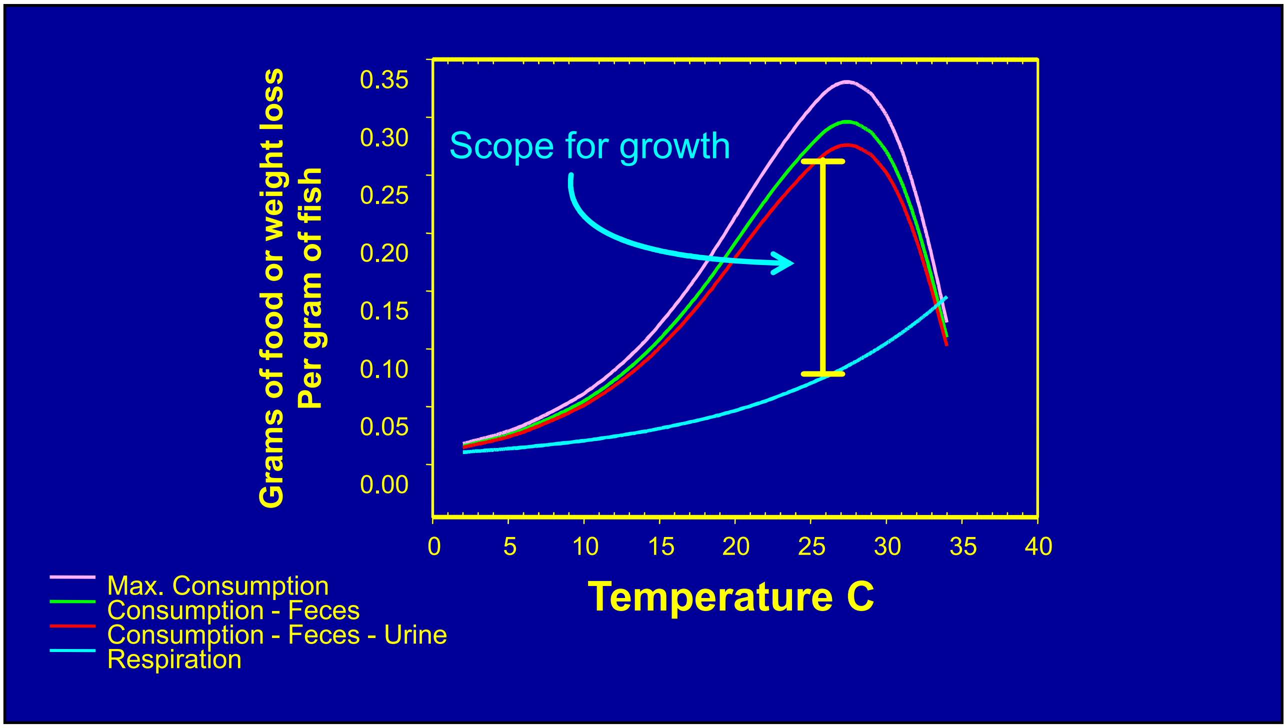
**Growth = Consumption - (Costs)**

**Costs = Respiration + Feces + Urine + Cost of Digestion**


Grams of food or weight loss
Per gram of fish
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
5
10
15
20
25
30
35
40
Temperature C
Max. Consumption
Respiration


Grams of food or weight loss
Per gram of fish
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
5
10
15
20
25
30
35
40
Temperature C
Max. Consumption
Consumption - Feces
Consumption - Feces - Urine
Respiration




## Model Inputs

### Individual Model

- Growth
  -body size, caloric density, reproduction
- Diet
  - prey type, caloric density
- Temperature

### Population Level

- Density
- Mortality

## Application of Bioenergetics Approaches to Harris Dam Impact Assessment

- Temperature fluctuation effect on metabolism
- Flow impact on activity rate – metabolism
- Downstream shifts on community structure and food availability

15

## Limitations of the “Wisconsin” Bioenergetics Model

- Currently no model for Tallapoosa Bass or Redbreast Sunfish
- Channel Catfish model parameters from lentic systems
- Temperature and activity operate on a daily time step

16

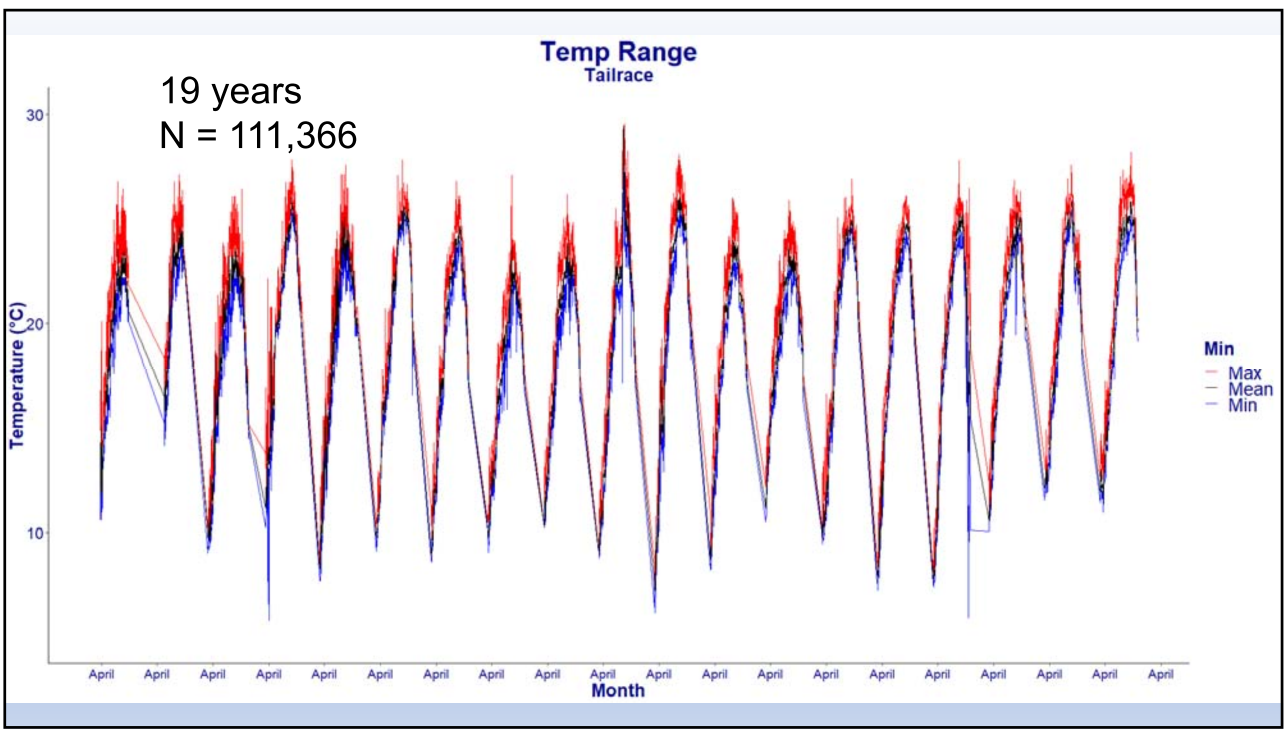
# Objective 1: Temperature Requirements

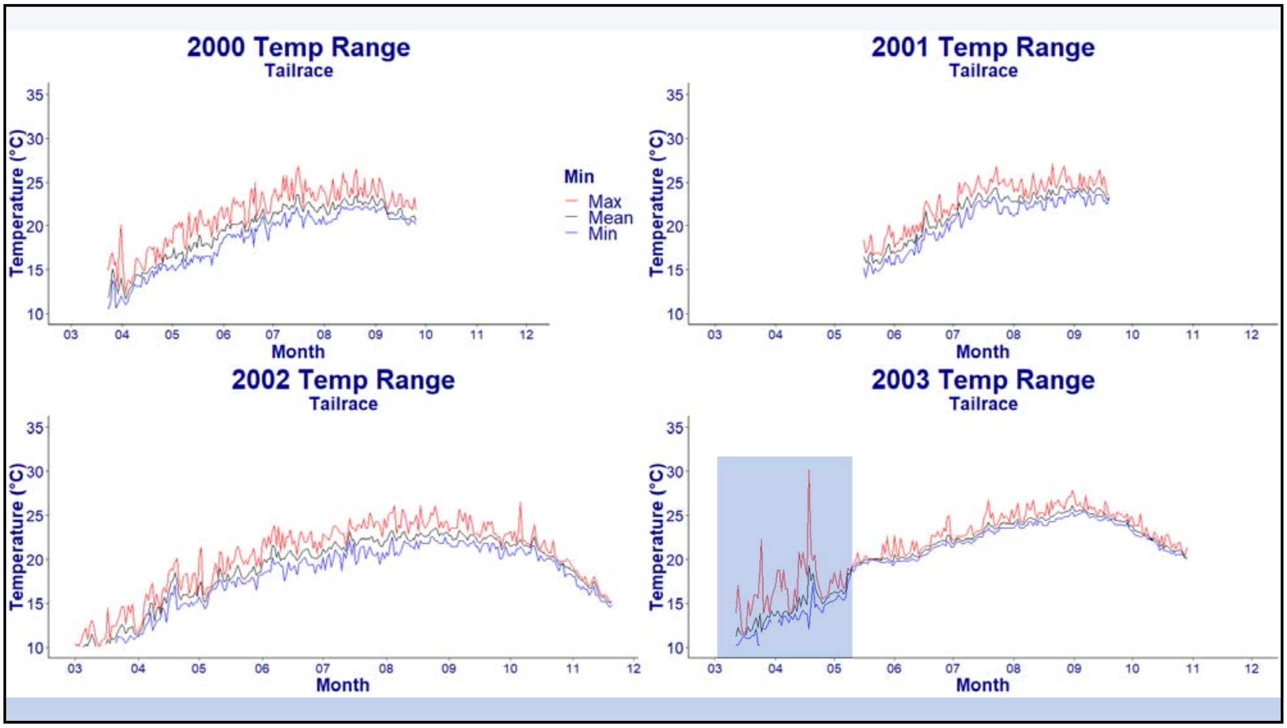
- Reviewed published literature, grey literature reports, agency reports, theses/dissertations, etc. for information on target and related species
  - Redbreast Sunfish
  - Tallapoosa Bass
  - Channel Catfish
- **Extremely limited data available except for Channel Catfish in ponds/reservoirs**
- **Continuing our search for additional data**

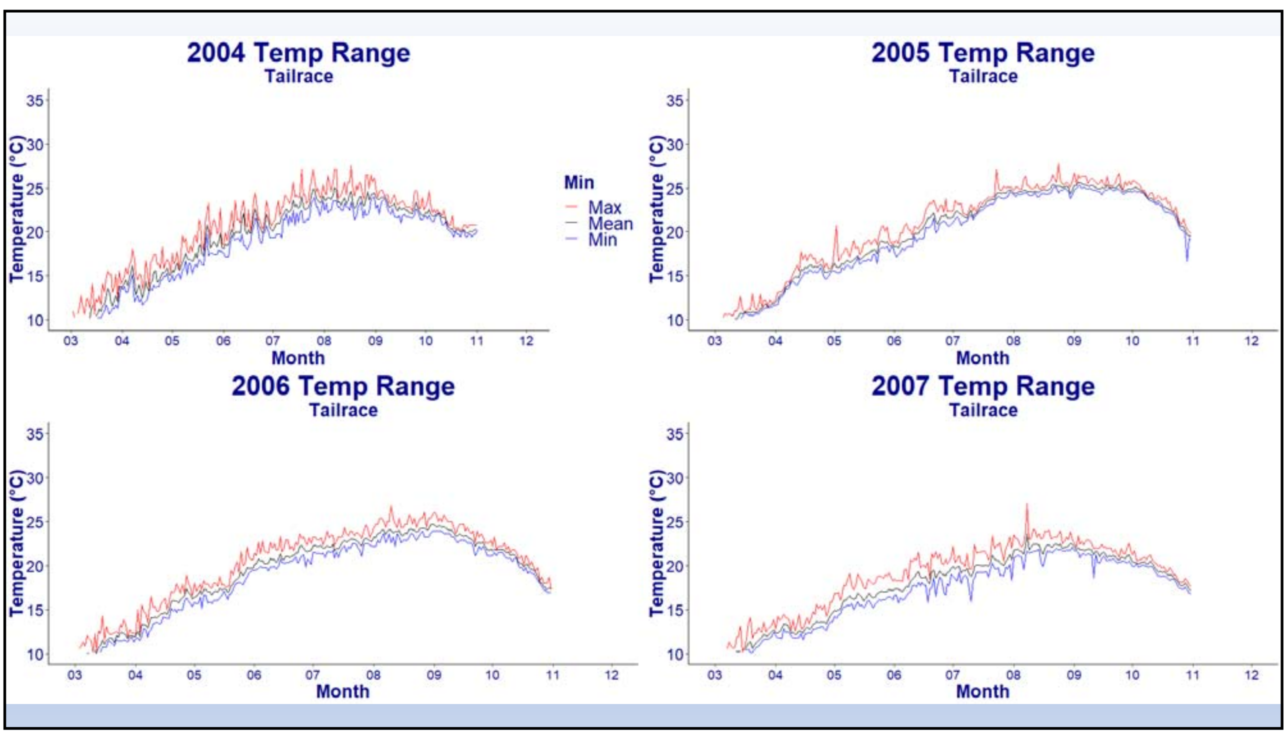
# Objective 2 … ummary

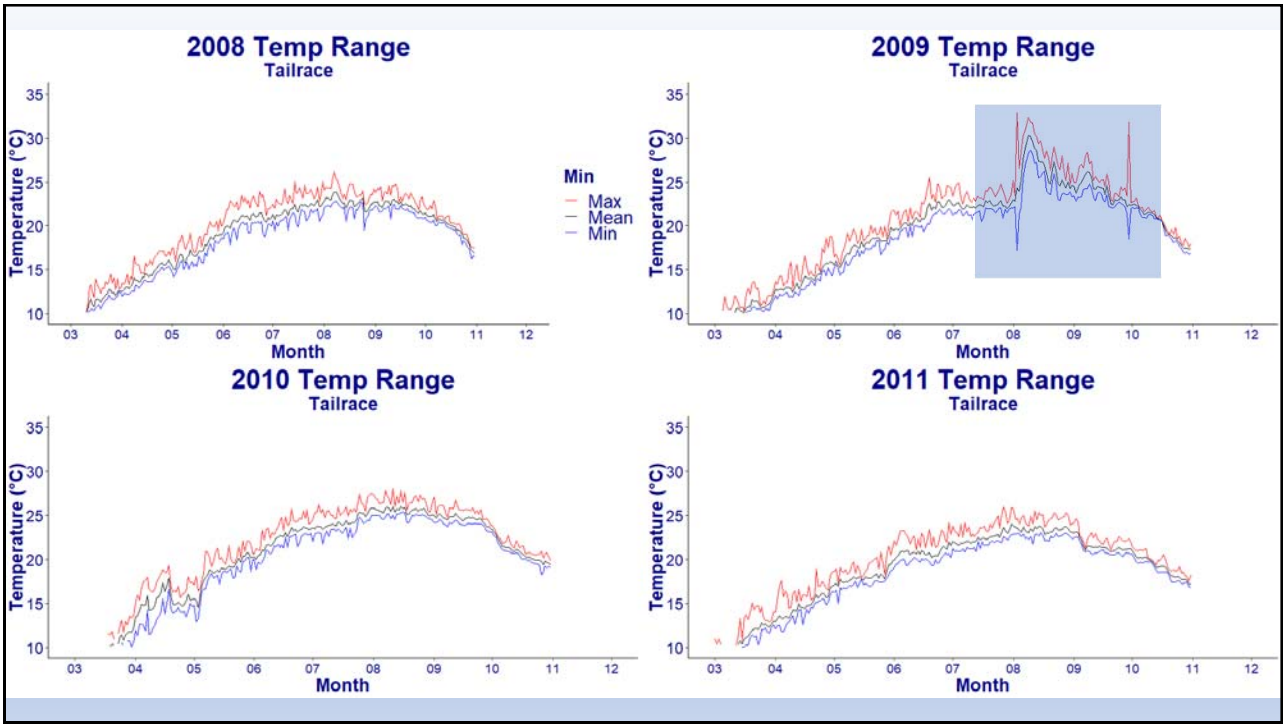

- Obtained tempe … wer for three sites (tailrace, Malon …
- Continuing to se … ata
- Graphed max, n … ear
- Compared pre/p … each site
- Compared site t …

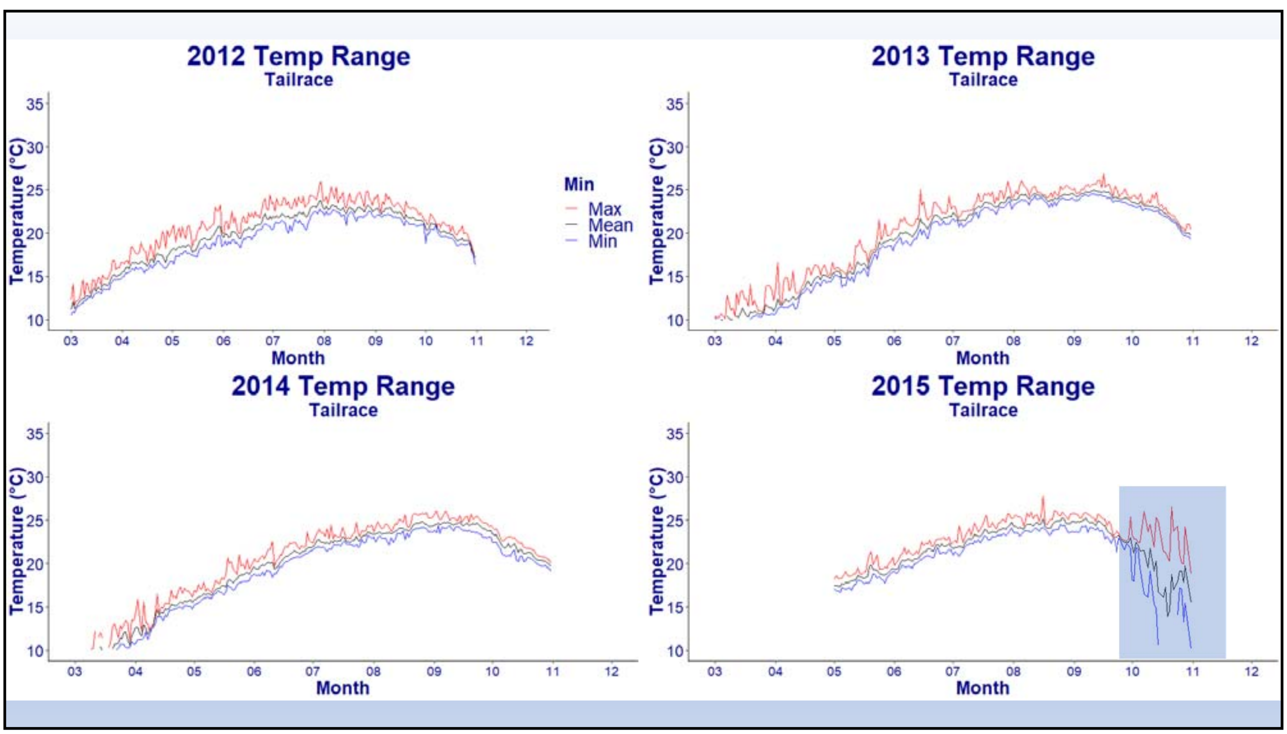

Tallapoosa River
R.I. Harris Dam
RL Harris
Reservoir
Google

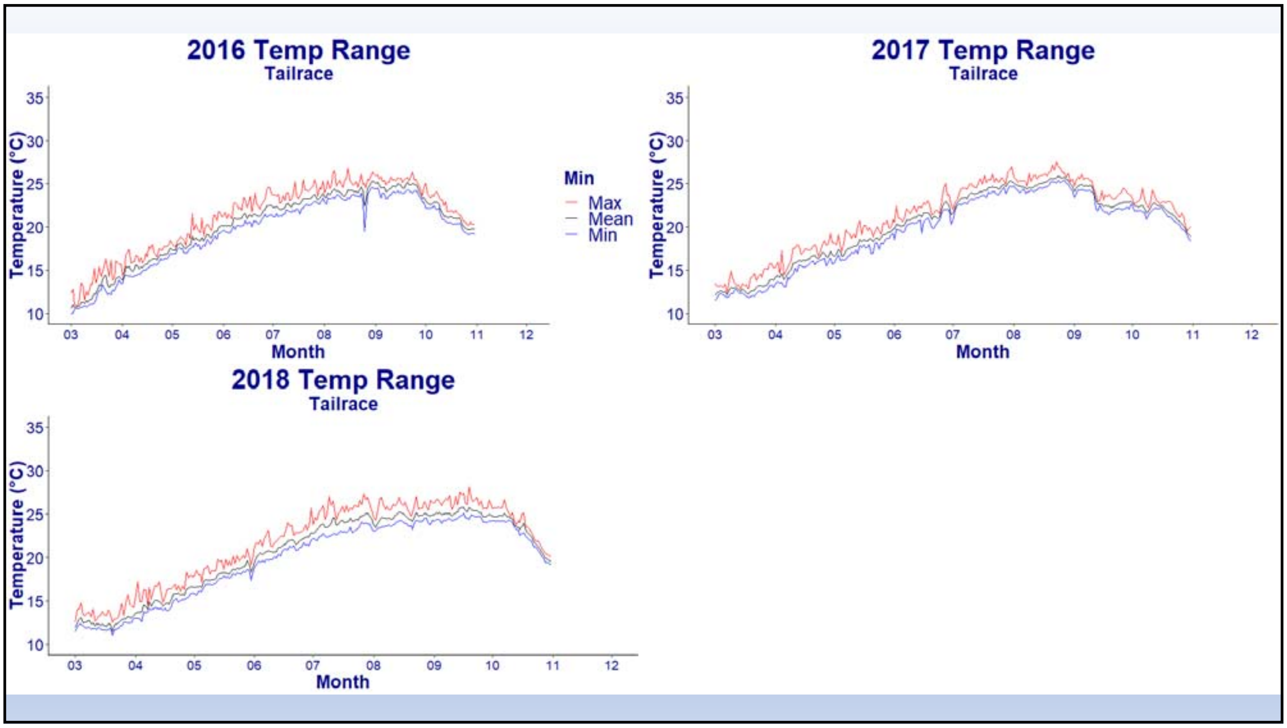

Temp Range
Tailrace
19 years
N = 111,366
Temperature (°C)
30
20
10
April
Month
Min
Max
Mean
Min

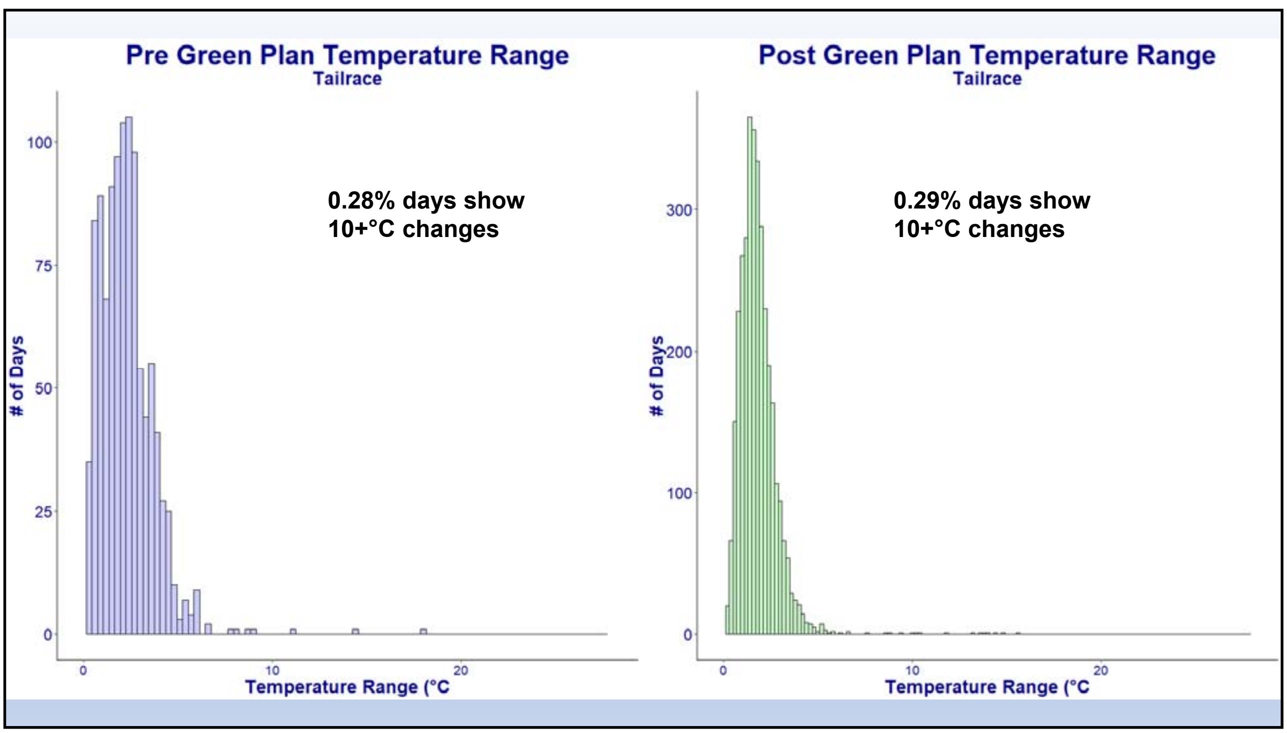

2000 Temp Range
Tailrace
2001 Temp Range
Tailrace
2002 Temp Range
Tailrace
2003 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

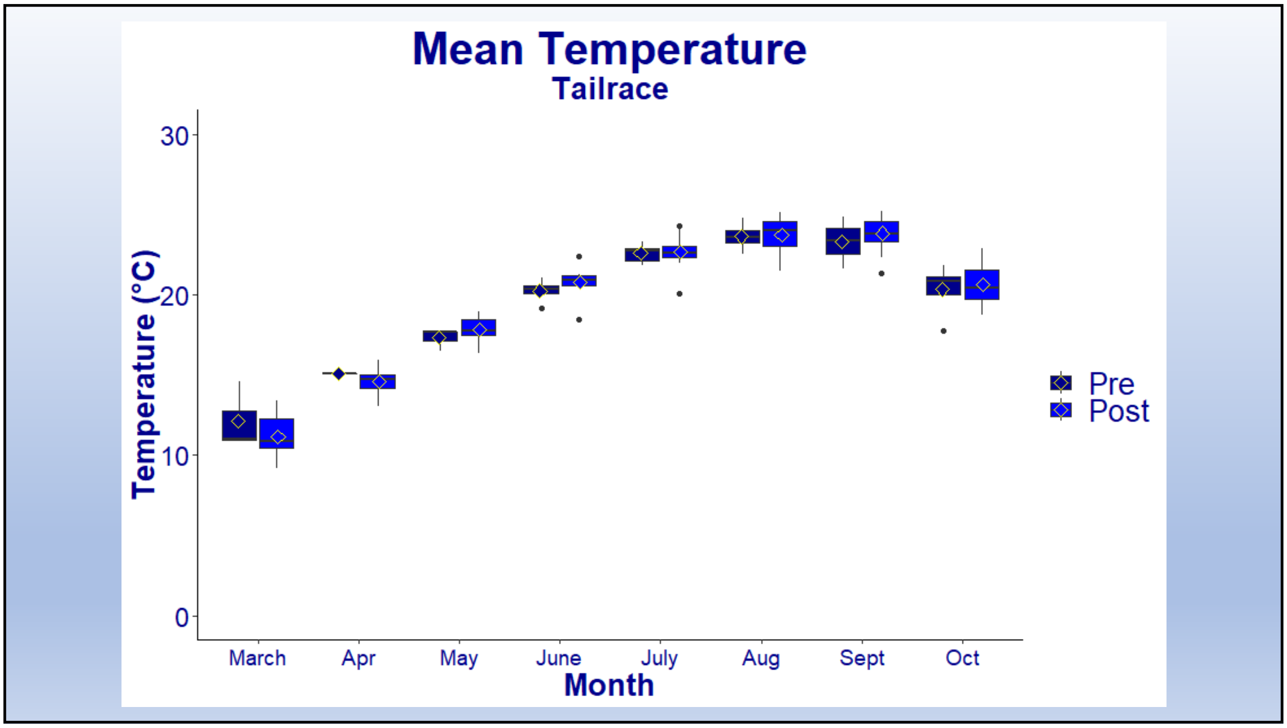

2004 Temp Range
Tailrace
2005 Temp Range
Tailrace
2006 Temp Range
Tailrace
2007 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

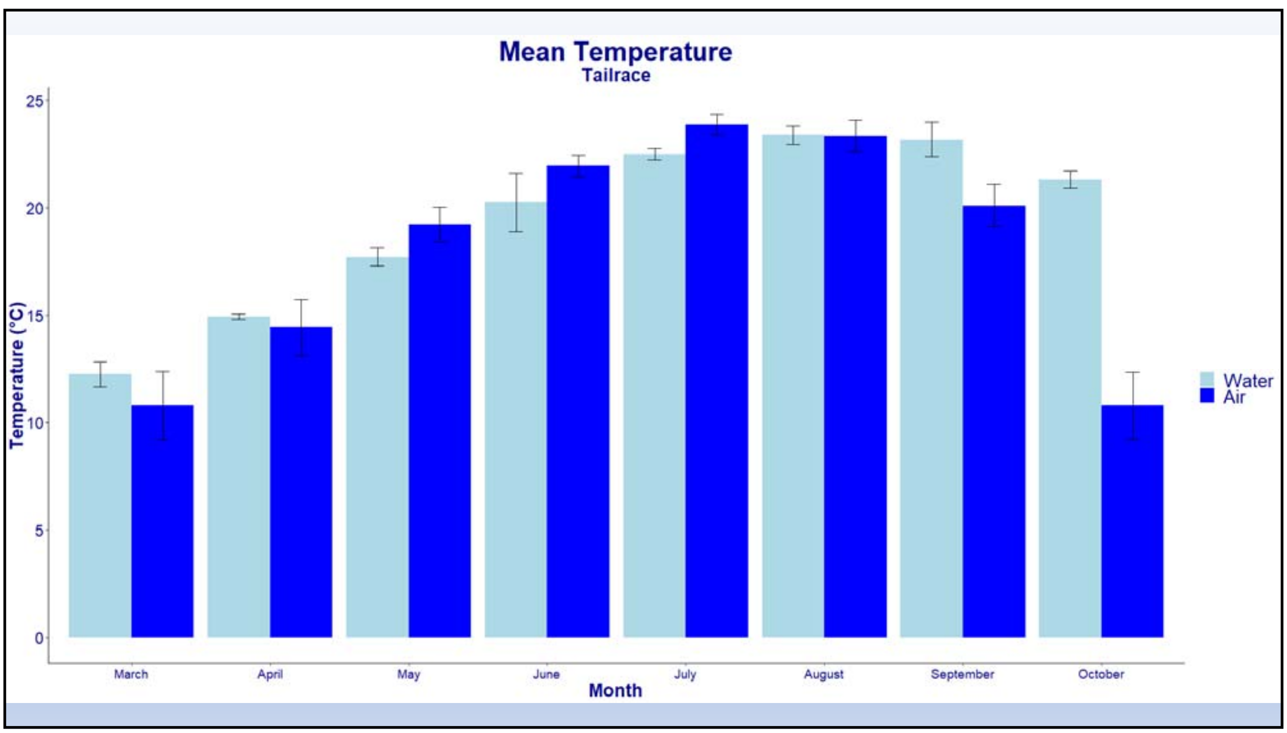

2008 Temp Range
Tailrace
2009 Temp Range
Tailrace
2010 Temp Range
Tailrace
2011 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

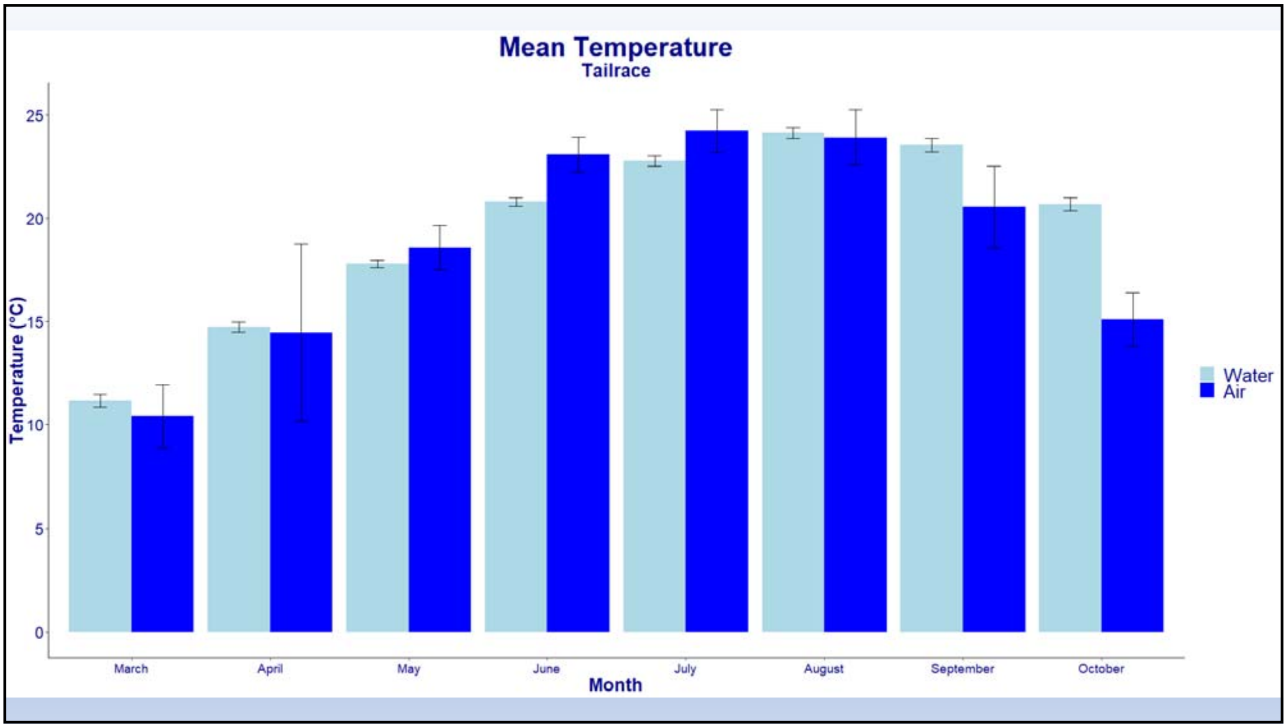

2012 Temp Range
Tailrace
2013 Temp Range
Tailrace
2014 Temp Range
Tailrace
2015 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min


2016 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min
2017 Temp Range
Tailrace
Temperature (°C)
Month
2018 Temp Range
Tailrace
Temperature (°C)
Month


Pre Green Plan Temperature Range
Tailrace
0.28% days show
10+°C changes
# of Days
Temperature Range (°C
Post Green Plan Temperature Range
Tailrace
0.29% days show
10+°C changes
# of Days
Temperature Range (°C

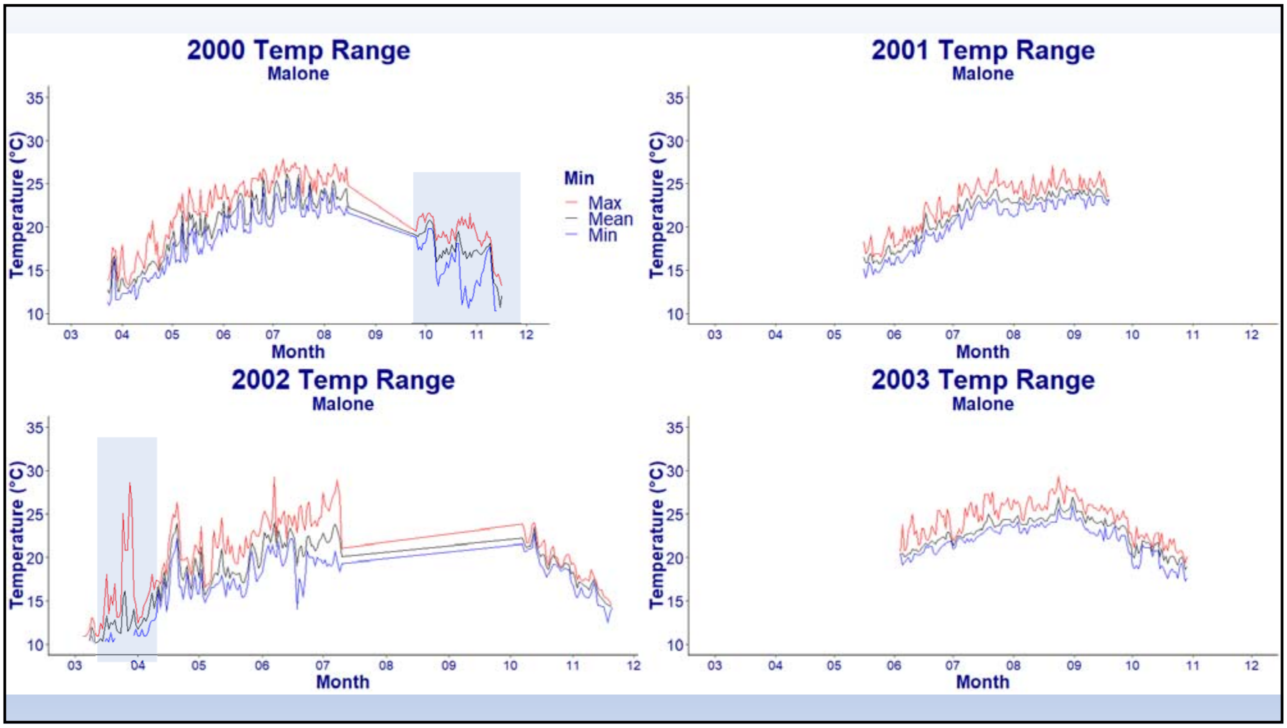

Mean Temperature
Tailrace
Temperature (°C)
30
20
10
0
March
Apr
May
June
July
Aug
Sept
Oct
Month
Pre
Post

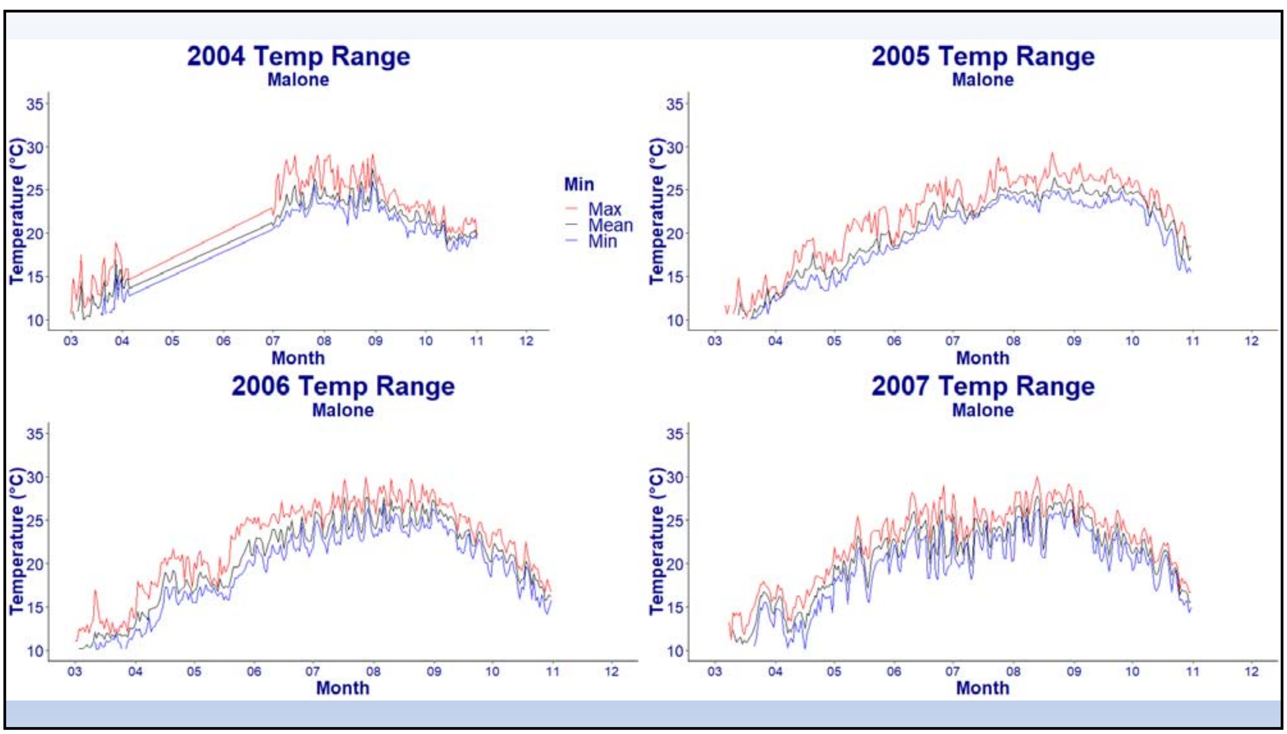

Mean Temperature
Tailrace
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

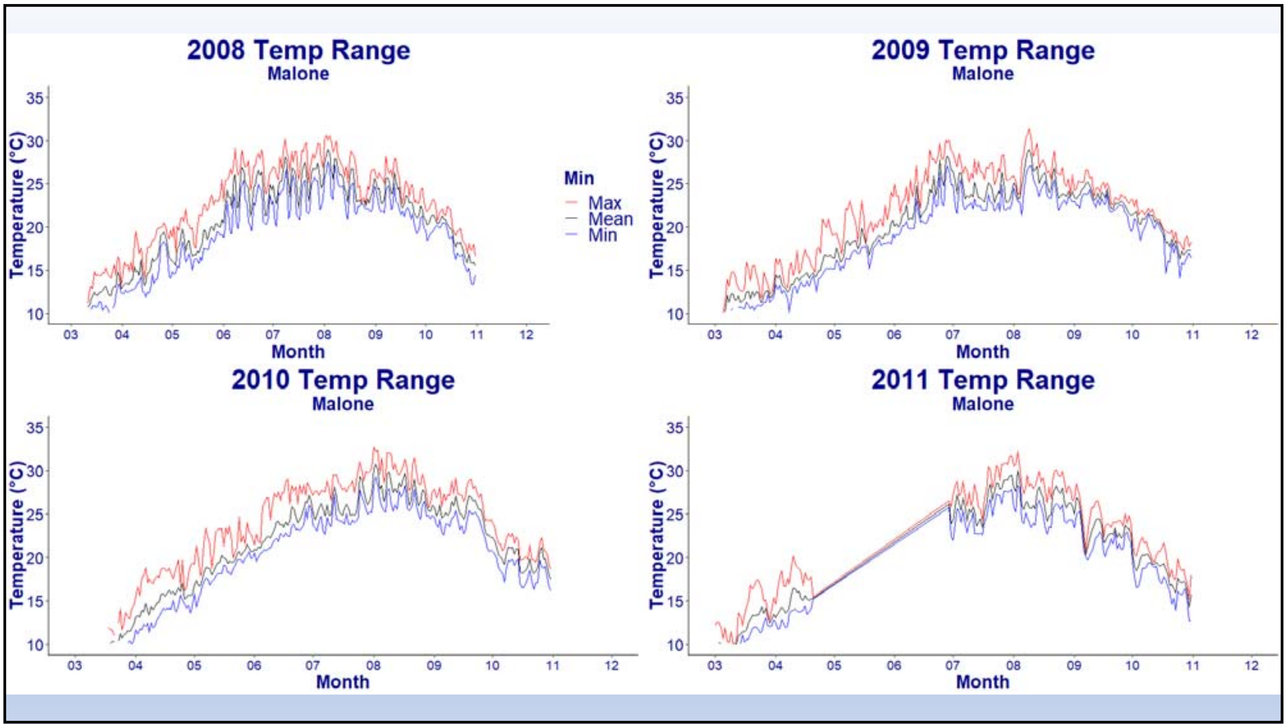


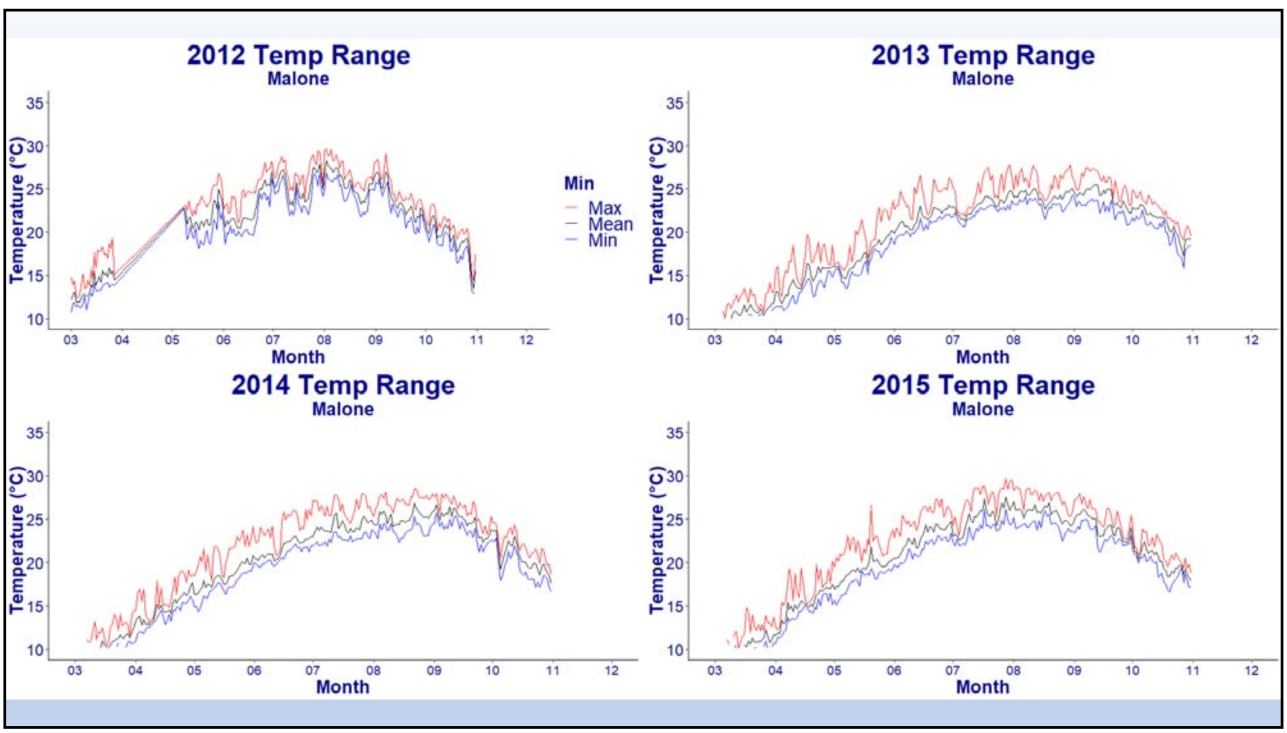
Mean Temperature
Tailrace
Temperature (°C)
0
5
10
15
20
25
March
April
May
June
July
August
September
October
Month
Water
Air

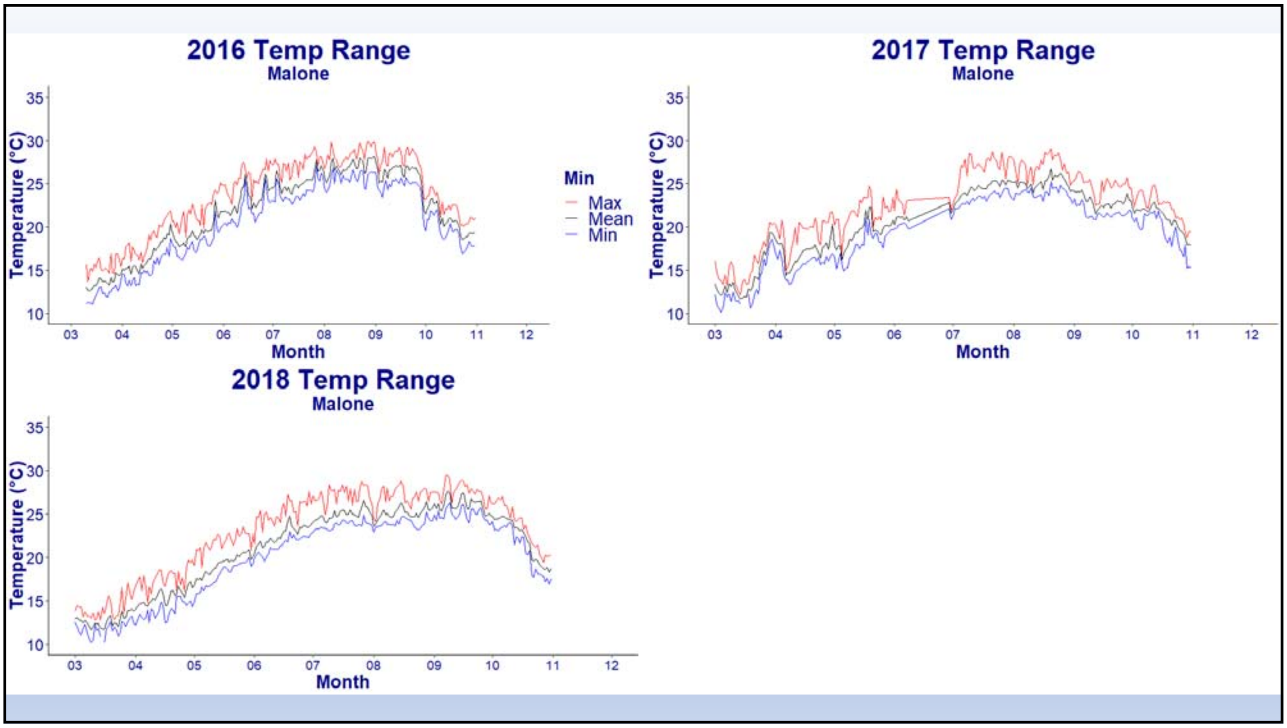

Cragford
Randolph
Corinth
Malone
© 2018 Google
Google Earth

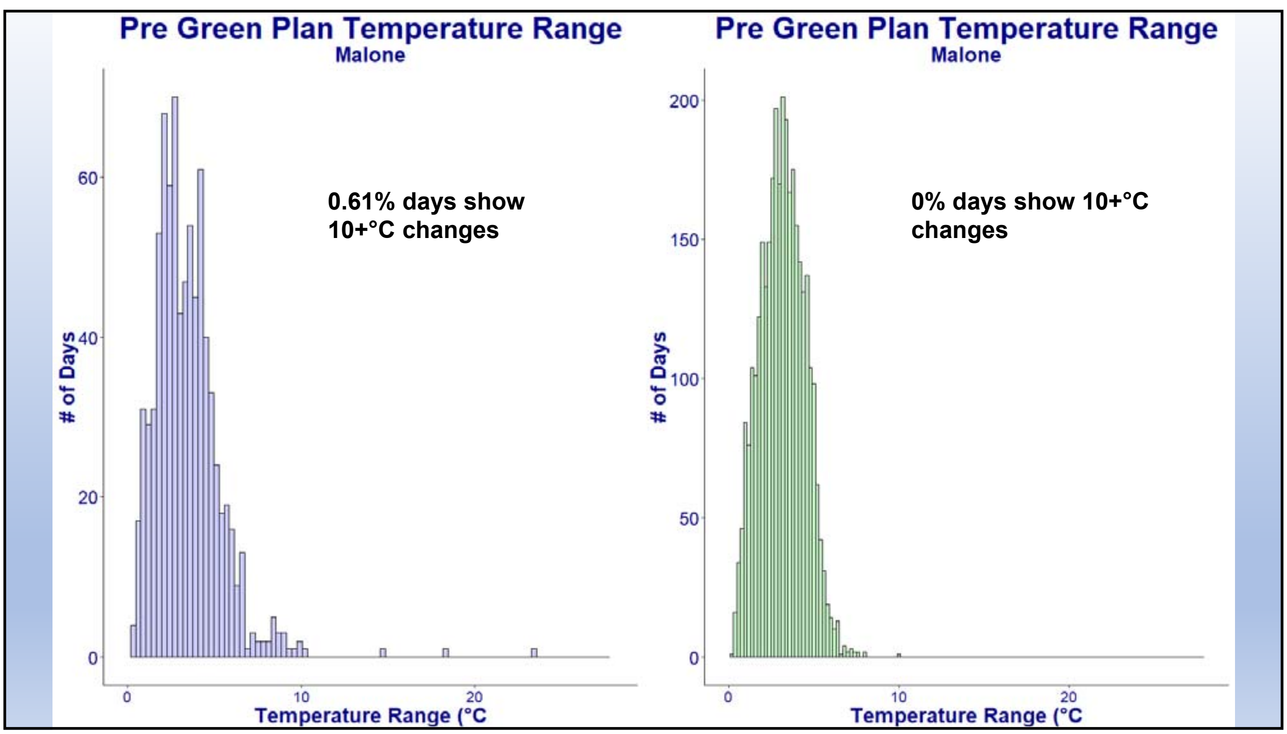

2000 Temp Range
Malone
2001 Temp Range
Malone
2002 Temp Range
Malone
2003 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

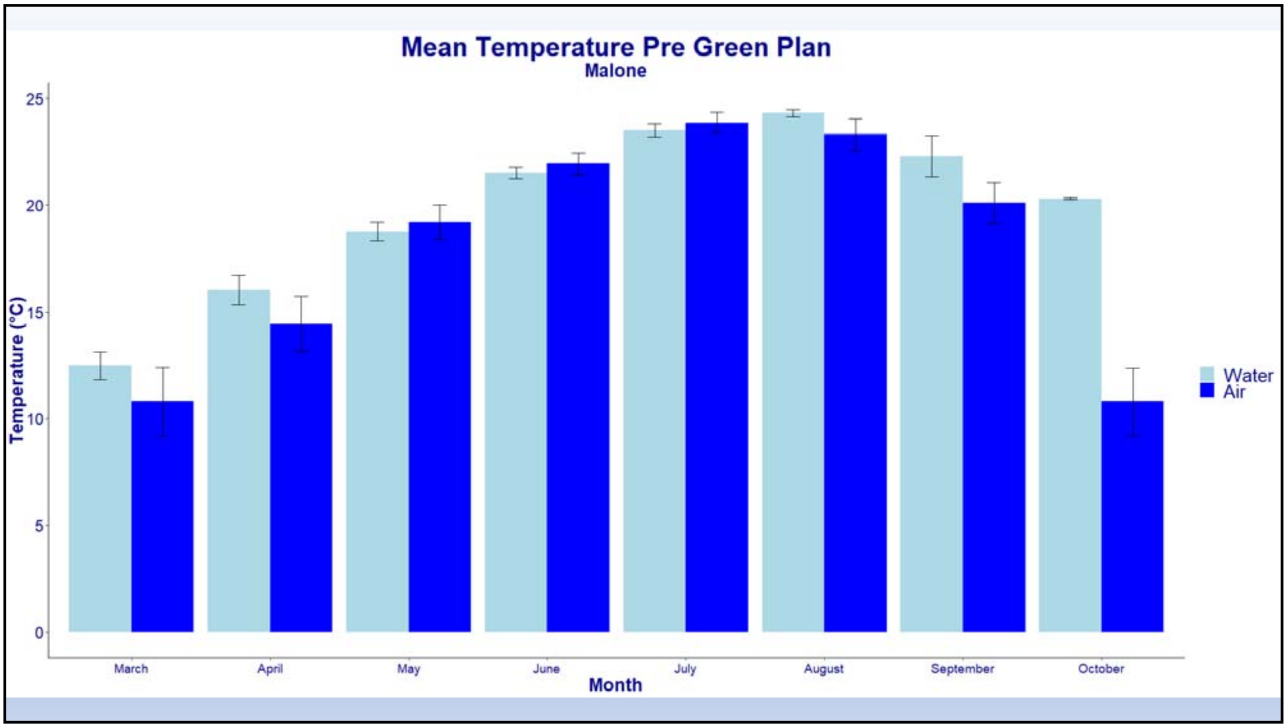

2004 Temp Range
Malone
2005 Temp Range
Malone
2006 Temp Range
Malone
2007 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

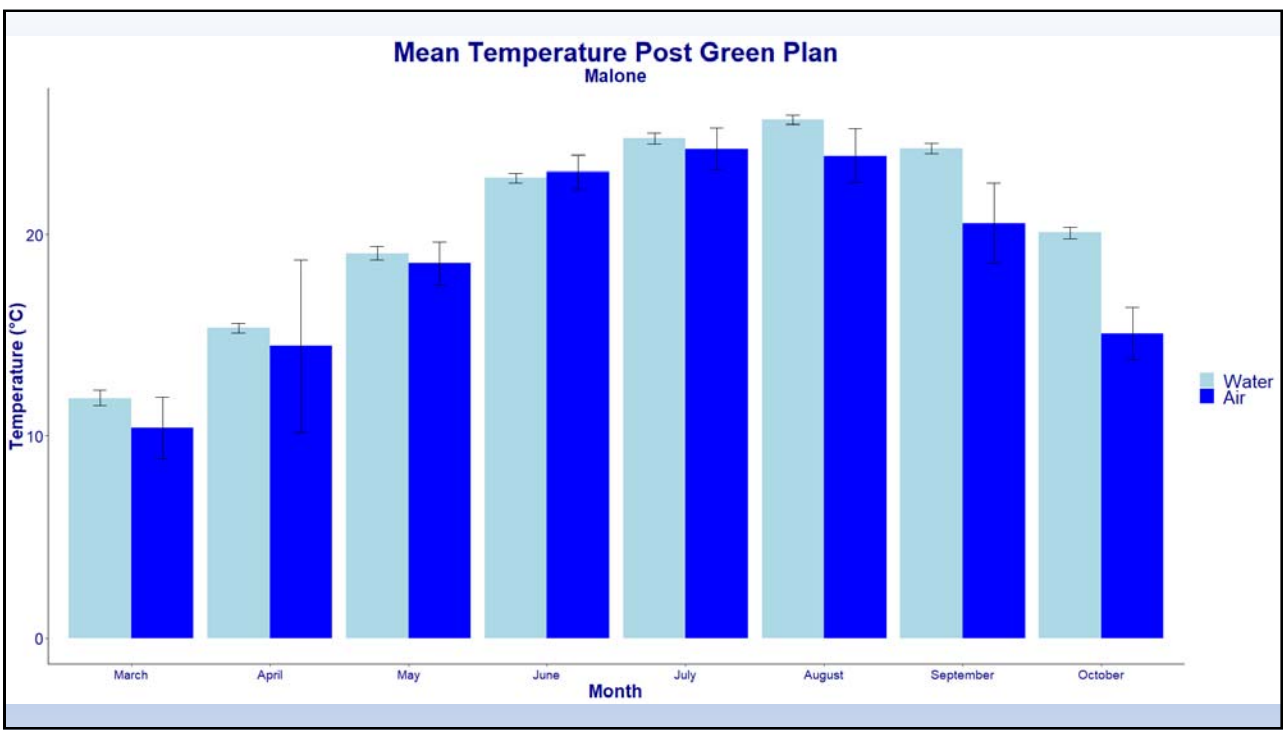

2008 Temp Range
Malone
2009 Temp Range
Malone
2010 Temp Range
Malone
2011 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

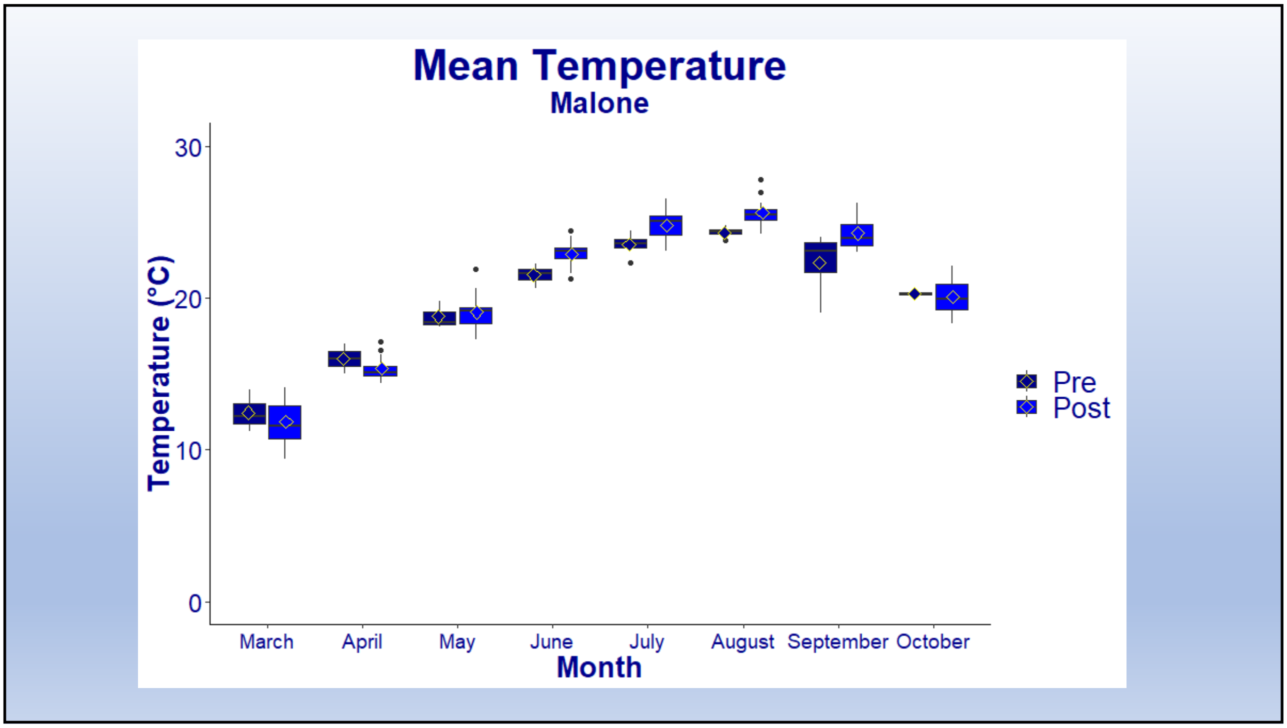

2012 Temp Range
Malone
2013 Temp Range
Malone
2014 Temp Range
Malone
2015 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min


2016 Temp Range
Malone
2017 Temp Range
Malone
2018 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

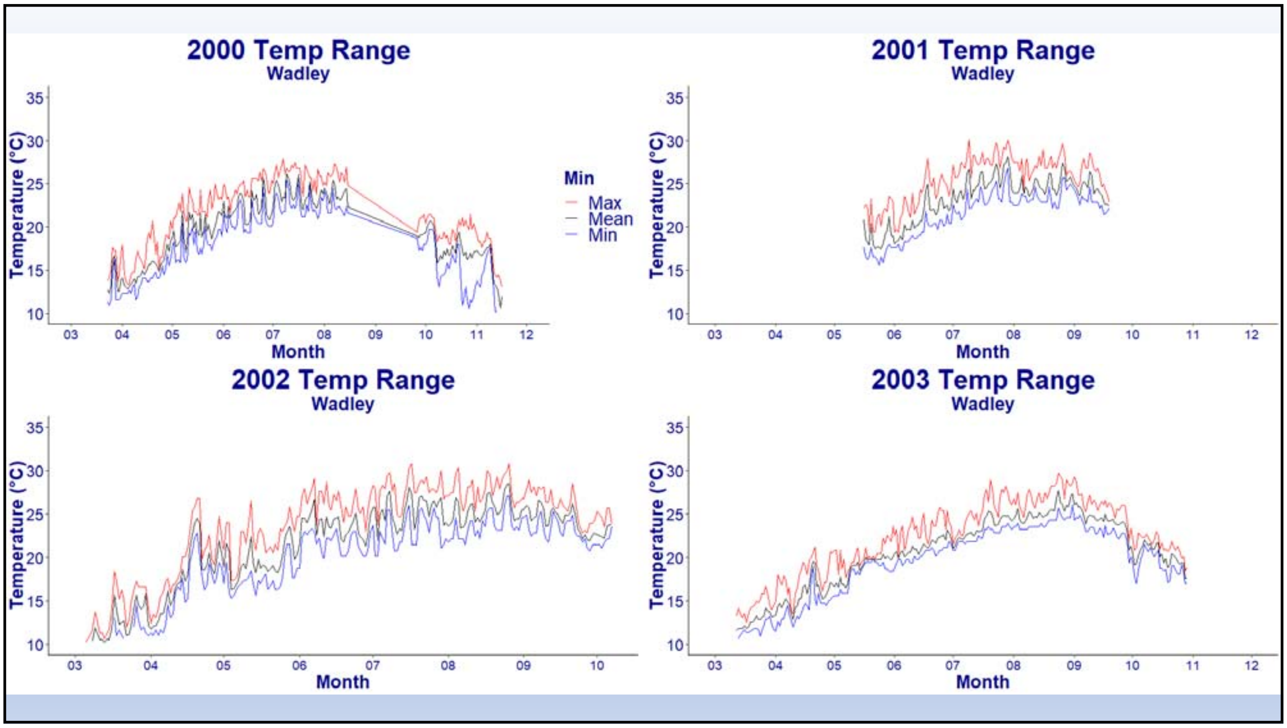

Pre Green Plan Temperature Range
Malone
0.61% days show 10+°C changes
Pre Green Plan Temperature Range
Malone
0% days show 10+°C changes
# of Days
Temperature Range (°C


Mean Temperature Pre Green Plan
Malone
Temperature (°C)
0
5
10
15
20
25
March
April
May
June
July
August
September
October
Month
Water
Air

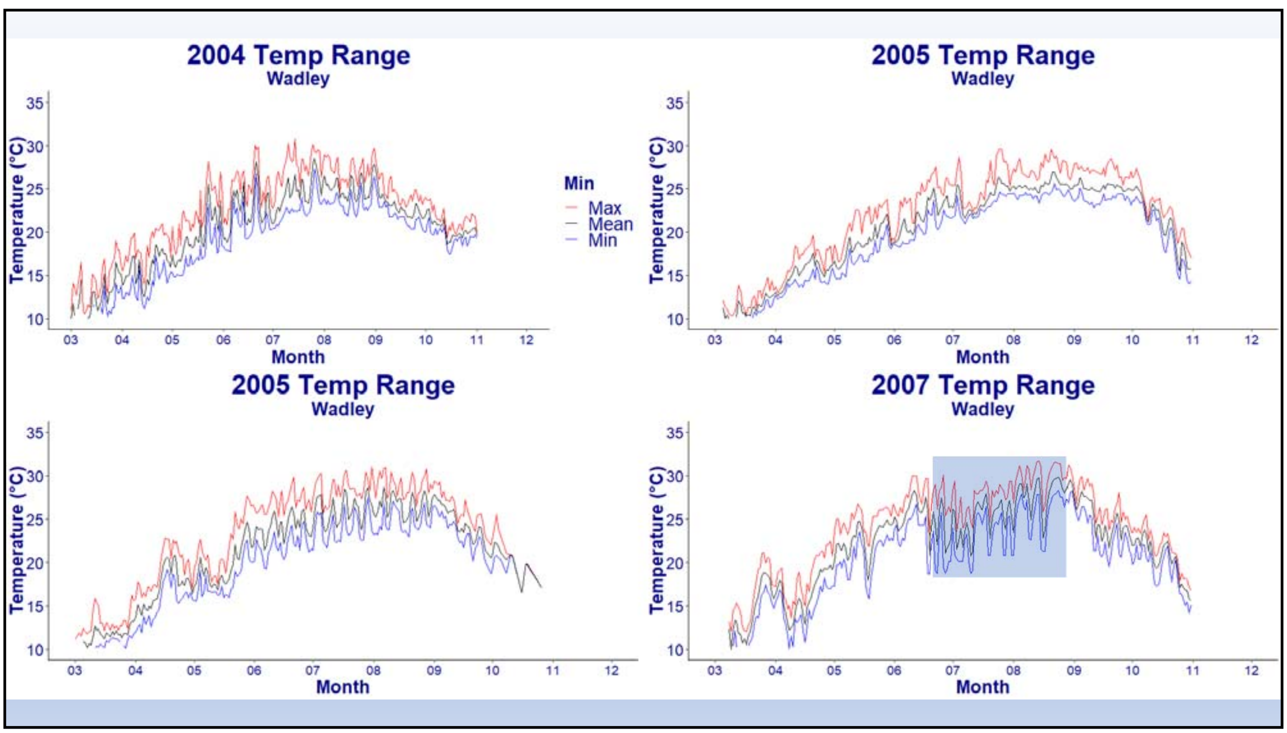

Mean Temperature Post Green Plan
Malone
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air


Mean Temperature
Malone
Temperature (°C)
30
20
10
0
March
April
May
June
July
August
September
October
Month
Pre
Post

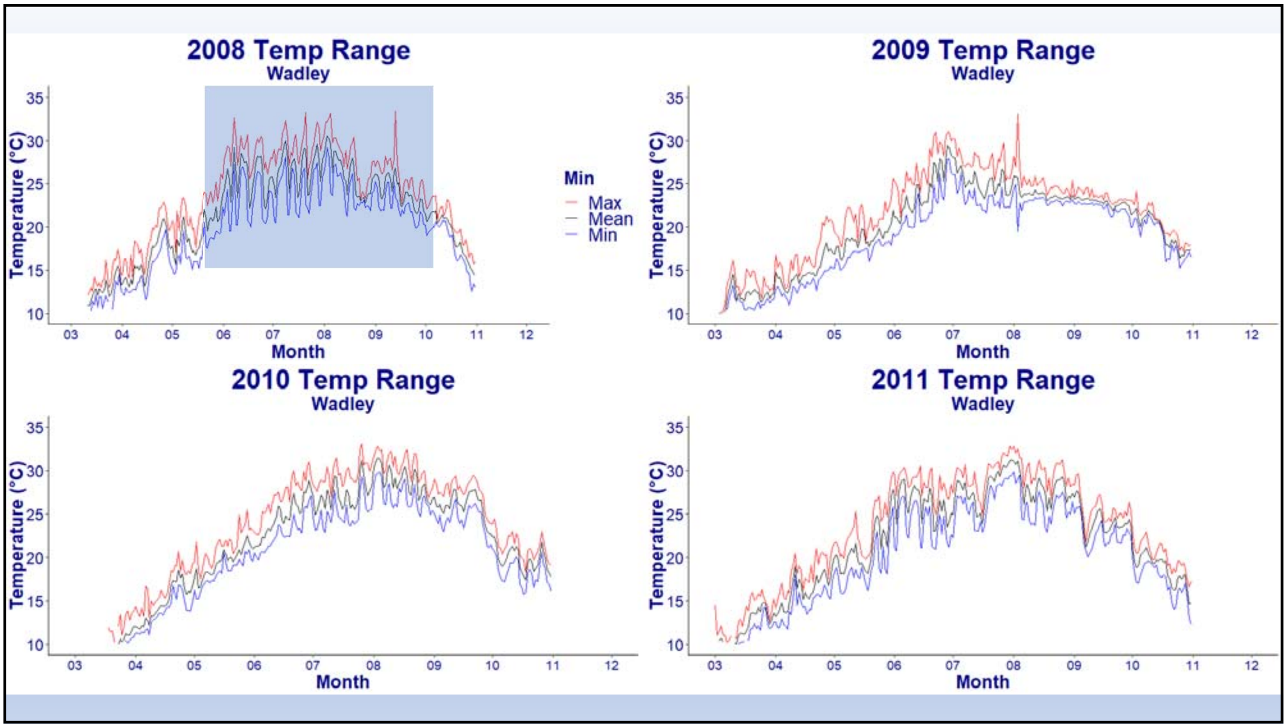

Cornhouse Creek Upstream
Cornhouse Creek Mid
Cornhouse Creek Confluence
Malone
Wadley
Google Earth

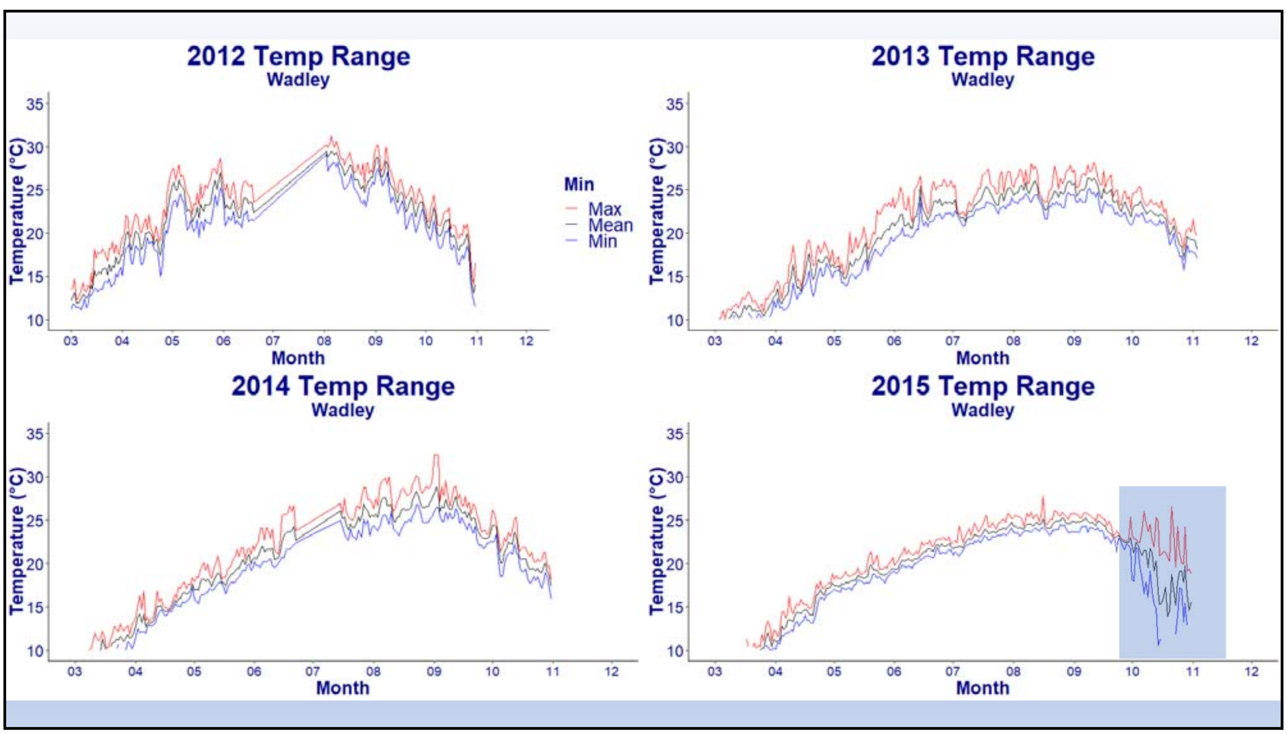


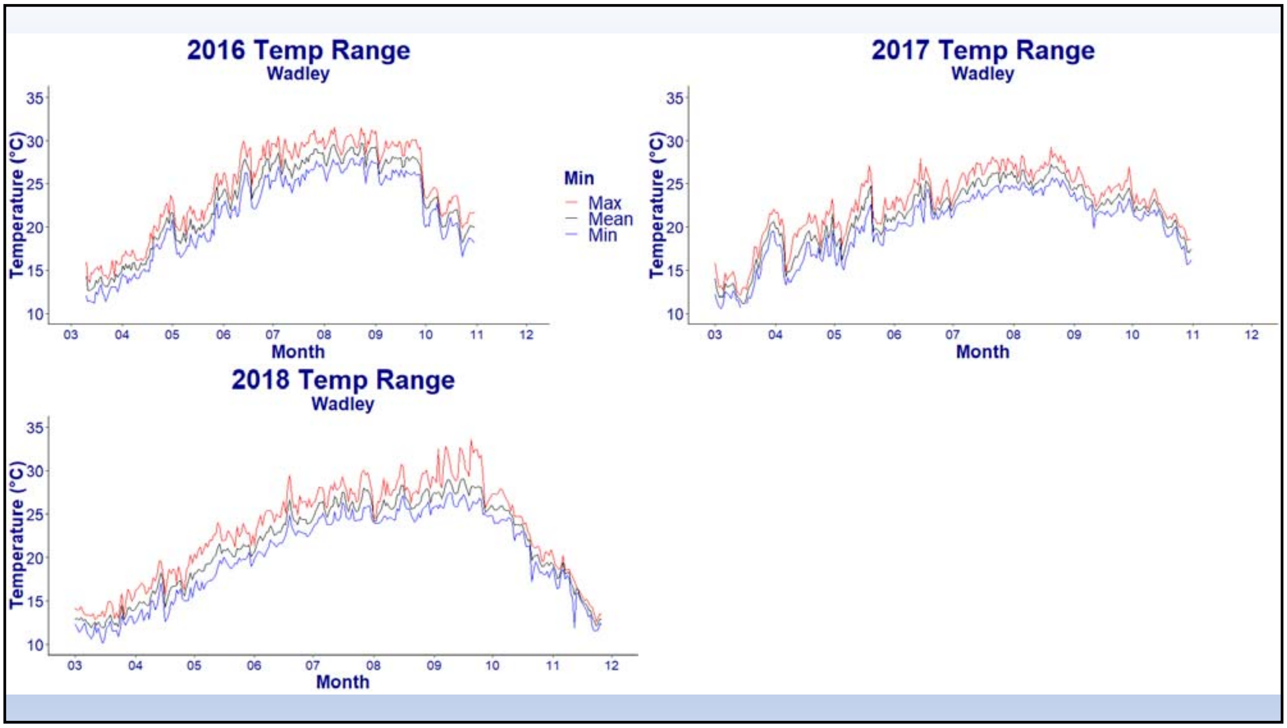
2000 Temp Range
Wadley
2001 Temp Range
Wadley
2002 Temp Range
Wadley
2003 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

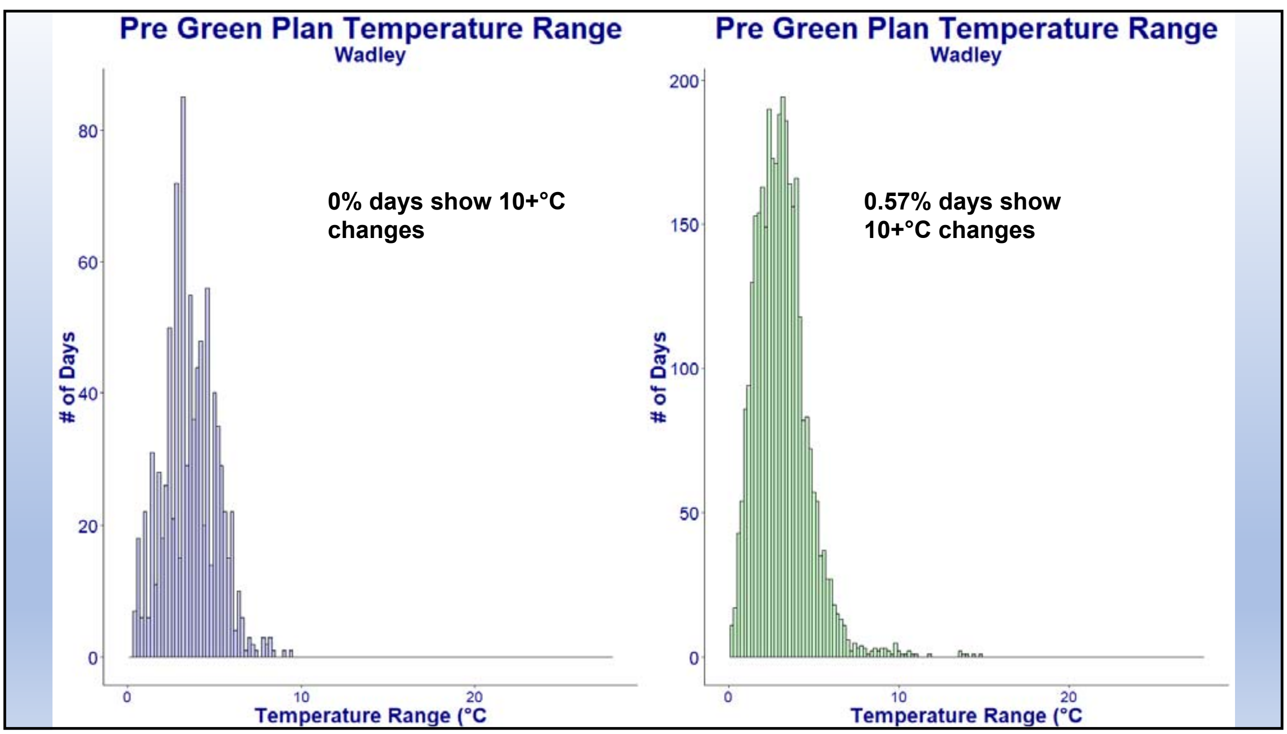
2004 Temp Range
Wadley
2005 Temp Range
Wadley
2005 Temp Range
Wadley
2007 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min


2008 Temp Range
Wadley
2009 Temp Range
Wadley
2010 Temp Range
Wadley
2011 Temp Range
Wadley
Temperature (°C)
35
30
25
20
15
10
03
04
05
06
07
08
09
10
11
12
Month
Min
Max
Mean
Min

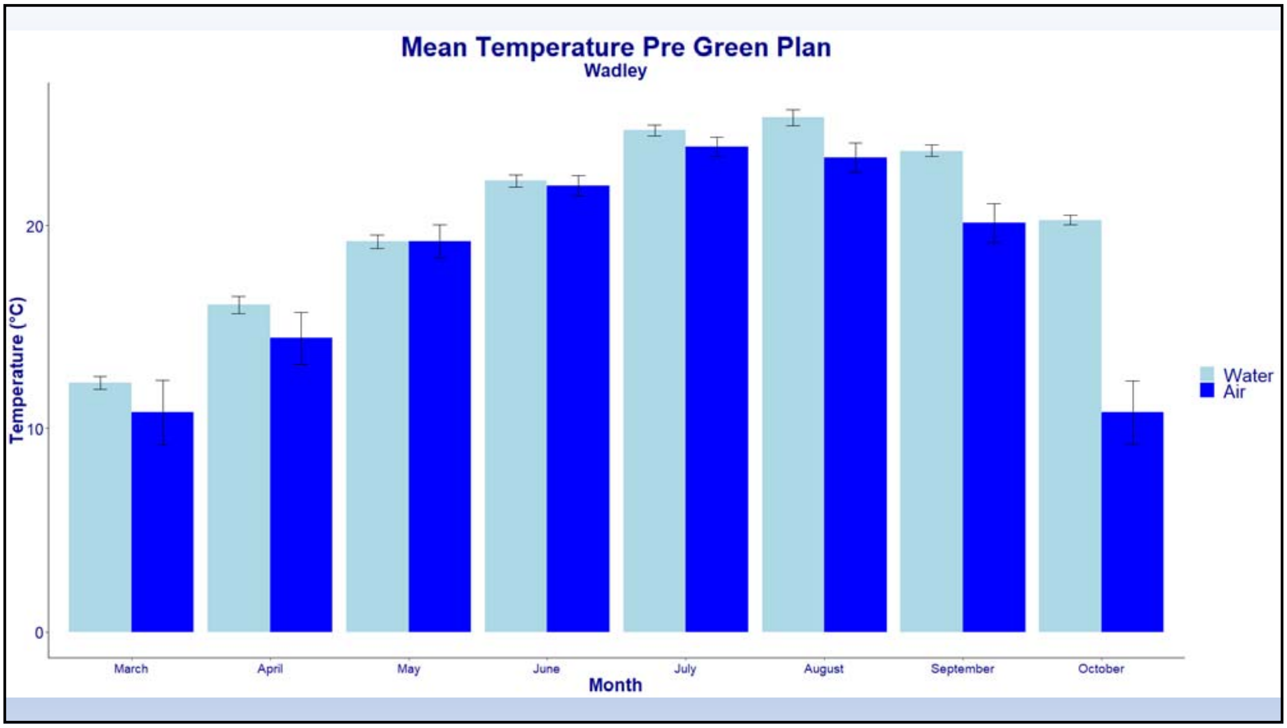

2012 Temp Range
Wadley
2013 Temp Range
Wadley
2014 Temp Range
Wadley
2015 Temp Range
Wadley
Temperature (°C)
35
30
25
20
15
10
03
04
05
06
07
08
09
10
11
12
Month
Min
Max
Mean
Min



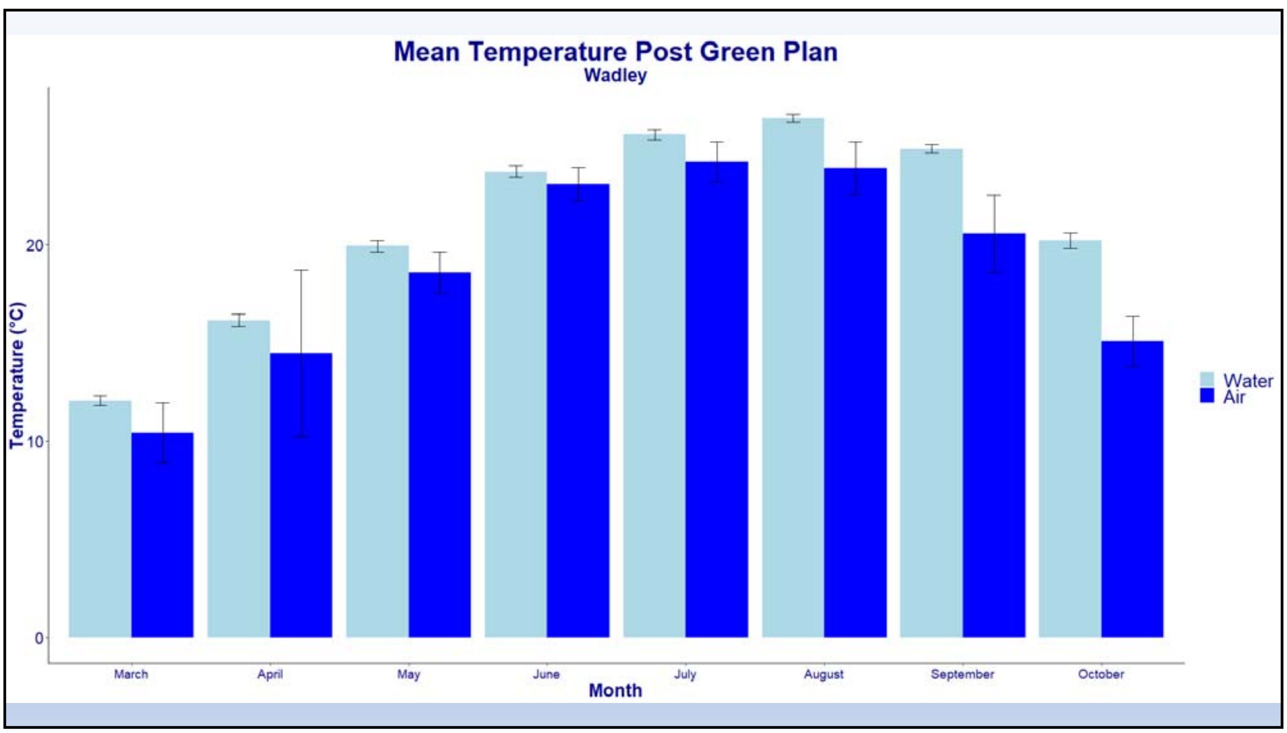
2016 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min
2017 Temp Range
Wadley
Temperature (°C)
Month
2018 Temp Range
Wadley
Temperature (°C)
Month

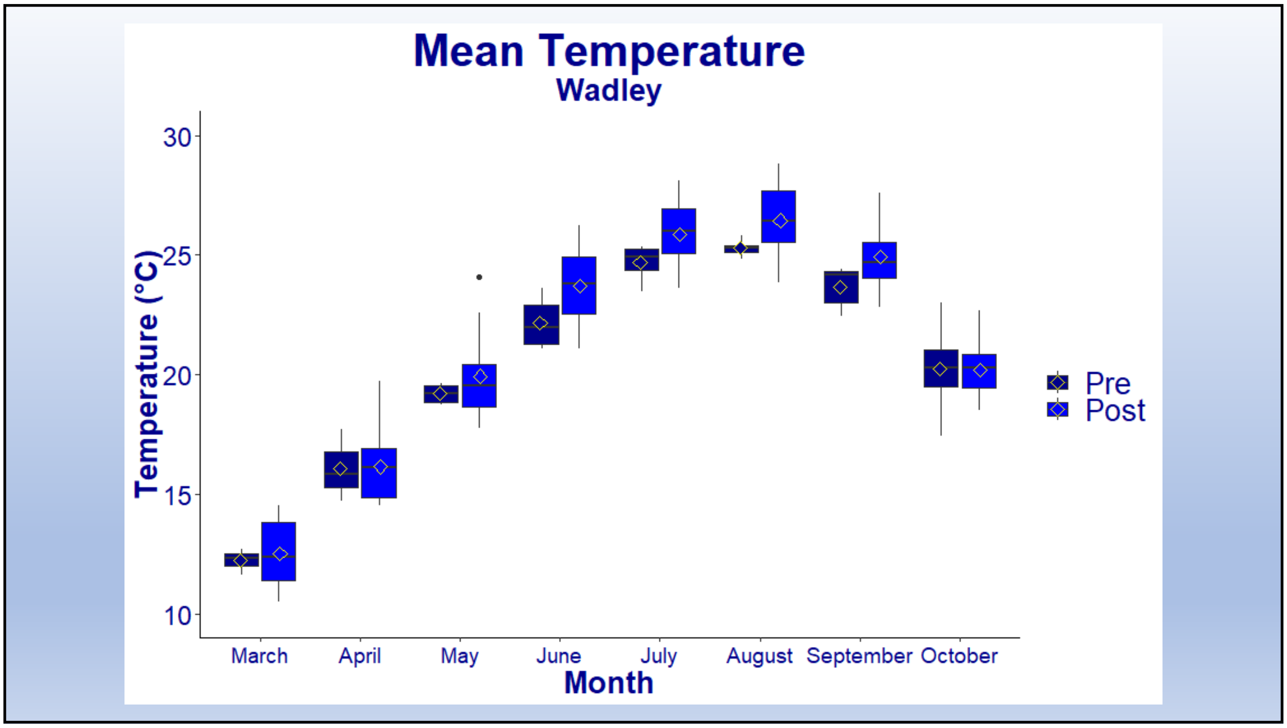
Pre Green Plan Temperature Range
Wadley
# of Days
0% days show 10+°C changes
Temperature Range (°C
Pre Green Plan Temperature Range
Wadley
# of Days
0.57% days show 10+°C changes
Temperature Range (°C



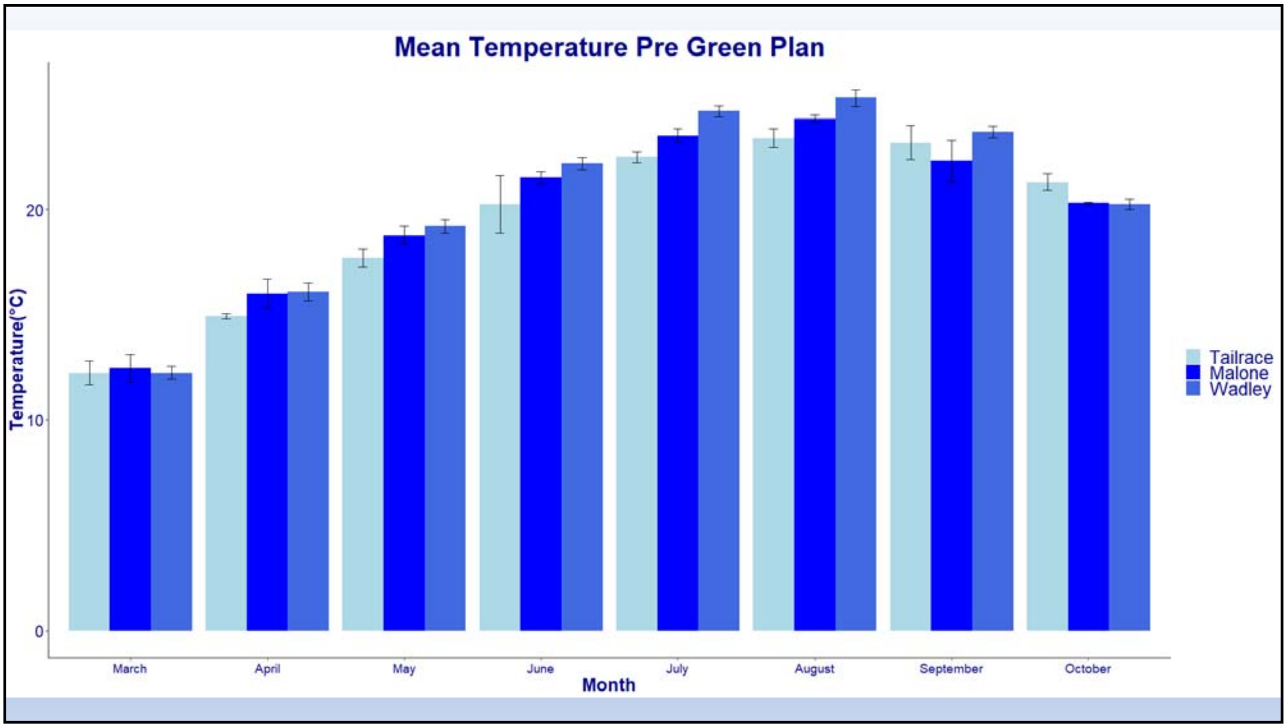
Mean Temperature Pre Green Plan
Wadley
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air

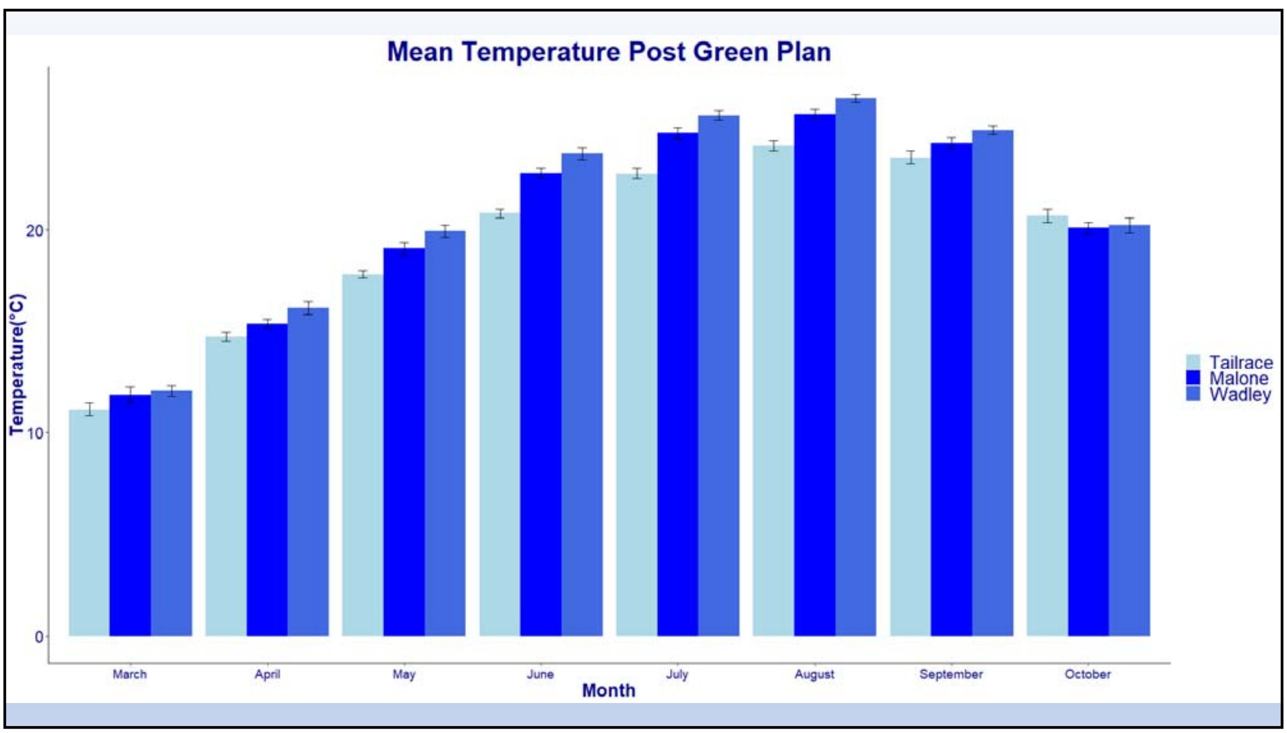



Mean Temperature Post Green Plan
Wadley
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air


Mean Temperature
Wadley
Temperature (°C)
30
25
20
15
10
March
April
May
June
July
August
September
October
Month
Pre
Post


All Three Sites Together


Mean Temperature Pre Green Plan
Temperature(°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Tailrace
Malone
Wadley


Mean Temperature Post Green Plan
Temperature(°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Tailrace
Malone
Wadley

## Preliminary Summary

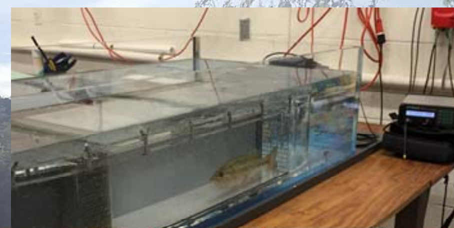
- No significant difference between temperatures before/after Green Plan
- Large variation in temperature during certain times
- Need winter temperature data
- Limited temperature tolerance data for riverine fish of interest

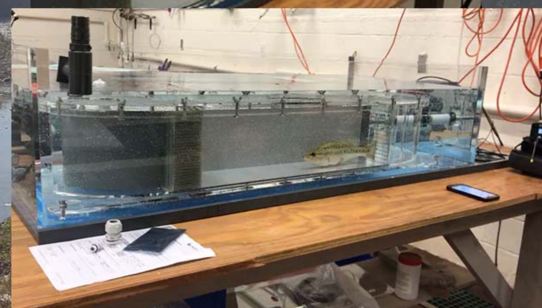
## Ongoing Work

- Continue to address objectives 1 and 2
  - Deploy temperature loggers
  - Compare flow and temperature patterns
  - Continue searching for temperature tolerance data

# Ongoing Work

- Begin work on objectives 3 and 4
  - Objective 3: Quantify the fish community across a gradient downstream from the Harris Dam tailrace and in a reference site upstream of Harris Reservoir
  - Objective 4: Quantify effects of temperature and flow variation on target fish species energy budgets using bioenergetics modeling





# Downstream Aquatic Habitat Study

**Goal**
To develop a model that describes the relationship between Green Plan operations and aquatic habitat.

**Geographic Scope**
Harris Dam through Horseshoe Bend

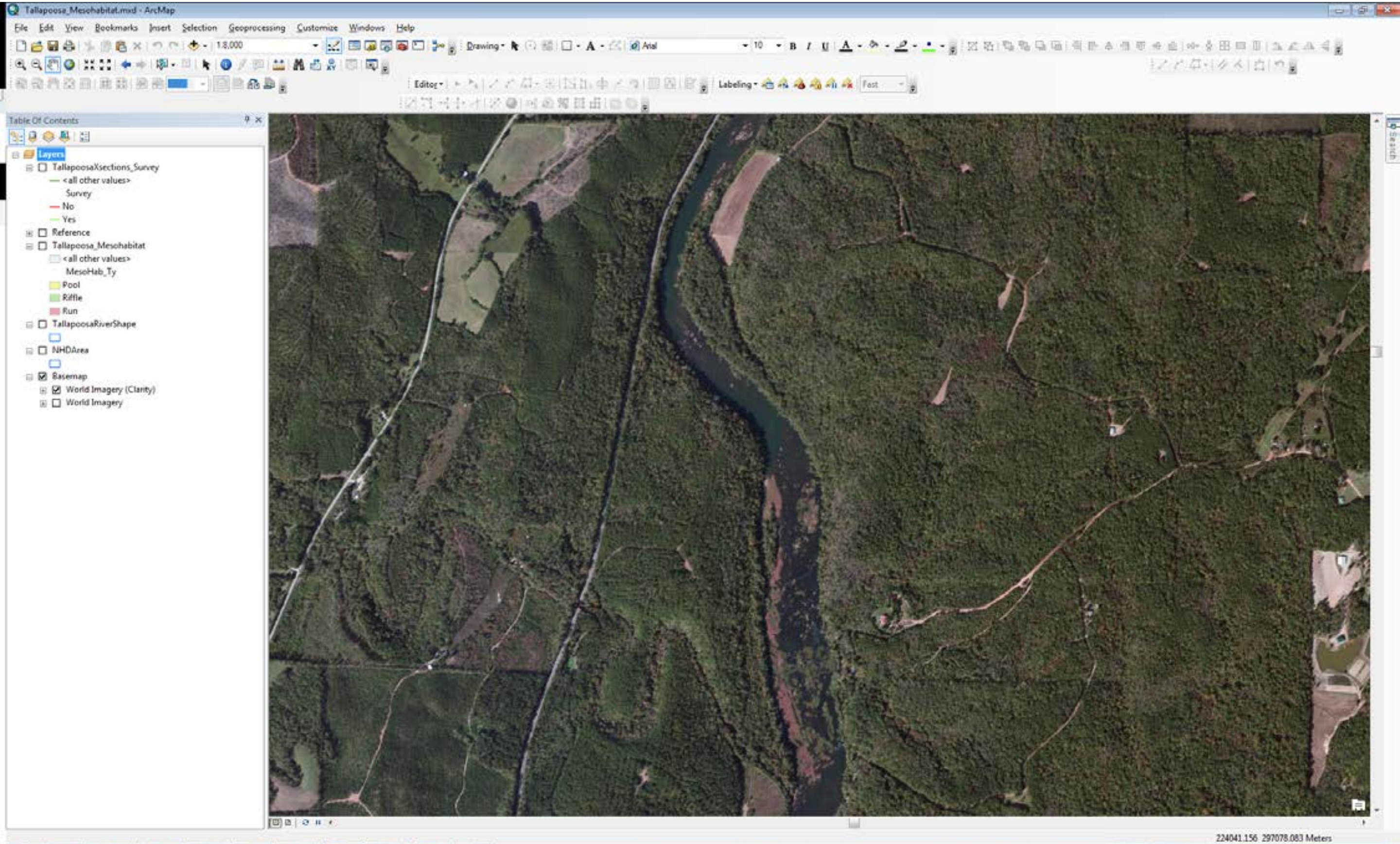
**Methods**

1. Mesohabitat Analysis: Desktop analysis of the types of available habitat (classified as riffle, run, pool)

2. Install water level loggers at up to 20 sites

3. Use HEC-RAS to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoal/shallow-water habitat.

# Mesohabitat Analysis



Tallapoosa_Mesohabitat.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
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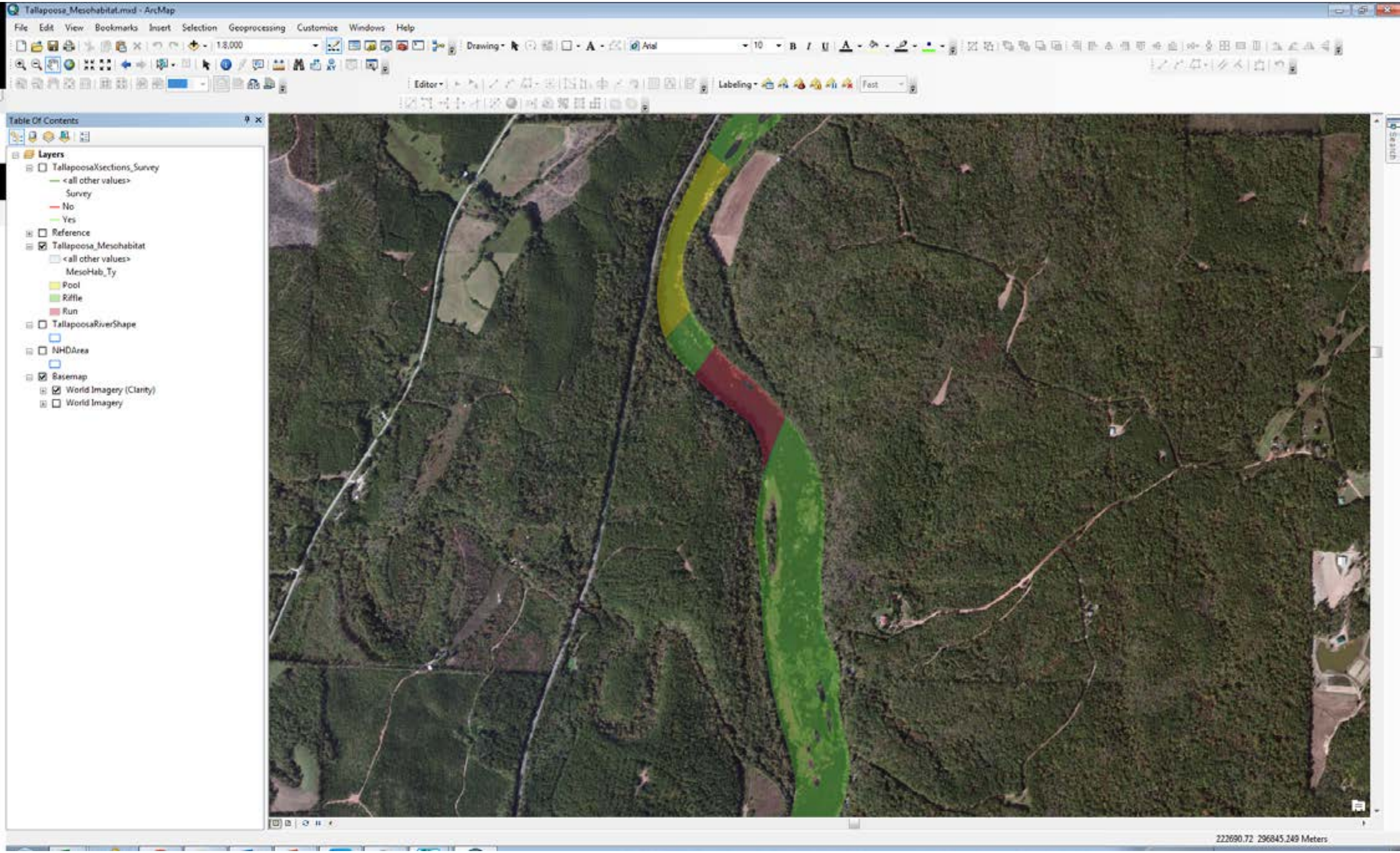
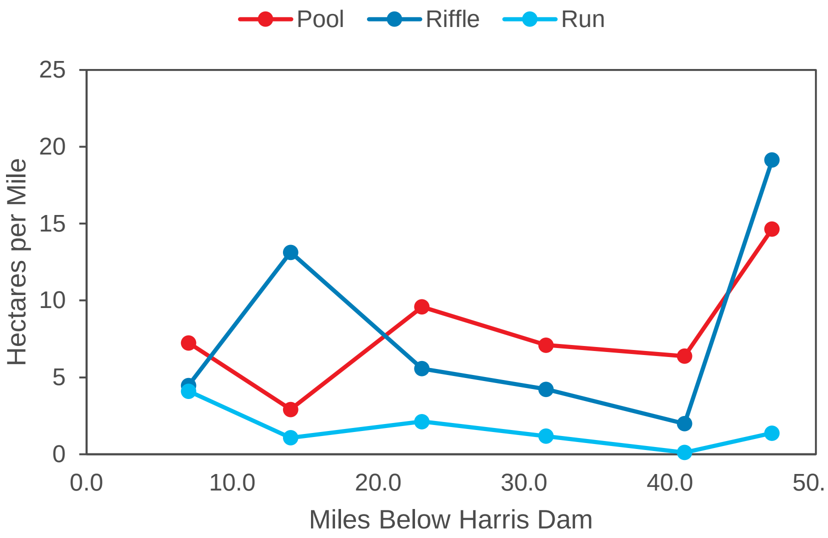
Drawing
Arial
10
Editor
Labeling
Fast
Table Of Contents
Layers
TallapoosaXsections_Survey
<all other values>
Survey
No
Yes
Reference
Tallapoosa_Mesohabitat
<all other values>
MesoHab_Ty
Pool
Riffle
Run
TallapoosaRiverShape
NHDArea
Basemap
World Imagery (Clarity)
World Imagery
224041.156 297078.083 Meters

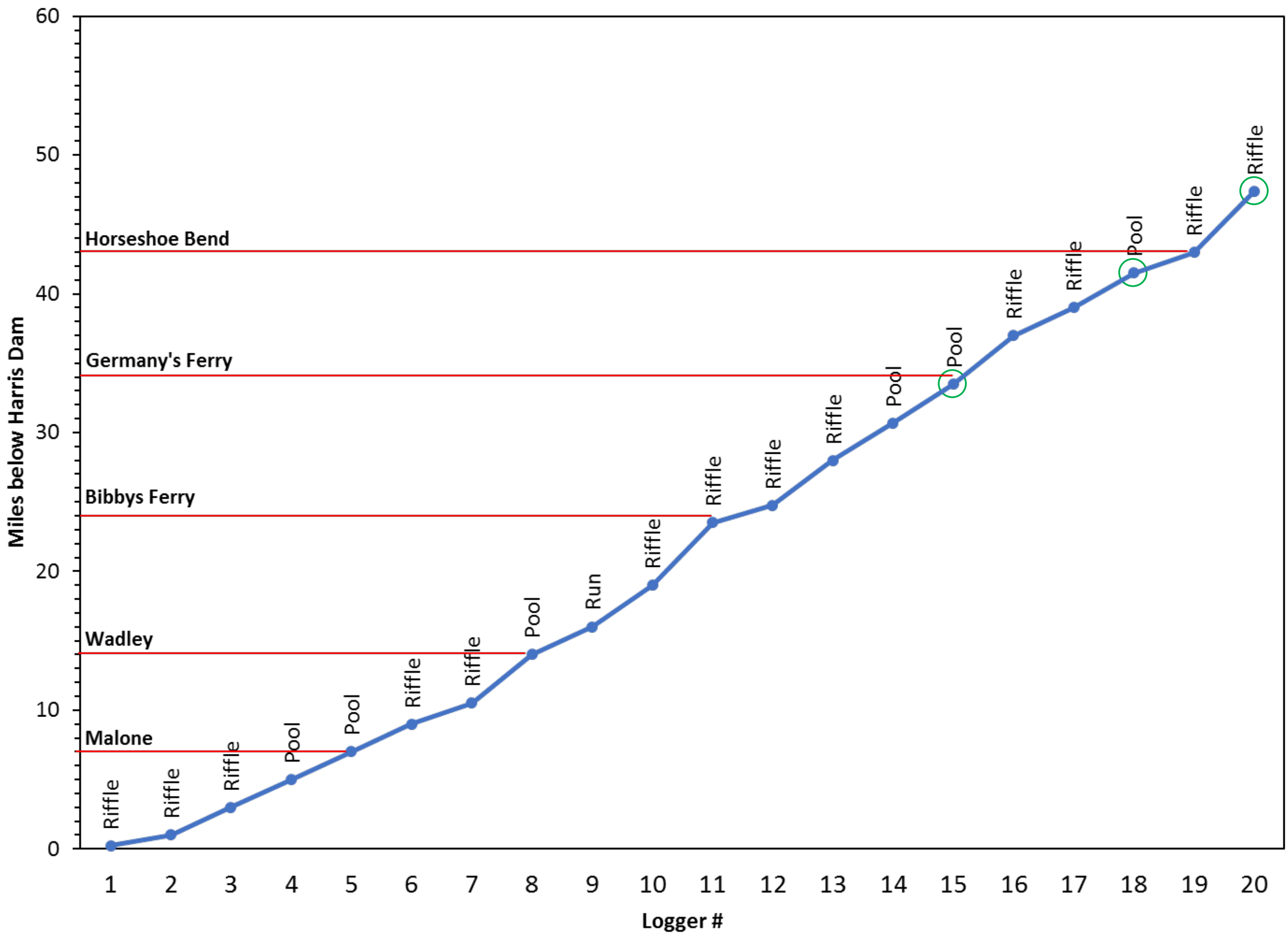

Tallapoosa_Mesohabitat.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:8,000
Drawing
Arial
10
Editor
Labeling
Fast
Table Of Contents
Layers
TallapoosaXsections_Survey
<all other values>
Survey
No
Yes
Reference
Tallapoosa_Mesohabitat
<all other values>
MesoHab_Ty
Pool
Riffle
Run
TallapoosaRiverShape
NHDArea
Basemap
World Imagery (Clarity)
World Imagery
222690.72 296845.249 Meters

# Mesohabitat Type by Reach (hectares)

| Reach | Pool |
|---|---|
| Malone | 50.7 |
| Wadley | 20.4 |
| Bibbys Ferry | 86.3 |
| Germany's Ferry | 60.3 |
| Horseshoe Bend | 60.7 |
| Irwin Shoals | 87.9 |
| **Grand Total** | **366.3** |

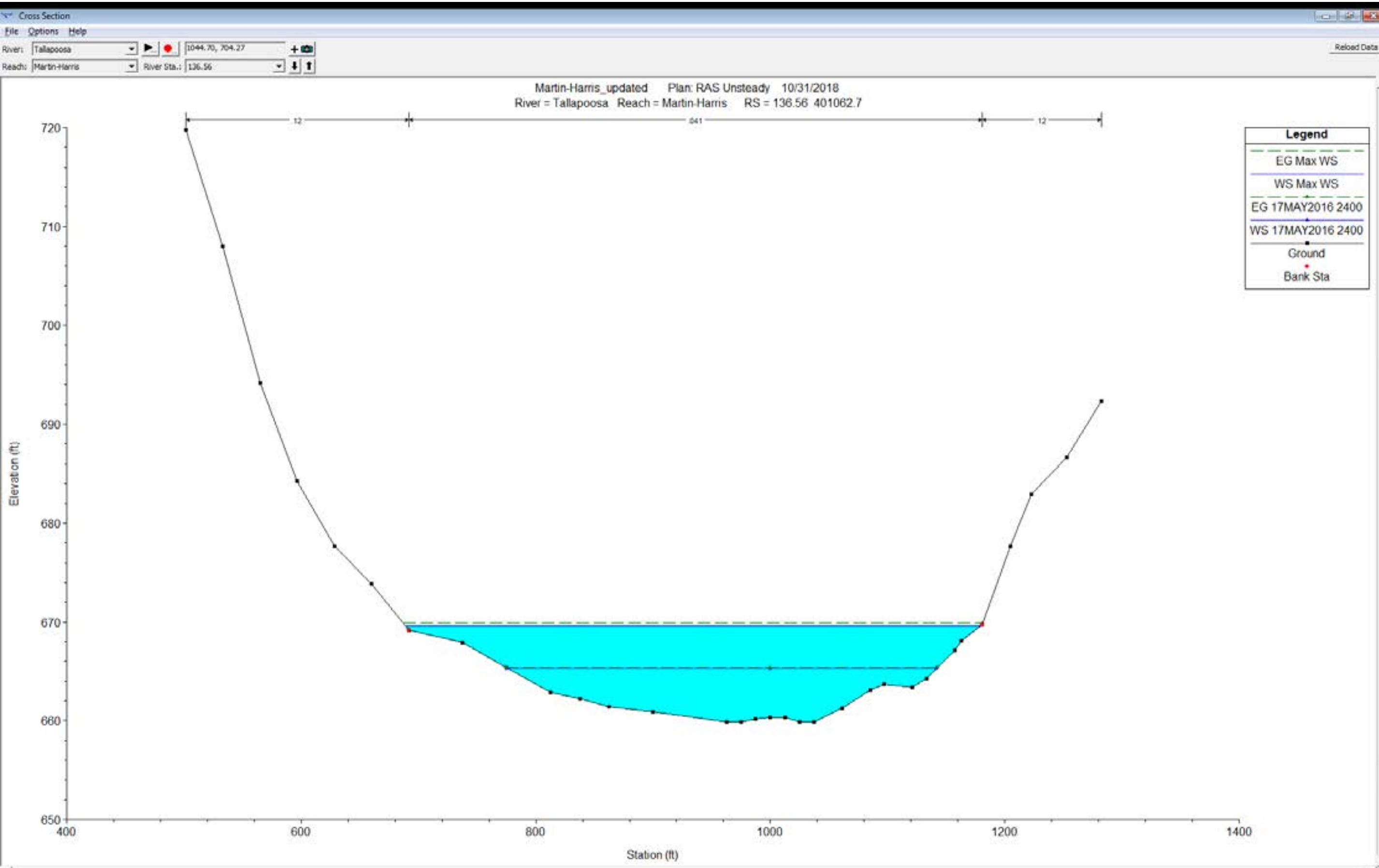

Pool
Riffle
Run
25
20
15
10
5
0
Hectares per Mile
0.0
10.0
20.0
30.0
40.0
50.
Miles Below Harris Dam

# Water Level Logger Deployments



Miles below Harris Dam
Logger #
0
10
20
30
40
50
60
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Horseshoe Bend
Germany's Ferry
Bibbys Ferry
Wadley
Malone
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Run
Riffle
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Riffle
Riffle

# HEC-RAS Model Development



Cross Section
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Reach: Martin-Harris
River Sta.: 136.56
1044.70, 704.27
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
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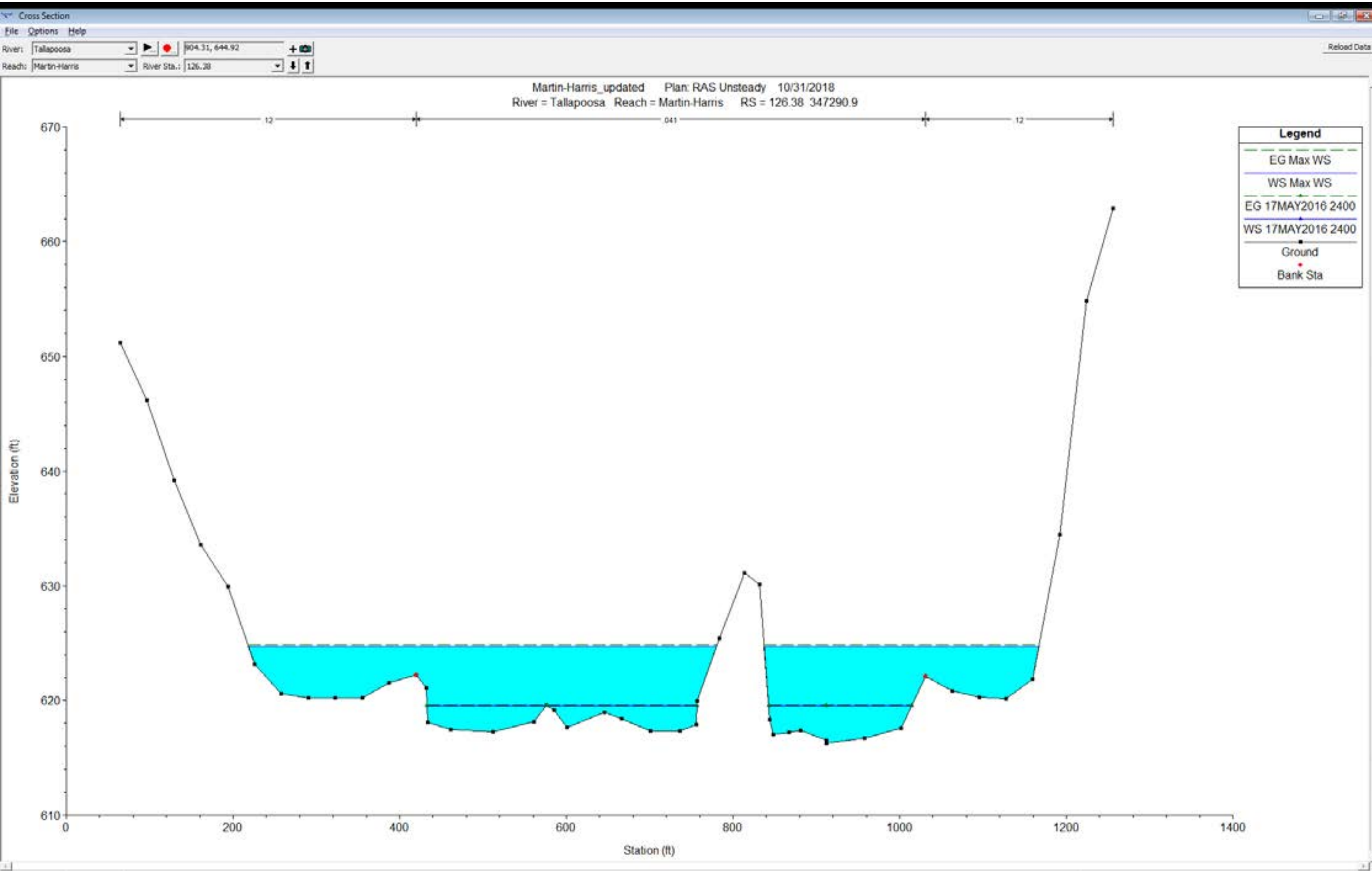
.12
.041
.12
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
720
710
700
690
680
670
660
650
400
600
800
1000
1200
1400
Station (ft)



Cross Section
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Reach: Martin-Harris
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Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
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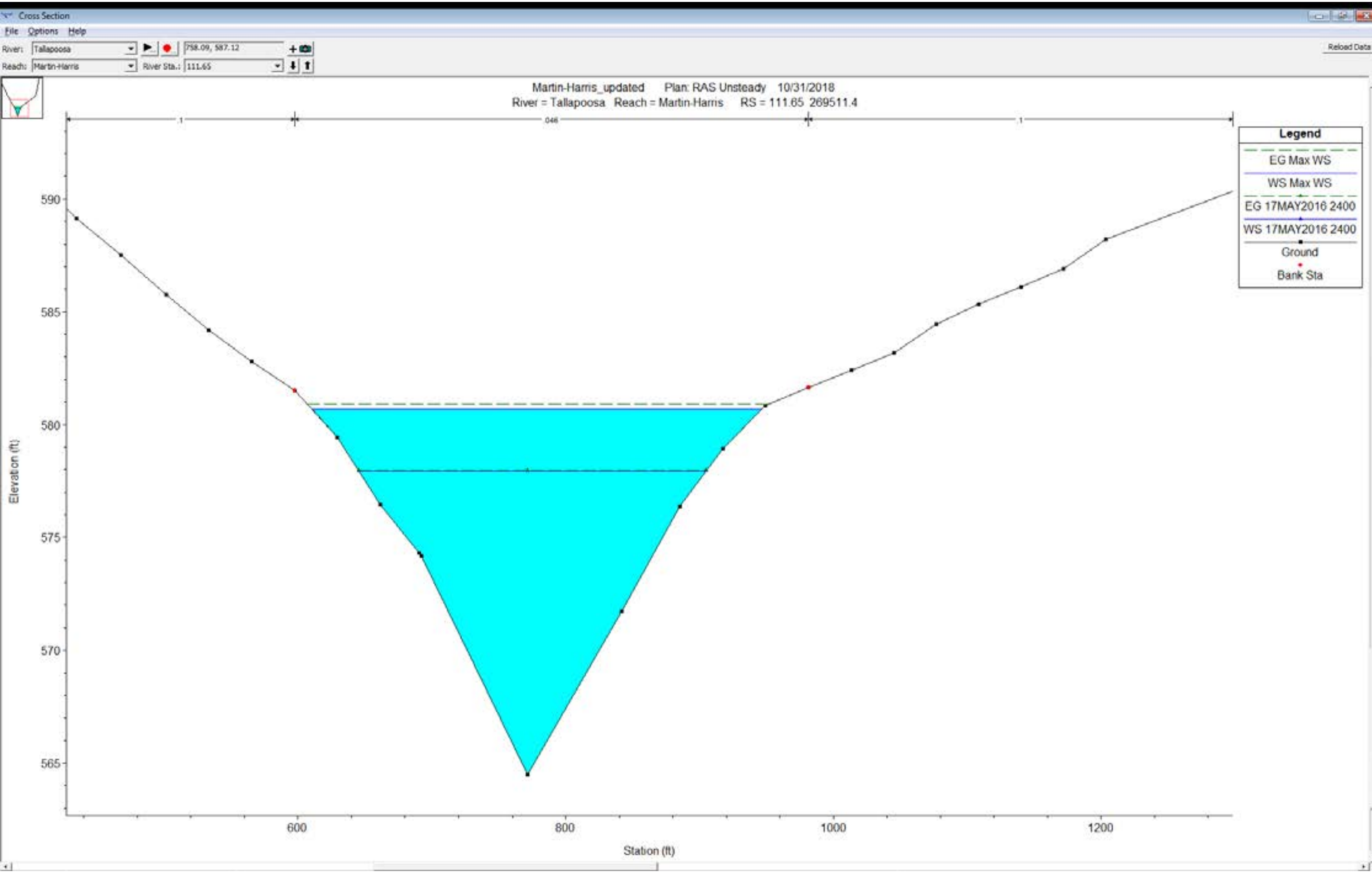
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
Station (ft)


Cross Section
File Options Help
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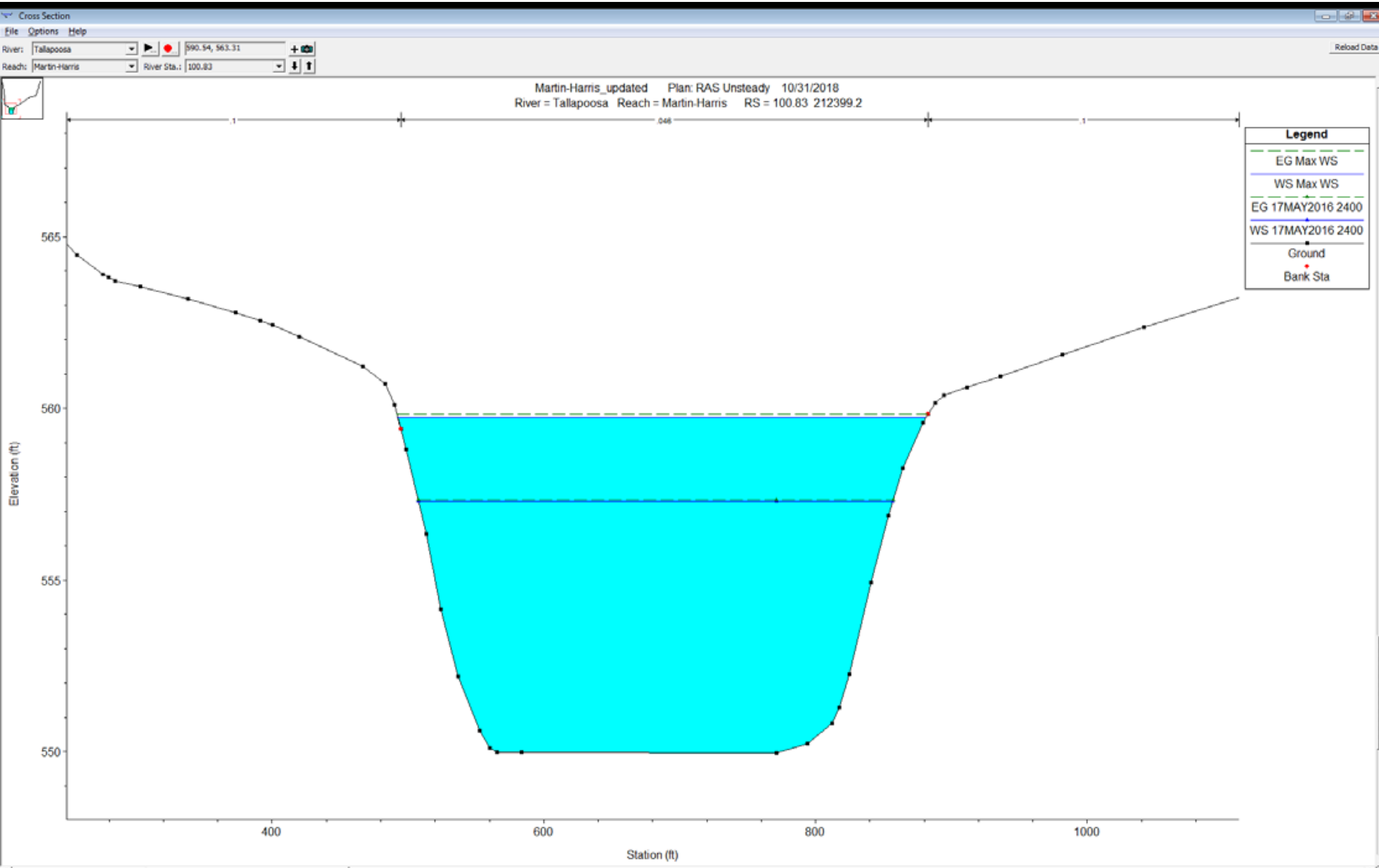
Reach: Martin-Harris
River Sta.: 111.65
758.09, 587.12
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 111.65 269511.4
.1
.046
.1
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
590
585
580
575
570
565
Elevation (ft)
600
800
1000
1200
Station (ft)


Cross Section
File Options Help
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Reach: Martin-Harris
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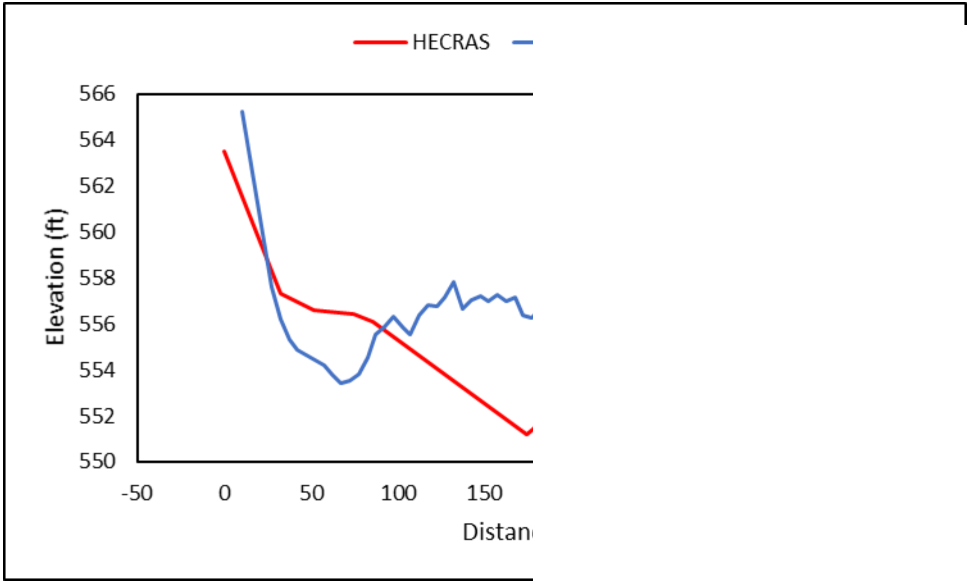
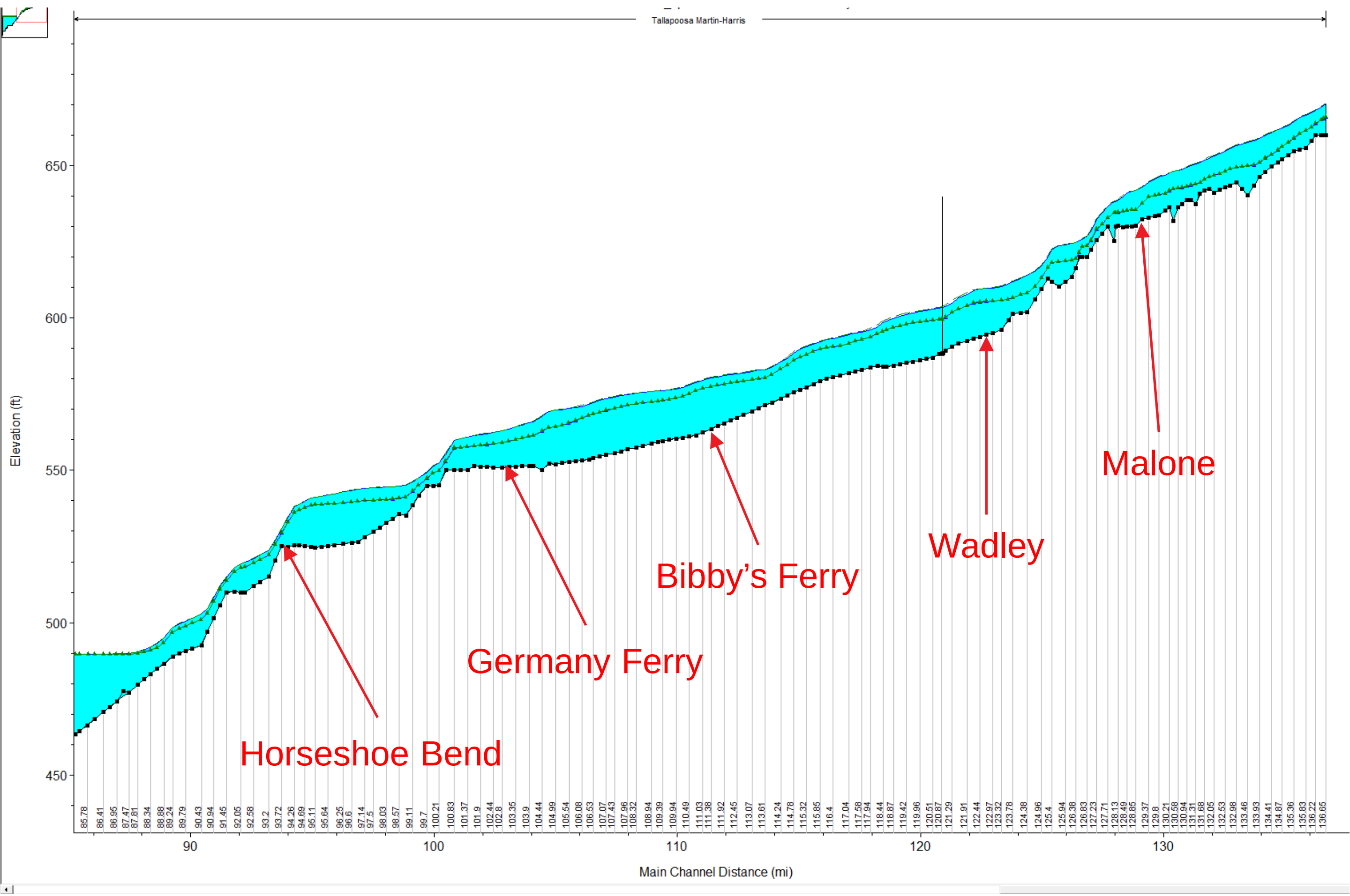
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 100.83 212399.2
.1
.046
.1
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
565
560
555
550
400
600
800
1000
Station (ft)




~200 cross-sections

Collect bathymetry data at:

- Poorly interpolated cross-sections
- New cross-sections where gradient is steep



Tallapoosa Martin-Harris
Elevation (ft)
Main Channel Distance (mi)
Horseshoe Bend
Germany Ferry
Bibby's Ferry
Wadley
Malone

# Level logger information

## APC Harris Relicensing

Mon 10/14/2019 6:34 PM

**To:** 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
**Bcc** damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov <stan.cook@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>; tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; jhaslbauer@adem.alabama.gov <jhaslbauer@adem.alabama.gov>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>; mlen@adem.alabama.gov <mlen@adem.alabama.gov>; fal@adem.alabama.gov <fal@adem.alabama.gov>; djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; mcoker@southernco.com <mcoker@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; sgraham@southernco.com <sgraham@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cmnix@southernco.com <cmnix@southernco.com>; kodom@southernco.com <kodom@southernco.com>; alpeeple@southernco.com <alpeeple@southernco.com>; dpreston@southernco.com <dpreston@southernco.com>; scsmith@southernco.com <scsmith@southernco.com>; twstjohn@southernco.com <twstjohn@southernco.com>; cchaffin@alabamarivers.org <cchaffin@alabamarivers.org>; clowry@alabamarivers.org <clowry@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; kmo0025@auburn.edu <kmo0025@auburn.edu>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; lgallen@balch.com <lgallen@balch.com>; jhancock@balch.com <jhancock@balch.com>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; gene@wedoweelakehomes.com <gene@wedoweelakehomes.com>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; chris.goodell@kleinschmidtgroup.com <chris.goodell@kleinschmidtgroup.com>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; jessecunningham@msn.com <jessecunningham@msn.com>; mdollar48@gmail.com <mdollar48@gmail.com>; drheinzen@charter.net <drheinzen@charter.net>; sforehand@russelllands.com <sforehand@russelllands.com>; 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>; sandnfrench@gmail.com <sandnfrench@gmail.com>; lgarland68@aol.com <lgarland68@aol.com>; rbmorris222@gmail.com <rbmorris222@gmail.com>; Ira Parsons (irapar@centurytel.net) <irapar@centurytel.net>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; richardburnes3@gmail.com <richardburnes3@gmail.com>; eilandfarm@aol.com <eilandfarm@aol.com>; athall@fujifilm.com <athall@fujifilm.com>; ebt.drt@numail.org <ebt.drt@numail.org>; georgettraylor@centurylink.net <georgettraylor@centurylink.net>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; dbronson@charter.net <dbronson@charter.net>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; jec22641@aol.com <jec22641@aol.com>; sonjaholloman@gmail.com <sonjaholloman@gmail.com>; butchjackson60@gmail.com <butchjackson60@gmail.com>; donnamat@aol.com <donnamat@aol.com>; goxford@centurylink.net <goxford@centurylink.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; jerrelshell@gmail.com <jerrelshell@gmail.com>; bsmith0253@gmail.com <bsmith0253@gmail.com>; inspector_003@yahoo.com <inspector_003@yahoo.com>; paul.trudine@gmail.com <paul.trudine@gmail.com>; lindastone2012@gmail.com

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Good afternoon,

There have several questions at recent HAT meetings about the location of the level loggers that are collecting elevation and temperature data that will be used in several of the relicensing studies. For your information, here is a link to a map that shows the locations of the 20 level logger monitors: Level Logger Locations. This link will also be placed under HATs 1 and 3 on the Harris relicensing website, www.harrisrelicensing.com.

Thanks,

**Angie Anderegg**
Hydro Services
(205)257-2251

arsegars@southernco.com

## HAT 3 - Downstream Aquatic Habitat conference call


Anderegg, Angela Segars

Thu 11/14/2019 7:53 PM

**To:** 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>

**Bcc:** amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov <stan.cook@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>; ken.wills@jcdh.org <ken.wills@jcdh.org>; arsegars@southernco.com <arsegars@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; clowry@alabamarivers.org <clowry@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; kmo0025@auburn.edu <kmo0025@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; jhancock@balch.com <jhancock@balch.com>; lgallen@balch.com <lgallen@balch.com>; chrisoberholster@birminghamaudubon.org <chrisoberholster@birminghamaudubon.org>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; sforehand@russelllands.com <sforehand@russelllands.com>; lgarland68@aol.com <lgarland68@aol.com>; pace.wilber@noaa.gov <pace.wilber@noaa.gov>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; donnamat@aol.com <donnamat@aol.com>; trayjim@bellsouth.net <trayjim@bellsouth.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; straylor426@bellsouth.net <straylor426@bellsouth.net>; triciastearns@gmail.com <triciastearns@gmail.com>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; decker.chris@epa.gov <decker.chris@epa.gov>; bill_pearson@fws.gov <bill_pearson@fws.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>


HAT 3,

Please join us for a conference call on Wednesday, December 11, from 1:00-2:30 to review the habitat analysis modeling results.

Please use the “Join Skype Meeting” link below to view the presentation on your computer and mute your computer’s microphone. Then dial the number below to join the audio portion by phone. This will help avoid technical issues with sound.

[Join Skype Meeting]

+1 (205) 257-2663

Conference ID: 3660816

Thanks!

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

| | |
|---|---|
| **From:** | Anderegg, Angela Segars |
| **To:** | "harrisrelicensing@southernco.com" |
| **Bcc:** | amy.silvano@dcnr.alabama.gov; chris.greene@dcnr.alabama.gov; damon.abernethy@dcnr.alabama.gov; evan.lawrence@dcnr.alabama.gov; keith.henderson@dcnr.alabama.gov; mike.holley@dcnr.alabama.gov; stan.cook@dcnr.alabama.gov; steve.bryant@dcnr.alabama.gov; taconya.goar@dcnr.alabama.gov; matthew.marshall@dcnr.alabama.gov; ken.wills@jcdh.org; arsegars@southernco.com; ammcvica@southernco.com; dkanders@southernco.com; jcarlee@southernco.com; jefbaker@southernco.com; kechandl@southernco.com; tlmills@southernco.com; cggoodma@southernco.com; clowry@alabamarivers.org; mhunter@alabamarivers.org; gjobsis@americanrivers.org; devridr@auburn.edu; irwiner@auburn.edu; kmo0025@auburn.edu; wrighr2@aces.edu; jhancock@balch.com; lgallen@balch.com; chrisoberholster@birminghamaudubon.org; sarah.salazar@ferc.gov; allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; monte.terhaar@ferc.gov; amanda.fleming@kleinschmidtgroup.com; colin.dinken@kleinschmidtgroup.com; henry.mealing@kleinschmidtgroup.com; jason.moak@kleinschmidtgroup.com; kate.cosnahan@kleinschmidtgroup.com; kelly.schaeffer@kleinschmidtgroup.com; sforehand@russelllands.com; lgarland68@aol.com; pace.wilber@noaa.gov; mitchell.reid@tnc.org; donnamat@aol.com; trayjim@bellsouth.net; mhpwedowee@gmail.com; straylor426@bellsouth.net; triciastearns@gmail.com; wmcampbell218@gmail.com; holliman.daniel@epa.gov; decker.chris@epa.gov; bill_pearson@fws.gov; evan_collins@fws.gov; jeff_powell@fws.gov; jennifer_grunewald@fws.gov; jeff_duncan@nps.gov; rosoweka@mcn-nsn.gov; RaeLynn Butler |
| **Subject:** | 2019-12-11 HAT 3 meeting notes |
| **Date:** | Thursday, December 19, 2019 1:14:59 PM |

HAT 3,

Meeting notes and the presentation from the December 11 conference call on the Downstream Aquatic Habitat Study can be found at www.harrisrelicensing.com in the HAT 3 folder.

Thanks,

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

**Meeting Summary**
**HAT 3 Meeting**
**December 11, 2019**
**1:00 pm to 2:00 pm**
**Conference Call**

**Participants:**
Angie Anderegg – Alabama Power
Jeff Baker – Alabama Power
Keith Chandler – Alabama Power
Kate Cosnahan – Kleinschmidt Associates
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Colin Dinken – Kleinschmidt Associates
Amanda Fleming – Kleinschmidt Associates
Henry Hershey – Alabama Rivers Alliance (ARA)
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt Associates
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt Associates

*NOTE: A copy of the HAT 3 December 11, 2019 presentation is attached.*

**Meeting Summary:**

Angie Anderegg (Alabama Power) opened the meeting by introducing everyone and stated that the purpose of the meeting was to discuss methods for the habitat analysis using the HEC-RAS model. Jason Moak (Kleinschmidt Associates) summarized the March 20, 2019 HAT 3 meeting and then reviewed the Downstream Aquatic Habitat Study Plan, including the goal, geographic scope, and methods. The study goal is to develop a model that describes the relationship between Green Plan operations and aquatic habitat and the geographic scope is the Tallapoosa River from R. L. Harris Dam (Harris Dam) through Horseshoe Bend.

The study methods include mesohabitat analysis, water level data (and temperature data for other studies) at up to 20 sites, and development of a HEC-RAS model as a tool to determine how operations affect wetted habitat. Jason explained that mesohabitat was analyzed using aerial photography and first-hand observations and then classified as riffles, runs, and pools. Mesohabitat types were summarized by reach: Malone, Wadley, Bibby's Ferry, Germany Ferry, Horseshoe Bend, and Irwin Shoals. There is a consistent mix of habitat types throughout the geographic scope except for the reach between Malone and Wadley, where riffles are more prevalent. Jason noted that the level loggers have been in the river since June 2019 and are recording water level and temperature data every 15 minutes.

Jason then reviewed the development of the HEC-RAS model. The model initially included 200 cross-sections between Harris Dam and Jaybird Landing. Some of these cross-sections in the existing model were interpolated based on surrounding landscape and did not accurately characterize actual channel geometry. Therefore, many of these cross-sections (>100) were surveyed in 2019 to provide better channel geometry for the HEC-RAS model. Jason provided an example cross-section to compare the difference between the old data (pre-2019) and the new (2019). He explained that water surface elevations were also collected to provide reference points for water level data.

Alabama Power is adding the new channel geometry into the model. Jason provided some example graphs of how outputs from the model will be analyzed, including a graphic of a cross-section of the river with the amount of wetted perimeter at multiple discharge scenarios. He reiterated that this was an example of how the data will be analyzed and did not represent actual results. The analysis will focus on how wetted perimeter changes in relation to discharge in cubic feet per second (cfs). The range in wetted perimeter will be calculated by subtracting the minimum wetted perimeter from the maximum. Jason provided an example of a habitat duration curve that will aid in the comparisons.

Jason reviewed the operating scenarios that will be analyzed: peaking only, the Green Plan, 150 cfs minimum flow with peaking, and a modified Green Plan (different timing of pulses or different frequencies). Allan Creamer (FERC) asked if Alabama Power will analyze different minimum flow scenarios other than 150 cfs. Jason replied that no additional operating scenarios have been proposed by stakeholders to date, and that some stakeholders have wanted to see results of these four scenarios before proposing different scenarios. Allan suggested looking at a wider range of minimum flow scenarios once stakeholders have reviewed initial results.

Angie noted that any impacts of the operating scenarios on temperature will be examined and this is just one data point in the overall relicensing studies. Jason added that, for example, the effect of the operating scenarios on fish will be measured to determine the optimal conditions for fish, and then the effect of those conditions on lake levels will be analyzed. Angie announced that there will be another HAT 3 meeting in March 2020; date to be determined. Henry Hershey (Alabama Rivers Alliance) asked if the cross sections account for islands and side chutes. Jason replied that they do since the model geometry was constructed using LIDAR, which captured objects such as islands that are above the water.

# R.L. Harris Project Relicensing

# HAT 3 – Downstream Habitat Study

December 11, 2019

# Meeting Agenda

- Study Overview
- Mesohabitat Mapping
- Level Logger Deployments
- HEC-RAS Model Development
- Analysis of HEC-RAS Outputs

HARRIS DAM
RELICENSING

# Downstream Aquatic Habitat Study

**Goal**

To develop a model that describes the relationship between Green Plan operations and aquatic habitat.

**Geographic Scope**

Harris Dam through Horseshoe Bend

**Methods**

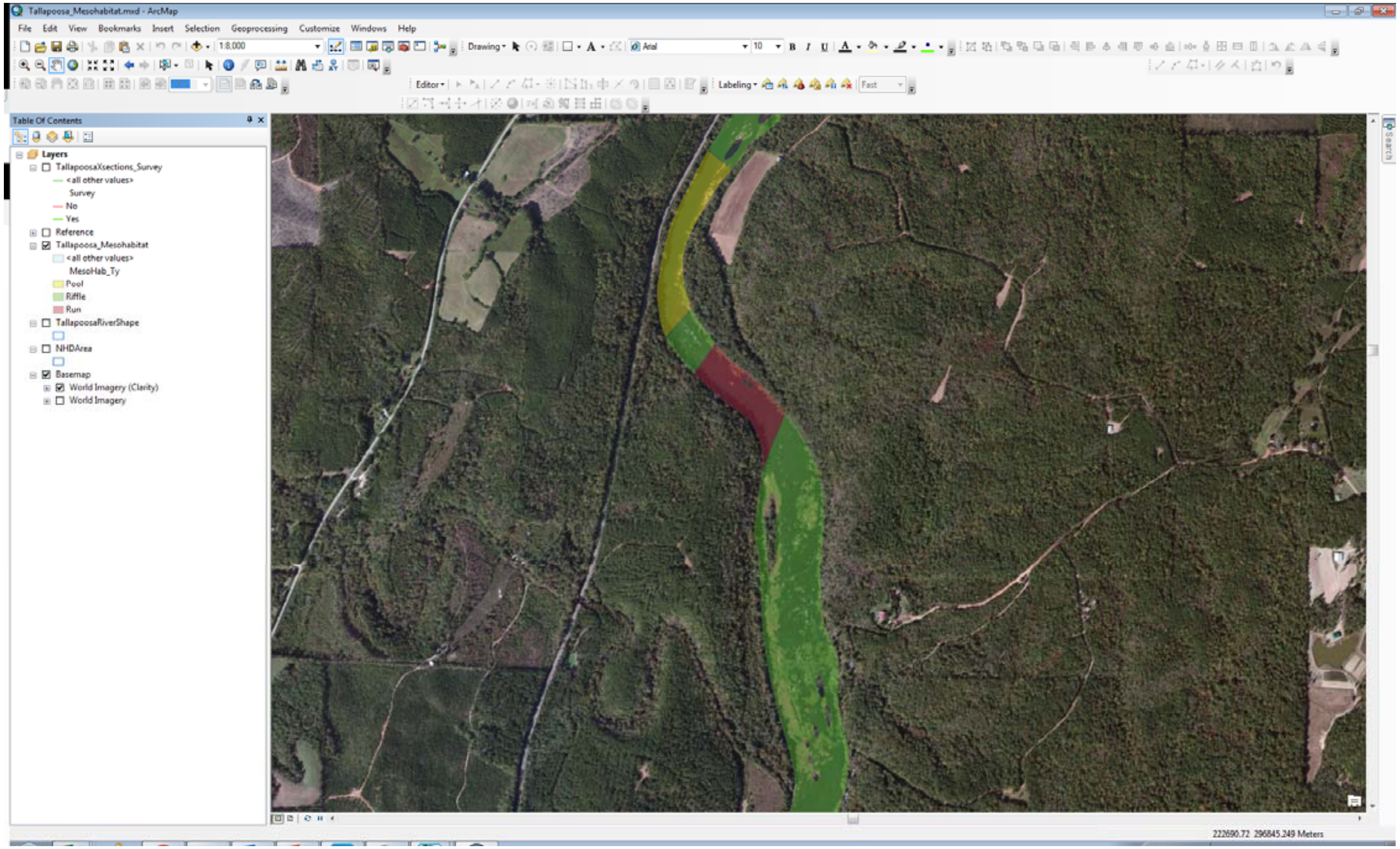
1. Mesohabitat Analysis: Desktop analysis of the types of available habitat (classified as riffle, run, pool)

2. Install water level loggers at up to 20 sites

3. Use HEC-RAS to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoal/shallow-water habitat.

# Mesohabitat Mapping and Analysis

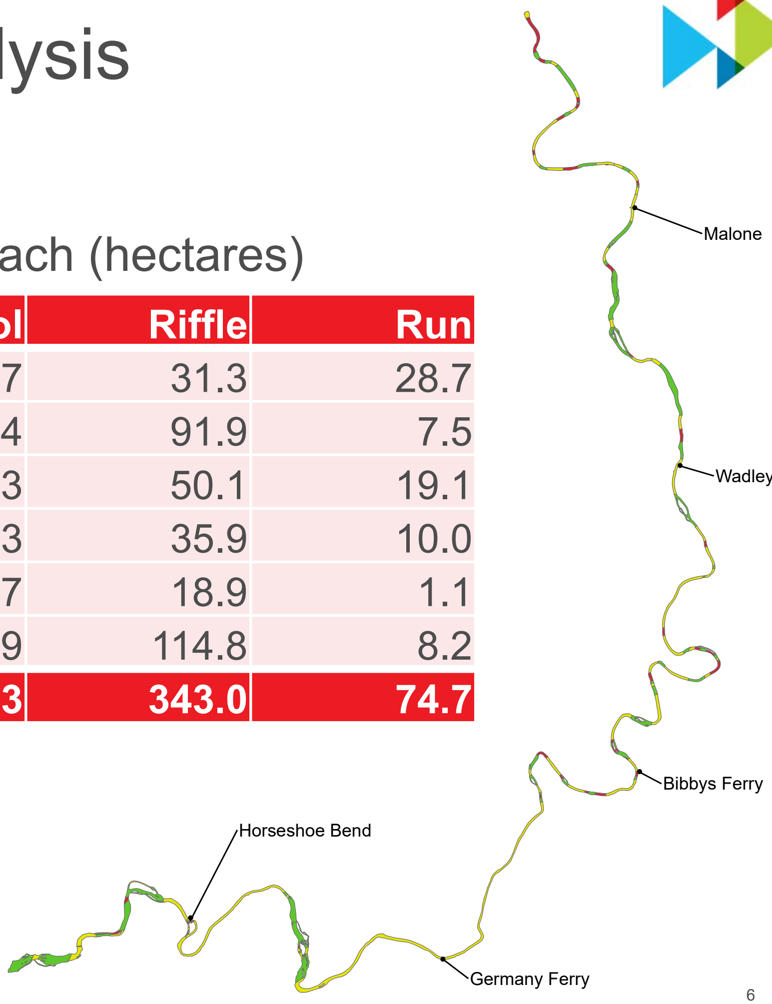
# Mesohabitat Mapping



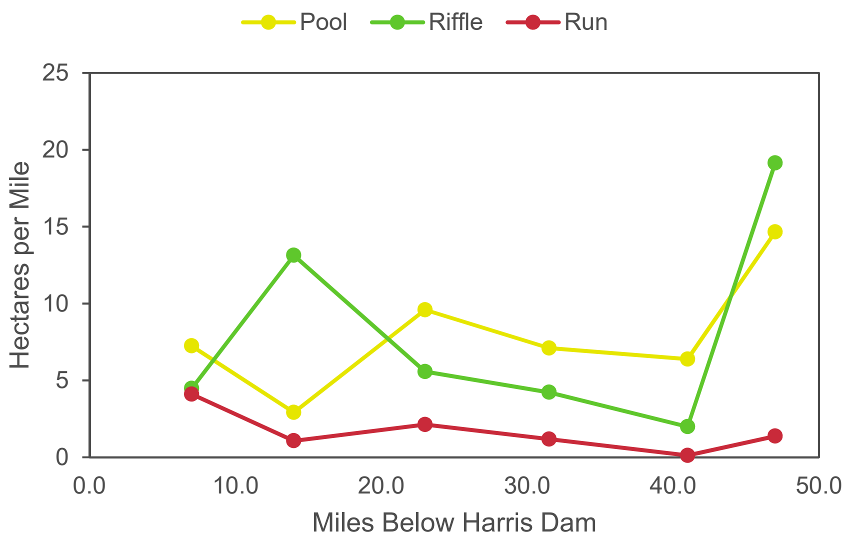
# Mesohabitat Analysis

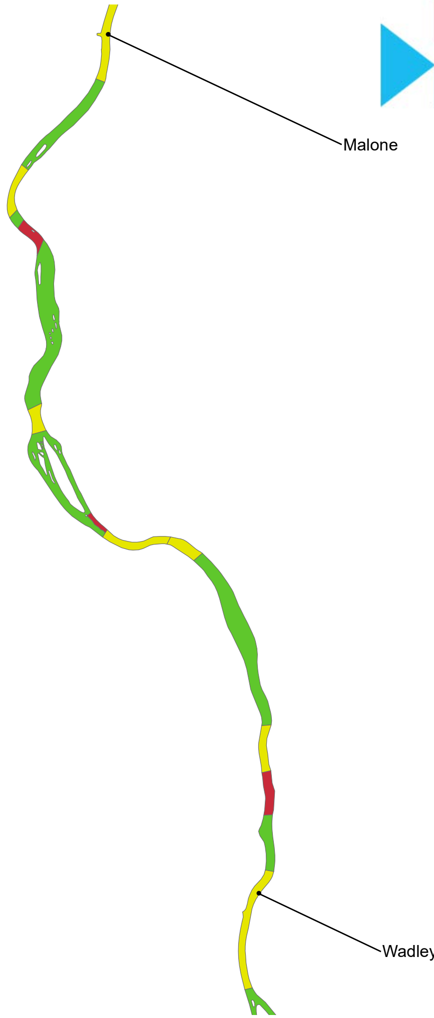
## Mesohabitat Type by Reach (hectares)

| Reach | Pool | Riffle | Run |
|---|---|---|---|
| Malone | 50.7 | 31.3 | 28.7 |
| Wadley | 20.4 | 91.9 | 7.5 |
| Bibbys Ferry | 86.3 | 50.1 | 19.1 |
| Germany's Ferry | 60.3 | 35.9 | 10.0 |
| Horseshoe Bend | 60.7 | 18.9 | 1.1 |
| Irwin Shoals | 87.9 | 114.8 | 8.2 |
| **Grand Total** | **366.3** | **343.0** | **74.7** |



# Mesohabitat Analysis



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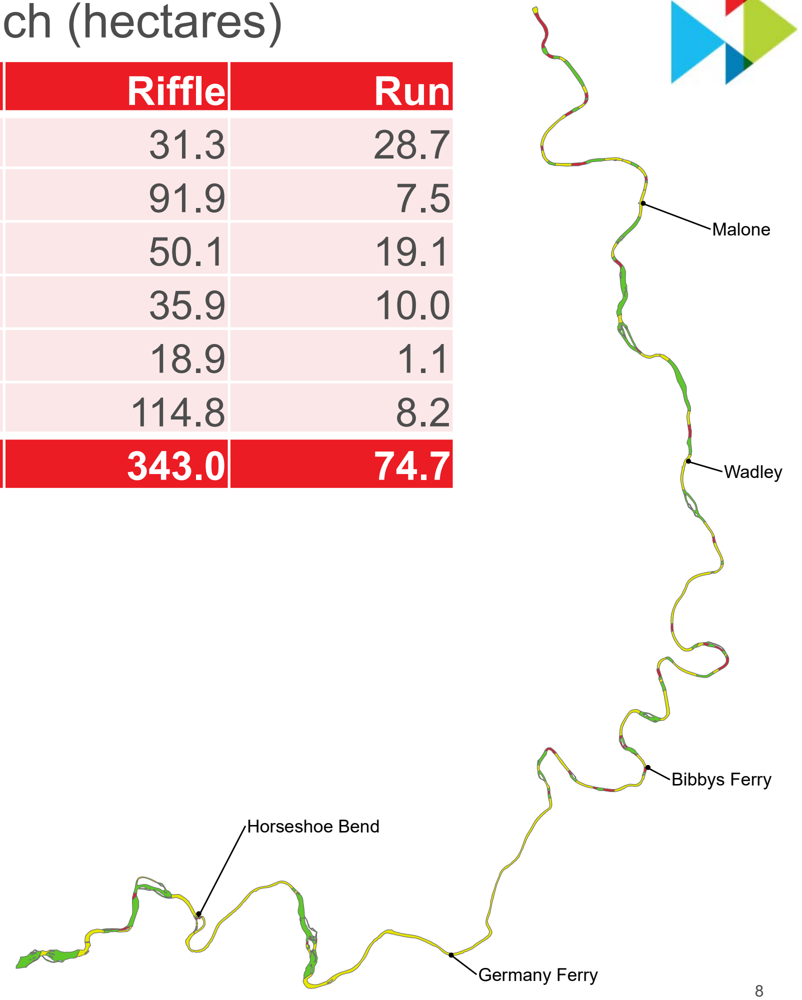
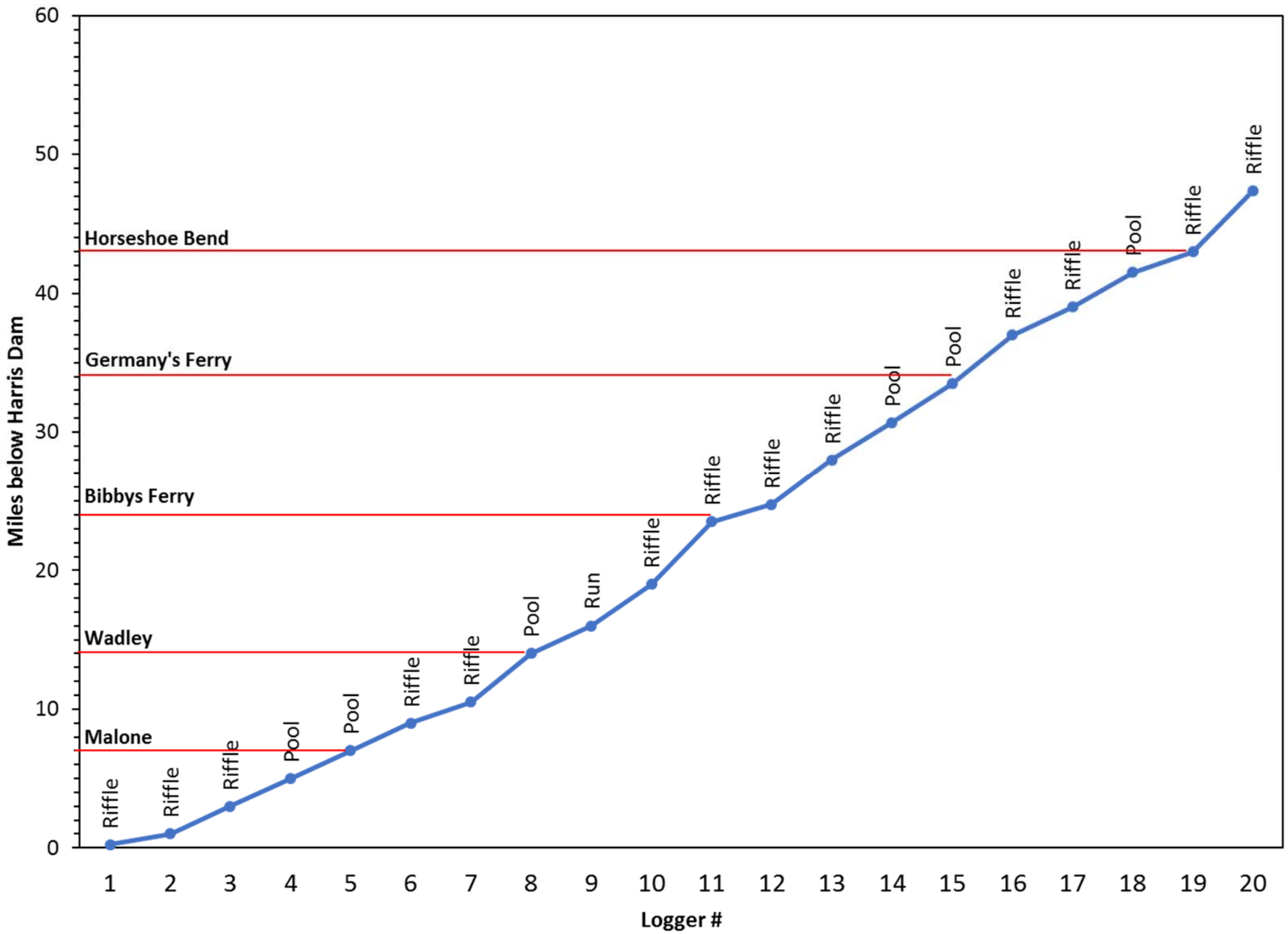


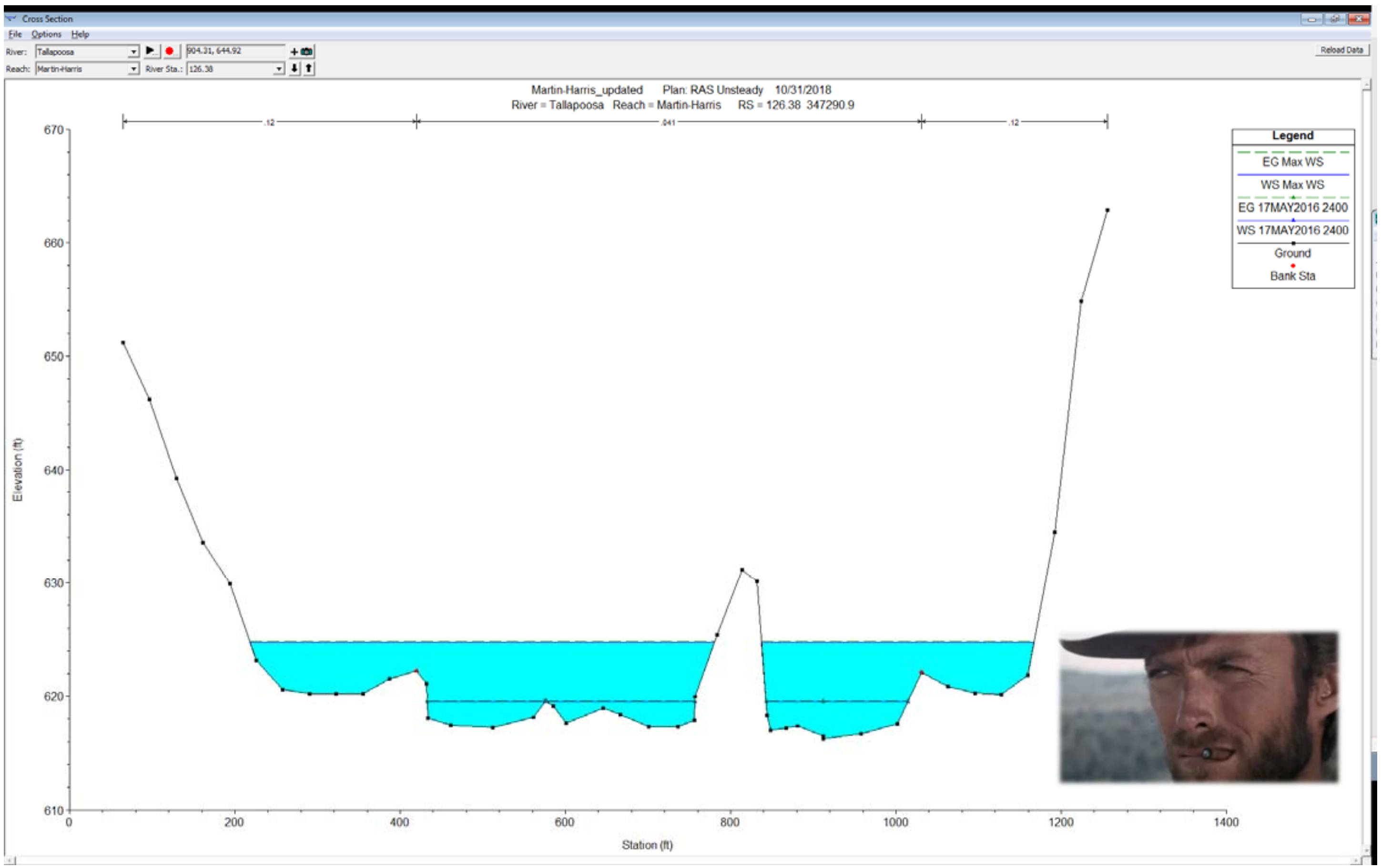
# Water Level Logger Deployments



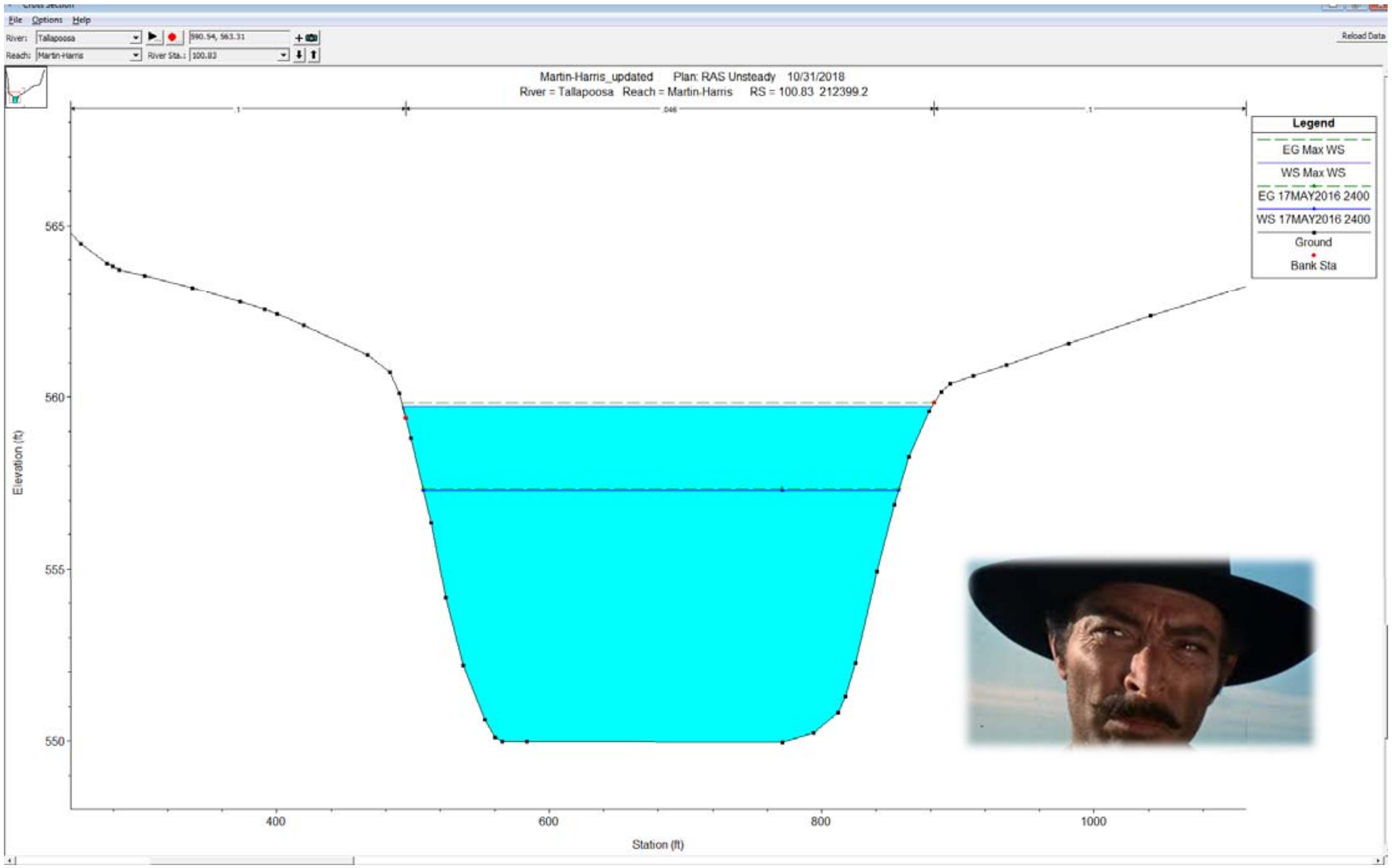
60
50
40
30
20
10
0
Miles below Harris Dam
Horseshoe Bend
Germany's Ferry
Bibbys Ferry
Wadley
Malone
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Run
Riffle
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Riffle
Riffle
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Logger #

# HEC-RAS Model Development

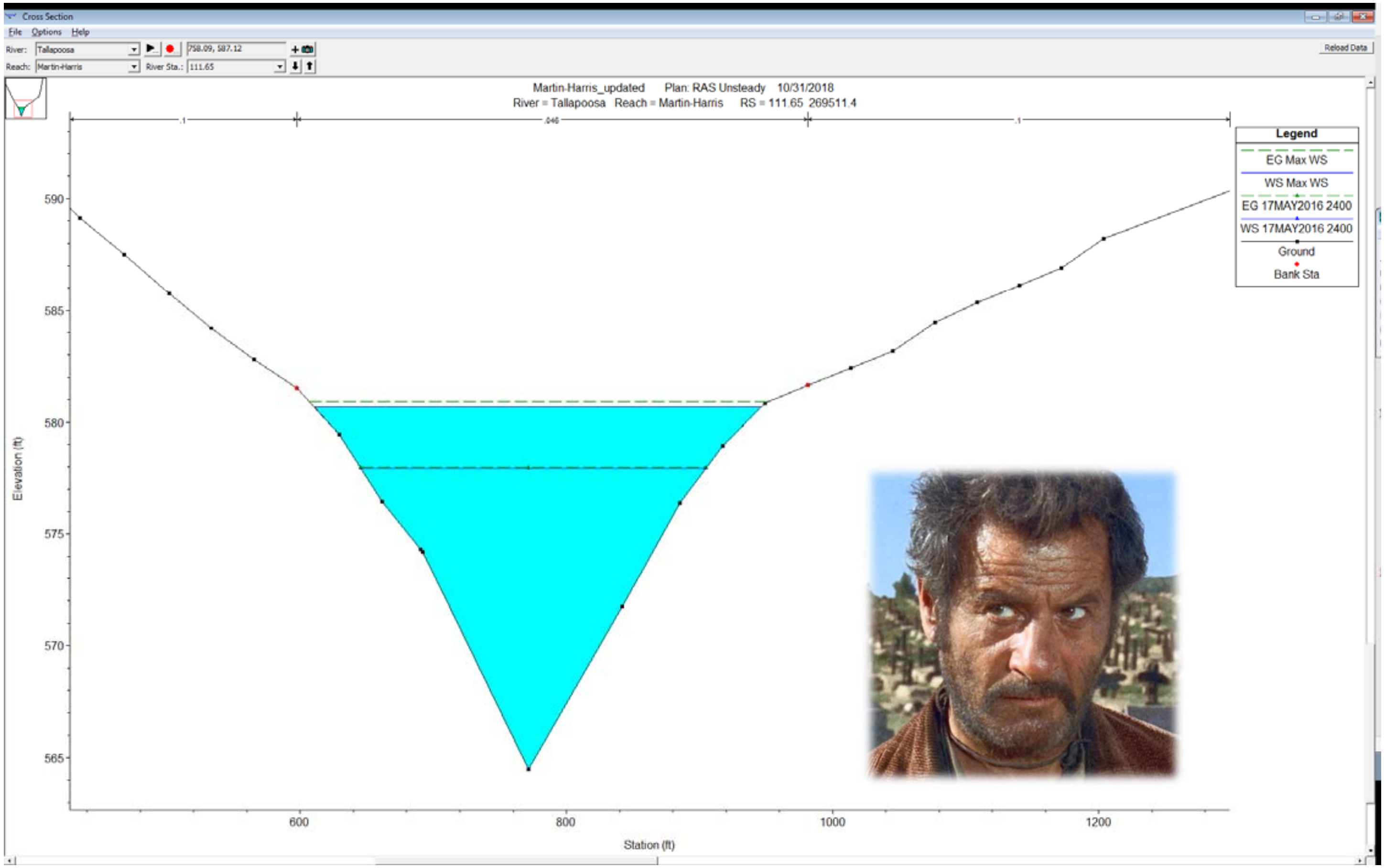
# River Cross-Sections – The Good

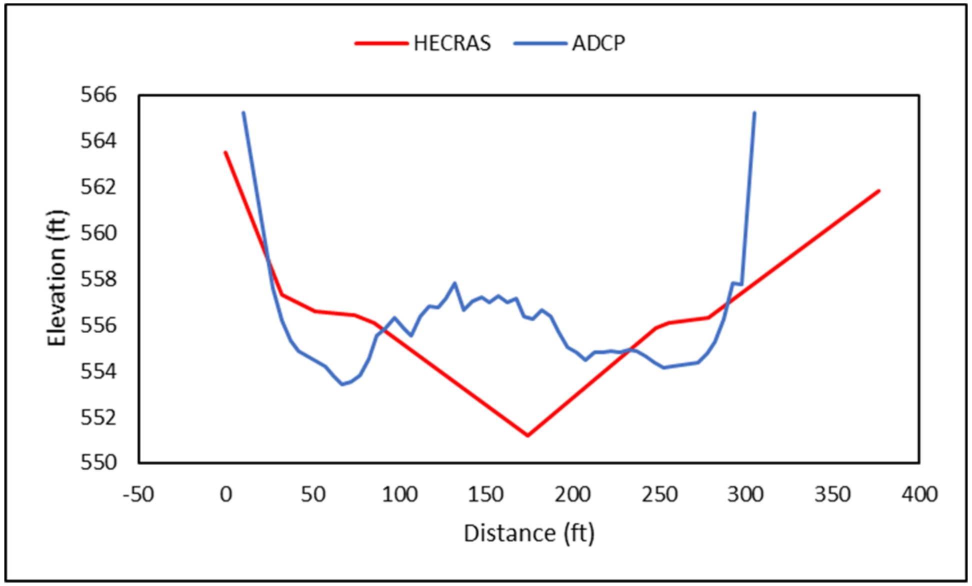


# River Cross-Sections – The Bad



# River Cross-Sections – and the Ugly

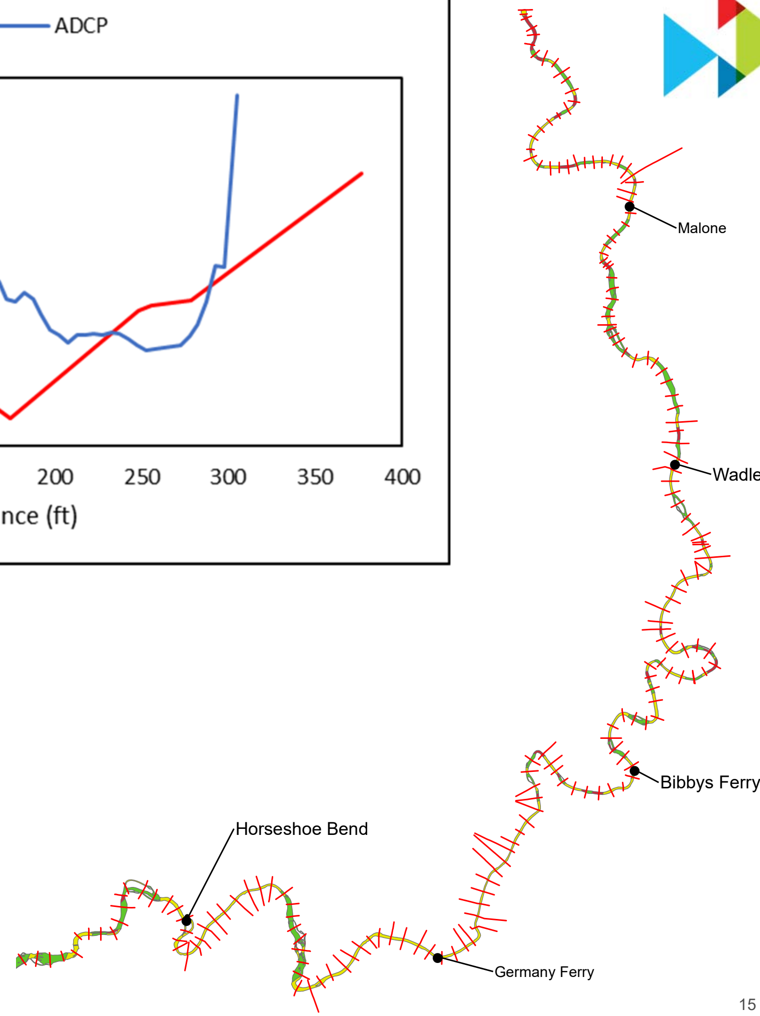


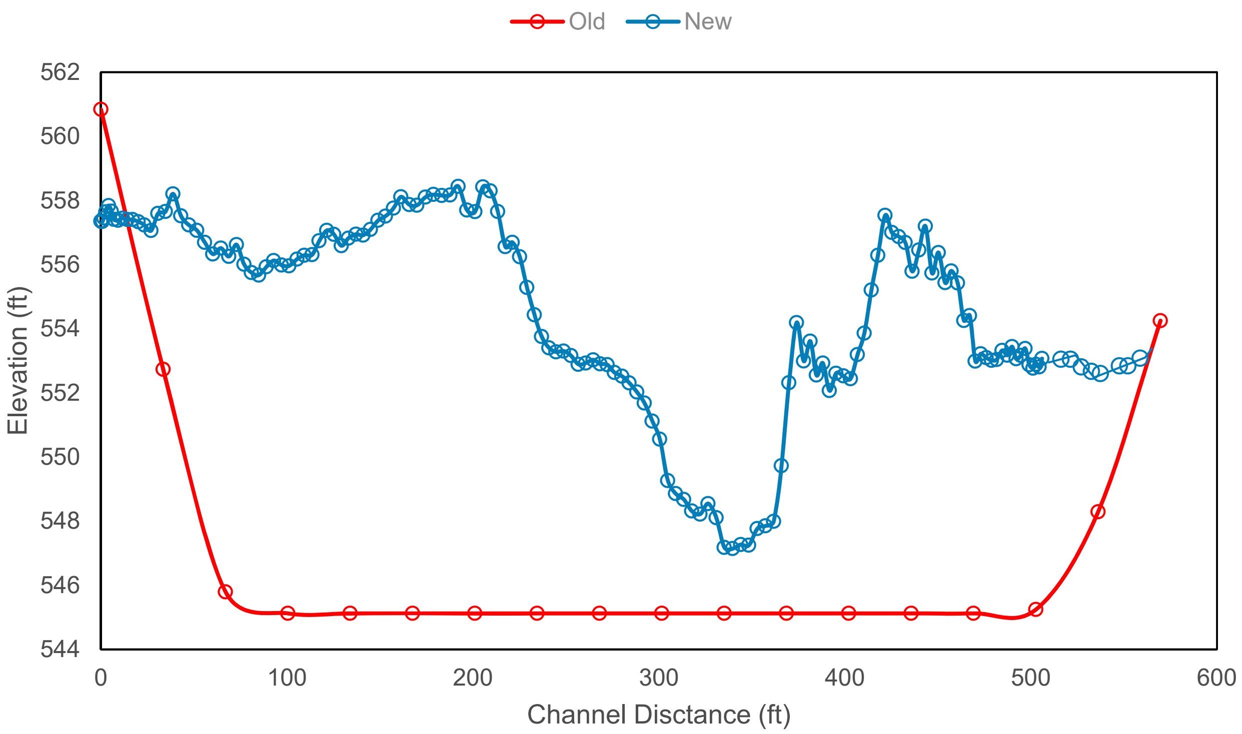



~200 cross-sections

Collect bathymetry data at:

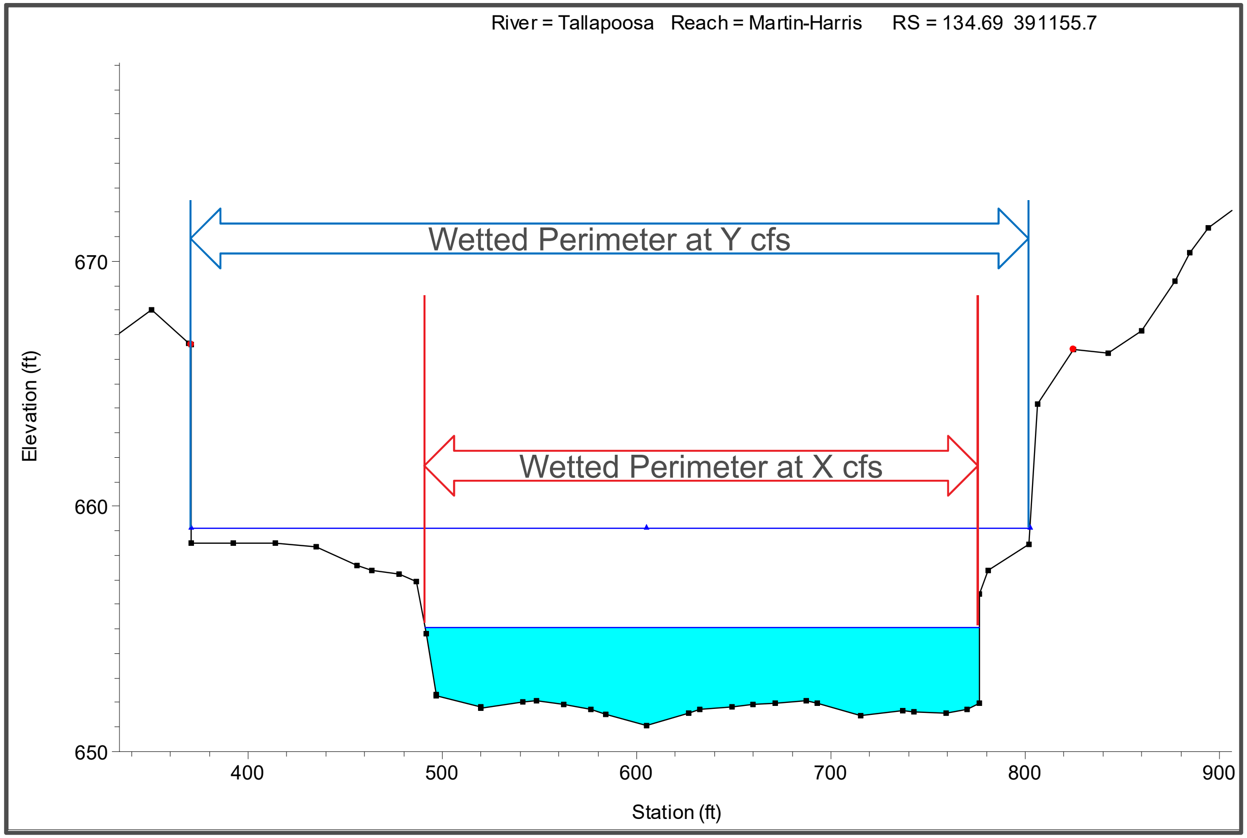
- Poorly interpolated cross-sections
- New cross-sections where gradient is steep




Old
New
562
560
558
556
554
552
550
548
546
544
Elevation (ft)
0
100
200
300
400
500
600
Channel Disctance (ft)

# HEC-RAS Results Analysis

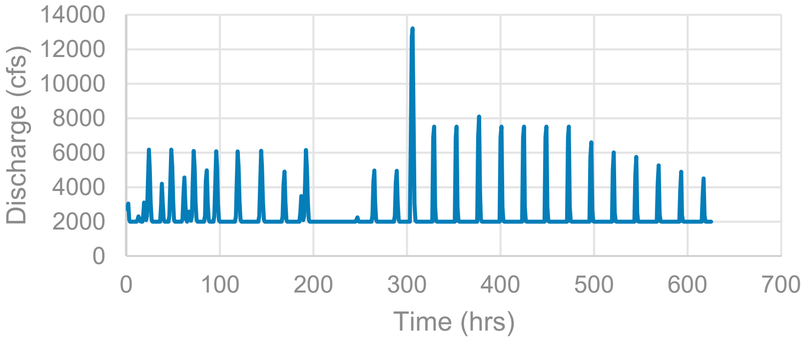
# HEC-RAS Results Analysis

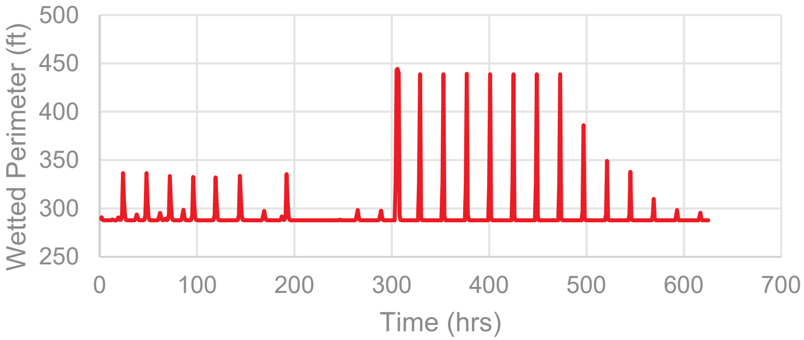


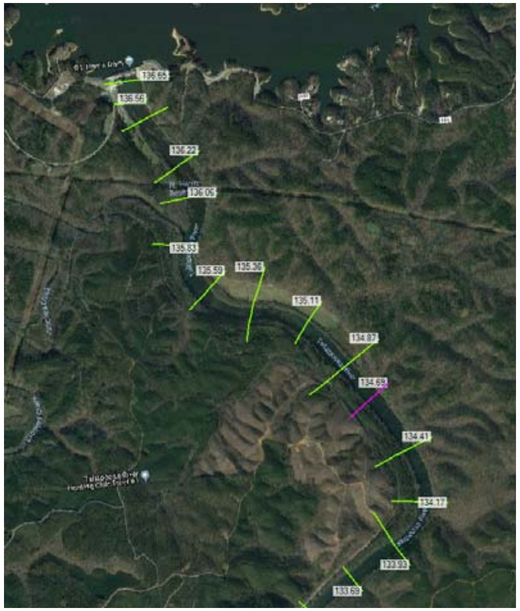
# HEC-RAS Results Analysis

| River Station | Discharge (cfs) | Wetted Perimeter (ft) | Water Surface Elevation (ft) |
|---|---|---|---|
| 134.69 | 2001 | 287.71 | 654.58 |
| 134.69 | 2001 | 287.71 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2312 | 288.44 | 654.79 |
| 134.69 | 4240 | 293.02 | 656.11 |
| 134.69 | 6112 | 333.6 | 657.57 |
| 134.69 | 5227 | 310.29 | 657.25 |
| 134.69 | 3231 | 291.84 | 655.77 |
| 134.69 | 2134 | 288.3 | 654.75 |
| 134.69 | 2005 | 287.74 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |

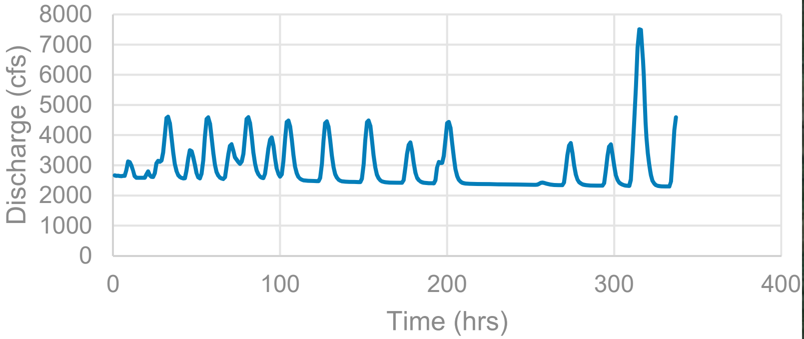
# Tailwater Transect

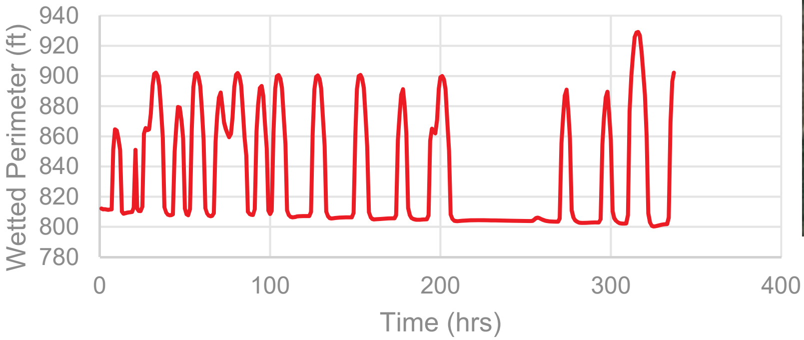


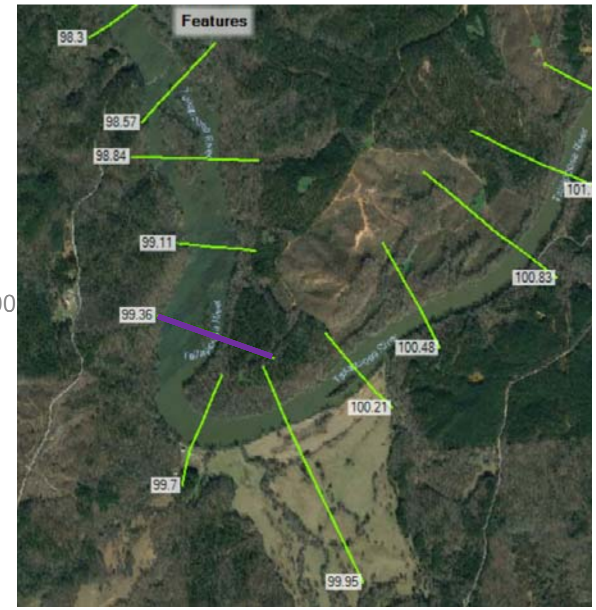



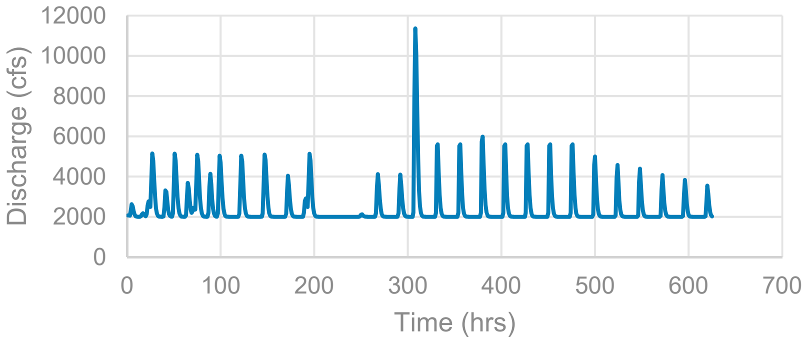
# Shoal Transect

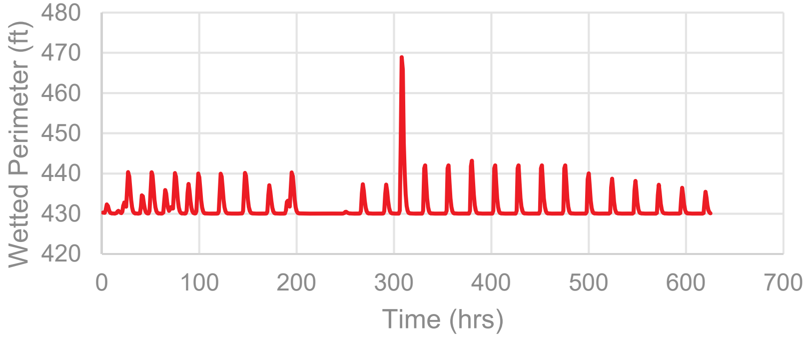


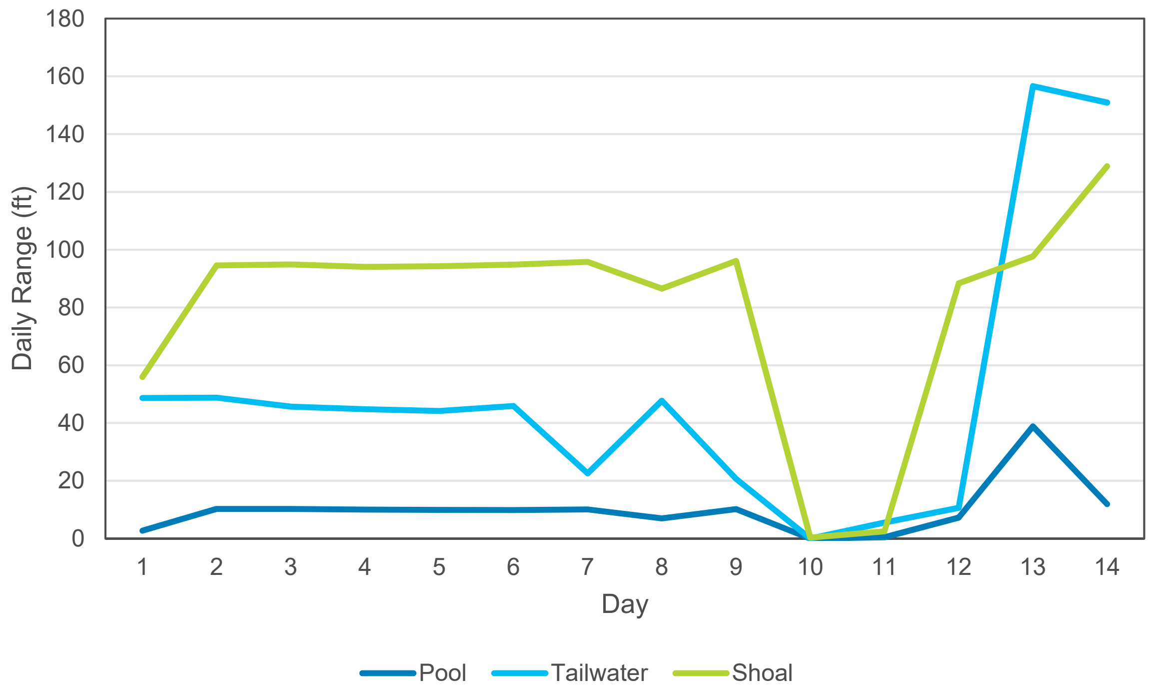
# Pool Transect



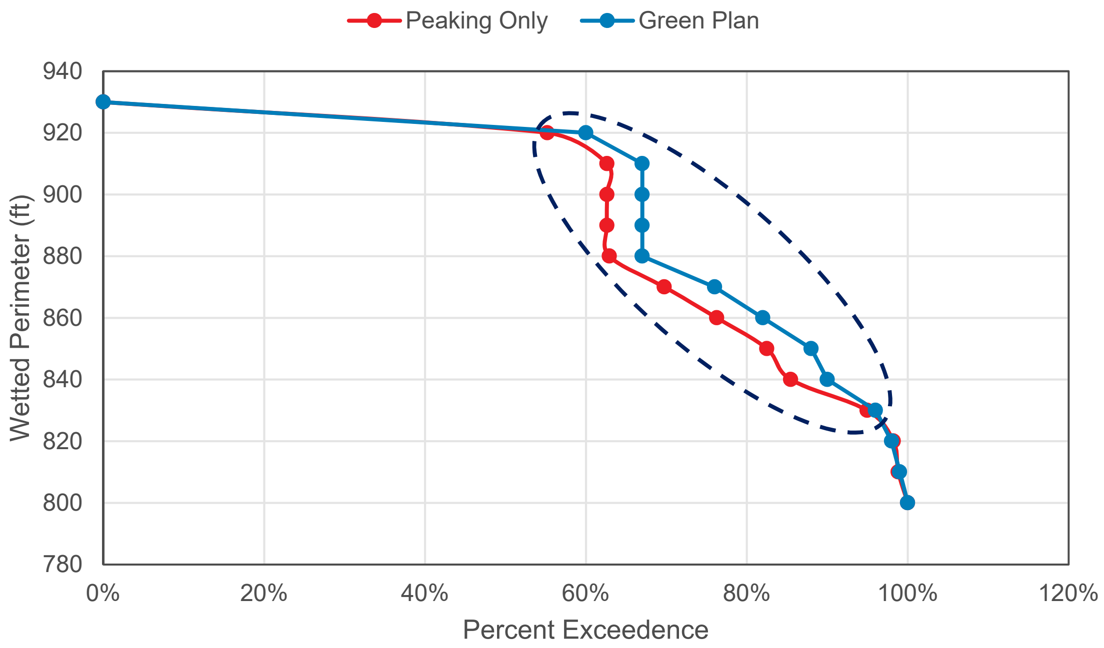




# Example Range Comparison

$$WP_{range} = WP_{max} - WP_{min}$$

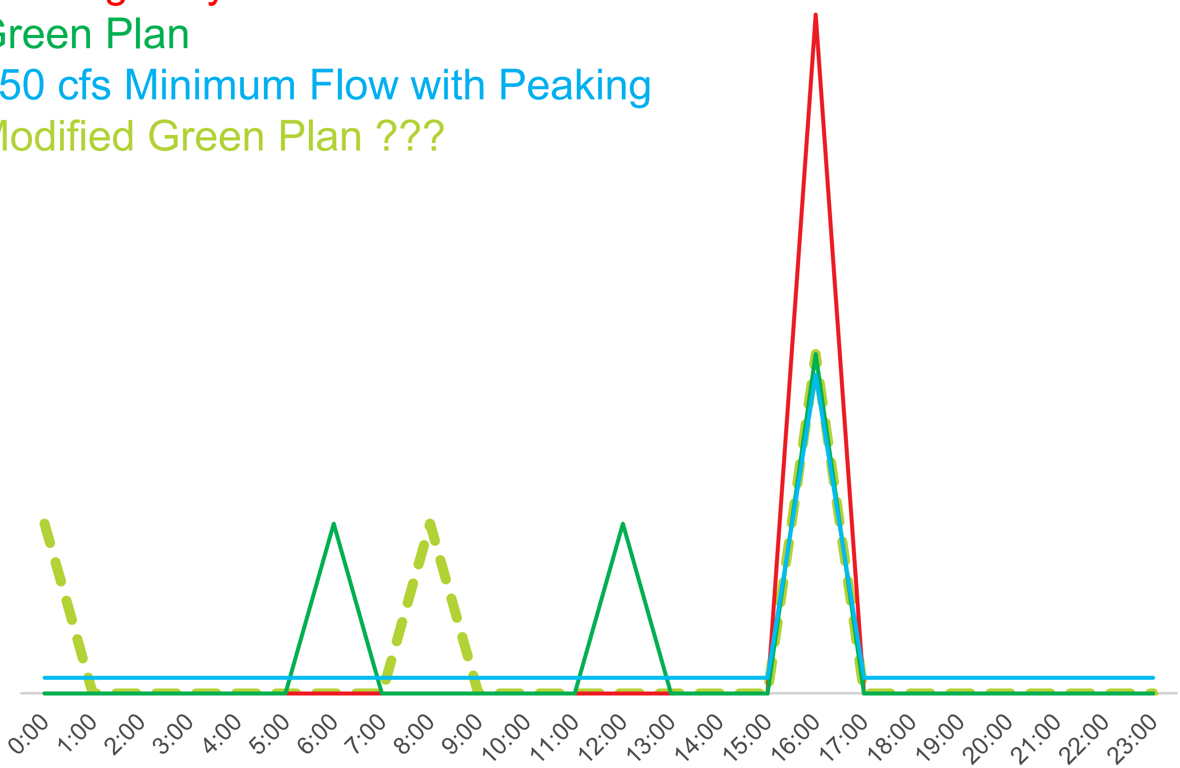


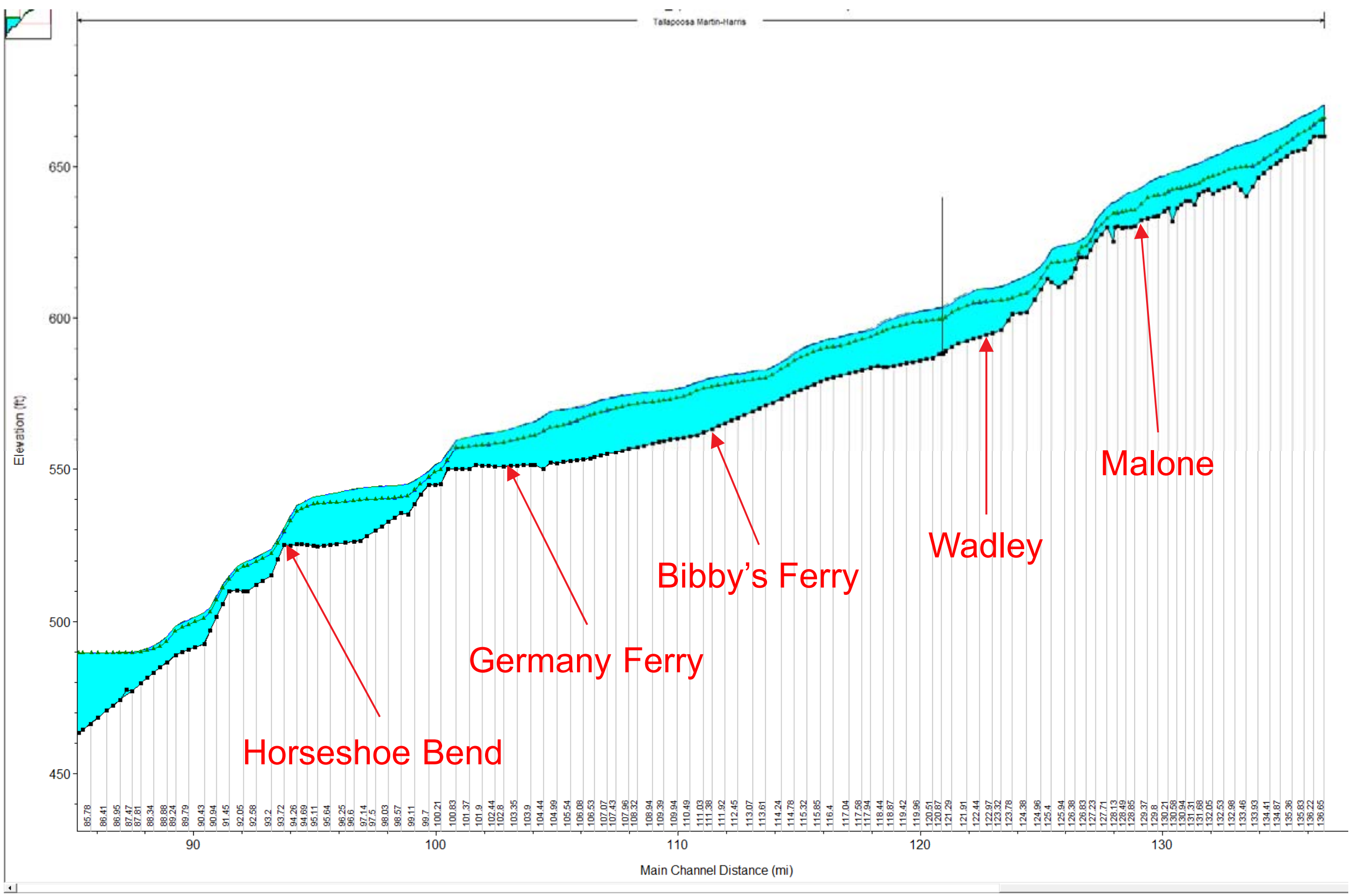
# Example Frequency Comparison



# Scenarios to Analyze

- Peaking Only
- Green Plan
- 150 cfs Minimum Flow with Peaking
- Modified Green Plan ???





Tallapoosa Martin-Harris
Elevation (ft)
650
600
550
500
450
90
100
110
120
130
Main Channel Distance (mi)
Horseshoe Bend
Germany Ferry
Bibby's Ferry
Wadley
Malone

# HAT 3 - Downstream Aquatic Habitat conference call

APC Harris Relicensing <g2apchr@southernco.com>

Thu 1/23/2020 6:41 PM

**To:** 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
**Bcc:** amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; stan.cook@dcnr.alabama.gov <stan.cook@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; taconya.goar@dcnr.alabama.gov <taconya.goar@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; ken.wills@jcdh.org <ken.wills@jcdh.org>; arsegars@southernco.com <arsegars@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; clowry@alabamarivers.org <clowry@alabamarivers.org>; mhunter@alabamarivers.org <mhunter@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; kmo0025@auburn.edu <kmo0025@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; jhancock@balch.com <jhancock@balch.com>; lgallen@balch.com <lgallen@balch.com>; chrisoberholster@birminghamaudubon.org <chrisoberholster@birminghamaudubon.org>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; sforehand@russelllands.com <sforehand@russelllands.com>; lgarland68@aol.com <lgarland68@aol.com>; pace.wilber@noaa.gov <pace.wilber@noaa.gov>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; donnamat@aol.com <donnamat@aol.com>; trayjim@bellsouth.net <trayjim@bellsouth.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; straylor426@bellsouth.net <straylor426@bellsouth.net>; triciastearns@gmail.com <triciastearns@gmail.com>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; decker.chris@epa.gov <decker.chris@epa.gov>; bill_pearson@fws.gov <bill_pearson@fws.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>

HAT 3,

Please join us for a conference call on February 20th from 1:00-3:00 to discuss the Downstream Aquatic Habitat Study. We will review the methods we are using for this analysis and share preliminary results.

.........................................................................................................................................

## Join Skype Meeting

### Join by phone

+1 (205) 257-2663

Conference ID: 3660816

Thanks,

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

| | |
|---|---|
| **From:** | Anderegg, Angela Segars |
| **To:** | Fobian, Todd |
| **Subject:** | FW: HAT 3 - Downstream Aquatic Habitat conference call |
| **Date:** | Wednesday, February 19, 2020 1:25:44 PM |

Hi Todd,

I wanted to make sure you have the Skype and call in info for Thursday's HAT 3 meeting. The Downstream Aquatic Habitat Study Plan and meeting notes are on our website: www.harrisrelicensing.com. We have another HAT 3 meeting in Oxford on March 19th. I'll be sending out the details to everyone by the end of this week.

Thanks!

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

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**From:** APC Harris Relicensing
**Sent:** Thursday, January 23, 2020 12:42 PM
**To:** 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
**Subject:** HAT 3 - Downstream Aquatic Habitat conference call

HAT 3,

Please join us for a conference call on February 20th from 1:00-3:00 to discuss the Downstream Aquatic Habitat Study. We will review the methods we are using for this analysis and share preliminary results.

.........................................................................................................................................

Join Skype Meeting

Join by phone

+1 (205) 257-2663
Conference ID: 3660816

Thanks,

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

**Meeting Summary**
**HAT 3 Meeting**
**February 20, 2020**
**1:00 pm to 1:45 pm**
**Conference Call**

**Participants:**
Angie Anderegg – Alabama Power
Jeff Baker – Alabama Power
Kate Cosnahan – Kleinschmidt Associates
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Colin Dinken – Kleinschmidt Associates
Amanda Fleming – Kleinschmidt Associates
Todd Fobian – Alabama Department of Conservation of Natural Resources (ADCNR)
Donna Matthews – Tallapoosa River Heritage
Tina Mills – Alabama Power
Ashley McVicar – Alabama Power
Jason Moak – Kleinschmidt Associates
Sarah Salazar - FERC

*NOTE: A copy of the HAT 3 February 20, 2020 presentation is attached.*

**Meeting Summary:**

Angie Anderegg (Alabama Power) opened the meeting by introducing everyone and recapping the previous HAT 3 conference call from December 2019. In December, the methods for the analysis were presented. The purpose for this conference call was for Jason Moak (Kleinschmidt Associates) to present some preliminary results.

Jason reviewed the purpose and goal of the Downstream Aquatic Habitat Study, which is to develop a model that describes the relationship between Green Plan operations and aquatic habitat. The HEC-RAS model outputs will be used to determine how current operations affect the amount and persistence of wetted habitat. Jason discussed how mesohabitat of the Tallapoosa River downstream of Harris Dam was delineated into riffles, pools, and runs for different reaches (Malone, Wadley, Bibby's, Germany, HOBE, and Irwin Shoals) using GIS. Jason stated that 20 water level loggers have been deployed since June 2019 and they are logging both water level and temperature data every 15 minutes.

Jason discussed how the HEC-RAS model was developed. Previously, the model included roughly 200 cross-sections between Harris Dam and Jaybird Landing. However, some of the data had been interpolated using the surrounding landscape and were not ideal. More than 100 cross-sections were surveyed in 2019 to provide better channel geometry for the HEC-RAS model.

The HEC-RAS model will be used to examine the feasibility of alternative operating modes. For this study, the amount of wetted habitat will be measured under the different operating mode scenarios. Jason presented some examples of the results. Areas closer to the dam show more drastic fluctuations in discharge when compared to more downstream reaches. Jason demonstrated how shallow-water habitats would be affected more by changes in operating modes than pool habitats, which exhibit a less variable range of responses and smaller changes to wetted perimeter.

Jason explained the daily range comparison calculation: wetted perimeter range = wetted max - wetted min. An example frequency comparison between peaking, Green Plan, and 150 cubic feet per second (cfs), was shown to explain what the results may look like, but no actual data was used for this example. The operating scenarios that will be analyzed are peaking only, Green Plan, 150 cfs minimum flow, and a modified Green Plan. The modified Green Plan has not been determined yet and will likely resemble the current Green Plan but with pulses occurring at different times of day. Jason showed a figure of elevation changes from the dam downstream through Horseshoe Bend.

Sarah Salazar (Federal Energy Regulatory Commission (FERC)) asked if the model could be used to examine change in water levels at the erosion sites described in the Erosion and Sedimentation Study and Jason confirmed that the model will be used to determine how these operation scenarios can affect the erosion areas. He stated that the model will also be used to measure the effects of alternative operation scenarios on the operation curve change of the lake.

Jason and Angie said these notes and presentation will be uploaded to the relicensing website. Jason stated that some of the data is being reviewed and therefore some results were not yet ready to be shown, but more results will be presented in March. Angie will send out information about the March 19 HAT meeting soon.

Todd Fobian (Alabama Department of Conservation of Natural Resources (ADCNR)) asked how long the loggers have been gathering data. Jason replied that some have been out longer than others, but there have been 20 loggers gathering data since June 2019. Donna Matthews (Tallapoosa River Heritage) asked if the whole dataset is derived from an average of different sampling times and asked if any data will describe what is simultaneously happening to the lake level. Jason said that Reservoir Management ensured that none of these proposed operation scenarios will affect the guide curve of the lake. For example, under the hypothetical minimum flow scenario, 150 cfs will consistently be released and any excess water will be used for generation, so all these scenarios should allow the lake to remain on the guide curve. Donna asked if these data are tied to rain events. Jason said extreme conditions occur, but these examples used a year with median conditions (2001). There are still high and low flow events within that dataset, however.

The group discussed the current rain conditions at the Tallapoosa River and throughout the rest of the Southeast. Todd asked about the amount of leakage at Harris Dam. Sarah asked if the model accounts for tributaries, which may contribute to flow. Jason stated these locations were identified and hydrographs for all the tributaries between Harris and the downstream end of the model were developed so the model should account for their contribution to flow.

# R.L. Harris Project Relicensing

# HAT 3 – Downstream Habitat Study

February 20, 2020

HARRIS DAM
RELICENSING

# Meeting Agenda

- Study Overview
- Mesohabitat Mapping
- Level Logger Deployments
- HEC-RAS Model Development
- Analysis of HEC-RAS Outputs

HARRIS DAM
RELICENSING

# Downstream Aquatic Habitat Study

**Goal**
To develop a model that describes the relationship between Green Plan operations and aquatic habitat.

**Geographic Scope**
Harris Dam through Horseshoe Bend

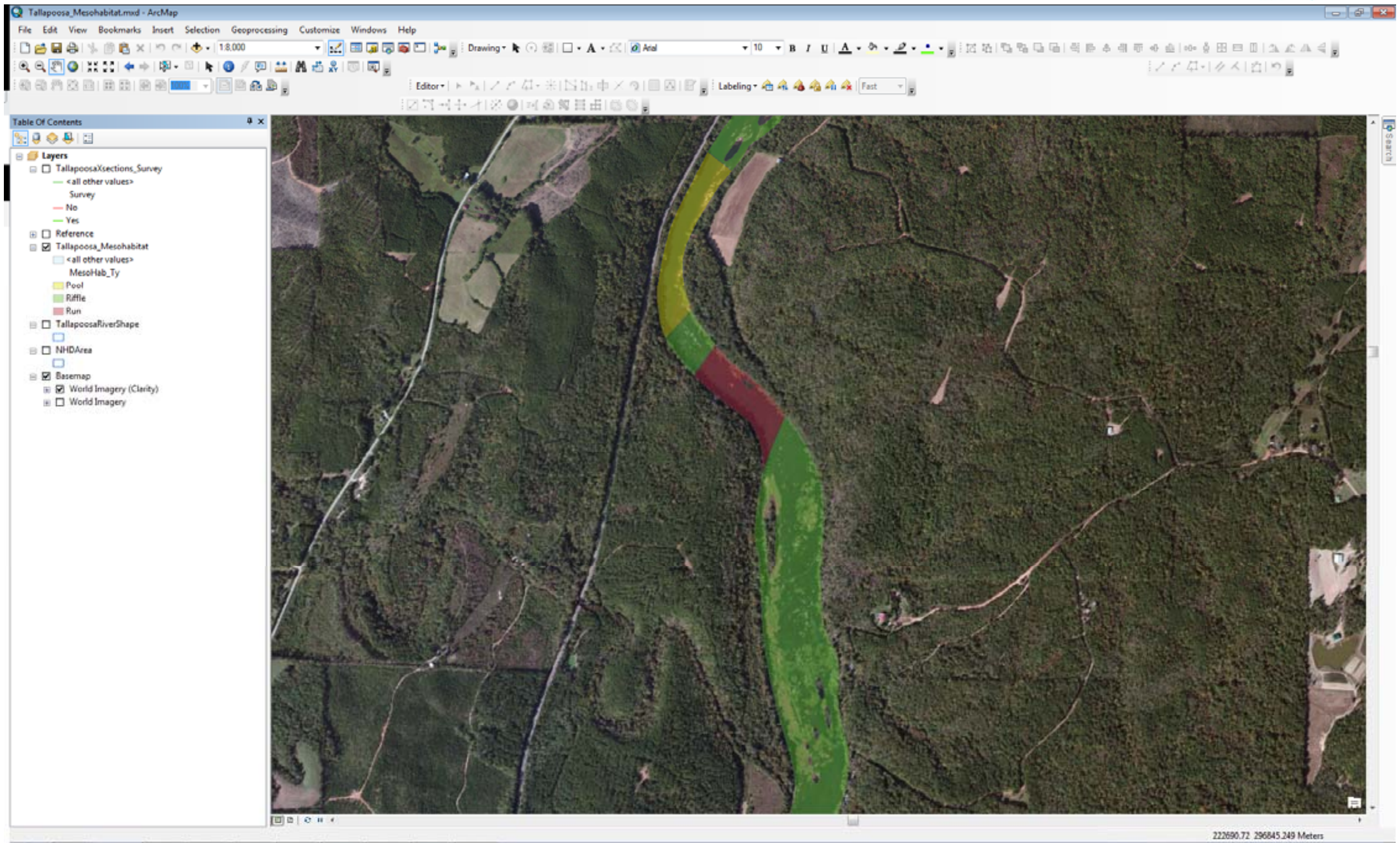
**Methods**
1. Mesohabitat Analysis: Desktop analysis of the types of available habitat (classified as riffle, run, pool)

2. Install water level loggers at up to 20 sites

3. Use HEC-RAS to evaluate the effect of current operations on the amount and persistence of wetted aquatic habitat, especially shoal/shallow-water habitat.

# Mesohabitat Mapping and Analysis

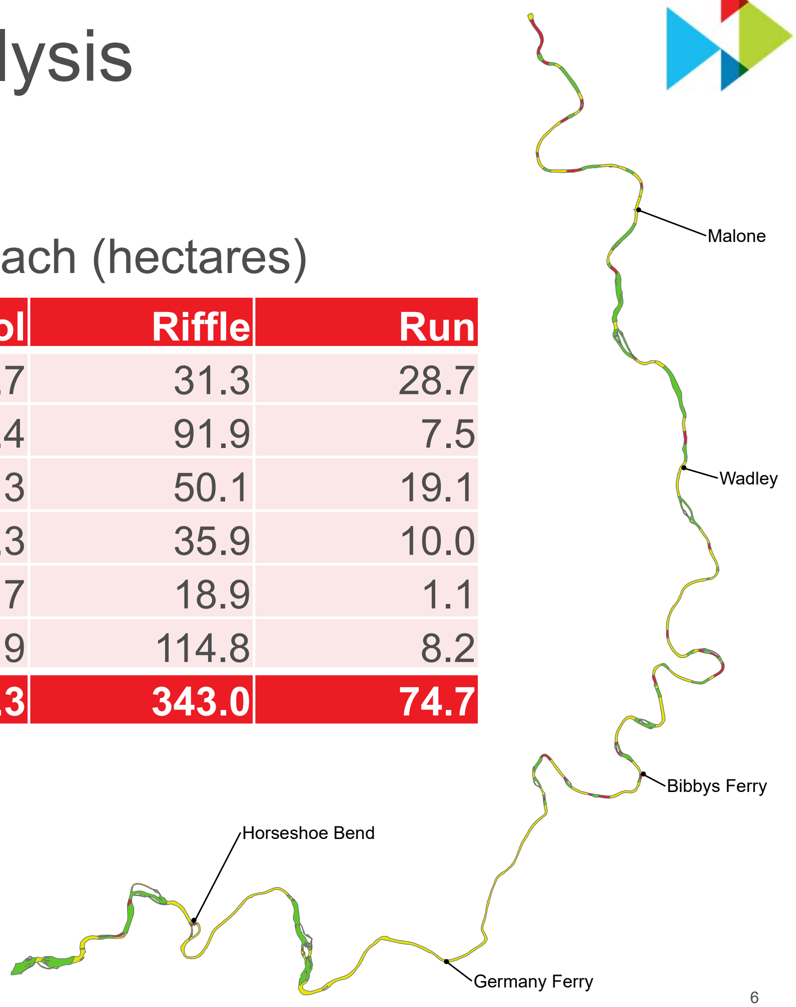
# Mesohabitat Mapping



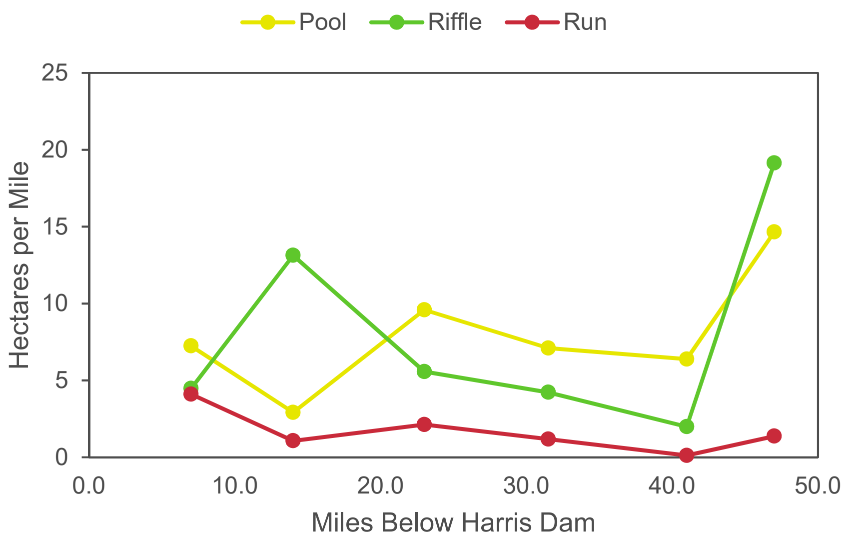
# Mesohabitat Analysis

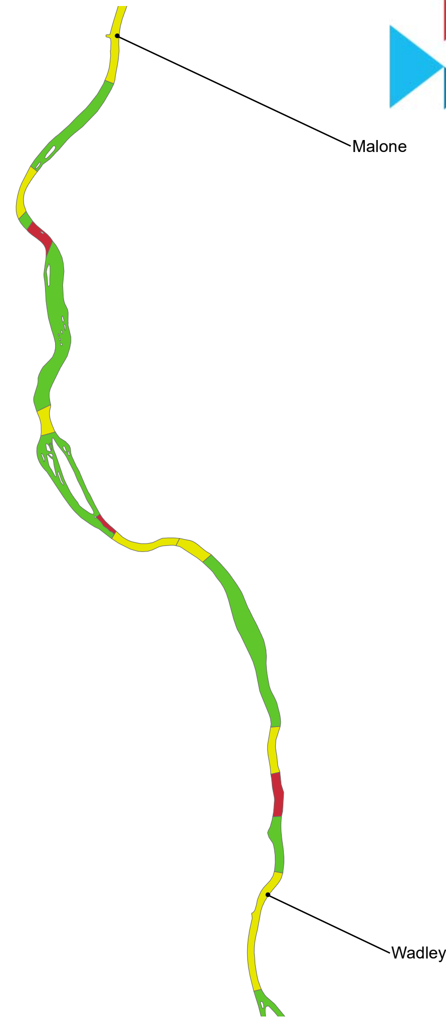
Mesohabitat Type by Reach (hectares)

| Reach | Pool | Riffle | Run |
|---|---|---|---|
| Malone | 50.7 | 31.3 | 28.7 |
| Wadley | 20.4 | 91.9 | 7.5 |
| Bibbys Ferry | 86.3 | 50.1 | 19.1 |
| Germany's Ferry | 60.3 | 35.9 | 10.0 |
| Horseshoe Bend | 60.7 | 18.9 | 1.1 |
| Irwin Shoals | 87.9 | 114.8 | 8.2 |
| **Grand Total** | **366.3** | **343.0** | **74.7** |



# Mesohabitat Analysis



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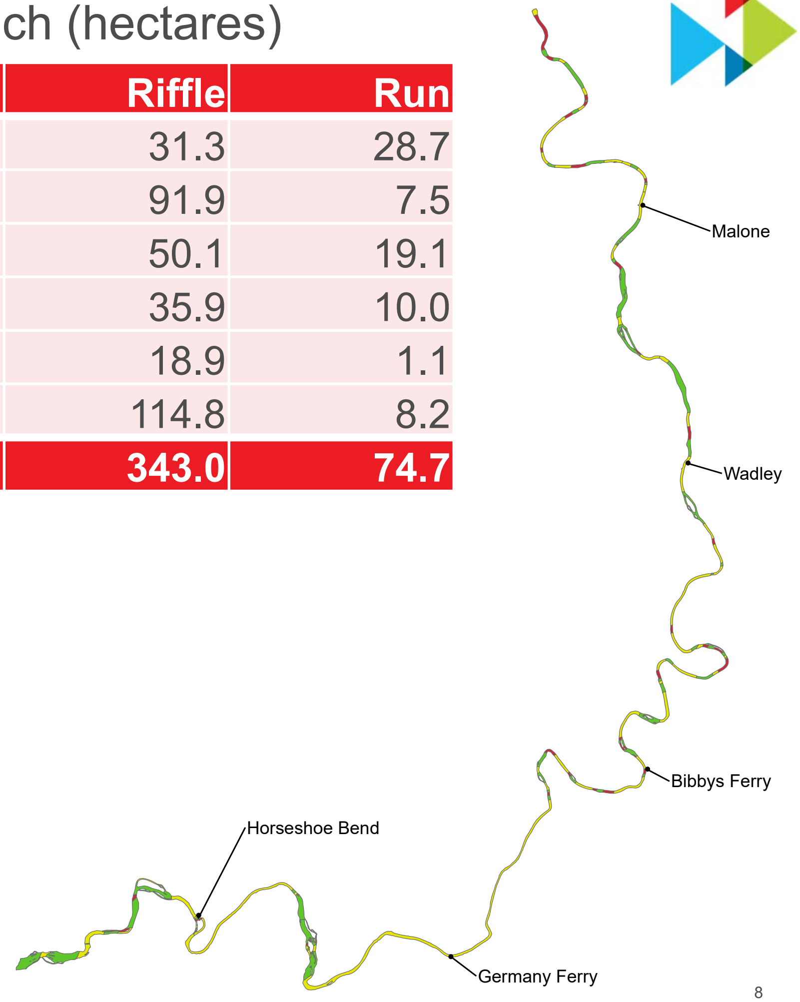
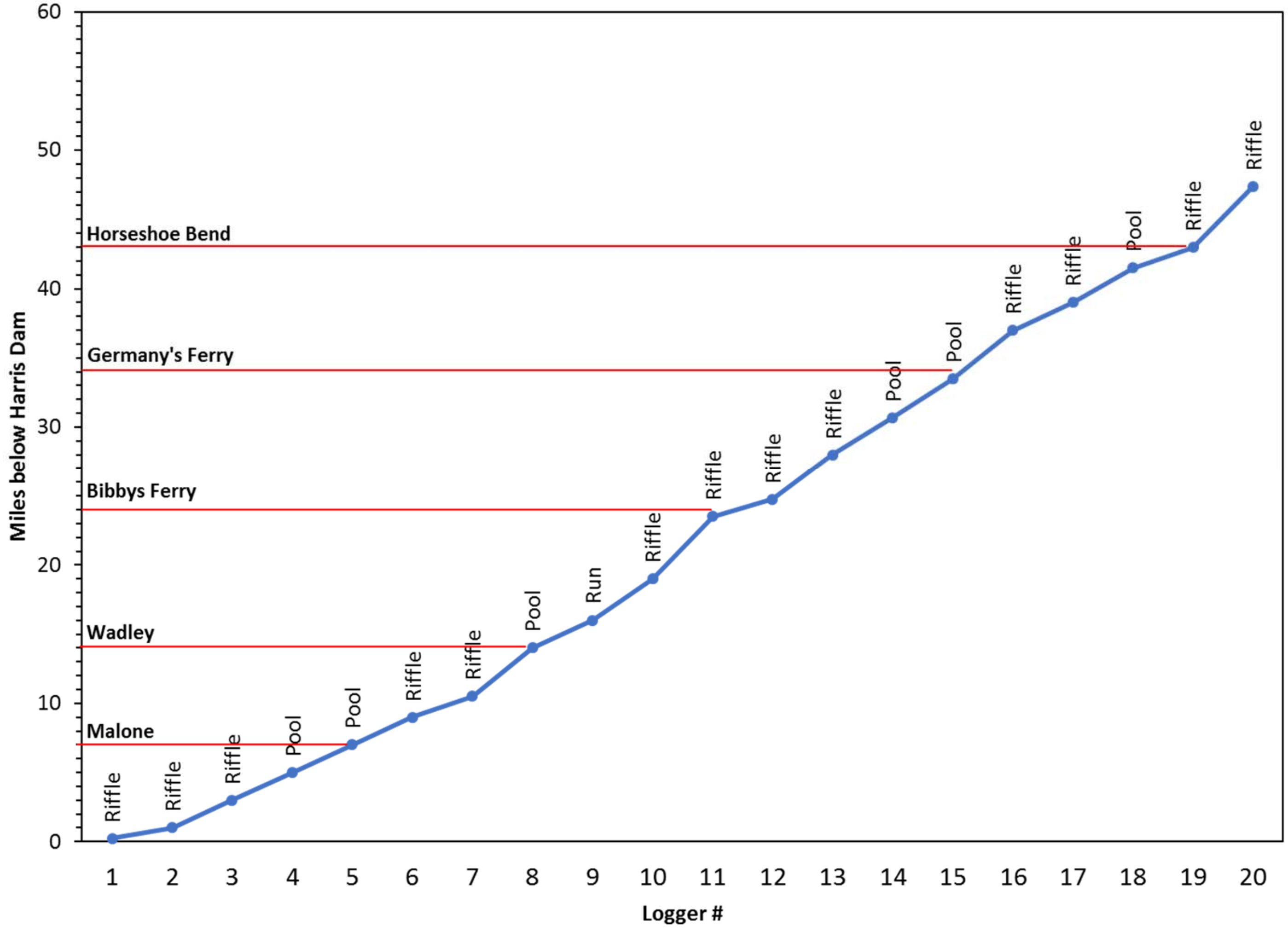


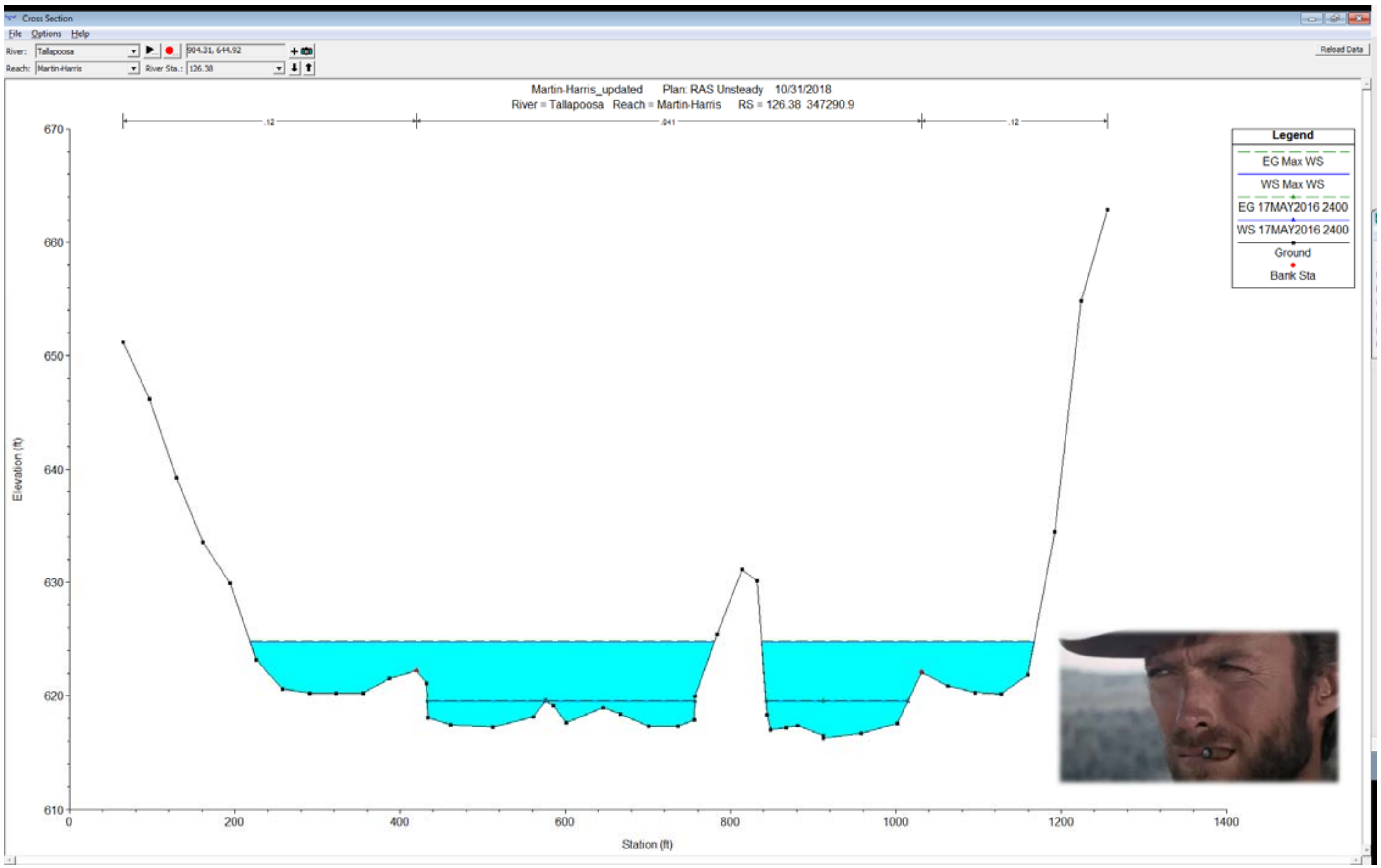
# Water Level Logger Deployments



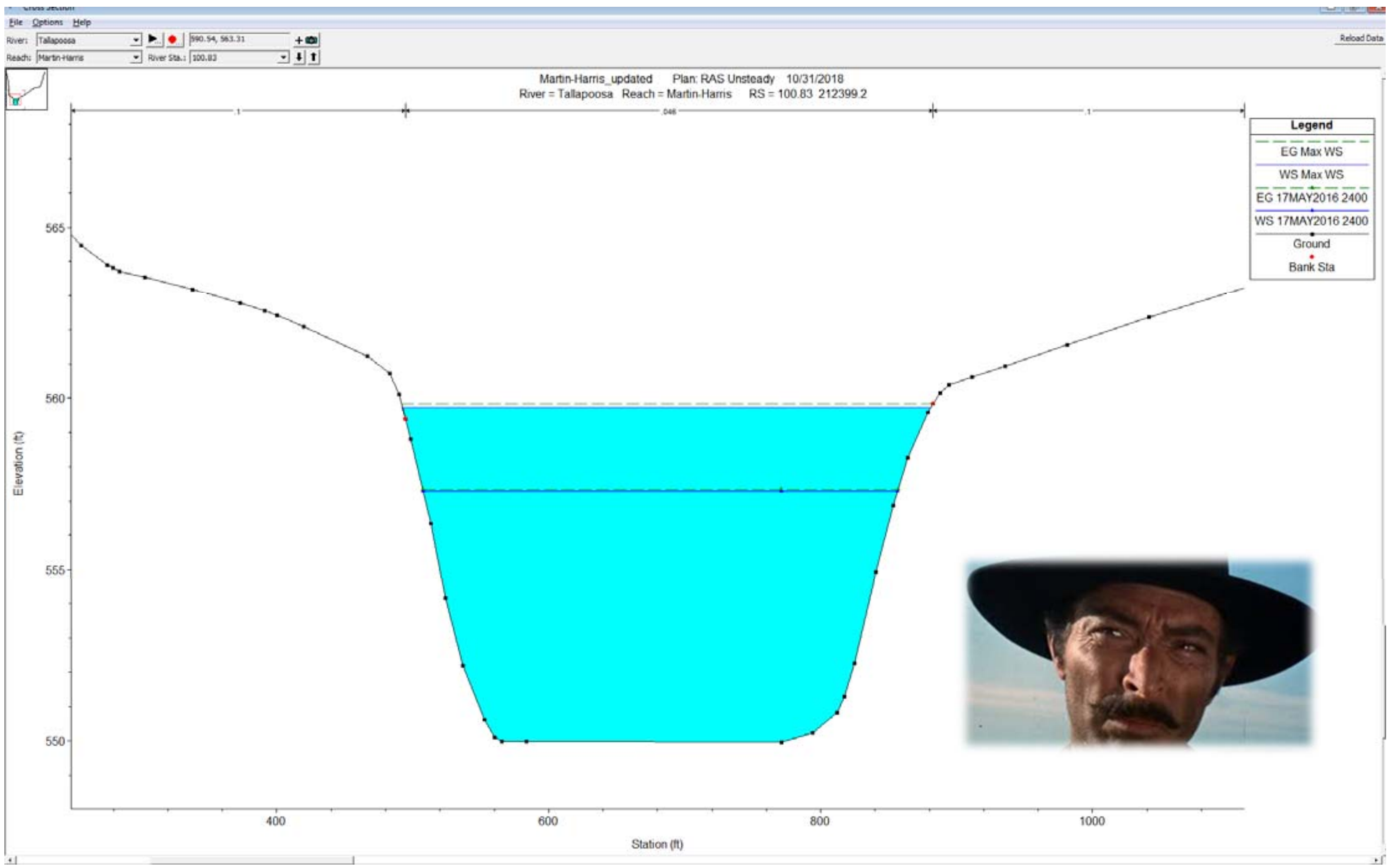
Horseshoe Bend
Germany's Ferry
Bibbys Ferry
Wadley
Malone
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Run
Riffle
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Riffle
Riffle
Miles below Harris Dam
Logger #
0
10
20
30
40
50
60
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

# HEC-RAS Model Development

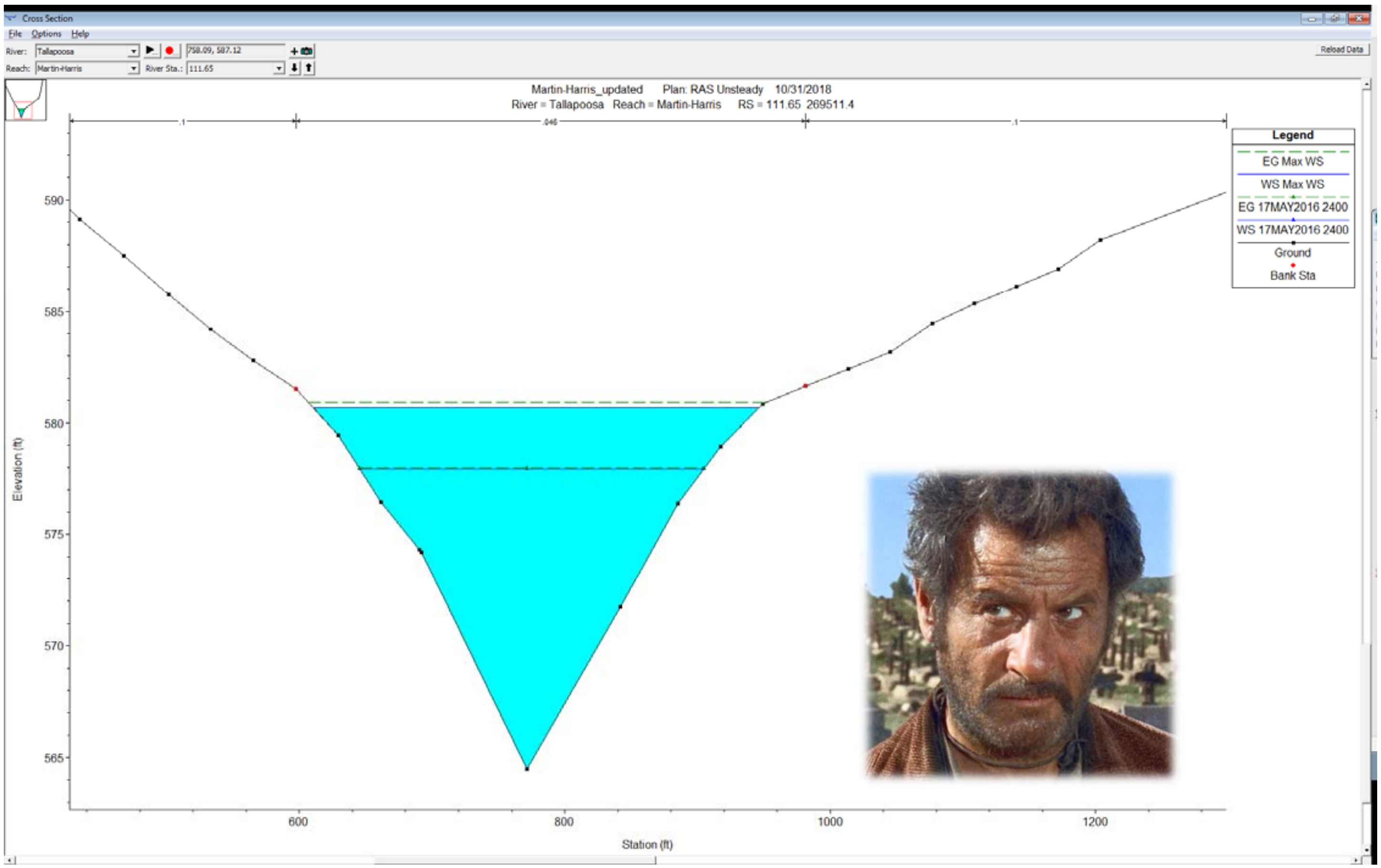
# River Cross-Sections – The Good

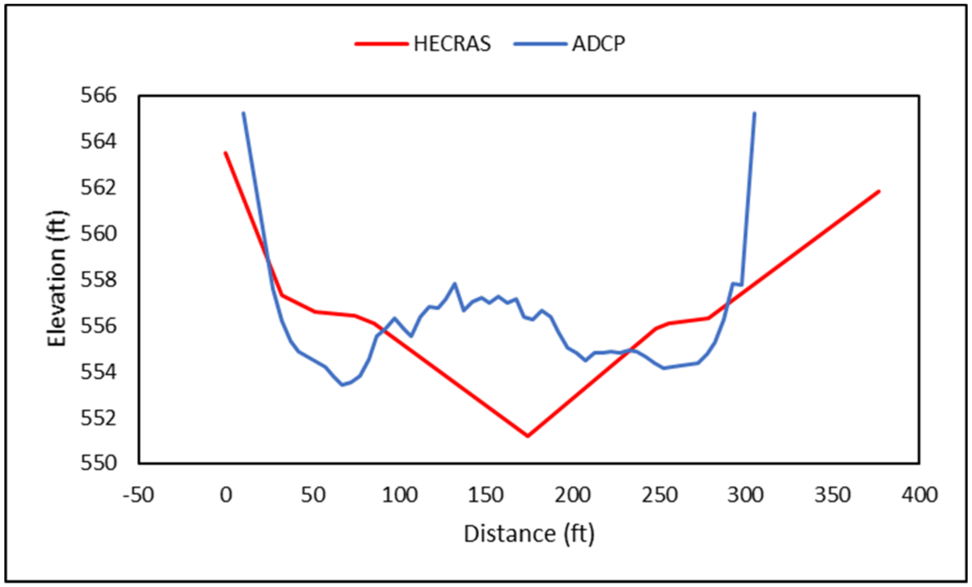


# River Cross-Sections – The Bad



# River Cross-Sections – and the Ugly

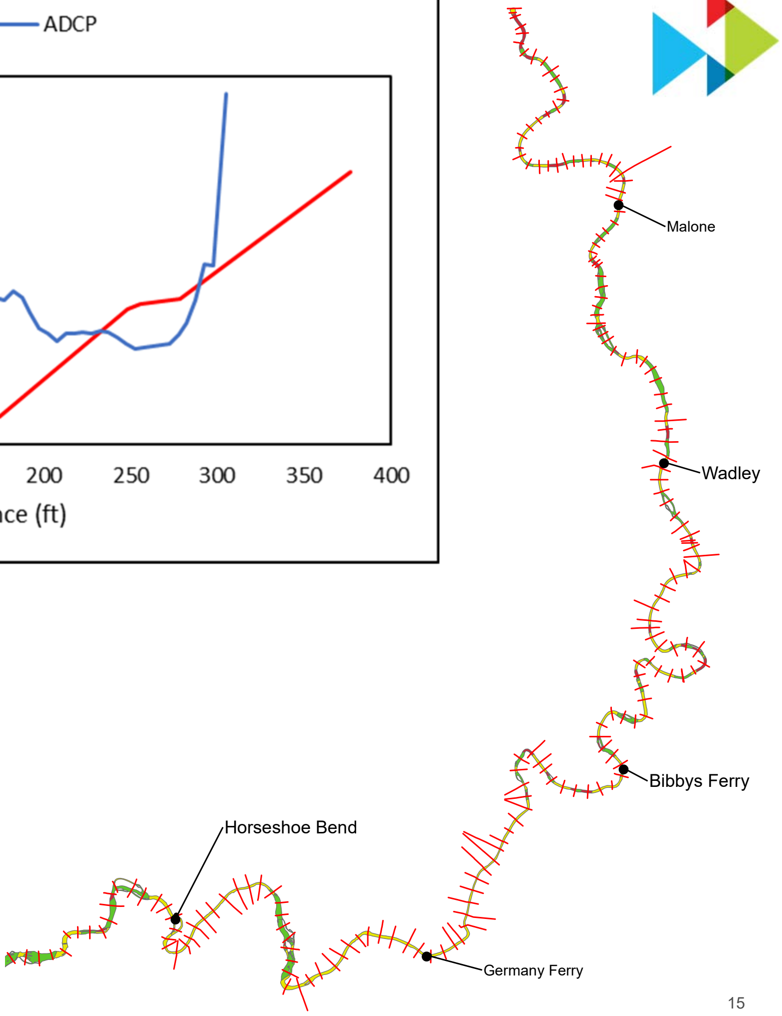


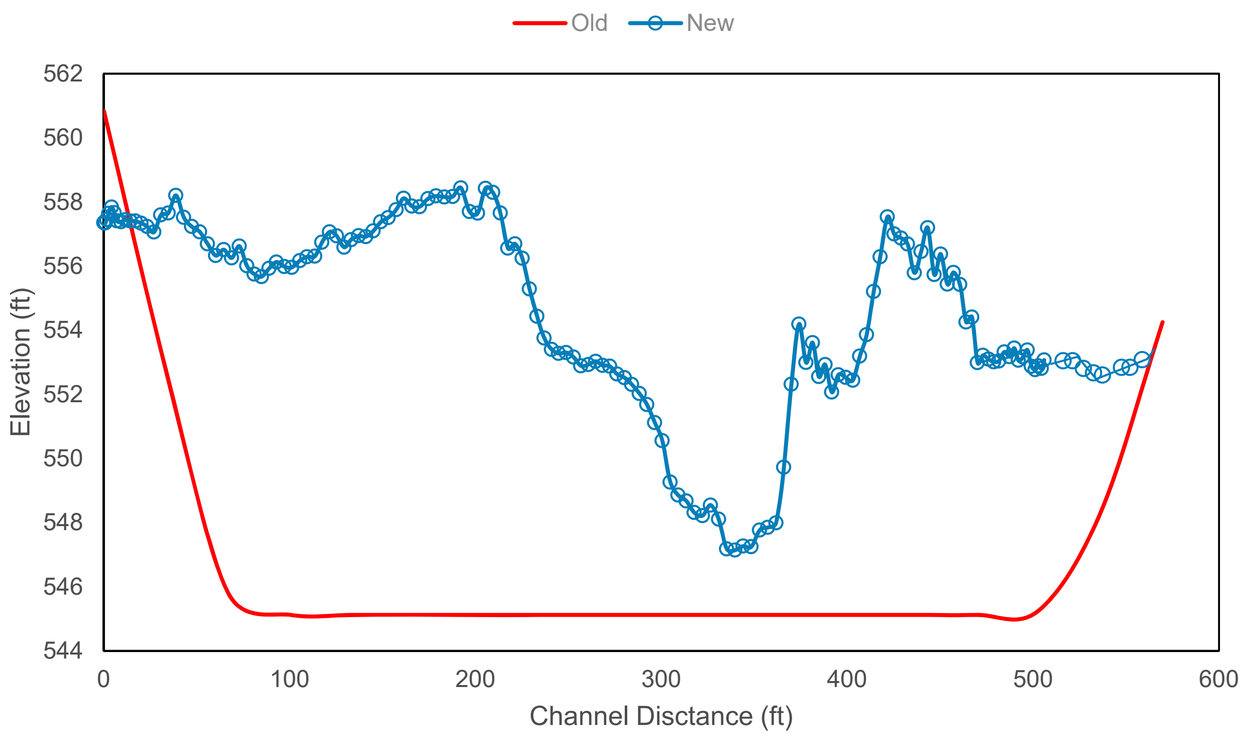



~200 cross-sections

Collect bathymetry data at:

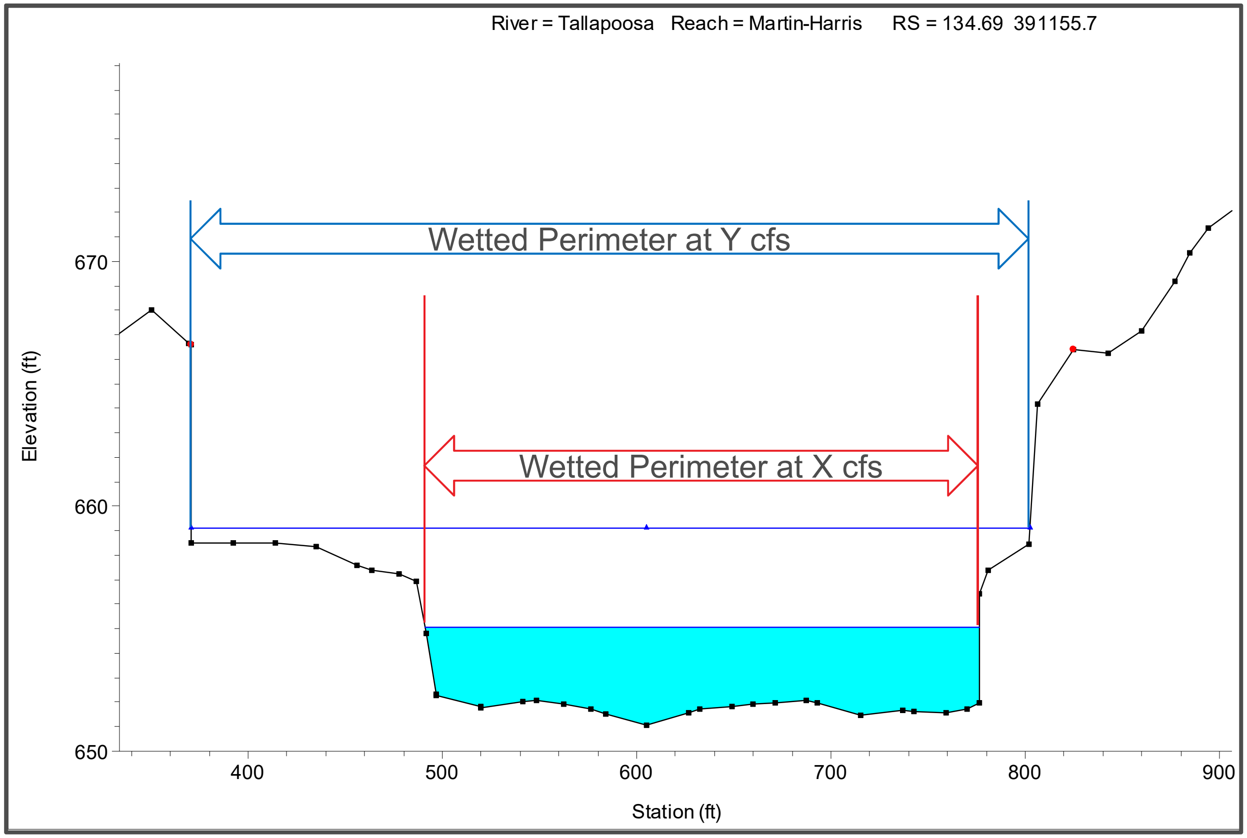
- Poorly interpolated cross-sections
- New cross-sections where gradient is steep



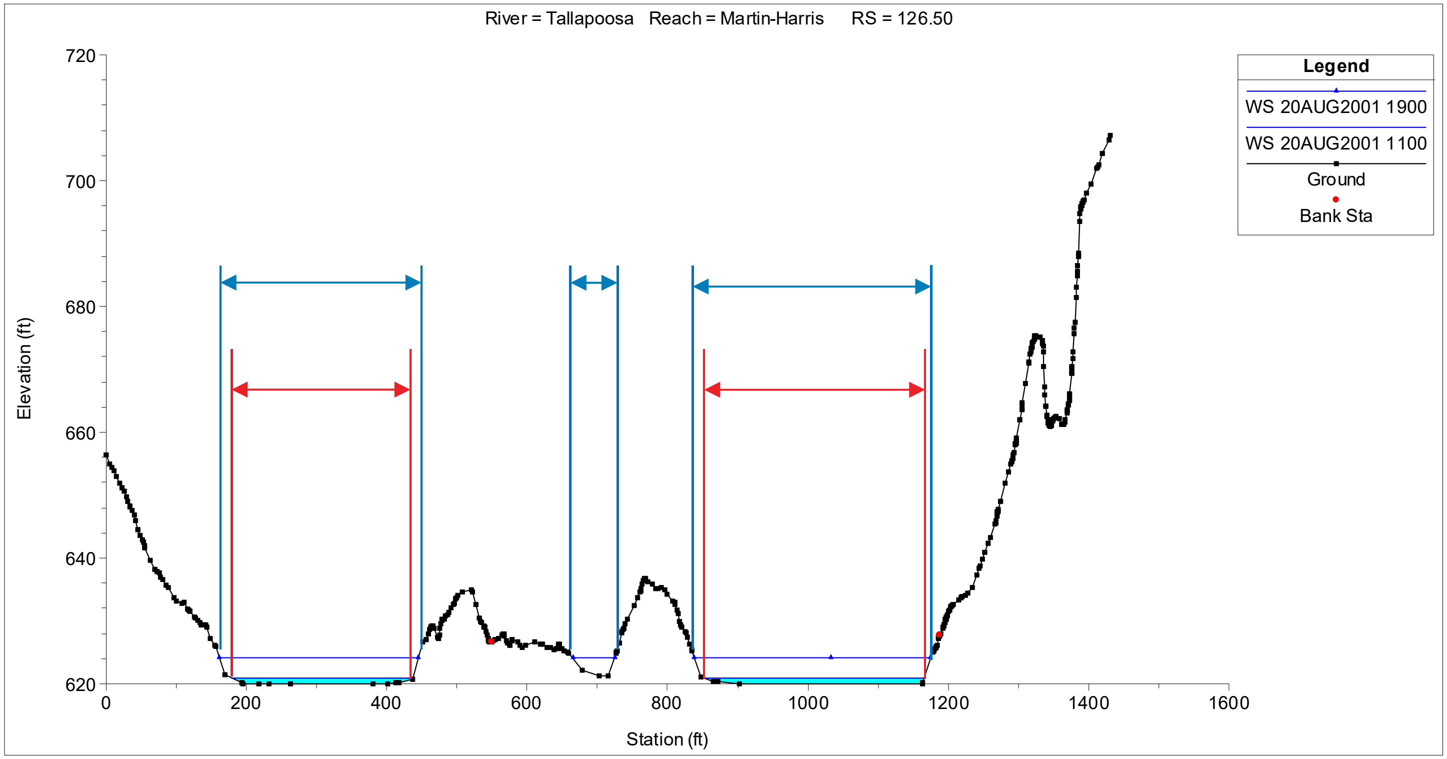

Old
New
562
560
558
556
554
552
550
548
546
544
Elevation (ft)
0
100
200
300
400
500
600
Channel Disctance (ft)

# HEC-RAS Results Analysis

# HEC-RAS Results Analysis



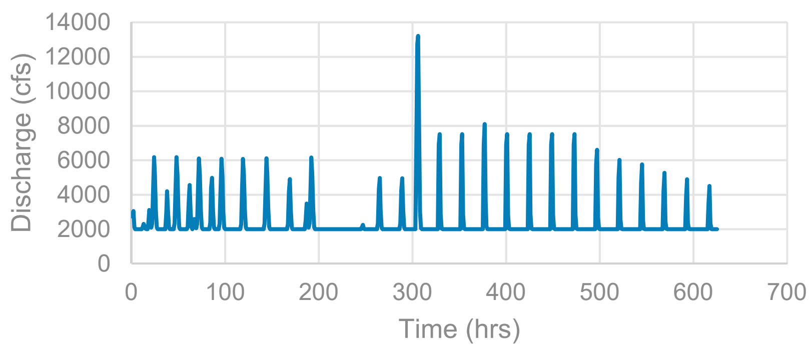
# HEC-RAS Results Analysis

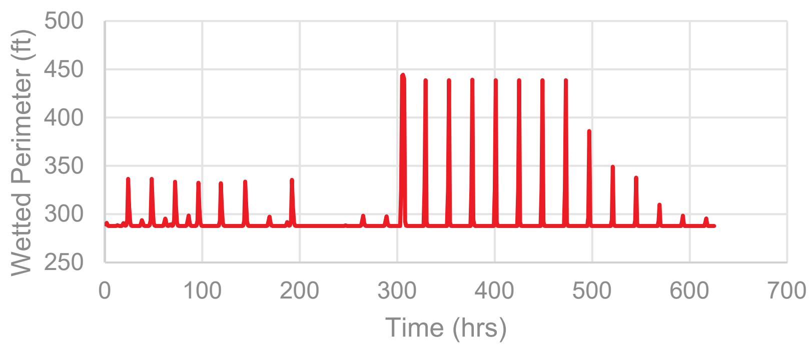


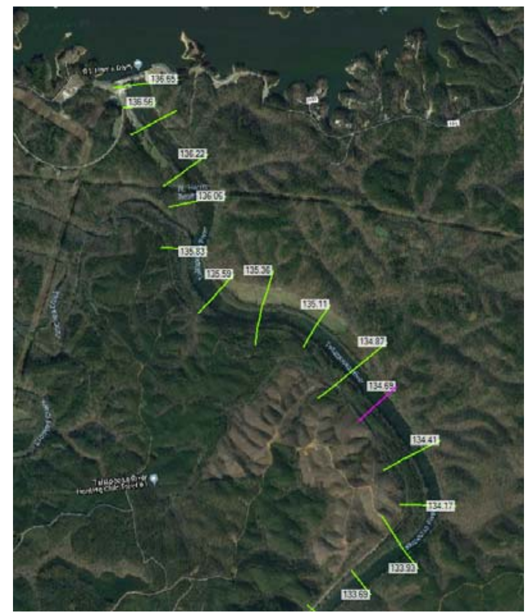
# HEC-RAS Results Analysis

| River Station | Discharge (cfs) | Wetted Perimeter (ft) | Water Surface Elevation (ft) |
|---|---|---|---|
| 134.69 | 2001 | 287.71 | 654.58 |
| 134.69 | 2001 | 287.71 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2312 | 288.44 | 654.79 |
| 134.69 | 4240 | 293.02 | 656.11 |
| 134.69 | 6112 | 333.6 | 657.57 |
| 134.69 | 5227 | 310.29 | 657.25 |
| 134.69 | 3231 | 291.84 | 655.77 |
| 134.69 | 2134 | 288.3 | 654.75 |
| 134.69 | 2005 | 287.74 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.58 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |
| 134.69 | 2000 | 287.71 | 654.57 |

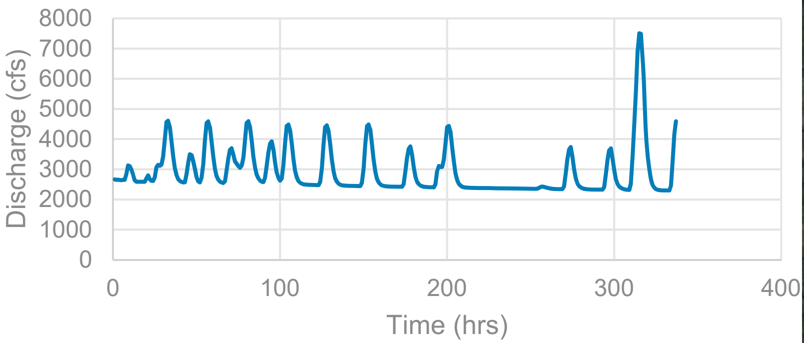
# Tailwater Transect

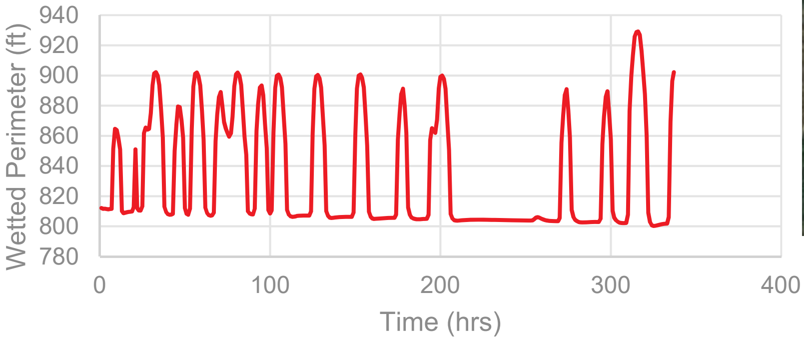


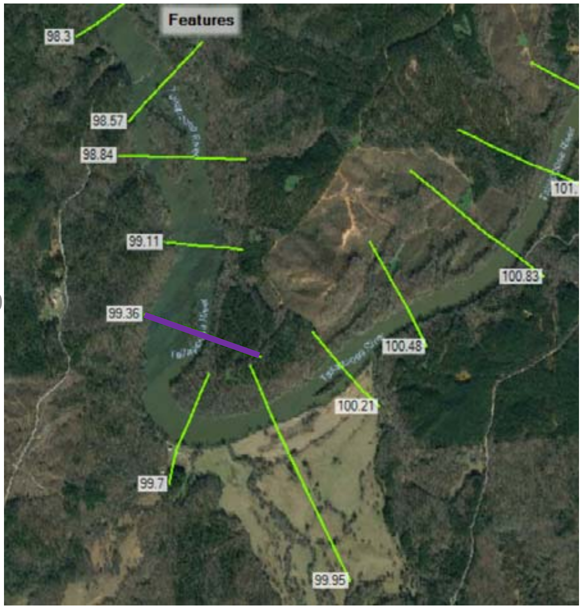



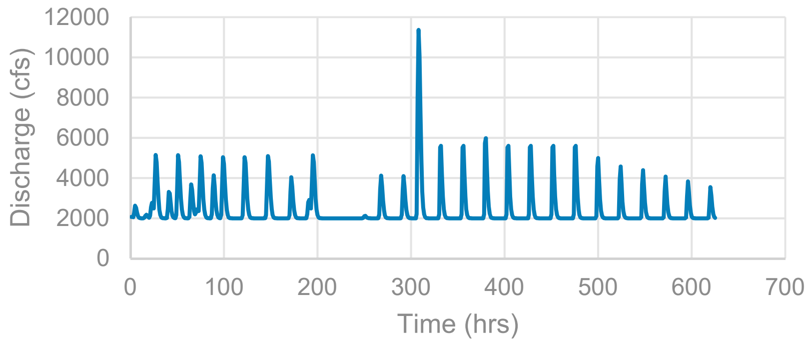
# Shoal Transect

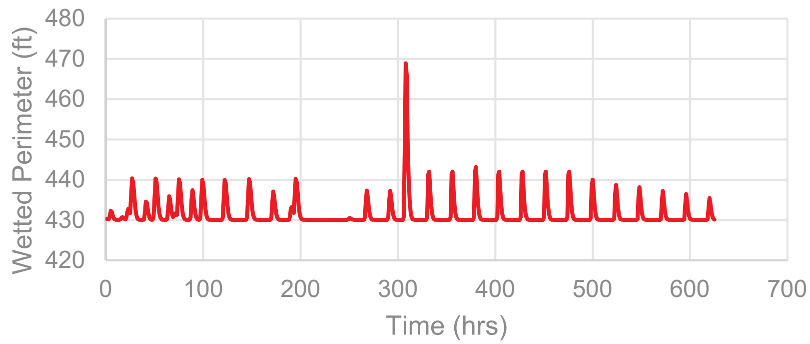


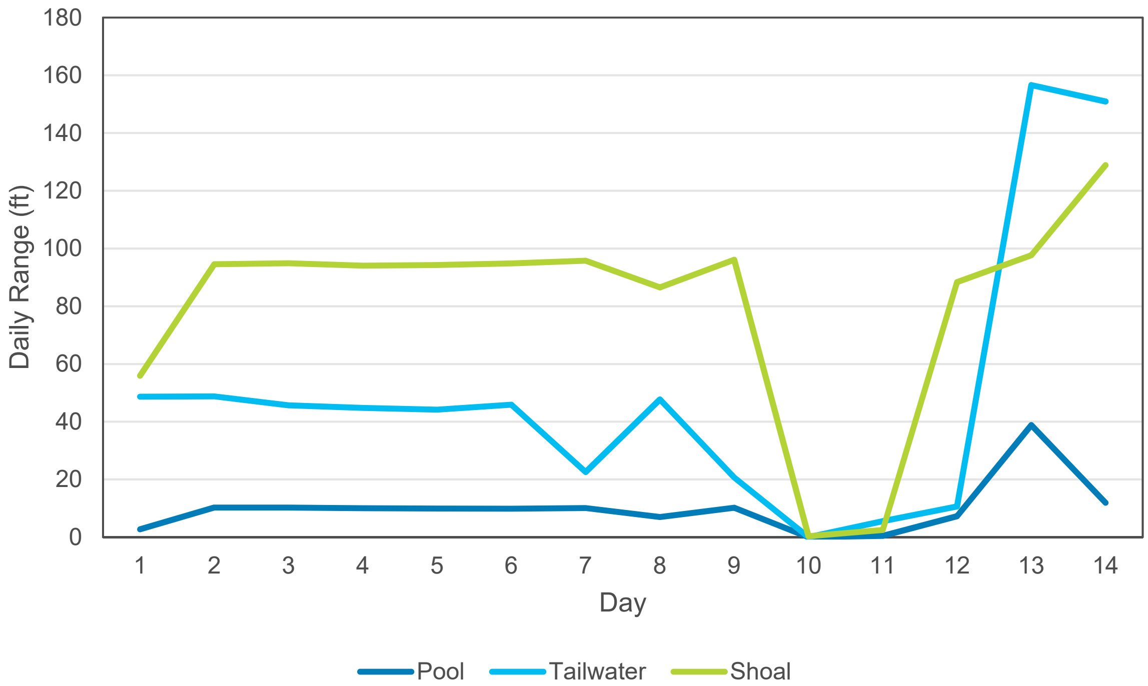
# Pool Transect



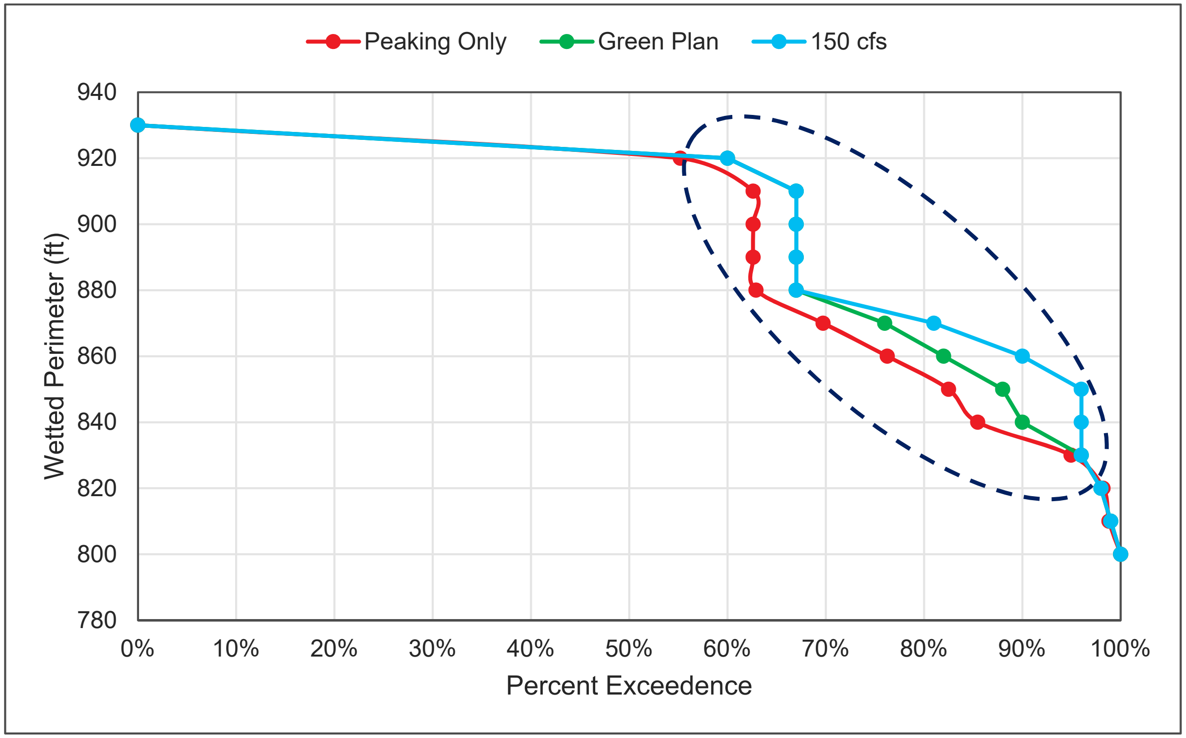




# Example Daily Range Comparison

$$WP_{range} = WP_{max} - WP_{min}$$

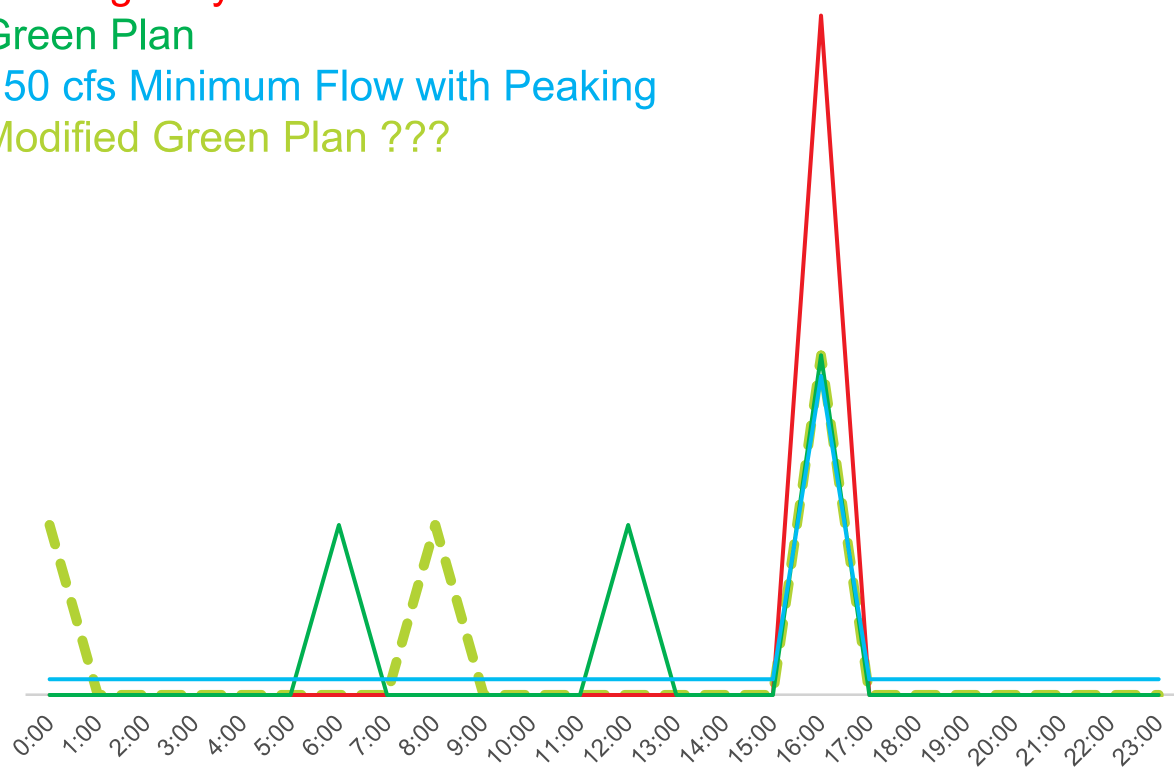


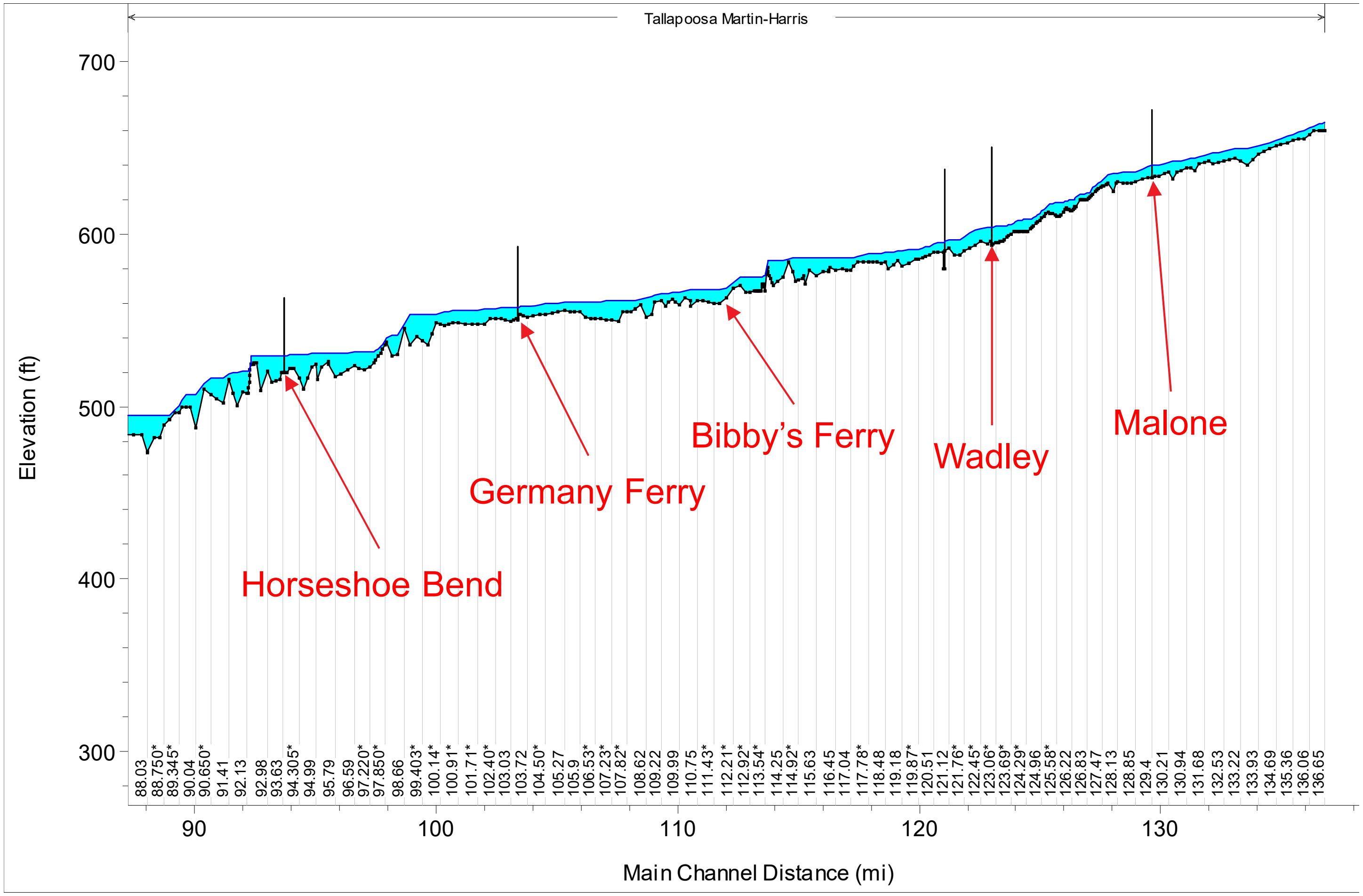
# Example Frequency Comparison



# Scenarios to Analyze

- Peaking Only
- Green Plan
- 150 cfs Minimum Flow with Peaking
- Modified Green Plan ???





Tallapoosa Martin-Harris
Elevation (ft)
700
600
500
400
300
88.03
88.750*
89.345*
90.04
90.650*
91.41
92.13
92.98
93.63
94.305*
94.99
95.79
96.59
97.220*
97.850*
98.66
99.403*
100.14*
100.91*
101.71*
102.40*
103.03
103.72
104.50*
105.27
105.9
106.53*
107.23*
107.82*
108.62
109.22
109.99
110.75
111.43*
112.21*
112.92*
113.54*
114.25
114.92*
115.63
116.45
117.04
117.78*
118.48
119.18
119.87*
120.51
121.12
121.76*
122.45*
123.06*
123.69*
124.29*
124.96
125.58*
126.22
126.83
127.47
128.13
128.85
129.4
130.21
130.94
131.68
132.53
133.22
133.93
134.69
135.36
136.06
136.65
90
100
110
120
130
Main Channel Distance (mi)
Horseshoe Bend
Germany Ferry
Bibby's Ferry
Wadley
Malone

| | |
|---|---|
| **From:** | APC Harris Relicensing |
| **To:** | "harrisrelicensing@southernco.com" |
| **Bcc:** | amy.silvano@dcnr.alabama.gov; chris.greene@dcnr.alabama.gov; damon.abernethy@dcnr.alabama.gov; evan.lawrence@dcnr.alabama.gov; keith.henderson@dcnr.alabama.gov; mike.holley@dcnr.alabama.gov; steve.bryant@dcnr.alabama.gov; matthew.marshall@dcnr.alabama.gov; todd.fobian@dcnr.alabama.gov; ken.wills@jcdh.org; arsegars@southernco.com; ammcvica@southernco.com; dkanders@southernco.com; jcarlee@southernco.com; jefbaker@southernco.com; kechandl@southernco.com; tlmills@southernco.com; cggoodma@southernco.com; clowry@alabamarivers.org; mhunter@alabamarivers.org; gjobsis@americanrivers.org; devridr@auburn.edu; irwiner@auburn.edu; kmo0025@auburn.edu; wrighr2@aces.edu; jhancock@balch.com; lgallen@balch.com; chrisoberholster@birminghamaudubon.org; sarah.salazar@ferc.gov; allan.creamer@ferc.gov; rachel.mcnamara@ferc.gov; monte.terhaar@ferc.gov; amanda.fleming@kleinschmidtgroup.com; colin.dinken@kleinschmidtgroup.com; henry.mealing@kleinschmidtgroup.com; jason.moak@kleinschmidtgroup.com; kate.cosnahan@kleinschmidtgroup.com; kelly.schaeffer@kleinschmidtgroup.com; sforehand@russelllands.com; lgarland68@aol.com; Barry Morris - Lake Wedowee Property Owners Association (rbmorris222@gmail.com); pace.wilber@noaa.gov; mitchell.reid@tnc.org; donnamat@aol.com; trayjim@bellsouth.net; mhpwedowee@gmail.com; straylor426@bellsouth.net; triciastearns@gmail.com; wmcampbell218@gmail.com; holliman.daniel@epa.gov; decker.chris@epa.gov; bill_pearson@fws.gov; evan_collins@fws.gov; jeff_powell@fws.gov; jennifer_grunewald@fws.gov; jeff_duncan@nps.gov; "Morris, Barry"; devridr@auburn.edu; Russell Wright |
| **Subject:** | Harris Relicensing - March 19th HAT 3 meeting |
| **Date:** | Friday, February 21, 2020 12:47:01 PM |
| **Attachments:** | 2020-03-19 HAT Meeting Agenda.doc |

HAT 3,

Alabama Power Company will be hosting a series of HAT meetings on **Thursday, March 19, 2020 at the Oxford Civic Center,** 401 Mccullars Ln, Oxford, AL 36203. The HAT 3 meeting will be from **1:30-3:30** (see attached agenda). The purpose of the HAT 3 meeting is to review progress to date for the Threatened and Endangered Species, Downstream Aquatic Habitat and Aquatic Resources studies.

**Please RSVP by Friday, March 13, 2020**. Lunch will be provided (~11:15) so please indicate any food allergies or vegetarian preferences on or before March 13, 2020. I encourage everyone to attend in person. If this is not feasible, we are also offering a Skype option (info below). It would be ideal to join on your computer as we will be viewing presentations and maps.

If you have any questions about the agenda or meeting, please email or call me at ARSEGARS@southernco.com or (205) 257-2251.

Join Skype Meeting

+1 (205) 257-2663

Conference ID: 3660816

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com

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| **Subject:** | UPDATE - Harris Relicensing March 19th HAT 3 meeting |
| **Date:** | Friday, March 13, 2020 1:00:35 PM |
| **Attachments:** | 2020-03-19 HAT Meeting Agenda.doc |

HAT 3,

Due to the ongoing situation with the spread of COVID-19 (the "coronavirus"), Southern Company has directed its employees to use virtual meetings, when possible. Therefore, the HAT 3 meeting scheduled for Thursday, March 19th will **only be held via the Skype link below and call-in number below**. If you are able to join via Skype, we will be sharing the presentation. If you are not, we will provide the presentation in a PDF document the morning of the meeting and the presenter will help you follow along with the slides.

**The Skype link will be available all day**. I suggest you join early to make sure that your computer is capable of joining (has all the necessary software). We will be muting and unmuting the phones from the control center, so please don't worry about announcing that you joined. **At 1:30 am, the meeting will begin**, and we will conduct a roll call to make sure we have a record of who attended the meeting. Also, if you use your computer's microphone and speaker to join the call, there is no need to use the phone number.

If you have any questions, please let me know.

HAT 3,

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| **Subject:** | CANCELLED - Harris relicensing - HAT 3 meeting |
| **Date:** | Monday, March 16, 2020 12:53:05 PM |

HAT 3,

First, I apologize for the multiple emails regarding this week's meeting and I appreciate you bearing with us. Because we are all in such a state of flux with schools closing and more and more of us being asked to telecommute, and the uncertainty of how well our technology is going to work when we're all trying to use it at once, we have decided to cancel this Thursday's stakeholder meeting. The information we were going to cover will be included in the Initial Study Report filing, along with several draft reports, in April.

Again, thank you for bearing with us. Stay well!

**Angie Anderegg**
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(205)257-2251
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**Subject:** HAT 3 - 2/20 DAH meeting notes
**Date:** Thursday, May 14, 2020 10:19:11 AM

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HAT 3,

It was brought to my attention that we forgot to place the meeting presentation and notes from the February 20 Downstream Aquatic Habitat meeting on our website. You can now find them in the HAT 3 folder: http://harrisrelicensing.com/_layouts/15/start.aspx#/HAT%203%20%20Fish%20and%20Wildlife/Forms/AllItems.aspx.

Thanks,

**Angie Anderegg**
Hydro Services
(205)257-2251
arsegars@southernco.com