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

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

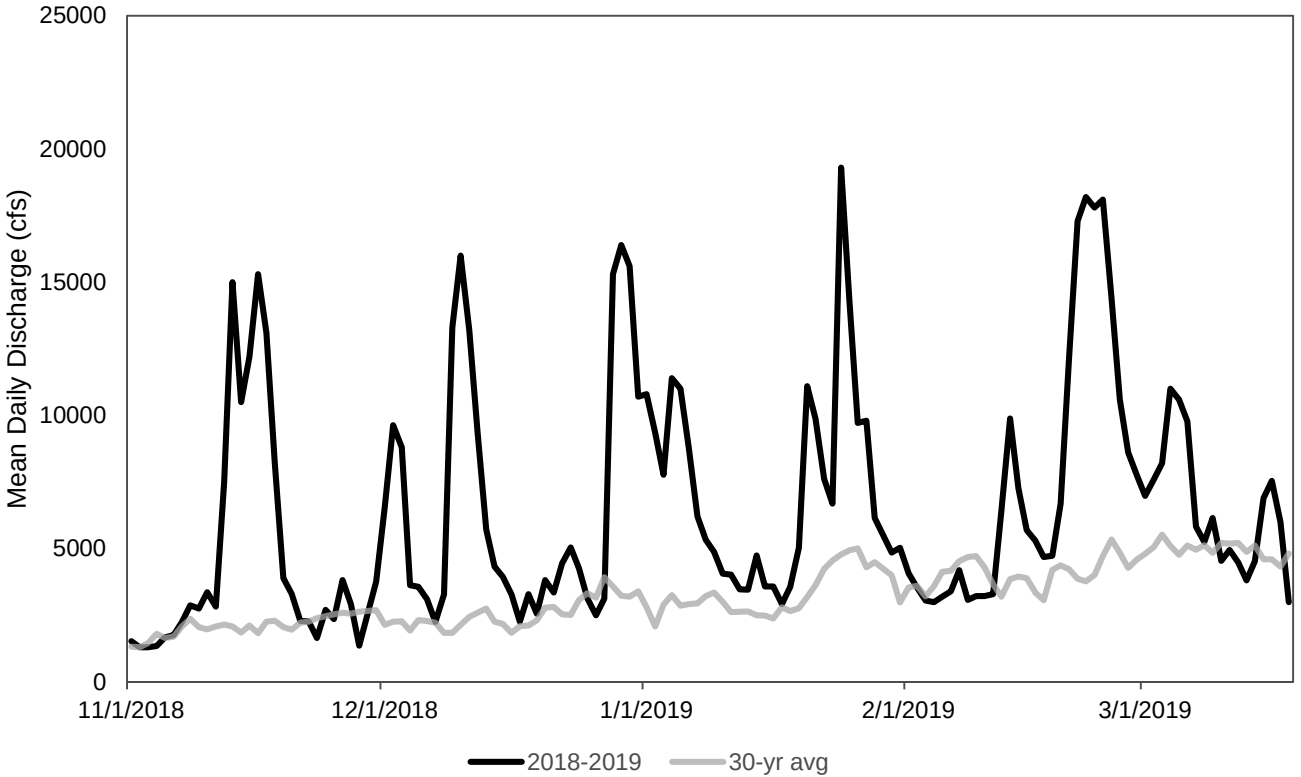
Evaluate the effects of the Harris Project on aquatic resources.

Geographic Scope

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

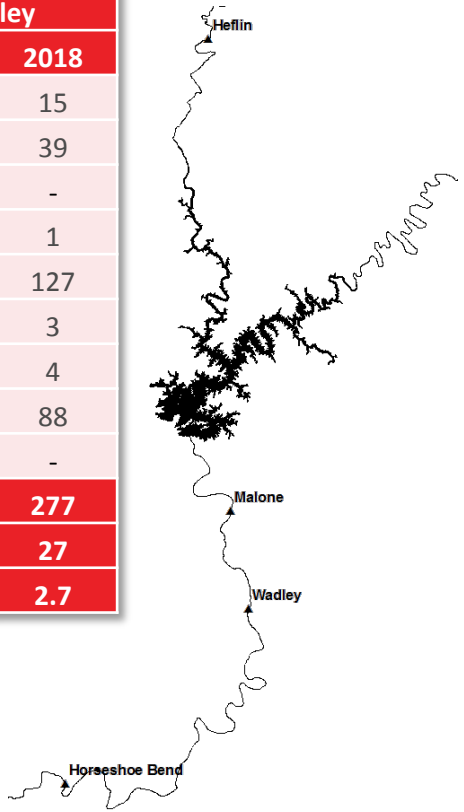
Study Components

- 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

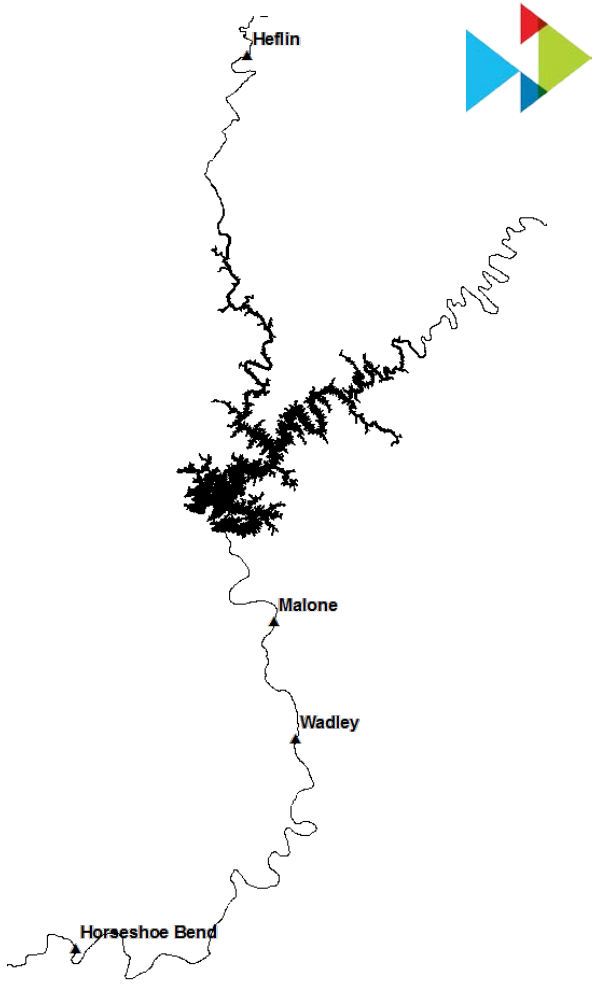

25000
20000
15000
10000
5000
0
Mean Daily Discharge (cfs)
11/1/2018
12/1/2018
1/1/2019
2/1/2019
3/1/2019
2018-2019
30-yr avg

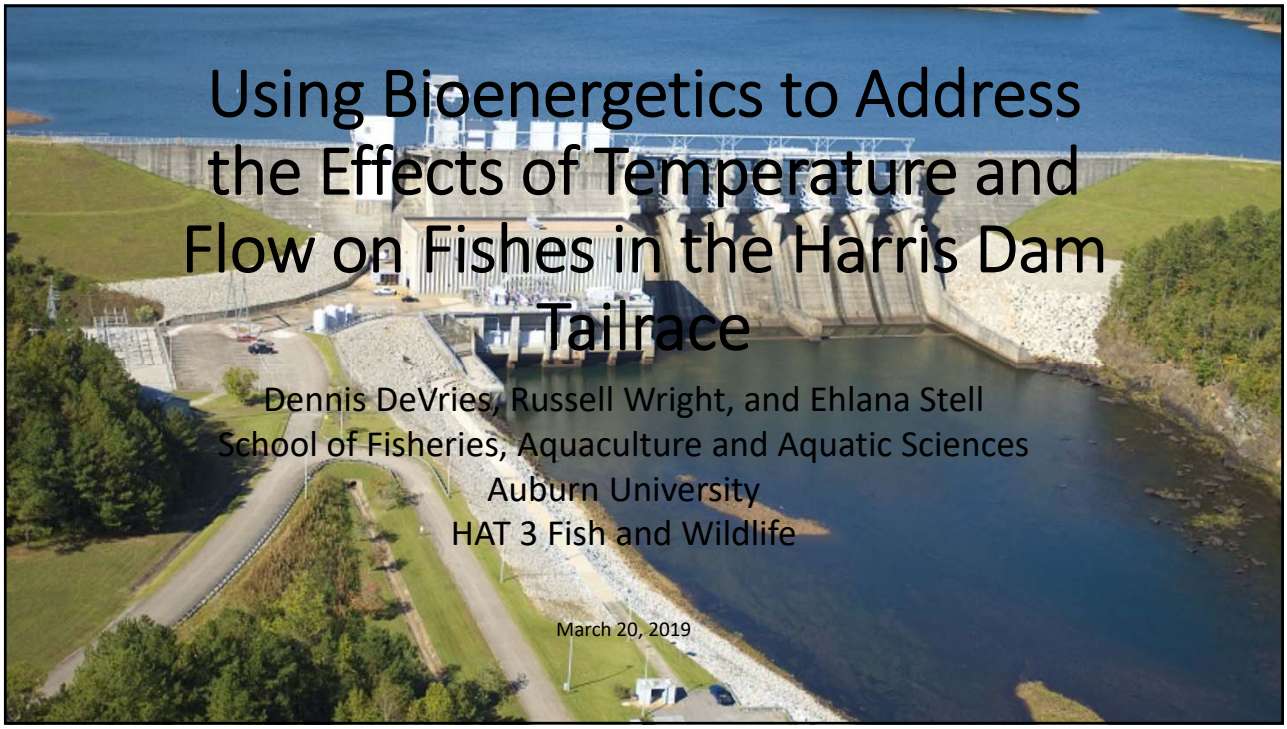
2017 & 2018 Fish Survey Results

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

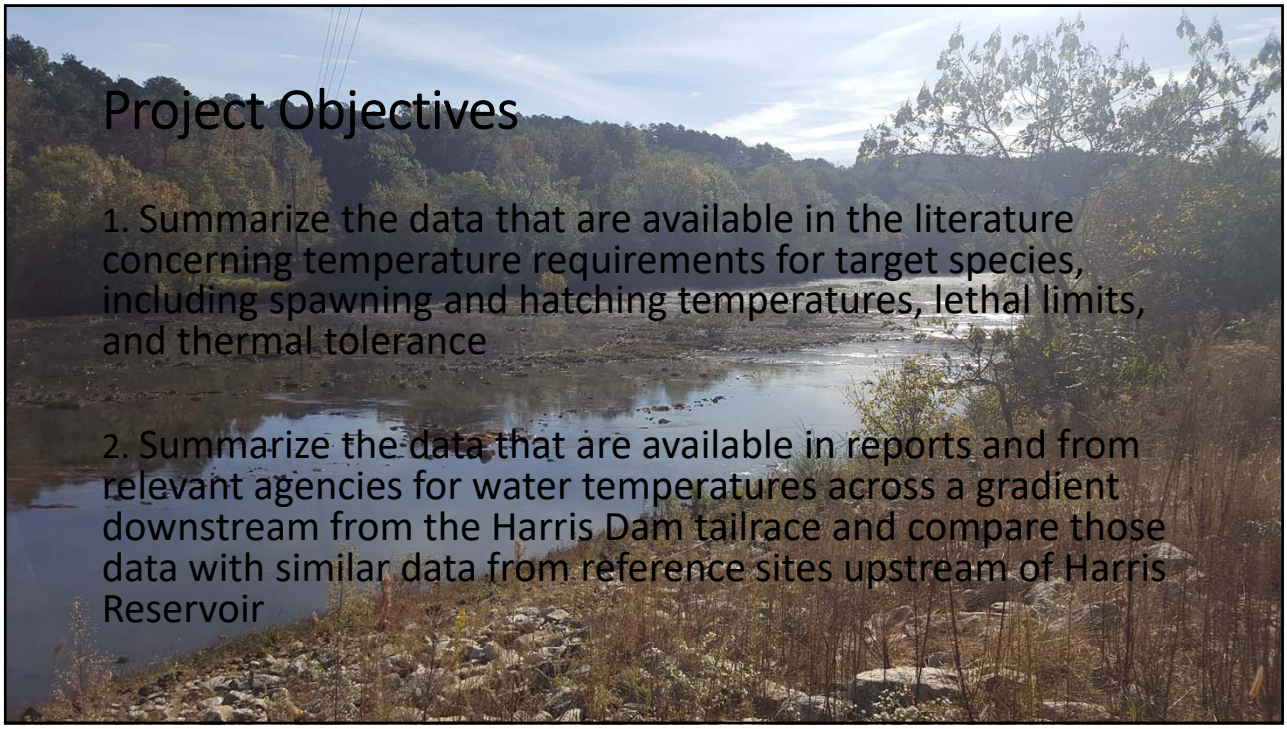




Using Bioenergetics to Address the Effects of Temperature and Flow on Fishes in the Harris Dam Tailrace

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

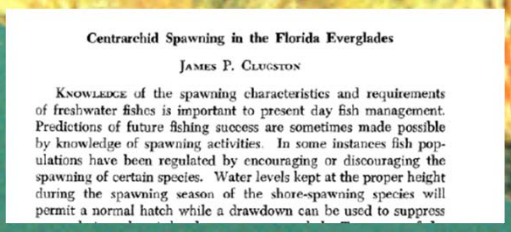
2. Summarize the data that are available in reports and from relevant agencies for water temperatures across a gradient downstream from the Harris Dam tailrace and compare those data with similar data from reference sites upstream of Harris Reservoir

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

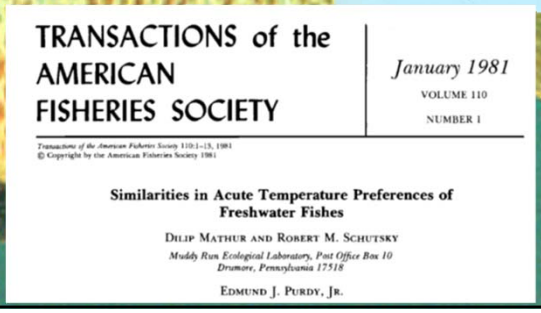
- Continuing to search for published temperature tolerance information
- Aho and Anderson 1986 (similar to LMB?)
- Some suggestion that metabolic patterns may be system-dependent?



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

Similarities in Acute Temperature Preferences of Freshwater Fishes

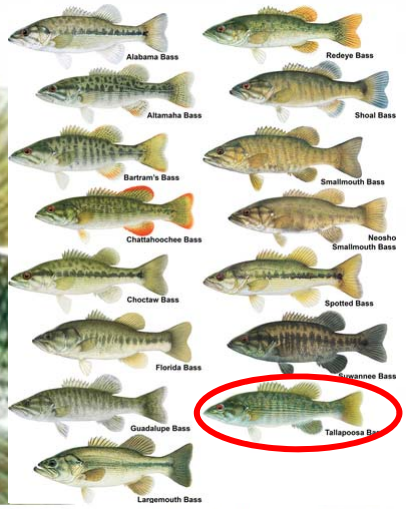
Dilip Mathur and Robert M. Schutsky

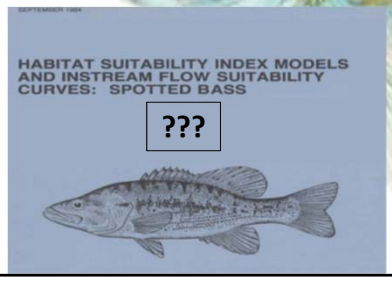
Muddy Run Ecological Laboratory, Post Office Box 10
Drumore, Pennsylvania 17518

Edmund J. Purdy, Jr.

Tallapoosa Bass

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





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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: whrbaker@earthlink.net

Channel Catfish

- Some data available, but most are for pond fish

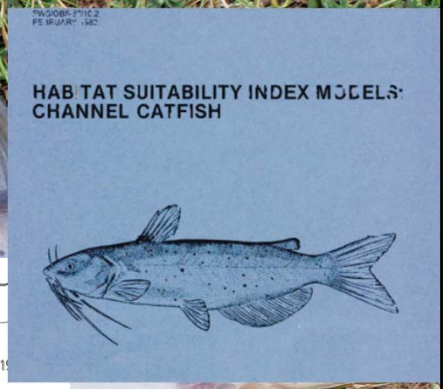
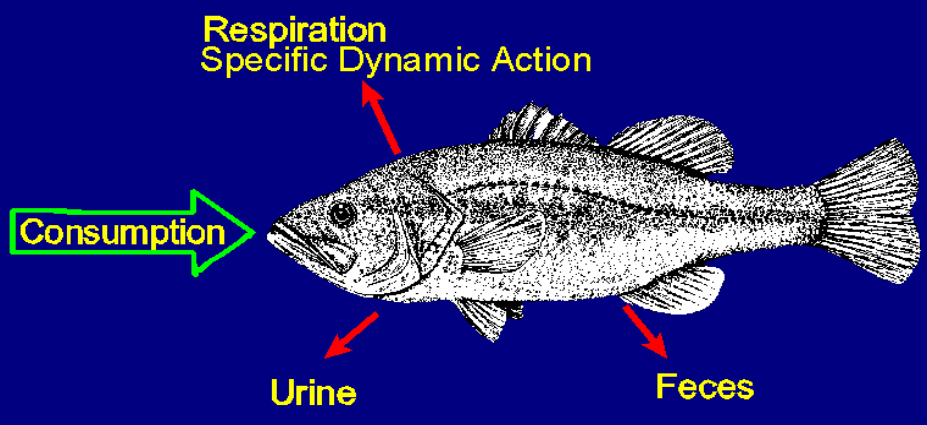


Table 4. Estimated physiological parameter values of channel catfish used as inputs to the Hewett & Johnson (1992) model

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)

Basic Bioenergetics Approach



Growth = Consumption - (Respiration + SDA + Feces + Urine)

Uses of Bioenergetics Models

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

8

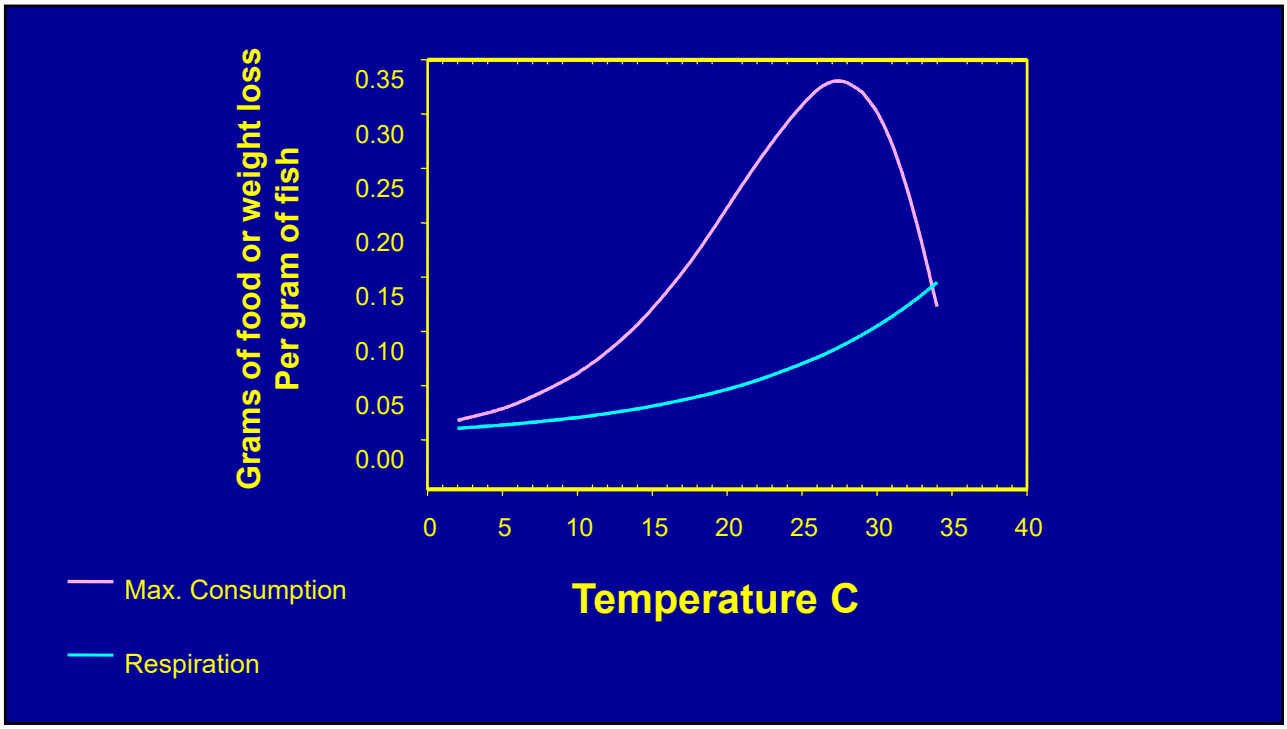
Uses of Bioenergetics Models

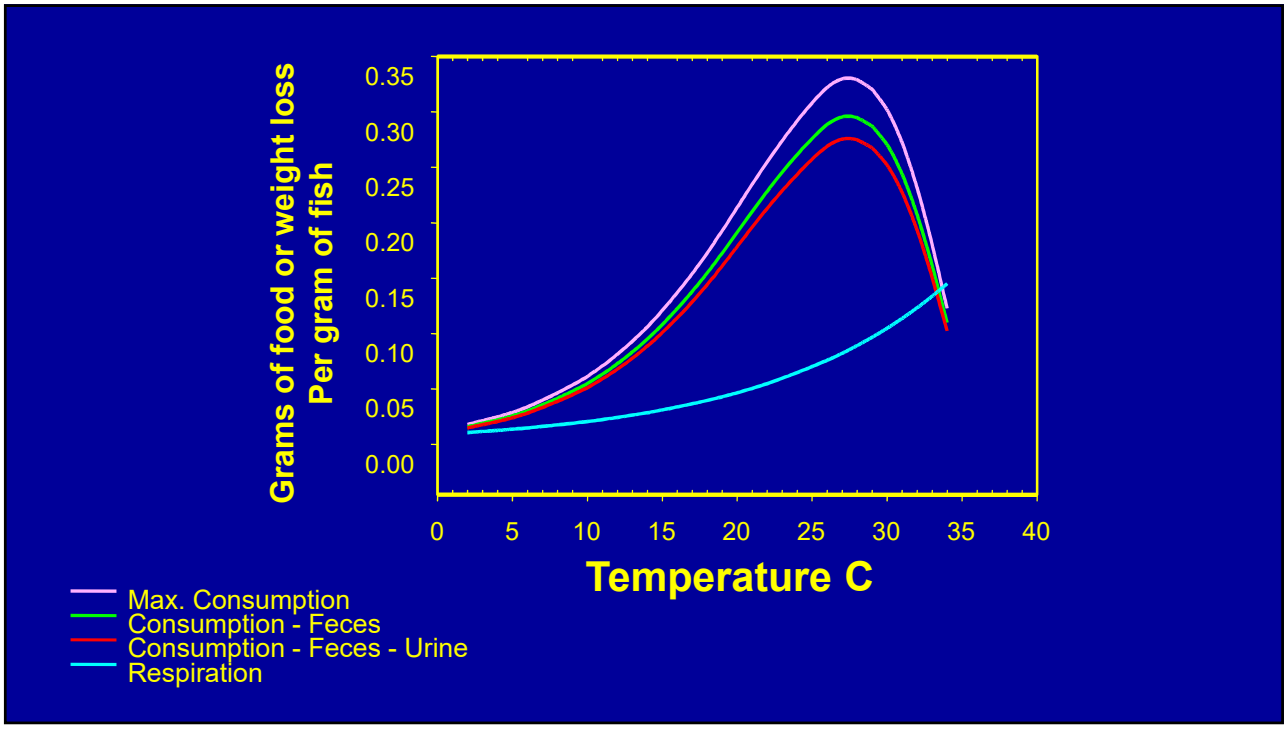
- evaluation of stocking
- nutrient recycling
- contaminant accumulation
- aquaculture
- exploring evolutionary influences
- habitat effects on growth
- effects of environmental stress

9

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
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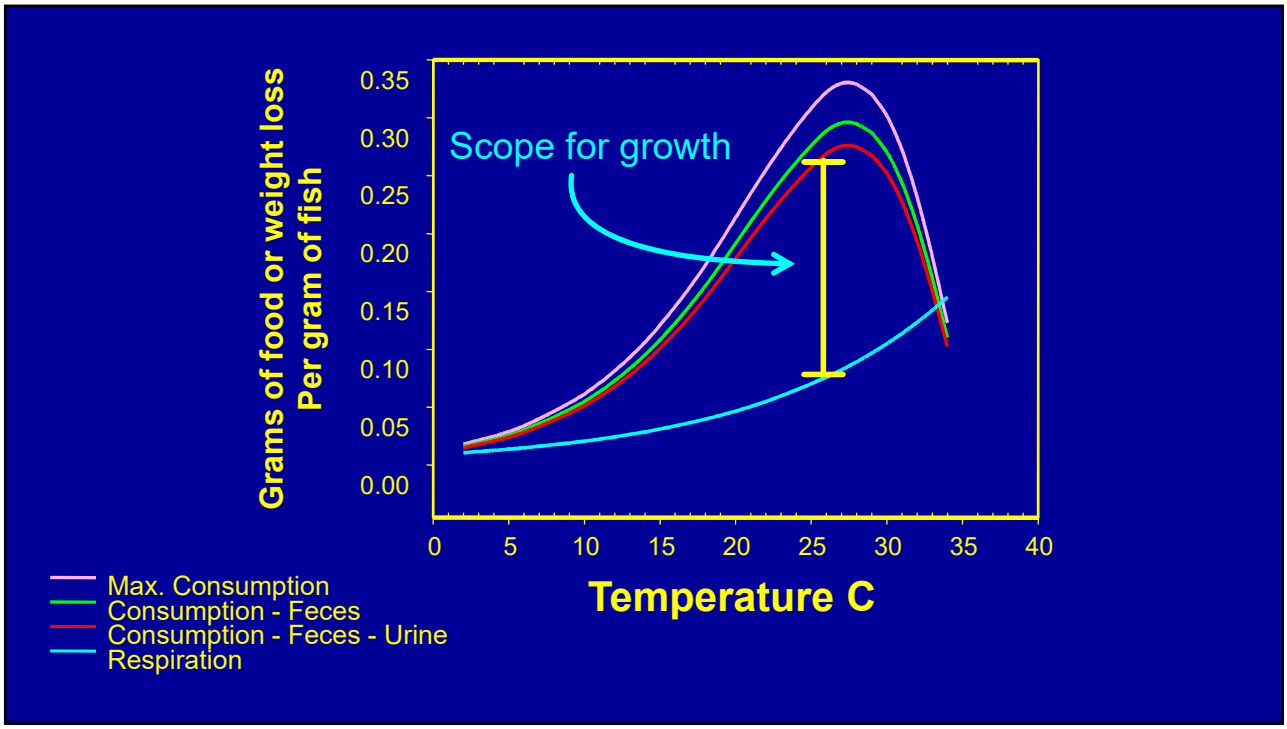
20
25
30
35
40
Temperature C
Max. Consumption
Consumption - Feces
Consumption - Feces - Urine
Respiration



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

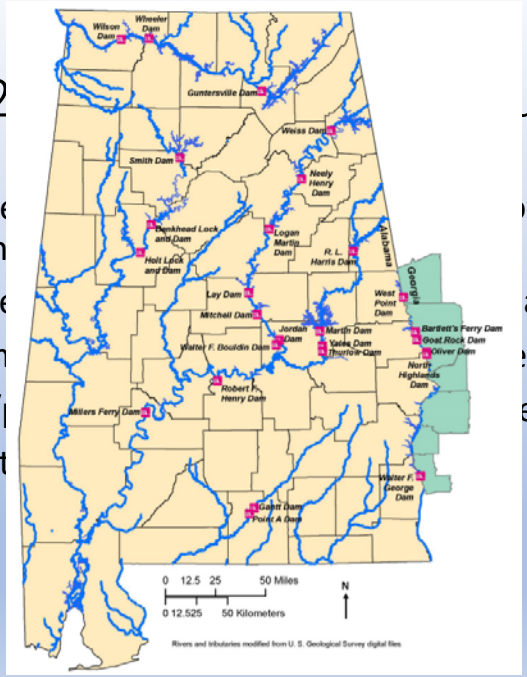
16

Objective 1: Temperature Requirements

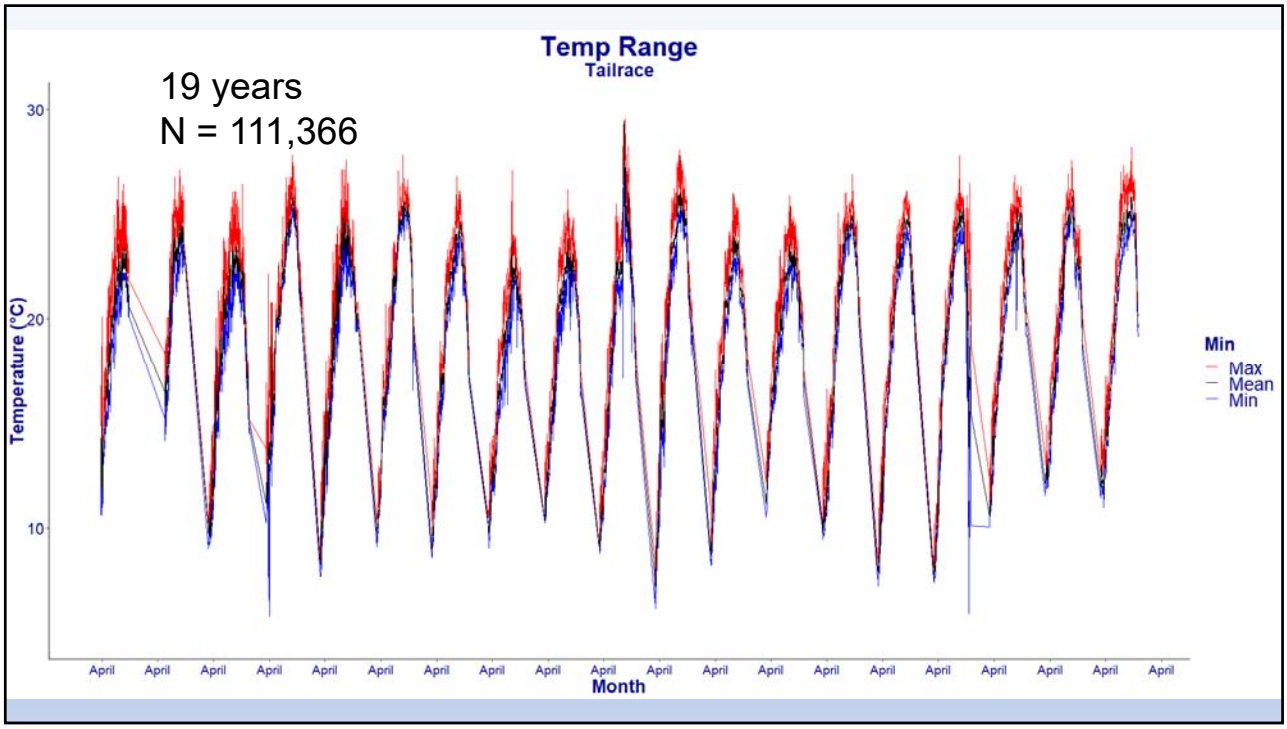
- Reviewed published literature, gray literature reports, agency reports, theses/dissertations, etc. for information on target and related species
  - Redbreast Sunfish
  - Tallapoosa Bass
  - Channel Catfish
- **Extremely limited data available except for Channel Catfish in ponds/reservoirs**
- **Continuing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

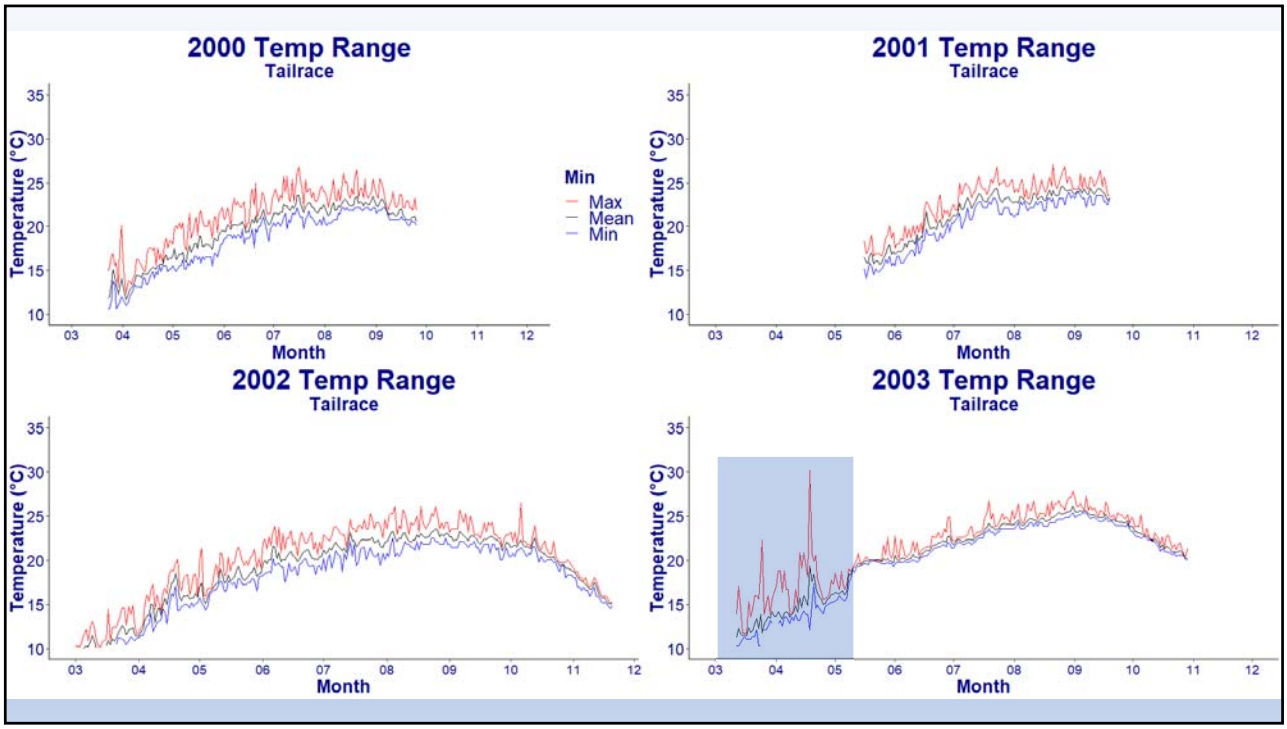
Objective 2 ummary

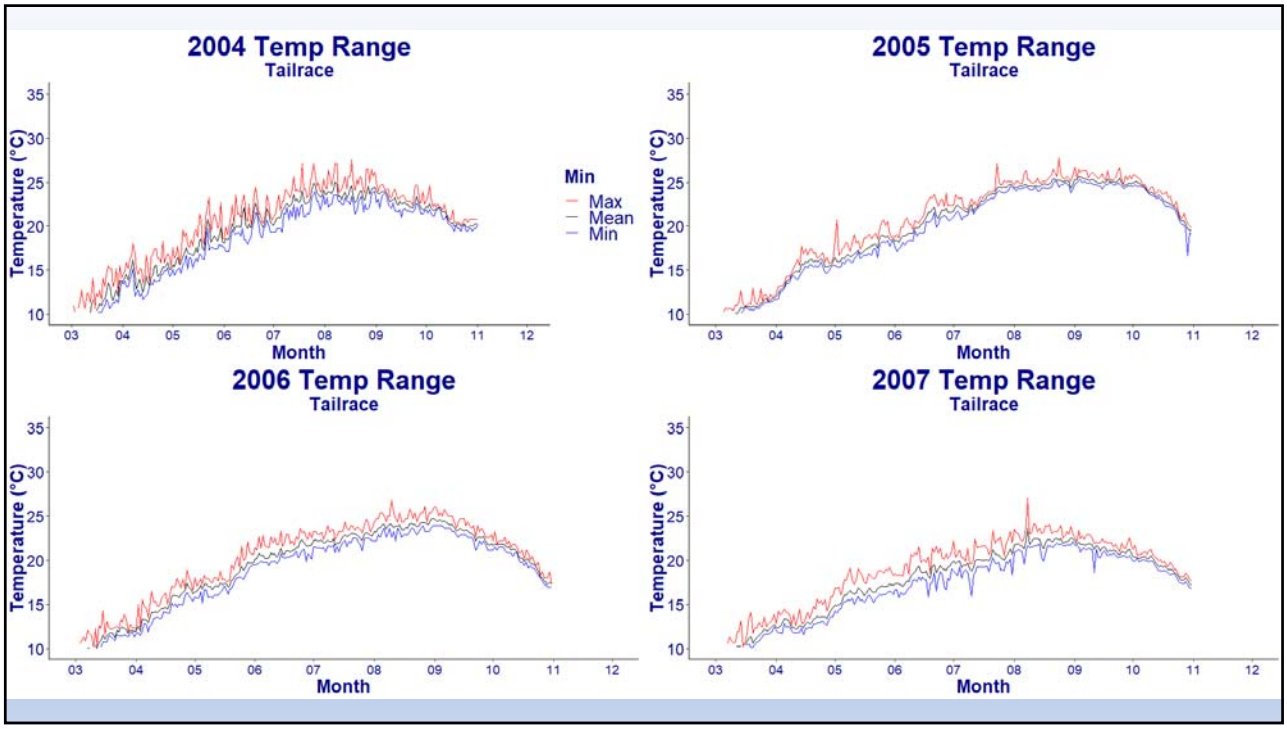
- Obtained tempe wer for three sites (tailrace, Malon
- Continuing to se ata
- Graphed max, n ear
- Compared pre/ each site
- Compared site t

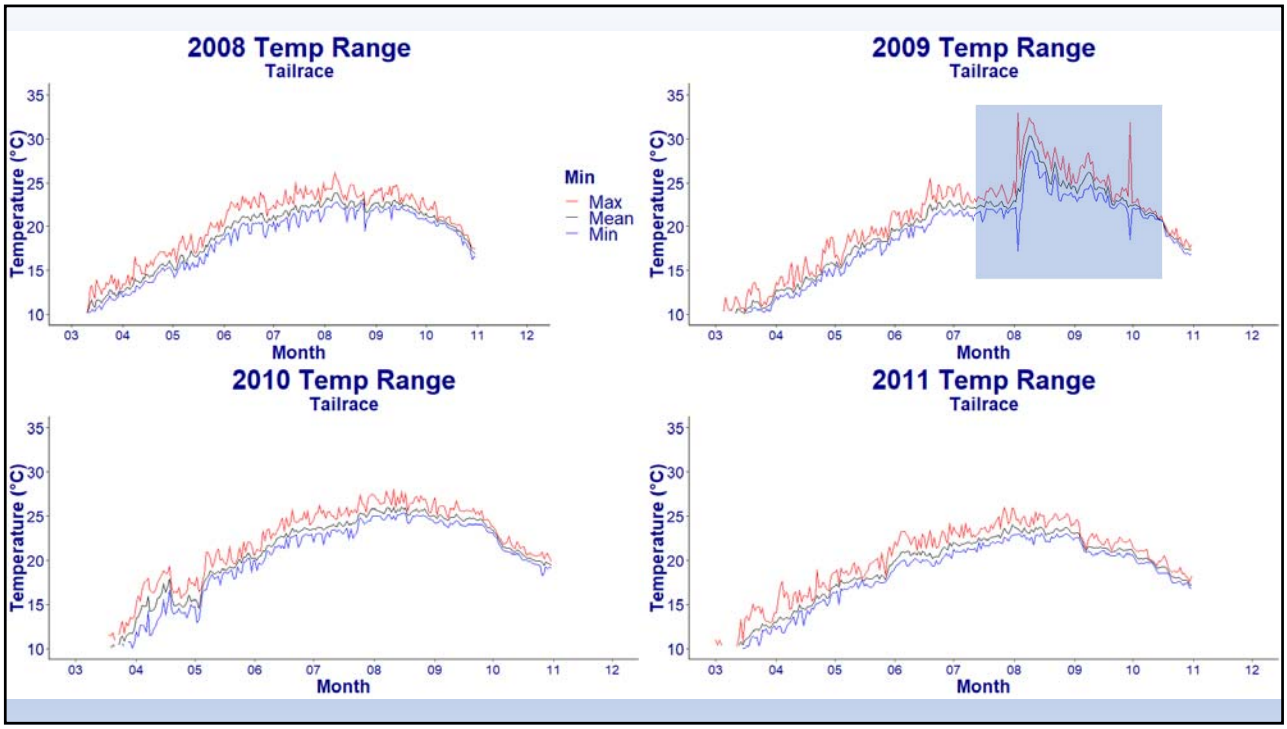


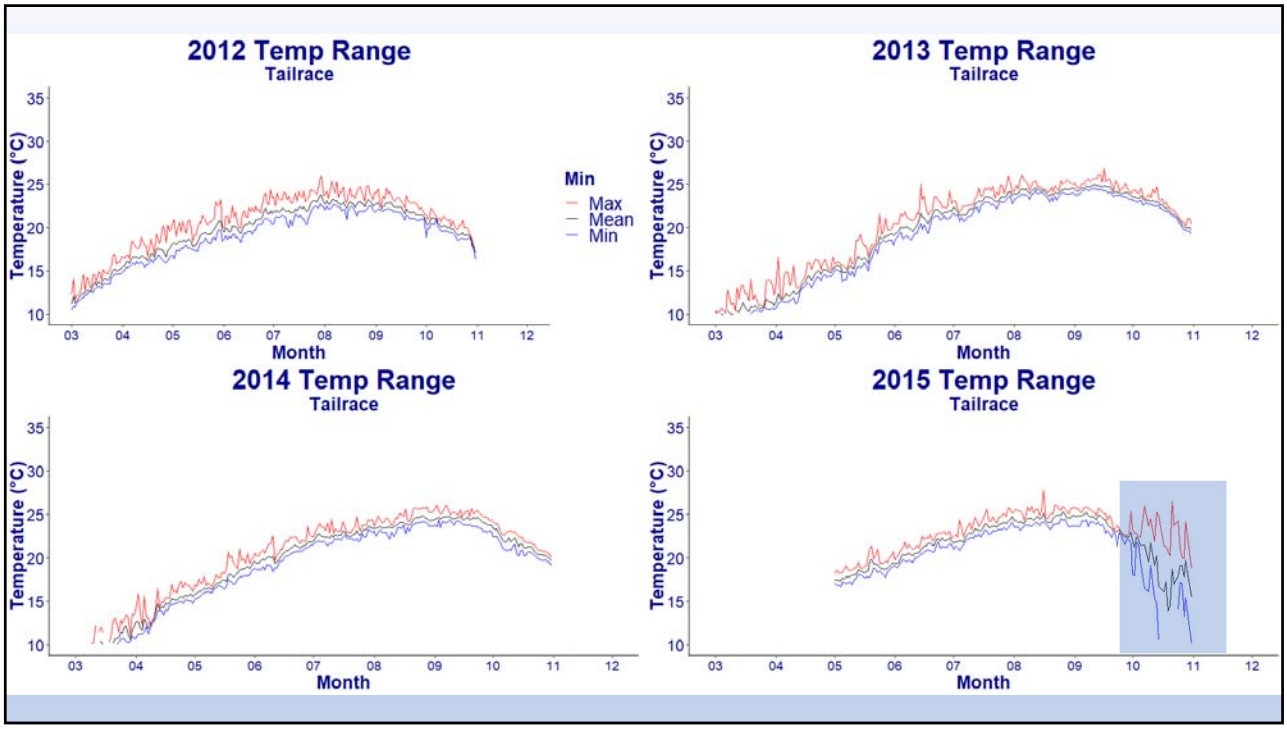

Tallapoosa River
R.I. Harris Dam
Google
RL Harris
Reservoir

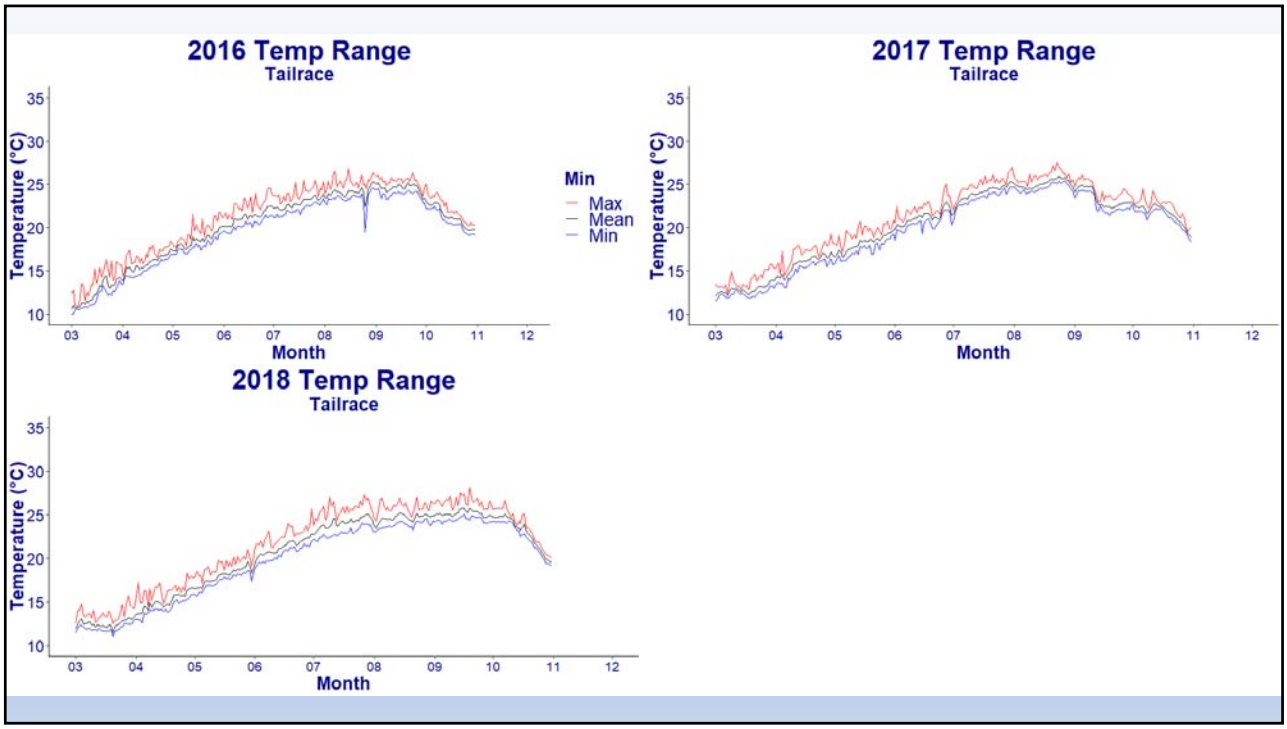

Temp Range
Tailrace
19 years
N = 111,366
Temperature (°C)
30
20
10
April
Month
Min
Max
Mean
Min

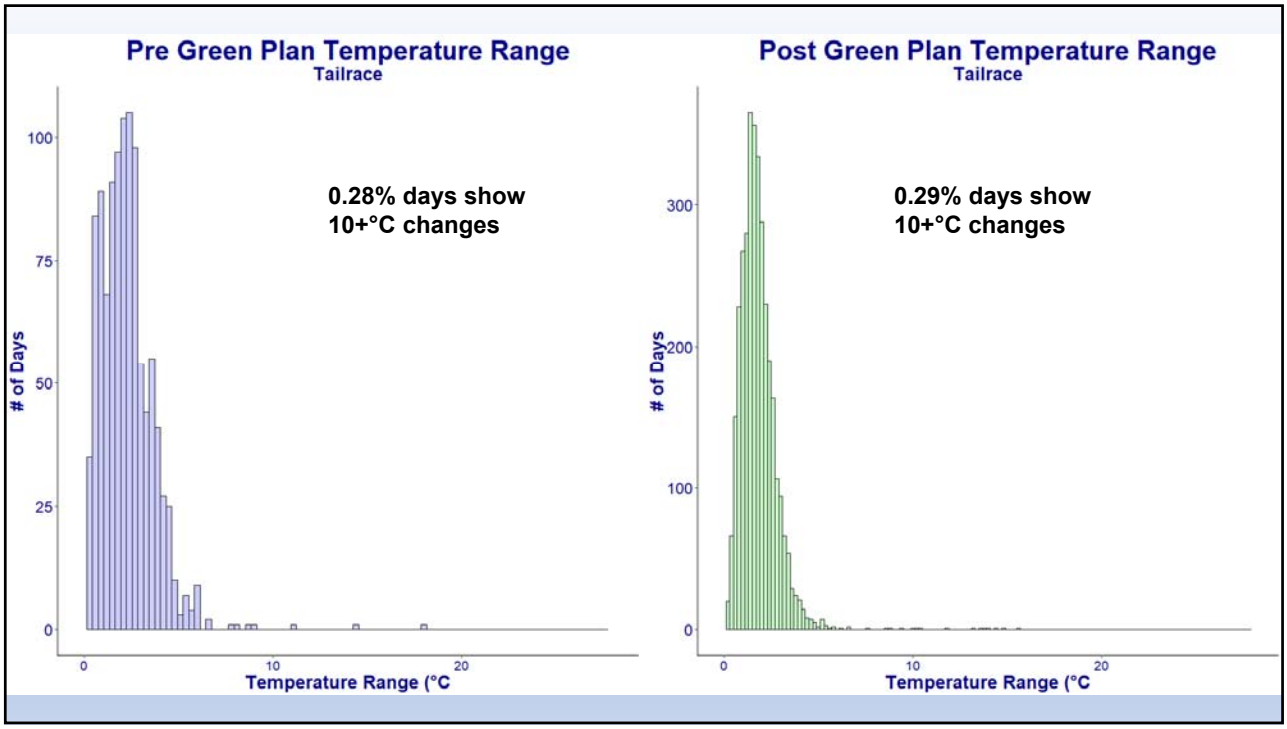

2000 Temp Range
Tailrace
2001 Temp Range
Tailrace
2002 Temp Range
Tailrace
2003 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

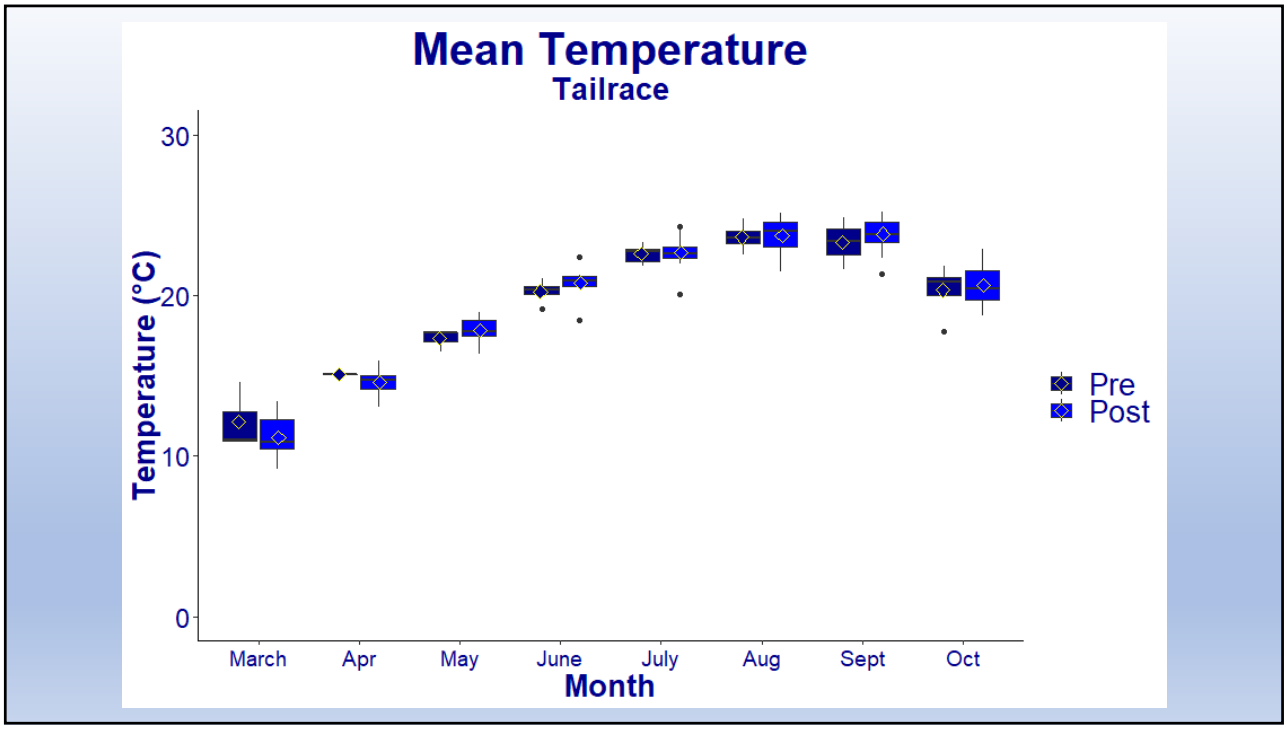

2004 Temp Range
Tailrace
2005 Temp Range
Tailrace
2006 Temp Range
Tailrace
2007 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

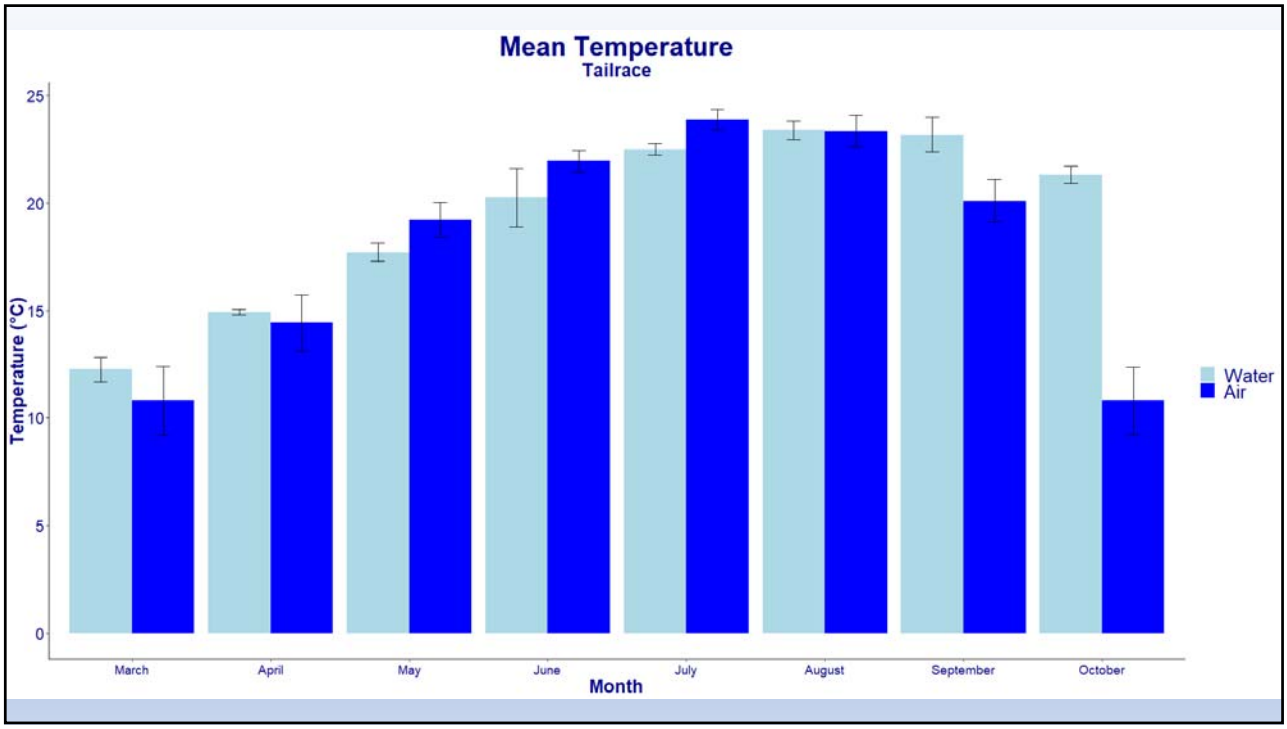

2008 Temp Range
Tailrace
2009 Temp Range
Tailrace
2010 Temp Range
Tailrace
2011 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

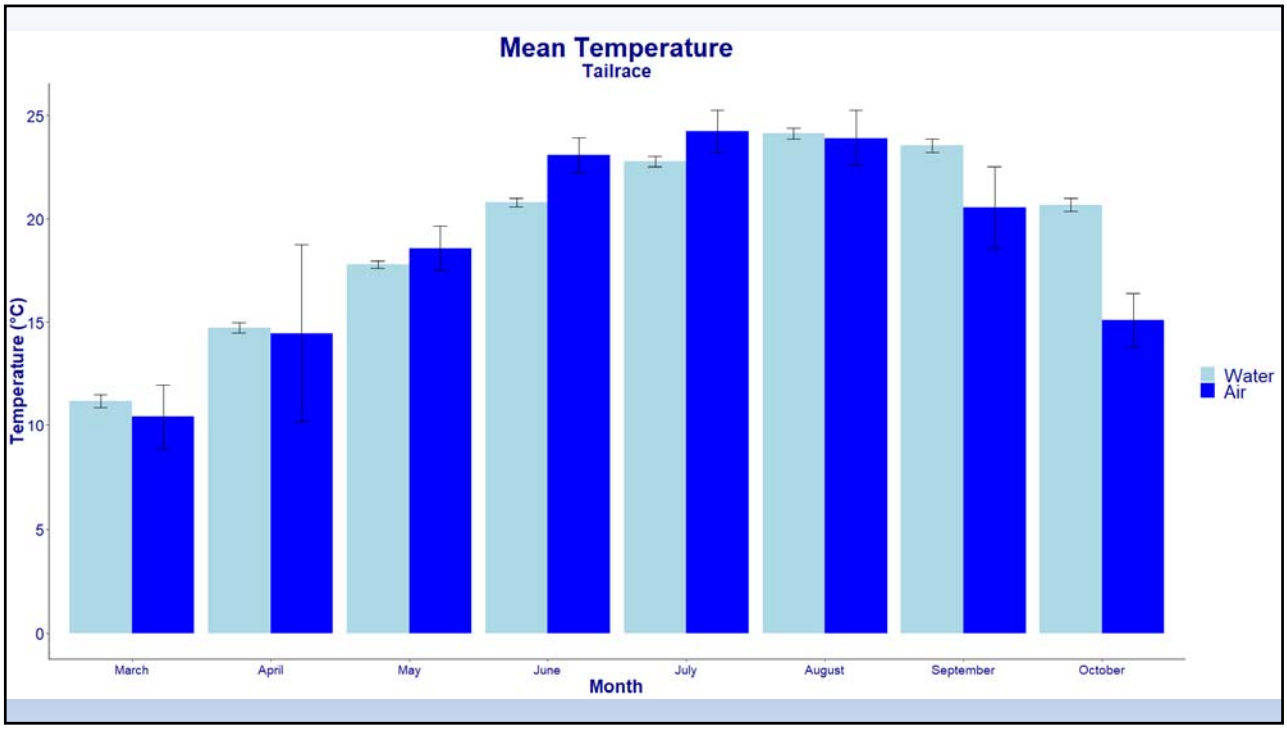

2012 Temp Range
Tailrace
2013 Temp Range
Tailrace
2014 Temp Range
Tailrace
2015 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

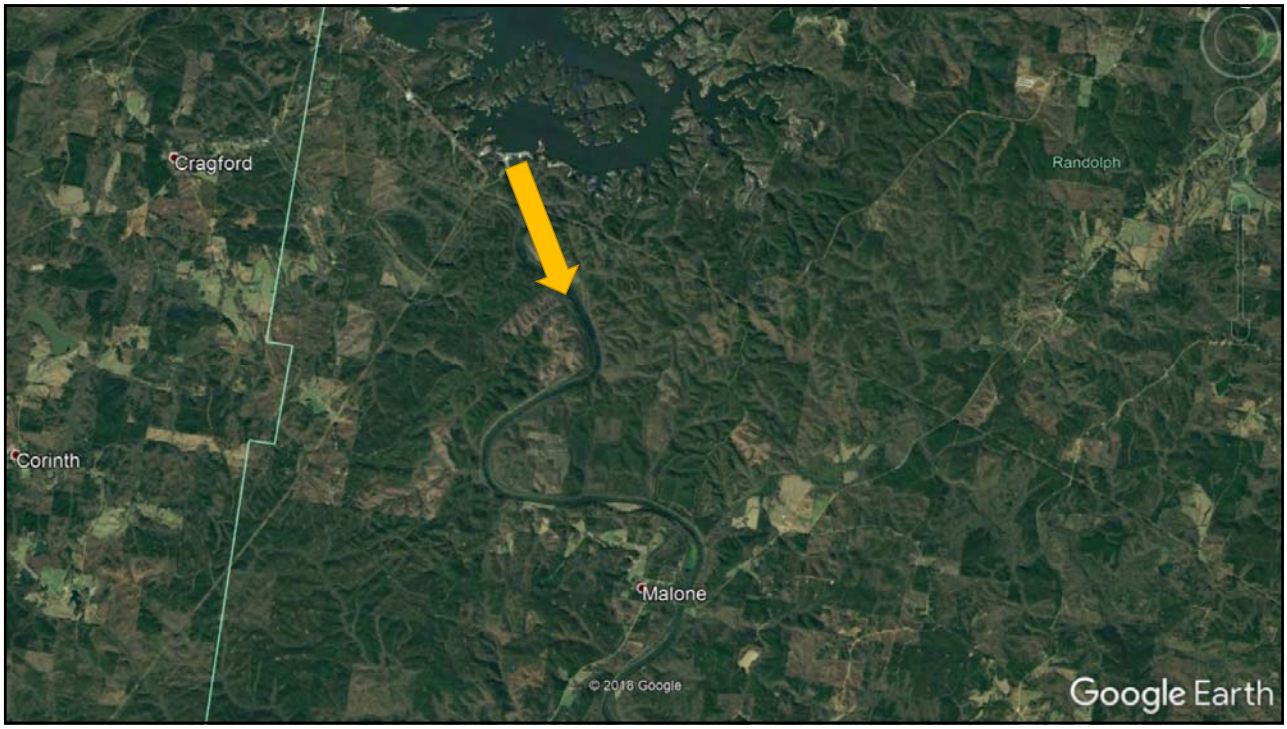

2016 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min
2017 Temp Range
Tailrace
Temperature (°C)
Month
2018 Temp Range
Tailrace
Temperature (°C)
Month

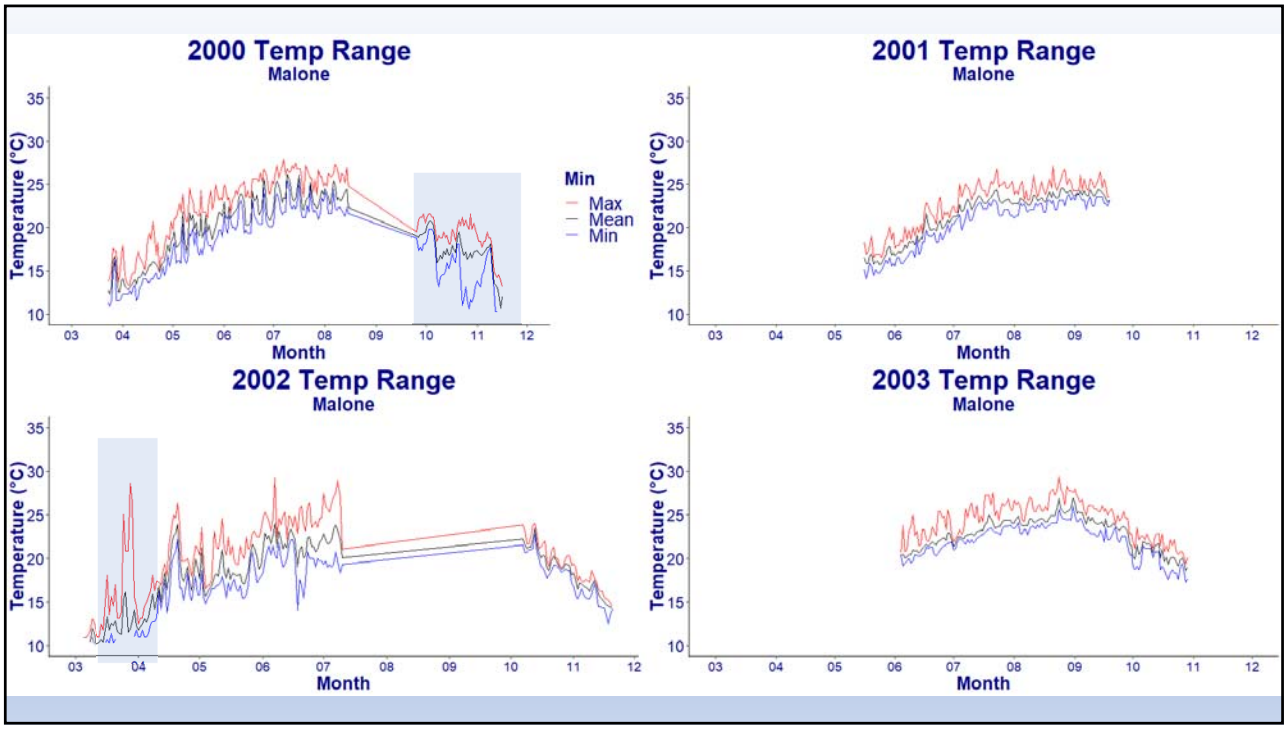

Pre Green Plan Temperature Range
Tailrace
# of Days
Temperature Range (°C
0.28% days show
10+°C changes
Post Green Plan Temperature Range
Tailrace
# of Days
Temperature Range (°C
0.29% days show
10+°C changes

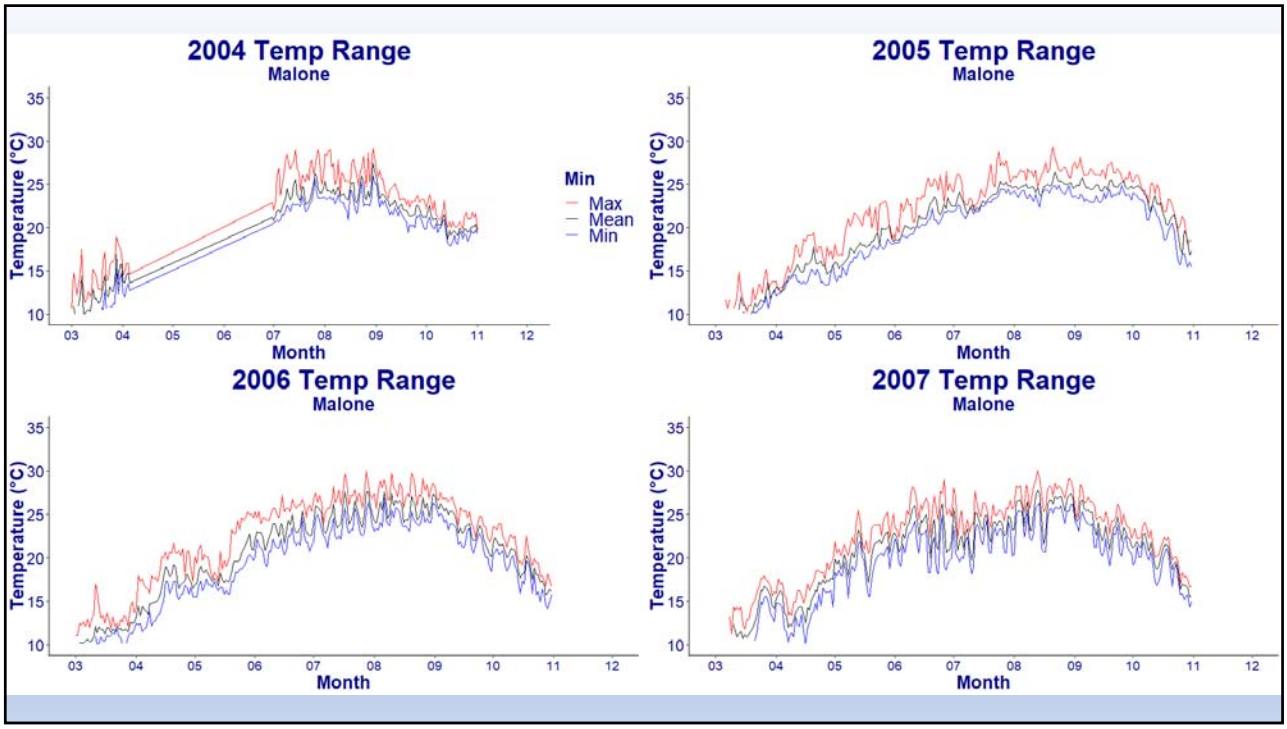

Mean Temperature
Tailrace
Temperature (°C)
30
20
10
0
March
Apr
May
June
July
Aug
Sept
Oct
Month
Pre
Post

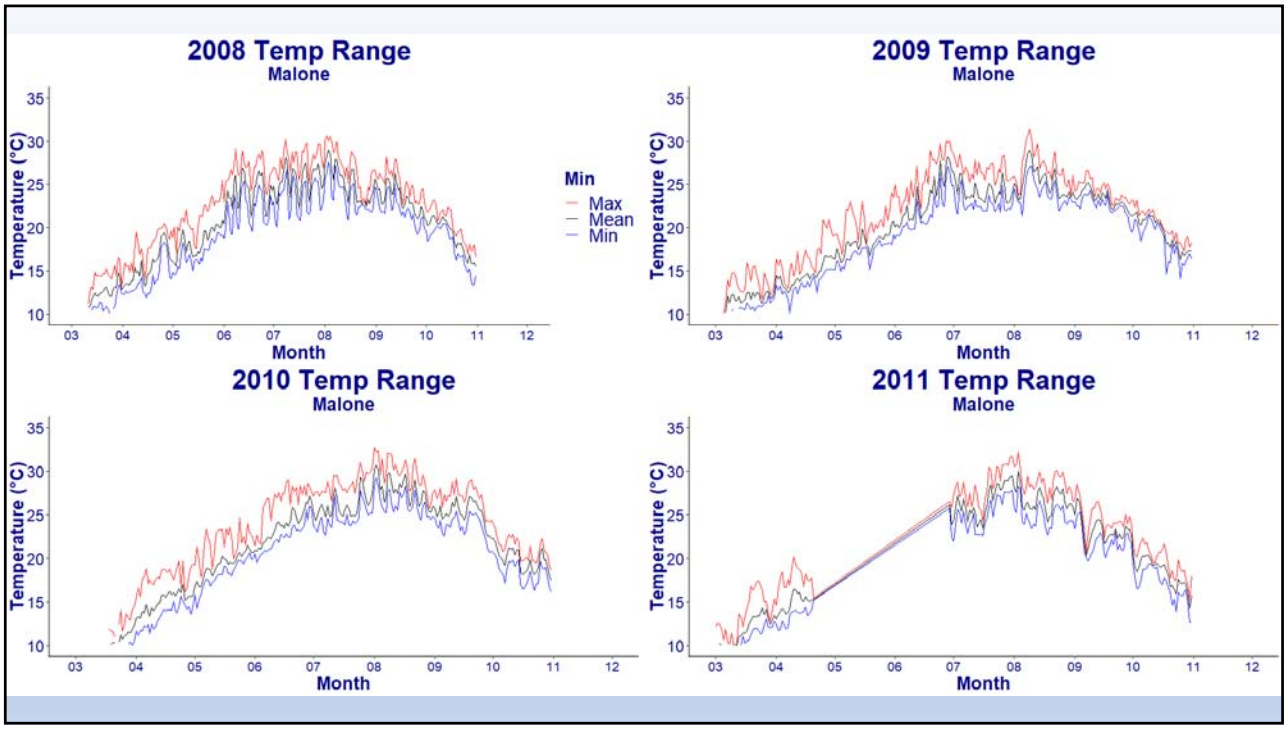

Mean Temperature
Tailrace
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

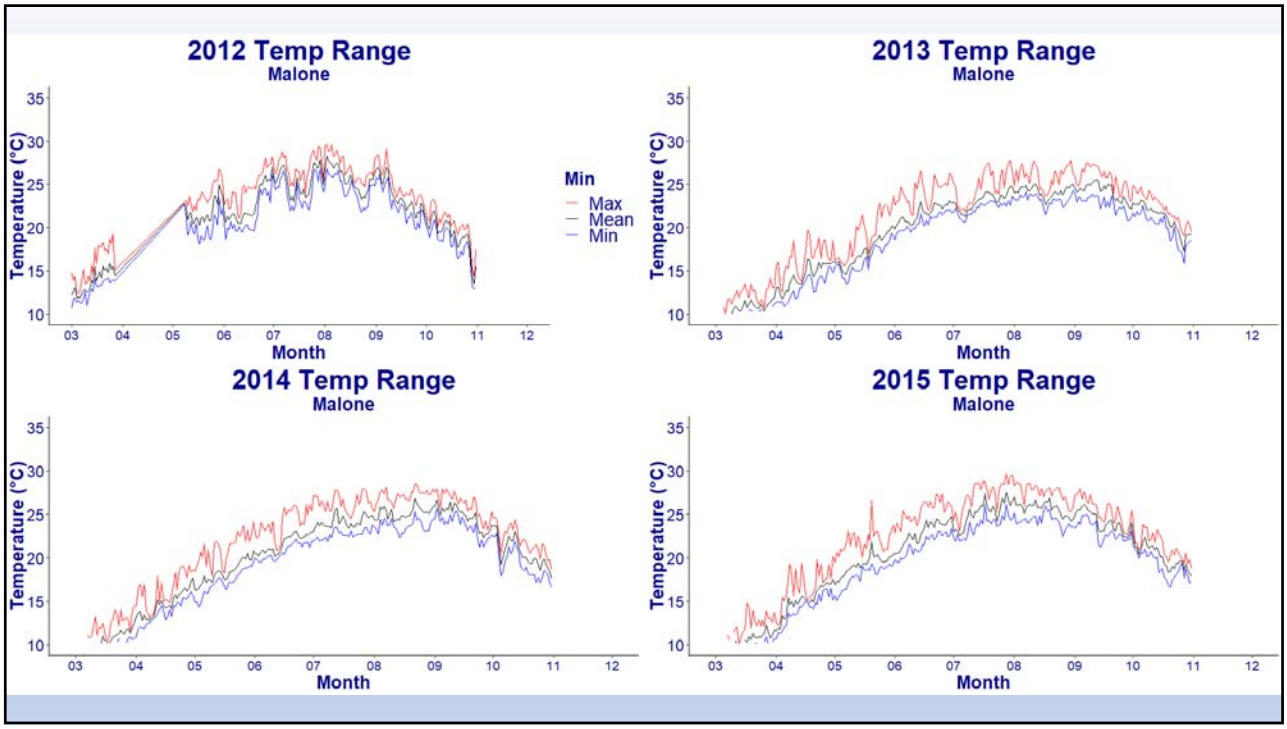

Mean Temperature
Tailrace
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

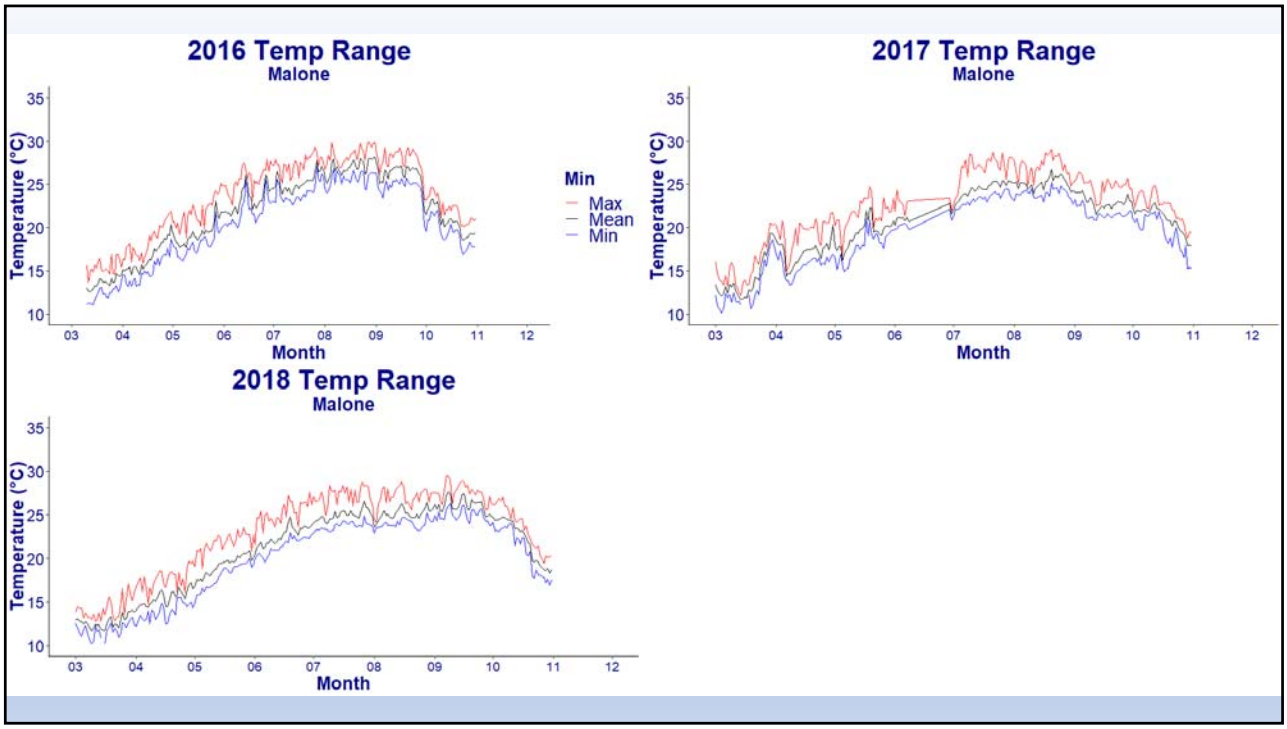

Cragford
Randolph
Corinth
Malone
© 2018 Google
Google Earth

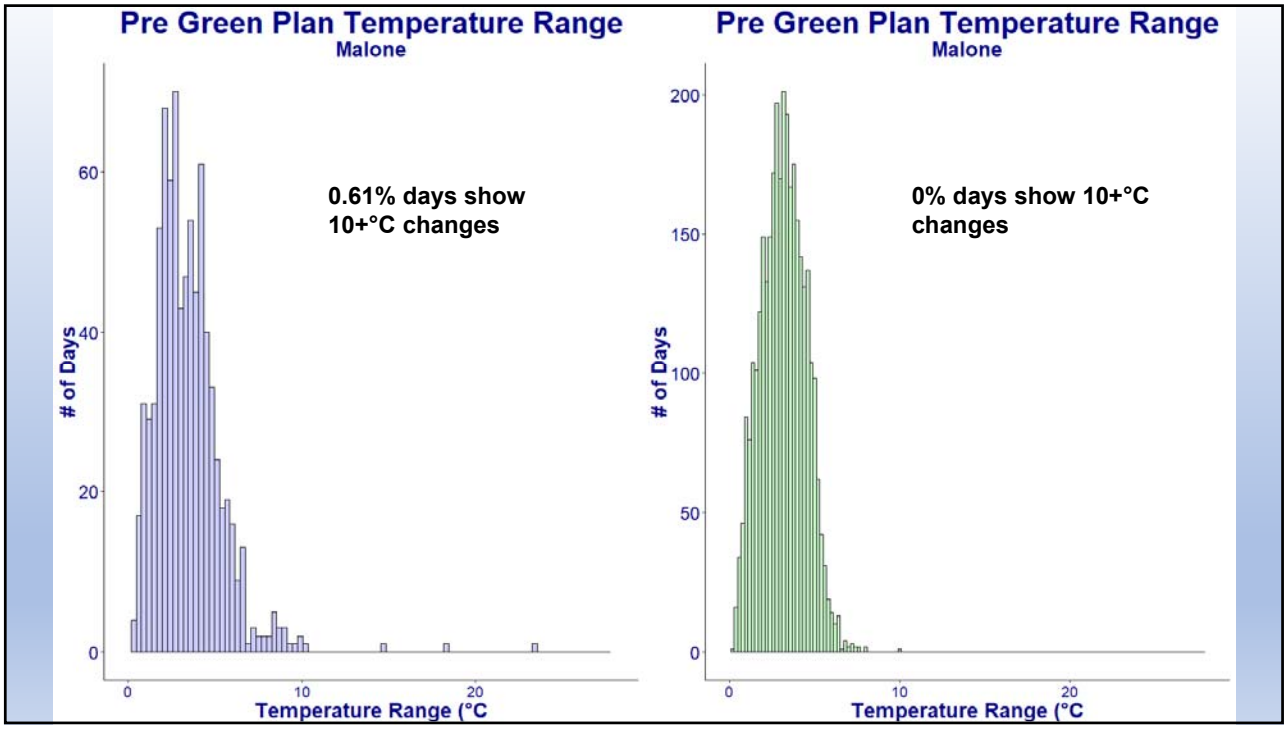

2000 Temp Range
Malone
2001 Temp Range
Malone
2002 Temp Range
Malone
2003 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

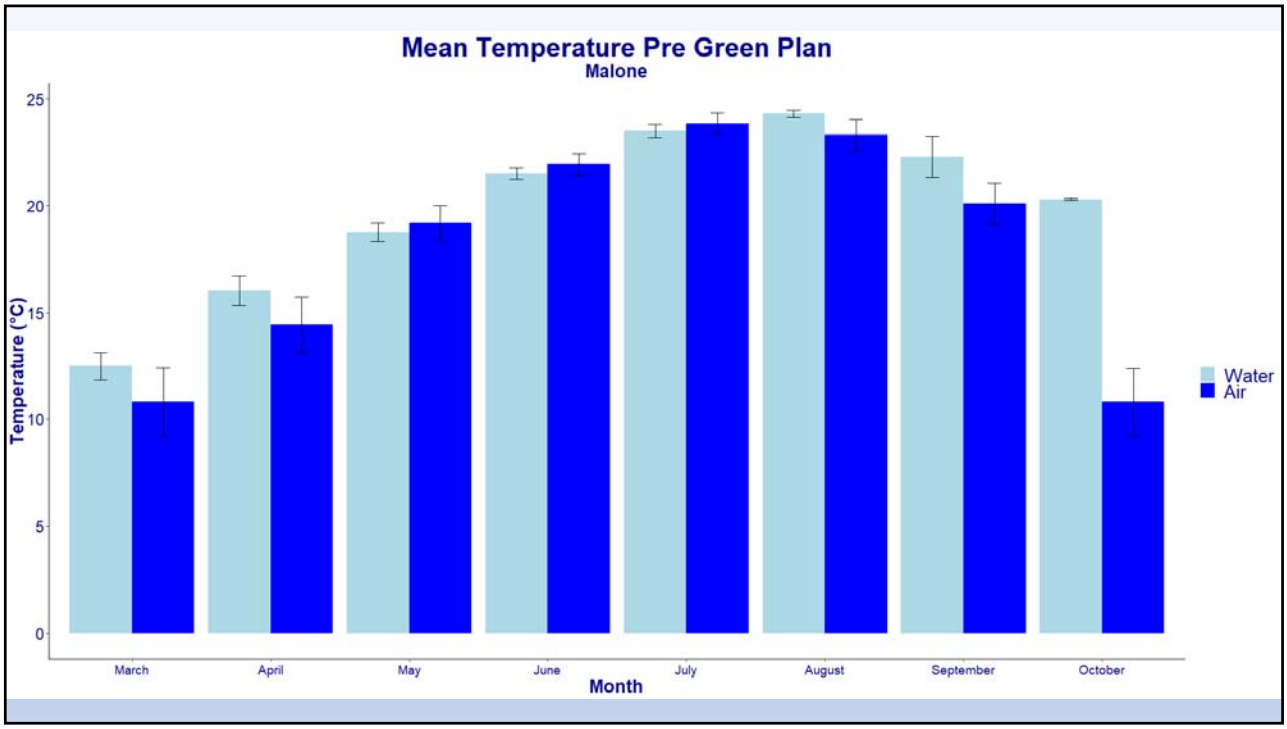

2004 Temp Range
Malone
2005 Temp Range
Malone
2006 Temp Range
Malone
2007 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

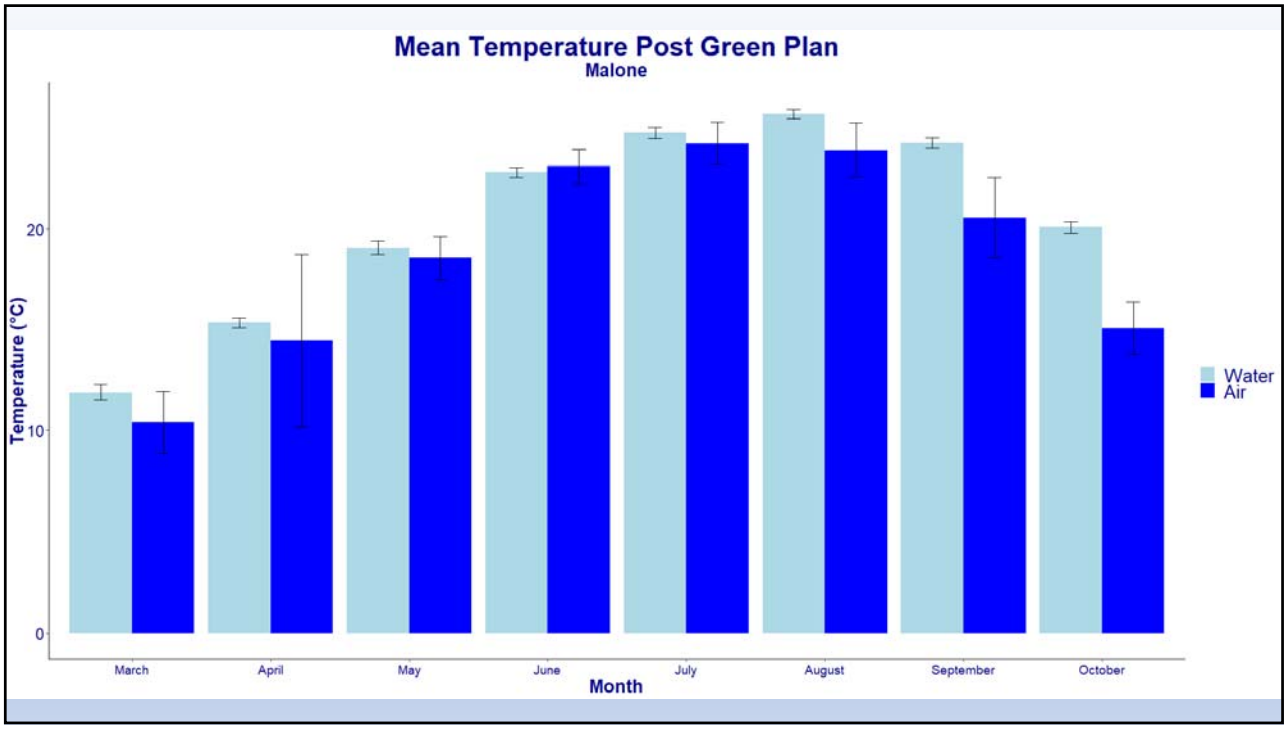

2008 Temp Range
Malone
2009 Temp Range
Malone
2010 Temp Range
Malone
2011 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

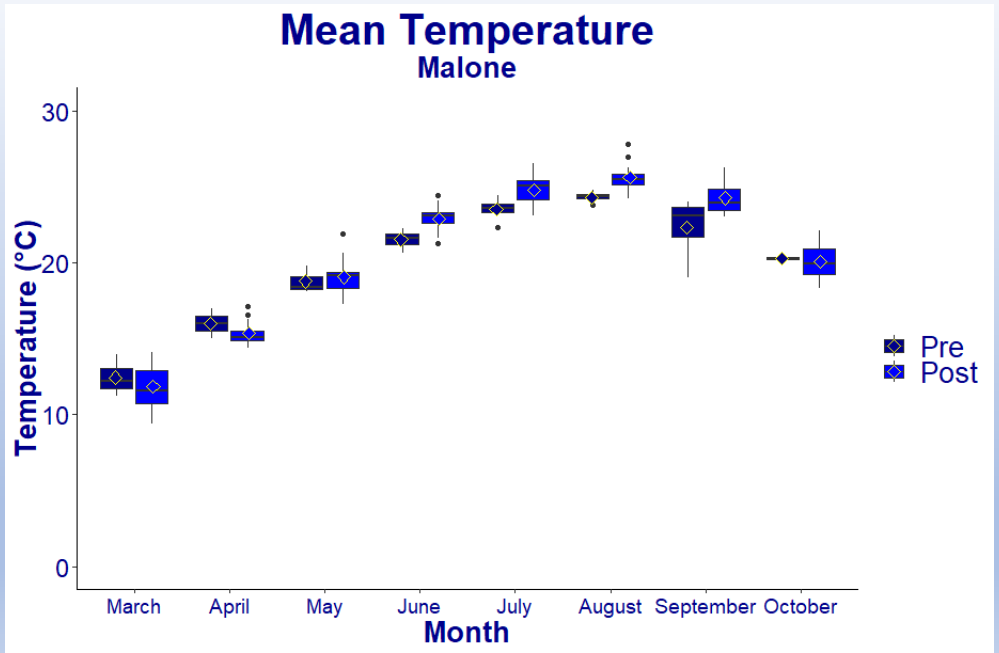

2012 Temp Range
Malone
2013 Temp Range
Malone
2014 Temp Range
Malone
2015 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min


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

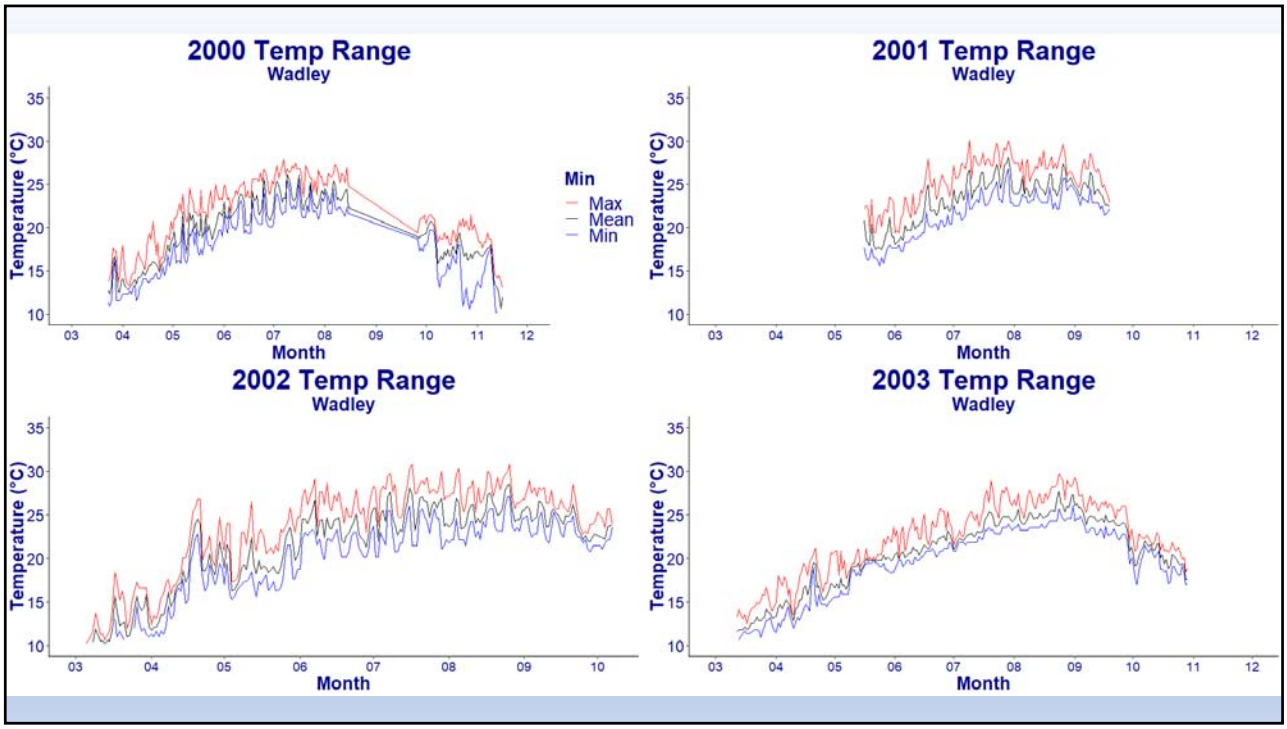

Pre Green Plan Temperature Range
Malone
# of Days
Temperature Range (°C
0.61% days show 10+°C changes
Pre Green Plan Temperature Range
Malone
# of Days
Temperature Range (°C
0% days show 10+°C changes

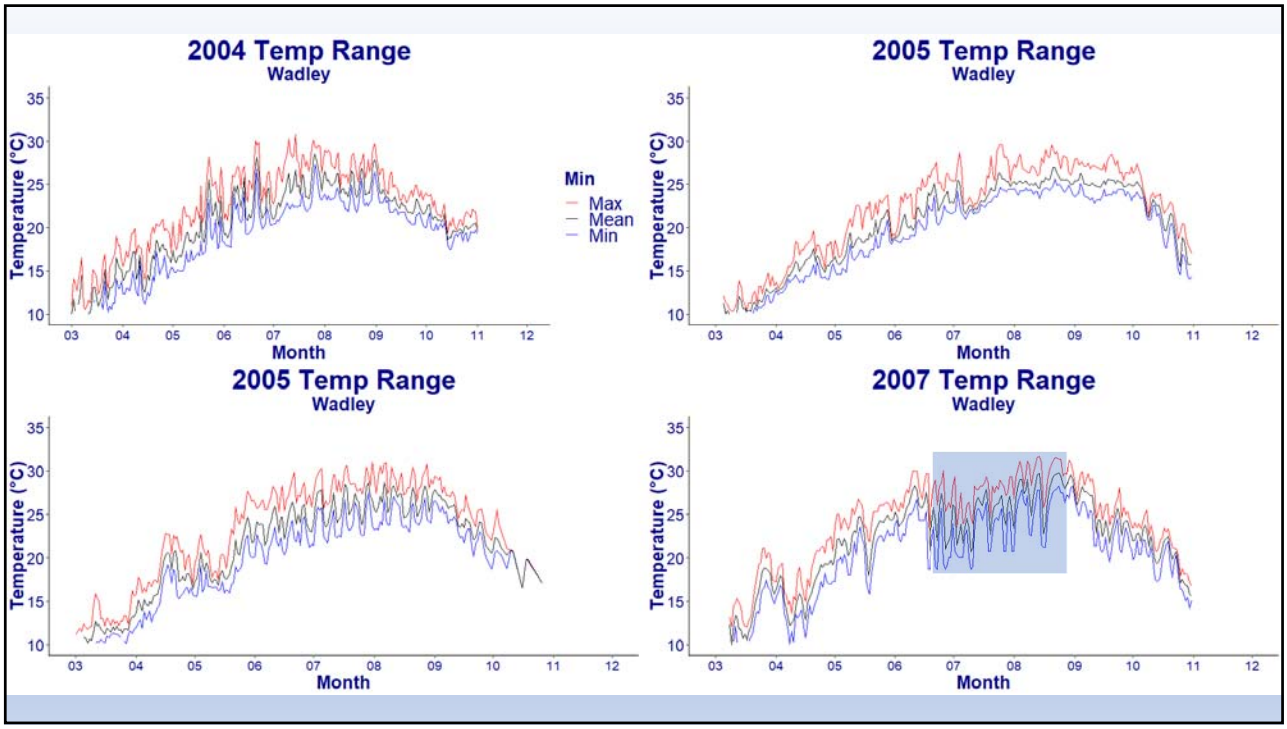

Mean Temperature Pre Green Plan
Malone
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

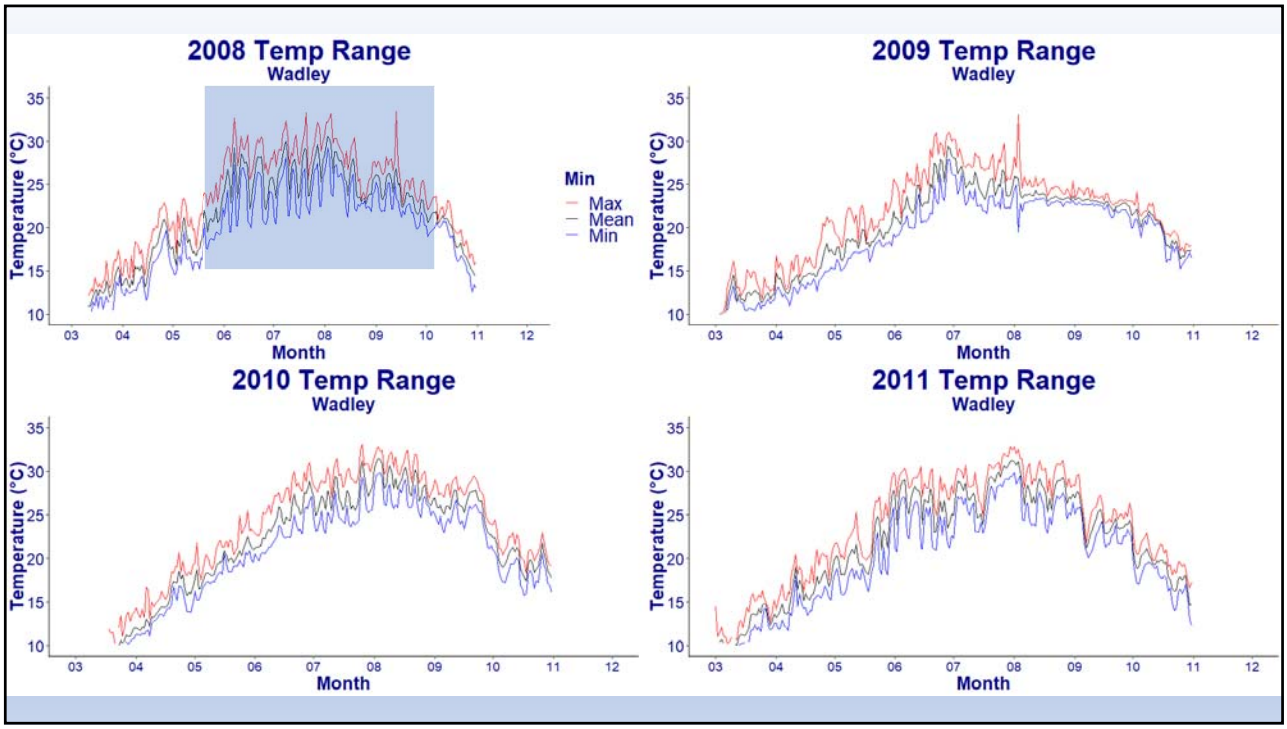

Mean Temperature Post Green Plan
Malone
Temperature (°C)
20
10
0
March
April
May
June
July
August
September
October
Month
Water
Air

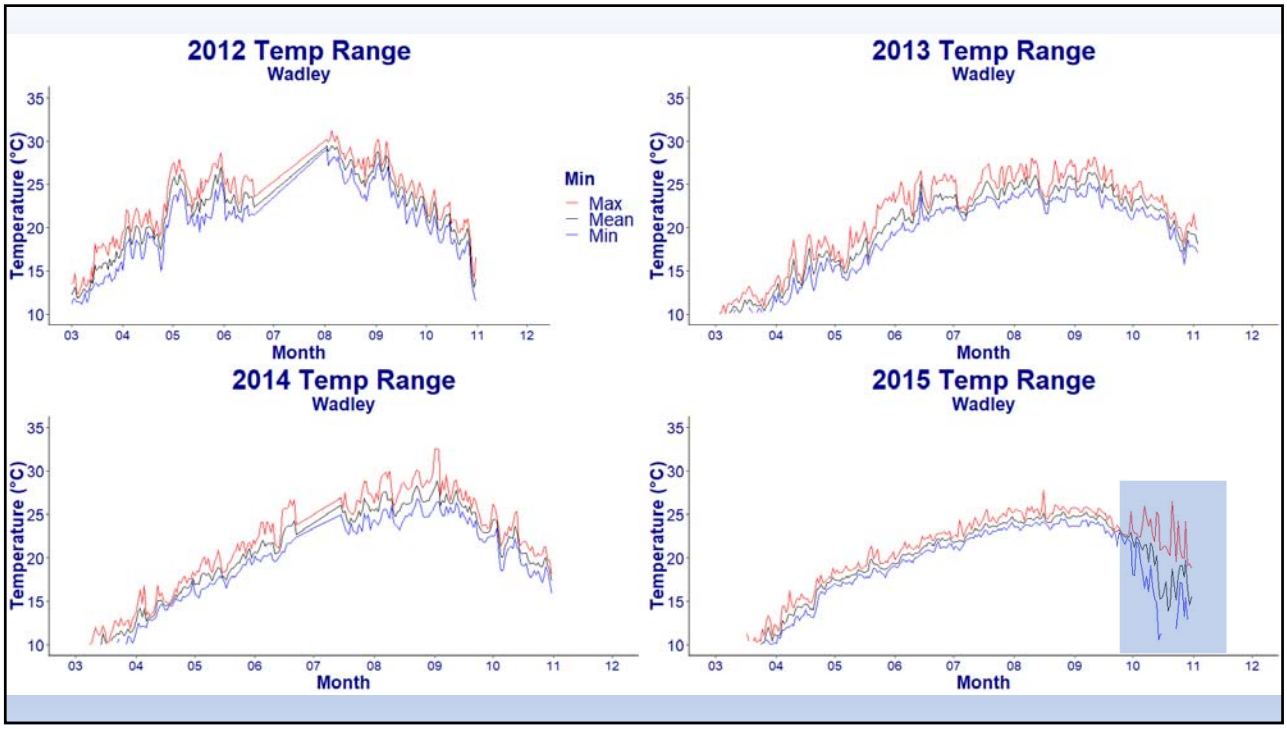

Mean Temperature
Malone
Temperature (°C)
0
10
20
30
March
April
May
June
July
August
September
October
Month
Pre
Post

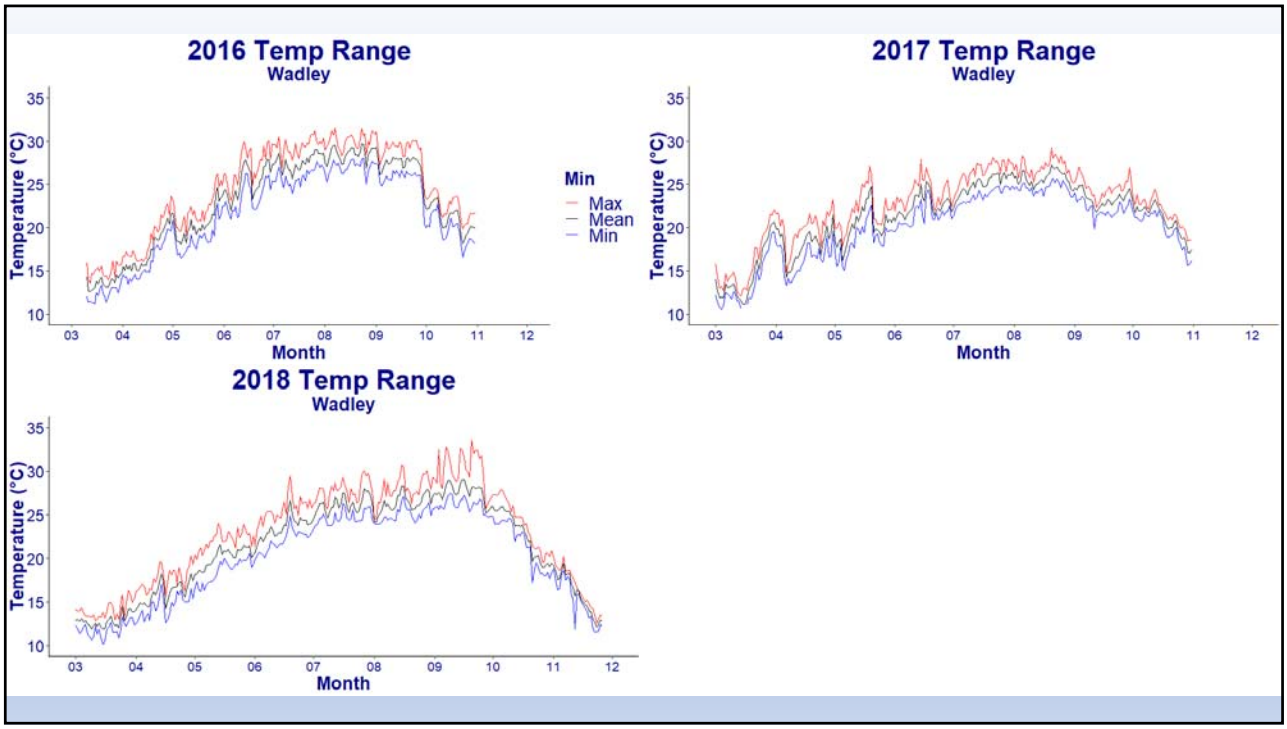

Cornhouse Creek Upstream
Cornhouse Creek Mid
Cornhouse Creek Confluence
Malone
Wadley
Google Earth

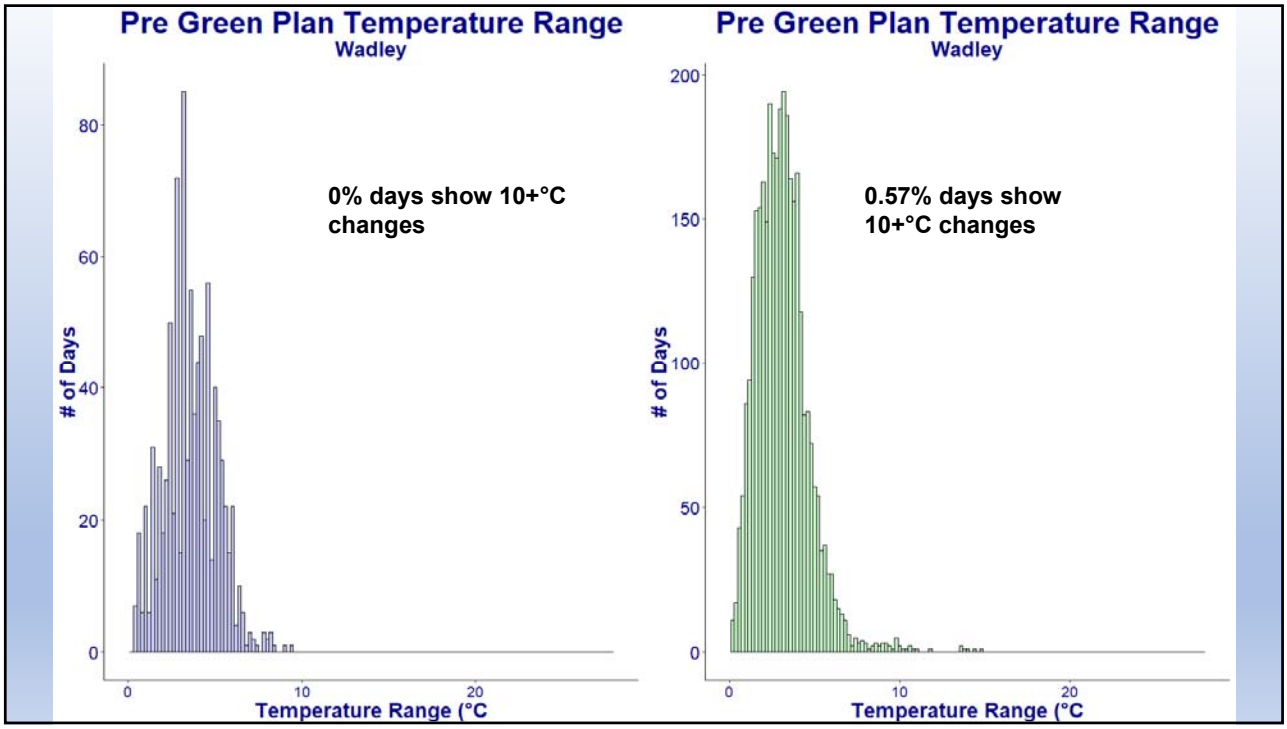

2000 Temp Range
Wadley
2001 Temp Range
Wadley
2002 Temp Range
Wadley
2003 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

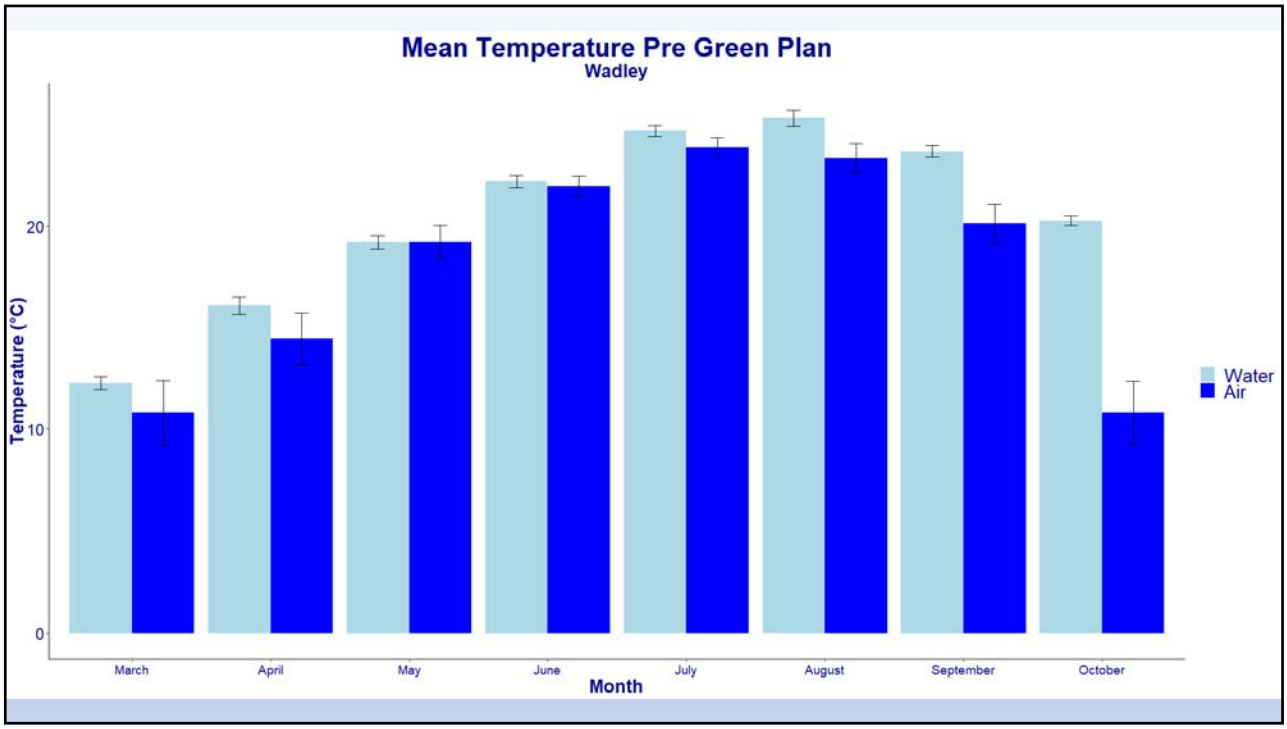

2004 Temp Range
Wadley
2005 Temp Range
Wadley
2005 Temp Range
Wadley
2007 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

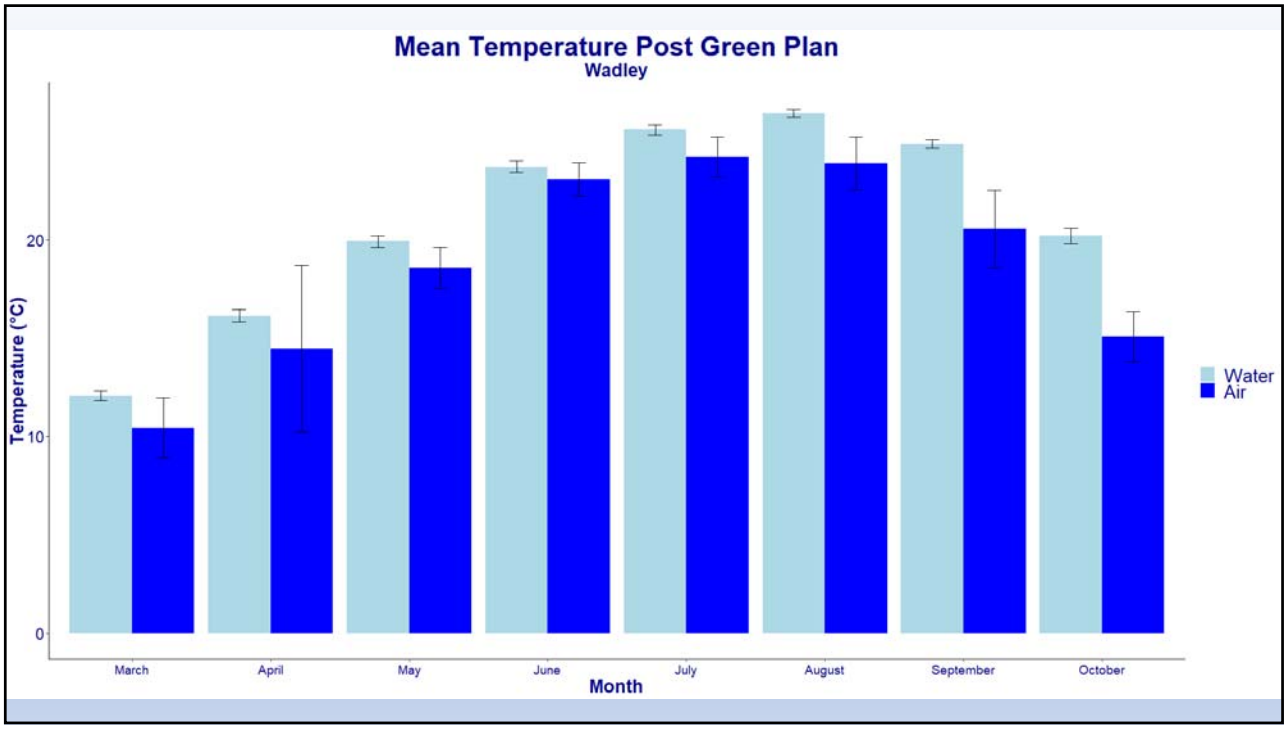

2008 Temp Range
Wadley
2009 Temp Range
Wadley
2010 Temp Range
Wadley
2011 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

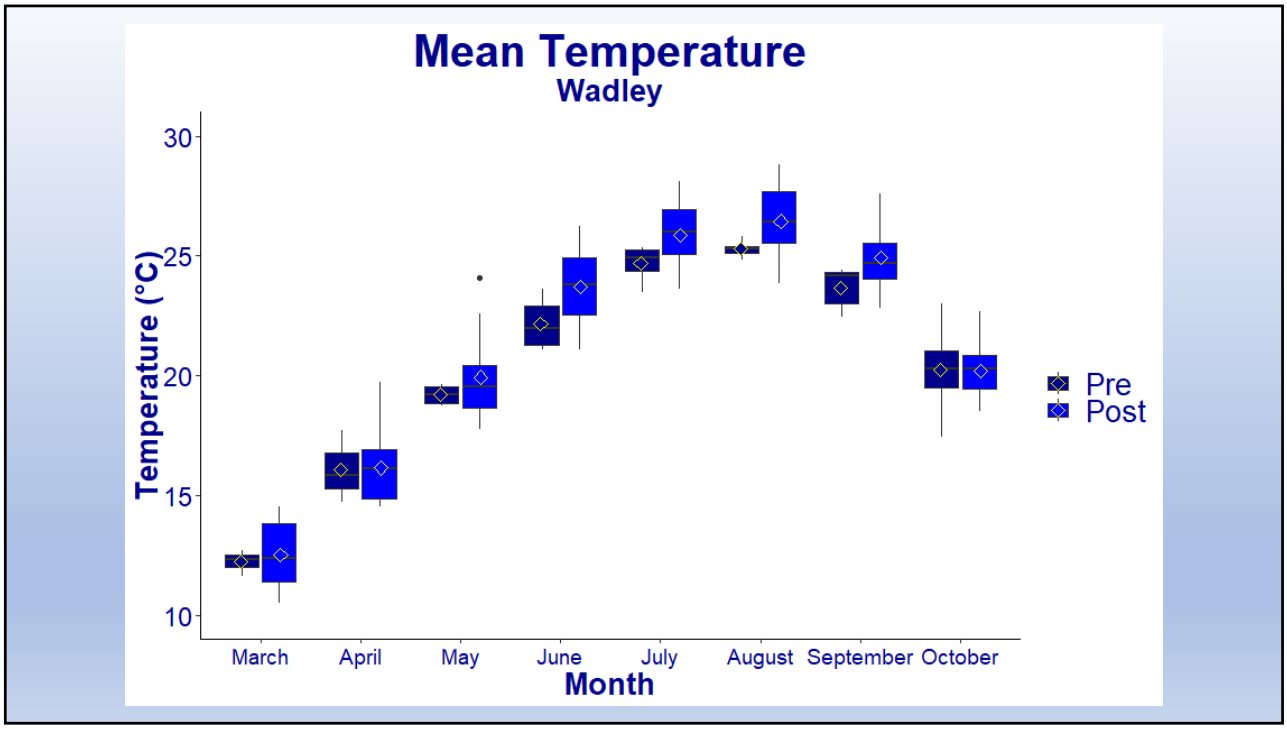

2012 Temp Range
Wadley
2013 Temp Range
Wadley
2014 Temp Range
Wadley
2015 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min


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

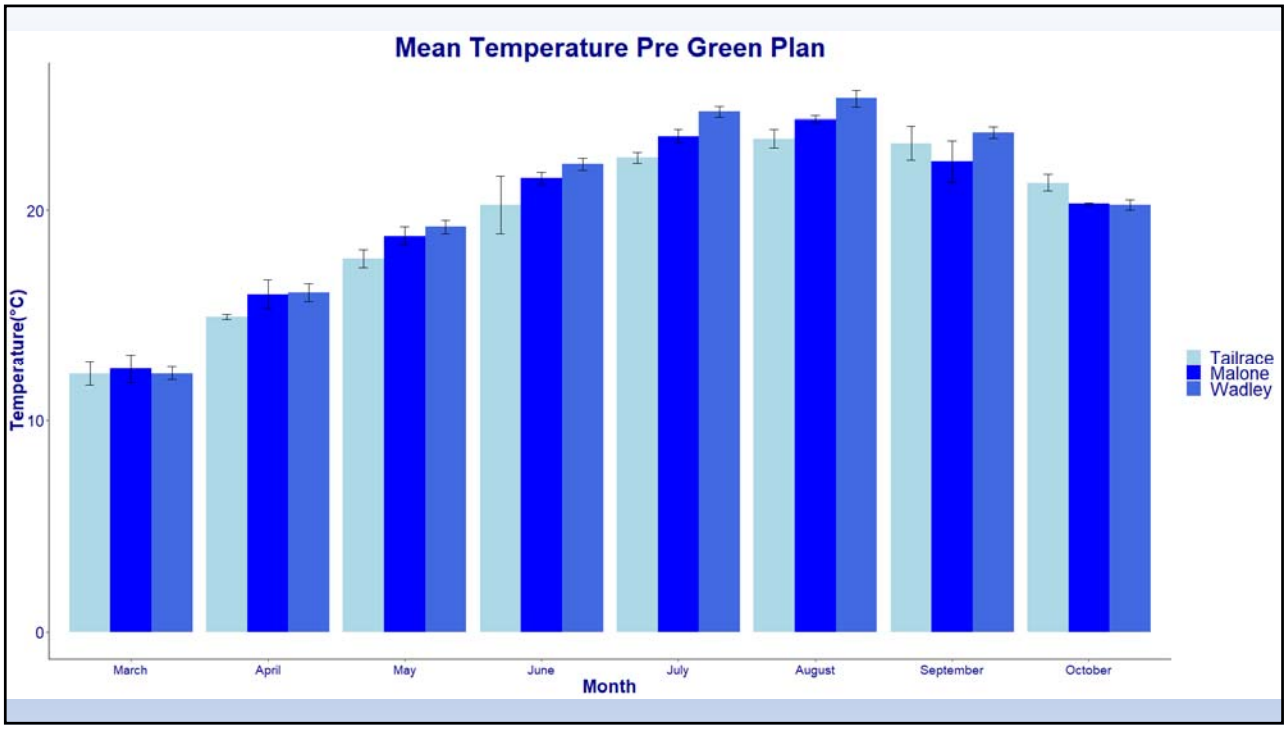

Pre Green Plan Temperature Range
Wadley
0% days show 10+°C changes
# of Days
Temperature Range (°C
Pre Green Plan Temperature Range
Wadley
0.57% days show 10+°C changes
# of Days
Temperature Range (°C

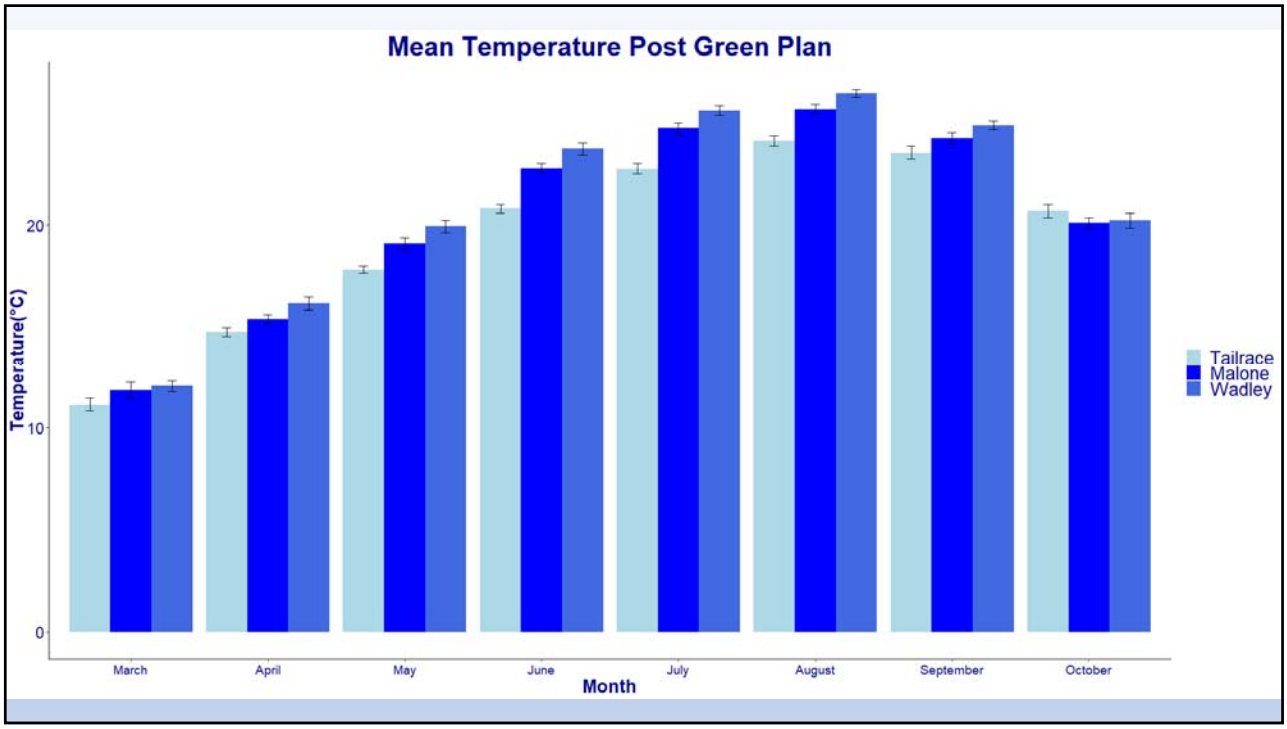

Mean Temperature Pre Green Plan
Wadley
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air

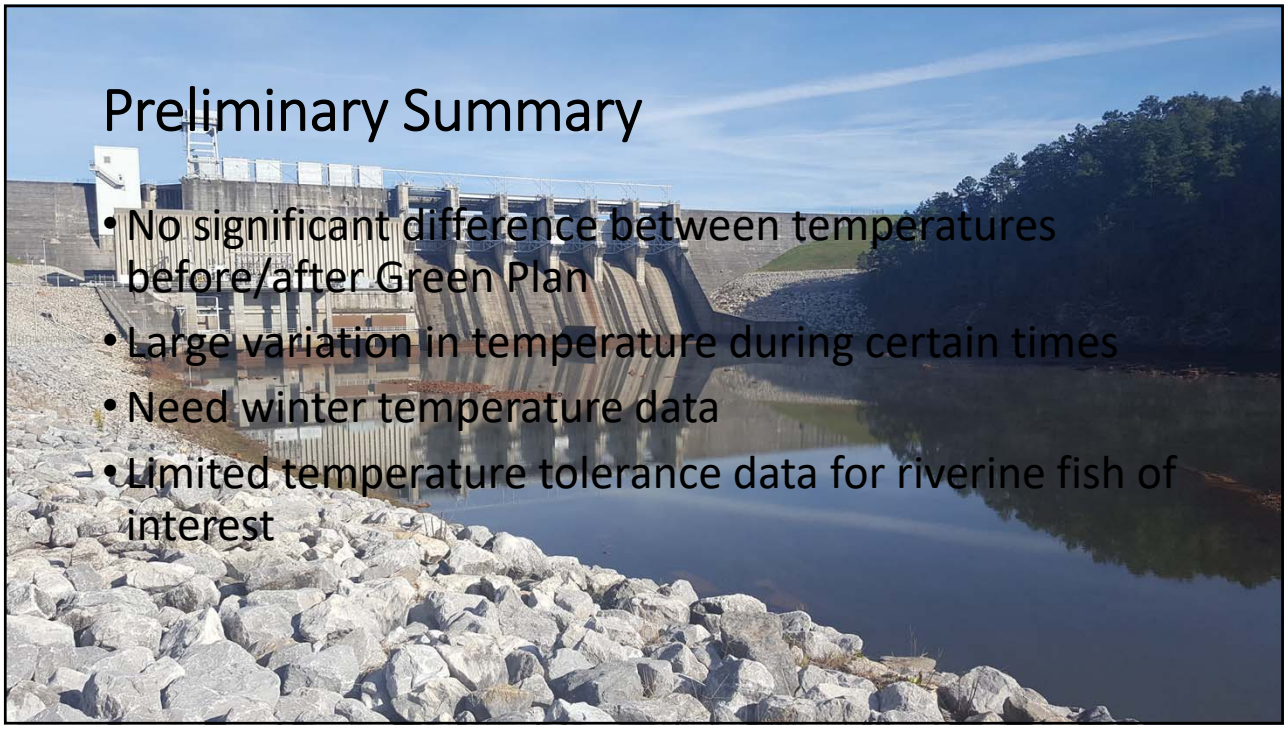

Mean Temperature Post Green Plan
Wadley
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air

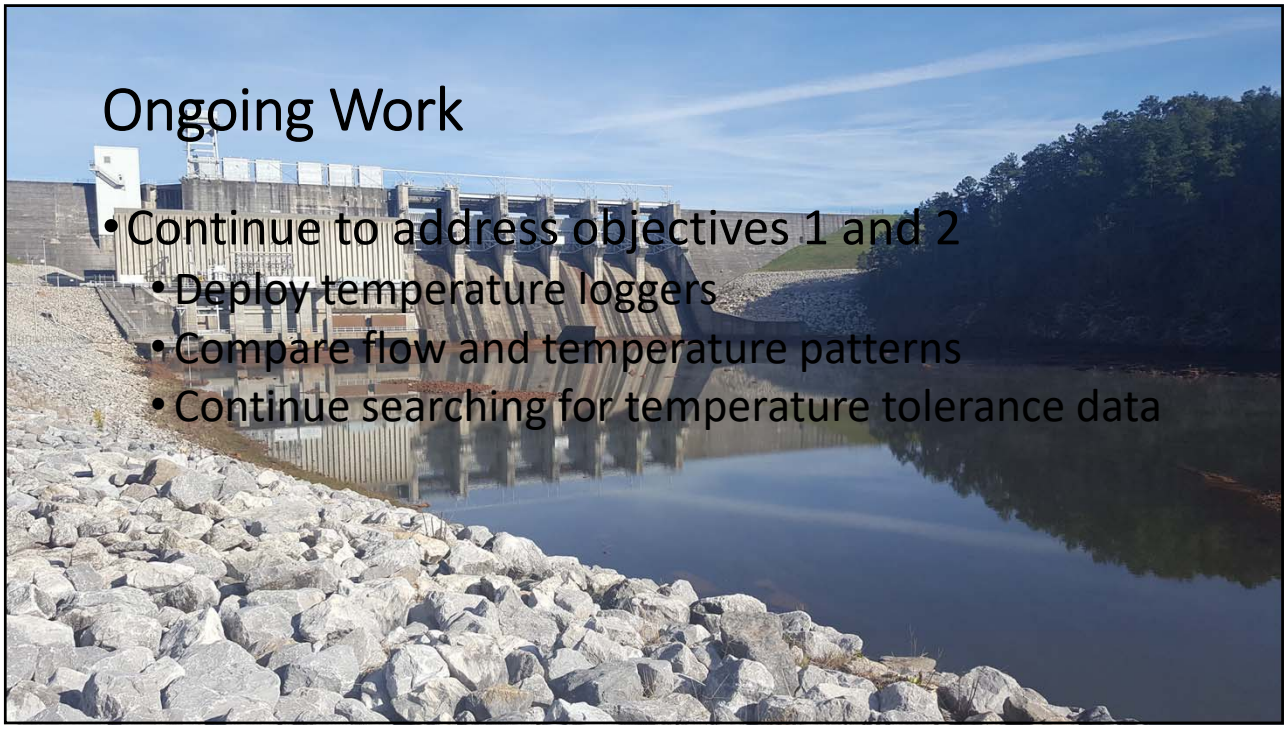

Mean Temperature
Wadley
Temperature (°C)
30
25
20
15
10
March
April
May
June
July
August
September
October
Month
Pre
Post


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

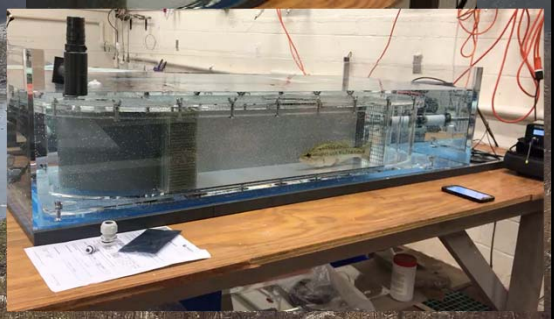

Mean Temperature Post Green Plan
Temperature(°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Tailrace
Malone
Wadley


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

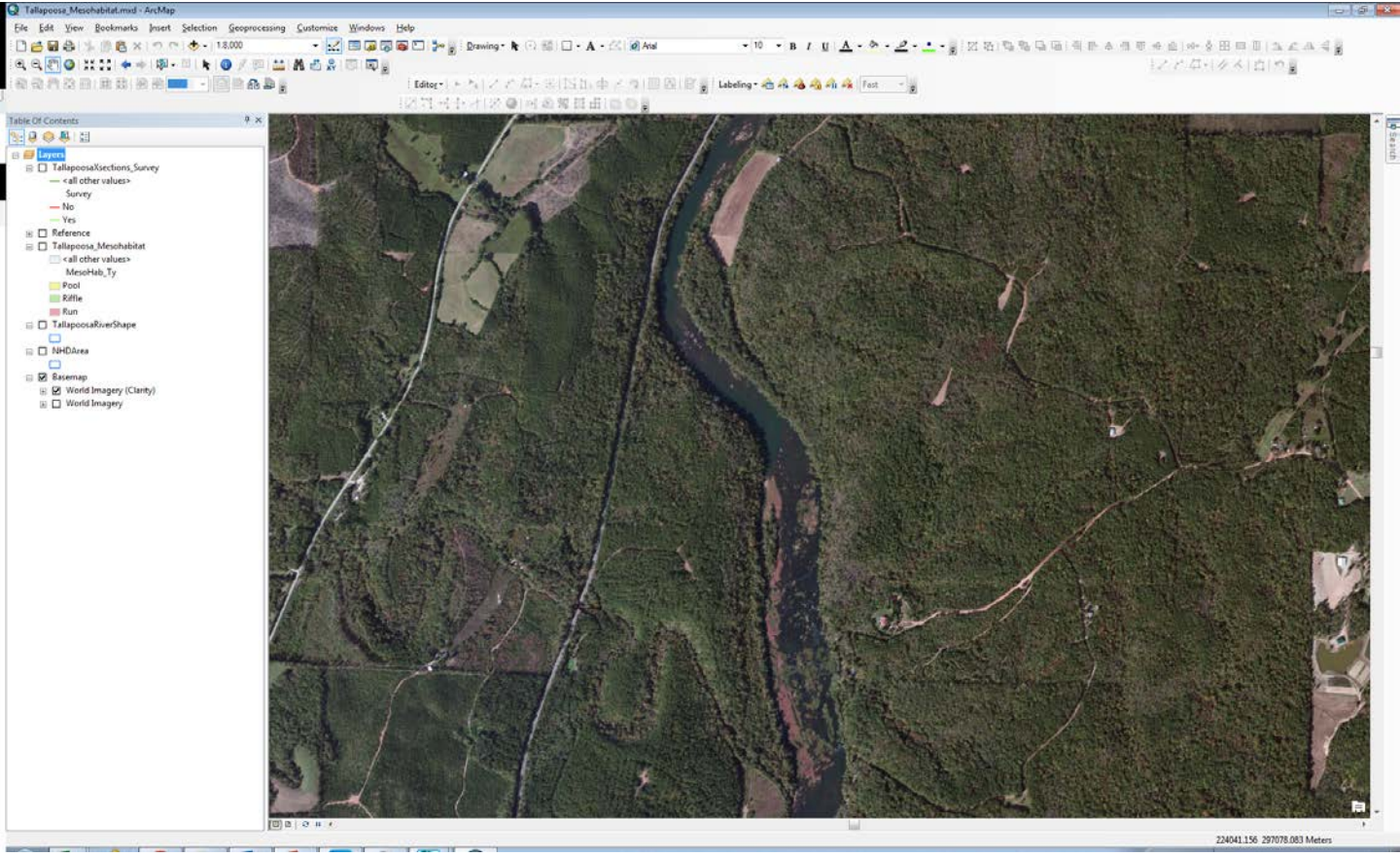
Methods

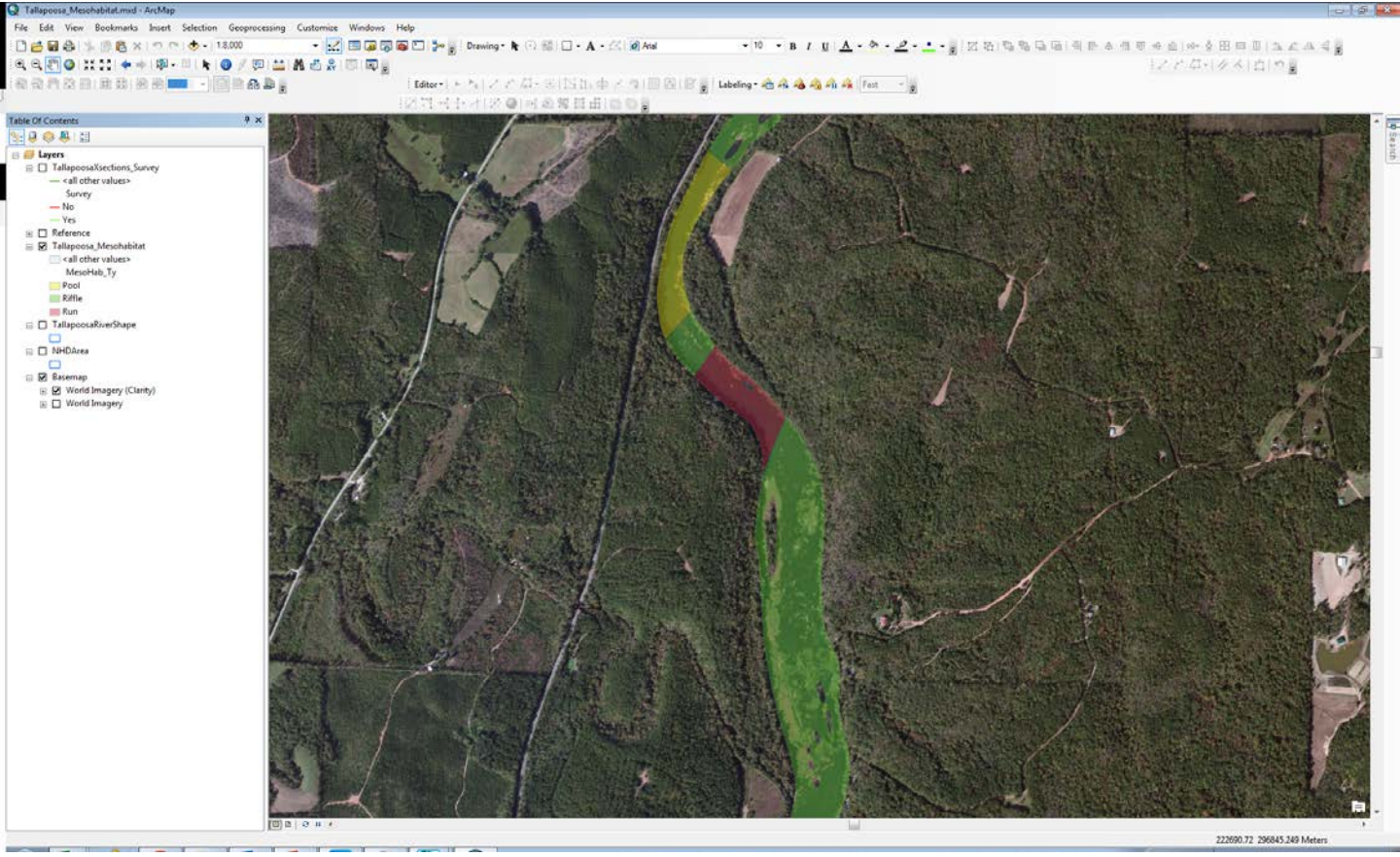
1. Mesohabitat Analysis: Desktop analysis of the types of available habitat (classified as riffle, run, pool)

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.

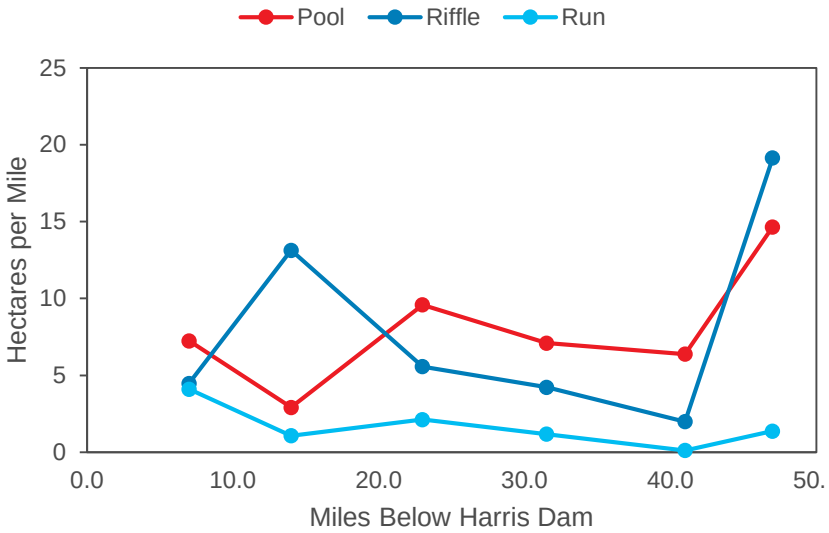
Mesohabitat Analysis


Tallapoosa_Mesohabitat.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
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

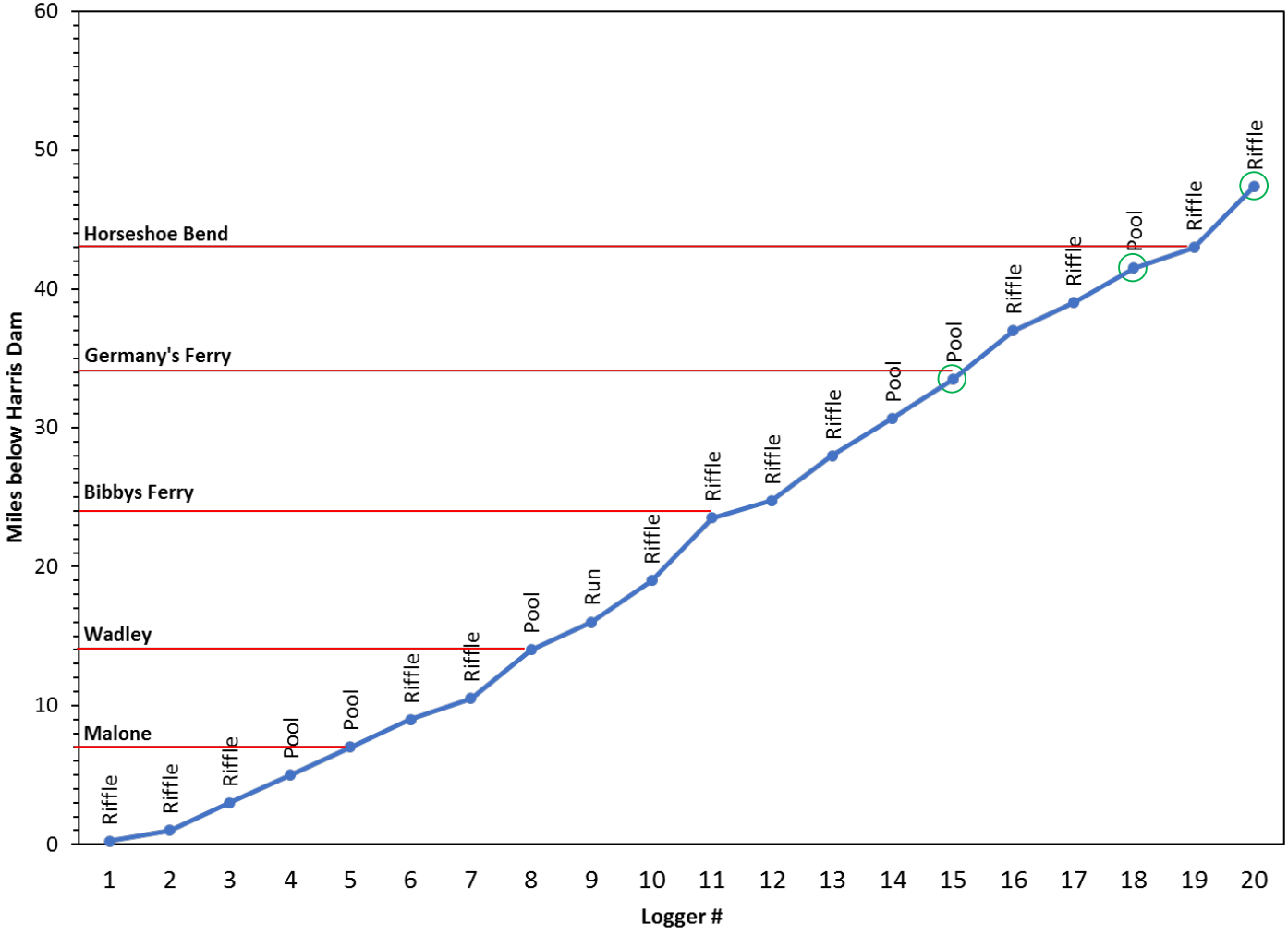

Tallapoosa_Mesohabitat.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
TallapoosaXSections_Survey
<all other values>
Survey
No
Yes
Reference
Tallapoosa_Mesohabitat
<all other values>
MesoHab_Ty
Pool
Riffle
Run
TallapoosaRiverShape
NHDArea
Basemap
World Imagery (Clarity)
World Imagery
222690.72 296845.249 Meters

Mesohabitat Type by Reach (hectares)

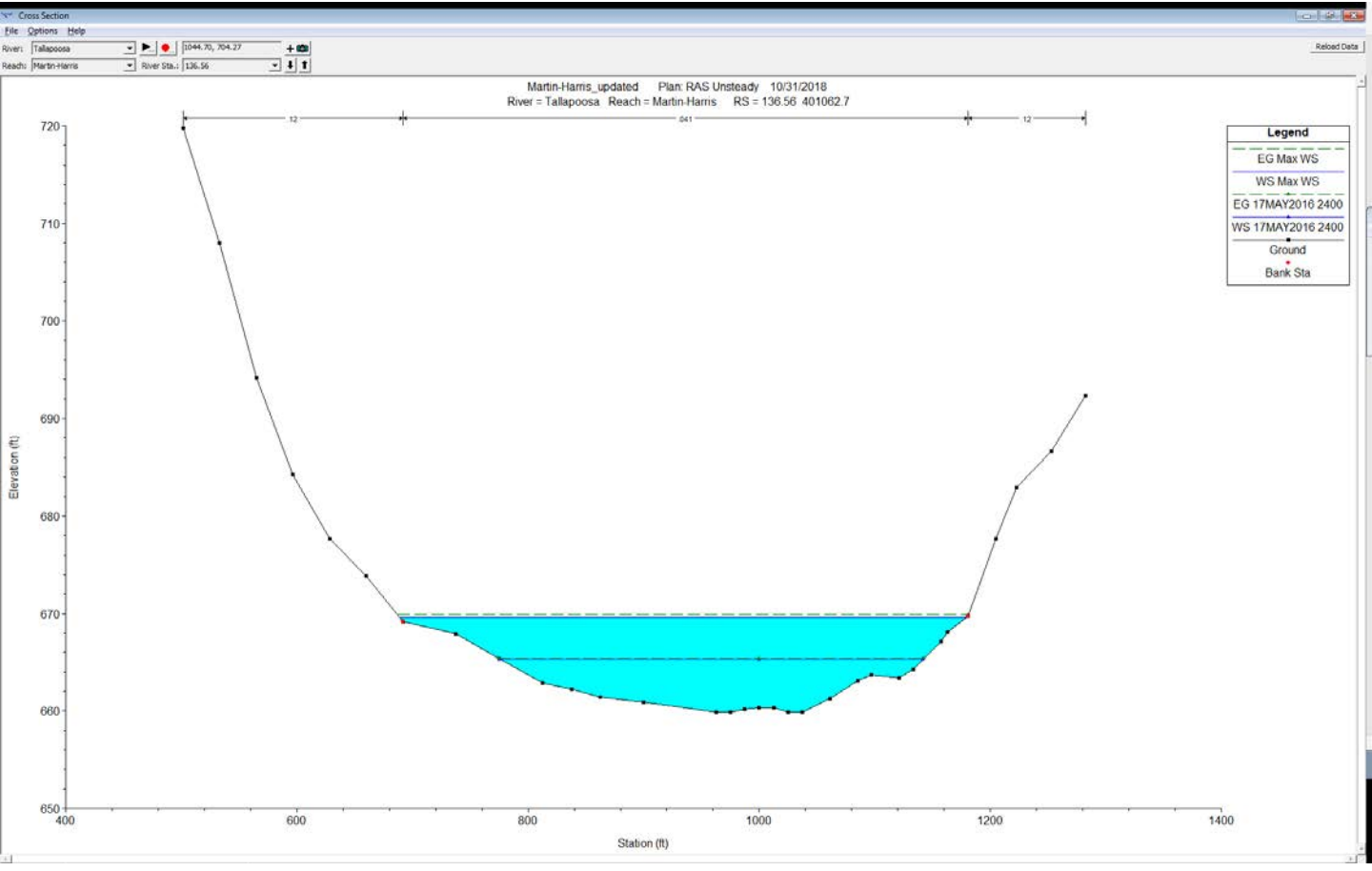
Reach	Pool
Malone	50.7
Wadley	20.4
Bibbys Ferry	86.3
Germany's Ferry	60.3
Horseshoe Bend	60.7
Irwin Shoals	87.9
Grand Total	**366.3**

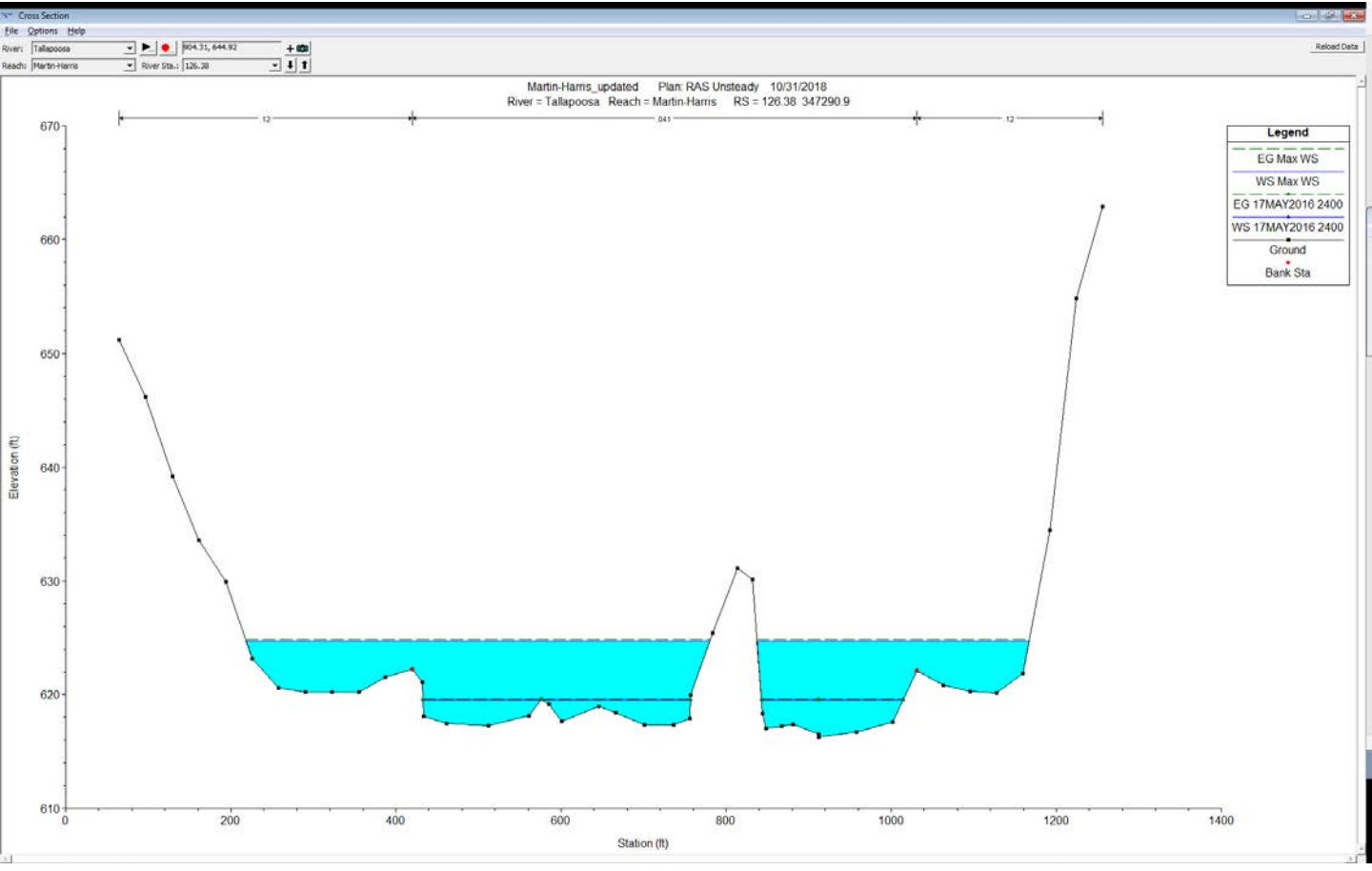

Pool
Riffle
Run
25
20
15
10
5
0
Hectares per Mile
0.0
10.0
20.0
30.0
40.0
50.
Miles Below Harris Dam

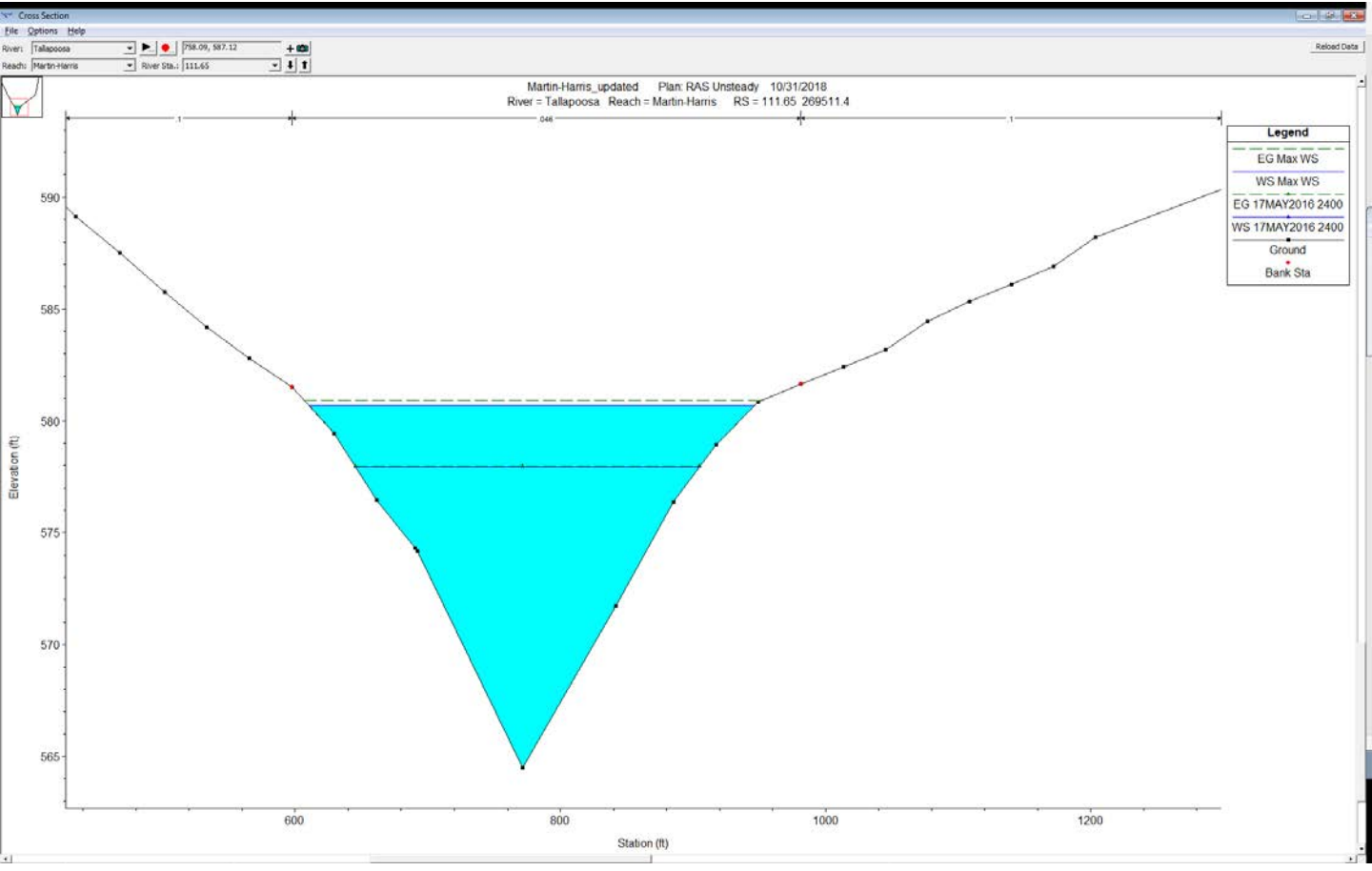
Water Level Logger Deployments

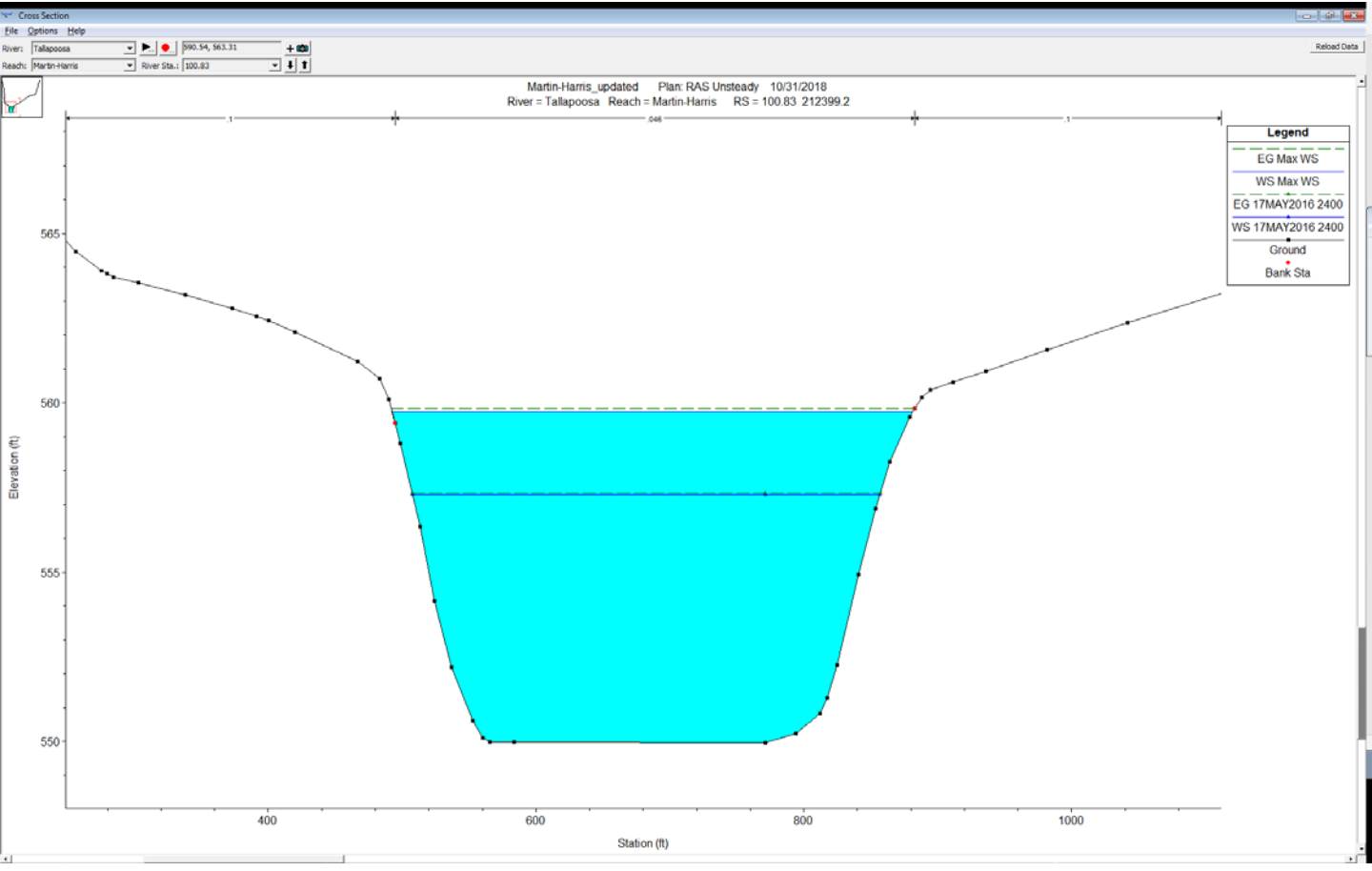

Miles below Harris Dam
Logger #
Horseshoe Bend
Germany's Ferry
Bibbys Ferry
Wadley
Malone
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Run
Riffle
Riffle
Riffle
Pool
Pool
Riffle
Riffle
Pool
Riffle
Riffle

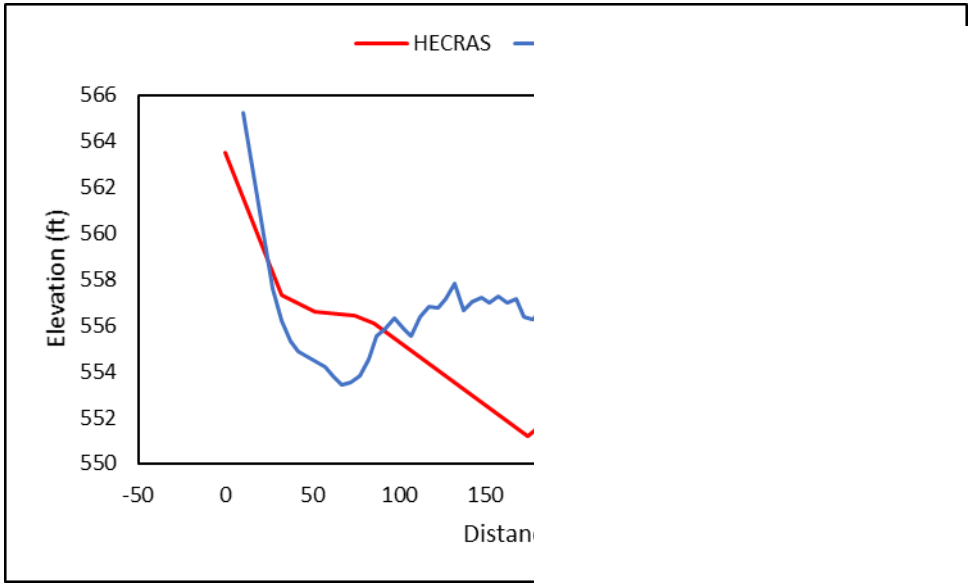
HEC-RAS Model Development


Cross Section
File Options Help
River: Tallapoosa
Reach: Martin-Harris
1044.70, 704.27
River Sta.: 136.56
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 136.56 401062.7
12
641
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
File Options Help
River: Tallapoosa
Reach: Martin-Harris
River Sta.: 126.38
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 126.38 347290.9
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
Station (ft)
670
660
650
640
630
620
610
0
200
400
600
800
1000
1200
1400


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

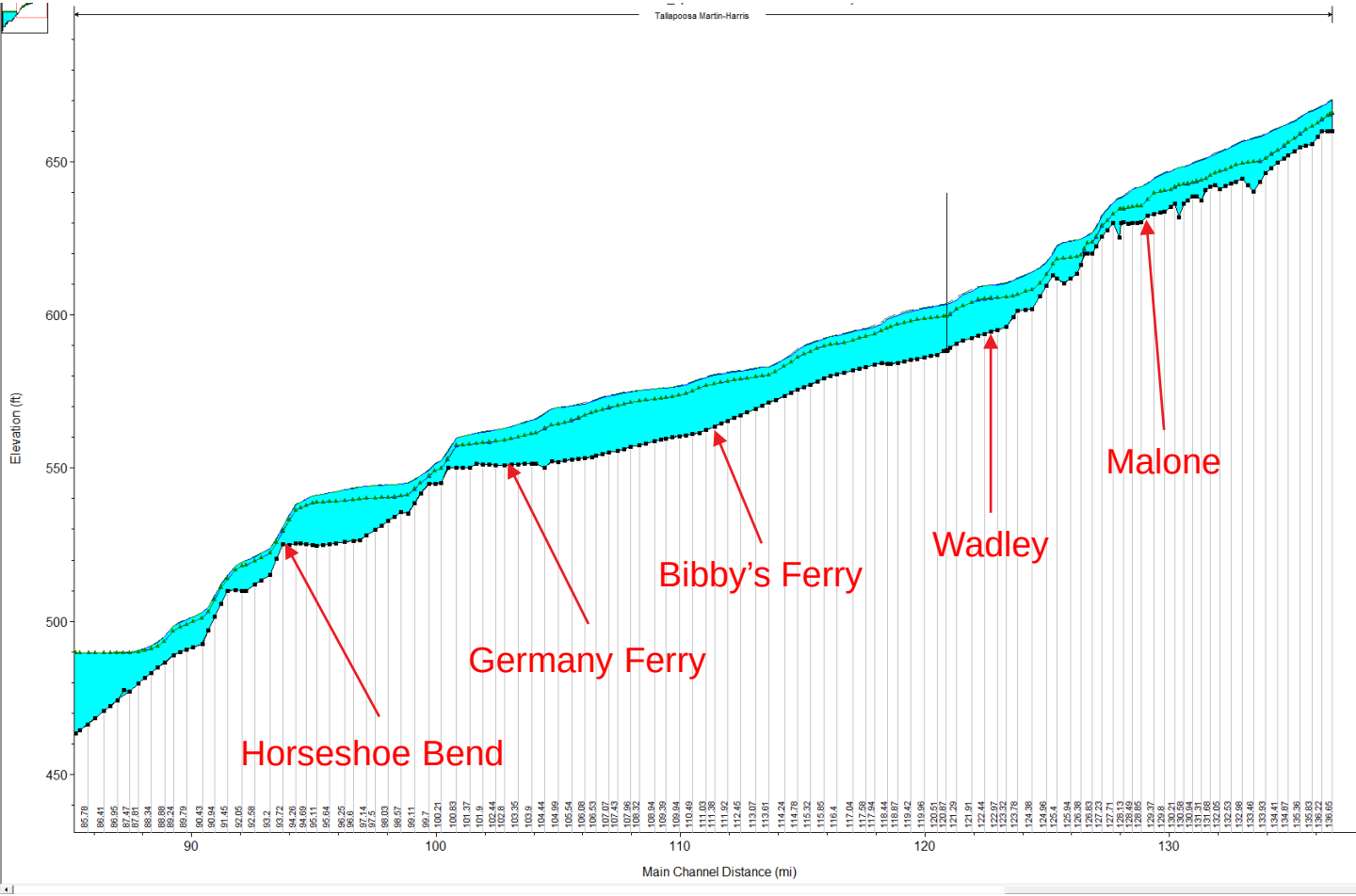

Cross Section
File Options Help
River: Tallapoosa
Reach: Martin-Harris
590.54, 563.31
River Sta.: 100.83
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 100.83 212399.2
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
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)
650
600
550
500
450
90
100
110
120
130
Main Channel Distance (mi)
Horseshoe Bend
Germany Ferry
Bibby's Ferry
Wadley
Malone