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July 28, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Draft Aquatic Resources 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 Determination[1] (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 Aquatic Resources Study Plan required Alabama Power to complete the Draft Aquatic Resources Study Report (Draft Report) by July 2020, included as Attachment 1.

This filing also includes the stakeholder consultation for this study beginning March 2019 through July 2020 (Attachment 2). Stakeholders have until August 28, 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.

[1] Accession No 20190412-3000.

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 Aquatic Resources Study Report
Attachment 2 – Aquatic Resources Consultation Record (March 2019-July 2020)

cc: Harris Action Team 3 Stakeholder List

Attachment 1

Draft Aquatic Resources Report

DRAFT AQUATIC RESOURCES STUDY REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared by:

Alabama Power Company

and

Kleinschmidt Associates

July 2020

harrisrelicensing.com

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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) has initiated the Federal Energy Regulatory Commission (FERC) relicensing of the 135-megawatt (MW) R.L. Harris Hydroelectric Project (Harris Project), 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. The Harris Reservoir is the 9,870-acre reservoir created by the R.L. Harris Dam (Harris Dam). The unimpounded reach of the Tallapoosa River between Harris Dam and the headwaters of Lake Martin is approximately 52 miles in length.

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

Numerous aquatic resource studies have been conducted in the Tallapoosa River below Harris Dam. Monitoring conducted since initiation of the Green Plan has indicated a positive fish community response and increased shoal habitat availability (Irwin et al. 2011); however, little information exists characterizing the extent that the Green Plan has enhanced the aquatic habitat from Harris Dam downstream through Horseshoe Bend. Some results indicated a positive response by some fish species, while other research indicates that cooler stream temperatures may be affecting the reproduction, growth, and recruitment of other fish species downstream of Harris Dam (Goar 2013; Irwin and Goar 2015). The Alabama Department of Conservation and Natural Resources (ADCNR) noted the abundance of some species is below expected levels, which could be due to several factors including sampling methodologies, thermal regime, flow regime, and/or nutrient availability.

During the October 19, 2017 issue identification workshop and other meetings with resource agencies, stakeholders noted that stream temperatures in the Tallapoosa River downstream of Harris Dam are generally cooler than other unregulated streams in the same geographic area, and this portion of the Tallapoosa River experiences temperature fluctuations due to releases from Harris Dam. There is concern that the lower stream temperatures and temperature fluctuations are impacting the aquatic resources (especially fish) downstream of Harris Dam.

In addition to effects on downstream fish populations discussed above, there is concern the Harris Project may have effects on other aquatic fauna within the Project Area, including macroinvertebrates such as mollusks and crayfish. Comments received on the Pre-Application Document (PAD) and Scoping Document 1 recommended that Alabama Power investigate the effects of the Harris Project on these aquatic species. Additionally, commenters suggested Alabama Power perform an assessment of the Harris Project's effects on species mobility and population health.

On November 13, 2018, Alabama Power filed ten proposed study plans for the Harris Project, including a study plan for aquatic resources. 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.

Alabama Power formed the Harris Action Team (HAT) 3 to specifically address issues pertaining to aquatic and wildlife resources. To present the findings from the FERC-approved study, Auburn University developed an audiovisual presentation on the study progress and preliminary results to date to deliver to HAT 3 at a scheduled meeting for March 19, 2020. The meeting was rescheduled to June 2, 2020 due to COVID-19 and related travel, public gathering restrictions, and statewide office closures.

Alabama Power prepared this draft report to support the relicensing process and to fulfill the requirements of the FERC-approved Aquatic Resources Study Plan. The draft report is comprised of two components: 1) results of the desktop assessment used to compile background information of various aquatic resources in both the reservoir and river and the possible effects of dam operations and 2) progress and results to date of Auburn University's research on the literature requirements of target species located in the Tallapoosa River below Harris Dam, an analysis of existing temperature data below Harris Dam, fish community sampling and evaluation, and respirometry tests and bioenergetics modeling of fish.

2.0 DESKTOP ASSESSMENT

2.1 INTRODUCTION

The purpose of this desktop assessment was to compile background information regarding the presence of various aquatic resources in both the Harris Reservoir and Tallapoosa River downstream of Harris Dam through Horseshoe Bend and the possible effects of dam operations. Literature used for this assessment includes a study predating Harris Dam as well as studies conducted after the construction of the dam, both in the reservoir and the river downstream, including both Pre-Green Plan and Green Plan operations.

2.2 METHODS

Relevant current and historic information characterizing aquatic resources at the Harris Project were compiled and summarized. The Study Area[1] for this assessment includes the Harris Reservoir, Tallapoosa River downstream of Harris Dam through Horseshoe Bend, and in selected unregulated reference streams. The focus of this assessment was to identify aquatic species and populations within the Study Area that may have been affected by the Harris Project. Sources of information included reservoir fisheries management reports, scientific literature from aquatic resource studies conducted in the Study Area, ADCNR Natural Heritage Database data, Alabama Power faunal survey data, and state and federal faunal survey data.

2.3 RESULTS

2.3.1 TALLAPOOSA RIVER BASIN

The Tallapoosa River Basin (TRB) encompasses approximately 4,687 square miles, including 1,454 square miles above Harris Dam (Figure 2-1). The Tallapoosa River flows southward 265 miles from its headwaters at the southern end of the Appalachian Mountains in Georgia to its confluence with the Coosa River near Montgomery, Alabama, forming the Alabama River. The Tallapoosa River above Lake Harris represents the only unregulated portion of the Tallapoosa River. Four hydropower developments are located

[1] The Study Area includes the geographic scope in the FERC-approved Aquatic Resources Study Plan.

on the Tallapoosa River, with Harris being the most upstream. A majority of the land cover in the TRB is vegetated (~75 percent), with agricultural lands accounting for approximately 14 percent (Multi-Resolution Land Characteristics Consortium 2019).

An estimated 137 species of fish occur or have occurred within the TRB, including 124 native and 13 non-native species from 23 families and 59 genera (Table 2-1) (Freeman et al. 2005). Three of these, Gulf Sturgeon (*Acipenser oxyrinchus desotoi*), Alabama Sturgeon (*Scaphiryhnchus suttkusi*), and Alabama Shad (*Alosa alabamae*) are considered extirpated from the TRB. The conservation status of 112 species of TRB native fishes are considered stable, with seven species vulnerable and two species threatened.

An estimated 15 mussel species occur or have occurred within the TRB (Table 2-2) (NatureServe 2020). One species, the Georgia Pigtoe (*Pleurobema hanleyianum*), is considered extirpated from the TRB. Of the remaining 14 species, nine are considered imperiled or critically imperiled, with five currently listed as threatened or endangered under the Endangered Species Act.

An estimated nine crustacean species in the Upper and Middle TRB have been reported in ADCNR's Natural Heritage Database (Table 2-3). One species, the Virile Crayfish (*Orconectes virilis*), has been reported only in the Upper TRB and two species, the Jewel Mudbug (*Lacunicambarus dalyae*) and the Grainy Crayfish (*Procambarus verrucosus*), have been reported only in the Middle TRB.

An estimated 129 caddisfly species in the Upper and Middle TRB have been reported in ADCNR's Natural Heritage Database (Table 2-4). Twenty species were reported only in the Upper TRB and 37 species were reported only in the Middle TRB. All occurrences of caddisfly species in the Upper and Middle TRB were reported prior to the construction of Harris Dam. Irwin (2019) performed macroinvertebrate sampling on the mainstem of the Tallapoosa River downstream of Harris Dam. In that study, 24 of the 40 genera listed as occurring in the Middle TRB prior to the construction of Harris dam were collected in the Tallapoosa River between 2005 and 2014.

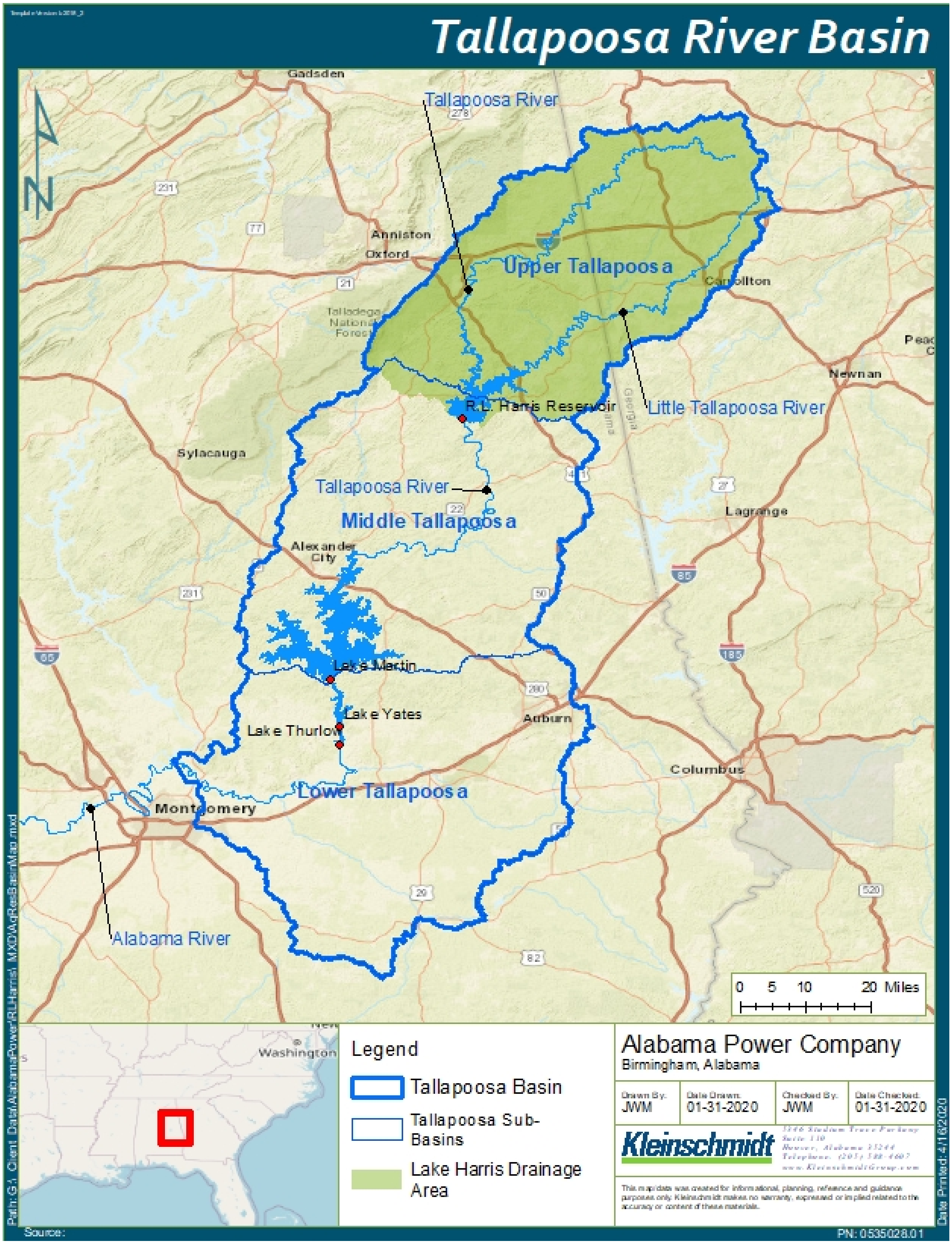

FIGURE 2-1 TALLAPOOSA RIVER BASIN MAP

TABLE 2-1 FISH SPECIES OF THE TALLAPOOSA RIVER BASIN

Family	Genus	Species	Common Name	Native	Status
Petromyzontidae (Lampreys)	*Ichthyomyzon*	*castaneus*	Chestnut Lamprey	N	CS
	Ichthyomyzon	*gagei*	Southern Brook Lamprey	N	CS
	Lampetra	*aepyptera*	Least Brook Lamprey	N	CS
Acipenseridae	*Acipenser*	*oxyrinchus desotoi*	Gulf Sturgeon	EXT	T
	Scaphiryhnchus	*suttkusi*	Alabama Sturgeon	EXT	E
Polyodontidae (Paddlefishes)	*Polyodon*	*spathula*	Paddlefish	N	V
Lepisosteidae (Gar)	*Lepisosteus*	*oculatus*	Spotted Gar	N	CS
	Lepisosteus	*osseus*	Longnose Gar	N	CS
Amiidae (Bowfins)	*Amia*	*calva*	Bowfin	N	CS
Anguillidae (Freshwater Eel)	*Anguilla*	*rostrata*	American Eel	N	CS
Clupeidae (Herrings and Shads)	*Alosa*	*alabamae*	Alabama Shad	EXT	V
	Alosa	*chrysochloris*	Skipjack Herring	N	CS
	Dorosoma	*cepedianum*	Gizzard Shad	N	CS
	Dorosoma	*petenense*	Threadfin Shad	I	CS
Hiodontidae (Mooneyes)	*Hiodon*	*tergisus*	Mooneye	N	CS
Cyprinidae (Minnows and Carps)	*Campostoma*	*oligolepis*	Largescale Stoneroller	N	CS
	Campostoma	*pauciradii*	Bluefin Stoneroller	N	CS
	Carassius	*auratus*	Goldfish	I	CS
	Ctenopharyngdon	*idella*	Grass Carp	I	CS
	Cyprinella	*callistia*	Alabama Shiner	N	CS
	Cyprinella	*gibbsi*	Tallapoosa Shiner	N	CS
	Cyprinella	*venusta*	Blacktail Shiner	N	CS
	Cyprinus	*carpio*	Common Carp	I	CS
	Hybognathus	*hayi*	Cypress Minnow	N	CS
	Hybognathus	*nuchalis*	Mississippi Silvery Minnow	N	CS

Family	Genus	Species	Common Name	Native	Status
	Hybopsis	*lineapunctata*	Lined Chub	N	V
	Hybopsis	*winchelli*	Clear Chub	N	CS
	Luxilus	*chrysocephalus*	Striped Shiner	N	CS
	Luxilus	*zonistius*	Bandfin Shiner	N	CS
	Lythrurus	*atrapiculus*	Blacktip Shiner	N	CS
	Lythrurus	*bellus*	Pretty Shiner	N	CS
	Macrhybopsis	sp. *cf. aestivalis*	"Fall Line Chub"	N	V
	Macrhybopsis	sp. *cf. aestivalis*	"Pine Hills Chub"	N	CS
	Macrhybopsis	*storeriana*	Silver Chub	N	CS
	Nocomis	*leptocephalus*	Bluehead Chub	N	CS
	Notemigonus	*crysoleucas*	Golden Shiner	N	CS
	Notropis	*ammophilus*	Orangefin Shiner	N	CS
	Notropis	*asperifrons*	Burrhead Shiner	N	CS
	Notropis	*atherinoides*	Emerald Shiner	N	CS
	Notropis	*baileyi*	Rough Shiner	N	CS
	Notropis	*buccatus*	Silverjaw Minnow	N	CS
	Notropis	*candidus*	Silverside Shiner	N	CS
	Notropis	*edwardraneyi*	Fluvial Shiner	N	CS
	Notropis	*stilbius*	Silverstripe Shiner	N	CS
	Notropis	*texanus*	Weed Shiner	N	CS
	Notropis	*uranoscopus*	Skygazer Shiner	N	CS
	Notropis	*volucellus*	Mimic Shiner	N	CS
	Notropis	*xaenocephalus*	Coosa Shiner	N	CS
	Opsopoeodus	*emiliae*	Pugnose Minnow	N	CS
	Phenacobius	*catostomus*	Riffle Minnow	N	CS
	Pimephales	*notatus*	Bluntnose Minnow	N	CS

Family	Genus	Species	Common Name	Native	Status
	Pimephales	*promelas*	Fathead Minnow	I	CS
	Pimephales	*vigilax*	Bullhead Minnow	N	CS
	Semotilus	*atromaculatus*	Creek Chub	N	CS
	Semotilus	*thoreauianus*	Dixie Chub	N	CS
Catostomidae (Suckers)	*Carpiodes*	*cyprinus*	Quillback	N	CS
	Carpiodes	*velifer*	Highfin Carpsucker	N	CS
	Cycleptus	*meridionalis*	Southeastern Blue Sucker	N	V
	Erimyzon	*oblongus*	Eastern Creek Chubsucker	N	CS
	Erimyzon	*sucetta*	Lake Chubsucker	N	CS
	Erimyzon	*tenuis*	Sharpfin Chubsucker	N	CS
	Hypentelium	*etowanum*	Alabama Hog Sucker	N	CS
	Ictiobus	*bubalus*	Smallmouth Buffalo	N	CS
	Minytrema	*melanops*	Spotted Sucker	N	CS
	Moxostoma	*carinatum*	River Redhorse	N	CS
	Moxostoma	*duquesnei*	Black Redhorse	N	CS
	Moxostoma	*erythrurum*	Golden Redhorse	N	CS
	Moxostoma	*poecilurum*	Blacktail Redhorse	N	CS
Ictaluridae (Catfishes)	*Ameiurus*	*catus*	White Catfish	I	CS
	Ameiurus	*melas*	Black Bullhead	N	CS
	Ameiurus	*natalis*	Yellow Bullhead	N	CS
	Ameiurus	*nebulosus*	Brown Bullhead	N	CS
	Ictalurus	*furcatus*	Blue Catfish	N	CS
	Ictalurus	*punctatus*	Channel Catfish	N	CS
	Noturus	*funebris*	Black Madtom	N	CS
	Noturus	*gyrinus*	Tadpole Madtom	N	CS
	Noturus	*leptacanthus*	Speckled Madtom	N	CS

Family	Genus	Species	Common Name	Native	Status
	Noturus	*nocturnus*	Freckled Madtom	N	CS
	Pylodictis	*olivaris*	Flathead Catfish	N	CS
Esocidae (Pikes)	*Esox*	*americanus*	Redfin Pickerel	N	CS
	Esox	*masquinongy*	Muskellunge	I	CS
	Esox	*niger*	Chain Pickerel	N	CS
Salmonidae (Trouts and Chars)	*Oncorhynchus*	*mykiss*	Rainbow Trout	I	CS
Aphredoderidae (Pirate Perch)	*Aphredoderus*	*sayanus*	Pirate Perch	N	CS
Fundulidae (Topminnows and Killifishes)	*Fundulus*	*bifax*	Stippled Studfish	N	V
	Fundulus	*olivaceus*	Blackspotted Topminnow	N	CS
Poeciliidae (Livebearers)	*Gambusia*	*affinis*	Western Mosquitofish	N	CS
Atherinopsidae (New World Silversides)	*Labidesthes*	*sicculus*	Brook Silverside	N	CS
Cottidae (Sculpins)	*Cottus*	*carolinae infernatus*	Alabama Banded Sculpin	N	CS
	Cottus	*tallapoosae*	Tallapoosa Sculpin	N	CS
Moronidae (Temperate Basses)	*Morone*	*chrysops*	White Bass	I	CS
	Morone	*saxatilis*	Striped Bass	N	CS
	Morone	*chrysops x saxatilis*	Hybrid Striped Bass	I	CS
Elassomatidae (Pygmy Sunfishes)	*Elassoma*	*zonatum*	Banded Pygmy Sunfish	N	CS
Centrarchidae (Sunfishes)	*Ambloplites*	*ariommus*	Shadow Bass	N	CS
	Centrarchus	*macropterus*	Flier	N	CS
	Lepomis	*auritus*	Redbreast Sunfish	PI	CS
	Lepomis	*cyanellus*	Green Sunfish	N	CS
	Lepomis	*gulosus*	Warmouth	N	CS
	Lepomis	*humilis*	Orangespotted Sunfish	I	CS
	Lepomis	*macrochirus*	Bluegill	N	CS
	Lepomis	*megalotis*	Longear Sunfish	N	CS

Family	Genus	Species	Common Name	Native	Status
	Lepomis	*microlophus*	Redear Sunfish	N	CS
	Lepomis	*miniatus*	Redspotted Sunfish	N	CS
	Micropterus	*dolomieu*	Smallmouth Bass	I	CS
	Micropterus	*henshalli*	Alabama Bass	N	CS
	Micropterus	*tallapoosae*	Tallapoosa Bass	N	CS
	Micropterus	*salmoides*	Largemouth Bass	N	CS
	Pomoxis	*annularis*	White Crappie	N	CS
	Pomoxis	*nigromaculatus*	Black Crappie	N	CS
Percidae (Perches)	*Ammocrypta*	*beanii*	Naked Sand Darter	N	CS
	Ammocrypta	*meridiana*	Southern Sand Darter	N	CS
	Crystallaria	*asprella*	Crystal Darter	N	V
	Etheostoma	*artesiae*	Redspot Darter	N	CS
	Etheostoma	*chlorosoma*	Bluntnose Darter	N	CS
	Etheostoma	*chuckwachatte*	Lipstick Darter	N	CS
	Etheostoma	*davisoni*	Choctawhatchee Darter	N	CS
	Etheostoma	*histrio*	Harlequin Darter	N	CS
	Etheostoma	*jordani*	Greenbreast Darter	N	CS
	Etheostoma	*nigrum*	Johnny Darter	N	CS
	Etheostoma	*parvipinne*	Goldstripe Darter	N	CS
	Etheostoma	*rupestre*	Rock Darter	N	CS
	Etheostoma	*stigmaeum*	Speckled Darter	N	CS
	Etheostoma	*swaini*	Gulf Darter	N	CS
	Etheostoma	*tallapoosae*	Tallapoosa Darter	N	CS
	Etheostoma	*zonifer*	Backwater Darter	N	CS
	Percina	*brevicauda*	Coal Darter	N	T
	Percina	*kathae*	Mobile Logperch	N	CS

Family	Genus	Species	Common Name	Native	Status
	Percina	*lenticula*	Freckled Darter	N	T
	Percina	*maculata*	Blackside Darter	N	CS
	Percina	*nigrofasciata*	Blackbanded Darter	N	CS
	Percina	*palmaris*	Bronze Darter	N	CS
	Percina	*shumardi*	River Darter	N	CS
	Percina	*smithvanizi*	Muscadine Bridled Darter	N	V
	Percina	*vigil*	Saddleback Darter	N	CS
	Sander	*vitreus*	Walleye	N	CS
Sciaenidae (Drums)	*Aplodinotus*	*grunniens*	Freshwater Drum	N	CS

Native: N = native, EXT = extirpated native, I = introduced, PI = probably introduced
Status: CS = currently stable, V = vulnerable, T = threatened, E = endangered.
Source: Freeman et al. (2005)

TABLE 2-2 MOLLUSK SPECIES OF THE TALLAPOOSA RIVER BASIN

Common Name	Scientific Name	Basin Occurence [1]	State Conservation Status [2]	Federal Status [3]
Alabama Orb	*Cyclonaias asperata*	L	S5	
Alabama Spike	*Elliptio arca*	UML	S2	
Delicate Spike	*Elliptio arctata*	UML	S2	
Finelined Pocketbook	*Hamiota altilis*	UML	S2	T
Southern Pocketbook	*Lampsilis ornata*	L	S4	
Rough Fatmucket	*Lampsilis straminea*	L	S4	
Alabama Heelsplitter	*Lasmigona alabamensis*	L	S3	
Alabama Moccasinshell	*Medionidus acutissimus*	L	S2	T
Southern Clubshell	*Pleurobema decisum*	L	S2	E
Georgia Pigtoe	*Pleurobema hanleyianum*	L	SX	E
Ovate Clubshell	*Pleurobema perovatum*	L	S1	E
Alabama Creekmussel	*Pseudodontoideus connasaugaensis*	UL	S3	
Rayed Kidneyshell	*Ptychobranchus foremanianus*	L	S1	
Southern Purple Lilliput	*Toxolasma corvunculus*	L	S1	
Coosa creekshell	*Villosa umbrans*	U	S2	

[1] Upper Tallapoosa Basin (U), Middle Tallapoosa Basin (M), Lower Tallapoosa Basin (L)

[2] Secure (S5), Apparently Secure (S4), Vulnerable (S3), Imperiled (S2), Critically Imperiled (S1), Presumed Extirpated (SX)

[3] Threatened (T), Endangered (E)

Source: NatureServe (2020)

TABLE 2-3 CRUSTACEAN SPECIES REPORTED IN THE UPPER AND MIDDLE TALLAPOOSA RIVER BASINS

Genus	Species	Common Name	Pre-Dam[1]	Pre-Green Plan	Green Plan	GCN Rank
Cambarus	*englishi*	Tallapoosa Crayfish	UM	UM	UM	2
Cambarus	*halli*	Slackwater Crayfish	UM	UM	UM	2
Cambarus	*latimanus*	Variable Crayfish	UM	UM	UM	
Cambarus	*striatus*	Ambiguous Crayfish	UM		UM	
Lacunicambarus	*dalyae*	Jewel Mudbug		M		
Orconectes	*erichsonianus*	Reticulate Crayfish		UM		
Orconectes	*virilis*	Virile Crayfish			U	
Procambarus	*spiculifer*	White Tubercled Crayfish	UM	UM	UM	
Procambarus	*verrucosus*	Grainy Crayfish			M	3

[1] Upper Tallapoosa Basin (U), Middle Tallapoosa Basin (M)
Source: ADCNR 2020

TABLE 2-4 INSECT SPECIES REPORTED IN THE UPPER AND MIDDLE TALLAPOOSA RIVER BASINS

Genus	Species	Sub-Basin
Agapetus	*rossi*	UM
Agarodes	*griseus*	M
Anisocentropus	*pyraloides*	UM
Brachycentrus	*nigrosoma*	M
Ceraclea	*ancylus*	UM
Ceraclea	*cancellata*	UM
Ceraclea	*flava*	UM
Ceraclea	*maculata*	UM
Ceraclea	*nepha*	UM
Ceraclea	*ophioderus*	M
Ceraclea	*protonepha*	UM
Ceraclea	*tarsipunctata*	UM
Ceraclea	*transversa*	UM
Ceratopsyche	*sparna*	UM
Cernotina	*calcea*	M
Cernotina	*spicata*	M
Cheumatopsyche	*burksi*	M
Cheumatopsyche	*campyla*	UM
Cheumatopsyche	*edista*	M
Cheumatopsyche	*ela*	UM

Genus	Species	Sub-Basin
Cheumatopsyche	*geora*	UM
Cheumatopsyche	*harwoodi*	M
Cheumatopsyche	*minuscula*	M
Cheumatopsyche	*pasella*	UM
Cheumatopsyche	*pettiti*	UM
Cheumatopsyche	*pinaca*	UM
Chimarra	*aterrima*	UM
Chimarra	*moselyi*	M
Chimarra	*obscura*	UM
Cyrnellus	*fraternus*	UM
Dolophilodes	*distinctus*	U
Glossosoma	*nigrior*	UM
Goera	*calcarata*	M
Goera	*townesi*	U
Helicopsyche	*borealis*	U
Heteroplectron	*americanum*	U
Hydropsyche	*alvata*	U
Hydropsyche	*betteni*	UM
Hydropsyche	*demora*	M
Hydropsyche	*fattigi*	M
Hydropsyche	*mississippiensis*	UM
Hydropsyche	*phalerata*	U
Hydropsyche	*venularis*	UM
Hydroptila	*alabama*	UM
Hydroptila	*amoena*	U
Hydroptila	*armata*	UM
Hydroptila	*berneri*	U
Hydroptila	*callia*	M
Hydroptila	*delineata*	M
Hydroptila	*gunda*	UM
Hydroptila	*hamata*	UM
Hydroptila	*lonchera*	U
Hydroptila	*novicola*	U
Hydroptila	*oneili*	M
Hydroptila	*paramoena*	UM
Hydroptila	*quinola*	UM
Hydroptila	*remita*	U

Genus	Species	Sub-Basin
Hydroptila	*waubesiana*	UM
Lepidostoma	*latipenne*	UM
Lepidostoma	*togatum*	UM
Lype	*diversa*	UM
Macrostemum	*carolina*	M
Macrostemum	*zebratum*	M
Matrioptila	*jeanae*	UM
Mayatrichia	*ayama*	M
Micrasema	*charonis*	U
Micrasema	*rusticum*	UM
Micrasema	*wataga*	UM
Molanna	*blenda*	U
Molanna	*tryphena*	U
Molanna	*ulmerina*	UM
Mystacides	*sepulchralis*	UM
Nectopsyche	*candida*	UM
Nectopsyche	*exquisita*	UM
Nectopsyche	*pavida*	UM
Neotrichia	*vibrans*	UM
Nyctiophylax	*affinis*	UM
Nyctiophylax	*celta*	M
Nyctiophylax	*denningi*	UM
Nyctiophylax	*serratus*	M
Oecetis	*avara*	M
Oecetis	*cinerascens*	M
Oecetis	*ditissa*	UM
Oecetis	*inconspicua*	UM
Oecetis	*nocturna*	UM
Oecetis	*persimilis*	UM
Oecetis	*sphyra*	UM
Orthotrichia	*aegerfasciella*	UM
Orthotrichia	*cristata*	U
Oxyethira	*forcipata*	UM
Oxyethira	*grisea*	UM
Oxyethira	*janella*	UM
Oxyethira	*lumosa*	M
Oxyethira	*novasota*	UM

Genus	Species	Sub-Basin
Oxyethira	*pallida*	UM
Oxyethira	*rivicola*	M
Oxyethira	*zeronia*	UM
Phylocentropus	*carolinus*	UM
Phylocentropus	*lucidus*	M
Phylocentropus	*placidus*	UM
Plectrocnemia	*cinerea*	UM
Polycentropus	*barri*	M
Polycentropus	*blicklei*	U
Polycentropus	*confusus*	UM
Protoptila	*georgiana*	M
Protoptila	*palina*	UM
Psilotreta	*frontalis*	UM
Psilotreta	*labida*	M
Psychomyia	*flavida*	UM
Ptilostomis	*ocellifera*	M
Ptilostomis	*postica*	U
Pycnopsyche	*indiana*	M
Pycnopsyche	*lepida*	M
Rhyacophila	*carolina*	UM
Rhyacophila	*fuscula*	UM
Rhyacophila	*ledra*	U
Rhyacophila	*nigrita*	UM
Rhyacophila	*torva*	M
Setodes	*incertus*	M
Stactobiella	*delira*	UM
Stactobiella	*martynovi*	UM
Stactobiella	*palmata*	UM
Theliopsyche	*tallapoosa*	M
Triaenodes	*flavescens*	M
Triaenodes	*ignitus*	UM
Triaenodes	*marginatus*	UM
Triaenodes	*nox*	U
Triaenodes	*ochraceus*	U
Triaenodes	*tardus*	M

[1] Upper Tallapoosa Basin (U), Middle Tallapoosa Basin (M)
Source: ADCNR 2020

2.3.2 LAKE HARRIS

The Harris Reservoir fishery contains many centrarchid species, including Largemouth Bass (*Micropterus salmoides*), Alabama Bass (*Micropterus henshalli*), and Black Crappie (*Pomoxis nigromaculatus*). The ADCNR Wildlife and Freshwater Fisheries Division routinely performs surveys of these species in the Harris Reservoir to keep records of the fishery and to determine the need for, or changes to, the regulations.

On October 1, 1993, a 13-16 inch slot limit[2] for all black bass species was implemented in the reservoir with the goal of improving growth and condition of fish by reducing competition (Andress and Catchings 2005). Unfortunately, widespread negative attitudes toward the harvest of bass under 13 inches reduced the effect of the imposed limit (Andress and Catchings 2005). In 2006, Largemouth Bass population structure exceeded the state's 75th percentile for many of the larger size classes, and mean lengths for Largemouth Bass ages 1-4 were above statewide averages (Andress and Catchings 2006). Alabama Bass[3] did not respond well to the slot limit (Andress and Catchings 2006), so the limit was removed for this species in 2006 due to an excessive number of specimens smaller than 13 inches (Andress and Catchings 2007). In 2010, the condition of Largemouth Bass had steadily improved (Holley et al. 2010) and by 2012, maintaining the slot limit for Largemouth Bass and removing the slot limit for Alabama Bass in 2006 was found to have a positive effect on black bass populations (Holley et al. 2012). As of 2018, the slot limit on Largemouth Bass and removal of the slot limit on Alabama Bass in 2006 have continued to yield positive results, indicated by a greater relative density of slot-sized or larger bass (Hartline et al. 2018).

In 2015, Black Crappie were targeted for sampling due to a low catch rate reported in 2010 creel surveys (Holley et al. 2010; Hartline et al. 2018). Black Crappie were found in large numbers in the Harris Reservoir and exhibited much better growth and size structure than crappie (*Pomoxis* spp.) in the river, which was attributed to more abundant habitat and forage availability in the reservoir (Hartline et al. 2018).

During the spring, Alabama Power coordinates with ADCNR to manage Harris lake levels for the benefit of fish species (e.g., Largemouth Bass and crappie) that spawn in littoral

[2] The slot limit does not allow the harvest of fish between 13 and 16 inches total length.

[3] Previously described in this region as a subspecies of Spotted Bass (*Micropterus punctatus*), but later described as a separate species named Alabama Bass (Baker et al. 2008).

(near-shore) areas. Based on input from ADCNR and when conditions permit, Alabama Power voluntarily maintains the lake at a stable or a slightly rising elevation for a period of 14 days to increase the spawning success of these species.

2.3.3 TALLAPOOSA RIVER AND TRIBUTARIES

The following is a chronologically ordered synopsis of available information pertaining to aquatic resources in the Tallapoosa River downstream of Harris Dam. Figure 2-2 is provided to help orient the reader to locations within this reach that are commonly referred to throughout this section. Table 2-5, located at the end of this section, provides a summary of major findings of the studies included in this section.

Swingle (1954) performed one of the earliest studies on the effects of dams and impoundments on populations of fish in Alabama. Fish were sampled in multiple rivers and impoundments from a variety of habitats. Generally, sport fish rarely made up more than five percent of the total population in large rivers. River populations generally consisted of Blue Catfish (*Ictalurus furcatus*), Channel Catfish (*Ictalurus punctatus*), Flathead Catfish (*Pylodictis olivaris*), Freshwater Drum (*Aplodinotus grunniens*), and species of buffalo (*Ictiobus* spp.). In the Tallapoosa River, fish were sampled in deep areas of unimpounded river in 1951 and in coves and deep, open areas of Lake Martin in 1949 and 1951. Gizzard Shad (*Dorosoma cepedianum*), Blue Catfish, and Freshwater Drum were not found in the Tallapoosa River or in Lake Martin. Sport fishes such as Largemouth Bass, Alabama Bass (formerly Spotted Bass in this region at the time of this study), White Bass (*Morone chrysops*), and crappie were abundant in Lake Martin, comprising between 24.6 to 27.9 percent of the population. Both Largemouth Bass and Bluegill (*Lepomis macrochirus*) comprised a larger percentage of the total biomass of fish in Lake Martin than in the river. Common Carp (*Cyprinus carpio*) were already present in the river and became very abundant in Lake Martin shortly after impoundment but gradually declined in the impoundment over the following 24-26 years until they became roughly 4.1 percent of the population.

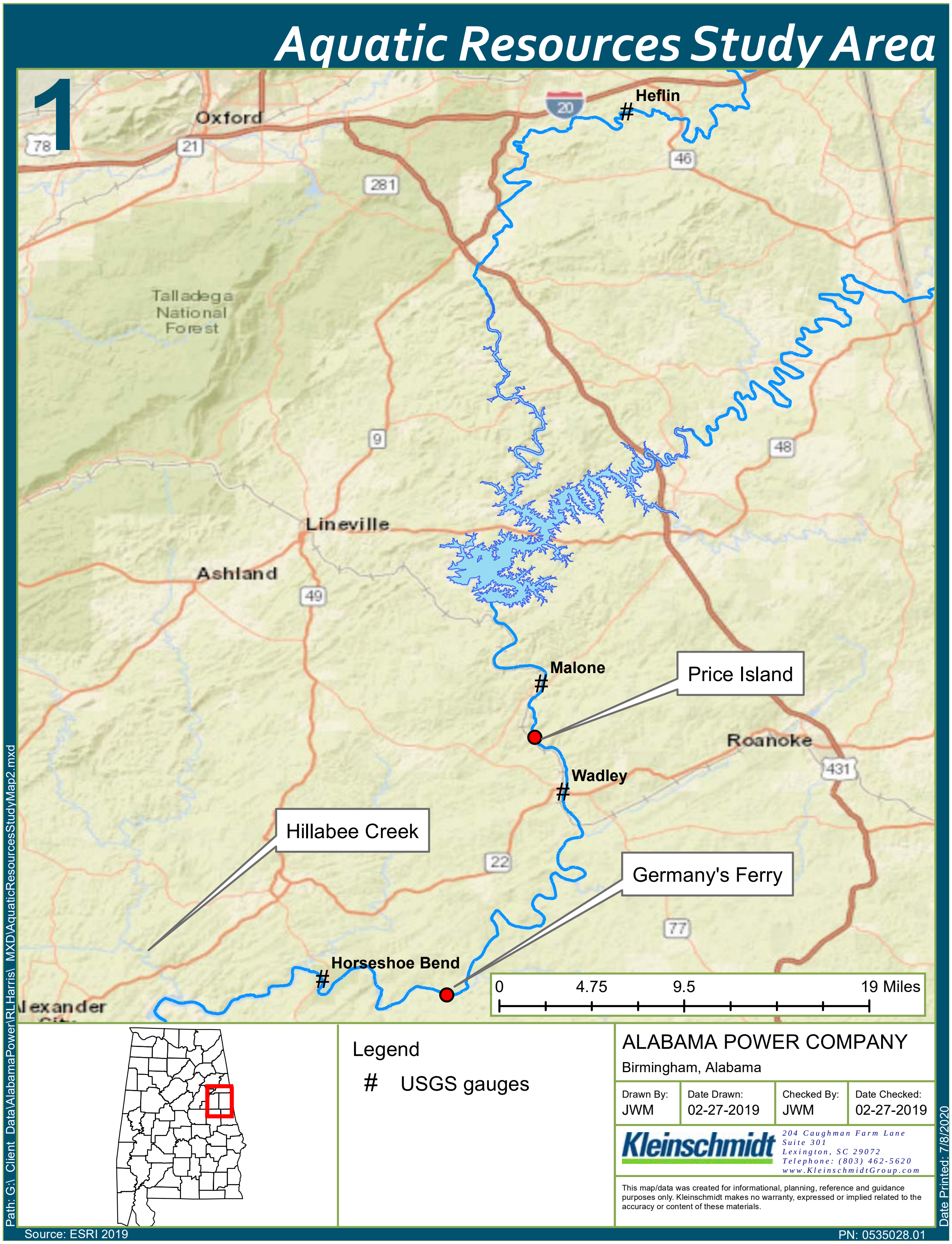

FIGURE 2-2 AQUATIC RESOURCES STUDY AREA

Travnichek and Maceina (1994) measured species richness (the number of species present), diversity (a measure of the number and abundance of each species), and relative abundance (a measure of how common or rare a species is in relation to other species) in two unregulated sites (Little Tallapoosa River and upper Tallapoosa River) and three regulated sites (all downstream of Harris Dam) in both deep and shallow habitats from 1990 to 1992. In deep habitat, species richness was greater in regulated reaches of the Tallapoosa River than in unregulated portions. However, relative abundance of catostomids (suckers) decreased in regulated reaches. There was no significant difference in the number of centrarchid (bass and sunfish) and catfish species caught between unregulated and regulated reaches. In shallow habitat, fish abundance in unregulated reaches was about twice as high compared with fish abundance in regulated reaches. Species richness was also greater in unregulated reaches and increased progressively with distance from Harris Dam in regulated reaches.

Bowen et al. (1996) sampled fish at the same sites as those sampled in Travnichek and Maceina (1994) in 1994 and 1995. Bowen (1996) used a modified index of biological integrity (IBI), a tool used to assess the health of aquatic ecosystems, based specifically on small-bodied fishes and calculated IBI scores for data gathered in 1994 and 1995 as well as data gathered by Travnichek and Maceina (1994) during 1990-1992. Eight of the 78 species collected were classified as intolerant. Cyprinids (minnows, carp, and shiners) and percids (darters and perch) were highest in relative abundance. The IBI was most affected by changes in the percentage of insectivorous cyprinids (minnows), the percentage of intolerant species, fish abundance, and the number of darter species. The unregulated reach of the Tallapoosa River had higher IBI scores (1990-1992: 60.11; 1994: 72.26; 1995: 83.40) than the regulated reaches (1990-1992: 48.80-52.52; 1994: 68.58-72.74; 1995: 68.19-72.54) of the Tallapoosa River. The IBI scores were higher in 1995 than in 1994 at both unregulated sites and two out of three of the regulated sites, which was attributed to higher discharge in 1994, leading to reduced reproductive success and survival that year.

Johnson (1997) developed a species list of mussel, snail, and crayfish species in the Tallapoosa River drainage by surveying 35 sites from June through August 1995. In the headwater reaches of the Tallapoosa River (~43-50 miles upstream of Harris Dam), the mussel species Delicate Spike (*Elliptio arctata*), Gulf Pigtoe (*Fusconaia cerina*), and Finelined Pocketbook (*Hamiota altilis*) were found along with the snail species Yellow Elimia (*Elimia flava*). In Lake Harris, the mussel species Paper Pondshell (*Utterbackia* *imbecillis*) was found around an ADCNR public boat ramp in Harris Reservoir (west of Wedowee, Alabama) but no snail or crayfish species were collected. The mussel species Southern Rainbow (*Villosa iris*), the snail species Yellow Elimia, a subspecies of Tadpole Physa (*Physella gyrina albofilata*), a subspecies of Pewter Physa (*Physella heterostropha pomila*), and the crayfish species White Tubercled Crayfish (*Procambarus spiculifer*) were found in a tributary downstream of Harris Dam and upstream of Malone. In the mainstem between Malone and Wadley, Yellow Elimia were present. Tributaries near Wadley contained Yellow Elimia and *Physella* spp. and Tallapoosa Crayfish (*Cambarus englishi*), Slackwater Crayfish (*Cambarus halli*), *Cambarus latimanus* (no common name), and White Tubercled Crayfish. Tributaries between Wadley and Bibby's Ferry contained Yellow Elimia, Rock Fossaria (*Fossaria modicella*), Tadpole Physa (*Physella gyrina*), Mimic Lymnaea (*Pseudosuccinea columella*), and White Tubercled Crayfish and Slackwater Crayfish. In tributaries between Germany Ferry and Horseshoe Bend National Military Park (HSB), no mussels were found; however, the snail species Yellow Elimia, Carib Physa (*Physella cubensis*), the Tadpole Physa subspecies *albofilata*, Slackwater Crayfish, *Cambarus latimanus*, Tallapoosa Crayfish, and White Tubercled Crayfish were present. Around HSB, the Southern Rainbow, Pointed Campeloma (*Campeloma decisum*) and Yellow Elimia, and Tallapoosa Crayfish, *Cambarus latimanus*, and White Tubercled Crayfish were found. In Jaybird Creek, Yellow Elimia and the Tadpole Physa subspecies *albilata* were present along with the Slackwater Crayfish. The invasive clam species *Corbiculus fluminea* was present at nearly every site.

Bowen et al. (1998) examined the availability and persistence of key habitats and fish assemblages at the same regulated and unregulated sites as Travnichek and Maceina (1994) and Bowen et al. (1996) in 1994 and 1995. Hydropeaking dam operations decreased both the average duration of shallow-water habitats and year-to-year variation in persistence of these habitats when compared to unregulated sites. The relative abundance of percids was lower with median availability of deep-fast habitat during the spring and summer, likely due to limited suitable habitat for spawning. Catostomids showed the lowest densities in some of the larger, regulated reaches. In the summer, persistence of shallow and slow-water habitats yielded greater abundances of percids, catostomids, and cyprinids. Bowen et al. (1998) concluded that increased availability of shallow-water habitats during the spring and summer can likely lead to an increase in reproductive success by a large variety of stream fishes.

Irwin and Belcher (1999) gathered angler use data by installing a creel station at the boat ramp at HSB from June 1997 to December 1998. They also tagged and stocked adult Flathead Catfish and assessed their effect on the creel survey. There was no creel clerk present at the creel station, so it was unknown if survey respondents were representative of all anglers in the area. Creel survey results yielded a catch of 38 percent catfish (ictalurids) and 62 percent centrarchids. Referencing five angler diaries predating the impoundment, the catch-per-unit-effort (CPUE) in the 1970's on the Tallapoosa River in the area of interest was 1.9 fish/hour, compared to 0.8 fish/hour from the creel survey in 1997 and 1998. Similarly, in the early 1970's, Alabama Bass (formerly Spotted Bass in this region at the time of this study) were caught at a rate of 0.7 fish/hour compared to 0.1 fish/hour in the 1997-1998 creel survey. None of the tagged Flathead Catfish were reported in the creel survey, possibly due to a large population of Flathead Catfish in the area, the migration of tagged fish out of the area, or a low amount of angler effort.

Freeman et al. (2001) measured young-of-year (YOY) (i.e., fish born within the past fiscal year) fish abundance during the summers of 1994-1997 to determine the relation to hydrologic and habitat variability in an unregulated reach approximately 32.9 miles upstream of Harris Reservoir and a regulated reach approximately 12.4 miles downstream of Harris Dam. YOY abundances in the unregulated reach were most commonly correlated with the availability of shallow, slow-moving habitat in summer and the persistence of shallow, slow-moving and shallow, fast-moving habitat in the spring. YOY abundances in the regulated reach were most commonly correlated with the persistence of shallow habitats than with habitat availability or the intensity of flow extremes. In the regulated reach, habitat persistence levels comparable to those in the unregulated site only happened during summer when power generation occurred less frequently due to factors such as lower rainfall. Therefore, species that spawn in the summer were a large part of the assemblage at the regulated site.

In 1999 and 2000, Irwin et al. (2001) compared nesting habits across river reaches, measured the effects of flow on nest survival, and estimated the amount of time necessary for development to post-larval life stages for centrarchids. Redbreast Sunfish (*Lepomis auritus*) nests were observed in a regulated area of the Tallapoosa River near Wadley and a non-regulated area near Heflin. At the Wadley site, nest success was more likely affected by discharge than thermal regime. The greatest rate of nest failure occurred in Wadley in 1999 due to 2-unit generation events causing physical damage to nests that were not protected by substantial cover. In 2000, nest success rate was greater in Wadley than in

Heflin, which could be attributed to periods of non generation and flows that were less variable and lower in magnitude than in the previous year. The cumulative number of degree days required for larval fish development was higher at Wadley than at Heflin. However, this difference may not be biologically significant. Irwin et al. (2001) concluded that both flow and temperature regime affect Redbreast Sunfish nest success and flow regulation can disrupt the relationship between these variables.

Sakaris (2006) sampled age-0 Channel Catfish in 2005 prior to implementation of the Green Plan (see Section 1.1) and found that growth of age-0 Channel Catfish in unregulated reaches was surprisingly lower than in regulated reaches despite fluctuating water temperatures, citing fluctuations up to 10 °C downstream of Harris Dam reported in Irwin and Freeman (2002). In unregulated reaches, age-0 Channel Catfish mainly hatched in early June to late August. In regulated reaches, hatching occurred during this time frame but also occurred during September, suggesting a prolonged spawning period downstream of the dam. This was attributed to a possible alternative life history strategy that may occur in more unpredictable environments (Einum and Fleming 2004 as cited in Sakaris 2006). Another study reported Channel Catfish in regulated sites were typically older than those in unregulated sites (Nash 1999 as cited in Sakaris 2006). Based on model results, Sakaris (2006) recommended several periods of low and stable flow conditions in the summer months, a moderate number of high pulses with slow and steady fall rates[4], and the maintenance of a higher minimum flow to enhance growth and spawning success of age-0 Channel Catfish.

Martin (2008) observed behavior and measured nesting success of male Redbreast Sunfish in unregulated reaches (Saugahatchee Creek) and a regulated reach (near Wadley) in 2006 and 2007 using video recordings of nests. Due to drought in 2007, about half the number of nests and a quarter of attempted nests were examined compared to 2006; however, nest success was no different between years. Because temperature and discharge were correlated, Martin could not determine whether temperature had an impact on nest survival. During base flow conditions (defined by Martin 2008 as low flow conditions), the most common behaviors observed were *defend* (male displaying aggressiveness; presumed to be protecting nest) and *leave* (male leaving the nest). When discharge from one-unit generation events reached Wadley, these behaviors initially

[4] This is the rate at which the volume of dam releases decreases, defined by Sakaris (2006) as the "mean or median of all negative differences between consecutive daily values" of discharge volume ($-m^3/s/d$). Sakaris (2006) tested fall rates of -2.8 $m^3/s/d$ and -14.2 ($-m^3/s/d$).

decreased while the *clean* behavior (tending to the nest and removing debris) increased. The *leave* behavior became more common over the duration of one-unit generation flows and *defend* began to occur less frequently while *clean* increased. Spawning behaviors such as *court* and *milt* were never seen during one-unit generation events. Martin (2008) suggested a spawning window of 10-11 days based on findings from this study and from findings in Andress (2001).

Martin (2008) also collected male Redbreast Sunfish in 2007 to compare bioenergetic models between the regulated river and an unregulated site and to perform diet analysis. The diets of male Redbreast Sunfish were comprised of invertebrates. There was no difference between whole body caloric content of pre-spawn males between sites. However, post-spawn males exhibited greater caloric content in the regulated reach than in the unregulated tributary. This was attributed to lower temperature, and resulting lower energetic cost, related to generation in the regulated reach.

Irwin et al. (2011) sampled fish during spring and fall of 2005-2009 in two unregulated reaches (Heflin and Hillabee Creek) and in three regulated reaches (Malone, Wadley, and Horseshoe Bend). The main purpose of the study was to investigate the effects of Green Plan operations on the recovery of shoal species of greatest conservation need: Tallapoosa Darter (*Etheostoma tallapoosae*), Muscadine Darter (*Percina smithvanzini*), Lipstick Darter (*Etheostoma chuckwachatte*), Tallapoosa Shiner (*Cyprinella gibbsi*), Tallapoosa Sculpin (*Cottus tallapoosae*), and Stippled Studfish (*Fundulus bifax*). IBI scores were lower in regulated reaches than in unregulated reaches but varied greatly. Occupancy and colonization estimates suggested that Tallapoosa Darter and Muscadine Darter were unaffected by Harris Dam operations, and high occupancy estimates and an extinction estimate of 0 in the regulated river indicated that Lipstick Darter may be be positively affected by flow regulation. Irwin hypothesized that flow management was maintaining the type of shallow habitat preferred by these three species. Furthermore, they are benthic species, meaning they occupy habitat near the riverbed and can likely find refuge from increased flows. Occupancy estimates suggested that Tallapoosa Shiner and Tallapoosa Sculpin were in decline and that Stippled Studfish were absent in the regulated river. The Tallapoosa Shiner usually dwells higher in the water column, so occasional high flows from generation are more likely to carry this species downstream. The Tallapoosa Sculpin and Stippled Studfish had generally low detection probabilities in both regulated and unregulated reaches, so reasons for their possible decline or absence in the regulated reaches are not explicit. Sucker species such as the Black Redhorse

(*Moxostoma duquensnei*) and Blacktail Redhorse (*Moxostoma poecilurum*) were also deemed possible species of concern whose populations may have declined in the regulated river. The availability of shoal habitat serving as spawning grounds for adults and refuge for juveniles may explain the decline (Boschung and Mayden 2004 as cited in Irwin et al. 2011).

Irwin et al. (2011) also measured reproductive condition and hatch date and found that regulated reaches generally had higher percentages of mature females than unregulated reaches. Specifically, Alabama Shiners (C*yprinella callistia*) showed high percentages of mature females in 2006 due to the frequency of pulses but low percentages in 2007 due to drought. Recruitment of Tallapoosa Shiners and Bullhead Minnows (*Pimephales vigilax*) may have been impacted by river regulation, but Tallapoosa Darters seemed to be reproducing and faring well downstream of the dam.

Irwin et al. (2011) also sampled crayfish and found three species: White Tubercled Crayfish, Tallapoosa Crayfish, and Slackwater Crayfish. Generally, there was no indication of an effect of flow regulation on occupancy estimates for crayfish species with the exception of Tallapoosa Crayfish in 2006 and 2007 and juveniles in 2006. Occupancy estimates were greatest nearest to the dam. Overall, fish and crayfish assemblages varied between regulated and unregulated reaches, within unregulated reaches, between seasons, and among years, suggesting there is a level of natural variability that exists within the Tallapoosa River.

Earley (2012) sampled Alabama Bass and Tallapoosa Bass[5] from 2009-2011 in two regulated sites between Horseshoe Bend and Germany's Ferry (lower site) and between Wadley and Price Island (middle site) and in an unregulated site on the upper Tallapoosa River (upper site). Earley (2012) found that dam operations had a small effect on growth of Alabama and Tallapoosa Bass. Greater growth in both species appeared to be related to years of minimal flow variability, although hydrology appeared to have a smaller effect on the growth of older fish. Alabama Bass growth was negatively affected by high and steady flows in the unregulated site, and both Alabama and Tallapoosa Bass growth were affected by variability of flow in the middle site, where flow variations were most profound. Alabama Bass in the middle site showed higher growth rates, possibly resulting

[5] Previously described in this region as Redeye Bass (Micropterus coosae), but later described as a separate species (Micropterus tallapoosae; Baker et al. 2013) and commonly referred to as Tallapoosa Bass.

from decreased intraspecies competition due to low density, increased foraging opportunities during pulses due to the drift of prey downstream (Cushman 1985 as cited in Earley (2012), or some effect of temperature. Additionally, movement of Alabama and Tallapoosa Bass was influenced by season, but flow periods (the study observed four categories of flow periods: base/low, rising, peak, and falling) and dam operations had little effect on movement and habitat use. Earley (2012) noted this may be due to the presence of velocity refugia such as boulders and large woody debris.

Earley (2012) also investigated the stress response of Tallapoosa Bass and Redeye Bass using cortisol as an indicator. Fish were sampled approximately 20 km downstream of the dam and at two unregulated reference sites (Hillabee Creek and Saugahatchee Creek) in October and November 2011. Baseline cortisol levels, an indicator of physiological stress, were higher in fish at the regulated sites compared to the unregulated sites; however, fish from the unregulated sites exhibited higher cortisol response when subjected to an additional confinement stressor than fish in the regulated site. Earley (2012) suggested lower cortisol response in the regulated site could indicate that fish below the dam are acclimated to chronic stress or are trying to regain homeostasis (physiological equilibrium). Earley (2012) cited Hontela et al. (1992) and Norris et al. (1999) in support of this last theory, stating that the biological mechanism controlling the release of cortisol may not function at normal capacity in chronically stressed animals. Cortisol had no substantial effect on growth in these Alabama Bass and Tallapoosa Bass. Therefore, elevated baseline cortisol levels may not have decreased overall fitness of these species.

Goar (2013) sampled Redbreast Sunfish in 2005 and 2007-2009 and found that growth of age-0 Redbreast Sunfish was higher at regulated sites than at unregulated sites. This was attributed to either lower densities of fish; and, therefore, lower competition for resources among fish or higher prey density due to increased discharge. Modeling results did not indicate that hydrologic and temperature variables had an effect on incremental growth rates in age-0 Redbreast Sunfish. Most Redbreast Sunfish hatched when discharge was less than 7,770 cfs. When flows were greater than 7,770 cfs, adult Redbreast Sunfish often abandoned nests, causing the nests to fail (Martin 2008 as cited in Goar 2013). There were higher hatch rates of Redbreast Sunfish in drought years. Additionally, laboratory experiments showed high flow variability and decreased water temperatures (10° C) have a negative effect on survival and early growth of age-0 Channel Catfish and Alabama Bass.

Sammons et al. (2013) examined potential impacts of dam operations on age and growth of Alabama Bass, Channel Catfish, Redbreast Sunfish, and Tallapoosa Bass (formerly Redeye Bass in this region at the time of this study) from 2009-2011. Fish were sampled in an unregulated reach of the Tallapoosa River upstream of the dam (upper reach), in a regulated reach between Price Island and Wadley (middle reach), and in a regulated reach between Germany Ferry and Horseshoe Bend (lower reach). Recruitment of Alabama Bass was negatively affected by flow in the unregulated reach but seemed unaffected in regulated reaches. Recruitment of Tallapoosa Bass seemed to be unaffected by hydrologic variability in any portion of the river, and recruitment of Channel Catfish was negatively affected by high flow in the unregulated reach. The hydrologic regime had a minor effect on the growth of all four species, which was likely biologically insignificant in Alabama and Tallapoosa Bass. However, for the bass species, growth of age-1 fish seemed to improve in years with low variability of flow.

Sammons et al. (2013) also investigated behavior and habitat use of Alabama and Tallapoosa Bass in response to hydrologic regimes in 2010 and 2011. The movement of both species was more affected by season than by dam operations, with more movement occurring during the spring. Both species did move during higher flow releases and likely sought refuge from higher water velocities. Alabama Bass typically showed more hourly movement than Tallapoosa Bass over most flow periods and seasons, indicating that Tallapoosa Bass may be a more sedentary species or that Alabama Bass adapt better to alternative flows. Increased flows caused fish to move deeper in the winter and move toward the banks during other seasons. In the winter, Alabama Bass selected large rock substrates when flows increased while Tallapoosa Bass utilized smaller rock. In the spring, both species selected smaller rock or fine sediment during high flows.

A third objective of Sammons et al. (2013) was to investigate impacts of flow on hatch date and growth of age-0 Alabama Bass, Redbreast Sunfish, and Tallapoosa Bass in 2010 and 2011. All three species generally started hatching earlier in the lower reach, which was less regulated due to attenuation of the effects of Harris Dam operations, compared to the middle and upper reaches below Harris Dam. Fish that hatch later in the season often grow faster due to warmer temperatures, less variable hydrology, and a greater abundance of food. However, fish that hatch earlier have the advantage of an extended growing season, which may allow them to reach sizes similar to later-hatched fish near the end of the first growing season (Diana 1995 as cited in Sammons et al. 2013). Continuous hatching distributions were seen in Alabama Bass, Redbreast Sunfish, and

Tallapoosa Bass in 2011, a year in which flows were lower and more stable in both regulated and unregulated reaches. In 2010, the growth rate of Alabama Bass was greater in the unregulated reach than in the regulated reaches, but in 2011, the growth of both bass species was greatest in the middle reach where the effects of Harris Dam operations on flow were greater. This may be the result of drought conditions that year, which prevented Harris Dam from conducting daily hydropeaking discharges and reduced the effects of Harris Dam operations. Researchers concluded that the dam can cause substantial fluctuation in flow that attenuates downstream, but there were no large differences in spawning or age-0 growth among areas sampled, both unregulated and regulated. All species showed an unexpected ability to hatch successfully even during sudden movements of water through the river, but both years sampled were characterized by below-average rainfall.

Gerken (2015) sampled fish to measure catch rates, species size and composition, and the effects of environmental impacts on catch rates of sport fish from 2013-2015. Fish were sampled at an unregulated reach between Heflin and the uppermost unimpounded section of the Tallaposoa River (upper reach), a regulated reach from Malone to Wadley (middle reach), and another regulated reach between Germany Ferry and Horseshoe Bend (lower reach). In the lower reach, where the effects of dam operations are not likely as great as the effects at the middle reach, Redbreast Sunfish were caught most frequently, followed by Alabama Bass and then Tallapoosa Bass. Water temperature was positively correlated with harvest-per-unit-effort (HPUE) and discharge was negatively correlated with HPUE in both Alabama Bass and Redbreast Sunfish. Lower water temperatures resulting from dam releases may affect fishing success for Redbreast Sunfish; however, both water temperature and discharge were negatively correlated with HPUE for Tallapoosa Bass.

Irwin and Goar (2015) measured the influence of hydrology on growth and hatching success of age-0 black bass species and Channel Catfish in both regulated and unregulated reaches from 2010-2014. Growth was greatest among age-0 fish in regulated reaches. In regulated reaches, most hatching occurred during times of low, stable flow. Hatches sometimes seemed to occur during unfavorable temperature conditions, but it is possible this is a result of recruitment from warmer tributaries. In regulated reaches, suitable conditions for Channel Catfish spawning do not occur until later in the year compared to unregulated reaches, likely due to cooler temperatures. Irwin and Goar (2015) reported faster growth rates in age-0 fish downstream of the dam, citing similar findings in Sakaris (2006), Earley (2012), and Goar (2013), and attributed these findings to less intraspecific competition for resources resulting from lower densities of fish downstream of the dam. An alternative theory proposed by Irwin and Goar (2015) is that fish collected in these areas are survivors of these conditions and are therefore more genetically suited for faster growth rates. The study suggests that hatching success could increase if 10-15 day spawning periods of stable flows < 5,000 cfs are provided in the spring and summer months.

Kennedy (2015) used a modeling framework to estimate occupancy, colonization, and extinction rates of fish collected from 2005-2010 in regulated and unregulated reaches. Most species observed showed changes in occupancy as distance from the dam increased, indicating attenuation of the dam operation's effects further downstream. Blacktail Shiner (*Cyprinella venusta*), Speckled Darter (*Etheostoma stigmaeum*), Tallapoosa Darter, and Bronze Darter (*Percina palmaris*) did not show an obvious occupancy pattern with distance from the dam. Consistent flows in regulated reaches lead to an increase in availability of deep, fast habitat which likely resulted in an increase in occupancy of the Alabama Shiner. Largescale Stoneroller (*Campostoma oligolepis*) and Alabama Hogsucker (*Hypentelium etowanum*) both had occupancy probabilities estimated to decline in regulated reaches but stay consistent in unregulated reaches throughout the study. Low abundance of Largescale Stoneroller and Alabama Hogsucker in regulated reaches has been attributed to a low persistence of spawning habitat during the spring (Freeman et al. 2001 as cited in Kennedy 2015). Redbreast Sunfish and Muscadine Darter also had estimated decreases in occupancy during the duration of sampling. Juvenile Muscadine Darter prefer shallow, slow water habitats and Redbreast Sunfish require shallow and stable habitat for spawning. These species' decline in occupancy was attributed to changes in the availability and persistence of suitable physical and thermal habitat. Redbreast Sunfish, Muscadine Darter, and Bullhead Minnow all showed increased occupancy in unregulated reaches, possibly due to drought conditions that created favorable habitat. Occupancy of Tallapoosa Shiner was estimated to increase in regulated reaches due to increased baseflow; and decreases in unregulated reaches, possibly due to shallow, slow habitat during the study. By the end of sampling in 2010, occupancy probabilities of Tallapoosa Shiner did not differ among sites. Kennedy (2015) stated that tributaries can cause increases in baseflows and attenuation of hydrological effects of dams, could provide refuge from unfavorable mainstem conditions, and could serve as a source to supplement populations of fish in the mainstem, citing Bruns et al. (1984), Bain and Boltz (1989), and Kingsolving and Bain (1993). Kennedy (2015) therefore concluded that the 2007 drought may have caused fish to migrate out of tributaries and increase occupancy in the mainstem.

Lloyd et al. (2017) stocked marked juvenile Redbreast Sunfish and Channel Catfish in regulated areas below Harris Dam in 2015 and 2016 to determine if stocking these species could affect year-class strength. Redbreast Sunfish were marked by immersion in oxytetracycline to mark calcified structures of the fish. Stocked Channel Catfish were genetically distinguishable from native Channel Catfish and therefore did not need to be marked. Redbreast Sunfish did not uptake the marker (determined from some marked fish that were withheld from stocking) and no marked Channel Catfish were recaptured. The lack of recovered Channel Catfish may have been due to high mortality, predation, or emigration to tributaries or the downstream reservoir (Lake Martin) to escape thermal or hydrologic changes or to pursue better foraging opportunities. Length data gathered from the study showed low numbers of 150-250 mm Channel Catfish, a size class in which the stocked juveniles would likely belong. This was attributed to the likelihood of environmental bottlenecks for recruitment of this species.

Lloyd et al. (2017) also estimated growth, mortality, and recruitment in Channel Catfish and observed age-specific survivorship and fecundity rates in 2015 and 2016. The Channel Catfish population consisted of fish from ages 0 to 17. Capture rates were generally low but were highest at Horseshoe Bend. Temperature data was collected in both unregulated and regulated reaches and used to calculate cumulative degree days (°D) for Channel Catfish spawning for 2005-2016. In the regulated portion, median conditions for spawning (100°D) occurred in 7 out of 12 years and occurred as early as July 8. In the unregulated site, thermal spawning conditions occurred every year and were reached earlier than in regulated reaches every year. Population models determined that survival to age-1 was estimated to be < 0.03 percent and survival of fish at the first four age classes had the most substantial effect on population growth. Nash (1999), as cited in Lloyd et al. (2017), stated that low capture rates of younger fish and a lack of optimal thermal conditions for spawning could indicate recruitment overfishing.[6]

Irwin (2019) assessed the occupancy of shoal dwelling fish species above and below Harris Dam from 2005-2016. Specifically, Irwin (2019) measured persistence (defined as the

[6] Recruitment overfishing occurs when the population of mature, spawning adults is harvested at a rate that prevents the overall population from replenishing itself.

likelihood of a fish species present one year being present the following year) and colonization (defined as the likelihood of an absent fish species being present the following year), noting that wet years were underrepresented and dry/drought years were common during the study period. Fish were sampled from both regulated sites (reaches near Malone, Wadley, and Horseshoe Bend) and unregulated sites (in the mainstem Tallapoosa River upstream of Harris Reservoir and in Hillabee Creek). A total of 46 species were recorded over the duration of the study. Overall, fishes exhibited lower persistence and colonization rates at regulated sites than at unregulated sites, and there were considerable differences found among sites and years. Models of the effects of river regulation indicated lower probabilities of persistence and colonization of fishes at regulated sites compared to unregulated sites, which was attributed to flow instability and reduced temperatures. However, location downstream from the dam had an estimated positive effect on persistence of 23.7 percent of sampled species and an estimated positive effect on colonization of Shadow Bass (*Ambloplites ariommus*) and Lipstick Darter. Irwin (2019) stated that adults of the majority of species could likely persist below Harris Dam, but the Green Plan may not be conducive to colonization rates capable of increasing populations.

Irwin (2019) also assessed the macroinvertebrate community above and below Harris Dam from 2005-2017 at Malone, Wadley, Horseshoe Bend, the upper Tallapoosa River (Heflin) and Hillabee Creek. Regulated sites showed greater overall density but lower overall species richness than unregulated sites. More specifically, the average density of caddisflies (Trichoptera) was over three times greater in regulated sites than in unregulated sites. Mayflies (Ephemeroptera), true flies (Diptera), and caddisflies dominated regulated sites. Mayflies, true flies, and beetles (Coleoptera) dominated unregulated sites. Specifically, mayflies in regulated sites were mostly comprised of small minnow mayflies (baetids). True flies were mostly comprised of non-biting midges (chironomids) in regulated sites and both non-biting midges and black flies (simuliids) in unregulated sites. Greater diversity was found within the five most dominant orders (true flies, caddisflies, mayflies, beetles, and aquatic oligochaete worms (Tubificida)) in unregulated sites than in regulated sites. The absence of burrowing taxa requiring finer burrowing sediments and the abundance of generalist feeders in regulated sites suggest hydropeaking releases may reduce habitat and foraging resources for some species.

TABLE 2-5 SUMMARY OF FINDINGS FROM STUDIES IN THE TALLAPOOSA RIVER BELOW HARRIS DAM

Source	Years Sampled	Findings
Swingle 1954	1949, 1951	Pre-Harris surveys showed productivity in the Tallapoosa River was much lower than other Alabama rivers
Travnichek and Maceina 1994	1990-1992	Gamefish in deepwater habitats same in regulated vs. unregulated
		Sucker species densities higher in unregulated
		Overall densities higher in unregulated
Bowen et al. 1996	1990-1992[7], 1994, 1995	Mean IBI scores typically higher in unregulated Tallapoosa River than in regulated
Johnson 1997	1995	Yellow Elimia and an invasive species of Asian clam were present at nearly every mainstem and tributary site within the Project Area
Bowen et al. 1998	1994, 1995	Lower persistence of shallow water habitats may explain reduced densities of suckers
Irwin and Belcher 1999	1997, 1998	Creel data showed mostly catches of centrarchids followed by ictalurids
		Catch-per-unit-effort lower than in 1970s
Freeman et al. 2001	1994-1997	YOY abundance in regulated reach most commonly correlated with persistence of shallow habitat than with availability or intensity of flow extremes
		In regulated reach, habitat persistence levels similar to those in unregulated reaches only occurred in summer
Irwin et al. 2001	1999, 2000	Nest success of Redbreast Sunfish greater when flows are less variable, lower in magnitude, and when there are longer periods of non-generation
		Extremely high flows can cause nest failure
Sakaris 2006	2005	Age-0 catfish grew faster in regulated reach
Martin 2008	2006, 2007	Redbreast Sunfish abandon nest during peak flows
		Lower temps in regulated reach help Redbreast Sunfish "avoid" thermal maxima that cause negative growth in unregulated reaches
Irwin et al. 2011	2005-2009	IBI scores lower at regulated sites, but varied widely

[7] Data collected by Travnichek and Maceina (1994) during 1990-1992 was used in this study in addition to data collected in 1994 and 1995.

Source	Years Sampled	Findings
Earley 2012	2009-2011	Peaking had little effect on growth; no effect on movement
		Fish at regulated sites more stressed
Goar 2013	2005, 2007-2009	Fish growth rates higher at regulated sites
		Decreased temperature and flow fluctuations in lab studies negatively impacted growth and survival of age-0 Channel Catfish and Alabama Bass
Sammons et al. 2013	2009-2011	No strong evidence that growth, mortality, or recruitment were impacted by flow
Gerken 2015	2013-2015	Water temperature positively correlated with harvest-per-unit-effort
		Discharge negatively correlated with harvest-per-unit-effort of Alabama Bass and Redbreast Sunfish
Irwin and Goar 2015	2010-2014	Growth of age-0 fish higher at regulated sites
		Daily incremental growth negatively correlated with flow fluctuations
Kennedy 2015	2005-2010	Species occupancy increased with distance from dam
		Some species showed greater occupancy in the unregulated reaches, and some were greater in the regulated
Lloyd et al. 2017	2015, 2016	Possible environmental bottlenecks for recruitment of Channel Catfish
		Thermal spawning conditions for Channel Catfish met more frequently in unregulated site and occurred earlier
Irwin 2019	2005-2017	Overall lower persistence and colonization rates of fish species in regulated sites than in unregulated sites
		Macroinvertebrates showed greater density in regulated sites and greater richness in unregulated sites
		Macroinvertebrates that are generalist feeders are more abundant in regulated sites

2.4 SUMMARY

An estimated 137 species of fish have been known to occur within the TRB: 13 are non-native and three are considered to be extirpated (Gulf Sturgeon, Alabama Surgeon, and Alabama Shad). An estimated 15 mussel species have been known to occur within the TRB: one is considered extirpated, nine are considered imperiled or critically imperiled, two are considered threatened, and three are considered endangered.

In the spring, Alabama Power coordinates with ADCNR to maintain Harris Reservoir at a stable or slightly rising elevation for a two-week period to increase spawning success of sport fish species, including Largemouth Bass, Alabama Bass, and Black Crappie. A 13-16 inch slot limit was implemented in 1993 for all black bass species (Andress and Catchings 2005) but was later removed from Alabama Bass in 2006 (Andress and Catchings 2006). Since then, black bass population metrics and conditions have improved (Holley et al. 2012). Black Crappie have exhibited greater growth rates and size structures in the reservoir than in the river (Hartline et al. 2018).

After construction of Harris Dam, the Tallapoosa River downstream was initially regulated by peaking operations only, with no intermittent flows between peaks. In studies comparing the regulated portion of the river to unregulated reaches, the unregulated reaches typically showed higher IBI scores, and higher discharges were found to negatively affect IBI scores (Bowen et al. 1996). River regulation, which limited the amount and persistence of shallow habitat, appeared to affect fish that preferred those habitats more so than those that prefer deeper habitat (Travnichek and Maceina 1994; Bowen et al. 1998). Increased availability of these shallow-water habitats during spring and summer would likely increase reproductive success in a large variety of species (Bowen et al. 1998). However, the abundance of some species did not appear to differ in regulated reaches (Travnichek and Maceina 1994). Hydropeaking could also reduce nest success by causing physical damage to nests (Irwin et al. 2001) or by causing nest abandonment (Martin 2008). Nest success appears to be more affected by discharge than thermal regime (Irwin et al. 2001) and is more likely greater when flows are less variable, lower in magnitude, and when periods of non-generation are longer (Irwin et al. 2001).

The Green Plan was introduced in 2005 to reduce operational effects on downstream aquatic habitats. Spawning success of some species may benefit from periods of low and stable flow conditions in the summer and a moderate number of high pulses with steady fall rates (Sakaris 2006). The maintenance of higher minimum flow has been recommended to enhance growth and spawning success in Channel Catfish (Sakaris 2006). Spawning windows with suitable conditions of 10-15 days have also been recommended (Andress 2001; Martin 2008; Irwin and Goar 2015); however, thermal differences have been reported between unregulated and regulated reaches due to discharges being below ambient temperature. Channel Catfish appear to have a delayed spawning period below Harris Dam, possibly due to lower temperatures (Sakaris 2006), and some species tend to hatch earlier in less regulated reaches (Sammons et al. 2013; Lloyd et al. 2017). Conversely, growth rates of some species have been found to be higher in regulated reaches, possibly due to lower fish densities and a resulting lack of intraspecific competition for resources (Sakaris 2006; Earley 2012; Goar 2013). Some studies have found no significant differences in spawning or age-0 growth between unregulated and regulated reaches (Sammons et al. 2013). Recruitment overfishing may be occurring in the regulated portion of the river and is another factor that may affect population and condition metrics of sport fish species (Nash 1999, cited in Lloyd et al. 2017).

3.0 DOWNSTREAM FISH POPULATION STUDY

3.1 INTRODUCTION

Alabama Power and Auburn University are evaluating factors affecting fish populations in the Tallapoosa River below Harris Dam. Field sampling is currently ongoing to evaluate the fish community below Harris Dam. Although this study includes an assessment of the entire fish population, a subset of target species is being studied more intensively. The target species include Redbreast Sunfish, Tallapoosa Bass, Alabama Bass, and Channel Catfish. Data gathered from target species includes age, growth, and diet data. A literature review of existing information of preferred temperature ranges for the target species, including data on specific life stages (e.g., spawning) is being conducted and historical water temperature data is being evaluated to compare regulated and unregulated portions of the Study Area. Finally, Auburn University is developing a bioenergetics model for the target species to assess the extent to which Harris Dam operations affect fish growth in the Tallapoosa River. The model is incorporating a variety of inputs being collected by Auburn University including: existing literature/studies, age, growth, and diet data, fish tracking data, laboratory testing, and historical water temperature data. Auburn University's progress report, including methods and findings to date, is included in Appendix B.

3.2 SUMMARY

3.2.1 LITERATURE BASED TEMPERATURE REQUIREMENTS FOR FISH

Auburn University is reviewing existing literature for information on temperature requirements and limitations of the four target species; specifically, thermal minima, optimal temperature range, preferred temperature range (which can be dependent on acclimation temperatures), thermal maxima, and ideal spawning temperatures. There is little existing temperature data on the recently described Tallapoosa Bass and Alabama Bass species. Spotted Bass data are being gathered as a surrogate to Alabama Bass data since the two species are very closely related. The current known temperature requirement information of target species is summarized in Section 2.1 of Appendix B.

3.2.2 COMPARISION OF TEMPERATURE DATA IN REGULATED AND UNREGULATED PORTIONS OF THE STUDY AREA

Auburn University obtained historic temperature data (2000-2018) from Alabama Power at the Harris Dam tailrace, Malone, and Wadley. The temperature was least variable in the tailrace and most variable at Wadley. Daily fluctuations of 10 °C were rare during both Pre-Green Plan and Green Plan operations. Overall, releases from Harris Dam could cause temperature decreases of 4 °C in the summer and 1-2 °C in the fall (see June 2, 2020 HAT 3 meeting summary in Attachment 2). Mean monthly temperatures, yearly temperature variation, daily temperature ranges, mean temperature trends, and average air and water temperatures are summarized in Section 2.2 of Appendix B. A direct comparison of temperatures between unregulated and regulated reaches will be included in the Final Aquatic Resources Study Report in April 2021.

3.2.3 DESCRIPTION OF CURRENT FISH POPULATION

Auburn University is assessing the fish population at three locations in the Tallapoosa River downstream of Harris Dam (the Harris Dam tailrace, Wadley, and Horseshoe Bend) and at one reference site upstream of Lake Harris on the Tallapoosa River (Lee's Bridge). Due to closure of the Horseshoe Bend National Military Park for COVID-19, Griffin Shoals (roughly 4.5 miles upstream of Horseshoe Bend) was sampled instead of Horseshoe Bend during May 2020. All collected fish are identified, weighed, and measured. Target fish are transported to Auburn University for respirometry tests and are having otoliths, gonads, and stomach contents removed to gather growth, reproductive, and diet data for bioenergetics modeling. Numbers of target species and summaries of fish species caught at each of the sites to date are summarized in Section 2.3 of Appendix B.

3.2.4 BIOENERGETICS MODELING

Auburn University is conducting respirometry tests to model the bioenergetics of the target species in response to hydropeaking. Specifically, intermittent flow static respirometry is being conducted to quantify standard metabolic rates of fish at multiple temperatures (10 and 21 °C) and swimming respirometry is being used to quantify performance capability and the active metabolic rates of target species. Swimming respiration tests will assess the effects of rapid flow changes, rapid temperature changes, and a combination of both rapid flow and temperature changes on active metabolic rate. Additional information on the methods and progress of respirometry tests to date are summarized in Sections 2.4 and 3.4 of Appendix B.

Metabolic rates will be used with other variables collected from fish to create the bioenergetics model. Of the target species, only Channel Catfish has a published bioenergetics model (Blanc and Margraf 2002, as cited by Auburn University in Appendix B). However, this model is based on a population from a lentic environment, not a lotic environment such as the Tallapoosa River. Bioenergetics modeling will be used to assess the effect of Harris Dam operations on growth of the target species. Results and implications of the bioenergetics modeling will be provided in the Final Aquatic Resources Study Report in April 2021.

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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

AUBURN UNIVERSITY PROGRESS REPORT

USING BIOENERGETICS TO ADDRESS THE EFFECTS OF TEMPERATURE AND FLOW ON FISHES IN THE HARRIS DAM TAILRACE

PROGRESS REPORT

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USING BIOENERGETICS TO ADDRESS THE EFFECTS OF TEMPERATURE AND FLOW ON FISHES IN THE HARRIS DAM TAILRACE

PROGRESS REPORT

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USING BIOENERGETICS TO ADDRESS THE EFFECTS OF TEMPERATURE AND FLOW ON FISHES IN THE HARRIS DAM TAILRACE

PROGRESS REPORT

1.0 INTRODUCTION

Peaking hydroelectric dams are an important component of the energy production portfolio of many electric power generation companies (U.S. DOI Bureau of Reclamation 2005; Kaunda et al. 2012; FERC 2017). In these peaking systems, the upstream reservoir provides stored water for generation of hydropower during periods of high demand for electricity. Although some possible benefits of these peaking flows to the downstream riverine environments have been suggested (e.g., vegetation control, sediment scouring, cues for spawning or migration; Young et al. 2011), most quantified effects have been negative (reviewed in Young et al. 2011). Unfortunately, the fluctuation of high and low flows causes dramatic changes in the habitat downstream for aquatic species (Cushman 1985; Perry and Perry 1986; Ligon et al. 1995; Young et al. 2011). Not only does flow increase as water is released during generation but variation can occur in water temperature (depending on both the amount of base flow and the temperature of water released from the reservoir relative to that in the tailrace) and dissolved oxygen (e.g., Ashby et al. 1999). Rapid shifts in either flow or temperature as well as a combination of the two can create stressful conditions for aquatic life, including fishes, in the tailrace (e.g., Floodmark et al. 2004; Carolli et al. 2012; Taylor et al. 2012). Some short-term effects of increasing flow for fishes include increased energetic expenditure due to rapid swimming against the current, forcing the fish to take refuge in low flow perhaps suboptimal areas, or causing them to be swept downstream. High flow events can also scour the streambed, potentially removing habitat, reducing available food, or destroying nests if occurring during nesting or spawning. Water temperature shifts can cause behavioral changes in fishes, reduced swimming performance (reduced scope for activity), reduced feeding rate, and/or reduced respiration rates. Clearly there are a variety of complex and interconnected effects that such peaking flows can have on the tailrace community below a dam (Young et al. 2011).

Harris Dam on the Tallapoosa River is an example of a peaking generation hydroelectric facility. Operation of the Harris Project began in 1983, functioning at that time as a peaking facility with no intermittent flows between generation periods. During generation events at Harris Dam, water is released from the deeper colder layers of water, the hypolimnion, from the upstream reservoir causing a simultaneous rapid decrease in tailrace water temperature (during the warmer months) and increase in water velocity; effects are most pronounced in the immediate tailrace area and, at least for temperature, can decrease with distance downstream of the tailrace (e.g., Ashby et al. 1995, 1999). Discussions among stakeholders led to a modification of the Harris Dam operations in 2005 which included a pulsing scheme for releases from Harris Dam that came to be known as the "Green Plan" (Kleinschmidt Associates 2018; also see Parasiewicz et al. 1998, L'Abee-Lund and Otero 2018). Although the Green Plan does provide for flows between peaking flows, the water is still pulled from the hypolimnion, continuing to yield pulses of higher flow with cold water temperatures during peaking high flow events.

More than a decade has passed since implementation of the "Green Plan" for the operation of Harris Dam, but questions remain as to the effects of current operations on temperatures, flow, and ultimately on fishes in the immediate tailrace and downstream. Some stakeholders are concerned that water temperatures are cooler downstream of Harris Dam than in unregulated areas and that those lower temperatures, temperature fluctuations, and flow variation are affecting fishes (see Goar 2013).

Bioenergetics modelling is a powerful approach to understand the effects of this complex combination of environmental conditions and biological factors. More specifically, bioenergetics models have been used to integrate and investigate the impacts of changing diet, temperature, activity rates, and the influence of stressors on the growth of fishes (Hartman and Hayward 2007). Parameters of these models are largely drawn from experiments where the fish are acclimated to relatively constant temperature and activity conditions. The conditions downstream of peaking generation facilities are highly variable, requiring the evolution of these models to be applicable.

Here we propose to use a multifaceted approach combining use of published data, field sampling, and laboratory investigations, all integrated within a bioenergetics modeling framework to quantify and describe the potential impacts of variation in both flow and temperature on the performance of fish species that are both recreationally and ecologically important below Harris Dam.

Project Objectives: The overall objective for this project is to evaluate the effects of altered flow and temperature due to discharge from Harris Dam on resident fishes in the tailrace using a bioenergetics modeling approach. Specific objectives are to:

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

2.0 PROGRESS SUMMARY

2.1 OBJECTIVE 1: LITERATURE REVIEW OF TEMPERATURE REQUIREMENTS

While some data relevant to the effects of temperature exist for two of our study species (redbreast sunfish and channel catfish), none exist for Tallapoosa bass, given its relatively recent description as a new species (Baker et al. 2013). In addition, the Alabama bass *Micropterus henshalli* was also just recently described (Baker et al. 2008), so we have searched for temperature data for the most closely related species, the spotted bass *Micropterus punctulatus*.

Data we have located to date are included in Table 1. We continue to search for data that include lethality or LC50 tests that would indicate the minimum and/or maximum temperatures leading to mortality of our study species; however, to date we have not been able to locate any such information. The information that is presented in Table 1 is drawn from a variety of studies that infer maximum or minimum temperatures, as well as optimal and/or preferred temperatures (e.g., McMahon and Terrell 1982; McMahon et al. 1984; Aho et al. 1986). In fact, Mathur et al. (1981) demonstrated that preferred temperatures of a wide range of species were influenced by acclimation temperature, further complicating these findings. We continue to work with these data and search for additional data.

2.2 OBJECTIVE 2: SUMMARY OF ANALYSIS OF EXISTING TEMPERATURE DATA

Historic temperature data from 2000 – 2018 were provided to Auburn by the Alabama Power Company. Temperature loggers recorded temperature once per hour at three locations (Wadley, Malone, and Harris Dam Tailrace) along the Tallapoosa River; however, due to periods of high flow or device malfunction, some data were missing every year. The missing data tended to occur during winter and thus winter temperatures could not be analyzed for any year. Temperature data from the tailrace, Malone, and Wadley were analyzed using the statistical package R (R Studios 2015).

In total there were 111,366 temperature measurements across the 19 years, with 2000-2004 measuring pre-Green Plan and 2005-2018 measuring post-Green Plan. Hourly data points were used to generate daily averages, maximum, and minimum temperatures through the year. This eliminated some temperature variation but allowed for the best comparison of temperatures across years. Once this was done for each site, average monthly temperatures pre- and post-Green Plan were analyzed using analysis of variance. The only significant differences were within years due to seasonality while there were no significant differences in monthly temperature pre- and post-Green Plan (Figure 1).

Most years showed temperatures rising over the summer and being lower in fall and spring. Some years did have periods of relatively higher variation during both pre- and post-Green Plan periods, although these fluctuations did not differ significantly from other years (Figure 2). The tailrace showed the least total variation in daily temperatures while Wadley had the greatest total temperature variation. Extreme fluctuations in temperature (defined here as a 10°C shift; Malone: 0.61% days pre-Green Plan, 0% days post-Green Plan, Wadley: 0% days pre-Green Plan, 0.57% days post-Green Plan) (Figure 3) were rare. Temperature tended to increase as water moved downstream across most months, with slightly greater differences, though not statistically significant, among locations post-Green Plan versus pre-Green Plan (Figure 4). Water temperature in the tailrace tended to be warmer than air temperature in the fall and spring, and vice versa in the summer, while water temperature at the Malone and Wadley sites was generally greater than air temperature in all months (Figure 5).

2.3 OBJECTIVE 3: FISH COMMUNITY SAMPLING

SITE DESCRIPTIONS (see Figure 6).

Horseshoe Bend. The Horseshoe Bend site is at a popular recreational location on the Tallapoosa River with a paved boat ramp and parking area. Riffles and runs dominate the habitat within the immediate vicinity of the access point; however, upstream and downstream of the access point are deep pools and channels. We currently have two active temperature loggers (Onset Computer Corporation; Massachusetts, USA) deployed at this site- one upstream of the access point and one downstream. The upstream logger is in an eddy off a large run while the downstream logger is in a deep pool; both are anchored to a tree on the bank and to a brick in the water. We are sampling this site once every other month using standardized boat electrofishing (Midwest Lake Management, Inc.; Missouri, USA).

Wadley. The Wadley site is located just southeast of Wadley, Alabama, and is accessed via bank-launch under the AL-77 bridge. Sampling at this site is limited by a small, impassible shoal upstream and a larger shoal complex downstream. The area between shoals is mostly deep, flowing water with abundant hard woody debris along the banks. We currently have two temperature loggers (Onset Computer Corporation; Massachusetts, USA) deployed at this site- one in the deeper central stretch and one in a shallow part of the downstream shoal. We are sampling this site once every other month using standardized boat electrofishing (Midwest Lake Management, Inc.; Missouri, USA).

Lee's Bridge. The Lee's Bridge site is our upstream, least-impacted ("control") site and is located 6.4 river km upstream of the Lee's Bridge boat ramp. There is little habitat heterogeneity at this site which is dominated by sluggish, turbid water. The upstream boundary of our sampling area is a small shoal that is impassible under normal flow conditions. We currently have two temperature loggers (Onset Computer Corporation; Massachusetts, USA) deployed at this site- one located immediately downstream of the bounding shoal and one in a deeper, slower pool. We are sampling this site once every other month using standardized boat electrofishing (Midwest Lake Management, Inc.; Missouri, USA). Low flows during November 2019 prevented us from reaching our usual site; for this one trip, we substituted a reach ~0.8 river km downstream.

Tailrace. The tailrace site is in the immediate tailrace of R.L. Harris Dam. This site is composed primarily of shoal habitat interspersed with deep, rocky pools. On the western side of the river there is a large, man-made "rip-rap" bank that extends ~0.3 km downstream of the dam. We currently have one temperature logger (Onset Computer Corporation; Massachusetts, USA) deployed at this site at the base of the rip-rap bank. We are sampling this site once every other month using standardized push-barge electrofishing (Midwest Lake Management, Inc., Missouri, USA). Given that barge electrofishing requires the sampling team to be in the water while sampling, the voltage/amperage used is slightly lower than boat electrofishing (see below).

SAMPLING METHODS

We collected samples via boat (Photo 1) and barge (Photo 2) electrofishing using six (6), 10-minute (600 second) transects. When using the boat, amperage was set at 5-7 amps with 25 pulses per second; when using the barge, amperage was set at 3-5 amps with 25 pulses per second. After each transect, all collected fish were euthanized and placed in a labeled bag on ice for transport to the lab. In the lab, all individuals were identified to species, weighed, and measured. Target species were sexed and dissected, and we extracted the largest otolith (lapillar in Siluriformes and sagittal in Centrarchidae) for age-and-growth analysis and stomach contents for use with the bioenergetics model.

RESULTS

All sites were sampled in April/May, July, September, November 2019, and January and March 2020 with 6 transects sampled per site per date. During May 2020 Horseshoe Bend National Military Park was closed due to the Covid-19 pandemic, so the Horseshoe Bend site was not accessible; given this, we sampled Griffin Shoals for the May 2020 sampling date. Collected fish were returned to the lab where all individuals were identified, and up to 10 individuals per non-target species were weighed (nearest g) and measured (nearest mm total length). Additional individuals beyond those 10 were bulk weighed as a group by species. In addition, all individuals for all target species (including black basses) were weighed (nearest g), measured (nearest mm total length), sexed, gonads removed and weighed, diets removed and preserved in 95% ethanol, and otoliths removed, cleaned, and stored dry. To date, all diets have been quantified, all prey items identified and a subsampled measured, and all diet data have been entered into a spreadsheet. The number of fish sampled to date whose diet have been quantified are presented in Table 2. In addition, to date otoliths of all target species have been stored dry and are in the process of being prepared, sectioned (for those fish ≥5 years old), aged, and all annuli measured to allow back-calculations of size-at-age for growth analysis. Thus far we have collected 54 species of fish (plus individuals of 3 hybrid combinations), with 16 species having been collected across all 4 sites (Table 3). Current species richness across sites ranged from a low of 32 (Horseshoe Bend) to a maximum of 37 (Lee's Bridge). Several species were unique to a particular site. These included 6 species at Lee's Bridge (bowfin, grass carp, pretty shiner, white bass, bullhead minnow), 4 species at the Harris tailrace (snail bullhead, rough shiner, black madtom, Dixie chub), 1 species and 1 hybrid at Wadley (speckled madtom, redbreast sunfish x unknown sunfish hybrid), and 3 species at Horseshoe Bend (blueback herring, skipjack herring, golden shiner)

2.4 OBJECTIVE 4: RESPIROMETRY AND BIOENERGETICS MODELING

In order to model the energetics of the target species in relation to hydropeaking conditions, we are using two forms of respirometry in the lab: intermittent flow static respirometry and closed-system swimming respirometry. Static respirometry is being used to measure the baseline metabolic rate of the target species at multiple temperatures. Metabolic rates from this work will be incorporated into the bioenergetics models for the target species at each location. The recent addition of a swimming respirometer to our laboratory allows us to measure the active metabolic rates of swimming fish and to evaluate swimming performance for our target species. While we have begun this laboratory work, it is ongoing and thus not yet fully complete. In Table 4 we present the number of fish that have been tested to date, and in Table 5 we present the number of fish that each trial requires. Challenges encountered in the work completed to date include designing and assembling large static respiration chambers and technical issues in running the swimming respirometer.

Individuals of the target species were collected from our 4 sites via electrofishing (Figure 6). Collected fish were placed into aerated buckets on the boat, transferred to an oxygenated transport tank or aerated cooler filled with river water, and transported to the Auburn University Ireland Center wet lab. In the laboratory, fish were acclimated to experimental test temperatures via a maximum 1°C per day adjustment until experimental temperatures were reached.

To quantify the effects of hydropeaking operations on fish metabolic rate, we are using intermittent static respirometry to quantify standard metabolic rates (Figure 7; Photo 3). After fish are acclimated to laboratory conditions for 2 weeks, individuals are transferred to a Loligo respirometry chamber of appropriate size to minimize fish movement and activity (Photo 3). Fish are then allowed to acclimate overnight in the chamber with continual flushing with water from a temperature-controlled water reservoir. After the overnight acclimation period, the system is sealed by turning off the flush pump while maintaining flow through a recirculating pump. Fish are left in the sealed system with oxygen levels measured by a Loligo Witrox 4 fiber optic system once every second until oxygen is depleted (< 1 mg/L). Two temperatures are being used for recirculating static respirometry (10 and 21°C); at the present time, fish have only been tested at 21°C (Table 4). Standard metabolic rates are being determined for adult sized individuals of all target species for individuals collected from all four sites.

We are using swimming respirometry to quantify both the performance capabilities of fish and their active metabolic rates (Figure 8; Photo 4). Individuals are lightly sedated (until loss of voluntary movement and reduced reflexes) with neutrally buffered MS-222 to allow us to weigh and measure them (both length and cross-sectional area), after which the fish is allowed to acclimate to the chamber overnight. During this acclimation, water is flushed through the system continuously to maintain constant temperature and dissolved oxygen at a flow rate of one-half body length per second. A Loligo Witrox 4 unit is used in combination with Loligo's AutoResp software to monitor and record temperature and dissolved oxygen throughout acclimation and experimentation. Water is recirculated through a heated/chilled and oxygenated water reservoir until testing begins, at which point the swim tunnel is sealed via automated control. Exhaustion is defined as when a fish impinges on the back grating of the swim chamber for longer than 20 seconds or impinges for a second time at the same speed. Cameras are placed in both vertical and horizontal planes to ensure that the full range of motion is being captured. For both basic swimming performance and active metabolic rates, flow rates are started at 0.5 body lengths per second and increased every 1 hour by 0.5 body lengths per second until the fish reaches exhaustion (unless the fish is sufficiently large to reduce the oxygen concentration in the water quickly, in which case the speed is increased every 0.5 hour). At that point, critical swimming speed can be calculated (Bell and Terhune 1970, Gehrke et al. 1990) using the following equation:

$$U_{crit} = u1 + (u2)(\frac{t1}{t2})$$

where $u1$ is the last speed the fish swam the prescribed time, $u2$ is the velocity increment, $t1$ is the time the fish swam at the fatigue velocity and $t2$ is the time increment per velocity step (Parsons and Foster 2007). Active metabolic rates will be calculated at each speed increment for use in bioenergetics modeling.

Bioenergetics models of fish physiology can be used to simulate the impact of changes in prey type, water temperature, and activity on the either growth rate or food consumption rate of target fishes. These models are essentially energy-balance simulations where food consumed is converted to growth, waster products, or energy in the form of metabolism (respiration) (Figure 10). Bioenergetics models rely on mechanistic functions that relate maximum consumption and respiration on the body weight of the fish, water temperature, and, for respiration, activity (Adams and Breck 1990). For several species, the parameters of these functional relationships have been published and the resulting models have been tested. For the species of interest in the Tallapoosa River (channel catfish, Tallapoosa bass, Alabama bass, and redbreast sunfish), only channel catfish has a bioenergetics model that has been published and that model was for a lentic population (Blanc and Margraf 2002). As part of our study, we are determining the temperature and weight dependence parameters needed to estimate respiration rates for our target fish species. Currently, we have measured the baseline respiration rates for redbreast sunfish, Alabama bass, and channel catfish.

Model simulations require data from Tallapoosa River fish populations including diets, body weight, growth, and water temperature. Diet, size distributions, and growth rates are currently being estimated as part of the field fish sampling program. Water temperatures are being recorded with data loggers.

3.0 PLANNED ACTIVITIES FOR 2020

3.1 OBJECTIVE 1: LITERATURE REVIEW OF TEMPERATURE REQUIREMENTS

We continue to search the published and unpublished literature for any available information relative to temperature tolerances, preferences, or optima for our study species and will incorporate any data we find into our final report.

3.2 OBJECTIVE 2: SUMMARY OF ANALYSIS OF EXISTING TEMPERATURE DATA

Temperatures recorded from 2019 and 2020 will be incorporated with the historical data and will be analyzed for any differences between 2019/2020 versus previous years. These data will be used to inform swimming respirometry trials. We will compare the temperatures upstream of R.L. Harris Dam (Lee’s Bridge site) to those downstream of the dam to determine if the hypolimnetic releases during power generation alter the water temperatures downstream.

3.3 OBJECTIVE 3: FISH COMMUNITY SAMPLING

We will continue to sample each site every other month, weather and water-level permitting. Additionally, we will explore the potential for adding an alternative "control" site upstream of R.L. Harris Reservoir or in an unregulated tributary. We believe an alternative site is necessary because the flow regime of our current upstream site appears to be more closely linked to dam operations than previously thought. Additionally, over the course of 2019 we found only one Tallapoosa Bass upstream of the reservoir so additional sites may be necessary to collect a suitable dataset.

Recent research in our lab has demonstrated that electromyogram (EMG) telemetry data may be somewhat limited in its ability to quantify fish swimming energetic costs. This, combined with the relatively large size of these tags for our study target species has led us to consider other options to quantify fish movement. At this point, we plan to use combined acoustic/radio (CART) tags which will allow us to actively track individual fish from a canoe/jon boat as well as detect their position with a stationary receiver. Tagging and tracking will occur during summer 2020 when weather conditions and water temperatures exhibit strong variation. Due to the small size of the tags, the batteries have a relatively short life so it is imperative that we plan our tracking efforts when conditions are most likely to be favorable.

3.4 OBJECTIVE 4: RESPIROMETRY AND BIOENERGETICS MODELING

In 2020 we will complete the planed trials for static and swimming respirometry outlined in Table 5. Static respirometry will also continue with fish tested at both 21°C and 10°C. With acquisition of larger chambers, adult fish can now be included in standard metabolic rate measurements. Fish will be collected throughout the year to capture seasonal variation (due to reproductive state, season, ambient temperature prior to acclimation, etc.).

To model fish response to rapidly changing water temperature in the swimming respirometer, after acclimation, fish will be swum for 2 hours at 50% of that species' average critical swimming speed for their collection location with the tunnel sealed and respiration quantified. After 2 hours, the water will be exchanged between a water reservoir (chilled to a temperature that occurs during a hydropeaking pulse in the tailrace based on HOBO logger data) and the swim chamber. After temperature has stabilized, the system will be sealed, and oxygen consumption recorded for 2 more hours while the fish again swims at half of critical swimming speed (Figure 9).

We will also combine increasing water velocity with decreasing water temperature. The fish will swim for 2 additional hours at 50% of that species' average critical swimming speed for their capture location while respiration is monitored in the sealed system. After two hours, the water velocity will be increased to the maximum critical swimming speed recorded for that location as cooler water is simultaneously exchanged into the chamber. Water will continue to be exchanged until the temperature in the swim channel stabilizes, at which time the chamber will be sealed, and respiration monitored for 2 more hours at 50% critical swimming speed. These same procedures will be repeated with fish experiencing an increase in water velocity and a water change with same temperature water as a control.

To complete the bioenergetics models needed for the simulations, we will estimate the physiological parameters and functions describing the impact of changing temperature and flow rate (activity) on respiration rate from data collected in the swimming respirometry trials. Consumption parameters will be derived from similar species for which consumption parameters are published.

Once we have estimated the physiological parameters necessary, we will integrate those into the basic bioenergetics model to conduct simulations needed to test the potential influence of water temperature and flow on the growth rate of fish below Harris Dam. We plan to test scenarios estimating the annual growth of the target fish species using temperature patterns and diets observed in control versus more impacted reaches of the Tallapoosa River. The impact of activity rate will be tested using the observed changes respiration observed from the swimming respirometery trials. These simulations will allow us to explore the potential impacts of the flow and temperature variation on the physiological responses of the fish. Differences between the observed patterns of growth from the field and the simulated patterns will suggest mechanisms other than physiological responses such as changes in food availability or behavioral shifts that may negatively or positively modify the responses of the fish to pulsed releases of water from Harris Dam.

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Table 1. Temperature information as obtained from the published literature and grey literature publications.

	Thermal Minima	Optimal Temp Range	Preferred Temps[1]	Thermal Maxima	Ideal Spawning	Sources
Redbreast Sunfish	15	27-29, 25-30	18-32	36	21,20-25,22-26	Mathur et al. 1981; Aho et al. 1986; Sammons and Maceina 2009; Beauchene et al. 2014
Tallapoosa Bass	--	--	--	--	--	nothing currently available
Alabama Bass/Spotted Bass	10	23.5-24.4		34?	14-15	McMahon et al. 1984
Channel Catfish	6.5, 18	26-29	15-31	33.5,38.7; 28-30 for fry	21	Mathur et al. 1981; McMahon and Terrell 1982

[1]=depends on acclimation temps

Table 2. Numbers of target species individuals for which diets have been obtained and quantified by sample site. Griffin Shoals was sampled during May 2020 because Horseshoe Bend National Military Park was closed due to the Covid-19 pandemic, making that sample site inaccessible.

	Lee's Bridge	Harris Tailrace	Wadley	Horseshoe Bend	Griffin Shoals
Tallapoosa Bass	1	2	6	15	12
Alabama Bass	43	55	107	91	18
Largemouth Bass	4	0	3	1	2
Redbreast Sunfish	12	17	72	133	10
Channel Catfish	40	32	8	18	6

Table 3. Species present at four sampling sites on the Tallapoosa River, Alabama. Species listed in **bold** font were captured at all four primary sampling locations (Lee's Bridge, Tailrace, Wadley, Horseshoe Bend); Griffin Shoals was sampled during May 2020 because Horseshoe Bend National Military Park was closed due to the Covid-19 pandemic, making that sample site inaccessible. N values for each site are the total number of species (not counting hybrids) collected at each site (not included for Griffin Shoals because that site was only sampled once).

Species	Lee's Bridge	Tailrace	Wadley	Horseshoe Bend	Griffin Shoals
	n=37	n=36	n=33	n=32	
Alosa aestivalis				x	
Alosa chrysochloris				x	
Ambloplites ariommus		x	x	x	x
Ameiurus brunneus		x			
Ameiurus melas					x
Ameiurus natalis	x	x	x		x
Ameiurus nebulosus		x	x		
Amia calva	x				
Campostoma oligolepis	x	x	x		
Ctenopharyngodon idella	x				
Cyprinella callistia		x	x	x	x
Cyprinella gibbsi	x		x	x	
Cyprinella venusta	**x**	**x**	**x**	**x**	x
Cyprinus carpio	**x**	**x**	**x**	**x**	
Dorosoma cepedianum	x			x	
Dorosoma petenense	**x**	**x**	**x**	**x**	
Etheostoma chuckwachatte		x	x		x
Etheostoma stigmaeum	x	x	x		
Etheostoma tallapoosae		x	x		
Fundulus olivaceus	**x**	**x**	**x**	**x**	
Hypentelium etowanum	**x**	**x**	**x**	**x**	x
Ictalurus furcatus	x			x	
Ictalurus punctatus	**x**	**x**	**x**	**x**	x
Lepomis auritus	**x**	**x**	**x**	**x**	x
Lepomis auritus x unknown			x		
Lepomis cyanellus		x	x	x	
Lepomis gulosus	x	x		x	
Lepomis macrochirus	**x**	**x**	**x**	**x**	x
Lepomis macrochirus x auritus			x		x

Species	Lee's Bridge	Tailrace	Wadley	Horseshoe Bend	Griffin Shoals
Lepomis macrochirus x cyanellus		x	x	x	
Lepomis microlophus	x	x		x	x
Luxilus chrysocephalus		x	x		
Lythrurus bellus	x				
Micropterus henshalli	**x**	**x**	**x**	**x**	x
Micropterus salmoides	**x**	**x**	**x**	**x**	x
Micropterus tallapoosae	**x**	**x**	**x**	**x**	x
Minytrema melanops	x		x	x	
Morone chrysops	x	x			
Morone saxatilis	x				
Moxostoma carinatum	x				
Moxostoma duquesnei	x		x	x	x
Moxostoma poecilurum	**x**	**x**	**x**	**x**	x
Notemigonus crysoleucas				x	
Notropis baileyi		x			
Notropis stilbius	x		x	x	x
Notropis texanus	x	x			
Notropis xaenocephalus	**x**	**x**	**x**	**x**	
Noturus funebris		x			
Noturus leptachanthus			x		
Percina kathae	**x**	**x**	**x**	**x**	
Percina palmaris		x	x	x	x
Percina smithvanizi	**x**	**x**	**x**	**x**	
Pimephales vigilax	x				
Pomoxis annularis	x	x	x		
Pomoxis nigromaculatus	**x**	**x**	**x**	**x**	
Pylodictis olivaris	x			x	x
Semotilus thoreauianus		x			

Table 4. (A) Numbers of fish of each target species that have been run in static respirometry during 2019 and through May 2020 at either 10°C or 21°C. (B) Numbers of fish that have been tested in the swimming respirometer during 2019 and through May 2020 under baseline and temperature change conditions to quantify critical swimming speed and active metabolic rate.

A.

Temperature (°C)	Redbreast Sunfish	Channel Catfish	Alabama Bass	Tallapoosa Bass
10	5	0	0	8
21	35	2	11	4

B.

Trial Type	Redbreast Sunfish	Channel Catfish	Alabama Bass	Tallapoosa Bass
Baseline	9	5	14	2
Temperature Change	0	0	6	0

Table 5. (A) The total number of fish of each target species still needed for static respirometry at each temperature in 2020. (B.) The total number of fish of each target species needed for swimming respirometry in 2020. Note that all of these numbers represent minima and we hope to be able to run more than these numbers.

A.

Temperature (°C)	Redbreast Sunfish	Channel Catfish	Alabama Bass	Tallapoosa Bass
10	6	20	20	14
21	8	18	9	16

B.

Trial Type	Redbreast Sunfish	Channel Catfish	Alabama Bass	Tallapoosa Bass
Baseline	3	4	5	10
Quick flow change	12	12	12	12
Quick temperature change	12	12	6	12
Combined flow and temperature change	12	12	12	12

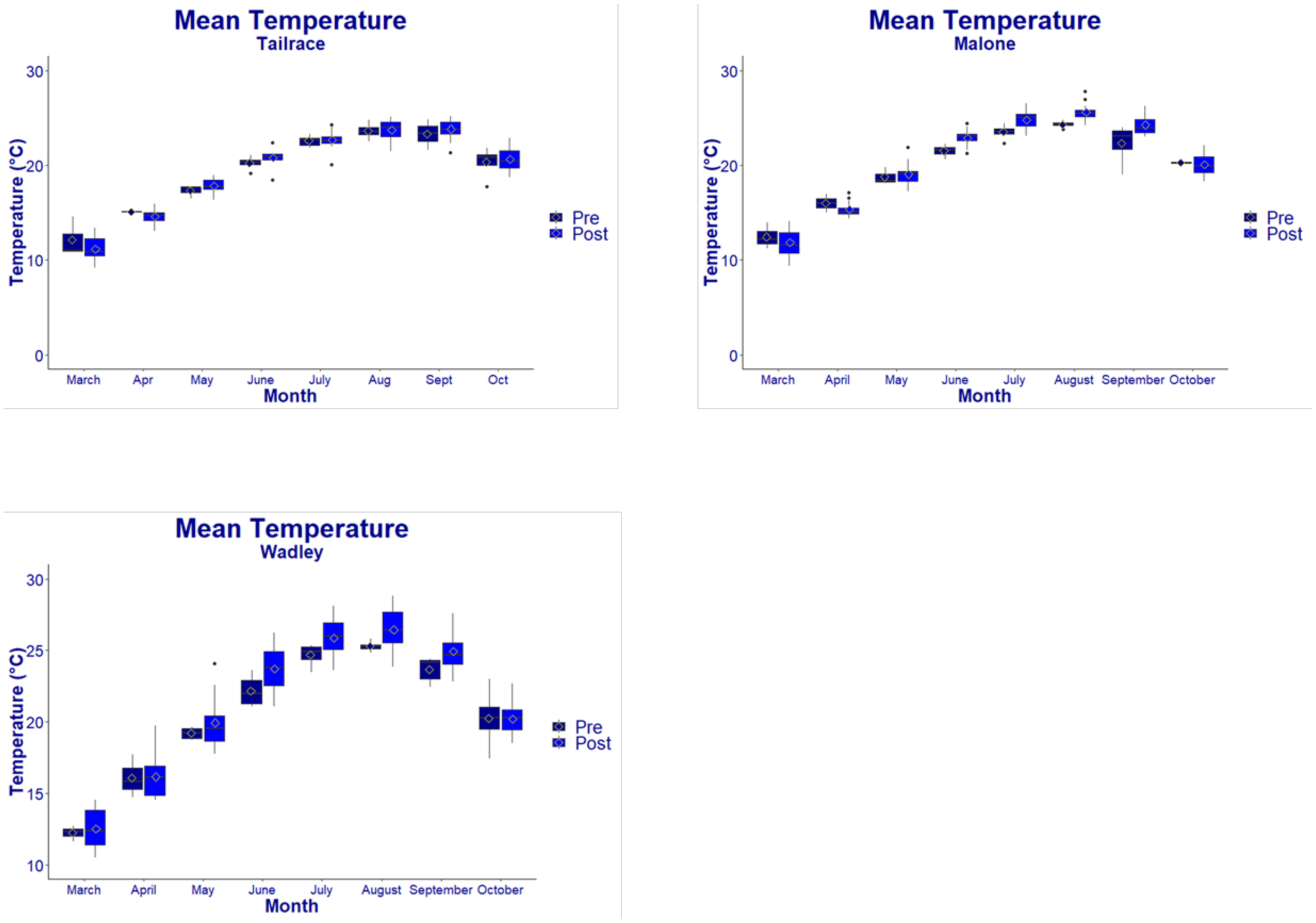
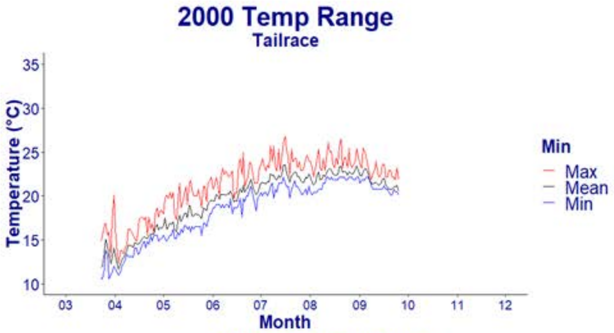


Figure 1. Boxplots show the mean average temperatures (diamonds) per month pre- and post-Green Plan for all three locations. First and third quartiles are represented by boxes and whiskers show 1.5*interquartile range with outliers being plotted points. Mean average temperatures were not significantly different between pre- and post-Green Plan years. Though not significant, the largest variation was recorded at Wadley, which is the furthest site downstream.


2000 Temp Range
Tailrace
Temperature (°C)
35
30
25
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05
06
07
08
09
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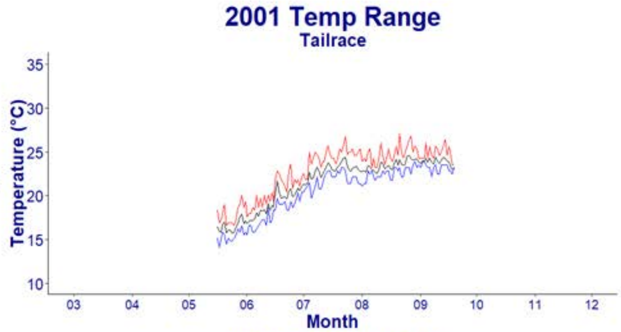
11
12
Month
Min
Max
Mean
Min


2001 Temp Range
Tailrace
Temperature (°C)
35
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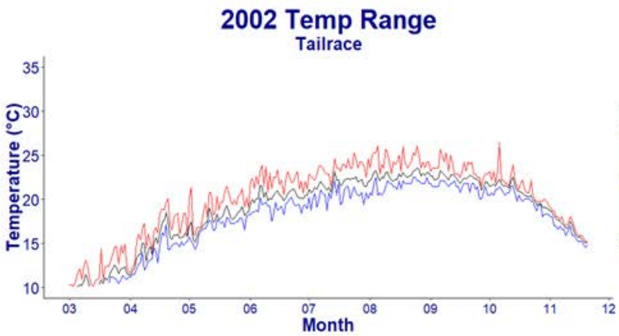
Month


2002 Temp Range
Tailrace
Temperature (°C)
35
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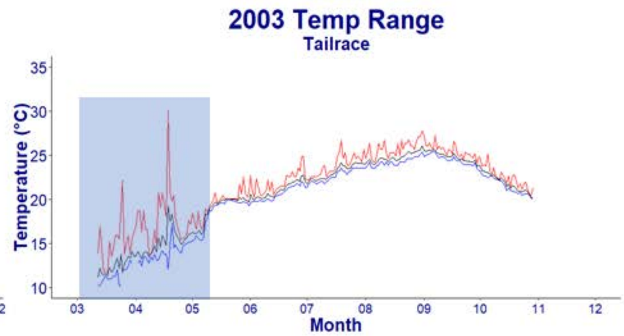
12
Month


2003 Temp Range
Tailrace
Temperature (°C)
35
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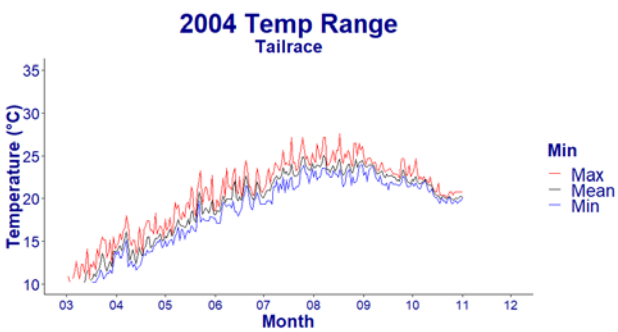
Month


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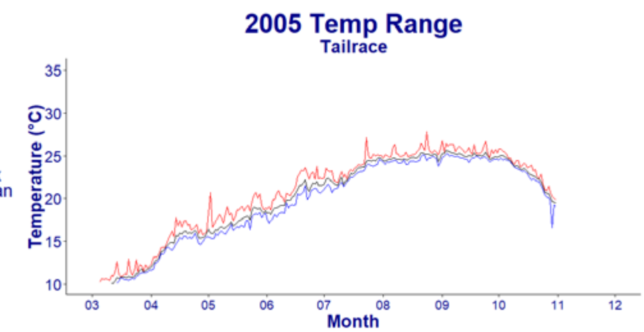
Month
Min
Max
Mean
Min


2005 Temp Range
Tailrace
Temperature (°C)
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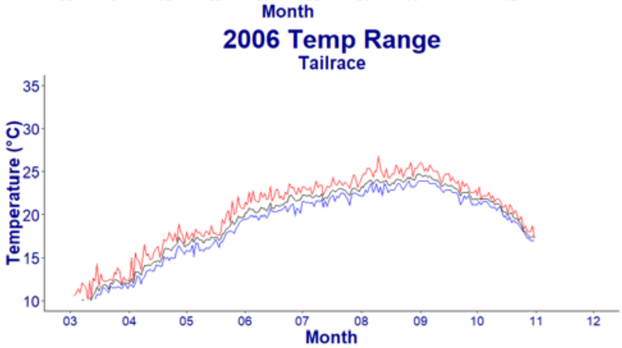
Month


2006 Temp Range
Tailrace
Temperature (°C)
35
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10
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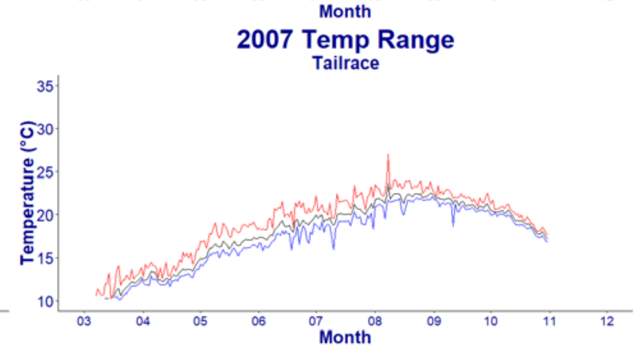
12
Month


2007 Temp Range
Tailrace
Temperature (°C)
35
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10
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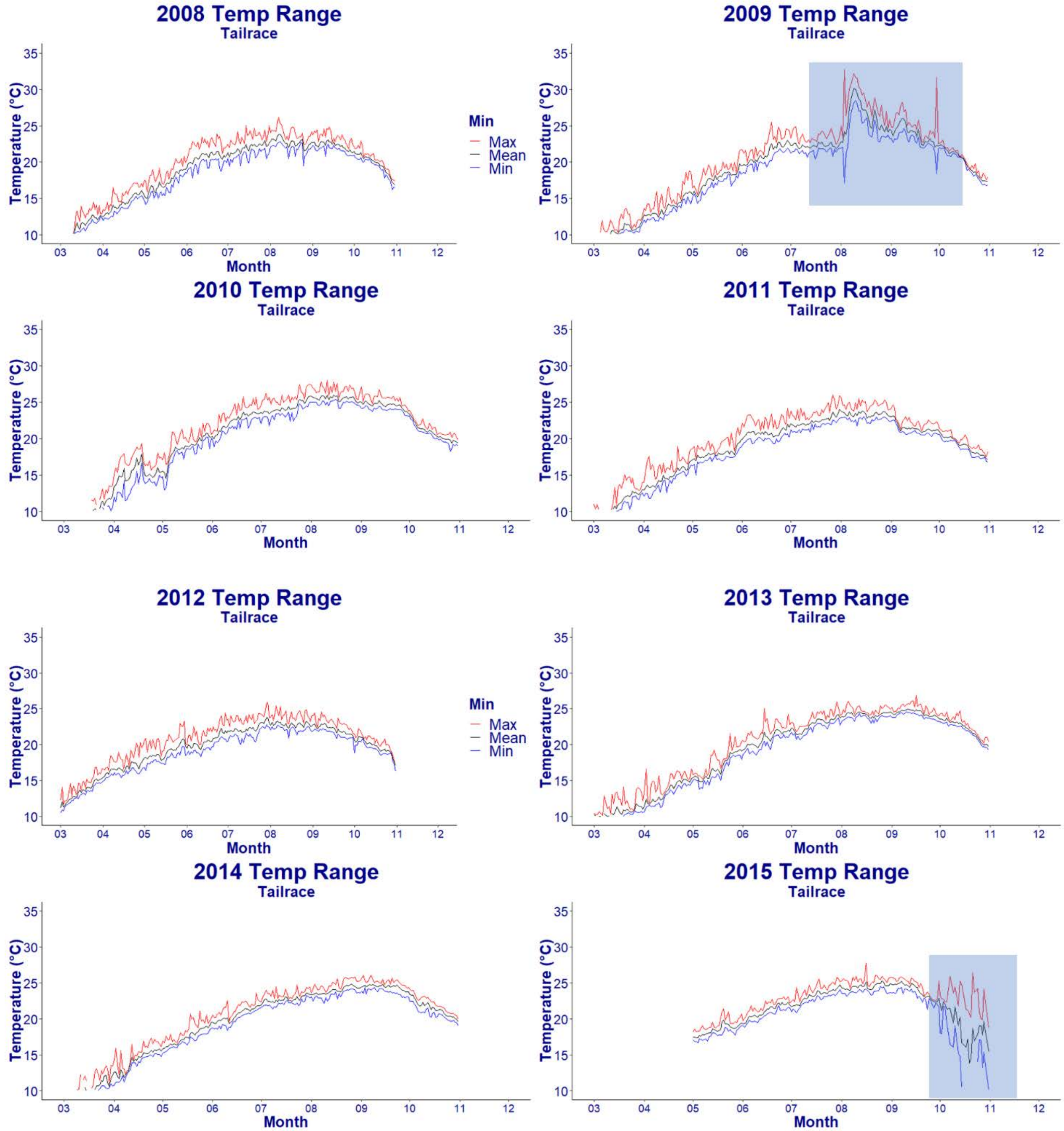
12
Month


2008 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min
2009 Temp Range
Tailrace
2010 Temp Range
Tailrace
2011 Temp Range
Tailrace
2012 Temp Range
Tailrace
2013 Temp Range
Tailrace
2014 Temp Range
Tailrace
2015 Temp Range
Tailrace

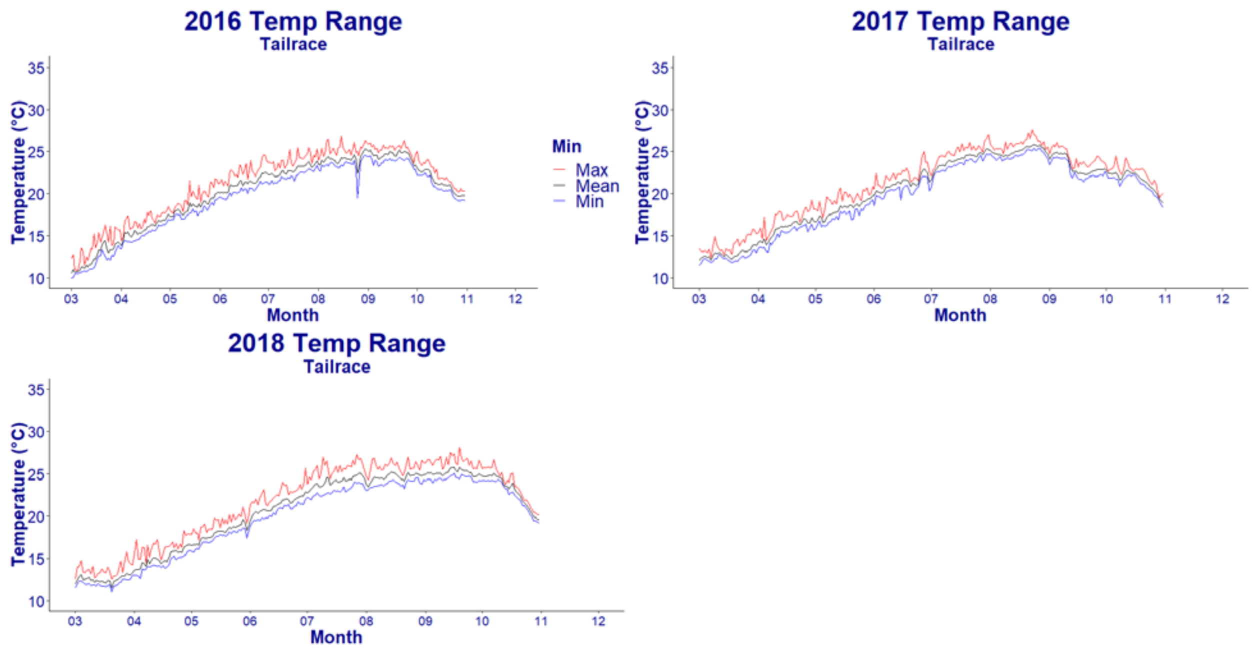
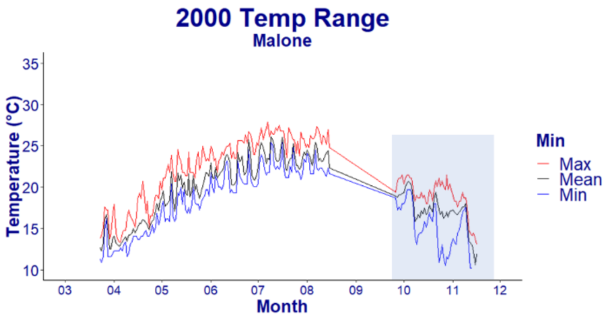
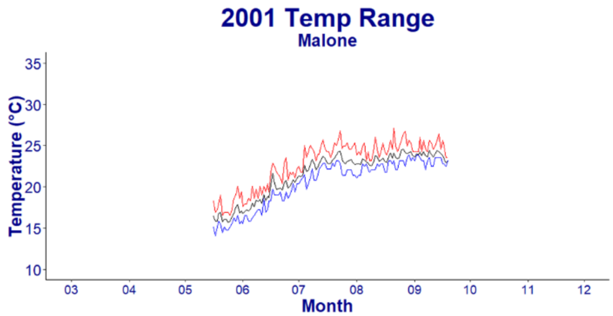
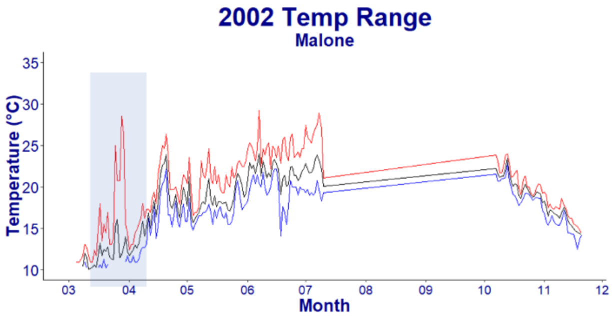
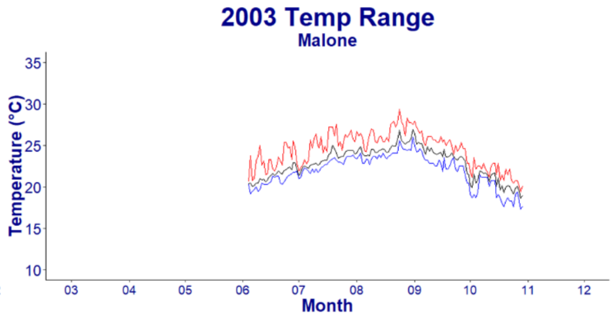


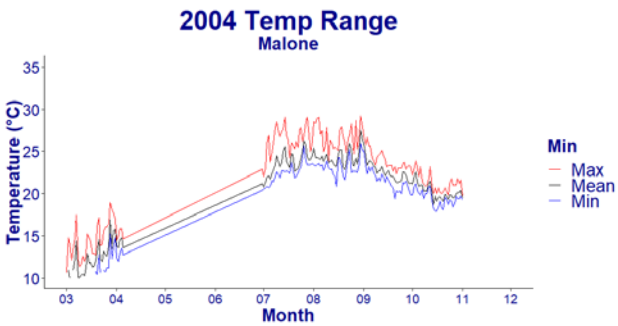
Figure 2A. Yearly temperature variation (maximum, mean, and minimum) at the Harris Dam tailrace site. Blue shaded boxes indicate periods of particularly large temperature variation.

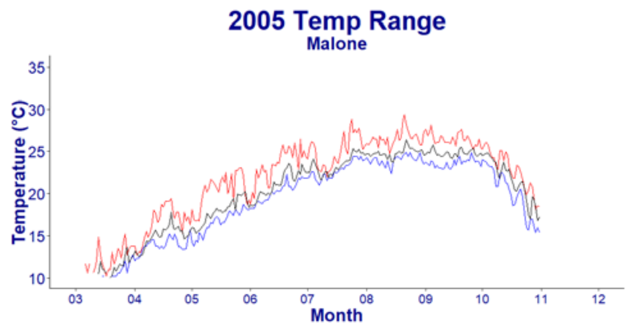

2000 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

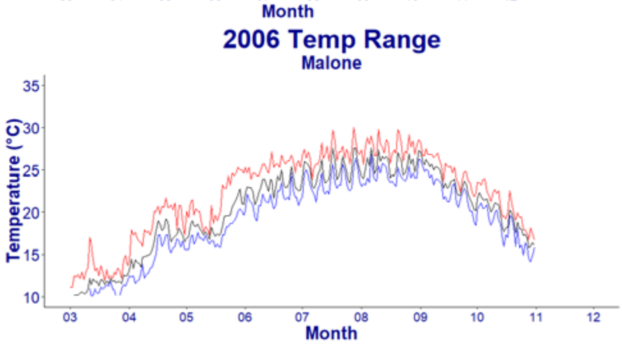

2001 Temp Range
Malone
Temperature (°C)
Month

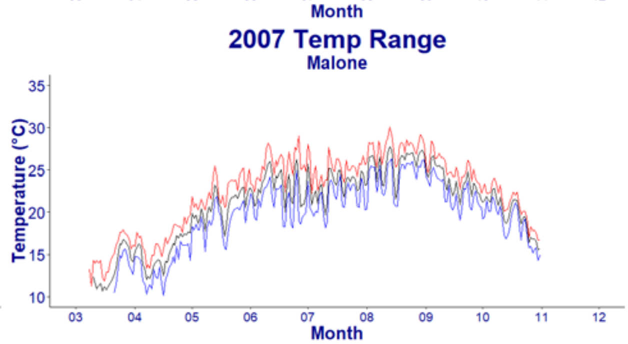

2002 Temp Range
Malone
Temperature (°C)
Month

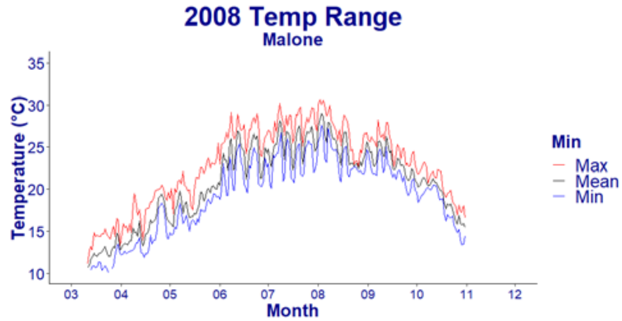
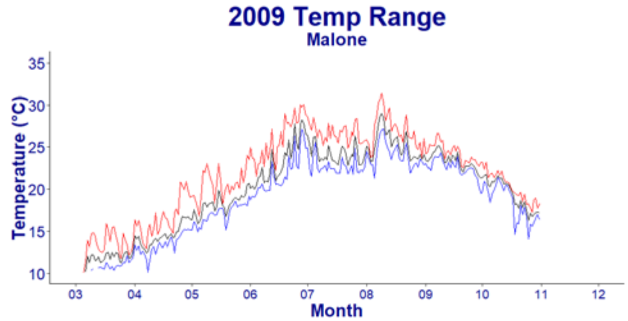
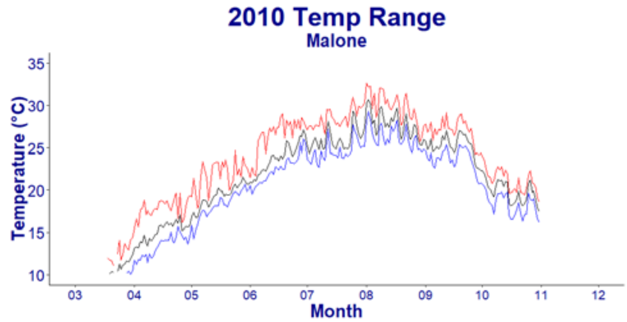
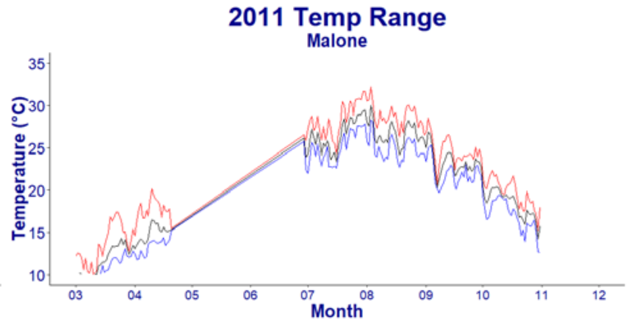
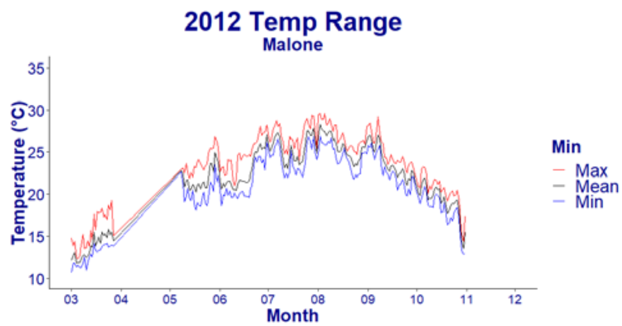
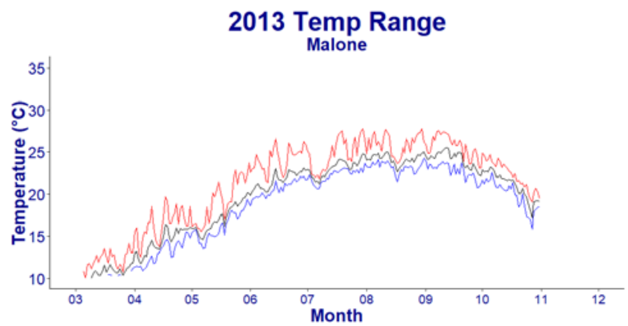
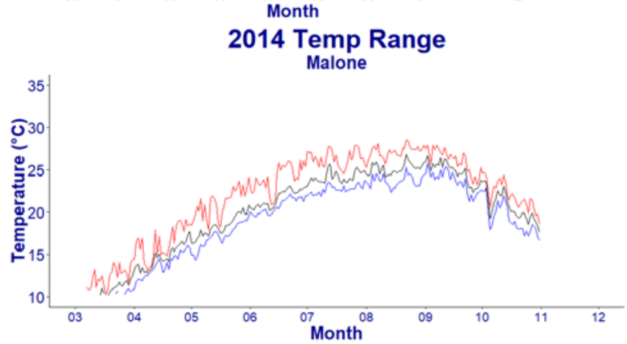
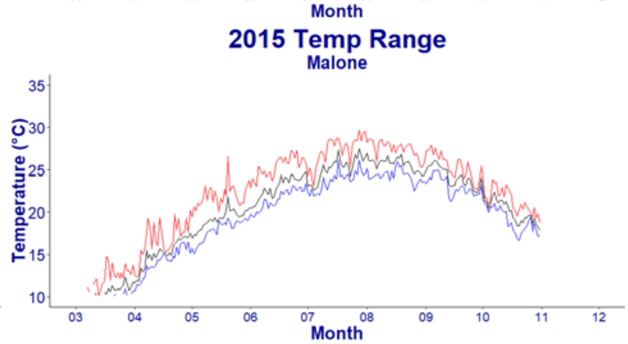

2003 Temp Range
Malone
Temperature (°C)
Month


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


2005 Temp Range
Malone
Temperature (°C)
Month


2006 Temp Range
Malone
Temperature (°C)
Month


2007 Temp Range
Malone
Temperature (°C)
Month


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

2009 Temp Range
Malone
Temperature (°C)
Month

2010 Temp Range
Malone
Temperature (°C)
Month

2011 Temp Range
Malone
Temperature (°C)
Month

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

2013 Temp Range
Malone
Temperature (°C)
Month

2014 Temp Range
Malone
Temperature (°C)
Month

2015 Temp Range
Malone
Temperature (°C)
Month

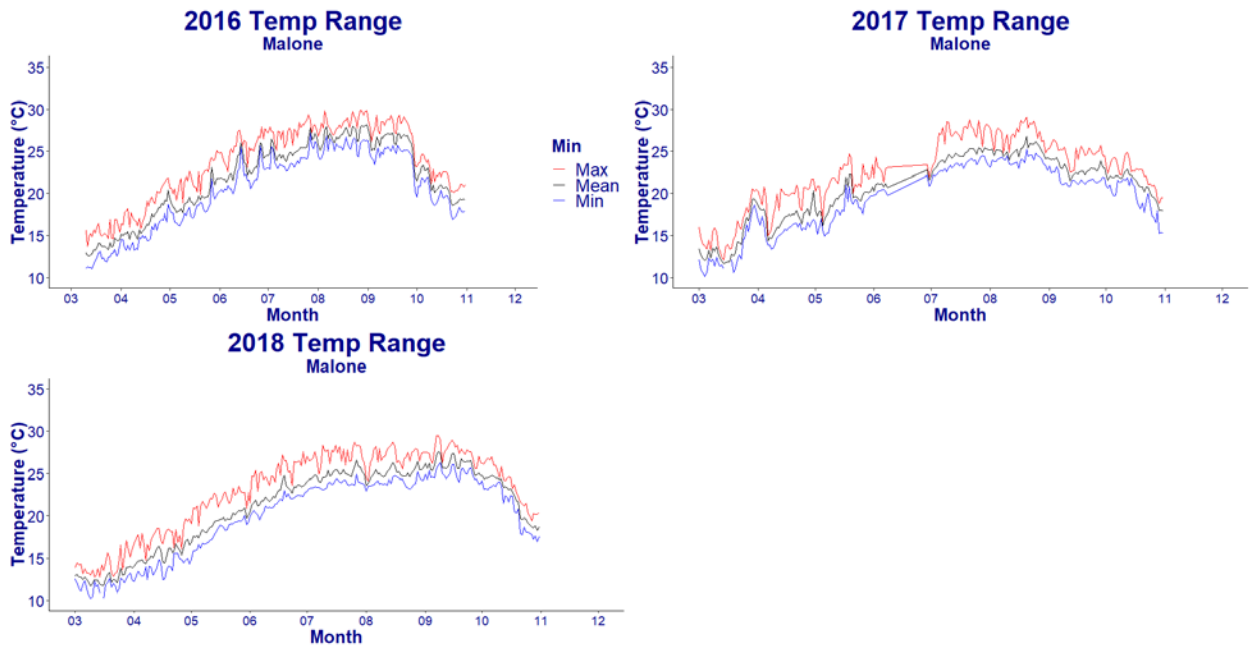
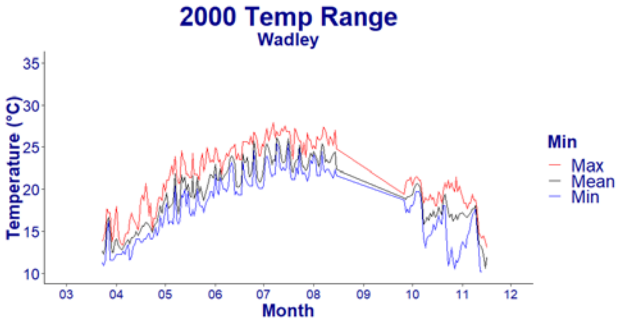
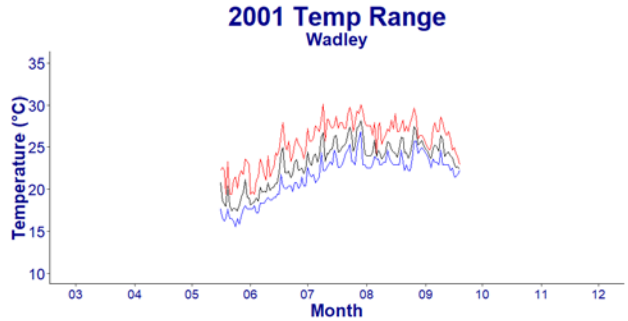
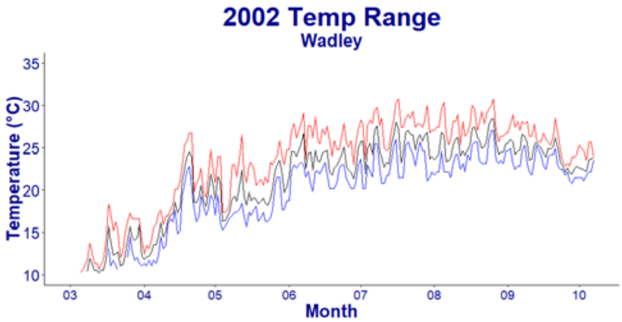
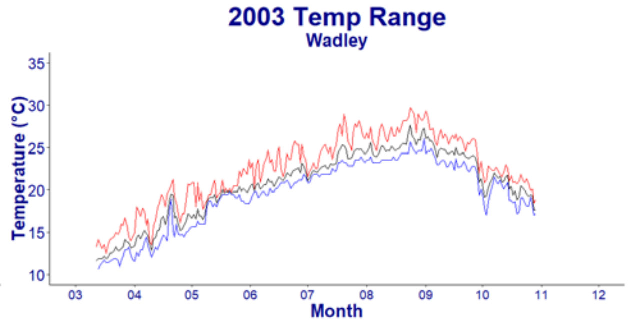
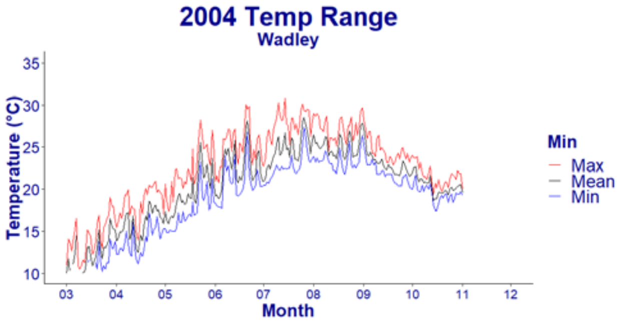


Figure 2B. Yearly temperature variation (maximum, mean, and minimum) at the Malone site. Blue shaded boxes indicate periods of particularly large temperature variation.


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

2001 Temp Range
Wadley
Temperature (°C)
Month

2002 Temp Range
Wadley
Temperature (°C)
Month

2003 Temp Range
Wadley
Temperature (°C)
Month

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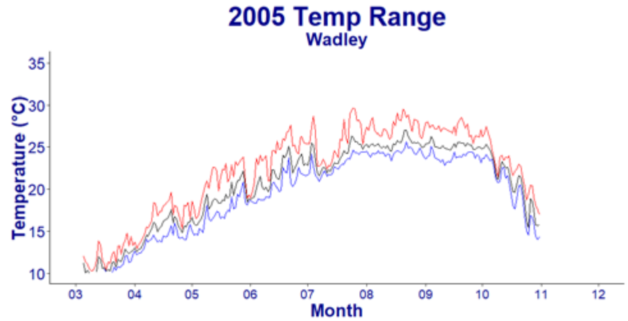
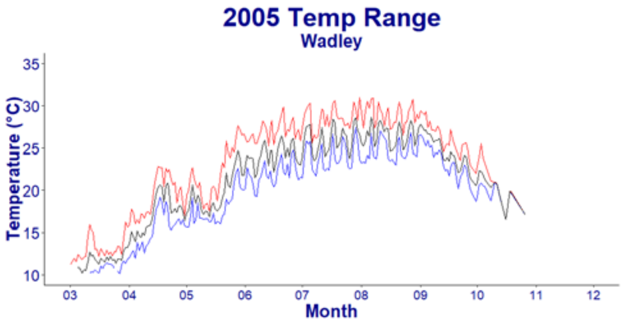
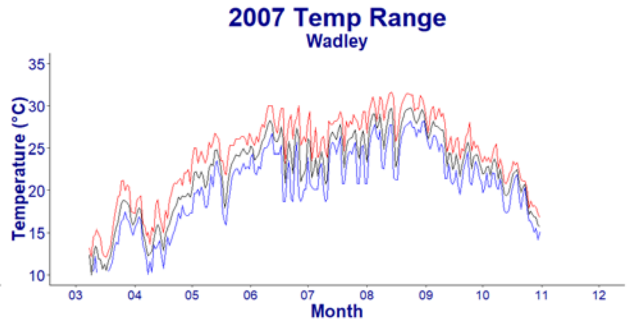
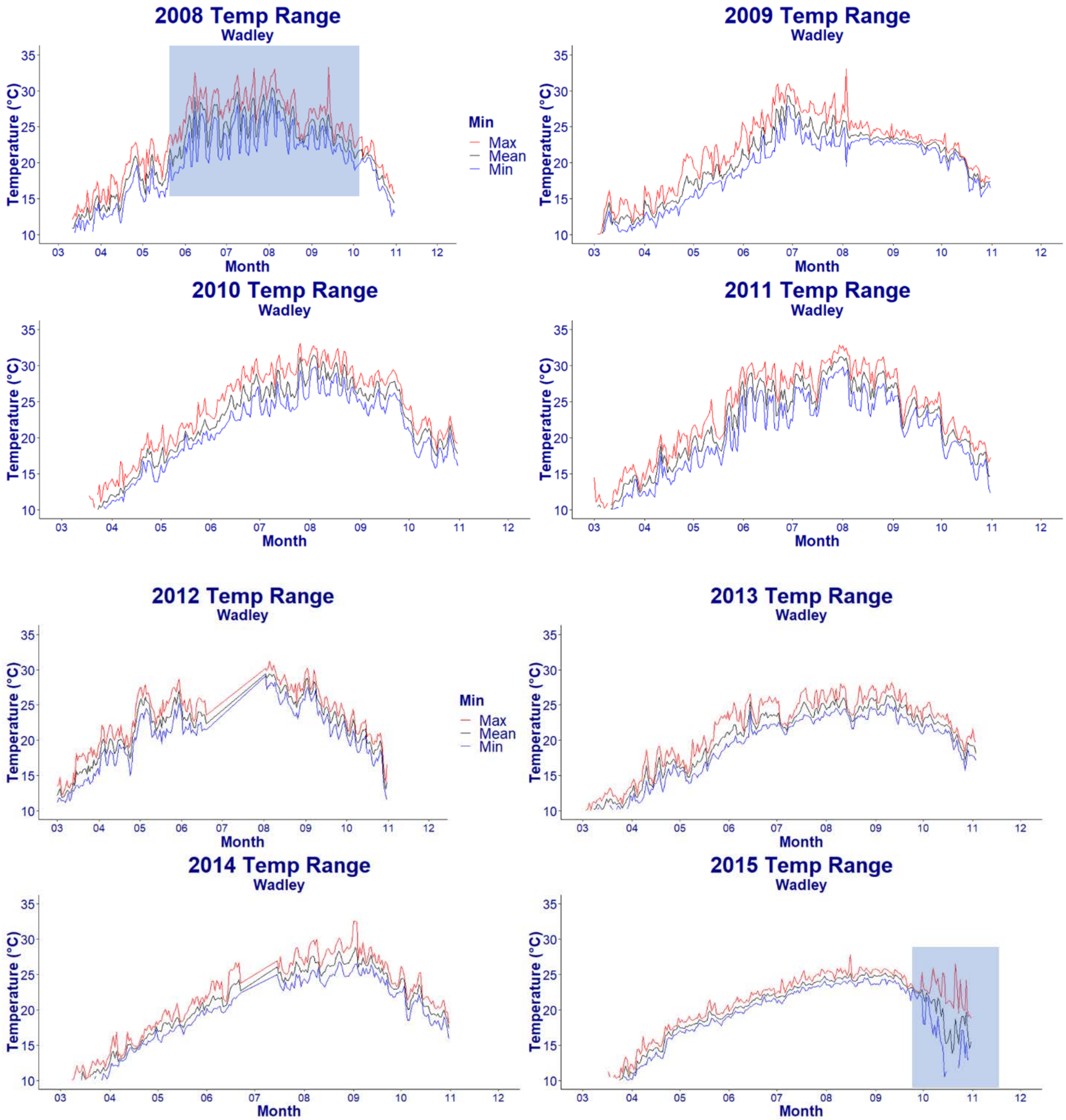

2005 Temp Range
Wadley
Temperature (°C)
Month

2005 Temp Range
Wadley
Temperature (°C)
Month

2007 Temp Range
Wadley
Temperature (°C)
Month


2008 Temp Range
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2013 Temp Range
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2015 Temp Range
Wadley
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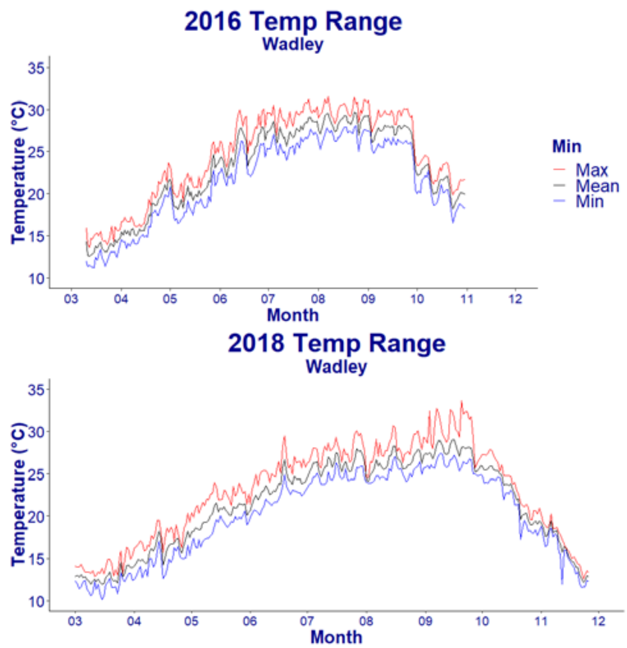


Figure 2C. Yearly temperature variation (maximum, mean, and minimum) at the Wadley site.

Blue shaded boxes indicate periods of particularly large temperature variation.

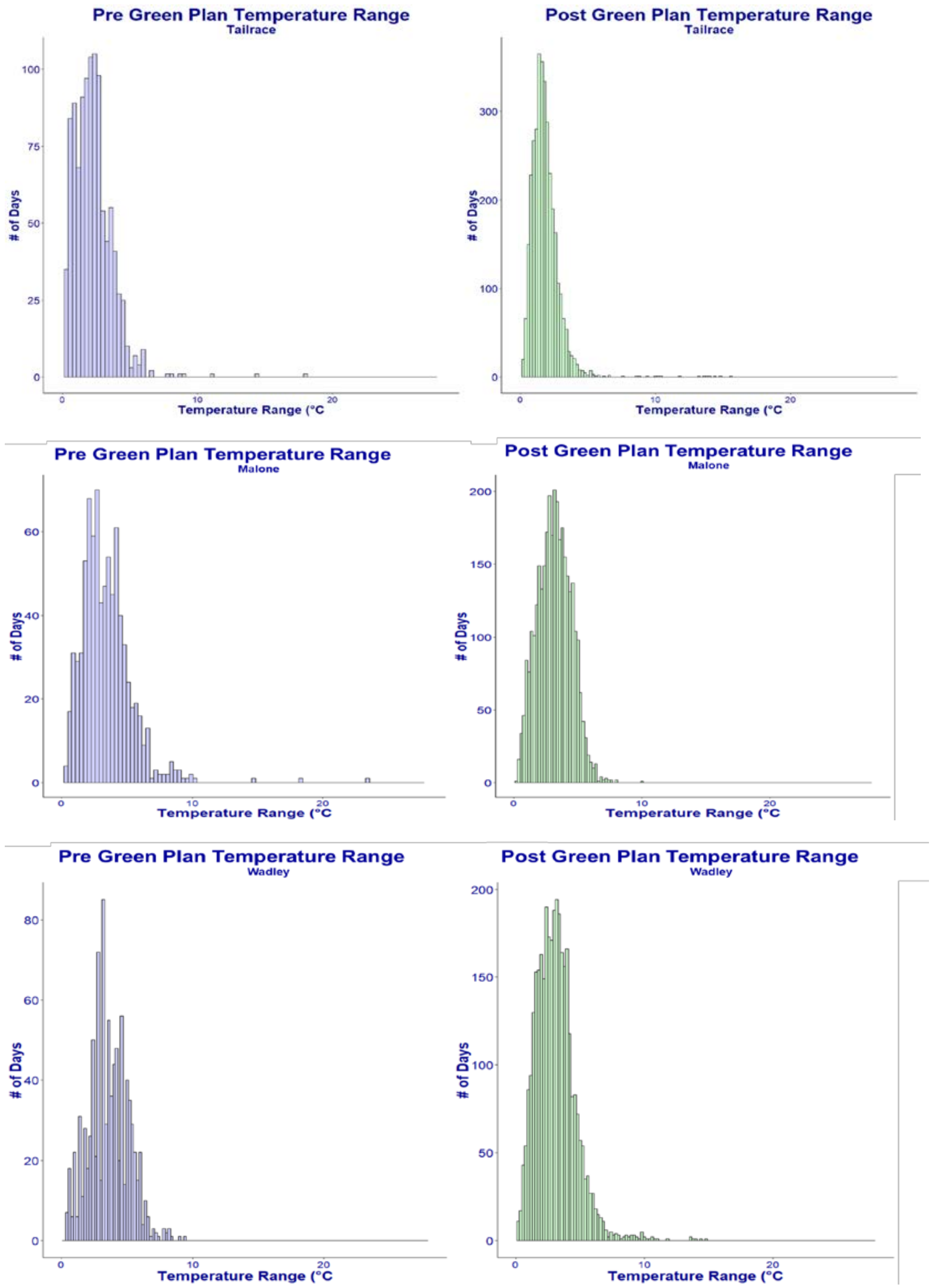
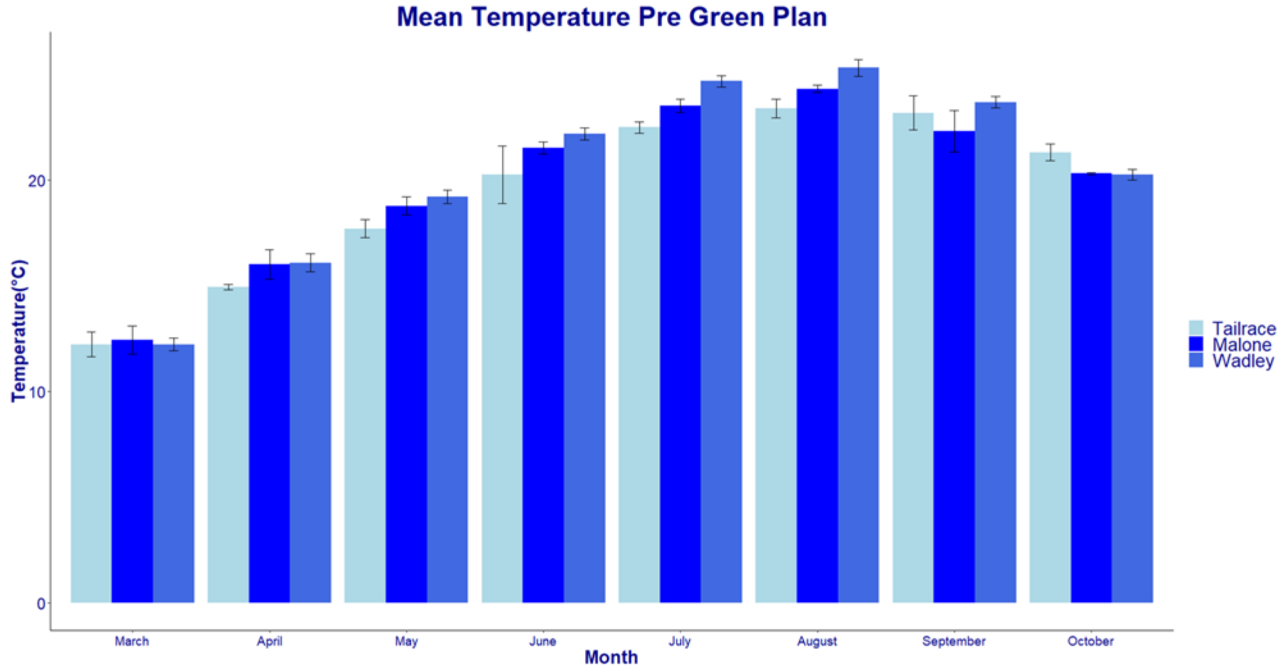


Figure 3. Distribution of daily temperature ranges for Harris Tailrace, Malone and Wadley.



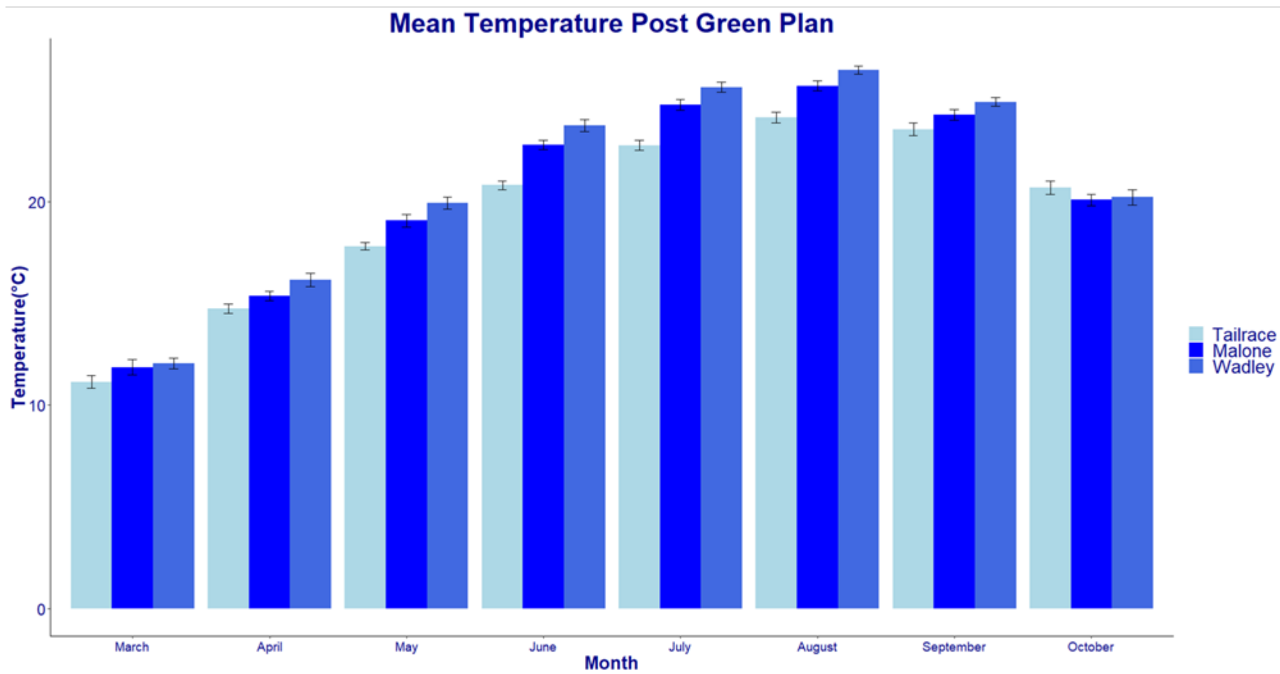
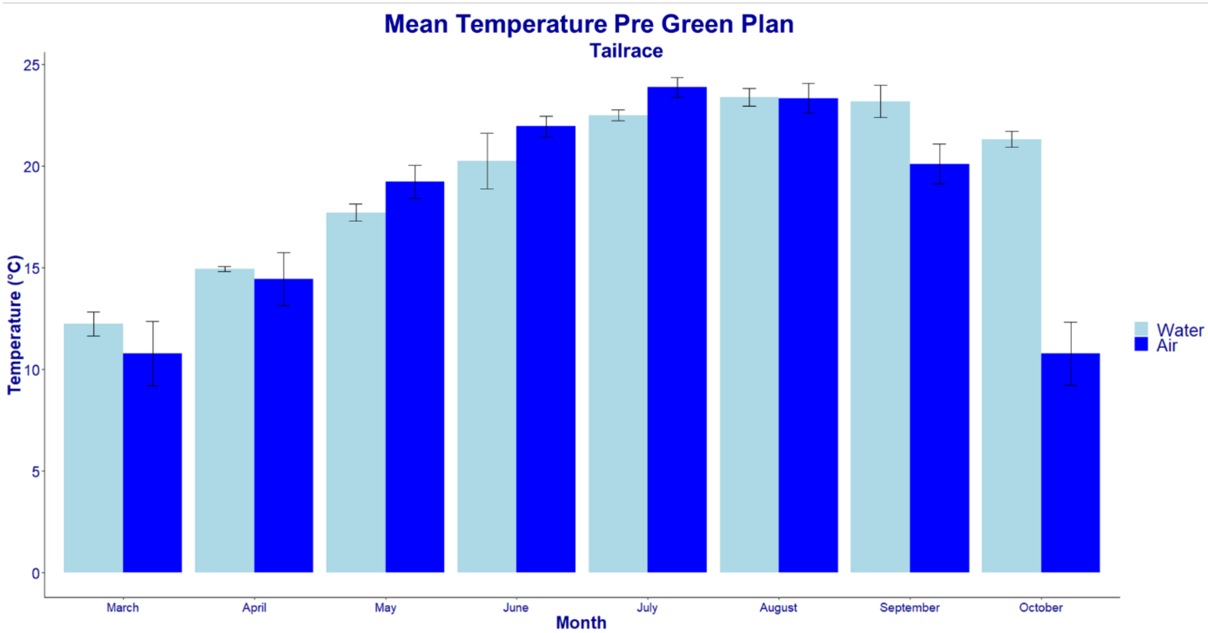


Figure 4. Mean temperature trends pre- and post-Green Plan across three locations.



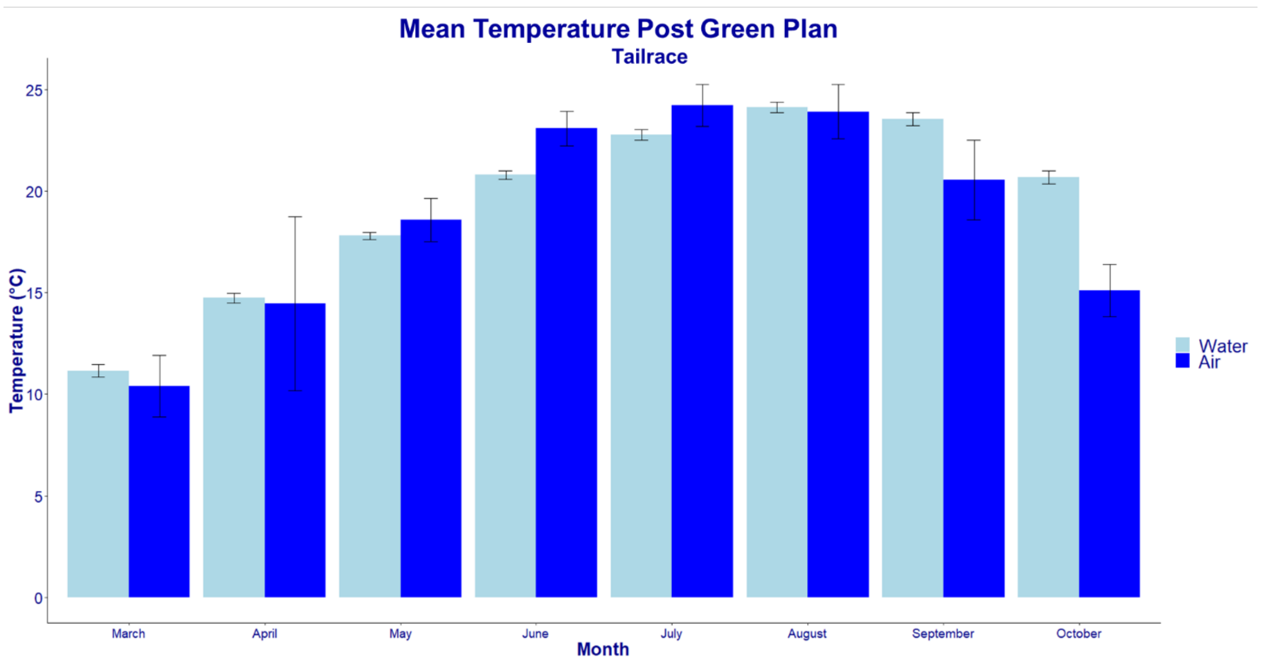
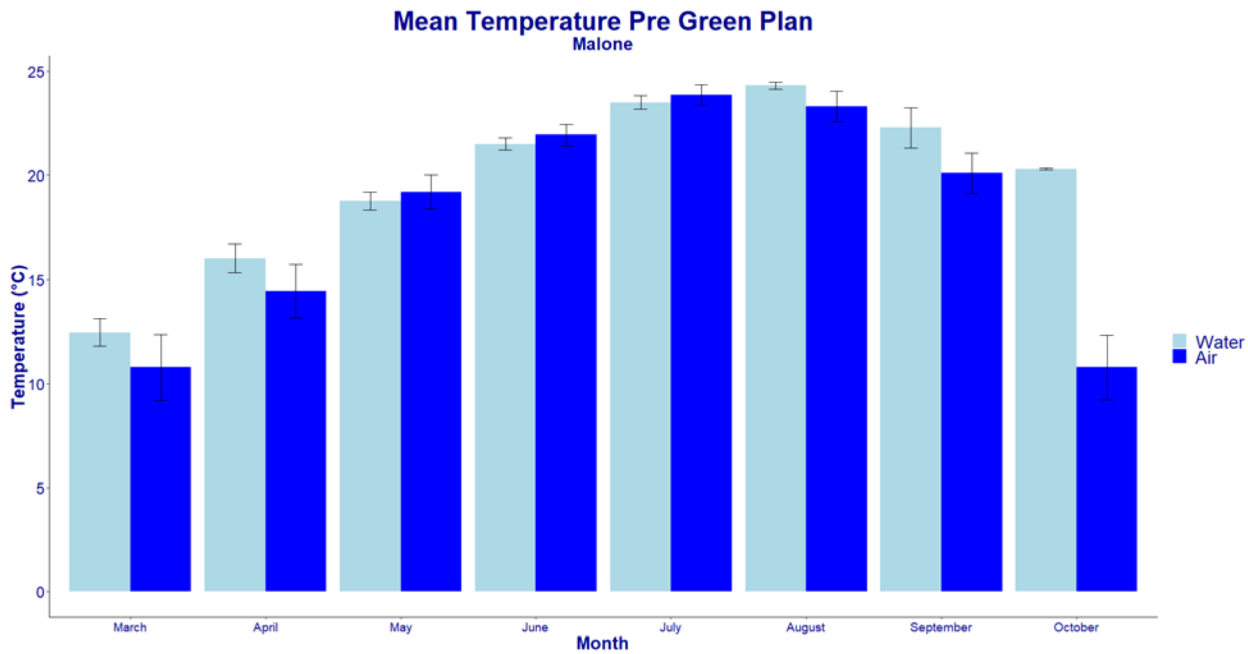


Figure 5A. Average air and water temperatures pre- and post-Green Plan at the Harris Dam tailrace site.



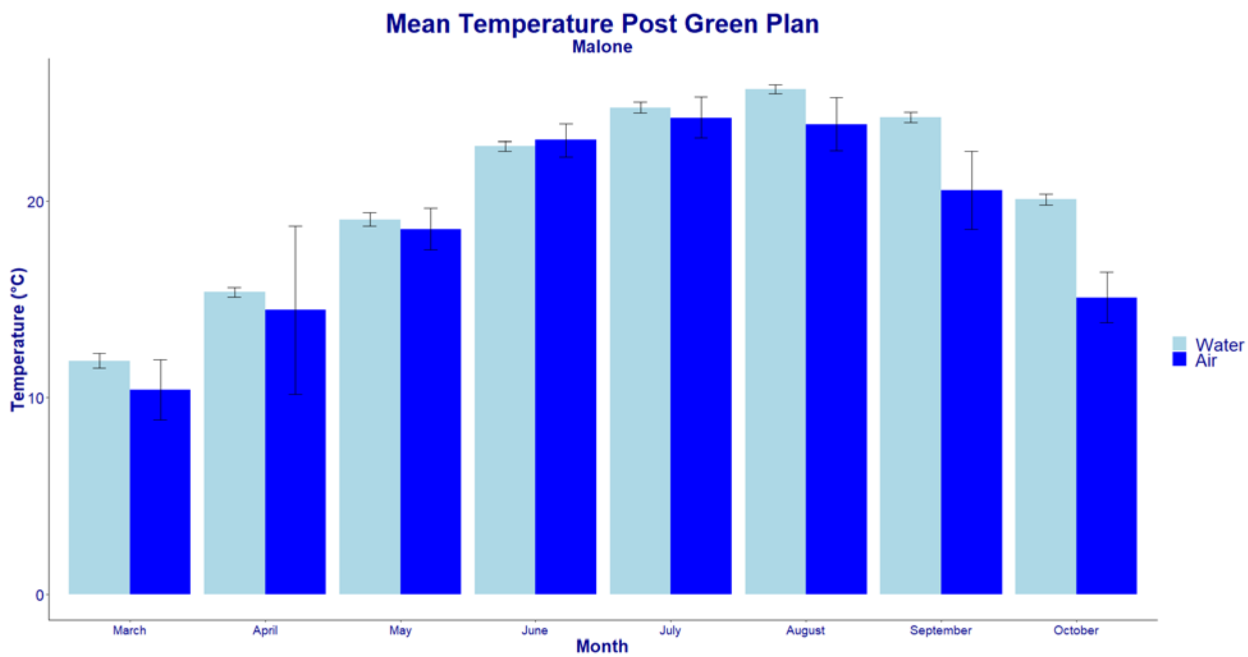
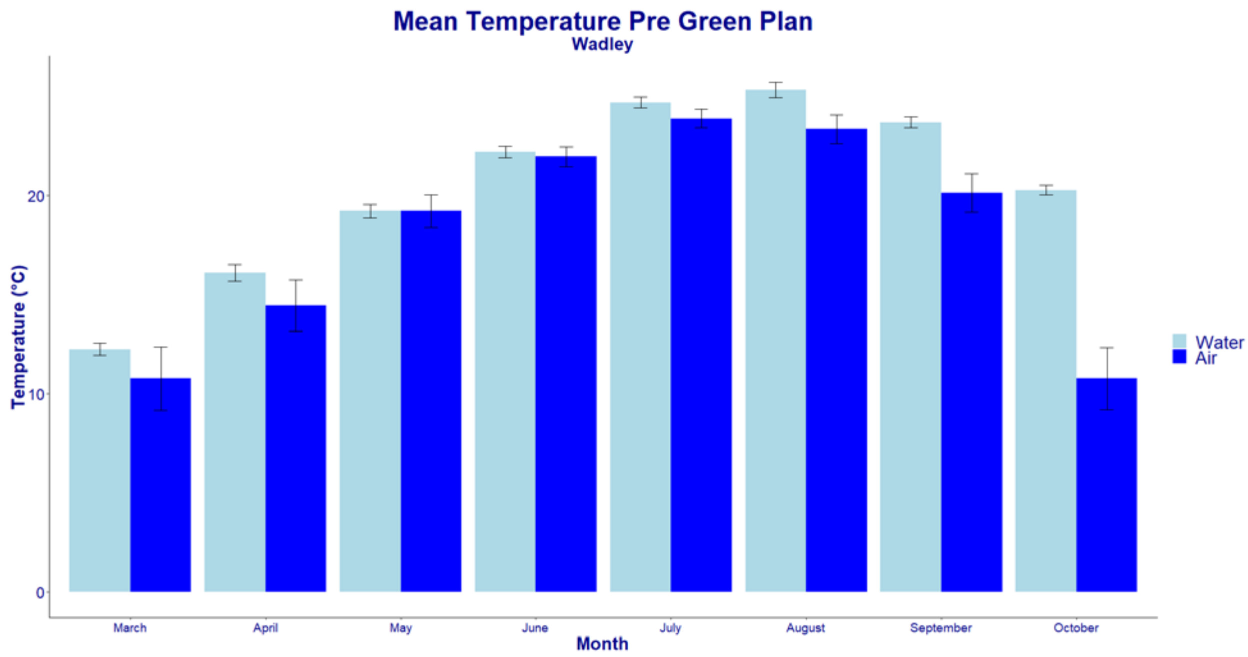


Figure 5B. Average air and water temperatures pre- and post-Green Plan at the Malone site.



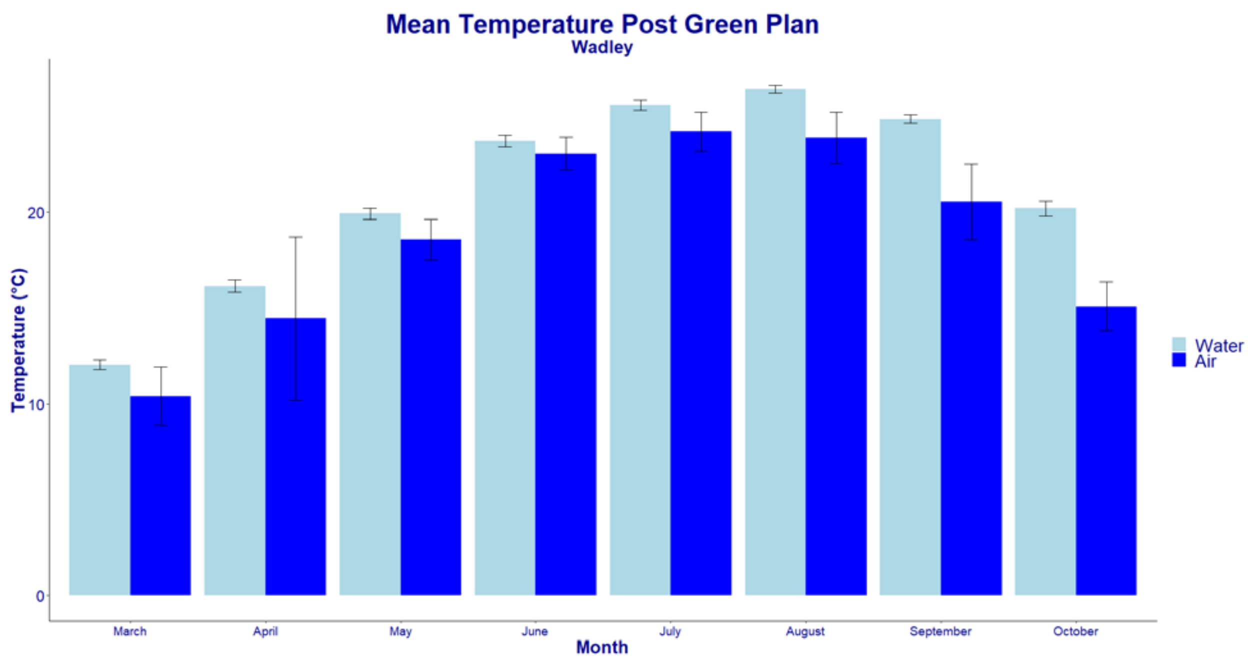


Figure 5C. Average air and water temperatures pre- and post-Green Plan at the Wadley site.

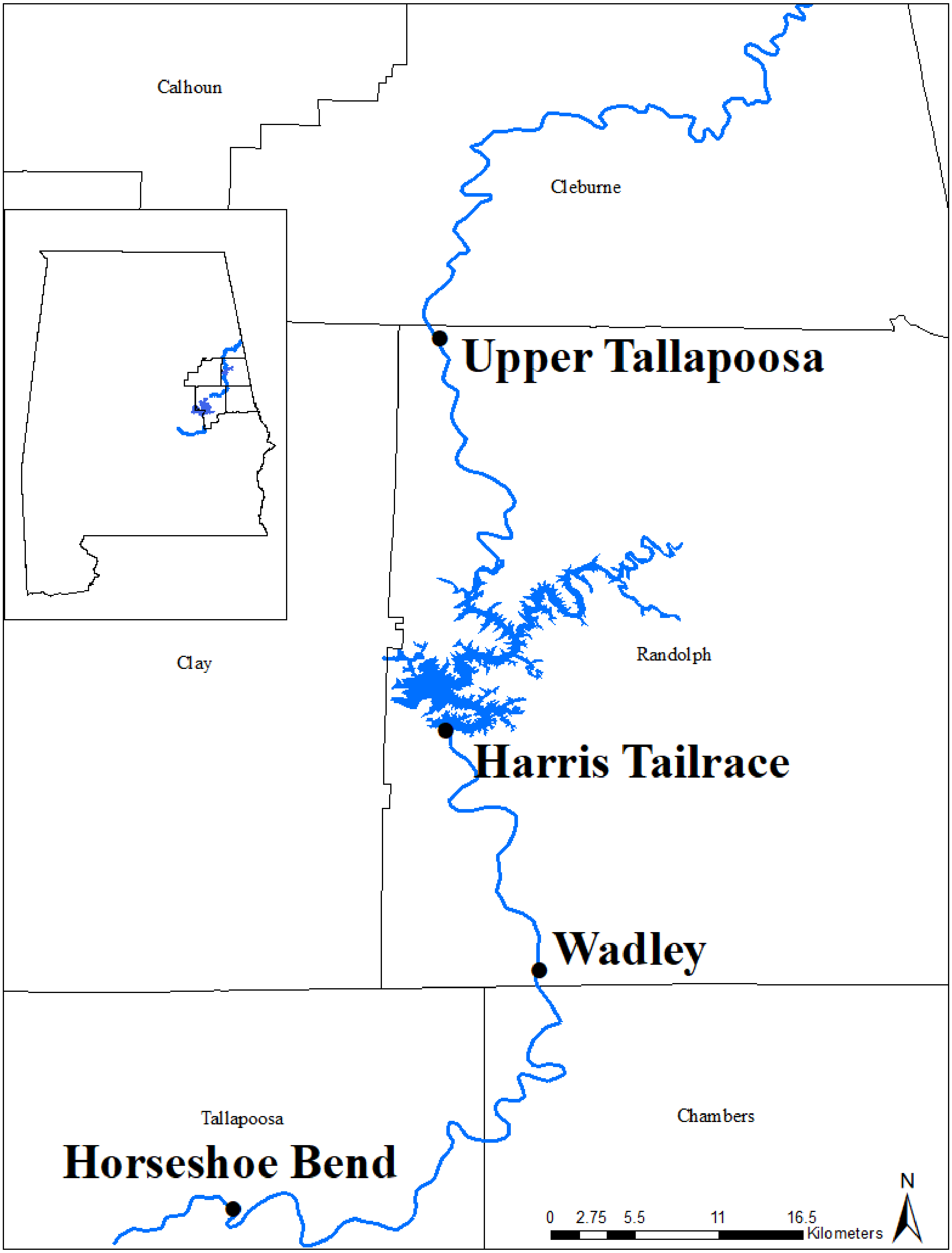


Figure 6. Map of study area.

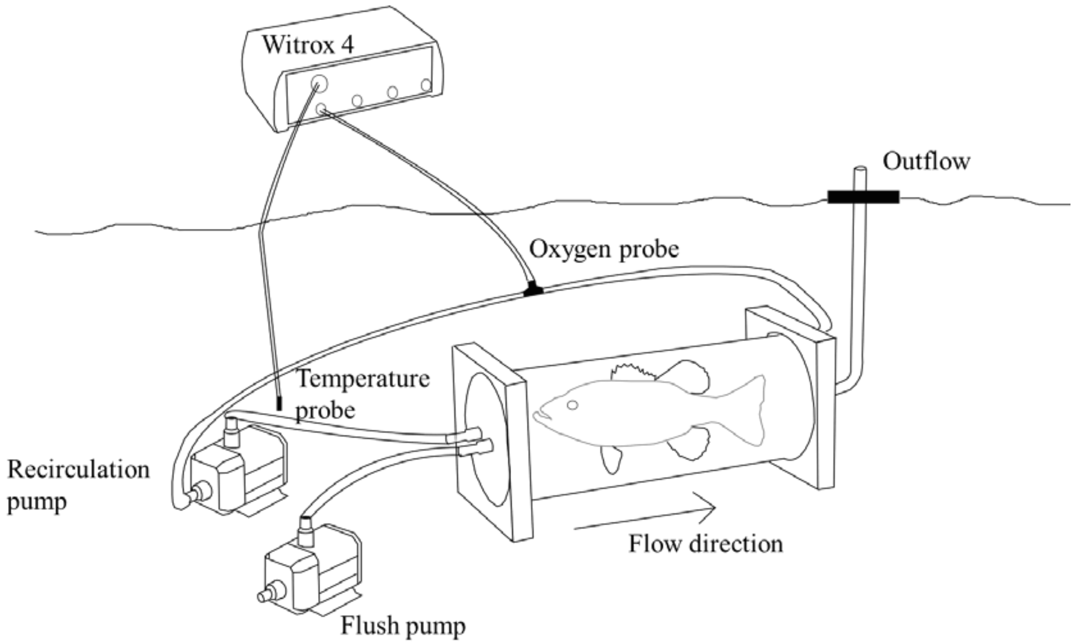


Figure 7. A static respirometry system.

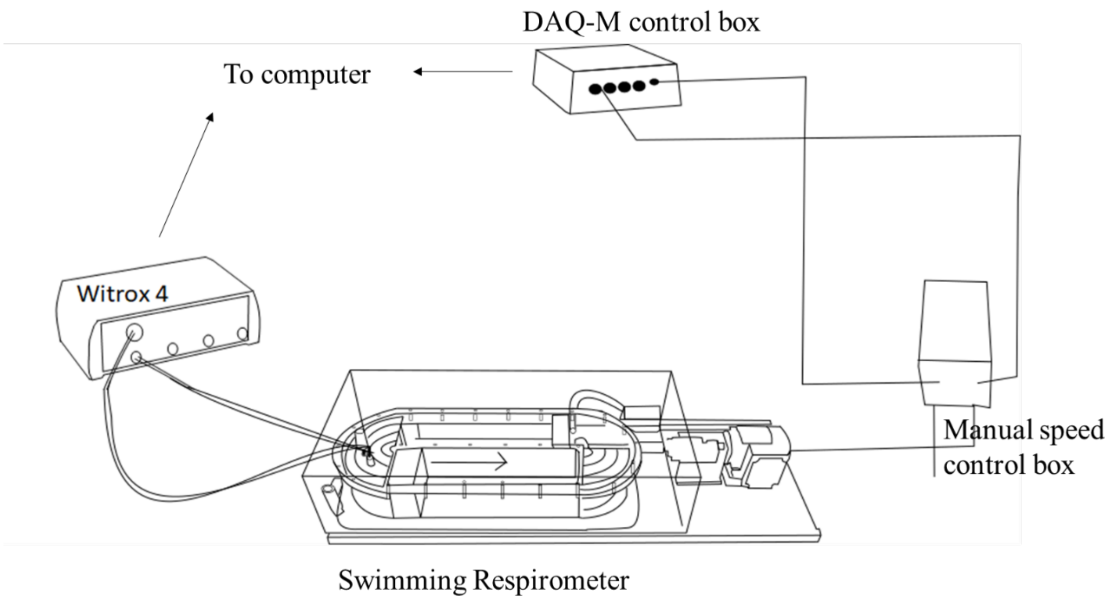


Figure 8. A swimming respirometer.

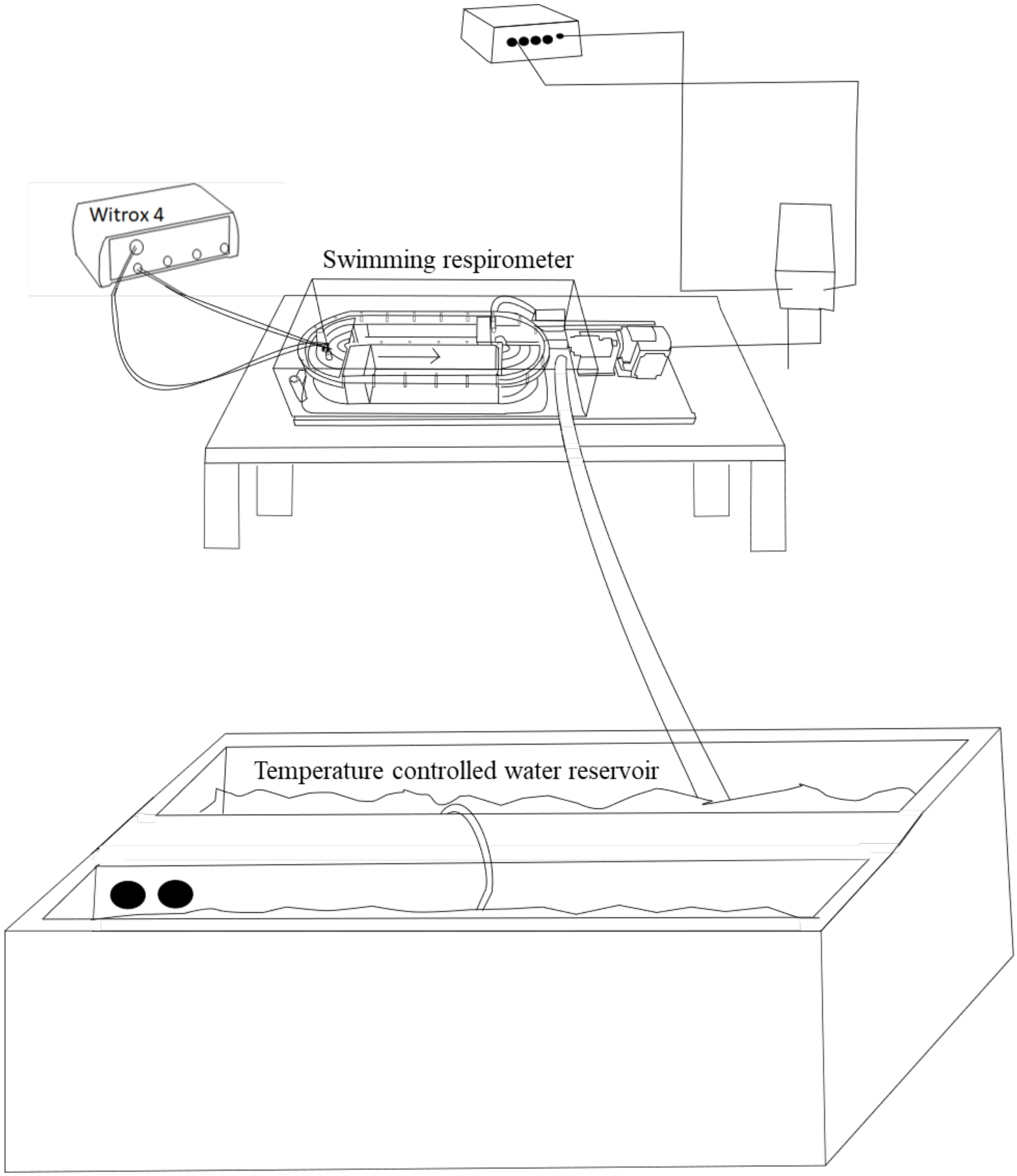


Figure 9. Set up of water exchange with the swimming respirometer.

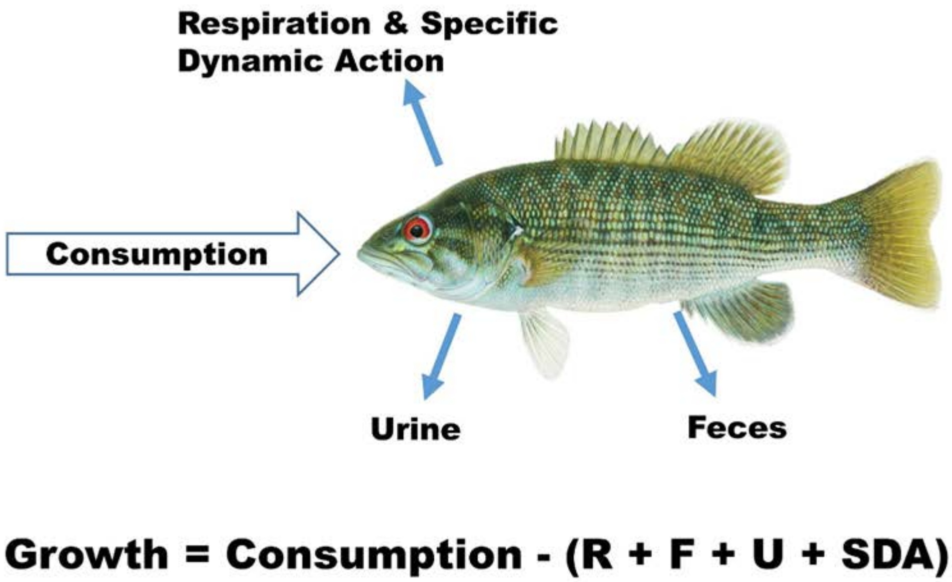


Figure 10. A graphical representation of a typical bioenergetics model of the growth of a fish.

Photo 1. Electrofishing boat used to sample at the Wadley, Horseshoe Bend, and Lee's Bridge sites. The top left photo shows the bank access at the Wadley site.

Photo 2. Electrofishing barge boat used to sample the Harris tailrace site.

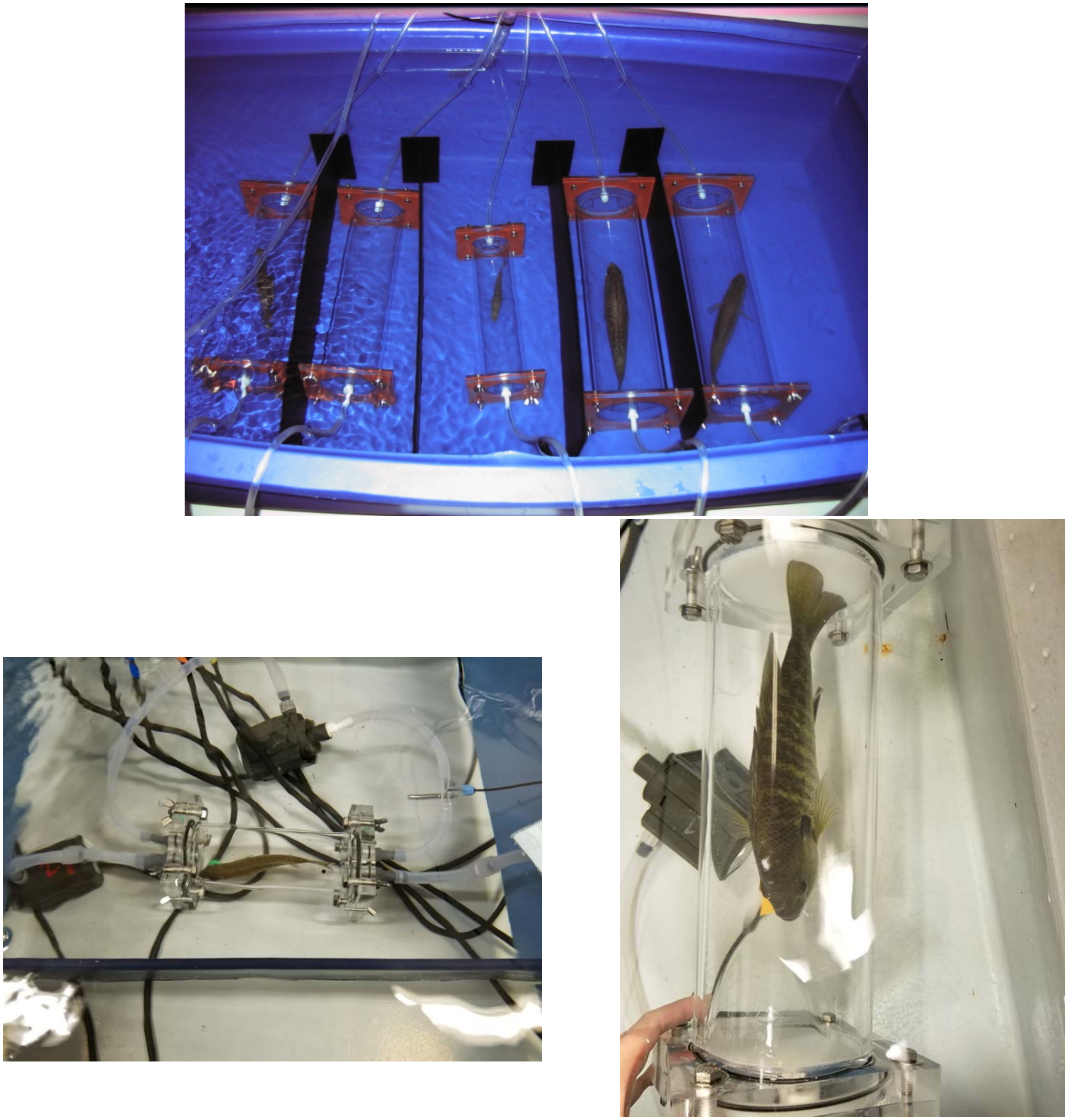


Photo 3. Chambers used in static/intermittent respirometry.

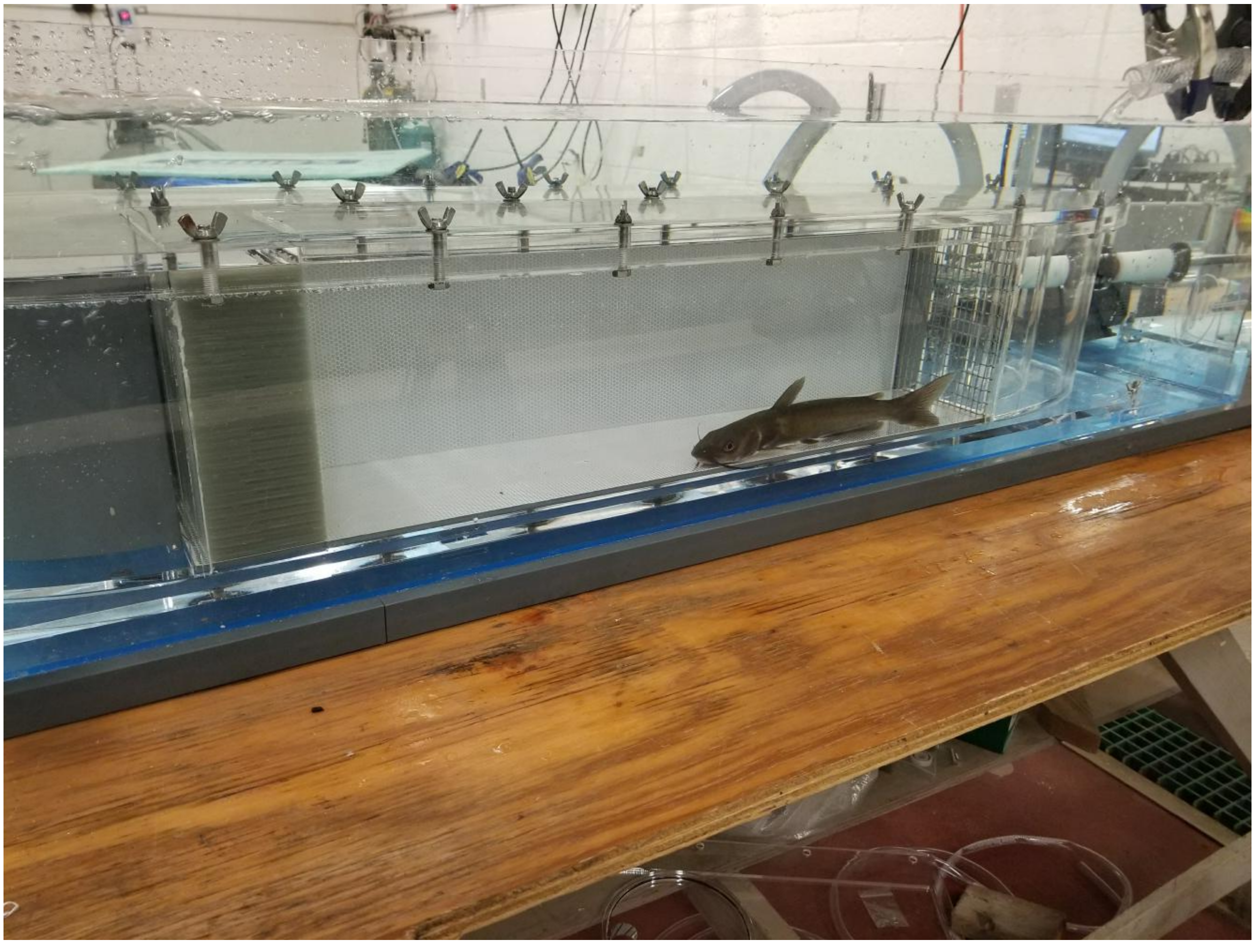


Photo 4. The swimming respirometer with a channel catfish in the chamber.

Attachment 2

Aquatic Resources Consultation Record

(March 2019-July 2020)

APC Harris Relicensing

From: APC Harris Relicensing
Sent: Friday, February 22, 2019 11:01 AM
To: APC Harris Relicensing
Subject: HAT 3 meeting

HAT 3,

Please save the date for a HAT 3 meeting on March 20th at the E.W. Shell Fisheries Center in Auburn from 10:00 to 2:00. At this meeting we will provide an update on the Aquatic Resources Study Plan and Downstream Aquatic Habitat Study Plan activities, as well as give everyone an opportunity to visit the lab that will be used for the Bioenergetics model. Lunch will be provided. Please RSVP to harrisrelicensing@southernco.com no later than March 13th.

Thanks,

Angie Anderegg
205-257-2251

HAT 3 meeting - next Wednesday

APC Harris Relicensing

Thu 3/14/2019 8:19 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>; nick.nichols@dcnr.alabama.gov <nick.nichols@dcnr.alabama.gov>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; ken.wills@jcdh.org <ken.wills@jcdh.org>; 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>; rskrotze@southernco.com <rskrotze@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; tlmills@southernco.com <tlmills@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>; chrisoberholster@birminghamaudubon.org <chrisoberholster@birminghamaudubon.org>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@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>; 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>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; triciastearns@gmail.com <triciastearns@gmail.com>; trayjim@bellsouth.net <trayjim@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; decker.chris@epa.gov <decker.chris@epa.gov>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; bill_pearson@fws.gov <bill_pearson@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>;

1 attachments (46 KB)

2019-03-20 HAT3 Meeting Agenda.docx;

HAT 3,

This is a friendly reminder that we will have a HAT 3 meeting next Wednesday, March 20, in Auburn. A google map link to the E.W. Shell Fisheries Center is provided below and an agenda is attached. If you haven't already done so, please let us know ASAP if you plan to attend so we can plan on you for lunch.

https://goo.gl/maps/Mqj58oBEX7Q2

Thanks!

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

HAT 3,

Please save the date for a HAT 3 meeting on March 20th at the E.W. Shell Fisheries Center in Auburn from 10:00 to 2:00. At this meeting we will provide an update on the Aquatic Resources Study Plan and Downstream Aquatic Habitat Study Plan activities, as well as give everyone an opportunity to visit the lab that will be used for the Bioenergetics model. Lunch will be provided. Please RSVP to harrisrelicensing@southernco.com no later than March 13th.

Thanks,

Angie Anderegg
205-257-2251

HAT 3 Meeting
March 20, 2019
E.W. Shell Fisheries Center
10 AM – 2 PM

- Welcome and Safety Moment
- Relicensing Update
- Aquatic Resources Study
  - Fall Wadeable Fish Survey update – Alabama Power
  - Temperature Data Analysis – Auburn
- LUNCH
- Downstream Aquatic Habitat Study
  - Draft Mesohabitat Analysis
  - Level Logger Deployment
  - HEC-RAS model
- Research Lab Tour

HAT 3 meeting notes

Anderegg, Angela Segars

Fri 4/12/2019 7:54 PM

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

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

1 attachments (4 MB)

2019-03-20 HAT 3 meeting notes and presentations.pdf;

Good afternoon HAT 3,

Attached are notes, along with presentations, from our March 20th meeting at the Auburn Fisheries Center. These notes and presentations can also be found at www.harrisrelicensing.com under the HAT 3 folder.

Thanks,

Angie Anderegg

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

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

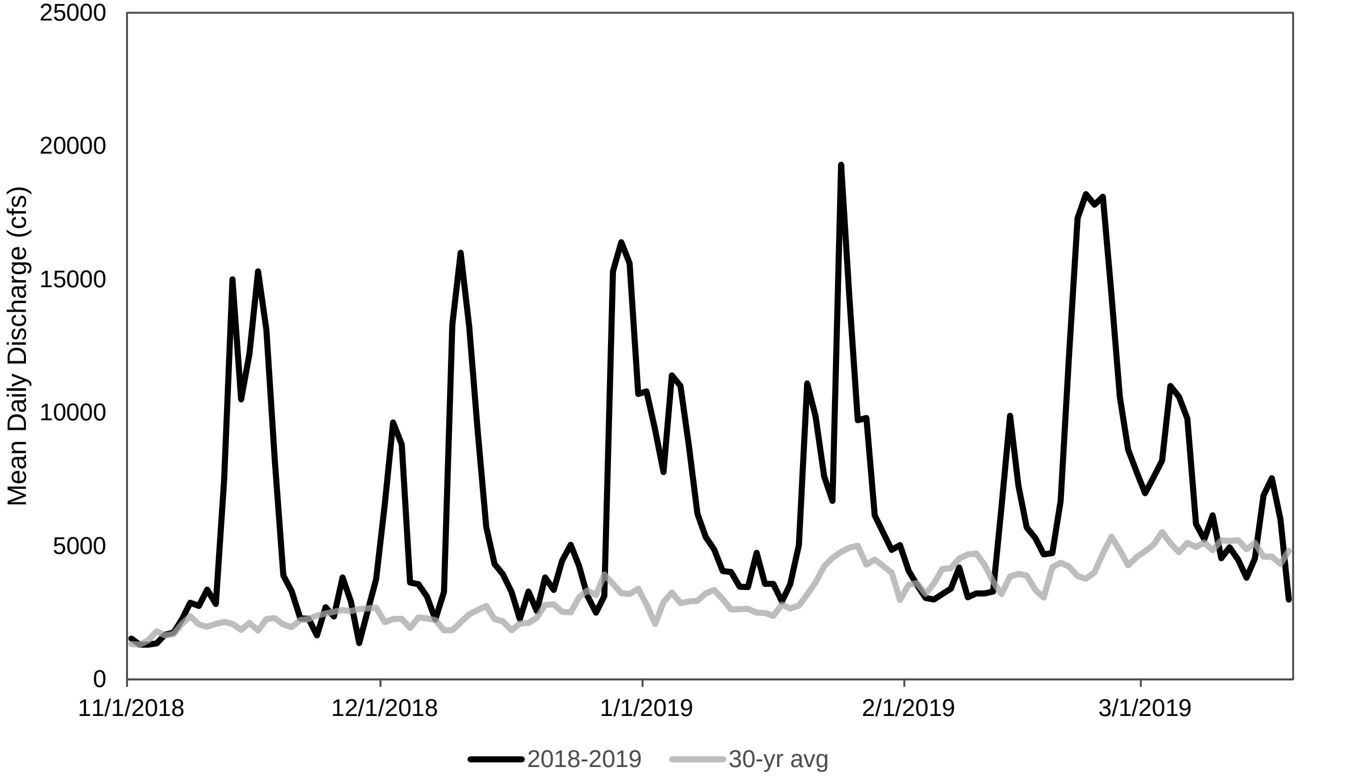
Summer/Fall 2019 – Various HAT meetings

Aquatic Resources Study

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

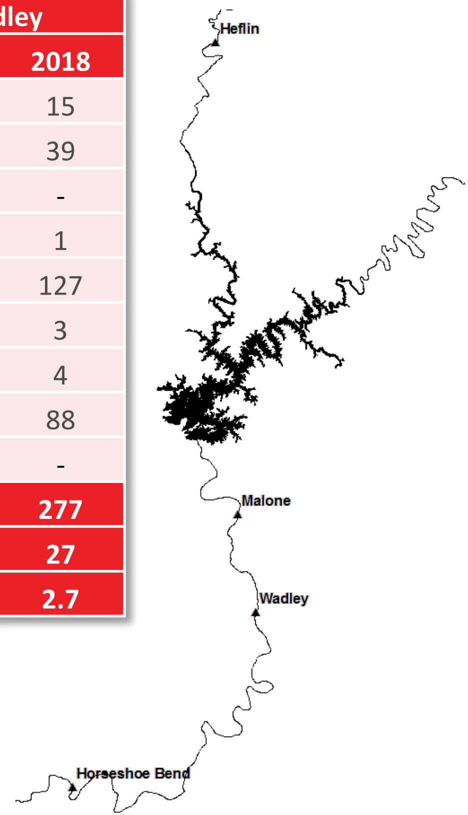
Geographic Scope
Harris Reservoir, the Tallapoosa River downstream of Harris Dam through Horseshoe Bend, and in selected unregulated reference streams.

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

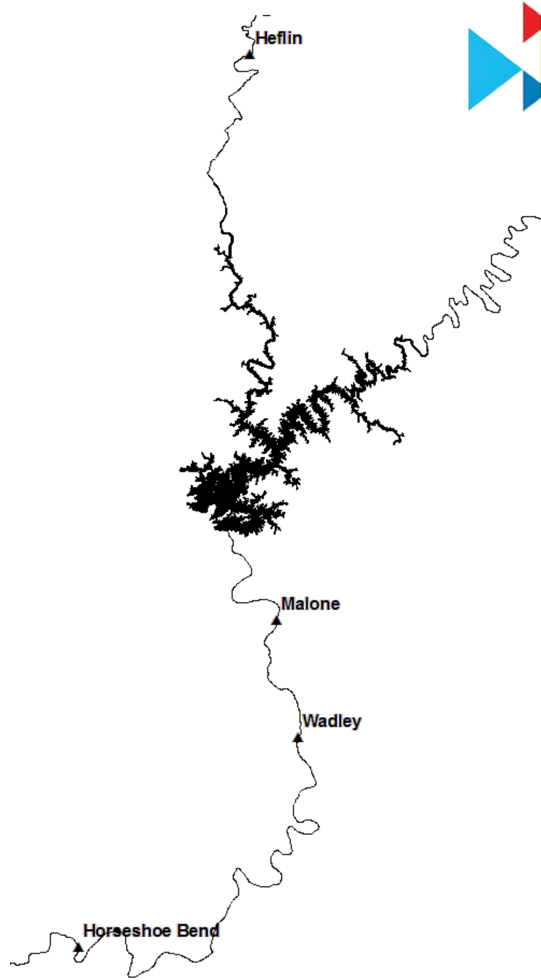

25000
20000
15000
10000
5000
0
Mean Daily Discharge (cfs)
11/1/2018
12/1/2018
1/1/2019
2/1/2019
3/1/2019
2018-2019
30-yr avg

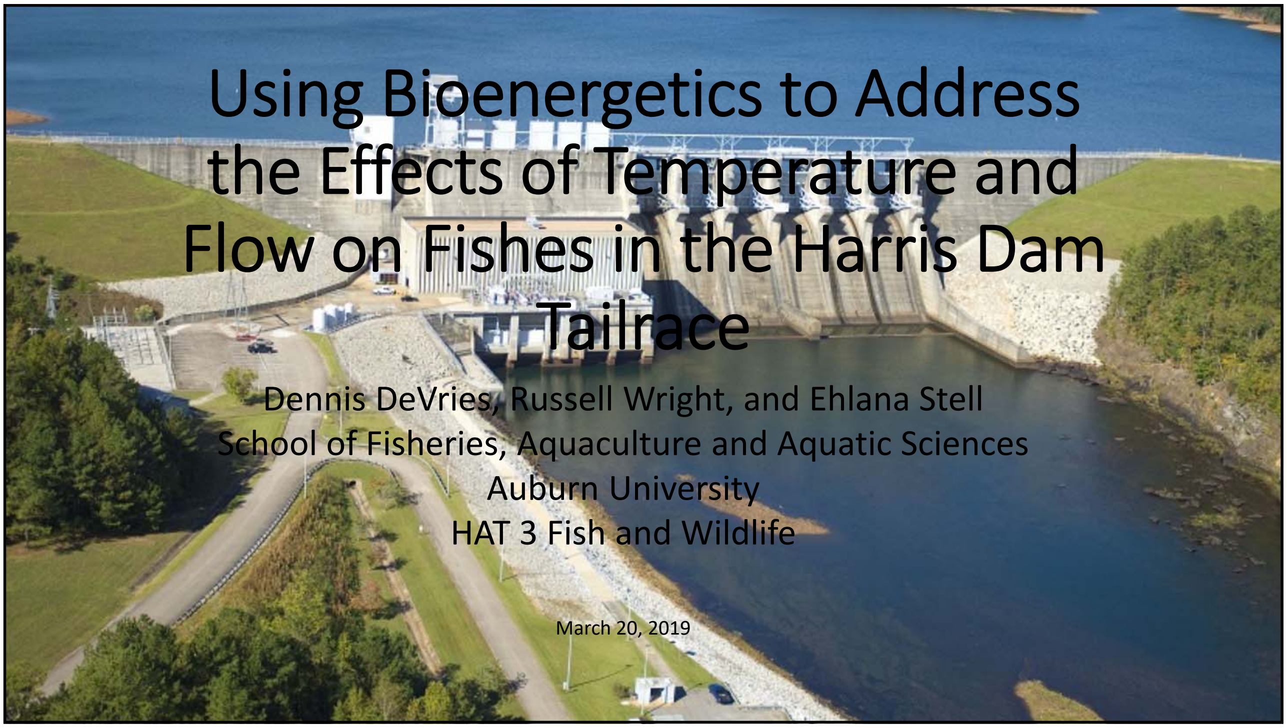
2017 & 2018 Fish Survey Results

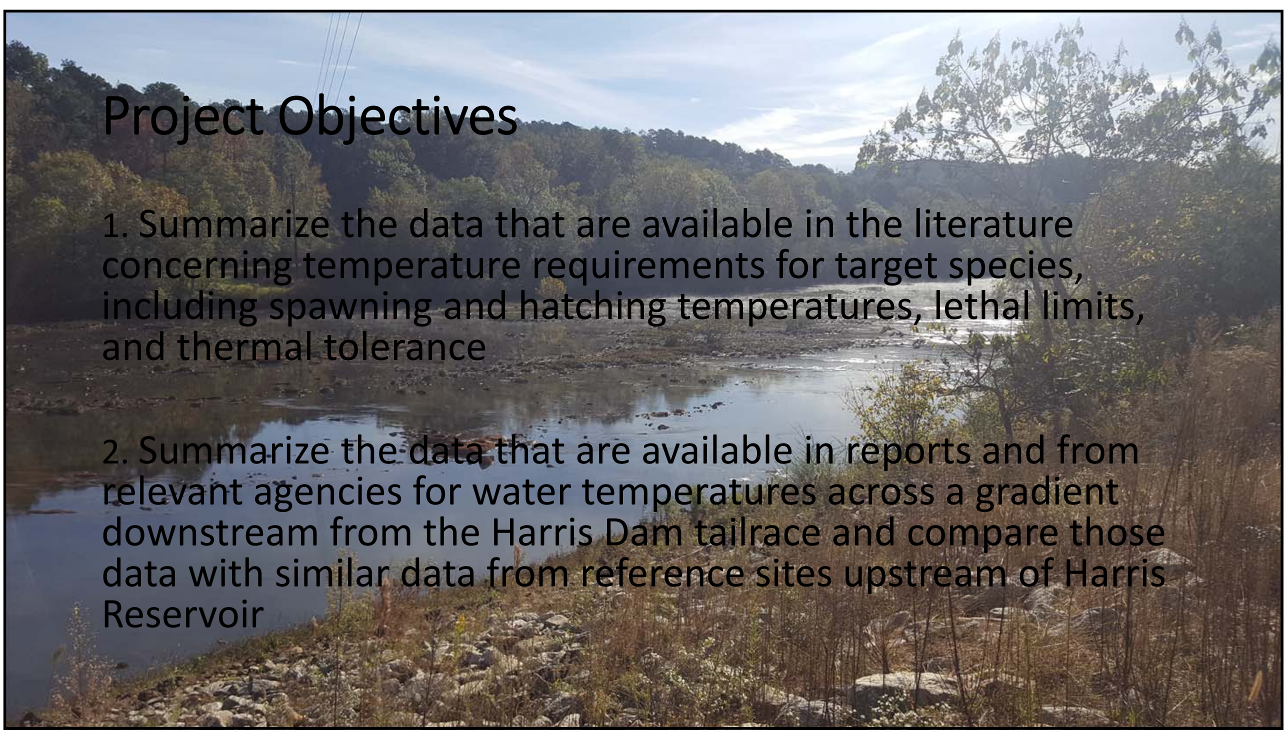
Family	Heflin		Malone		Wadley	
	2017	2018	2017	2018	2017	2018
Catostomidae	28	19	14	23	16	15
Centrarchidae	95	51	45	22	97	39
Clupeidae	-	-	1	-	-	-
Cottidae	2	1	-	-	-	1
Cyprinidae	207	121	61	91	41	127
Fundulidae	23	6	2	1	2	3
Ictaluridae	8	4	6	1	5	4
Percidae	242	124	153	174	80	88
Poeciliidae	5	-	-	-	-	-
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**

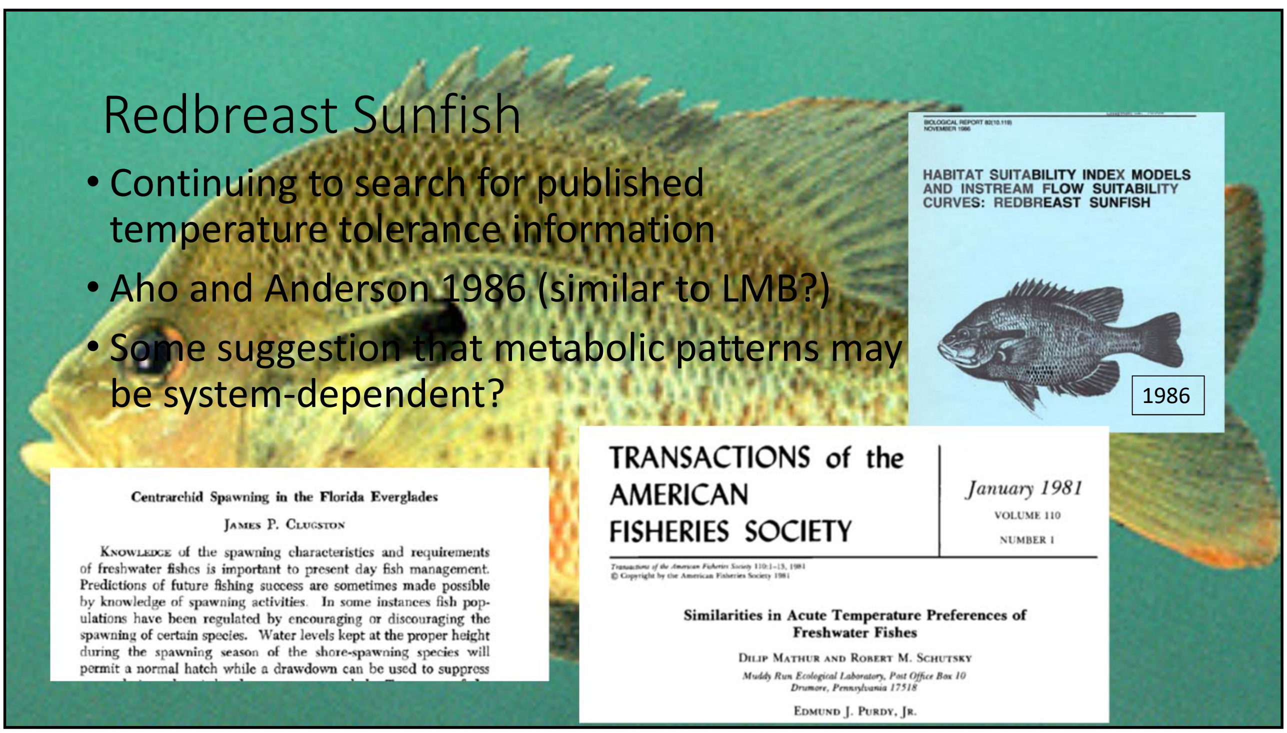



Using Bioenergetics to Address the Effects of Temperature and Flow on Fishes in the Harris Dam Tailrace
Dennis DeVries, Russell Wright, and Ehlana Stell
School of Fisheries, Aquaculture and Aquatic Sciences
Auburn University
HAT 3 Fish and Wildlife
March 20, 2019


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?

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

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.

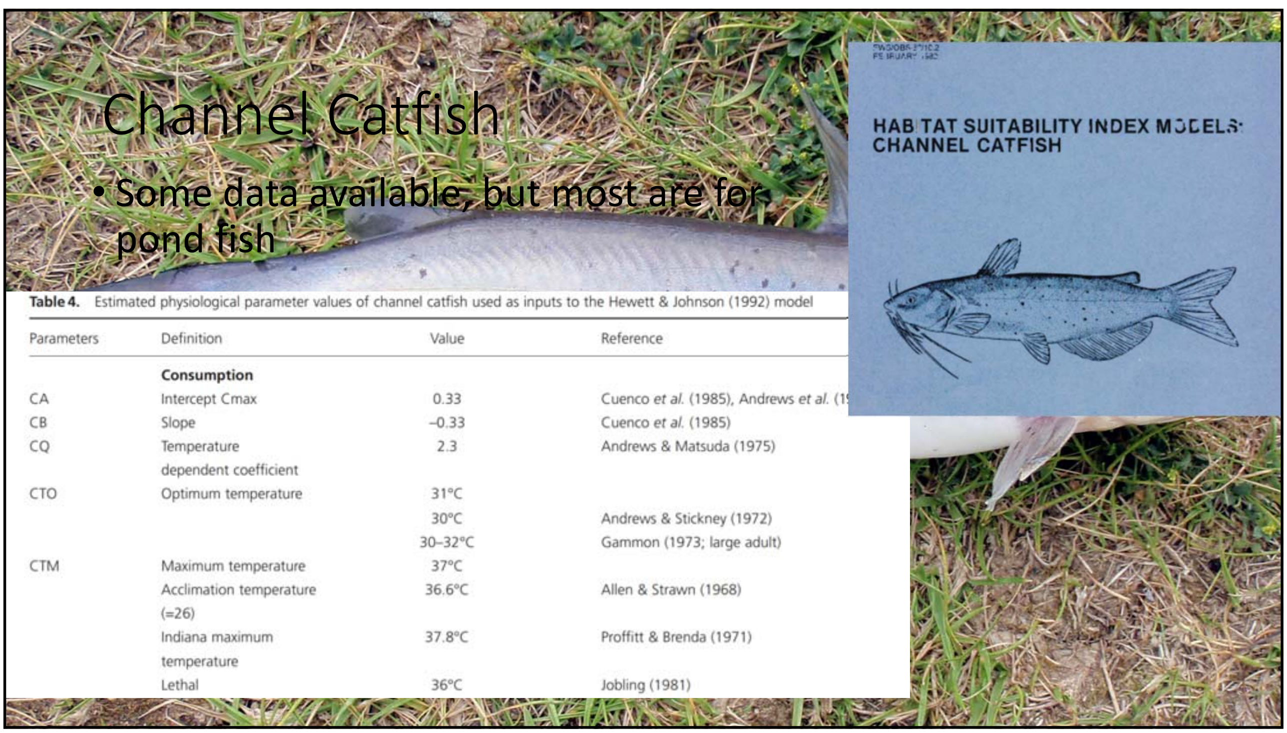
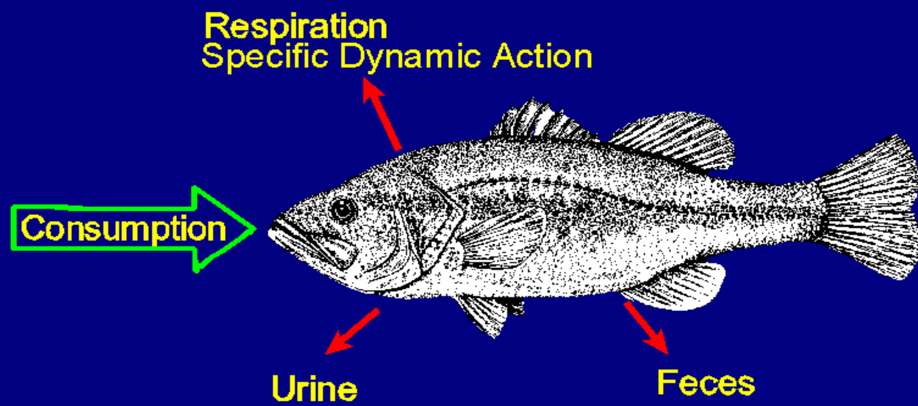


Table 4. Estimated physiological parameter values of channel catfish used as inputs to the Hewett & Johnson (1992) model

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

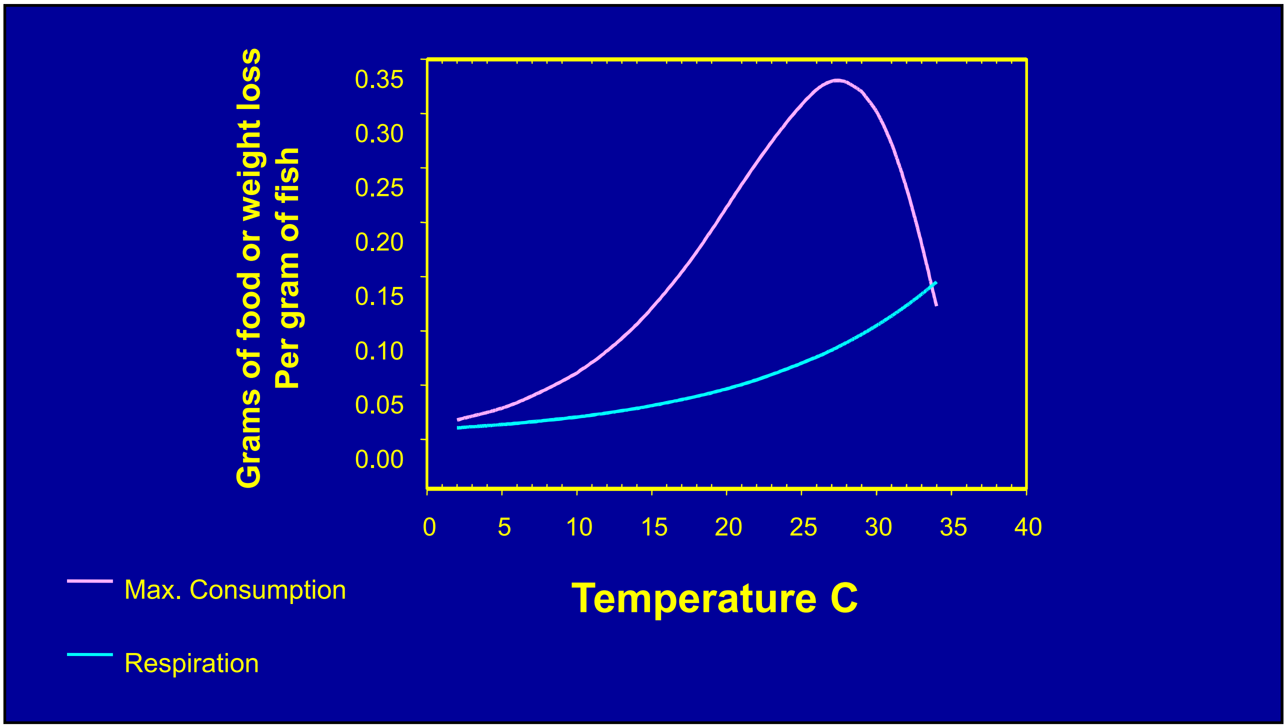
Uses of Bioenergetics Models

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

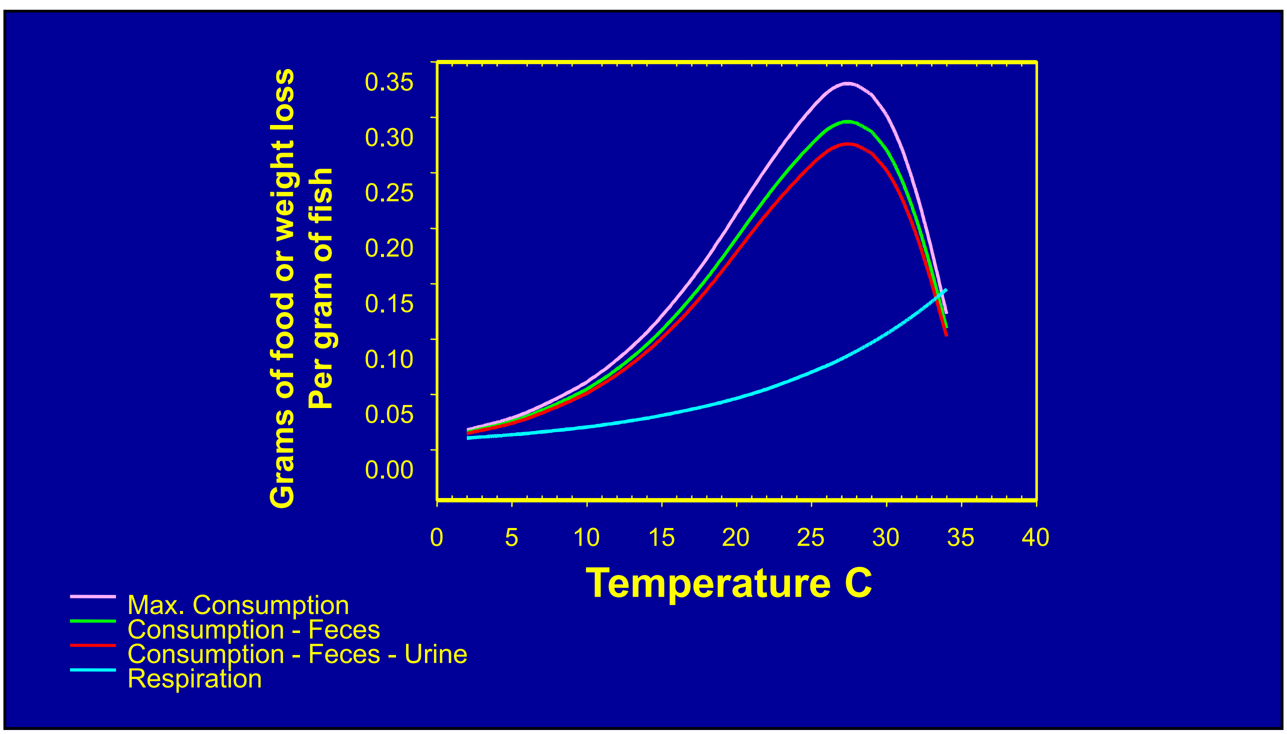
9

Growth = Consumption - (Costs)

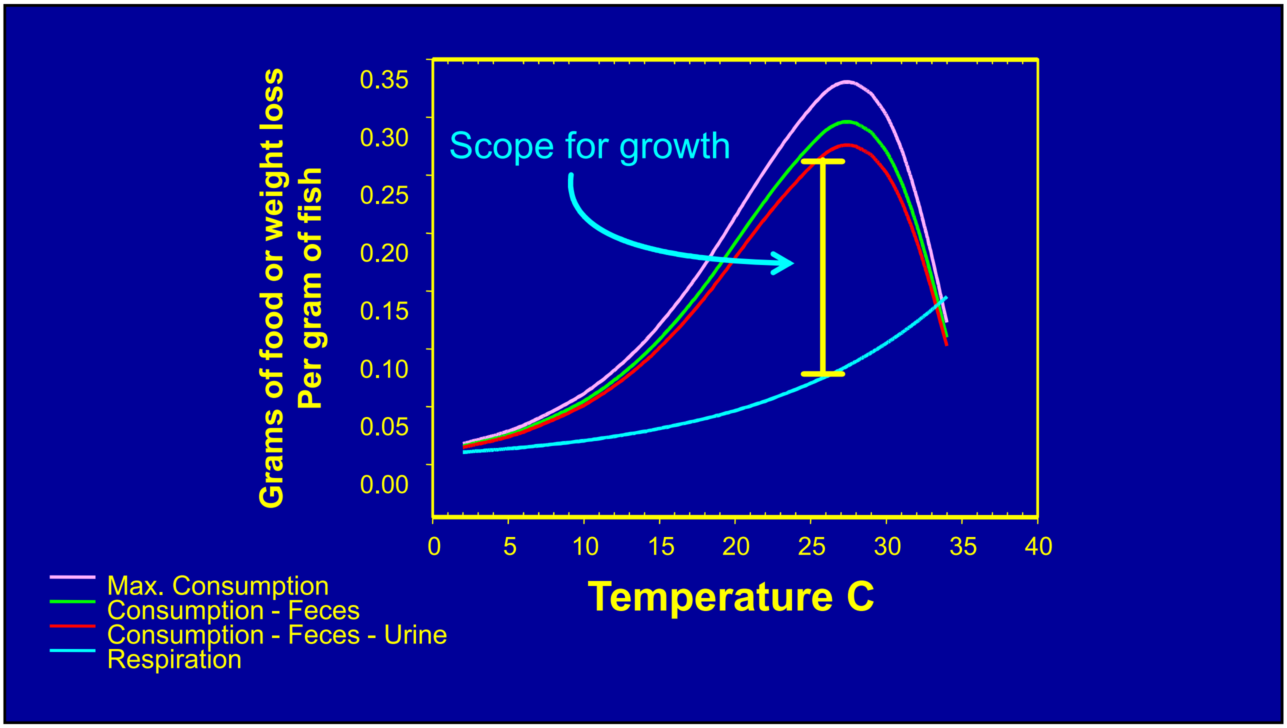
Costs = Respiration + Feces + Urine + Cost of Digestion



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
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

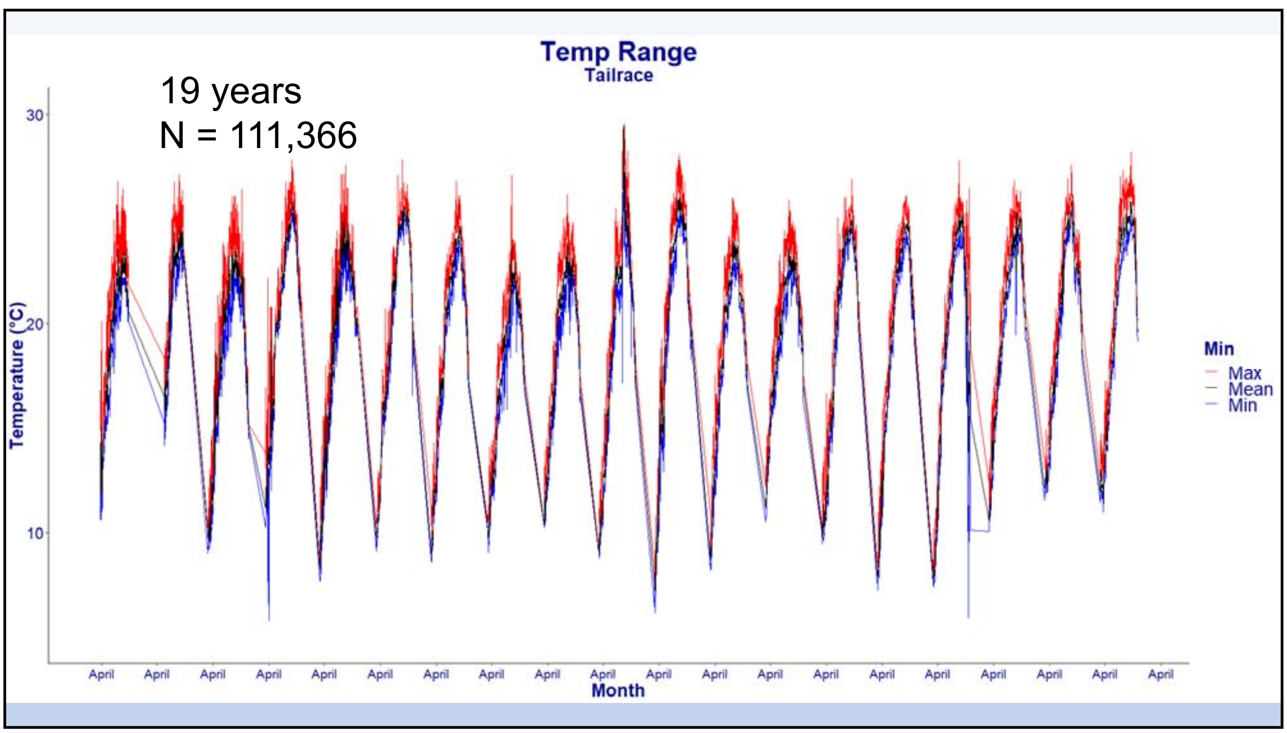
Objective 1: Temperature Requirements

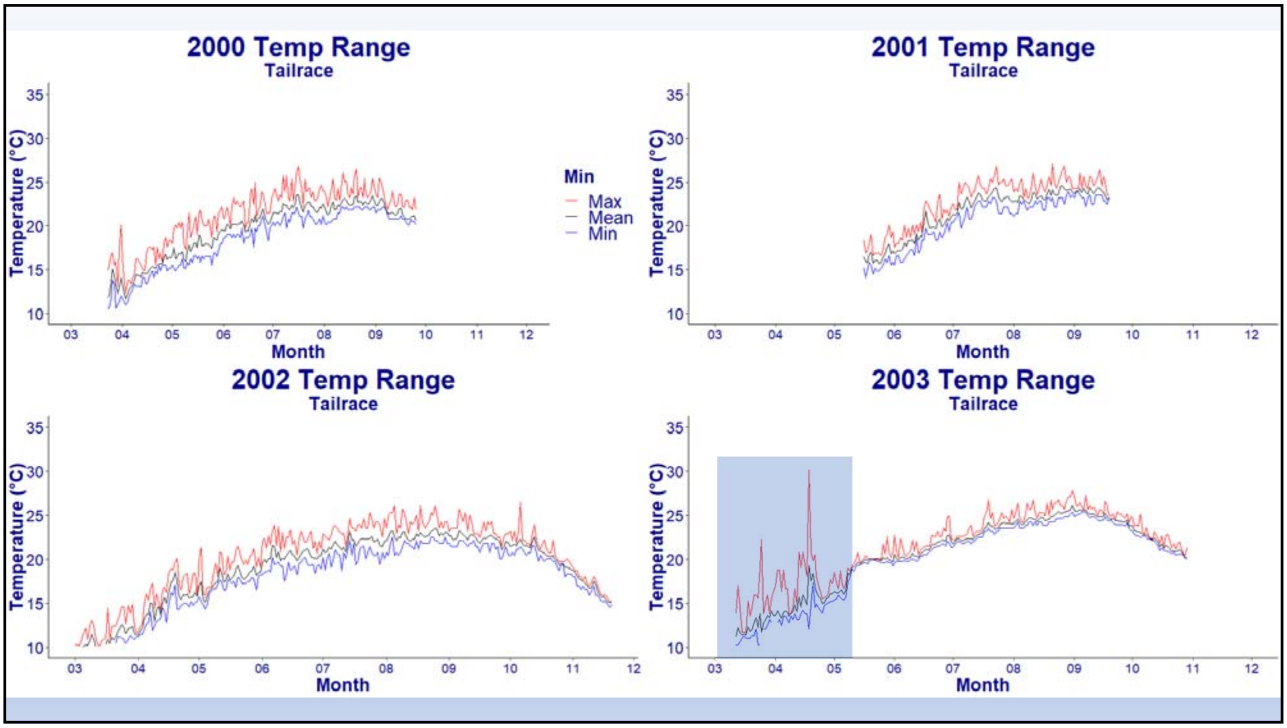
- Reviewed published literature, grey literature reports, agency reports, theses/dissertations, etc. for information on target and related species
  - Redbreast Sunfish
  - Tallapoosa Bass
  - Channel Catfish
- **Extremely limited data available except for Channel Catfish in ponds/reservoirs**
- **Continuing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

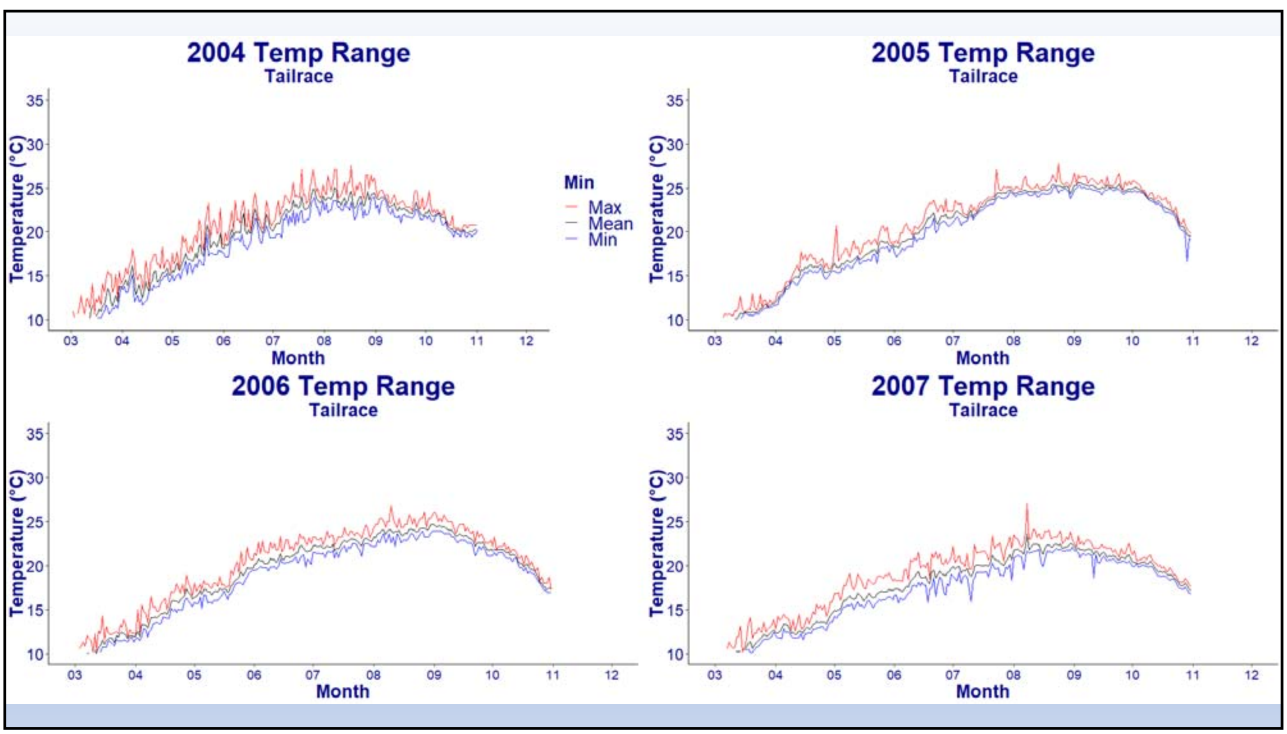
Objective 2 ummary

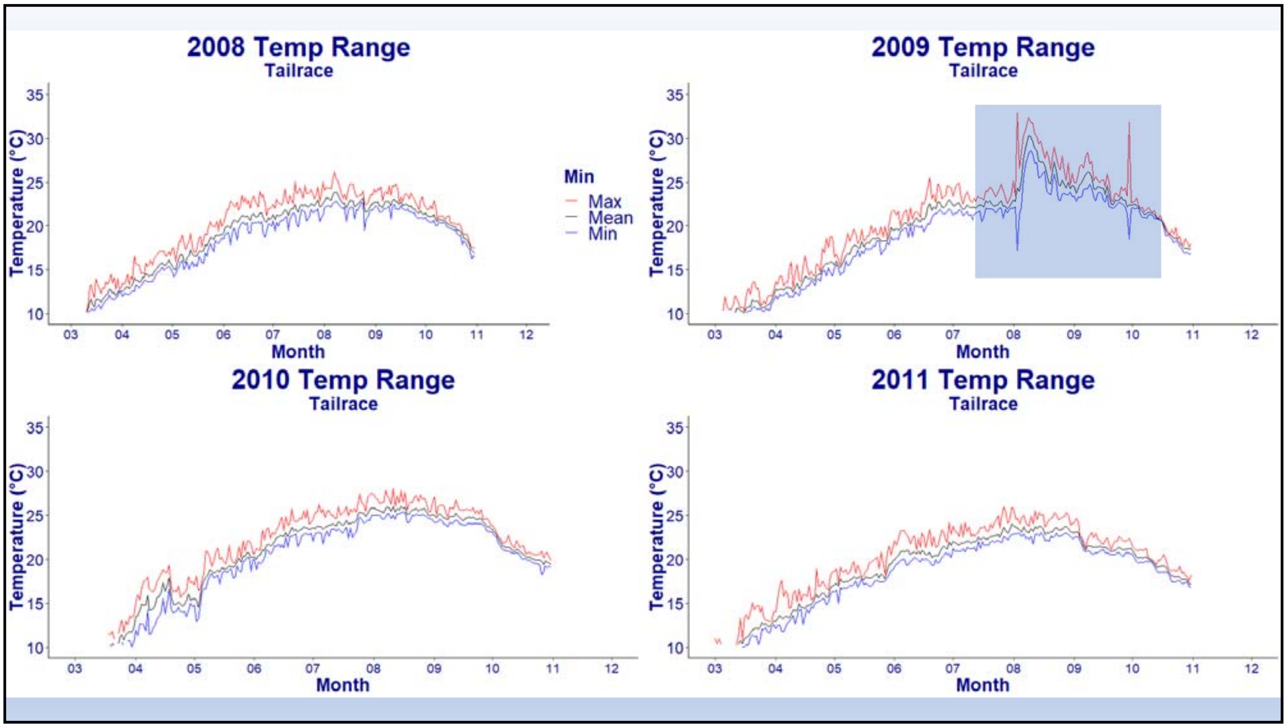
- Obtained tempe wer for three sites (tailrace, Malon
- Continuing to se ata
- Graphed max, m ear
- Compared pre/p each site
- Compared site t

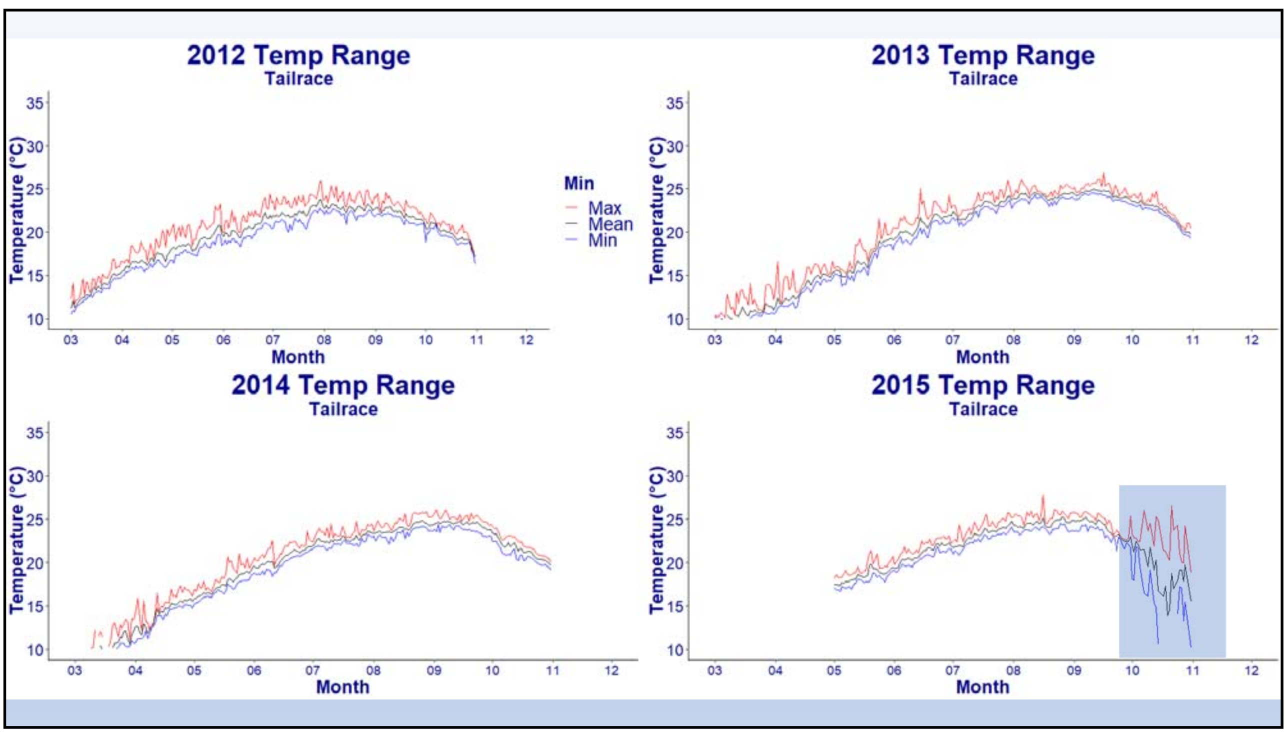

Tallapoosa River
R.I. Harris Dam
Google
RL Harris
Reservoir

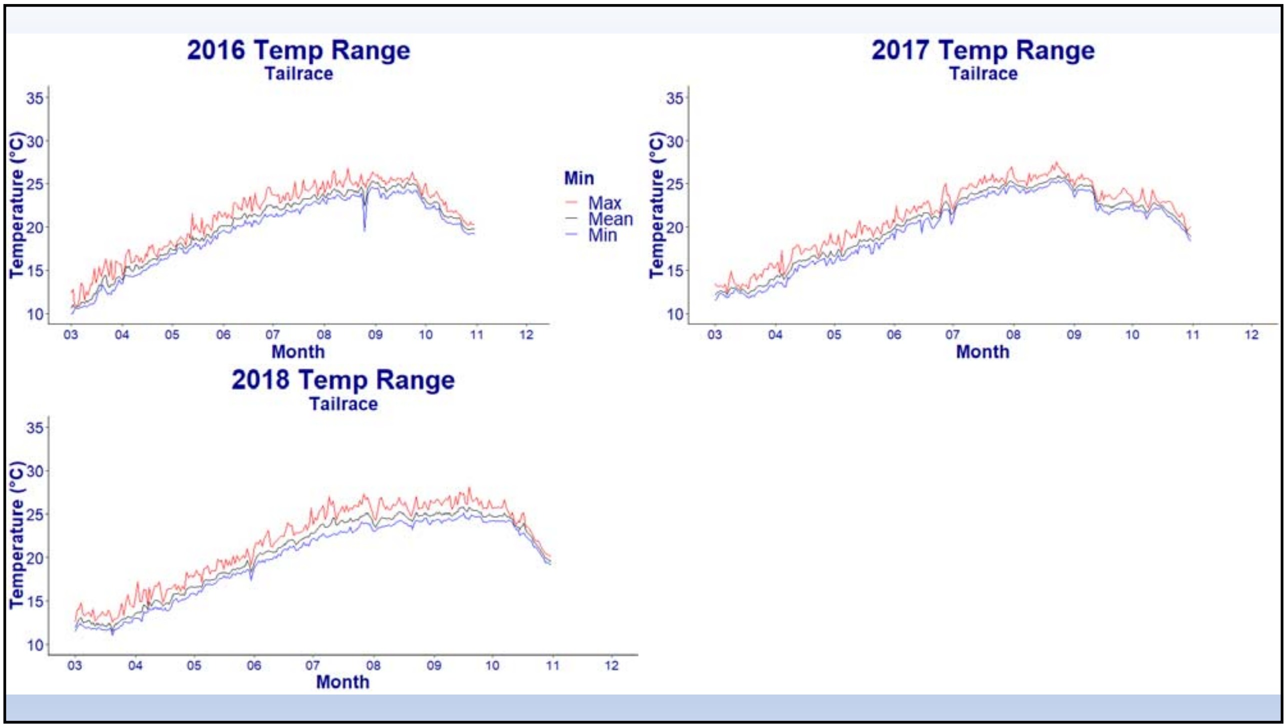

Temp Range
Tailrace
19 years
N = 111,366
Temperature (°C)
30
20
10
April
Month
Min
Max
Mean
Min

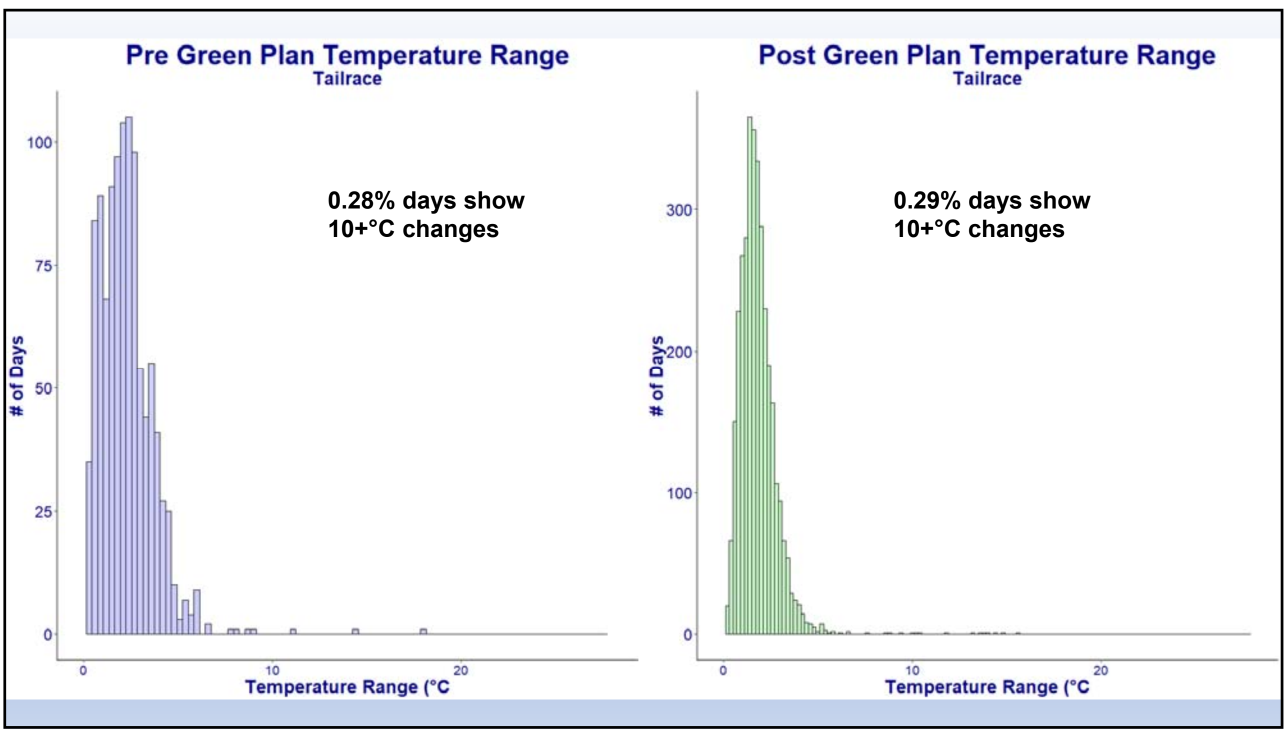

2000 Temp Range
Tailrace
2001 Temp Range
Tailrace
2002 Temp Range
Tailrace
2003 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

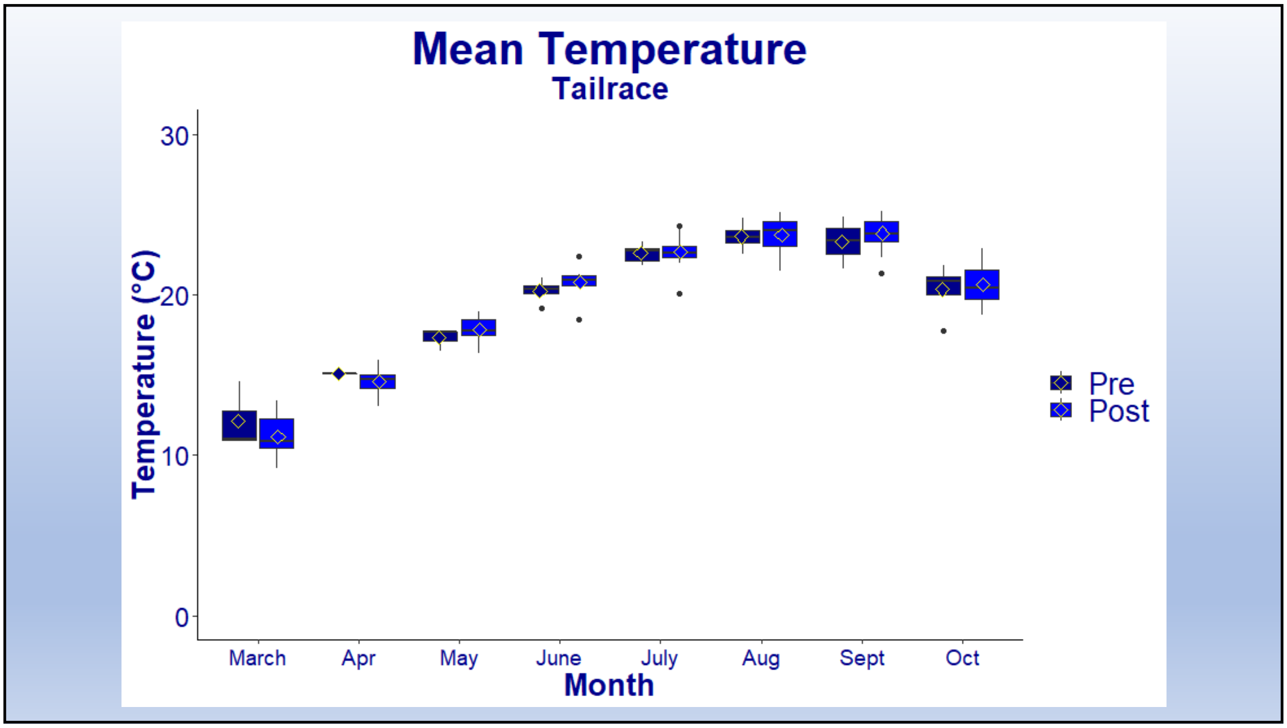

2004 Temp Range
Tailrace
2005 Temp Range
Tailrace
2006 Temp Range
Tailrace
2007 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

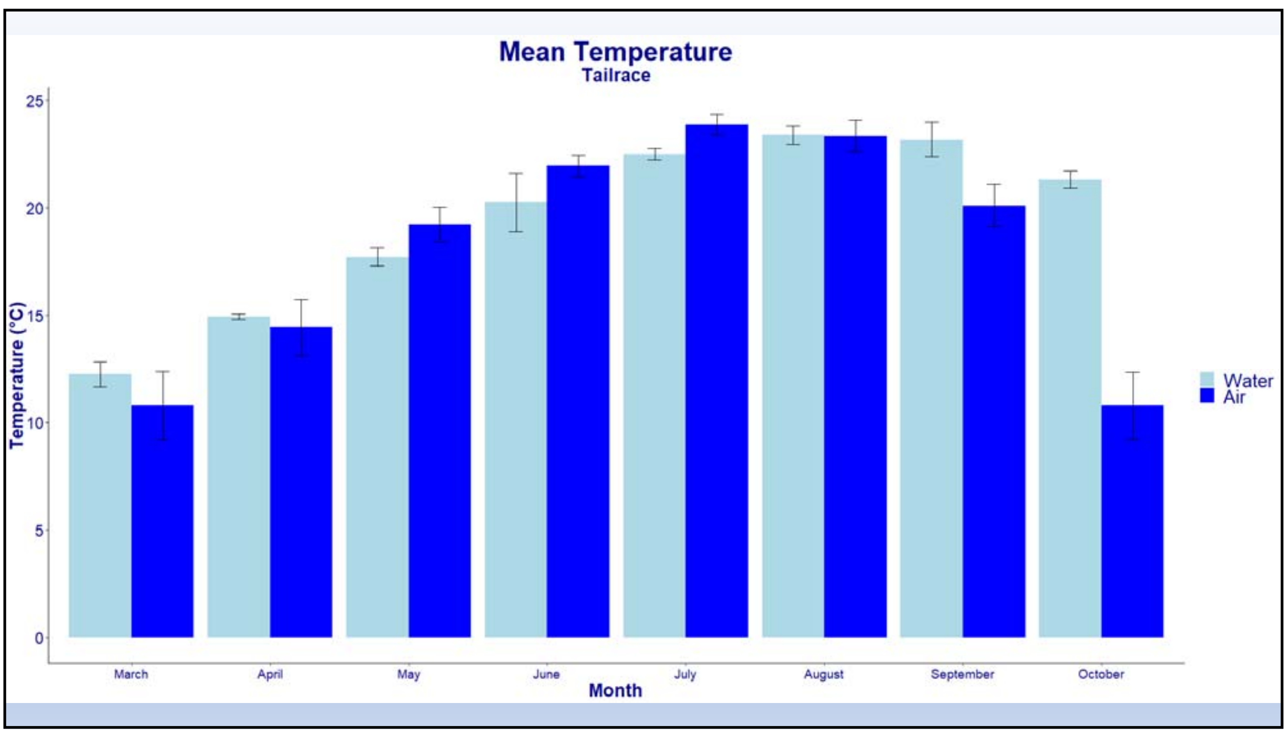

2008 Temp Range
Tailrace
2009 Temp Range
Tailrace
2010 Temp Range
Tailrace
2011 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min

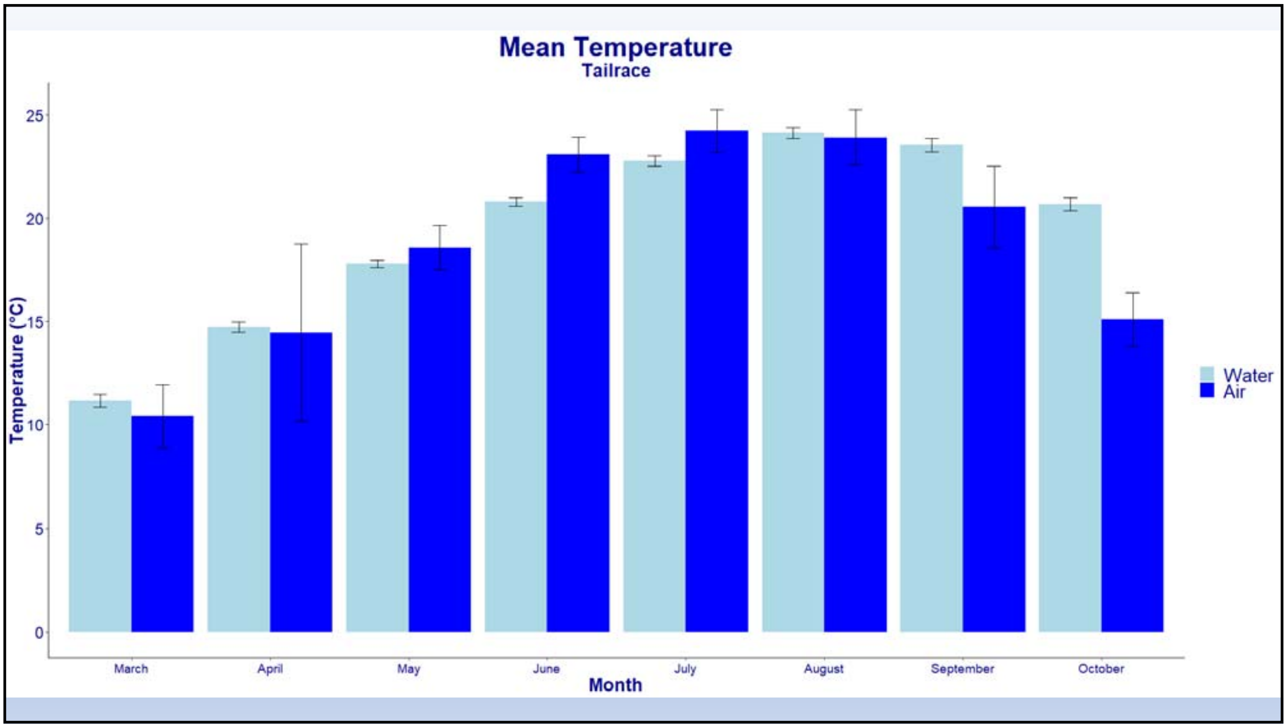

2012 Temp Range
Tailrace
2013 Temp Range
Tailrace
2014 Temp Range
Tailrace
2015 Temp Range
Tailrace
Temperature (°C)
Month
Min
Max
Mean
Min


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

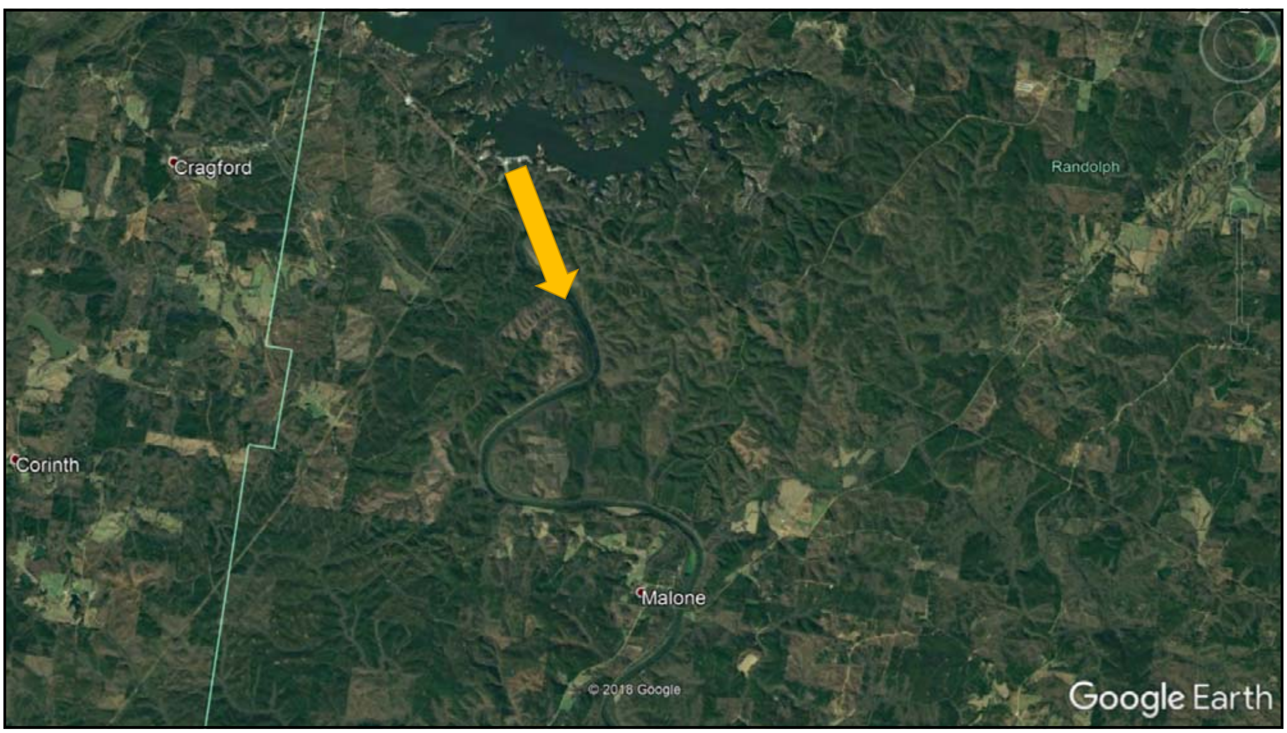

Pre Green Plan Temperature Range
Tailrace
0.28% days show
10+°C changes
# of Days
Temperature Range (°C
Post Green Plan Temperature Range
Tailrace
0.29% days show
10+°C changes
# of Days
Temperature Range (°C


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

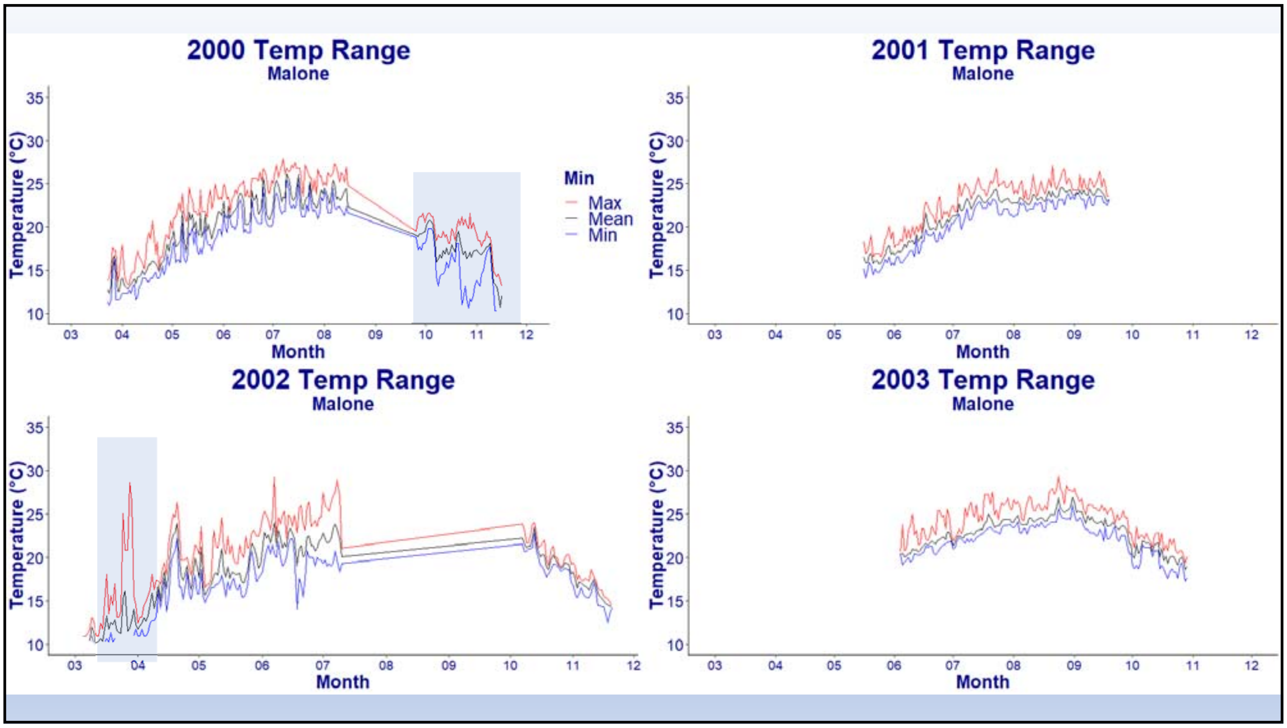

Mean Temperature
Tailrace
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

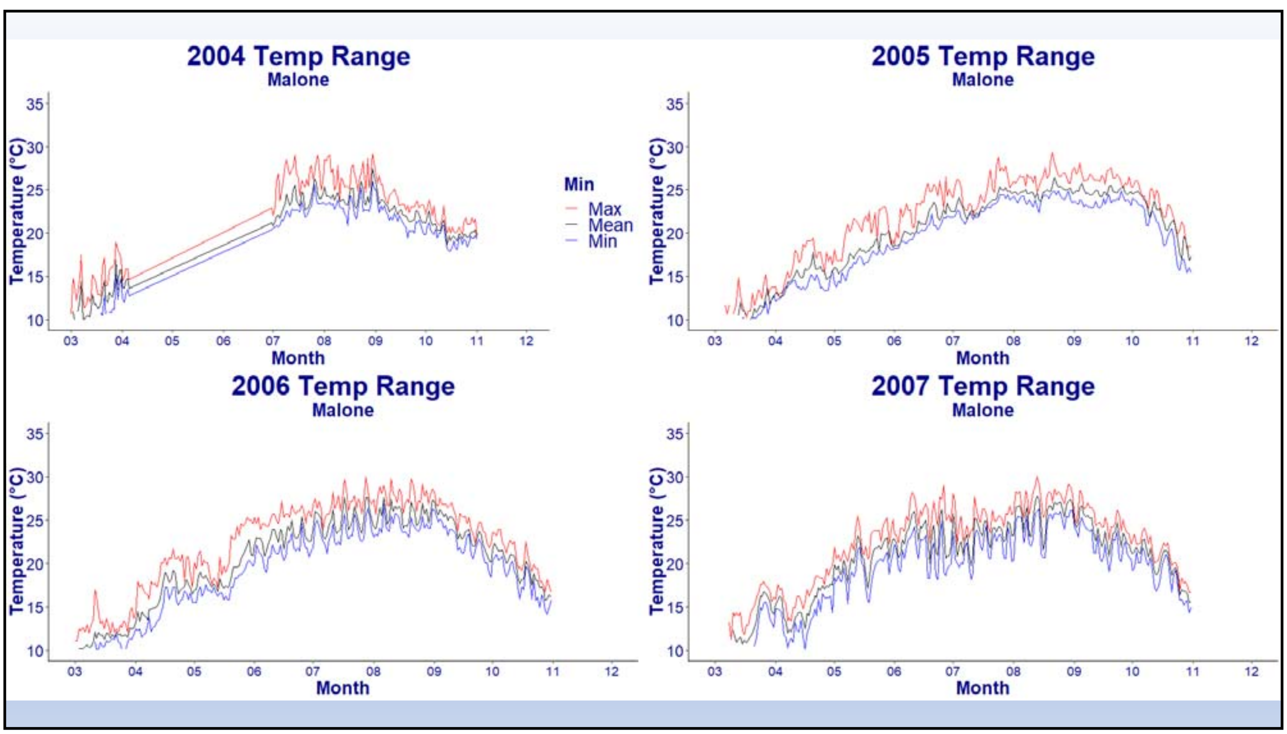


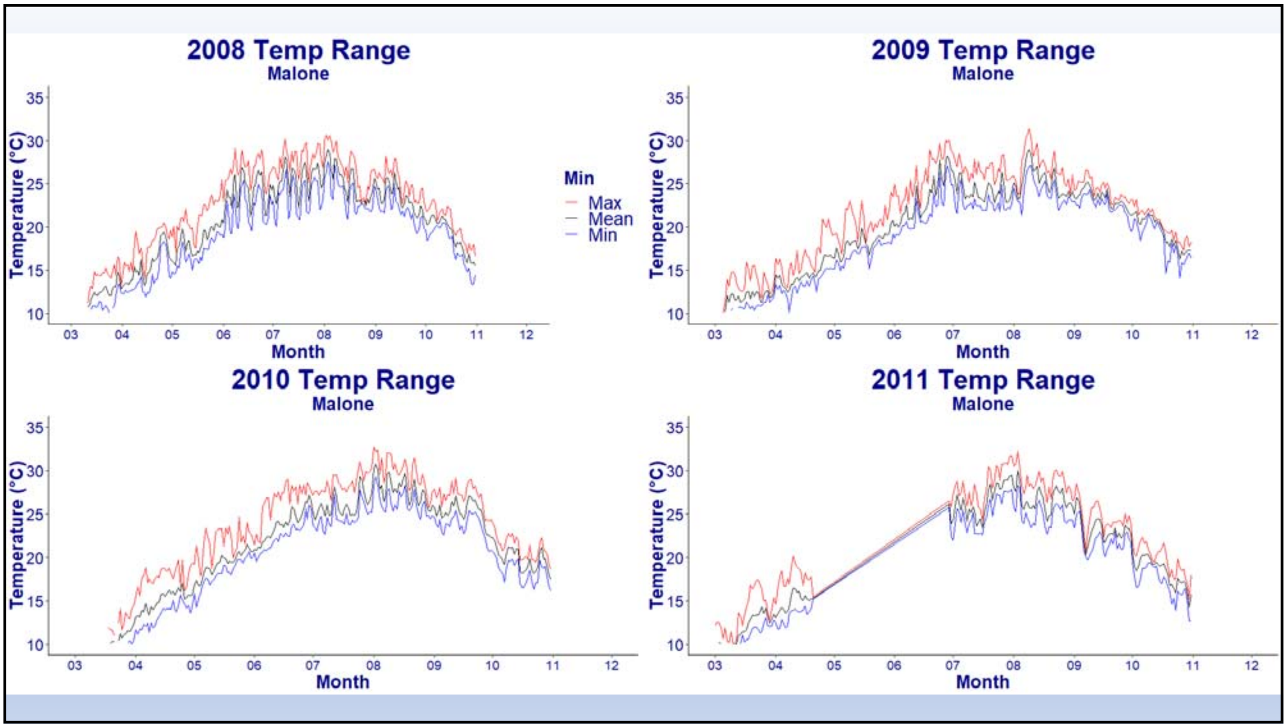
Mean Temperature
Tailrace
Temperature (°C)
0
5
10
15
20
25
March
April
May
June
July
August
September
October
Month
Water
Air

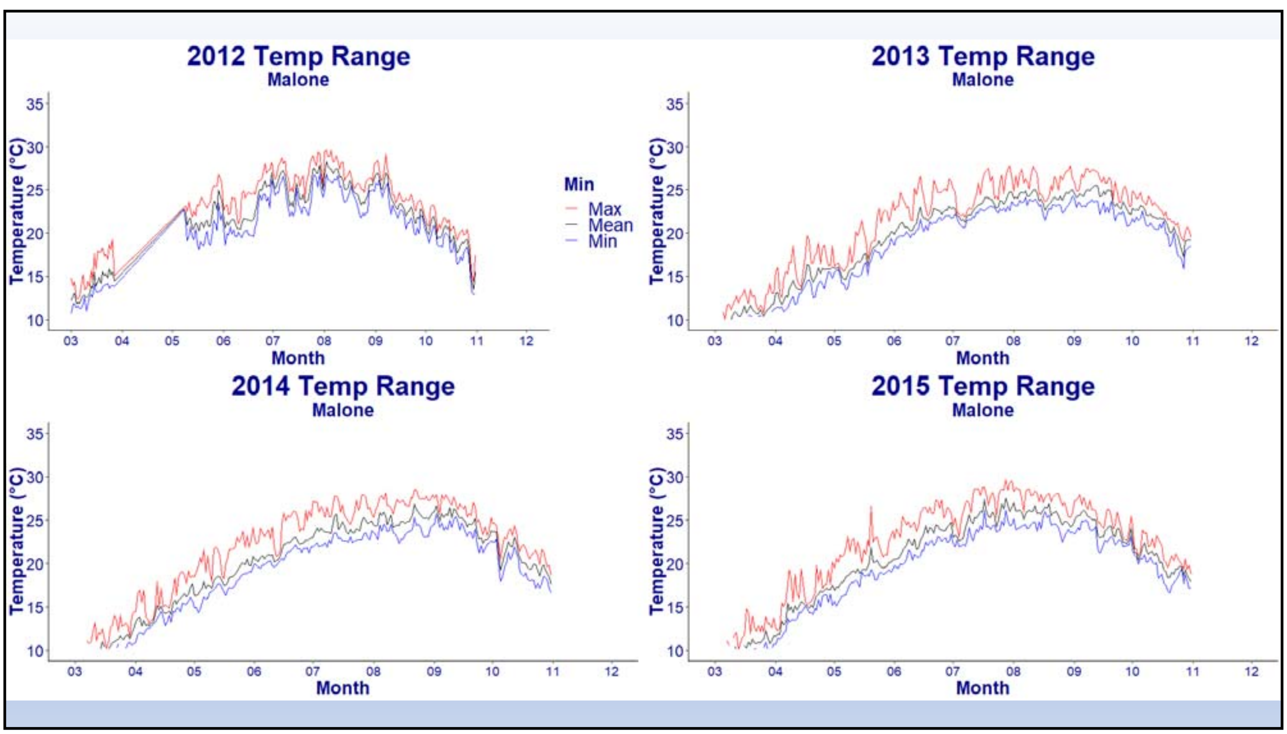


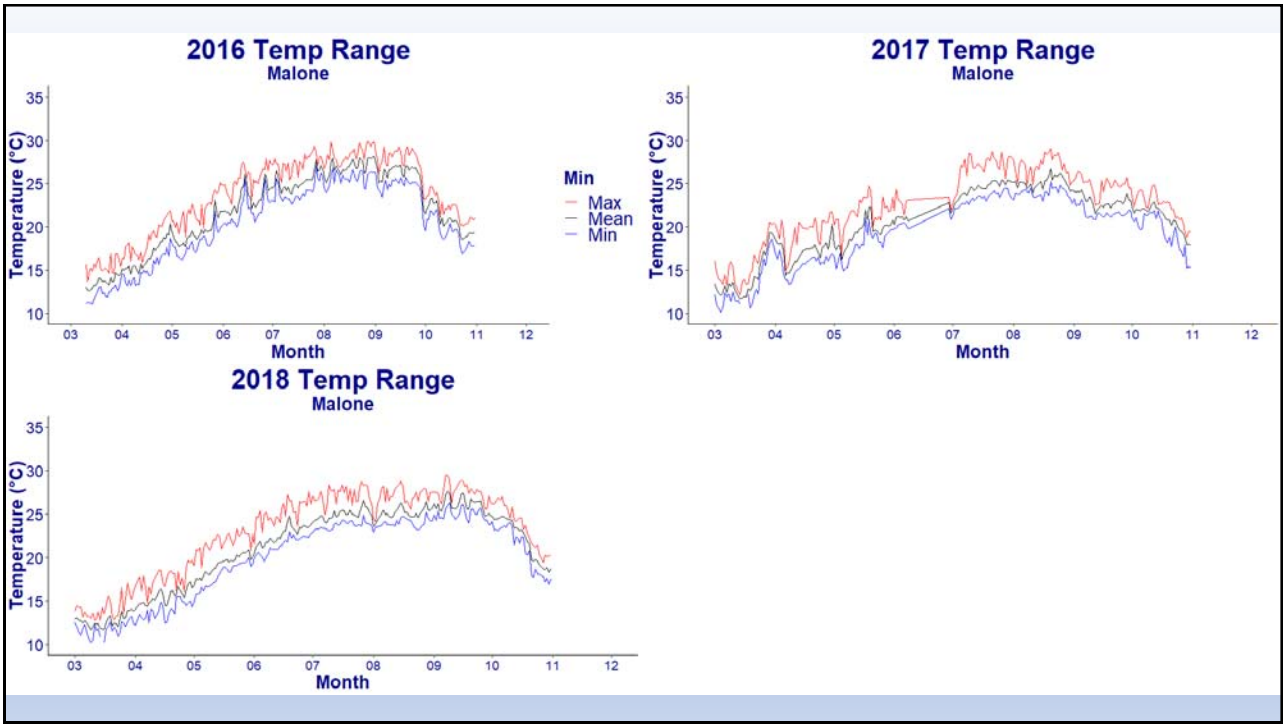
Cragford
Randolph
Corinth
Malone
© 2018 Google
Google Earth

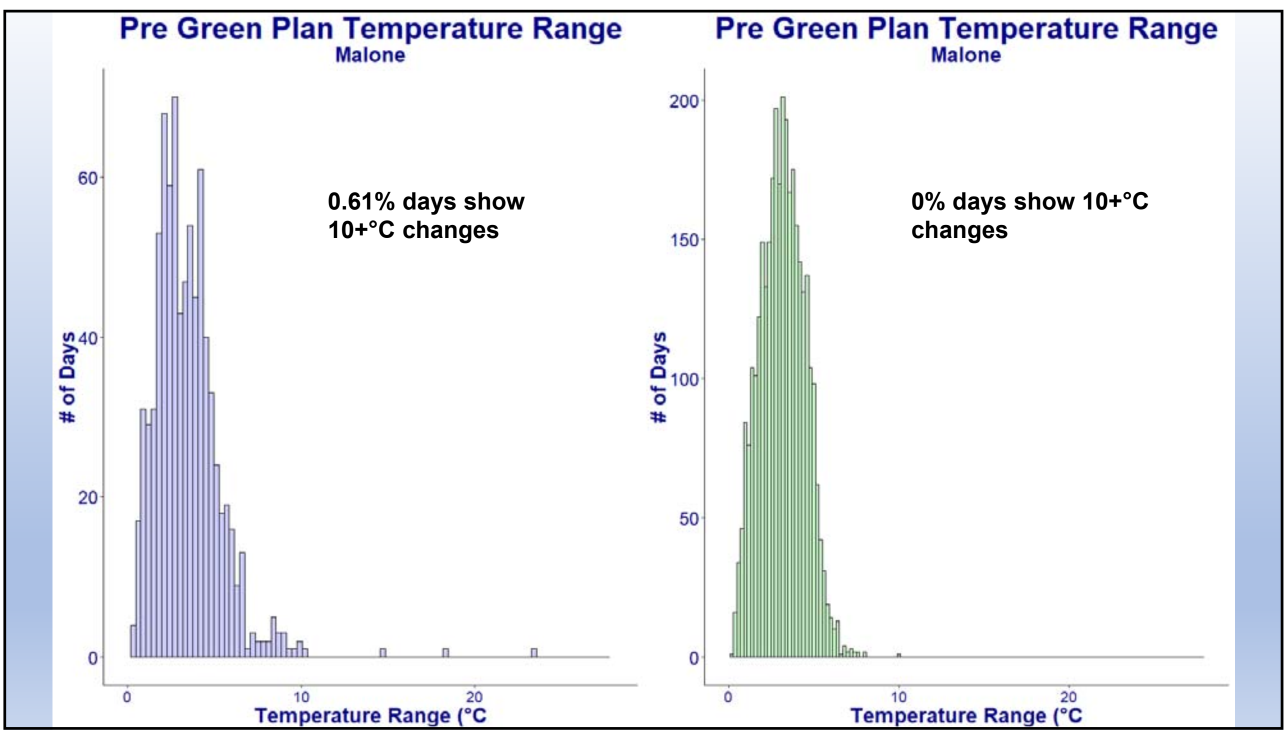

2000 Temp Range
Malone
2001 Temp Range
Malone
2002 Temp Range
Malone
2003 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min

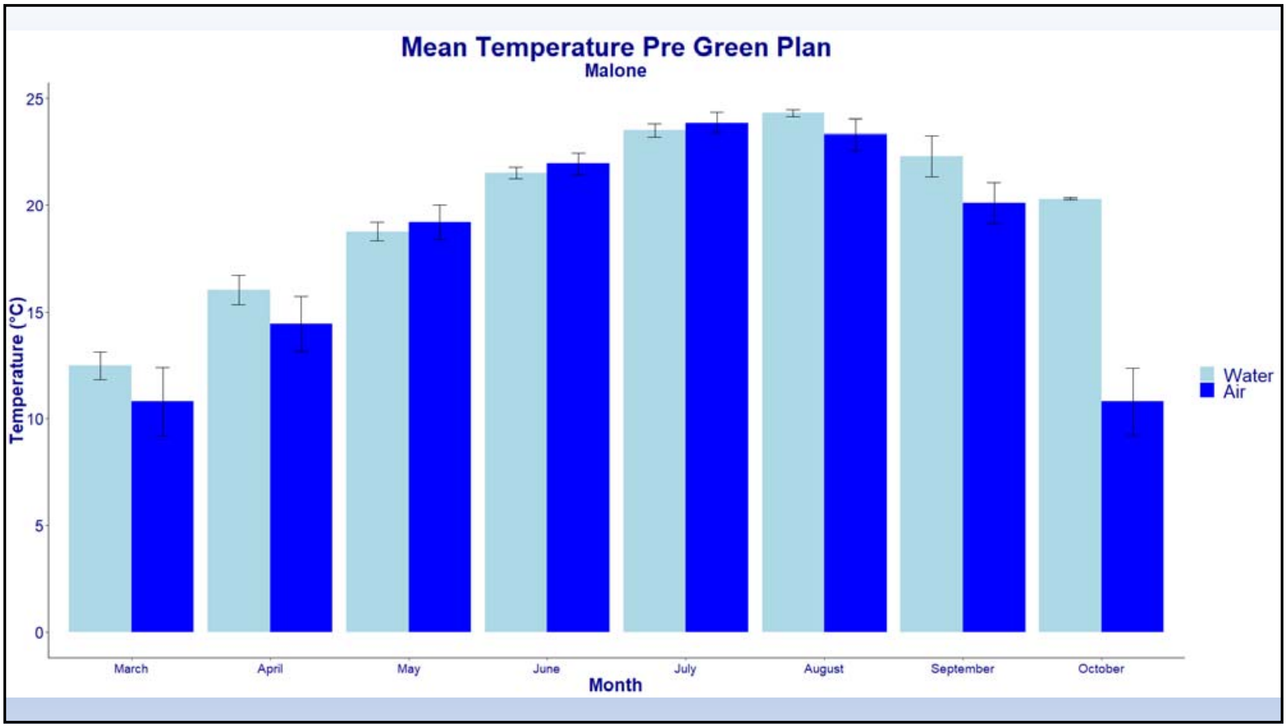

2004 Temp Range
Malone
2005 Temp Range
Malone
2006 Temp Range
Malone
2007 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min


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

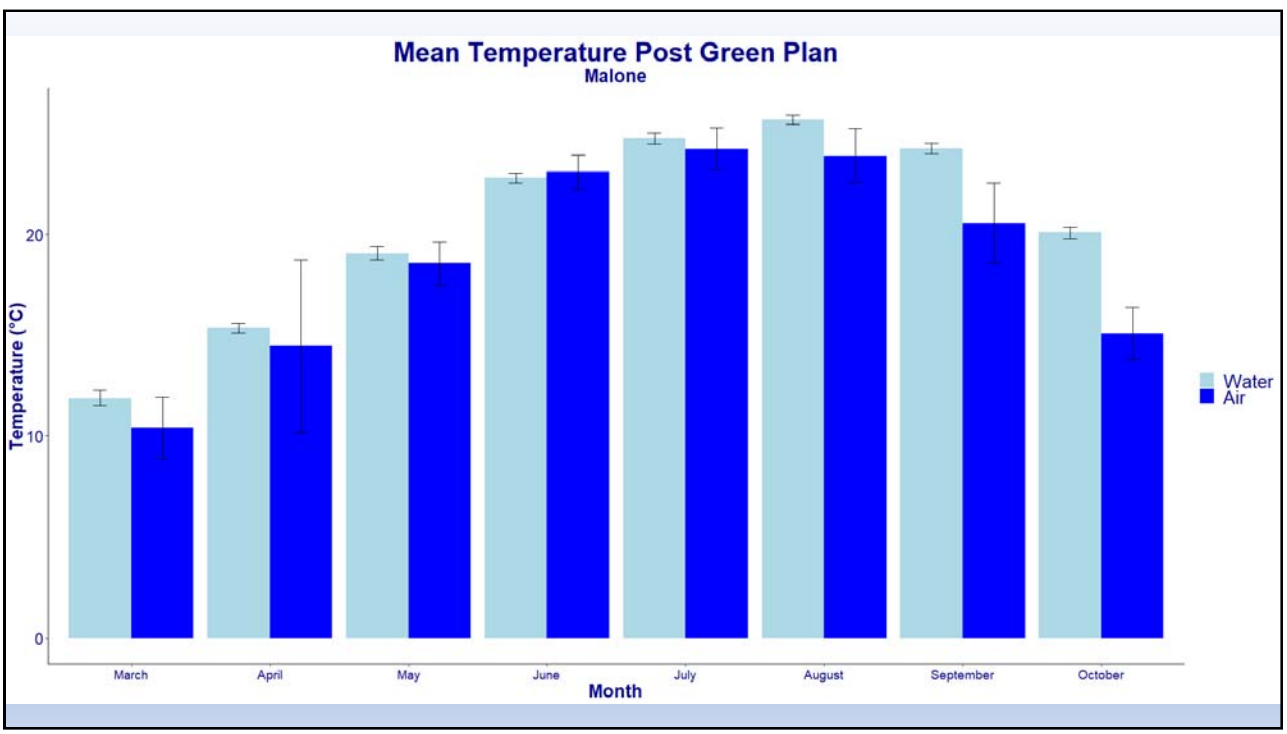

2012 Temp Range
Malone
2013 Temp Range
Malone
2014 Temp Range
Malone
2015 Temp Range
Malone
Temperature (°C)
Month
Min
Max
Mean
Min
03 04 05 06 07 08 09 10 11 12
10 15 20 25 30 35


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

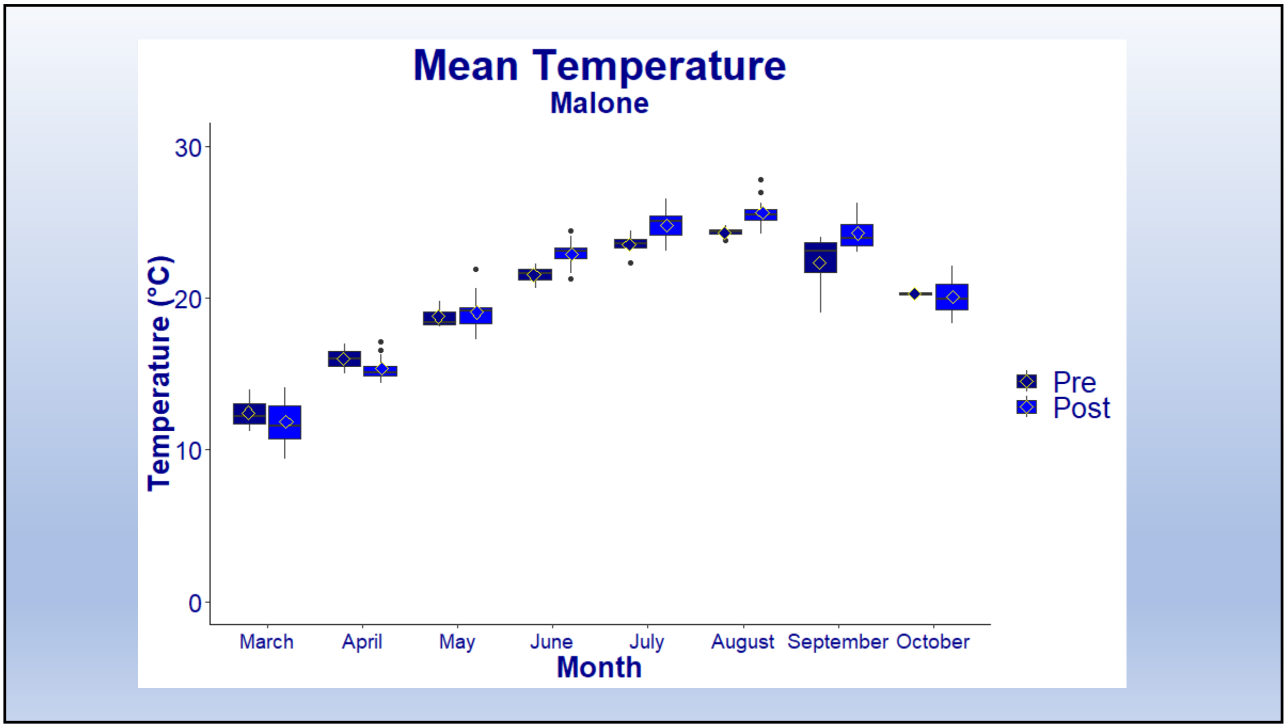

Pre Green Plan Temperature Range
Malone
# of Days
0.61% days show 10+°C changes
Temperature Range (°C
Pre Green Plan Temperature Range
Malone
0% days show 10+°C changes
Temperature Range (°C

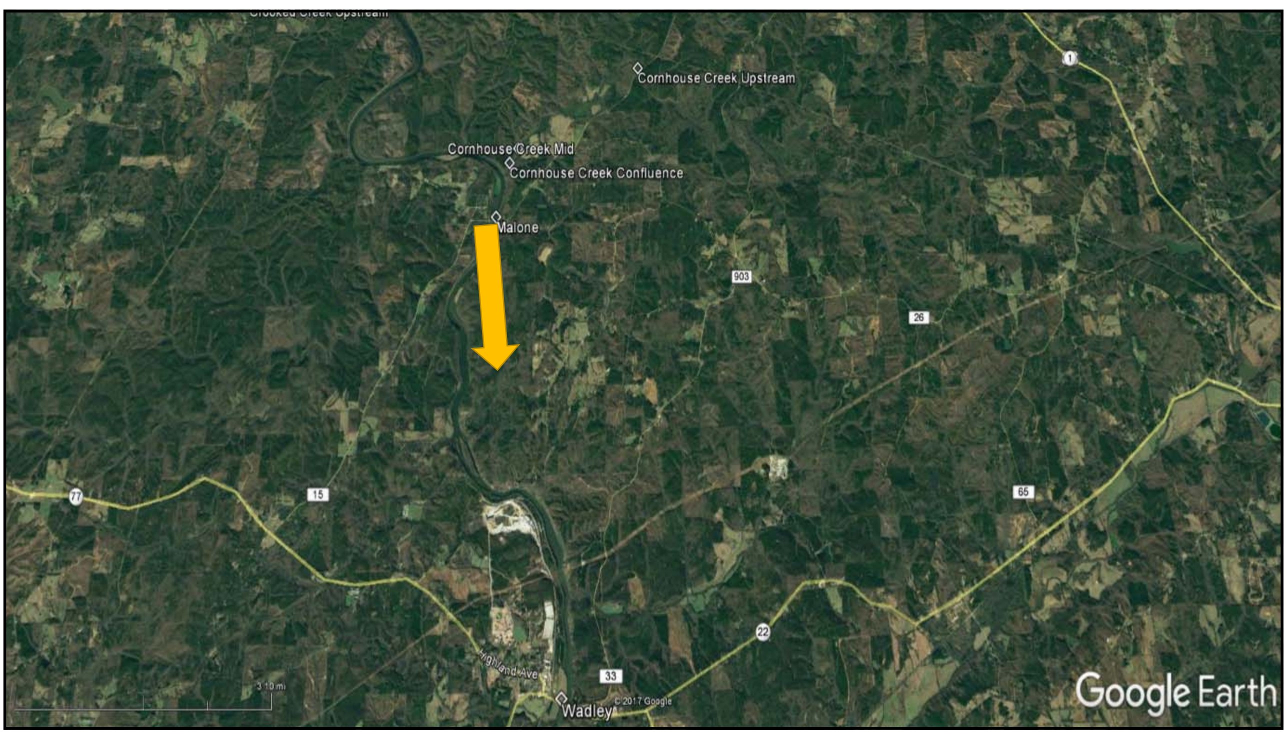


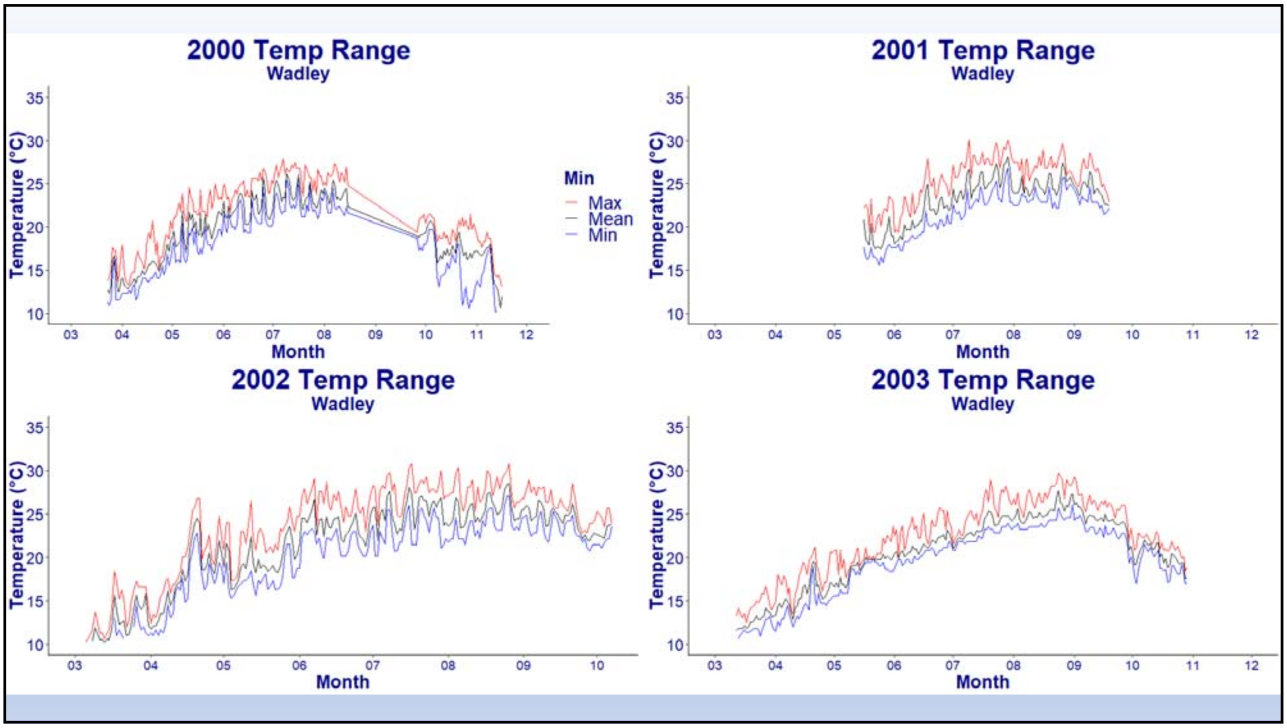
Mean Temperature Pre Green Plan
Malone
Temperature (°C)
25
20
15
10
5
0
March
April
May
June
July
August
September
October
Month
Water
Air

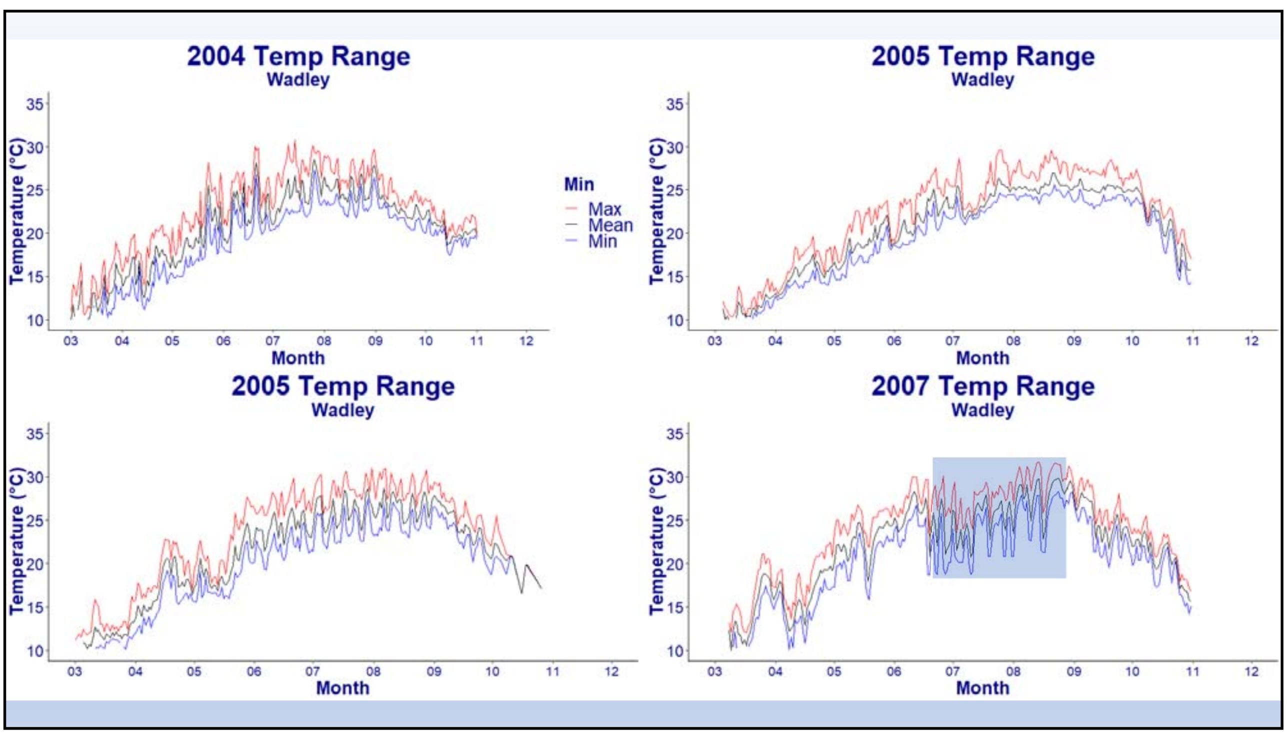


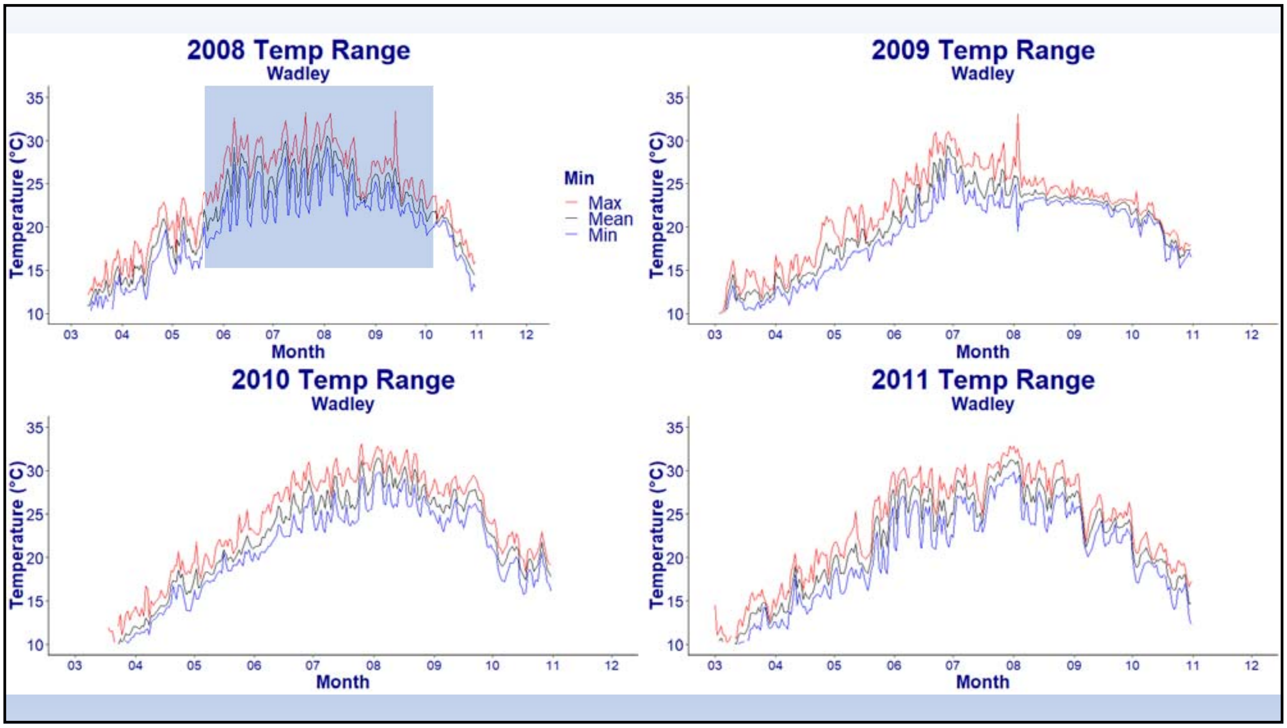
Mean Temperature Post Green Plan
Malone
Temperature (°C)
20
10
0
March
April
May
June
July
August
September
October
Month
Water
Air

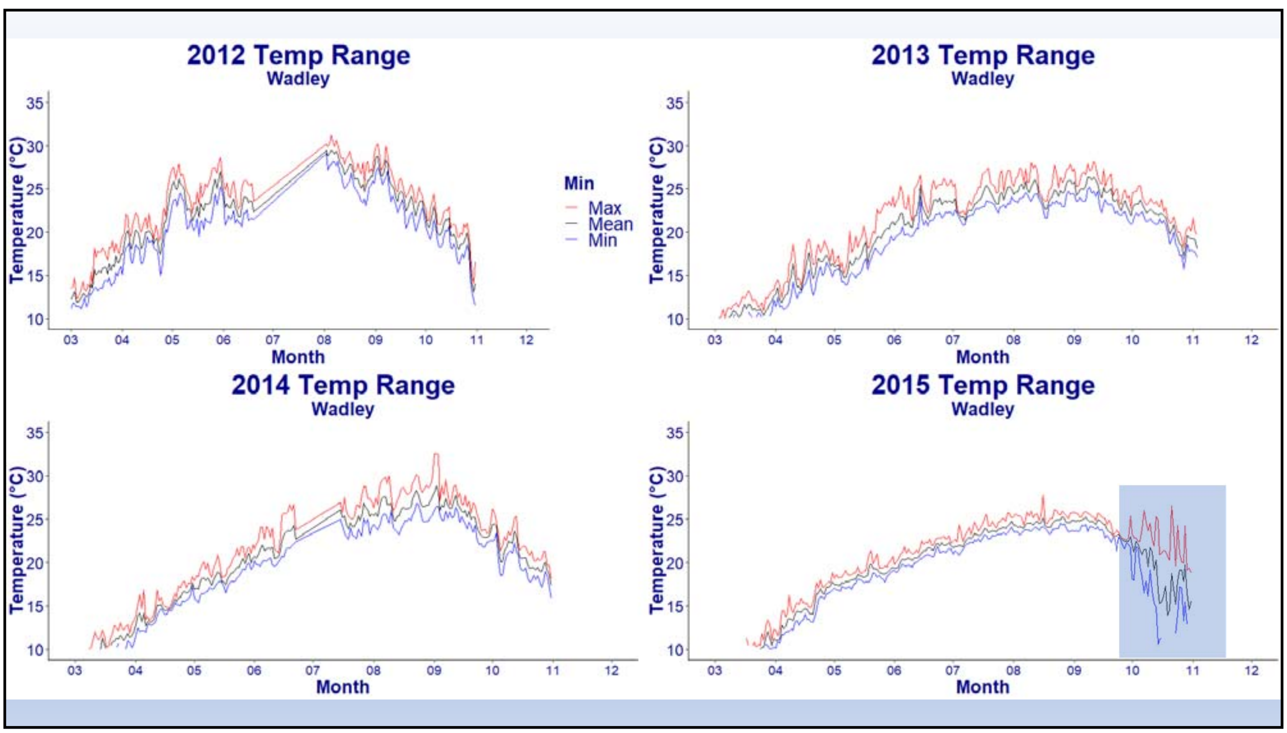

Mean Temperature
Malone
Temperature (°C)
30
20
10
0
March
April
May
June
July
August
September
October
Month
Pre
Post

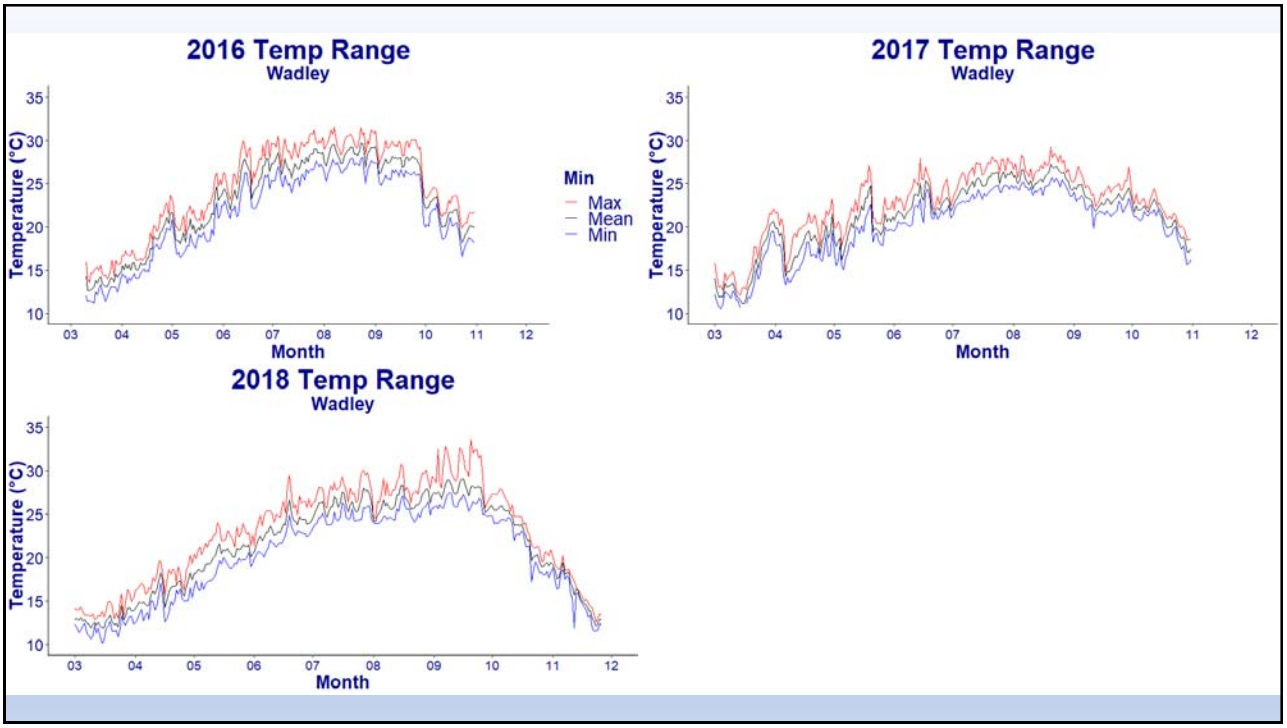

Cornhouse Creek Upstream
Cornhouse Creek Mid
Cornhouse Creek Confluence
Malone
903
26
77
15
65
22
33
Wadley
Google Earth

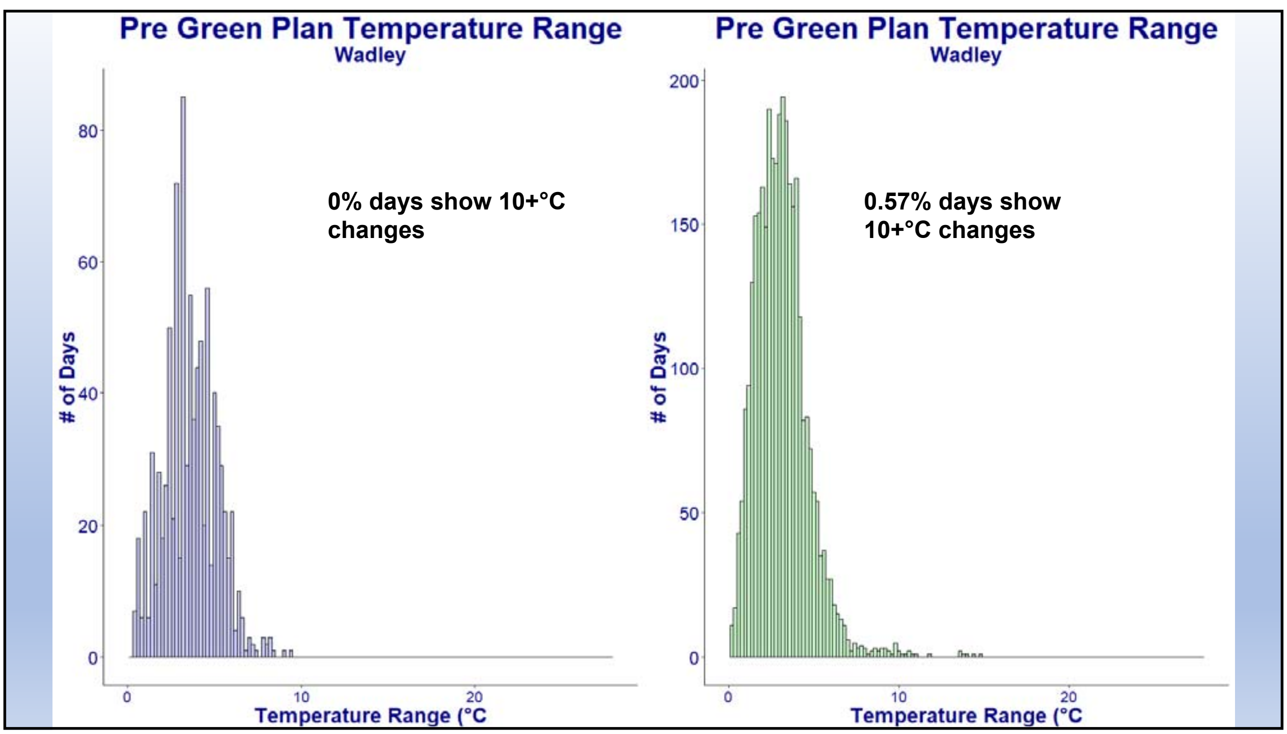

2000 Temp Range
Wadley
2001 Temp Range
Wadley
2002 Temp Range
Wadley
2003 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

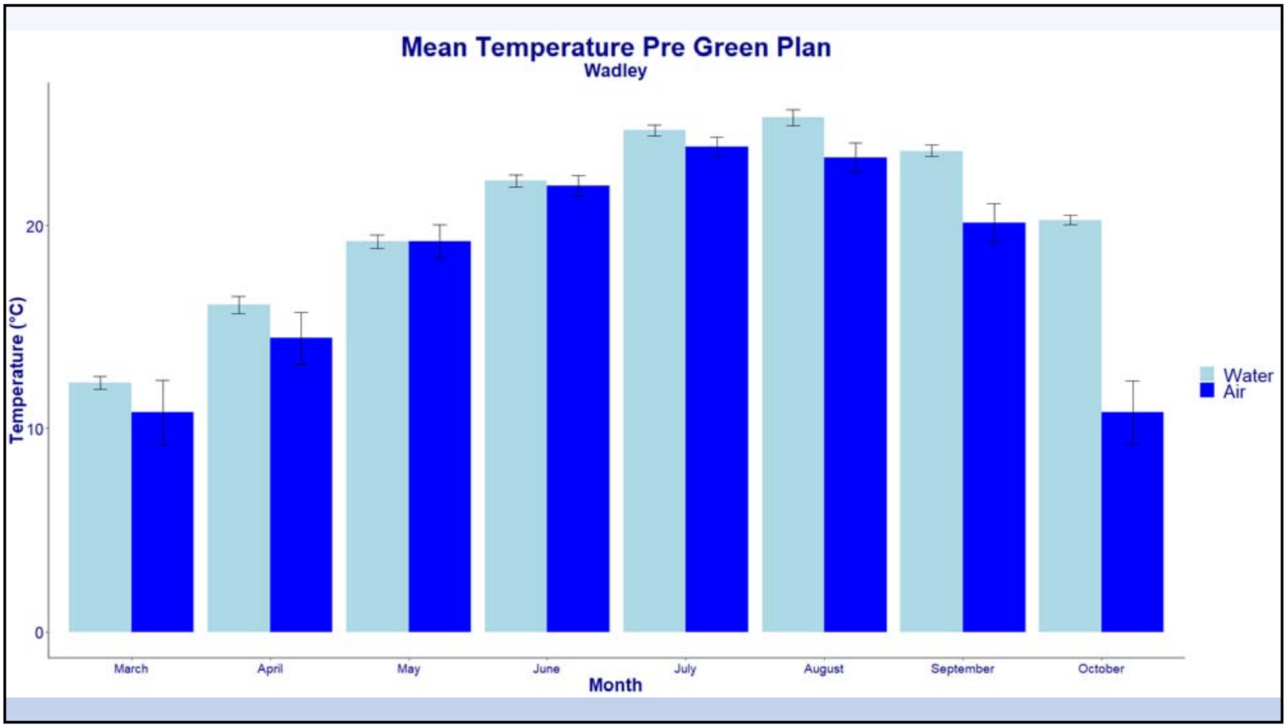

2004 Temp Range
Wadley
2005 Temp Range
Wadley
2005 Temp Range
Wadley
2007 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

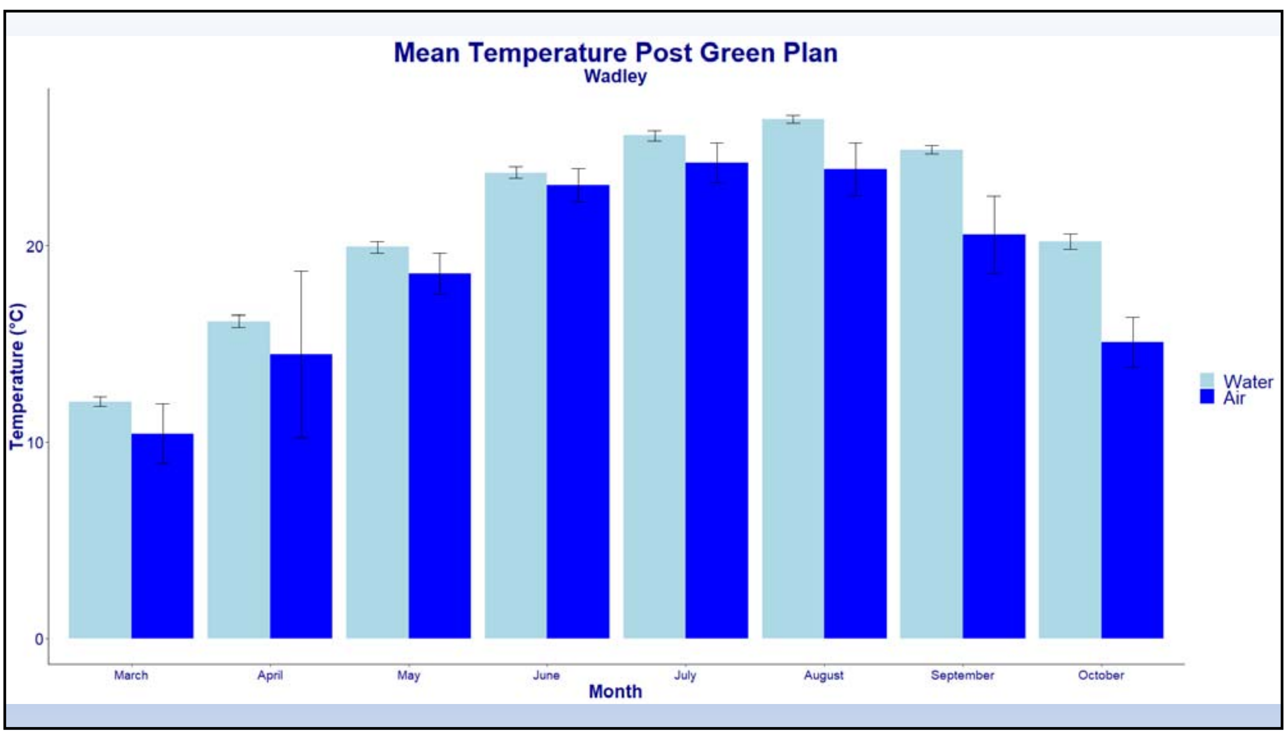

2008 Temp Range
Wadley
2009 Temp Range
Wadley
2010 Temp Range
Wadley
2011 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min

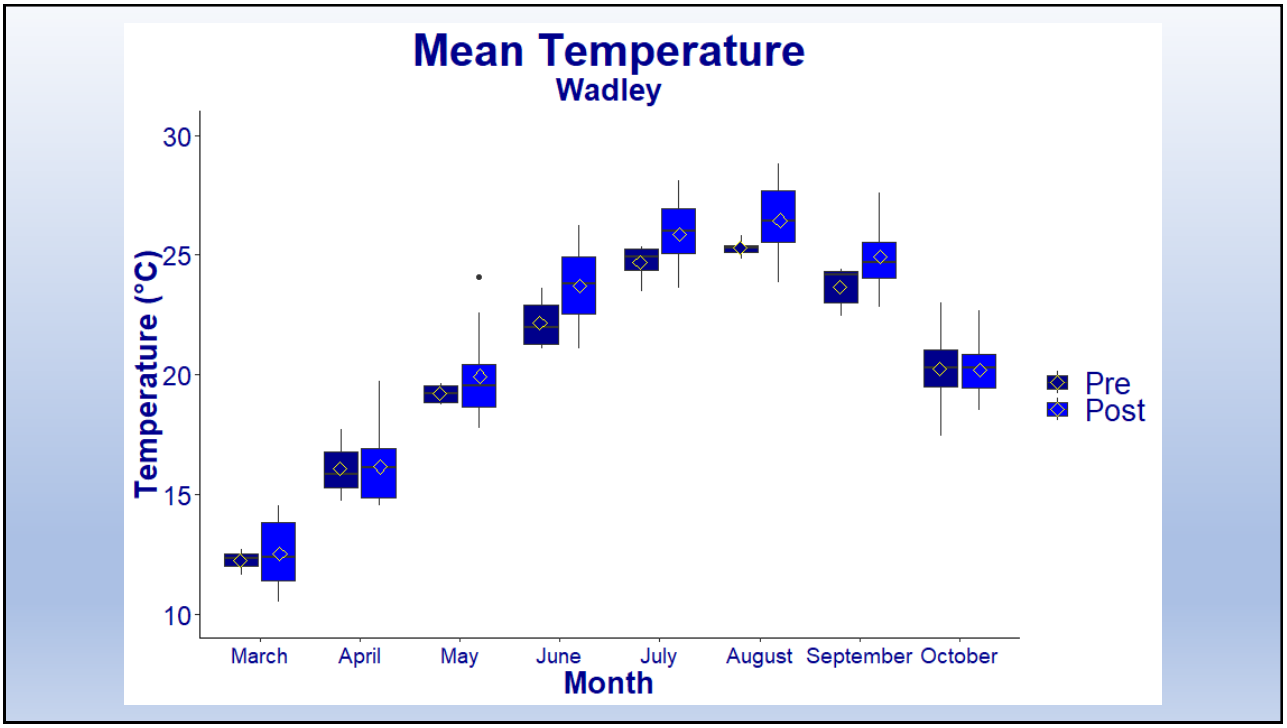

2012 Temp Range
Wadley
2013 Temp Range
Wadley
2014 Temp Range
Wadley
2015 Temp Range
Wadley
Temperature (°C)
Month
Min
Max
Mean
Min


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

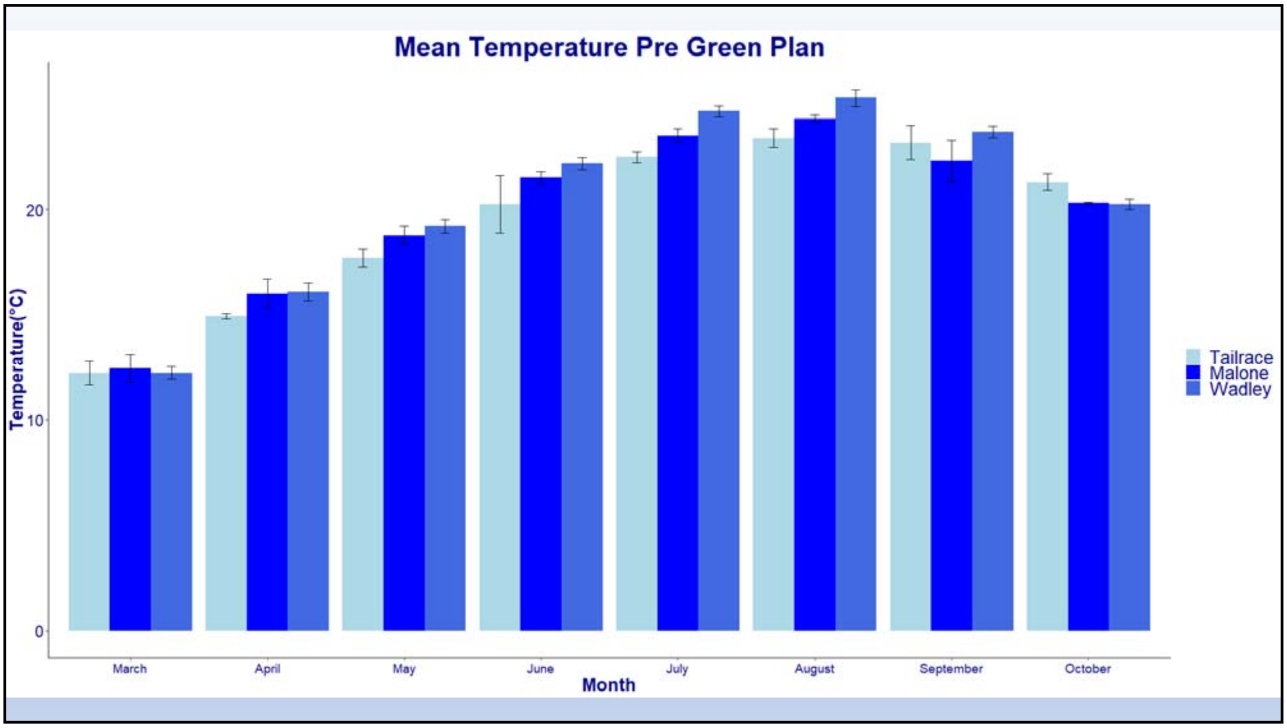

Pre Green Plan Temperature Range
Wadley
# of Days
Temperature Range (°C
0% days show 10+°C changes
Pre Green Plan Temperature Range
Wadley
# of Days
Temperature Range (°C
0.57% days show 10+°C changes

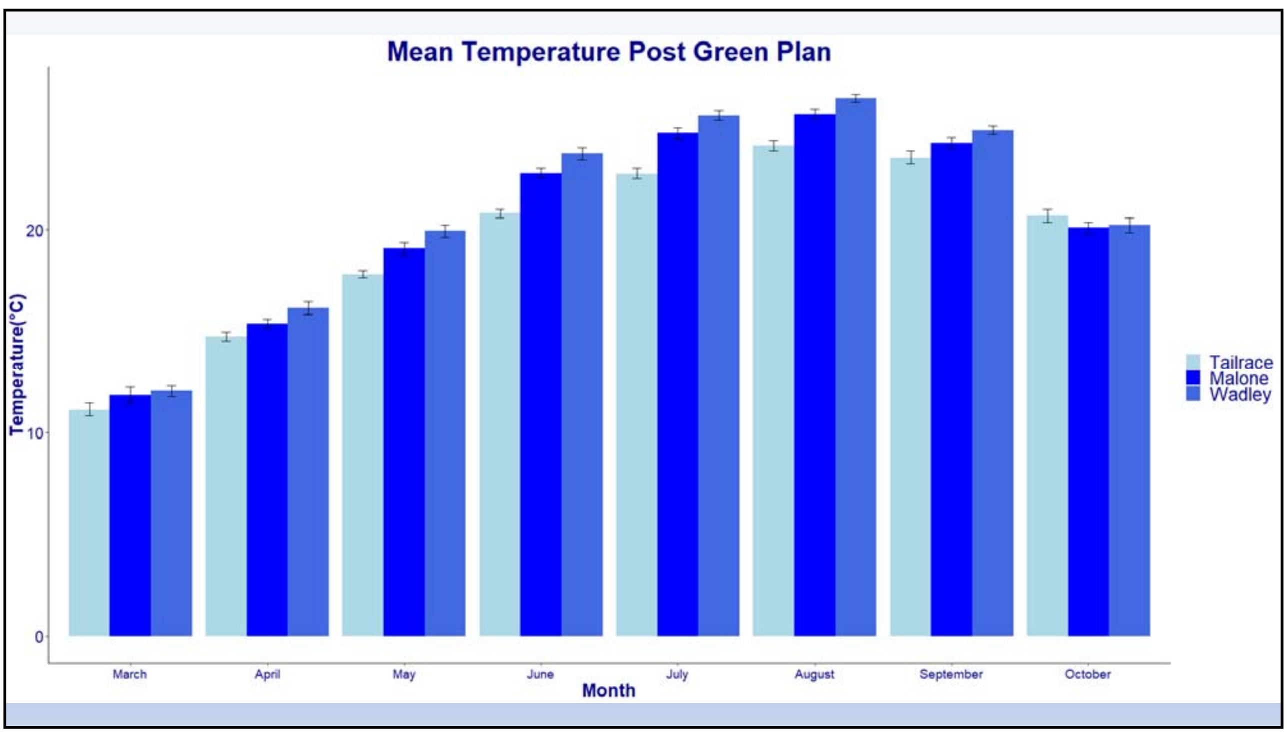

Mean Temperature Pre Green Plan
Wadley
Temperature (°C)
0
10
20
March
April
May
June
July
August
September
October
Month
Water
Air


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

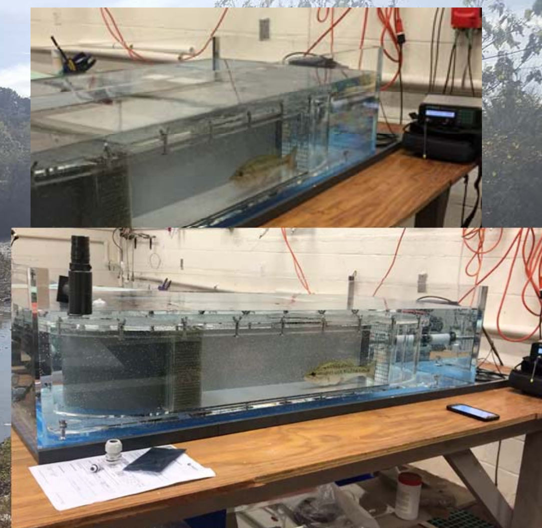
- No significant difference between temperatures before/after Green Plan
- Large variation in temperature during certain times
- Need winter temperature data
- Limited temperature tolerance data for riverine fish of interest

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

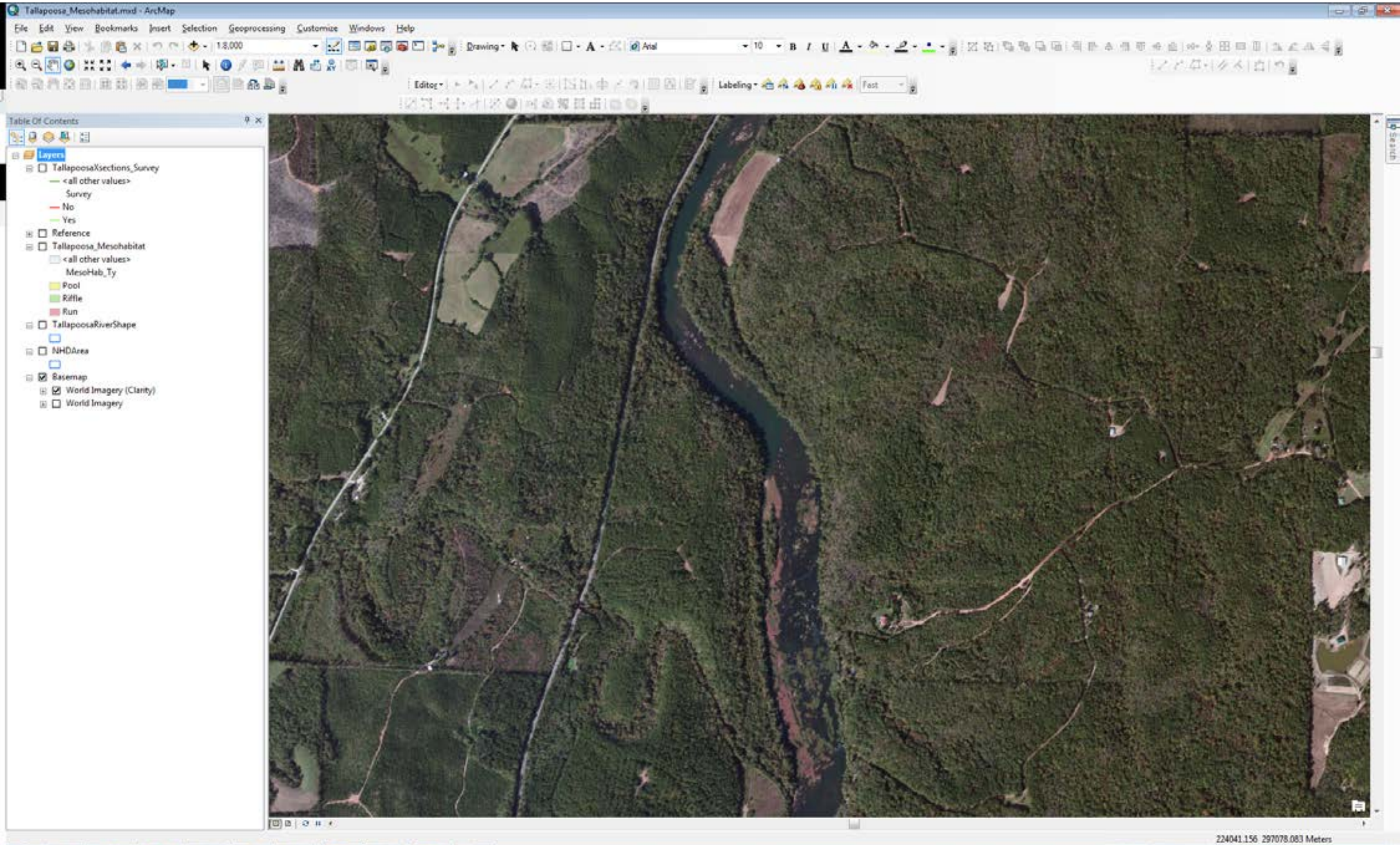
Methods

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
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Drawing
Arial
10
Editor
Labeling
Fast
Table Of Contents
Layers
TallapoosaXsections_Survey
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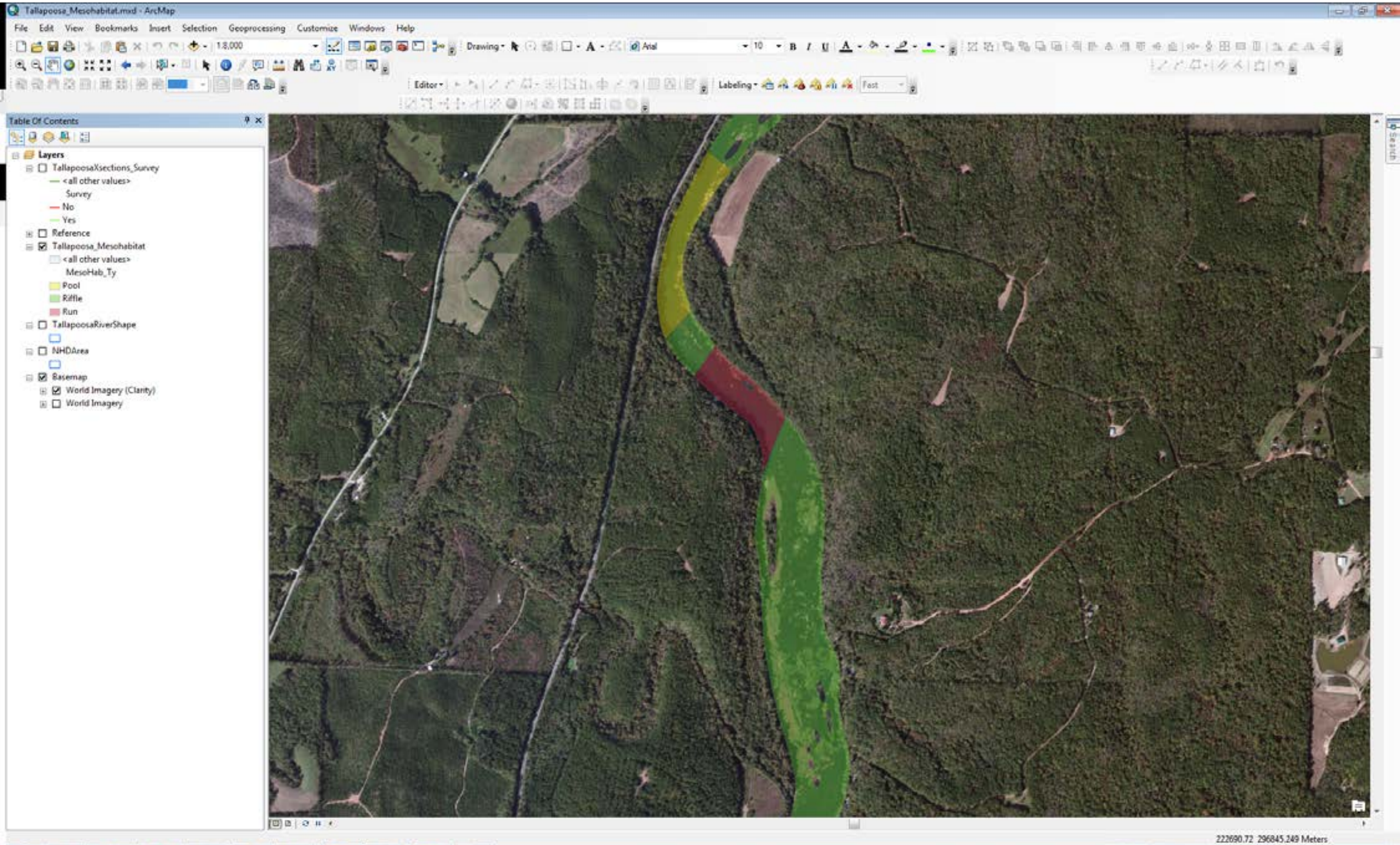
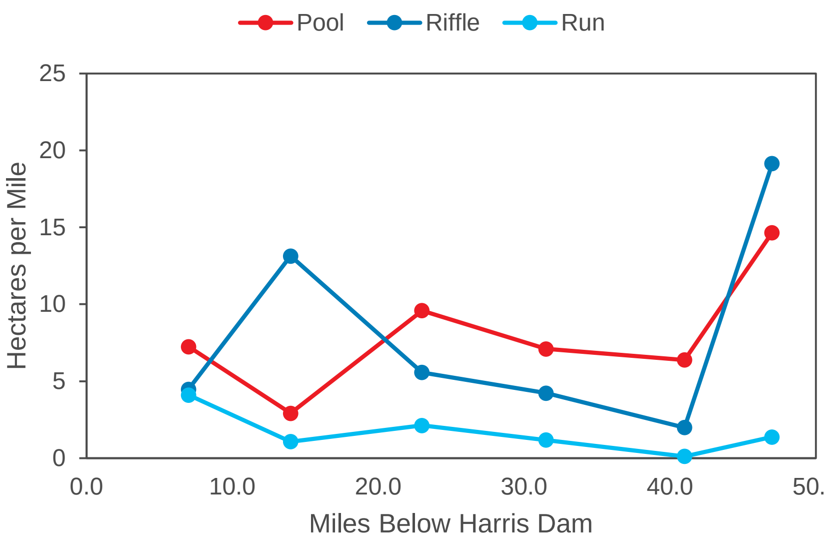
Survey
No
Yes
Reference
Tallapoosa_Mesohabitat
<all other values>
MesoHab_Ty
Pool
Riffle
Run
TallapoosaRiverShape
NHDArea
Basemap
World Imagery (Clarity)
World Imagery
224041.156 297078.083 Meters



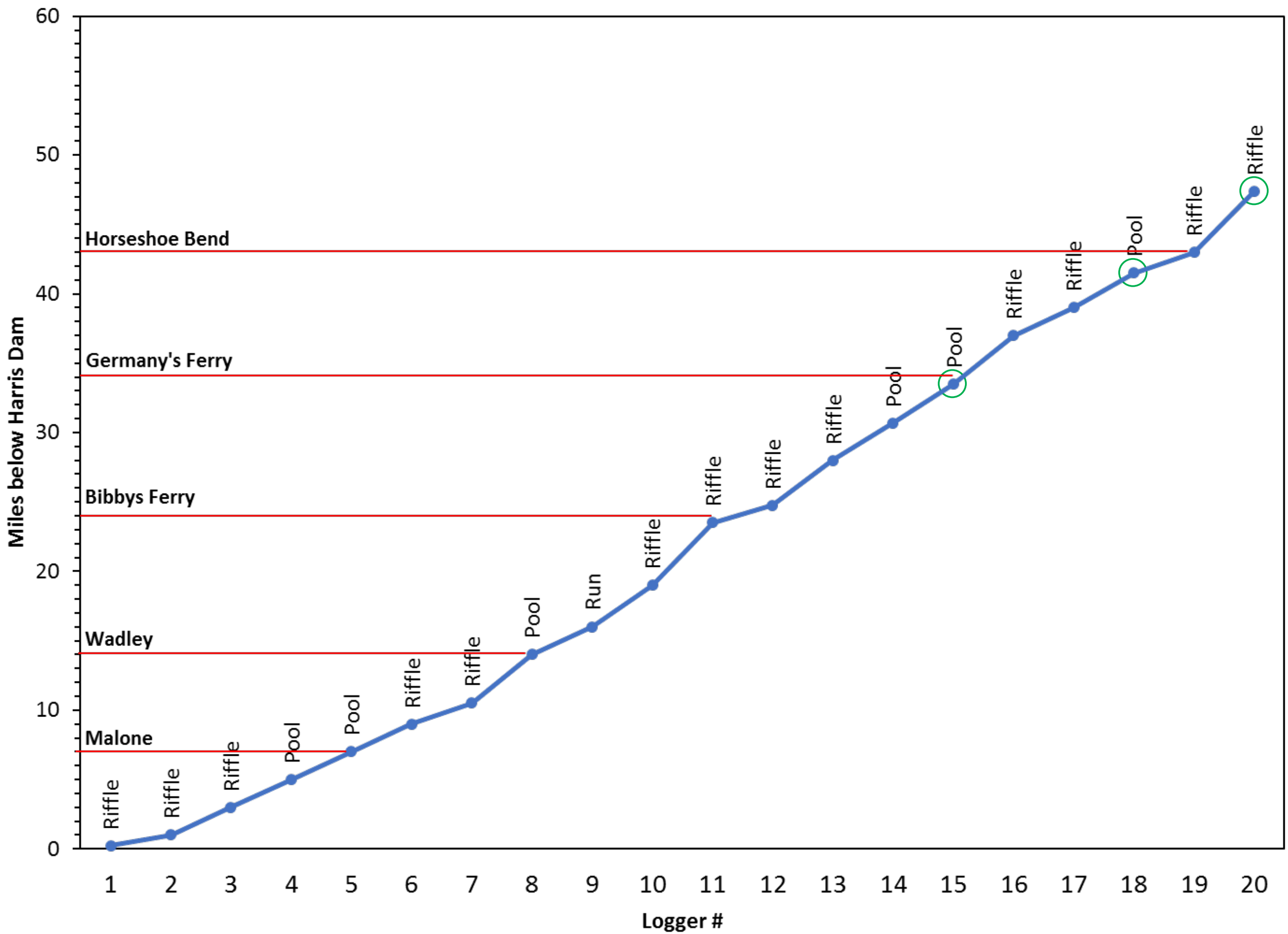
Tallapoosa_Mesohabitat.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:8,000
Drawing
Arial
10
Editor
Labeling
Fast
Table Of Contents
Layers
TallapoosaXsections_Survey
<all other values>
Survey
No
Yes
Reference
Tallapoosa_Mesohabitat
<all other values>
MesoHab_Ty
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**

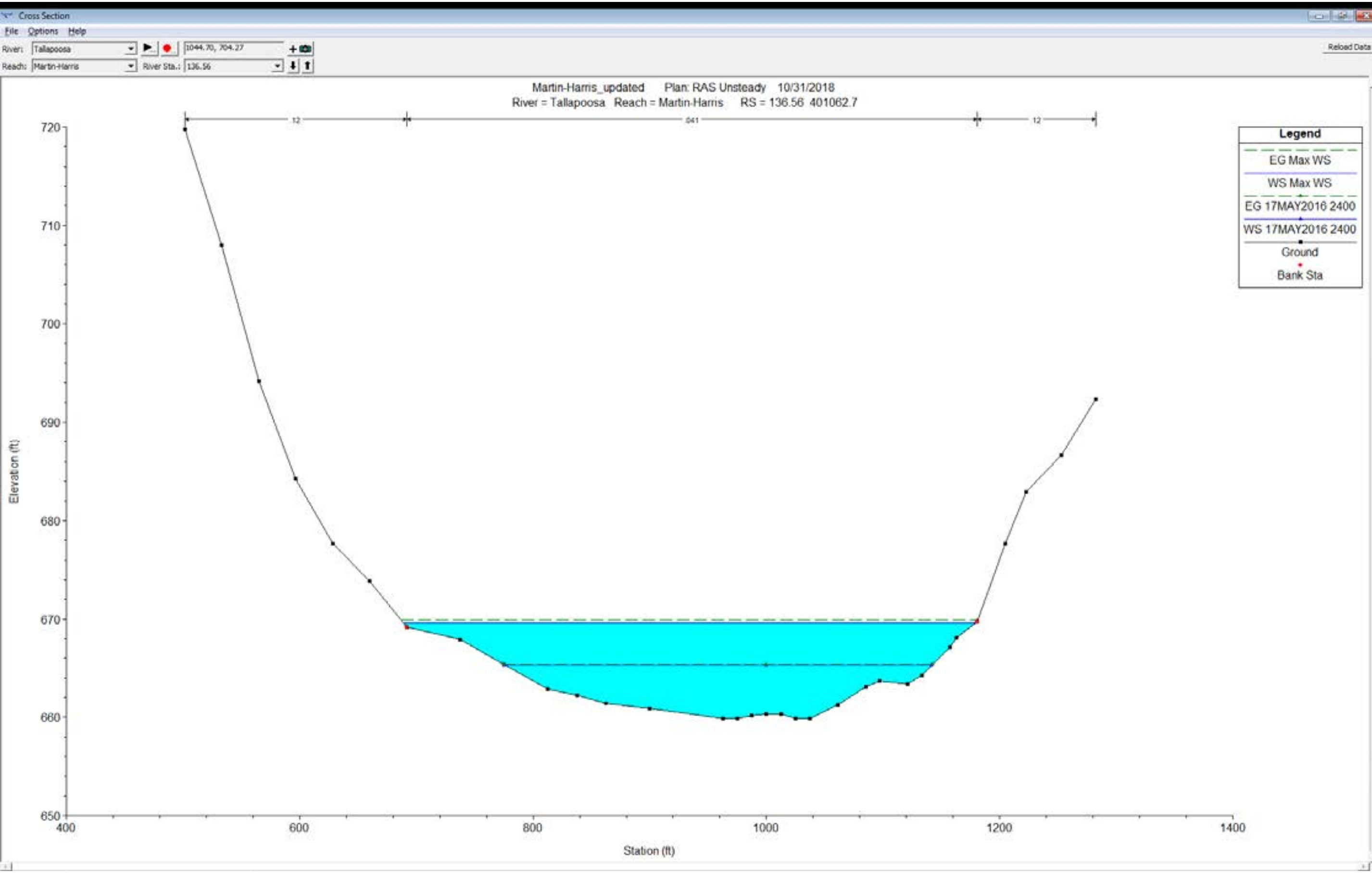

Pool
Riffle
Run
25
20
15
10
5
0
Hectares per Mile
0.0
10.0
20.0
30.0
40.0
50.
Miles Below Harris Dam

Water Level Logger Deployments



Miles below Harris Dam
Logger #
Horseshoe Bend
Germany's Ferry
Bibbys Ferry
Wadley
Malone
Riffle
Pool
Run
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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Reach: Martin-Harris
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1044.70, 704.27
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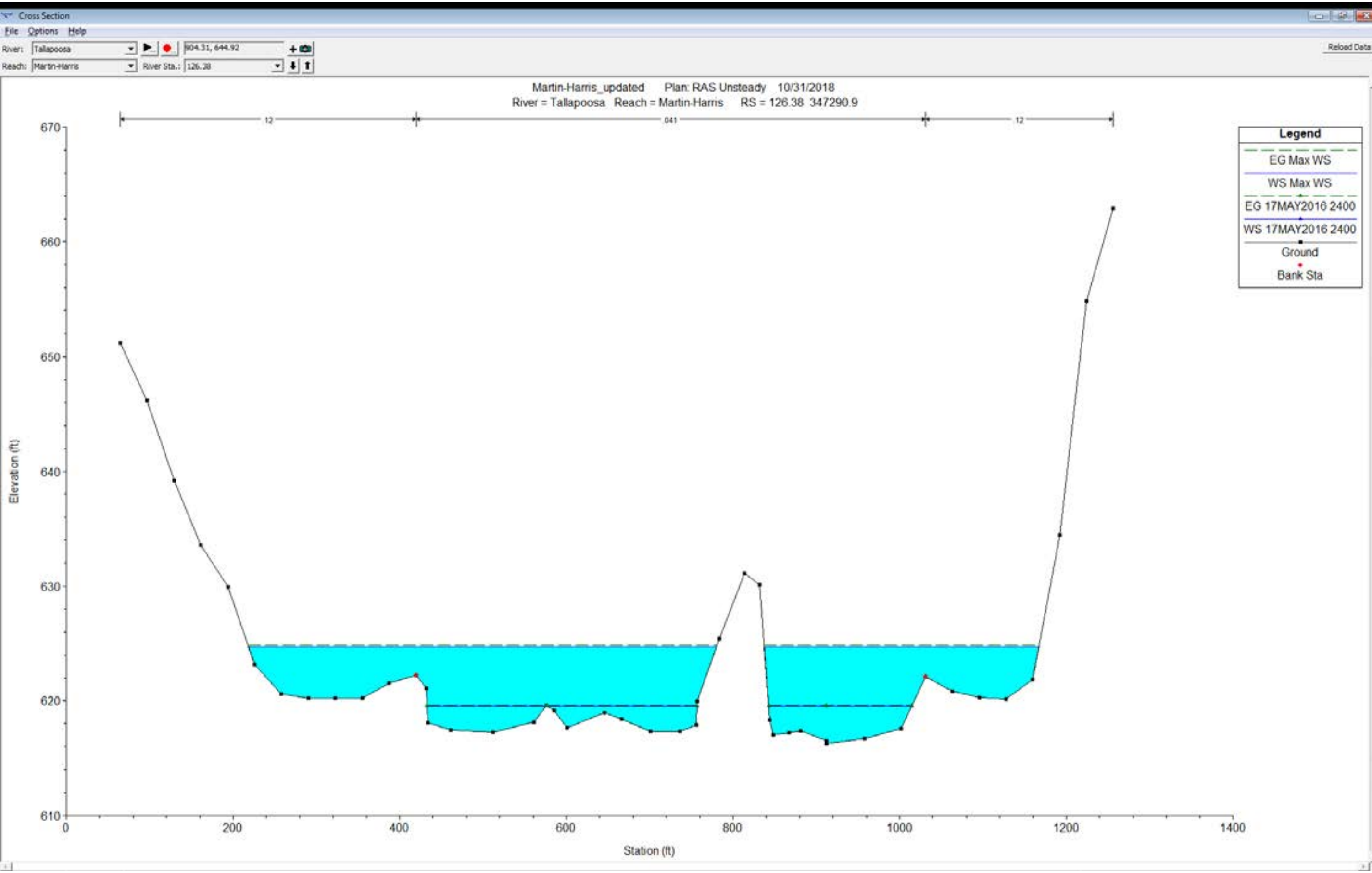
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 136.56 401062.7
.12
.041
.12
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
720
710
700
690
680
670
660
650
400
600
800
1000
1200
1400
Station (ft)



Cross Section
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Reach: Martin-Harris
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804.31, 644.92
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Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
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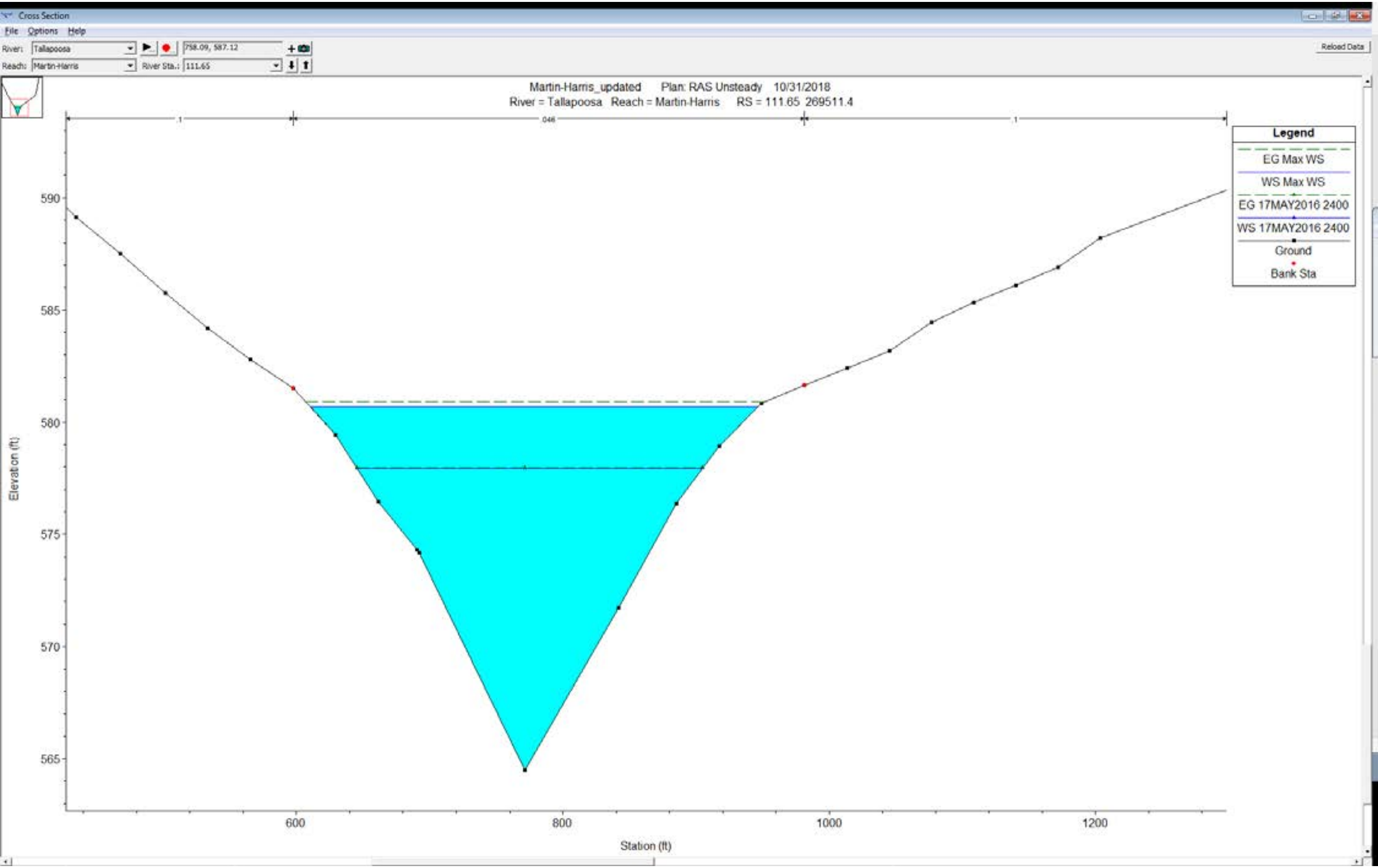
.12
.041
.12
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
670
660
650
640
630
620
610
0
200
400
600
800
1000
1200
1400
Station (ft)



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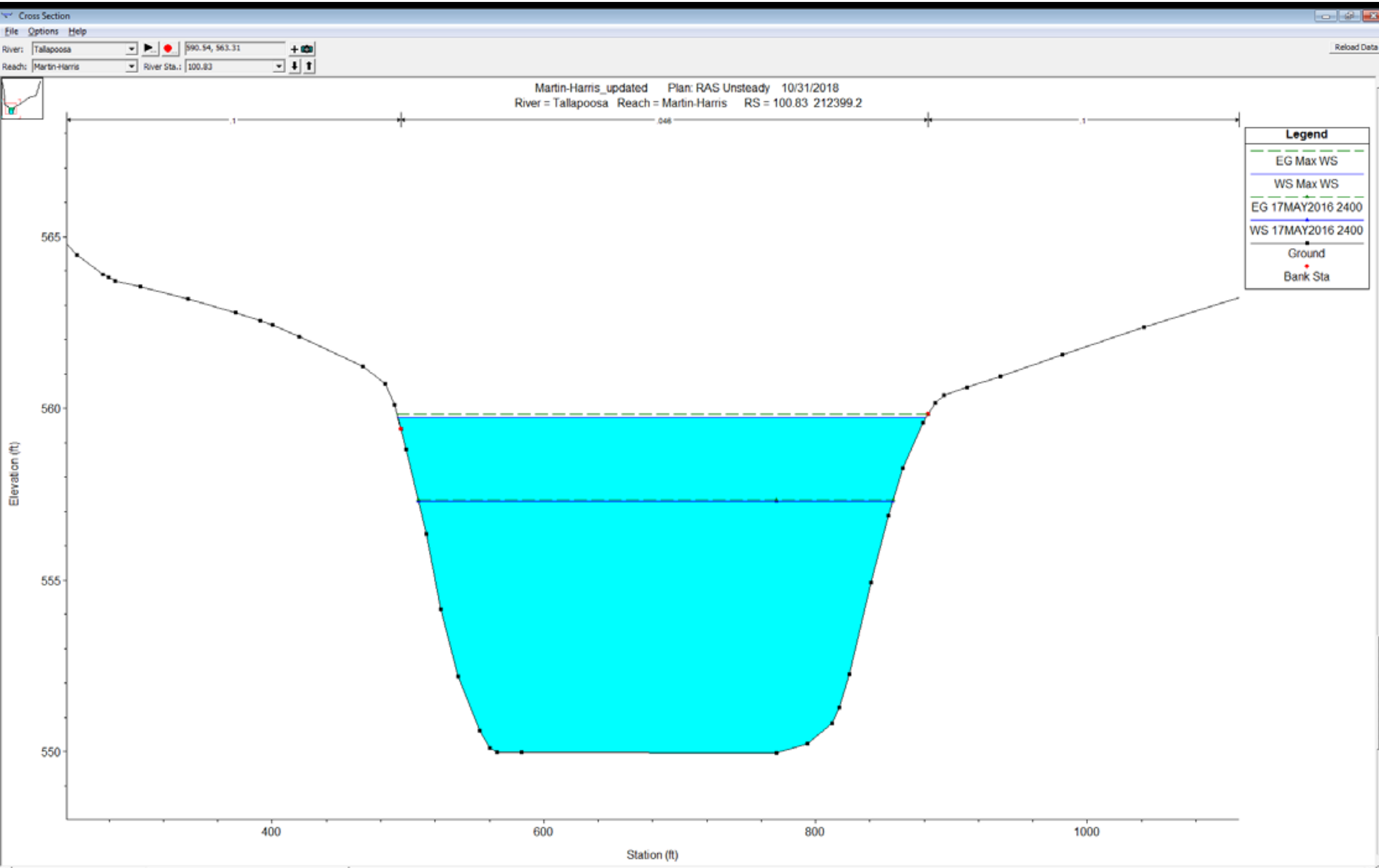
.1
.046
.1
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
590
585
580
575
570
565
600
800
1000
1200
Station (ft)


Cross Section
File Options Help
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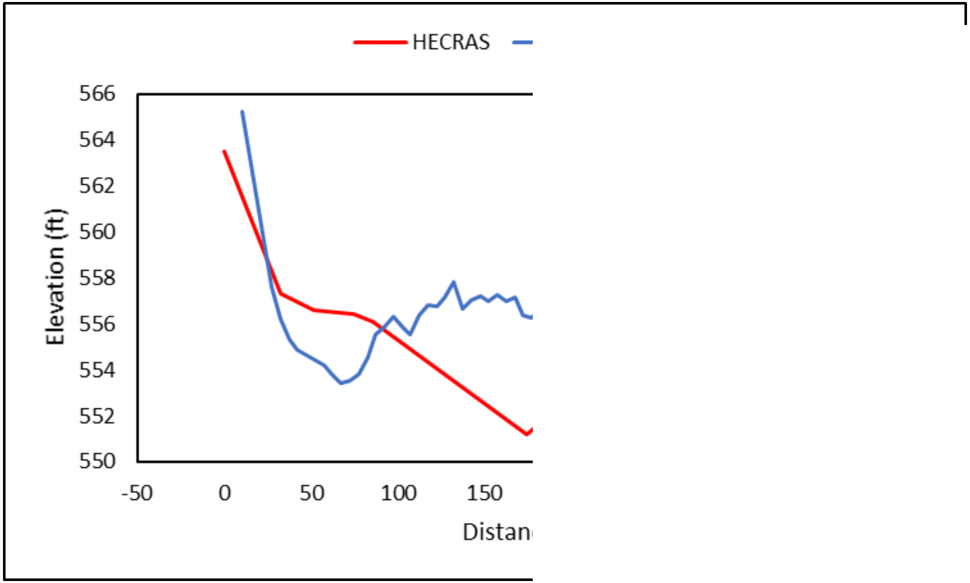
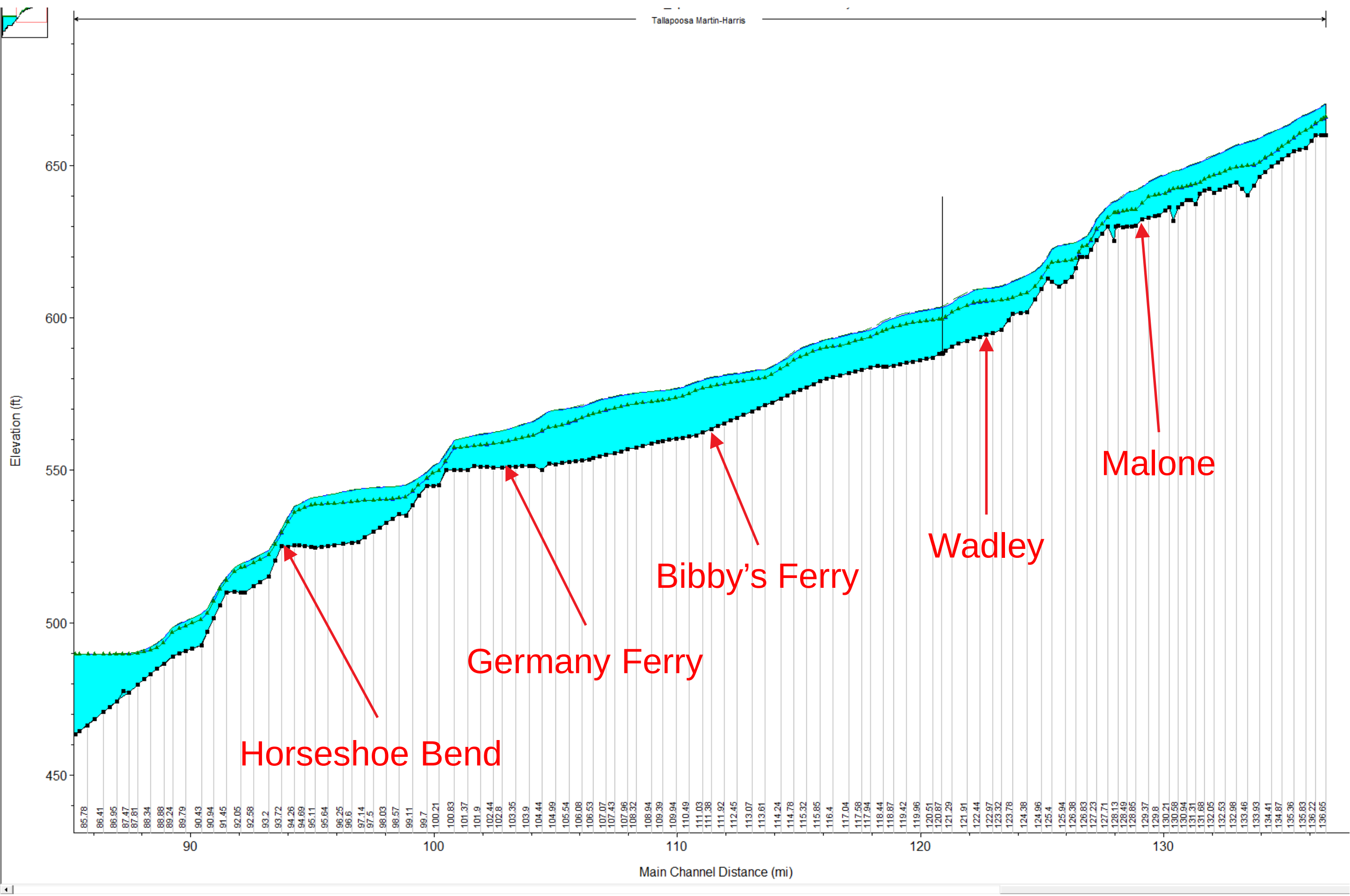
Reach: Martin-Harris
River Sta.: 100.83
Reload Data
Martin-Harris_updated Plan: RAS Unsteady 10/31/2018
River = Tallapoosa Reach = Martin-Harris RS = 100.83 212399.2
.1
.046
.1
Legend
EG Max WS
WS Max WS
EG 17MAY2016 2400
WS 17MAY2016 2400
Ground
Bank Sta
Elevation (ft)
565
560
555
550
400
600
800
1000
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)
650
600
550
500
450
90
100
110
120
130
Horseshoe Bend
Germany Ferry
Bibby's Ferry
Wadley
Malone

APC Harris Relicensing

From: Anderegg, Angela Segars
Sent: Friday, July 26, 2019 9:43 AM
To: Elise Irwin
Subject: RE: A couple of things....

Hi Elise,

Thanks for sending the report Jason requested. For the temperature data, are you referencing the data we discussed during the HAT 3 meeting at Auburn in March. If so, that data will be shared with all stakeholders when we share the HAT 3 report. If I may ask, what were you needing it for?

I wasn't aware of this open file report. It says prepared in cooperation with APC, agencies and other stakeholders, but did any of those groups have the opportunity to review before it was published?

And yes, we are still on for August 22nd. I'll follow up closer to time so we can work out details.

Thanks,

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

From: Elise Irwin <irwiner@auburn.edu>
Sent: Thursday, July 18, 2019 3:17 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: A couple of things....

Angie, Hope your summer is going well. I am writing to ask for the pre-Green Plan temperature data that APC has. Let me know if you need something more formal than this to obtain those data.

I am attaching a final report that Jason requested…it took me a while to find it. I will send it to him as well.

Finally, this link takes you to our Open File Report on the AMP. Let me know if you have questions before our meeting on August 22 (I am assuming that it is still on). I wasn't sure if you were aware of the publication.

https://pubs.er.usgs.gov/publication/ofr20191026 [pubs.er.usgs.gov]

Thanks and let me know if you have any questions or concerns,
elise

¸. · ´¯` · . ´¯` · .¸¸ . · ´¯` · .¸ ><((((º>
Elise R. Irwin, Ph.D.

USGS, Alabama Cooperative Fish & Wildlife Research Unit
Auburn University
119 Swingle Hall
Auburn, Alabama 36849
334.844.9190

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

<lindastone2012@gmail.com>; granddadth@windstream.net <granddadth@windstream.net>; trayjim@bellsouth.net <trayjim@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; robert.a.allen@usace.army.mil <robert.a.allen@usace.army.mil>; randall.b.harvey@usace.army.mil <randall.b.harvey@usace.army.mil>; james.e.hathorn.jr@sam.usace.army.mil <james.e.hathorn.jr@sam.usace.army.mil>; lewis.c.sumner@usace.army.mil <lewis.c.sumner@usace.army.mil>; jonas.white@usace.army.mil <jonas.white@usace.army.mil>; gordon.lisa-perras@epa.gov <gordon.lisa-perras@epa.gov>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>; 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>; cchaffin@alabamarivers.org <cchaffin@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>

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

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

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; nathan.aycock@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; jwest@alabamarivers.org; gjobsis@americanrivers.org; devridr@auburn.edu; irwiner@auburn.edu; kmo0025@auburn.edu; wrighr2@aces.edu; jhancock@balch.com; lgallen@balch.com; chris@alaudubon.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; 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
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.

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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

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; nathan.aycock@dcnr.alabama.gov; ken.wills@jcdh.org; Anderegg, Angela Segars; McVicar, Ashley M; Anderson, Dave; Carlee, Jason; Baker, Jeffery L.; Chandler, Keith Edward; Mills, Tina L.; Goodman, Chris G.; clowry@alabamarivers.org; mhunter@alabamarivers.org; jwest@alabamarivers.org; gjobsis@americanrivers.org; devridr@auburn.edu; irwiner@auburn.edu; kmo0025@auburn.edu; wrighr2@aces.edu; Hancock, Jim (Balch); Allen, Leslie G. (Balch); chris@alaudubon.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; 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; Jack West
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
Hydro Services
(205)257-2251
arsegars@southernco.com

From:	APC Harris Relicensing
To:	james traylor
Subject:	RE: UPDATE - Harris Relicensing March 19th HAT 3 meeting
Date:	Monday, March 16, 2020 1:09:08 PM

That is good to know. Thanks!

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

From: james traylor <trayjim@bellsouth.net>
Sent: Saturday, March 14, 2020 6:05 PM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: Re: UPDATE - Harris Relicensing March 19th HAT 3 meeting

Just a thought....The internet service below the damn will not support Skype!

Jimmy Traylor
Sent from iPhone

On Mar 13, 2020, at 1:00 PM, APC Harris Relicensing <g2apchr@southernco.com> wrote:

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.

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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

<2020-03-19 HAT Meeting Agenda.doc>

From: Anderegg, Angela Segars
Sent: Monday, May 18, 2020 3:06 PM
To: Mayo, Lydia
Subject: RE: Exhibit S doc
Attachments: 1980-3-24 Harris - Revised Exhibit S.pdf

Hi Lydia,

Old files can be hard to find on elibrary. Attached is the Revised Exhibit S referenced in the PAD (Alabama Power 1980).

Thanks,

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

From: Mayo, Lydia <Mayo.Lydia@epa.gov>
Sent: Friday, May 15, 2020 2:36 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Exhibit S doc

Hi Angie.
Can you help me locate a copy of the revised Exhibit S of FPC Dec 27, 1973 license referenced in the June 1, 2018 NOI/PAD?
I found a copy of the letter that references the Revised Exhibit S dated June 8, 1982 (attached) on FERC's elibrary, but the actual exhibit S is not included in the file.
Thank you for any help you can provide!
Lydia

Lydia Mayo

Water Quality Standards Section

U.S. Environmental Protection Agency

Region 4, Atlanta, GA

Phone: (404) 562-9247

Alabama Power Company
600 North 18th Street
Post Office Box 2641
Birmingham, Alabama 35291
Telephone 205 323-5341

F. L. CLAYTON, JR.
Senior Vice President

Alabama Power
the southern electric system

March 24, 1980

Project No. 2628 - Alabama
R. L. Harris Dam

Mr. Kenneth F. Plumb
Secretary
Federal Energy Regulatory Commission
825 Capitol Street, N.E.
Washington, D.C. 20426

Dear Mr. Plumb:

Transmitted herewith are twenty (20) copies of Exhibit S (revised) for the R. L. Harris Dam, FERC Project No. 2628 - Alabama. This plan is submitted for approval as a revision to the Exhibit S of the license application. It is requested that this information be accepted for filing in compliance with the requirements of Article 52 as of this date. The plan proposes a program of study of the potential fishery resources of the reservoir and describes measures that will be taken to maintain or enhance water quality downstream of the project.

Yours very truly,

F L Clayton Jr

CGO/jd

Enclosures

cc: Mr. A. O. Kauranen

bc: Mr. J. M. Farley
Mr. A. R. Barton
Mr. J. S. Vogtle (w/enclosure)
Mr. J. E. Dorsett (w/enclosure)
Mr. J. T. Young (w/enclosure)
Mr. R. H. Krotzer (w/enclosure)
Mr. O. D. Smith (w/enclosure)
Mr. T. E. Diffee (w/enclosure)
Mr. David Miller (w/enclosure)
Mr. D. D. Dill (w/enclosure)
Mr. R. L. Scott (w/enclosure)
Mr. R. V. Maudlin (w/enclosure)
Mr. Marshall Timberlake (w/enclosure)
Mr. R. A. Bowron (w/enclosure)

File: CC 16-15

Revised Exhibit S

Article 52 of the order issuing license for the R. L. Harris Hydroelectric Facility (FERC Project No. 2628) requires that a revised Exhibit S be filed for Commission approval. Article 52 states that the revised Exhibit S include: "1) plans for a study of the potential fishery resources of the reservoir to be conducted in cooperation with the appropriate State and Federal Fishery agencies; and (2) a description of measures being taken to maintain or enhance the water quality of the Tallapoosa River downstream from the project".

FISHERY RESOURCES

Applicant will conduct a detailed post impoundment study to assess fish population existing at the project. Plans include fish population studies to be conducted on two occasions following impoundment of the reservoir. Fish population studies will be conducted one year following impoundment of the river for the purpose of evaluating existing fish populations. Studies conducted during the first sample period will provide data which will be used to describe the existing fishery resources, and include: (1) species present, (2) relationships between forage and piscivorous species, and (3) the need for stocking additional forage or sport species.

The first year studies are expected to indicate the need for stocking such species as the threadfin shad (*Dorosoma petenense*), which is an important forage species not expected to be present in the project, and the stocking of striped bass (*Morone saxatilis*) and/or the hybrid striped bass (*Morone saxatilis* X *Morone chrysops*). Information obtained from the Alabama Department of Conservation and Natural Resources indicates that data presently being collected on striped bass introductions in the lower Tallapoosa River projects should provide a base for determining the sport potential and stocking rates of this species in the R. L. Harris project. Striped bass research conducted to date by the Alabama Department of Conservation indicates that the introduction of this species would probably significantly enhance sport fishing in the project.

Fishery studies to be conducted during the second study period will be initiated two years after the first study period and three years after filling of the reservoir. Information gained from the second population study will be used to determine the status of species identified during the first study. Relationships between forage and piscivorous species will be assessed, as will the growth and reproduction of sport species. Studies conducted during the second study period will also provide information relative to the success of any species added to the reservoir following the one year post impoundment survey.

The previously described studies are intended to provide the basis for applicant's commitment to: (1) assess the fishery resources of the project and to enhance these resources by stocking additional species as are determined to be beneficial to the project, and (2) through cooperation in conducting and evaluating results of studies with the appropriate State and Federal Fishery Agencies. Detailed plans for fish population studies, including selection of sample areas, collection methods and evaluation of data will be formalized prior to the first post impoundment survey to be conducted one year after filling. Discussions with staff of the Alabama Department of Conservation and Natural Resources have indicated that development of detailed study plans for the assessment of project fisheries would be inappropriate at this time since reservoir conditions and physiography would be difficult to evaluate prior to filling of the reservoir. Selection of sample areas and methodology will depend upon an evaluation of the reservoir after normal pool elevations are achieved.

Subsequent to filing of this Revised Exhibit S, Applicant will provide FERC Staff with a study plan for the evaluation of project fisheries, which shall be developed prior to the first post impoundment survey. Applicant will also provide, as an addendum to the Exhibit S, the results of the post impoundment surveys and information relative to the introduction of additional species to project waters should the decision be made to make such additions.

WATER QUALITY

Maintenance of minimum stream flows

Alabama Power is committed to maintaining a minimum continuous stream flow below Harris Dam at the Wadley Gage of 45 cfs to assure that the Tallapoosa River will always be a continuously flowing stream, even under low flow conditions.

Maintenance of 5 ppm dissolved oxygen in discharges

Stratification of reservoirs in the summer and fall seasons is a common problem in the south. The warm epilimnion or surface waters typically contain the highest quality water, that with the most dissolved oxygen in water. The hypolimnion or deep waters is much cooler water and, because of its density, does not mix with surface waters, thereby becoming oxygen depleted as organic material decays and consumes available oxygen. For enhancement of discharge water quality, it is desirable to withdraw water from as close to the surface as possible. At Harris Dam, which employs seasonal drawdown, the objective of surface withdrawal has been solved by incorporating into the design movable sills at the invert of each intake opening. At full elevation, the sills are fully extended up. As the reservoir level drops, the sills can be lowered a maximum of 18 feet to facilitate surface withdrawals. The movable sills allow penstock openings to be adjusted in 18 inch increments between elevations 764 and 746 msl, as shown in the attached Figure 1. Location of these sills at the highest levels possible for operation will ensure the highest quality water being drawn into the turbines.

To further assure 5 ppm or better of dissolved oxygen in the turbine discharge, Alabama Power Company is incorporating into the turbine discharge an aspiration system to provide up to a 2 ppm increase in dissolved oxygen. The type of system to be installed is now in use on many of Alabama Power Company's existing hydroelectric turbines. These systems have been proven to be efficient and reliable in operation. Air is injected directly below the turbine in the draft tube at several ports where a wedge shaped plate creates a negative pressure area which draws air in through the port. The ports are connected to a manifold pipe and air intake located above the hydraulic grade line. A layout of the system is included in the attached Figure 2.

FIGURE 1

R. L. HARRIS INTAKE STRUCTURE
SHOWING MOVABLE SILL

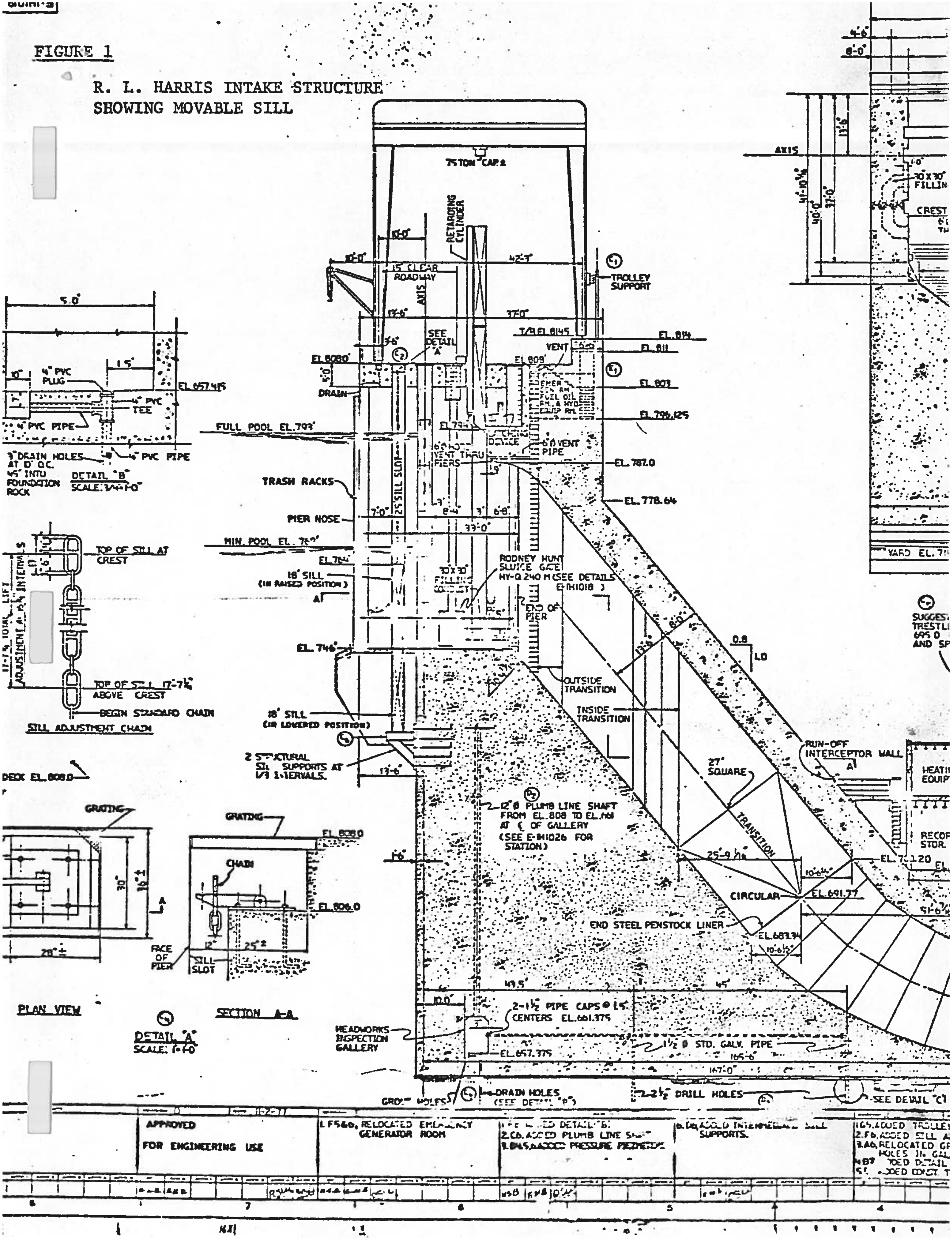
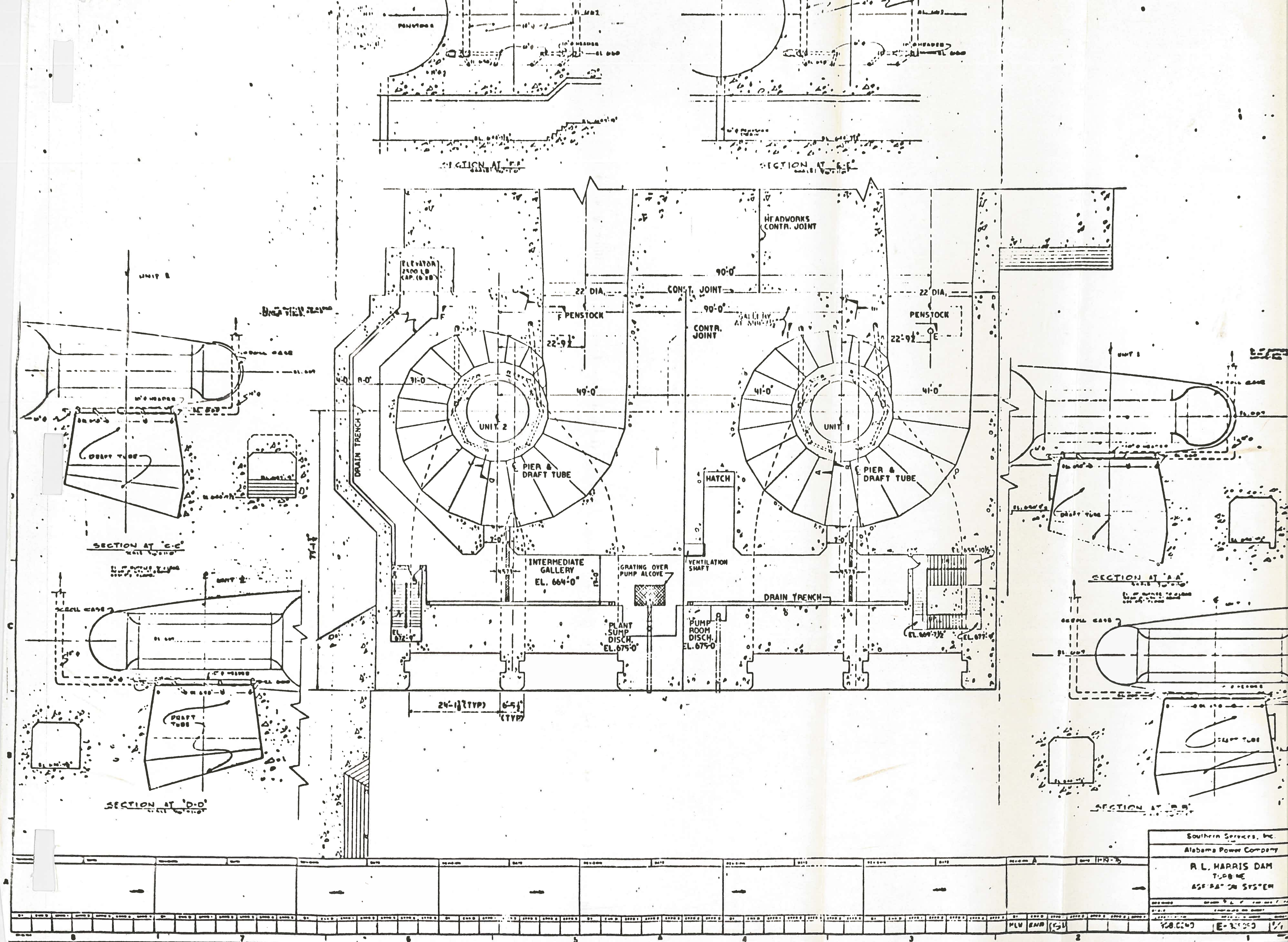


FIGURE 2



050526-3
SECTION AT "F-F"
SECTION AT "E-E"
HEADWORKS CONTR. JOINT
90'-0"
22' DIA.
CONST. JOINT
PENSTOCK
CONTR. JOINT
22'-9½"
ELEVATOR
49'-0"
41'-0"
31'-0"
UNIT 2
UNIT 1
DRAIN TRENCH
PIER & DRAFT TUBE
HATCH
INTERMEDIATE GALLERY EL. 664'-0"
GRATING OVER PUMP ALCOVE
VENTILATION SHAFT
PLANT SUMP DISCH. EL. 675'-0"
PUMP ROOM DISCH. EL. 675'-0"
24'-1½" (TYP)
6'-5½" (TYP)
SECTION AT "C-C"
SECTION AT "D-D"
SECTION AT "A-A"
SECTION AT "B-B"
DRAFT TUBE
SCROLL CASE
Southern Services, Inc.
Alabama Power Company
R. L. HARRIS DAM
TURBINE
ASPIRATION SYSTEM

HAT 3 meeting - June 2

APC Harris Relicensing <g2apchr@southernco.com>

Wed 5/20/2020 3:53 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>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@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>

HAT 3,

Please join us for a HAT 3 meeting on June 2nd, from 1:00-3:00. This meeting will provide an opportunity for us to review the progress on the Aquatic Resources study. Specifically, Auburn will share information that we had planned to present at the March meeting that was cancelled due to COVID-19. This will include a summary of water temperature data analysis, results of the literature review of target fish temperature preferences, fish community sampling, respirometry trials, and bioenergetics model development.

Call in information is below.

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone -+1 (205) 257-2663

Conference ID: 8297850

Thanks,

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

HAT 3 meeting - today at 1:00

APC Harris Relicensing <g2apchr@southernco.com>
Tue 6/2/2020 1:54 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>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@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>

1 attachments (8 MB)
2020-6-2 HAT 3 meeting - Auburn presentation.pdf;

HAT 3,

We will be using Skype for the HAT 3 meeting this afternoon. For those of you who don't have access to Skype, the meeting presentation is attached for you to be able to follow along. Please note that the data included in this presentation remain preliminary at this point.

Thanks,

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

HAT 3,

Please join us for a HAT 3 meeting on June 2nd, from 1:00-3:00. This meeting will provide an opportunity for us to review the progress on the Aquatic Resources study. Specifically, Auburn will share information that we had planned to present at the March meeting that was cancelled due to COVID-19. This will include a summary of water temperature data analysis, results of the literature review of target fish temperature preferences, fish community sampling, respirometry trials, and bioenergetics model development.

Call in information is below.

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone -+1 (205) 257-2663

Conference ID: 8297850

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

HAT-3 Aquatic Resources Update Meeting

~~19 March 2020~~ 2 June 2020

AUBURN UNIVERSITY

SCHOOL OF FISHERIES, AQUACULTURE, AND AQUATIC SCIENCES

Alabama Power

Study Species

Alabama Bass

Micropterus henshalli

- Habitat generalist
- Omnivore

Joseph Tomellari

Tallapoosa Bass

Micropterus tallapoosae

- Lotic Specialist
- Omnivore

Joseph Tomellari

Redbreast Sunfish

Lepomis auritus

- Lentic Specialist
- Invertivore

Duane Raver

Channel Catfish

Ictalurus punctatus

- Benthic specialist
- Omnivore

Maynard Reece

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.

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    - Tallapoosa Bass
        - Redeye bass
        - Described in 2013: limited data available

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.

- Tallapoosa Bass
    - Redeye bass
    - Described in 2013: limited data available
- Alabama Bass
    - Similar species, possible surrogate
    - Described in 2008: limited data available
    - Spotted bass next possible surrogate?

	Thermal Minima	Optimal Temp Range	Preferred Temps[1]	Thermal Maxima	Ideal Spawning	Sources
Redbreast Sunfish	15	27-29, 25-30	18-32	36	21,20-25,22-26	Mathur et al. 1981; Aho et al. 1986; Sammons and Maceina 2009; Beauchene et al. 2014
Tallapoosa Bass	--	--	--	--	--	nothing currently available
Alabama Bass/Spotted Bass	10	23.5-24.4		34?	14-15	McMahon et al. 1984
Channel Catfish	6.5, 18	26-29	15-31	33.5,38.7; 28-30 for fry	21	Mathur et al. 1981; McMahon and Terrell 1982
			[1]=depends on acclimation temps			

	Thermal Minima	Optimal Temp Range	Preferred Temps[1]	Thermal Maxima	Ideal Spawning	Sources
Red Su						
Tall B						
Ala Bass/ E						
Ch Ca						
			[1]=depends on acclimation temps			

Some takeaways . . .

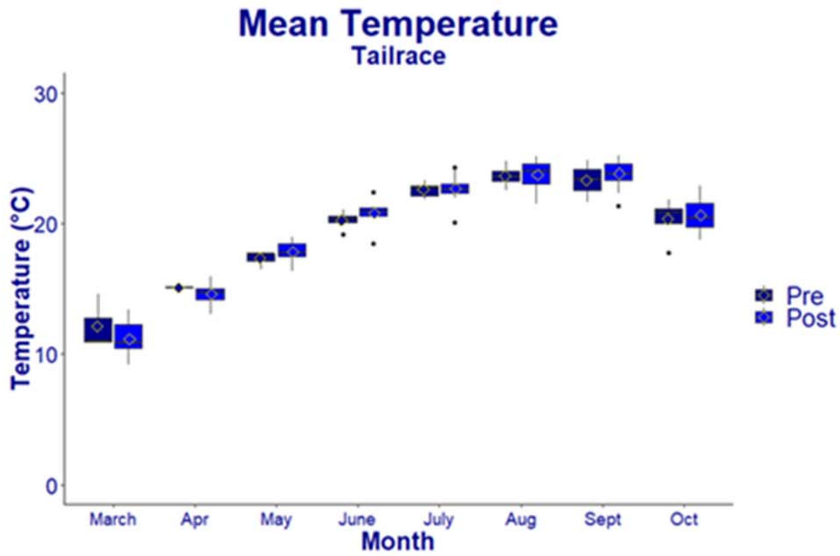
- Most data are available for channel catfish (but not from moving waters)
- There are no lethal temperature trial data
- Acclimation temperatures can be important . . .

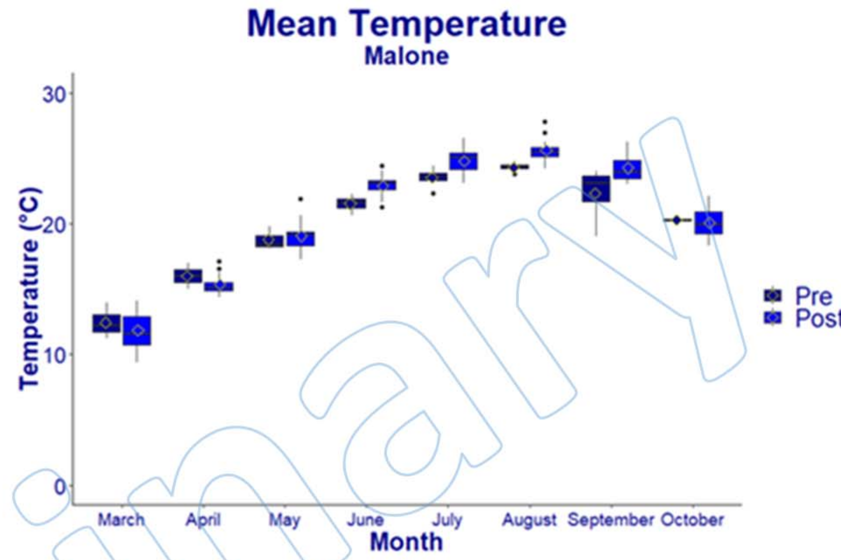
Project Objectives

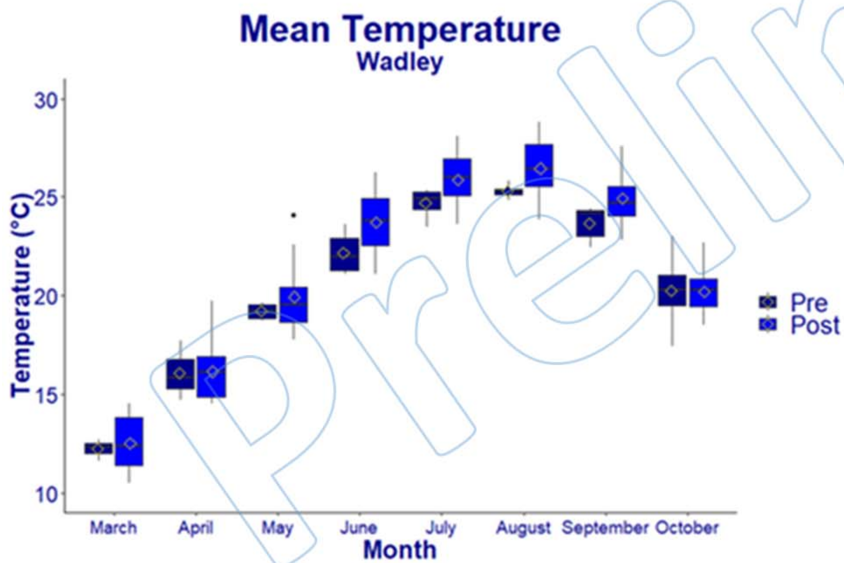
2. Summarize the data that are available in reports and from relevant agencies for water temperatures across a gradient downstream from the Harris Dam tailrace and compare those data with similar data from reference sites upstream of Harris Reservoir.

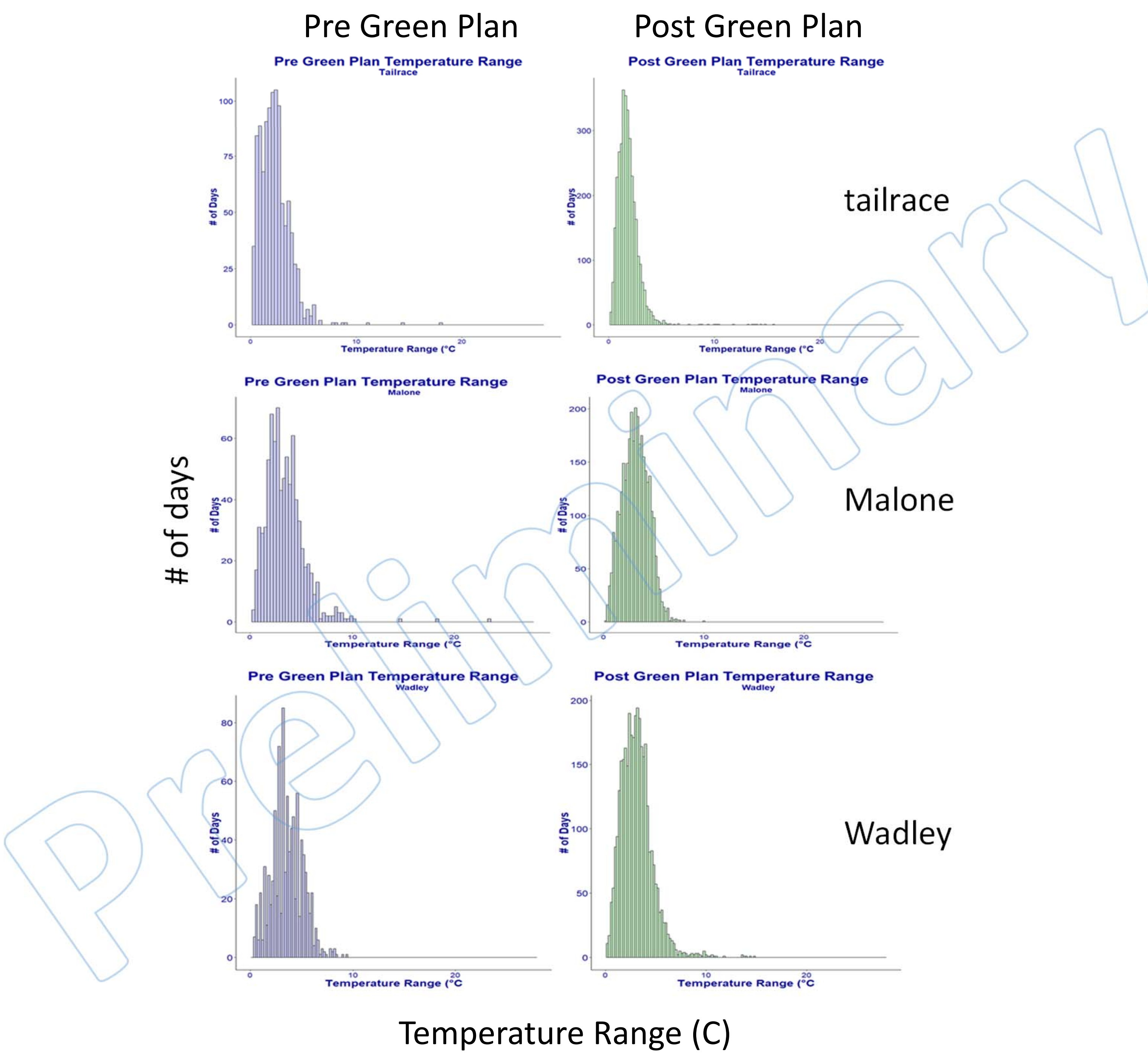
    - Results presented previously at the 19 March 2019 HAT 3 meeting.
    - 3 sites (Tailrace, Malone, Wadley)
    - 2000-2018 data from the Alabama Power Company
    - 111,366 temperature measurements

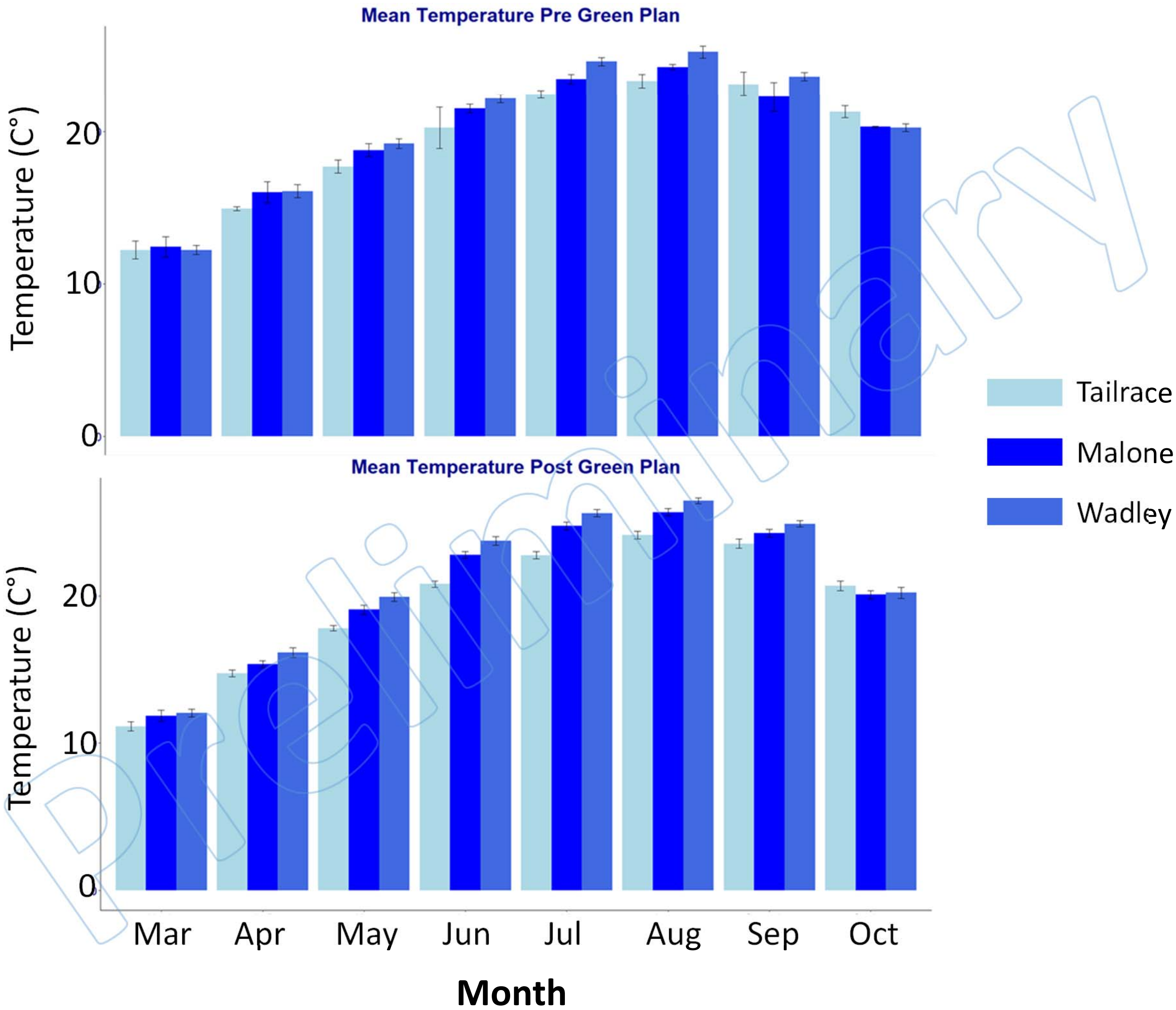
There are a LOT of data!!

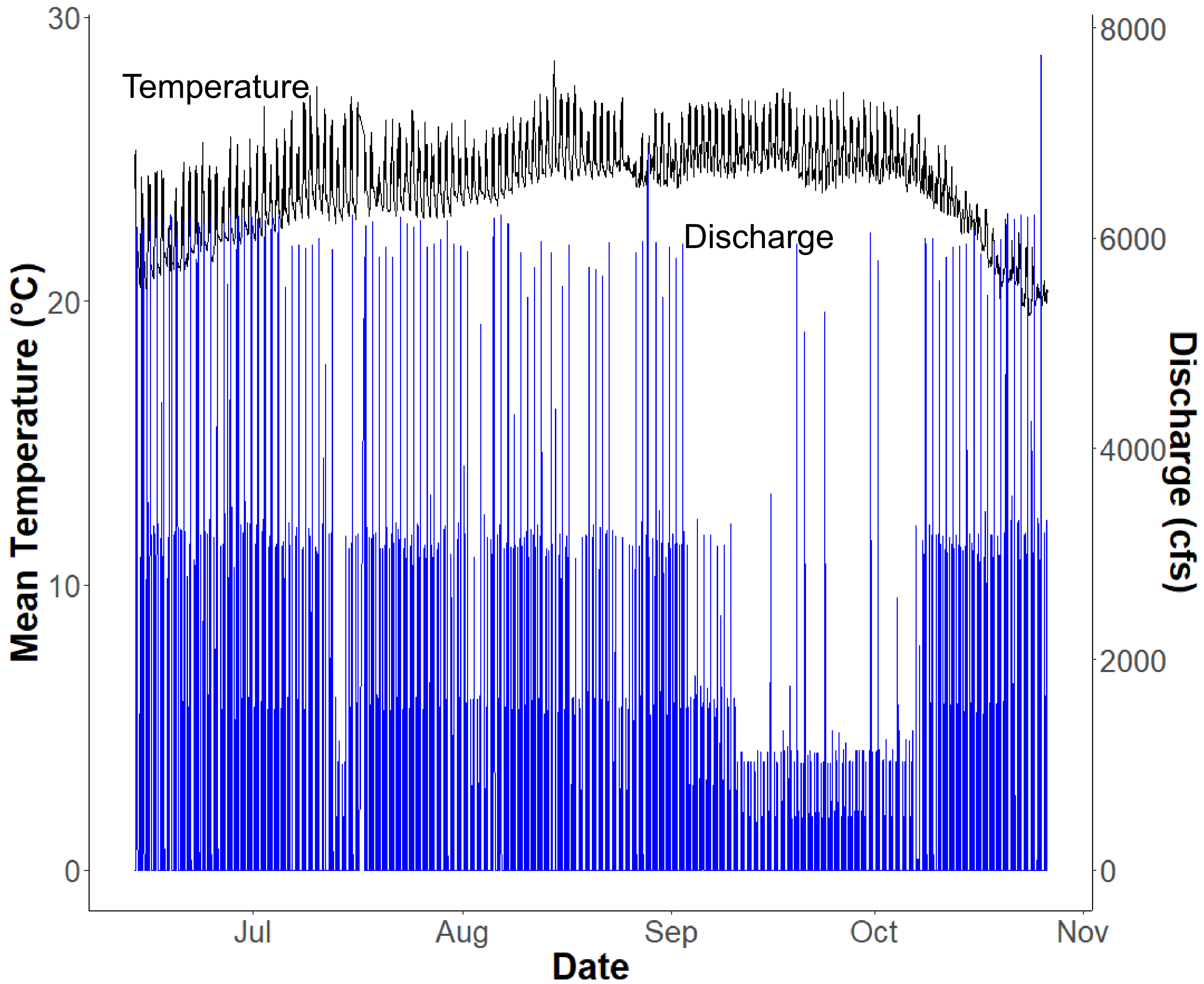

Mean Temperature
Tailrace
30
20
10
0
Temperature (°C)
March
Apr
May
June
July
Aug
Sept
Oct
Month
Pre
Post


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

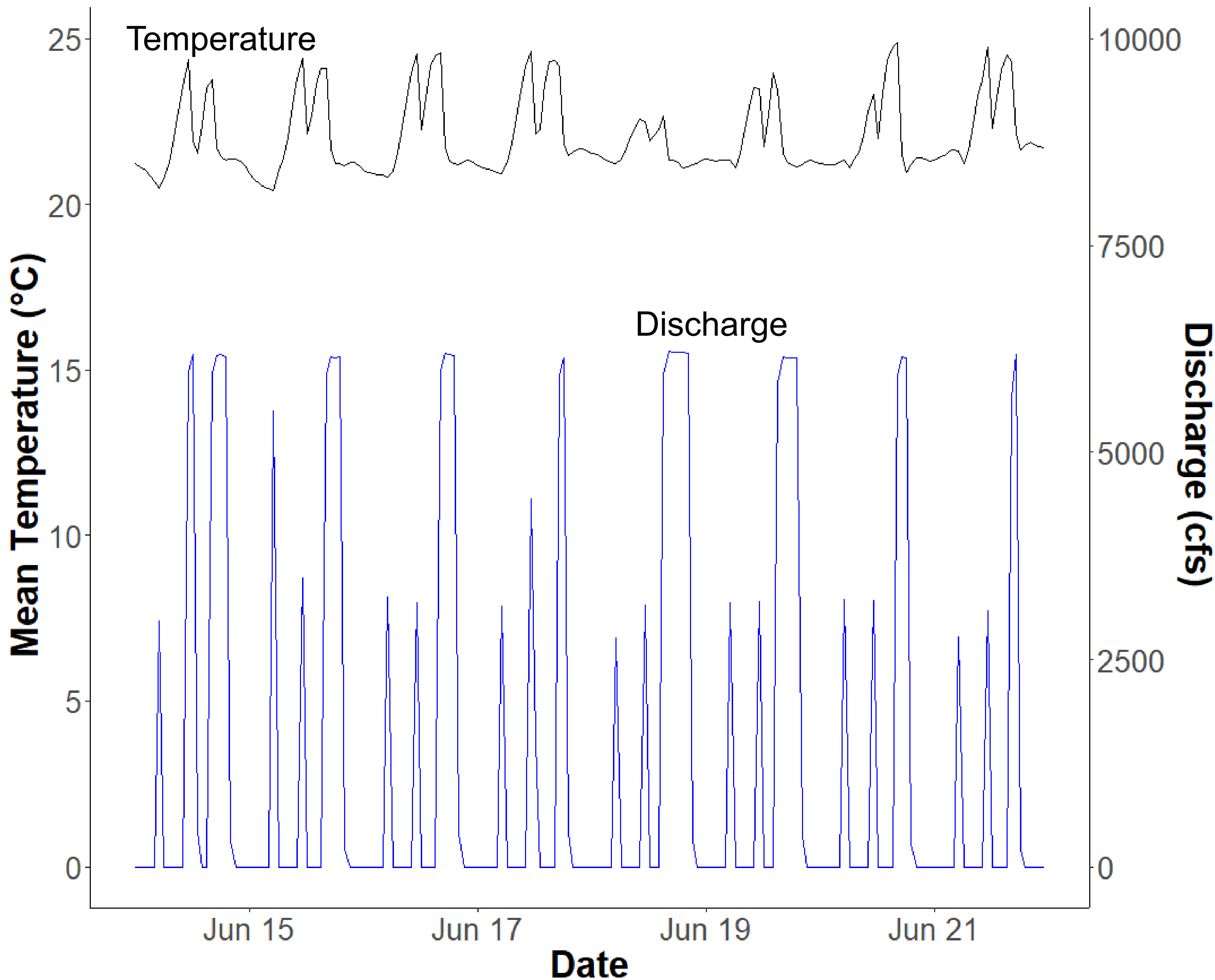

Mean Temperature
Wadley
30
25
20
15
10
Temperature (°C)
March
April
May
June
July
August
September
October
Month
Pre
Post


Pre Green Plan
Post Green Plan
Pre Green Plan Temperature Range
Tailrace
Post Green Plan Temperature Range
Tailrace
tailrace
Pre Green Plan Temperature Range
Malone
Post Green Plan Temperature Range
Malone
Malone
Pre Green Plan Temperature Range
Wadley
Post Green Plan Temperature Range
Wadley
Wadley
# of Days
Temperature Range (°C
# of days
Temperature Range (C)
Preliminary

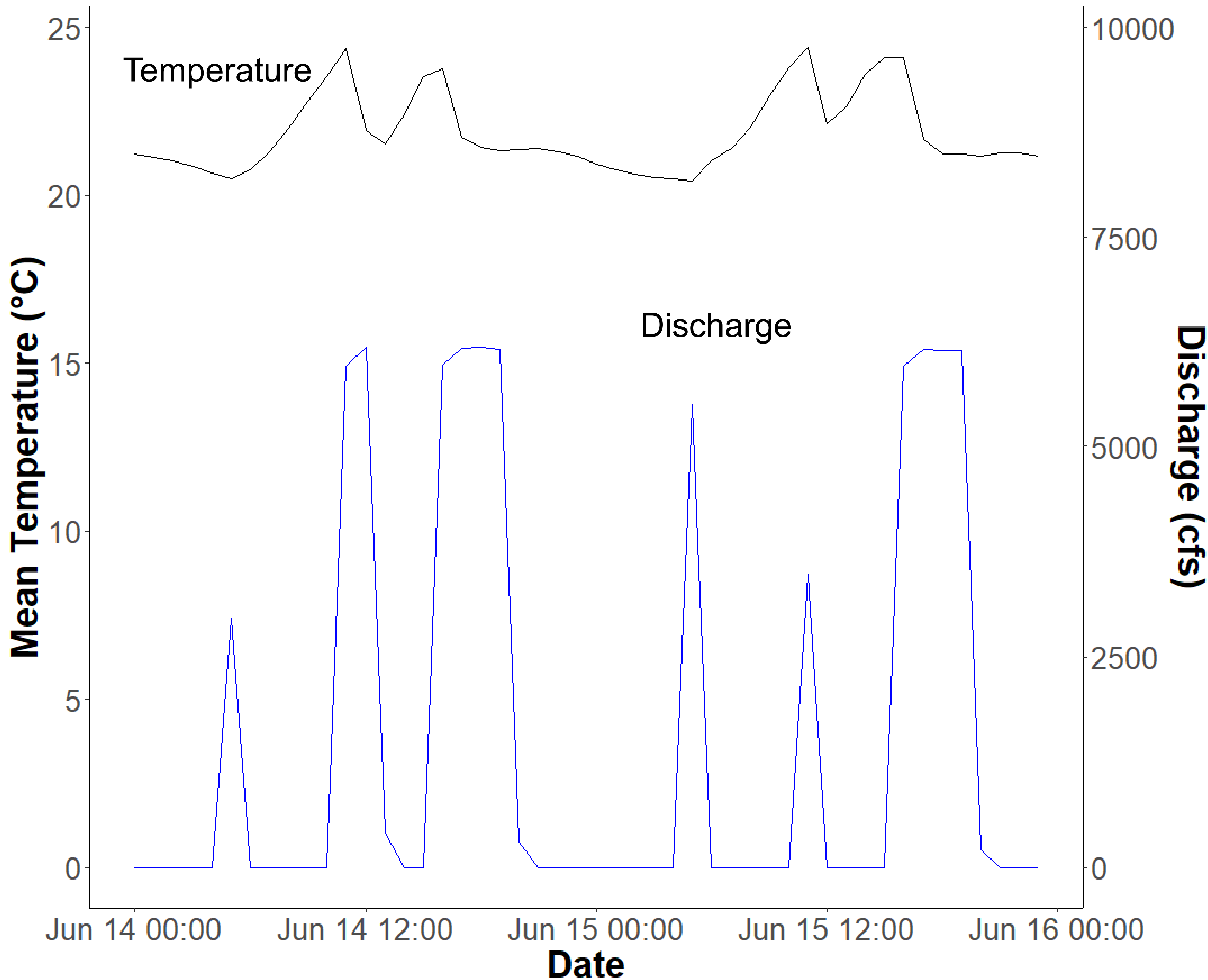

Mean Temperature Pre Green Plan
Temperature (C°)
20
10
0
Mean Temperature Post Green Plan
Temperature (C°)
20
10
0
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Month
Tailrace
Malone
Wadley
Preliminary



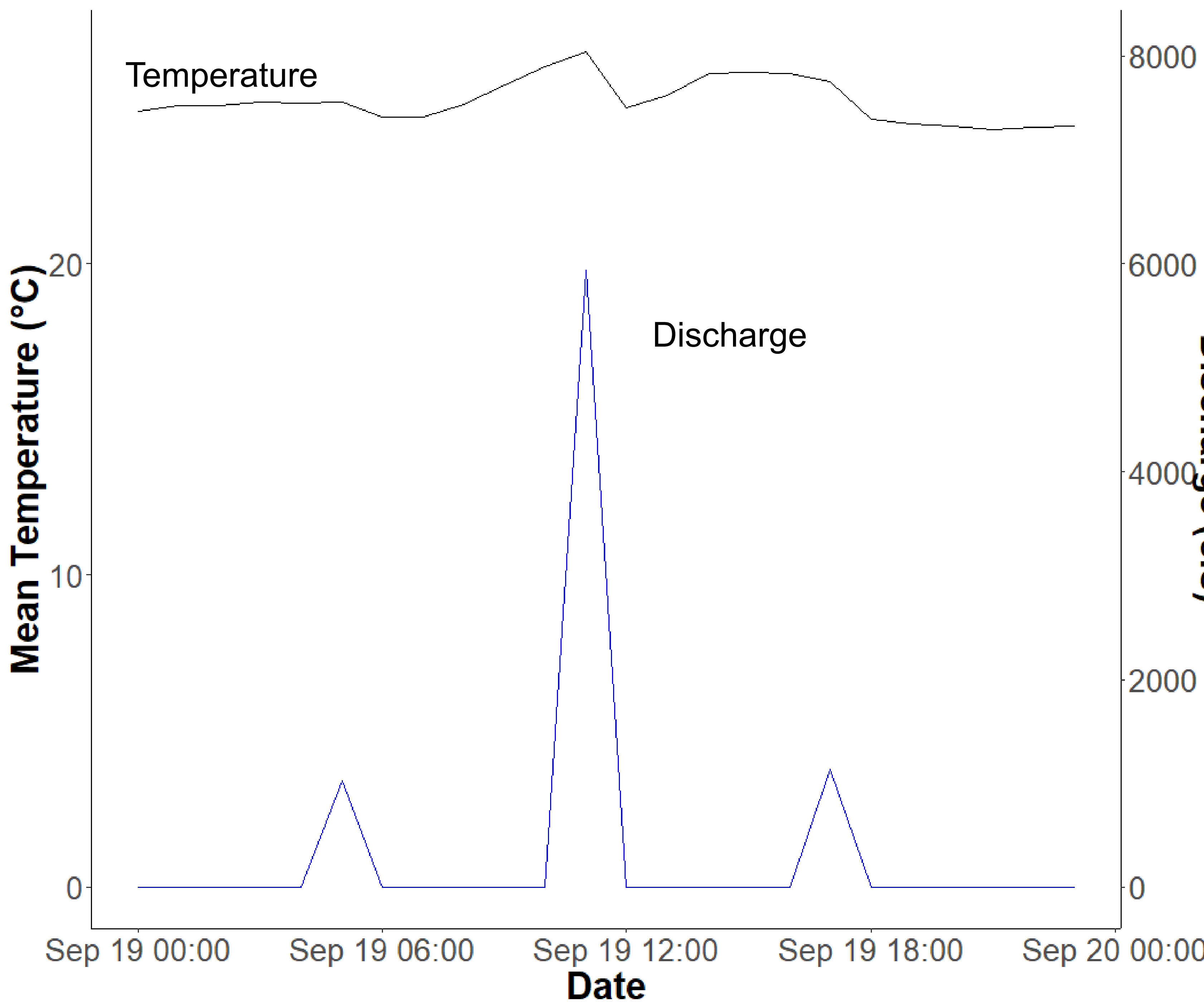
Temperature
Discharge
Mean Temperature (°C)
Discharge (cfs)
Date
30
20
10
0
8000
6000
4000
2000
0
Jul
Aug
Sep
Oct
Nov



Temperature
Discharge
Mean Temperature (°C)
25
20
15
10
5
0
Discharge (cfs)
10000
7500
5000
2500
0
Jun 15
Jun 17
Jun 19
Jun 21
Date



Temperature
Discharge
Mean Temperature (°C)
Discharge (cfs)
Date
25
20
15
10
5
0
10000
7500
5000
2500
0
Jun 14 00:00
Jun 14 12:00
Jun 15 00:00
Jun 15 12:00
Jun 16 00:00


Temperature
Discharge
Mean Temperature (°C)
Discharge (cfs)
Date
0
10
20
0
2000
4000
6000
8000
Sep 19 00:00
Sep 19 06:00
Sep 19 12:00
Sep 19 18:00
Sep 20 00:00

Some Take-Home Points . . .

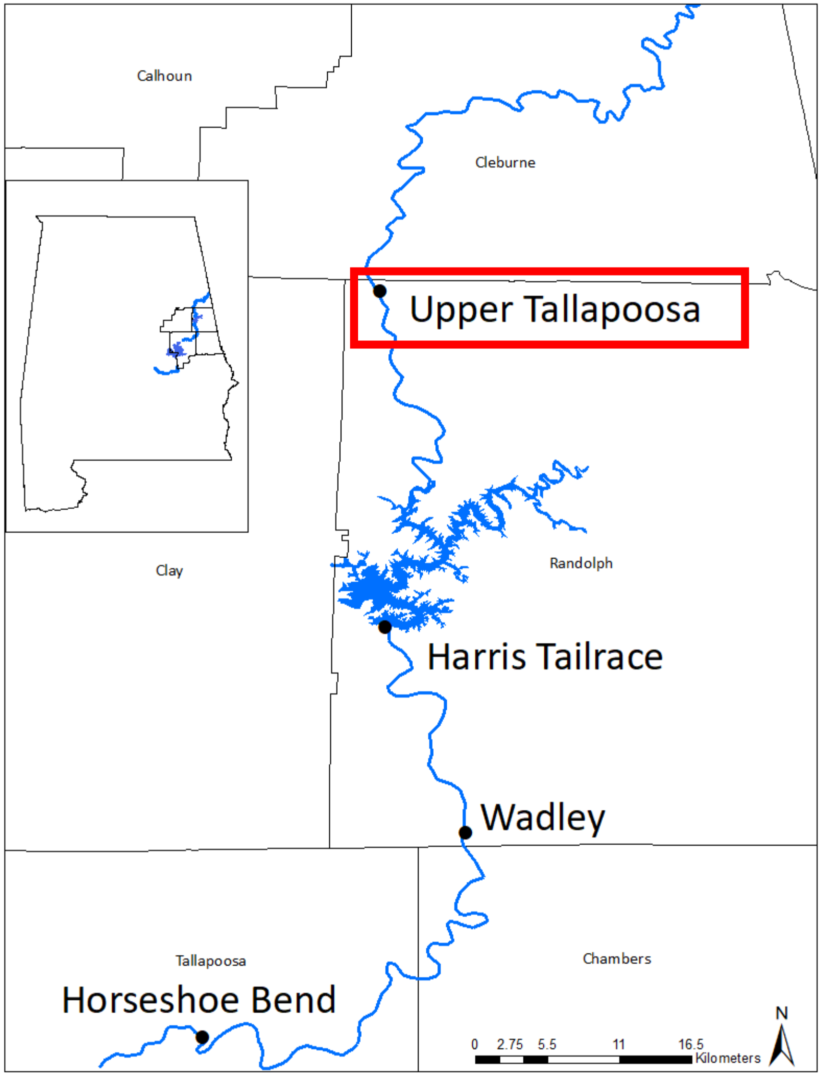
- No significant difference between temperatures before/after Green Plan
- Large variation in temperature during certain times
- Need winter temperature data
- Limited temperature tolerance data for riverine fish of interest
- Discharge changes water temperature over small time scales

Project Objectives

3. Quantify the fish community across a gradient downstream from the Harris Dam tailrace and in a reference site upstream of Harris Reservoir.

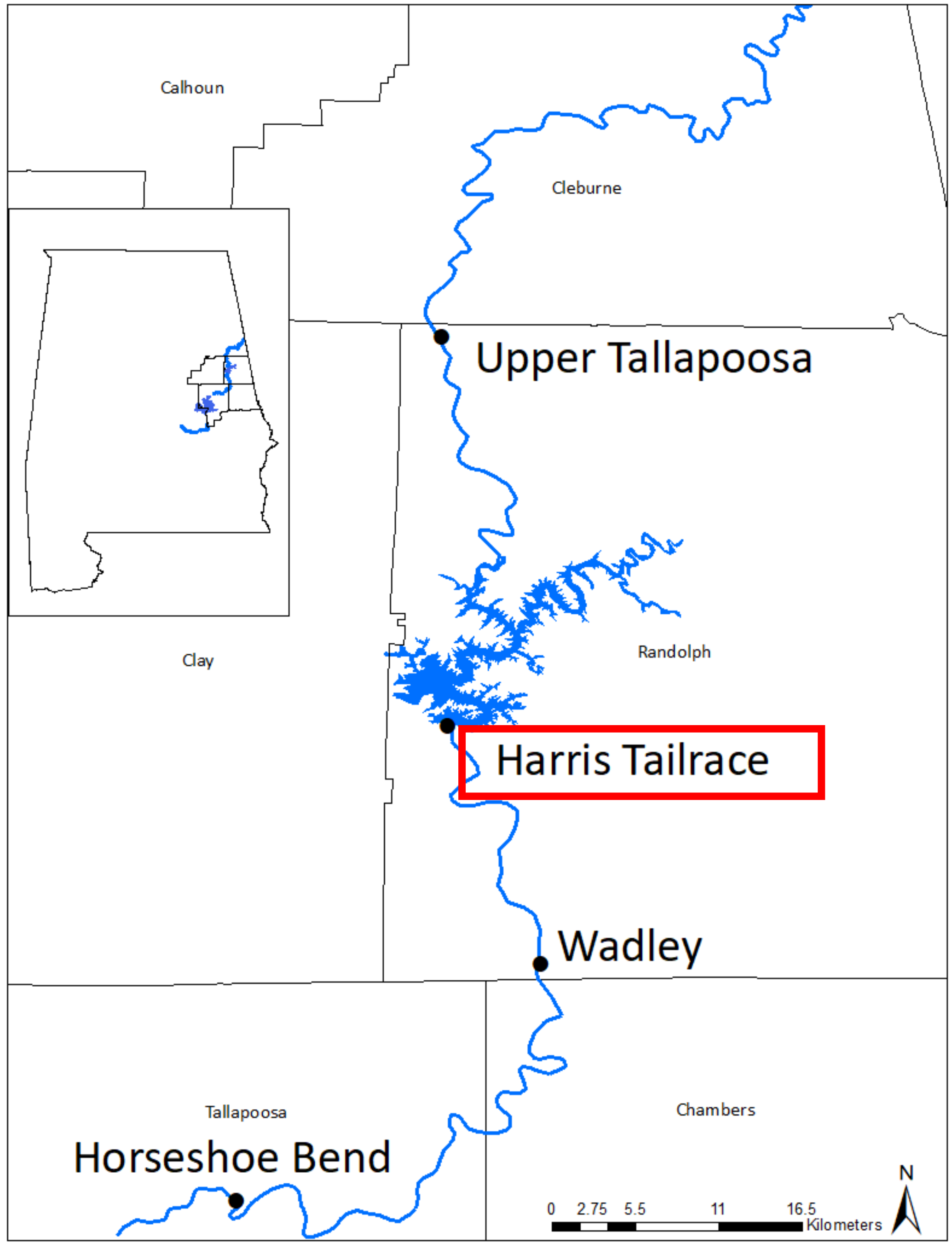
Study Sites

- Mainstem Tallapoosa River
- Three sites regulated by Harris Dam
  - Tailrace
  - Wadley
  - Horseshoe Bend
- One unregulated, upstream site
  - Upper Tallapoosa/Lee's Bridge



Upper Tallapoosa/Lee's Bridge

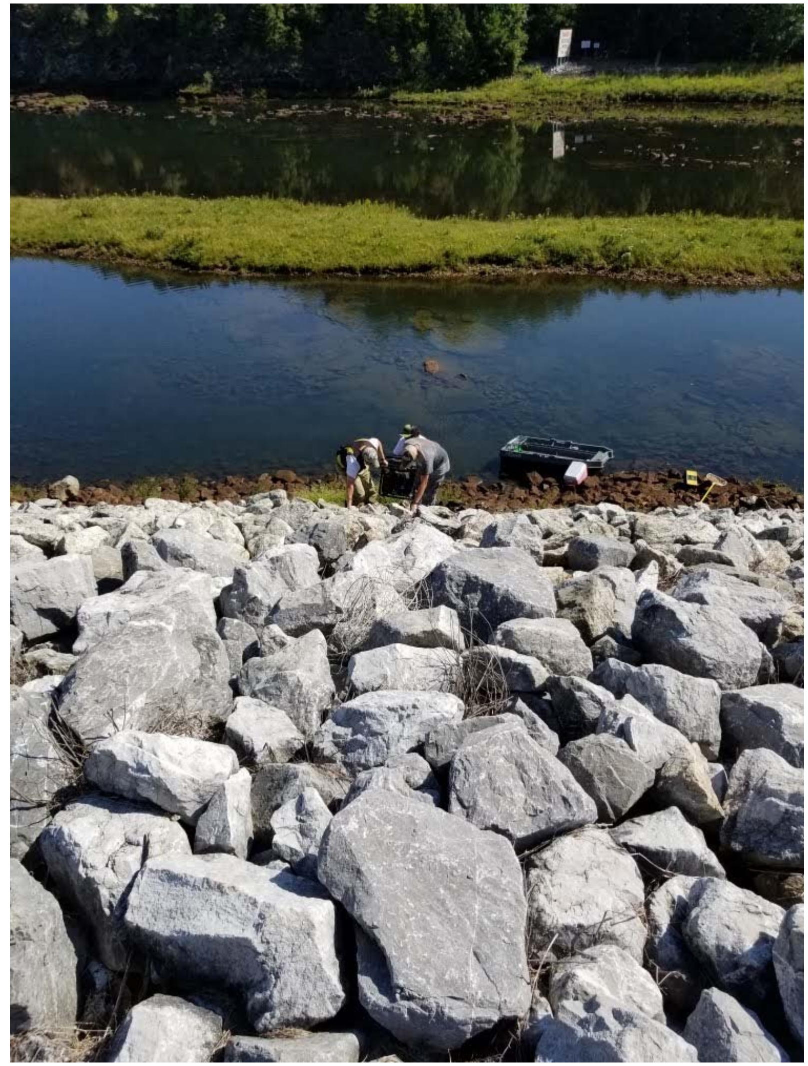
- ~45 RKM upstream of Harris Dam
- Small shoal complex at upstream boundary
- Deep, turbid water
- Accessed via ramp on CR-88

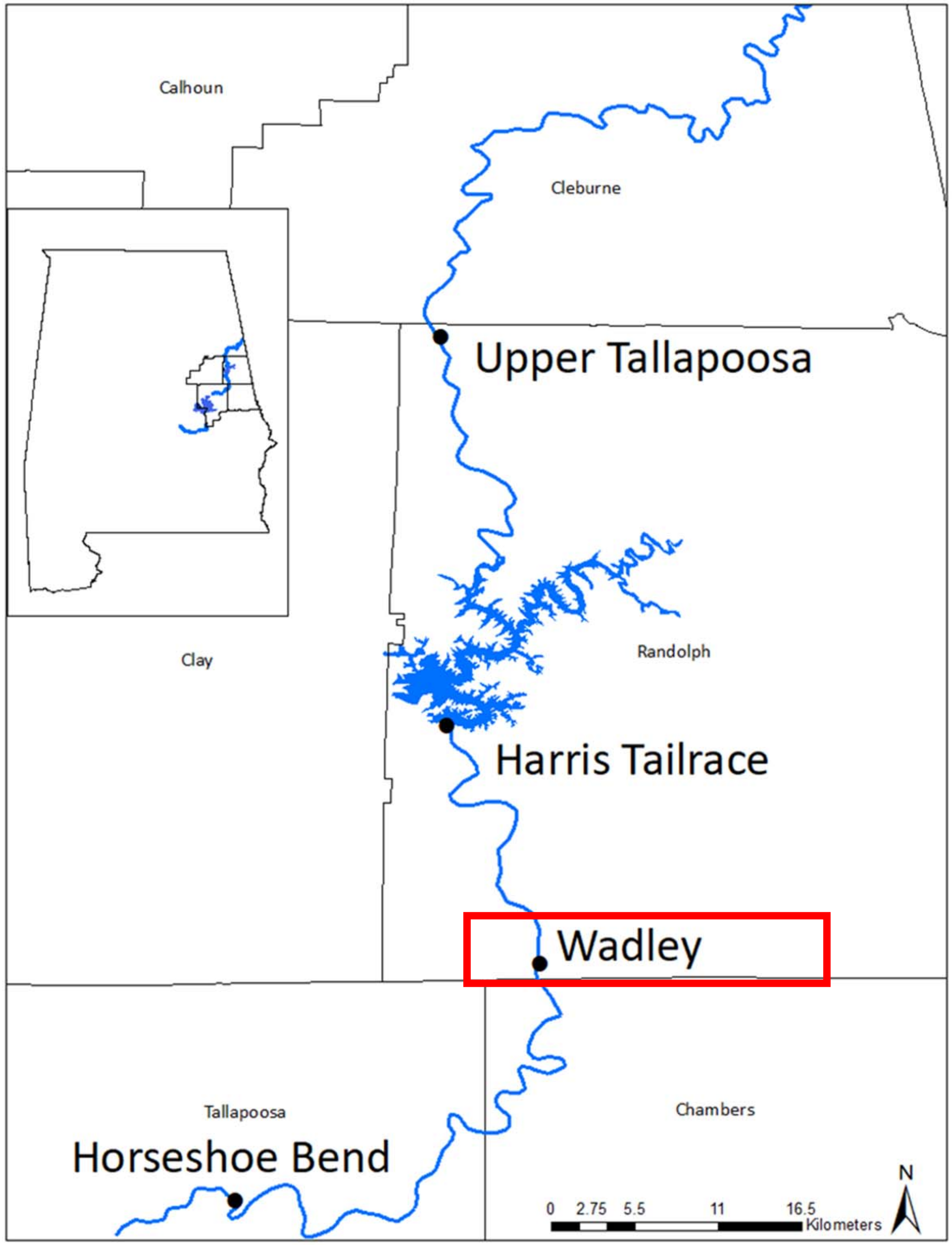


Calhoun
Cleburne
Upper Tallapoosa
Clay
Randolph
Harris Tailrace
Wadley
Tallapoosa
Chambers
Horseshoe Bend
N
0 2.75 5.5 11 16.5
Kilometers

Harris Tailrace

- The immediate tailrace of Harris Dam
- Bedrock dominated shoal habitat
- Shallow and clear
- Sampling coordinated with dam release schedule
- Accessed via dam facility




Calhoun
Cleburne
Upper Tallapoosa
Clay
Randolph
Harris Tailrace
Wadley
Tallapoosa
Chambers
Horseshoe Bend
0 2.75 5.5 11 16.5
Kilometers
N

Wadley

- ~23 RKM downstream of Harris Dam
- Upstream and downstream shoal complexes
- Deep, clear water
- Abundant woody debris
- Accessed via bank launch at AL-77

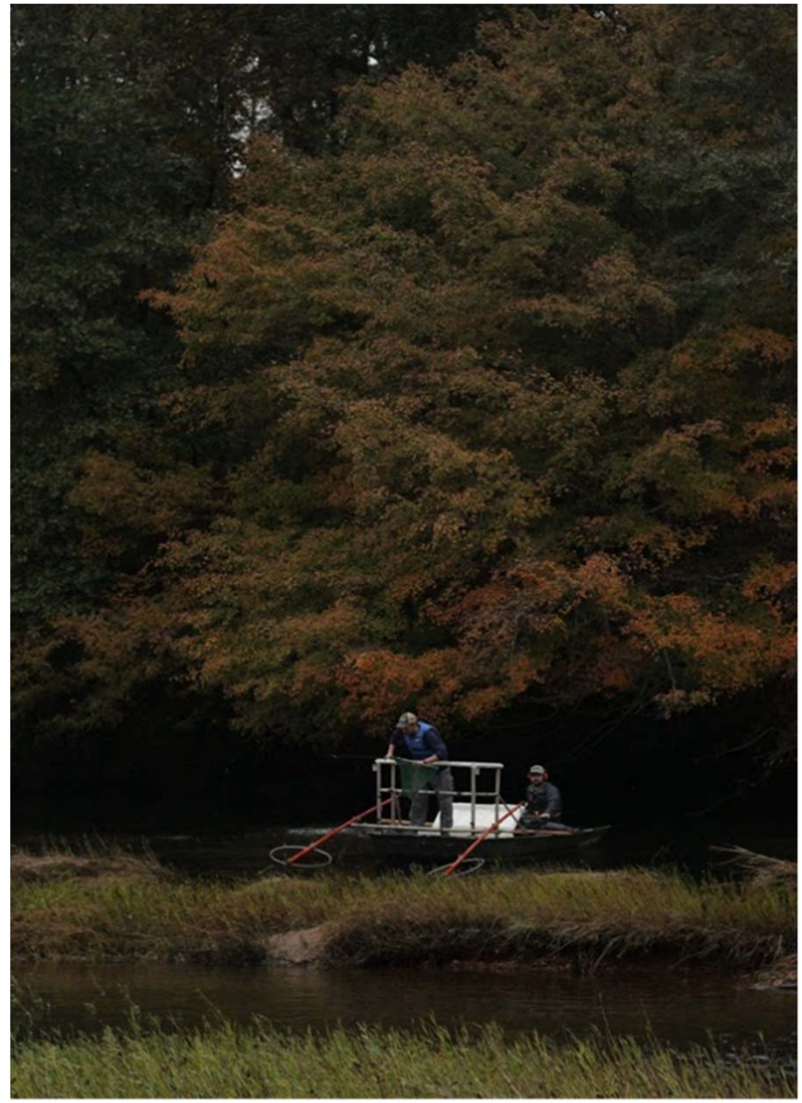
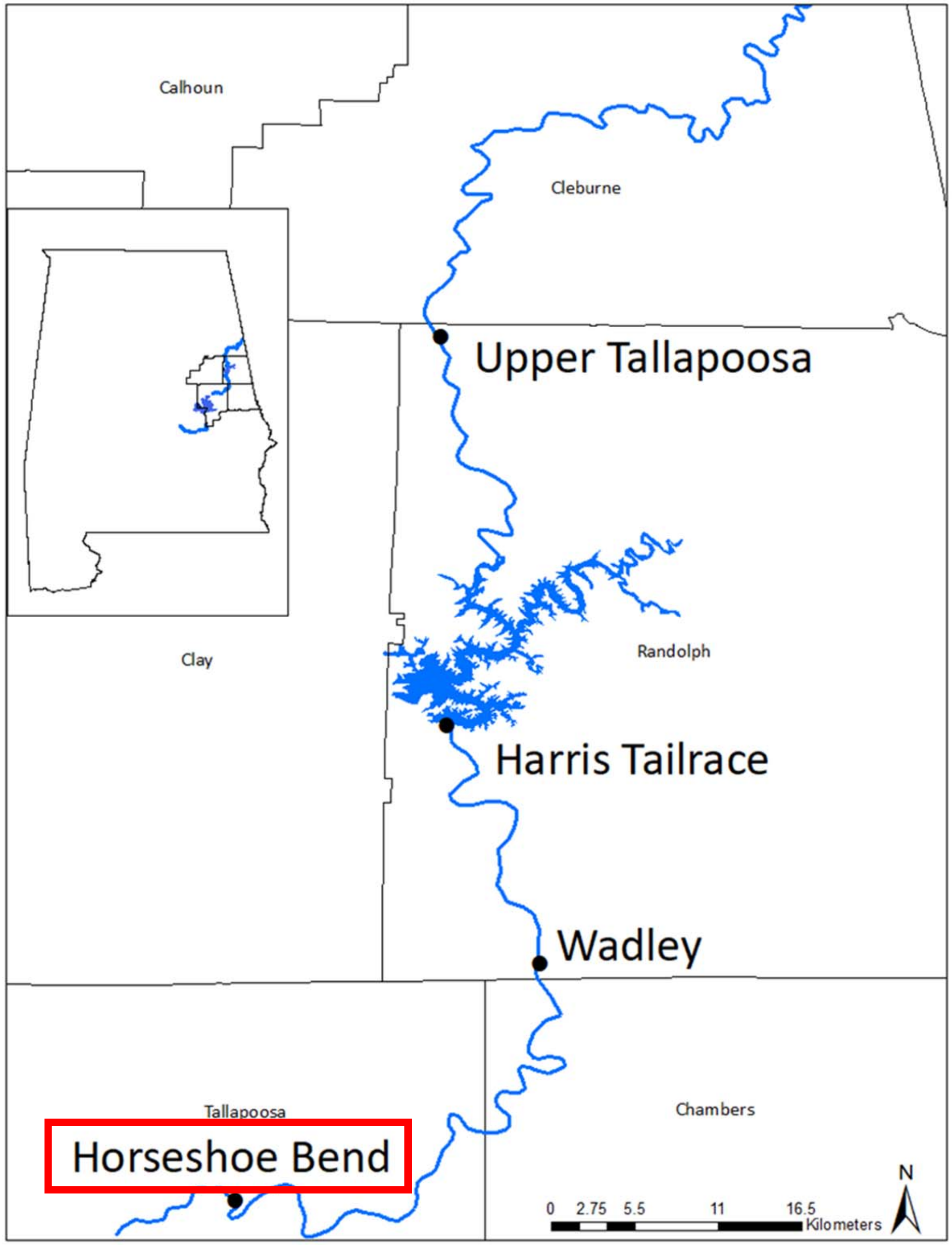


Photo Courtesy of Henry Hershey

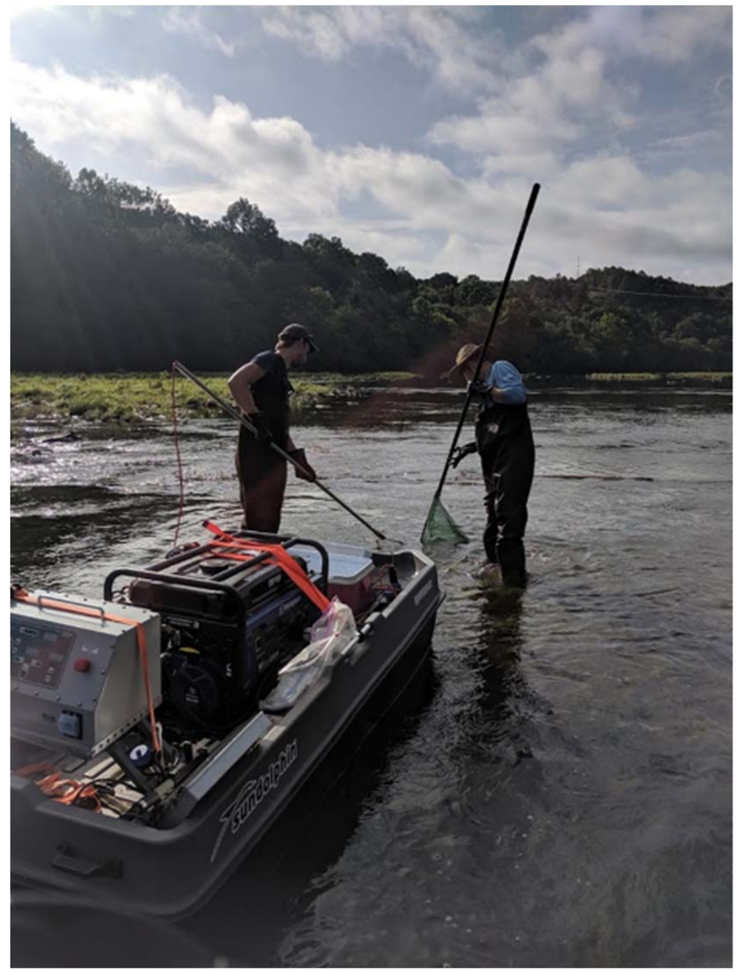

Calhoun
Cleburne
Upper Tallapoosa
Clay
Randolph
Harris Tailrace
Wadley
Tallapoosa
Chambers
Horseshoe Bend
0 2.75 5.5 11 16.5
Kilometers
N

Horseshoe Bend

- ~66 RKM downstream of Harris Dam
- Deep pools bounded by shoal complexes
- Clear, flowing water
- Accessed via Horseshoe Bend National Military Park

Field Methods

- All sites sampled every-other month
- Standardized boat/barge electrofishing
  - 6, 10-minute transects
  - Barge used in the tailrace
  - Fish transported to lab



Lab Methods

- All fish identified to species
- Non-target species
  - 10 of each non-target species weighed/measured
  - Remaining individuals weighed as a group
- Target species
  - Otoliths, gonads, and diets extracted
  - Fin clips collected from Alabama bass and Tallapoosa bass
  - Ages estimated, annuli measured

Species found at more than 1 site

Largescale stoneroller

Alabama shiner

Blacktail shiner

Striped shiner

Silverstripe shiner

Weed shiner

Coosa shiner

Common Carp*

Alabama hogsucker

Black redhorse

Blacktail redhorse

Yellow bullhead

Blue catfish

Channel catfish

Flathead catfish

Blackstripe topminnow

Bold indicates found at all sites; *Non-native

Species found at more than 1 site

Shadow bass

Redbreast sunfish

Green sunfish

Bluegill

Redear sunfish

Hybrid sunfish

Black crappie

Largemouth bass

Tallapoosa bass

Alabama bass

Lipstick darter

Speckled darter

Mobile logperch

Bronze darter

Muscadine darter

Bold indicates found at all sites; *Non-native

Species unique to Lee's Bridge

- Bowfin
- Threadfin shad
- Pretty shiner
- Spotted sucker
- River redhorse
- Total species richness: 28

www.outdooralabama.com/redhorse/river-redhorse

www.outdooralabama.com/other-species/threadfin-shad

Species unique to Harris tailrace

- Snail bullhead
- Tallapoosa darter
- Striped bass
- Rough shiner
- Rosyface shiner
- Total species richness: <u>33</u>

www.outdooralabama.com/darters/tallapoosa

Species unique to Wadley

- Brown bullhead
- Speckled madtom
- Tallapoosa shiner
- Redbreast sunfish hybrid
- Total species richness: <u>30</u>

www.outdooralabama.com/shiners/tallapoosa

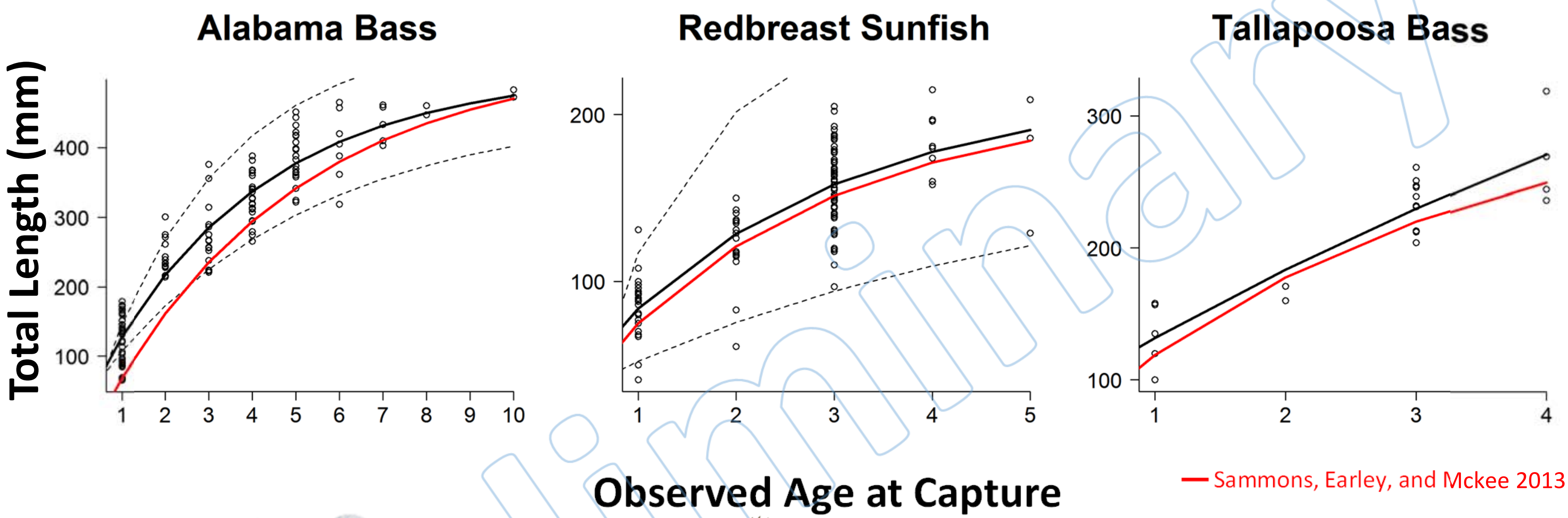
Species unique to Horseshoe Bend

- Blueback herring*
- Skipjack herring
- Blackspotted topminnow
- Warmouth
- Total species richness: 33

*Non-native

www.outdooralabama.com/other-species/skipjack-herring

Preliminary Results – von Bertalanffy Growth Curves



L_∞=507.17
K=0.26
T_0=0.91
CPUE: 12.0hr^{-1}

L_∞=216.05
K=0.41
T_0=0.83
CPUE: 9hr^{-1}

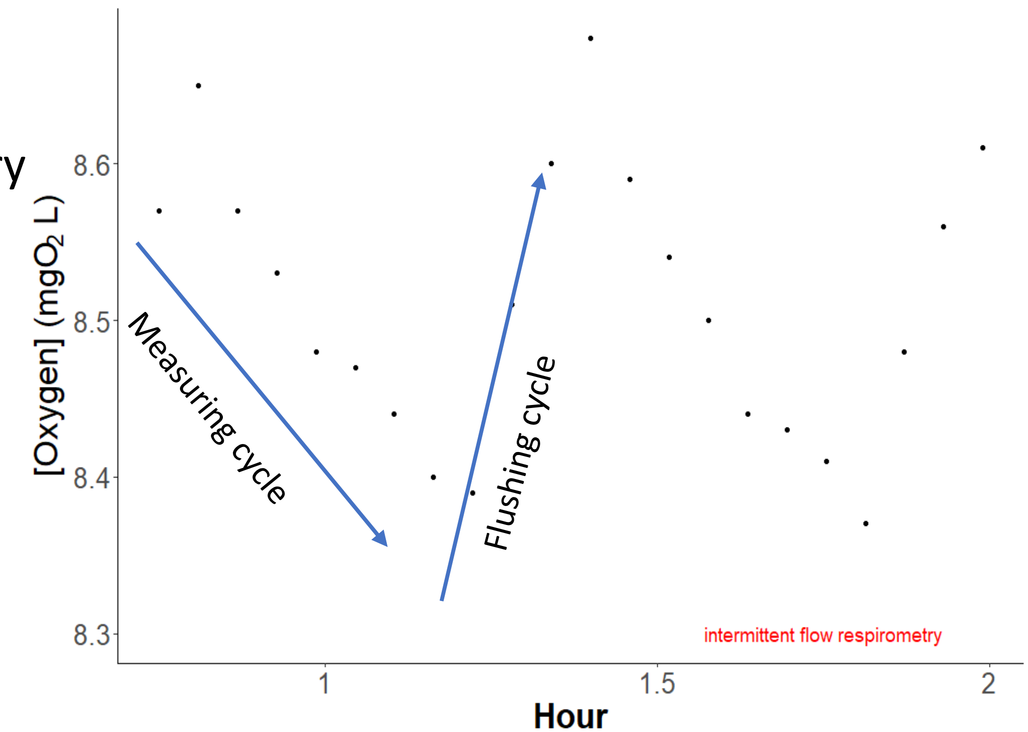
L_∞=633.39*
K=0.11
T_0=0.32
CPUE: 1.2hr^{-1}

Objective 4

- Quantify effects of temperature and flow variation on target fish species energy budgets using bioenergetics modeling
  - Part 1: Respirometry
    - Static Respirometry
    - Swimming Respirometry

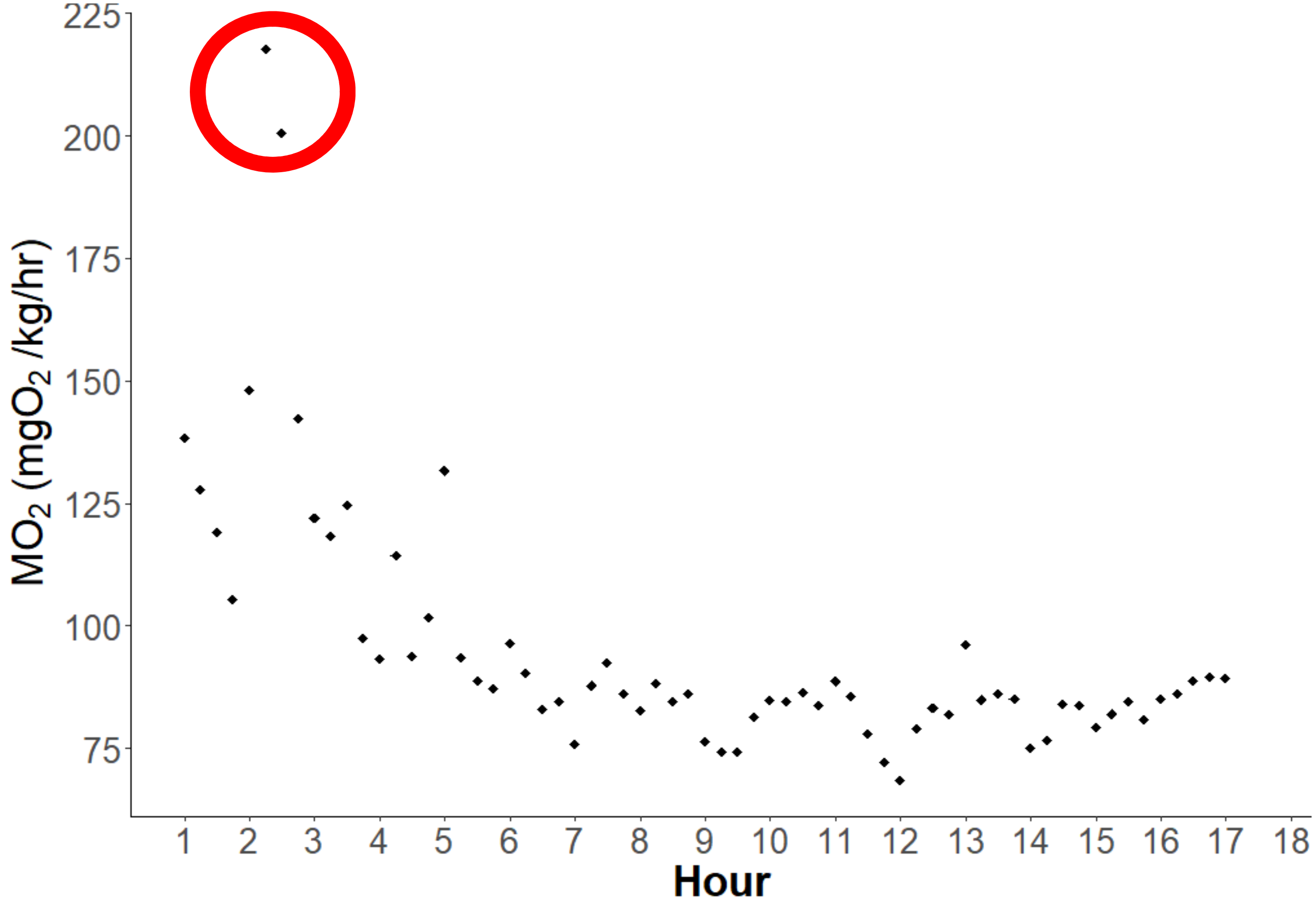
Static Respirometry

- Standard metabolic rate
  - Stationary, no swimming
    - Intermittent flow respirometry
    - Closed respirometry
- MO_2 ($mgO_2kg^{-1}hr^{-1}$)
  - (initial $[O_2]$ – final $[O_2]$) * (V_c/t) / W
- Requires acclimation time



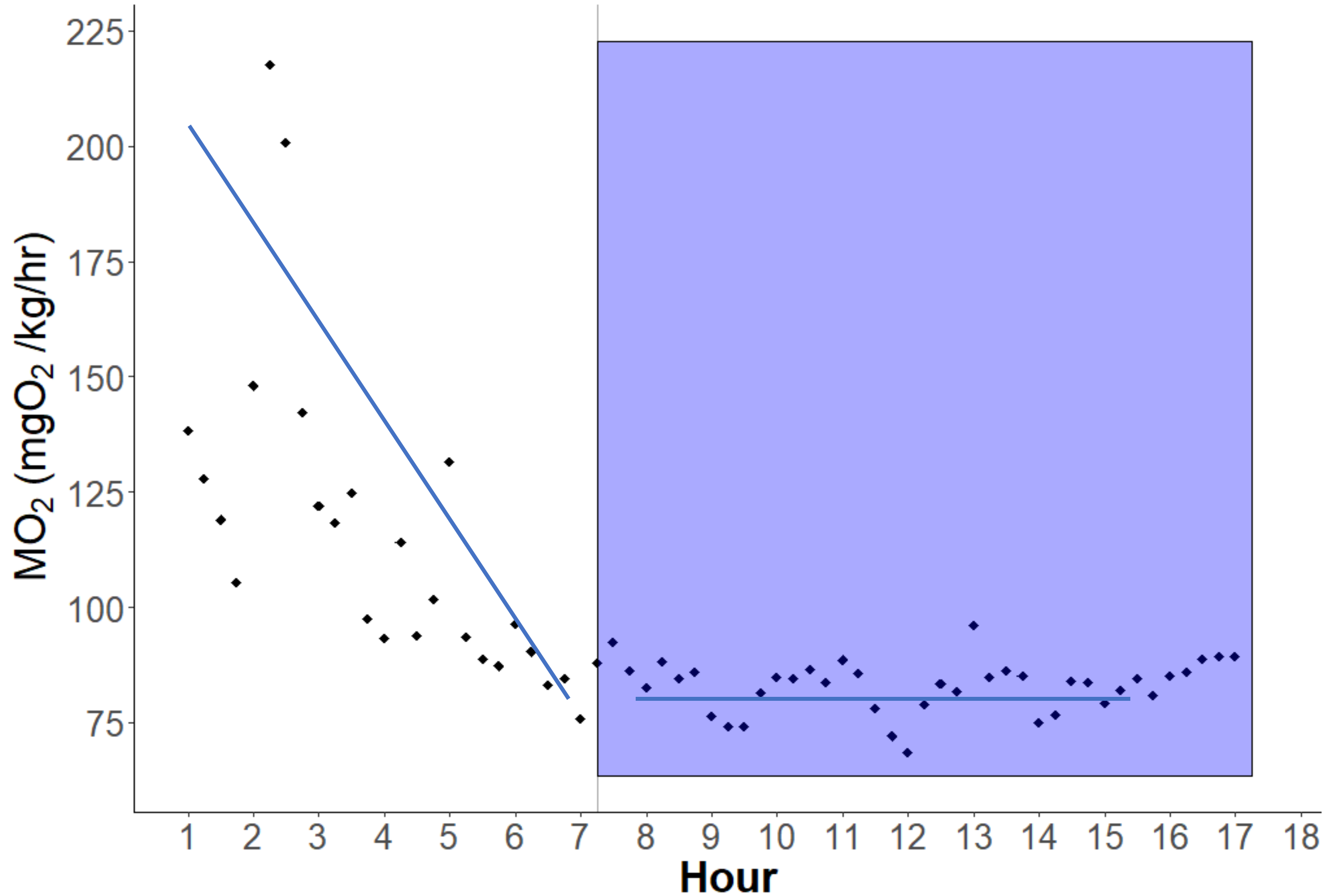
Static Respirometry

- Point stress event
- Determine acclimation



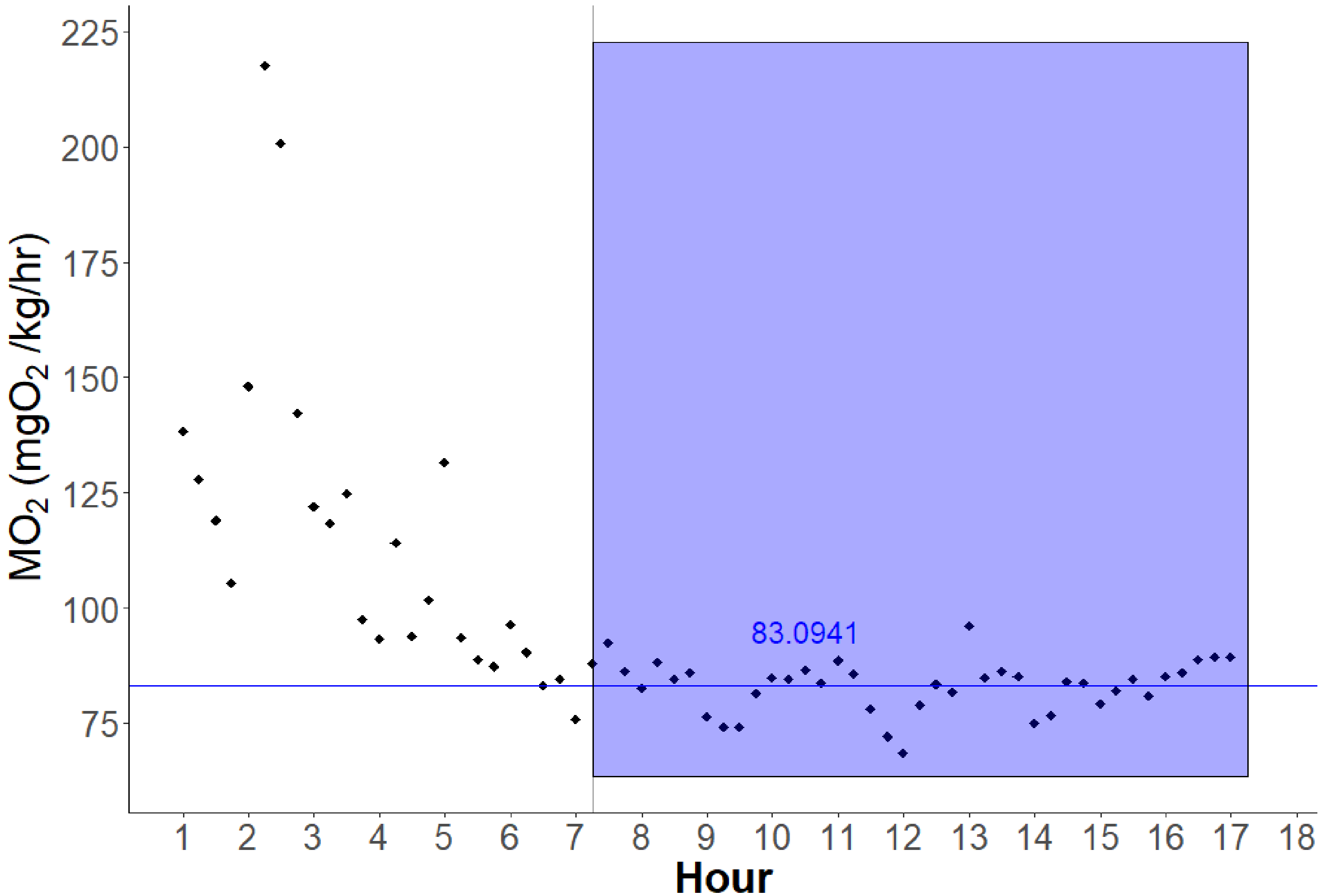
Static Respirometry

- Acclimation determination
  - Break point
    - Differs per individual



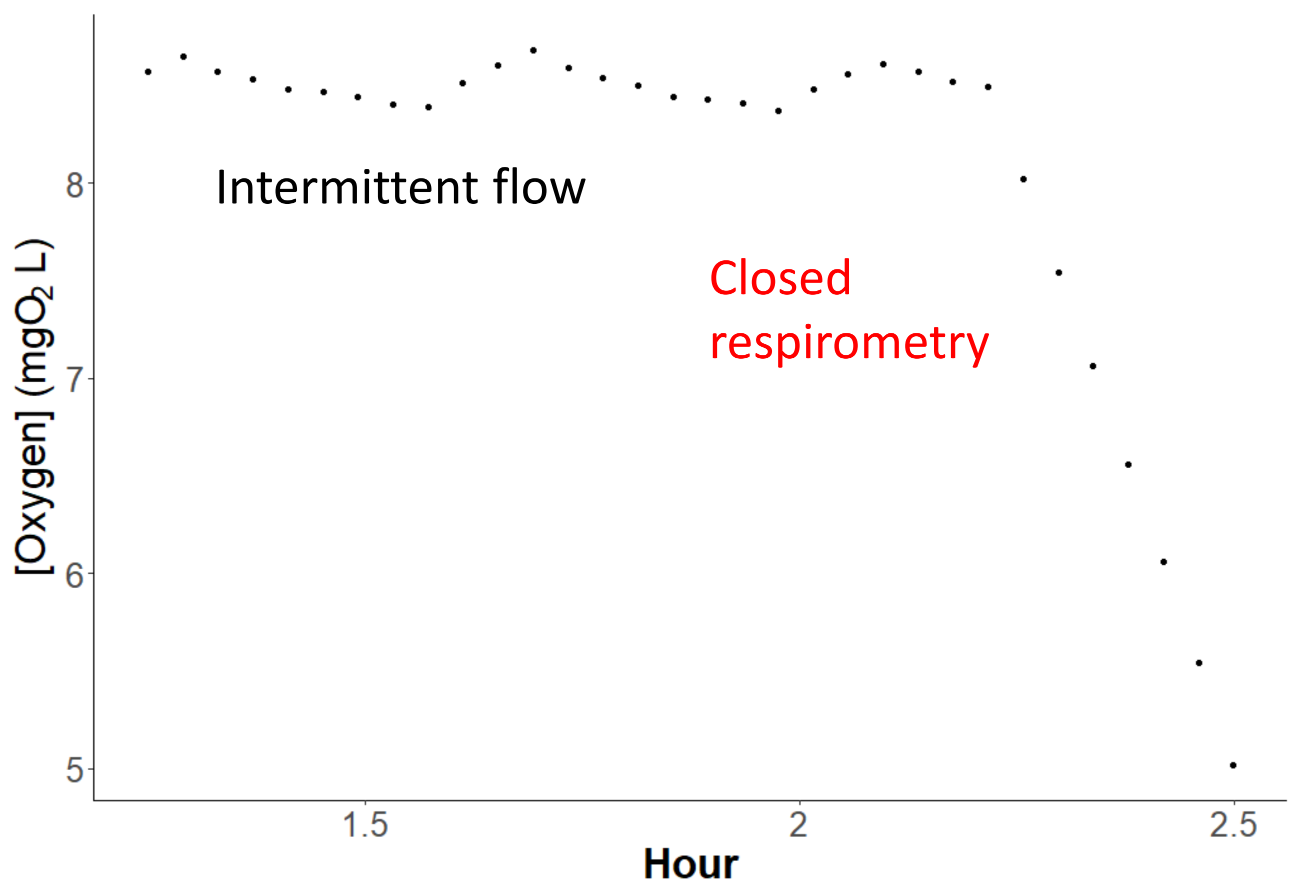
Static Respirometry

- Acclimation determination
  - MO_2 = 83.094



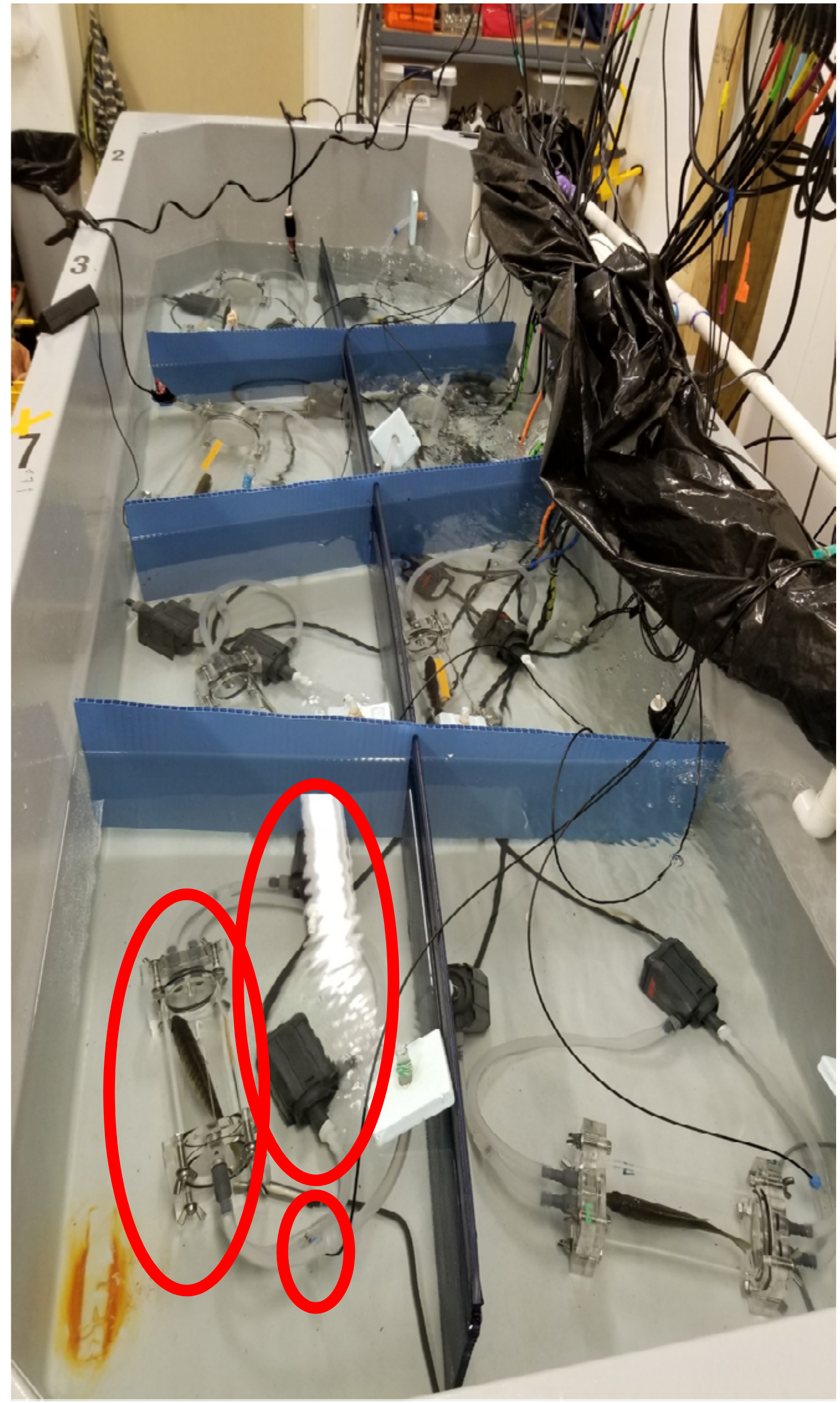
Static Respirometry

- Closed respirometry
  - No flushing
  - Final measurement
- Calculate overall MO_2



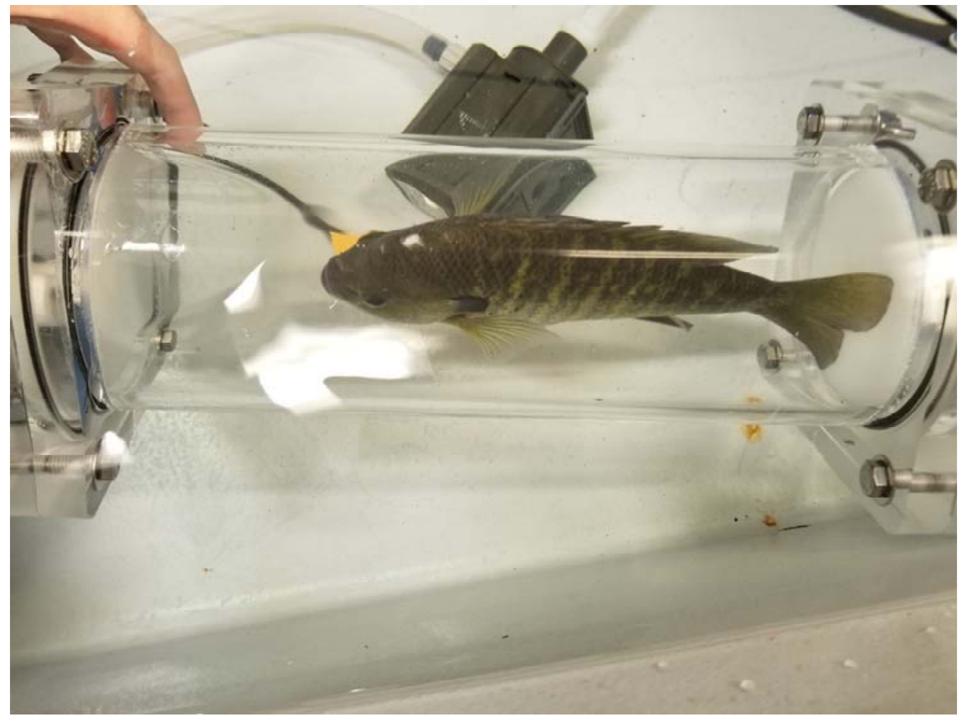
Static Respirometry

- 8 chamber system (Loligo)
  - Medium chambers: ~600 ml
  - Large chambers: ~2600 ml
- Intermittent flow respirometry
  - Automated
- Temperature controlled
- Oxygen measured electronically



Static Respirometry

- Standard metabolic rate 21°C
  - Channel Catfish (n=2)
    - Weight range: 306 – 314 g
  - Alabama Bass (n=7)
    - Weight range: 17.36 -158.2 g
  - Redbreast Sunfish (n=14)
    - Weight range: 17.14 – 87.8 g
  - Tallapoosa Bass (n=1)
    - Weight range: 103.5 g



Static Respirometry

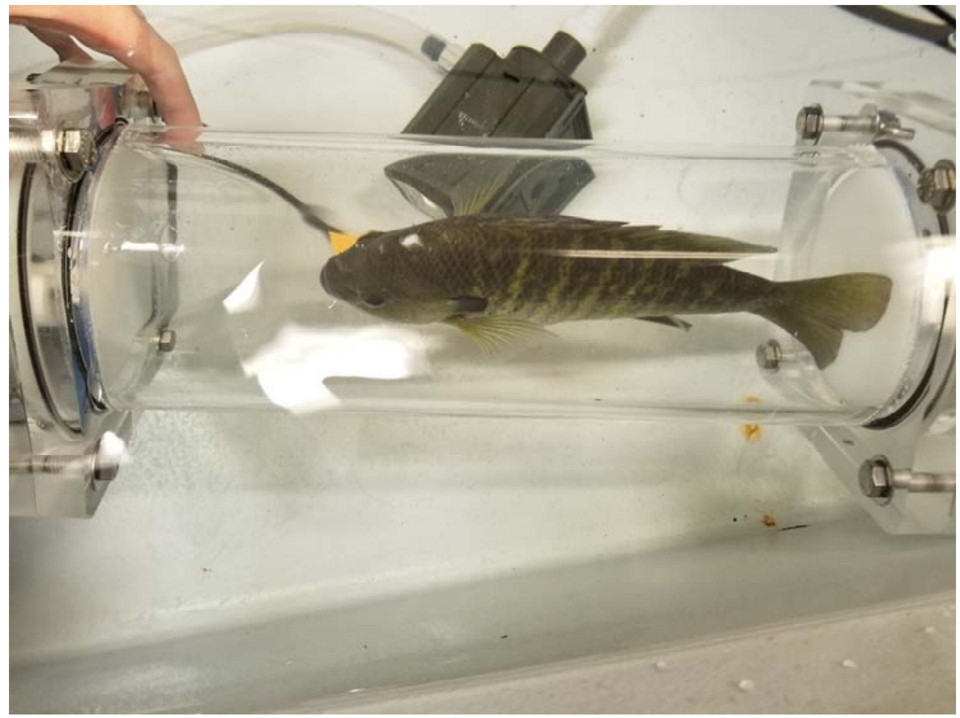
- Fish weighed
- Acclimated in chamber
  - 12 hr + 1
  - Intermittent flow respirometry
    - 1200/180 s
- Closed respirometry

Preliminary Static Respirometry 21°C

Size (g)	Redbreast Sunfish	Alabama Bass	Channel Catfish	Tallapoosa Bass
14-34	104.570 (2)	120.917 (3)		
34.1-54	89.299 (4)	114.736 (1)		
54.1-74	114.267 (4)	97.993 (1)		
74.1-94	85.518 (4)	54.176 (1)		
94.1-114				78.029 (1)
294.1-314			89.373 (2)	
354.1-374		68.598 (1)		

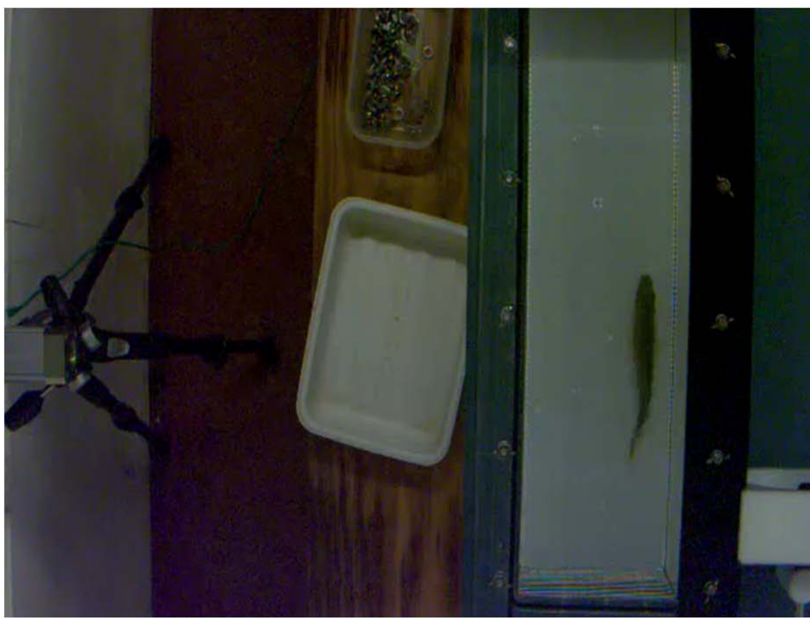
Work in 2020

- Test fish from all species from all sites
- Add 10°C temperature trials

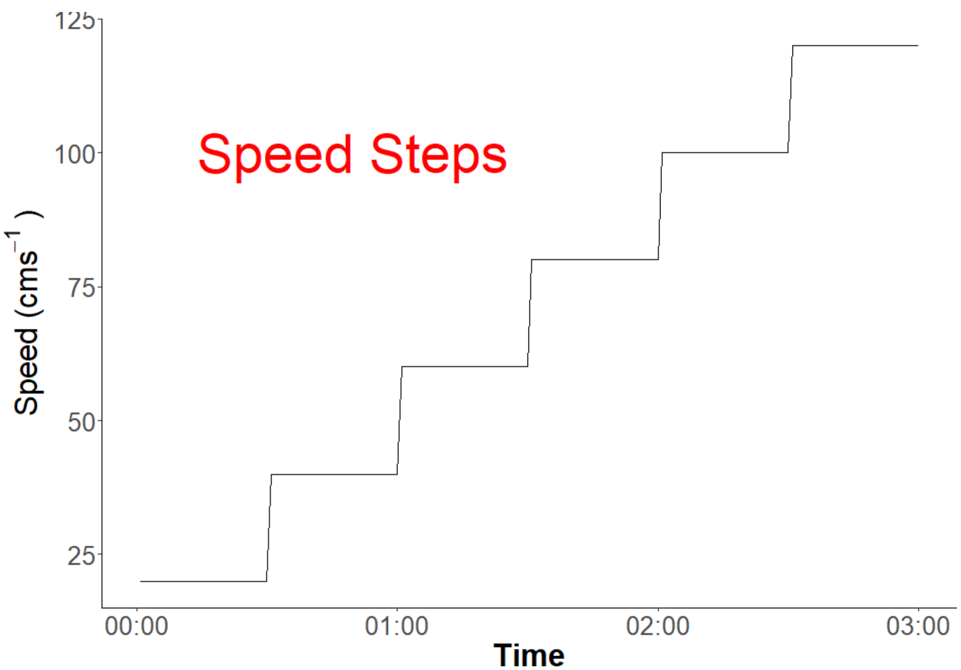


Swimming Respirometry & Performance

- Active metabolic rates
  - Metabolic rate of fish at given swimming speed
- Swimming performance
  - Critical swimming speed



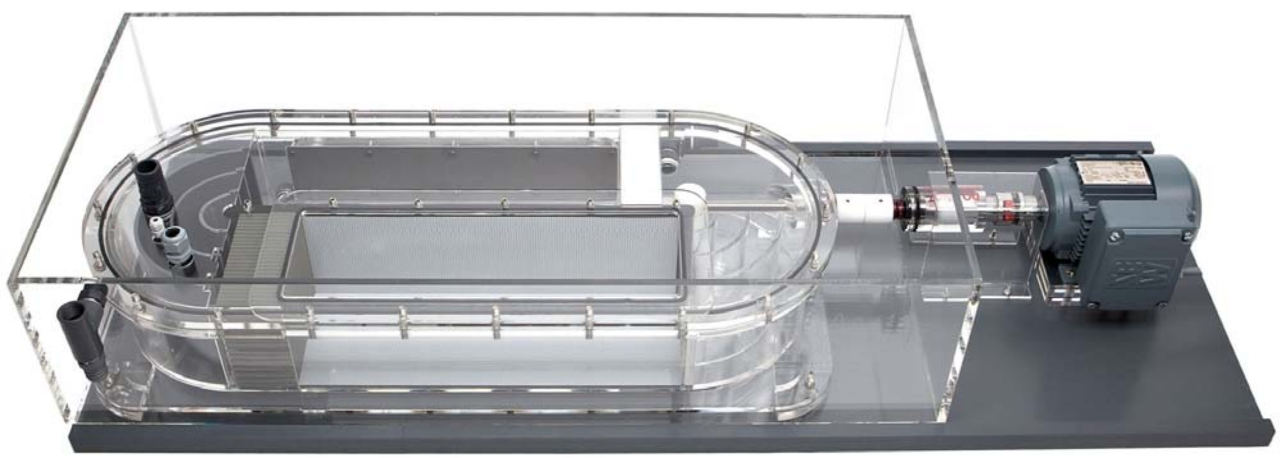

Swimming Performance



- Critical Swimming Speed
- $U_{crit} = U_1 + U_2(\frac{t_1}{t_2})$
  - U_1 - last completed bout
  - U_2 - velocity increment
  - $\frac{t_1}{t_2}$ - proportion of time at last step
- Bass – 30 min
- Redbreast Sunfish – 45 min
- Channel Catfish – 30 min

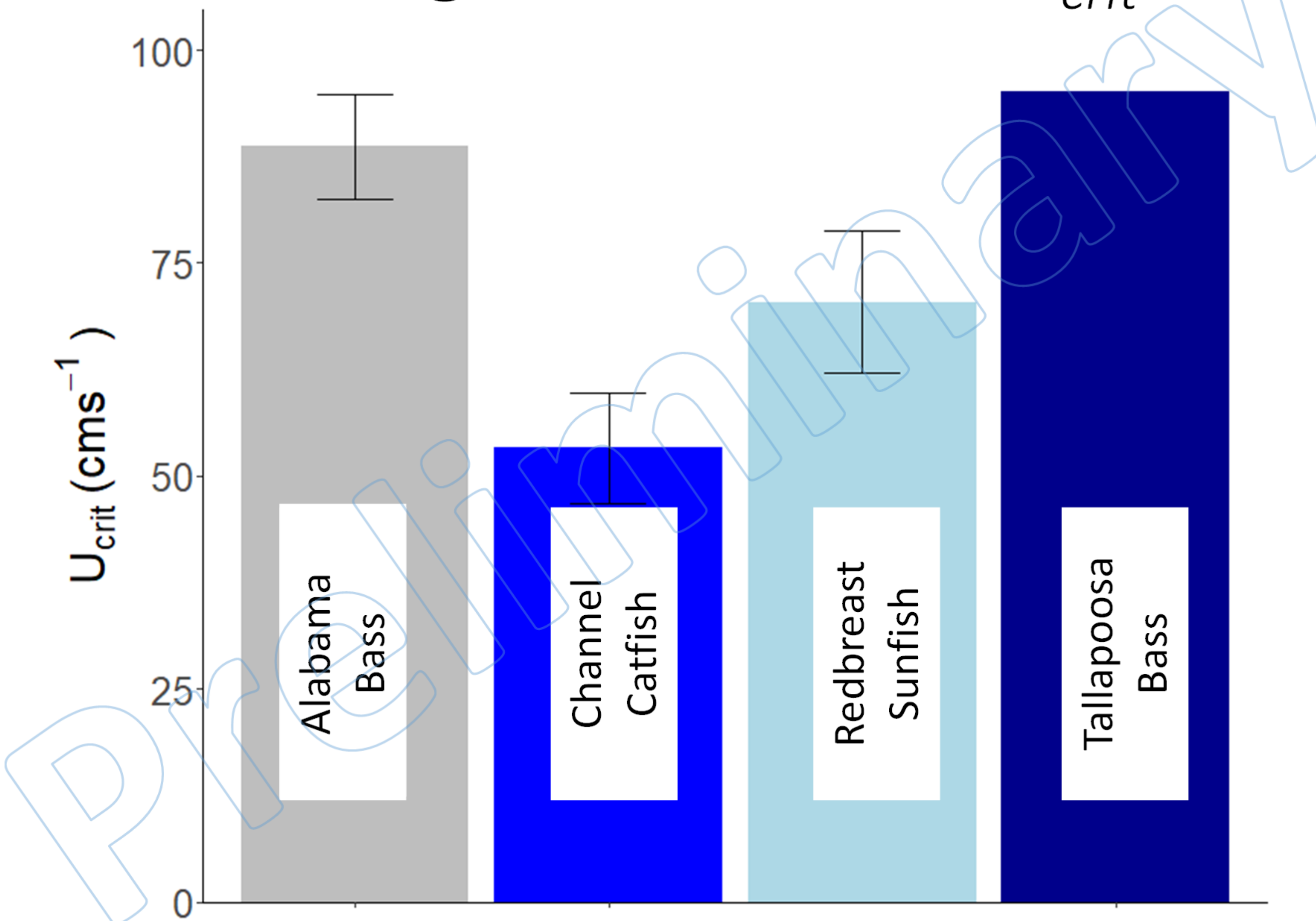
Swimming Respirometry & Performance

- 90 L Loligo swimming respirometer
- Temperature controlled
  - Water reservoirs
- Oxygen measured electronically
- Speed control automated

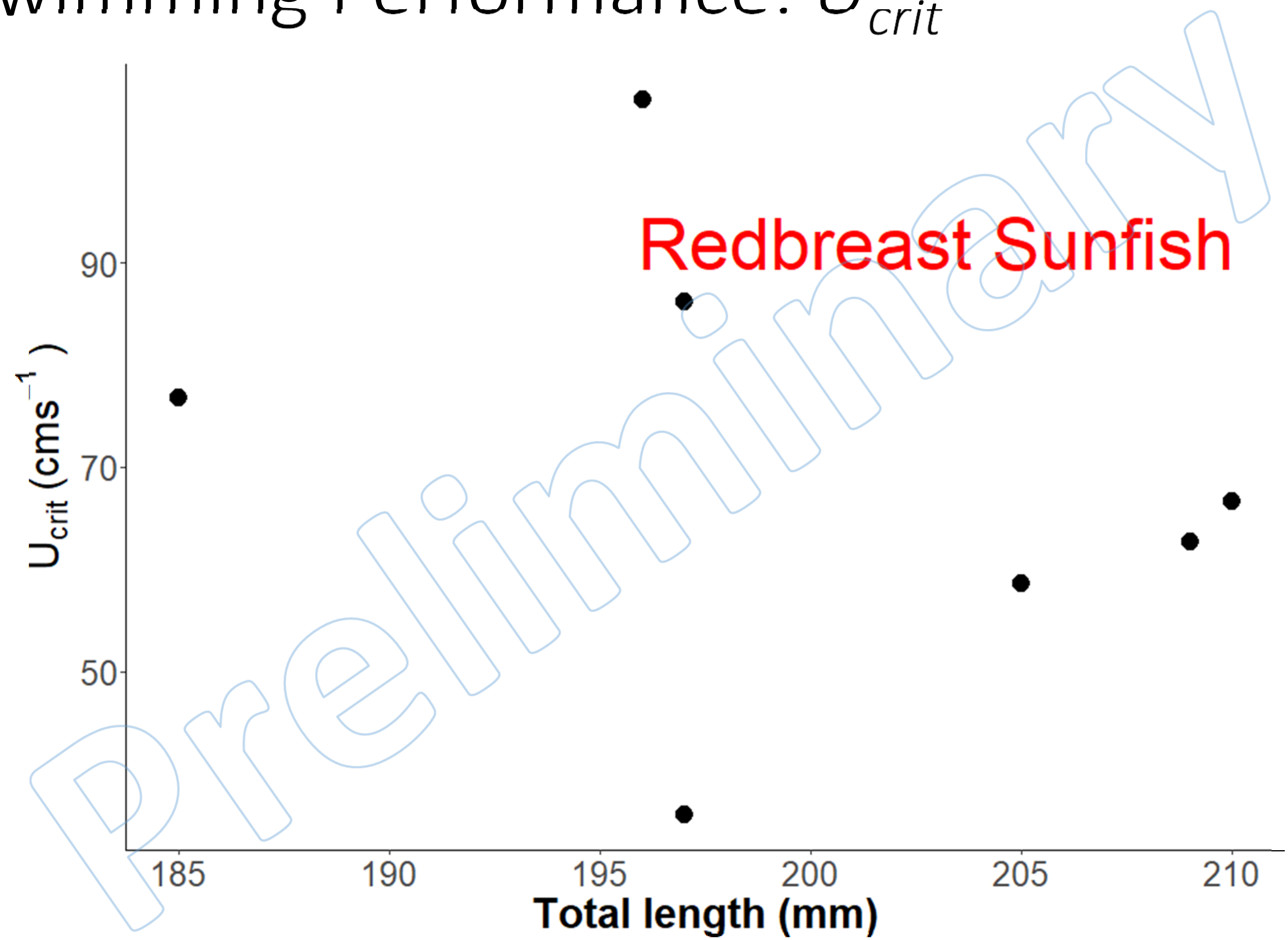


PRELIMINARY DATA

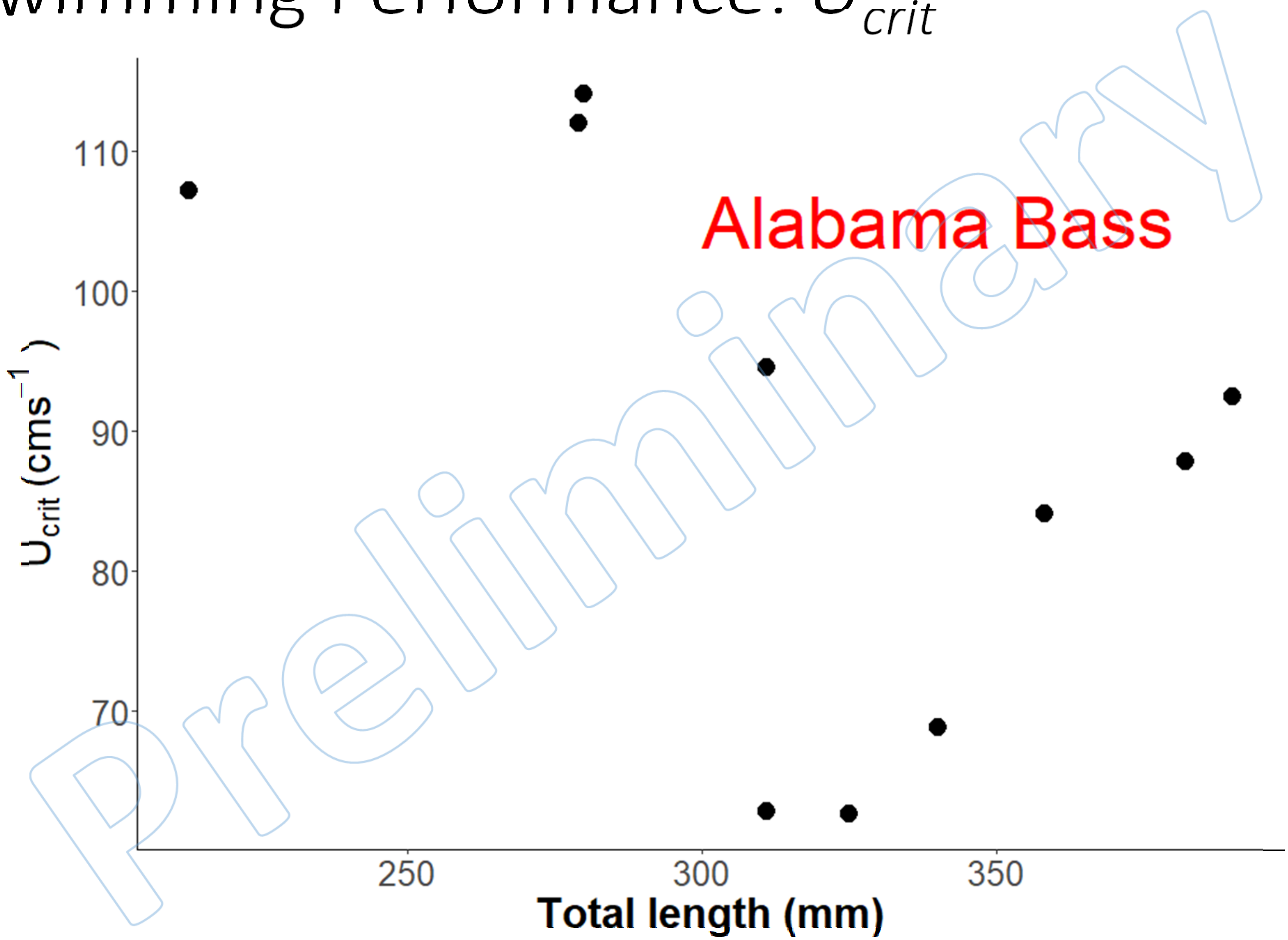
Swimming Performance: U_{crit}



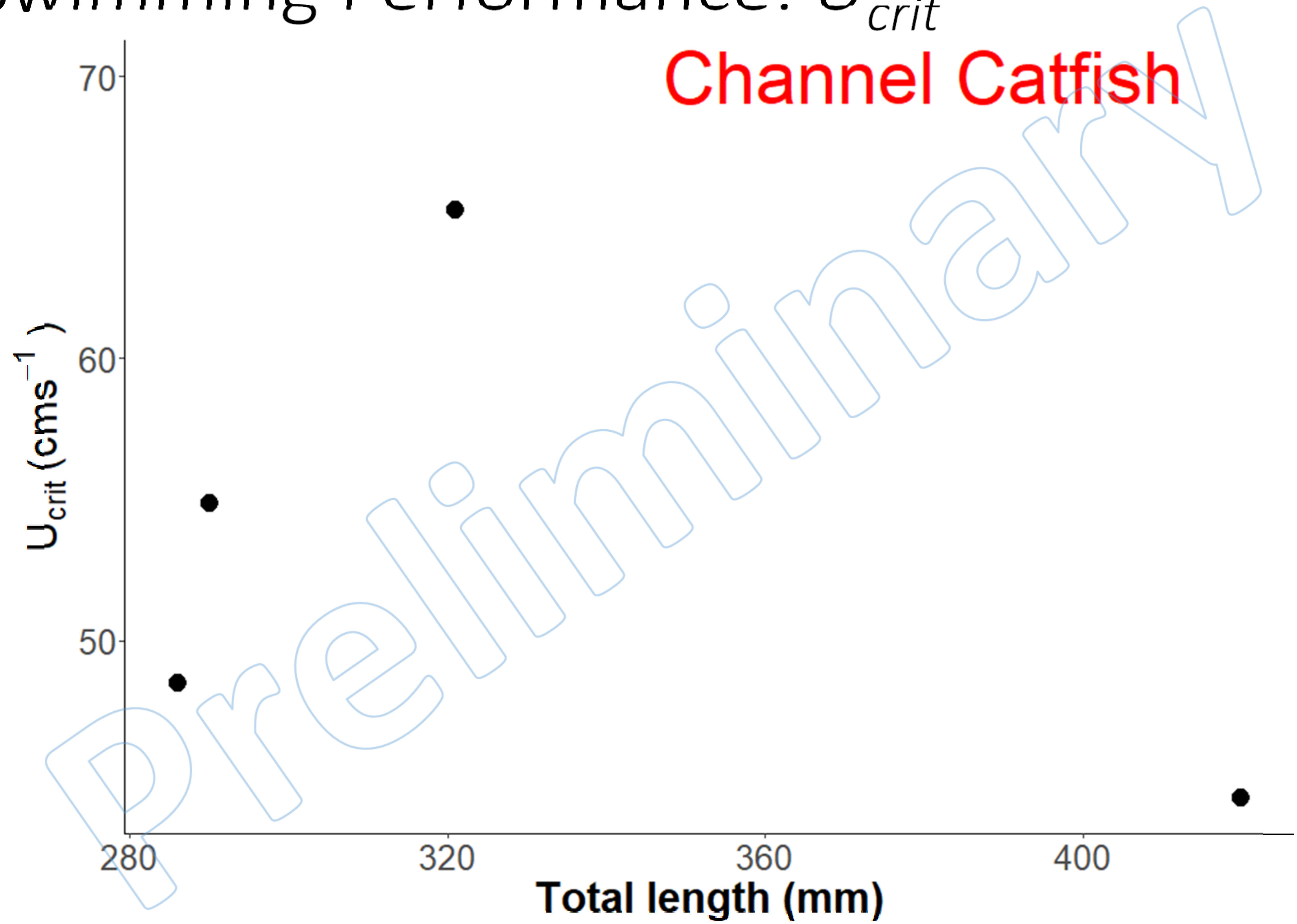
Swimming Performance: U_{crit}



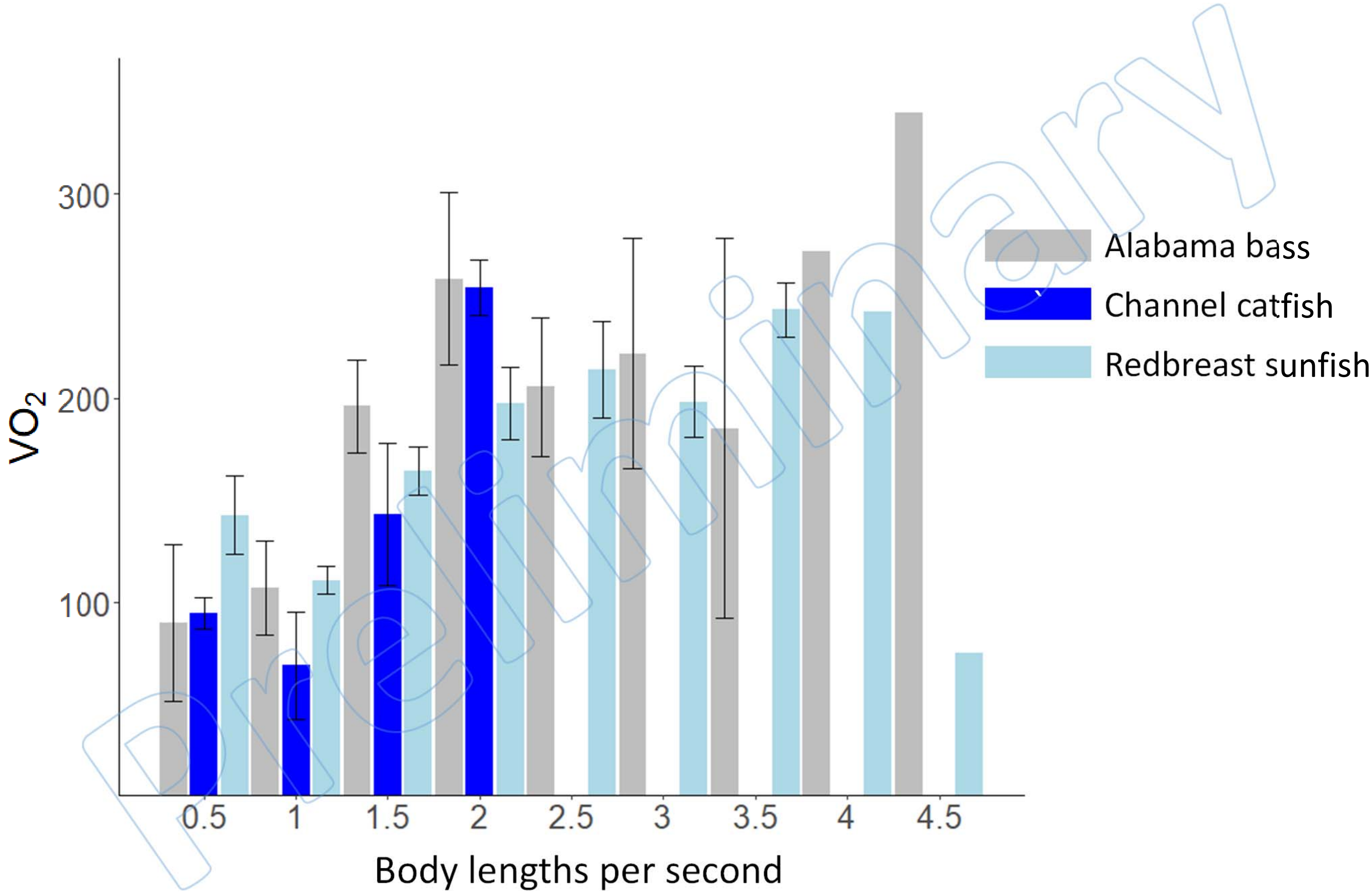
Swimming Performance: U_{crit}



Swimming Performance: U_{crit}

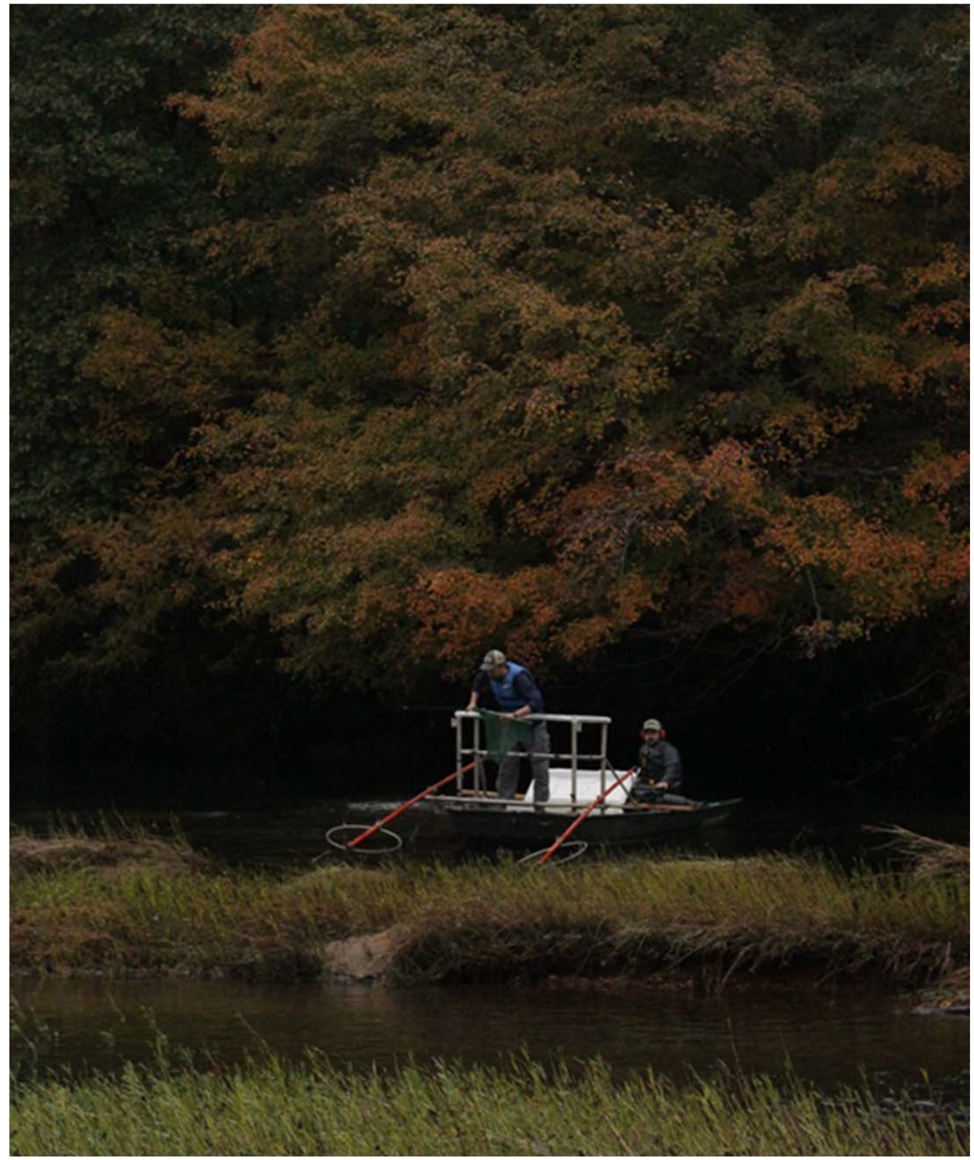


Swimming Respirometry VO_2



Experimental Work in 2020

- Complete trials to determine bioenergetics parameters
- Conduct swimming trials with rapid temperature and flow change
- Complete tailbeat analysis

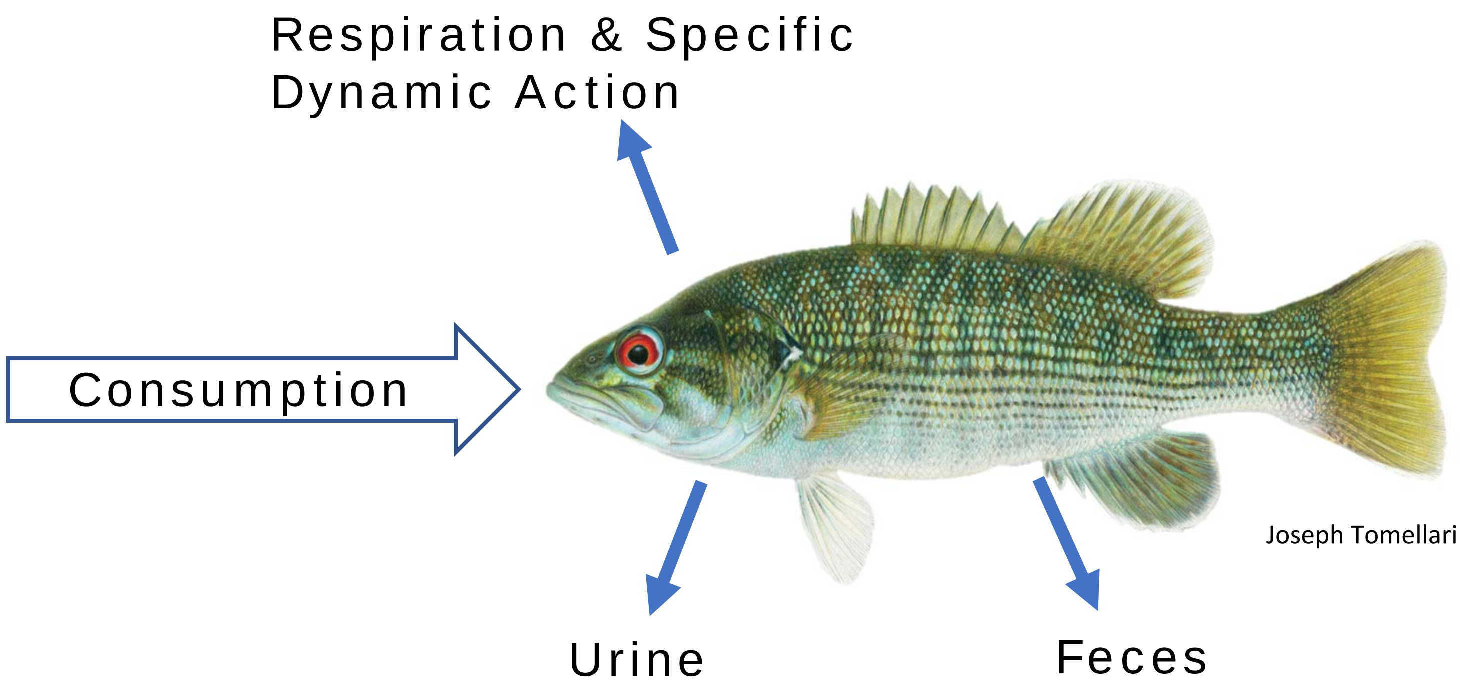


Objective 4

- Quantify effects of temperature and flow variation on target fish species energy budgets using bioenergetics modeling

    - Part 2: Bioenergetics modeling

Basic Fish Bioenergetics Model



Growth = Consumption - (R + F + U + SDA)

Growth = Consumption - (Costs)

Costs = Respiration + Feces + Urine + Cost of Digestion

Uses of Bioenergetics Models

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

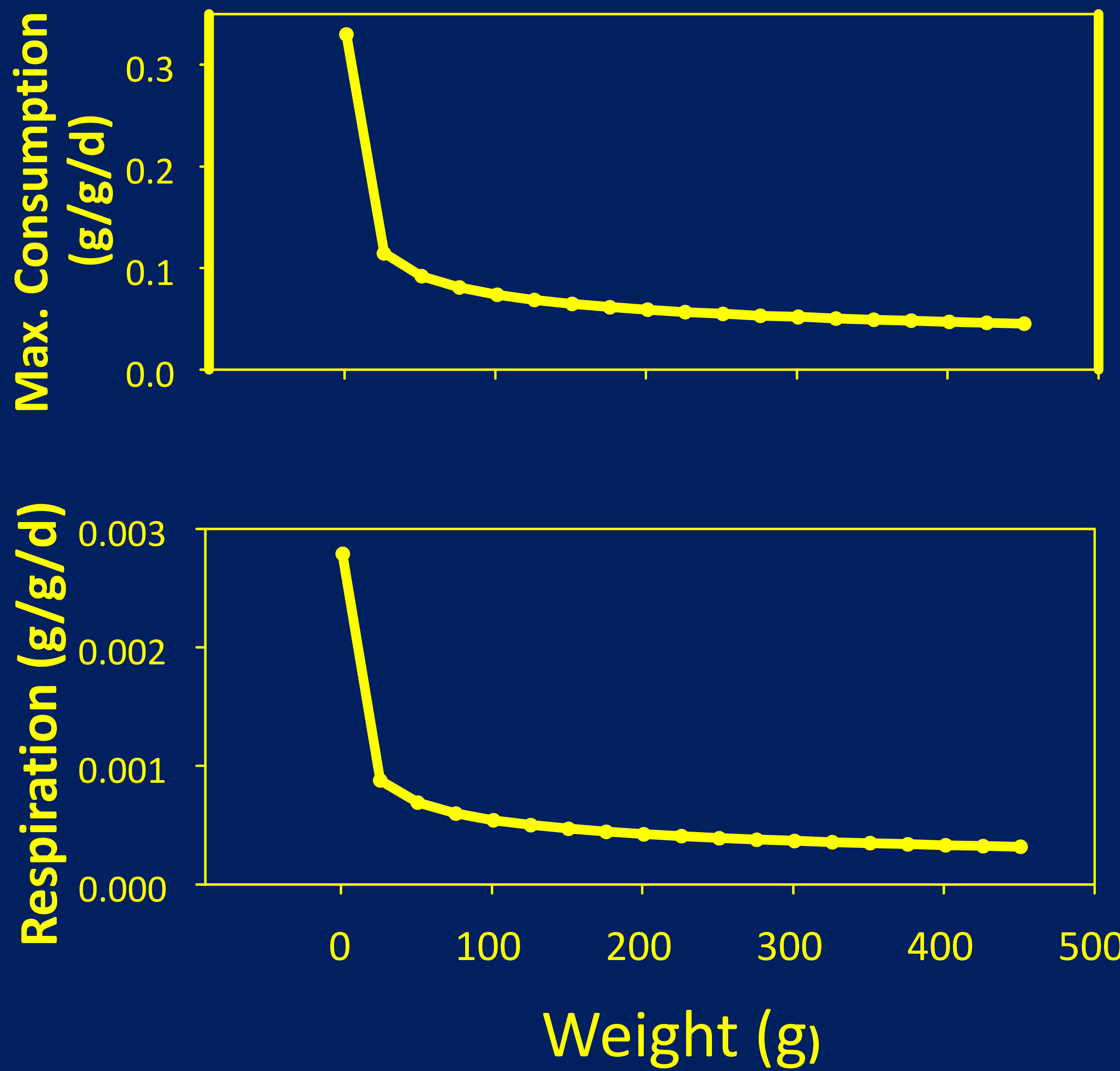
Uses of Bioenergetics Models

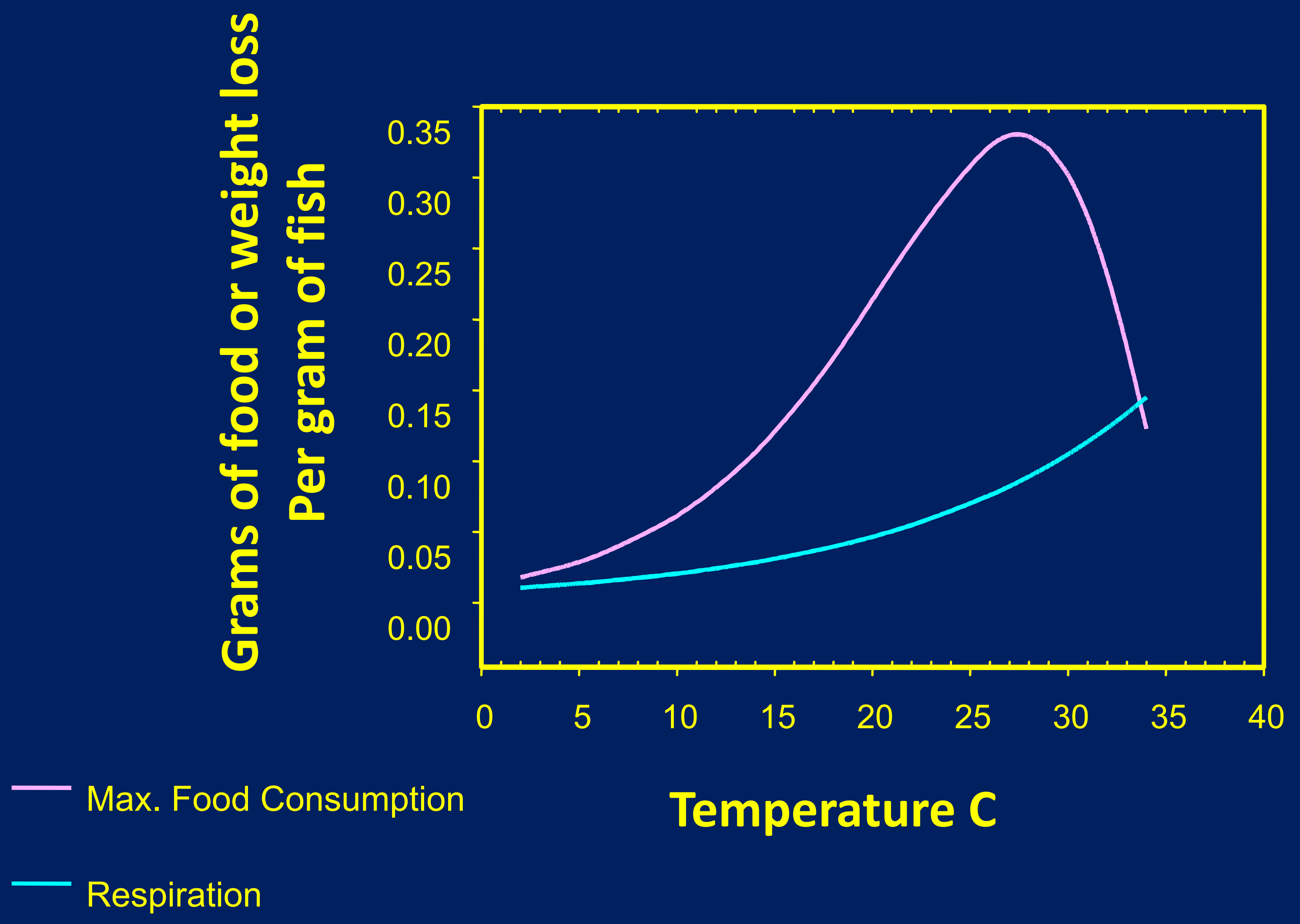
- evaluation of stocking
- nutrient recycling
- contaminant accumulation
- aquaculture
- exploring evolutionary influences
- **habitat effects on growth**
- **effects of environmental stress**

What functional relationships do we need to construct and run bioenergetics models?

- The effect of temperature on respiration and food consumption
- The effect of body weight on respiration and food consumption
- The effect of activity (swimming) on respiration

Effect of weight on respiration & consumption




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
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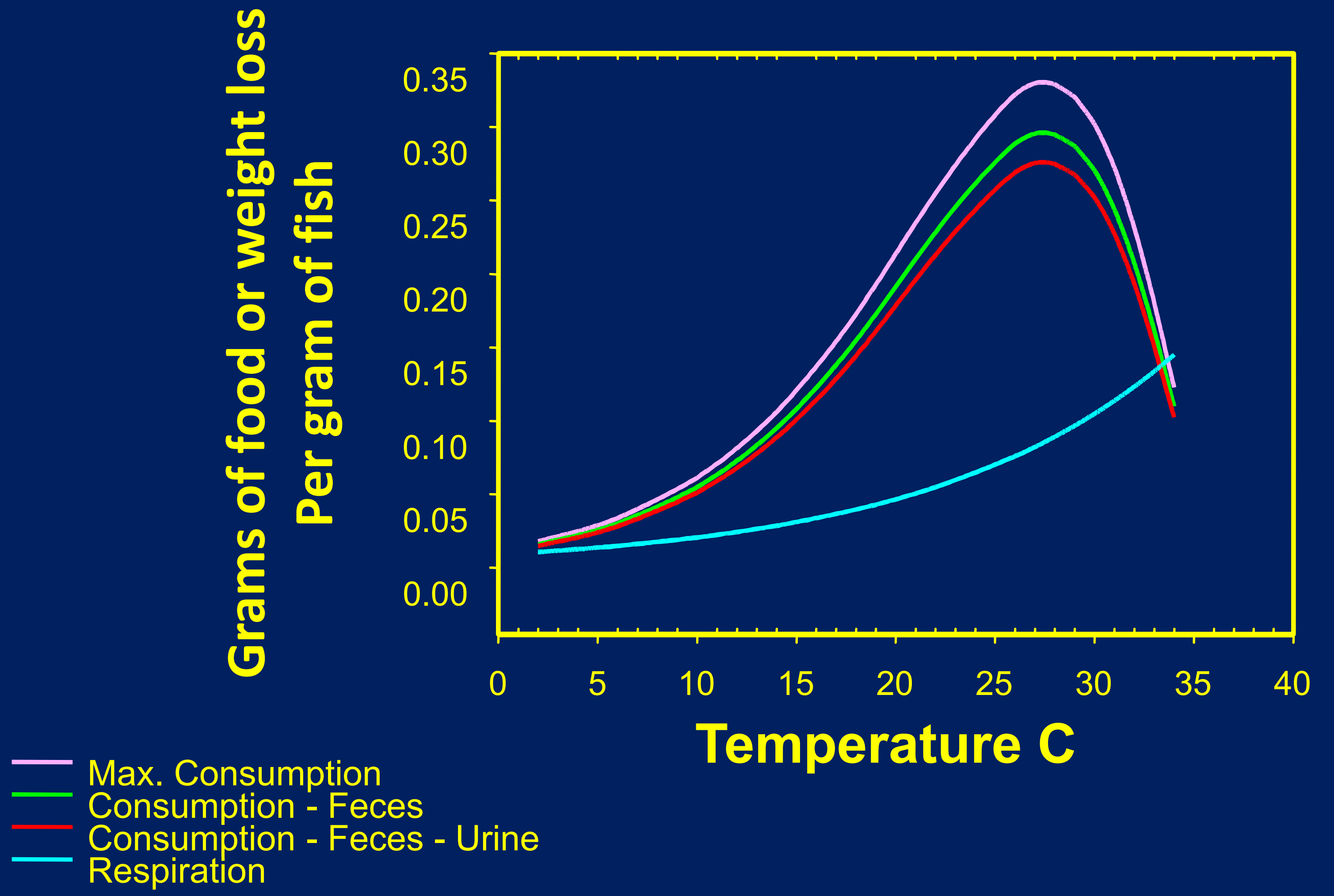
5
10
15
20
25
30
35
40
Temperature C
Max. Food Consumption
Respiration



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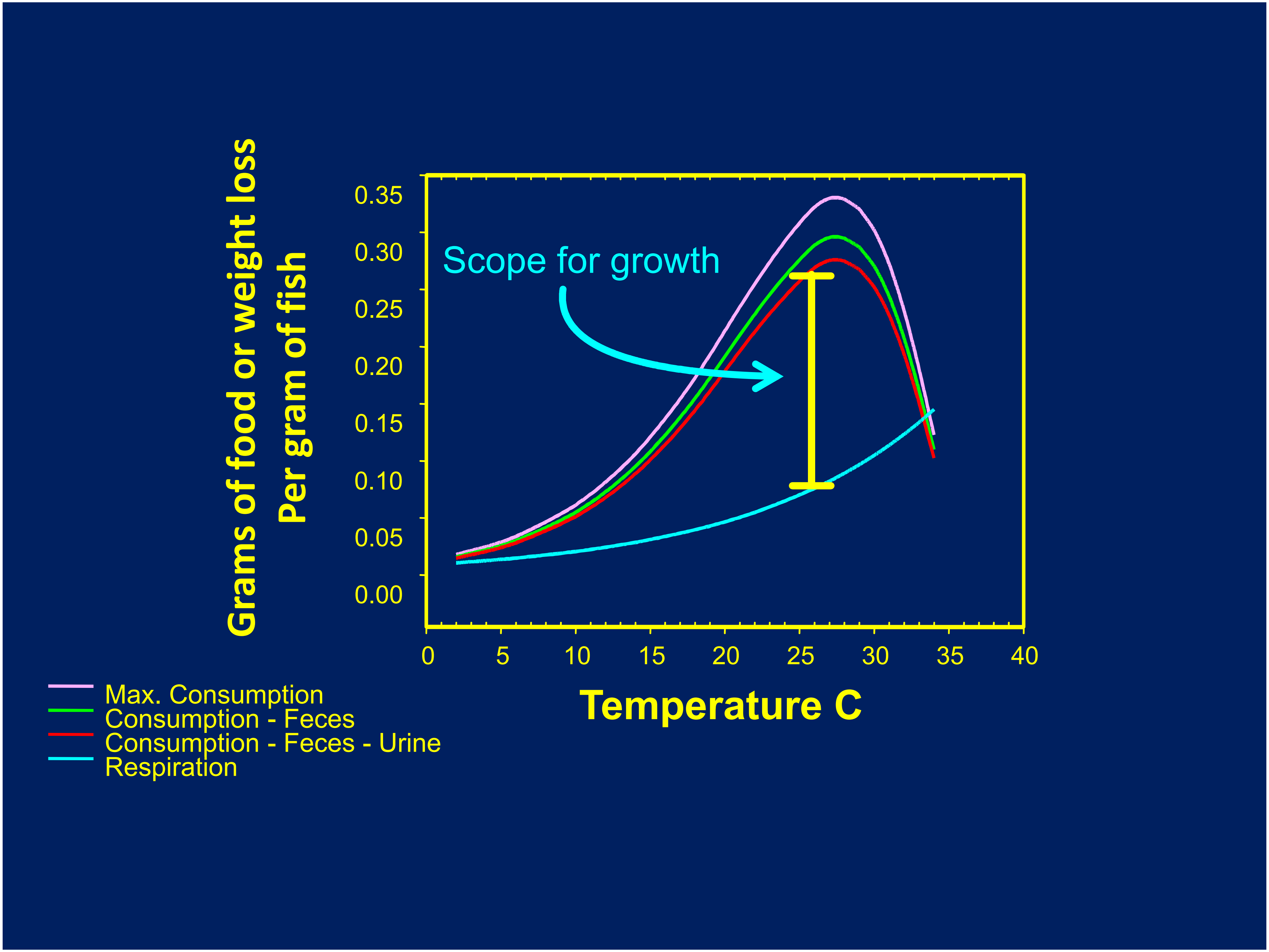
30
35
40
Temperature C
Max. Consumption
Consumption - Feces
Consumption - Feces - Urine
Respiration



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
Scope for growth
0
5
10
15
20
25
30
35
40
Temperature C
Max. Consumption
Consumption - Feces
Consumption - Feces - Urine
Respiration

Model Data Inputs

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

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

Current 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

Current Status and Plans for Bioenergetics Modeling

- Field data (growth, diets, water temperature) are being collected
- Respiration parameters for temperature and weight dependence are being determined
- Consumption parameters will be "borrowed" from related species
- Simulations will be run starting this summer comparing variable temperature and activity rates

FEDERAL ENERGY REGULATORY COMMISSION
MEMORANDUM

DATE: June 9, 2020

FROM: Sarah Salazar, Environmental Biologist
Division of Hydropower Licensing
Office of Energy Projects

TO: Public Files for the R.L. Harris Hydroelectric Project
(FERC Project No. 2628-065)

SUBJECT: Email communication with the Alabama Rivers Alliance regarding the comment period for the Initial Study Report for the R.L. Harris Hydroelectric Project.

On June 5, 2020, Jack West (Alabama Rivers Alliance) emailed Commission staff to inquire about the comment period for the Initial Study Report for the R.L. Harris Hydroelectric Project. Commission staff responded on June 8, 2020.

A copy of the email correspondence is attached.

Sarah Salazar

From: Sarah Salazar
Sent: Monday, June 08, 2020 12:52 PM
To: Jack West
Cc: Allan Creamer; Rachel McNamara
Subject: RE: Question Re: Harris Relicensing

Good afternoon Jack,

Yes, we strongly recommend filing any comments you have on the Initial Study Report, including the draft study reports, by June 11, 2020.

To the extent that you think that any of the approved study plans and schedules should be modified to address your concerns, we recommend that you file, by June 11, 2020, a request for study plan modification(s) using the criteria in the Commission's regulations at 18 C.F.R. § 5.15(d) (2019). The approved study plans can be found in the applicant's Revised Study Plan that was filed on March 13, 2019. Updates to the study schedules, as required in the Commission's April 12, 2019 Study Plan Determination, were filed in an updated Revised Study Plan on May 13, 2019. If you would like to request any new studies, you would need to file, by June 11, 2020, such a request using the criteria in the Commission's regulations at 18 C.F.R. §5.9(b) and 5.15(e) (2019). I'm including excerpts of the cited regulations below.

Excerpt from 18 C.F.R. § 5.15

(d) *Criteria for modification of approved study*. Any proposal to modify an ongoing study . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a demonstration that:
- (1) Approved studies were not conducted as provided for in the approved study plan; or
- (2) The study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.

(e) *Criteria for new study*. Any proposal for new information gathering or studies . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a statement explaining:
- (1) Any material changes in the law or regulations applicable to the information request;
- (2) Why the goals and objectives of any approved study could not be met with the approved study methodology;
- (3) Why the request was not made earlier;
- (4) Significant changes in the project proposal or that significant new information material to the study objectives has become available; and
- (5) Why the new study request satisfies the study criteria in § 5.9(b).

Excerpt from 18 C.F.R. § 5.9(b)

(b) *Content of study request*. Any information or study request must:
- (1) Describe the goals and objectives of each study proposal and the information to be obtained;
- (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
- (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
- (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;

(5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

(7) Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

Thanks again for your inquiry. I hope this response answers your question. Please let me know if you have additional questions.

Note, I will be filing this email to our record for the project.

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

Please consider the environment before printing this email.

From: Jack West <jwest@alabamarivers.org>
Sent: Saturday, June 06, 2020 2:19 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Cc: Allan Creamer <Allan.Creamer@ferc.gov>; Rachel McNamara <Rachel.McNamara@ferc.gov>
Subject: Re: Question Re: Harris Relicensing

Sarah,

No problem at all. Thanks for the response, and have a great weekend.

On Fri, Jun 5, 2020 at 4:54 PM Sarah Salazar <Sarah.Salazar@ferc.gov> wrote:

> Hi Jack,
>
> Thanks for your message and inquiry. Sorry for the delay in responding. I was actually off today, but I will get back to you first thing next week.
>
> Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*
>
> ***Please consider the environment before printing this email.***
>
> **From:** Jack West <jwest@alabamarivers.org>
> **Sent:** Friday, June 05, 2020 11:56 AM
> **To:** Sarah Salazar <Sarah.Salazar@ferc.gov>; Allan Creamer <Allan.Creamer@ferc.gov>; Rachel McNamara <Rachel.McNamara@ferc.gov>
> **Subject:** Question Re: Harris Relicensing

Hi Sarah, Allan, and Rachel:

Thank you for encouraging stakeholder input during the Harris relicensing. I'm writing with a procedural question regarding the timing of stakeholder requests for additional modeling of downstream release alternatives.

During the ISR meeting in April and during some HAT meetings, stakeholders have been asked by Licensee to suggest any additional flow release alternatives we would like to see modeled as soon as possible. We believe that modeling a wider variety of flows will strengthen the studies and inform future adaptive management, and we do plan to suggest other downstream release alternatives to model.

However, without at least draft reports of the Aquatic Resources Study and the Aquatic Habitat study, we feel it is premature to ask stakeholders to put forth all alternatives. Flows, thermal impacts on aquatic resources, water quality, and aquatic habitat reports are all deeply interrelated. Flows and the thermal regime, in particular, should be considered together, but analysis of the impacts of temperature on aquatic life is still forthcoming.

Licensee itself acknowledges that the results from the Aquatic Resources Study are needed to design the fourth flow scenario it plans to model (an alternative Green Plan). Those same results will help stakeholders, as well, to make the most informed flow recommendations for study.

We understand that the modeling of additional flows takes time and effort, and we have no desire to unnecessarily delay, but to be of the most value, requests for additional flow modeling should be informed by the results of the fisheries studies.

Which brings me to the question: Do absolutely all requests for modeling of additional flows need to be submitted by the comment period ending June 11, or will there be an opportunity for stakeholders to put forth additional release alternatives once the draft fisheries studies are available?

I can certainly include these thoughts in our comments to be filed next week. Again, my thanks for incorporating stakeholders in this process, and I look forward to continuing to participate in the relicensing.

I hope you're staying safe and well.

--

Jack West, Esq.

Policy and Advocacy Director

Alabama Rivers Alliance

2014 6th Ave N, Suite 200

Birmingham, AL 35203

205-322-6395

www.alabamarivers.org

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

--

Jack West, Esq.
Policy and Advocacy Director
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Birmingham, AL 35203
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FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
June 10, 2020

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA FERC Service

Ms. Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
600 North 18th Street Birmingham,
AL 35203

Subject: Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Dear Ms. Anderegg:

Staff have reviewed Alabama Power Company's (Alabama Power) Initial Study Report (ISR) and associated draft study reports for the R.L. Harris Hydroelectric Project (Harris Project) filed on April 10, 2020, attended the ISR Meeting held via teleconference on April 28, 2020, and reviewed the ISR Meeting Summary filed on May 12, 2020. Alabama Power filed its ISR two days earlier than the published deadline of April 12, 2020. However, staff is maintaining the original deadline posted in previously issued process plans, June 11, 2020, for filing: comments on the ISR and draft study reports; comments on the ISR Meeting summary; requests for modifications to the approved study plan; and proposals for new studies.

Any stakeholder requests for study plan modifications or new studies should follow the Commission's regulations at 18 C.F.R. § 5.9(b) and 5.15 (2019), which are attached for stakeholder convenience (Attachment B). A copy of the Commission's Integrated Licensing Process (ILP) schedule for the Harris Project pre-filing milestones is attached as a reminder (Attachment C).

Based on a review of the ISR, associated draft study reports, discussions at the ISR Meeting, and a review of the ISR Meeting Summary, staff provide comments and recommended updates on Alabama Power's filings in Attachment A. Unless otherwise noted, please address the comments in Attachment A in the Updated Study Report or the preliminary licensing proposal and license application, as appropriate. Alabama Power's requests for variances to their approved schedules for the Water Quality Study, the Draft Recreation Evaluation Study Report, and the Cultural Resources Study[1] will be addressed after the close of the ISR comment period.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Allan E. Creamer

for Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Enclosures: Attachment A
Attachment B
Attachment C

[1] Alabama Power intends to submit its Clean Water Act section 401 Water Quality Certification application to the Alabama Department of Environmental Management in April 2021 instead of in 2020, as originally proposed. Alabama Power proposes to file its Draft Recreation Evaluation Study Report in August 2020 instead of June 2020 to allow time to complete two new recreation surveys, the Tallapoosa River Downstream Landowner Survey and the Tallapoosa River Recreation User Survey. Alabama Power also proposes to finalize the Area of Potential Effect (APE) for its Cultural Resources Study and file it with documentation of consultation in June 2020.

Attachment A

Staff comments on the Initial Study Report (ISR) and Initial Study Report Meeting Summary

Draft Operating Curve Change Feasibility Analysis (Phase 1) Study Report

1. Figure 5-3, on page 39 of the Draft Operating Curve Change Feasibility Analysis (Phase 1) Study Report, shows how changing the winter pool elevation from the current project operating curve to the +1, +2, +3, and +4-foot winter operating curves could affect reservoir elevations in Lake Harris throughout the year. Moreover, the figure documents the interaction between higher winter pool levels and low-inflow periods. During the period between 2006 and 2008, which encompasses two low-flow periods, the model showed that increasing the winter pool elevation can result in higher reservoir elevations during low-flow years, compared to the existing operating curve. However, Figure 5-3 shows that from about July 2007 through mid-February 2008, modeled reservoir levels for the +2 and +3-foot winter pool curve alternatives were lower than that of the other operating curve alternatives for the same operating period. Please explain what appears to be an anomaly in the modeling result in the final report.

Draft Downstream Release Alternatives (Phase 1) Study Report

2. During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.

3. According to the approved study plan, the goal of the Downstream Release Alternatives Study is to evaluate the effects of four downstream flow release alternatives on project resources. The four release alternatives are: (1) the Green Plan, or Alabama Power's current pulsing operation; (2) the Pre-Green Plan, or Alabama Power's historic peaking operation; (3) the Pre-Green Plan with a continuous baseflow of 150 cubic feet per second (cfs); and (4) a modified Green Plan. The Phase 1 Report, filed on April 10, 2020, presented complete results for Pre-Green Plan operation and Green Plan operation, partial results for the Pre-Green Plan with a 150-cfs baseflow, and no results for the modified Green-Plan alternative.

During the ISR Meeting, Alabama Power requested that stakeholders identify and propose downstream flow release alternatives so that the proposed alternative's effects on environmental resources can be assessed during Phase 2 of the study. To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions.[1] We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat,[2] and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage.[3] The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs.

In addition, we recommend that the modeling for Alabama Power's Aquatic Resources Study and Downstream Aquatic Habitat Study,[4] as well as any Phase 2

[1] *See* Tennant, D.L. 1976. Instream flow regimens for fish, wildlife, recreation, and related environmental resources. in Instream flow needs, Volume II: Boise, ID, Proceedings of the symposium and specialty conference on instream flow needs, May 3-6, American Fisheries Society, p. 359-373. Tennant (1976) defines habitat quality (measured by average depth and velocity of flow) as a percentage of the average annual flow. Poor habitat is represented by 0.1 (10 percent of the average annual flow), fair habitat is represented by 0.1 to 0.3 (10 to 30 percent of the average annual flow), and good habitat is represented by 0.3 to 0.4 (30 to 40 percent of the average annual flow), depending on season.

[2] *Id.*

[3] For purposes of this analysis, we assumed an aquatic base flow of 0.5 cubic feet per second per square mile (or cfsm) of drainage area (1,675 square miles at the Wadley gage). *See* U.S. Fish and Wildlife Service. 1981. Interim Regional Policy for New England Streams Flow Recommendations. Region 5. Boston, Massachusetts.

[4] The Aquatic Resources Study involves the use of a bioenergetics model to conduct simulations needed to test potential influence of water temperature and flow on growth rates of fish species downstream from Harris Dam. The Downstream Aquatic Habitat Study involves using a HEC-RAS model to evaluate the effect of alternative operations on the amount and persistence of wetted aquatic habitat in the Tallapoosa River downstream from Harris Dam.

assessment(s) include all the downstream flow release alternatives identified and evaluated as part of the Downstream Flow Release Alternatives Study. The results of all the modeling for the Aquatic Resources Study and Downstream Aquatic Habitat Study should be included in the final study reports and filed with the Updated Study Report, due by April 12, 2021.

4. The Draft Downstream Release Alternatives (Phase 1) Study Report refers to data sets (e.g., topographic and geometric data on pages 12-13 and 17-19) that were used to develop the models. To assist us in interpreting the models, we recommend including in the final study report a table and/or figure that summarizes all of the data sets used in the models and identifies their spatial extents in terms such as watershed segments, river miles (RMs), and square miles covered by each dataset (as appropriate), with reference to other geographic landmarks (e.g., nearest city, dam, bridge, etc.). Please incorporate into the table and/or figure, the stakeholder- and Alabama Power-identified erosion areas of concern. In addition, please provide the metadata for each data set used.

5. Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.

6. Pages 15 and 16 of the Draft Downstream Release Alternatives (Phase 1) Study Report, state that the drought indicator thresholds, or triggers, are only evaluated on the 1st and the 15th of every month in the model and that once a drought operation is triggered, the drought intensity level can only recover from drought condition at a rate of one level per "period." Please clarify in the final report if one "period" is equal to 15 days (i.e., the interval for evaluating drought triggers) and if this protocol is used for managing reservoir operations currently, or if it is only a parameter used in the model.

<u>Draft Erosion and Sedimentation Study Report</u>

7. The Erosion and Sedimentation Study in the approved study plan states that Alabama Power would analyze its existing lake photography and Light Detection and Ranging (LIDAR) data using a geographic information system (GIS) to identify elevation or contour changes around the reservoir from historic conditions and quantify changes in

lake surface area to estimate sedimentation rates and volumes within the reservoir. In addition, the approved study plan states that Alabama Power will verify and survey sedimentation areas for nuisance aquatic vegetation. According to the study schedule, Alabama Power will prepare the GIS overlay and maps from June through July 2019 and conduct field verification from fall 2019 through winter 2020.

The Draft Erosion and Sedimentation Study Report does not include a comparison of reservoir contour changes from past conditions or the results of nuisance aquatic vegetation surveys. The report states that limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for comparison to historic conditions and that Alabama Power will conduct nuisance aquatic vegetation surveys during the 2020 growing season.

It is unclear why the existing aerial imagery and Alabama Power's LIDAR[5] data did not allow for comparison with past conditions or why the nuisance aquatic vegetation surveys will be conducted during the 2020 growing season instead of during the approved field verifications from fall 2019 to winter 2020. As part of your response to stakeholder comments on the ISR, please clarify what existing aerial imagery and LIDAR data was used and why it was not suitable for comparison with past conditions. Also, please explain the change in timing for conducting the nuisance aquatic vegetation surveys.

Draft Water Quality Report

8. Figure 3-8, on page 18 of the Draft Water Quality Study Report shows dissolved oxygen (DO) profiles for the Harris Project forebay. While much of the data is typical of the DO stratification pattern in a southern reservoir, the figure also shows that in June, July, and August of 2017 and 2019, there was a 2.0 to 3.0 milligram per liter increase in DO concentration at a depth of about 20 to 25 meters in Lake Harris, which is uncommon in such reservoirs. Please include Alabama Power's interpretation of this DO anomaly in the final Water Quality Study Report.

Draft Threatened and Endangered (T&E) Species Study Report

9. The goals of Alabama Power's T&E Species Study are to assess the probability of T&E species populations and/or their critical habitat occurring within the Harris Project boundary or project area and determine if there are project related impacts (i.e., lake fluctuations, downstream flows, recreation and shoreline management activities, timber

---

[5] During the June 4, 2020 Harris Action Team #1 and #5 meeting, Alabama Power stated it has LIDAR data sets from different years and would check its records to confirm the number of LIDAR data sets, and for which years the LIDAR data were collected.

management, etc.) to those species and critical habitats. According to the study schedule, Alabama Power would develop the GIS overlays and maps from April through July 2019, and conduct field verifications, if required, from October 2019 through September 2020.

The Draft T&E Species Study Report does not provide information on the presence or absence of potentially suitable habitat within the project boundary for all of the T&E species (e.g., red cockaded woodpecker,[6] northern long-eared bat,[7] pool sprite,[8] and white fringeless orchid[9]) on the official species list for the project.[10] Therefore, Alabama Power was unable to determine whether or not these species are likely to occur within the project boundary or identify a complete list of T&E species that require field surveys.

---

[6] Page 8 the report states that land use data is not specific enough to determine if the 3,068 acres of coniferous forest in the project boundary at Lake Harris has the specific habitat characteristics suitable for red-cockaded woodpeckers.

[7] Page 19 of the report states that the Lake Harris and Skyline project boundaries fall within the range of the northern long eared bat and that there are no known hibernacula or summer roost trees within the project boundaries. However, as discussed in the ISR meeting, the report does not state whether any known northern long-eared bat hibernacula occur within a 0.25-mile radius of the project boundaries, or whether known summer roost trees occur within a 150-foot radius of the project boundaries. The report also does not provide information about timber/vegetation management practices within the project boundary. This information is needed in order to determine known occurrences of northern long-eared bats within or adjacent to the project boundaries and to determine potential project effects to this species.

[8] Page 21 of the reports states that pool sprite was documented at Lake Harris in Flat Rock Park in 1995. While subsequent surveys have not detected pool sprite, the report indicates that there are 138.4 acres of granite geology within the project boundary at Lake Harris. However, this species' vernal pool habitat was not identified at the project due to "a lack of available data."

[9] Page 22 the report states that National Wetland Inventory data is not detailed enough to identify potentially suitable habitat for white fringeless orchid within the project boundary.

[10] See FWS's official lists of T&E species within the Harris Project boundaries (i.e., at Lake Harris and Skyline) that were accessed on July 27, 2018, by staff using the FWS's Information for Planning and Conservation website (https://ecos.fws.gov/ipac/) and filed on July 30, 2018.

As part of your response to stakeholder comments on the ISR, please provide: (1) the maps and assessment of the availability of potentially suitable habitat within the project boundary for all of the T&E species on the official species list for the project; (2) documentation of consultation with FWS regarding the species-specific criteria for determining which T&E species on the official species list will be surveyed in the field; (3) a complete list of T&E species that will be surveyed during the 2nd study season as part of the T&E Species Study; and (4) confirmation that Alabama Power will complete the field verification scheduled by September 2020.

Draft Project Lands Evaluation (Phase 1) Report

10. The goals of the Project Lands Evaluation include: (1) identifying and classifying lands at the project that are needed for Harris Project purposes; (2) evaluating existing land use classifications at Lake Harris and determining if any changes are needed to conform to Alabama Power's current land classification system and other Alabama Power Shoreline Management Plans; and (3) identifying lands to be added to, or removed from the current project boundary.

Appendix B of the Draft Project Lands Evaluation (Phase 1) Report includes a small scale map of Lake Harris and the existing shoreline classifications, as well as larger scale maps showing parcels of land within the project boundary for which Alabama Power is considering either changing the existing land use classification, adding parcels to the project boundary, or removing parcels from the project boundary. However, the report does not include large scale maps showing the land use classifications for all of the existing shoreline. To facilitate review of the existing shoreline land use classifications, please file larger scale maps of all the shoreline areas as a supplement to the Draft Project Lands Evaluation Report, as part of your response to stakeholder comments on the ISR. Please include land use classifications on the maps. In addition, if available, please file the GIS data layers of the existing and proposed shoreline land use classifications.

Attachment B

Excerpt from 18 C.F.R. § 5.15

(d) *Criteria for modification of approved study*. Any proposal to modify an ongoing study . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a demonstration that:

  (1) Approved studies were not conducted as provided for in the approved study plan; or
  (2) The study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way.

(e) *Criteria for new study*. Any proposal for new information gathering or studies . . . must be accompanied by a showing of good cause why the proposal should be approved, and must include, as appropriate to the facts of the case, a statement explaining:

  (1) Any material changes in the law or regulations applicable to the information request;
  (2) Why the goals and objectives of any approved study could not be met with the approved study methodology;
  (3) Why the request was not made earlier;
  (4) Significant changes in the project proposal or that significant new information material to the study objectives has become available; and
  (5) Why the new study request satisfies the study criteria in § 5.9(b).

Excerpt from 18 C.F.R. § 5.9(b)

(b) *Content of study request*. Any information or study request must:

  (1) Describe the goals and objectives of each study proposal and the information to be obtained;
  (2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
  (3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
  (4) Describe existing information concerning the subject of the study proposal, and the need for additional information;
  (5) Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how

the study results would inform the development of license requirements;

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate filed season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and

(7) Describe considerations of level of effort and cost, as applicable, and why proposed alternative studies would not be sufficient to meet the stated information needs.

Attachment C

R.L. Harris Process Plan and Schedule for the Integrated Licensing Process (ILP)

(shaded milestones are unnecessary if there are no study disputes; if due date falls on a weekend or holiday, the due date is the following business day)

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§ 5.5(a)	Alabama Power	Filing of NOI and PAD	Actual filing date	6/1/2018
§ 5.7	FERC	Initial Tribal Consultation Meeting	No later than 30 days from NOI and PAD	7/1/2018
§5.8	FERC	FERC Issues Notice of Commencement of Proceeding and Scoping Document (SD1)	Within 60 days of NOI and PAD	7/31/2018
§5.8 (b)(3)(viii)	FERC/ Stakeholders	Public Scoping Meetings and Environmental Site Review	Within 30 days of NOI and PAD notice and issuance of SD1	8/28/2018 - 8/29/2018
§ 5.9	Stakeholders/ FERC	File Comments on PAD, SD1, and Study Requests	Within 60 days of NOI and PAD notice and issuance of SD1	9/29/2018
§5.10	FERC	FERC Issues Scoping Document 2 (SD2), if necessary	Within 45 days of deadline for filing comments on SD1	11/13/2018
§5.11(a)	Alabama Power	File Proposed Study Plans	Within 45 days of deadline for filing comments on SD1	11/13/2018
§5.11(e)	Alabama Power/ Stakeholders	Study Plan Meetings	Within 30 days of deadline for filing proposed Study Plans	12/13/2018
§5.12	Stakeholders	File Comments on Proposed Study Plan	Within 90 days after proposed study plan is filed	2/11/2019
§5.13(a)	Alabama Power	File Revised Study Plan	Within 30 days following the deadline for filing comments on proposed Study Plan	3/13/2019
§5.13(b)	Stakeholders	File Comments on Revised Study Plan (if necessary)	Within 15 days following Revised Study Plan	3/28/2019
§5.13(c)	FERC	FERC Issues Study Plan Determination	Within 30 days following Revised Study Plan	4/12/2019
§5.14(a)	Mandatory Conditioning Agencies	Notice of Formal Study Dispute (if necessary)	Within 20 days of Study Plan determination	5/2/2019
§5.14(l)	FERC	Study Dispute Determination	Within 70 days of notice of formal study dispute	7/11/2019
§5.15(a)	Alabama Power	Conduct First Season Field Studies	Spring/Summer 2019	

18 C.F.R.	Lead	Activity	Timeframe	Deadline
§5.15(c)(1)	Alabama Power	File Initial Study Reports	No later than one year from Study Plan approval	4/12/2020
§5.15(c)(2)	Alabama Power	Initial Study Results Meeting	Within 15 days of Initial Study Report	4/28/2020
§5.15(c)(3)	Alabama Power	File Study Results Meeting Summary	Within 15 days of Study Results Meeting	5/12/2020
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/Modifications to Study/Requests for New Studies	Within 30 days of filing Meeting Summary	6/11/2020
§5.15(c)(5)	Alabama Power	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	7/11/2020
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination (if necessary)	Within 30 days of filing responses to disputes	8/10/2020
§5.15	Alabama Power	Conduct Second Season Field Studies	Spring/Summer 2020	
§5.15 (f)	Alabama Power	File Updated Study Reports	No later than two years from Study Plan approval	4/12/2021
§5.15(c)(2)	Alabama Power	Second Study Results Meeting	Within 15 days of Updated Study Report	4/27/2021
§5.15(c)(3)	Alabama Power	File Study Results Meeting Summary	With 15 days of Study Results Meeting	5/12/2021
§5.15(c)(4)	Stakeholders/ FERC	File Meeting Summary Disagreements/ Modifications to Study Requests/Requests for New Studies	Within 30 days of filing Meeting Summary	6/11/2021
§5.15(c)(5)	Alabama Power/ Stakeholders	File Responses to Disagreements/Modifications/ New Study Requests	Within 30 days of disputes	7/11/2021
§5.15(c)(6)	FERC	Resolution of Disagreements/ Study Plan Determination (if necessary)	Within 30 days of filing responses to disagreements	8/10/2021
§5.16(a)	Alabama Power	File Preliminary Licensing Proposal (or Draft License Application) with the FERC and distribute to Stakeholders	Not later than 150 days before final application is filed	7/3/2021
§5.16 (e)	FERC/ Stakeholders	Comments on Alabama Power's Preliminary Licensing Proposal, Additional Information Request (if necessary)	Within 90 days of filing Preliminary Licensing Proposal (or Draft License Application)	10/1/2021
§5.17 (a)	Alabama Power	License Application Filed		11/30/2021

Alabama Rivers Alliance
Water Is Life

June 11, 2020

VIA ELECTRONIC FILING

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

RE: Comments on Initial Study Reports, Study Modification Requests, and New Study Proposal for R.L. Harris Hydroelectric Project (P-2628-065)

Dear Secretary Bose:

Enclosed for filing in the above-referenced docket are comments, study modification requests, and a new study proposal submitted by Alabama Rivers Alliance for the R.L. Harris Hydroelectric Project.

Thank you for your assistance in this matter. If you have any questions or need additional information, please call me at 205-322-6395.

Sincerely,

Jack K. West

Jack K. West, Esq.

Alabama Rivers Alliance
Policy and Advocacy Director
2014 6th Avenue North
Suite 200
Birmingham, AL 35203

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alabama Power Company	)	R.L. Harris Hydroelectric Project
	)	
	)	Project No. 2628-065

ALABAMA RIVER ALLIANCE'S COMMENTS ON INITIAL STUDY REPORTS, STUDY MODIFICATION REQUESTS, AND NEW STUDY PROPOSAL

The Alabama Rivers Alliance (ARA) submits the following comments on the currently available draft study reports as part of the Federal Energy Regulatory Commission's Integrated Licensing Procedure (ILP) for the R.L. Harris Hydroelectric Project, FERC Project No. P 2628-065 ("Harris" or "Harris Project"). Study modification requests for the Water Quality Study and Downstream Release Alternatives Study are contained in Sections I and II, and a new study proposal for a Battery Storage Feasibility Study comprises Section IV. Drafts of the Downstream Aquatic Habitat Study Report, Aquatic Resources Study Report, and the Recreation Study Report will be filed by Licensee over the summer, and the results of the forthcoming fisheries studies will likely inform future comments on the study reports currently available and commented upon here.

I. DRAFT WATER QUALITY REPORT

A. Request for Water Quality Study Modification

The caliber and usefulness of the studies conducted pursuant to the ILP will only be as good as the quality and quantity of data collected. ARA recommends that each opportunity to gather relevant data be taken during the relicensing process. The Draft Water Quality Study Report gathers data from three sources: Alabama Power Company (Licensee), the Alabama Department of Environmental Management (ADEM), and Alabama Water Watch.[1]

Of primary concern for downstream ecological health are the two monitors collecting data closest to the dam, both of which are operated and monitored by Licensee. Continuous, 15-minute interval data for dissolved oxygen levels and water temperature has been collected from a monitor in the tailrace (approximately 800 feet from the dam) during the months of June - October in 2017, 2018, and 2019 ("Tailrace Monitor"). A second continuous, 15-minute interval monitor operated by Licensee was placed roughly 0.5 miles downstream of the dam ("Downstream Monitor") and collected dissolved oxygen and temperature data from March 12 through October 31 of 2019, excluding approximately a week's worth of data due to problems with the monitor.[2]

[1] Draft Water Quality Study Report (Mar. 2020), Accession No. 20200410-5095, at 5.
[2] *See* Appendix B (Excel spreadsheet) of the Draft Water Quality Report, "Downstream Monitor 2019" and "Notes" tabs.

Data collected by these two monitors, in particular, are essential to understanding the quality of water being discharged by Harris because they are closest to the dam and are the only continuous samplings included in the study. The ILP process allows for two seasons of study and data collection; however, Licensee is only collecting one season's worth of water quality data under the current study plan.[3] While the 2019 dissolved oxygen levels from the Downstream Monitor met or exceeded 5mg/L 99.9% of the time,[4] this is but one year's worth of data collected during a non-drought year. Data from the Tailrace Monitor for 2017 and 2018—closer in time to actual drought conditions in late 2016—shows "numerous events" where dissolved oxygen levels did not meet 5mg/L.[5] Due to flooding events, the Downstream Monitor could not be deployed until March 12, 2019, and was inoperable for approximately another week due to a dead battery and washing ashore.[6] Combined, roughly three weeks of data (or ~10% of the total) scheduled to be collected in the Water Quality Study Plan was not collected because of equipment failure and environmental conditions.

To bolster the studies being performed, and to provide the most useful reports to stakeholders and FERC, pursuant to 18 C.F.R. § 5.15(d), ARA proposes a second year of water quality monitoring at the Downstream Monitor to collect dissolved oxygen and water temperature data in 15-minute intervals from July1 – October 31, 2020, and from March 1 – June 30, 2021. While 2020 has been a wet year thus far, conditions later in the year and early next year may provide an opportunity to collect data during drier, potentially drought, periods.

Additionally, we request that discharge data be included along with the dissolved oxygen and temperature data collected by the Downstream Monitor in 2020-21 to enable stakeholders to better understand the relationship between releases and water quality. The Tailrace Monitor data included in Appendix B to the Water Quality Report for 2017-2019 includes 15-minute interval discharge data for "Turbine 1," "Turbine 2," and "Total Discharge," and such data should be included with the continued monitoring data.

Finally, an assessment of any aeration or aspiration devices used to boost dissolved oxygen levels should also be included in order to take into account such artificial enhancements (and to consider any declines in water quality were these devices not to function properly). Documents filed with FERC prior to Harris' operation describe "incorporating into the turbine discharge an aspiration system to provide up to a 2 ppm increase in dissolved oxygen."[7] The condition of any existing aspiration system and a comparison to current technologies used to enhance dissolved oxygen levels should be undertaken.

As FERC staff have recognized, it is difficult to draw conclusions and make decisions with only one season's worth of data from a critical monitoring location.[8] Without additional monitoring efforts, Licensee, FERC, and stakeholders will miss an opportunity to collect data more reflective

[3] *See* Final Water Quality Study Plan (May 2019), Accession No. 20190513-5093.
[4] Draft Water Quality Study Report (Mar. 2020), Accession No. 20200410-5095, at 46.
[5] *Id.*
[6] *See* Appendix B (Excel spreadsheet) of the Draft Water Quality Report, "Notes" tab.
[7] Application of Alabama Power Company for Approval of Revised Exhibit S to License (Apr. 30, 1982), Accession No. 19820504-0246, at 5.
[8] *See* Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 24-27.

of periods where water quality is decreased and water quality criteria more difficult to meet. Gathering a second year of continuous, 15-minute interval data for dissolved oxygen and temperature (paired with discharge data) at the Downstream Monitor will provide a more robust dataset and strengthen the studies conducted during this ILP.

B. Water Temperature Concerns

There is significant stakeholder concern over the temperature of releases from Harris, and ARA understands that analysis of the effects of temperatures will be included in the forthcoming Aquatic Resources Study Report.[9] This concern stems from the scientific literature documenting the ecological consequences of cold-water pollution from hydroelectric dams[10] and decades of research on Harris indicating "thermal alteration and generation frequency negatively affect the occupancy of most fish species below the dam."[11] As additional study and analysis of the thermal regime progresses and is reported in the Aquatic Resources Study, ARA recommends that *temperature and flows be considered in tandem* during this analysis because "both discharge and temperature must be simultaneously considered for the successful implementation of environmental flow management below dams."[12]

The existing license for Harris required Licensee to work with state agencies and EPA prior to commencement of construction to come up with an "optimum design and placement of the project intake structures to permit withdrawal of water from selected levels of the reservoir to control the water quality of the discharges from the powerhouse."[13] Within four years of the issuance of the existing license, Licensee was required to file a revised (and then a re-revised) Exhibit S that included its plans to study the potential fishery resources of the reservoir and "a description of measures being taken to maintain or change the water quality of the Tallapoosa River downstream from the project."[14]

Licensee's re-revised Exhibit S filed in April of 1982 evidenced Licensee's understanding of the connection between temperatures and water quality and the need to design an intake structure to withdraw high-quality surface waters. Licensee's re-revised Exhibit S reads in part:

> "For enhancement of discharge water quality, it is desirable to withdraw water from as close to the surface as possible. At Harris Dam, which employs seasonal drawdown, the objective of surface withdrawal has been solved by incorporating into the design movable sills at the invert of each intake opening.…Location of

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[9] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 26.

[10] Julian D. Olden & Robert J. Naiman, *Incorporating Thermal Regimes into Environmental Flows Assessments: Modifying Dam Operations to Restore Freshwater Ecosystem Integrity*, Freshwater Biology (2010) 55, at 88-90.

[11] Elise R. Irwin, *Adaptive Management of Flows from R.L. Harris Dam (Tallapoosa River, Alabama)—Stakeholder Process and Use of Biological Monitoring Data for Decision Making*, U.S. Geological Survey Open-File Report 2019-1026, at 22 [hereinafter "USGS Open-File Report 2019-1026"].

[12] Olden, *supra* note 10, at 87.

[13] Harris Dam License, FERC No. P-2628, Article 51, Appendix F to PAD, Accession No. 20180601-5125 [hereinafter "Harris License"].

[14] Harris License, Article 52.

> these sills at the highest levels possible for operation will ensure the highest quality water being drawn into the turbines."[15]

Despite early attempts to engineer an intake to accommodate epilimnetic withdrawals and "solve" the problem of cold releases with lower dissolved oxygen content, thermal pollution[16] has plagued the river downstream from Harris since it began operations.

Unfortunately, neither the Aquatic Resources Study Plan nor the Draft Water Quality Report contemplate the study of any potential remedial actions to adjust water temperatures in line with unregulated reaches of the Tallapoosa. Licensee has acknowledged that once an issue has been identified with water temperatures, it plans to study technologies that can address the thermal regime.[17] Due to the available evidence of low temperatures impacting both colonization and persistence of fishes and the downstream macroinvertebrate community[18] and the sizeable stakeholder concern, ARA urges thorough study of the infrastructure enhancements available for implementation at Harris to control release temperatures. A variety of temperature management strategies exist, including multi-level intake structures, floating intakes, and reservoir destratification approaches using pumps and submerged weirs, as well as operational adjustments in the timing and volume of releases.[19]

II. DRAFT DOWNSTREAM RELEASE ALTERNATIVES STUDY REPORT

The extent to which the Harris project has altered flows of the Tallapoosa River is reflected in comments submitted by the Alabama Department of Conservation and Natural Resources (ADCNR) in 1982, which lament the "loss of 49 percent of the last major free-flowing river habitat…in Alabama."[20] According to the ADCNR's reading of USGS data at the time, flows from the pre-dam period of 1923 to 1972 equaled or exceeded the minimum flow of 45cfs stipulated in Article 13 of the license *100% of the time*.[21] Flows of 8,000cfs due to single turbine generation at Harris were equaled or exceeded during that era only 4.4% of the time, and flows of 16,000cfs due to two-unit generation were equaled or exceeded only 1.2% of the time.[22] For decades the Tallapoosa downstream of Harris has weekly experienced flows it otherwise would have seen, on average, roughly eight days out of a given year.

This flow regime has not been without consequences. Researchers have documented as much as a 67% reduction in flows than during pre-dam periods, greater instability of day-to-day flow

[15] Revised Exhibit S to Harris License Article 52 (Apr. 20, 1982), Accession No. 19820504-0246, at 5.
[16] Olden, *supra* note 10, at 91.
[17] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 26.
[18] *See generally*, USGS Open-File Report 2019-1026.
[19] Olden, *supra* note 10, at 97-101; *See also* Karin Krchnak et al., *Integrating Environmental Flows into Hydropower Dam Planning, Design, and Operations*, World Bank Technical Guidance Note (Nov. 22, 2009), at 24-27, *available at* http://documents.worldbank.org/curated/en/712981468346147059/Integrating-environmental-flows-into-hydropower-dam-planning-design-and-operations.
[20] Comments filed by ADCNR (Aug. 11, 1982) Accession No. 19820813-0012, at 3.
[21] *Id.* (emphasis added).
[22] *Id.*

variations, and an increase in very low-flow periods.[23] The flow instability and altered thermal patterns caused by hydropeaking operations have depressed species richness, "influenced fish persistence and colonization," reconfigured the downstream macroinvertebrate community, and created "adverse effects on hydraulic variables such as water velocity, depth, and temperature."[24]

As a result of Harris operations, the 14-mile stretch of the Tallapoosa from the dam to Alabama Highway 77 is currently listed by ADEM as a Category 4C waterbody impaired due to hydrologic alteration.[25] And the U.S. Geological Survey's (USGS) Open-File Report from last year indicates "that hydrologic alteration in the river has affected various biological processes."[26]

Despite the past decades of disruption, studies performed during the ILP and a reinvigorated adaptive management approach can shape a new framework for creating positive ecological responses below Harris. As the USGS Open-File Report on adaptive management of flows from Harris states, "[i]f flow and thermal alteration from the dam can be modified toward improving natural resource objectives, adaptive management processes and long-term monitoring could further reduce uncertainty related to biotic response to new Federal Energy Regulatory Commission licensing requirements."[27]

A. A Wider Variety of Release Patterns Needs to Be Modeled and Considered

We appreciate that Licensee was willing fifteen years ago to enter into a collaborative process with stakeholders and to voluntarily operate the Harris project according to an adaptive management plan known as the Green Plan,[28] the purpose of which "was to reduce effects of peaking operations on the aquatic community downstream."[29] The Green Plan was a starting point for adaptive management, but evidence suggests it has not improved conditions for aquatic life. The most recent published literature demonstrates that although "[h]abitat availability for fishes increased under the Green Plan management…improved conditions did not improve recruitment processes for species of interest."[30] Further, "results indicate that the Green plan did not meet the stakeholder objective to restore and maintain macroinvertebrate community composition similar to unregulated reaches within the regulated portions of the river."[31]

[23] Elise R. Irwin & M.C. Freeman, *Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A.*, Conservation Biology (2002), 16(5): 1212-1222.
[24] USGS Open-File Report 2019-1026, at 2-3.
[25] ADEM's *2020 Alabama Integrated Water Quality Monitoring and Assessment Report* required by Clean Water Act Section 305(b), Appx. B, at 33 *available at* http://www.adem.state.al.us/programs/water/waterforms/2020AL-IWQMAR.pdf.
[26] USGS Open-File Report 2019-1026, at 9.
[27] USGS Open-File Report 2019-1026, at 3.
[28] FERC Scoping Document 2 (Nov. 16, 2018), Accession No. 20181116-3065, FN11 at 16 ("The Green Plan is an adaptive management program that began in 2005, and that consists of providing pulsing flow releases (10 to 30 minutes in length) in the Tallapoosa River to enhance aquatic habitat, fish, and other aquatic organism downstream from Harris Dam.").
[29] Downstream Release Alternatives Study Plan (May 2019), Accession No. 20190513-5093, at 2.
[30] USGS Open-File Report 2019-1026, at 22.
[31] *Id.* at 3.

Since beginning adaptive management and the Green Plan roughly fifteen years ago, no actual adaptation or iteration has occurred. This relicensing and the studies now underway provide an opportunity to iterate, adapt, and improve flows and subsequent impacts on downstream aquatic life, recreation opportunities, erosion and sedimentation, and water quality. In order to make the refinements contemplated by a full adaptive management process, a wide variety of flow scenarios should be studied, and "[c]ontinuing adaptive management in tandem during the FERC relicensing process would be advantageous to include a specific assessment of long-term objectives of all stakeholders."[32]

B. Until Aquatic Resources and Aquatic Habitat Study Reports Are Available, It Is Premature to Ask Stakeholders to Specify All Flow Alternatives to Model

Commenters, stakeholders, and FERC staff have encouraged Licensee to examine a broad range of flows throughout the ILP.[33] Currently, licensee is studying two possibilities other than its current flow regime and its prior flow regime. The Draft Downstream Release Alternatives Phase 1 Report filed by Licensee assesses impacts to operational parameters (*e.g.*, generation, reservoir levels, flood control) under three flow scenarios: (i) the current Green Plan pulsing regime that has been in effect since 2005 through a voluntary adaptive management process; (ii) the pre-Green Plan regime with no intermittent flows between peaks, which occurred from 1983 to 2004; and (iii) a continuous minimum flow of 150cfs, which is the equivalent daily volume of the current Green Plan pulses and has never been physically implemented and studied.

A fourth release scenario, the alternative/modified Green Plan, will be evaluated in Phase 2 of the study, once results from the Aquatic Resources Study are available to shape the design of an altered Green Plan.[34] The two alternatives that have never been implemented—a continuous minimum flow of roughly an equivalent volume and altering the timing of the existing Green Plan releases—are effectively different flavors of the existing release scheme, though studying those modifications may yield important insights into improving flows.

The summary of the Initial Study Report meeting reflects that Licensee desires "to hear from stakeholders now" regarding alternative flow scenarios stakeholders would like to have modeled,[35] despite no draft Aquatic Resources Study or Aquatic Habitat Study reports being available. The downstream release alternatives, aquatic resources, water quality, and aquatic habitat reports are *all deeply interrelated*, and without at least draft reports of the fisheries studies, stakeholders should not be required to propose alternative flow scenarios until more information is available. Indeed, Licensee itself acknowledges that the results from the Aquatic Resources Study are needed

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[32] *Id.* at 19.
[33] Initial Study Report Meeting Summary (May 12, 2020), Accession No. 20200512-5083, at 40; *see also* Comments submitted by the Environmental Protection Agency (Sept. 25, 2018), at 5 ("The EPA encourages APC to consider adding as many feasible modeling scenarios as possible to determine the optimal downstream flow conditions.").
[34] Draft Downstream Release Alternatives Phase 1 Report (Apr. 2020), Accession No. 20200410-5069, at 2, FN1.
[35] Initial Study Report Meeting Summary (May 12, 2020), Accession No. 20200512-5083, at 21.

to design the fourth flow scenario it plans to model.[36] Those same results will also inform what variety of inputs stakeholders suggest.

In fact, the logical time to propose additional flow scenarios is after Licensee has "analyze[d] the effects of each downstream release alternative on other resources, including water quality… downstream aquatic resource (temperature and habitat), wildlife and terrestrial resources, threatened and endangered species, recreation, and cultural resources," which will be accomplished by Phase 2 of the study.[37] At a minimum, stakeholders should be equipped with the draft fisheries studies showing the current status of aquatic resources before being required to list all alternative flows to be studied.

C. Preliminary Proposals for Additional Flow Modeling and Study Modification Request

However, ARA understands that the modeling of additional flows takes time and effort, and Licensee has made clear that it would like to have as much stakeholder input as to various flows to model as soon as possible. While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study:

(i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin streamgage, rather than the current 75%;

(ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;

(iii) A constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability;[38] and

(iv) 300cfs and 600cfs minimum flows.

Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing.[39] Studying a wider range of potential flows during the ILP

[36] Draft Downstream Release Alternatives Phase 1 Report (Apr. 2020), Accession No. 20200410-5069, at 2, FN1 ("Results from the other three scenarios as well as from the Aquatic Resources Study are needed to design the alternative to be studied.").
[37] *Id.* at 2-3.
[38] We understand that there may limitations imposed by the existing turbines to implementing this type of flow, but modeling it would provide a frame of reference to other options relative to a more natural flow.
[39] USGS Open-File Report 2019-1026, at 10 ("The other three alternatives were based upon the concept of mimicking the flow regime recorded at the USGS streamgage in Heflin, at Wadley, 22 km below the dam. The Heflin streamgage measures flows in the unregulated upper portion of the Tallapoosa River (fig. A1); several stakeholders hypothesized that mimicking these flows at the dam would allow for some natural flow variability in the regulated portion of the river. The first of these alternatives was, in effect, modeled as a constant flow from the dam to maintain the Heflin

could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality.

III. DRAFT EROSION AND SEDIMENTATION REPORT

FERC has identified erosion and sedimentation as an issue to assess for cumulative impacts, with the tentative geographic scope of inquiry to encompass the upper Tallapoosa and the 44 river miles downstream of Harris dam, including Horseshoe Bend Military Park.[40] The Erosion and Sedimentation Study Plan involves "collecting and summarizing information under baseline operations," meaning the project and project operations as they exist today.[41] While the Draft Erosion and Sedimentation Study Report primarily attributes erosion downstream of the dam to clear-cutting and agricultural use, it reports that "erosion at these sites may be exacerbated as a result of flow releases from Harris Dam."[42]

Article 20 of the existing license states that Licensee "is responsible for and must take reasonable measures to prevent erosion and sedimentation."[43] Such measures and responsibility must be comprehensive in light of hydropeaking's amplifying effects on other potential sources of erosion both upstream and downstream of Harris. The High Definition Stream Survey (HDSS) completed as part of the Erosion and Sedimentation Study Report describes opportunities to "support targeted restoration, habitat improvement," and identified at least one area that "would be an excellent area to focus streambank rehabilitation efforts."[44] The HDSS states that it documents baseline conditions and that future surveys could be directly compared to it in order to understand ongoing shifts in river conditions.[45] ARA supports the collection of future surveys for this purpose.

As part of its environmental analysis, ARA encourages FERC to consider all historical evidence available when assessing how geology and soils may be impacted over another 30- to 50-year license term, including any evidence submitted by stakeholders in the form of photographs, maps, and personal accounts. If the Green Plan, or a similar pulsing flow regime is to be continued as part of a renewed license, a suspended solids sampling conducted pre-pulse, during generation, and post-pulse would better identify how and when sediment transport is occurring in the river, enabling an identification of project operations' impact apart from natural river processes and other potential sources of erosion.

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target at Wadley (Heflin), which consisted of minimum flows plus any necessary generation flows. The second was similar, except the flow from the dam was to never reach levels below 8.5 m3/s (Heflin 300). The third was an option proposed by the power utility, in which at least 75 percent of the Heflin target was maintained by 2–3 daily pulses, 1 at 0600 and 1 at 1200.").

[40] FERC Scoping Document 2 (Nov. 16, 2018), Accession No. 20181116-3065, at 21-22.

[41] Erosion and Sedimentation Study Plan (May 2019), Accession No20190513-5093, at 2.

[42] Draft Erosion and Sedimentation Study Report (Mar. 2020), Accession No. 20200410-5091, at 31.

[43] Harris License, Article 20.

[44] *See* Appendix E to Draft Erosion and Sedimentation Study Report (Mar. 2020), Accession No. 20200410-5091, High Definition Stream Survey Final Report prepared by Trutta Environmental Solutions, LLC, at 43.

[45] *Id.*

IV. NEW STUDY PROPOSAL FOR BATTERY STORAGE FEASIBILITY STUDY TO RETAIN FULL PEAKING CAPABILITIES WHILE MITIGATING HYDROPEAKING IMPACTS

Project operations of hydropeaking dams come with environmental costs, and over the past decade dam operators have faced increasing pressure to shift from highly-altered hydrologic conditions (*i.e.*, peaking operations) to more natural flows to restore downstream ecosystems.[46] Yet the need to meet peak system demand remains, and researchers are increasingly studying the use of battery energy storage systems (BESS) to mitigate the effects of hydropeaking while retaining full peaking capabilities. Increasingly cost-effective BESS can substitute for the peaking ability (or a portion of the peaking ability) usually provided by conventional hydropower plants by storing hydropower produced during off-peak hours (*e.g.*, generated with a continuous minimum flow or variable flow) and discharging this power during peak periods.[47]

By implementing BESS, restrictions can be imposed on ramping rates, which requires operators to adjust flows more slowly and constrains peaking capabilities; however, supplemental energy can be discharged from the BESS to still meet peak demand. BESS also provide additional grid benefits of frequency regulation, voltage support, black start services, and can further accommodate intermittent renewables, which make up a growing portion of the generation mix. According to new research, BESS "should begin to enter into discussions related to hydropeaking mitigation, especially given the typically long duration of operating licenses."[48]

At Harris, Licensee has expressed concerns that a 150cfs minimum flow would begin to constrain the utility's ability to peak with its current level of flexibility.[49] By undertaking a study of pairing BESS with existing hydropower generation, FERC, Licensee, and stakeholders may uncover a cost-effective path to expand operational flexibility, create new grid benefits, and achieve multiple stakeholder objectives, including accommodating a wider range of releases and mitigated peaking that improve ecological health downstream. Some studies indicate that "BESS can help to restore the natural [flow] regime at lower costs than using environmental flows alone," and such may be the case with the Harris Project.[50]

Pursuant to 18 C.F.R. §§ 5.15(e) and 5.9(b), ARA submits this proposal for a new study to determine the feasibility of adding BESS to the Harris Project to both serve project purposes and address project effects.

A. Goals, Objectives, and Information to Be Obtained - § 5.9(b)(1)

[46] Ryan A. McManamay et al., *Organizing Environmental Flow Frameworks to Meet Hydropower Mitigation Needs*, Environmental Management 58(3):365-85, doi: 10.1007/s00267-016-0726-y (Jun. 25, 2016), at 366.
[47] *See generally* Yoga Anindito et al., *A New Solution to Mitigate Hydropeaking? Batteries Versus Re-Regulation Reservoirs*, Journal of Cleaner Production 210 (2019) 477-489, *available at* https://kern.wordpress.ncsu.edu/files/2018/11/1-s2.0-S0959652618334401-main.pdf.
[48] Anindito, *supra* note 47, at 487.
[49] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 23.
[50] Anindito, *supra* note 47, at 487.

The goal of conducting the Battery Storage Feasibility Study is to determine whether a BESS system could be economically integrated at Harris to mitigate the impacts of hydropeaking while retaining full system peaking capabilities. The objectives of the study are to assess:

1. What type, size, and configuration of BESS is most practical?
2. How much would the BESS cost, and what are the ownership options?
3. What are the economic benefits of a BESS addition, including capacity and ancillary benefits and the ability to enable future additions of non-dispatchable renewables?
4. Could BESS integration allow Harris to generate more often while retaining week-day peaking capabilities?
5. What are the technical and economic barriers to integrating BESS?

B. Resource Management Goals of the agencies or Indian Tribes with Jurisdiction over the Resource to Be Studies - § 5.9(b)(2)

Not applicable.

C. Relevant Public Interest Considerations in Regard to the Proposed Study - § 5.9(b)(3)

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

This study request relates to the public interest of restoring riverine ecosystems, including by providing more natural flow regimes that promote aquatic habitat and increase opportunities for fishing and other recreation. Riverine ecosystems are resources of particular public interest for a variety of reasons, including their ecological functions, sporting interest, and subsistence use. Describing the effects on these resources is necessary to fulfill the Commission's responsibilities under the National Environmental Policy Act (NEPA). Ensuring that environmental measures pertaining to these resources are considered in a reasoned way is relevant to the Commission's public interest determination.

D. Existing Information and the Need for Additional Information - § 5.9(b)(4)

While sources of information related to project generation and peak demand exist, there is a need for a more holistic understanding of Harris' role in the power system and what contributions it is required to make to meet system peak demand. The Pre-Application Document (PAD) filed by Licensee does not contain detailed information about the current operational flexibility of Harris, its limitations, and the causes of those limitations. A data gap exists around Project ramping rates, and understanding the extent to which imposing maximum ramping rates can smoothen the dam's discharge pattern and mitigate the impacts of hydropeaking would be useful to many stakeholders and to FERC. To ARA's knowledge, no battery feasibility study has been performed at other hydropower projects owned by Licensee that could provide sufficient comparable information, and a feasibility study is needed to assess how much operational flexibility BESS could provide and how it might allow for more fine-tuned control of ramping rates and discharges while also benefitting the larger grid and Licensee.

E. Nexus to Project - § 5.9(b)(5)

A clear project nexus exists between project operations, downstream releases, and aquatic habitat. The Harris Project regulates the timing, allocation, and distribution of water flows in the Tallapoosa below Harris Dam, and prior to the Green Plan, completely cut off flows of the river at times. This regulation influences the availability of water for a variety of uses, including power generation, fisheries, and recreation. This requested study could form the basis for license requirements stipulating minimum or variable releases, mitigation measures, and assist future adaptive management.

F. Study Methodology - § 5.9(b)(6)

Integrating BESS at hydropower projects is a relatively new field with no established methodology.[51] This study can be completed through desktop analysis only and is primarily a financial cost/benefit analysis. By lessening hydropeaking activities, energy and perhaps capacity revenues from Harris will be reduced, and the study must quantify the additional value of BESS to Harris. Adding BESS has the potential to produce energy, capacity, and ancillary revenues (as well as deferral of transmission and distribution investments) that could offset these implementation costs. Importantly, some of these values are not dependent upon water flow.

Study activities will include:

- Creating a survey of battery cost estimates based on public sources focusing on price projections for 2023 and beyond, as well as any incentives that may be available.
- Describing the operational flexibility gains for a range of BESS (*e.g.*, 5 MW, 2-hour; 5 MW, 4-hour; 10 MW, 2-hour; 10 MW, 4-hour) vs. costs.
- Comparing BESS options to "business-as-usual" Harris operations to quantify revenues to be replaced by a BESS alternative. This will provide a preliminary alternative framework to consider changes in operations and allow for comparisons against other possible project mitigation measures.

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[51] Examples of battery-paired hydropower projects, such as the 4 MW battery storage project added to Byllesby project in Virginia and the hydro-battery microgrid project in Alaska, can be used to further develop this study. *See generally* James R. Thrasher, *How the Byllesby Hydro Plant Continues to Make History*, Hydro Review (Jul. 29, 2019), *available at* (https://www.hydroreview.com/2019/07/29/hydro-review-how-the-byllesby-hydro-plant-continues-to-make-history/#gref); Clay Koplin, *Cordova's Microgrid Integrates Battery Storage with Hydropower*, T&D World (Mar. 7, 2019), *available at* https://www.tdworld.com/distributed-energy-resources/energy-storage/article/20972311/cordovas-microgrid-integrates-battery-storage-with-hydropower; and Marek Kubik, *Adding Giant Batteries To This Hydro Project Creates A 'Virtual Dam' With Less Environmental Impact*, Forbes (May 23, 2019), *available at* https://www.forbes.com/sites/marekkubik/2019/05/23/adding-giant-batteries-to-this-hydro-project-cre

- Identifying any technical requirements and limitations to integrating BESS, including siting restrictions and any separate metering needed to allow the BESS to draw power from hydro generation, the grid, or a combination of the two.
- Preparing a report summarizing economic data and other analysis to be presented to stakeholders and commented upon.

G. Level of Cost and Effort - § 5.9(b)(7)

The total cost of this study is expected to be \$20,000 - \$30,000. This cost estimate is based on a recent battery storage feasibility study conducted for a series of four hydroelectric dams in the northeast. The study would include a review of dam operational constraints and power system requirements (2 days), gathering BESS economic data (1/2 day), analysis (4 days), project report development (3 days), and presentation of results to the stakeholders (1/2 day).

H. Changes in Law or Regulations - § 5.15(e)(1)

There have been no material changes in law or regulations applicable to the information in this study proposal.

I. Goals and Objectives of Other Studies - § 5.15(e)(2)

This study request puts forward new goals and objectives that are not addressed by the methodology of any of the current approved studies.

J. Timing of Request - § 5.15(e)(3)

Adding battery storage to existing hydropower projects is a relatively new topic with examples and studies just becoming available. The enabling factor has been decreases in battery prices in recent years, making the technology an increasingly economic option, along with the growing body of scientific literature documenting the need for better environmental performance at hydropeaking dams.

This study request was not made earlier because the subject of minimum flows constraining Licensee's ability to peak arose after the Draft Downstream Release Alternatives Study Report was filed. This study can be completed in a relatively short amount of time with desktop work only, and if taken into account with the ongoing flow modeling, could inform possible release alternatives and operational parameters that meet the objectives of Licensee and stakeholders, making it an appropriate request at this stage in the relicensing.

K. Changes in Project Proposal - § 5.15(e)(4)

There have been no significant changes in the project proposal.

June 11, 2020

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

RE: Comments on Initial Study Reports for Relicensing of Harris Dam (P-2628-065)

As a charter member of the Tallapoosa River Heritage group, I am the official spokesperson for other members who have concerns about our river and its ecosystems. Disturbed by changes that have been taking place on our river, we need to express our opinions, document our information, and preserve our memories of a river that has been vital to our economy for generations.

Some of those who have submitted to interviews go back three generations on the Tallapoosa, whether they are landowners or not. The Tallapoosa River has always been important, and only through our efforts do we believe that it will continue to be.

In fact, the area surrounding the town of Wadley itself (where my family has resided for at least four generations before me) was developed on the west bank of the Tallapoosa River to take the best advantage of the power it could provide (reprint of *LaGrange Reporter*, 14 Aug. 1908, as quoted in *Taproots: An Historical Account of Southern Union State Junior College and Areas in Randolph County*, October 1978). In fact, the main thoroughfare of the town was changed when the location of the river bridge was moved in the 1920s. The location of the bridge and its proximity to the river have always significantly influenced the town's configuration and therefore, its residents.

I am filing these anecdotal records on behalf of the following persons who for one reason or another either do not have an email address or who are intimidated by the submission process.

Dana Chandler
Wayne Cotney
Ronnie Siskey and Nelson Hay
Mike Smith
John Carter Wilkins

Dana Chandler (This is a reprint of an article I wrote for the local newspaper this spring)

Although most Randolph County residents are familiar with the river and its recreational uses, few of us may be aware of its historical and archaeological significance. According to Dana Chandler of Tuskegee University who is an expert on the river and its history, "The Tallapoosa river system was home for Native Americans from Archaic (3000 to 1000 BCE) through Creek (1600 to 1830 CE) time periods. Not only was the river a major transportation route, it also supplied an abundance of aquatic life to the communities. Interestingly, there were over a hundred habitation sites located along the Big and Little Tallapoosa river systems. Furthermore, the natives relied on river mollusks as a staple and even developed a tool used for opening them and extracting the meat. Although these tools have been found in other locales, they are found in abundance throughout these river systems" (email communication, 2 March 2020).

Chandler adds the Tallapoosa River was once the habitat for more species of mollusks than any other Alabama river. Of course, many of these are now gone because of the inconsistent river flow, among other reasons.

Over 100 fish wiers (traps) were lost when the river was dammed, and now below the dam, the inconsistent release of water has led to other sites being washed away or covered, ones that were used during the prehistoric period.

During the historic period, the river was navigable up to a point at Malone, but now many crossing sites have been decimated. These were all along the river.

The river banks have long been spots to find pottery shards and other Native American artifacts, but those sites are now almost gone, having been covered or washed away (personal communication, 1 March 2020).

We have a responsibility to preserve those sites that still exist and to record our experiences for those who come after us.

Wayne Cotney

Wayne Cotney is another lifelong river who has fished from the Wadley bridge to the head of the backwater since 1954. He has especially enjoyed fishing around Horseshoe Bend and the Frogeye/Bibby's Ferry areas. He tells me that it breaks his heart to know how the river used to be and to see it now and how much it has changed just during his lifetime.

When he was a boy, he and his grandfather Bishop, neither of whom could swim, would use fish baskets. There were always trees to hold on to, and trees that were small when he was a boy are now large trees, and some have even washed away. He remembers fishing around Capp's Island, so named for Capp Hodnett, a local farmer. All that's left are a few trees and a pile of rocks.

He remembers when the bridge was built at Horseshoe Bend and when folks kept boats tied to the banks up and down the river. Fishing was a way of life—and a way of feeding one's family—during those days. Those days are long gone, for several reasons, including but not limited to erosion and "fast water" that comes from up the river.

Wayne knows and uses the 800 number to check the generation schedule. However, he finds the information he obtains from the number to be quite inadequate, even downright incorrect. For instance, he was fishing June 2 and 3, 2020, near Horseshoe Bend. Checking the generation schedule, he learned the turbine would run from the morning of June 2 to 8 PM. According to Wayne, you seldom see big surges at Horseshoe Bend like the ones you see in Wadley, and if you do, it takes about 10 hours to reach the bend. On June 2, the rushing water ran him and his companions out of the water. They are experienced fishermen, and this water seemed to be more than what would have been released through generation.

He has noticed during the past week (June 1-9) that the river banks are washing away, with water at flood stage for several days. It appears that 25-50 feet of bank have eroded since last fall.

There was a sandbar below the Horseshoe Bend bridge that has all but disappeared, but for the past few months, it seems to be reappearing! That is the enigma of the Tallapoosa River and its path. This is just one person's experiences with a river that has almost mythical significance to folks around here.

Ronnie Siskey and Nelson Hay

Ronnie Siskey and his brother-in-law Nelson Hay live within sight of the river and have been fishing its waters for years. Eating a mess of fish for supper that they pulled from the river in the afternoon was not unusual at all for their family. They are familiar with the Tallapoosa River and fish "patterns."

I am directly quoting him: "I haven't been able to fish all year. The water won't let me fish. I can call and get the release schedule, but then I can't go by it because it's not reliable. I used to be able to depend on it being accurate. Not anymore."

Mike Smith

Mike Smith, a resident of Wadley in his early 70s, has been raised and has lived on the river all of his life. He inherited the property that his parents owned on the banks of the Tallapoosa just below the Wadley bridge, and he, too, has seen the banks of the river gradually erode over the years, leaving trees uprooted or barely hanging onto the soil at the edge of the water that alternately rushes and meanders on its way to Horseshoe Bend. He says that his biggest concern is the erosion that is eating away at the bank. He lives within sight of Hutton Creek, which crosses Highway 22 just inside the Wadley city limits. He has watched that creek fill with trees and silt to the point that it no longer flows as freely as it did when he was a boy.

His father, Charles Smith, was a fisherman who caught baskets of fish that were plentiful in the river during the 1950s and 60s. According to Mike, his dad "caught lots of fish. We gave them away, sold them, ate them, froze them. There were always plenty of fish!"

Although Mike never fished as his father did, others were allowed to "put in" at their place for years. However, no one does that anymore, just highlighting the issues that come with the fishing on the river these days. It is not the relaxing activity that it once was.

John Carter Wilkins

John Carter Wilkins is yet another lifelong Wadley resident who has lived on the river over half his life. He has, of course, witnessed the erosion issues, but his concern is the mostly for the wildlife that no longer exists on his property.

In the past, he says that he could catch a mess of yellow cats, but now he is lucky if he catches one. Bullfrogs used to be so plentiful that he could frog gig at night, but not he might see one frog if he goes out at night.

The land and the wildlife are no longer what they were. To him, that is the greatest shame of all.

Chuck Denman
1810 Oak Grove Road
Titusville Florida
32796

Regarding:Alabama Power Company relicensing for the Harris Hydroelectric Project (FERC No. 2628-065).

Harris Dam additional studies suggested

A general review of historical materials ie newspapers, and other records dealing with the proposals for constructing the Dam. Including comments and conditions provided in initial permitting. With the goal being to determine if the dam has achieved the original benefits expected. Perhaps a score card.

A pre vs post Dam analysis of down stream impacts. Including flooding,erosion and habitat changes to flora and fauna.

1. Flooding :storm runoff model comparing 25,50 and 100 year 24 hour storm events.
2. Erosion : utilizing available remote sensing materials to compare river channel and islands size and shape today and pre dam.
3. Plants: utilize remote sensing materials to map flag grass and invasive plant communities to compare changes from pre Dam.
4. Fisheries: review available materials from locals in the community, fish and game and other resources to determine what effect the Dam has had on down stream fish types and numbers.

6/2 HAT 3 meeting summary

APC Harris Relicensing <g2apchr@southernco.com>

Tue 6/16/2020 7:29 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>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@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>

1 attachments (388 KB)

2020-06-02 HAT 3 meeting summary.pdf;

HAT 3,

Attached is a summary from our June 2nd HAT 3 meeting that provided an update on the Aquatic Resources study. This summary can also be found on the relicensing website: www.harrisrelicensing.com.

Thanks,

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

Harris Action Team 3 Meeting Summary
June 2, 2020
1:00 pm to 3:00 pm
Conference Call

Participants:
See Attachment A

Action Items:
- Alabama Power will distribute the Draft Aquatic Resources Study Report to the HAT in July 2020.

Meeting Summary:
Angie Anderegg (Alabama Power) opened the meeting by introducing everyone and described the meeting purpose: for Auburn University to present its research to date and to inform the HAT of remaining work on the Aquatic Resources Study. Jason Moak (Kleinschmidt Associates) stated this meeting was intended to be held March 19, 2020 but was rescheduled due to COVID-19. This study has two main components: 1) a desktop assessment of current and historic information to describe the broad range of effects of the Harris Project (Project); and 2) Auburn University's research, which includes a literature review of temperature requirements of the target fish species, historical water temperature data, fish community surveys, and bioenergetics modeling.

Dennis Devries (Auburn University) summarized the first study objective and described the target species: Alabama Bass, Tallapoosa Bass, Redbreast Sunfish, and Channel Catfish. The Tallapoosa Bass was described several years ago and was formerly known as Redeye Bass in the study area[1]. There are not currently any temperature preference data available for Tallapoosa Bass. The Alabama Bass was also described several years ago and was split from Spotted Bass. Dennis stated that most of the available data are for Channel Catfish, but the majority of these data were gathered from ponds and aquaculture systems instead of moving water.

Ehlana Stell (Auburn University) summarized the second study objective. Historical temperature data below Harris Dam was gathered from three sites: the Harris tailrace, Malone, and Wadley. There were no significant temperature differences between pre- and post-Green Plan. Temperatures at the three sites only differ significantly in the summer. Releases from Harris Dam can cause temperature decreases of about 4°C in the summer but only 1-2°C in the fall.

Eli Lamb (Auburn University) summarized the third study objective. The fish community is being assessed at three sites downstream of Harris Dam (the Harris tailrace, Wadley, and Horseshoe Bend) and at one reference site (Lee's Bridge on the upper Tallapoosa River). Eli described the four sites in terms of location (river kilometers from Harris Dam) and available habitat. Each site is sampled every other month by electrofishing, and all fish are transported back to the lab. Eli described the information gathered from both non-target and target species. Genetic information was also gathered from Alabama Bass and Tallapoosa Bass for identification. Eli showed all the species found at multiple sites and all species unique to each site. He stated that a new species is added to the list each time they sample, so this information is

[1] The study area is the Tallapoosa River from the Harris Dam downstream through Horseshoe Bend.

constantly changing. The growth curves of Alabama Bass, Redbreast Sunfish, and Tallapoosa Bass were presented. This study objective is ongoing.

Ehlana summarized the first part of the fourth study objective. Static respirometry is used to measure the standard metabolic rate. Fish are not swimming during static respirometry, and temperature is held constant. To date, trials have been conducted at 21°C. Swimming respirometry and performance work was also described, which will measure active metabolic rates. The critical swimming speed, or U_{crit}, is being measured. U_{crit} can be described as an assessment of the swimming abilities of fish using the time and velocity at which the fish becomes fatigued. Preliminary U_{crit} data was presented. Alabama Bass showed the highest U_{crit} values. Larger fish can typically swim faster at absolute speeds. Ehlana described VO_2 as the metabolic rate during increases of speed; VO_2 increases with increasing speed. Ehlana detailed the remaining static and swimming respirometry and performance work to be completed in 2020.

Rusty Wright (Auburn University) summarized the second part of the fourth study objective. Rusty defined bioenergetics and stated that much of the energy gained from consumption is lost as metabolic waste and used for respiration and activity. A bioenergetics model can integrate all these factors to determine what energy is left for growth. The bioenergetics model is focusing on habitat effects on growth. Rusty described the components needed to run the bioenergetics model. Small fish have higher consumption and respiration rates per gram than large fish. Consumption increases as water temperature increases until conditions get too warm and consumption decreases. The bioenergetics model can help determine what temperatures could potentially provide the best growth (which is species specific). Growth data is being gathered from otoliths, and caloric density can be gathered from published literature. Currently there is no model for Tallapoosa Bass or Redbreast Sunfish so literature on similar species is being utilized. Previous Channel Catfish models have been constructed from specimens from lakes and ponds instead of lotic systems, so some additional information for that species must be gathered. Rusty noted that simulations will be run in the summer 2020. See presentation in Attachment A.

There was a break for questions. Todd Fobian (Alabama Department of Conservation of Natural Resources (ADCNR)) asked if the Snail Bullhead identification was correct since that species has previously been described in Alabama as only existing in the Chattahoochee River. Eli replied that the identification is likely correct, and Dr. Carol Johnston of Auburn University has been sent these specimens to confirm identification. Todd also wanted to confirm the Skipjack Herring record. Eli stated that both Skipjack Herring and Blueback Herring have been confirmed by Dr. Johnston.

Next, Donna Matthews (Tallapoosa River Heritage) asked if the model that Auburn is making could be used by other researchers and applied to other situations. Rusty said fish are being used from the Tallapoosa River specifically and this population may differ from other populations, but this model could be used in similar studies. Diets of fish in other populations may need to be adjusted, but the basic bioenergetics model should be applicable to other populations. Auburn University stated that bi-monthly sampling will continue through winter 2021 (February 2021); however, the minimum number of fish required for modeling will likely be acquired around August 2020. Eli will also be looking at tagging and tracking fish in the field to monitor their movement in the river. Sarah Salazar (Federal Energy Regulatory Commission (FERC)) reminded HAT 3 participants to check the schedule in the study plan if there is any confusion. Allan Creamer (FERC) asked how the bioenergetics information would be integrated into all the other study plans. Auburn University stated that the sampling in early 2021 will provide information on the fish community, but all the required information for the bioenergetics work will have already been gathered at that time. Allan asked if the data gathered in early 2021 will be added into the final model. Rusty said it is possible it could feed into the model, but they will likely have enough temperature, diet, and growth data to generate simulations. Angie added that ultimately, the results of this study will be summarized and added to the Preliminary Licensing Proposal. HAT meetings will be held to provide updates as each component of the study is completed.

Martha Hunter (Alabama Rivers Alliance) asked if the 30-minute flushing cycle used in the static respirometry tests was the same length of time as the dam releases. Rusty said the chambers are just flushed to give fish fresh oxygenated water. That is the intermittent approach that allows multiple measurements on one fish. There is also a "pulse" flushing during the swimming tests to simulate the effect of a pulse of water released from the dam, that will be applied along with an exchange of cooler water (4-5 degrees C), simulating the actual environment below Harris Dam. The timing is more about how long it takes to get a good respirometry measurement and is not exactly mimicking the full variation in the river. Martha asked for clarification on whether this study will be mimicking what is happening in the Tallapoosa River. Ehlana said water is being exchanged for about 10-15 minutes to drop the temperature while maintaining a constant speed so the fish are subjected to a change in temperature but not a change in water velocity. Auburn University then monitors changes in the fish caused by changes in temperature, but there is no way to completely mimic the conditions of the Tallapoosa River and all the effects of Harris Dam operations.

Sarah asked about the lack of information on the Tallapoosa Bass and the use of the Alabama Bass as a surrogate species. Is it a concern that there is not enough data on a lotic species? Auburn University stated it would be preferable to have a surrogate lotic species, but there are limitations on what can be used as a surrogate. Rusty said they are looking at temperature parameters in the literature and a surrogate with similar life histories is sufficient. Sarah asked if there were any other surrogate species to be considered as a lotic species. Dennis said these surrogate species were determined after discussion with Alabama Power and ADCNR. A closely related species is ideal, but there is not much physiological data on any Redeye Bass species.

Donna asked if spawning and hatching data will be used in any capacity. Eli said they will be looking at some reproductive measures so they will be looking at gonads but will not be looking directly at spawning and hatching. Jason said as part of the desktop assessment, some spawning and recruitment literature was reviewed, so that portion of the Draft Aquatic Resources Study Report will have some information on those topics.

In addition, Jimmy Traylor (downstream property owner) asked how the feeder creeks (i.e., tributaries on the Tallapoosa River) vary from the mainstem as far as species diversity. Ehlana said other researchers at Auburn University are looking at tributaries but all research for this study is being done in the mainstem of the Tallapoosa River. Rusty said in general, these tributaries may or may not have higher diversity. Jimmy noted that the fish population in the feeder creeks is much less than what it was since the dam was built. Jimmy also noted there is an overall reduction in bugs and frogs. He thinks it would be worth studying. Rusty agreed that there is a link between the mainstem of the Tallapoosa River and tributaries, but other variables have contributed to changes in the aquatic community, including development in the watershed. Jimmy said since construction of Harris Dam, the temperature difference between the creeks and the dams has reversed with cooler water now in the mainstem of the Tallapoosa River and warmer water in the tributaries.

Next, Drew Morgan (stakeholder) asked if the study scope includes assessing the species above Harris Dam. Eli said that it is not within the scope of this study. Dennis noted there is not enough information, with just one upstream sampling site, to conclude that there is more diversity upstream. Jason said the desktop assessment includes both regulated and unregulated upstream portions of the mainstem of the Tallapoosa River.

Jimmy asked if Elise Irwin (United States Geological Survey) would present data from the study she conducted prior to Harris relicensing. Angie stated that all available information, including Elise Irwin's research, was included in the Summary of R. L. Harris Downstream Flow Adaptive Management and History Research (Appendix E), filed with the Preliminary Application Document (PAD) and this current study will compliment that work. Jimmy then asked who was doing a study on bugs. Angie replied that macroinvertebrate data was included in Appendix E of the PAD. Jason commented that the gut content analysis of collected fish will provide insight into which macroinvertebrates are being utilized for food.

Jason stated that the next step is to release the Draft Aquatic Resources Study Report to the HAT in July 2020. Additional HAT 3 meetings will be held in the fall. Angie will schedule another HAT meeting once everyone has had time to review the Draft Aquatic Resources Study Report and the meeting summary and presentation will also be on the Harris relicensing website. Angie reminded everyone that any comments on the Initial Study Report and Draft study reports should be filed with FERC by June 11, 2020.

ATTACHMENT A
HARRIS ACTION TEAM 3 MEETING ATTENDEES

Angie Anderegg – Alabama Power
Dave Anderson – Alabama Power
Jeff Baker – Alabama Power
Evan Collins – United States Fish and Wildlife Service
Jason Carlee – Alabama Power
Keith Chandler – Alabama Power
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Dennis Devries – Auburn University
Colin Dinken – Kleinschmidt Associates
Jeff Duncan – National Park Service
Amanda Fleming – Kleinschmidt Associates
Todd Fobian – Alabama Department of Conservation of Natural Resources
Chris Goodman – Alabama Power
Lisa Gordon – Environmental Protection Agency
Martha Hunter – Alabama Rivers Alliance (ARA)
Elise Irwin – United States Geological Survey
Carol Knight – Downstream Property Owner
Eli Lamb – Auburn University
Donna Matthews – Tallapoosa River Heritage
Lydia Mayo – Environmental Protection Agency
Ashley McVicar – Alabama Power
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt Associates
Drew Morgan - Stakeholder
Barry Morris – Lake Wedowee Property Owners Association
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt Associates
Ehlana Stell – Auburn University
Jimmy Traylor – Downstream Property Owner
Jack West – ARA
Russell Wright – Auburn University

RE: 6/2 HAT 3 meeting summary

Anderegg, Angela Segars <ARSEGARS@southernco.com>
Wed 6/17/2020 1:52 PM

To: APC Harris Relicensing <g2apchr@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>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@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>

HAT 3,

I forgot to attach the presentation from the 6/2 meeting to the meeting summary. Both summary and presentation are now included on the website: www.harrisrelicensing.com.

Thanks,

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

From: APC Harris Relicensing
Sent: Tuesday, June 16, 2020 2:30 PM
To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Subject: 6/2 HAT 3 meeting summary

HAT 3,

Attached is a summary from our June 2nd HAT 3 meeting that provided an update on the Aquatic Resources study. This summary can also be found on the relicensing website: www.harrisrelicensing.com.

Thanks,

Angie Anderegg
Hydro Services
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Alabama Power

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July 10, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Response to Initial Study Report (ISR) Disputes or Requests for Modifications of Study Plan

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) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

On June 10, 2020, FERC staff provided comments on the ISR and the ISR Meeting Summary.[1] FERC requested that Alabama Power respond to specific comments by July 11, 2020. Attachment A of this filing includes Alabama Power's responses to those questions for which FERC requested a July 11 response.

Stakeholders and FERC provided three Additional Study Requests and two study modifications as part of comments on the ISR and ISR Meeting Summary. Two of the requested studies do not meet the criteria outlined in FERC's regulations at 18 C.F.R. § 5.9(b) and 5.15 and/or address pre-project conditions. Although, the other study request meets FERC's criteria, Alabama Power is not incorporating the study request into the relicensing process for the Harris Project. The complete response to these study requests is in Attachment B.

FERC staff, Alabama Rivers Alliance (ARA)[2], and the U.S. Environmental Protection Agency (EPA)[3] also requested the inclusion of additional downstream flow release alternatives as modifications to Alabama

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[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

[3] Accession Nos. 20200612-5025 and 20200612-5079.

Power's existing Downstream Release Alternatives Study. Alabama Power's response to the recommended modifications is also provided in Attachment B.

Within preliminary comments on the Draft Water Quality Study Report as well as during the ISR Meeting and within comments on the ISR and ISR Meeting Summary, multiple stakeholders requested that Alabama Power continue monitoring water quality downstream of Harris Dam in 2020 and 2021. To collect dissolved oxygen and water temperature data in 2020, Alabama Power installed the continuous monitor on May 4, following the ISR meeting. The generation monitor was installed on June 1 to align with the monitoring season start date in the Water Quality Study Plan. Alabama Power also agrees to collect water quality data at both locations in 2021 (from March 1 – June 30, 2021 at the continuous monitor and June 1 – June 30, 2021 at the generation monitor) to include in the final license application.

The EPA recommended inclusion of water quality monitoring data with the Water Quality report. Alabama Power notes that the Draft Water Quality Study Report contains an appendix with the 2017 – 2019 water quality monitoring data, and the Final Water Quality Study Report will contain a similar appendix with the complete set of water quality monitoring data (including 2020). Any data collected in 2021 and after the Final Water Quality Study Report is provided will be included within the Final Licensing Proposal.

Alabama Power reviewed FERC and stakeholder comments on the ISR and Draft Study Reports and will address all other comments in any Final Study Reports (filed in 2020 and 2021), the Updated Study Report (USR) (due April 10, 2021), or the Preliminary Licensing Proposal (PLP) (due on or before July 3, 2021).

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

Sincerely,

Angela Anderegg

Angie Anderegg
Harris Relicensing Project Manager

Attachment A: Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Attachment B: Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

cc: Harris Stakeholder List

Attachment A

Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

FERC questions are presented in italic text and the specific information requested is highlighted in yellow; Alabama Power's response follows.

Draft Downstream Release Alternatives (Phase 1) Study Report

Question #2: During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.

Alabama Power Response:

Alabama Power's response to evaluating additional flow alternatives is discussed in Attachment B.

Regarding the Aquatic Resources and Downstream Aquatic Habitat Studies, it is Alabama Power's intent to provide stakeholders 30 days to review, provide comments, and recommend any additional flow analyses based on the information in the draft reports. It is also Alabama Power's intent to meet with the Harris Action Teams (HATs) between Fall 2020 and Spring 2021 to present preliminary results, including the bioenergetics modeling, and obtain stakeholder input on additional analyses.

Question #5: Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.

Alabama Power Response:

The HEC-ResSim model bases the releases on the Green Plan, which specifies the use of the Heflin gage. During development of the Green Plan, the Heflin gage was considered the gage that best mimicked the unregulated, natural flow of the Tallapoosa River. Based on available information from stakeholder meetings in early 2000, the Newell gage was not considered. Stakeholders involved in the Green Plan development process did acknowledge that the Heflin gage excluded the flow from Little Tallapoosa River.

Below is a brief summary of the recorded stakeholder discussions that reference the use of the Heflin gage.

- 5/21/2003 Stakeholder Meeting: Stan Cook (Alabama Department of Conservation and Natural Resources (ADCNR)) stated that the Heflin gage is being used to mimic natural events and that the “Big” Tallapoosa River better reflects a larger scale drainage.
- 8/4/2003 Stakeholder Meeting: Elise Irwin presents findings on the models indicate that the Heflin gage is a promising location.
- 11/3/2003 Stakeholder Meeting: Alabama Rivers Alliance (ARA) stated they wanted Alabama Power to evaluate use of a house turbine that would provide capabilities to duplicate the Heflin gage flows. During this meeting, it was mentioned that the Heflin gage does not include flows from the Little Tallapoosa River, and no one stated opposition to use of the Heflin gage.
- 1/1/2006 Stakeholder Meeting: Stakeholders commented that mimicking Heflin flows would allow for some natural variability of flow in the regulated part of the river.

Draft Erosion and Sedimentation Study Report

Question #7: The Erosion and Sedimentation Study in the approved study plan states that Alabama Power would analyze its existing lake photography and Light Detection and Ranging (LIDAR) data using a geographic information system (GIS) to identify elevation or contour changes around the reservoir from historic conditions and quantify changes in lake surface area to estimate sedimentation rates and volumes within the reservoir. In addition, the approved study plan states that Alabama Power will verify and survey sedimentation areas for nuisance aquatic vegetation. According to the study schedule, Alabama Power will prepare the GIS overlay and maps from June through July 2019 and conduct field verification from fall 2019 through winter 2020.

The Draft Erosion and Sedimentation Study Report does not include a comparison of reservoir contour changes from past conditions or the results of nuisance aquatic vegetation surveys. The report states that limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for comparison to historic conditions and that Alabama Power will conduct nuisance aquatic vegetation surveys during the 2020 growing season. It is unclear why the existing aerial imagery and Alabama Power's LIDAR data did not allow for comparison with past conditions or why the nuisance aquatic vegetation surveys will be conducted during the 2020 growing season instead of during the approved field verifications from fall 2019 to winter 2020. As part of your response to stakeholder comments on the ISR, please clarify what existing aerial imagery and LIDAR data was used and why it was not suitable for comparison with past conditions.

Alabama Power Response:

Alabama Power has 2007 and 2015 Light Detection and Ranging (LiDAR) data for Lake Harris that it will use to develop a comparison for the Final Erosion and Sedimentation Study Report.

Ms. Donna Matthews proposed a new study of the Tallapoosa River downstream of Harris Dam to use historic images overlaid on current imagery to evaluate changes in the Tallapoosa River.[1] Alabama Power's response to this study request is addressed in Attachment B; however, Ms. Matthews noted in the ISR Meeting that she would share various images of the Tallapoosa River pre-Harris Dam and after construction. Alabama Power intends to facilitate obtaining copies of these images to provide to FERC for its use in addressing cumulative effects, as noted in FERC's November 16, 2018 Scoping Document 2.[2]

Regarding the nuisance aquatic vegetation component of the Erosion and Sedimentation study, the growing season is late spring into summer, which did not correspond with the fall 2019 to winter 2020 in the FERC-approved study plan schedule. Therefore, Alabama Power plans to conduct the nuisance aquatic vegetation survey in summer 2020. These results will be provided to HAT 2 participants as a technical memo to supplement the Draft Erosion and Sedimentation Study Report.

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[1] Accession No. 20200612-5018.

[2] Accession No. 20181116-3065.

Question #9: (comment provided below includes only the information requested by FERC) As part of your response to stakeholder comments on the ISR, please provide:

1) *the maps and assessment of the availability of potentially suitable habitat within the project boundary for all of the T&E species on the official species list for the project;*
2) *documentation of consultation with FWS regarding the species-specific criteria for determining which T&E species on the official species list will be surveyed in the field;*
3) *a complete list of T&E species that will be surveyed during the 2nd study season as part of the T&E Species Study; and*
4) *confirmation that Alabama Power will complete the field verification scheduled by September 2020.*

Alabama Power Response:

1) The maps and assessment of the availability of potentially suitable habitat within the Harris Project Boundary were included in the draft Threatened and Endangered Species Desktop Assessment Report and were prepared based on available sources of information. Any maps and assessments of habitat suitability that could not be resolved in the desktop assessment will be included in the Final Threatened and Endangered Species Study Report. Alabama Power is actively consulting with U.S. Fish and Wildlife Service (USFWS) regarding Threatened and Endangered Species (T&E species) where existing information is insufficient to determine their presence/absence and habitat suitability. Alabama Power plans to continue to work with USFWS and the Alabama Natural Heritage Program (ANHP) to resolve questions about the species and perform field surveys as deemed appropriate.

2) Alabama Power met with HAT 3 participants on August 27, 2019 to discuss species included in the Threatened and Endangered Species Study Plan. As a result of that meeting and based on recommendations from USFWS, Alabama Power conducted surveys for Finelined Pocketbook in the Tallapoosa River and Palezone Shiner in Little Coon Creek. Additional surveys for Finelined Pocketbook in tributaries to Lake Harris are ongoing and should be completed in Summer 2020. Alabama Power is consulting with the USFWS and ANHP to determine the need for additional surveys. If requested, Alabama Power may perform surveys for additional species and/or assessments to determine suitability of habitat that could not be resolved in the Threatened and Endangered Species Desktop Assessment. All consultation regarding this process will be included as an appendix to the Final Threatened and Endangered Species Study Report.

3) Alabama Power plans to conduct additional surveys for Finelined Pocketbook in Summer 2020. Based on ongoing consultation with USFWS and with input from ANHP, Alabama Power may perform surveys for Price's Potato Bean, White Fringeless Orchid, and Little Amphianthus (pool sprite) as well as assessments to determine if suitable habitat exists for Red-cockaded Woodpecker and Little Amphianthus.

4) Alabama Power plans to complete field verifications by September 2020.

Question #10: To facilitate review of the existing shoreline land use classifications, please file larger scale maps of all the shoreline areas as a supplement to the Draft Project Lands Evaluation Report, as part of your response to stakeholder comments on the ISR. Please include land use classifications on the maps. In addition, if available, please file the GIS data layers of the existing and proposed shoreline land use classifications.

Alabama Power Response:

Included with this filing are the larger scale maps, including land classifications, and the GIS files of the existing and proposed shoreline land use classifications.

Attachment B

Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Alabama Power received two recommendations to modify the existing FERC-approved studies and three Additional Study Requests. Alabama Power's response to the study modifications and Additional Study Requests is discussed below.

A. <u>Modifications to Existing Studies</u>

1) FERC Question #3:[1] "To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions. We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage. The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs."

2) ARA's June 11, 2020 comments:[2] "While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study:

   (i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;

   (ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;

   (iii) A constant but variable release that matches the flow at the USGS Wadley stream gage to the UGSG Heflin stream gage to mimic natural flow variability, and

   (iv) 300 cfs and 600 cfs minimum flows.

   Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing. Studying a wider range of potential flows during the ILP could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality."

[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

3) In its June 11, 2020 comments[3], EPA "requests that the flow scenarios include the evaluation of an option including both the pulses of the Green Plan with a minimum flow, and a higher minimum flow.

Alabama Power's Response:

Based on FERC, ARA, and EPA's recommendation to modify the Downstream Release Alternatives study, Alabama Power will model the following additional downstream flow scenarios:

- A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;
- A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;
- 300 cfs continuous minimum flow;
- 600 cfs continuous minimum flow; and a
- 800 cfs continuous minimum flow.

These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include:

- Pre-Green Plan (peaking only; no pulsing or continuous minimum flow);
- Green Plan (existing condition);
- Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and
- 150 cfs continuous minimum flow.

Alabama Power has not included ARA's recommended "constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability", as an alternative to model. This alternative would eliminate peaking operations, which would significantly reduce or eliminate use of the Harris Project for voltage support and system reliability, including black start operations. Alabama Power regards this alternative as a complete change in Project operations (from peaking to run-of-river) that is not consistent with Project purposes.[4]

Furthermore, the units are not capable of adjusting to the extent of simulating natural river flows. The flow through the Harris units varies only to the extent of changes in gross head (the difference between the forebay elevation and tailwater elevation) and the wicket gate opening. Small wicket gate openings lead to excessive pressure drops, which is the primary driver of cavitation[5] initiation. The best way to minimize cavitation and its associated detrimental vibrations is to quickly move the wickets gates from a closed position to the best gate setting. The best gate setting is a permanent setting on the governor system to ensure that the control system will force a fast movement of the wicket gates through the "rough zone" to the best gate position thereby minimizing the time spent in the rough zone. The rough zone is an area on the operating curve where flows that are less than efficient gate cause increased vibrations in the turbine

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[3] Accession Nos. 20200612-5025 and 20200612-5079.

[4] For additional explanation, see Alabama Power's March 13, 2019 letter to FERC (Accession No. 20190313-5060).

[5] Cavitation is a phenomenon in which rapid changes of pressure in a liquid lead to the formation of small vapor-filled cavities in places where the pressure is relatively low.

and cavitation along the low-pressure surfaces of the turbine runner. For these reasons, this is not a viable alternative.

Alabama Power also declines FERC's recommendation to study all of the continuous minimum flows combined with the Pre-Green Plan, Green Plan, and Modified Green Plan. Alabama Power asserts that modeling one combination of a continuous minimum flow AND pulsing (the hybrid Green Plan listed above) is adequate to determine the effect of this downstream release alternative on Project operations and other resources. The eight alternatives Alabama Power will model will provide sufficient information to evaluate the resources of interest, determine any downstream release proposal, and determine protection, mitigation, and enhancement (PM&E) measures to be incorporated into the new license for the Project.

B. <u>Proposed Additional Studies</u>

1) ARA proposed a new study for "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts".

<u>Alabama Power's Response:</u>

While ARA's additional study request appears to conform to FERC's regulations and criteria for additional study requests, Alabama Power respectfully declines to complete this study for the Harris Project relicensing. Our reasons are provided below:

a. ARA notes that there is a data gap around Project ramping rates. The Harris Project units are not capable of ramping; rather they were designed as peaking units to quickly react to electrical grid needs, and as such, the turbines were not designed to operate in a gradually loaded state—or restricted ramping rate—over an extended period of time. In fact, restricted ramping is avoided to prevent damage to hydroturbine machinery. When transitioning from spinning mode to generating mode, the wicket gates are opened over a period of approximately 45 seconds. One reason for this method of operating is so the turbine spends a minimal amount of time in the rough zone.

b. The goal of this study, as outlined by ARA, is to determine whether a battery energy storage system (BESS) could be economically integrated at Harris. This technology is very new and there is no established methodology for integrating BESS at hydropower facilities. The cost of a BESS system with restricted hydraulic ramping is concerning because the cost must include not only the battery but also the cost of replacing both turbine runners and determining the extent of the effect on the balance of plant. Each unit at Harris makes approximately 60 megawatts (MW) at efficient gate. For an example, a 60 MW/60-megawatt hour (MWhr), 1-hour duration, standalone battery including construction and installation, is estimated to cost $36M dollars.[6] This battery would need to be sized to produce up to 60 MW for one hour so that the full capacity of the turbine could be supplemented from battery power. The battery would need this capacity because ramping would essentially begin at zero MWs with a very small wicket gate opening and then gradually open over the period of one hour. A smaller MW battery would not be large enough to make up the lost MWs in a full ramping scenario. For example, if a 5 MW battery

[6] Fu, Remo and Margolis, "2018 U.S. Utility-Scale Photovoltaics-Plus-Energy Storage System Costs Benchmark", National Renewable Energy Laboratory, NREL/TP-6A20-71714.

were used, the unit would have to ramp very quickly, within 30 to 45 seconds, to an output of 55 MW. The 5 MW battery would then make up for the remaining power to reach the original power output of 60 MW. To be clear, a battery smaller than the unit's power at efficient gate does not allow for full ramping because the unit must quickly be brought up to a point where the unit's power plus the battery's power equals 60 MW.

The cost of $36M would be doubled to $72M since there are two units at Harris Dam and peaking requires the availability of both units. Additionally, this is a one-hour battery, so the unit(s) must be at efficient gate at one hour past the start of generation. If a longer ramping rate was desired, the battery would likely need to be even larger. The cost to upgrade the turbine runners in order to have a much wider operating range would also need to be considered. It is also important to note that it is undetermined, due to the site-specific conditions and the geometry of the water passages in the powerhouse, if a suitable turbine runner with a wide operating range can even be produced.

c. While information and access to battery storage technology is increasing, as ARA notes, integrating BESS at hydropower projects is a relatively new field with no established methodology. This is especially true for the size of BESS needed to replace the full megawatt capacity at Harris. Furthermore, full-scale redesign of the existing turbines is not being considered by Alabama Power during this relicensing.

For these reasons, Alabama Power declines this study proposal and contends that the downstream release alternatives study will provide information for Alabama Power and the stakeholders to effectively evaluate effects of downstream releases on Project resources (both on Lake Harris and in the Tallapoosa River below Harris Dam) and for Alabama Power to propose an operating scenario for the next license term.

2) Pre-and Post-Dam Analysis of Downstream Impacts, including flooding, erosion, and habitat changes to flora and fauna.

Alabama Power's Response:

Mr. Chuck Denman[7] proposed that Alabama Power conduct an additional study that analyzes pre-dam and post-dam impacts on flooding, erosion, plants, and fisheries. This study request did not meet FERC's criteria for an additional study; however, Alabama Power notes that many of the analyses requested by Mr. Denman are in fact occurring as part of the Harris relicensing. FERC does not require a licensee to evaluate pre-project conditions in a relicensing. In FERC's "*Guide to Understanding and Applying the Integrated Licensing Process Study Criteria*" (2012), FERC notes that where information is being sought solely to look at historic effects, FERC staff will not require an applicant to reconstruct pre-project conditions, because that is not the baseline from which the FERC conducts its environmental analysis. The FERC's choice of current environmental conditions as the baseline for environmental analysis in relicense cases was affirmed in American Rivers v. FERC, 187 F.3d 1007, amended and rehearing denied, 201 F.3d 1186 (9th Cir., 1999); Conservation Law Foundation v. FERC, 216 F.3d 41 (D. C. Cir. 2000).

[7] Accession No 20200611-5174.

Alabama Power has consistently communicated and explained that it will use the 100-year flood event to model effects from a change in Harris Project operations on downstream resources. Alabama Power has also completed an erosion evaluation and is reviewing all stakeholder comments on lake and downstream erosion and sedimentation and will address those comments in the Final Erosion and Sedimentation Report. Alabama Power is also evaluating how changes to current Project operations may affect nuisance aquatic vegetation. Finally, Alabama Power has compiled a large amount of existing information on the Tallapoosa River fisheries community and is also conducting three studies investigating fish habitat, aquatic resources in the Tallapoosa River, and water quality and water temperature in both Lake Harris and in the Tallapoosa River. For these reasons, Alabama Power believes the issues raised by Mr. Denman are covered in the FERC-approved Study Plan and a new study is not warranted.

3) A New Study of the Downstream River Using Historic Images Overlaid onto Current Imagery

Alabama Power's Response:

Ms. Donna Matthews[8] proposed that Alabama Power conduct a new study using GIS to compare historic imagery to current imagery to evaluate effects of releases downstream of Harris Dam. Ms. Matthews notes that existing data can be used and that Alabama Power can gather historic images and overlay them on current images to determine the effects of the dam on the river downstream. The primary purpose of this study is to address "significant and persistent concerns about erosion" in the Tallapoosa River downstream of Harris Dam.

Alabama Power notes that while this study does not conform to FERC's criteria for additional studies, Alabama Power is committed to evaluating erosion and sedimentation effects on Lake Harris and in the Tallapoosa River downstream of Harris Dam. Alabama Power is reviewing stakeholder comments on the Draft Erosion and Sedimentation Report and will address these comments in the Final Erosion and Sedimentation Report. Further, the FERC-approved Erosion and Sedimentation Study Plan provides adequate methodology to address erosion and sedimentation issues resulting from Harris Project operations.

As noted above, FERC does not require licensees in the relicensing process to study pre-project conditions; however, Ms. Matthews volunteered in the April 28, 2020 ISR Meeting to provide images to Alabama Power that FERC may consider in conducting its cumulative effects analysis for soils and geologic resources, specifically erosion and sedimentation. Alabama Power intends to contact Ms. Matthews to obtain copies of these photos.

[8] Accession No. 20200611-5169.

Note: The large-scale maps referenced in the response to Question #10 are not included in this version of the filing due to file size recommendations for eFiling.

Harris relicensing - response to ISR comments

APC Harris Relicensing <g2apchr@southernco.com>

Fri 7/10/2020 6:58 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Bcc: 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; 9sling@charter.net <9sling@charter.net>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; alpeeple@southernco.com <alpeeple@southernco.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; amanda.mcbride@ahc.alabama.gov <amanda.mcbride@ahc.alabama.gov>; amccartn@blm.gov <amccartn@blm.gov>; ammcvica@southernco.com <ammcvica@southernco.com>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; andrew.nix@dcnr.alabama.gov <andrew.nix@dcnr.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; athall@fujifilm.com <athall@fujifilm.com>; aubie84@yahoo.com <aubie84@yahoo.com>; awhorton@corblu.com <awhorton@corblu.com>; bart_roby@msn.com <bart_roby@msn.com>; baxterchip@yahoo.com <baxterchip@yahoo.com>; bboozer6@gmail.com <bboozer6@gmail.com>; bdavis081942@gmail.com <bdavis081942@gmail.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>

1 attachments (143 KB)

2020-07-10 Response to ISR Comments.pdf;

Harris relicensing stakeholders,

On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

Alabama filed a response to ISR comments with FERC today. The response is attached and can also be found on the relicensing website: www.harrisrelicensing.com under “Relicensing Documents.” Note that the larger scale maps requested by FERC can be found in the HAT 4 – Project Lands folder.

Thanks,

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