Meeting Summary
Harris Relicensing Harris Action Team (HAT) 1 Meeting
April 1, 2021
9:00 am – 11:00 am
Microsoft Teams Meeting

Participants:
Angie Anderegg – Alabama Power Company (Alabama Power)
Dave Anderson – Alabama Power
Wesley Anderson – Alabama Power
Jeff Baker – Alabama Power
Jason Carlee – Alabama Power
Keith Chandler – Alabama Power
Evan Collins – U.S. Fish and Wildlife Service (USFWS)
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Jim Crew – Alabama Power
Colin Dinken – Kleinschmidt Associates (Kleinschmidt)
Scott Fant – Alabama Power
Amanda Fleming – Alabama Power
Todd Fobian – Alabama Department of Conservation and Natural Resources (ADCNR)
Chris Goodman – Alabama Power
Stacey Graham – Alabama Power
Jim Hancock – Balch and Bingham
Jennifer Haslbauer - Alabama Department of Environmental Management (ADEM)
James Hathorn – U.S. Army Corps of Engineers (USACE)
Mike Holley – ADCNR
Martha Hunter – Alabama Rivers Alliance (ARA)
Elise Irwin – U.S. Geological Survey (USGS)
Kelly Kirven – Kleinschmidt
Michael Len – ADEM
Fred Leslie – ADEM
Ashley Lockwood – ADEM
Donna Matthews – Downstream Property Owner
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt
David Moore –ADEM
Barry Morris – Lake Wedowee Property Owners Association (LWPOA)
Kevin Nebiolo – Kleinschmidt
Jessica Nissenbaum – Alabama Power
Kenneth Odom – Alabama Power
Erin Padgett – USFWS
Alan Peeples – Alabama Power
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt
Sheila Smith – Alabama Power
Thomas St. John – Alabama Power
Monte Terhaar – FERC

Jimmy Traylor – Downstream Property Owner
Sandra Wash – Kleinschmidt
Jack West – ARA

Meeting Summary:

Angie Anderegg (Alabama Power) opened the meeting with a safety moment and stated the meeting purpose: to present a summary of the quantitative and qualitative analysis of potential resource effects from the downstream release alternatives. Angie noted the Draft *Downstream Release Alternatives Phase 2 Study Report* would be filed April 12, 2021 with a stakeholder comment period until May 11, 2021. Dave Anderson (Alabama Power) reminded the participants of the downstream release alternatives that were analyzed in the Phase 1 report and provided a summary of the models and assumptions used in the study. Dave presented the effects of the downstream release alternatives on Harris Reservoir elevations, generation, revenue, flood control, navigation, drought operations, and the Martin Project Conditional Fall Extension.

Jimmy Traylor (Downstream Property Owner) asked what the generation would be in megawatts (MWs) with the continuous minimum flow (CMF) of 300 cubic feet per second (cfs). Angie replied the assumption used in the HydroBudget model was approximately 2.5 MWs for the theoretical 300 CMF unit. Angie explained the assumption for all the continuous minimum flow alternatives is that the flow is making power, but the power is provided off-peak with a separate unit. Jimmy inquired if Project resources, including generation for Alabama Power, would benefit if Lake Harris was raised year-round (with updated turbines at Harris Dam). Dave noted that the United States Army Corps of Engineers (USACE) Water Control Manual (WCM) dictates the operations at Lake Harris and the most efficient turbines were installed in the 1970s based on the size and head provided by the reservoir. Jimmy clarified his question, if Alabama Power would benefit financially with a raised operating curve and downstream flow regime that was approved by USACE. Dave explained that the Harris Relicensing Project studies analyze changing the winter rule curve at Lake Harris and providing releases in the Tallapoosa River downstream of the Dam. Specifically, the studies analyze the effects on resources, including generation and revenue to Alabama Power. Barry Morris (Lake Wedowee Property Owners Association, LWPOA) asked for clarification that a third unit would provide the minimum flow. Angie confirmed that the assumption for the model includes a new minimum flow unit that would release the flow and would make power.

Jason Moak (Kleinschmidt Associates (Kleinschmidt)) presented the effects of the downstream release alternatives on water quality and water use. Sarah Salazar (Federal Energy Regulatory Commission (FERC)) asked what stratification layer of the water column was being drawn from for generation. Jason M. confirmed water was being drawn from approximately 30-feet below the surface which, depending on the time of year, is either the metalimnion layer (a transition layer between the epilimnion and hypolimnion layer), or the hypolimnion. Jason M. added that the lake is a dynamic system that varies year-to-year. Jason M. referenced the *Water Quality Study Report* that notes a "u-shaped curve" has been experienced in some years, with a higher dissolved oxygen (DO) layer and warmer temperatures on top, a middle layer exhibiting lower DO, and a bottom layer with higher DO. Jason M. suggested this could be due to runoff and oxygen-demanding organic matter residing in the middle layer. Sarah asked if the models could show how the stratification layer might change under the different alternatives. Jason M. responded that it had not been modeled but major differences would not be expected based on existing information.

Jack West (Alabama Rivers Alliance (ARA)) inquired on the status of existing aeration devices. Jason M. responded that Alabama Power has draft tube aeration on the existing turbines that are operated in the low-DO season as well as a moveable sill that was incorporated into the design to allow the intake to draw from different layers in water column. Jason M. noted that the sill has been in the uppermost position for the last 15-20 years drawing from relatively high in the water column.

Allan Creamer (FERC) inquired if the hypothetical unit to capture the minimum flows would also be designed with aeration. Angie confirmed, as any flow that is passed from the Harris Dam would also need to meet the state water quality standard. Allan provided a hypothetical scenario where the weir is in its uppermost position (not varying) with the lake level elevation decreasing one foot. Allan stated that in theory more of the upper layer in the summer would be heated by the sun and would expect increased temperatures downstream. Jason M. noted that in this scenario the opposite effect also occurs. Jason M. explained that retention time would be reduced, so there would be less time for the water to be heated by the sun. Allan stated he would expect a little variation but that it may not be significant and that the two scenarios could potentially cancel each other. Jason. M. agreed that the two scenarios would likely cancel each other. Allan stated that temperature impacts could be modeled but may be beneficial to monitor the temperature post-implementation.

Jason M. presented the results on Erosion and Sedimentation and mentioned general trends downstream of Harris Dam. Regarding the table on slide 27 in the presentation, Sarah asked why the 300 CMF does not follow those general trends, specifically why the average daily fluctuations increased at 1 mile downstream under the 600 CMF+Green Plan (GP) compared to the 300 CMF+GP. Jason M. noted the data would be rechecked to confirm there was not an error in the presentation[1].

Jason M. presented the Aquatic Resources analysis regarding aquatic habitat, temperature, and fish entrainment. Keith Chandler (Alabama Power) asked for clarification on the Daily Average Wetted Perimeter Fluctuation table (slide 36). Jason M. explained that the percent changes in the table show the differences from existing conditions (GP) in daily average wetted perimeter fluctuation. For example, the 800 CMF alternative at two miles downstream shows wetted perimeter fluctuations would be reduced by 82% compared to baseline conditions.

Jason M. noted the HEC-RAS model revealed little difference in overall average water temperatures between each downstream release alternative at all locations analyzed; however, a noticeable difference in daily temperature fluctuations was present closer to Harris Dam. Barry asked for clarification on his interpretation that under any continuous minimum flow alternative, temperature variations would still exist downstream when generating. Jason M. noted that while the average temperature does not change between the alternatives, the daily fluctuation in temperature is smaller under some of the minimum flow alternatives. Angie confirmed that a delta or change in temperature does exist under any alternative. Jason M. added that daily 2–3-degree Celsius (°C) deltas can be present in unregulated streams on a summer day with natural conditions. Sarah requested that parameters (in graphs and boxplots) be defined in each graph to aid in data interpretation. Jack stated that daily short-term temperature variations decrease as minimum flow alternatives increase. With regard to the new minimum flow unit, Jack asked if

[1] There was an error in the presentation and the results are accurately portrayed in the Draft *Downstream Release Alternatives Phase 2 Study Report*. The table has been corrected in the attached presentation.

the flows would be drawn from higher in the reservoir or at the same depths as the main units. Jason M. replied that the assumption is that the flows from the theoretical unit would be drawn from the same depth and existing penstock, and that is why the average temperatures are not changing.

Regarding a potential new unit and penstock location, Allan asked if a new unit could be designed to draw water from higher in the water column. Angie stated that an engineering design analysis would have to be completed, but a new intake may require boring into the dam. Allan stated that if a minimum flow is drawing from higher in the water column, it could potentially put warmer water downstream and decrease temperature fluctuations but noted design considerations and limitations. Keith added that deltas would likely increase under that scenario when the existing units were loaded. Jason M. also added that deltas decrease with a CMF due to having more water in the channel as it prevents the water from getting shallower and experiencing thermal heating.

Jason M. presented results on wildlife and terrestrial resources and threatened and endangered (T&E) species. Sarah asked if there were any results for state-listed species. Jason M. noted he was unsure if there were any state-listed species in the Project Area. Angie noted Alabama Power would confirm[2]. Sarah asked how littoral and wetland types may shift, in terms of acreage under the different alternatives. Jason M. stated that this information is in the report. Jack asked if the analysis considered the Finelined Pocketbook (*Hamiota altilis*) (mussel) critical habitat that is located upstream of the reservoir. Jason M. confirmed and noted that the critical habitat is upstream of the reservoir and outside of the area that fluctuates. In addition, none of the downstream release alternatives increase the elevation of the reservoir, thus, there is no effect upstream. Jack asked if greater releases downstream could potentially lower the elevation of the lake in a way that impacts the critical habitat. Jason M. responded that if the lake is lower, that transitional section from flowing water into lake habitat would shift further downstream; however, since the critical habitat is above the current reservoir fluctuations, lower lake levels shouldn't impact the area.

Colin Dinken (Kleinschmidt) and Dave presented recreation results. Martha Hunter (ARA) stated that effects on the lake and downstream resources are both important and there are a lot of issues to consider. Martha asked if Alabama Power budgeted for a new generator that would allow for a CMF. Angie responded no and explained that a theoretical unit was used in the modeling. Martha noted that although the unit is theoretical, the study results and the impacts to Project resources suggest there will be some sort of upgrade to the equipment at Harris. Under the assumption that a more efficient generator would be installed, Martha asked if an ideal lake level could first be determined to dictate the amount of flow released downstream. Kelly Schaeffer (Kleinschmidt) replied no and noted that Alabama Power evaluated the alternatives that were proposed by stakeholders and FERC. Kelly added that if a minimum flow is selected, Alabama Power will then evaluate how to provide the flow. Kelly stated that the Preliminary Licensing Proposal (PLP) will incorporate all the study results and contain Alabama Power's operating proposal. Martha asked if Alabama Power would be required to modify the proposal if FERC disagreed. Kelly replied that Alabama Power's goal is to ensure FERC has been provided enough information to make a decision, but FERC could request additional information or clarification. Sarah encouraged stakeholders to provide comments on the PLP. Sarah added that there is an

[2] The Lipstick Darter (*Etheostoma chuckwachatte*) is a state-protected fish species occurring downstream of Harris Dam. The Finelined Pocketbook (*Hamiota altilis*) is a federal and state-protected mussel species with critical habitat located in the Tallapoosa River upstream of Harris Reservoir.

additional comment period on the Final License Application (FLA), and FERC will consider stakeholder comments and recommendations. Sarah asked what criteria were used to determine which lake structures were removed from the recreation analysis, and Colin replied that a field inventory was performed to confirm the imagery, and structures that were severely damaged, appeared to be unmaintained or unused, or were under construction were omitted from the analysis.

Amanda Fleming (Alabama Power) presented results of the cultural analysis. Sarah inquired about the results of the table on slide 59, specifically that the third column represents the increase in percent of time that sites would be inundated versus the total. Amanda confirmed and added that Pre-GP is negative and represents less time of inundation compared to baseline (GP).

Barry mentioned when the GP was first being considered, one of the options was a re-regulation dam downstream that would provide a smaller lake to capture water and release flow slowly. Barry asked if that was still an option. Angie responded that it was eliminated when the GP was being evaluated as it essentially created an additional lake and potential adverse impacts to environmental resources. Jack noted that Alabama Power is in the process of completing the Battery Energy Storage System (BESS) study and inquired if it would be reevaluated with the other alternatives. Angie replied that the BESS analysis is being considered separately due to comparison constraints. Angie explained that models with operating rules exist in the Downstream Release Alternatives Study, with one rule being that the Project is to operate for power/peaking. Angie added that the power/peaking would be removed under the BESS alternative and would require new operating rules, which is beyond the scope of the analysis. Angie noted the analysis has been completed, including the impacts on aquatic resources and recreation, and the report will be filed on April 12, 2021 for review and comment.

The meeting concluded.

HAT 1 Meeting
Downstream Release Alternatives - Phase 2 Analyses

R.L. Harris Dam Relicensing
FERC No. 2628

April 1, 2021

Meeting Etiquette

- ❑ Be patient with technology issues
- ❑ Follow the facilitator's instructions
- ❑ Phones will be muted during presentations
- ❑ Follow along with PDF of presentations
- ❑ Use the "chat" feature in Microsoft Teams or write down any questions you have for the designated question section
- ❑ Facilitator will ask for participant questions following sections of the presentation
- ❑ Clearly state name and organization when asking questions
- ❑ Meeting will be recorded to assist with meeting notes

HARRIS DAM RELICENSING

Safety and Roll Call

Spring is here!

Meeting Purpose

- Present a summary of the quantitative and qualitative analysis of potential resource effects from the downstream release alternatives.

- Used the modeling results from Phase 1 along with FERC-approved relicensing study results and existing information

- Draft Phase 2 Report will be filed **April 12, 2021**

- Comments on draft report due on **May 11, 2021**

Relicensing Review

- Much data/reports on the Harris Project resources exists – see https://harrisrelicensing.com

- Summary level Presentation today
  - Reports available for review & comment April 12
  - Read the reports for details

- If you have concerns about current operations, contact Alan Peeples in Reservoir Management
  - Today's focus is the summary of operating alternatives

- 11 alternatives analyzed
  - All alternatives include the Harris Dam and peaking operations
  - **Baseline** for relicensing is the existing condition, which includes Harris Dam, powerhouse, Lake Harris

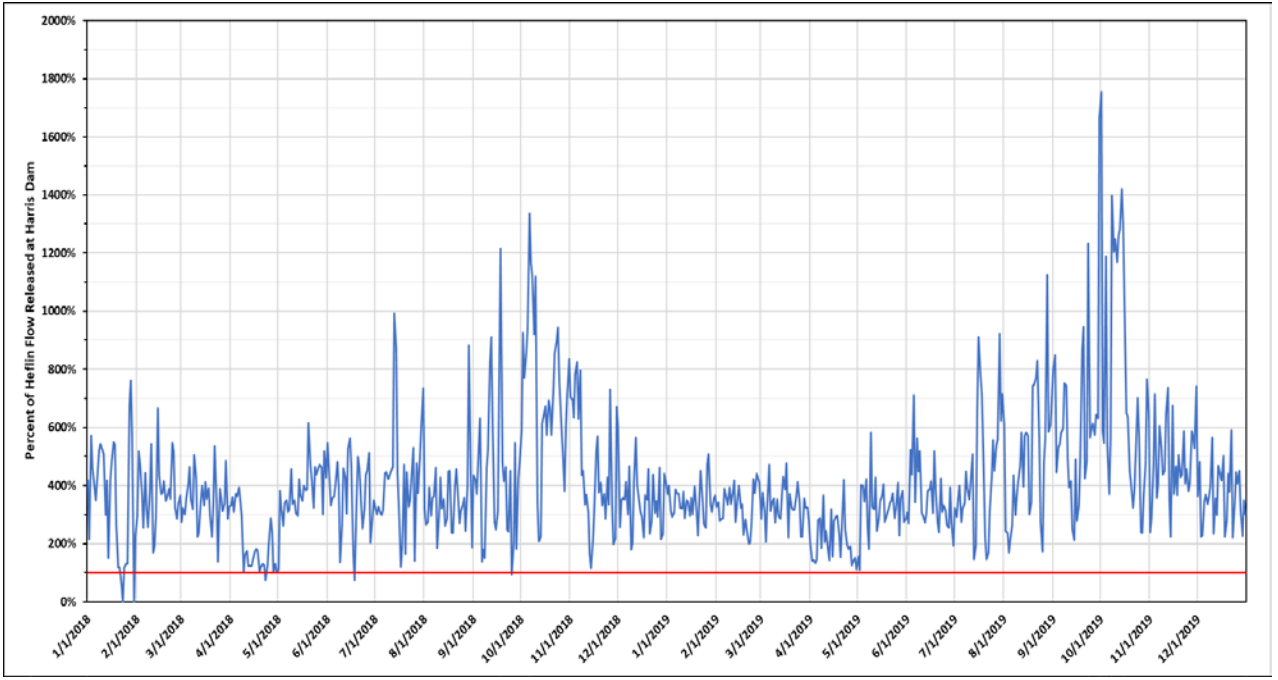
Agenda

- Present a Summary of Effects of the Downstream Release Alternatives Phase 2 Analysis by resource area
  - Hydrologic Model Summary
  - Operational Parameters
  - Martin Conditional Fall Extension
  - Water Quality
  - Water Use
  - Erosion and Sedimentation
  - Aquatic Resources (Temperature, Habitat, Fish spawning, and Entrainment)
  - Wildlife, Threatened and Endangered Species
  - Terrestrial Wetlands
  - Recreation
  - Cultural

Review of Alternatives Analyzed in Phase 2

Name/Description	Abbreviation
Green Plan (baseline or existing condition) – pulsing flows as described in the Green Plan release criteria	GP
Pre-Green Plan (peaking only; no pulsing or continuous minimum flow)	PreGP or PGP
Modified Green Plan	ModGP
150 cfs continuous minimum flow (CMF)	150CMF
300 cfs continuous minimum flow	300CMF
600 cfs continuous minimum flow	600CMF
800 cfs continuous minimum flow	800CMF
A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing described in the existing Green Plan release criteria	150CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 300 cfs and the pulsing described in the existing Green Plan release criteria	300CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 600 cfs and the pulsing described in the existing Green Plan release criteria	600CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 800 cfs and the pulsing described in the existing Green Plan release criteria	800CMF+GP

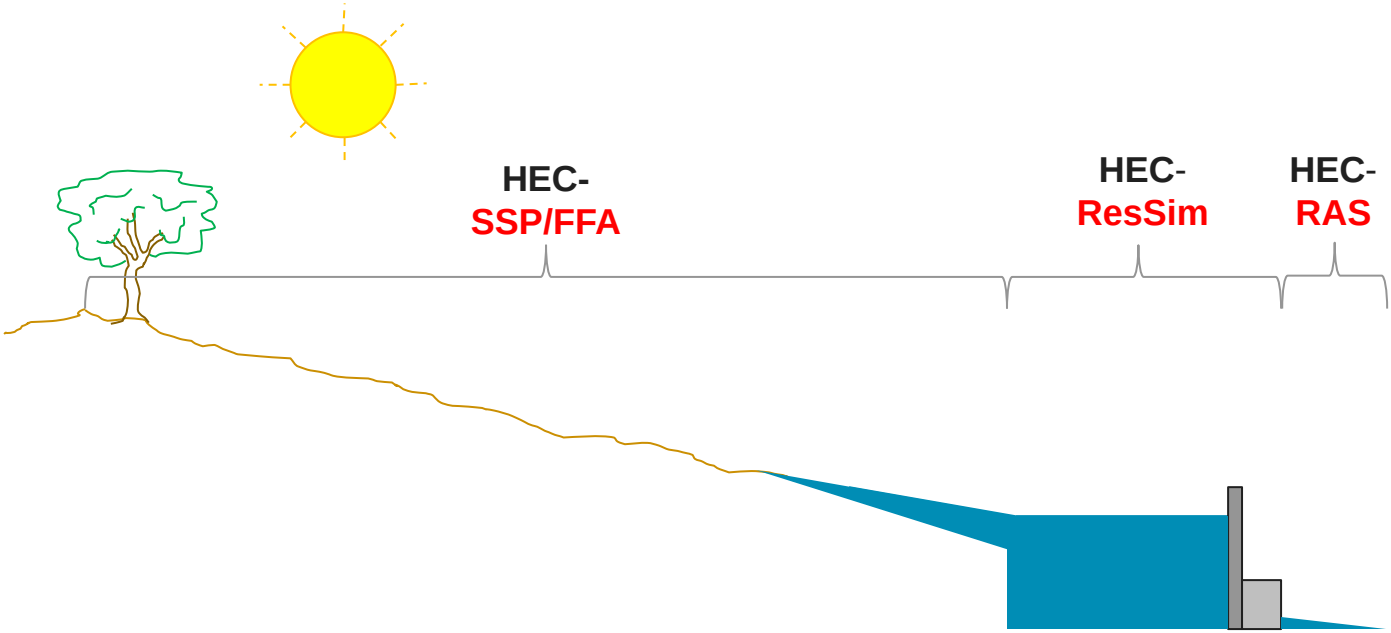
Review of Alternatives Analyzed in Phase 2



RELEASES FROM HARRIS DAM IN 2018 AND 2019 COMPARED TO 100% FLOW AT THE USGS HEFLIN GAGE

HARRIS DAM RELICENSING

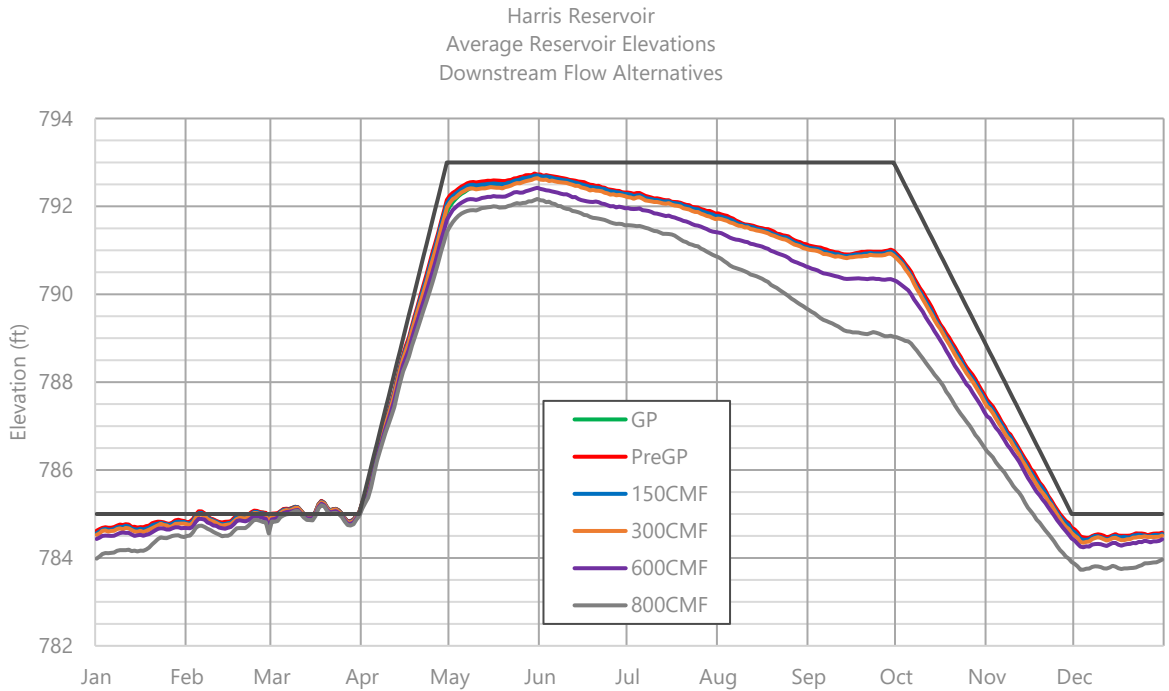
Hydrologic Models



Operations Model Assumptions

- A rule for peaking operations is included in all simulations.
- The minimum elevation for Harris Reservoir is 770.5 feet msl.
- Pre-Green Plan: The release criteria from the Green Plan contained in the model were removed.
- Continuous Minimum Flows: A new continuous release rule replaces the current Green Plan release rule. The releases were reduced to 85 cfs when the flows at the Heflin gage drop below 50 cfs. This is the drought cutback in the current Green Plan.
- Continuous Minimum Flows + Green Plan: A new continuous release rule is added with the current Green Plan release rule. Both rules reduce their releases to 85 cfs when the flows at the Heflin gage drop below 50 cfs. This is the drought cutback in the current Green Plan.
- A theoretical minimum flow unit that uses same intake as existing Harris unit to produce power.

Operations Analysis



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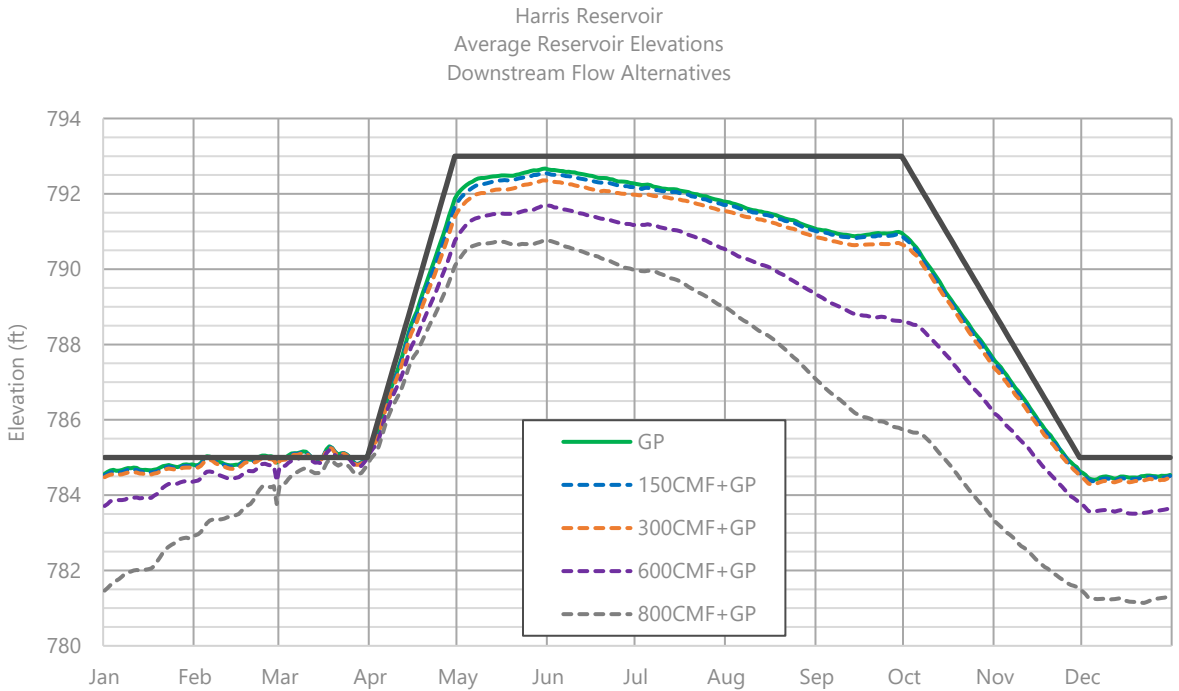

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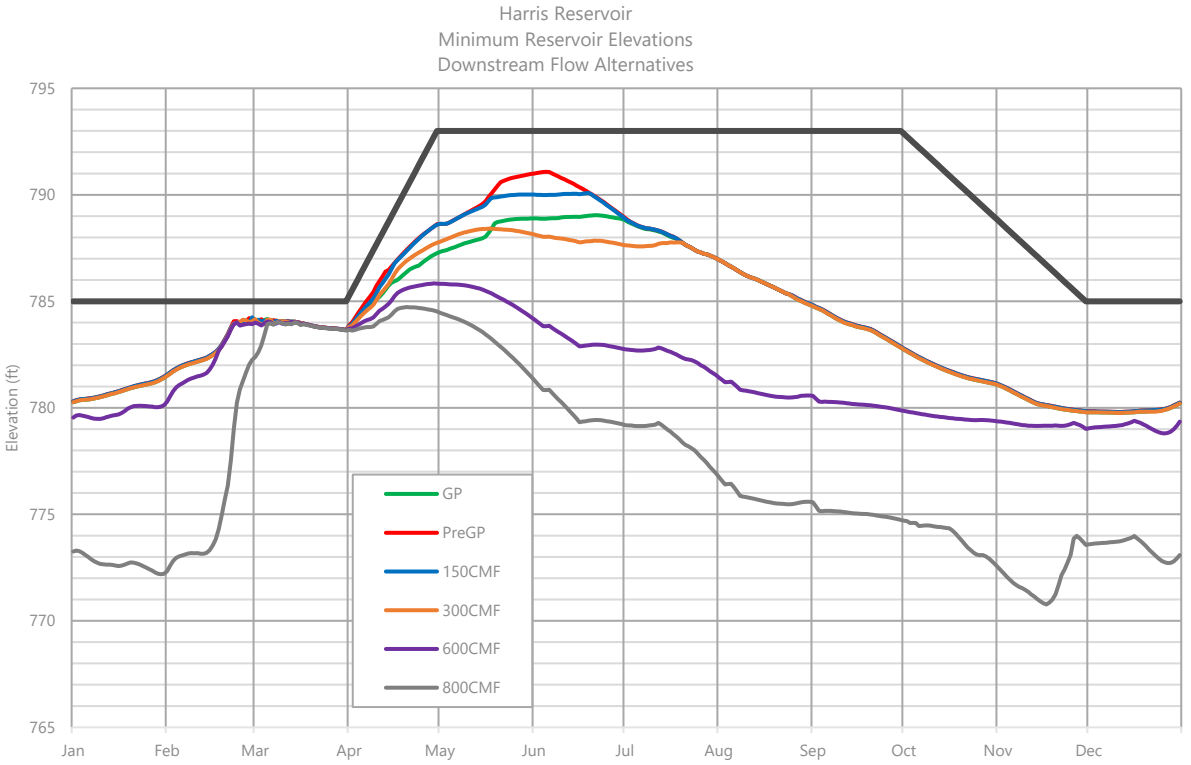

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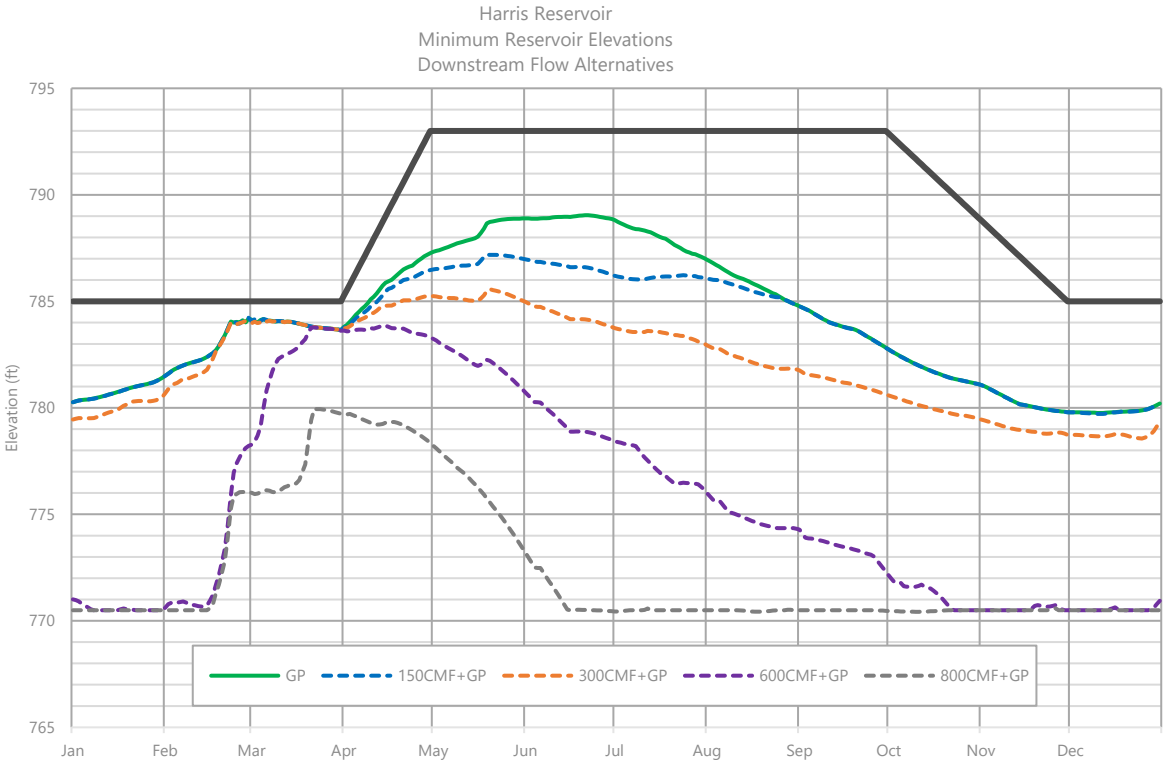

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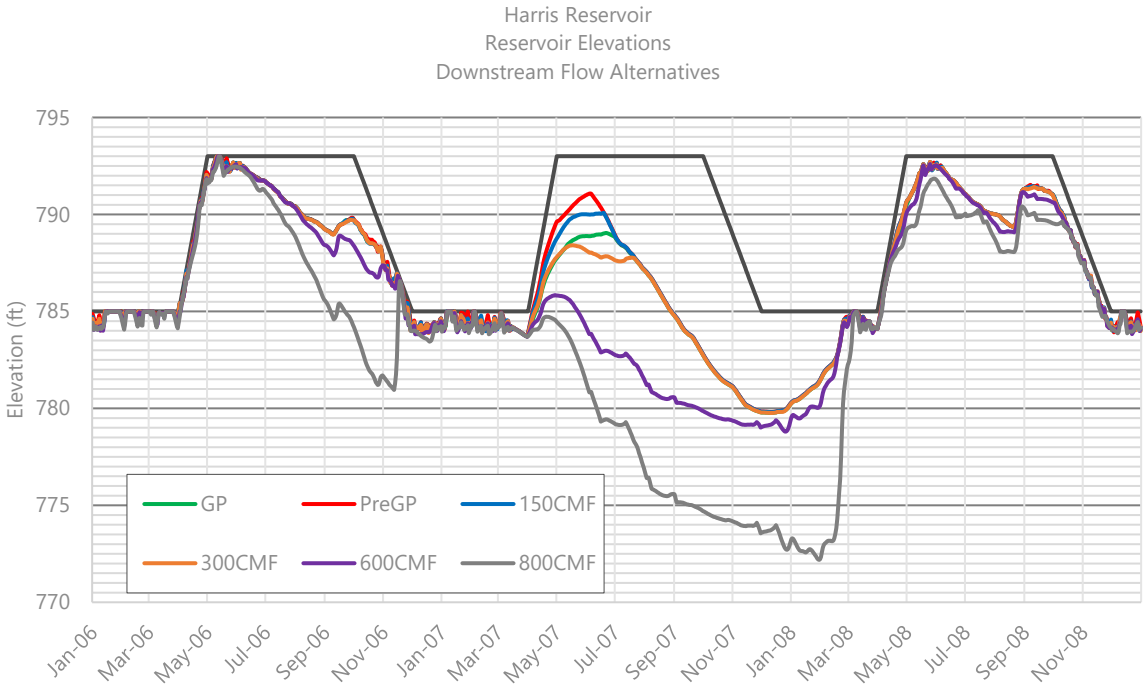

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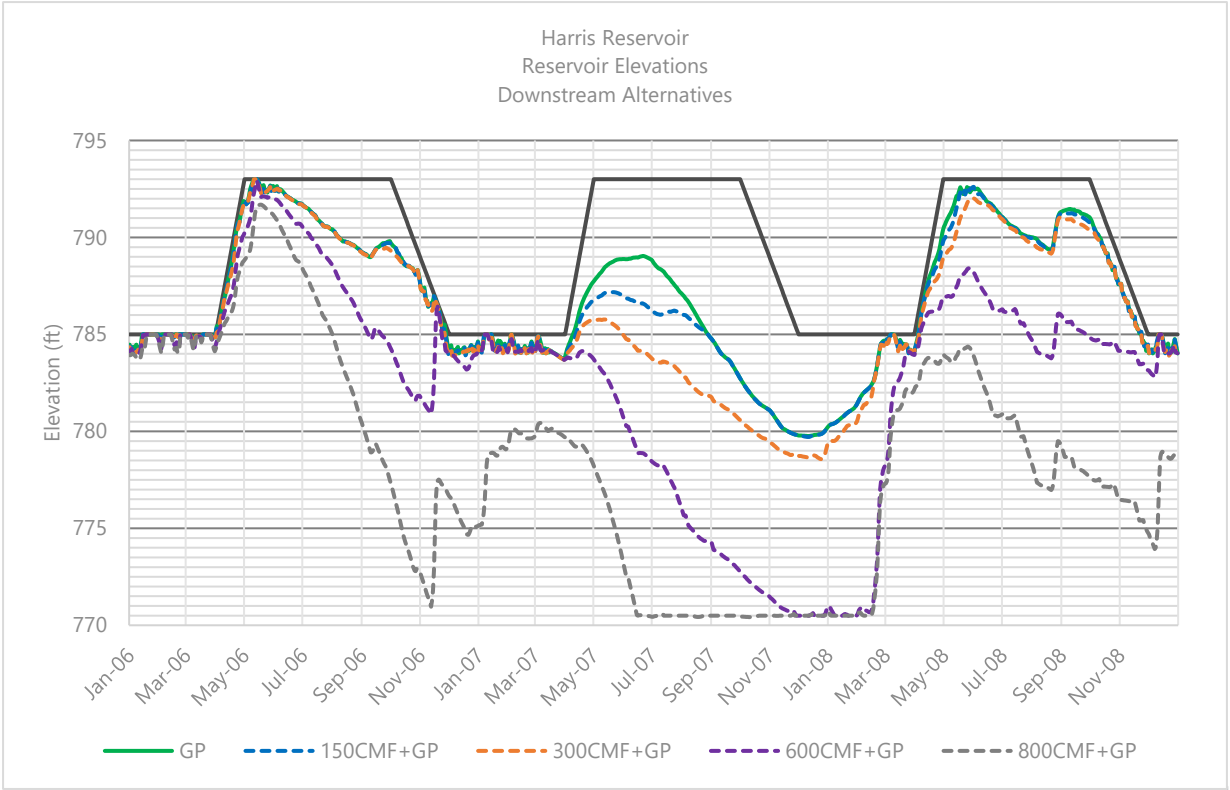

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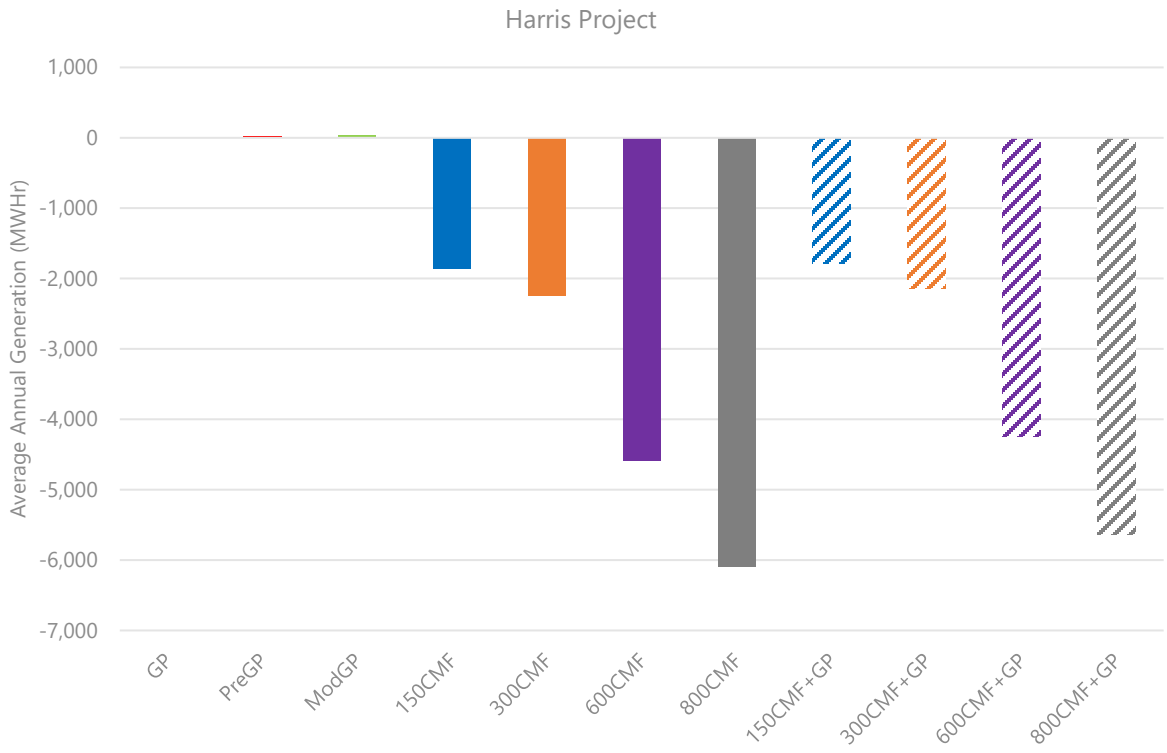

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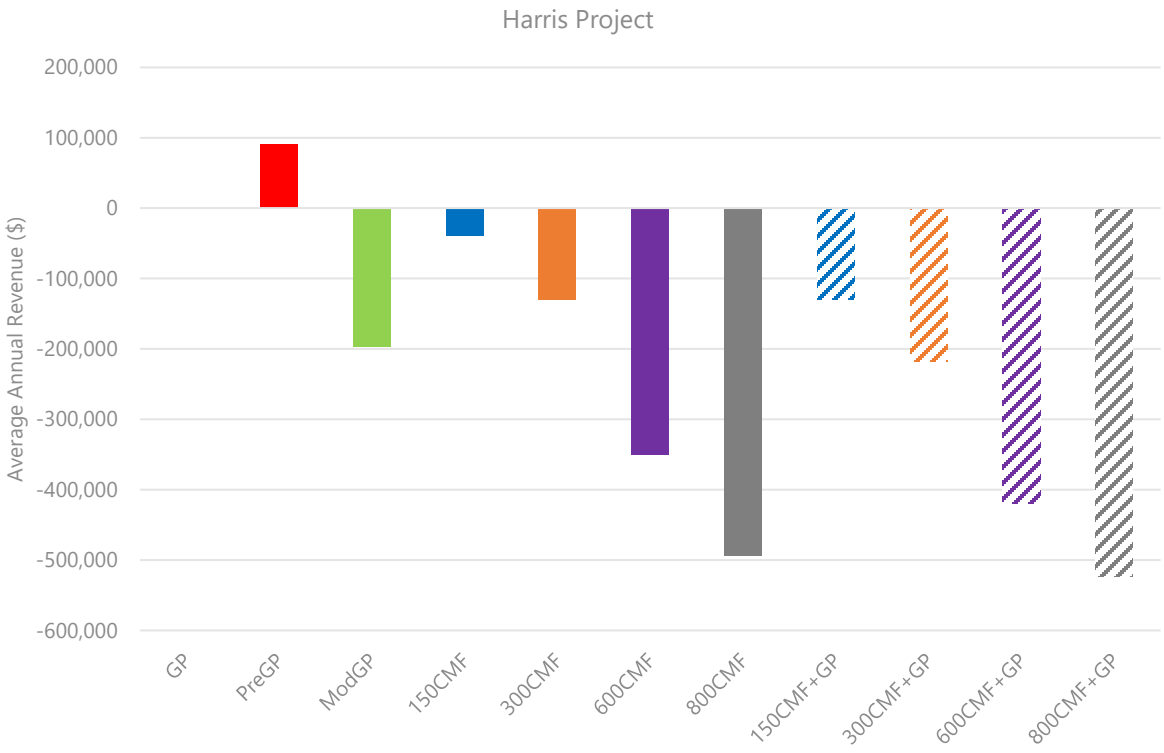


Operations Analysis

Flood Control

- The downstream release alternatives were modeled with the current USACE-approved flood control procedures that are incorporated into the daily HEC-ResSim model. Modifying the downstream releases would not impact this operation.

Navigation

- Altering downstream releases will not impact to the number of days over the period of record that each alternative would support navigation releases under each of the downstream release alternatives.

Drought Operations

- The HEC-ResSim model was used to evaluate how drought operations may be positively or adversely affected by the downstream release alternatives.
- Little storage is available in Harris Reservoir compared to other storage projects within the ACT basin.
  - Therefore, there is no change in the percentage of time spent over the period of record in each drought intensity level.

Martin Project Conditional Fall Extension Analysis

Article 403 of the Martin Project license requires Alabama Power to evaluate four conditions annually, beginning July 14, to implement the conditional fall extension (CFE), where the flood control curve remains at elevation 491 feet msl from September 1 to October 15.

Conditions

1. Lake Martin is above its operating curve during September (487 to 488.5 feet msl).

2. The rolling 7-day average total basin inflow (i.e., the average of the total daily basin inflow for the previous 7 days recalculated on a daily basis for a given period of time) on the Tallapoosa River, calculated at Thurlow Dam, is at or higher than the median flow (i.e., the median of the recorded daily flows over the period of record for the particular day of interest).

3. The rolling 7-day average total basin inflow on the Coosa River, calculated at Jordan Dam, is at or higher than the median flow.

4. The elevations at the Weiss, Neely Henry, and Logan Martin developments on the Coosa River and the R.L. Harris Project on the Tallapoosa River must all be within 1 foot of their respective operating curves.

Martin Project Conditional Fall Extension Analysis

NUMBER OF YEARS OVER THE PERIOD OF RECORD (1939-2011) THE CONDITIONAL FALL EXTENSION IS IMPLEMENTED AT THE MARTIN DAM PROJECT BASED ON HEC-RESSIM MODEL OF DOWNSTREAM RELEASE ALTERNATIVES AT HARRIS DAM

Alternative	Implementation of Martin Conditional Fall Extension		
	Number of Years (Over Period of Record)	Number of Years Compared to Baseline	Percent of Time (Over Period of Record)
GP (Baseline)	19	-	26%
PreGP	25	6	34%
150CMF	22	3	30%
300CMF	20	1	27%
600CMF	14	-5	19%
800CMF	14	-5	19%
150CMF+GP	18	-1	25%
300CMF+GP	13	-6	18%
600CMF+GP	10	-9	14%
800CMF+GP	6	-13	8%

Water Quality Analysis

Methods

- Data from the PAD, Baseline Water Quality Report, and results from the FERC-approved Water Quality Study were used to qualitatively describe potential effects on dissolved oxygen in the tailrace and forebay water quality that may occur due to change in downstream releases.

Results

- Lake Harris
  - 600CMF and 800 CMF resulted in lower average and minimum elevation compared to the GP, 150 CMF, and 300CMF alternatives.
    - This could reduce retention times compared to the GP and theoretically result in lower surface water temps and less stratification

- Downstream
  - Continuous releases may provide additional aeration, having a beneficial effect on dissolved oxygen in the tailrace
  - Each downstream release alternative that results in lower average lake level elevations would likely result in changes to tailrace water quality.
  - As the depth from the lake surface to the intake becomes shallower, water withdrawn by Harris Dam for generation would theoretically be warmer and have higher dissolved oxygen concentrations.

Water Use Analysis

Methods

- Qualitatively assessed using results from:
  - HEC-ResSim modeling
  - HEC-RAS modeling
  - Water Quantity, Water Use, and Discharges Report

Results

- Lake Harris
  - The Lakeside Campground and Marina – no effect
  - The Wedowee Water, Sewer, and Gas Board
    - 600CMF+GP, 800CMF and 800CMF+GP result in lower winter pools
      - These alternatives could occasionally draw the reservoir level nearly fifteen feet below winter pool, reducing the amount of available water for use in Harris Reservoir.
- Downstream
  - No effect

Erosion and Sedimentation Analysis

Methods

- Assessments were used from the Erosion and Sedimentation Study

- HEC-RAS model (downstream)
  - Results were used to produce daily average water surface fluctuations for the study area (Harris Dam through Horseshoe Bend)

  - Analyzed to produce fluctuation exceedance curves at representative locations downstream of Harris Dam

  - Daily fluctuations were calculated for each day of the year for each downstream release alternative then ranked from greatest to least and assigned an exceedance probability

  - These factors were weighed against bank and soils conditions to qualitatively assess potential for bank degradation or erosion

HARRIS DAM RELICENSING

Erosion and Sedimentation Analysis

Results

- Lake Harris – No Effect
  - Erosion areas exist at or above the existing full pool elevation
  - While lower reservoir elevations could reduce wind and boat induced wave action affecting these areas, the proposed downstream releases will not affect identified erosion areas on Harris Reservoir

Erosion and Sedimentation Analysis

Results

- Downstream
  - Daily average fluctuations at the 15 most impaired streambank areas downstream of Harris Dam range from less than one foot to more than three feet depending on the downstream release alternative at each area.
  - Generally, fluctuations decrease further downstream due to flow attenuation
  - Because water fluctuation can exacerbate bank erosion, the daily fluctuations were calculated by determining the difference between daily maximum and minimum water surface elevations. The values were subsequently ranked from greatest to least and assigned an exceedance probability.

Erosion and Sedimentation Analysis

AVERAGE DAILY WATER SURFACE ELEVATION FLUCTUATIONS (IN FEET)

Alternative	Miles Below Harris Dam										
	0.4	1	2	4	7	10	14	19	23	38	43
PreGP	4.67	4.38	4.17	4.47	3.26	2.68	3.66	3.06	2.03	0.92	1.80
GP	4.62	4.24	3.99	4.22	3.20	2.56	3.60	3.01	2.01	0.92	1.79
ModGP	4.18	3.96	3.80	3.95	3.00	2.45	3.53	2.96	1.98	0.90	1.74
150CMF	4.10	3.94	3.81	4.07	3.15	2.56	3.63	3.02	2.01	0.93	1.80
300CMF	3.59	3.51	3.44	3.72	2.96	2.34	3.54	2.99	1.99	0.92	1.74
600CMF	2.84	3.51	2.86	3.14	2.56	2.01	3.17	2.82	1.92	0.90	1.68
800CMF	2.50	2.57	2.57	2.85	2.34	1.83	2.97	2.70	1.85	0.88	1.63
150CMF+GP	4.06	3.86	3.71	3.91	3.04	2.44	3.54	2.99	2.00	0.91	1.75
300CMF+GP	3.53	3.43	3.33	3.56	2.84	2.23	3.41	2.92	1.96	0.91	1.72
600CMF+GP	2.78	2.80	2.77	3.03	2.46	1.95	3.11	2.77	1.88	0.89	1.65
800CMF+GP	2.43	2.49	2.49	2.76	2.26	1.79	2.95	2.67	1.82	0.86	1.61

Aquatic Resources Analysis

Methods

- Aquatic Habitat
  - Used info from the Downstream Aquatic Habitat Study
  - Each downstream release alternative was simulated using the HEC-RAS model
    - Hourly time-series of wetted perimeter values at multiple river cross sections; This data analyzed with same methodology employed in the Downstream Aquatic Habitat Study to assess the amount and stability of wetted habitat.

- Temperature Downstream
  - Water temperature data was used from 2019-2020 to calibrate data for the HEC-RAS model
  - Two weeks of Spring (April), Summer (July) and Fall (Sept.) were simulated
  - HEC-RAS model generated an hourly time-series of water temperature for each downstream release alternative

- Fish Entrainment
  - Reviewed info from Desktop Fish Entrainment and Turbine Mortality Report (PAD Appendix M)
  - The effect of downstream release alternatives on fish entrainment at the Harris Project were assessed based on changes in volume and velocity of water passing the turbines.

Aquatic Resources Analysis

Results

- Lake Harris
  - The higher CMF alternatives (600CMF and 800CMF) would result in lower average elevations in Harris Reservoir compared to GP, 150CMF, and 300CMF, reducing the amount of littoral habitat for juvenile fish and mollusks.
  - Lower elevations could reduce retention time and cause less thermal stratification, which could theoretically reduce the amount of cooler, oxygenated water during the summer months necessary for the survival of Striped Bass

- Fish Entrainment
  - The volume and velocity of water passing through the turbines would not differ among downstream release alternatives; therefore, fish entrainment is not expected to change under any of the downstream release alternatives.

Aquatic Resources Analysis

Results

- Downstream Aquatic Habitat – Wetted Perimeter

  - All Downstream releases, except the PreGP, increases wetted perimeter compared to the GP
    - ModGP resulted in the smallest increase, while the 800CMF resulted in the largest
    - Wetted perimeter increases generally diminished for each alternative with increasing distance from Harris Dam

  - The addition of GP pulse to the CMF alternatives did not increase wetted perimeter

Aquatic Resources Analysis

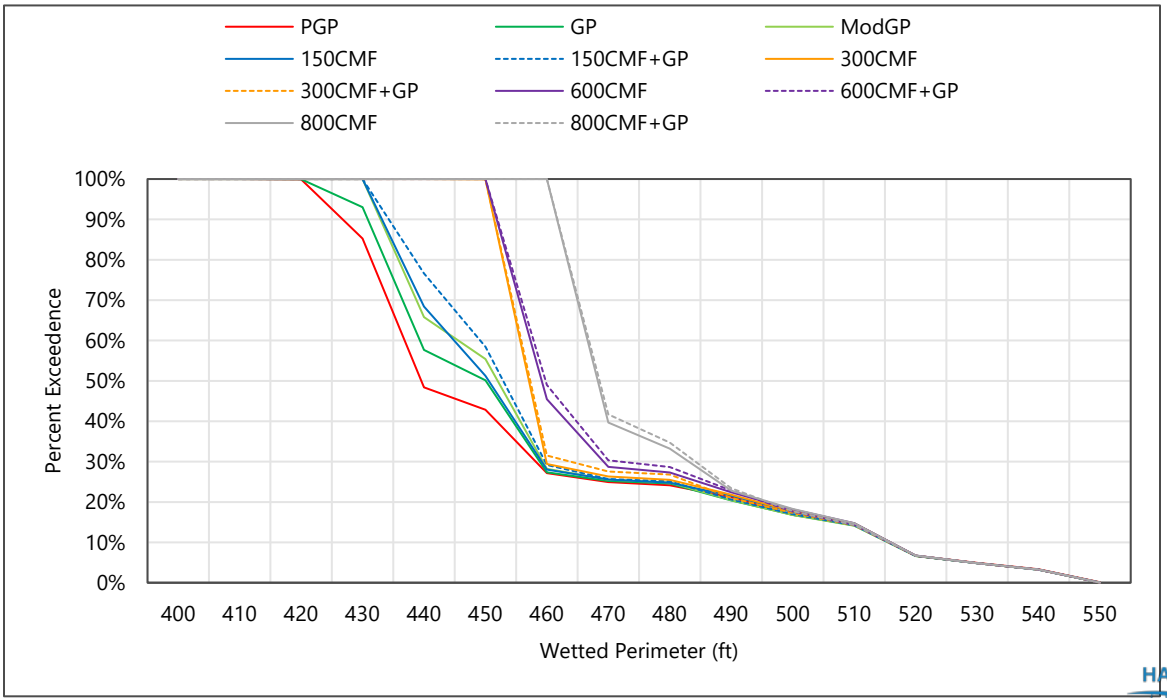
DIFFERENCE FROM EXISTING CONDITIONS (GP) IN AVERAGE WETTED PERIMETER

	Miles Below Harris Dam Habitat Type										
	0.4	1	2	4	7	10	14	19	23	38	43
Alternative	Riffle	Riffle	Riffle	Pool	Pool	Riffle	Run-Pool	Riffle-Run	Riffle	Riffle	Pool
PreGP	-1.2%	-0.5%	-2.2%	-0.2%	-2.0%	-0.3%	-0.1%	-0.6%	-0.5%	-0.1%	-0.1%
GP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ModGP	2.2%	0.6%	2.3%	0.2%	2.8%	0.5%	0.3%	0.6%	0.5%	0.5%	0.1%
150CMF	2.5%	0.7%	2.4%	0.2%	2.3%	0.5%	0.3%	0.7%	1.1%	0.6%	0.3%
150CMF+GP	3.0%	1.0%	3.4%	0.3%	3.5%	0.6%	0.3%	1.0%	1.0%	0.6%	0.2%
300CMF	5.8%	2.2%	6.8%	0.5%	6.0%	1.1%	0.6%	2.4%	2.8%	1.3%	0.7%
300CMF+GP	6.3%	2.4%	7.0%	0.5%	6.6%	1.2%	0.6%	2.7%	3.0%	1.3%	0.7%
600CMF	10.9%	3.2%	8.3%	1.0%	10.6%	1.9%	1.0%	7.1%	7.2%	2.2%	1.4%
600CMF+GP	11.1%	3.3%	8.4%	1.0%	10.8%	1.9%	1.0%	7.1%	7.4%	2.2%	1.4%
800CMF	14.1%	4.0%	9.1%	1.2%	12.4%	2.4%	1.2%	10.9%	10.6%	2.8%	1.9%
800CMF+GP	14.1%	4.1%	9.2%	1.2%	12.5%	2.4%	1.2%	10.8%	10.8%	2.8%	1.9%

HARRIS DAM RELICENSING

Aquatic Resources Analysis

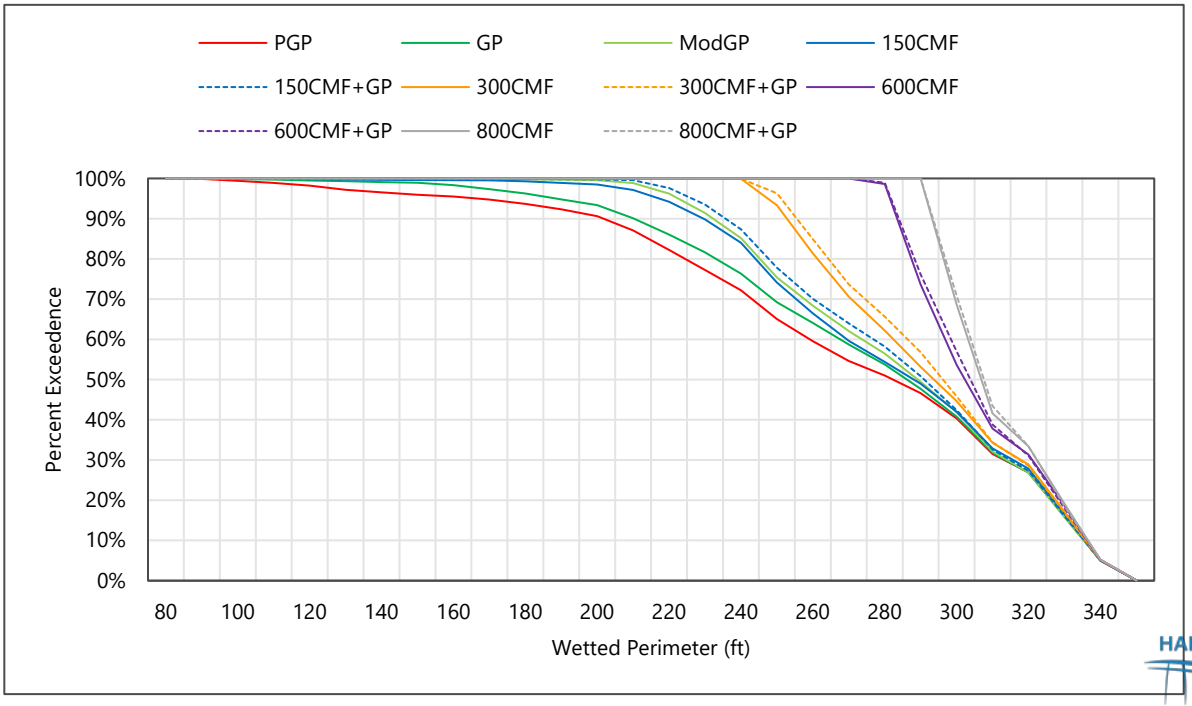
Results



Aquatic Resources Analysis

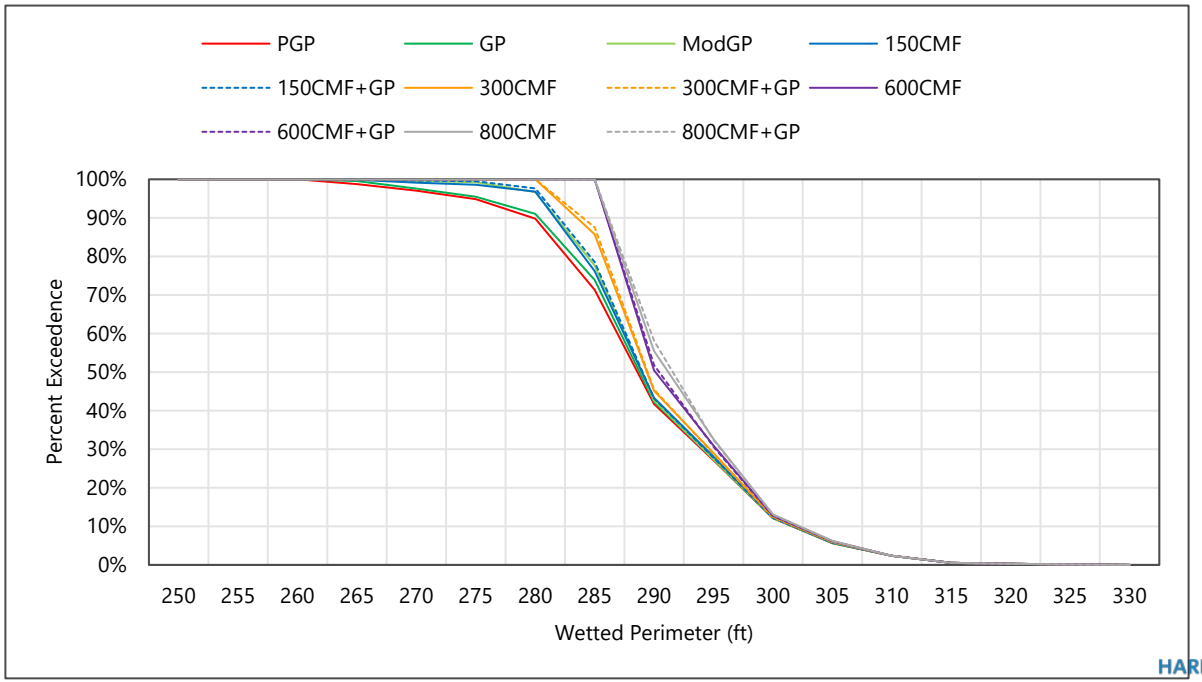
Results

Wetted Perimeter Duration: **7.5 miles** Below Harris Dam



Aquatic Resources Analysis

Results



Aquatic Resources Analysis

Results

- Downstream Aquatic Habitat - Habitat Stability
  - All Downstream release alternatives, excluding the PreGP, resulted in decreased wetted perimeter fluctuations (i.e., increased stability)
  - ModGP resulted in the smallest percent decrease in wetted perimeter fluctuation over existing conditions (GP) – ranging from 0-21 percent
  - Wetted perimeter fluctuations generally diminished for each alternative with increasing distance from Harris Dam
  - 800CMF resulted in the largest percent decrease in fluctuations, ranging from 1 to -78 percent
  - The addition of GP pulse to the CMF alternatives did not increase wetted perimeter stability

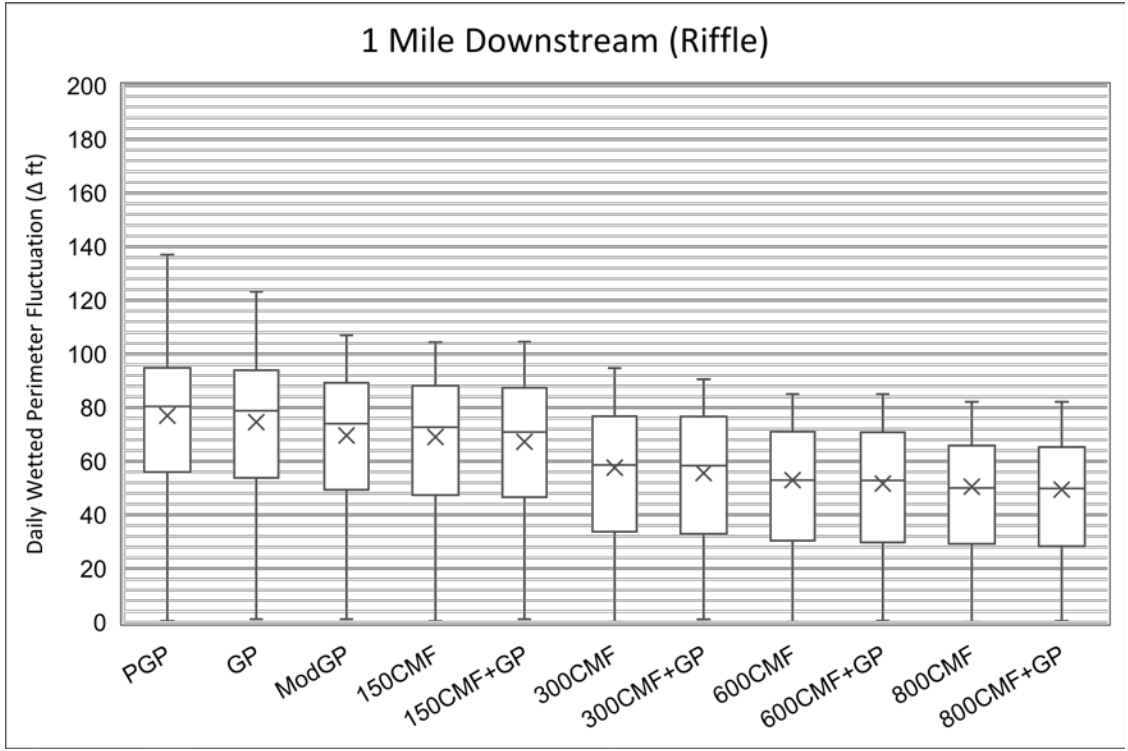
Aquatic Resources Analysis

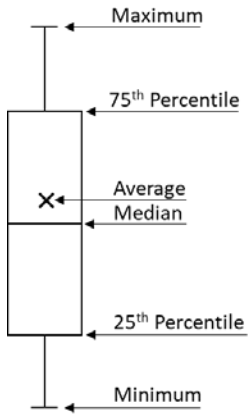
DIFFERENCE FROM EXISTING CONDITIONS (GP) IN DAILY AVERAGE WETTED PERIMETER FLUCTUATION

Alternative	Miles Below Harris Dam Habitat Type										
	0.4	1	2	4	7	10	14	19	23	38	43
	Riffle	Riffle	Riffle	Pool	Pool	Riffle	Run-Pool	Riffle-Run	Riffle	Riffle	Pool
PreGP	-1%	3%	5%	13%	16%	5%	4%	2%	0%	1%	1%
GP	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
ModGP	-15%	-7%	-21%	-9%	-19%	-7%	-9%	-2%	0%	-5%	-4%
150CMF	-20%	-7%	-31%	-7%	-11%	-3%	-5%	1%	1%	-3%	-2%
150CMF+GP	-19%	-10%	-32%	-10%	-19%	-8%	-10%	-1%	1%	-5%	-5%
300CMF	-37%	-23%	-68%	-14%	-31%	-13%	-13%	0%	3%	-9%	-9%
300CMF+GP	-37%	-25%	-70%	-18%	-35%	-16%	-16%	-3%	2%	-10%	-10%
600CMF	-61%	-29%	-78%	-28%	-56%	-22%	-23%	-5%	4%	-14%	-20%
600CMF+GP	-61%	-31%	-78%	-30%	-58%	-24%	-25%	-8%	2%	-15%	-21%
800CMF	-77%	-32%	-82%	-35%	-64%	-26%	-28%	-16%	2%	-17%	-27%
800CMF+GP	-78%	-34%	-82%	-37%	-66%	-28%	-29%	-17%	1%	-18%	-27%

Aquatic Resources Analysis

WETTED PERIMETER FLUCTUATION SUMMARY PLOT





Aquatic Resources Analysis

Results

- Downstream Aquatic Habitat – Temperature
- HEC-RAS model revealed little difference in overall average water temperatures between each downstream release alternative at all locations analyzed.
- Noticeable difference in daily temperature fluctuations closer to dam.

Period	Period Average Temp (℃)		Daily Average Temp Fluctuation (℃)	
	PGP	800 CMF	PGP	800 CMF
Spring	16.95	17.12	3.90	1.88
Summer	24.76	23.48	5.59	1.79
Fall	25.72	25.49	4.60	1.58

- Maximum daily, average hourly, and maximum hourly water temperature fluctuations generally followed this same trend, both in the tailrace and one mile downstream of Harris Dam.
- Differences between all downstream release alternatives were relatively small when compared at a location seven miles downstream of Harris Dam

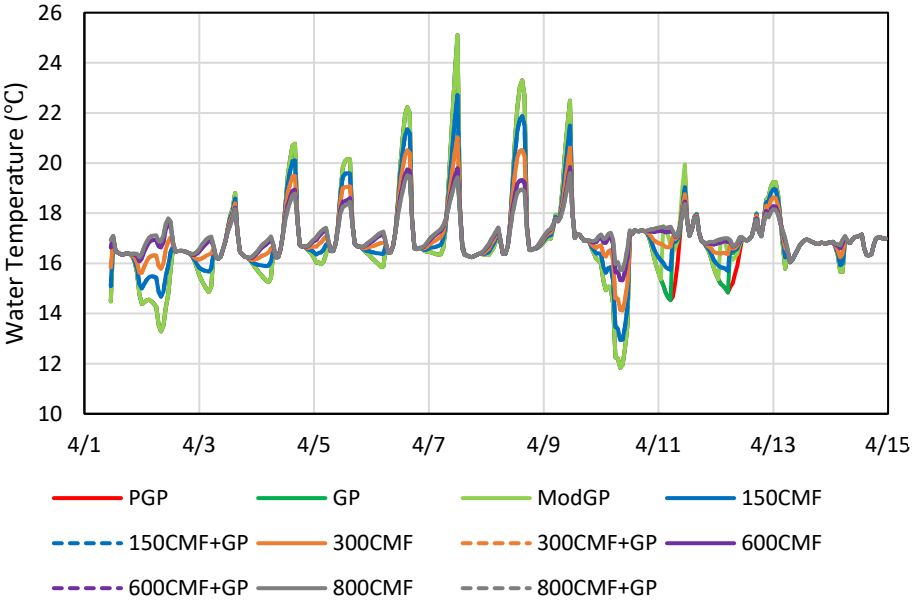
Aquatic Resources Analysis

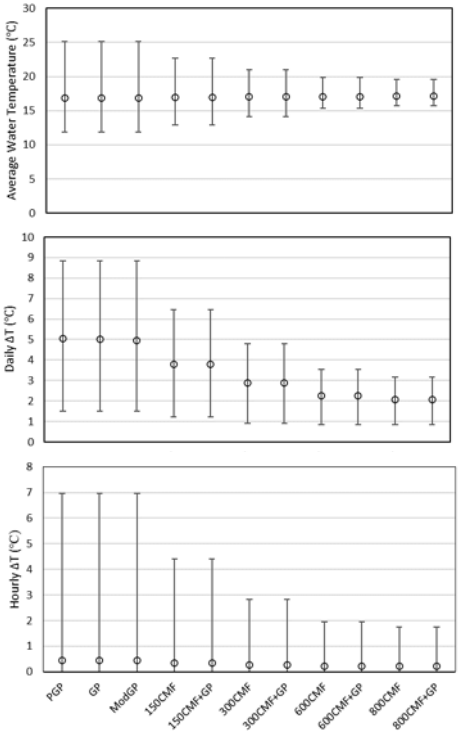
SUMMARY OF WATER TEMPERATURE MODELING RESULTS

	Alternative	Spring					Summer					Fall				
		Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ	Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ	Period Avg	Avg Daily Δ	Max Daily Δ	Avg Hourly Δ	Max Hourly Δ
1-mi Downstream	PGP	**16.82**	**5.03**	**8.85**	**0.43**	**6.96**	**25.38**	**7.43**	**9.37**	**0.67**	**5.87**	**25.87**	**6.48**	**8.36**	**0.548**	**3.38**
	GP	16.85	5.00	8.85	0.43	6.96	24.15	5.15	6.04	0.59	4.07	25.41	4.75	5.67	0.45	2.22
	ModGP	16.90	4.95	8.85	0.44	6.96	24.43	5.01	6.37	0.63	5.40	25.81	4.65	5.59	0.45	2.65
	150CMF	16.94	3.80	6.47	0.34	4.40	24.03	4.20	5.03	0.47	3.11	25.75	4.47	5.71	0.38	2.38
	150CMF+GP	16.94	3.80	6.47	0.34	4.40	24.03	4.20	5.03	0.47	3.11	25.48	3.44	4.06	0.32	1.64
	300CMF	17.02	2.90	4.78	0.27	2.82	23.88	3.28	4.05	0.36	2.24	25.65	2.98	3.72	0.26	1.63
	300CMF+GP	17.02	2.90	4.78	0.27	2.82	23.88	3.28	4.05	0.36	2.24	25.53	2.57	3.04	0.24	1.14
	600CMF	17.08	2.25	3.54	0.22	1.96	23.72	2.48	3.12	0.26	1.51	25.56	2.04	2.50	0.21	1.11
	600CMF+GP	17.08	2.25	3.54	0.22	1.96	23.72	2.48	3.12	0.26	1.51	25.54	1.92	2.24	0.20	0.94
	800CMF	17.10	2.07	3.18	0.21	1.76	23.65	2.24	2.81	0.23	1.30	25.54	1.79	2.17	0.20	0.97
	800CMF+GP	**17.10**	**2.07**	**3.18**	**0.21**	**1.76**	**23.65**	**2.24**	**2.81**	**0.23**	**1.30**	**25.53**	**1.74**	**2.00**	**0.19**	**0.92**

Units = ℃

Aquatic Resources Analysis





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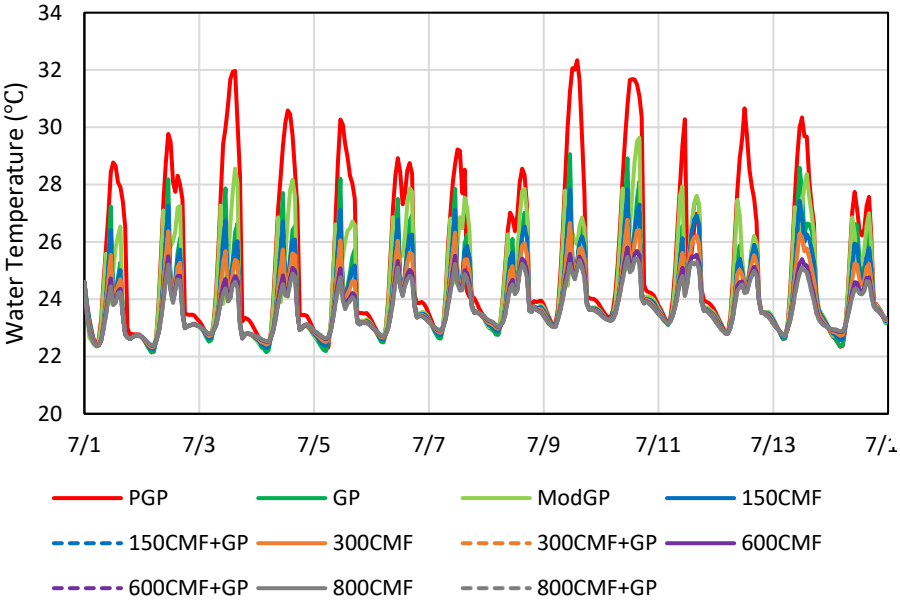

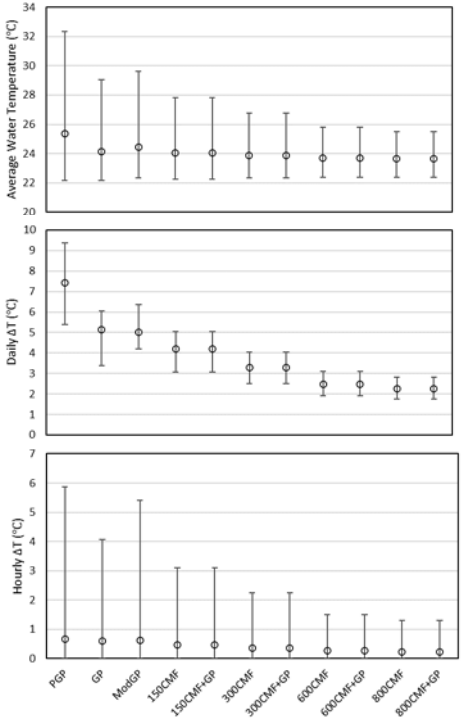

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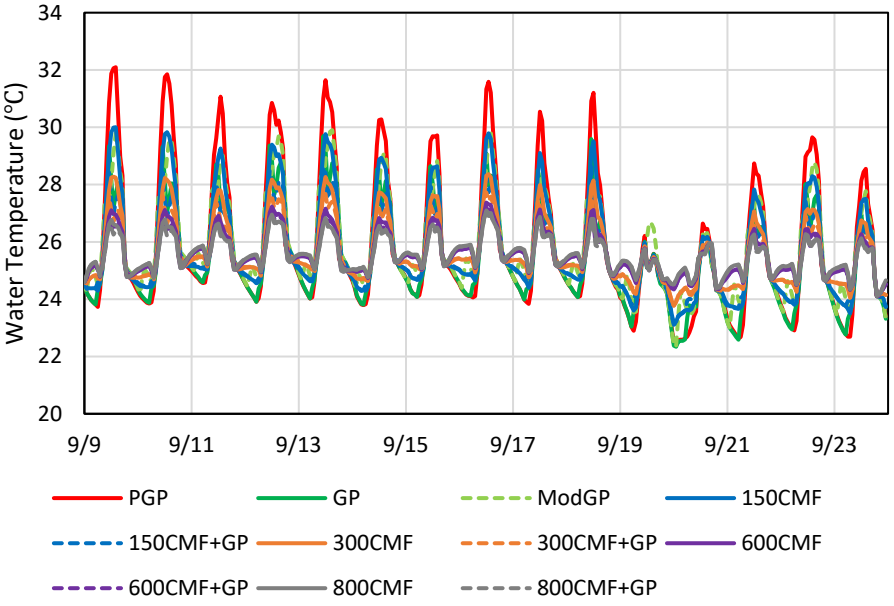
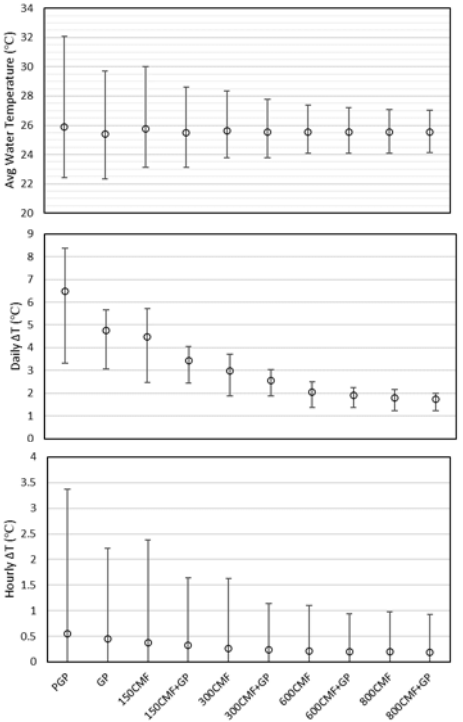




HARRIS DAM RELICENSING

Wildlife and Terrestrial Resources Analysis

Methods

- Lake Harris and Downstream
  - Alabama Power used the outputs from the HEC-ResSim and HEC-RAS models to assess the effects of downstream release alternatives on wildlife and terrestrial resources.

Results

- Lake Harris
  - 600CMF, 600CMF+GP, 800CMF, and 800CMF+GP alternatives result in lowering the water surface elevation for all months of the year
  - May result in a net decrease in littoral habitat available for amphibians, mussels, and other invertebrates that only persist in shallow water
  - Areas that are permanently de-wetted due to lower water elevations will shift habitat type

Wildlife and Terrestrial Resources Analysis

Results

- Downstream
  - All proposed downstream release alternatives are expected to have a positive effect on wildlife and terrestrial resources in the Tallapoosa River below Harris Dam (wetted area and wetted perimeter fluctuation)
    - Littoral habitat is expected to increase at a similar % as the wetted perimeter.
    - Greater amounts of wetted perimeter may result in marginal increases in availability of shallow breeding sites for early spring breeding amphibians

- Wetted Perimeter Fluctuation
  - As water perimeter fluctuations decrease, littoral habitat stability increases.
  - All release alternatives (excluding PreGP) would decrease the wetted perimeter fluctuation between Harris Dam and Horseshoe Bend.
    - 150 CMF provides the least percent increase to littoral habitat stability
    - 800CMF and 800CMF+GP provides the greatest percent increase in littoral habitat stability

Threatened and Endangered Species Analysis

Methods

- Alabama Power used the Threatened and Endangered Species Study and outputs from the HEC-RAS model to assess the effects of downstream release alternatives on threatened and endangered species.

Results

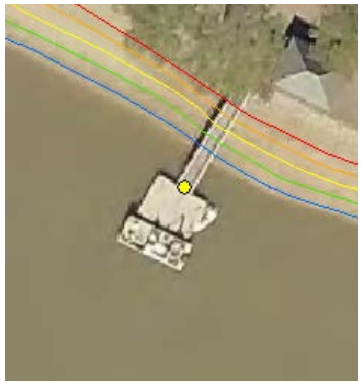
- No T&E species or critical habitats are present in the Tallapoosa River from Harris Dam through Horseshoe Bend; therefore, there would be no effects on T&E species from any of the downstream release alternatives.

Recreation Analysis

Methods

- LIDAR used to measure elevation (785, 786, 787, 788, 789 ft msl contours)
- Elevation data used to calculate depth at point
- Depth for points beyond the 785 ft msl contour was estimated by slope analysis
- The amount of depth was determined separately for each type of private structure (i.e., boathouses, floats, piers, wet slips, and boardwalks) and for public boat ramps.

- Example:



HARRIS DAM RELICENSING

Recreation Analysis

Results

- Private structures
  - 2,282 private structures identified
  - 2,123 private structures analyzed

- PGP, 150CMF, 300CMF, and 150CMF+GP have minimal effects on usability of lake recreation structures throughout the year
- Higher downstream release alternatives have the potential to reduce the usability of these structures in the summer months.

Recreation Analysis

NUMBER OF PRIVATE RECREATION STRUCTURES ON HARRIS RESERVOIR THAT ARE USABLE AT SPECIFIED RESERVOIR ELEVATIONS

Lake Elevation (feet msl)	Number of Usable Private Structures	Percentage of Usable Private Structures
793	2123	100.0
792	1990	93.8
791	1786	84.1
790	1568	73.9
789	1327	62.5
788	1112	52.4
787	826	38.9
786	642	30.2
785	449	21.1
784	311	14.6
783	199	9.4
782	138	6.5
781	95	4.5
780	63	3.0

600CMF (summer pool)

800CMF (summer pool)

800CMF (winter pool)

Recreation Analysis

NUMBER OF PRIVATE RECREATION STRUCTURES ON HARRIS RESERVOIR THAT ARE USABLE AT SPECIFIED RESERVOIR ELEVATIONS

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780	63	3.0

600CMF+GP (summer pool)

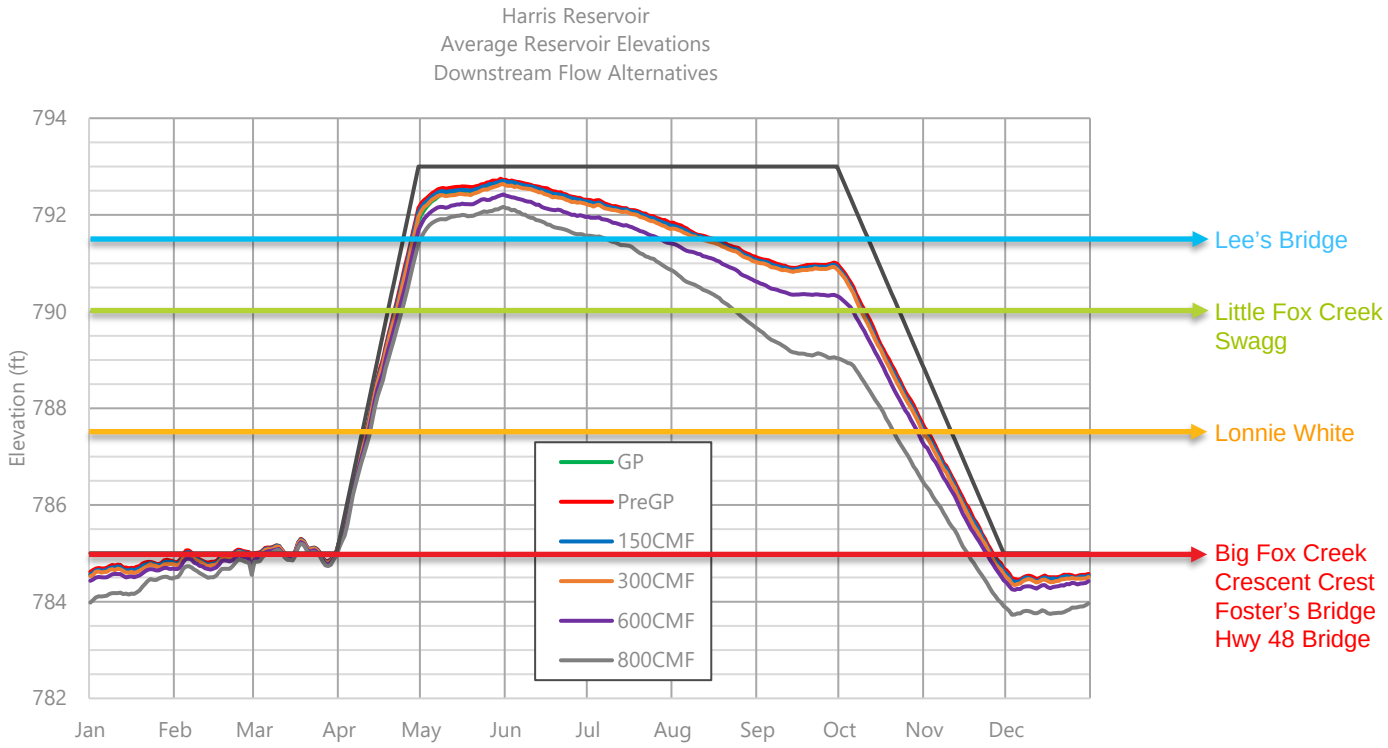
800CMF+GP (summer pool)

600CMF+GP (winter pool)

800CMF+GP (winter pool)

HARRIS DAM RELICENSING

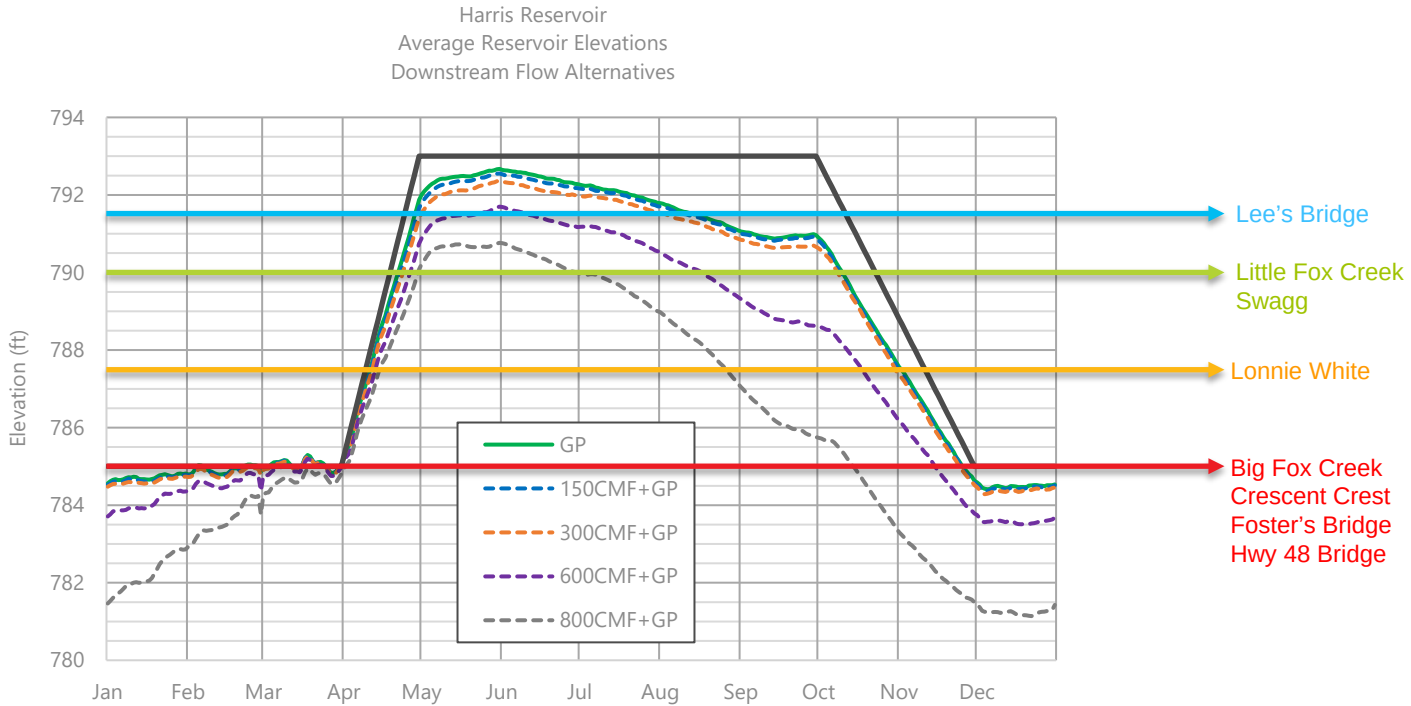
Recreation Analysis



MINIMUM WATER LEVELS FOR BOAT RAMP USABILITY

HARRIS DAM RELICENSING

Recreation Analysis



MINIMUM WATER LEVELS FOR BOAT RAMP USABILITY

Recreation Analysis

Methods

- Downstream
  - "Boatable days" were defined as days (both weekday and weekend) when flows measured at the Wadley gage were between 450 cfs and 2,000 cfs between sunrise and sunset

  - HEC-RAS was used to assess the impact of downstream releases on boating recreation closer to Harris Dam
    - HEC-RAS model was used to generate one year of hourly data for each of the 11 alternatives, using 2001 historical data as a baseline typical year, to be able to compare the different alternatives

  - Additionally, flow depth from Harris Dam to Malone was assessed by examining the minimum depth at ten cross sections for each of the downstream release alternatives
    - Minimum water depth was calculated by subtracting the lowest water surface elevation, occurring at any point in the year, from the minimum channel elevation at each cross section

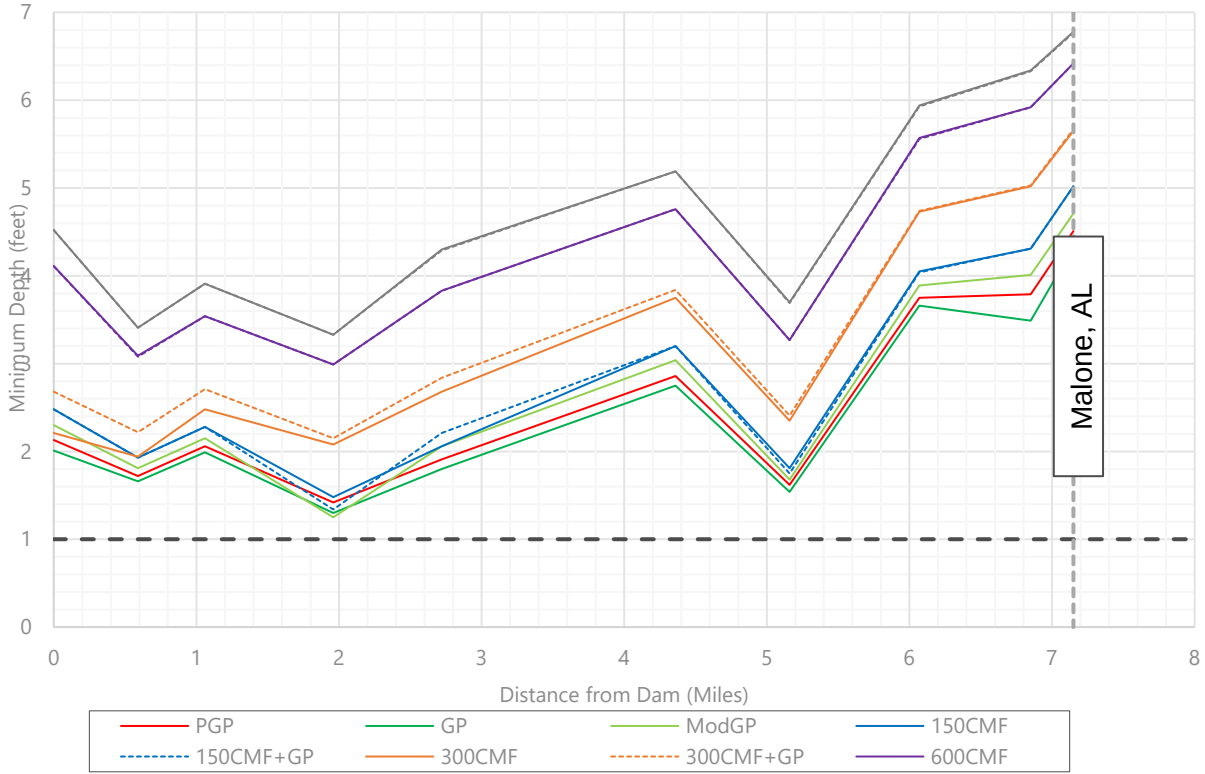
Recreation Analysis

Results

- Spring and Fall have the most variation in number of boatable days, with the most annual boatable days occurring with the 300CMF+GP alternative.

Alternative	Winter	Spring	Summer	Fall	Annual
PreGP	27	19	21	30	97
GP	30	18	23	29	100
ModGP	30	19	31	40	120
150CMF	29	19	24	37	109
300CMF	32	15	29	61	137
600CMF	29	7	27	63	126
800CMF	27	4	25	61	117
150CMF+GP	34	17	28	43	122
300CMF+GP	35	16	31	63	145
600CMF+GP	30	11	28	63	132
800CMF+GP	26	6	28	62	122

Recreation Analysis



MINIMUM DEPTH (IN FEET) OF THE TALLAPOOSA RIVER FROM HARRIS DAM TO MALONE BASED ON HEC-RAS MODEL OF DOWNSTREAM RELEASE ALTERNATIVES

Recreation Analysis

Methods

- Downstream Navigability
  - For the initial analysis, the minimum flow depth threshold of one foot was achieved if any portion of a cross section measured at least that depth.

  - A one-foot threshold at any one given point on a cross section is not an accurate indicator of river navigability.
    - Therefore, an annual depth analysis was performed to compare change in surface water elevations at particular cross sections.

    - This additional study was performed to depict a single low flow period on a single day (Sept. 9, 2001) at 10 cross sections between Harris Dam and Malone

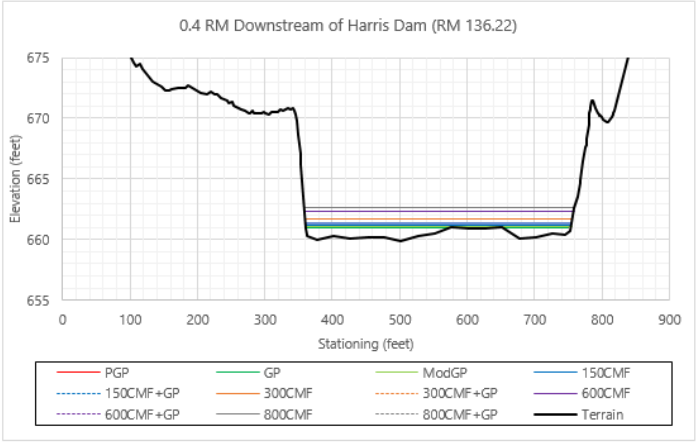
Recreation Analysis

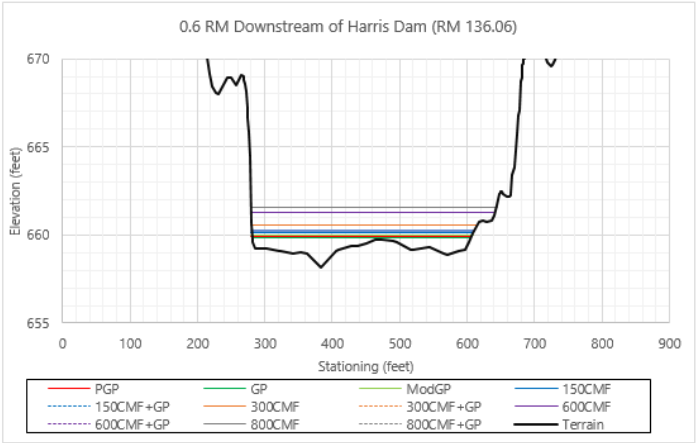
Results

Alternative	Miles Below Harris Dam									
	0.4	**0.6**	**0.8**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	**4.4**	**6.0**
GP	0	0	0	0	0	0	0	0	0	0
PreGP	0.08	0.07	0.08	0.06	0.07	0.07	0.08	0.1	0.04	-0.01
150CMF	0.28	0.28	0.33	0.29	0.31	0.3	0.36	0.48	0.28	0.19
150CMF+GP	0.28	0.28	0.33	0.29	0.31	0.3	0.36	0.48	0.28	0.22
ModGP	0.18	0.17	0.2	0.17	0.19	0.18	0.21	0.29	0.15	0.12
300CMF+GP	0.72	0.75	0.86	0.79	0.79	0.8	0.94	1.27	0.87	0.86
300CMF	0.72	0.75	0.86	0.79	0.79	0.8	0.94	1.27	0.87	0.86
600CMF+GP	1.38	1.43	1.57	1.54	1.48	1.49	1.76	2.42	1.74	1.5
600CMF	1.38	1.43	1.57	1.54	1.48	1.49	1.76	2.42	1.74	1.5
800CMF+GP	1.69	1.75	1.92	1.91	1.81	1.83	2.16	2.97	2.18	1.87
800CMF	1.69	1.75	1.92	1.91	1.81	1.83	2.16	2.97	2.18	1.87

CHANGE IN WATER SURFACE ELEVATION (IN FEET) IN THE TALLAPOOSA RIVER DOWNSTREAM OF HARRIS DAM BASED ON HEC-RAS MODEL OF DOWNSTREAM RELEASE ALTERNATIVES COMPARED TO BASELINE (GP)

Recreation Analysis





Cultural Resources Analysis

Methods

- Used existing information (LIDAR, expert opinion) and the models developed for the Phase 1 Report to assess cultural resources

Results

- Lake Harris
  - No changes from baseline with the PreGP, the 150CMF, the 300 CMF, or the 150 CMF +GP alternatives due to stable water elevations.
  - 600CMF, 800CMF, 300 CMF + GP, 600CMF+GP, 800CMF+GP will impact Harris Reservoir elevations, which will expose the cultural resources in and around Harris Reservoir to additional reservoir fluctuations, wind erosion, and vandalism.

- Downstream
  - The 19 cultural resources downstream of Harris Dam to Horseshoe Bend are inundated 49.4% of the time under existing conditions.

Cultural Resources Analysis

NUMBER OF CULTURAL RESOURCE SITES IN THE TALLAPOOSA RIVER BETWEEN HARRIS DAM AND HORSESHOE BEND NATIONAL MILITARY PARK AFFECTED DIFFERENTLY BY DOWNSTREAM RELEASE ALTERNATIVES COMPARED TO GREEN PLAN OPERATIONS

Alternative	Number of Cultural Resources Sites Affected Differently Than Baseline (GP)	Percent of Time Inundated Compared to Baseline (GP)
PreGP	8	-0.2
ModGP	0	0.0
150CMF	8	0.2
300CMF	8	1.9
600CMF	19	4.1
800CMF	19	4.2
150CMF+GP	5	0.4
300CMF+GP	5	2.4
600CMF+GP	5	4.0
800CMF+GP	5	4.3