Appendix 10

Technical Report: Response to NMFS FPA Section 10(j) Recommended Conditions (HDR Engineering, Inc. and Stephen Grinnell, P.E.)

Response to NMFS FPA Section 10(j) Recommended Conditions

Yuba River Development Project
FERC Project No. 2246

Prepared by HDR Engineering, Inc. & Stephen Grinnell, P.E.

October 9, 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

RESPONSE TO THE NATIONAL MARINE FISHERIES SERVICE FEDERAL POWER ACT SECTION 10(J) RECOMMENDED CONDITIONS

The Yuba County Water Agency (YCWA), licensee for the Yuba River Development Project (YRDP), Federal Energy Regulatory Commission (FERC) Project No. 2246 ("Project"), has prepared this document in response to the comments, recommendations, and preliminary terms and conditions filed by the National Marine Fisheries Service (NMFS) in response to YCWA's Final License Application that was filed with the FERC on April 21, 2014, as amended on June 5, 2017. The NMFS Comment Letter presented a suite of recommended actions for the lower Yuba River.

The NMFS Comment Letter identified a total of seven recommended conditions. These recommended conditions are listed here:

1. FPA §10(j) Condition #1: Spring Snowmelt Pulse Flow and Recession
2. FPA §10(j) Condition #2: Schedule 6 Water Year Type Summer Minimum Instream Flows
3. FPA §10(j) Condition #3: Implement Large Woody Material Augmentation Program
4. FPA §10(j) Condition #4: Develop and Implement Physical Habitat Improvement Projects for Juvenile Salmonid Rearing
5. FPA §10(j) Condition #5: Fish Exclusion Devices and Stranding Prevention and Reporting
6. FPA §10(j) Condition #6: Anadromous Fish Monitoring
7. FPA §10(j) Condition #7: Special Status Species Protection, Mitigation, and Consultation

Only two (Condition #1 and Condition #2) of the seven NMFS recommended conditions pertain to actions that have the potential to alter flow or water temperature conditions for anadromous salmonids in the lower Yuba River. Consequently, only those two NMFS recommendations are considered and evaluated in this report.

YCWA has prepared a separate response addressing specific issues associated with NMFS' recommended Condition #2 - Schedule 6 Water Year Type Summer Minimum Instream Flows and has included that response in YCWA's master response document. However, because many flow-related components are integrated, and must be considered in YCWA's hydrologic operations model, the Schedule 6 water year type summer minimum instream flows were incorporated into the modeling conducted to represent the "Combined NMFS Recommendations" scenario. For this reason, a brief description of NMFS' Recommended Condition #2 is provided below. YCWA also has prepared separate responses to address the non-flow recommended conditions (Conditions 3, 4, 5, 6 and 7) in NMFS's Comment Letter.

This report refers to NMFS's recommendations as the "Combined NMFS Recommendations", because the scenario described in this report includes all components of the AFLA's proposed conditions except for NMFS's recommended Conditions #1 and #2 listed above, and the Base Case Conference Year minimum flow requirements. Comparisons are made to scenarios with the corresponding suite of YCWA proposed conditions referred to herein as the Amended Final License Application (AFLA), and the Base Case.

The FERC should not include the NMFS recommended conditions in the new Project license for several reasons, which are described in this report.

To support the information and evaluations presented in this report, YCWA conducted modeling to identify physical habitat and water temperature impacts and potential redirected impacts resulting from the NMFS recommendations. Consequently, all pertinent modeling results (both physical habitat and water temperature suitabilities) associated with specific species/run lifestages for the "Combined NMFS Recommendations" are presented in this report.

At the request of YCWA, HDR Engineering, Inc. (HDR) and Stephen Grinnell, P.E. have prepared this technical report.

1. YCWA Proposed Condition

YCWA has not identified a proposed condition in its AFLA that directly equates to the "Combined Recommendation" provided by NMFS. For evaluation purposes in this response document, scenarios for YCWA's AFLA and the "Combined NMFS Recommendations" both contain the following conditions from YCWA's AFLA:

- WR2 – Determine Water Year Types for Measures Pertaining to Our House Diversion Dam, Log Cabin Diversion Dam, and New Bullards Bar Dam
- WR5 – Maintain New Bullards Bar Reservoir Minimum Pool
- WR6 – Operate New Bullards Bar Reservoir for Flood Control
- AR1 – Maintain Minimum Streamflows below Our House Diversion Dam, Log Cabin Diversion Dam, and New Bullards Bar Dam
- AR2 – Control Project Spills at Our House Diversion Dam
- AR12 – Control Project Spills at Log Cabin Diversion Dam
- GS2 – Implement Our House and Log Cabin Diversion Dams Sediment Management Plan
- RR3 – Provide Whitewater Boating Below Our House Diversion Dam

Recommended changes to specific components of other YCWA Proposed Conditions that are proposed by NMFS are described as part of the "Combined NMFS Recommendations" in Section 1.2, below.

1.1 Combined NMFS Recommendations

1.1.1 NMFS FPA Section 10(j) Recommended Condition 1 - Spring Snowmelt Pulse Flow and Recession

The NMFS' FPA Section 10(j) Recommended Condition 1, Spring Snowmelt Pulse Flow and Recession, is proposed as a new recommendation for a term and condition under FPA Section 10(j), and includes the following.

(A) During a Schedule 1 water year type (as determined by YCWA's proposed Condition WR3 in the FLA), the Licensee shall provide 60 days continuous flow above 3,500 cubic feet per second (cfs) as measured at United States Geological Survey (USGS) Gage 11421000 (Marysville Gage) between March 1 and June 15.

(B) During a Schedule 2 water year type (as determined by YCWA's proposed Condition WR3 in the FLA), the Licensee shall provide 30 days continuous flow above 2,500 cfs as measured at USGS gage 11421000 (Marysville Gage) between March 1 and June 15.

1) It is expected the Licensee will use scheduled forecasts of rainfall, snowmelt, and streamflow to determine the optimal time to begin the snowmelt pulse flow. The Licensee should utilize flow from the Middle and South Yuba Rivers to the maximum extent possible and coordinate the springtime pulse flow to coincide with anticipated spill events from Englebright Reservoir.

(C) If the Licensee has not initiated the pulse flow by April 15 of a schedule 1 or 2 year, the pulse flow will commence on April 15 and last for the next 60 days (Schedule 1) or 30 days (Schedule 2).

(D) If at any point during the 60-day schedule 1 snowmelt pulse release, the water year type changes to schedule 2, the pulse flow may conclude at 30 days. If the water year type changes to schedule 3 or lower the pulse flow will conclude immediately subject to the recession condition outlined below in section (E).

(E) From the onset of the pulse flow outlined above in sections (A) and (B) through September 30, and whenever flow is at or below 4,130 cfs as measured at the Smartsville Gage (USGS 11418000), flows shall be not be reduced by more than 5 percent of the previous day's average flow as measured at the Smartsville Gage (USGS 11418000).

(F) Minimum streamflows in this condition may be temporarily modified for short periods, as necessary for emergencies, powerhouse outages required for inspections and maintenance purposes upon approval of the Commission.

(G) If any of the minimum flow requirements in the Licensee's water right permits are temporarily modified by the State Water Resources Control Board (SWRCB) or its Deputy Director for Water Rights, and if the Licensee, NMFS, Fish and Wildlife Service (FWS or

USFWS) and California Department of Fish and Wildlife (CDFW) agree, then the Licensee may make corresponding temporary modifications to the requirements in this condition. The Licensee shall provide notification to the Commission as soon as possible but no later than 10 days after such temporary modifications are made.

1.1.2 NMFS FPA Section 10(j) Recommended Condition 2 - Schedule 6 Water Year Type Summer Minimum Instream Flows

The NMFS FPA Section 10(j) Condition 2 - Schedule 6 Water Year Type Summer Minimum Instream Flows, would require that, in Schedule 6 years (as determined by YCWA's proposed Condition WR3 in the FLA), the Licensee must maintain a minimum instream flow of 350 cfs at USGS gage 11421000 (Marysville Gage) during the months of June, July and August. The intent of this condition is to maintain suitable water temperatures in those months of Schedule 6 years.

YCWA has prepared a separate response addressing the minimum flow recommendations associated with Schedule 6 years. In addition, modeling incorporated in this response includes the combined effects of minimum streamflow requirements (including those intended for water temperature management and spring snowmelt pulse flow and recession).

1.1.3 NMFS' Stated Biological Objectives

According to NMFS's Comment Letter (pg. 30), the Project has decreased the magnitude and duration of stream flows during the peak snowmelt months, which has resulted in large decreases in off-channel rearing habitat for salmonids. NMFS condition 1 would require 60 or 30 days of inundation during a Schedule 1 or 2 year, respectively, which NMFS states would provide full expression of the benthic macroinvertebrate food web and would allow for primary productivity derived from inundated habitat to be realized throughout most of the lower Yuba River.

1.2 Response to NMFS' Recommended Changes in the "Combined NMFS Recommendations"

YCWA conducted modeling to identify redirected impacts resulting from NMFS recommendations. Consequently, all pertinent modeling results (both physical habitat and water temperature suitabilities) associated with specific species/run lifestages for the "Combined NMFS Recommendations" (i.e., the operations model run titled "NMFS_Complete" scenario) are presented in this report.

FERC should not include the NMFS FPA Section 10(j) Recommended Conditions 1 and 2, which are referred to in this report as the "Combined NMFS Recommendations", in the new license for the following reasons.

- <u>The NMFS recommendations would not accomplish the stated objective of enhanced juvenile salmonid rearing habitat resulting from the recommended minimum flow requirements</u>. This is because the recommended measure:

1) Does not recognize the interactions between flow and physical habitat structure, or the fact that the resultant juvenile rearing habitat conditions are primarily due to factors that do not have a direct nexus to the Project (e.g., hydraulic mining legacy, channelization and reduction in meander, limited habitat diversity and complexity, channel relocation and reconfiguration).

2) Is not based on substantial evidence regarding the need for different amounts of rearing habitat, and NMFS has not demonstrated that current or proposed AFLA minimum instream flow requirements adversely affect anadromous salmonid populations.

3) Would actually decrease, rather than increase, the magnitude or duration of floodplain inundation, relative to the Base Case or the AFLA.

4) Would not substantially increase the amount of estimated juvenile salmonid rearing habitat (WUA) during the spring period, relative to the Base Case or the AFLA.

- <u>The NMFS recommendations would result in numerous unaccounted for redirected water temperature impacts to anadromous salmonid populations in the lower Yuba River.</u>

5) The NMFS recommendations would result in overall less suitable water temperature conditions for spring-run Chinook salmon upstream migration, holding, spawning, embryo incubation and juvenile rearing.

6) The NMFS recommendations would result in overall less suitable water temperature conditions for fall-run Chinook salmon immigration and staging, spawning, embryo incubation.

7) The NMFS recommendations would result in overall less suitable water temperature conditions for steelhead upstream migration and holding, and smolt emigration.

- <u>The NMFS recommendations would result in significant costs to YCWA in terms of reduced operational flexibility, water supply, water transfers, power generation and revenue</u>. The NMFS recommendations:

8) Would require extreme Project operations in some years to comply with the required flows at Marysville Gage. In fact, YCWA would not be able to comply with the NMFS recommended condition if the water year type were to change to a Schedule 1 with the May Bulletin 120 or any subsequent update.

9) Would result in water delivery shortages to local farmers in wetter water years, and would significantly reduce water supply reliability for farmers and farm operations in some years.

10) Would significantly reduce and, in some years, eliminate April and early May YCWA water transfers, and would reduce summer water transfers which, in turn, would reduce water transfer revenue.

11) Would negatively impact power generation and associated Project revenue.

1.2.1 Analysis of the "Combined NMFS Recommendations"

YCWA's analysis includes the following evaluated scenario:

- The scenario that includes NMFS' recommended minimum stream flows is referred to as "NMFS_Complete".[1]

This scenario is evaluated to determine whether, and to what degree, NMFS's recommended conditions would accomplish NMFS's stated objectives, whether the NMFS's recommendations would provide any substantive benefits to aquatic habitat conditions, and whether the NMFS recommendations would result in any re-directed adverse impacts to aquatic resources in the lower Yuba River. YCWA also examined and evaluated numerous lifestages, comparing NMFS's recommendations (for the operations model run "NMFS_Complete"), the AFLA and the Base Case. The results of these evaluations are discussed below.

YCWA utilized daily flow and water temperature output from its 41-year YRDP Operations Model to evaluate potential impacts. The species/run and lifestage-specific identified potential physical habitat impacts, as well as potential impacts to water temperature suitabilities, are described below. Water temperature exceedance probabilities, overlaid with lifestage-specific Water Temperature Index (WTI) suitabilities for spring-run Chinook salmon, fall-run Chinook salmon and steelhead are presented in **Attachment 1**.

1.2.1.1 Species and Lifestage Specific Analysis

Spring-run Chinook Salmon

Lifestage periodicities and associated upper optimum (UO) and upper tolerable (UT) WTI values for spring-run Chinook salmon are presented in **Table 1**.

[1] The scenario is available in Appendix 6 of YCWA's October 9, 2017, Response to Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions.

Table 1. Lifestage-specific periodicities for spring-run Chinook salmon in the lower Yuba River.

Lifestage	UO WTI	UT WTI	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Adult Migration	64°F	68°F							■	■	■	■	■	■	■	■	■	■	■	■						
Adult Holding	61°F	65°F							■	■	■	■	■	■	■	■	■	■	■	■						
Spawning	56°F	58°F																	■	■	■					
Embryo Incubation	56°F	58°F																	■	■	■	■	■	■	■	■
Fry Rearing	61°F	65°F	■	■	■																			■	■	■
Juvenile Rearing	61°F	65°F	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Juvenile Downstream Movement	61°F	65°F	■	■	■	■	■	■	■	■	■	■	■	■										■	■	■
Smolt (Yearling+) Emigration	63°F	68°F	■	■	■	■	■	■	■	■	■										■	■	■	■	■	■

Source: RMT 2013.

Note: EPA (2003) Criteria – salmon/trout migration (64°F); adult holding (61°F); spawning and incubation (55°F); salmon/trout core rearing (61°F); salmon/trout non-core rearing (64°F).

Adult Immigration and Holding

Because there are no known physical habitat barriers or impediments[2] to adult upstream migration and holding, analysis of the combined effects of the "NMFS_Complete" scenario addresses differences in water temperature suitabilities relative to the Base Case and the AFLA scenarios for the adult immigration and holding lifestage.

Migration

NMFS's recommendations would result in less suitable water temperatures, exceeding the UO WTI value of 64°F about 5 percent more often during June at Marysville and would result in:

- Less suitable conditions during July, exceeding the Environmental Protection Agency (EPA) (2003) 7DADM value of 64°F about 5 percent more often at Daguerre Point Dam (DPD).
- Less suitable conditions during August, exceeding the EPA (2003) 7DADM value of 64°F about 5 percent more often at DPD.

[2] It is recognized that Daguerre Point Dam may represent an impediment to the adult upstream (as well as juvenile downstream) migration of anadromous salmonids. However, Daguerre Point Dam is a United States Army Corps of Engineers (USACE)-owned facility and is not within the Project boundary and, therefore, is not included in YCWA's responses to Agencies' Recommendations for changes to YCWA's proposed AFLA.

Holding

NMFS's recommendations would result in less suitable water temperatures during August, exceeding the UO WTI value of 61°F nearly 5 percent more often at DPD and the EPA (2003) 7DADM value of 64°F about 5 percent more often at DPD.

Spawning

Spring-run Chinook salmon spawning habitat (Weighted Usable Area, or WUA) , as percent of maximum), using the agreed-upon Relicensing Participants Habitat Suitability Criteria (HSC) specified in Technical Memorandum (TM) 7.10, *Instream Flow Below Englebright Dam*, was compared under the Base Case, the AFLA and the NMFS recommendations (NMFS_Complete) scenarios (**Figure 1**). YCWA's analysis demonstrates that the NMFS recommendations (NMFS_Complete) scenario would result in the following.

- Essentially the same amount of spring-run Chinook salmon spawning habitat over most of the exceedance probability distribution under the NMFS recommendation, relative to the AFLA.
- Less spring-run Chinook salmon spawning habitat is available over the highest portion (about the highest 4 percent) of the exceedance probability distribution under the NMFS recommendations scenario, relative to the Base Case and the AFLA, when the least amount of habitat is present.

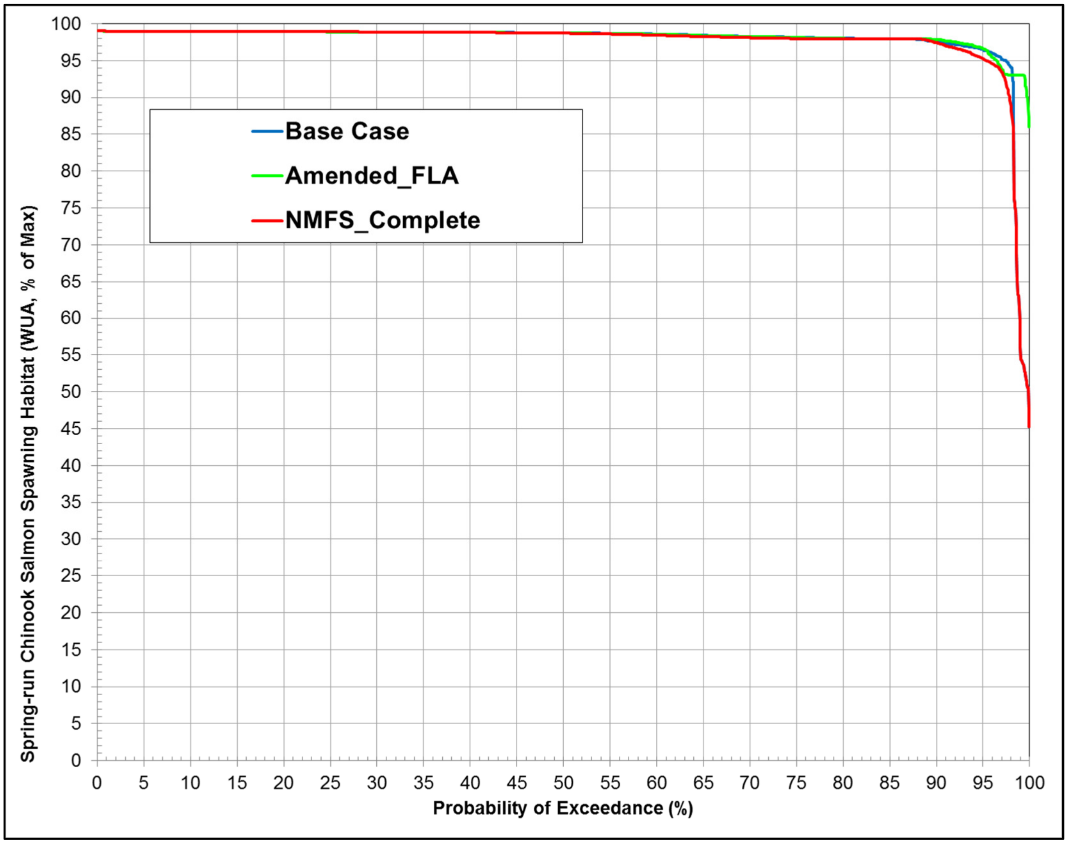

Figure 1. Comparison of spring-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

- Slightly less spring-run Chinook salmon spawning habitat would be provided by the NMFS recommendations scenario relative to both the AFLA and Base Case as a long-term average, and as an average by water year type (**Table 2**).

Table 2. Comparison of long-term and water year type average spring-run Chinook salmon spawning WUA (percent of maximum) under the Base Case, the Amended_FLA, and the NMFS _Complete scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	97.6	98.0	98.5	98.6	98.5	95.4
Base Case	97.8	98.2	98.6	98.6	98.6	95.5
Differences	-0.2	-0.2	-0.1	0.0	-0.1	-0.1

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	97.6	98.0	98.5	98.6	98.5	95.4
Amended_FLA	98.3	98.2	98.6	98.6	98.5	98.0
Differences	-0.7	-0.2	-0.1	0.0	0.0	-2.6

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

NMFS's recommendations would result in consistently less suitable water temperatures exceeding the UO WTI value of 56°F over nearly the entire range of the distributions during October at DPD relative to the AFLA or the Base Case, and would result in:

- Less suitable conditions during September, exceeding the UO WTI value of 56°F about 5 percent more often at Smartsville.

Embryo Incubation

NMFS's recommendations would result in consistently less suitable water temperatures exceeding the UO WTI value of 56°F over nearly the entire range of the distributions during October at DPD relative to the AFLA or the Base Case, and would result in:

- Less suitable conditions during September, exceeding the UO WTI value of 56°F about 5 percent more often at Smartsville.

Fry Rearing

- YCWA compared spring-run Chinook salmon fry rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover specified in TM 7.10, under the NMFS recommendations, the AFLA, and the Base Case scenarios for the mid-November through February fry rearing period (**Figure 2**).

  Essentially identical amounts of habitat would be provided by the NMFS recommendations, the AFLA and the Base Case scenarios during the mid-November through February spring-run Chinook salmon fry rearing period. Thus, the NMFS recommendations would not provide any substantial benefit to spring-run Chinook salmon fry rearing.

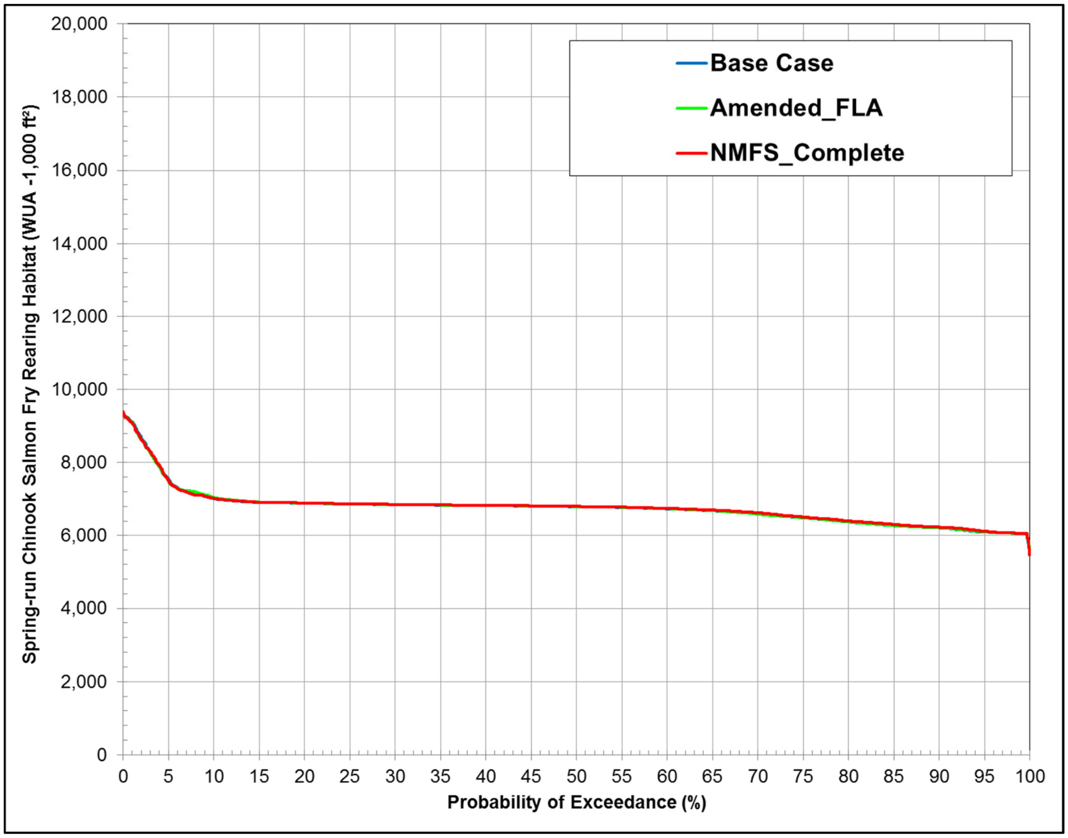

Figure 2. Spring-run Chinook salmon fry rearing habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the spring-run Chinook salmon fry rearing period.

Juvenile Rearing

- YCWA compared spring-run Chinook salmon juvenile rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover specified in TM 7.10, under NMFS recommendations, the AFLA and the Base Case scenarios for the year-round juvenile rearing period (**Figure 3**).

  Essentially identical amounts of habitat would be provided by the NMFS recommendations, the AFLA and the Base Case scenarios during the year-round spring-run Chinook salmon juvenile rearing period. Thus, the NMFS recommendations scenario would not provide any substantial benefit to spring-run Chinook salmon juvenile rearing.

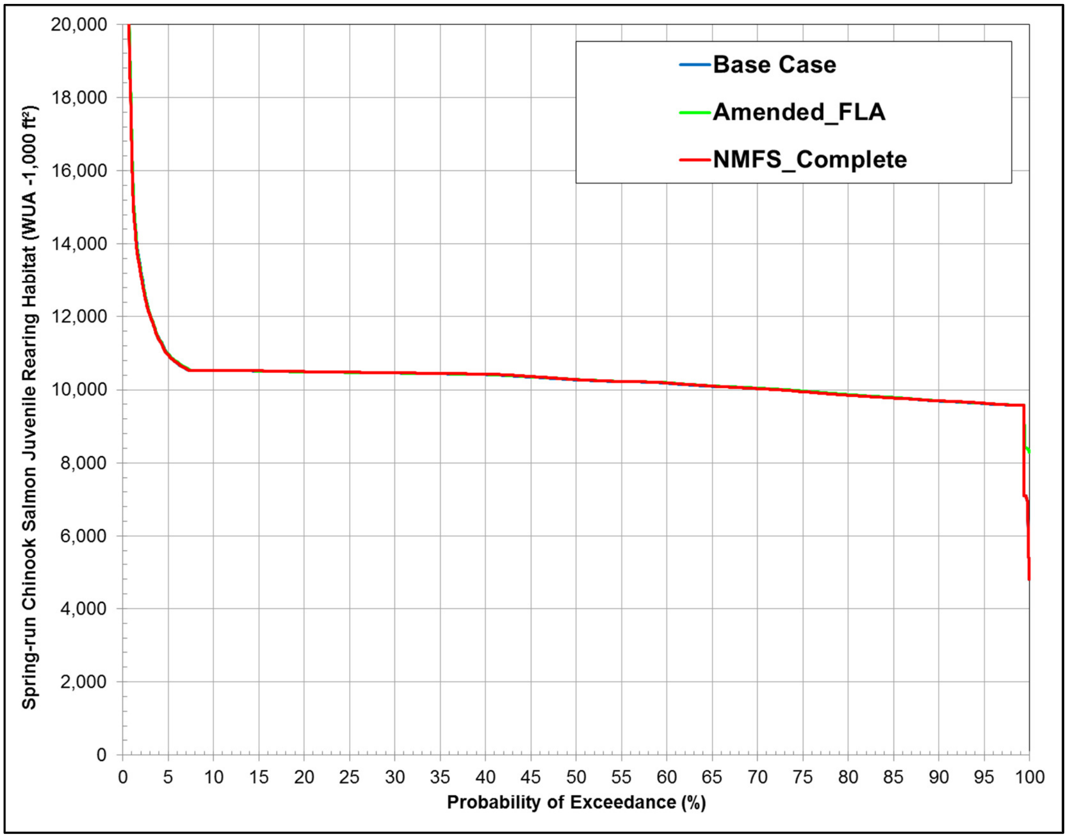

Figure 3. Spring-run Chinook salmon juvenile rearing habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Water temperatures under the NMFS recommendations, the AFLA and Base Case scenarios all would generally remain below all WTIs during the November through March period of the year-round juvenile rearing lifestage periodicity.

NMFS's recommendations would result in more suitable conditions during April, with water temperatures remaining below the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F about 8 percent more often at Marysville.
- Less suitable conditions during August, exceeding the UO WTI value of 61°F over 5 percent more often at DPD, and the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at DPD.
- Less suitable conditions during September, exceeding the UO WTI value of 61°F about 5 percent more often at DPD.

Juvenile Downstream Movement

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the November through March period of the November through June juvenile downstream movement lifestage periodicity.

NMFS's recommendations would result in more-suitable conditions during April, with water temperatures remaining below the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F about 8 percent more often at Marysville.

Smolt (yearling+) Emigration

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the October through mid-May smolt emigration period.

Fall-run Chinook Salmon

Lifestage periodicities and associated UO and UT WTI values for fall-run Chinook salmon are presented in **Table 3**.

Table 3. Lifestage-specific periodicities for fall-run Chinook salmon in the lower Yuba River.

Lifestage	UO WTI	UT WTI	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Adult Immigration & Staging	64°F	68°F													■	■	■	■	■	■	■	■	■	■	■	■
Spawning	56°F	58°F																			■	■	■	■	■	■
Embryo Incubation	56°F	58°F	■	■	■	■	■	■													■	■	■	■	■	■
Fry Rearing	61°F	65°F	■	■	■	■	■	■	■	■																■
Juvenile Rearing	61°F	65°F		■	■	■	■	■	■	■	■	■	■	■												
Fry & Juvenile Downstream Movement	61°F	65°F	■	■	■	■	■	■	■	■	■	■	■	■												■

Source: RMT 2013

Note: EPA (2003) Criteria – salmon/trout migration (64°F); adult holding (61°F); spawning and incubation (55°F); salmon/trout core rearing (61°F); salmon/trout non-core rearing (64°F).

Adult Immigration and Staging

NMFS's recommendations would result in less suitable conditions, exceeding the EPA (2003) 7DADM value of 64°F about 5 percent more often during July at DPD, and would result in:

- Less suitable conditions during August, exceeding the EPA (2003) 7DADM value of 64°F about 5 percent more often at DPD.
- Less suitable conditions during September, exceeding the EPA (2003) 7DADM value of 64°F nearly 5 percent more often at DPD.

Spawning

- NMFS's recommendations would provide slightly more fall-run Chinook salmon spawning habitat over about the 90-95 percent portion of the exceedance probability distribution relative to the Base Case and the AFLA (**Figure 4**).

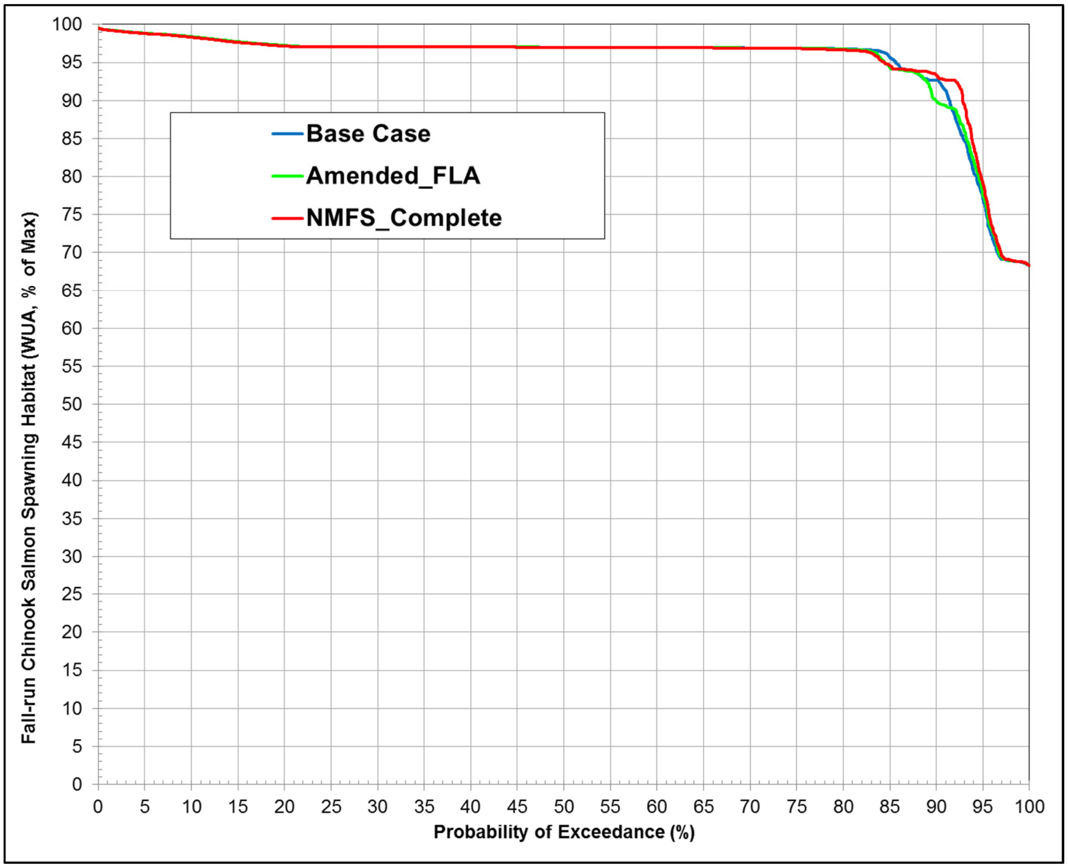

Figure 4. Comparison of fall-run Chinook salmon spawning habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA and the NMFS_Complete scenarios.

Similar amounts of fall-run Chinook salmon spawning habitat would be provided by the NMFS recommendations scenario relative to both the AFLA and Base Case scenarios as a long-term average, and as an average by water year type (**Table 4**).

Table 4. Comparison of long-term and water year type average fall-run Chinook salmon spawning WUA (percent of maximum) under the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	95.3	93.6	95.4	96.3	96.6	96.8
Base Case	95.2	93.1	95.4	95.9	96.9	97.1
Differences	0.1	0.5	0.0	0.4	-0.3	-0.3

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	95.3	93.6	95.4	96.3	96.6	96.8
Amended_FLA	95.1	93.2	95.3	95.9	96.6	96.9
Differences	0.2	0.4	0.1	0.4	0.0	-0.1

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

NMFS's recommendations would result in less suitable water temperatures during October, consistently exceeding water temperatures under the AFLA and Base Case scenarios when water temperatures would be higher than the EPA (2003) 7DADM value of 55°F more often at Smartsville, DPD and Marysville.

Embryo Incubation

NMFS's recommendations would result in less suitable water temperatures during October, consistently exceeding water temperatures under the AFLA and Base Case scenarios when water temperatures would be higher than the EPA (2003) 7DADM value of 55°F more often at Smartsville, DPD and Marysville.

Fry Rearing

YCWA compared fall-run Chinook salmon fry rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover specified in TM 7.10, under the Base Case, the AFLA and the NMFS recommendations scenarios for the mid-December through April fry rearing period (**Figure 5**).

Essentially identical amounts of habitat would be provided by the NMFS recommendations, the AFLA and the Base Case scenarios during the mid-December through April fall-run Chinook salmon fry rearing period. Thus, the NMFS recommendations would not provide any substantial benefit to fall-run Chinook salmon fry rearing.

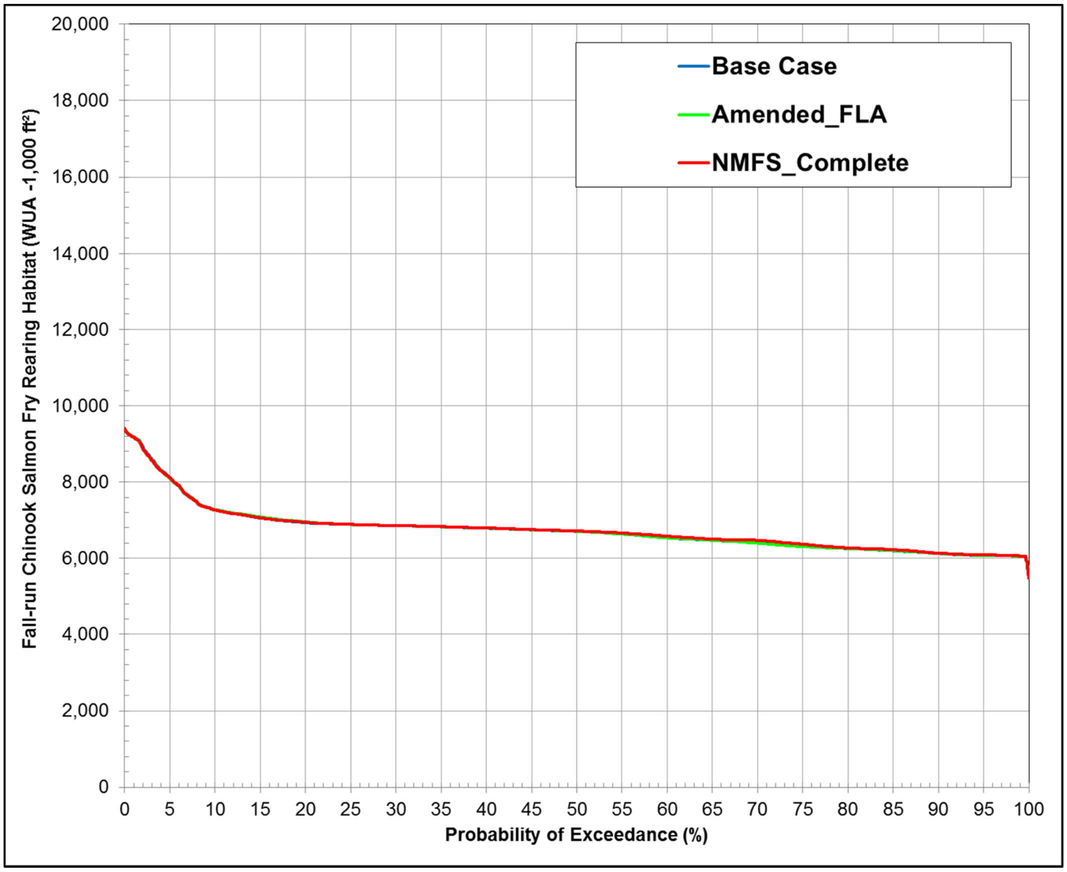

Figure 5. Fall-run Chinook salmon fry rearing habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS _Complete scenarios.

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the December through March period of the fry rearing lifestage. Relative to water temperatures under the AFLA and the Base Case scenarios, water temperatures under the NMFS recommendations scenario would be more suitable during April, remaining below the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at Marysville.

Juvenile Rearing

YCWA compared fall-run Chinook salmon juvenile rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover specified in TM 7.10, under the NMFS recommendations, the AFLA and the Base Case scenarios for the mid-January through June juvenile rearing period (**Figure 6**).

Essentially identical amounts of habitat would be provided by the NMFS recommendations, the AFLA and the Base Case scenarios during the mid-January through June fall-run Chinook salmon juvenile rearing period. Thus, the NMFS recommendations would not provide any substantial benefit to fall-run Chinook salmon juvenile rearing.

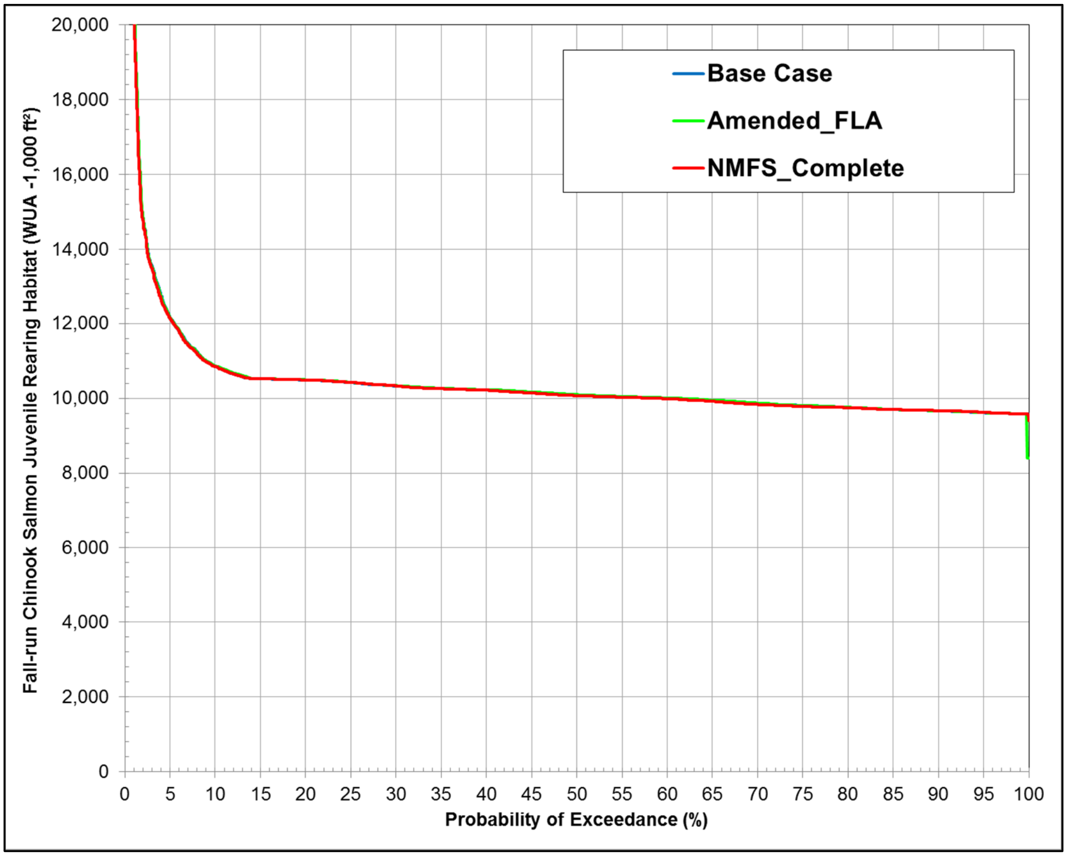

Figure 6. Fall-run Chinook salmon juvenile rearing habitat duration over the 41-year hydrologic period during the juvenile rearing lifestage for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the January through March period of the January through June juvenile rearing lifestage periodicity.

NMFS's recommendations would result in more suitable conditions during April, remaining below the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F about 8 percent more often at Marysville.

Juvenile Downstream Movement

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the December through March period of the December through June juvenile downstream movement lifestage periodicity.

NMFS's recommendations would result in more suitable conditions during April, with wataer temperatures remaining below the EPA (2003) 7DADM value of 61°F nearly 5 percent more often at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F about 8 percent more often at Marysville.

Steelhead

Lifestage periodicities and associated UO and UT WTI values for steelhead are presented in **Table 5**.

Table 5. Lifestage-specific periodicities for steelhead in the lower Yuba River.

Lifestage	UO WTI	UT WTI	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Adult Migration	64°F	68°F	■	■	■	■	■	■	□	□	□	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■
Adult Holding	61°F	65°F	■	■	■	■	■	■	□	□	□	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■
Spawning	54°F	57°F	■	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Embryo Incubation	54°F	57°F	■	■	■	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Fry Rearing	65°F	68°F	□	□	□	□	□	□	■	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□	□	□
Juvenile Rearing	65°F	68°F	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Fry & Juvenile Downstream Movement	65°F	68°F	□	□	□	□	□	□	■	■	■	■	■	■	■	■	■	■	■	■	□	□	□	□	□	□
Smolt (Yearling+) Emigration	52°F	55°F	■	■	■	■	■	■	■	□	□	□	□	□	□	□	□	□	□	□	■	■	■	■	■	■

Source: RMT 2013

Note: EPA (2003) Criteria – salmon/trout migration (64°F); spawning and incubation (55°F); salmon/trout core rearing (61°F); salmon/trout non-core rearing (64°F); steelhead smoltification (57°F).

Adult Immigration and Holding

Migration

NMFS's recommendations would result in less suitable conditions during August, with water temperatures exceeding the EPA (2003) 7DADM value of 64°F about 5 percent more often at DPD.

Holding

NMFS's recommendations would result in less suitable conditions during August, with water temperatures exceeding the UO WTI value of 61°F nearly 5 percent more often at DPD, the UT WTI value of 65°F about 5 percent more often at Marysville, and the EPA (2003) 7DADM value of 64°F about 5 percent more often at DPD.

Spawning

- NMFS's recommendations would provide slightly more steelhead spawning habitat during a portion of the exceedance distribution and slightly less steelhead spawning habitat during another portion of the exceedance distribution (**Figure 7**). Overall, however, similar amounts of habitat would be provided by the NMFS recommendation, the AFLA and the Base Case scenarios. Thus, the NMFS recommendations would not provide any substantial benefit to steelhead spawning.

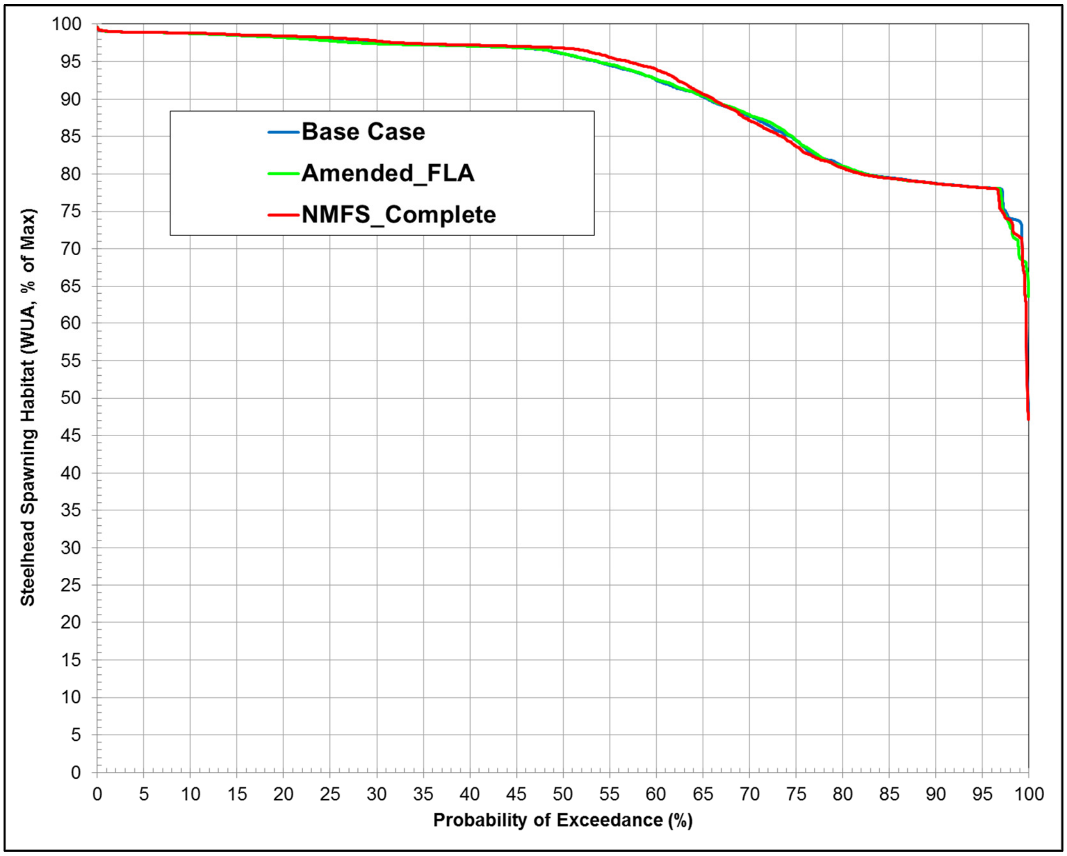

Figure 7. Comparison of steelhead spawning habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Similar amounts of steelhead spawning habitat would be provided by the NMFS recommendations relative to both the AFLA and the Base Case as a long-term average and most water year types, although slightly higher amounts would be provided during dry water year types (**Table 6**).

Table 6. Comparison of long-term and water year type average steelhead spawning WUA (percent of maximum) under the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	91.6	96.6	94.9	93.4	91.8	83.5
Base Case	91.4	96.5	95.4	93.1	90.4	83.8
Differences	0.2	0.1	-0.5	0.3	1.4	-0.3

Scenario	Long-term Full Simulation Period[2]	WYTs[1]				
		Wet	Above Normal	Below Normal	Dry	Critical
NMFS_Complete	91.6	96.6	94.9	93.4	91.8	83.5
Amended_FLA	91.4	96.4	95.4	93.0	91.0	83.8
Differences	0.2	0.2	-0.5	0.4	0.8	-0.3

[1] As defined by the Yuba River Index (YRI) WY Hydrologic Classification.
[2] Based on the WY 1970-2010 simulation period.

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scenarios all would generally remain below all WTIs during the January through March period of the spawning lifestage. Relative to the AFLA and the Base Case scenarios, water temperatures under the NMFS recommendations scenario would be more suitable during April, remaining below the UO WTI value of 54°F about 5 percent more often at DPD, and remaining below the EPA (2003) 7DADM value of 55°F nearly 15 percent more often at DPD.

Embryo Incubation

Water temperatures under NMFS recommendations, the AFLA and the Base Case scenarios would generally remain below all WTIs during the January through March period of the spawning lifestage. Relative to the AFLA and the Base Case scenaraios, water temperatures under the NMFS recommendations scenario would be more suitable during April, remaining below the UO WTI value of 54°F about 5 percent more often at DPD, and remaining below the EPA (2003) 7DADM value of 55°F nearly 15 percent more often at DPD.

- Water temperatures under the NMFS recommendations scenario would be less suitable during May, exceeding the UO WTI value of 54°F over 5 percent more often at DPD.

Fry Rearing

YCWA compared steelhead fry rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover specified in TM 7.10, under the Base Case, the AFLA and the NMFS recommendation scenarios for the April through July fry rearing period (**Figure 8**).

Essentially identical amounts of habitat would be provided by the NMFS recommendation, AFLA and Base Case scenarios during the April through July steelhead fry rearing period. Thus, the NMFS recommendation scenario would not provide any substantial benefit to steelhead fry rearing.

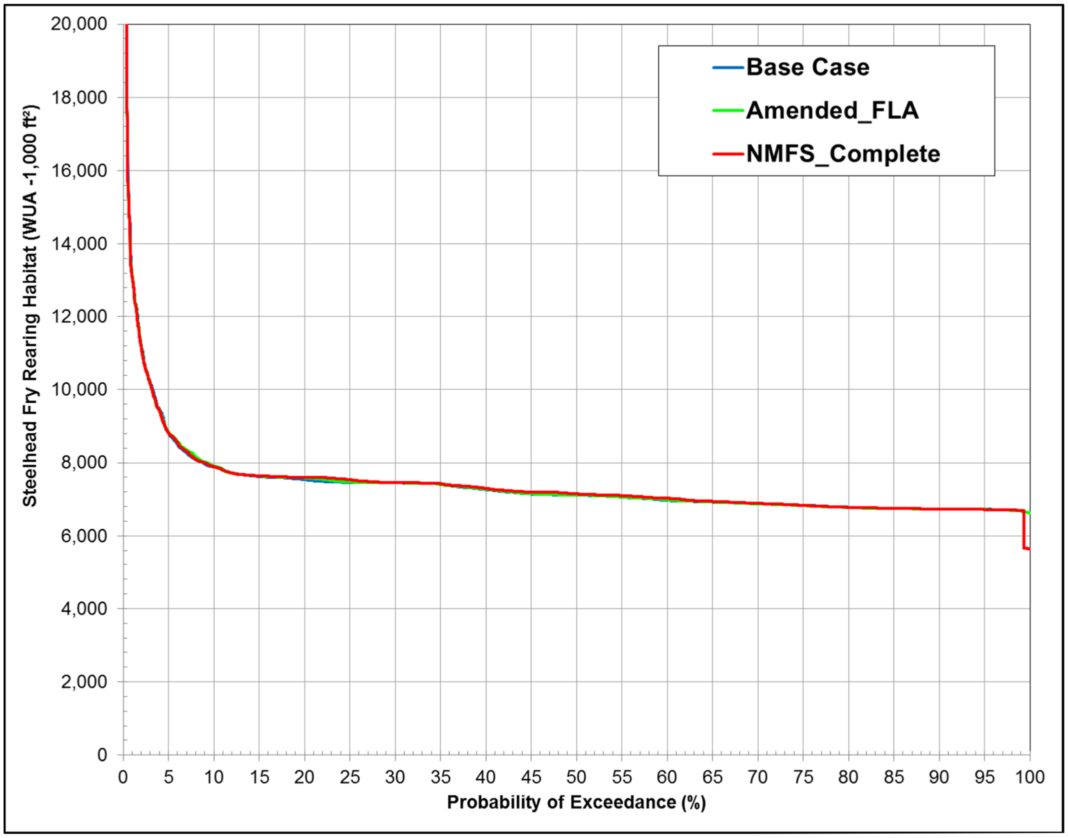

Figure 8. Steelhead fry rearing habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

NMFS' recommendations would result in more suitable water temperatures under the EPA (2003) criteria, remaining under the 7DADM value of 61°F about 5 percent more often than the AFLA or the Base Case during April at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F over 5 percent more often at Marysville.

Juvenile Rearing

YCWA compared steelhead juvenile rearing habitat (WUA in sq ft), using the agreed-upon Relicensing Participants HSC with cover as specified in TM 7.10, under the Base Case, the AFLA and the NMFS recommendation scenarios for the year-round juvenile rearing period (**Figure 9**).

Essentially identical amounts of habitat would be provided by the NMFS' recommendation, the AFLA and the Base Case scenarios during the year-round steelhead juvenile rearing period. Thus, the NMFS recommendations would not provide any substantial benefit to steelhead juvenile rearing.

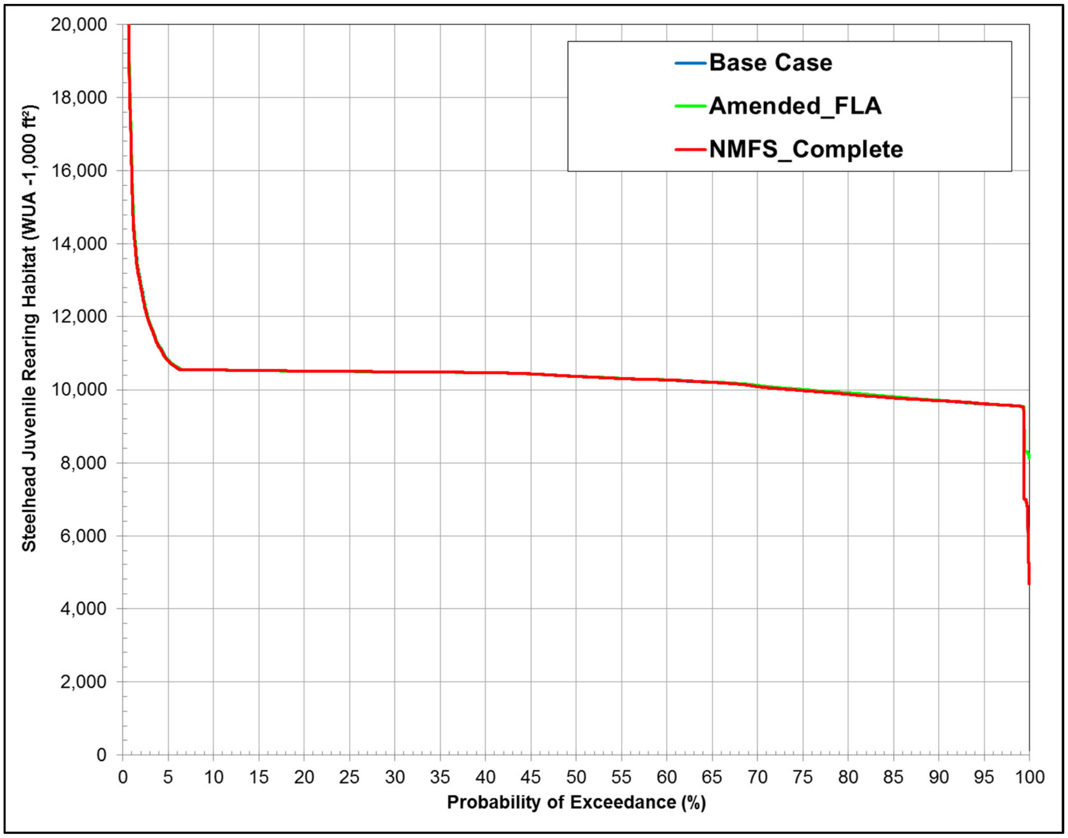

Figure 9. Steelhead juvenile rearing habitat duration over the 41-year hydrologic period for the Base Case, the Amended_FLA, and the NMFS_Complete scenarios.

Water temperatures under the NMFS recommendations, the AFLA and the Base Case scnearios all would generally remain below all WTIs during the October through March period of the year-round juvenile rearing lifestage periodicity.

NMFS's recommendations scenario would result in more suitable water temperatures under the EPA (2003) criteria, remaining under the 7DADM value of 61°F nearly 5 percent more often than the AFLA scenario or the Base Case scenario during April at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F over 5 percent more often at Marysville.
- Less suitable conditions during August, exceeding the UO WTI value of 65°F about 5 percent more often at Marysville.

Juvenile Downstream Movement

The NMFS recommendations scenario would result in more suitable water temperatures under the EPA (2003) criteria, remaining under the 7DADM value of 61°F nearly 5 percent more often than the AFLA scenario or the Base Case scenario during April at Marysville, and would result in:

- Less suitable conditions during May, exceeding the EPA (2003) 7DADM value of 61°F over 5 percent more often at Marysville.
- Less suitable conditions during August, exceeding the UO WTI value of 65°F about 5 percent more often at Marysville.

Smolt (yearling+) Emigration

The NMFS recommendations scenario would result in consistently less suitable water temperatures, which would exceed the UO WTI value of 52°F over nearly the entire range of the distributions during October at Smartsville, DPD and Marysville, relative to the AFLA scenario or the Base Case scenario, and would result in:

- Consistently less suitable water temperatures relative to the AFLA and the Base Case during October when water temperatures exceed the UT WTI value of 55°F at DPD and Marysville.
- Consistently less suitable water temperatures relative to the AFLA and the Base Case during October when water temperatures exceed the EPA (2003) 7DADM value of 57°F at DPD and Marysville.
- Consistently less suitable water temperatures relative to the AFLA and the Base Case during November when water temperatures exceed the UO WTI value of 52°F at DPD and Marysville.
- More suitable water temperatures during April, remaining under the UO WTI value of 52°F about 10 percent more often at Marysville and about 15 percent more often at DPD, and the UT WTI value of 55°F about 10 percent more often at Marysville and 5 percent more often at DPD, and remaining under the EPA (2003) 7DADM value of 57°F about 15 percent more often at Marysville, and about 5 percent more often at DPD.

1.2.1.2 NMFS's characterization of Project effects is incorrect and misleading for recent and AFLA conditions for the lower Yuba River.

In NMFS's rationale for its recommended Condition 1 spring pulse flow and recession (pg. 30 of NMFS Comment Letter), NMFS states "*Flows in the month of May in the lower Yuba have decreased by 33% across all water years as a result of the YRDP. The largest decrease in flow magnitude occurs in wet years, with median monthly flows dropping from 6,141 cfs (without-Project flow) to 3,637 cfs (with-Project), a decrease of 40%. During dry years, median monthly flows have decreased from 1,618 cfs (without-Project) to 900 cfs (with-Project), a decrease of 44% (YCWA 2013 pg. 73).*"

NMFS (pg. 30 of NMFS Comment Letter) further states "*Similar decreases in magnitude have occurred in April in the lower Yuba River with median monthly flows dropping from 3,921 cfs to 2,048 cfs, a decrease of 48%. Flows in June have slightly increased across all water years as a result of the YRDP with slight decreases in flow during dry and critical years.*"

The cited reference (YCWA 2013) does not contain the information presented in the two quoted paragraphs of the NMFS Comment Letter. On page 73 of YCWA (2013), which was cited by NMFS, there is a table of percent days of inundation at a specified flow range by month, and the document does not have any information to support the flows stated in NMFS's comment letter.

NMFS's characterization of lower Yuba flows does not correctly reflect the differences between the Without-Project condition and recent Project flows on the lower Yuba River. Using recent historical data of Yuba River at Smartsville Gage flows for the period when the Yuba Accord has been implemented from 2007 to 2016, and using a mass balance calculation of "Without Project flows" results in an estimated median May Without-Project flow of 2,816 cfs and an estimated historical May flow of 2,122 cfs, a 25 percent reduction in flow, substantially less than the 40 percent stated by NMFS. Although NMFS did not define what a wet year is, using Schedule 1 and 2 years of the 2007 to 2016 period, which are 7 years of the 10-year period, the median May Without-Project flow was 3,141 cfs and the historical median May flow was 2,804 cfs, an 11 percent reduction. For April, the change in median flow for this period was a 25 percent reduction and for June the change from Without- Project flow was a 91 percent increase in flow. NMFS's characterizations of June flows during dry and critical years also are incorrect. During the three years of 2008, 2014 and 2015 that were the only three years of the 2007 to 2016 period that were not Schedule 1 or 2 years, and the historical monthly average flows for these three years were 112 percent, 207 percent and 216 percent greater than the corresponding Without-Project flows.

Comparing the modeling results for Yuba River below Deer Creek for the AFLA scenario flows with the Without-Project flows produces similar results. For the 41-year period of simulation of 1970 to 2010, the median May Without-Project flow is 4,060 cfs and the AFLA May flow is 3,312 cfs, an 18 percent reduction in flow, substantially less than the 40 percent stated by NMFS. For April, the median Without-Project flow is 4,060 cfs while the AFLA modeled median flow is 2,369, a 42 percent reduction. June median flows for the AFLA are 74 percent higher than the Without-Project median flows for the period of simulation.

1.2.1.3 NMFS's Recommended Spring Snowmelt Pulse Flow and Recession Rate would not result in flows that occur during the spring snowmelt peak flow or recession.

The NMFS rationale for Condition 1 "Spring Snowmelt Pulse Flow and Recession" discusses the importance of the spring snowmelt recession but NMFS's recommended flows and recession rate would not result in flows that would occur during the spring snowmelt peak flow or recession. As described in this section, operation of the Project for this recommended required flow would occur almost a month earlier than the peak snowmelt flow in Schedule 1 years and almost a month and one half earlier than the peak snowmelt flow in Schedule 2 years. Ramping rates associated with this recommended condition would occur immediately after the end of the 60 or 30 day flow period and would end by the end of April or, at latest, by the second week of May, well before the spring snowmelt peak and recession on the Yuba River, which generally occurs in these years in late May and early June.

NMFS has recommended a new measure to include a "Spring Snowmelt Pulse Flow and Recession" in Schedule 1 and 2 years. The NMFS recommended measure states:

(A) During a Schedule 1 water year type (as determined by YCWA's proposed Condition WR3 in the FLA), the Licensee shall provide 60 days continuous flow above 3,500 cfs as measured at USGS Gage 11421000 (Marysville Gage) between March 1 and June 15.

(B) During a Schedule 2 water year type (as determined by YCWA's proposed Condition WR3 in the FLA), the Licensee shall provide 30 days continuous flow above 2,500 cfs as measured at USGS gage 11421000 (Marysville Gage) between March 1 and June 15.

> *1) It is expected the Licensee will use scheduled forecasts of rainfall, snowmelt, and streamflow to determine the optimal time to begin the snowmelt pulse flow. The Licensee should utilize flow from the Middle and South Yuba Rivers to the maximum extent possible and coordinate the springtime pulse flow to coincide with anticipated spill events from Englebright Reservoir.*

(C) If the Licensee has not initiated the pulse flow by April 15 of a schedule 1 or 2 year, the pulse flow will commence on April 15 and last for the next 60 days (Schedule 1) or 30 days (Schedule 2).

(D) If at any point during the 60-day schedule 1 snowmelt pulse release, the water year type changes to schedule 2, the pulse flow may conclude at 30 days. If the water year type changes to schedule 3 or lower the pulse flow will conclude immediately subject to the recession condition outlined below in section (E).

The NMFS recommended measure identifies a time period from March 1 to June 15 for a 60 day, 3,500 cfs requirement in Schedule 1 years or a 30 day 2,500 cfs requirement in Schedule 2 years, but the measure would not be implemented as contemplated by NMFS because:

1. YCWA would not have information to "*use scheduled forecasts of rainfall, snowmelt, and streamflow to determine the optimal time to begin the snowmelt pulse flow*". Long range forecasts of May and June runoff available in March are not reliable enough to base release decisions.

2. The natural spring snowmelt peak flow occurs very late in this period, with the Schedule 1 peak snowmelt centered on late May and the Schedule 2 peak snowmelt centered on early to mid-May, based on examination of the historical flow data from USGS gage "North Yuba River below Goodyears Bar". To utilize the flow from the Middle and South Yuba Rivers, in most years the release would need to be scheduled in late May and June because that is when peak runoff occurs on these rivers due to upstream project operations (Yarnell 2013). However, the timing and magnitude of flows from these two rivers would not provide the most efficient method for meeting the NMFS's recommended flows while preserving storage in New Bullards Bar Reservoir for water supply. Therefore, the required flow would not occur at the time of peak snowmelt flows on the Middle and South Yuba Rivers.

3. Analysis of the impacts to storage in New Bullards Bar Reservoir and resulting water supply deliveries from the NMFS recommendations leads to the conclusion that YCWA

would have to implement a release plan to comply with the NMFS recommended condition that would start operations for the 60 or 30-day requirement in Schedule 1 and 2 years immediately on March 1 or immediately after the March Bulletin 120 is issued and a determination occurs of a water year type that results in a Schedule 1 or 2 year. The 41 years of modeled hydrology and operations of the YRDP under Base Case conditions show that in 35 years that start on March 1 as a Schedule 1 or 2 or that result in a Schedule 1 or 2 with the March Bulletin 120, the lowest demand (smallest volume of additional release) on New Bullards Bar storage would result if YCWA were to start the release on March 1 for a current Schedule 1 or 2 year or to start the release immediately with a determination of Schedule 1 or 2 in the March Bulletin 120. In only 3 of those 35 years of Schedule 1 or 2 would less storage release be required if the required flow period were to being on a later date. At this early time of March 1 to March 15, there is no reliable information available that would forecast greater runoff later in the period that could be utilized to forgo starting the pulse in March and instead provide the 60 or 30 day pulse flow later in the spring, given that the probability is about 90 percent (32/35 years) that an immediate start to meet the requirement would be warranted.

Because of the timing of runoff that would be required to implement the NMFS recommendation, and because of the potential significant reductions in storage and resulting water supply impacts that would result from the NMFS recommendation, this recommendation would result in Project operations to meet the requirement starting either on March 1 or as soon as the March Bulletin 120 is issued, which would be no later than March 15. The result of the above discussion would be that the release to meet this requirement would not be a 60 or 30-day release of water in May or June, and instead would be a release in March in Schedule 2 years and in March and April of Schedule 1 years, with the potential to delay the release to about March 15 to May 15 if the year type changed to a Schedule 1 when the March Bulletin 120 forecast was issued.

Based on the above discussion, which concludes YCWA would make the required 60 or 30-day release in Schedule 1 and 2 years almost always in the months of March and April, this NMFS recommended measure would result in an operation for a "spring pulse" that mostly would not coincide with the timing of the natural spring snowmelt peak flow. Examination of "North Yuba River flow above New Bullards Bar" from the Water Balance Operations model shows that the peak snowmelt flow that immediately precedes the spring snowmelt recession occurs on May 22 on average. In Schedule 1 years the average peak flow date is May 28 and in Schedule 2 years the average peak flow date is May 12, with the spring snowmelt recession occurring immediately after these dates. In only two years of the 41-year record is the peak snowmelt flow date earlier than May 1. With these peak dates and an operation by YCWA to meet this required flow that minimizes impacts to New Bullards Bar Reservoir storage as described above, operation for this flow would occur almost a month earlier than the peak snowmelt flow in Schedule 1 years and almost a month and one half earlier than the peak snowmelt flow in Schedule 2 years. Ramping rates associated with this recommended condition would occur immediately after the end of the 60 or 30 day flow period and would end by the end of April or at latest the second week of May, well before the spring snowmelt peak and recession on the Yuba River.

The NMFS rationale for Condition #1 for spring pulse flows and ramping incorrectly states that "*Coordinating the springtime pulse flow with spill events from Englebright Reservoir will provide multiple benefits to salmonids*" because the implementation of this measure would not coordinate the springtime pulse flow with spill events, but instead would result in a static, March and April requirement that is completed before the spring snowmelt and would only occur concurrently with Englebright spill events only by happenstance and not coordination.

1.2.1.4 The NMFS recommended Condition #1 "Spring Snowmelt Pulse and Recession" would not increase the magnitude or duration of floodplain inundation, relative to the Base Case or the AFLA but instead would decrease floodplain inundation.

YCWA conducted modeling for this report that compared the AFLA, the NMFS recommended flows and ramping rate (NMFS "Combined"), and the Base Case scenarios. Results of these comparisons demonstrate that:

- The NMFS flows would result in fewer days of inundation of the floodplain of the lower Yuba River from Englebright Dam to Daguerre Point Dam (area inundated at flows above 5,000 cfs) than under Base Case or AFLA conditions. Modeling results show that the NMFS Flows (NMFS "Combined") would reduce the average number of days of inundation for all years from 25.5 to 24.8, and would reduce the median number of days of inundation for all years from 11 to 9, an 18 percent reduction.

- NMFS rationale statement for its Condition #1 suggests that NMFS's recommended flows would contribute to "engage floodplain habitat". However, YCWA's inundation analysis of the NMFS flows shows that these flows would not contribute to inundating floodplain habitat compared to Base Case or AFLA, but instead would reduce inundation of the floodplain. NMFS states in is Comment Letter at page 30 "*To provide full expression of the benthic macroinvertebrate food web, engaged floodplain habitat should be inundated annually for between 30 and 90 days to allow for primary productivity derived from inundated habitat to be realized throughout most of the lower Yuba River. Flow contributions from the Middle and South Yuba River coupled with NMFS Condition 1 is expected to meet this need in most years*." The NMFS flows would result in a slight decrease in inundation of the floodplain across all years with an average annual decrease of 1 percent and median decrease of 2 percent compared to the Base Case. In wetter years, the NMFS "Combined" flows would result in a decrease of 1 percent for the average and a 7 percent decrease for the median, with wet years defined as Schedule 1 and 2 years, which account for 34 of the 41 years modeled. The AFLA flows would result in a 1 percent increase in inundation of the floodplain compared to the Base Case for the average of all years, and about a 1 percent decrease for the median of all years. For wetter Schedule 1 and 2 years, the AFLA would increases floodplain inundation about 1 percent for the average and median statistics.

1.2.1.5 NMFS recommended recession rate of a 5 percent reduction from the previous day's flow rate as measured at the Smartsville Gage is not supported by substantial evidence.

The NMFS stated rationale for its recommendation is an oversimplified characterization of recession rates it that ignores the results of the cited studies and does not relate the recession rate to effects on the lower Yuba River. The NMFS recommended condition would impose the recession rate after a 60-day or 30-day spring pulse, but the ends of those periods would be earlier than the spring snowmelt recession in almost all years, and therefore the NMFS recommended spring recession rates would have little relationship to the change in flow rates of the natural hydrograph for the April and early May period when the 5 percent recession rate would be in effect. As discussed above in Section 1.2.1.3, the NMFS spring pulse would end in most years by the end of April in Schedule 1 years and by the end of March in Schedule 2 years, but the natural spring recession does not start until mid to late May.

The natural spring recession has a characteristic shape with a varied peak, varied starting flow and varied staring date that depends on snowpack size, location of observation and meteorology. The NMFS rationale states " *NMFS' recommendation of a 5% daily decrease in flows is greater than the unimpaired spring flow recession rate in the North Yuba, but similar to the overall unimpaired recession rates in Sierra Nevadan watersheds – conditions which native species have adapted to and evolved in for millennia*." This is not a correct statement and is not a correct assessment of the cited reference, Yarnell (2013). That reference details an analysis of recession rates that include rates for the North Yuba River. It states at page 16 "*Average rate of change is calculated as the percent decrease in flow per day over the duration of the recession"* and the table included in the NMFS rationale statement refers to a "maximum daily decrease of 6.9 percent. But even this reference and average daily rate ignores the variability of the recession, which is characterized by higher rates early in the recession and lower rates later in the recession.

Examination of the North Yuba River inflow to New Bullards Bar Reservoir mean daily flow for the 1970 to 2010 period from the Water Balance/Operations model shows that, in the springtime, the natural recession rate can be very high, with rates exceeding 15 percent reduction of the previous day flow, to a more moderate rate of generally less than 5 percent by late July and August. **Figure 10** plots the daily flow reduction during the spring recession for the Yuba River above New Bullards Bar Reservoir, expressed as a percentage of the previous days' flows. The average and average plus one standard deviation are shown as solid and dotted black lines respectively. The figure shows that at the average plus one standard deviation level, which would be expected to be exceeded about 20 percent of the time, the May recession rate is above 10 percent, the June recession rate is about 10 percent for the first half of the month and 5 percent to 10 percent for the second half and the July rate is at or below 5 percent.

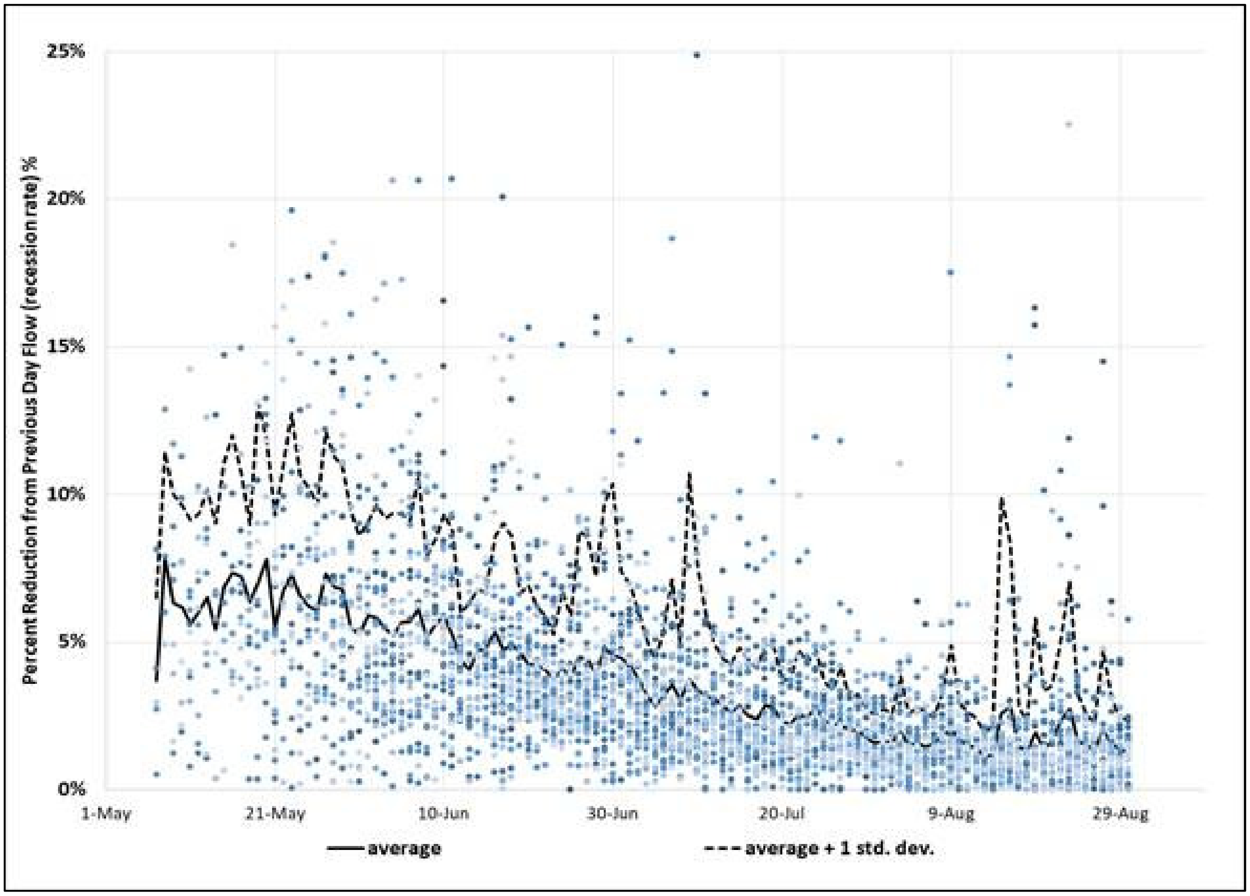

Figure 10. North Yuba River Above New Bullards Bar Reservoir spring day to day percent reduction in flow (percent recession rate) for the Period 1970 to 2010.

The NMFS rationale statement that "*The current flows as dictated by the Yuba Accord and as proposed in YCWA's license application do not dictate a gradual recession from the high flows of the spring snowmelt to the steady lower summer flows"* is misleading and ignores that the AFLA included in Condition AR9 Table 3 a spring recession rate condition that would limit flow reductions during April 1 to July 15 to a maximum reduction from the previous days flow of: 79 cfs, 150 cfs and 200 cfs for previous day flows of 400 to 499 cfs, 1,000 to 1,999 cfs and 2000 to 4,130 cfs respectively. These recession rates, which are tied to flow ranges, are intended to avoid river level reductions that would impact riparian seed establishment. The NMFS rationale for the recommended recession rate is based on a very conservative view of natural recession rates that is lower than the average recession rates over the range of natural flows in the watershed.

To assess the NMFS recession rate in the context of natural recession rates of the North Yuba River, which NMFS refers to in its rationale statement, YCWA compared daily spring snowmelt recession rates of the North Yuba River above New Bullards Bar Reservoir to the NMFS recession rate and the recession rates of AFLA Condition AR9. **Figure 11** shows each day's recession after the spring snowmelt peak flow that is a flow reduction from the previous days flow for the period of 1970 to 2010 as blue dots, with the NMFS recession rate of 5 percent shown as a red line and the Condition AR9 recession rates shown as a green line. The figure shows that:

1. There is a general trend of increasing recession rate versus increasing previous day's flow in the natural recession of the North Yuba River.

2. There is a general trend of a 5 percent recession rate as the average recession rate in the range of flows from low flow to about 1,000 cfs, while the Condition AR9 recession rates are within the range of natural recession rates but generally envelop those rates.

3. In the range of 1,500 to 4,000 cfs flow, the natural recession rates exhibit a very wide recession rate range, the NMFS recession rate is lower than the general trend of natural recession rates and the Condition AR9 recession rates are generally in the middle of the range.

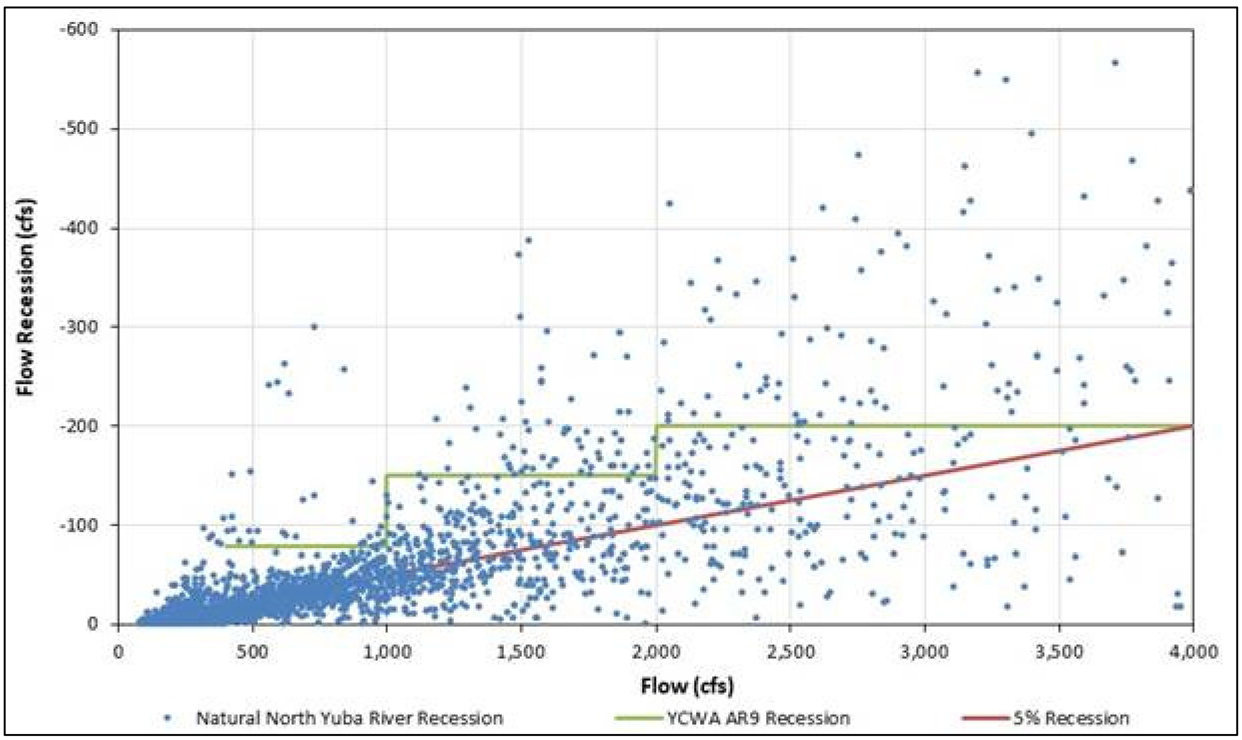

Figure 11. North Yuba River Above New Bullards Bar Reservoir spring day to day reduction in flow versus previous day flow for the Period 1970 to 2010 with the NMFS 5 percent recession shown as a red line and the AFLA AR9 recession rates shown as a green line.

The comparison of North Yuba River natural recession rates to the NMFS 5 percent recession rate and the Condition AR9 recession rates shows that the Condition AR9 recession rates would limit Project release reductions to rates that are within the range of natural spring recession rates for the North Yuba River while the NMFS recession rate would limit Project release reductions to rates that are less than the average natural recession rates of the North Yuba River.

1.2.1.6 The NMFS recommendations would result in significant costs to YCWA in terms of reduced operational flexibility, water supply, water transfers, and power generation and revenue to support, in part, habitat enhancement and management actions.

- The NMFS recommendations would require extreme Project operations in some years to maintain the required flows at Marysville Gage. In fact, YCWA would not be able to comply with the NMFS recommended condition, if the water year type were to change to a Schedule 1 with the May Bulletin 120 or any subsequent update.

Extreme and unconventional YRDP operations would be required in some years because: 1) the combined total capacity of the Narrows 2 and PG&E's Narrows 1 Powerhouses is not sufficient to release enough flow to meet the required flow of 3,500 cfs in Schedule 1 years and lower Yuba River diversions, if this required flow were to occur in late April, May and June; and 2) because without the Narrows 1 Powerhouse, which is not owned operated by YCWA, there would be many years when YCWA would have to force a spill at Englebright Dam or curtail or eliminate irrigation diversions to meet the required flow.

The NMFS recommended conditions state in part (C) "If the Licensee has not initiated the pulse flow by April 15 of a schedule 1 or 2 year, the pulse flow will commence on April 15 and last for the next 60 days (Schedule 1) or 30 days (Schedule 2)." If a Schedule 1 year is initiated with the April Bulletin 120, the 60-day required flow of 3,500 cfs would commence on or just before April 15 and would continue until about June 15. The combined total maximum capacity of the Narrows 1 and 2 Powerhouses is about 4,130 cfs and almost always by mid-May irrigation diversions are greater than 630 cfs, which when combined with the required flow of 3,500 cfs would exceed the combined total powerhouse release capacity. Also, in some drier springs, irrigation diversion exceed this 630-cfs amount by late April. In the period when this NMFS flow requirement would occur, the only option for YCWA would be to release sufficient water from New Bullards Bar Reservoir to spill enough water at Englebright Dam to meet the required flows plus the diversions. Without such spills, YCW would have to curtail irrigation diversions to comply with the NMFS flow requirement.

There would be no way for YCWA to comply with the NMFS recommended condition, if the water year type were to change to a Schedule 1 with the May Bulletin 120 or any subsequent update. This is because any change to a Schedule 1 after April 17 would not provide the 60 days within the March 1 to June 15 compliance period specified in the NMFS condition. It is highly likely that in some years a Schedule 1 designation first will occur after the April Bulletin 120, and the Schedule 1 determination then would be too late for YCWA to be able to make the 60 day release. This problem also could occur if the year type Schedule changed from a 3 or greater Schedule to a Schedule 2 with a Bulletin 120 update after the initial May Bulletin 120.

- The NMFS recommendations would result in water delivery shortages to local farmers in wetter water years, and would significantly reduce water supply reliability for farmers and farm operations in some years.

  The release capacity of YCWA's Narrows 2 Powerhouse is about 3,400 cfs, which is about 100 cfs less than the NMFS recommended required flow of 3,500 cfs at Marysville Gage for 60 days in Schedule 1 years. YCWA has a coordinated operations agreement with PG&E for operations of the Narrows 1 Powerhouse, but that agreement does not mean that the Narrows 1 powerhouse would always be available when the 3,500 cfs flow would be required. In addition, eight YCWA Member Units divert water upstream of Daguerre Point Dam which can reduce Narrows 2 releases by as much as 1,000 cfs in April, May and June. If Member Units were to divert 1,000 cfs, the net flow at Marysville would be about 2,400 cfs, if Narrows 1 was not available. YCWA has contracts with the Member Units, and YCWA could require some of the Member Units to stop diverting water, but three of those Member Units have their own water rights and could decide to divert under those rights. Limiting diversions to some or all of the Member Units would have large impacts to farmer operations and economics. Water Balance/Operations modeling results for the scenario "NMFS Combined" demonstrate that for April of 1970 and 2004, when 3,500 cfs would be required in April, almost all diversions in the last week of the month would have to cease for YCWA to be able to comply with the NMFS recommendations. This type of shortage would occur in 9 additional Schedule 1 years for a total of 11 of 19 Schedule 1 years in April and sometimes in May, over the model simulation period.

  Water delivery shortages would occur in wetter years with the NMFS Spring Pulse Flow and Recession recommendations ("NMFS Combined"), whereas under the Base Case and AFLA such shortages would only occur in dry years. Modeling results show that under Base Case and AFLA conditions, water delivery shortages would occur in one very dry year (1977). With the NMFS recommendations, additional years of water delivery shortages would occur in 1970, 1997, 2004 2007 which are Schedule 1, 1, 1 and 2 years, respectively. Each of these years is characterized by large winter runoff volume but lower than normal spring runoff, with April to July unimpaired flows of less than 65 percent of average.

  Although the four years of the NMFS Combined scenario during which there would be irrigation diversion shortages are classified as Schedule 1 and 2 water years, this classification is based on annual inflow to New Bullards Bar Reservoir and was optimized for allocation of the Yuba Accord flows schedules. The much higher NMFS recommended flows for Schedule 1 and 2 years would require significantly more water to be released in March, April and sometimes in May. The Base Case required flow in Schedule 1 years has a total annual volume of just under 600,000 AF, while the NMFS recommended modifications would require from 830,000 AF to over 875,000 AF, an almost 50 percent increase in required flow. All this additional required flow of about 275,000 AF is focused on 2 months. Each of 1970, 1997, 2004 and 2007 is a year with significant winter runoff, but with well below average spring runoff. Because of the required winter flood reservation space, much of the winter runoff cannot be stored for use in the spring and in these years the spring runoff is not sufficient to support this level of required flow without impacting flows during other times of the year or water supplies for other uses. A comparison of the required flow volume versus total runoff volume (without Project flow volume) for April for these four years shows that, on average, the required flow would be 106 percent of the total runoff volume. The maximum percentage would occur in 1970 when the required flow would be almost 200 percent of the total natural runoff volume.

Water supply shortages that would occur with the NMFS recommendations would have significant costs to YCWA and local farmers. YCWA has conjunctive use agreements with its Member Units. Those agreements include a provision that YCWA would pay the groundwater pumping costs to Member Units that had supplemental water supplies in their water supply agreements and who had to pump groundwater to replace shortages in surface water deliveries. Any additional shortages in irrigation deliveries that were above the amounts of supplemental water supplies would be a direct cost of pumping groundwater to a Member Unit and individual farmers that would not be reimbursed. In the recent drought of 2015, YCWA reimbursed Member Units at the rate of $35/acre-ft for groundwater pumping to make up for surface water delivery shortages. This is the cost to YCWA for shortages. The results of the model scenario "NMFS Combined", which models the NMFS recommendations and AFLA conditions upstream of Englebright Dam, when compared to the Base Case and AFLA results in an increase in average annual shortage of 5,000 acre-ft with an average annual cost of $175,000 per year and a maximum single year cost of just over $3 million.

Implementation of the NMFS recommended required flow would result in even more frequent shortages than shown in the modeling. Water supply allocations are made in April and use a 90 percent forecast of future runoff conditions to ensure sufficient water supply is available to farmers as decisions related to crop planting are made. An updated forecast of water supply is made in May, but this is usually too late for summer cropping decisions. An April forecast of water supply together with a forecast of 90 percent future runoff would result in forecasting more frequent and larger shortages than shown in the modeling results. The water supply planning implications of having shortages in wet years means that for Yuba County farmers that depend on Yuba River diversions, no longer would drought planning be associated only with dry conditions - water supply shortages could occur in a wide range of hydrologic conditions, and even during wet water years.

- <u>The NMFS recommendations would significantly reduce and in some years eliminate, April and early May YCWA water transfers, and would reduce summer water transfers which, in turn, would reduce water transfer revenue.</u>

The NMFS recommended flows would result in significant reductions in, and in some years elimination of, Yuba Accord water transfers and associated revenues. The NMFS recommended required flows would have two types of impacts to Yuba Accord transfer flows. First, the recommended high spring flow requirements would be larger than the Yuba Accord spring flow requirements from March through April and into May in Schedule 1 years and mostly March and sometimes April in Schedule 2 years. The Yuba Accord flow requirement is the mechanism that produces transfer releases from the Yuba River in drier times of the year. Because the NMFS recommended flow requirements are higher than the Accord flow requirements, the resultant higher flows would override the transfer flows of the Yuba Accord. During the past 10 years, 6 percent and 9 percent of Accord surface water transfer releases have occurred during the months of April and May, respectively, and almost all of this water would no longer be available as a transfer release in Schedule 1 and 2 years with the NMFS recommended required flow. Second, because these requirements would cause large amounts of water to be released during the spring, less water would be available for transfer releases during summer.

In about 60 percent of years, Accord transfer releases are made from storage in New Bullards Bar Reservoir during the summer, and are higher than the instream flow requirements of the Accord. Examination of the actual transfers that occurred in 2009, 2010, and 2016 indicate that the commenters' recommendations ("Combined") would have been implemented in those years, and the summertime transfer volumes in each of those years would have been reduced by from 40 to 60 TAF.

An example of the impact of NMFS recommendations ("NMFS Combined") on transfer flows can be demonstrated by examining what would have occurred in 2013 and 2014 if the recommended flows had been implemented. A comparison of the NMFS recommended flows versus the actual flows in spring 2013 is shown in **Figure 12**. The figure demonstrates that in 2013, the NMFS recommended flows would have required 2,500 cfs in March and early April, eliminating some of the surface water transfer flows for April. In addition, if YCWA had been required to comply with the NMFS recommended flows:

- In 2013, there likely would have been water supply shortages in the irrigation season (whereas only fall rice field flooding shortages actually occurred in 2013). Surface water transfer volume would have been reduced by about 8,000 acre-ft. At prices from the YCWA-DWR Water Purchase Agreement the resulting loss of revenue would have been $0.8 million.

- In 2014, almost all of the surface water transfer and groundwater substitution transfer (that combined totaled 162,000 AF) would have been eliminated. Using the transfer water prices for transfer surface water from the YCWA-DWR Water purchase agreement and the groundwater substitution pricing from 2014 that was actually paid by DWR, the lost water transfer revenue that would have occurred due to lower transfer volumes in 2014 with the commenters recommended lower Yuba flows would be about $40 million.

- In 2014, there would have been even greater water supply shortages than those that occurred and it would have been a Schedule 6 year instead of a Schedule 5 year.

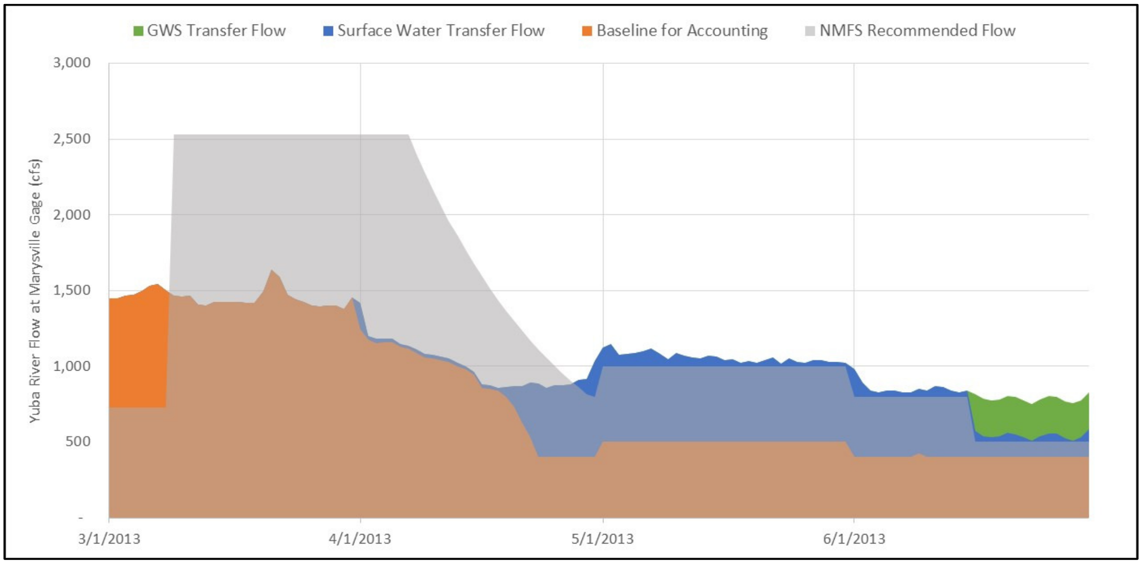

Figure 12. 2013 Yuba Accord water transfer flows with NMFS recommended flows superimposed in grey.

- <u>The NMFS recommendations would negatively impact power generation and associated Project revenue.</u>

  Given the foregoing discussions, the only remaining option for YCWA would be to release enough water from New Bullards Bar Reservoir to force a spill at Englebright Dam to provide enough flow to meet the NMFS recommended Marysville required flow of 3,500 cfs. Releases would have to be made through the Colgate Powerhouse (3,400 cfs capacity) and augmented with either spills at New Bullards Bar Reservoir through the spillway gates, or through the New Bullards Bar Reservoir low level outlet. In either case, forcing spill at Englebright Dam by making releases from New Bullards Bar Reservoir, which is located 35 miles upstream of the Marysville Gage, would be required. Spilling of Englebright Dam would eliminate the peaking and ancillary services capacity of New Colgate Powerhouse during these operations due to AFLA proposed license flow fluctuation limitations. These operations would also result in the loss of power generation because some of the water from New Bullards Bar Reservoir would be released through non-generating outlet.

  Modeling results of the NMFS “Combined” scenario shows that violations in meeting the required flow at the Marysville Gage would occur because the model is not programed to simulate spills at Englebright Dam to meet flow requirements. Also, in some years, and as shown in the results of model scenario NMFS “Combined” for the spring of 1989, even with a forced spill at Englebright Dam, the New Colgate Powerhouse capacity would not be sufficient to provide all of the flow needed to meet irrigation diversions and the 3,500 cfs required flow at the Marysville Gage. Releases through the low-level outlet at New Bullards Bar Dam or spills through the Flood Control Spillway Gates would be needed. The model results show that in 1989 as much as 600 cfs of spill at New Bullards Bar Dam would be needed. Just for this one occurrence about 18,000 acre-ft of water would need to be spilled at New Bullards Bar Dam, representing about 20,000 MWh of lost generation.

- The NMFS recommended flows "NMFS Combined" scenario would result in an average annual decrease of 3.2 percent power generation from the Project compared to the Base Case. Almost all of this decrease would be due to upstream conditions that were included in this scenario and not due to recommendations by NMFS. When compared to the AFLA scenario the "NMFS Combined" scenario would result in about the same average annual generation. Modeling results for single year and five-year average generation impacts show a maximum one-year reduction on a percentage basis of a 16.7 percent reduction or 123,321 MWh from the AFLA generation, and a five-year maximum annual average reduction of 25,757 MWh which is about a 2 percent average annual reduction for the five-year period.

- Large reductions in revenues would occur with the NMFS recommendations compared to the Base Case and AFLA scenarios. While the "NMFS Combined" scenario would result in about the same average annual generation as the Base Case, because the NMFS recommended flows would require higher powerhouse releases in the low power value months of March and April which would reduce powerhouse releases in higher value months, total revenue would be reduced. The NMFS recommendations with upstream AFLA proposed conditions would result in an average annual reduction in power generation revenue of $1.58 million which would be a 3.1 percent reduction in revenues compared to the Base Case and an average annual $0.5 million or 1 percent reduction compared to the AFLA scenario. The greatest single year revenue decrease would occur in 1990, with about $5.6 million and $4.3 million reductions and 15.8 percent and 12.5 percent reductions in power revenue compared to the Base Case and AFLA respectively. Compared to the Base Case, every rolling 5-year period would have a reduced generation revenue of at least 1 percent, with the greatest 5 year rolling average reduction in power revenue being about $1.9 million annually or 5 percent overall. When compared to the AFLA scenario, the minimum 5 year rolling average revenue of the NMFS Combined scenario would be about $1.3 million annually or 3 percent lower. Average, and the minimum average for a 5-year period for revenue are important statistics because YCWA uses a 5-year revenue projection in its planning for reserves, project expenditures and planning for flood control activities. Significant reductions in the 5-year revenue forecast would have a negative impact on YCWA's ability to plan and engage in projects that require large, multi-year expenditures of Project revenue. Estimates of changes in annual average power generation and power generation revenue are provided in the Technical Report "Modeling Approach to Support Responses to Flow-Related Recommendations" filed under separate cover.

1.2.1.7 NMFS recommendation that the Spring Snowmelt Pulse and Recession Flow should inundate floodplain habitat annually for 60 days to allow for primary productivity contradicts the duration of inundation in other studies on the lower Yuba River, and contradicts the rationale statement.

In the rationale NMFS provided for FPA §10(j) Condition #1, NMFS states *"..To provide full expression of the benthic macroinvertebrate food web, engaged floodplain habitat should be inundated annually for between 30 and 90 days to allow for primary productivity derived from inundated habitat to be realized throughout most of the lower Yuba River. Flow contributions from the Middle and South Yuba River coupled with NMFS Condition 1 is expected to meet this need in most years. The 60-day inundation period is based on establishment of benthic macroinvertebrate guilds: shredders, conditioners, collectors (Poff et al. 1997, Short & Maslin 1977) contributing to the prey base for salmonids (Allen et al. 2003) .*

NMFS relies, in part, on the report provided by cbec (2013). In a discussion pertaining to the duration of floodplain inundation, cbec (2013) states…… *"In other lowland Central Valley river floodplains, studies have shown increased growth rates as a result of at least 21 days on the floodplain (Jeffres et al., 2008; Sommer et al., 2001, 2002). During this time period, phytoplankton and zooplankton life cycles produce valuable food resources in relatively slow moving, shallow water with temperatures typically warmer than the main river channel (Sommer et al., 2004)… An inundation event lasting at least 21 days would likely provide the opportunity for invertebrates to colonize off-channel areas. Studies on the lower American River, a system more analogous to the LYR, have shown that floodplain invertebrate densities approach main channel densities after 2 to 4 weeks of inundation (Merz, personal communication). In summary, both durations have the potential to benefit juvenile salmonids by providing additional food resources and diverse offchannel habitats for a period of time, and the 21 day duration would provide additional resources through new benthic production."*[underline added].

Thus, the 60-day duration of inundation in NMFS's recommendation is contradicted by supporting literature on the lower Yuba River citied by NMFS that recommends only at least 21 days of inundation for new benthic production.

2. References Cited

cbec 2013. Hydrologic and Geomorphic Analysis to Support Rehabilitation Planning for the Lower Yuba River from Parks Bar to Marysville. Final Report. Prepared for South Yuba River Citizens League and the U.S. Fish and Wildlife Service. December 6, 2013.

United States Environmental Protection Agency (EPA). 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. Seattle, WA: Region 10 Office of Water.

Yarnell S.M., R.A. Peek, D.E. Rheinheimer, A.J. Lind, and J.H. Viers. 2013. Management of the Spring Snowmelt Recession: An Integrated Analysis of Empirical, Hydrodynamic, and Hydropower Modeling Applications. California Energy Commission. Report No. CEC-500-2014-030.

YCWA. 2013. Technical Memorandum 6-2 – Riparian Habitat Downstream of Englebright Dam. Yuba River Development Project FERC Project No. 2246. June 2013.

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Attachment 1
Water Temperature Suitabilities

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Spring-run Chinook Salmon
Water Temperature Exceedance Curves

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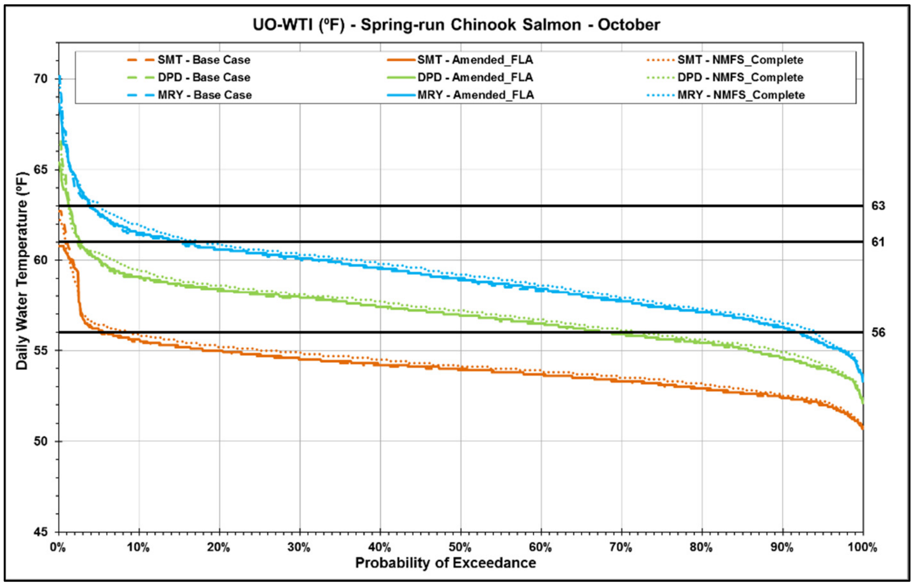
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DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
63
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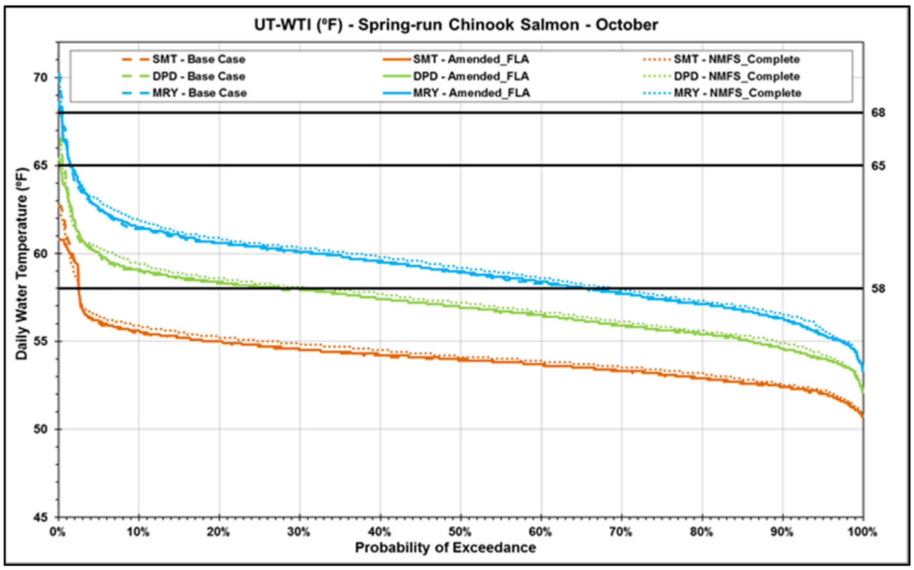
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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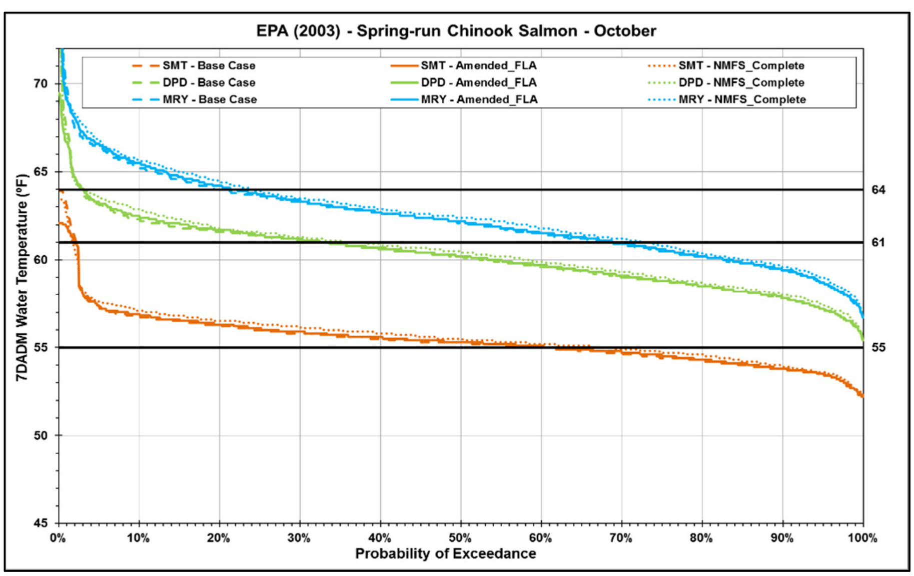
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7DADM Water Temperature (ºF)
Probability of Exceedance
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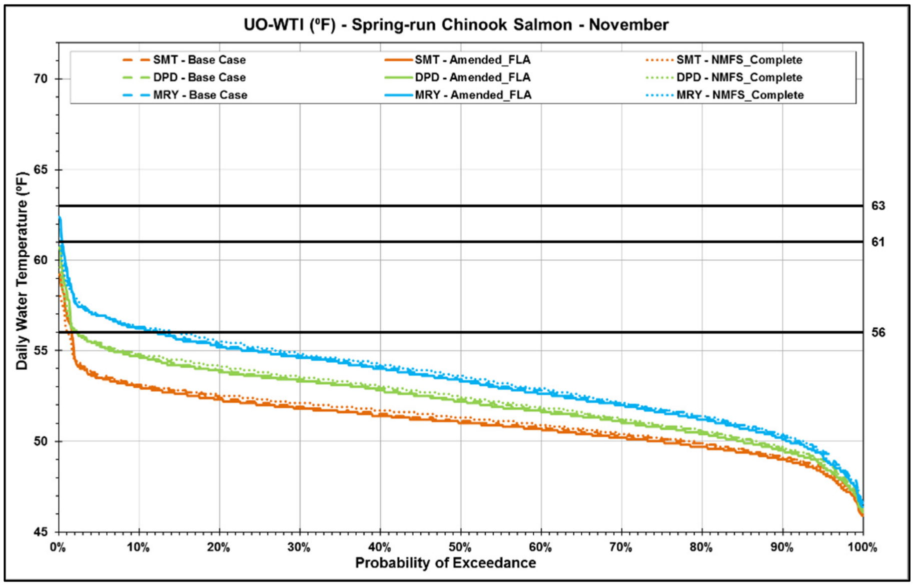
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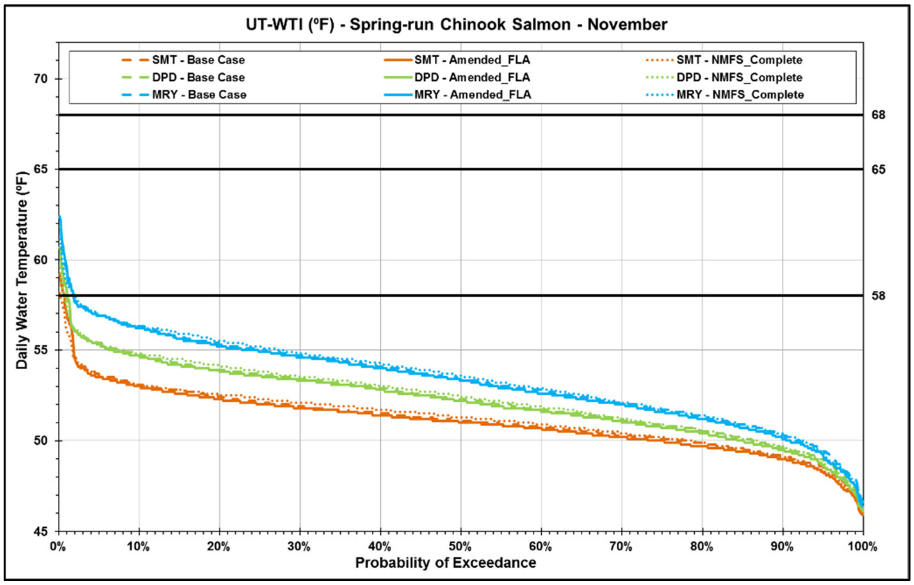
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Daily Water Temperature (ºF)
Probability of Exceedance
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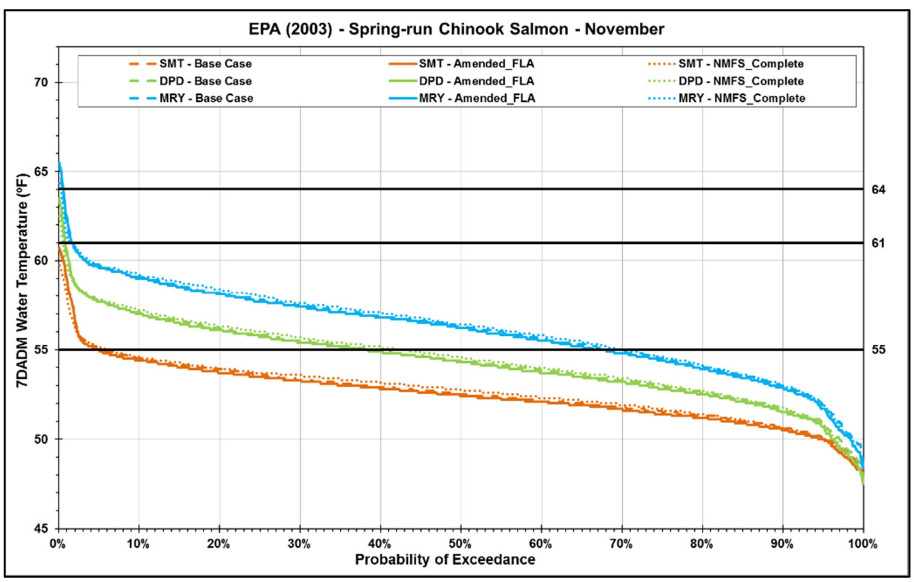
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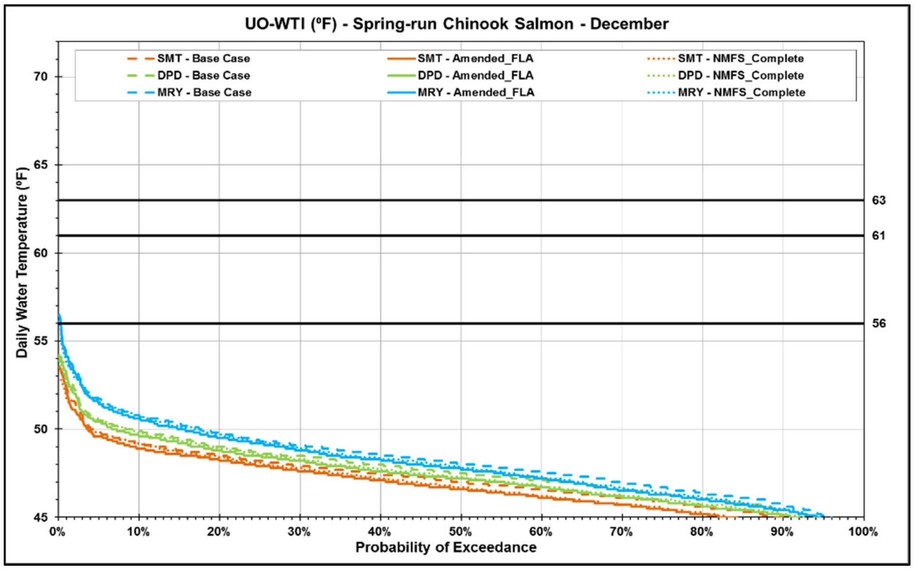
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Daily Water Temperature (ºF)
Probability of Exceedance
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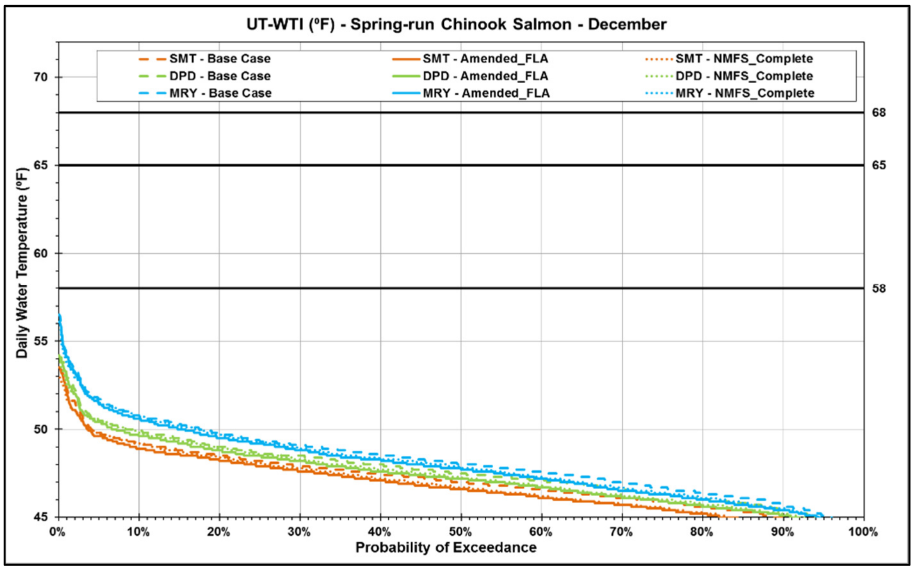
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Probability of Exceedance
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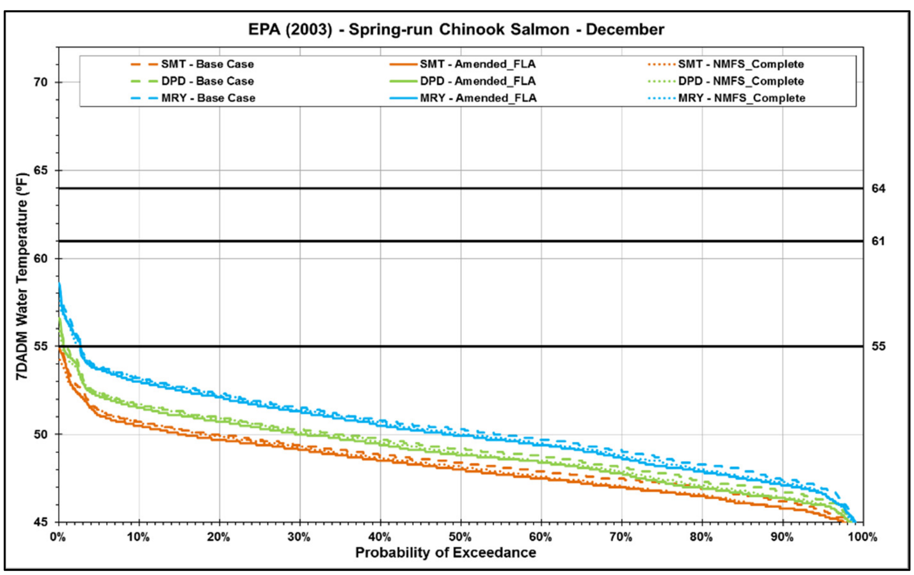
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7DADM Water Temperature (ºF)
Probability of Exceedance
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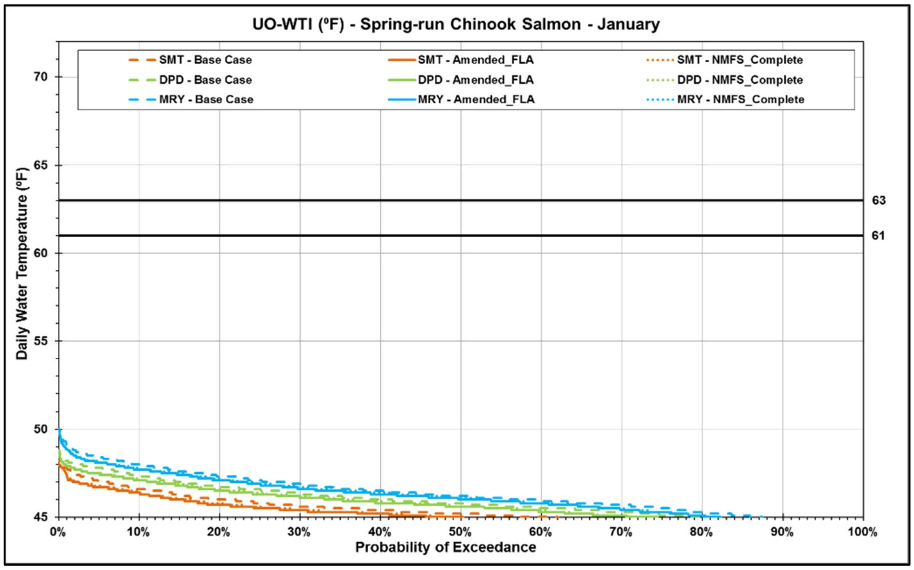
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Daily Water Temperature (ºF)
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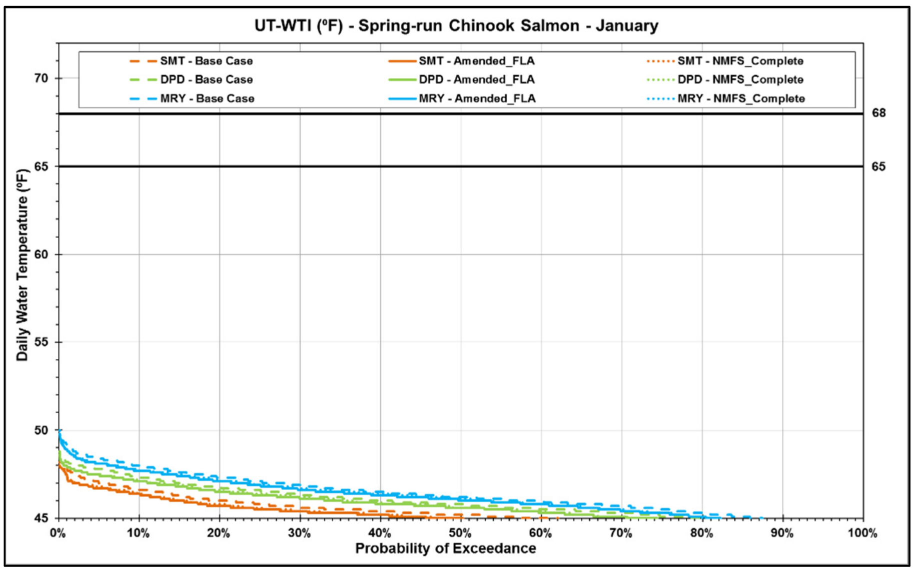
Probability of Exceedance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Daily Water Temperature (ºF)
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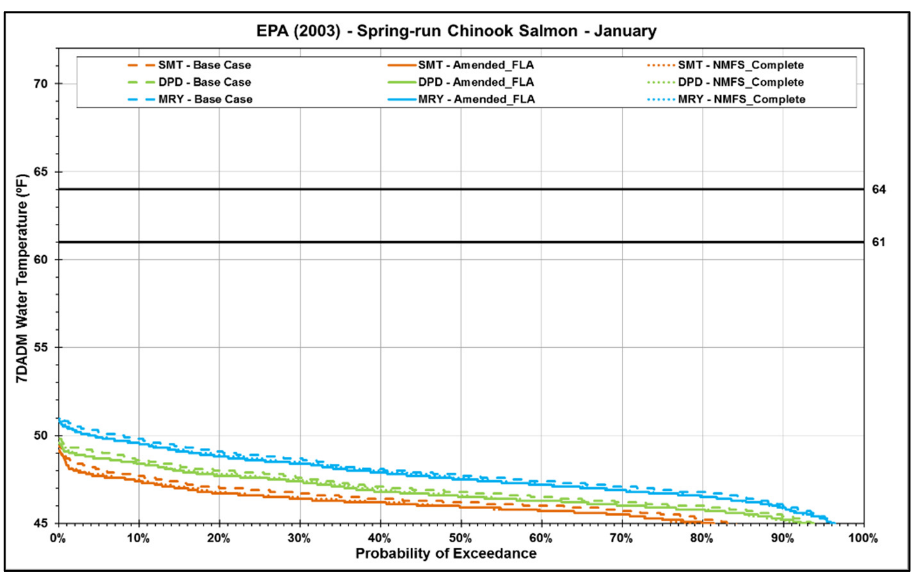
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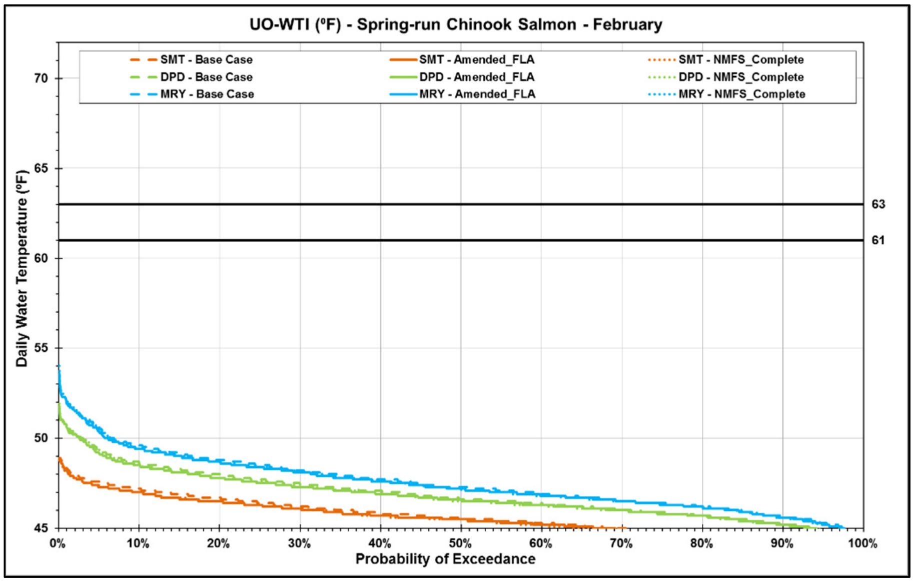
Probability of Exceedance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Daily Water Temperature (ºF)
Probability of Exceedance
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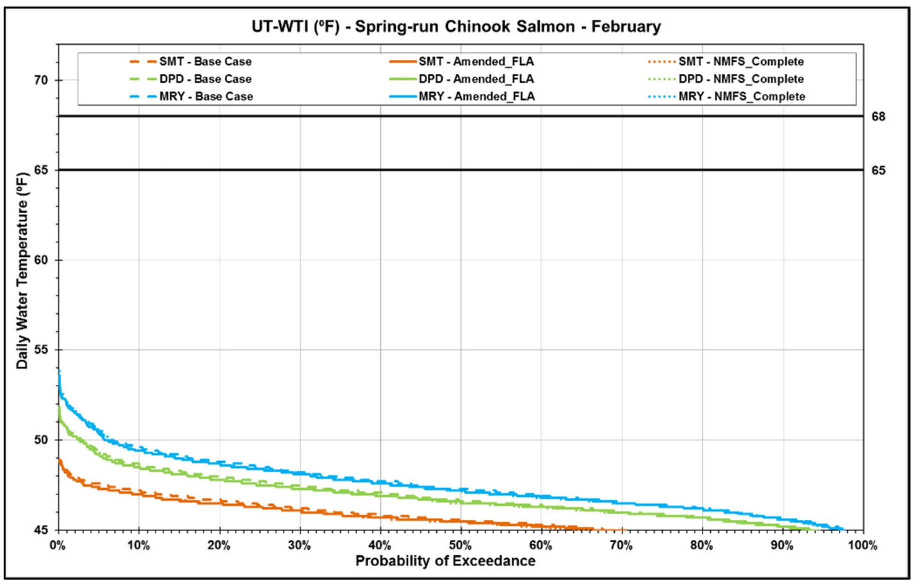
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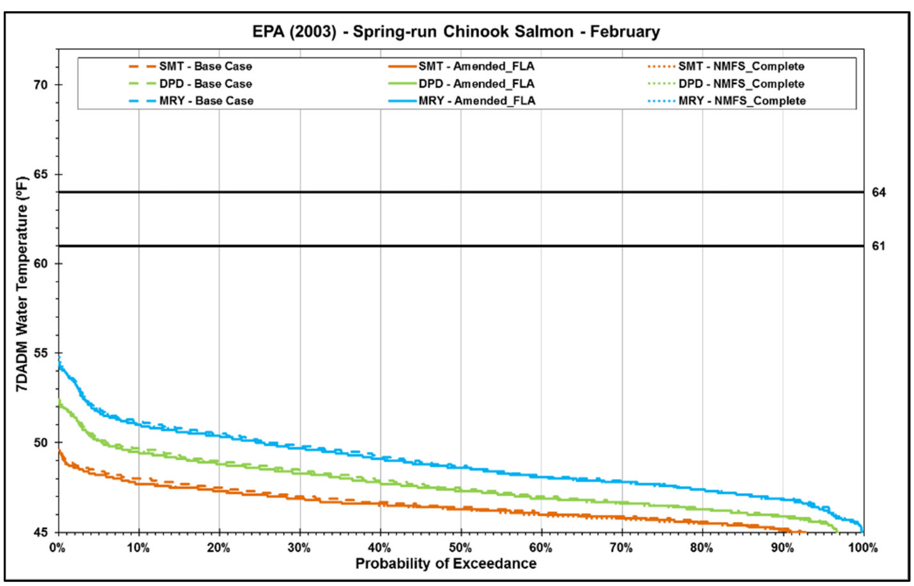
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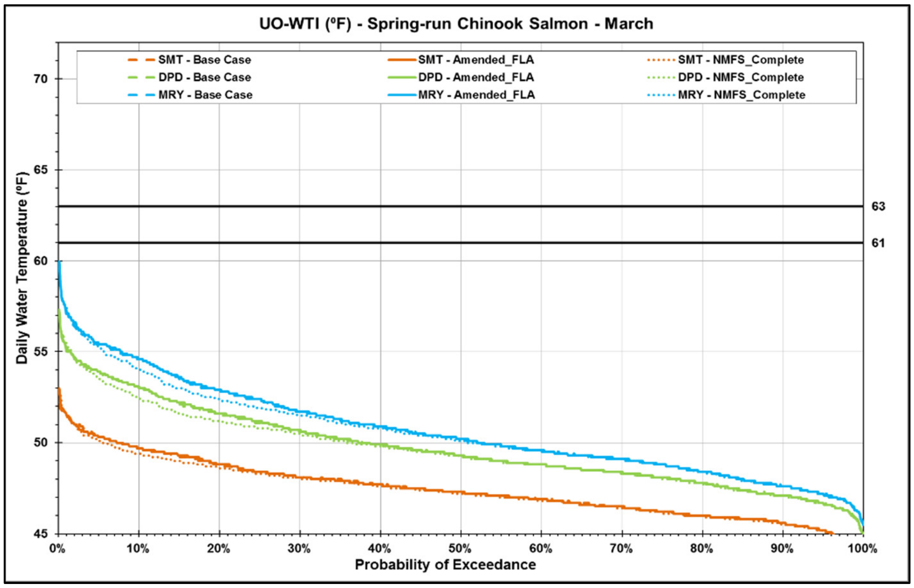
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61


UO-WTI (ºF) - Spring-run Chinook Salmon - March
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SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
63
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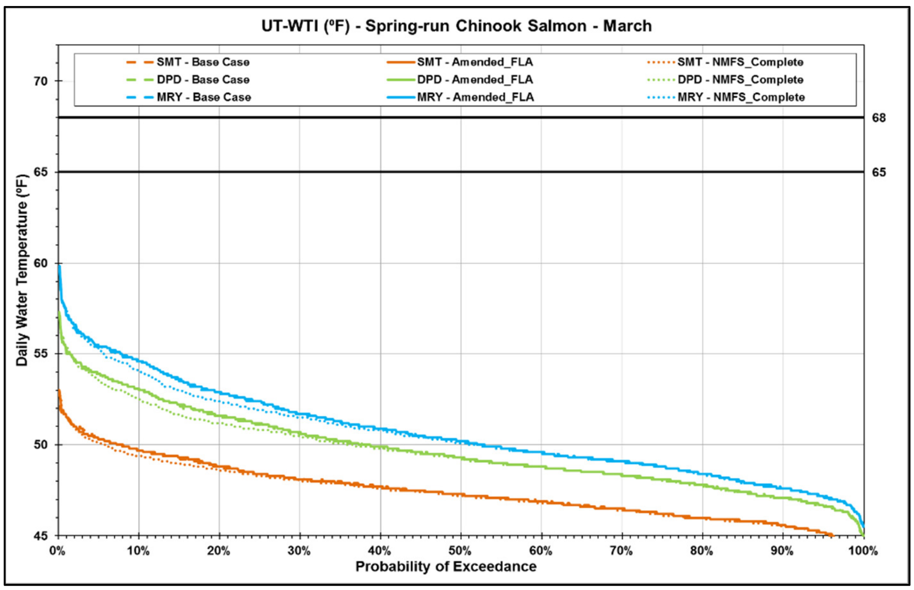
UT-WTI (ºF) - Spring-run Chinook Salmon - March
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
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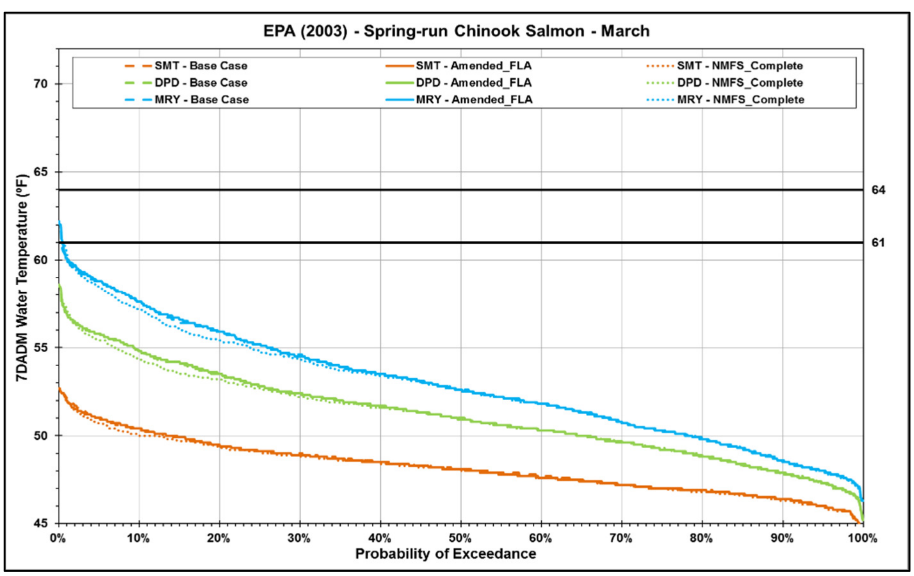
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SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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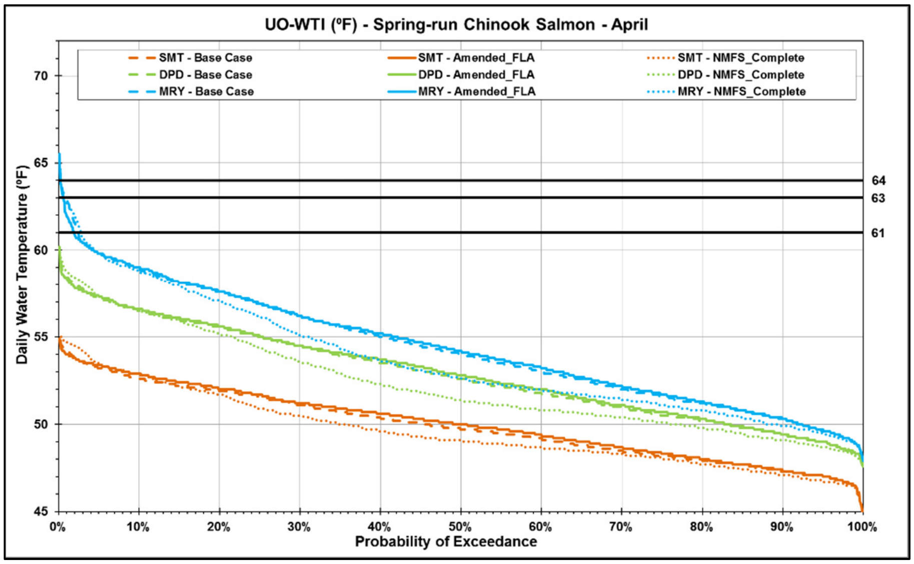
UO-WTI (ºF) - Spring-run Chinook Salmon - April
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MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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63
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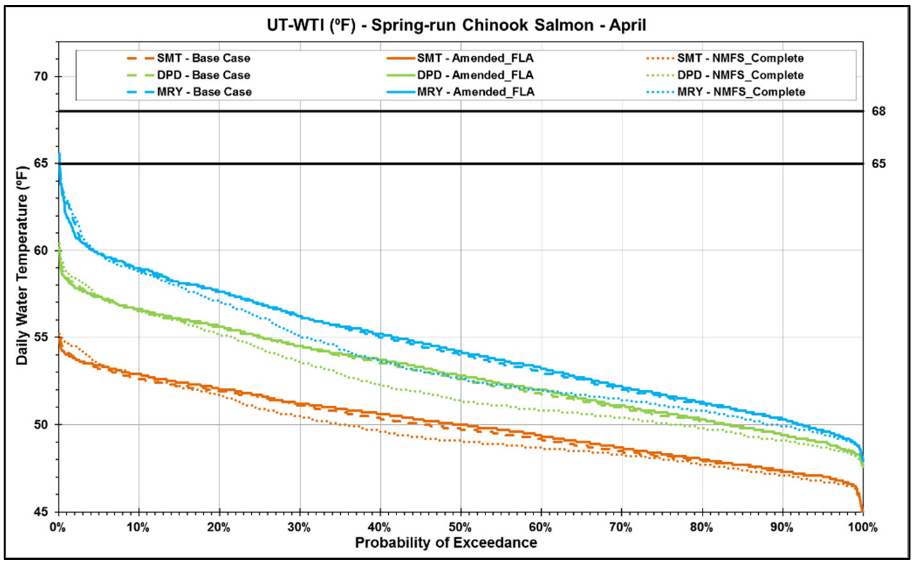
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SMT - NMFS_Complete
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DPD - Amended_FLA
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
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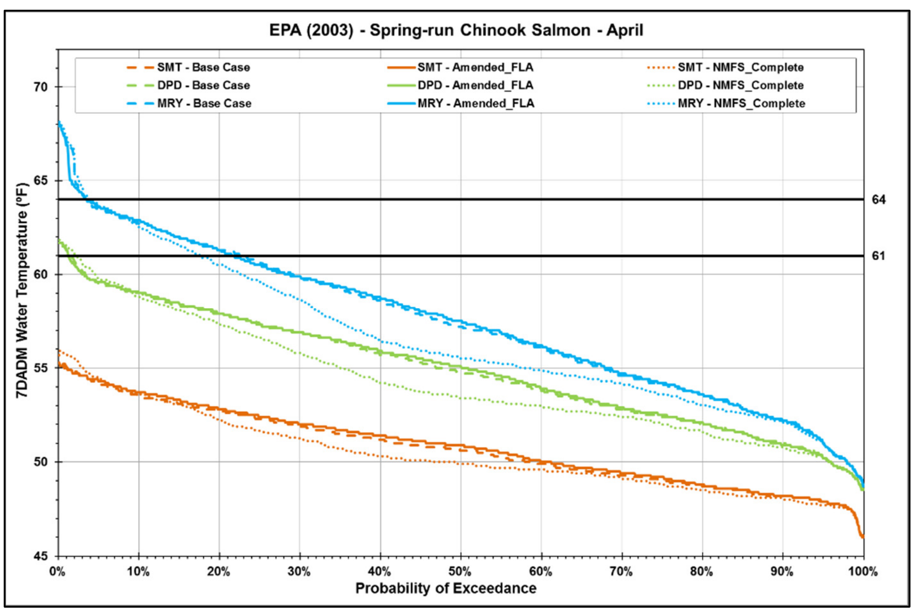
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SMT - Amended_FLA
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DPD - Base Case
DPD - Amended_FLA
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MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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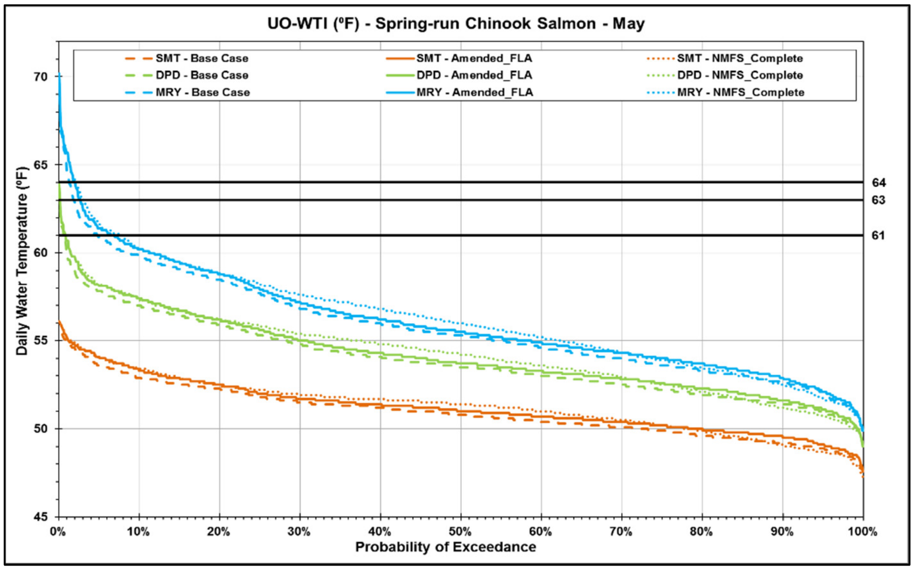
UO-WTI (ºF) - Spring-run Chinook Salmon - May
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SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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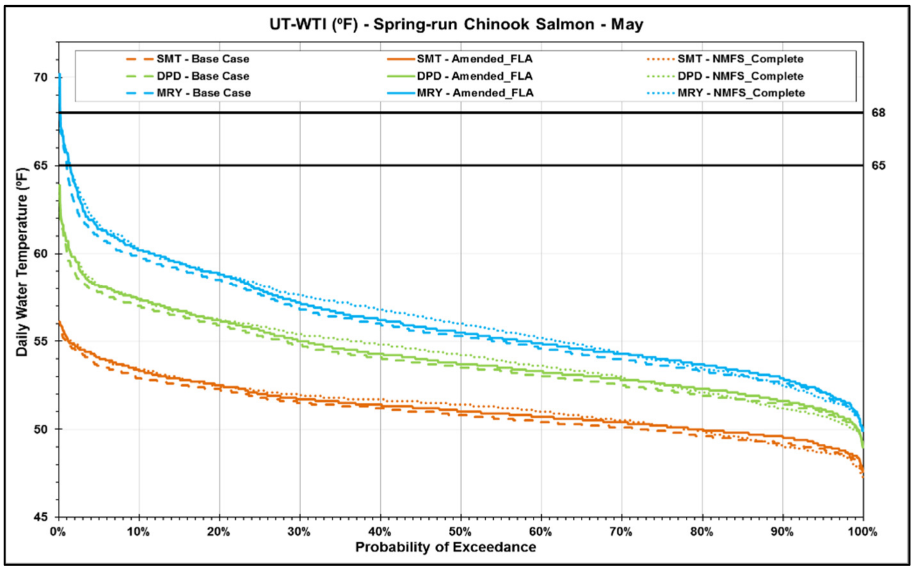
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SMT - NMFS_Complete
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MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
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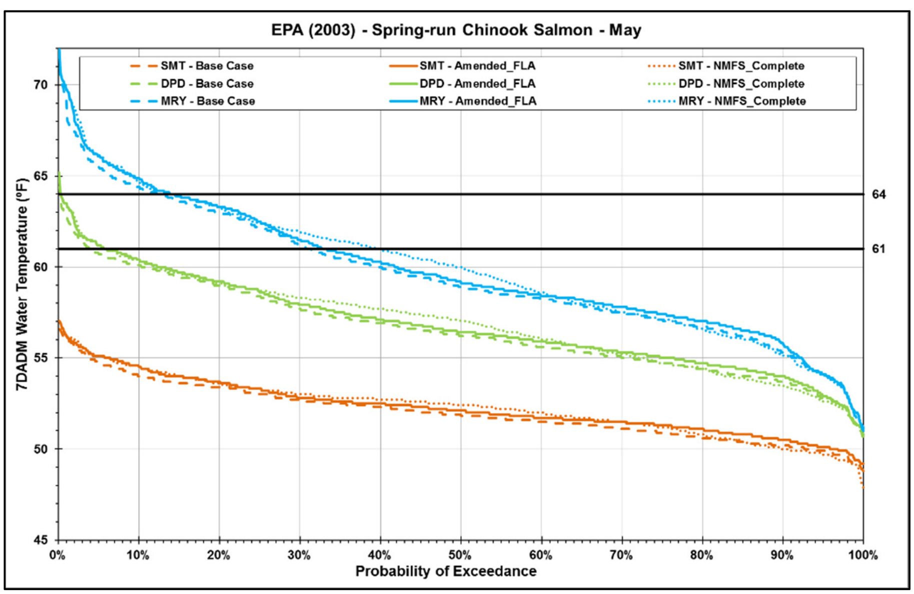
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SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
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MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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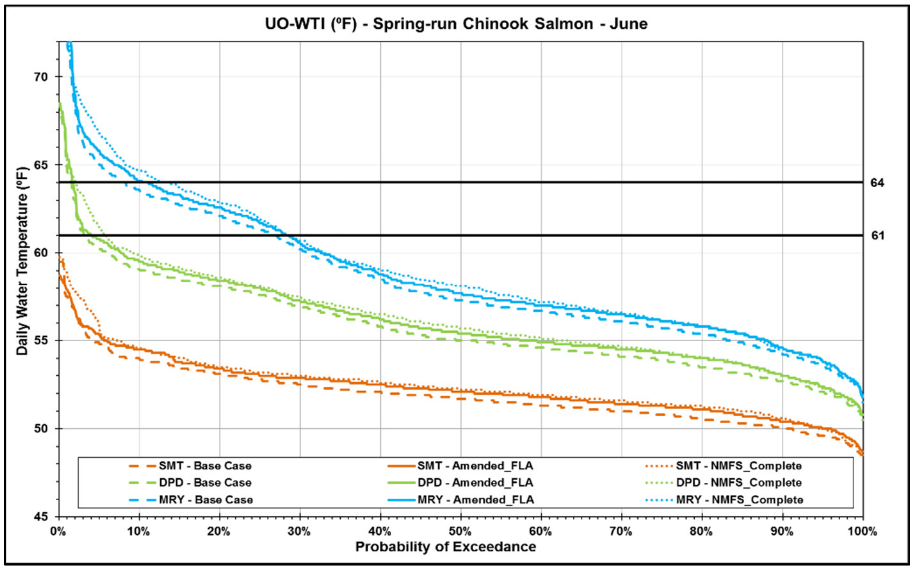
UO-WTI (ºF) - Spring-run Chinook Salmon - June
Daily Water Temperature (ºF)
Probability of Exceedance
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SMT - Amended_FLA
SMT - NMFS_Complete
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DPD - Amended_FLA
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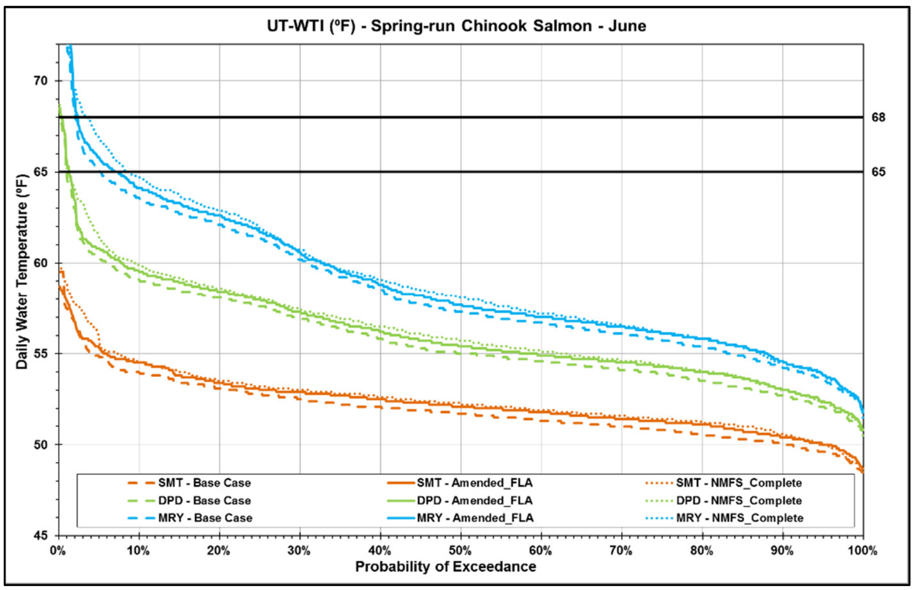
UT-WTI (ºF) - Spring-run Chinook Salmon - June
Daily Water Temperature (ºF)
Probability of Exceedance
68
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SMT - Base Case
SMT - Amended_FLA
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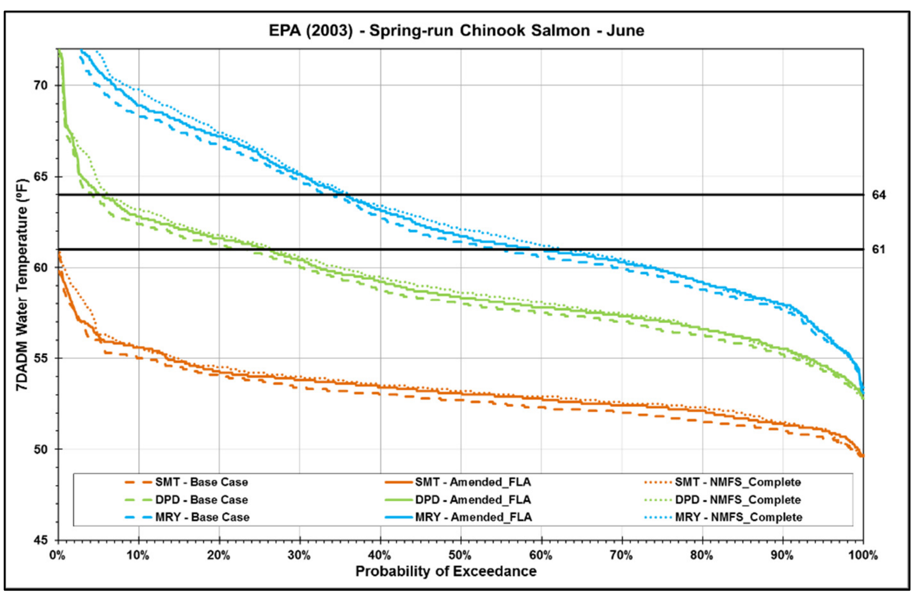
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7DADM Water Temperature (ºF)
Probability of Exceedance
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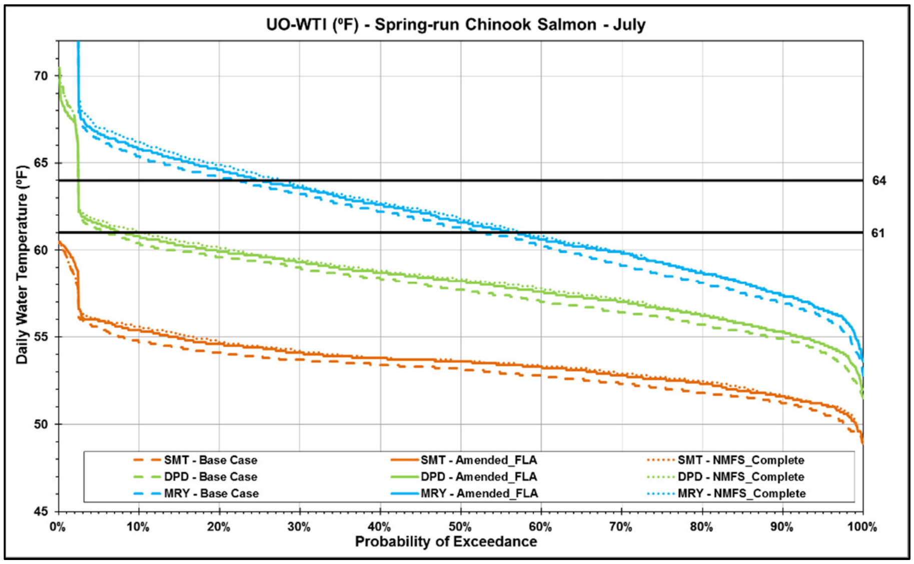
UO-WTI (ºF) - Spring-run Chinook Salmon - July
Daily Water Temperature (ºF)
Probability of Exceedance
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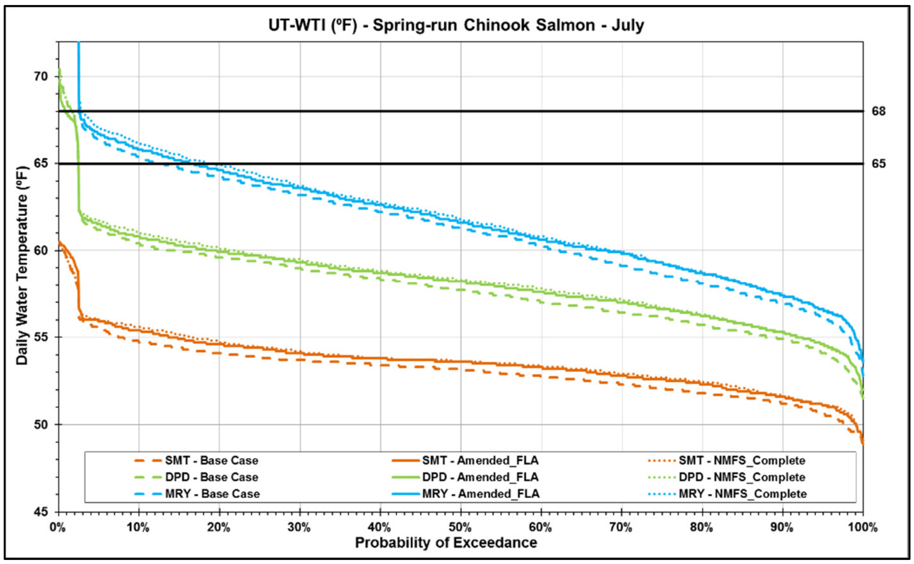
UT-WTI (ºF) - Spring-run Chinook Salmon - July
Daily Water Temperature (ºF)
Probability of Exceedance
68
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SMT - Base Case
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DPD - Amended_FLA
MRY - Amended_FLA
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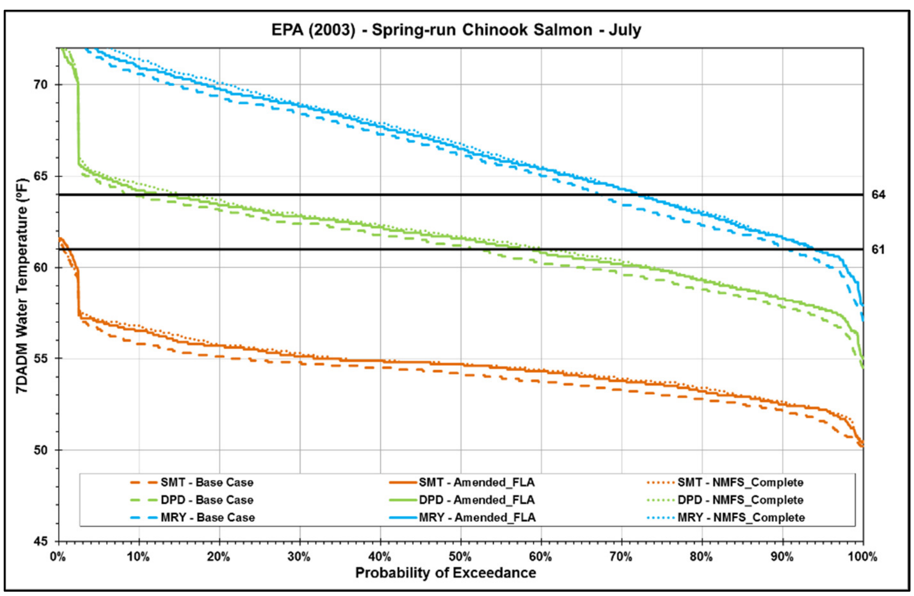
EPA (2003) - Spring-run Chinook Salmon - July
7DADM Water Temperature (ºF)
Probability of Exceedance
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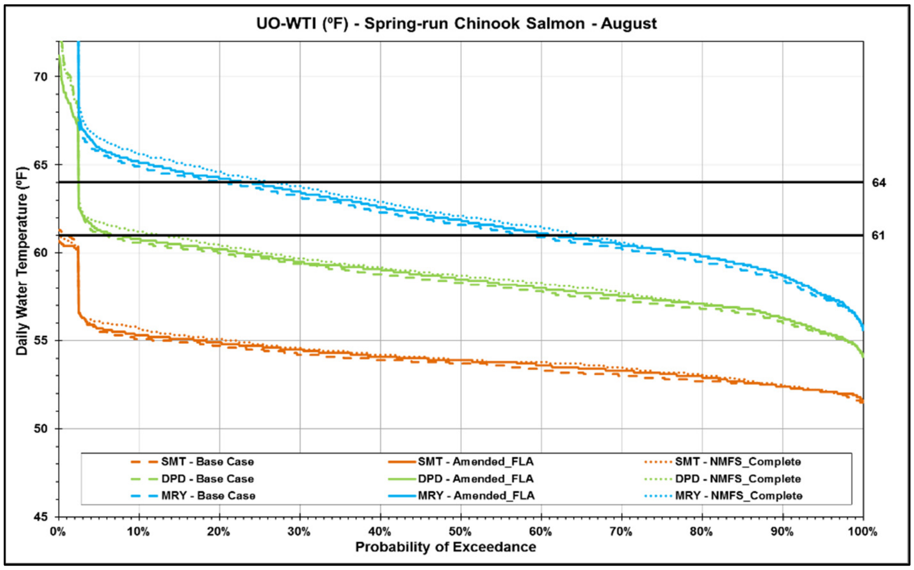
UO-WTI (ºF) - Spring-run Chinook Salmon - August
Daily Water Temperature (ºF)
Probability of Exceedance
64
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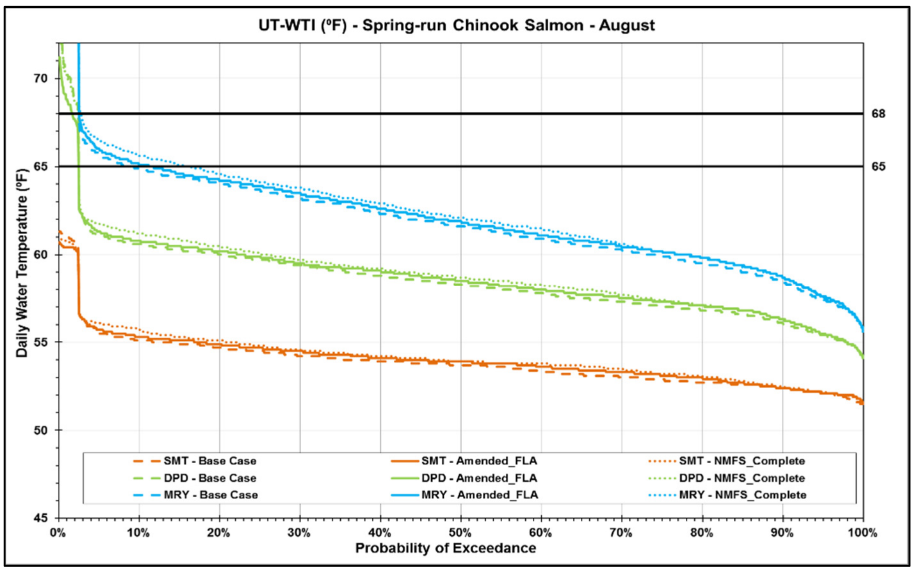
UT-WTI (ºF) - Spring-run Chinook Salmon - August
Daily Water Temperature (ºF)
Probability of Exceedance
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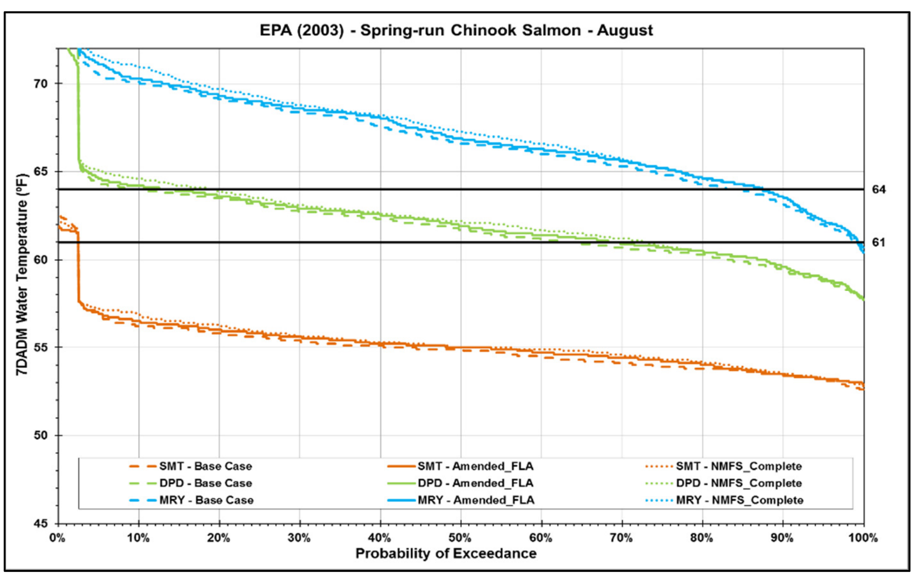
EPA (2003) - Spring-run Chinook Salmon - August
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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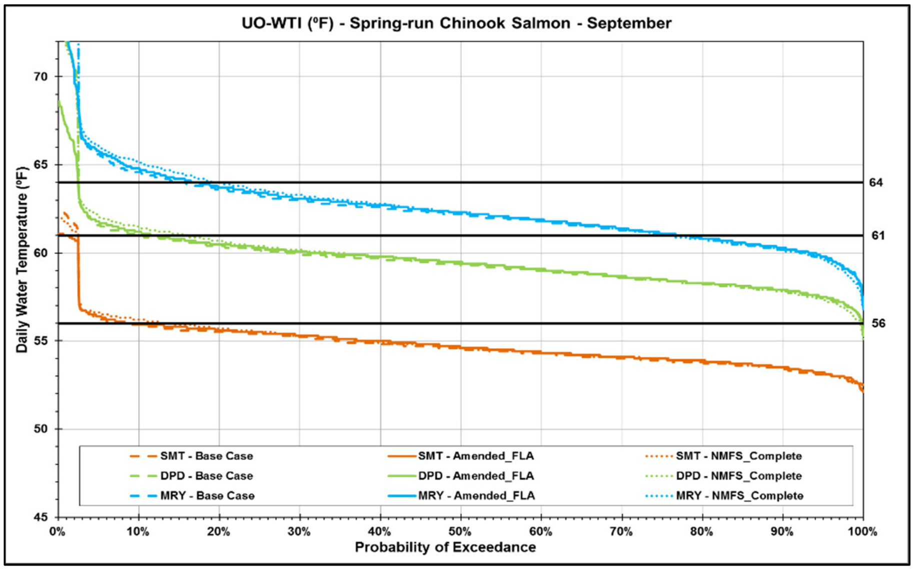
UO-WTI (ºF) - Spring-run Chinook Salmon - September
Daily Water Temperature (ºF)
Probability of Exceedance
64
61
56
SMT - Base Case
DPD - Base Case
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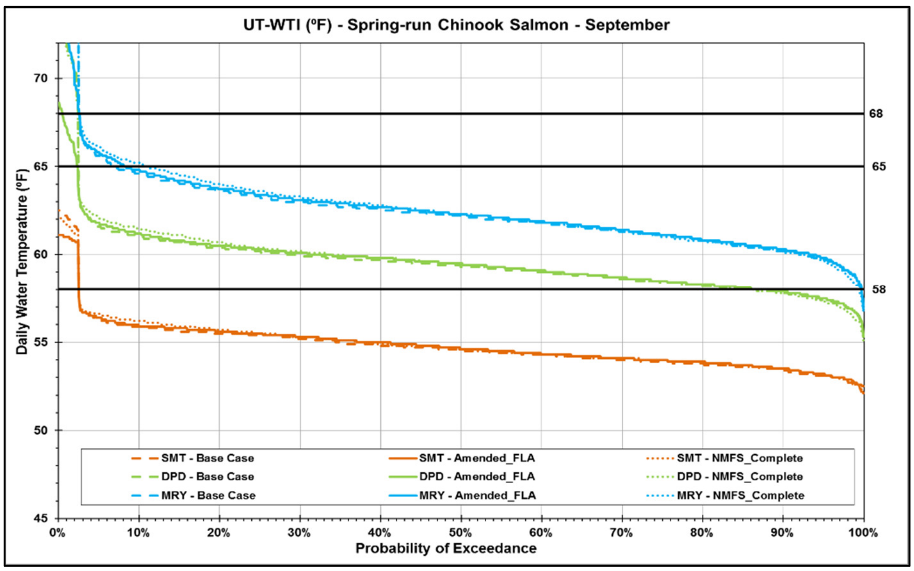
UT-WTI (ºF) - Spring-run Chinook Salmon - September
Daily Water Temperature (ºF)
Probability of Exceedance
68
65
58
SMT - Base Case
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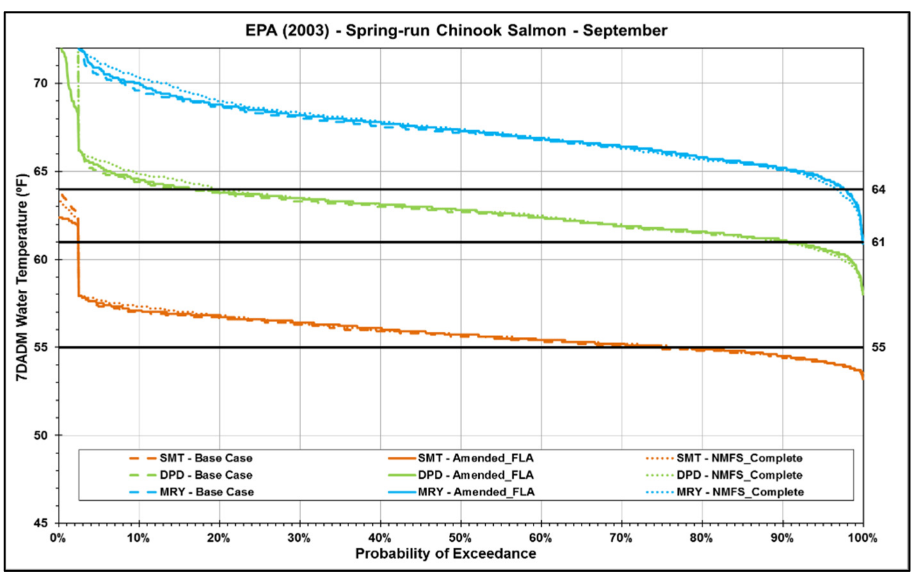
EPA (2003) - Spring-run Chinook Salmon - September
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
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DPD - Amended_FLA
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Fall-run Chinook Salmon
Water Temperature Exceedance Curves

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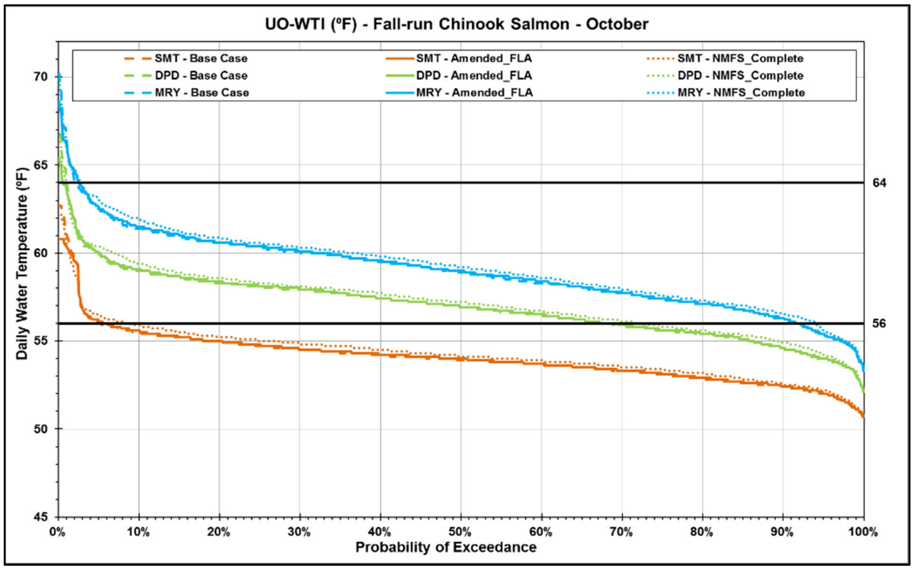
UO-WTI (ºF) - Fall-run Chinook Salmon - October
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SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
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MRY - Base Case
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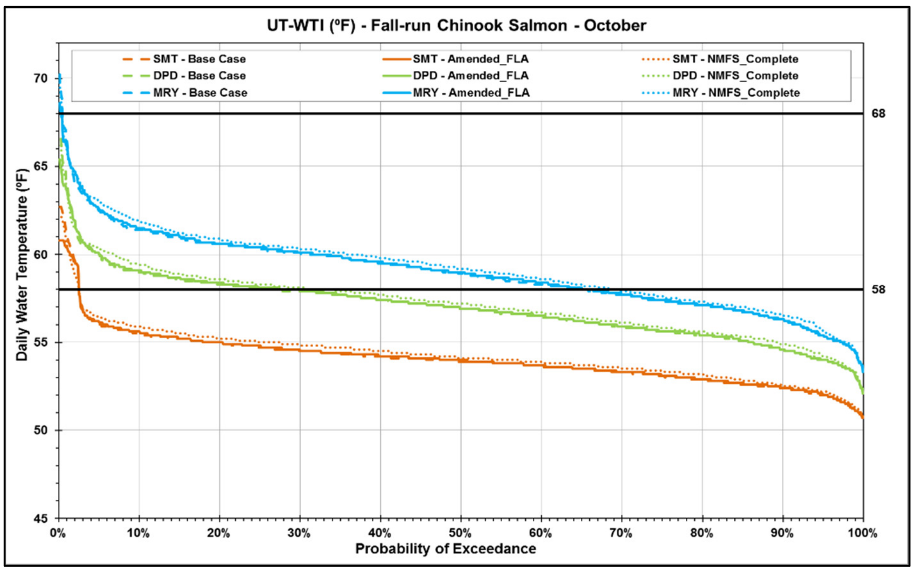
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
64
56


UT-WTI (ºF) - Fall-run Chinook Salmon - October
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Daily Water Temperature (ºF)
Probability of Exceedance
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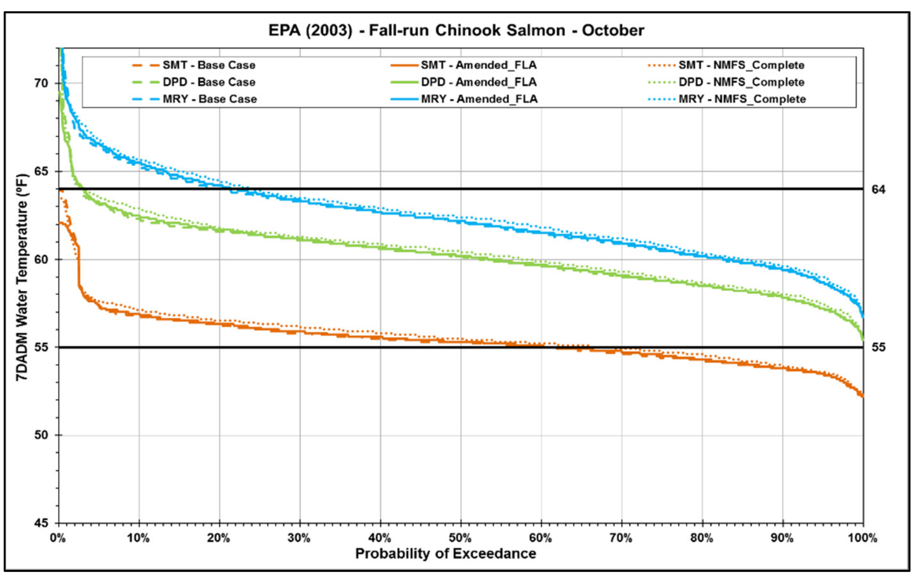
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MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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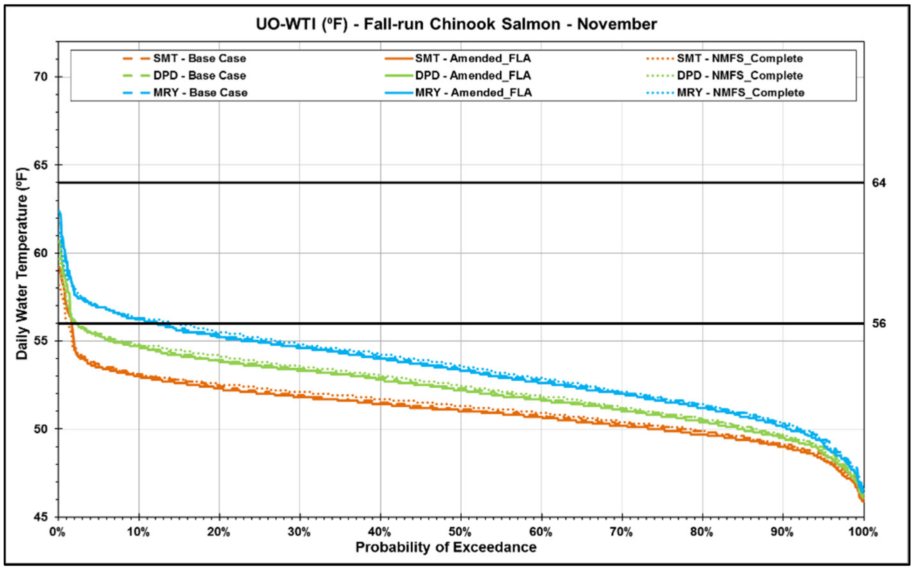
UO-WTI (ºF) - Fall-run Chinook Salmon - November
SMT - Base Case
DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
64
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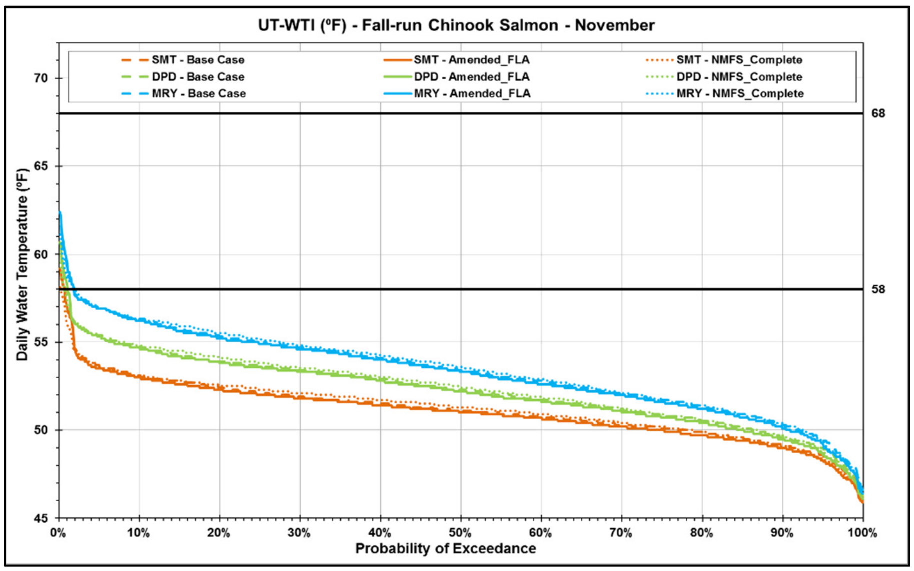
UT-WTI (ºF) - Fall-run Chinook Salmon - November
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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
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SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
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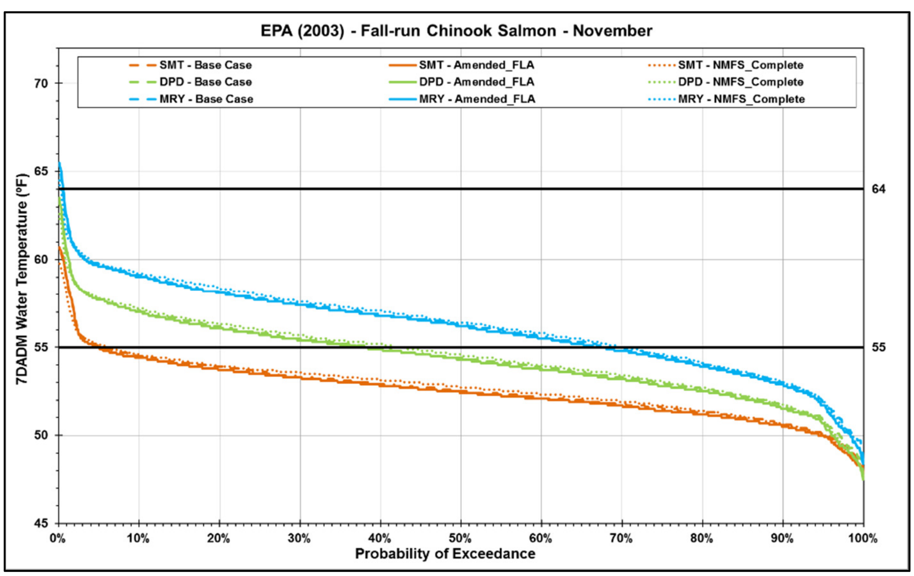
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7DADM Water Temperature (ºF)
Probability of Exceedance
64
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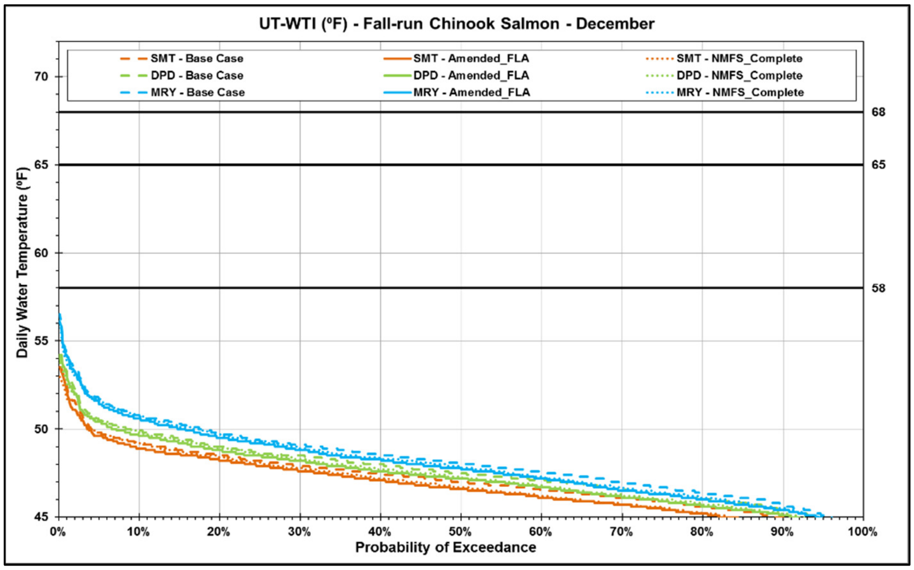
UT-WTI (ºF) - Fall-run Chinook Salmon - December
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DPD - Base Case
MRY - Base Case
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DPD - Amended_FLA
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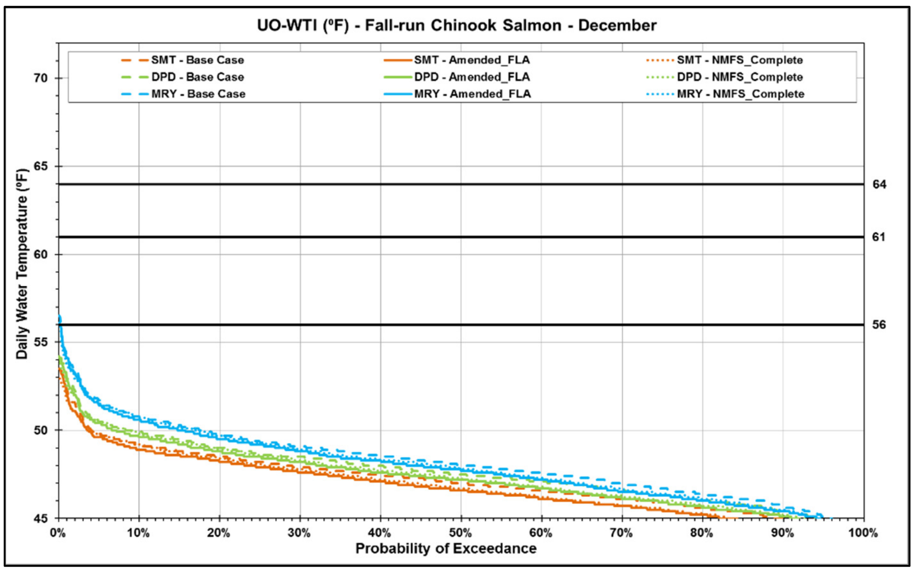
DPD - NMFS_Complete
MRY - NMFS_Complete
68
65
58
Daily Water Temperature (ºF)
Probability of Exceedance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DPD - NMFS_Complete
MRY - NMFS_Complete
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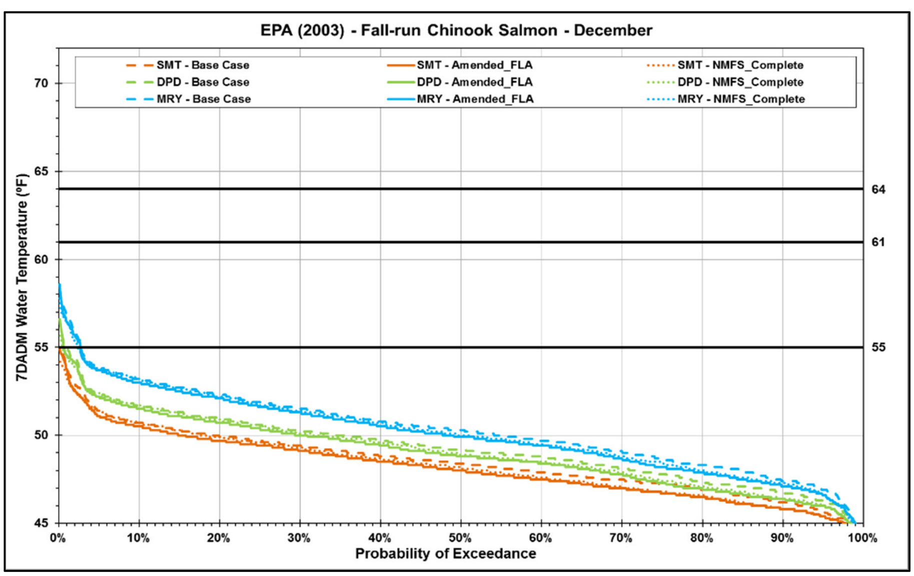
Daily Water Temperature (ºF)
Probability of Exceedance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MRY - Base Case
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MRY - Amended_FLA
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DPD - NMFS_Complete
MRY - NMFS_Complete
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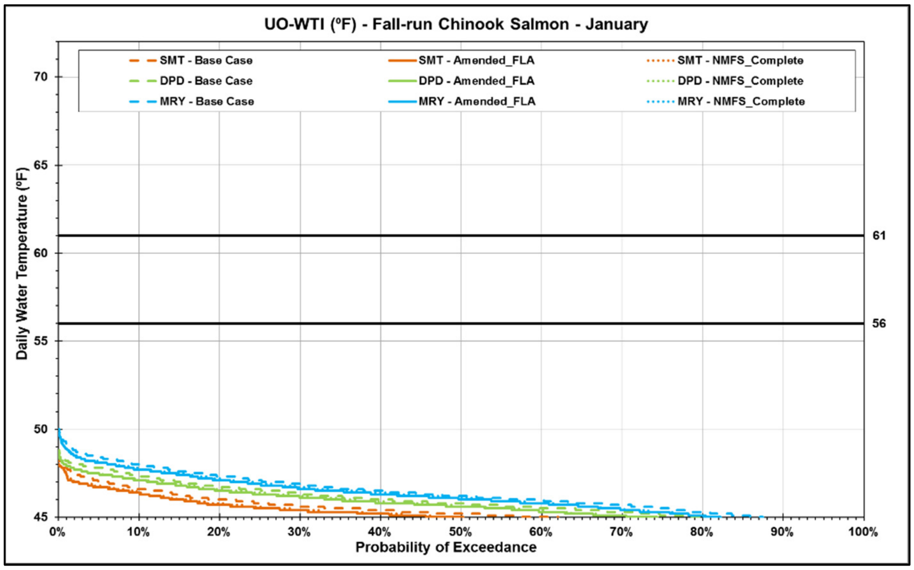
7DADM Water Temperature (ºF)
Probability of Exceedance


UO-WTI (ºF) - Fall-run Chinook Salmon - January
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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
61
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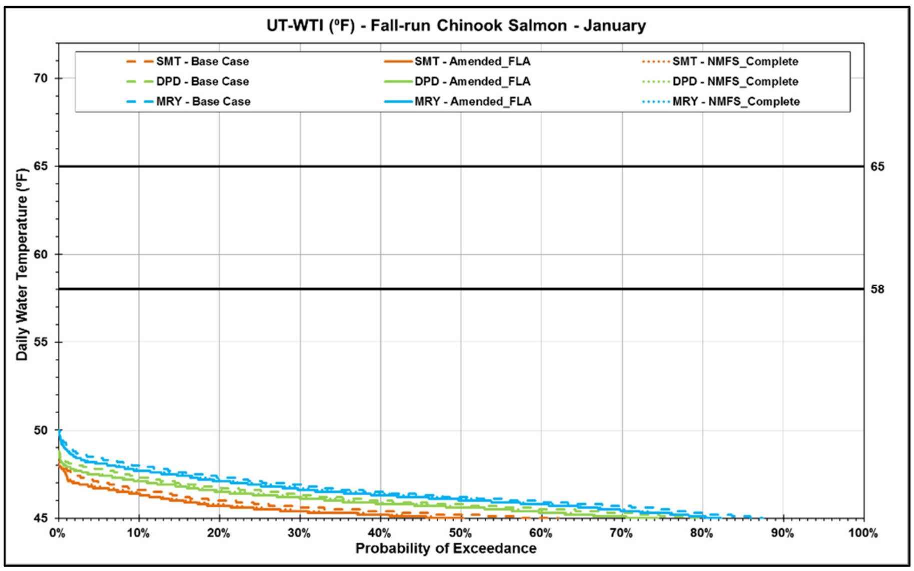
Probability of Exceedance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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
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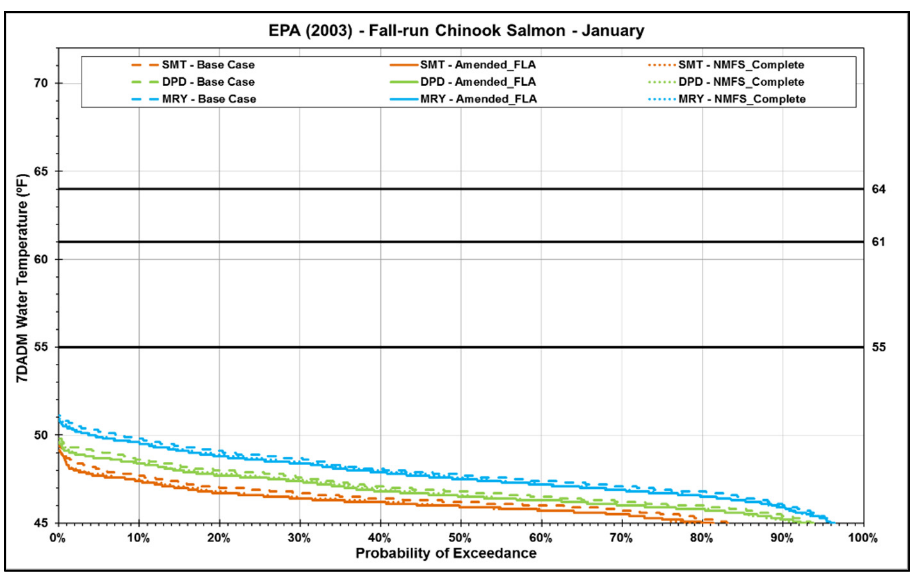
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
65
58
Probability of Exceedance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MRY - Base Case
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MRY - Amended_FLA
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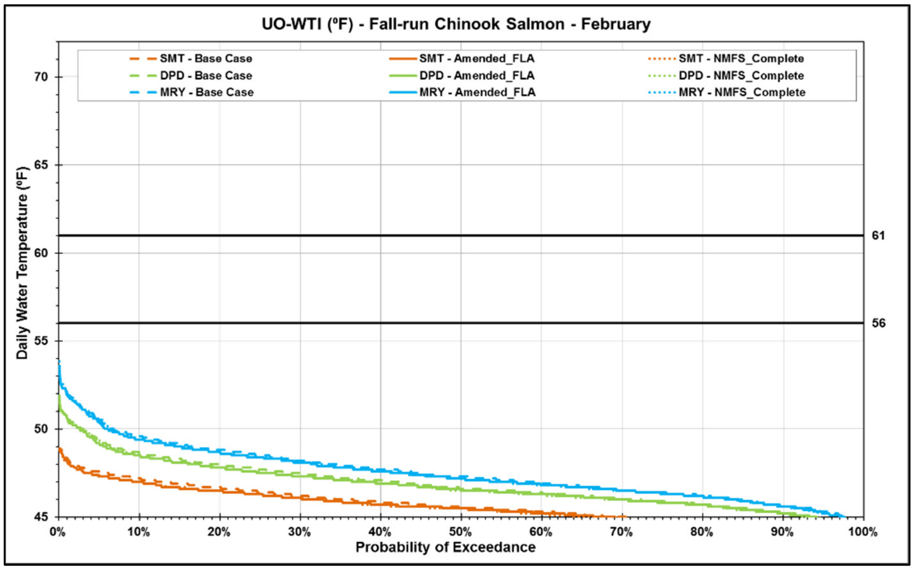
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
64
61
55
Probability of Exceedance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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
61
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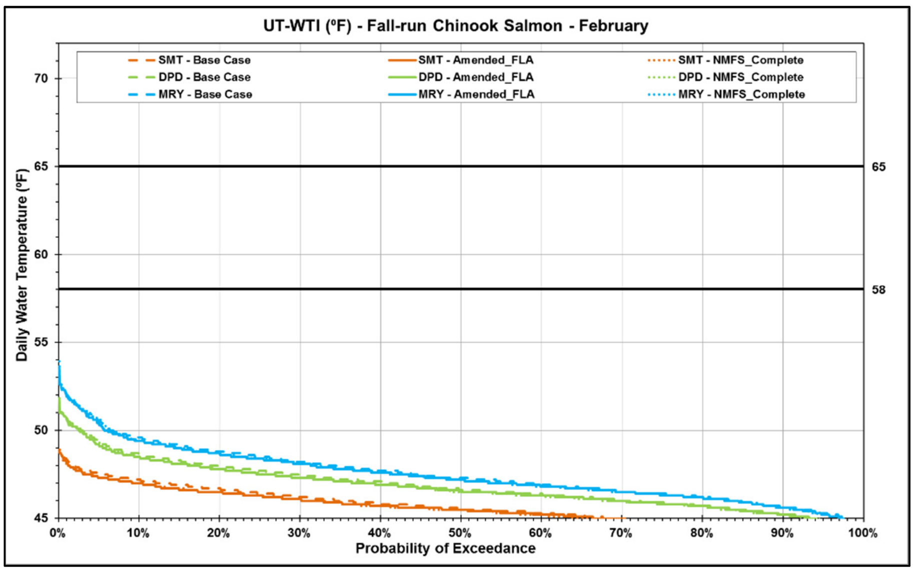
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SMT - NMFS_Complete
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Daily Water Temperature (ºF)
Probability of Exceedance
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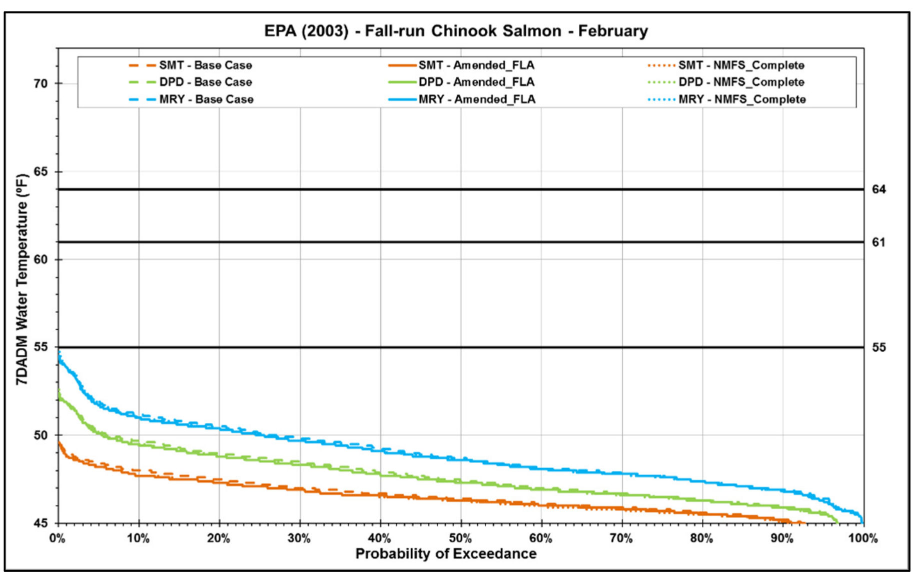
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DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
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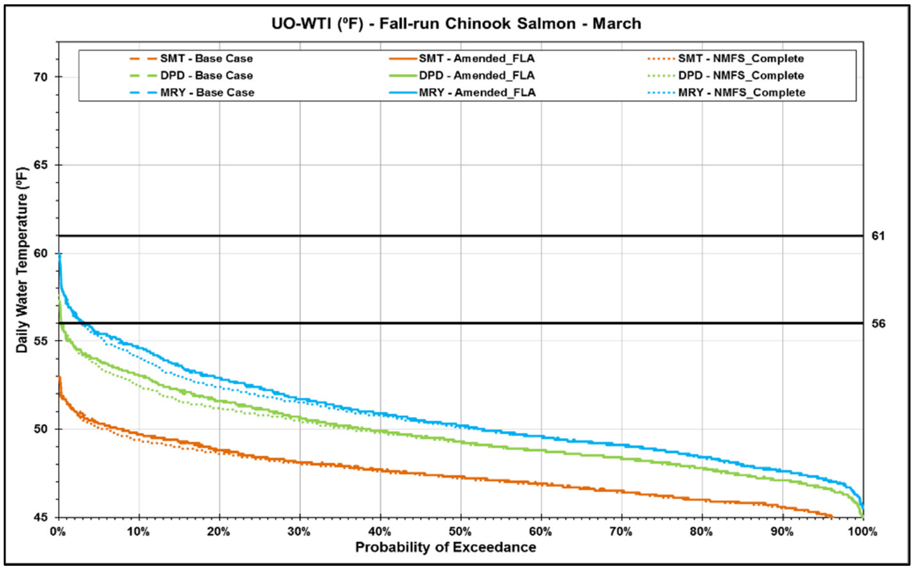
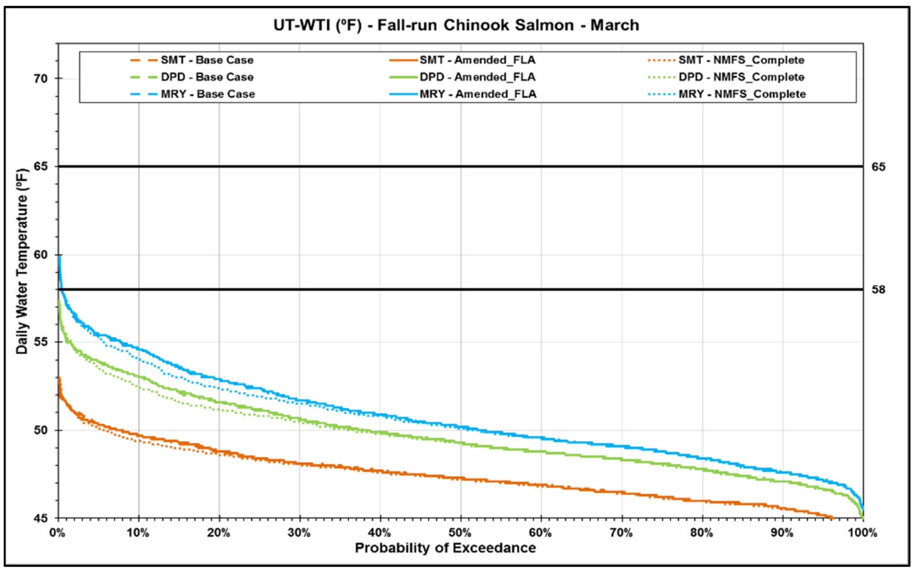
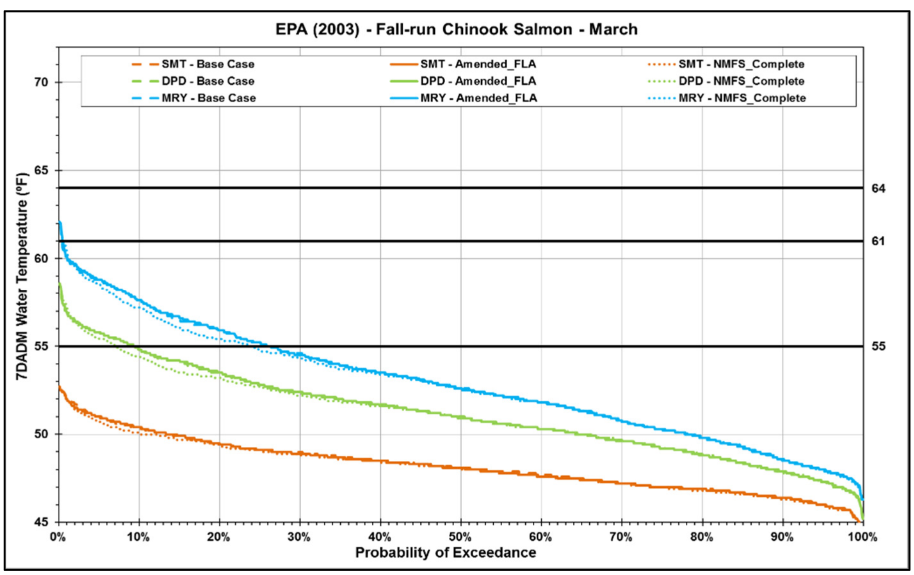

UO-WTI (°F) - Fall-run Chinook Salmon - March
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (°F)
61
56
Probability of Exceedance


UT-WTI (°F) - Fall-run Chinook Salmon - March
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (°F)
65
58
Probability of Exceedance


EPA (2003) - Fall-run Chinook Salmon - March
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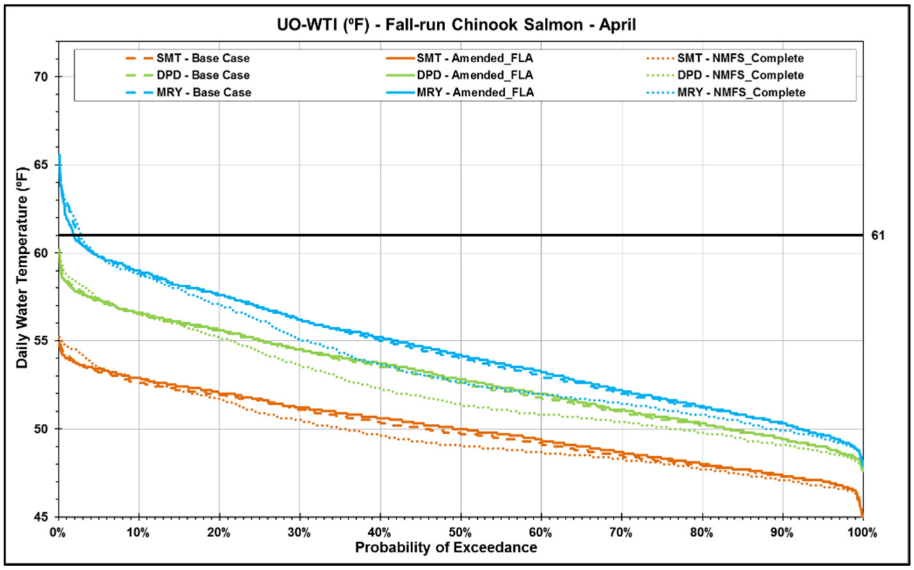
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (°F)
64
61
55
Probability of Exceedance


UO-WTI (ºF) - Fall-run Chinook Salmon - April
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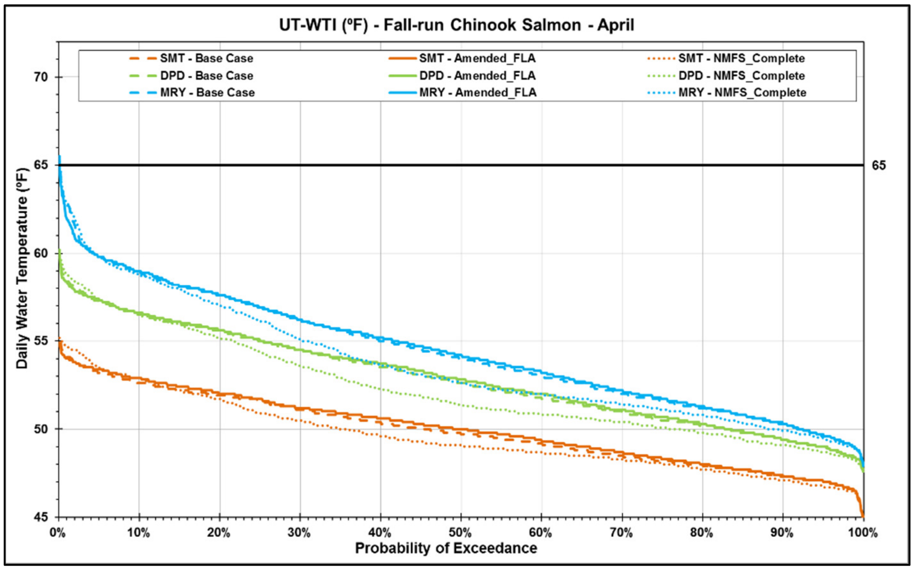
DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
61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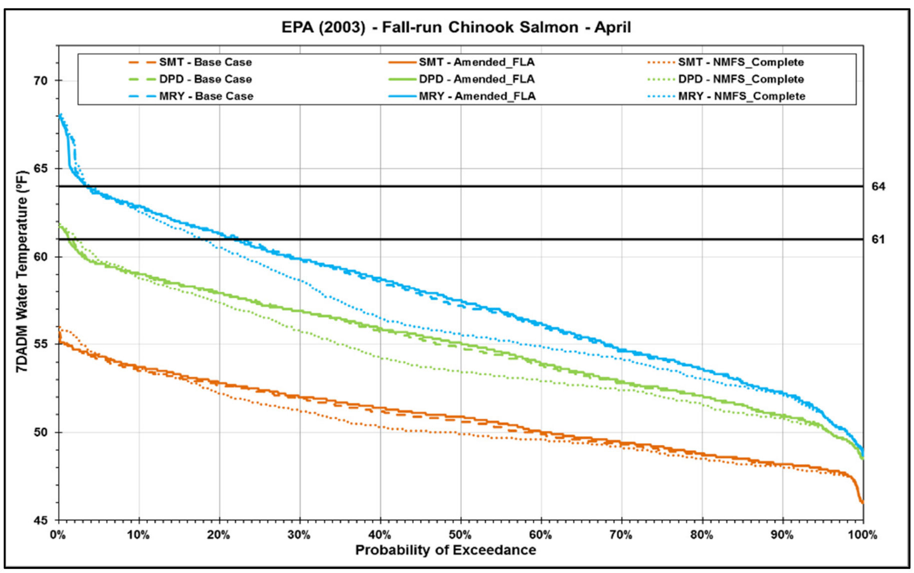
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
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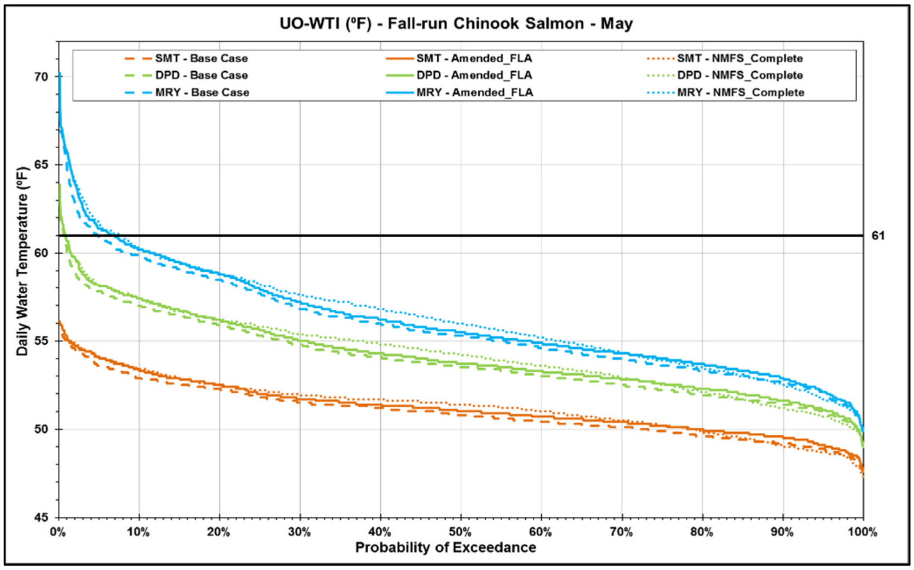
DPD - NMFS_Complete
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61


UO-WTI (ºF) - Fall-run Chinook Salmon - May
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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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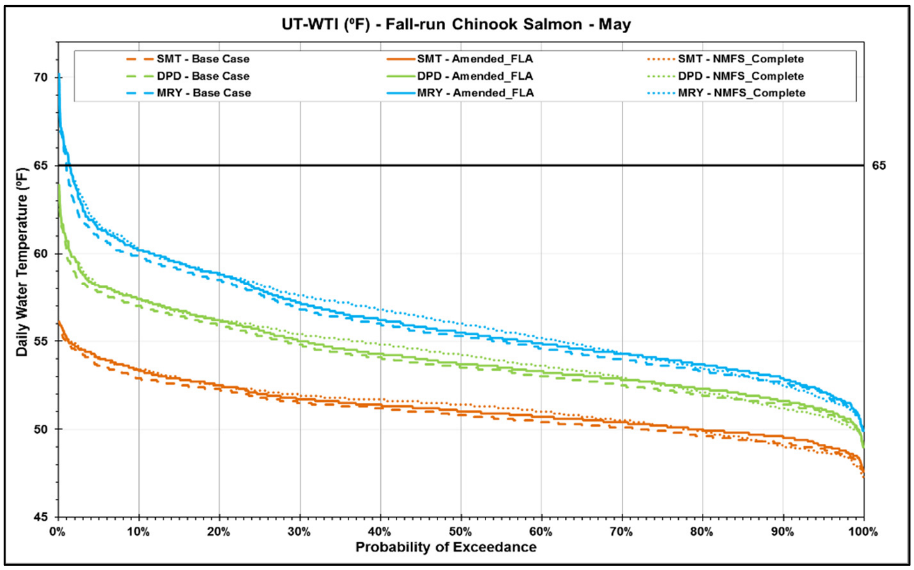
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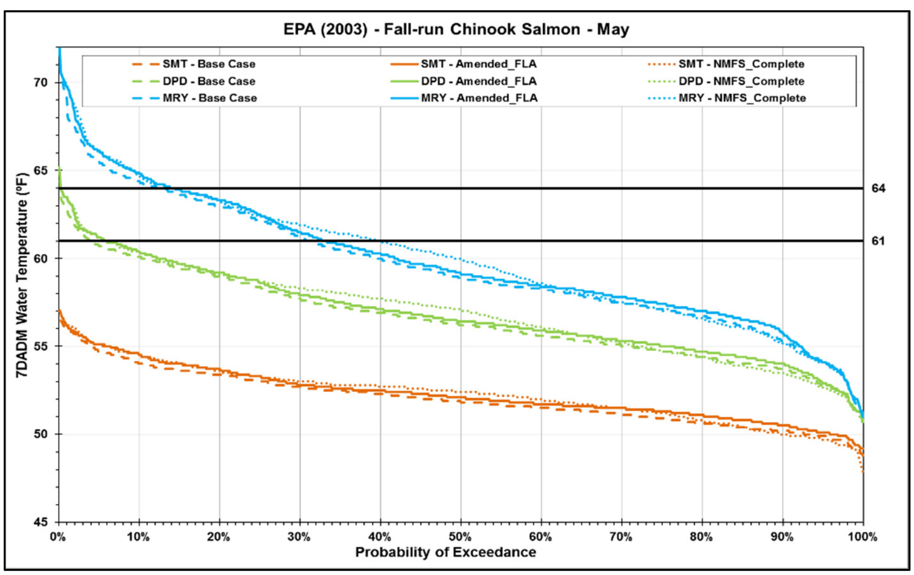
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
SMT - NMFS_Complete
DPD - NMFS_Complete
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65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DPD - Base Case
MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
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DPD - NMFS_Complete
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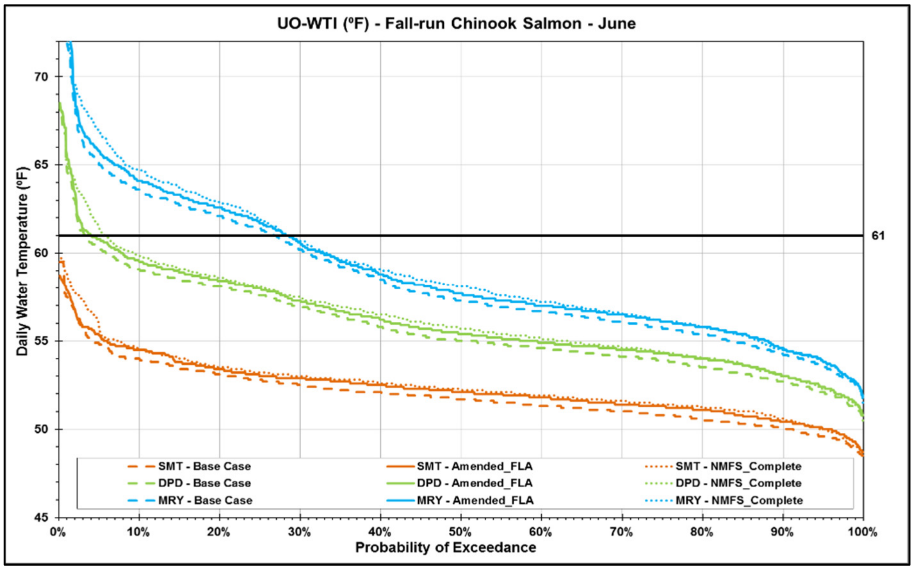
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61


UO-WTI (ºF) - Fall-run Chinook Salmon - June
Daily Water Temperature (ºF)
Probability of Exceedance
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SMT - Amended_FLA
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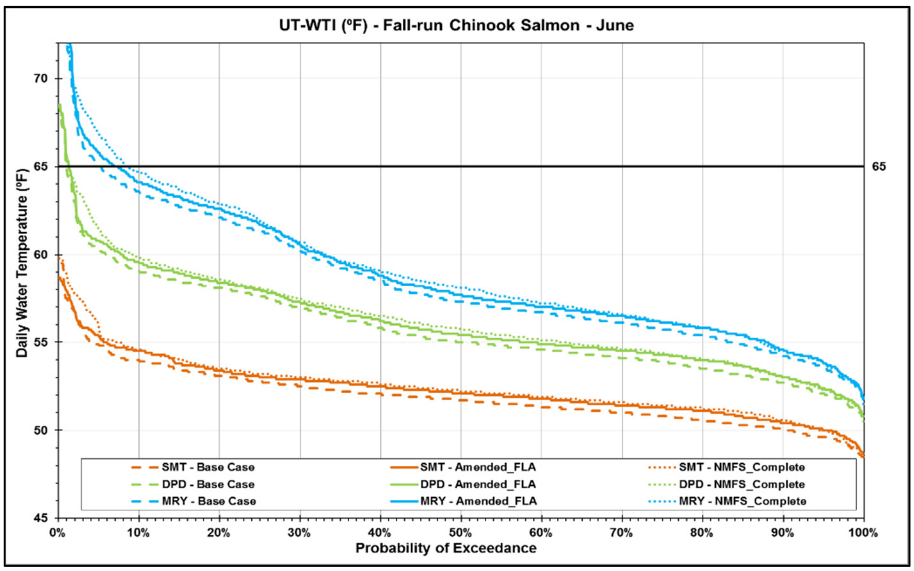
UT-WTI (ºF) - Fall-run Chinook Salmon - June
Daily Water Temperature (ºF)
Probability of Exceedance
65
SMT - Base Case
SMT - Amended_FLA
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DPD - Amended_FLA
DPD - NMFS_Complete
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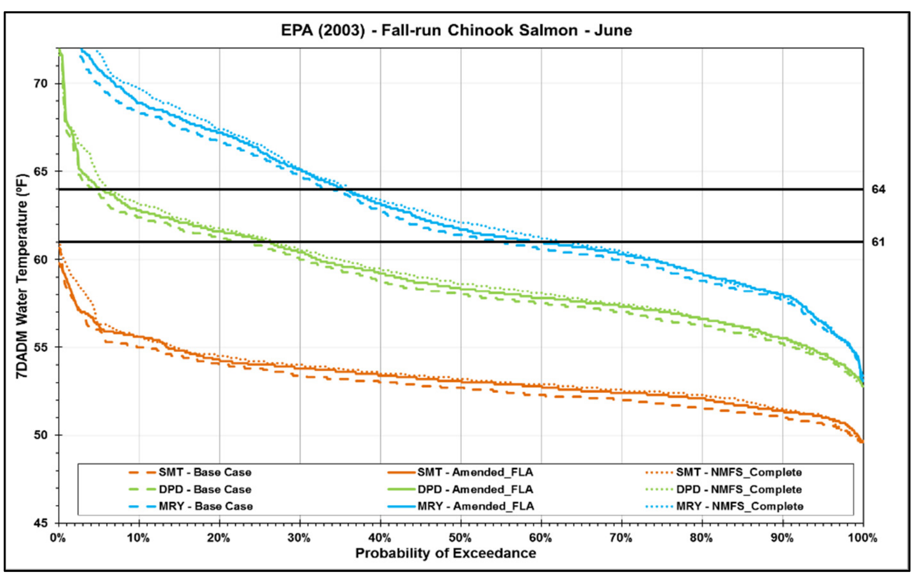
EPA (2003) - Fall-run Chinook Salmon - June
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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SMT - Amended_FLA
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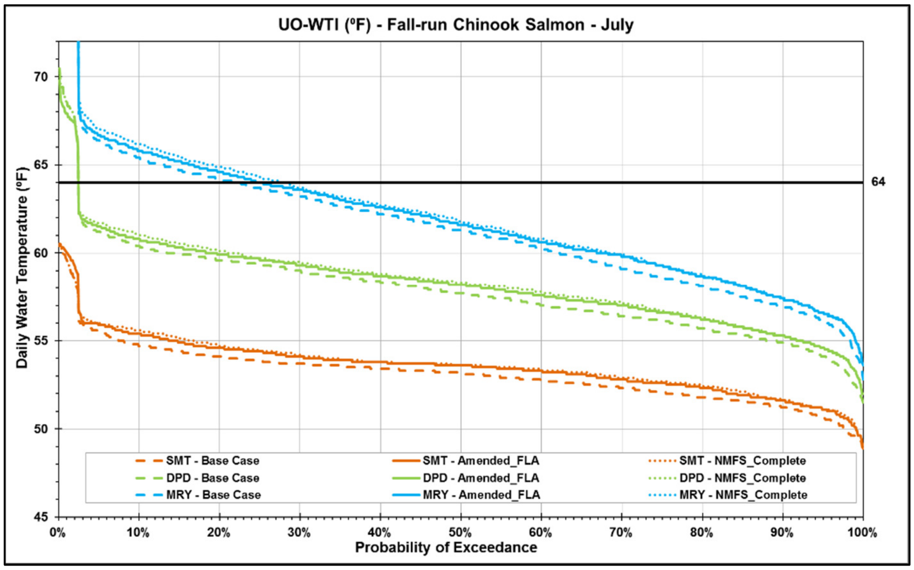
UO-WTI (ºF) - Fall-run Chinook Salmon - July
Daily Water Temperature (ºF)
Probability of Exceedance
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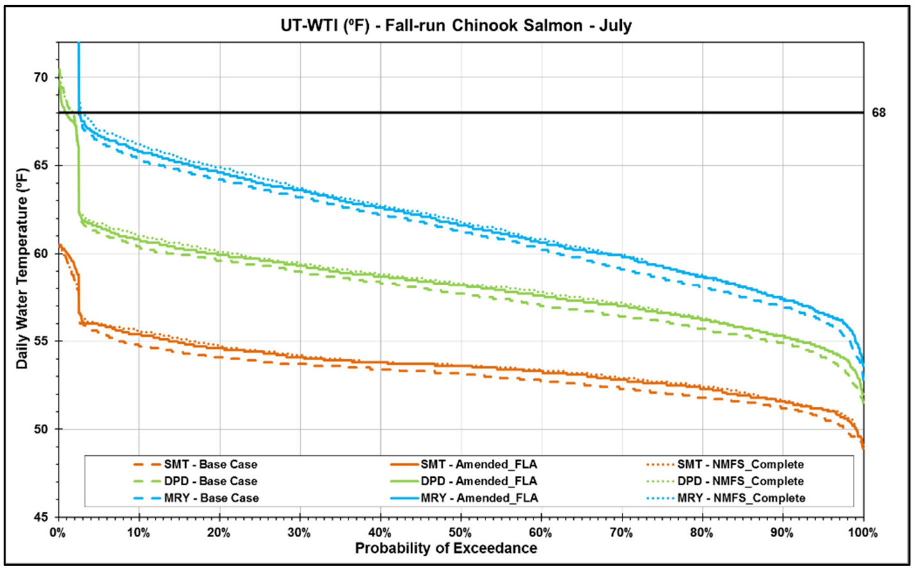
UT-WTI (ºF) - Fall-run Chinook Salmon - July
Daily Water Temperature (ºF)
Probability of Exceedance
68
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SMT - Amended_FLA
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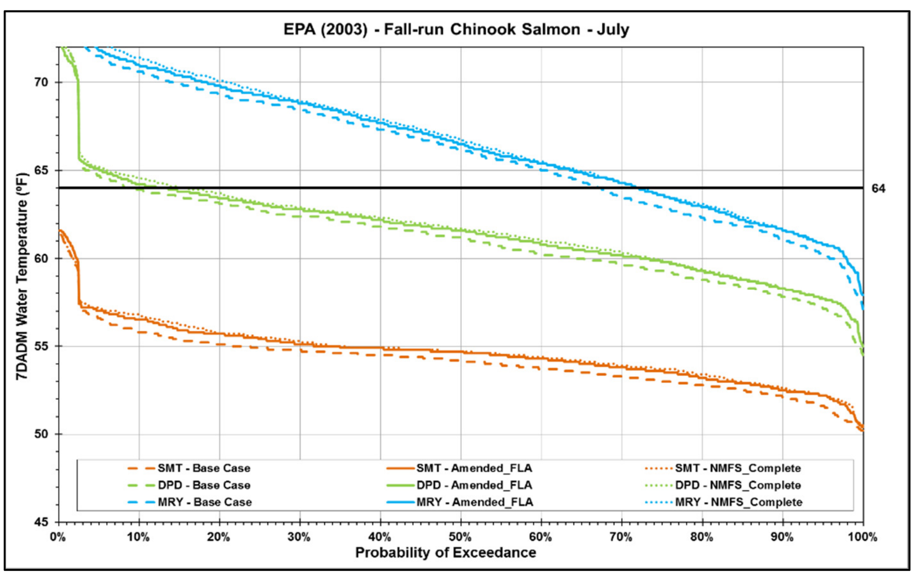
EPA (2003) - Fall-run Chinook Salmon - July
7DADM Water Temperature (ºF)
Probability of Exceedance
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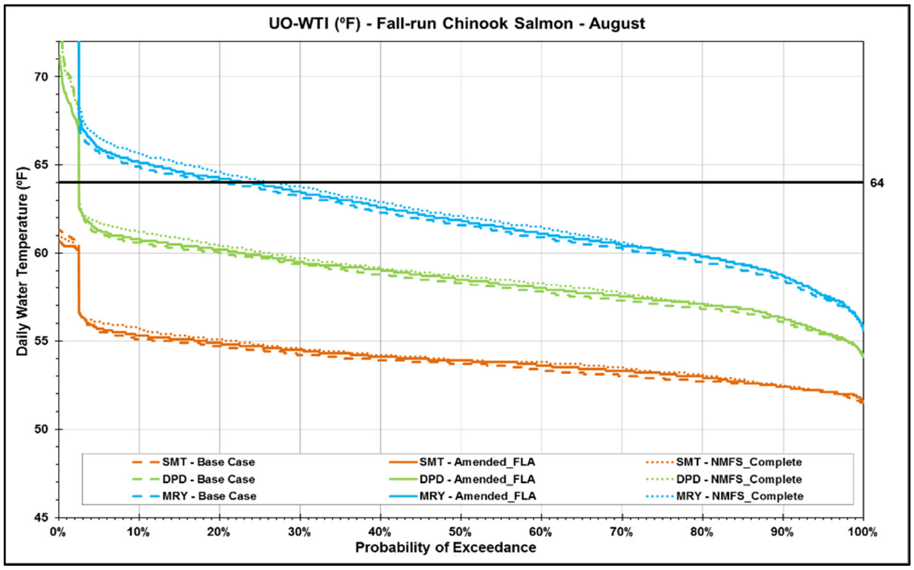
UO-WTI (ºF) - Fall-run Chinook Salmon - August
Daily Water Temperature (ºF)
Probability of Exceedance
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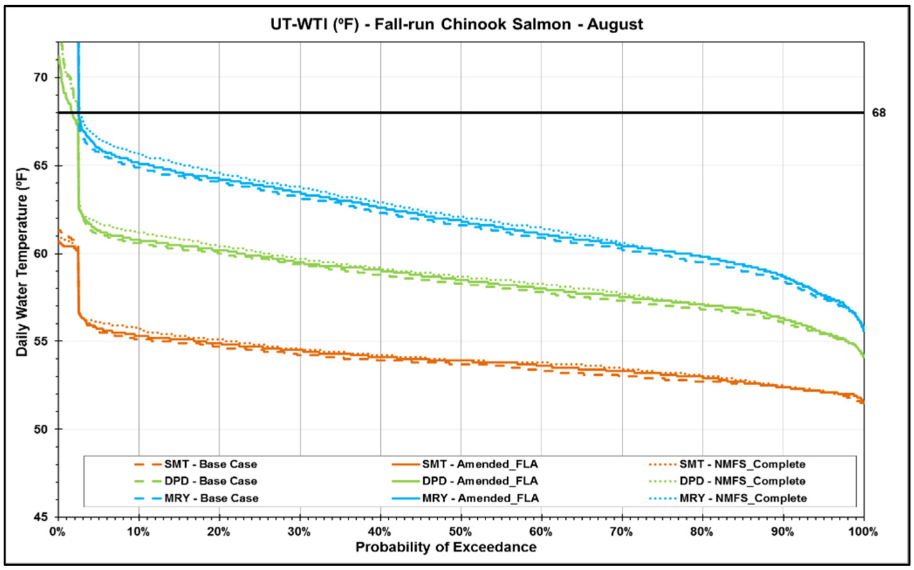
UT-WTI (ºF) - Fall-run Chinook Salmon - August
Daily Water Temperature (ºF)
Probability of Exceedance
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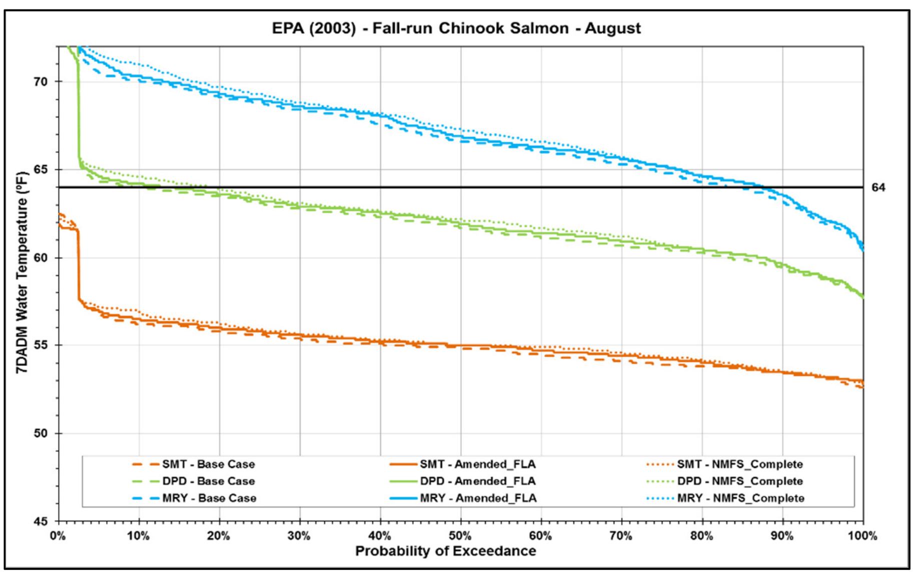
EPA (2003) - Fall-run Chinook Salmon - August
7DADM Water Temperature (ºF)
Probability of Exceedance
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DPD - Base Case
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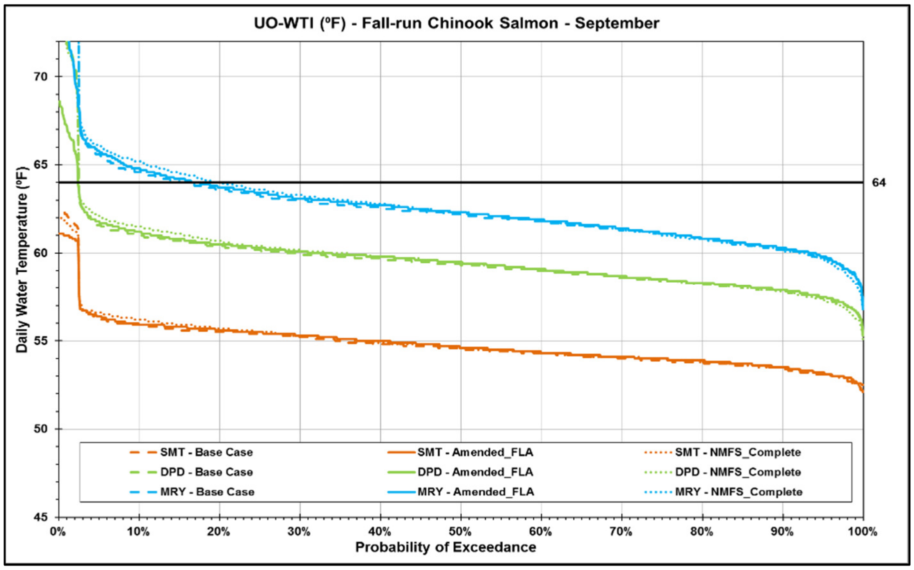
UO-WTI (ºF) - Fall-run Chinook Salmon - September
Daily Water Temperature (ºF)
Probability of Exceedance
64
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SMT - Amended_FLA
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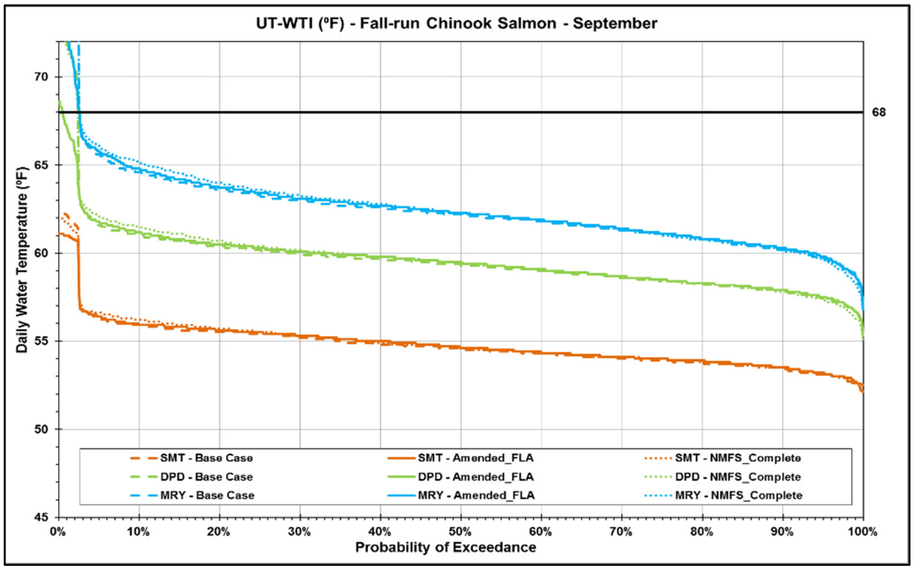
UT-WTI (ºF) - Fall-run Chinook Salmon - September
Daily Water Temperature (ºF)
Probability of Exceedance
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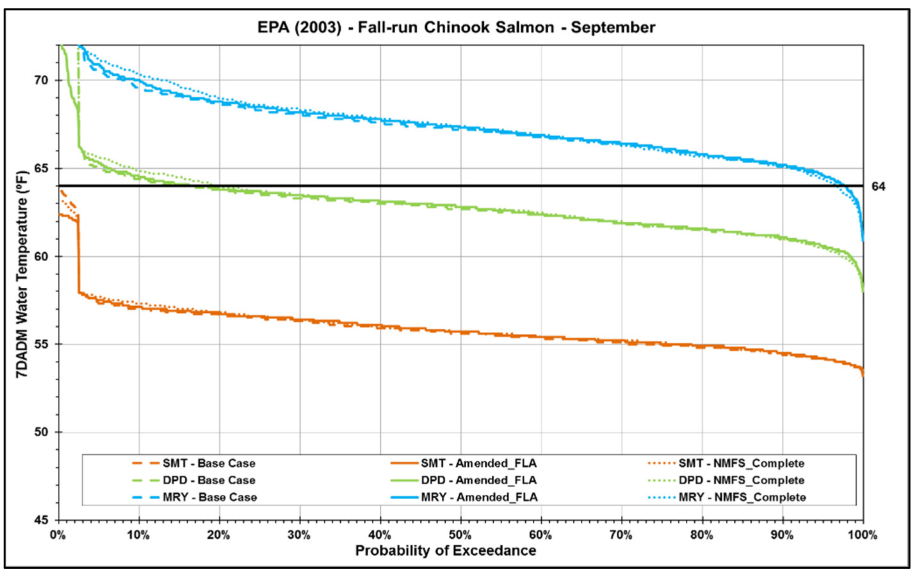
EPA (2003) - Fall-run Chinook Salmon - September
7DADM Water Temperature (ºF)
Probability of Exceedance
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SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete

Steelhead
Water Temperature Exceedance Curves

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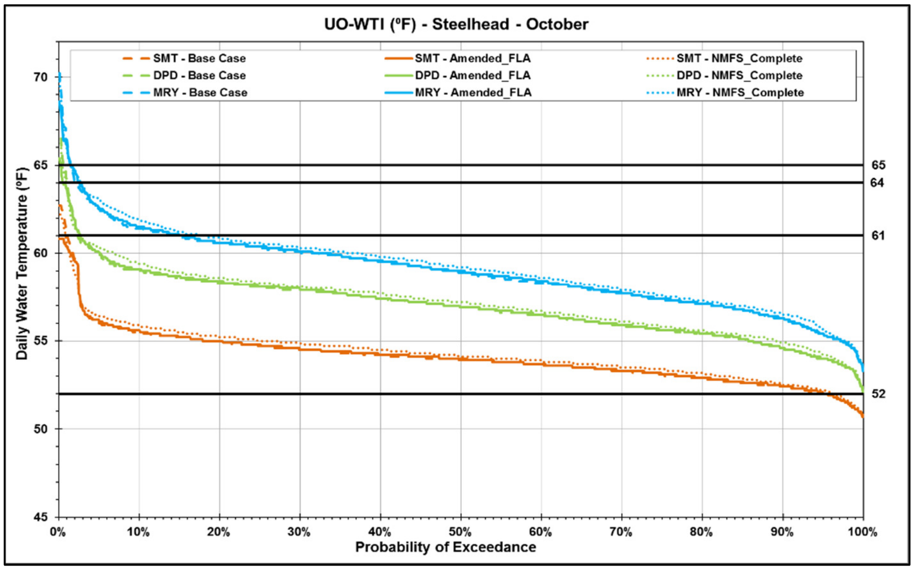
UO-WTI (ºF) - Steelhead - October
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MRY - Base Case
SMT - Amended_FLA
DPD - Amended_FLA
MRY - Amended_FLA
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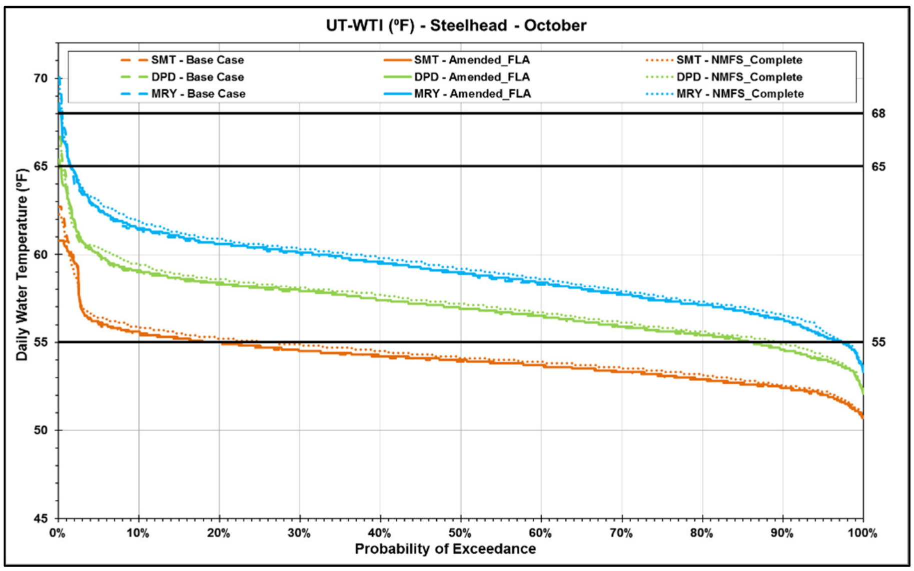
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
52


UT-WTI (ºF) - Steelhead - October
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MRY - Base Case
SMT - Amended_FLA
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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65
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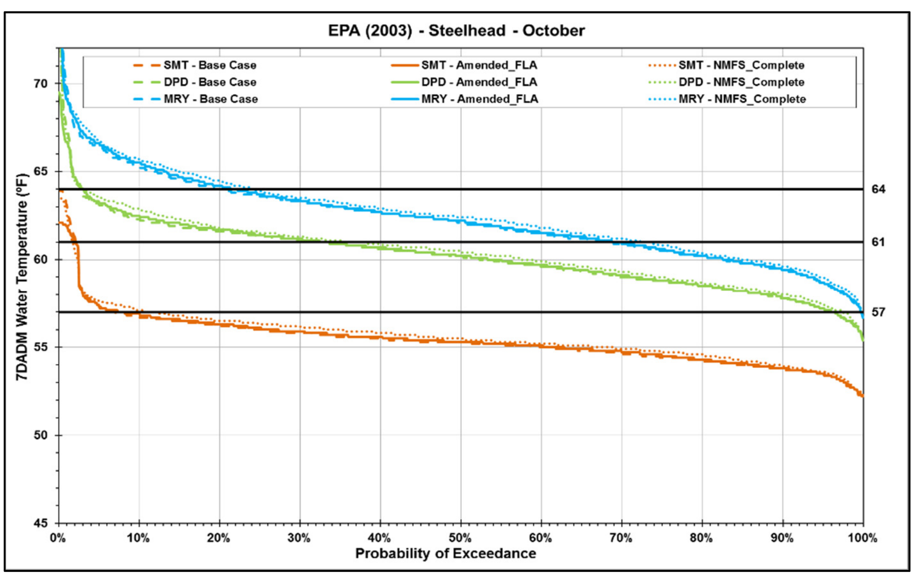
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MRY - Base Case
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MRY - Amended_FLA
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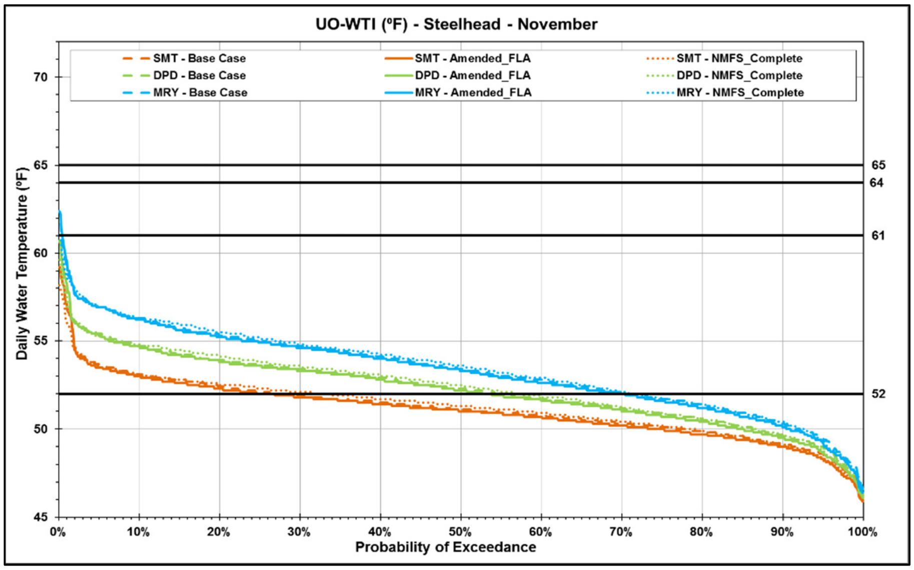
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
57


UO-WTI (ºF) - Steelhead - November
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DPD - Amended_FLA
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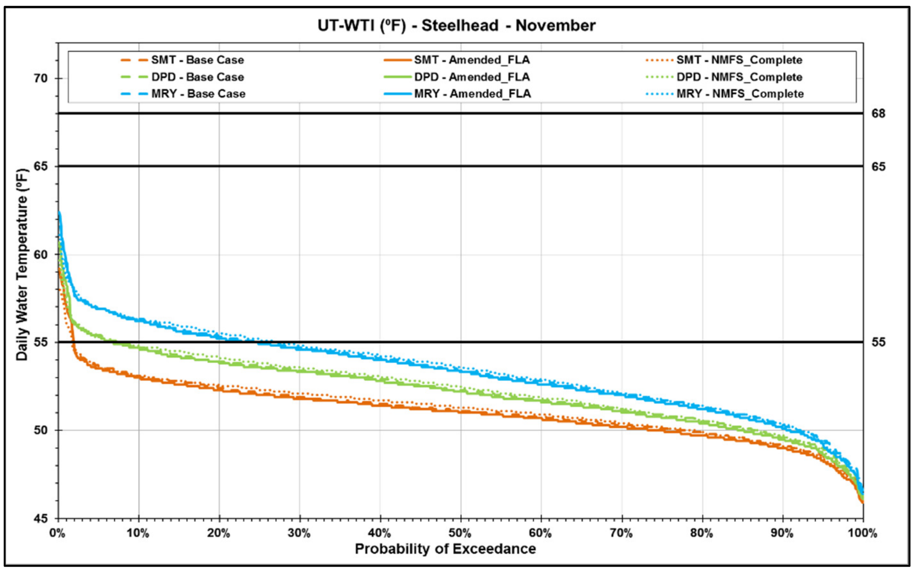
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
52


UT-WTI (ºF) - Steelhead - November
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
65
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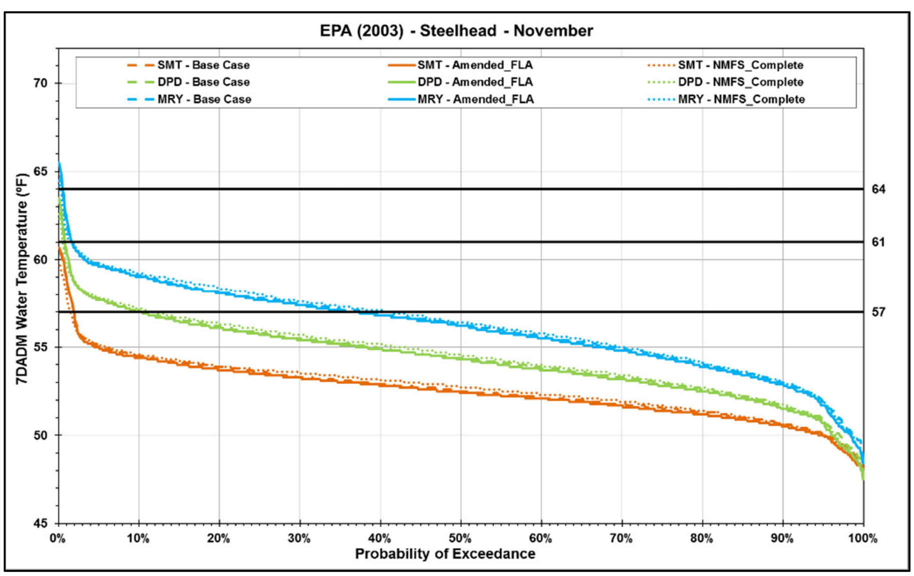
EPA (2003) - Steelhead - November
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MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
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61
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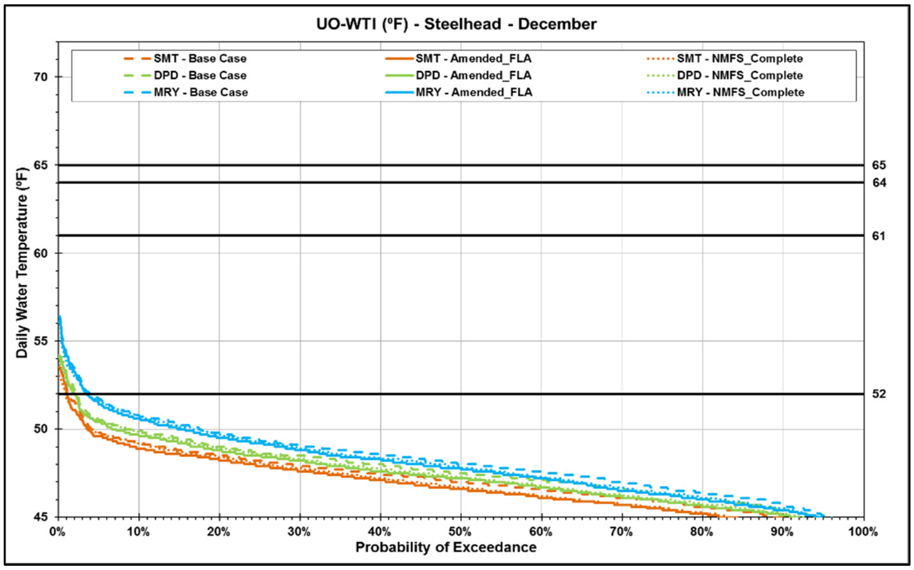
UO-WTI (ºF) - Steelhead - December
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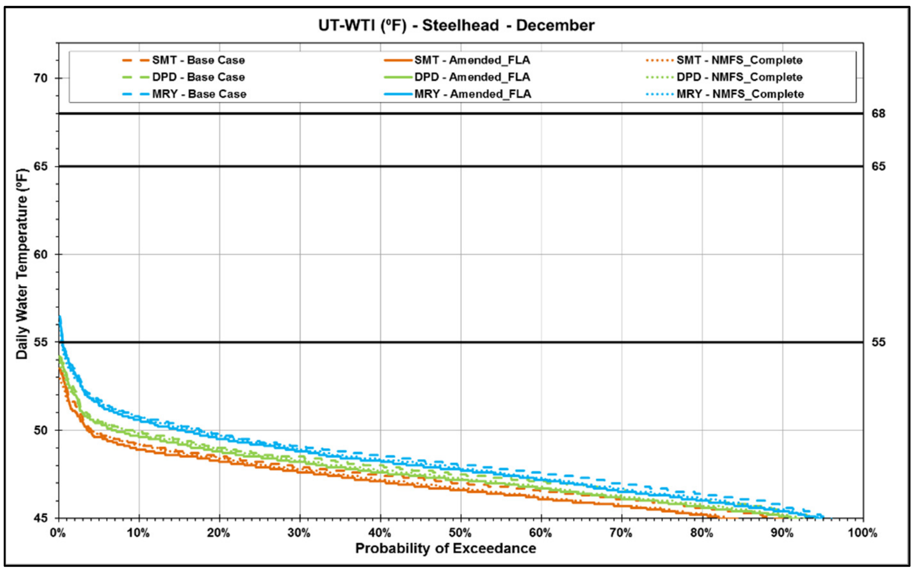
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
52


UT-WTI (ºF) - Steelhead - December
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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65
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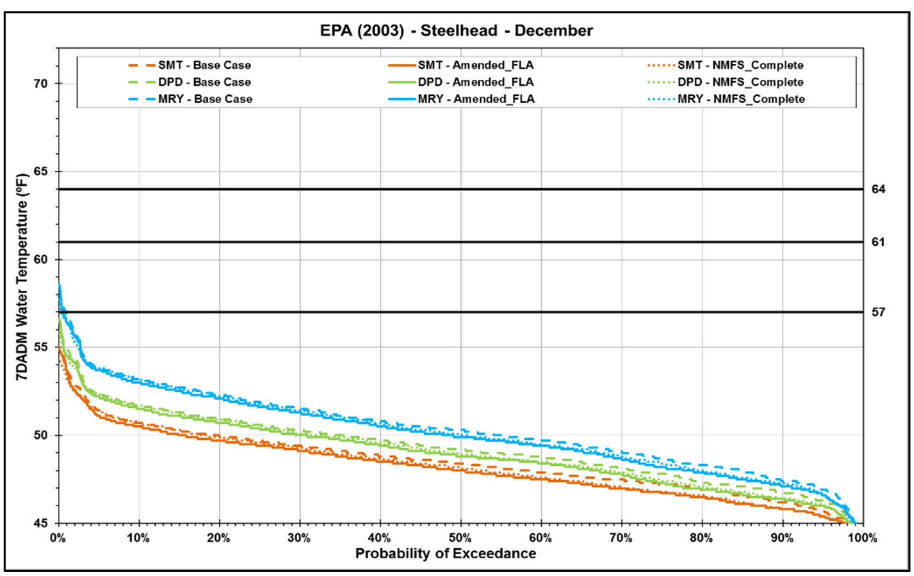
EPA (2003) - Steelhead - December
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7DADM Water Temperature (ºF)
Probability of Exceedance
64
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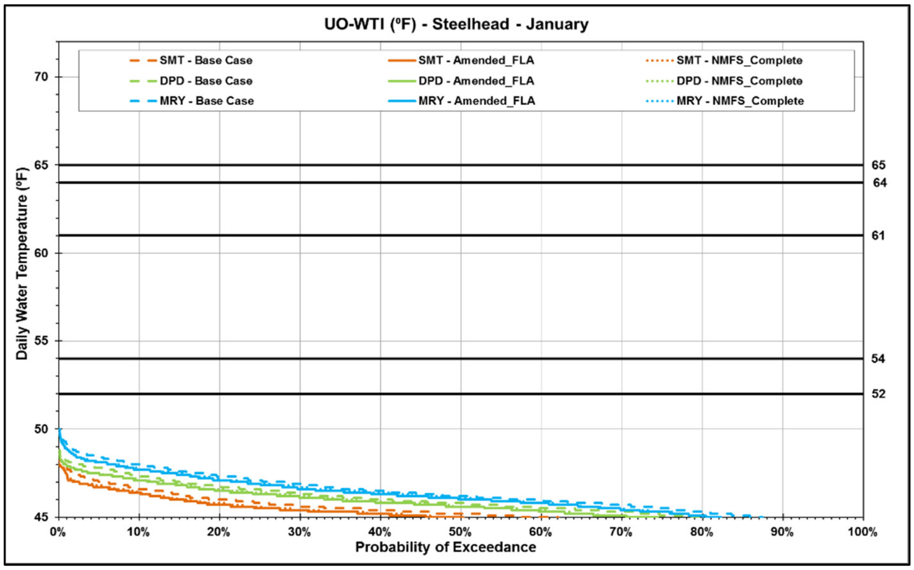
UO-WTI (ºF) - Steelhead - January
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DPD - Amended_FLA
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
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54
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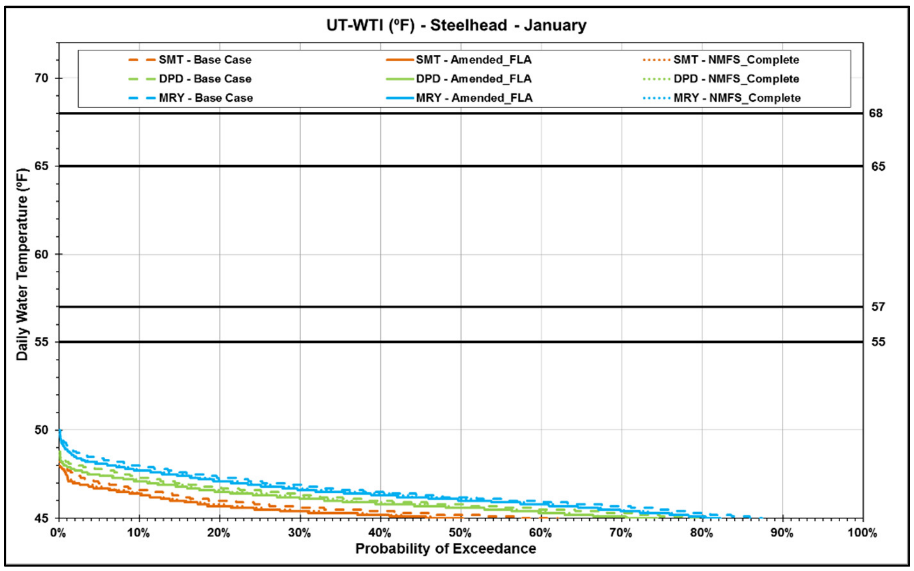
UT-WTI (ºF) - Steelhead - January
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DPD - Base Case
DPD - Amended_FLA
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MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
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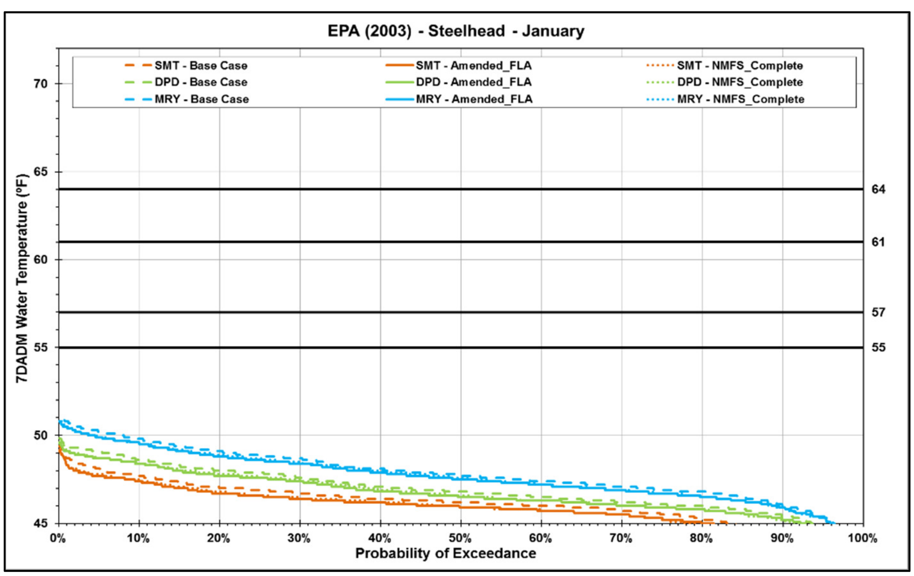
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DPD - NMFS_Complete
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MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
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57
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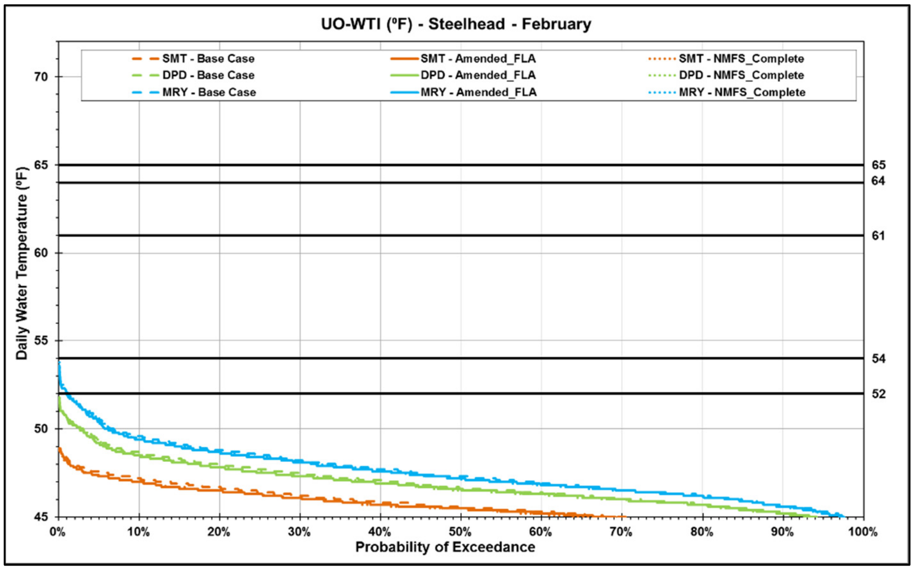
UO-WTI (ºF) - Steelhead - February
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DPD - Amended_FLA
DPD - NMFS_Complete
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
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54
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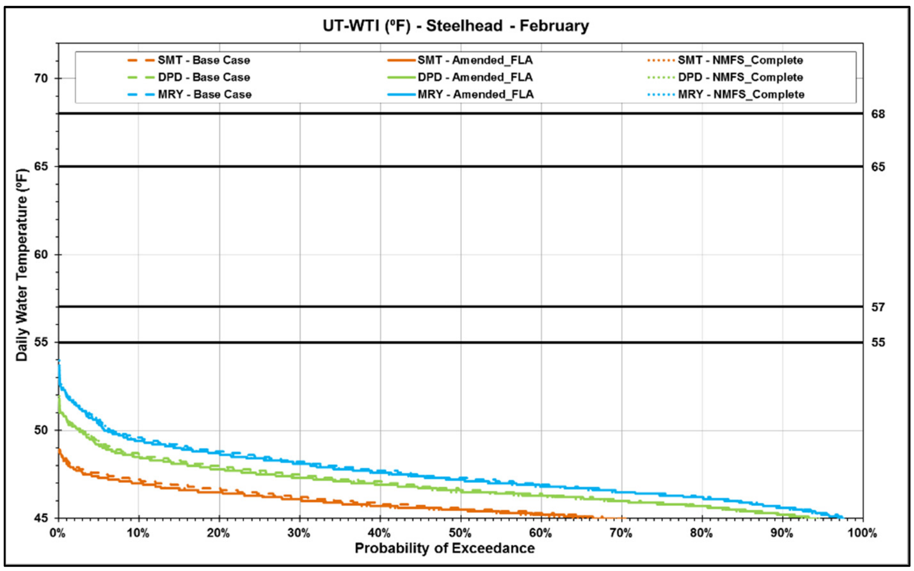
UT-WTI (ºF) - Steelhead - February
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DPD - Amended_FLA
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MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
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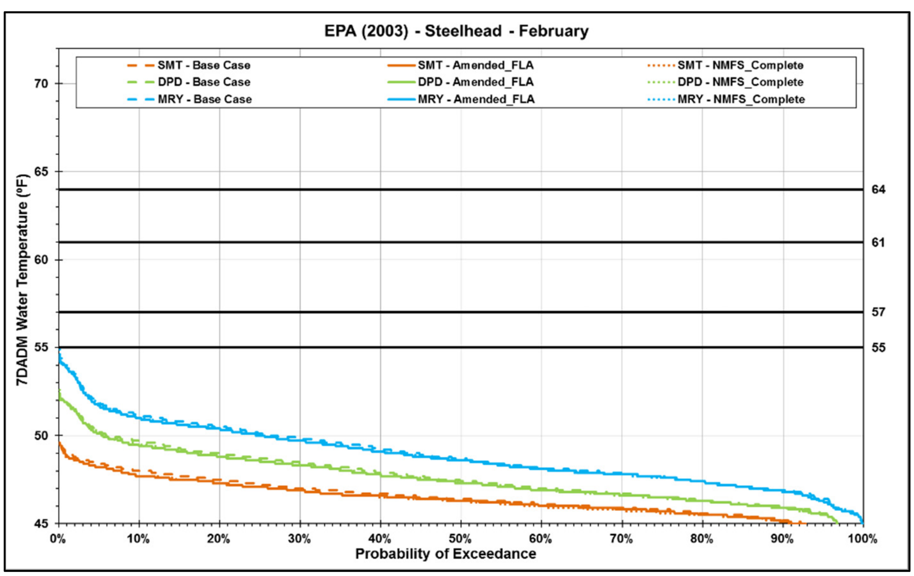
EPA (2003) - Steelhead - February
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7DADM Water Temperature (ºF)
Probability of Exceedance
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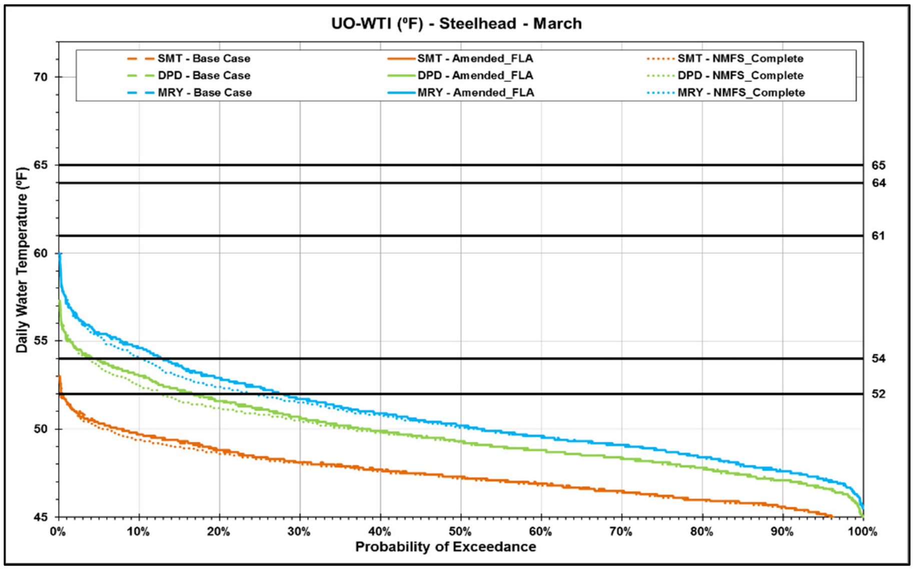
UO-WTI (ºF) - Steelhead - March
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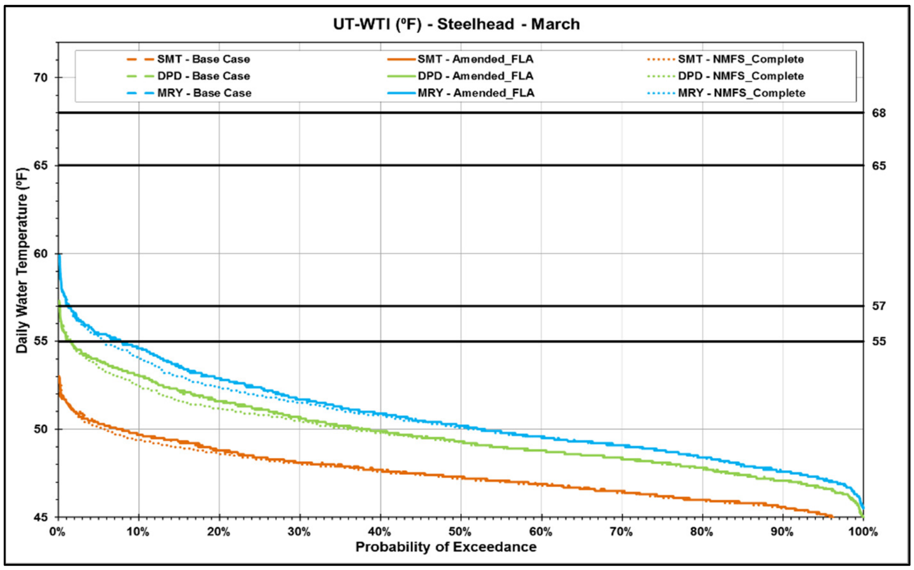
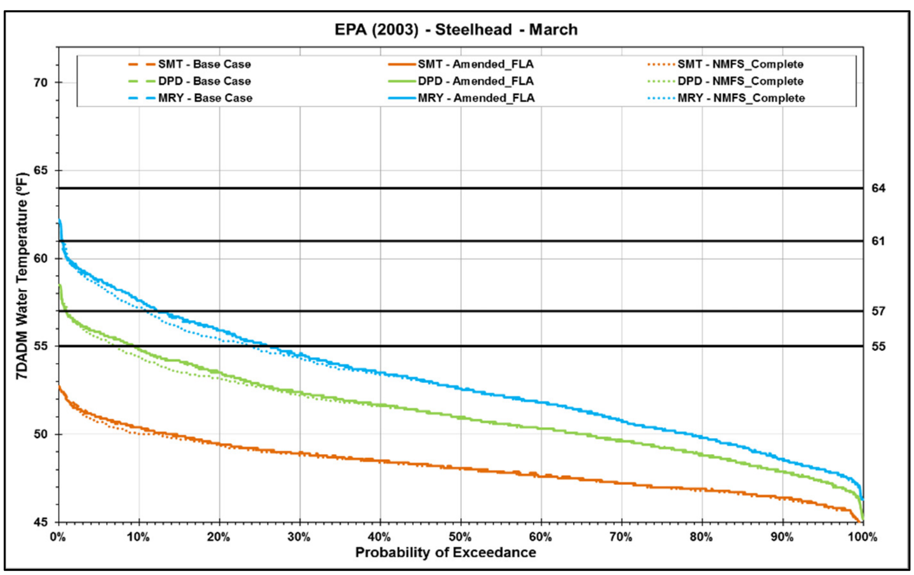
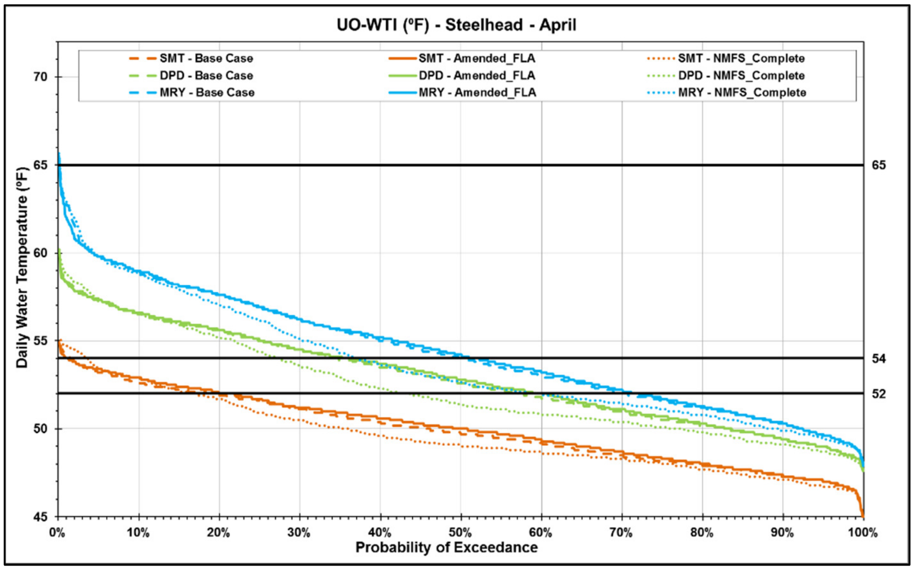
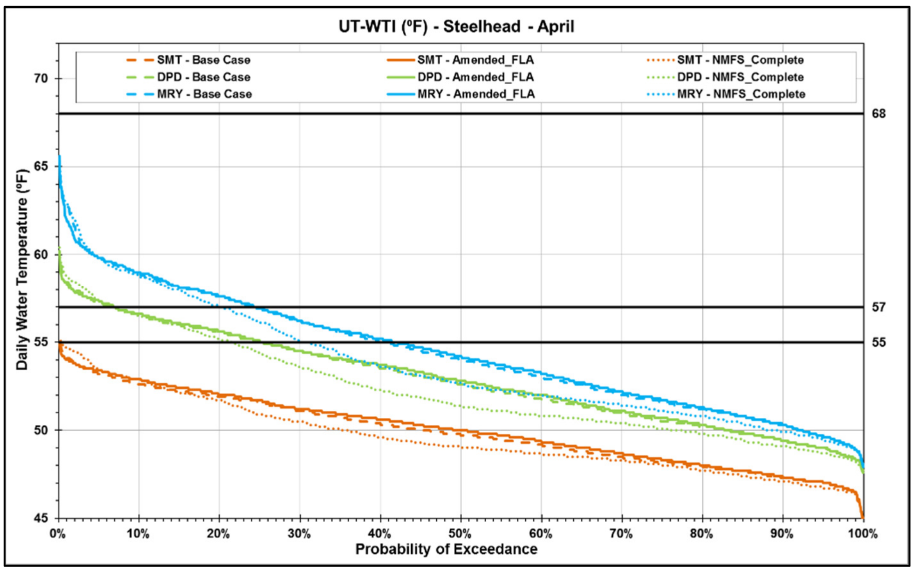
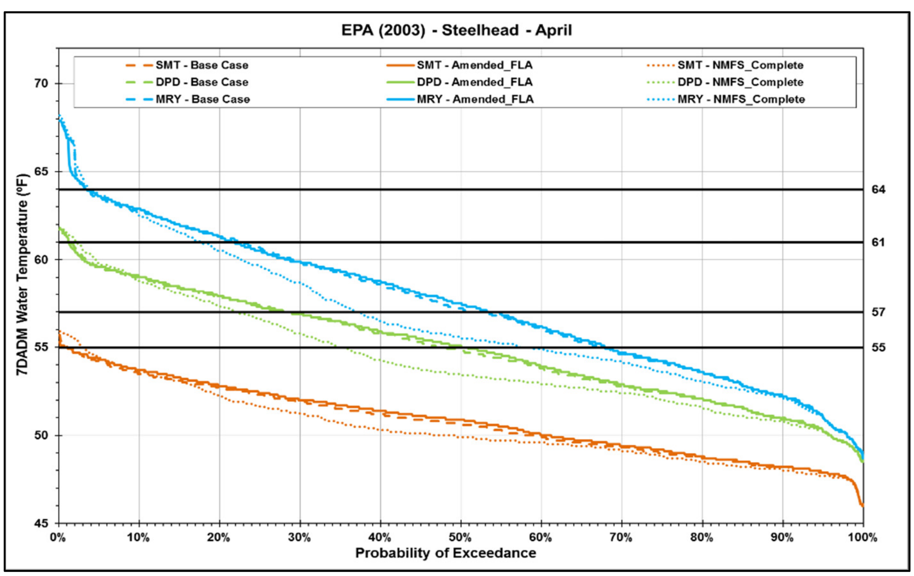
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
54
52

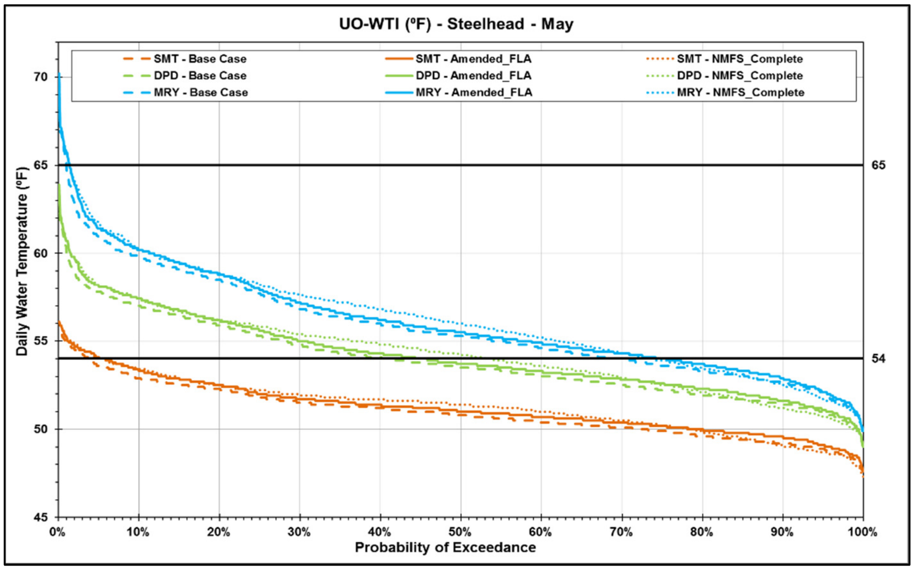

UT-WTI (ºF) - Steelhead - March
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
65
57
55

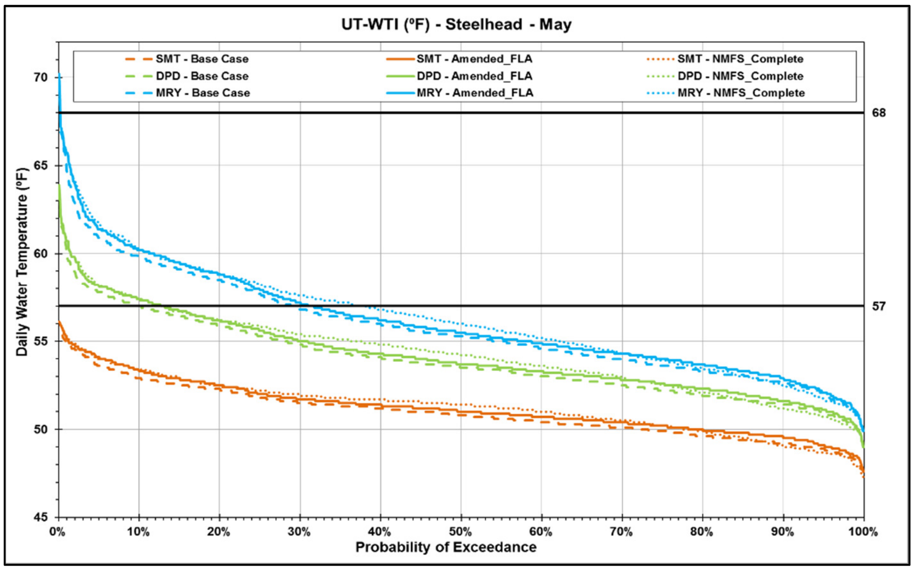

EPA (2003) - Steelhead - March
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
57
55

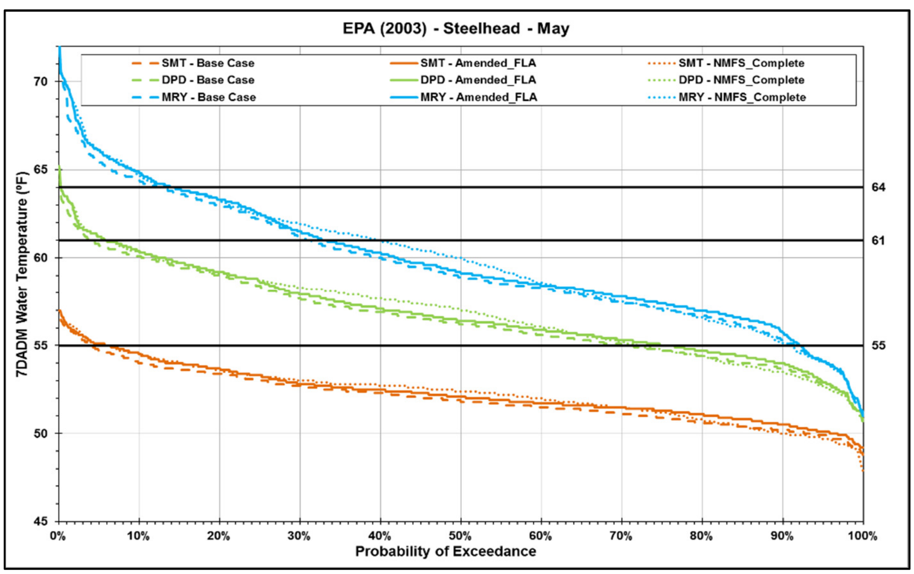

UO-WTI (ºF) - Steelhead - April
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
54
52

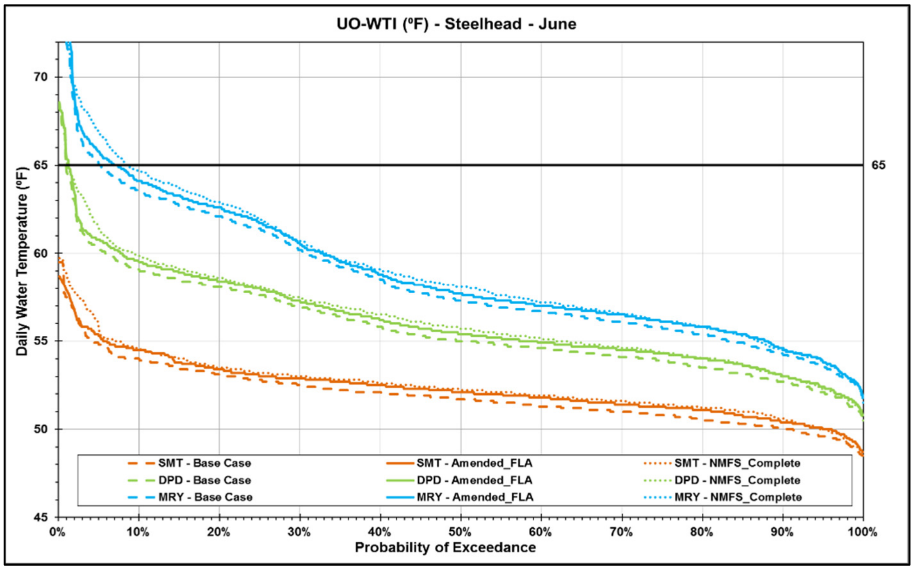

UT-WTI (ºF) - Steelhead - April
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
57
55

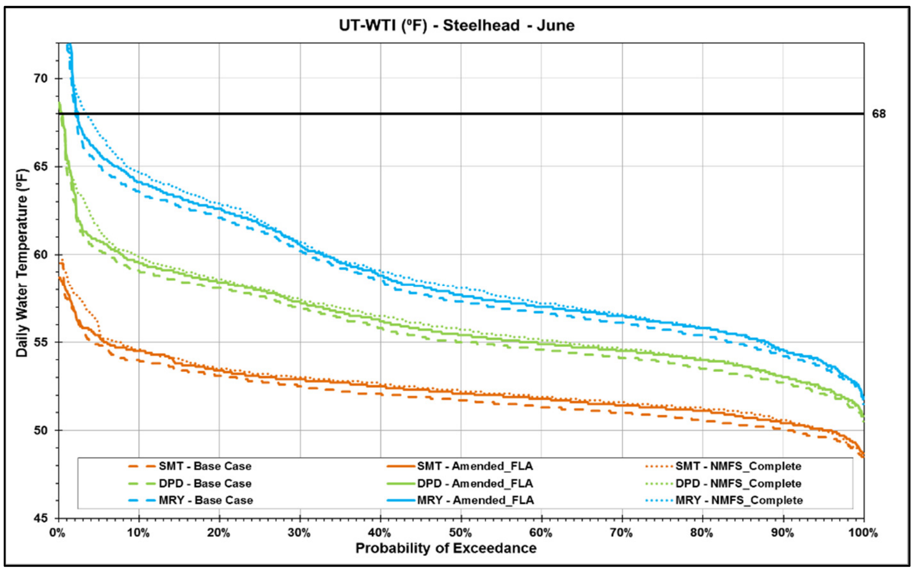

EPA (2003) - Steelhead - April
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
57
55

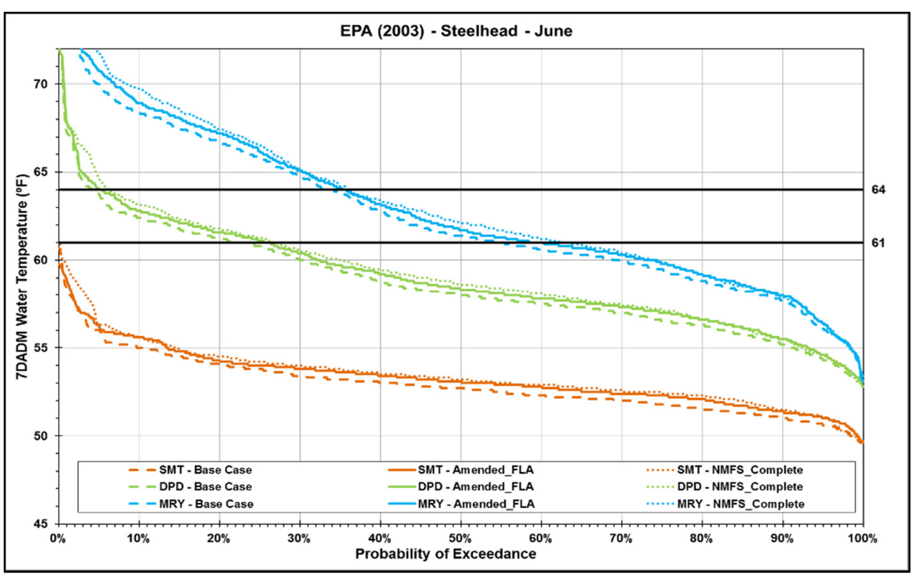

UO-WTI (ºF) - Steelhead - May
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
65
54

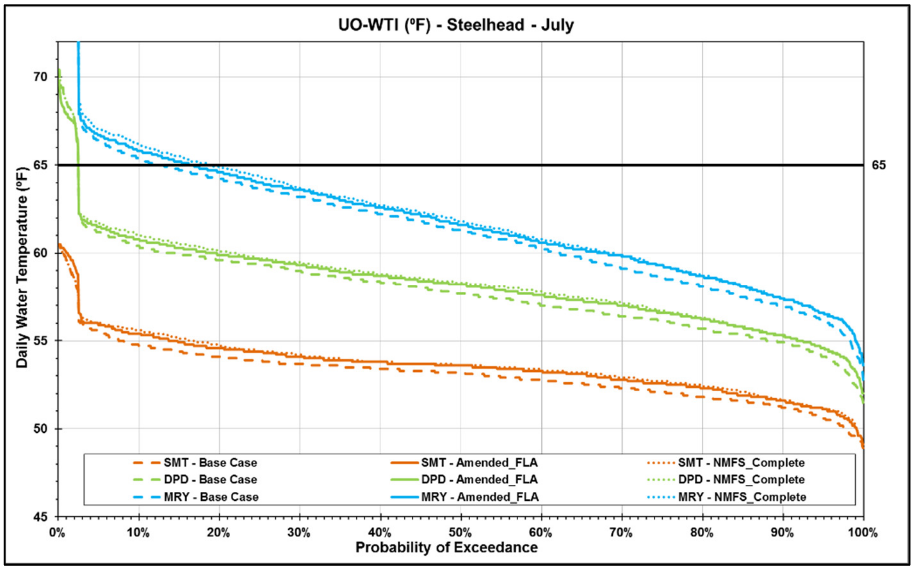

UT-WTI (ºF) - Steelhead - May
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
Daily Water Temperature (ºF)
Probability of Exceedance
68
57

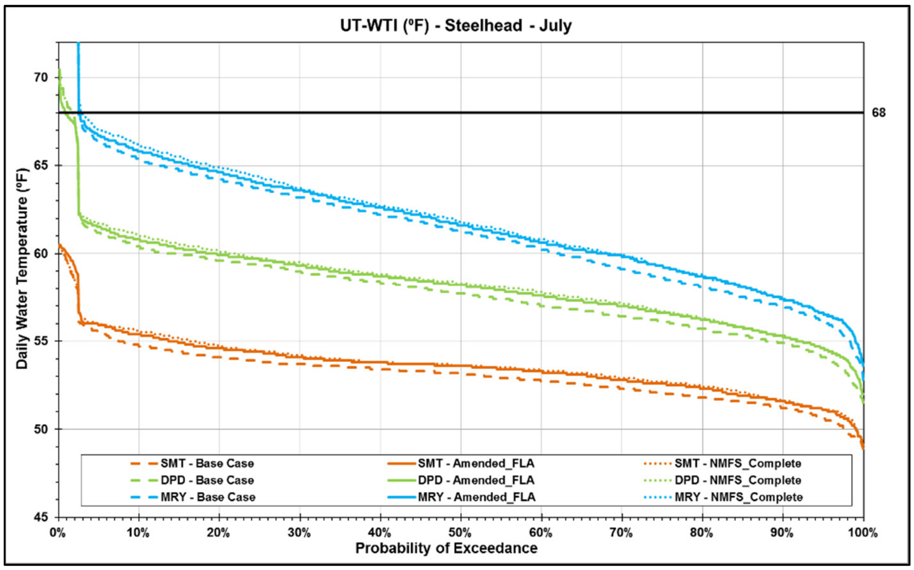

EPA (2003) - Steelhead - May
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
55

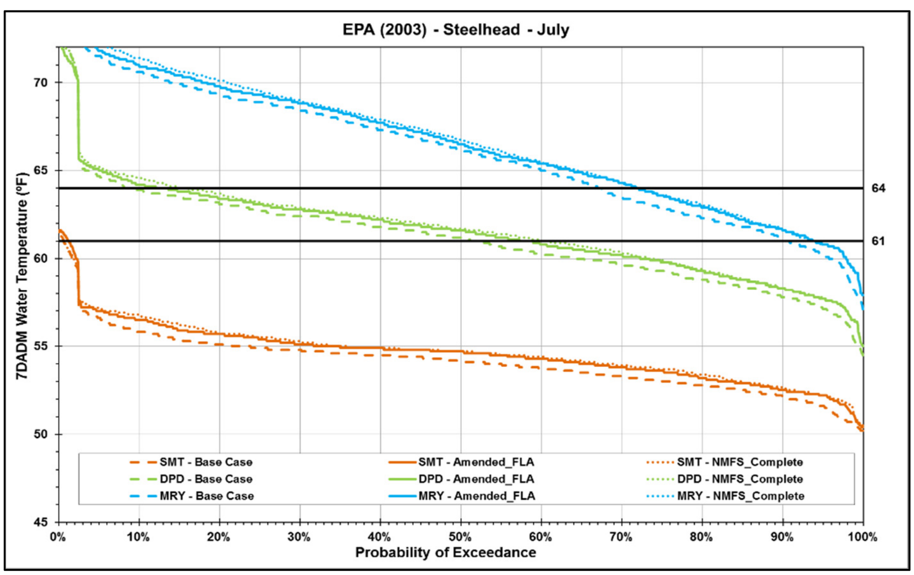

UO-WTI (ºF) - Steelhead - June
Daily Water Temperature (ºF)
Probability of Exceedance
65
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete

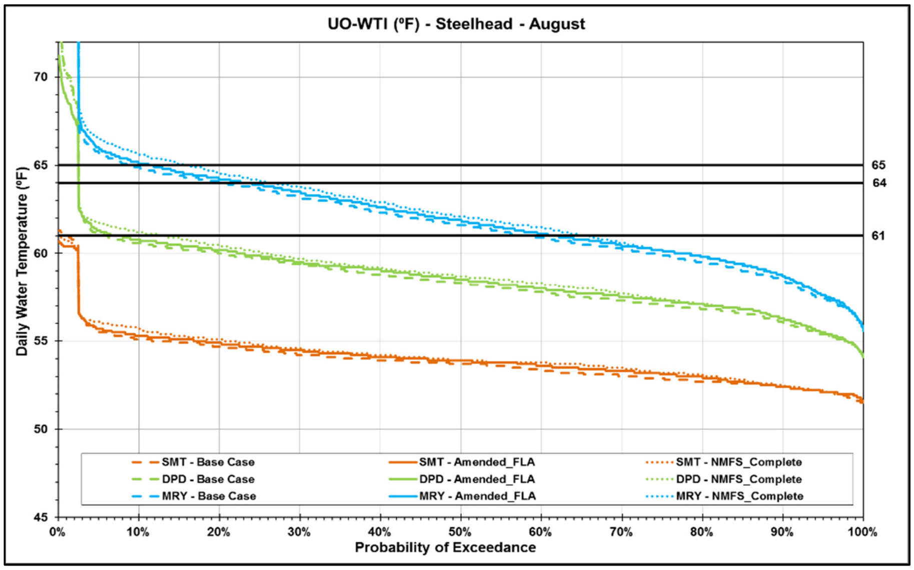

UT-WTI (ºF) - Steelhead - June
Daily Water Temperature (ºF)
Probability of Exceedance
68
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete

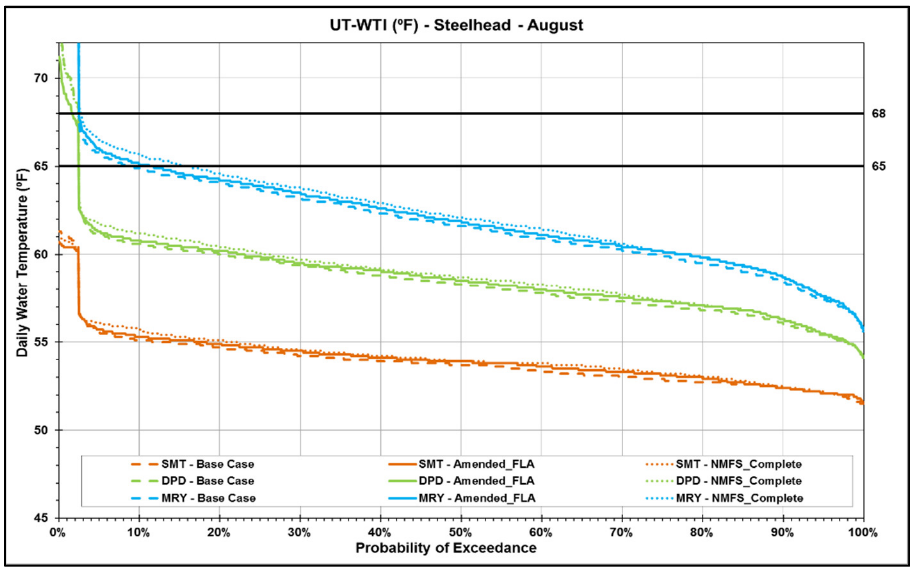

EPA (2003) - Steelhead - June
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UO-WTI (ºF) - Steelhead - July
Daily Water Temperature (ºF)
Probability of Exceedance
65
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UT-WTI (ºF) - Steelhead - July
Daily Water Temperature (ºF)
Probability of Exceedance
68
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


EPA (2003) - Steelhead - July
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UO-WTI (ºF) - Steelhead - August
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UT-WTI (ºF) - Steelhead - August
Daily Water Temperature (ºF)
Probability of Exceedance
68
65
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
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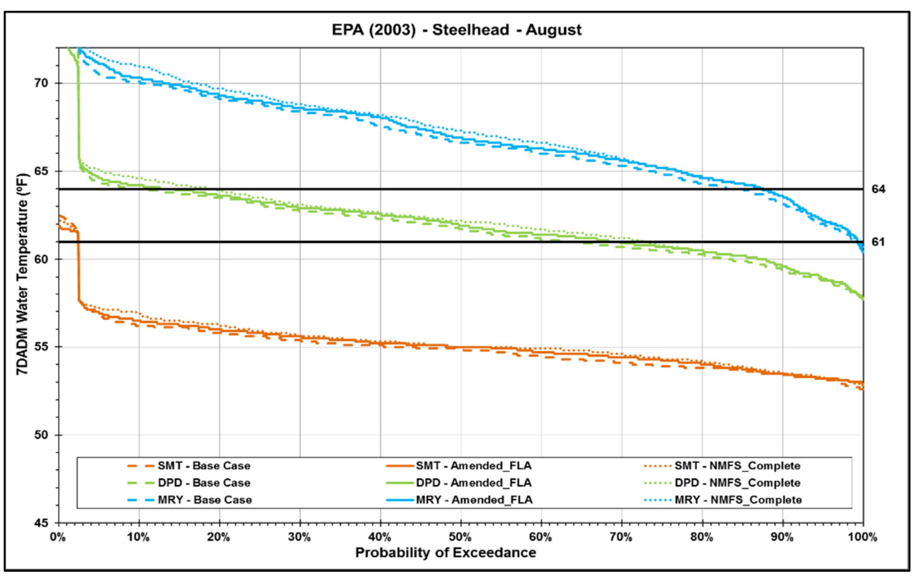
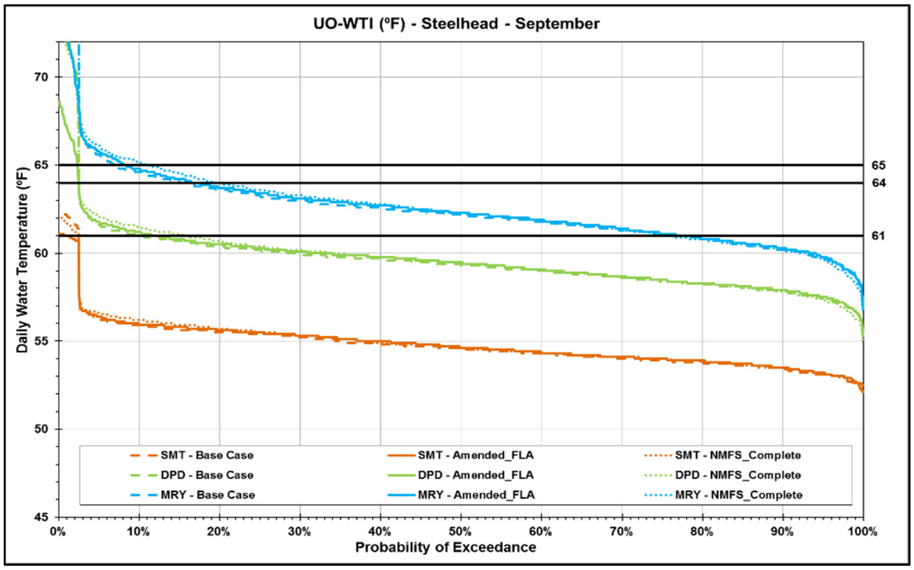
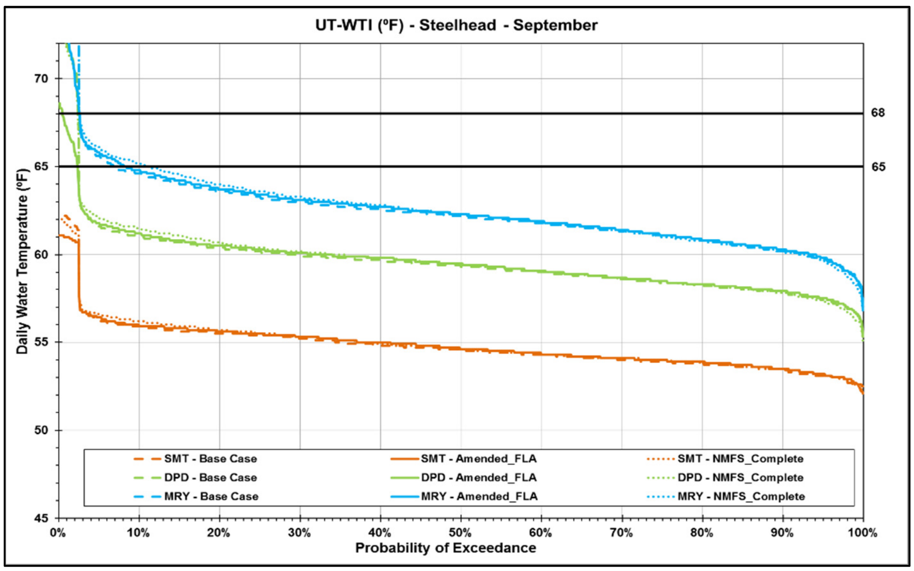
MRY - NMFS_Complete


EPA (2003) - Steelhead - August
7DADM Water Temperature (ºF)
Probability of Exceedance
64
61
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UO-WTI (ºF) - Steelhead - September
Daily Water Temperature (ºF)
Probability of Exceedance
65
64
61
SMT - Base Case
SMT - Amended_FLA
SMT - NMFS_Complete
DPD - Base Case
DPD - Amended_FLA
DPD - NMFS_Complete
MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete


UT-WTI (ºF) - Steelhead - September
Daily Water Temperature (ºF)
Probability of Exceedance
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SMT - Base Case
SMT - Amended_FLA
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DPD - Amended_FLA
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MRY - Base Case
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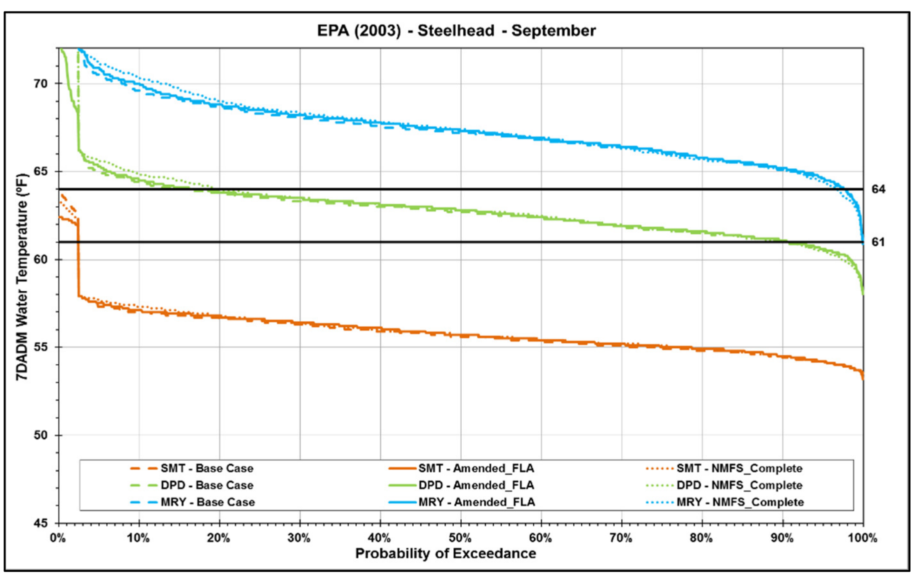
EPA (2003) - Steelhead - September
7DADM Water Temperature (ºF)
Probability of Exceedance
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SMT - Base Case
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MRY - Base Case
MRY - Amended_FLA
MRY - NMFS_Complete