

Salinas River Operations

Habitat Conservation Plan

salinasrivermanagementprogram.org



SROHCP Reservoir Operations TAC

- Charter
- Salinas Valley Operational Model
- Critical Riffle Analysis
- Current Flow Prescription
- IOP
- Fish Passage Targets
- Comparison Point Scenarios
- Reservoir Re-operation Scenarios



SROHCP Reservoir Operations TAC

Charter – Goals and Objectives

The goal of the HCP-TAC is to develop and provide technical recommendations to be considered during the development of water management scenarios for the Salinas River Operations HCP. Specific objectives include but are not limited to:

- Provide expert advice and recommendations to the HCP development team regarding flow release triggers specific to species conservation, including migration, spawning, and rearing conditions for South-Central California Coast steelhead.
- Provide expert advice and recommendations to the HCP development team regarding reservoir release strategies to meet existing water conservation goals related to groundwater recharge and Salinas River Diversion Facility (SRDF) operation.



Reservoir Re-operation Protocols

Presented for Discussion
November 2024 TAC Meeting

Scenario 1: Modified Passage Flows and Migration Targets

Scenario 2: Modified Passage Flows and Migration Targets
plus Winter Releases from Storage

Scenario 3: Modified Passage Flows and Migration Targets
plus Winter Bypass Flows



Revised Reservoir Re-operation Protocols

Scenario 1: Modified Passage Flows and Migration Targets

Scenario 2: Modified Passage Flows and Migration Targets
plus Winter Bypass Releases

Scenario 3: Opportunistic Release following Lagoon Opening



Scenario 1

Refinement of existing flow prescription to make it more biologically relevant, more operationally feasible, use water more efficiently

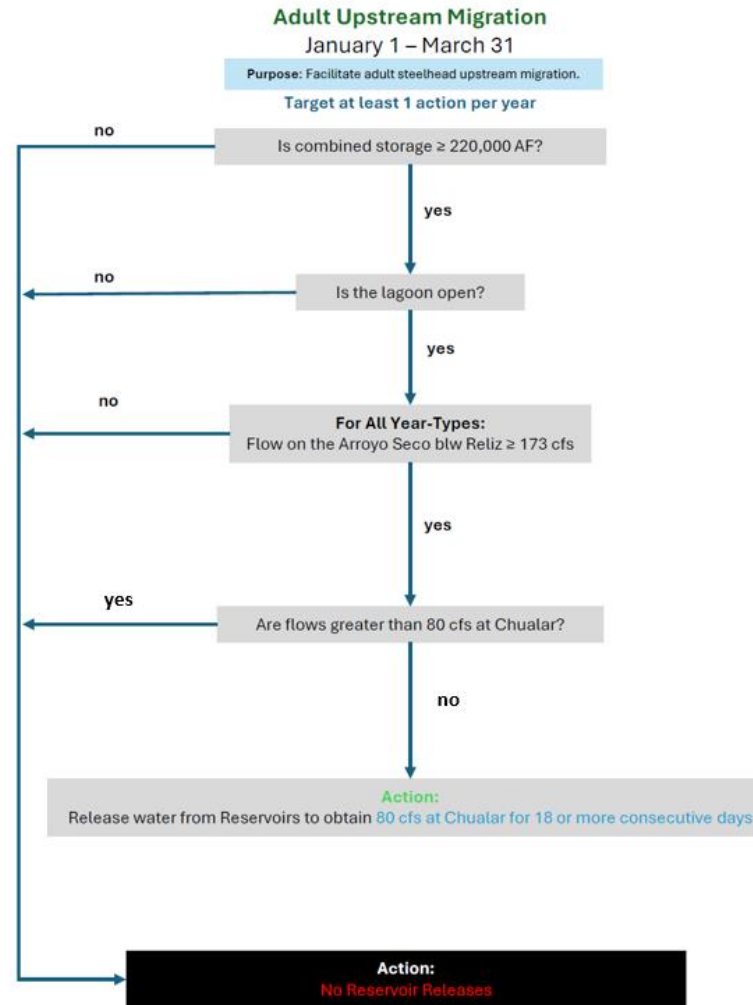
- Incorporated modified passage flow targets
 - Critical riffle survey established 80 cfs at Chualar as an acceptable passage threshold for all steelhead life stages
 - Incorporated the concept of holding flows for periods when river flows temporarily drop below passage thresholds but allow enough flow for fish to hold in the system without being stranded
- Extended upstream migration actions to allow steelhead more time to move into the upper watershed
 - Improved migration opportunities
 - Improved operational success - 5 day targets are very difficult to meet
 - Holding flows also help operational success



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Scenario 1

- Refined "block flow" releases to be more biologically relevant, more operationally feasible, and more compatible with SRDF operations
 - Established new target flow ranges based on year type
 - Reduced pulse flows in drier year types to be more consistent with natural year type flows
 - Increases the chance of operational success
 - Uses water more efficiently to provide migration opportunities
 - Reduced outmigration flows after April 1 to be more consistent with natural spring conditions and allow simultaneous migration flows and SRDF operations
 - Same as adult upstream target flow of 80 cfs at Chualar
- Refined counting of passage days to include a 5 year rolling average to better account for the steelhead life cycle and climate cycles
- *SRDF bypass flows will be reconsidered for biological relevance and operational feasibility*



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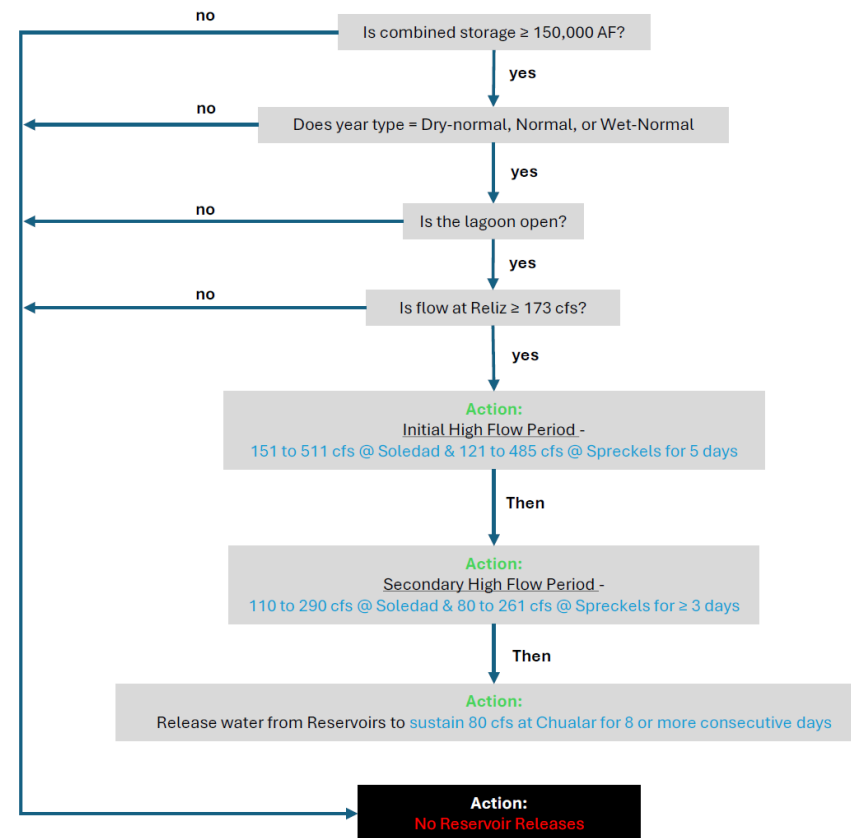
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Smolt Outmigration

March 15 – March 31

Purpose: Facilitate steelhead smolt downstream migration prior to SRDF operation.

Target is 1 action per year

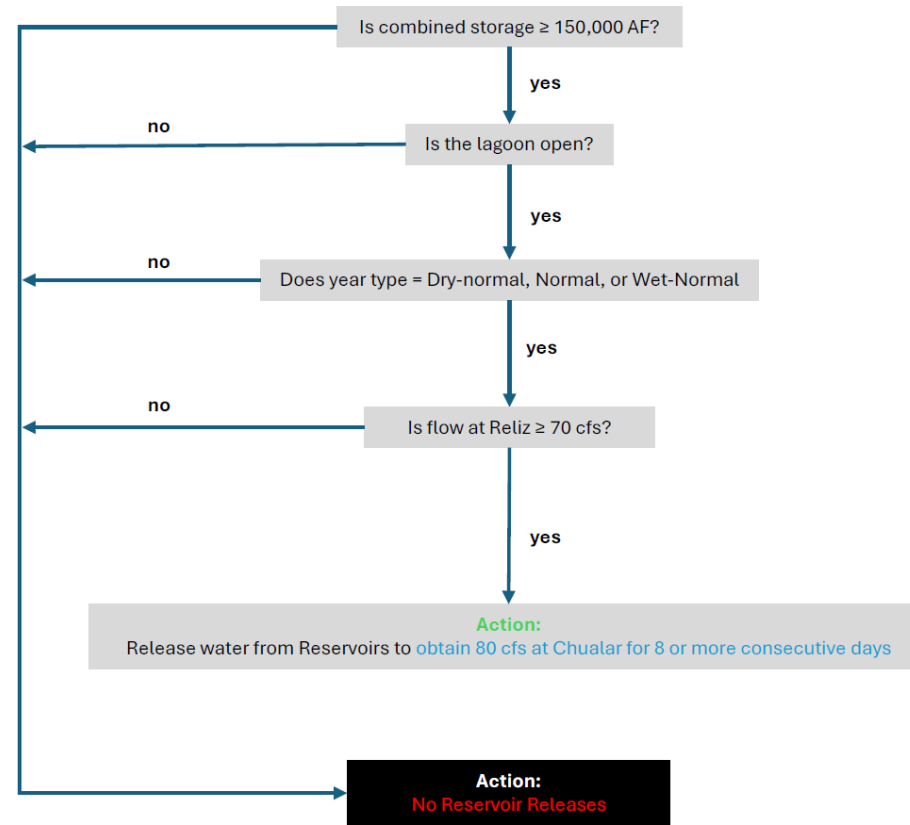


Smolt & Kelt Outmigration

April 1 – June 15

Purpose: Facilitate steelhead smolt and kelt downstream migration during the SRDF operational period.

Target at least 1 action per year



Scenario 2

Incorporates the concept of winter releases into an early winter channel wetting flow using Reservoir bypass flows

- Goal of wetting the main stem Salinas during rain events that would otherwise be captured behind the dams
 - More closely replicate pre-dam hydrology
 - "prime the system"
 - Perceived benefit of easier reconnection to the ocean during larger storm events
 - Additional winter groundwater recharge
- During Jan – Feb when combined storage thresholds are met, fish passage has not already occurred, and a reservoir inflow of at least 5,000 AF has occurred, bypass some reservoir inflow to target flow to the Salinas River near Chualar for channel wetting



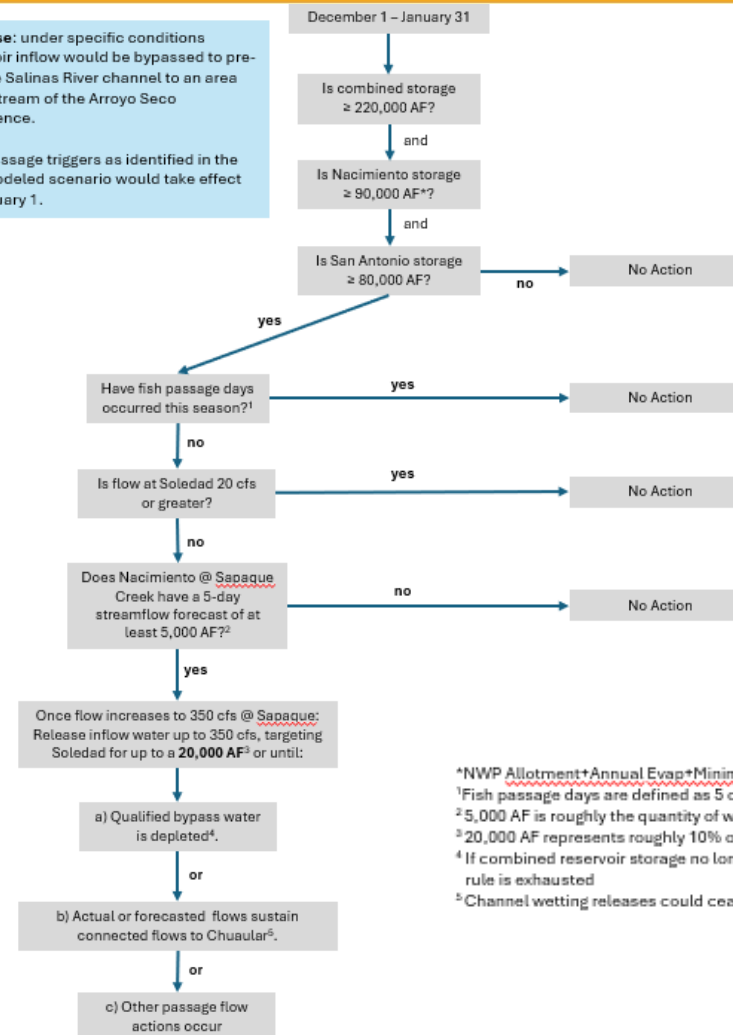
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Purpose: under specific conditions reservoir inflow would be bypassed to pre-wet the Salinas River channel to an area downstream of the Arroyo Seco confluence.

Fish passage triggers as identified in the first modeled scenario would take effect on January 1.



*NWP Allotment+Annual Evap+Minimum Pool +Dead Pool

¹Fish passage days are defined as 5 consecutive days of minimum flows (80 cfs) at Chualar.

²5,000 AF is roughly the quantity of water needed to maintain channel-wetting reservoir releases of 350 cfs for one week.

³20,000 AF represents roughly 10% of a full conservation season release volume.

⁴If combined reservoir storage no longer exceeds 220,000 AF meaning that once inflow that has not been collected to storage according to the 30-day rule is exhausted

⁵Channel wetting releases could cease if forecasted natural flows are expected to sustain Salinas River flows without additional reservoir releases.



Scenario 2

- Investigation into this scenario identified that this action would almost never be triggered in the dry-normal to normal year types when the action would be most beneficial, less beneficial in wetter years when triggers are met (natural flow often exists)
 - Difficult to model
 - Difficult to evaluate effectiveness
- Bypass channel wetting flows under this scenario were not found to be a reliable option



Scenario 3

Provides a fish migration release when the Salinas River opens to the ocean regardless of other streamflow triggers

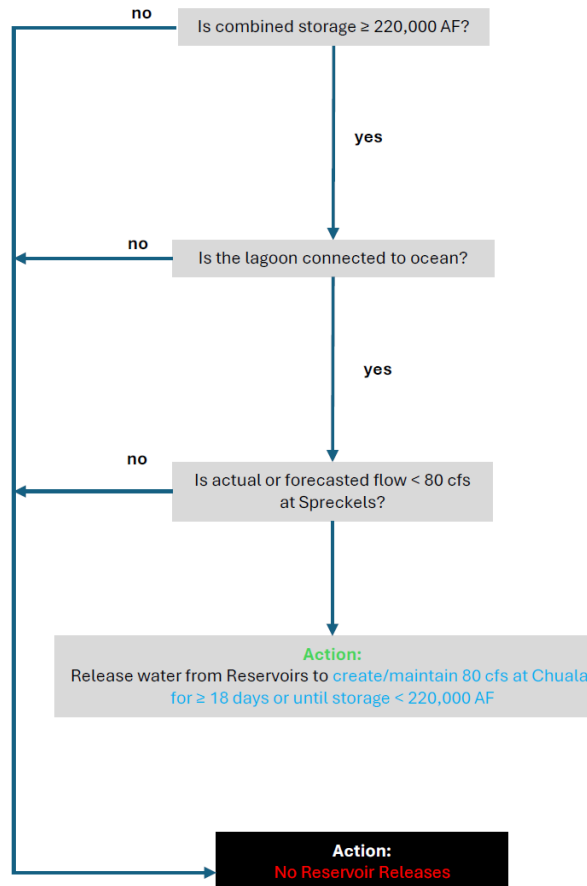
- Follow any lagoon opening event with a release to create 18 days of fish passage
- Goal to guarantee a passage period to the Nacimiento and San Antonio Rivers in every year the lagoon opens to the ocean
- Arroyo Seco passage not guaranteed due to lack of flow triggers but likely in most situations



Opportunistic Releases

December 1 – April 30

Purpose: Opportunistically release water to supplement passage conditions when water is available, and lagoon is open.



Scenario 3

- Initially considered as a stand-alone option with an extended migration release
 - Fish migration flows and channel wetting that would prepare the river channel for later natural storm flows or SRDF operations
 - Operationally simple
- Modeling and historical flow analysis shows similar results to the scenario 1 upstream migration action with less regard to natural tributary flows that might encourage migration behavior
- Currently considering this scenario as an adaptive management option to help meet 5 year rolling average passage day targets
 - More frequently triggered because of lack of tributary flow triggers
- TAC thoughts on how this could be implemented?





Groundwater-Surface Water Modeling Update

April 16, 2025

Outline

- Background (Updated)
- Modeling Process To Date
- HCP Comparison Point Scenarios
- HCP Reoperation Scenarios (New)
- Summary (New)

Background

Background

- Salinas River Operations HCP is investigating the occurrence of conditions in the Salinas River and its tributaries conducive to the **migration** of threatened SCCC steelhead trout between the **Pacific Ocean** and **spawning grounds**
- HCP Comparison Point Scenarios simulate the system under **all, some, or none** of the **current operational approach** MCWRA uses for the Nacimiento and San Antonio Reservoirs
- These scenarios can be **compared** to each other to show the effect of the current operational approach on the system, and will be used to determine the effect of operational changes included in the Reoperation Scenarios
- Metrics used to assess these scenarios are based on the Flow Prescription

Background

- HCP Reoperation Scenarios simulate the system under **alternative operational approaches** proposed under the Reoperation Protocol
- Triggers and requirements are based on **new data and surveys** that provide better estimates of minimum flow conditions needed to support steelhead migration
- These scenarios can be **compared** to the HCP Comparison Point Scenarios and to each other to show the effect of changes to the current operational approach
- Metrics used to assess the HCP Reoperation Scenarios are based on the Reoperation Protocol, and are different from those used to assess the HCP Comparison Point Scenarios

Background

- Relies on the Salinas Valley Operational Model (SVOM or Operational Model), currently under development by the USGS
- MODFLOW-OWHM model of the groundwater-surface water system in the alluvial basin, with Nacimiento and San Antonio Reservoirs integrated using the Surface Water Operations Process (SWO)
- Built from Salinas Valley Integrated Hydrologic Model (SVIHM or Historical Model)
- All results are considered provisional until final (published) model version is used

Background

USGS Disclaimer:

SVOM Model: Unofficial Collaborator Development Version of Preliminary Model. Access to this repository and use of its data is limited to those who are collaborating on the model development. Once the model is published and recieved [sic] full USGS approval it will be archived and released to the public. This preliminary data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided specifically to collaborate with agencies who are contributing to the model development and meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

Background

Water Year Types

- **Water year type** is determined based on the average annual (water year) streamflow at the Arroyo Seco near Soledad gauge using exceedance probability:
 - Wet: Exceedance probability 0% to 25% (wettest 25% of years)
 - Wet-Normal: Exceedance probability 25% to 41.7%
 - Normal: Exceedance probability 41.7% to 58.3%
 - Dry-Normal: Exceedance probability 58.3% to 75%
 - Dry: Exceedance probability 75% to 100% (driest 25% of years)

Background

Water Year Types

- **Operational water year type** is determined on 3/15 each year and re-calculated on 4/1 each year, based on correlation between average annual streamflow and 3/15 or 4/1 streamflow at Arroyo Seco near Soledad gauge:
 - Wet: Exceedance probability 0% to 25% (wettest 25% of years)
 - Normal: Exceedance probability 25% to 75%
 - Dry: Exceedance probability 75% to 100% (driest 25% of years)
- Operational decisions (e.g., smolt block flow) are made based on operational water year type, except where noted

Modeling Process To Date

Modeling Process to Date

- USGS provided preliminary versions of SVIHM and SVOM in Summer/Fall 2023
- HCP Comparison Point Scenarios developed in Fall 2023
- Recognized that SVIHM over-predicted lower streamflows in Salinas River in Fall/Winter 2023
- Developed Bias Correction process in Winter/Spring 2024
- Ran “Final” HCP Comparison Point Scenarios in Spring 2024
- USGS released updated preliminary versions of SVIHM and SVOM in May 2024
- Draft documentation of HCP Comparison Point Scenarios released in July 2024

Modeling Process to Date

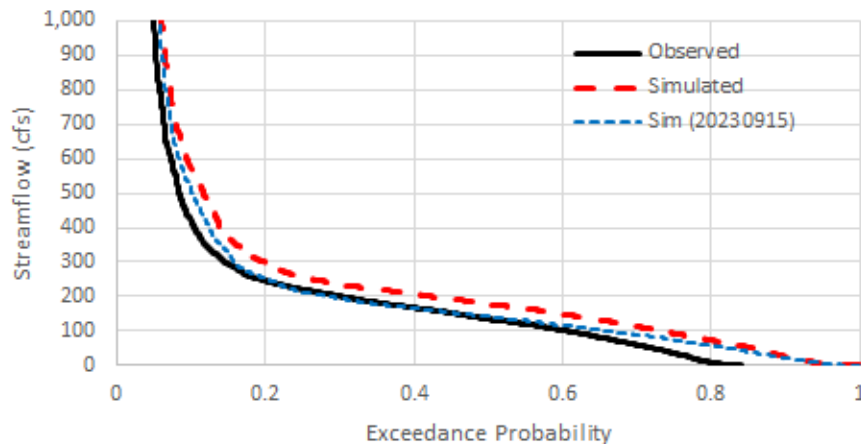
- Draft Reoperation Protocol provided in August 2024
- Initial Reoperation Scenario 1 (reflecting the Draft Reoperation Protocol) developed in Fall 2024
- Initial Reoperation Scenarios 2 and 3 developed in Winter 2025
- Further development of Reoperation Scenarios in Winter and Spring 2025
- Updated Reoperation Scenarios 1 and 3 developed and run in Spring 2025

Modeling Process to Date

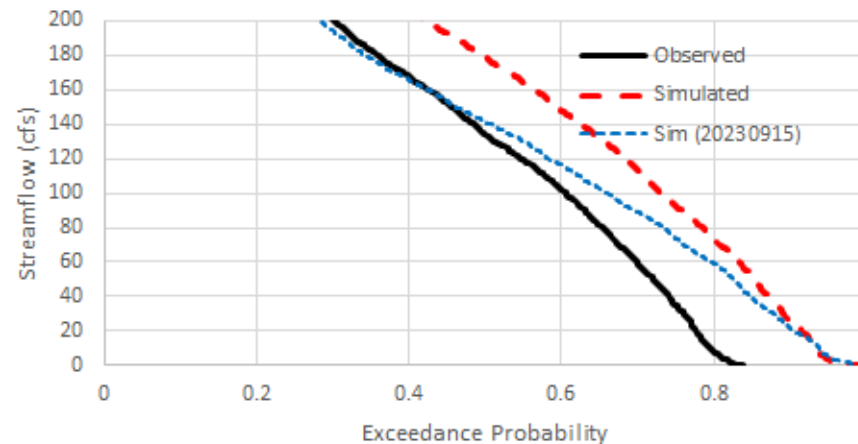
Analysis of May 2024 Model Update

- At Soledad, the updated model has a slightly better r^2 and regression slope slightly closer to 1
- Exceedance probabilities were closer to the observed data for the previous model version

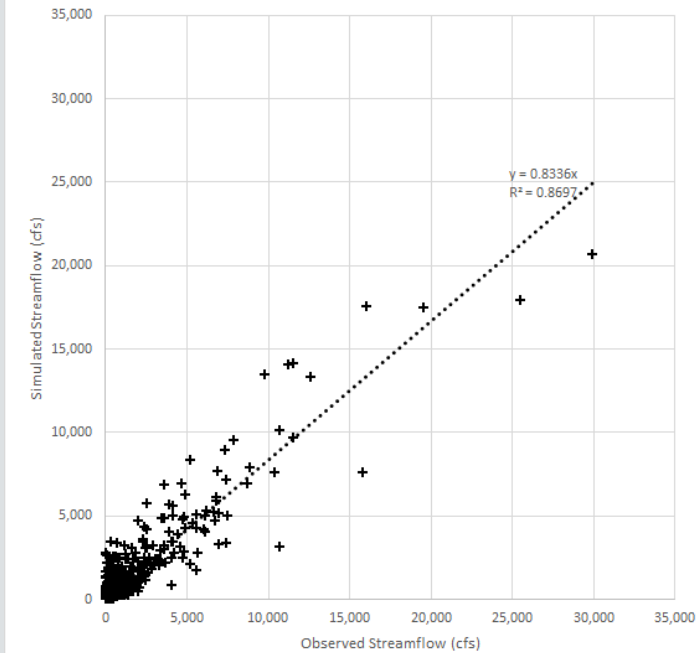
Salinas River at Soledad



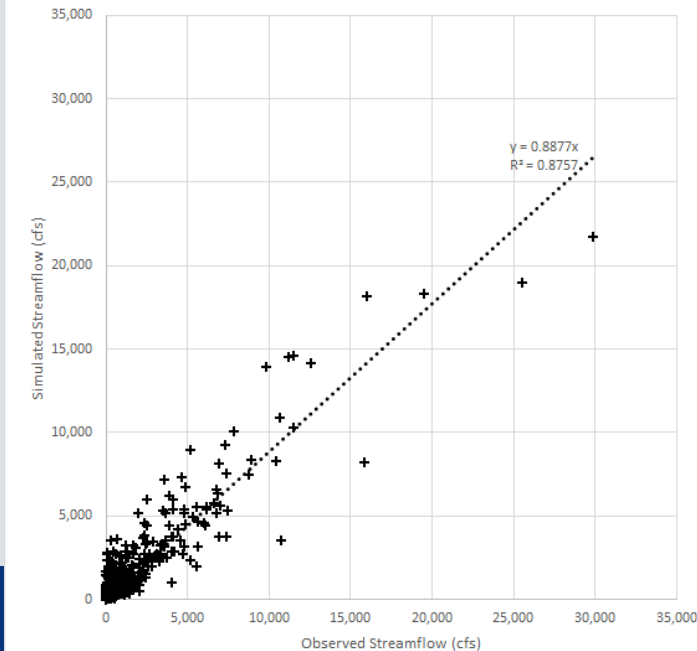
Salinas River at Soledad



Historical Scenario w/ 15 Sep 2023 SVIHM



Historical Scenario w/ 16 May 2024 SVIHM

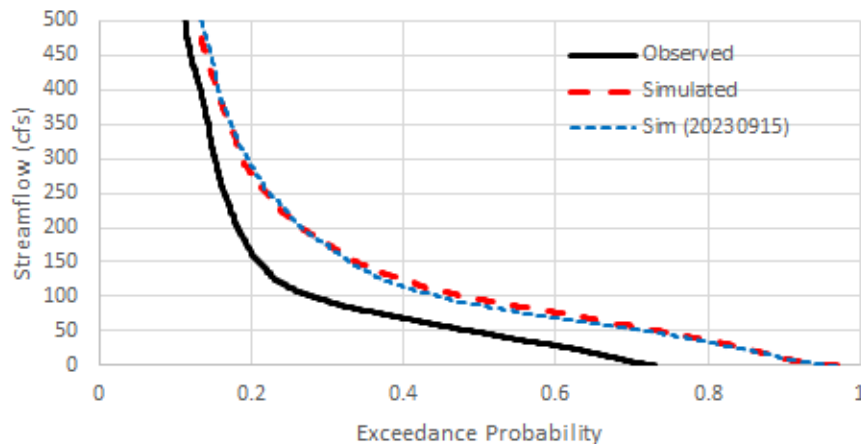


Modeling Process to Date

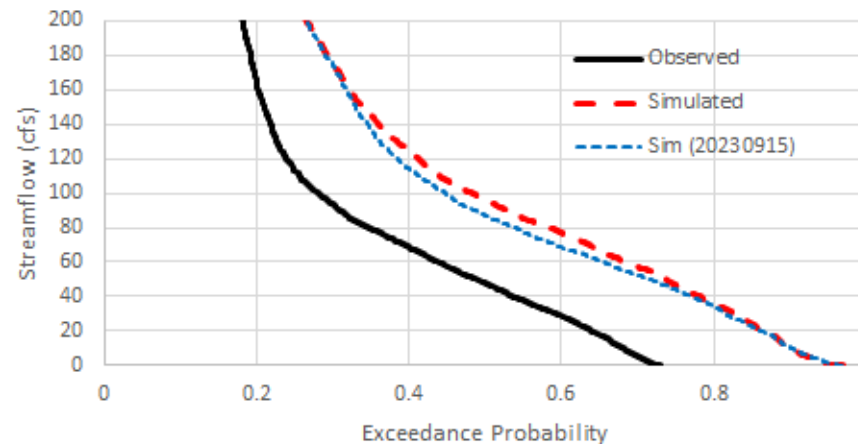
Analysis of May 2024 Model Update

- At Chualar, the updated model has a slightly better r^2 and regression slope slightly closer to 1
- Almost no difference in exceedance probabilities between the previous and latest model versions

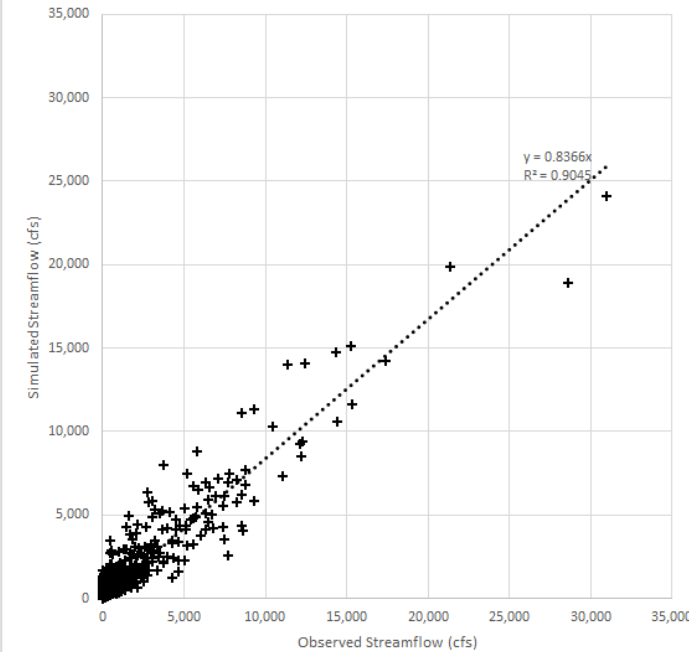
Salinas River at Chualar



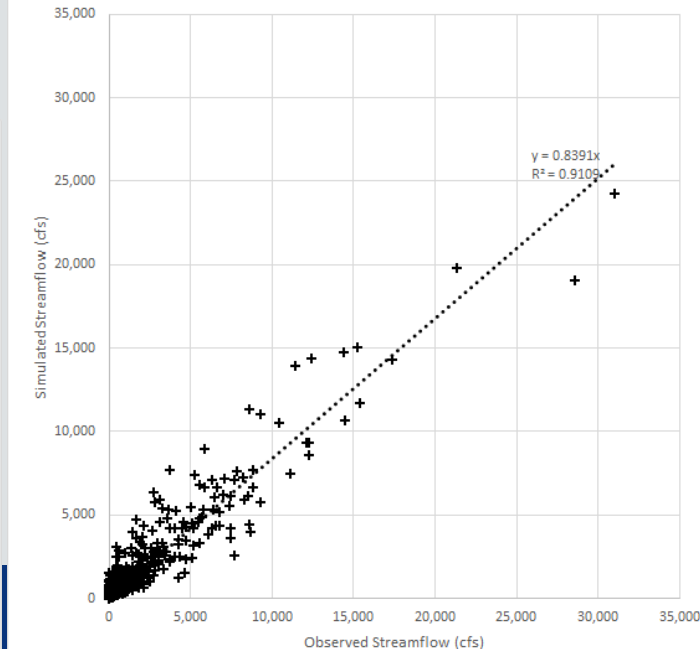
Salinas River at Chualar



Historical Scenario w/ 15 Sep 2023 SVIHM



Historical Scenario w/ 16 May 2024 SVIHM

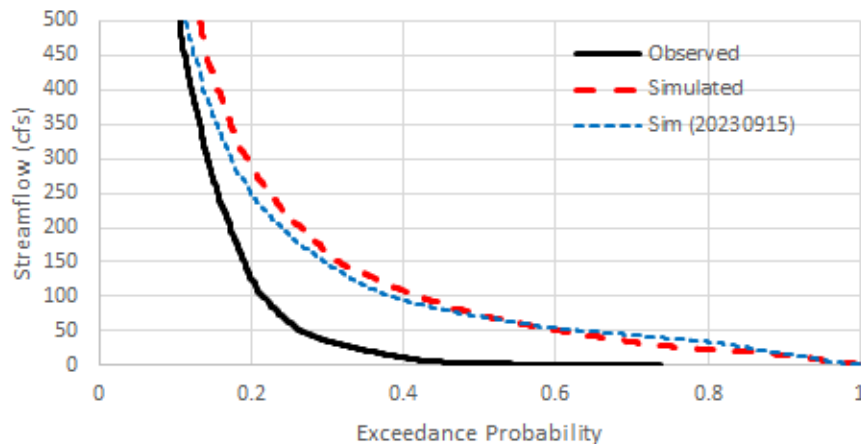


Modeling Process to Date

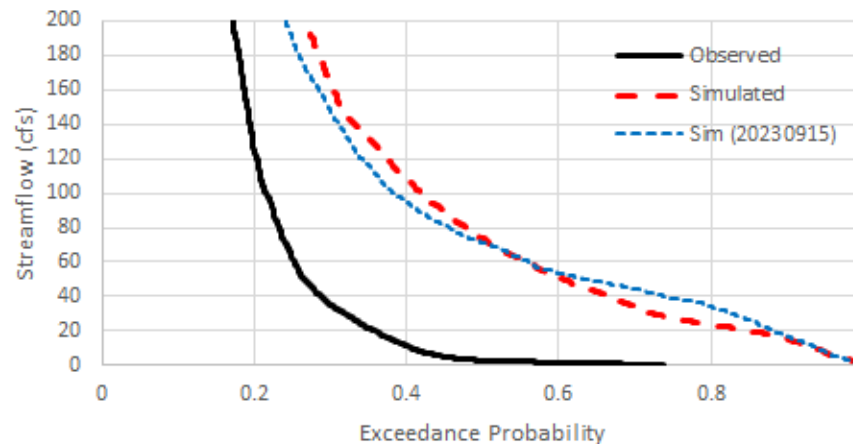
Analysis of May 2024 Model Update

- At Spreckels, The updated model has a slightly worse r^2 and regression slope slightly closer to 1
- Exceedance probabilities were slightly closer to observed over most of range < 500 cfs, except between ~ 20 and 55 cfs

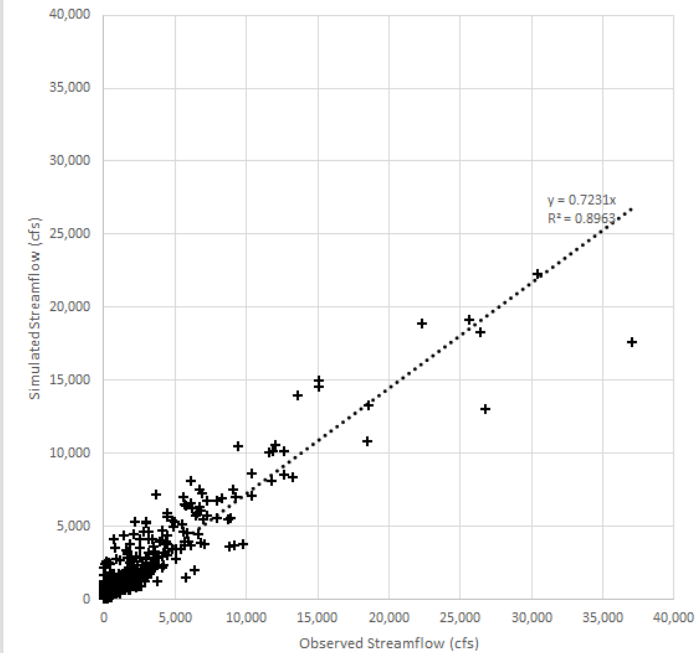
Salinas River at Spreckels



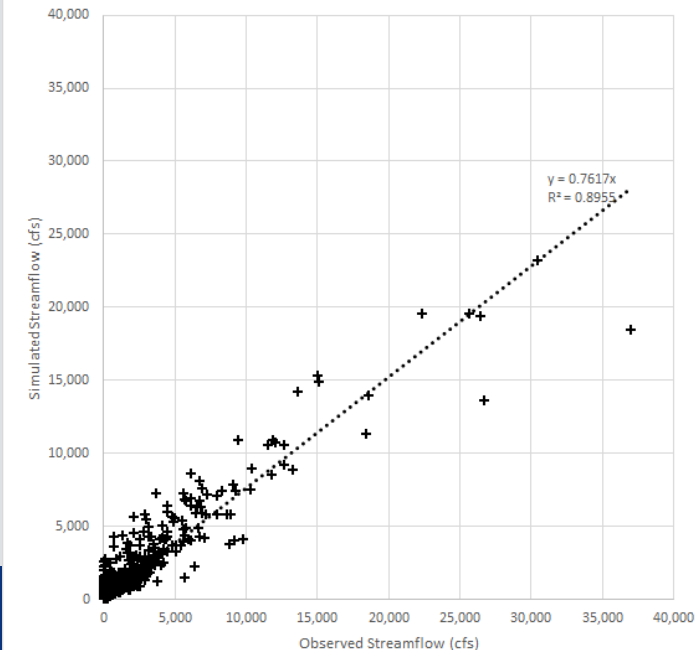
Salinas River at Spreckels



Historical Scenario w/ 15 Sep 2023 SVIHM



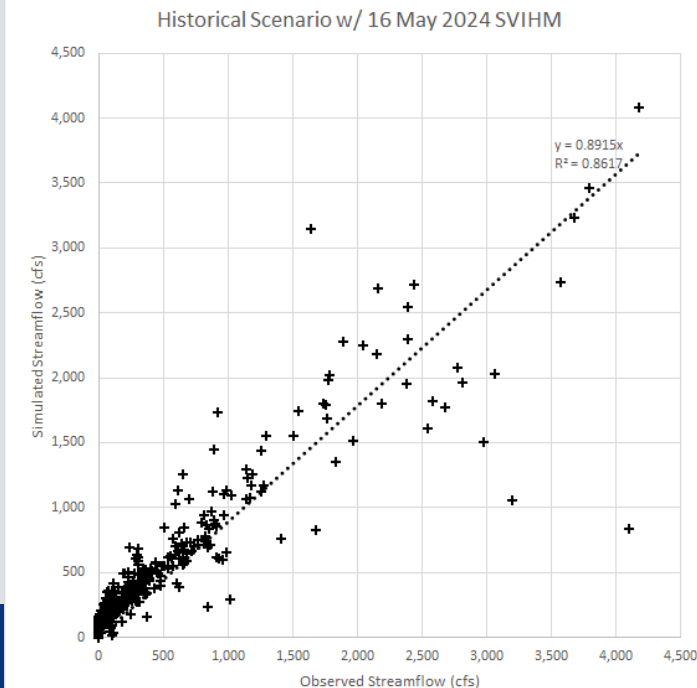
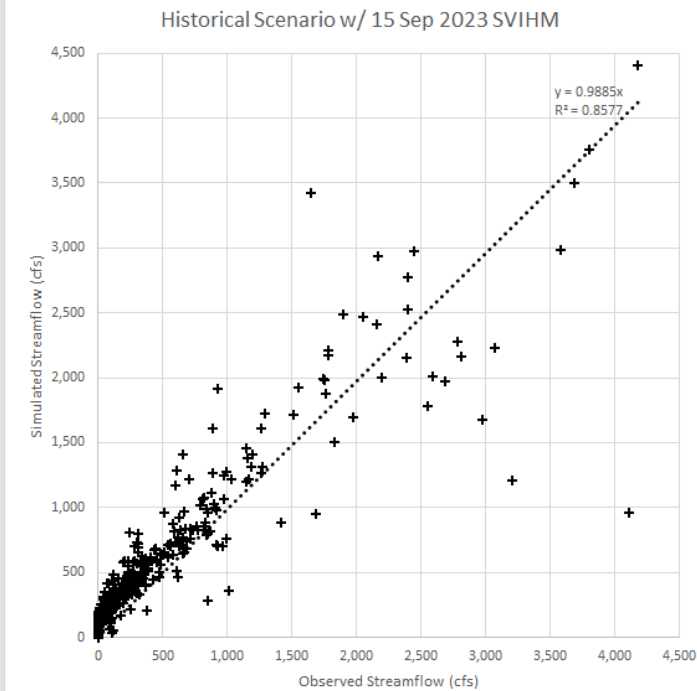
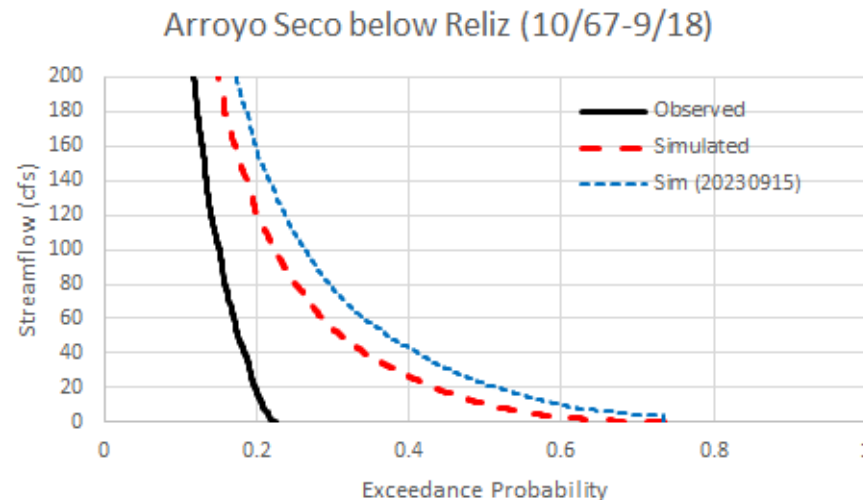
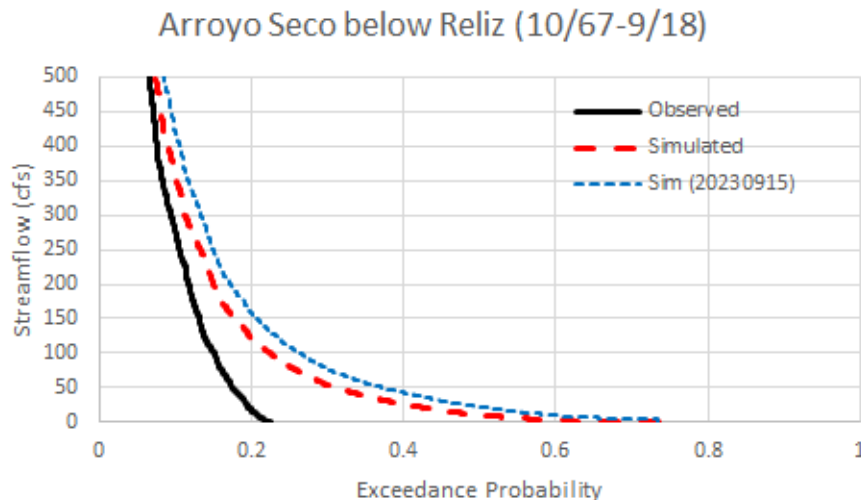
Historical Scenario w/ 16 May 2024 SVIHM



Modeling Process to Date

Analysis of May 2024 Model Update

- At Arroyo Seco below Reliz Creek, the updated model has a slightly better r^2 but a lower regression slope
- The updated model exceedance probability curve is somewhat closer to the observed



Modeling Process to Date

Analysis of May 2024 Model Update

- HCP Comparison Point Scenarios had already been run prior to May 2024 Update
- May 2024 Update does not seem to produce substantially better simulation of observed streamflows
- Therefore, decided to move forward with existing HCP Comparison Point Scenario runs using September 2023 model version

Modeling Process to Date

Model Modifications (Through HCP Comparison Point Scenarios)

- Minimum Conservation Release (to prevent diversion of natural flows)
- Update to Kelt and Juvenile Release Rules
- Smolt and Kelt Counter Incrementation
- Timestep Streamflow Inputs
- Bias Correction
- Customized Outputs

HCP Comparison Point Scenarios

HCP Comparison Point Scenarios

Three Comparison Point Scenarios:

- Current Operations Scenario
 - Matches, as closely as possible, the operational approach currently employed by MCWRA for the reservoirs and related projects and programs
- No Flow Prescription Scenario
 - Identical to Current Operations Scenario, with rules of Flow Prescription removed
- No Operations Scenario
 - Identical to Current Operations Scenario with all reservoir operations removed
 - Reservoirs release as much water as possible at all times, subject to physical limitations

HCP Comparison Point Scenarios

Scenario Design

	Current Operations Scenario	No Flow Prescription Scenario	No Operations Scenario
Flood Rule Curves	Current Curves	No Changes	Removed
Release Capacity	Current Capacities	No Changes	No Changes
Release Balancing	Prioritize Nacimiento	No Changes	No Prioritization
Operational Pools	Current Pools	No Changes	No Pools
Fish Passage Requirements	Current Approach	Removed	Removed
SRDF Operations	Current Approach	2 cfs Bypass Flow Removed	Removed
Fish and Wildlife Habitat Releases	Nacimiento: 60 cfs San Antonio: 10 cfs	Nacimiento: 25 cfs San Antonio: 10 cfs	Removed
SLO Allotment	Current Table	No Changes	Removed
Water Rights	Current Rights	No Changes	Removed

HCP Comparison Point Scenarios

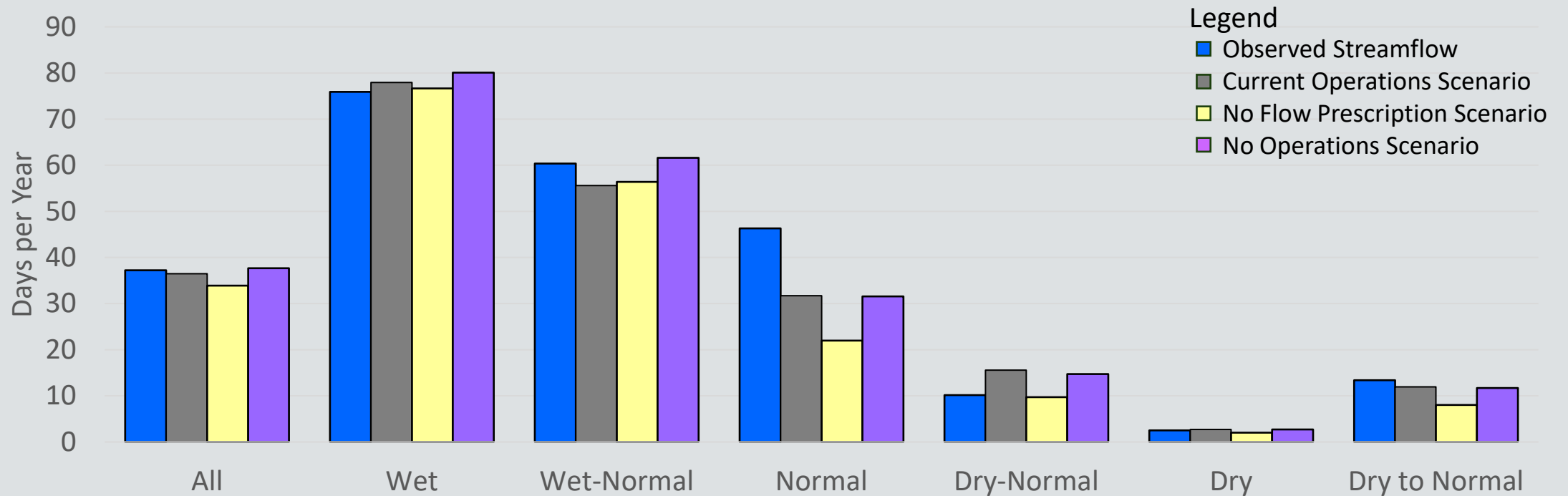
Scenario Intercomparison

- Current Operations Scenario – No Operations Scenario = Effect of Current Operational Approach
- Current Operations Scenario – No Flow Prescription Scenario = Effect of Flow Prescription Rules
- No Flow Prescription Scenario – No Operations Scenario = Effect of Current Operational Approach Without Flow Prescription Rules

HCP Comparison Point Scenarios

Adult Passage Days (Flow Prescription Criteria)

- Days per year, 1/1 to 3/31, with at least 260 cfs (less 10%) in Salinas River at Chualar, and Salinas River Lagoon open to ocean



HCP Comparison Point Scenarios

Adult Passage Days (Flow Prescription Criteria)

- Days per year, 1/1 to 3/31, with at least 260 cfs (less 10%) in Salinas River at Chualar, and Salinas River Lagoon open to ocean

Water Year Type	Observed (Timestep-Averaged)	Current Operations Scenario	No Flow Prescription Scenario	No Operations Scenario
All	37	36	34	38
Wet	76	78	77	80
Wet-Normal	60	56	56	62
Normal	46	32	22	32
Dry-Normal	10	16	10	15
Dry	3	3	2	3
Dry to Normal	13	12	8	12

HCP Comparison Point Scenarios

Smolt Block Flow Triggers (Flow Prescription Criteria)

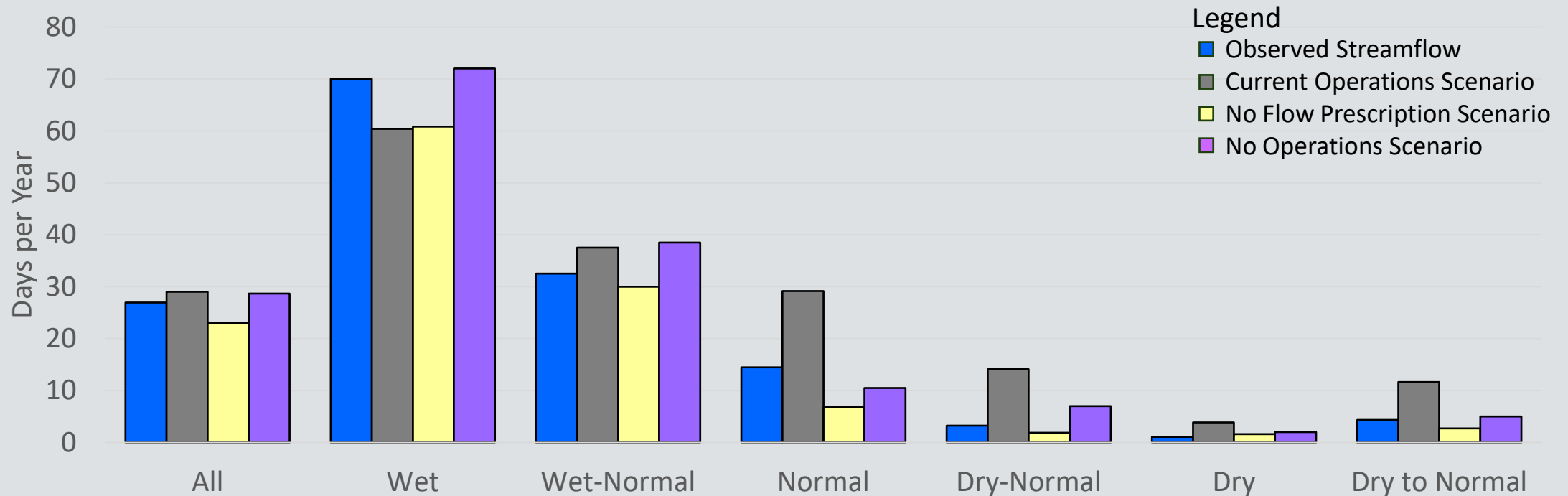
- Percentage of normal years with $\geq 150,000$ af total reservoir storage on 3/15 and natural flow triggers met (≥ 125 cfs at Sapaque OR ≥ 70 cfs at Reliz, less 10%)

Water Year Type	Observed (Timestep-Averaged)	Current Operations Scenario	No Flow Prescription Scenario	No Operations Scenario
Total Number of Normal Years	20	25	25	25
Normal Years with Smolt Block Flow Triggers Met	15	19	18	0
Percentage of Normal Years with Triggers Met	75%	76%	72%	0%

HCP Comparison Point Scenarios

Outmigration Passage Days (Flow Prescription Criteria)

- Days per year, 3/15 to 6/30, with at least 150 cfs (less 10%) in Salinas River at Spreckels, and Salinas River Lagoon open to the ocean



HCP Comparison Point Scenarios

Outmigration Passage Days (Flow Prescription Criteria)

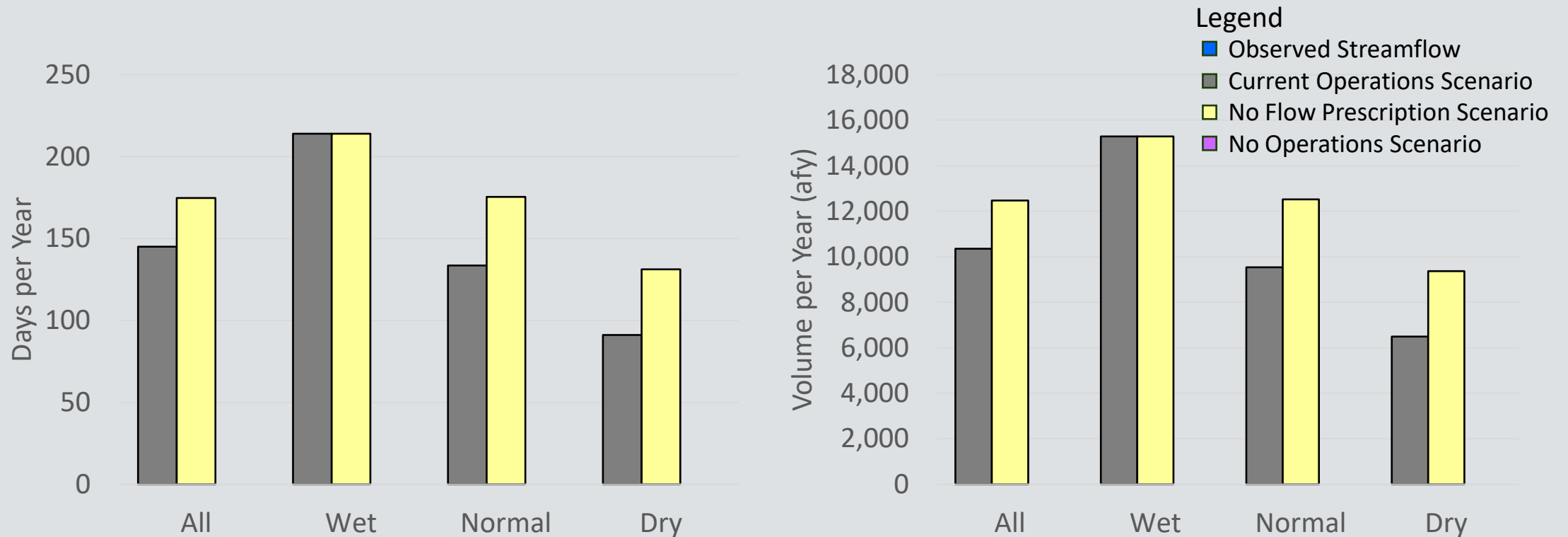
- Days per year, 3/15 to 6/30, with at least 150 cfs in Salinas River at Spreckels, and Salinas River Lagoon open to the ocean

Water Year Type	Observed (Timestep-Averaged)	Current Operations Scenario	No Flow Prescription Scenario	No Operations Scenario
All	27	29	23	29
Wet	70	60	61	72
Wet-Normal	33	38	30	39
Normal	15	29	7	11
Dry-Normal	3	14	2	7
Dry	1	4	2	2
Dry to Normal	4	12	3	5

HCP Comparison Point Scenarios

SRDF Operations

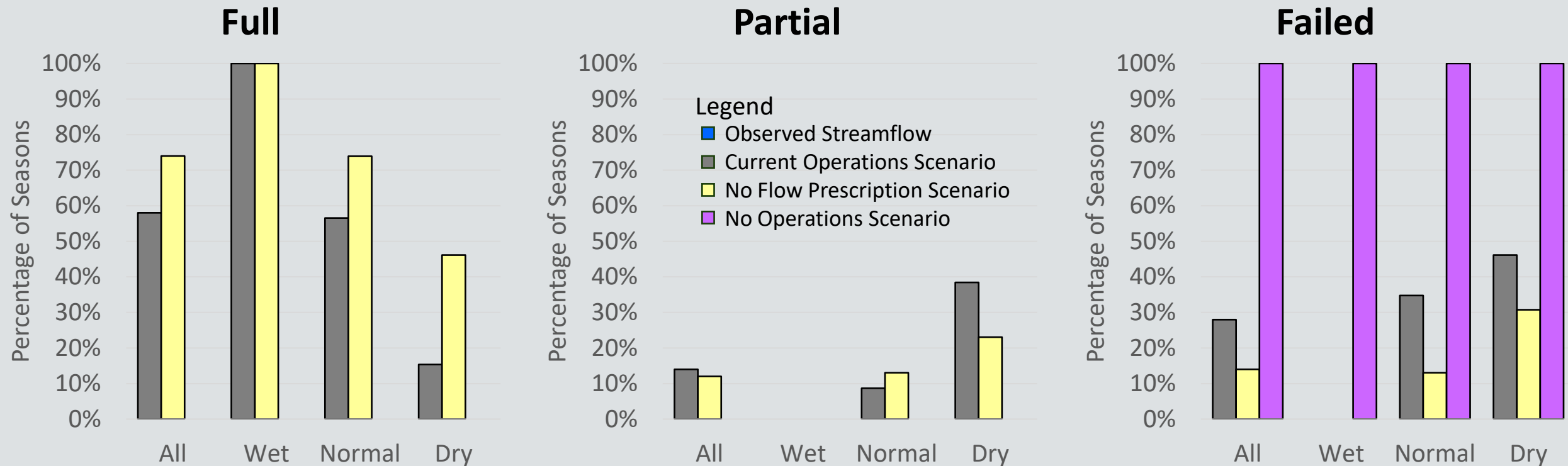
- Days and volume of diversion, 4/1 to 10/31



HCP Comparison Point Scenarios

SRDF Operations

- Full season = 214 days, Partial season = 1 to 213 days, Failed season = 0 days



HCP Comparison Point Scenarios

SRDF Operations

- Days and volume of diversion, 4/1 to 10/31
- Full season = 214 days, Partial season = 1 to 213 days, Failed season = 0 days

Water Year Type		Observed (Timestep-Averaged)	Current Operations Scenario	No Flow Prescription Scenario	No Operations Scenario
All	Div. Days	--	145	175	0
	Div. Volume	--	10,400	12,500	0
	Full Part Fail	64% 9% 27%	58% 14% 28%	74% 12% 14%	0% 0% 100%
Wet	Div. Days	--	214	214	0
	Div. Volume	--	15,300	15,300	0
	Full Part Fail	100% 0% 0%	100% 0% 0%	100% 0% 0%	0% 0% 100%
Normal	Div. Days	--	134	175	0
	Div. Volume	--	9,500	12,500	0
	Full Part Fail	50% 25% 25%	57% 9% 35%	74% 13% 13%	0% 0% 100%
Dry	Div. Days	--	91	131	0
	Div. Volume	--	6,500	9,400	0
	Full Part Fail	50% 0% 50%	15% 38% 46%	46% 23% 31%	0% 0% 100%

HCP Reoperation Scenarios

HCP Reoperation Scenarios

Three Reoperation Scenarios:

- Reoperation Scenario 1
 - Fish passage rules described in the Draft Reoperation Protocol
- Reoperation Scenario 2
 - Identical to Reoperation Scenario 1, with additional rules allowing for bypass of some wet season inflows to Nacimiento Reservoir
- Reoperation Scenario 3
 - Replacement of all fish passage rules with simplified Opportunistic Releases rules

Decision trees presented on subsequent slides

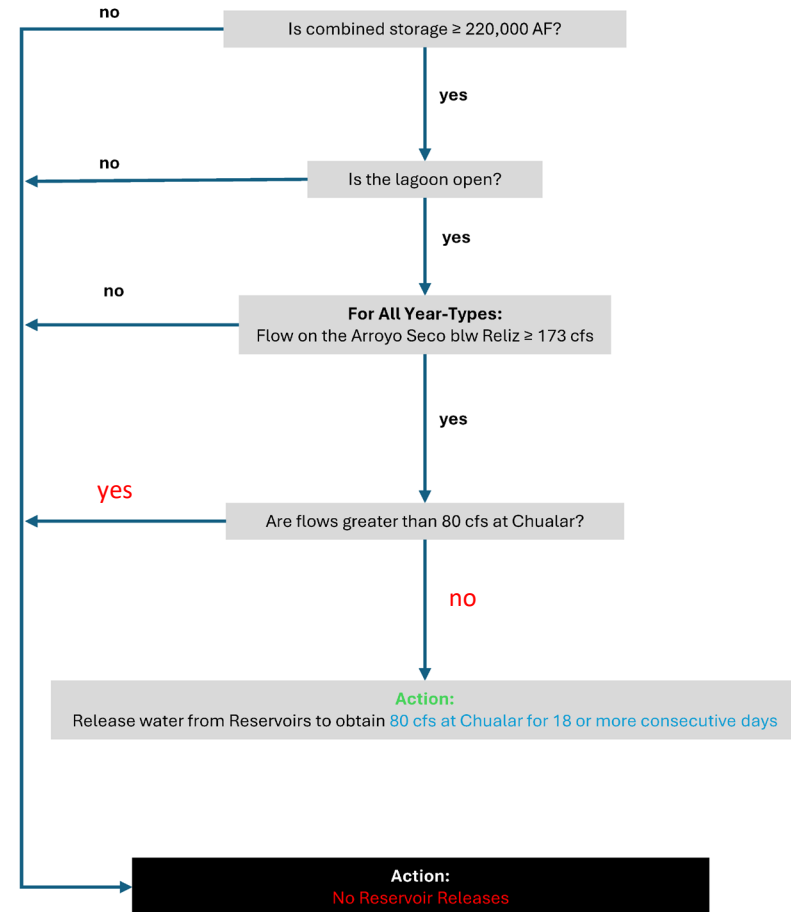
HCP Reoperation Scenario 1

Adult Upstream Migration

January 1 – March 31

Purpose: Facilitate adult steelhead upstream migration.

Target at least 1 action per year

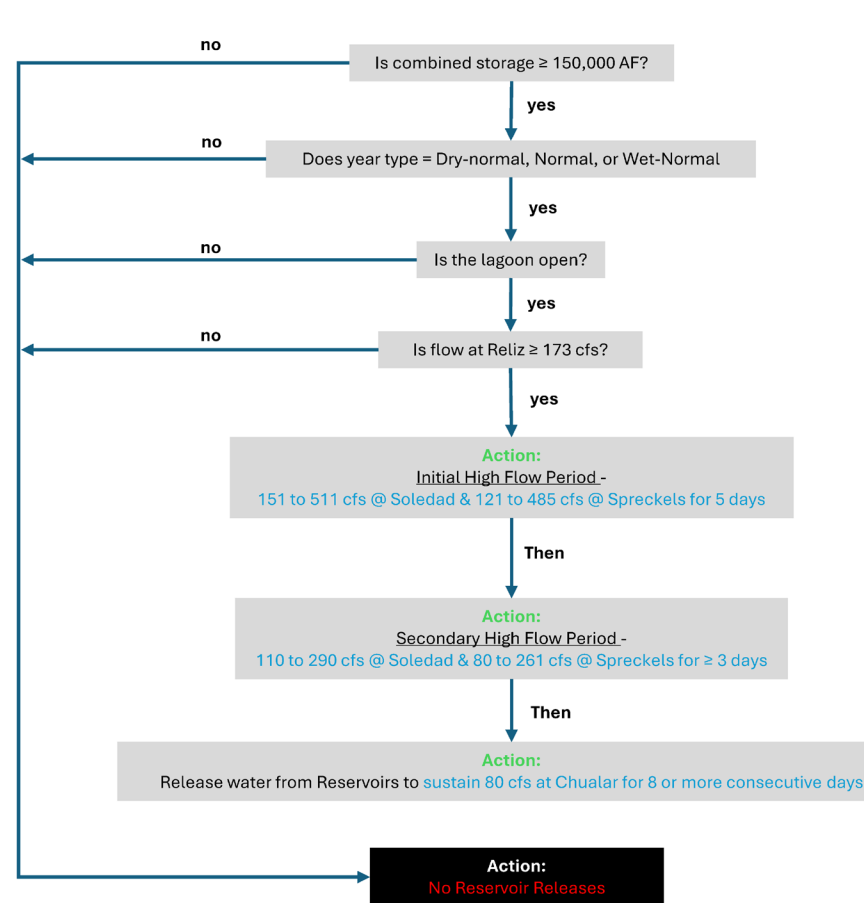


Smolt Outmigration

March 15 – March 31

Purpose: Facilitate steelhead smolt downstream migration prior to SRDF operation.

Target is 1 action per year

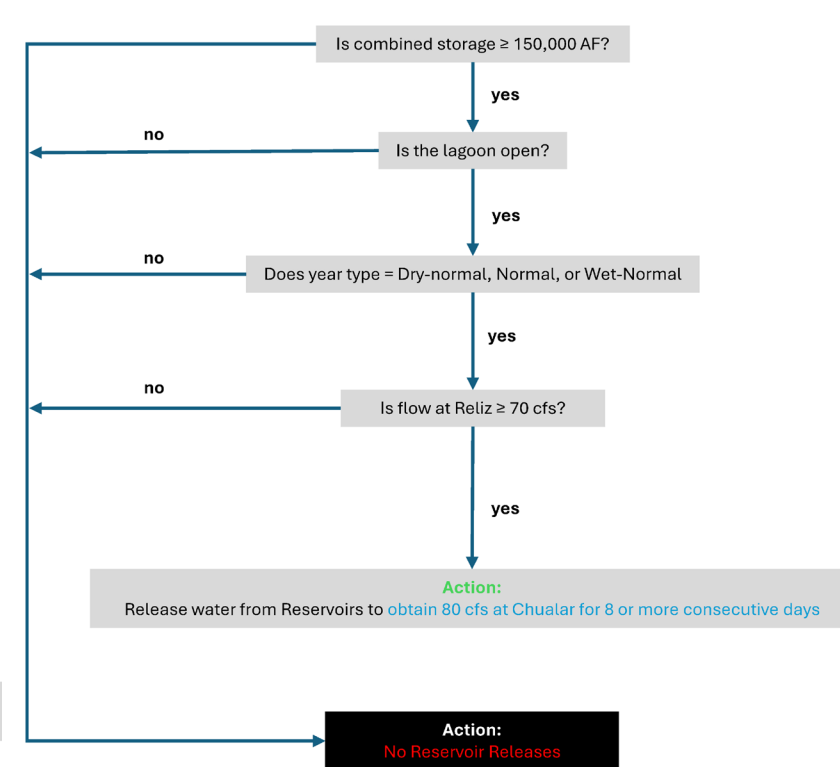


Smolt & Kelt Outmigration

April 1 – June 15

Purpose: Facilitate steelhead smolt and kelt downstream migration during the SRDF operational period.

Target at least 1 action per year

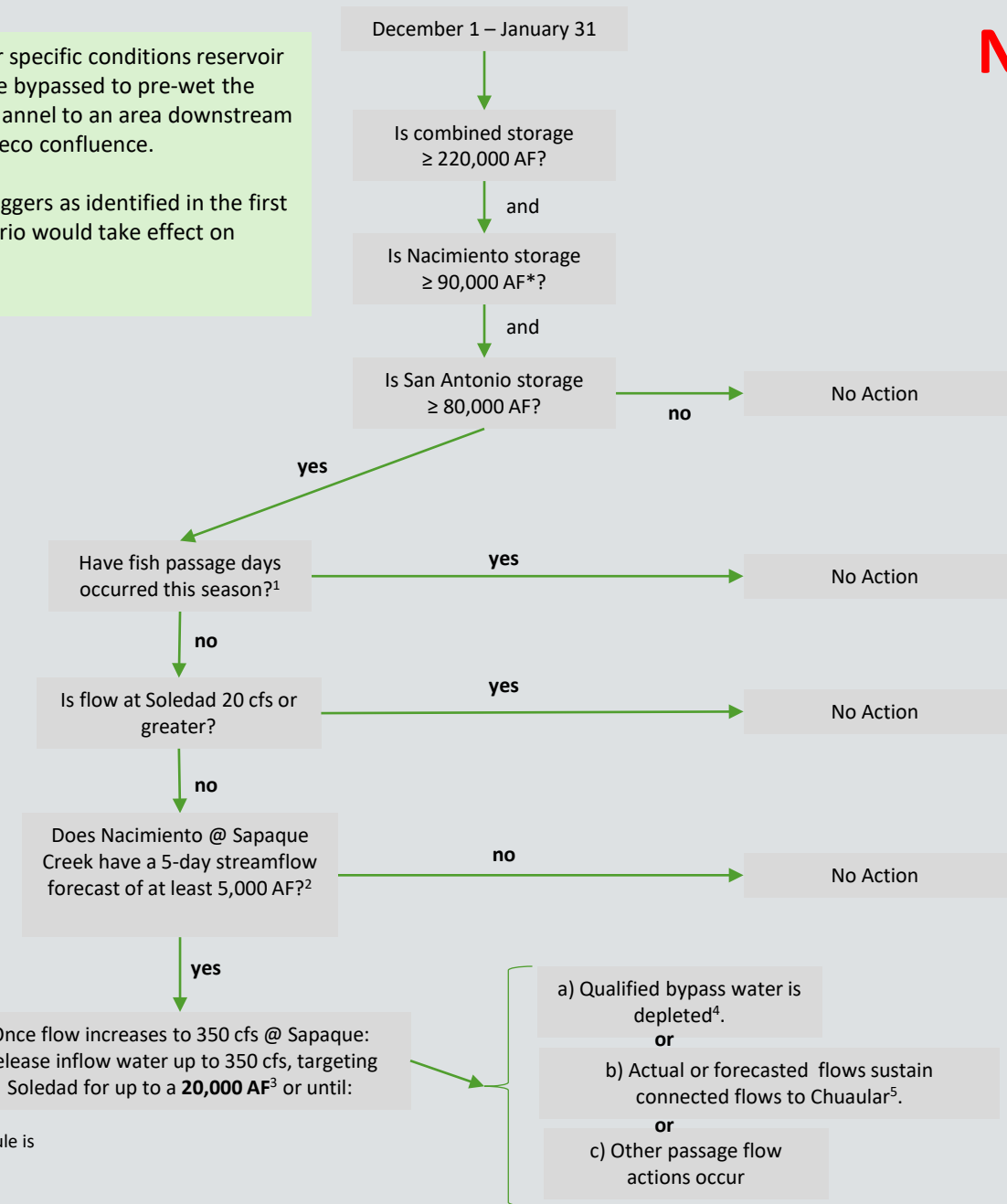


HCP Reoperation Scenario 2 (Winter Bypass Flows)

Purpose: under specific conditions reservoir inflow would be bypassed to pre-wet the Salinas River channel to an area downstream of the Arroyo Seco confluence.

Fish passage triggers as identified in the first modeled scenario would take effect on January 1.

*Because bypass flows were found to trigger very seldom (only twice in the 51-year model period), Reoperation Scenario 2 was not pursued beyond an initial run, built from Reoperation Scenario 1 V2. Differences from Reoperation Scenario 1 (V3) presented in these slides are largely down to the difference in versions of Reoperation Scenario 1, not the effects of the bypass flows.



*NWP Allotment+Annual Evap+Minimum Pool +Dead Pool

¹Fish passage days are defined as 5 consecutive days of minimum flows (80 cfs) at Chualar.

²5,000 AF is roughly the quantity of water needed to maintain channel-wetting reservoir releases of 350 cfs for one week.

³20,000 AF represents roughly 10% of a full conservation season release volume.

⁴If combined reservoir storage no longer exceeds 220,000 AF meaning that once inflow that has not been collected to storage according to the 30-day rule is exhausted

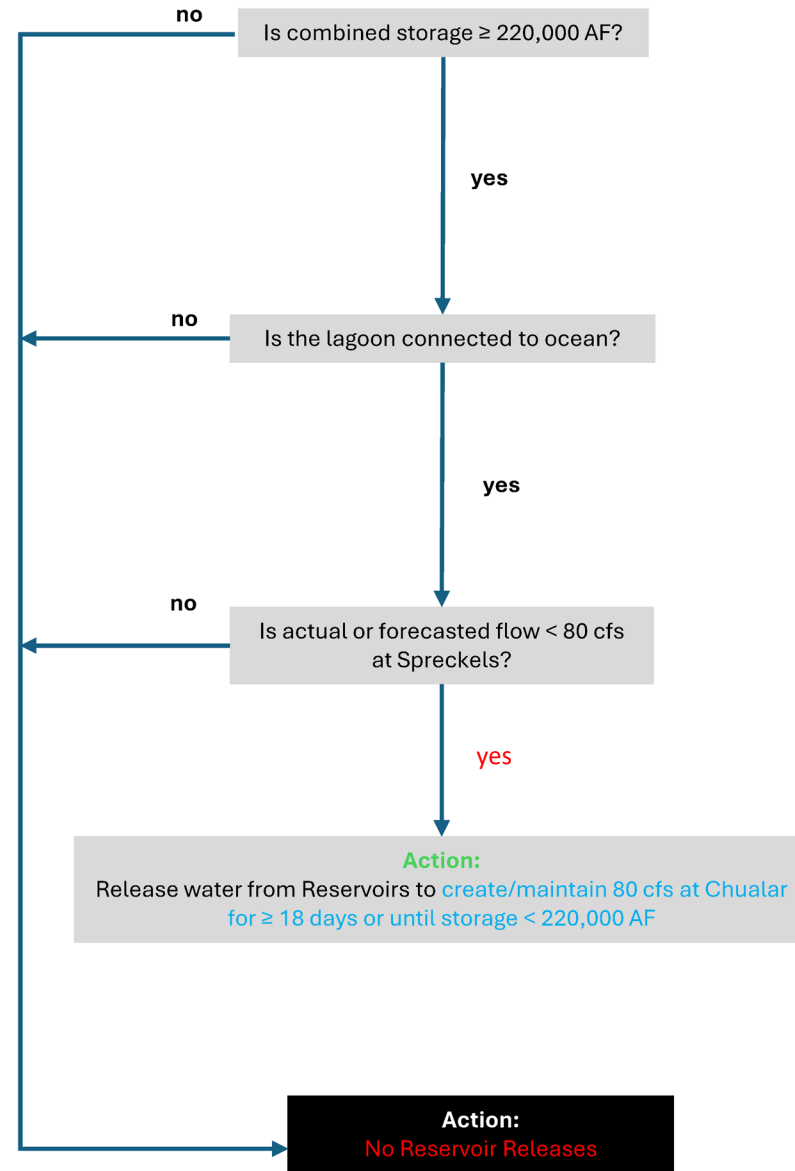
⁵Channel wetting releases could cease if forecasted natural flows are expected to sustain Salinas River flows without additional reservoir releases.

HCP Reoperation Scenario 3 (Opportunistic Releases)

Opportunistic Releases

December 1 – April 30

Purpose: Opportunistically release water to supplement passage conditions when water is available, and lagoon is open.



HCP Reoperation Scenarios

Metrics Used to Assess Reoperation Scenarios:

- Reoperation Adult Passage Days
 - Jan 1-Mar 31, at least 80 cfs (less 10%) at Chualar, Lagoon open
- Reoperation Outmigration Passage Days
 - Mar 15-Jun 30, at least 80 cfs (less 10%) at Chualar
- SRDF Operations (Diversion Days, Diversion Volume, Failed/Partial/Full Seasons)
- Reservoir Storage
- Reservoir Releases

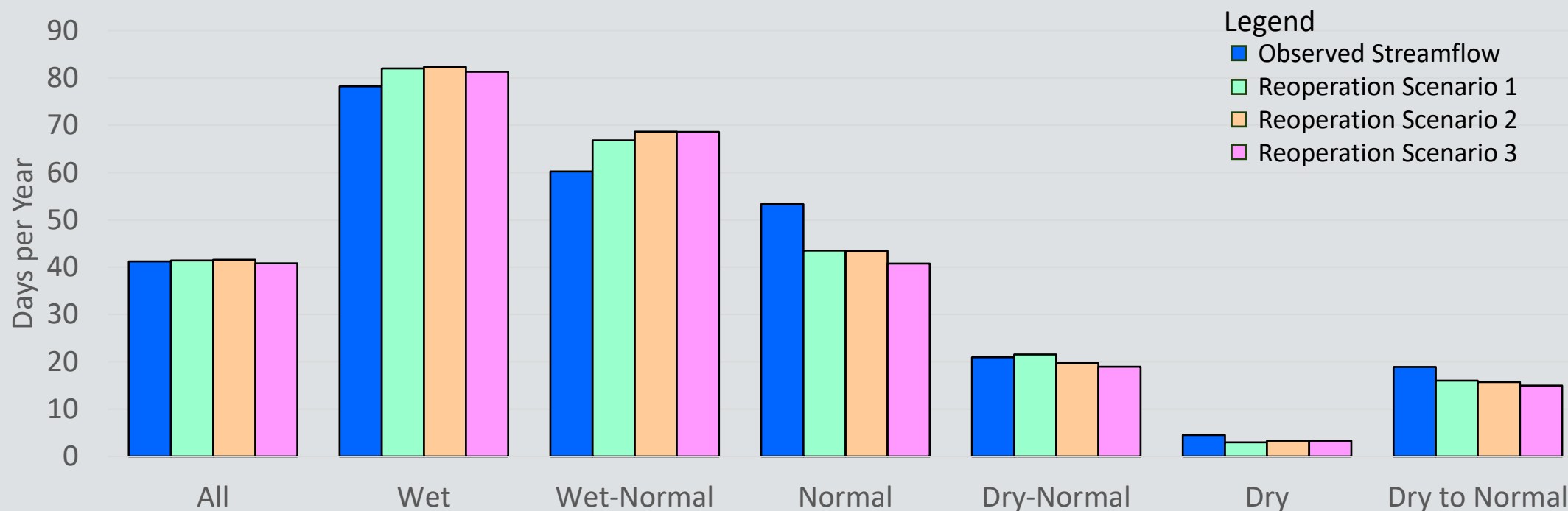
HCP Reoperation Scenarios

Adult Upmigration Passage Days

HCP Reoperation Scenarios

Adult Passage Days at Chualar (Reoperation Criteria)

- Days per year, 1/1 to 3/31, with at least 80 cfs (less 10%) in Salinas River at Chualar, and Salinas River Lagoon open to ocean (max possible = 90 days, 91 in leap years)



HCP Reoperation Scenarios

Adult Passage Days at Chualar (Reoperation Criteria)

- Days per year, 1/1 to 3/31, with at least 80 cfs (less 10%) in Salinas River at Chualar, and Salinas River Lagoon open to ocean (max possible = 90 days, 91 in leap years)

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	41	41	42	41
Wet	78	82	82	81
Wet-Normal	60	67	69	69
Normal	53	44	43	41
Dry-Normal	21	22	20	19
Dry	5	3	3	3
Dry to Normal	19	16	16	15

HCP Reoperation Scenarios

Adult Passage Days at Chualar (Reoperation Criteria)

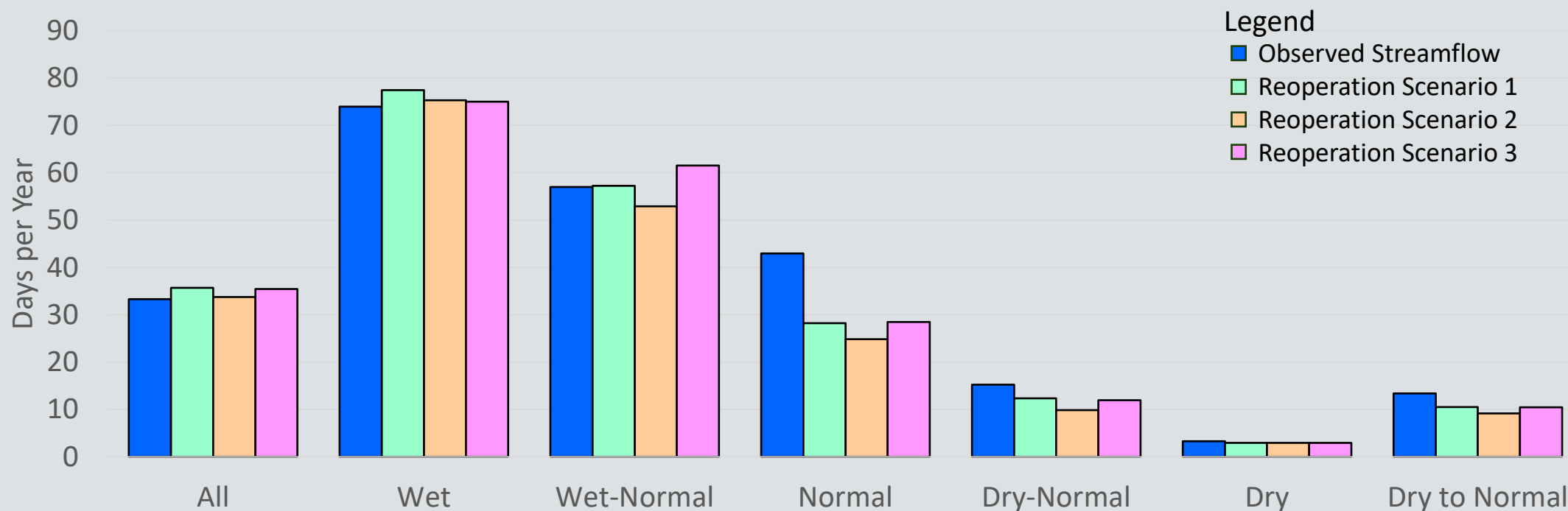
- Percentage of years with at least 5 consecutive Adult Passage Days (max possible = 100%)

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	81%	75%	77%	78%
Wet	100%	100%	100%	100%
Wet-Normal	100%	100%	100%	100%
Normal	100%	100%	100%	100%
Dry-Normal	86%	88%	88%	100%
Dry	46%	25%	31%	31%
Dry to Normal	68%	57%	60%	63%

HCP Reoperation Scenarios

Adult Passage Days at Soledad (Reoperation Criteria)

- Days per year, 1/1 to 3/31, with at least 152 cfs (less 10%) in Salinas River at Soledad, and Salinas River Lagoon open to ocean (max possible = 90 days, 91 in leap years)



HCP Reoperation Scenarios

Adult Passage Days at Soledad (Reoperation Criteria)

- Days per year, 1/1 to 3/31, with at least 152 cfs (less 10%) in Salinas River at Soledad, and Salinas River Lagoon open to ocean (max possible = 90 days, 91 in leap years)

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	33	36	34	35
Wet	74	77	75	75
Wet-Normal	57	57	53	62
Normal	43	28	25	28
Dry-Normal	15	12	10	12
Dry	3	3	3	3
Dry to Normal	13	11	9	10

HCP Reoperation Scenarios

Adult Passage Days at Soledad (Reoperation Criteria)

- Percentage of years with at least 18 consecutive passage days to Nacimiento per year (max possible = 100%)

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	46%	55%	53%	55%
Wet	100%	100%	100%	100%
Wet-Normal	100%	100%	100%	100%
Normal	75%	67%	50%	67%
Dry-Normal	14%	25%	25%	25%
Dry	0%	6%	6%	6%
Dry to Normal	17%	23%	20%	23%

HCP Reoperation Scenarios

Adult Passage Summary

- Opportunities for Adult Upmigration are generally similar between the three Reoperation Scenarios
- Little difference from the observed record, although the model simulates fewer Passage Days for Normal-Normal Years (this may be affected by the small number of each type of Normal Year in the record)
- All Wet, Wet-Normal, and Normal Years (and most Dry-Normal Years) had at least 5 consecutive Adult Passage Days at Chualar, indicating passage opportunities to Arroyo Seco
- All Wet and Wet-Normal Years (and most Normal Years) had at least 18 consecutive Adult Passage Days at Soledad, indicating passage opportunities to the Nacimiento River

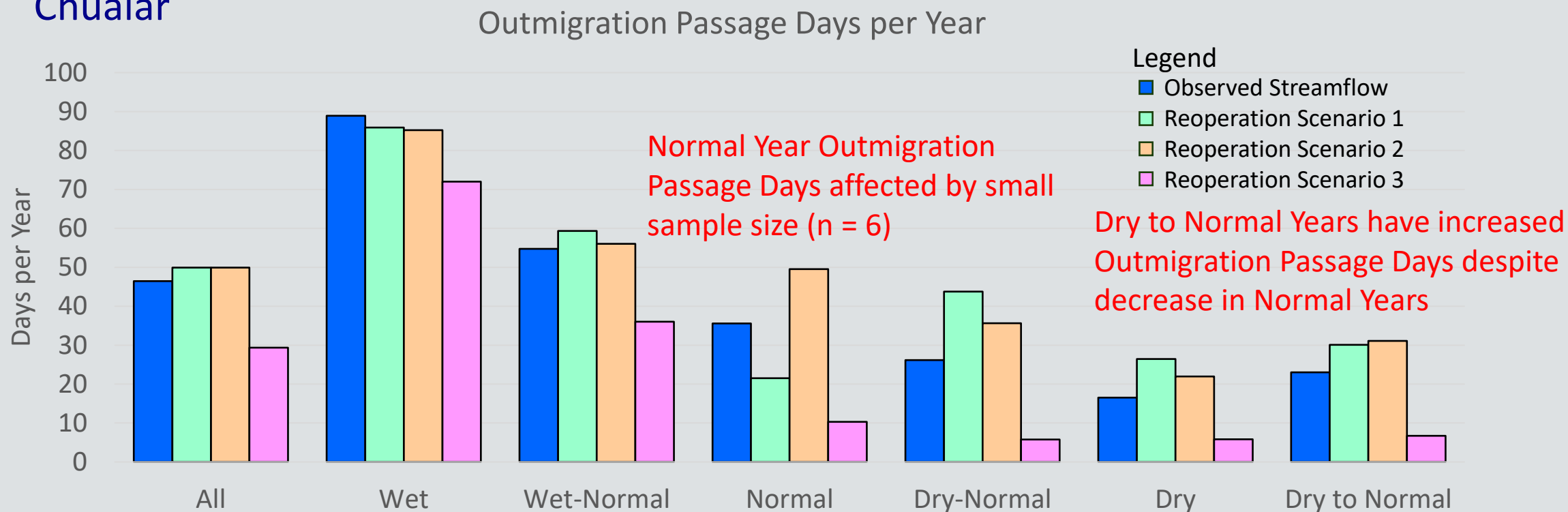
HCP Reoperation Scenarios

Outmigration Passage Days (Smolt/Kelt/Juvenile)

HCP Reoperation Scenarios

Smolt and Smolt/Kelt Outmigration Passage Days (Reoperation Criteria)

- Days per year, 3/15 to 6/30, with at least 80 cfs (less 10%) in Salinas River at Chualar



HCP Reoperation Scenarios

Smolt and Smolt/Kelt Outmigration Passage Days (Reoperation Criteria)

- Days per year, 3/15 to 6/30, with at least 80 cfs (less 10%) in Salinas River at Chualar

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	46	50	50	29
Wet	89	86	85	72
Wet-Normal	55	59	56	36
Normal	36	22	50	10
Dry-Normal	26	44	36	6
Dry	17	26	22	6
Dry to Normal	23	30	31	7

HCP Reoperation Scenarios

Initial High Flow Actions for Smolt (Reoperation Criteria)

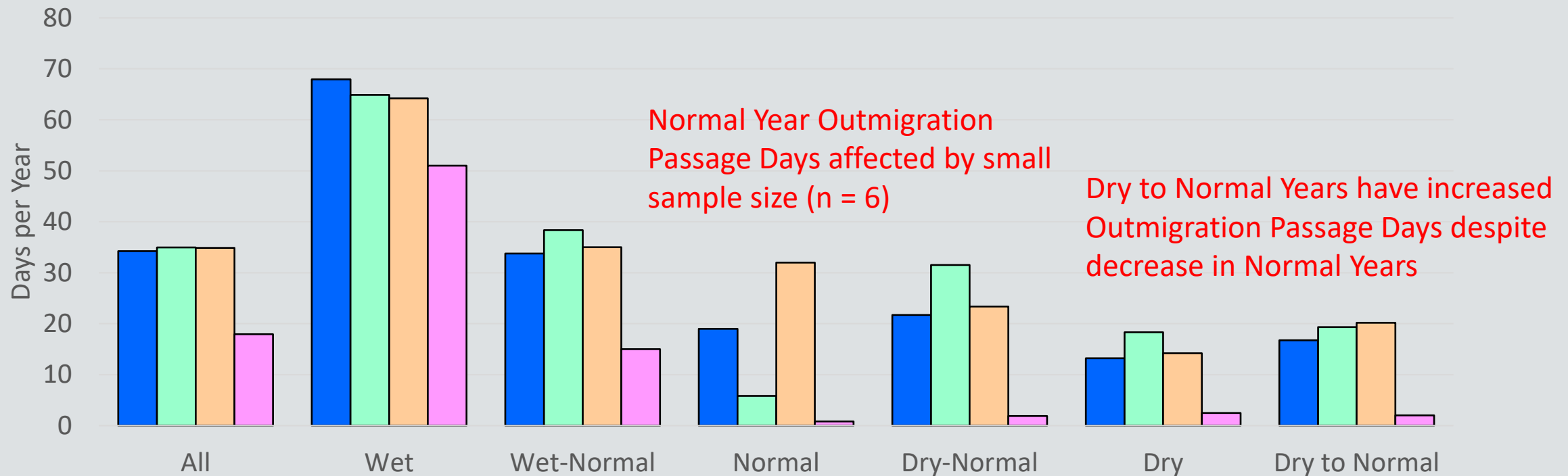
- Percentage of years with initial high flow action taken

Water Year Type	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)
Wet-Normal	83%	83%
Normal	50%	67%
Dry-Normal	25%	13%

HCP Reoperation Scenarios

Smolt/Kelt Outmigration Passage Days (Reoperation Criteria)

- Days per year, 4/1 to 6/30, with at least 80 cfs (less 10%) in Salinas River at Chualar



HCP Reoperation Scenarios

Smolt/Kelt Outmigration Passage Days (Reoperation Criteria)

- Days per year, 4/1 to 6/30, with at least 80 cfs (less 10%) in Salinas River at Chualar

Water Year Type	Observed (Timestep-Averaged)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	34	35	35	18
Wet	68	65	64	51
Wet-Normal	34	38	35	15
Normal	19	6	32	1
Dry-Normal	22	32	23	2
Dry	13	18	14	3
Dry to Normal	17	19	20	2

HCP Reoperation Scenarios

Smolt/Kelt Outmigration Summary

- Reoperation Scenario 1 results in more Outmigration Passage Days, especially in Dry to Normal Years
- Little difference between Reoperation Scenario 1 and observed conditions in terms of Outmigration Passage Days from April to June
- Reoperation Scenario 3 results in far fewer Outmigration Passage Days across all year types, but especially Dry to Normal Years
- Simulated conditions in the few Normal Years have outsized impact on averages

HCP Reoperation Scenarios

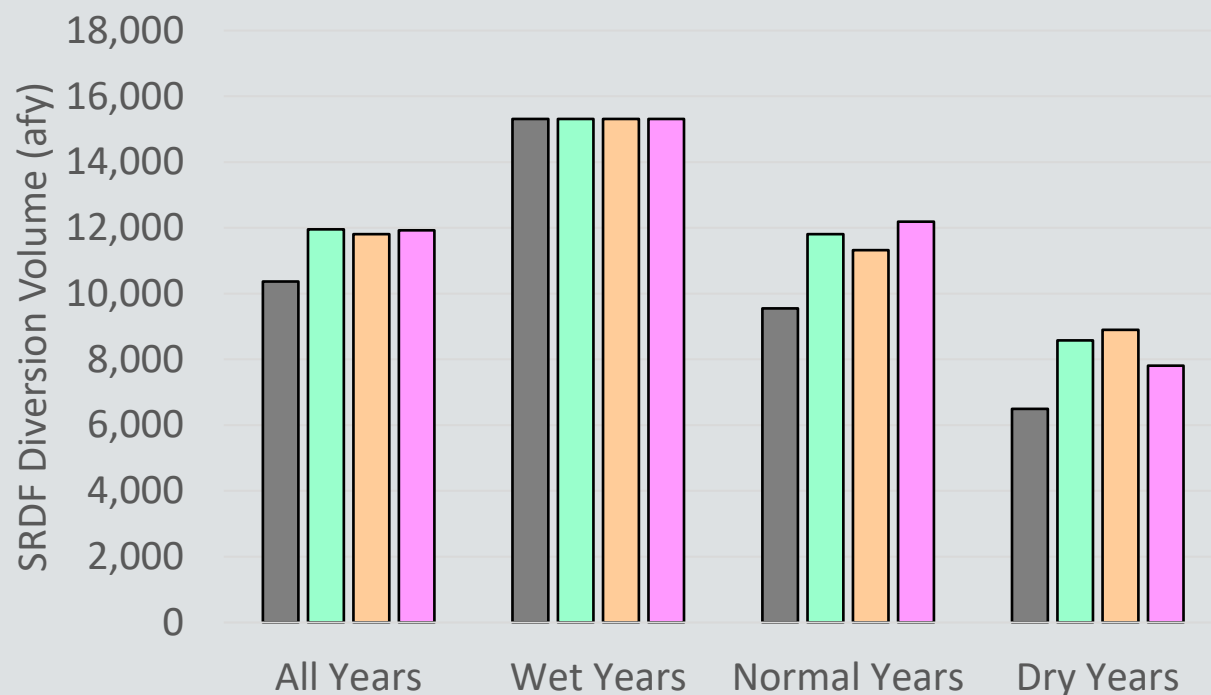
SRDF Operations

HCP Reoperation Scenarios

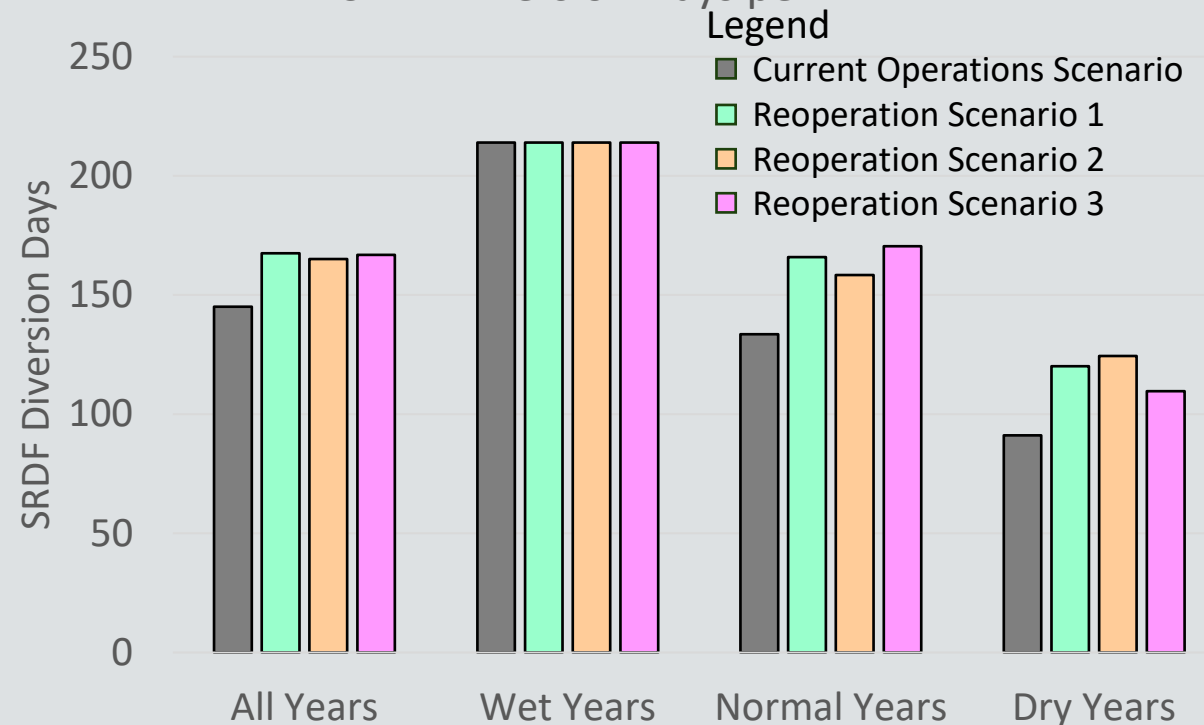
SRDF Operations

- Increased operation of the SRDF, with more diversion volume and diversion days

SRDF Diversion Volume per WY (in afy)



SRDF Diversion Days per WY



HCP Reoperation Scenarios

SRDF Operations

- Increased operation of the SRDF, with more diversion volume and diversion days

Year Type	Current Operations (with Bias Correction)		Reop. Scen. 1 V3 (with Bias Correction)		Reop. Scen. 2 (with Bias Correction)		Reop. Scen. 3 V2 (with Bias Correction)	
	Div. Vol. (afy)	Div. Days	Div. Vol. (afy)	Div. Days	Div. Vol. (afy)	Div. Days	Div. Vol. (afy)	Div. Days
All	10,400	145	12,000 <i>+1,600</i>	167 <i>+22</i>	11,800 <i>+1,400</i>	165 <i>+20</i>	11,900 <i>+1,600</i>	167 <i>+22</i>
Wet	15,300	214	15,300 <i>+0</i>	214 <i>+0</i>	15,300 <i>+0</i>	214 <i>+0</i>	15,300 <i>+0</i>	214 <i>+0</i>
Normal	9,500	134	11,800 <i>+2,300</i>	166 <i>+32</i>	11,300 <i>+1,800</i>	158 <i>+24</i>	12,200 <i>+2,600</i>	170 <i>+36</i>
Dry	6,500	91	8,600 <i>+2,100</i>	120 <i>+29</i>	8,900 <i>+2,400</i>	125 <i>+33</i>	7,800 <i>+1,300</i>	110 <i>+19</i>

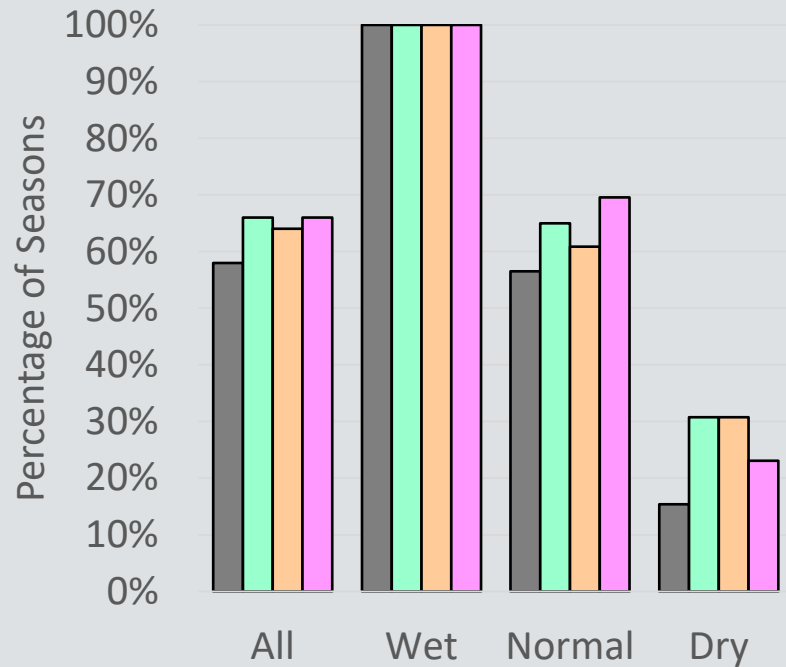
Totals may not sum due to rounding

HCP Reoperation Scenarios

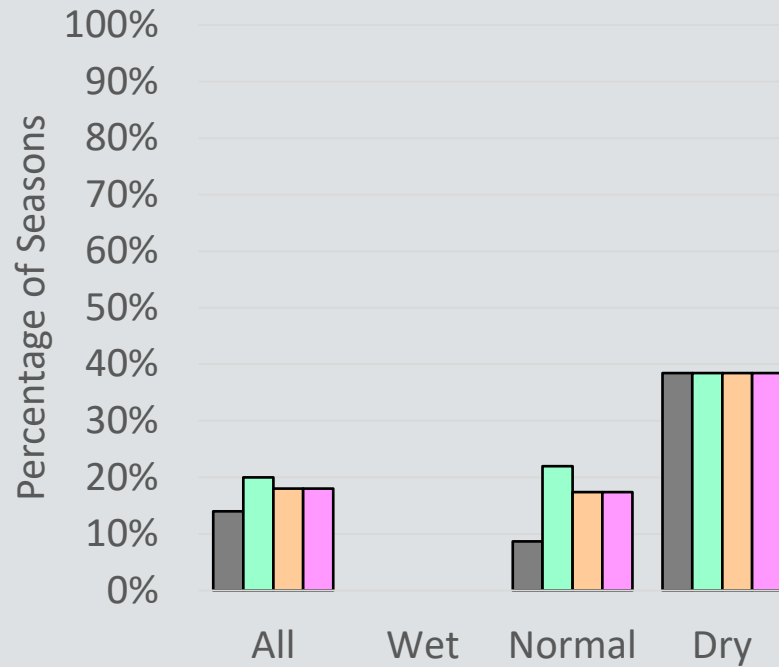
SRDF Operations

- Increased operation of the SRDF, with fewer “Failed” years, more “Partial” and “Full” years

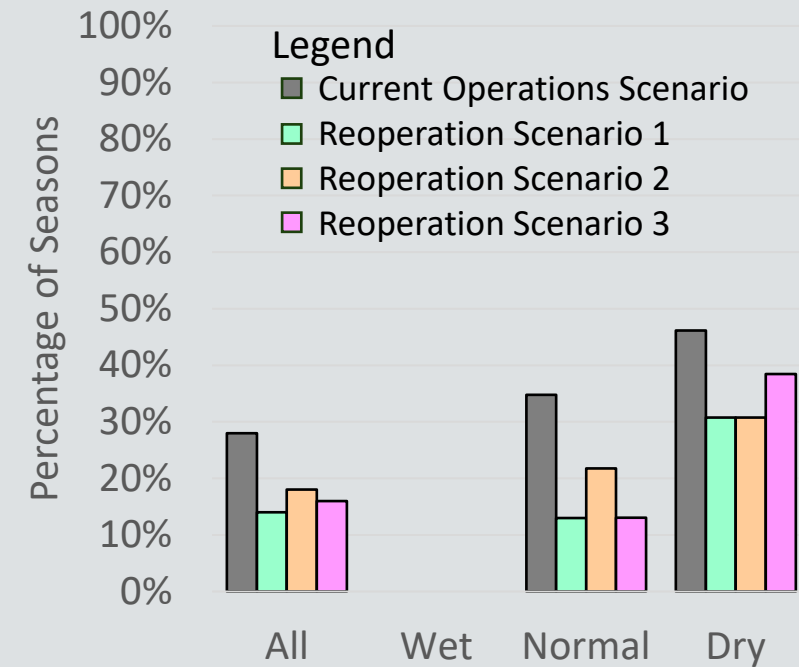
Full



Partial



Failed



HCP Reoperation Scenarios

SRDF Operations

- Increased operation of the SRDF, with fewer “Failed” years, more “Partial” and “Full” years

Year Type	Current Operations (with Bias Correction)			Reop. Scen. 1 V3 (with Bias Correction)			Reop. Scen. 2 (with Bias Correction)			Reop. Scen. 3 V2 (with Bias Correction)		
	Full Years	Partial Years	Failed Years	Full Years	Partial Years	Failed Years	Full Years	Partial Years	Failed Years	Full Years	Partial Years	Failed Years
All	58%	14%	28%	66%	20%	14%	64%	18%	18%	66%	18%	16%
Wet	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%
Normal	57%	9%	35%	65%	22%	13%	61%	17%	22%	70%	17%	13%
Dry	15%	38%	46%	31%	38%	31%	31%	38%	31%	23%	38%	38%

Totals may not sum due to rounding

HCP Reoperation Scenarios

SRDF Operations Summary

- Increased operation of the SRDF, with more diversion volume and diversion days compared to Current Operations
- More Full SRDF season and fewer Failed SRDF seasons
- Wet Years continue to be uniformly Full seasons, so the difference is manifested in Normal and Dry Years

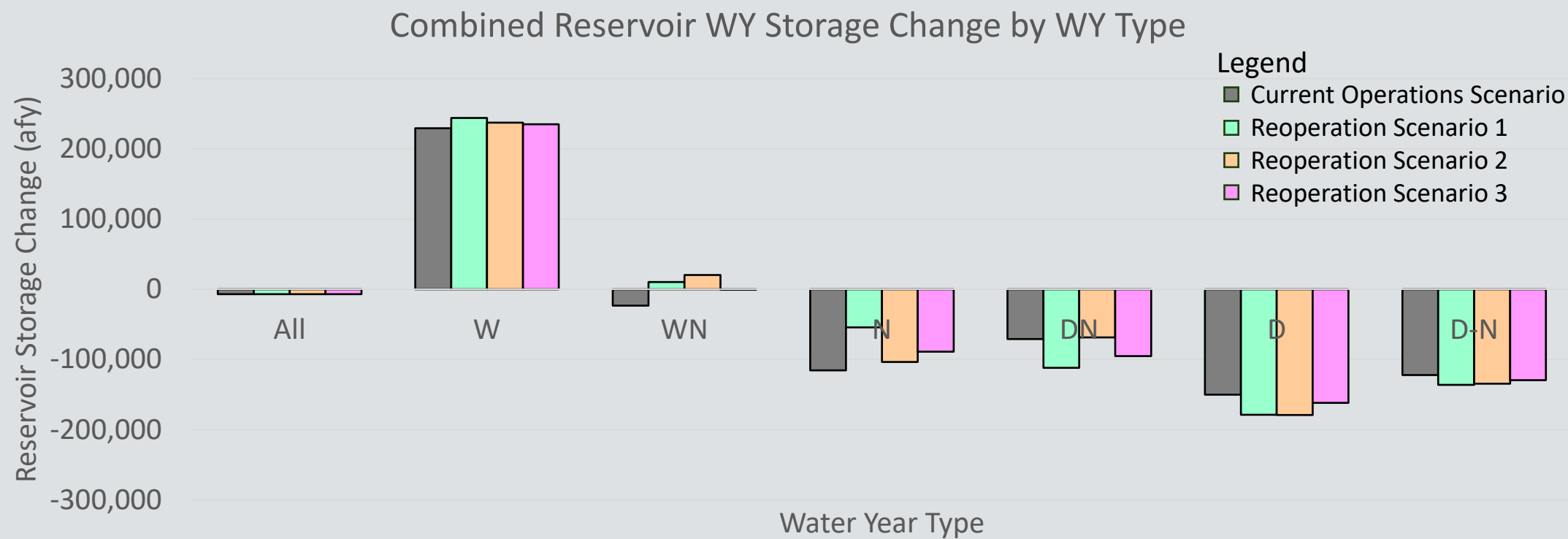
HCP Reoperation Scenarios

Reservoir Storage and Releases

HCP Reoperation Scenarios

Reservoir Storage

- Combined Reservoirs Average Annual Storage Change (in acre-feet per year)



HCP Reoperation Scenarios

Reservoir Storage

- Combined Reservoirs Average Annual Storage Change (in acre-feet per year)

Water Year Type	Current Operations (with Bias Correction)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	-7,000	-7,000	-7,000	-7,000
Wet	+229,000	+244,000	+237,000	+235,000
Wet-Normal	-23,000	+10,000	+20,000	-1,000
Normal	-115,000	-54,000	-104,000	-89,000
Dry-Normal	-71,000	-112,000	-69,000	-95,000
Dry	-150,000	-179,000	-179,000	-162,000
Dry to Normal	-122,000	-136,000	-135,000	-129,000

Totals may not sum due to rounding

HCP Reoperation Scenarios

Release Categorization

- Minimum Release: each reservoir's target minimum release (60 cfs at Nacimiento Reservoir, 10 cfs at San Antonio Reservoir)
- Flood Control Release: releases to remain at or below the Flood Rule Curve for each reservoir
- Conservation Release: releases to provide groundwater recharge and supply diversion at the SRDF
- Fish Passage Release: releases to meet active fish passage requirements
- Over-Release: additional releases made due to recognized bug in MODFLOW-OVHM

HCP Reoperation Scenarios

Release Categorization

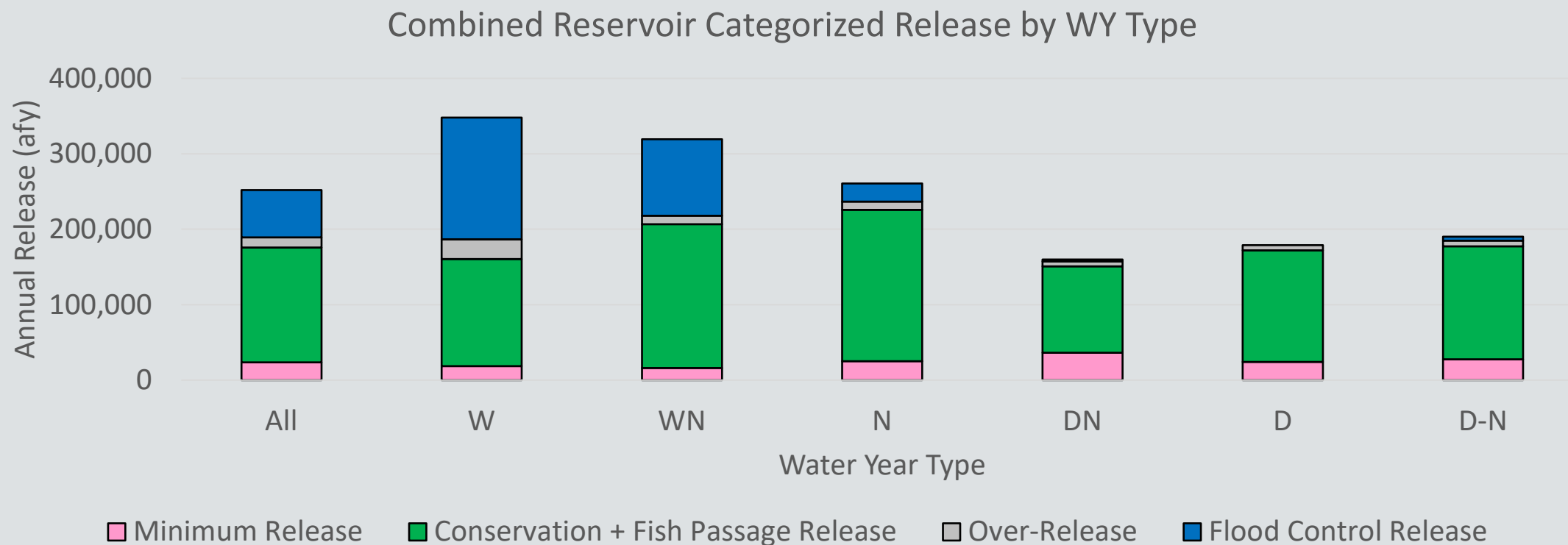
- Minimum Release happens when other release categories do not add up to the reservoir's target minimum
- Flood Control Release happens whenever reservoir stage is above the Flood Rule Curve
- Conservation Release happens whenever SRDF is active
- Fish Passage Release happens when a fish passage requirement is active and other release types are not sufficient to meet that requirement
- Over-Release typically happens during the SRDF period, and is often equal to the minimum release target at Nacimiento Reservoir

***Conservation and Fish Passage Releases are combined on following slides**

HCP Reoperation Scenarios

Release Categorization: Current Operations Scenario

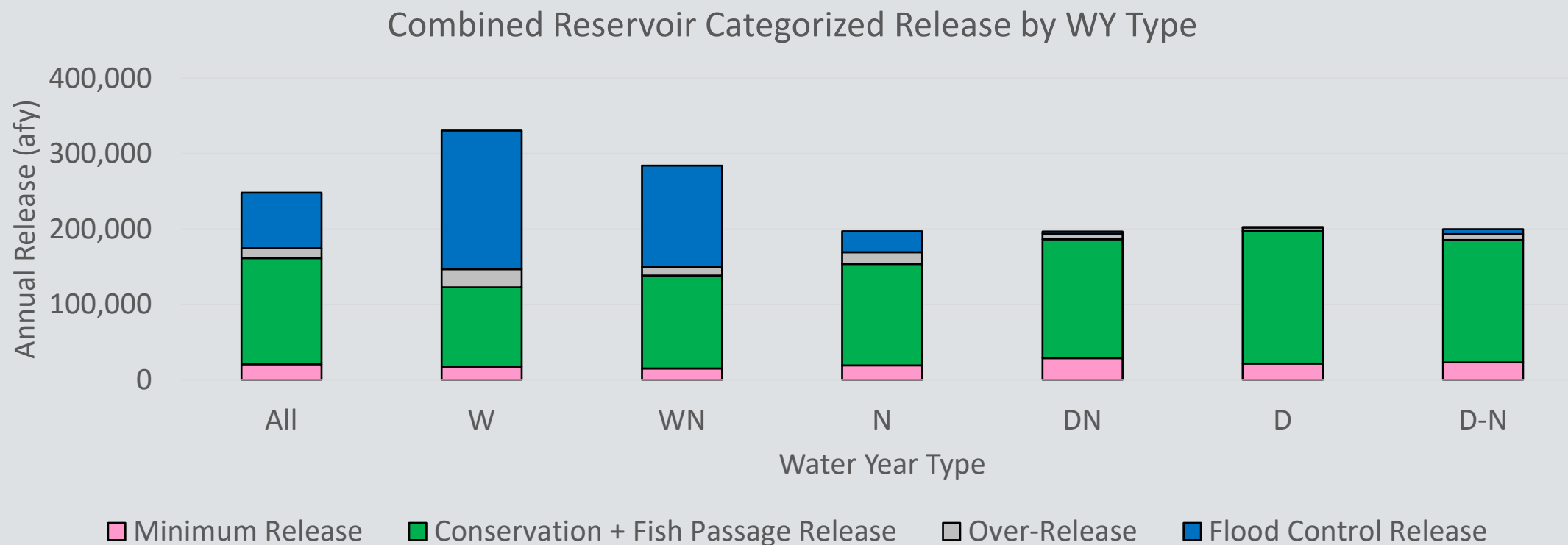
- Combined Reservoir Release



HCP Reoperation Scenarios

Release Categorization: Reoperation Scenario 1

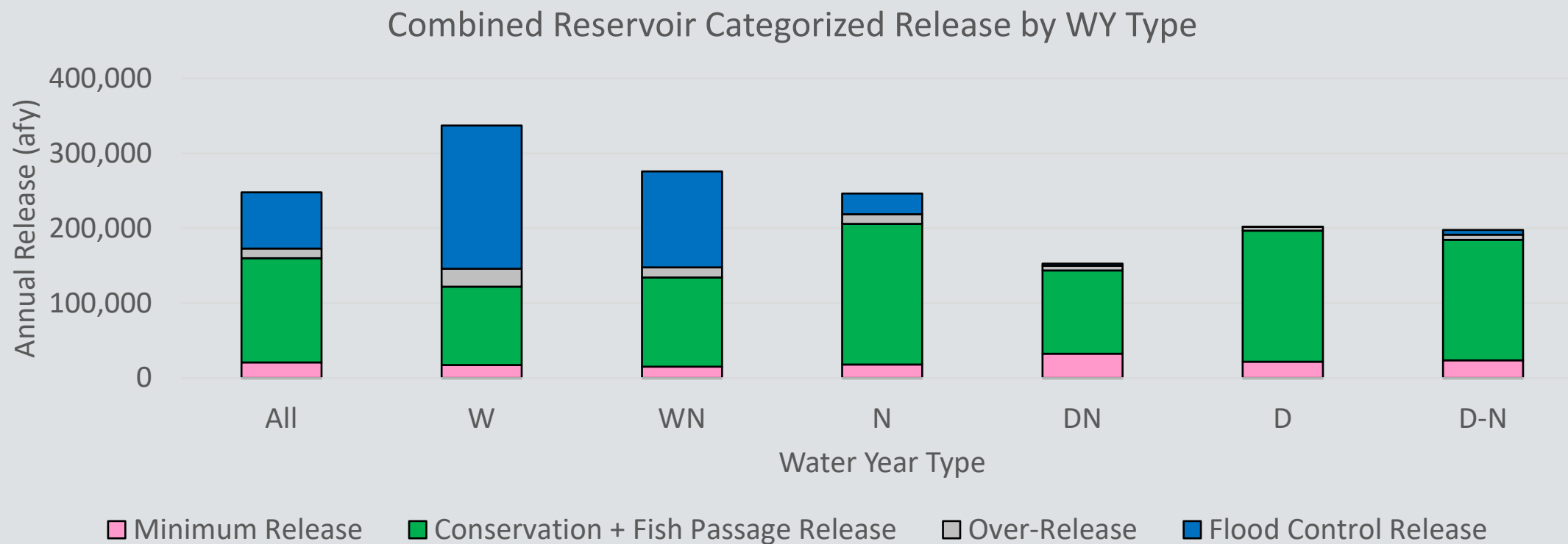
- Combined Reservoir Release



HCP Reoperation Scenarios

Release Categorization: Reoperation Scenario 2

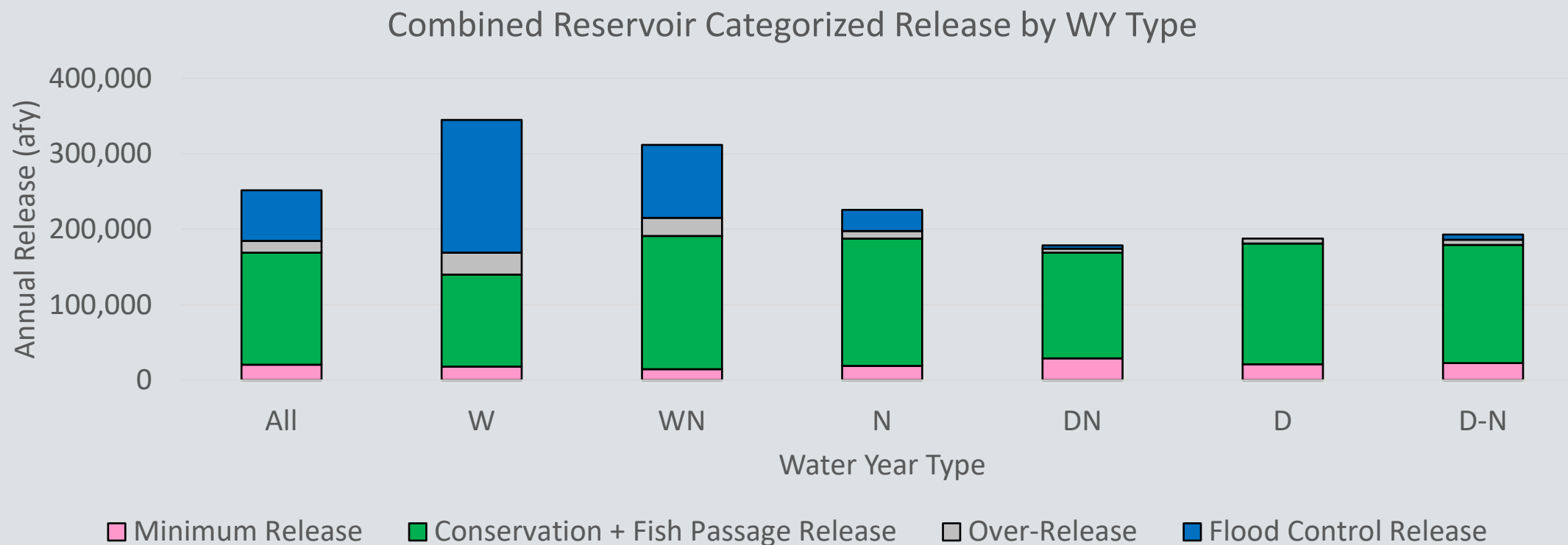
- Combined Reservoir Release



HCP Reoperation Scenarios

Release Categorization: Reoperation Scenario 3

- Combined Reservoir Release



HCP Reoperation Scenarios

Reservoir Release

- Combined Reservoirs Average Annual Flood Control Release (in acre-feet per year)

Water Year Type	Current Operations (with Bias Correction)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	63,000	74,000	75,000	67,000
Wet	161,000	184,000	191,000	176,000
Wet-Normal	101,000	135,000	128,000	97,000
Normal	24,000	28,000	28,000	28,000
Dry-Normal	3,000	3,000	3,000	4,000
Dry	0	< 1,000	< 1,000	0
Dry to Normal	5,000	7,000	7,000	7,000

Totals may not sum due to rounding

HCP Reoperation Scenarios

Reservoir Release

- Combined Reservoirs Average Annual Non-Flood Control Release (in acre-feet per year)

Water Year Type	Current Operations (with Bias Correction)	Reop. Scen. 1 V3 (with Bias Correction)	Reop. Scen. 2 (with Bias Correction)	Reop. Scen. 3 V2 (with Bias Correction)
All	189,000	175,000	173,000	184,000
Wet	187,000	147,000	146,000	169,000
Wet-Normal	218,000	150,000	148,000	215,000
Normal	237,000	169,000	219,000	198,000
Dry-Normal	157,000	194,000	150,000	174,000
Dry	179,000	202,000	202,000	188,000
Dry to Normal	185,000	193,000	191,000	186,000

Totals may not sum due to rounding

HCP Reoperation Scenarios

Reservoir Storage and Releases Summary

- Little overall difference in combined reservoir storage, since the inputs (reservoir inflow, precipitation rate, and evaporation rate) are fixed
- Reoperation Scenario 1 results in more Flood Control Release and less Non-Flood Control Release because the reservoirs can achieve the similar passage conditions with less release

Summary

HCP Reoperation Scenarios

Reoperation Scenarios implement the Reoperation Protocol with variations

- Reoperation Scenario 1 represents the Reoperation Protocol as provided
- Reoperation Scenario 2 adds the bypass of select winter storm events
- Reoperation Scenario 3 replaces the Reoperation Protocol rules with a simplified Opportunistic Release ruleset

HCP Reoperation Scenarios

Reoperation Scenarios result in conditions conducive to Adult Upmigration to both Arroyo Seco and the Nacimiento River

- All Wet, Wet-Normal, and Normal Years (and most Dry-Normal Years) had at least 5 consecutive Adult Passage Days at Chualar, indicating passage opportunities to Arroyo Seco
- All Wet and Wet-Normal Years (and most Normal Years) had at least 18 consecutive Adult Passage Days at Soledad, indicating passage opportunities to the Nacimiento River
- Dry-Normal and Dry Years had less frequent passage conditions, but this is in line with the (observed) historical record

HCP Reoperation Scenarios

Reoperation Scenario 1 results in conditions conducive to Smolt and Kelt Outmigration

- More Outmigration Passage Days, especially in Dry to Normal Years
- Little difference in Outmigration Passage Days from observed conditions from April to June

Reoperation Scenario 3 results in far fewer Outmigration Passage Days across all year types, but especially Dry to Normal Years

HCP Reoperation Scenarios

Reoperation Scenarios result in more successful operation of the SRDF

- More diversion volume and more diversion days under all Reoperation Scenarios compared to Current Operations Scenario
- More Full seasons and fewer Failed seasons
- Difference from Current Operations Scenario occurs in Dry and Normal Years

HCP Reoperation Scenarios

Reoperation Scenarios have little effect on overall conditions in the reservoirs

- Similar annual changes in storage to the Current Operations Scenario
- Reoperation Scenarios result in more Flood Control Release and less Non-Flood Control Release (Minimum, Conservation, Fish-Passage, and Over-Release)

THANK YOU

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Year Types

Reservoir and Salinas River conditions are affected by hydrologic conditions of the previous year

		Is Followed By:				
		W	WN	N	DN	D
Year Type:	W	3	3	3	1	5
	WN	2	2	1	0	1
	N	1	0	0	4	1
	DN	4	1	1	0	2
	D	5	0	1	3	6

$n = 50$





Reoperation Protocol Field Testing

Two Recent Release Actions based on Flow Prescription Triggers:

- Adult steelhead upstream migration (February 17- March 3)
- Outmigration (Block Flow) (March 16 – April 3)





2025 Steelhead Upstream Migration Release Actions

Per the Flow Prescription.....

Adult steelhead upstream migration triggers are in effect from February 1st through March 31st

When flow triggers occur, the Agency takes action if needed to facilitate upstream migration of adult steelhead by ensuring flows of at least 260 cfs at the Salinas River near Chualar for five or more consecutive days when the river mouth is open to the ocean.

Triggers for Releases:

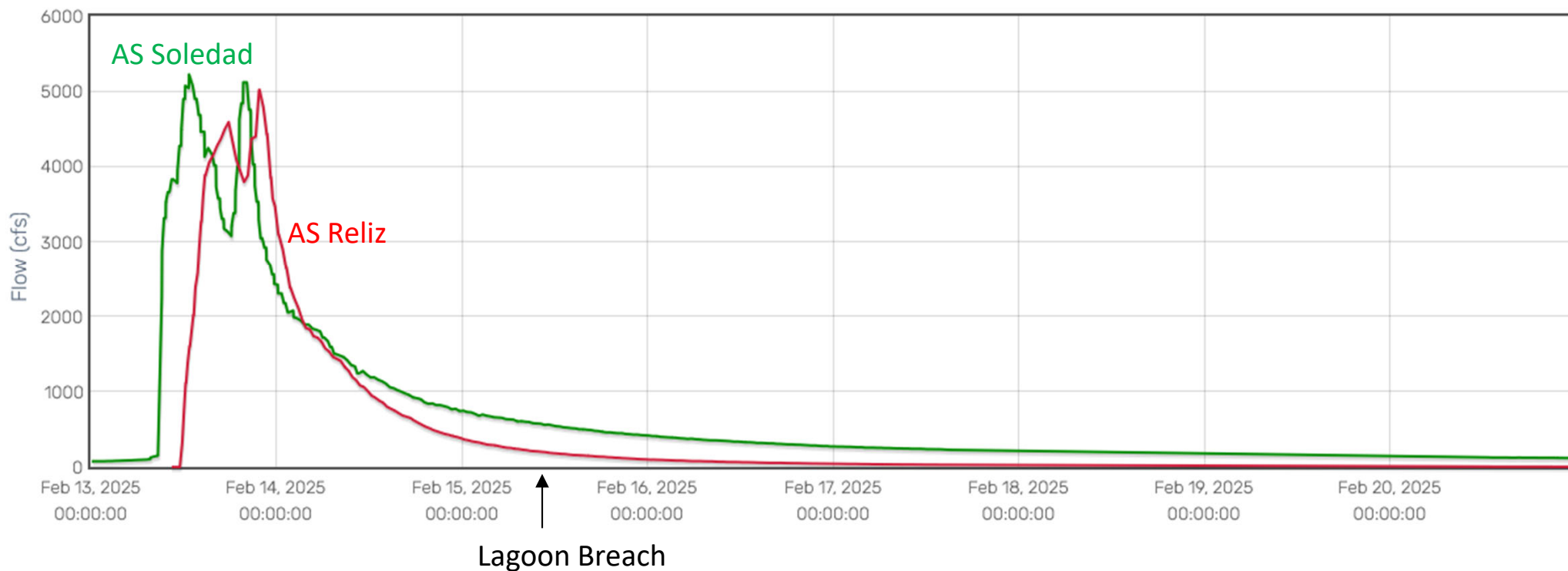
- Combined reservoir storage is greater than 220,000 AF,
- 340 cfs at the Arroyo Seco near the Soledad gage, *and*
- 173 cfs at the Arroyo Seco below the Reliz Creek gage



2025 Steelhead Upstream Migration Release Actions

Adult Steelhead Upstream Migration Triggers on February 15th

- ✓ Agency facilitated breach of Salinas Lagoon
- ✓ Reservoir Storage > 220,000 AF
- ✓ Arroyo Seco nr Soledad > 125 cfs
- ✓ Arroyo Seco bl Reliz > 173 cfs





2025 Steelhead Upstream Migration Release Actions

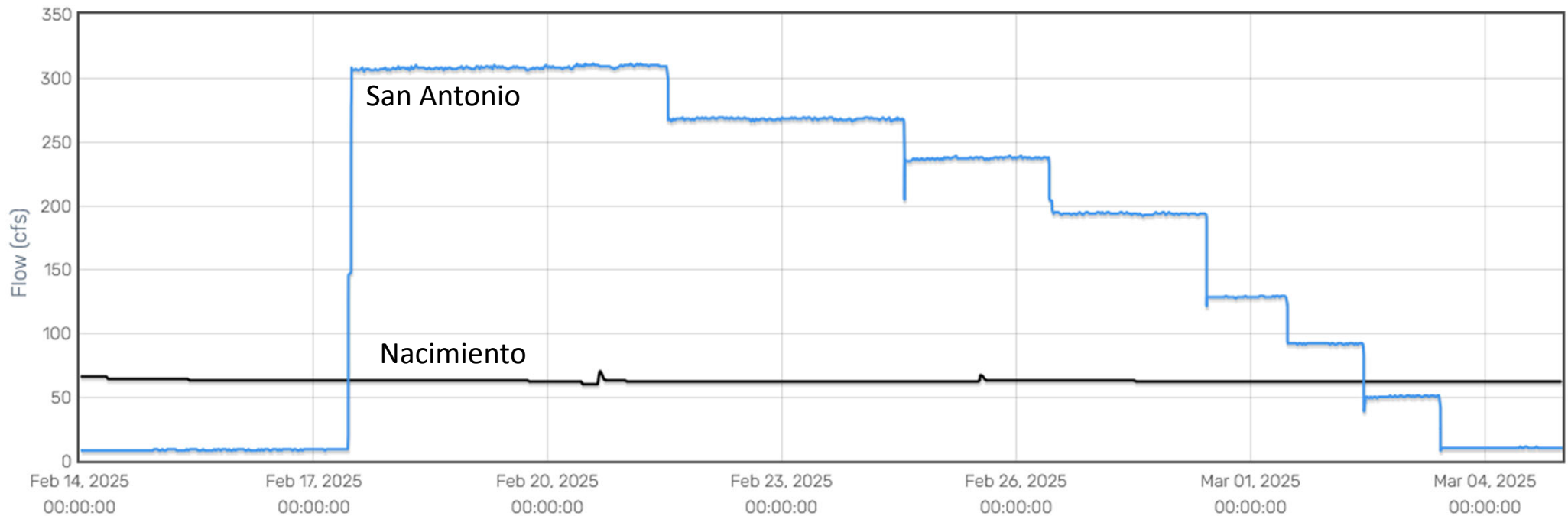
In response to adult steelhead upstream migration triggers:

- Releases initiated to target flow prescription goals
 - 260 cfs at Chualar for 5 or more consecutive days
- The Agency continued releases beyond the 5 day target
 - Test of critical riffle passage threshold of 80 cfs at Chualar
 - Allow fish time to migrate to upper Salinas
 - Meet dry-normal year type passage goal of 16 days
- In support of HCP reservoir reoperation modeling and TAC efforts
 - FISHBIO checked Salinas River cross sections near Chualar used in the CRA
 - Ensure suitable passage conditions with the Chualar target flow
 - FISHBIO collected eDNA samples upstream and downstream of the Arroyo Seco confluence
 - 2 rounds of sampling for steelhead and striped bass



2025 Steelhead Upstream Migration Release Actions

Reservoir Release Rates



Phase 1

Days 1-5
Target: 260 cfs at Chualar

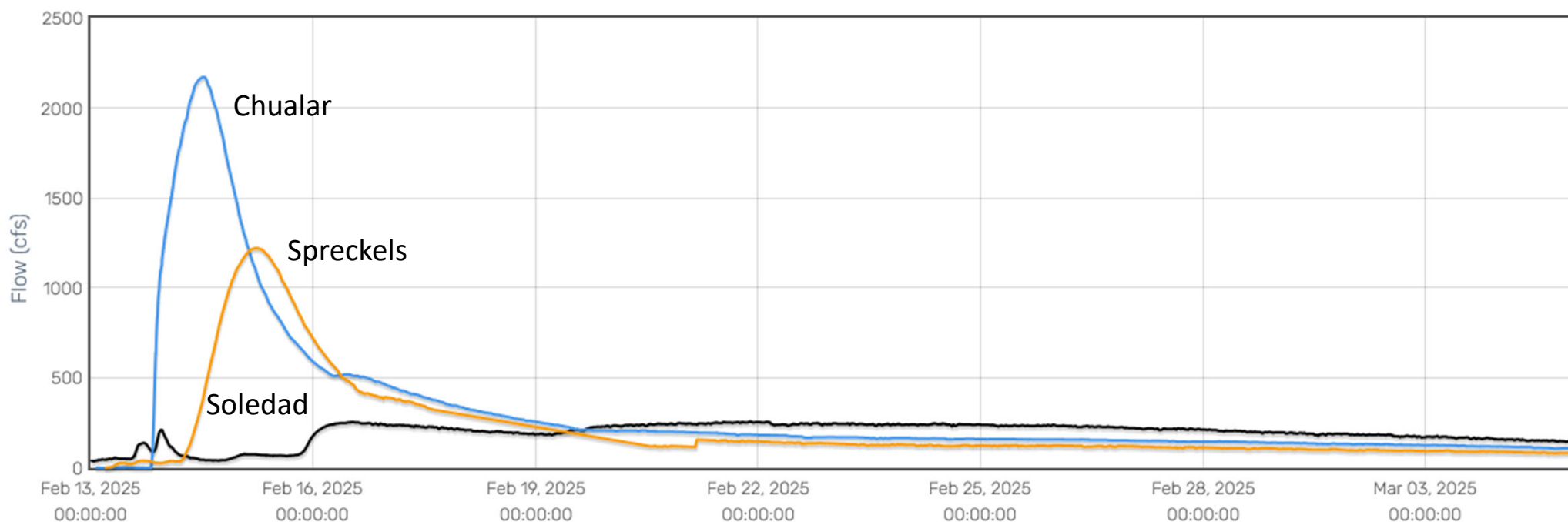
Phase 2

Days 6-16
Maintain 80 cfs at Chualar



2025 Steelhead Upstream Migration Release Actions

Flow at key streamflow gages



Phase 1

Days 1-5
Target: 260 cfs at Chualar

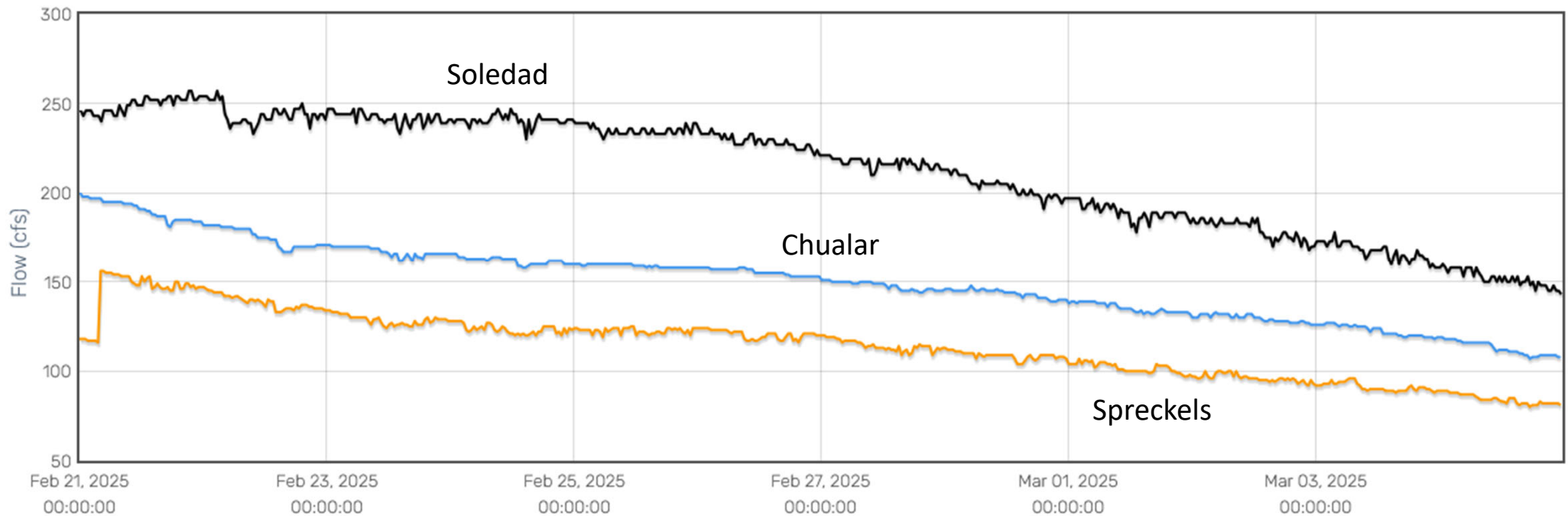
Phase 2

Days 6-16
Maintain 80 cfs at Chualar



2025 Steelhead Upstream Migration Release Actions

Flow at key streamflow gages





2025 Steelhead Outmigration Release Actions

Outmigration (Block Flow) triggers: March 15th to May 31st

A block flow release to facilitate downstream migration of steelhead in the Salinas River will occur during normal year types when the following triggers are met:

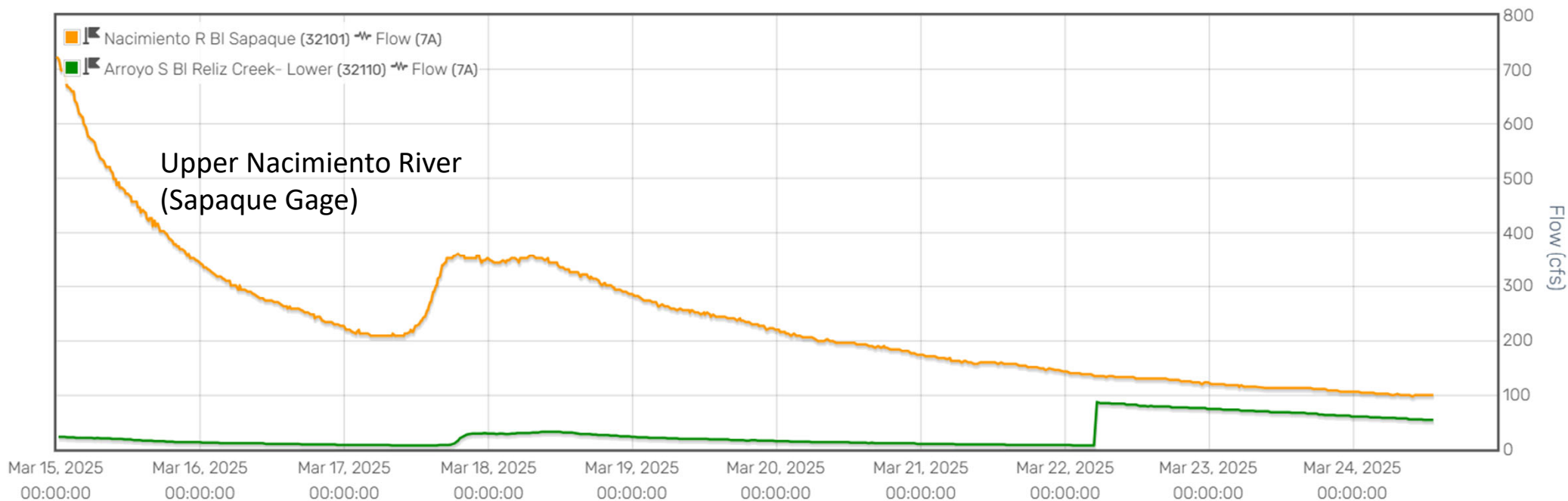
- Combined reservoir storage >150,000 AF,
- 125 cfs or higher flows at the Nacimiento below Sapaque USGS streamgage, **or**
- 70 cfs or higher flows are present at the Arroyo Seco below the Reliz Creek USGS streamgage



2025 Steelhead Outmigration Release Actions

Steelhead Outmigration Triggers met on March 15th

- ✓ March 15th YT Forecast = Dry-normal
- ✓ Reservoir Storage > 150,000 AF
- ✓ Nacimiento R bl Sapaque > 125 cfs

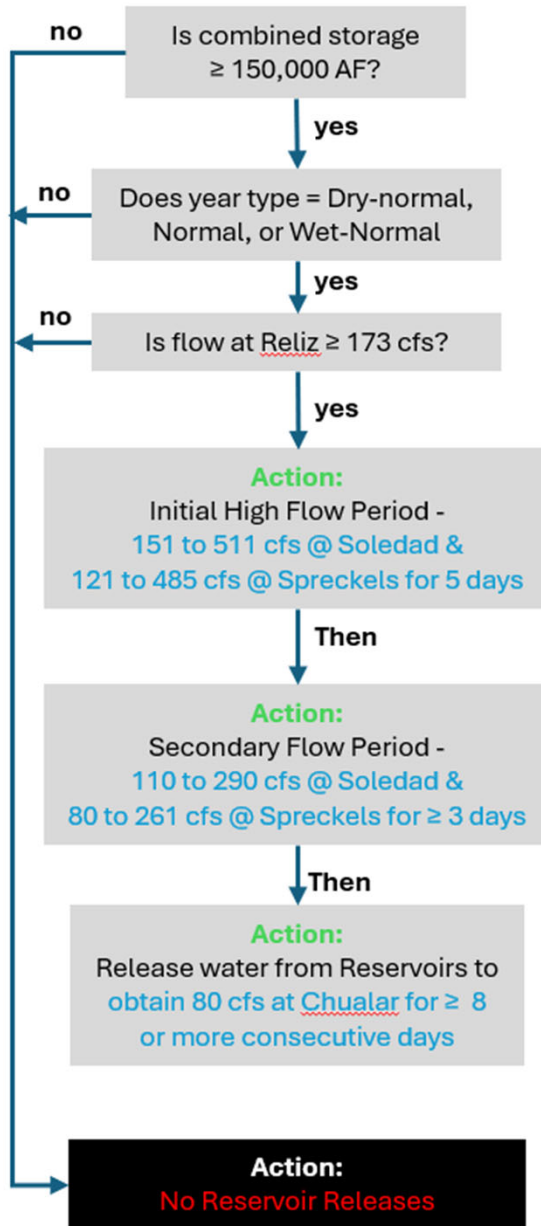


2025 Steelhead Outmigration Release Actions

Smolt Outmigration

March 15 – April 1

Purpose: Facilitate steelhead smolt downstream migration prior to SRDF operation.



In response to smolt outmigration triggers:

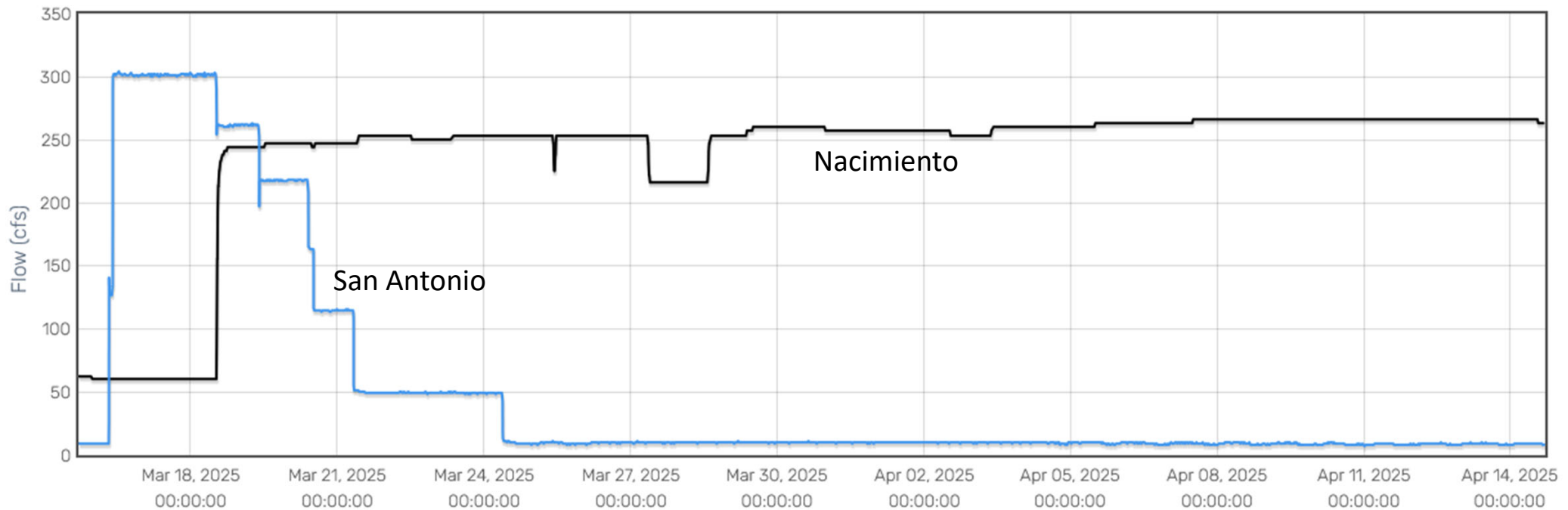
Agency initiated a test of the new reservoir reoperation protocols under development for the HCP

- Reservoir Re-operation Scenario 1
- Modeled as part of HCP development
- Opportunity to test operational feasibility
- Provides a real-world example for consideration



2025 Steelhead Outmigration Release Actions

Reservoir Release Rates



Phase 1 (5 days)
Initial high flow
151 cfs at Soledad
121 cfs at Spreckels

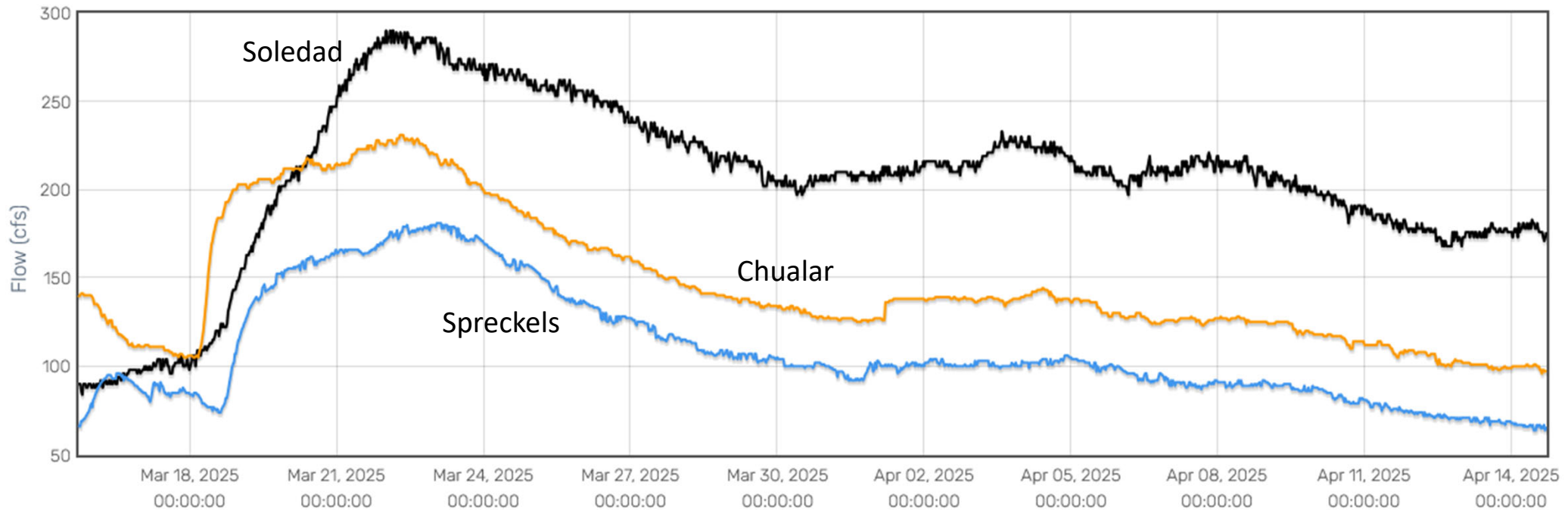
Phase 2 (3 days)
Secondary flow:
110 cfs at Soledad
80 cfs at Spreckels

Phase 3 (at least 8 days)
80 cfs at Chualar



2025 Steelhead Outmigration Release Actions

Flow at key streamflow gages



Phase 1 Phase 2 Phase 3

Phase 1 (5 days)
Initial high flow
152 cfs at Soledad
121 cfs at Spreckels

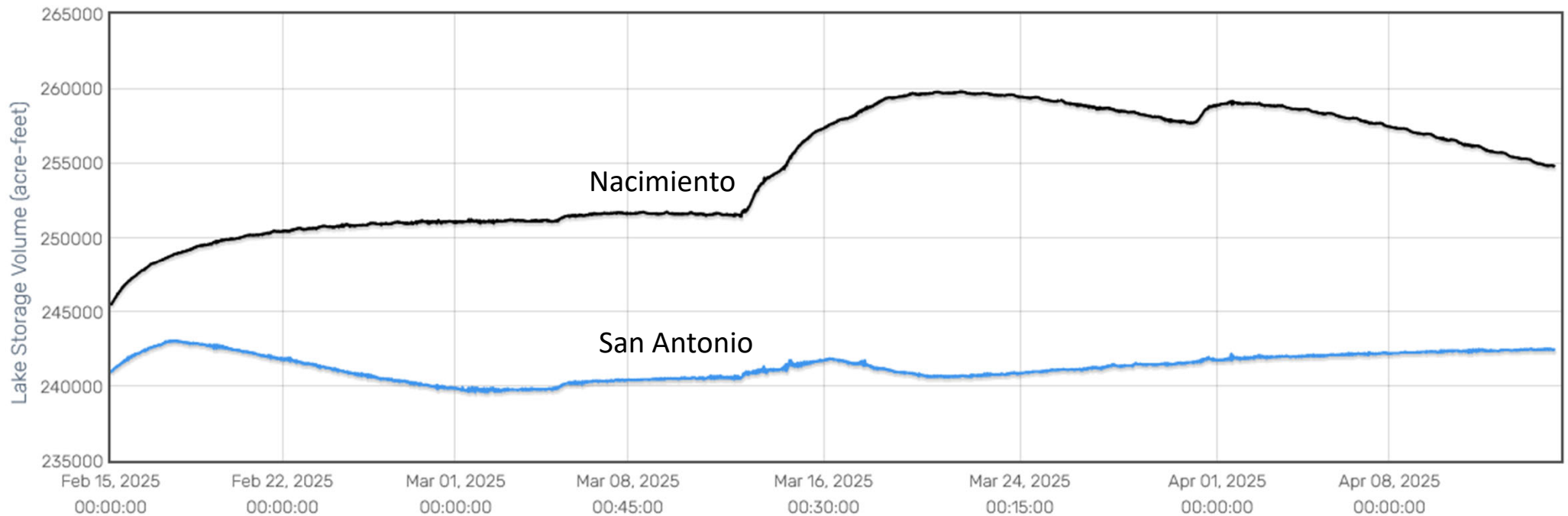
Phase 2 (3 days)
Secondary flow:
110 cfs at Soledad
80 cfs at Spreckels

Phase 3 (at least 8 days)
80 cfs at Chualar

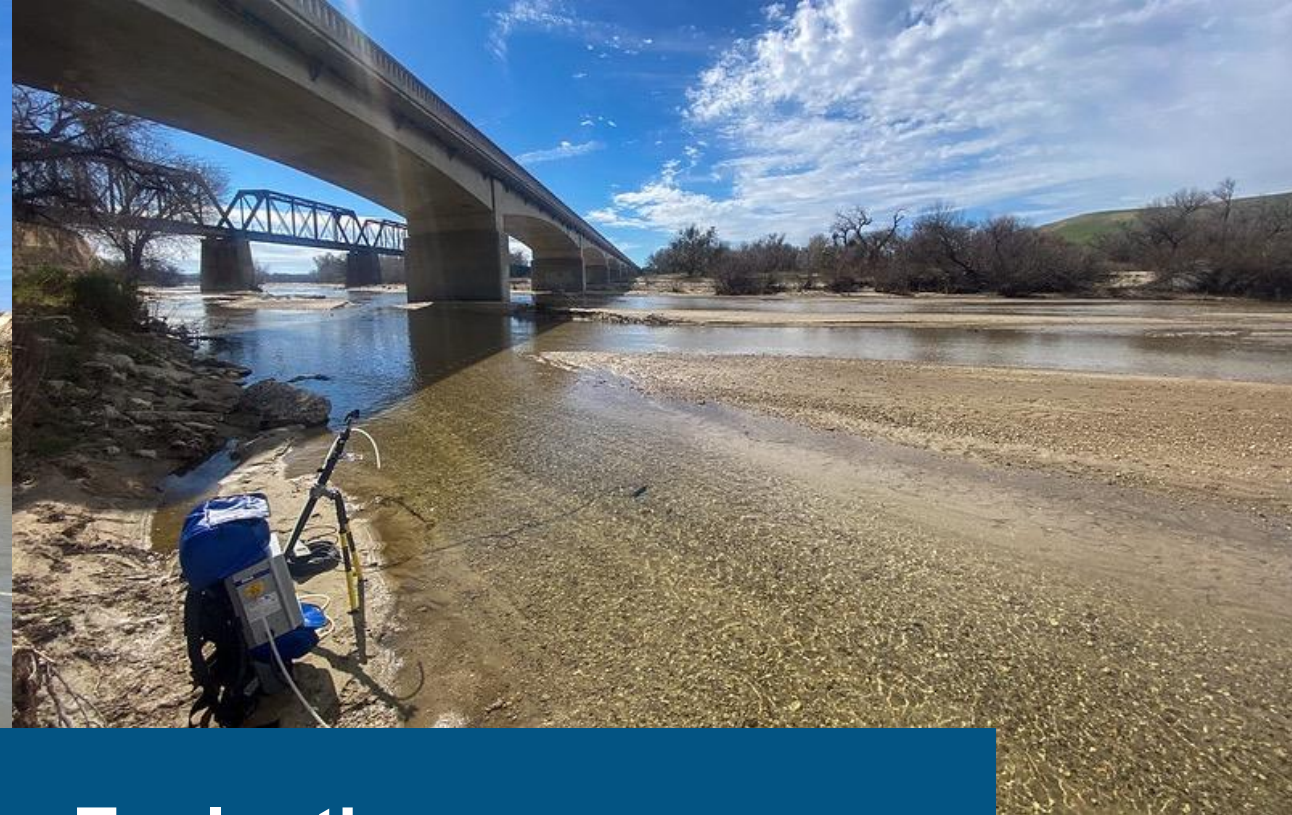


2025 Steelhead Migration Release Actions

Reservoir Storage Volume







Fish Passage Evaluation

Assessing Fish Migration Opportunities During a Managed Flow Release

Presenters: Michael Hellmair and Dana Lee



TAC Meeting | April 16, 2025

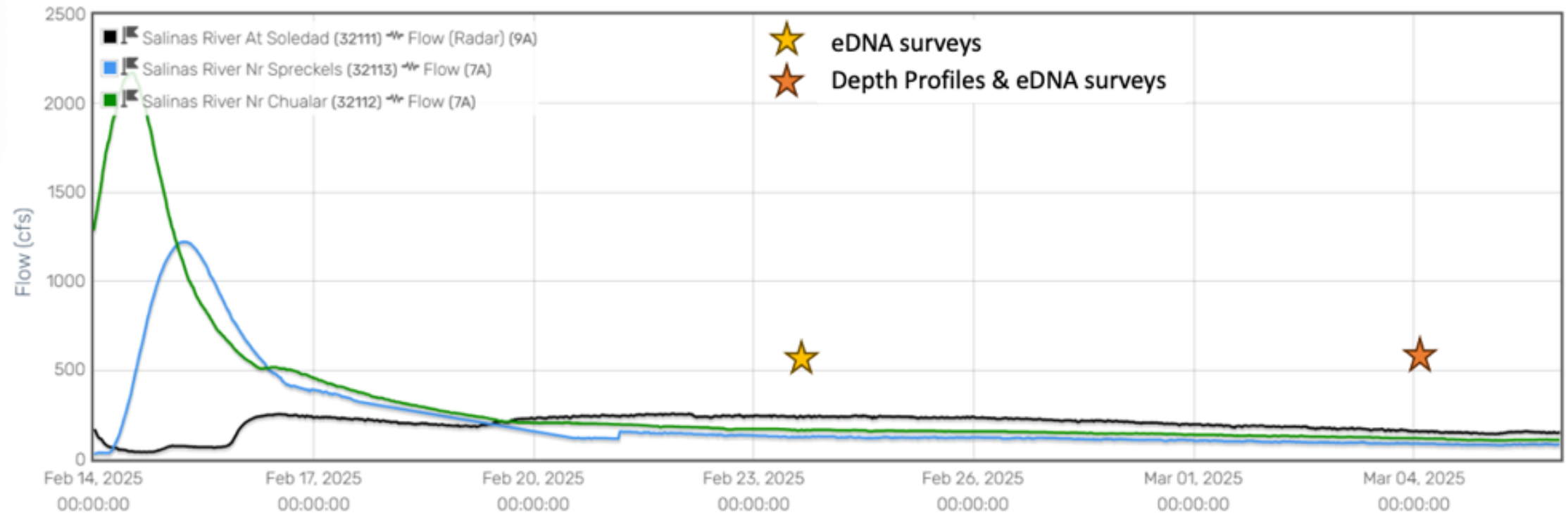
Objectives

- **Purpose:** assess effectiveness of a managed flow release for providing fish passage conditions
 - Validate recommended flow thresholds (FISHBIO 2024)
 - Document presence and potential migration of steelhead and striped bass using eDNA





Survey Timing

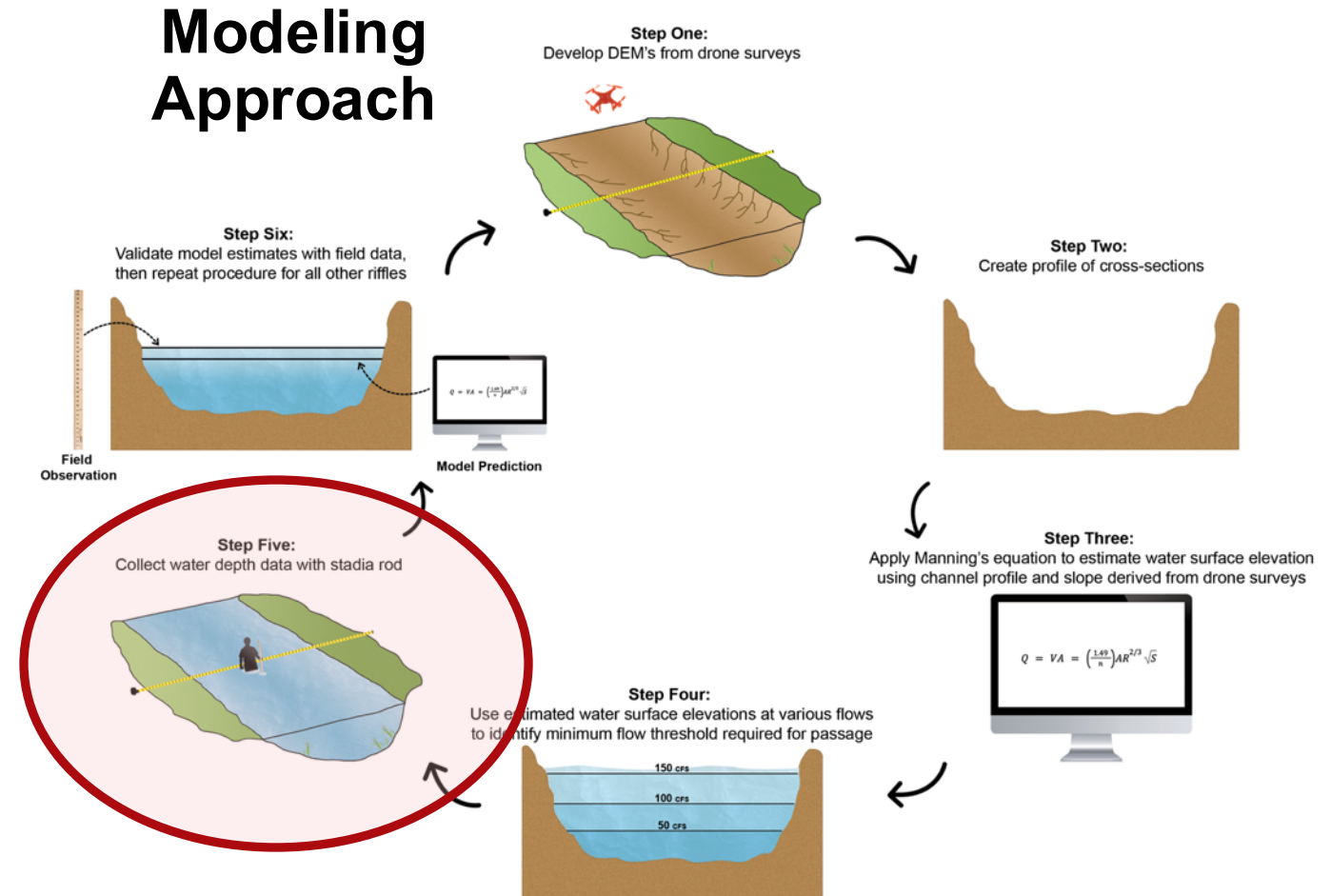


- eDNA surveys occurred during beginning of flow releases on Feb 24
- Depth Profiles and eDNA surveys occurred near tail end of releases (March 3-4)
 - Flows at Chualar ~106 cfs



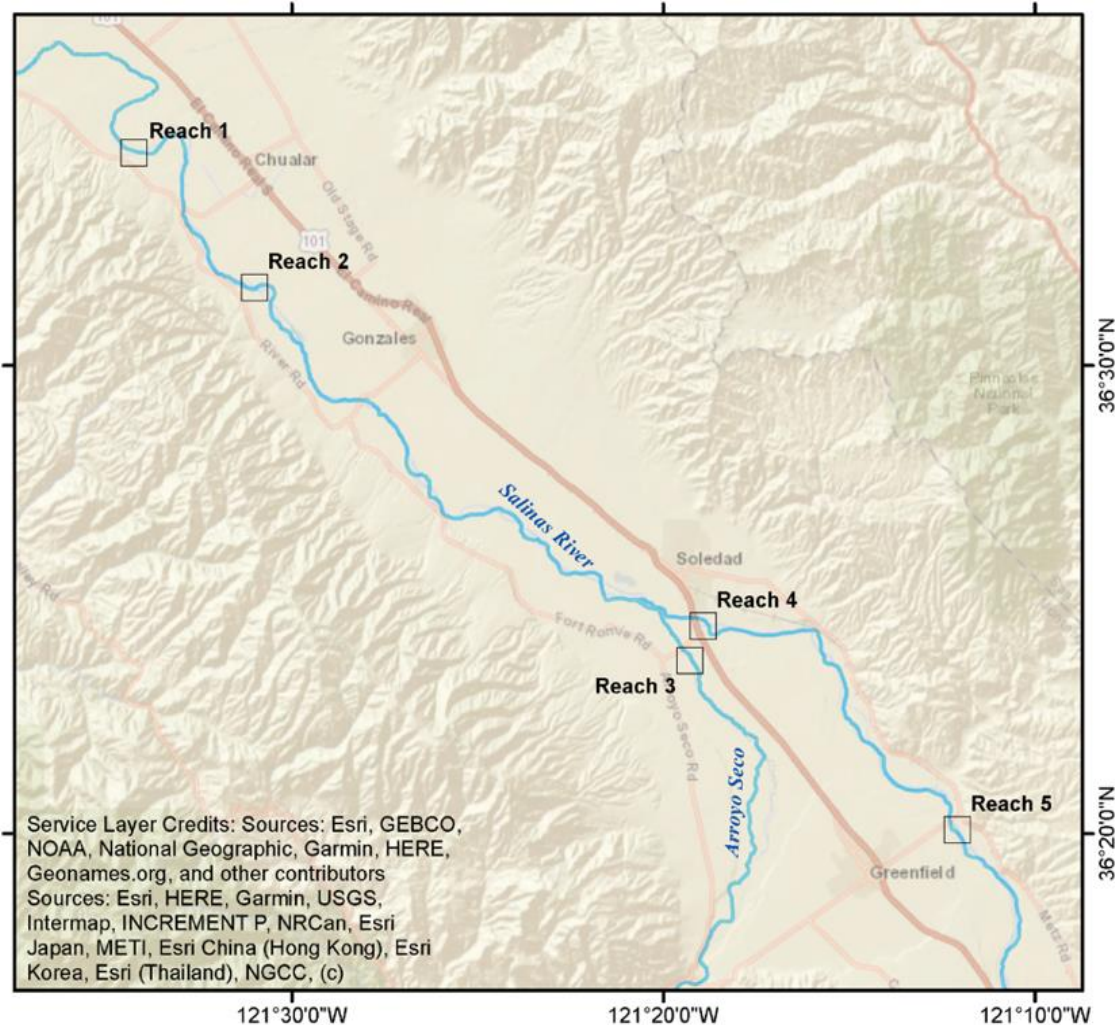
Critical Riffle Methods

- Recommended flow thresholds based on drone surveys and desktop modeling
- 80 cfs and Chualar determined to provide passage throughout mainstem Salinas
- Steelhead passage threshold is 0.7 ft across >25% of the channel
- First opportunity to validate thresholds under a managed flow release





Survey Locations



- Riffle validation at two downstream reaches
- Reach 1 is much narrower and more incised
- Reach 2 channel geometry has changed over the last few years as a result of high flows
 - New riffles selected due to substantial changes since last year



Survey Results

- Passage possible at all riffles
- Average depth in Reach 1 greater than in Reach 2
- Persistent thalweg across all assessed riffles
- Riffle 3-C was relatively shallow yet appeared that passage would be possible at 80 cfs

Reach	Transect*	Total Length	Average Depth	Max Depth	% of Channel >0.7ft
1	1-B	50.4	1.21	1.55	98.0%
1	3-B	41.4	1.27	1.55	85.4%
1	4-B	49.2	1.16	1.95	91.8%
2	1-C	103.4	0.84	1.65	63.1%
2	2-C	113	0.86	1.45	68.8%
2	3-C	143	0.76	1.8	49.3%



Key Takeaways



- Evaluation did not include modeling to determine exact flow threshold at each riffle
- Riffle depths much greater CDFW criteria at 106 cfs
- Flow threshold unchanged despite substantial changes to channel geometry
- *Confident that 80 cfs is a conservative and durable flow threshold for providing steelhead passage*



eDNA Methods

- Collect/filter eDNA samples at various locations along the mainstem Salinas River to test for signals of migratory fishes
- Used Smith-Root backpack filtration to collect two samples at six locations, twice (2/24 & 3/3, 2025) – 24 samples total
- Samples analyzed by Aquatrace Genomics using qPCR to detect steelhead (*O. mykiss*) and striped bass (*M. saxatilis*)



eDNA Results

- 2/24:
 - Detection of trace amounts of *O. mykiss* eDNA at **River Road** (between Chualar and Spreckles)
 - No evidence of striped bass
- 3/3:
 - Detection of trace amounts of *O. mykiss* eDNA at **River Road, Gonzales Road and WWTP** (by Soledad)
 - No evidence of striped bass





Key Takeaways



A dry section of the Salinas River located between Chualar and Gonzales in 2012, revealing hundreds of striped bass, indicating that the species moves upstream under certain flow conditions. Photo provided by MCWRA.

- Some migration of steelhead during the managed flow release
- Detections at several times and locations (downstream of Arroyo Seco) in the migratory corridor
- Unlikely that eDNA was transported long distance
- Unknown if detections attributable to juveniles or adults



Questions?

