Salinas River Operations
Habitat Conservation Plan

salinasrivermanagementprogram.org

Salinas River Operations HCP
Technical Advisory Committee Meeting

11/13/2024

Forrest Carpenter, ICF

Summary of Steelhead Passage Criteria

- We evaluated the following components for adults, smolts, kelts, and juvenile migration periods:
  - Migration Period
  - Migration Distance and Travel Time
  - Minimum Passage Flows
  - Passage Day Targets
  - Methods for Calculating Achievement of Passage Criteria

Dams and Reservoirs | County of Monterey, CA

Arroyo Seco: Fish in a dry stream (fishbio.com)

→ Approach for Re-evaluating Passage Criteria for HCP

- Extend the period during which flow augmentation could occur and when passage days are counted towards targets to December 1 through April 1.
- Establish 80 cfs measured at Chualar as the minimum migration threshold for successful adult upstream passage.
- Retain the five consecutive day criteria of meeting minimum migration threshold.
- Lagoon and Arroyo Seco connectivity required for augmentation.
- Establish migration holding flows that that are defined as flows that remain above 45 cfs before reaching or exceeding the minimum threshold of 80 cfs at Chualar.
- Consider defining passage day targets based on historical data from before construction of the dams by water year type.
- Calculate achievement of passage criteria on a five-year rolling average within one standard deviation of the average total days minimum flow thresholds were met prior to dam construction → 54 days (±33 days).

→ Adult Upstream Migration

- Establish March 15 through May 31 as the period during which flow augmentation could occur and minimum thresholds would be required.
- Establish 80 cfs at Chualar (roughly 40 cfs at Spreckels) as the minimum flow threshold for successful smolt downstream passage.
- Establish a minimum of 8 consecutive days of flows meeting minimum thresholds as the criteria for successful passage.
- Establish Outmigration Flows defined using calculated exceedance flows for water year types. For two windows – March 15 to April 1 and April 1 to May 31.
- Maintain Outmigration Flow high flows during Period 1 for at least five consecutive days. Maintain flow during Period 2 immediately following Period 1 for at least 15 consecutive days or as long as conditions permit.
- Actions would be taken regardless of lagoon connectivity to promote lagoon-anadromous life history.

Window 1

Water Year Types	Minimum Flows for Initial High Flow Period 1 (Day 1 – 5)			Minimum Flows Following Initial High Flow Period 2 (Day 6 – 20)		
	Exceedance	Spreckels	Soledad	Exceedance	Spreckels	Soledad
Dry	No Action			No Action		
Dry-Normal	85% of pre-dam 25% exceedance	121	151	2x minimum passage flows	80	110
Normal	85% of pre-dam 45% exceedance	214	243	85% of pre-dam 55% exceedance	130	160
Wet-Normal	80% of pre-dam 55% exceedance	485	511	85% of pre-dam 5% exceedance	261	290
Wet	No Action			No Action		

Window 2: "During SRDF operations flows would be managed not to exceed the operational limitations of the SRDF or roughly 150 cfs as measured at Spreckels. Flows would be managed to meet the minimum requirements (80 cfs at Chualar for 8 days) described above and increases consistent with SRDF operations would be made as conditions permit to encourage movement of smolts through April and May."

Smolt Downstream Migration

- Minimum migration flow thresholds of 80 cfs at Chualar following end of smolt migration period through June 15 should conditions permit.

Kelt Downstream Migration

- Maintain minimum migration flows of 80 cfs at Chualar through the end of June as conditions permit for wet-normal and wet water year types with a target of 10 consecutive days while the Arroyo Seco River is connected to the Salinas River.

Juvenile Relocation Period

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Water. Engineered.

Modeling Update

November 13, 2024

Outline

- Reoperation Scenario V1 Initial Results

USGS Disclaimer on SVOM

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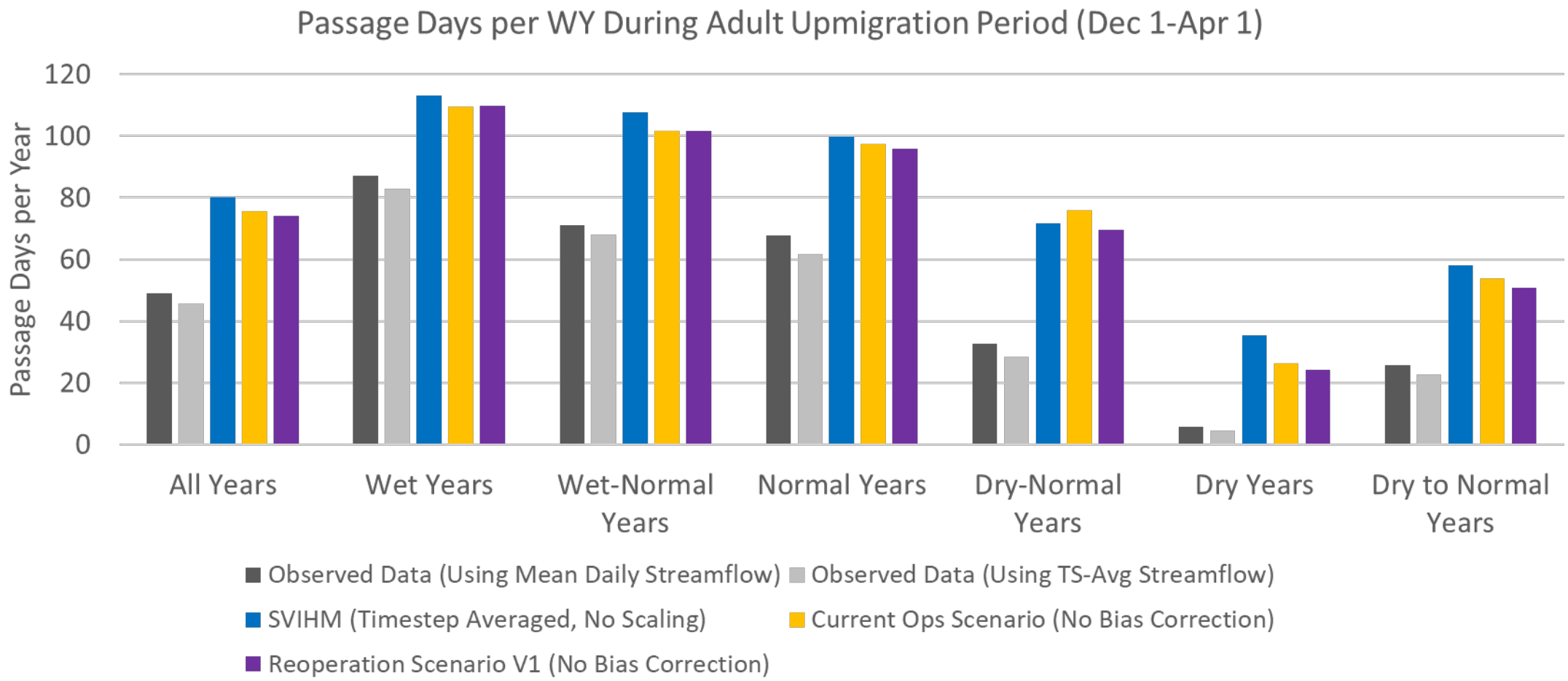
Reoperation Scenario V1

- Implements the fish passage rules of the Draft Reoperation Protocol (see draft Reoperation Decision Trees provided with TAC Meeting Materials)
- Holding not implemented for Adult Passage determination
  - Detailed look at historical observations indicated this every “holding period” would be at least 80 cfs when averaged across model timesteps
- Does not yet implement Bias Correction (next step)
- All fish passage metrics presented here reflect the criteria of the Draft Reoperation Protocol, including those of the Current Operations Scenario
  - i.e., simulated streamflows from the Current Operations Scenario reflect the rules of the Flow Prescription, but are assessed for this presentation using the Reoperation Protocol criteria to allow an apples-to-apples comparison to the Reoperation Scenario results

Passage Days* per Year During Adult Upmigration Period (Dec 1-Apr 1)

*Defined as 80 cfs at Chualar while the Lagoon is Open



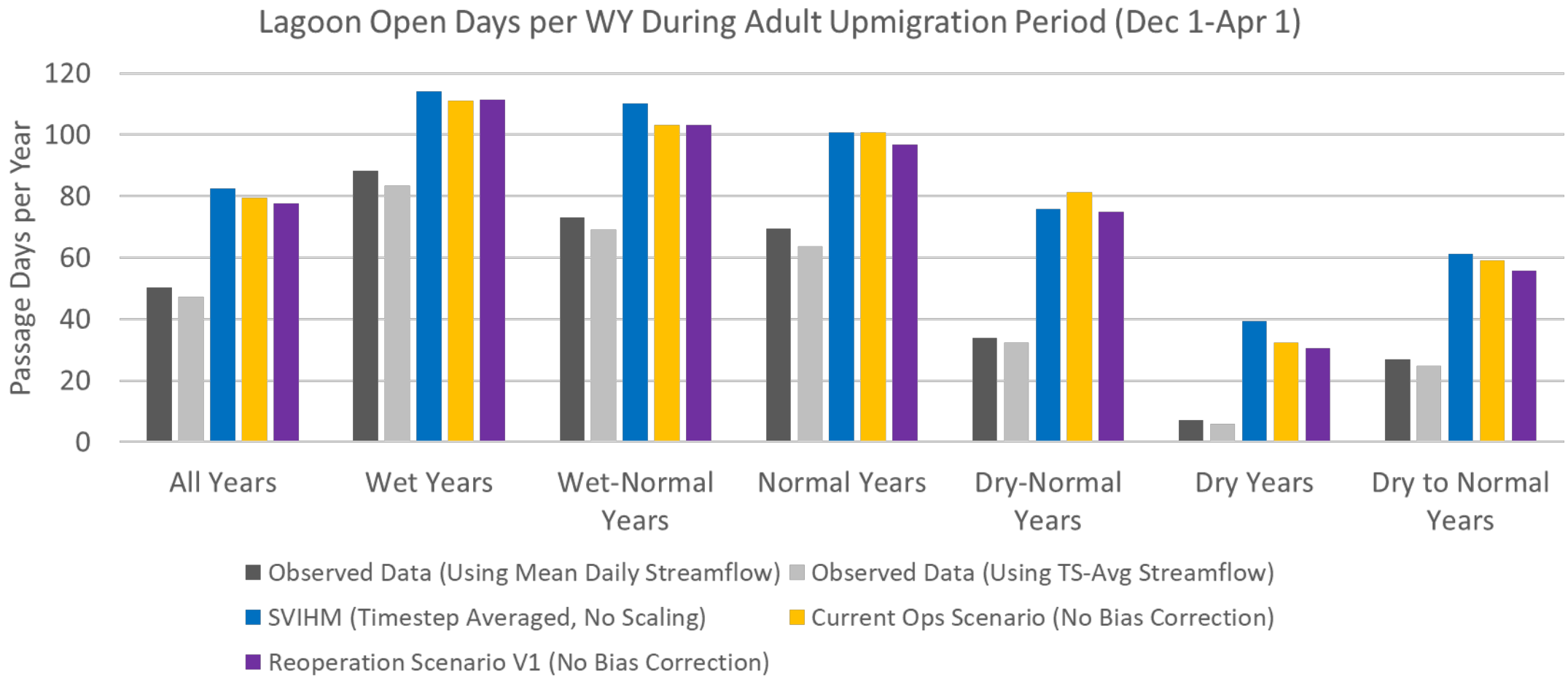
Passage Days* per Year During Adult Upmigration Period (Dec 1-Apr 1)

*Defined as 80 cfs at Chualar while the Lagoon is Open

Water Year Type	Observed Data (Using Mean Daily Streamflow)	Observed Data (Using TS-Avg Streamflow)	SVIHM (Timestep Averaged, No Scaling)	Current Ops Scenario (No Bias Correction)	Reoperation Scenario V1 (No Bias Correction)
Averaging Period	*Dec 1-Apr 1*	*Dec 1-Mar 31*	*Dec 1-Mar 31*	*Dec 1-Mar 31*	*Dec 1-Mar 31*
All Years	49	46	80	76	74
Wet Years	87	83	114	109	110
Wet-Normal Years	71	68	110	102	102
Normal Years	68	62	101	98	96
Dry-Normal Years	33	29	76	76	70
Dry Years	6	5	39	26	24
Dry to Normal Years	26	23	61	54	51

Lagoon Open* Days per Year During Adult Migration Period (Dec 1-Apr 1)

*Defined as 80 cfs at Spreckels during the previous timestep



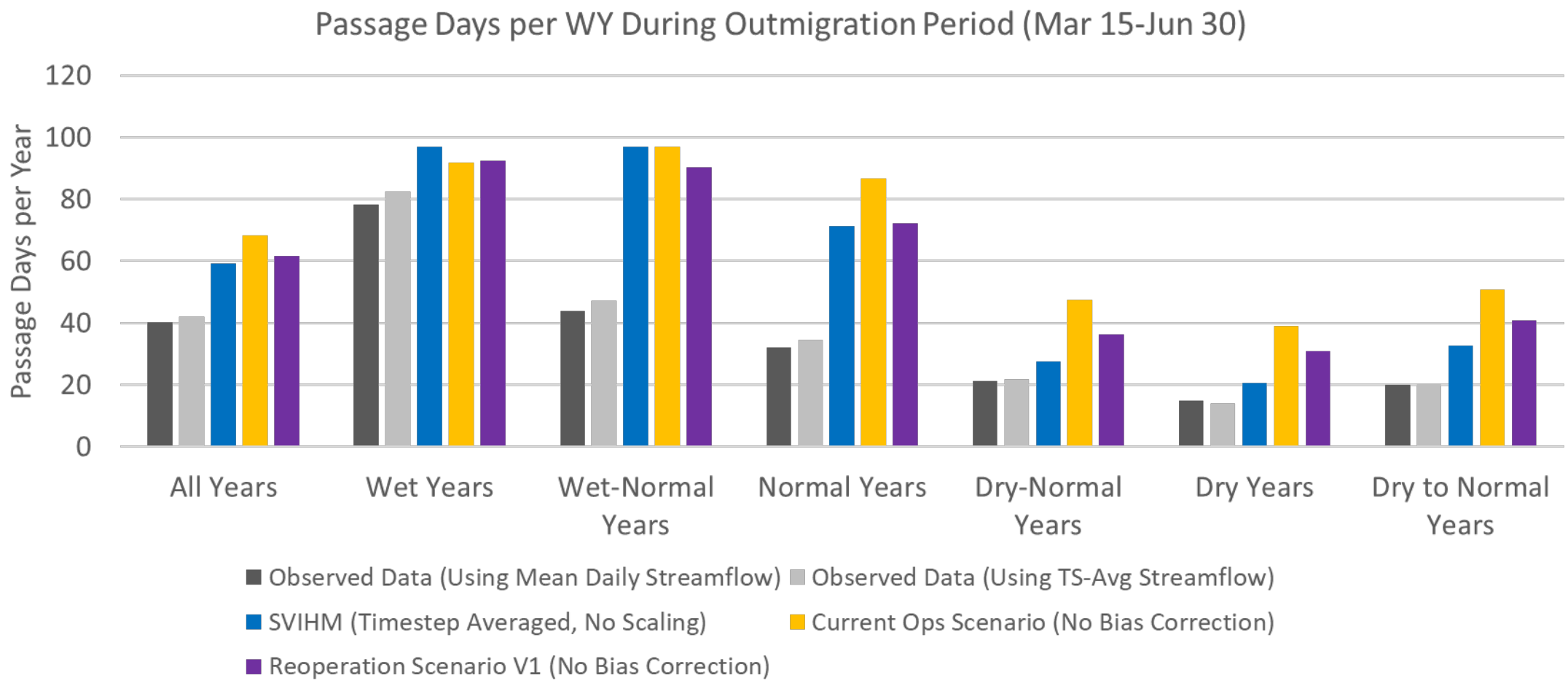
Lagoon Open* Days per Year During Adult Migration Period (Dec 1-Apr 1)

*Defined as 80 cfs at Spreckels during the previous timestep

Water Year Type	Observed Data (Using Mean Daily Streamflow)	Observed Data (Using TS-Avg Streamflow)	SVIHM (Timestep Averaged, No Scaling)	Current Ops Scenario (No Bias Correction)	Reoperation Scenario V1 (No Bias Correction)
Averaging Period	*Dec 1-Apr 1*	*Dec 1-Mar 31*	*Dec 1-Mar 31*	*Dec 1-Mar 31*	*Dec 1-Mar 31*
All Years	50	47	82	80	78
Wet Years	88	84	114	111	111
Wet-Normal Years	73	69	110	103	103
Normal Years	69	64	101	101	97
Dry-Normal Years	34	32	76	81	75
Dry Years	7	6	39	32	31
Dry to Normal Years	27	25	61	59	56

Passage Days* per Year During Outmigration Period (Mar 15-Jun 30)

*Defined as 80 cfs at Chualar



Passage Days* per Year During Outmigration Period (Mar 15-Jun 30)

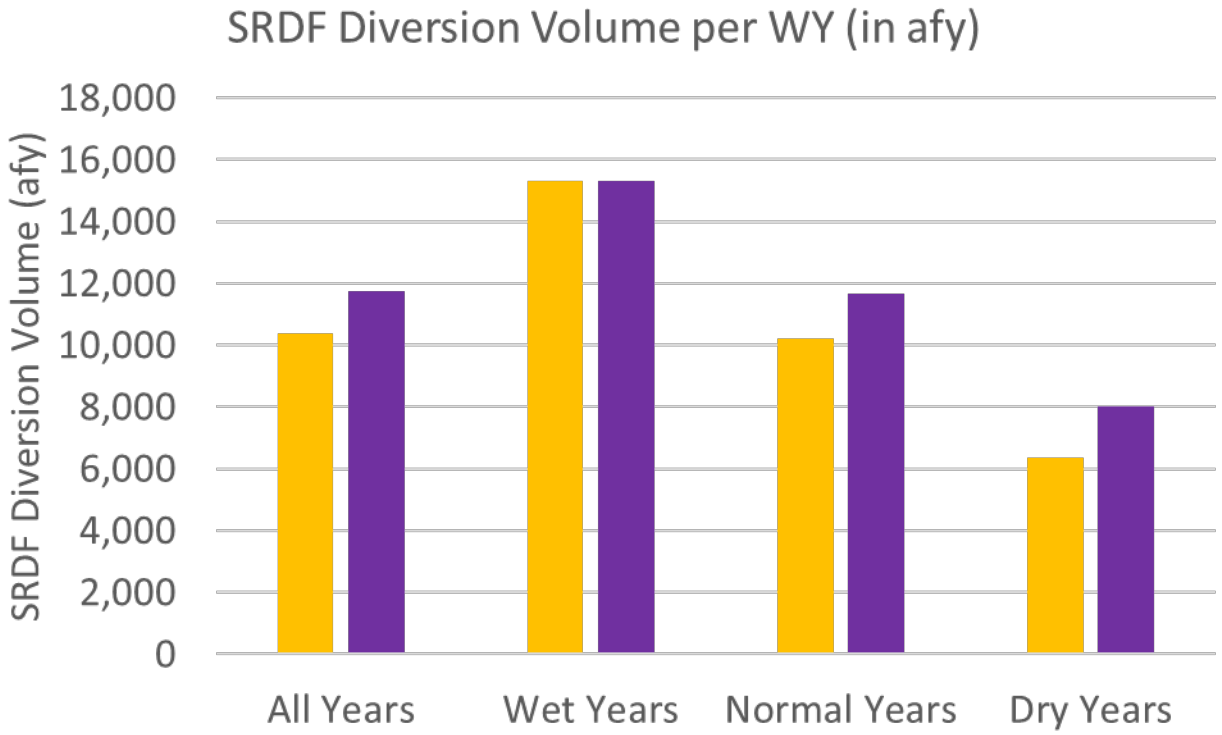
*Defined as 80 cfs at Chualar

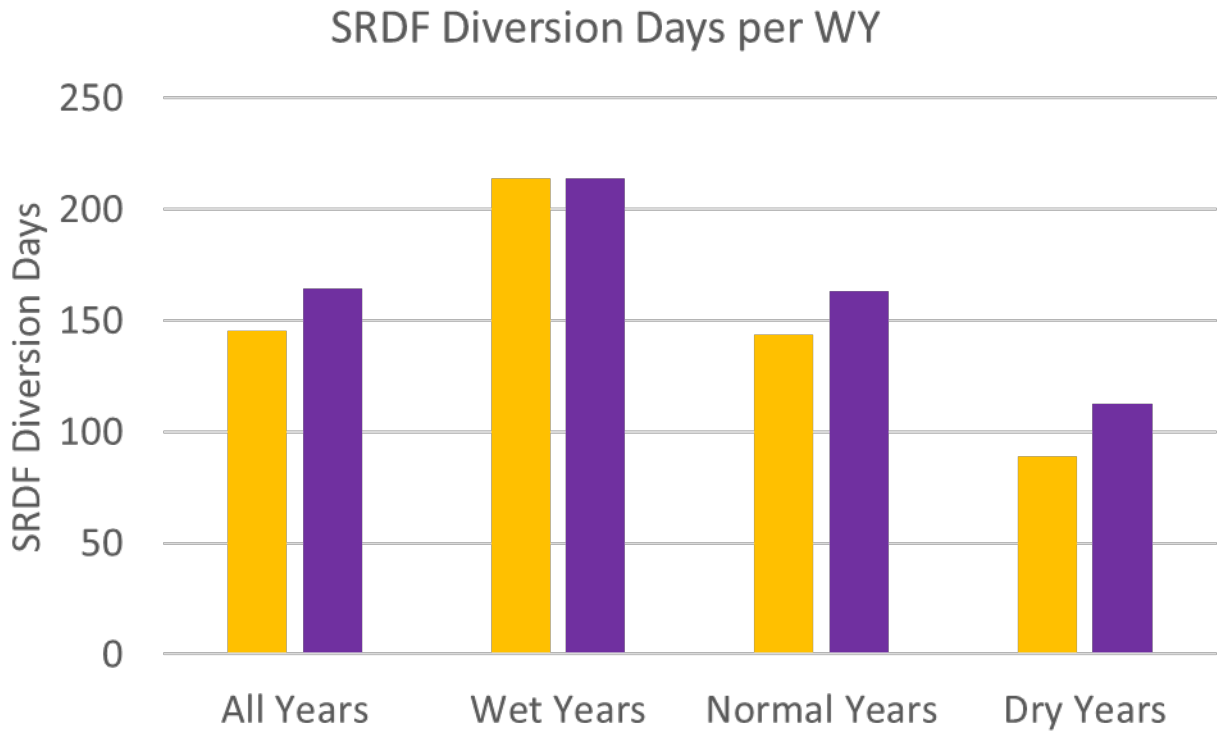
Water Year Type	Observed Data (Mean Daily Streamflow)	Observed Data (Using TS-Avg Streamflow)	SVIHM (Timestep Averaged, No Scaling)	Current Ops Scenario (No Bias Correction)	Reoperation Scenario V1 (No Bias Correction)
Averaging Period	*Mar 15-Jun 30*	*Mar 11-Jun 30*	*Mar 11-Jun 30*	*Mar 11-Jun 30*	*Mar 11-Jun 30*
All Years	40	42	59	69	62
Wet Years	78	82	98	93	93
Wet-Normal Years	44	47	97	97	90
Normal Years	32	35	71	87	72
Dry-Normal Years	21	22	28	48	36
Dry Years	15	14	21	39	31
Dry to Normal Years	20	20	33	51	41

SRDF Operations

Current Operations Scenario
Reoperation Scenario V1

- Increased operation of the SRDF
  - About 13% more diversion volume and diversion days during all years
  - About 25% more diversion volume and diversion days during dry years





SRDF Operations

- Increased operation of the SRDF
  - About 13% more diversion volume and diversion days during all years
  - About 25% more diversion volume and diversion days during dry years

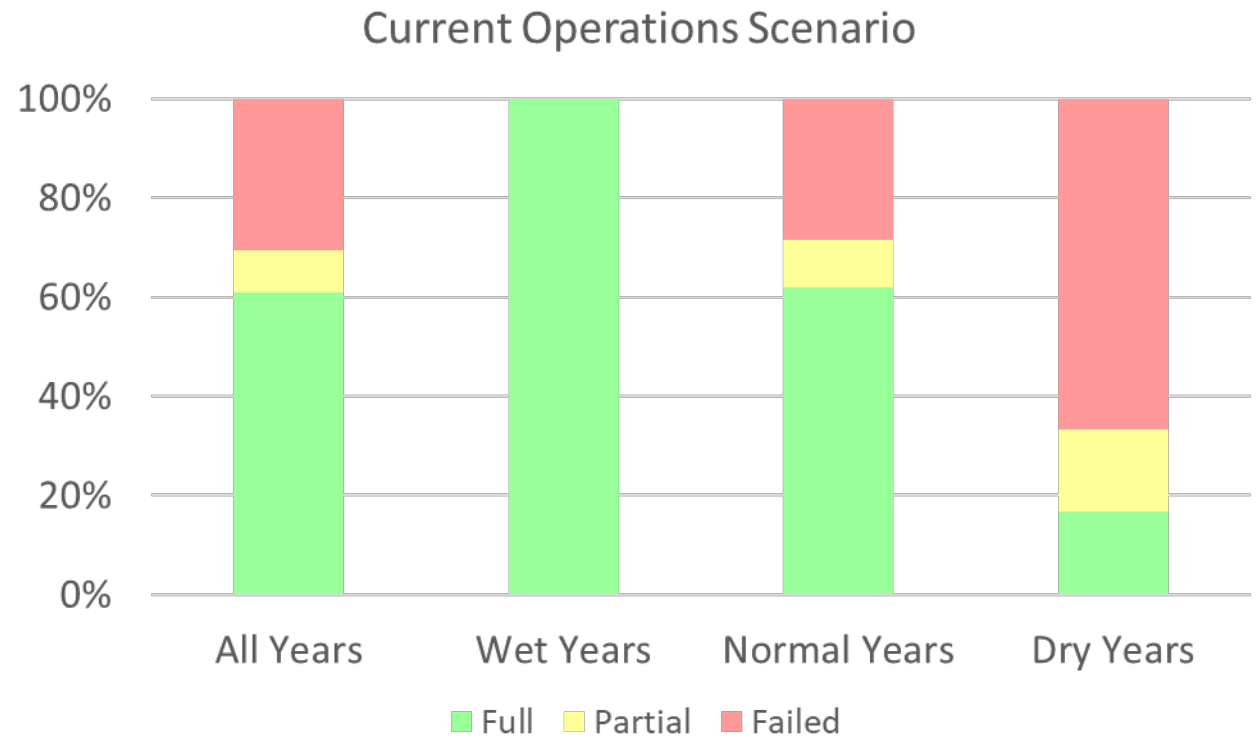
Year Type	Current Operations (No Bias Correction)		Reoperation V1 (No Bias Correction)	
	Diversion Vol (afy)	Diversion Days	Diversion Vol (afy)	Diversion Days
All	10,400	145	11,700 *+1,400*	164 *+19*
Wet	15,300	214	15,300 *+0*	214 *+0*
Normal	10,200	144	11,700 *+1,500*	163 *+20*
Dry	6,400	89	8,000 *+1,700*	112 *+24*

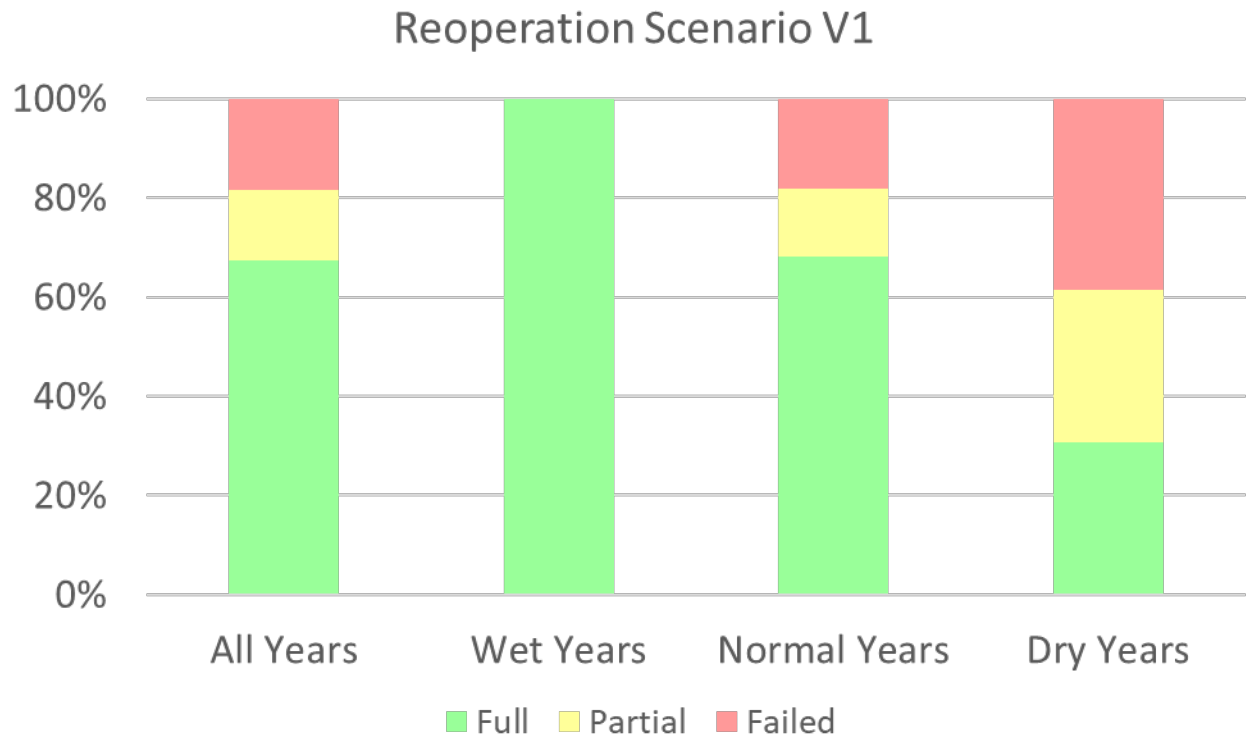
Totals may not sum due to rounding

SRDF Operations

- Increased operation of the SRDF
  - Fewer “Failed” years, more “Full” years

- Out of 51 operational years in the model:
  - 5 changed from “Failed” to “Partial”
  - 6 changed from “Partial to “Full”
  - 1 changed from “Partial” to “Failed”





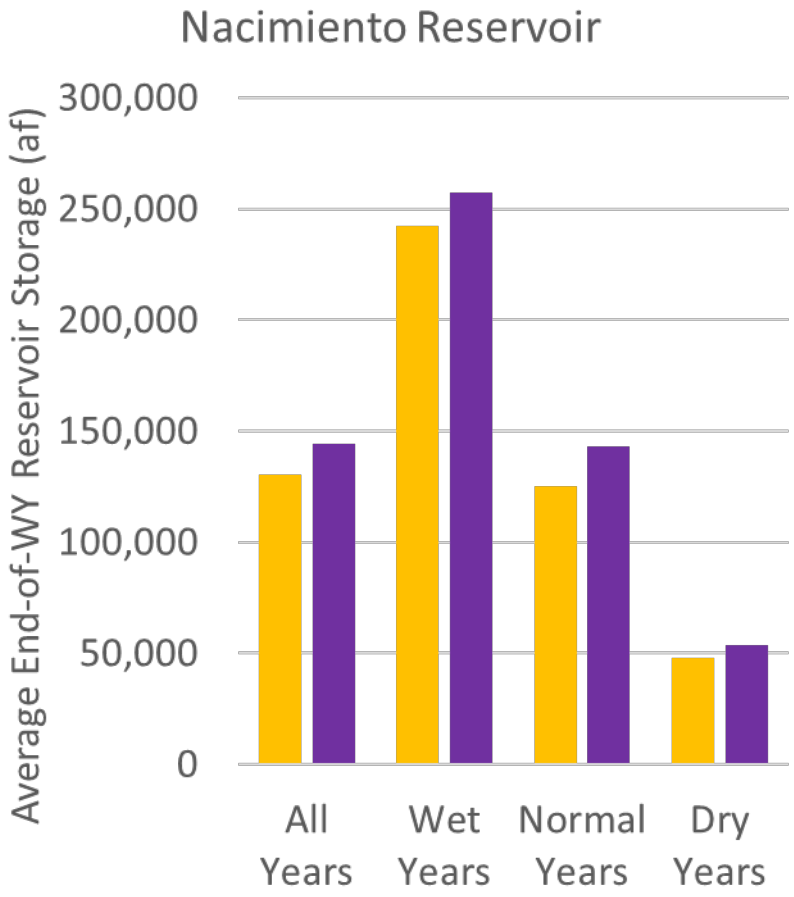
SRDF Operations

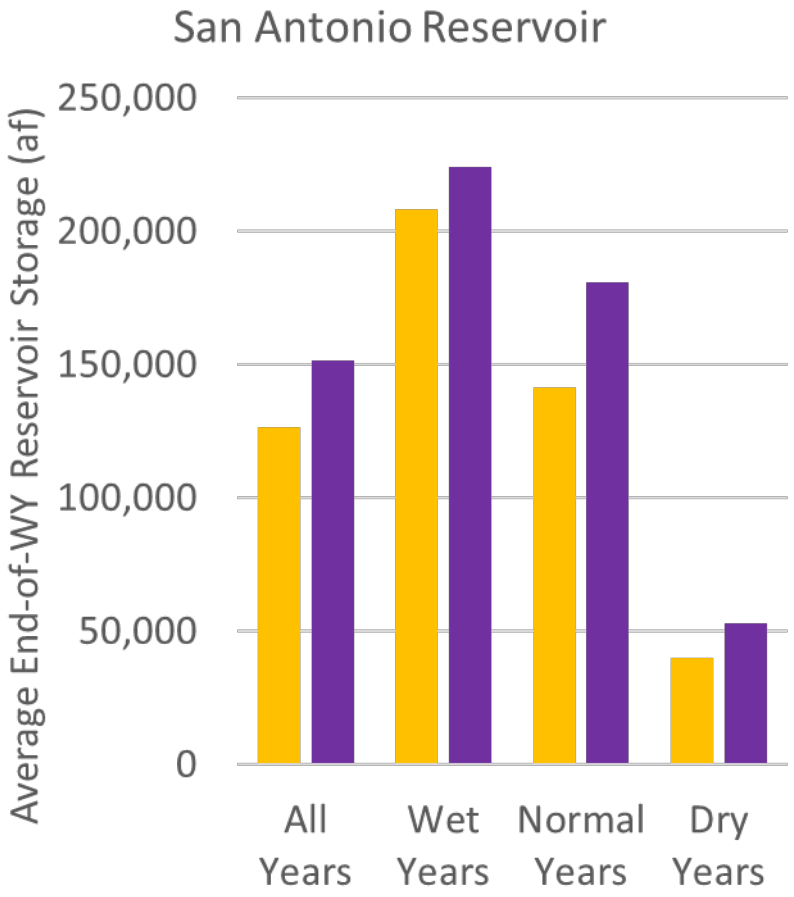
- Increased operation of the SRDF
  - Fewer “Failed” years, more “Full” years
  - Out of 51 operational years in the model:
    - 5 changed from “Failed” to “Partial”
    - 6 changed from “Partial to “Full”
    - 1 changed from “Partial” to “Failed”

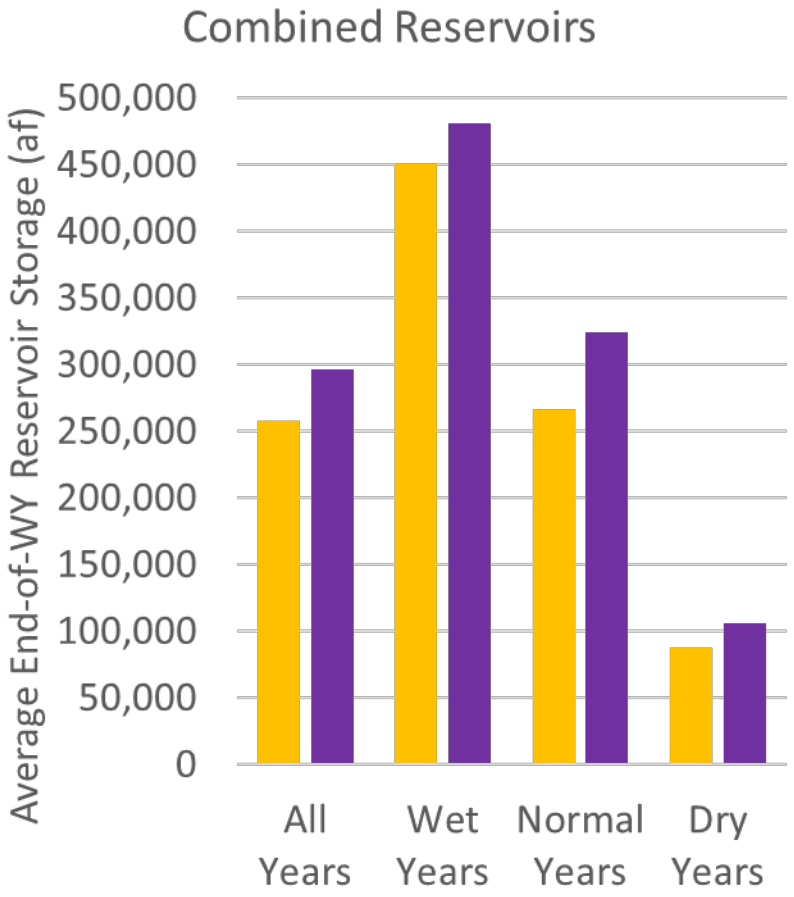
Year Type	Current Operations (No Bias Correction)			Reoperation V1 (No Bias Correction)		
	Full Years	Partial Years	Failed Years	Full Years	Partial Years	Failed Years
All	56%	8%	28%	66%	14%	18%
Wet	100%	0%	0%	100%	0%	0%
Normal	59%	9%	27%	65%	13%	17%
Dry	13%	13%	53%	31%	31%	38%

Reservoir Storage

- Increased storage in the reservoirs







Reservoir Storage

- Increased storage in the reservoirs

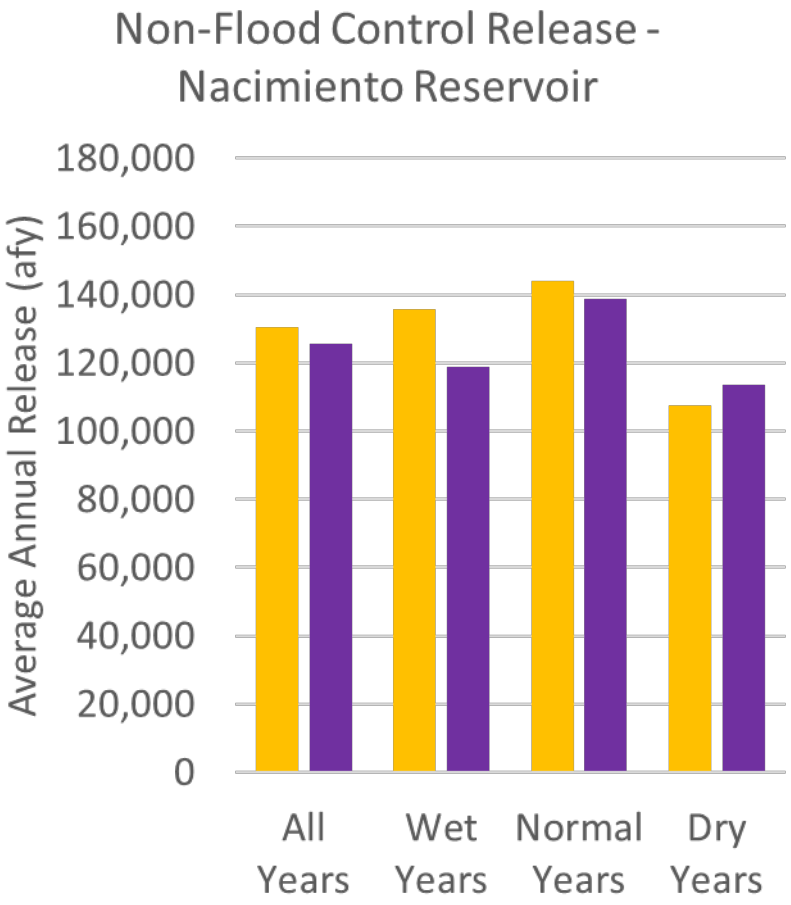
	Current Operations End-of-WY Storage (af)			Reoperation Scenario End-of-WY Storage (af)		
	Nacimiento	San Antonio	Combined	Nacimiento	San Antonio	Combined
All Years	130,600	126,600	257,200	144,000 *+13,400*	151,600 *+25,000*	295,600 *+38,400*
Wet Years	242,400	208,300	450,700	257,200 *+14,800*	223,800 *+15,500*	481,000 *+30,300*
Normal Years	124,900	141,400	266,300	143,100 *+18,100*	180,800 *+39,400*	323,900 *+57,600*
Dry Years	47,600	39,700	87,400	53,400 *+5,700*	52,600 *+12,900*	106,000 *+18,600*

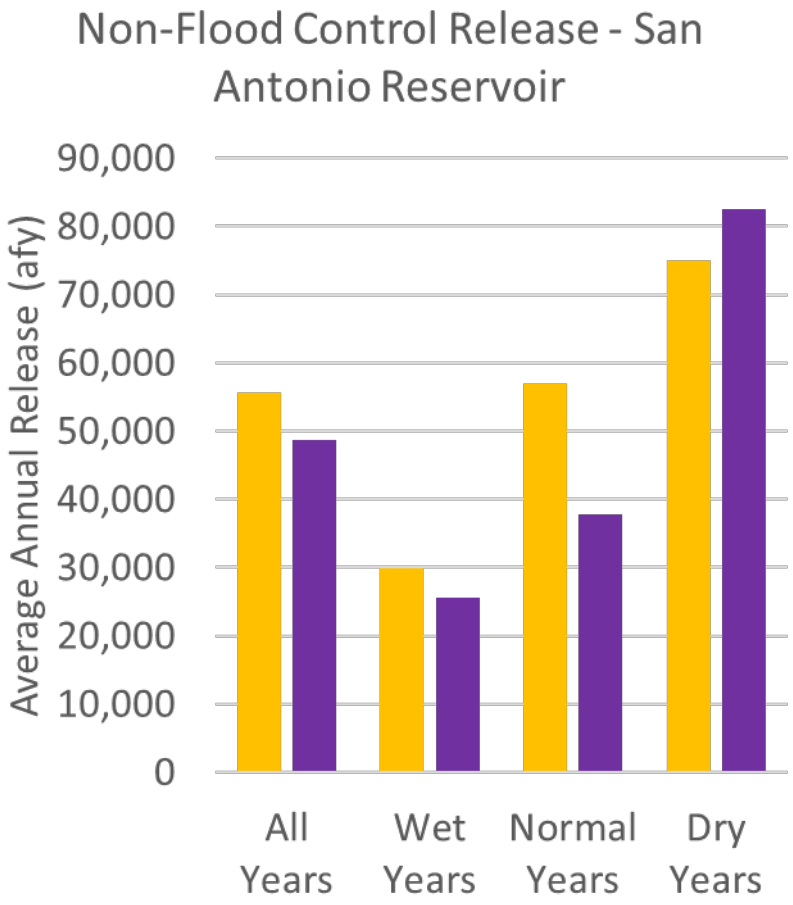
Totals may not sum due to rounding

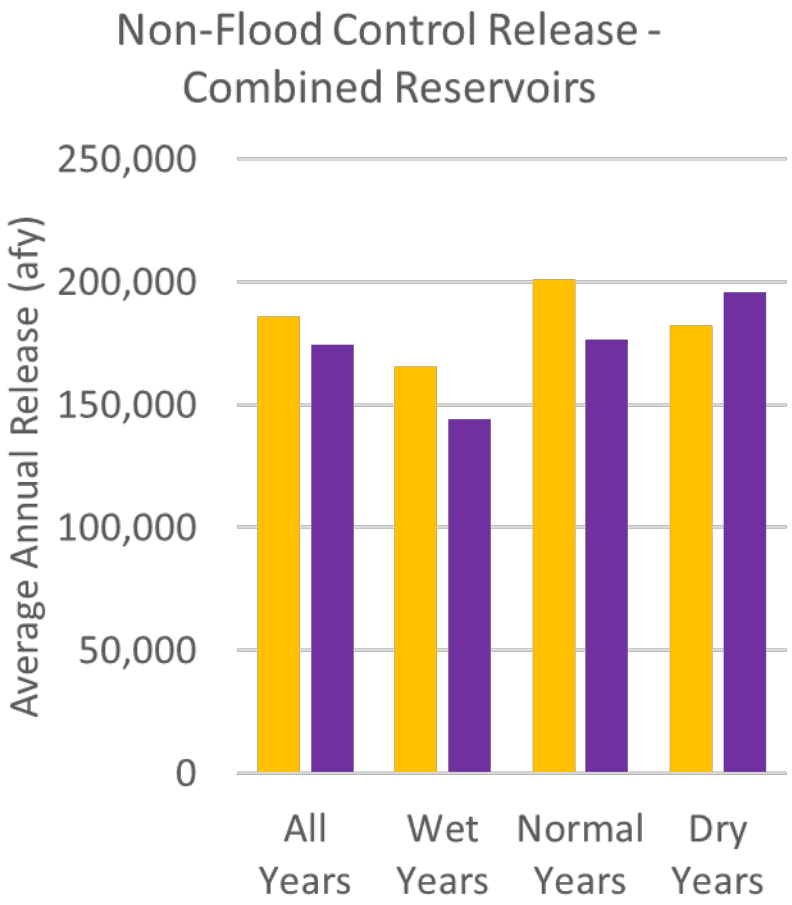
Reservoir Releases

Current Operations Scenario
Reoperation Scenario V1

- Decreased non-Flood Control Releases, increased Flood Control Releases







Reservoir Releases

- Decreased non-Flood Control Releases, increased Flood Control Releases

Average Annual Non-Flood Control Release (afy)

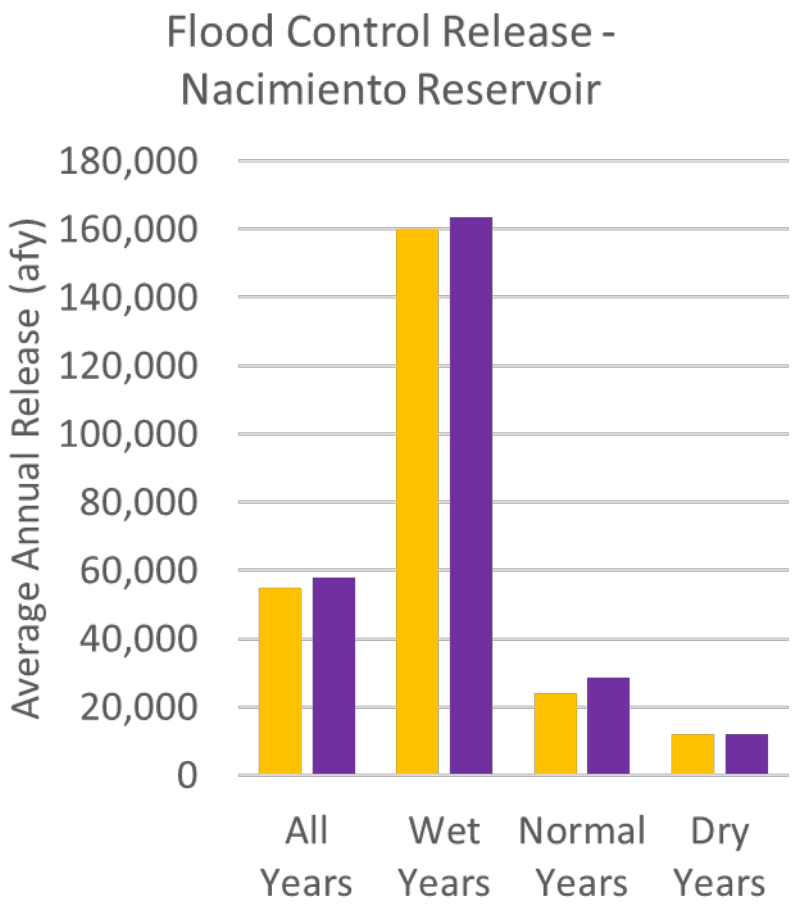
	Current Operations Non-FCR (afy)			Reoperation Scenario Non-FCR (afy)		
	Nacimiento	San Antonio	Combined	Nacimiento	San Antonio	Combined
All Years	130,400	55,700	186,100	125,700 *-4,700*	48,700 *-7,000*	174,400 *-11,700*
Wet Years	135,900	29,900	165,700	118,700 *-17,100*	25,500 *-4,400*	144,200 *-21,500*
Normal Years	143,900	56,900	200,800	138,700 *-5,200*	37,800 *-19,100*	176,500 *-24,300*
Dry Years	107,400	75,000	182,400	113,400 *+6,000*	82,500 *+7,500*	195,900 *+13,500*

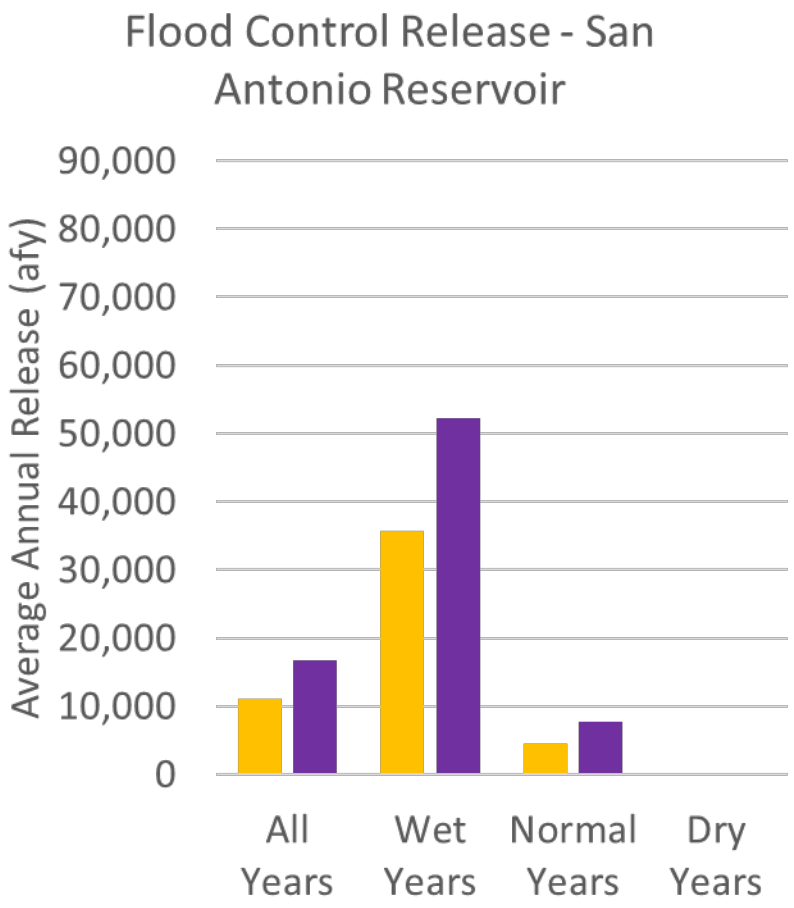
Totals may not sum due to rounding

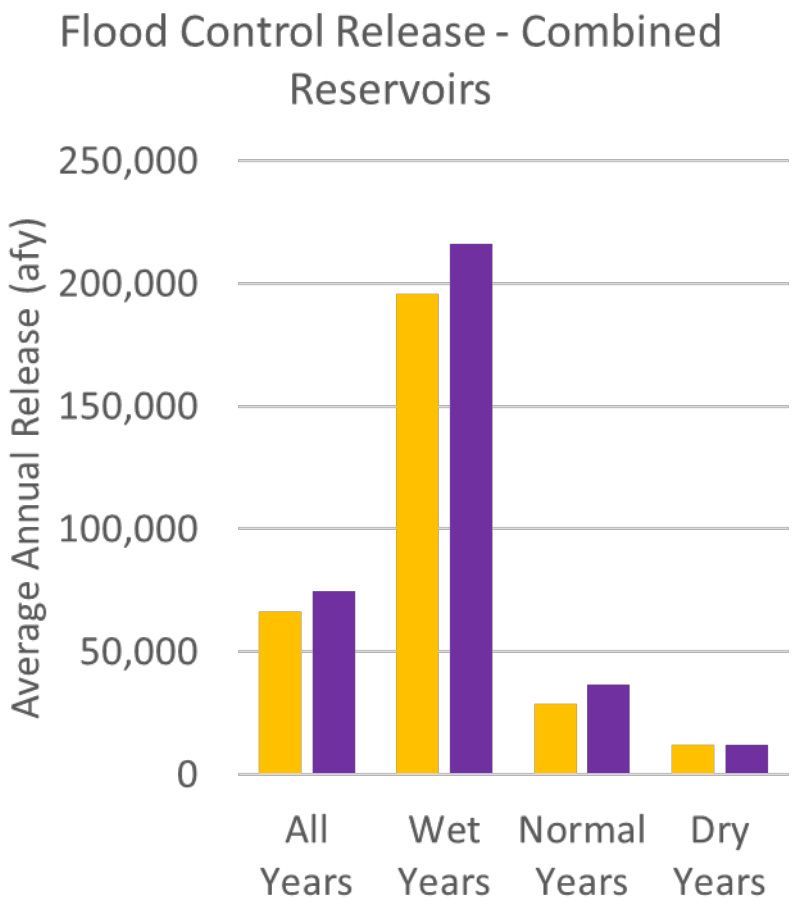
Reservoir Releases

Current Operations Scenario
Reoperation Scenario V1

- Decreased non-Flood Control Releases, increased Flood Control Releases







Reservoir Releases

- Decreased non-Flood Control Releases, increased Flood Control Releases

Average Annual Flood Control Release (afy)

	Current Operations Non-FCR (afy)			Reoperation Scenario Non-FCR (afy)		
	Nacimiento	San Antonio	Combined	Nacimiento	San Antonio	Combined
All Years	54,900	11,100	66,000	57,800 *+2,800*	16,700 *+5,600*	74,500 *+8,400*
Wet Years	160,200	35,800	196,000	163,600 *+3,400*	52,300 *+16,600*	215,900 *+20,000*
Normal Years	24,000	4,600	28,500	28,500 *+4,500*	7,800 *+3,200*	36,300 *+7,700*
Dry Years	12,000	0	12,000	12,000 *+0*	0 *+0*	12,000 *+0*

Totals may not sum due to rounding

Results Summary

- Slight decrease in the number of Passage Days per year during Adult Upmigration Period (Dec 1-Apr 1) and Outmigration Period (Mar 15-Jun 30)
- Longer SRDF seasons and greater SRDF diversion volume
- Fewer failed SRDF seasons and more full SRDF seasons
- Increased end-of-WY storage in the reservoirs
- Decreased non-Flood Control Release, increased Flood Control Release

Next Steps

- Further post-processing of this scenario
- Potential modification of Reoperation Protocol rules
  - Arroyo Seco flow triggers
  - Outmigration periods and triggers
- Refine Outmigration Passage Days to differentiate Smolt/Kelt/Juvenile period Outmigration Passage Days
- Implementation of Bias Correction on this scenario
- Development of additional Reoperation Scenarios

THANK YOU

WESTYOST.COM

DRAFT Decision Trees for Initial Reoperation Scenario

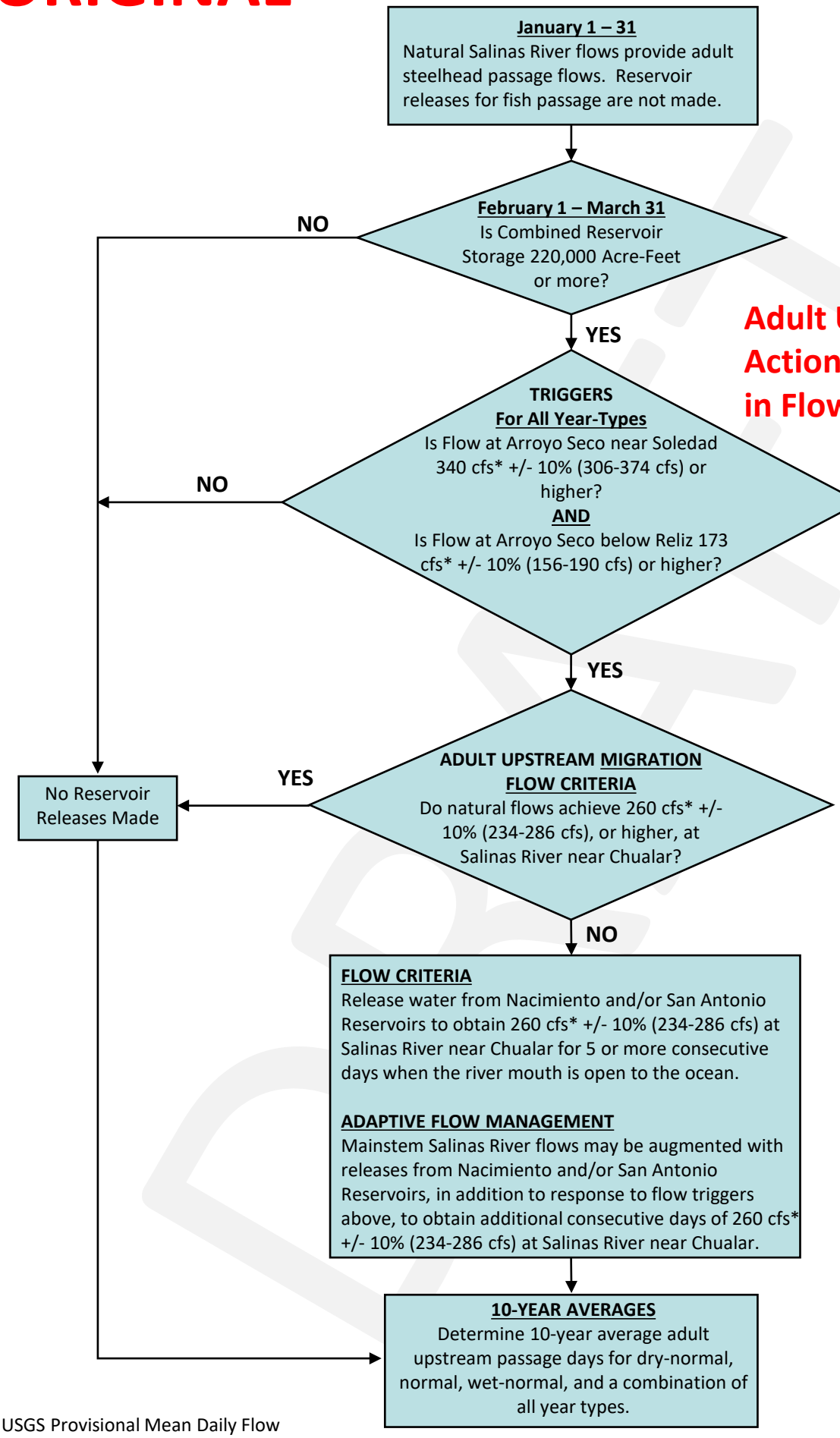
Salinas River Operations Habitat Conservation Plan TAC Meeting

13 Nov 2024

Slide	Decision Tree
2	Adult, Flow Prescription
3	Adult, Reoperation Protocol
4	Smolt, Flow Prescription
5	Smolt/Kelt, Reoperation Protocol
6	Kelt/Juvenile, Flow Prescription
7	Juvenile, Reoperation Protocol

ORIGINAL

Adult Upstream Migration Action Flow Chart, Figure 3 in Flow Prescription



*USGS Provisional Mean Daily Flow

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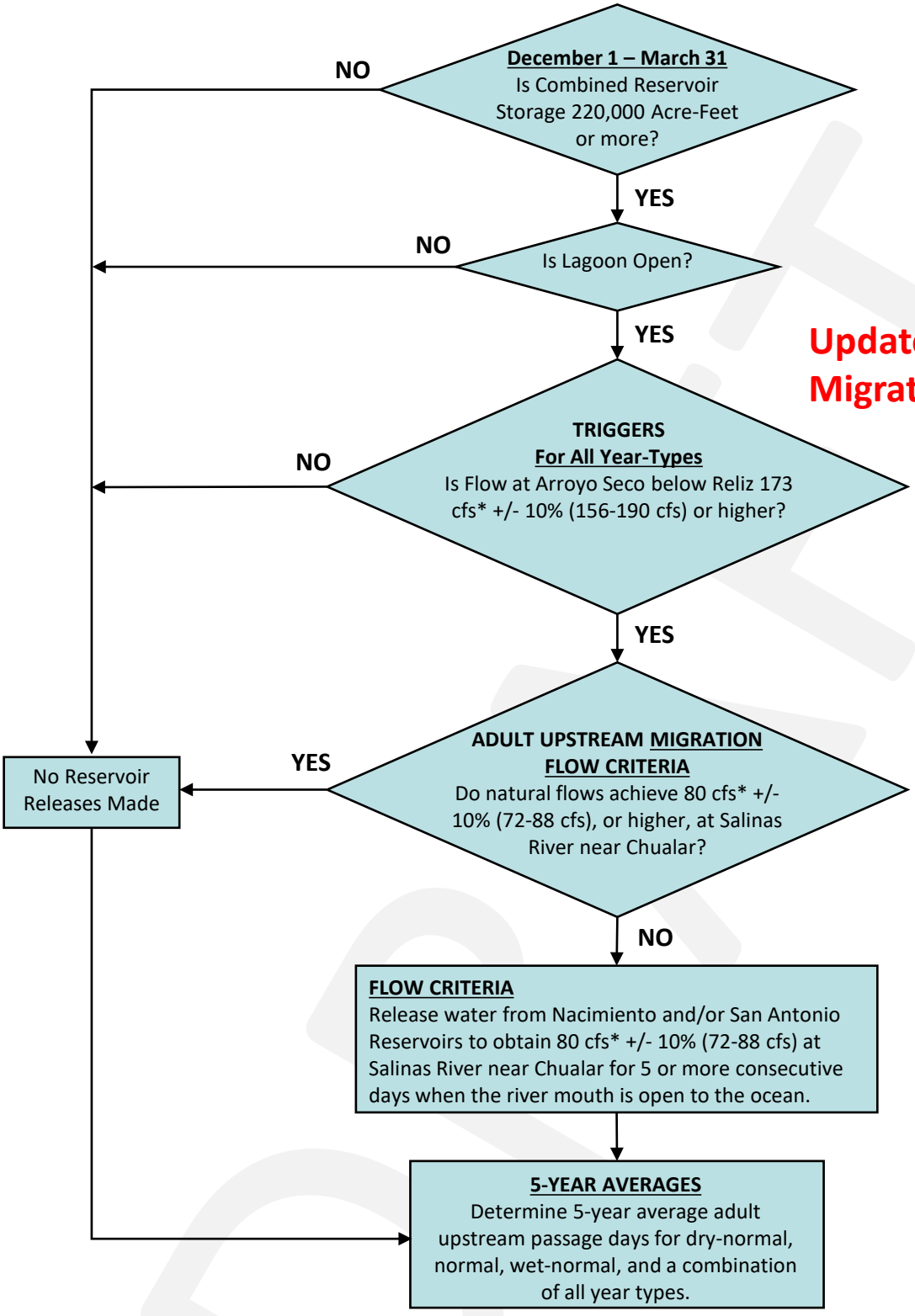
Adult Rules

Updated Adult Upstream Migration Action Flow Chart



*USGS Provisional Mean Daily Flow

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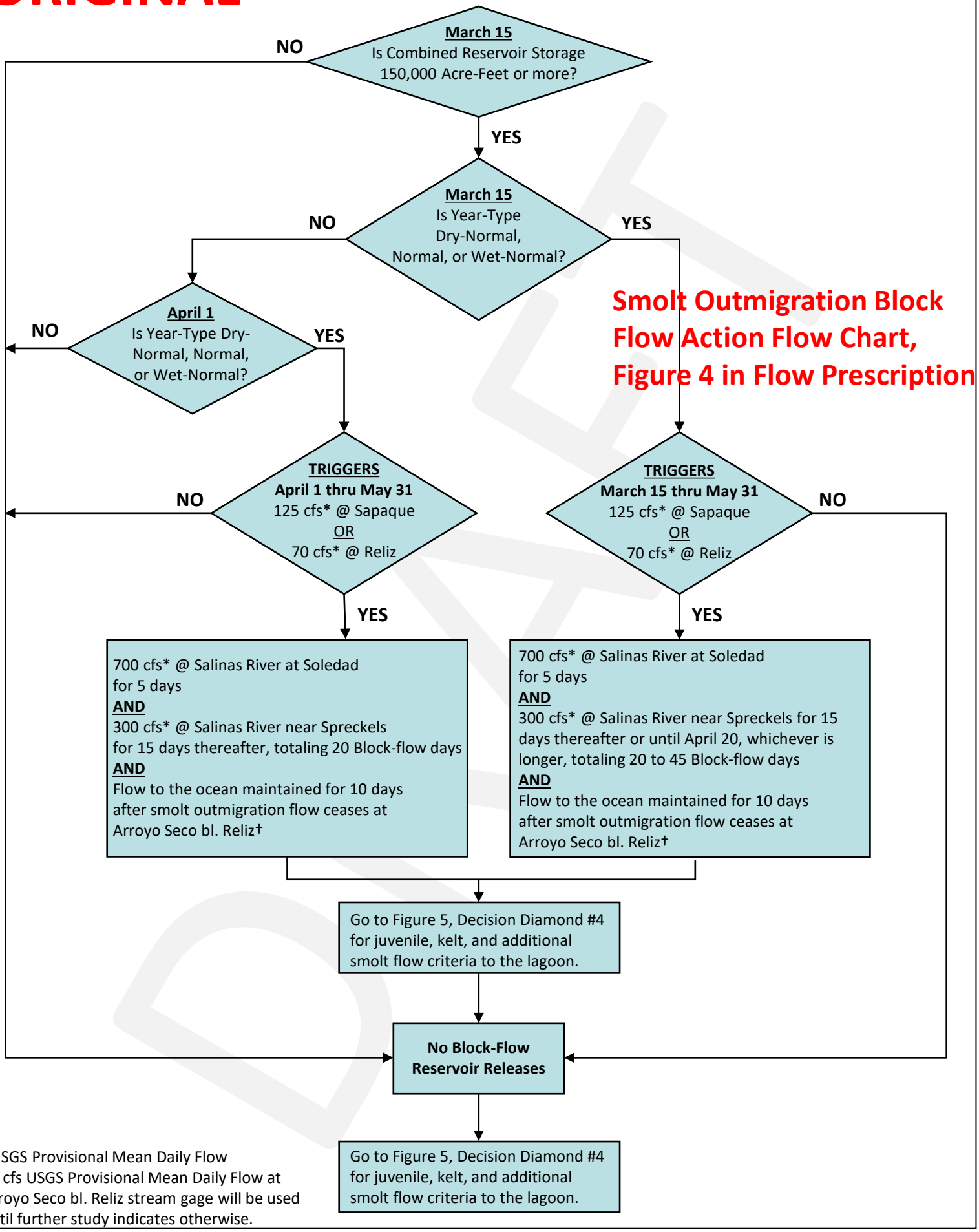
ORIGINAL



Smolt Outmigration Block Flow Action Flow Chart, Figure 4 in Flow Prescription

*USGS Provisional Mean Daily Flow
†1 cfs USGS Provisional Mean Daily Flow at Arroyo Seco bl. Reliz stream gage will be used until further study indicates otherwise.

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Smolt Rules

Updated Smolt and Juven Outmigration Action Flow Chart

March 15
Is Combined Reservoir Storage 150,000 Acre-Feet or more?

NO

YES

March 15
Is Year-Type Dry-Normal, Normal, or Wet-Normal?

NO

YES

April 1
Is Year-Type Dry-Normal, Normal, or Wet-Normal?

NO

YES

TRIGGER
March 15 thru March 31
173 cfs* @ Reliz

NO

YES

TRIGGER
April 1 thru May 31
173 cfs* @ Reliz

NO

YES

Initial High Flow Period:
151 to 511 cfs* @ Salinas River at Soledad AND
121 to 485 cfs* @ Salinas River near Spreckels for 5 days
AND
110 to 290 cfs* @ Salinas River at Soledad AND
80 to 261 cfs* @ Salinas River near Spreckels for 3 to 15 days

FLOW CRITERIA
Release water from Nacimiento and/or San Antonio Reservoirs to obtain 80 cfs* +/- 10% (72-88 cfs) at Salinas River near Chualar for 8 or more consecutive days.

April 1 - June 30
2 cfs to Lagoon when SRDF diversion flows OR conservation releases occur

Kelt Rules

TRIGGER
June 1 thru June 15
173 cfs* @ Reliz

YES

NO

FLOW CRITERIA
Release water from Nacimiento and/or San Antonio Reservoirs to obtain 80 cfs* +/- 10% (72-88 cfs) at Salinas River near Chualar.

Go to juvenile rule decision tree

No Smolt or Kelt Reservoir Releases

No Kelt Reservoir Releases

*USGS Provisional Mean Daily Flow
†1 cfs USGS Provisional Mean Daily Flow at Arroyo Seco bl. Reliz stream gage will be used until further study indicates otherwise.

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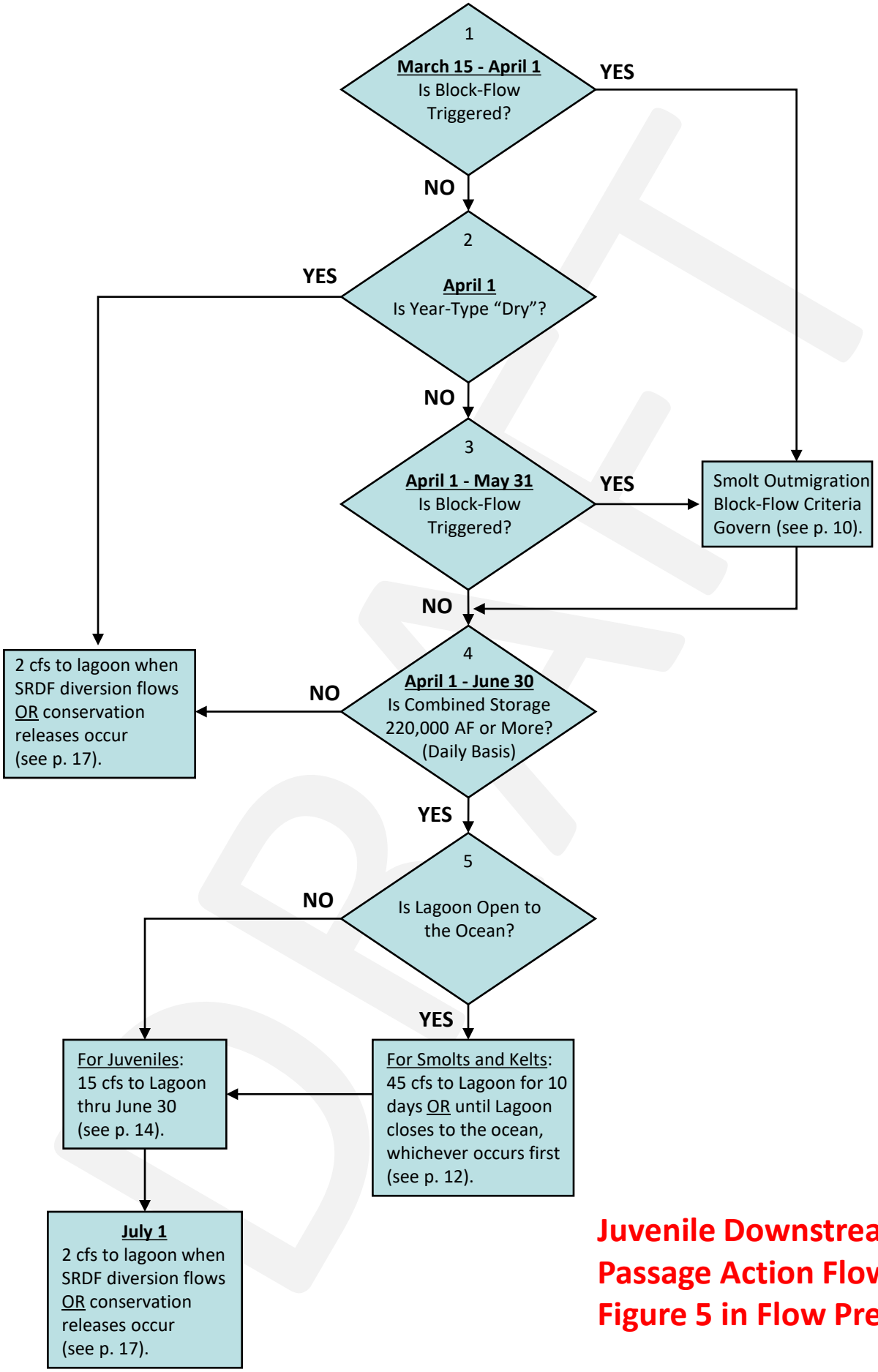
WEST YOST

ORIGINAL



Juvenile Downstream Passage Action Flow Chart, Figure 5 in Flow Prescription

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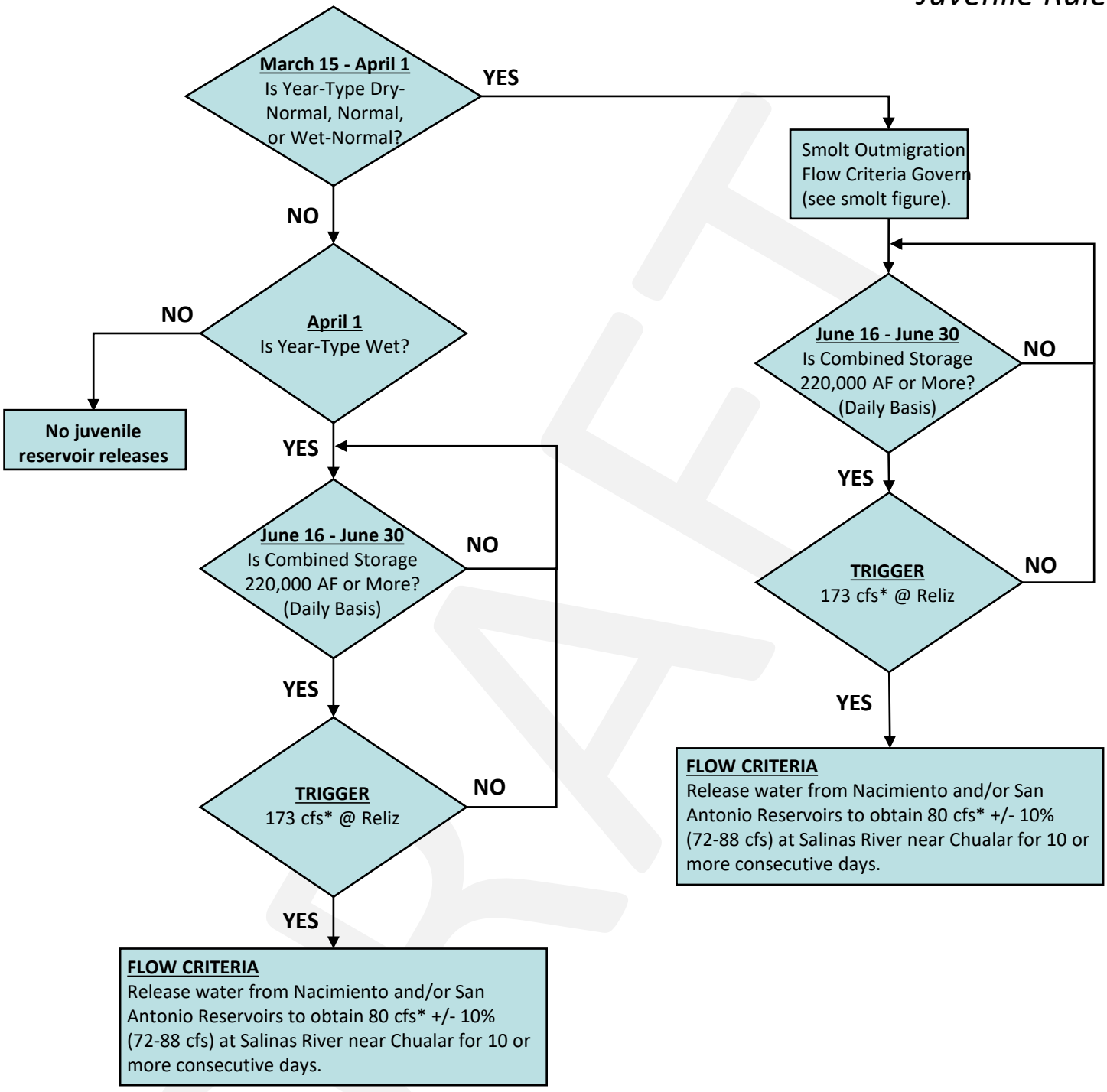
Juvenile Rules



April 1 - June 30
2 cfs to Lagoon when SRDF diversion flows OR conservation releases occur

Updated Juvenile Downstream Passage Action Flow Chart

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Reservoir Reoperation Scenarios

Jason Demers – MCWRA

3 Scenarios Proposed at last TAC Meeting

1. Modified Passage Flow Targets
2. Modified Passage Flow Targets plus Winter Releases from Storage
3. Modified Passage Flow Targets plus Winter Bypass Flows

3 Scenarios – Revised

1. Modified Passage Flow Targets – initial model run performed
2. Modified Passage Flow Targets ~~plus Winter Releases from Storage~~ plus Winter Bypass flows (Fish Passage)
   - Initial comments suggested a preference for bypass flows over releases from storage
   - Propose using bypass flows to meet specific fish passage goals (IOP)
3. Modified Passage Flow Targets plus Winter Bypass Flows (Channel Wetting)

Scenario 1: Modified Passage Flow Targets

- Critical Riffle Analysis results identified target flow of 80 cfs at Chualar as sufficient for adult upstream passage
- Upstream Passage time window expanded: December 1-April 1.
- Propose to use 80 cfs target for all life stages, upstream and downstream migration
- One model run with new target, time window and modified block flow

Scenario 1: Modified Passage Flow Targets

- Results….
- Were there any specific circumstances where TAC members feel fish passage targets were not met or fish passage opportunities were not sufficient?

Scenario 2: Scenario 1 plus Winter Bypass Flows (Fish Passage)

- Based on the model results presented for Scenario 1, were there any areas where triggers and flow failed to meet fish passage needs?
- Can those areas be improved by implementing an IOP like scenario using bypass flows?

Scenario 3: Scenario 1 plus Winter Bypass flows (Channel Wetting)

- Bypass some winter inflow during early season storm events when fish triggers are not met
- November-December early season is focus
- Mimic natural conditions
- Winter recharge closer to natural occurrence
- Channel wetting flows without impacting water rights storage

Scenario 3: Considerations

- Is there a measurable benefit to fish or groundwater from making channel wetting flows?
- Trigger for bypass flows
  - Reservoir storage?, volume of inflow?
- Duration of bypass
  - Percentage of inflow, volume, number of days?
- Other?