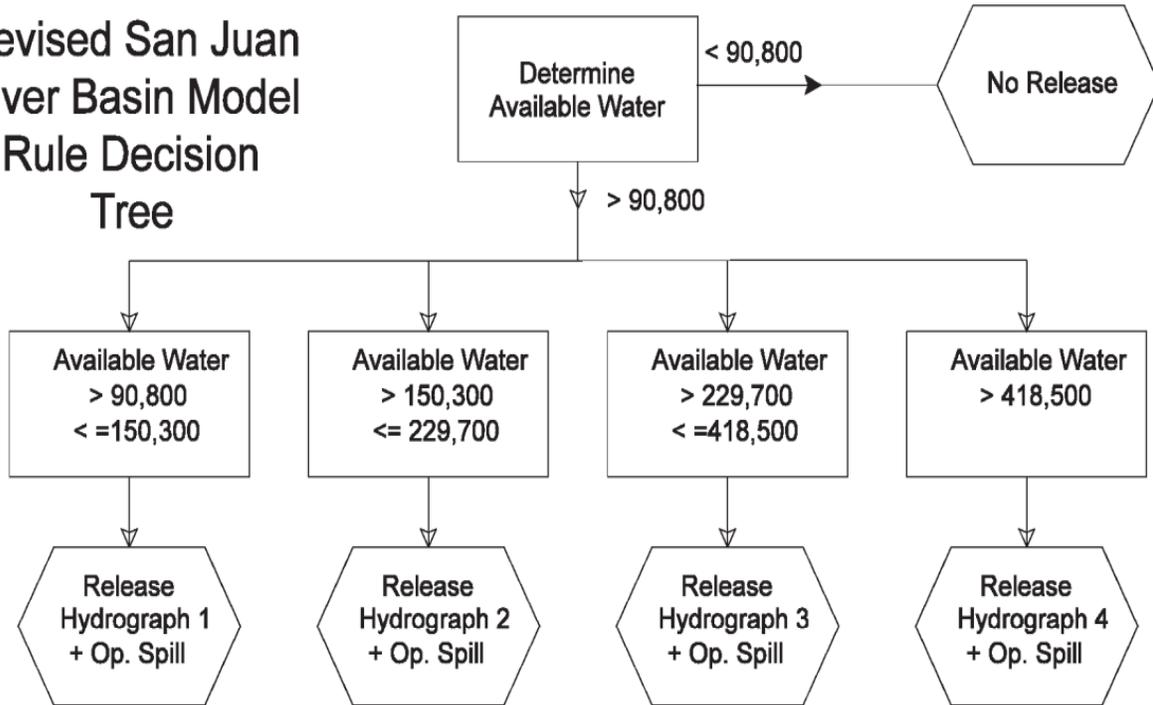


**2015 interim operations decision tree, EWYST 6,063**

**Revised San Juan  
River Basin Model  
Rule Decision  
Tree**



**Notes on Spring Peak Releases (SPR):**

Hydrograph 1: 1-week at 5,000 cfs with 3 day ramps up and down: 90,843 af

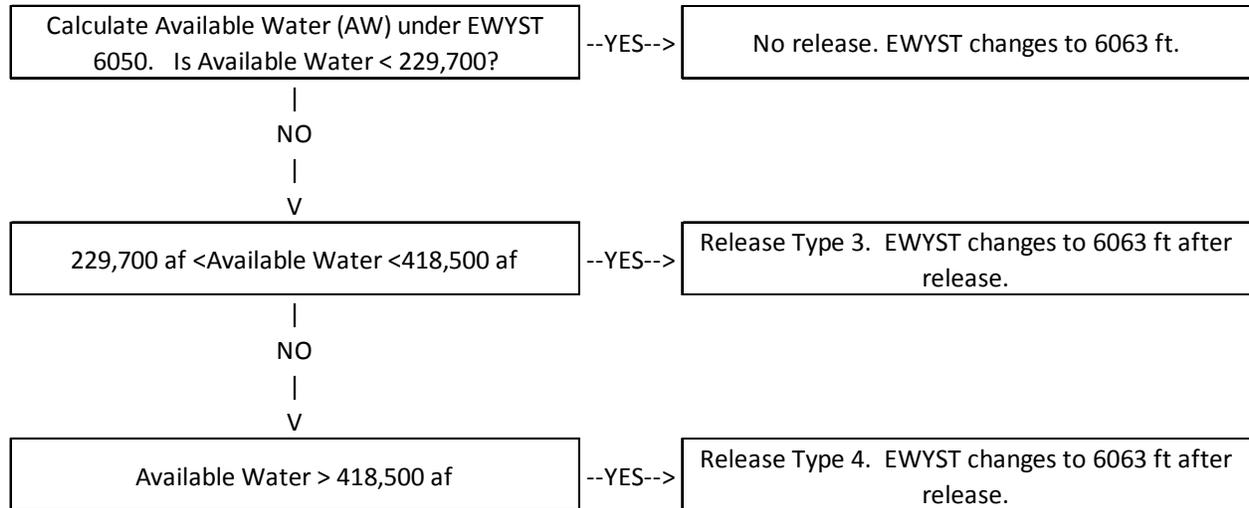
Hydrograph 2: 2-weeks at 5,000 cfs with 3 day ramps up and down: 150,347 af

Hydrograph 3: 3-weeks at 5,000 cfs with 3 day ramps up and down: 229,686 af

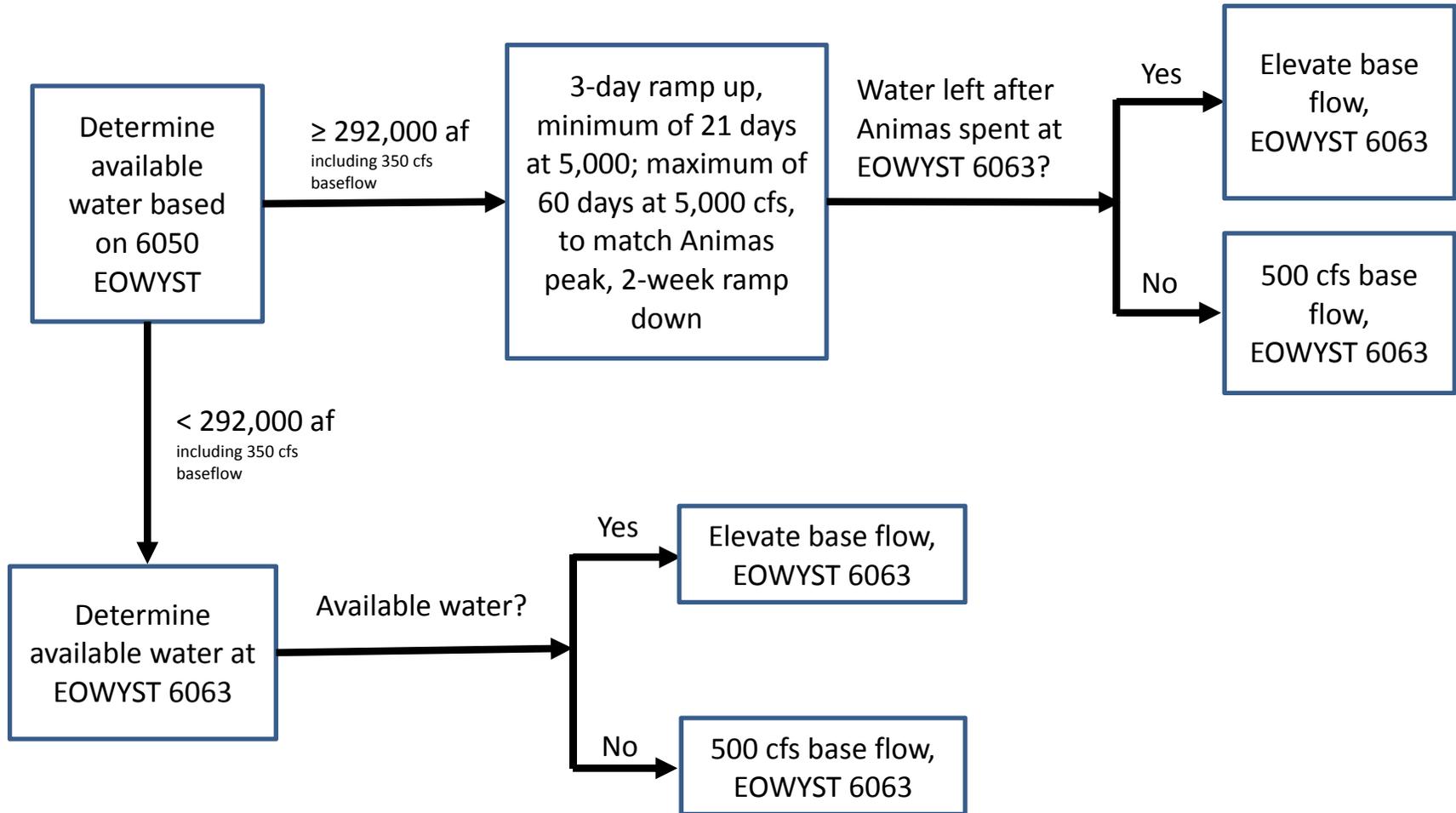
Hydrograph 4: Full Hydrograph, 3-weeks at 5,000 cfs with full ramps: 418,512 af

Operational spill (Op. Spill) = (Available water - SPR ) Released as nose water if full hydrograph (4) was selected and then remaining water is released as an increase in target base flows and then a fall spike release. For Hydrographs 1 to 3, released first as increase in target base flow and then fall spike release.

## Flexible EWYST decision tree releasing Type 3 and Type 4 releases



**Flexible EWYST decision tree releasing maximum days at 5,000cfs**



## Hypothesized effects of flow recommendation benchmarks

### 10,000 cfs Flow Metric

Duration: **A minimum of 5 days between March 1 and July 31.**

Frequency: **Flows >10,000 for 5 days or more need to occur in 20% of the years on average for the period of record 1929-1993.** Maximum number of consecutive years without meeting at least a flow of 9,700 cfs (97% of 10,000 cfs) within the 65-year period of record is 10 years.

Hypothesized effects $\geq 10,000$ cfs:	
Abiotic	Evidence and assumptions
1. Out of bank flow	
2. Generates new cobble sources	
3. Changes channel morphology and maintains channel complexity	Increased number of islands after high flows
4. Increases nutrient loading and productivity	
5. Suppress nonnative vegetation in the bank full channel	
6. Promote Cottonwood recruitment/regeneration	
Biotic	
1. Colorado Pikeminnow reproductive success	
2. Important to Colorado Pikeminnow and Razorback Sucker	
3. Promote native fish abundance	Gido and Propst (2012)

### 8,000 cfs Flow Metric

Duration: **A minimum of 10 days between March 1 and July 31.**

Frequency: **Flows of > 8,000 cfs for 10 days or more need to occur in 33% of the years on average for the period of record 1929-1993.** Maximum number of consecutive years without meeting at least a flow of 7,760 cfs (97% of 8,000 cfs) within the 65-year period of record is 6 years.

Hypothesized effects $\geq 8,000$ cfs:	
Abiotic	Evidence and assumptions
1. Maintenance of channel cross section	Bankfull discharge is between 7,000 and 10,500 cfs below Farmington, with 8,000 cfs being representative of the bulk of the river.
2. Moves cobble and builds cobble bars	
3. Create larval Razorback Sucker habitat during peak and receding flows	
4. Suppress nonnative vegetation in the bank full	

channel	
5. Promote Cottonwood recruitment/regeneration	
<b>Biotic</b>	
1. Increase abundance of native fish	Bluehead Sucker and Speckled Dace showed a positive response to flows above 8,000 cfs for 0-19 days. Gido and Propst (2012)
2. Colorado Pikeminnow reproductive success	

5,000 cfs Flow Metric

Duration: **A minimum of 21 days between March 1 and July 31.**

Frequency: **Flows of > 5,000 cfs for 21 days or more need to occur in 50% of the years on average for the period of record 1929-1993.** Maximum number of consecutive years without meeting at least a flow of 4,850 cfs (97% of 5,000 cfs) within the 65-year period of record is 4 years.

Hypothesized effects $\geq$ 5,000 cfs:	
<b>Abiotic</b>	<b>Evidence and assumptions</b>
1. Clean backwaters and maintain low velocity habitat in Reach 3	Increases nursery habitat
<b>Biotic</b>	

2,500 cfs Flow Metric

Duration: **A minimum of 10 days between March 1 and July 31.**

Frequency: **Flows of > 2,500 cfs for 10 days or more need to occur in 80% of the years on average for the period of record 1929-1993.** Maximum number of consecutive years without meeting at least a flow of 2,425 cfs (97% of 2,500 cfs) within the 65-year period of record is 2 years.

Hypothesized effects $\geq$ 2,500 cfs:	
<b>Abiotic</b>	<b>Evidence and assumptions</b>
1. Moves cobble in high gradient areas	
2. Cleans cobble for spawning	
<b>Biotic</b>	
1. Triggers spawning by Colorado Pikeminnow	

Timing of the peak flows noted above must be similar to historical conditions, and the variability in timing of the peak flows that occur historically must also be mimicked.

Timing: Mean date of peak flow in the habitat range (RM 180 and below) for any future level of development when modeled for the period of 1929-1993 must be within 5 days +/- of historical mean date of May 31 for the same period.

Hypothesized effects timing of peak flow:	
Abiotic	Evidence and assumptions
Biotic	
1. Important for endangered fish spawning	

Target base flow (mean weekly non-spring runoff flow)

Level: 500 cfs from Farmington to Lake Powell, with 250 cfs minimum from Navajo Dam.

Hypothesized effects target base flow:	
Abiotic	Evidence and assumptions
1. Enhances nursery habitats	
2. 500-1000 cfs optimizes backwater habitat	
3. Target base flows need to be higher to achieve desired effects.	Long-term decline in total channel area (Lamarra)
Biotic	
1. Important for endangered fish spawning	
2. Suppress nonnative fish abundance (red shiner, fathead minnow and mosquitofish).	Gido and Propst (2012)

Flood control releases (incorporated into operating rule)

Control: Handle flood control release as a spike (high magnitude, short duration) and release when flood control rules require, except that the release shall not occur earlier than September 1. If an earlier release is required, extend the duration of the peak of the release hydrograph. A ramp up and ramp down of 1,000 cfs per day should be used to a maximum release of 5,000 cfs. If the volume of water to release is less than that required to reach 5,000 cfs, adjust the magnitude of the peak accordingly, maintaining the ramp rates. Multiple releases may be made each year. These spike release shall be used in place of adjustment to base flow.

Hypothesized effects of flood control releases:	
Abiotic	Evidence and assumptions
1. Improve low velocity habitat quality by flushing sediment	
Biotic	
1. Suppress Red Shiner and Fathead Minnow abundance	