Environmental Flow Regime Implementation Example

Implementation Rules

- *Subsistence* and lower flows –passed without being diverted

- *Pulse or overbank flows* – when flow reaches a pulse peak magnitude, water can be diverted down to the peak magnitude until the described volume or duration is obtained

Implementation Rules

- *Base flows (high, medium, low)*
  - Divert down to high base flow when flow below pulse and higher than high base flow regime value
  - Divert down to medium base flow when flow below high base flow and above medium base flow
  - Divert down to low base flow when flow below medium base flow and above low base flow
  - No diversions below the low base flow

  - Determined by **hydrologic condition**

Onion Creek Fake Off-channel Reservoir Example

Step 1: Stakeholders identify the **hydrologic** condition:

Drives the engagement frequencies:

- High base flow – 25% of the time
- Medium base flow – 50% of the time
- Low base flow – 25% of the time

	Winter			Spring				Summer		Fall		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
High Flow Pulses	Qp: 174 cfs with Average Frequency 1 per season Regressed Volume is 899 to 4,088 (1,917) Regressed Duration is 3 to 20 (8)			Qp: 615 cfs with Average Frequency 1 per season Regressed Volume is 1,910 to 7,311 (3,737) Regressed Duration is 3 to 19 (7)						Qp: 116 cfs with Average Frequency 1 per season Regressed Volume is 290 to 1,092 (563) Regressed Duration is 2 to 11 (5)		
				Qp: 198 cfs with Average Frequency 2 per season Regressed Volume is 568 to 2,175 (1,111) Regressed Duration is 2 to 11 (4)						Qp: 18 cfs with Average Frequency 2 per season Regressed Volume is 36 to 136 (70) Regressed Duration is 1 to 5 (2)		
Base Flows (cfs)	26 (42.2%)			34 (42.2%)				6.7 (40.6%)		7.3 (35.3%)		
	6 (58.6%)			12 (59.6%)				2.4 (55.9%)		2.7 (52.5%)		
	2 (75.3%)			3.7 (76.4%)				0.89 (71.5%)		0.32 (70.0%)		
Subsistence Flows (cfs)	0 (100.0%)			0 (100.0%)				0 (100.0%)		0 (100.0%)		

Flow Levels
High (75th %ile)
Medium (50th %ile)
Low (25th %ile)
Subsistence

Notes:

1. Period of Record used : 1/1/1980 to 12/31/2009.
2. Q95 calculation used for subsistence flows. Annual Q95 value is 0 cfs.

Example Hydrologic Condition
Total stream flow for the preceding season

- High base trigger – higher than or equal the WAM Run 3 **75th percentile flow** and lower than the lowest pulse flow for a season
- Low base trigger – lower than the WAM Run 3 **25th percentile flow**
- Medium base trigger – all flows between the high and low conditions

Step 2: Kirk calculates how much water would be in Onion Creek on a daily basis using WAM Run 3.

Step 3: Kirk calculates how much water is removed from Onion Creek by your project on a daily basis if you followed the implementation rules.

Step 3: Kirk calculates how much water remains in the creek on a daily basis.

Step 4: Kirk calculates how frequently the low, medium, and high daily average base flows are equaled or exceeded for each season.

Ex. In winter with the project following the implementation rules:

High base flow of 26 cfs exceeded 26% of time

Medium base flow of 6 cfs achieved 53% of time

Low base flow of 2 cfs achieved 68% of time

Step 5: Compare the frequencies at which the base flows would occur in Step 4 to the frequencies in the HEFR/Hydrological Analysis table in the report (p. 2-118).

Ex. Winter historical frequencies:

High base flow of 26 cfs achieved 42% of time

Medium base flow of 12 cfs achieved 59% of time

Low base flow of 2 cfs achieved 75% of time

Step 7: BBEST evaluates the differences in the frequencies and determines whether they are ecologically significantly different from the historical frequencies they occurred.

High base flow: 26% of time with project, vs. 42% of time historically

Medium base flow: 53% of time with project, vs. 59% of time historically

Low base flow: 68% of time with project, vs. 75% of time historically

Step 8: BBEST and stakeholders talk about options regarding project withdrawal and effects of options on sound environment.

Step 9: Repeat steps 2-8 until stakeholders are satisfied

Implementation Rules

- *Drought contingency* – water can be diverted down to subsistence flow when there is a drought (reservoir storage below the 5% WAM Run 3 reservoir volume)