DRAFT Yakima River Reaches: Instream Flow Improvement Matrix (Rev. 2)

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
Keechelus Dam to Lake Easton	Flow too high in July, Aug & 1st week of-Sept; over 800 cfs	Improve summer rearing by reducing flows down to 450-550 cfs. Increase winter flow to 120 cfs (connection to side channels at that flow). Provide pulses in winter. Provide spring pulses.	High	K to K Pipeline Wymer storage downstream of Keechelus Aquifer storage	Spring is probably okay
	High late summer flows reduced below 800 cfs 99.8 % of the time, as opposed to 55.6 % of the time under FWIP. In the winter, 120 cfs is exceeded 99.6 % of the time under the Integrated Plan as compared to 23.5 % of the time under the FWIP.				
Kachess River	No change proposed – lesser priority for improving river flow because of other objectives				
Easton Reach	Spring – need outmigration flow for spring Chinook	Provide spring pulse of 1000 cfs for 48 hours during dry years, augment spring Q for channel maintenance occasionally (5-yr for riparian recruitment – bank full during wet years)	Medium	Wymer Aquifer storage	**Uncertainties:** Don't know fish usage May be fish in future? Look at pit-tag relationship to determine pulse size/duration
	Fall/Winter – need additional flow for spawning and rearing	Currently 180 cfs, start spawning flow at 220 cfs, increase to 250-300 cfs in winter, 250 cfs provides connection to side channels. Spawning flows at 220 cfs.	High		
	Spring pulse flows provided in 19 out of 26 years under Integrated Plan; Average fall/winter flows increased from 424 to 466 cfs.				
Cle Elum River	Summer flows (July and August) are too high	Reduce flow, modify flip flop to give more gentle change in hydrograph. In wet years, spill earlier but hold water back in August to reduce flow (reduce by 1000 cfs). Also desire to bridge peaks between spring and summer to improve cottonwood establishment.	High	Bumping Wymer Flip / flop modification/relax Aquifer storage K to K Cle Elum pool raise	This reach is ripe for restoration as floodplain ownership is held in conservation easements. One-third of spring Chinook population spawns here.

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
	Fall/Winter Flows (September 10 through March): no flow variation (sp. Chinook, steelhead)	Increase to 500 cfs September through March. Side channels are thought to be activated around 500 cfs, and one was recently modified to activate at 200 cfs, provide pulse flows.			
	Average summer flows have decreased from 2683 to 2200 cfs. Average fall/winter flows have increased to 443 from 323 cfs.				
Cle Elum to Teanaway River	Summer flows are too high	Reduce flows from 4000 cfs to 1000 cfs by late August. Ok to have high flow in July, as mimics unregulated hydrograph.	High	See Cle Elum list	Spring flows support cottonwood regeneration
	Need Channel shaping flows in spring occasionally for riparian restoration	Provide channel shaping flows every 5 years or so.	Medium		
	In winter, a flat hydrograph exists	Provide flow variability, see Cle Elum River.	Medium		
	Average flow on August 31st has been reduced to 1996 from 2513 cfs.				
Teanaway to Roza Dam	Summer flows are too high	Reduce flows	High	See Cle Elum list	There are tributaries in this reach which reduces effects in spring and winter
	Need channel shaping flows in spring occasionally for riparian restoration Not as a big as issue as upstream reach because of tributary inflow	Provide channel shaping flows every 5 years or so	Medium		
	Some flow variability exists because of tributaries but magnitude could be increased	Provide flow variability, time pulses to match natural events.	Medium		
	Average summer flows have been reduced from 2988 to 2432 cfs.				

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
Roza-Naches	In Spring from beginning of March to end of May, need additional outmigration flow	Increase flow to about 1400 cfs for high and average water years from March through May[1].	High	See Cle Elum list Roza hydropower subordination Roza dam removal	**Predation Issues:** Late fall to early winter At 400 cfs to support power production **Uncertainties:** Opportunity to support reintroduced sockeye and summer Chinook Consider three potential scenarios: 1) Current operations 2) Without operating power plant 3) With subordination Try to more closely mimic unregulated flow during subordination period(s)
	In Fall/winter there needs to be sufficient flow to support movement of fish to lower river, rearing and spawning	Increase to 1000-1400 cfs (use IFTAG flows). Link flows to habitat needs. Compare to 2-D habitat model for reach above Roza Dam.	High		
	In Summer flow is not an issue because of Roza diversions but ability to modify flow in this reach may be useful – talk to habitat subcommittee to determine	Variability (?)	Low to medium		
	The average spring flow has increased to 1400 from 1370 cfs. In the fall/winter the average flow is939, as opposed to the FWIP average of 983 cfs.				
Bumping Dam—Lower Naches	Fall flows after flip-flop are too high, then get reduced in winter	Reduce flows by 70-100 cfs from August through October	Medium		Bumping Expansion, change operations in Naches arm
	Average daily flow from August through October has increased to 267 from 186 cfs.				
Tieton River	Low winter flows and no variation (November to March)	Maintain minimum 125 cfs flow during winter months	High	Change in operations (minor improvements on shoulders of flip-	Current winter flows (75 – 120 cfs)

[1] Roza – Sunnyside Joint Board of Control is planning to conduct a study below Roza to improve the biological basis for flow enhancements in this reach. Results are expected in 12 -18 months.

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
	High flows in September due to flip-flop (and shoulders)	Reduce flows as much as possible.	Medium	flop) Bumping (for operational flexibility) Contingent on South Fork Fish Passage Project to allow more flexibility in reservoir operations	Key project is South Fork Fish Passage Project, needs to be to constructed to allow flexibility in reservoir operations
	Average winter flows have increased from 215 to 293 cfs. Average flow in September has decreased to 1128 from 1457 cfs.				
Lower Naches River	Summer flows are low, ramping rate from high spring flows to summer flows is abrupt, affects rearing for steelhead, coho, spring Chinook. Up to ½ of flow in river is lost to groundwater in part of this reach.	Change ramping rate from spring to summer, increase summer low flow, check habitat needs vs flow.	High	Change operations to improve Water Conservation for Gleed, Naches Selah, and other systems (non-YRBWEP projects) to improve summer flow	**Uncertainties:** Gaining/losing reaches Complexity Limited recharge Try to stay below flow level that affects cottonwood regeneration
	High flows in flip-flop operations	Reduce flows as much as possible, look at releasing more in summer and reducing flip flop.	High		
	When compared to FWIP, the average summer flow has decreased by approximately 58 cfs, resulting in an average flow of 1112 cfs.				
Yakima River from Naches River to Parker	High summer flow	Reduce as much as possible	Low	Habitat projects	Habitat improvements will be primary enhancement strategy
	When compared to FWIP, the average summer flow has increased by approximately 104 cfs, resulting in an average flow of 3184 cfs.				
Yakima River from Parker to Toppenish Creek (Wapato reach)	In spring, flow is low and outmigration flow needed, mostly during dry years	15,000 – 20,000 acre-feet to use specifically for smolt outmigration in dry years. See SOAC recommendations for pulse flows. Maybe early and late pulse? Sockeye passage also? Change ramping rate at end of high flows that occur in June-July in average-wet years.	High	Water Conservation primarily. Secondarily Water Storage in Wymer, Cle Elum, Kachess Dead Storage, Bumping,	Temperature issues with shoulders of spring and fall Fit channel to river

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
	Low Summer flow	link to habitat needs	No priority assigned[2]	Modify operations	
	Average summer flow under the integrated plan is 2632 cfs, as compared to an average flow of 2636 under the FWIP.				
Yakima River between Toppenish Creek to Prosser Dam	In spring, flow is low (similar to Wapato Reach)	See Wapato Reach	See Wapato Reach	See Wapato Reach	Summer and Winter flow—OK
	Average spring flow has increased to 3527 from 3448 cfs, an increase of 79 cfs under the Integrated Plan.				
Yakima River—Chandler Reach	Need more flow in July (shoulder period) and September	Need greater than 1000 cfs in September	Low	Chandler Power Plant subordination, KID projects See Wapato Reach for more projects	Biggest issue: mortality at canal Winter flow—OK
	Need more flow in Spring	Although some subordination occurs to provide 1000 cfs, need more flow	Low		
	Under the integrated plan, the average flow in July (753 cfs) and September (494 cfs) has increased when compared to FWIP. Average spring flows have increased from 2373 (FWIP) to 2441 cfs (IP).				
Lower Yakima River (Chandler Powerplant to mouth)	In spring, flow is low (similar to Wapato Reach) but more emphasis in June needed to push fish out	see Wapato Reach	Low	See Wapato Reach KID	Winter—OK
	in Summer flow can be low, cover is an issue	link to habitat needs	Low		
	Under the integrated plan, the average spring flow has increased by 75 cfs, resulting in an average flow of 3617 cfs.				
Tributaries					
Manastash, Taneum, Cowiche		Summer and early fall flow issues	High	Deliver water directly to tribs if supply replacement not feasible	See Kittitas CD flow study for Manastash Creek See other IFIM studies Discuss with habitat group
Big, Little,		Summer and early fall flow issues	Medium	Same as above	

[2] This reach needs to better understanding of existing conditions. Design and implement research, monitoring and evaluation (RM&E) program to better understand improvements needed. Develop flow objectives from RM&E results.

River Reach	Problem	Flow Objective	Priority	Potential Projects	Other Notes
Ahtanum	Urbanization, irrigation conservation are issues	Summer and early fall flow issues	High		Water rights concerns will limit ability to implement any projects in Ahtanum Creek Basin
Wenas	Need to redo irrigation diversions—will there be water for streamflow	Summer and early fall flow issues	Lower		
North Side Kittitas Valley Tributaries	Fish barriers are big issue		TBD	Thorp to Wymer using KRD North Branch Canal could serve water users	Need to figure out creek systems—too many distributaries. May need to simplify the systems to keep enough water in stream