

Problem	Scope / Parameters (e.g. location and quantity)	Data	Tools	Project Name	Project ID #	Description	Project Cost	Icicle River Project Benefit					
Inadequate Flow (F)	RM 0 to 2.7 (68,000 ac-ft deficit in WAC 173-545 flow in average years). WAC 173-545 minimum flows on the order of 267 cfs to 550 cfs (Aug-Oct), actual low flow in September 150-200 cfs. RM 2.7 to 4.5 (20 cfs minimum via BiOp = 1,200 ac-ft/month); IFIM study in historic channel. RM 4.5 to 5.8 (flow need uncertain)	IFIM (estimated completion July 2013)	Pump Exchange / Diversion Change (P)	Icicle-Peshastin Irrigation District Pump Exchange Project 1	FH-PH-01	Pump on Wenatchee River at Dryden to pump to Peshastin Canal, reduces interbasin transfer from Icicle to Peshastin (40 cfs for 8 weeks total project savings, 15 cfs to Icicle, 25 cfs to Peshastin)	\$3.9 M (construction), 300K (design), \$3.7 M (50-year O&M)	15	cfs	RM 0.0 to 5.7			
				Icicle-Peshastin Irrigation District Pump Exchange Project 2	FH-PH-02	Pump on Wenatchee River at Dryden to pump to Peshastin Canal and Booster Pump to Icicle Canal (40 cfs for 8 weeks total project savings, 30 cfs to Icicle, 10 cfs to Peshastin)	\$7.2 M (construction), 500K (design), \$6.8 M (50-year O&M)	30	cfs	RM 0.0 to 5.7			
				Icicle-Peshastin Irrigation District Pump Exchange Project 3	FH-PH-05	Pump on Wenatchee River at Dryden to pump to Peshastin Canal and Booster Pump to Icicle Canal (60 cfs for 8-weeks total project savings, 30 cfs to Icicle, 30 cfs to Peshastin)	\$9.15 M (construction), 650K (design), \$8.65 M (50-year O&M)	30	cfs	RM 0.0 to 5.7			
				Icicle Pump Exchange 1	FH-PH-03	Pump on Wenatchee River at Leavenworth (Safeway) to pump to IID canal on north side of Wenatchee River (15 cfs for 8 weeks total project savings to Icicle River)	\$3.9 M (construction), 300K (design), \$3.7 M (50-year O&M)	15	cfs	RM 0.0 to 5.7			
				Icicle Pump Exchange 2	FH-PH-04	Pump on Wenatchee River at Leavenworth (Safeway) to pump to IID canal on north & south side of Wenatchee River (30 cfs, 15 cfs each, 8 weeks total project savings to Icicle River)	\$7.2 M (construction), 500K (design), \$6.8 M (50-year O&M)	30	cfs	RM 0.0 to 5.7			
				Leavenworth National Fish Hatchery Water Re-Use Pilot (Draft due March 2013)									
		Boulder field study (estimated completion April 2013).	Boulder field study (estimated completion April 2013).	Optimization / Modernization / Automation of Existing Storage (O)	Alpine Lakes Optimization Study	FHMA-OH-1	Evaluation of Alpine lakes recharge for varying water years/climate change, and identification of opportunities to optimize timing of storage release. Assume 2,000 acre-feet of additional water could be released in non-drought years (6.7 cfs for 75 days).	\$100K (feasibility/design), \$10,000/ year for Lake Management Workgroup	1,000	ac-ft	RM 0.0 to 5.7		
					Alpine Lakes Automation (PID)	FHMA-OH-2	Automation of lake release for remote operation (likely tied to optimization project)	\$200K (feasibility/design), \$500K (construction)	0	ac-ft	RM 0.0 to 5.7		
					Raise Upper Snow Lake and Provide Automation	FHMA-OH-3	Raise Upper Snow Lake by 5 feet, Automate Outlet (4.1 cfs over 75 days)	\$688 K (design, construction)	607	ac-ft	RM 0.0 to 5.7		
					Raise Lower Snow Lake and Provide Automation	FHMA-OH-4	Raise Lower Snow Lake by 5 feet, Automate Outlet (2.1 cfs over 75 days)	\$405K (design, construction)	305	ac-ft	RM 0.0 to 5.7		
					Increase Drawdown of Lower Snow Lake and Provide Automation	FHMA-OH-5	Increase Drawdown of Lower Snow Lake by 3 feet, Automate Outlet (1.1 cfs over 75 days)	\$135 K (design, construction)	167	ac-ft	RM 0.0 to 5.7		
					Eight-Mile Lake Restoration	FHMA-OH-6	Restore 1,300 acre-feet of storage to Eight-Mile Lake normal permitted pool elevation (8.7 cfs for 75 days).	\$1.2M (design, construction)	1,000	ac-ft	RM 0.0 to 5.7		
	Lower Icicle IFIM (Reclamation, 2005)				Lower Icicle IFIM (Reclamation, 2005)	Conservation (Demand-Side Strategies) (D)	Icicle Irrigation District Efficiencies	FHA-DH-01	Update Icicle Irrigation District management plan, presume 1,500 acre-feet at \$2,500 / acre-foot in projects implemented (or 5 cfs over 150 days).	\$3.75 M (construction), \$100,000 (plan update)	1,500	ac-ft	RM 0.0 to 5.7
							Peshastin Irrigation District Efficiency Project	FHA-DH-02	Irrigation Efficiency Scoping Study and Infrastructure Improvements, presume 1,000 acre-feet at \$2,500 / acre-foot in projects implemented (or 3.3 cfs over 150 days).	\$2.5 M (construction), \$50,000 (plan update)	1,000	ac-ft	RM 0.0 to 5.7
							Cascade Orchard Efficiency Project	FHA-DH-03	Irrigation Efficiency Scoping Study and Infrastructure Improvements, presume 500 acre-feet at \$2,500 / acre-foot in projects implemented (or 1.6 cfs over 150 days).	\$1.25M (construction), \$50,000 (feasibility)	500	ac-ft	RM 0.0 to 4.5
							Mountain Home Off-Channel Reservoir (USFS Land)	FHMA-SH-01	Surface storage on USFS land, including potential land exchange of 1,700 acres (small storage estimated at \$15,000 / acre-foot)	\$1M (feasibility/design), \$22M (construction)	1,500	ac-ft	RM 5.0 (est)
	New Storage (Surface or Aquifer) (S)	New Storage (Surface or Aquifer) (S)	Conservation (Demand-Side Strategies) (D)	Mountain Home Off-Channel Reservoir (private land)	FHMA-SH-02	Small surface storage reservoir(s) on private property, identified in Wentachee Watershed Plan (2006), (small storage estimated at \$15,000 / acre-foot)	\$500K (feasibility/design), \$5M (construction)	350	ac-ft	RM 5.0 (est)			
				Eight-Mile Lake Expansion	FHMA-SH-03	Increase capacity of Eight-Mile Lake to 5,000 acre-feet (about 1,200 ac-ft currently, with 2,500 ac-ft to Icicle-Peshastin and 2,500 acre-feet to others (e.g. Leavenworth)), which equates to 17 cfs over 150 days. Cost assumed at \$5,000 / acre-foot, 25 cfs over 75 days.	\$20M (feasibility, design, construction)	3,800	ac-ft	RM 0.0 to 5.4			
				Water Banking / Water Markets (B)	Icicle Creek Water Quantity Projects	FHMA-BH-01	Icicle Basin water acquisition projects, leasing, buying (presume \$1,000 / acre-foot acquisition, 500 acre-feet is 1.67 cfs for 150 days).	\$500K	500	ac-ft	RM 0 to 5.7		
	Leavenworth National Fish Hatchery Optimization / Conservation (N)	Leavenworth National Fish Hatchery Optimization / Conservation (N)	Conservation (Demand-Side Strategies) (D)	Leavenworth National Fish Hatchery Water Effluent Pump Back	FH-NH-01	Reduce current hatchery diversions through pump back of effluent to recharge wellfield, presumes reduction in recharge of wellfield by 10 cfs.	\$5 M (placeholder)	10	cfs	RM 2.7 to 3.8			
				Leavenworth National Fish Hatchery Wellfield Enhancement	FH-NH-02	Study and develop wellfield in communication with historic channel to reduce hatchery channel rehydration needs	\$5 M (placeholder)	10	cfs	RM 2.7 to 3.8			
				Leavenworth National Fish Hatchery Water Re-Use Project	FH-NH-03	Reduce current hatchery diversions through on-site reuse, presumes hatchery use diminished by approximately half.	\$10 M (placeholder)	20	cfs	RM 2.7 to 4.5			
				Leavenworth National Fish Hatchery Pump Exchange	FH-NH-04	Pump exchange from Icicle River below historic channel confluence, presumes 42 cfs savings in historic channel and future peak surface diversions of 20 cfs for hatchery.	\$20 M (placeholder)	42	cfs	RM 2.7 to 4.5			
	Habitat improvements (H)	RM 0 – RM 2.7 RM 2.7 – RM 4.5 RM 4.5 and above Icicle Basin	RTT Biological strategy revisions Icicle Creek Minimum Roads Analysis (USFS) 2013-2015 IFIM (estimated completion July 2013). USFS info. Ecology Qual 2K	Habitat Improvements (H)	Habitat improvements in RM 0 - RM 2.7	H-H-01	Riparian plantings, engineering log jams, conservation easements, and other habitat projects	\$100K (placeholder)	2.7	miles	RM 0 to 2.7		
					Habitat improvements in RM 2.7-4.5	H-H-02	Riparian plantings, engineering log jams, conservation easements, and other habitat projects	\$300K (placeholder)	1.8	miles	RM 2.7 to 4.5		
					Icicle Creek Water Quantity Projects	FHMA-BH-01	Icicle Basin water acquisition projects, leasing, buying (presume \$1,000 / acre-foot acquisition). 500 acre-feet is 3.3 cfs for 75 days.	\$500K	500	ac-ft	RM 0 to 5.7		
					Wenatchee Lands Plan	H-H-03	Acquire private land as part of a package of projects benefiting instream and out-of-stream uses	\$2 M (placeholder)	7,000	acres	Basinwide		
					All Inadequate Instream Flow Project Above (F)		See projects FH-PH-01, FH-PH-02, FH-PH-03, FH-PH-04, FHMA-OH-1, FHMA-OH-2, FHMA-OH-3, FHMA-OH-4, FHA-DH-01, FHA-DH-02, FHA-DH-03, FHMA-SH-01, FHMA-SH-02, FHMA-SH-03, FHMA-SH-04, FH-NH-01, FH-NH-02, FH-NH-03, and FH-NH-04 above.						
					Fish Passage, Impediments, Distribution, and Movement Issues (P)	Structure 5 @ RM 2.7 (movement) Structure 2 @ RM 3.7 (impediment and distribution) Hatchery Intake @ RM 4.5 (impediment) Boulder field @ RM 5.6 (impediment)	Boulder field study (estimated completion April 2013) 401 Cert studies Wild Fish Conservancy studies US F&W Service studies.	Fish Passage Improvements (F)	Leavenworth National Fish Hatchery Intake Replacement (Jacob's Design)	P-F-01	Replace hatchery intake with a new pump diversion at RM 3.8 (pump, controls, screen, intake, and weir)	\$9M (2009 dollars)	10
	Rehabilitate existing LNFH Intake	P-F-02	Replace delapidated sections of intake piping	\$5 M (placeholder)					10	cfs	RM 2.7 to 4.5		
	Resolve Structure 2 Passage Needs	P-F-03	Modify Structure 2, likely in combination with one of the hatchery improvement projects	\$500K (placeholder)					10	cfs	RM 2.7 to 4.5		
	Resolve Structure 5 Passage Needs	P-F-04	Replace Structure 5 with an access bridge	\$500K (placeholder)					10	cfs	RM 2.7 to 4.5		
Boulder Field Construction Project	P-F-06	Presuming anthropogenic fish barriers are determined by study	\$500K (placeholder)	10					cfs	RM 5.6+			
Tribal fisheries maintenance / improvements	P-F-07	Maintain / improve tribal fishery access, avoid conflicts with other alternatives	\$500K (placeholder)	10					cfs	RM 2.7 to 4.5			
Screening (S)	LNFH/COIC Intake structure City of Leavenworth Intake Structure Icicle/Peshastin ID intake	Studies complete per WDFW, USFWS, and NOAA criteria.	Habitat and Screening Improvements (H)	LNFH/COIC Screening Improvements					S-H-01	Improve existing screen to current standards, likely additive with intake projects	\$1-2 M	10	cfs
				Cascade Orchard Screen Improvements	S-H-03	Improve existing screen to current standards, likely additive with intake projects	\$300 K	10	cfs	RM 4.5			
				Icicle / Peshastin Irrigation District Intake and Screening Improvements	S-H-02	Improve existing screen to current standards	\$1.3 M +	10	cfs	RM 5.7			
Municipal and domestic needs (M)	0.1-0.5 cfs (73-365 ac-ft) in reserve through 2025 City of Leavenworth 800 ac-ft need Municipal/domestic 1,400 ac-ft need through 2050.	Established in or extrapolated from existing planning documents.	Conservation (Demand-Side Strategies) (D)	Legislative (L)	M-L-01	Instream Flow Rule Amendment	(\$50K placeholder, rule amendment)	365	ac-ft	RM 0.0 to 5.4			
				Reoperation / Optimization of Existing Storage (O)	Alpine Lakes Optimization Study	FHMA-OH-1	Evaluation of Alpine lakes recharge for varying water years/climate change, and identification of opportunities to optimize timing of storage release. Assume 2,000 acre-feet of additional water could be released in non-drought years (6.7 cfs for 75 days).	\$100K (feasibility/design), \$10,000/ year for Lake Management Workgroup	1,000	ac-ft	RM 0.0 to 5.7		
	Alpine Lakes Automation (PID)	FHMA-OH-2	Automation of lake release for remote operation (likely tied to optimization project)		\$200K (feasibility/design), \$500K (construction)	0	ac-ft	RM 0.0 to 5.7					
	Raise Upper Snow Lake and Provide Automation	FHMA-OH-3	Raise Upper Snow Lake by 5 feet, Automate Outlet (4.1 cfs over 75 days)		\$688 K (design, construction)	607	ac-ft	RM 0.0 to 5.7					
	Raise Lower Snow Lake and Provide Automation	FHMA-OH-4	Raise Lower Snow Lake by 5 feet, Automate Outlet (2.1 cfs over 75 days)		\$405K (design, construction)	305	ac-ft	RM 0.0 to 5.7					
	Increase Drawdown of Lower Snow Lake and Provide Automation	FHMA-OH-5	Increase Drawdown of Lower Snow Lake by 3 feet, Automate Outlet (1.1 cfs over 75 days)		\$135 K (design, construction)	167	ac-ft	RM 0.0 to 5.7					
	Eight-Mile Lake Restoration	FHMA-OH-6	Restore 1,000 acre-feet of storage to Eight-Mile Lake normal permitted pool elevation (6.7 cfs for 75 days).		\$1.2M (design, construction)	1,000	ac-ft	RM 0.0 to 5.7					
	New Storage (Surface or Aquifer) (S)	New Storage (Surface or Aquifer) (S)	Mountain Home Off-Channel Reservoir (USFS Land)	FHMA-SH-01	Surface storage on USFS land, including potential land exchange of 1,700 acres	\$250K (feasibility/design), \$TBD (construction)	1,500	ac-ft	RM 5.0 (est)				
			Mountain Home Off-Channel Reservoir (private land)	FHMA-SH-02	Small surface storage reservoir(s) on private property, identified in Wentachee Watershed Plan (2006)	\$250K (feasibility/design), \$TBD (construction)	350	ac-ft	RM 5.0 (est)				
			Eight-Mile Lake Pool Raise	FHMA-SH-03	Increase capacity of Eight-Mile Lake by 5,000 acre-feet, which equates to 33 cfs over 75 days. Presume \$3,000 / acre-foot for small storage.	\$500K (feasibility / design / permitting), \$15 M (construction)	5,000	ac-ft	RM 0.0 to 5.4				
	Water Banking / Water Markets (B)	Water Banking / Water Markets (B)	Conservation (Demand-Side Strategies) (D)	Icicle Creek Water Quantity Projects	FHMA-BH-01	Icicle Basin water acquisition projects, leasing, buying (presume \$1,000 / acre-foot acquisition). 500 acre-feet is 1.67 cfs for 150 days.	\$500K	500	ac-ft	RM 2.7 to 5.7			
				Icicle Irrigation District Efficiencies	FHA-DH-01	Update Icicle Irrigation District management plan, presume 1,500 acre-feet at \$2,500 / acre-foot in projects implemented (or 5 cfs over 150 days).	\$3.75 M (construction), \$100,000 (plan update)	1,500	ac-ft	RM 0.0 to 5.7			
	Restore 1,000 ac-ft additional storage, increased automation and reliability.	Restore 1,000 ac-ft additional storage, increased automation and reliability.	Conservation (Demand-Side Strategies) (D)	Peshastin Irrigation District Efficiency Project	FHA-DH-02	Irrigation Efficiency Scoping Study and Infrastructure Improvements, presume 1,000 acre-feet at \$2,500 / acre-foot in projects implemented (or 3.3 cfs over 150 days).	\$2.5 M (construction), \$50,000 (plan update)	1,000	ac-ft	RM 0.0 to 5.7			

Agricultural needs (A)		Continue the optimization storage study. Perform a reservoir refill and climate change resiliency study.		Cascade Orchard Efficiency Project	FHA-DH-03	Irrigation Efficiency Scoping Study and Infrastructure Improvements, presume 500 acre-feet at \$2,500 / acre-foot in projects implemented (or 1.6 cfs over 150 days).	\$1.25M (construction), \$50,000 (feasibility)	500	ac-ft	RM 0.0 to 4.5
			Reoperation / Optimization of Existing Storage (O)	Alpine Lakes Optimization Study	FHMA-OH-1	Evaluation of Alpine lakes recharge for varying water years/climate change, and identification of opportunities to optimize timing of storage release. Assume 2,000 acre-feet of additional water could be released in non-drought years (6.7 cfs for 75 days).	\$100K (feasibility/design), \$10,000/ year for Lake Management Workgroup	1,000	ac-ft	RM 0.0 to 5.0
				Alpine Lakes Automation (IPID)	FHMA-OH-2	Automation of lake release for remote operation (likely tied to optimization project)	\$200K (feasibility/design), \$500K (construction)	0	ac-ft	RM 0.0 to 5.0
				Raise Upper Snow Lake and Provide Automation	FHMA-OH-3	Raise Upper Snow Lake by 5 feet, Automate Outlet (4.1 cfs over 75 days)	\$688 K (design, construction)	607	ac-ft	RM 0.0 to 5.0
				Raise Lower Snow Lake and Provide Automation	FHMA-OH-4	Raise Lower Snow Lake by 5 feet, Automate Outlet (2.1 cfs over 75 days)	\$405K (design, construction)	305	ac-ft	RM 0.0 to 5.0
				Increase Drawdown of Lower Snow Lake and Provide Automation	FHMA-OH-5	Increase Drawdown of Lower Snow Lake by 3 feet, Automate Outlet (1.1 cfs over 75 days)	\$135 K (design, construction)	167	ac-ft	RM 0.0 to 5.0
				Eight-Mile Lake Restoration	FHMA-OH-6	Restore 1,000 acre-feet of storage to Eight-Mile Lake normal permitted pool elevation (6.7 cfs for 75 days).	\$1.2M (design, construction)	1,000	ac-ft	RM 0.0 to 5.0
			New Storage (Surface or Aquifer) (S)	Mountain Home Off-Channel Reservoir (USFS Land)	FHMA-SH-01	Surface storage on USFS land, including potential land exchange of 1,700 acres (small storage estimated at \$15,000 / acre-foot)	\$1M (feasibility/design), \$22M (construction)	1,500	ac-ft	RM 5.0 (est)
				Mountain Home Off-Channel Reservoir (private land)	FHMA-SH-02	Small surface storage reservoir(s) on private property, identified in Wentachee Watershed Plan (2006), (small storage estimated at \$15,000 / acre-foot)	\$500K (feasibility/design), \$5M (construction)	350	ac-ft	RM 5.0 (est)
				Eight-Mile Lake Pool Raise	FHMA-SH-03	Increase capacity of Eight-Mile Lake to 5,000 acre-feet (about 1,200 ac-ft currently, with 2,500 ac-ft to Icicle-Peshastin and 2,500 acre-feet to others (e.g. Leavenworth)), which equates to 17 cfs over 150 days. Cost assumed at \$5,000 / acre-foot, 25 cfs over 75 days.	\$20M (feasibility, design, construction)	3,800	ac-ft	RM 0.0 to 5.0
			Water Banking / Water Markets (B)	Icicle Creek Water Quantity Projects	FHMA-BH-01	Icicle Basin water acquisition projects, leasing, buying (presume \$1,000 / acre-foot acquisition). 500 acre-feet is 1.67 cfs for 150 days.	\$500K	500	ac-ft	RM 2.7 to 5.0