EVALUATION OF HABITAT RESTORATION OBJECTIVES
Developed by Mobrand Biometrics, Inc.
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"Active" restoration strategies were proposed for the geographic areas (GA's) with the largest practicable restoration potential for steelhead, spring chinook, and bull trout, and "passive" measures were proposed for the GA's judged to have the greatest *protection* value for these species. As previously described, there were five critical GA's from the perspective of restoration: Lower North Fork, Lower South Fork, Upper Asotin, Charley Creek and Lower George Creek. Although four of these areas (lower North Fork, Charley, Upper Asotin and Lower South Fork) were also among the key protection areas, there were five key protection areas that were not also key restoration areas. These five areas -- Upper North Fork, Upper South Fork, Upper George Creek, North Fork Tributaries and the "Headwaters" GA's – were targeted for passive restoration.

Active restoration actions were intended to lessen the negative impact of the following environmental attributes, all of which were previously identified (Section **xx**) as significant limiting factors for the top five restoration areas: fine sediment, embeddedness, turbidity, woody debris, pools and pool tailouts, anthropogenic confinement, riparian function, temperature, bed scour and low flow. The Asotin Subbasin Work Group attempted to identify the ultimate causes of these environmental problems, as well as specific restoration actions that would reduce their impact. They also estimated the maximum degree to which this group of limiting factors might be restored to normative conditions over a 15-year period given the likely measures at hand and the economic, social and ecological constraints of the Subbasin. Table **AA** summarizes their findings and lists specific objectives by reach and environmental attribute. It should be clearly borne in mind that objectives are expressed in terms of the *percent restoration of normative (Historical) conditions*. Thus, an objective of "75% restoration" for an environmental attribute rated "0" historically and "4" now implies a post-implementation value of "1". The objective values for targeted environmental attributes were then substituted for Current values in the EDT model to estimate the approximate benefits to steelhead and spring chinook production of a habitat restoration program defined by the specific reach-by-attribute objectives summarized in Table **AA**.

Protection, or "passive restoration", was applied to all GA's that were important protection areas but were not among the top restoration areas. The actions proposed for key protection areas were intended permit natural regeneration of riparian corridors and upland areas, as well as protect them, and included such activities as CRP, CREP, direct seeding, riparian plantings, riparian easements and fenced exclosures. Somewhat arbitrarily, full restoration of passage at all obstructions was included with the passive restoration group. It should be noted that this passage objective applied to all reaches in the Subbasin, regardless of their restoration or protection priority. The targeted environmental attributes and the assumed impact of these passive measures on them are summarized in Table BB. The EDT model was also used to estimate the benefits to Asotin Creek steelhead and spring chinook of successfully implementing the actions described in Table BB, as well as the combined impact of all active and all passive restoration actions.

Table AA. Active habitat restoration objectives for Asotin Creek. Cells represent percent restoration of normative (Historical) conditions for specific reach-by-attribute combinations.

GEOGRAPHIC AREA	REACH[a]	Fines	Embed	Turbidity	Pools	Pool Tailouts	Carcass Loading	Benthic Production	Backwater Pools	LWD	Riparian Function	Temp Maximum	Bed Scour	Confine Hydro	Low Flow	Minimum Channel Width
Lower North Fork	NF Asotin 1	50%	50%	50%	37%	37%	10%[b]	10%[b]	31%[b]	63%	25%	---	50%	25%	---	---
	NF Asotin 2	62%	62%	62%	48%	48%	10%[b]	10%[b]	25%[b]	50%	50%	---	50%	---	---	---
	NF Asotin 3	35%	35%	35%	67%	67%	10%[b]	10%[b]	25%[b]	50%	50%	---	---	---	---	---
Lower South Fork	SF Asotin 1	100%	100%	100%	29%	29%	10%[b]	10%[b]	13%[b]	25%	25%	100%	---	25%	---	---
Upper Asotin	Asotin 6	50%	50%	50%	62%	62%	10%[b]	10%[b]	8.5%[b]	17%	25%	100%	---	33%	---	---
	Asotin 5	50%	50%	50%	72%	72%	10%[b]	10%[b]	13%[b]	25%	25%	100%	---	33%	---	---
Charley Creek	Charley 1	50%	50%	50%	25%	25%	10%[b]	10%[b]	25%[b]	50%	25%	---	38%	31%	---	---
	Charley 2	50%	50%	50%	67%	67%	10%[b]	10%[b]	37.5%[b]	75%	25%	---	38%	---	---	---
	Charley 3	50%	50%	50%	50%	50%	10%[b]	10%[b]	37.5%[b]	75%	25%	---	50%	---	---	---
	Charley 4	69%	69%	69%	---	---	10%[b]	10%[b]	37.5%[b]	75%	---	---	38%	---	---	---
Middle Asotin[c]	Asotin 3a	25%	25%	25%	---	---	10%[b]	10%[b]	13%[b]	25%	25%	85%	---	---	---	---
	Asotin 3b	25%	25%	25%	---	---	10%[b]	10%[b]	16%[b]	33%	25%	80%	---	---	---	---
Lower Asotin[c]	Asotin 2	50%	50%	50%	---	---	10%[b]	10%[b]	19%[b]	38%	50%	85%	---	---	---	---
	Asotin 1	50%	50%	50%	---	---	10%[b]	10%[b]	19%[b]	38%	63%	80%	---	---	---	---
Lower George	George 1	92%	92%	92%	65%	65%	---	---	---	---	17%	100%	80%	17%	50%	75%
	George 2	83%	83%	83%	---	---	10%[b]	10%[b]	38%[b]	75%	25%	100%	67%	---	---	---
	George 3	67%	67%	67%	---	---	10%[b]	10%[b]	38%[b]	75%	25%	100%	50%	---	---	---

a. See Table XX for detailed reach description.

b. LWD addition assumed to increase carcass retention, benthic production and area of backwater pools.

c. Only LWD & Riparian actions target this area directly, but beneficial effects of upstream sediment loading and temperature reduction programs are assumed to propagate downstream.

Table BB. Passive restoration objectives for Asotin Creek. Cells represent percent restoration of normative (Historical) conditions for specific reach-by-attribute combinations.

GEOGRAPHIC AREA	REACH[a]	Fines	Embed	Turbidity	Riparian Function	Temp Maximum	Pools	Pool Tailouts	Backwater Pools	Passage	Benthic Production	Predation Risk	Carcasses	LWD	High Flow	Low Flow	Flashy Flow
Upper North Fork	NF Asotin 4	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	NF Asotin 5	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
North Fork Tribs	SF of North Fork	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Middle Branch	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	Lick Cr	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Upper George	George 4	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	George 5	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	George 6	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	George 7 (Trent Grade Culvert)	---	---	---	---	---	---	---	---	100%	---		---	---	---	---	---
	George 8	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	George 9	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Upper South Fork	SF Asotin 2	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
	SF Asotin 3	15%	15%	15%	15%	15%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

a. See Table XX for detailed reach description.

Tables CC and DD shows the results of EDT simulations for summer steelhead and spring chinook in which the partially restored environmental attributes targeted for active and passive restoration were substituted for Current values.

Table CC. Performance of Asotin Creek summer steelhead as estimated by EDT simulation under Current, Historical and PFC conditions, and after passive, active, and combined passive/active restoration as defined in Tables AA and BB

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Smolt Productivity	Mean Smolt Abundance
Current	219	1.98	443	18.0%	159	19,788
Historical	8,196	19.92	8,629	100.0%	219	100,459
PFC	412	2.35	719	66.0%	180	36,434
Passive Restoration	225	2.00	449	19.0%	160	20,355
Active Restoration	327	2.38	564	40.0%	189	29,545
Passive + Active Restoration	332	2.39	571	41.0%	190	29,945

Table DD. Performance of Asotin Creek spring chinook as estimated by EDT simulation under Current, Historical and PFC conditions, and after passive, active, and combined passive/active restoration as defined in Tables AA and BB

Scenario	Mean Adult Abundance	Adult Productivity	Adult Carrying Capacity	Life History Diversity	Smolt Productivity	Mean Smolt Abundance
Current	128	1.32	529	28.0%	210	24,205
Historical	4,348	14.87	4,662	100.0%	556	604,491
PFC	820	3.53	1,145	97.0%	442	200,050
Passive Restoration	134	1.34	533	29.0%	211	25,393
Active Restoration	539	2.50	899	64.0%	340	117,074
Passive + Active Restoration	543	2.50	905	67.0%	341	117,905

The benefits of active and combined active/passive restoration are considerable for both steelhead and spring chinook. Although the 50% increase in mean steelhead abundance after combined active and passive restoration is significant, the 20% increase in productivity and, especially, the doubling of life history diversity, is even more significant. A listed stock such as Asotin Creek steelhead can be sent into a demographic death spiral by localized catastrophes or by a relatively short succession of drought years if it does not have the resiliency conferred by robust productivity and a reasonably large number of viable alternative life history strategies. While a productivity of 2.38 adult returns/spawner can hardly be described as “robust”, it is certainly better than the current value of 1.98. There is, however, no need for equivocation in interpreting the significance of more than doubling the life history diversity index. In a small, agricultural watershed like Asotin Creek, accidents and localized natural events can seal the fate of a depressed population, especially if that population is wholly dependent upon a small number of critical pieces of habitat.

The benefits of the proposed package of restoration actions to spring chinook are similar to those for steelhead, but considerably more impressive. Clearly the most important result is the near doubling of productivity from 1.32 to 2.50. Such a development might well be enough to move Asotin spring chinook from the status of museum piece to a viable natural stock and an important hedge against extinction for the larger ESU in which it belongs. The 139% increase in life history diversity is nearly as important as the productivity increase, and for the same reasons cited for steelhead: this increase loosens the life-or-death dependence on a handful of reaches.