Estimated Benefits of Accomplishing Habitat Objectives –Lower Snake Subbasin

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The strategic habitat objectives for Almota Creek targeted the following environmental attributes, all of which were highlighted by the EDT diagnosis: embeddedness, fine sediment, turbidity, riparian function, LWD, primary pools and bed scour. The specific objectives set, by attribute and reach, are summarized in Table 1. Table 1 transforms the previously described objectives into terms compatible with EDT evaluation, and essentially quantifies the ecological intensity of the objectives, by expressing them in terms of "percent restoration of normative conditions". The "percent restoration" metric expresses the degree to which the difference between current and historical/normative condition for a specific environmental attribute has been eliminated[1]. A goal of 100% restoration would therefore imply the intent to eliminate any difference between current and historical conditions. As Table 1 shows, the objectives were most ambitious for erosion-related attributes (fines, turbidity, embeddedness) and bed scour, setting goals as high as 50% restoration for the former and 74% for the latter.

Table 1 Habitat objectives for Almota Creek by environmental attribute and reach. Cell contents represent the objective expressed in terms of percent restoration of historical/normative conditions for a specific attribute in a specific reach.

Reach	Fines	Embed.	Turbidity	Riparian Function	Woody Debris	Pools	Bed Scour
Almota Cr, mouth to Little Almota Cr	50%	50%	50%		13%		
Little Almota, mouth to headcut					17%		
Little Almota, headcut to cascade/culvert near Little Almota Rd					17%		
Almota Cr, L. Almota Cr to Second L. Almota Cr (Hungate Grade)	50%	50%	50%	33%	13%	13%	
Second L. Almota Cr, mouth to impassibly steep in Sec 18					17%		
Almota Cr, Second Little Almota Cr to unnamed RB ephemeral stream below confined reach	50%	50%	50%	33%	13%		
Almota Cr, confined reach ending at forks in Sec 11	25%	25%	25%		17%	17%	61%
North Branch of upper Almota, mouth to impassibly steep and dewatered section	25%	25%	25%		17%	17%	74%
Almota Cr, forks in Sec 11 to impassibly steep section	25%	25%	25%		17%		

Parenthetically, the Lower Snake Work Group did not set explicit objectives for pool restoration in either Almota Creek or Deadman Creek. The objectives for pools in Almota Creek were, "facilitate an increase in primary pools to >10% of the stream surface area from L. Almota-Second L. Almota, and to >8% from RB trib to the forks and in North Branch". Pool objectives were similarly open-ended for Deadman Creek. Accordingly, for both Almota and Deadman Creeks, it was assumed that the percent pool restoration would be equal to the percent restoration for LWD (for those reaches in which an increase in pool area was expected). This assumption is based on the well-known correlation between LWD and pool area.

[1]Note that two reaches with identical restoration objectives for the same attribute may well have different absolute objectives for the targeted attribute after implementation. Percent restoration refers to the difference between current and historical values; if historical values for an attribute in one reach were much better than historical values in another, the degree of improvement from current conditions in the former will obviously have to be much greater than for the latter.

Table 2 compares the performance of Almota steelhead if all habitat objectives were attained against performance under current, historical and PFC conditions. These performance estimates were generated by the EDT model.

While attainment of habitat objectives is estimated to result in an average steelhead abundance that is only 57 and 31% as great as PFC and historical, respectively, attainment of habitat objectives does transform the population qualitatively in terms of productivity and, to a lesser degree, life history diversity. Both the EDT model and the limited empirical observations suggest that the current steelhead population is quite unproductive. The EDT estimate of current productivity, 1.6 returns/spawner, is characteristic of populations in decline. Natural production in such a population is typically sporadic, with small number of spawners in some years and none in others. In metapopulation terms, Almota Creek under current conditions could be described as a "satellite population" that cannot persist without a continual infusion of colonists from a larger, more productive "core population". The current life history diversity value of 26% implies that 74% of the "biologically possible" life history patterns are no longer viable – return fewer adult progeny than parents. This in turn means that the population is extremely vulnerable to random events impacting the handful of reaches capable of supporting a self-sustaining population.

Table 2 Comparison of Almota Creek steelhead performance if all habitat restoration objectives were attained with performance as estimated under current, PFC and historical/normative conditions. EDT model estimates, March, 2004.

Scenario	Life History Diversity	Productivity (adult returns/spawner)	Carring Capacity (Adults)	Average Abundance (Adults)
Current without harvest	26%	1.6	75	29
Habitat objectives attained	43%	3.0	92	62
PFC	60%	6.3	129	108
Historic potential	60%	13.1	217	201

However, if all habitat objectives are attained, the resilience of Almota steelhead should increase substantially. Not only does productivity increase to 3 returning adults/spawner, but life history diversity nearly doubles, increasing from 26 to 43%. From previous EDT analyses of populations known empirically to be self-sustaining or in decline, it has been observed that a productivity estimate of 3.0 marks the approximate boundary between stable and declining populations. The predicted increase in life history diversity also suggests that natural production would become more robust if habitat objectives were attained, because the population would be less dependent on a limited number of higher quality reaches.

Tables 3 and 4 for Deadman Creek steelhead are analogous to Tables 1 and 2 for Almota Creek: Table 3 summarizes habitat objectives by reach in terms of percent restoration, and Table 4 compares the estimated benefits of attaining habitat objectives with steelhead performance under current, PFC and historical conditions.

Table 3 Habitat objectives for Deadman Creek by environmental attribute and reach. Cell contents represent the objective expressed in terms of percent restoration of historical/normative conditions for a specific attribute in a specific reach.

Reach	Fines	Embed.	Turbidity	Riparian Function	Woody Debris	Pools	Temp.
Deadman embayment					14%		
Deadman Cr, embayment to Willow Gulch Cr					14%		
Deadman Cr, Willow Gulch Cr to Ping Gulch Cr					14%		
Ping Gulch Cr, mouth to bridge at Leonard property					14%		
Deadman Cr, Ping Gulch Cr to Lynn Gulch Cr	35%	35%	35%	17%	14%	14%	100%
Lynn Gulch Cr, mouth to perched culvert near mouth					14%		
Lynn Gulch Cr, culvert to historical access limit at confluence of East Lynn Gulch Cr					14%		
Deadman Cr, Lynn Gulch Cr to confluence of NF & SF Deadman Cr	27%	27%	27%	25%	14%	14%	
NF Deadman Cr, mouth to current access limit at intermittant zone					14%		
NF Deadman Cr, end of current access zone to historical access limit at forks of NF					14%		
SF Deadman Cr, mouth to access limit at confluence of SF Deadman Gulch	50%	50%	50%		14%	14%	

Table 4 Comparison of Deadman Creek steelhead performance if all habitat restoration objectives were attained with performance as estimated under current, PFC and historical/normative conditions. EDT model estimates, March, 2004.

Scenario	Life History Diversity	Productivity (adult returns/spawner)	Carring Capacity (Adults)	Average Abundance (Adults)
Current without harvest	1%	1.2	160	21
Habitat objectives attained	11%	1.6	219	80
PFC	83%	4.8	420	333
Historic potential	83%	8.0	651	569

A comparison of Table 3 with Table 1 shows that habitat objectives for Deadman Creek, at least in terms of percent restoration of historical/normative conditions, were less ambitious than for Almota Creek. The objective for restoring erosion-related attributes was as high as Almota Creek only in one reach (SF Deadman), and the objectives for riparian function (17 and 25%) were also significantly lower than for Almota Creek (33%). Moreover, objectives of any sort were set for relatively fewer reaches in Deadman Creek than Almota.

This reduction in the intensity and scope of objectives, not surprisingly, translates to a lower level of benefits to Deadman Creek steelhead production. Although the relative increase in life history diversity is substantial, the absolute value attained under the restoration scenario is still quite low. Moreover, the productivity value estimated under the habitat restoration objective, 1.6, is exactly the value estimated for Almota Creek under current conditions.

Indeed, the performance of Deadman Creek steelhead assuming full attainment of habitat objectives would probably be quite comparable to steelhead performance in Almota Creek under current conditions. The overall impact of the proposed habitat objectives for Deadman Creek steelhead would perhaps be best summarized as a change from frankly endangered to threatened status in terms of the prospects for long-term survival.

Report 3 - Future Scenario Juvenile Outmigrant Population Performance Parameters

Deadman Creek

Population	Scenario	Productivity	Capacity	Abundance
Deadman Summer Steelhead	Current without harvest	45	8,825	855
	ALL	70	11,491	3,774
	Historic potential	242	22,217	19,135
Deadman Summer Steelhead	Current without harvest	45	8,825	855
	PFC	222	21,522	16,680
	Historic potential	242	22,217	19,135

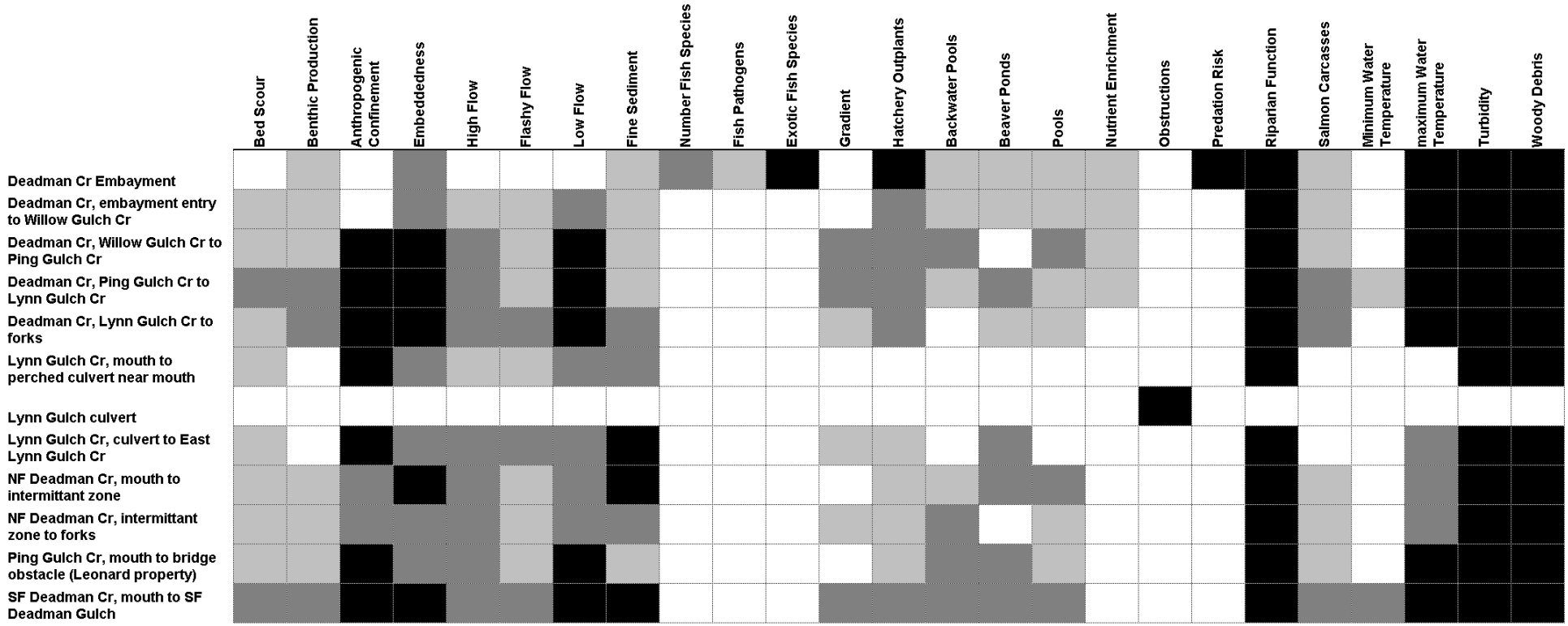

Figure 1 Level 2 Diagnosis of Deadman Creek. This figure summarizes the relationship between the impact of specific environmental attributes on steelhead productivity if historical values were substituted for current. The impact on productivity is reach-specific.

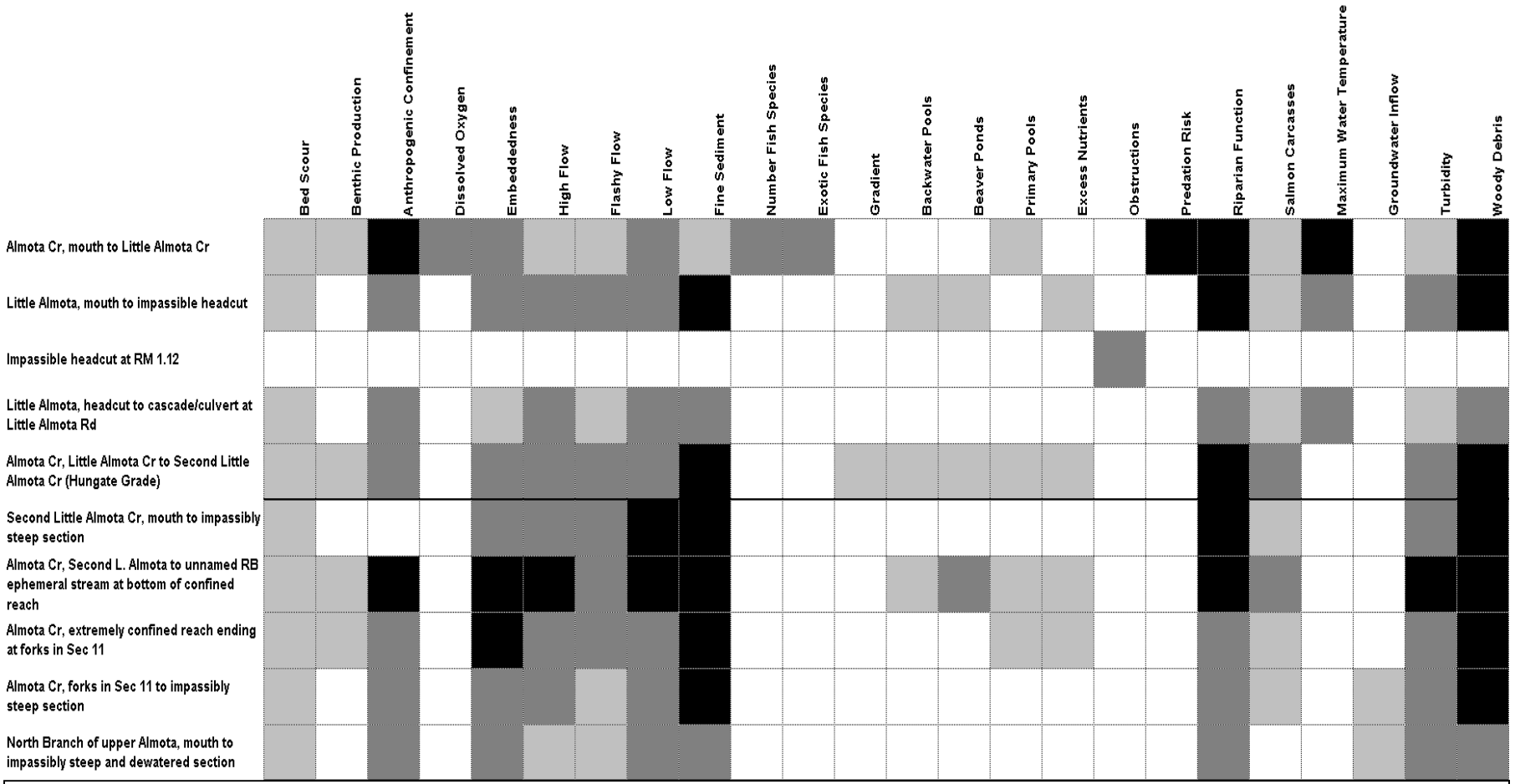

Figure 1 Level 2 Diagnosis of Almota Creek. This figure summarizes the relationship between the impact of specific environmental attributes on steelhead productivity if historical values were substituted for current.