Level 2 Diagnosis and Project Inventory, Lower Snake Tributaries
Prepared by: Mobrand Biometrics, Inc.
April 2004

A Level 2 Diagnosis (L2D) is a method of identifying reach-specific survival impacts caused by a specific environmental attribute for a particular species. Figure 1 is a Level 2 Diagnosis for Almota steelhead, and Figure 2 is a combined Level 2 Diagnosis/Project Inventory for Deadman Creek steelhead. The L2D is created by substituting historical values for current for a single attribute in a single reach, and then using the EDT rules to estimate the decrease in productivity between current and historical conditions attributable to this single attribute. In Figures 1 and 2, the black cells represent a productivity decrease of 0.0025 while the gray and light gray cells indicate productivity decrements one and two orders of magnitude less – 0.00025 and 0.000025, respectively. Therefore, in the absence of other considerations to the contrary, a fish habitat manager developing a restoration plan based solely by EDT output would place greatest emphasis on the black cells, less emphasis on the dark gray cells and least on the light gray cells.

A simple inspection of Figure 1 suggests that woody debris, fine sediment and riparian function are the three major limiting factors for Almota steelhead, whereas inspection of Figure 2 suggests turbidity, maximum temperature, woody debris and riparian function are the dominant limiting factors for Deadman steelhead. This visual impression is confirmed by the actual values summarized in Table 1. Table 1 shows the sum of productivity decrements across all reaches for Almota and Deadman Creek steelhead normalized to 1.0 for the attribute with the most severe impact. For Almota Creek, the dominant limiting factor is woody debris, and the attributes with a productivity impact at least ten percent as large as woody debris are fine sediment, riparian function, anthropogenic confinement, low flow, embeddedness, turbidity and high flow. Turbidity is the top limiting factor for Deadman Creek steelhead and the attributes with an impact at least a tenth as large are maximum temperature, woody debris, riparian function, anthropogenic confinement, embeddedness, low flow and fine sediment.

Table 1. Relative impact of individual environmental attributes across all reaches for Almota and Deadman Creek steelhead. Impact is indexed by the sum of estimated productivity decrements normalized to 1.0 for the attribute with the largest sum.

Almota Creek Steelhead		Deadman Creek Steelhead	
Attribute	**Relative Impact**	**Attribute**	**Relative Impact**
Woody Debris	100.0%	Turbidity	100.0%
Fine Sediment	64.3%	Maximum Water Temperature	87.0%
Riparian Function	38.1%	Woody Debris	59.6%
Anthropogenic Confinement	22.1%	Riparian Function	55.3%
Flow Low	22.1%	Anthropogenic Confinement	25.0%
Embeddedness	21.7%	Embeddedness	23.6%
Turbidity	14.5%	Low Flow	18.3%
Flow High	12.6%	Fine Sediment	11.6%
Predation Risk	8.1%	Obstructions	4.2%
Maximum Water Temperature	7.0%	Exotic Fish Species	4.1%
Flow Flashy	6.2%	Hatchery Outplants	3.7%
Dissolved Oxygen	3.0%	Flow High	3.3%
Obstructions	2.7%	Primary Pools	2.3%
Exotic Fish Species	2.1%	Gradient	2.3%
Salmon Carcasses	2.0%	Beaver Ponds	2.1%
Bed Scour	1.9%	Predation Risk	2.0%
Number Fish Species	1.6%	Salmon Carcasses	1.6%
Beaver Ponds	1.6%	Flashy Flow	1.6%
Benthic Production	1.1%	Benthic Production	1.3%
Nutrient Enrichment	0.7%	Bed Scour	1.2%
Primary Pools	0.7%	Backwater Pools	1.1%
Backwater Pools	0.6%	Number Fish Species	0.8%
Groundwater Input	0.4%	Nutrient Enrichment	0.4%
		Minimum Water Temperature	0.3%
		Fish Pathogens	0.1%

Steelhead in both watersheds suffer from a lack of woody debris and riparian function, as well as anthropogenic confinement and sediment-related factors. The diagnostic picture between populations differs primarily in the role played by maximum temperature, which is much more significant in Deadman Creek than Almota.

ReachName	Steelhead Protection Value[a]	Steelhead Restoration Potential[a]	Bed Scour	Benthic Production	Confinement	Dissolved Oxygen	Embeddedness	Flow High	Flow Flashy	Flow Low	Fine Sediment	Number Fish Species	Exotic Fish Species	Gradient	Backwater Pools	Beaver Ponds	Primary Pools	Nutrient Enrichment	Obstructions	Predation Risk	Riparian Function	Salmon Carcasses	Maximum Water Temperatu	Groundwater Input	Turbidity	Woody Debris
Almota Cr, mouth to Little Almota Cr	9	19																								
Little Almota, mouth to headcut	8	3																								
Little Almota headcut	9	11																								
Little Almota, headcut to cascade/culvert near Little Almota Rd	9	12																								
Almota Cr, L. Almota Cr to Second L. Almota Cr (Hungate Grade)	5	4																								
Second L. Almota Cr, mouth to impassibly steep in Sec 18	4	6																								
Almota Cr, Second L. Almota Cr to unnamed RB ephemeral stream below confined reach	1	2																								
Almota Cr, confined reach ending at forks in Sec 11	5	7																								
North Branch of upper Almota, mouth to impassibly steep and dewatered section	7	8																								
Almota Cr, forks in Sec 11 to impassibly steep section	12	9																								

a. These rankings are the mean rankings of productivity, equilibrium abundance and life history diversity. Ties are possible and some values are missing because they apply to the Snake and Columbia Rivers.

Figure 1 Level 2 diagnosis of Almota Creek steelhead. Shading represents the decrease in steelhead productivity from historical values for a specific attribute in a specific reach. Darker shading represents a more severe impact, while unshaded cells indicate no impact for a particular attribute in a particular reach. EDT analysis, March 2004.

			Habitat Quantity			Habitat Quality																						
Geographic Area	Restoration Rank[a]	Protection Rank[a]	Backwater Pools	Beaver Ponds	Primary Pools	Bed Scour	Benthic Production	Anthropogenic Confinement	Embeddedness	High Flow	Flashy Flow	Low Flow	Fine Sediment	Number Fish Species	Fish Pathogens	Exotic Fish Introductions	Gradient	Hatchery Outplants	Nutrient Enrichment	Obstructions	Predation Risk	Riparian Function	Salmon Carcasses	Maximum Temperature	Minimum Temperature	Turbidity	Woody Debris	Total "Hits" By Reach
Deadman embayment	12	6																										
Deadman Cr, embayment entry to Willow Gulch Cr	10	10							2	2	2	2	2											2	2	2		16
Deadman Cr, Willow Gulch Cr to Ping Gulch Cr	5	7							6	6	6	6	6											6	6	6		48
Deadman Cr, Ping Gulch Cr to Lynn Gulch Cr	2	4							6	6	6	6	6											6	6	6		48
Deadman Cr, Lynn Gulch Cr to confluence of NF & SF Deadman Cr	7	5																										
Lynn Gulch Cr, mouth to perched culvert near mouth	13	13																										
Lynn Gulch culvert	14	13																										
Lynn Gulch Cr, culvert to historical access limit at confluence of East Lynn Gulch Cr	11	11																										
NF Deadman Cr, mouth to current access limit at intermittant zone	7	8							3	3	3	3	3											3	3	3		24
NF Deadman Cr, end of current access zone to historical access limit at forks of NF	3	8							7	7	7	7	7											7	7	7		56
Ping Gulch Cr, mouth to aproned bridge obstacle at the Leonard property	6	11																										
SF Deadman Cr, mouth to access limit at confluence of SF Deadman Gulch	1	2							21	21	21	21	21											21	21	21		168
Total "Hits" By Environmental Attribute									45	45	45	45	45											45	45	45		360

a. Overall rank is the mean of the rank for life history diversity, productivity and equilibrium abundance. Ties are possible, and some ranks may be missing because they apply to the mainstem Snake and Columbia.

Fig 2 Level 2 diagnosis of Deadman Creek steelhead and habitat project summary. Shading represents the decrease in steelhead productivity from historical values for a specific attribute in a specific reach. Darker shading represents a more severe impact, while unshaded cells indicate no impact for a particular attribute in a particular reach. The numbers inside the cells are an index of the habitat restoration/protection effort targeting a specific attribute in a specific reach. Effort is indexed by "hits" (see text or details). EDT analysis, March 2004.

Figure 2 differs from Figure 1 by virtue of the fact it includes an estimate of the reach-specific "habitat effort" that has been focused on key attributes in recent years[1]. The phrase "habitat effort" is to be understood as projects intended to restore or protect fish habitat. For Deadman Creek, recent habitat effort has included a number of passive measures – e.g., direct seeding, fencing, sediment basins -- intended to allow natural restoration of erosion processes and hydrological and riparian function. The effort has been quite extensive in the watershed, with a footprint covering the entirety of two reaches, Deadman 3 (Deadman Creek from Willow Gulch to Ping Gulch) and the South Fork of Deadman Creek, 61% of another (Deadman Creek from Ping Gulch to Lynn Gulch), and from 5 –15% of three other reaches. Table 3 summarizes to nature and scope of the habitat projects analyzed for Deadman Creek.

Table 3 Summary of habitat effort in Deadman Creek watershed, 1996 to present.

Practice	Number	Units
2 pass seeding	2,809	acres
Direct Seed	2,002	acres
Fencing	12,697	feet
Grasses and Legumes in Rotation	113	acres
No-till seeding	8,552	acres
Pasture and Hayland planting	15	acres
Sediment Basins	54,270	cyds
Strip Cropping	1,073	acres
Subsoiling	3,878	acres
Terraces	80,734	feet
Grassed Waterways	23,866	feet

While the information in Table 3 usefully summarizes the general nature and scope of recent habitat effort in Deadman Creek, it does not explicitly identify the attributes or the specific reaches targeted. This degree of reach/attribute specificity is necessary if the "fit" between the Level 2 Diagnosis and recent effort allocation is to be determined.

In order to assess the congruence between the Level 2 Diagnosis and effort allocation, a new metric had to be devised. For want of a more descriptive term, this metric has been termed a "hit". A hit is an environmental attribute that can reasonably be expected to have been affected in a specific reach by a specific project. A riparian planting project in the Deadman 4 reach, for instance, can reasonably be expected to affect riparian function, maximum temperature, large woody debris, embeddedness, fine sediment and a number of other attributes over a 10-15 year time period. Each of these attributes represents a hit in the Deadman 4 reach.

It is clear that the "hit" is a very imprecise metric, reflecting neither true geographic scope ("footprint") nor effectiveness (how well the project actually worked). Nevertheless, the congruence between effort and the Level 2 Diagnosis can be at least crudely assessed by the similarity between the distribution of hits and reach rank, or between hits and attribute priority. Moreover, it is important to do assess the congruence between effort and the diagnosis, because gross inconsistencies reflect either an erroneous environmental diagnosis or some other factor that prevents work from being done where it would accomplish the most.

As Figures 2 and 3 show, there is a fair measure of congruence between the distribution of effort as indexed by hits and the relative importance of Deadman Creek reaches when "importance" is equated to the EDT Restoration or Protection Rank. The highest-ranking reach for either protection or restoration (the South Fork) receives considerably more hits than any other reach; reaches of intermediate rank receive an

---

[1]A search of available data turned up only a single project for Almota Creek, which therefore was not analyzed for congruence between effort and limiting factors.

intermediate degree of effort; and the lowest ranking reaches receive little or no effort. This is generally the pattern of effort allocation one would hope to see when resources are limited.

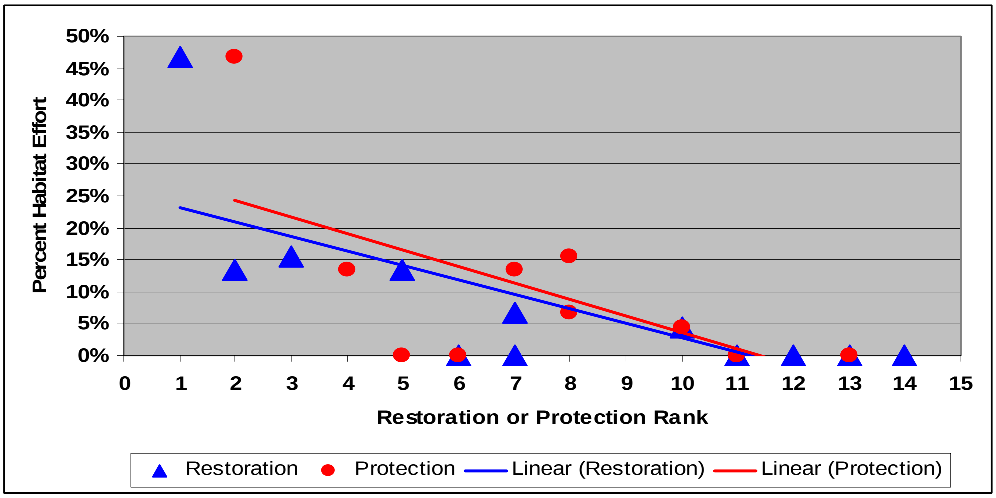

Figure 3 Relationship between reach rank for restoration or protection and habitat effort allocation indexed by "hits". EDT analysis of Deadman Creek steelhead, March 2004.

The congruence between the attributes actually targeted in high priority reaches and the attributes most in need of improvement is perhaps not so good. Figure 2 indicates little or no effort has been focused on anthropogenic confinement, riparian function of woody debris. These attributes rank 3, 4 and 5 in terms of negative impact on steelhead productivity across all reaches.