

APPENDIX D

Definition of Properly Functioning Conditions, as Applied in EDT Analyses

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Properly functioning conditions (PFC) is a concept created originally by the Bureau of Land Management (BLM) to assess the natural habitat-forming processes of riparian and wetland areas (Pritchard et al. 1993). When these processes are working properly, it can be assumed that environmental conditions are suitable to support productive populations of native anadromous and resident fish species. The notion of Properly Functioning Conditions for salmonid systems has also been advanced by the National Marine Fisheries Service (1996) in connection with recovery of species listed under the Endangered Species Act.

The PFC concept has been translated into a set of EDT Level 2 attribute ratings—ratings that define a PFC environmental condition relevant to anadromous salmonids within Pacific Northwest streams.

PFC does not imply pristine or template conditions. There are many examples of healthy populations occupying degraded habitat (Hanford Reach Chinook, for example). With this in mind, PFC ratings were applied to all reaches regardless of current habitat rating, e.g., if riparian function is 100 percent for the current condition, the PFC condition would still apply the 70 percent functional rating. Also, PFC is not intended to imply a standard against which all streams are compared. PFC cannot be “better” than historic conditions for a stream reach, e.g., if percent fine sediment in historic reconstruction was 15 percent, the PFC rating for sediment must be greater than or equal to 15 percent.

Properly Functioning habitat conditions outlined by the National Marine Fisheries Service (1996) were used to help define the EDT PFC Level 2 ratings. The NMFS document includes a Matrix of Pathways and Indicators (MPI) that relates closely to EDT attributes. An inter-agency team organized by the WDFW and the NWIFC and facilitated by Mobrand Biometrics, Inc. was responsible for translating the NMFS definitions into EDT Level 2 attributes. EDT attribute ratings and their relationship to the NMFS definition of PFC are presented in Table D-1. The MPI addressed only a subset of the attributes used in EDT.

Table D-1 also includes those attributes that were not defined by NMFS, but were assigned a PFC rating by the inter-agency technical team. Guidance for these attributes was an understanding of the intent of the NMFS definition of properly functioning, gleaned largely from attributes described in the MPI.

The composition of habitat types (pool, riffle, glide, etc.) was not clearly defined in the MPI for PFC. The MPI provided pool frequency by channel width (number of pools per mile). However, this description did not adequately consider differences in gradient and channel confinement between stream reaches. Furthermore, the pristine composition of habitat types is not consistent with the overall PFC definition. Simply applying the template assumptions to PFC is not appropriate.

Table D-1 Correspondence of Properly Functioning Condition as Designated by NMFS (1996) and Fully Functional as Used in the Recovery Target Analysis (EDT)

Attribute	NMFS (1996) Properly Functioning	Representation of PFC in EDT Level 2 Environmental Attribute
Hydrological Characteristics		
1) Annual Variation in High Flow	Change in Peak/Base Flow: Watershed hydrograph indicates peak flow, base flow, and flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography	Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
2) Annual Variation in Low Flow		Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
3) Diel Variation in Flow		Consistent with natural runoff pattern or hydro project following WDFW ramping rate criteria (Rating 1).
4) Intra-Annual Variation in High Flow	Increase in Drainage Network: Zero or minimum increases in drainage network density due to roads.	Consistent with undisturbed watershed of similar size, geology, and geography (Rating 2).
5) Natural Hydrologic Regime	Not described	Attribute describes basic geomorphology and hydrology of basin
6) Regulated Hydrologic Regime	Not described	Flow not modified by hydro project (Rating 0)
Stream Corridor Structure		
7) Channel Length	Not described	EDT analysis assumed historic (template) channel length, gradient and widths; this assumption consistent with assumptions for channel hydromodifications (none)
8) Gradient		
9) Channel Minimum Width		
10) Channel Maximum Width		
11) Hydromodifications	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	Stream channel is fully connected to the floodplain although very minor structures may exist that do not result in flow restriction or constriction (Rating 0).
12) Natural Channel Confinement	Not described; attribute describes basic geomorphology of reach	No difference historic and current ratings in EDT

Attribute	NMFS (1996) Properly Functioning	Representation of PFC in EDT Level 2 Environmental Attribute
13) Habitat Types	a) Pool Frequency: <ul style="list-style-type: none"> • Width 5' 184 pools/mile • Width 10' 96 pools/mile • Width 15' 70 pools/mile • Width 20' 56 pools/mile • Width 50' 26 pools/mile • Width 75' 23 pools/mile • Width 100' 18 pools/mile b) Pool Quality: Pools > 1 meter depth (holding pools) with good cover and cool water, minor reduction of pool volume by fine sediment	Assumed to be consistent with 80% of historic (template) pool frequency; EDT criteria developed to acknowledge reach-specific differences in pool frequency.
14) Habitat Type – Off Channel	Backwaters with cover, and low-energy off-channel areas (ponds, oxbows, etc.)	Assumed full connection of historic (template) off-channel habitats.
15) Migration Obstructions	Any man-made barriers present in watershed allow upstream and downstream fish passage at all flows	Obstructions removed or designed to allow full passage of juveniles and adults (Rating 0)
16) Water withdrawals	Not described	Very minor withdrawals (entrainment probability considered to be very low) (Rating 0)
17) Bed Scour	Although not described, bank stability - >90% of banks not actively eroding -implies a stable stream bed.	Average depth of scour >2 cm and < 10 cm (Rating 1)
18) Icing	Not described	Riparian function is high, assumed no degradation of channel stability due to icing – assume historic (template) condition
19) Riparian Function	The riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers include known refugia for sensitive aquatic species (>80% intact); and/or grazing impacts; percent similarity of riparian vegetation to the potential natural community composition > 50%.	> 70%-90% of functional attributes present (overbank flows, vegetated streambanks, groundwater interactions typically present) (modeled 70% - Rating 1.6).
20) Wood Debris	>80 pieces/mile (diameter > 2"; length > 50') and adequate sources of woody debris recruitment in riparian areas.	Complex array of large wood pieces but fewer cross channel bars and fewer pieces of sound large wood due to reduced recruitment; influences of large wood and jams are a prevalent influence on channel morphology where channel gradient and flow allow such influences. (Rating 1).
21) Embeddedness	Dominant substrate is cobble or gravel, or embeddedness < 20%	>10% and <25% covered by fine sediment (Rating 1)
22) Fine Sediment (< 0.85 mm) and	Fines: < 12%, turbidity low	Fines: 6%-11% (modeled 11% fines - Rating 1.5). Turbidity

Attribute	NMFS (1996) Properly Functioning	Representation of PFC in EDT Level 2 Environmental Attribute
Turbidity		low, infrequent episodes, short duration, low concentrations (<50 mg/l) (Rating 0.5)
Water Quality		
23) Alkalinity and Dissolved Oxygen	Not described	Assumed historic (template) conditions
24) Pollutants (Metals, misc. pollutants)	Low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches	No toxicity expected due to dissolved heavy metals to salmonids under prolonged exposure (1 month exposure assumed) (Rating 0.5).
25) Nutrient enrichment		Very small amount suspected through land use activities (Rating 1.5)
26) Temperature – Daily Maximum	10-14°C	10-16°C on warmest day (Rating 1)
27) Temperature – Daily Minimum	Not described	Assumed historic (template) conditions
28) Temperature – Spatial Variation	Not described	Assumed historic (template) conditions
Biological Community		
29) Biological community (benthic community richness, introduced species, predator risk, and fish community richness)	Not Described	Assumed historic (template) conditions
30) Fish Pathogens	Not Described	a) No fish stocking within last decade; or b) no sockeye population in basin; or c) no viral epizootics in kokanee populations at the subbasin level (Rating 1).
31) Salmon Carcasses	Not Described	Very abundant -- an average number of carcasses per total miles of main channel habitat >400 and < 800 (Rating 1.5).
32) Hatchery Outplants	Not Described	No more than two instances of fish releases in the past decade in the drainage (Rating 1.5).

The EDT definition of habitat types under PFC assumes 80 percent of the template or 80 percent of current (whatever is greater) pool type habitat (primary pools, backwater pools and pool tailouts, and beaver ponds) within the reach. The composition of non-pool habitat (riffles and glides) is calculated using the template composition of these habitat types for the reach. This assumes that the template characterization for riffle and glide habitat (largely based on an assessment of channel gradient and confinement for the reach) would correctly represent the natural composition, i.e., derived through natural habitat-forming processes, for these habitat types.

REFERENCES

- National Marine Fisheries Service. 1996. Making ESA determinations of effect for individual or grouped actions at the watershed scale. Environmental and Technical Services Division, Habitat Conservation Branch, Portland, OR.
- Prichard, D., H. Barrett, J. Cagney, R. Clark, J. Fogg, K. Gebhardt, P. Hansen, B. Mitchell, and D. Tippy. 1993. Riparian area management: process for assessing proper functioning condition. TR 1737-9. Bureau of Land Management, BLM/SC/ST-93/003+1737, Service Center, Co.