

Appendix C – Habitat Attribute Definitions

Habitat attribute definitions used to rate reach-level conditions. The source for attribute definitions is provided in brackets.

Reach Attribute	Good	Fair	Poor
Riparian condition	At least a 100 ft. riparian buffer with: > 80% mature trees, or consistent with potential native community < 20% riparian disturbance (human) > 80% canopy closure in the riparian zone. Three seral stages represented [Reach Based Ecosystem Indicators, e.g. USBR 2012]	25 to 100 ft. riparian buffer with: 50 to 80% mature trees < 20% riparian disturbance (human) > 80% canopy closure in the riparian zone. Two seral stages represented [Reach Based Ecosystem Indicators, e.g. USBR 2012]	Less than 25' buffer width <50% mature trees One seral stage represented [Reach Based Ecosystem Indicators, e.g. USBR 2012]
Floodplain connectivity	Floodplain areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession. Minimal human disturbance of the floodplain. <2mi/mi ² road density in the floodplain [adapted from NFMS 1996]	Reduced linkage of wetland, floodplains and riparian areas to main channel, overbank flows are reduced relative to historical frequency as evidenced by moderate degradation of wetland function, riparian vegetation/succession 2-3 mi/mi ² road density in the floodplain [adapted from NFMS1996]	Reduced linkage of wetland, floodplains and riparian areas to main channel, overbank flows are reduced relative to historical frequency as evidenced by moderate degradation of wetland function, riparian vegetation/succession >3 mi/mi ² road density in the floodplain [adapted from NFMS 1996]
Bank condition / Channel migration	Channel is migrating at or near natural rates. Minimal bank armoring or human-induced erosion. [Reach Based Ecosystem Indicators, e.g. USBR 2012]	Limited amount of channel migration is occurring at a faster/slower rate relative to natural rates, but significant change in channel width or planform is not detectable; large woody material is still being recruited. [Reach Based Ecosystem Indicators, e.g. USBR 2012]	Little or no channel migration is occurring because of human actions preventing reworking of the floodplain and large woody material recruitment; or channel migration is occurring at an accelerated rate such that channel width has at least doubled, possibly resulting in a channel planform change, and sediment supply has noticeably increased from bank erosion. [Reach Based Ecosystem Indicators, e.g. USBR 2012]
Vertical channel stability	No measurable trend of human-induced aggradation or incision. [adapted from Reach Based Ecosystem Indicators, e.g. USBR 2012]	Measureable trend of aggradation or incision that has the potential to but not yet caused disconnection of the floodplain or a visible change in channel planform (e.g., single thread to braided).	Enough incision that the floodplain and off-channel habitat areas have been disconnected; or, enough aggradation that a visible change in channel planform has occurred (e.g., single thread to braided).

Reach Attribute	Good	Fair	Poor
Pools (quantity/quality)	<p>Pools have good cover and cool water and only minor reduction of pool volume by fine sediment.</p> <p>Many large pools >3 ft. deep with good fish cover.</p> <p>Pool frequency dependent upon channel width* (5' width = 184 pools/mi, 10' = 96 pools/mi, 15' = 70 pools/mi, 20' = 56 pools/mi, 25' = 47 pools/mi, 50' = 26 pools/mi, 75' = 23 pools/mi, 100' = 18 pools/mi)</p> <p>[Reach Based Ecosystem Indicators, e.g. USBR 2012, and NMFS 1996]</p>	<p>Meets pool frequency standards but LWD recruitment inadequate to maintain pools over time.</p> <p>Moderate reduction of pool volume by fine sediment.</p> <p>Fewer large pools >3 ft. deep with good fish cover.</p> <p>[adapted from NMFS 1996]</p>	<p>Does not meet pool frequency standards and no deep pools.</p> <p>[adapted from NMFS 1996]</p>
Large wood and log jams	<p>> 80 pieces/mi (>24 in diameter; > 50 ft. long) [from NMFS 1996]</p> <p>≥30 log jams/mi (jam = >10pieces/jam, >6in diam and 20 ft long) [based on reference conditions in Upper Wind (Wind 7a)]</p>	<p>Currently meets standards for 'Good', but lacks potential sources from riparian areas of woody material recruitment to maintain that standard. [adapted from NMFS 1996]</p> <p>10 – 30 log jams/mi</p>	<p>Does not meet standards for 'Good' and lacks potential large woody material. [adapted from NMFS 1996]</p> <p><10 log jams/mi</p>
Mainstem habitat complexity	<p>Greater than 20 habitat units per mile</p> <p>[adapted from The Nature Conservancy's Key Ecological Attributes]</p>	<p>Between 5-20 habitat units per Mile</p> <p>[adapted from The Nature Conservancy's Key Ecological Attributes]</p>	<p>Less than 5 habitat units per mile</p> <p>[adapted from The Nature Conservancy's Key Ecological Attributes]</p>
Off-channel habitat	<p>Reach has ponds, oxbows, backwaters, side-channels, and other off-channel areas with cover that are consistent with natural conditions. No manmade barriers are present that prevent access to off-channel areas.</p> <p>[adapted from NMFS 1996]</p>	<p>Reach has some ponds, oxbows, backwaters, side-channels, and other off-channel areas or these areas have no cover.</p> <p>[adapted from NMFS 1996]</p>	<p>Few or no ponds, oxbows, backwaters, side-channels, and other off-channel areas.</p> <p>[adapted from NMFS 1996]</p>
Fish passage	<p>Passage open year-round [NMFS 1996]</p>	<p>Passage not possible at base/low flows [NMFS 1996]</p>	<p>Passage not possible at a range of flows. [NMFS 1996]</p>
Temperature	<p>Always meets applicable Water Quality Standards for Surface Waters of the State of Washington or more stringent spawning and incubation protection guidelines.</p> <p>[WDOE 2012]</p>	<p>Typically meets applicable Water Quality Standards for Surface Waters of the State of Washington or more stringent spawning and incubation protection guidelines.</p> <p>[WDOE 2012]</p>	<p>Does not meet applicable Water Quality Standards for Surface Waters of the State of Washington or more stringent spawning and incubation protection guidelines.</p> <p>[WDOE 2012]</p>

Reach Attribute	Good	Fair	Poor
Flow	Watershed hydrograph indicates flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography. [WDOE 2012]	Some evidence of altered flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography. [WDOE 2012]	Pronounced changes in flow timing characteristics comparable to an undisturbed watershed of similar size, geology, and geography. [WDOE 2012]
Fine Sediment	<12% fines (<0.85mm) in gravel; turbidity low [NMFS 1996]	12-17% fines; turbidity moderate [NMFS 1996]	>17% fines; fines at surface or depth in spawning habitat; turbidity high [NMFS 1996]

References

National Marine Fisheries Service (NMFS). 1996. Making Endangered Species Act determinations of effect for individual or grouped actions at the watershed scale. Lacey, Washington, National Marine Fisheries Service, Environmental and Technical Services Division, Habitat Conservation Branch.

USBR (United States Bureau of Reclamation). 2012. Lower Entiat Reach Assessment, Chelan County, WA. USBR Pacific Northwest region, Boise, ID, US Department of the Interior.

Washington Department of Ecology (WDOE). 2012. Water quality standards for surface waters of the state of Washington. Chapter 173-201A WAC. Amended May 9, 2011. Revised January 2012. Publication no. 06-10-091. Washington State Department of Ecology. Olympia, Washington.