

*Appendix G*

**Habitat Concerns Data Dictionary**



## **Appendix G**

### **Habitat Concerns Data Dictionary**

This appendix presents a standardized list of habitat-related concerns that affect salmon and steelhead in the Pacific Northwest. The NMFS Northwest Fisheries Science Center developed this so-called “data dictionary” (Hamm 2012) to facilitate the use of a common parlance in discussing limiting factors in Northwest Region salmon and steelhead recovery plans. For the Lower Columbia River ESU recovery plan, NMFS Northwest Region staff expanded the initial, habitat-oriented data dictionary in this appendix to include hydropower, harvest, and hatchery concerns; the result served as a framework for summarizing stratum- and ESU-level limiting factors and threats. (See Appendix H for a fuller description of how NMFS correlated limiting factor information from the Oregon, Washington, and White Salmon management unit plans with the ecological concerns terminology of the NMFS data dictionary.)

Two versions of the habitat concerns data dictionary are included in this appendix: a full version complete with definitions of habitat concerns and subcategories, and an abbreviated version that excludes definitions.



Limiting Factors	ID	Habitat Concern	Definition	Alternate Terms	ID	Habitat Concern-Sub Category	Definition	Alternate Terms
Habitat-Spawning and egg incubation, Habitat-Rearing, Habitat-Adult	1	Habitat Quantity	Insufficient quantity of total habitat or habitat diversity due to the elimination of access	Connectivity, Access, Structure, Simplification, Availability	1.1	Anthropogenic Barriers	Loss of access to habitat and/or habitat sub-types due to anthropogenic activity. Includes partial or ephemeral barriers.	Access, Barriers, Access to Side-Channels, Flap Gates, Tidal Gates, Culverts, Obstacles, Obstructions, Passage Issues, Blocked
					1.2	Natural Barriers	Lasting natural barriers to stream or estuary access, including waterfalls, sand bars, log jams, sufficiently steep gradients or insufficient water. May represent the end of good quality habitat	Water Falls, Sand Bar, Bar Breach, Log Jams, Steep Gradient
Direct Mortality	2	Direct Mortality	Induced instantaneous mortality.	Predation, Disease, Species Interactions	2.1	Predation	Introduced salmon predators or changes to the habitat that increase native predator numbers or increase predator success.	Invasive/Exotic Fish or Invertebrate Predators Native Fish, Native Bird, Native Pinnipeds
					2.2	Pathogens	Introduction of disease causing organisms or parasites.	Disease, Sea Lice,
Direct Mortality	3	Toxic Contaminants	Exposure to chemical substances capable of causing sub-lethal or lethal impacts to individuals or offspring.	Pollution	3.1	Water	Direct exposure to toxic substance in the water column.	Short-term Toxicity, Stormwater Discharge, Outfalls, Wastewater, Non-point Source Pollution, Spills, Marine Debris, Point Source Pollution, Copper, Mercury
					3.2	Biota	Toxic substances found in prey that negatively affect salmon. Includes persistent toxic substances that are concentrated as they are consumed and move to the next trophic level.	Bioaccumulation Toxicity, PBDEs, PCBs, Oil, Organochlorides, Pesticides
Food	4	Food	Insufficient food for salmonids.	Competition, Prey Availability, Species Interactions	4.1	Altered Primary Productivity	Alteration of ecological dynamics affecting the quantity, quality and/or species composition of phytoplankton or detritus resulting in insufficient food available for salmonids or prey species.	Micro and Macro-Detrital Inputs, Loss of Marine Derived Nutrients, Carcasses, Downwelling, Ocean Conditions, Detritus, Phytoplankton
					4.2	Competition	Insufficient food due to interspecific and intraspecific (hatchery produced) competition.	Hatchery Fish, Increased Natural Competitors, Invasive Species
					4.3	Altered Prey Species Composition and Diversity	Alteration of ecological dynamics affecting the species composition, distribution or nutritional quality of zooplankton, macroinvertebrates, forage-fish or other prey resulting in insufficient food for salmonids.	Species Diversity, Prey Species Abundance, Invasive Species, Altered Food Web Dynamics
Habitat-Spawning and egg incubation, Habitat-Rearing, Habitat-Adult	5	Riparian Condition	Degradation of the habitat adjacent to streams, rivers, lakes and nearshore environments. Impairment of the near-bank environment to support plants including large trees that help stabilize stream banks, provide shade, add primary production to the aquatic ecosystem and includes the supply of mature trees into streams as LWD.	Impaired Riparian Function/Condition, microclimate, lack of shade	5.1	Riparian Condition	Disturbance to streamside ecological relationships, including but not limited to, loss of flora, erosion and increased light and temperatures	Bank Degradation, Cover, Canopy, Inability to supply organic matter and filter sediments, Insufficient buffers, Light, Loss of Natural Shade
					5.2	LWD Recruitment	Loss of mature streamside trees that may become instream structures and associated decline in habitat complexity	LWD supply
Habitat-Rearing, Habitat-Adult	6	Peripheral and Transitional Habitats	Loss and degradation of relatively flat peripheral habitat of streams and rivers that is periodically inundated during high flows. Includes associated sloughs, side-channels, and freshwater wetlands important for rearing. Includes factors that contribute to multiple limiting factors	High quality over-winter rearing habitat, Habitat Diversity, (Key) Habitat Quantity/Quality, Refugia Habitat	6.1	Side Channel and Wetland Conditions	Loss and degradation of side-channels, associated sloughs and freshwater wetlands important for rearing. Includes loss of connectivity	Side Channels, Sloughs, Wetlands, Peripheral Habitat, swamp
					6.2	Floodplain Condition	Loss and degradation of relatively flat peripheral habitat of streams and rivers that is periodically inundated during high flows. Includes loss of connectivity due to anthropogenic alterations	Floodplain, Bank Condition, Overbank Area
					6.3	Estuary Conditions	Loss and degradation of saltwater transition zone	Estuary, Salt-water Transition Zone, Lagoon, Estuary Plume, Delta, Slough
					6.4	Nearshore Conditions	Loss and degradation of shallow water nearshore habitat	Beaches, tidal flats, eelgrass beds, kelp forest, baitfish spawning grounds
Habitat-Spawning and egg incubation, Habitat-Rearing, Habitat-Adult	7	Channel Structure and Form	Changes to River, Stream, Lake. Estuarine tributary and Distributary channel form, causing bedload movement including the loss (scour) or fill (aggradation) of the channel and associated loss of spawning habitat, disruption to passage and loss of instream ecosystem function	Channel Conditions, Channel Form, Channel morphology, Channel Instability, Channel Stability, Loss of Spawning Substrate due to high flow, Bedload Movement	7.1	Bed and Channel Form	Changes to River, Stream, Lake. Estuarine tributary and Distributary channel form, causing bedload movement including the loss (scour) or fill (aggradation) of the channel and associated loss of spawning habitat, disruption to passage and loss of instream ecosystem function	Connectivity, Levees, Dikes, Loss of sinuosity, Isolated Floodplain, Loss of Peripheral Habitat, Bank Hardening, Channel Incision, Channelized, Aggradation, Bed substrate stability, Armoring, Bridge Crossings, Diking, Confinement, Nearshore sediment loss, Beach erosion
					7.2	Instream Structural Complexity	Decline of the instream habitat quality. Based on the degree of habitat complexity and variety includes the quantity and variability of stream depth and pools of varying size and depth.	LWD, Pools, Boulders, Bank Overhang, Cover, Refuge, Habitat Structure, Instream Habitat, Habitat, Stream Complexity, High Quality Over Winter Rearing Habitat, Habitat Diversity, (Key) Habitat Quantity/Quality, Refugia Habitat, Channel Conditions, Instream Roughness, Poor Gravel/Sediment Sorting

Habitat-Spawning and egg incubation, Habitat-Rearing, Physiological Thresholds	8	Sediment Conditions	Reduction of the quantity or quality of spawning habitat due to changes to the background (natural) quantity, rate, and size of sediment inputs to the stream system.	Sediment, Stream Spawning Habitat, Spawning Gravel, Beach Spawning Habitat (lake), Substrate, Benthic Habitat	8.1	Decreased Sediment Quantity	Decreased input of sediment to the stream system.	Sediment Quantity, Substrate Quantity, Scour, Entrenchment, Loss of Spawning Habitat, Lack of spawning Gravel
					8.2	Increased Sediment Quantity	Increases input of sediment to the stream system.	Bank Erosion, Sediment Quantity, Substrate Quantity, Excessive Sedimentation, Aggradation, Sediment Load, Excess Fines, Embeddedness, Sediment Size Ratio
Habitat-Spawning and egg incubation, Habitat-Rearing, Habitat-Adult, Physiological Thresholds, Direct Mortality	9	Water Quality	Degraded chemical, physical, and biological characteristics of water with respect to its suitability for a salmon, excluding toxins and pathogens.		9.1	Temperature	Water temperature deviations, either in intensity or duration, sufficient to have adverse effects on listed salmonids	Winter Cover Inadequate, Low Winter Water Temperatures
					9.2	Oxygen	Oxygen concentration deviations sufficient to induce adverse effects in listed salmonids.	Eutrophication, Excess Nutrients
					9.3	Turbidity	Increased concentrations of suspended fine particulate matter sufficient to have adverse effects in listed salmonids, including reduction of their foraging ability and/or degradation of ecosystem function.	Suspended sediments, Plume Effects,
					9.4	pH	Acidity/alkalinity deviations sufficient to adversely effect salmonids or the species on which they feed.	Alkalinity, Ocean Acidification, CO2
					9.5	Salinity	Salinity at concentrations harmful to salmon	Refuge from Salinity Regimes
Habitat-Spawning and egg incubation, Habitat-Rearing, Habitat-Adult, Physiological Thresholds, Direct Mortality	10	Water Quantity	Detrimental effects of deviations to the background (natural) amount and timing of water quantity instream, including lowered water quality and barriers to access.	Changes in Flow Regime, Spring Freshets, Piped Outfalls of Surface and Ground Water, Withdrawals, Flow-Related Plume Changes	10.1	Increased Water Quantity	Habitat disturbance associated with abnormally (compared to background) high water flow and increased "flashiness", including loss of channel substrate and the flushing of young fish downstream.	High Flow, High Volume, Flooding, Plume Changes, Increased Velocity, Increased Peak Flows, Decreased Flood Lag Time, Redd Scouring, Flashiness, Increased Runoff, Water Storage Capability, Road Density
					10.2	Decreased Water Quantity	Habitat disturbances associated with abnormally (compared to background) low water flow, including but not limited to, increased temperature, loss of sediment, nutrients and barriers to passage and redd dewatering.	Low Volume, Low Flows, Redd Dewatering, Water Withdrawals, Surface Impoundments, Diversions, Lake Level, Plume Changes
					10.3	Altered Flow Timing	Habitat changes associated with alterations to the background (natural) timing of water quantity instream.	Water Releases, Impervious Surfaces, Urbanization, Low Flows, Dewatering

ID	Habitat Concern	Alternate Terms	ID	Habitat Concern Sub-Category	Alternate Terms
1	Habitat Quantity	Connectivity, Access, Structure, Simplification, Availability	1.1	Anthropogenic Barriers	Access, Barriers, Access to Side-Channels, Flap Gates, Tidal Gates, Culverts, Obstacles, Obstructions, Passage Issues, Blocked
			1.2	Natural Barriers	Water Falls, Sand Bar, Bar Breach, Log Jams, Steep Gradient
2	Direct Mortality	Predation, Disease, Species Interactions	2.1	Predation	Invasive/Exotic Fish or Invertebrate Predators Native Fish, Native Bird, Native Pinnipeds
			2.2	Pathogens	Disease, Sea Lice
3	Toxic Contaminants	Pollution	3.1	Water	Short-term Toxicity, Stormwater Discharge, Outfalls, Wastewater, Non-point Source Pollution, Spills, Marine Debris, Point Source Pollution, Copper, Mercury
			3.2	Biota	Bioaccumulation Toxicity, PBDEs, PCBs, Oil, Organochlorides, Pesticides
4	Food	Competition, Prey Availability, Species Interactions	4.1	Altered Primary Productivity	Micro and Macro-Detrital Inputs, Loss of Marine Derived Nutrients, Carcasses, Down-welling, Ocean Conditions, Detritus, Phytoplankton
			4.2	Competition	Hatchery Fish, Increased Natural Competitors, Invasive Species
			4.3	Altered Prey Composition and Diversity	Species Diversity, Prey Species Abundance, Invasive Species, Altered Food Web Dynamics
5	Riparian Condition	Impaired Riparian Function/Condition, microclimate, lack of shade	5.1	Riparian Condition	Bank Degradation, Cover, Canopy, Inability to supply organic matter and filter sediments. Insufficient buffers, Light, Loss of Natural Shade
			5.2	LWD Recruitment	LWD supply
6	Peripheral and Transitional Habitats	High quality over-winter rearing habitat, Habitat Diversity, (Key) Habitat Quantity/Quality, Refugia Habitat	6.1	Side Channel and Wetland Conditions	Side Channels, Sloughs, Wetlands, Peripheral Habitat, swamp
			6.2	Floodplain Condition	Floodplain, Bank Condition, Overbank Area
			6.3	Estuary Conditions	Estuary, Salt-water Transition Zone, Lagoon, Estuary Plume, Delta, Slough
			6.4	Nearshore Conditions	Beaches, Tidal Flats, Eelgrass Beds, Kelp Forest, Baitfish Spawning Grounds, Nearshore sediment loss, Beach erosion
7	Channel Structure and Form	Channel Conditions, Channel Form, Channel morphology, Channel Instability, Channel Stability, Loss of Spawning Substrate due to high flow, Bedload Movement	7.1	Bed and Channel Form	Connectivity, Levees, Dikes, Loss of sinuosity, Isolated Floodplain, Loss of Peripheral Habitat, Bank Hardening, Channel Incision, Channelized, Aggradation, Bed substrate stability, Armoring, Bridge Crossings, Diking, Confinement
			7.2	Instream Structural Complexity	LWD, Pools, Boulders, Bank Overhang, Cover, Refuge, Habitat Structure, Instream Habitat, Habitat, Stream Complexity, High Quality Over-Winter Rearing Habitat, Habitat Diversity, (Key) Habitat Quantity/Quality, Refugia Habitat, Channel Conditions, Instream Roughness, Poor Gravel/Sediment Sorting
8	Sediment Conditions	Sediment, Stream Spawning Habitat, Spawning Gravel, Beach Spawning Habitat (lake), Substrate, Benthic Habitat	8.1	Decreased Sediment Quantity	Sediment Quantity, Substrate Quantity, Scour, Entrenchment, Loss of Spawning Habitat, Lack of spawning Gravel
			8.2	Increased Sediment Quantity	Bank Erosion, Sediment Quantity, Substrate Quantity, Excessive Sedimentation, Aggradation, Sediment Load, Excess Fines, Embeddness, Sediment Size Ratio
9	Water Quality		9.1	Temperature	Winter Cover Inadequate, Low Winter Water Temperatures
			9.2	Oxygen	Eutrophication, Excess Nutrients
			9.3	Turbidity	Suspended Sediments, Plume Effects
			9.4	pH	Alkalinity, Ocean Acidification, CO2
			9.5	Salinity	Refuge from Salinity Regimes, Freshwater Outflow
10	Water Quantity	Changes in Flow Regime, Spring Freshets, Piped Outfalls of Surface and Ground Water, Withdrawals, Flow-Related Plume Changes	10.1	Increased Water Quantity	High Flow, High Volume, Flooding, Plume Changes, Increased Velocity, Increased Peak Flows, Decreased Flood Lag Time, Redd Scouring, Flashiness, Increased Runoff, Water Storage Capability, Road Density
			10.2	Decreased Water Quantity	Low Volume, Low Flows, Redd Dewatering, Water Withdrawals, Surface Impoundments, Diversions, Lake Level, Plume Changes
			10.3	Altered Flow Timing	Water Releases, Impervious Surfaces, Urbanization, Low Flows, Dewatering

