



Fishery Habitat:

1) Living Space and Reproductive Requirements

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Even though humans think they are very different from the cold-blooded, slimy, finned creatures that live in the water, their basic needs are the same. Just like humans, fish need a place to live and reproduce, oxygen, tolerable temperatures, and low pollutants (Sato, 1989).

Even though fish live in the water, they still require adequate living space. Cover for juvenile and adult salmonids is important for protection from predators and to provide living space. Salmonids use two forms of cover, overhead and submerged. Overhead cover consists of riparian vegetation, overhanging banks, turbulent water, and logs. Submerged cover usually consists of large rocks, aquatic vegetation, logs, etc. (Reiser and Bjornn, 1979). Space requirements vary with species, age, and time of year. Space is generally made up of pools within the stream. In general, more space and food means more fish. However, the quality (i.e., amount of cover, proper temperature, and amount of food) of living space may be more important than the quantity of living space. Also, space needed by fish increases with age and size (Reiser and Bjornn, 1979).

Streamflow and morphology of streams is very important in terms of providing living space for salmonids. Streamflow has been related to cover, pool area to fish biomass (i.e., weight in kg/ha or lb/ac), and fish biomass to cover (Reiser and Bjornn, 1979). Low summer flow is also one of the major factors controlling fish population (Koski, 1972). This suggests that

carrying capacity of streams is related to the amount and timing of the high and low flows. Drought years can cause a major reduction in fish populations that may last for several years.

In addition to having a place to live, fish need adequate conditions to reproduce. Cover and stream characteristics are important for successful upstream migration, spawning, incubation, and rearing of salmonids (Reiser and Bjornn, 1979).

Adequate streamflow creates the depth, velocities, and temperature that are important for upstream migration of adult salmonids. Many salmonids migrate upstream months before spawning, and cover is important to protect fish from disturbance and predation. Since many of the redd (spawning nest) sites are in open areas, nearness of cover for protection of spawning salmonids is important.

The water depth, water velocity, substrate (stream bottom material) size, and area needed for spawning

depends largely on fish species and size (Reiser and Bjornn, 1979). These criteria are shown in Table 1.

Substrate size has an effect on incubation and emergence of newly hatched salmonids. Substrate on stream bottoms usually consists of sand, gravel, cobbles, and rocks. Eggs are generally buried 3-16 inches, depending on

species, into the substrate (Chapman, 1988). Water flow around the egg pockets within the gravel is determined by substrate size and depth which eggs are buried. Water needs to flow freely to allow for adequate dissolved oxygen levels for incubation (embryonic growth) and to

remove waste products from developing embryos (Reiser and Bjornn, 1979). Even if embryos hatch, survival will be poor if they cannot emerge from the gravel. Emergence of fry can be reduced when fine sediments, #0.25 in., make up >20 percent of the substrate.

Table 1. Water depth, velocity, and substrate size and area needed for salmonid spawning in the Western United States.

Species	Water Depth (ft)	Water Velocity (ft/s)	Substrate Size (in)	Average Size of Redd (ft ²)	Recommended Area per Spawning Pair (ft ²)
Chinook					
Fall	\$0.8	1.0-3.0	0.5-4.0	54.9	216.3
Spring	\$0.8	1.0-3.0	0.5-4.0	35.5	144.2
Summer	\$1.0	1.0-3.6	0.5-4.0	54.9	216.3
Chum	\$0.6	1.5-3.3	0.5-4.0	24.7	99.0
Coho	\$0.6	1.0-3.0	0.5-4.0	30.1	125.9
Kokanee	\$0.2	0.6-2.4	---	---	---
Steelhead	\$0.8	1.3-3.0	0.2-4.0	47.3-58.1	---
Rainbow	\$0.8	1.6-3.0	0.2-2.0	2.2	---
Cutthroat	\$0.2	0.4-2.4	0.2-4.0	1.0-9.7	---
Brown	\$0.8	0.7-2.1	0.2-3.0	5.4	---

Source: Adapted from Reiser and Bjornn (1979).

Note: 1 ft = 0.3048 m, 1 in = 2.54 cm, 1 ft² = 0.0920 m²

Bibliography

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Note: This fact sheet only contains general information about fishery requirements. Additional sources of information include *Pacific Salmon Life Histories*, edited by C. Croot and L. Margolis, UBC Press, Vancouver. For information on specific species see *Habitat Suitability Information: for species interested in...*, published by U.S. Department of Interior, Fish and Wildlife Service. See your local fishery biologist for information about fish in any specific stream.

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