

## HANDOUT 10.1

# Salmon Survival

A single pair of salmon produces thousands of fertile eggs, but the number of adult salmon that will survive depends on harvest levels and salmon habitat, especially ocean conditions.

After release, hatchery fish may not survive as well as wild ones, and they compete with wild populations for food and safe places to grow. Hatcheries cannot remedy the loss of fish habitat, but they remain tools that managers can use to help support endangered salmon populations.

The chart below shows the average number of salmon that survive at each stage of their life cycle, or the **survival rate**. (The chart uses average numbers for coho salmon. The numbers for other species of salmon are different, but they follow the same general pattern. The survival rate at each stage can vary considerably from the average.)

### Wild coho salmon survival

Stage of development	Number	Deaths	Number of survivors	Survival rate	Causes of death
Eggs/Alevins	2,500	2,125	375	15%	<ul style="list-style-type: none"><li>• Unfertilized eggs</li><li>• Gravel movement</li><li>• Low oxygen in water</li><li>• Drastic changes in water temperature</li><li>• Pollution and/or sedimentation</li><li>• Disease</li><li>• Predators</li><li>• Poor habitat conditions</li></ul>
Fry Eggs/Alevins	375	245	30		<ul style="list-style-type: none"><li>• Lack of adequate food or space</li><li>• Predators (rainbow trout, doll varden, char, grayling trout, sculpin, steelhead trout, ducks, merganser, tern, kingfisher)</li><li>• River blockage or diversion along migration route</li><li>• Pollution</li></ul>

*This chart uses average numbers for coho salmon. The numbers for other species of salmon are different, but they follow the same general pattern.*

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# Salmon Survival

## Wild coho salmon survival (cont'd)

Stage of development	Number	Deaths	Number of survivors	Survival rate	Causes of death
Smolts	30	25.5	4.5		<ul style="list-style-type: none"> <li>• Predators (other fish, killer whale)</li> </ul>
Adults	4.5	2.5	2.0		<ul style="list-style-type: none"> <li>• Harvesting (sport, commercial, Aboriginal food fishery)</li> <li>• Predators</li> </ul>
Spawners	2	2	0		<ul style="list-style-type: none"> <li>• Water levels too high or low</li> <li>• Predators (bears, otters, minks, birds)</li> <li>• Obstructions (dams, rock slides, log jams)</li> <li>• Diseases</li> <li>• Death after spawning</li> </ul>

Fish hatcheries can greatly increase the number of salmon that survive the early stages. However, the smolts from hatcheries may not survive as well as wild smolts. Only a few grow to become adults

and return to spawn in their home stream or lake.

The next chart shows the number of salmon that survive when the eggs are reared in a hatchery.

## Hatchery coho salmon survival

Stage of development	Number	Deaths	Number of survivors	Survival rate	Causes of death
Eggs/Alevins	2,500	250	2,250		<ul style="list-style-type: none"> <li>• Unfertilized eggs</li> <li>• Failure of hatchery systems</li> <li>• Disease</li> </ul>
Fry	2,250	450	1,689		<ul style="list-style-type: none"> <li>• Disease</li> <li>• Predators (otters, minks, birds)</li> </ul>
Smolts	1,689	1,530	253		<ul style="list-style-type: none"> <li>• Predators (other fish, killer whale)</li> </ul>
Adults	253	162	111		<ul style="list-style-type: none"> <li>• Harvesting (sport, commercial, Aboriginal food fishery)</li> <li>• Predators</li> </ul>
Spawners	111	111	0		<ul style="list-style-type: none"> <li>• Water levels too low or too high</li> <li>• Predators (bears, otters, minks, birds)</li> <li>• Obstructions (dams, rock slides, log jams)</li> <li>• Diseases</li> <li>• Death after spawning</li> </ul>

# Salmon Survival

## Hatchery coho salmon survival

1. Use graph paper and coloured pencils or a computer graphing program to create a graph showing the number of survivors at each stage of a natural salmon cycle.
2. Add a graph showing the number of survivors at each stage of a hatchery salmon cycle.
3. What does the difference between the charts show? \_\_\_\_\_

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4. The survival rate is the percentage of the original eggs that remains alive at each stage. You can calculate the survival rate for each stage using this formula:  
$$\frac{\text{number of survivors}}{\text{number of eggs}} \times 100$$
  
For example, the survival rate of natural eggs and alevins is 15% ( $375/2500 \times 100$ ).
5. Calculate the survival rate after each stage in the natural life cycle. Add it to the chart.
6. Calculate the survival rate after each stage in the hatchery life cycle. Add it to the chart.

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7. At which stage is the difference between the natural and the hatchery survival rate greatest?
8. If salmon lived at the hatchery survival rate, what would happen to the number of salmon?

Explain your answer. \_\_\_\_\_

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