Salmon farming, like other food producing operations—whether for tomatoes, beef, wheat or any other commodity—impacts our environment. Thus, like these other agricultural production systems, it must stand up to rigorous evaluation of its environmental impact.

Evaluating the environmental impact of a food producing operation must consider not only what happens to the environment immediately surrounding the production site, but also how it impacts the worldwide ecosystem. As a relatively new and rapidly evolving form of food production, salmon farming and the rest of aquaculture have been the subject of intensive environmental assessments.

These assessments, when done with unbiased scientific scrutiny, consistently find that salmon farming poses a low risk to the environment, and the ones that do occur are fully reversible through natural processes in a relatively short period of time. It is also noteworthy that salmon farming, as is all of aquaculture, is extremely efficient in converting inputs into food, which has a positive impact far beyond local environmental effects.

Feed Conversion

Feed conversion is an important measure of the impact of animal production on the environment. The lower the conversion ratio, the less feed it takes to produce a pound of edible product. In this regard, farmed Atlantic salmon are among the most productive food animals. Conversely, the production efficiency for wild salmon is relatively low (high ratio of feed-to-fish) primarily because of the high mortality rates of the wild fish before they are caught.

Feed Conversion

Ratio of feed to edible food (in pounds)

Farmed Atlantic Salmon	2:1
Beef	10:1
Pork	5:1
Chicken	2:1
Wild Salmon	10:1 to 15:1*

*Difficult to calculate accurately due to wildly varying mortality rates and feeding.

The Effect on Feed Fish Stocks

Fishmeal used in salmon farming represents about 30 percent of the salmon feed consumed, which accounts for about 9 percent of the world consumption of fishmeal. The bulk of the fishmeal used worldwide goes into livestock and poultry feeds and for fertilizer.

The fishmeal used in salmon feed is composed primarily of fish, commonly called forage fish, that are fast-growing, short-lived, and not generally used for human consumption. The Food & Agricultural Organization (FAO) of the United Nations has stated that the forage fish sources for fishmeal are not over-fished or depleted.

The industry continues to work on ways to utilize more vegetable-based feed sources such as soybeans and canola, so that as the industry grows a reliable feed source is assured.

The Footprint of a Salmon Farm

Salmon farming sites occupy a tiny portion of the coastal zone areas in which they are located. Issuing permits for each site is the responsibility of the local, regional and national jurisdictions and varies by locale. This process is rigorous; for example, in Maine the process involves the review by over 15 authorities and typically takes 24 months to complete.

In Maine the total area occupied is about 635 acres for all sites. This represents a very small percentage of the more than 2.5 million acres of fishable waters off Maine's coast, which includes several hundred miles of shoreline. The actual salmon pens on these sites represent only about 30 percent of the 635 acres, the rest being open water. By comparison, pleasure boat marinas in Maine are estimated to occupy 1,275 acres of water space. And, of course, unlike salmon farm sites, these are all located on the most accessible shoreline.

In Canada, including operations in both British Columbia and the Bay of Fundy in the east, the total area is about 8,900 acres, which represents less than 1/10,000 (0.01%) of the coastal area in which these sites are placed.

In Chile it is estimated salmon farm sites occupy less than 1/50,000 (0.002%) of the available area.

The Effect on Water Quality

One example from Maine is representative of the total additional load placed on the environment: Based on a single-year class cycle (24 months) at a farm site that includes 18 cages with 500,000 salmon, on average, each day a total of 294 pounds (dry weight) of salmon byproduct are discharged. At this particular site, this is integrated into approximately 1.7 billion gallons of water (two tidal flushes). This is equivalent to 2 tablespoons of salmon byproduct being integrated into the amount of water found in 24 average-size, in-ground swimming pools.

The Effect on Wild Salmon

Wild Pacific and Atlantic salmon stocks in the lower 48 states and Canada have seen significant declines over the last several decades, starting long before salmon farming operations started. All the evidence points to the fact that the declines were caused by a combination of climate change, over-fishing, and freshwater-habitat destruction.

The evidence shows salmon farming has not had a significant impact and poses a low risk to Pacific salmon. On the east coast of the United States, wild Atlantic salmon is an endangered species. While farmed Atlantic salmon did not impact on their decline, there is concern about inter-breeding between wild and escaped farmed salmon. This is being addressed by the industry.

How Farming Techniques Help Wild Salmon

Many people are surprised to learn that about one in three of the salmon caught in the waters off Alaska, the principal salmon fishery, started their life in a hatchery. Over 1.5 billion of these salmon are released into the ocean each year where they join their naturally wild cousins, grow and are caught with them. In Alaska, this represents about 30 percent of the catch. In the lower 48 states, hatcheries account for over half the salmon caught.

These hatchery programs allow wild salmon to flourish even as the catch exceeds natural reproduction capacity. In the hatchery these young salmon are reared almost identically to the salmon that will be farm-raised.

SALMON OF THE AMERICAS

FICTION	FACT
Farmed salmon are high in PCBs.	Farmed salmon from Chile, Canada and the USA are typically found to have 1/100 of the FDA tolerance for PCBs. Routine testing shows levels often 1/400 of the tolerance.
Even at these levels which are well below the FDA tolerance, the levels of PCBs in farmed salmon are dangerous and significantly increase the risk of cancer.	• The 2003 National Academy of Sciences review of PCBs in foods made recommendations on decreasing consumption for other foods to limit PCB intake. However, they recommended no change in fish/salmon intake. • The National Cancer Institute disagrees that there is any conclusive evidence that the low PCB levels found in salmon are linked to cancer. • The FDA recently reviewed the tolerance level and affirmed that it is correct and protective of consumers.
Farmed salmon are higher in PCBs than wild salmon.	Wild salmon are not routinely tested as farmed salmon are, but several studies found higher PCB levels in wild salmon than are found in farmed salmon. These were in the Puget Sound of Washington State and the Copper River of Alaska. Both were government studies of a large sample. PCB levels were not above the FDA tolerance and this fish, as is the case with farmed salmon, is safe to eat.
PCBs in farmed salmon comprise a significant part of the PCBs people ingest.	For more details see *Food Safety Fact Sheet*. In summary, based on the average per capita consumption, people get eight times the amount of PCBs in a year from eating beef. PCBs from salmon represent about six percent of the total PCBs from food.
Farmed salmon have a mercury problem.	Because of the focus on mercury in fish, extensive tests are constantly done and mercury is most typically not detected at all in farmed salmon. When it is detected, it is at extremely low levels, well below that in almost all other fish.
Farmed salmon are higher in saturated fat than wild salmon.	One species of wild salmon has 50% more saturated fat than farmed, one species has about the same amount, and three of the wild salmon species have less. The important point is that all of these—wild and farmed—are relatively low in saturated fat (one-third of chicken), so these differences are meaningless and only serve to confuse consumers.
Farmed salmon are inferior in omega-3 content.	Farmed salmon are consistently higher in omega-3 fatty acids than all but one species of wild salmon which has about 6% more. On average, you will get twice the omega-3 in farmed salmon compared to wild.

FICTION	FACT
People prefer the taste of wild salmon.	Taste tests are very variable. In general, the larger, unbiased tests show: some prefer wild (20%), some prefer farmed (20%), and 60% have no preference.
Farmed salmon are dyed.	Farmed salmon are not dyed. Farmed salmon gain their color much the same way wild salmon does—from compounds contained in the feed they eat.
The products in the feed of wild salmon which account for the color are dangerous.	Both astaxanthin and canthaxanthin used in the feed of farmed salmon are carotenoids: nutrients which are found in virtually all animal or plant life in one form or another. The products in salmon feed are nature identical to those eaten by wild fish. Levels of astaxanthin in farmed salmon, the principal carotenoid fed, are equal to or lower than those found in wild salmon.
Farmed salmon feeds are depleting wild fish (meal) stocks.	Salmon account for 9% of the fishmeal used in the world. The consumption of fishmeal has remained constant over the past 10 years even as salmon consumption has risen, and forage fish are not at risk, according to FAO studies. Only 30% of the feed fed to salmon is fishmeal, the rest is plant-based feed. Salmon convert 1.5 lbs. of feed into a pound of edible fish. Wild salmon need 10 to 15 lbs., and beef about 10 lbs.
Farmed salmon are "bathed in antibiotics."	Farmed salmon are bathed only in clean seawater. In general, 3% of the feed contains antibiotics which are used to treat diseases, which occur in both wild and farmed salmon. Careful attention is paid to withdrawal times to ensure that antibiotic levels in salmon are below FDA permissible tolerances when they are harvested.
Salmon farms pollute the ocean.	This is simply not true. See SOTA fact sheet on the environment for detailed facts.
Everyone can get the benefits of salmon by eating wild salmon.	• Farmed salmon typically cost $5.00 per pound, wild salmon cost $12.00 to $18.00 per pound. The salmon-cost of a home-cooked meal for four people (1.5 lbs.) is $7.50 for farmed and $18.00 to $27.00 for wild. • Fresh wild salmon is available four months of the year.

PCBs and Mercury

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PCBs

A recent report about farmed salmon by the Environmental Working Group (EWG) has resulted in concern about the acceptable levels of PCBs in farmed salmon. While, overall, PCBs in the environment are a concern, food safety experts agree that the low levels found in farmed salmon do not warrant any change in salmon consumption patterns and the benefits of salmon greatly outweigh any unproven risks.

The genesis of the report was a sample of 10 fish done by the EWG which showed an average PCB level of 27 parts per billion (ppb) which is 99 percent under the tolerance of 2,000 ppb (2.0 parts per million) set by the U.S. Food and Drug Administration (FDA). The report has been heavily criticized by many independent scientists because of its lack of scientific methodology and its conclusions.

While the levels are far below the FDA tolerance, the EWG finds fault with them. Rather than the FDA tolerance, they want to use guidelines set by the Environmental Protection Agency (EPA) for sport and subsistence fishermen who repeatedly fish the same heavily contaminated waters. The implication by the EWG is that since the EPA guidelines are lower, they must be the ones to follow. That is not the case, however, since these guidelines are for a different purpose. The EPA guidelines do not represent new findings, nor new methodology.

The EWG view is at odds with not just the FDA, which has issued a statement reaffirming their tolerance (they reviewed it in 2000, specifically with regard to this issue), but also with the stated positions of the National Cancer Institute regarding the cancer risk of PCBs at the low levels found in salmon, the National Academy of Sciences (which completed a review of this topic just six months ago) and a host of other reputable, independent scientists. Much of what is in the report has been quoted in the media without much (or any) analysis of the facts.

It is important to note that this report is neither a study nor research, in the accepted use of the word. It is largely undocumented, has not undergone peer review, and lacks the scientific rigor and unbiased analysis to give it meaning. Most of all, it has no bearing on the safety of farmed salmon. Below are a few of the statements made about the study by responsible, independent scientists and organizations.

Robert Lawrence, Professor, Johns Hopkins Bloomberg School of Public Health

"The benefits of eating fish rich in fatty acids are more clearly proven than the risk of PCB exposure. Omega-3 fatty acids protect against heart disease, reduce hypertension and ease joint pain and arthritis."

Lawrence led a National Academy of Sciences panel on the health implications of PCBs and similar compounds that issued a report in June. The panel decided against changing the current federal recommendation to consume two servings of fish a week.

Terry Troxell, Director, FDA Office of Plant and Dairy Foods and Beverages

"Part of our equation is looking at the overall picture, the positives in nutrition versus the trace levels of PCBs that may be remaining in our environment."

FDA officials began a review of their standards for dioxins and dioxin-like substances, such as PCBs, in 2000, including an examination of farm-grown and wild salmon. The FDA continues to recommend eating salmon and other fish because of the health benefits.

Charles Santerre, Professor of Food and Nutrition at Purdue University

"If the public listened to this, our health would be negatively affected. Any small additional risk of cancer is far outweighed by the benefits of fatty acids in the fish."

What Some Real Scientists Think About the Environmental Working Group

Marcia van Gemert, Retired Chief of Toxicology, EPA's Office of Pesticide Programs

"EWG is politically, not toxicologically, driven."

Dr. Bruce Ames, Director of the National Institute of Environmental Health Sciences Center at the University of California at Berkeley

"The EWG's baby food report, is an attempt to scare parents over something that is no threat to their children's health."

The American Medical Association

"The Alar scare (EWG initiated) shows what can happen when science is taken out of context or the risks of a product are blown out of proportion."

Sheldon Jones, Director, Arizona Department of Agriculture

"EWG's approach is more alarmist politics and it lacks sound scientific health or risk assessment information."

The Risk Compared to Other Food

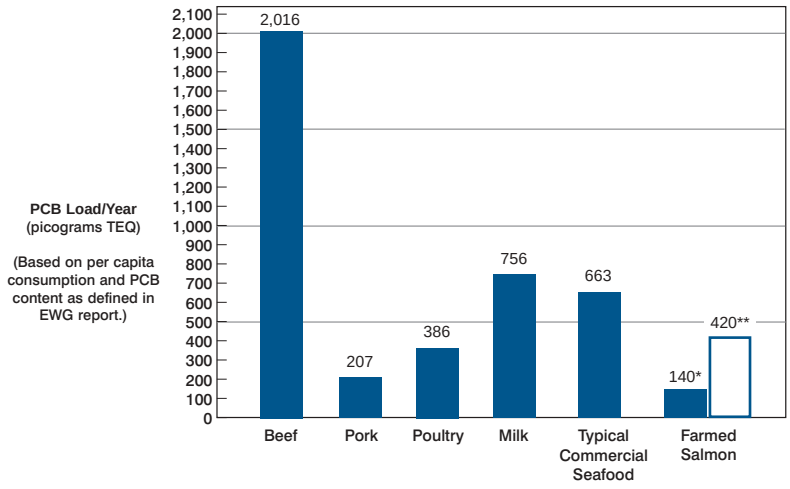
Unfortunately, PCBs are found throughout the environment. Salmon farmers aggressively deal with this in many ways and have been successful at lowering the levels over the years, as is evidenced by the current levels, which are far below the existing tolerance and continue to decline. To get a perspective on PCBs in the environment and how misleading the EWG report is if you simply read their headlines, consider the graph below. It represents the total PCB intake based on per capita consumption of various foods referenced in the EWG report using their PCB numbers.

What it clearly shows is that salmon is not the source of most of the PCB load, and that even if per capita consumption of salmon were to triple, it would be a fraction of what it is in beef. Note that the per capita consumption of milk means it is 507 glasses of milk a year, far below what most growing children drink. If the same standards as the EWG wants applied to salmon for limiting consumption to one serving a month were applied to milk, it would mean that people could only drink a single 6-ounce glass of milk ever other day.

This is not to indict any other food, or to dismiss the PCB levels in salmon as unimportant, but it does call the logic and motivation of the EWG report into question.

Annual Per Capita Load of PCBs by Food

(Based on Environmental Working Group report of July 30, 2003)



* Based on EWG report average PCB level of 27 ppb.

** Salmon at three times the current per capita consumption level.

Mercury

Mercury, which has been found to be a troublesome problem in some fish, prompting the FDA to recommend some individuals limit their intake, is not a problem in farm-raised (or wild) salmon. In fact, in ongoing testing conducted by the FDA, salmon is consistently rated as among the fish with the very lowest mercury levels, most often at no detectable levels.

Antibiotics and Hormones

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Antibiotic Residues

Antibiotics are used in salmon feed from time to time for the treatment of specific disease conditions which occur in both farmed and wild salmon. Antibiotics are not used for growth promotion or for low level prophylactic treatment, and overall antibiotic use in salmon is a fraction of what is used in poultry and livestock operations. Antibiotics are administered under the direct supervision of a licensed veterinarian and for salmon sold in the United States, only drugs approved by the United States Food and Drug Administration (FDA) are permitted to be used.

There are strict withdrawal periods which are monitored by government agencies including the FDA for salmon produced or consumed in the United States. These are designed to ensure that antibiotics in salmon harvested for food do not exceed permissible limits.

Hormones

Hormones are not used in salmon grown for human consumption.