

FIRST NATIONS AND AQUACULTURE IN BRITISH COLUMBIA

Cultivating Change to Preserve Tradition





Context

For thousands of years, First Nations people have gathered food from the sea and shore, the rivers and lakes — and they have also made changes to increase food productivity. From coastal peoples building the ancient clam gardens lining the coast, to interior peoples sending wedding gifts of salmon eggs to populate new streams, this is aquaculture and it is integrated into the land and the cycles of the ecosystem. Aquaculture has been practiced throughout human history and to the present day, in BC and around the world. Indigenous people have long known how to make changes to the land or sea to cultivate a bountiful and stable harvest for their community.

Aquaculture is the practice of farming marine or freshwater creatures — planting or keeping them to ensure a good harvest. Around the world today, aquaculture could be a Chinese farmer raising carp or eels in rice paddies to provide extra food for the family; a high-tech indoor sturgeon farm producing luxury caviar, or the plots of hand-planted seaweed replacing long-gone kelp forests along the Atlantic coast.

This brochure includes three case studies of First Nations aquaculture projects: the K'ómoks First Nation's shellfish farm, the Námgis and their closed-containment land-based salmon farm, and the Okanagan Nation Alliance's freshwater Sockeye salmon hatchery. These stories are not meant to be models to follow, but rather to be the story from the community's view: where they are, how they got there, and why they made the decisions that they made.

Each story tells of successes as well as struggles that the community experienced in engaging with aquaculture.

The First Nations Fisheries Council respects each Nation as rights-holders to make their own decisions. FNFC's role is to provide as much information as possible and to support First Nations' positions in the places where their collective interests align. This publication is intended to be a tool to provide information.



First Nations Traditions and Aquaculture



A key feature of all traditional First Nations aquaculture practices is habitat maintenance and awareness of ecosystem impacts. These traditional practices increase, diversify or stabilize a harvestable species without disrupting the other workings of the ocean, shore or river — sustainability for future generations is a fundamental value.

A traditional method of increasing clam harvest is building a clam garden¹. Ancient clam gardens have been found along the entire BC coast, and they are shown to increase clam productivity by a huge amount: quadruple the harvest of butter clams and twice the harvest of littleneck clams². Many clam gardens were built to create clam habitat from rocky or unsuitable shorelines.

Some First Peoples have practiced traditions to increase their bounty of fish and ensure a steady and sustainable harvest. When huge schools of herring spawned in one bay, but not in another, the people would transplant some of the herring roe on kelp or hemlock boughs into the empty bay.

Herring transplantation establishes a new productive area and increases the geographic spread of the stock, making it more resilient to local changes in habitat.

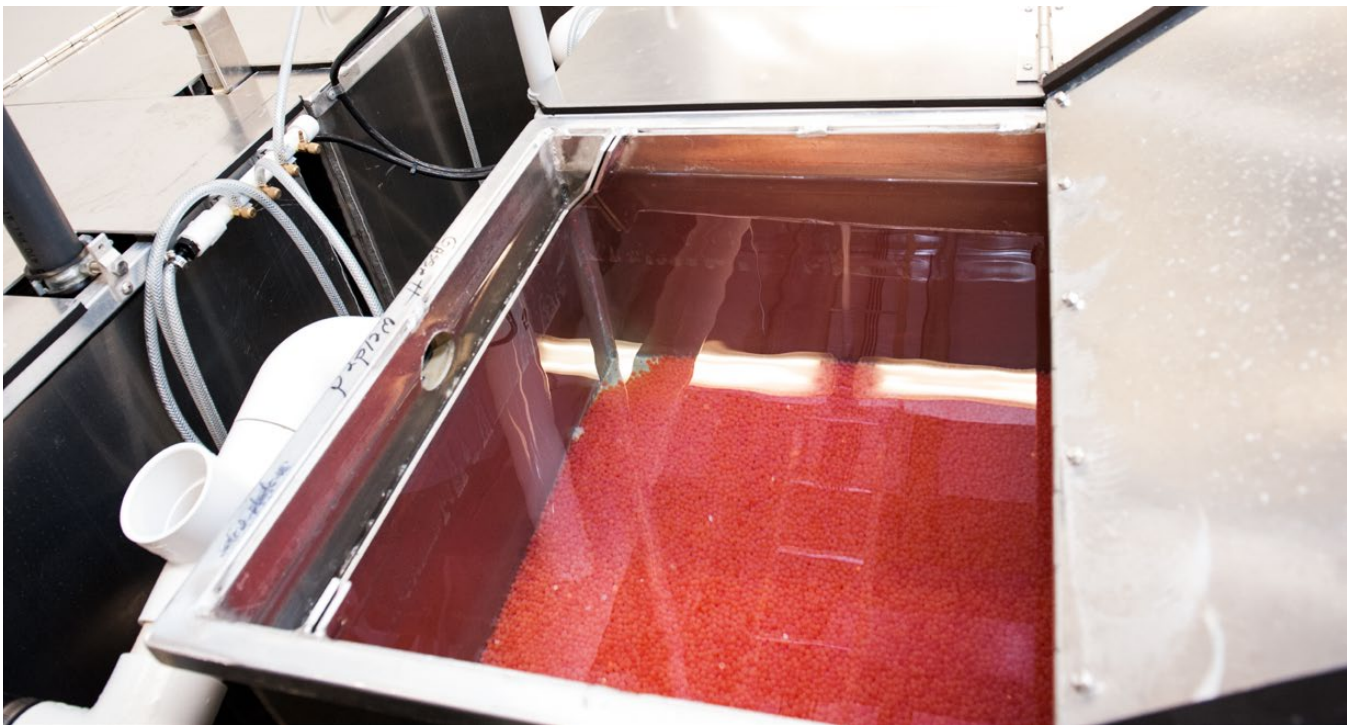
When the salmon run is good, the spawning fish will produce so many eggs that the stream won't have enough food for the fry to survive when they hatch. So some First Peoples have traditionally transplanted salmon roe from a productive stream to a stream that has no salmon. In the next cycle, salmon will return to both streams. With luck, the future generations of salmon will increase until both streams are at capacity.

Today First Nations in British Columbia are diverse in how they choose to engage, or not engage, with aquaculture. There is no one-size-fits-all approach to aquaculture in a First Nations context. Some nations are pursuing commercial aquaculture projects, and at the same time, other nations may oppose the aquaculture industry operating on their traditional territories or near the wild fish stocks they have rights to access.

1. www.cbc.ca/news/canada/british-columbia/clam-gardens-call-into-question-hunter-gatherer-past-of-b-c-first-nations-1.3068709 and McKechnie et al 2014
2. www.sfu.ca/sfunews/stories/2014/ancient-clam-gardens-nurtured-food-security.html



Global Production

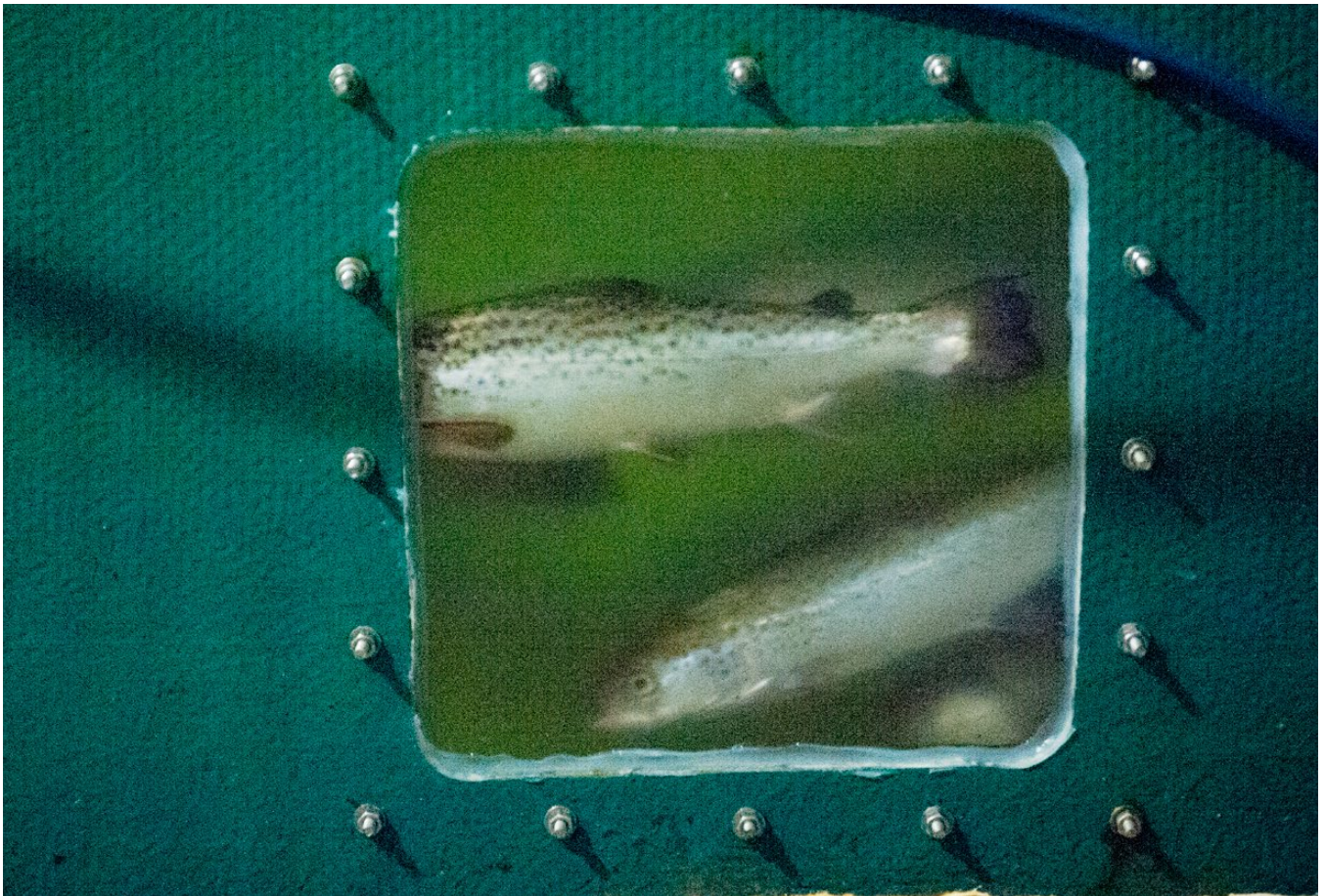


Production levels in wild fisheries around the globe have shrunk in the last few decades. There are many factors, including decreasing numbers of fish, increased fishing regulations, and market competition from lower-priced farmed seafood. At the same time, the aquaculture industry has exploded and shows no signs of slowing down. Aquaculture now produces more than 50% of the world's seafood¹ and billions of people depend on seafood as a source of protein in their diets². British Columbia has become a major supplier to the huge global farmed-seafood market, and the market is hungry for more. First Nations in British Columbia need good information to make decisions for their future when navigating these choppy waters.

The largest aquaculture farms in the world are in China, representing over 1/3 of the global

supply³. Southeast Asia is also known for producing large volumes of farmed seafood, especially shrimp. The impact of this large-scale aquaculture is similar to industrial farming of corn or beef — a huge quantity of food at low cost but with a destructive impact on the surrounding ecosystem. For example, large areas of Southeast Asian coastal mangrove forests, where wild shrimp once thrived, have been destroyed and replaced by ponds for densely-packed shrimp farming. Most of this shrimp is sold to China and the US, bringing employment into struggling areas. However, the local ecosystem and people have suffered as well — lack of mangroves has left the coast vulnerable to tsunamis, typhoons, erosion, and future sea level rise⁴, and the loss of mangroves means habitat loss for many species, including native shrimp.

1. www.hakai.org/blog/geospatial-technology/great-walls-quadra
2. In 2013, fish provided 3.1 billion people with almost 20% of their intake of animal protein. www.msc.org/healthy-oceans/the-oceans-today/fish-as-food
3. marinesciencetoday.com/2015/01/22/sustainable-aquaculture-in-china
4. www.reuters.com/article/us-mangroves-idUSBRE8AD1EG20121114



Local Production



The aquaculture industry in British Columbia mostly produces seafood for export rather than local food needs. In BC there are approximately 740 aquaculture operations including salmon farms, shellfish farms, hatcheries and other types. Together they have a total harvested value of around \$534 million annually¹.

BC finfish² aquaculture includes farmed Atlantic and Pacific salmon, sablefish and halibut, and farmed sturgeon (both for meat and for caviar). Farmed shellfish includes clams, oysters, geoduck, and mussels. Atlantic salmon makes up the largest part of the industry by dollar amount. The reputation in the media of open-net pen Atlantic salmon farms means that this industry often defines what the word “aquaculture” means to BC residents. Canada is the fourth largest producer of farmed salmon in the world, about half of which is from BC³.



This publication is intended to help with understanding the recent history of aquaculture and politics in BC. Knowing the shape of the current landscape will help First Nations staff and leaders to make the right decisions for their community’s needs. FNFC supports BC First Nations through science, policy and communications programs, supporting the Nations where their interests align.

The paths of each BC First Nation have been and will continue to be very different. Each First Nation is faced with a different set of circumstances and each one makes different decisions about how they and others use their land, water and resources. But all decision-makers can benefit from accurate and complete information. In order to find the best path for the future of their people and their land, each community member and political leader must have the best available information.

1. *Aquaculture in British Columbia*, www.pac.dfo-mpo.gc.ca/publications/pdfs/aqua_mgmt-gest_aqua-eng.pdf
8. A scientific category of bony fish including salmon, halibut, trout and others.
9. www.dfo-mpo.gc.ca/aquaculture/sector-secteur/stats-eng.htm



Political Landscape

FEDERAL GOVERNMENT

Currently, aquaculture regulation is under jurisdiction of the Ministry of Fisheries and Oceans Canada (DFO). This is a recent development. DFO's jurisdiction began in 2010 after the 2009 decision in *Morton v the Province of British Columbia*. Before this, DFO's responsibility was to preserve the oceans and safeguard wild fish. Licensing, expanding and promoting the aquaculture industry was done by the Agriculture Ministry along with other farmed foods: grains, vegetables, and meat. Alexandra Morton brought a lawsuit to argue that salmon farms should be regulated by DFO, instead of Agriculture, and the judge decided in her favour. Today, DFO's mandate is to both protect the ocean and to expand and promote the aquaculture industry. There are still many unresolved issues from the transition.

DFO grants licenses to aquaculture farms to produce a certain type and number of fish or shellfish. Under the Species at Risk Act, they are

also responsible for ensuring that endangered and threatened marine animals, including whales and sea lions, are not impacted by aquaculture operations. DFO has the "lead federal role in managing Canada's fisheries and safeguarding its waters." This means the federal government is responsible for promoting, growing, and regulating the aquaculture industry, in addition to its role in safeguarding the health of the oceans and overseeing the harvest of wild fish.

The same year as the Morton decision there was a collapse of the important Fraser sockeye salmon run. The Harper government called a federal commission of inquiry to investigate the cause of the collapse. This became known as the Cohen Commission, after presiding justice Bruce Cohen. The Commission examined science and testimony on all potential factors that may have caused the collapse, including climate change, habitat loss, overfishing, and the effects of open-net pen Atlantic salmon farms. Cohen was unable to find clear evidence to confirm that the wild salmon run collapse was

caused by aquaculture: there was no “smoking gun.” However, Cohen did say that the facts were cause for concern, and he recommended limitations on the open-net pen salmon farming industry. He also raised strong concerns about DFO’s contradictory mandate, and directed the Federal government to address this issue¹.

The Department of Fisheries and Oceans has a large number of programs, committees and processes in place for Aquaculture. At the federal level, there are science programs, industry programs, regulatory programs, programs that provide funding and programs that provide data that relates to aquaculture. They also provide financial and marketing support in Canada and abroad to promote and expand the aquaculture industry.

BC PROVINCIAL GOVERNMENT

While DFO licenses aquaculture production, the BC government is responsible for approving sites. Pre-approved locations are called “tenures” and they are allocated to aquaculture companies who apply to the province. When DFO gained responsibility for licensing of aquaculture, the tenure allocation process stayed with the Province of BC. DFO can limit the amount of seafood produced through their licenses, but the tenure is what specifies the location of the operation.

In order to start a new aquaculture operation, a proponent must apply to DFO for the license allocation and to the Province of BC to allocate the tenure. The municipal government must also





approve the facility, showing that it met zoning regulations and followed any requirements to consult local residents.

The Province of BC has responsibility for regulating freshwater fisheries, and this extends to freshwater aquaculture such as trout hatcheries and lake stocking. To undertake this work, the Province funds a non-profit organization, the Freshwater Fisheries Society. This non-profit receives 100% of revenue from recreational fishing licenses, and runs six hatcheries throughout the Province, as well as stocking over 800 lakes.² This work has been done with little or no meaningful consultation with

affected First Nations. There is little transparency in the work of the Freshwater Fisheries Society. The scientific data, potential impact on sustainability — including a potential change to genetic makeup of stocks — and decision-making processes are not made available to First Nations input.

1. publications.gc.ca/site/eng/432516/publication.html
2. <https://www.gofishbc.com/About-Us.aspx>



Overview of the FNFC

The First Nations Fisheries Council was established in 2007. The FNFC works on fisheries, ocean and freshwater issues in BC. By establishing cooperation and collaboration among First Nations and between First Nations and government, the FNFC assists BC First Nations to become active fisheries managers and decision-makers. The vision of the FNFC members is to ensure fisheries resources are conserved for the benefit of future generations.

The FNFC's mandate is to work with and on behalf of BC First Nations to:

- Advance and protect First Nations Title and Rights to fisheries and aquatic resources, including priority access for food, cultural and economic purposes;
- Support First Nations to build and maintain capacity in fishing, planning, policy, law, management, and decision-making at a variety of scales (local, regional, national and international); and

- Facilitate discussions towards a collaborative BC-wide fisheries management framework among First Nations, one that recognizes and respects First Nations jurisdiction, management authority and responsibilities.

The FNFC was formed to address a need among various Nations to present a united front and united voice on fisheries management issues. The FNFC develops capacity and relationships that enable BC First Nations to influence planning and management of fisheries and aquatic resources. When the FNFC was formed, the participating First Nations sought to establish a structure that reflects the diversity in fisheries, species, ecosystems, management practices and priorities across the province. Fourteen regions were identified, and each region now appoints its own delegate to the Executive Council.



The FNFC and Aquaculture



Since the Morton decision in 2009, which transferred responsibility for aquaculture management to the federal government, the FNFC has engaged with DFO to involve First Nations in aquaculture management.

In 2014 the FNFC drafted and endorsed the Declaration on First Nations Aquaculture Governance. This declaration established collaboration among BC First Nations to advance their common interests in the management of marine finfish, shellfish, and freshwater aquaculture. The Declaration also established a First Nations aquaculture technical committee (Tier 1), and established what roles were necessary for engagement in aquaculture:

- Each of the 14 FNFC regions will nominate a delegate to a Tier 1 technical committee;
- The FNFC will provide coordination support to the committee and will provide policy and program advice to DFO based on committee decisions; and
- The First Nations Leadership Council will act as political advocates to advance consensus-based positions and perspectives developed by the technical committee, in accordance with the Declaration and Protocol of Recognition, Support, Coordination and Collaboration with the FNFC and its Memorandum of Understanding with the Minister of Fisheries and Oceans Canada.



- This committee, formally called the Tier 1 Aquaculture Coordinating Committee (ACC), began to solidify in the fall of 2015. The purposes of the committee are:
- To share information related to aquaculture management between and amongst First Nations;
- To develop strategies for First Nations engagement related to aquaculture; and
- To develop and articulate recommendations to advance First Nations common interests in aquaculture management.

The FNFC has supported the development of the Tier 1 ACC table, while DFO has also encouraged First Nations to participate in the Aquaculture Management Advisory Committees (AMACs)

which are multi-stakeholder tables. Stakeholders at the AMAC include representatives from the aquaculture industry, ENGOs, regional districts and others. However, the membership is heavily weighted and industry representatives make up the majority of the table. First Nations have brought up many concerns about the AMAC structure through the ACC and elsewhere. The concerns include lack of funding for regional engagement or communication and lack of any direct negotiation between DFO and First Nations (Tier 2) to inform and guide the multi-stakeholder AMAC process. Given these flaws, the ACC and the FNFC believe in working towards a strong Tier 1 First Nations process and direct Tier 2 engagement with DFO to identify priorities and opportunities for collaboration.

G5
 Ld #7 0415L
 INV 9110
 AVG 3.2Kg
 Kg 29,361
 58.7 Kg/m³
 lights: 6

G4
 Ld #8 1015L
 INV 16,304
 AVG 1.22 Kg
 Kg 19,842
 31.7 Kg/m³
 lights: 6

P
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G3
 Ld #8 1015 S
 INV 19,141
 AVG 993g
 Kg 19,007
 38.0 Kg/m³
 lights: 6

G1
 Ld #7 0415S
 INV 14,680
 AVG 2.85
 Kg 41,779
 83.6 Kg/m³
 lights: 6

G2
 Ld #9 0116
 INV 39,207
 AVG 888g
 Kg 34,816
 69.6 Kg/m³
 lights: 5

Q: #10 0416 37.312 @ 316g = 11,791 kg = 47.2 Kg/m³

RECORDER
 FEEDING
 VENTILATION
 Q = 1000
 G = 100%
 WALL FANS
 Q = 100
 G.O = 100%
 MAKE UP
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Key Topics in Aquaculture for the FNFC



OPEN-NET PEN ATLANTIC SALMON FARMING

Without a doubt, the aquaculture management issue of most concern for First Nations in BC is the open-net pen farming of Atlantic salmon and the risks this industry poses to wild salmon stocks and ecosystems.

Some BC First Nations are involved in the open-net pen industry while others are strongly opposed to it. This creates challenges for FNFC in its mandate to develop common messages and perspectives among all BC First Nations, and to present a united front and united voice to DFO. However, ***the protection of wild salmon stocks and ecosystems*** is a primary and common interest of all First Nations who engage with the FNFC on aquaculture management issues.

Since the 2012 release of the Cohen Commission report, many BC First Nations and the FNFC have called for DFO to immediately implement all of the report's recommendations. In no uncertain terms, the FNFC has heard that many BC First Nations lack confidence in DFO's commitment to the protection of wild fish, given its two conflicting mandates: to promote aquaculture and to protect ocean ecosystems.



OTHER ISSUES

First Nations in BC have identified other issues in aquaculture management that require coordinated action and collaboration with DFO and other agencies. Current and ongoing aquaculture management issues raised by First Nations through the ACC process include:

- The development of a Geoduck Aquaculture Management Framework that recognizes First Nations rights and enables sustainable economic development for coastal First Nations communities;
- Ensuring that the management of freshwater and inland aquaculture, including brood stock collection and lake stocking, respects First Nations rights and includes First Nations in management decision-making;
- Ensuring an appropriate role for First Nations in aquaculture science, from the development of priorities through to monitoring and implementation.

Case Studies

**THREE AQUACULTURE PROJECTS
INITIATED AND RUN BY FIRST NATIONS**





K'ómoks Shellfish

AQUACULTURE AND FIRST NATIONS CASE STUDY

“I remember when my father was a commercial fisherman, he used to take off in February or the end of March, for the start of the herring fishery. You gave him a hug and a kiss... and he was pretty much gone for 6 months of the year because of the fishing industry... My dad will go out on a commercial fishery now, and you'll talk to him, he'll say, yeah I'm going fishing for a while. But your mindset as a kid is, well you're going to be gone for a few weeks. But then you'll see him the next day, and you'll be like, I thought you went fishing. And he says, Oh yeah, we did! It was 6 hour opening. We started at 6, done at noon.”

Richard Hardy of K'ómoks First Nation tells us this story as we ride across Baynes Sound towards a cluster of floating oyster rafts in the traditional waters of the K'ómoks people. The fishing industry has undergone a massive change in one generation, and Hardy has seen the impact first-hand.

It's clear to the K'ómoks that wild commercial fisheries can no longer support their people economically. But to keep their rights and title, they needed to assert the right to harvest from the ocean and manage ocean resources, and to provide jobs – ideally out on the water. This has

always been the foundation of the economy and part of the social fabric of the community. Hardy tells us of the ancient shellfish middens found on Denman Island. At one time, for the peoples now known as K'ómoks, shellfish was an abundant food.

Recently, over 50% of BC's shellfish industry takes place in Baynes Sound, and K'ómoks First Nation is concerned about losing their rights and title to local waters for the harvest of shellfish. It was clear to K'ómoks that oyster farming would create revenue and jobs, unlike the wild fishery. DFO would only offer them 10 of the



225 licenses for the wild commercial fishery in area 14. “For us it was a no brainer. We thought, leave the commercial fishery alone, just focus on aquaculture,” Hardy says.

When the shellfish aquaculture industry expanded into the area, the Nation asked BC to slow down tenure allocations in K’ómoks traditional territory. In 2000, the Province entered into negotiations with K’ómoks First Nation on limiting industry expansion in their area.

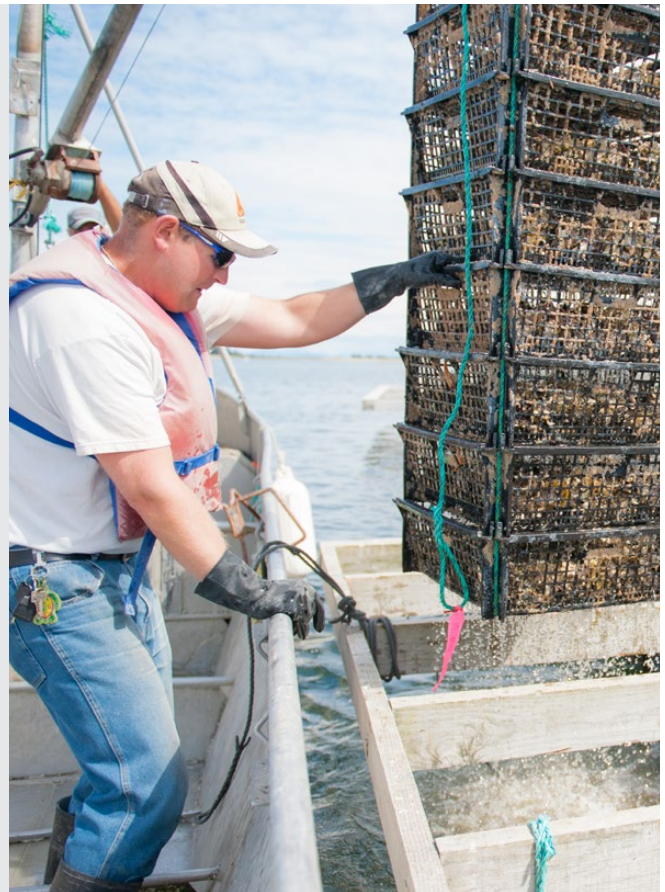
Farmed bivalve shellfish — oysters, clams, and mussels — are some of the most sustainable protein sources on earth. Monterey Bay Aquarium’s Seafood Watch recommends farmed oysters¹ and other farmed shellfish as a “best choice” for sustainability. Oysters, mussels, and

clams are ideal for farming. They naturally grow in dense populations and require no food or medication added to the water.

Through the Morton (2009) decision, aquaculture was deemed a fishery.² This led to jurisdiction over aquaculture being moved from the Province of BC to DFO. But DFO began allocation of aquaculture licenses within the K’ómoks traditional territory without any consultation. The K’ómoks First Nation filed for a judicial review in 2011/12 regarding DFO allocating aquaculture licenses without due consultation. Hardy says that after a long fight, “they came back and said ‘ok we would be willing to do consultation now.’”

Despite this, the federal and provincial government continue to challenge the K’ómoks

1. www.seafoodwatch.org/seafood-recommendations/groups/oysters?method=farmed
2. elc.ab.ca/Content_Files/Files/NewsBriefs/BCAquacultureLaws.pdf



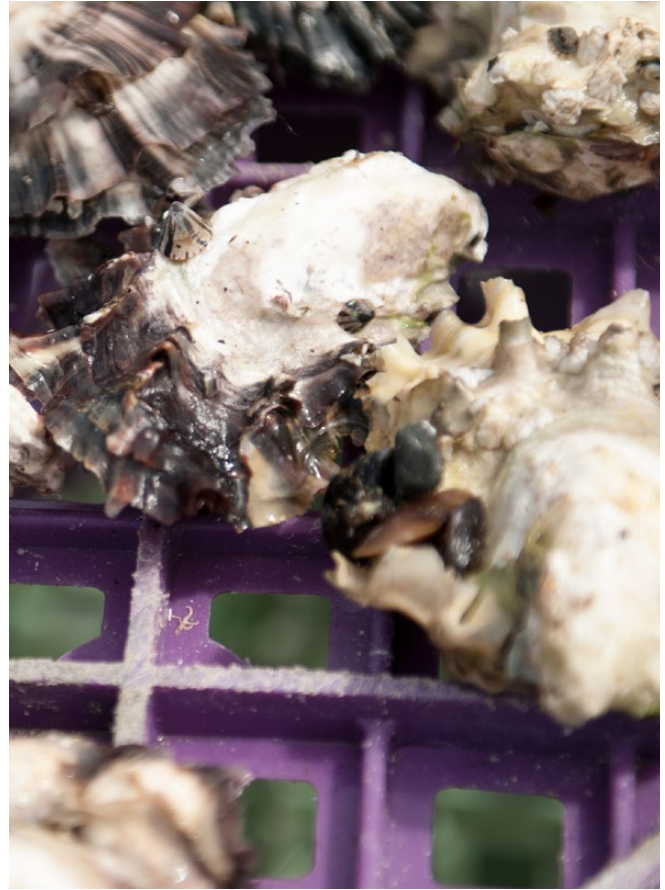
First Nation on their traditional rights and title. He says, “They still continue to argue: Is it really impacting your title? Do you have title? Can you show title?” Hardy says that whether the shellfish is wild or farmed doesn’t matter — they are still managing ocean resources and harvesting. And that provides the Nation their legal basis for an assertion of rights and title.

Hardy says nobody in the community was opposed to the aquaculture project. The shellfish aquaculture team sat down with the whole community and presented the short, medium and long-term goals. The short-term goal was training and developing capacity to manage the shellfish resources within their traditional territory: husbandry and harvesting capacity first with beach-farmed shellfish, and then a marketing

program. The medium-term goal was to start the “racking culture”³ program and a processing plant. The processing plant would allow the K’ómoks to have greater control, as they don’t rely on services from an outside corporation. The long-term vision is industry diversification, possibly including geoduck, finfish, sea urchin, and sea cucumber. And after that? Hardy envisions forming relationships with other First Nations across Canada:

“We grow oysters here. There are other First Nations who have lobster on the east coast. There are First Nations in the Ontario region with white fish. We have First Nations on the prairies that grow bison, or rice, or wheat. How do we start getting that food chain going? Like we used to do a long time ago. There were different

3. Oysters suspended in the water column and hanging from a floating platform. This increases growth rate because the oysters are always underwater and feeding — beach oysters stop feeding when they are exposed to air by the tides.



stories, going back in time, about shellfish beads from the west coast that ended up on the east coast. They end up in Ontario... we'd like to try and, in our own way, re-establish that trading trail again." It's an inspiring vision that can help a person deal with the many government roadblocks and red tape.

In 2003, K'ómoks signed an MOU with the Province to begin securing areas of interest for shellfish aquaculture but DFO and the BC Shellfish Growers Association told them every good site in Baynes Sound had been tenured out. The remaining sites were closed by Environment Canada and CFIA due to bacteria in the water, making the shellfish unsafe to eat.

The Nation didn't give up on these sites, though. Between 2005 and 2007, K'ómoks source-tracked bacteria, and used DNA to figure out whether the bacteria contamination

came from livestock, wild animal or human waste.

While this project was getting underway, the aquaculture tenure application process for these sites (unwanted by anyone else) stalled. CFIA, DFO, BC Ministry of Water, Land and Air Protection, BC Ministry of Agriculture, Food & Fisheries, and others — all said they needed other departments to approve it first before their department would approve it. Hardy said they "...found the process to be like a dog chasing its bureaucratic tail."

The K'ómoks solution was simple but very effective: get all the parties in one room, explain the situation and discuss everyone's concerns. Each department or ministry could hear concerns from every other group; all concerns would be documented, and everyone could agree on how to solve problems.

The contamination clean-up project also used a collaborative approach: provincial and municipal government agencies, the Comox Valley Farmers Association, Comox Yacht club, harbour authority, Comox residents association, commercial fishing representatives and others. K'ómoks First Nation began having meetings even before they started sampling. "It wasn't pointing fingers at anybody...if it works and we find out what the [contaminant] sources are, then we can remediate together," Hardy explained, "I think a lot of people liked that approach because they could come into the meeting thinking, 'Hey, it's not my fault, we're all coming into this together.'"

The next hurdle was local: to build capacity and generate funds, the Nation wanted to start with an intertidal (beach) oyster farm. The Islands Trust manages Denman Island zoning, and

was opposed to any K'ómoks aquaculture. The Nation wrote a letter to inform Islands Trust that the K'ómoks Nation had never relinquished its rights and title to Denman Island, and beach harvesting was part of their traditional practices. When Islands Trust realized the battle they faced, they compromised and allowed the project to move forward.

The Province of BC finally approved their aquaculture tenure and license in November 2010. In December 2010, DFO took over jurisdiction of aquaculture activities.⁴ K'ómoks First Nation had to wait 2.5 years to get a new aquaculture license from DFO, even though the Province had previously given them one. It was a frustrating setback; Hardy estimates \$400,000 in lost revenue for the two full seasons the farms sat idle.

4. see 2009 Morton decision, page 11.





At the 2012 National Aboriginal Fisheries Forum in Nanaimo, in a room full of First Nations Fisheries managers from across Canada, and DFO staff, a K'ómoks First Nations representative gave a presentation, noting the stalled license and lost revenue. This didn't sit well with the attendees, and two months later the Nation had their aquaculture license.

When outsiders look at the K'ómoks shellfish aquaculture program, they might see an income generator or job generator. They might see

smart business decisions and good marketing. What you probably won't see, unless you sit down with the people behind the project, is that the K'ómoks First Nation got into the shellfish aquaculture business for a strategic reason: to assert their rights and title over their land. And from that, to reconnect the trading routes between First Nations food producers, the way it was.



'N̄amgis Closed Containment Atlantic Salmon

AQUACULTURE AND FIRST NATIONS CASE STUDY

The open-net pen Atlantic salmon farming industry continues to be a point of contention among many First Nations, the Canadian public, the Canadian government, and local and global industries. Critics fear that this practice poses a major threat to the health of BC wild salmon stocks. For the 'N̄amgis First Nation, this issue hits close to home: the Broughton Archipelago is a hotspot for open-net pen (ONP) Atlantic salmon farms, directly on a wild salmon migration route through 'N̄amgis traditional harvesting areas.

“We have long had grave concerns about the impacts of these Atlantic salmon farms on the Pacific salmon we depend on,” says Chief Debra Hanuse. 'N̄amgis people have spent time, money and energy on fighting the ONP industry — through protests and in court — and they've seen little success on those fronts. The farms remain, and may even expand in the future. So while other groups continue court actions, the 'N̄amgis came up with a different idea: the Kuterra project.

Kuterra — the name combines *kutala*, the Kwak'wala word for salmon, with *terra*, the Latin word for land — is part of the Nation's long-term mission to permanently remove Atlantic salmon from Pacific waters. The Kuterra project embodies resilience and creative, solution-oriented thinking necessary to take control of a difficult situation, while still honouring 'N̄amgis traditional values. In the words of Chief Hanuse, “Wild Pacific salmon have sustained us for thousands of years, are at the heart of our culture, and the heart of what we pass on to our children.” She continues, “The 'N̄amgis First Nation takes very seriously our obligation as stewards of the world around us. Care for lands and waters is intertwined with care for future generations.”

With support from many organizations and government agencies, the 'N̄amgis First Nation developed this project on an area of their reserve near the lower Nimpkish River. When we



arrived, we were immediately given a briefing on biosecurity protocol — an essential part of the operation, which enables Kuterra to keep the fish disease-free.

The Kuterra plant is in a non-descript grey metal-sided warehouse, surrounded by machinery and a wide dirt road. There are excavated gravel ponds out front, ringed by flowers that the staff planted. Within this modest building are big dreams. With Kuterra, the 'N̓am̓gis seek to change the whole the global salmon farming industry, by quickening its evolution towards a more sustainable alternative. Kuterra wants show that maintaining this separation of farmed and wild fish can be done in an economically feasible way, and looks towards a future in which ONP farms are made obsolete, technologically

and environmentally. Kuterra seeks to prove that recirculating aquaculture systems (RAS) are the future of producing sustainable, affordable farmed fish.

Kuterra is the first business in North America to use RAS technology to grow Atlantic Salmon for the market, as opposed to just for hatchery fish. Kuterra collects detailed data on every aspect of growing fish — major funders made this a condition of their funding. Changing industry practices requires a collective effort, and Kuterra's publically available data is a key way to share this information with other groups seeking to develop land-based fish farming.¹ "To date we've demonstrated the technological and biological feasibility of doing this, and defined the parameters of economic feasibility," Chief

1. For more on Kuterra's performance metrics reports see: www.kuterra.com/industry-development

Hanuse tells us, “through the open-source operations and extensive public reporting, we’ve helped other producers and potential producers grow their operations.”

When considering this project, the most important priority for the 'N̄amḡis was the health of the river, the ocean, and the wild salmon. The Kuterra site was chosen because hydrological studies revealed the water discharged by Kuterra does not go into the Nimpkish River and does not put wild salmon at risk. The geology of the site is important; the entire area under Kuterra is a huge gravel pile, an effective water purifier. RAS technology produces very little wastewater, much less than an average beef or chicken farm, but even a small amount needed to be planned for. This attention to detail in environmental impact shows the care with which the 'N̄amḡis treat their lands and waters.

The wastewater seeps through the ground for more than a kilometre before it reaches the ocean, and by then it has been thoroughly purified by two excellent water filters: gravel and time. But the 'N̄amḡis weren't satisfied with predictions. Kuterra several test wells to confirm that the water was going where they thought it was. The Pacific Salmon Foundation contracted an independent environmental monitor to test incoming and outgoing water and monitor all environmental impacts of Kuterra from the start of construction. The independent monitoring program ended after more than two years of operations, and the final report stated that Kuterra was environmentally safe.

As an operation at the forefront of innovation, Kuterra also has other environmental benefits. A fertilizer company comes to collect the solid waste, which is nutrient-rich, composts it to



make excellent fertilizer. And there is research on site experimenting with aquaponics — growing plants using the discharged water.

Despite the positive outlook, there are many challenges in undertaking RAS projects. The technology is expensive to start up, with little direct financial benefit to the Nation so far. Such a long-term project means that it is hard to build community confidence in the project because the community is not seeing new jobs or income.

Kuterra faced other challenges as it pioneered this new use of RAS technology:

- *High startup costs.* The project required over \$10M in initial costs, plus several expensive retrofits. Much of the investment money was needed before the product hit the market. Kuterra is still optimizing the facility to try and get operating costs down and increase

revenues, and the business has not yet seen a profit.

- *Sustainability of feed source.* Even though RAS farming is capable of growing fish with much less feed than other farming methods,² all farmed salmon feed contains wild-caught fish. The sustainability of the fish that are used in feed production is an ongoing concern, and there is still work needed to improve feed sustainability in an affordable way.
- *Availability of expert staff.* There are not many RAS technicians in BC, or even in North America — and even fewer people experienced enough to manage a facility. Kuterra’s own operations manager was hired based on his 20 years of experience in the European industry, as Europe is more advanced in adoption of this technology than North America.

2. www.kuterra.com/facts/faq





- *Unexpected surprises.* The Kuterra facility was built based on projections, but some projections turned out to be inaccurate. For example, the fish used more oxygen than predicted, so Kuterra had to purchase another oxygen generator, which was a costly retrofit.

Part of Kuterra's mission is to face challenges and solve them. In the future, new producers will be able to use this knowledge to reduce their own risk and be more successful. For example, now that Kuterra has new information about oxygen usage in RAS farming with Atlantic salmon, new facilities will know they need to build more oxygen capacity. But a new operation would still have to figure out a number of other parameters — for example, the discharge method, which will depend on the site's geology and location.

Despite the many challenges of starting this project, Kuterra has proven the technological and biological feasibility of applying RAS technology to Atlantic salmon, and it has clearly identified the variables—such as scale and smolt supply—that will need more work to achieve economic success. It has also globally raised the profile of the new industry with industry regulators, potential investors, elected officials and consumers. The staff tells us of visitors from all around the world who have come to this plant to learn about their project.

Kuterra found a valuable marketing and distribution partner in Albion Farm and Fisheries Ltd., a company with a history of supporting sustainable seafood. Negotiating a good contract was still important, but the value of the partnership is beyond just the dollar amounts:



Photo: Kuterra

“Albion really knows the sustainable seafood market, and they are so supportive; small producers like Kuterra absolutely need those kinds of supportive partnerships to get the word out and find the best buyers,” one staff member tells us. Albion was able to help them get “buzz” and wide media coverage. And this media attention also worked toward their primary mission — to shape a future that permanently changes the Atlantic salmon farming industry, moving it out of the Pacific and onto the land.

The 'N̄am̄gis investment in Kuterra’s innovative recirculating aquaculture system for Atlantic

salmon is not simply an economic venture. It is a constructive challenge to the status quo. The land-based industry is already taking off, showing signs of growth in Canada and around the world, and the data collected by Kuterra only helps to push the technology forward. Chief Hanuse reminds us, “Kuterra’s mission is to catalyze a change in the Atlantic salmon farming industry, to show that it does not need to be based on open pens in contact with the wild environment.”

An aerial view of a large, rectangular hatchery tank filled with water. The water is a vibrant green color, and several salmon are visible swimming in the tank. The tank is bordered by a white concrete edge on the right side.

Syilx Sockeye Salmon Hatchery

AQUACULTURE AND FIRST NATIONS CASE STUDY

“The return of Okanagan Sockeye to our fishing grounds used to be only a dream”, says Grand Chief Stewart Phillip, “in the summer of 2010 we witnessed the salmon come back in the numbers not seen for 100 years. The work of supporting the Sockeye is ongoing and continues with this new hatchery, another aspect of our collective assertion to have a rightful place in the ongoing stewardship of our lands and resources.”¹

The new *kl cp'əlk' stim* hatchery facility run by the Okanagan Nation Alliance (ONA) is a symbol of the success of their Sockeye reintroduction program. The beautifully designed pathway leading to the front door is flanked with sculptures of traditional salmon fishing by Syilx artists, as well as plaques that explain to visitors the history of the Syilx people and their deep connection to the salmon in their territory. Inside the building, visitors will see more art (from many artists, including youth) and a huge map showing the incredible journey these salmon make.

“Compared to historical literature, we’ve been very successful... In less than ten years we’ve

managed to get natural spawning happening in the population,” ONA Fisheries Program Manager Howie Wright tells us. Wright credits this amazing success to two things: the ONA’s innovative and experimental methods of hatchery management, and the integration of the culture and ceremonies of the Syilx people at all stages. Wright says, “We’ve taken a very cultural approach, with the ceremonies of the Okanagan. The cultural aspects of it being included, having songs to call the salmon back...” and prayer ceremonies at both fry release and salmon feast. The streams we saw — packed full of dark red spawning Sockeye — are evidence that they know what they are doing.



The Okanagan River Sockeye are one of the populations that enter a river in the United States before swimming north over the border. This means that management of these salmon can look quite different than populations that are managed entirely within Canada.

The Okanagan River had a struggling Sockeye run that was nearly wiped out, and in 13 years it's become abundant, successful, and food-providing. The problems started in the 1930s, when a huge amount of development happened along the Columbia River in Oregon and Washington State. Dams were constructed to provide power to the area; many, many dams. Today there are a total of nine dams between the Okanagan River spawning areas and the ocean.

The Sockeye population hit a crisis point in the 1990s. In 1995, only about 5,000 fish spawned,

with just 2,500 females — a dangerously small gene pool.² At this point, the urgency of the situation got things moving politically. There was extensive trans-border negotiation, with the ONA and the Colville Federated Tribes working together to push the negotiations forward for the good of the salmon. The plan included fish ladders at dam sites, hatchery programs, monitoring stations, scientific studies and habitat restoration projects. The ONA's implementation kicked off in 2003 with a pilot project. The pilot was declared a success and in 2004 ONA proceeded to full implementation of their Sockeye plan.

165,000 Sockeye were counted crossing Wells Dam in 2008³, which is the last of the nine dams on the Columbia River that Sockeye must cross to enter the Okanagan river. "We started getting returns — they actually made it up into the



upper lake by themselves, through the dams, by 2012,” Howie Wright, tells us. Numbers have been increasing each year since then, and there is now a large enough population to support a Traditional Food, Social and Ceremonial Fishery, a First Nations commercial fishery and a sport fishery.

“In the Canadian portion of the Okanagan River, there’s only one natural section left. The rest is all channelized” Wright told us. This is the area we visited on the last egg-collecting day of 2016. The river runs behind several farms, and a walking trail has been built next to it. Here the river is clear and cold, with a strong current and pebbly bottom — the perfect place for the Sockeye to lay their eggs. The soft soil bank

overhangs the river in many places, so the tiny fry, once hatched, can hide from predators in the shadows. In the clear water, we could clearly see the Sockeye gathering and pairing off to spawn.

Walking a little further, we find the ONA hatchery staff hard at work. A team is in the water in waders. Most of them are dragging a seine net while two people in front of the net hit the water with sticks that make a loud noise. The noise scares the fish into the net and the team circles it up. They hold the net very carefully so the fish stay under the water but can’t escape. Then they start to lift them out, identify the “bucks” and “does,” and put back the ones that are finished spawning. The good ones are put into special sacks to keep the fish low-stress: long black

1. www.syilx.org/2014/09/grand-opening-set-for-sockeye-salmon-hatchery
2. <http://okanaganlife.com/return-of-the-sockeye/>
3. <http://hatcheryinternational.com/Profiles/new-gravity-fed-sockeye-hatchery-opens-in-british-columbia/>



cylinders with mesh at both ends. The mesh allows the water to flow freely through the space while the darkness makes the fish feel safe and hidden. Floats and handles at each end make it easy for the teams to drag the bags behind them to the harvesting area. Once there, they are placed into pens in the stream while they wait to be harvested.

Even though the work is hard and the water is cold, the good spirits and camaraderie in the team is clear. Some people are lifting and identifying, some holding the net and watching for escapes, others holding full sacks open for one more fish, or getting empty sacks ready to go. Everyone is laughing and making jokes while working, even though this is the last seine set of the biggest egg harvest the ONA hatchery has ever done.

It wasn't all laughter at the beginning though. When it was first proposed, the community had concerns: they were aware of research showing possible negative effects of hatcheries on wild salmon populations. The hatchery team made sure there was pro-active communication to the community and the leadership, explaining all the risk mitigation strategies. The ONA hatchery plan had been designed to compensate for possible negative effects, including a genetic management plan designed for their small wild Sockeye population. The fact that the hatchery was run directly by the ONA, rather than an outside government or organization, meant that the community's voice was respected and they were fully informed and consulted about what was happening. And the community aspect is still fully integrated into the hatchery work.



Long before the project showed such success the proposal for a First Nations-run hatchery was met by skepticism and confusion on the part of DFO and their Salmon Enhancement Program staff. “DFO is used to doing things their own way, and not having to deal with change. SEP [staff were] asking, ‘Is this our facility? Do we have to pay for this facility? Who is operating this facility? Do you have capacity for operating it? Who is going to control the facility?’” Wright tells us. DFO also had no framework to license a facility like this, Wright says, “It took a long time to get the license... we essentially told them what we were doing, and left it up to them to figure out how to license it.” Wright says they took a collaborative stepwise approach

to work with DFO. At each stage they involved DFO in decision-making processes and fully informed them of what was going on. ONA used DFO staff expertise, from site selection to feasibility design to report-outs on construction progress. The ONA showed an exemplary level of communication and accommodation to DFO.

DFO was not the only government roadblock they faced. The facility is on reserve land, so they did not have to apply for a tenure from the Province of BC. But BC’s freshwater aquaculture is largely implemented by the Freshwater Fisheries Society.⁴ “We had the provincial Freshwater Fisheries Society send a letter to the minister against salmon restoration. They said it would

4. A non-profit society funded by recreational fishing license fees, set up as an “arms-length” organization by the Province to manage freshwater fish.



kill all the Kokanee⁵ in the lake,” Wright tells us, “And then when we were looking at design and construction of the facility, they said to us, ‘Just let us design and build and operate it for you guys, thank you very much.’ They didn’t support the facility, but they wanted to build and operate it.”

But ONA was able to stay on track with their plans to have this be a fully First Nations-run facility, built and operated to their standards. And many people credit these high standards with the success of the program. It started from the design and construction. The facility’s water system is entirely gravity-fed, and it uses a passive heating and cooling system to control temperature. This saves a huge amount on energy costs, keeps the environmental footprint smaller and reduces the amount of critical machinery that must be maintained.

This facility, and the whole design of the program, show how much of a difference that First Nations values and techniques can bring to salmon recovery. Wright is very strong in his belief that the future of hatcheries and restoration efforts should be led by First Nations. “I see First Nations being much more involved in freshwater aquaculture and in aquaculture in general; taking control of aquaculture in society, taking control of what and where within their territory. And if there are mitigation programs that require aquaculture, that it’s the First Nations who would benefit and so would operate it. He adds, for those First Nations considering running a program like this, “Don’t believe people when they say is complicated or too technical. You can bring in the expertise and manage it yourself ... First Nations need to take a leadership role in this, in decision making and implementation.”

5. Because Kokanee don’t migrate to the ocean, they are under the jurisdiction of the Province; Kokanee and Sockeye live side-by-side within many ecosystems, much like the other species of salmonids.







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