



# Trends Around Practical Salmon and Trout Feeds in North America

# The Motivation...

- North America's desire to be more self-sufficient in seafood
- Declining wild seafood stocks
- A growing and shifting demand toward seafood
- A growing population
- Multiple health benefits of eating oily fish
- North America is rich in feed inputs
- Consumers prefer “home-grown”
- Safe seafood produced to high standards
- Fish are efficient converters of feed
- New feed solutions for new applications (RAS)

# Legacy EW OS Salmon and Trout feed Operations





# WHAT IS FISH FEED MADE OF?

**EWOS**

KNOWLEDGE MAKES THE DIFFERENCE

## PLANT-SOURCE RAW MATERIALS

**Wheat**

whole grain  
and flour

**Corn**

gluten meal

**Canola**

seed and oil

**Legumes**

lentils, peas and pea  
protein concentrate

**Flax**

seed

**SEAFOOD FOR  
GENERATIONS**

## ANIMAL-SOURCE RAW MATERIALS

**Fish/Trawlings**

meal and oil  
(no salmon meal or oil is used)

**Poultry**

meal and oil

**Porcine**

meal

**Krill**

meal  
(small amounts)

## SMALL, BUT IMPORTANT!

**Micro-Ingredients:** Vitamin and Mineral

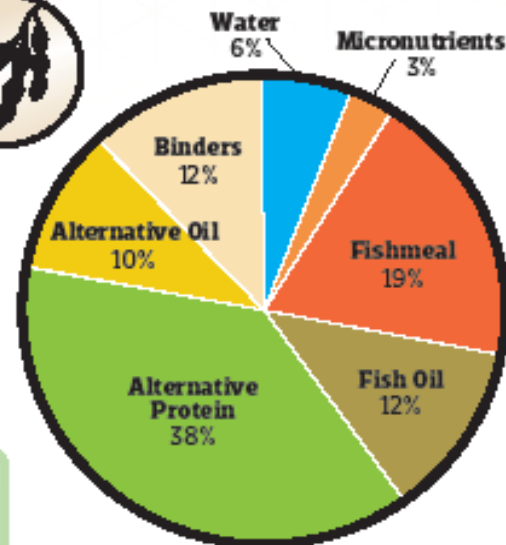
Premix + Pigment + Essential amino acids + Natural ingredients that promote wellbeing, such as prebiotics and nucleotides (in specific feeds)

## What is fish feed made of?

Fish feed consists of fishmeal, fish oil, land-animal meals and oils (e.g. poultry, but not bovine), vegetable proteins and fats (such as canola and peas), wheat (as a binder to help the feed maintain its pellet shape), vitamins, minerals and carotenoid pigment. Fish nutrition is not static. New ingredients (e.g. algae meal and oil) to replace marine sources are continuously being explored and natural products, such as prebiotics, are common ingredients.

### Ingredient Sourcing

Compared to other global production areas, fish feeds produced in North America have the highest inclusion of non-marine proteins and fats. This means that they rely less on marine-source raw materials. Where marine-source ingredients are used, fishery by-products are preferred as a sustainable choice. Fishmeal and fish oil are sourced from fisheries that are certified to the IFPO-RS (International Fishmeal and Fish Oil—Responsible Supply) and/or Marine Stewardship Council standard.



**Cargill**

# EWOS/CQN diets for...

Cultured in

- Atlantic Salmon



- Coho Salmon



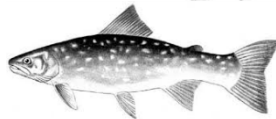
- Chinook Salmon



- (Various) Trout



- Arctic Char



- (Various) Bass



- Sturgeon



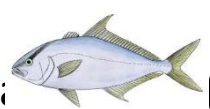
- Tilapia



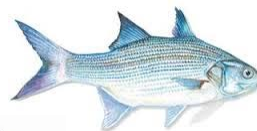
- Catfish



- Kompachi



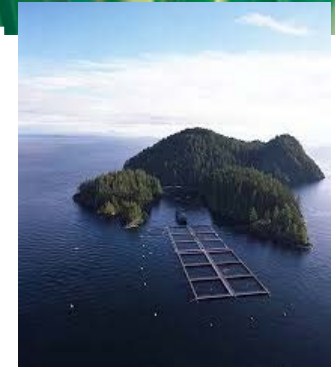
- Pacific Thre



- White Seabass



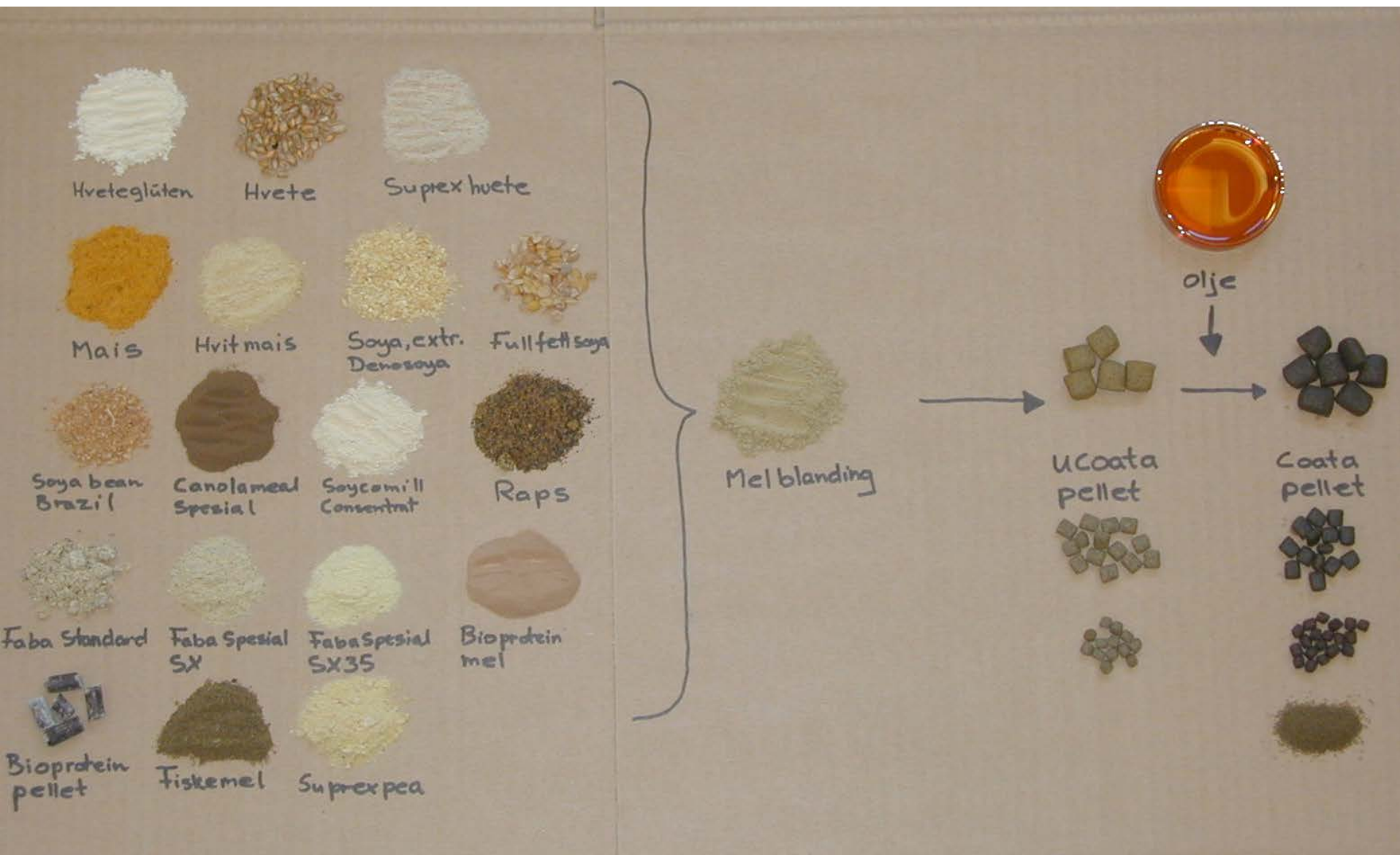
- Cobia



FIOW



# Optimizing raw material blends...



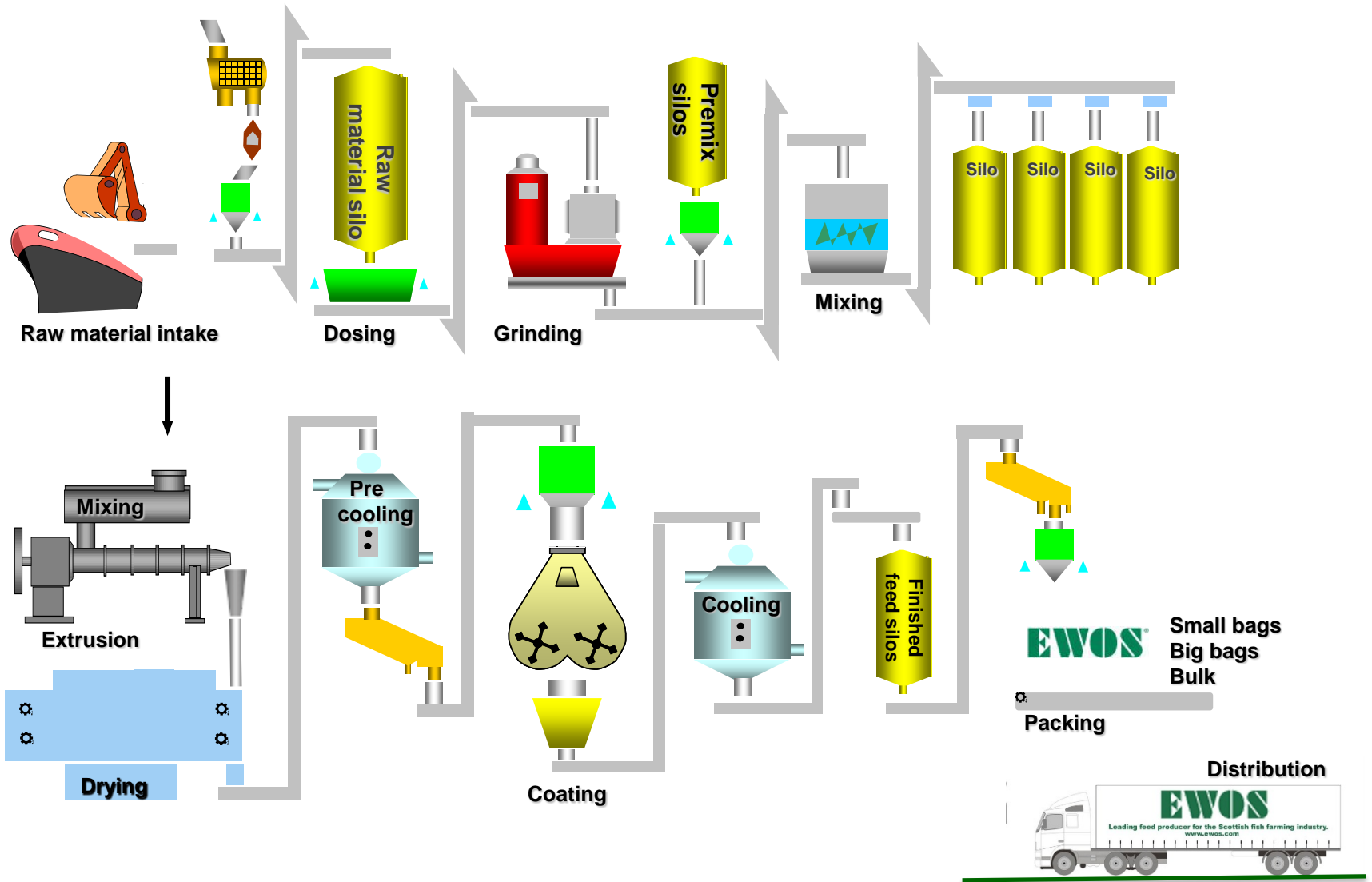


# Fish Feed Technology Center



# Carefully-chosen ingredients blended and made into pellets

**EWOS®**





# CARGILL INNOVATION CENTER - CHILE

NEW UNIT OPENED IN 2016

---





## FOR RECYCLING MEAT BY-PRODUCTS

Protect your brand, a sustainable local food system & the environment by keeping your beef, pork, poultry and fish out of compost.

For information visit [www.wcrl.com](http://www.wcrl.com)

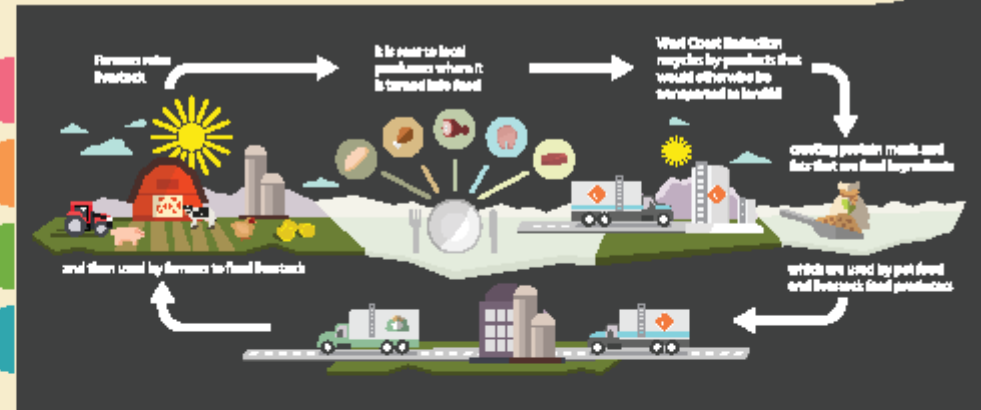
## EPA Food Waste Hierarchy



The Food Waste Hierarchy prioritizes actions companies can take to prevent & divert wasted food. Each tier focuses on different food waste recovery strategies & the top levels of the hierarchy create the most benefits for the environment, society and the economy.

## Sustainable Local Food Chain

Rendering is an integral part of a sustainable local food chain. By creating usable products from materials that would otherwise be sent to landfill or compost, rendering keeps energy in the local food chain and reduces costs to farmers and food producers.



Using innovative thinking, progressive processes, and modern facilities, we recycle inedible animal by-products and create products such as protein meals and fats which are then sold to customers worldwide. These fats and meals are ingredients for everything from pet and livestock feed to fertilizers, soaps, lubricants, detergents, and biofuel.

**Compared to composting, rendering reduces Green House Gas emissions by 90% and adds five times more value to the local economy.**



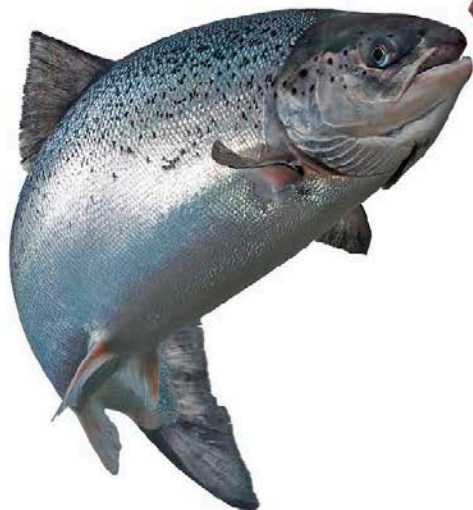


# New Diet series RAS-validated : Practical and Sustainable

- Fishmeal & GMO free
- Zero Fish in: fish out (by Seafood Watch)
- North American-sourced ingredients
- Natural pigment added (non-gmo phaffia yeast)
- Only fish oil (byproduct of processing residuals)
- Formulated by Rick Barrows (USDA) & Jason Mann (EWOS-Cargill)
- 20 MT produced by EWOS-Cargill



EWOS®



## CONSERVE FMF

### Fishmeal Free!

A breakthrough feed with high sustainability credentials that will ensure your fish standout in the marketplace.

EWOS Conserve Fishmeal Free (FMF) is formulated by nutritional experts using plant and animal by-products of human food production.



EWOS®



### EWOS Conserve FMF

Size	Protein	Fat
L and XL shaped pellet	40	30

## EWOS CONSERVE FMF

### Fish that Standout in the Market

- **Fishmeal Free** – the only fishmeal free diet that uses commonly sourced ingredients
- **Zero Wild Fish In: Farmed Fish Out Ratio** (as defined by Seafood Watch program) – uses fish oil by-product from human food fish processing
- **Natural Astaxanthin** – 80 ppm from natural sources achieves optimal fillet colour
- **Enhanced Local Sourcing Minimizes Carbon Footprint** – all major ingredients are North American origin
- **Share the Earth** – uses plant and animal by-products from human food production
- **Healthy Omega-3 Fatty Acid Levels** – fish oil levels reflect less marine ingredient reliance but ensure heart and brain-healthy Omega-3 fatty acid levels
- **Available with no Genetically Modified Ingredients**

### No Risk Production Results

- **Expert Formulation** – formulated by nutritional experts from the USDA Agricultural Research Service and Cargill Aqua Nutrition Canada to meet requirements set by The Conservation Fund Freshwater Institute
- **Proven Ingredients** – a mixture of well-tested protein sources have established nutrition and are readily sourced
- **Excellent Performance** – semi-commercial production in The Conservation Funds Freshwater Institute's RAS facility yielded FCR of 1.18 with 97 percent survival during 10-month growout
- **Validated Production Results** – 12 tonnes of Atlantic salmon raised from 600 grams to 4.5-5.0 kg harvest weight
- **High Nutrient Specification** – ensures nutrient requirements are well met, specifically designed for Atlantic salmon from 1.5 kg to harvest

**ASC Certification?** With no fishmeal and with by-product fish oil only, EWOS CONSERVE FMF will simplify responding to the ASC Salmon standard's feed requirements and will ensure the ability to meet marine ingredient sourcing indicators does not limit certification of sites.



**Chinook Salmon**

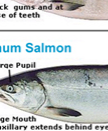
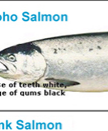


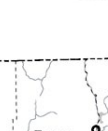
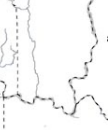
small eye

black gums and at base of tooth

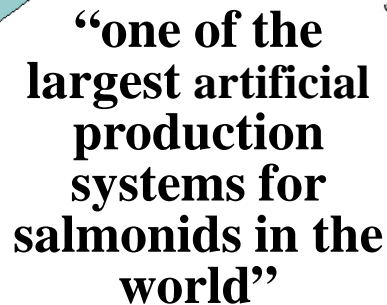
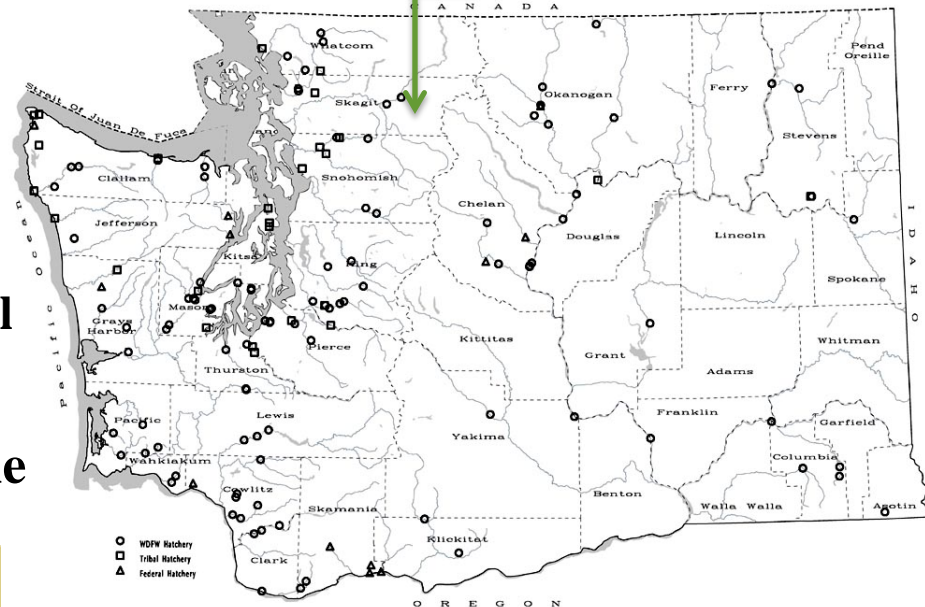
long black spots

tail covered with spots

thick caudal fin and scales

- Chinook Salmon**
- 
- Small Eye  
Tail covered with spots  
1-mm black spots  
Black gums and at base of teeth  
Thick caudal  
13-19 anal rays
- Chum Salmon**
- 
- Large Pupil  
Silver Strake  
No spots  
Large Mouth  
(Maxillary extends behind eye)  
Narrow caudal  
13-17 anal rays
- Coho Salmon**
- 
- Spots on upper lobe  
Silver colour adjacent to caudal  
Base of teeth white, edge of gums black  
Thick caudal  
13-16 anal rays
- Pink Salmon**
- 
- Scales small  
Large oval spots  
Soft body (limp fish)  
13-17 anal rays
- Sockeye Salmon**
- 
- Small black speckles  
Scales larger and distinct  
No spots  
Dark color  
13-18 anal rays  
Body slender and firm
- Steelhead Trout**
- 
- Short head  
Slender lateral profile  
Small black spots  
Uniform spots on tail  
Square tail  
Wide caudal  
8-12 anal rays

## River Enhancement

US Dept of  
Commerce



# USA Seafood trimmings...



# Fish Oil source...





# Global Oilseeds and Grains

- This is the largest sector comprising the diets in Europe.
- Global demand has increased for soy protein concentrates from SA.
- There is a large dependence created there.
- Brazil, Argentina, USA have large production areas of soybeans
- Corn Gluten Meal is used in Americas
- Concentrates from peas, beans are high-potential
- Flaxseed has potential but requires processing (Omega-3)
- Wheat and flour is large in North America

- **Single Cell Protein**
- FeedKind *Aqua* protein is produced via natural fermentation with non-GM organisms
- From natural gas.
- FeedKind *Aqua* protein improves nitrogen retention and increases growth rates in Atlantic Salmon.



- **Single Cell Protein**
- FeedKind *Aqua* protein is produced via natural fermentation with non-GM organisms
- From natural gas.
- FeedKind *Aqua* protein improves nitrogen retention and increases growth rates in Atlantic Salmon.
- Made by Calysta with support from Cargill

- **Fishoil/meal supplement**
- **Algae containing high levels (20%) of Omega-3 (DHA) oil developed by ADM**
- **Produced in Iowa for Aqua use**
- **Launched in June 2016 in EU, Chile**
- **Approvals now being sought in USA and Canada**



- **Empyreal – Corn Protein Concentrate**
- High-protein product made for Aquaculture
- Made in mid-west USA
- Highly-digestible by salmon and trout
- 75% protein level

- **Camelina**
- Oilseed suited for marginal farm-land (dry)
- Canadian Prairies
- Oil has a better blend than Canola oil (Omega 3)
- Undergoing approvals by CFIA and FDA



# Panaferd AX Natural Astaxanthin



## IDENTITY

Inactive dried bacterial cells of astaxanthin-rich *Paracoccus carotinifaciens* (*paracoccus* colourant).

Main components : Natural lipids and proteins produced by *Paracoccus* cells.

Primary colourant : Natural astaxanthin.

Secondary colourant : Natural adonirubin, natural canthaxanthin

## USE

The colourant is authorized only for the production of feeds for salmon and for trout.

## APPEARANCE

Dark-red granular solid

## APPROVAL

EU, Norway, USA, Canada

## TYPICAL ANALYSIS

### Carotenoids

Astaxanthin • 21 g/kg

Adonirubin • 8 g/kg

Canthaxanthin • 2 g/kg

### Major Components

Moisture • 3.5 %w/w

Crude Protein • 52.5 %w/w

Crude Fat • 1.9 %w/w

# Important Environmental Trend



- **Sea Temperatures higher past years in PNW**
- **2 to 3 C higher SW sites, milder winter temps**
- **Feed intake remains higher through winter months**
- **Seeing higher % early maturation in Salmon**
- **Fresh water temperatures**
- **Feeding strategies and feed design**

# How to deal with early sexual maturation

- In pre-smolt phase use lower temp and not  $> 14^{\circ}\text{C}$
- In pre-smolt phase (S0) when having summer simulated additional light period use 18:6 instead of 24hr light:0 hr dark. Long periods with winter phase is also important (12:12)
- In post-smolt avoid having continuous long periods of higher temperature of more than  $15-16^{\circ}\text{C}$
- Difference in strains
- Develop all-female





# Important trends

- **Realization of seafood shortfall**
- **USA imports >90% of its demand**
- **Are safety rules the same in all countries?**
- **How do consumers make decisions at retail level?**
- **EU, Norway, India, China, Vietnam, USA, Canada, Chile equal in seafood production methods ?**

# Important trends



- **How can domestic demand be more locally-produced ?**
- **A partnership approach among suppliers, growers and buyers: A common cause**
- **Promote and tell the story consistently**
- **Lower FCR: “less is more”**

# Important trends



- RAS technology incorporated in FW and Post-smolt stage of salmon farming
- Increasing use of functional feeds
- Government engagement
- Community Engagement
- Increased public communications and education
- Academic Engagement
- Certifications/Standards
- Branding





**CO<sup>♥</sup>ST**  
**FRESH**  
SALMON RAISED IN BC

**Thank You!**

