Expanded Outline Draft 8-18-17

Guidance for Managing Marine Net-pen Aquaculture in Washington's Straits and Estuaries

Figure 1: Map of study area

Figure 2: Map of existing commercial net pen and hatchery sites

Executive Summary

Project Overview

Project Need

Shoreline Master Programs

Water Quality Permits

Fish health and stock management

Market demand

Project Goal and Objectives

Objective 1

Objective 2

Objective 3

Objective 4

Deliverables

Intended Audience

Temporal Scale

Spatial Scale

Project Area Description

Greater Puget Sound

Grey's Harbor

Willapa Bay

Net Pen Aquaculture Industry

The need for aquaculture

History of net-pen aquaculture nationally and internationally

Norway

Chile

British Columbia

Net-pen aquaculture in the United States

Maine

Hawaii and the Caribbean

Washington

Legal authorities

Local authorities and requirements

Shoreline Master Program

Substantial Development Permit (SDP)

Conditional Use Permit (CUP)

Applicable state laws and administrative codes

State authorities and requirements

Washington Department of Ecology (Ecology)

National Pollutant Discharge Elimination System (NPDES) Permit

Section 401 Water Quality Certification

Washington Department of Fish and Wildlife (WDFW)

Marine Finfish Aquaculture Permit

Live fish Transportation/Import Permit

Hydraulic Approval Permit

Other Requirements

Applicable state laws and administrative codes

Washington Department of Natural Resources (WDNR)

Aquatic Use Authorization (Aquatic Lands Lease)

Applicable state laws and administrative codes

Additional state authorities – Ocean Resource Management Act (ORMA)

Additional state authorities – State Environmental Policy Act (SEPA)

Federal authorities and requirements

National Oceanic and Atmospheric Administration (NOAA)

National Marine Fisheries Service (NMFS)

Office for Coastal Management (OCM)

Office of National Marine Sanctuaries (ONMS)

U.S. Army Corps of Engineers (USACE)

Section 10 Permit

Section 404 Permit

U.S. Coast Guard (USCG)

U.S. Environmental Protection Agency (USEPA)

U.S. Fish and Wildlife Service (USFWS)

U.S. Food and Drug Administration (FDA) Error! Bookmark not defined.

Tribal authorities and requirements

The Permitting Process

Management recommendations

Summary of Management Recommendations

Benthic Effects

State of the Science

Deposition of nitrogen, phosphorous and carbon

Biogeochemistry

Chemicals

Siting

Washington Specificity

Washington Coastal Waters

San Juan Islands

Central Puget Sound

Grays Harbor

Willapa Bay

Required Monitoring and Standards for net-pen facilities

Historical Results of farm site benthic monitoring

Recommendations

Siting
Feeds
Net pen cleaning
Fallowing

Permitting/regulatory authorities

Dept. of Ecology

Water quality

State of science

Nitrogen
Phosphorous
Dissolved Oxygen
Turbidity

Washington specificity

General Description of WQ in the study areas
Required monitoring and standards

Recommendation

Siting
Feed Management
Cage cleaning
BMP's

Permitting/regulatory authorities

EPA/Ecology

Fish Health and Disease Management

State of science

Prevention and Treatment
Water Quality
Feeds
Vaccines
Therapeutic compounds
Coordinating disease treatment between farms in similar areas
Diseases of Note in Salmon Aquaculture- chart
Zoonotic diseases

Washington specificity

Overview/History of diseases seen in WA net pen culture
Differences from BC, Europe, Chile
Transmission
Screening practices
Prevention and treatments used
Regulatory oversight and reporting
Vaccines
List of available drugs, therapeutics and antibiotics

Recommendation

Biosecurity/Fish Health Plan for each specific site
Employee training (signs of illness, safety considerations, etc.)
Contact for fish health emergencies
Fish stock
Source
Transportation and stocking
Siting to minimize pathogen transmission
Management Strategies
All in all out stocking
Fallow sites
Surveillance (HABs and Sea Lice)
BMP's

Permitting/regulatory authorities

WDFW Fish Health Policy RCW 77.115
WAC 220-77-020
Salmonid disease control policy
Dept of Ecology
FDA
USFWS INAD's AADAP
USDA CAPHS and NAAHP
PNFHPC
Link to Fish Health Plan template

Antibiotics

Define antibiotics and explain the problem

Antibiotics use in food animals
Antibiotics as an environmental concern
Antibiotics as a human health concern
Overview of the use of antibiotics in aquaculture

Explain proper use of antibiotics

Improper use includes prophylactic tx; Tx without id and sensi

What are the associated risks of using antibiotics?

Release into the environment harm beneficial organisms

Evolution of resistant strains

Washington specificity

Explain the regulatory and reporting process involved with antibiotic use in US

Diseases seen in WA that may necessitate antibiotics

What are the antibiotics available for use

Recommendation

Veterinary Guidance

Follow proper protocols

Vaccination

Permitting/regulatory authorities

FDA

USFWS INAD

Veterinary Oversight

Dept of Ecology Reporting

Feeds

State of science

Overview of the feeds problem

Use of wild sourced fishmeal and fish oil as primary ingredients in aquafeeds is unsustainable

Opportunities for alternative ingredients

Fishery by-products

Land animal sources

Proteins and oils from crops

Types of feeds used in industry today

Sustainable ingredients, feed costs and optimum feed efficiency

Risk of disease if nutritionally deficient

Using functional feeds/ medicated feeds

Environmental risk of poorly managed ingredients and practices- global and local

Washington specificity

Cold water increases risk of persistence in environment

Use of colorants

Extensive research on Atlantic salmon nutrition and feed ingredients

Status of Organic Standards in US Aquaculture

Recommendation

Work with professional/ recognized manufacturer

Understand the nutrient requirements of your fish

Proper storage - pests, contamination

Observe feedings, minimize loss

Permitting/regulatory authorities

FDA- ingredients and drugs

Ecology- reporting medicated feed use

Want to know More?

NOAA/USDA Feeds Initiative

FDA Animal Food and Feed

Fouling Prevention

State of science

Effects of fouling

Control methods

Biocide-based coatings

Non-biocide-based coatings

Net materials

Cleaning in situ

Changing netsManagement options to deal with fouling

The risks of bioaccumulation and indirect effects of antifoulants

Present day use of antifoulants in net-pen aquaculture

Washington specificity

Recommendation

Permitting/regulatory authorities

Ecology

Sensitive habitats

State of science

Feed and fecal settling

Nutrient enrichment

Changes in micro and macrofauna assemblage

Washington specificity

Designated Habitats of Special Significance in the area

1986 Guidelines recommend set backs

Recommendation

Sensitive habitat is a primary factor when determining farm siting

Proximity to habitats should be reconciled against depth & current

Permitting/regulatory authorities

WDFW, CZM Ecology

Escapes

State of science

Escape reporting and trends from industry

Behavior of escapees

Interaction with wild salmon

Dispersion

Disease transfer

Review of methods to minimize impact

Sterilization/monosex populations

Siting

Recapture

Closed containment systems

Washington specificity

Historical intentional release

Marking of fish is required

Recommendation

Prevention

Inspection of cages, hardware, moorings and anchors

Use practices and equipment during fish transfer and harvest that minimize the opportunity for escape

Minimizing impact

Recapture

Siting

A healthy native ecosystem

Permitting/regulatory authorities

WDFW

Salmon interactions

State of the science

Risks to wild salmon in the Atlantic versus the Pacific

Risk of escapees competing with native salmon for resources

Atlantic salmon colonization risk

Disease transfer risk from aquaculture to native salmon

Sea Lice

Bacteria
Virus
Risk of chemicals used on farm impacting native salmon

Washington specificity

Differences between Washington, BC, Chile, Europe
Washington's native salmon protection and restocking programs

Recommendation

Ecosystem scale approach must be used to evaluate stressors on salmon populations
Prevent escapes
Promoting animal health
Continued vigilant disease monitoring

Permitting/regulatory authorities

WDFW

Marine life and other protected species interactions

State of science

Benthic interactions
Risks from consuming uneaten feed
Risk of exposure to chemicals used on farm
Water Column Interactions
Entanglement risk
Risk of exposure to chemicals used on farm
Behavior Change
Farm as FAD
Animals choosing to avoid the area
Predation
Worker safety

Washington specificity

Wild fisheries
Pinnipeds
Otters
Whales
Sharks
Seabirds

Recommendation

BMP's to reduce attraction
Daily removal of mortalities
Minimize feed loss

Use of predator netting and bird netting
Cage integrity- tight mesh, minimize fouling, inspect as much as possible
Wildlife monitoring- noting occurrence in log

Permitting/regulatory authorities

NMFS/NOAA
WDFW

Predator control

State of science

Who are the predators, what is their history?
Anti-predation tactics risks and benefits

Washington specificity

Local history of interaction
Use of predator exclusion

Recommendation

Predator nets, husbandry, equipment to avoid predation
Reduction of attraction and damage using infrastructure and husbandry

Permitting/regulatory authorities

WDFW
NOAA/NMFS

Transfer and importation

State of science

Risks associated with transporting fish
Current regulations for fish transport in US and State of Washington
Sources of stock for net pen operations

Washington specificity

History of transportation and importation for net pen stock
Current practices for sourcing smolt

Recommendation

Trusted local sources
Disease screening
SOP for minimizing stress during transport and stocking
Cumulative Impacts

Permitting/regulatory authorities

USDA APHIS for interstate and international transportation
WDFW

Marine debris

State of science

Overview- Definition, sources, impact
How can aquaculture contribute to marine debris
Shellfish farms (brief)
Net pen farming of finfish
Trickle of trash and tools during daily ops
Abandoned and derelict farm sites
Debris caused by catastrophic events- cage loss
How marine debris can impact aquaculture

Washington specificity

Local issues and incidences
Types of debris commonly seen in Puget Sound and Straits

Recommendation

Preventing marine debris during daily operations
During Farm site fallowing or upon farm site closure
Cases of catastrophic events

Permitting/regulatory authorities

NPDES Solid Waste Management Plan
Coast Guard

Emerging Challenges and Opportunities

Climate change

Novel diseases
Sea lice if salinity changes in PS
Weather events
Ocean acidification

Cultivation of other species of finfish (non-salmonid)

Integrated multi trophic aquaculture

Land-based Atlantic salmon aquaculture

Siting Considerations

Summary of Siting Recommendations

Depth and Current

State of science
Minimum Depth and Current Velocity

Maximum Current- consider the fish
Pen engineering

Washington specificity

Puget Sound and the Straits
Depth
Currents
EIS guidelines have been in place since 1990
Discuss monitoring results from active farm sites

Recommendation

Farm maintenance/ management considerations
Pen engineering cost and practicality
Sensitive Habitats
Designated Sensitive Habitat
Set backs
Fallowing
Feed input, site characteristics and fish growth
Modeling
Navigation
Protected Resources
Other Industries
Recreational and commercial fishing
Exclusion from (or allowance in) lease areas
Tourism
Shellfish aquaculture
Housing development
Aesthetics, Nuisance Issues
Tool and resources
Environmental Models
NCCOS CAPP
GIS

Research Recommendations

Washington specific market analysis regarding land based facilities

Pilot projects for certain cage designs or operation practices

New visual impacts assessment workbook for local governments

Literature cited

Appendices

Project Process and Timeline

Spatial Planning Tool

Technical Review

Communications and Outreach