

ALASKA LEGISLATURE SPECIAL COMMITTEE/SUBJECT FILE 8672
1912 SCOMM 75: MARICULTURE (FISH FARMING), 1987-1990

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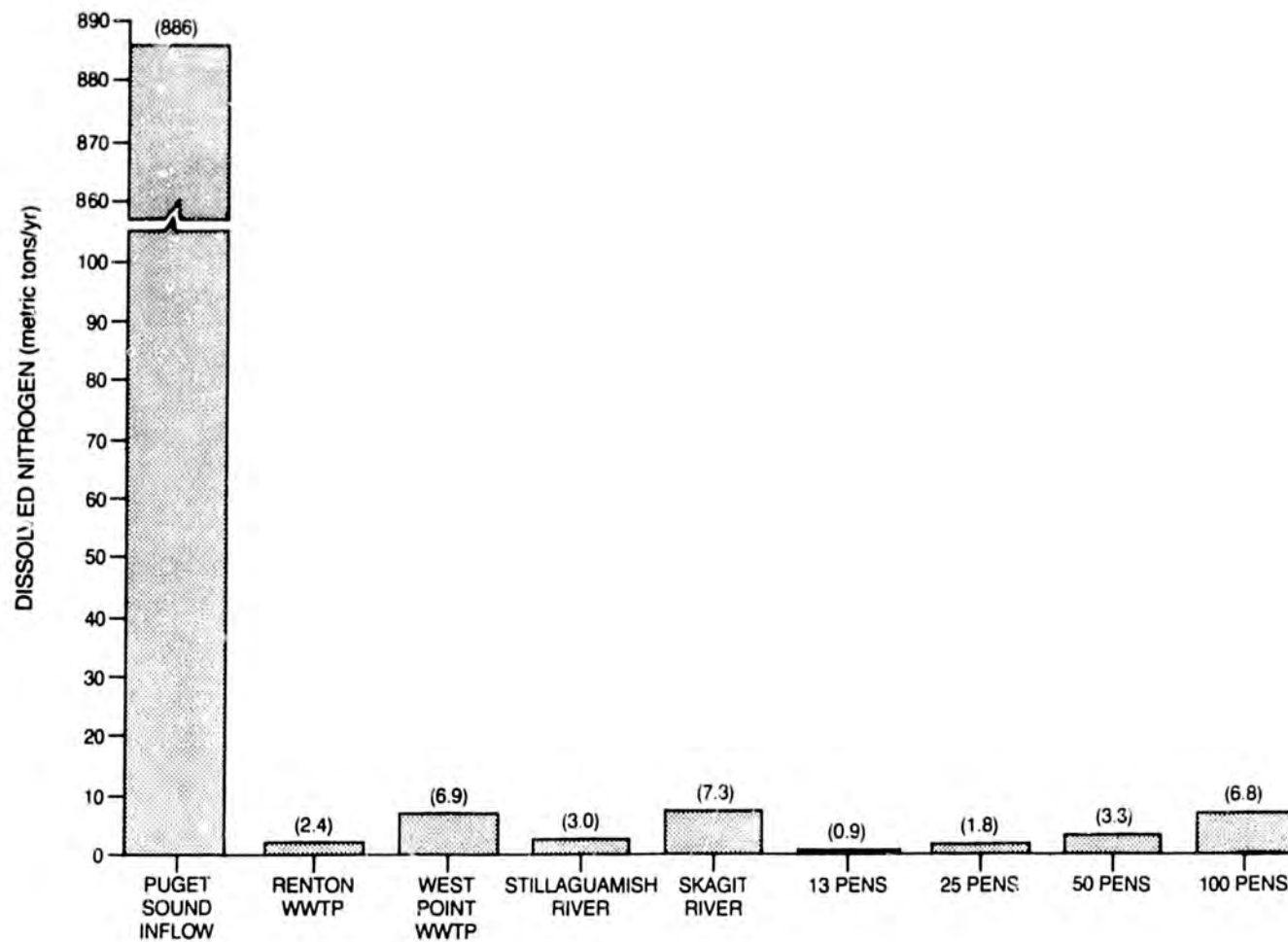


Figure 27.
Nitrogen loading from tidal and freshwater Inflow, Renton and West Point Wastewater Treatment Plants, Stillaguamish and Skagit River, and various levels of net-pen development.

In summary, the impact of 25, 50, or 100 net pens on the overall water quality of Puget Sound would be very weak and largely negligible. Consequently, the net-pen production in Puget Sound will be limited by the availability of sites that can be developed without significant local impact to water quality and degradation of benthic communities. Furthermore, conflicting uses of the water (navigation, fishing, aesthetics) may limit the number of farms to production levels well below the maximum production level considered here.

D. LAND-BASED TANK FARMS

A recent development in the culture of salmon is the rearing of fish on shore in large tanks. Sea water is continuously pumped through the tanks or raceways and discharged back into adjacent marine waters. Experimental culture of Atlantic salmon in Iceland has demonstrated the feasibility of this culture method. However, wide-scale commercial operations are just being initiated. Thus the method must be still considered experimental, but one which may provide an alternative method of fish culture in some areas and situations.

The primary advantage of tank farms to the fish grower is that he has much greater control over the water and the fish culture environment. By selecting the depth of the water source, the farmer can avoid noxious plankton, have limited control of temperature, salinity, and dissolved oxygen. He can also control flow rates through the tanks to provide optimal growing conditions, and may add supplemental oxygen or air to the water to allow higher stocking densities and lower disease risks. Other advantages include the ability to work in any weather, avoidance of many of the potential conflicts with other water users and avoidance of predator problems. Tank farms also provide the opportunity for treatment of the effluent in areas that may be sensitive to nutrient enrichment.

Disadvantages of tank farms are the higher construction and operating costs to pump water. Perhaps the greatest disadvantage is the limited availability of suitable sites, which must be flat, near water, and close to sea level to minimize pumping requirements.

The following discussion briefly describes tanks farms and the potential environmental impacts of this culture method which, in some situations, may provide an alternative method of fish culture to net pens.

The primary features of a land-based system include:

- An intake pipeline located subtidally to provide a constant supply of high quality water;
- A pump and delivery system to circulate water through the rearing tanks; and

- A series of upland rearing tanks and or raceways (circular tanks up to 20 meters [66 ft] in diameter and 3 m [10 ft] deep appear to be the preferred tank design).

Land-based sites low in elevation and near shoreline areas are preferred. Such locations reduce the length of the intake system and maintain pumping efficiency by limiting the pumping head (the vertical height water must be pumped to supply the rearing ponds). In addition, tank farms should be located in areas free of plankton blooms and near relatively deep water where water can be drawn from below any blooms.

The physiological requirements of salmon reared in tank farms are the same as those of salmon reared in net pens. However, because of different rearing conditions and economic considerations, there are notable differences in the two technologies in terms of rearing densities and operation and maintenance procedures. These differences are projected to have a significant effect on the quality of the discharge.

The most notable difference between the two technologies may be the amount of feed required for production of an equivalent amount of fish. Average food conversion ratio (FCR) in net-pen facilities may vary from 1.5 to 1 (Hardy 1988, personal communication) to 2.0 to 1 (Weston 1986). Recent work suggests that a FCR of 1.2 to 1.0 or less may be achieved (Asgard et al 1988). This ratio accounts for conversion of feed to fish flesh (dry pellets of 10 percent moisture compared to fish flesh of 70 percent moisture) as well as loss of feed (a 0-20 percent loss of the feed depending on the site location, type of feed, and rearing practices), loss of fish due to mortality, or other reasons. Since onshore tank farms use circular tanks with controlled flow and oxygen conditions, proponents claim that salmon are able to feed and convert fish feed more efficiently to flesh than in net pens that are subject to variations in water velocity and existing oxygen conditions. As the FCR improves (lower ratio), the amount of waste feed and total solids loss drops significantly.

Other positive aspects of land-based tank farming include the relatively high quality of waste water that is a result of dilution by the large volume of water flow necessary in the tanks. Since self-cleaning tanks may be designed, "shock loads" due to sudden discharges of large amounts of organic waste during cleaning may be avoided. Stocks of fish may be separated for disease isolation and treatment. Routine addition of oxygen may improve dissolved oxygen levels relative to existing source water conditions. This extra oxygen allows higher stocking densities and reduced incidence of disease.

Potential negative impacts of land-based tank farming include release of a more concentrated effluent than net pens. Because large volumes of flow are necessary for land-based tank farms, the concentration of pollutants such as ammonia in the effluent may be low, but not as low as that seen from net pens. The receiving waters must have active hydrodynamics to allow dispersion of the solid and dissolved wastes. This requirement is enforced through the National Pollution Discharge Elimination System (NPDES) permit system administered by the Washington Department of Ecology. Due to salt content, solids isolated from onshore tank farms are not readily disposable on

land as fertilizer or fill. Depending on its design and site, land-based tank farms may need to screen their intakes to prevent fish from being taken up in the intake.

In general, land-based rearing of fish allows for tighter control over all phases of outgrowing (growth to marketable size) compared to net pens. In a land-based system, water flow rates and dissolved oxygen concentrations (variables important to fish health) can be adjusted dependent upon the fish rearing requirements. In addition, fish reared in tanks are easily observed and sampled. This accessibility to the fish helps develop efficient feeding schedules, identify stress and disease, and aid in the treatment of fish if a fish disease or parasite is identified.

On the other hand, land-based tank farms are more costly to construct and operate than a net-pen system. Unlike net pens, tank farms need intake and outlet structures, as well as rearing ponds. Greater operational costs also occur with tank farms due to maintenance of the rearing facilities and the cost of pumping and circulating rearing water.

The successful operation of a land-based facility is, therefore, dependent upon efficient management and close control over the rearing process. Compared to net-pen operations, land-based facilities can potentially increase overall survival, improving harvest rates, as well as improving feed conversion ratios which result in decreased feed costs.

While there are no operating land-based tank farms in Puget Sound, upland systems have been proposed for Grays Harbor and Clallam counties, and other areas of the United States and Canada. Saltwater tank farms are successfully operating in western Europe and Iceland. Upland tank farms are a new technology and have yet to be fully proven economically. They appear, however, to offer an alternative means of growing fish which may complement net-pen farming and provide an alternative to net pens in situations where net pens would otherwise be impossible.

Land-based tank farms must comply with all local, state and federal regulations pertaining to net pens, with the possible exception of the Corps of Engineers permits concerning navigation (Section 10). In addition, tank farms as sources of point-source discharge, are subject to permitting requirements under the National Pollutant Discharge Elimination System.

The following discussion briefly summarizes the possible environmental impacts of upland tank farms for the purpose of comparison with net-pen culture.

1. SEDIMENTATION

Tank farms can introduce sediment into the marine environment through discharge pipes at an outfall. Unlike net pens, the fish farmer can regulate the effluent from the facility. Feces and excess feed frequently will settle to the bottom of the tanks where they can be removed, or be collected in settling ponds.

Any sediment which is discharged from a tank farm would affect the marine environment in a manner similar to the sediment deposited from a net-pen facility or similar discharges. Unlike net pens which by their size provide a vast area for dispersal, tankfarm discharges are a point source which would concentrate sediment impacts without adequate sediment removal or adequate dispersal of the discharged material.

A range of responses, similar to those described for net pens, will occur at the effluent outfall. Where effluent is rapidly and effectively dispersed, the effects will range from local enrichment of the bottom community to no noticeable change. If dispersion is minimal, the effects will be substantial with all three zones occurring as all of the sedimentation will occur in a concentrated area. Dispersion can be increased by placement of the discharge pipe in areas of high current flow and through the use of diffusers on the end of the pipe.

2. WATER QUALITY

The potential water quality impacts from land-based tank farms will be like those from floating net pens. Because of the relatively small volumes of water in tank farms relative to net pens, the dissolved oxygen concentration in the discharge water may be reduced. Data from 38 fresh water tank farms in Europe were used to calculate an average decrease in dissolved oxygen of 1.6 mg/l through the facilities (Alabaster 1982). As a worst-case approximation, a decrease of 2 mg/l through a land-based tank farm and an initial concentration of 6 mg/l would require a minimum dilution factor of about 10 to meet the state standard (5.8 mg/l in this case). A dilution factor of 10 would likely be achieved in close proximity to a land-based tank farm outfall. Tank farms also have the potential to aerate or oxygenate water entering and leaving the tanks. This can improve the culture environment for the fish as well as offset any oxygen demand from the fish or the discharged nutrients.

Land-based tank farms are subject to the same nutrient enrichment considerations as net-pen farms. That is, restricted embayments with nutrient sensitivity should be avoided for both the good of the cultured fish due to dinoflagellate blooms, and for the possible enrichment effect upon algae or phytoplankton in the discharge waters. The three onshore tank farms proposed or being built in Washington state are located in non-nutrient sensitive waters. As in net pens, about 70 percent of the nutrients are discharged in solution. Retention time of water within the tank farms will generally be less than two hours, and the water is actively moving in the tanks and pipes. Both the period of time and movement of the water are not conducive for the development of optimum algal growing conditions. Site characteristics, especially the physical oceanography, depth of intake and discharge, and the density of water at both intake and discharge depths will greatly influence the fate of discharged waste water.

Chemical usage in tank farms would generally be less than in net pens, again because the tank farm operator has much greater control over the culture environment. Antibiotic use would probably be less because the farmed fish will not be directly exposed to disease carrying wild fish, and the controlled culture environment reduces the probability of disease and permits easier control of any disease outbreaks. In addition,

it is likely that tank farms would not use large amounts of antifoulant materials. The use of any chemical in tank farms would have impacts on the aquatic environment like to those described in Section II.A.2.

3. FISH AND SHELLFISH

The primary impacts of net pens on fish and shellfish are the possible smothering of sessile (immobile) organisms below the pens, if the pens are located in shallow, poorly flushed areas, and the attraction of mobile fish and shellfish species to the site. Because tank farms would have a much more concentrated discharge, the area of bottom affected would be less than for net pens and the potential impact of sessile bottom-dwelling organisms would be reduced. Construction of the intake and outfall structures, however, could destroy shellfish beds in the construction area. Because shellfish populations usually occur in discrete beds, proper site selection can avoid significant impacts for clams, oysters, geoducks, etc.

In the absence of a significant structure in the water, the attraction of fish and shellfish to the site would be reduced or eliminated. Fish could be adversely affected if entrained in the intake pipe; therefore, proper screening of the intake will be necessary. It will also be necessary to avoid areas of intertidal herring and smelt spawning or important habitats for other fish species. Because the location of all these habitats is unknown, field observations will be necessary to determine what species use the area and if important habitats would be affected.

The potential for fish to escape into the wild from tank farms is relatively remote when compared to net pens. Even in the event of a major catastrophe, (for example, a tank ruptures during a large earthquake), most fish would be stranded on dry ground and die. If fish were to escape, the impacts to wild populations would be the same as for net-pens.

4. WILDLIFE

Construction of each land-based tank farm could result in the loss of several acres of upland habitat depending upon the previous use of that land.

Most of the habitat loss would be due to construction of the rearing tanks and support facilities such as operations buildings and new access roads. Clearing of vegetation would remove habitat and may result in losses or displacement of small vertebrates such as mice, snakes, and frogs. Larger animals such as river otter, deer, raccoon, beaver, and birds may temporarily avoid construction sites. Noise generated by net-pen construction and operation may temporarily displace or disturb nearby wildlife. Consultation with fish and wildlife agencies during permit review is required to avoid affecting the habitats of any threatened or endangered species. Stretching netting over the top of upland facilities is an effective technique for keeping predators away from the fish.

5. ODORS

Operation of a land-based tank farm facility would be less likely to produce odors than would a floating net-pen facility because nets and their associated fouling organisms would not be present and because the availability of enclosed storage areas for food. Minor odors could result from diesel engines used for emergency pumping during power outages, or from trucks servicing the facility. All odor impacts would be occasional and intermittent. As with floating net pens, dead fish could create unpleasant odors if not removed from the tanks and disposed of properly. Because tank farms are located on shore, they may be closer to residents than net pens. Consequently any odors produced may have a greater effect on these residents.

6. NOISE

Sources of noise at land-based tank farms would be similar for any small agricultural or commercial activity. Large pumps and compressors would be required for aeration and pumping. These would be electrically powered and enclosed in buildings or located below grade and would probably produce little detectable noise off the farm property.

Land-based tank farms would be required to meet the relevant local and state noise standards. In rural areas with low existing noise levels, noise levels meeting state standards may be disturbing. In such areas, additional mufflers, sound enclosures, or buffer zones could be used to minimize any disturbance of nearby residents.

7. UPLAND AND SHORELINE USE

Land-based tank farms have the same requirements for high quality water as floating operations and will provide ongoing monitoring of water quality. Other shoreline activities adversely affecting water quality would harm the fish culture operations. As in the review of any proposed activity, new projects near the tank farm would be evaluated for their effect on existing activities and their impacts on water quality and other elements of the environment.

Activity levels associated with an upland tank farm will be similar to those of a small farm or commercial facility. Increased vehicle traffic from employees travelling to and from work will occur and from deliveries of food and other supplies and shipment of harvested fish. In some cases, the farms may also attract visitors and tourists. The number of trips will depend upon the size of the facility and its proximity to suppliers. In addition, land-based tank farms may have other commercial elements such as fish processing which must be considered.

8. AESTHETICS

The extent of aesthetic impacts resulting from tank farms will vary depending on the site, especially the existing activities and structures in the area, and the visibility of the facility to outside observers. Highly visible tank farms may be perceived as visually

intrusive in rural or natural areas yet be unobtrusive at sites surrounded by industrial or commercial uses.

Aesthetic impacts in sensitive areas can be minimized by providing for adequate setbacks from adjoining properties and by providing landscaping to visually shield land-based facilities from nearby observers.

9. RECREATION

Recreational activities would not be impacted by land-based tank farms, except where the facility displaced existing shore-based use. If the beach is privately owned, recreational use by the public would be allowed only with the owner's permission. If the beach is publicly owned, intake and discharge pipes could be buried to avoid any conflict with existing use except during construction.

10. LOCAL SERVICES

The impacts of land-based tank farms on local services are expected to be similar to the impacts of floating net pens and would not be significant. Tank farms would have more demand on local services such as electricity, roads, and fire protection. They would also be subject to local property and other taxes which currently do not apply to net pens.

E. RELATIONSHIP TO LAND USE PLANS AND REGULATIONS

The geographical focus of this net pen PEIS is Puget Sound and its adjacent marine waters. This area includes counties, incorporated cities and towns, and large tracts of land under state or federal jurisdiction. Lands covered by water are included within the boundaries of unincorporated or incorporated jurisdictions. However, these lands are also subject to both state and federal regulation.

Local Jurisdictions. Local jurisdictions have a variety of land use policies and regulations that affect the construction and operation of salmon-rearing facilities. These land use policies are generally expressed in comprehensive plans and shoreline management master programs. Land use regulations are embodied in zoning codes, the use requirements of shoreline management master programs, and performance regulations (for example, noise ordinances).

(a) Comprehensive Plans. The comprehensive plans of local jurisdictions generally contain goal statements and policies that seek to protect the environment and to avoid incompatibilities with surrounding uses. To this end, agricultural and commercial development is usually considered appropriate in designated areas. However, approval of a proposed activity usually hinges on a demonstration that the project will not adversely impact adjacent uses and can be operated to prevent environmental degradation.

An aquaculture operation can have both agricultural and commercial elements. The Legislature of the State of Washington has determined that aquaculture, including the

raising of fish, is an agricultural enterprise (RCW 15.85). This legislation states in part: "The legislature finds that aquaculture should be considered a branch of the agricultural industry of the state for purposes of any laws that apply to or provide for the advancement, benefit, or protection of the agriculture industry within the state." However, processing, wholesale transactions and other activities, which may be associated with a fish-growing operation, can be considered commercial uses.

Consistency with the goals and policies of a comprehensive plan is addressed as part of permit review. The permits required by a local jurisdiction will depend on the project and the site. A shoreline permit is required for a substantial development within shoreline jurisdiction. A use permit may be required if upland portions of the project are not permitted outright in the zoning ordinance.

(b) Shoreline Master Program. Shoreline master programs contain both policies and regulations affecting substantial development within shoreline jurisdiction. "Shorelines" are defined as all waters of the state, including reservoirs and their associated wetlands. The exceptions are stream segments on rivers having a mean annual flow of less than 20 cubic feet per second, and segments on lakes less than 20 acres in size. "Associated wetlands" include areas within 200 feet of these shorelines, together with marshes, bogs, swamps, floodways and floodplains that influence or are influenced by these waterbodies (RCW 90.58.030).

The policies contained in local shoreline master programs reflect the priorities and guidelines of the State Shoreline Management Act (90.58 RCW) and regulations for implementing it (WAC 173-14 through 173-22). Although local governments are given wide latitude in tailoring shoreline master programs to meet local needs, the policies and regulations must be consistent with these state laws. To this end, all master programs must be reviewed and approved by the Washington Department of Ecology.

Of specific importance to the development of local policy on aquaculture is the state policy on "shorelines of statewide significance." The Shoreline Management Act states that in the case of shorelines of statewide significance, local master programs shall give prioritized preference to uses which:

- recognize and protect the state-wide interest over local interest;
- preserve the natural character of the shoreline;
- result in long-term over short term benefit;
- protect the resources and ecology of the shoreline;
- increase public access to publicly owned areas of the shoreline;
- increase recreational opportunities for the public in the shoreline; and

- provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.

A shoreline of state-wide significance includes all subtidal lands as well as specifically designated intertidal areas, lakes, and rivers. Therefore, local government must give priority in these areas to developments meeting the criteria listed above. RCW 15.85 declares that it is the policy of the state to encourage the development and expansion of aquaculture. In addition, the state guidelines for shoreline master program development indicate that aquaculture is a water dependent use that, if properly sited and managed to avoid environmental degradation, is a preferred use of the water area (WAC 173-16-060 (2)).

It is in this context that floating-net pen operations are evaluated in local shoreline master programs. Local shoreline administrations have attempted to account for statewide interests while taking into consideration local land and shoreline use issues. The adoption of aquaculture policy and regulation at the local level has been a difficult task, and shoreline master programs vary widely on the approach used to achieve a balance.

A floating net-pen operation must receive a shoreline substantial development permit in order to operate. Shoreline substantial development permits are approved if the proposed development is consistent with the local shoreline master program. Shoreline permit decisions are reviewed by the Department of Ecology and both permit approvals and denials can be appealed by this agency to the Washington State Shorelines Hearings Board. If a shoreline conditional use permit or variance is involved, the Department of Ecology has the authority to deny a permit that has been approved at the local level.

In many local jurisdictions the shoreline master program is adopted as an element of the comprehensive plan. When this is the case, approval of a shoreline substantial development permit is contingent upon a finding that the proposal is consistent with the comprehensive plan.

(c) Zoning and Other Regulations. Local jurisdictions would also regulate upland portions of a floating net-pen operation or tank farm through zoning regulations. Zoning regulations normally include limitations on the bulk of structures and also include some site design requirements such as setbacks from property lines. Whether the facility is permitted or requires conditional approval, it would have to meet the requirements of the underlying zone. Zoning ordinances are the implementing arm of the local comprehensive plan. Therefore, approval of a zoning permit requires a finding that all portions of the proposal are consistent with the policies of the comprehensive plan.

Regulations on other aspects of land uses, such as noise and air pollution may be included in zoning regulations or may be included in separate legislation. These regulations are discussed in appropriate sections of this document.

State and Federal Jurisdictions. Locating a floating net pen, in or adjacent to the marine waters of Puget Sound, would require leases and permit approval from several

Washington State agencies. In addition, the federal government has specific authorities over navigable waters and wetlands of the state. Appendix F is a list of the permits which may be required for a floating net-pen development. As stated earlier, this list covers both salt and freshwater, floating or land-based aquaculture operations. Some of these permits may not be applicable to all proposed projects.

III. DISTRIBUTION LIST

Federal Agencies

U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Food and Drug Administration
National Marine Fisheries Service
National Park Service
Environmental Protection Agency
Bureau of Indian Affairs

Tribes and Tribal Organizations

Northwest Indian Fisheries Commission
Duwamish Tribal Office
Point No Point Treaty Council
Jamestown-Klallam Tribes
Klallam Tribe
Lower Elwha Tribal Council
Lummi Business Council
Makah Tribal Council
Muckleshoot Indian Tribe
Nisqually Indian Tribal Council
Northwest Indian Fisheries Commission
Port Gamble Business Committee
Puyallup Tribal Council
Sauk-Suaittle Indian Tribe
Skokomish Tribal Council
Small Tribes of Western Washington
Squaxin Island Tribal Council
Stillaguamish Tribal Council
Suquamish Tribal Council
Swinomish Tribal Council
Tulalip Board of Directors
Upper Skagit Tribal Council

State Agencies and Elected Officials

Office of Governor Booth Gardner
Senate Environment and Natural Resources Committee
House Environmental Affairs Committee
House Fisheries and Wildlife Committee
Office of the Attorney General
Department of Agriculture

Department of Community Development
Department of Ecology
Department of Natural Resources
Department of Parks and Recreation
Department of Social and Health Services
Department of Trade and Economic Development
Department of Wildlife
Washington Parks and Recreation Commission
Interagency Commission on Outdoor Recreation
Shorelines Hearings Board

County Governments

Washington State Association of Counties
Whatcom County
Skagit County
San Juan County
Island County
Snohomish County
King County
Pierce County
Mason County
Thurston County
Kitsap County
Jefferson County
Clallam County

Regional Agencies

Puget Sound Water Quality Authority
Thurston Regional Planning Council

Libraries

Copies of this EIS will be distributed to major libraries along the Puget Sound basin.

Organizations

Puget Sound Gillnetters Association
Washington Aquaculture Council
Washington Environmental Council
Washington Fish Growers Association
Interclub Boating Association
National Audubon Society
Washington State Sports Council
Marine Environment Consortium
Washington Trollers Association

American Waterway Operators
Trout Unlimited
Sierra Club
Northwest Towboat Association
Inner Sound Crab Association
Interclub Boating Association
Purse Seine Vessel Owners Association
Puget Sound Alliance
Seattle Aquarium
Washington Steelheaders Association
Save Our Shores

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ETOLIN ISLAND AREA

Mariculture Pilot Project



Alaska Department of
**NATURAL
RESOURCES**

1988

AQUATIC FARM DISTRICTING PROJECT

Interagency meetings were held in Juneau and Anchorage to discuss districting proposals for aquatic farming in Alaska. Meeting dates and members present:

Southeast (October 5, 1988)

Janet Burleson (Chair)	DNR, DLWM
Kevin Duffy	ADF&G, FRED
Gary Gunstrom	ADF&G, Comm. Fish.
Charles Low	USFS
(for John Harmening)	
Nancy Holguin	OMB, DGC
Amy Kruse	DEC, EQ
Andy Pekovich	DNR, DLWM
Terry Rader	DNR, DLWM
Rick Reed	ADF&G, Habitat
Ron Schonenbach	DNR, DLWM
Lana Shea	ADF&G, Habitat

Southcentral (October 10, 1988)

Janet Burleson (Chair)	DNR, DLWM
Terry Rader	DNR, DLWM
Dennis Haanpah	ADF&G, Comm. Fish.
Wayne Dolezal	ADF&G, Habitat
Mike Ostasz	DEC, EH
Janetta Prichard	DNR, DLWM
Veronica Gilbert	DNR, DLWM
Mike Sullivan	DNR, DLWM
Kevin Duffy	ADF&G, DLWM

District Nomination Process

Invitations for nominations were mailed to approximately 300 individuals and organizations. Ads were placed in 13 coastal area newspapers. News releases were prepared and distributed to all newspapers and radio stations within the state.

Over 1600 nominations for aquatic farm districts and areas to be excluded from aquatic farm development were received by DNR staff during the 40 day nomination period. Nominations summaries are:

Southeast:	Proposed aquatic farm areas:	162
	Proposed for exclusion from areas:	369
	Areas identified as used by fishing organizations:	500(+)
	Total:	1031

Southcentral:	Proposed for aquatic farm areas:	83
	Proposed for exclusion from areas:	79
	Areas identified as used by fishing organizations:	412
	Total:	574

Total for both districts: 1605

General consensus among the group was that subdistrict boundaries should follow existing boundaries where practical and feasible. Boroughs, coastal management zones and area plan boundaries were suggested as potential subdistrict boundaries.

Other items discussed:

- Clarification of DNR authority to close areas and not accept applications for those areas was requested.
- Closing areas adjacent to wilderness areas were discussed but no agreement was reached.
- State parks should not comprise a separate subdistrict but be included in whatever subdistrict they are in. Clarification of management intent would be provided in the narrative of each subdistrict.

AQUATIC FARM DISTRICTING PROJECT

NARRATIVE COMMENTS FROM NOMINATION REQUEST BY ORGANIZATION OR INDIVIDUAL:

SIERRA CLUB
Alaska Field Office
241 E. Fifth Avenue, Suite 205
Anchorage AK 99501
276-4048

Aquatic farm development should be prohibited from:

- Marine Parks
- ADF&G Critical Habitat Areas
- Critical Wildlife Habitat (such as: eagle nests, mouths of anadromous fish streams, seal haul out and pupping areas, seabird colonies, and waterfowl/shorebird concentration areas)
- Key Recreation Anchorages
- Key Commercial Fishery Anchorages
- Areas with Restricted Navigability

Aquatic farm development should not occur adjacent to:

- Designated or Proposed Federal Wilderness Areas
- State or National Park Uplands and Tidelands
- State or Federal Areas set aside for Fish/Wildlife Viewing, Protection or Interpretation
- Other Areas where aquaculture is incompatible with the designated purpose

Aquatic farming should be limited to:

- Areas of existing development:
 - To avoid user conflict.
 - To keep costs down by having existing transportation opportunities and commercial markets nearby.

ALASKA CENTER FOR THE ENVIRONMENT
700 H Street, Suite 4
Anchorage AK 99501
274-3621

Aquatic farm development should not be sited offshore of:

- State or National Parks
- Designated or Proposed Wilderness Areas
- State or Federal Areas set aside for the protection of fish and wildlife when the purpose of those areas are primarily for viewing or natural history interpretation and include a substantial aesthetic component (for

example, Round Island).

Aquatic farming should generally be located:

- Adjacent to existing developments (because):
 - Such policy both protects fish and wildlife, aesthetic and recreational values in presently undisturbed areas, and
 - Reduce costs by siting aquatic farms close to existing markets and to transportation and other facilities.

In particular:

- In Prince William Sound areas farther than 1 - 2 miles (depending on topography, etc.) from the following locations should not be made available: the town of Whittier, Cordova, Valdez, Chenega and Tatitlek, and the hatcheries at Cannery Creek, Main Bay, Lake Bay and Port San Juan.

U.S. FOREST SERVICE
U.S. Dept. of Agriculture
Forest Service
Alaska Region
P.O. Box 21628
Juneau AK 99802-1628

Aquatic farms should not be located:

- Adjacent to Wilderness Areas.
- Adjacent to Wilderness Study Areas until studies are complete.
- Heavy used recreation areas next to communities and recreation cabin sites.
- Bays with Log Transfer Facilities.
- Areas where development would limit navigation.
- Heavily used subsistence areas; subsistence determinations would be required before any upland permits could be issued.
- Areas managed for remote, primitive recreation experience.
- Key access public points for resource and recreation uses.

Aquatic farm districts in general should:

- Encompass state and private land first, and contain a minimum of Forest Service Lands.
- Incorporate areas as designated for mariculture in the

Prince William Sound Plan, Prince of Wales Plan, and
the Etolin Island Area Mariculture Pilot Project.

Other:

- Since conflicts have developed concerning upland uses and caretaker residences, consideration should be given to making districts small so some basic consolidations could take place for upland uses such as caretaker residences.
- The mariculture program should be incorporated into the forest plans and area plans as much as possible. We recommend that Don Lyon of the TLMP Revision Team be contacted to discuss how the information regarding mariculture districts might best be coordinated in the TLMP Revision.

ROBERT J. ELLIS
Box 2966
Sitka AK 99835

Aquatic farms should not be located:

- Adjacent to designated wilderness areas.
- In areas or bays used for commercial or subsistence fisheries (presently or historically).
- In, or adjacent to areas used for subsistence hunting or fishing.
- Where displacement of present or historic uses of public lands would occur as a result of aquatic farming.

KACHEMAK BAY CONSERVATION SOCIETY
Nancy Lord
Box 846
Homer AK 99603

Aquatic farms should not be located:

- With the exception of the presently-existing experimental 25 acre site for mussel rafts in Halibut Cove Lagoon, there should be no aquatic farming within the waters of Kachemak Bay State Park and Kachemak Bay State Wilderness Park, to include waters in the proposed additions to these parks.

ALASKA WILDERNESS SAILING SAFARIS
P.O. Box 1313
Valdez AK 99686

All areas in Prince William Sound should be closed except:

- Sites in tidal lands adjacent to lands owned by the Cities of Whittier, Valdez (except areas proposed for AMSA status as part of the Valdez Coastal Management Plan), Cordova, Tatitlek, and Chenega and in Lake Bay and Port San Juan (with the provision Prince William Sound DEC and ADF&G offices receive adequate funding.)
- Reasoning:
 - Locating new industries adjacent to existing settlement reduces production costs, administrative costs and provides superior services to aquatic farm development.
 - Prevents competition with existing uses in remote areas.

SOUTHEAST ALASKA CONSERVATION COUNCIL
 P.O. Box 021692
 Juneau AK 99802
 586-6942

Aquatic farms should not be developed:

- Adjacent to existing or proposed wilderness areas & monuments.
- National and State Parks.
- National and State Wildlife Refuges.
- Fish and wildlife habitat areas.
- Critical Habitat Areas as defined by ADF&G.
- Popular Recreation Areas.
- Important Subsistence Areas.
- Bird Rookeries.
- Marine Mammal Haul Outs.
- Estuarine Habitat for Shellfish & Benthic Organisms.
- Sedge Grass Flats.
- Saline Sedge Grass Marshes.
- Bear Concentrations
- Salt Chucks.
- Anadromous Fish Streams.

Designating districts should not be a complicated process. Throughout the legislative debate, the intent was to institute a relatively simple process in order to avoid time consuming and expensive preparation of full area plans. SEACC believes this planning is necessary to avoid negative cumulative impacts and user conflicts.

SEACC recommends that the minimum logical districts would be:
 (see attached map)

- Northern Southeast
- Southern Southeast
- Prince William Sound

- Cook Inlet
- Kodiak
- The Alaska Peninsula and Aleutian Islands
- Western Alaska

CHUGACH ALASKA CORPORATION

Chugach Alaska Building
3000 A St., Suite 400
Anchorage AK 99503

The Prince William Sound should be the base for aquatic farm district planning. Chugach Alaska Corp. provided comments to the PWS Plan toward the goal that development of the mariculture industry in the State be managed so as to strengthen the viability of the existing seafood production, processing and marketing industries.

Chugach Alaska promotes the objective that mariculture facilities should be permitted where compatible with upland resource management direction.

NORTH PACIFIC FISHERIES ASSOCIATION, INC.

Headquarters
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- The Division of Land and Water Management should solicit comments from ADF&G concerning aquatic farm siting.
- NPFA sees no merit in having two very large aquatic farm districts (SE & SC) subdivided into subdistricts of which the vast majority are unsuitable for aquatic farming. A plan of this sort smacks of administrative convenience and should be abandoned. We feel that the legislature was clear in its intent that the districts only be organized around areas where aquatic farming can succeed.
- No aquatic farming should be allowed within one mile from mean low water terminus of any stream listed in the State's anadromous stream catalog.
- No aquatic farm development should be allowed abutting National Parks or Monuments.
- Any single bight, cove or bay need be filled shoreline to shoreline with aquatic farms. No bay should have more than 30% of its total area be considered impacted area and, no more than 40% of any bight, cove or bay, at mean low water shall be impacted area.
- No preference rights for use of uplands should be given to aquatic farm permittees.

- Initial permits for aquatic farms should be short term. Longer term permits should only be issued after all improvements are installed and the aquatic farm is underway.

- All aquatic farms should be required to obtain a state business license.

AQUATIC FARM DISTRICTING PROJECT

NARRATIVE COMMENTS FROM NOMINATION REQUESTS BY ISSUE:

1. Aquatic farm development should be limited to areas near existing development.

- Development in these areas prevent developments in undeveloped areas.
- Aquatic farms would have the benefit of community services, closer access to market, transportation centers etc.

Supported by:

Sierra Club
Alaska Center for the Environment
Alaska Wilderness Sailing Safaris

2. Aquatic Farms should not be developed adjacent to wilderness areas (designated, proposed or areas under study):

Supported by:

Sierra Club
Alaska Center for the Environment
U.S. Forest Service
Robert J. Ellis
Southeast Alaska Conservation Council

3. Aquatic Farms should not be developed in or adjacent to:

Marine Parks
Critical Habitat Areas
Key Anchorages
Commercial Fishing Areas
Terminal Transfer Facilities
National Parks or Monuments
Designated Fish/Wildlife viewing areas
Popular Recreation Areas
Areas with Restricted Navigability
Important Subsistence Areas
Areas Managed for Remote, Primitive Recreation
Access Points
Bird Rookeries
Marine Mammal Haul Outs
Sedge Grass Flats
Saline Sedge Grass Marshes
Salt Chucks
Anadromous Fish Streams

Supported by All or Some of the Following:

Sierra Club
Alaska Center for the Environment
U.S. Forest Service
Robert J. Ellis
Kachemak Bay Conservation Society
Alaska Wilderness Sailing Safaris
Southeast Alaska Conservation Council
North Pacific Fisheries Association, Inc.

AQUATIC FARM DISTRICTING PROJECT

NOMINATIONS FOR DISTRICTS/SUBDISTRICTS BY MAJOR AREA

The project team has received several nominations for larger areas for districts or subdistricts:

Nominated by Cities/Boroughs:

- Kodiak Island
- Sitka City and Borough
- Yakutat Area from Cape Spencer to Cape Suckling (see map)

Nominated or Considered by State Agencies:

- Prince of Wales Island Planning Area
- Prince William Sound Planning Area
- Stikine Planning Area (when defined)
- Kenia Planning Area

All State Marine Parks

Nominated by Southeast Alaska Conservation Council:

see map

AQUATIC FARM DISTRICTING PROJECT

CLOSURES AND STIPULATIONS

DNR recognizes there may be areas identified within subdistricts that should be closed to mariculture development. Other areas may require development of specific stipulations to accommodate conflict of interest.

DNR clearly has authority to close areas and not accept applications for them. Two options have been identified for effecting closures:

1. Close entire subdistricts to development.
2. Close areas within subdistricts to development.

Size of proposed subdistricts may make closing entire subdistricts difficult, for other areas within a subdistrict may be suitable for mariculture development. It is more likely that areas identified as unsuitable for mariculture development will be noted in the narrative description for each subdistrict and applications will not be accepted for those areas.

Large subdistricts are proposed for this first districting scenario. As the mariculture industry matures and agencies gain expertise to manage development, corrections and modifications may be made to subdistricts.

CONFLICTS WITH OTHER USES

DNR uses an adjudication process when responding to applications for land use authorizations. Statutes mandate DNR make a "best interest" determination prior to conveying any property rights. Best interest determinations are based on planning guidelines and classifications (when they exist). Other uses of the area being applied for are also considered. For mariculture, a public review process is mandated which will include public hearings in the district where permits may be issued.

The Etolin Island Area Mariculture Pilot Project contains a comprehensive list of guidelines and mitigating measures for siting, designing or operating aquatic farms. These guidelines, when used with information from area plans, land classifications and public comments provide good sources of information on which to make a best interest determination.

Conflict resolution usually involves two approaches:

1. Separating uses geographically. Competing uses can often be separated to avoid conflicts.
2. Mitigating measures, such as site design, timing

restrictions on use, or access corridor stipulations may allow more than one use of a site and resolve conflicts.

The following is a discussion of specific areas recommended for closure or for development stipulations:

Wilderness Areas

Area plans recognize wilderness areas are managed to maintain the primitive and remote character of the land. Area plan guidelines from Prince of Wales Island and Prince William Sound Area Plans are summarized below:

- Tideland facilities may be authorized consistent with the recreation, habitat, and wilderness intent for the wilderness.
- Tideland facilities may be allowed if they are mostly underwater and cause only limited impact on fish and wildlife, recreation, tourism, and wilderness values.
- Tideland authorizations may be issued if the land manager determines no feasible alternative location exists and that the benefits outweigh the impacts to the wilderness, and fish and wildlife.

In addition to these general guidelines, area plans may identify areas where mariculture development may not occur due to conflicts or other use designations.

The Etolin Island Area Mariculture Pilot Project makes the following recommendation:

- Recommendation #3: Mariculture development should be consistent with any approved federal, state or local government plans. All mariculture development permitted by the State of Alaska adjacent to lands under management of other agencies should consider any land use designations by those adjacent land managers.

A task force should be formed to develop procedures for identification of significant use conflicts, policies to resolve conflicts during the district review process, and to develop review criteria to assign "best use" of public lands and waters.

State Marine Parks

State marine parks are by statute open to aquatic farming. However, no leases may be issued for lands within designated state parks and any permits issued must be short term. It was suggested at the first meetings that a separate subdistrict for

marine parks may not be appropriate. State marine parks would be included within subdistrict boundaries and narrative description of the parks and special conditions applicable to them could be included in the subdistrict description.

Other Conflicts

The list of other potential conflicts includes:

- Recreation Uses
- Anchorage
- Fish and Wildlife Harvest
- Other Commercial Uses of Tidelands
- Logging
- Mining
- Urban Development
- Residential Development
- Historic or Archeological Sites
- Access
- Subsistence Uses
- Fish and Wildlife Habitat

Development of specific guidelines to minimize conflicts, such as site design, culture techniques or time restrictions may be necessary.

AGENDA
Southeast Subdistrict Meeting
October 25, 1988

Introduction

Old Business

- DNR Authority for Closures
- Introduction of Proposed Boundaries
- Conflicts - DNR's adjudication process for conflict resolution

New Business

- Permitting and Development Guidelines
 - Area Plan Guidelines
 - Etolin Guidelines

AQUATIC FARM DISTRICTING PROJECT

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Mariculture in Area Plans

Area plans are currently being developed for two Alaska coastal areas with mariculture potential: Prince of Wales Island Area Plan and Prince William Sound Area Plan. Other area plans will be developed in the future.

Guidelines for mariculture are evolving and being developed in various offices throughout state government. Because of this evolution, area plans avoid rigid, inflexible guidelines. Instead, they initially develop general guidelines and indicate issues additional guidelines should address.

The Alaska legislature has declared a moratorium on finfish mariculture development to extend through June, 1990. Plan guidelines are not sufficient to address complex issues related to these types of mariculture. Should these activities become legal, area plans recommend development of policies for these activities prior to authorizing them. Policy development could take the form of a plan, study, or recommendations of a working group. Area plans identify some issues for policy development.

Mariculture discussion occurs for two levels of management in Prince of Wales Island and Prince William Sound Area Plans: 1) area wide guidelines give general management direction and limited siting criteria for mariculture and; 2) site specific management direction is provided to guide the state's response to potential competing uses.

Clarification of management intent reflects department policy requiring other activities to be compatible with designated primary uses. Mariculture sites have not been designated due to lack of sufficient data to identify appropriate sites.

In general, mariculture activities may encounter the following situations under area plans.

1. Areas which have not been designated for other specific uses or have been designated for other uses and resources which do not present apparent conflicts. It is reasonable to expect that in these areas it will be easier to obtain authorization for mariculture activities.

2. Areas that have been designated for other uses and resources which may present significant conflicts. Areas designated for log transfer or storage, mineral access, crucial fish and wildlife habitat, intensive harvest areas, developed recreation, anchorages, or adjacent to existing or proposed land sale areas may have significant conflicts. Siting mariculture activities in these areas may be more difficult. Mariculture can be authorized if the conflicts can be adequately addressed and if mariculture operations can meet the management intent and guidelines for the area.

3. Areas where specific requirements may be attached to mariculture locations or operations. For example, mariculture will not be sited within 300' of the mouth of an anadromous fish stream without the approval of ADF&G.

Offshore of Wilderness Areas or Wildlife Refuges, mariculture growing facilities that are submerged and do not impact the visual characteristics of the wilderness or refuge may be easier to permit than floating types. However, support or caretaker facilities will not be authorized in these areas.

4. Performance standards will be attached to permits or leases to ensure the area is used for the appropriate activity, use is economically viable, and the permit or lease is not used for speculation. Similarly, development plans will be required before approval of a permit or lease. Stipulations will be determined during permit processing.

Area plans can provide guidance for mariculture in specific areas. This is to clarify policy implementation or to note specific circumstances affecting mariculture development.

Examples of proposed area plan guidelines include:

1. Where there is an existing community or state subdivision, mariculture may be allowed if it is consistent with land sale design and will not: 1) block access, 2) detract from the view of waterfront lots, or 3) require upland owners to meet higher sewage treatment costs.

2. Near proposed state land sales, mariculture may be permitted if adjacent uplands are: 1) unlikely to be used for residential settlement, 2) unlikely to be reserved for public use, or 3) where mariculture can accept a short term permit or lease.

3. Mariculture will not preclude floathomes in six limited area designations for floathomes in Prince of Wales Island planning area.

4. Areas known for high recreation or fish and wildlife harvest values are discouraged from mariculture if there are feasible and prudent alternatives.

5. In areas that have a high potential for mariculture development such as Sea Otter Sound in the Prince of Wales Island planning area, cumulative impacts of mariculture will be periodically assessed.

SCOMM

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THE FOLLOWING DOCUMENT HAS
NOT BEEN FILMED BUT IS
AVAILABLE IN THE ORIGINAL
FILE

World Markets for Salmon: Pen-Reared Salmon Impacts

Sections 2 through 9 and Appendix

Prepared for:

**State of Alaska
Department of Commerce and Economic Development
Division of Business Development**

APRIL 1988

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FILE

World Markets for Salmon: Pen-Reared Salmon Impacts

Executive Summary and Summary

Prepared for:

**State of Alaska
Department of Commerce and Economic Development
Division of Business Development**

APRIL 1988