**IP(10)7**

# *Aquaculture, Introductions and Transfers and Transgenics Focus Area Report*

## *United States*

# Table of Contents

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## 1. Introduction:

This Focus Area Report (FAR) describes the current management approach and regulatory actions implemented within the United States (US) to minimize adverse effects from Atlantic salmon aquaculture, introductions and transfers, and transgenics.

The historic distribution of anadromous Atlantic salmon in the US as described in Colligan et al. (1999) included populations inhabiting all of the larger rivers (i.e., from the Housatonic river in the south - to the Aroostook river in the north) and many smaller coastal rivers throughout the six northeastern states collectively referred to as New England (Figure 1). Contemporary populations found in larger New England Rivers (Connecticut, Merrimack, Saco, Penobscot) and smaller coastal rivers (Sheepscot, Pleasant, Narraguagus, Machias, East Machias and Dennys) are currently supported through state and federal stocking programs. In 2000, the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) jointly listed the Gulf of Maine Distinct Population Segment (GOM DPS) of anadromous Atlantic salmon as endangered under the federal Endangered Species Act (ESA) (65 Federal Register 223, Nov 17, 2000). Despite continuing restoration and recovery efforts, populations in the US continue to decline (NRC 2003). A recent Status Review of anadromous Atlantic salmon populations in the US concluded additional large rivers (e.g., Penobscot, Kennebec and Androscoggin) are needed to bolster the recovery of anadromous Atlantic salmon within the geographic range of the GOM DPS (Fay et al. 2006). In 2009, the NMFS and USFWS published a final rule which describes the expanded range for the GOM DPS of Atlantic salmon under the ESA (74 Federal Register 29344, June 19, 2009). Further, the latest Status Review supported the previous findings from Colligan et al. and delineated the US anadromous Atlantic salmon populations into three Distinct Population Segments (e.g., Long Island Sound DPS, Central New England DPS and Gulf of Maine DPS) considering relevant biological, ecological, environmental and geographical features that are important to the survival of the species.

The different populations of anadromous Atlantic salmon found throughout New England are divided into two categories for implementing conservation and management activities at the federal, state and local levels. Currently, the rivers in Maine supporting extant populations of wild Atlantic salmon (e.g., GOM DPS) are offered protections under the ESA and are the primary focal point of salmon recovery actions in Maine (NMFS 2005). The rivers south of the Androscoggin River in central Maine with extirpated populations of anadromous Atlantic salmon are under active restoration (Figure 2). The populations found outside of the GOM DPS were completely extirpated in the 1800s or early 1900s (Fay et al, 2006) and as such, do not qualify for protection under the ESA.

Atlantic salmon farming operations are concentrated in large bays and interspersed among the many islands characteristic of the Maine coast (Figure 3). Some Maine rivers supporting the GOM DPS of Atlantic salmon have active commercial aquaculture net pen facilities located within the near shore embayment areas, in addition to commercial hatcheries on several of the rivers within the range of the GOM DPS (Figure 3). Contemporary production of farmed salmon (Table 2) has significantly increased after reaching the lowest levels since 1991. The recent decrease in production reflected consolidation of lease ownerships, different site management and operational changes which were implemented after a major disease outbreak from an Infectious Salmon Anemia Virus (ISAV) in 2005. The salmon farming industry in Maine has

compensated for the changes in regulatory requirements, fish health protocols and anticipates increasing production slightly to fully utilize existing lease sites.

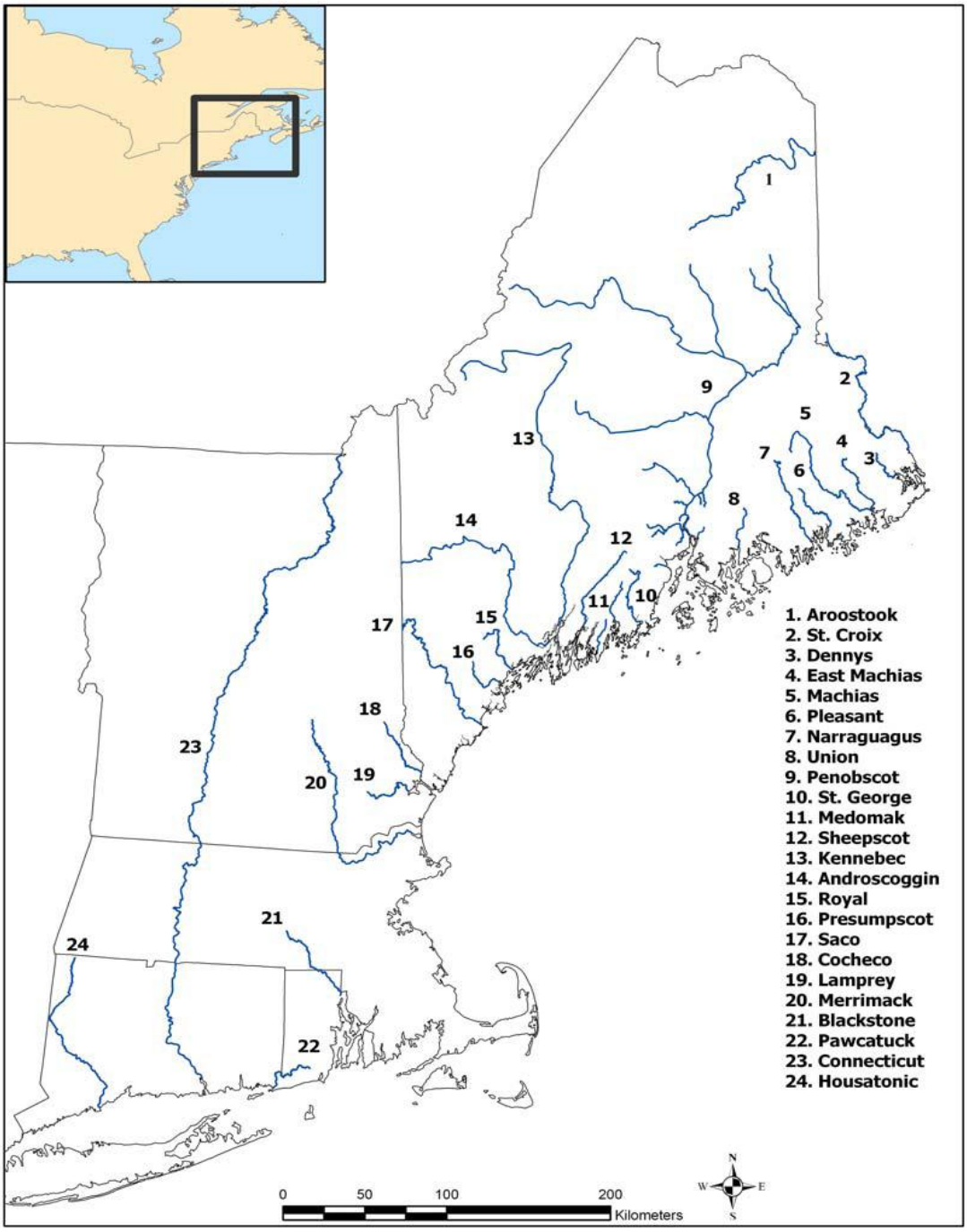



**Figure 1. Map of selected historic Atlantic salmon rivers in New England.**

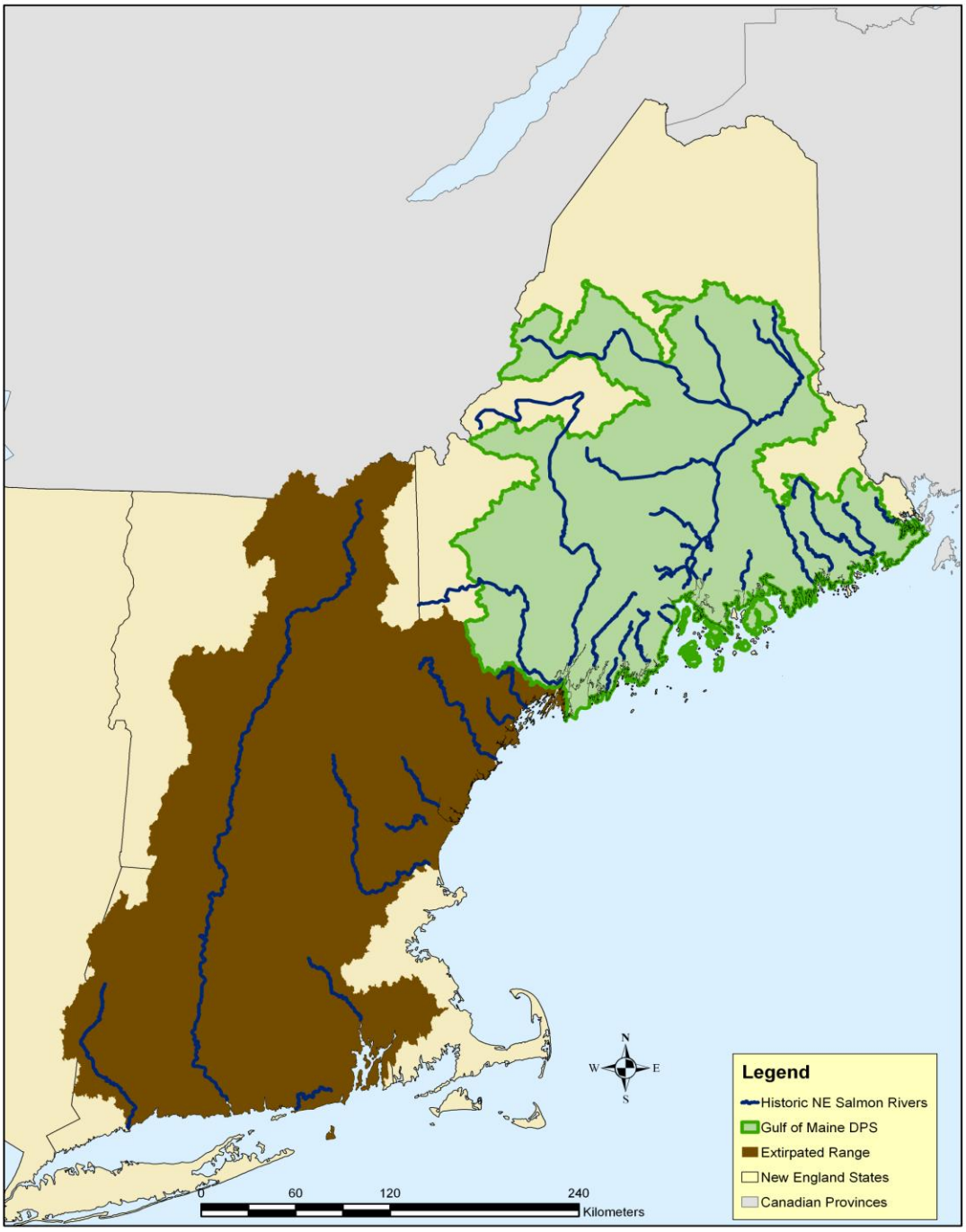



**Figure 2. Map of Atlantic salmon management units within the New England states with major salmon rivers highlighted.**

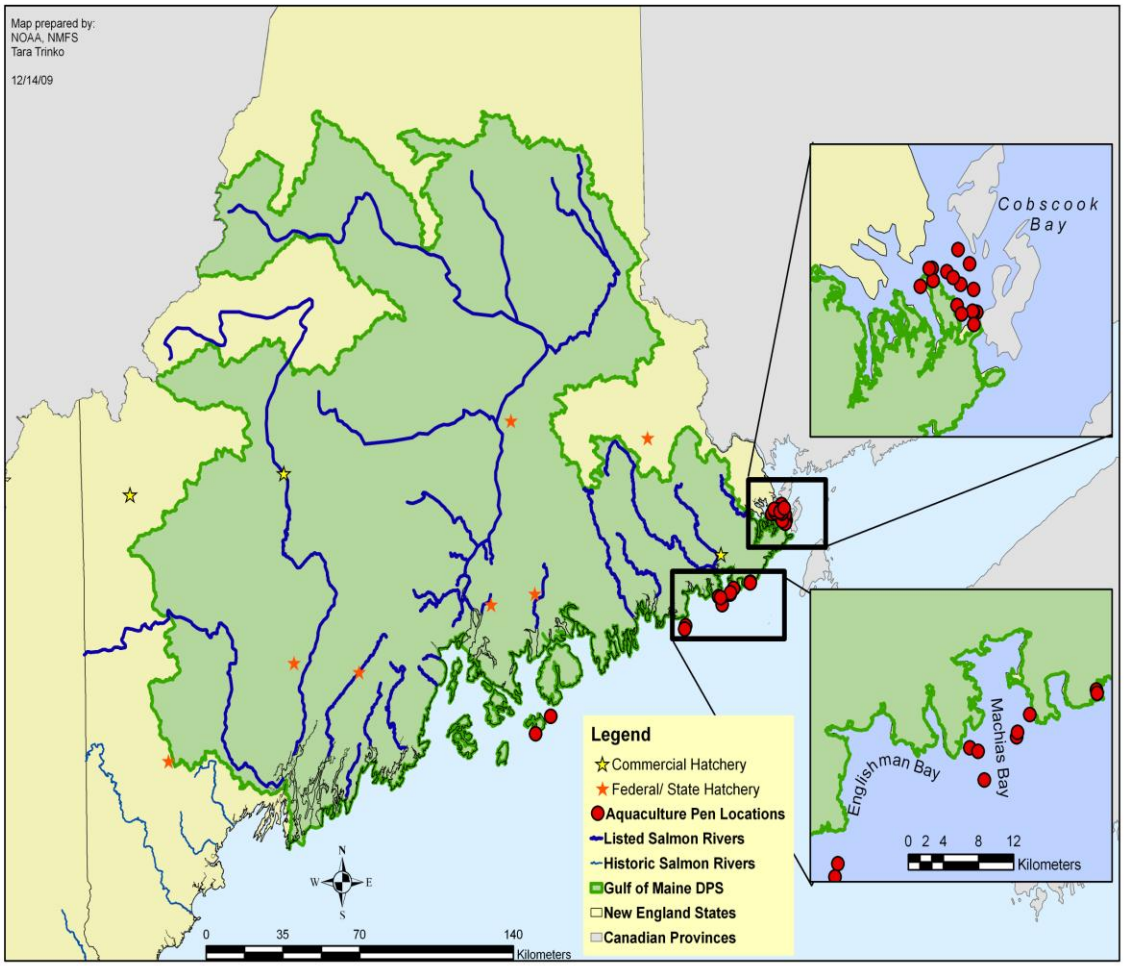



**Figure 3. Map showing locations of commercial, federal and state hatcheries and active Atlantic salmon aquaculture lease sites in Maine.**

### 1.1 Activities within the jurisdiction of the United States related to aquaculture, introductions and transfers, and transgenics

Activities within the jurisdiction of the United States related to aquaculture, introductions and transfers, and transgenics are comprised of fisheries programs supporting restoration, recovery, recreational fishing and commercial aquaculture. Fisheries activities within the jurisdiction of the US vary greatly depending on the different program objectives, which range from coldwater recreational fisheries for salmonids – brook trout (*Salvelinus fontinalis),* landlocked Atlantic salmon (*Salmo salar),* brown trout (*Salmo trutta)*, rainbow trout (*Oncorhynchus mykiss)* and kokanee salmon (*Oncorhynchus nerka)*, to fisheries for smallmouth bass (*Micropterus dolomieu*), to recovery of endangered anadromous Atlantic salmon. All of the New England states covered in this report provide recreational fishing opportunities for salmonids through programs managed and administered by the individual state inland fish and wildlife agencies.

State stocking programs are extremely popular among recreational anglers and are managed mostly to maximize catchability of the target species (i.e., put and take fishery) and do not explicitly analyze the potential impacts of such programs on anadromous Atlantic salmon. In some areas of New England wild populations of native salmonids exist (e.g., brook trout, landlocked Atlantic salmon), these fisheries often have the greatest potential for impacts to anadromous Atlantic salmon because of the significant inter and intra-specific interactions as a result of limited suitable habitat necessary for the survival of these species. For instance, native wild landlocked Atlantic salmon, an alternative life history form indigenous to lake systems, occupies similar riverine habitat during critical life stages (i.e., spawning and early rearing of juveniles) and co-exist in some remote areas of Maine with populations of wild brook trout and GOM DPS Atlantic salmon. Additionally, these species have co-evolved in the northeastern freshwater ecosystem and have created a unique ecological niche that provides spatial separation to minimize deleterious effects from interactions, however, where habitat is limited or has been altered (i.e., straightened stream channels to facilitate historical logging activities) or degraded as described in Fay et al. (2006), habitat usage can overlap resulting in adverse ecological effects. Federally managed fisheries for recovery and restoration programs are focused on native species, including Atlantic salmon. Many of the New England states having extirpated runs of native Atlantic salmon (CT., MA., NH., RI., VT), have active ongoing restoration efforts to restore anadromous Atlantic salmon (figure 1). The state of Maine is the only state within the US which has remnant runs of native wild Atlantic salmon which are currently listed as endangered under the federal ESA. Commercial Atlantic salmon farming operations are only found in Maine state waters (Figure 3) and are regulated through state and federal permits which require farmers to follow specific conditions for the protection of wild salmon and the environment.

Movements of fish into and within the US are regulated by state and federal laws intended to minimize the risk of ecological effects and disease transfer to wild stocks. Within the NAC area, stocking of native Atlantic salmon for restoration and recovery purposes is guided by the NAC protocols contained in the Williamsburg Resolution (WR). An analysis of US stocking practices relative to the WR was conducted in 2005 (Appendix A).

Transgenic animals or Genetically Modified Organisms (GMOs) are federally regulated through the U.S. Food and Drug Administration (FDA). The FDA Center for Veterinary Medicine regulates, in whole or in part, diverse animal biotechnology (i.e., genetically engineered) products. Novel agricultural products such as GMOs produced for food must undergo a review by the FDA to ensure consumer safety which also requires additional environmental analysis to prove no significant detrimental ecological and biological effects from the growing and rearing of these animals and/or plants within the US.

### 1.2 Policy and management structure within the United States as it relates to aquaculture, introductions and transfers and transgenics

A variety of state and federal environmental acts, statutes and regulations address potential threats to wild Atlantic salmon from introductions and transfers, and transgenics in regards to commercial aquaculture and ongoing state and federal restoration and recovery programs (Appendix B). These laws are complemented by international actions under NASCO, in addition to many interagency agreements underpinning state-federal cooperative efforts. State and federal agencies have established coordination mechanisms for implementation and enforcement of

these laws and regulations and have worked with private industries for the continued protection of Atlantic salmon.

Atlantic salmon management is shared at the federal level between the NMFS and USFWS, collectively referred to as the "Services" and hereafter in this report unless otherwise specified. There are a number of other federal agencies, (e.g., U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (ACOE), Federal Energy Regulatory Commission (FERC)), which have broad environmental mandates that also offer protection to Atlantic salmon and their habitat. Furthermore, all federal agencies have some responsibility to ensure that in carrying out their mandates they avoid adverse impacts and seek positive opportunities to contribute to the conservation and recovery of depleted species. Most prominently, federal authority is provided through environmental acts such as Endangered Species Act, Clean Water Act and section 10 of the Rivers and Harbors Act (for more information see Appendix B). Within each state, a single state agency is charged with management responsibility over anadromous Atlantic salmon (e.g., Maine Department of Marine Resources Bureau of Sea Run Fish and Habitat (DMR BSRFH), Connecticut Department of Environmental Protection, Massachusetts Department of Fish and Game, Vermont Fish and Wildlife Department, New Hampshire Fish and Game Department, and the Rhode Island Fish and Game Department). State authority is provided through environmental laws and mandates specific to each state and action agency. Additionally, other state agencies with responsibilities for inland species, marine species, and water quality also contribute to the conservation and recovery of salmon, other diadromous species, and their habitats. National and local non-governmental (NGO) conservation organizations, salmon clubs, and watershed organizations compliment these state and federal efforts.

## 2. Implementation of the Williamsburg Resolution:

Implementation of the recommendations contained within the Williamsburg Resolution includes minimizing risks associated with commercial aquaculture, salmonid introductions and transfers while providing protections to all anadromous Atlantic salmon stocks within the US. Many of the management actions necessary to minimize potential adverse effects from aquaculture, introductions and transfers and transgenics, have been implemented through a federal regulatory regime, while others are implemented at the state and local levels. The most significant federal actions in regards to commercial aquaculture were implemented through the ESA consultation process, whereby the ACOE had to consult with the NMFS to determine the effect on wild salmon of issuing permits for the placement of cages in marine waters for the purpose of commercial Atlantic salmon culture. As a result of that formal consultation, a Biological Opinion (NOAA 2003) was issued. The analysis within the Opinion determined the activity may adversely affect but was not likely to jeopardize the existence of the GOM DPS of Atlantic salmon. The consultation assumed fish that escape from marine aquaculture net pens and enter a salmon river will result in take[1] or otherwise harm or harass wild Atlantic salmon through redd superimposition, competition for food or space, and/or genetic introgression. This conclusion was reached considering the protective measures proposed to be implemented to minimize any adverse effects on the wild stocks. The recommended protective measures include the following:

[1] In full, the statutory definition of "take" includes "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct"

1) use only local North American salmon stocks for production; 2) implementation of containment measures to reduce escapes; 3) audits and reporting requirements; 4) prohibitions on stocking transgenic salmon; and 5) marking all salmon placed in marine pens within the US. All of the recommendations from the Services are incorporated into permit requirements and are verified through annual third party audits.

A Finfish Bay Management Agreement (Appendix C) has been developed for all US companies operating sites in Cobscook Bay and select Canadian companies operating sites immediately adjacent to Cobscook Bay (see Figure 3 insert). The foundation for this agreement is coordinated management of common bay areas with Maine and New Brunswick agreeing to manage the Cobscook, Campobello, and Deer Island marine sites as one management area. There are several benefits to this approach; 1) better coordination of site fallows; 2) fewer overlapping year classes in production; and 3) reduced disease transmission between year classes. This approach is critical to effective disease management and addresses several key factors in minimizing outbreaks of ISA. The Bay Management Area Fish Health and Biosecurity Plan guidelines are intended to minimize the spread of infectious diseases such as Infectious Salmon Anemia (ISA), through rigorous fish husbandry protocols and third party biosecurity audits. This agreement also seeks to control movements of fish and vessels within the bay in order to minimize disease transfer between US and Canadian marine sites. In addition to the bay area agreement, a compilation of best management practices and gear standards have been incorporated into a Code of Containment, Containment Management System (CMS) and Integrated Pest Management Program. These industry wide programs follow current state, federal and New England fish health protocols and are permit conditions for commercial Atlantic salmon aquaculture in Maine.

The protections for Atlantic salmon provided through state and federal permitting authority are supplemented by many cooperative agreements between salmon farming interests. The private aquaculture industry in Maine has adopted many best management practices (BMPs) which have been implemented through several industry wide agreements. For example, an Industry Code of Practice (Belle 2001) was established to minimize adverse effects to the environment. Fish welfare is also considered in a Fish Culture Code of Practices for Atlantic salmon culture in freshwater and sea cage sites. These BMPs include optimal fish stocking densities, minimal handling and disturbance of fish during rearing, careful monitoring of diseases and parasites, and recommendations for using automated feeding systems to reduce waste of fish feed.

Stocking programs for rebuilding and recovering Atlantic salmon populations in the US (which include the Connecticut River, Maine Rivers, Merrimack River, and Pawcatuck River Programs; Figure 1) follow guidelines for stocking Atlantic salmon as found in Annex 4 of the Williamsburg Resolution (Appendix A). The objectives and criteria to achieve these management goals are guided by technical committees established through collaboration among state, federal, and public interest groups or NGOs. Fisheries management activities related to restoration of Atlantic salmon and their habitat within the US, but outside of the freshwater range of the GOM DPS, is guided by technical committees established for all of the larger river programs (Connecticut River Atlantic Salmon Commission(CRASC), Merrimack River Technical Advisory Committee), except the Pawcatuck River in Rhode Island.

Incorporating socio-economic factors is particularly difficult in the US because of the severe decline in the Atlantic salmon populations that has occurred. The objectives of the ESA are to

recover threatened and endangered species and also the ecosystems they depend on. When determining whether or not a species qualifies for protection under the ESA, the Services are to make these determinations based solely on the best scientific and commercial data available; consideration of economic impacts is not permitted. Further, if a project is determined to jeopardize the continued existence of a species listed under the ESA, the Services cannot authorize any take and instead must identify an alternative project that would not result in jeopardy. Recommendations to minimize impacts (take), avoid jeopardy, or avoid adverse modification or destruction of critical habitat do include some consideration of economics.

**2.1 The parties shall cooperate in order to minimize adverse effects to the wild salmon stocks from aquaculture, introductions and transfers and transgenics.**

The NASCO Party which the US cooperates with the most to minimize adverse effects from aquaculture, introductions and transfers and transgenics is Canada. Both the US and Canada recognized the need to cooperate on comparable and consistent approaches on these issues in order to maximize the potential to achieve the desired protection of wild stocks. Coordination and collaboration resulted in the NAC Protocols for the Introduction and Transfer of Salmonids, first adopted in 1992. There have been revisions to the Protocols and staffs have collaborated annually to review introductions and transfers for consistency with the Protocols and also annually review new information to ensure relevancy of the Protocols themselves.

The US has collaborated more generally with other NASCO Parties through involvement in the working group that drafted the Williamsburg Resolution, through participation in scientific symposia including the ICES/NASCO Bergen Symposium, involvement in the NASCO/ISFA Liaison Group and more recently the Task Force on best practice in aquaculture to address impacts to wild salmon stocks. Continued participation in these scientific and management venues is essential to providing the best available scientific data for use in making management decisions.

In 2008, under the auspices of the NAC, the US and Canada jointly developed notification procedures when there is an escape event. The protocol in place requires a minimal level of notification between the Parties to facilitate a response to an escape of farmed fish from a marine facility supporting the Atlantic salmon farming industry in the US and Canada. Currently, the joint document outlining notification procedures is undergoing revisions by both Parties.

**2.2 The United States should require the proponent of an activity covered by the Williamsburg Resolution to provide all information necessary to demonstrate that the proposed activity will not have a significant adverse impact on wild salmon stocks or lead to irreversible change.**

Applicants for a state or federal permit are required to identify the work they propose to conduct, describe how it is to be carried out, and to follow the sequence of identifying impacts, avoiding impacts, minimizing unavoidable impacts, and mitigating any remaining impact. For activities occurring in the GOM DPS, there is an even higher burden on project proponents to avoid impacts to the ESA listed species and/or designated critical habitat.

Activities that may have an effect on Atlantic salmon must be reviewed for consistency with the laws and regulations described in Section 1.2. For federal actions within the range of the GOM

DPS of Atlantic salmon, this review process most often occurs in the context of Section 7 consultations as described above. In order for a project proponent to receive an incidental take statement that authorizes some level of take, they must: 1) thoroughly describe the activity; 2) describe the level of impact anticipated to occur as a result of the action; and 3) describe any conservation measures to be implemented that will minimize the level of impact. The Services require monitoring to ensure the level of the effects is not greater than anticipated at the outset of the project. Consultation is initiated when a federal agency or applicant provides a complete package describing the project they are undertaking and contains an assessment of how that project will affect Atlantic salmon. The federal resource agency Section 7 biologists then review that package to determine if it is complete and if so they initiate consultation. If there are data gaps, the benefit of the doubt is given to the species.

In regards to populations of salmon undergoing restoration outside of the freshwater range of the GOM DPS, state and federal laws and regulations in place require the regulatory agency to place the burden of proof upon the applicant. Some activities that would harm salmon are clearly prohibited by state or federal law. For those activities that are not prohibited, but which have the potential to adversely affect Atlantic salmon, the Party applying for a state or federal permit to conduct the activity must conduct the activity in accordance with best management practices in order to reduce adverse impacts.

Stocking and research activities proposed to be conducted on Atlantic salmon within the freshwater range of the GOM DPS are reviewed by technical committees to identify any conflicting research priorities or adverse impacts to the GOM DPS. The full research proposals are vetted through action teams composed of individuals with expertise in their particular field working for federal and state agencies involved in restoration and recovery of Atlantic salmon in New England. Stocking and research conducted outside the GOM DPS is reviewed by state and federal agencies involved in restoration activities occurring on those specific rivers, many of which have technical committees to provide additional expertise.

State fisheries programs supporting recreational salmonid fisheries could result in adverse ecological effects such as predation and increased competition for food and habitat. For instance, activities such as stocking non-indigenous salmonids (e.g., *Salmo trutta, Oncorhynchus mykiss* ) into waters containing anadromous Atlantic salmon is not prohibited in the US. Cooperative agreements between state and federal agencies seek to reduce conflicts with existing programs and balance the need of providing benefits to the public through recreational fishing activities, while considering the long term survival of anadromous Atlantic salmon within their historic range. Many times deleterious effects can be mitigated by using different stocking strategies, such as altering the location of stocking, size and species of fish being released and numbers of fish being stocked.

**2.3 The United States should develop and apply appropriate risk assessment methodologies in considering the measures to be taken in accordance with the Williamsburg Resolution.**

The Section 7 consultation process under the ESA uses a risk assessment approach by requiring analysis and prediction of potential impacts, consideration of a range of alternatives, and an open and transparent process of avoiding, minimizing and mitigating impacts. If impacts can be completely avoided, consultation can be completed informally with a conclusion that the

proposed action is not likely to adversely affect listed species or adversely modify critical habitat. If, as was the case for commercial Atlantic salmon aquaculture, it is determined that the proposed action may affect listed species and/or their habitat, then formal consultation is required. The formal consultation examines the baseline status of the listed species, the potential impact of the proposed action, and requires measures to minimize the extent or severity of impacts. Specifically, in regards to commercial aquaculture in Maine, a more transparent process emerged to implementing protective measures identified in the Biological Opinion (see section 2.10 for more information on protective measures). For example, industry participation on working groups led to improved containment, fish husbandry and stocking practices which have reduced farmed fish interactions (Table 1) and environmental impacts associated with large commercial production operations. At the time of the ESA consultation, the US industry was already located in close proximity to ESA listed GOM DPS rivers and embayment areas (Fig. 3). The option to relocate sites away from wild salmon rivers was considered, however alternative suitable sites were not able to be identified. Therefore, other risk reduction measures including compatibility of the equipment to the site conditions, a containment management system, audits, inventory control, a prohibition on the use of non North American strain salmon and marking were all required.

The state of Maine DMR lease permit application for the placement of commercial Atlantic salmon farming operations requires the applicant to submit information on site characteristics (i.e., tide direction, prominent wind direction, fetch, current speed) including frequency and magnitude of storm events and gear to be deployed. The applicant must also demonstrate that the equipment to be used is suitable for that site. This information is used to evaluate the proposed lease site for appropriateness and suitability to gear type, species and cage configuration. The proposal review must consider public opinion (i.e., public hearings for each aquaculture lease are required), existing uses of the area, Essential Fish Habitat (EFH), accessibility, and potential conflicts with riparian land owners. Alternative sites are considered during the application process and the goal is to select a site that optimizes growing conditions while minimizing the environmental impacts and risk of equipment failure.

Containment Management System plans are based on a Hazard Analysis Critical Control Point approach to identify areas of possible escapes from hatcheries and marine sites. A hazard analysis is conducted to identify critical control points and appropriate equipment modifications needed to eliminate escapes from each facility. After the fish culture activities or areas of the facility have been determined to pose a risk of escape, BMPs and corrective measures are implemented to reduce or eliminate the risk of escapes. Critical Control Points (CCP) are monitored daily to ensure corrective measures are in place and operational. For example, a final barrier placed on the effluent from commercial hatcheries is monitored for the presence of fish in front of the barrier; if present, the fish must be removed and the cause of escape from the rearing areas abated. Because this is a CCP, the integrity of this barrier is also documented, and if compromised, must be immediately repaired or replaced and the corrective action documented.

**2.4 The United States shall take measures in accordance with Annexes 2, 3 and 4 of the Williamsburg Resolution to**

**2.4.1 minimize escapes of farmed salmon to a level that is as close as practicable to zero through the development and implementation of action plans as**

**envisaged under the guidelines on Containment of Farm Salmon (Annex 3 of the Williamsburg Resolution – CNL(01)53).**

To minimize escapes of farmed salmon, the Atlantic salmon farming industry in Maine is required to employ a fully functional Containment Management System (CMS) at all production facilities supporting commercial salmon aquaculture; this includes both freshwater hatcheries and marine sites. The generic CMS template and framework (Appendix D) was developed through collaboration between private industry, public interest groups, environmental NGOs and state and federal agencies and was led by the Maine Aquaculture Association. These generic plans were used by the hatchery and marine site managers to develop site specific actions and response plans based on the specific needs of each site. A hazard analysis was conducted to identify critical control points and appropriate equipment modifications needed to eliminate losses from each facility. The site specific plans were refined during a one year trial period, during which time state and federal agencies provided oversight to site managers to implement CMS plans at each site. The Maine Aquaculture Association in cooperation with the salmon farming industry developed equipment standards (e.g., Code of Containment; Appendix D) which formed the basis of each plan and were established using industry expertise and data collected through analyses of load exerted on cages during extreme weather and tide conditions. The major components of the CMS plans include standard operating procedures specific to fish husbandry, stocking, harvesting, predator control, vessel operation, fish transfers, net changes and managing unique events such as storms and winter icing. Reporting of escapes, record keeping (e.g., cage and net numbers), corrective actions and annual training of employees and managers explaining how to implement CMS plans are mandatory components of each plan.

Commercial freshwater hatchery facilities located on rivers with endangered salmon populations are required to eliminate losses of juvenile salmon by screening discharges from the hatchery. For example, a three barrier system is required to be installed on the outflow from each facility to prevent salmon from escaping into streams and rivers. For each marine grow-out site, CMS protocols are in place to prevent losses during all activities including stocking and harvesting. Seals and avian predators are controlled using predator nets. Farmed salmon are contained within their rearing areas (e.g., floating net pens) by jump barriers and containment nets meeting gear requirements specific to moorings, nets and cage design found in the Code of Containment (Appendix D). Each aquaculture company maintains records of all gear deployed, these records are audited annually by a third party and the results of these audits are reviewed by the Services and permitting agency for compliance to permit conditions. Facilities found not in compliance will be required to initiate corrective measures to bring the facility into compliance before smolts can be transferred. Any deficiencies found during the routine annual audits are corrected through a corrective action plan and if major deficiencies are found, a follow up audit to monitor the progress of implementing corrective actions is conducted. Mandatory audits are required for losses greater than 25% of cage biomass or 50 fish greater than 2 kg in size. As is illustrated in Table 1, documented farmed origin salmon entering US salmon rivers have decreased significantly since the implementation of these measures.

In addition, the Atlantic salmon farming industry in Maine is required to mark all farmed salmon so as to identify which hatchery and marine site the fish has been placed. Furthermore, seasonal weirs are maintained by the state of Maine DMR BSRFH to screen returning adults for putative aquaculture origin and to collect biological information on the native stocks.

### 2.4.2 minimize impacts of ranched salmon by utilizing local stocks and developing and applying appropriate release and harvest strategies;

There are currently no Atlantic salmon ranching activities being conducted in the U.S. North American Commission area.

### 2.4.3 minimize the adverse genetic and other biological interactions from salmon enhancement activities, including introductions and transfers;

The U.S. Fish and Wildlife Service is solely responsible for the operation of freshwater hatcheries in support of the recovery of endangered GOM DPS of Atlantic salmon in the US. To provide guidance to these operations, the USFWS developed a Captive Broodstock Management Plan (Appendix F) through collaboration between state and federal agencies responsible for recovery of the GOM DPS of Atlantic salmon. Similarly, a Captive Broodstock Management Plan is being developed by the CRASC to define strategies for managing captive broodstock supporting the Connecticut River restoration program. In Maine, a river specific approach was employed to ensure the genetic integrity of each of the populations. Accordingly, only local river specific stocks are used for the recovery of the GOM DPS populations. Standard mating protocols are established using genetic information and evaluation for each individual brood fish collected from the wild. The protocols also include screening for aquaculture origin salmon prior to spawning. In addition, gene banking is employed at one federal hatchery for rivers in danger of extinction or at risk of genetic introgression from aquaculture origin escapes. For example, a pedigree line was initiated in 2005 following an intrusion of aquaculture origin salmon into one of the GOM DPS rivers. The escaped farmed origin fish were attributed to losses from an isolated vandalism event occurring at several marine cages located in Canada (Bean 2005).

Stocking programs for rebuilding and recovering Atlantic salmon populations in the US follow guidelines for stocking Atlantic salmon as found in Annex 4 of the Williamsburg Resolution (see Appendix A for more details). In general, all fisheries management programs supporting Atlantic salmon restoration and recovery enlist active participation of partners and stakeholders. Management and fish culture actions and measures are identified and prioritized in planning documents available to all interested parties. No salmon of European origin are cultured or released in US waters. Fish health inspections and best management practices are established and maintained at all culture facilities, and fish transfers among facilities are in compliance with all national and state regulations. Restoration and recovery plans are adaptive, culture programs implement best management practices in consultation with geneticists and conservation biologists, and proponents and agencies responsible for salmon stocking and managing populations evaluate programs and compile and maintain summary and accomplishment reports.

### 2.4.4 minimize the risk of disease and parasite transmission between all aquaculture activities, introductions and transfers, and wild stocks.

The New England Salmonid Health Committee was established in 1985 to address policy issues and provide guidelines related to Atlantic salmon disease management and other health needs related to Atlantic salmon culture for the purposes of restoration and recovery. This committee is comprised of individuals with specific expertise in fish health (e.g., Fish Pathologist, Veterinarians, Fisheries Biologist) working for federal and state resource agencies throughout

New England. This group was originally established only to address Atlantic salmon, later their charge was expanded to all regional salmonid health issues in 1987. Having consistent practices across all New England states helps minimize the risk of disease and parasite transmission across facilities and state lines. The guidelines created by the New England Salmonid Health Committee are implemented by the appropriate agency within each state.

Federal fish health regulations for commercial Atlantic salmon farming in Maine are in place and administered by the United States Department of Agriculture (USDA) through the Infectious Salmon Anemia (ISA) program established in 2001. Participation in this program is mandatory for the Atlantic salmon farming industry in the US. The emphasis of the program is placed on the following: maintenance of the current state and federal fish health protocols; development of an emergency disease eradication program; and expansion of an ongoing epidemiological monitoring program to determine the type, incidence and geographic distribution of salmonid pathogens in Maine. The major components of the program are:

- vaccination of farmed fish prior to stocking in sea cages;
- protocols for harvesting and stocking of farmed salmon;
- mandatory fallowing and single year class stocking and;
- vessel traffic protocols and gear and vessel disinfection protocols.

In addition, an Integrated Pest Management (IPM) plan is a requirement for the ISA program (Appendix E). Integrated pest management protocols include monitoring of sea lice levels and evaluating treatment efficacy. The guidelines include BMPs that seek to reduce the need for use of chemicals or medications. Routine monitoring of sea lice populations occur at least bi-weekly when water temperatures are greater than 8ºC, and monthly when water temperatures are between 6ºC and 8ºC. A maximum treatment threshold for sea lice counts is presently 1 gravid female and 5 pre-adult, on average, with a minimum of two samples. At the discretion of the licensed veterinarian, treatment may be initiated before such a count is reached. If therapeutic treatment is necessary, Emamectin Benzoate (SLICE®) has been prescribed to treat sea lice infestations since 2001 under an Investigational New Animal Drug permit. In some cases smolts being transferred from Canadian hatcheries may receive a pre-treatment of SLICE® in the hatchery prior to placement at US marine sites. All treatments are authorized and monitored by the accredited Veterinary person in Charge (VC). If appropriate, coordinated bay-wide therapeutic treatments are used to reduce initial infection. All medications administered for the control of disease or parasites are in accordance with state and federal regulations and are prescribed by a licensed VC.

The National Aquatic Animal Health Plan (NAAHP) is a broader scope plan for the control of diseases that affect the health of finfish, crustaceans and mollusks imported and exported into and out of the US. This plan seeks to provide the framework for the US to develop specific actions to coordinate and facilitate monitoring, reporting and identifying diseases of regulatory concern. While the NAAHP is not a regulation, it provides general principles and guidelines for how the US federal agencies with jurisdiction over aquatic animal health should take action to protect farmed and wild resources, facilitate safe commerce, and make available laboratory testing, training, and other programs as needed to implement the NAAHP (74 Federal Register 161, August 21, 2009). Currently, the draft 2008 version of the NAAHP is in review and is anticipated to have all comments received by late 2009.

**2.5 Movements into commission area of reproductively viable Atlantic salmon or their gametes that have originated from outside of the Commission area should not be permitted.**

Movements of Atlantic salmon into the US are regulated to prevent adverse biological and ecological impacts to the wild fish populations. All transfers of salmonids into and out of the US – including the NAC area, are controlled by federal salmonid importation regulations (e.g., Title 50 CFR Part 16) administered through the USFWS. This regulation seeks to minimize or eliminate spreading disease pathogens associated with the importation of salmonid fish, salmonid fish eggs, and salmonid fish products. For example, stringent importation guidelines include trans-continental restrictions intended to eliminate spreading viral pathogens (e.g.,VHS, IHN, IPN) from the west coast of North America to the east coast. Live salmonid fish and their gametes can be imported into the US only upon written approval from the Director of the USFWS. Documentation such as certification of the disease status of the product must accompany the shipment to allow entry into the US. The rule further identifies certification requirements such as; disease status (i.e., officially certified by registered fish pathologist) and standardized testing and sampling procedures for diseases of concern. Title 50 regulations are enforced by federal port agents (e.g., U.S. Customs, USFWS inspectors) working at border crossings and airport security checkpoints, where importation into the US is likely to occur.

Movements of Atlantic salmon within the New England states are controlled by permits issued at the state level. For example, the Maine Department of Marine Resources (MDMR) statute 12 M.R.S.A., Sec. 6071, provides the MDMR regulatory authority over the importation and introduction of live marine organisms to prevent the entry of any infectious or contagious diseases and parasites into Maine waters. This regulation also includes a prohibition on importing live Atlantic salmon of European or Icelandic origin for introduction into the waters of the state of Maine. In addition, provisions are included for the transfers of fish from freshwater hatcheries to marine cages in Maine, which are regulated through transfer permits, issued by the MDMR. Each individual transfer permit identifies the numbers, age, genetic strain and fish health status (i.e., vaccinations applied and results from fish health testing), of fish being transferred to individual marine sites. MDMR maintains an inventory of Atlantic salmon stocked into marine cages for the purposes of commercial aquaculture. Monthly reports describing the standing inventory are submitted for each marine site, including any losses which may have occurred during that time.

In addition, all applicable state and federal permit requirements must be met for all transfers and stocking of Atlantic salmon into the NAC area. For example, New England Salmonid Health requirements for inter-state transfer permits include; all lots of fish being transferred must be tested for disease of concern and are validated through a state veterinarian certification. All hatcheries transferring fish into the NAC area must comply with all state and federal fish health regulations, including having a record of past inspections to verify the disease status of the facility.

**2.6 Introductions into a Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes should not be permitted.**

Deliberate authorized introductions of non-indigenous anadromous salmonids into the U.S. NAC area do not occur. However, introductions of non-indigenous salmonids which have the potential to become anadromous (e.g., *Salmo trutta, Oncorhynchus mykiss and Oncorhynchus*

*nerka*) do occur within the NAC area. Domesticated lines of brown trout, rainbow trout and kokanee salmon which are stocked for recreational fisheries are not primarily anadromous. Rainbow trout and kokanee salmon are not known to subsequently adopt an anadromous life history in New England, however, some brown trout populations are known to adopt an anadromous life history, despite the fact, the genetic composition of the imported strains of salmonids does not include anadromous forms. The presence of small local residual populations of anadromous brown trout have been documented in New England for over 50 years and are not believed to be a result of recent introductions (S. Gephard, pers. comm.). The introductions that do occur are regulated at the state level to reduce adverse biological and ecological impacts to the wild fish populations. For example, stocking salmonids into areas without access to the ocean (e.g., landlocked) eliminates the potential for the introduced population to become anadromous. In addition, all hatcheries transferring fish into the NAC area must comply with all state and federal fish health regulations, including having a record of past inspections to verify the disease status of the facility. All applicable state and federal permits are required for stocking. Fish health regulations in place require all lots of fish being transferred to be tested for disease of concern and validated through veterinarian certification. This transfer permit process provides verification as to the disease status of the fish being transferred.

**2.7 No non-indigenous fish should be introduced into a river containing Atlantic salmon without a thorough evaluation of the potential adverse impacts on Atlantic salmon population(s) which indicates that there is no unacceptable risk of adverse ecological interactions.**

Stocking of non-indigenous species into waters containing anadromous Atlantic salmon are widespread and authorized by the appropriate state agency having jurisdiction over these actions. For example, stocking into the waters of the state of Maine are regulated through the Department of Inland Fish and Wildlife (MDIFW). This agency has sole authority over the management of the waters within the state of Maine and works closely with other state and federal agencies to reduce adverse biological and ecological impacts to the wild fish populations. Cooperative agreements are in place to reduce any adverse effects from stocking practices into rivers containing wild Atlantic salmon. However, prohibitions on introducing non-indigenous fish (e.g., smallmouth bass *Micropterus dolomieu*) into rivers containing wild Atlantic salmon are not in place. State managed programs supporting recreational fisheries often include stocking non-indigenous salmonid fish (e.g., *Salmo trutta, Oncorhynchus mykiss*) into rivers containing anadromous Atlantic salmon as described in Section 2.2. There are formal requirements under the ESA Section 7 process (as described in section 2.3) for evaluating potential impacts from a federally funded action on the listed GOM DPS population. Accordingly, state managed programs receiving federal support would qualify for requiring a thorough analysis including identifying, evaluating and mitigating potential adverse impacts to any endangered or threatened species that are affected.

**2.8 The United States should apply the guidelines for Action on Transgenic Salmon (Annex 5 of the Williamsburg Resolution – CNL(04)41), to protect against potential impacts from transgenic salmon on wild stocks**

Permits for the commercial culture of Atlantic salmon in net pens and freshwater hatcheries in the US prohibit the use of transgenic salmon. However, it should be noted, an application has been submitted to the U.S. Food and Drug Administration (FDA) for the sale of transgenic

salmon within the US. Under the guidance provided within the new animal drug provisions of the Federal Food, Drug, and Cosmetic Act, the FDA is required to consult with the Services during their review of the application. The FDA is requiring a risk assessment as part of the New Animal Drug Application (NADA) process for genetically engineered animals. Furthermore, FDA approval of the NADA would constitute a federal action and pursuant to the National Environmental Policy Act would require the action agency to develop an Environmental Assessment based on the potential environmental impact from the product and action. Additionally, the Services have notified the FDA that a consultation is required under the federal ESA to determine the potential impacts of this application on endangered Atlantic salmon. The scope and complexity of those analyses will depend on the type of approval ultimately sought from FDA – rearing in freshwater facilities in the US, rearing in marine waters in the US, or only sale of the fillets and whole fish in the US.

**2.9 The United States should, as appropriate, develop and apply river classification and zoning systems in accordance with Annex 6 of the Williamsburg Resolution for the purposes of developing management measures concerning aquaculture, and introductions and transfers.**

Anadromous Atlantic salmon rivers within the US fall into the categories of either restoration or recovery; rivers are also classified as essential fish habitat (i.e., for all current and historic anadromous Atlantic salmon rivers) and critical habitat (i.e., for rivers with populations listed under the ESA). In 2009, the NMFS published a final rule which describes the critical habitat designation for the GOM DPS of Atlantic salmon under the ESA (NOAA 2009). The rule identifies essential Atlantic salmon habitat found within the state of Maine which supports the listed GOM DPS population (Figure 2). The ESA defines critical habitat as: 1) specific areas within the geographical area occupied by the species at the time of listing, on which are found those physical or biological features that are essential to the conservation of the listed species and that may require special management considerations or protection; and 2) specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of a listed species. The ESA regulations clearly say to focus on the "primary constituent elements" or PCEs, in identifying these physical or biological features. The ESA requires that each federal agency, in consultation with and with the assistance of NMFS, ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of the GOM DPS of Atlantic salmon or result in the destruction or adverse modification of critical habitat. Furthermore, the ESA requires the Services to consider the economic impacts, impacts on national security, and other relevant impacts of specifying any particular area as critical habitat.

For the purposes of identifying the appropriate stocking guidance for Atlantic salmon restoration and recovery programs (see Appendix A for more details), the US has adopted guidelines established through the NAC, which classifies rivers into three types: Class 1 (Pristine), Class II (Habitat alterations, non-indigenous wild or hatchery-reared Atlantic salmon populations), and Class III (Habitat alterations, non-indigenous fish species). Accordingly, Class I rivers do not exist in the US. Whereas, the rivers in Maine include both Class II and III rivers, only Class III rivers are represented in other salmon restoration programs (i.e., non- GOM DPS rivers). Three Zones are identified in the current NAC protocols, and two are applicable to the coastal waters of Maine. Specifically for the state of Maine, all areas east of Rockland, lies within Zone II and the areas west of Rockland lies within Zone III. For example, the protocols would place rivers

within the GOM DPS range from the Kennebec river drainage eastward in Zone II and west of the Kennebec river drainage in Zone III (non GOM DPS rivers).

**2.10 The United States should initiate corrective measures without delay where significant adverse impacts on wild stocks are identified**

The US has implemented measures to minimize the potential effects from commercial Atlantic salmon aquaculture on the GOM DPS. Accordingly, the Atlantic salmon farming industry in Maine is required to implement protective measures to minimize the risk from farmed fish interactions. These specific measures are anticipated to provide much needed data to determine the efficacy of the containment measures implemented with a goal of eliminating losses of farmed fish. Annual third party audits validate the CMS plans and annual state and federal Services reviews monitor these protective measures in place for compliance with the permit requirements.

Specifically, the measures in place for the protection of Atlantic salmon include;

- use of North American broodstock for production;
- Containment Management System;
- prohibition on the use of transgenic salmon;
- auditing and reporting requirements including losses, gear, inventory, and feed records and;
- marking of individual fish to identify origin.

Starting July 30, 2009, the Maine salmon farming industry was required to mark all salmon placed in marine net pens to enable the identification of the specific site the fish is being reared. Initially, the Services agreed to an incremental approach to marking specificity, from broad based US industry identification the first year, to more specific hatchery and hatchery sub-lots the following years. This allowed the different companies to work through production difficulties realized in trying to reach the goal of site-specific marking for all farmed Atlantic salmon placed into the waters of the state of Maine. Taking this approach allowed production techniques to be modified to provide more flexibility during freshwater rearing in commercial hatcheries. The Maine Atlantic salmon farming industry used different marking techniques to comply with these permit requirements and eventually chose genetic marking (e.g., parentage assignments) to achieve the benchmark for mark detection of greater than 95% set by the Services. Annual Quality Assurance and Quality Control (QA/QC) audits validate mark detection rates and Chain of Custody documentation prior to stocking (FW hatchery) and immediately following stocking into marine net pens. This genetic based marking system will enable tracking fish through the complete production cycle and will provide sufficient information to identify the facility where the fish was reared.

Furthermore, state and federal resource agencies in Maine have implemented several measures to minimize deleterious effects from farmed fish interactions which include: 1) installation of a permanent weir on the Dennys river and temporary weirs on several GOM DPS rivers to minimize potential adverse impacts from farmed fish introductions into rivers with wild salmon and to collect information on the native stocks; 2) screening wild broodstock for origin and disease; 3) farmed fish escape notification procedures between the US and Canadian commercial salmon farming industry, government agencies and state resource agencies to expedite the response time needed to minimize impacts from farmed fish interactions; and 4) USFWS

initiated pedigree lines for GOM DPS rivers with high risk of genetic introgression from farmed fish interactions or poor demographic structure limiting recruitment success.

**2.11 The United States should encourage research and data collection (as detailed in Annex 7 of the Williamsburg Resolution) in support of the Williamsburg Resolution and should take steps to improve the effectiveness of the Williamsburg Resolution.**

Research and data collection in support of the Williamsburg Resolution is currently ongoing and conducted by universities, private interest groups, state and federal agencies primarily interested in salmon restoration. Some New England states have established funding programs for research and management related to commercial aquaculture activities within state waters. The NOAA aquaculture program (established in 2004) is focused on providing support for developing environmentally sustainable aquaculture. Funding opportunities are made available through federally managed programs such as the Saltonstall-Kennedy (S/K) grant program (established in 1990) and the National Marine Aquaculture Initiative program initiated in 1998 − which serve as competitive grants programs supporting research and demonstration projects advancing sustainable marine aquaculture. Through the S/K grant program, the NMFS set aside federal money in 2003 to promote the continued development of the Atlantic salmon aquaculture industry by minimizing the potential for negative impacts on wild Atlantic salmon. Some of the projects funded included many fish health projects investigating ISAV (i.e., monitoring and detection techniques, developing effective vaccines), an engineered lift-up system to reduce environmental impacts and investigations into understanding the behavior of escaped farmed fish (Whorisky et al. 2006) and the feasibility of their recapture.

Starting in 2006, the state of Maine DMR has been collecting data on the source and causes of losses from marine net pens and freshwater hatcheries (Appendix G). Information is provided from the salmon farming industry in response to losses caused by predation, severe weather, foreign objects, fish husbandry, human interactions and equipment failure. Detailed descriptions are identified for each of the major causes listed above to allow the correct classification for each event to be documented. No significant losses of farmed salmon have occurred since initiating this specific reporting requirement.

Another source of information on farmed fish interactions is provided through the United States Atlantic Salmon Assessment Committee (USASAC) annual reports on rivers which are monitored for returning adult salmon. To minimize any interactions with farmed fish, weirs were constructed and maintained by the DMR BSRFH on several GOM DPS salmon rivers. The Dennys river weir is currently the only permanent weir that is operated annually during the salmon run. Other weirs were discontinued; however temporary weirs can be installed within 24 hours of any reported aquaculture escape. These provide a platform to screen wild salmon and remove any farmed origin salmon; data on the number of farmed fish captured entering some GOM DPS rivers is collected annually and is included in the USASAC reports (Table 1). Putative aquaculture origin fish are screened using scale and genetic analyses to determine the origin and stocking location of each fish captured.

The efficacy of using Emamectin Benzoate (Slice®) for treating sea lice infestations on thirteen farms in Cobscook Bay was evaluated from 2002-2005 (Gustafson et al, 2006). The treatment regime prescribed during this study followed guidelines provided within the USDA ISA Program Standards and Integrated Pest Management plan. The study showed a strong response to

treatment as compared to pre-treatment baseline levels. Using untreated controls was not possible due to increased risk of exposure to ISAV. Additional investigational new animal drug studies for alternative treatments are ongoing with results and anticipated publications to follow.

**2.12 Education materials should be developed and distributed to increase awareness of the risks that introductions and transfers of aquatic species may pose to wild salmon stocks and the need for measures to control these activities.**

The US is currently involved in outreach and education intended to reach audiences such as the general public, aquaculture and seafood industries, coastal communities and commercial and recreational fisherman. More recent outreach efforts are focused on increasing awareness about the importance of protecting and recovering wild populations of anadromous Atlantic salmon to facilitate the expanded ESA listing. Additional educational efforts are more general to sustainable aquaculture and the benefits of eating seafood, some are targeted regionally to support local aquaculture initiatives. Much of the information is disseminated at public meetings and conferences, local events and through the Sea Grant and USDA Aquaculture Extension networks. For example, a local event such as the Wellfleet Oyster Festival celebrating shellfish held in a small fishing community on Cape Cod, Massachusetts, or at the annual Farmed Fish Health Workshop sponsored by the local Sea Grant extension office held in Eastport, Maine. Continued participation in these scientific and public venues is essential to providing the public with the latest available scientific data for understanding the benefits and risks associated with sustainable seafood production.

## Table 1.

**Documented aquaculture origin Atlantic salmon caught in weirs in select Maine Rivers, expressed in numbers of fish, 1994-2008.**

| | St.Croix | Union | Narraguagus | Dennys | Pleasant | DPS rivers Total |
|---|---|---|---|---|---|---|
| 1994 | 97 | n/a | 1 | 48 | n/a | 49 |
| 1995 | 14 | n/a | 0 | 4 | n/a | 4 |
| 1996 | 20 | n/a | 8 | 21 | n/a | 29 |
| 1997 | 27 | n/a | 0 | 2 | n/a | 2 |
| 1998 | 24 | n/a | 0 | 1 | n/a | 1 |
| 1999 | 23 | 63 | 3 | n/a | n/a | 3 |
| 2000 | 30 | 6 | 0 | 29 | 0 | 29 |
| 2001 | 58 | 2 | 0 | 65 | 0 | 65 |
| 2002 | 5 | 6 | 0 | 4 | 0 | 4 |
| 2003 | 9 | 0 | 0 | 2 | 0 | 2 |
| 2004 | 4 | 0 | 0 | 0 | 0 | 0 |
| 2005 | 35 | 4 | 0 | 8 | n/a | 8 |
| 2006 | 7 | 0 | 1 | 4 | n/a | 5 |
| 2007 | 1* | 0 | 0 | 0 | n/a | 0 |
| 2008 | 0 | 0 | 0 | 0 | n/a | 0 |

**Data source: U.S. Atlantic Salmon Assessment Committee Report 2009**

n/a- No trapping facility in place and/or operational, * found dead on fishway screening

## Table 2.

**Annual production for Maine Atlantic salmon farming industry 2000-2008.**

| Year | Total salmon stocked | Harvest Total (lbs) |
|---|---|---|
| 2000 | 4,511,361 | 36,290,154 |
| 2001 | 4,205,161 | 29,105,536 |
| 2002 | 3,952,076 | 14,987,837 |
| 2003 | 2,660,620 | 13,243,419 |
| 2004 | 1,580,725 | 18,771,739 |
| 2005 | 294,544 | 11,602,436 |
| 2006 | 3,030,492 | 10,303,944 |
| 2007 | 2,172,690 | 5,986,143 |
| 2008 | 1,481,259 | 20,666,854 |

**Data source: U.S. Atlantic Salmon Assessment Committee Report 2009**

# Appendices

## Appendix A. U.S. Stocking Guidelines - Excerpt from United States Atlantic Salmon Assessment Committee 2005 Report.

**The U.S. Atlantic Salmon Assessment Committee (USASAC) was created to provide scientific information and advice to the U.S. Commissioners to NASCO. This committee is comprised of individuals serving state and federal resource agencies, private interest groups, NGOs and the meetings are open to the general public. At the request of the Commissioners, the USASAC reviewed stocking practices in the US to evaluate their consistency with the Williamsburg Resolution, and specifically the NAC Protocols. The excerpts from their report are included below in this Appendix.**

**4.4 Stocking Guidelines**

**Compliance with NASCO Stocking Guidelines found in Document CNL(03)55**

Programs for rebuilding and recovering Atlantic salmon populations in the US (which include the Connecticut River, Maine Rivers, Merrimack River, and Pawcatuck River Programs) are in compliance with the NASCO guidelines for stocking Atlantic salmon as found in document CNL (03)55. The term stocking is defined in the guidelines as "the deliberate release of Atlantic salmon at any stage of their life cycle into the wild for enhancement, mitigation, restoration, rehabilitation or ranching purposes." For the purposes of stocking guidance, the North American Commission (NAC) classifies rivers into three types: Class 1 (Pristine), Class II (Habitat alterations, non-indigenous wild or hatchery-reared Atlantic salmon populations), and Class III (Habitat alterations, non-indigenous fish species). Class I rivers do not exist in each of the four stated programs. Whereas the Maine Rivers program includes both Class II and III rivers, only Class III rivers are represented in other programs. All programs enlist active participation of partners and stakeholders, and culture and management actions and measures are identified and prioritized in planning documents available to all interested parties. No salmon of European origin are cultured or released in US waters. Fish health inspections and best management practices are established and maintained at all culture facilities, and fish transfers among facilities are in compliance with all national and state regulations. Restoration and recovery plans are adaptive, culture programs implement best management practices in consultation with geneticists and conservation biologists, and proponents and agencies responsible for salmon stocking and managing populations evaluate programs and compile and maintain summary and accomplishment reports. The Committee has not identified any necessary changes to the existing Stocking Guidelines.

**4.4.1. Connecticut River**

B. Guidelines applicable to all rivers:

1. No salmon of European origin are released.

2. Fish health inspections are maintained at all facilities and no 'emergency diseases' were detected in any fish.

3. All transfers between facilities within the basin are in compliance with all national and State regulations. There are no transfers across the basin boundaries.

4. Considerable consultation with geneticists and conservation biologists has occurred throughout the 37-year history of the program and a Genetics Subcommittee has developed management protocols and monitors implementation.

a. Eggs of wild, sea-return fish are used in the program but are augmented with eggs from reconditioned kelts and captive broodstock that are F1 generation of wild parents.

b. The removal of wild spawners does not have a negative impact on the population because the nascent population has always been maintained in hatcheries and does not rely on natural reproduction.

c. Over 90% of wild returning salmon is retained for spawning and the selection of these fish (as opposed to the other 10%) is random and includes all components of the populations.

d. For much of the history of the program, more than 50 random pairs have been used in spawning. In recent years, the number of returning adults has dipped below 100 fish and the balance of the 50 females (when needed) were made up with captive kelts (females that were sea-returns during a previous year) and the balance of the 50 males were made up with mature parr from streams stocked with fry that had wild, sea-return parents. Although these mature parr had not been to sea, the reasoning has been that the fish spent minimal time in a hatchery and had been subjected to natural selection in the stream and therefore these fish were preferable over domestic broodstock that had spent their entire life in a hatchery.

e. Milt is never mixed in breeding, with mating schemes of 1 to 1.

f. Early in the history of the program, eggs from a number of different North American rivers were used in the stocking program. The full extent of the contribution of some of these stocks to subsequent generations is unknown but it is known that Maine salmon stocks have made major contributions to the development of the Connecticut River stock.

g. The major stocking strategy is fry stocking with sporadic and relative small stockings of hatchery-reared smolts and very minor stockings of eggs and parr.

5. It is assumed that the large Connecticut River watershed historically supported multiple Atlantic salmon stocks and ideally when salmon is re-established to the river, the population will be managed in a manner that will allow the development of separate sub-populations in large tributaries or portions of the watershed. However, at this point in the restoration program, all fish are being managed as one population. Due to low numbers of returns and the need to maintain a minimum effective breeding population, management for separate sub-populations (stocks) is premature.

E. Guidelines applicable to Class III rivers (the Connecticut River is a class III river):

1. There are no remaining native stocks of Atlantic salmon in the Connecticut River watershed or within 300 miles of the mouth of the Connecticut River so the stocking of salmon in this watershed may proceed without the need for “careful ecological impact evaluations”.

2. Rehabilitation

(a) The key strategies are to improve degraded habitat, restore fish passage, and generate sea-returns through stocking. However, at this point in the program, a very small true spawning escapement is allowed. Most returning adults are captured for captive broodstock spawning to produce fry for stocking. Eventually, as returns increase, more sea-returns will be released for a true spawning escapement.

(b) The stocking of cultured salmon is a major tool for rehabilitation.

3. Restoration of salmon in a river where there are no salmon (this is the case for the entire Connecticut River watershed)

(a) All tributaries to the Connecticut River as well as most rivers in New England have lost their native salmon populations and it has not been useful to evaluate "genetic and ecological characteristics" of these streams.

(b) The restoration program has relied on the use of the nearest salmon river: the Penobscot River.

(c) Consideration has been given to impacts on the existing fish community and fisheries. No deleterious impacts are expected. Existing parr populations seem to be coexisting with other stream species and existing fisheries.

4. No commercial ranching of Atlantic salmon currently exists in or around the Connecticut River.

IV. Guidelines for Authorizing Stocking

A. All stockings are conducted by State or federal agencies that are partners of the restoration program.

B. Proponent of stocking

1. All agencies that stock salmon must have the approval of the Connecticut River Atlantic Salmon Commission (CRASC) and the information provided is consistent with that in Box 1.

2. justifications are not necessary since the stockings are all part of the restoration program.

3. Not applicable.

4. All stockings are reported back to the Commission.

C. Responsibility of the Commission, which issues permits

a. Not applicable- no existing wild salmon populations.

b. All proponents are members of the Commission and understand the guidelines.

c. A permit system and inventory for all stockings has been established and is maintained.

d. Each State within the watershed has enacted regulations that control the stocking of salmon.

e. Formal evaluation of the stockings occurs annually.

f. Not applicable- no existing wild salmon populations.

g. No comment.

h. Can be provided upon request.

**4.4.2. Maine Rivers**

**Rationale for stocking:**

The current Atlantic salmon stocking program in Maine is focused on populations listed as endangered under the Endangered Species Act, including the Penobscot River, and several other rivers. All rivers contain populations that are at very low levels, and most if not all populations would be extinct if not for the stocking program. Our goal is to restore salmon to Maine rivers. To this end, we have followed a program of stocking salmon that would not adversely affect the wild populations or have negative impacts on the ecological systems.

**A. River Classes in Maine:**

Maine has only Class II and III rivers.

**B. Guidelines applicable for all rivers:**

1. Maine uses only native strains of salmon for stocking. We actively genetically screen fish for European ancestry and remove them from the population if identified.

2. All fish and eggs are screened for disease and pathogens before they are moved to another facility or stocked into the wild.

3. All fish moved or stocked comply with national, state, and provincial (border waters) regulations for restricted diseases.

4. All broodstock has been derived from wild collected salmon. Whenever possible, all hatchery populations are derived from natal populations specific to a river to maintain the uniqueness of the stocks. Broodstock has been derived from various age classes including adults, young of the year, parr, and smolts. Parr are the primary source of broodstock, except on the Penobscot where sea-run adults are the source of broodstock. Removal of donor broodstock generally has little negative impact on the number of naturally reared returning adults. In cases where the population is at high risk, removing fish for broodstock may be the only method to maintain the population until recovery becomes successful. All broodstock populations are managed for as robust an effective population size as possible. While this can be challenging with very small populations, we strive to maintain minimum numbers of parents per generation. We also generally follow a one:one mating scheme. However, we will deviate from this to optimize genetic diversity in very small populations.

5. Our current system does not attempt to manage subpopulations within drainages. Most rivers are small and likely had only one population. In larger rivers with diverse habitat (Penobscot,

Machias), there may have been more than one population. However, it is not clear if these populations were extant when the stocking program was implemented.

**D. Class II Guidelines**

1. Maine does not use non-indigenous populations in any rivers for any type of stocking. We do restoration activities in the freshwater and marine environments of some rivers.
2. Maine is attempting to restore and protect habitat, as well as increase the numbers of spawning adults by numerous fisheries management approaches. The extremely small sizes of some of our populations, as well as the endangered status under ESA, have also necessitated using river-specific populations for restoration. In cases where the natal population is no longer extant or too small to be viable, we will seek the ecologically and genetically best population(s) for restoration. We predominantly stock fry in rivers, many of which do not have any, or very few spawning adults. We have also stocked pre-spawn adults, and continue to evaluate this as a restoration approach. In the Penobscot, and other rivers at times, we stock smolts. This is done when too few fry are available, or demographics require returning adults annually.
3. In cases where the river is devoid of natal salmon we would stock the river with fry or eggs from a nearby river with genetically and ecologically compatible fish.
4. Maine does not sea ranch salmon for population restoration or recreational fishing. However, commercial aquaculture operations rear salmon in marine net pens.

**E. Class III guidelines**

1. For class III rivers Maine would follow the guidelines outlined for Class II rivers.

**Guidelines for Administering Stocking**

All Atlantic salmon stocking in Maine is permitted through the DMR BSRFH. This agency follows the guidelines for proponents. All stocking proposals undergo a technical review by the Conservation Hatchery Action team before being permitted. All stocking is reported by this agency. Evaluation of the effectiveness of the stocking program is ongoing, led by the DMR BSRFH in collaboration with NOAA Fisheries and the United States Fish and Wildlife Service. Results of this evaluation process will be used to modify and improve the stocking program and its effectiveness towards the goals of achieving self-sustaining populations of Atlantic salmon in Maine rivers.

**4.4.3. Merrimack River**

B. Guidelines applicable to all rivers:

1. No salmon of European origin released.

2. Fish health inspections maintained at all facilities.

3. All transfers among facilities supporting the program were in compliance with all national and State regulations.

4. Consultation with geneticists and conservation biologists has occurred throughout the history of the Merrimack River program and the results of a recent genetic characterization of sea run returns, kelts, and domestic broodstock at the Nashua and North Attleboro National Fish Hatcheries will now be used to refine hatchery mating protocols and management measures.

    a. Eggs of wild, sea-return fish are used in the program but are augmented with eggs from reconditioned kelts and captive broodstock that are F1 generation of wild parents.

b. The nascent population is maintained in hatcheries and has not relied on natural reproduction.

c. All sea-returning salmon are retained for spawning, and donor stocks of age 1 hatchery smolts of Penobscot River origin are released annually in the watershed.

d. For much of the history of the program, about 50 random pairs have been used in spawning. Throughout the last decade, donor stocks of age 1 hatchery smolts (Penobstock River, 50,000) have been released in the watershed and time series suggest that approximately 80% of sea-returning adults typically originate from these smolt donor stocks each year. Captive kelts (females that were sea-returns during a previous year) and domestic broodstock are also used to produce gametes to meet fry production targets for the program.

e. The program has strived to achieve mating schemes of 1 to 1, and the results of recent genetic characterization of adult spawners will provide opportunities to implement refined spawning protocols.

f. Early in the history of the program, eggs from a number of different North American rivers were used in the stocking program. The full extent of the contribution of some of these stocks to subsequent generations is unknown but it is likely that Maine salmon stocks have made major contributions to the development of the Merrimack River stock.

g. The major stocking strategy is fry stocking (unfed fry), and age 1 smolt stocking.

5. It is assumed that the Merrimack River watershed historically supported multiple Atlantic salmon stocks and ideally when a run of salmon is re-established, the population will be managed in a manner that will allow the development of separate sub-populations in large tributaries or portions of the watershed. At this time all fish are being managed as one population. Due to low numbers of returns and the need to maintain a minimum effective breeding population, management for separate sub-populations (stocks) is premature.

E. Guidelines applicable to Class III rivers (the Merrimack River is a Class III river):

5. There are no native stocks of Atlantic salmon in the Merrimack River watershed or within 200 miles of the mouth of the Merrimack River so the stocking of salmon in this watershed may proceed without the need for “careful ecological impact evaluations”.

6. Rehabilitation

(a) The key strategy is to improve degraded habitat, restore fish passage, and generate sea-returns through stocking. At this point no spawning escapement occurs. All returning adults are captured for captive broodstock spawning to produce fry for stocking. As returns increase, sea-returns will be released for spawning escapement.

(b) The stocking of cultured salmon is a major tool for rehabilitation.

7. Restoration of salmon in a river where there are no salmon (this is the case for the entire Merrimack River watershed)

(a) All tributaries to the Merrimack River as well as most rivers in New England have lost their native salmon populations and it has not been useful to evaluate "genetic and ecological characteristics" of these streams.

(b) The restoration program has relied on the use of the nearest salmon river: the Penobscot River.

(c) Consideration has been given to impacts on the existing fish community and fisheries. No deleterious impacts are expected. Existing parr populations seem to be coexisting with other native stream species and existing fisheries.

8. No commercial ranching of Atlantic salmon currently exists in or around the Merrimack River.

IV. Guidelines for Authorizing/Administering Stocking

A. All life stages of fish are released by State or federal agencies that are partners in the restoration program.

B. Proponent of stocking

5. All agencies that stock salmon must have the approval of the Merrimack River Policy Committee (Policy Committee) and the information provided is consistent with that in Box 1.

6. Justifications are not necessary since the stockings are all part of the restoration program.

7. Not applicable.

8. All stockings are reported back to the Policy Committee.

C. Responsibility of the Commission, which issues permits

1. Not applicable- no existing wild salmon populations.

2. All proponents are members of the Policy Committee and understand the guidelines.

3. A permit system and inventory for all stockings has been established and is maintained.

4. Each State within the watershed has enacted regulations that control the stocking of salmon.

5. Formal evaluation of the stockings occurs annually.

6. Not applicable- no existing wild salmon populations.

7. Can be provided upon request.

**4.4.4. Pawcatuck River**

B. Guidelines applicable to all rivers:

1. No salmon of European origin released.

2. Fish health inspections maintained at all facilities.

3. All transfers among facilities supporting the program were in compliance with all national and State regulations.

4. Consultation with geneticists and conservation biologists has occurred throughout the history of the Pawcatuck River program and the results of a recent genetic characterization of sea run returns, kelts, and domestic broodstock at the Nashua and North Attleboro National Fish Hatcheries will now be used to refine hatchery mating protocols and management measures.

    h. Eggs from captive broodstock that are F1 generation of wild parents are used in the program.

    i. The nascent population is maintained in hatcheries and has not relied on natural reproduction.

    j. All sea-returning salmon are retained for spawning, and donor stocks of fry from Merrimack River captive broodstock that are F1 generation of wild parents are used in the program.

    k. For much of the history of the program donor stocks of fry from Merrimack River captive broodstock that are F1 generation of wild parents have been used in the program. Donor stocks of age 1 hatchery smolts (Penobstock River, 50,000) have been released in the Merrimack River watershed and time series suggest that approximately 80% of sea-returning adults typically originate each year from these smolt donor stocks.

    l. The program has strived to achieve mating schemes of 1 to 1, and the results of recent genetic characterization of adult spawners will provide opportunities to implement refined spawning protocols.

    m. Early in the history of the program, eggs from a number of different North American rivers were used in the stocking program. The full extent of the contribution of some of these stocks to subsequent generations is unknown but it is likely that Maine salmon stocks have made major contributions to the development of the Merrimack River stock.

    n. The major stocking strategy is fry stocking (unfed fry), and occasionally age 1 smolt stocking.

5. It is assumed that the Pawcatuck River watershed historically supported multiple Atlantic salmon stocks and ideally when a run of salmon is re-established, the population will be managed in a manner that will allow the development of separate sub-populations in large tributaries or portions of the watershed. At this time all fish are being managed as one

population. Due to low numbers of returns and the need to maintain a minimum effective breeding population, management for separate sub-populations (stocks) is premature.

E. Guidelines applicable to Class III rivers (the Pawcatuck River is a class III river):

1. There are no native stocks of Atlantic salmon in the Pawcatuck River watershed or within 200 miles of the mouth of the Pawcatuck River so the stocking of salmon in this watershed may proceed without the need for "careful ecological impact evaluations".

2. Rehabilitation

(b) The key strategy is to improve degraded habitat, restore fish passage, and generate sea-returns through stocking. At this point no spawning escapement occurs. All returning adults are captured for captive broodstock spawning to produce fry for stocking. As returns increase, sea-returns will be released for spawning escapement.

(c) The stocking of cultured salmon is a major tool for rehabilitation.

3. Restoration of salmon in a river where there are no salmon (this is the case for the entire Pawcatuck River watershed)

(d) All tributaries to the Pawcatuck River as well as most rivers in New England have lost their native salmon populations and it has not been useful to evaluate "genetic and ecological characteristics" of these streams.

(e) The restoration program has relied on the use of the nearest salmon river: the Penobscot River.

(f) Consideration has been given to impacts on the existing fish community and fisheries. No deleterious impacts are expected. Existing parr populations seem to be coexisting with other native stream species and existing fisheries.

4. No commercial ranching of Atlantic salmon currently exists in or around the Pawcatuck River.

IV. Guidelines for Authorizing/Administering Stocking

A. All life stages of fish are released by State or federal agencies that are partners in the restoration program.

B. Proponent of stocking

1. All agencies that stock salmon must have the approval of the Rhode Division of Fish and Wildlife (Division) that is consistent with that in Box 1.

2. Justifications are not necessary since the stockings are all part of the restoration program.

3. Not applicable.

4. All stockings are reported back to the Division.

C. Responsibility of the Commission, which issues permits

1. Not applicable- no existing wild salmon populations.

2. All proponents coordinate with the Division and understand the guidelines.

3. A permit system and inventory for all stockings has been established and is maintained.

4. Each State within the watershed has enacted regulations that control the stocking of salmon.

5. Formal evaluation of the stockings occurs annually.

6. Not applicable- no existing wild salmon populations.

7. Can be provided upon request.

**4.5 Stock Rebuilding**

**Adherence to NASCO Guidelines on the Use of Stock Rebuilding Programmes in the Context of the Precautionary Management of Salmon Stocks (CNL(04)55)**

The status and stock rebuilding programs for Atlantic salmon populations in the US (which include the Connecticut, Maine, Merrimack, and Pawcatuck River Programs) continue to be evaluated in relation to conservation limits, exploitation, stock history and diversity indices, uncertainty in data and estimation procedures, and the reasons for declines and population losses. With the exception of the Pawcatuck River, each Program has established a Technical Advisory Committee to guide the implementation of management measures designed to restore or recover salmon stocks above conservation limits. Factors that contribute to depressed population levels (e.g. environmental changes, habitat losses, subsistence harvest, etc.) are also being evaluated. In addition, genetics and pathology are assessed, research and management actions prioritized for restoration and recovery, and strategies developed to protect and restore critical habitats. Stakeholders have been identified and included in theses processes. In Maine, the river-specific stocking already established is consistent with NASCO Stocking Guidelines. Threat assessments are also underway in Maine to identify risks as part of the Endangered Species Act listing and the recovery planning process.

**4.5.1. Connecticut River**

1. Background: The Connecticut River population is below its Conservation Limit and a stock rebuilding program has been developed.

2. A Technical Advisory Committee is in place to guide the implementation of management measures designed to restore or recover this stock above conservation limits.

3. An evaluation of the stock's status has been conducted. The native stock(s) is extinct. A restoration population is far below the Conservation Limit for the watershed.

4. An evaluation of stock decline and threats has been conducted.

    A) Natural environmental change - changes have occurred since the extirpation of the native stocks but environmental conditions still appear to fall within the range of acceptability for Atlantic salmon.

B) Habitat degradation - considerable habitat degradation has occurred since the extirpation of the native stocks, particularly in terms of sedimentation, water quality and migratory barriers. However, and with remedial actions, it is believed that the condition of the existing habitat will support Atlantic salmon.

C) Species interactions - There are many interactions with native species that are not worrisome, but there are many non-native species in the basin (some of these non-natives may have negative impacts on Atlantic salmon populations).

D) Exploitation - There is no exploitation, commercial or recreational, of salmon in the basin.

E) Differential effects on stock components - Very few grilse return to the Connecticut River. New England grilse tend to return in late summer, when Long Island is too warm for salmon.

5. Stakeholders and partners in the Connecticut River Program have been identified and are fully involved in the program.

6. Management actions have been planned and prioritized with the development of a strategic plan (Anonymous. 1998). The plan includes research needs, environmental management, fishery management, and gene banking.

7. Interim measures have been identified and implemented. These include stocking of juveniles, capture of returning adults for breeding, and the prohibition of all salmon exploitation. Interim reference points are provided in the Strategic Plan.

8. Social and economic factors have been considered in the program. A new socio-economic study is proposed for the program.

9. Population sizes and responses to management activities are monitored, and management activities are regularly evaluated.

**4.5.2. Maine Rivers**

1. In Maine, a stock-rebuilding program is in place, partly as a result of the listing of the Gulf of Maine Distinct Population Segment (DPS) as endangered under the United States Endangered Species Act (ESA), and partly because of general efforts to restore salmon to Maine waters.

2. An Atlantic Salmon management framework with technical action teams is in place to guide the implementation of management measures designed to restore or recover DPS and Penobscot-strain stocks above conservation limits.

3. The status of salmon stocks in Maine continues to be evaluated in relation to conservation limits, exploitation, and uncertainty in data and estimation procedures, history of the stocks, stock diversity, and the reasons for the declines and loss of populations in Maine.

4. Factors that may contribute to the depressed levels of Maine's salmon stocks are currently being evaluated. These include environmental change (such as hydrology and water temperature alterations); habitat degradation and habitat loss; species interactions (including exotic species, aquaculture, and indigenous species); exploitation (salmon fishing in Maine is not permitted), including Greenland ocean harvest; and demographic and genetic factors and susceptibilities.

5. The Maine Program has identified, included, and involved stakeholders from federal, state, tribal, and local governments and their agencies; commercial interests (such as aquaculture, forestry, and agriculture); various local and broader non-profit environmental groups; academic institutions; and the general public.

6. The process of identifying threats, prioritizing rivers and populations, and prioritizing management actions and research to best manage and restore salmon in Maine is part of the ESA listing process, but is also being pursued independently of this process. The Maine Program has been protecting critical habitat, restoring habitat, and attempting to

evaluate various factors, both natural and anthropogenic, that may be causing the decline in salmon. Currently the harvest strategy is no harvest. A captive broodstock program for six populations that serves as a protective gene bank in case of full loss in the wild has been established (Draft, 2005).

7. The Maine Program is currently establishing recovery goals, including interim measures. A risk assessment process has been initiated in tandem with recovery planning. In addition, we have already established a stocking program (based on river-specific culture and stocking protocols) that follows NASCO Stocking Guidelines.

8. The Maine Program continues to assess and adapt our management based on social and economic factors. Biological factors are the primary decision-making tools, but social and economic factors are considered and evaluated in decision-making.

9. The Maine Program will continually monitor, evaluate progress and assess the effectiveness of our management activities.

### 4.5.3. Merrimack River

1. Background: The Merrimack River population is below its Conservation Limit and a stock rebuilding program has been developed.

2. A Technical Advisory Committee is in place to guide the implementation of management measures designed to restore or recover this population above conservation limits.

3. The native stock(s) is extinct. The restoration population is far below the Conservation Limit for the watershed.

4. An evaluation of stock decline and threats has been conducted.

   A) Natural environmental change - changes have occurred since the extirpation of the native stocks but environmental conditions still appear to fall within the range of acceptability for Atlantic salmon.

B) Habitat degradation - considerable habitat degradation has occurred since the extirpation of the native stocks, particularly in terms of sedimentation, water quality and migratory barriers. However, there have been remedial actions and it is believed that the condition of the existing habitat will support Atlantic salmon.

C) Species interactions - There are many interactions with native species that are not worrisome but there are many non-native species in the basin (some of these non-natives may have negative impacts on Atlantic salmon populations).

D) Exploitation - There is no exploitation, commercial or recreation, of wild sea-returning salmon in the watershed.

E) Differential effects on stock components - Few grilse return to the Merrimack River, and the majority of sea-returning fish of fry origin are identified as age 4 fish (W2.2) and as age 1 smolt-origin fish (H1.2).

5. Stakeholders and partners involved in the Merrimack River Anadromous Fish Restoration Program are fully engaged in activities, and roles and responsibilities are defined.

6. Management actions and measures have been planned and prioritized with the development of a Strategic Plan (Technical Committee for Anadromous Fishery Management of the Merrimack River Basin and Advisors to the Technical Committee. 1997). The plan includes research needs, environmental and fishery management measures, hatchery production targets, and overall goals and objectives.

7. Interim measures are identified in the Strategic Plan and many have been implemented. Measures include stocking of various life stages, capture of returning adults for breeding, and a prohibition of the exploitation of sea-run salmon.

8. Social and economic factors have been considered in the program.

9. Population sizes and responses to management activities are monitored, and management activities are regularly evaluated.

### 4.5.4. Pawcatuck River

1. Background: The Pawcatuck River population is below its Conservation Limit and a stock rebuilding program has been developed.

2. A Technical Advisory Committee will be re-established to guide the implementation of management measures designed to restore or recover this population above conservation limits.

3. An evaluation of the stock status has been conducted. The native stock(s) is extinct. A restoration population is far below the Conservation Limit for the watershed.

4. An evaluation of stock decline and threats has been conducted.

F) Natural environmental change - changes have occurred since the extirpation of the native stocks but environmental conditions still appear to fall within the range of acceptability for Atlantic salmon.

G) Habitat degradation - considerable habitat degradation has occurred since the extirpation of the native stocks, particularly in terms of sedimentation, water quality and migratory barriers. However, there have been remedial actions and it is believed that the condition of the existing habitat will support Atlantic salmon.

H) Species interactions - There are many interactions with native species that are not worrisome but there are many non-native species in the basin (some of these non-natives may have negative impacts on Atlantic salmon populations).

I) Exploitation - There is no exploitation, commercial or recreation, of wild sea-returning salmon in the watershed.

J) Differential effects on stock components - Very few grilse return to the Pawcatuck River.

5. Stakeholders involved in the Pawcatuck River Anadromous Fish Restoration Program are fully engaged in activities, with roles and responsibilities well defined.

6. Management actions and measures have been planned and prioritized with the development of a Strategic Plan (Technical Committee for Anadromous Fishery Management of the Pawcatuck River Basin. 1997). The plan includes research needs, environmental and fishery management measures, hatchery production targets, and overall goals and objectives.

7. Interim measures are identified in the Strategic Plan and many have been implemented. Measures include stocking of various life stages, capture of returning adults for breeding, and a prohibition of the exploitation of sea-run salmon.

8. Social and economic factors have been considered in the program.

9. Population responses to management activities are monitored and management activities are evaluated.

## Appendix B. Federal Environmental Acts

The following are some specific federal statutes providing a mechanism for regulatory oversight in regards to commercial aquaculture, recovery and restoration activities, including introductions and transfers of salmonids:

Endangered Species Act of 1973: The purpose of the ESA is to conserve threatened and endangered species and their ecosystems. The USFWS and NMFS share responsibility for implementing the ESA. The listing of a species as endangered makes it illegal to "take" that species. Effects to listed species must be minimized and in some cases conservation efforts are required to offset any take. The ESA requires federal agencies conducting, permitting or funding activities to consult with the NMFS and USFWS to ensure that their actions will not jeopardize the continued existence of a listed species or adversely modify or destroy critical habitat. In addition, all federal agencies are directed to use their authorities to help further recovery. The information can be found online (www.fws.gov/laws/lawsdigest/ESACT.HTML).

Magnuson-Stevens Fishery Conservation and Management Act: The Magnuson-Stevens Act (MSA) authorizes the federal government to regulate fishing from 3 miles offshore out to 200 miles. The Magnuson-Stevens Act was amended in 1996 by the Sustainable Fisheries Act which made several substantive changes regarding bycatch and the conservation of habitat. Specifically, the 1996 amendments required the designation of essential fish habitat (EFH) for managed species, which includes Atlantic salmon. Effects to EFH caused by fishing are to be minimized and efforts are to be undertaken to identify other actions affecting EFH and encouraging the conservation and enhancement of EFH. EFH for Atlantic salmon includes all waters currently or historically accessible to the species within the streams, rivers, lakes, ponds, wetlands and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut. The information can be found online (www.law.cornell.edu/uscode/htm).

Pursuant to section 402 of the Federal Water Pollution Control Act (Clean Water Act [CWA]), the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point source discharges into water bodies within the US Facilities that discharge directly into water bodies must obtain a NPDES permit. In most cases the Environmental Protection Agency (EPA) authorizes states to administer the NPDES permit program. The permits issued by the state of Maine (MEPDES) also place limits on the amount of pollutants discharged and impose other conditions such as monitoring and best management practices in order to protect wild salmon stocks. The EPA retains oversight authority over MEPDES permits issued by the state of Maine, including the authority to object to a permit where EPA finds that the permit does not ensure adequate protection to Atlantic salmon. Reasonable and prudent protective measures for Atlantic salmon are included in MEPDES permits issued for discharges from Atlantic salmon farms in Maine. The information can be found online (www.fws.gov/laws/lawsdigest/FWATRPO.HTML).

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. '403) also provides for the U.S. Army Corps of Engineers (ACOE) to regulate structures within navigable waters of the US In particular, ACOE seeks to avoid adverse impacts and offset unavoidable adverse impacts to existing aquatic resources. Permit applications must be reviewed by the USFWS and the NMFS

for impacts on fish and wildlife. To comply with ESA regulations pertaining to the GOM DPS of Atlantic salmon, (for projects within the freshwater range of the GOM DPS), these reviews must ensure that issuance of the permit does not jeopardize the continued existence of the listed entity (e.g., GOM DPS). The information can be found online (www.fws.gov/laws/lawsdigest/RIV1899.HTML).

Animal Health Protection Act (H.R. 2646 Farm Bill 2002) as amended, section 1021 authorizes the Secretary of Agriculture to initiate measures to prevent, detect, control and eradicate diseases and pests essential to the protection of animal health, human health and welfare, the economic interests of the livestock and related industries, and the environment of the United States. The information can be found online (www.law.cornell.edu/uscode/html/uscode07/usc_sup_01_7_10_109.html).

Anadromous Fish Conservation Act (16 U.S.C. 757a-757f; 79 Stat.) as amended Public Law 89-304 authorizes the Secretaries of the Interior and Commerce to enter into cost sharing agreements with the states and other non-federal interests for conservation, development, and enhancement of the nation's anadromous fish (such as Atlantic salmon, Pacific salmon, shad, and striped bass). Investigations, engineering and biological surveys, research, as well as the construction, maintenance and operations of hatcheries are authorized. The information can be found online (www.fws.gov/laws/lawsdigest/ANADROM.HTML).

Fish and Wildlife Act of 1956 (16 U.S.C. 742a-742j; 70 Stat. 1119), as amended Section 7(a), among other things, authorizes the Secretary of Interior to initiate measures required for the development, enhancement, management and conservation, to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The statute requires federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources; take action to prevent loss or damage to these resources; and provide for the development and improvement of these resources. The information can be found online (www.fws.gov/laws/lawsdigest/FWACT.HTML).

Fish and Wildlife Coordination Act of 1934 (6 U.S.C. 661-66; 48 Stat. 401), as amended Under this Act the federal regulatory and construction agencies must give consideration to fish and wildlife resources in their project planning and in the review of applications for federal permits and licenses. These agencies must consult with state and federal fish and wildlife agencies regarding the possible impacts of proposed actions and obtain recommendations for fish and wildlife protection and enhancement measures. The USFWS and the NMFS provide recommendations to federal action agencies that include measures to protect fish and wildlife resources. The FWCA consultation requirement applies to water-related activities for which federal permits are required, the most significant of which are Section 404 and discharge permits under the Clean Water Act, and Section 10 permits under the River and Harbors Act described above. Agency recommendations are to be given full consideration by the permitting agency, but are not binding. However, once accepted, these recommendations are promulgated into state and federal permit requirements and are enforced through state and federal agency oversight. The specific regulations pertaining to the protection of Atlantic salmon are subject to annual audits to ensure compliance with the permit requirements. The information can be found online (www.fws.gov/laws/lawsdigest/FWCOORD.HTML).

National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, 83 Stat. 852) as amended, Title I of the 1969 National Environmental Policy Act (NEPA) requires that all federal agencies prepare detailed environmental impact statements for every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment. The 1969 statute also stipulated the factors to be considered in environmental impact statements, and required that federal agencies employ an interdisciplinary approach in related decision-making and develop means to ensure that un-quantified environmental values are given appropriate consideration, along with economic and technical considerations. The information can be found online (www.fws.gov/laws/lawsdigest/NATLEP.HTML).

## Appendix C. Cobscook Bay Management Agreement

# Maine Aquaculture Association

## Finfish Bay Management Agreement

## Appendix D. Containment Management Systems for hatchery and marine sites and Code of Containment

**PREVENTATIVE SYSTEM MANAGEMENT**
**FOR THE CONTAINMENT OF**
**AQUACULTURED SALMON AT HATCHERY SITES**
**---------**
**GENERIC, CONTAINMENT MANAGEMENT SYSTEM TEMPLATES FOR THE PREPARATION OF COMPANY-SPECIFIC CONTAINMENT MANAGEMENT AND HACCP PLANS**

**A COOPERATIVE PROJECT FUNDED THROUGH A**
**MAINE AQUACULTURE ASSOCIATION/NATIONAL FISH AND WILDLIFE FOUNDATION GRANT IN SUPPORT OF THE DEVELOPMENT OF AN AQUACULTURE CONTAINMENT SYSTEM, ESTABLISHED**
**JULY 1, 2001**
**--------**

**PREPARED FOR THE MAINE AQUACULTURE ASSOCIATION**
**BY JIM OSTERGAARD, PEREGRINATOR MARINE SERVICES**
**THOMASTON, MAINE 04861**
**MAY 17, 2002**

TABLE OF CONTENTS

**Project Overview**

In August 2000, representatives of Maine's salmon aquaculture industry and the environmental community began meeting to discuss potential areas of collaboration concerning the containment of farmed salmon. The objective for all parties was to work towards a predictable and stable regulatory climate for the aquaculture industry that minimizes interactions between sea-run salmon and farmed salmon in the waters of the State of Maine.

In May 2001, representatives of Maine's three largest salmon aquaculture companies (Atlantic Salmon of Maine, Heritage Salmon and Stolt Sea Farm), the Maine Aquaculture Association, the Atlantic Salmon Federation, the Conservation Law Foundation and Trout Unlimited all signed an agreement entitled, "Framework for a Salmon Aquaculture Containment Policy in the State of Maine". Among other things, the framework agreement provided for the "participatory development of a standard Containment Management System (CMS) that serves as a model for company plans. Individual companies (are to) develop company specific, business confidential CMS plans approved by (Maine's Department of Marine Resources) and transparent to the regulators to comply with the standards and reporting requirements and predetermined corrective actions of the standard CMS."

The intent of this collaborative agreement was to design a CMS based upon a Hazard Analysis Critical Control Point (HACCP) system, building upon the Maine Aquaculture Association's 1998 Code of Practice for the Responsible Containment of Farmed Salmon in Maine Waters. The HACCP approach to risk assessment and mitigation was first developed by the National Aeronautic and Space Administration to ensure quality control and safety in the U.S. space program and has been adopted by the U.S. Food and Drug Administration to ensure food safety in the seafood processing industry. The development of a HACCP system relies upon seven principles:

1. The development of a process flow chart describing a facility or operation.
2. An analysis of the process' hazards and risks (hazard analysis).
3. A determination of the process' critical limits, defined at Critical Control Points (CCP).
4. The development of monitoring schedules and procedures for the critical limits at each CCP.
5. The establishment of predetermined corrective actions to be taken in order to keep the process within its critical limits.
6. The establishment of a verification system.
7. The establishment of a record-keeping system and procedures.

(The accepted order of principles 6 and 7 has been recently modified to the format above by the Codex Alimentarius Commission, a World Health Organization/Food and Agriculture Organization international standards committee.)

The implementation of the CMS agreement has been aided by a National Fish and Wildlife Foundation (NFWF) grant, secured by the Maine Aquaculture Association in July 2001, entitled "Development of an Aquaculture Containment Verification System."

During the past year, a NFWF grant Advisory Committee has overseen the development of this document, generated by the collective efforts of a Containment Audit Working Group.

NFWF grant Advisory Committee members include:
Mary Colligan, National Marine Fisheries Service (NMFS)
Andrew Fisk, Maine Department of Marine Resources (DMR)
Andrew Goode, Altantic Salmon Federation (ASF)
Jeff Kaelin, Heritage Salmon, Inc. (HIS)
Mark Kesselring, Stolt Sea Farm, Inc. (SSF)
Fred Kircheis, Atlantic Salmon Commission (ASC)
Dennis Merrill, Maine Department of Environmental Protection (DEP)
Steve Page, Fjord Seafood/Atlantic Salmon of Maine (ASM)
John Phillips, The Ocean Conservancy
Jeff Reardon, Trout Unlimited (TU)
Gordon Russell, United States Fish and Wildlife Service (USFWS)
Peter Shelley, Conservation Law Foundation (CLF)
Stephen Silva, U.S. Environmental Protection Agency (EPA)

Containment Audit Working Group members include:
Ken Beland, ASC
David Bean, NMFS
Monica Daniels, NMFS
Andrew Fisk, DMR
Roger Fleming, CLF
Chris Frantsi, Heritage Salmon, Inc.
Andrew Goode, ASF
Mike Hendrix, USFWS
Bobbi Hukki, ASM
Mark Kesselring (SSF)
Sonny Pierce, Pierce Associates, Inc.
Jeff Reardon (TU)
Stephen Silva (EPA

The attached document transmits the initial work product of the Containment Audit Working Group and contains a description of the mandatory Containment Plan Components, HACCP Plan Components, Generic HACCP Plan Template, Criteria for Onsite Audits and Audit Severity Rating Worksheet.

The Containment Management System is a two-part system that includes a series of procedures that make up a mandatory prerequisite program and a HACCP-based plan that conducts a hazard analysis and assigns critical control points only to those steps in the hatchery process where there is a significant risk for the escapement of aquacultured product.

While these generic documents are not business confidential, company-specific plans will be and company personnel are advised to label them as such.

**Containment Management System Plan Components**

**Containment Plan**

The Containment Management System Plan describes with supporting documentation the system that will be implemented by each firm for each of its salmon hatchery sites. There are two major parts to the plans. They include, 1) a series of procedures that make up a mandatory prerequisite program, and, 2) a HACCP-based plan that through a hazard analysis and risk assessment assigns critical control points to the steps (control points) in a flow chart. The flow chart on which the HACCP Plan is based depicts the physical activity on the entire hatchery process from egg trays to the final transfer for transport to a marine site.

This plan must be in place and available to an independent auditor at all times.

**Prerequisite Program for Materials, Construction, Structure, Layout and Methodology**

Each firm will have in place a program that describes the operational components of the system they employ to ensure compliance with the Code for the Responsible Containment of Farmed Atlantic Salmon in Maine waters developed by the Maine Aquaculture Association (10/98). Additional criteria are described in this document. New hatchery sites must have a hazard analysis completed and the critical control points where hazards are to be controlled described prior to operation. An annual review of the Containment Management System must be undertaken by each firm for each of it's sites. Documentation of this annual verification is required.

This system is intended to reduce the likelihood of escapement of cultured salmon. It is recognized that it is unlikely a zero escapement will be achieved and it is the intent of this plan to record all escapes at each site in order build a data base of such escapes. This will be used to identify trends that may be occurring. The reporting and logging of this information will not be used to penalize site operators by the regulatory authorities. Conversely, the deliberate failure of proper reporting and logging of incidents that are later detected through the audit process will be considered a serious violation by the authorities.

All of the categories described below will be audited for compliance with the Prerequisite Program.

**1. Site plan**

A site plan or schematic illustrating, with specifications for the system, will be included in the firm's containment plan. A plan will be developed for each site. The flow chart developed as part of the HACCP plan will fulfill the site plan requirement for hatcheries. This site plan must be verified and signed off by the farm manager before inclusion in the containment system document.

The site plan will also describe the use of an effective physical containment barrier (s) appropriate to the life history of the fish. These containment barriers will be kept in place and maintained at all times when fish are in both rearing and growing units. In rearing units this barrier must be placed between the rearing unit and water exit into drain system.

All barriers are designed to eliminate escapement from specific areas of the facility, this will facilitate recapture procedures needed to recover escaped fish in the event of a compromised barrier. Barriers installed in the system may be of the screen type or some other similarly effective device used to contain fish of a specific size in a designated area. Required sites needing additional containment would be fish cultural facilities located within the DPS watersheds for listed salmon.

**2. Inventory Control Procedures**

Each firm will describe the methodology of the fish count used at the shipping step. The shipping count will in include the reasonable variance that is expected from such counts based on the firms' methodology and will be considered the inventory count for the purposes of this program.
Daily observations of effluent and overflow screens will take place at each site and documentation of the numbers of fish observed in front of such screens recorded.
Inventory methods and records associated with numbers of fish contained within rearing units used in production shall be made available to the Services in the event of a large escape from the facility. The records should provide information on the number, life stage and size of fish that escaped. Large escape events involving compromised containment barriers that could possibly lead to fish escapement into the wild would require immediate corrective action including stabilizing the situation, secondary containment within facility and notification of the appropriate personnel to further prevent escapes.
Escapes will be classed as less than 25, greater than 50 or greater than 100 fish escaping from the system. Each site will describe the daily monitoring and documentation of their last barrier. The corrective action for an observed compromise of the final barrier will include immediate contact with the appropriate agency.

**3. Predator Management Procedures**
If it is determined that predators can effect the site or system for which this plan is written, a procedure for control of such will be developed. This plan and any attendant records will be available during an audit.

**4. Response Procedures**
A site-specific response plan that demonstrates the firm's capability to take immediate corrective actions or make repairs to the site in the event of a system breakdown will be developed for each site. Stabilization of the situation will be the highest priority. Notification of the assigned agency when the last threshold (as described in the site's plan) is compromised and an escape is suspected. Contact numbers will be listed on site and employees will be trained in response procedures. It is the intent to record all escapes at the site in order build a data-base of such incidences.
On site replacement screens of an appropriate size will at a minimum be required as part of the response standby equipment.

**5. Severe Weather Preparation Procedures**
Each site will determine if the potential for severe weather or floods exists tht may compromise the containment system. If it is determined that severe weather could affect the site or system for which this plan is written, a procedure for such shall be developed.

**6. Training**
Employees who take a direct role in any aspect of this plan will have in-house and orientation training. Each site will describe this training, who is responsible for providing it and document it has taken place. The purpose of such training is to familiarize each employee in understanding control measures and their attendant monitoring, corrective actions, verification procedures and record-keeping procedures. Additional training may be required for personnel with special responsibilities for oversight of any of the procedures, event management and preparations described in this system.

**Components of the HACCP-based System for Containment**
The components that make up a HACCP plan have been developed by the Codex Alimentarius Commission, of the World Health Organization/Food and Agriculture Organization. This system was developed for the food industry and has been in place for several decades. Below the components required to make up a HACCP plan are briefly described. Compliance with these components will be determined through the systems audit process.

**Organizational Chart and Narrative**
Provide a diagram identifying your company personnel, by job description, who have responsibility for your company's site specific plan development, implementation and maintenance. Use a short narrative to describe each position and its relationship to the above diagram.

**Develop A Process Flow Chart**
A process flow diagram(s) that illustrates the operational steps the fish follow through the system is required for each site. This diagram should start at the first step in the hatchery process and continue until the fish are removed to the marine site or when ownership or responsibility is transferred at another site. This process flow chart may be used as a site plan as described under Site Plan.

**Hazard Analysis**
A Hazard Analysis for this specific site will be conducted to determine which of those operational control steps illustrated on the process flow chart are Critical Control Points.
For each step that is determined to be a Critical Control Point (CCP) the following criteria will be developed and described:
Describe where the Critical Control Point (CCP) is located and:
The hazard to be controlled at the above location

| | |
|---|---|
| A Control Mechanism | A Corrective Action |
| A Critical Limit | A Verification Procedure |
| The Monitoring Procedure | Record-Keeping Procedures |

**Verification Procedure**
Verification Procedures will be developed that verify that the Critical Limits, Monitoring Procedures and Corrective Actions at each CCP are controlling the process. Two types of verifications will be included. The first, a short-term verification, which demonstrates that the appropriate critical limit has been monitored, and, if exceeded, a corrective action has been taken. This may take the form of oversight by management that the document has been properly executed.
Each firm will conduct an annual verification to evaluate the overall effectiveness of the Containment and the HACCP-based plans. Audit data will be reviewed to determine if trends are indicated relative to system failure. A record of the results of the annual verification will be kept.

**Record Keeping Procedures**
A description of the system the firm/site will use to complete, store and verify the monitoring procedures required in either the HACCP plan and/or the Prerequisite Program for Materials, Construction, Structure, Layout and Methodology. Records will be filled out and signed at the time of the actual monitoring. Records will be available for review during an audit.

Documentation of personnel trained in the design, management, and record of the containment system.

***Generic***
***HACCP-based plan***
***Template***

This page represents a template of the cover page for the site's confidential HACCP-based plan. In order to protect confidential business practices and processes it is recommend that each page of the HACCP-based plan be marked with the words "Confidential."
These confidential documents are intended for review by auditors and regulators only as agreed to by the Advisory Committee.

A CONFIDENTIAL DOCUMENT

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

1.0 INTRODUCTION

Scope: This is a HACCP-based containment management plan developed on behalf of the fictitious Maine Salmon Hatchery, a salmon aquaculture company located in Topsfield, Maine. Included in this document in addition to the HACCP-based plan is a description of the methods used in the preventative systems management for containment at this site. Concerns with the contents of this program should be directed to the onsite HACCP Coordinator.

Describe the facility location, ownership and operational addresses. Also, a list of the members of the team assembled to manage the HACCP-based plan should be developed.

Facility
Maine Salmon Hatchery
Corporate/Operations Addresses:
Maine Salmon Hatchery
P.O. Box
Spruce Head, ME.

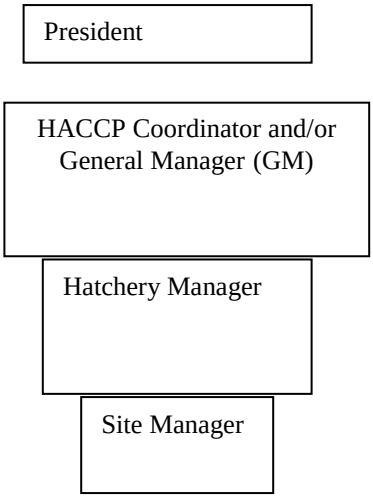
Operations Address:
Topsfield, Maine

HACCP Program Management Team & HACCP Coordinator:
Management Team:
1.
2.
3.
4.

_____ _____
Obadiah Snow Date
President
Maine Salmon Hatchery

_____ _____
Signature Date
HACCP Coordinator

1.0 Introduction
1.1 Organizational Chart




Describe the facility location, ownership and operational addresses. Also, draw a chart, which shows the flow of responsibility relative to the containment plan in your company. A list of the members of the team assembled to manage the HACCP-based plan should be developed.

1.2 Organizational Chart Narrative

| | |
|---|---|
| **President:** | The President of Maine Salmon Hatchery is responsible for the overall direction of the company. He oversees and reviews the overall |

| | |
|---|---|
| | Containment System and HACCP program with the General Manager/HACCP Coordinator. |
| **General Manager/HACCP Coordinator:** | Unless otherwise noted, the General Manager also acts as the onsite HACCP Coordinator and is herein referred to as the GM. The GM is responsible for managing the day-to-day operations of the facility; these responsibilities include employee placement and supervision, QA, all containment systems and related functions. |
| **Hatchery Manager:** | The farm manager is responsible for gathering daily containment system and HACCP program paperwork for review. The farm manager is responsible for ensuring that records are properly kept at all process points throughout the processing system. |
| **Site Manager:** | The site manger is responsible for monitoring the required CCP's and other parts of the containment system as required. The site manager is also responsible for the original signature on each required CCP record. |

## Hazard Analysis

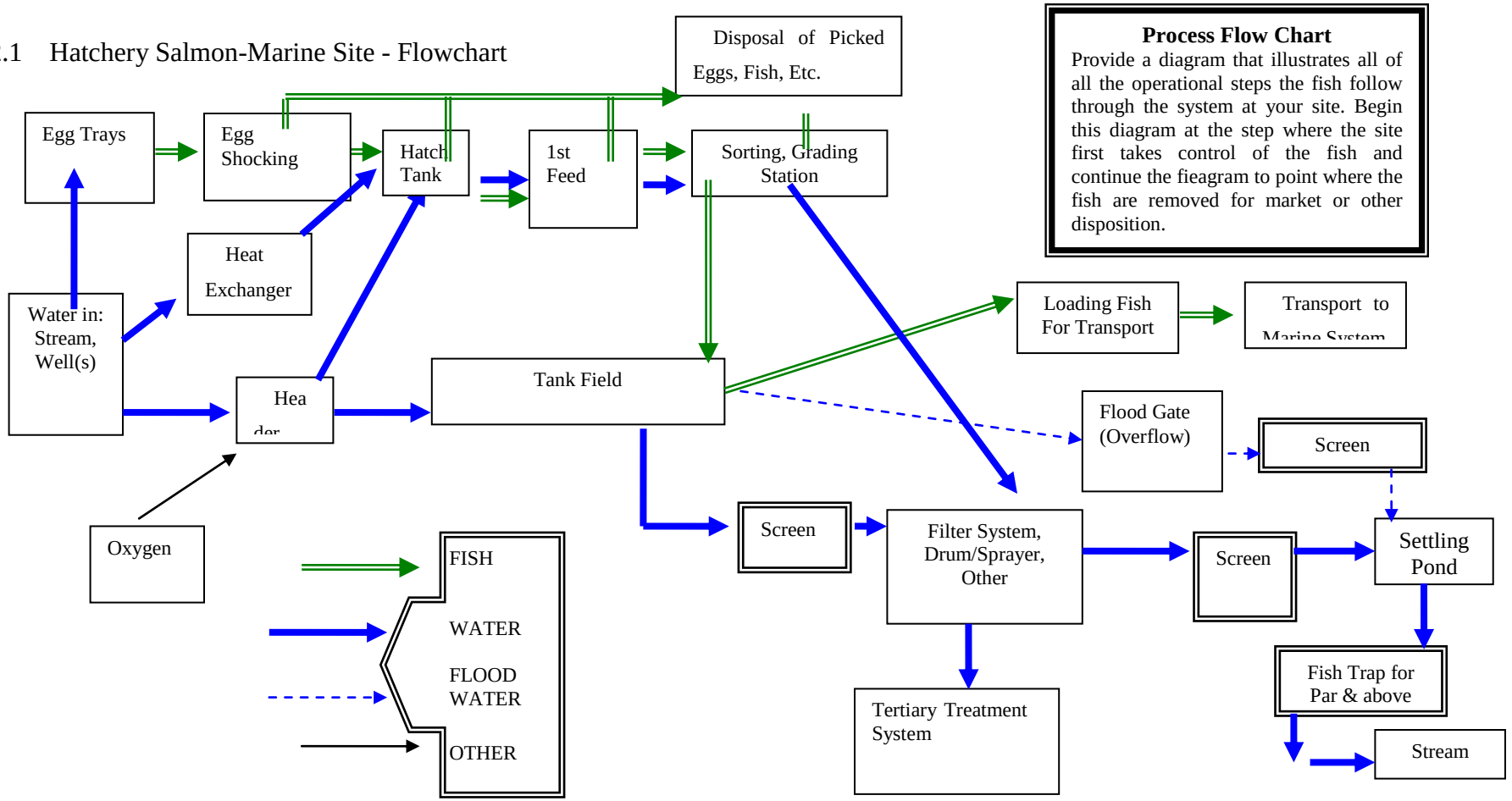
The **Hazard Analysis** of your site consists of the development of a flow chart of the operation and an analysis to determine which of those operational steps illustrated on **the process flow chart** are Critical Control Points.

2.1 Product Description and Intended end-use. **Species:** Atlantic Salmon

**2.1.1 Hatchery Salmon:** Salmon eggs are hatched and reared to smolts in a fresh water hatchery and transferred to the marine site for grow out. Salmon smolts are transferred to a marine site and control of same is transferred to the marine site within three weeks of delivery.

## Flowchart

### 2.2.1 Hatchery Salmon-Marine Site - Flowchart




**Process Flow Chart**

Provide a diagram that illustrates all of all the operational steps the fish follow through the system at your site. Begin this diagram at the step where the site first takes control of the fish and continue the fieagram to point where the fish are removed for market or other disposition.

**Hazard Analysis Worksheet Template**
On the hazard analysis worksheet template determine which of those operational control steps illustrated on your process flow chart are Critical Control Points. Use the determinations established by the Working Group, below.

Hazard Analysis

2.3.1 **Hatchery Site** Hazard Analysis Worksheet for **Fish Flow** **1 of 2**

| **(1)**<br><br>**Process step** | **(2)**<br>**Identify potential hazards.** | **(3)**<br>**Is the potential for escape significant? (Yes/No)** | **(4)**<br>**Justify your decision for column 3** | **(5)**<br>**What control measures(s) can be applied to prevent the significant hazard?** | **(6)**<br>**Is this step a CCP (Yes/No)** |
|---|---|---|---|---|---|
| Egg Trays | Egg Escape | Yes | Without proper preventive screening eggs may make their way into local waters. Local waters may be to cold for egg survival. | Installation of screens of appropriate size placed between unit and streams | No |
| Egg Shocking | EGG Escape | Yes | Without proper preventive screening eggs may make their way into local waters. Local waters may be to cold for egg survival. | Installation of screens of appropriate size placed between unit and streams e | No |
| Hatch Tank | EGG/FISH ESCAPE | Yes | Without proper preventive screening eggs/fish may make their way into local waters. Local waters may be to cold for egg survival. | Installation of screens of appropriate size placed between unit and streams | No |
| First Feed | FISH ESCAPE | Yes | Without proper preventive screening fish may make their way into local waters. | Installation of screens of appropriate size placed between unit and streams | No |
| Grading and Sorting | FISH ESCAPE | Yes | Without proper preventive screening fish may make their way into local waters. | Installation of screens of appropriate size placed between unit and streams | No |
| Tank Field | FISH ESCAPE | Yes | Without proper preventive screening fish may make their way into local waters. | Installation of screens of appropriate size placed between unit and streams | No |

| | | | | | |
|---|---|---|---|---|---|
| Transfer to Marine Site | FISH ESCAPE | Yes | Without proper preventive screening fish may make their way into local waters. Following of standard operating procedures for transfer. | Installation of jump under transfer device | YES |

2.0 Hazard Analysis

2.3.1 **Hatchery Site** Hazard Analysis Worksheet - **Water Flow** **2 of 2**

| **(1)**<br><br>**Process step** | **(2)**<br>**Identify potential hazards introduced, at this step?** | **(3)**<br>**Is the potential for escape significant?**<br>**(Yes/No)** | **(4)**<br>**Justify your decision for column 3** | **(5)**<br>**What control measures(s) can be applied to prevent the significant hazard?** | **(6)**<br>**Is this step a CCP (Yes/No)** |
|---|---|---|---|---|---|
| Screens | Fish Escape | Yes | Without proper preventive screening eggs/fish may make their way into local waters. | Installation of screens of appropriate size placed between unit and streams | Yes |
| Filter System | Fish Escape | Yes | Without proper preventive screening eggs/fish may make their way into local waters. Monitoring of filter system needed to prevent screen failure | Installation of screens of appropriate size placed between unit and streams e | Yes |
| Fish Trap | FISH ESCAPE | Yes | Without proper preventive screening eggs/fish may make their way into local waters. | Installation of screens of appropriate size placed between unit and streams | Yes |

***Hazard Analysis Critical Control Point (HACCP ) Plan***

A CONFIDENTIAL DOCUMENT

The page is a template for the cover page of the site's confidential HACCP based plan. In order to protect confidential business practices and processes it is recommended that each page of the HACCP-based plan be marked with the words "Confidential."
These documents are intended for the review by auditors and regulators as agreed to by the advisory committee only.

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

**3.0 HACCP Plan**

**3.1.1 Hatchery Site Salmon HACCP Plan** **1 of 3**

**Chart Format**

The following three pages represents a template in chart format that may be used to describe the controls established at each Critical Control Point.

HACCP PLAN FORM

Firm Name: Maine Salmon Hatchery
Firm Address: P.O. Box
Spruce Head, Me.

Site Location: Topsfield, Maine.
Type of Site: Land Based Hatchery.

Date Excepted:
Signature:

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| Filters | Fish Escape | In place and operational | Filter System | Visually | Daily | Site Manager or designee | -A plugged filter will be cleared and down stream filter or fish trap monitored to detect potential fish escape. If a fish escapes is suspected due to failure of integrity of the screen a replacement will be installed and notification of the appropriate agency will be completed within 24 hours or by the next working day. | -Daily records review<br>-Annual plan review | - Screen - Filter Log or Daily Ops Log<br>-Corrective Action Report |

**3.0 HACCP Plan**

**3.1.1 Hatchery Site Salmon HACCP Plan** **2 of 3**

HACCP PLAN FORM

Firm Name: Maine Salmon Hatchery Site Location: Topsfield, Maine.

Firm Address: P.O. Box
Spruce Head, Me. Type of Site: Land Based Hatchery.

Date Excepted: Signature:

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| Screens | Fish Escape | Screen of appropriate size based on life stage of fish in place and effective at all times | Screen | Visually | Once each day | Site Manager or designee | -If a fish escapes is suspected due to failure of integrity of the screen a replacement will be installed and notification of the appropriate agency will be completed within 24 hours or by the next working day. | -Daily records review<br><br>-Annual plan review | -- Screen - Filter Log or Daily Ops Log<br><br>-Corrective Action Report |

**3.0 HACCP Plan**

**3.1.1 Hatchery Site Salmon HACCP Plan 3 of 3**

Firm Name: Maine Salmon Hatchery Site Location: Topsfield, Maine.

Firm Address: P.O. Box, Spruce Head, Me. Type of Site: Land Based Hatchery.

Date Excepted: Signature:

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| Fish Trap | Fish Escape | Daily Observation | Trap | Visually | Daily | Site Manager or designee | -If a fish escapes is suspected due to failure of integrity of the trap a replacement will be installed and notification of the appropriate agency will be completed within 24 hours or by the next working day. | -Daily records review<br>-Annual plan review | -Screen - Filter/Trap Log or Daily Ops Log<br>-Corrective Action Report |
| Smolt Transfer Hatchery site to transport vehicle | Fish Escape | Jump net is in place and secured prior to transfer of any fish | Jump net | Visually | Each shipment (continuos) | Site Manager or designee | -If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified so fish cannot escape. | -Daily records review<br>-Annual plan review | -Smolt Shipment Log<br>-Corrective Action Report |

**Narrative Format**
Some operators may prefer to develop the description of the controls established at each Critical Control Point in a Narrative rather than a Chart format. The next six pages represents a template of the Narrative format.

3.0 HACCP Plan
3.2.1 Filters
**Critical Control Point:** Yes

**Hazard or Defect:**
1. Fish Escape
**Critical Limits:**
1. Filters are in place and operational
**Monitoring Procedures:**
1. Filters will be visually checked once a day by the site manager or designee.
**Corrective Actions:**
1. If a filter is observed is not operational, the filter will be cleared and down stream filter or fish trap monitored to detect potential fish escape. If a fish escape is suspected due to failure of integrity of the screen a replacement will be installed and notification of the appropriate agency will be completed within 24 hours or by the next working day.

**Verification Procedures:**
1. Daily records review
2. Annual plan review

**Record Keeping Procedures:**
1.

**Records:**
1. Screen/Filter or Daily Ops. Log
2. Corrective Action Report

3.0 HACCP Plan
3.2.1 Screens
**Critical Control Point:** Yes

**Hazard or Defect:**
1. Fish Escape
**Critical Limits:**
1.
**Monitoring Procedures:**
1.
**Corrective Actions:**
1.

**Verification Procedures:**
1. Daily records review
2. Annual plan review

**Record Keeping Procedures:**
1.

**Records:**1. 2.Corrective Action Report
3.0 HACCP Plan
3.2.1 Fish Trap
**Critical Control Point:** Yes

**Hazard or Defect:**
1. Fish Escape
**Critical Limits:**
1.
**Monitoring Procedures:**
1.
**Corrective Actions:**
1.

**Verification Procedures:**
1. Daily records review
2. Annual plan review

**Record Keeping Procedures:**
1.

**Records:**
1. Smolt Transfer Log / Corrective Action Report
2. Corrective Action Report

3.0 HACCP Plan
3.2.1 Smolt Transfer – Facility to Transport Vehicle
**Critical Control Point:** Yes

**Hazard or Defect:**
1. Fish Escape
**Critical Limits:**
1. Jump net is in place and secured prior to any transfer
**Monitoring Procedures:**
1. The site manager or designee will visually monitor and record that the jump net is in place and properly secured prior to transfer of fish from the shore to the transfer vessel.
**Corrective Actions:**
1. If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified if necessary so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:**
1. Daily records review
2. Annual plan review

**Record Keeping Procedures:**

1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:**

1. Smolt Transfer Log / Corrective Action Report
2. Corrective Action Report

***Program for Materials, Construction, Structure, Layout and Methodology***

## 4.0 Program for Materials, Construction, Structure, Layout and Methodology

### 4.1 Site plan

A site plan or schematic with specifications for the system for which this specific plan is designed will be included in the firm's containment plan. A plan will be developed for each site illustrating the site. The flow chart developed as part of the HACCP plan will fulfill the site plan requirement. It will be verified by the farm manager before inclusion in the containment system document. This verification requires a signature.
In addition each site will describe the number and location of appropriate barriers.

### 4.2 Inventory Control Procedures

Each firm will describe the methodology of the fish count used at the shipping step. The shipping count will in include the reasonable variance that is expected from such counts based on the firms' methodology and will be considered the inventory count for the purposes of this program.
Minimum of daily observations of effluent and overflow screens will take place daily at each site and documentation of the numbers of fish observed in such screens recorded.

### 4.3 Predator Management Procedures

All operators will develop and include in their containment plan a site-specific integrated predator deterrent plan.

### 4.4 Response Procedures

A site-specific response plan which demonstrates the firm's capability to take immediate corrective actions or make repairs to the site in the event of a system breakdown will be developed for each site. Stabilization of the situation will be the highest priority. Notification of the Maine Department of Marine Resources and the required protocols when the last barrier is compromised is required. Contact numbers will be listed on site and employees will be trained in response procedures. It is the intent to record all escapes at the site in order build a data base of such incidences.

### 4.5 Unique Event Management

An assessment of the potential for escapement due to an unusual occurrence (tank event, rejection of dead fish at delivery) and procedures developed where necessary. Such procedures will outline steps for request for assistance from any appropriate agency.

### 4.6 Severe Weather Preparation Procedures

Each site will determine if the potential of severe weather or floods exists. If it is determined that severe weather could affect the site or system for which this plan is written, a procedure for such will be developed.

### 4.7 Training

Employees who take a direct role in any aspect of this plan will have in-house and orientation training. Each site will describe this training, who is responsible for providing it and document it has taken place. The purpose of such training is to familiarize each employee in understanding control measures and their attendant monitoring, corrective actions, verification procedures and record-keeping procedures. Additional training my be required for personnel with special responsibilities for oversight of any of the procedures, event management and preparations described in this system.

***Records & Attachments***

Copies of all the records and any other documents used to substantiate observations are attached to the site's Containment plan in this section.

5.0 Records & Attachments

5.1 Smolt Transfer log

Smolt Transfer log

Reviewed by: _____ Date: _____

Maine Salmon Hatchery Topsfield, Maine

5.0 Records & Attachments

5.2 Corrective Action Report

Corrective Action Report -Maine Salmon Hatchery, Top Island, Maine

Date: Weather Conditions:

Site:

Deviation:

_____

_____

_____

_____

_____

Corrective Action taken:

Number of fish escaped:

Signature: Date:

Reviewed by: Date:

**Audit Criteria for the Salmon Containment System**

**Introduction**

The criteria listed below will be those standards upon which the hatchery system audit will be held.
All barriers will designed to reduce the likelihood of escapement from specific areas of the facility, this will facilitate recapture procedures needed to recover escaped fish in the event of a compromised barrier. Barriers installed in the system may be of the screen type or some other similarly effective device used to contain fish of a specific size in a designated area.
The criteria below will be considered the most stringent for audits of hatcheries that discharge into watersheds currently supporting sea run salmon. In watersheds outside current sea run salmon waters the containment criteria may be modified depending on whether or not a significant risk exists.
Severity ratings on the System Audit Checklist shall be followed. If either a minor, major or serious deficiency is not corrected within the prescribed time such deficiency will be moved up to the next or more serious criteria.
There are four levels of deficiencies found on the Systems Audit Checklist. In ascending order of severity they are: Minor, Major, Serious and Critical. A Minor deficiency is one that must be remedied prior to the next audit. A Major deficiency must be remedied in the time specified for the category to which it is applied. A Serious deficiency shall me addressed immediately. A Critical deficiency that all by itself indicates the probability of a fish escape must be remedied immediately and, a report of a possible escape is mandatory. The criteria listed below include those (A,B,C) which relate to the performance of the HACCP Plan itself and remaining are criteria used to judge the methods used to conform to the remaining criteria.
The deficiencies noted by the auditor during an audit are cumulative. They are totaled at the end of the audit and the totals are used to determine the facilities level of compliance.

**A. Records**

All records that support both the Prerequisite Program and HACCP plan will be up to date, with complete data including a signature of the monitoring personnel. Records will accurate and will show verification by management. No falsified documents are permitted. Records will be collected and or collated to a point of summary no later than every ten days.

**B. Procedures**

Control measures that are designed into the system must be followed or taken unless supported by documentation that another equally effective control action was taken. All Critical limits will be complied with and the subsequent monitoring procedure undertaken as designed into the site-specific system. When a critical limit has been exceeded it is required that a corresponding corrective action be undertaken. A record of such corrective action must accompany the original record.

**C. Other**

Each facility or site will have in place a written containment system developed under the guidelines in the document entitled " Preventive Systems Management for the Containment of Aquacultured Salmon at hatchery sites. This document will be made available to the system auditor. This document will be reviewed on an annual basis by the facility (annual verification) and if changes are made they will be incorporated into a new version or the most current version of this document.

**1. Site Plan**

A signed (verified) site plan or schematic with descriptions and specifications for the system in place will be included in the firm's containment plan. Such a plan or schematic will illustrate all containers; egg/fish transfer points, effluent exits and clean water return to streams. The site plan will be updated when new materials of a different specification are installed or when otherwise modified. Maintenance records may be audited to verify that changes in gear or materials occurred. Such records may be attached to the up schematic prior to completion of new site plan.

An effective physical containment barrier appropriate to the life of the history will be kept in place and maintained at all times when fish are on the site. An effective physical containment barrier appropriate to the life stage of fish being reared will be kept in place and maintained at all times when fish are in rearing units. In rearing units this barrier must be placed between the rearing unit and water exit into drain system.

All required sites needing additional containment barriers shall have in place both a three barrier system for fish 2-5 grams and a two barrier system for fish 5 grams and larger.

The three barrier system will include one barrier at the incubation/rearing unit, one barrier at the effluent from the hatch house/fry rearing area and a third barrier placed inline with the entire effluent from the facility, each barrier will be appropriate to the size of fish being contained.

The two barrier system will include one barrier at the individual rearing unit drain and one barrier inline with the total effluent from the facility. This barrier must be placed between tanks and water exit into streams or other public waterways.

In a system where drum filters are used and the mesh size is equal to or smaller than the above requirement it will meet the above requirement for a barrier. Backwash flow shall have a barrier in place.

Maintenance and replacements records will be kept and be available to the auditor.

**2. Inventory Management Procedures**

Each site will use the final count of fish at the shipping (trucking) step. Each facility will describe the final inventory methodology of such count and this description will include the variance in such methods. Supporting documents will be available during the audit.

In addition, through the daily observation of the last containment barrier, the following actions must be taken. If it is determined low numbers of fish are escaping from rearing areas (less than 25) the causes and resolution of the failure requires documentation. When it is determined that more than 50 fish have escaped from the rearing area, fish will be recovered from the system and this corrective action documented. In the event of high numbers of fish escaping from rearing areas corrective action must be taken immediately to prevent further escapement and to recover the fish from the system.

**3. Predator Management Procedures**

If it is determined that there is significant risk of predators then each site or general site area shall develop a narrative describing all the control measures that will be put in place. All active measures will be monitored and a log will be kept that verifies the described procedures are observed where required.

**4. Response Procedures**

The Department of Marine Resources will be contacted if an escape of 500 or more fish occurs. Contact numbers for reporting to DMR within 48 hours of an occurrence will be posted as well as a list of trained personnel available to respond in the event of such an escape. Training shall, at a minimum

consist of team member identification and the assigning of responsibilities, a leadership role and an understanding of the risk to the sea run salmon.

**4.A Contact Protocol**

The protocol below is current as of May 17, 2002. It will be updated every quarter by the Maine Department of Marine Resources and distributed to each Salmon facility.

**Primary contact:** During week, DMR, Aquaculture Coordinator, 624-6554 / andrew.c.fisk@state.me.us

**Off-hours**, Orono State Police Dispatch 1-800-432-7381

Person filing report to State Police must provide the following information:

They should indicate that they are notifying the Maine Marine Patrol of a reportable escape event at either a marine cage or hatchery. They should identify the location, DMR site ID for marine cages, contact person and number, time of event, estimated size of escape, and actions being taken.

Dispatch will then contact the Marine Patrol's Officer of the Day (they have 24/7 coverage) who will then contact:

Andrew Fisk 588-0074 (h) and leave a message with same information from above AND - Leave a message at Commissioner's office 624-6553 with same information from above.

Following notification DMR will contact:Marine & hatchery sites:

EPA Office of Environmental Stewardship, Maine Water Enforcement Officer (tel.)617-918-1811

NMFS Aquaculture Coordinator, David Bean (tel.) 978-281-9133

USFWS Endangered Species Coordinator, (tel.) 207-827-5938

USFWS, Maine Rivers Coordinators Office, (tel.) 207-469-6701

U.S. Army Corps of Engineers, Maine Project Office, (tel.) 207-623-8367

Maine DMR Finfish Aquaculture Monitoring Program, Jon Lewis (tel.) 207-633-9594

Maine Atlantic Salmon Commission, Joan Trial 941-4452 / joan.trial@state.me.us

Response equipment is to be available as described in the sites written response procedures. This equipment will at a minimum consist of replacement screens or devices for each required barrier located at the hatchery site.

**5. Severe Weather Preparation Procedures**

Written if needed. Justification if not needed. Details of personnel responsibilities and protocols for severe weather events must be available and personnel conversant in such protocols. The protocols will detail procedures for dealing with flooding and or power outages.

**6. Training**

Documentation will be provided that shows individuals have been trained to undertake the responsibilities of any procedure in the system that is part of their job responsibilities as outlined in the containment plan. An outline of facilities training will be available for review.

**MAINE AQUACULTURE ASSOCIATION**
**CONTAINMENT MANAGEMENT SYSTEM**
**---------**
**GENERIC, CONTAINMENT MANAGEMENT SYSTEM TEMPLATES FOR THE PREPARATION OF COMPANY-SPECIFIC CONTAINMENT MANAGEMENT AND HACCP PLANS**

**A COOPERATIVE PROJECT FUNDED THROUGH A**
**MAINE AQUACULTURE ASSOCIATION/NATIONAL FISH AND WILDLIFE FOUNDATION GRANT IN SUPPORT OF THE DEVELOPMENT OF AN AQUACULTURE CONTAINMENT SYSTEM, ESTABLISHED JULY 1, 2001**
**--------**

**PREPARED FOR THE MAINE AQUACULTURE ASSOCIATION**
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**THOMASTON, MAINE 04861**
**MAY 17, 2002**

**TABLE OF CONTENTS**

**Project Overview**

In August 2000, representatives of Maine's salmon aquaculture industry and the environmental community began meeting to discuss potential areas of collaboration concerning the containment of farmed salmon. The objective for all parties was to work towards a predictable and stable regulatory climate for the aquaculture industry that minimizes interactions between sea-run salmon and farmed salmon in the waters of the State of Maine.

In May 2001, representatives of Maine's three largest salmon aquaculture companies (Atlantic Salmon of Maine, Heritage Salmon and Stolt Sea Farm), the Maine Aquaculture Association, the Atlantic Salmon Federation, the Conservation Law Foundation and Trout Unlimited all signed an agreement entitled, "Framework for a Salmon Aquaculture Containment Policy in the State of Maine". Among other things, the framework agreement provided for the "participatory development of a standard Containment Management System (CMS) that serves as a model for company plans. Individual companies (are to) develop company specific, business confidential CMS plans approved by (Maine's Department of Marine Resources) and transparent to the regulators to comply with the standards and reporting requirements and predetermined corrective actions of the standard CMS."

The intent of this collaborative agreement was to design a CMS based upon a Hazard Analysis Critical Control Point (HACCP) system, building upon the Maine Aquaculture Association's 1998 Code of Practice for the Responsible Containment of Farmed Salmon in Maine Waters. The HACCP approach to risk assessment and mitigation was first developed by the National Aeronautic and Space Administration to ensure quality control and safety in the U.S. space program and has been adopted by the U.S. Food and Drug Administration to ensure food safety in the seafood processing industry. The development of a HACCP system relies upon seven principles:

8. The development of a process flow chart describing a facility or operation.
9. An analysis of the process' hazards and risks (hazard analysis).
10. A determination of the process' critical limits, defined at Critical Control Points (CCP).
11. The development of monitoring schedules and procedures for the critical limits at each CCP.
12. The establishment of predetermined corrective actions to be taken in order to keep the process within its critical limits.
13. The establishment of a verification system.
14. The establishment of a record-keeping system and procedures.

(The accepted order of principles 6 and 7 has been recently modified to the format above by the Codex Alimentarius Commission, a World Health Organization/Food and Agriculture Organization international standards committee.)

The implementation of the CMS agreement has been aided by a National Fish and Wildlife Foundation (NFWF) grant, secured by the Maine Aquaculture Association in July 2001, entitled "Development of an Aquaculture Containment Verification System."

During the past year, a NFWF grant Advisory Committee has overseen the development of this document, generated by the collective efforts of a Containment Audit Working Group.

NFWF grant Advisory Committee members include:

Mary Colligan, National Marine Fisheries Service (NMFS)
Andrew Fisk, Maine Department of Marine Resources (DMR)
Andrew Goode, Altantic Salmon Federation (ASF)
Jeff Kaelin, Heritage Salmon, Inc. (HIS)
Mark Kesselring, Stolt Sea Farm, Inc. (SSF)
Fred Kircheis, Atlantic Salmon Commission (ASC)
Dennis Merrill, Maine Department of Environmental Protection (DEP)
Steve Page, Fjord Seafood/Atlantic Salmon of Maine (ASM)
John Phillips, The Ocean Conservancy
Jeff Reardon, Trout Unlimited (TU)
Gordon Russell, United States Fish and Wildlife Service (USFWS)
Peter Shelley, Conservation Law Foundation (CLF)
Stephen Silva, U.S. Environmental Protection Agency (EPA)

Containment Audit Working Group members include:
Ken Beland, ASC
David Bean, NMFS
Monica Daniels, NMFS
Andrew Fisk, DMR
Roger Fleming, CLF
Chris Frantsi, Heritage Salmon, Inc.
Andrew Goode, ASF
Mike Hendrix, USFWS
Bobbi Hukki, ASM
Mark Kesselring (SSF)
Sonny Pierce, Pierce Associates, Inc.
Jeff Reardon (TU)
Stephen Silva (EPA

The attached document transmits the initial work product of the Containment Audit Working Group and contains a description of the mandatory Containment Plan Components, HACCP Plan Components, Generic HACCP Plan Template, Criteria for Onsite Audits and Audit Severity Rating Worksheet.

The Containment Management System is a two-part system that includes a series of procedures that make up a mandatory prerequisite program and a HACCP-based plan that conducts a hazard analysis and assigns critical control points only to those steps in the marine site process where there is a significant risk for the escapement of aquacultured product.

While these generic documents are not business confidential, company-specific plans will be and company personnel are advised to label them as such.

**Containment Management System Plan Components**

The containment plan is based on a two-part system that includes ; 1) a series of procedures that make up a mandatory prerequisite program, and; 2) a HACCP-based plan that conducts a hazard analysis and assigns critical control points only to those steps in the marine site process where there is a significant risk for the escapement of the aquacultured product.
This plan must be in place and available to an independent auditor at all times.

**Prerequisite Program for Materials, Construction, Structure, Layout and Methodology**

Each firm will have in place prior to operating a lease site a program that describes the operational components of the system they employ to ensure compliance with the Code for the Responsible Containment of Farmed Atlantic Salmon in Maine waters developed by the Maine Aquaculture Association (10/98). Additional criteria are described in this document. New sites must have a hazard analysis completed and critical control points described prior to operation. An annual review of the Containment Management System must be undertaken by each firm for each of it's sites. Documentation of this annual verification is required.
This system is intended to reduce the likelihood of escapement of cultured salmon. It is recognized that it is unlikely a zero escapement will be achieved and it is the intent of this plan to record all escapes at each site in order build a data base of such escapes. This will be used to identify trends that may be occurring. The reporting and logging of this information will not be used to penalize site operators by the regulatory authorities. Conversely, the deliberate failure of proper reporting and logging of incidents that are later detected through the audit process will be considered a serious violation by the authorities. All of the categories described below will be audited for compliance with the Prerequisite Program.

**1. Site plan**
A site plan or schematic with specifications for the system for which this specific plan is designed will be included in the firm's containment plan. A plan will be developed for each site illustrating the mooring setup, cage location, impacting current direction and mooring specifications. The site plan must be verified by the farm manager prior to inclusion in the containment system. This verification requires a signature.
In addition, a copy of the lease from the State of Maine will be attached to this plan.

**2. Mooring System**
Mooring system specification will comply with the most current Code of Containment developed by the Maine Aquaculture Association and or other criteria as developed.

**3. Net System**
Net system specifications will comply with the most current Code of Containment developed by the Maine Aquaculture Association and or other criteria as developed.

**4. Cage System**
Cage system specifications will comply with the most current Code of Practice developed by the Maine Aquaculture Association and or other criteria as developed.

**5. Inventory Control Procedures**
Each firm will develop from their current inventory control system a procedure that demonstrates that fish inventory is within current allowable percentages, thus supporting no escapes have occurred. This procedure will be updated whenever new and more accurate inventory control systems are implemented.

**6. Predator Control Procedures**
All operators will develop and include in their containment plan a site-specific integrated predator deterrent plan, which may include sonic devices, nets and/or other techniques. The predator deterrent plan will be based upon the best available science and/or the most current industry techniques and will comply with the most current code of containment.
Sites which have no predator nets in place, if they experience a seal attack , will document the attack as an unusual occurrence. If new evidence indicates the potential for seal predation, a site without predator nets in place will conduct a new risk assessment.

**7. Severe Weather Preparation Procedures**
A risk assessment will be conducted to determine possibilities for system failure during severe weather. Methodologies will be described which reduce the likelihood of cage failure If the site is located where ocean storms or other severe weather events are likely to negatively impact the cage system. A storm event procedure will be developed and will detail tasks and responsibilities for those employees assigned to stand by during the event. Procedures for cover net installation will be described.

**8. Escape Response Procedures**
A site-specific response plan will be developed which demonstrates the operator's capability to take immediate corrective actions or make repairs to the site in the event of a system breakdown. This will include a description of vessel capabilities, when needed to carry out the response, and where escape response equipment (if required) is stored. The planned response time will be included in the procedures as will a list of personnel to be contacted and their responsibilities for an event requiring a response. The primary focus of this plan is to stabilize the situation at the site in as short time as possible or as soon as practical without risk of injury to any responders. The Maine Department of Marine Resources will be contacted within 48 hours of an escapement of greater than 500 fish. It is the intent to record all escapes at the site in order build a database of such incidences.

**9. Training**
Employees who take a direct role in any aspect of this plan will have training. The purpose of such training is to familiarize each employee in understanding control measures and their attendant monitoring, corrective actions, verification procedures and record-keeping procedures. Additional training may be required for personnel with special responsibilities for oversight of any of the procedures, event management and preparations described in this system
.

## HACCP Plan Components

The components that make up a HACCP plan have been developed by the Codex Alimentarius Commission, of the World Health Organization/Food and Agriculture Organization. This system was developed for the food industry and has been in place for several decades. Below the components required to make up a HACCP plan are briefly described. Compliance with these components will be determined through the systems audit process.

**Organizational Chart and Narrative**
Provide a diagram identifying your company personnel, by job description, who have responsibility for your company's site specific plan development, implementation and maintenance. Use a short narrative to describe each position and its relationship to the above diagram.

**A Process Flow Chart**
Provide a diagram in the style of a flow chart that illustrates all the operational steps the fish follow through the system at your site. Start this diagram at the step where the site takes control of the fish and continue until the fish are removed for market or other considerations.

**Hazard Analysis**
A Hazard Analysis for this specific site will be conducted to determine which of those operational control steps illustrated on the process flow chart are Critical Control Points. The Hazard Analysis will be included as part of the individual site plan. For each step that is determined to be a Critical Control Point (CCP) the following criteria will be developed and described in either the narrative format or in chart form but not both.

The location (Critical Control Point or CCP) of the identified hazard
The hazard to be controlled at the above location
Control Mechanism
Critical Limit
Monitoring Procedure
Corrective Action
Verification Procedure
Record-Keeping Procedures

**Verification Procedures**
Verification Procedures will be developed that verifies that the Critical Limits, Monitoring Procedures and Corrective Actions at each CCP are controlling the process. Two types of verifications will be included. The first, a short-term verification, which demonstrates that the appropriate critical limit has been monitored, and, if exceeded, a corrective action has been taken. This may take the form of oversight by management that the document has been properly executed.
Second, the firm, in order to evaluate the overall effectiveness of the containment and the HACCP-based plans, will conduct an annual verification. Audit data will be reviewed to determine if trends are indicated relative to system failure. A record of the results of the annual verification will be kept.

**Record Keeping Procedures**
A description of the system the firm/site will use to complete, store and verify the monitoring procedures required in either the HACCP plan and/or the Prerequisite Program for Materials, Construction, Structure, Layout and Methodology. Records will be filled out and signed at the time of

the actual monitoring.  Records will be available for review during an audit. Documentation of personnel trained in the design, management, and record of the containment system.

*Generic*
*HACCP-based plan*
*Template*

This page represents a template of the cover page for the site's confidential HACCP-based plan. In order to protect confidential business practices and processes it is recommend that each page of the HACCP-based plan be marked with the words "Confidential."
These confidential documents are intended for review by auditors and regulators only as agreed to by the Advisory Committee.

A CONFIDENTIAL DOCUMENT

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

## 2.0 INTRODUCTION

Scope: This is a HACCP-based containment management plan developed on behalf of the fictitious Maine Salmon Farms a salmon aquaculture company located in Beals Island, Maine. Included in this document in addition to the HACCP-based plan is a description of the methods used in the preventative systems management for containment at this site. Concerns with the contents of this program should be directed to the onsite HACCP Coordinator.

Describe the facility location, ownership and operational addresses. Also, a list of the members of the team assembled to manage the HACCP-based plan should be developed.

### 2.1 Facility

Maine Salmon Farms

### 2.2 Corporate/Operations Addresses:

Corporate address:
Maine Salmon Farms
P.O. Box
Spruce Head, ME.

Operations Address:
Beals Island, Maine

### 2.3 HACCP Program Management Team & HACCP Coordinator:

Management Team:

1.
2.
3.
4.

_____ _____

Obadiah Snow — Date
President
Maine Salmon Farms

HACCP Coordinator:

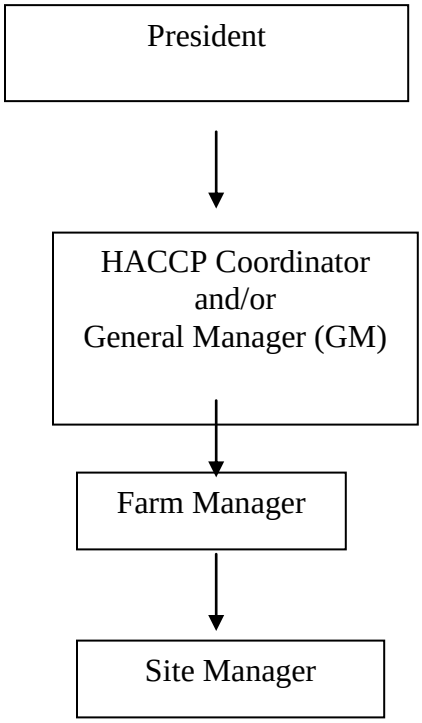
_____ _____

Signature — Date

1.0 Introduction

2.4 Organizational Chart

Provide a diagram identifying your company's personnel, by job description, who have responsibility for your company's site specific plan development, implementation and maintenance. Use a short




1.0 Introduction

2.5 Organizational Chart Narrative

| | |
|---|---|
| **President:** | The President of Maine Salmon Farms is responsible for the overall direction of the company. He oversees and reviews the overall Containment Management System and HACCP program with the General Manager/HACCP Coordinator. |
| **General Manager/HACCP Coordinator:** | Unless otherwise noted, the General Manager also acts as the onsite HACCP Coordinator and is herein referred to as the GM. The GM is responsible for managing the day-to-day operations of the facility; these responsibilities include employee placement and supervision, quality assurance, all containment systems and related functions. |
| **Farm Manager:** | The farm manager is responsible for gathering daily containment system and HACCP program paperwork for review. The farm manager is responsible for ensuring that records are properly kept at all process points throughout the processing system. |
| **Site Manager:** | The site manger is responsible for monitoring the required CCP's and other parts of the containment system as required. The site manager is also responsible for the original signature on each required CCP record. |

**Hazard Analysis**

The **Hazard Analysis** of your site consists of the development of a flow chart of the operation and an analysis to determine which of those operational steps illustrated on **the process flow chart** are Critical Control Points.

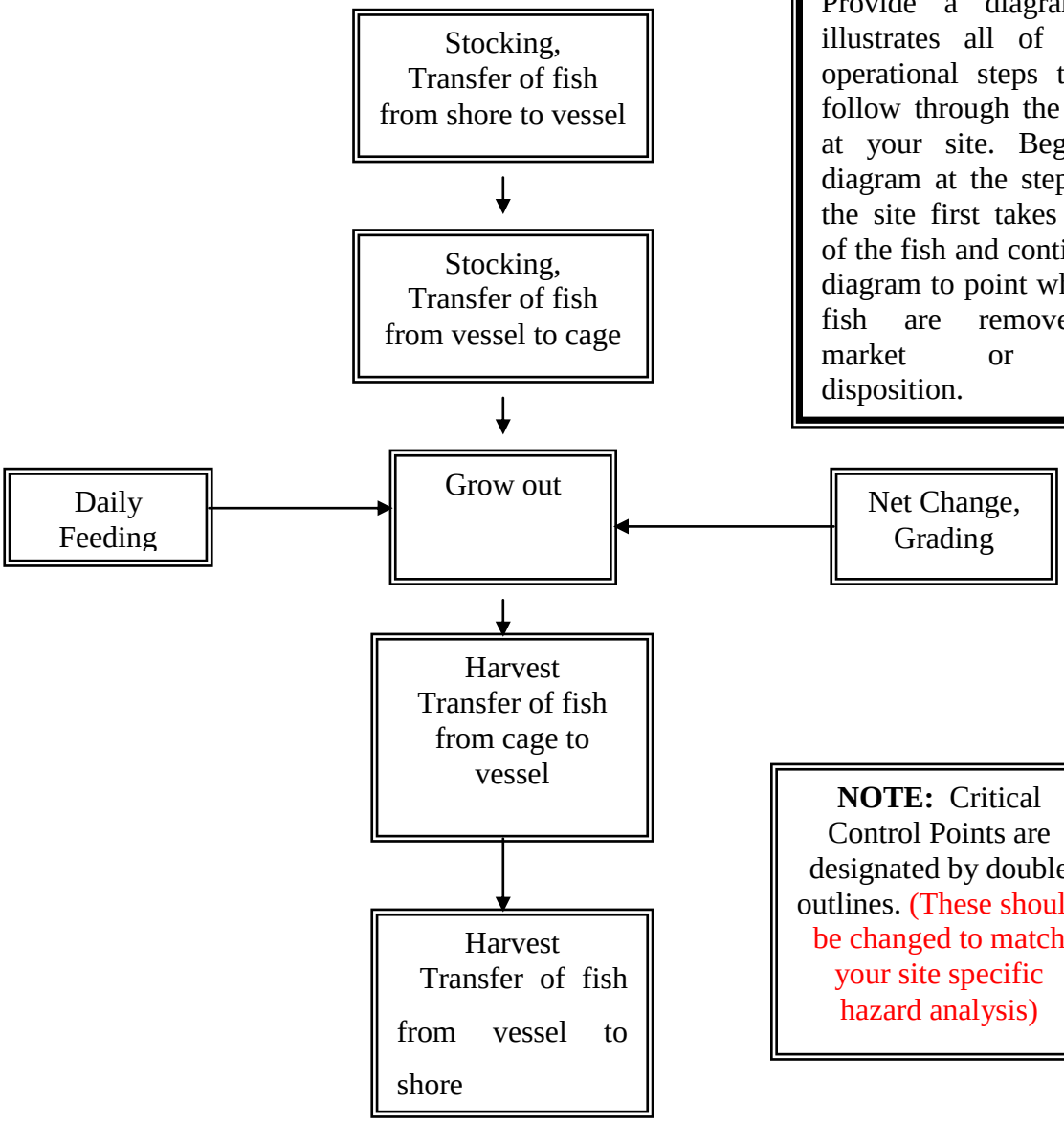
2.3 Product Description and Intended end-use

**Species:** Atlantic Salmon

**2.1.1 Farmed Salmon:** Salmon are raised from smolts obtained at a fresh water hatchery and transferred to the marine site for grow out. Salmon that are harvested are transported to a shoreside site where they arethen transported to a processing center.

.

**Process Flow Chart**
Provide a diagram that illustrates all of all the operational steps the fish follow through the system at your site. Begin this diagram at the step where the site first takes control of the fish and continue the diagram to point where the fish are removed for market or other disposition.




**NOTE:** Critical Control Points are designated by double outlines. (These should be changed to match your site specific hazard analysis)

2.0 Hazard Analysis

**Hazard Analysis Worksheet Template**
On the hazard analysis worksheet template determine which of those operational control steps illustrated on your process flow chart are Critical Control Points. Use the determinations

2.3.1 **Marine Site** Hazard Analysis Worksheet Template **1 of 1**

| **(1)**<br><br>**Process step** | **(2)**<br>**Identify potential hazards introduced, controlled or enhanced at this step?** | **(3)**<br>**Is the potential for escape significant ?**<br>**(Yes/No)** | **(4)**<br>**Justify your decision for column 3** | **(5)**<br>**What control measures(s) can be applied to prevent the significant hazard?** | **(6)**<br>**Is this step a CCP (Yes/No )** |
|---|---|---|---|---|---|
| Smolt transfer: shore to vessel (Clearly indicate whether the marine site or the hatchery is responsible for containment at this step) | Fish Escape | YES | Without proper preventive netting in the transfer area fish may make their way into local waters. | Installation of jump net under transfer device | YES |
| Smolt transfer: Vessel to grow out cage (Clearly indicate whether the marine site or the hatchery is responsible for containment at this step) | Fish Escape | YES | Without proper preventive netting in the transfer area fish may make their way into local waters. | Installation of jump net under transfer device | YES |
| Grow out Cage Daily feeding | FISH ESCAPE | YES | Feed consumption rate may indicate escape | Quick check procedure based on consumption data base | YES |
| Grow out Cage Net change | FISH ESCAPE | No | Methods used include divers setting replacement net completely around old net prior to its removal | | NO |

| | | | | | |
|---|---|---|---|---|---|
| Grow out Cage Grading | FISH ESCAPE | YES | Without proper preventive netting in the transfer area fish may make their way into local waters. | Installation of jump net under grading device | YES |
| Harvest - Grow out cage to vessel | FISH ESCAPE | YES | Without proper preventive netting in the transfer area fish may make their way into local waters. | Installation of jump net under transfer device | YES |
| Harvest – Vessel to shore | FISH ESCAPE | YES | Without proper preventive netting in the transfer area fish may make their way into local waters. | Installation of jump net under transfer device. | YES |

*Hazard Analysis Critical Control Point (HACCP ) Plan*

A CONFIDENTIAL DOCUMENT

The page is a template for the cover page og the site's confidential HACCP based plan. In order to protect confidential business practices and processes it is recommended that each page of the HACCP-based plan be marked with the words "Confidential."
These documents are intended for the review by auditors and regulators as agreed to by the advisory committee only.

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

**Chart Format**

The following three pages represents a template in chart format that may be used to describe the controls establisheded at each Critical Control Point.

3.0 **HACCP Plan**

3.1 Marine Site HACCP Plan Template 1 0f 3

HACCP PLAN FORM

Firm Name: Maine Salmon Farms Site Location: Beals Island, Maine.

Firm Address: P.O. Box Spruce Head, Me. Type of Site: Moored Steel Cage.

Date Excepted: Signature:

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| Smolt Transfer Dock to Vessel (Clearly indicate whether the marine site or the hatchery is responsible for containment at this step) | Fish Escape | Jump net is in place and secured prior to transfer of any fish | Jump net | Visually | Each delivery (continuos) | Site Manager or designee | -If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer. | -Daily records review<br>-Annual plan review | -Smolt Transfer Log<br>-Corrective Action Report |
| Smolt Transfer Vessel to Grow Out Cage (Clearly indicate | Fish Escape | Jump net is in place and secured prior to transfer of any fish | Jump net | Visually | Each delivery (continuous) | Site Manager or designee | -If a fish escapes all operations will be stopped. The net will be refastened or its hanging | -Daily records review<br>-Annual plan | -Smolt Transfer Log<br>-Corrective |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| whether the marine site or the hatchery is responsible for containment at this step) | | | | | | | modified so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer. | review | Action Report |

3.0 **HACCP Plan**

3.1 Marine Site HACCP Plan Template 2 of 3

Firm Name: Maine Salmon Farms Site Location: Beals Island, Maine.

Firm Address: P.O. Box Spruce Head, Me. Type of Site: Moored Steel Cage.

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| GROW OUT CAGE<br><br>Daily Feeding | Fish Escape | 25 % drop in feed consumption for a 72 hour period | Feed Consumption | Visually | Each feed delivery (Weekly) | Site Manager or designee | -Divers will be sent down on the cage to determine if | -Daily records review | -Daily Feed Log |
| | | note of abnormal fish behavior | Fish Behavior | Visually | Daily | Feeder | escapement is the cause of the drop in feed consumption if no other reasonable explanation is evident | -Annual plan review | -Corrective Action Report |
| GROW OUT | Fish Escape | | | | Each time | Site Manager | -If a fish escapes | --Daily | -Daily Ops |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CAGE<br><br>Grading | | | | | grading is implemented | or designee | all operations will be stopped until the cause is determined | records review<br><br>-Annual plan review | Log<br><br>-Corrective Action Report |

3.0 **HACCP Plan**

3.1 Marine Site HACCP Plan Template 3 of 3

Firm Name: Maine Salmon Farms Site Location: Beals Island, Maine.

Firm Address: P.O. Box
Spruce Head, Me. Type of Site: Moored Steel Cage.

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Critical Control Point (CCP) | Significant Hazard / Defect | Critical Limits for Each control Measure | Monitoring | | | | Corrective Actions | Verification | Records |
| | | | What | How | Frequency | Who | | | |
| Harvesting Cage to Vessel | Fish Escape | Jump net is in place and secured prior to transfer of any fish | Jump net | Visually | Each delivery (continuos) | Site Manager or designee | -If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer. | -Daily records review<br>-Annual plan review | -Harvesting Log<br>-Corrective Action Report |
| Harvesting Vessel to Shore | Fish Escape | Jump net is in place and secured prior to transfer of any fish | Jump net | Visually | Each delivery (continuous) | Site Manager or designee | -If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer. | -Daily records review<br>-Annual plan review | -Harvesting Log<br>-Corrective Action Report |

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Smolt Transfer – Shore to Vessel (Clearly indicate if the hatchery or marine site is responsible for containment)

**Narrative Format**
Some operators may prefer to develop the description of the controls established at each Critical Control Point in a Narrative rather than a Chart format. The next six pages represents a template of the Narrative format.

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. Jump net is in place and secured prior to any transfer

**Monitoring Procedures:** 1.The site manager or designee will visually monitor and record that the jump net is in place and properly secured prior to transfer of fish from the shore to the transfer vessel.

**Corrective Actions:** 1. If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified if necessary so that fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:** 1. Daily records review
2. Annual plan review

**Record Keeping Procedures:** 1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:**
1. Smolt Transfer Log / Corrective Action Report
2. Corrective Action Report

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Smolt Transfer – Vessel to Grow-out Cage (Clearly indicate if the hatchery or marine site is responsible for containment)

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. Jump net is in place and secured prior to any transfer

**Monitoring Procedures:** 1.The site manager or designee will visually monitor and record that the jumpnet is in place and properly secured prior to transfer of fish from the shore to the transfer vessel.

**Corrective Actions:** 1. If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified if necessary so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:** 1. Daily records review
2. Annual plan review

**Record Keeping Procedures:** 1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:**
1. Smolt Transfer Log / Corrective Action Report
2. Corrective Action Report

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Grow-out Cage – Daily Feeding

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. 25 % drop in feed consumption lasting for no more than 72 hours.
2. Note of abnormal feeding behavior

**Monitoring Procedures:** 1. The site manager or designee will visually monitor the daily feed record to determine the rate of feed consumption.
2. The staff worker doing the feeding will note fish feeding behavior daily

**Corrective Actions:** 1. If fish feed consumption is down for a 72 hour period divers will be sent down as soon as practical to determine whether or not a net break has occurred.
2. If a major escape has occurred the response procedures will be immediately initiated.

**Verification Procedures:**
1. Daily records review
2. Annual plan review

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Grow Out Cage – Grading

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. Jump net is in place and secured prior to any transfer

**Monitoring Procedures:** 1. The site manager or designee will visually monitor and record that the jump net is in place and properly secured prior to transfer of fish from the shore to the transfer vessel.

**Corrective Actions:** 1. If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified if necessary so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:** 1. Daily records review
2. Annual plan review

**Record Keeping Procedures:** 1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:** 1. Grading log / Corrective Action Report

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Harvesting – Grow-out Cage to Vessel

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. Jump net is in place and secured prior to any transfer

**Monitoring Procedures:** 1. The site manager or designee will visually monitor and record that the jump net is in place and properly secured prior to transfer of fish from the shore to the transfer vessel

**Corrective Actions:** 1. If a fish escapes all operations will be stopped. The net will be refastened or its hanging modified if necessary so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:** 1. Daily records review
2. Annual plan review

**Record Keeping Procedures:** 1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:** 1. Harvesting Log / Corrective Action Report
2. Corrective Action Report

3.0 HACCP Plan
3.2 Narrative Template
**Process Step:** Harvesting – Vessel to Shore

**Critical Control Point:** Yes

**Hazard or Defect:** 1. Fish Escape

**Critical Limits:** 1. Jump net is in place and secured prior to any transfer

**Monitoring Procedures:** 1. The site manager or designee will visually monitor and record that the jump net is in place and properly secured prior to transfer of fish from the shore to the transfer vessel

**Corrective Actions:** 1. If a fish escapes, all operations will be stopped. The net will be refastened or its hanging modified if necessary so fish cannot escape. The number of fish escaped will be recorded and reported to the inventory control officer.

**Verification Procedures:** 1. Daily records review
2. Annual plan review

**Record Keeping Procedures:** 1. All records will be reviewed and filed daily. All records will be held for two years running. All records will be maintained in a reasonable area.

**Records:** 1. Harvesting Log / Corrective Action Report
2. Corrective Action Report

This section is a template where each site can describe the methods they will use to make and document observations to show compliance with the requirements of this section of the Containment Management Program.

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

4.0 Prerequisite Program (for Materials, Construction, Structure, Layout and Methodology)

### 4.1 Site plan

A site plan or schematic with specifications for the system for which this specific plan is designed will be included in the firm's containment plan. A plan will be developed for each site illustrating the mooring setup, cage location, impacting current direction and mooring specifications. The site plan will be verified by the farm manager prior to inclusion in the containment system. This verification requires a signature.

### 4.2 Inventory Control Procedures

Each firm will develop from their current inventory control system a procedure that demonstrates that fish inventory is within current allowable percentages, thus supporting no escapes have occurred. This procedure will be updated whenever new and more accurate inventory control systems are implemented.

### 4.3 Predator Control Procedures

All operators will develop and include in their containment plan a site-specific integrated predator deterrent plan, which may include sonic devices, nets and/or other and techniques. The deterrent plan will be based on the best available science and/or industry techniques and will at least meet the standards put forth in the most current Code of Containment.

### 4.4.1 Response Procedures

A site-specific response plan will be developed which demonstrates the firm's capability to take immediate corrective actions or make repairs to the site in the event of a system breakdown. This will include a description of vessel capabilities, when needed to carry out the response, and where response equipment (if required) is stored. The planned response time will be included, in the procedures as will a list of personnel to be contacted and their responsibilities for an event requiring a response. The primary focus of this plan is to stabilize the situation in as short a time as possible or as soon as practical and then contact DMR if appropriate.

### 4.4.2 Recovery Procedures

This section is to be left incomplete until the steering committee determines the appropriate recovery procedures.

### 4.5 Unique Event Management

A hazard analysis and risk assessment will be conducted for each site described and may include the following or other events: feed delivery**,** a net change, the installation change or removal of a cage, the transfer of fish for reasons other than for grading or market purposes, such as ISA culling and the installation of new barges. If it is determined that the risk of escapement is probable for any of these events then special procedures will be designed and implemented to prevent the escapement of fish. Include a list of SOPs that exist for unique events. If undertaking an unusual event for which a hazard analysis has not been done, one should be completed prior to undertaking the operation.

### 4.6 Severe Weather Preparation Procedures

A risk assessment will be conducted to determine possibilities for system failure during severe weather. Methodologies will be described which reduce the likelihood of cage failure If the site is located where ocean storms or other severe weather events are likely to negatively impact the cage system. A storm event procedure will be developed and such procedure will detail tasks and responsibilities for those employees assigned to stand by during the event. The severe weather plan will be written to conform with the conditions given in the most current Code of Containment.

### 4.7 Training

Employees who take a direct role in any aspect of this plan will have training in the purpose, control measures and their attendant monitoring, corrective actions, verification procedures and record-keeping procedures. Additional training may be required for personnel with special responsibilities for oversight of any of the procedures, event management and preparations described in this system.

*Records*
*&*
*Attachments*

Copies of all the records and any other documents used to substantiate observations are attached to the site's Containment plan in this section.

Concerns or issues with this program should be addressed to the onsite HACCP Coordinator.

5.0 Records & Attachments

5.1 Smolt Transfer log

Smolt Transfer log

Reviewed by: _____ Date: _____

5.0 Records & Attachments

5.1 Daily Feed log

5.2 Net Change log

Reviewed by: _____
Date: _____
Maine Salmon Farms Beals Island, Maine

## 5.5 Corrective Action Report

Corrective Action Report (CAR)

Date: Weather Conditions:

Site:

Amount involved:

Deviation:

Corrective Action taken:

Number of fish escaped:

Signature: Date:

Reviewed by: Date:
Maine Salmon Farms Beals Island

**Criteria for On-site Marine Audits**

The criteria developed below are a result of the consensus of the Containment Audit Working Group and come from a variety of sources, including the Maine Aquaculture Association's Code of Practice (10/98) and current Best Management Practices in the aquaculture industry. Each of the listed categories has a corresponding line on the audit checklist.

Severity ratings on the system audit checklist shall be followed. If either a minor, major or serious deficiency is not corrected within the prescribed time such deficiency will be moved up to the next or more serious criteria.

There are four levels of deficiencies found on the Systems Audit Checklist. In ascending order of severity they are: Minor, Major, Serious and Critical. A Minor deficiency is one that must be remedied prior to the next audit. A Major deficiency must be remedied in the time specified for the category to which it is applied. A Serious deficiency shall me addressed immediately. A Critical deficiency that all by itself indicates the probability of a fish escape must be remedied immediately and, a report of a possible escape is mandatory.

The deficiencies noted by the auditor during an audit are cumulative. They are totaled at the end of the audit and the totals are used to determine the facilities level of compliance.

**A. Records**

All records that support both, the Prerequisite Program and HACCP Plan will be up to date, with complete data including a signature of the monitoring personnel. Records will be accurate and will show verification by management. No falsified documents are permitted. Records will be collected and or collated to a point of summary no later than every ten days.

**B. Procedures**

Control measures that are designed into the system must be followed unless supported by documentation that another equally effective action was required and taken. All Critical Limits will be complied with and the subsequent monitoring procedure undertaken as designed into the site-specific system. When a Critical Limit has been exceeded it is required that a corresponding corrective action be undertaken. A record of such corrective action must accompany the original record.

**C. Other**

Each facility or site will have in place a written Containment Management System. This document will be made available to the system auditor. This document will be reviewed on an annual basis by the site's HACCP coordinator (annual verification) and if changes are made they will be incorporated into a new or the most current version.

**1. Site Plan**

A signed (verified) site plan or schematic with specifications for the mooring system in place will be included in the firm's containment plan. Such plan or schematic will illustrate the mooring setup, cage location, impacting current direction and mooring specifications. The site plan will be updated when new gear of a different specification is installed or when otherwise modified. Maintenance records may be audited to verify that changes in gear occurred and attached to the up schematic prior to the completion of a

new site plan and verification. A copy of the lease from the State of Maine will be attached to this plan.

**2. Mooring System**

All mooring systems must be appropriate for the type of bottom and sea conditions of the site. The minimum standards as outlined in the most current Code of Containment for mooring system components, design, and inspections shall be met.

**3. Net System**

The net system will meet all of the minimum standards outlined in the most current Code of Containment.

**-Diver Entrance**

All entrances to a cage through either predator or primary nets system shall be secured at all times including when divers are in the water.

**4. Cage System**

The cage system will comply with the minimum standards as outlined in the most current Code of Containment.

**-General condition**

Hinges, connectors, and shackles shall be maintained and shall not show signs of significant wear and or breakage. Broken connector mechanisms between cage sets will not be allowed.

**-US Coast Guard regulations**

All lease sites will be marked in accordance with the lease site's permit for fixed private aids to navigation from the USCG.

**5. Inventory Control Procedures**

Compliance: The firm will demonstrate that it has implemented, as part of the Containment Management System a current inventory procedure that monitors feed reports in order to determine if any cage is down 25% in consumed feed. If this off-feed condition persists for 72 hours total elapsed time, a diver will be sent down to inspect the net for damage and to assess mortality. Any corrective action taken will be recorded. The following will be noted in the site managers' daily log: incident description and cause, date of occurrence, corrective action taken, and signature of person responsible. These records will be submitted to the inventory control officer for the site and filed along with inventory control records. These procedures and records may be site-specific. Records, corrective actions and feed reports will be available during the audit where possible and the point of summary.

**6. Predator Control Procedures**

A narrative describing all the control measures that will be put in place and at what time of year they will be used will be developed for each site or general site area. The predator control plan will conform to the minimum standards outlined in the most current Code of Containment.

A log will be kept sufficient that the described procedures are observed and that a sonic device (if in use) are operational during the times described.

Predator nets shall be installed as described in the predator deterrent plan.

**7. Severe Weather Preparation Procedures**

Written and details personnel responsibilities and protocols for severe weather events.

Cover net provisions are to be made as follows: If the wave action or ice weight of a weather event creates a situation where fish can be washed over the jump skirt of the cage. Then the cover nets will be lowered to the surface of the lead or other appropriate cage.

**8. Escape Response Procedures**

The Department of Marine Resources will be contacted if an escape of 500 or more fish occurs. Contact numbers for reporting to DMR within 48 hours of an occurrence will be posted as well as a list of trained personnel available to respond in the event of such an escape. Training shall, at a minimum consist of team member identification and the assigning of responsibilities, a leadership role and an understanding of the risk to the sea run salmon.

**Contact Protocol**

The protocol below is current as of May 17, 2002. It will be updated every quarter by the Maine Department of Marine Resources and distributed to each Salmon facility.

**Primary contact:** During week, DMR, Aquaculture Coordinator, 624-6554 / andrew.c.fisk@state.me.us

**Off-hours**, Orono State Police Dispatch 1-800-432-7381

Person filing report to State Police must provide the following information:

They should indicate that they are notifying the Maine Marine Patrol of a reportable escape event at either a marine cage or hatchery. They should identify the location, DMR site ID for marine cages, contact person and number, time of event, estimated size of escape, and actions being taken.

Dispatch will then contact the Marine Patrol's Officer of the Day (they have 24/7 coverage) who will then contact:

Andrew Fisk 588-0074 (h) and leave a message with same information from above

AND - Leave a message at Commissioner's office 624-6553 with same information from above.

Following notification DMR will contact:Marine & hatchery sites:

EPA Office of Environmental Stewardship, Maine Water Enforcement Officer (tel.)617-918-1811

NMFS Aquaculture Coordinator, David Bean (tel.) 978-281-9133

USFWS Endangered Species Coordinator, (tel.) 207-827-5938

USFWS, Maine Rivers Coordinators Office, (tel.) 207-469-6701

U.S. Army Corps of Engineers, Maine Project Office, (tel.) 207-623-8367

Maine DMR Finfish Aquaculture Monitoring Program, Jon Lewis (tel.) 207-633-9594

Maine Atlantic Salmon Commission, Joan Trial 941-4452 / joan.trial@state.me.us

A response vessel shall be identified and will be operational. If out of service this fact will be noted in the manager’s daily log and an adequate alternative transportation means should be identified.

Response equipment is to be available as described in the sites written response procedures.

Equipment shall be in a serviceable condition and readily available.

**9. Training** Documentation will be provided that shows individuals have been trained to undertake the responsibilities of any procedure in the system that is part of their job description.

## Appendix E ISA Program Standards

# Infectious Salmon Anemia Program Standards

**USDA APHIS Veterinary Services**

**Maine Department of Marine Resources**

**Maine Aquaculture Association**

Version January 2008

# Appendix F. Broodstock Management Plan

Captive Broodstock Management Plan
for Atlantic salmon at
Craig Brook National Fish Hatchery

Prepared by: TAC Captive Broodstock Management Plan Committee
Meredith Bartron (*Chair*, FWS)
Denise Buckley (FWS)
Tim King (USGS)
Tom King (FWS)
Mike Kinnison (U of Maine)
Greg Mackey (ASC)
Tim Sheehan (NOAA)
Ken Beland (ASC-retired)
Jerry Marancik (FWS-retired)

March 3, 2006

**This version was endorsed by the full TAC by electronic voting protocols on March 24, 2006. Responses to questions raised in the review process are available upon request.**

Appendix G. Definition and Classification of Escape Event Causes

Definition and Classification of Escape Event Causes
Ad-hoc Comm. Approved Version-July 13, 2006

Group: Mike Pietrak, Jennifer Robinson, Dave Bean and Matt Young

Steering Committee Charge: Provide a standard definition and classification of the causes of escape events that can be used in the DMR data base.

The following classification system is based on a four digit number. The first number refers to the overall major cause of the escape event. The second refers to a subcategory of events (or predator) that is defined under each major cause. The third number refers to the equipment system that failed as a result of the major cause described in the first two numbers. The final number deals with whether or not the equipment that failed was installed and maintained according to the site specific CMS plan.

The system is laid out in outline fashion with each digit as a new level in the outline. For example 2,1,1,1 is a severe weather event in which the waves from the storm caused damage to gear and as a result a tear in the primary containment net, all gear was installed properly. Where needed, definitions of what should be classified in a specific category are provided.

Major Cause of Event:

1) Predation; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to the attempts of a predator to get inside a cage.*

Predator

1) Seal
2) Bird
3) Terrestrial Mammal
4) Other

Failure

1) Fish escaped through failure of the primary containment net.
2) Fish escaped through the bird net or because of bird predation and a bird net was not present.
3) Fish escaped through the jumpskirt, for example: *an otter got into the cage through the jumpskirt and carried out a fish which escaped from it.*
4) Predator net

Properly installed and operated

1) Procedures in site specific predation plan were being followed and equipment that failed was installed according to CMS plan and met COC standards.
2) Procedures in site specific predation plan were not being followed or equipment that failed was not installed according to CMS plan or did not met COC standards.

2) Severe Weather; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to a variety of severe weather or storms.*

Event

1) Storm event: Damage from wind, waves or other phenomena caused by a storm

2) Ice event: Damage from icing of gear

Failure

1) Net system

2) Mooring system

3) Cage system: ie, handrails, collar, walkways etc.

4) Other equipment failed and this failure directly allowed the escape to occur.

Properly installed and operated

1) Procedures in the site specific severe weather plan were being followed and equipment that failed was installed according to CMS plan and met COC standards.

2) Procedures in the site specific severe weather plan were not being followed or equipment that failed was not installed according to CMS plan or did not met COC standards.

3) Foreign Object Interaction; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to a collision, including a boat or other object such as driftwood, into equipment on the site.*

Event

1) Boat Collision: Actual collision of a boat (including harvest boats, work barges, moored feed barges and non-farming related boats) into a cage or pulling away from a cage without untying from the cage. The damage from the collision is the primary cause of failure to containment systems thereby allowing fish to escape. Propeller damage may or may not be a secondary cause of escape

2) Propeller: The propeller of a boat causes the primary damage to containment systems leading to the escape of fish. This may or may not occur without the boat necessarily colliding with the cage.

3) Object other than boat: This category includes all other potential objects such as drift logs. Permanently moored feed barges that slip their moorings should be called a boat collision.

4) Other

Failure

1) Net system

2) Mooring system

3) Cage system: ie, handrails, collar, walkway etc

4) Other equipment failed and this failure directly allowed the escape to occur

Properly installed and operated

1) Equipment that failed was installed according to CMS plan and met COC standards

2) Equipment that failed was not installed according to CMS plan or did not met COC standards

4) Husbandry Practices; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to any normal or abnormal activity on the farm by company employees conducting fish culture activities.*

Event

1) Stocking procedures: Any activities related to or during stocking a cage.
2) Harvesting procedures: Any activities related to or during harvesting a cage.
3) Handling procedures: Any normal husbandry activities including: grading, vaccination, splitting a cage, sampling or entering and exiting cage (diver or boat).
4) Other

Failure

1) Net system
2) Mooring system
3) Cage system: ie, handrails, collar, walkways etc.
4) Human error: This category should be selected if the primary cause was the failure of site workers to follow SOP for the activity or some other human error
5) Other equipment failed and this failure directly allowed the escape to occur

Properly installed and operated

1) Equipment that failed was installed according to CMS plan and met COC standards and existing SOPs were followed
2) Equipment that failed was not installed according to CMS plan or did not met COC standards or existing SOPs were not followed

5) Unauthorized Human Interactions; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to unauthorized human interactions.*

Event:

1) Vandalism
2) Poaching: Any activity related to illegal fishing inside of the cages.
3) Fishing gear: Any activity related to legal or illegal fishing outside of the cage. For example, dragging for urchins damages mooring system and results in an escape. If the escape is caused by the boat doing the dragging actually colliding with the cage then it should go under boat collisions (category 31).
4) Other

Failure:

1) Net system
2) Mooring system
3) Cage system: ie, handrails failed due to wind
4) Other equipment failed and this failure directly allowed the escape to occur.

Properly installed and operated

1) Equipment that failed was installed according to CMS plan and met COC standards and existing SOPs were followed.
2) Equipment that failed was not installed according to CMS plan or did not met COC standards or existing SOPs were not followed.

6) Equipment Failure; *An escape event resulting from a failure or breach of the net system or other equipment that was directly due to equipment failure under normal conditions*.
*This category should only be used when the reason for the equipment failure does not fall into one of the other major categories.*

Reason:
1) Equipment used on site was not suitable for the site conditions
2) Equipment was not properly maintained
3) Equipment was not properly installed
4) Equipment was defective
5) Other

Failure:
1) Net system
2) Mooring system
3) Cage system: ie, handrails failed due to wind
4) Other equipment failed and this failure directly allowed the escape to occur.

Properly installed and operated
1) Equipment that failed was installed according to CMS plan and met COC standards.
2) Equipment that failed was not installed according to CMS plan or did not met COC standards.

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