

Ad Hoc Review Group

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Implementation Plan

Norway

Implementation Plan – Norway (11.02.2008)

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1 Introduction

Objectives of the national management strategy

- 1.1 The legal basis and overall goal for the management of wild Atlantic salmon is expressed in section 1 Objective of the "Act Relating to Salmonids and Fresh-Water Fish etc.":

"The objective of the Act is to ensure that natural stocks of anadromous salmonids, fresh water fish and their habitats, as well as other fresh-water organisms, are managed in such a way as to maintain natural diversity and productivity. Within this framework, the Act shall provide a basis for the improvement of stocks with a view to raising yields for the benefit of holders of fishing rights and recreational fishermen.

- 1.2 Built on this legal basis and a process including extensive stakeholder involvement, specific goals for the management of wild Atlantic salmon were set in 1997 by the Directorate of nature management and approved by the Ministry of environment. These goals have been revised according to a proposal to Parliament (St.prp. nr. 32 (2006-2007)). As a result of this process, Norway's objectives for salmon management are:

To conserve and restore spawning stocks at levels of abundance and with a composition, that ensures genetic diversity and the full utilisation of the natural productive capacity of salmon habitat. Salmon habitat shall be managed to preserve diversity of nature and its productive capacity, and threats and adverse impacts shall be identified and eliminated. Wherever this is not possible, adverse impacts on the production, abundance and composition of salmon stocks shall be counteracted or neutralized. Impacts threatening the genetic diversity of salmon shall be reduced to not-harmful levels by 2010.

The internationally acknowledged Precautionary Approach shall be applied as a basic principle for all sectors involved. As a basic rule those responsible for adverse impacts on the salmon resource shall also be responsible for restoration and compensation measures.

Within this framework the salmon resource shall be managed to the greatest possible benefits to society, fishing right holders and recreational fishermen.

- 1.3 In developing these objectives it has been an important goal to reflect and integrate Norway's international obligations under the NASCO convention, NASCO's main management objective, "To contribute through consultation and co-operation to the conservation, restoration, enhancement and rational management of salmon stocks taking into account the best scientific advice available", ...
... and the various guidelines and agreements under the Precautionary approach to salmon management including management of salmon fisheries, habitats, stock enhancement and aquaculture as well as introductions and transfers.

Nature and extent of resource

- 1.4 Norway has 450 rivers that sustain or once sustained self-reproducing Atlantic salmon stocks. About 40% of the remaining overall catches in the North Atlantic are caught in Norwegian coastal waters and salmon rivers. The wild salmon has historically been, and still is, important to Norwegian and Sami culture. Originally as a source of food and spiritual value for the first inhabitants of the country, the Norwegian wild salmon stocks caught the attention of British anglers in the mid-1800s. Since then the biggest

revenue from wild salmon is derived from selling fishing permits and providing accommodation, guiding etc. to foreign as well as Norwegian anglers. Approximately 150-200.000 anglers fish for salmon and sea trout every year. Most salmon rivers are located away from the major towns/cities of Norway, thus wild salmon is of significant economic value to the rural countryside. The socio-economic value of the 50 most important wild salmon stocks is estimated to be around 20 billion NOK (2,5 billion €) (Naverud 2001).

Overview of fisheries

- 1.5 With a few exceptions fishing rights in fresh water belong to the owner of the shoreline. Along the coast owners of land with a shoreline have the right to fish with stationary gear. Fishing regulations in Norway are based on the principle of general protection, which is established in Section 4 of the " Act Relating to Salmonids and Fresh-Water Fish etc." stating: *Anadromous salmonids are protected unless otherwise determined in provisions set out in or issued pursuant to this Act. The same applies to other fish in watercourses or parts of watercourses containing anadromous salmonids, ...*
- 1.6 Current fisheries regulations are based primarily on regulations for gear and fishing season. Fishing is restricted or closed in rivers and sea-areas with threatened or vulnerable stocks.

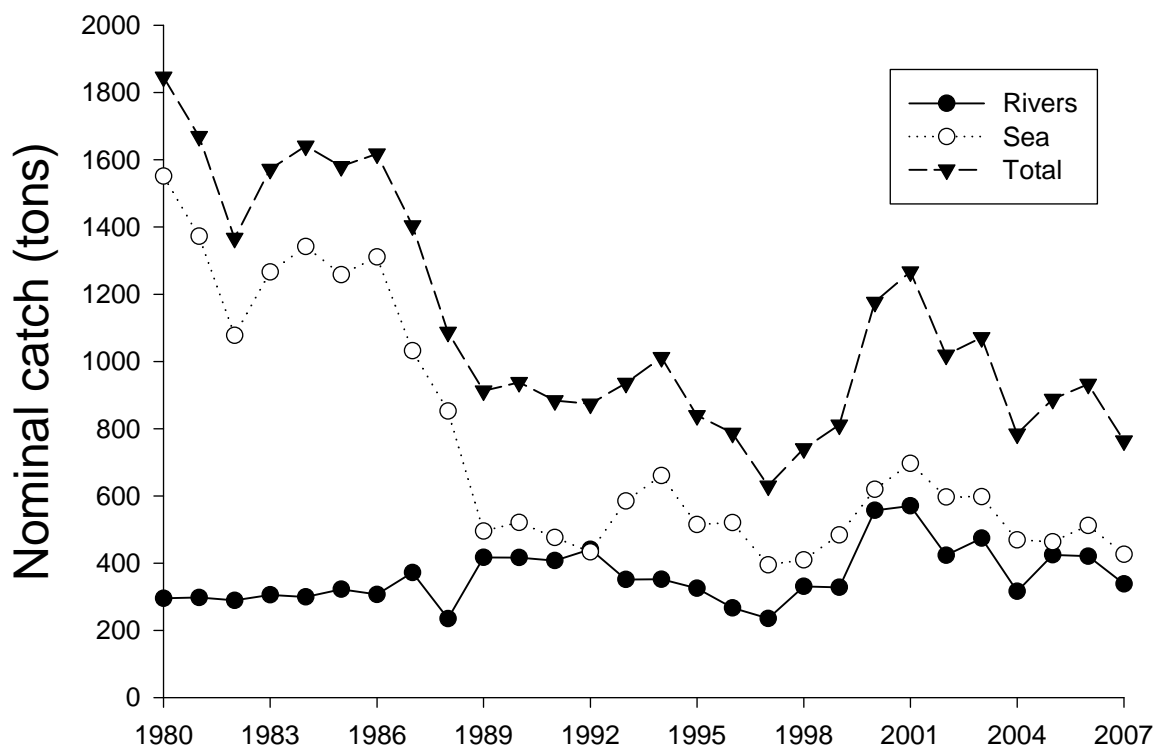


Figure 1. Nominal catches of Atlantic salmon in Norway 1980-2007 (escaped farmed salmon included).

- 1.7 The reported annual catch of Atlantic salmon in Norway (including escaped farmed salmon) is shown in figure 1. As shown in figure 1 about 80% of the catch was taken in sea and coastal fisheries before the late 80ies. Since then about half of the total catch is taken in coastal fisheries - mainly by bag nets, but in the northernmost county of

Finnmark, bend nets also contribute. The other half of the catch is taken in river fisheries, which are almost solely rod-fisheries.

1.8 Studies have shown that approximately 40% of the salmon caught in Faroese waters in the 80-ies were of Norwegian origin. Today, an interceptory fishery is suspected to occur in international waters as by-catch in mackerel fisheries.

1.9 Estimated catches in numbers of wild salmon are shown in figure 2.

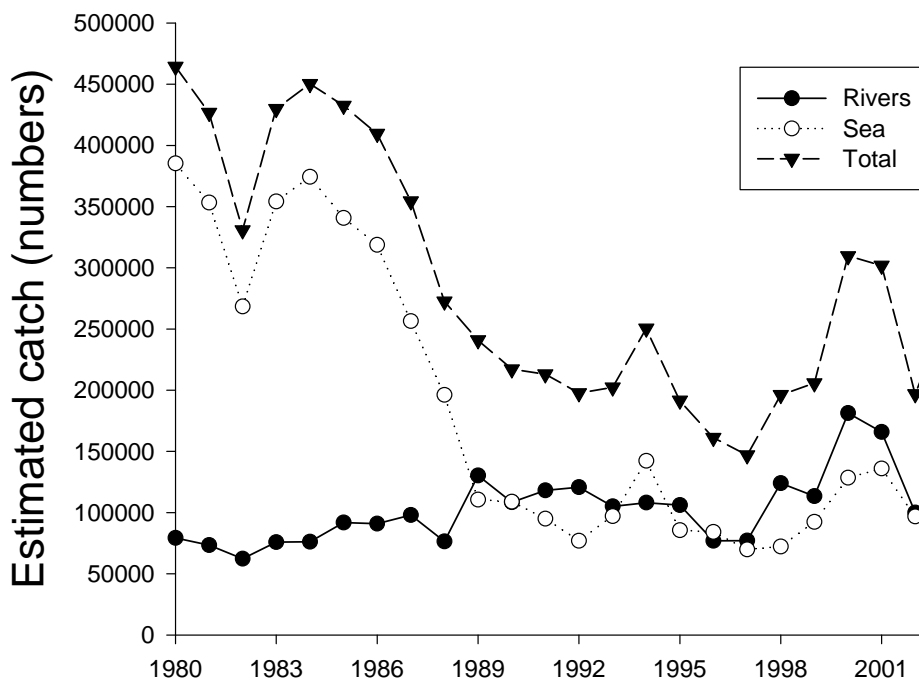


Figure 2: Estimated catches in numbers of wild salmon (1980-2006)

Management entities involved in salmon management

1.10 Although the responsibility for the management of wild Atlantic salmon and the regulation of salmon fisheries both in fresh- and salt water lies with the Ministry of environment (founded on the "Act Relating to Salmonids and Fresh-Water Fish etc". No. 47 of May 1992) the responsibility and legal means to regulate most of the factors affecting salmon and salmon management lie with other authorities and industries. The most important challenges, authorities and legislation involved in or affecting salmon management are shown in table 1.

1.11 A number of organisations representing fishing right holders, public interests and conservation interests are involved in different aspects of salmon management. In order to facilitate stakeholder participation and influence in salmon management a number of local and regional councils have been established. On a national level salmon advisory and consultation meetings are normally held twice a year. National organisations of fishing right holders, recreational and commercial fishing interests, nature conservation, aquaculture and hydropower industries and relevant authorities are represented. Over the last decade, local management bodies in salmon rivers have been given greater responsibility, especially local river-by-river organizations of landowners and fishing right holders.

Table 1: Challenges, responsible authorities and legislation in salmon management

CHALLENGES	RESPONSIBLE AUTHORITIES	LEGISLATION
Management of Salmon stocks	Environmental authorities	Act relating to Salmonids and Fresh-Water Fish etc.
Hydropower development	Water recourses authorities, environmental authorities	Water Resources Act; Watercourse Regulation Act
Fish farming	Fisheries-, environmental-, and water recourses authorities	Aquaculture act; Food Safety Act, Pollution Control Act, Act relating to harbours and fairways (The Harbour Act)
Pollution	Environmental and fisheries authorities	Pollution Control Act
<i>Gyrodactylus salaris</i>	Environmental and fisheries authorities	Act relating to Salmonids and Fresh-Water Fish etc.; Food Safety Act
Acid precipitation	Environmental authorities	Pollution Control Act, Acid Precipitation Convention
By-catch	Fisheries and environmental authorities	Act relating to sea-water fisheries, etc.; Act relating to Salmonids and Fresh-Water Fish etc.
Physical habitat deterioration in and along watercourses	Water recourses-, environmental-, transport-, agriculture-authorities and municipals	Water Resources Act; Act relating to Salmonids and Fresh-Water Fish etc.; Act relating to Land Use; Planning and Building Act

2 Status of stocks

Abundance

- 2.1. The total return of salmon to Norway has been estimated for the years 1984-2005. Estimated numbers of wild salmon are shown in figure 3.

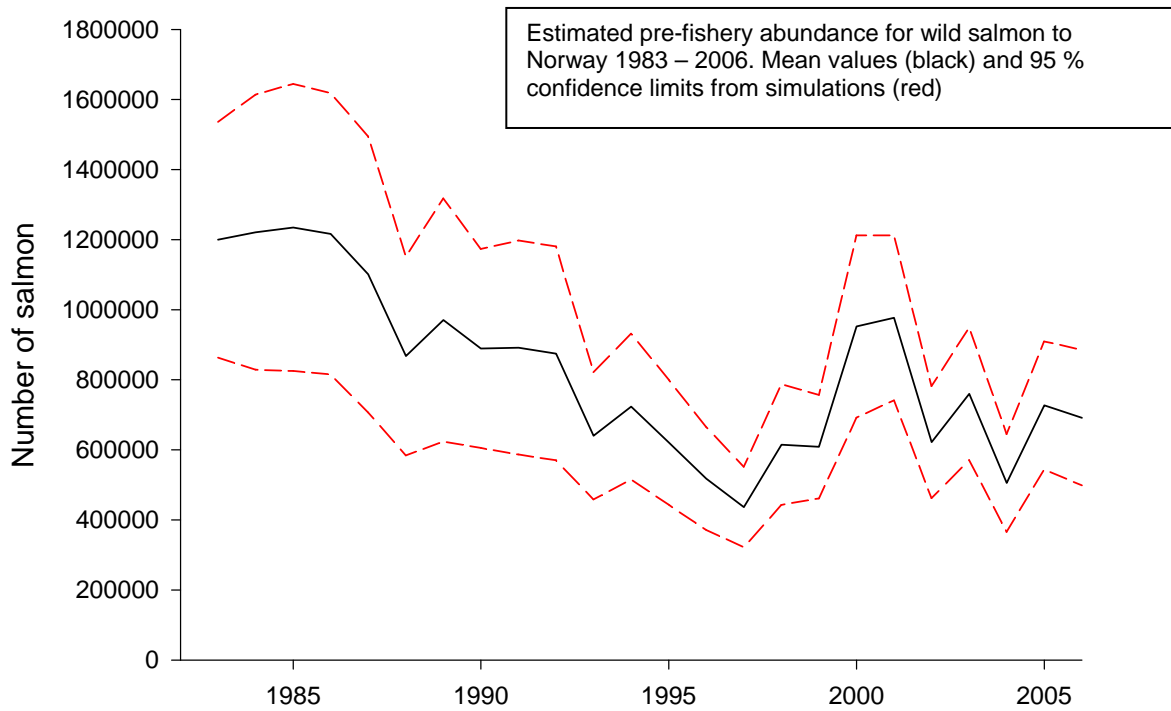


Figure 3: Estimated pre fishery abundance for wild salmon to Norway 1983 – 2006. Black line, red line 95 % confidence limits from simulations

- 2.2 In order to detect regional variations the coastline has been divided into 3 regions Southern Norway (from the Swedish border to Stadt), Mid Norway (from Stadt to Vesterålen) and Northern Norway (from Vesterålen to the Russian border). Estimates for the three regions are shown in figures 4, 5 and 6.

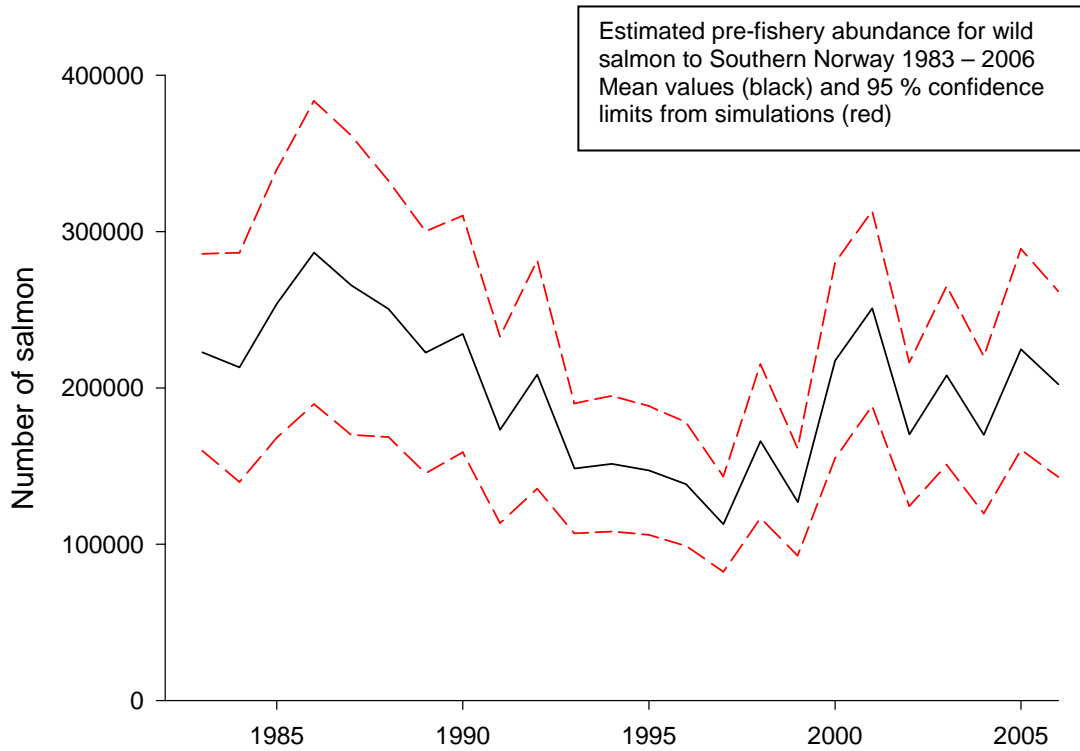


Figure 4: Estimated pre fishery abundance for wild salmon to Southern Norway 1983 – 2006.

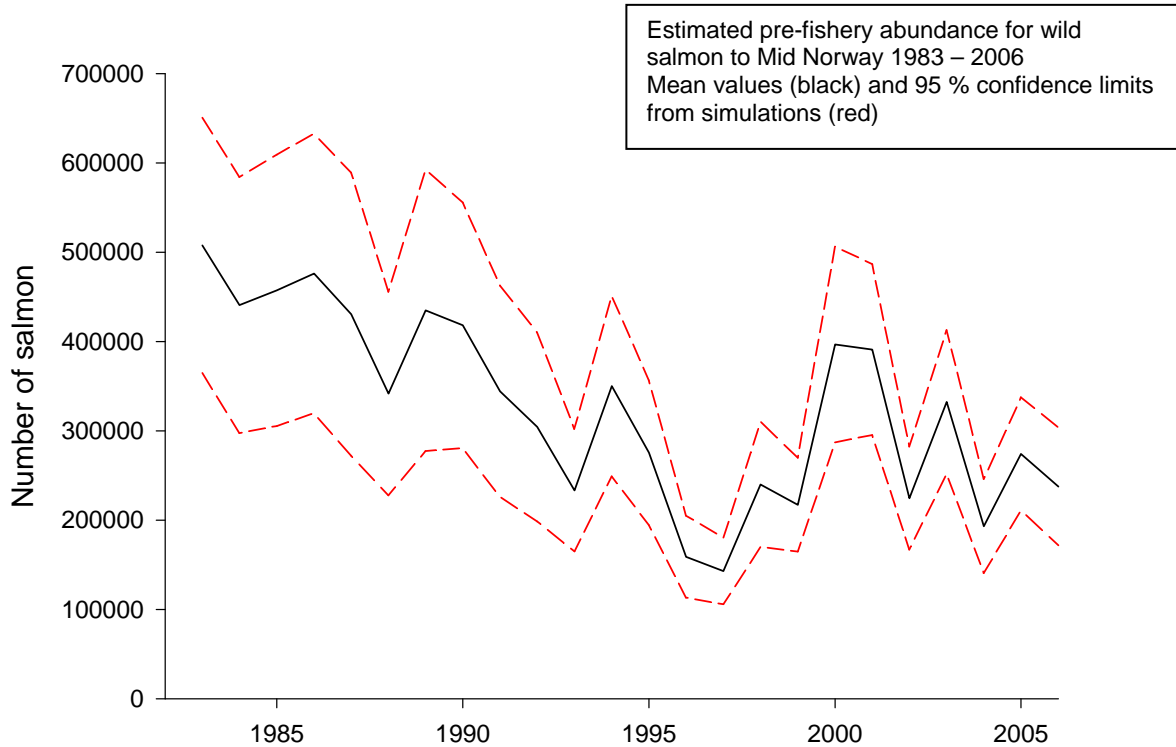


Figure 5: Estimated pre fishery abundance for wild salmon to Mid Norway 1983 – 2006

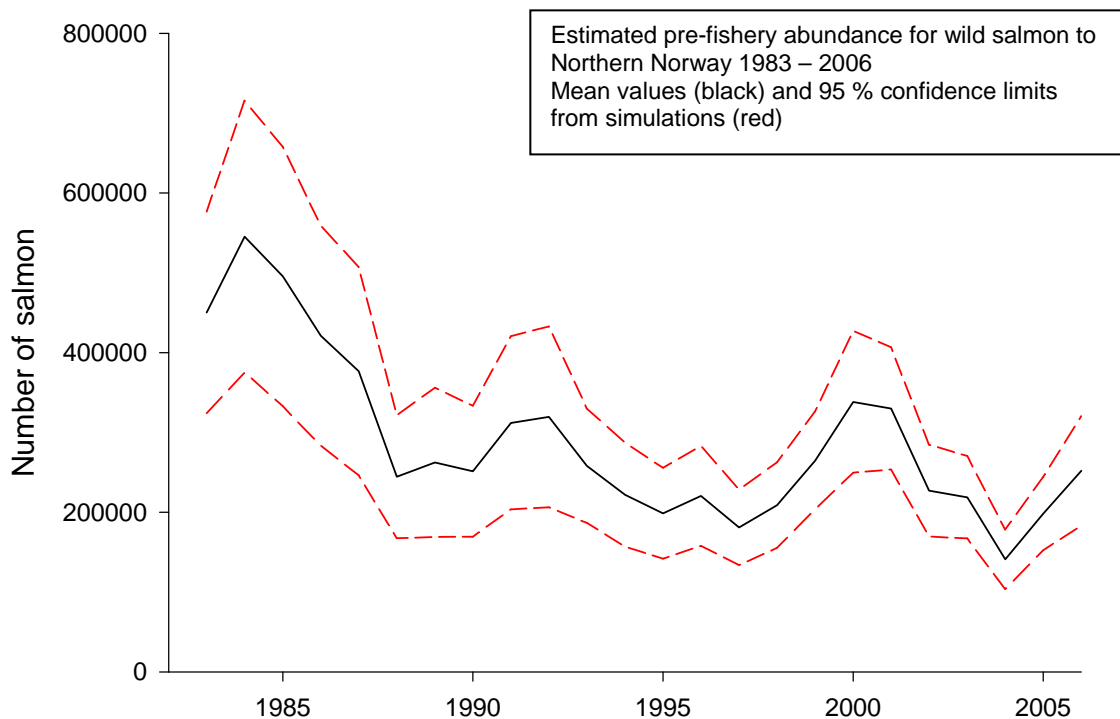


Figure 6: Estimated pre fishery abundance for wild salmon to Northern Norway 1983 – 2006

Diversity

- 2.3 In Norway there is only one yearly “salmon run”, whereas in other parts of Europe there may be a “spring run” and a “summer run”. The salmon is widely distributed from the temperate South to the arctic North. There are numerous small populations and some large ones. There is large variation in phenotype and life history traits between stocks, reflecting the diverse conditions under which the salmon lives. A survey made by the Norwegian Institute of Nature Research in 2004 defined several categories of stocks based on duration of stay at sea and body size: “Typical grilse stocks” (consists predominantly of salmon that spends one winter at sea), “grilse stocks with large grilse”, “2SW stocks (with a large component of salmon that spends two winters at sea), and MSW stocks” (consists predominantly of salmon that spends two or more winters at sea). The “typical grilse stocks” are found mainly along the coast line, while “2SW and MSW” stocks are found in the innermost parts of the fjords. Norway also has two stocks of landlocked salmon.
- 2.4 Norway is perhaps the country where Atlantic salmon shows the greatest diversity. Nevertheless, diversity in Norwegian salmon has been little studied and documented. There is little knowledge about how various human activities impact diversity, except in cases where entire stocks have been lost. The best-documented case is the selective effect of gillnets. During the height of the drift net fishery in the 1970’s and 80’s, the fishing pressure was much higher on 2 sea winter fish than on grilse. The biggest threats to salmon diversity today are the lethal parasite *Gyrodactylus salaris*, and crossbreeding between wild salmon and escaped farmed salmon.

Threatened or endangered stocks

2.5 In order to keep an overview of stock status and developments in stocks, the Directorate for Nature Management established a salmon stock registry in 1993. The registry is based on information collected from a number of sources, including local salmon management authorities. This registry contains a category system for salmon rivers (see chapter 5) based on the condition of the salmon stock in relation to adverse human impact. Category assignment is based on an overall assessment of all important factors affecting the stock's existence and production. Only rivers that have or have had a self-reproducing stock are categorized. The system underwent significant revision in 2002, which resulted in a reduction of the number of salmon stocks compared with the previous version of the system.

2.6 The assessment from 2006 showed that 45 of 450 wild stocks are recognized as extinct, 30 threatened and 32 near threatened as displayed in table 1.

Table 1. Categorisation of salmon rivers (June 2007). The table shows the number of watercourses that have or have had self-reproducing salmon stocks by county and category, and the number of watercourses affected by various factors (only the impact-factor(s) which is decisive for assigned category is/are shown). One watercourse might be affected by several impact factors.

County	Number of watercourses with self-reproducing salmon stock	Category*										Factor decisive for assigned category										
		1	2	3a	3b	4a	4b	5a	5b	X	Hydro-Power development	Other habitat deterioration	Acidification	Pollution by agriculture	Other water pollution	Gyrodactylus salaris	Sea-Lice	Other Fish Diseases	Overexploitation	Unknown factor	Other factors	
Østfold	2							2			1	1	1	2	2							
Oslo og Akershus	10			8		2					3	7		4	6							
Buskerud	3				2			1							2							
Vestfold	3		2					1			1	1		1	1	1						
Telemark	3	1				1		1			3											
Aust-Agder	1		1								1											
Vest-Agder	9	3			6								8	1								
Rogaland	32	2		3	6	6		11		4	8	1	13	3	2						1	
Hordaland	25	6	8	2	4	1		3		1	7		10		2		12				1	
Sogn og Fjordane	32	5	1	2	1	5		18			7	1	9			1	16					
Møre og Romsdal	62		9			7		38	8		8	5			8							
Sør-Trøndelag	59	4		2		23	1	23	6		18	13		6	1							1
Nord-Trøndelag	31	4	4	4		2		16	1		9	1			2		1					4
Nordland	99	16	4	4		14	1	50	10		15	5	1	4	2	12	2	1				5
Troms	37	1	2	5		1		25	2			1			2					3		6
Finmark	42	3	1			1		19	12	6	5	2								8		3
The whole country	450	45	32	30	19	63	2	208	38	13	83	37	41	20	17	28	22	2	11	2		19

*** Category 1: Lost stock:** *Rivers where the stock has been lost as a result of human impact*

Category 2: Threatened stock: *Rivers where the stock is at high risk of becoming lost as a result of human impact*

Category 3: Vulnerable stock: *Rivers where the stock can become threatened as a result of human impact*

3a: Rivers where the stock is near threatened

3b: Rivers where the stock is maintained

Category 4: Reduced stock: *Rivers with considerably reduced young fish production and or adult fish stock resulting from human impact*

4a: Rivers with considerably reduced young fish production

4b: Rivers with substantially reduced adult fish stock, but where young fish production is not considerably reduced

Category 5: Moderate or lightly affected stock: *Rivers where the stock is moderately or lightly affected by human impacts*

5a: Rivers with stocks requiring special concern

5b: Rivers with stocks not requiring "special concern"

A more detailed description of different categories can be found in chapter 5.

- 2.7 Due to insufficient monitoring, the numbers of escaped farmed salmon in spawning stocks are only estimated in a limited number of rivers. Thus escaped farmed salmon has not yet been included as an impact factor in the category system.
- 2.8 The category system for salmon rivers is used as a basis for deploying necessary management measures both on a local, regional and national level. Management guidelines are developed for each category e.g. with regard to fishery regulations.

3 Threats to stocks and current management measures

An overview over the frequency of adverse human impacts decisive for category assignment is given in table 1 and figure 7.

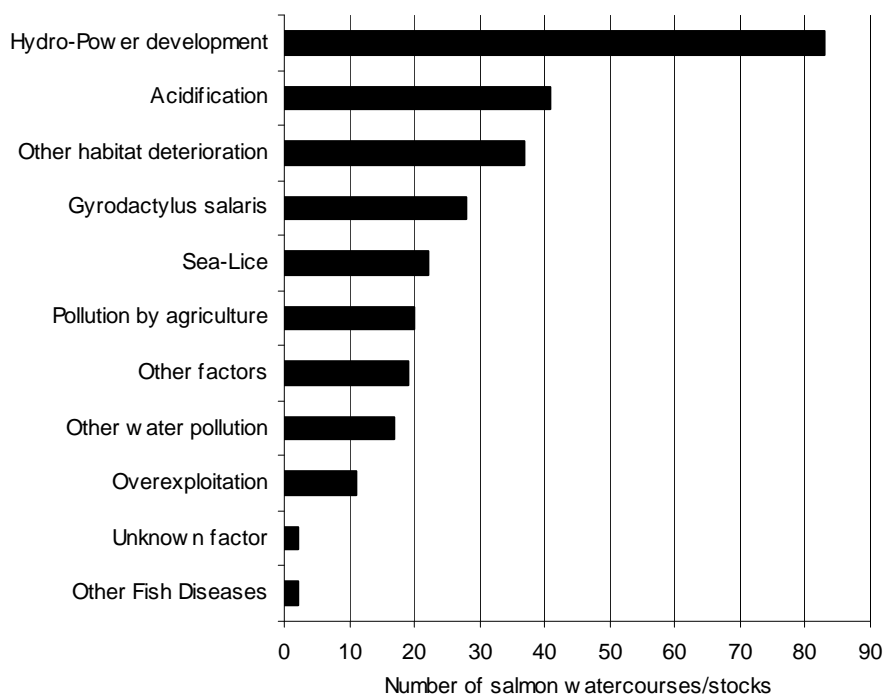


Figure 7: Overview over frequency of adverse human impacts decisive for category assignment

Acidification, the parasite *Gyrodactylus salaris* and river regulation for hydropower purposes are the main reasons for salmon stocks becoming extinct or threatened by extinction. River regulation is the single most widespread adverse human impact factor in salmon rivers in Norway, resulting in both loss of stocks and significant reductions in the productive capacity of salmon rivers. High densities of sea lice caused by aquaculture activities affect survival of post-smolts, and is considered to have reduced adult returns significantly. Monitoring of sea lice infection levels on wild stocks is very limited and the numbers presented are therefore incomplete. Based on the latest research results, interbreeding between escaped farmed and wild salmon is now considered to be amongst the most severe threats to the long-term existence of wild Atlantic salmon in Norway.

Based on this information Norway has decided to focus on the following management areas and adverse human impacts:

- Salmon fisheries
- Acidification
- Hydropower development
- Other habitat deterioration
- Escaped farmed salmon
- Sea lice
- *Gyrodactylus salaris*

3.1 Salmon fisheries

Background

A background and overview on Norwegian salmon fisheries is given in section 1.3.

Status

- 3.1.1 Since 1986 there has been a significant reduction in fishing effort with marine fishing gear in Norway. The most significant measure was the ban on the drift net fishery from the 1989 fishing season. In recent years some significant regulations have been introduced in Norwegian home waters. The most important was the ban on bend nets along the Norwegian coast from Rogaland county to Troms county in 1997. In 2003 the use of this gear was banned throughout the country, except in Finnmark.
- 3.1.2 In 1998 the start of the fishing season for bagnets was postponed by two weeks on the west coast of Norway. The purpose of this regulation was to reduce exploitation of MSW salmon. The number of bend nets registered in 2006 was 685, a slight increase from 2005 but still the third lowest in the time series 1986-2006. The number of bagnets in use in Norway has been relatively stable in recent years. In 2006, 1283 nets were registered, the lowest number since 1988. Since 1990 all adjustments to the salmon fishing season have contributed to a reduction in overall fishing effort in sea fisheries. In the same period all fisheries on threatened stocks in rivers have been closed, and the fishing season has been shortened and/or the starting date has been delayed in most rivers.
- 3.1.3 In 2003 a 5-year regulatory regime was introduced for the first time as a means of rationalizing regulatory procedures. The regulations will be reviewed every year during the 5-year period and adjustments made only when changes are needed and can not wait until the next period. At the same time new and revised guidelines for the management of salmon fisheries was introduced.
- 3.1.4 In preparation for the 5-year regulatory regime adopted in 2003, Norwegian Authorities undertook a comprehensive survey of the status of the stocks. The revised category system for stock status was applied in the survey. The revised category system includes many of the questions addressed in the NASCO Decision Structure for Management of North Atlantic Salmon Fisheries. The Decision Structure was then widely used in adoption of the regulatory regime.
- 3.1.5 The coast was divided into 25 regulatory zones. This allowed for far more detailed regulations taking into account the status of the stocks within the zone.
- 3.1.6 Conservation limits or spawning targets have been available for only a few rivers. Therefore, other indicators such as juvenile fish production, counts or estimates of salmon runs and spawning-stock sizes, catch pr unit effort and catch statistics have been used. Catch and release was not introduced as a regular management measure. Instead fishing pressure was adjusted according to the current status of the stocks.
- 3.1.7 The introduction of a new regulatory regime raised the question of quota-based regulations. The Directorate for Nature Management appointed a Working Group to deal with this question. Both river and coastal fisheries interests were represented. The Working Group concluded that the necessary management tools to develop a

better or more precise regulatory system based on quotas was not available at that time.

Responsible authorities

- 3.1.8 Ministry of Environment: Overall responsibility
Directorate for Nature Management: Responsible for salmon management at a national level. Regulates coastal fisheries and develops guidelines for regulations of river-fisheries.
County Governor: Regulate river fisheries
- 3.1.9 In addition to public authorities, landowners (fishing right holders) and their associations play a significant role in designing local fishing rules. Any given fishing right holder can make more strict fishing rules within the laws and regulations and guidelines given by the authorities. Landowner organisations that meet certain legal requirements are entitled to make recommendations for regulations that County Governors are obliged to follow, unless the recommendation is inconsistent with guidelines given by the authorities.
- 3.1.10 **Legislation**
The Act Relating to Salmonids and Fresh Water Fish etc. states that salmon are protected unless otherwise determined. Provisions based upon this law regulate i.a. when and where it is allowed to fish, what kind of fishing gear is allowed and how to report catches.

3.2 Factors affecting estuarine and freshwater salmon habitat

Acidification

- 3.2.1 **Background**
Due to its high acid sensitivity, production of salmon in many salmon rivers in southern Norway was greatly reduced as early as 1920, several decades before acid rain was recognized as an environmental problem. The causes of acidification of surface water in Scandinavia were clarified during the 1960's and 1970's, almost a century after the first negative effect on fish populations was detected. The first indications of acidification affecting fish are from episodic deaths of Atlantic salmon (*Salmo salar*) in some southern rivers in Norway around 1910. Official Norwegian salmon catch statistics shows a large decline in catches around 1900. In the two southern counties, Aust-Agder and Vest-Agder, catches declined about 80% from 1885 to 1920. Sporadic catches of salmon were reported up to the late 1960's, but the natural salmon stocks in this region were virtually extinct around 1960.
- 3.2.2 **Status**
Today 52 Norwegian salmon stocks are affected by acidification. International agreements on reduced atmospheric emissions will reduce acidification effects in Norway in the coming 10-20 years. However, the extreme acid sensitivity of salmon makes the destiny of this species in Southern Norway uncertain. Liming in combination with reduced emissions will be an important contribution to protection of the Atlantic salmon species in Norway.
- 3.2.3 To counteract negative impacts from acidification the Directorate for Nature Management has worked out an Action plan on liming for the period 2004-2010. Liming is an effective measure to protect and restore fish populations in acidified waters. Liming of acidified

salmon rivers has become important in Norway the last 15 years, and in 2006, 22 rivers were limed at a yearly cost of about NOK 50 million (approximately £ 4 million). Mean densities of salmon fry in limed rivers increased from 10 to 60 fish per 100 m² in the period 1991-2002. The catches of salmon in the limed rivers contributed in 2006 to about 11% of the total river catch measured in tonnes in Norway, or about 25 000 fish. The catch has increased from 5 tonnes prior to liming in the early 1980`s, to 40 tonnes the recent years. The catch in limed rivers is expected to be between 75 and 80 tonnes in 2015.

3.2.4 The Norwegian Institute for Nature Research (NINA) has estimated that the salmon stocks in limed rivers will be fully re-established after about 15 years of liming. Two strategies have been used: Liming in combination with stocking, or liming only. So far both strategies seem to be successful, but we do not yet know the genetic effect or the long-term result of either strategy. Research is in progress on the re-colonisation process of salmon (population dynamics, genetic effects, stocking vs natural re-colonisation etc).

3.2.5 **Responsible authorities**

Ministry of Environment

Directorate for Nature Management (in cooperation with the County Governors): Liming in accordance with guidelines by the Ministry of Environment and Government funding, monitoring of stock responses and environmental effects.

Norwegian Pollution Control Authority: Monitoring water quality and emission levels

3.2.6 **Legislation**

International agreements: During the last two decades the European nations have adopted various agreements to reduce atmospheric emissions of acidifying compounds. The latest and most extensive was signed in Gothenburg in December 1999.

Pollution Control Act: The use of powdered limestone has been approved by the Norwegian pollution control authorities. The use of industrially processed lime or other neutralizing substances must have a special permit under the Pollution Control Act.

Hydropower development

3.2.7 **Background**

A large proportion of the salmon rivers in Norway are regulated for hydropower purposes, which can heavily affect the natural physical and biological processes of the watercourses. Physical impacts in regulated rivers might be: Migration obstacles such as dams, dewatering of river stretches, rapid fluctuations in water level, change in water temperature regime, deposition of fine sediments and gradual homogenisation and degradation of bottom substrate. The physical changes will typically affect biodiversity in terms of reduced diversity of species, reduced biomass and production, depleted fish stocks and, consequently, reduced fishing opportunities.

3.2.8 **Status**

A third of the Norwegian salmon rivers are developed for hydropower production, and hydropower development has been identified as a significant negative factor for a total of 85 salmon stocks. A majority of the highest-producing salmon rivers in the country are regulated, including several top-20 rivers such as Altaelva, Namsen, Orkla, Driva, Surna, Lærdalselva, Suldalslågen and Numedalslågen. With respect to anthropogenic eradications of salmon stocks, hydropower development is a major factor resulting in 19 lost stocks, which exceeds the effects of acid rain (16 lost stocks) as well as the introduction of *Gyrodactylus salaris* (10 lost stocks). The regulatory regime in a number of key salmon rivers will be scrutinised with respect to

biological and environmental constraints during the next decade. The modernised regime is supposed to mitigate the negative impact.

3.2.9 The environmental focus was considerably weaker in the 1960-ies than in the years to follow. After 1980 provisions on water flow have been included in most of the hydropower concessions. The need for mitigation and compensatory measures are considerable in salmon rivers with reduced water flow and significant changes in the water temperature regime and ice cover. In general, the concessionaire is obliged to stock a certain number of salmon smolt, largely corresponding to the estimated loss in smolt production. In less affected rivers, the concessionaire might stock salmon egg, fry or parr instead of smolt. The licensing authority in agreement with the responsible authority could as an alternative or substitute decide other compensatory measures such as habitat restoration or constructing fish passages that give the fish access to unregulated stretch. The general conclusion after studying the effects of such measures is that they only to a small extent compensate for the negative effect on fish production.

3.2.10 **Responsible authorities**

The management of regulated watercourses and affected salmon stocks is a shared responsibility between the Ministry of Petroleum and Energy and the Ministry of Environment.

The Ministry of Petroleum and Energy (MPE) is responsible for the legislations and regulations of water use and physical impacts in watercourses. Norwegian Water Resource and Energy Directorate, a subordinate department of the MPE's organization, is responsible for licensing water extraction projects and encroachments in the river courses. This includes groundwater extraction, water supply, hydropower, flood control projects and all other physical constructions in the rivers that may have negative impacts on the environment or other user interests. Larger hydropower projects, after The Water Courses Regulation Act, are licensed by the government. For more details, see annex 1.

The Ministry of Environment (ME) is responsible for the legislation on biodiversity in water-bodies and their surroundings. The regulation concession empower the authorities to instruct the concessionaire to fund specific physical and biological mitigation measures, such as building of fish ladders and stocking of fish. The Directorate for Nature Management, a subordinate department of the ME's organization, is responsible for the follow-up of the environmental aspects such as biological assessments, documentation of impacts on biodiversity and outdoor life, and mitigation measures.

3.2.11 **Legislation**

The legal base for hydropower development is:

- The Water Courses Regulation Act (1917) and
- The Water Resources Act (2001)

3.2.12 Rules of operation are given in a concession (permit) given by the State for a predefined or undefined period. In 1992, the Norwegian parliament decided that all rules of operations are subject to revision within a thirty-year period, i.e. not later than year 2022. In the nearest future (2006-2012), the rules of operation for the salmon rivers Eira and Surna in Mid Norway and Røssåga in Northern Norway can be revised. The scope of the revisions will be on how the ecological status of the affected

water bodies can be improved without essential reduction in hydropower production. The oncoming implementation of the EU directive for water resources will contribute substantially to a stronger emphasis on the environmental objectives in heavily modified water bodies.

Other habitat deterioration

3.2.13 Background

The impact from one single deterioration of habitat is often small, while the combined effects of several small changes with negative impacts often may cause problems for Atlantic salmon. Typical impacts on salmon habitats from a variety of activities could be:

- Increased siltation/sedimentation
- Blocked migration (injury to fish, impaired access to spawning habitat and production areas, impaired migration to marine environment)
- Changed shelter/cover
- Changed substrate
- Changed river morphology
- Changed water quantity (alteration of flow regimes, transfers, modifications to natural/seasonal fluctuations, reduction in volume, changing water temperature)
- Changed water quality (addition of chemicals, nutrient enrichment)

3.2.14 Examples of activities that could cause these impacts are canalisation, embankment, protection measures against erosions, in-river engineering, encroachment for transportation or constructions, extraction of gravel, use of water, removal of riparian vegetation, ditching, agriculture and culverts.

3.2.15 There is a lack of opportunities for instructing measures to mitigate the harm caused by some of these activities, and often a single of these actions is so small that the consequences for the salmon are not sufficient considered.

3.2.16 Status

According to the categorisation of salmon rivers (table 2), different types of habitat deterioration have, been identified as a factor causing considerable damage to salmon stocks in 40 rivers. In light of the large number of these incidents, the yearly smolt-losses caused by "other habitat deterioration" are considered to be of the same scale as hydropower development, i.e. approximately one million smolts.

3.2.17 Habitat restoration/improvement projects are carried out in several salmon rivers, by hydro electrical companies, water recourses and environmental authorities and by different stakeholders. To run an inventory of finished and ongoing habitat projects will be a task for the proper responsible entities.

3.2.18 In 2003 the Norwegian Parliament established a system of national salmon rivers and national salmon fjords where the wild Atlantic salmon is granted special protection. A number of sea areas had already been designated as safeguard zones by the Ministry of Fisheries and Coastal Affairs in 1989, and a number of these safeguard zones were carried on in this new management regime. The aim of the national salmon rivers and national salmon fjords is to protect and regenerate salmon stocks to a level and composition that will maintain diversity within the species while exploiting its

productive potential. In the national salmon rivers no permission will be given to new enterprises or activities that might harm the wild salmon. In the national salmon fjords no additional salmon aquaculture plants will be established and existing installations will be subject to more stringent standards for preventing escapes and controlling sea lice and other diseases. The salmon stocks included will also be prioritized for other measures aimed at strengthening the wild salmon.

3.2.19 In the first phase of this management regime 37 national salmon rivers and 21 national salmon fjords were established. The Parliament also decided that in the second phase a number of additional rivers should be designated. In 2007 15 additional rivers and 8 additional fjord areas were included in the scheme. In total the scheme now comprises 52 national salmon rivers and 29 national salmon fjords. The national salmon rivers and fjords will give special protection to about 3/4 of the total Norwegian wild salmon production.

3.2.20 Important instruments to address negative impacts caused by "other habitat deterioration" are: The protection regime applied for protecting the Atlantic salmon habitat in the National Salmon Rivers, the implementation of the National Plan of Action to the Protection and Restoration of Atlantic Salmon Habitat (following NASCO Council No. CNL (01)51), The Water Recourses Act and the implementation of the EU Water Framework Directive.

3.2.21 **Responsible authorities**

The responsibility for regulating these activities is shared mainly between Water Recourses-, Environmental-, Transport- and Agriculture Authorities together with the municipals. The Ministry of Petroleum and Energy is in charge of all legislation regulating water use and physical properties of the watercourses, while the Ministry of Environment is in charge of legislation for protection of biodiversity of the watercourses and their surroundings. The Ministries of Transport and Communications and of Agriculture and Food are responsible of the activities connected to transportation, agriculture and forestry while much of the authority connected with building activities is delegated to the municipalities.

3.2.22 **Legislation**

The legal base for hydropower development, which is in force in this perspective, is the Act of Water Resources, while it is the Act relating to Salmonids and Fresh-Water Fish etc that come into force to protect the biodiversity. The Act relating to Land is the responsibility of the Agriculture Authorities while the Planning and Building Act is the responsibility of the Environmental Authorities. Parts of the last mentioned act are delegated to the municipals.

3.3 Impacts of aquaculture, introductions and transfers and transgenics

Escaped farmed salmon

3.3.1 **Background**

In 2007, the total production of farmed salmon in Norway was 750 000 tonnes. A total of 209 million smolts were released into to sea cages along the Norwegian coast. In comparison, the estimated total number of wild fish returning to Norwegian salmon rivers in 2005 was about 700 000 salmon or equivalent to 2 500 tonnes.

3.3.2 Official statistics (1996-2006) from the Norwegian Directorate of Fisheries, shows the expansion in production and number of escaped farmed salmon (figure 8). The number of reported escapees has fluctuated around an average of 495 thousand salmon a year. In 2006, however, the number of escaped salmon and rainbow trout was 917 thousand, the highest number ever recorded. The numbers for 2007 are 270 thousand escaped salmon and about 100 thousand rainbow trout. The percentage of farmed fish reported as having escaped is rather small, between 2‰ and 4‰.

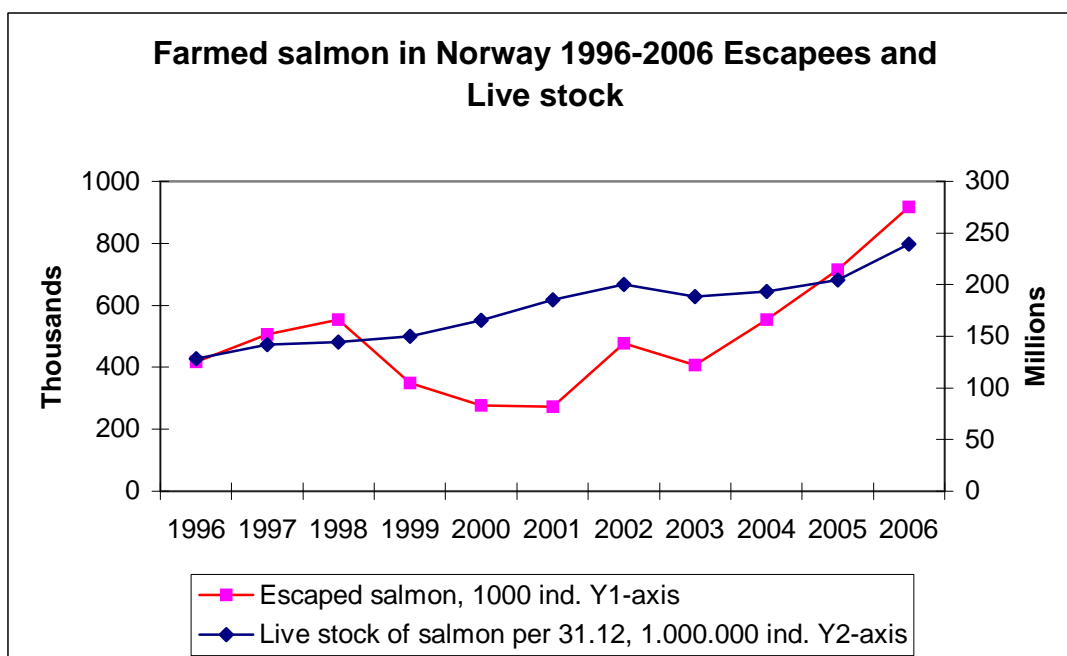


Fig. 8: Development in production and number of reported escaped farmed salmon

3.3.3 The high percentages of escaped farmed salmon detected in Norwegian fisheries and river spawning stocks indicate that the total number of farmed salmon lost into the wild every year, probably is considerably higher than the numbers reported. Surveys made to find the causes for escapes as well as monitoring programmes on escaped farmed salmon, show that farmed salmon escapees at all ages and sizes from before they become smolts and up to market sized fish. Daily trickle losses due to e.g. handling, "small accidents" and minor holes in sea cages, account for a considerable contribution to the total number of farmed salmon escaping into the wild each year.

3.3.4 The Directorate of Fisheries has launched a special programme to identify unreported escapes and develop measures to minimise "trickle losses."

3.3.5 Status

The percentage of escaped farmed salmon in fisheries has been systematically monitored since 1988. In general the percentage of escaped farmed salmon has been lowest in river fisheries during the fishing season, higher in the spawning stock later in the year and highest in coastal fisheries. Compared to the mid 90-ies, percentages of farmed salmon in spawning stocks have been significantly lower in later years - despite the fact that the production of farmed fish has doubled in that same period. After two years with rather high numbers of recorded escaped farmed salmon, the percentages of escaped farmed salmon in spawning stocks have again shown an upward trend. Nevertheless with few exceptions, e.g. in areas with low densities of salmon farms, the numbers of escaped farmed salmon have been unacceptably high in

all the years monitored. In some rivers escaped farmed salmon accounts for more than 50% of the total brood stock.

3.3.6 The latest scientific evidence suggests significantly lower productivity as well as loss of genetic diversity in wild stocks resulting from interbreeding between wild salmon and escapees from aquaculture plants. Escaped farmed salmon must therefore be considered a severe threat to the productivity and long term existence of wild stocks of Atlantic salmon.

3.3.7 **Responsible authorities**

Ministry of Fisheries and Coastal Affairs
Norwegian Directorate of Fisheries

3.3.8 **Legislation**

The Aquaculture Act (entered into force 1st January 2006)

3.3.9 Measures and regulations in relation to the requirements in the Williamsburg Resolution, concerning escapes:

- “Regulation concerning the management of aquaculture farms” 28. desember 2005 (“Akvakulturdriftsforskriften”).
- Action plan on escapes of March 2006 by the Norwegian Fish Farmer Association, in co-operation with the authorities (environment and fisheries) and the Insurance Association. The two measures of highest priority in the Action Plan were:
 - Quality management systems on production and operation
 - Approval scheme of floating fish farming plants
- Measures introduced in 2004:
 - Regulations concerning Internal Control entered into force 1st January 2005 whereby fish farmers were required to establish a system of internal control.
 - Regulations on the technical standard of installations used for fish farming activities (the NYTEK Regulations) entered into force 1st January 2004. The regulations limit the use of new installations and main components to those certified in accordance with NS 9415. Such certification has to be performed by an accredited certification body. Existing installations are required to have a proof of capability stating that the installation meets the operational requirements in NS 9415 by 1 January 2006 in accordance with the regulations. Proof of capability may only be issued by accredited inspection-bodies.
- Minimum distance between new salmon farms and salmon rivers is 2,5 km.
- Emergency plan that amongst other measures has to include an overview over
 - How escapes can be detected and limited
 - Increasing the efficiency of re-catch
 - Establishing precaution measures for towing of cages
 - Handling of fish and plants during loading and unloading.
- Mandatory reporting on escape incidences.

Sea-lice/salmon lice

3.3.10 Background

Dense aggregations of farmed fish are ideal breeding grounds for diseases and parasites. In addition, stress on fish resulting from high density and intensive cultivation is often sufficient to allow pathogens to take hold and form disease reservoirs. In parts of the Norwegian Coastline, numbers of sea-lice are now significantly increased as a result of the millions of cultured fish in the sea.

3.3.11 At the fish farms, the sea-lice problem can be managed by de-lousing. However, a great number of larvae are produced with even a low number of adult female lice. Given the short life cycle of sea-lice (52 days for females at 10°C), the growth rate is at times exponential. A great number of sea-lice larvae will then meet the wild salmon smolts migrating to the sea, and the balance between parasite and host will be disturbed. Estimates show that 10 –15 adult lice on a smolt can be lethal to young salmon compared to an average of 80 sea lice per salmon found in a study in 2001. In later years the situation has improved and the conditions have changed considerably. In the spring of 2004, it was estimated that only 3% of the migrating smolts in the Sognefjord had lethal amounts of sea lice. From the central parts of Norway and further north, however, the infection pressure is still considered to be high. In 2007 however, the number of sea lice larvae and infections rates on wild fish were again at very high levels. New research also indicates that infection rates lower than those previously considered harmful can significantly reduce the chances of survival for smolts. The Hardangerfjord project also indicates that there is an upper bearing capacity for fish farming in any given area.

3.3.12 The improvement is credited to better management at the farms. In co-operation with the Directorate of Fisheries, the Directorate for Nature Management, the Association of Aquatic Veterinary Surgeons and the Norwegian Association of Fish Farmers, the Norwegian Animal Health Authority under the Ministry of Agriculture has drawn up a *National plan of action against salmon lice on salmonids*. The responsibility for dealing with sea lice has been transferred to the Ministry of Fisheries and Coastal Affairs and the action plan is currently under revision. Nevertheless in the meantime the main principles from the expired plan are followed up.

3.3.13 Best results are achieved by co-ordinating measures for a region or fjord-system. Measures are therefore initiated at the county level, providing the best opportunity to reduce the problem of lice in the Norwegian aquaculture industry to a minimum.

3.3.14 The most important measures are:

- systematic registering and reporting of lice in fish farms
- systematic de-lousing schemes in winter and spring
- more extensive use of wrasse

3.3.15 Norwegian experts in this field agree that co-ordinated de-lousing at the onset of winter and in the spring is decisive for reducing the risk of infecting migrating wild smolts. It will also be a strategically correct use of drugs, but it presupposes that effective means for de-lousing are available. All treatments must, however, be undertaken on the basis of knowledge about the actual occurrence of lice in the plants.

3.3.16 The most common drug used in Norway at present is SLICE. There is considerable concern about development of resistance. Specific directions about variation in drug use are given. The minimum level of lice attack that gives mandatory delousing actions is 0,5 mature female lice pr. fish.

3.3.17 **Responsible authorities**

Ministry of Fisheries and Coastal Affairs

Norwegian Food Safety Authority

3.3.18 **Legislation**

The Aquaculture Act (entered into force 1st January 2006), Food Safety Act and Animal Protection Act

Measures, regulations:

- “Regulation concerning the management of aquaculture farms” 22. Dec. 2004 (“Akvakulturdriftsforskriften”).
- “Regulation concerning the management of sea-lice infestations”
- (Lakselusforskriften)
- National action plan against salmon lice.

Gyrodactylus salaris

3.3.19 **Background**

The salmon parasite *Gyrodactylus salaris* is considered to be one of the worst threats to Atlantic salmon in Norway. Salmon stocks have been more or less wiped out wherever the parasite has been registered. If measures are not implemented to combat the parasite, it will spread and, in the worst-case scenario, to each and every Norwegian salmon stock with disastrous consequences.

3.3.20 *Gyrodactylus salaris* does not occur naturally in eastern Atlantic salmon populations. It has been introduced in later years to rivers in Norway, to rivers on the Swedish west coast, and to one Russian river draining into the White Sea. The parasite was introduced to Norway in 1975, as a result of importation of infected salmon smolts from the Baltic region. Four transports of infected fish to Norway are known.

3.3.21 **Status**

After introduction to Norway the parasite has so far been spread to 46 watercourses, mainly by stocking from infested hatcheries and migration of fish from infested rivers to neighbouring rivers in fjord systems with low salinity. The parasite is a freshwater species, but can live in brackish water for a limited period of time. The parasite has also been spread by movements of Atlantic salmon and Rainbow trout related to fish farming.

3.3.22 In an attempt to counteract the damage caused by *G. salaris*, Norwegian authorities have drawn up an action plan to combat the parasite. The main elements of this plan include: A surveillance programme, preventive measures, eradication measures and preserving fish stocks. The fight against *G. salaris* is a priority area for Norwegian authorities, and the aim is to eradicate the parasite where possible and minimize the risk of transmission to new areas.

3.3.23 The most effective measure for reducing the risk of infection through fishing and outdoors activities is to inform the general public about the parasite, the laws and

regulations in force, the status of infection, the risk of contamination and procedures for disinfecting gear.

3.3.24 Establishing facilities for disinfecting fishing gear and equipment used in infected rivers is a requirement for permission to operate organized outdoor activities such as fishing.

3.3.25 Unregistered fish-farming facilities that move fish from one place to another represent a considerable risk of infection. Getting an overview of these facilities is therefore a priority task. Small-scale farming of rainbow trout in the inland is of special concern. If an infection is discovered in a fish-farming facility, the facility is sanitized and banned from use for a period of time before new fish can be brought in.



Figure 9. The distribution of *G. salaris* in Norway, 2007. All infected rivers (20) and rivers treated but not yet reported free from *G. salaris* (11).

3.3.26 Eradication measures include fish migration barriers and chemical treatment of infected rivers.

3.3.27 Fish migration barriers are used to prevent the salmon from entering parts of the river to spawn. After five to seven years the area above the fish barrier will be devoid of salmon and freed of the parasite, as the young salmon will either be dead due to the

parasitic infection or will have migrated as smolts. Thus the infested river-stretch is reduced to the areas below the fish barrier, simplifying the work to combat the parasite.

3.3.28 Chemical treatment has been carried out in a total of 35 infested rivers in Norway. In 15 of them the parasite has been successfully eradicated, 11 rivers are still being monitored and in 9 rivers the parasite is still present after chemical treatment. Five years of monitoring after treatment is necessary to be sure that the treatment has been successful and that the river can be taken off the sick list. The total number of infested rivers has been reduced from 46 to 20 (figure 9).

3.3.29 **Responsible authorities**

Ministry of Environment

Ministry of Fisheries and Coastal Affairs

3.3.30 The responsibility for carrying out the action plan is divided between the Directorate for Nature Management and the Norwegian Food Safety Authority. The Directorate for Nature Management is responsible for eradication measures such as chemical treatment and fish migration barriers, preservation of fish stocks e.g. in gene banks, information regarding the effect of *Gyrodactylus salaris* and chemical treatment, and international co-operation. The Norwegian Food Safety Authority is responsible for the surveillance program, epidemical monitoring, preventive measures against *Gyrodactylus salaris*, information regarding the status of distribution, and exposure hazard and international co-operation.

3.3.31 **Legislation**

Laws and regulations/directives being in force:

- Act relating to Salmonids and Fresh-water Fish
- Act relating to Food Safety with appurtenant regulation of *Gyrodactylus salaris*
- The Pollution Control Act
- The Norwegian regulation implementing directive 98/8/EC (Biocidal products), "Forskrift om godkjenning av biocider og biocidprodukter (biocidforskriften)"
- The Watercourse Regulation Act

4 Management approach

This section provides the management approach (including goals, measures and milestones), which will be used to address the problems identified in Section 3 over a period of at least five years. The approaches described should give measurable results against which subsequent reports can be assessed. The approaches are presented under three headings: management of fisheries; protection and restoration of salmon habitats and management of aquaculture, introductions and transfers. In each of these areas, the socio-economic implications of proposed actions should be considered.

- Management of fisheries: goals, measures and milestones that will be adopted to review and modify fishery regulations deploying the NASCO Decision Structure (SCPA (02)16) as appropriate;
- Protect and restore salmon habitat: goals, measures and milestones that will be adopted to assess estuarine and freshwater habitat quality, identify problems and prioritise remedial actions, taking account of the guidance in the NASCO Plan of Action for the Protection and Restoration of Atlantic Salmon Habitat (CNL (01)51);
- Management of aquaculture, introductions and transfers: goals, measures and milestones that will be adopted to minimise any adverse impacts from aquaculture and control introductions and transfers, in line with the Williamsburg Resolution (CNL (04)54);

4.1 Management of fisheries

Fisheries regulations

4.1.1 Management goal:

- Harvesting of the salmon resource shall rest on the principle of sustainable resource management, and the interests of different user groups and stakeholders shall be safeguarded.

4.1.2 A new five-year regulation regime of salmon fisheries will come into effect from 2008. The regime will be based on current ICES advice and implementation of the Decision structure for management of fisheries. Based on an analysis of stock status and probable future development as well as threats, fisheries compared to ICES advice and NASCO guidelines, the main focus will be on:

- Further reduction in mixed stock fisheries in which the stocks exploited cannot be identified and/or where vulnerable and or threatened stocks are targeted.
- Assessment of further regulatory measures in the remaining bend net fisheries. The county of Finnmark is the last area where bend nets are still allowed.
- Further use of spawning targets in fisheries regulations. Spawning targets should be met consistently.
- Reduction of the proportion of escaped farmed salmon in spawning stocks e.g. by reducing fishing pressure on wild fish.
- Strengthening of the cooperation with Finland concerning the application of the Precautionary approach to salmon management in the river Tana.

Guidelines for Incorporating Social and Economic Factors into Management Decisions will be applied e.g. by involving landowners, fishing interests and other stakeholders in the management process.

Milestones

Nr	Year	Action	Responsible	Remarks
1	2006	Establish spawning targets for 80 rivers	Directorate for Nature Management (DN)	Including all <i>National Salmon Rivers</i>
2	2006	Establish critical levels of escaped farmed salmon in spawning stocks, which necessitate special measures	DN	In cooperation with Directorate of Fisheries
3	2006/07	Revise the "marine regulatory regions" with the aim to reduce mixed stock fisheries	DN	
4	2007	Establish a joint working group on stock monitoring and research in the river Tana	DN	In cooperation with Finland
5	2007	Complete establishment of spawning targets for all significant river fisheries	DN	Minor rivers will not be included before 2008
6	2007	Conduct a comprehensive review of the status of stocks	DN	In cooperation with The County Governors
7	2008	Introduce a new 5-year regulatory regime taking into concern ICES advice on fisheries and employing the <i>Decision structure on management of fisheries</i>	DN and County Governors	After extensive consultation with stakeholders on both local, regional and national level
8	2008	Establish spawning targets for remaining salmon rivers	DN	
9	2009-2012	Make adjustments in regulatory regime in the case of unforeseen changes in status of stocks or other crucial new information	DN	In cooperation with County Governors involving local management bodies
10	2011-2012	Conduct a comprehensive review of the status of stocks including development of "second generation" spawning targets	DN	In cooperation with the County Governors
11	2013	Introduce a new 5-year regulatory regime taking into concern ICES advice on fisheries and employing the <i>Decision structure on management of fisheries</i>	DN and County Governors	After extensive consultation with stakeholders on both local, regional and national level

4.2 Protection and restoration of salmon habitat

Liming as a mitigation measure in acidified salmon rivers

4.2.1 Management goals:

- To restore and re-establish salmon stocks that have been adversely affected or lost due to acidification
- To restore and create fishing possibilities

4.2.2 The more operative goal is to follow up the current Action plan for liming of watercourses 2004 – 2010.

4.2.3 The current Action plan for liming of watercourses 2004 – 2010 is based on a stable level of funding of about 88 million NOK each year. About half of this amount is spend on liming activities in salmon rivers. Reduced atmospheric emissions are expected to reduce the necessary expenditures on ongoing liming projects with about 2,5 % pr year. Expenditure savings are supposed to cover necessary investments in ongoing and new projects.

Milestones

Nr	Year	Action	Responsible	Remarks
1	2006-2010	Continue liming of 22 Salmon rivers and assess the inclusion of new rivers	Directorate for Nature Management (DN)	In cooperation with County Governors
2	2006	Start liming of the River Nidelva, Aust-Agder county	DN	In cooperation with County Governor
3	2007	Necessary investments in ongoing liming projects in rivers in the county of Vest-Agder	DN	In cooperation with County Governor Potential rivers: Audna, Lygna, Kvina
4	2007	Examine the need and feasibility of liming in the river Otra, Vest-Agder county	DN	
5	2008	Start liming of the river Storåna in Ørdsdal, Rogaland county	DN	In cooperation with County Governor
6	2008	Complete necessary investments in ongoing liming projects in rivers in county of Vest-Agder	DN	In cooperation with County Governor
7	2009	Start liming of the river Otra and Sogndalselva, Vest-Agder county, if necessary	DN	In cooperation with County Governor
8	2007-2010	Start liming of the rivers Årdal in Rogaland county and Tysse in Hordaland county	DN	Depending on decisions made by the Ministry of Petroleum and Energy concerning waterflow regimes.
9	2010	Revise Action plan for liming of watercourses	DN	

Hydropower development

4.2.4 Management goals:

- New hydropower development shall not have significant adverse affects on wild salmon
- The revision of licence conditions for hydropower developments will whenever technically and economically possible improve conditions for salmon production, including:
 - a. Improved water flow conditions by establishing or revising rules of operation
 - b. Improved knowledge base on effects of low water flow conditions on salmon stocks
 - c. More active use of the admission to impose mitigation measures in licence conditions

4.2.5 New hydropower development shall not have significant adverse affects on wild salmon. Moreover renewal of already established licences and the revision of licence conditions represent the most important option to improve conditions for wild salmon stocks in regulated rivers. In 1992 the Norwegian parliament decided that all rules of operation and other conditions attached to the licence given for a predefined or undefined period are subject to possible revision within a thirty-year period, i.e. not later than year 2022.

4.2.6 The need for revision of conditions with regard to wild salmon stocks will be considered on a case-by-case basis taking into account the need for stability in electricity production. In *National Salmon Rivers* wild salmon interests will be given special priority.

Milestones

Nr	Year	Action	Responsible	Remarks
1	2007	Improved supervision of existing conditions in hydropower licences	The Norwegian Water Resources and Energy Directorate (NVE)	In cooperation with Directorate for Nature Management (DN)
2	2007	Develop an overview over timescales for renewal or revision of hydro power licences, open to the public on the Internet	NVE	Renewal means full licence process. Revision covers certain licence conditions
3	2007-2008	Develop guidelines for revision of licence conditions in relevant rivers incl. salmon rivers	NVE/DN	In cooperation with County Governors
4	2007-2008	Develop an improved control system for existing conditions in relation to salmon	DN	In cooperation with NVE
5	2007-2009	Revise imposed mitigation measures in all <i>National Salmon Rivers</i>	DN	
6	2007-2011	Establish and restore salmon stocks in rivers where conditions again become suitable for salmon	DN/NVE	In cooperation with hydropower companies
7	2007-2011	Establish salmon production monitoring in all regulated salmon rivers	DN	
8	2007 - 2011	Conduct revision of licence conditions in all relevant rivers	NVE/DN/ Government	In cooperation with County Governors

National Plan of Action for the Protection and Restoration of Atlantic Salmon Habitat

4.2.7 The NASCO agreement on habitat issues (CNL (01)51) consists of two main tasks:

1. The protection of Atlantic salmon habitat
2. Develop a plan for the restoration of habitats that are negatively affected.

The protection of Atlantic salmon habitat

4.2.8 Management goals:

- 52 National Salmon Rivers and 29 National Salmon Fjords shall have special protection against adverse human impacts.
- Implement this objective in ongoing management.

4.2.9 The protection of Atlantic salmon habitat is covered by the National Salmon River and National Salmon Fjords scheme.

Milestones

Nr	Year	Action	Responsible	Remarks
1	Spring 2007	Decision on the supplementation of the National Salmon Rivers and Fjords scheme	Norwegian Parliament	Incl. a revision of regulations regarding management and protection
2	2007	Establish a new habitat management principle "No net Loss"	Ministry of Environment	
3	2011	Remove salmon farms from three National Salmon Fjords (Trondheimsfjorden, Altafjorden, Tanafjorden)	Ministry of Environment	Affected salmon farms are given a fair compensation

Development of a habitat restoration plan

4.2.10 Management goal:

- Salmon habitat adversely affected by human impacts shall be restored where possible and there shall be no further net loss of salmon habitat

4.2.11 According to NASCO Plan of Action for the Application of the Precautionary Approach to the Protection and Restoration of Atlantic Salmon Habitat (CNL (01)51) a national plan for restoration of Atlantic salmon habitat should consist of an inventory of salmon rivers and an action plan for restoration of Atlantic salmon habitat.

4.2.12 An inventory of salmon habitat according to the NASCO agreement is under development and will be completed by the end of 2009.

4.2.13 A plan for the restoration of Atlantic salmon habitat (other than liming, see section 4.2.1) will consist of a general strategy, including measures to minimize adverse impacts, objectives describing the extent of salmon habitat restoration measures and a prioritization of restoration projects, restoring habitat, taking into account cost/benefit considerations. Thus the plan will also serve as a framework for better management of salmon habitat and in general. National Salmon Rivers will in general be given high priority. A restoration plan will be developed successively and completed by the end of 2010.

4.2.14 Guidelines for Incorporating Social and Economic Factors into Management Decisions will be applied e.g by involving hydropower companies, landowners, fishing interests and other stakeholders in the management process.

Milestones

Nr	Year	Action	Responsible	Remarks
1	2006	River data and salmon production data for 80 rivers incl. all <i>National Salmon Rivers</i>	Directorate for Nature management (DN)	
2	2007-2008	Productive capacity all remaining salmon rivers with considerable river fisheries	DN	
3	2008	River data for all remaining salmon rivers	DN	In cooperation with The Norwegian Water Resources and Energy Directorate (NVE)
4	2008	Habitat impact data all <i>National Salmon Rivers</i>	DN/ NVE	In cooperation with County Governors
5	2008	Plan for restoration of fish ladders	DN	In cooperation with landowners and hydropower industry
6	2008	Plan for restoration of Salmon habitat covering all <i>National Salmon Rivers</i>	DN/ NVE	
7	2009	Habitat impact data further 80 rivers	DN/NVE	
8	2009	Plan for restoration of Salmon habitat further 80 rivers	DN/ NVE	
9	2009	Productive capacity/ Habitat impact data remaining rivers	DN/ NVE	
10	2010	Plan for restoration of Salmon habitat remaining rivers	DN/ NVE	

4.3 Management of aquaculture, introductions and transfers

Reduction of escapes from fish farms – Vision Zero Escapes

4.3.1 Management goal:

- There shall not be harmful levels of escaped farmed salmon in spawning stocks by 2010.

- 4.3.2 The Directorate of Fisheries adopted an action plan against escaped farmed fish in April 2006. The original plan consisted of 29 items, and intended to visualise and communicate the Directorates work with this problem. The reason was the large number of Atlantic salmon and cod escapes, and in 2006 reported escapement was even higher. The action plan was the result of a dialog from a wide perspective of the aquaculture industry, other administrative departments and environmental organisations. After a mid-term evaluation early in 2007, it was obvious that all the original goals could not be achieved at the end of the plan period. The DG of Fisheries concluded that the level of ambition should not be decreased, so the plan was revised in December 2007 and prolonged for two new years. Even if not all the milestones in the plan were reached, reported escapements decreased in 2007.

The plan is printed on the next pages and available under the following link:

<http://www.fiskeridir.no/fiskeridir/layout/set/print/content/view/full/13912>

Guidelines for Incorporating Social and Economic Factors into Management Decisions will be applied e.g by involving the aquaculture industry, wild salmon and nature conservation interests and other stakeholders in the management process.

<u>Action group</u>	<u>What is the goal</u>	<u>How do we solve the problem</u>
<u>Motivate (01)</u> Urge for desirable conduct through positive means	Obtain a positive focus and incitement for desirable action and attitude	(1) Hand out the Directorate of Fisheries environmental prize during Aqua Nor 2009 (2) Review "Smiley Fish" – hand out when zero deviations after auditing? Possible list on the internet. (3) Standardised introduction regarding attitude towards escapes during audits etc (4) Procedure for better interaction with the insurance industry
<u>Demand (02)</u> Development of regulations	Examine possible regulation amends with the intention of preventing escapes	(1) Prepare a proposal for a revised NYTEK - regulation (2) Implement the work task at hand in the regulation committee - escapes (3) Prepare a proposal for the regulation regarding National Salmon Fjords/National Salmon Rivers (NLV/NLF) (4) Examine restrictions for moving fish (both the moving as such, and size requirements to fish/mesh?) (5) Propose regulations for transportation to/from aquaculture installations (6) Examine regulation demands for slaughteries (7) Examine provisions for time restricted biomass reduction and compulsory transfer
<u>Measure (03)</u> Monitor escaped fish and their harmful effects	Follow up the agreement regarding monitoring and make visible the need for suitable effect monitoring of escaped fish	(1) Follow up the commitment in the monitoring program concerning NLF/NLV (2) Propose the implementation of the monitoring program to Ministry of Fisheries and Coastal Affairs
<u>Investigate (04)</u> Investigation of scenes. Assist the Escape Commission for Aquaculture (RKA)	Perform investigations into escape episodes and collect information in harmony with the RKA and also on own accord.	(1) Investigation of scenes under the direction of the Directorate of Fisheries' regional office (2) Manage the secretariat for the RKA (3) Report the RKA' work and results to the Ministry of Fisheries and coastal Affairs (4) Evaluate the RKA' work

<u>Action group</u>	<u>What is the goal</u>	<u>How do we solve the problem</u>
<u>Follow up (05)</u> Follow up the demands for technical standards in the aquaculture industry	Ensure that the provisions for technical demands in the regulations are respected by the industry	(1) Audit, inspection and investigation of scenes in response to an escape (2) React to apparent breaches of regulations (3) Active and predictable follow up of equipment contractors and accredited companies where there is suspicion or flaws (4) Active dialogue with Norwegian Accreditation (NA) regarding effective follow up of current documents and accredited companies (5) Control campaign on smolt escapements 2008
<u>Amend (06)</u> Better implements for the administration	Better implements for the administration	(1) Examine mandatory adipose fin clipping together with the Norwegian Food Safety Authority (2) Better positioning of aquaculture installations (Project STAK) (3) Order yearly environmental risk assessment reports for Norwegian aquaculture (4) Plan and implement contingency response exercises with regards to escapes (5) Implement possible instructions from the Ministry of Fisheries and Coastal Affairs concerning sterile salmon (6) Establish permanent procedures and standard equipment packages for sampling and tracking fish with regards to escapes from unknown source (7) Checklist for inspections (8) New instructions with regards to escapes (9) Joint instructions for the Norwegian Nature Inspectorate/County Governors Environmental Department with regards to escapes (10) Interrogating procedure with regards to escapes pursuant to own and RKA' categories. Linkage of this information to case lists. (11) Adapt procedures for registering escape cases for unknown source (12) Escape register as part of a new aquaculture register
<u>Standardize (07)</u> Standardizing with regards to systemizing good actions	Initiate standardizing within own areas for the achievement of better security measures regarding escapes	(1) Participate in the international standardization work ISO/TC.234 and the corresponding Norwegian Standard NS/K 278 (SN). (2) Consider recommending NS for smolt facilities (3) Examine the need for NS for user handbooks

<u>Action group</u>	<u>What is the goal</u>	<u>How do we solve the problem</u>
<u>Communicate (08)</u> Information and communication actions concerning escapes	Implement dialogue and communication that sets focuses on the work against escapes through appropriate measures	(1) One-day conference regarding escapes at Aqua Nor 2009 (2) Communicate quarterly statuses regarding vision NO ESCAPEES on the internet (3) Implement annually dialogue meetings with the industry (4) Accumulate experience involving the regional offices, RKA and the industry (5) Internet page/gateway for the industry where information regarding rules and regulations etc. are clearly laid out (6) More active journalism tied to escapes (Fiskets Gang) (7) Monthly updates of all cases and aggregated lists regarding escapes
<u>Share (09)</u> Describe good assessments and practice with regards to risk operations that illustrate the regulations functional demands	Communicate important knowledge concerning practise, which reduce the risk of escapes to staff members, producers and contractors.	Implement the project AkvaBest ; (1) Internal experience registry in the Directorate of Fisheries (2) Version 1 of the experience registry on the internet
<u>Learning (10)</u> Competence requirements for own employees, employees in the aquaculture industry	Implement competence requirements	(1) Define competence requirements for the Directorate of Fisheries' employees (2) Implement internal courses (3) Contribute to better tuition (courses) regarding aquaculture at sixth form comprehensive schooling (4) Contribute to courses for the industry; offer organisations a series of lectures (5) Identify and establish a few special competence regions for the work against escapes
<u>Evaluate (11)</u> Implement evaluation of Vision NO ESCAPEES and report to the Ministry of Fisheries and Coastal Affairs	Evaluate and report the efforts made visuable in vision NO ESCAPEES through practical methods	(1) Midway evaluation the progress during Nov. - Dec. 2008. (2) Report evaluation to the Ministry of Fisheries and Coastal Affairs (3) Ex-post evaluation of the progress during Nov. - Dec. 2009

Reduction of sea lice infections on wild stocks

4.3.4 Management goal:

- There shall not be harmful levels of sea lice on wild salmon by 2010.

4.3.5 The Norwegian Food Safety Authority will strengthen the Action Plan against sea lice, and this will be supplemented by revisions of existing rules.

4.3.6 Development of new and more effective measures against sea lice will be prioritized, including vaccines and synchronized treatment schemes. A revision of the sea lice regulation will include i.a. strict requirements for registration and reporting of sea lice, regional limit values based on tolerance limits of salmon stocks and synchronized treatment. New rules will be operative as soon as possible.

Milestones

Nr	Year	Action	Responsible	Remarks
1	2007	Develop a revised Action plan against sea lice	The Norwegian Food Safety Authority (MT)	
2	2007	Initiate necessary long term monitoring and research on sea lice vs wild fish populations	MT	
3	2007/08	Develop levels for tolerable infection rates on wild fish	MT	
4	2007/08	Develop the legal basis for mandatory regional and synchronized sea lice treatments in fish farms	MT	
5	2007/08	Adjust current action levels for sea lice treatments in fish farms	MT	
6	To be decided	Development of new treatments/vaccines		

Eradication of *Gyrodactylus salaris* from Norwegian salmon rivers

4.3.7 Management goal:

- To eradicate *Gyrodactylus salaris* from Norwegian salmon rivers wherever realistic and to minimize the risk of further spreading of the parasite.
- To restore and re-establish salmon stocks that have been adversely affected or lost due to *G. salaris*
- To restore and recreate fishing possibilities

4.3.8 The more operative goals for the next five-year period are as follows:

- Follow up the Action Plan for Eradication of *G. salaris*
- Carry out chemical treatments to eradicate *G. salaris* in the Lærdal-, Steinkjer-, Vefsn- and Romsdal regions
- Prevent the spread of *G. salaris* to new regions
- Facilitate the further progress of NASCO's Road Map

- 4.3.9 Guidelines for Incorporating Social and Economic Factors into Management Decisions will be applied e.g. by involving local communities, landowners, fisheries and nature conservation interests and other stakeholders in the management process.

Milestones

Nr	Timelines	Action	Responsible	Remarks
1	2006-2008	Chemical treatments in the Lærdal region	Directorate for Nature management (DN)	In cooperation with The Norwegian Food Safety Authority (MT)
2	2006-2008	Chemical treatments in the Steinkjer region	DN	In cooperation with MT
3	2006-2008	Develop a plan for eradication in the Vefsn region	DN	In cooperation with MT
4	2007	Revision of the national monitoring programme of <i>G. salaris</i>	MT	
5	2007	Develop a programme for epidemic surveillance of <i>G. salaris</i>	MT	
6	2007-2008	Finalize the National Contingency Plan	DN/MT	
7	2008	Develop a new Action Plan	DN/MT	
8	To be decided ¹	Chemical treatments in the Vefsn region	DN	In cooperation with MT
9	To be decided ¹	Chemical treatments in the Romsdal region	DN	In cooperation with MT

¹ Estimates of progress beyond 2008 can not be given at present. This is due to i.a. unforeseen difficulties during this year's chemical treatment with a relatively new method still under development. We will come back with updated information as soon as possible, probably during the spring of 2009.

5 Evaluation

5.1 To evaluate status of salmon stocks and the efficiency of management measures, the following monitoring and evaluation programmes will be assessed and, if necessary, improved:

- *National Salmon Rivers and National Salmon Fjords*
- limed salmon rivers and rivers subject to acid precipitation, including rehabilitation of salmon stocks
- escaped farmed salmon in fisheries and spawning stocks
- sea lice infestations in fish farms
- sea lice infestations on wild and escaped salmon and sea-trout?
- presence of *Gyrodactylus salaris* in rivers and inland fish farming facilities
- epidemic surveillance of *G. salaris* as part of regional eradication programmes
- restoration of salmon stocks in rivers chemically treated to eradicate *G. salaris*

- general assessment of stock size, composition, and juvenile production
- sea survival
- status of salmon stocks in regulated rivers

- 5.2 During the 5-years interval running from 2008, the fisheries regulation regime will be assessed from external research institutes through an evaluation project. The goal of this project is to study implications from the new regulation regime on the salmon stocks, behaviour of fishermen and anglers, economical and socio-cultural aspects, and cultural aspects like for instance Sami interests. The project will extend for 5 years, and reporting will be accomplished on an annual basis.
- 5.3 Information from these activities as well as other sources form the basis for the yearly survey of stock status and human impact factors.
- 5.4 Stock status is summarized in categories as follows:

Category 1: Lost stock

Rivers where the stock has been lost as a result of human impact

The category concerns loss of stocks in nature. Rivers where a salmon stock is being re-established, e.g. through stocking with fish from the gene bank or with fish of other origin, are categorized as normal with notes on its reestablishment.

Category 2: Threatened stock

Rivers where the stock is at high risk of becoming lost as a result of human impact

The stock is affected by human impact factors that have both sufficient damaging potential and scale to threaten the stock with loss. This will often be the case when the stock is exposed to human impact factors that inflict high death rates, e.g. *G. salaris* and river acidification.

The category does not include rivers where the stock is maintained through alleviating actions see Category 3b).

Category 3: Vulnerable stock

Rivers where the stock can become threatened as a result of human impact

3a: Rivers where the stock is near threatened

A moderate increase in potential or scale of human impact factors can result in the stock becoming threatened. The chances that alleviating actions will be successful are much higher than in the case of threatened stocks.

3b: Rivers where the stock is maintained

Rivers where the stock is maintained by alleviating actions (liming, stocking, etc.), and can become threatened if these actions cease.

Category 4: Reduced stock

Rivers with considerably reduced young fish production and or adult fish stock resulting from human impact

These are rivers with reduced stocks that do not qualify for lower categories.

4a: Rivers with considerably reduced young fish production

The category also includes rivers where measures are undertaken to compensate for the reduced production (stocking, liming, opening of new anadromous stretches, etc.).

The reduction in production can be attributed to a reduction in the rivers capacity to produce salmon, and/or to a reduction in productive ability of the stock, e.g. due to reduced numbers of spawners. The causes of the reduction shall be noted. The reduction in production is regarded as considerable when it is easy to detect and is of size order 10% or more.

4b: Rivers with greatly reduced adult fish stock, but where young fish production is not considerably reduced

These are rivers where the adult fish stock is strongly reduced by human impact factors other than a sustainable fishery.

Category 5: Moderate or lightly affected stock

Rivers where the stock is moderately or lightly affected by human impacts

5a: Rivers where stocks require special concern

Rivers where moderate changes in human impact may negatively affect the productivity of stocks.

5b: Rivers where stocks do not require special concern

ANNEX 1: Responsibilities of the Norwegian Water Resource and Energy Directorate (NVE) in relation to Hydropower development.

The Norwegian Water Resource and Energy Directorate (NVE) is responsible for licensing all kind of water extraction projects and encroachments in the river courses. This includes groundwater extraction, water supply, hydropower, flood control projects and all other physical constructions in the rivers that may have negative impacts on the environment or other user interests. All applications for hydropower projects bigger than 40 GWh or reservoirs bigger than 10 mill.m³ are handled in accordance with the procedures in the Planning and Building Act (PBA), including an early notification and environmental impact assessments (EIA). Applications for projects smaller than 40 GWh and investment bigger than 50 mill. NOK (7 mill. \$) must follow the regulations in the PBA regarding an early notification and EIA if the environmental impacts exceed limits stated in the Planning and Building Act. For all other projects the handling procedures are less complicated. There is no need for a notification and the program for impact assessments is decided by NVE without a hearing process. The impact assessments must be according to the rules in the Water Resources Act or The Water Courses Regulation Act, depending on whether or not the project includes reservoirs for storing water from one season to another. The guidelines according to the Planning and Building Act set up a framework for the impact assessments, but different projects have different sizes and impacts. Therefore it is important to concentrate on crucial impacts and to adjust the program for impact assessments so that the assessments focus on relevant issues. The impact assessments must concentrate on impacts which are of importance in the decision making process and for the evaluation of mitigating measures. The procedures are as follows:

1. A notification is worked out by the developer and sent to NVE. The notification includes a description of the technical plan, alternatives, environmental impacts and the developer's proposed program for impact assessments needed. The notification is sent by NVE to the relevant authorities and NGOs and published in local newspapers. NVE will arrange a public meeting in the affected area to inform about the project, the proposed program for impact assessments and the handling procedures. All comments on the notification must be received within 6 weeks. The intention is to elicit comments on the impact assessment program and what should be taken into consideration during the planning.
2. NVE decides, after consultation with the Ministry of Environment, on a program for the impact assessments, based on the information in the notification, the comments received and NVE's own evaluation. The issues included in the program must be relevant for the decision-making.
3. The applicant is responsible for preparing the impact assessments and to present them to NVE. I would like to emphasise the importance of co-ordination between the impact assessments and the development of the technical plan. One of the major goals of the impact assessment process is to adjust the technical plan so as to avoid or minimise the negative environmental impacts.
4. The Application and the impact assessment are sent to the relevant authorities and NGOs and published in local newspapers with a time limit of 12 weeks for comments. A public meeting should take place in the project area with a presentation of the plan, conclusions of the impact assessments and the handling procedures. The applicant is given the opportunity to comment on the statements received.
5. Based on the comments received and NVE's own evaluation, NVE decides if the impact assessments have been developed in accordance with the program stated in point 2 (see above), and that the case in question is sufficiently prepared.

6. NVE make their final evaluation of the project based on the application, the impact assessments and the comments received. The evaluation consists of a discussion of all the costs and benefits of the project, including environmental issues. A license is recommended only if the total benefits are considered bigger than the cost.
7. NVE's evaluation and conclusions are sent in the form of a recommendation to the Ministry of Petroleum and Energy who are responsible for preparing the case for the Government after a short hearing with affected municipalities and the ministries involved. Large projects are presented to the parliament.

The procedures ensure participation from related authorities, affected communities and the public. All documents are publicly available and all parties are invited to express their opinion on both the need for impact assessments and whether a license should be granted or not.

The legislation establishes conditions for the licenses. Based on experience and co-operation with the relevant authorities, NVE has developed a set of standard terms of license, which covers:

- Time limitation for licenses.
- Rules for revision every 30 years of the terms of license
- Construction deadlines. The construction must start within 5 years after the license is granted.
- Nature conservation. Authority to require mitigating measures regarding:
 - landscape
 - biotope adjustments to maintain biological diversity
 - weirs in the affected river stretch
 - fish stocking
 - pollution
- Preservation of ancient monuments
- Hydrological measurements
- Approval of detailed plans regarding landscape and safety
- Monitoring of long-term environmental effects
- Punishment for operation in conflict with the rules of operation