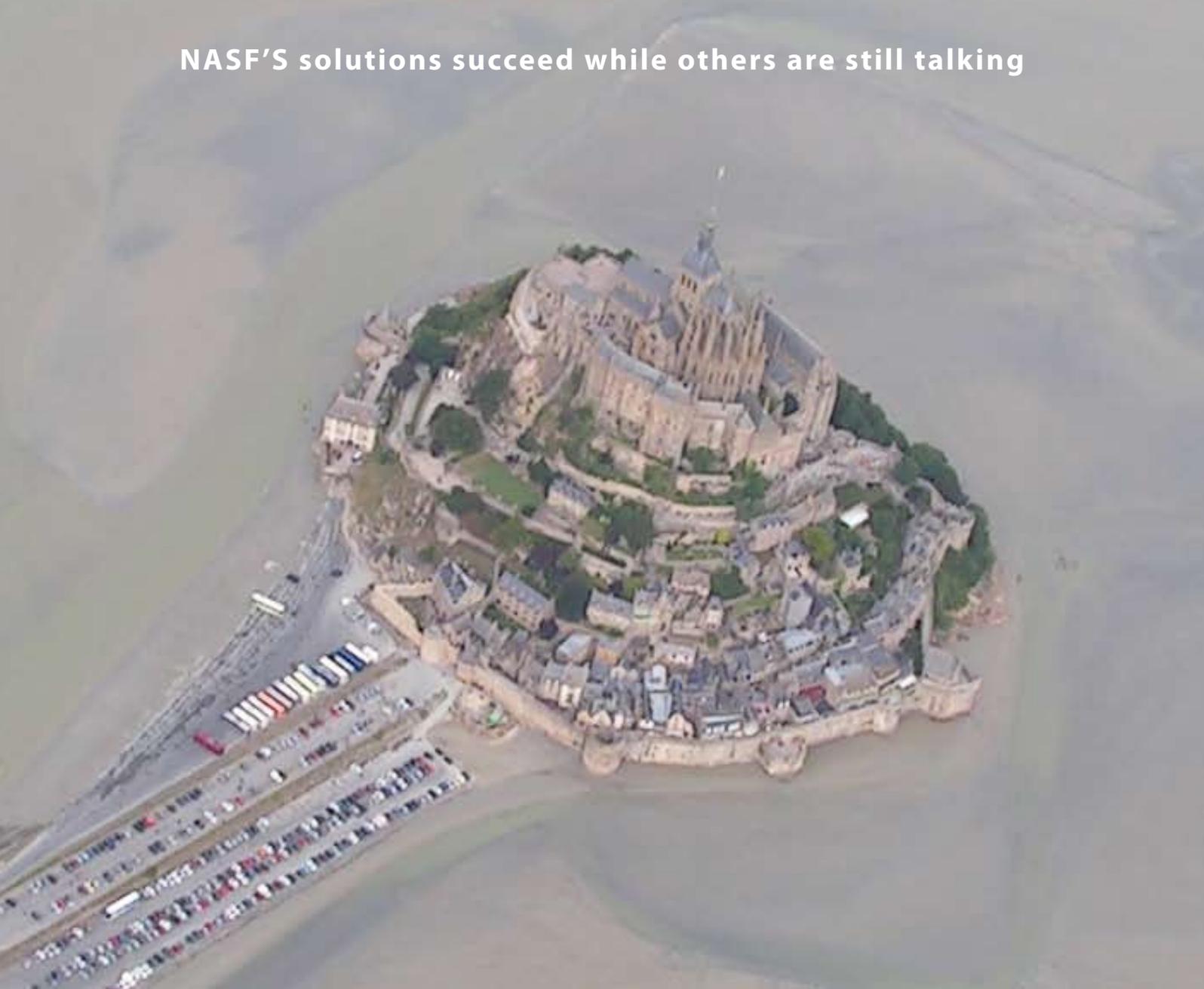




**NASF'S solutions succeed while others are still talking**



# NASF HAS WORKED FOR 20 YEARS TO RETURN SALMON STOCKS TO THEIR HISTORIC ABUNDANCE

The North Atlantic Salmon Fund (NASF) is a coalition of volunteers that since 1989 has brokered market-based compensation agreements that end interceptory netting and long-lining for salmon. NASF provides cash, resources or alternative fisheries to commercial fishermen who agree to stop harvesting salmon.

Nothing beats the commonsense approach when it is backed by the advice of our experts.

And now we are getting there. Crude estimates suggest that our work has allowed 15 million extra salmon to return to their home rivers. NASF believes that close to 90% of all salmon netsmen in the north Atlantic regions have now signed up to the doctrine of commercial conservation agreements.

Salmon in Europe:

The North Atlantic Salmon Fund (NASF) aims at restoring wild salmon stocks to their historic abundance. Together with key European partners in France, Spain, Germany, Switzerland and the Czech Republic, NASF is helping develop a plan to restore salmon stocks to a number of European rivers.



## SHORTLIST OF PROBLEMS IN STREAMS CAUSED BY DAMS:

- physical barrier to migration-both upstream and down, and both are equally important
- change the flow regime in river above and below the dam
- change riverine water temperatures
- change dissolved oxygen concentrations
- change the way sediment moves through river systems
- because of changes in flow regimes, river channels are altered
- aquatic insects and other invertebrates within streams are changed
- predator and prey relationships are changed in a number of ways
- alters the distribution of nutrients in the river system
- directly alters habitats, especially those needed by migratory species
- changes in habitats favor lake dwelling organisms over migratory species
- pollutants are more likely to become trapped in the river system
- encourages the use of hatcheries as a "solution" to the problems caused by dams

# NASF AND THE SÉLUNE PROJECT



## Introduction

NASF understands that the French authorities will shortly announce a dramatic new plan to restore the wild salmon runs of the rivers Sélune and Sée in Normandy. Following an advisory visit by a team from NASF International the authorities in the popular French holiday region have decided to open up large new areas of salmon habitat by demolishing two massive dams.

The bigger of the two dams is at Vezins, 20 kms up the Sélune. Some 34 metres (111 ft) high it was built to provide water and hydroelectric power in a three-year building operation completed in 1932. A similar dam was pulled down at Kernansquillec on the Léguer river in Brittany in the 1990s.

The second dam that is to be demolished was constructed at La Roche-qui-Boit during the First World War. It is only half the height of its upstream counterpart but it is 12 kms nearer the sea and its construction created a complete barrier for salmon seeking to reach the headwaters. Both dams were designed and built by the same engineer/architect partnership, Louis Pelnard-Considère and Albert Caquot.

## Green Initiative

This very 'green' initiative demonstrates the determination of the French government and the country's salmon anglers to lead growing efforts by several European countries to restore their lost stocks of wild Atlantic salmon. France is already taking important steps towards the restoration of its salmonid populations with the aim of increasing salmon numbers to levels to maximum sustainable levels. The removal of the two dams will be an important further step in this process.

Wild Atlantic salmon were once plentiful in all the European rivers from northern Portugal to Finland's border with Russia. Pollution and dams that prevented salmon reaching their spawning grounds have since wrecked stocks in almost all the rivers south of Norway and Sweden. However, interesting restoration and dam removal projects aimed at restoring Atlantic salmon, goes on in several countries, such as Denmark, Great Britain, Germany, USA and Canada.

In France there were once about 100,000 salmon in the the Loire and its main tributary, the Allier, with catches of 30,000 to 45,000 fish. This huge stock has largely disappeared.

## Dams

The Saint-Etienne du Vigan dam, which closed off some of the Allier's best spawning grounds for over 100 years, was dismantled in 1998. For half a century an even more formidable obstacle, the Poutès-Monistrol dam built in 1941, stopped all migration to the upper reaches of the Allier. This meant that until a salmon lift was built in 1986 only 8% of the original salmon spawning areas were available to the fish. In theory the lift opened up some 2,000 hectares of salmon habitat but natural recovery has proved to be very slow. In 1996, 10 years after the elevator was commissioned, it was used by only 67 adult salmon.

In Normandy the dams that are to be removed have also prevented returning salmon reaching much of the potential spawning areas. The hope is that the complete removal of the two dams will produce a much speedier stock recovery than has taken place on the Loire-Allier.



### **Catchment area**

Between them the Sélune and Sée have a total catchment area of 1,480 square kilometres. The combined waters of the two rivers flow into the Bay of Mont Sain-Michel through what is reputed to be the largest wetland area in mainland Europe. The 4,000 hectares of salt-meadows are said to be a wildlife haven that is unique in Europe. The salmon of both rivers are unusual in having largely identical genes and the fish seem to be able to live and breed quite freely in either river.

President Nicholas Sarkozy has shown great enthusiasm for environmental projects like the Normandy initiative. In 2007 he instigated the “Grenelle de l’Environnement”, an environment round table that aims to define the key points of government policy on ecological and sustainable issues for the next five years.

With the French authorities keen to review the prospects of rebuilding the salmon runs in the Sélune and Sée the ecological status of the two rivers was first investigated by local experts from ONEMA (Office National de l’Eau et des Milieux Aquatiques), Agence de l’Eau Seine Normandie and the President of SAGE Sélune (the Sélune catchment abstraction management authority).

They found that there are no major problems with the water quality and that agricultural run-off in the two catchment areas is at acceptable levels for young salmon. Quite apart from restoring an important natural resource, the scheme has considerable potential to extend Normandy’s holiday industry. It has been estimated that the region receives three million tourist visitors a year.

### **NASF and French authorities**

Since 1993, NASF has enjoyed a good relationship with the French authorities in respect of salmon restoration. The French Government supported NASF’s high seas moratorium projects and the campaign in Ireland to end the Irish drift netting that intercepted a great many salmon that would otherwise have returned to their native rivers in France, Spain, Germany, England and Wales.

NASF met and discussed the project with leading French experts at the invitation of the French authorities. Normandy and Brittany are the first areas of mainland Europe to receive the remnants of the huge numbers of Atlantic wild salmon that formerly returned to the continent from the salmon’s high seas

feeding grounds off Greenland, Iceland and the Faroe Isles. This makes the prospect of successfully restoring salmon stocks in Normandy of considerable importance in encouraging growing efforts in countries from Northern Spain to Germany to rebuild low salmon numbers and to recreate the salmon runs of rivers that have lost their stocks.

NASF believes that if the plan is to succeed a campaign to win the support of the local population is just as necessary as providing good and abundant in-river habitat. NASF chairman Orri Vigfusson, a member of the visiting advisory team, said: ‘Healthy salmon stocks are an excellent indicator of good environmental status and water quality. NASF also feels it is important to link this project to efforts to extend the premium image of Normandy’s tourism.

### **Business Plan is key to success**

‘The economy of the whole region would enjoy very substantial benefit from angling visitors if salmon stocks can be fully restored. Anything that can be done to raise the public awareness of the value to the area of salmon and sea trout will be beneficial. We would suggest that an overall business plan should be produced to highlight the economic benefits.’



Compared to the extended tourism that takes place on the other side of the Channel the traditional holiday season in northern France is remarkable short. The fact that salmon run the Sélune and Sée from April to October and that growing numbers of the fish arrive during September and October could be used to create a valuable extension of the holiday season both before and after the usual holiday influx take place.

If the plan succeeds angling tourism offers great potential for an expansion of the rural economy and the incomes of land owners, hoteliers and shopkeepers. There will also be opportunities for the creation of some angling-related specialist supply and service enterprises. A viable salmon run can increase the number of visitors to the area at a time when there are unused bed-nights at farm cottages, hostels and hotels. In addition, a wide range of wild life other than salmon will benefit from the dam removals and this offers incentives to visit to a range of other environmental enthusiasts who have no interest in fishing. Local shops will also benefit from these visitors.

NASF believes that the French government and the various agencies involved in the restoration of wild Atlantic salmon numbers in France would be well advised to seek co-operation for much of the work of rehabilitation from the private sector.



It is NASF's view that as far as the restoration and improvement of salmon stocks is concerned the public sector is best fitted to enable, encourage and regulate.

The hands-on management of salmon rivers and the introduction and execution of the habitat improvement programmes and other restorative efforts necessary to restore an abundance of salmon will be quicker and more efficient if stakeholders in the private sector form an alliance in partnership with the local authorities.

The establishment of a unit like a fishery board could well be the best way of stimulating and maintaining enthusiastic support from the local community. It should be fully representative of all stakeholders who will benefit from the scheme or could contribute to it.

Such a unit must be capable of raising the necessary long term funds, including those available from the EU, to finance the professional expert staff charged with achieving the objectives of the business and environmental strategy.

The directors must have the vision and drive to fully exploit the potential of the Sélune and Sée project. Their immediate task will be the drafting of a detailed business and action plan and the identification of sources of supportive funding for the programme.

The plan should establish sound management objectives for the fisheries and set out the way the day-to-day implementation of the restorative work should proceed. It should also include the development of schemes to advertise and promote the fisheries.

NASF suggests the following initiatives should be considered:

- Setting up a fishery board or similar body to involve all relevant stakeholders in the area including representatives of conservationists, the local tourist boards and district councils.
- The adoption of a wide and inclusive approach as a key factor in triggering voluntary work. This could contribute, for example, to habitat restoration, surveillance and monitoring and enforcement.
- Seeking diversity in the angling clientele by adopting an overall plan that ensures an acceptable mix of private and club waters. This should be aimed at providing good access to high quality beats and it should also offer opportunities to fish to the general public providing those taking part can enjoy the sport without overcrowding. It is particularly important to cater for the needs of local anglers
- The full co-operation and financial support of tourism and business groups. is needed.
- The help of the environmental organisations that could be valuable in assisting the prevention of illegal and damaging activities and the effective surveillance of the river system.
- The design of a conservation and restoration action plan for anglers that would include catch limits, catch-and-release and the possible provision of the salmon hatcheries that may be needed to accelerate the recovery whilst also providing high quality fishing.

- Consideration of the introduction of a “Salmon Event”, perhaps as a peak season week-end that focuses on salmon angling, conservation, education, and activities related to salmon angling, such as fly tying, fly casting etc. It should give beginners and interested novices a ready opportunity to join the culture of responsible and sustainable salmon angling.
- Give consideration to the provision of guiding courses and viewing activities, aimed at anglers as well as the non-angling sector, especially schools and colleges. The viewing of salmon during the spawning season is one activity that would attract the interest of the educational bodies in Normandy and further afield.

necessary funding will be retained if anglers are allowed to fish providing they return their quarry unharmed.

A specific protocol should be designed toward optimising survival of Catch & Release fish which might include barbless hooks, fly only fishing, single treble hooks on lures and baits and perhaps suspension of angling if water temperatures reach say 19°C



### Cooperation

ONEMA is already working on the scheme with stakeholders and the local authorities. NASF has suggested that the cooperation of other fishery, conservation and environmental agencies and organizations should be sought. Mr Vigfusson said: ‘We shall try to support the French team as much as possible. We would certainly suggest that our habitat expert, Dr Martin O’Grady, who is a senior member of the group of scientists who advise the Central Fishery Board in Ireland, should be asked to join the team in France to provide independent science-based advice to the agencies involved.’

NASF thinks that high levels of sustainable stocks can be reached quite quickly if the best practical advice on habitat improvement and river management is implemented and linked to fishing regulations that embody the best practices as followed by the most successful fishing clubs around the world.

### Natural recovery

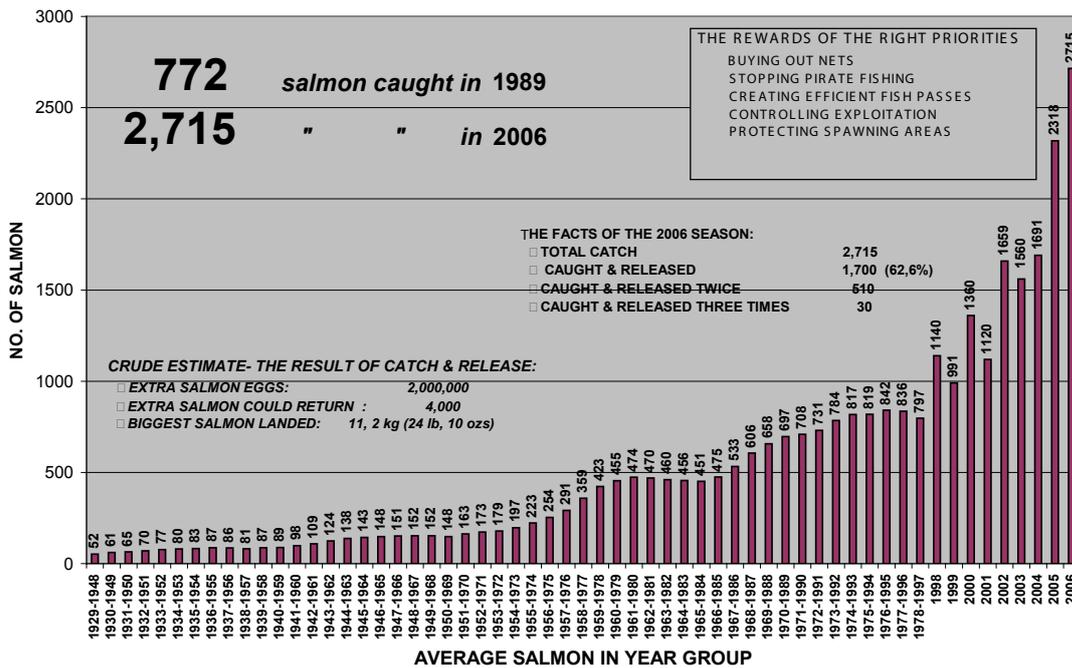
It is NASF’s view that once the dams in Normandy are gone the potential for a natural recovery should be given its chance. That will involve a minimum wait of at least five years to see if stock numbers have increased once the present stocks have been given free passage throughout the river system. If no significant progress is seen, hatchery enhancement using native salmon as parents is the obvious way to produce a very much faster restoration of the stock.

Catch-and-release as a management tool will be vital to the restoration of the Sélune and Sée. We suggest that a special plan be devised to educate anglers in this method of increasing spawning numbers. The support of the sport fishermen and other interested parties who will have to provide at least part of



# CATCH & RELEASE IN ACTION

SELÁ RIVER - NASF's MODEL RIVER  
 1998-2006 SALMON CATCHES COMPARED WITH THE AVERAGE ANNUAL  
 SALMON CATCHES OF PROGRESSIVE 20-YEAR PERIODS FROM 1929 TO 1997



More and more anglers world wide have adopted this way of rebuilding stocks and this approach should be built into the proposed business plan. Attached is a chart showing the beneficial effect of catch-and-release in NASF's model river, the Icelandic Selá. In little more than a decade catches rose from 700 salmon a year to over 2,100. all of them wild. There is a crude estimate of 2-million extra salmon eggs for the habitat.

acceptable to salmon, long term entrapment of water and the resultant loss of velocity will have caused considerable siltation upstream. In agricultural, and of course, industrial areas, these silts will contain toxins from insecticide and herbicide spraying and perhaps sheep dip. These will not only affect the immediate area upstream but the achieved new exposure to running water will pollute the river downstream."

The Hampshire Avon on the other side of the Channel has a very similar project as part of the plan to rebuild the salmon stock.. The private sector there is led by the Wessex Salmon and Rivers Trust. We asked its chairman, Mr. Brian Marshall, for some guidelines. He said:

"Again, the upstream habitat that may look suitable for salmon spawning could also be affected and the long term unused gravels may have become concreted. I am sure your adviser will be aware of these dangers but I think they should be mentioned and costed in the recovery plan so that expectations are not raised too high."

"This is a very exciting project. Whilst the habitat may look very



"I would introduce a hatchery scheme immediately to kickstart the recovery, to allow selection of likely MSW fish and to accelerate commercial viability. To rely on wild re-generation is a fine ideal but there is increasing evidence that the present serious reduction in the percentage of smolts that successfully return from the sea to spawn may seriously delay the recovery and the financial benefits of restoration. I have been waiting for the Avon to recover without a hatchery for 30 years and it has not happened yet even though we have hectares of unused, high quality salmon habitat."

Mr. Marshall also suggested a close look at the sea trout population. We are aware the sea trout stocks in Normandy are currently very low, but suggest that the situation may improve as the project moves on.

In England the massive revival of the River Tyne's salmon stock and the restoration of the lost salmon run of the River Trent show what can be achieved by dedicated hatchery work.

NASF's preference has always been on natural recovery. However, we believe that glass babies or stocking is vital to the recovery of European rivers. Where stocks have sunk to such low levels that a sizeable existing spawning force and ample diversity do not exist focused and disciplined enhancement

stocking using local broodstock becomes a necessity. Within 2 – 3 years, we suggest that a special meeting should be organized to look at such applications including for the Sélune recovery project.

January 2009

Orri Vigfusson

Acknowledgements: The NASF would like to thank CEO Mr. Patrick Lavarde, Alexis Delaunay, Michel Holl and Arnaud Richard (ONEMA), The Private Office of Environment Minister Mr Jean-Louis Borloo as well as the Direction de l'eau et de la biodiversité (MEEDDAT) for providing details and generous assistance.

Credits and references:

Brian Marshall, Professor Oystein Aas, Michael Charleston OBE, Marc-Adrien Marcellier

Photo credit: BS2A, Martin O'Grady Einar Falur and Golli



**Can you help us change the course of history?**

© Rodger Nye.

Greg Pearson • 37 lbs • York River

# SOME NOTES ON THE EFFECT OF DAMS ON SALMON HABITAT

The natural spawning habitat for salmon is areas of loose gravel, in which the hen fish can dig its nest. In the steep upper reaches of rivers suitable spawning gravels accumulate naturally at the tail of plunge pools. Further downstream in the middle and lower reaches, suitable spawning gravels accumulate upstream and downstream of meander bends.

Such quality spawning and nursery areas are of course vital for the maintenance of healthy salmon stocks in a river. Once the salmon emerge from eggs in the spawning gravels their next requirement is a safe and sustaining nursery area. In morphological terms these areas comprise shallow glide zones where the bed is composed of large gravels, cobbles and boulders.

It is important to note that the spawning gravels and the cobble and gravel materials in salmon nursery areas are not fixed features of the riverbed. In fluvial systems there is constant downstream movement of riverbed materials, mostly during times of flood events. The degree of movement will be dictated by the hydromorphology of individual rivers.

From the above information we can ascertain that the construction of a dam on a salmon river can have seriously adverse effects on salmon spawning and nursery in the zones downstream of the dam.

From a fisheries perspective dam construction results in three major problems:

A dam interrupts the downstream movement (recruitment) of fresh gravels and cobbles from the upper reaches. Regulation of river flows by the dam may cause siltation and compaction of loose gravels in downstream areas, eliminating their usefulness to salmon for spawning purposes and reducing the nursery potential of the habitat. Regulated flows may reduce the erosion (recruitment) level of cobble and gravel materials from banks downstream of the dam, thereby compounding the problem and extending the extent of the degraded spawning and nursery area downstream of the dam.

Naturally, there are several other problems caused by dams in rivers. Fluctuations in water temperatures, operation of the dam turbines resulting in a rapid drop in water level can have a drastic effect on young salmon living in areas below the dam. Such events can leave fry and parr stranded in puddles or dry land. (As experienced on the Alta in Norway).



# **SALMON FISHERY MANAGEMENT PROPOSALS FOR THE SELUNE RIVER TO FOLLOW A PROPOSED DAM REMOVAL PROJECT**

This report outlines, in summary form, the nature of programmes which might be undertaken in the Selune River Catchment to accelerate the recovery of the Atlantic salmon and other migratory fish stocks (eels, marine lamprey, shad and sea trout) following the removal of the two large dams at Vezins and La Roche-qui-Boit. The reader should note that this report deals solely with habitat enhancement issues. The author regards the whole question of managing the angling aspects of this fishery as being beyond the scope of this report.

These proposals are made on the basis that, historically, the Selune river was one of the best salmon rivers in Normandy. Consequently its restoration, following dam removal should be a feasible proposition provided the following areas are addressed.

## **1. Channel Reconstruction following Dam Removal**

The entire impounded channel reach will need to be desilted following dam removal. This should involve the recreation of a channel which has a natural channel basewidth and sinuosity and the deposition of the silt removed onto the adjacent silt banks on either side of the "new" narrower channel basewidth.

Consideration should be given to reseedling the exposed lateral silt banks with suitable grasses and excluding farm stock from this zone until these banks are vegetated and stabilised. Reseedling should take place immediately after channel excavation to stop erosion of marginal silt deposits back into the "new river channels". The creation of "gentle bank slopes (<300) along this new channel would also help to limit bank erosion.

Assuming that adjacent landowners may, in the longer term, use these land stripes for grazing, or other agricultural purposes, consideration should be given to fencing off the "new river channel", ideally with the fence being at least 3m back from each bank. Apart from reseedling with grasses the stripe between the fence and the river bank should also be planted with suitable native deciduous trees. Observations by the author in the See and Selune catchments suggest that Alders tend to provide a monoculture along many reaches of these rivers – they tend to be the first tree species to recolonise bare banks. Consequently it is recommended that no Alders be planted as part of this programme. They will inevitably recolonise the banks over time. It is important therefore to ensure that other deciduous tree species be given an opportunity to re-establish themselves before the natural Alder recolonisation takes place. The author noted that Ranunculus species are one of the major aquatic plant species in both

the See and Selune catchments. This is a very important plant in salmonid rivers as it harbours large populations of macroinvertebrate species of dietary importance to juvenile salmonids. Ranunculus species will tolerate dappled shade. This plant tends to die back significantly where there is heavy shade. Care should be taken to ensure that any planted tree line, over time, will not create heavy shade.

## **2. The Channel Reach Downstream of the Lower Dam at La Roche-qui-Boit**

Most of this channel reach has a low gradient and is therefore of limited value in terms of salmonid spawning and nursery areas. However, the known salmon spawning areas in this zone should be targeted for works. In river reaches like this, downstream of one or more dams, the quality of suitable spawning grounds for salmon tends to decline following dam construction upstream – the dam itself eliminates the natural recruitment of gravels downstream to the lower reaches. In addition, regulated discharges can lead to the compaction of gravel materials. Following dam removal a physical survey of the limited spawning areas here should be carried out to:

Establish the suitability of existing gravel deposits for spawning. To see if existing gravel deposits are limited in extent because of a lack of recruitment of fresh materials over the last 90 y

Access to the river here is quite good and would allow the input of additional gravels should they be required. If gravel compaction is an issue here then the tossing of gravels, using a hydraulic machine, would quickly resolve this problem.

## **3. A Programme of Works for the Upper and Middle Zones of the Catchment**

O.N.E.M.A. has estimated the potential production of salmon in the middle and upper reaches of the Selune River (Figure 1). To ensure that these production figures are attained over time it will be necessary to carry out a baseline survey of potentially productive channels. Problem areas need to be identified and subsequently addressed. These are likely to include:-

- i) Many compacted gravel bed areas – because salmon have not spawned here for over 90 years.
- ii) Small man made barriers (weirs and pipe bridges) which may act as partial or complete barriers to migratory fish.
- iii) Extensive tunnelling of channels with dense Alder colonises which may be creating bank erosion problems and excessively shading channels.
- iv) Establish the water quality status (in pollution terms)

at intervals in all sub-catchments to ensure that expenditure on morphological channel adjustments or bankside regimes is targeted in areas where water quality is sufficiently high enough to support juvenile salmon.

- v) Land management practices in certain areas may have led to a degradation of physical channel form in selected reaches. Such areas need to be identified and enhancement programmes designed and implemented where necessary.
- vi) Currently it is thought that circa 50km of 1st and 2nd order streams in the upper catchment have been canalised to aid land drainage. While these channels are too small to function as salmon spawning or nursery streams they are thought to be contributing large volumes of silt to the larger salmonid channels, leading to a reduction in salmonid habitat quality. This area needs to be examined in detail with a view to significantly reducing the extent of this problem.

A baseline survey programme over the course of one year incorporating (i) to (vi) above would quickly identify key problem areas and allow one to generate and accurately cost a productive works programme.

#### **4. Restocking of Salmon**

In the author's opinion the stocking of salmon, after dam removal, should not be considered as a part of this programme. O.N.E.M.A. have shown that the See and Selune Rivers, which share a common estuary, would appear to share a single genetic stock of salmon – tagged salmon entering the lower reaches of the Selune have subsequently gone back downstream and thereafter run the See.

Given the healthy status of juvenile salmon stocks currently in the See River, some of these, returning as adults, are likely to spawn in the Selune. In the author's broad experience in Scotland and Ireland, salmon will immediately run upstream in channels once manmade barriers are removed. The recovery of salmon stocks in the Selune will be a significantly faster process

than that observed in Irish or Scottish Rivers simply because most salmon in Normandy smoltify as one year old fish. Irish and British salmon smolts are predominantly two year old individuals.

#### **5. Monitoring**

The author would strongly recommend that O.N.E.M.A. extend its current juvenile salmon monitoring programme to the middle and upper reaches of the Selune following dam removal. Over time this should prove to be a very valuable data base. It should prove to be particularly useful in estimating the rate of recovery of salmon populations in other rivers in France where dams might be removed at some future date.

#### **6. Fish Counter**

The removal of the dams might be an appropriate opportunity to construct a fish counter on the Selune. The most appropriate site would be at the current location of the lower dam at La Roche-qui-Boit. There are limited spawning opportunities for salmon in the Selune River downstream of this point. Consequently a salmon count at this location would be close to a total count for this catchment.

#### **7. An Initial Moratorium on Angling**

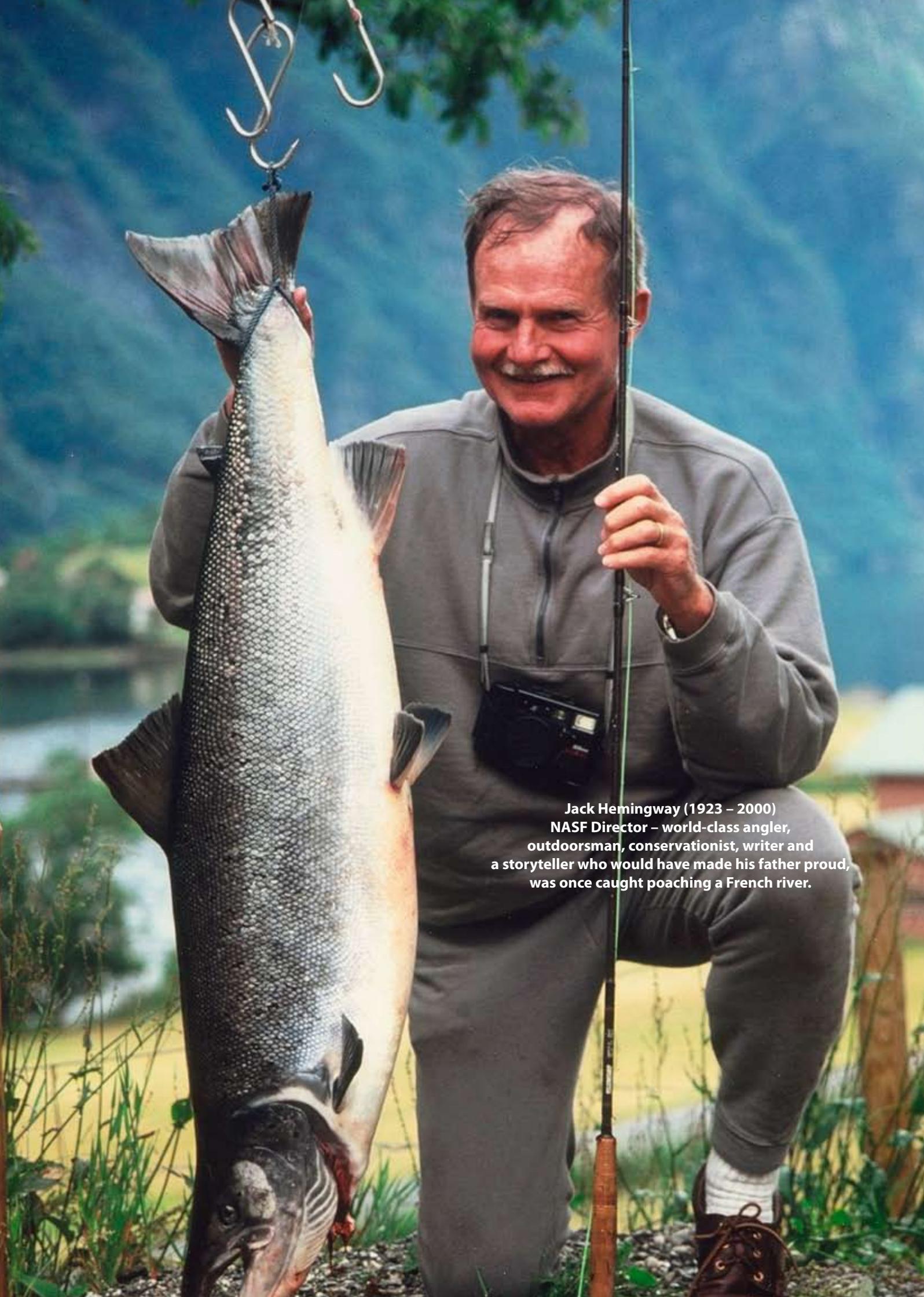
Consideration might be given to having a moratorium, or a catch and release system, in relation to salmon angling in the Selune River for a number of years after the dams have been removed. Annual monitoring data on the level of juvenile salmon stocks in the system, in combination with counter data, would indicate when salmon conservation stock levels have been reached and, more importantly, exceeded, at which point some level of angling harvest would be viable.

#### **8. Acknowledgements**

The author is most grateful to Richard Arnaud (O.N.E.M.A.) for providing him with all of the background information referenced in this report.

I would like to thank my friends in N.A.S.F. for affording me the opportunity to contribute to this project.





**Jack Hemingway (1923 – 2000)**  
NASF Director – world-class angler,  
outdoorsman, conservationist, writer and  
a storyteller who would have made his father proud,  
was once caught poaching a French river.