



Manual for consultation process in fish farming in the county of Jämtland

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Description

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Abstract <p>There are good conditions for fish farms in the county of Jämtland. The demand is primarily for small-scale farms and local farming. There is often very good local knowledge among the fish conservation organisations that it is worthwhile a future practitioner taking note of.</p> <p>What is up for discussion and what a future practitioner ought to take into account are matters concerning the origin of the fish, risks of infection between farms and wild fish plus the risk of parasites, and the matter of nutrient loads and the impact on beds are very important.</p> <p>In a test, licensing authorities will demand extensive documentation regarding the assessment of the impact of the fish farms on the nutritional balance in the lakes and on local fauna. Further questions may concern environmental disruption on the part of transportation for residents and local businesses plus the impact on the existing natural surroundings and national interests.</p> <p>The report is divided into three sections; section 1 deals with the licence and EID process from both a general perspective and the perspective that is specific to aquaculture. Section 2 deals with the designated localities in the county of Jämtland, including an account of the points of view that have been put forward in the process. Section 3 details some argumentation that may be of value in a licence and EID process when the authorities' fundamental survey requirements increase and substantial importance is placed on a good basis in a licence process.</p>		
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Introduction

AQUABEST has produced this communication for the purpose of facilitating matters for companies that intend to establish aquaculture in the county of Jämtland. It is intended to function as a manual prior to consultation and licence application in accordance with The Environmental Code. The particular lakes that are dealt with in this report have been put forward as the most interesting from a possible aquaculture point of view using GIS analyses and chemical water analyses in 2012 - 2013.

The selection work also included discussions with the municipalities in the county of Jämtland and with the particular fish conservation areas affected. Contact has also been made with the County Administrative Board in the county of Jämtland – the water department (fishing) and the environmental protection unit. Points of view have not yet been obtained from Sami villages affected.

The report is divided into three sections; section 1 deals with the licence and EID process from both a general perspective and the perspective that is specific to aquaculture. Section 2 deals with the designated localities in the county of Jämtland, including an account of the points of view that have been put forward in the process. Section 3 details some argumentation that may be of value in a licence and EID process when the authorities' fundamental survey requirements increase and substantial importance is placed on a good basis in a licence process.

Summary

Before an aqua farm can be set up and begin production, a licence is required in accordance with Swedish law as per The Environmental Code, among others. An initial step in the environmental consideration process consists of the consultations that must take place with everyone, private persons, authorities and interest organisations which may be affected in some way by the planned activities. This report focuses on the questions that have been put forward and that are emphasised as particularly important questions in the face of possible establishments.

To summarise, questions on nutrient loads and the impact on the ecosystems of lakes, lake beds and local fish fauna constitute major questions. Analyses of the water chemistry in a relevant lake and well-founded calculations of the load potential are of major importance in a consultation process. There is a widespread acceptance of small-scale farms that demonstrate pronounced sustainability thinking compared with farms that are of greater volume. The County's authorities are examining the option of setting up this type of requirement prior to possible tests.

A future practitioner has much to gain from holding discussions at local level at an early stage of the process with fish conservation area associations, landowners, Sami villages and the representatives of the municipalities. Even after an activity has been established and is in operation, it is important to continue to hold objective discussions about the environmental impact of the activities.

Conclusion

There are good conditions for fish farms in the county of Jämtland. The demand is primarily for small-scale farms and local farming. There is often very good local knowledge among the fish conservation organisations that it is worthwhile a future practitioner taking note of.

What is up for discussion and what a future practitioner ought to take into account are matters concerning the origin of the fish, risks of infection between farms and wild fish plus the risk of parasites, and the matter of nutrient loads and the impact on beds are very important.

In a test, licensing authorities will demand extensive documentation regarding the assessment of the impact of the fish farms on the nutritional balance in the lakes and on local fauna. Further questions may concern environmental disruption on the part of transportation for residents and local businesses plus the impact on the existing natural surroundings and national interests.

1. Background

AQUABEST is part of the 2007-2013 Baltic Sea Region Programme. The objective of the project is to stimulate the development of environmentally-neutral aquaculture in the Östersjö region.

The project consists of several work packages whose aim is to:

- Compile, compare and analyse different national methods for aquaculture licensing and to provide proposals for new models with strong incentive for environmental consideration.
- Develop methods to identify suitable methods for fish and mussel farming within the Östersjö region.
- Produce alternative types of food in cooperation with the fish feed industry.
- Develop and spread knowledge of fish farming recirculation systems.

The Regional Association in the county of Jämtland is the project leader for the subproject aiming to develop methods of identifying suitable localities for fish and mussel farms. This will mean that it is possible to identify localities with good potential for larger fish farms of at least 300 tonnes of produced fish per year and with the possibility of being developed to 1000 tonnes per year.

Within the framework of this work package, Ramböll Sverige AB was tasked by the Regional Association of the County of Jämtland with examining conditions and producing a consultation basis for a number of interesting localities in the county of Jämtland. The purpose of this report was to serve in the long term as a basis for possible interested parties who are considering starting up aquaculture activities in the county of Jämtland.

Since it proved to be difficult to produce a concrete consultation basis for the designated lakes from bodies affected, the Regional Association conferred with the consultant and chose to change the specialisation of the project to instead produce a manual for possible interested parties within the aquaculture industry. This report aims to constitute a basis for and guidelines in the consultation process and licence application for aquaculture activities in accordance with the Environmental Code.

1.1. Description of the assignment

The original assignment description included going into consultation with affected property owners around the county to produce a basis that could be comparable with a consultation basis; this section of the assignment could not be carried out for several reasons. This is primarily because there is no real activity to give an opinion on so there was a relatively low level of interest and desire to give points of view. The authorities do not wish to or are unable to give points of view on a “fictitious” activity that this concerns as there is no actual proposal to give an opinion on.

Since aquaculture is something that is surrounded by a great deal of negative “opinions”, negative points of view tend to dominate without any real foundation in discussions concerning the location and activities of aquaculture.

The material that comes up in this comparison can be seen as nothing more than a guideline and cannot be used as an individual basis in a licensing process in accordance with Chapters 6 and 9 of The Environmental Code.

1.2. The process of selecting the lakes

In cooperation with WSP, the Regional Association has produced a GIS-based analysis tool to use parameters such as area, average depth, average evapotranspiration, regulation amplitude and biodiversity, etc., to be able to indicate lakes that may have good conditions to be able to accommodate aquaculture.

Parameters such as near-shore depths, distance to roads, electricity node/the option of drawing electricity, plus distance to power station outlet can also be factored in.

The selection process for bring up the lakes that have been assessed as suitable for possible aquaculture at this stage has taken place using a GIS-based tool. The analyses have taken place in three different main elements:

- Analyses at whole lake level
- Grid division
- Analyses at water locality level

The parameters used in the different elements in the first stage are analyses at whole lake level, area, average depth, average evapotranspiration, regulation amplitude and biodiversity (biodiversity is not included in the ranking, only as the visualisation for the presentation). After ranking and grid division (which aims to pick out lake surface areas that are too small or too large), parameters such as areas with restrictions, near-shore depths, distance to road, distance to the nearest electricity node and distance to power station outlet and population are also factored.

For the county of Jämtland, we are looking at around 1500 lakes that have been included in the analysis.

The 20 highest ranked lakes (based on the analysis) in the county of Jämtland are: Ströms Vattdal, Kallsjön, Gesunden, Storsjön, the Midskog dam area, Kvarnbergsvattnet, Hotagen, Torrön, Hetögeln, Torrön, Flåsjön, Svaningssjön, Havern, Liten, Storsjön (Berg municipality), Svegssjön, Landögssjön, Tåsjön, Fågelsjön, Juvuln and Näldsjön. Some of these lakes were removed from the current report primarily for conservation value reasons.

The lakes that have later been included in the Aquabest sampling programme are: Torrön, Juvuln, Kallsjön, Liten, Gesunden, Hotagen, Hetögeln, Svaningen (Svaningssjön), Flåsjön and Lossen. These are the lakes that are presented in current report.

For a more in-depth explanation as to how the GIS analysis was carried out and the way in which the different parameters have been drawn up, reference is made to the report entitled "GIS analysis for the placement of suitable localities for fish farms in the county of Jämtland" Reports on Aquabest project by Jens Andersson.

1.3. Sustainability cycle

The objective of the Aquabest projects is to create conditions for sustainable aquaculture in the Östersjö region. Future fish farms must be located where there is social and ecological space, and research and experiments will simultaneously develop a new fish feed for the Östersjö area. The new feed will be based on raw products from the Östersjö region, thereby reducing the importation of the

nutrients till the region. For example, experiments are ongoing with mussel farms in the nutritionally overloaded Östersjön whereby these mussels will then be transformed into fish feed for fish farms in Östersjön's water system. The end objective is for Östersjön not to be vulnerable to additional nutrient loads and for the augmentation (the nutrients) to be balanced by that which is extracted.

1.4. Fish farming, ecologically sustainable or an environmental problem?

The objective of the Aquabest projects is, as previously mentioned, to develop a long-term sustainable aquaculture business in the Östersjö region. For the county of Jämtland, this means that the project, together with affected authorities, local population and business will nominate ten possible localities for the farming of char and rainbow trout on a larger scale, at least 300 tonnes per year.

When planning a fish farm, there are many factors that need to be taken into account - where the farm will be situated in the lake, inflows and outflows, depth of the water, transportation and nearby residents, etc. The fish themselves also require an adequate water temperature, a good oxygen supply and a good water circulation. The lakes in Jämtland generally speaking fulfil these requirements well.

The farmer in turn requires a financial income, a road network, buildings, proximity to a slaughterhouse and preferably open water all year round.

The environmental impact can be minimised by dimensioning and positioning the fish farm, efficient feeding and high quality feed and regular checks.

2. The licensing process

2.1. Legislation

Fish farms that use more than 40 tonnes of feed per calendar year (B business) require a licence in accordance with Chap. 9 of The Environmental Code. For these, it is the environmental advisory committee at the County Administrative Board that determines whether a licence is granted. As well as environmental legislation, fish farms are covered by fishery legislation, infectious disease control legislation, animal protection legislation, the EU's Water Directive and the Planning and Building Act (planning permission matters).

The following table summarises the different sections of the law that are affected, listing regulations and provisions as well as laws. Affected authorities include those who have overall responsibility and those who have the local responsibility for supervision and testing.

Legislation	Business	Affected authority
The Fisheries Act (1993:787) SJVFS 2011:34 SFS 1994:1716	Licence to trap fish, crustaceans, mussels or oysters. Licence to move fish between waters Construct and run fish farm.	the County Administrative Board and the Marine and Aquatic Authority
Infectious disease control legislation (1999:657) and several provisions linked to this law	Prevention and combating of generally dangerous infectious animal diseases	The National Board of Agriculture
Animal Protection Act (1988:534) SFS 1988:539 DFS 2006:8, etc.	Fish in fish farms for food production	The County Administrative Board and the National Board of Agriculture
The Food Act 2006:804 Food regulation SFS 2006:813 EU's requirement food safety no. 178/2002	Handling of food, including primary production	The municipality The Swedish National Food Association
EU's Water Directive SFS 2004:660	Questions about the quality of water	The Water Authority and Planning Secretariat for the Water Authority (the County Administrative Board)
The Planning and Building Act 2010:900 The Planning and Building regulation, SFS 2011:338	Municipal planning	The municipality The Swedish National Board of Housing, Building and Planning
The Environmental Code 1998:808 SFS 1998:899 SFS 1998:905 SFS 2011:13 etc.	Licence for fish farming (this includes the consultation process)	The County Administrative Board (the Municipality)

Table 1. Laws and regulations concerning fish farm activities

2.2. Licence in accordance with The Environmental Code - consultation

The licensing process for all environmentally hazardous activities (Chap. 9 of The Environmental Code) starts with consultation, which aims to highlight at an early stage questions concerning activities of fish farms in respect of potential farming location, scope, design, the environmental impact and scope and content of the environmental impact description (EID). The purpose of the consultation and environmental impact description is to fulfil the Environmental Code's requirements:

According to Chap. 2, Section 6, for a business or action that makes use of an area of land or water, a site that is suitable with regard to the fact that the end purpose will be achievable with the minimum interference and inconvenience to human health and the environment must be selected.

The aim of the consultation is for the practitioner to collect points of view from affected property owners, authorities, organisations, the public, etc.

The practitioner is responsible for and runs the consultation process until the application and the environmental impact description are submitted to the licensing authority.

Prior to the consultation the applicant will have produced:

- details of the company (administrative details),
- scope of activities, e.g. quantities produced, operating time, etc.,
- business code (according to the appendix to the regulation (1998:899) on environmentally hazardous activities and health protection). Relevant codes for fish farms are 5.10 for farming with a consumption of more than 40 tonnes feed per year and 5.20 for farming with consumption of between 1.5 tonnes and 40 tonnes per year.
- relevant map material showing proposed position, transportation routes, distance to the nearest settlement for the activities
- alternative sites for the activities,
- documentation in the form of drawings of the facility,
- estimate of the number of transportations,
- noise-producing activities,
- assessment of emissions/discharges till recipient and measures to limit these,
- assessment of the expected environmental impact,
- description of activities
- conceivable risks of accidents and description of safety measures

The documentation must also show the natural conditions of the chosen site such as:

- water quality,
- natural fauna,
- possible conservation values that may be affected by activities, and
- the protection measures that the practitioner intends to undertake.

The consultation basis must be in writing.

Consultation will take place with authorities (the County Council's environmental and fishing departments and the municipality) and with landowners, nearby residents, Sami villages and the fish conservation area, plus other interested organisations that may be affected.

When a consultation has taken place, discussion points, questions and the practitioner's intended action are compared in a special consultation report, which will also include a list of current property owners and an account of the way in which the consultation procedure has taken place. The consultation document is then enclosed with the application and environmental impact description when the applicant submits his application to the decision-making authority.

A business of this size (B business) is always assumed to lead to a significant the environmental impact, which means that a consultation will be held with property owners and affected authorities.

No unreasonable amount of time must pass between consultation and application; for the County Councils, this means that an application can be rejected if it is shown that the consultation was held more than one year before the application has been submitted.

Smaller businesses: fish farms or overwintering of fish where more than 1.5 tonnes of feed (but less than 40 tonnes) are consumed per calendar year have to be notified (designation C in the appendix to the regulation on environmentally hazardous activities), and in these cases, the respective municipality is notified of the activities.

Remember also that aquaculture often requires dispensation from the shore protection. This dispensation is handled by the relevant municipality.

2.2.1. Consultation parties

Authorities

The County Administrative Board and relevant municipality (see contact details in sect. 6.)

The Sami villages

Within the county of Jämtland there are the Sami villages of Voernese, Kall, Ohredahke, Mittådalen, Raedtievaerie, Handölsdalen, Jijnjevaerie, Tåssåsen, Jovnevaerie, Ruvhten Sijte and Njaarke.

Maps showing the distribution of summer and winter grounds, migration routes and relevant contact details are on the Sami parliament's website: www.sametinget.se

The fish conservation areas

The County Administrative Board's water department can provide information on the fish conservation areas and relevant contact persons.

The fish conservation areas' contact persons often have very good knowledge of lakes and watercourses in their areas and it may be a good idea to contact these early on to have a good discussion about the conditions for possible aquaculture.

Property owners, nearby residents

Property maps and details on property owners can be purchased from the National Land Survey, www.metria.se

Details of property owners can also be obtained from the municipalities, but to a limited extent since they do not always definitely have the resources to produce all details.

Also includes settlements along transportation routes and by exits to public roads.

Water Conservation Society

There is a Water Conservation Society for Indalsälven and Ljusnan-Voxnan in the county.

Local Nature Conservation Society

These may also have valuable knowledge on the environment and the natural conditions at the site.

2.2.2. Prior to the consultation meeting

Fish farms or aquaculture are the subject of strong emotions, points of view, rumours, claims and discussions among the public and especially those affected. The discussions are primarily about the negative effects that can be associated with the activities of fish farms, such as: escape fish and the threat to the natural fauna in the form of diseases and parasites, eutrophication problems, dead or strongly-affected beds next to the boxes, heavy means of transport and noise problems, dead fish next to the farms. Several of the county's municipalities highlight these problems and also report that some sections of the industry are unwilling to discuss these problems.

The farmers must be prepared to objectively discuss the inconveniences that can arise and also show good willingness to counteract the occurrence of similar problems. It is very valuable to be able to

have an objective and open dialogue concerning the benefits and disadvantages of the activities and to show goodwill when it comes to solving possible problems.

In the county of Jämtland, the criticism against fish farming and its practitioners has grown in recent years. A future farmer has much to gain from holding an open and objective dialogue with affected parties early on in an establishment process.

There is also a value in the fact that the fish that are farmed in the county are also fed, slaughtered and processed locally. These are business aspects that either Aquabest or the authorities can control but the overall perspective is worth highlighting. A farmer/processor who can accentuate both ecological and social aspects generates more goodwill than one who does not have the same overall perspective.

2.3. Application and environmental impact description

When the consultation with authorities and affected parties has taken place, application documents and environmental impact description (EID) are completed. The application and EID must clearly show how you intend to take into account the points of view that have been put forward in the consultation.

Application documents, EID and consultation report ought to be clearly delimited.

The documents must show the abovementioned details, but also;

- Administrative details
- The scope and description of the activities in different sections of the business
- Justification for selected locality
- Feed consumption
- Justification as to why the activities should be allowed
- Which protective measures will be taken to minimise the impact on the recipient, existing fauna and the environment in general
- Storage and handling of feed, possible chemicals, fuels
- Proposals for terms for the activities
- Description of, if appropriate, the existing values and the way in which these are affected by the activities

3. Aquaculture in the county of Jämtland

3.1. The county of Jämtland - description

The county of Jämtland is the third largest county in Sweden with a surface area of a good 49 000 km². The county includes three major watercourses, Ljusnan, Ljungan and Indalsälven which begin in the mountains and run eastwards to the Bothnian Sea. Klarälven also originates in the county and runs in a southerly direction through western Härjedalen. The county's rivers and large streams cover a distance of approx. 280 miles. Innumerable smaller watercourses and brooks have not been included.

The bedrock in the county of Jämtland is extremely complex and includes everything from granites and sandstone, which means poor buffering capacity against acidification, to the limey bedrock in the centre of the county. Bedrock and soil types are important to the chemical water qualities and a brief description of these parameters will form part of a consultation basis.

The soil types are dominated by moraine but there are also large areas of burial grounds and gravel deposits.

The county of Jämtland has around 17 000 lakes. Typical fish species are brown trout, char, grayling, common whitefish, perch and pike.

Substantial inputs have been made since the 1990s to counteract acidification and restore the biodiversity in the parts of the county that are affected by acidification. This work has meant that as well as the chemical water parameters, careful surveys have also been completed with regard to the bed fauna and the prevalence of fish in the county's lakes and watercourses. More information on this is available from the County Council in the county of Jämtland.

3.2. Summary

Since the task consisted of producing a basis suitable for use as a consultation basis in a possible licence process in accordance with Chapter 9 of the Environmental Code (environmentally hazardous activities), those who may conceivably be affected in a similar process have also been contacted in this task.

Several of the affected authorities, etc. do not wish to precede any licence process and have therefore chosen to refrain from giving points of view at this stage.

All municipalities in the county of Jämtland have been asked for the requirements that they would set for a possible practitioner, possible restrictions and other general points of view. Several of the municipalities are working actively with these questions in ongoing reviews of the overview plans and in some cases also municipal fishery plans.

3.3. Results

Based on the results of the consultation basis that have come up in the process, the lakes that are part of the survey can be ranked in two groups: one group that is well suited to fish farming in certain cases on condition that man the preservation of certain values can be assured, and one group of less suitable lakes.

The lakes that appear to be suitable for fish farming are Hetögeln, Svaningssjön, Flåsjön, Juvuln, Kallsjön and Gesunden.

Ones counted as less suitable are Hotagen, Torrön, Liten and Lossen

3.3.1. Other important points of view

Some of the fish conservation areas have reported that previous contacts with practitioners of existing or former fish farms have not always functioned very well. In this connection, we would like to emphasise the importance of saying that a possible interested party has much to gain from contacting the relevant fish conservation association at an early stage and developing a close dialogue about possible business.

As far as the Sami villages are concerned, the location and thereby the scope of the means of transport for possible business are of particular interest.

3.3.2. Licensing authority

The licensing authority for B businesses is the County Councils' environmental advisory committee (MPD); for activities in the county of Jämtland, the environmental advisory committee for the County Council in the county of Västernorrland makes decisions regarding licences. However, the County Council in the county of Jämtland is the participant in the consultation and is one of the referral bodies.

3.4. The municipalities in the county of Jämtland

Generally speaking the representatives of the municipalities are cautiously positive towards this type of business, but would like to point out that the activities are actually environmentally hazardous since they can contribute to the eutrophication of lakes and watercourses and can lead to a negative impact on the natural fauna.

If the environmental requirements can be fulfilled, the value of fish farming combined with local processing is emphasised, thereby fortifying the local anchorage and the development of the local job market.

Several municipalities are calling for consensus between the municipalities as regards aquaculture and the utilisation of the county's lakes.

The question of aquaculture is being handled in varying degrees in the municipalities' overview plans (see the following Chapter which is partly based on existing overview plans from the county's municipalities). Some of the details have also come up during contact with representatives of the municipalities.

3.4.1. Östersund municipality

The overview plan discusses aquaculture as a business with possibilities.

There are great conditions for developing a business in Storsjön and the Midskog dam area. The demand for the areas where fish farms producing large amounts of edible fish has increased because today, aquaculture is seen as being commercially successful and one of the businesses that has the greatest possibility of satisfying future animal protein needs. Today, there are also methods that use sustainability thinking to avoid eutrophication. Aquabest is an EU-financed research project that is in the process of producing a sustainable method for fish farming in the whole of the Östersjö region. The pilot study is taking place in the counties of Jämtland and Kalmar.

At the moment, there are no municipal guidelines or policies for Östersund municipality. The next thing is a forthcoming water use plan (VAP) for Storsjön where it is hoped that it will be possible to set an emissions/discharges ceiling for Storsjön (in the ongoing consideration of the increase in existing fish farming, the emissions/discharges are only close to a ceiling for what the lake ought to be able to tolerate!). It would be good if the County Council were to take a leading role in the work with a water use plan.

The possibility of arguing for sustainability thinking for fish farms is sought as regards both feed and emissions/discharges. From a municipal direction, we are looking for more guidance in the field; some of the things discussed include how far it is possible to maintain that the best possible technology (in accordance with the Environmental Code's requirements) (sic). Politically speaking, the municipality is cautiously optimistic with regard to aquaculture.

3.4.2. Åre municipality

Work with a new overview plan is ongoing (autumn 2013). In working with this, the AQUABEST project's data and results have been taken into account. It has not been possible to produce more detailed information.

3.4.3. Strömsund municipality

Strömsund municipality has brought up problems concerning existing fish farms and is looking at the possibility of setting higher requirements for these businesses. In the impact description for the overview plan for Strömsund municipality, it is noted that in Aquabest's previous analysis of suitable farming lakes in the county of Jämtland there are seven lakes that are situated in Strömsund municipality; Ströms Vattudal, Kvarnbergsvattnet, Hetögeln, Flåsjön, Svaningssjön, Tåsjön and Fågelsjön.

In the proposed overview plan, Strömsund municipality intended to prioritise Ströms Vattudal, Flåsjön, and Tåsjön.

Apart from the risk of greater quantities the nutrients from a fish farm to the water from faeces and feed residues, there is also a risk of diseases and other ecological impacts.

The spreading of alien populations may be of great economic value but not much is known about the effects this has on the biodiversity. In the Environmental Protection Agency's report on the spreading of species, the authors point out that there are obvious risks with the spreading of new species. There is a risk that the biodiversity will be affected in the first instance at genetic level in "recipient" natural populations but also in the future at higher levels (species and ecosystem level). This type of impact can lead to loss of and change to the biodiversity. The authors recommend that the Environmental Protection Agency reviews the reasonableness of keeping genetically alien species in enclosures that they can escape from. The National Veterinary Institute says that diseases in farmed fish can lead to substantial economic losses for an individual company. Simultaneously, the same disease in the wild fish can experience dramatic economic and biological consequences for the region and throughout the country. From an infectious disease control point of view, fish is one of the most difficult types of animal to handle, partly because the water the fish live in runs from a source to the coast and a contagion can thereby be spread quickly over a large area. Farmed fish live near wild fish, which means that diseases can easily be transferred from wild to farmed fish with and from farmed to wild fish. The possibilities of therapy and the limitation of disease in wild fish are negligible. Diseases in fish are often discovered at a late stage and the infection can have spread over large areas.

3.4.4. Krokoms municipality

Krokoms municipality has also experienced some of the problems described concerning fish farms and emphasises the importance of good communication. The municipality has held a number of meetings and is meeting the municipality's residents and experts to discuss the advantages and disadvantages of aquaculture. The intention is for the forthcoming overview plan to show which requirements the municipality is setting for this business and which localities may be considered suitable. The municipality's attitude is that aquaculture must not be established on a scale or be run in such a way as to compromise the quality of lakes and watercourses.

3.4.5. Ragunda municipality

The forthcoming review of the overview plan also intends to include the matter of aquaculture. The preparations for this have just begun (Oct. 2013) but a political decision will be made first of all. Ra-

gunda municipality thinks that an important question regarding fish farms is the matter of cleaning; it would be nice to see strict requirements set with regard to feed and cleaning, but the rules and guidelines to support these requirements are currently lacking.

3.4.6. Härjedalen municipality

The overview plan for Härjedalen municipality (adopted in 2004) does not specifically discuss the matter of aquaculture but is based on extensive documentation regarding water quality and environmental issues associated with water quality.

3.4.7. Berg municipality

The existing overview plan, with supplements regarding the LIS areas (LIS – Rural development In Shoreline-protected areas) in 2013, shows that:

there is a development potential through an increased level of processing of local raw products in businesses like agriculture, forestry and fisheries, visiting and experience tourism and local service production.

Berg municipality has not pointed out any special areas that are suitable for fish farming.

3.4.8. Bräcke municipality

According to the overview plan from 2003:

Bräcke municipality has a mainly positive view of a more intensive utilisation of the lakes in the municipality, including through some aquaculture. The municipality therefore sees possibilities mainly for fish farming in a smaller number of lakes.

Each individual desire to establish a fish farm will be tested on the basis of an analysis of the environmental conditions and business life aspects, however.

Bräcke municipality has along with Uppsala University's limnological institution carried out a limnological survey of lakes in the municipality with regard to suitability for fish farming. The survey covers: the catchment areas, lake descriptions, phosphorus load and fish farm capacity and conditions for box farming of rainbow trout and environmental protection aspects.

The lakes surveyed are:

Hemsjön, Håvdsjön, Brehungen, Hungsjön, Bodsjön, Börjesjön, Sundsjön (southern section), Rindsjön-Revsundssjön, Anvikssjön, Revsundssjön, Tavnäsviken-Revsundssjön, Norsfjärden-Revsundssjön, Fisksjön, Singsjön, Stor-Kälsjön, Sicksjön, Övsjön, Hemsjön/Baksjön, Balsjön, Gransjön (the upper section), Hällesjön and Lungsjön.

(Reference is also made to the following reports: Limnological survey with regard to suitability for fish farming LIV 1986 B:4 and LIV 1985 B:6, Basis for the overview plan for Bräcke municipality.)

3.5. VattenInformationsSystem Sverige

VISS (VattenInformationsSystem Sverige, or Water Information Sweden) is a database that has been developed by the water authorities, the County Councils and the Marine and Water Authority. VISS is currently managed by the County Administrative Board in Kalmar.

VISS contains classifications and maps of all of Sweden's large lakes, watercourses, groundwater and coastal water. For these waters, you can find information on:

Status classification. Here, you can find an extensive assessment of the health of the water (ecological status and chemical status) but also underlying assessments of things such as fish and acidification.

Environmental quality standards. Regulations on the requirements regarding the quality of the water. Environmental quality standards are guidelines for authorities and municipalities when they apply laws.

The work with VISS is continuous and the relevant status and possible action plan can be seen on www.viss.se

Relevant data should be obtained from VISS prior to any consultation.

4. Description of the lakes

4.1. General

Localities are described briefly with basic data on the municipality, size, evapotranspiration, depth and surface area. The bedrock is also described in respect of the quality of the water in the lakes.

Information and points of view from authorities have been included; however, in many cases the authorities have chosen not to precede possible tests and have therefore refrained from giving points of view.

Generally speaking, the points of view on aquaculture in the relevant the lakes that have come in concentrate a great deal on the nutrient loads to which a fish farm leads for the ecosystems of the lakes. As previously mentioned, there is a far greater acceptance for small-scale and local activity compared with large-scale and more industrial activity.

The summary assessment for each locality shows which parameters may be of particular interest or constitute an obstacle to establishment.

4.2. Hetögeln

Strömsund municipality

Map sheet 21 E, 22 E

Lake surface area 22.95 km²

Average depth 19.4 m

Average evapotranspiration 106.2 m³/s

Regulation amplitude 4 m

Bedrock: Glittering metamorphic rock types such as phyllite, slate or paragneiss in the northern section of the lake. The southern section is underlain by quartz and feldspar-rich sedimentary rock types such as sandstone and greywacke. Ultrabasic, basic and intermediate metamorphic rock types such as amphibolite may also occur.

Nature, culture, environment, location

Hetögeln lies in Strömsund municipality in the northern section of the county of Jämtland, close to the border with Norway. The nearest large place is Gäddede, which is situated by the northern inflow to the lake. The lake is part of the system which goes by the name of Ströms Vattudal.

According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore monument localities around Hetögeln.

Areas that are of national interest to nature conservation are next to the lake.

Reindeer herding

The area lies in the Sami villages of Raedtievaerie and Jijnjevaerie's land use area.

Protected areas

Hetögeln is not affected by any special protection area (according to the County Councils' mapping service). The area is covered by national interest in active outdoor recreation. A couple of smaller areas that constitute national interest in nature conservation are next to the lake.

Fish Conservation Organisation

The lake is part of Gäddede fish conservation area.

*Points of view and information from authorities and affected parties***The County Administrative Board in the county of Jämtland**

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Strömsund municipality

There is a smaller fish farm in the northern section of Hetögeln. There are also fish farms downstream (Gärdsnäs and Äspnäs).

There are some households that take water from the lake. Otherwise, Strömsund municipality knows of no other circumstances that may be an obstacle to a possible fish farm.

Fish Conservation Organisation

No negative points of view on a possible fish farm were brought up when talking to the contact person for Gäddede fish conservation organisation.

Assessment

As there is already an existing fish farm in the lake (and also further downstream in Ströms Vattudal), any possible interested party ought to seriously take into account questions about nutrient loads in the account of environmental impacts. Since there may be some households that take drinking water from the lake, these must be located before consultation takes place. Protection or compensation measures must be reported prior to consultation and in the application.

Two areas of national interest in nature conservation are next to the lake, Gråberget on the north-eastern side and Hällingsån on the south-western side. In Hällingsån, Hällingsåfallet also constitutes a

Natura 2000 area. An aquaculture establishment must not affect the conditions so that the values that formed the basis for the assessment disappear or are negatively affected. The matter of means of transport will also form part of such an assessment.

These national interests will be discussed in a consultation and any impact on the areas of national interest will be reported.

Contact ought to be made with the fish conservation area prior to location discussions to avoid disruptions to recreational fishing as far as possible. There is a road all around the lake which means that transportation routes are relatively accessible.

Hetögel'n is assessed as being suitable for fish farming.

4.3. Svaningssjön (Svaningen)

Strömsund municipality

Map sheet 21 F

Lake surface area 20.62 km²

Average depth 20.3 m

Average evapotranspiration 123.5 m³/s

Regulation amplitude 3 m

Bedrock: Svaningssjön is situated in an area that is dominated by granites. There may be elements of basic and intermediate intrusive rock types such as diabase, gabbro, etc.

Nature, culture, environment, location

Svaningssjön lies in Strömsund municipality in the northern section of the county of Jämtland.

The nearest large place is Gäddede which is situated around 45 km north-west of the lake. The lake is part of the system that goes by the name of Ströms Vattudal.

According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore monument localities by Svaningssjön (primarily the northern section).

Reindeer herding

The area lies in the land use area of Raedtievaerie and Jijnjevaerie Sami villages.

Protected areas

Svaningssjön is not affected by any special protection area (according to the County Councils' mapping service). The lake is next to an area of national interest in cultural environment protection.

Fish Conservation Organisation

The lake is part of Övre Vattudalen's fish conservation area.

*Points of view and information from authorities and affected parties***Strömsund municipality**

A fish farm in Svaningssjön may affect the fish farms outside Gärdnäs and Äspnäs. There may be households that take drinking water from the lake. Strömsund municipality does not know of any other circumstances to prevent possible aquaculture.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Fish Conservation Organisation

According to information, no direct obstacles to a possible establishment are currently seen on the part of the fish conservation area; it will primarily be a matter of landowners deciding whether a fish farm would be relevant. Note that only annual passes are currently sold to landowners and leisure homes.

There is no fish stocking in the lake.

Assessment

Since there may be some households that take drinking water from the lake, these must be located before consultation takes place. Protection or compensation measures must be reported prior to consultation and in the application.

Since there are existing fish farms in the system, Ströms Vattudal, any potential interested party should seriously take into account questions on total nutrient loads in the report on environmental impacts.

Between Svaningssjön and Stor-Ringsjön there is an area of national interest in cultural environment conservation in the form of a forestry environment with older and newer housing settlements and floating plant. This area is next to Svaningssjön in its south-western section. No establishment should be moved to this area.

Svaningssjön is assessed as being suitable for fish farming

4.4. Flåsjön

Strömsund municipality

Map sheet 21 G

Lake surface area 109.94 km²

Average depth 25.3 m

Average evapotranspiration 13 m³/s

Regulation amplitude 3 m

Bedrock: The bedrock around Flåsjön consists mainly of quartz and feldspar-rich sedimentary rock types like sandstone, greywacke, etc. Next to the northern sections of the lake is a limestone vein. Granite gneisses occur by the southern sections of the lake. Flåsjön is crossed by a number of shear zones.

Nature, culture, environment, location

Flåsjön lies in Strömsund municipality in the northern section of the county of Jämtland. The nearest large place is Hoting, around 12 km east of the lake.

According to the Swedish National Heritage Boards map data (Fornsök), there are a number of near-shore monument localities around Flåsjön.

Reindeer herding

The area lies in the land use area of Ohredahke Sami village.

Protected areas

Flåsjön is not affected by any special protection area (according to the County Councils' mapping service). Parts of the area are covered by a national interest in reindeer herding.

Fish Conservation Organisation

The lake is part of Flåsjön's fish conservation area.

Points of view and information from authorities and affected parties

Strömsund municipality

At least four large water associations (Gubbhögen, Alanäs, Havsnäs & Järvsand) use Flåsjön as a surface water catchment area and no protective areas are established for this. A smaller association (Stornäsudden) and some households also take water from the lake. Any fish farms must be positioned with regard to the water intake. There is a municipal sewage treatment plant in Lövberga.

According to the fishing plan for Strömsund municipality, Flåsjön/Kvarnån has a protection-worthy strain of brown trout that spawns upstream and that has been deemed as worthy of special protection from the fisheries science point of view and/or is deemed to be of substantial interest to the future fish conservation.

Flåsjön has been assessed by the County Council as being a lake that has valuable lake spawning populations (char, grayling). It is said that protection for the spawning areas is particularly urgent.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

The fish conservation area

When speaking to Mona Boström Asserwall (contact person for Flåsjön's fish conservation organisation), it was said that there was nothing directly negative to say about possible plans for fish farms. The desire is to have the opportunity to give points of view should concrete plans be made for fish farm operations. Told that existing char in the lake have almost disappeared today as a consequence of the regulation.

Assessment

Strömsund municipality has pointed out the importance of any establishment needing to take place with regard to existing water extraction for large water associations and for individual households. A

location of a possible fish farm must be preceded by a careful survey of flows and bed conditions in the lake; this must be compared to where the water inlets are situated. A potential farmer ought also to ensure that the drinking water is sampled and analysed before an establishment comes to fruition to enable the follow-up of possible complaints about the quality of drinking water.

Prior to consultation and application the origin of the fish ought also to be reported and a description given of how it can be ensured that diseases are not transferred into Flåsjön.

Questions on safety (safe boxes, escape fish), measures in the event of diseases, parasites, etc., may be subject to detailed discussions.

Flåsjön is assessed as being suitable for fish farming on condition that the existing fish fauna is not affected.

4.5. Hotagen

Krokom municipality

Map sheet 20 E

Lake surface area 45.36 km²

Average depth 16.3 m

Average evapotranspiration 73 m³/s

Regulation amplitude 3.5 m

Bedrock: In the northern parts of the lake, granites of volcanic origin occur, both quartz and feldspar-rich sedimentary rock types. The bedrock in the area is partly metamorphic. In the southern section of the lake, the bedrock consists of quartz-feldspar-rich sedimentary rock types such as sandstone or greywacke.

The whole length of the lake is situated in a deformation zone (fault or fracture).

Nature, culture, environment, location

Hotagen is situated in the northern section of Krokom municipality. The nearest large place is Föllinge, around 14 km south of the lake. The town of Röt Viken is situated by the northern section of the lake and the town of Laxviken at its southern end.

According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore monument localities around Hotagen.

Reindeer herding

The area lies in the land use areas of Jovnevaerie and Jijnjevaerie Sami villages.

Protected areas

Hotagen is not affected by any special protection area (according to the County Councils' mapping service).

The area is fully or partially covered by Natura 2000, national interest in reindeer herding and national interest in active outdoor recreation.

Fish conservation area

The lake is part of Laxviken's Fish Conservation Organisation.

Points of view and information from authorities and affected

Krokom municipality

Krokom municipality has not given any points of view.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Fish Conservation Organisation

When speaking to Roger Brandt (contact person for Laxviken's fish conservation organisation), it was said that the lake may be seen as suitable for a smaller fish farm (between 300 and 1000 tonnes). There are no strains of fish worthy of special protection in the lake.

Assessment

The whole of the lake is part of the Natura 2000 area for Hårkan. This means that all activities that may affect the conditions for the conservation of the values that form the basis for Natura 2000 must be looked into. In this connection, a potential farmer must show that a possible farm will not affect the preservation values for the Natura 2000 area.

In this case, one of the conservation values for the Natura 2000 area consists of "oligo-mesotrophic lake with the occurrence of annual vegetation on exposed shorelines" and "naturally large fennoscandic watercourse". According to information, bullhead occurs in the N2000 area (although not noted from Hotagen). When testing environmentally hazardous activities, great importance will be attached to the matter of the impact on the Natura 2000 area.

Hotagen is deemed to be less suitable for aquaculture due to the risk of the impact on the Natura 2000 area.

4.6. Torrön

Åre municipality

Map sheet 20 D

Lake surface area 102.9 km²

Average depth 39.8 m

Average evapotranspiration 47.3 m³/s

Regulation amplitude 12.85 m

Bedrock: Torrön is situated in a border zone between two different types of bedrock. The west is dominated by quartz and feldspar-rich sedimentary rock types such as sandstone and greywacke and the more metamorphic phyllite and slate. To the east, you instead find acidic types of rock like granite, granodiorite, etc.

Nature, culture, environment, location

Torrön lies in Åre municipality, close to the border with Norway. The nearest large place is Åre, which is situated around 40 km south of Torrön.

Torrön is next to the Skäckerfjällen nature reserve. The lake is also affected by Natura 2000, national interest in nature conservation, national interest in unbroken areas of mountain terrain, reindeer herding and active outdoor recreation.

According to the Swedish National Heritage Boards map data (Fornsök), there are some near-shore monument localities by Torrön; these are located primarily by the southern sections of the lake.

Reindeer herding

The area lies in the land use area for the Sami villages of Njaarke and Kalls.

Protected areas

Torrön is next to the Skäckerfjällen nature reserve (according to the County Councils' mapping service). The area is covered by several national interests, including active outdoor recreation, reindeer herding and nature conservation.

Fish Conservation Organisation

Half of the lake constitutes the state's water on reindeer grazing mountains (the Sami village of Kalls). The other half is not open for use.

Points of view and information from authorities and affected parties

Åre municipality

Åre municipality says that Torrön is regulated with high amplitude. There are no municipal water and sewage plants next to the lake.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Assessment

Torrön is affected by several national interests such as reindeer herding, outdoor recreation and nature conservation and is next to the Natura 2000 area. These national interests must be reported prior to a consultation and a future farmer must also be able to show how these national interests and Natura 2000 will not be affected by any activities.

Torrön is deemed to be less suitable for fish farm partly because of the fact that the lake is affected by several national interests.

4.7. Juvuln

Åre municipality

Map sheet 20 D

Lake surface area 37.5 km²

Average depth 20.3 m

Average evapotranspiration 109 m³/s

Regulation amplitude 8.55 m

Bedrock: the lake is situated in an area that is dominated by basic and intermediate metamorphic rock types such as amphibolite. Glittering metamorphic rock types like slate also occur.

Nature, culture, environment, location

Juvuln lies in Åre municipality, The nearest large place is Åre, which is situated around 35 km south of the lake. According to the Swedish National Heritage Board's map data (Fornsök), there are a number of near-shore monument localities around Juvuln, primarily on the northern side of the lake.

Reindeer herding

The area lies in the land use area for the Sami villages of Njaarke and Kalls.

Protected areas

Juvuln is not covered by any protection in the form of protected areas. The lake is affected by a national interest in reindeer herding and a national interest in active outdoor recreation.

Fish Conservation Organisation

Juvuln's fish conservation organisation

Points of view and information from authorities and affected parties

Åre municipality

Åre municipality has no points of view on possible aquaculture in Juvuln; there are no municipal water supply sources in the lake. Nor are there any details of other values that may be affected.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Fish Conservation Organisation

The fish conservation area knows of no special protection values in the lake. Recreational fishing takes place, primarily during the winter. People are cautiously positive towards a possible establishment but are enquiring about a detailed investigation into nutrient loads, the issue of escape fish and infections if a fish farm is started in the lake.

Assessment

Juvuln is deemed to be suitable for aquaculture activities. No points of view or facts which require extra clarification prior to a consultation process were brought up. Possible consultation documentation (application and EID) must show how the national interests in outdoor recreation and reindeer herding may be affected.

4.8. Kallsjön

Åre municipality

Map sheet 19 D, 20 D

Lake surface area 158.38 km²

Average depth 40.1 m

Average evapotranspiration 88.7 m³/s

Regulation amplitude 3.2 m

Bedrock: the lake's surroundings are dominated by quartz-feldspar-rich, sedimentary rock types such as sandstone, greywacke, etc. Occasionally you find glittering sedimentary rock types such as shale.

Basic and intermediate metamorphic rock types such as amphibolite can occur east of the lake.

Nature, culture, environment, location

Kallsjön lies in Åre municipality in the northern section of the county of Jämtland, close to the border with Norway. The nearest large place is Järpen, which is situated around 10 km south of the lake's outflow; several smaller communities such as Huså and Sölvsved are located around the lake.

According to the Swedish National Heritage Board's map data (Fornsök), there are a number of near-shore monument localities around Kallsjön.

Reindeer herding

The area lies in the land use area for the Sami villages of Njaarke and Kalls.

Protected areas

Kallsjön is not affected by any special protection area (according to the County Councils' mapping service).

The area is covered by a national interest in active outdoor recreation.

Fish Conservation Organisation

The lake is part of Suljätten's fish conservation organisation, Anjan-Gråsjöns fish conservation organisation, Huså-Smedjeviken's fish conservation organisation and Kall-Kyrkslätt's Sports Fishing Association.

Points of view and information from authorities and affected parties

Åre municipality

Kallsjön is regulated. There are wastewater plants with emissions/discharges in Kall and Huså and there is a fish hatchery by the outflow in Bonäshamn.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from any assessment at this stage.

Fish Conservation Organisation

No points of view put forward.

Assessment

An investigation into possible farming in Kallsjön must show in particular the risks to which this may lead for the fish hatchery (Bonäshamn) and how these risks will be minimised.

Kallsjön is assessed as being suitable for fish farming.

4.9. Liten

Åre municipality

Map sheet 19 D

Lake surface area 16.23 km²

Average depth 20.3 m

Average evapotranspiration 160.9 m³/s

Regulation amplitude 5 m

Bedrock: Quartz-feldspar-rich sedimentary rock types (sandstone and greywacke) are dominant in the area. The southern section of the lake lies in an area with glittering sedimentary rock types such as shale.

Aquatic environment

Liten is a nutrient-poor lake. The water is clear and has a big Secchi depth. The oxygen content is high in the surface and near the bed. In the upper sections of the lake, the water speed is relatively high to then lessen in the south-eastern sections.

Nature, culture, environment, location

Liten lies in Åre municipality in the western section of the county of Jämtland. The nearest large place is Järpen, which is situated on the northern side of the lake. The lake is part of Indalsälven's water system. The E14 and a railway run along the northern shore of the lake.

According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore monument localities around Liten, particularly in the western parts.

Reindeer herding

The area lies in the Sami village of Tossåsen's land use area.

Fish Conservation Organisation

The lake is part of Uppland's fish conservation organisation and Liten's western fish conservation area.

*Points of view and information from authorities and affected parties***Åre municipality**

The Liten lake is affected by contaminants from the Järpen industrial area. Elevated levels of metal (arsenic, mercury, nickel, copper) occur in sediment. The contaminants have resulted in toxic damage to bed fauna (damage to the mouth parts). Organic contaminants also occur in the area; PAH compounds, chlorophenols, PCB compounds and trichloroethene have been shown in the ground and groundwater but have not been investigated more closely. The scope and spreading of these contaminants is uncertain.

There may be mercury-contaminated fibre banks from previous businesses in the area (mechanical pulp mill). No fibre banks have been found but nor has there been any full charting of sediment in the lake.

Owing to considerable dilution, the metal levels in the surface water of Järpströmmen are low. The accumulation beds in Liten probably constitute a recipient for contaminants from the industrial area.

Source: Undersökning av föroreningspåverkan i sjön Liten, Kemakta konsult 2012 [Survey of the impact of contamination in Lake Liten, Kemakta consultant, 2012]

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Fish Conservation Organisation

People wish to wait for a possible proposal for a test and have not put forward any points of view.

Assessment

When producing a consultation basis for a possible fish farm in Liten, the location survey is very important. Bed sediment at the relevant locations must be surveyed and if fibre banks are discovered, the applicant must be able to show how he will ensure that these will not be affected, with a risk of an increase in mercury transportation in the system.

Authorities may set requirements stating that the application and EID show the extent of the contaminants, which may mean fairly extensive surveys of both land, water and bed sediment. The possible impact of the contaminants on the quality of the fish as food should also be reported.

Liten is deemed to be less suitable for aquaculture activities owing to the known contamination problems.

4.10. Gesunden

Ragunda municipality

Map sheet 19 G, 19 F

Lake surface area 29.76 km²

Average depth 16.8 m

Average evapotranspiration 383.5 m³/s

Regulation amplitude 2 m

Bedrock: The bedrock in the area is dominated by acidic intrusive rock types such as granite. There are elements of sedimentary quartz-feldspar-rich rock types like sandstone or greywacke in the western parts and out to the easternmost area.

Nature, culture, environment, location

Gesunden occupies a relatively central location in Ragunda municipality. The nearest large place is Stugun, which is situated by the lake's inflow in the west. There are major roads north and south of the lake. The lake constitutes a part of Indalsälven's system. According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore monument localities around Gesunden.

Reindeer herding

The area lies in the land use area of Raedtievaerie and Jijnjevaerie Sami villages. The Sami village of Ohredahke may be affected (the western part of the lake).

Protected areas

Gesunden is not affected by any special protection area (according to the County Councils' mapping service).

The area is covered by a national interest in reindeer herding; Gesunden is also affected by a national interest in the cultural environment in some smaller designated areas in the western sections of the lake and in Indalsälven downstream from the lake.

Fish Conservation Organisation

The lake is part of Gesunden's fish conservation area.

Ragunda municipality

Ragunda municipality knows of a few drinking water sources around Gesunden and downstream from the river. However, the building and environment committee does not have a full database of these water supply sources. It is pointed out that downstream from Gesunden there are six valuable water-courses (reproduction areas) designated in Ragunda municipality's fishing plan. Ammerån, which is situated downstream from Gesunden, is a Natura 2000 area. The municipality's overview plan lacks guidelines for aquaculture. A review of the overview plan will begin in 2013. This review will include the aquaculture questions.

To summarise, the building and environment committee thinks that additional documentation and studies are needed to highlight the following points in particular in the event of any aquaculture:

- the impact on individual drinking water and municipal drinking water in Hammarstrand and Bispgården
- the impact on and consequences of recreational fishing in general, particularly concerning Gesunden
- the risk of infection from and to the fish farm
- the impact on recreational fishing in Ammerån and its unique spawning brown trout strains
- the flows and currents in Gesunden
- -assessing the risk of breakthrough in Tjärnviksdalen.

The County Administrative Board in the county of Jämtland

The County Administrative Board's environmental protection unit does not want to precede any possible test and is therefore refraining from making any assessment at this stage.

Fish Conservation Organisation

According to Gesunden's fish conservation organisation, Gesunden is a lake with a good throughput which probably lends itself well to at least one small aquaculture site.

Stocking of fish has taken place for several years and there are plenty of brown trout, perch and pike. In the lake occurs also a relicta shrimp (it is probably the Arctic Ocean's relicta, the opossum shrimp (*Mysis relicta*) which is referred to). Otters have been observed in the area.

The regulation has meant that shore and bed vegetation have almost disappeared.

According to information, there is a clear underwater stream in the lake which is situated a few hundred metres out from the southern shoreline. As far as the fish conservation area is concerned, the location of a possible fish farm next to this stream would be particularly beneficial from the aquaculture point of view.

Assessment

Gesunden appears to be well suited to the establishment of a small fish farm. Questions concerning nutrient loads, infection risks and risk of the impact on the Natura 2000 area of Ammerån are particularly important questions to look into prior to the consultation, however.

Gesunden is assessed as being suitable for fish farming on condition that the Natura 2000 area's conservation values are not affected by the activities.

4.11. Lossen

Härjedalen municipality

Härjedalen municipality

Map sheet 17 C

Lake surface area 31.31 km²

Average depth 20.3 m

Average evapotranspiration 22.4 m³/s

Regulation amplitude 27 m

Bedrock: Lossen is situated in a zone containing with older slaty and gneiss rock types, primarily porphyric granite but also quartz-feldspar-rich sedimentary rock types such as sandstone and greywacke, which can also be porphyric.

Nature, culture, environment, location

Lossen lies in the western part of Härjedalen municipality. The nearest large place is Funäsdalen, just 4 km west of the lake in its northern parts. Hede lies 30 km east of the lake. The Rv 84 road runs just south of the lake. According to the Swedish National Heritage Board's map data (Fornsök), there are several near-shore culturally historic relics in and around Lossen.

Reindeer herding

The area lies in the land use area of Mittådalen and Ruvhten sijte Sami villages.

Protected areas

Lossen is not affected by any special protection area (according to the County Councils' mapping service).

The area is covered by a national interest in active outdoor recreation. Rosselberget west of the lake is covered by a national interest in Natura 2000. The lake's inflow is covered by a national interest in cultural environment protection.

Points of view and information from authorities and affected parties

Härjedalen municipality

The fishing group in Härjedalen municipality thinks that a full environmental impact description must be drawn up before establishing farming to the extent referred to in the enquiry (at least 300 tonnes). It is pointed out that this section of Ljusnan accommodates a valuable strain of freshwater brown trout whose existence must under no circumstances be compromised.

The Business and Development Office at Härjedalen municipality looks positively at possible future company establishments linked to fish farms provided that requisite surveys take place in consultation with all interested parties concerning the lake.

Fish Conservation Organisation

The lake is part of Lossen's fish conservation area. The contact person for Lossen's fish conservation organisation, Mats Dahlgren, believes that the conditions for fish farming in the lake are fairly poor due to the high regulation amplitude of 27 m. Proposes looking at Rörhån instead, which is situated downstream. It is thought that the lake's water level amplitude (27 m) means that it may not be certain how farming to this extent (at least 300 tonnes) will be taken care of and maintained in a safe and sustainable manner.

Assessment

The large amplitude of the lake, 27 m, sets great demands for finding the "right" location in the lake. Since Härjedalen municipality is setting requirements stating that existing strains of brown trout must not be affected, any consultation basis must show how the impact on existing fish strains will be avoided.

Lossen is deemed to be less suitable for aquaculture.

5. In-depth discussion

5.1. Ecosystem services

Fish farming is to be seen as an ecosystem service since man benefits from nature by obtaining food. A discussion concerning the value of the "service" tapped into: the farm and living environment for the farmed fish versus the cost, i.e. feed production, the local impact on the ecosystem of the relevant

lake, the impact downstream and finally on the end recipient, Östersjön, should be part of the environmental impact description which will form part of the documentation in a licence application. Proposals for compensatory measures that can be taken by the individual farmer to compensate for the impact on the ecosystem should also be included.

The concept of ecosystem service is relatively new in Sweden but the requirement of reporting the value of the gain versus the cost of obtaining the desired product is not completely new. Previous argumentation has also been given (and this remains) in terms of lifecycle analyses, requirements regarding the best possible technique, accounts of alternative locations, etc., which is already a requirement for a licence for environmentally hazardous activities in accordance with the Environmental Code.

An ecosystem service is a concept that clarifies the requirement for a detailed analysis of the impact of the planned activities on the natural environment, not just in the short term or in the nearby area but also taking into account the impact that the ecosystem can tolerate in the long term and how the end recipient may be affected.

Economic valuation is a manner of assessing ecosystems and ecosystem services that are not just something to be purchased and sold or that have a price on the market. The value and valuation of the concepts can also refer to a measurement of how ecosystem services help to fulfil human needs.

Tapping into ecosystem services is often closely linked with the analysis of the way in which the activities affect the environmental quality targets.

5.2. Environmental quality targets

Environmental quality targets that are of particular interest for discussion in a licence application are the following: no eutrophication, living lakes and watercourses, balanced sea and living coast and archipelago. The Marine and Water Authority (HaV) has a particular responsibility for these environmental goals. The County Administrative Board in the county of Jämtland has drawn up regional targets and action plans for the environmental quality targets.

6. Contact details and links

6.1. The municipalities in the county of Jämtland

Municipality	Address	www	Committee or department responsible
Strömsund	Box 500 833 24 Strömsund +46 670-161 00 (ex)	www.stromsund.se	The Environment and Building Department The Building and Environment Committee +46 670-16390
email	stromsunds.kommun@stromsund.se		
Åre	Box 201 830 05 Järpen +46 647-161 00 (ex)	www.are.se	The Environmental Construction & Rescue Committee The Environmental Office
email	kundtjanst@are.se miljoavdelningen@are.se		
Krokom	Offerdalsvägen 8 835 80 Krokom +46 640-161 00 (ex)	www.krokom.se	The Building and Environment Committee The Environment and Building Department
email	krokoms.kommun@krokom.se		
Östersund	The Town Hall 831 82 Östersund +46 63-14 30 00	www.ostersund.se	The Environmental and Urban Planning Committee The Urban Planning Administration, Environment and Health
email	kommun@ostersund.se samhallsbyggnad@ostersund.se		
Ragunda	Box 150 840 70 Hammarstrand +46 696-68 20 00	www.ragunda.se	The Building and Environment Committee The Building and Environment Office
email	ragunda.kommun@ragunda.se bygg.miljo@ragunda.se		
Berg	Box 73 840 40 Svenstavik +46 687-161 00	www.berg.se	The Building and Environment Committee The Environmental Office
email	bergs.kommun@berg.se mob@berg.se (the Building and Environment Committee)		
Bräcke	Hantverksgatan 25 Box 190 840 60 Bräcke +46 693-161 00	www.bracke.se	The Building and Environment Committee
email	bracke@bracke.se		
Härjedalen	The Civic Hall 842 80 Sveg +46 680-161 00	www.herjedalen.se	Environment and Building Office +46 680-161 08
email	kommun@herjedalen.se miljo.bygg@herjedalen.se		

6.2. Links and information sites

The County Administrative Board in the county of Jämtland, tel. +46 10-225 30 00
www.lansstyrelsen.se/jamtland

The Environmental Protection Agency: www.naturvardsverket.se

The Marine and Water Authority: www.havsandvatten.se

Ångermanälven's and Vapstälven's water council
www.vattenorganisations.se/angermanalven/

Sweden's Fishing Owners' Association: www.vattenagarna.se

Swedish Aquaculture Association: www.vattenbrukarna.se

Sweden's aquaculture companies: www.svensktvattenbruk.se

Documentation concerning monuments and suchlike can be seen in the "Fornsök" service on the Swedish National Heritage Board's website, www.fmis.raa.se

On the County Councils' for mapping services page, www.gis.lst.se, you can bring up information concerning nature reserves, Natura 2000, national interests, etc..

Details concerning ecological and chemical status and the special values in the water area can be obtained from www.viss.se, VattenInformationSystem Sverige.

References

Sweden's geological survey, www.sgu.se
The Swedish National Heritage Board, www.fmis.se
The County Councils' mapping services, www.gis.lst.se
The Sami Parliament, www.sametinget.se
The County Administrative Board in the county of Jämtland, www.lansstyrelsen.se/jamtland
The County Administrative Board in the county of Västernorrland,
www.lansstyrelsen.se/vasternorrland

Contacts

The County Administrative Board in the county of Jämtland:
Britta Munksten, the Environmental Protection Unit
Joakim Svensson, the Water Department

The fish conservation areas

Mats Dahlgren, Tännäs' fish conservation organisation
Mariua Lövgren Embretson, Glissjöberg-Mosätt's fish conservation organisation
Jonas Bertilsson, Uppland's fish conservation organisation
Tor-Egon Vedin, Tåsjön's fish conservation organisation
Mona Boström Asserwall, Flåsjön's fish conservation organisation
Roger Brandt, Laxviken's fish conservation organisation
Jan-Peter Albertsson, Gäddede's fish conservation organisation
Jan-Olov Nässén, Litsbygden's fish conservation organisation
Katrín Johansson, Stugun's fish conservation organisation
Mikael Eriksson, Övre Vattudalen's fish conservation organisation
Yngve Johansson, Kvarnbergsvättnet
Jon Ocklind, Juvuln's fish conservation organisation
John-Erik Johansson, Gesunden's fish conservation organisation