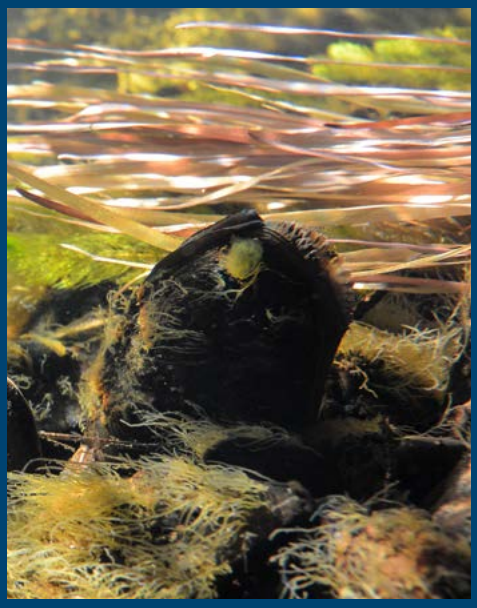


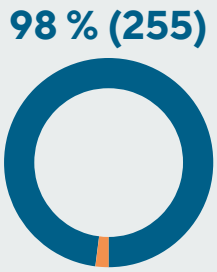
PHOTOGRAPHERS: FREDRIK LINDGREN, NIKLAS WENGSTRÖM & MAJA KRISTIN NYLANDER

State of the Swedish Aquatic Environment 2023

Some examples

Swedish Agency
for Marine and
Water Management

Major impact from hydropower



WATER IS and has historically been an important resource. The power of water has been harnessed both for transport and for production of energy. This has resulted in, among other things, straightening rivers for log driving, draining of land and damming watercourses for mills and sawmills, and more recently for hydroelectric power stations. This has had a major impact on conditions in the water and not least its connectivity. There are almost 11,000 mapped dams in flowing water in Sweden today. In connection with these there are 2000 active hydropower plants, of which 255 account for 98% of the produced hydropower electricity.

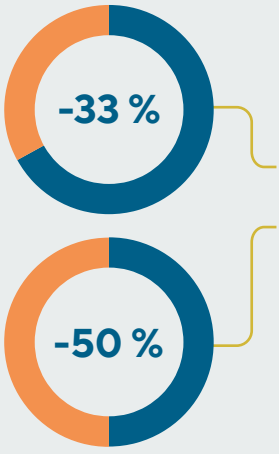

PHOTOGRAPHER: ANNA EK

The importance of being able to move freely – a chain effect

SWEDISH TERRITORIAL WATERS offer great variation in salinity, temperature, depth, type of bottom and currents. This means that the animal and plant species here have adapted their living habits accordingly and like variation. For example, some fish, such as salmon and sea trout, are born in shallow fresh water but live as adults in the open salty sea. When it is time to reproduce, they swim back to fresh water. This requires connectivity – that is, the ability to move between places with different conditions during different life stages. This can mean movements of anything from a few metres to many hundreds of kilometres. Some species move by themselves, while others rely on water currents or other species for transportation.

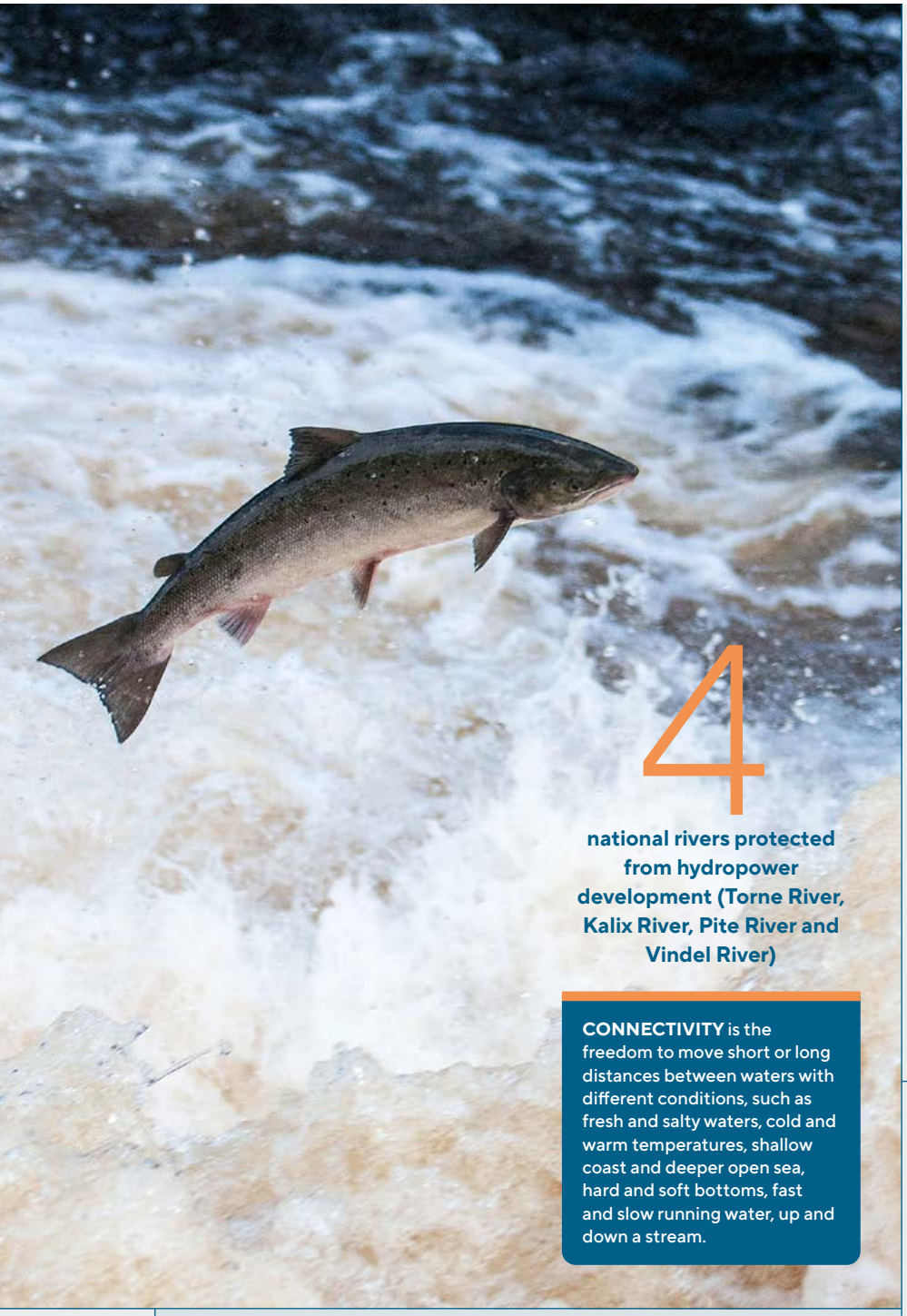
Connectivity describes how different water areas are connected. When watercourses are dammed or constructions built along the coast, connectivity and the ability of species to move between areas with suitable conditions are affected. When sea trout and salmon cannot move between fresh and salt water due to, for example, hydropower dams, this also results in negative effects on other species, such as the endangered freshwater pearl mussel. Pearl mussels depend on salmon and trout to reproduce. For a few months during the larval stage of the mussel they live as small parasites on the gills of these fish, before letting go and establishing themselves at the sandy bottom of a stream.


PHOTOGRAPHER: INGEMAR PETTERSSON, AZOTE LIBRARY



Freshwater pearl mussel in decline

THE FRESHWATER PEARL MUSSEL has disappeared from a third of Swedish watercourses over the past hundred years and reproduction is currently only taking place in half of the populations. This indicates that connectivity in Swedish watercourses has deteriorated sharply, in part caused by existing dams. Migration obstacles such as dams and culverts affect the ability of the trout to move between different waters and thus reduces the chances of the freshwater pearl mussel to survive and reproduce.



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national rivers protected from hydropower development (Torne River, Kalix River, Pite River and Vindel River)

CONNECTIVITY is the freedom to move short or long distances between waters with different conditions, such as fresh and salty waters, cold and warm temperatures, shallow coast and deeper open sea, hard and soft bottoms, fast and slow running water, up and down a stream.

Local restoration measures

MANY LOCAL MEASURES are taken to restore connectivity in watercourses and along the coast. Migration barriers such as dams and wrongly installed culverts are being removed, fish and fauna passages are built at dams and cleared or straightened watercourses are restored. The goal is to enable fish to migrate between waters with different conditions and to recreate or mimic a natural flow of water. This allows animals and plants, as well as sediment and organic matter to move.

This is being done!

- Obstacles are cleared
- Fish & fauna passages are being built
- Watercourses are restored

This is needed!

- Completion of the national plan for revision of hydropower station licenses
- Additional resources to follow-up measures
- Consideration of ecological connectivity during planning of new protected areas

READ MORE: The hydropower's regulatory contribution and value for the electricity system (ER 2016:11), Programme of measures for freshwater pearl mussel (HaV 2020:19), Report on government assignment on knowledge compilation of dams (HaV 2021)

Migration obstacles in the Ljusnan catchment area

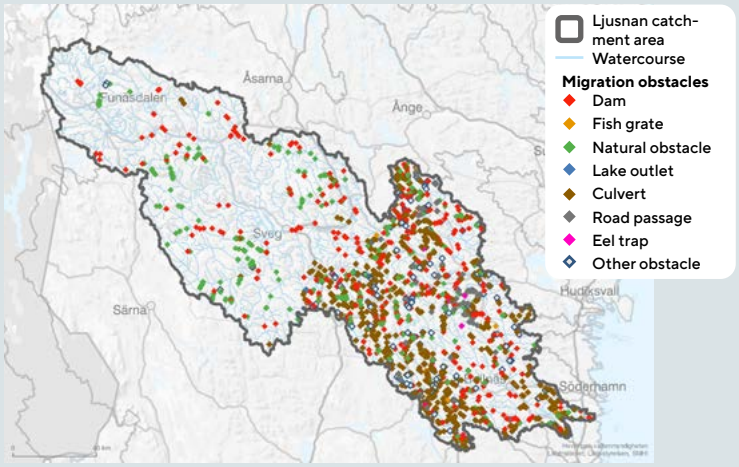
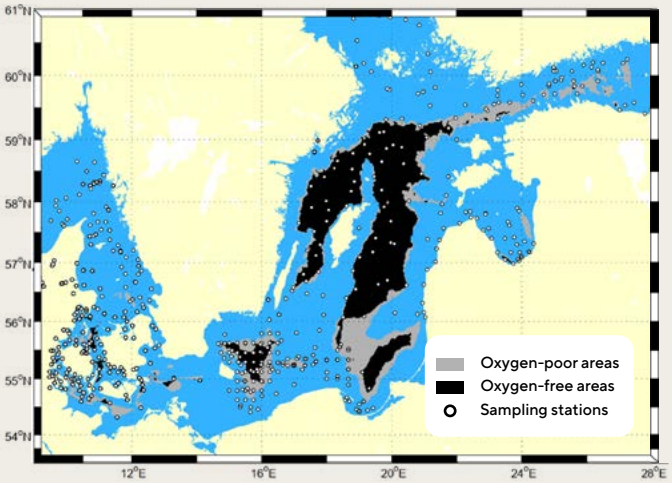


ILLUSTRATION: SWEDISH AGENCY FOR WATER AND MARINE MANAGEMENT
SOURCES: LAND SURVEY AND SWEDISH METEOROLOGICAL AND HYDROLOGICAL INSTITUTE

A multifaceted problem requires many different solutions

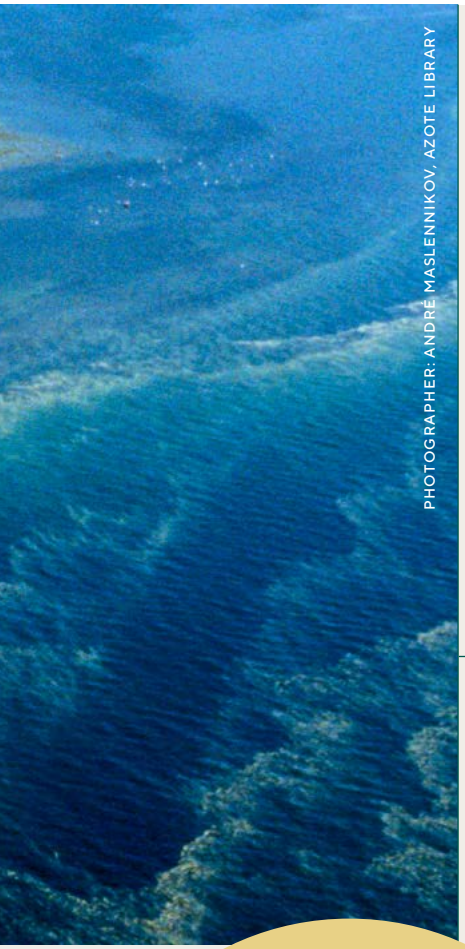
IN THE BALTIC SEA, there are relatively few species in the food web, which makes it sensitive to change. Several factors have led to a steady decline in populations of large coastal predatory fish over the past 50 years. In addition to fishing, factors such as eutrophication, environmental toxins, climate change and increased predation pressure from seals and cormorants, have contributed to this. Predatory fish are important for limiting the number of smaller fish. When smaller fish species become more numerous, they eat more of their prey species. These prey species are often important for reducing the growth of certain algae. Resulting blooms of opportunistic algae can cover sea grass, rocks and sandy bottoms and cause oxygen deficiency during decay. They may also create unfavourable conditions for larger vegetation like eelgrass and bladderwrack, that are important nursing grounds for many predatory fish. Imbalance in the food web thus reduce the ability of ecosystems to cope with changing conditions. To improve the situation various measures are being taken to reduce nutrient leakage from land to water and to establish protected areas where fishing is prohibited during all or part of the year. Protection of fish spawning areas, together with measures reducing eutrophication and environmental toxins, should lead to viable fish stocks and hence a restored balance in the food web.



SOURCE: OCEANOGRAPHIC UNIT, SMHI

Too many nutrients and algae result in a lack of oxygen

WHEN LARGE AMOUNTS of nutrients are added to seas, lakes and streams from, for example, agriculture and wastewater treatment plants or through deposition from the air, the growth of algae is favoured. Increased algal growth may develop into severe algal blooms which later sink to the bottom and cause oxygen deficiency as they decay and rot. When oxygen decreases or disappears, biological and chemical conditions at the bottom change. Bottom-dwelling species that depend on oxygenated water for their survival either die or migrate to areas with oxygen. Today, about 30% of the Baltic Proper - including the Gulf of Finland and the Gulf of Riga - is either affected by oxygen deficiency or completely oxygen free.



PHOTOGRAPHER: ANDRÉ MASLENNIKOV, AZOTE LIBRARY

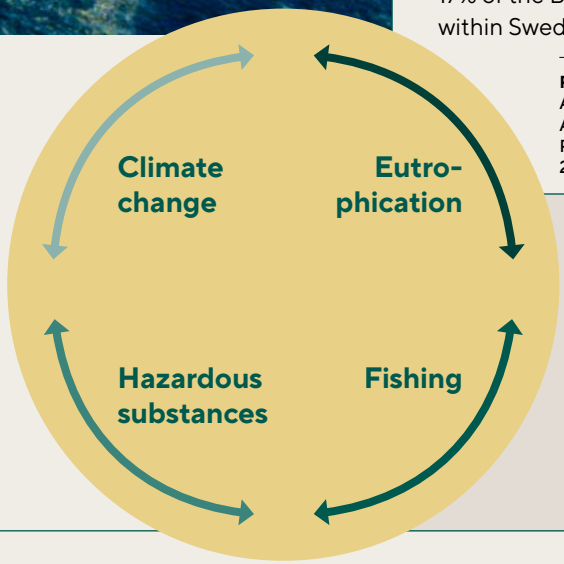
How eutrophication is reduced

MANY MEASURES are being taken to reduce eutrophication and restore balance in the food web. Important tools include marine protected areas with catch limitations and gear restrictions, as well as protection and restoration of shallow coastal habitats. Buffer zones, catch crops and balanced fertilization plans in agriculture contribute to reduced nutrient leakage. Improved treatment processes in wastewater treatment plants and restoration and management of wetlands are also used to reduce nutrient inputs to the water. Both local coordination, through local action coordinators, and international cooperation are of the utmost importance in order to address the problem.

Transboundary protection

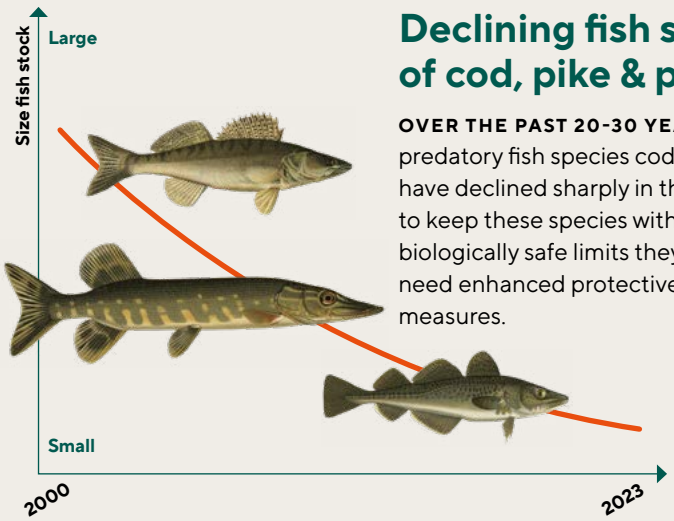
PROTECTION OF IMPORTANT coastal and marine areas needs to be done nationally as well as transboundary. Within the EU, we have a goal of protecting 30% of our marine areas by 2030 in order to preserve biodiversity. Today, 32% of the North Sea, 17% of the Baltic Sea and 5% of the Gulf of Bothnia, within Swedish jurisdiction, are protected

READ MORE: OSPAR, Eutrophication Thematic Assessment (2023), OSPAR, Food webs Thematic Assessment (2023), EU Biodiversity Strategy 2030, Programme of measures for the Marine Environment 2022-2027, Statistics Sweden.



Imbalance in the sea

SEVERAL FACTORS, such as hazardous substances, eutrophication, high fishing pressure and climate change lead to imbalances in the marine food web. Resulting in a reduced ability of ecosystems to cope with changing conditions.



Declining fish stocks of cod, pike & pikeperch

OVER THE PAST 20-30 YEARS, stocks of the predatory fish species cod, pike and pikeperch have declined sharply in the Baltic Sea. In order to keep these species within biologically safe limits they need enhanced protective measures.

READ MORE about fish and shellfish stocks at the Fiskbarometer.

This is being done!

- Protected areas
- Protection and restoration
- Reduced nutrient leakage
- Improved treatment processes
- Coordination of measures
- International agreements

This is needed!

- Developing better fishing gear which reduces the impact on natural resources and the climate
- More protected areas
- Sufficient, predictable and long-term funding for measures to reduce nutrient leakage
- Clearer political priorities, for example between reduced eutrophication and increased food production

Be careful – think ahead, ban and take action

PHOTOGRAPHER: SVEN-ERIK ARNDT, AZOTE LIBRARY

Eco-friendly alternatives to toxic antifouling paint

THE GROWTH of algae, barnacles and mussels on boat hulls increases fuel consumption and reduces manoeuvrability. There are however environmentally friendly alternatives to painting hulls with toxic antifouling. For example, it is recommended to take the boat to a boat wash service a few times a season and scrub the hull clean, or to lift the boat and clean it with the help of a pressure washer. It is also possible to scrub the boat by hand using special brushes. Along the Baltic coast, barnacles settle on a couple of occasions per season, and by washing your boat shortly thereafter the hull can be kept free from fouling all summer. When the boat is in port, a hull cover that closes tightly around the hull can be used to prevent fouling. There are also non-toxic paints on the market that prevent growth with mechanical action, either containing silicone that makes the surface smooth and difficult to adhere to or with a self-polishing function that repels fouling by flaking.

Non-toxic ways to reduce the growth of barnacles, algae and mussels on the boat hull

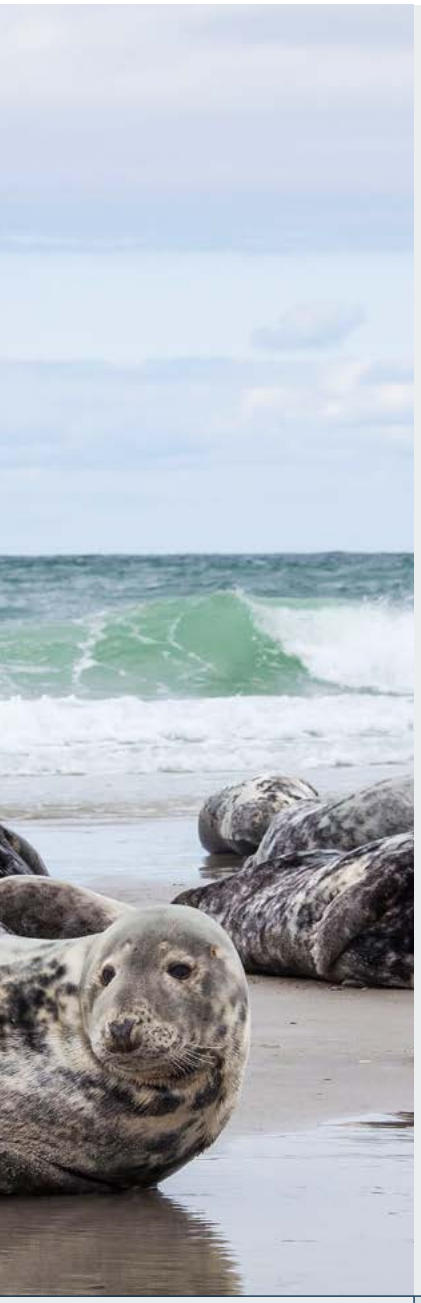
- Use boat wash services
- Lift and pressure wash
- Scrub using hand brush
- Use hull cover
- Mechanically acting antifouling paint

PHOTOGRAPHER: MAJA KRISTIN NYLANDER

Shipwrecks as an environmental problem

ANOTHER LEGACY from the past is the approximately 17,000 shipwrecks lying at the bottom along Sweden's coast. 300 of these are considered environmentally hazardous and 30 pose an acute danger to nature. These wrecks generally contain oil which could leak out as the wrecks collapse. This risks significant damage to animals and plants nearby. Large oil spills mainly result in acute physical damage, while in the case of continuous, minor oil leaks, it is primarily the toxic substances in the oil (PAHs) which cause long-term damage. Examples of such damage are impaired reproduction and growth, genetic damage and reduced resilience to other disturbances. Since 2017, oil and lost fishing gear have been recovered from the most hazardous wrecks.

PHOTOGRAPHER: FREDRIK LINDGREN



SEVERAL OF THE hazardous substances found in nature today are inherited from a time when they were used without restriction. Many of the substances that turned out to have undesirable consequences are now banned, which in Swedish waters has given good results for species such as the white-tailed eagle and the grey seal. These two species have recovered from record low numbers in the 1970s to viable populations in the Baltic Sea area today, thanks to the banning of the hazardous substances PCB and DDT. This shows that if decisive action is taken, wildlife can recover. Despite prohibitions, the effects of hazardous substances, which are often very stable and difficult to break down, can remain in nature for many years. This is in part due to the ability of these substances to accumulate in animals and plants and thus remain in the food web for many generations. It is also a result of these substances being used in, for example, materials for building and in paint for boat hulls and thus they can constitute a source of emission for a long time. An example of this phenomenon is organotin compounds, where mainly the substance TBT has been used for many years in antifouling paint to prevent the growth of barnacles. In the early 1980s TBT was shown to damage the reproductive capacity and cause malformed shells in oysters along the Atlantic coast of France. TBT has since been proven to cause sterility in a large number of different snail species. Although TBT was banned globally in 2008, the effects of the substance can still be seen today, albeit on a smaller scale than before the ban.

The levels of many legacy hazardous substances are declining in nature

This is being done!

- Salvage of oil from wrecks to avoid leakage into the marine environment
- Remediation of contaminated sediments
- EU proposals for improved treatment processes in water treatment plants
- Prohibition of the use of certain hazardous substances

This is needed!

- Tougher legislation and faster bans on substances proven to be toxic
- Ensure that the polluter pays principle is applied
- To think ahead – before hazardous substances are being spread into nature

Many hazardous substances are not monitored

FOR SOME of the hazardous substances that are monitored today such as dioxins, brominated flame retardants and PFOS, decreasing trends are seen in general, both in the Baltic Sea and the North Sea. However, there are several potentially hazardous substances that we do not yet monitor and thus do not know the trends for, or effects of, in nature.

A selection of the hazardous substances monitored today:

- Dioxin
- Flame retardants
- PAHs
- PCBs
- PFOS
- Cadmium
- Copper
- Lead
- Mercury
- Nickel

READ MORE: Tributyltin (TBT) antifoulants: a tale of ships, snails and imposex (2008), HELCOM Thematic assessment of hazardous substances, marine litter, underwater noise and non-indigenous species 2016-2021 (2023), OSPAR Hazardous Substances Thematic Assessment (2023).

How are our lakes, streams, coasts and seas doing? In this brochure, we highlight some examples taken from the in-depth evaluation of the Swedish environmental objectives 2023, "Water in the landscape – from source to sea" and other reports produced by the Swedish Agency for Marine and Water Management. By understanding existing connections, seeing the bigger picture and having a system perspective, we can achieve a thriving ecosystem, from the source all the way out to the sea. Sustainable aquatic ecosystems are a prerequisite for social and economic development, reliable energy and food production as well as for access to clean drinking water and for securing society against the impacts of climate change.

More information about what we do to manage and improve the condition of our waters can be found on our website havochvatten.se/en.

This brochure has been produced by the Swedish Agency for Marine and Water Management. The Agency is responsible for its content and conclusions.

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Swedish Agency for Marine and Water Management