

Photo: www.mostphotos.com



Many waterfowl species, including great crested grebe, can be observed in Wetland Alhagen.

## FAQ

### Which type of water is treated in the wetland?

Mechanically, chemically and biologically treated wastewater from Nynäshamn WWTP is pumped to the wetland for further treatment, primarily to reduce the nitrogen content. Stormwater from the town is also released in the wetland.

### Does the wetland treatment work in wintertime?

Yes, nitrogen removal also takes place in the winter, but the process is more efficient in the summer. Bacterial activity increases with increasing temperature. To prevent ice damage, the water levels in the ponds are kept constant during the cold winter months.

### What proportion of nitrogen can be removed?

The annual nitrogen load to the treatment system amounts to approximately 90 tonnes, whereof 40 percent is removed in the WWTP. About 46 tonnes of nitrogen is passed on to the wetland which removes an additional 35 tonnes of the total annual load (see figure 3).

### Is harvest of wetland plants necessary to maintain nitrogen reduction?

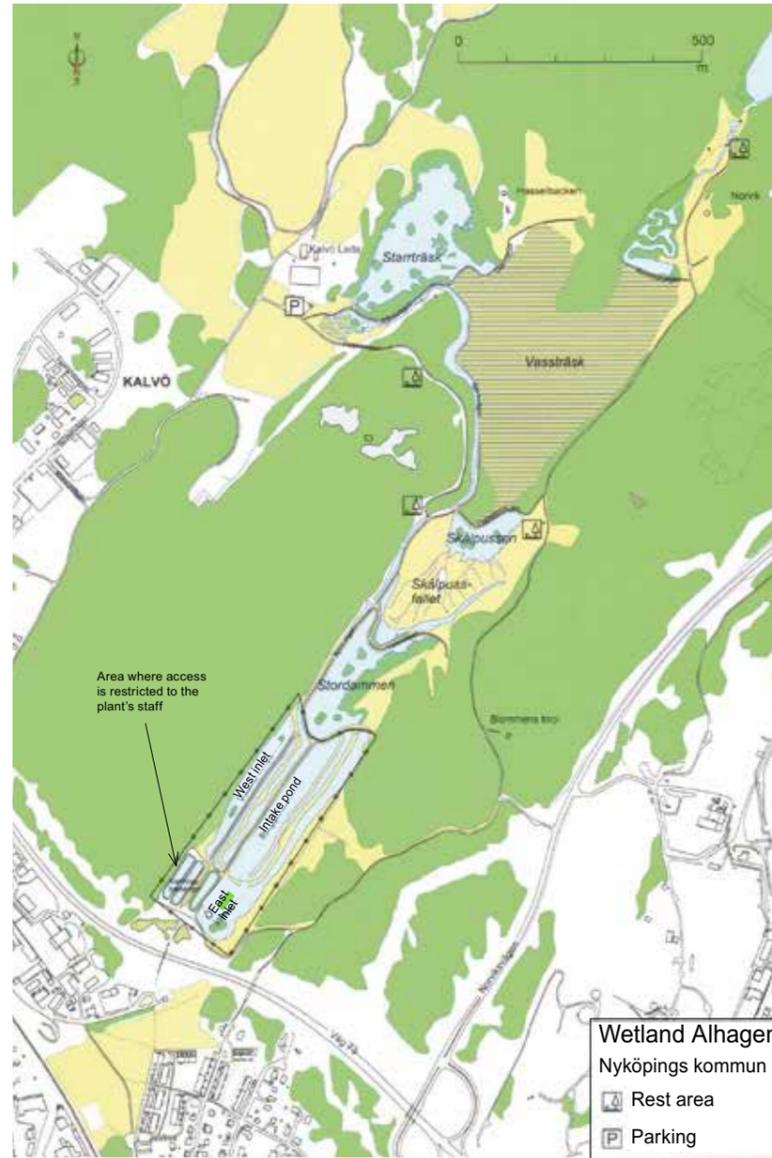
No. Dead plants provide carbon and energy that is needed in the process where bacteria removes nitrogen from the wastewater. The vegetation is cut in some parts in order to enhance the distribution of water in the wetland and improve conditions for birds, but the residues are left as a carbon source.

### Is there any smell?

Sometimes there is a faint smell of sewage at the inlet pond, but in general the smell from the wetland is comparable to what is normal for such a wetland area.

### How long is the water treated in the wetland?

It takes about two weeks for the water to travel through the wetland.



### Wetland Alhagen – a new multifunctional approach

Wetland Alhagen demonstrates a new approach to systems for wastewater treatment and was established by the municipality of Nynäshamn in 1997. Natural processes are transforming dissolved nitrogen to atmospheric nitrogen in the wetland, and thus limiting the flow of eutrophic substances into the sensitive Baltic Sea.

Wetland Alhagen is not only a water treatment system. It is also an important recreational area, with a diversity of wet habitats creating room for a rich variety of plant and animal species. Several hiking trails enables visitors to enjoy the beauty and diversity found at Wetland Alhagen.



www.nynashamn.se



Photo: WRS

# Wetland Alhagen

A wastewater treatment system  
where nature makes it happen



Room to grow

Photo: WRS



Hiking trails guides visitors through Wetland Alhagen.

## Wetland Alhagen

Wetland Alhagen is one of the largest constructed wetlands in Sweden for tertiary treatment of wastewater. It was established in 1997 to reduce nutrients and bacteria in the final step of a sewage treatment system already set up with mechanical and chemical treatment. A biological step was added to the system in 2003 to increase flexibility in the treatment process.

In Sweden wastewater treatment plants (WWTP) must have a nitrogen removal step to allow discharging treated wastewater into the Baltic Sea south of the Åland Sea. The Baltic Sea is a vulnerable marine ecosystem which is very sensitive to eutrophication.

### What it is

The wetland comprises an area of 28 hectares, localized in a valley that opens into the Baltic Sea. Originally there was a mix of arable land and elements of natural wetlands in the valley. Nowadays wetland Alhagen consists of a series of interconnected shallow ponds and wetland areas.

Wastewater having passed a primary and secondary treatment step in a conventional sewage plant is pumped to clarification basins in the upper part of the wetland. The water is then distributed to the eastern or the western inlet. By alternately filling and emptying the inlets the water is oxygenated before it passes to the intake pond and further on to the pond Stordammen. Behind these ponds the water is distributed as overland flow on two hectares of permeable grassland, Skålpussfallet.

The water is then passed on to a large wetland area, ending up in the meandering stream Näckrosån that flows into the Baltic Sea (see map).

Stormwater from the city of Nynäshamn is released to lower parts of the wetland after treatment in a separate stormwater management system.

Figure 1. Yearly average reduction of total N (%) in Wetland Alhagen

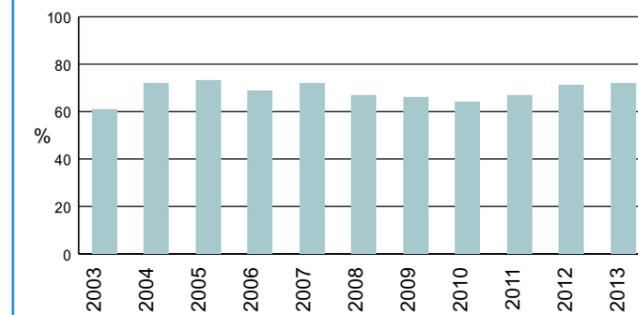
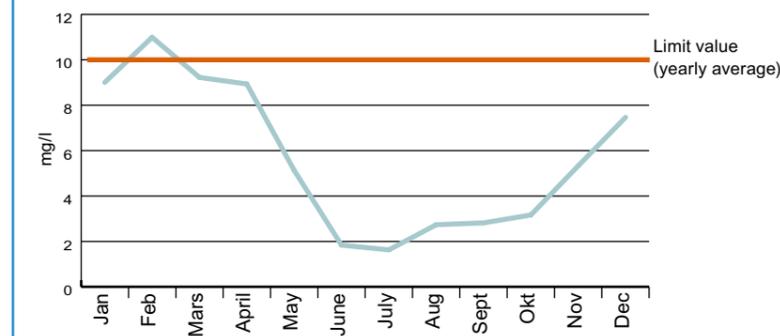


Figure 2. Total N (mg/l) in outgoing water from Wetland Alhagen



Between 2003-2013 the average reduction in the wetland of total incoming nitrogen was 69 percent per year, see fig 1. Reduction levels of total N varies with season, but is well below the yearly average limit value of 10 mg/l set by authorities, see fig 2.

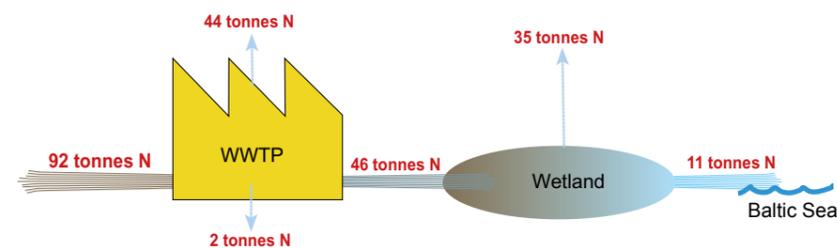
### How it works

By passing through ponds and wetlands, different biological processes reduce the content of bacteria and nutrients in the wastewater – primarily nitrogen since the bulk of phosphorous is reduced by chemical precipitation in the sewage plant. Treated water has approached natural water quality when reaching the Baltic Sea, see figure 3.

Plant substrate provides bacteria with energy and the ponds in the wetland are densely covered with emerged and submerged vegetation, which act by immobilizing supplied nutrition in plant substrate. Bacteria are also taking part in the reduction of nitrogen, by nitrification and denitrification.

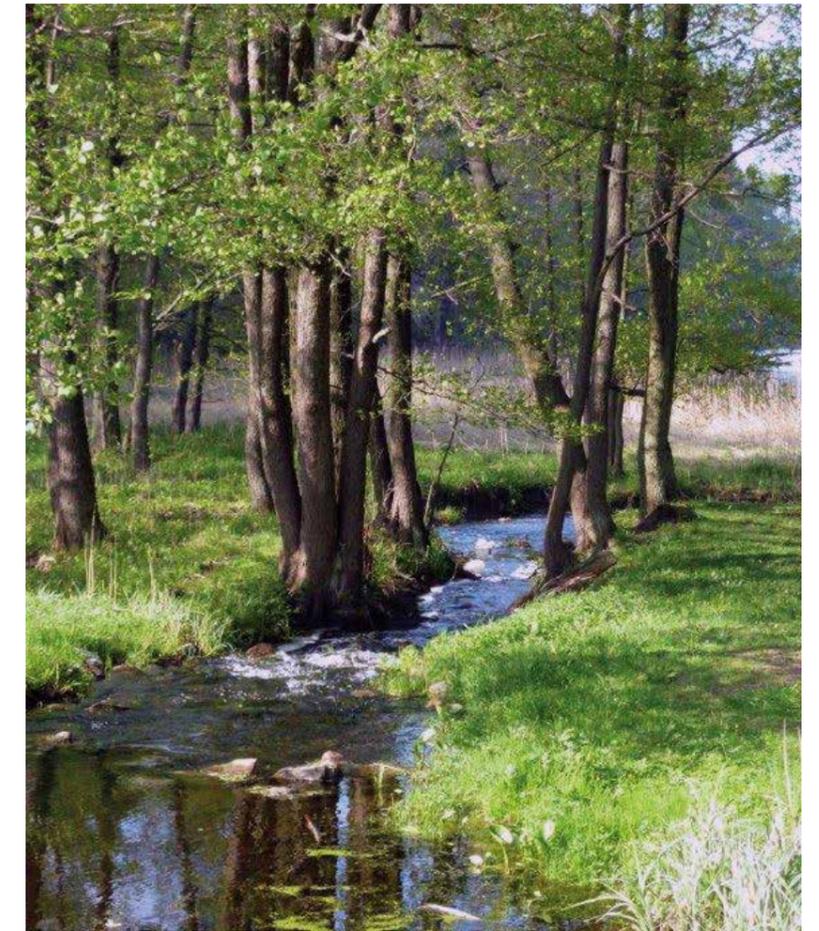
Based on over a decade of operation the wetland has proven to be a very efficient and cost effective treatment method for nitrogen removal. The rate of nitrogen reduction varies between 40–85 percent of total nitrogen in incoming water to the wetland. The reduction rate is highest during the vegetation period, but still works during the winter (see figure 2).

Figure 3. Budget of total N on a yearly basis (2014)



Nitrogen input to the treatment system amounted to 92 tonnes in 2014. In the wetland 35 of supplied 46 tonnes nitrogen were transformed to atmospheric nitrogen.

Photo: WRS



Scenic views and a rich diversity of wet habitats can be found in Wetland Alhagen.

### Additional values

The wetland has developed into a popular recreational area and a well-known site for bird watching. This is partly due to natural conditions but also as a result of a thoughtful approach when constructing the wetland. A key issue has been a desire to connect proposed actions needed to the environment, in order to create a wide variety of habitats.

The local public school uses the wetland for outdoor studies. Every young person in Nynäshamn thus develops a personal relation to the wetland and gains good insights into why wastewater treatment is so important.

Photo: Robert Lättman-Masch



Outdoor studies at Wetland Alhagen.