Minskning av kväveutsläpp och kvävets miljöpåverkan i samband med gruvdrift

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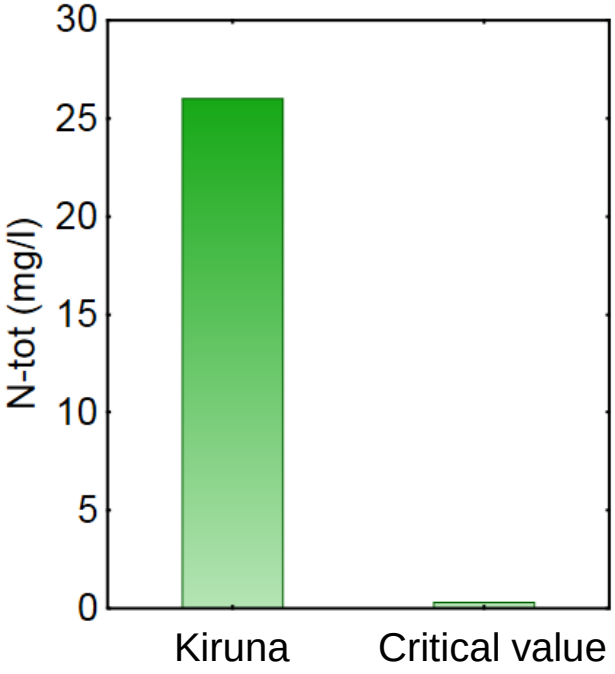
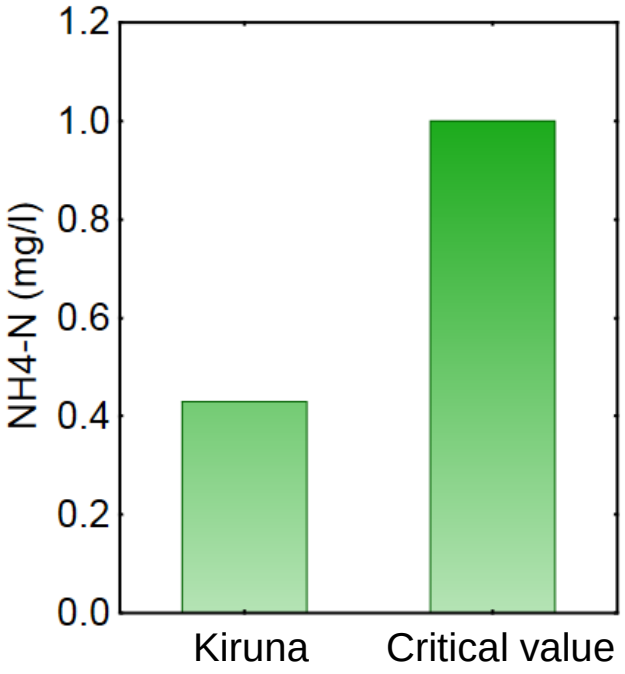
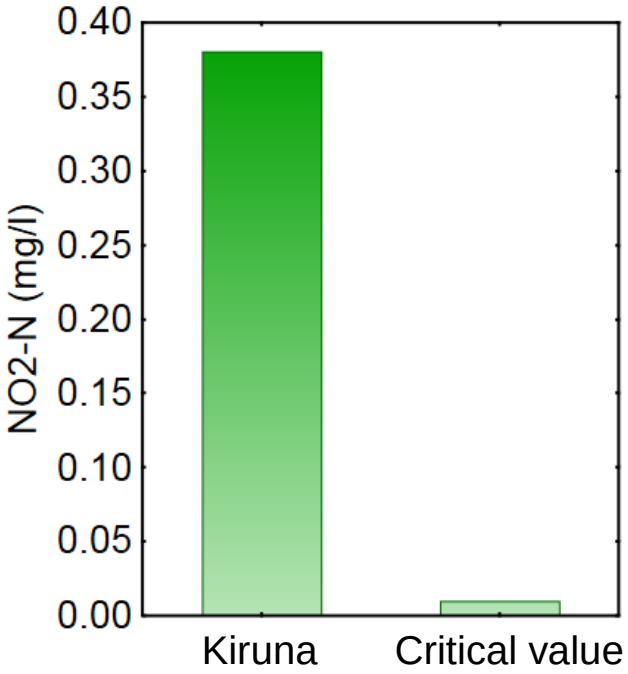
Nitrogen problem







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Cause of N-problem

- Ammonium-nitrate based explosives
- Cyanides in gold extraction processes

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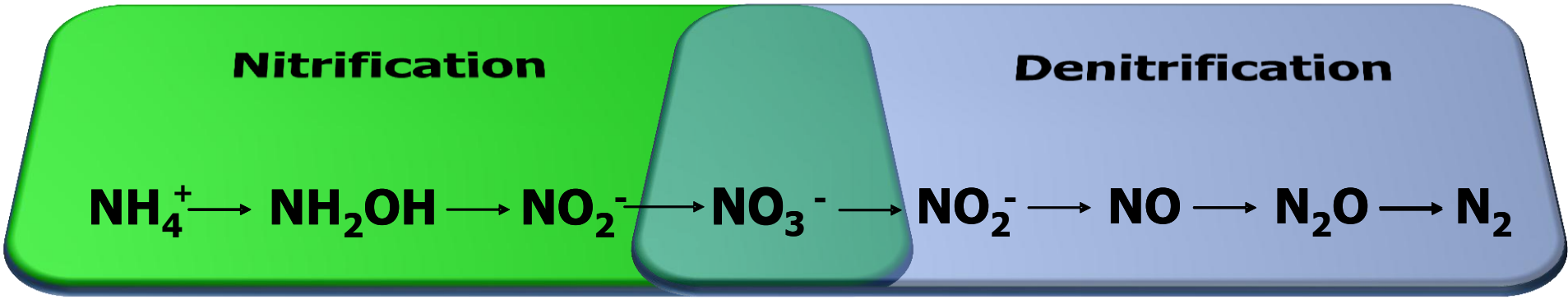
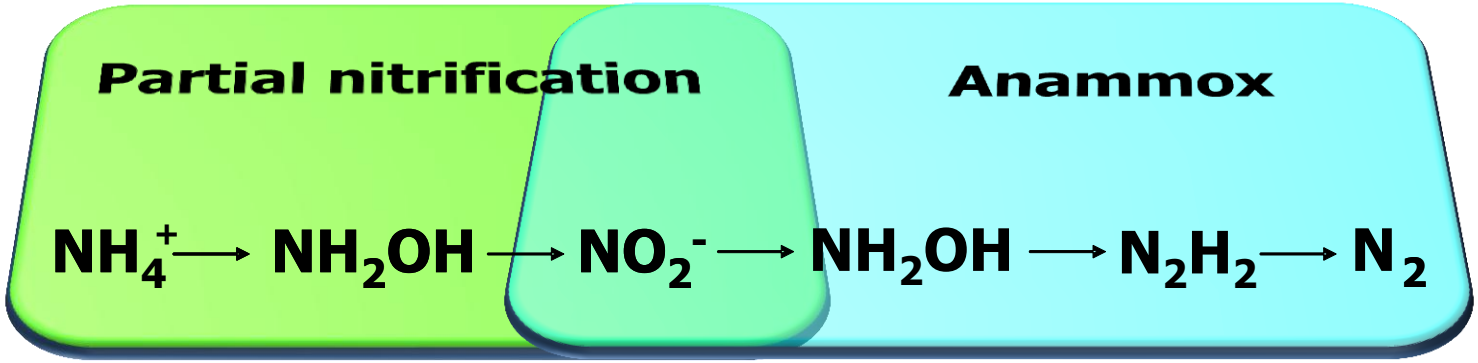
Nitrogen cycle





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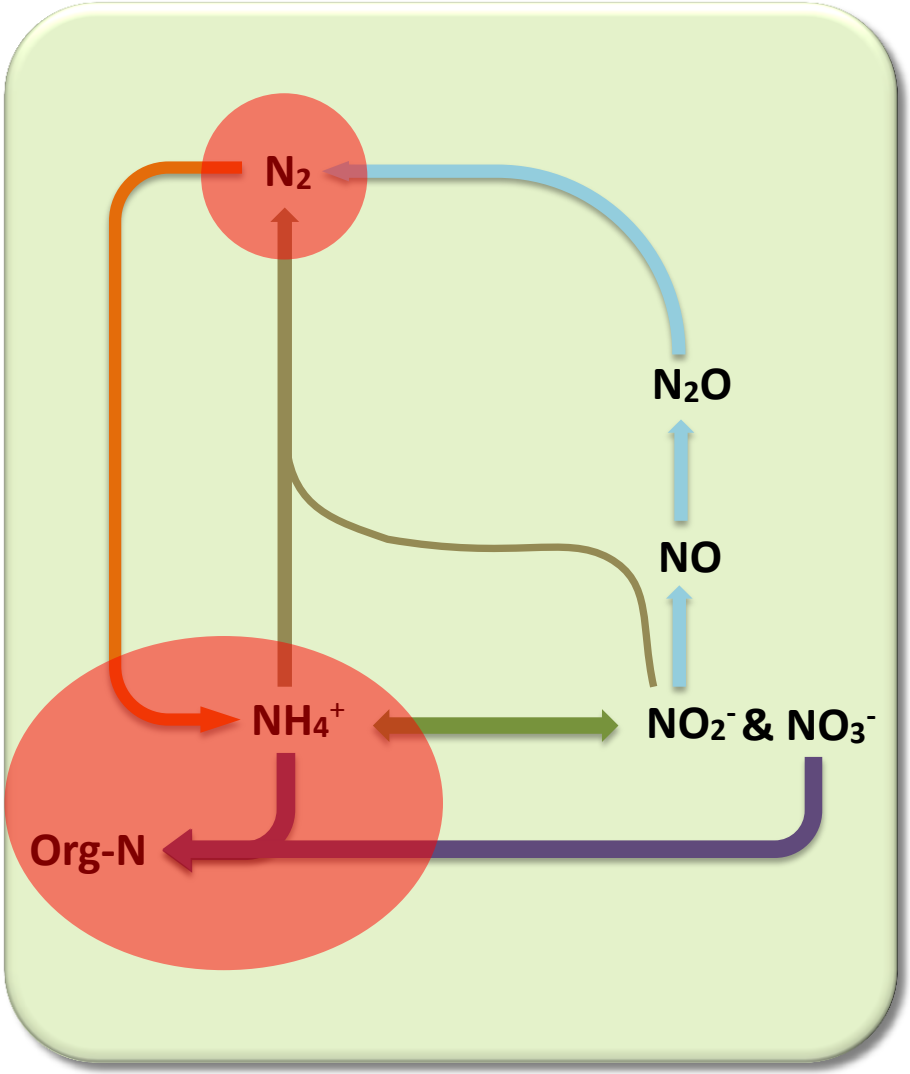
Nitrogen cycle



Overall objectives

- Identification of treatment techniques
  - remove N from mine site drainage
  - recipient concentrations are maintained at levels that are in agreement with national and international legislation

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Treatment systems

1. Studies of N-release from waste rock & bioreactor system for nitrogen removal from mine waters through denitrification

2. System for optimizing microbial denitrification in tailings ponds

3. Wetland systems for nitrogen removal through denitirification, anammox and phytoremediation by macrophytes and algae

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Waste rock pile & Bioreactor

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Nitrogen removal in clarification ponds

Nitrate removal through denitrification

$5CH_2O + 4NO_3^- \rightarrow 2N_2 + CO_2 + 4HCO_3^- + 3H_2O$

- Better understanding of the possibilities to optimize the conditions for nitrogen removal in clarification ponds at Kiruna and Aitik
- Nitrogen reactions and removal mechanisms in clarification ponds will be modelled and computer simulated
- Nitrogen removal through algal growth and denitrification will be studied in experimental mesocosms

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Main experimental field site at the Kiruna mine

Tailings and clarification ponds at Kiruna

Experimental field site

Mesocosms at the experimental field site
1000 L containers filled with 0.3 m of tailings and water

Conditions in the clarification pond are simulated in mesocosms

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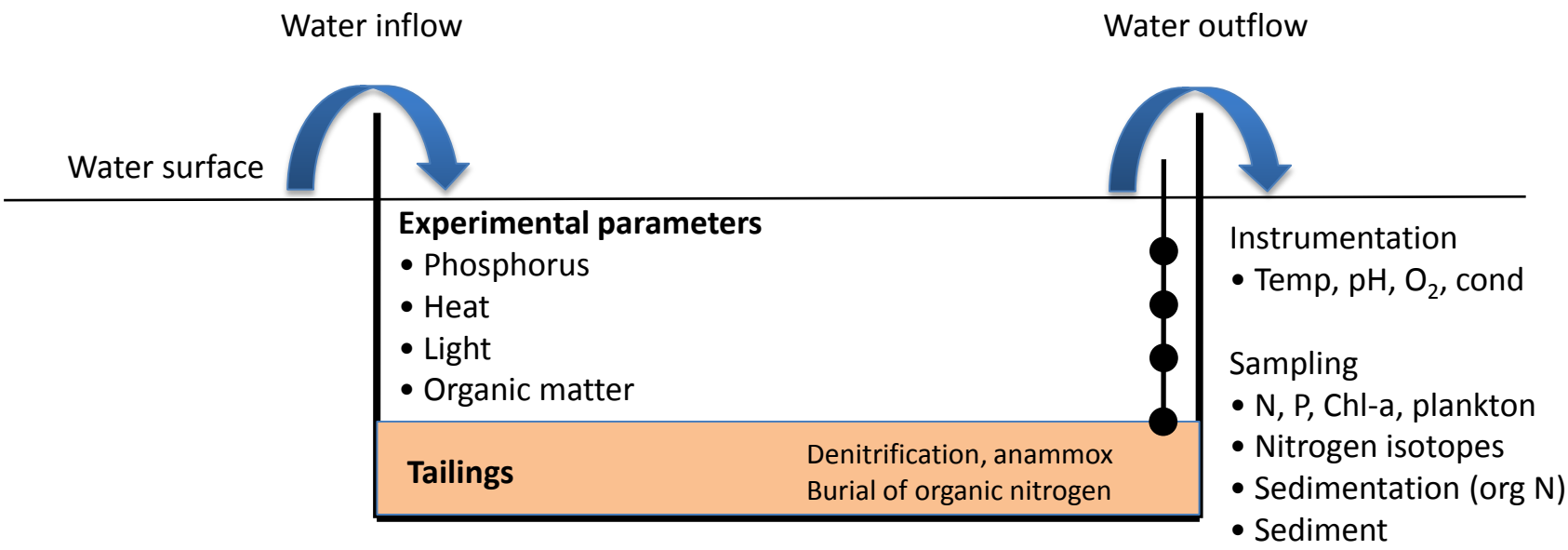
Experimental mesocosms



- Laboratory and field measurements have been performed to study the conditions for algal growth and denitrification in the clarification pond

- Measurements in the mesocosms will start in 2015, with a sampling program based on the results from the laboratory and field measurements

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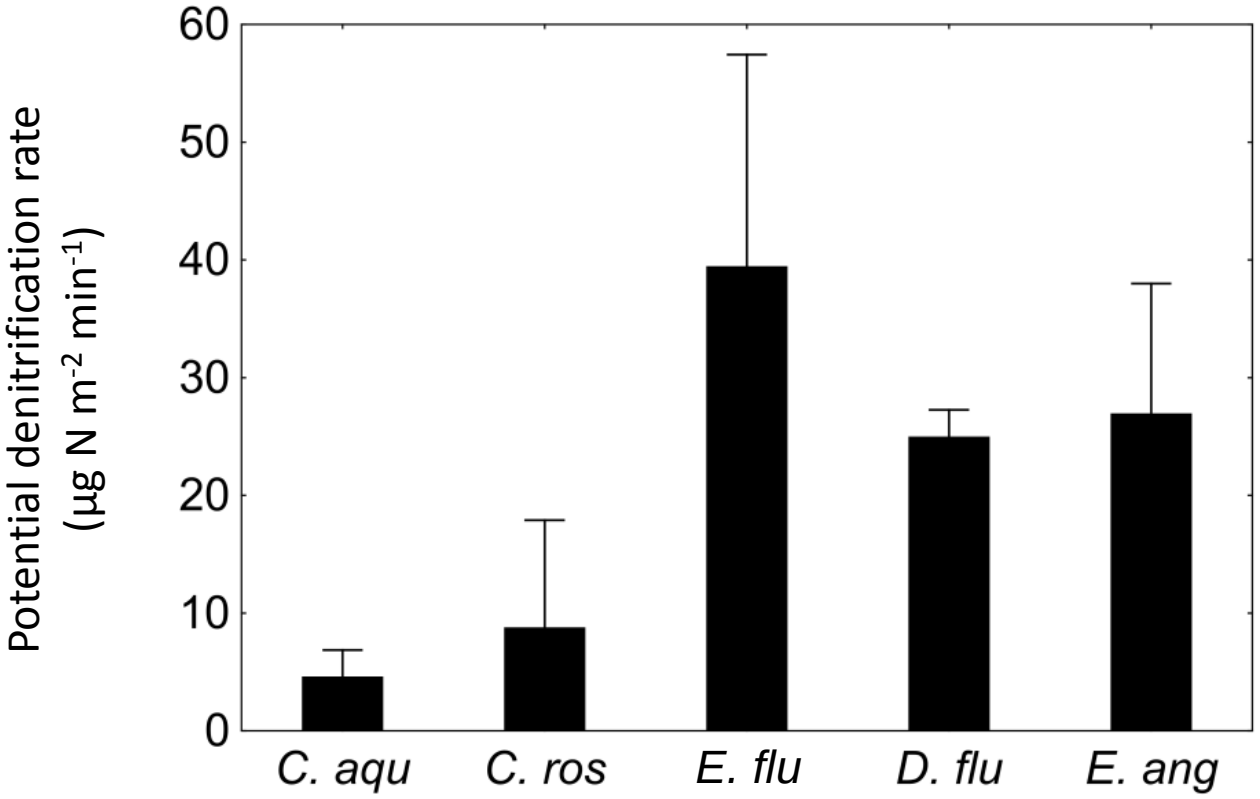
Wetland system

Natural, constructed & floating wetlands as final treatment step

- Lab-scale experiments
- Pilot-scale field studies

Denitrification rates



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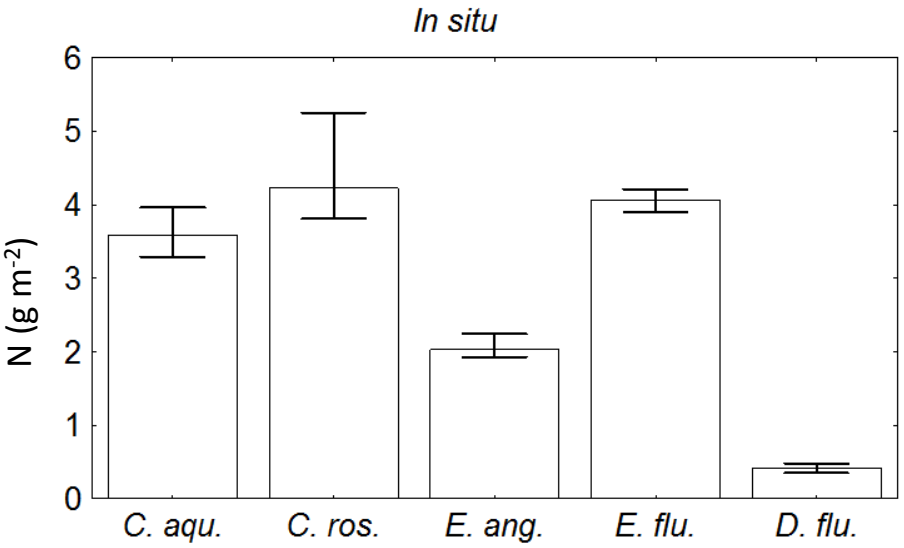
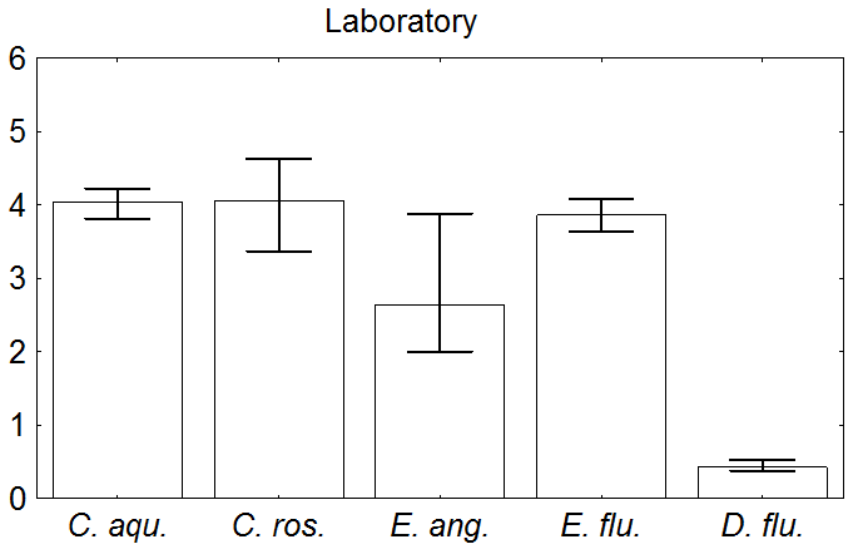
Tack!

Frågor?

N-removal by plants





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