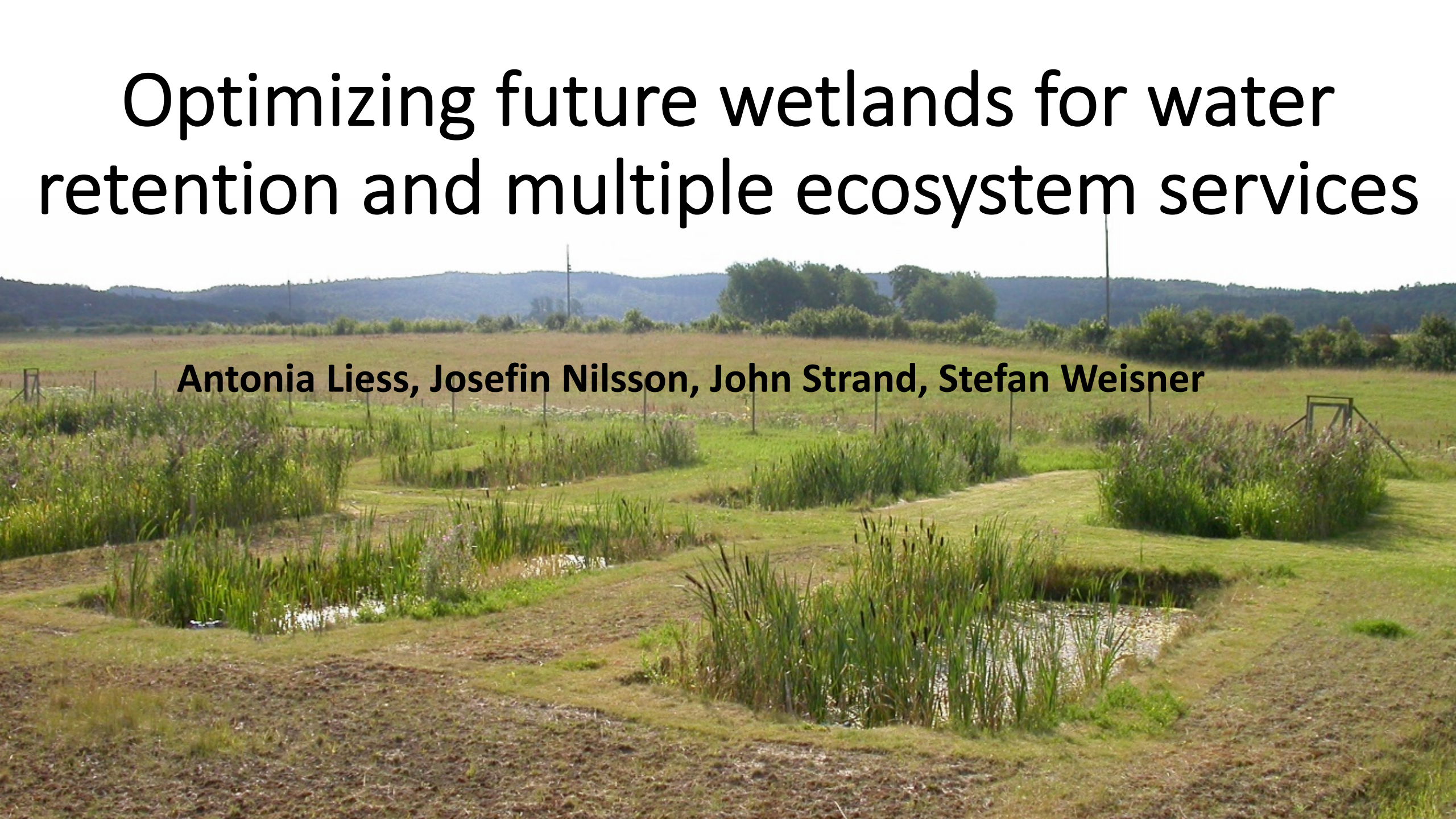
Optimizing future wetlands for water retention and multiple ecosystem services



Antonia Liess, Josefin Nilsson, John Strand, Stefan Weisner

Objectives

Clarify how **hydrological regime** and **optimized water retention** in wetlands affects **nutrient removal**.

Give recommendations on wetland design and restoration

AIM:

Best wetland multi-functionality in a future climate!

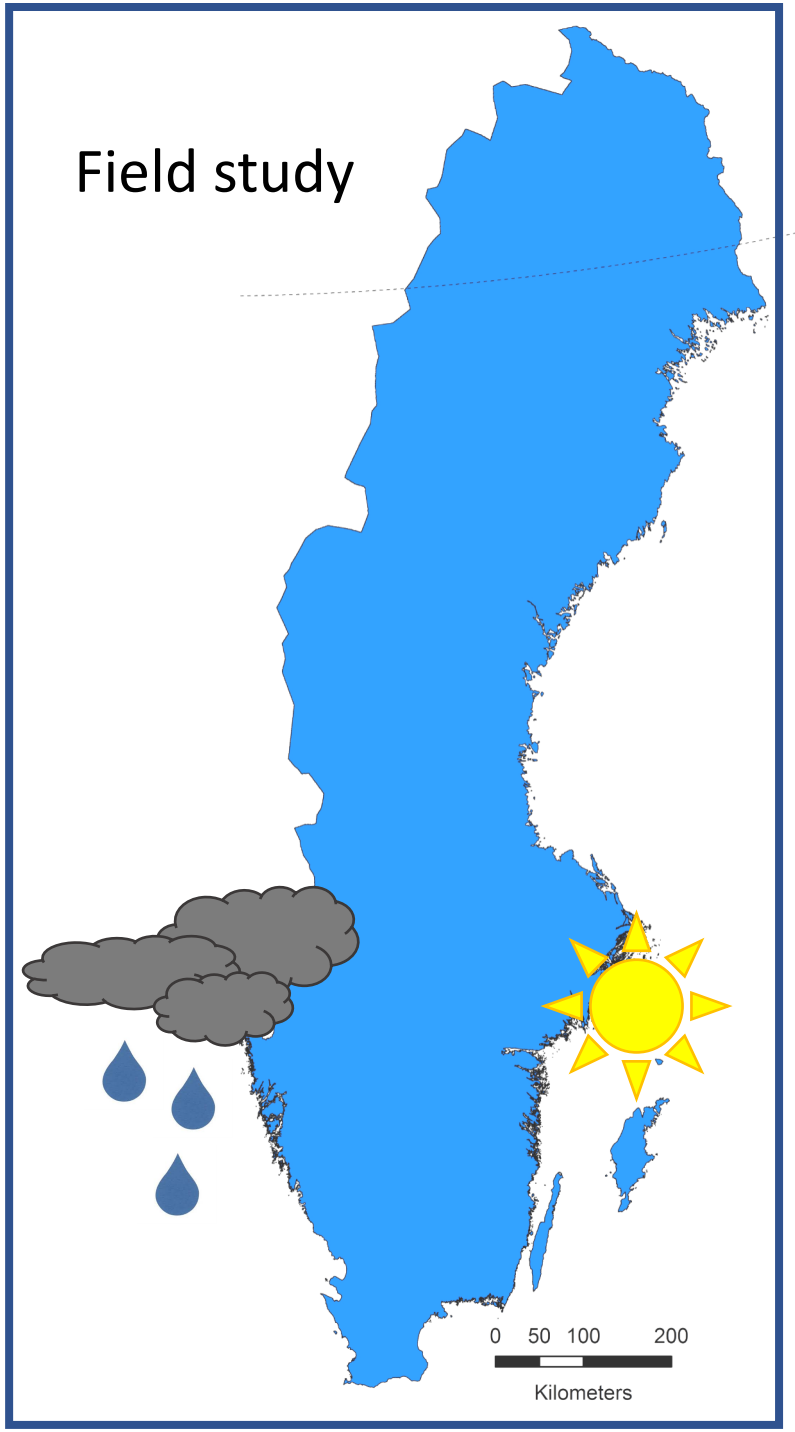
Research questions

1. Which effects do hydrological regimes have on wetland nutrient removal?

2. Does wetland design to optimize water retention capacity affect nutrient removal?

3. How can agricultural wetlands be designed for optimization of water retention as well as other ecosystem services?

4. Should design and restoration recommendations vary with geographical location and regional climate and hydrology?



Research questions

1. Which effects do hydrological regimes have on wetland nutrient removal?

2. Does wetland design to optimize water retention capacity affect nutrient removal?

3. How can agricultural wetlands be designed for optimization of water retention as well as other ecosystem services?

4. Should design and restoration recommendations vary with geographical location and regional climate and hydrology?

Field experiment

Research questions

1. Which effects do hydrological regimes have on wetland nutrient removal?

2. Does wetland design to optimize water retention capacity affect nutrient removal?

3. How can agricultural wetlands be designed for optimization of water retention as well as other ecosystem services?

4. Should design and restoration recommendations vary with geographical location and regional climate and hydrology?

Guide to stakeholder

Research questions

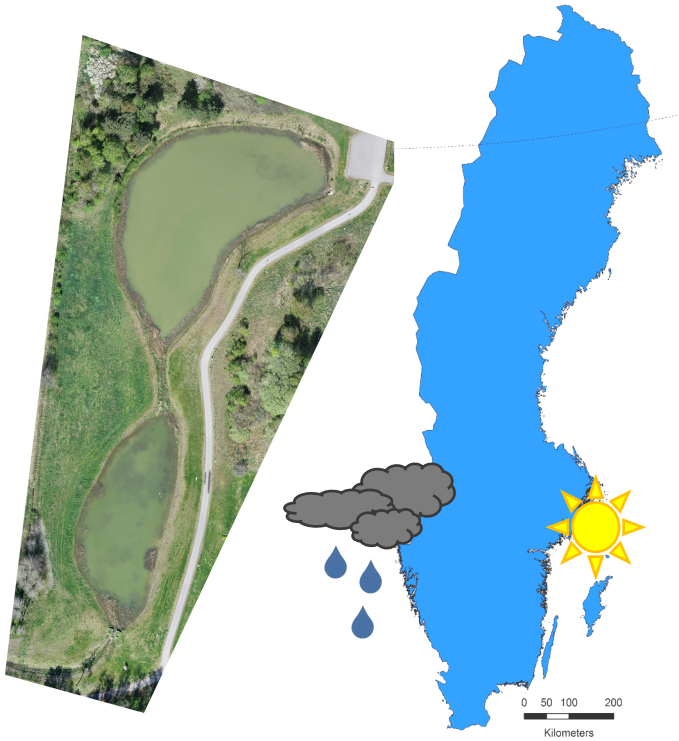
1. Which effects do hydrological regimes have on wetland nutrient removal?

2. Does wetland design to optimize water retention capacity affect nutrient removal?

3. How can agricultural wetlands be designed for optimization of water retention as well as other ecosystem services?

4. Should design and restoration recommendations vary with geographical location and regional climate and hydrology?

Guide to stakeholder



Q1: How does hydrological regimes affect wetland nutrient removal?

Annual rainfall west coast = 2 x east coast

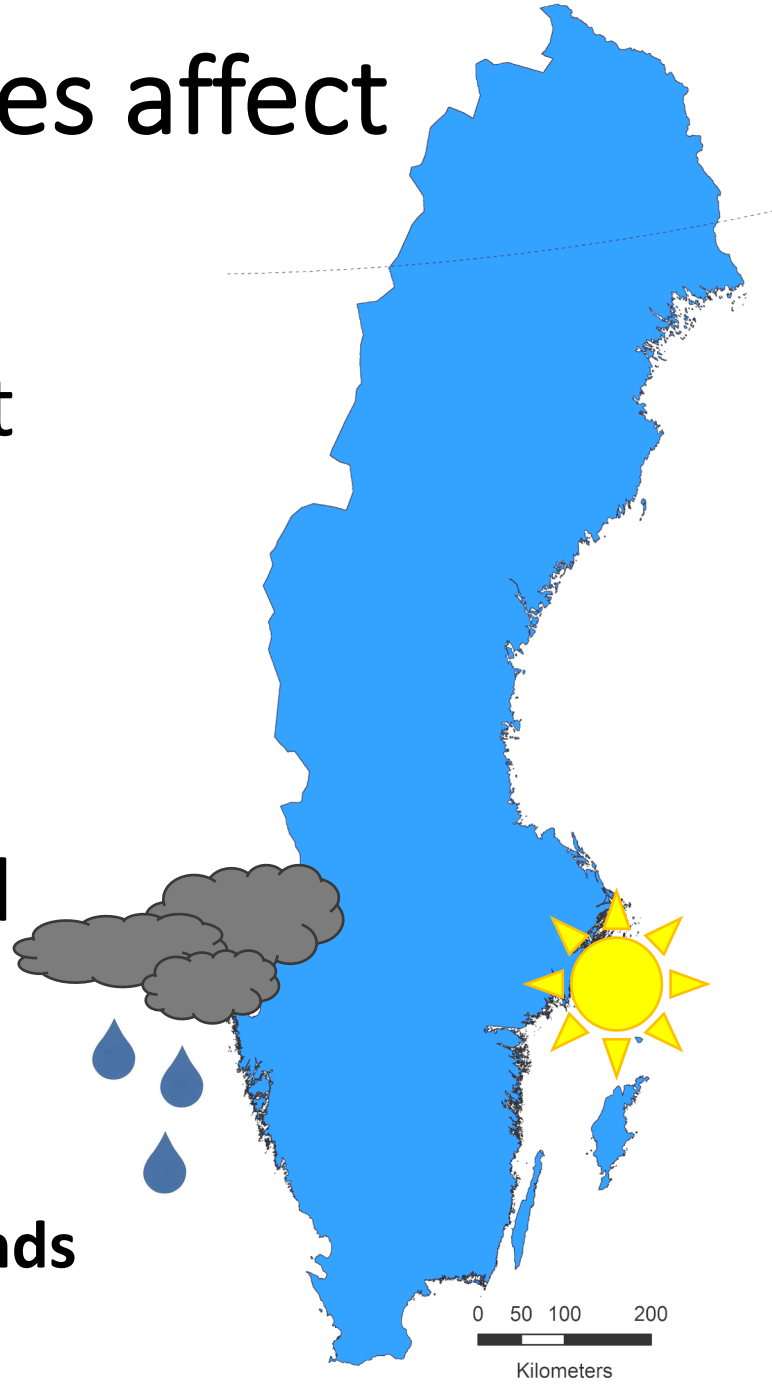
-> **more runoff per catchment area** and

-> **higher hydraulic loading rate**

into west than east coast wetlands

Hydrological differences can be attributed to wetland design:

- Lower **wetland : catchment area ratio** increases hydraulic load
- **Deep wetlands** dry out less often than **shallow wetlands**



Q1: How does hydrological regimes affect wetland nutrient removal?

Field study: 8 wetlands created to intercept agricultural runoff.

Wetlands have a **range of hydraulic loading rates** (HLRs).

Name	Size (ha)	Catchment (ha)	Ratio	Depth (m)	Coast	Time (yr)	HLR
Resmo	1	500	0.002	1.0	East	3.5	Low
Hossmo	1.5	350	0.004	0.5	East	3.5	Low
Grisbäck	2.5	500	0.005	0.5	East	3.5	Low
Påboda	2	200	0.010	0.5	East	3.5	Intermediate
Hanåsa	2.3	?	?	1.5	East	3.5	?
Bölarp	0.28	200	0.001	1.0	West	2	High
Edenberga	0.22	60	0.004	0.8	West	1.5	High
Lilla Böslid	0.4	500	0.001	1.0	West	3	High

Available: Data to calculate nutrient removal & hydraulic parameters.

Q1: How does hydrological regimes affect wetland nutrient removal?

Field study: 8 wetlands created to intercept agricultural runoff.

Wetlands have a **range of hydraulic loading rates** (HLRs).

Name	Size (ha)	Catchment (ha)	Ratio	Depth (m)	Coast	Time (yr)	HLR
Resmo	1	500	0.002	1.0	East	3.5	Low
Hossmo	1.5	350	0.004	0.5	East	3.5	Low
Grisbäck	2.5	500	0.005	0.5	East	3.5	Low
Påboda	2	200	0.010	0.5	East	3.5	Intermediate
Hanåsa	2.3	?	?	1.5	East	3.5	?
Bölarp	0.28	200	0.001	1.0	West	2	High
Edenberga	0.22	60	0.004	0.8	West	1.5	High
Lilla Böslid	0.4	500	0.001	1.0	West	3	High

Available: Data to calculate nutrient removal & hydraulic parameters.

Q1: How does hydrological regimes affect wetland nutrient removal?

Field study: 8 wetlands created to intercept agricultural runoff.

Wetlands have a **range of hydraulic loading rates** (HLRs).

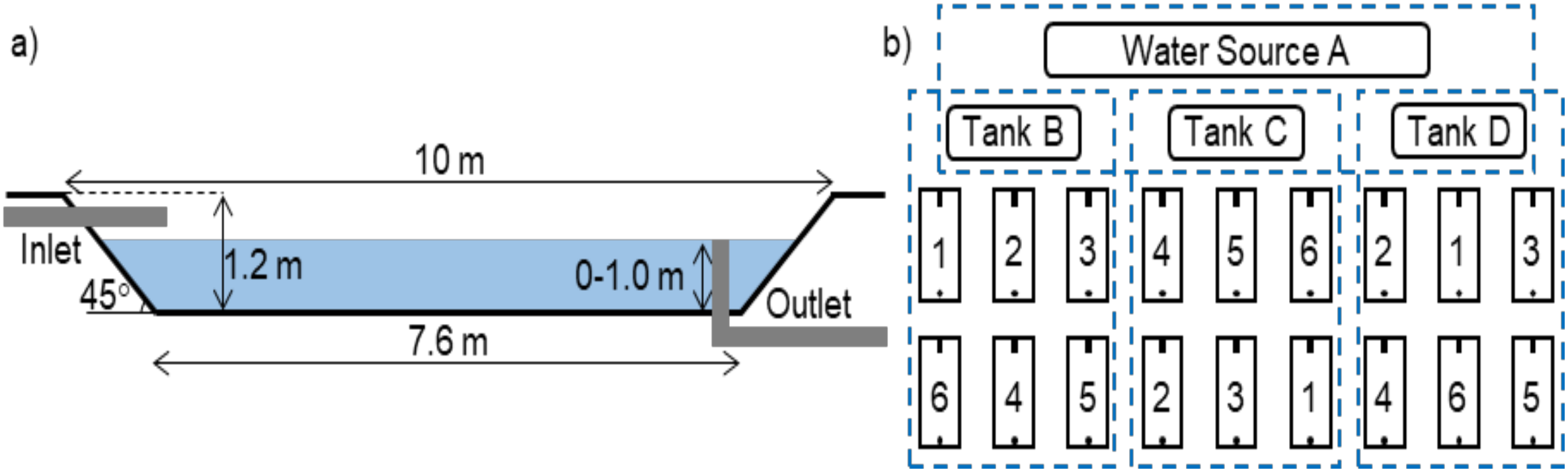
Goal: Determine if **hydrological regime** affects **wetland nutrient removal.**

Q2: Does wetland design to optimize water retention capacity affect nutrient removal?

- Experimental Wetland Facility in Halmstad, Sweden
- 18 experimental wetlands

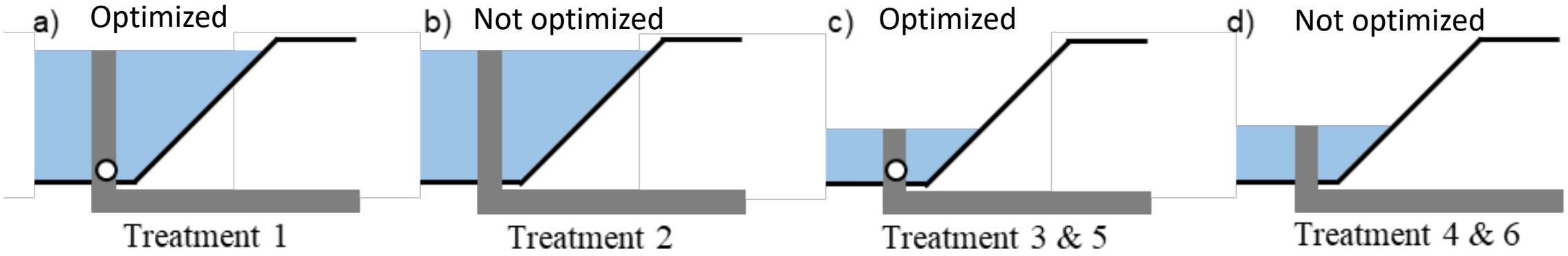
Q2: Does wetland design to optimize water retention capacity affect nutrient removal?

- Experimental Wetland Facility in Halmstad, Sweden
- 18 experimental wetlands



Q2: Does wetland design to optimize water retention capacity affect nutrient removal?

- Experimental Wetland Facility in Halmstad, Sweden
- 18 experimental wetlands
- Wetland manipulation in (1) wetlands optimized for water retention and (2) wetlands not optimized for water retention



Optimized wetlands empty slowly to the bottom, where the outlet pipe is perforated.

Q2: Does wetland design to optimize water retention capacity affect nutrient removal?

This will give information on the possibilities of combining wetland water retention and nutrient removal under varying hydrological conditions.

Goal: Future wetlands optimised for multiple ecosystem services.

Holistic analysis and dissemination

Q3. How can agricultural wetlands be designed for optimization of water retention as well as other ecosystem services?

Q4. Should design and restoration recommendations vary with geographical location and regional climate and hydrology?

Method: Use data from first part of the project plus literature data to answer Q3 & 4

***Goal:* Guide for stakeholder on how to design the optimal wetland in each climate.**


Thank you for listening!