Naturskyddsföreningen

2017-03-11

Buffer Zones

Juchowo Conference 2022-10-28

Mia Svedäng SSNC
mia.svedang@naturskyddsforeningen.se

Naturskyddsföreningen

Today…

- About the Swedish Society for Nature Conservation (SSNC)
- The riparian area
- Why buffer zones?
- Processes in the buffer zone
- Different types of buffer zones
- Buffer zones in agriculture
- Forest buffers
- Ecologically Functional Riparian Zones
- Dimensions?
- Buffer zones in the Baltic countries
- The EU Nature Restoration Law

Naturskyddsföreningen

Sweden's largest environmental organisation

- A non-profit environmental organisation
- Founded 1909
- Over 200,000 members
- SSNC:s own environmental label: Good Environmental Choice (Bra Miljöval)

Bra Miljöval

Naturskyddsföreningen

The riparian area

1

Naturskyddsföreningen

What are riparian zones?

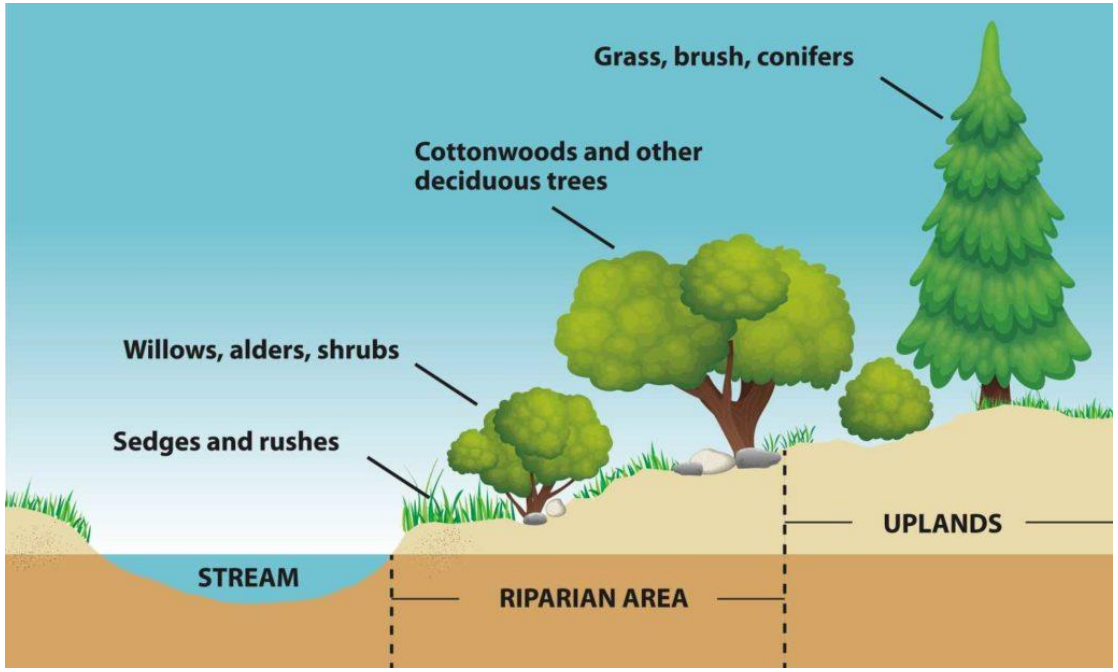
*Riparian zones are the **interface** between the aquatic and the terrestrial ecosystems that connect and help regulate the ecological functions of both systems*

(Gregory et al., 1991; Naiman and Décamps, 1997)

Naturskyddsföreningen

Riparian areas (floodplains)

- Lands that occur along watercourses and water bodies
- Riparian areas provide important **habitat** for many species
- Riparian vegetation can **remove excess nutrients** and sediment from surface runoff
- Riparian ecosystems generally occupy small areas – but they are usually **more diverse** and have more plants and animals than adjacent upland areas



Naturskyddsföreningen

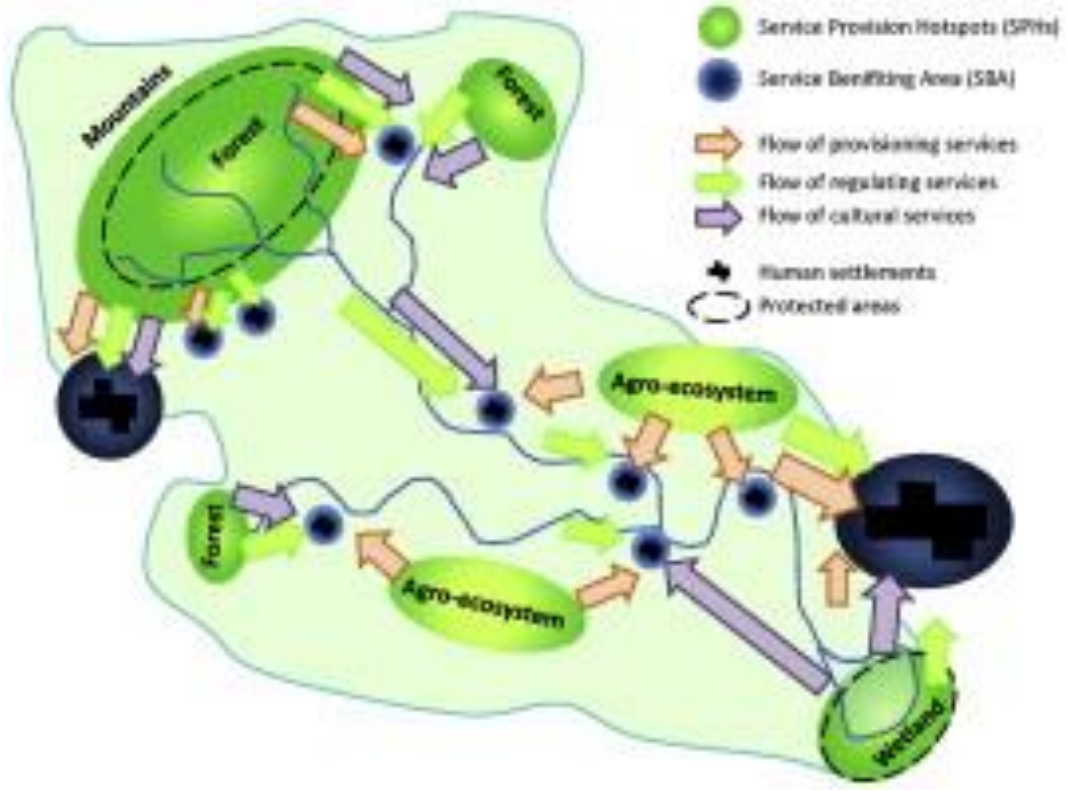
Why buffer zones?

2

Naturskyddsföreningen

The idea of Buffer Zones

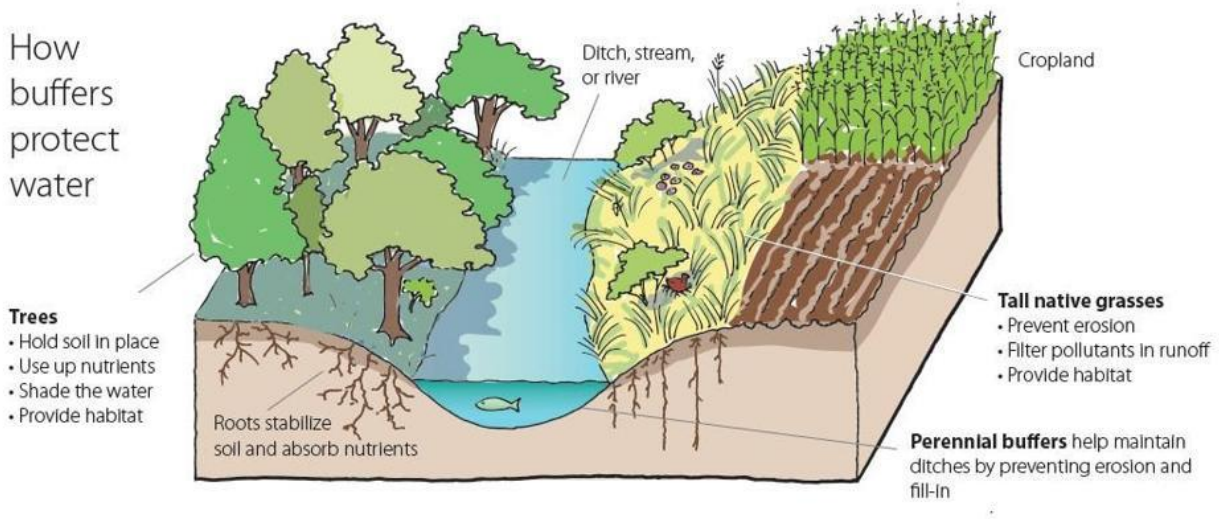
The idea evolved in the early 1970s from the intention of better protecting conservation areas by minimizing the negative impacts of human activities on nature
(Ebregt and Greve, 2000)



Naturskyddsföreningen

What is a buffer zone?

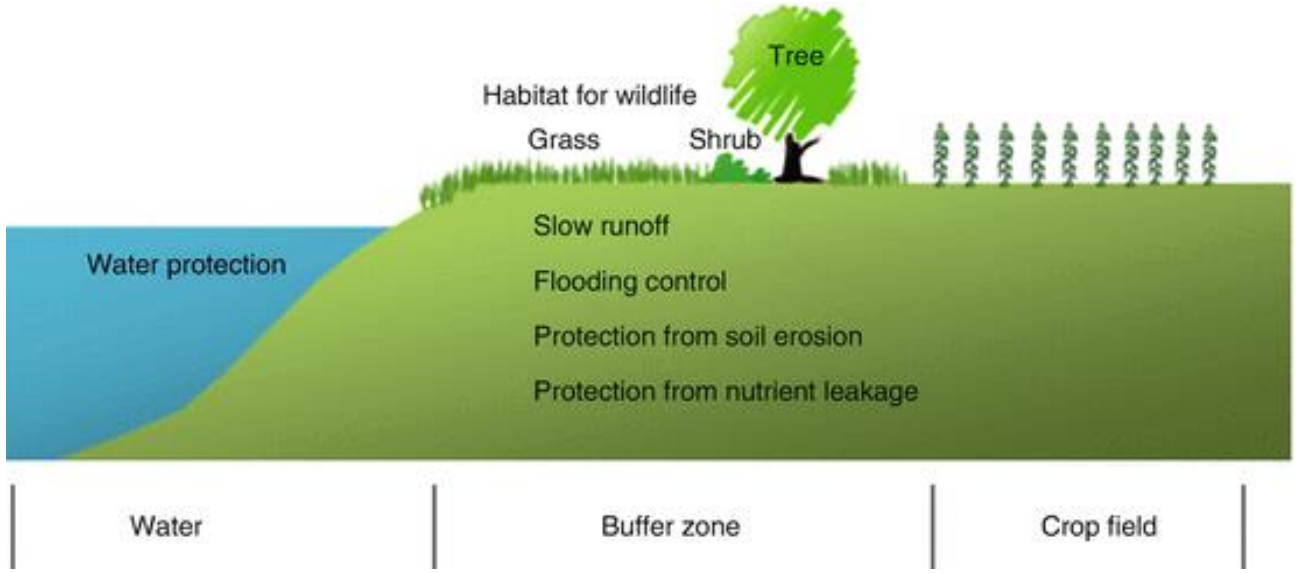
- Strips of land with **permanent vegetation** next to streams, rivers and lakes



Naturskyddsföreningen

Streamside buffers are multifunctional

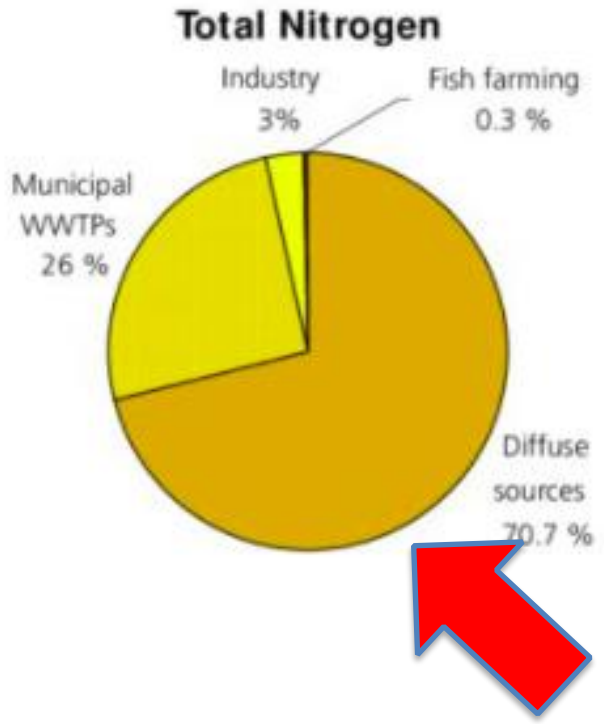
- They decrease **pollution**
- They control **erosion**
- They provide **wildlife habitat**

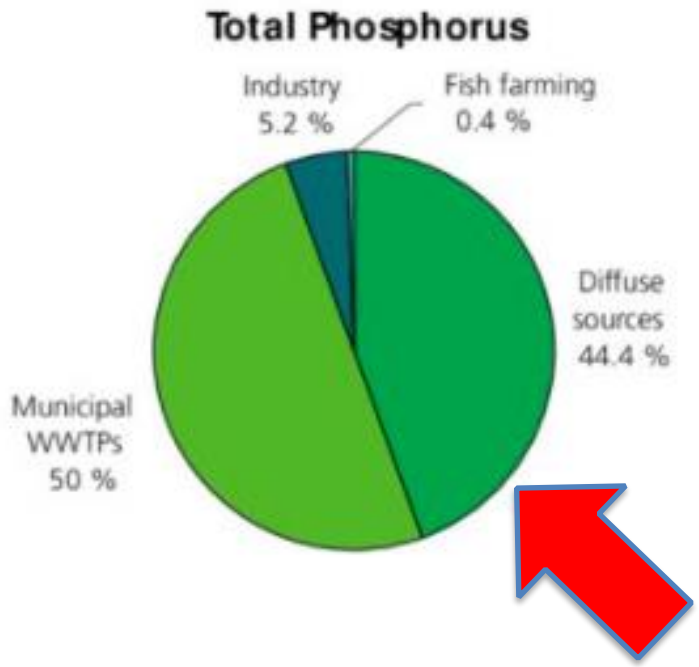


Naturskyddsföreningen

Diffuse runoff very important

Proportion of the inputs of total N and P by source into surface waters withi n the catchment area of the Baltic Sea





Naturskyddsföreningen

Buffer zones – “natural filters”

- Buffer zones can target **both P and N**
- An optimum situation for P is not necessarily the same as for N

Naturskyddsföreningen

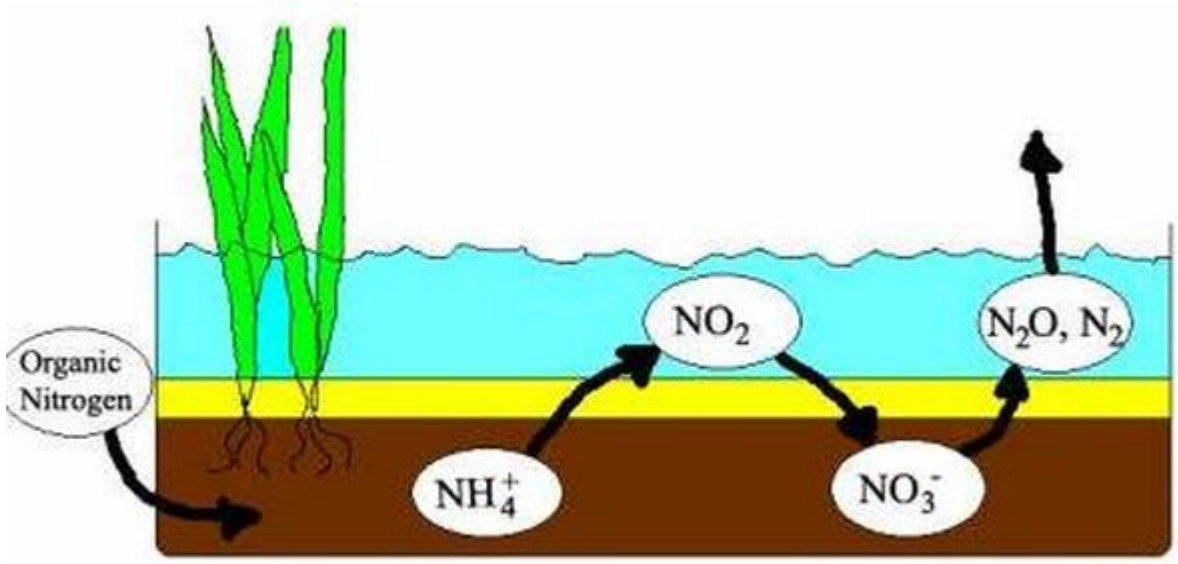
Processes in the buffer zone

3

Naturskyddsföreningen

Processes in the buffer zone that reduce the load of sediments, organic matter and nutrients

- Deposition – vegetation (i.e. grass) slows surface runoff allowing infiltration, sedimentation and deposition.
- Absorption
- Plant uptake
- Denitrification



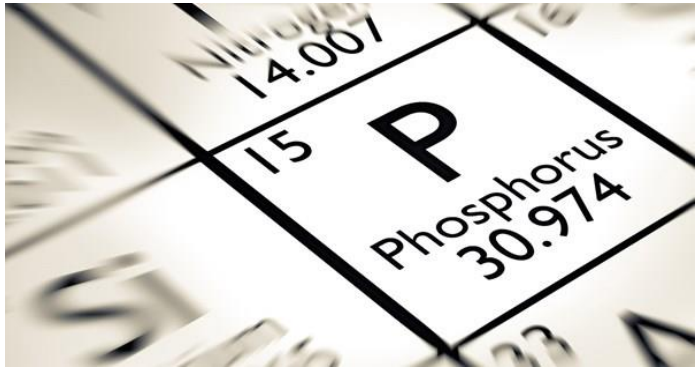
Wetland Nitrogen Cycle (Gooselink,2001)

https://nitrogencycleapes.weebly.com/denitrification.html

Naturskyddsföreningen

Differences between P and N:
Phosphorus

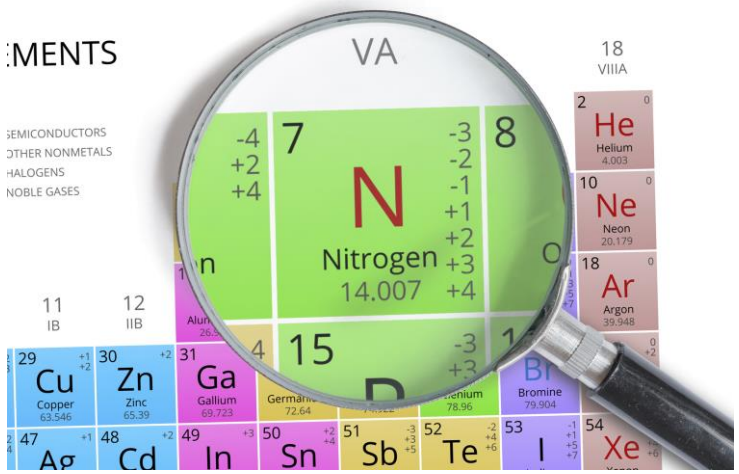
- P is often transported in **particulate form**
- P is reduced while passing through the buffer due to the effect of **sediment trapping**
- The effectiveness of P removal is increased in buffers that enhance deposition, infiltration and **decreasing of flow velocity**
- Soil characteristics do also affect phosphorous behavior
- (Different with dissolved P – but it is not the dominant form of P in agricultural runoff)



Naturskyddsföreningen

Differences between P and N:
Nitrogen

- N is often transported in **solute form**
- N removal effectiveness varies widely
- N is removed through **plant uptake**, microbial immobilization, soil storage, and **denitrification**
- Often the **larger the width of the buffer**, the higher the efficiency in the removal of nitrogen
- Clément et al. (2002) found no difference in the rates of denitrification among three vegetation types (forest, understorey vegetation, and grass)



Naturskyddsföreningen

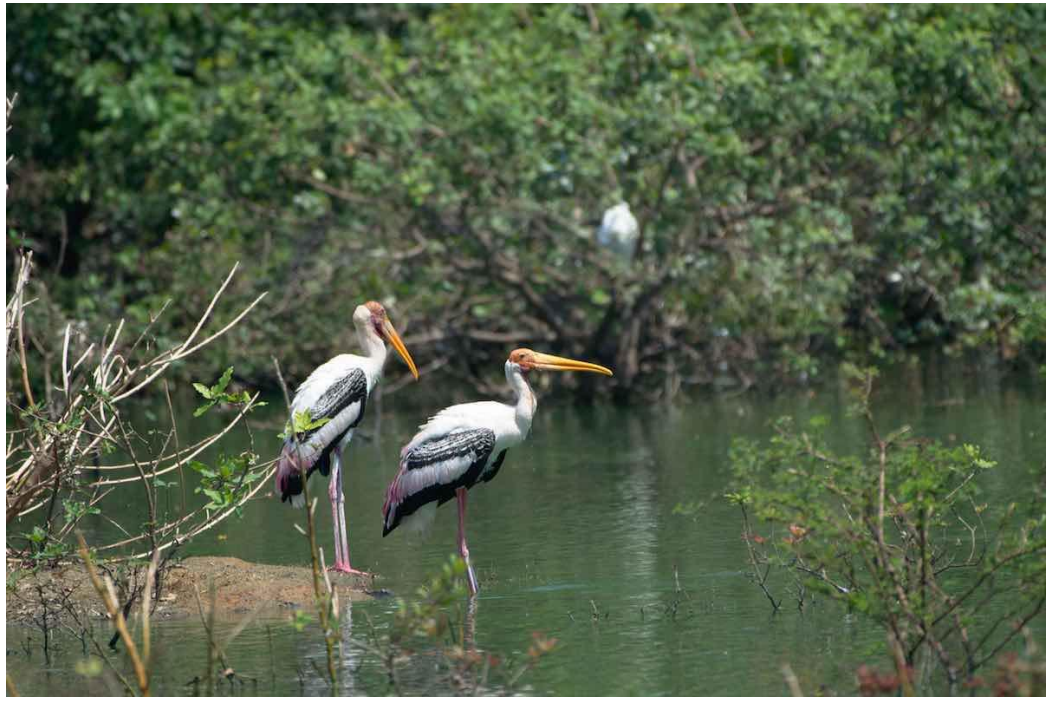
Buffer zones reduce erosion

- Trees close to the stream grow deep roots and increase riverbank stability

Naturskyddsföreningen

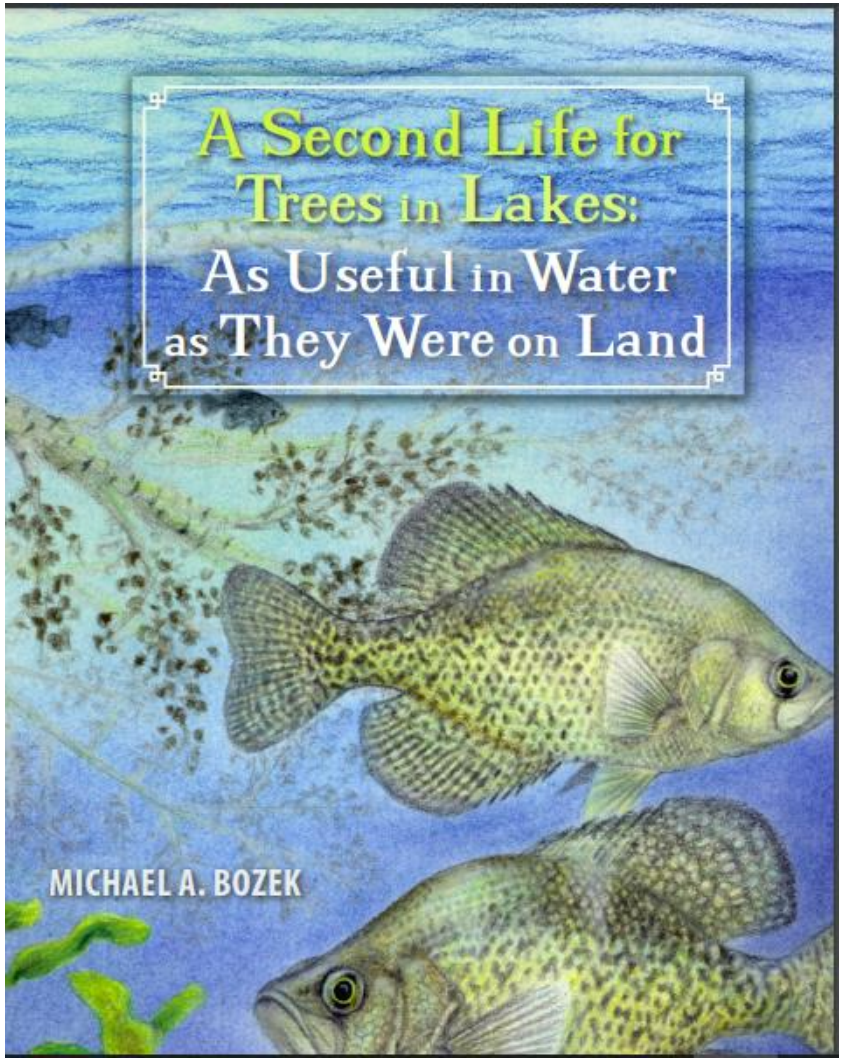
Wildlife and biodiversity

- Buffers containing trees and bushes often exhibit greater **species richness** than buffer covered merely in grass
- **Shading** – important for water temperature
- Organic material (i.e. leaves) – **food** for organisms in the water
- Dead wood provides **habitat** and **protection** for fish and other aquatic organisms



Naturskyddsföreningen

Accepting the look of "natural" shorelines with many trees and shrubs will be the first step toward restoring habitats for animals using these areas on shore, as well as fish using the trees when they fall in the water.
(In Bozek University of Wisconsin https://www.uwsp.edu/cnr-ap/clue/Documents/Water/TreesShoreline.pdf)



Naturskyddsföreningen

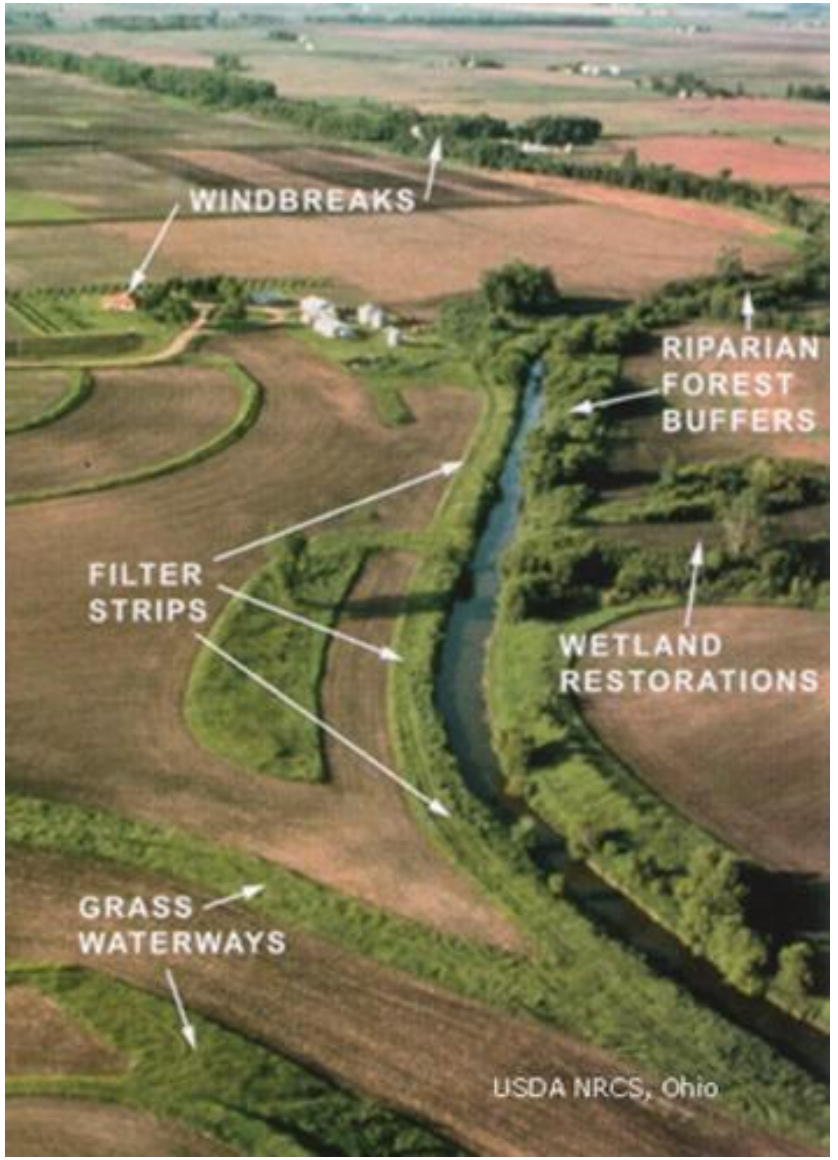
Different types of buffer zones

4

Naturskyddsföreningen

Buffer zones both in riparian forest areas and in farmlands

- **Filter strips** - narrow strips of grass
- **Forest buffer strips** - strips containing trees and grass – left for protection when carrying out harvesting
- **Ecologically Functional Riparian Zones** – multifunctional



https://www.geo.fu-berlin.de/en/v/iwm-network/learning_content/_archive/higher_education/ressource_water/03_management/02_protection/buffer/index.html

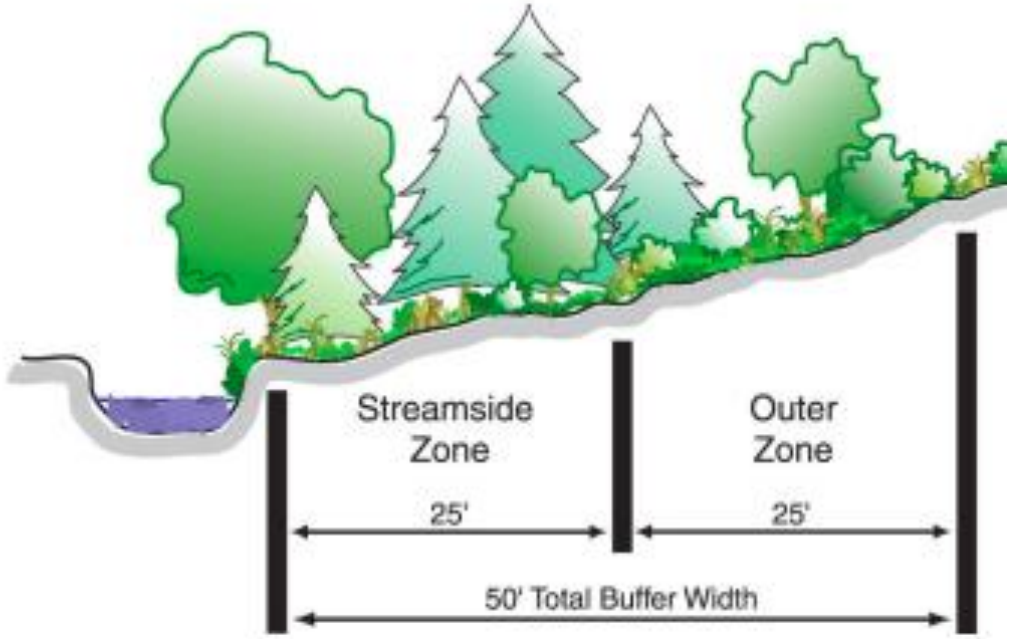
Naturskyddsföreningen

The effectiveness of buffer zones depends on…

- Topography
- Type of vegetation
- Soil type
- Climate
- The extent of the nutrient load

But probably most importantly:

- The buffer zones **width!**



Naturskyddsföreningen

Buffer zones in agriculture

5

Naturskyddsföreningen

Agriculture is the largest source of human-related nutrients to the Baltic Sea

- 40% of total N & 30% of total P
- The main nutrient leakage source from agriculture is **overfertilization practices**
- Mineral fertilizers
- Manure
- The loss of nutrients is also correlated with variations in discharge

Naturskyddsföreningen

Grass buffer strips

- A practical way of managing agricultural fields
- Buffer strips can effectively **mitigate** the movement of **sediment, nutrients**, and **pesticides** in farm fields
- Do not require much space or specialized maintenance.

Naturskyddsföreningen

Buffer zones can reduce leakage

- “Natural filters”
- Can remove > 75 % of **sediments**
- Can remove > 50 % of **nutrients** and **pesticides**
- (But - There are difficulties in calculating the effects of the measures i.e. on phosphorus)

Naturskyddsföreningen

Pesticides

- Grass buffer zones are **effective** in **reducing pesticide** transfer from agricultural field to water bodies
- A wide range of **physical and biochemical processes** are involved in the process - their relative importance can vary

Naturskyddsföreningen

Forest buffers

6

Naturskyddsföreningen

Leaving protective zones with trees and brush

- A forest buffer is a zone of forest left for protection adjacent to a water body
- Forest buffers can reduce inputs of **nutrients, suspended solids** and **Hg**
- Valuable terrestrial habitats **supporting important biota**

A forest buffer along a small stream in northern Sweden with the clear-cut area on the left. Photo by Eva Ring in Good practices for forest buffers to promote good surface water quality in the Baltic Sea region — A handbook https://www.skogsstyrelsen.se/globalassets/projektwebbplatser/wambaf/riparian-forests/good-practices/english---good-practices---forest-buffers.pdf

Naturskyddsföreningen

Recommendations

- Establish forest buffers along **all types of wate**r in the forest - springs, small streams, rivers and lakes
- The buffer should consist of **multi-layered** and **uneven-aged** trees
- Adjust buffer width to **local conditions** such as soil type, topography, vegetation and discharge areas
- Promote **broadleaved trees** near forest streams
- **Prevent soil disturbance** within the buffer- i.e. minimize off-road traffic etc

Naturskyddsföreningen

Ecologically Functional Riparian Zones

7

Naturskyddsföreningen

What is an Ecologically Functional Riparian Zones ERZ (Lind et al 2019)

- Providing as many primary ecosystem functions as possible
- "**Natural filter**" - reducing nutrients
- Providing **organic material** which functions as a source of energy for organisms in the water **and** habitat for instream organisms
- **Stabilizing the banks** of the waterway
- Providing or capturing **instream wood** - habitat for organisms **and** increasing flow heterogeneity
- **Shading** – moderating the temperature

Naturskyddsföreningen

Dimensions of buffer zones?

8

Naturskyddsföreningen

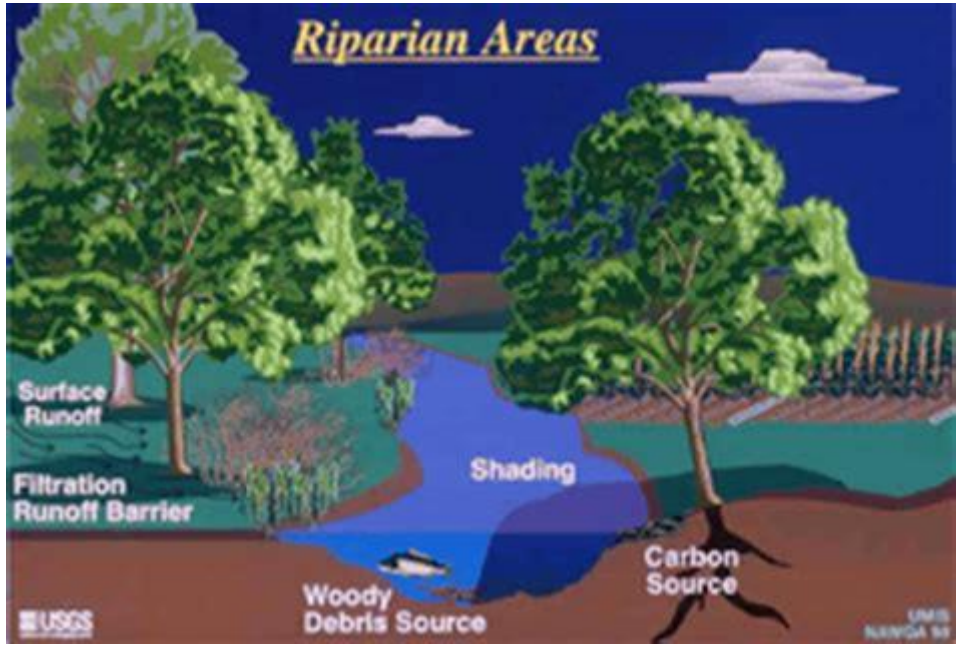
What is the goal with the buffer zone?

- Reducing sediments and nutrients only requires **a narrow** riparian zone (3–10 m)
- The **protection of many organism** requires wider riparian zones (> 30 m)

Naturskyddsföreningen

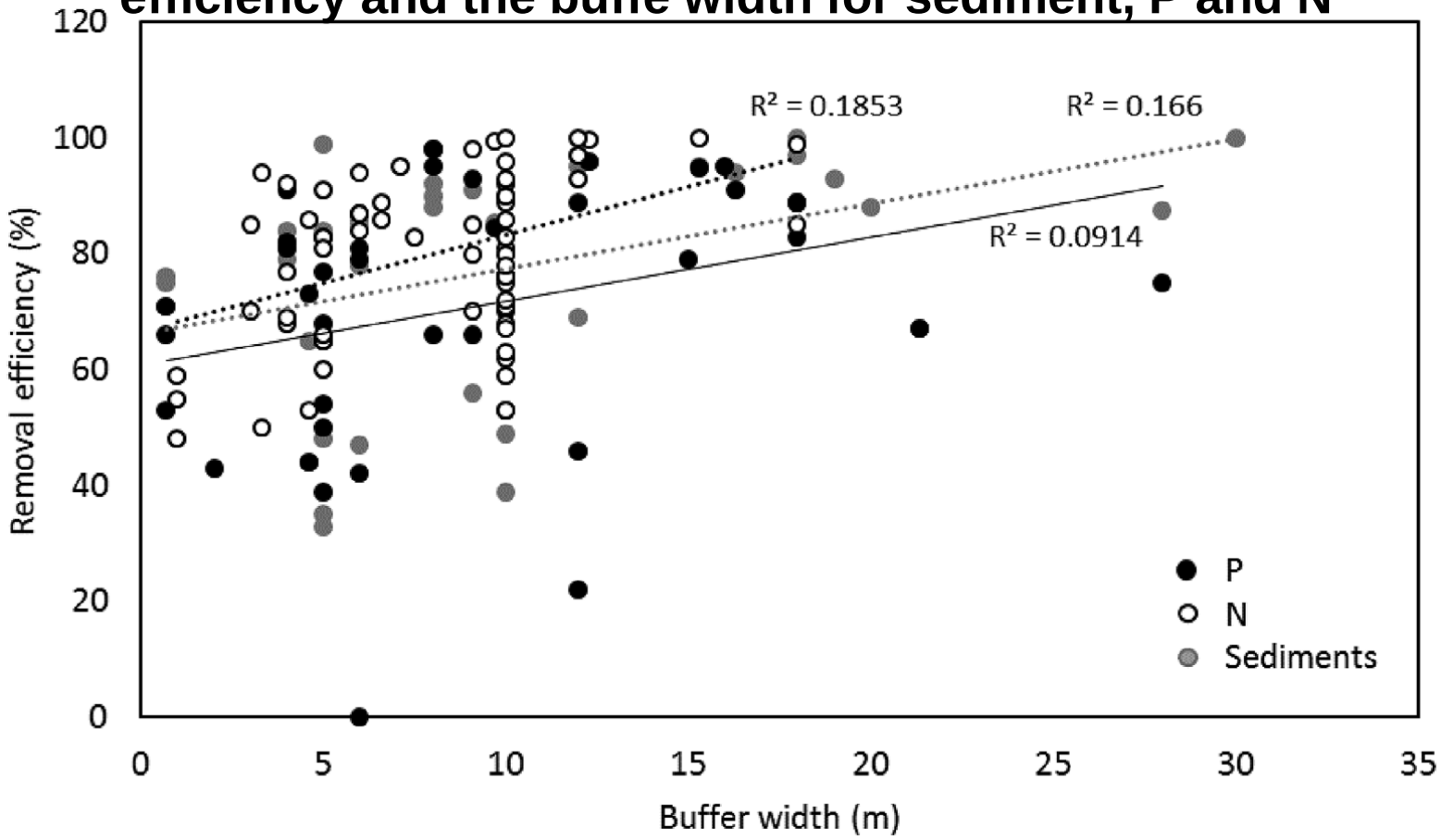
Broader is better

- Areas with **steep slopes** require wider buffers than flat areas
- To generate stable water temperature (**shading**) a forested riparian buffer need to be wide enough (i.e. > 20 m)
- Often (but not always): Broader buffer strip – more retention
- Mayer et al (2007): Estimated 50, 75, and 90% N removal in buffers of 27, 81, and 131 meters of width respectively



Naturskyddsföreningen

A low but significant relationship between the removal efficiency and the buffe width for sediment, P and N



The relationship between buffer width (m) and removal efficiency (%) of phosphorous (P), nitrogen (N), and sedi- ments (al l: P < 0.001). All data included regardless of removal efficiency. From Lind, Hasselquist & Laudon 2019

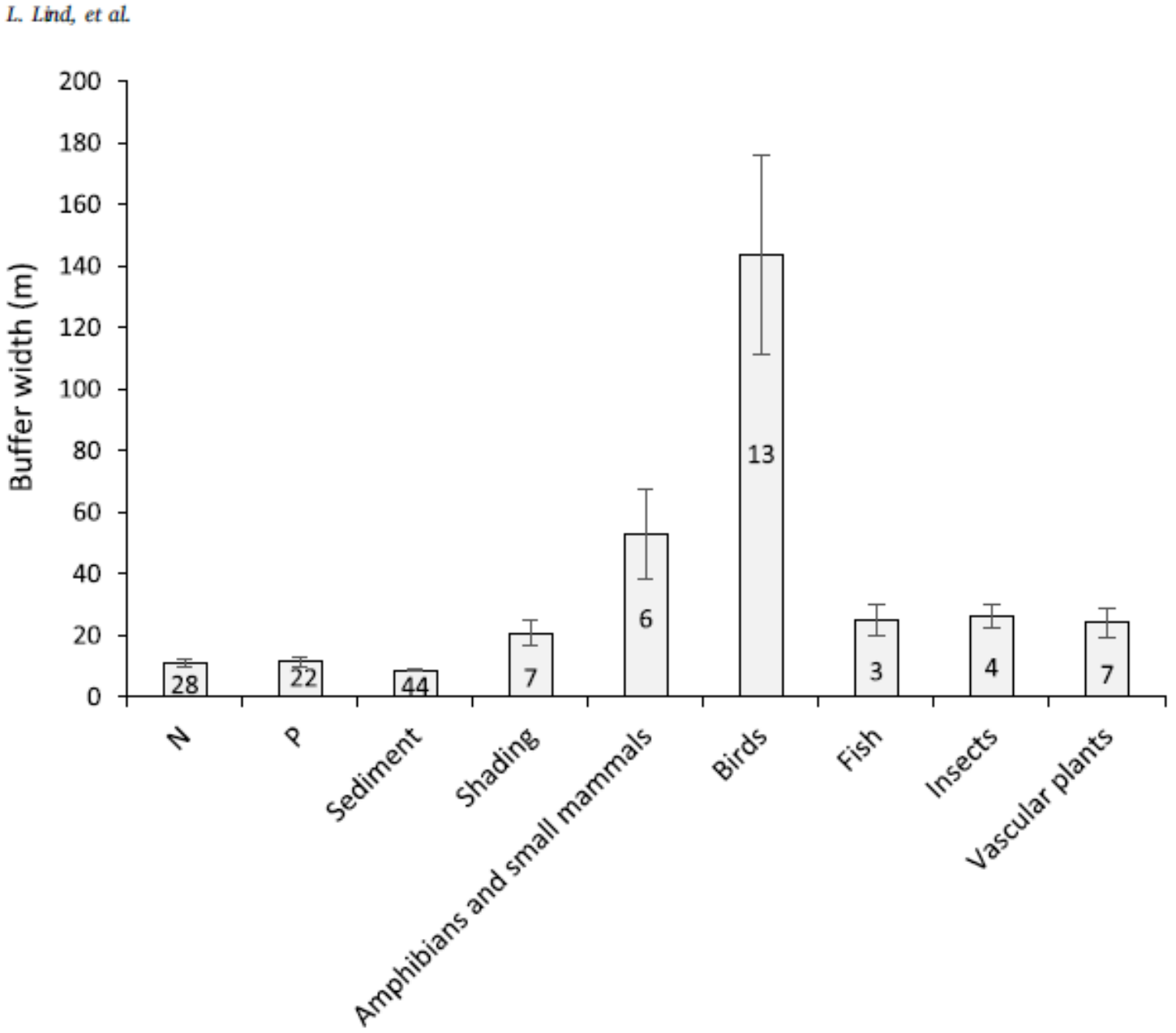
Naturskyddsföreningen

To ensure an Ecologically Functional Riparian Zone

*There is no optimal width for ensuring all ecosystem functions and high biodiversity – but a **30 m wide riparian zone** ensures an 'Ecologically Functional Riparian Zone' with stable water temperature, a high floral diversity that delivers sufficient organic material, instream wood, and bank stability*
(Lind, Hasselquist & Laudon 2019)

Naturskyddsföreningen

The width of the riparian zone needed to fulfil different ecosystem services for reduction in nitrogen
(N), phosphorus (P) and sediment inputs (≥75% removal efficiency), shading, and protecting/promoting biodiversity and plants and animals(From Lind et al 2019)



Naturskyddsföreningen

Buffer zones in different countries

9

Naturskyddsföreningen

Buffer zones in agriculture

- **Few countries** have national regulations of buffer widths in agriculture
- Germany and Switzerland: 5m wide
- In Sweden farmers can apply for funding for buffer strips

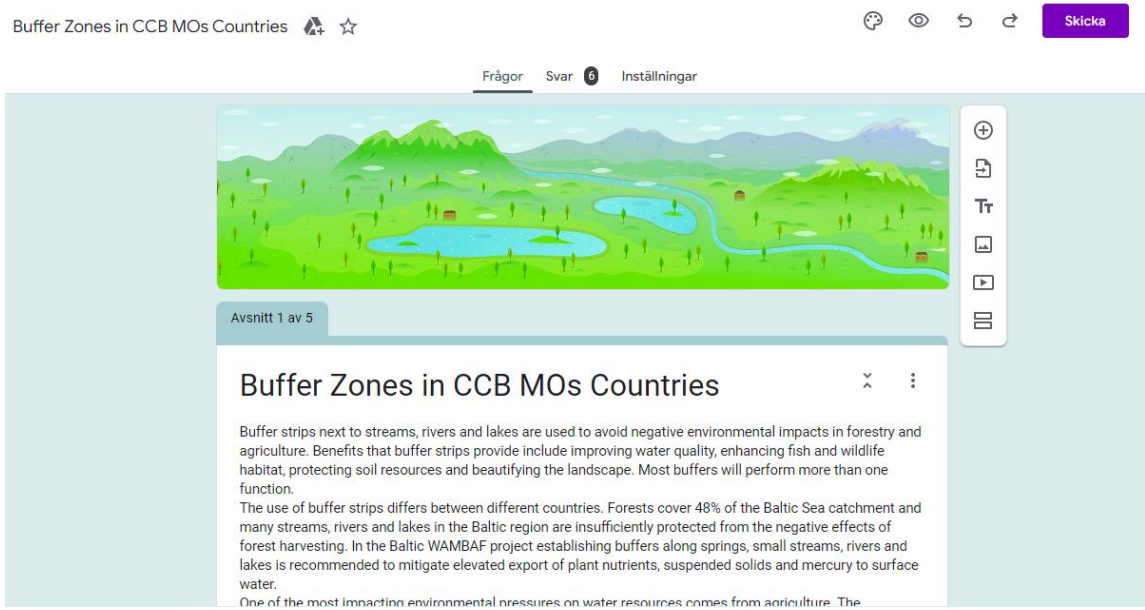
Forest buffer zones

- Are used for protection **all around the Baltic**
- National legislation, forest certification and guidelines determine how the forest buffers are implemented
- Narrow buffers (about 5–25 m wide) are typically left along smaller watercourse (sometimes more..)
- Most countries specify fixed widths in meters (Not Sweden and Finland)

Naturskyddsföreningen

CCB Buffer Zone Project

- We want to push for more buffer zones in agriculture and in forestry
- **Questionnaire** to all CCB member organizations
- Data not analyzed yet…



Naturskyddsföreningen

The EU Nature Restoration Law

9

Naturskyddsföreningen

Proposal for new legislation 22/6

- To restore damaged ecosystems and bring nature back across Europe
- The aim is to cover at least 20% of the EU's land and sea areas by 2030 with nature restoration measures
- Extend to all ecosystems in need of restoration by 2050.
- Will now be discussed by the European Parliament and the Council

Press release | 22 June 2022 | Brussels

Green Deal: pioneering proposals to restore Europe's nature by 2050 and halve pesticide use by 2030

Page contents

Top
Related media
Print friendly pdf
Press contact

Today, the Commission adopted pioneering proposals to **restore damaged ecosystems and bring nature back across Europe**, from agricultural land and seas, to forests and urban environments. The Commission also proposes to **reduce the use and risk of chemical pesticides by 50% by 2030**. These are the flagship legislative proposals to follow the Biodiversity and Farm to Fork Strategies, and will help ensure the resilience and security of food supply in the EU and across the world.

The proposal for a **Nature Restoration Law** is a key step in avoiding ecosystem collapse and preventing the worst impacts of climate change

Naturskyddsföreningen

Article 9 Restoration of agricultural ecosystems

- Member States shall achieve an increasing trend at national level of….
- (c) share of agricultural land with **high-diversity landscape features**

Naturskyddsföreningen

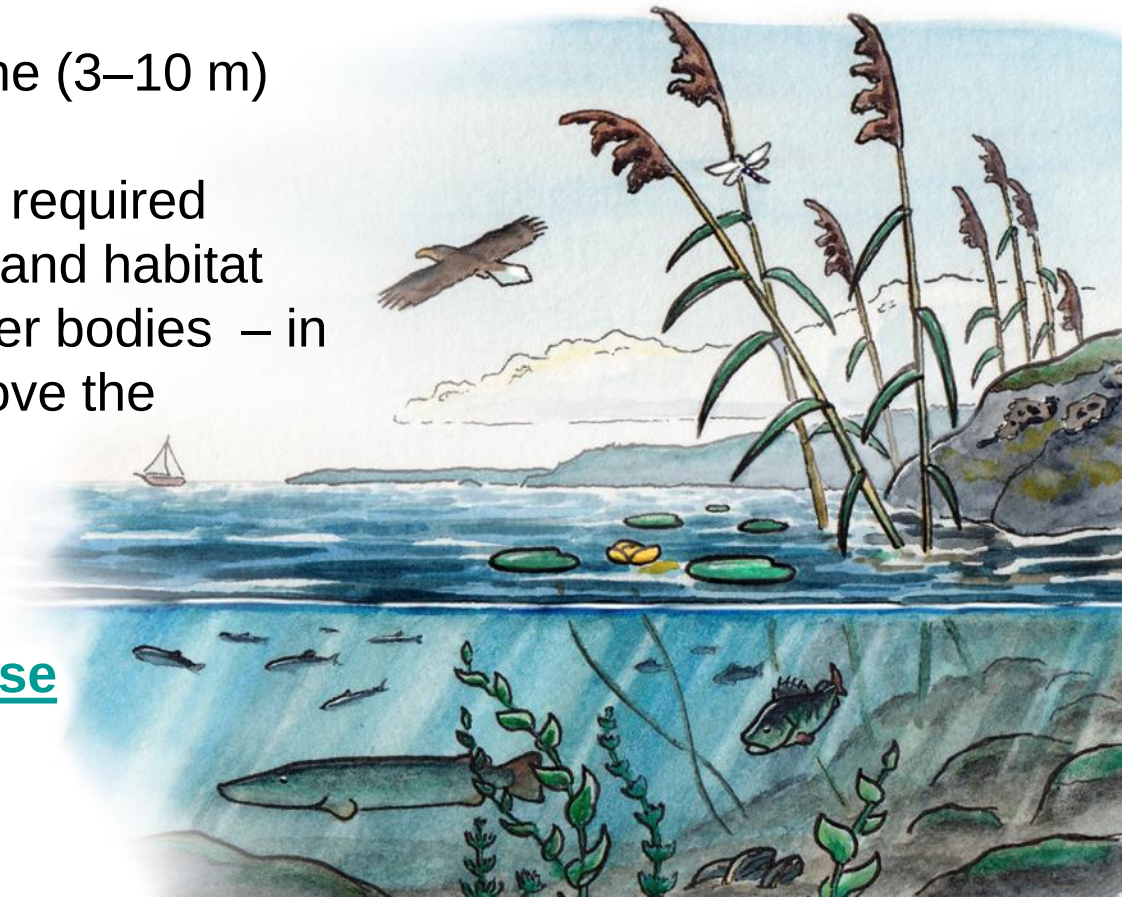
From the proposal

*High-diversity landscape features on agricultural land, including **buffer strips,** rotational or non-rotational fallow land, hedgerows, individual or groups of trees, tree rows, field margins, patches, ditches, streams, small wetlands, terraces, cairns, stonewalls, small ponds and cultural features, provide space for wild plants and animals, including pollinators, prevent soil erosion and depletion, filter air and water, support climate change mitigation and adaptation and agricultural productivity of pollination-dependent crops.*

Naturskyddsföreningen

Takeaway message

- Buffer zones are multifunctional
- Can reduce sediments and nutrients
- This only requires a narrow riparian zone (3–10 m)
- Grass is OK
- To protect biodiversity larger zones are required
- Trees and bushes provide shade, food and habitat
- Buffer zones along all streams and water bodies – in agriculture and in forestry - would improve the environment significantly!



THANK YOU!

mia.svedang@naturskyddsforeningen.se

Naturskyddsföreningen

Retention of P in Sweden, Norway and Finland

Plats	Varak-tighet	Slutt-ning	Jordtyp	Bredd	Vegeta-tionstyp	Retention	Referens
C Sverige	3	10	Styv lera	5	Gräs	5 (TP)* 0 DP	Ulén, 1988
S Sverige	-	10	Sandig lättlera	8	Gräs	65 (DRP)	Vought et al., 1994
S Sverige	-	10	Sandig lättlera	16	Gräs	95 (DRP)	Vought m.fl., 1994
Norge	8	12	Mjälalättlera	5, 10	Gräs	78–90 (TP)	Syversen, 2005
SV Finland	10	12–18	Mycket styv lera	10	Gräs som skördades	41 (TP) 0 (DRP)	Uusi-Kämppä, 2005
SV Finland	10	12–18	Mycket styv lera	10	Buskar och gräs	41 (TP) –71 (DRP)	Uusi-Kämppä, 2005

* *Reduktion endast ett år med kraftig erosion*

From Jordbruksverket Rapport 2012::22