

Grön Infrastruktur

-GI genom GIS, vad kräver paraplyarterna?

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Grön infrastruktur = Att lösa en del av vad som krävs i Miljömål och EU-direktiv i ett avrinningsområdesperspektiv.

Tolkat mer som funktionella habitat, processer och konnektivitet.

Landskapsekologi

- tillräckligt stora habitat
- av tillräckligt god kvalitet (även processer) med
- tillräckliga migrationsmöjligheter till andra habitat

Vår metod:

Utifrån funktionella livsmiljöer (indikerade av paraplyarter) beskriva huvudsakliga habitat- och spridningskrav.

Och sedan identifiera var dessa förutsättningar finns i landskapet.

Med fokus på **bristanalys – vad fanns, finns och saknas i dag?**

Lämpliga paraplyarter i olika skalor och miljötyper.

Farligt att utgå från befintliga arter.

Arten kan vara borta, men miljön är intakt eller kan enkelt restaureras.

Därför fokusera på habitat (strukturer & processer) och konnektivitet för paraplyarter.

Målet:

Identifiera, bevara, skydda och/eller restaurera habitat i ett landskapsperspektiv.

- Fokus på strömhabitat med kantzon i första skedet.
- Hur identifiera **befintliga** och **potentiella**
Ekologiskt funktionella habitat =>
Ekologiskt funktionella vatten =>
Ekologiskt funktionella avrinningsområden
- funktionella spridningsvägar.
- Kritiska hinder som bör prioriteras för eliminering!

Förslag:

Använd akvatiska **paraplyarter** för att sätta nivåer på habitatets storlek, kvalitet och konnektivitet.

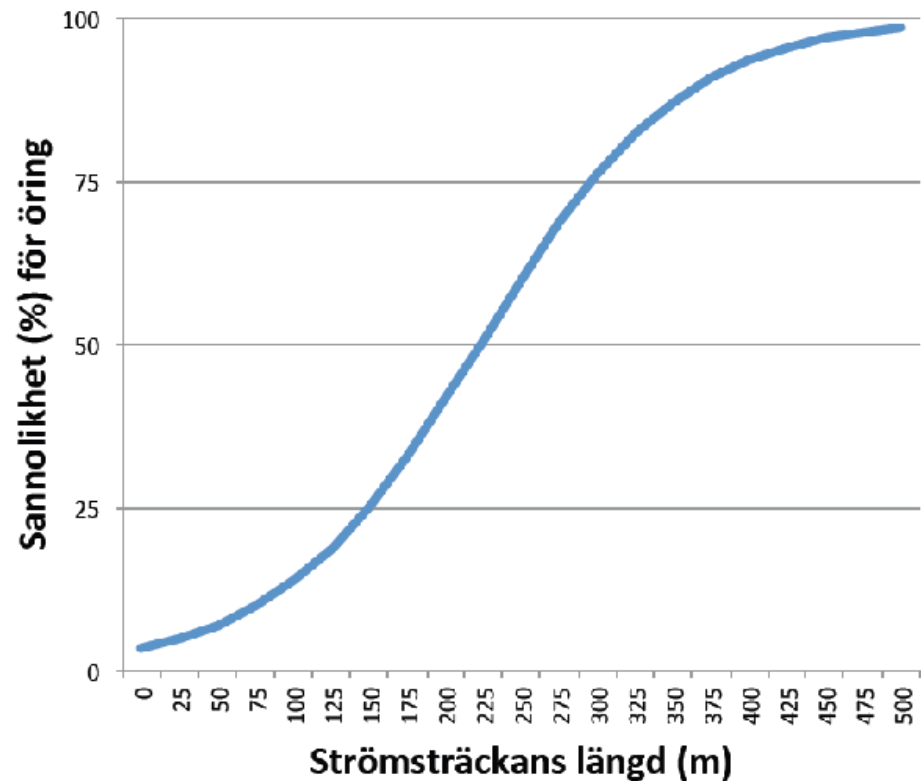
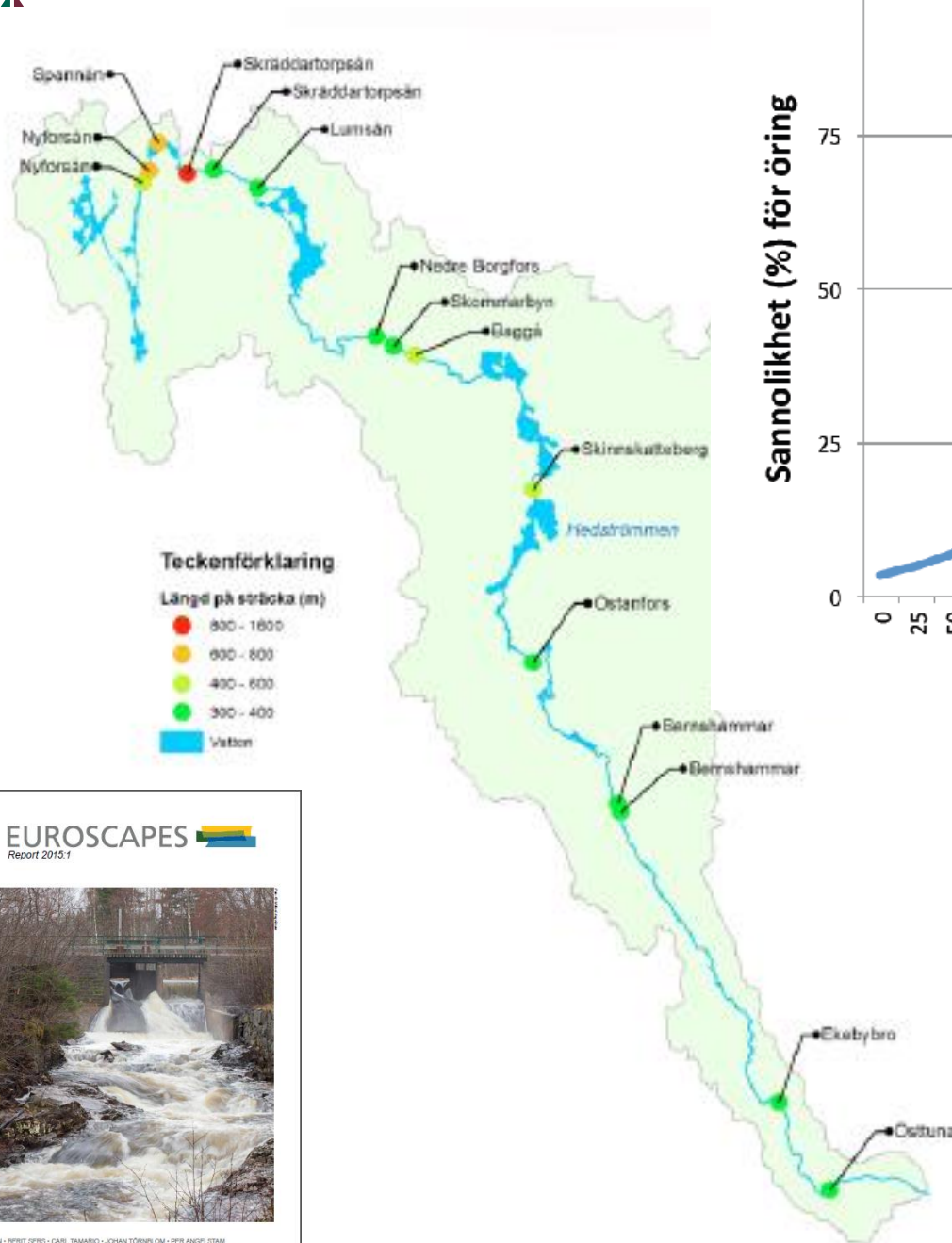
*Begreppet paraplyart handlar om att det finns arter som behöver **funktionella** livsmiljöer och att dessa behov även täcker in flera andra arters behov som då också har goda förutsättningar att finnas.*

Förslag på paraplyarter i olika skalor.



Exemplet Öring och flodpärlmussla i Hedströmmen

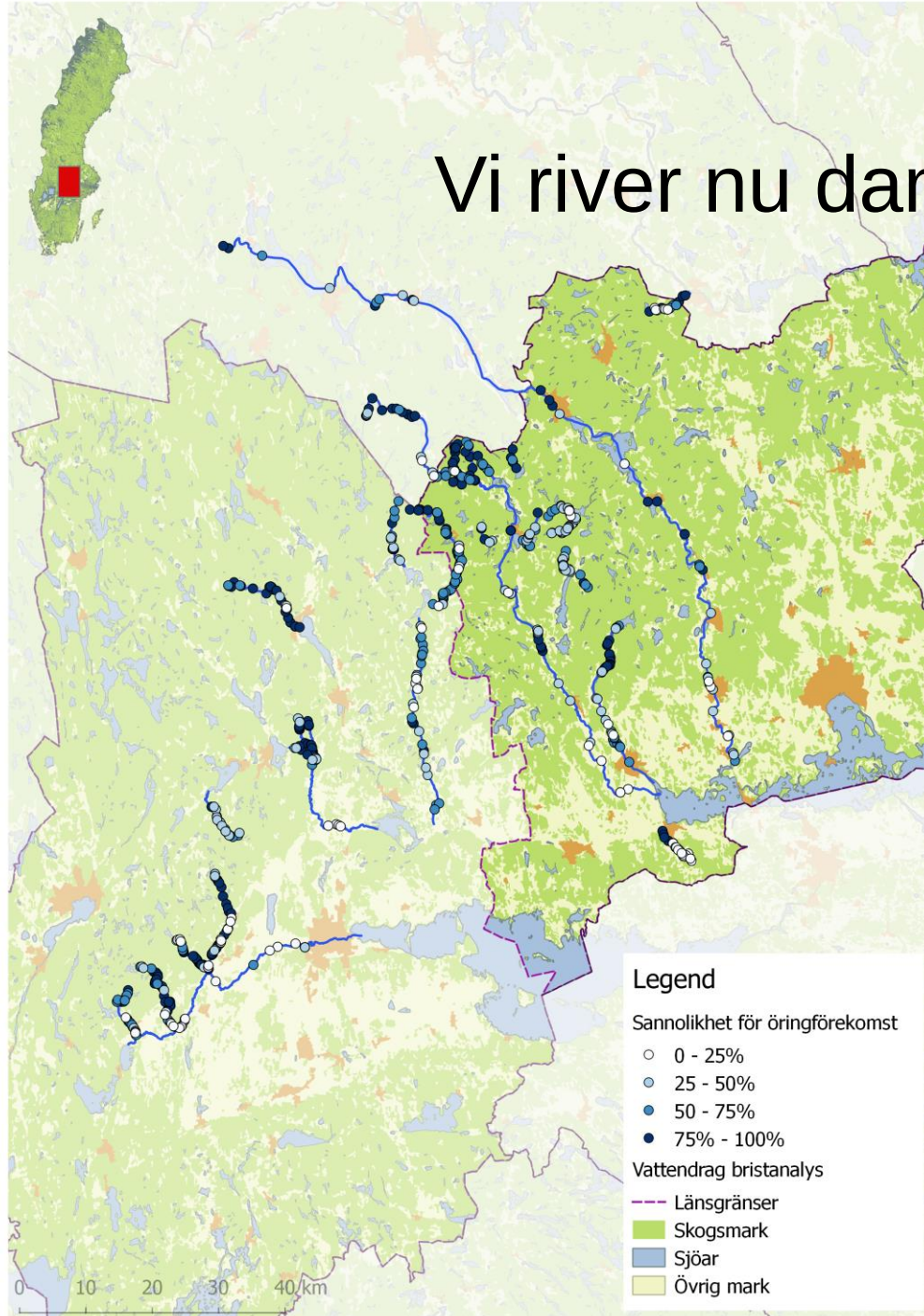




Krävdes en viss längd/yta för att hysa en öringpopulation. Fanns flera habitat intill varandra och vandring var möjlig minskade storleken på nödvändig yta.



Vi river nu dammar teoretiskt!



Legend

Sannolikhet för öringförekomst

- 0 - 25%
- 25 - 50%
- 50 - 75%
- 75% - 100%

Vattendrag bristanalys

- Länsgränser
- Skogsmark
- Sjöar
- Övrig mark

OK, vi vet vad en öringpopulation kräver i Hedströmmen,
Men vad krävs i andra system? Måste kollas!

Och vad kräver **flodpärlmusslan** av habitat och landskap?

Vad krävs för en population som är långsiktigt säkerställd?

Modellering – logistisk regression & boosted regression trees

Vilka faktorer ger svaga bestånd av flodpärlmussla?

En studie av 111 vattendrag i Västernorrland



Predicting population status of freshwater pearl mussel (*Margaritifera margaritifera*, L.) in central Sweden using instream and riparian zone land-use data

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ABSTRACT

1. The freshwater pearl mussel *Margaritifera margaritifera* (L.) has become scarce and threatened throughout most of its distribution range, and is consequently listed as 'endangered' by the IUCN. It has been suggested and used as an indicator species and even as an umbrella species. Despite this few studies have examined factors affecting its catchment-level population status.
2. This work tested the hypothesis that it is possible to predict freshwater pearl mussel population viability (reproducing/lost reproducing) and population status in central Sweden from a combination of geospatial data describing riparian land-cover and use, water chemistry data, and desludging data describing the abundance of the host fish species brown trout, *Salmo trutta* L. in 56 streams.
3. Mussel population viability was best predicted by total phosphorus. Using hyperbolic regression data (six catchment population status, but fish abundance (in trout) was the best predictor. At abundances below 5 fish per 100 m² and above a concentration of 1 µg L⁻¹ total phosphorus, only three viable populations existed.
4. Geospatial data could be used to predict levels of total phosphorus and thereby indirectly to predict mussel viability. Geospatial data could not be used to predict abundance of fish trout, which is thought to depend more on instream factors. This study demonstrates that geospatial data on riparian land-use and cover can be a useful tool for assessing watersheds potentially harbouring non-reproducing mussel populations.

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KEY WORDS: molluscs; fish; nutrient; catchment; riparian; trout; endangered species; indicator species

INTRODUCTION

The freshwater pearl mussel (FPM) (*Margaritifera margaritifera* L.) has become scarce or even endangered throughout most of its Holarctic range (Wells *et al.*, 1985; Young *et al.*, 2001). Freshwater

mussel species in general are among the world's most endangered organisms (Chesney and Oliver, 1998; Gungl and Fennel, 2007). In Sweden, the FPM has disappeared from 40–50% of the sites where it was observed at the beginning of the 20th century (Enksson *et al.*, 1998), and young

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PRIMARY RESEARCH PAPER

Catchment land cover as a proxy for macroinvertebrate assemblage structure in Carpathian Mountain streams

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Abstract We compared land cover, riparian vegetation, and instream habitat characteristics with stream macroinvertebrate assemblages in 25 catchments in the Carpathian Mountains in Central Europe. This study area was particularly selected because of its diverse history of forest and agricultural ecosystems linked to geospatial dynamics, which provide a suite of unique landscape-scale land cover settings in one ecoregion. Canonical Correspondence Analysis (CCA) showed that variation in composition and structure of macroinvertebrate assemblages was primarily related to four

land cover types, and not to riparian or instream habitat. These were the portions in the catchment area of (1) broadleaved forest, (2) fine-grained agricultural landscape mosaic with scattered trees (e.g., pre-industrial cultural landscape), (3) mixed forest, and (4) natural grassland without trees. Principal Component Analysis (PCA) suggested that land cover type and stream channel substrate co-varied. The PCA also showed that chemical variables, including organic carbon, had higher values in the agricultural landscape compared to natural forests. The major source of variation among taxa in streams was higher abundance of Diptera in agricultural landscapes and of Plecoptera, Coleoptera, Trichoptera, and Amphipoda in forests. Gastropoda and Oligochaeta were more abundant in open, fine-grained agricultural landscape mosaics with scattered trees. Ephemeroptera taxa were quite indifferent to these gradients in catchment land cover, but showed a tendency of being more abundant in the pre-industrial cultural landscape.

Our findings suggest that land cover can be used as a proxy of the composition and structure of macroinvertebrate assemblages. This means that land use management at the catchment scale is needed for efficient conservation, and recovery of stream invertebrate communities.

Keywords Land use · Land cover · European Water Framework Directive · Macroinvertebrates · Ecological integrity

Original research article

Multiple factors and thresholds explaining fish species distributions in lowland streams

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ABSTRACT

Appropriate restoration and conservation measures require a good understanding of the factors limiting the distribution of species, the presence of any changes in the distribution along environmental gradients and the effect of environmental interactions on species distribution. We used 12 environmental variables describing connectivity, hydrology, climate and stream morphology, to model the distributions of 17 fish species from 2005 Swedish stream data that were sampled between 2000 and 2011. Modelling was performed using boosted regression trees and random forest, two machine learning techniques to assist the relationship between species distributions and their environment. Temperature, width and connectivity (minimum distance to lake or the sea and water discharge) were the most important variables explaining changes in species distributions at large spatial scales. Important cores of forest occurrence probabilities along gradients often showed abrupt changes, however, their threshold effects were difficult to detect, their results show clear differences across species and even in the outcomes of the two algorithms, implying that a simultaneous assessment of multiple species may provide a better signal of ecosystem change than the use of surrogate species.

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1. Introduction

Freshwater habitats, supporting ca 10% of all known species, are among the most threatened ecosystems in the world (Vennart *et al.*, 2010). Some of the most severe threats to freshwater biodiversity, such as habitat degradation, flow regulation, and species invasion, result in loss of taxa richness (Schlager *et al.*, 2012), declines in the distribution range and abundance of many species (Brazner *et al.*, 2004; Strayer *et al.*, 2003), and eventually have negative effects on ecosystem functioning. Degradation of freshwater ecosystems will continue, as water demand and physical alterations will increase with human population density (Ungerer *et al.*, 2005; Schrage *et al.*, 2012), and as a result of anthropogenic induced climate change (Brazner *et al.*, 2004; Griffith *et al.*, 2014). In an attempt to prevent European freshwater systems from further degradation, the Water Framework Directive (European Commission, 2000) and the EC Habitats Directive (Council of the European Communities, 1992) were developed, which aim at maintaining and restoring freshwater habitats to a favorable conservation status through the development of management and restoration strategies. This is, however, a difficult task because species are affected by multiple factors acting at different spatial scales (e.g. local and

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Projektförslag

- a) Identifiera lämpliga paraplyarter (**öring-flodpärlmussla**, ål?, lax? tjockskalig målarmussla? utter?)
- b) deras krav på **habitatkvalitet, habitatstorlek, plats i landskapet, konnektivitet**
- c) med GIS analyseras hur dessa villkor uppfylls i utvalda system. Validerar genom att predikterar förekomst och tillstånd för arterna och jämför med biologiska prov.
- d) ger konkreta riktlinjer för vad myndigheterna kan ta fram med GIS (ger funktionella habitat/vatten/avr.områden – nuvarande och potentiella samt funktionella spridningsvägar och kritiska hinder).