Urgent & endangered: biodiversity needs for future

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Novel Earth Observation techniques for Biodiversity Monitoring and Research

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Reasons for declining biodiversity are the same in Finland and globally

In Finland

- Red List of Species 2010
  - Habitats becoming uninhabitable for single species due to direct and active human activity, has been assessed as one of the most common factors threatening the species
- Threatened Habitat types in Finland (2008)
  - All the most important factors threatening Habitat types are linked to direct and active human activity that deteriorates their quality or destroys them

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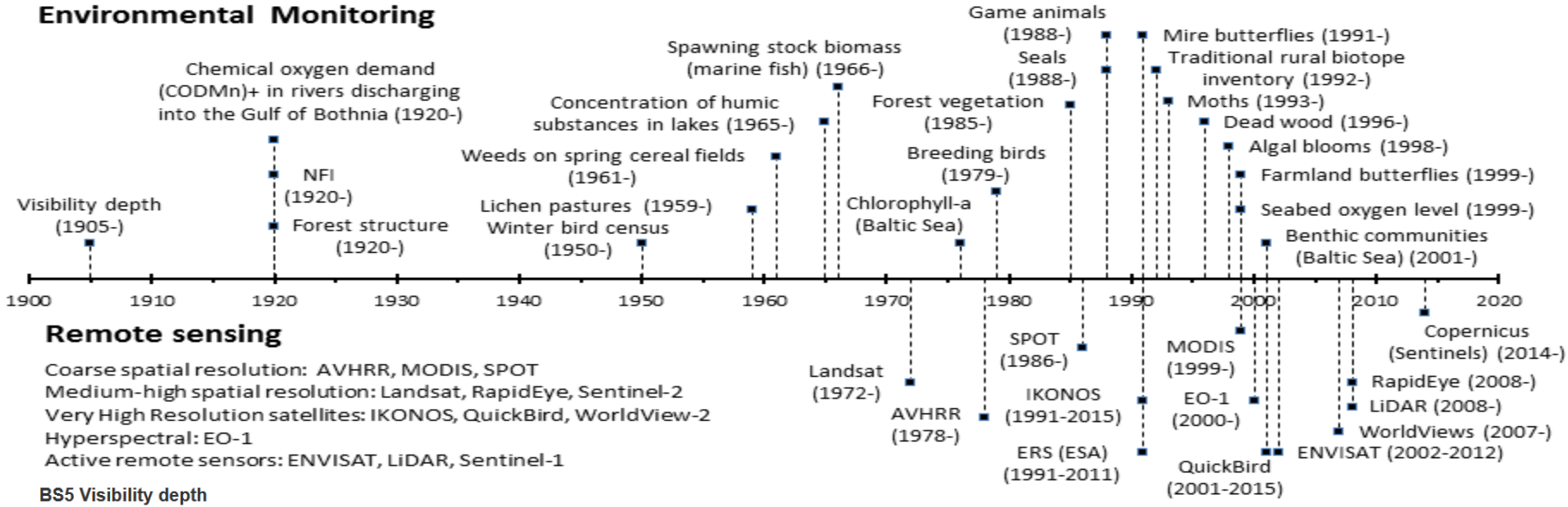
Environmental Monitoring

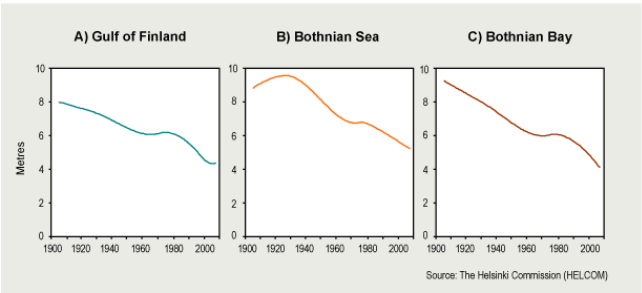


Remote sensing

Coarse spatial resolution: AVHRR, MODIS, SPOT
Medium-high spatial resolution: Landsat, RapidEye, Sentinel-2
Very High Resolution satellites: IKONOS, QuickBird, WorldView-2
Hyperspectral: EO-1
Active remote sensors: ENVISAT, LiDAR, Sentinel-1

BS5 Visibility depth

DPSIR



>> Background information

Vihervaara et al. 2017: How Essential Biodiversity Variables and remote sensing can help national biodiversity monitoring. *Global Ecology and Conservation* 10: 43-59

SUOMEKSI

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HOME | ABOUT | INDICATORS | HABITATS | BIODIVERSITY | PARTNERS | LINKS | FEEDBACK

Indicators by category

- Forests
- Mires
- Baltic Sea
- Inland waters
- Farmlands
- Alpine habitats
- Urban areas
- Shores
- Rocky and esker habitats
- Climate change
- Alien species

Biodiversity.fi ECOSYSTEM SERVICES

National ACTION PLAN

GENETIC RESOURCES & legislation

Welcome to Biodiversity.fi

On these pages you can find a wealth of research based information on the state and development of nature in Finland.

Biodiversity.fi includes more than 110 indicators reflecting the state and development of various components of biological diversity as well as factors driving changes in Finland's nature. Biodiversity.fi is financed by the Ministry of Environment and it has been developed in close cooperation by Finnish environmental research organisations and non-governmental organisations.

On the left-hand side you can find a link to Finnish ecosystem service indicators which are currently under development.

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SUSTAINABLE DEVELOPMENT GOALS

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Need for novel EO based monitoring methods

Case Finland

- Monitoring of ecosystem condition and extent urgently needed
- Traditional means are labour-intensive hence expensive
  - ➢ Lack of financial resources for monitoring

- Need for
  - better quality
  - higher coverage (both spatially and within ecosystems)
  - and more frequent data collection (up-to-date)

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Benefits of novel EO monitoring data

Case Finland

- Better quality, higher coverage and more up-to-date monitoring data would:
  - Result in better quality of reports,
  - diminish the need of expert work
  - and allow for reallocation of resources to data collection/processing.

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Need for monitoring data

Case Finland

- Red lists of Ecosystems and Species (every 10 years)
- Reporting under EU directives (every 6 years)
- Reporting for CBD (every 4 years)
- Assessment of impacts of policy measures
- Design of new policy measures
- …

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National Satellite Data Center and other existing datasets

Co-operation of experts: ecosystems and remote sensing methods

General and specific indicators: EBVs, ecosystem extent, ecosystem condition

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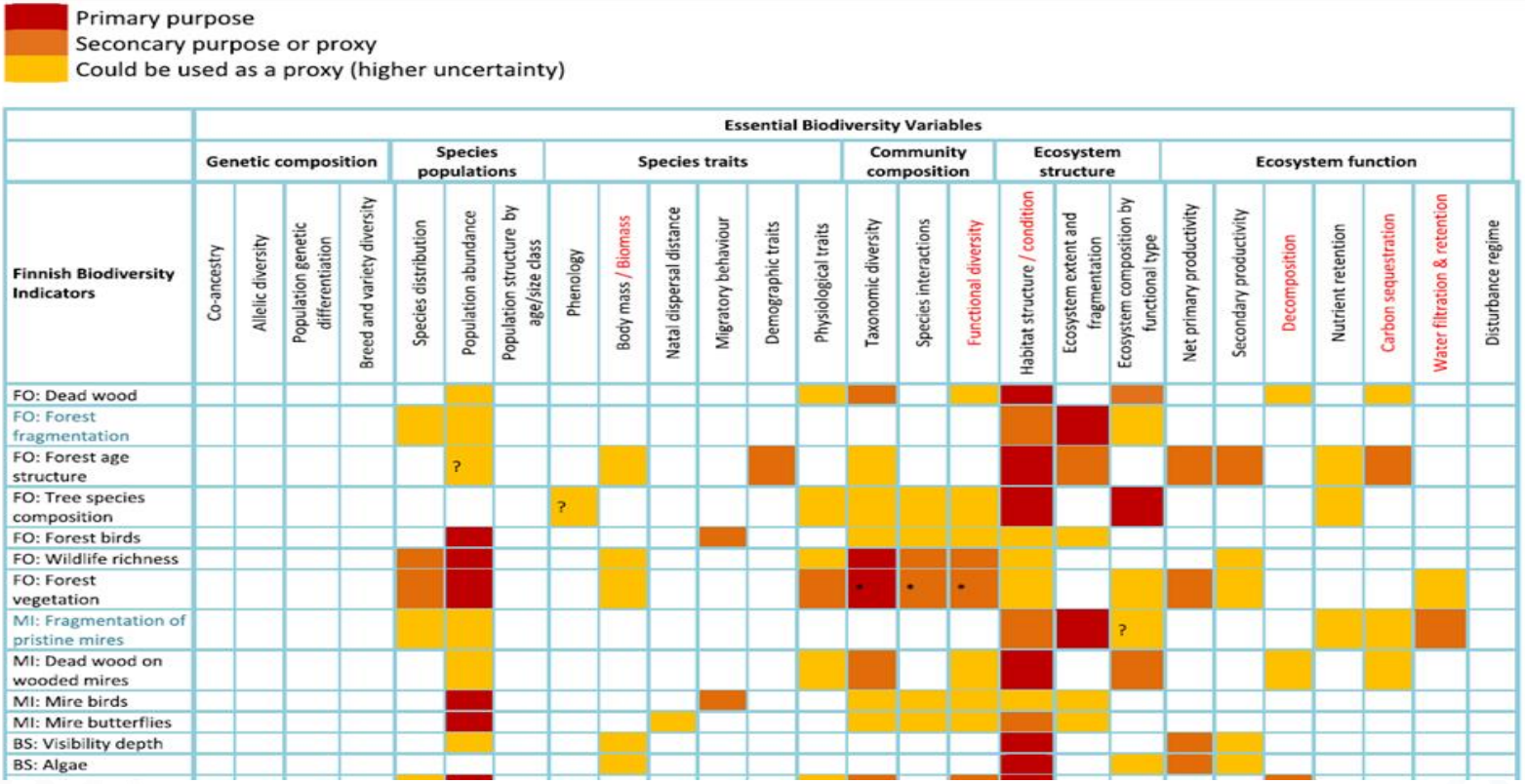
Table 1
Links between Finnish Biodiversity indicators and Essential Biodiversity Variables. Abbreviations: Forests (FO), Mires (MI), Baltic Sea (BS), Inland waters (IW), Farmlands (FA), Alpine habitats (AL), Urban habitats (UA), Shores (SH), Rocky and esker habitats (RE), and Climate change (CC). Indicators with names in blue on the left column are under preparation. EBV sub-classes marked in red are additions suggested by the authors. An asterisk (*) refers to a monitoring scheme at risk of being discontinued. Question mark (?) relates to some uncertainty in the correspondence of the biodiversity indicator and EBV.



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Concrete data needs

Based on past experiences from Finland

- Area of ecosystems
  - Trends (long and short term)
  - Within and outside protected area networks
- Range of occurrences of ecosystems
- Structure and functions of ecosystems

- Pressures and threats
  - Identification
  - Intensity
  - Trends

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Most potential Habitat types for development of remote sensing reported under Article 17 of the Habitats Directive

- 7110 Active raised bogs*
- 7310 Aapa mires*
- 9020 Esker forests
- 91E0 Alluvial forests*
- 1220 Perennial vegetation on stony banks
- 1610 Esker islands
- 1620 Boreal baltic islets and islands…
- 1640 Boreal Baltic sand beaches…
- 9030 Natural forests of primary succession stages…
- 8220 Siliceous rocky slopes…
- 8230 Siliceous rock with pioneer vegetation…

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Examples of RS applications

Mires

- Open mires: status of mire complexes and palsa mires (7110, 7310, 7320)
- Increase of trees, changes in moisture conditions, ditching, size and condition of palsas

Fell area

- Mountain heats (4060) ja Mountain birch scrub (9040)
- Climate change impact, reindeer pressure: changes in vegetation, lichens

Seashore meadows (1630), sand beaches (1640), dunes (2110-2190)

- Effects of eutrophication and increased vegetation; ALS could be used

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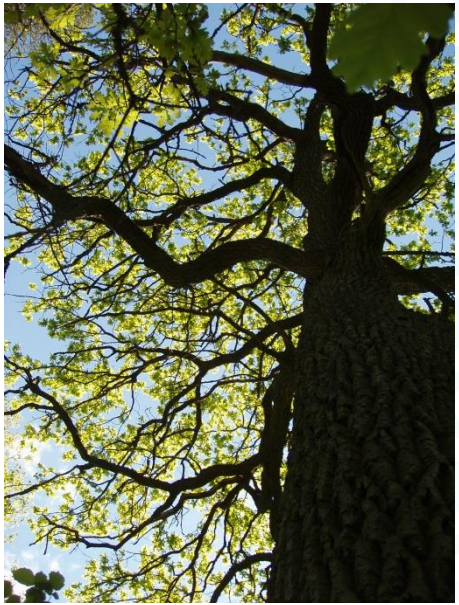
Examples of RS applications

Forests

- Natural forests of primary succession stages, structural complexity (e.g. multi-layered), deadwood, Aspen (*Populus tremula*), herb-rich forests with broadleaved deciduous trees (e.g. oaks), Esker forests (9010, 9030, 9020, 9060)
- LiDAR & hypespectral



Traditional rural biotopes (dry meadows, wooded pastures)

- Monitoring of status: management, overgrowing (trees, bushes, reed on shores)

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Finnish Ecosystem Observatory (FEO)

New initiative from SYKE

- Collecting/connecting and synthesising national BD (& ES) data
  -> ”FinBON”

- Habitat specific RS -indicators for monitoring condition and extent of ecosystems
- Design a national monitoring network (in- and outside conservation areas) optimized by the monitoring needs of habitats
- Establish a data infrastructure to serve reporting needs
- Operationalization of EBVs at local and regional scale

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Kiitos!
Thank you!

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