

Plant life form based habitat monitoring in a European landscape framework for early warning of changes in land cover and biodiversity

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Outline

• Different methodologies used to monitor habitats in a landscape change perspective:

- **The NOVANA-program** – The National Monitoring and Assessment Program for the Aquatic and Terrestrial Environment. With emphasis on threatened habitats and species.
- **The SBMP** – The Small Biotope Monitoring Program and its methodology. A Complementary program for habitats of vernacular landscapes.
- **BioHab** – A European platform for permanent habitat monitoring, its methodology and testing of it on Danish conditions.

→ Perspectives and relation to the Global Land Project

SBMP, NOVANA & BioHab

- **Denmark:** SBMP since 1981. An area covering landscape monitoring program with emphasis on small biotopes.

• The BioHab project:

Aim: To set up and test a manual for a field-based European-wide monitoring of all types of habitats and associate changes in biodiversity.

Output: A common European Field Monitoring Handbook as a user-friendly tool in support of implementing the Habitat Directive, including NATURA 2000, and linking scientific and policy-oriented European projects (www.biohab.alterra.nl).

The Small Biotope Monitoring Program 1

- "Human transformations of ecosystems and landscapes are the largest source of change on Earth..." (GLP). In Denmark the agricultural production (1970ties) resulted in rapid removal of small biotopes.
- SBMP started in 1981 covering 13 squares of 4 km², extended to 26 squares in 1986 and got its nationwide coverage in 1991 with 32 squares.



The Small Biotope Monitoring Program 2

The SBMP consists of:

- A total land cover and land use registration.
- A detailed field registration of all linear and area biotopes.
- Interviews with farmers concerning agricultural practice and functions of the small biotopes.
- Information on ownership, socio-economic and landscape values among farmers in the sample areas.
- Information on the landscape and on geo-related structures and forces.
- A historical record of small biotopes for selected sample areas based on air photographs and topographical maps.

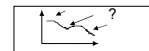
- **Aim:** To monitor the dynamics of the small biotopes and relate this to environmental conditions and socio-economic constraints at a regional and local level.

The SBMP & NOVANA

Results:

- A clear general decline of small biotopes up to the mid-80ties, followed by stagnation/modest increase until the last survey in 1996.
- Indications of a renewed general decline since the mid-90ties.

A continuation of SBMP as part of NOVANA is planned for the future starting in 2006.



Perspectives:

- The upcoming NOVANA-program is interesting, due to the apparently close relation between small biotope dynamics and agricultural and environmental policy and management (aspects link to the GLP, Sub-Theme 1.2).
- The integration in the NOVANA-program will not include the socio-economical aspects.

The SBMP as part of NOVANA

NOVANA:

- All unfarmed areas of more than 10m² will be monitored.
- Addition to the SBMP: the species composition and invasive species are recorded in selected areas.
- The program is primarily measuring evolutionary trends on the 4 km² square level and on the national level and is not incorporating a European monitoring perspective.

The BioHab framework - 2005

The European monitoring role of the BioHab framework:

- is to establish a landscape-based connection between the remote sensing-based monitoring of the environment and the site-specific indicators of biodiversity.

The BioHab methodology does permit this operational monitoring that can relate changes in biodiversity to changes in land cover and habitat composition and quality, thus function as an early warning system by changes in environmental conditions, including climate changes.

The specific objective of the BioHab framework for a European-wide monitoring of habitats, is

"...to obtain statistically robust estimates of their extent and associated changes in biodiversity".

Needed: Essential habitat features that can be expressed easily and quantitatively for identification and mapping of small but significant changes at a landscape level.

130 General Habitat Categories – GHC's

The GHC's have been defined based on the scientific hypothesis: Habitat structure is related to environmental factors.

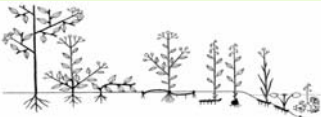
130 GHC's:

- Cover the pan-European region
- Field tested throughout the environmental zones of Europe
- Variations within a GHC are expressed by environmental and global qualifiers: Combinations of soil humidity, nutrient status, acidity and other habitat characteristics. Additional information is given by adding codes from predefined lists of site and management qualifiers.

The basis of the GHC's: Raunkiaers life form concept

BioHab: Raunkiaers plant life form concept from 1907 reintroduced.

Definition: Plants can be divided into 30 LFs depending on the plants adaptation to survive the most unfavourable season which is seen by the location of the plants overwintering buds.



Why Life Form's? Plant life forms express to a high degree the structure/conditions of the habitat and thereby the habitat's quality for the species assemblage.

Plant Life Forms

- Plant LF combinations will adjust to the environmental conditions → monitoring changes in LF composition should make us able to monitor the effects of climate changes and relate changes in biodiversity to changes in environment = early warning system for environmental changes.



- "Here then Plant Geography as a botanical science gives place to Plant Geography as geographical science. We shall consider vegetation as an expression of the climate, and life forms of plants as a means of determining the biological characteristics of the different climates"
(Raunkiaer 1934).

Validating and testing the BioHab methodology

- Extensive field testing due to limitations of using theoretical classifications for mapping in the field (e.g. EUNIS).
- DK contribution: testing the handbook's applicability and consistency on Danish conditions.



Distribution of main visits for field validation within the BioHab project.

Danish contribution in Taagerup

- May 2005, BioHab was applied to one of the Danish Small Biotope Monitoring Areas.
- Detailed mapping of a 1km² area using 1:5.000 ortophotos and specific recording sheets.



Field recording sheet – a simple areal example

Areal Features Observer names: Martin & Margit. Date: May 2005

| Code | Field 1 | Field 2 | Field 3 | Field 4 | Field 5 | Field 6 |
|------|--------------------------|------------------------|----------------|----------------|--------------------------------|-----------------|
| a | General Habitat Category | Global/ Env. Qualifier | Site Qualifier | Man. Qualifier | Life form/Species | Pan Europ class |
| A | HER/LHE | 5.3 | 106 | 402 | LHE 60 Taraxacum officinale 80 | EUNIS - E2.7 |

HER/LHE: Herbaceous Leafy Hemicryptophytes (herbs/forbs)

5.3: Moisture regime: Mesic, Ellenberg values: Neutral

106: Geomorphology: Moraine

402: State management code: Abandoned (formerly agriculture which has not been used for over 3 years).

E2.7: EUNIS Habitat Classification: "Unmanaged mesic grass land"

Integration of a European perspective in NOVANA?

- SBMP + BioHab = Landscape based methodologies with the same objectives.
- BioHab also covers small biotopes + monitoring at the same scale.
 - Not difficult to adapt the SBMP to the BioHab framework!
- NOVANA is a national monitoring program that by very limited extra resources can be raised to an international level by coupling the SBMP to the registration of GHC's following the BioHab Field Handbook.
 - Ensures a common European platform for detecting changes in habitat composition.

Integration of human dimensions in NOVANA?

- SBMP + BioHab are designed to register data on management practice in agricultural landscapes. → Important to register to separate changes in plant composition induced by man, from changes due to environmental/climatic factors.
 - BioHab gives a quantitative expression of the management making statistically treatment of the data easy, but lacking explanatory power.
 - The "original" SBMP included interviews with farmers gathering explanatory data on management practice and land cover changes.

Integration of human dimensions in NOVANA?

- Integration of SBMP in NOVANA does not include the socio-economical aspects: + continuation of interviews with farmers since the 1981.
- Expected: A reduction of the explanatory power of the monitoring scheme.

Thank You