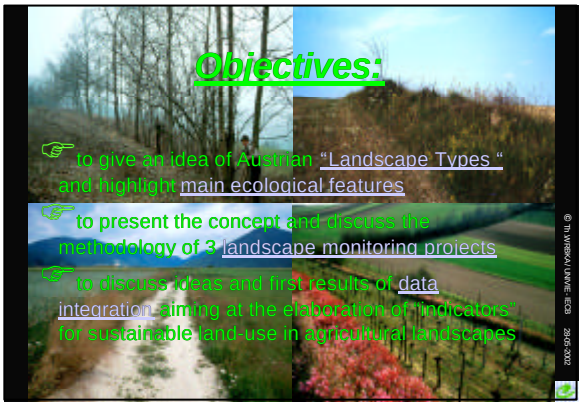

Landscape and Vegetation Monitoring in Austria
Thomas WRBKA
University of Vienna - IECB
Dept.of. Conservation Biology, Vegetation & Landscape Ecology
© Oct.2000
INSTITUT FÜR ÖKOLOGIE UND NATURSCHUTZ
DER UNIVERSITÄT WIEN

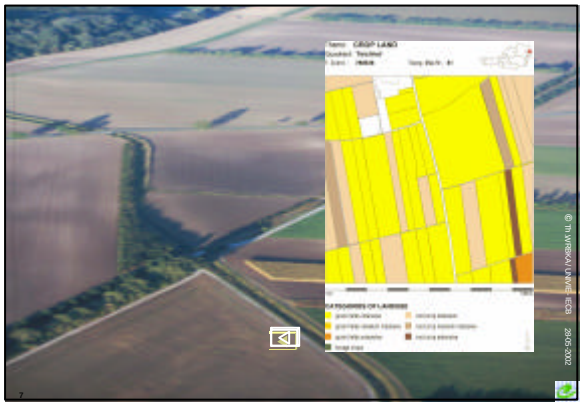

Objectives:
to give an idea of Austrian "Landscape Types " and highlight main ecological features
to present the concept and discuss the methodology of 3 landscape monitoring projects
to discuss ideas and first results of data integration aiming at the elaboration of "indicators" for sustainable land-use in agricultural landscapes

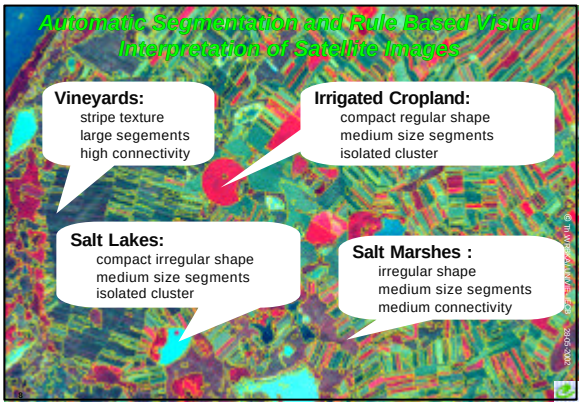

Landscape Monitoring Projects in Austria
There is no single project targeting specifically the issue of "Landscape Monitoring"
Landscape Monitoring is a "hidden agenda" in three research projects conducted by our workinggroup in cooperation with several institutions:
SINUS (1996-2000): "Landscape Structure"
BINKL (1998- 2001): "Bioindicators"
LANDLEBEN (2000- 2002): "Biodiversity assessment and Farming styles"

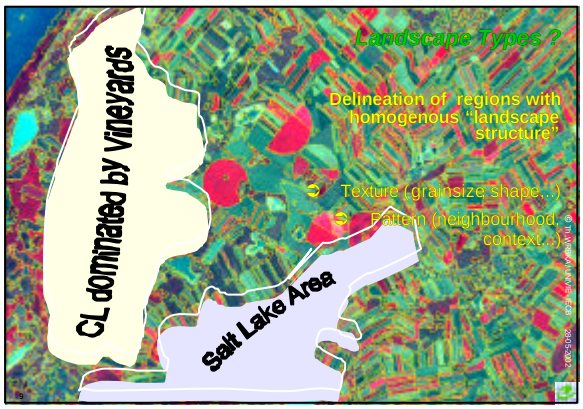

Landscapes ?
= repeated spatial pattern of landscape elements
for example:
Scattered patch landscape
Corridor dominated landscape
Network landscape
Checkerboard landscape
...Delineation of landscape types ?

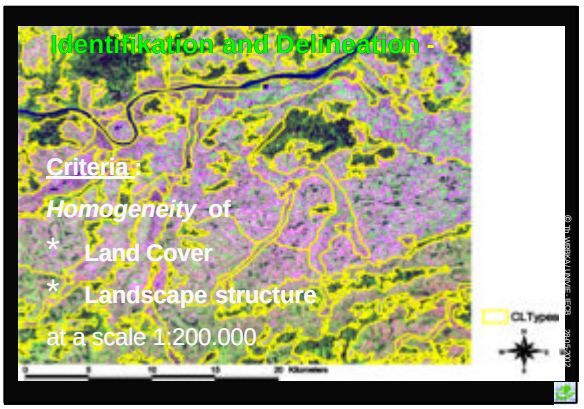

Wild River Corridor

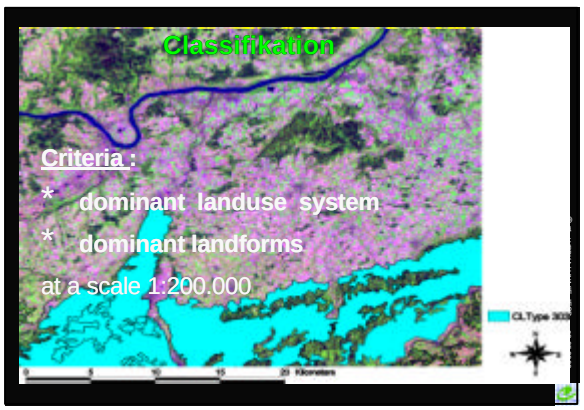


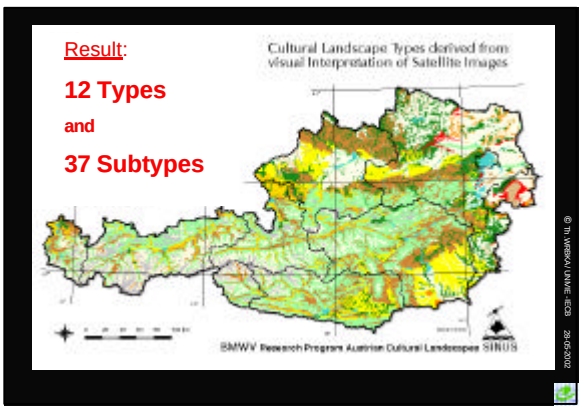


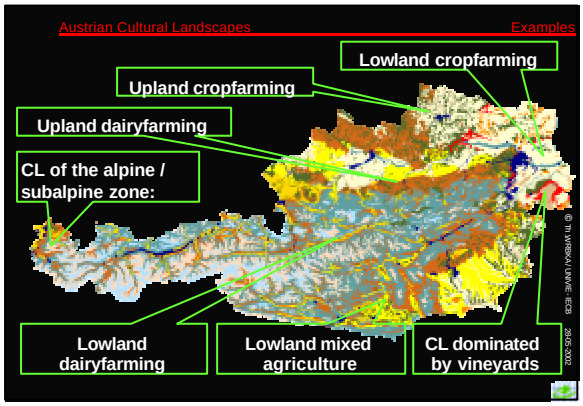

Automatic Segmentation and Rule Based Visual Interpretation of Satellite Images
Vineyards:
stripe texture
large segements
high connectivity
Irrigated Cropland:
compact regular shape
medium size segments
isolated cluster
Salt Lakes:
compact irregular shape
medium size segments
isolated cluster
Salt Marshes :
irregular shape
medium size segments
medium connectivity

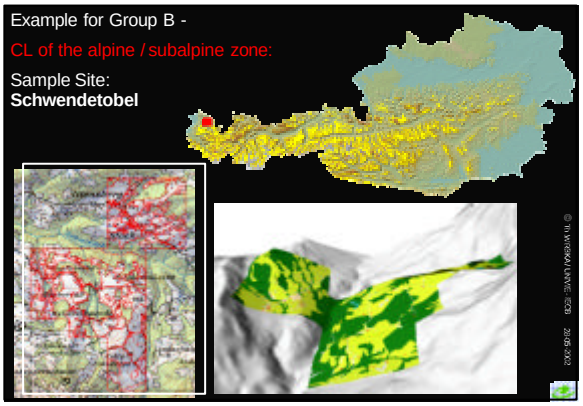

Landscape Types ?
Delineation of regions with homogenous "landscape structure"
Texture (grainsize, shape...)
Pattern (neighbourhood, context...)
CL dominated by Vineyards
Salt Lake Area

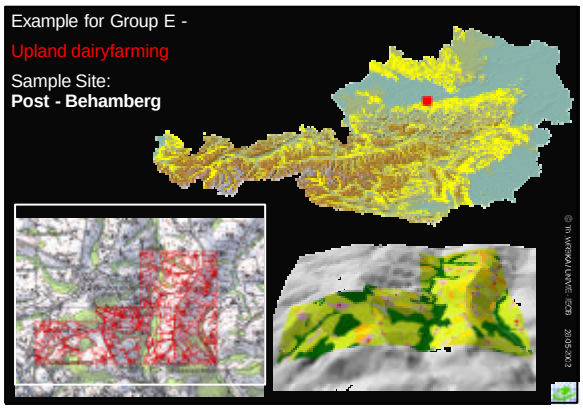

Identifikation and Delineation -
Criteria :
Homogeneity of
* Land Cover
* Landscape structure
at a scale 1:200.000
CLTypes

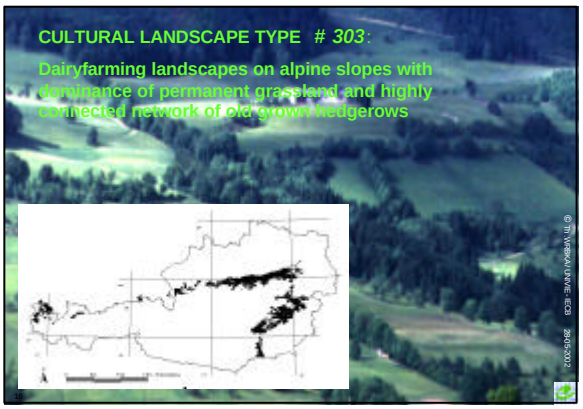

Classifikation
Criteria :
* dominant landuse system
* dominant landforms
at a scale 1:200.000

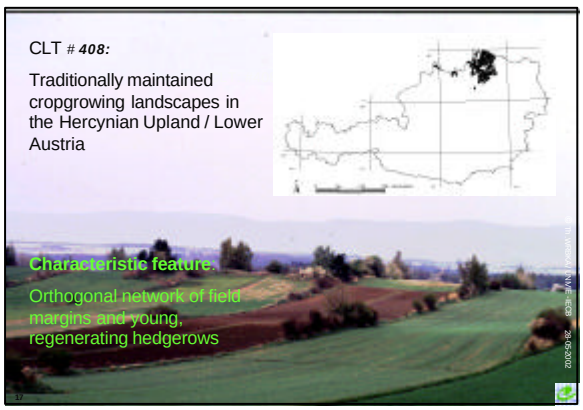

Result:
12 Types
and
37 Subtypes
Cultural Landscape Types derived from visual Interpretation of Satellite Images
BMWV Research Program Austrian Cultural Landscapes SINUS

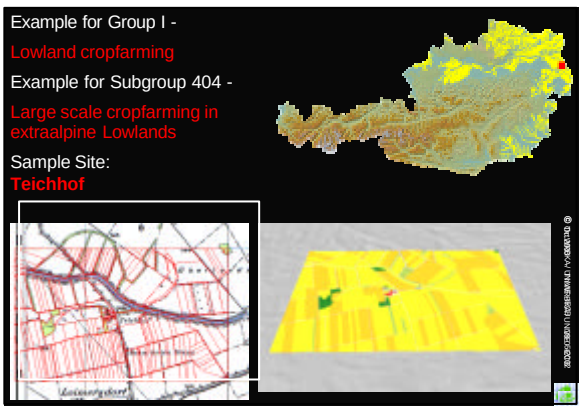

Austrian Cultural Landscapes
Examples
Lowland cropfarming
Upland cropfarming
Upland dairyfarming
CL of the alpine / subalpine zone:
Lowland dairyfarming
Lowland mixed agriculture
CL dominated by vineyards


Example for Group B -
CL of the alpine / subalpine zone:
Sample Site:
Schwendetobel


Example for Group E -
Upland dairyfarming
Sample Site:
Post - Behamberg


CULTURAL LANDSCAPE TYPE # 303:
Dairyfarming landscapes on alpine slopes with dominance of permanent grassland and highly connected network of old grown hedgerows


CLT # 408:
Traditionally maintained cropgrowing landscapes in the Hercynian Upland / Lower Austria
Characteristic feature:
Orthogonal network of field margins and young, regenerating hedgerows


Example for Group I -
Lowland cropfarming
Example for Subgroup 404 -
Large scale cropfarming in extraalpine Lowlands
Sample Site:
Teichhof

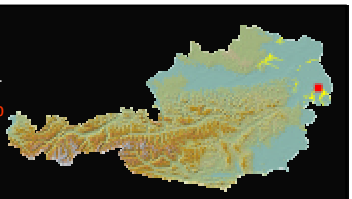
Example for Group K -

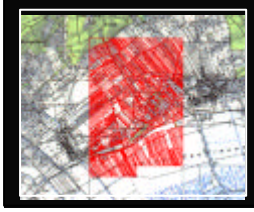
CL dominated by vineyards

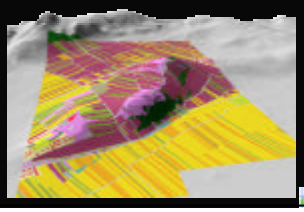
Example for Subgroup 602 -

Terraced vineyards on steep slopes

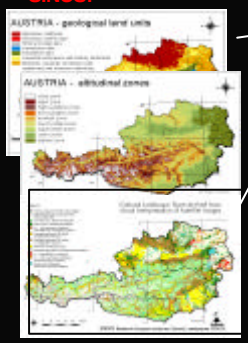
Sample Site:
Jois







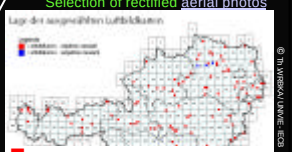
SINUS: Sampling Design



Intersection of thematic maps and stratification by isoclustering (8 classes)

Intersection of classes with topographical maps and aerial photos

Selection of rectified aerial photos



80 random (10 per stratum)

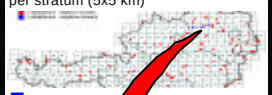
20 subjective

SINUS: Sampling Design 2

Field survey in 200 testsites (160 stratified random, 40 subjective)



80 random selected aerial photos per stratum (5x5 km)



20 subjective selected aerial photos (5x5 km)



2 paired sites per aerial photo (1x1 km)

SINUS — Data collection / Field Survey

Which Attributes ?

- Land Use
- Patch Origin Types:
  - Disturbance
  - Regeneration
  - Introduced
  - Resource
  - Remnant
- Matrix / Patch / Corridor
- Hemerobiotic State
- Species Richness

22

SINUS — Data collection / Field Survey



Land Use:

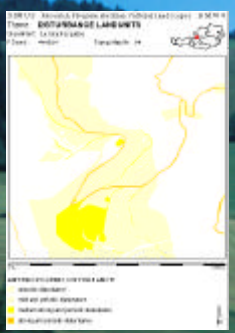
160 categories / 10 groups

Mountain Forest Ski-runs

Terraced vineyards on steep slopes

Subalpine grassland

SINUS — Data collection / Field Survey



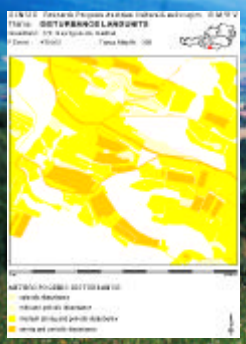
Attribute:
Anthropogenic disturbance
(ploughing, harvesting, grazing,..)

Evaluation:
Mild and periodic disturbance predominant

Landscape Type:
Subalpine Rangeland

SINUS

Data collection / Field Survey



Attribute:
Anthropogenic disturbance
(ploughing, harvesting, grazing,..)

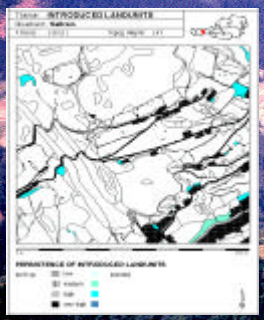
Evaluation:
Medium strong and strong periodic disturbance intermingled

Landscape Type:
Upland farming with mixed agriculture

© Th.Wrbka/U.Wolfe 2003

SINUS

Data collection / Field Survey



Attribute:
Distribution of persistant introduced landunits
(plantations, buildings, roads,..)

Evaluation:
Moderately intersected by highly persistant introduced landunits

Landscape Type:
Mountain Peasantry with moderately used permanent grassland

© Th.Wrbka/U.Wolfe 2003

SINUS

Data collection / Field Survey



Attribute:
Distribution of persistant introduced landunits
(plantations, buildings, roads,..)

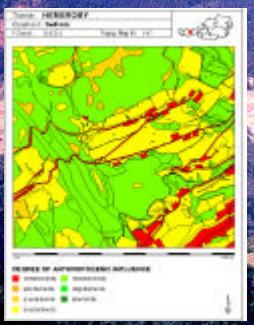
Evaluation:
Intersected by large tracts of persistant introduced landunits

Landscape Type:
Intensively used alpine pastures partly transformed to ski-runs

© Th.Wrbka/U.Wolfe 2003

SINUS

Data collection / Field Survey



Attribute:
Hemerobiotic State
(Sukopp 1972)

Overall evaluation:
Mesohemerob / influenced to Beta-euhemerob / moderately altered

Landscape Type:
Mountain Peasantry with moderately used permanent grassland

© Th.Wrbka/U.Wolfe 2003

SINUS

Data collection / Field Survey



Attribute:
Hemerobiotic State
(Sukopp 1972)

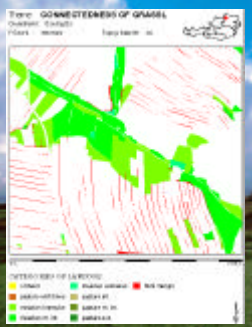
Evaluation:
Polyhemerob - strongly altered

Landscape Type:
Lowland farming with intensively used cropland

© Th.Wrbka/U.Wolfe 2003

SINUS

Data collection / Field Survey

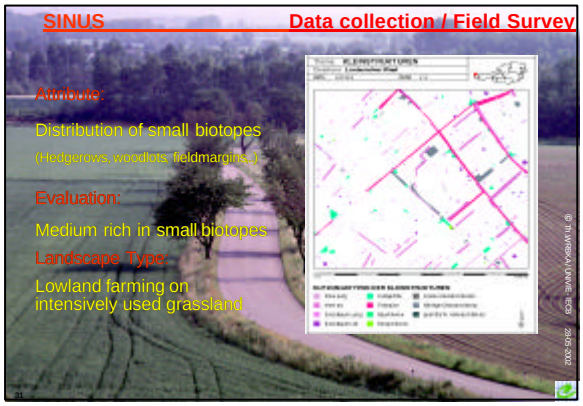


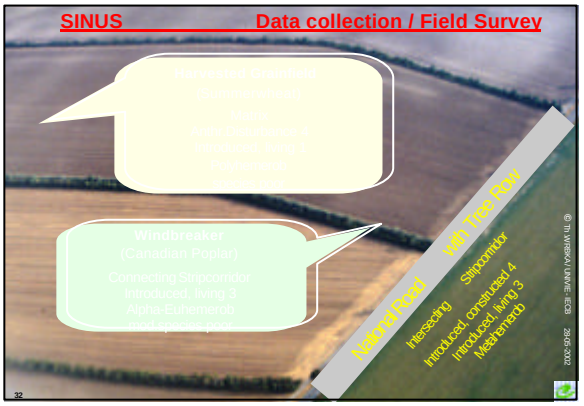
Attribute
Connectedness of grassland
(derived from land use mapping)

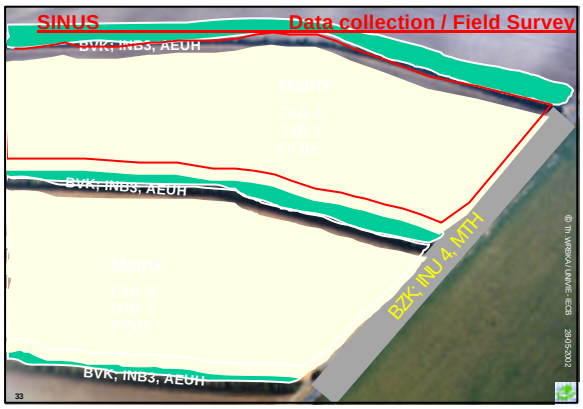
Evaluation
Corridor Density: very high
Network Circuitry: high
Size of Nodes: big

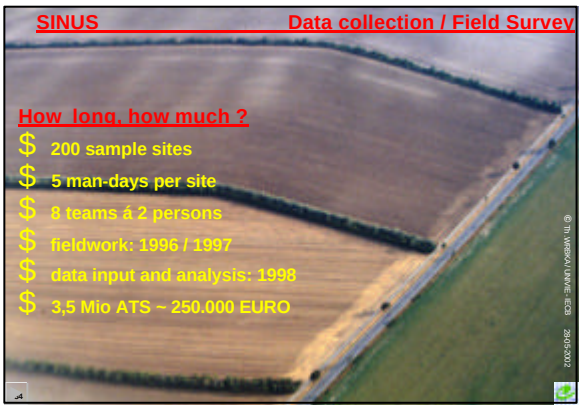
Connectedness high

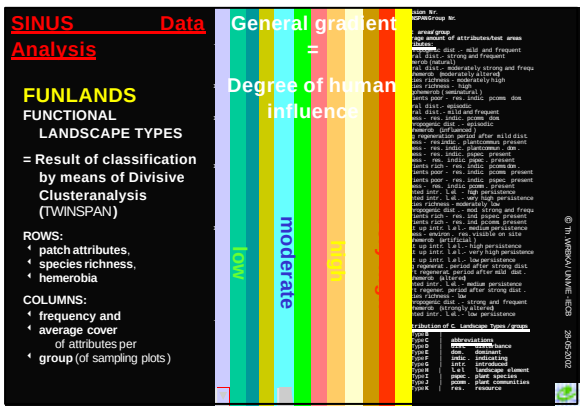
© Th.Wrbka/U.Wolfe 2003


SINUS
Data collection / Field Survey
Attribute:
Distribution of small biotopes
(Hedgerows, woodlots, fieldmargins,..)
Evaluation:
Medium rich in small biotopes
Landscape Type:
Lowland farming on
intensively used grassland


SINUS
Data collection / Field Survey
Harvested Grainfield
(Sommerweizen)
Matrix
Anthr.Disturbance 4
Introduced, living 1
Polyhemerob
Windbreaker
(Canadian Poplar)
Connecting Stripcorridor
Introduced, living 3
Alpha-Euhemerob
mod.species poor
Natural Forest
with Tree Row
Stripcorridor
Introduced, constructed 4
Introduced, living 3
Mesohemerob
Interseeding


SINUS
Data collection / Field Survey
BVK, INB3, AEUH
Matrix
BIA 4
INB 1
FOH
BVK, INB3, AEUH
BZK INU 4, MTH
Matrix
BIA 4
INB 1
FOH
BVK, INB3, AEUH


SINUS
Data collection / Field Survey
How long, how much ?
$ 200 sample sites
$ 5 man-days per site
$ 8 teams á 2 persons
$ fieldwork: 1996 / 1997
$ data input and analysis: 1998
$ 3,5 Mio ATS ~ 250.000 EURO


SINUS
Data Analysis
FUNLANDS
FUNCTIONAL
LANDSCAPE TYPES
= Result of classification by means of Divisive Clusteranalysis (TWINSPAN)
ROWS:
patch attributes,
species richness,
hemerobia
COLUMNS:
frequency and
average cover
of attributes per
group (of sampling plots)
General gradient
=
Degree of human influence
low
moderate
high


SINUS
Data analysis / Classification
FUNLAND group #1 "SNATMILD":
Seminatural, species rich landscapes with pronounced environmental resources, mild anthropogenic and considerable natural disturbance
Geoecological land units:
Alpine and subalpine plateaus, ridges and slopes
Predominant land use system:
Extensive rangeland
Predominant landscape pattern:
Scattered resource patches

SINUS Data analysis / Classification

FUNLAND group #4 INFLNADI:

Influenced, moderately species rich landscapes with moderately strong anthropogenic and considerable natural disturbance

Geoecological land units:

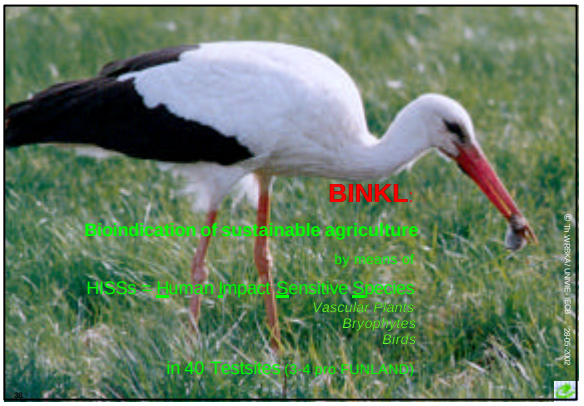
Alpine slopes and narrow valleys

Predominant land use system:

Medium intensive dairy farming

Predominant landscape pattern:

Orthogonal network of forest remnants



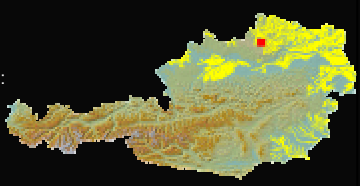
Example for Group I:

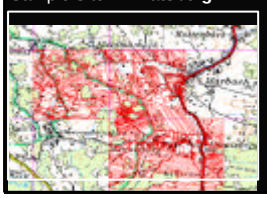
Extraalpine landscapes dominated by cropland

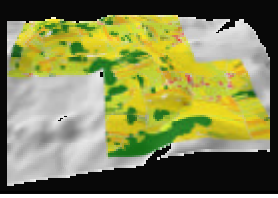
Example for Subgroup 408:

Upland agriculture with traditionally maintained cropland

Sample Site: **Annatsberg**





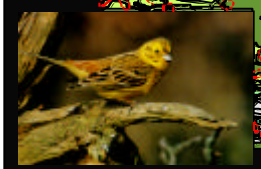


BINKL / BIRD

HISSPs
Upland Agriculture with traditionally maintained cropland

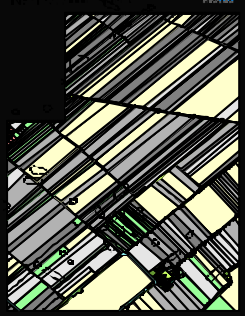


Emberiza citrinella / Yellowhammer



BINKL / BIRD

HISSPs
Lowland Agriculture with dominant cropland



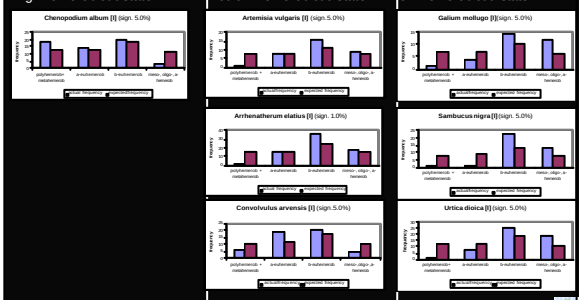


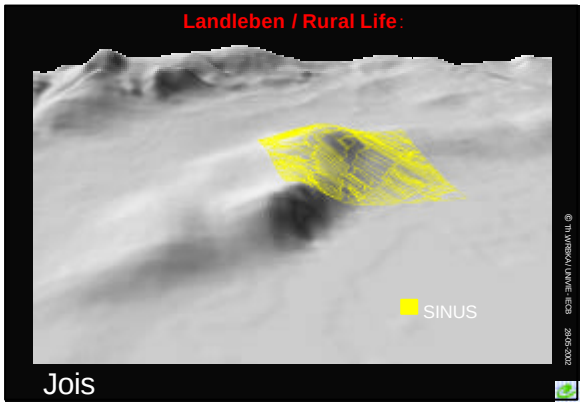
Emberiza calandra / Corn bunting

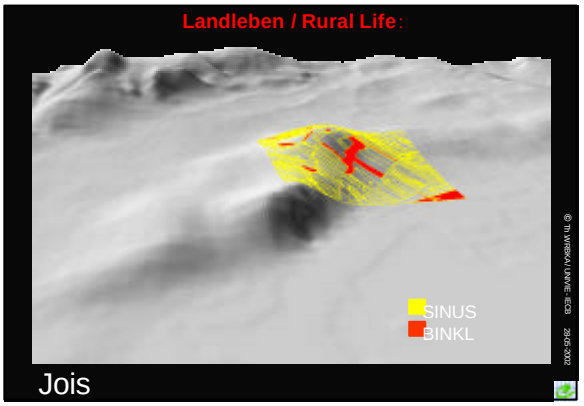
BINKL / VEG

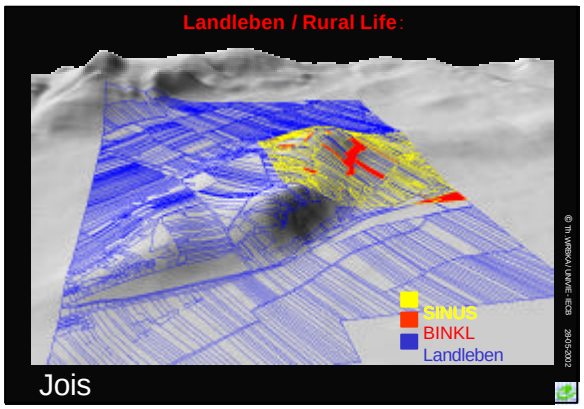
HISSPs
Lowland Agriculture with large-scale cropland

high hemerobiotic state | medium hemerobiotic state | low hemerobiotic state

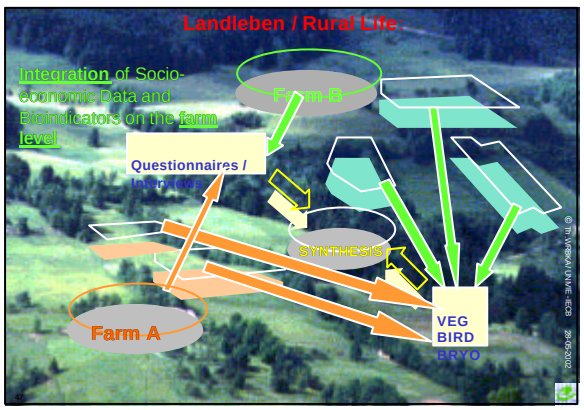


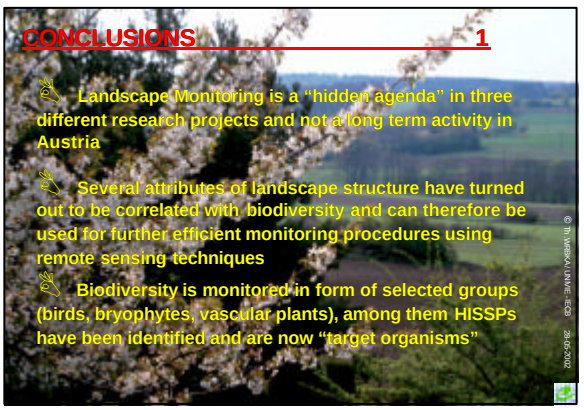

Landleben / Rural Life:
SINUS
Jois

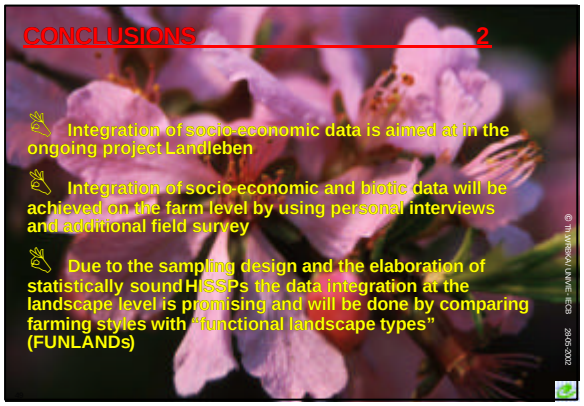

Landleben / Rural Life:
SINUS
BINKL
Jois


Landleben / Rural Life:
SINUS
BINKL
Landleben
Jois


Landleben / Rural Life:
Collection of Socio-economic Data
Interviewing of farmers (data on social and economic situation, environmental awareness,..) in selected test sites
Elaboration of farming styles
Identification of the driving forces for landscape changes


Landleben / Rural Life:
Integration of Socio-economic Data and Bioindicators on the farm level
Farm B
Questionnaires / Interviews
SYNTHESIS
Farm A
VEG
BIRD
BRYO


CONCLUSIONS 1
Landscape Monitoring is a "hidden agenda" in three different research projects and not a long term activity in Austria
Several attributes of landscape structure have turned out to be correlated with biodiversity and can therefore be used for further efficient monitoring procedures using remote sensing techniques
Biodiversity is monitored in form of selected groups (birds, bryophytes, vascular plants), among them HISSPs have been identified and are now "target organisms"


CONCLUSIONS 2
Integration of socio-economic data is aimed at in the ongoing project Landleben
Integration of socio-economic and biotic data will be achieved on the farm level by using personal interviews and additional field survey
Due to the sampling design and the elaboration of statistically sound HSSPs the data integration at the landscape level is promising and will be done by comparing farming styles with "functional landscape types" (FUNLANDs)