



Diversity of Land Use and Land Cover

Habitat diversity and the spatial distribution of different habitats within the landscape have a crucial impact on biodiversity. Structured landscapes harbor more species, above all species in need of several adjoining habitats because they forage, raise their young, and rest in different habitat types. Hence, a habitat mosaic composed of forests, open grassland, bodies of water, etc. offers favorable conditions to most living beings. However, species depending on uniform large-area habitats are impaired by marked small-area spaces. Small-area spaces also have an adverse effect on biodiversity when they are the result of intact habitats being cut up. For this reason, the E5 indicator can only be assessed in conjunction with others, particularly Z7: Species Diversity in Landscapes, and Z8: Population Size of Common Species.

Development in Switzerland

Land cover diversity in Switzerland has slightly increased.

The following table shows the mean number of changes per square kilometer from one kind of land use or land cover to another for all of Switzerland, established with a 95% confidence interval. The situations recorded for 1985 and 1997 refer to the Swiss Land Use Statistics of 1979/85 and 1992/97 respectively.

	Situation in 1985	Situation in 1997	Changes
Switzerland	82,3 ±0,4	82,9 ±0,4	0,6 ±0,0

Reading example

Between 1985 and 1997, the mean number of changes from one type of land use to another per square kilometer increased by 0.6 units.

Comments

Diversity of land use and land cover increased only very little between 1985 and 1997, but it did so in a statistically significant manner.

A constant number of changes does not necessarily mean that the landscape concerned stayed the same. Changes in landscapes also occur when one type of land use is replaced by another. While land use diversity will not be increased by such a change, biodiversity may be positively or negatively affected just the same.

Sources

Swiss Federal Statistical Office, Swiss Land Use Statistics.

State

June 2006. The data will be updated again after the third Swiss Land Use Statistics survey has been completed. It will take place based on aerial photographs taken in the period of 2004 to 2009.

Interpretations are scheduled to be finalized by 2013.

Development in the regions

Land cover diversity has slightly increased in most regions.

The following table lists the mean number of changes per square kilometer from one kind of land use or land cover to another in Switzerland's biogeographical regions, established with a 95% confidence interval. The situations recorded for 1985 and 1997 refer to the Swiss Land Use Statistics of 1979/85 and 1992/97 respectively.

	Situation in 1985	Situation in 1997	Changes
Jura	101,7 ±0,8	102,3 ±0,8	0,6 ±0,2
Central Plateau	93,1 ±0,7	93,5 ±0,7	0,4 ±0,1
Northern Alps	85,7 ±0,8	86,8 ±0,8	1,1 ±0,1
Western Central Alps	55,1 ±1,4	55,8 ±1,4	0,7 ±0,1
Eastern Central Alps	57,0 ±1,1	57,5 ±1,1	0,5 ±0,1
Southern Alps	82,7 ±1,4	82,5 ±1,4	-0,2 ±0,2

Reading example

In 1985, types of land use per square kilometer in the Northern Alps changed 84.9 to 86.5 times on average. Twelve years later, the number of changes had risen to 86.0 to 87.6, increasing the mean diversity of land use in the Northern Alps by 1.0 to 1.2 units per square kilometer.

Comments

In most regions, diversity of land use increased only little, but in a statistically significant manner. When the Swiss Land Use Statistics were first established, there were more uniform large areas (grassland). A few years later, some of these open landscapes had taken on a more heterogeneous appearance, particularly in the Northern Alps, where a large percentage of open grassland became studded with shrubbery or new buildings and roads. Closed forest areas have partially been dispersed as well, which added to land use diversity. On the Central Plateau, settlements advanced further, parceling out formerly cohesive agricultural areas (see also indicator E2).

However, diversity of land use and land cover in the Southern Alps has slightly decreased. Already densely forested in 1985, this region continued to succumb to forestation.

Mean land use diversity varies from one region to another. It is highest in the Jura and lowest in the Central Alps. For one thing, the Central Alps encompass large areas uniformly covered by either rock or glaciers. Furthermore, due to climatic reasons, the number of possible types of land cover decreases as the altitude increases. Once a certain altitude is reached, for example, agricultural use is no longer possible, and trees cannot grow.

Sources

Swiss Federal Statistical Office, Swiss Land Use Statistics.

State

June 2006. The data will be updated again after the third Swiss Land Use Statistics survey has been completed. It will take place based on aerial photographs taken in the period of 2004 to 2009.

Interpretations are scheduled to be finalized by 2013.

Significance for biodiversity

The spatial distribution of habitats within the landscape affects biodiversity. Richly structured landscapes offer more habitats than monotonous environments, which in turn makes them suitable for a larger number of species. Many species depend on landscape diversity because they forage, rest, breed, and raise their young in different habitats. The black grouse, for example, forages in the undergrowth of clear forests, but needs open areas for lekking. For this reason, a mosaic of habitats is likely to have a favorable effect on biodiversity. However, the composition of this mosaic is of vital importance. Densifying the road network creates small-area habitats as well, but since it cuts up formerly cohesive habitats first, it is bad for biodiversity. Hence, increasing the diversity of land use and land cover can have either a positive or a negative impact on biodiversity. As a result, the E5 indicator must be assessed in conjunction with other BDM indicators, particularly Z7: Species Diversity in Landscapes, and Z8: Population Size of Common Species.

Further information

Responsible for this indicator

Béatrice Nussberger, nussberger@hintermannweber.ch, +41 (0)31 312 82 72

Expert contact for Swiss Land Use Statistics: Mr. Andreas Finger, Swiss Federal Statistical Office, andreas.finger@bfs.admin.ch, +41 (0)32 713 67 04

Additional sources of information

www.bfs.admin.ch (extensive information on Swiss Land Use Statistics 1979/85, 1992/97, and 2004/09)

Definition

Change in the frequency of transitions from one type of land use to another within one square kilometer, aggregated by biogeographical region and for Switzerland as a whole.

The indicator is based on the categorization used in the Swiss Land Use Statistics of the Swiss Federal Statistical Office.

Surveying methods

The E5 indicator compares the mean number of changes in land use and land cover per square kilometer registered between 1979/85 and 1992/97 in Switzerland's biogeographical regions and the country as a whole.

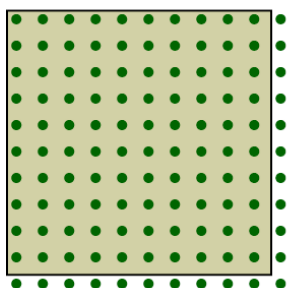
The basic data have been extracted from the Swiss Land Use Statistics 1979/85 and 1992/97 established by the Swiss Federal Statistical Office using a sampling network characterized by a 100-meter grid spacing on hectometer coordinates. This method results in 100 sampling points per square kilometer or 4.1 million sampling points all over Switzerland. Using stereoscopic air-photo interpretation, each one of these sampling points was assigned to one of the 74 use categories covered by the Swiss Land Use Statistics. BDM experts condensed these 74 use categories into 23 BDM land use categories (see list below).

Using this new categorization system, it is possible to differentiate land uses and land covers of ecologic significance. Furthermore, BDM data can now be compared to the European CORINE Land Cover system.

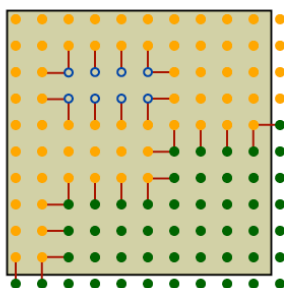
BDM land uses on sampling points are compared to land uses on neighboring points both in a horizontal (West-East) and vertical (North-South) direction. Each transition from one type of land use to another is counted, allowing for 0 to 200 changes per square kilometer.

Simplified example illustration of different land use patterns per square kilometer:

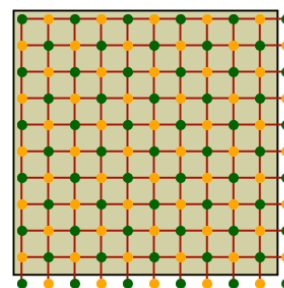
Number of land use types = 1
Number of changes = 0



Number of land use types = 3
Number of changes = 28



Number of land use types = 2
Number of changes = 200
(improbable pattern)



Types of land use:

- Closed mixed forest
- Grassland
- Standing bodies of water

— Change

List of the 23 BDM land use categories:

Predominantly urban areas
Land used by industry, commerce, or traffic
Manmade green spaces not subject to agricultural use
Arable land
Vineyards
Fruit plantations
Standard fruit tree orchards
Horticultural land
Grassland
Permanent pastures
Small woods, semi-wooded agricultural land
Closed deciduous forest
Closed mixed forest
Closed coniferous forest
Forest strips and copses
Semi-wooded land
Transitional stages between small woods and brush
Small woods on alpine pastures
Natural green spaces
Open spaces with little or no vegetation
Wetlands, littoral vegetation
Watercourses, flood barriers, and riverbanks
Standing bodies of water

These informations are based on the German document 624 320.10 Produkt E5 v1 of the 27th of september 2006.