CHANGES OF NATURAL LANDSCAPE IN THE BESKID NISKI MOUNTAINS DURING 1938-1998 AS EXEMPLIFIED BY THE ROPIANKA STREAM CATCHMENT

WOJCIECH MACIEJOWSKI

Institute of Geography and Spatial Management of the Jagiellonian University, 64 Grodzka Street, Cracow, Poland

Abstract


The author discusses landscape changes over the past 60 years in a small catchment basin of the Ropianka stream, in the south-eastern part of the Beskid Niski (Low Beskid) Mountains, in Polish Carpathians. For the chosen historical periods he reconstructs a dominating pattern of landscape, the extent of forest areas as compared with areas under cultivation, and the height of crop boundary. The author also presents relationships between historical events, man's activities and his interference with the natural environment, the rate of which affects changes in the catchment landscape. At the same time the author shows these changes in space, explains the causes, and separates stages in which the changes took place. An analysis displays diametrical transformations that had taken place in the relevant area over 1938-1998. By 1938 the landscape of the catchment was dominated by arable land (nearly 85% of the surface). At that time the upper limit of crops was reaching as high as 590 m a.s.l. in the northern part of the area. Since 1947 the former agricultural areas were included in the process of natural plant succession, which strengthened by planting actions caused the lowering of the crop boundary to 490 m a.s.l. at the beginning of the 1980s and the domination of forest areas (over 60%) in the landscape. Over 1980-1998 a decreasing tendency was marked in the surface of forest area (below 60%), chiefly in favour of meadows, pastures and parklands used for cattle grazing (40% of the area).

Introduction

The research area is situated in the south-eastern part of the Beskid Niski Mts (Carpathians) and covers 5.5 sq. km. It includes the catchment of a small stream Ropianka, right-bank tributary of the Wilsznia River (Wisłoka basin). The catchment is representative of low mountain areas, with strong migrations of population essentially affecting their number.
The bedrock of the major part of the area is built of sandstones and shales (Paleocene-Oligocene) of the Magura nappe, with insertions of thick beds of argillaceous and mottled shales. Only north-eastern margins of the area are composed of thick-bedded Oligocene sandstones (Mszanka sandstones) belonging to the Dukla unit (The Geological Map of Poland, 1967), with insertions of cherts and shales. The highest points in the catchment are two heights: Jasieniów Mt (629.1 m a.s.l.) and Krzemienna Mt (615.3 m a.s.l.), the lowest ones – the mouth region of the Ropianka stream into the Wilszna river (422.7 m a.s.l.). Height differences in the area in question reach 206.4 m. The relief of the area is marked by a clear asymmetry of slopes, this due to the tectonics of the bedrock (monoclinal dip of strata) and a varied resistance of rocks. The ridges of mountain ranges are built of resistant sandstones, while river valleys are formed on the outcrops of less resistant shales. Inclinations of south-west facing slopes range between 20 and 45 degrees, while of north-east facing slopes are most often between 6 and 15 degrees. The mountain ridges surrounding the catchment are characteristically flattened, which may be related to the foothill planation surface (Starkel, 1969). In many places slopes are dissected by permanently or periodically flowing streams with predominantly V-shaped valleys, or dingles. The Ropianka stream is accompanied by very narrow terrace shelves of; the accumulational gravel-bank, the alluvium (1-1.5 m high), and the meadow terrace (4-6 m high). On sandstone rocks acid brown soils are developed while the shaly bedrock is covered by leached brown soils (Adamczyk, Gerlach, 1983). The potential plant cover on the prevailing part of the area is composed of lower subalpine beech forests (Dentario glanulosae-Fagetum (Śwież, 1983), associated with moderately warm climatic zone covering the whole study area (Hess, 1965). Stream valleys are accompanied by mountain alder (Alnetum incanae), with black alder (Alnus incana). In many places the natural beech-fir and beech stands were replaced by artificial plantings, chiefly of spruce (Picea abies), or mixed stands with larch (Larix decidua), pine (Pinus sylvestris), and birch (Betula sp.). Transformations under way in the natural environment of the Beskid Niski Mountains have already been the subject of scientific studies. Researches relating to the functioning and the state of particular elements of the environment were carried out by Gerlach, Koszarski (1968), Klimek (1974, 1983), Hess et al. (1977), or by Lach (1975a). Complex studies in that, and the neighbouring area, were performed by Lach (1968, 1972, 1975b), who was interested in the evolution of landscape in the western part of the Beskid Niski Mts and in changes of particular elements of the natural environment, as well as by Adamczyk (1978) who studied alterations in land use and the landscape of the Carpathians over the space of the 17th-19th centuries. The premise to undertake studies in the landscape of the Ropianka catchment were both accessible records describing the character of its landscape in the past as well as the shortage of updated research papers for the area in question.
The aim and the method

The aim of the paper is a study of changes performed in the natural landscape of the relevant catchment in the period 1938-1998, establishing their direction and the degree of their intensity, explaining their causes, as well as an attempt at separating time stages in which these changes had taken place.

For establishing changes in the landscape of the Ropianka stream catchment comparative methods were applied, which confront the present-day state of the natural environment with that recorded in the accessible cartographic materials such as: the Map of the Military Geographical Institute (1: 100 000) of 1935, and the Map of the Central Office of Geodesy and Cartography (1: 10 000), as well as written matter (Sarna, 1898; Adamczyk, 1978; Dobrowolska, 1981, and records of population censuses). In the period 1997-1998 author's own studies were performed, during which classical methods of field studies were used, such as descriptions based on observations and measurements. The base-map was a map at a scale 1: 10 000. The scope of research included among other things: compilation of an updated map of land use followed by a plotting of patches representing new felling sites, finding and mapping traces of the old pattern of land use (old terraces and field gravel-mound, foundations of delapidated buildings), as well as establishing the present-day boundary of cultivation. Interviews were also carried out with inhabitants of the village Ropianka; also valuable were author's landscape observations carried on nearly annually since 1983. The results of the field studies were then compared with accessible materials, basing the analysis on maps in the scale of 1: 25 000.

Results

By 1938 the structure of the landscape of the Ropianka stream catchment was dominated by arable land (Fig. 1). The arable land covered both low and middle portions of the slopes, sometimes with angles exceeding 15-20 degrees (in many places the slope was terraced), as well as the peak reaches of ridges, which constituted fragments of planation surfaces. Meadows and pastures were then in the upper portions of slopes, and in the bottom of the Ropianka valley.

At that time arable land covered more than 40% of the catchment area, while meadows and pastures some 45% of its area. Forest areas were to be found in the form of small patches and covered slightly more than 80 ha (some 15% of the catchment area). These were represented by poorly transformed beech stands, which overgrew steep, sometimes creeping slopes with angles above 30 degrees, covered by stony rock debris. At that time the cultivation limit reached very high, up to 590 m a.s.l. in the northern part of the area in question. In the centre of the catchment there was a large village Ropianka, at that time one of the more important centres of oil extraction in the country. The oil extraction and the agricultural use (in the form of arable land) of most of the neighbouring areas was in 1938 the basis for the existence of more than 200 inhabitants of the village.

After 1947 the structure of the landscape underwent essential alterations, which was heavily affected by nearly total stoppage of man's interference with the natural environment, this caused by depopulation of the area in question. In 1944 the Battle of the Dukla Pass took place there, the result of which was the death of many inhabitants, or the loss of their property and the following departure. Three years later all the remaining inhabitants were - under the so-called "Vistula" action - compulsorily resettled into the present-day Ukraine, or other parts of Poland. The village Ropianka was completely destroyed (Fig. 2).
and at the same time oil extraction was abandoned and the existing oil wells were dismantled. On the former arable land a natural succession of vegetation was initiated. The slopes, terraced in many places, were quickly overgrown with seedlings of birch (<em>Betula sp.</em>) and black alder (<em>Alnus incana</em>). Even today it is possible to find amidst forest complexes former field terraces overgrown with beech stand with an admixture of other species; nothing surprising is also the occurrence of fruit trees in old stands. Initially the land-
scape was dominated by grassy areas (85% of the catchment area), which over time were replaced by forests successively increasing its area (Fig. 3a). The process of the natural succession of vegetation was quickest in V-shaped valleys and dingles as well as on areas in the vicinity of the existing forest complexes. The succession was not halted by the return of a small number of resettlers from Ropianka (22 persons in 1950), who after their return were living on agriculture, though on a limited scale. The basic source of their livelihood was work in state-owned plants of nearby major towns (Krosno, Dukla). It is worth to add that since 1970s a constant decrease in the number of inhabitants of the village was recorded (Fig. 3b). In 1960s an action of reforestation (chiefly spruce) was carried out, first of all on slopes above 10 degrees, the effect of which was an increase in the area of forests to more than 60% 1978 of the whole of the area in question in 1978. At that time arable land – dominating earlier the structure of the landscape – constituted as little as more than 10 ha, thus being a subsistence basis for three families (together 9 persons in 1978). The remaining part of the catchment was covered by meadows, pastures, and by specific plantings of parkland, i.e. grassy areas with many single trees, first of all pines (Pinus sylvestris), birches (Betula sp.), poplars (Populus sp.), and old fruit trees used as pastureland. Numerous in occurrence were also bushes of junipers (Juniperus sp.) and hazel (Corylus avellana). Most frequently park coppices invaded the middle portions of slopes but in places they went
down as low as the bottom of the Ropianka valley. The fourfold increase in the forest area was accompanied by a simultaneous lowering of the crop limit down to 490 m a.s.l.

Since the middle of 1980s a weak decreasing tendency in the surface of forest area has been marked. This is due to the appearance of sometimes very large felling sites, first of all of beech and alder ones, without any rational, deliberate action of planting young trees. In the
second half of 1980s felling sites were associated with oil and gas prospecting carried out in the northern part of the catchment. Over 1984–1992 an intense use of pastures and park coppices was observed, this caused by a large-scale cattle grazing linked with a period of prosperity of state-run farming establishments (PGRs) in the neighbouring locality of Mszana.

Nowadays, the structure of the landscape in the catchment of the Ropianka stream is dominated by forest areas, which cover middle and upper portions of the slopes, and also form a complex of riverine forests along the Ropianka stream and its tributaries. They cover
a little more less than 60% of the catchment area (Fig. 4). Characteristic elements of the landscape are also meadows and pastures, some 40% of the area, which most frequently take the lower portions of the slopes. It is to be mentioned that after political-economic changes of 1989 (and the relevant, slightly later collapse of state-run farming enterprises), meadows and pastures- as opposed to 1980s- are now sporadically used by two local farmers. This is usually possible where heavy machinery can reach (Fig. 5). This relates first of all to old, former field terraces on which there is an opportunity to use mechanical equipment. Total disappearance is instead observed in the landscape of grounds used as arable land, which now amount to only 3 ha (0.5% of the catchment area). Crop boundary is now at a height of 480 m a.s.l.

Conclusions

The investigations performed point out that over the past 60 years radical changes have taken place in the landscape of the Ropianka catchment, the Low Beskid Mts, these due directly to man's activities and the degree of his interference with the natural environment. The arable land, meadows, and pastures, sometimes covering terraced slopes that domi-
nated the catchment landscape in 1938, were by 1998 changed into complexes of forests separated by bushy park coppices. The reduction of the number of village Ropianka inhabitants, this caused by events of 1944 and 1947, had brought about a total breakdown of cultivation on the prevailing part of the area. The stoppage of crops had involved a start of the process of renaturalization of forest communities on former arable land. That process, initiated by a natural succession of alder and birch stands, or of coppices with juniper, was later in several places considerably accelerated by man through complex, artificial plantings of spruce and pine. The result has been a fourfold increase in forest area with a nearly complete disappearance of arable land. The effect of that was a lowering by more than 100 m of the cultivation limit. It is possible to distinguish four stages of landscape evolution in the Ropianka stream catchment:

I 1938-1947 – domination in the structure of landscape of arable land over forest areas, and the occurrence of high-lying cultivation limit

II 1947-1984 – change of domination by forest plant succession, and the lowering of cultivation limit; renaturalization of the landscape, which leads to the domination of forest areas over arable land

III 1984-1991 – halting of the increase of forest areas caused by small fellings and by intensified cattle grazing impending the process of natural plant succession on pastures; relative stabilization of cultivation limit

IV 1991-1998 – slow but visible process of the shrinkage of forest areas associated with a successive stage of increased interference of man with the natural environment.

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References


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