THE SCENIC VALUE OF ABANDONED MINING AREAS IN POLAND

URSZULA MYGA-PIĄTEK[1] – JERZY NITA[2]

[1]Department of Geoecotourism, Faculty of Earth Sciences, University of Silesia, Będzińska 60, 41-200 Sosnowiec, Poland; E-mail ump@wnoz.us.edu.pl, [2]Department of Fundamental Geology, Faculty of Earth Sciences, University of Silesia, Będzińska 60, 41-200 Sosnowiec, Poland; E-mail jnita@wnoz.us.edu.pl,

Abstract
Abandoned Polish mining areas are commonly heavily transformed so that they endanger no longer the environment. A disadvantage is that the newly created areas commonly contribute to the monotonous urban-industrial landscape, rather than providing additional value. This is partly due to legislation that hampers a more diversified management of abandoned mining areas as potentially valuable landforms. One of the legal barriers that restricts the possibilities of making these areas more attractive, regards the utilization of remaining exploitation holes (i.e. land depressions of at least 2 m deep, formed as a result of open-pit mining of energy, chemical, building or metallurgical resources) and waste heaps as important cultural and scenic elements. Such a new use of these old mining-induced phenomena is important if it is intended not only to involve the regional population in the process of exploring and exploiting the earth's resources, but also to confront them with some negative consequences of these activities, including shaping the landscape in which these objects are situated. The current attitude towards a new architecture for abandoned mining areas should be reconsidered; particularly the present-day approach based on narrow specializations – for instance of experts in mineral exploitation, spatial planning or environmental protection – should be replaced by interdisciplinary action regarding shaping the landscape of abandoned mining areas.

Keywords: urban-industrial landscape, abandoned mining areas, mineral management, environment protection, land reclamation, valuable landforms.

1. Introduction

Mineral management in Poland is subject to regulations included in the Nature Protection Act (Act of 27 April, 2001) that, among others, states that exploitation should be carried out in an economically justified way, providing rational yield and use of the minerals but applying measures to limit damage to the environment. Companies or other organizations or individuals that carry out mining activities should take the necessary steps to protect both the reserves and the environment, as well as restore the environment (and its elements) into an appropriate condition (Lipiński, 2000; Act of 27 April, 2001). Current regulations oblige mining companies to repair any damage to arable land and forests by means of land reclamation through restoring the previous condition. Reclamation should, in this context, be regarded as the total of activities aimed at restoring devastated areas for economic use to an extent that is both technically feasible and economically justified (Box, 1993, 1999). The reclamation procedures are prescribed by regulations, including the geological and mining law (Act of 3 February 1995).

Reclaimed areas can be used for a variety of purposes, most commonly forestry, agriculture, recreation and municipal activities.

The attitude that prevailed among geologists until recently was that matters of post-exploitation site management were out of their scope of interest and competence. It was believed to be an issue for ecologists and environmental protection professionals. This consequently resulted commonly in decisions about a re-shaping of the abandoned mining site that did not take into account any geological considerations.

Here, the present authors will focus on some problems that arise from legal rules that hamper a more diversified management of post-exploitation areas; in addition, the need for input from geologists and geomorphologists in the course of the complex reclamation of post-mining landscapes will be emphasized. It is advocated that geologists should participate in the many essential decisions regarding environmental shaping and protection: this becomes ever more necessary because the rate of environmental transformation is continuously increasing. One of the aspects that earth scientists should become involved in is the future utilization of the mining holes and waste dumps left after exploitation of mineral resources.

Until recently, the landforms resulting from geological/mining activities, especially those related to open-pit exploitation, were considered in terms of their risk for the environment, and they were, as a rule, regarded as negative types of landscape. Hence, when plans were made for future land reclamation, these used to imply ground leveling by refilling the holes or quarries, "dismantling" the waste heaps or re-naturalization of the mining dumps (usually by means of forestation). For the purpose, centralized regulations and ordinances exit concerning the methods, forms and stages of reclamation. Not all of the reclamation plans were effectuated, however, and post-mining forms began increasingly to develop within the anthropogenic landscape, thus affecting its specific features (Cohn et al. 2000; Jefferson, 1984; Jochimsen, 1996).

Southern Poland has been an area of intense industrialization for many decades, and this has resulted in a landscape that is now considered as a stereotype of a mining area. The results of research on selected mining objects has, in addition, largely contributed to the idea that everything related to the exploitation of natural resources is harmful to the natural environment. Such thinking cannot bring any positive effects, which is shown by the fact that, until recently, suggestions that abandoned mining sites could increase the scenic value of an area were considered unrealistic. Even any remark emphasizing the importance of mining/geological activities for geological didactics seemed irrational. Claims of some geologists that an abandoned exploitation hole or quarry is an excellent place for geological research were perceived as naive, and claims that such sites could be used for the

presentation of geological phenomena to both students and the general were not given the attention that they reserved. The common opinion was rather that boreholes and natural rock exposures offered the same - if not better - opportunities (Alexandrowicz and Urban, 2003).

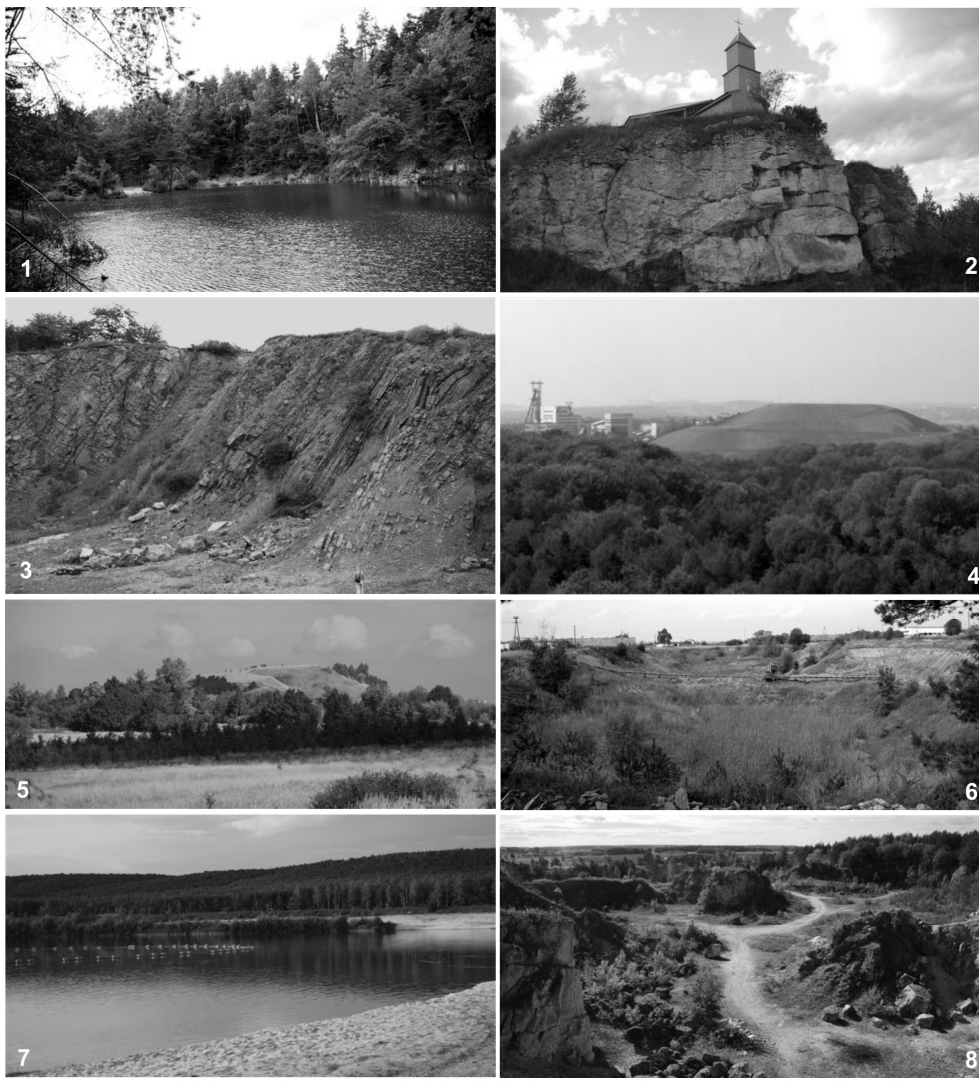
A change in attitude towards the handling of abandoned mining sites has, fortunately, developed in recent years. Open-pit mining areas become increasingly recognized as elements of the European cultural heritage, as they are so closely related to the history social development during the period of intense industrialization. This new approach towards the management of abandoned mining areas is due to the good experiences of western European countries (e.g. Great Britain, Germany, The Netherlands), where intense exploitation of minerals was finished much earlier than in Poland; even Slovakia can serve as an example (Tokarska-Guzik, 2001; Nita and Myga-Piątek, 2005, 2006).

It is now ever more commonly recognized that geological and mining objects do not have to be a threat for their surroundings after the activities have come to an end, but that they can, on the contrary, enrich the otherwise monotonous urban-industrial landscape of a mining region. This change in attitude becomes apparent in the contents of numerous studies by biologists and ecologists, the results of which show that post-mining terrains are commonly areas of great floral and faunal diversity (Tokarska-Guzik, 2001, 2003; Tokarska-Guzik et al. 2000; Woźniak, 1998). It appears even that Nature has changed many abandoned mining sites into refuges for rare and protected species. This finding has caused that institutions and offices responsible for reclamation now changed their ways of managing such areas. Such a changed approach is, fortunately, obvious in the Silesian Upland, where numerous sites are now under legal protection because of their biotic values (e.g. Łężczok, Żabie Doły, Blachówka – Silesia Region) or scenic value, such as Tarnowskie Góry. The change in the way of thinking can also be seen in actions of landscape planners, botanists and spatial planners (Aleksandrowicz and Urban, 2003).

While suggesting that mining holes and waste heaps be left as elements that enhance the landscape, it should be emphasized that each object should be treated individually. It makes, obviously, not sense to apply the same approach to areas that are dangerous for the environment and to those that create no direct danger. An individual approach implies that specific values of the surroundings should be taken into account. The earlier applied “level and re-forest” approach, which was aimed at restoring a copy of the original landscape should be given up.

An individual approach for the reclamation of abandoned sites requires experts in various fields to carry out landscape and geoenvironmental studies [photo 1-8]. These should include modeling and simulations in order to predict possible

negative effects of the envisaged reclamation plans. Computer modeling techniques for the purpose have recently become generally available. Such a timely study of potential threats is particularly important in the case of plans for renewed utilization of waste heaps and mining dumps or when the area will be made ready for tourism and recreation (Nita and Myga-Piatek 2005, 2006).



1.Barcza – quartizitic sandstons (Ordovician/Silurian); 2. Działoszyn – Zalesiaki – limestones (Jurassic); 3.Mogiłki-Kostomłoty – limestones and marls (Devonian); 4. Katowice – Murcki – coalmine dump (Carbonian); 5. Stara Huta – iron ore – siderite (Jurassic); 6. Woźniki – clay-stone – (Triassic); 7. Mosty –sand and sandpit – (Quaternary); 8. Rebielice Królewskie – limestone (Jurassic)

2. Scenic value as a factor of importance

A natural landscape owes its specific characteristics by its combination of surface features. These result from the interaction of numerous natural phenomena and processes; geological and geomorphological processes play a dominant part. If a natural landscape is affected by human activities, it acquires a cultural form; it can then be considered as a cultural landscape, although natural aspect may still play an important role. In fact, such a kind of landscape is a result of combined environmental and cultural influences, and thus has its own peculiar physiognomy (Myczkowski, 2003). The physiognomic aspect of an anthropogenically influenced landscape should not be described in material terms, but rather in visual and aesthetic ones. Whereas the value of a natural landscape should be judged on the basis of its natural features, the value of a cultural landscape deserves therefore that its physiognomy be judged also on visual and aesthetic (i.e scenic) criteria. According to both approaches (landscape ecology and landscape architecture) are not only complementary but also of equal importance.

The value of a landscape in a given area is most frequently assessed on the basis of an inventory of the elements of natural or cultural value. Such objects may become subject to protection by establishing applicable legal forms derived from current acts and regulations, e.g. the Nature Protection Act or the Cultural Property Protection Act. It is increasingly recognized that landscape management should be understood as a process of planned and organized actions with the objective of harmonious caretaking of valuable elements. It is essential for the purpose that analytic (quantitative) criteria be complemented by qualitative ones. These may include:

- landscape structure – understood as the frequency of occurrence an the type of features with a specific value;
- diversity – the variety of valuable features, taking into account their abundance and quality;
- the spatial arrangement – the position of the valuable features with respect to both one another and the surrounding area;
- background – defined by panoramas, scenic interiors and scenic axes;
- exposure – the way and direction in which any of the objects can be observed.

These features can be described by means of architectonic-landscape units, e.g. the method of Complexes of Architecture-Landscape Units, which is now commonly used in landscape architecture (Myczkowski, 2003).

Of great importance is the need for protecting valuable objects along with their surroundings in their wider scenic context. Thus, it is necessary to collect as many data about the surroundings as possible, in combination with specifics of the

natural environment. Only in this way the approach towards conscious land reclamation and management can be ascertained according to the rules of keeping compositional harmony and beauty in a condition that can meet the needs of operation (if a mining activity is still going on), technology and economy.

The Polish Nature Protection Act of 16 April, 2004 is the first to include the measures required for landscape protection (quotation: "*preserving the characteristic features of given landscape")*. The more seldom specific scenic values occur, the more valuable they are. An area is therefore the most valuable if it forms an entity that is characterized by a high diversity of rare features. A key element in the process of landscape management is therefore the inventory and caretaking of characteristic, native elements, which make the landscape different from the increasing landscape uniformity that results from globalization and unification. One of the most important aims in Poland in this context is to preserve and improve scenic values as representatives of the national, regional or local identity, taking into account current needs resulting from economic development. Following a similar approach, landscapes may become important indicators of European identities, and, indeed, landscape protection policy has already developed on a European scale.

This continent-wide development is most fortunate, as the European Spatial Development Perspective points out that systematic destruction of landscapes is taking place all over the continent. Particularly in countries of eastern and central Europe, where rapid urbanization and industrialization have had a most unfavorable effect upon landscapes, a great need exists to repair was has been destroyed and, at least, to protect what has remained (Ostrowski, 2001; Szabó et al. 2008). The post-industrial landscape should be shaped in a multi-layer manner, as the heritage of nature, agriculture, forestry, mining and processing industry. Typical landscape forms in areas of intense mining activities include various types of exploitation holes and waste heaps (most usually mining dumps) as well as objects of industrial architecture, usually from the 19th century.

3. Importance of geological and mining objects in the landscape of Poland

The over 200 years of intense surface exploitation of mineral resources in Poland have resulted in vast exploitation holes, mining dumps and waste heaps, which often have a surface are of several square kilometers [photo 1-8]. Obviously, smaller mining areas existed as well, and they were more numerous.

Underground mining in Poland has had direct impact on the morphology of an area that totals approx. 728 km^2, and has affected more indirectly an area of about 1000 km^2 (data by Central Statistical Office - for the years 2000-2002). The total

thickness of the layers exploited by underground mining reaches over 30 m, which is reflected in an average total lowering of the surface of about 20-25 m. The yearly rate of subsidence caused by deformation of the post-exploitation area is about 20 cm.

There are about 5500 sites where resources of rock and chemical minerals have been exploited. Of this number, almost 2200 were operational during the time of the most intense exploitation, i.e. 1995-1997 (Ostrowski, 2001). Exploitation mainly concerned building stone and aggregate and road stone (about 1420 open pits). Clays were exploited in about 520 open pits, sandstone in about 91 larger pits, and carbonate rocks in 63.

Transformation of the natural environment as a result of developing industrial (including mining) activities, which employ more and more advanced equipment and sophisticated technologies, brings about the creation of so-called engineering landscapes. This term is used for landforms with distinct features resulting from relief transformation and management of the ground for reasons of production, exploitation, communication, power generation, etc.

Due to a relatively fast process of creation, new mining activities initially degrade the landscape, forming "wounds" in the previous surface features. At the same time, they disturb the spatial and ecological-environmental interrelations that existed before. In the course of time, however, unique landscapes can be formed within these 'wounds'. Abandoned mining areas sometimes resemble natural environments such as a sandy desert, a tundra, cliffs or a dried lake. Present-day reclamation should therefore aim not necessarily at the neutralization of an engineering landform by planting or leveling it, but rather at a way of making it fit into the landscape, exposing the boldness of the forms and restoring the broken ecological chains and the architectural-spatial relations (Nita and Myga-Piątek, 2005, 2006).

In the Silesian Upland, for example, this would require more detailed investigations of the technical and ecological conditions of post-industrial areas (areas of hard-coal mines, both closed down and assigned for closing down, old zinc and lead mines, and processing plants located mostly in the northern part of the Upper Silesian Coal Basin –USCB - near Gliwice, Bytom, Sosnowiec, and between Rybnik and Tychy). These areas, with highly transformed surface features and polluted soils, include a vast industrial infrastructure in different states of preservation. There are objects in the USCB that affect the landscapes of the area not only in an aesthetically dubious way, but that also pose the quality of people's life at risk.

A thorough analysis regarding the quality of the biosphere, hydrosphere and anthroposphere is therefore required, just as an evaluation of the economic and material value of existing buildings and devices. Such a study should be carried out in order to select areas for industrial or social re-management and to determine which areas require partial or complete reclamation and deserve protection. One should avoid, however, to apply extreme procedural stereotypes (level all, or leave all unchanged); instead, the method of management should comply with the results of preliminary surveys and evaluations.

Many of geological/mining forms are important components of the landscape, and they may fit harmoniously in their surroundings if shaped and composed in a deliberate way. Moreover, they may be of large value, which - with appropriate accessibility, management and promotion - may attract tourists to the region. For example, mining dumps in the USCB and historical coal mines are not only valuable as historical archives, but they may also become areas of tourist attractions. At the same time, they serve as landmarks and shape the identity of a place. Various forms of utilization could be applied for them, for example related to recreation and sports (such as in the well-known cases of skiing slopes and sledge runs at Bełchatów, Bytom and Tarnowskie Góry). Areas where interesting faunal/floral relationships have been recognized should be considered for legal protection in the form of documentation sites or natural-scenic complexes [photo 1-8].

We are hereby calling for larger interest of natural scientists (and particularly geologists and geomorphologists) in order to invite their participation in complex projects on the reclamation of abandoned mining areas. They should join the actions of engineers, technicians and architects, who are already strongly involved in such activities. A joint effort might change the stereotype idea that post-mining sites are, by definition, devastated landscapes that are dangerous for the natural environment. Society has the right to know that such areas can not only have a large scenic value, but that they can also offer a variety of possibilities ranging from touristic attraction to sport-devoted areas.

4. Conclusions

On the basis of the above, the following conclusions can be drawn.

There are numerous mining/geological objects that might be integrated in the natural landscape without damage to the environment, while improving the value of the region more than could be achieved by restoration of the area into its pre-mining state.

Abandoned sites, selected through a detailed inventory and evaluation, should be kept in an unchanged state until a well-founded decision can be taken for reclamation or adaptation to a new function of spatial utilization (without restoring the initial state at any cost).

Anthropogenic landforms related to mining activities may become available natural/cultural heritage site through careful enhancement and diversification of the landscape, and through recording its economic history; they thus can become a natural laboratory for monitoring the relief-shaping and ecological processes.

Exploitation holes and waste heaps can serve as important elements in education (didactic values for school children and students).

Selected mining objects may serve tourist, recreational and sporting functions.

It is highly advisable that geologists start to convince ecologists that geological features such as rock walls, exposures in sloping rocks, ravines, boulder fields, rock falls, etc. are essential parts of a landscape, determining its quality. It is the lithology that largely determines the ecosystem. Geological forms should therefore be considered as sites of great importance for biologists (rather than merely contributing to the aesthetic value or to a setting for flora and fauna).

It is important to explain and emphasize geological values, particularly because each site is - in contrast to, for instance, each animal or plant individual - unique in appearance. Lack of recognition might easily result in the destruction or even the 'extinction' of rare geological phenomena.

Mining will remain important for the mineral industry. As Poland is predicted to construct many new highways in the nearest future, there will be growing demand for aggregate. It seems only justified not only to investigate possible new sites for exploitation of aggregate and building stone, but also to consider the reclamation activities for the post-mining stage.

The authorities should prepare laws that make geological studies and a centralized registration of larger geological/mining objects obligatory, and these should be carried out in the same way as for archeological sites.

Although coal mines are currently being closed in Poland for economic reasons, it cannot be excluded that coal prices will go up in the future. Mining dumps might then become attractive areas for easy recovery of raw material; the dumpings should therefore not be destroyed.

Stabilized mining dumps, if appropriately managed, may serve as areas for recreation and sports, education (on nature and landscape protection, geology and geomorphology), science (recording and monitoring changes in micro relief, slope processes, etc.), culture and documentation.

In case of thermally active mining dumps, it is possible to implement projects concerning heat recovery from inside them without the need for leveling them.

Abandoned mining sites are part of the public property. The local community should therefore be involved in plans for reclamation. This is sofar hardly the case in Poland.

Decisions regarding the method of reclamation of geological/mining objects should not be taken centrally, without consultation of scientists, local representatives and local residents.

Lack of knowledge of how degraded areas should be reclaimed hampers adequate action. It is still difficult to obtain reliable information from former mines, either as mining objects (State Mining Authorities) or as geological areas (Institute of Geology). Local authorities often only have some general information about exploitation holes and waste heaps, which is reflected in their spatial management plans that refer to such sites as "industrial areas" without detailing their actual condition.

In order to define practical guidelines for reclaiming areas degraded by mining, it is necessary to inventory them and to collect all possible information in an interdisciplinary database. Lacking information should be obtained through purposely started research projects. These data should form the basis of any plans for reclamation or revitalization, or should lead to the suspending of actions as long as the effects of reclamation are negative or dubious.

References

Act of 27 April (2001): on Environmental Protection

Act of 3 February (1995): on Agricultural and Forest Land Protection

Alexandrowicz, Z. – Urban, J. (2003): Management of quarries for protection of geological heritage – projects and implementation thereof, in: Shaping landscape of post-mining areas in mining industry. Resources for the International Conference, AGH, University of Science and Technology, Kraków: pp. 193-195.

Cohn, E.V. – Rostański, A. – Tokarska-Guzik, B. – Treuman, I.C. – Woźniak, G. (2000): The flora and vegetation of an old Solvay Process tip in Jaworzno (Upper Silesia, Poland). *Acta Societatis Botanicorum Poloniae* **70** (1): 47-60.

Box, J. (1993): Conservation or greening? The challenge of post-industrial landscape. *British Wildlife* **4** (5): 273-279.

Box, J. (1999): Nature conservation and post-industrial landscapes. *Industrial Archeology Review* **21** (2): 137-146.

Lipiński, A. (2000): Elements of environment law. Edition by Zakamycze (in polish)

Jefferson, R.G. (1984): Quarries and wildlife conservation in the Yorkshire Wolds. *England. Biol. Conserv*. **29**: 363-380.

Jochimsen, M. (1996): Reclamation and the botanical significance of some former mining and manufacturing sites in Britain. *Environ. Conserv*. **5**: 223-228.

Myczkowski, Z. (2003): Landscape studies and compositions of selected post-mining objects. in: Shaping landscape of post-mining areas in mining industry. Resources for the International Conference, AGH, University of Science and Technology, Kraków pp. 87-100.

Nita, J. – Myga-Piątek, U. (2005): Searching for management possibilities of post-mining areas aimed at protection of their geological and scenic values. *Exploration Technology, Geosynoptics and Geothermal Energy*, book **233**, (3): 53-72

Nita, J. – Myga-Piątek, U. (2006): Landscape directions in management of post-mining areas. *Geological Journey* **54** (3): 256-262.

Ostrowski, J. (ed). (2001): Environment protection on mining terrain. Publication of Institute for Management of Mineral Resources and Energy of Polish Academy of Sciences (PAN), Kraków.

Tokarska-Guzik, B. – Rostański, A. – Woźniak, G. (2000): Sustainable development of urban and postindustrial areas in photographs. Some examples [in]: Cohn E. et al.: Sustainable development of Industrial and urban areas. Student manual. University of Silesia Edition. Katowice.

Tokarska-Guzik, B. (2001): Environmental management of post-mining areas. In: Restoration of utility values of mining areas. *Polish Academy of Sciences*: 209-222.

Tokarska-Guzik, B. (2003): Reclamation or renaturalization? Management of post-industrial areas, in.: Shaping landscape of post-mining areas in mining industry. Resources for the International Conference, AGH, University of Science and Technology, Kraków pp. 155-171.

Szabó, Gy. – Braun, M. – Koi, R. – Szabó, Sz. – Szegedi, S. **(**2008): Environmental Impacts of an opencast mine. *Methods of landscape research. Dissertations Commission of Cultural Landscape* **8**: 113-126.

Woźniak, G. (1998): Primary succession on the sedimentation pools of coal mines (in Upper Silesia, Poland). *Phytocoenosis* **10** (9): 189-198.