



EITHER DEVIL

The human factor in Białowieża.



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There is a saying in Sweden that “sometimes one misses the forest for the trees,” and I think this is a good way of expressing the topic of this special issue. The species we will be discussing can be considered either as a devil or as a saint, and I will try to explain this. The organizers of the conference stated that its purpose is to “evaluate the scientific merit and justification of sanitary felling in protected forest areas and develop best possible recommendations for the protection of the bark-beetle-affected Białowieża Forest.” In natural resource management, various types of overhead and organizational schemes are typically presented on a neutral white background – yet it is in fact this background that is often the most interesting part. In this case,

the keynote species in the background of this contentious debate is not really the bark beetle, but in fact *homo sapiens*.

Questions about forest services

I will begin by outlining the history of forestry policy, which is what the problem largely boils down to. Such policy has evolved from single-benefit to multiple-benefit, taking into consideration the preservation of the environment. As a scientist dealing with contested issues, I try to preserve an objective perspective and not become too attached to any particular opinion. I of course do realize that Białowieża is the cradle of forestry in Poland, that many innovations have come from there and that Polish foresters are very proud of that fact.

For centuries, wood was the world’s most important natural resource. It was not until the 1980s and 90s that the priority of protecting forested areas and biodiversity began to make some inroads with respect to timber-harvesting, although much still



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remains to be done in this regard. In the future, we may perhaps see a greater balancing of economic, ecological, sociological and cultural interests, although there is still a long way to go.

For any policymaker it can be confusing when research paradigms shift. These days it has become fashionable to talk about “ecosystem services,” although this is essentially a new name for old ideas. In environmental management there are different interest groups that focus on various aspects of the landscape – some actors think about forests, others about legal regulations, others about agriculture. The term “green infrastructure” captures this, as a specially designed network of natural and semi-natural areas meant to ensure a broad range of ecosystem services while at the same time protecting biological diversity. Given the diversity of ways of managing forested areas, it is obvious that none of them is able on its own to ensure all the objectives of sustainable forest development or deliver all ecosystem services. There are many aspects to sustainable development: economic, ecological, sociological, and cultural. The model based on clear-felling systems is desirable from the economic standpoint, yielding the highest profits, and from the sociocultural standpoint, because it preserves traditional

employment in the forestry industry, but it is not good for many species of plants and animals. Natural disturbances, in turn, are disastrous from an economic standpoint yet beneficial from an ecological perspective, whereas from the sociocultural standpoint they can, for instance, create modern jobs.

Two faces of the bark beetle

Let us now consider the various ways we can look at the bark beetle. Foresters see it as a devil, as it kills trees. It poses a danger to the forest, at least as foresters perceive the forest. The solution is to cut trees that have been infected, for safety reasons or in the hope that this will stop the infestation. But is that possible? To answer that question, we have to try to see the forest, and not just the trees, so to speak. The problem needs to be viewed from a broader perspective than just that of the Białowieża Forest alone. Over the past two decades of my research work, I have visited many forest stands in Eastern Europe, because the region forms a kind of natural laboratory, with individual countries differing in terms of their history and forestry policies. The eastern EU borderland, meaning where Poland, Ukraine, and Belarus meet, is particularly interesting.

My first observation is that the Białowieża Forest and the neighboring areas are very special. Many years ago I was involved in a study comparing various forests in Europe in terms of such indicators of naturalness as quantity of deadwood, and in this sense northeastern Poland stood out distinctly from both Western European forests in Scotland, northern Italy and western Austria, and also from forests to the east, near Pskov in Russia.

Later we studied the impact of the roadway infrastructure development on the disappearance of forests, looking at Białowieża and Roztocze in Poland, Polesie on the Ukrainian-Belarusian boarder, and the Carpathians. EU accession brings roadway expansion, and roadways in turn open up access to forests. The annual rate of forest loss to harvesting is 0.29% in Białowieża, 0.35% in the Belarusian part of Polesie and 0.68% in the Ukrainian part, 0.48% in Roztocze, 0.07% in the Bieszczady Mountains, and around 0.5% in the Ukrainian and Romanian Carpathians. In Sweden, by comparison, we have very intensive forest management, with the of 1% per year. We finished this study in 2014, but since then there has been a dramatic increase in forest disappearance in certain areas, as is visible on the maps on the website Global Forest Change (<https://earthenginepartners.appspot.com>) maintained by the University of Maryland. In the Białowieża Forest, this is the result of sanitary logging in connection with the current bark beetle outbreak.

Now let us look at the bark beetle from the other perspective: as a saint. The insects cause disturbances which are a natural characteristic of forest ecosystems. Disturbances can be classified into three main groups. The first is succession, when the forest recovers after a fire or windstorm: first we have a young forest which, if it survives, may continue into old age. The second type involves what is called cohort dynamics, whereby a disturbance causes only some trees to die. A typical example of this can be found in the fires in Scots pine forests on sandy soils. Such fires are typically low-intensity, and the pines have thick bark and high treetops, thanks to which some individual trees can survive. This gives rise to a forest of trees of broad age distribution. The third type of disturbance involves gap dynamics, when a disturbance leads to treeless gaps of various size, such as those caused by the bark beetle. The resulting tree stands are characterized by a high average age, as well as highly variable age of the individual trees.

The individual types of disturbances seen in Białowieża are related to the type of soil. Areas with sandy soils see fires, windfalls and insect invasions, glaciofluvial gravel areas see low-intensity fires, while clay soil areas are affected by wind, fungi and insects. In the landscape, of course, we usually have a mixture of these three types of forest, each with its

own age distribution. Natural forests are dominated by old tree stands with large quantities of deadwood, whereas intensive forest management changes the age distribution in favor of young trees, which is not without significance for preserving biodiversity.

Studies of the Białowieża Forest have shown that only rarely have there been large fires, leading to significant successional replacement on the tree stand scale (the last one in 1811), with small, low-intensity fires being more frequent. The breakdown of the forest is shaped by a dynamic system consisting of gaps of up to several square kilometers, where renewal occurs. If a gap appears in a stand, for example due to the death of an old tree, young individuals begin to grow into it. When the treetop canopy above the gap closes, growth of young trees is impeded until another gap appears. It sometimes takes 3-5 such cycles before a young tree reaches its ultimate height.

People times four

Finally we should say a few words about the key species figuring in the conflict over the Białowieża Forest: this is of course homo sapiens. This which naturally require us to shift from forestry science to sociology. In the 1920s, Max Weber distinguished four types of human activity: rational action, taken with the purpose of achieving something; value-based action, stemming from specific beliefs (ethical, aesthetic, or religious) which are more important than the results of the action itself; emotional action, based on affect and feelings; and traditional action, based on customs and practice. Based on this classification, we can consider the ways of looking at the bark beetle outbreak problem. Rational arguments in favor of refraining from intervention are based on sustainable forest management, while value-based arguments invoke the notions of biocentrism, green infrastructure, UN sustainability goals, etc. Emotional action can be seen in groups of environmentalist, whereas traditional action appeals for the conservation of forest landscapes. As far as arguments in favor of intervention are concerned, rational action is based on sustained yield forestry, value-based action treats the forest as a natural resource and invokes the argument that the “EU should not interfere in internal Polish affairs.” Emotional action appeals to the forester ethos, while traditional action priorities the continued harnessing of forest goods.

Coming down to earth

This brings us to the international dilemma over “land-sparing” vs. “land-sharing”. The former approach means allowing forest management in some area, while setting aside and protecting some oth-

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er area. The latter approach involves trying to archive all the benefits desired by various groups in the same area.

I have spent a lot of my time studying the boreal forests of Eastern Europe. This area can be viewed as a gigantic leaf, which has a caterpillar feeding on it. This caterpillar is economic demand for wood. The leaf is very big, the caterpillar moves slowly, and the frontier of logging based on demand for shipbuilding material, which began in the United Kingdom and the Netherlands in the sixteenth century, is slowly progressing. The caterpillar has been feeding on various parts of the leaf for different amounts of time, so what we have is a kind of time machine.

To study this, we selected one hundred and twenty-five 100-square-kilometer areas in five areas – Sweden, Latvia, Belarus and Russia (the Pskov district and the Komi republic) – and looked at them from the standpoint of an investor. The main criterion was large volumes of coniferous wood close to a road. Next we “swapped glasses” and looked at the same areas from the standpoint of umbrella species of birds. Then we simply calculated how many of these different kinds of ecosystem services, favoring biodiversity vs. economic growth, are available in these areas. The results were as follows. Sweden is very good at wood production, but poor at protecting biodiversity, something that stems from our long history of harnessing forests as a natural resource. The situation is quite different in Latvia, where timber harvesting began much later, but wood exports are nevertheless an important economic factor. Then we have Belarus, the Pskov district and the Komi republic, all of which have retained biodiversity in good condition – albeit not because this was done on purpose. Our caterpillar has simply not yet gotten that far, although efforts are being made there to intensify cultivation and forest harvesting.

Getting back to Białowieża: the bark beetle outbreak problem is what is known as a “wicked” problem: one that is difficult or impossible to solve for several reasons. Firstly, our knowledge about such outbreaks is incomplete and the existing data are contradictory. Also, it is a highly interconnected problem where some actors consider aspect A to be the most important, others consider aspect B, etc. In my career I have dealt with various “wicked” problems, and I would like to highlight that there are different kinds of research. There are various disciplines of science, such as sociology, political science, ecology, geology, etc., each responsible for specific categories of problems, the solution of which may benefit various groups of stakeholders. In one approach to scientific research, known as the “ivory tower” type, the scientist is driven by curiosity to study a particular issue, an interest in further-

ing his or her own academic career, etc., but is unconcerned with what interest groups might stand to benefit. Secondly we have applied research, where a stakeholder puts forward a problem, the solution of which requires knowledge from several scientific disciplines; this is a stakeholder-driven approach. In Białowieża, in turn, we have a case of something else, something that is called transdisciplinary research: here there are many stakeholders that perceive different kinds of problems, each of which requires the engagement of different scientific disciplines. A single discipline is not enough, the knowledge of individual scientists is not enough, and only the combination of efforts can possibly yield a solution. Scientists therefore have to move out of the “comfort zone” of their own specialization and admit that there are things they have no idea about. Then they have to try to learn something new.

A good case study illustrating the problem of sustainable development was described in the book *Compass and Gyroscope* dealing with the history of the Colombia river basin in the northwestern United States. The river had numerous hydroelectric plants, irrigation projects, etc., until some people began to realize they had different needs and wanted the salmon to come back, so a major restoration project was begun. This example shows how people need to work together and interests need to be balanced. The gyroscope provides balance, but there also needs to be a compass to provide direction. Such a compass is provided by data; we need to understand what is happening. Then we can move from the sphere of policy down to the ground. But there also needs to be collaborative learning through knowledge-based dialog – not debating, not arguing with one another, but rather dialog.

Coming down to earth can also be related to what we call the landscape approach. It consists of three elements: the linking of ecological and social systems, partnerships embracing interest groups representing different sectors, and monitoring to ensure sustainable development. I think that Białowieża is an excellent place for such action. Here there is a lot of research work focused on the Forest, there is good research infrastructure, and the forest itself provides an excellent natural laboratory. However, I do not see much integration of these elements, so I would very much like to urge you to move in this crucial direction.

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This is a summary of a presentation given by Prof. Angelstam at the international conference “Managing the Bark Beetle Outbreak in the Białowieża Primeval Forest,” organized by the Polish Academy of Sciences on 4 December 2017 (preceded by a study visit to Białowieża).