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Fundacja Centrum GeoHistorii
Redakcja Studia Geohistorica
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The End of Gaps and Heathlands in French National Forests, 19th Century. A Case Study Based on Forest Management Plans

Xavier Rochel

Introduction

Gaps, heathlands and other pastures used to be very common among European woodlands¹, and their study is among the most important emerging research fields for historical geographers interested in past forest landscapes. In the State Forest of Orléans, in Central France, they covered a third of the forest in the middle of the 19th c. Foresters tried to convert them into productive forests by the sowing and planting of conifers, mainly pine (*Pinus sylvestris*, *Pinus pinaster*). This resulted into a spectacular landscape conversion which took place mainly between 1820 and 1900; such dynamics were very common in European forests at the time.

In order to reconstruct vanished forest gaps and understand forestry operations and conifer plantations, we collected all the cartographic and textual archives at our disposal from the 17th c. on. The most interesting documents were management plans dating back to the 2nd half of the 19th c. These registers offer an immense quantity of data including age and species of trees, forest gaps, forestry operations, forest drainage and such. This data was collected and analyzed through a historical GIS which helps us understand why, when, and how foresters turned a semi-open silvo-pastoral landscape into a very productive conifer forest.

In search of a geohistorical process: the end of forest gaps and heathlands

We do not only consider in this study gaps in the forest canopy as natural, ephemeral habitat patches such as those considered by ecologists when studying natural forest ecosystems and processes². The openings we are dealing with may originally be linked with natural disturbances such as windthrows, fire, or outbreaks of insects; but we also consider them as persistent, long-lasting through decades or centuries, forest traits, mainly because they were maintained, voluntarily or not, by human activities.

Wild animals were not alone in roaming and browsing through European forests in past centuries. Millions of domestic animals were left roaming, or led as small or large herds by shepherds, through most forests. Woodlands thus may be considered as important parts of agrarian landscapes and certainly not as perfectly natural spaces, evolving spontaneously apart from any human impact. In France, this activity used to be so important as to become one of the most prominent questions in forest policies: should grazing in forests be considered as a normal activity, a perfectly acceptable use of forest resources, or else an archaic, wasteful use of good lands that should be used more efficiently for timber, firewood, and charcoal production³? Whenever the grazing of domestic stock was intensive, forest gaps were created and/or enlarged, either by the sheer action of the animals, or by pastoral fires set in order to expand pasture resources⁴. In many parts of France, it is supposed that forests were heavily degraded on their borders, and their interior was crossed by many small and large openings. Heathlands and woodlands were thus combined into a complicated, ever shifting landscape pattern, even though the existence of a “wood

¹ O. Rackham, *Trees and Woodland in the British Landscape*, London 1976; *Trees, Forested Landscapes and Grazing Animals. A European Perspective on Woodlands and Grazed Treescapes*, ed. I.D. Rotherham, London 2013; F.W.M. Vera, *Grazing Ecology and Forest History*, Wallingford 2000.

² G. Peterken, *Natural Woodland. Ecology and Conservation in Northern Temperate Regions*, Cambridge 1996.

³ M. Badré, *Histoire de la forêt française*, Paris 1992; M. Chalvet, *Une histoire de la forêt*, Paris 2011.

⁴ X. Rochel, *Les anciennes fonctions forestières: conflits, compromis et partages*, in: *La forêt: ressource et patrimoine*, ed. M. Galochet, Paris 2005, pp. 155–169.

pasture” land use category was not formalized in the same way as, for instance, in Great Britain.

During the 18th and 19th c., most State foresters used to present forest grazing as a particularly archaic, destructive practice. Whenever a shepherd entered a wood, the result would inevitably be an enlargement of existing gaps: “[...] the art of the shepherd lies in knowing, using, and extending the clearings in the forest. In any forest that is repeatedly grazed, the openings will be connected first by narrow passages, then by paths, and finally by large tracks” – wrote Alphonse Mathey⁵, one of the prominent foresters on the front against pastoralism around 1900 (fig. 1). The position of the foresters may be understandable if one thinks of the large tracks of land that were theoretically wooded, and in reality used mostly as pastures. Literature gives us some rough data on the areas that were considered as gaps and heathlands inside French forests: very often, one third, or one quarter of a forest would be entirely or almost entirely devoid of trees. Even if we keep close to Paris, in regions where a centralized political authority was well maintained, the figures are very significant. We are told that one third of the Bois de Boulogne, adjacent to Paris, was mostly occupied by heath and grass in the 17th c., while at the same time almost all of the Bois de Vincennes was converted into grasslands⁶. In 1796, we are also told that the large forest of Fontainebleau had one quarter of its surface occupied by what foresters called, with evident contempt, *vides*, literally “empties” or “empty spaces”. Some forests were less impacted: in Villers-Cotterets, only one sixteenth of *vides*⁷. Are these figures true to historical reality, or do we have to read them as gross overestimations coming from foresters whose interest was in depicting a gloomy picture, in order to justify actions against pastoral activities?

Heathlands were also used as privileged places for the cutting of grass, heath, and other types of vegetation used either as fodder or material for

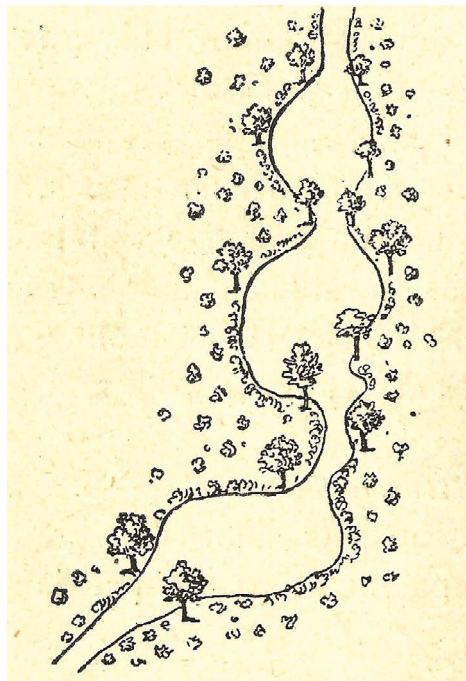


Fig. 1. The establishment and expansion of an opening in a forest under pastoral pressure, as seen by a forester in 1900.

Source: A. Mathey, “Le pâturage en forêt”, Besançon 1900

livestock bedding, and they were maintained as such by regular burning, or even uprooting of young tree saplings. But during the 19th c., agrarian and pastoral activities were progressively excluded from woodlands, especially after the implementation of a new Forestry Code in 1827, and after the distribution in all French regions of State forest engineers trained in the forestry school founded in Nancy in 1824. This belongs to a continental-wide historical process, linked to the post-Enlightenment period, when forestry and agriculture were firmly dissociated under the authority of firm, centralized States and their agents, including State foresters⁸.

In the northern half of France, the semi-open landscapes that resulted from past agropastoral activities now belong to vanished landscapes,

⁵ A. Mathey, *Le pâturage en forêt*, Besançon 1900.

⁶ J.-M. Derex, *Histoire du Bois de Boulogne*, Paris 1997.

⁷ J.-A. Bosc, J.-A. Baudrillart, *Dictionnaire de la culture des arbres et de l'aménagement des forêts*, Paris 1821.

⁸ J. Oosthoek, *Issues in European Woodland History*, in: *Australia's Ever-changing Forests*, ed. J. Dargavel, B. Libbis, Canberra 2002.

wiped out by 19th c. modernization of forest management and economy. No large forest escaped this process, and in the region there are no such places as Burnham Beeches or the New Forest that exist to be displayed as conservatories of past agropastoral landscapes. Since present-day woodlands bear no visible trace of these past realities, we need to refer to archives in order to find out what these landscapes looked like: what of woodland/pastures surfaces? What of the overall landscape pattern: a division between coppices and wood-pastures with scattered trees, like in Great Britain?⁹ Pasture patches in a woodland matrix, or the reverse? Archives may also help us to understand the social and technical aspects of this historical landscape transition from agropastoral, semi-open landscapes to forestry-oriented, monofunctional, totally wooded landscapes. 19th c. forest registers and especially management plans issued in the 2nd half of the century certainly are the best sources for such a study in the northern half of France. Before 1850, replanting schemes were still feeble, and the agropastoral landscape was still in place and fully functional. After 1900, in these well-managed State forests, gaps and heathlands were almost fully replanted, fires quelled, and domestic animals expelled. Thus the only helpful archive sources date back to this short period during which, thankfully, the very bureaucratic

state forest administration issued a very important amount of documents¹⁰.

This study belongs to a long-lasting¹¹ but until recently too scantily practiced academic tradition, for which the use of forest surveys and management plans is the main, or one of the main means by which historical geography, environmental history, or historical ecology try to understand recent evolutions in forest landscapes and ecosystems. Such studies seem to have flourished in recent years¹² but still need to be carried out in more diverse regions, and for the understanding of such varied questions as evolutions in forest composition, changes in forest stands structures, fauna management, and many more.

A case study on the national forest of Orléans

Covering a total of 35 000 ha of lowlands, about 80 km south of Paris, the State forest of Orléans is the largest single State forest in France. Forest stands are dominated by Oak (*Quercus robur* L.), as regards broad-leaved species; and Scots pine (*Pinus sylvestris* L.), as regards conifers. While oak is here a native species, Scots pine has been implanted during the last two centuries in order to restore forest stands, first in heathlands, later in ruined coppices.

The history of the forest is now quite well known, since this exemplary State forest was close to Paris and thus close to an important pool of academic researchers, who were able to dedicate themselves to the study of the social, economical, and ecological history of the site. As soon as 1892, Paul Domet published the first monograph on the history of the forest¹³. But although he and many other historians studied the site, the evolution of the local landscape during the last centuries is still somewhat unclear, since no researcher yet has had the occasion to build

⁹ O. Rackham, *Trees and Woodland. Les sources de l'histoire de l'environnement: le XIXe siècle*, ed. A. Corvol, Paris 1990.

¹⁰ G. Peterken, *The Development of Vegetation in Staverton Park, Suffolk*, "Field Studies", 3, 1969, pp. 1–39; G. Peterken, P.T. Harding, *Recent Changes in the Conservation Value of Woodlands in Rockingham Forest*, "Forestry", 47, 1974, pp. 109–128; G. Peterken, *Long-term Changes in the Woodlands of Rockingham Forest and Other Areas*, "Journal of Ecology", 64, 1976, pp. 123–146; G. Houzard, *Les massifs forestiers de Basse Normandie*, Caen 1980.

¹¹ S. Ericsson, L. Östlund, A.-L. Axelsson, *A Forest of Grazing and Logging: Deforestation and Reforestation History of a Boreal Landscape in Central Sweden*, "New Forests", 19, 2000, pp. 227–240; Y. Boucher, D. Arseneault, L. Sirois, *Logging-induces Change (1930–2002) of a Preindustrial Landscape at the Northern Range Limit of Northern Hardwoods, Eastern Canada*, "Canadian Journal of Forestry Research", 36, 2006, pp. 505–517; eidem, *Logging History (1820–2000) of a Heavily Exploited Southern Boreal Forest Landscape: Insights from Sunken Logs and Forestry Maps*, "Forest Ecology and Management", 258 (7), 2009, pp. 1359–1368; J. Brunet, A. Felton, M. Lindbladh, *From Wooded Pasture to Timber Production – Changes in a European Beech (Fagus sylvatica) Forest Landscape between 1840 and 2010*, "Scandinavian

Journal of Forest Research", 27 (3), 2012, pp. 245–254; J. Mullerova, P. Szabó, R. Hedl, *The Rise and Fall of Traditional Forest Management in Southern Moravia: a History of the Past 700 Years*, "Forest Ecology and Management", 331, 2014, pp. 104–115; eidem, *Coppice Abandonment and its Implication for Species Diversity in Forest Vegetation*, "Forest Ecology and Management", 343, 2015, pp. 88–100.

¹² P. Domet, *Histoire de la Forêt d'Orléans*, Orléans 1892.

¹³ J.-B. Plinguet, *Traité sur les réformations et aménagements des forêts, avec application à celles d'Orléans et de Montargis*, Orléans 1789.

a historical GIS that could include such information as dominant species, forestry operations, replanting, or drainage. We are told that in the 18th c., the total number of domestic animals that were granted access into the forest amounted to 17 000 cattle heads, 2500 horses, and 32 000 sheep¹⁴. We lack information on wild animals, especially large ungulates. According to a 1671 land survey, gaps and heathlands amounted to 20% of the surface of the forest¹⁵. In the middle of the 19th c., this proportion was increased to 30%¹⁶. Of course, these data have to be confirmed or corrected, and whenever possible transferred into maps and plans.

We collected all cartographical and spatially explicit archives related to the site, in order to build a historical GIS. Local archives proved to be plethora and we decided to put an emphasis on data relating to the period between 1850 and 1900. As a matter of fact, maps and plans prior to 1850 did exist, but showed none of the useful information we hoped to find. Marginal heathlands surrounding the forests were represented, but the bulk of the forest itself was shown as a large, homogeneous green area with no representation of any gap small or large. Documents posterior to 1900 showed a uniformly wooded forest where replanting had been carried out in about all degraded parts of the forest. Useful documents depicting the shape and distribution of gaps thus date back to a quite short period of time, which may be interpreted as a sign of the efficiency in forestry operations, since the replanting of gaps and heathlands took but a few decades.

Management plans issued during this period are quite monumental pieces of archives, and those made for the forest of Orléans make no exception. These were issued in 1867–1870, and then again in 1886–1889, leaving us hundreds of pages depicting forest stands and intended forestry operations. We could not use them for the whole of the forest, which might not have been very useful anyway since the forest lies in

a quite uniform topographical and edaphological context. Data was collected for the two easternmost subdivisions called the Cantonnement de Châteauneuf and Cantonnement de Lorris. This includes data related to gaps and heathlands; we know that measuring them was particularly useful for the preparation of replanting operations (ordering pine seeds or setting up tree nurseries for example). The four following maps depict, in the best approximation, what we know of gaps and heathlands in this part of the forest during what may be considered as their last decades of existence.

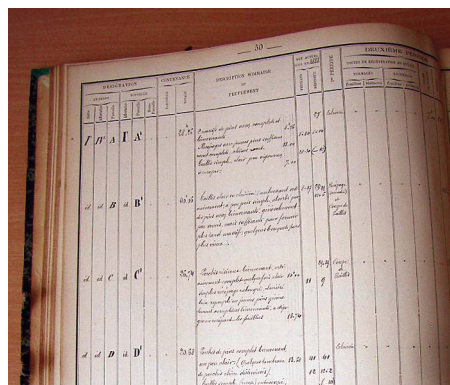


Fig. 2. The 1869 management plan of the Cantonnement de Châteauneuf.

Source: Archives Nationales, CAC 26DF 164

Results: forest gaps before their disappearance

Figure 3 shows a first set of data which we deem relevant for the understanding of the landscape pattern at the time. In the 1867–1870 management plans, foresters give an overall area of *vides*, gaps and heathlands for the whole of each cantonnement – that is, for instance, 2465 of the 7002 ha in the cantonnement de Châteauneuf (35%). The detail of their locations is not directly given: we do not know if these gaps and heathlands were gathered into a few large bulks, or scattered as small openings throughout all of the forest, or concentrated mostly on its brinks for

¹⁴ J.-B. Plinguet, *Traité sur les réformations et aménagements des forêts, avec application à celles d'Orléans et de Montargis*, Orléans 1789.

¹⁵ J.-A. Bosc, J.-A. Baudrillard, *Dictionnaire*.

¹⁶ P. Domet, *Histoire*.

example. But we have one useful information: the location of pine plantations. We know that they were made firstly in the most open parts of the forest; thus mapping pine plantations, using simultaneously registers and forest maps, is indirectly a way of mapping a part of our heathlands, that part that had been already planted with conifers in 1867–1870. One may easily understand the possible biases in this approach: we do not know exactly how foresters chose the sites of their first plantations: why closing this particular gap first, and not that other one? Did they start with the largest, the smallest ones? But what we already know at this stage is: 1. gaps and heathlands were quite scattered throughout the forest; 2. although they were quite widely scattered, one can identify some parts of the forest that may have been more open than others – at least, where foresters thought that a greater effort in replanting had to be made. We must add that there is no clear correlation with soil conditions, although a further study has to be carried out on the subject.

Figures 4 and 5 show the progress of pine proportions in the same areas between the two man-

agements plans of 1867–1870 and 1886–1889. The amount of conifer conversions was then at its peak. The first conifers were planted as soon as 1810, at first with *Pinus pinaster* and *Pinus sylvestris*; but most of the plantations occurred during the 2nd half of the century, mostly with *Pinus sylvestris*, especially after 1879 when a harsh winter proved fatal to most of the *Pinus pinaster*. By following the conifer plantations, we indirectly follow the closing of gaps and heathlands; and as in the previous map, we observe plantations in almost the whole of the two *cantonnements*, even though the easternmost part seems to be less massively converted into pine stands, and may be supposed to having been in a better condition (from the foresters point of view). The imperfect correlation between figures 3 and 4 is easily explained by figure 3 being based on the spatial representation of (pure) pine stands, while figure 4 is based on the proportion of pines in each stand.

Figure 6 is adapted from the 1886–1889 management plans, where, this time, foresters registered in detail the remaining *vides*, compartment by compartment, and thus enabled us to obtain a rough cartography of the last gaps and

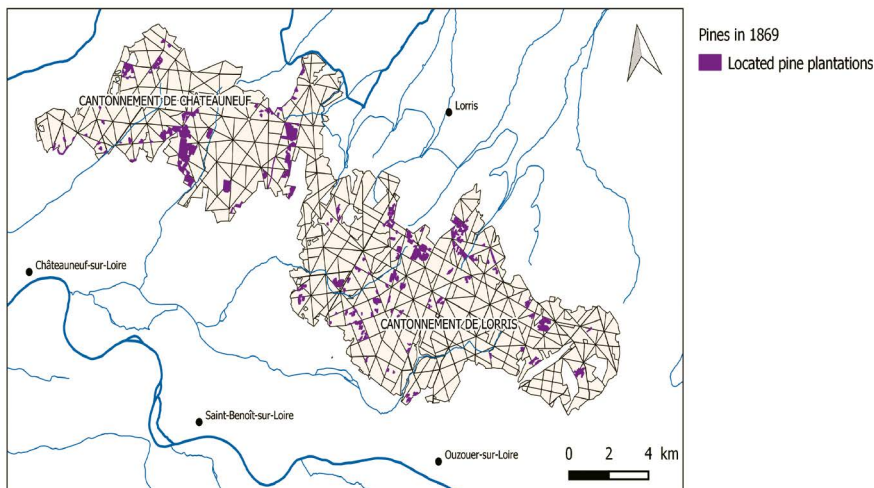


Fig. 3. The first pine plantations, as mentioned in the 1867–1870 management plans

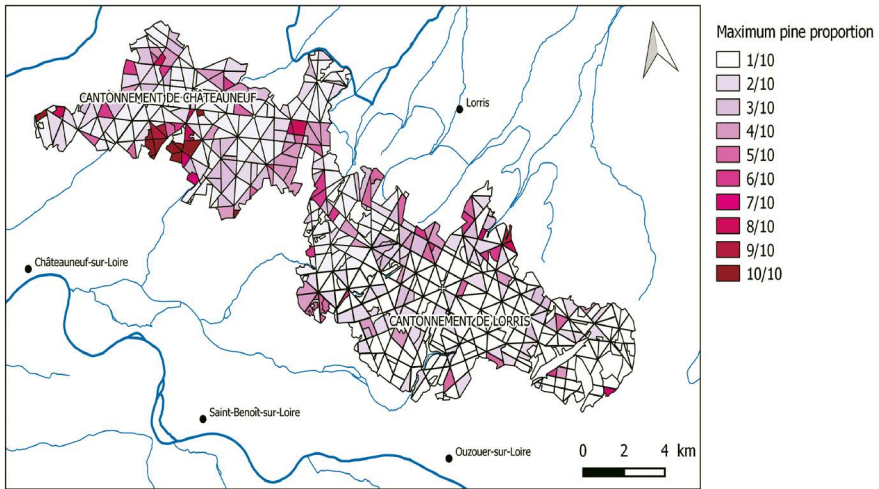


Fig. 4. The proportion of pines in forest stands, according to the 1867–1870 management plans

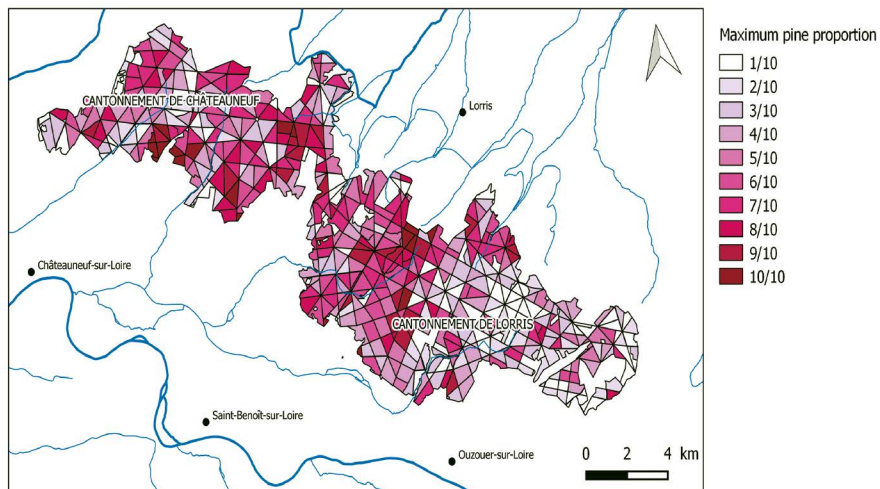


Fig. 5. The proportion of pines in forest stands according to the 1886–1889 management plans

heaths in the forest, just before they were planted in their turn. In the Cantonnement de Châteauneuf, for instance, the total of 2465 ha devoid of trees in 1867 is reduced to 1037 ha in 1889. These are the last remains of the then fast-

-disappearing pastoral landscape inside the forest. One could have anticipated a logical distribution in the forest, correlated to the proximity of villages and farms, the soil conditions, or the residence of foresters for example; but at least for

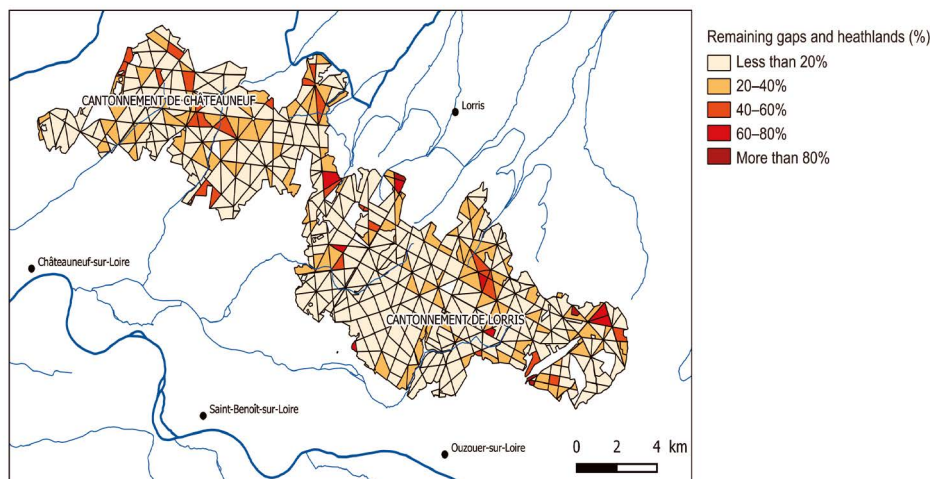


Fig. 6. The remaining gaps and heathlands in 1887–1889 (percentage of each compartment occupied by gaps and heathlands)

that period (late in the process of closing an replanting) we found no clear explanation for the observed distribution. Further studies should be carried out on the subject.

Conclusion

Although the lack of a logical explanation for the spatial distribution of gaps and heathlands in the forest of Orléans may be considered as somewhat frustrating, this study brings nevertheless a few solid conclusions. The first one is that the archives of the 2nd half of the 19th c., and most of all the management plans issued by State forestry, indeed enable us to catch a glimpse of sylvo-pastoral landscapes before their disappearance, although the available data are sometimes incomplete, or indirect, as we have seen. The second one is that the gaps and heathlands in this particular forest were scattered as though

the landscape was dominated by a mosaic of small patches, more than an clear opposition of woodlands and pastures such as might have been observed on the other side of the British Channel. Whether this local observation can be extrapolated to most forests of the region, or if different patterns can be observed in other forests of Northern France remains to be seen. The third conclusion is that by stating that many forests were reduced to heathlands or grasslands in important proportions, for example one quarter or one third of the total surface, 17th to 19th c. foresters did not exaggerate at all. We think studies such as this one may be multiplied in order to renew the debates born with what has been called “the Vera hypothesis” and the confronting ideas regarding the management of our so-called natural heritage¹⁷. ■

¹⁷ F.W.M. Vera, *Grazing Ecology*; H.J.B. Birks, *Mind the Gap: How Open Were European Primeval Forests? “Trends in Ecology & Evolution”*, 20, 2005, p. 154–156; *Trees, Forested Landscapes*.

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Zanik polan i wrzosowisk we francuskich lasach państwowych w XIX w. Studium przypadku na podstawie planów zarządzania lasami

Streszczenie

Polany, wrzosowiska czy pastwiska były niegdyś powszechnymi elementami krajobrazu europejskich lasów. W celu ich odtworzenia oraz zrozumienia dawnej gospodarki leśnej, a także rozwoju plantacji drzew iglastych w lasach państwowych Orleanu zebrano i przeanalizowano kartograficzne i pisane źródła archiwalne z 2. poł. XIX w.

Zawierają one ogromną ilość danych, w tym dotyczące wieku i gatunków drzew, informacje o polanach, gospodarce leśnej, drenażu itd. Dane te zostały zebrane i przeanalizowane z wykorzystaniem GIS. W badaniu nieistniejących już krajobrazów i ekosystemu geografia historyczna jest niezwykle użyteczna. ■

Słowa kluczowe: geografia historyczna, las, Historical GIS, archiwa, polany, przekształcenia lasów iglastych

Keywords: historical geography, forest, Historical GIS, archives, forest gaps, conifer conversion

Xavier Rochel – lecturer, Université de Lorraine. As a historical geographer, his researches are focused on the use of archives for a better understanding of natural, semi-natural, biocultural landscapes
(e-mail: xavier.rochel@univ-lorraine.fr)