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Large Carnivore impacts

Case study: Saxony, Germany

Insight into a wolf – livestock conflict 25 years after wolf recolonization



Imprint

Produced for the EU Platform on Coexistence between People and Large Carnivores by the Platform Secretariat (adelphi consult GmbH, Istituto di Ecologia Applicata, IEA, and Callisto) as part of the services provided to DG Environment for Service Contract 09.0201/2023/907799/SER/ENV.D.3. The report does not necessarily reflect the official view of the European Commission.

Suggested Citation: Reinhardt, I and Kluth, G (2024). Large Carnivore impacts, Case study: Saxony, Germany. Insight into a wolf – livestock conflict 25 years after wolf recolonization. EU Platform for the Coexistence of People and Large Carnivores, Berlin: adelphi consult GmbH

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Photo credits: Michael Hamann

Status: 2024

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Summary

Saxony is a federal state in the very east of Germany. It was the first state recolonized by wolves after they were eradicated more than a century ago. It covers an area of 18,420 km² and is home to more than 4 million people. The average population density is state wide 221 inhabitants per km², while in the rural counties the population density varies between 99 and 180 per km². Since 2000, Saxony's economy has grown by 30.3%. The unemployment rate amounts to 6.5 %. The majority of people are blue- or white-collar workers, only 1.3 % of employees are working in agriculture or forestry. The south of Saxony extends over several low mountain ranges, while the north and east are predominantly flat. Forest covers about 28.3 %, but is unevenly distributed over the area.

The wolf returned to Saxony in 2000 when the first reproduction of wild wolves in Germany was proofed on a military training area in the very east of the state. Since then, the wolf population in Saxony grew from one to 43 packs and pairs in 2023. The distribution of the wolf population in Saxony is strongly biased. While the east of the state was rapidly repopulated by wolves, the population spreading into the western part of Saxony is much slower. The majority of wolves lives in the pine dominated lowlands of eastern Saxony. In the recent years the population growth slowed down despite large areas of suitable habitat in the south of Saxony are still unoccupied.

The livestock damages caused by wolves in Saxony were increasing over the years. Especially, in recent years the number of wolf attacks on livestock are on a strong rise contrary to the wolf population development. The livestock species mainly affected by wolf depredation is sheep while cattle are up to date only rarely attacked. Most wolf packs in Saxony do not or only rarely attack livestock. The damage caused by wolves that (more) frequently attack livestock (> 5 times per monitoring year) accounts for most of the total damage in recent years. In the monitoring year 2023/24 78 % of damages occurred in 17 % of the wolf territories. Thus, wolf damages are not evenly distributed over the area of wolf occurrence, but often cluster in damage hotspots. Compared to other causes of death, livestock killed by wolves in Saxony makes up only a very small proportion of carcasses disposed in the rendering plant. The return of the wolves coincided with an already very difficult economic situation for many sheep and goat farmers.

Saxony tries to mitigate this conflict by funding of prevention measures and offering advice on the correct implementation of these measures. All owners of sheep and goats as well as of farm deer can apply for prevention funding. For sheep and goats 100 % of the acquisition costs for electric fences and livestock guarding dogs are funded. In addition, damages caused by wolves are compensated. For sheep, goats and farm deer compensation is linked to prevention.



The rising number of wolf depredations in Saxony is a hint that simply funding of prevention measures is not enough to significantly reduce the number of attacks. In addition to financial resources, technical expertise must also be available for correct application and maintenance. At the latest when a cluster of depredation events starts to arise the functionality of prevention measures must be routinely checked. Prevention intervention units like those already successfully tested in the LIFE Wolf Alps project could provide a solution. Early reaction as soon as several depredations occur within the same wolf territory may help to prevent the development of damage hotspots. Recommendations on how to minimize the danger of flock-breakthroughs should be developed. Non-electric fences that help wolves to learn how to overcome fences should not be regarded as minimum prevention standard any more. In this context, it is important to rethink the policy of fencing against African Swine Fever. It is particularly important to strengthen the reputation and recognition of livestock owners who succeed in minimizing wolf caused damages within the wolf area. The focus in the communication should be laid on successful damage prevention and the fact that in most wolf territories only few damages occur. It is necessary that the public understands, that successful livestock protection is not only possible, but the normality.



Glossary

AfD	Alternative für Deutschland	Alternative for Germany
ASF	Afrikanische Schweinepest	African Swine Fever
BArtSchV	Bundesartenschutzverordnung	Federal Regulation for the Protection of Species
BLE	Bundesanstalt für Landwirtschaft und Ernährung	Federal Office for Agriculture and Food
BNatschG	Bundesnaturschutzgesetz	Federal Nature Conservation Act
BMEL	Bundesministerium für Ernährung und Landwirtschaft	Federal Ministry for Food and Agriculture
BMUB	Bundesministeriums für Umwelt, Naturschutz, Bau und Reaktorsicherheit	Federal Ministry for the Environment, Nature Conservation, Spatial Planning and Nuclear Safety
CDU	Christlich Demokratische Union Deutschlands	Christian Democratic Union
DBBW	Dokumentations- und Beratungsstelle des Bundes zum Thema Wolf	The Federal Documentation and Consultation Centre on Wolves
LfULG	Landesamt für Umwelt, Landwirtschaft und Geologie	Saxon State Office for the Environment, Agriculture and Geology
MCP	Minimum Convex Polygon	Minimum Convex Polygon
No.	Anzahl	number
SMG	Senckenberg Museum Görlitz	Senckenberg Museum Görlitz
SächsWolfM VO	Sächsische Wolfsmanagement Verordnung	Saxon Wolf Management Regulation



SMEKUL	Sächsisches Staatsministerium für Energie, Klimaschutz, Umwelt und Landwirtschaft	Saxon State Ministry for Energy, Climate Protection, Environment and Agriculture
SPD	Sozialdemokratische Partei Deutschlands	Social Democratic Party of Germany
TSK	Sächsische Tierseuchenkasse Anstalt des öffentlichen Rechts	Saxon Animal Diseases Fund, a public law institution
TSchNutzV	Tierschutz-Nutztierhaltungsverordnung	Order on the protection of animals and the keeping of livestock



1. Introduction

The goal of this report is to get a better understanding of the impact the return of the wolf (*Canis lupus*) has on livestock husbandry in the federal state of Saxony. Saxony was chosen as a model region from Germany because it was the first federal state to which wolves returned after more than a century of absence. The population and the Saxon authorities therefore have the longest experience of what the return of wolves to a human-dominated landscape means. In Germany Saxony played a pioneering role for setting up a wolf management based on the three pillars monitoring, damage prevention / damage assessment and public relation work.

The wolf in Germany is strongly protected according to national and international law. Germany adopted the Bern Convention in 1984 without reservations regarding the wolf. According to the Habitats Directive, the wolf is listed in Appendix II and IV. In the Federal Republic of Germany, the wolf has been strictly protected since 31st August 1980 (BArtSchV). In the German Democratic Republic, the wolf was classified as a game species, and since 1984 wolves could and were to be hunted all year round. Consequently, individuals immigrating from Poland were shot. After reunification in 1990, the wolf became a fully protected species in Germany. Today the wolf is governed by the Federal Nature Conservation Act, where it is listed as strictly protected (§44 BNatSchG 29.07.2009). The enforcement relies on the federal states. All federal states, except the city states Berlin, Hamburg, Bremen have own wolf management or action plans. These 13 regional management plans mainly deal with organization and responsibilities for wolf monitoring, damage prevention and assessment as well as how to deal with wolves behaving bold toward people. Several states, including Saxony have furthermore ratified own wolf management regulations that clarify the (lethal) removal of wolves. In recent years several federal states have made the wolf subject to state hunting law. The first state was Saxony in 2012. The subordination to hunting law does not allow any deviation from international and European law (BMUB 2015).

Wolf management in Germany including monitoring is under the jurisdiction of the federal states. Since 2016 the data collected by the states are once a year compiled on a national level within the frame of the DBBW project (the Federal Documentation and Consultation Centre on Wolves¹). This relates to monitoring data and also to data on wolf caused damages, prevention and compensation regulations within the federal states. The annual status and damage reports are available from the DBBW website². In addition, many federal states have their own wolf related websites with up-to-date information and information

¹ <https://www.dbb-wolf.de/home>

² <https://www.dbb-wolf.de/mehr/literatur-download>



material concerning their own region. The wolf information website for Saxony is: <https://www.wolf.sachsen.de/>.



Figure 1. In the initial wolf colonization area of Saxony the landscape is characterized by active and recultivated lignite opencast mines (top) and pine forest (bottom), © Ilka Reinhardt, LUPUS



2. Methods

For this report we scanned the information that is publicly available for data relevant in the context of this report. There is a great abundance of publicly available statistics regarding the human population, the economy as well as in respect to livestock numbers and husbandry, both on state and on national level. We tried to filter what might be most relevant in the frame of this report. Where information was still missing or difficult to find we asked the relevant authorities and were readily provided with answers. Data on the wolf population and wolf caused damages on livestock is regularly published in the frame of the DBBW project³. Additional information was drawn from the Saxon wolf monitoring data base or provided upon request by the relevant authorities in Saxony.



Figure 2. Wolves in Saxony live in a human dominated landscape., © top left, bottom right: Sebastian Koerner, top right, bottom left: LUPUS

³ <https://www.dbb-wolf.de/mehr/literatur-download/berichte-zu-praevention-und-nutztierschaeden>

3. People and wolves in Saxony

3.1 The study area

Saxony is a federal state in the East of Germany (Figure 3). It covers an area of 18,420 km² and is home to more than 4 million people (4,086,152 in 2022). With 221 inhabitants per km² Saxony is, besides Berlin, the most densely populated state in the east of Germany (former GDR), with 35 % of people living in the three large cities of Leipzig, Dresden and Chemnitz. In the rural counties the population density varies between 99 and 180 per km² (Statistisches Bundesamt 2023). Between 1990 (year of German reunification) and 2011 the state lost nearly 1/5 of its inhabitants. Since then, the population development stabilized⁴. The average age in Saxony is 46.8 years (Statista 2024). The per capita income was 23,536 € in 2022 (Statistisches Landesamt des Freistaates Sachsen 2024a). Since 2000, Saxony's economy has grown by 30.3% (as of March 2022), that is the second strongest economic growth of all German area states. With 508 employed persons per 1000 inhabitants Saxony has the highest employment density among the five new federal states⁵. The unemployment rate amounts to 6.5 %⁶. The majority of working people between the ages of 15 and 65 were employed in 2022. 83.4 % of men and 88.4 % of women were blue or white-collar workers. The proportions of civil servants were 3.3 % and 3.1 %, respectively. Only 1.3 % of employed people in Saxony work in agriculture, forestry or fishery⁷. The number of people employed in the agricultural sector in Saxony is decreasing over the years⁸ as it is the case in other areas of Germany.

The south of Saxony extends over several low mountain ranges, while the north and east are predominantly flat. The forest covers about 28.3 % of Saxony with a very uneven distribution. While the south and the east of the federal state are forested above the states average, the proportion of forest in the middle and the (north-)west of Saxony is below average. Agricultural areas make up 48.8 % of Saxony with the largest areas located in the middle and the (north-)western part of the state. The initial wolf recolonization area in the east of Saxony is characterized by active and recultivated lignite opencast mines and an active military training area. Pine (*Pinus silvestris*) is the predominant tree species in this area (Figure 1).

⁴ ec.europa.eu

⁵ <https://www.wirtschaft.sachsen.de/>

⁶ <https://statistik.arbeitsagentur.de/DE/Navigation/Statistiken/Statistiken-nach-Regionen/Politische-Gebietsstruktur-Nav.html;jsessionid=09CE0F15DF4618CAA64EF0009ED017E2>

⁷ <https://www.statistik.sachsen.de/html/statistischbetrachtet-erwerbsleben.html#a-43844>

⁸ <https://www.landwirtschaft.sachsen.de/arbeitskraefte-in-landwirtschaftlichen-betrieben-37243.html>



3.2 The wolf in the study area

The return of the wolf to Germany following its extinction 150 years ago started in Saxony. The first wolf pack in Germany was confirmed in 2000 on a military training area in the east of Saxony, close to the Polish border (Kluth et al. 2002, Reinhardt et al. 2019). Therefore, Saxony is the federal state in Germany with the longest experience regarding wolves. The wolf population in Saxony grew from 1 pack in 2000 to 37 packs and 6 pairs in the monitoring year 2023/24 (Figure 3). A monitoring year resembles the biological wolf year, spanning from the 1st May until the 30th April of the following calendar year. In general, the detected number of territories of the last monitoring year will slightly increase in the course of the following monitoring year when new data arrive. The numbers are then corrected. It is expected that the population in Saxony was slightly increasing during the last monitoring year, what is not yet apparent from the Figures 3C and 5.

The distribution of the wolf population in Saxony is strongly biased (Figure 3A and B). While the east of the state was rapidly repopulated by wolves, the population spreading into the western part of Saxony is much slower. The majority of wolves lives in the pine dominated lowlands of eastern Saxony (Figure 1 and 3). In the recent years the population growth slowed down despite large areas of suitable habitat in the south of Saxony are still unoccupied. In 2023 Saxony was hosting nearly one sixth of the German wolf population and the east of Saxony was the area with the highest density of wolf territories in Germany⁹ (Figure 3A).

Wolves in Germany are mainly feeding on wild ungulates which constitute more than 90 % of their diet. The main prey species is roe deer (*Capreolus capreolus*), followed by wild boar (*Sus scrofa*), red deer (*Cervus elaphus*) and fallow deer (*Dama dama*). Food composition can vary regionally depending on the species community. However, livestock makes up only less than 2 % of the biomass consumed by wolves (Wagner et al. 2012, Lippitsch et al. 2024). Most of the scats that were analysed for the diet studies of Wagner et al. (2012) and Lippitsch et al. (2024) were sampled in Saxony, therefore the feeding ecology of wolves in Saxony is well known. Roe deer is present in high densities throughout Saxony while red deer and fallow deer are not present in the whole area, but occur locally in high densities. Wild boar was present in high densities until the outbreak of African Swine Fever (ASF) in 2020. Since then, the wild boar population was drastically reduced in the east of Saxony.

Wolves in Saxony occur in a human dominated landscape. Mean wolf territory size is 312 km² MCP100 or 198 km² MCP95 and every wolf territory is fragmented by numerous streets and settlements. Telemetry data show that wolves try to avoid human encounters by strongly avoiding main roads and settlements (Reinhardt et al. submitted). Wolves first

⁹ <https://www.dbb-wolf.de/Wolfsvorkommen/territorien/karte-der-territorien>



established themselves in the east of Saxony on and around an active military training area. From here the population spread into other areas of Germany and Saxony (Reinhardt et al. 2019). After colonizing the more forested areas in the east and the north of Saxony, wolves meanwhile spread also into areas that were not predicted as suitable in a recent habitat suitability analysis (Kramer-Schadt et al. 2020).

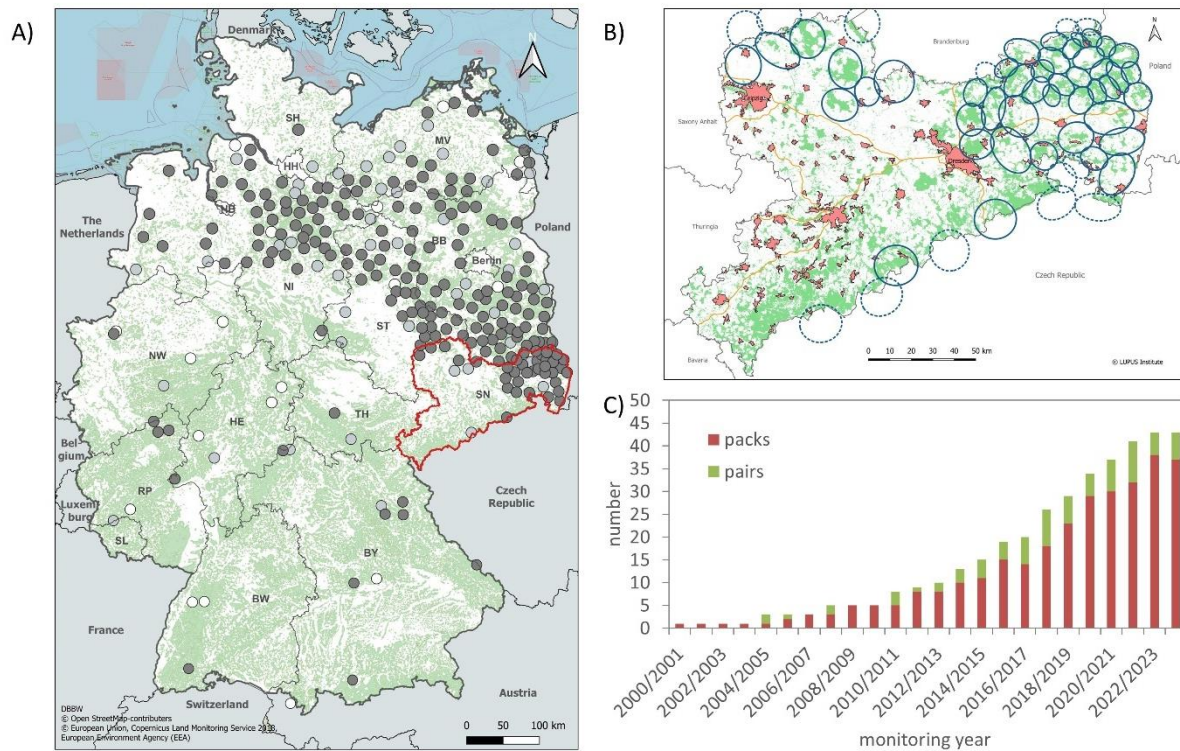


Figure 3. A) Wolf distribution in Germany in the monitoring year 2023/24. The federal state of Saxony is marked in red. B) Distribution of wolf territories in Saxony in the monitoring year 2023/24. C) Development of the wolf population (packs and pairs) in Saxony from 2000/01 to 2023/24.

3.3 Wolf management in Saxony

The Saxon State Office for the Environment, Agriculture and Geology (LfULG) is responsible for monitoring and damage assessment, environmental education and public relations. However, the decision on the use of legal authorisations for deterrence or removal and the implementation itself remains a general species protection task for the responsible lower nature conservation authorities of the districts (SächsWolfMVO 2019). The LfULG can commission contractors to carry out the tasks assigned to it, e.g. the Senckenberg Museum Görlitz / LUPUS Institute with the wolf monitoring. In addition, the LfULG has the task of promoting suitable preventive measures within the framework of the available budget funds to avoid damage to livestock by wolves. The State Directorate of Saxony is responsible for compensation in accordance with Section 40 (6) of the Saxon Nature Conservation Act (SächsWolfMVO 2019).



3.4 The social perception of wolves in Saxony

Several attitude surveys in Germany have shown that most people welcome the return of the wolf and perceive wolves as an asset (Lehnen et al. 2021). This was also true for the area initially colonized by wolves in Saxony (Kaczensky 2006, Arbieu et al. 2019). The most recent of these attitude surveys was published in 2019 showing that even 20 years after the wolf started to recover most people within the initial colonization area in Saxony had positive or neutral attitudes toward wolves. These consistent high levels of neutral or positive attitudes were linked inter alia to the public relation work done by a special state employed information office (Arbieu et al. 2019). When the wolf started to return to Saxony the public interest on this topic was immense. The Saxon state ministry for the environment and agriculture reacted to this huge information demand by establishing in 2004 the contact office “Wolf region Lusatia” (later named “Wolves in Saxony”) as a central information point about wolves in Saxony for citizens, authorities, and the media. Its goal was to deliver information about wolf biology, behaviour, distribution and livestock protection methods in an objective, factual and straightforward way. The office was responsible for answering questions from the public, organizing target-group oriented lectures and writing press releases. In addition, it was publishing newsletters and information material as well as maintaining a wolf exhibition and a website with up-to-date information about the distribution, scientific projects, livestock depredations, etc. All this raised awareness and offered easily available information. The long-lasting communication work showed that the people living in the Saxon wolf area were more factual and neutral than people in areas where wolves have newly arrived. They had a high trust in the science-based information provided by this information office (Arbieu et al. 2019). Building trust has proven as a key element in resolving conservation conflicts, including reducing fear of large carnivores (Arbieu et al. 2019).

In course of restructuring of the Saxon wolf management in 2018 the contact office was closed and its tasks have been partly transferred to the Wolf department of the Saxon State Environmental Agency (LfULG). However, the focus of the work of the Wolf Department is clearly on damage assessment and less on public relation work. This restructuring fell in a time where the public debate about the wolf became increasingly heated and polemic. While most people in the wolf region do not perceive the wolf as one of their main problems as apparent from the surveys the debate that is being conducted at the political level and in the media is often dominated by extreme and particularly loud voices. This gives a distorted picture of the actual mood of the population.

As in other countries, in Germany there is a lower level of acceptance or stronger rejection of the wolf among groups of people who hunt or keep livestock (Lehnen et al. 2021). This is not surprising as they are the ones that are mostly affected by the wolf presence. Although these groups make up a rather small percentage of the total population, they often dominate the public wolf debate. Traditionally these groups have a strong link into the politics and so we have seen in recent years - not only in Saxony - that the wolf has become more and



more of a political issue. Several public hearings in the state parliament have shown that the political debate is driven largely by emotions and claims and less based on scientific data. Meanwhile the wolf is an election issue. State elections took place in Saxony in 2024. The CDU in Saxony was always the strongest party since the German reunification and has always provided the Environmental Minister except in the last election period. In its government program 2024 - 2029 the CDU (2024) announces that the wolf population should be controlled through hunting and up to one third of the wolves may allowed to be hunted each year. On the contrary, the Green party that currently provides the Environmental and Agricultural Minister in Saxony emphasizes both nature conservation and livestock farming: "To ensure that both the wolf and livestock farming have a future in the Free State, we are developing Saxony's wolf management along the European and federal political framework." (BÜNDNIS 90/Die GRÜNEN Sachsen 2024). Similarly, the SPD (2024) states "The Saxon wolf management should continue to ensure a balanced approach between species and herd protection. We want to continue the wolf education programs and continue to finance compensation for damages and herd protection measures." The AfD (2024) has dedicated an entire subchapter to the wolf in its 2024 election manifesto: "Regulating wolf populations to protect people, grazing animals and our cultural landscape". Wolf core areas are to be established in particularly sparsely populated parts of Saxony. The result of the state election 2024 in Saxony are as follows (in percent): CDU 31.9, AfD 30.6, SPD 7.3, Grüne 5.1, Linke 4.5, BSW 11.8.

For many people, including the ones in the Saxonian wolf core area, encountering a wolf is a positive experience (Arbieu et al. 2020). However, with a reduction in public relation work, an increase in wolf caused livestock damages (chapter 4.1, 4.5) and the polarized debate in the media the previously positive attitude of many people towards the wolf is in danger of tipping over. Negative experiences with wolf attacks on livestock can have a relatively strong negative effect on attitudes (Arbieu et al. 2019). In addition, information from press or TV news was associated with more negative attitudes compared to information given by the contact office (Arbieu et al. 2019). The clear reduction in the public relation work in recent years could lead to a decrease in acceptance if the rural population feels that they are left alone with the "wolf problem".

3.5 Wolves and Tourism

As Saxony was the first federal state recolonized by wolves in Germany, there was and still is some potential for rural tourism. In the first years of occurrence there were reports of an increase in the number of booked overnight stays in guest houses in the Lusatian area in East Saxony. In the Erlichthof, a small museum village with local handicraft, restaurants and a guesthouse a permanent wolf exhibition was installed and regular excursions for



locals and tourists are offered by the office for environmental education¹⁰. The souvenir shop in the Erlichthof offers many different wolf related products like books, t-shirts and post cards. There are a few small companies that specialized on tourists interested in wolves: Wolfland Tours¹¹ offers scientifically guided tours carried out by biologists and nature guides from the region. The company collaborates with local people and thus creates opportunities and economic value for the local communities. Among other things, they collaborate with shepherds and guest houses. A nature guide, who also works for Wolfland Tours and offers environmental education in schools and for groups within the framework of the public relation work of the Wolf department (FSW) of the Saxon State Office for Environment, Agriculture and Geology (LfULG), also runs an own small business offering hiking tours for small groups in the wolf area¹². Also, the Spreecamp¹³ offers the opportunity to guide excursions with information around the wolf and other species and in addition provides accommodations close to nature. Together with another small company the Spreecamp offers also weekends and weeks around the wolf¹⁴.

The wolf triggered the wilderness school Wildniswissen¹⁵ to regularly offer tracking courses in the Lusatia area. Here the soil is sandy and offers good opportunities for animal tracking. The participants of the tracking courses live and eat in local guesthouses. Often, they later return together with their families and spend their holidays in the area.

The LUPUS institute for wolf monitoring and research¹⁶ is based in Spreewitz in east Saxony. This small scientific institute does not operate in the tourist sector, but is responsible for the wolf monitoring in Saxony and advises as part of the DBBW (<https://www.dbb-wolf.de/>) state and federal nature conservation authorities on demand on wolf related issues. Several persons are employed at LUPUS and came into the region because of the wolf. In addition, LUPUS offers together with Wildniswissen annual training courses for recognizing and documenting wolf signs for participants that are delegated by state or federal (federal forest agency) authorities in order to support the wolf monitoring.

These few companies are small and partly interlinked with each other, altogether providing less than 20 jobs. However, they may send out a sign that the wolf brings some value for the region.

¹⁰ <https://www.kreis-goerlitz.de/Beratungsstellen/Wolf.htm/02-Landkreis/Seiten/Oeffentliche-Veranstaltungen.html?>

¹¹ <https://www.wolflandtours.de/>

¹² <http://www.wolfswandern.de/>

¹³ <https://www.natur-lausitz.de/angebote/wolfstagestour/>

¹⁴ <https://natur-wildnisschule.de/spurenlesen-wahrnehmung/auf-der-spur-der-woelfe/>

¹⁵ <https://wildniswissen.de/>

¹⁶ <https://www.lupus-institut.de/>



3.6 Wolves and Biodiversity

There are no studies on how wolves may affect the biodiversity in the study area. In human dominated landscapes like in Central Europe / Germany it is extremely difficult to subtract the effect of a single species, even an apex predator, on biodiversity. The human based impact of agriculture, forestry, hunting and other recreational activities on ecosystems and single species is likely to overlay that of the wolf. In general, a more complete web of life is thought to be more resilient and healthier (e.g. Albrecht et al. 2021, Oliver et al. 2015; Vallina, S. M. and Le Quéré 2011). However, in many aspects the influence the return of single species could have may be diluted due to human activities. For instance, laypeople often believe that wild ungulates completely change their behavior in response to the wolfs return. What is forgotten is, that wild ungulates are confronted with many more human hunters in their home ranges than wolves. Therefore, deer and other species cannot solely adapt their behavior to the occurrence of wolves, but have to calibrate their behavior between food availability and the different predation risks.



4. Livestock husbandry in the study area

4.1 Livestock numbers

The number of livestock and the number of livestock farmers has decreased in Saxony since 1990 like in other areas of Germany and in Europe (Linnell and Cretois 2018). In 1990 274,195 sheep were kept in Saxony (Statistisches Landesamt des Freistaates Sachsen 2024b), 2023 this number was down to 129,594 (TSK 2024). This decrease started long before the return of the wolf and continued after 2000 regardless of whether wolves occurred in the area or not. Rather, the decline was less pronounced in the core area of the wolf population compared to other areas in Saxony (LfULG 2024). In recent years the number of sheep seem to stabilize in Saxony (Figure 4, Table 1). Similarly, the cattle population decreased by about 60 % between 1989 and 2023 with the largest decline following the years of the German reunion (Statistisches Landesamt des Freistaates Sachsen 2024c).

Table 1: Number of livestock registered with the animal health insurance fund in Saxony during the years 2018 – 2023 (TSK 2021, 2024). The figures include both, livestock kept by main and part-time farmers as well as hobby owners.

Species	2018	2019	2020	2021	2022	2023
Sheep	135,830	131,412	130,402	125,660	127,841	129,594
Goat	16,126	16,013	16,363	17,518	17,844	19,011
Cattle	480,906	472,666	457,580	449,703	439,660	431,232
Horse	32,988	33,418	34,842	35,434	36,014	36,392
Fenced game*	NA	NA	NA	NA	NA	NA

* Data on the numbers of game animals kept in agricultural farms are not available. In Saxony there are about 500 holdings of game animals with the majority keeping fallow deer. Red deer, sika deer, mouflon and wild boar are also kept for the production of game meat.



The majority of farms in Germany that keep sheep have less than 100 animals, nearly half of them less than 20 (47.8 %) and another quarter (24.6 %) less than 50 sheep (BMEL 2020). In Saxony 51 % of the sheep (66,300 out of 129,594 Table 1) were kept in 420 agricultural holdings in 2023 (Destatis 2024). We did not find figures how many of these farms had their main income from sheep. As 200 of the 420 holdings had less than 50 sheep (Destatis 2024) there are probably way less than 200 farms in Saxony that mainly earn their money from sheep. Almost half of the sheep holdings in Saxony have less than 20 sheep (out of the 129,594 registered at the TSK for 2023 only 66,300 are registered by the Statistisches Landesamt des Freistaates Sachsen, that records only sheep holdings from 20 sheep on).

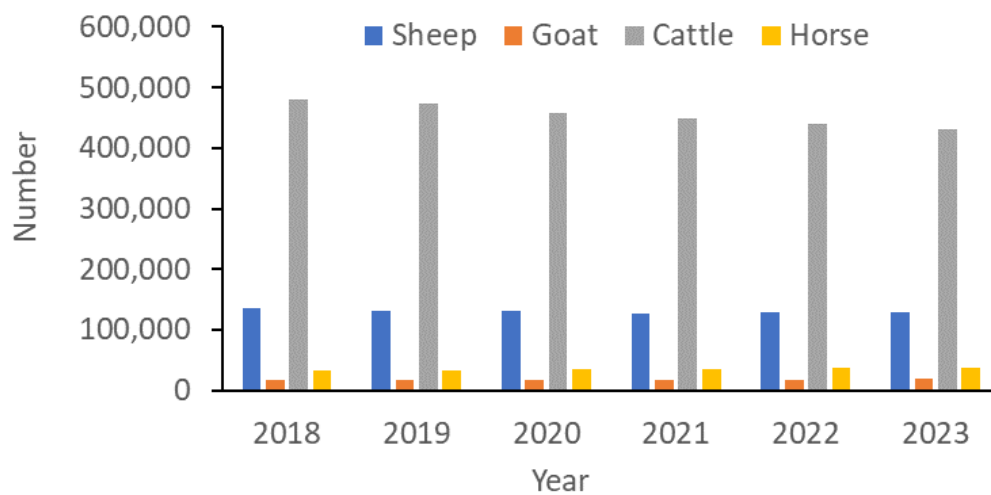


Figure 4: Number of livestock registered in Saxony (TSK 2021, 2024).

4.2 Husbandry

According to the Federal Ministry of Agriculture (BMEL) the majority of farm sheep has access to pastures¹⁷ (97 %). Contrary to sheep the majority of cattle is kept year-round in stables. In Germany only about one third of the cattle has at least part-time access to pastures¹⁸, in Saxony 27.6 % (Statistisches Landesamt des Freistaates Sachsen 2021). The return of the wolves coincided with an already very difficult economic situation for many sheep and goat farmers. The majority of income from sheep and goat farms comes from allowances and subsidies for landscape maintenance, with income from the sale of meat coming in second place; wool is hardly of any economic significance (BLE 2022).

¹⁷ <https://www.bmel-statistik.de/landwirtschaft/tierhaltung/schafhaltung>

¹⁸ <https://www.bmel-statistik.de/landwirtschaft/tierhaltung/rinderhaltung>



Wolves are the only large carnivore in Saxony. In 2024 a lynx reintroduction program started. That means in the future there might be areas where both wolves and lynx occur. Occasionally dogs kill sheep, but these are single case events as stray dogs are rare in Germany and feral dogs absent.



Figure 5. Most professional shepherds in Saxony keep their flocks behind electric sheep nets, © LUPUS



Figure 6. In addition to electric fences livestock guarding dogs are increasingly used by professional sheep farmers, © LUPUS

According to the animal welfare livestock farming ordinance (TschNutzV) livestock has to be controlled and cared for at least once a day. Most professional shepherds in Saxony keep their flocks behind electric fences, mostly electric sheep nets (Figure 5). For many years mainly 90 cm nets were in use because they are easier to handle in comparison with higher net fences. Only in recent years higher nets (105 cm) and fences with 5 electric wires are becoming more common. Livestock guarding dogs are increasingly used by professional sheep farmers in addition to electric fences (Figure 6). In general, sheep of professional sheep farmers are better protected than that of hobby sheep owners. The latter have their sheep often behind fences that keep the sheep in, but not predators out. Non-electric fences are still common among non-professional sheep owners and still regarded as “minimum protection standard” in Saxony (see Box 1¹⁹), although it is known that wolves can quickly learn to overcome non-electric fences. Often the pastures where sheep are kept for hobby are small and / or narrow not allowing the sheep sufficiently to evade an approaching

predator. In consequence, sheep often break out of the fenced pastures and then become easy prey to wolves. Most sheep of non-professional sheep owners in Saxony are kept close to villages or houses, being used as “living lawn mowers”.

¹⁹ <https://www.wolf.sachsen.de/schutz-von-nutztieren-4181.html>



Box 1: Minimum protection standard

The “minimum protection standard” is a standard that defines the minimum protection that has to be in place in order to get compensation payments in the case of a wolf attack. The “minimum protection standard” is a compromise between the effort a livestock owner must make to protect the animals and the quality of protection the measures provide against wolf attacks. The minimum protection standard varies between the federal states in Germany. In general, it is primarily defined for small livestock like sheep, goats and fenced game (mostly deer). In Saxony a 90 cm electric sheep net with a minimum voltage of 2,000 volts or a 120 cm non-electric fence meet the requirements of the minimum protection standard. Game enclosures (depending on the species 160 cm or 180 cm high) must have protection against undermining. There are no minimum protection criteria set for other livestock species, such as alpacas, cattle or horses in Saxony. Damage caused by wolves to these species can still be compensated if the wolf was identified as cause during an assessment of the animal's injuries.



5. Livestock farming in Saxony in the context of the wolf population spreading

5.1 Livestock damages caused by wolves

With the growing wolf population in Saxony the livestock damages caused by wolves are increasing too. Especially, in recent years the number of wolf attacks on livestock strongly increased although the growth of the wolf population has levelled off (Figure 7).

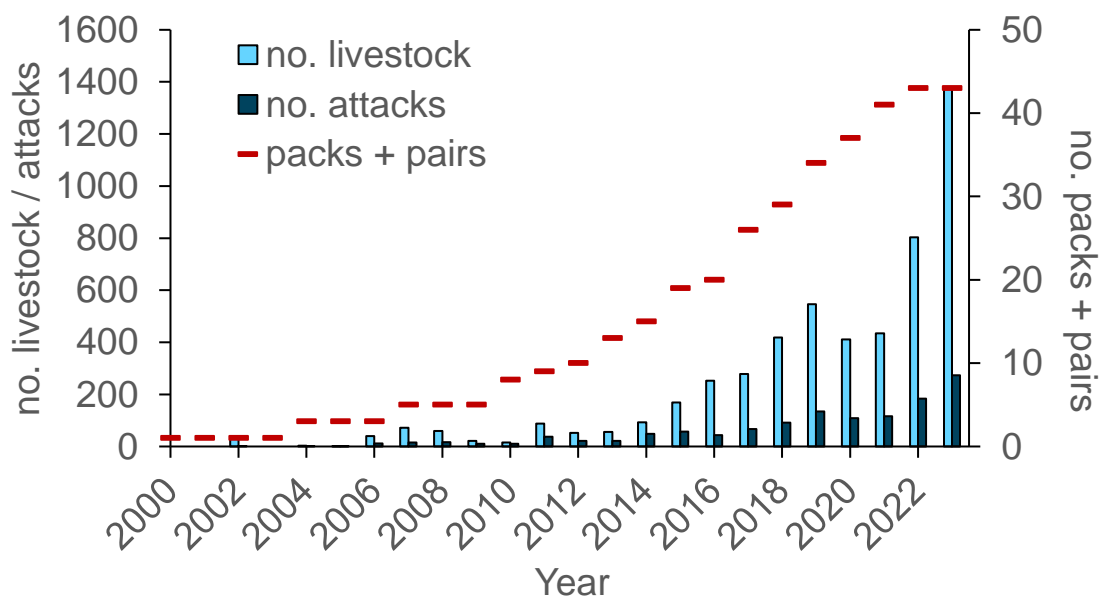


Figure 7: Development of wolf attacks on livestock and the number of livestock damaged (killed / injured / wounded) in comparison with the development of the wolf population (number of packs and pairs) in Saxony.

The livestock species mainly affected by wolves in Saxony is sheep while cattle are up to date only rarely attacked (Figure 8) despite they are not protected against wolves. The second most predated livestock are farm deer that are kept in game enclosures for meat production.



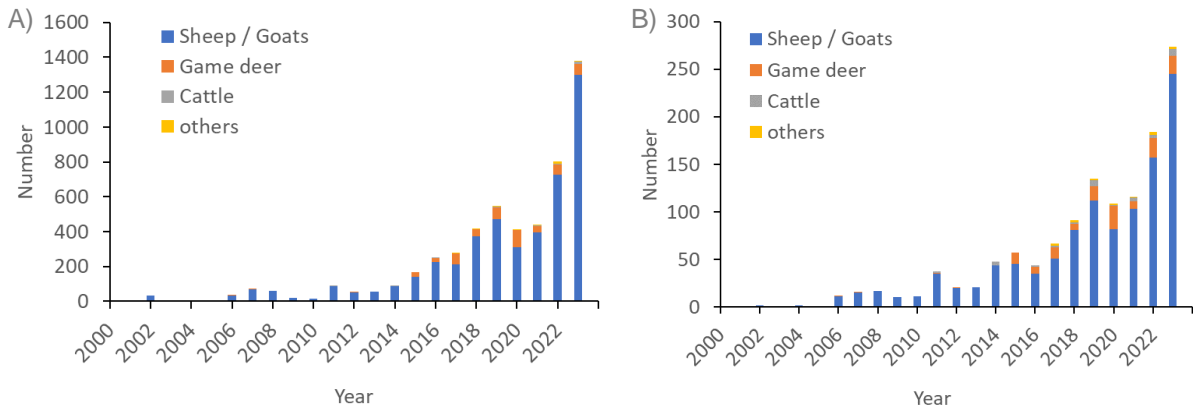


Figure 8: Development auf wolf caused damages in Saxony in respect to livestock species. A) number of livestock damaged, B) number of wolf attacks.

Wolf caused damages are not evenly distributed over the wolf area in Saxony, but cluster in hotspots, some last for years. Most wolf packs (as well as pairs and single territorial wolves) do not or only rarely (0 – 2 times per monitoring year) attack livestock (Figure 9A). The damage caused by wolves that (more) frequently attack livestock (> 5 times per monitoring year) accounts for most of the total damage in recent monitoring years (Figure 9B). In the monitoring year 2023/24 78 % of damages occurred in 17 % of the wolf territories (in 7 out of 43).

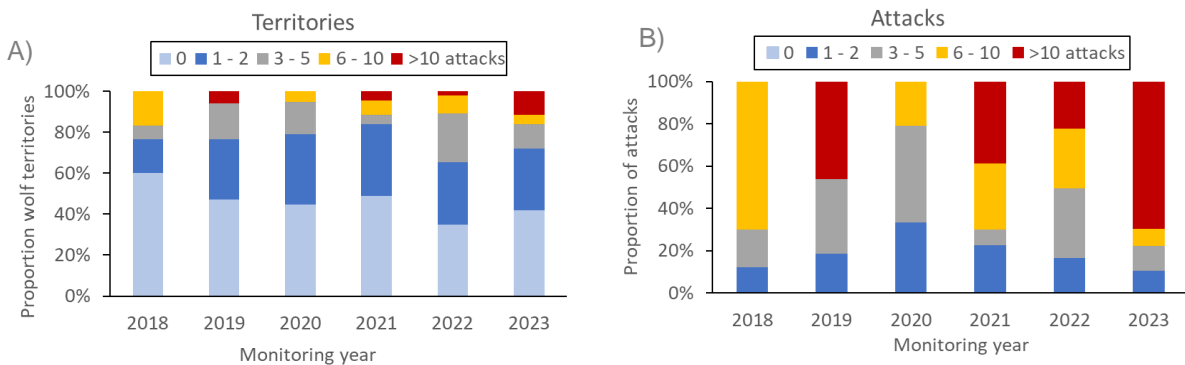


Figure 9: A) Proportion of wolf territories in Saxony in the monitoring years 2018/19 to 2023/24 that attacked livestock 0, 1 - 2, 3 - 5, 6 - 10 or more than 10 times per monitoring year. B) Proportion of wolf attacks in the respective categories of attack frequency to the total number of attacks. Territory data include single territorial wolves as they can cause considerable damages too. Damage data are analysed per monitoring year in order to ensure correct assignment of damages to wolf territories. Source: Monitoring database Saxony.



In 2023 there were about 12,398 owners of sheep²⁰, 6,686 cattle owners (TSK 2024) and about 500 game enclosures registered. 273 wolf attacks on livestock were reported in 2023 in Saxony (LfULG 2023, Figure 8B). That means the vast majority of livestock farmers in Saxony had not experienced a wolf attack. Of those who had wolf attacks on their flocks, most had no more than one attack per year (Figure 10).

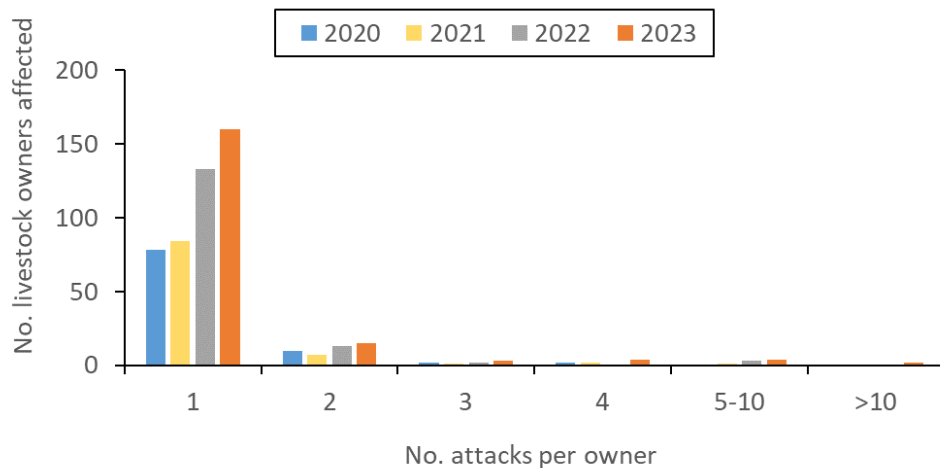


Figure 10: Number of livestock owners with wolf caused damages in the years 2020 - 2023 and how often their animals were attacked per year. Source: LfULG / Fachstelle Wolf.

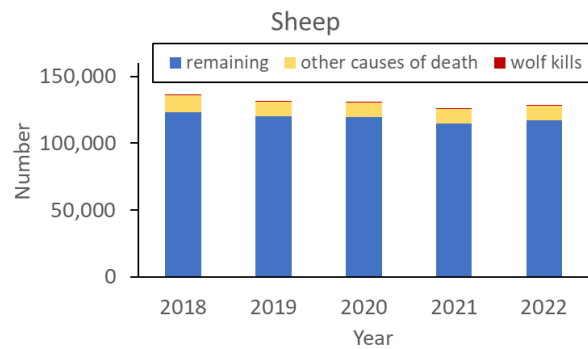
5.2 Mortality causes of livestock

Compared to other causes of death, livestock killed by wolves in Saxony makes up only a very small proportion of carcasses disposed in the rendering plant (Figure 11). Wolves killed between 2018 and 2022 yearly about 0.25 – 0.6 % of the total stock of sheep. In the same time period about 9 % of the total sheep stock were disposed in the rendering plant of Saxony every year. Wolf kills accounted for 2.6 – 6.5 % of the sheep carcasses disposed in the rendering plant. For cattle the numbers are as follows: between 10.6 and 11.4 % of the total stock of cattle were yearly disposed in the same time period in the rendering plant (mostly calves) whereas wolves killed between 0.0002 and 0.0013 %.

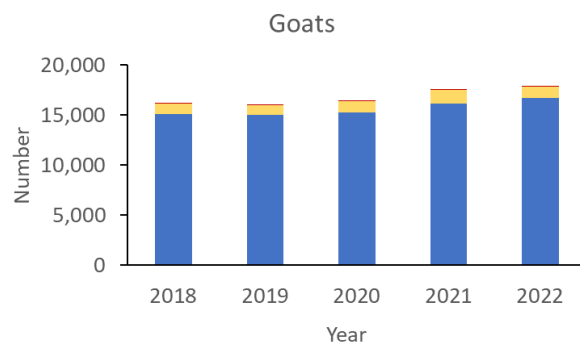
²⁰ In the yearly report of the animal disease fund this number is given as the number of locations where livestock were kept. Therefore, there might be less owners than locations. Since the majority of sheep owners in Saxony keeps less than 20 sheep it is assumed that most owners keep their livestock in one location and the number of sheep locations more or less represents the number of sheep owners. This applies similar to cattle owners.



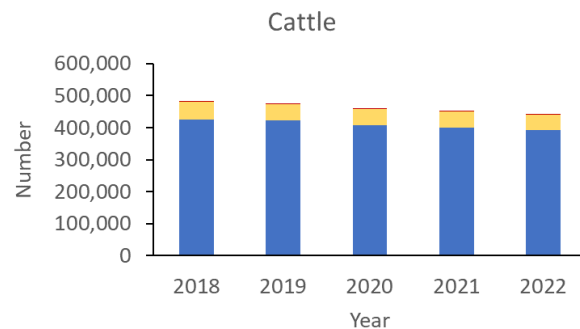
SHEEP	stock	other causes of death	wolf kills
2018	135,830	12,559	340
2019	131,412	10,998	468
2020	130,402	10,713	297
2021	125,660	10,961	383
2022	127,841	10,476	726



GOATS	stock	other causes of death	wolf kills
2018	16,126	1005	35
2019	16,013	1012	5
2020	16,363	1106	13
2021	17,518	1350	11
2022	17,844	1128	2



CATTLE	stock	other causes of death	wolf kills
2018	480,906	55,020	2
2019	472,666	50,838	6
2020	457,580	49,062	1
2021	449,703	49,118	4
2022	439,660	46,484	5



HORSES	stock	other causes of death	wolf kills
2018	32,988	1393	0
2019	33,418	1379	0
2020	34,842	1359	0
2021	35,434	1485	0
2022	36,014	1554	0

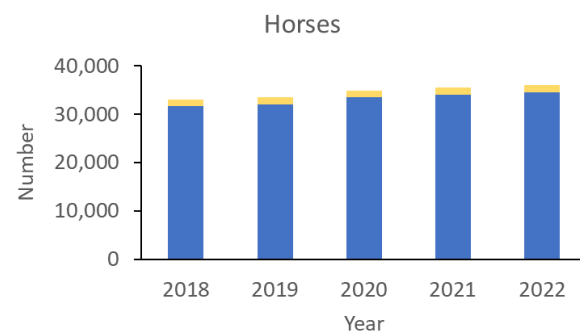


Figure 11: Number of sheep, goats, cattle and horses disposed in the rendering plant of Saxony (2018 – 2022). The cause of death of the carcasses disposed is classified as wolf kills and other causes of death. In the figures on the right side the remaining stock is displayed as the total number of animals registered to the Saxony animal disease fund (tables on the left side) minus the number of carcasses disposed (yellow and red bars). Source: Rendering plant Saxony (number carcasses disposed), Animal disease fund Saxony (TSK 2020, 2024), DBBW (2019, 2020, 2021, 2022, 2023).



5.3 Livestock welfare

According to the animal welfare livestock farming ordinance (TschNutzV) livestock owners are obliged to protect their animals against predatory attacks (Mennerich-Bunge und Karl 2024). It is the responsibility of veterinary authorities to monitor compliance with animal welfare in livestock farms and to react at least when gross violations of animal welfare become known. However, little attention has been paid to the fact that livestock depredation and the prevention of carnivore attacks are also the responsibility of official animal welfare authorities (Mennerich-Bunge und Karl 2024).

5.4 Assessment of the implementation of damage prevention measures

All owners of sheep and goats as well as of farm deer can apply for funding for damage prevention measures in Saxony regardless of how many animals they have. For sheep and goats 100 % of the acquisition costs for electric fences and livestock guarding dogs are funded, for game deer 100 % of the material and labour costs for undermining protection for game fences are subsidized. For other livestock like cattle, horses or alpacas / llama prevention measures are not funded in general, but funding may be granted after wolf caused damages occurred. Funding is provided from state funds according to the regional directive “natural heritage” that was notified by the European Commission. The additional time expenditure necessary in wolf areas for setting up damage prevention measures in the field can be subsidized under the regional directive “sheep and goat farming”. For herds of 37 or more sheep or goats (older than 9 month) a grant of 55 € / animal / year can be applied for (LfULG 2021).

Livestock damages caused by wolves can be compensated in Saxony according to the Saxon nature conservation law in connection with the administrative large carnivore regulation. For sheep / goats and game deer compensation is linked to prevention. The prerequisite for damage compensation for these species is that protective measures were in place that correspond to at least the minimum prevention standards (see Box 1). For other livestock species no such minimum prevention standards are defined. That means, wolf caused damages on cattle or other species are compensated regardless whether prevention measures were in place or not. The damage inspection is carried out by trained staff of the wolf department of the Saxon State Office for Environment, Agriculture and Geology. Potential wolf damages must be reported within 24 hours, damage inspection should take place within 24 hours after reporting. Compensated is for hobby- and part time farmers the average market value, for farms the actual revenue from the last annual financial statements can be used. Following a wolf attack up to 80 % of veterinary costs and labor costs for searching for missing animals can be refunded as well as 100 % of pasture material destroyed during the attack.

Between 2018 and 2023 Saxony invested between 5 to 14 times more financial resources for prevention measures compared to compensation (Figure 12). Compared to some other



federal states Saxony focusses more on livestock owners with just a few animals. As stated above, about half of the sheep owners have less than 20 sheep. Experience of the last years shows that hobby owners of sheep are more affected by wolf attacks in Saxony as main-time farmers, what is likely a matter of flock protection. This is also reported from other areas (Mennerich-Bunge and Karl 2024).

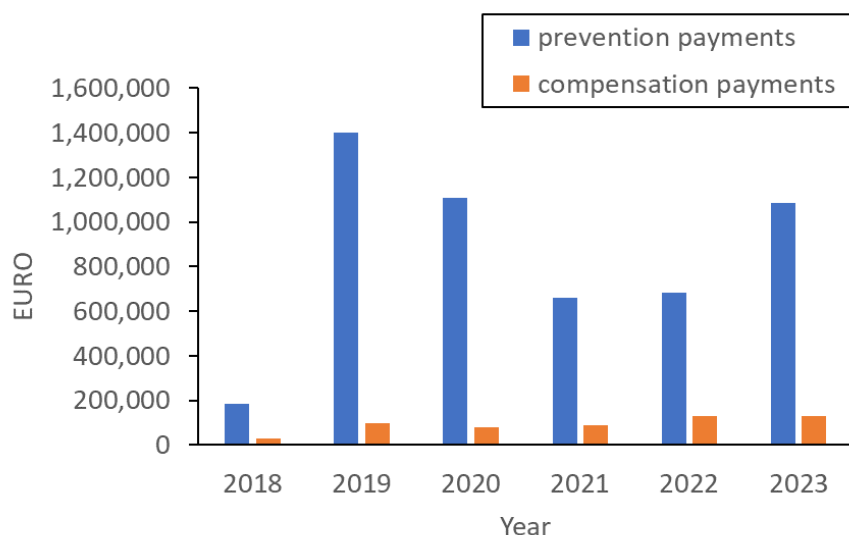


Figure 12: The yearly amount of money spent for prevention measures compared to compensation payments in Saxony from 2018 – 2023. Sources: DBBW 2019 – 2024.

Between 2018 and 2023 prevention measures were funded in 4534 cases (Tab. 2). Since there were roughly 12,000 owners of sheep and about 500 game enclosures in 2023 that means about 1/3 of owners of small livestock or game deer in Saxony received funding for prevention measures in this time period. From 2020 – 2023 there were 281 attacks on flocks for which prevention measures were funded before (41 % out of 683 attacks). This concerned 184 livestock owners (SMEKUL 2024). The number of livestock owners compensated is considerably lower than the number of attacks (Tab. 2) indicating that in a number of cases either several livestock owners had more than one attack on their flocks or compensation was not paid because of missing or unsuitable prevention measures.

According to the Saxon wolf regulation (SächsWolfMVO 2019) a shooting permit can be issued when two incidents occur, where a wolf overcomes reasonable (“zumutbare”) prevention measures within two weeks in an established territory. Regarded as reasonable for the protection of sheep / goats are electric fences with a minimum height of 90 cm and a minimum voltage of 4000 V. After the first such incident the second has to be concerning an electric fence which is minimum 120 cm high or a minimum 90 cm e-fence combined with livestock guarding dogs in order to be accepted as overcoming reasonable protection measures (for details see SächsWolfMVO 2019). Up to date (October 2024) no wolf was



shot because of livestock depredation in Saxony despite of several permits being issued. Either the permits were withdrawn or suspended, or no wolf was shot.

Table 2: Prevention and Compensation payments in Saxony from 2018 – 2023, the number of prevention cases funded, number of attacks and of attacks despite prior prevention funding, number of livestock owners with flocks that were attacked despite prior prevention funding, the number of livestock owners compensated per year and the average compensation payment these livestock owners received. Sources: DBBW 2019 – 2024; Landesdirektion Sachsen; SMEKUL 2024.

	2018	2019	2020	2021	2022	2023
Prevention payments [EURO]	183,743	1,401,989	1,108,8130	661,090	684,700	1,085,100
No. of prevention cases funded	283	1,095	1010	683	650	813
Average per prevention case funded [EURO]	649	1280	1098	968	1053	1335
No. of attacks	91	135	109	116	184	274
No. of attacks despite prior prevention funding*	NA	NA	28	52	48	153
No. of livestock owners with attacks despite prior prevention funding*	NA	NA	23	40	35	86
No. of livestock owners compensated*	50	65	66	57	94	62
Compensation payments**	37,135	128,299	77,714	84,302	127,079	126,610
Average per livestock owner compensated [EURO]	743	1,974	1,177	1,479	1,352	2,042

* Note that it is unknown whether the prevention measures were functional during the time of attack.

** The figures for compensation payments differ from those given in the yearly damage reports (DBBW). For the DBBW reports the compensation payments corresponding to the damages in a given year are requested. By the date of the annual data query for the DBBW reports (1st May), not all payments may have been made, as claims for compensation can be submitted up to 6 months after the damage event. Here, in this table the payments that have been paid out in a fiscal year are listed. For this figure it is not important when the damage occurred, but when the cash payment was made. The number of livestock owners compensated corresponds to the compensation payment in this table.

5.5 Why are livestock damages still increasing in Saxony?

The ever-increasing number of wolf-caused damages on livestock in Saxony is not a result of the increasing and spreading wolf population alone as apparent from Figures 3 and 7. Damage hotspots that sometimes prevail over years indicate that even in areas where



wolves occur since years prevention measures may at least partly be suboptimal. Apparently, the payment of subsidies for prevention measures alone is not enough to significantly reduce the number of attacks. This finding is neither new nor exclusive to Saxony / Germany (Reinhardt et al. 2023). A random checking of subsidized “predator-proof” fences in Sweden yielded the sobering result that 86% of the fences were not functional (Frank and Eklund 2017). Similar experiences have been reported from other countries (Krofel et al. 2011). Therefore, in addition to financial resources, technical expertise must also be available for correct application and maintenance and the functionality of protective measures must be routinely checked (Linnell et al. 2012; Khorozyan and Waltert 2019b; Reinhardt et al. 2023). In Saxony livestock owners do have access to technical advice for the correct handling of prevention measures. There are government employed livestock protection consultants that advice on demand. However, there is no regular checking on the functionality of funded prevention measures, not even on a random basis in damage hotspots (SMEKUL 2024).

Experience in Saxony has shown that damage hotspots often start with unprotected or inadequately protected sheep (Reinhardt et al. 2023). It can be assumed that every successful attack on unprotected/poorly protected sheep encourages a wolf to try again. Such sheep are much easier prey than nimble deer or defensive wild boars. Once the incentive is there, the damages start to raise. A wolf that had several successful experiences with poorly protected sheep may be motivated to find the weak points in prevention measures. Wolves usually try to overcome obstacles such as fences by crawling under them. It is therefore particularly important for electric fences that the lower live wire is low enough to prevent them from crawling under. It is in general relatively rare for wolves to jump over fences (Reinhardt et al. 2012). However, they can learn to jump over fences, for example on non-electric fences or on incorrectly installed electric fences. Wolves that have been able to train repeatedly on poorly protected sheep are much more difficult to deter with simple protection measures (which, for example, meet the minimum prevention standard, Box 1) than their conspecifics that did not have such a learning effect or have even received an electric shock from a correctly installed fence (Reinhardt et al. 2023). In order to prevent the development of predation hotspots it would be necessary to check and if necessary, improve the suitability and functionality of prevention measures in territories where 3 - 5 livestock attacks occur in a few months (see Figure 9).

In Saxony non-electric fences are still regarded as minimum prevention standard (Box 1). Experience shows that these fences are no effective prevention measure unless they are reinforced with protection against digging under and climbing over. For instance, the breeding female of the Rosenthal pack in Saxony was 30 x genetically proven on livestock kills between 2014 and 2022 (note that not all kills were genetically analysed). This individual had learned that non-electric fences are easy to overcome. This wolf has learned to check for gaps in the fence or a place to dig under and if that did not work to climb over the fences.



In the east of Saxony fences that were built since 2020 against the spreading of African Swine Fever (ASF) may further fuel this problem. Where hundreds of kilometres of (non-electric) fence lines with protection against digging under are cutting through the landscape and through wolf territories more wolves may learn to cross fences by jumping over them. Once a wolf has learned to jump over a fence it probably doesn't matter whether there is electricity on the fence or not. Electric fences are normally functional because wolves usually approach obstacles carefully and check out if they can crawl under. By doing so they get an electric shock and cautious as they are stay away from electric fences in future. However, it is assumed that wolves that routinely jump over (ASF-)fences while moving through their territory will more easily do the same with electric fences. However, up to date no evaluation has been done whether more wolves overcome livestock protection measures in territories with ASF-fences than in territories without.

Quite often it is not the wolves that overcome protection measures, but the sheep themselves. If the fenced pasture is too small and the flock cannot avoid a potential threat, they panic and run over the fence. In these cases, the fences might have been technically functional to keep a wolf out, but not to keep the sheep in. So far there are no recommendations for minimum pasture sizes, recommended pasture shapes or for fences specifically designed for small pastures.

Another point that may hinder the mitigation of damages is the way some authorities, politicians and some media communicate about wolf caused damages on livestock. While wolf caused damages are reported in great detail the absence of damages is not. For the general public and for livestock owners in particular this may give the impression that damage prevention measures are not working. Some livestock owners, especially such with repeated damages are very present in the (social) media dominating the public discussion. Sometimes, they are visited by politicians drawing even more media attention to these cases even if they refused to apply recommended prevention measures. In consequence, the public attention is almost completely on (apparently) not working damage prevention given the impression to the public and politicians alike that prevention measures are no solution to the ever-increasing wolf-livestock conflict. On the other hand, livestock owners without damages or owners that managed to reduce damages considerably are completely underrepresented in the media and in the public discussion. They do not even occur in state media information. In discussions that take place in a protected environment, such livestock owners repeatedly report bullying. The mere fact that they show that herd protection works (regardless of how critical they may be of the return of the wolf) is enough for other livestock farmers to attack them verbally and put them under pressure. The increasingly loud announcements by politicians to make it easier to shoot wolves in order to reduce attacks on livestock are therefore having a devastating effect on the motivation of some livestock owners to implement recommended herd protection measures. We hear time and again from livestock owners that they are not prepared to (further) increase their efforts to protect livestock, but expect shooting licences to be issued more quickly.



5.6 Suggestions for reducing livestock damages in Saxony on a long-term basis

Defining clear objectives for wolf management help authorities plan the approach to achieve that objective. Although the tasks of the competent authorities, such as damage inspection, compensation and prevention funding, are clearly defined, the actual main objective is not. In the wolf-livestock conflict the main objective is to reduce wolf damages to livestock. Once the objective is defined, the most appropriate methods to achieve that objective must be selected based on available scientific evidence (Vucetich et al. 2017, Reinhardt et al. 2023). To verify how effective the selected methods are, criteria are needed to evaluate success or failure. These could be concrete values below which the number of attacks should be reduced within a certain time and area. The targets set serve as a success control for wolf management. They make it possible to make targeted adjustments and pool resources where the goal has not been achieved (Reinhardt et al. 2023). Below we give some recommendations how the applied methods could be improved.

Obviously, the funding on prevention measures and the offer to get advice on the correct implementation of prevention measures was so far not sufficient to decrease wolf caused livestock damages in Saxony. There are several suggestions how this could be improved. A first approach would be to have a look into other countries what worked well and what not. A promising example how the functionality of prevention measures could be improved and damages reduced is the LIFE Wolf Alps project in which the deployment of wolf **prevention intervention units** was successfully tested (Menzano et al. 2023). Such teams can react quickly if damage cases start to cluster in a given area, hence before a damage hotspot develops. Prevention intervention units provide case-by-case advice and keep contact to livestock owners to ensure that the functionality of prevention measures is maintained. It is important that they do not only contact livestock owners that already suffered damages, but include also those that did not (yet) have any.

Experience shows, that the correct use of prevention systems cannot be taken for granted (Frank and Eklund 2017, Krofel et al. 2011, Menzano et al. 2023), even not for professional livestock farmers. The functionality of funded prevention measures should be checked at least on a random basis regardless of damage events. This is not meant as a tool to control livestock owners, but to help them to reduce attacks on their livestock. The data from **functionality checks** will help to get an overview of the proportion of prevention measures that are functional. Such data are a prerequisite to estimate possible differences in the effectiveness of different prevention methods (Treves 2019, Treves et al. 2019, Louchouart et al. 2020, Oliveira et al. 2021). The checks will also help to learn what hampers the maintenance of functionality over longer time periods (what are the weak points) and how this can be improved. Functionality checks could be conducted by prevention intervention units.



Non electric fences for sheep / goats should not be regarded as minimum prevention measures any more. These fences are known to be non-effective or even to promote that wolves learn how to overcome fences. Instead, non-electric fences should either be improved with a protection against digging under and electric wires that prevent climbing over or completely replaced by electric fences. Game enclosures that are higher than most sheep fences and usually have a protection against digging under should be upgraded with tools that prevent climbing over, at the latest after a wolf was climbing over the fence.

For areas with **ASF-fence** lines prevention systems should be developed, that sufficiently deter also wolves that are routinely jumping ASF-fences. This includes to compare the effectiveness of already applied prevention systems in ASF areas. Before new ASF-fences are built it should be evaluated, if ASF-fences are really an effective tool to prevent ASF from spreading into domestic pig farms and therefore necessary. If new ASF-fences are built, crossing aids for wolves have to be included in the fences in a way that is accepted by wolves. Likewise existing ASF-fences should be equipped with such crossing aids. This should prevent wolves from learning to jump over fences because they frequently need to overcome ASF-fences while roaming their territories.

Technical tools that help to control the functionality of electric fences like electric fence guards (“Zaunwächter”) should continue to be promoted. However, they are no panacea as a fence may have enough voltage, but still provide physical crossing opportunities (gaps, jumping aids, clearance from surface) for a wolf looking for weak points.

It would be helpful to **analyse the damage data** collected during the past 25 years in order to better understand, when reaction is urgent. For example, analyzing what number of attacks per time period in a given area that poses the risk of developing a damage hotspot could help to focus prevention intervention units on the areas most at risk. An analysis which fence / pasture / flock parameter promote or prevent that flocks run over fences could help to develop recommendations on how to minimize the danger of flock-breakthroughs. Should minimum pasture sizes (taking into account the flock size) become part of the minimum prevention standards?

It is particularly important to **strengthen the reputation and recognition of livestock owners who succeed in minimizing wolf caused damages** within the wolf area. It is necessary that the public understands, that successful livestock protection is not only possible, but the normality. The focus in the communication should therefore be laid on successful damage prevention and the fact that in most wolf territories only few damages occur. Besides shifting the focus in communication from damages to successful damage prevention, another consideration would be to promote a (financial) reward for livestock owners with no damages. Whatever the specifications, it is mandatory to acknowledge and emphasize the motivation of livestock owners to protect their animals. In order for successful livestock protection to become a matter of course, it is important to create a social environment in which livestock owners who successfully protect their animals (and



often put in extra work to do so) are recognised by society instead of being attacked by other livestock owners as 'nest-busters'. Achieving such a change in thinking among livestock farmers is made more difficult if regulations and management plans focus primarily on when the criteria for (rapid) culling are met, rather than on improving the effectiveness of livestock protection measures.



6. Conclusions

The return of the wolf to Saxony / Germany after more than a century of absence was and still is welcomed by the majority of people. Among hunters and people keeping livestock, the groups most affected by the wolf, acceptance is lower and rejection is stronger. The return of the wolves coincided with an already very difficult economic situation for many sheep and goat farmers. For some, the wolf was the straw that broke the camel's back in an already tense economic situation. However, the decline in the number of livestock and livestock farmers has started long before the return of the wolf.

Saxon state authorities are addressing the wolf-livestock conflict with several mitigation measures. For instance, owners of sheep and goats can apply for up to 100 % funding of the acquisition costs for electric fences and livestock guarding dogs. All livestock owners have access to advice on the correct implementation of these measures. In addition, damages caused by wolves are compensated. For sheep, goats and farm deer compensation is linked to prevention. Saxony invests much more financial resources for prevention measures compared to compensation. Despite these efforts, the number of wolf attacks on livestock strongly increased in recent years, although the growth of the wolf population has leveled off. Still, livestock killed by wolves in Saxony account for only a very small proportion of the carcasses disposed of in animal rendering plants compared to other causes of death.

The damage statistics illustrate, that the payment of subsidies for prevention measures alone is not enough to significantly reduce the number of attacks on the state level. Also, the very commendable offer for livestock owners to receive free advice on the technical implementation of prevention measures has not yet led to a general reduction in wolf damages. It is important to note, that the majority of wolf packs (and pairs) do not or only rarely cause damages to livestock. So, there might well be an effect of all these efforts on a local level. The majority of damages is caused by a rather few wolf packs. The data also indicate that a few livestock owners have repeatedly attacks on their flocks. It therefore seems appropriate to focus the efforts more than before on damage hotspots. This means going into the areas where a hotspot could develop as early as possible and actively approaching livestock farmers, checking the functionality of the fences in these areas and improving them if necessary.

Saxony has made considerable efforts to address the wolf-livestock conflict in the last 20 years. The starting point for the goal of sustainably reducing livestock attacks is good and the necessary structures are in place. Based on the available data we give some recommendations on how the methods to reduce livestock attacks could be farther improved or used in a more targeted way. These includes:



- Prevention intervention units that quickly react if wolf attacks start to cluster in a given area.
- Investigate possible differences in the effectiveness of different prevention methods, including areas with ASF-fences.
- Collect data on the functionality of prevention methods as a prerequisite to estimate the effectiveness of different prevention methods. These data also help to learn what hampers the maintenance of functionality over longer time periods and how this could be improved.
- Non-electric fences should either be improved with a protection against digging under and electric wires that prevent climbing over or completely replaced by electric fences. They should not be regarded as minimum prevention standard any more.
- Analyse damage data of the last 25 years in order to better recognize the signs as early as possible when a hotspot develops.
- Development of recommendations on how to minimize the danger of flock-breakthroughs.
- Test and develop prevention systems that sufficiently deter also wolves that are routinely jump ASF-fences.
- Equip ASF-fences with suitable crossing aids for wolves.
- Shifting the focus in communication from damages to successful damage prevention and strengthen the reputation and recognition of livestock owners who succeed in minimizing wolf caused damages.



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Produced for the EU Platform on Coexistence between People and Large Carnivores by the Platform Secretariat (adelphi consult GmbH, Istituto di Ecologia Applicata, IEA, and Callisto) as part of the services provided to DG Environment for Service Contract 09.0201/2023/907799/SER/ENV.D.3. The report does not necessarily reflect the official view of the European Commission.