EXPEDITION REPORT

Expedition dates: 17 June – 21 July 2017

Report published: June 2018

Love / hate relationships: Monitoring the return of the wolf to the German state of Lower Saxony.

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Authors:

Peter Schütte
Wolf commissioner

Matthias Hammer (editor)
Biosphere Expeditions

Abstract

Biosphere Expeditions in collaboration with the State Wolf Bureau (Wolfsbüro) in Lower Saxony, Germany, conducted an active wolf (Canis lupus lupus) monitoring project from 17 June to 21 July 2017. Four weekly groups of up to twelve citizen scientists per group as well as staff, local wolf commissioners and, on occasion, trained wolf scat detection dogs focused on finding wolf sign exclusively on public paths. The study area covered various priority areas in Lower Saxony as advised by the State Wolf Bureau and wolf commissioners. Twenty-five 10x10 km grid cells of the EEA grid system and 1,133 km were surveyed on foot or by bicycle. All grid cells were surveyed multiple times so that they were covered 52 times.

76 wolf scat samples were collected. 33 yielded material for DNA analysis and 75 provided material for dietary analysis. Thirty-two tracks, a variety of fur remains and five wolf kill carcasses were also found, but did not pass quality assessment procedures.

Twenty-two (29%) of the 76 scat samples collected were classified as C1 pieces of hard evidence on the SCALP classification system, 19 (24%) as C2 confirmed observation and 30 (40%) as C3 unconfirmed observations. Five (7%) did not originate from a wolf. One direct sighting was also recorded as a C1 piece of hard evidence. Dietary analysis is ongoing and should be published in the next report.

Two individual female and four male wolves, as well as the presence of a new wolf pack in the Walle area, were confirmed by DNA analyses of samples collected by the expedition and others. Results also identified two areas of high wolf activity: one each in the districts of Celle and Luchow-Dannenberg.

The quantity and quality of samples collected by the active monitoring effort of the expedition is remarkable, boosting annual official wolf sign records by over a third in quantity and producing a quality ratio of 53% of C1 and C2 records (the quality ratio of the official monitoring programme, which is a passive programme, is 40%). All this shows that with a two days of training, contributions of citizen scientists towards wolf research and conservation can be both high quality and high quantity.

49 citizen scientists took part in the expedition, 42 from Germany or its immediate neighbour states (86%) with four of them (8%) from Lower Saxony, three from North America (6%), two from Australia (4%), as well as one person each from India (2%) and Singapore (2%).

The expedition also achieved significant media coverage involving 28 articles, TV and radio programmes, predominantly in the German-speaking countries of Germany and Austria (89%) and one each (3.6%) in the Netherlands, UK and India. All articles and radio programmes created by journalists who attended the expedition were positive. Three negative articles appeared in local newspapers written by journalists who had not been on the expedition and who interviewed staff on the telephone only. Negative coverage and voices in the media, the latter mainly from hunting and landowner sources, were based on falsities, misinterpretations and erroneous assumptions that are comprehensively refuted in this report.

Hunters and landowners also made unsuccessful attempts to sabotage and discredit the project and it is clear that the return of the wolf is a highly emotional and politically charged subject in Germany. The way in which the issue is discussed bears no relation to the perceived or actual harm wolves can do to humans or livestock, bearing in mind the small number of wolves resident in Germany (60 packs at the last count). Positive aspects of and opportunities connected to the wolf's return are almost entirely absent from the discussion, which appears to be dominated by a vocal anti-wolf minority that does not reflect the welcoming stance of the large (79%) majority of Germans.

The wolf has returned to Germany to stay. It is an adaptable generalist and a highly protected species. Calls for regional or large-scale culls are therefore unrealistic, unwarranted and not goal-oriented. The key to successful human/wolf co-existence instead lies in supporting those who are exposed to genuine risks by wolf presence. Since wolves almost never represent a threat to humans, including children, this means supporting livestock owners and listening to their experiences and concerns. Livestock protection and wolf management measures in areas frequented by wolves are of paramount importance and must be applied consistently and effectively, preferably on a federal, rather than state level.

Opportunities arising from the return of the wolf are being largely ignored. We argue that there are many, currently untapped, areas of opportunity especially in nature-based, sustainable tourism. The expedition covered in this report serves as a showcase for this and demonstrates how (citizen) science, domestic and international visitors, wolf research & conservation, local NGOs and providers of touristic services can all benefit.

ZUSAMMENFASSUNG

Dieser Bericht beschreibt die Feldarbeit von Biosphere Expeditions im Rahmen eines aktiven Monitorings des Großen Beutegreifers Wolf (*Canis lupus lupus*) in Zusammenarbeit mit dem Wolfsbüro des Landes Niedersachsen. Die Feldarbeit wurde vom 17. Juni bis 21. Juli 2017 in vier einwöchigen Gruppen von max. 12 Teammitgliedern durchgeführt. Schwerpunkt der Feldarbeit der Teammitglieder (in Kleingruppen aufgeteilt) sowie der Mitarbeiter, der Wolfsberater und zeitweise der zur Suche nach Wolfslosung ausgebildeten Suchhunde lag darin, Wolfshinweise zu finden, insbesondere Losungen für DNA-Beprobung und Nahrungsanalysen. Geländebegehungen fanden ausschließlich auf öffentlich begehbaren Wegen statt. Das Untersuchungsgebiet umfasste verschiedene Schwerpunktgebiete in Niedersachsen, die vom staatlichen Wolfsbüro und Wolfsberatern empfohlen wurden. Fünfundzwanzig 10x10 km große Zellen des EU-Gitternetzes und insgesamt 1.133 km wurden zu Fuß oder mit dem Fahrrad untersucht. Alle Rasterzellen wurden mehrfach besucht, so dass sie insgesamt 52 Mal abgedeckt wurden.

Die Expedition sammelte 76 Wolfslosungen. 33 davon wurden genetisch untersucht und 75 Losungen befinden sich im Rahmen einer großen Analyse zur Nahrungszusammensetzung von Wölfen derzeit noch im Labor. 32 Wolfsspuren, eine Vielzahl von Fellresten und fünf Kadaver potentieller Beutetiere wurden ebenfalls gefunden, konnten aber aufgrund der strengen Datenqualitätsvorgaben nicht als Wolfshinweise genutzt werden.

22 (29%) der 76 gesammelten Losungsproben wurden als C1 (eindeutiger Nachweis) nach dem SCALP-Verfahren bewertet, 19 (24%) als C2 (bestätigter Hinweis) und 30 (40%) als C3 (unbestätigter Hinweis). Fünf (7%) Losungen stammten nicht von einem Wolf. Zusätzlich wurde noch eine direkte Sichtung als ein C1 (eindeutiger Nachweis) aufgenommen. Die Nahrungsanalyse läuft derzeit noch und wird im nächsten Bericht veröffentlicht werden.

Durch DNA-Analysen der 33 DNA-fähigen Losungen konnten zwei Fähen und vier Rüden identifiziert werden. Unter anderem durch die Funde der Expedition konnte ein neues Wolfsrudel in Walle bestätigt werden. Außerdem konnten zwei Gebiete mit hoher Wolfsaktivität identifiziert werden: jeweils im Landkreis Celle und Lüchow-Dannenberg.

Sowohl die Quantität, als auch die Qualität der Losungsproben, die im Rahmen der Expedition gesammelt wurden, ist beachtlich. Die Quantität der von der Expedition in einem Monat gesammelten Losungsproben beträgt gut ein Drittel der insgesamt durch das gesamte offizielle Wolfsmonitoring gesammelten Proben pro Jahr. Mit 53% C1- und C2-Bewertungen ist deren Qualität bemerkenswert hoch und deutlich höher als die 40% des passiven offiziellen Monitorings außerhalb der Expedition. All dies zeigt, dass Bürgerwissenschaftler mit eineinhalb Tagen entsprechender Schulung einen quantitativ und qualitativ hochwertigen Beitrag zum Wolfsmonitoring leisten können.

49 Bürgerwissenschaftler nahmen an der Expedition teil, 42 davon aus Deutschland oder seinen unmittelbaren Nachbarstaaten (86%), mit vier Personen (8%) aus Niedersachsen, drei aus Nordamerika (6%), zwei aus Australien (4%), sowie je einer Person aus Indien (2%) und Singapur (2%).

Die Expedition fand ein großes Medienecho. So berichteten verschiedene Medien in über 28 Artikeln, TV- und Radioprogrammen überwiegend in den deutschsprachigen Ländern Deutschland und Österreich (89%) und jeweils einem (3,6%) in den Niederlanden, Großbritannien und Indien. Alle Artikel, TV- und Radioprogramme, die von Journalisten veröffentlicht wurden, die an der Expedition teilgenommen haben, waren positiv. Die drei tendenziell eher negativen Artikel, die in lokalen Zeitungen erschienen, wurden von Journalisten verfasst, die nicht vor Ort und im Gelände an den Expeditionen teilgenommen haben. Sie bezogen ihre Informationen von Beteiligten ausschließlich telefonisch. Negative Berichterstattung und Stimmen in den Medien, letztere hauptsächlich von Jägern und Landbesitzern, beruhten auf Falschaussagen, Fehlinterpretationen und falschen Annahmen, die in diesem Bericht umfassend widerlegt werden.

Es gab auch erfolglose Bemühungen von Jägern und Landbesitzern, das Projekt zu behindern und zu diskreditieren. Es ist offensichtlich, dass die Rückkehr des Wolfes ein hochemotionales und politisch aufgeladenes Thema in Deutschland ist. Die Art und Weise, wie das Thema diskutiert wird, ist in Teilen absurd und wird der geringen Anzahl von Wölfen in Deutschland (60 Rudel im Monitoringjahr 2016/17) nicht gerecht. Auch gibt es eine Diskrepanz zwischen wahrgenommenen oder tatsächlichen Risiken, die durch Wölfe entstehen können. Positive Aspekte und Möglichkeiten, die mit der Rückkehr des Wolfes verbunden sind, fehlen fast vollständig in der Diskussion, die von einer lautstarken Anti-Wolf-Minderheit dominiert wird, die nicht die positive Haltung der 79% Mehrheit der Deutschen widerspiegelt.

Der Wolf ist nach Deutschland zurückgekehrt und wird bleiben. Er ist ein anpassungsfähiger Generalist und eine hoch geschützte Tierart. Aufrufe zu regionalen oder großangelegten Ausrottungsprogrammen sind daher unrealistisch, unberechtigt und nicht zielführend. Der Schlüssel zum erfolgreichen Zusammenleben von Mensch und Wolf liegt vielmehr darin, diejenigen zu unterstützen, die durch Wolfsvorkommen echten Risiken ausgesetzt sind. Da Wölfe sehr selten eine Bedrohung für Menschen, einschließlich Kinder, darstellen, bedeutet dies, Weidetierhalter zu unterstützen und auf ihre Erfahrungen und Sorgen zu hören. Herdenschutzmaßnahmen in Gebieten, die von Wölfen frequentiert werden, sind ein Muss und sollten konsequent und effektiv angewendet werden, am besten in Verbindung mit einem professionellen Wolfsmanagement, vorzugsweise mit einem Reglement auf Bundes- anstatt auf Länderebene.

Die Chancen und Möglichkeiten, die durch die Rückkehr des Wolfes entstehen, werden weitgehend ignoriert. Wir sind überzeugt, dass gerade im naturnahen, nachhaltigen Tourismus viele, bisher ungenutzte Chancen liegen. Die in diesem Bericht behandelte Expedition dient als Vorzeigeprojekt und demonstriert, wie (Bürger-)Wissenschaft, nationale und internationale Besucher, Wolfsmonitoring und –forschung, sowie Naturschutz, lokale Organisationen und Anbieter von touristischen Dienstleistungen von der Rückkehr des Wolfes profitieren können.

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1. Expedition Review

Matthias Hammer (editor)
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

This project report deals with an expedition to the state of Lower Saxony in Northern Germany that ran from 17 June to 21 July 2017 with the aim of conducting conservation research monitoring on wolves.

By the end of the monitoring year 2016/17, counts had confirmed 60 wolf packs in Germany (BfN 2017). Wolves first appeared in the German federal state of Lower Saxony in 2006 and have since then expanded to 14 wolf packs, four wolf pairs, one single wolf and six unconfirmed territories (LJN 2018d). With this expansion comes potential for conflict. Negative aspects of wolf presence often make news headlines and as such facilitate a heightened sense of fear. It is true that wolves can sometimes cause considerable losses to livestock, particularly sheep, which is often the main source of conflict (DBBW 2018b), and as a result hunters often believe wolves will also decimate game populations (ARD 2018). The result is frequent demands of culls, which is the approach that eradicated carnivores from Germany and Western Europe in the past. The concurrent emergence of new threats to wildlife and their habitats through economic development and population pressure means that a more sensitive approach is required; one based on a sound, science-based understanding of the place of carnivores in ecosystems, but also taking into consideration their impact on local people. There is much to be done in order to achieve these goals. Field work conducted by Biosphere Expeditions aims to make an important contribution to this by providing science-based monitoring data for developing answers and strategies.

1.2. Research area

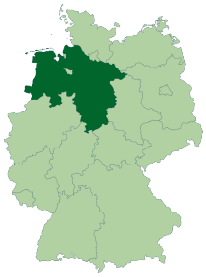
The expedition took place in Lower Saxony (German: Niedersachsen), a German federal state (Bundesland) situated in northwestern Germany, which among the sixteen German states is the second largest by area (47,624 square kilometres) and fourth largest by population (8 million). The state has a population density of 170 persons per square kilometre (Wikipedia 2018).

The state capital is Hanover (German: Hannover). There are seven other major cities in the state: Brunswick, Oldenburg, Osnabrueck, Wolfsburg, Goetingen, Hildesheim and Salzgitter. Important neighbours are the metropolitan areas of Bremen and Hamburg.

Figure 1.2a.
Flag and map of Germany,
base (red dot) and study area (red circle).

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

Below: Lower Saxony, one of 16 German states.



The Lueneburg Heath (German: Lüneburger Heide) is a large area of heath, geest and woodland in the northeastern part of Lower Saxony. It forms part of the hinterland for the cities of Hamburg, Hanover and Bremen and is named after the town of Lueneburg. Most of the area is a nature reserve. The extensive areas of heathland are typical of those that covered most of the north German countryside until about 1800, but which have almost completely disappeared in other areas. The heaths were formed after the Neolithic period by overgrazing of the once widespread forests on the poor sandy soils of the geest, as this slightly hilly and sandy terrain in northern Europe is called. The Lueneburg Heath is therefore a historic cultural landscape. The remaining areas of heath are kept clear mainly through grazing, especially by a north German breed of moorland sheep called the "Heidschnucke". Due to its unique landscape, Lueneburg Heath is famous in Germany and beyond as a recreation area.

Another landscape covered by this expedition covered was deciduous woodlands containing trees with broad leaves such as oak, beech and elm. They occur in places with high rainfall, warm summers and cooler winters and lose their leaves in winter. As some light can get through, the vegetation is layered and a shrub layer can also be found beneath the taller trees, containing species such as hazel, ash and holly. Grass, bracken and bluebells can be also be found in the ground layer. Animals present include various species of deer, wild boar, red fox, badger, brown hare, golden eagle, osprey, raven, pine marten, stone marten, racoon dog and otter.

In addition there are also wetlands such as bogs that accumulate peat, a deposit of dead plant material - often mosses, and in a majority of cases, sphagnum moss.

Figure 1.2b. Typical heath landscape.

Figure 1.2c. Typical woodland landscape.

1.3. Dates

The project ran over a period of two months divided into four seven-day slots, each composed of a team of international citizen assistants, scientists, wolf commissioners and an expedition leader. Slot dates were:

17 – 23 June | 24 – 30 June | 08 – 14 July | 15 – 21 July 2017

Team members could join for multiple slots (within the periods specified). Dates were chosen to coincide with the increased activity period during the raising of juvenile wolves.

1.4. Local conditions & support

Expedition base

The expedition team was based on the southern edge of the Lueneburg Heath nature reserve at NABU Gut Sunder, at a guesthouse / research station with all modern amenities. Team members shared twin rooms with modern showers and toilets. Breakfast and dinner was provided at base and a lunch pack was supplied for each day spent in the field.

Figure 1.4a. Expedition base: The “Seminarhaus” at NABU Gut Sunder.

Weather

Average summer daytime temperatures range between 10 and 30 ºC with an average of eight hours sunshine per day and up to ten days with rain per month. In line with this, the weather during the expedition was very variable from hot days with a lot of sunshine to cooler, overcast days and days with plenty of rain and thunderstorms (see appendix I for full weather records).

Field communications

There was patchy mobile phone coverage around the base and very little to no mobile phone coverage in the study areas. The expedition also used hand-held radios for groups working close together. The expedition base had WiFi internet. The expedition leader posted a diary with multimedia content on Wordpress and excerpts of this were mirrored on Biosphere Expeditions' social media sites such as Facebook and Google+.

Transport & vehicles

Team members made their own way to the assembly point at Bremen airport. From there onwards and back to Bremen all transport was provided for the expedition team. The expedition used a combination of cars from staff and team members, supplemented by hire cars as necessary. Surveys were generally conducted on foot, but for some of the surveys the expedition team also used bicycles provided by NABU Gut Sunder.

Medical support and incidences

The expedition leader was a trained first aider and the expedition carried a comprehensive medical kit. The nearest hospital is located in the nearby town of Celle (30 km from base) or the university medical centre in Hanover (70 km from base). In case of immediate need of hospitalisation, and weather permitting, ambulance and rescue services were available. All team members were required to carry adequate travel insurance covering emergency medical evacuation and repatriation. Safety and emergency procedures were in place, but did not have to be invoked as there were no accidents or mishaps.

1.5. Expedition scientist

Peter Schütte was born in Germany and studied geography and geoinformatics at the Universities of Bremen (Germany), Gothenburg (Sweden) and Salzburg (Austria). He has worked in this field for several international mapping and remote sensing projects, one of which involved him in wildlife conservation in Namibia, where he was a member of Biosphere Expeditions' team of local scientists. Starting in 2004, Peter led expeditions in Namibia/Caprivi, Altai, Oman and Slovakia for Biosphere Expeditions. Working on projects involving cheetahs, leopards and lions in Namibia for years, he gathered experience in the field of human-wildlife conflicts. Back in his native Germany, Peter is now working to gain acceptance for the return of wolves to the country. He is involved in wolf monitoring and is working on human-wildlife conflict solutions, such as livestock protection measures.

1.6. Expedition leader

Malika Fettak is half Algerian, but was born and educated in Germany. She majored in Marketing & Communications and worked for more than a decade in both the creative field, but also in PR & marketing of a publishing company. Her love of nature, travelling and the outdoors (and taking part in a couple of Biosphere expeditions) showed her that a change of direction was in order. Joining Biosphere Expeditions in 2008, she runs the German-speaking operations and the German office and leads expeditions all over the world whenever she can. She has travelled extensively, is multilingual, a qualified off-road driver, diver, outdoor first aider, and a keen sportswoman.

1.7. Expedition team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were (in alphabetical order and with country of residence):

17 – 23 June 2017: Philip Bethge* (Germany), Andrew Coogan (UK), Peter Gorr (USA), Susan Gorr (USA), Dagmar Hofmeister (Germany), Angela Holz (Germany), Gabriele Koßmann (Germany), Brian Oikawa (Canada), Brigitte Osterath* (Germany), Horst Paehlke (Germany), Peter Pilbeam (UK), Rasha Skybey (Australia), Patricia Smith (Belgium), Benjamin Steffes-Lai (Germany).

24 – 30 June 2017: Christine Flamsholt Jensen (Denmark), Vibeke Jensen (Denmark), Lalitha Krishnan (India), Oliver Kunz (Germany), Graham Makepeace-Warne (UK), Daniel McCourt (UK), John McIlroy (UK), Peter Nussbaumer (Switzerland), Martyn Roberts (UK), Kate Silverthorne (UK), Samantha Lim Xiu Zhen (Singapore).

8 – 14 July 2017: Julia Balasch (Austria), Fran Fitzpatrick (UK), Michael Gähwiler (Switzerland), Anja Giles (Germany), Martin Kugler* (Austria), Anne Medinger (Luxembourg), Monika Monn (Switzerland), Ben Rees (UK), Ingeborg Stephan (Germany), Stefan Thuerey (Germany), Verena Thuerey (Germany).

15 – 21 July 2017: Yvette Albright (Germany), Nadine Andrews (UK), Graham Borden (UK), Oliver Gerhard* (Germany), Tim Hudd (UK), Franz Lerchenmueller* (Germany), Abhilasha Mohandas (UK), Michael Mueller (Germany), Ben Rees (UK), Nina Rettberg (Germany), James Rowland (UK), Mark Rowland (UK), Alex Vernon (Australia).

In addition for some or all of the time: Matthias Hammer & Tessa Merrie (Biosphere Expeditions staff), Theo Grüntjens, Kenny Kenner (wolf commissioners), Bärbel Wittor (NABU), Felix Böcker and Valeska de Pellegrini (of Wildlife Detection Dogs e.V.).

*Member of the media.

1.8. Partners

Biosphere Expeditions' main partner on this expedition was the state's environmental authority the NLWKN (Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz, Nature = Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency), which is officially responsible for the monitoring of all wildlife in the state. The authority's Wolfsbüro (wolf bureau) was established in 2015 with the remit to (a) gather and consolidate information about wolves in Lower Saxony, (b) organise the monitoring of this protected species in conjunction with the Hunter's Association of Lower Saxony (Landesjägerschaft Niedersachsen e.V., LJN), (c) support livestock owners suffering losses caused by wolves and (d) inform the public about issues concerning the wolf. Wolf management includes scientists, environmentalists, foresters, hunters, etc., and has at least contact person in most of the 46 districts, the so-called 'wolf commissioners'. Wolf bureau staff were closely involved in all expedition activities. Other partners included forestry departments, district and communal authorities, Kenner's Landlust and NABU Gut Sunder (Nature and Conservation Union).

1.9. Expedition budget

Each team member paid a contribution of £1,580 per person per seven-day slot towards expedition costs. The contribution covered accommodation and meals, supervision and induction, special research equipment and all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses such as telephone bills, souvenirs etc., or visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	71,353
Expenditure	
Expedition base includes all food & services	15,180
Transport includes hire cars, fuel, taxis in Germany	3,185
Equipment and hardware includes research materials & gear etc. purchased internationally & locally	4,314
Staff includes local and Biosphere Expeditions staff salaries and travel expenses	14,727
Administration includes miscellaneous fees & sundries	1,040
Set-up includes all pre-expedition set-up costs of inaugural expedition	4,754
Team recruitment Germany as estimated % of annual PR costs for Biosphere Expeditions	6,733
Income – Expenditure	**21,420**
Total percentage spent directly on project	**70%**

1.10. Acknowledgements

We are very grateful to all the expedition citizen scientsts, who not only dedicated their spare time to helping but also, through their expedition contributions, funded the research. Thank you also to those who brought their own cars and supported the expedition in this way too. Thank you to all our partners metioned above, especially those at the 'Wolfsbüro' at NLWKN (Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz) and to all those professionals who provided assistance and information. Special thanks go also to all of the wolf commissioners (Wolfsberater) and helpers working on a voluntary basis in support of the expedition. Their efforts and local knowledge were crucial to the success of our field work. A very special thank you goes to Dorit Mersmann, who has very diligently contributed to the early drafts of this report. Biosphere Expeditions would also like to thank members of the Friends of Biosphere Expeditions and donors for their sponsorship. Finally, thank you to the staff of NABU Gut Sunder for being such excellent hosts and making us feel at home.

1.11. Further information & enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Enquires should be addressed to Biosphere Expeditions at the address given on the website.

2. Monitoring wolves in Lower Saxony

Peter Schütte
Wolf commissioner

Matthias Hammer (editor)
Biosphere Expeditions

2.1. Introduction

The Eurasian wolf (*Canis lupus lupus*) belongs to the canine family (Canidae), is a native species to Europe and was eradicated by humans in Western Europe more than 150 years ago. Wolves are habitat generalists and live in packs, which mostly consist of the two parents and their offspring of the last two to three years (DBBW 2018). Young wolves usually leave the parental territory, sometimes as early as at age 10 months, but sometimes also staying until age 22 months, at which point they,search for their own territory and a mating partner. Body mass can vary from approximately 30 up to 80 kg (DBBW 2018). Wolves are highly territorial and defend their territory from other packs through howling, scent markings (defecation, urination, scratching), and attacks (Ronnenberg et al. 2017).

After an absence of more than 150 years, wolves, by and large from Eastern European populations, started to colonise Germany again at the turn of the millennium, and reached Lower Saxony in 2006 from Poland via Eastern Germany. The species was classified by the International Union for Conservation of Nature (IUCN) as Endangered in 2012 (Kaczensky et al. 2013) and is protected by European law through the Fauna Flora Habitat (FFH) Directive and German law (Federal Nature Conservation Act), where the wolf is listed in Annex II and IV of the FFH Directive. This listing requires that active mangagement plans for the wolf should be in place. According to the Directive, the objective is to achieve and maintain a “favourable conservation status” (FCS) for the wolf population. This FCS is defined in the management plan guideline (Linnell et al. 2008) and stipulates that a population is in an FCS if all of the following eight conditions are met:

1) The population is stable or increases
2) The natural range of the species is neither being reduced, nor is it likely to be reduced in the foreseeable future
3) Wolf habitats are likely to maintain their quality
4) The size of the “favourable reference population” (FRP) has been reached (based on the IUCN Red List criteria)
5) The population is as large as, or greater than, that at the time the Directive came into effect
6) The “favourable reference range” (FRR) is occupied
7) An exchange of individuals within the population or between populations is taking place or is promoted (at least one genetically effective migrant per generation)
8) An efficient and robust monitoring system of the species is established

The FCS is set at a national level, but takes local population levels into account. Wolves in Germany together with those in western Poland form a self-contained population (the Central European Lowland Population) and this population is currently defined as isolated, as there is no unrestricted reproductive exchange with other populations. This fact alone shows that an FCS has not been reached.

All EU states are obliged to monitor the state of conservation of their country and to report to the European Commission every six years. Due to the federal system in the Federal Republic of Germany, this monitoring task is within the jurisdiction of each individual federal state.

In Lower Saxony, official wolf monitoring studies have shown that the wolf has in fact been breeding (LJN 2016). In addition, Fechter and Storch (2014) have shown that there are many more areas in Lower Saxony suitable for wolf re-colonisation than are currently being occupied by the species. Furthermore, recent wolf monitoring has shown that the wolf is so adaptable that it even colonises areas previously thought unsuitable for wolves (LJN 2018). Moreover, young wolves are by their nature always actively looking for new areas to found packs in and more wolves are pushing into the state from healthy breeding packs in the German states to the east of Lower Saxony. As a result, more wolves are spotted by people, there is increased media coverage, and unprotected livestock can be predated upon. These elements have resulted in decreasing wolf acceptance amongst local people (Deutscher Bundestag 2015), especially hunters and livestock owners, who play a crucial role in wolf survival (Deutscher Bundestag 2018). This means that the threat of real and perceived conflict with humans, livestock and game species is ever increasing, as is the need to educate and inform local people about the presence of wolves in their area. If the wolf is to have a future in Lower Saxony, people must be educated about the wolf's movements and habits, as well as about the correct application of livestock protection measures, so that human-wolf conflict can be reduced as much as possible or avoided altogether.

BMUB (2015) argues that human-wolf conflict resolution should encompass the following activities in the state’s wolf management: Informing stakeholders and the general public, measures to protect livestock from wolf depredation, interaction with the hunting community, effective and lawful procedures to deal with problem wolves, monitoring and research.

The Lower Saxony wolf management plan (MU 2018) provides important contacts and chains of action for different situations and it also includes guidelines for wolf monitoring procedures in accordance with a nationwide set of standard criteria and protocols. The experiences of the last two decades in Germany suggest that co-existence of humans and wolves is possible (NABU 2014), but it requires effective and transparent information campaigns to inform stakeholders and the wider population. The return of the wolf certainly has its challenges, especially for livestock owners. They need quick chains of action and recommendations for best practice, e.g. livestock protection measures and strategies for public relation activities (NABU 2015). At the moment the German population is stongly in favour of the wolf returning (79% in favour). However, an increase in livestock kills could result in the loss of public support, so it is crucial to work on solutions for co-existence between livestock on open pasture lands and free-roaming wolves. In addition, detailed knowledge of temporal trends in the spread and abundance of wolves is an important basis for taking effective measures, thus monitoring of wolf populations is essential.

Since the wolf, as a habitat generalist, is able to adapt to many different habitats and circumstances, the species has found itself able to survive and propagate effectively in today's highly cultivated landscape in Germany. The wolf does not need, as is often suspected, a wilderness in order to survive. It simply needs an adequate food supply and retreat areas for breeding.

Wolf territories

At the end of the monitoring year 2016/17 there were 60 confirmed wolf packs in Germany (DBBW 2018a). The distribution of territories occupied by the wolf today is largely a function of expansion from founder populations in southeast Saxony in the early 2000s, through the states of Brandenburg and Saxony-Anhalt northwest to Lower Saxony (Fig. 2.1.a).

Prior to the expedition, the latest numbers of wolves in Lower Saxony, as per the 2016/2017 monitoring year was eleven wolf packs, one wolf pair, two single wolves and eight unconfirmed territories (LJN 2017). In April 2018 numbers increased to 14 wolf packs, four wolf pairs, one single wolf and six unconfirmed territories (LJN 2018d) (Fig. 2.1b). This demonstrates that the wolf population in the area is clearly increasing.

Study area

The study area was in the state of Lower Saxony, mainly in areas around the Lueneburg Heath. Study sites were chosen in close collaboration with the state authorities responsible for wolf monitoring, mainly the wolf bureau, which advised where wolf population data was needed most, for example because there was little recent knowledge about breeding activity or other aspects of population dynamics or because wolves had entered a new area.

Lower Saxony borders the North Sea in the north, where some areas are depressions below sea level. In the north-east the Elbe river is part of the state border. The southeast border runs through the Harz Mountains with the highest peak at 971 m. The northeast and west of the state are part of the North German Plain, while the south is in the Lower Saxon Hills. The Lueneburg Heath is located in the northeast of the state (Fig. 2.1d). The main large rivers are the Elbe, Weser, Aller and Ems.

The state of Lower Saxony was created after World War II and has geographic, historic and cultural roots. The state is divided into 37 districts (Landkreise, Fig. 2.1c). Districts are a constituent part of the German federal system. The constitution requires a vertical distribution of public power to politically constituted local authorities, namely municipalities, districts, states and the federal government. This ensures a decentralised service of public duties. The districts have to fulfill communal services such as, for example, handling of nature conservation issues.

Land use and land cover

More than half of Germany’s surface area is used for agriculture, although this proportion is declining slowly, while settlements and traffic infrastructure steadily rise. Almost 60% of Lower Saxony is used for agriculture, 22% is occupied by forests, with settlements and traffic infrastructure forming the third biggest type of land use (18%) (Niedersachsen 2018) (Fig. 2.1d).

In densely populated Lower Saxony, a variety of infrastructure such as roads, railways, settlements or industrial areas divide up the landscape (Fig. 2.1d). The state’s 799 nature reserves account for only 4.1% of its surface area (NLWKN 2017), so it is clear that large, uninterrrupted habitats for wild animals do not exist within the heavily populated and cultivated landscape, forcing wildlife to live within a highly fragmented landscape.

Figure 2.1a.

Wolf territories in Germany on 30 April 2017 (source).

Rudel (blue) = wolf pack

Paar (red) = wolf pair

Einzeltier (yellow) = single individual

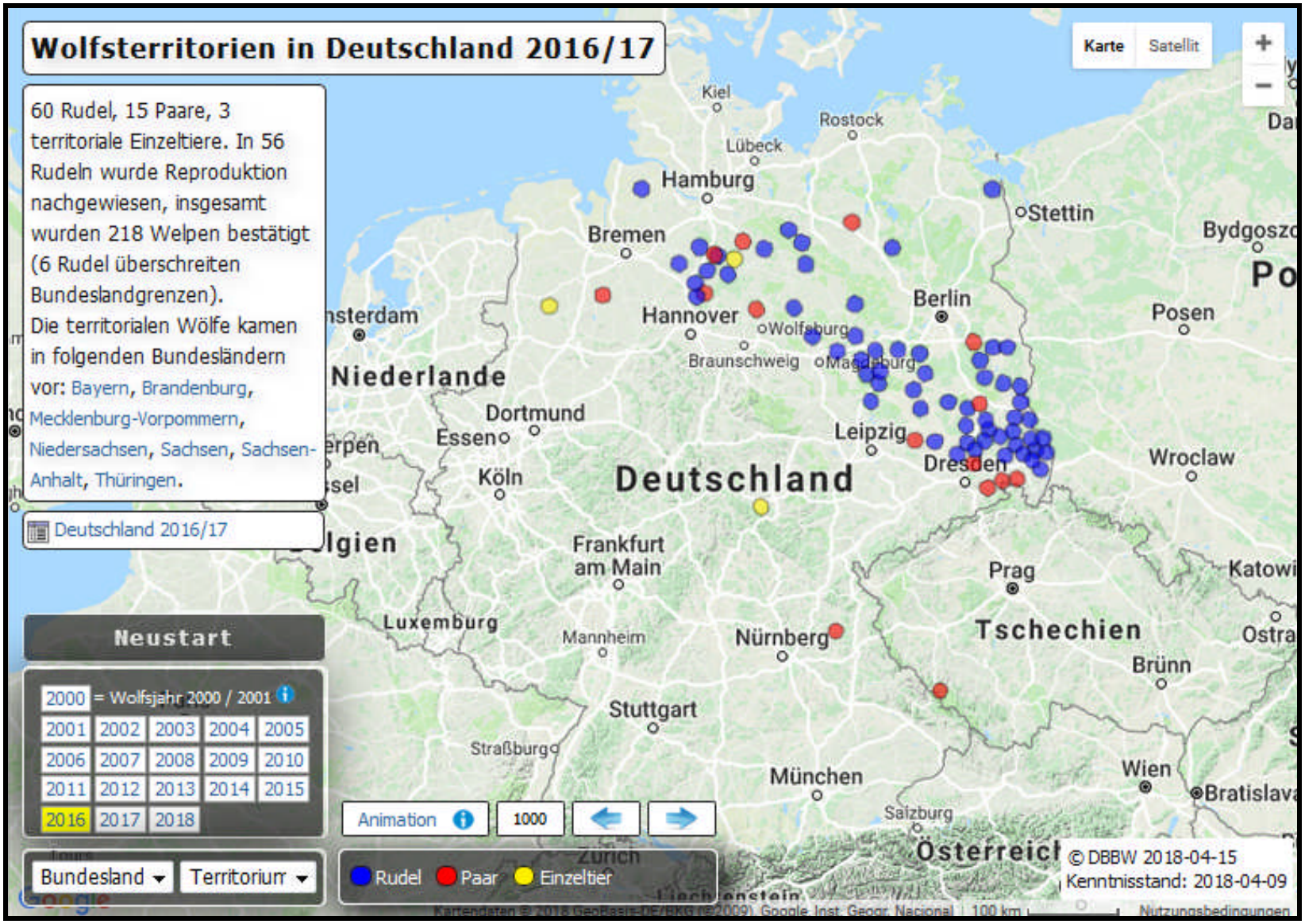


Figure 2.1b.

Wolf territories in Lower Saxony on 16 April 2018 (source).

Wolfsrudel (orange) = wolf pack

Wolfspaar (red) = wolf pair

Residenter Einzelwolf (green) = resident individual

Unklar (grey) = unclear

Unter Beobachtung (blue) = confirmed / under observation

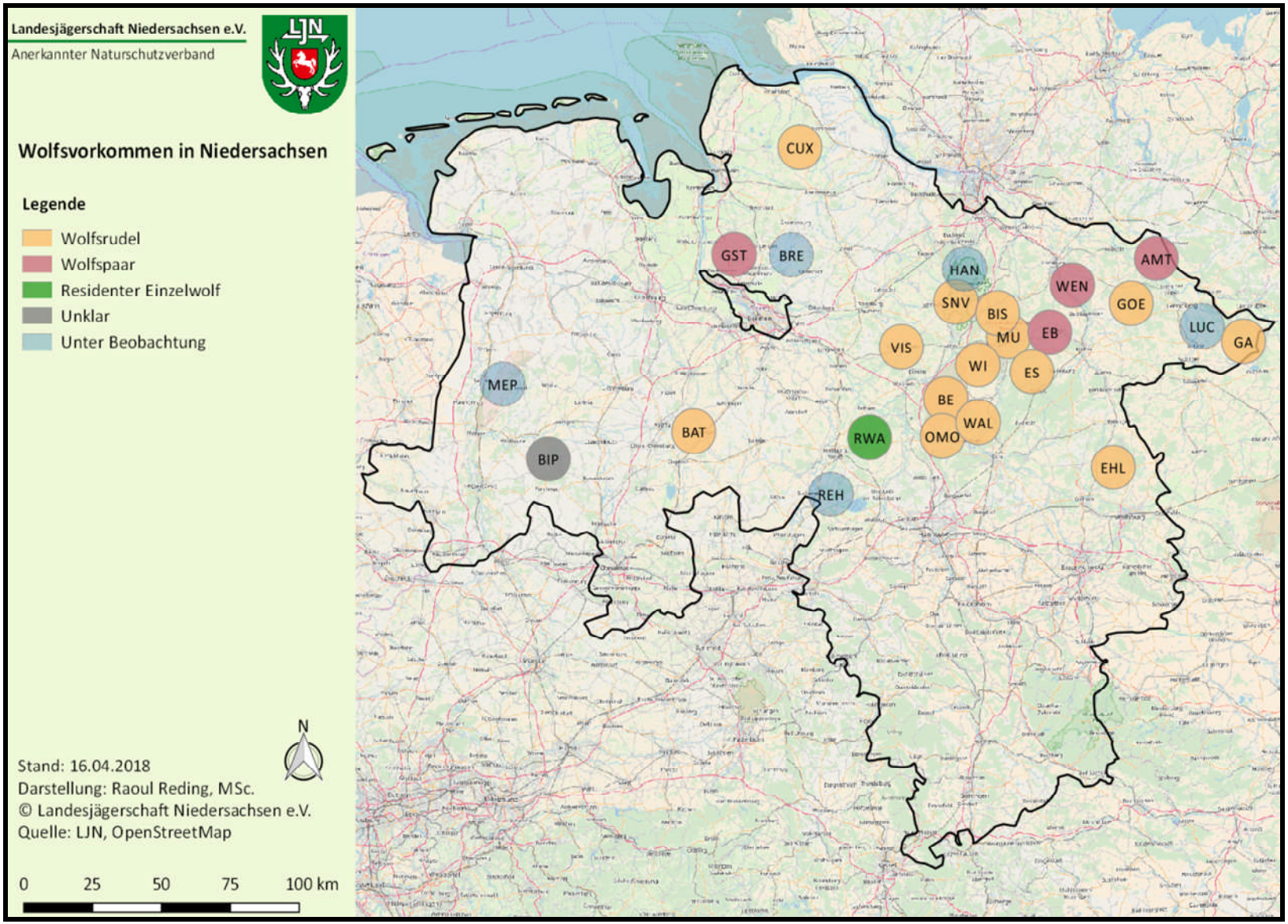


Figure 2.1c.

Districts and urban districts of Lower Saxony (source).

Figure 2.1d.

Land use of Lower Saxony (source).

Main roads (red)

Railways (black)

Rivers (blue)

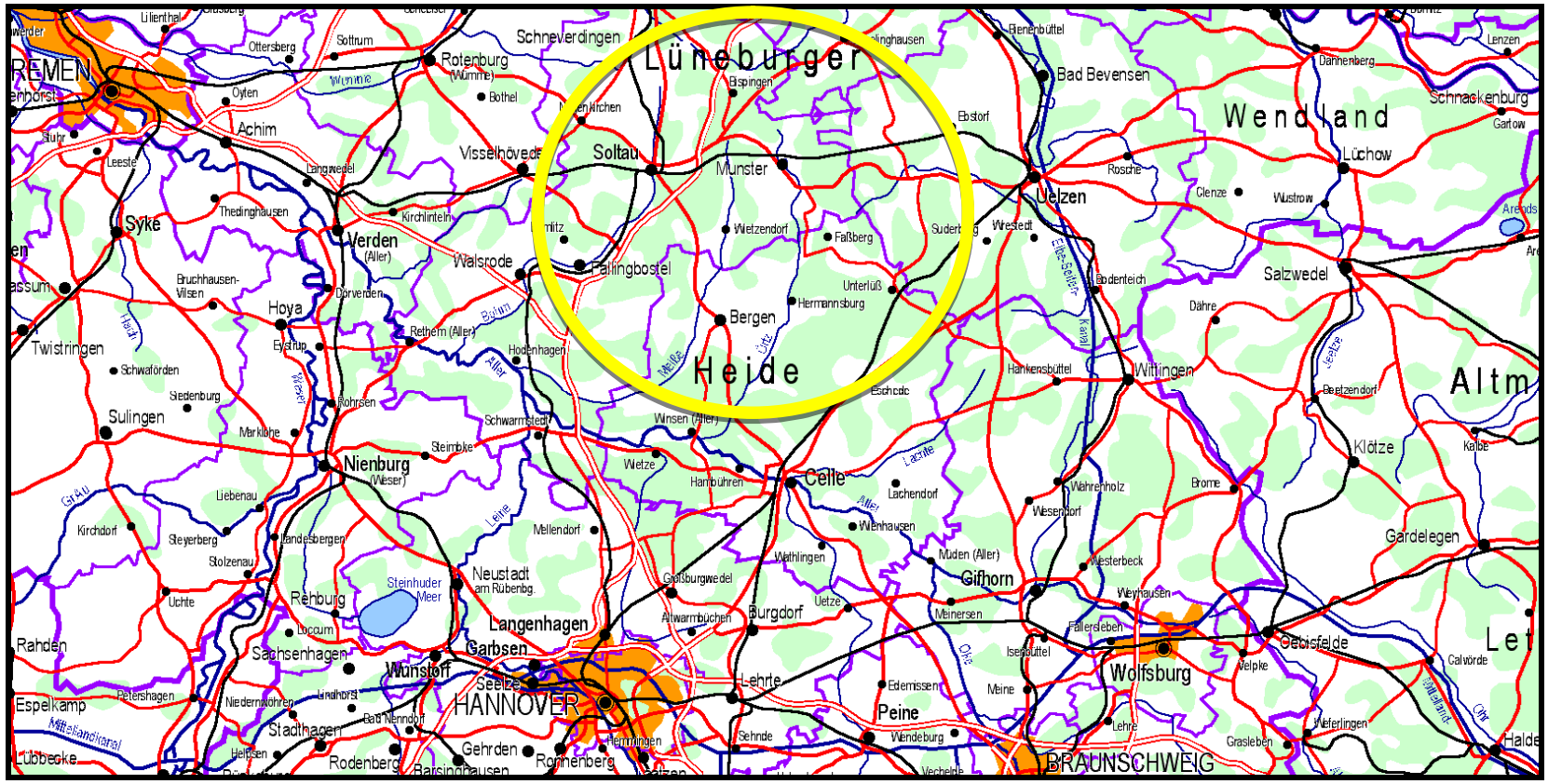
Forests (green)

Agricultural areas (white)

Urban areas (orange)

District boundaries (purple)

The Lueneburg Heath (Lüneburger Heide) is marked by a yellow circle



The physical and biological ground cover and the ways in which it is used are very diverse in Lower Saxony. Although there are some larger areas of forests and agriculture, the state is very fragmented (Fig. 2.1e). In all four study sites, there are several settlements, a great variety of infrastructure, and also intensily farmed agricultural areas.

Wolf monitoring shows that wolf territories in Lower Saxony are predominantly in forest and heath regions, but there are also some in the middle of cultivated and densely populated areas (LJN 2018d).

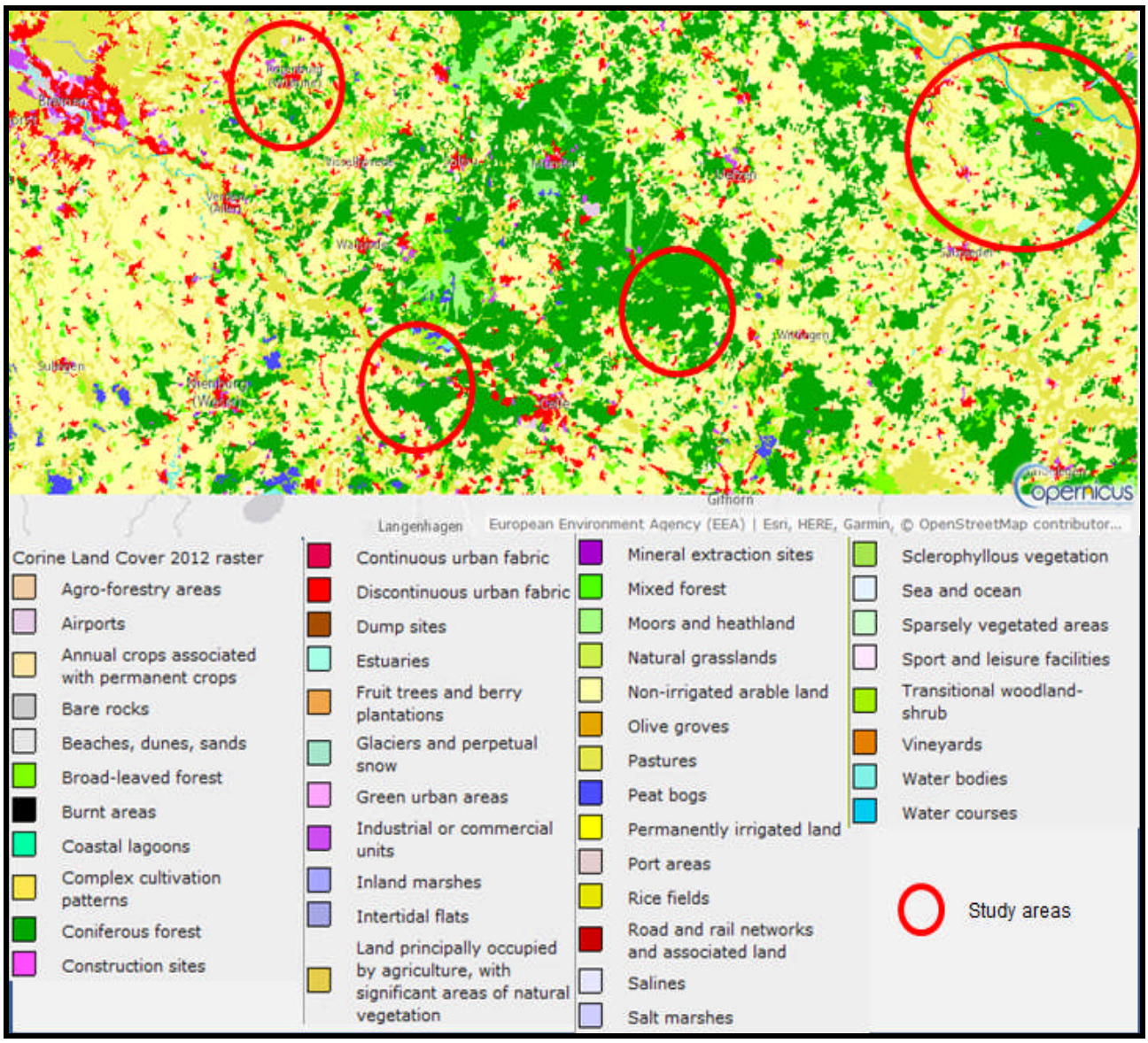


Figure 2.1e. Land use cover in study areas, map adapted from CORINE.

Climate

Lower Saxony is located in the west wind zone, Central Europe's temperate zone, in a transition area between the maritime climate of the western part and the continental climate of the eastern part of Europe. Hence there are noticeable climatic differences within the state. The northwest has an Atlantic climate with a low temperature amplitude. Further inland the climate is more continental with stronger temperature differences between summer and winter, the precipitation is lower and seasonally unevenly distributed. The highest rainfall is recorded in the Harz mountains. The average annual temperature is around 8°C.

Survey areas and habitats

Field work covered 25 standard 10 x 10 km cells of the EEA grid system (European Environment Agency 2018) in four different survey areas, situated in the districts of Celle, Uelzen, Luchow-Dannenberg and Rotenburg (Fig. 2.1f), and covering a variety of habitats such as forest, swamp, heath, agricultural and forestry land (Figs. 1.2b & c, 2.1g-j). All study sites were chosen in consultation with the State Wolf Bureau and local wolf commissioners.

Survey routes were always on public paths, forest or hiking trails, never on private ground or off public pathways. This was done in order to avoid any trespassing, but equally importantly to increase the chances of finding wolf sign, because wolves predominantly use public pathways and other human infrastructure for travelling and territorial marking (Reinhardt et al. 2015a).

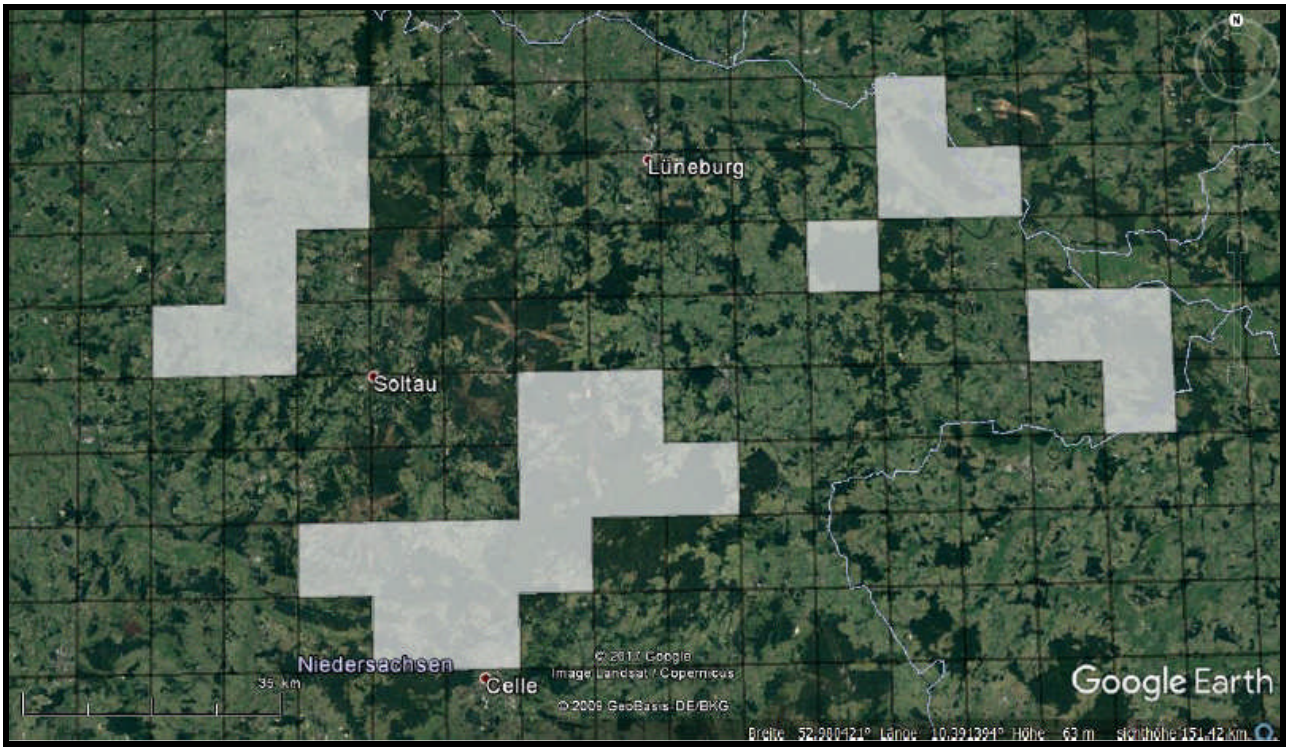


Figure 2.1f. EEA grid cells covered during the surveys (indicated as pale shading).

Figure 2.1g. Forest and field edge habitat. Photo courtesy of Daniel McCourt.

Figure 2.1h. Open woodland habitat.

Figure 2.1i. Conifer forest habitat. Photo courtesy of Graham Makepeace-Warne.

Figure 2.1j. Open marshland habitat. Photo courtesy of Angela Holz.

2.2. Materials and methods

2.2.1 Monitoring

In Lower Saxony, wolf monitoring is usually conducted via a passive system. This means that those responsible for collecting data only become active when they receive messages about wolf signs such as scats, sightings, kills, etc. from the local population (LJN 2018a).

Data are collected and evaluated following nationwide standards for the monitoring of large carnivores in Germany (Reinhardt et al. 2015a) and are collated in quarterly reports. In Lower Saxony, for better or for worse and as a result of a political decision, the agency responsible for collation, analysis and publication is the State Hunter's Association of Lower Saxony (LJN = Landesjägerschaft Niedersachsen). The LJN works in cooperation with volunteer wolf commissioners (Wolfsberater). Wolf commissioners are appointed by the state's Ministry of Environment and work on a voluntary basis. Their remit is to support wolf monitoring efforts and educate the public about wolves. There are about 120 wolf commissioners distributed across Lower Saxony's districts. In addition to their role as advisors, where they would for example advise livestock owners about herd protection, they also record reports of sightings, livestock and game kills and other evidence of wolf occurrence.

According to Reinhardt et al. (2015a), interpretation of data collected via passive means should be done "very carefully as these data are collected randomly and not systematically". There is thus a clear need for active monitoring efforts to detect more signs of wolf presence, collected specifically and systematically. Active wolf monitoring methods are used in certain areas by the LJN, the State Wolf Bureau, the wolf commissioners and also by Biosphere Expeditions in the current study.

Breitenmoser et al. (2006) define active monitoring as data and information collection specifically for the purpose of monitoring a species or a population. Scale, resolution and timing of field activities, as well as the collection methods are designed with the objective of the monitoring system in mind, as well as species biology and environmental conditions. The aim is to collect data that have the least possible bias so that the result of the monitoring programme can answer the question asked with as little bias as possible.

In official wolf reports, the spatial condition of a population is described through the occurrence and distribution area. This refers to the area that is populated by the species. Monitoring data is displayed in the EEA grid system (on 10 x 10 km grid cells) (European Environment Agency 2018) (Figs. 2.2.1a & b). In the official wolf monitoring system in Germany, a grid cell is considered occupied if it produces at least one observation, classified as C1 (hard evidence) (Reinhardt et al. 2015b). In the absence of a C1 record, at least three C2 records (confirmed observations) are required (see appendix II for details and definitions of the SCALP classification system).

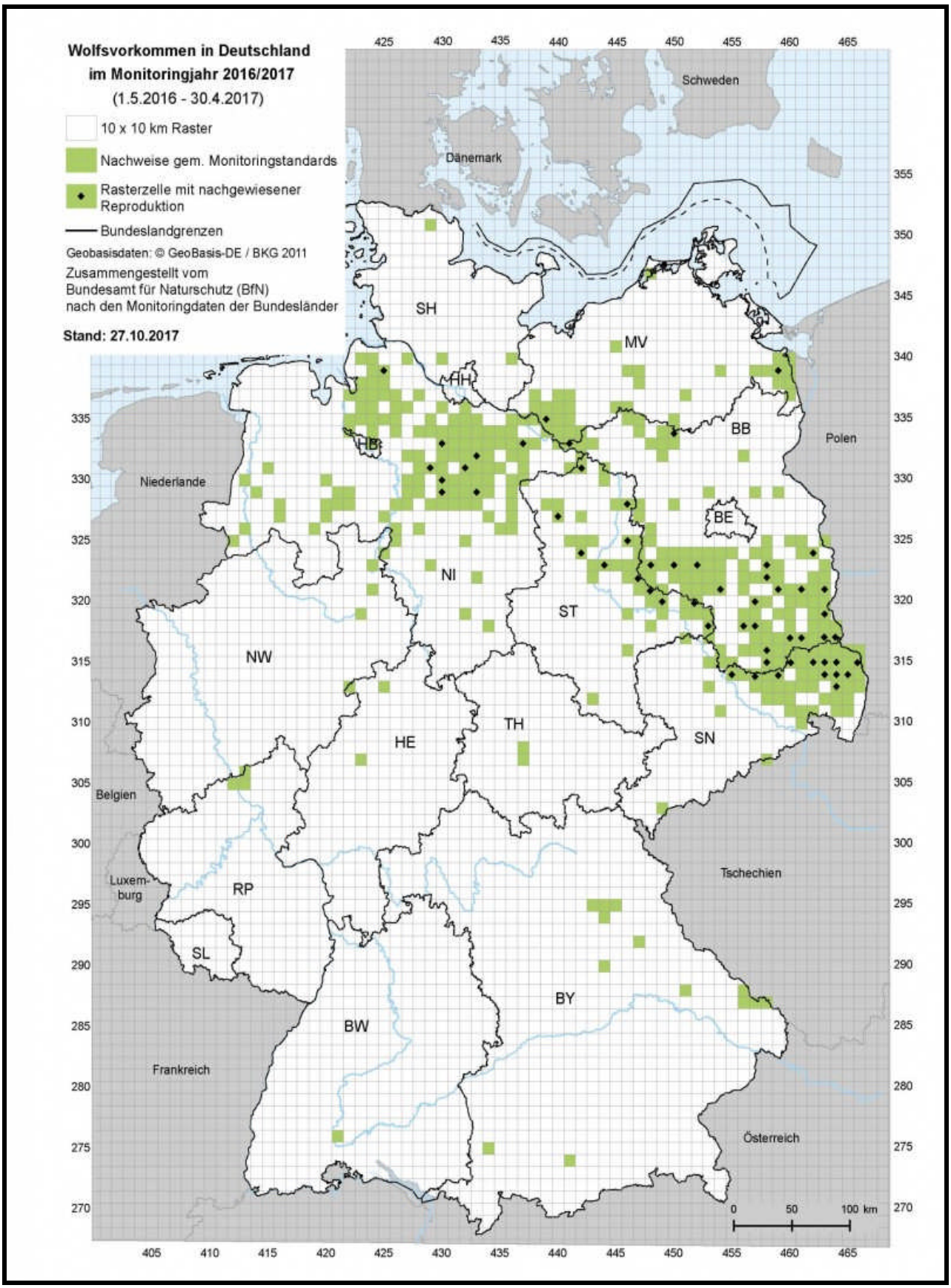


Figure 2.2.1a. Distribution of wolves in Germany in 2016/2017 on the EEA grid system (source).
Green cell = wolf presence confirmed in accordance with monitoring standards.
Green cell with blacl dot = wolf presence and reproduction confirmed.

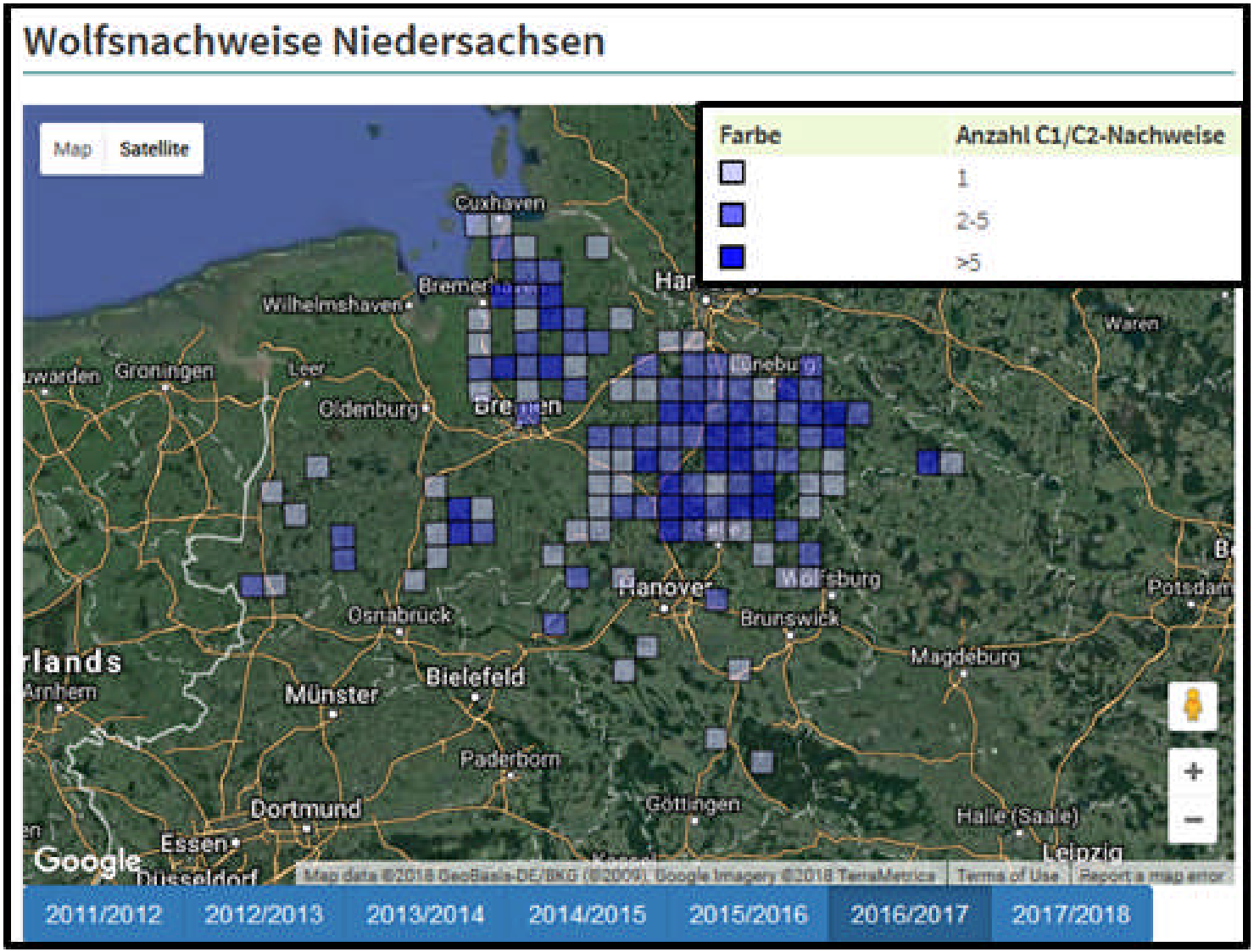


Figure 2.2.1b. Distribution of wolves in Lower Saxony in 2016/2017 on the EEA grid system (source).

For demographic analysis and accurate population size estimation, Reinhardt et al. (2015b) recommend working with population indices such as the number of packs and scent marking pairs. The population size is usually given in sexually mature individuals. Validated and categorised monitoring data can then be used to deduce the area of occurrence or population size and to distinguish between adjacent territories, pack size and reproduction. The recommended methods to estimate these parameters are described by the authors, who also provide the following definitions:

Single resident wolf: single wolf living in an area for at least six months

(Scent marking) pair: male and female wolf marking together but not (yet) having reproduced

Pack (family group): a group of more than two wolves living in a territory

Reproductive pack (family group): group consisting of at least one mature wolf with confirmed reproduction

Mature wolf: equal to or older than 22 months

Pup: wolf in its first year of life; since most pups are born at the beginning of May, the transition from pup to yearling takes place on 1 May. Accordingly, the official monitoring year is from 1 May to 30 April.

Yearling: wolf in its second year of life

2.2.2. Signs and methods used during the expedition

In order to glean useful, high quality data, we followed Reinhardt et al.'s (2015b) monitoring methods and ways of documenting and evaluating findings in the field. Citizen scientists conducted so-called presence sign surveys, i.e. they searched for signs of wolves such as tracks, scats, scratch marks, kills or direct sightings. Since wolves often use existing human pathways for travelling and territorial marking, such pathways were surveyed on foot or by bicycle, sometimes with the use of specially trained dogs to detect scats. Citizen scientists were given an area to survey each day and they walked or rode along selected pathways slowly and in small groups and documented the route covered, as well as all signs found. Data were collected in standardised data sheets (see appendix III for week-by-week survey results).

Presence sign surveys can be conducted all year round under almost all environmental conditions (Reinhardt et al. 2015b). The method is simple but laborious, and often there is simply a lack of personnel to examine areas. This is where citizen science can make a significant contribution, as Foster-Smith & Evans (2003) and many others have shown.

We collected and assessed the following wolf signs, following Reinhardt et al. (2015a):

Tracks

It is not possible, even for experts, to make a clear distinction between a dog and wolf of similar size from single footprints or a few visible steps. Only paw prints over a longer track make the distinction apparent, because wolves typically use an energy-saving gait called direct register trot. Tracks of wolves in direct register trot appear as very straight track lines with hind paws placed in the prints of the front paws, a so-called overprint pattern. Dogs, by contrast, show a much more erratic track.

Instructions for the expedition team were to record only direct register trot lines that (a) could be followed for at least 100 m and (b) where at least three separate measurements of three separate paw prints showed that the overprint or front paw was at least 8 cm in length without claws and (c) where at least three separate measurements of three separate step lengths showed that the step length was longer than 1.10 m. After a training phase for citizen scientists lasting two days, all tracks found and fitting the criteria were to be photographed, measured and recorded in the field and then quality assessed by project staff back at base on the same day before entering into data records (see appendix III). Approved records would have yielded a C2 confirmed observation on the SCALP classification system (appendix II), but no tracks fitting the criteria were found during the expedition.

Scat

Wolves use faeces as terrtitorial markers, so faeces can often be found on paths or crossings, often in exposed spots. Faeces can be identified as wolf, because they often contain hair and/or large fragments of bones and other prey remains. Additionally they usually emit a typical strong wolf-like smell. Faeces of wolf puppies cannot be distinguished from those of foxes. Scat is a major source of information as fresh faeces can provide genetic material, which is important for the genetic monitoring and identification of individuals.

Citizen scientists were trained and then collected faeces during their surveys, following a set protocol designed to eliminate contamination. Samples for genetic analysis were stored in a container of ethanol (96%); samples for dietary analysis were frozen. Faeces yield a C1 piece of hard evidence if genetic analyses confirm it is wolf scat, or a C2 confirmation observation if all of the following criteria are met: (1) Scat found by wolf track, (b) scat contains hair, bones, hooves, teeth, (c) diameter > 2.5 cm, (d) length > 20 cm, (e) photographic documentation and (d) written documentation.

Sightings

Direct sightings are the second most common signs for wolf presence in Lower Saxony (LJN 2017). Wolf sightings yield a C1 piece of hard evidence if a photo or video record exists and the animal is confirmed as wolf by an expert or experienced person. Wolf sightings yield a C3 unconfirmed observation if there is no photo or video record, or if the animal could not be categorically confirmed as a wolf.

Kills (game or livestock)

The assessment and documentation of kills requires considerable experience as well as permission by the owner and authorities. As such, kill assessment can only be conducted only by wolf commissioners or veterinarians. Citizen scientists can assist with, but cannot conduct kill assessments. Kills yield a C1 piece of hard evidence if genetic analysis confirms wolf as the predator. Kills yield C2 confirmed observations if the carcass was skinned and tyical wolf kill characteristics were found. These can be a combination of (a) a well placed, bloodless bite on the throat, (b) drag mark > 5 m, (c) more than 5 kg eaten during the first night after the kill, (d) more than 50% of bites have penetrated the skin, (e) the intercanine distance is between 4.0 and 4.5 cm. Photo and written documentation is also required.

Hair

Hair samples can yield a C1 piece of hard evidence only via genetic analysis. Microscopic examination of hair can only determine if a wolf (or canid) can be excluded, but not confirm a wolf. The citizen scientists were instructed to collect possible wolf hair in dry paper and then inside a plastic bag for storage. However, no wolf hair was collected during field work on this expedition.

Camera trapping

Camera traps are a useful tool to gain basic data about wolves. Once an appropriate spot is found, cameras can collect data on wolf presence, pack size, the physical condition of individuals or disease symptoms. Camera trap photos yield a C1 piece of hard evidence if the animal is visible from the side or as completely as possible from the front and all wolf characteristics are visible, or if the animal is clearly identifiable (transmitter collar, known wolf with distinguishing features), or if the animal was identified as a wolf by an experienced person. Camera trap photos yield C3 unconfirmed observation if the animal cannot categorically be confirmed as a wolf, but also cannot be excluded. The expedition had camera traps available and expedition participants were trained in their usage. However, due to Germany's very strict property and data privacy restrictions no suitable areas to place cameras were found and no camera traps were used during the expedition.

Usage of genetics

Genetic monitoring of wolves is based on non-invasively collected sample material, such as scat or hair. This project collected scat samples, stored them and sent them via the State Wolf Bureau to the laboratory of the Research Institute Senckenberg for genetic analysis as detailed by the Senckenberg Institut für Wildtiergenetik (2018).

Scent dogs

Scent dogs are trained to detect the scent of a particular animal in order to locate it or find signs of it. They can work in terrain and conditions where it is difficult or impossible for people to survey wildlife. The use of scent dogs as a wolf monitoring method is relatively new to Germany, but has been tried abroad. Long et al. (2007) describe training scent dogs and carrying out surveys with them and state that they are "highly effective at

locating scats from forest carnivores and are an efficient and accurate method for collecting detection–nondetection data on multiple species". Long et al. (2008) also compared the effectiveness of scent dogs with other monitoring methods and found that scent dogs yielded the highest raw detection rate and probability of detection, as well as the greatest number of unique detections. Reinhardt et al. (2015a) suggest and recommend the testing of this method, especially in new territories with unknown wolf presence or in the periphery of areas of occurrence. Two dog handler teams of Wildlife Detection Dogs e.V. kindly supported this study and helped to find hidden scats next to the road, behind obstacles or in the high grass.

2.2.3. Expedition work

Field training

All field training was provided as part of the expedition and no prior knowledge was required. The first two days of each week were dedicated to training the citizen scientists through a mixture of background talks and presentations, as well as classroom sessions and practical lessons in the field. Training included recognising wolf sign ID (tracks, scat, kills/carcasses, hair or urine), sample collection and handling in accordance with Kaczensky et al. (2011) and Senckenberg Institut für Wildtiergenetik (2011). Documentation of findings was also covered, using data sheets and photos following Reinhardt et al. (2015a), as well as equipment training on GPS receivers, camera traps, radios, and use of rulers/yardsticks, cameras and scat collection kits to collect data. Standardised datasheets, translated from and closely based on those of the offical wolf monitoring programme, were designed for surveys, tracks, scats, camera trapping and sightings and citizen scientists were trained on how to complete them correctly.

Typical expedition day

Survey routes were decided in advance with input from wolf commissioners, landowners/landusers and foresters. They were confirmed in the morning, depending on the weather. Each morning the expedition team divided into sub-teams of two or more people, who were assigned to survey a certain area that day. Each group was equipped with field and tracking guides, rulers and yardsticks, datasheets, GPS devices, radios for communication between groups, and a scat collection kit consisting of a plastic box with paper, bag, surgical gloves and tubes containing alcohol for collecting samples from which DNA can be obtained from scat or hair. Surveying was done on foot or bike according to the terrain. Cars were used to reach the survey starting points. Teams had lunch in the field and returned to base in the afternoon to log results and discuss findings with the expedition scientist as part of a standard data quality assessment procedure. The day ended with a review session where groups presented results to each other, discussed the survey day and planned the next.

Data collection protocols and use

When tracks, kills, scats or other signs of wolf were found, citizen scientists recorded them using GPS receivers, cameras and datasheets in line with monitoring standards. Data recorded included the GPS position of the find along with details such as the number of individuals (in the case of a sighting), characteristics of footprints and tracks (length, width

and estimated age of the footprint, etc.), the direction of movement of the individual and the substrate type. Route and track data were recorded into a GPS device using the track log and waypoint features and these were backed up and consolidated onto a laptop once back at base. Photos were taken in line with the monitoring standards and also stored onto the expedition laptop following a clearly specified naming protocol. Samples suitable for DNA analysis were collected in the field into a tube with 96% ethanol and sealed into a plastic bag. Samples for dietary analyses were collected into sealed plastic bags and deep frozen. All samples were labelled and recorded.

All samples and data were quality assessd by qualified staff. Only those approved were analysed and sent on for further analysis. Samples for dietary analyses and assessment of their SCALP status were stored at -18°C before they were handed over to the laboratory at the University of Veterinary Medicine Hannover Foundation (Institute for Terrestrial and Aquatic Wildlife Research, Prof. Siebert) after the expedition. Scat samples fresh enough for DNA analysis and assessment of their SCALP status were stored in 96% ethanol immediately after they were found and sent to the laboratory of the Research Institute Senckenberg for analysis after the expedition via the State Wolf Bureau, which performed another quality assessment. Great care was taken to avoid direct contact and therefore contamination of the samples.

The photo documentation and data sheets of each team were reviewed, quality checked and supplemented by notes for further data processing. GPS data were checked and visualised in GIS in the EEA grid system and shared with the expedition team during the daily review session.

The data gathered by this study form part of the official wolf monitoring programme of Lower Saxony. All relevant data were integrated into the official database and as such were reviewed by the official wolf monitoring programme and assessed by SCALP categories. Since our data form part of the official wolf monitoring programme, they are published in the official LJN annual monitoring report, as well as in their quarterly reports.

2.3. Results

In four weeks of surveying, participants walked and cycled 1,133 km and covered 25 grid unique cells of the EEA 10x10 km grid in total, all of them multiple times so that grid cells were covered 52 times (Fig. 2.1f, Table 2.3a).

Table 2.3a. Number of grid cells and length of routes surveyed by the expedition teams during the four expedition weeks. Note that the team split into four or fewer groups per day.

Week	Grid cells (N)	Routes total (km)	Routes day 2** (km)	Routes day 3 (km)	Routes day 4 (km)	Routes day 5 (km)	Routes day 6 (km)
1	15	310.50	14.10	62.80	102.70	71.70	59.20
2	13	322.45	13.65	92.90	69.20	64.40	82.30
3	10	217.30	9.70	64.20	38.70	28.50	76.20
4	14	283.00	15.30	41.50	55.60	72.50	98.10
Total	**52***	**1133.25**					

*As all surveys took place within 25 grid cells, some grid cells were surveyed multiple times
** Day 2: training day, survey in one group

Scat and their SCALP status of findings

We collected a total of 76 wolf scat samples in ten EEA grid cells. 33 of these samples were fresh enough (less than 48 hours old) to yield material for DNA analysis, so a small sample of these 33 scats was put in ethanol and sent to the Research Institute Senckenberg for genetic analysis and SCALP assessment. 75 scats were frozen for dietary analysis (not enough material of one scat was collected to make dietary analysis possible) and sent to the laboratory at the University of Veterinary Medicine Hannover, Foundation (Institute for Terrestrial and Aquatic Wildlife Research, Prof. Siebert) and LJN for analysis of wolf diet components and SCALP assessment (Fig. 2.3a and Table 2.3b). Samples shown to be from wolf by genetic analysis were scored as a C1 piece of hard evidence. Samples where wolf could be genetically excluded were scored as false reports. In addition to these data, one record of a sighting during the expedition was submitted to LJN.

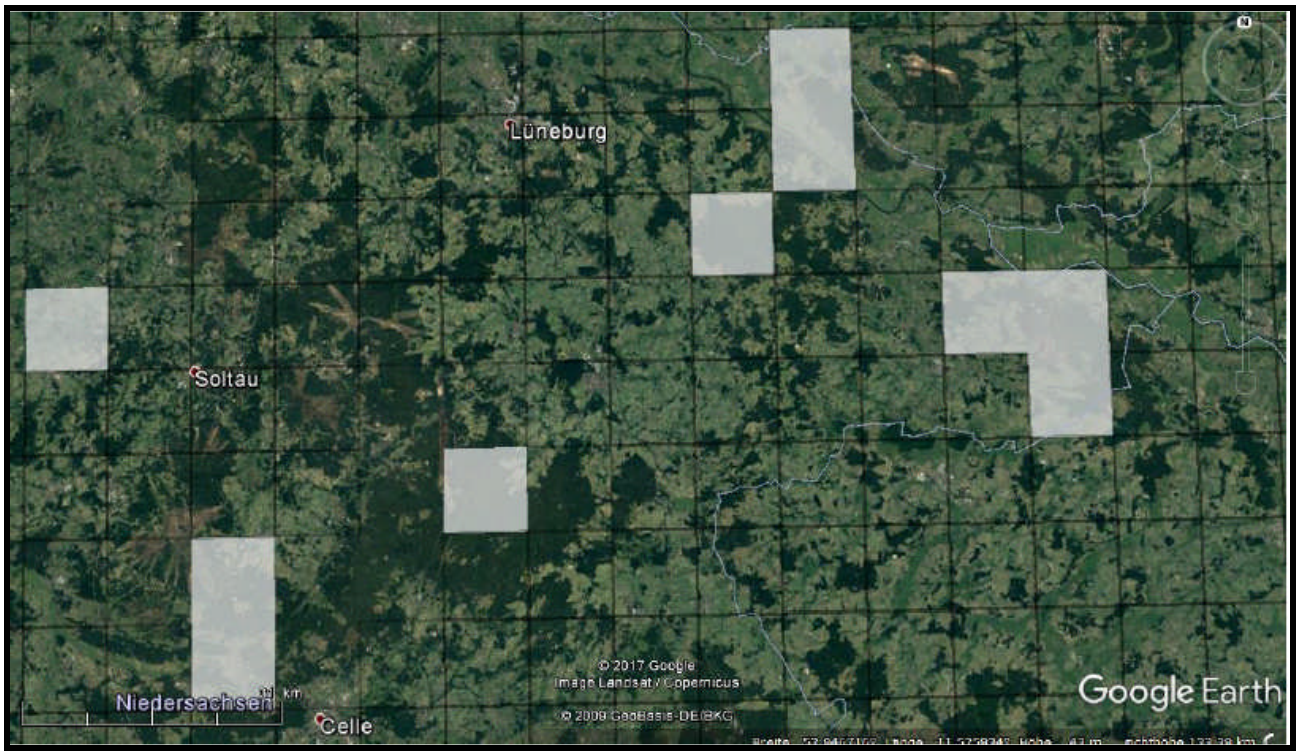


Figure 2.3a. EEA grid cells in which wolf scat samples were collected.

Table 2.3a. Samples gathered by the expedition.

Week	Scat samples total	Scat samples for diet analysis	Scat samples for genetic analysis	Sightings
1	2	2	1	0
2	10	9	6	0
3	40	40	22	0
4	24	24	4	1
Total	**76**	**75**	**33**	**1**

Two, ten, forty and twenty four scat samples were collected in weeks 1-4 respectively (Table 2.3b). In total, 22 (29%) of the 76 samples were classified as C1 pieces of hard evidence, 19 (24%) as C2 confirmed observation (Fig. 2.3b), 30 (40%) were classified as C3 unconfirmed observations and five (7%) did not originate from a wolf (Fig. 2.3c). The one direct sighting was classified as a piece of C1 hard evidence.

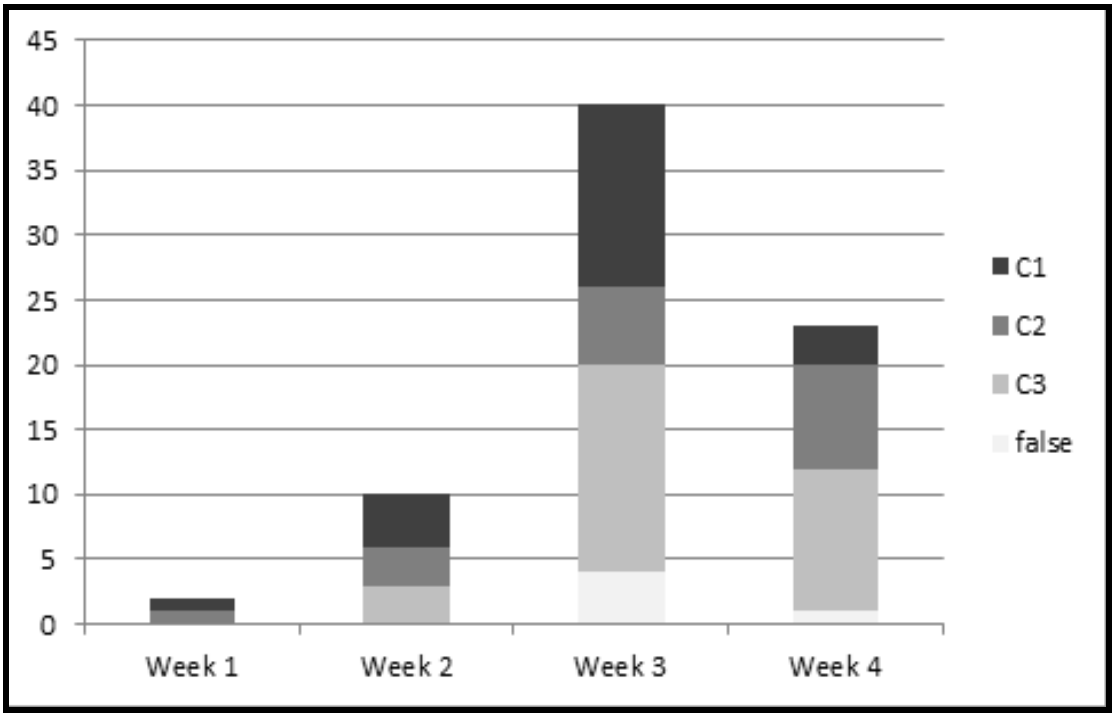


Figure 2.3b. 76 scat samples by their SCALP scoring and per week. C1 = hard evidence, C2 = confirmed observation, C3 = unconfirmed observation, false = false report, no wolf.

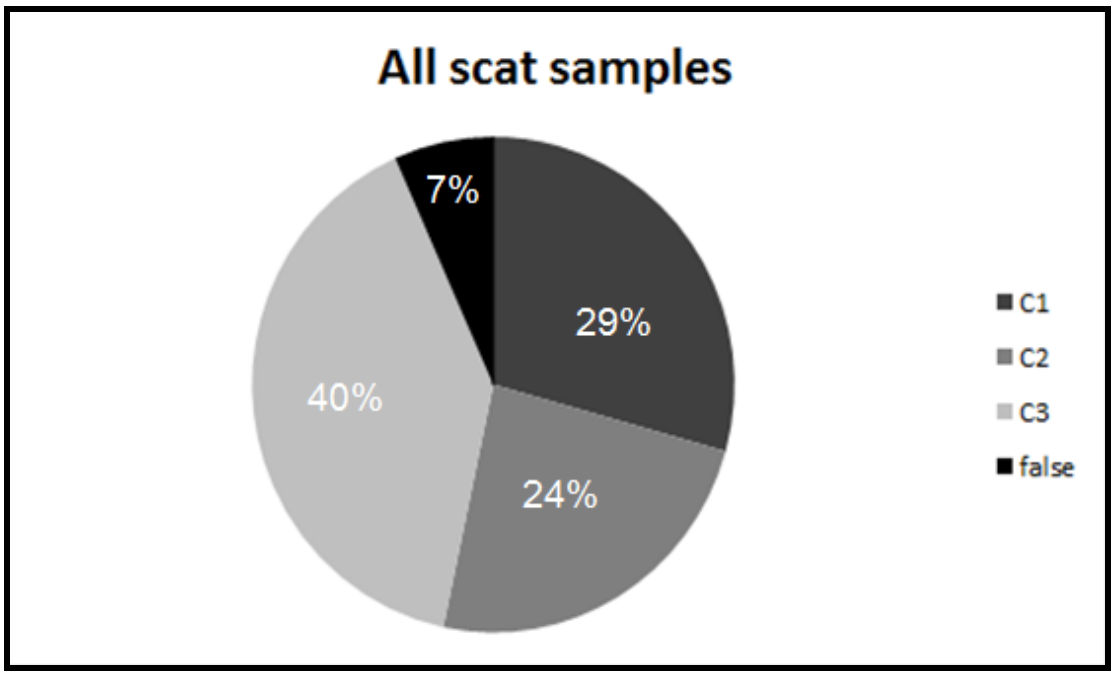


Figure 2.3c. 76 scat samples by their SCALP scoring and in total. See above for legend.

Dietary analysis

75 scat samples were submitted for dietary analysis. This analysis is currently being conducted by Masters student Charlotte Steinberg at the University of Veterinary Medicine Hannover, Foundation (Institute for Terrestrial and Aquatic Wildlife Research, Prof. Siebert) and LJN. As the laboratory work is not yet complete, there are no publishable results. We hope to include the results in the next report.

Genetics

DNA analysis revealed that 22 of the 33 DNA samples originated from wolves (Table 2.3b) and four came from foxes. For the remaining seven samples it was not possible to determine the originating species as wolf. This may be because the sample quality was too poor (too old, too wet) and therefore DNA could not be extracted and sequenced. Six individual wolves could be identified from the samples: two female wolves and four male wolves (Table 2.3c). For ten samples the species wolf, but no single individual could be identified.

Table 2.3b. Results of genetic analyses.

	DNA wolf	DNA no wolf	Species not determinable	Total DNA samples
Week 1	1	0	0	1
Week 2	4	0	2	6
Week 3	14	4	4	22
Week 4	3	0	1	4
Total	**22**	**4**	**7**	**33**

Table 2.3c. Detail of the six wolf individuals sampled.

No.	Individual	Gender	Territory	Sampled in week
1	GW644f	female	Walle	2
2	GW825m	male	Amt Neuhaus	2
3	GW825m	male	Amt Neuhaus	2
4	GW819m	male	Goehrde	2
5	GW644f	female	Walle	3
6	GW816m	male	?	3
7	GW816m	male	?	3
8	GW816m	male	?	3
9	GW824m	male	Gartow?	3
10	GW826f	female	Walle	3
11	GW644f	female	Walle	3
12	GW824m	male	Gartow?	4

GW644f: The female GW644f was first identified in November 2016. With the help of the expedition teams, who sampled three of her scats in June and July (weeks 2 and 3), her presence was documented repeatedly. Thus, the official status of this female wolf living in the territory of Walle was changed to single resident wolf in September 2017 (LJN 2018b).

GW826f: GW826f was detected with one sample from the expedition and other samples. This individual was identified as a female puppy of GW644f. After further analyses, LJN was able to confirm in March 2018 a wolf pack in Walle, comprising the female GW644f, a male, and four related puppies - three female (one is GW826f) and one male (LJN, 2018c).

GW819m: This is a male individual not previously known. He was identified as the offspring of a known male in the Goehrde area.

GW825m: This male has been known from the Amt Neuhaus area since June 2017. Together with the identification of a confirmed female in the same area, mating is now likely to be happening in this area (LJN 2018a).

GW816m: The status this male in the Luchow-Dannenberg area is unclear. This animal originated in Saxony and could not be assigned to a pack yet.

GW824m: Two samples of this male were found in the Gartow area. The status of this male is also unclear and could not be assigned to a pack yet.

Other possible wolf signs

During the expedition, other possible signs of wolf presence were recorded, but did not pass quality assessment procedures and as such were not submitted to official records. Instead they serve as hints for upcoming investigations and expeditions.

Of this type of sign, in total 32 tracks (conditions or measurements for rating not met), 32 scats (too old, not clear, no wolf-like smell) and a variety of fur remains were recorded (Fig. 2.3e). Five carcass remains were found and one team accompanied a wolf commissioner assessing three dead sheep.

Scent dogs

Wildlife Detection Dogs e.V. kindly supported the expedition for four field work days, with one dog accompanying a group for a full survey day. A total of nine wolf scats were found with the dogs. Two of them would certainly not have been found without a scent dog.

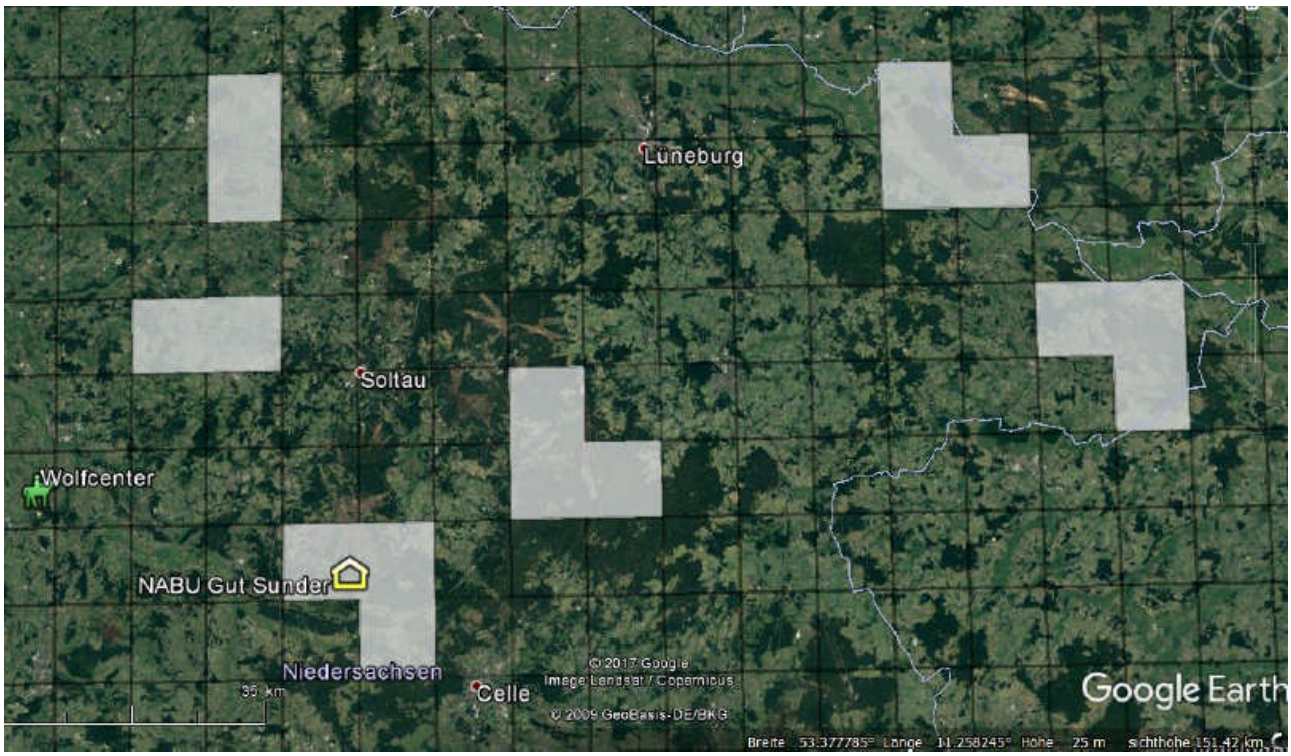


Figure 2.3d. Possible wolf signs (tracks, scats, carcasses, hair) recorded from 17 June - 21 July 2017 in 16 EEA grid cells.

Team composition

49 citizen scientists took part in the expedition, divided into four groups of twelve persons each and lasting a week. 42 people came from Germany or its immediate neighbour countries (86%), four of them (8%) from Lower Saxony. Three participants came from North America (6%), two from Australia (4%), as well as one person each from India (2%) and Singapore (2%).

Media coverage and reaction to the expedition

The expedition achieved significant media coverage (see appendix IV). 28 articles, TV and radio programmes appeared predominantly in the German-speaking countries of Germany and Austria (n=25, 89%) and one each (3.6%) in the Netherlands, UK and India. Two articles were neutral news pieces and one was an advertorial. Out of the 25 remaining articles, 22 (88%) were positive and three (12%) were negative. All three negative articles appeared in local newspapers and were written by journalists who had not been on the expedition and interviewed staff on the phone only. All positive articles and radio programmes were created by journalists who attended the expedition from one day to the full eight day duration of a group.

The initial negative coverage in June 2017 was based around vocal opponents of the expedition made up of two hunters (who were also leading members of the State Hunting Association) and two landowners. The most vocal of those was Helmut Dammann-Tamke, president of LJN (State Hunter's Association of Lower Saxony) and member of the state parliament (CDU / conservatives). His comments were so negative about citizen science, disrespectful of the expedition's citizen scientsts and based around erroneous assumptions that one of the authors (Matthias Hammer) wrote an open letter to Helmut Dammann-Tamke on 9 October 2017 with detailed explanations and clarifications (see online version and text version in appendix V). No response was received.

The erroneous statements made by Helmut Dammann-Tamke and others, as well as the initial negative local press coverage also obliged the two main project partners (State Wolf Bureau and Biosphere Expeditions) to publish a clarification of facts on 14 July 2017 on the State Wolf Bureau website (online version – German only).

In parallel with the initial negative coverage in June 2017, a letter which was quite aggressive in tone and contained a number of erroneous assumptions, mirroring those of the hunters and landowners, was also received by Biosphere Expeditions from the State Forestry Authority landowner (Niedersächsische Landesforsten). This letter was followed by phone calls from the State Forestry Authority to the Biosphere Expeditions office threatening legal action, which was never pursued. Permission for the expedition to access state forestry land was withheld for reasons unknown to the authors.

Once the expedition had started, the negative coverage largely ceased, although some threats and aggressive behaviour towards local staff persisted initially, but these also ebbed away as the expedition progressed and started to produce results.

2.4. Discussion and conclusions

2.4.1. Wolf monitoring science

The work of this expedition focussed on collecting wolf scat samples for identification of individual wolves via DNA and for dietary analyses. Results allowed the expedition to identify two areas of high wolf activity. One is located in the district of Celle, the other one in the district of Luchow-Dannenberg (Fig. 2.3e). Most scats were found in these two areas, but the survey effort was also the biggest here. In Celle, 40 scat samples (53% of total) in two grid cells and in Luchow-Dannenberg 28 scat samples (37% of total) in six grid cells of the EEA 10x10 km grid system were collected. The number of scat samples (76) collected by the expedition to assist official wolf monitoring efforts is remarkable. For comparison, the official wolf monitoring programme recorded a total of 215 scat samples in the preceding monitoring year of 2016/17 (LJN 2017). If the current 2017/2018 monitoring year produces as many scat samples again, our one-month long expedition will have increased the scat sample size by over a third. It will be interesting to calculate the exact increase of sample size through citizen science once the 2017/2018 monitoring year numbers are published, but it is clear already that our work has made a significant contribution to wolf monitoring efforts in Lower Saxony in terms of quantity.

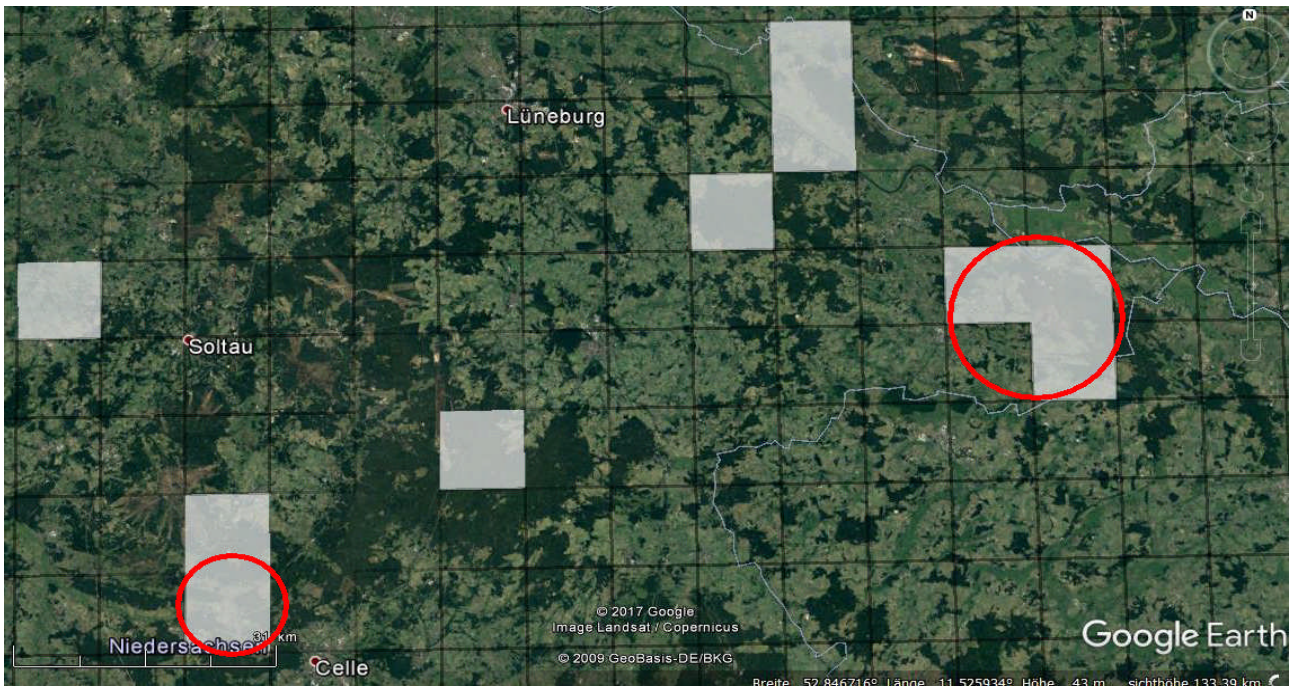


Figure 2.3e Areas of high wolf activity (red circles) from 7 June - 21 July 2017.

In terms of quality, the work of the citizen scientists was excellent too. The proportion of scats collected by the expedition and producing C1 and C2 records was 53%. The proportion for the same evidence level of samples submitted to the official wolf monitoring programme in the preceding monitoring year of 2016/17 was 40% (LJN 2017). This shows that with a day and a half of training, citizen scientists can make high quality and high quantity contributions.

Our initial goal was to collect wolf sign, with an emphasis on finding scat samples, in Lower Saxony in order simply to assist official wolf monitoring efforts and supplement the wolf monitoring database. However, data collected by this expedition led to some unique discoveries and conclusions in the official wolf monitoring reports (LJN 2018d), which would not have been possible without the data collected by this project being added to the official wolf monitoring database.

A total of six individual wolves were identified via DNA samples collected by the expedition. The confirmation of a resident wolf requires two C1 hard evidence scores of that individual wolf over a six months period. The expedition the conclusive C1 piece of evidence for adult female GW644f (the others were collected by a partner wolf commissioner).

In addition, with the help of the evidence we collected of the adult female GW644f and her puppy GW826f, the presence of a wolf pack at Walle could be confirmed. The Walle pack is a classic example of the formation of a pack within the territories of extant packs (see Fig. 2.1b). The parent animals (GW644w and GW911m) came from outside Lower Saxony, namely Brandenburg (LJN 2018c). The other four animals identified through our work were GW819m (Goehrde), GW825m (Amt Neuhaus), GW816m (unclear, origin in Saxony), GW824m (unclear, possibly Gartow). So far it has not been possible to assign these animals to packs. This is mainly due to the fact that there are not enough DNA samples to establish kinship.

For the monitoring year 2016/17 reproduction was detected in 87% of the wolf packs in all of Germany (DBBW 2018c). This means that an increase in the wolf population is highly likely and that more territories will be occupied, including in Lower Saxony. Active monitoring is essential to track those changes.

We await the completion and publication of the laboratory research on dietary analysis. Previous studies show that only about 1% of examined scats include remains of livestock (DBBW 2018c). It will be very interesting to see what the percentage will be in Lower Saxony.

During the four weeks of the expedition, the number of collected wolf scats varied for a variety of reasons. In week 1 (two scats found) we had to find our feet and find wolf activity hotspots. Since wolf activity radii were limited during the expedition due to puppy rearing, it took time to find the hotspots. In week 2 a total of ten wolf scats were collected in the areas of Walle and Goehrde, where we had found hotspots. In the following weeks 3 and 4 we intensified surveying in smaller areas and as a result found forty wolf scats in week 3 and twenty-four in week 4 in the Walle and Gartow areas.

Although directly sighting wolves was not an aim of the expedition, reports from a policeman not connected to the expedition came in during week four of the expedition. Group 4 met this policeman and documented the sighting. No expedition participant in over 1,000 survey km covered (1,133 km total, 48 km of these on bicycles, the rest on foot) saw a wolf. It is clear that the chances of encountering a wolf during daytime, even when looking for wolf sign in suitable habitat, are very small. Reports in the media and by anti-wolf campaigners of the state being “overrun” by wolves are therefore clearly exaggerated.

The distances of survey routes varied from day to day. This was due to very varied habitats and different vegetation on the tracks. Especially in June and July, vegetation growth is extremely high due to high rainfall and heat. Thus a wide gravel forest road could be surveyed faster (sometimes by bike) than a little used, overgrown forest road or an overgrown path in a swampy area. In addition, groups differed in walking/cycling and surveying speed, often as a function of the number of signs found. Also, especially in weeks 3 and 4, it was not always four groups that went into the field, but sometimes two or three groups, which split into sub-groups to survey a smaller area more intensively. On two days the field work had to be stopped due to thunderstorms.

2.4.2. Team composition

One of the criticisms levied at the expedition in the media was that it was “absurd and illogical” (source) to import foreigners from as far away as Australia to conduct citizen science work and that local people should do the work instead. Of the 49 citizen scientists 86% came from Europe and 8% from Lower Saxony. Biosphere Expeditions does not exclude people from expeditions based on their origin and as such will continue to host those from around the world who commit their time and funds to this project, irrespective of their ethnic origin, creed, colour, etc. However, it is agreed that local involvement is highly desirable and we will continue and increase our efforts to recruit local people through a combination of local media work and by making free placements on the expedition available for local people. It is also important to note that all wolf commissioners involved in the expedition were local and that some of them specifically requested help to cover their large survey patches.

2.4.3. Media coverage and reaction to the expedition

The attention that the expedition attracted from the media was remarkable and overwhelmingly positive. Negative coverage and voices, the latter mainly from hunting and landowner sources, were based on misinterpretations and erroneous assumptions. These were countered and covered in detail in the Biosphere Expeditions / State Wolf Bureau clarification of facts on 14 July 2017 and in the open letter to Helmut Dammann-Tamke on 9 October 2017 (also appendix V), namely:

Citzien science: The well-known concept of citizen science was explained and that it has been shown to produce valid, high-quality data and make significant contributions to science, by Foster-Smith & Evans (2003) and many others since. It was also explained that useful data can be gathered using exclusively public paths. The results presented here demonstrate this and refute opposing assumptions made in the media.

Expedition conduct: It was explained that only well-trained, small groups of citizen scientists, essentially indistinguishable from recreational users of the area, were sent into the field, mainly for the purpose of collecting scats, and that those small groups at all times travelled on public paths only. Data presented here corroborate this. Exact survey paths and sign findings, demonstrating exclusive public path usage, are not displayed here in order to protect the wolves, but these data are available from the authors on request for corroboration of assertions. It was also explained that the expedition was not a wolf watching holiday, seeking out or even disturbing wolves for the purpose of viewing, nor was it a “money-making ruse”. Data on the single wolf sighting and the transparent budget presented here, as well as the publicly available expedition diary/blog, corroborate this.

Public conduct and efforts to scupper the expedition: Efforts by hunters and landowners to scupper and discredit the project during the run-up and the initial phases of the expedition resulted in highly stressful situations for project staff, were counterproductive, unnecessary and unsuccessful. They were also detrimental to staff health and a first in twenty years of experience in running expeditions all over the world. It was especially suprising that much of the strife originated from publicly elected officials or those in positions of state authority in Germany, where it was assumed that public discourse would be reasonable and undemagogic. This was not so and it is clear that the return of the wolf is a highly emotional and politically charged affair in Germany, which appears to cloud people’s judgement, produce highly bipartisan views and unacceptable language. In particular, some remarks by Helmut Dammann-Tamke, president of the State Hunter's Association of Lower Saxony (LJN=Landesjägerschaft) and member of the state parliament (CDU / conservatives) and Hans Knoop, the Celle district hunting master, were unwarranted and defamatory. Their public assertions about the expedition’s citizen scientists and/or the expedition itself included “tourists coming round the corner only seeking cheap thrills" or "something out of the madhouse" (in German “Sensationstouristen” and “fette Böcke”, see source), or that the expedition was only “luring” people in for “wolf watching”, thereby “making the majority of wolf commissioners feel belittled" (source), or that participants would become "frustrated after two days, because they will not find anything" and will then "trespass onto private ground" (source). These prejudices voiced by elected officials and people representing state authority, who never attended the expedition or met or talked with its staff, had no basis in fact and are unacceptable populist demagogy designed to incite conflict, where collaboration and working together on challenges (and opportunities) would be preferable.

We did not expect such behaviour in Germany or that it would come from the head of the LJN, which is after all the state authority tasked with wolf monitoring in Lower Saxony and is the organisation with whom findings and results are shared freely. It is perhaps also based on the prejudices described that the State Forestry Authority withheld permission to conduct studies on its land in 2017. We will attempt to address this once this report is published.

The whole episode demonstrated what an emotionally and politically charged subject the return of the wolf has become. The way in which this issue is discussed is in parts absurd and bears no relation to the small number of wolves resident in Germany (see above), or the perceived or actual harm they do to humans or livestock, which is absent (in case of humans) or insignificant (in comparison to the damage from other wildlife species). Positive aspects and opportunities connected to the wolf's return are almost entirely absent from the discussion (see below), which appears to be dominated by a vocal anti-wolf minority, which does not reflect the welcoming stance of the large 79% majority of Germans.

2.4.4. The future of the wolf in Germany – challenges and opportunities

The wolf has returned to Germany to stay. It is a highly adaptable generalist that can live almost anywhere in Germany's highly cultivated and fragmented landscape. It is also a highly protected species that has the full protection of the law. Although some conservative politicans have unilaterally declared, without any basis in scientific fact, that the wolf in some German states has reached a favourable conservation state that can trigger management measures, including culls, the species is in fact nowhere near this state. Calls for culls are therefore unwarranted as well as counterproductive, because shooting a wolf almost never solves the problem at hand. Herds still have to be protected, whether there are one or several wolves, who can travel great distances in a single day, in the region; removing a wolf also upsets existing family structures, which can lead to an increase in livestock attacks as easier prey is targeted. Wolves also do not "learn" anything, as is often asserted, if a wolf is killed, even if the surviving wolves witness the kill, as they are unable to make the connection between a livestock attack that occurred at a different time and place and the retaliatory killing.

Most people in Lower Saxony will never see a wolf in the wild or suffer any detrimental effects through the wolf's presence in their state. Most Germans (79%) also support the wolf's presence in their country. The key to successful human/wolf co-existence in densely populated and cultivated Germany therefore lies in supporting those who are exposed to genuine risks by wolf presence. Since wolves very rarely represent a threat to humans, including children, this means supporting livestock owners and listening to their experiences and concerns. Livestock protection measures in areas frequented by wolves are a must and they must be applied consistently and effectively. Advice exists on how to do this and support networks are available for livestock owners, as are compensation schemes if effective livestock measures were in place and livestock predation by wolves still occurred, which is rare. However, because of the federal system in Germany, such schemes are often disjointed, bureaucratic, slow and differ significantly from state to state. Nationwide schemes and procedures are rare, but in our opinion essential and our advice is to nationalise them and generate true nationwide, effective, efficient and unbureaucratic support and compensation schemes. The wolf's return does have its challenges and it is important not to leave those facing the brunt of them exposed and fending for themselves.

That said, it is by and large the challenges that receive most attention, with opportunities through the wolf returning being largely ignored. It can be argued that especially in nature-based, sustainable tourism there are many, currently untapped, areas of opportunity. The expedition covered in this report is a case in point. We believe the citizen scientists who contributed their time and money to take part in this project deserve our respect, rather than derision. They also serve as a showcase of how the wolf can attract people to Germany; people who went on record to say that the species makes Germany "even more attractive" and that "the world could learn from how people in Germany are trying to coexist with wolves" (source). We argue that this enthusiasm and positive view of Germany has great potential for tourism. Many countries achieve significants amounts of income through nature-based tourism and tourism operators should be encouraged to consider this and its implication for Germany. The expedition covered in this report serves as a showcase and demonstrates how (citizen) science, domestic and international visitors, wolf research and conservation, local NGOs and providers of touristic services all benefit.

2.4.5. Summary

The wolf has returned to Germany to stay. Those who do not like this and employ fake news, populism and demagogy to incite conflict and highly emotional, politically charged and irrational arguments against wolves must be countered each time with calm, factual and science-based discourse. Those who are exposed to real risks through wolves, namely livestock owners, should be listened to, supported and compensated as necessary, ideally through an effective, unbureaucractic and nationwide support and advice system.

Whilst there are challenges that come with wolf presence, there are opportunities too, which have been largely ignored. We see the biggest potential in rural communities generating income through tourism based on nature and wolf presence.

Next to large-scale, national issues, this project on a Lower Saxony state and regional scale, and in close collaboration with the State Wolf Bureau, not only reached its goals, it exceeded all expectations. It is clear that the efforts of well-trained citizen scientsts deployed as part of a well-planned fieldwork expedition can be very productive and that highly valuable data can be acquired through targeted active wolf monitoring work conducted by citizen scientists. This refutes those who doubted that citizen science could make a useful contribution. This doubt was especially prevalent amongst hunters, hunting associations and some forestry landowners before and during the inaugural expedition. It is hoped that the results presented here will encourage them to give up this negative and non-collaborative stance, as well as their publically voiced populist prejudices based on erroneous assumptions and assertions. The authors are, and have been, ready to collaborate in the spirit of successful wolf conservation and wolf/human co-existence in Lower Saxony.

2.4.6. Recommendations for future expeditions

Repeat the expedition on an annual basis

- Adapt/improve methods and logistics as necessary, based on an annual review of activities.
- Establish camera trapping efforts wherever possible within the limitations of privacy and property laws.
- Extend the use of scent dogs during the expedition to establish and promote their effectiveness for wolf monitoring purposes.
- Test new methods such as video scats (Canu et al. 2017).
- Gain support from more wolf commisioners and district nature conservation authorities for active monitoring in areas of specific interest

Improve communications with stakeholders

- Particularly with the state forestry authority, and seek to address misconceptions and unfounded prejudices.
- Present results to hunting associations, forestry departments and other interested stakeholders in order to dispel prejudices and gain support.
- Repeat offers to stakeholders, such as hunting associations and forestry departments, to use/involve/allow the efforts of Biosphere Expeditions, e.g. camera trapping and sign surveys.

Involve local, national and international citizen scientists

- Seek grant and other support, or fund internally, free placements for local people on the expedition.
- Work with the media to encourage more local participation.

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Appendix I: Overview of temperature and rainfall values at NABU Gut Sunder during the expedition (own records)

Date	°C at 07:00	°C at 16:00	Rainfall (mm) 07:00 / 16:00
18 June 2017	15	24	0 / 0
19 June 2017	17	28	0 / 0
20 June 2017	17	26	0 / 0
21 June 2017	11	20	0 / 0
22 June 2017	15	25	0 / 0
25 June 2017	18	17	0 / 5
26 June 2017	12	18	4 / 0
27 June 2017	10	19	0 / 0
28 June 2017	15	19	0 / 3
29 June 2017	13	19	0.3 / 0
09 July 2017	16	20	0 / 0
10 July 2017	15	15	0 / 0
11 July 2017	12	20	7.5 / 0
12 July 2017	15	15	1.5 / 10.4
13 July 2017	11	16	0 / 0
16 July 2017	15	16	0 / 0
17 July 2017	15	20	0 / 0
18 July 2017	12	21	0 / 0
19 July 2017	18	26.5	0 / 0
20 July 2017	17	21	15 / 3

Appendix II: SCALP criteria

SCALP categories (Reinhardt et al., 2015b) are applied to all wolf sign in Germany. In line with these categories the data of the expedition's findings were categorised in the official monitoring database as:

Category 1 (C1): 'Hard evidence' - such as animals found dead, observations verified with photos, captured animals, locating via telemetry and genetic analysis.

Category 2 (C2): 'Confirmed observation' - verified reports from trained people such as kills of livestock and wild animals, tracks.

Category 3 (C3): 'Unconfirmed observation' - kills, tracks and scats that are not verified, and signs that are not verifiable such as animal sounds or sight observations.

False: 'false observations' - observation for which wolf can be ruled out.

'Evaluation not possible' - signs that cannot be evaluated due to lack of information.

Appendix III: Week-by-week survey results

Effort week 1

Survey days		5
EEA 10x10 km grid cells covered		15
Scats found / in EEA cells		2 / 1
Day	Distance covered by teams (km)	Remarks
Sun, 18 June	14.1	One training group only
Mon, 19 June	62.8	Maximum four small groups
Tue, 20 June	102.7	Maximum four small groups
Wed, 21 June	71.7	Maximum four small groups
Thu, 22 June	59.2	Maximum four small groups
Total	**310.5**	

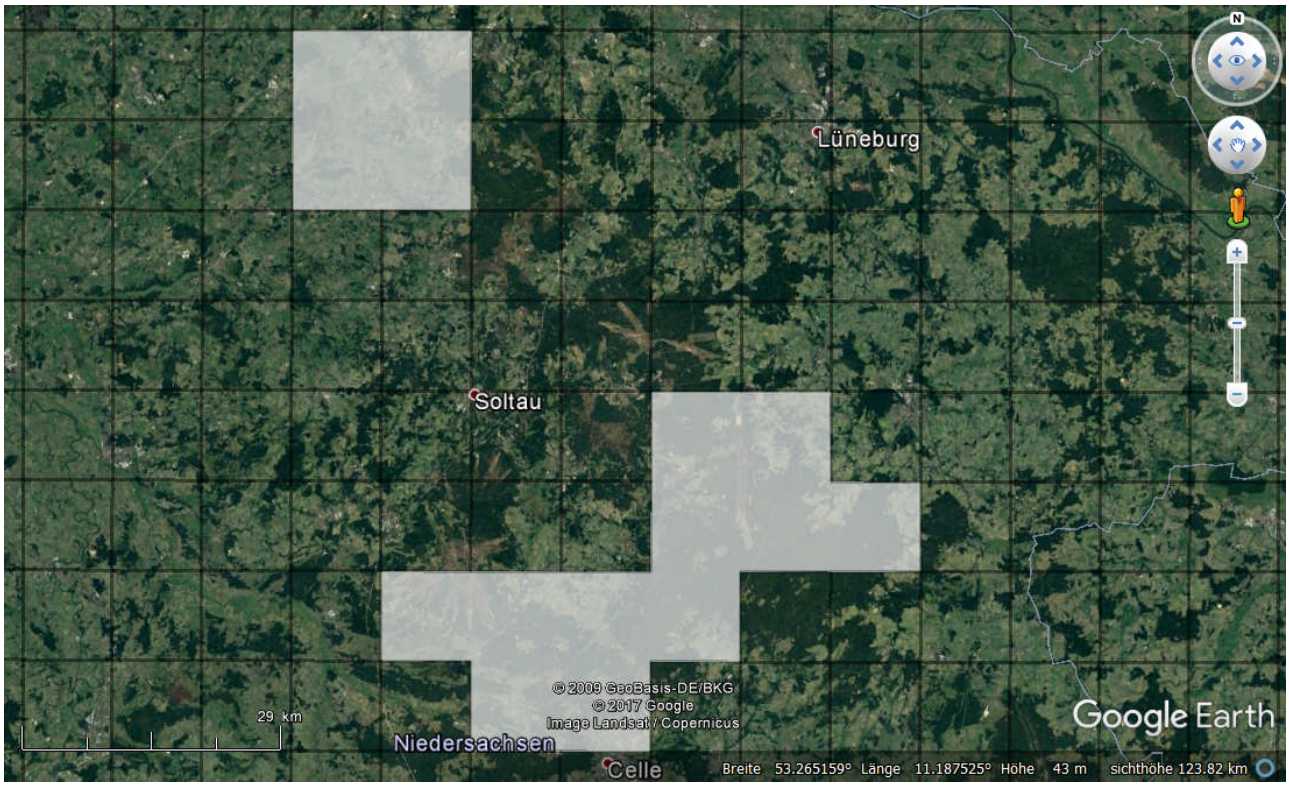

Figure IIIa. EEA grid cells covered in week 1.

Figure IIIb. Two scats were found in one EEA grid cells in week 1.

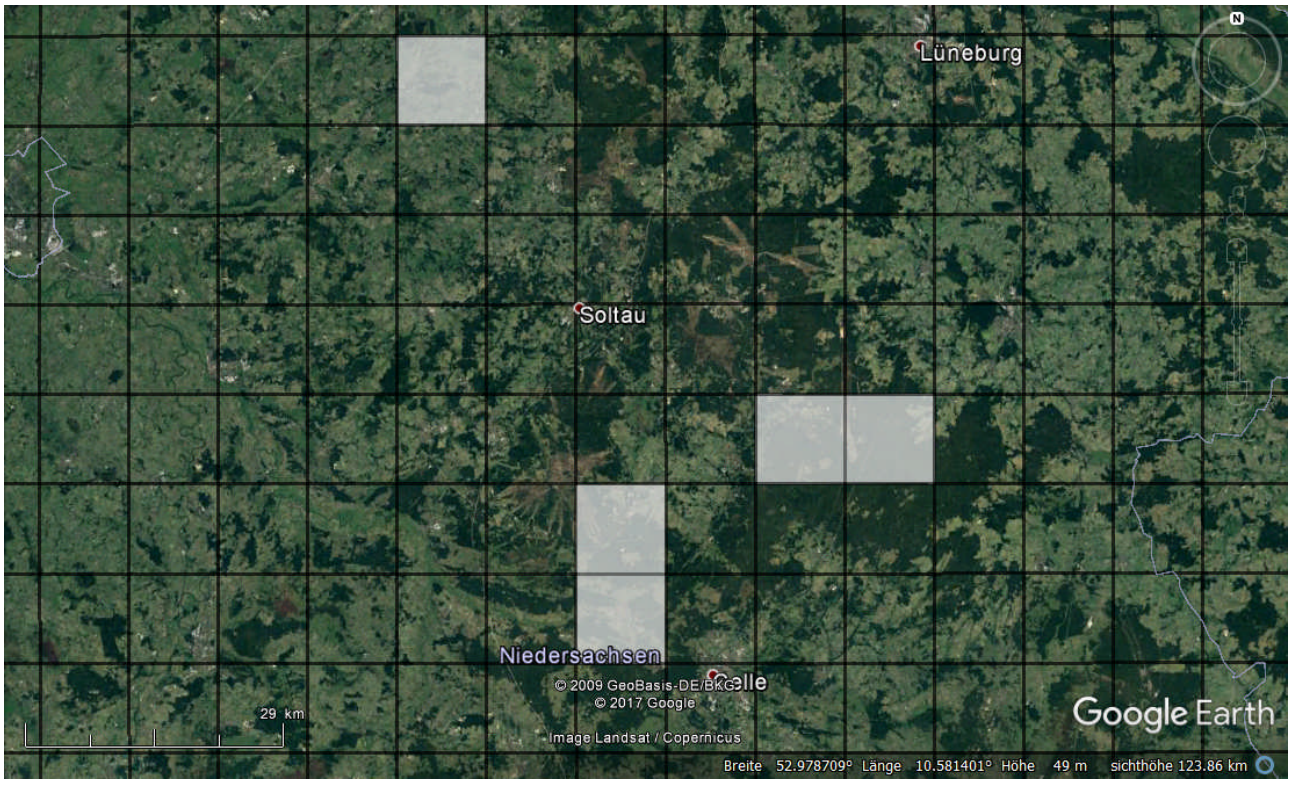

Figure IIIc. Possible wolf signs were found in five EEA grid cells in week 1.
Signs included seven unclear tracks and nine possible wolf scats (too old, not clear, no wolf-like odor).

Effort week 2

Survey days		5
EEA 10x10 km grid cells covered		13
Scats found / in EEA cells		10 / 6
Day	Distance covered by teams (km)	Remarks
Sun, 25 June	13.7	One training group only
Mon, 26 June	92.9	Maximum four small groups
Tue, 27 June	69.2	Maximum four small groups
Wed, 28 June	64.4	Maximum four small groups
Thu, 29 June	82.3	Maximum four small groups
Total	**322.5**	

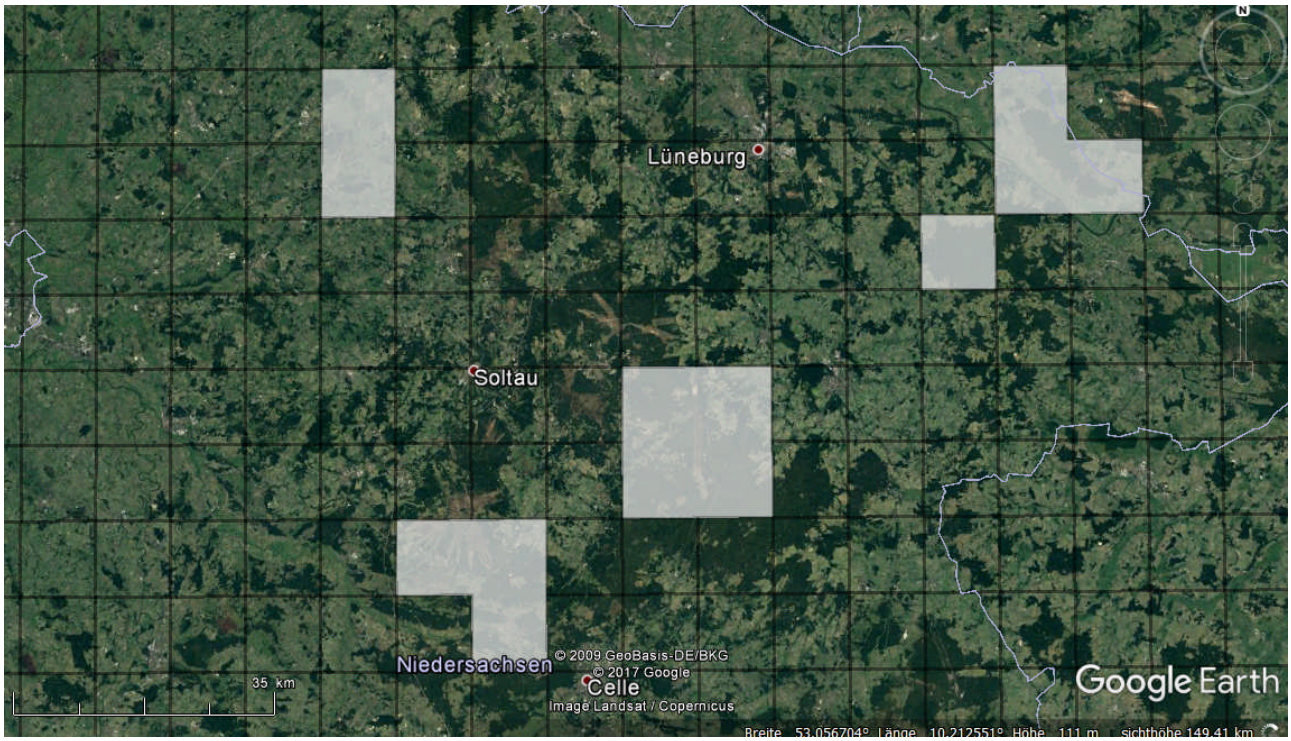

Figure IIId. EEA grid cells covered in week 2.

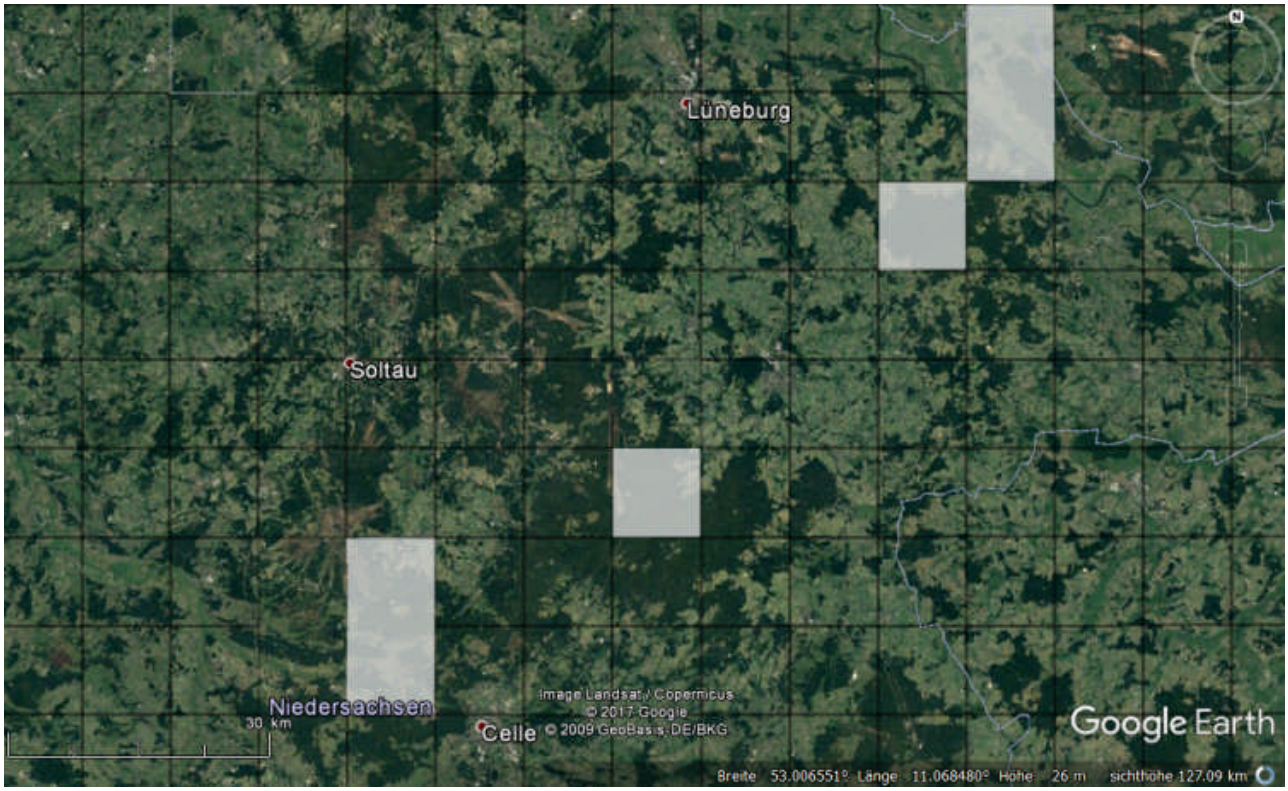

Figure IIIe. Ten scats were found in six EEA grid cells in week 2.

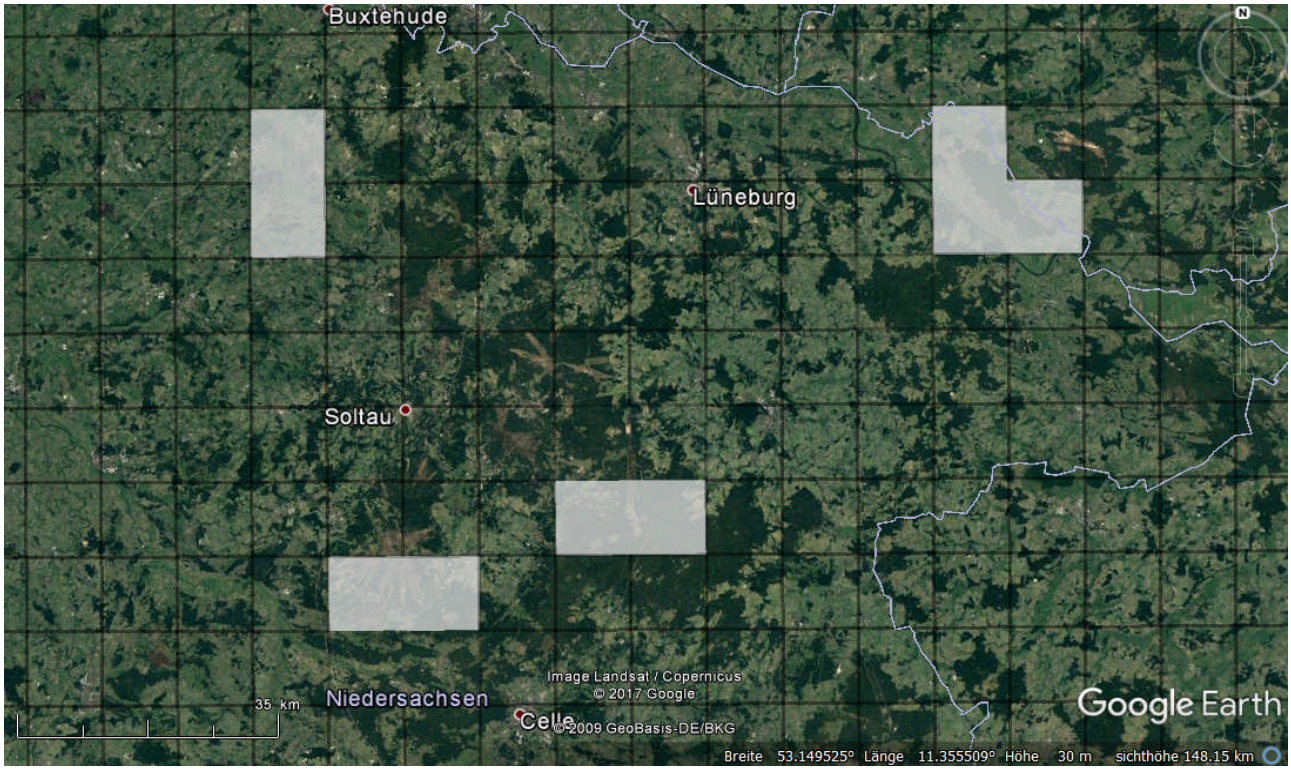

Figure IIIf. Possible wolf signs were found in nine EEA grid cells in week 2.
Signs included 13 unclear tracks and nine possible wolf scats (too old, not clear, no wolf-like odour).

Effort week 3

Survey days		5
EEA 10x10 km grid cells covered		10
Scats found / in EEA cells		40 / 5
Day	Distance covered by teams (km)	Remarks
Sun, 9 July	9.7	One training group only
Mon, 10 July	64.2	Maximum four small groups
Tue, 11 July	38.7	Maximum four small groups
Wed, 12 July	28.5	Maximum four small groups
Thu, 13 July	76.2	Maximum four small groups
Total	**217.3**	

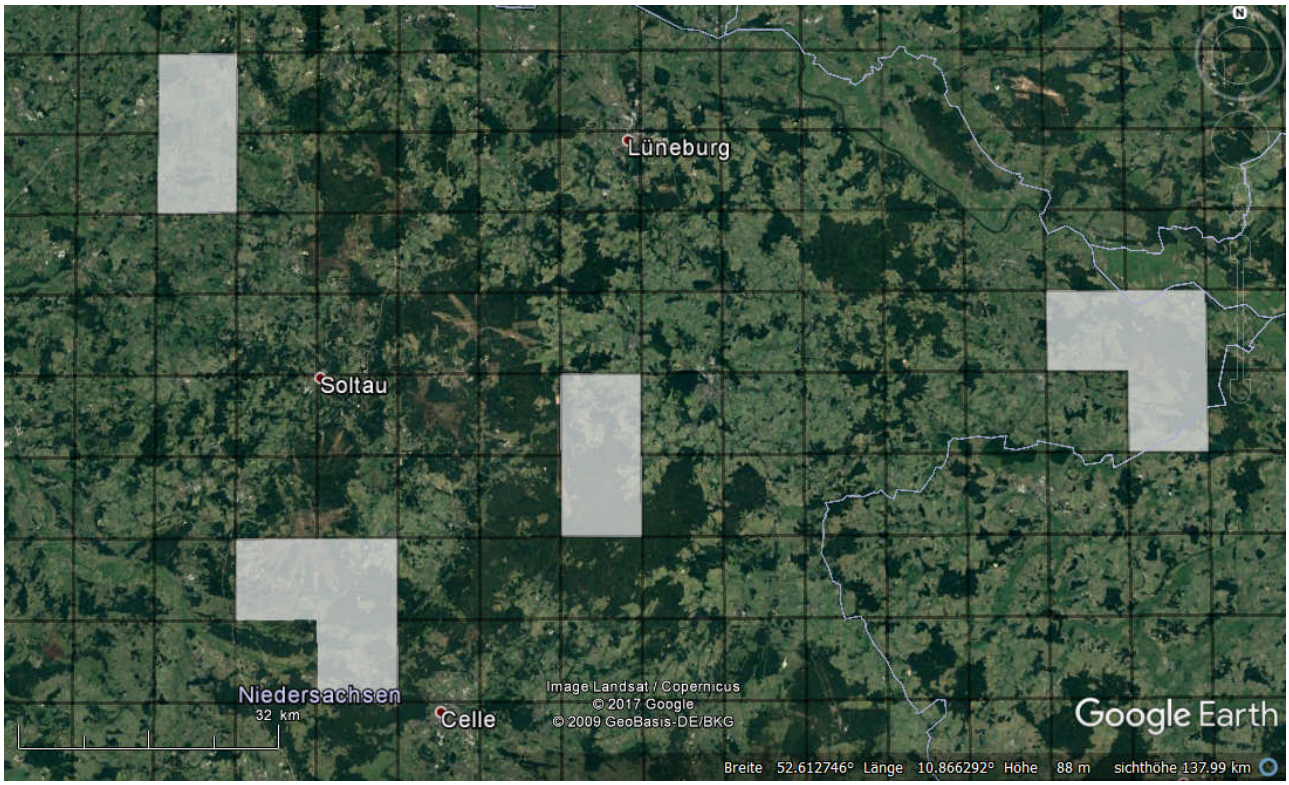

Figure IIIg. EEA grid cells covered in week 3.

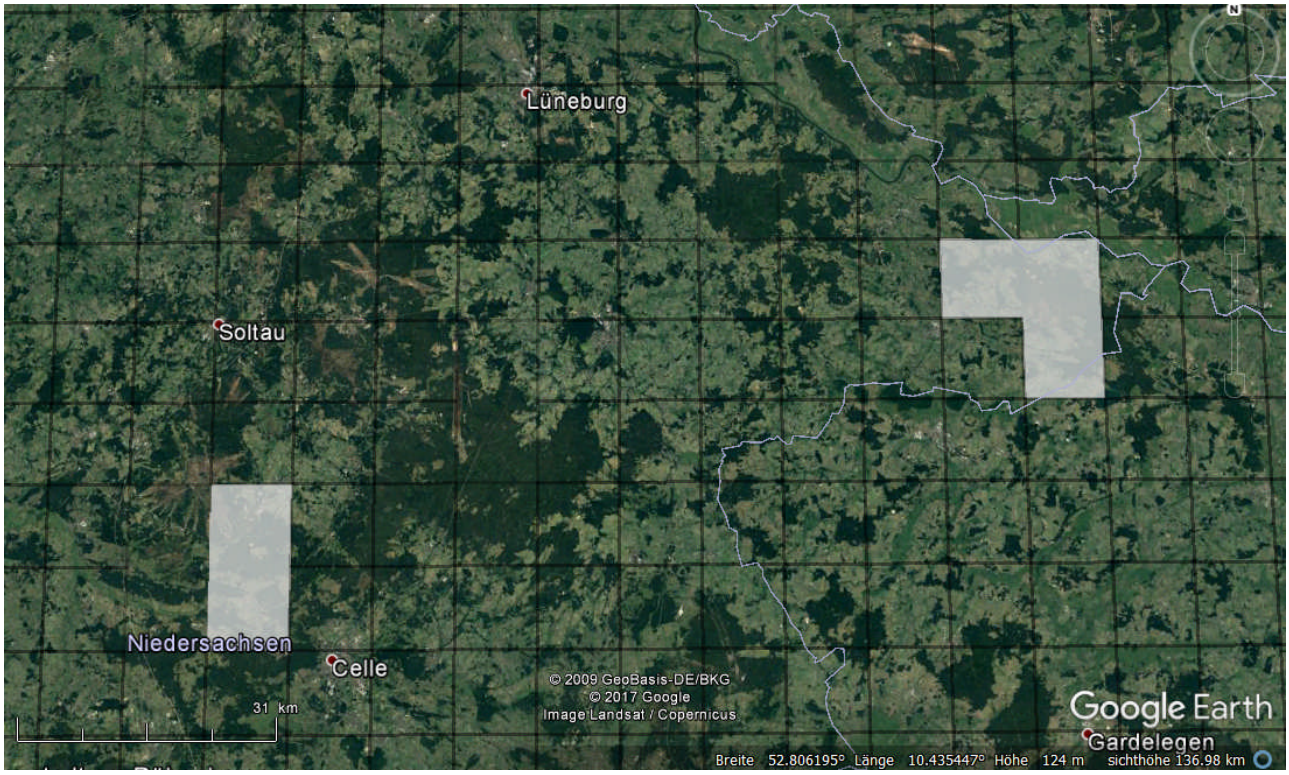

Figure IIIh. 40 scats were found in five EEA grid cells in week 3.

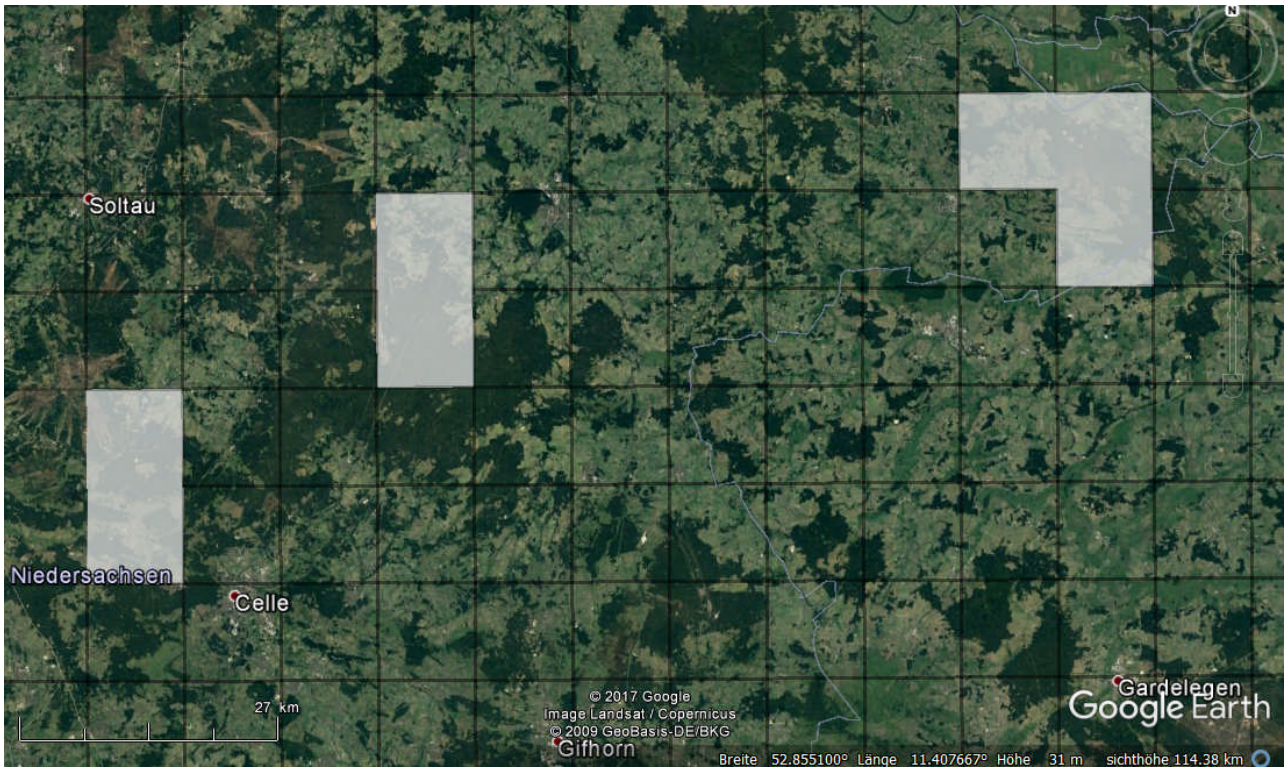

Figure IIIi. Possible wolf signs were found in seven EEA grid cells in week 3.
Signs included seven unclear tracks and nine possible wolf scats (too old, not clear, no wolf-like odour).
Two carcass remains were also found; one team accompanied a wolf commissioner to an assessment of killed sheep.

Effort week 4

Survey days		5
EEA 10x10 km grid cells covered		14
Scats found / in EEA cells		24 / 7
Day	Distance covered by teams (km)	Remarks
Sun, 16 July	15.3	One training group only
Mon, 17 July	41.5	Maximum four small groups
Tue, 18 July	55.6	Maximum four small groups
Wed, 19 July	72.5	Maximum four small groups
Thu, 20 July	49.5 / 48.6	Foot / bicycle
Total	**234.4 / 48.6**	**Foot / bicycle**

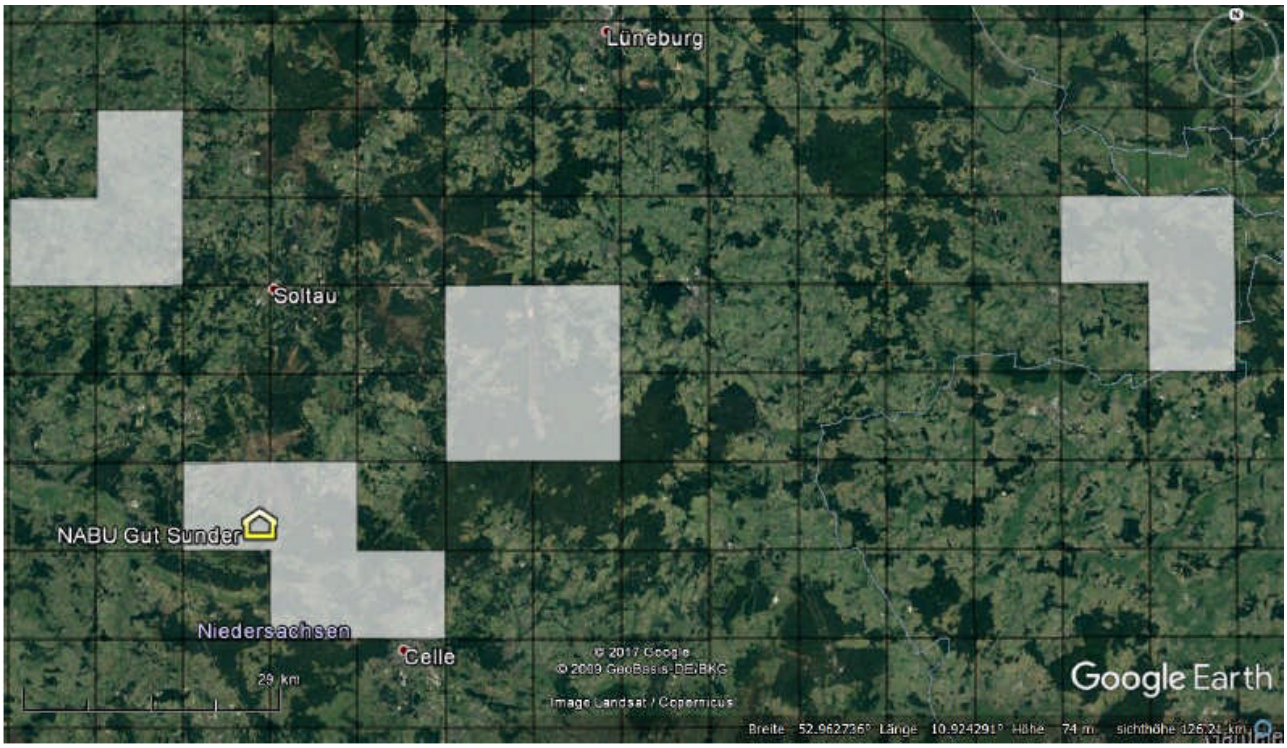

Figure IIIj. EEA grid cells covered in week 4.

Figure IIIk. 24 scats were found in seven EEA grid cells in week 4.

Figure IIII. Possible wolf signs were found in nine EEA grid cells in week 4.
Signs included 12 unclear tracks and 14 possible wolf scats (too old, not clear, no wolf-like odour).
In addition, three carcasses and one direct wolf sighting were recorded.

Appendix IV: Overview of coverage of the expedition in the media

Region	Medium	Publication date	Author	Description	Positive or negative coverage	Media clippings	
Germany	T-Online	29-May-18	Oliver Gerhard	Online feature about Germany wolf expedition	Positive	Clipping 1	
Germany	Aerztliches Journal	08-May-18	Oliver Gerhard	Six page feature about Germany wolf expedition	Positive	Clipping 1	Clipping 2
Germany	Rheinpfalz Zeitung	06-May-18	Franz Lerchenmueller	Half-page spread about Germany wolf expedition	Positive	Clipping 1	
Germany	Mannheimer Morgen	05-May-18	Franz Lerchenmueller	Half-page spread about Germany wolf expedition	Positive	Clipping 1	
Germany	Stuttgarter Nachrichten	02-May-18	Franz Lerchenmueller	Full-page spread about Germany wolf expedition	Positive	Clipping 1	Clipping 2
Germany	NABU Seminarheft	01-May-18	Malika Fettak	Double-page spread free advertorial in NABU Gut Sunder events booklet 2018	n/a		
Netherlands	de Volkskrant	28-Apr-18	Noël van Bemmel	Short mention of Germany wolf expedition in travel news section	n/a	Clipping 1	
Germany	Westdeutsche Zeitung (WZ)	28-Apr-18	Oliver Gerhard	Feature about Germany wolf expedition	Positive	Clipping 1	Clipping 2
Germany	Wanderlust	26-Apr-18	Sam Mittmerham	Feature about the wolf in Germany with short mention of Biosphere Expeditions	Positive	Clipping 1	
Austria	Universum	18-Apr-18	Martin Kugler	Six page feature about Germany wolf expedition	Positive	Clipping 1	
Germany	Deutschlandfunk	15-Apr-18	Franz Lerchenmueller	Ten minute radio programme about Germany wolf expedition	Positive	Listen	
Asia	Sanctuary Asia	01-Apr-18	Lalitha Krishnan	Five page feature about wolf expeditions in Germany and India	Positive	Clipping 1	Clipping 2
Germany	Achtsames Leben	27-Mar-18	Sam Mittmerham	Copy of wolf in Germany article from Biorama	Positive		
Germany	TAZ	11-Nov-17	Franz Lerchenmueller	Two page article about our Germany wolf expedition	Positive	Clipping 1	Clipping 2

Region	Medium	Publication date	Author	Description	Positive or negative coverage	Media clippings
Germany	WDR 5 Leonardo	18-Oct-17	Brigitte Osterath	Ten minute radio programme about Germany wolf expedition	Positive	Listen
Austria	Biorama	20-Oct-17	Sam Mittmerham	Five page feature about Germany wolf expedition	Positive	Clipping 1 Clipping 2
Germany	VOX	21-Oct-17	VOX TV	TV programme about wolves in Lower Saxony and the expedition	Positive	Watch
Germany	NABU NS e-news	19-Oct-17	NABU Niedersachsen	Picked up open letter	n/a	
Austria	Universum	28-Aug-17	Martin Kugler	Twelve page feature of wolves in Lower Saxony with the expedition mentioned on the sidelines	Positive	Clipping 1
UK	Geographical Magazine	08-Aug-17	Sam Mittmerham	Six page feature about Germany wolf expedition and rewilding in Europe	Positive	Clipping 1
Germany	NDR TV	25-Jul-17	NDR	Four-minute TV programme about Germany wolf expedition	Positive	Watch
Germany	Elbe-Jeetze-Zeitung	18-Jul-17	Christiane Beyer	Half-page article about our Germany wolf expedition	Positive	Clipping 1
Germany	Der Spiegel	15-Jul-17	Philip Bethge	Two page article about our Germany wolf expedition	Positive	Clipping 1
Germany	NDR Radio	10-Jul-17	Ulrike Kressel	Two radio programmes about our Germany wolf expedition	Positive	Clipping 1
Germany	Cellesche Zeitung	07-Jul-17	Amelie Thiemann	Article and opinion piece about our Germany wolf expedition	Negative	Clipping 1
Germany	Weser Kurier	21-Jun-17	Justus Randt	Article about Germany wolf expedition	Negative	Clipping 1
Germany	Hannoversche Allgemeine Zeitung	17-Jun-17	Heiko Randermann	Article about Germany wolf expedition	Negative	Clipping 1
Germany	Wanderlust	01-Jun-17	Sam Mittmerham	Six page feature about Germany wolf expedition and rewilding in Europe	Positive	Clipping 1

Appendix V: Open letter about wolves to Helmut Dammann-Tamke, president of the state hunter's association of Lower Saxony and member of the state parliament (CDU / conservatives).

This letter was sent on 9 October 2017. The version below is the text only version. German and English versions with links are online. No response was ever received.

Dear Herr Dammann-Tamke

We have not had the pleasure of meeting personally. And yet we have been mentioned together in the press over the last few weeks and months, mostly with opposing views. Because of this I am keen to clear up misunderstandings and find common ground. This common ground is, I believe, the state's official wolf monitoring programme, avoiding human/wildlife conflicts in conjunction with livestock protection measures, and the wolf itself and its protection in Germany, free from illegal wolf shooting fantasies, bordering on populist agitation and without the support of the majority's opinion in Lower Saxony. This is exactly what we were working towards with our citizen scientist expeditions this June/July, organised in close cooperation with the Wolfsbüro of the Niedersächsischen Landesbetriebs für Wasserwirtschaft, Küsten- und Naturschutz (NLWKN).

Please allow me initially to explain the concept of citizen science to you. This concept is largely unknown in Germany, save perhaps in specialist circles, so I can understand your apprehension of the unknown. However, citizen science is a globally proven method to collect scientifically valid and valuable field data, amongst other things in nature and wildlife conservation. It also involves people in scientific investigation and helps to finance the same (see also the Biosphere Expeditions website in German and English).

Within this, Biosphere Expeditions' aim is to make conservation project possible through the labour and financing provided by interested laypeople. In Lower Saxony this meant 49 citizen scientists taking part, divided into four groups of twelve persons each and lasting a week. 42 people came from Germany or its immediate neighbour states (86%), three from North America (6%), two from Australia (4%), as well as one person each from India (2%) and Singapore (2%).

Each group was divided into several small groups of two to four persons and sent into the field for four days, following an intensive two-day training phase (which is only half a day short of the training the state's official wolf ambassadors receive). Training was conducted by the NLWKN-Wolfsbüro, wolf ambassadors and the Biosphere Expeditions leader.

The aim of field data collection was the documentation and collection of wolf sign such as tracks and scats. Other sign such as hair samples or direct sightings were not part of the expedition aims and are extremely unlikely anyway. In rare cases, and then only with the cooperation and approval of those responsible locally, camera traps were set too.

The data gathered was quality assessed by the Wolfsbüro and wolf ambassadors, before being passed onto the State Hunting Association, which is responsible for coordinating wolf monitoring efforts in Lower Saxony.

Our groups used public paths and bridleways exclusively and a public diary reported on all activities. Searching public paths is a widely accepted method in wolf monitoring, because wolves prefer to use paths to cross, mark and patrol their territory in an energy-efficient way. Looking for wolf sign away from paths in the field randomly is scientifically undesirable and unlikely to produce results.

With the assistance of our citizen scientists, the expedition gathered data for four weeks. Preliminary results are more than 1,100 km covered on foot or bike, almost 80 scat samples and almost as many other sign, confirmed by local wolf ambassadors. Although these results are impressive, I would like to mention that we do not seek to replace either the wolf ambassadors or the State Hunting Association, nor do we seek to belittle their work in any way. On the contrary. The more scientifically valid data about population size and dynamics we can gather, the higher our chance to do good science and protect livestock more effectively, thereby avoiding conflict. And this, I believe, is what we all want in the end.

Hence the additional data gathered by us are a valuable contribution for the wolf monitoring programme, as are the data gathered by all other voluntary helpers, whom we acknowledge and appreciate. The wolf monitoring cooperation between the state of Lower Saxony, the State Hunting Association and the wolf ambassadors is a proven system, which can and should not be replaced, devalued or called into question by our expedition. Instead our expedition contributes to the wolf monitoring programme sensibly and effectively.

In summary our citizen scientists help on two levels: gathering valid field data and through their financial contribution, which finances the expedition. Especially in times of diminishing support for nature conservation such citizen science projects are an increasingly important source of data and successes in conservation. I believe we should give these citizen scientists our respect, rather than derision, because they have given up their time and money for this project. And we can also be a little bit proud, because the wolf is attracting people to our home who think the animal makes our country "even more attractive" and that "the world could learn from how people in Germany are trying to coexist with wolves" (see article in German weekly magazine Der Spiegel).

In addition we, as the non-profit organiser of the expedition, guarantee that across the world two-thirds of the contribution that the citizen scientists pay is used directly for the project, for example for staff, board & lodging, vehicles, fuel, equipment, educational materials, travel expenses, post-expedition admin and campaigns.

How money is used is always shown (voluntarily and fully transparent) in an expedition report, which is published after each expedition. Such a report will also be published for Germany, about six to ten months after the expedition. More on the above facts can also be found on Biosphere Expeditions' FAQ page.

Biosphere Expeditions, since its foundation in 1999, runs such expeditions all over the world and has accrued a long list of achievements and awards in the process.

Geographical Magazine (UK), Biorama (Austria), as well as German media such as Wanderlust Magazine, Der Spiegel weekly, NDR Radio (broadcast 1, broadcast 2) and the Elbe-Jeetzle-Zeitung newspaper mention all this and we gratefully acknowledge the very positive coverage. So really everyone wins: the expedition participants, the official wolf monitoring programme, the wolf ambassadors, etc. and I cordially invite you and your State Hunting Association to partake in this global success story also.

We would also be very pleased to receive reciprocal support and acknowledgement from you, instead of derision and obstruction up to now (see below), because the significant amount of data we provide is given freely and without effort or cost to anyone.

What we are definitely not, Herr Dammann-Tamke, is "tourists coming round the corner only seeking cheap thrills" or "something out of the madhouse" as you called it. And "scientifically significant findings" (all citations of yours so far translated from the Weser-Kurier newspaper) are, as explained above, to be made predominantly on public paths (which we use) and not off them (where we do not venture).

I have to admit to being very surprised by your last statement that wolf signs are not to be found on paths, as it shows little understanding of wolf biology. So I presume it was just an erroneous citation by the journalist. We also do not make a "business" out of wolves, nor do we "lure" people into "wolf watching", nor is there any reason whatsoever why, as you claim, "the majority of wolf ambassadors [should] feel belittled". On the contrary - I remind you of my words above - we work closely together with many wolf ambassadors and would be delighted to hear from more of them in order to cooperate more. We would also be very pleased to receive supportive and cooperative messages from your State Hunting Association, instead of derision and obstruction.

I also do not understand why, according to you, the cooperation between state and hunters should now be "very fraught" (all citations above translated from the Hannoverschen Allgemeinen Zeitung newspaper) or why "enough should be enough" (Weser-Kurier newspaper). Your colleague, district hunting master Herr Knoop, is also wrong with his entirely false and baseless claim that our citizen scientists are going to be "frustrated after two days, because they will not find anything" and will then "trespass onto private ground" (citations translated from the Celleschen Zeitung newspaper).

But perhaps this is a wrong citation too and real knowledge about wolves amongst hunters is really better than these citations lead one to believe. Such as, for example, the knowledge of your hunting colleague Walter Jäckel, a lawyer with a PhD and president of the Minden-Lübbecke hunting association in neighbouring North-Rhine-Westphalia, who, amongst other things, opines that hunters should have "nothing to do with wolves" and who also thinks that including wolves into hunting law is not "sensible" and neither is killing them. Moreover, our adult citizen scientists are also capable of following instructions and staying on the paths. This too answers the question submitted by your colleague Ernst-Ingold Angermann (CDU) to the Lower Saxony state parliament about the alleged, but non-existent, trespass of our citizen scientists into protected areas.

Herr Damann-Tamke, I firmly believe in the advantages of cooperation based on professional conduct and facts and within a respectful communication structure. Pithy and denigrating words such as tourists from the "madhouse", "only looking for cheap thrills" or aggressively worded parliamentary questions about "intruders", or baseless accusations and fake news of your hunting colleagues will only poison the conversation, despite our joint interests. Such communication behaviour will also make respectful discussions and cooperation very difficult.

An example of the negative consequences of poisoned communications are the totally unnecessary obstruction and hostility the expedition had to face from forest owners. The worst offender, sadly, was the State Forest Authority itself.

Instead of hostilities, disrespect and emotional discussions, I would much prefer the beginning of a de-escalation and cooperation on the basis of fact-based, respectful and prejudice-free discussions. This applies to you, your Sate Hunting Authority, as well as the State Forest Authority, whom I mentioned this to as well.

Dear Herr Damann-Tamke, I have worked in nature conservation worldwide for two decades now and of course realise that we tree-huggers are not always welcome. But I have never experienced hostility, aggression, disrespect and frankly slanderous accusations and unacceptable threats of the kind we have received in connection with the expedition. I am shocked and embarrassed that this was possible and I hope we can find a way back towards respectful and sober discussions and hopefully cooperation. I say again that we have much common ground, such as a science-based wolf monitoring programme, avoidance of human/wildlife conflict and the successful protection of livestock.

Perhaps the situation developed, because we never talked to each other personally. You can reach me on 0931/40480500. Let us talk to each other and perhaps organise a round table discussion with all concerned so that we do not waste our efforts an energy on pointless strife, but instead concentrate on the important issues in wolf protection and the coexistence of wolves and humans.

Yours sincerely

Dr. Matthias Hammer
Executive Director
Biosphere Expeditions

Appendix VI: Photo impressions

Figure VIa. Expedition team visits Wolfcenter Dörverden as part of training on day one.

Figure VIb. Theoretical lesson by Jana Sprenger of the State Wolf Bureau as part of the training on day one.

Figure VIc. Practical lesson outdoors by expedition leader Malika Fettak as part of the training on day two.

Figure VId. GPS training by expedition leader Malika Fettak as part of the training on day two.

Figure VIe. Blackboard with day-to-day plan, remarks, etc. (left).
Research equipment and datasheet on the table (middle); procedures and plans on the pin board (right).

Figure VIf. A team is briefed on the map by expedition scientist Peter Schütte before heading off into the field.

Figure VIg. Getting ready for survey work with wolf commissioner Kenny Kenner. Photo courtesy of Graham Makepeace-Warne.

Figure VIh. Wolf tracks spotted in the field. Photo courtesy of Sue Gorr.

Figure VIi. Wolf scat spotted in the middle of a forestry track. Photo courtesy of Graham Makepeace-Warne.

Figure VIj. Wolf scat collection and data recording in the field.

Figure VIk. Survey on foot in a small team on a forestry track. Photo courtesy of Dan McCourt.

Figure VII. Survey by bicycle in a small team on a forestry track. Photo courtesy of Dan McCourt.

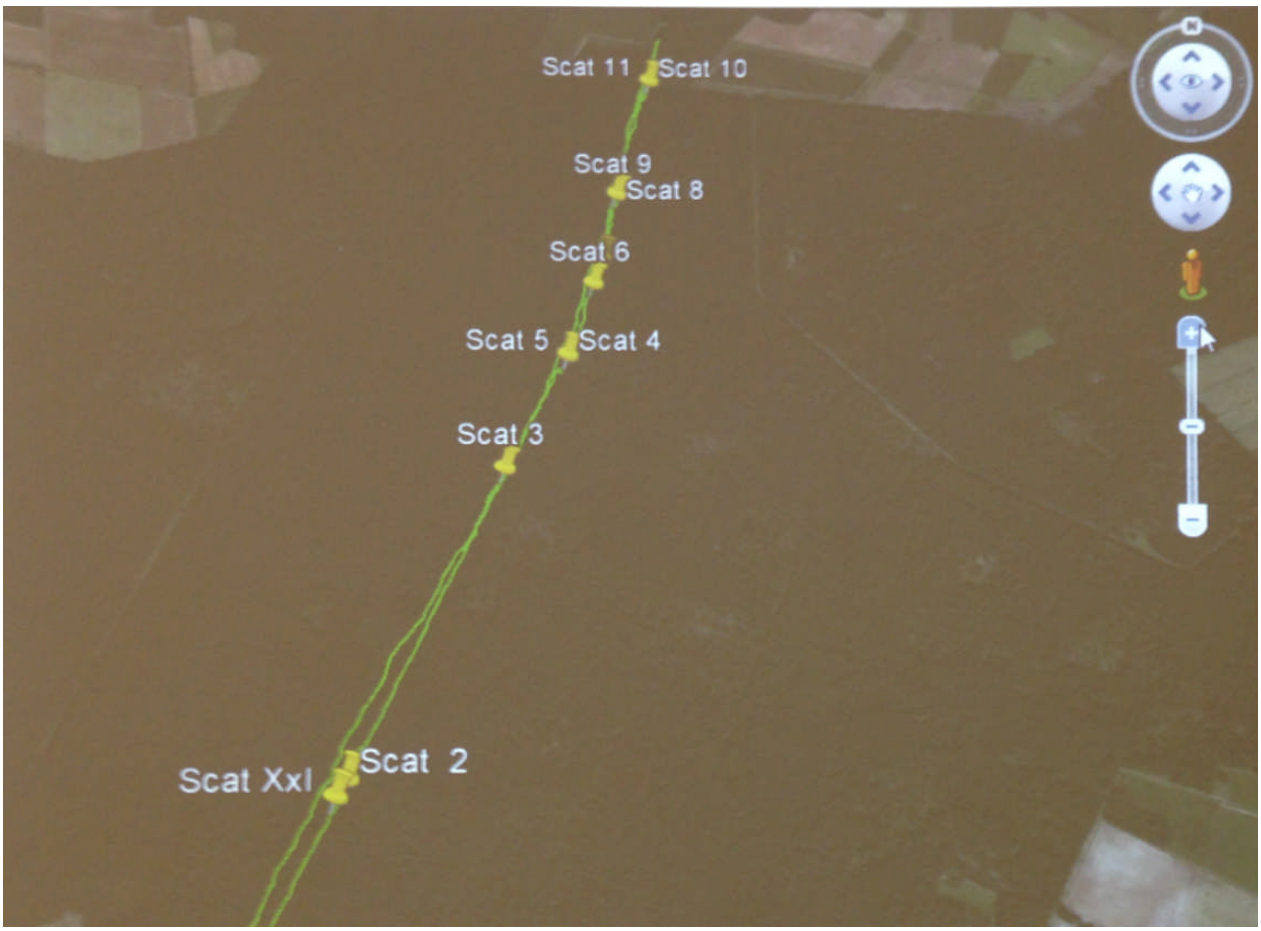

Figure VIm. Day's results of one survey displayed in the GIS.

Figure VIn. A day's wolf scat finds.

Figure VIo. Visiting a shepherd breeding livestock guarding dogs for livestock damage prevention.

Figure VIp. End of a survey day around the camp fire.

Appendix VII: Expedition diary and reports

A multimedia expedition diary is available on https://blog.biosphere-expeditions.org/category/expedition-blogs/germany-2017/.

All expedition reports, including this and previous expedition reports, are available on www.biosphere-expeditions.org/reports.