

WOLF-DETERRENT FENCING FOR HORSES: BEST PRACTICE IN LOWER SAXONY

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1. Horses, wolves and fences

In general, attacks by wolves (*Canis lupus*) on horses are very rare in Germany, especially in comparison with those on sheep and goats. Since 2017, there have been 11 confirmed wolf attacks on horses in Lower Saxony in which a total of nine horses were killed and ten injured. Nevertheless, keeping horses in areas with wolves raises many questions (Bathen et al., 2015). Rumours and myths circulate about the impact of wolves, partly due to a lack of long-term experience and reliable data on the subject from densely populated cultural landscapes.

As this is a relatively new phenomenon in Lower Saxony, more research and precise investigations are required to determine which factors may lead to such attacks. Field studies on the behaviour of horses in response to wolves have been conducted (see article by Solmsen et al. in this issue) but, so far, few reliable data have been collected due to the rarity of observed encounters.

In Germany, owners have a legal obligation to protect grazing animals against predators (VFD, 2020a; Bfj, 2020). While sheep and goats are the main focus, cattle and horse husbandry should not be forgotten. A risk assessment for possible wolf attacks is provided through the state's funding for preventive measures which, in the horse sector, only applies in areas

with confirmed wolf attacks (LWK, 2020). In order to minimise the risk, ubiquitous use of livestock protection measures has become necessary in some areas. Horses, like wolves, are extremely sensitive to electrical stimuli (FAß, 2018). Therefore, electric fences ensure optimal safety for horses as well as effective protection from wolves.

Basic distinctions can be made between stationary, semi-stationary and mobile fences, combinations, and external and internal fences (Hoffmann, 2019). However, there is a plethora of different fencing systems and, until recently, a wolf-deterrent function was not necessary. Common practice shows that proper assemblage is often neglected. Indeed, in the above-mentioned cases, none of the affected pastures had a wolf-deterrent fence installed (Nina Kronshage, personal communication).

2. Consultation and support

In 2019, a panel of Lower Saxony experts in nature conservation, agriculture, horse husbandry, animal welfare, veterinary care, wolf research and fence construction discussed solutions for wolf-deterrent fences in the equine sector. This resulted in recommendations and guidelines for eligibility in certain areas

(LWK, 2020). Nowadays, the state of Lower Saxony provides funding for the purchase of wolf-deterrent fencing in accordance with current guidelines (LWK, 2021).

For the implementation of effective measures, professional advice is essential. Through the project *Herdenschutz Niedersachsen* (Livestock Protection), since 2017 the Nature and Conservation Union (NABU) has provided practical support for owners to protect their livestock from wolf attacks. Whether new construction, upgrading an existing system or mobile solutions, the possibilities for a wolf-deterrent fence system are diverse and individual adjustments are always necessary. For this reason, individual on-site consultations are also offered. Experience shows that livestock owners are open to solutions if suitable technologies are presented to them in personal settings.

So far, the project has advised 43 horse owners, 22 of whom received active support from trained project volunteers to help construct wolf-deterrent fences (Fig. 1). Project activities have provided almost 100 hectares of horse pastures with 30 km of wolf-deterrent fencing in core areas of wolf activity. An important part of the project is to collect and evaluate experience of such fences, especially regarding their wolf-deterrent effect, safety and risk assessment for horses as well as maintenance and permeability to wildlife. Interestingly two horse farms advised by the project keep livestock guarding dogs (LGD) and report having managed their socialisation with horses and interactions with people without problems (Fig. 2). However, experience of using LGDs with horses is still rather limited and they may not be suitable for every holding, whereas wolf-deterrent fences have proven to be widely applicable.



Fig. 1 Horses within a permanent wolf-deterrent electric fence.

(Photo: Peter Schütte)



Fig. 2 Livestock guarding dogs with horses.
(Photo: Lena Kassebaum)

3. Technical specifications

To achieve a wolf-deterrent effect, it is essential to maintain the correct distance of 20–30 cm between electrical conductors, and no more than 20 cm between the lowest conductor and the ground, as wolves often try to sneak under or through obstacles (Agridea, 2020). To keep horses within pastures, and bearing in mind their safety, the total height of a horse fence is specified as approximately 80% of the horses' height at the withers (Priebe et al., 2016). For horses kept without stallions, consideration of these two factors results in a fence design with, for example, six electrical conductors at 20, 40, 60, 80, 110 and 140 cm off the ground.

It is particularly important to use highly conductive electrical conductors in order to reach high voltage. Electrical conductors must also be visible: plain steel wire is difficult to see and can cause deep cuts in the case of panic reactions, which are common among horses. Plain steel wire, barbed wire and wire fencing for horse pastures can cause severe injuries and are therefore contrary to animal welfare (FAB, 2018; Priebe et al., 2016). Based on experiences from the *Herdenschutz Niedersachsen* project, the use of horse fence wire, a plastic-coated, electrically conductive steel wire, is the material of choice. In addition to good visibility due to its white jacket, it offers the advantage of excellent conductivity with minimal risk of injury and an extremely high durability. With this well-tensioned electrical conductor material, it is almost impossible for horses to become entangled when rolling, pawing, stepping through or otherwise interacting with the fence. The risk of injury is also

low due to the 8 mm thick coating material. According to a project-specific survey among horse owners, alternatives may include electrical conductors such as rope or thin strands that tear quickly under physical load.

4. Key factors for efficiency

The main elements of an effective wolf-deterrent fence system are, in addition to highly conductive and durable material, a high-performance energiser producing at least 4,000 volts, an earthing system adapted to the soil conditions and proper installation, using insulators, joints and other components that match the system. Securing gates and ditches as well as avoiding any opportunity for wolves to jump over or dig under the fence should not be neglected. The *Herdenschutz Niedersachsen* project has produced a leaflet¹ in German summarising information on components and maintenance including testing earthing systems (Fig. 3).

Erfolgsfaktoren für wolfsabweisende Zäune:

- Fachgerechter Verbau aller Komponenten
- Leistungsfähiges Weidezaungerät (mind. 5 Joule) 230 V/12 V mit Solarmodul & Diebstahlsicherung
- Zaunspannung von mind. 4000 V
- Erdung passend zur Weidezaungeräteleistung und zu den Bodenverhältnissen
- Drahthöhen über Boden unbedingt einhalten 20 / 40 / 60 / 80 / 110 / 140 cm
- Elektrischer Leiter: Pferdezaundraht oder hochleitfähiges Seil
- Senkrechte Verbindung der elektrischen Leiter mindestens alle 350 m
- Feste Verbindungen mit Verbindungsschrauben schaffen, um Kurzschlüsse zu vermeiden
- Weidetore müssen vor Untergraben und Überklettern geschützt werden (z. B. Elektrifizierung)
- Zaun freigehalten von Bewuchs
- Einsprunghilfen außerhalb der Weide entfernen
- Tägliche Kontrolle inkl. Digitalvoltmeter (ggf. Zaunmonitoring mit elektr. Weidetagebuch)
- Alle Schäden sofort beheben

1 Festzaun-Isolator
2 Rotierender Spanner
3 Stahlspannfeder Edelstahl
4 Drahtverbindungsschraube
5 Elektrischer Leiter: Pferdezaundraht oder hochleitfähiges Seil
6 Streckenpfahl
7 Zugisolator
8 Eckpfosten: Robinie geschliffen 275 x 16 - 18 cm

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Fig. 3 Leaflet on wolf-deterrent fences on horse pastures.

¹ https://niedersachsen.nabu.de/imperia/md/content/niedersachsen/flyer_pferd.pdf

Previous publications recommended mounting electrical conductors on the outside of fences (DLG, 2020). However, it has been found within the project that this rather hinders fence construction, maintenance and mowing. Nor does it seem to be necessary, either to avoid increased susceptibility to injury or to increase the protective effect against wolves. Working with spacers inside may be useful to keep horses away from the outer fence. Such individual solutions depend on the situation, the behaviour of particular horses and other local influences.

Keeping an electric fence free of vegetation can be a considerable additional task, but is essential for the long-term, failure-free operation of electric fences (FAß, 2018). The key is meticulous preparation, ideally levelling the fence line. This greatly simplifies the use of mowing equipment. Possible legal requirements under nature conservation or building law require clarification in advance of fence construction (NS, 2020). Therefore, a professional on-site consultation and sensible planning are clearly recommended to ensure durability of the system and low maintenance.

5. Possible impacts on wildlife

Another important aspect of wolf-deterrent fences is their permeability or otherwise to wildlife. Concerns that such fences could present barriers to wildlife (ApP, 2019) and hence cause fragmentation of valuable landscape components (LNL, 2019) have not been borne out by experience during the project. According to user reports, direct observations and images from camera traps, five- or six-wire electric fences are permeable to wildlife. Smaller species such as reptiles and amphibians, foxes, martens and hares, easily crawl under the lowest electrical conductor; red deer jump over such fences and roe deer jump through them (Fig. 4). In contrast, wolves, wild boar and stray dogs are kept out by this kind of fence. Nevertheless, further research is needed to gather more evidence.

6. Discussion and conclusions

Wolf predation on horses is rare in Germany, but in some areas the potential risk justifies the use of prevention measures. Electric fences have proven to be one of the most widely applicable and effective methods to protect horses from wolves.



Fig. 4 Roe deer jumping through a wolf-deterrent fence.

(Photo: Karin Koschinski)

Regarding safety, there are clear guidelines for materials and construction methods that should be used to minimise the risk of injury (Hoffmann, 2019; Priebe et al., 2016). Some horse owners have continued to express concerns, particularly due to the electrical conductor at a height of 20 cm above the ground. However, observations have shown that horses tend to avoid high voltage fences rather than approach them. Recent consultations with horse owners, the Chamber of Agriculture, wolf researchers and fencing specialists have not revealed any evidence of an increased risk of injury, nor have there been any reports of injuries from the installation of wolf-deterrent components when using recommended materials. Adequate pasture sizes, feed supply and herd management (VFD, 2020b), as well as species-appropriate husbandry (Wendorff, 2015), are imperative.

The costs of additional labour for installing fences are borne by livestock owners as there are no subsidies for this. Maintaining fences and keeping them free of vegetation entail further work which is often said to be unfeasible for livestock owners and used as an argument against possible coexistence with wolves. However, this extra work is already being done by many livestock owners and it should be appreciated and further supported.

Finally, to move with the times, it is important to promote the development of more innovative and advanced measures for modern livestock protection (ApP, 2019), including systems for surveillance using networks as well as improved tools for mowing.

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