



**LIFE** Population level management and  
**DINALP** conservation of brown bears in northern  
**BEAR** Dinaric Mountains and the Alps



LIFE13 NAT/SI/000550

## **DAMAGE PREVENTION WITHIN LIFE DINALP BEAR PROJECT**

### **REPORT**

Action C.2: Conflict mitigation in the hot-spot areas –  
damage cases



ZAVOD za GOZDOVE  
SLOVENIJE  
Slovenia Forest Service



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## 1. Introduction

Damage to human property (e.g. beehives, livestock, orchards, fields, gardens, silage bales) is one of the most important causes for human-bear conflicts. Beside the damages on the property, these locations can also act as attractant for bears to approach human settlements and can cause bear habituation to human presence and food-conditioning.

In Slovenia and in Italian provinces, Regione del Veneto and Autonomously Province of Trento, best practice examples in areas with frequent bear damages were implemented. This involved mainly the protection of livestock and beehives. We used different protection techniques, which included electric fences, livestock guarding dogs and other devices for deterring brown bears from causing damages.

## 2. IMPLEMENTED MEASURES

### 2.1 ELECTRIC FENCES

The electricity represents a very efficient mean of keeping the animals from unwanted territory. This is why electricity is both used for keeping pasturing animals within pasture borders and for preventing wild animals from entering a certain area (e. g. large carnivores from pasture, wild ungulates from crop fields, etc.). The purpose of fencing is crucial, which means we have to pay attention on what type of animals we are dealing with. There is a big difference in fences, that are used to direct the pasturing animals in the pasture and those that are used to keep carnivores outside the pasture.

#### ○ ELECTRIC FENCES IN SLOVENIA

##### High electric nettings

**High electric fences (160 cm high)** represent a very efficient measure for protecting pasturing animals from large carnivores. These nettings' height prevents jumping over the fence, while the lowest wires and the dense structure of the netting prevent crawling under or going through the enclosure.

The implementation of high electric fences has started within LIFE Slowolf project, where 10 farmers received these fences to protect sheep herds from wolves. As the fences proved to be very effective (the damages to those farmers dropped by 85 %), we decided to continue with the good practice in the LIFE DINALP BEAR project.

In the LIFE DINALP BEAR project, each farmer typically received 300 meters of electric nettings, an energizer, an accumulator, a voltmeter, a protecting box for the energizer and three grounding rods. On the other hand, beekeepers received 25 or 50 meters of nettings to surround the beehive. We helped each recipient to complete and improve protection.

Between 2015 and 2019, we distributed 55 sets of equipment to livestock owners and beekeepers. With high electric nettings **we protected 21 mobile beehives and 18 sheep herds**. All the protected beehives remained undamaged, while two farmers experienced one attack on sheep, probably due to incorrect use of fences and/or demanding weather condition.



*Photo 1: High electric nettings protecting a sheep herd.*



*Photo 2: High electric nettings protecting a mobile beehive.*

## Multi-wire fences

Multi-wire fences, used in the project, consist of six metallic wires which are fixed on permanent poles. We recommended the use of this type of fence to protect stationary beehives, which are used year-round on the same location, which means the protection has to be present and functional all the time. **We equipped 16 stationary beehives** to protect them from bears and all of them remained safe.



*Photo 3: Multi-wire electric fence protecting a stationary beehive.*

## Intervention kits

Sometimes, when damages occur repeatedly in a short period, farmers are not able to set up a proper protection themselves. This is why we introduced the **intervention kits**. These are sets of equipment needed to quickly set up an effective protection. **Five intervention sets are available at SFS regional premises** to react quickly when damages occur. Altogether, we performed 15 interventions; in most cases to protect sheep or beehives, and in one case to protect cattle. We also instructed SFS officials how to use electric fences. Typically, we leave the kit in the field for one or two months, depending on the circumstances and the reoccurrence of bears or other large carnivores.

When setting intervention kits in the field, we sometimes monitored the situation in the vicinity of the enclosure to check, if the animals would return to the protected property. Despite the presence of bears and other carnivores around the fence, **all the protected properties remained undamaged after the implementation of the intervention kit.**



*Photo 4: The intervention kit applied for protection of young cattle on Pokojišče.*



*Photo 5: The intervention kit used for protection of a cherry orchard.*



### Projects' "side effects"




Based on project's good results, the Slovenian Environment Agency decided to subsidize the electric fences to farmers and beekeepers who experienced damages from large carnivores, which represents a great added value in terms of continuation of good practices. The Agency subsidizes 80% of the purchase of damage prevention equipment. Until June 2019, 60 farmers decided to apply to this scheme and effectively protected their property with high electric fences. To check the use of the subsidized equipment, SFS damage officials each year perform field controls.

After the implementation of the national subsidizing scheme, Slovenia Forest Service donated the equipment also to landowners who had no damages in the past and also in areas where bears were absent for decades to provide protection to as many farmers as possible and to maintain the tolerance towards bears in newly recolonized areas. Through the project, in cooperation with farmers and beekeepers, our team at SFS have become an advising expert reference for landowners in the areas of bear presence.

In addition to Slovenian Environment Agency co-financing, the knowledge and experiences obtained through the project has been transferred to different projects (e.g. Interreg project Carnivora Dinarica – implemented also in Croatia), which continues the practices regarding damage prevention in terms of using both electric nettings and livestock guarding dogs.

### Regular visits of financed measures

The improvement of protection measures comes from the collaboration with farmers and beekeepers. With regular visits we can improve the systems, received feed-back on challenges and workload, or just remind the farmers on the key elements of the protection system. Protection measures are efficient only if used correctly. To make sure the equipment is used correctly, we performed one control in the field each year, where we fill-in a special form, which includes all the important features that are crucial for the proper installation and functioning of the protection system.

Zapisnik št.: K/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
(K: (kontrola) / H: OE / začetni popis / leto / zaporedna številka zapisnika o kontroli)

**ZAPISNIK O IZVEDBI**

(iz: Z' označi nameni zapisnika)

PONOVNEGA PREGLEDA IZVEDBE UKREPA ZA PREPREČITEV NADALJNE ŠKODE (prvi pregled izveden dne: \_\_\_\_\_)

KONTROLE PRAVILNEGA VZDRŽEVANJA IN NAMENSKE UPORABE UKREPA ZA PREPREČITEV NADALJNE ŠKODE

**PODATKI POOBLAŠČENE OSEBE**

Institucija: (označi z X)

Zavod za gozdove Slovenije (ZGS)     Društvo Dinaricum

Ime in priimek: \_\_\_\_\_

Območna enota ZGS: \_\_\_\_\_

Datum obiska: \_\_\_\_\_      Ura obiska: \_\_\_\_\_

**PODATKI UPRAVIČENCA**

Ime in priimek: \_\_\_\_\_

Naslov: \_\_\_\_\_

Davčna številka: \_\_\_\_\_      Telefonska številka: \_\_\_\_\_

**VIR ZAŠČITNIH SREDSTEV** (označi z X)

ARSO (Pogodba št. 2551-15-100 \_\_\_\_\_)

LIFE DINALP BEAR

Ukrep za preprečevanje nadaljnje škode varuje:

- Ovrce / Koze      Število živali (ocena): \_\_\_\_\_
- Stationarni čebelnjak / Premečni čebelnjak
- Drugo: \_\_\_\_\_

1. Lokacija zaščitnih sredstev (ime kraja, ledinsko ime, ipd.): \_\_\_\_\_

Koordinate: X: \_\_\_\_\_ Y: \_\_\_\_\_

2. Ob ogledu izvedenih ukrepov je bilo ugotovljeno naslednje stanje:

- Električni tok prisoten: DA / NE
- Napetost v električni ograji (oddaljenost od pašnega aparata):
- 0 m: \_\_\_\_\_ kV      100 m: \_\_\_\_\_ kV
- Vzdrževanost ograje
  - Travnata ruta pod ograjo pokošena: DA / NE
  - Količniki stabilni in postavljeni navpično: DA / NE
  - Žice / mreže napete: DA / NE
  - Žice / mreže se dotikajo vegetacije (grmovja, dreves, ipd.): DA / NE
  - Prisotnost vdolbin pod ograjo (zveri lahko prehajajo pod ograjo): DA / NE
  - Poškodovanost ograje (ocena):
  - Nepoškodovanost: 1 2 3 4 5      Močno poškodovana, nedelujoča

Opis poškodb: \_\_\_\_\_

- Lastnosti električne ograde
  - Ograda v celoti sestavljena iz električnih mrež višine vsaj 160 cm: DA / NE
  - Obod ograde meri: \_\_\_\_\_ m
  - Ograda sestavljena iz mrež dolžine: 25 metrov \_\_\_\_\_ kosov; 50 metrov \_\_\_\_\_ kosov
  - Postavljena je (obkroži, možnih je več odgovorov):

na ravnem terenu    v breg    na kamnitem terenu    skoki zaradi čeno zemljišče    skoki gozd

Ob ogledu so živali v ogradi: DA / NE

Prisotnost pastirkega psa: DA / NE      Število psov ob čredi: \_\_\_\_\_

Dodatni zaščitni ukrepi? \_\_\_\_\_

Nepravilnosti in opazanja: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Photo 6: The control form is filled-in on every visit.

IMPLEMENTATION OF HIGH ELECTRIC FENCES					
YEAR OF IMPLEMENTATION	Type of protected property	Number of users	BEFORE IMPLEMENTATION	AFTER IMPLEMENTATION	SOURCE
			Yearly average of damages - 3 years before implementation	Yearly average of damages	
2011	Sheep	5	79.314	17.312	SloWolf
2012	Sheep	5	17.868	3.984	SloWolf
2015	Sheep	12	27.680	13.569	LIFE DINALP BEAR, ARSO
	Beehive	11	2.507	0	LIFE DINALP BEAR
2016	Sheep	9	3.488	91	LIFE DINALP BEAR, ARSO
	Beehive	11	11.823	873	LIFE DINALP BEAR
2017	Sheep	10	3.279	615	LIFE DINALP BEAR, ARSO
	Beehive	16	3.961	0	LIFE DINALP BEAR, ARSO
2018	Sheep	17	4.880	0	ARSO
	Beehive	20			LIFE DINALP BEAR, ARSO
	Orchard, corn field	3			ARSO
<b>TOTAL</b>		<b>119</b>	<b>154.800</b>	<b>36.443</b>	

Photo 7: The review of damages, that the recipients of high electric fences experienced before and after the implementation of this type of measure. We took into account the average yearly amount of damages (3 years before) and the average amount of yearly damages after the implementation.

The chart shows all the recipients from Slowolf project, LIFE DINALP BEAR project and those, who received the equipment from Slovenian Environment Agency. This year (2019) is not included in the calculation as it would not fit in the yearly average (although, this year the damages to these farmers are very low). The most important results are **the 84 % drop of experienced yearly damages** and the

fact that **79 % of the recipients have not experienced any damages after the implementation of high electric fences**. In cases, where we detected damages caused despite the use of high electric fences, we immediately went in the field, set the cameras around the fence perimeter and tried to inspect what happened. In most cases we detected that the damages occurred due to human error and/or demanding weather condition.

- ELECTRIC FENCES IN ITALY

In Veneto region, the activities were implemented in collaboration with similar action of LIFE Wolfalps project, particularly in the damage hot-spot areas for both bear and wolf. In 2017, 120 electrified fences provided by the LIFE DINALP BEAR project were purchased together with 60 sets from Wolfalps project, in order to achieve a better offer. In summer 2017, we delivered the fences to farmers who requested help. The delivery was performed with the support of BIT members of the Provincial Polices. For each set we signed a contract of free loan. The set included an energizer, battery, solar panel; nettings for sheep, wire and poles for cattle and other species. After the signing of an agreement between Veneto Region and the Italian Alpine Club (CAI) also CAI volunteers collaborated in the installation of fences. In 2018, thanks to technicians appointed by the Veneto Region with its own funds and to BIT staff, the delivery of fences to landowners in the provinces of Vicenza and Belluno was completed. A minimum part of materials was held as a reserve for emergency interventions. The technicians also verified the functionality of the fences already delivered in 2017. In 2019, 40 camera traps were purchased and, thanks to an external assignment to the “Il Villaggio degli Orsi” Association, were used to document the effectiveness of preventive measures on sample fences. The results are documented in action D1. The camera traps were then supplied to the provincial Polices for future monitoring of large carnivores and of the preventive measures effectiveness by the BIT staff.

In 2018 and 2019, Veneto Region replicated the positive experience of dissemination of prevention systems from LIFE Projects with provision of its own funds for contributions to farmers for the purchase of prevention systems against depredations. In June 2019, after the EC authorization for a modification of the 2014-2020 RDP, Measure 4.4.3 of the Veneto RDP was activated, with provision of 1 Million € for the period 2019-2020 for investments in preventive measures. Also in 2019, the technicians assigned by Veneto Region for the support to farmers in planning and installation of measures and the support of CAI volunteers were confirmed.



*Photo 8: The installation of electric nettings for the protection of sheep.*



*Photo 9: Multi-wired electric fence installed for the protection of cattle.*

## 2.2 LIVESTOCK GUARDING DOGS

### ○ LIVESTOCK GUARDING DOGS IN SLOVENIA

In 2016, we started the development of working lines by searching motivated and competent breeders to collaborate with. We hired two experts to provide help in the field. We selected five experienced LGD breeders and signed contracts. In December 2016, we announced the first litter and until the end of the project **20 pups from five established working lines were delivered to new owners**. Both the breeders and cynology experts followed the dogs in new environments to provide expert opinion to farmers who have no or little experiences in using LGDs. The progress, challenges and reports from meeting were described by each breeder and experts in yearly reports.

All the distributed dogs have been working very well. The collaboration between new owners and LGD breeders represents a good way to raise good LGDs on long-term perspective. LGD breeders act as field-advisors and already have plenty of experiences to teach new owners how to raise the dogs. On March 13 2019 in Ljubljana, we held a meeting with all breeders and cynologists to exchange experiences and set future steps of breeding LGDs in Slovenia. In collaboration with LGD breeders and cynologists we prepared the LGD breeders handbook to distribute to interested farmers on meetings and in the field. To give farmers a detailed overview of using LGDs for herd-protection, we organized a special meeting with field-demonstration on June 20 2019 in Pivka. At the meeting, 20 breeders, cynologists and project members shared their experiences regarding damage prevention, the work with LGDs, about raising pups, and presented the legal frames. We finished with a visit at one breeder's farm.



*Photo 10: The first "project litter" of tornjaks.*



*Photo 11: A visit from the project team and cynology expert.*



*Photo 12: Karst shepherd.*



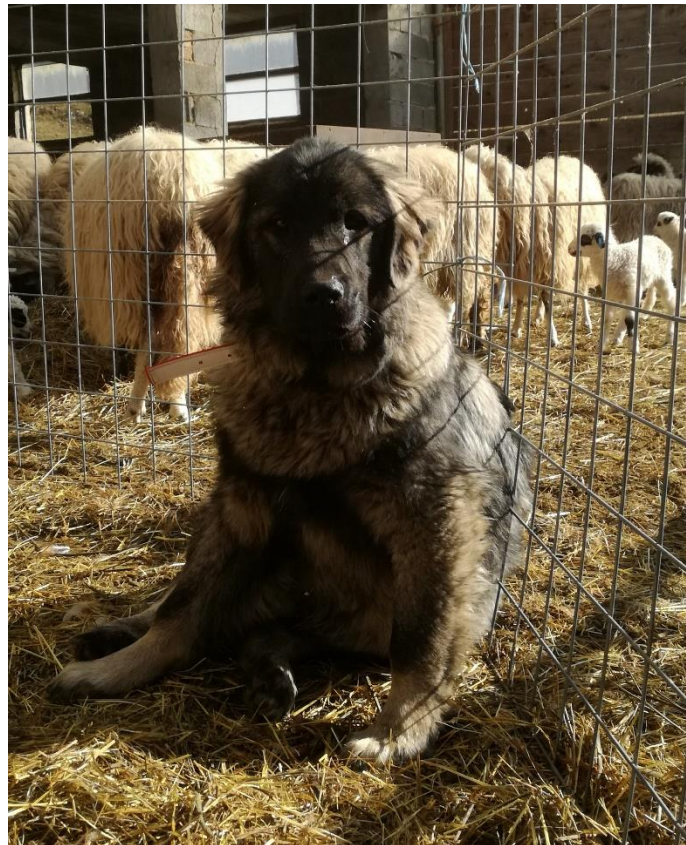
LIFE  
DINALP  
BEAR



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*Photo 13: A Caucasian shepherd dog pup.*



*Photo 14: A Sharplaninac pup.*

○ LIVESTOCK GUARDING DOGS IN ITALY

Because of the administrative frame in Trentino, PAT did not use the project budget to buy dogs. PAT invested its own resources into the project to buy LGDs: since 2014, 51 puppies have been distributed to 30 breeders. The dogs are certified by the association “Circolo maremmano abruzzese” that guarantees the pedigree. Each dog was periodically visited by a veterinarian LGD expert, paid with the project’s budget. We hired an expert referent for LGD for LIFE WOLFALPS, to check the health of dogs and the activities of breeders. It is very important to follow the first steps of dogs in the new environment, as the first period is crucial for future abilities and protection of the herd. **Nine of the breeders started with their own working lines** and from these lines, 25 pups were distributed to new owners and are already working as livestock guarding dogs. Also for these dogs, the veterinary visit was guaranteed.

As the need for improved protection and the demand for preventive measures among farmers is very high, the budget planned for purchase of dogs has been spent to buy 19 electric fences to protect beehives and livestock, accordingly with the project monitor.



*Photo 15: The veterinary expert visiting a donated livestock guarding dog.*



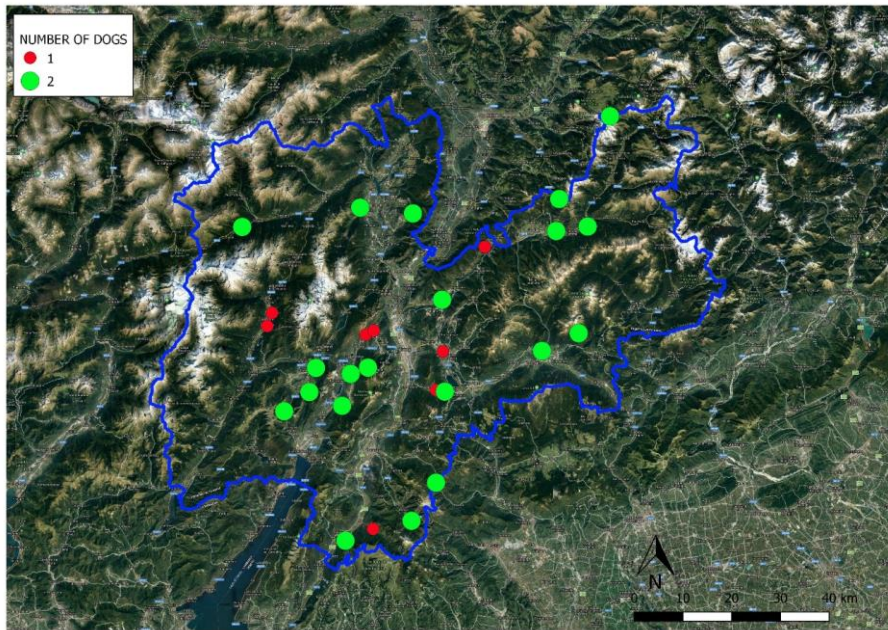


Photo 16: The distribution of livestock guarding dogs in Autonomous Province of Trento.

## 2.3 SCARING DEVICES

### ○ ELECTRONIC DETERRENTS

In order to test the usefulness and the effectiveness of different electronic devices to deter bears from human property, four different types of electronic devices were tested in the field. Before planning the test, we searched for different types of solutions on the market. From different literature, chemical deterrent are known to be unreliable and efficient for a short and limited period, as they emit the odours all the time and the animals get used to them very quickly. Therefore, we decided to test electronic devices, which could be a cost-effective solution for the protection of small areas, as beehives. We did not consider this type of deterrence as an option for protection of larger areas, such as pastures, as the cost of having tens of deterrence devices around the pasture perimeter would not be rational.

#### Motion-activated electronic devices

Unlike the chemical deterrence, motion-activated electronic devices are activated when the sensors detect movement in front of the devices. This provides a surprise-effect for the animals that passes by, causing a shock reaction, which usually scares the animal away. We searched on the market for different types of electronic deterrence and selected three types:

- a speaker with a loud combination of human speech and screaming,
- an ultrasonic device, that emits high-pitched sounds that are very unpleasant for animals,
- and a reflector, that flashes when the animal approaches it.

In order to test the effectiveness and usefulness of these scaring devices, we used them in areas where bears are regularly present. We started the test in October 2018 and left the devices in the field until June 2019. We used all the three device on the same area, placing them approximately 50 meter away from each other. To attract bears to the devices, simulating a situation, where we want to protect a human property, we placed wooden boxes with a mixture of smelly food (fish, fermented fruits, marmalade, etc.) on a tree trunk, approximately 170 cm from the ground. The box was closed to prevent other animals (like martens) from reaching inside the box, but still perforated to emit the odors. We placed the device under the box, targeting the average bear's height. In the tested area, we also used a control attractant box without any device to test the difference between the presence/absence of the scare device. In the testing period we changed the areas twice (Ilirska Bistrica, Jelšane and Prestranek) and left the devices in the field for several months. All the spots were constantly monitored by automatic cameras to document any presence and the behavior or the animals.

The results of testing the electronic scare devices prove the same as studies from abroad. These types of devices have a limited effect of scaring the animals away. At first, we did not detect the presence of bears close to the devices, probably due to large amount of natural food sources (mostly beech mast) available in the forest last autumn. Nevertheless, other animals (red deer, roe deer, wild boar, fox) passed by the devices, having different reactions, mostly being scared away. Later on, the bears started to be present in the vicinity of the devices and they destroyed the attractant boxes in a few weeks. The only device, that proved to have a least some effects on the animals, was the speaker with loud human

voice. In most cases, the bears ran away. Eventually, we noticed a significant individual difference in behavior, which resulted in a bear destroying the box above the speaker.

Our results show all the electronic devices are not reliable when used alone to deter bears. Such electronic scare devices can be used in addition to other, more reliable and effective solutions, as the electric fences. In this case, the scare device could prevent the bears from approaching the vicinity of the protected property, while the electric fence represents the reliable and proved defense against damages on the property.



*Photo 17: Top left: a reflector; top right: an ultrasonic device; bottom left: a speaker; bottom right: a camera is filming the situation around the tested location.*



Photo 18: A bear reaching for food in the box.

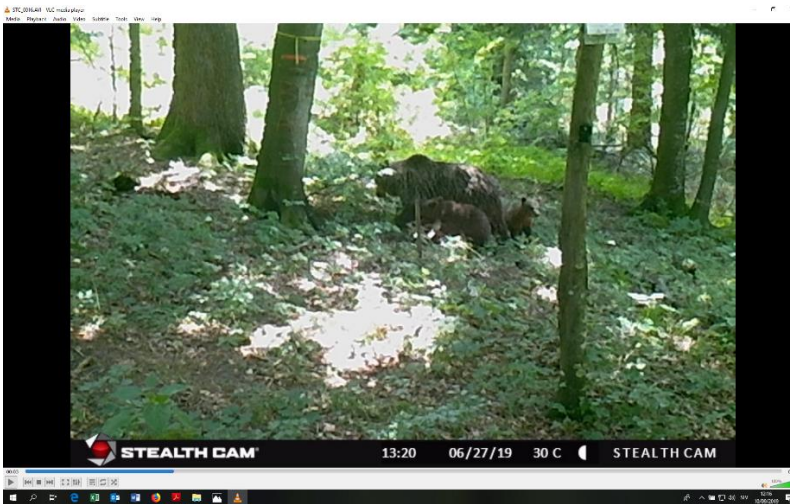


Photo 19: A bear family in the vicinity of the scare device.



Photo 20: A young bear climbing to the box, showing no fear of the scare device.

## ○ ELECTRIC MATS

Based on positive experiences from abroad (mainly from US), we decided to test the electric mats - a different electricity-based approach to prevent bear from approaching or entering buildings or damaging other types of property. The electric mat is basically a dense electric netting placed on a rubber mat on the ground. The mesh-wired net works as a conductor for electricity, and is placed on a rubber board, which insulates the conductor from the ground. The electric mat has to be placed around the property or in front of exposed sections. The animal which steps on the mat receives a painful electric shock that scares the animal away. The main difference with other electronic devices is that the animals cannot get used to the shock, as it triggers an uncontrolled nerve-muscle reaction that causes very unpleasant pain and it occurs every time the animal steps on the mat. The main difference is the short painful feeling that prevent the animals from retrying, while the scare devices do not cause any physical consequences, so the animals easily overcome the fear of flashing, beeping or voices.

We tested the electric mats to protect stationary beehives and beehive stations on three locations in areas where bears are regularly present. In all cases the beehives remained undamaged, which proves the efficiency of this type of deterrent.

We recommend the use of the electric mat for protection of stationary beehives, where the front exposed part is protected, and the rest of the beehive (in most cases) is made of solid materials, that cannot be damaged by bears. As the electric mat proved to be the only effective device, therefore we distributed two such electric mats to two interested beekeepers.



*Photo 21: The electric mat installed around a mobile beehive unit near Jelšane.*



Photo 22: Electric mat placed in front of a beehive house, near Loški Potok, to protect the most vulnerable parts from bears.

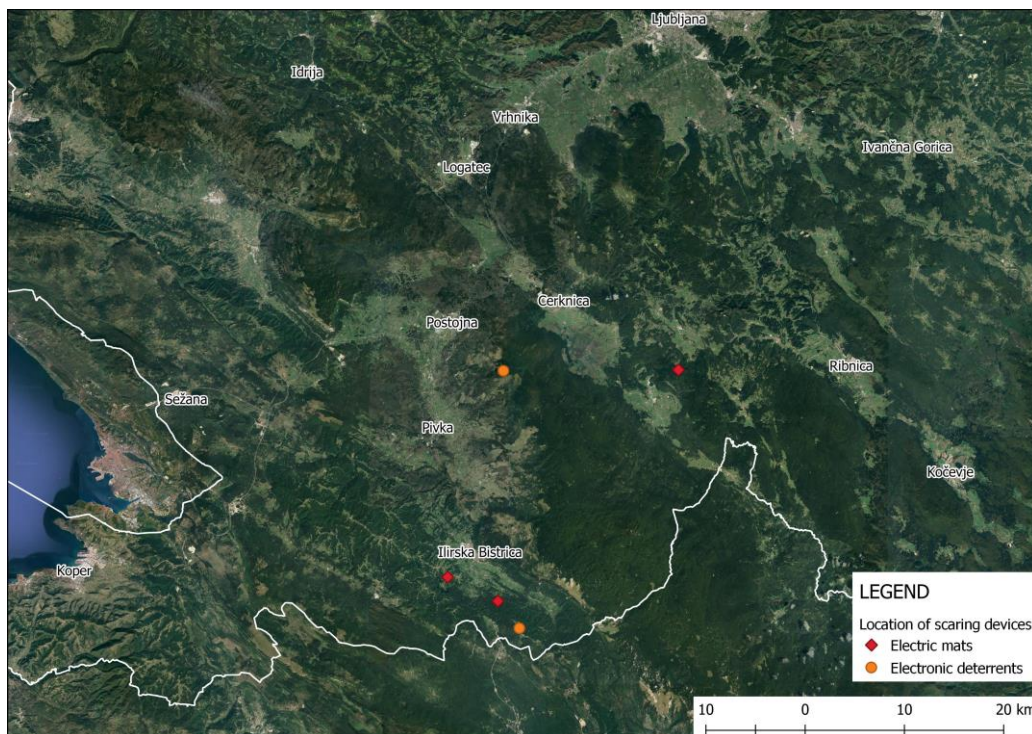


Photo 23: Locations of tested scaring devices: electronic devices and electric mats.

## 2.4 Special web-site for damage prevention and coexistence with large carnivores

Within the action E.4, in collaboration with other actions (C.1, C.2, etc.) we prepared a special web-site “Varna paša”, dedicated to the coexistence with bears and other large carnivores. It includes guidance on how to protect human property from damages caused by large carnivores, how to behave in areas where large carnivores are present and how to prevent bears from entering the vicinity of human settlements. It also includes step-by-step guidance on the procedure, when a damage occurs and how to apply to the national co-financing scheme. The website is available in Slovenian and English.

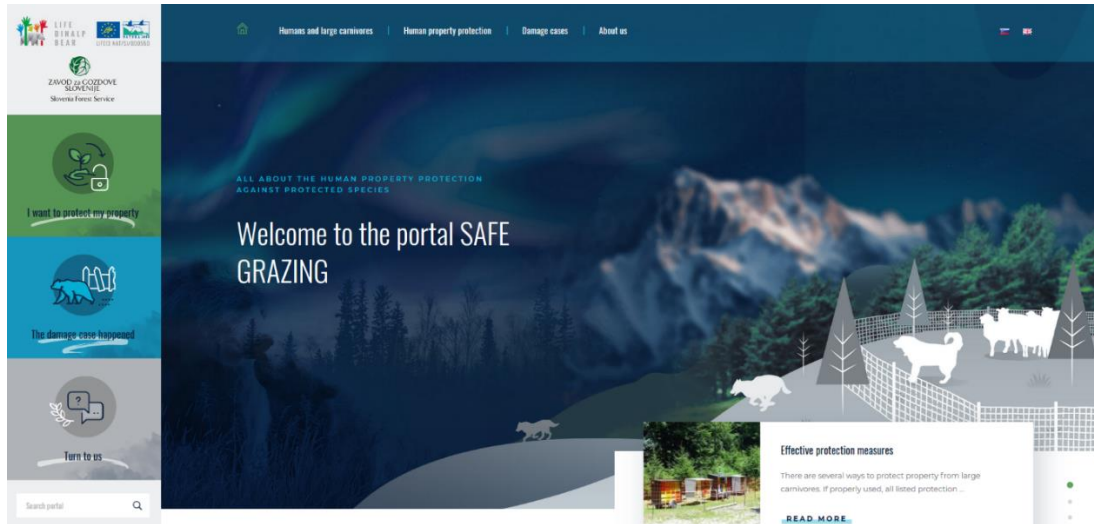


Photo 24: [www.varna-pasa.si](http://www.varna-pasa.si)

### 3. CONCLUSIONS

In the project LIFE DINALP BEAR we implemented different protection measures. Some of them proved to be effective, if used or implemented correctly (i.e. high electric fences, livestock guarding dogs and electric mats), while other tested measures failed (electric deterrents). As a project outcome, we consider the transfer of proved solutions, the high electric fences, into the national damage prevention system, one of the most important steps for the continuation of effective practices, that were extensively tested in the field. Now the Ministry of the Environment and Spatial Planning, through the Slovenian Environment Agency, is co-financing 80 % of the purchase of the equipment, needed to install an effective protection by using high electric fences. All the equipment installed in the field is regularly controlled by Slovenia Forest Service damage officials, who were taught how to perform field visits within the project.

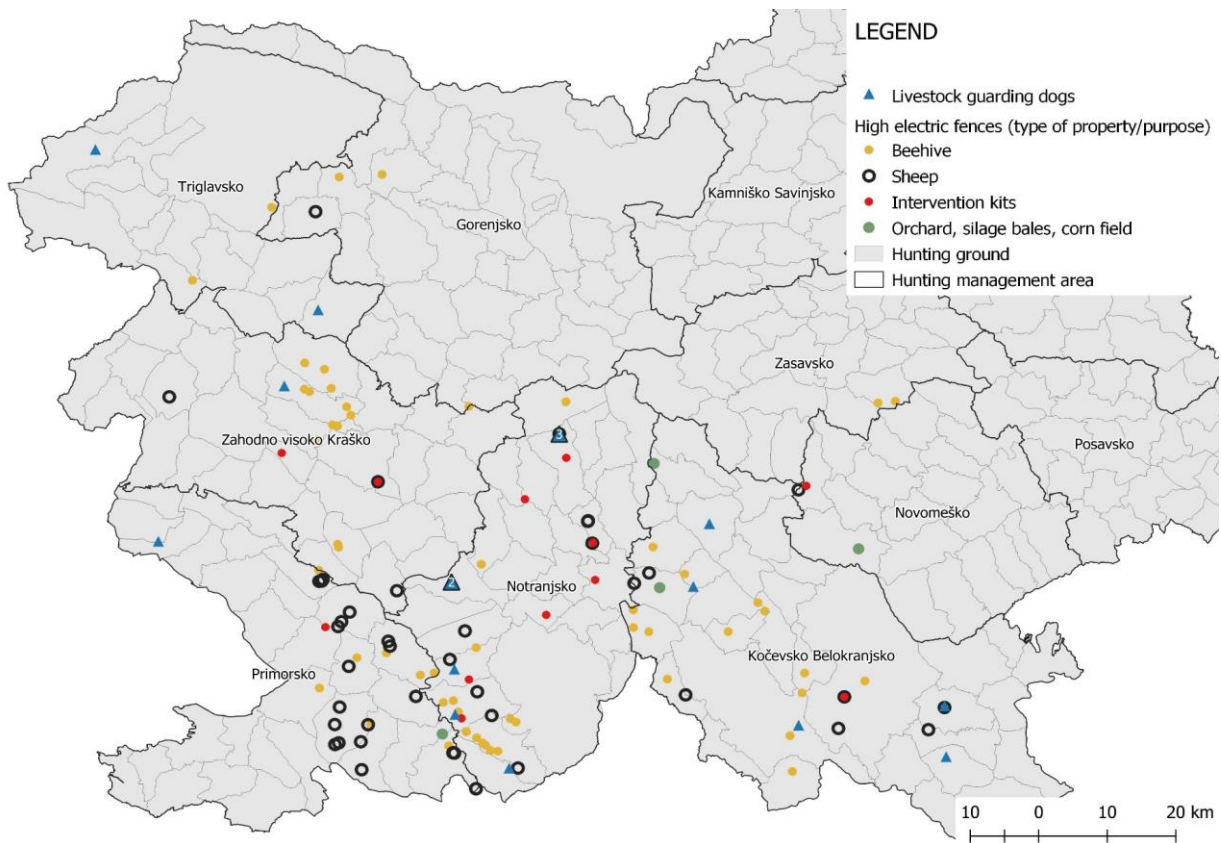


Photo 25: The summary of all implemented protection measures in Slovenia.



#### 4. LITERATURE

- Berce, T., Černe, R. 2016. Reja domačih živali in sobivanje z zvermi – Varovanje drobnice pred velikimi zvermi. Zavod za gozdove Slovenije. Naročnik: Ministrstvo za kmetijstvo, gozdarstvo in prehrano.
- Berce, T., Zahariaš, K., Sedmak, A., Bragalanti, N. 2018. Pastirski psi. Priročnik projekta LIFE DINALP BEAR
- [www.varna-pasa.si](http://www.varna-pasa.si)