

**MONITORING OF DEER  
MIGRATION PASSAGES –  
RED DEER (*Cervus elaphus*) and  
WILD BOAR (*Sus strofa*)**

**FINAL REPORT**

**CR – Správa Národního parku České Švýcarsko  
(Management of the National Park Czech Switzerland)  
Ing. Marek Klitsch  
Pražská 52  
407 46 Krásná Lípa**

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### **Project Objectives:**

Red deer (*Cervus elaphus*) and wild boar (*Sus scrofa*) are the largest wild mammals in the National Park Czech Switzerland (NPČŠ). Caring for deer and wild boar, including surveys of its abundance in different seasons, is an integral part of the overall care of forest ecosystems. Migration of both types of animals in the neighboring National Park Saxon Switzerland and vice versa is a frequently debated issue, while the Saxon side applies entirely different game management in different hunting periods. Deer represents a significant limiting factor in the transformation of forest ecosystems in the NPČŠ (browsing of trees). The project aims to determine the size of deer home precincts in the NPČŠ and the surrounding region. The obtained position data will be further used for evaluation of seasonal changes in the migration, use of pasture land and additional deer feeding facilities as well as game preferences of forest stands in relation to possible damage caused by the animals. The migratory distance and direction of migration as well as habitat stability and disintegration of family bands will be mainly established in boars.

### **Characteristics of the Area of Interest:**

The project is implemented in the right bank area of the Elbe Sandstone (divided by the Elbe River) with partial overlap in the Giant Mountains. The area of interest is of very rugged geomorphology (Turonian sandstone forming a rectangular sandstone rock towns and inverse ravine). Elevation of the area is from 115 m above sea level (the level of the Elbe River in Hřensko) to 736 m above sea level (Studenec top in the PLA Giant Mountains). high forest coverage is characteristic for the area (NPČŠ 97%). Forest communities were originally formed primarily by acidic beech forests, which are currently being replaced by secondary spruce monocultures. Beech forest is represented only in 11%, mainly on the individual basalt elevations. The edges of the area of interest are affected by intensive agriculture. Lynx (*Lynx lynx*) is the only natural predator monitored for both types of game in the NPČŠ.

### **Methodology:**

In the course of the project 19 heads of red deer and 60 heads of wild boar were marked. Deer (11 bucks and 9 hinds) were marked with GPS collars. Individuals of red deer were marked in different parts of the area of interest so to obtain positional data from as greatest surface area of interest as possible (map number 1). GPS collars were supplied by VECTRONIC - Aerospace GmbH based in Berlin. The collar records the position of the individual marked animals at set hourly intervals. Functionality of the collar is affected by a two-year battery life, and then it is necessary to remove the collar from an animal and replace the battery. For the functional period each GPS collar records around 17,500 positions. The collar is also equipped with an activity and mortality sensor, which "remote" tells about the

death of the marked individual. Equipment of the collar allows continuous non-contact transmission of positional and activity data to the field terminal throughout the whole period of operation of the collar. Positional data was downloaded at approximately 30-day intervals. software GPS Plus by VECTRONIC Aerospace GmbH served for transmission of primary data (location, activity) stored in the field terminal to PC, while the data was stored in the primary GDF format. Each entry was represented by one sentence stored in tabular form in one line, the position of points in the WGS 84 coordinate system. GPS Plus software allows viewing of recorded data in tabular and graphical format and supports export to several predefined formats - DBF, CSV, KML. For further work with records in the environment of geographic information systems, tabular data was exported to DBF format. Other modifications and data analysis were conducted in the environment of ArcGIS software by ESRI. The data were mainly filtered from records missing position information or containing inaccurate position data, and after visual inspection the data was transformed into a plane S-JTSK coordinate system. Using standard operations and functions MCP surface values were calculated to each set of data (minimum convex polygon) and subsequently cartographic outputs were developed.

Wild boar were caught in traps and then labelled with standardized ear-tags (supplier: Hema Malsice). In the area of interest four traps were constructed and deployed in order to catch wild boars from different parts of the area of interest. Wild boar were caught in the autumn and winter months. Subsequently, data on re-taking, observations and shoots were recorded and transmitted to the maps.

### **Catching and immobilization of the game:**

For immobilization of deer anesthetic rifle of Dist-injekt model 70 was used. Shots were made by Pseudart, in sizes 1.5 ml, 2 ml, 3 ml (supplier: Atomvet, Ltd.). All deer were immobilized at loose. A mixture of ketamine with xylazine, was used as an immobilization agent at doses: 5 mg xylazine/kg and ketamine 2mg/kg. Immobilized animals were leaving 30 to 250 meters from the point of immobilization and were usually ready for deployment of the collar within 30 to 40 minutes after application of immobilization mixture. Yohimbine or Atipam were used as an antidote at doses of 0.1 mg/kg. Part of yohimbine dose was administered intravenously. Antidote was applied after one hour since the beginning of immobilization. Wild boars were immobilized mixture of: xylazine, tiletamin, butorphanol, or telazol, butorphanol, detomidine. Neither any unusual incidents were recorded during immobilization of the caught animals nor any death of an animal occurred during and after immobilization.

Photo catching device + guns + shots + shot deer

### **Game marking:**

Deer were marked with a GPS collar. Length of the collar for deer was 75 cm with the possibility of mounting  $\pm 10\%$ . Length of the collar for hinds was 50 cm with the possibility of mounting  $\pm 10\%$ . Collars were deployed on deer with a sufficient reserve in length. Sufficient flexibility in deploying of collars is important particularly in the marking of young deer in summer coat. Deer suffered deployment of collars very well, no efforts at removing the collars were observed. The marked deer neither evaded the point of immobilization in the coming days delicate nor it showed any increased alertness in those areas.

Wild boars were labeled with standardized ear-tags. Each tag bore an abbreviation of the NPCŠ and a unique serial number from 1 to 100. Capture d and labeled wild boars did not evade the place where they were caught, which is evidenced by a number of repeated catches in the interval of several days after the first capture and marking.



Photo 1. Deer marked with the GPS collar





Photo 2. Immobilized young boar labeled with an ear-tag

## **Results:**

### **Space Activity - deer:**

119,544 positions, out of which 49,200 positions from collars deployed on bucks and 70,344 positions from collars deployed in the hinds, were obtained in total in the course of the project from 20 deployed GPS collars. Home districts were calculated and shown graphically as the area MCP from the position data (a total of 103,541 non-zero positions) for every marked buck and every marked hind (Table 1). The average size of the MCP at the deer was 3529 ha and 828 ha does. The average size of the MCP at the deer was 3529 ha and 828 ha at hinds. The range of home district of deer was from 1931 to 5454 ha and from 312 to 1371 ha for hinds, whilst the data used for MCP sizes came from the marked individuals that have been followed for at least 8 months. No data was obtained from the collar number 6755, since the collar stopped working shortly after the deployment. All marked deer showed typical daily movements of daily stands (forest - the resting spots) on the grazing areas (fields, meadows), where they came in the evening and from where they returned in the morning. Most of the deer preferred forested rocky ridges with a visual inspection area for their day stands (Figure 1, 2). In winter time, the size of the occupied territories significantly reduced and their presence was centered nearby additional feeding facilities (Map 17). Significant changes in migration were reported during the rutting season at bucks and during fawn births at hinds. The home district of bucks increased up to three times during the rutting season (September-October) (Map 18). Significant increase in MCP during the deer rut is due to deer migration to the rutting areas (4 -7 km) and active search for rutting hinds. Hinds left the usual route (daytime resting spots - night grazing areas) 1-2 days before delivery and went to an apparently pre-selected place for fawn birth, which they considered safe for the delivery and the first days of life of the fawn. After having fawns they remained in this place for 5 to 10 days and then they returned to the usual route: the day stands - night grazing areas. The old

deer had smaller home districts than younger deer. During growing season the deer commonly passed to the National Park Saxon Switzerland but in winter they always returned back to mangers in the NPČŠ. Far transitions to inland territories (CR) were recorded only for the marked one-year-old bucks, in particular up to 12 km.

### **Space Activity - wild boars:**

Wild boars were caught in the period of September - beginning of April. Labeled boars were recaptured up to spring into the same traps, in which have been labeled. The distant migrations began to occur not sooner than in spring and summer months, especially in male deer. This phenomenon may be due both to disintegration of the family band (litter period of the guiding sow) or migration for food (sown fields in the farmed landscape), or a combination of both these causes. Sows remained in the family band, which is probably habitat continuous, regardless of fluctuations in food supply. Migration was recorded in all directions, crossing the Elbe River has not been proven yet, despite known observations of boars overcoming the Elbe River. So far, the longest migration was detected in a young boar labeled on 02.12.2010 at Vysoká Lípa (February 27, 2010 re-captured) and subsequently hunted on 6.1.2011 at Dobranov (Česká Lípa). Direct distance of the route was 26.5 km. With increasing time of labeling of the individual heads the migration distance increased as well (Figure 1). It shows that the boars (especially one-year olds) migrate freely throughout the countryside and penetrate the new, for them unfamiliar territories. Out of the 27 piglets marked in the period October 2009 - March 2010 there were 15 provably hunted pieces (incoming feedback message).

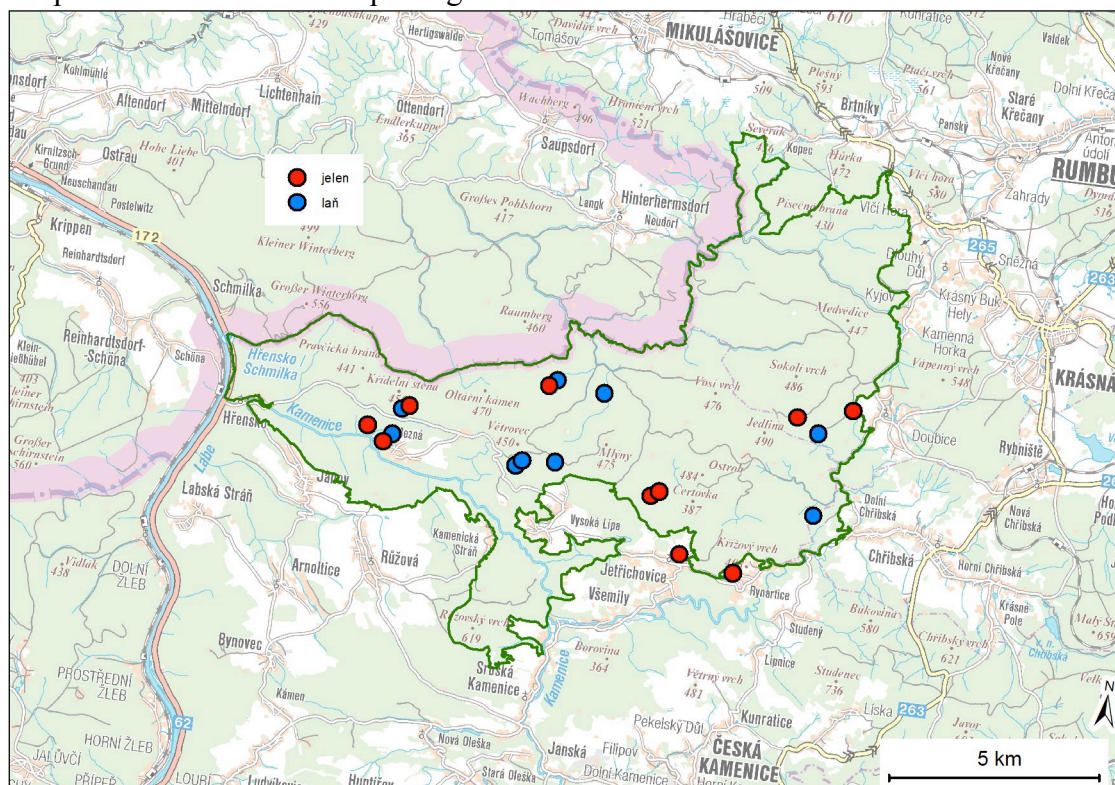
## **Annexes**

Chart 1

COLLAR NUMBER	SEX	APPROX. AGE WHILE CAPTURED	PLACE OF CAPTURE	MCP (ha)	START1	END1	START2	END2	NUMBER OF GPS positions for MCP
2151	buck	25 months	Mezná	227	16.3.2006	12.7.2006			528
2152	buck	8 years	Rynartice	1931	7.8.2007	5.9.2009			11269
6751	buck	25 months	Mezná	4999	27.2.2009	3.11.2009			4094
6752	buck	2 years	Černý grunt	5454	18.2.2010	23.8.2010	6.2.2011	19.4.2011	1 5472
6753	buck	3 years	Z. Jetřichovice	1213	9.2.2010	21.7.2010	24.1.2011	14.4.2011	1 1 5144

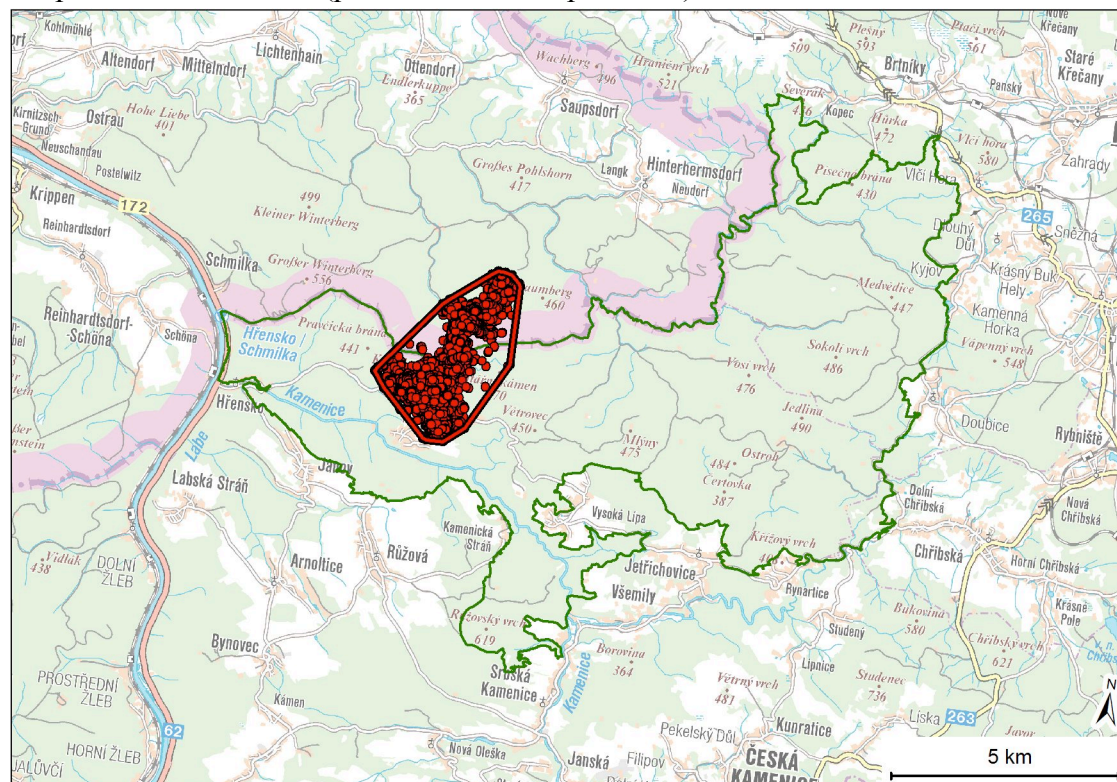
6754	buck	3 years	Doubice	3912	4.3.2009	2.3.2010			5675
6755	buck	5 years	Jetřichovice	0					0
6756	buck	9 years	Jetřichovice	2547	27.2.2009	3.10.2009			3755
6758	buck	4 years	Jetřichovice	2329	9.7.2010	8.2.2011			3899
6759	buck	8 years	Doubice	978	1.2.2010	14.4.2010			1683
6760	hind	3 years	Z. Jetřichovice	710	19.2.2009	22.9.2010			9422
6761	hind	6 years	Vysoká Lípa	373	30.10.2009	23.12.2010			9685
6762	hind	5 years	Mezná	312	12.2.2009	9.11.2009			4862
6763	hind	7 years	Mezní louka	839	25.2.2010	12.11.2010			4258
6764	hind	4 years	Mezní louka	1095	5.3.2009	27.8.2010			11272
6765	hind	8 years	Černý grunt	688	14.2.2009	18.4.2010			9542
6766	hind	3 years	Doubice	661	25.2.2009	7.11.2009			3990
6767	hind	6 years	Chřibská	1371	18.2.2010	5.11.2010			4529
6769	hind	7 years	Mlýnská rokle	575	8.3.2010	10.12.2010			4462

Map 1. Locations of deer capturing in the area of interest

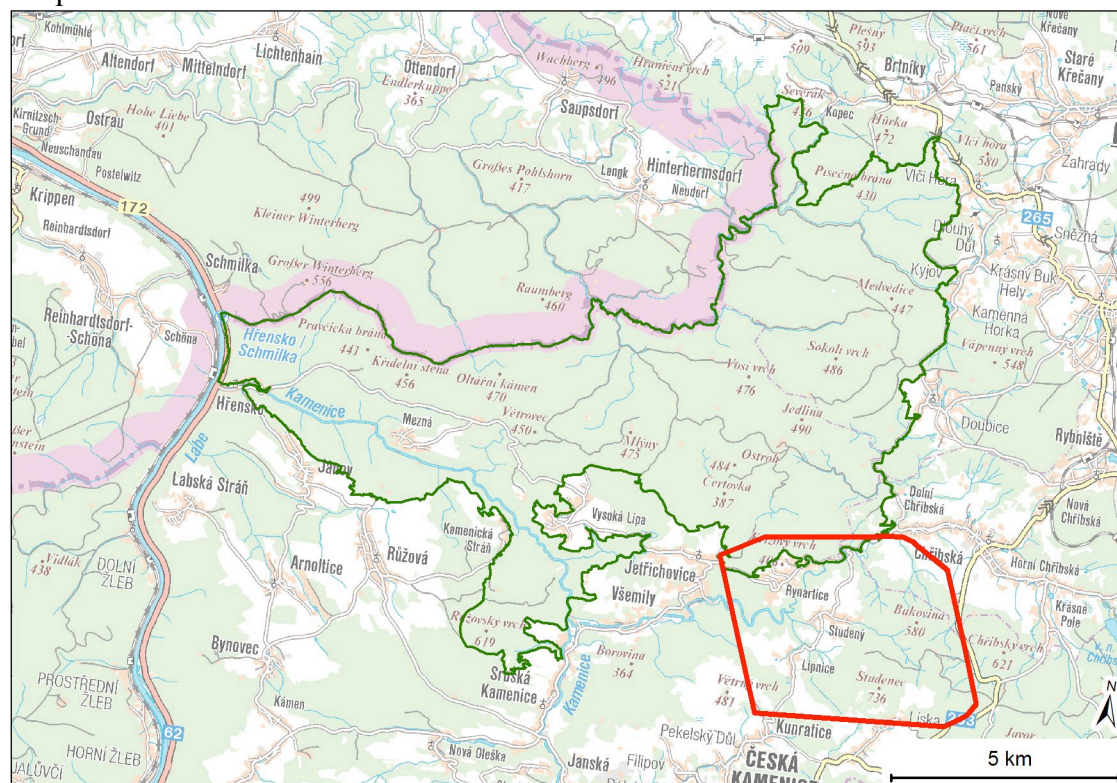




Map 2. MCP hind 6765 (points show 9542 positions)

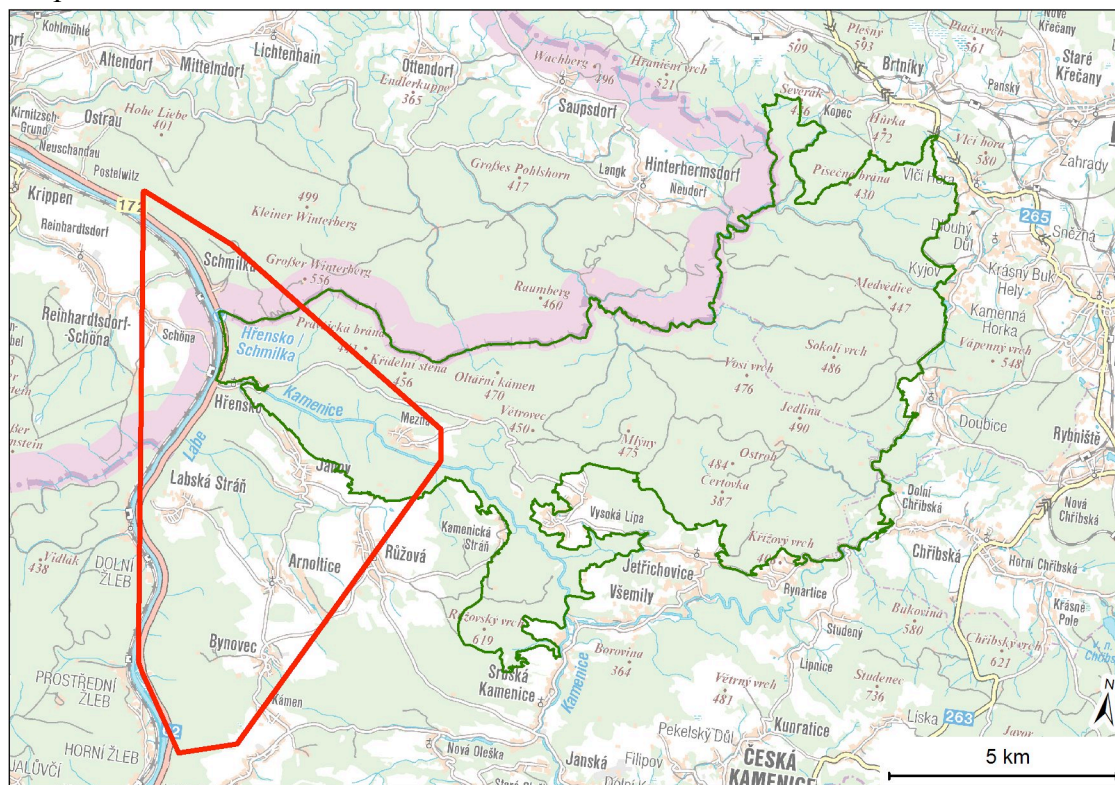


Map 3. MCP buck 2152

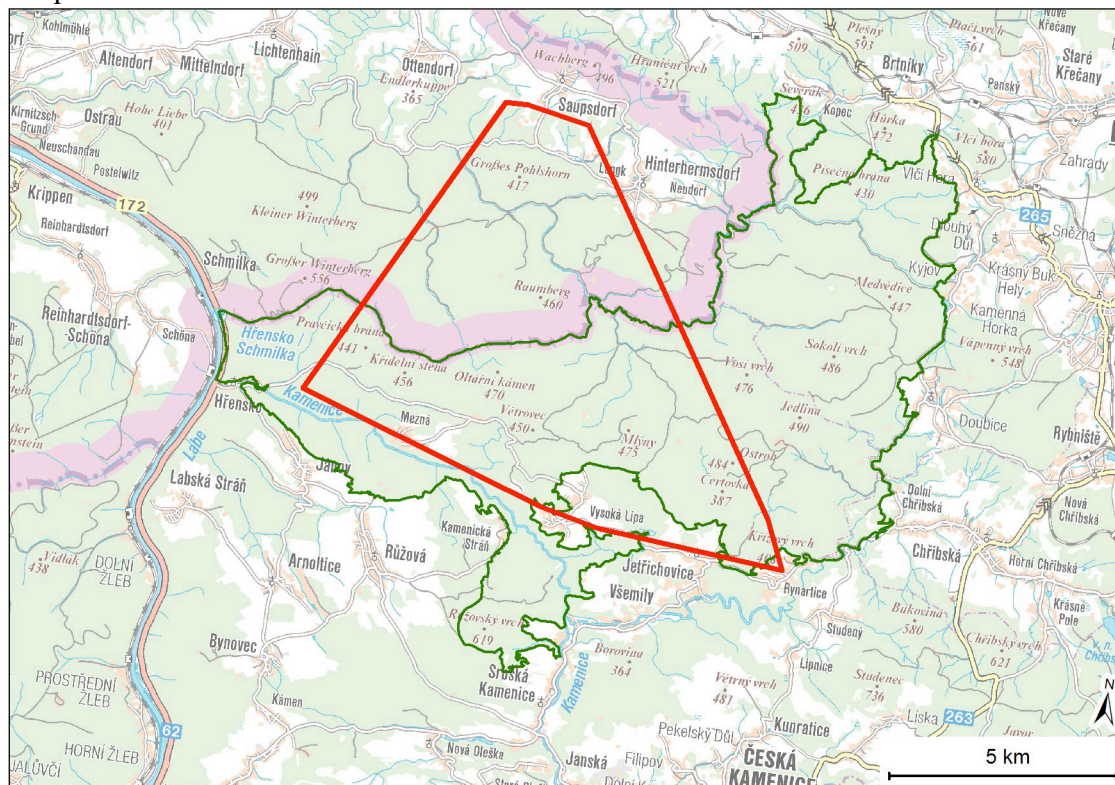




Map 4. MCP buck 6751

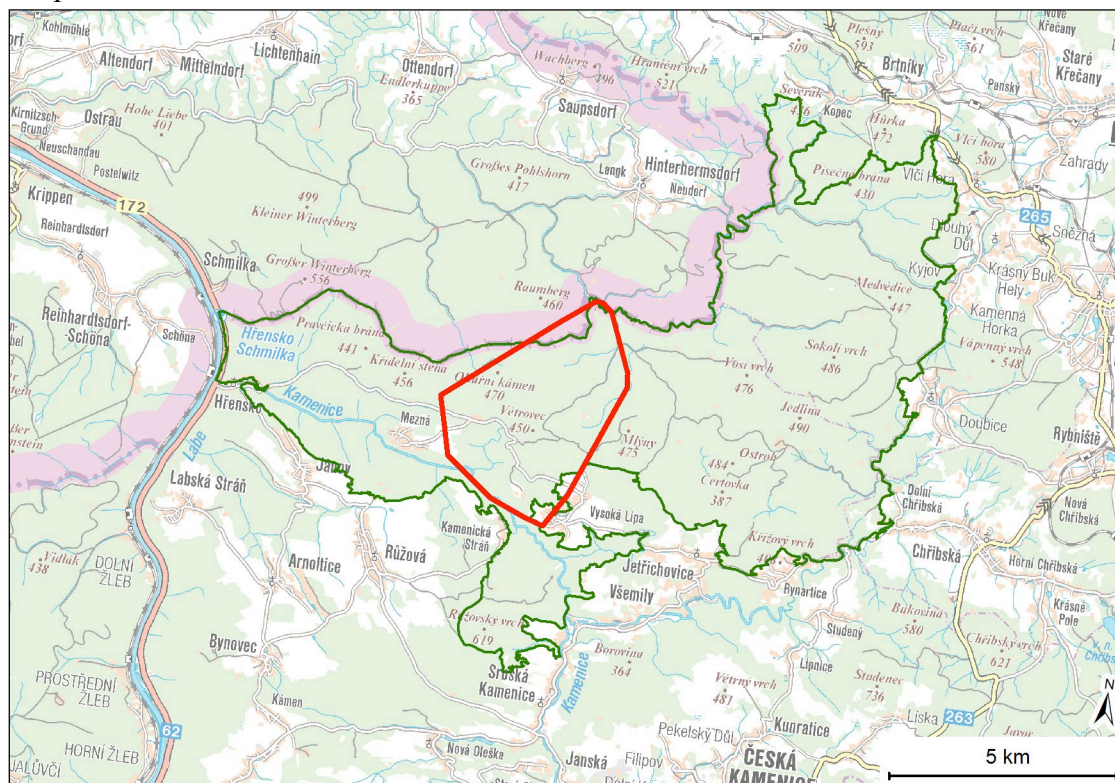


Map 5. MCP buck 6752

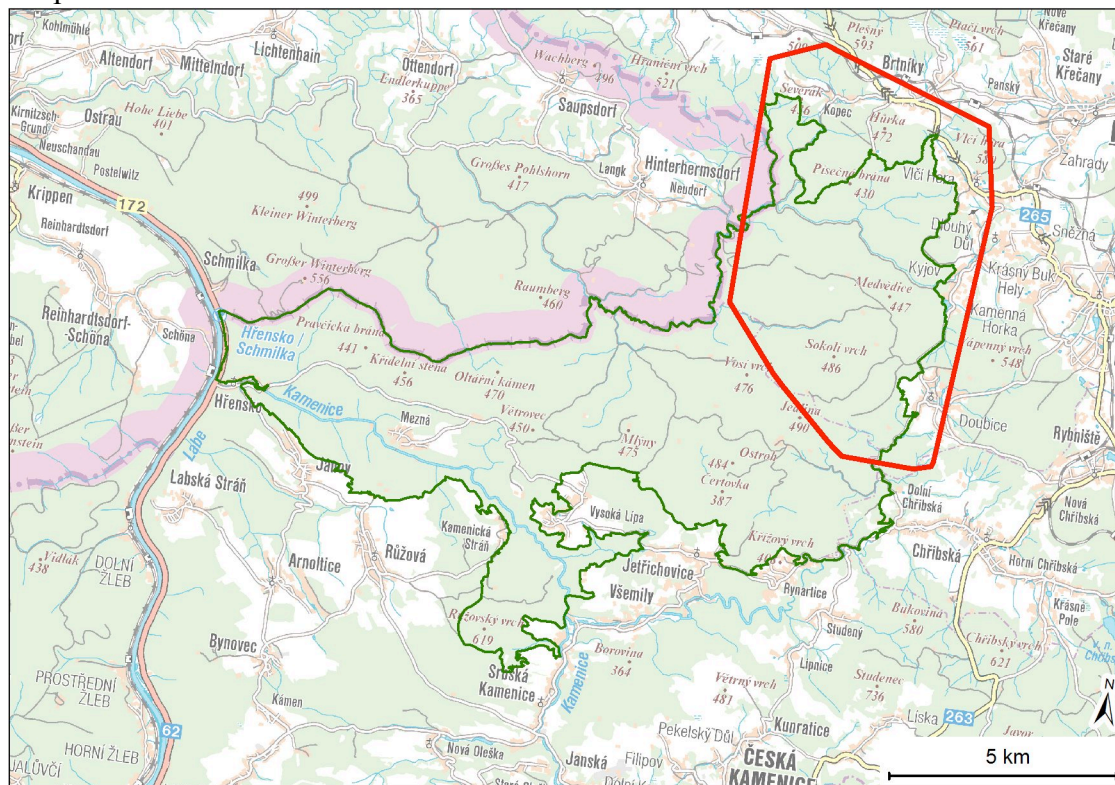




Map 6. MCP buck 6753

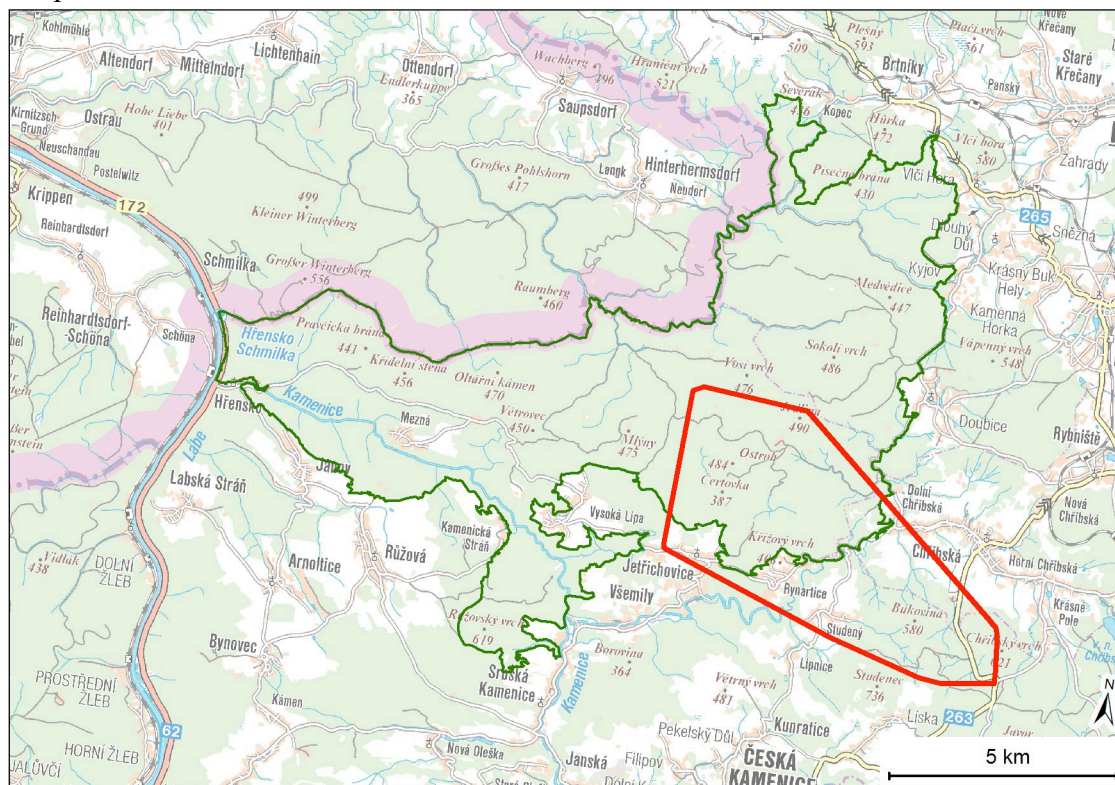


Map 7. MCP buck 6754

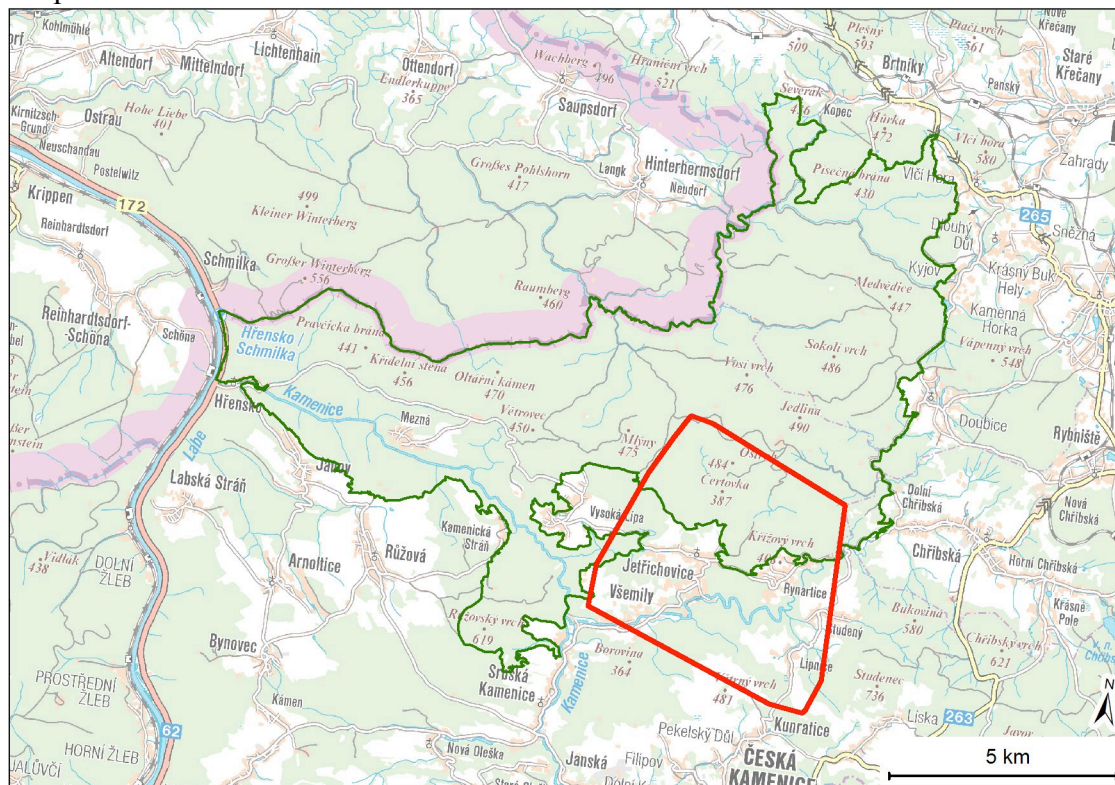




Map 8. MCP buck 6754

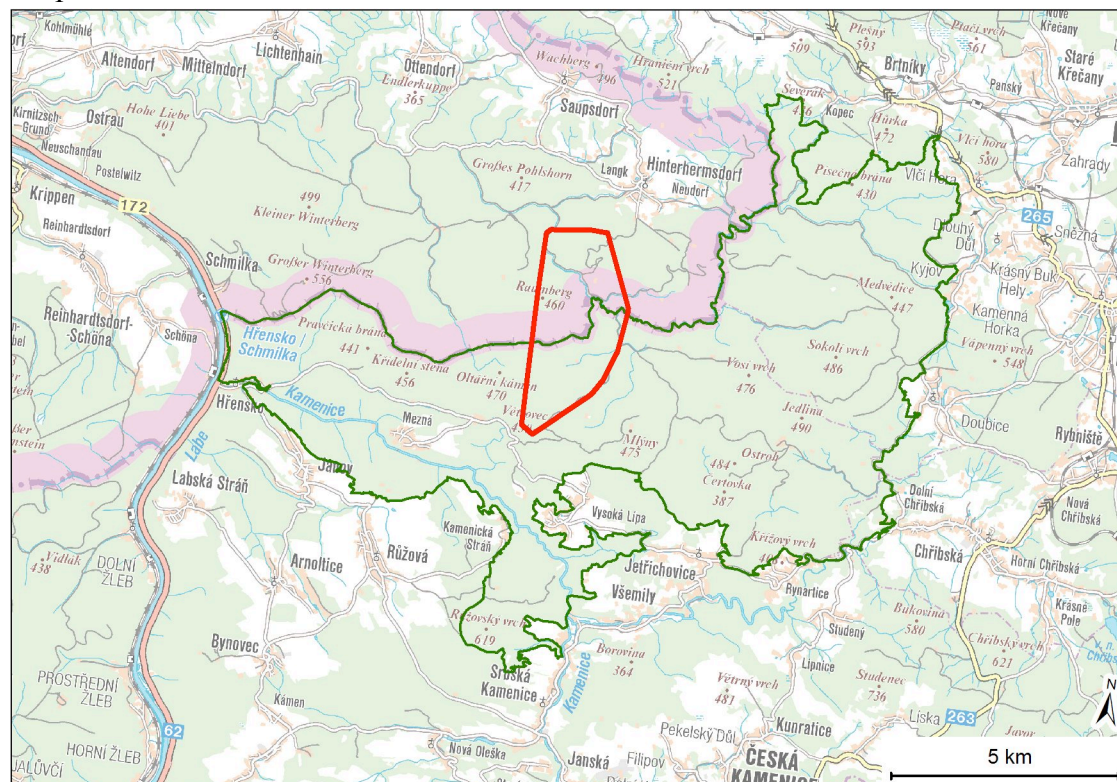


Map 9. MCP buck 6758

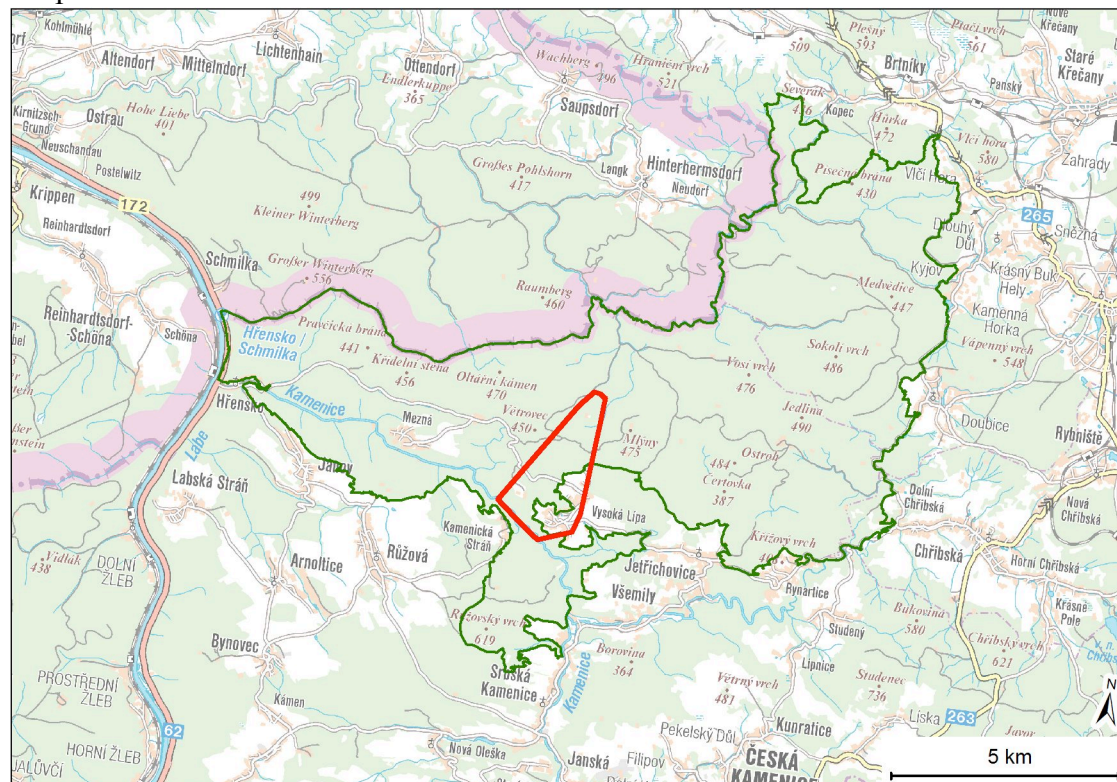




Map 10. MCP hind 6760



Map 11. MCP hind 6761





[illegible]

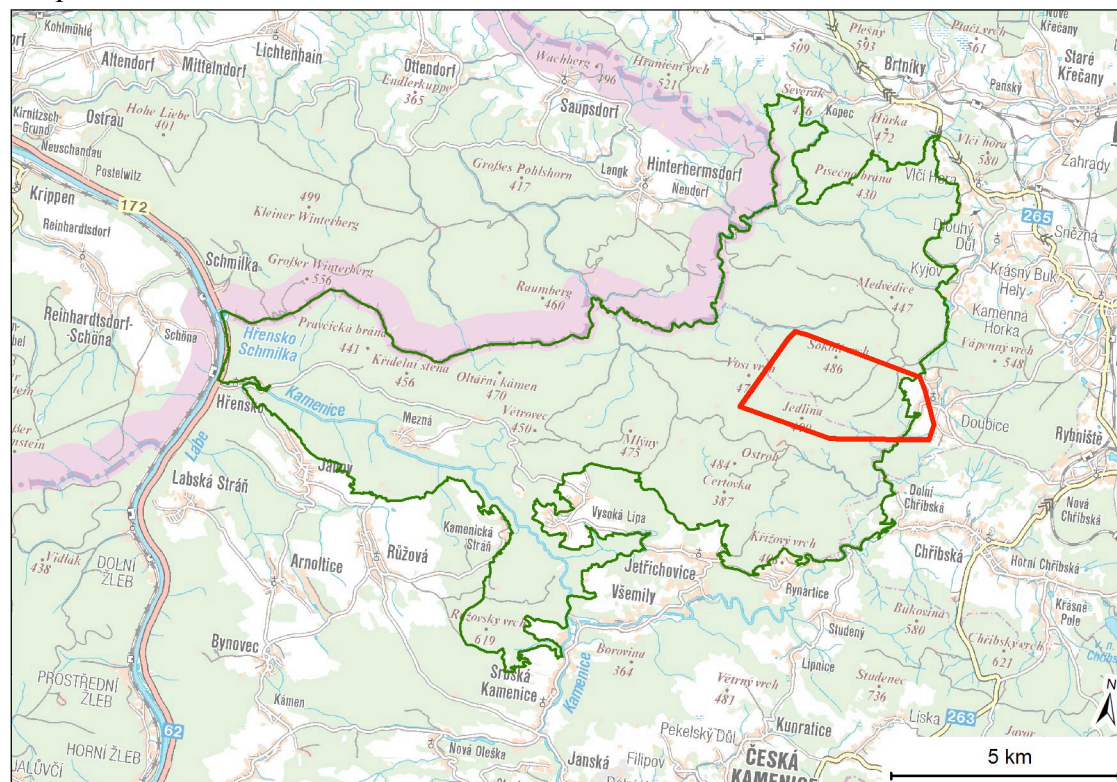
This topographic map shows the Kamenice region in the Czech Republic. The Hrensko-Schmilka area is highlighted with a red outline. The map includes numerous place names, elevation points, and geographical features. A scale bar at the bottom right indicates a distance of 5 km. The map also shows the location of the Kamenice river and the surrounding landscape.



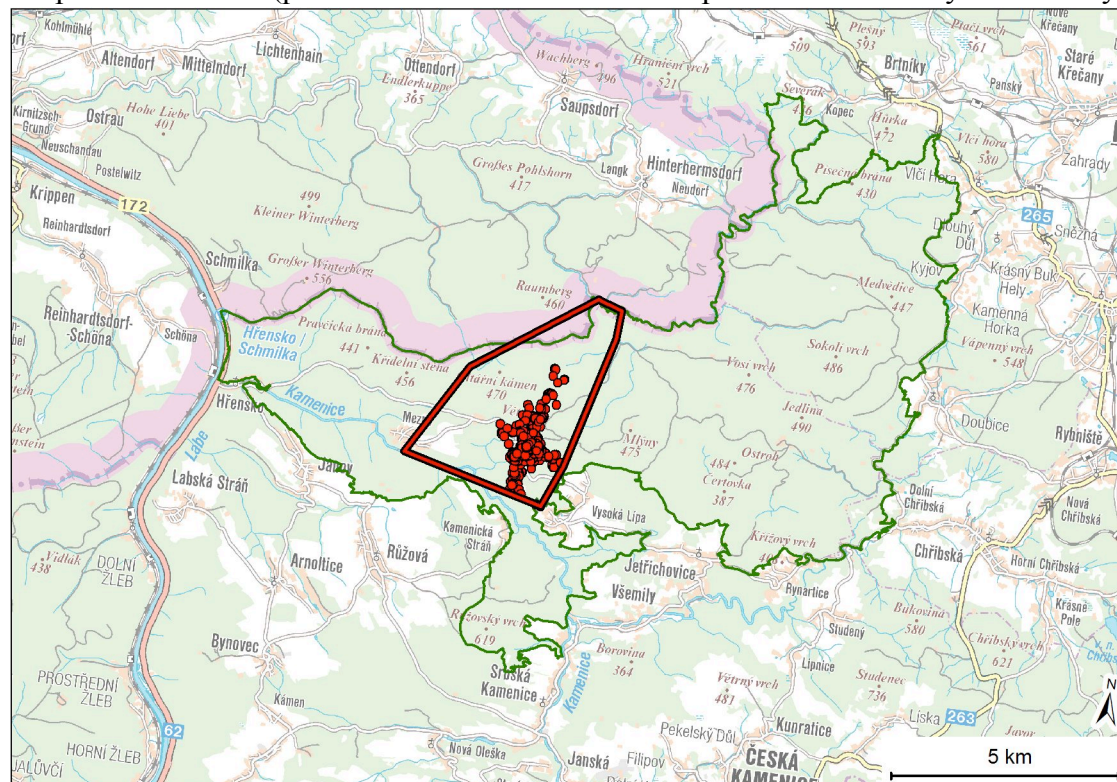




Map 16. MCP hind 6766

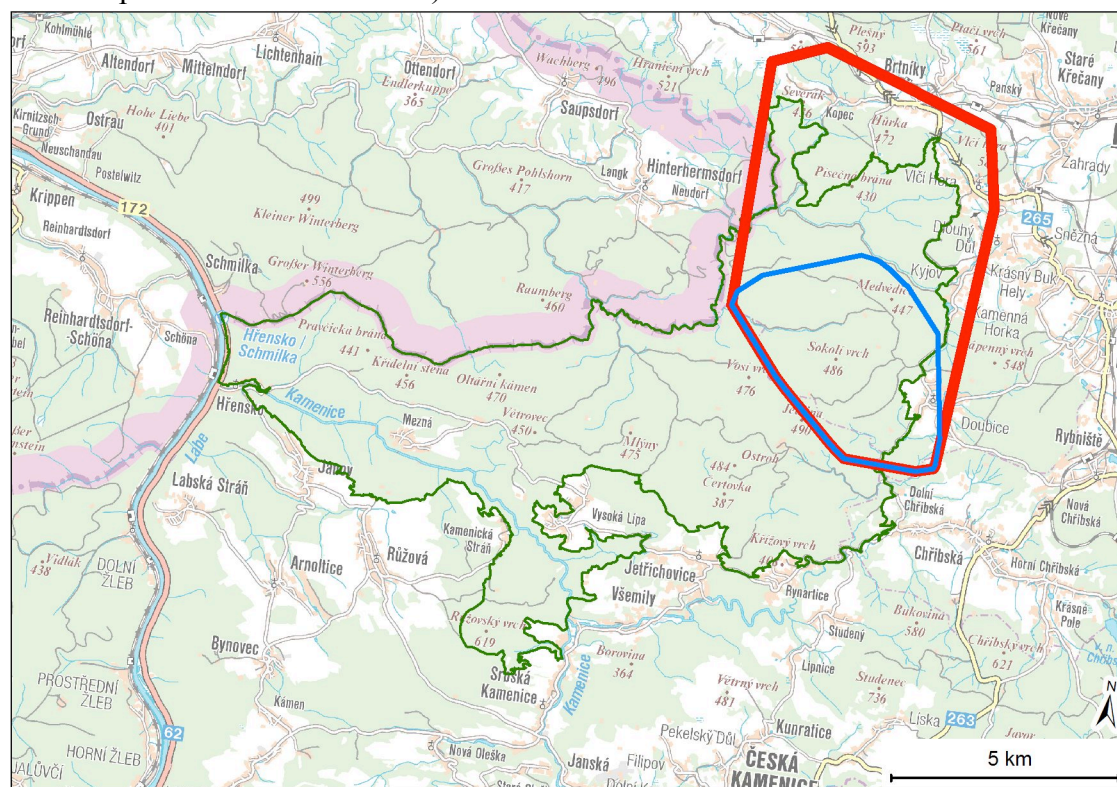


Map 17. Hind 6765 (points show the incidence in the period from January to February 2010)

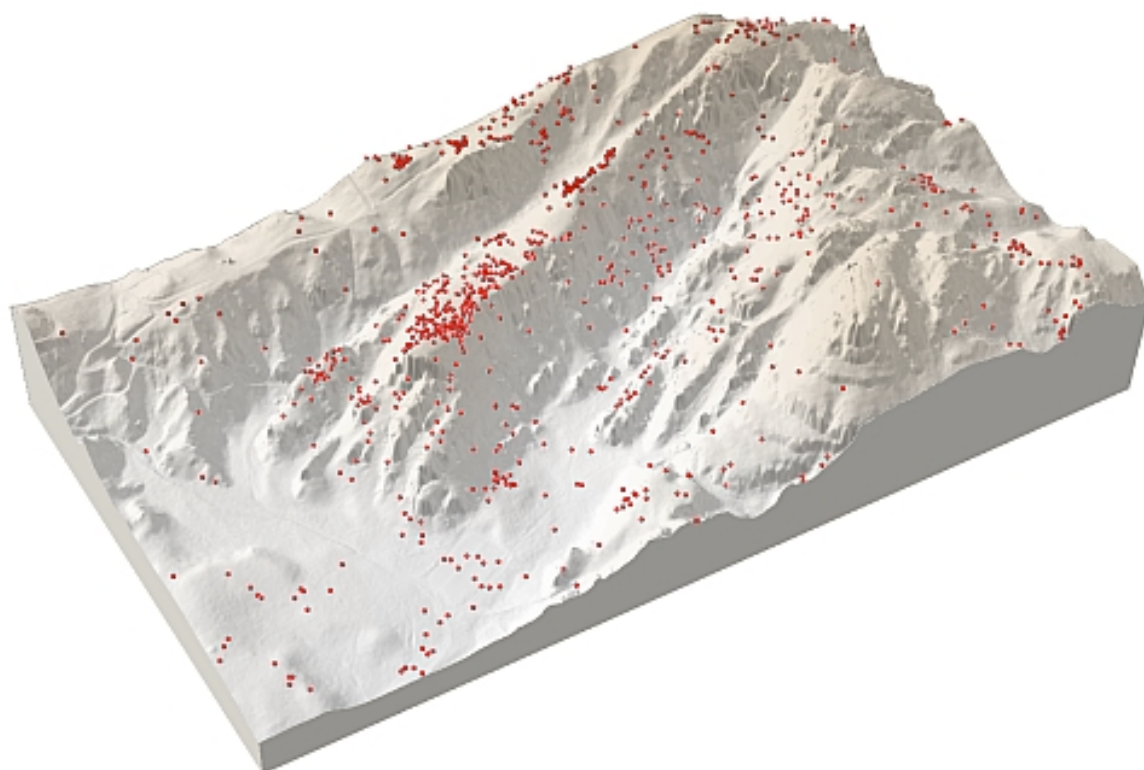




Map 18. Buck 6754 (blue MCP March – August 2009 + November 2009 –March 2010; red MCP September – October 2009)



Picture 1. Buck 6758 - day stands



Picture 2 Hind 6765 - 3D model – Background: digital terrain model

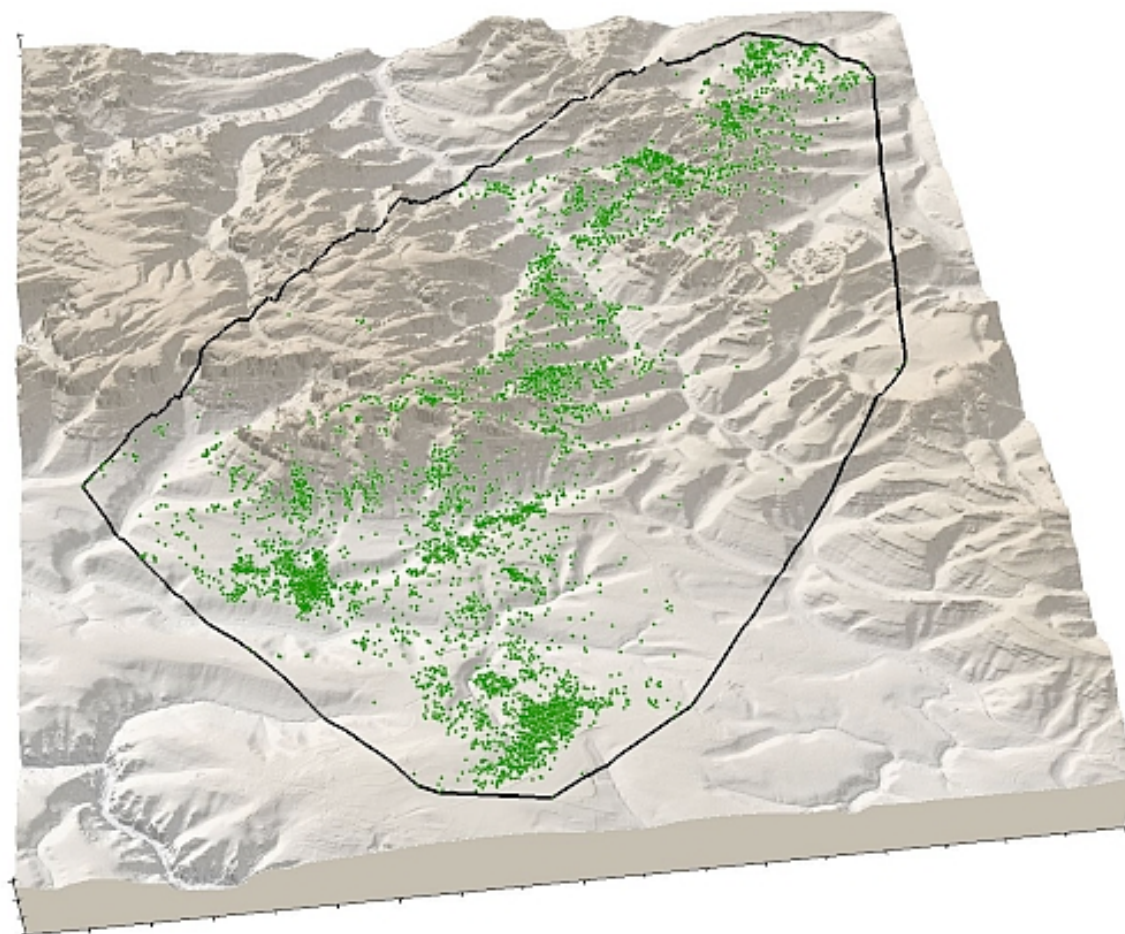
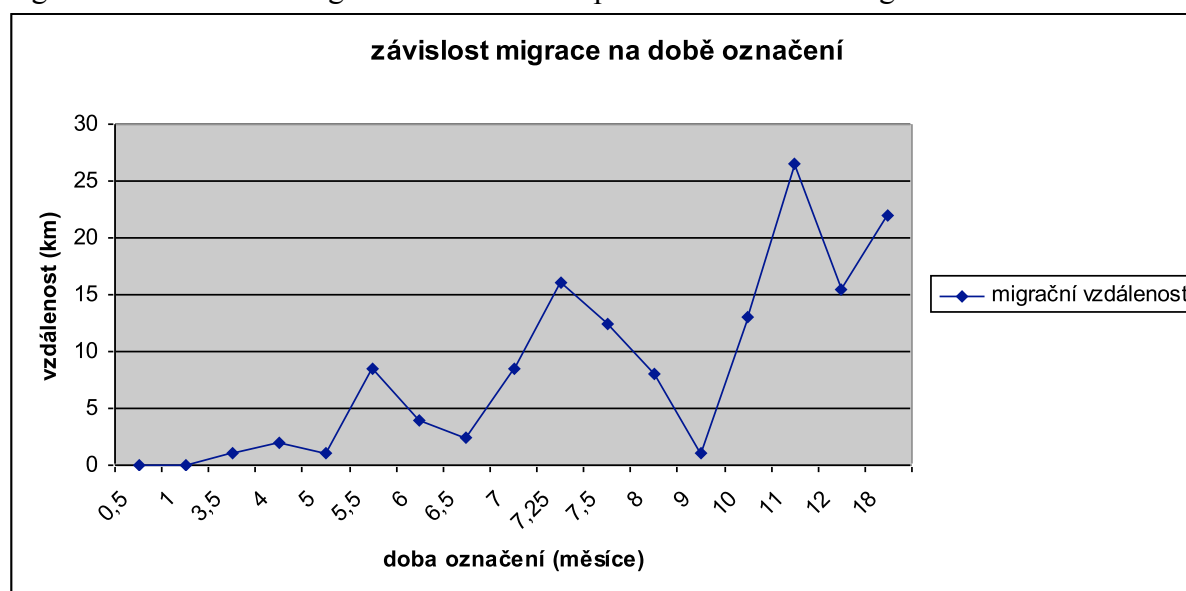


Figure 1. Wild boars - migration distance and period/ time of labeling



Distance (km)

Dependence of migration on the time of labeling

— - — Migration distance

Period/ time of labeling



Map 19. Locations of wild boar capturing and place of hunting

