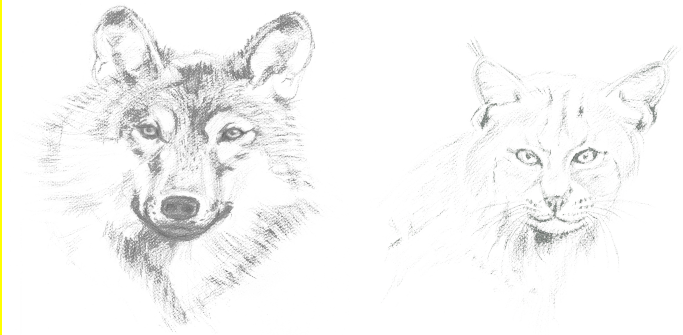

The pilot monitoring of wolf and lynx in Poland implemented under the State Environmental Monitoring –field and chamber works 2017-2020

Task no 1

METHODOLOGY OF EURASIAN LYNX MONITORING IN POLAND

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

Wolf monitoring main coordinator
dr Wojciech Śmietana

Lynx monitoring main coordinator
dr Marcin Bielecki

Project coordinator
dr hab. Jakub Borkowski, prof. UWM

National coordinator
dr hab. inż. Marek Wajdzik, prof UR

Board chairman
mgr inż. Ryszard Krynicki

Table of contents

List of tables

List of maps

List of figures

List of geometric layers

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A. MONITORING METHODOLOGY OF EURAZIATIC LYNX *Lynx lynx*

I. INTRODUCTION

The lynx monitoring methodology was developed on the basis of the methodology of Jędrzejewski et al. (2010) modified by Schmidt and Borowik (2016) and the experience gained during the implementation of the project entitled " The pilot monitoring of wolf and lynx in Poland implemented under the State Environmental Monitoring" ["Pilotażowy monitoring wilka i rysia w Polsce realizowany w ramach Państwowego Monitoringu Środowiska"] co-financed by EU funds under the Operational Programme Infrastructure and Environment [Program Operacyjny Infrastruktura i Środowisko] 2014-2020. The proposed methodology for lynx monitoring was developed to ensure the possibility of collecting and analyzing reliable data on the conservation status of the lynx at the local level (monitoring sites) and at the country-wide level, and in order to provide the necessary data for the preparation of a report submitted to the European Commission pursuant to Article 17 of the Habitats Directive. According to the proposal of Schmidt and Borowik (2016), the assessment of the parameter "population" should be carried out on the basis of the study indicators "density of family groups" and indicators "average number of young lynxes in family groups". The study of the "population density" indicator was abandoned because the assessment of the total number of lynxes is much more difficult than the assessment of the number of family groups. Taking into account the climatic changes, which cause more and more often snow-free winters, the use of camera traps (wildlife camera traps, photo-traps, photo traps) to complete the data to assess the indicators of the "population" parameter has been proposed. Furthermore, based on the experience of the above-mentioned project, it is recommended to use, instead of the hitherto estimation method performed by the managers of hunting district and national park services (Jędrzejewski et al. 2010) or the trial driving method (Borowik and Schmidt 2016), the method of counting pellet-group of roe deer (feces, faeces, droppings) to determine the availability of the food resources of the lynx. It was also proposed to introduce modifications to the determination of other indicators of the habitat (fragmentation, road density).

II. DESCRIPTION OF MONITORING STUDIES

1. The concept of species monitoring

According to the proposal by Schmidt and Borowik (2016), it is recommended that lynx monitoring be carried out at two levels: (1) country-wide (nationwide), which aims to determine the distribution of the species on a national scale, and (2) local, which aims to obtain detailed information about the state of the population and habitat statuses at selected monitoring sites.

2. Monitoring at the national level - monitoring of species distribution

The national monitoring of the lynx is carried out to track changes in the distribution of the species. Annual provision of basic data on the occurrence of wolves and lynxes on a national scale is ensured by the agreement of August 8, 2017 concluded between the Chief Inspector of Environmental Protection (CIEP) [Główny Inspektor Ochrony Środowiska (GIOŚ)] and the General Director of the State Forests [Dyrektor Generalny Lasów Państwowych, DGLP]. This agreement stipulates that the National Forest Holding "State Forests" (State Forests National Forest Holding)

[Państwowe Gospodarstwo Leśne Lasy Państwowe, PGL LP] will provide the following information each year:

1) presence of wolf/lynx in the Forest District (yes/no),
2) frequency of the wolf/lynx in the Forest District (regular/sporadic),
3) number of adult wolf/lynx individuals in the Forest District,
4) number of lynx family groups in total in the area of the entire Forest District,
5) the number of young individuals of the lynx in groups in the total area of the entire Forest District,
6) occurrence of the wolf/lynx in each Forest District,
7) the exact location where the wolf/lynx was observed (live and dead individuals separately),
8) the way of observing the occurrence of a wolf/lynx (direct observation, tracks, droppings, breeding dens, marking, howling, the remains of prey, the cause of death of dead individuals),
9) wolf/lynx food base (results obtained using the trial driving method),
10) date of the observation and the name of the observer.

As part of the wolf and lynx monitoring pilot project, the above data was provided by the Forest Districts PGL LP via electronic questionnaire (online forms). In the same way, data were obtained from national parks and forestry experimental stations. PZŁ (the Polish Hunting Association [Polski Związek Łowiecki, PZŁ]) data on the presence or absence of lynx in individual hunting districts were also obtained. As information on the occurrence of the species is collected only for the purpose of mapping its distribution, the scope of the survey data provided may be limited to the data contained in points 1, 7, 8 and 10 of the above-mentioned agreement.

Study of the species distribution in the country

The scope of the electronic survey concerning the presence of lynx on a national scale is similar to the scope of the survey concerning the presence of wolf, therefore these surveys should be conducted jointly. The lynx presence survey form should contain the following items:

1) name and address data of the institution providing the information,
2) general information about the presence or absence of the species in the managed area,
3) specific observation data including:
- observation location. It is advisable to give the exact geographic coordinates of the presence of a lynx. The location should be determined using a GPS receiver or determined from a map. Where this is not possible, please give the name of forestry number of department, comune, county or name of locality and plot number according to the land register or indicate a place on a shared online map.
- the method of determining the presence of a lynx (type of observation) – direct observations of living individuals, found dead individuals (with the cause of death), individuals registered on camera traps, and found tracks, scat, remains of wild prey, farm animals killed by lynxes, places of breeding.

If the presence of lynx is registered in an area where this species has not been recorded so far, or where it has been recorded very sporadically, it is recommended to submit the photographic documentation, if any, to the institution conducting the survey. The proposed survey form is included in Annex no 2. Electronic questionnaire should be addressed to all Forest Districts of the PGL LP, forestry experimental stations, national parks and the Regional Directorates for Environmental Protection

[Regionalne Dyrekcje Ochrony Środowiska, RDOŚ]. The survey should be conducted every year. Institutions surveyed should be allowed to enter data on an ongoing basis, in order to avoid workloads and to provide information from retrospectives. The survey should be conducted by a coordinator for the nationwide monitoring of the lynx distribution, who should have many years of experience in conducting field research (scientific or monitoring) on the lynx. Data for the preparation of an updated species distribution map should cover the period from May 1 to April 30 of the following year. The survey data concerning this period should be submitted by June 30, in accordance with the current agreement between CIEP and DGLP. In the absence of an exact location of the observation (geographical coordinates), the centroid of the area (e.g. department) to which the observation relates can be assumed as the approximate location of the observation. The species distribution map should be prepared in a 10 × 10 km square grid of the European Environment Agency, i.e. in the same reference grid in which the distribution and range maps of species are prepared for the purposes of the report submitted to the European Commission pursuant to Art. 17 of the Habitats Directive. Species distribution maps should be prepared every three years, separately for each period (from May 1 to April 30). The map should show the areas of constant (permanent) and occasional occurrence of the lynx in a 10 × 10 km square grid. The area of permanent occurrence of the species should be considered those squares of the grid within which at least two lynx observations were found during the given monitoring period (May 1 - April 30), and the time interval between the first and last observations is not less than six months. The squares where the presence of the lynx was found, but the observations do not meet the above criterion, should be considered as areas of sporadic occurrence of the species.

Parallel to data collection via online survey, it is recommended to collect data on the occurrence of lynx in individual hunting districts (controlled hunting zones, game shooting districts) on an annual basis. These data, limited to information, ‘occurs/does not exist’ in the area of the district, if possible, should be obtained from the Polish Hunting Association (leased grounds and Game Breeding Centers [Ośrodki Hodowli Zwierzyny – OHZ] managed by the PZŁ), the General Directorate of the State Forests (OHZ managed by the PGL LP) and other institutions, including research centers and commercial entities, managing hunting districts.

Data collected on the basis of an online survey on the occurrence of lynxes from Forest Districts, national parks and RDOŚ should be compared with the data from hunting districts (lynx occurs/lynx does not occur) using GIS tools. Before that, all observations from the survey that do not have an exact location should be given geographic coordinates - e.g. centroids of forest departments should be designated. Data from the online survey should be expected to be consistent with the data from hunting districts. If the survey data indicate the presence of the species in a given area, and the data from hunting districts contradict it (lynx does not occur), such survey data should be treated with caution. It is recommended to explain the inconsistency (it may result, for example, from mistaken data entered) by contacting the institution that provided the data. If it is impossible to confirm the presence of lynx, such data should be rejected.

3. Monitoring of the species at monitoring sites

3.1. Monitoring sites

A lynx site is an area such as a forest complex or a mountain range where the lynx is found to be permanent (see above). Monitoring studies aimed at assessing the conservation status of local lynxes populations and their habitats should be carried out at selected sites, which are referred to as monitoring sites. These sites should as far as possible cover all the largest compact forest complexes and mountain ranges where the presence of the lynxes is permanent. In the case of very large areas inhabited by this species, such as the Carpathians, monitoring sites should be evenly distributed throughout the area. The areas of the monitoring sites should be large enough to potentially accommodate several reproducing females. It is proposed to carry out detailed monitoring of the conservation status of lynx at the same eight sites where the research was conducted in 2017-2020 (Figure no 1). Five selected monitoring sites are located in the continental region (Puszcza Piska, Puszcza Augustowska, Puszcza Knyszyńska, Puszcza Białowieska, Roztocze i Puszcza Solska), and 3 sites in the Alpine region (Bieszczady, Beskid Sądecki, Beskid Żywiecki i Śląski). Detailed maps of individual monitoring sites can be found in Annex no 7. The size of the designated monitoring sites ranges from 769 to 1,793 km^2 (Table no 1). Depending on the success of the lynx reintroduction project in North-Western Poland (http://www.rysie.org/rysie-strona-glowna), it may be necessary to designate an additional monitoring site or sites in this region of the country in the near future. In order for the results to be comparable, the size of the area of new monitoring sites should be similar (should be within the range) to the area of the existing sites. The boundaries of the monitoring sites should be delineated on the basis of linear landscape elements, such as roads, rivers, large water reservoirs, field-forest border.

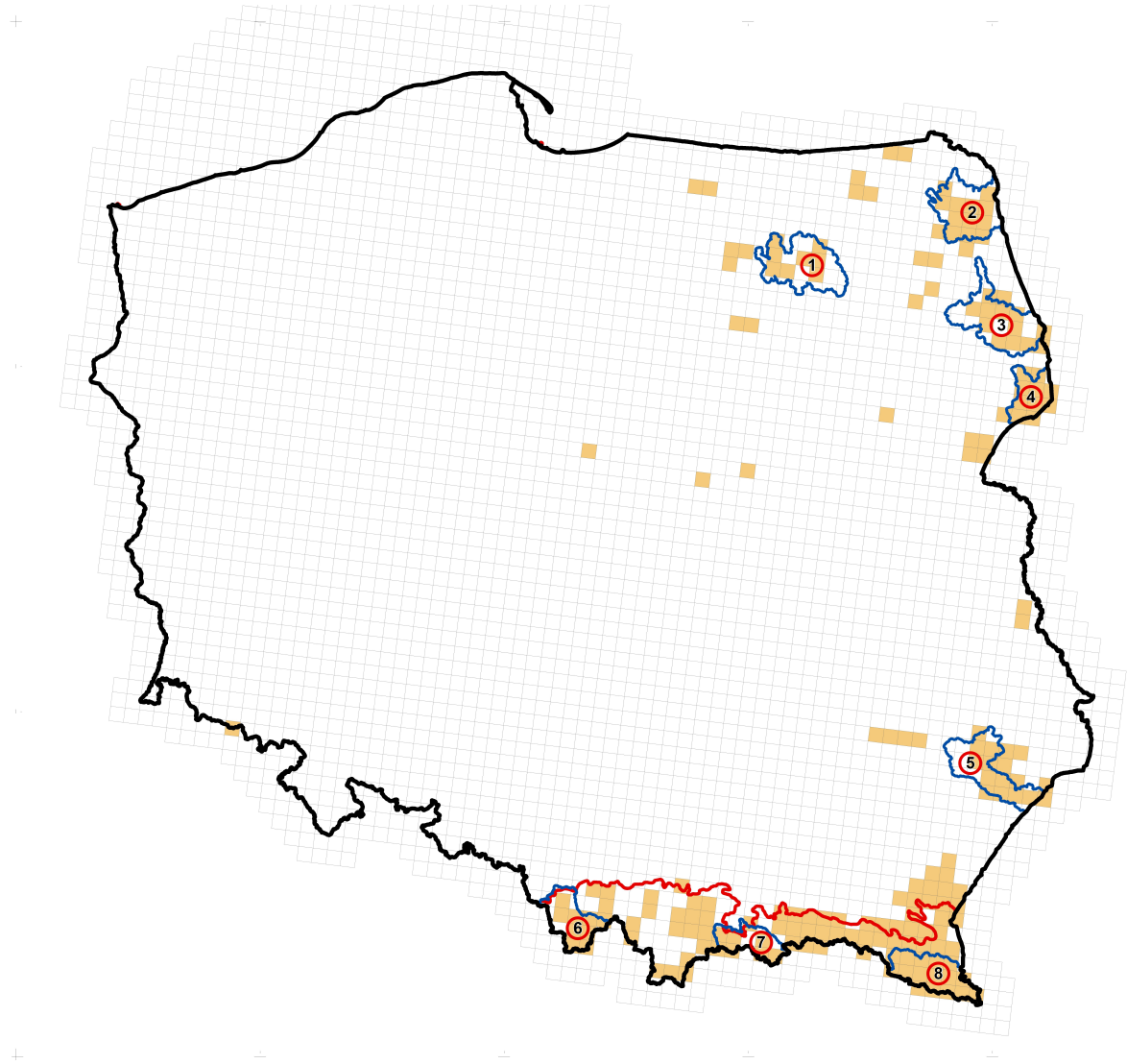

Figure no 1. Location of the proposed monitoring sites against the background of the Eurasian lynx distribution in Poland according to the 2019 report to the European Commission. 1) Puszcza Piska, 2) Puszcza Augustowska, 3) Puszcza Knyszyńska, 4) Puszcza Białowieska, 5) Roztocze i Puszcza Solska, 6) Beskid Żywiecki i Śląski, 7) Beskid Sądecki, 8) Bieszczady. The red line marks the boundary between continental biogeographic region (above the line) and the Alpine region (under the line).

Table no 1. List of the lynx monitoring sites

Lp.	Name of the monitoring site	Area of the monitoring site [km^2]
1	Puszcza Piska	1 707
2	Puszcza Augustowska	1 584
3	Puszcza Knyszyńska	1 793
4	Puszcza Białowieska	769
5	Roztocze i Puszcza Solska	1 499
6	Beskid Żywiecki i Śląski	1 042
7	Beskid Sądecki	783

Lp.	Name of the monitoring site	Area of the monitoring site [km^2]
8	Bieszczady	1222

3.2. Status of the population

The status of the lynx population (parameter) at a given monitoring site should be determined on the basis of the number of lynx family groups (the number of females leading cubs) and the number of female-led cubs (the number of young lynxes in family groups) (Schmidt and Borowik 2016) (Table no 2). Thus, the use of the "population density" indicator to assess the status of the population is abandoned. The determination of the number of family groups is easier to perform than the determination of the size of the entire population, because the areas of females leading the young lynxes practically do not overlap (Schmidt et al. 1997). Moreover, the density and size of family groups indicate the current changes in its status better than the general density of the population - a decline in reproductive success is usually preceded by a decline in the overall number of population. Valorization of the obtained results (Table no 3) is carried out in accordance with the existing limit values, proposed by Jędrzejewski et all (2010) and Schmidta and Borowika (2016), whith one reservation concerning the assessment of the indicator "average number of young in family groups". In according to the previously proposed values, the U2 rating was awarded when this index was lower than 1. Because this is logically impossible to occur (the average number of cubs in family groups cannot be less than 1) a logically correct entry was introduced that this only applies to situations where there is no presence of family groups at all. It should be noted here that the family group density indicator specified on the monitoring site may be a bit overestimated in relation to the actual status because some family group may also use area outside the site or it may be underestimated when part of the site may not be suitable for female lynx. This issue was overlooked in the previous methodological assumptions of lynx monitoring and therefore to maintain the comparability of the results obtained in the subsequent stages of monitoring studies the methodology was not modified in this range. It should be noted, however, that the methodological imperfection described above does not affect the possibility of a reliable tracking of changes in the population density indicator at a given site, which is the essence of monitoring.

The number of family groups and the number of young lynxes led by reproducing females should be determined based on tracking carried out on the same day in the entire area of the monitoring site. The results of year-round observations available as part of the survey, conducted by field employees of Forest Districts and national parks should be used to supplement the data. Additionally, it is proposed to complement the method of determining the status of the population with data obtained with the use of camera traps. Perhaps in the future, this method will be able to replace tracking, organizationally difficult and weather-dependent.

The monitoring of the status of the lynx population should be repeated at least once every six years. Field works (winter trackings and data collection with the use of photo-traps) should be performed under the supervision of the lynx monitoring coordinator at the monitoring site by specially trained persons with completed natural science education. The monitoring coordinator should have many years of experience in field research (scientific or monitoring) on the lynx.

Table no 2. Indicators of the population status of the lynx at the monitoring sites

Parameter	Indicator	Measure	Means of measurement/ frequency of research
Population	Density of family groups (females with kittens)	N/100 km^2	Determined on the basis of detailed winter tracking, year-round observations and photo material from camera traps; research repeated every ≤6 years
	Average number of young in family groups	N	Determined on the basis of detailed winter tracking, year-round observations and photo material from camera traps; research repeated every ≤6 years

Table no 3. Valorization of population status indicators of the lynx at the monitoring sites

Parameter	Indicator	Indicator rating*		
		FV	U1	U2
Population	Density of family groups (N/100km^2)	>0,5	0,3-0,5	<0,3
	Average number of young lynxes in family groups (N)	>2	1-2	No family groups

*FV – favourable conservation status, U1 – unfavourable-inadequate conservation status, U2 – unfavourable-bad conservation status. In the absence of data, XX is recorded – unknown conservation status

3.3. Study of population status indicators

The values of population status indicators should be determined on the basis of winter snow tracking carried out in the area of the entire monitoring site on the same day. Tracking should be carried out two days after fresh snowfall. Tracking should be carried out not later than February 15. Later tracking is not recommended, as there is a possibility of recognizing a pair that is about to breed as a family group (Schmidt and Borowik 2016). Fresh predator tracks should be searched for using vehicles and on foot along previously designated transects based on a network of forest roads. Where it is not possible to use vehicles, there should be pedestrian routes. Transects should be designated in such a way as to cover the entire area of a given site as evenly as possible. If possible, the transects should cross about every 2 km. While tracking, all routes and passages should be recorded using GPS receivers. The tracks encountered on transects should be identified in terms of species affiliation of the individuals that left them. Having found tracks of a lynx/lynxes, one should follow the track to determine whether the track was left by a single individual or a family group and, if the tracks point to a family group, to determine the size of this group. Following the track should be carried out until it is confirmed that the number of individuals has been correctly determined. If the specificity of a given area allows it, attempts ought to be made to determine the place where the lynx family group is currently located. This place should be determined by circling the area (the shortest possible way) to which the tracks lead. The lack of initial tracks indicates that the lynxes have stopped in a given area. Determining the living places of family groups gives you complete confidence that these groups have been correctly distinguished from each other. Track locations should be recorded in

GPS receivers. All traces of the presence of lynxes, including singles, should be recorded. All traces of the presence of lynxes should be photographed, because on this basis it is possible to determine the approximate size of the entire population at a given monitoring site. The collection of this data is necessary to estimate the size of the population in the country and biogeographical regions. These estimates are then reported to the European Commission pursuant to Art. 17 of the Habitats Directive. All traces of the presence of lynxes should be photographed. The collected data should be put on maps with marked transects and recorded in observation sheets (Annex no 1). In addition to the data from the winter tracking itself, the observation cards should include other observations of the presence of lynx found during field work at the monitoring site. The date and time of the observation, geographical coordinates of the observation site and location in a descriptive form (e.g. name of the forest district and forestry) should be recorded for each observation. The registration concerns following observations:

- individuals seen with information of their numbers
- dead individuals with (if it was established) their sex, age and cause of death
- tracks with number of individuals
- scats
- urine markings
- the remains of prey

The collected data can be used for possible comparisons with data obtained from online questionnaire form. It is also recommended to make and archive the photographic documentation of the above-mentioned observations. Then the information gathered should be organized into a database.

During office works, according to the recommendation of Schmidt and Borowik (2016), using the criterion of a minimum distance of 8 km between the identified family groups [according to Schmidt et al. (1997) the mean distance between neighboring females is 8.1 ± 3.4 km], the total number of females leading the cubs and the average number of cubs for these females should be estimated. It may very rarely happen that two family groups are separated by a distance of slightly less than 8 km. In such a situation, the criterion of the size of family groups should be additionally applied - if the groups differ in size, they should be considered separate family groups. The database created on the basis of the conducted traces should be supplemented with data provided by forest districts and national parks as well as data collected with the use of photo traps by the monitoring contractor. Taking into account the climate changes and the related frequent lack of snow cover, wildlife camera traps may completely replace winter tracking in the future. Camera traps should, if possible, be evenly distributed in forest areas within a given monitoring site. It is recommended to set up one camera trap for every 25 km^2 of the forest area of the site, due to which there should be several (about 5) camera traps within the area of each female. You should use camera traps that use only infrared radiation for night shots (they do not emit visible flashes) and are soundless (the shutters of some camera trap models make sounds that can be heard even by humans). Camera traps should be set according to the size of the animal and the terrain (on flat terrain it will be about 0.5 m from the ground surface).Photo traps should be placed on forest paths in places where there is a high probability of lynx register. In order to choose the best places (locations) for the installation of camera traps, follow the suggestions of local foresters, naturalists and hunters. The location of the camera trap should be precisely determined using a GPS receiver and the geographical coordinates entered

into the database. It is recommended to conduct observations with the use of camera traps for at least 80 days in the fall (September-November) (Weingarth et al. 2015) immediately before the winter period in which tracking is planned. The camera traps should be operated (check if they work properly, take photo materials, replace batteries) at least every 4 weeks and after each heavy snowfall.

In order to determine, on the basis of the materials collected with the help of photo-traps, the number of family groups present at a given monitoring site and the number of young lynxes led by reproducing females, the following assumptions should be made:

- the areas of females leading the young lynxes do not overlap or slightly overlap (0-8%) (Schmidt and Borowik 2016),
- the size of the area of females is about 150 km^2 (Schmidt et al. 1997, Okarma et al. 2007),
- the average length of daily displacements in a straight line in females is approx. 1.5 km (Jędrzejewski et al. 2002).

Based on the above assumptions, it is possible to identify lynx family groups without the need to identify individual animals. Nevertheless, wherever the color variation of the local lynx population allows it, family groups should also be identified by their hair mottling pattern (photo materials from camera traps).

In a situation where tracking proves impossible due to the lack of snow cover, the study of population indicators may be limited to the data provided by camera traps and obtained through the survey. Survey data should be used with care. The data should be analyzed by the lynx monitoring coordinator at the monitoring site.

3.4. Habitat for the species

The indicators of the status of the habitat are: forest cover, habitat fragmentation, availability of food resources, road density and habitat isolation (Table no 4). As part of lynx monitoring, only the roe deer (*Capreolus capreolus*), which is the main prey of this predator in the country, is taken into account to determine the availability of food resources (Schmidt 2008, Śmietana et al. 2000). In the methodology proposed by Schmidt and Borowik (2016), it was recommended to determine the availability of the food resources based on the results obtained using the trial driving method. Based on the results of the research carried out as part of the wolf and lynx monitoring pilot project, it is proposed to replace the logistically difficult and costly method of the trial driving with the method of counting pellet-groups on transects. Schmidt and Borowik (2016) proposed that the habitat fragmentation indicator should be determined on the basis of the share of the area occupied by development (residential, industrial and service). It is proposed to extend the concept of development to all areas heavily transformed by humans, including those occupied by roads, waste dumps, exploitation hollows, and areas located under technical devices. In order to assess the road density indicator, national and voivodeship roads are taken into account. However, in the next stage of monitoring, the possibility of changing the indicator „road density" to „traffic of motor vehicles" should be considered, bucause „road density" alone seems to be an insufficient indicator to determine the real impact of roads on the condition of the lynxs habitat.

The valorization of the habitat status indicators is carried out on the basis of the limit values described in table no 5. In order to perform the correct assessment of the habitat status, it is necessary to analyze all indicators. The overall assessment of

the status of the habitat is the same as the lowest assessment of any of the indicators of this parameter (Table no 6).

Table no 4. Indicators of the habitat status of the lynx at the monitoring sites

Parameters	Indicator	Measure	Means of measurement/ frequency of research
Habitat for the species	Forest cover	%	The ratio of the forest area to the total area of the site; calculations using GIS tools based on the current BDOT10k GUGiK data; research repeated every ≤6 years
	Habitat fragmentation	%	Share of the area occupied by the broadly understood buildings to the total area of the site; calculations using GIS tools based on the current BDOT10k GUGiK data; research repeated every ≤6 years
	Food resources availability	kg/km^2	Roe biomass per 1 km^2 of the site; calculations based on the roe population density determined by the method of counting pellet-group; research repeated every ≤6 years
	Road density	km/km^2	The national and provincial roads per 1 km^2 of the site; calculations using GIS tools based on the current BDOT10k GUGiK data; research repeated every ≤6 years
	Habitat isolation	three-point scale	Rating based on the current maps of the species distribution, current data on land cover in BDOT10k and the GUGiK orthophotomaps; badania powtarzane co ≤ 6 lat 1 - continuous connections with other areas inhabited by the species 2 - weak, interrupted connections 3 - total isolation; research repeated every ≤ 6 years

BDOT10k – the Database of Topographic Objects [Baza Danych Obiektów Topograficznych], GUGiK – the Head Office of Geodesy and Cartography [Główny Urząd Geodezji i Kartografii]

Table no 5. Valorization of habitat status indicators of the lynx at monitoring sites

Parameters	Indicator	Indicator rating*		
		FV	U1	U2
Habitat for the species	Forest cover (%)	>40	20-40	<20
	Habitat fragmentation (%)	<3	3-5	>5
	Food resources availability (kg/km^2)	>100	50-100	<50
	Road density (km/km^2)	<0,1	0,1-0,2	>0,2
	Habitat isolation (three-point scale)	1	2	3

*FV – favourable conservation status, U1 – unfavourable-inadequate conservation status, U2 – unfavourable-bad conservation status. In the absence of data, XX is recorded – unknown conservation status

3.5. Habitat status indicators research

Forest cover. The forest cover indicator is defined as the percentage ratio of forest and wooded areas to the total area of a given monitoring site. Calculations are made using GIS tools based on the most current land cover data contained in the Database of Topographic Objects [Baza Danych Obiektów Topograficznych, BDOT10k] of the Head Office of Geodesy and Cartography [Główny Urząd Geodezji i Kartografii, GUGiK]. All objects with the PTZL code (forests, coppices, tree plantings) should be used for calculations.

Habitat fragmentation. The fragmentation indicator is the percentage of the area heavily transformed by humans (occupied by residential, service and industrial buildings, areas under roads, rail and airports, yards, waste dumps, exploitation hollows and dumping grounds as well as areas under technical equipment and structures) in the overall area of the monitoring site. This share is determined using GIS tools on the basis of the most up-to-date information on land cover contained in the BDOT10k GUGiK. Calculations should be made with the use of all objects with codes: PTZB (buildings), PTKM (areas under roads for motor vehicles, areas under rail and airports), PTPL (squares), PTSO (waste landfills), PTWZ (exploitation hollows and dumps), PTNZ (areas under technical and construction sites, industrial and storage areas).

Road density. The road density indicator is calculated as the length of national and voivodeship roads per 1 km^2 of the monitoring site area. With the use of GIS tools, the road density indicator is determined on the basis of vector layers of road infrastructure included in BDOT10k GUGiK. All objects with SKDR code (roads) marked with attributes K and W (management category) should be used for calculations.

The degree of habitat isolation. The degree of habitat isolation is determined on the basis of the current maps of the species distribution and information on land cover contained in the current BDOT10k database and based on the current orthophotomaps of the GUGiK. The indicator is assessed on a three-point scale: 1- continuous connections with other areas inhabited by lynx populations, 2 – weak, interrupted connections, 3 - complete isolation. Continuous connection means that the neighboring sites are continuously connected by forest areas. A weak, interrupted connection means that the adjacent areas of the lynx occurrence are connected with each other by a series of small patches of forest areas that may constitute a chain of stepping stone habitats (Simberloff et al. 1992). Complete isolation means that there is neither a continuous forest connection between the adjacent sites, nor areas of forest that could constitute a chain of stepping stone habitats.

Food resources availability. The lynx's food base should be determined on the basis of counting pellet-groups of roe deer accumulated during the winter. Counting of pellet-groups on transects should be carried out under the supervision of lynx monitoring coordinators at monitoring sites by persons trained for this purpose with completed natural science education. Counting takes place on previously designated transects. Transects should be evenly distributed within the monitoring sites as far as possible. Transects should be determined prior to commencing field work. It is advisable to establish one transect for every 25 km^2 of forest area of the site. The transects should be 2.5 km long and, if possible, rectilinear. Transects should be delineated only in wooded areas, because in other areas (built-up areas, arable fields, meadows, etc.) the number of roe deer feces is negligible. All pellet-groups of roe deer located in a 3 m wide strip (1.5 m to the right and 1.5 m to the left

of the transect line) are subject to counting. In the case of pellet-groups located on the border of this strip of site, only those pelet-groups that are at least half within it (visual assessment) should be counted. Single droppings in the form of pellets are not reckoned up. When counting it is recomended to use a 1.5 m long linear ruler to determine wheter a pellet-group is located within the strips of site defined by the transect axis. It is advised to walk slowly along transect, to be notice each pellet-group. Number of counted pellet-groups should be recorded for each 500 m section of the transect and recorded in the pellet-group counting card (Annex no 3). Routs (traces) should be recorded with use of GPS receiver, and the geographic coordinates of the start and the end of each 500 m transect section should be noted. Next, the collected data should be organized in the form of a database. Counting of pellet-group should be carried out from February to April (possibly early May, if conditions allow). Counts are performed in the absence of snow cover and before the spring development of undergrowth vegetation. The value of roe deer density at the monitoring site is calculated according to the formula:

$$N = \frac{L}{T_A \times D \times n} \times \sum_{i=1}^{n} \frac{P_i}{t_i},$$

where:
N - number of individuals/km^2 (population density)
L - share of forested areas in the total area of the monitoring site (value of the habitat indicator "forest cover" expressed as a fraction),
T_A - the area covered by the counting of pellet-groups on a single 2.5 km long transect (0.0075 km^2),
D - average frequency of defecation (number of defecations per day) specific for the species,
n - number of transects,
P_i - the number of pellet-groups on the i-th transect,
t_i - time (number of days) of feces residual in the field of the i-th transect.

For calculations, it is assumed that the roe deer defecates on average 20 times a day (Mitchell et al. 1985). The time of pellet-group residual for the purpose of monitoring the availability of the lynx's food resources is taken as the number of days elapsed from November 15 (most leaves from trees are already on the ground and their fall does not affect the detection of droppings) to the day of pellet-group counting in a given transect. Based on the data obtained on the density of roe, its biomass per 1 km^2 of the monitoring site is calculated. The average body weight of roe deer depends of age and sex structrure of the local population and the region of its occurrence, therefore it is proposed to use data on the carcass weight of individuals for calculations, which were collected at the monitoring site by hunters (these data can be obtained from local PZŁ hunting clubs or forest districts). When making calculations, take into account that the weight of the carcasses to gutted animals and is approximately 30% less than the actual body weight. If it is not possible to obtain information on the carcass weight, assume that the average body weight of a roe deer is 20 kg (Flis 2015, Flis and Gugała 2016, Janiszewski et al 2009, Pielowski 1988). The calculated roe deer biomass is an indicator of the availability of the lynx's food resources (Table no 5).

If the lynx monitoring site is also a wolf monitoring site, it is recommended to conduct field studies on the lynx food availability indicator simultaneously with the wolf food availability indicator.

3.6. Future prospects

The future prospects (chances of preserving) of the species are assessed according to the scale included in the Regulation of the Minister of the Environment of February 17, 2010 on the preparation of a draft plan of conservation tasks for the Natura 2000 area (Journal of Laws No. 34, item 186) [Dz. U. nr 34, poz. 186]. The criteria for assessing the species protection prospects, in accordance with the above-mentioned regulation, are: FV assessment - No significant negative impacts and no major threats are expected in the future, there are no negative changes in the population and habitat. The preservation of the species in the next 10-20 years is almost certain. U1 assessment - The behavior of the species in the perspective of 10-20 years is not certain, but it is likely, as long as the existing negative impacts and moderate threats are prevented; U2 assessment preserving the species in the next 10-20 years will be very difficult, strong negative changes in population and habitat or predicted significant threats in the future (almost impossible to eliminate) (Tabele no 6).

When assessing the future prospects, the current status of the population and habitat, the existing negative impacts and the expected threats should be taken into account. In particular, one should take into account such impacts and threats as: development of road infrastructure, development of buildings, development of sports and recreational infrastructure, changes in land use, changes in the methods of livestock farming (e.g. abandoning traditional methods of protecting grazing farm animals), changes introduced to the hunting economy (e.g. planning to reduce the number of ungulates) as well as poaching and poisoning individuals of the species. The prospects for the conservation of the species are assessed for the next 10-20 years.

3.7. Overall assessment of the conservation status

The conservation status of the species (overall) is determined on the basis of all examined parameters (population, habitat for the species and future prospects) according to the scheme described in the Regulation of the Minister of the Environment of February 17, 2010 on the preparation of a draft plan of conservation tasks for the Natura 2000 area (Journal Of Laws No. 34, item 186) [Dz. U. nr 34, poz. 186] (Table no 7). Pursuant to that regulation, the application scheme is as follows:

1) if at least one of the three parameters is rated U2, then the overall assessment rating = U2;
2) if the above does not occur, but at least one of the three parameters is rated as U1, then the overall assessment rating = U1;
3) if the above does not occur, but two or three parameters are rated as XX, then the overall assessment rating = XX;
4) if the above does not occur (i.e. all three parameters are rated as FV or two parameters are rated as FV and one as XX), then the overall assessment rating = FV.

Table no 6. Valorization of the parameters of the population status and habitat status of the lynx at the monitoring sites

Parameter	Parameter rating*		
	FV	U1	U2
Population	The lowest rating among the assessed population status indicators		
Habitat for the species	The lowest rating among the assessed habitat status indicators		
Future prospects**	No significant negative impacts and no major threats are expected in the future, no negative changes in the population and habitat are observed. The preservation of the species in the next 10-20 years is almost certain	The retention of the species over the next 10-20 years is uncertain, but is likely if existing negative impacts and expected moderate threats can be avoided.	Preservation of the species in the next 10-20 years will be very difficult, strong negative changes in population and habitat or anticipated significant threats in the future (practically not to elimination).

* FV – favourable conservation status, U1 – unfavourable-inadequate conservation status, U2 – unfavourable-bad conservation status. In the absence of data, XX is recorded – unknown conservation status

** Rating criteria in accordance with the Regulation of the Minister of the Environment of February 17, 2010 on the preparation of a draft plan of conservation tasks for the Natura 2000 area (Journal of Laws No. 34, item 186) [Dz. U. nr 34, poz. 186]

Table no 7. Overall assessment of the species conservation status at monitoring sites

Rating of the species conservation status*, **			
FV	U1	U2	XX
All three parameters rated FV or two parameters rated FV and one unknown (XX)	None of the parameters were rated U2, but at least one of the three parameters was rated U1	At least one of the three parameters rated as U2	All parameters rated as unknown or two as unknown and one as FV

* FV - favourable conservation status, U1 – unfavourable-inadequate conservation status, U2 – unfavourable-bad conservation status, XX – unknown conservation status

** Rating criteria in accordance with the Regulation of the Minister of the Environment of February 17, 2010 on the preparation of a draft plan of conservation tasks for the Natura 2000 area (Journal of Laws No. 34, item 186) [Dz. U. nr 34, poz. 186]

3.8. Organization, deadlines and equipment for monitoring works

Organization of monitoring works. Data on lynx monitoring at the national level (monitoring of the species distribution) are provided by staff of the PGL LP, national parks, Forestry Experimental Station and RDOŚ, via online quetionnarie. The data is then analyzed and compiled by the monitoring coordinator at the national level. Online survey should be conducted simultaneously for the wolf and the lynx. Winter tracking, collection of photo materials from photo traps and counting of roe deer pellet-groups along the transects are carried out at a given monitoring site by field observers under the supervision of the lynx monitoring coordinator at the monitoring site. The monitoring coordinator analyzes and processes the results of the lynx monitoring at the monitoring site. At the lynx monitoring sites, which are also wolf

monitoring sites, field studies regarding the condition of the habitat including the availability of food base should be carried out jointly for both species.

Time and frequency of research. Data for monitoring at the national level (species distribution study) are collected continuously, each year. Data for a given monitoring period (May 1 - April 30) should be submitted to the institution conducting the survey by June 30. Species distribution maps should be prepared every three years. Species distribution maps should be prepared for each period from May 1 to April 30. Detailed studies on the status of the species and its habitats at individual monitoring sites are carried out every ≤6 years. Depending on financial and organizational possibilities, monitoring studies may be carried out simultaneously on all monitoring sites or may be conducted during the entire six-year period. Research on all assessed population and habitat status indicators is conducted at a given site at the same time (simultaneously). Data from photo traps should be collected for 80 days in the period from September to November, immediately before the planned winter tracking. Winter tracking on snow should be carried out in favorable weather conditions (two days after fresh snowfall) and not later than February 15. Counting pellet-groups of roe deer should take place from mid-February to the end of April (alternatively in early May), in the absence of snow cover and before the spring development of undergrowth vegetation.

Equipment and materials for monitoring research. The basic equipment for conducting field research at monitoring sites are GPS receivers, photo-traps, observation sheets (Annex no 1) and sheets for counting pellet-group of ungulates (Annex no 3). It is also advisable to keep photographic documentation (cameras) of all traces of the presence of a lynx found in the field. Habitat analyzes are performed using computers with GIS software. In order to perform habitat analyzes, it is also necessary to have access to the current BDOT10k topographic databases and the currently available GUGiK orthophotomaps.

3.9. Lynx monitoring in national parks and Natura 2000 sites

The status of the lynx population and its habitat in the areas of national parks and in Natura 2000 sites lying within the designated monitoring sites is determined together with the entire monitoring site, in the framework of monitoring carried out by GIOŚ. In the case of national parks and Natura 2000 sites not located within the selected GIOŚ monitoring sites and at the same time covering >600 km^2 it is recommended to determine the conditions of the population and habitat as the same way as at the monitoring site. In other national parks and in Natura 2000 sites, due to their relatively small size and/or fragmentation (> 1 plot of area), it is practically impossible to determine the denisty of family group. However, it is possible to define the number of family groups appearing, temporary occurring in this area. Therefore, in these areas, it is proposed to determine only the status of the habitat in accordance with the methodology described above. Whereas instead of population indicators (the density of family groups and the average number of young/kittens in family groups), it is proposed to use the indicator "number of family groups occurence in the area". The method of valorization of this indicator has been proposed in Table no 8. The scheme of this valorization was developed on the basis of the critical values of the indicator "concentration of family groups". The number of family groups occurring in a national park or Natura 2000 area with an area of <600 km^2 should be determined on the basis of one-day snow tracking, year-round observations and camera traps in the same way as it was proposed for monitoring sites. For areas

where reliable research shows that a species other than roe deer predominates or co-dominates the lynx diet, its biomass should be taken into account when calculating the index of food base availability. Such a situation may take place, for example, in the Tatra Mountains, where lynxes coexist with rupicapra (*Rupicapra rupicapra tatrica*).

Table no 8. Valorization of the population state parameter in national parks and Natura 2000 areas up to 600 km^2

Area of the national park or Natura 2000 site [km^2]	Number of family groups occurence in the area (indicator)	Assessment of the parameter**
< 200	≥1	FV
	0	U2
200 - 400	≥2	FV
	1	U1
	0	U2
400 - 600	≥3	FV
	2	U1
	<2	U2

* excluding lake and sea surfaces,
** FV - favourable conservation status, U1 – unfavourable-inadequate conservation status, U2 – unfavourable-bad conservation status. In the absence of data, XX is recorded – unknown conservation status.

3.10. Report on the assessment of the conservation status of the species

For each monitoring site and Natura 2000 site where a lynx is the subject of conservation, a report on the assessment of the conservation status of the species should be prepared on the basis of the monitoring studies carried out. This report contains information about the monitored site, the species conservation status, as well as current pressures and anticipated threats. The list of current pressures and anticipated threats is prepared in accordance with the classification in the annex to the Standard Data Form for Natura 2000 sites. General Directorate for Environmental, European Environment Agency, last actualisation 12.04.2011 (http://natura2000.gdos.gov.pl/wytyczne-i-poradniki)].

The most important pressures and threats to the conservation status of the lynx and its habitats include:

- development of road infrastructure,
- development of residential and service buildings,
- development of recreational, touristic and sports infrastructure,
- illegal killing of individuals and poisoning,
- unfavorable changes in the methods of livestock grazing (e.g. failure to protect herds against attacks by predators),
- unfavorable changes introduced to the hunting economy (e.g. reduction of the number of roe deer).

An exemplary report on the assessment of the species conservation status at the monitoring site is included in Annex no 4.

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B. ANNEX
I. Annex no 1. Obserwation form for Lynx (model)

OBSERVATION CARD LYNX (MODEL)

First name and last name of observer:....., Monitoring site:.....

Date [mm.dd.yyyy]	Time [hh.mm]	Location			Type of observation (Individual seen, tracks, droppings, prey)	The number of lynxes		Id of photo material	Comments
		Description of the site (i.e. a forestry or a protection district)	Geographic coordinates			all individuals	including young/kittens		
			latitude	longitude					

II. Annex no 2. A lynx distribution survey

A LYNX DISTRIBUTION SURVEY IN THE PERIOD FROM MAY 1, XXXX TO APRIL 30, XXXX+1.

1) Name of the Forest District of the PGL LP, National Park, RDOŚ or the Forestry Experimental Station (LZD):
……

2) Was lynx/lynxes found in the area of the Forest District/National Park/ RDOŚ/LZD?
Please put x on the correct answer.

YES ☐ NO ☐

3) Summary of information about individuals observed visually, registered with the use of camera traps and the traces of presence found (tracks, feaces/scats, urine marking, prey, place of breeding).

No.	Date of observation [yyyy.mm.dd]	Observation location [1]								Type of observation[2]	The number of lynxes[3]		Identification number of photo material[5]	Comments
		Geographical coordinates		Territorial unit of PGL LP			Administrative division of the Republic of Poland and plot number according to the land register				all individuals	including young[4]		
		latitude	longitude	forestry	department	allotment	county	commune	plot					

[1] provide the geographical coordinates (recommended), or the territorial unit of the PGL LP, or the administrative division of the Republic of Poland.
[2] visually observed individuals (alive only), picture materials from camera traps; tracks, scats, urine marking, prey (wild or domestic), place of breeding.
[3] if you could identify.
[4] if it can be distinguished from adults.
[5] the number of the photo/ video should be provided if it is transferred to the institution carrying out the survey. It is advisable to provide picture materials if lynx have not been recorded in the managed area so far or they appear very rarely.

4) Summary of information on found dead individuals.

No.	Date when a dead individual was found [yyyy.mm.dd]	Observation location [1]								Description of a dead individual			comments
		Geographical coordinates		Territorial unit of PGL LP			Administrative division of the Republic of Poland and plot number according to the land register			sex	age	cause of death[2, 3]	
		latitude	longitude	forestry	department	allotment	county	commune	plot				

[1] provide the geographical coordinates (recommended), or the territorial unit of the PGL LP, or the administrative division of the Republic of Poland.
[2] if it could be established.
[3] examples of death causes: mange, poisoning, collision with a vehicle, poaching, unknown.

5) Contact information of the institution completing the survey:

- e-mail adress: ……
- phone number: ……

III. Annex no 3 Roe deer pellet-group counts data sheet

ROE DEER PELLET-GROUP COUNTS DATA SHEET

Observer (name and surname)	Date (dd.mm.yyyy)
Name of the monitoring site	

length of the transect, 2.5 km; counting for each 500 m section of the transect; width of the transect, 3 m.

No. of the transect	Section number (500 m)	Coordinates of start and end of section	Comments	Number of roe pellet-group
1	1			
	2			
	3			
	4			
	5			
2	1			
	2			
	3			
	4			
	5			
3	1			
	2			
	3			
	4			
	5			
4	1			
	2			
	3			
	4			
	5			

IV. Annex no 4. Species conservation status assessment report – lynx (*Lynx lynx*), at the monitoring site

BIESZCZADY MOUNTAINS
Species conservation status assessment report – Euroasian lynx (*Lynx lynx*), at the monitoring site

Species observation sheet for the site

Code and species name	*Species code according to Habitats Directive, Polish name, Latin name, author according to current nomenclature* 1361 ryś, *Lynx lynx* Linnaeus, 1758
Code and name of the Natura 2000 site	*Code and name of the Natura 2000 site located at the monitoring site* PLC180001 Bieszczady, PLH180014 Ostoja Jaśliska, PLH180021 Dorzecze Górnego Sanu, PLB180002 Beskid Niski
Other forms of area conservation within which the site is located	N*ames of national parks, landscape parks, nature reserves, Protected Landscape Areas located on the monitoring site* National Park – the Bieszczady National Park. Landscape parks – Cisna-Wetlina Landscape Park, Jaśliska Landscape Park, San Valley Landscape Park. Nature reserves – Cisy na Górze Jawor, the Gołoborze, Hulskie im. Stefana Myczkowskiego, the Krywe, Olszyna Łęgowa in Kalnica, the Osława Gorge near Duszatyn, the Sine Wiry, the Woronikówka, the Zakole, the Zwiezło, Spring snowflake in Dwerniczek. Protected Landscape Areas – Low Beskids Protected Landscape Area, East Beskids Protected Landscape Area
Site name	*Site name* Bieszczady Mountains
Site type	*Referential or research* Referential
Biogeographic region	*Biogeographic region* the Alpine region
Site description	*General characteristic of the monitoring site: location, contents of the forest complex, predominate tree stand, habitat, river network* The site, located in south-eastern Poland, in the Carpathians, covers the area of dense forest complexes mainly composed of mountain beech and fir forests. The San River and many mountain streams flow through the site.
Site area	*Site area in km^2* 1222
Geographical coordinates	*Geographical coordinates of the centroid* 22° 26' 59,969" E; 49° 12' 31,667" N
Altitude above sea level	*Altidude range above sea lever (from-to)* od 420 m do 1346 m n.p.m.
Characteristics of the species habitat at the site	*General description of the habitat at the monitoring site: stands, agricultural land, water* The lynxs habitat in the site is beech and fir forests, the species also uses mountain riparian forests and meadows in the valleys of mountain streams and the San River.
Information about the species at the site	*Information on the number of family groups, methods of obtaining them* Estimated number of family groups at the monitoring site based on year-round and one-day winter tracking observations: 3 (1f + 2j, 1f + 2j, 1f + 3j) f - female, j – young lynx
Observer	*Name and surnemy of observer* Jan Kowalski
Observation dates	*Observation dates* October 30, 2018

The conservation status of the species at the site

Parameter	Indicator	Indicator value or conclusion	Indicator rating	Parameter rating
Population	Numbers of females with youngs	*Numbers of females with youngs per 100 km² of the monitoring site* 0,25 ind./100 km²	U2	U2
	Average number of young per female	*Average number of young per female* 2,3	FV	
Habitat for the species	Forest cover	*The ratio of the forest area to the total area of the monitoring sites in %* 90,8 %	FV	U2
	Habitat fragmentation	*Share of the area occupied by the buildings to the genral area of the monitoring site in %* 0,88 %	FV	
	Road density	*Lenght of roads per 100 km²* 0,05 km/km²	FV	
	Habitats isolation degree	*A three-point scale* 1	FV	
	Food resources availability	*Biomass od roe deer per 1 km² of the monitoring site* 37 kg/km²	U2	
Future prospects		*Assesment according to the Minister of the Environment from march 30, 2010 on the preparation of a draft plan of conservation tasks for the Natura 2000 area (Dz.U. 2010 nr 64, poz. 401)* No significant negative impacts and no major threats are expected in the future, no negative changes in the population and habitat are observed. The preservation of the species in the next 10-20 years is almost certain.	FV	
The overall rating			U2	

Pressures				
Code	**Name of an activity**	**Intensity**	**Impact**	**Synthetic descriptions**
E01.03	low-density development	B	-	Low-density development favor habituation of the lynx and may lead to a conflict between this species and humans.
E01.04	Other types of development	B	-	The development of chain of houses along the roads creates barriers for the movement of individuals of the species.
F03.01	Hunting	B	-	Hunting roe deer reduces the food base of the lynx
G01	sports and various forms of active recreation, performed outdoors	B	-	Outdoor activity promotes habituation and may lead to a conflict between this species and humans.
F03.02. 03	capture, poisoning, poaching	C	-	Poaching and poisoning have been reported ocasionally. The scale of the phenomenon is unknown.
G05.11	death or injury from collision	C	-	Intensive car traffic leads to collisions with individuals of the species.
D01.02	roads, highways	C	-	Roads on the area hinder the movement of individuals of the species.

Threats (future, anticipated impacts)				
Code	**Name**	**Intensity**	**Impact**	**Synthetic descriptions**
E01.03	low-density development	B	-	Low-density development favor habituation of the lynx and may lead to a conflict between this species and humans. Further development of detached buildings should be expected.
E01.04	Other types of development	B	-	The development of chain of houses along the roads creates barriers for the movement of individuals of the species. Further development of chain of houses should be expected.
G01	sports and various forms of active recreation, performed outdoors	B	-	Outdoor activity promotes habituation and may lead to a conflict between this species and humans. A further increase in activities related to outdoor recreation is to be expected.
G05.11	death or injury from collision	B	-	Intensive car traffic leads to collisions with individuals of the species. An increase in traffic intensity on public roads should be expected, especially during summer holidays and weekends.
D01.02	roads, highways	B	-	Roads on the area hinder the movement of individuals of the species. An increase in traffic intensity on public roads should be expected, especially during summer holidays and weekends.

List of the most important pressures and predicted threats influencing on the species and its habitat in the studied site; impact/threat coding in accordance with the Annex to the Standard Data Form for Natura 2000 sites; influence of an impact/a threat, + positive, - negative, 0 neutral; intensity of impact, A strong, B moderate, C weak.

Other information	
Other natural values	*Observed on the monitoring site: another rare species, protected species, endangeredand other valuable values biotic and abiotic nature* -
Invasive alien species	*Observed an the monitoring site invasive alien species* Not observed
Other comments	*Helpfull infomation to interpreting the results* -
Site management	*Moste important istututions resposible for land managment at the monitoring site, for example: forest district, national parks* The Bieszczady Forests are administered by six Forest Districts: Baligród, Cisna, Komańcza, Lesko, Lutowiska, Stuposiany and one national park – the Bieszczady
Existing protection plans and programs	*Forest managment plan, protection plan of national parks, landscape parks and nature reserves* Forest management plans for all Forest Disctricts, simplified forest management plans, plans of protection tasks for Natura 2000 areas, protection plans for nature reserves, protection plans for landscape parks.
Conducting conservation measures and assessment of their effectiveness	*List protective measures conducted at the monitoring site focused on species protection* No action
Proposed conservation measures	*List propsed protective measures for conducted at the monitoring site focused on species protection* No action

Numer of photo
-

V. Annex no 5. Instructions for filling in the observstion sheet

INSTRUCTIONS FOR FILLING IN THE OBSERVATION SHEET

1. First the name of the monitoring site and the name of observer should be noted in obserwation form of wolf and lynx.
2. After finding tracks or direct sighting of a wolf or lynx, record the date and time of the observation in the current row.
3. Then enter general data on the location of the observation by indication name: Forest District/ National Parks/ Forestry Experimental Station and Forestry
4. The description of the location of the observation should be supplemented with the geographical coordinates from the GPS receiver. Alternatively you can note the waypoint number in the notes (comments).
5. Then we note the type of observation, which can be: Individuals observed directly alive or dead, tracks fresh or old, pellet-group fresh or old, urine marking, prey or remains of prey, sounds (howling) etc.
6. The number of individuals (including cubs) is recorded if it is possible to determine it on the basis of direct observation or left traces.
7. If the observation was photographed, we also note the numbers of the photos in the comments (to document the work that observer performed)
8. In addition, we note any additional information in the comments e.g.: species, age and sex of prey; species, age and cause of death found death individual; taking samples for genetic analysis from the tracks found, etc.

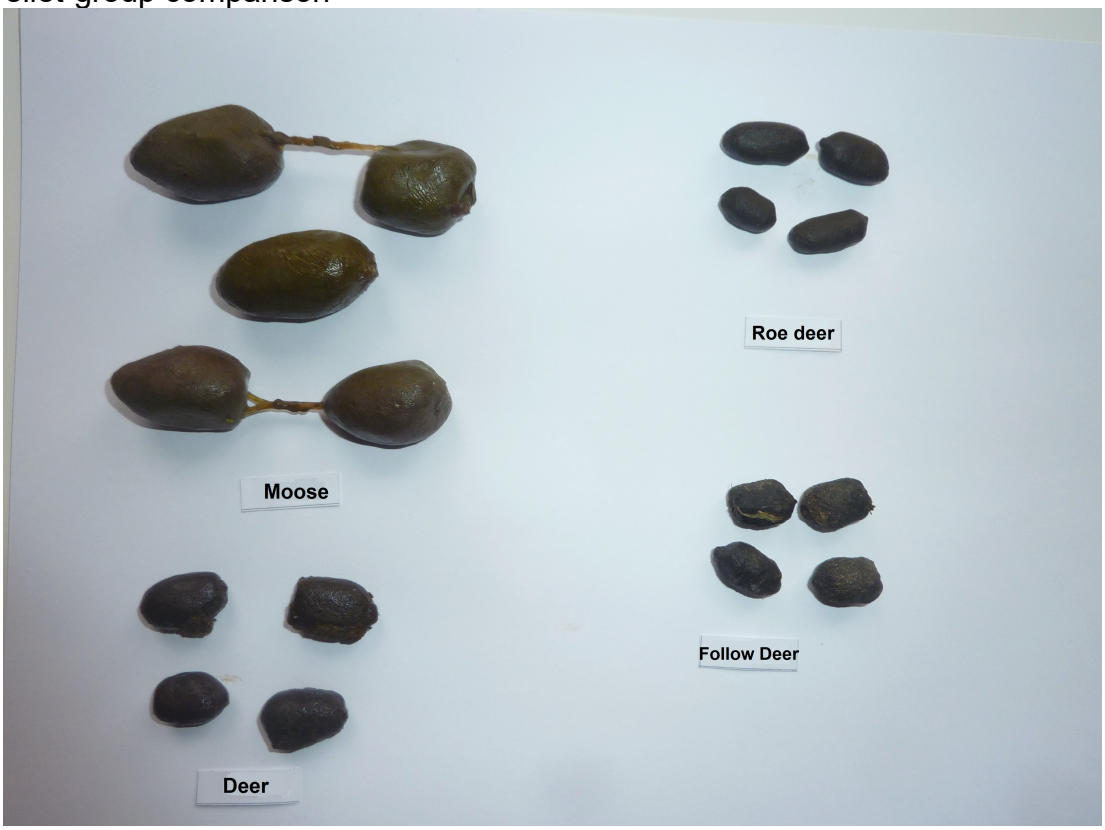
VI. Annex no 6. Instructions for roe pellet-group counting

INSTRUCTIONS FOR ROE DEER PELLET-GROUP COUNTING ON TRANSECTS

1. Countings are performed on transect previously designated by the national coordinator
2. The designed transects are 2.5 km long and 3 m wide (1.5 m on each side of the person crossing the transect). Each transect is divided into 5 sections of 500 m, for which we perform separate counting of pellet-group.
3. For the works should be prepared maps of the monitoring site and pellet-group counts data sheet in analog or electronic form.
4. GPS receivers should be used to determine your position during counting. In addition, the GPS should record the trail of the transition of the transect.
5. The beginning and end of the 500 meters transect should be marked with coordinates written in the form of roe deer pellet-group counting. If part of the transect needs to be moved (due to obstacles, e.g. fences), the intermediate points should also be with coordinates written in the form.
6. During the works, several photographs of the tree stand and encountered pellet-group should be taken (to document the work performed).
7. Walk very slowly through the transect in the middle, paying attention to the claster scat 1.5 m on the left and right side of the transect. In the case of presence of the pellet-group, we should note their presence. We count each pellet-group as separate. All the pellet-group concentrations of a distance of 500 m should be counted and the sum should be entered in the appropriate field on the counting sheet.
8. Each cluster, which at least partially overlaps a 3 m strip of the transect should be counted. If in doubt, wheter pellet-group is located on 3 m strip of the transect this must be checked by measuring the distance pellet-group from axis of the transect, using the ruler.
9. Characteristics of roe scat: smaller than deer (1-1.5 cm long, 0.6-1 cm wide), elongated, usually rounded on both sides. All features apply to the greater part of the "pellets" in the cluster.

1. Roe deer pellet-group (feces, droppings)

2. Pellet-group comparison



VII. Annex no 7. Maps

Map no 1. Overview map of the monitoring sites for species lynx *Lynx lynx*
(file: MAP_overview_LYNX_EN)
Map no 2. Situational map of the monitoring sites Puszcza Piska for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Puszcza_Piska_EN)
Map no 3. Situational map of the monitoring sites Puszcza Augustowska for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Puszcza_Augustowska_EN)
Map no 4. Situational map of the monitoring sites Puszcza Knyszyńska for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Puszcza_Knyszynska_EN)
Map no 5. Situational map of the monitoring sites Puszcza Białowieska for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Puszcza_Bialowieska_EN)
Map no 6. Situational map of the monitoring sites Roztocze i Puszcza Solska for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Lasy_Swietokrzyskie_EN)
Map no 7. Situational map of the monitoring sites Beskid Żywiecki i Śląski for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Beskid_Zywiecki_i_Slaski_EN)
Map no 8. Situational map of the monitoring sites Beskid Sądecki for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Beskid_Sadecki_EN)
Map no 9. Situational map of the monitoring sites Bieszczady for species lynx *Lynx lynx*
(file: MAP_situational_LYNX_Bieszczady_EN)

Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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Puszcza Augustowska
Puszcza Piska
Puszcza Knyszyńska
Puszcza Białowieska
Roztocze-Puszcza Solska
Beskid Żywiecki i Śląski
Beskid Sądecki
Bieszczady

OVERVIEW MAP OF THE MONITORING SITES FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 3 000 000

0 25 50 100 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring sites border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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640000 660000 680000 700000

660000 640000 620000

SITUATIONAL MAP OF THE MONITORING SITE
PUSZCZA PISKA
FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 200 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
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740000 760000 780000 800000 820000

700000 680000 660000

Suwałki
Olecko
Sejny
Augustów
Lipsk
Veisiejai
Leipalingis
Kapčiamiestis
Гродно
Wigierski Park Narodowy
Ландшафтный заказник «Гродненская пуща»
Rezerwat Jezioro Kalejty
Rezerwat Kurianskie Bagno
Lotnisko Suwałki
Selmęt Wielki
Las Trzyrzeczki
Lietuva
Беларусь
Polska
województwo podlaskie

S61 8 18 17 65 16 61 135 134 180 P42

SITUATIONAL MAP OF THE MONITORING SITE

PUSZCZA AUGUSTOWSKA

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 250 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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640000 620000 600000 580000

Suchowola Goniądz Mońki Sokółka Knyszyn Czarna Białostocka Supraśl Tykocin Choroszcz Białystok Michałowo Zabłudów Krynki Большая Берестовица Свислочь Гродненское водохранилище Аэропорт Гродно

Park Krajobrazowy Puszczy Knyszyńskiej

Narwiański Park Narodowy

Rezerwat Rabinówka

SITUATIONAL MAP OF THE MONITORING SITE

PUSZCZA KNYSZYŃSKA

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 300 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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SITUATIONAL MAP OF THE MONITORING SITE

PUSZCZA BIAŁOWIESKA

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 200 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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320000 300000 280000 260000

Zamość
Szczebrzeszyn
Szczebrzeszyński Park Krajobrazowy
Frampol
Zwierzyniec
Roztoczański Park Narodowy
Krasnobród
Krasnobrodzki Park Krajobrazowy
Józefów
Biłgoraj
Tomaszów Lubelski
Las Tyszowiecki
Tyszowce
Łaszczów
Park Krajobrazowy Puszczy Solskiej
Tarnogród
Narol
Lubycza Królewska
województwo podkarpackie
Cieszanów
Rawa-Ruska
Угнів
Львівська область
Polska
Україна
74
17
M-09
P-40

SITUATIONAL MAP OF THE MONITORING SITE

ROZTOCZE I PUSZCZA SOLSKA

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 250 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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SITUATIONAL MAP OF THE MONITORING SITE
BESKID ŻYWIECKI I ŚLĄSKI
FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 200 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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190000 180000 170000 160000

SITUATIONAL MAP OF THE MONITORING SITE

BESKID SĄDECKI

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 150 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

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Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94

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180000 160000 140000

N

SITUATIONAL MAP OF THE MONITORING SITE

BIESZCZADY

FOR SPECIES EURASIAN LYNX *LYNX LYNX*

SCALE 1 : 200 000

0 2,5 5 10 Kilometers

Coordinate System "PUWG 1992"

LEGEND:

- country border
- voivodeship border
- monitoring site border

Topographic background © authors OpenStreetMap

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Task no 1

METHODOLOGY OF EURASIAN LYNX MONITORING IN POLAND

Prepared by:
dr Wojciech Śmietana (KRAMEKO sp. z o.o.) – conception and substantive study
dr hab. Jakub Borkowski, prof. UWM (UWM w Olsztynie) – conception and substantive study
mgr inż. Ryszard Krynicki (KRAMEKO sp. z o.o.) – supervision of all works
mgr inż. Adela Krynicka (KRAMEKO sp. z o.o.) – financial supervision
mgr inż. Marcin Czerny (KRAMEKO sp. z o.o.) – work managment, development of instructions, typesetting
mgr inż. Aleksandra Wilczyńska (KRAMEKO sp. z o.o.) – GIS development, cartographic development
mgr inż. Mateusz Kowalczyk (KRAMEKO sp. z o.o.) – GIS development, cartographic development
dr hab. Maciej Stasiak (KRAMEKO sp. z o.o.) –English translation

Wykonawca: KRAMEKO sp. z o.o.
30-023 Kraków, ul. Mazowiecka 108
e-mail: sekretariat@krameko.com.pl
tel: +48(12) 294-52-22
fax: +48(12) 376-73-94