Large carnivores monitoring programmes as a part of the State Environmental Monitoring in Poland

10th Meeting of the Carpathian Convention Working Group on Biodiversity
25–28 November 2019 Colțești, Alba –ROMANIA

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Chief Inspectorate of Environmental Protection

State Environmental Monitoring

1. Air quality monitoring
2. Water quality monitoring
3. Soil and land quality monitoring
4. **Nature monitoring**
5. Noise monitoring
6. Electromagnetic field monitoring
7. Ionizing radiation monitoring

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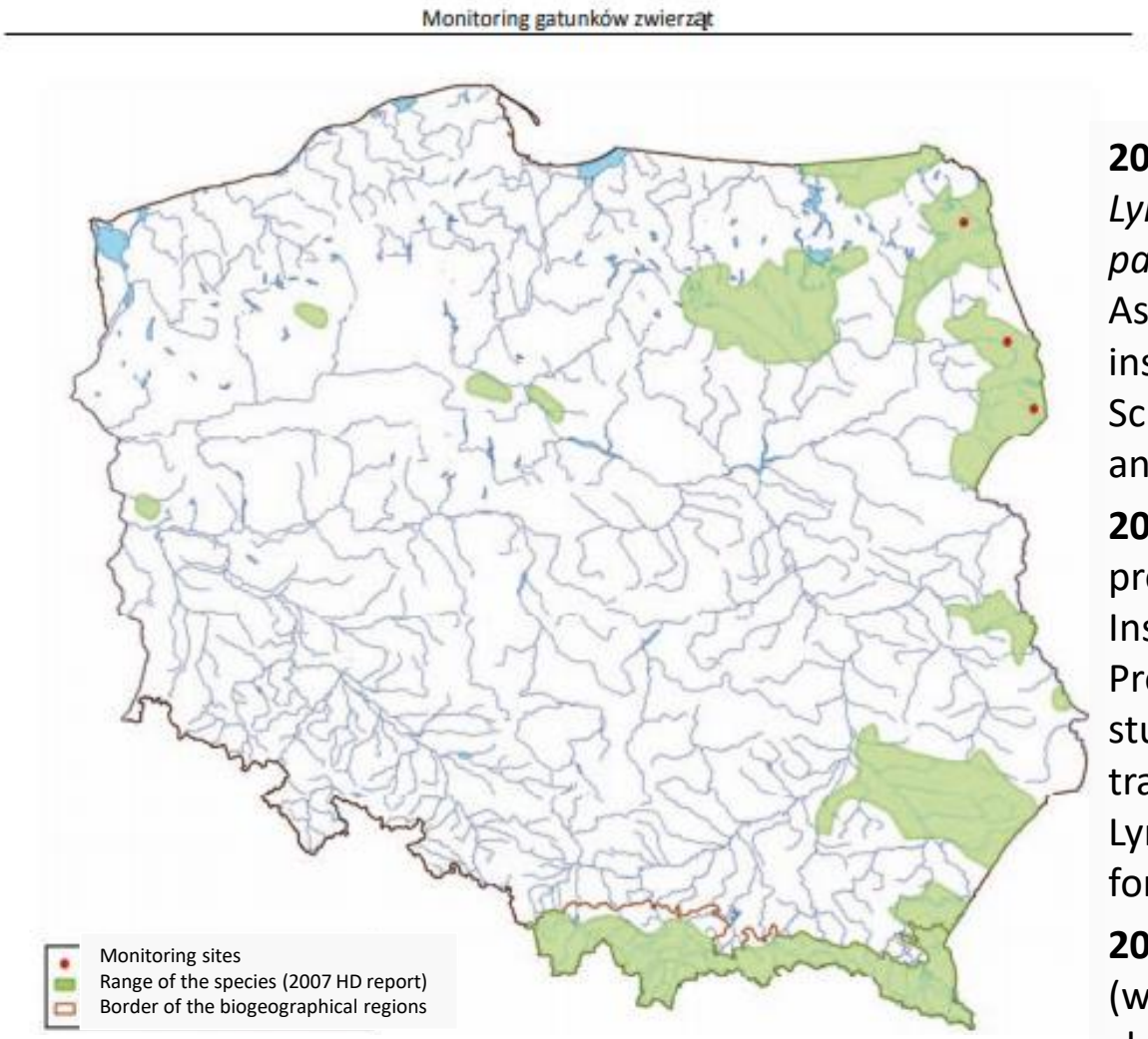
Fot. 1. Niedźwiedź brunatny *Ursus arctos* (© F. Zięba)

Fot. 1. Wilk *Canis lupus* (© M. Tokajuk)

Fot. 1. Ryś *Lynx lynx* (© M. Tokajuk)



2000 – *Nationwide count of Wolves and Lynx in forest inspectorates and national parks* programme, coordinated by the Association for Nature 'WOLF' and two institutions of the Polish Academy of Sciences, i.e. Mammal Research Institute and Institute of Nature Conservation

2007-2008 – Wolf and Lynx monitoring programme coordinated by Chief Inspectorate of Environmental Protection, 3 monitoring sites: (1) yearly studies encompassing all identified tracks and observations of Wolves and Lynx, (2) winter counts carried out in the form of track trailing in fresh snow

2014 – 7 additional monitoring sites (without population parameter), changes in methodology

Methodology

(Jędrzejewski *et al.* 2010)*

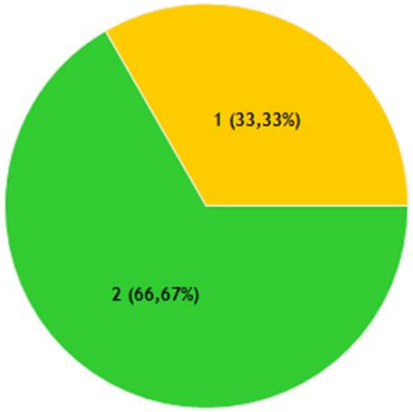
Canis lupus	*Lynx lynx*	*Ursus arctos*
Population: number of wolf packs, density	**Population**: density, number of females with litters, average number of kittens per female	**Population**: number of individuals, number of females with litters, average number of cubs per female
Habitat for the species: forest cover, habitat fragmentation, availability of prey, road density, degree of habitat isolation	**Habitat for the species**: forest cover, habitat fragmentation, availability of prey, road density, degree of habitat isolation	**Habitat for the species**: forest cover, habitat fragmentation, road density, population density, tourism intensity
Future prospects	**Future prospects**	**Future prospects**

Conservation Status

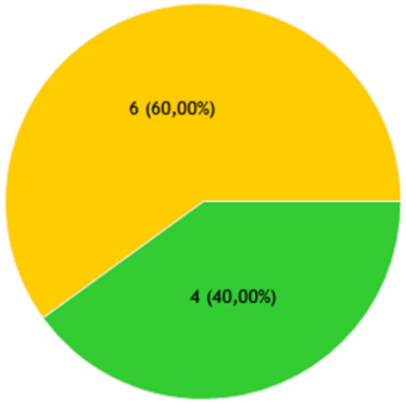
*http://siedliska.gios.gov.pl/pl/publikacje/przewodniki-metodyczne/pojedyncze-metodyki/dla-gatunkow-zwierzat

Overall assessment of Conservation Status - Wolf

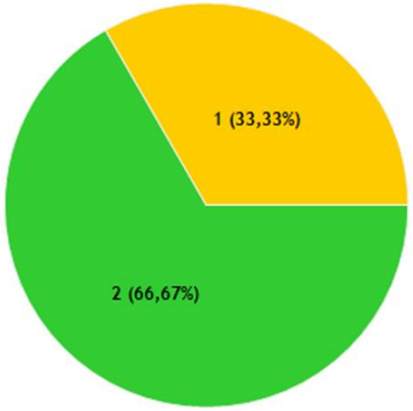
2008

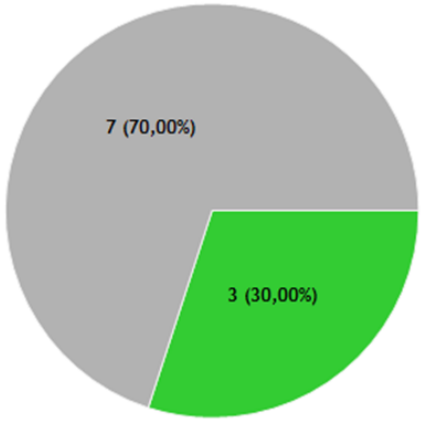


2014



Population - Wolf





Colors on the charts indicate conservation status:

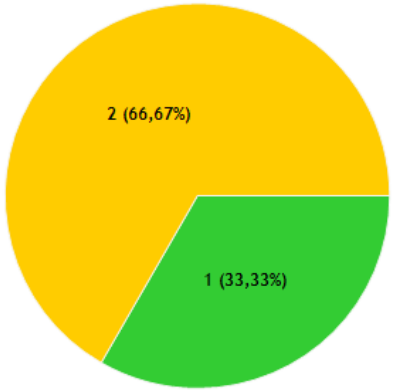
FV Favourable U1 Unfavourable-Inadequate

U2 Unfavourable-Bad XX Unknown

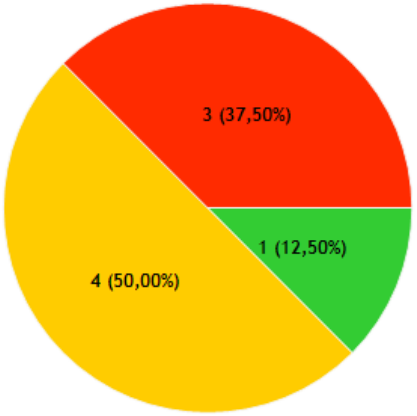
On the chart the number of sites and the percentage of conservation status is presented

Overall assessment of Conservation Status - Lynx

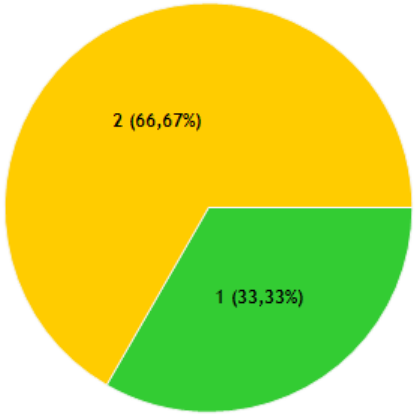
2008

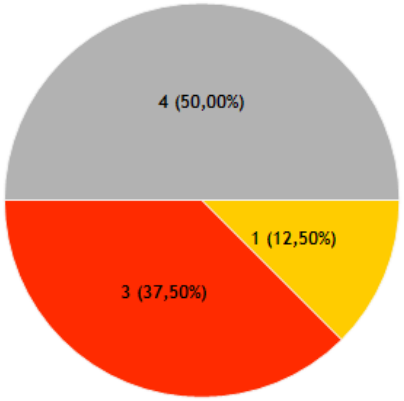


2014



Population - Lynx





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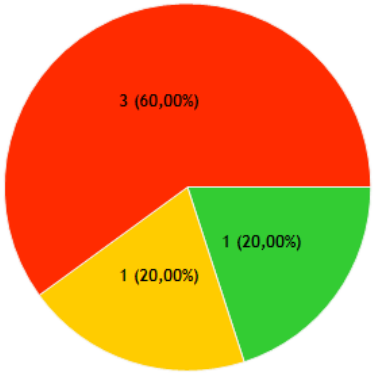
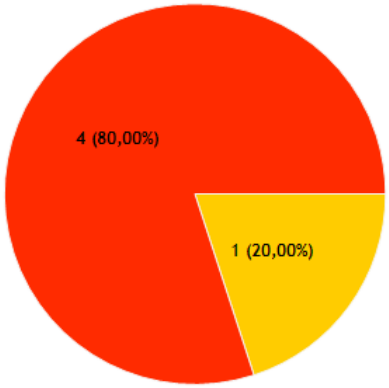
Overall assessment of Conservation Status – Brown Bear

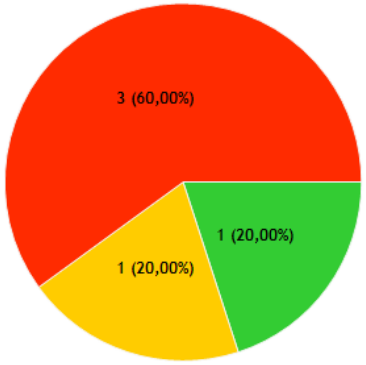
2007-2008

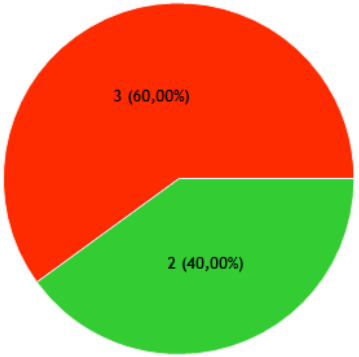


2014



Population – Brown Bear





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On the chart the number of sites and the percentage of conservation status is presented

The pilot monitoring of Wolf and Lynx in Poland carried out as part of the state environmental monitoring – field and in-house studies in years 2017-2020 project is co-funded by European Union from Operational Programme Infrastructure and Environment 2014-2020 (POIS.02.04.00-00-0040/16).

Wolf and Lynx monitoring results will be available at the end of the project, ie. in 2020.

www.gios.gov.pl/pl/poiis-monitoring-wilka-i-rysia

New approach – genetic mark-recapture

A two-level approach to Wolf monitoring includes:
1) a nationwide level to determine the range of the species occurrence (distribution);
2) a local level which aims to provide detailed information on the state of its population and habitats in selected monitoring sites.

The state of Wolf populations: indicators

Indicator	Measure	Measurement method
Density	N/100 km²	Recapture (CMR)[1] based on genetic identification[2] (faeces) of individual wolves

Indicator	Value*		
	FV	U1	U2
Density	>2,5	1,5-2,5	<1,5

*FV – favourable, U1 – unfavourable-inadequate, U2 – unfavourable-bad

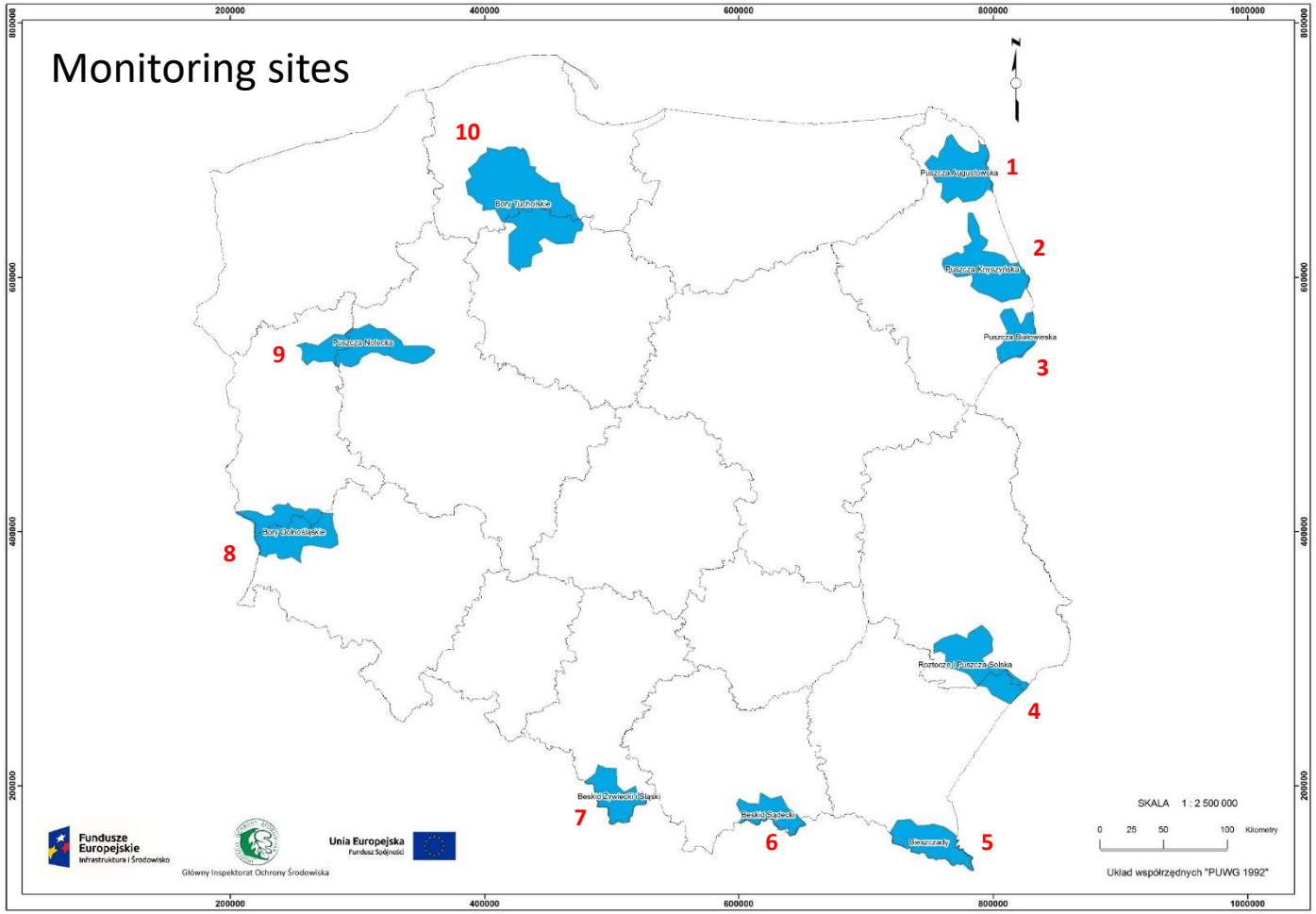
1. The CAPWIRE method (single-session population estimate) and ECM model (equal capture probabilities)
2. 13 Short Tandem Repeat (STR) loci from the 19 loci of Thermo Scientific Canine Genotypes Panel 1.1

The state of wolf habitats: indicators

Indicator	Measure	Measurement method
Forest cover	%	The ratio of forest cover to total area of a monitoring site
Habitat fragmentation	%	A percentile share of all land resources designated for residential, commercial and industrial use within the total area of a monitoring site
Road density	km/km^2	The length of national and regional roads per 1 sq. km within the total area of a monitoring site
Degree of habitat isolation		1 - continuous connections with other areas inhabited by Wolf populations, 2 - weak, interrupted connections, 3 - complete isolation

Indicators	Value*		
	FV	U1	U2
Forest cover	>40	20-40	<20
Habitat fragmentation	<3	3-5	>5
Road density	<0,1	0,1-0,2	>0,2
Degree of habitat isolation	1	2	3

*FV – favourable, U1 – unfavourable-inadequate, U2 – unfavourable-bad



1) Augustów Forest, 2) Knyszyn Forest, 3) Białowieża Forest, 4) Roztocze and Solska Forest, 5) Bieszczady Mountains, 6) Beskid Sądecki, 7) Beskid Żywiecki i Śląski, 8) Lower Silesia Forest, 9) Notecka Forest, 10) Tuchola Forest

Lynx

A two-level approach to Lynx monitoring includes:
1) a nationwide level to determine the range of the species occurrence (distribution);
2) a local level which aims to provide detailed information on the state of its population and habitats in selected monitoring sites.

The state of Lynx populations: indicators

Indicator	Measure	Measurement method
Number of female Lynx with litters	N/100 km^2	Established on the basis of thorough snow tracking and yearly observations
Average number of kittens per female Lynx	N	Established on the basis of thorough snow tracking and yearly observations

Indicator	Assessment*		
	FV	U1	U2
Number of female Lynx with litters	>0,5	0,3-0,5	<0,3
Average number of kittens per female Lynx	>2	1-2	<1

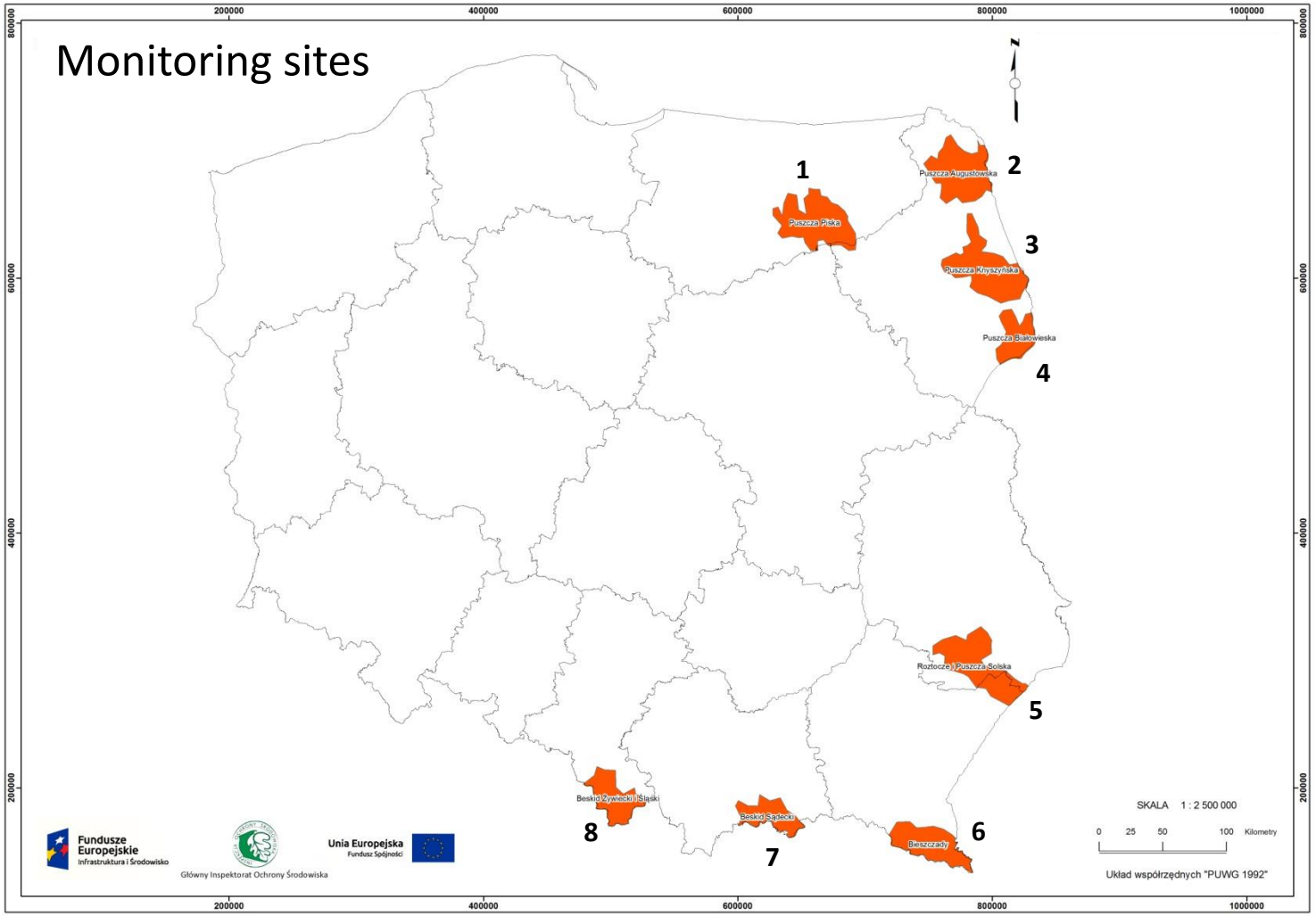
*FV – favourable, U1 – unfavourable-inadequate, U2 – unfavourable-bad

The state of Lynx habitats: indicators

Indicator	Measure	Measurement method
Forest cover	%	The ratio of forest cover to total area of a monitoring site
Habitat fragmentation	%	A percentile share of all land resources designated for residential, commercial and industrial use within the total area of a monitoring site
Road density	km/km^2	The length of national and regional roads per 1 sq. km within the total area of a monitoring site
Degree of habitat isolation		1 - continuous connections with other areas inhabited by Lynx populations, 2 - weak, interrupted connection, 3 - complete isolation
Food base accessibility	kg/km^2	Deer biomass in conversion to 1 sq. km of a monitoring site

Indicator	Value*		
	FV	U1	U2
Forest cover	>40	20-40	<20
Habitat fragmentation	<3	3-5	>5
Road density	<0,1	0,1-0,2	>0,2
Degree of habitat isolation	1	2	3
Food base accessibility	>100	50-100	<50

*FV – favourable, U1 – unfavourable-inadequate, U2 – unfavourable-bad



1) Pisz Forest, 2) Augustów Forest, 3) Knyszyn Forest, 4) Białowieża Forest, 5) Roztocze and Solska Forest, 6) Bieszczady Mountains, 7) Beskid Sądecki, 8) Beskid Żywiecki i Śląski

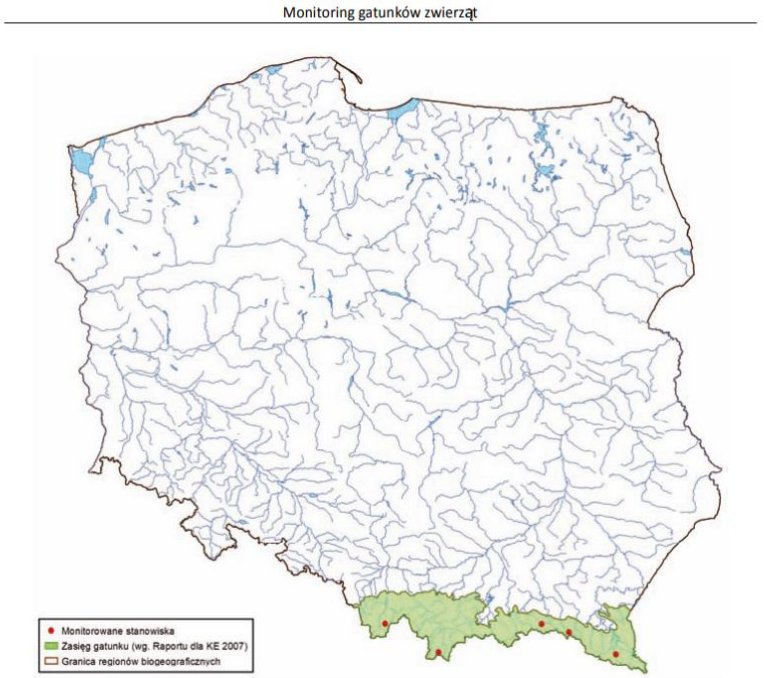
Monitoring site	Monitoring site area [km^2]	Years	Population estimates [N] (95% confidence intervals)	Density [N/100 km^2]	Assessment of population parameter
Bieszczady	1222	2017/2018	112 (98-125)	9,2	FV
Beskid Sądecki	783	2017/2018	8 (5-19)	1,0	U2
		2018/2019	10 (8-16)	1,3	U2
Beskid Żywiecki i Śląski	1042	2018/2019	11 (9-17)	1,1	U2
Puszcza Augustowska	1583	2017/2018	47 (36-62)	3,0	FV
Puszcza Białowieska	769	2017/2018	22 (18-29)	2,9	FV
Puszcza Knyszyńska	1793	2017/2018	33 (22-54)	1,8	U1
Roztocze i Puszcza Solska	1499	2017/2018	19 (15-24)	1,3	U2
Bory Tucholskie	1014	2017/2018	15 (7-33)	1,5	U1
		2018/2019	16 (15-18)	1,6	U1
Puszcza Notecka	1100	2018/2019	22 (18-27)	2,0	U1
Bory Dolnośląskie	1049	2018/2019	28 (24-34)	2,7	FV

Monitoring site	Monitoring site area [km^2]	Date of one day tracking	Number of tracks	Number of female Lynx with litters tracks (f - female, j - juvenile)
Bieszczady	1222	13.02.2018	10	1 (1f+1j)
Beskid Sądecki	783	27.01.2018	6	0
Beskid Żywiecki i Śląski	1042	24.01.2018	3	0
Puszcza Augustowska	1583	7.02.2018	1	1 (1f+1j)
Puszcza Białowieska	769	18.01.2018	18	1 (1f+1j)
Puszcza Knyszyńska	1793	8.02.2018	4	0
Roztocze i Puszcza Solska	1499	14.02.2018	4	0
Puszcza Piska	1707	9.02.2018	3	0

Monitoring site	2014 Number of female Lynx with litters (N/100 km^2)	2014 Average number of kittens per female Lynx (N)	2018 Number of female Lynx with litters (N/100 km^2)	2018 Average number of kittens per Female lynx (N)
Bieszczady	-	-	U2 (0,25)	FV (2,3)
Beskid Sądecki	-	-	U2 (0,13)	U1 (2)
Beskid Żywiecki i Śląski	-	-	U2 (0,1)	U1 (1,0)
Puszcza Augustowska	U2 (0,2)	U1 (1)	U2 (0,06)	U1 (1)
Puszcza Białowieska	U2 (0,2)	U1 (2)	U2 (0,13)	U1 (2,0)
Puszcza Knyszyńska	U1 (0,3)	U1 (1,7)	U2 (0)	U2 (0)
Roztocze i Puszcza Solska	-	-	U2 (0,07)	U1 (1,0)
Puszcza Piska	U2 (0,0)	U2 (0,0)	U2 (0,06)	U1 (2,0)

Ursus arctos – proposed methodology

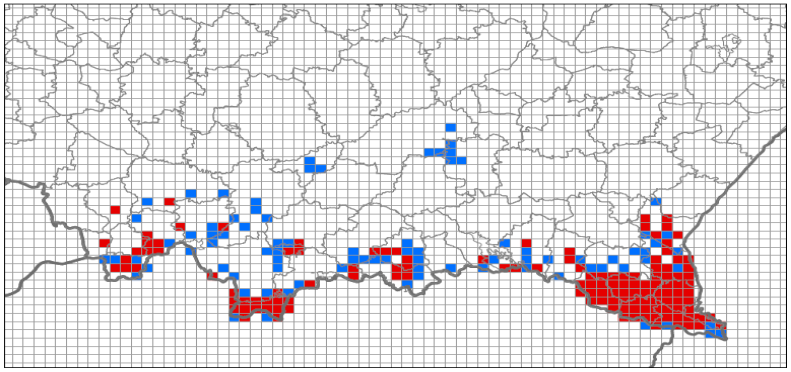
Fot. 1. Niedźwiedź brunatny *Ursus arctos* (© F. Zięba)



Ryc. 1. Zasięg występowania niedźwiedzia brunatnego *Ursus arctos* w Polsce (wg raportu dla Komisji Europejskiej 2007) i stanowiska monitorowane w latach 2007–2008 w ramach zadania: *Monitoring gatunków i siedlisk przyrodniczych ze szczególnym uwzględnieniem specjalnych obszarów ochrony siedlisk Natura 2000 – faza pierwsza i faza druga* (zaznaczono środkowe współrzędne geograficzne badanych stanowisk).

Indicator	Measure	Measurement method
Area	Number of 5 km × 5 km squares with Brown Bear presence	Every year query survey
Breeding	Number of 5 km × 5 km with females with cubs	Every year query survey
Population	Population estimates [N] (95% confidence intervals)	Recapture (CMR) based on genetic identification (non-invasive samples) of individuals (every six years)

Population assessment		
FV	**U1**	**U2**
>216	216-130	<130
≥130	129-98	≤97
>150 ind.	50-150 ind.	<50 ind.



Thank you for attention!

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