



## Improving Monitoring Accuracy of Amur Leopards in Southwest Primorye, Russia



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A lone male leopard enjoying an April sunset. Photo © WCS/ Land of the Leopard National Park

### FINAL REPORT TO THE WILDCATS CONSERVATION ALLIANCE MARCH 2019

Award Amount: £23,647

Grant Period: April 2018 - December 2018

Report Period: January 2018 - December 2018

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## Executive Summary

In 2018, we completed population monitoring of Amur leopards in the Nezhino and Northern sectors of Land of the Leopard National Park (LLNP), finding a record high number of leopards in our study area (29 cats). We believe these numbers are a reflection of nearly a decade of significant improvements to anti-poaching efforts at LLNP. We also sought to expand our camera trap network outside of the park, and worked to ensure the integrity of the camera trap database given a recent change in personnel overseeing that project at LLNP.

## Progress against Goals and Objectives

### *Objectives 1 and 2: Continue monitoring in the Nezhino and Northern sectors of LLNP*

From January to June 2018 we placed pairs of camera traps at 51 locations in the Nezhino (32 locations) and Northern (19 locations) sectors of Land of the Leopard National Park (LLNP; Figures 1, 2). Cameras were operational from January 16 to May 30, 2018, summing 5,381 trap nights. As in past years, our monitoring efforts encompassed nearly 800 km<sup>2</sup> (Table 1). We obtained 225,515 photographs in total and, after removing false triggers (usually caused by wind), 6,311 images of wildlife remained, including 1,719 images of 29 individual leopards in 90 trap events (9 males, 15 females, 2 of unknown sex, and 3 cubs; Figure 3). This number—29—is the most we have ever tallied of this endangered subspecies since monitoring began in this larger region in 2015. Leopard densities in our long-term (and smaller) study area were estimated to be  $1.4 \pm 0.37$ , and the density estimated for our larger study area (which includes the smaller one) was  $1.2 \pm 0.128$  individuals/100 km<sup>2</sup> (Table 2). These density estimates are similar to previous estimates dating back to 2003, and the slightly lower density estimates for the larger area likely reflects that the long-term area represents some of the best leopard habitat in Southwest Primorye (Figure 4). Estimates across the entirety of the park (and in China) provide strong indications that leopard numbers have increased, but our study area represents what has always been some of the best protected and best quality habitat for leopards, so it is not surprising that we are not seeing any large-scale changes in leopard numbers in this “core” area.

In addition to our observations on leopards, we obtained 445 photographs that represented 35 captures of 13 tigers, including 5 females, 3 males, and 5 cubs. This is the largest number of cubs reported in our study area. Our Bayesian estimate of density ( $0.35 \pm 0.12$ ) was the lowest for the three years we have collected information in this region. Overall, tiger numbers have clearly increased in the region, but we expect variation when surveying in relatively small areas. Results from the entire region are demonstrating consistently high densities of tigers.

To make better use of our “bycatch” camera trap images, we also examined captures of ungulates to derive a relative abundance index (RAI) for prey species (sika deer, wild boar, and roe deer) in Land of the Leopard National Park (Table 3). Sika deer are by far the most common prey species in the region. Although not statistically significant, RAI estimates for all three species show modest increases over the three years.

Stable numbers of leopards and tigers in these core areas, coupled with an overall increase in numbers of both cat species and prey across the transboundary region represent a validation of WCCA’s investment in long-term population monitoring. With the goal of improving conditions for leopards, tigers, and their prey, Land of the Leopard National Park has for nearly a decade engaged in sustained anti-poaching improvements (Figures 5, 6) in association with support from WCS. Without long-term monitoring, assessing the conservation impacts of these considerable efforts would be based on anecdotal evidence. With monitoring data, we can point to rising leopard numbers as evidence that our SMART anti-

poaching efforts are being reflected in the big cat populations. Additionally, the higher RAI for sika deer in Land of the Leopard National Park, compared to the other ungulate species, also suggests that the prey biomass is likely high in this park and works in tandem with improved protection to support growing leopard numbers.

*Objective 3. Expand camera trap network to suitable habitat not currently covered*

In 2018 we expanded the camera trap network outside the boundaries of the national park to include 38.2 km<sup>2</sup> of forested habitat along the south slopes of the Graznaya (“Dirty”) River (Figure 2). This region was considered potentially suitable leopard habitat, but had never been included in the regional survey. We placed 7 camera trap pairs in this region, resulting in 142 photographs of leopards, representing 5 adult leopards, including 2 that were not captured elsewhere. In addition, we obtained 21 photographs of one adult male and one female tiger with two cubs, but the quality of the photographs of the female and cubs were too poor to identify her. This region will be included in future estimates of density for the region.

*Objective 4: Ensure integrity of camera trap database*

During the 2018 camera trapping season, WCS and LLNP staff worked together to set camera traps in our study area, and then WCS staff assisted in putting camera traps across the remaining areas not yet set up in LLNP, showing the good working relations at maintaining the camera trap field work. In January 2019, ANO Leopard organized a small meeting of advisors (including Dale Miquelle of WCS) to help develop a roadmap of priorities for the scientific staff. Included was a discussion of the camera trapping effort, and how to improve organization and management of the LLNP camera trap database.

## **Conclusion**

We are deeply grateful to WildCats Conservation Alliance for their long-term investments in Amur leopard conservation. Within the past year we have been able to continue our long-term monitoring, expand to an additional area, and continue to improve the quality of monitoring across the larger park. These efforts have yielded important information about population trends of this critically-endangered subspecies. We look forward to continuing our partnership with WCCA to ensure that conservation decisions are based on reliable estimates of Amur leopard numbers.

## **Attachments**

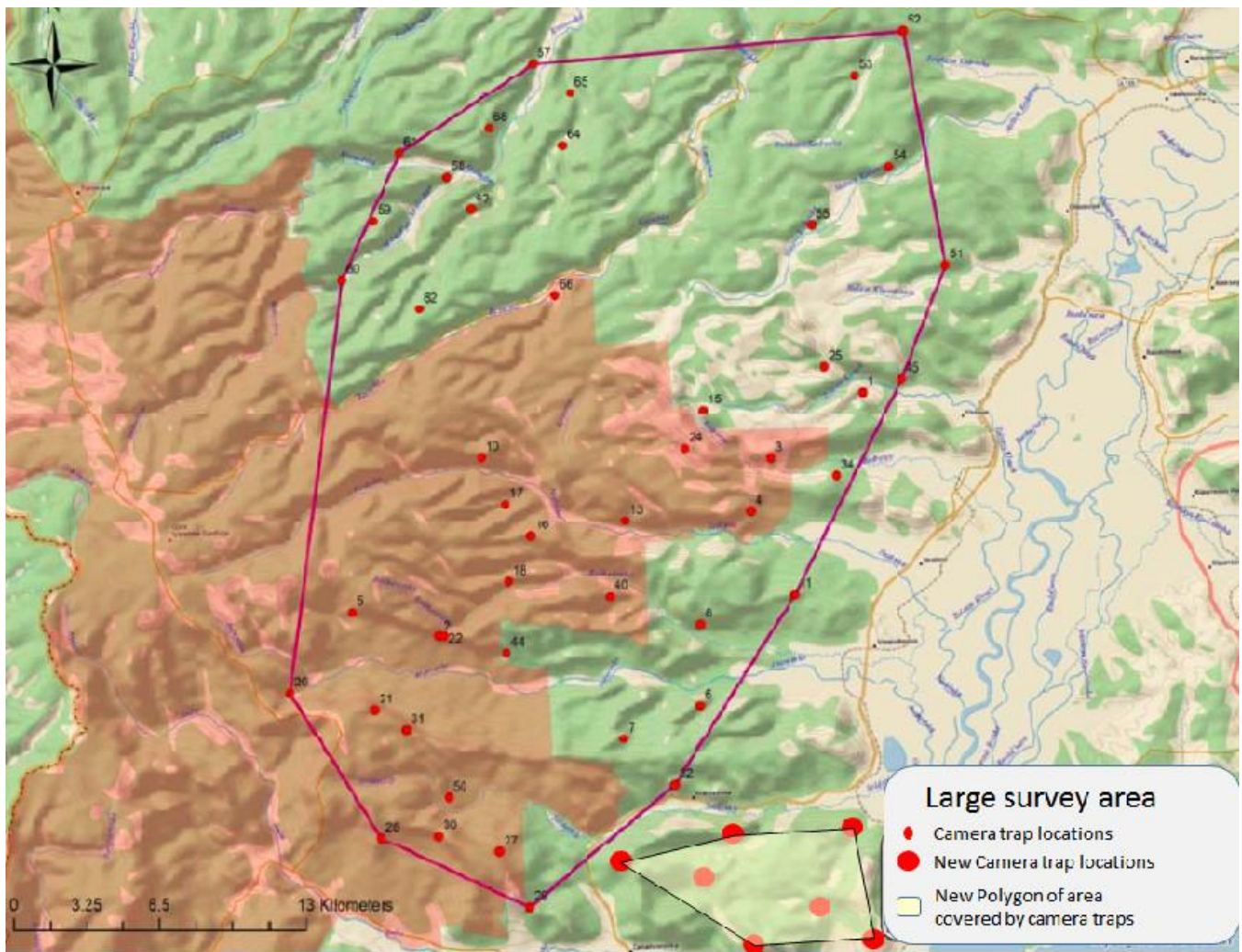
- Figures and tables
- Financial report
- Project photos

## Figures and Tables



**Figure 1.** Camera trap sectors in Land of the Leopard National Park.



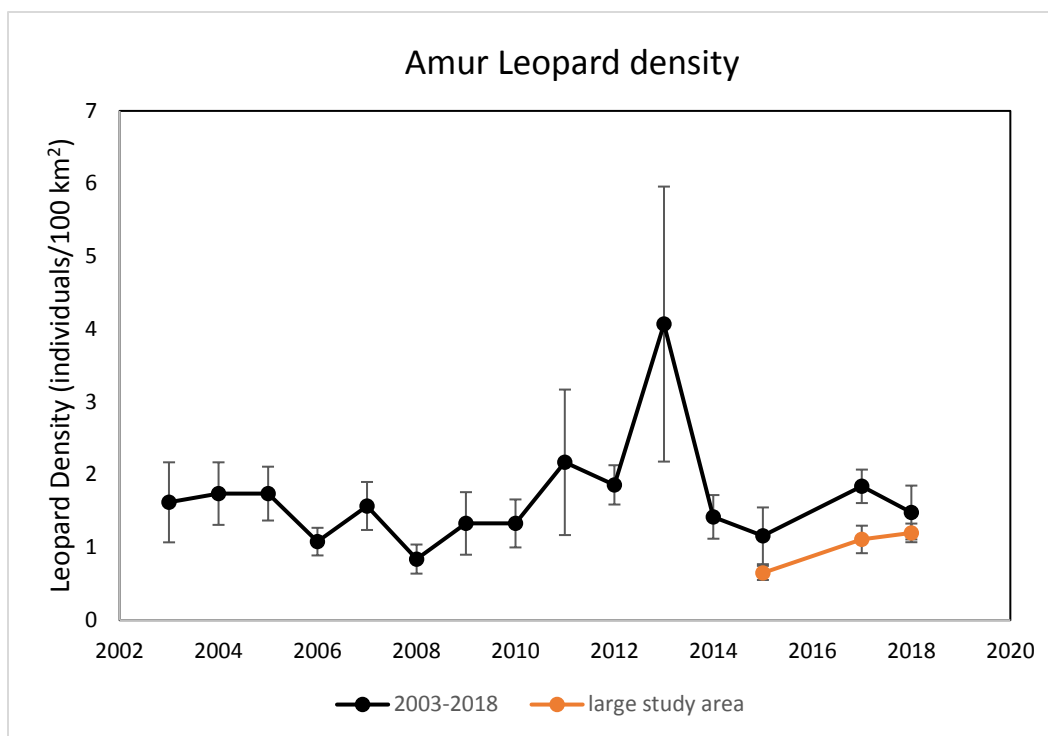


**Figure 2.** Camera trap locations across the combined Nezghino and Northern Sectors of Land of the Leopard National Park, the larger study area surveyed by WCS since 2015. New (2018) camera trap locations (bottom right) extend coverage to additional leopard habitat outside the national park.

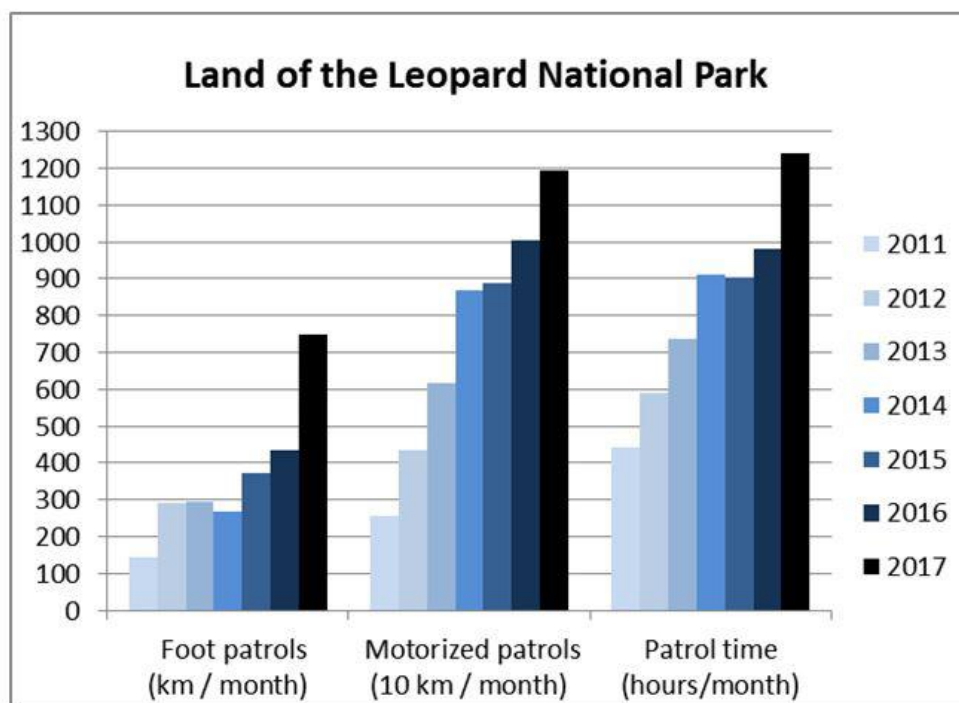




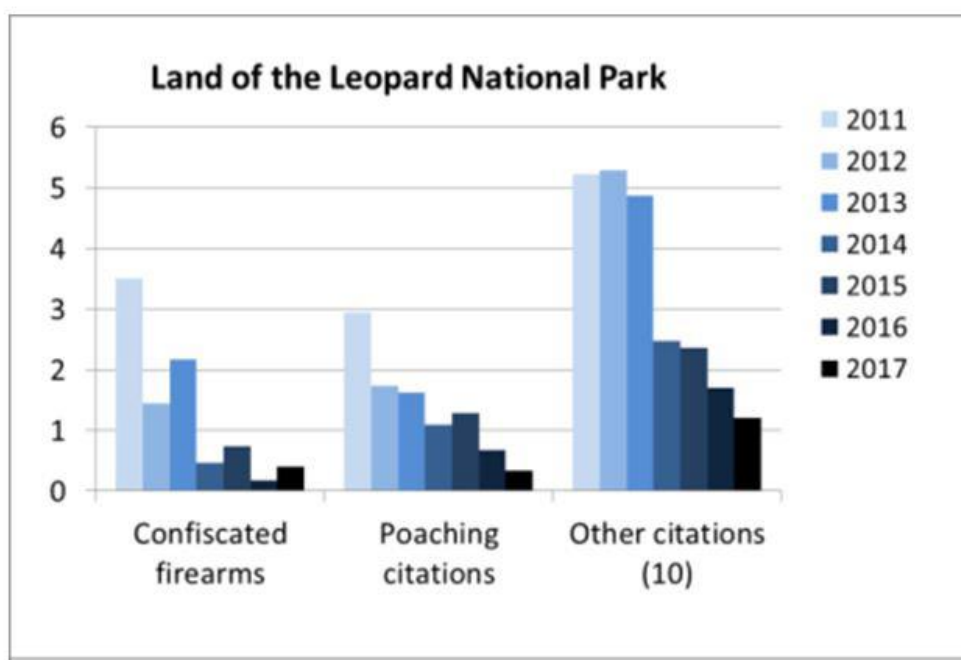
**Figure 3.** Amur leopard photographed in Land of the Leopard National Park on January 30, 2018. A series of low snow winters continues in Southwest Primorye.



**Figure 4.** Amur leopard density in the WCS long-term study area, 2003 to 2018, and in the enlarged area since 2015. Amur leopard densities in this core area have been largely stable over the entire study period, indicating that this area has had sufficient protection. Lower densities in the larger study area reflect the fact that the long-term area represents what is probably the best and most secure habitat for leopards in Southwest Primorye.



**Figure 5.** Anti-poaching effort in Land of the Leopard National Park, with a focus on three indicators of success in improving patrol effort: 1) average distance travelled on foot per month by patrol teams; 2) average distance travelled by vehicle, motor bike, snowmobile, or all-terrain vehicle or boat per month by teams of inspectors, and 3) average total time spent on patrol per month (in hours) for teams.



**Figure 6.** Anti-poaching patrol results from Land of the Leopard National Park (confiscated firearms, citations for poaching, citations for other violations such as trespassing, logging, fishing and campfires) per patrol-effort unit (in this case per 1000 patrol hours) form an indication of poaching and other human pressures. The reduction in pressure over is an indication that increases in patrol effort are having an impact.

**Table 1.** History of camera trapping by WCS in Land of the Leopard National Park.

Year	Study Area (km <sup>2</sup> )	Survey Start Date	Survey End Date	No. Camera Trap Days	No. of Camera Trap Locations	Trap Density (# traps/100 km <sup>2</sup> )
2002-2003	321	24.11.2002	28.01.2003	66	24	7.47
2004	321	25.01.2004	31.03.2004	67	23	7.16
2005	321	25.01.2005	31.05.2005	127	22	6.85
2006	303	01.02.2006	31.05.2006	120	21	6.93
2007	303	15.02.2007	08.05.2007	83	21	6.93
2008	303	10.02.2008	10.06.2008	122	21	6.93
2009	303	10.03.2009	30.06.2009	113	21	6.93
2010	303	30.03.2010	27.06.2010	117	21	6.93
2011	303	01.02.2011	01.06.2011	121	21	6.93
2012	345	18.02.2012	03.06.2012	107	30	8.7
2013	341	20.02.2013	11.07.2013	142	28	8.2
2014	774	04.03.2014	15.07.2014	134	59	7.6
2015	792	13.01.2015	05.07.2015	174	55	6.9
2016	<i>Data acquired but not yet analyzed</i>					
2017	792	27.12.2016	14.06.2017	148	51	6.4
2018	792	16.01.2018	30.05.2018	135	50	6.31



**Table 2.** Densities of Amur leopards in the Nezhino and combined Nezhino and Northern sectors of Land of the Leopard National Park in 2015, 2017, and 2018, estimated using program SPACECAP.

Year	Average Density (Individuals/100 km <sup>2</sup> ) $\bar{D} \pm S$	95% Confidence Interval
2015 (Nezhinskoe)	0.64±0.13	0.42-0.89
2015 (Combined)	0.65±0.097	0.48-0.81
2017 (Nezhinskoe)	0.98±0.23	0.52-1.42
2017 (Combined)	1.11±0.189	0.75-1.47
2018 (Combined)	1.20±0.128	0.90-1.44

**Table 3.** Relative index of Abundance (RAI = captures/100 trap nights) for ungulates in Land of the Leopard National Park protected areas based on camera trap surveys from 2016 to 2018.

Location	Year	Wild boar			Roe deer			Sika deer		
		mean	n	95% CI	mean	n	95% CI	mean	n	95% CI
Land of the Leopard NP	2016	0.5	27	0.7	0.5	27	0.5	8.5	27	3.6
	2017	0.5	53	0.2	0.7	54	0.4	11.0	53	3.4
	2018	1.2	54	0.6	0.7	54	0.4	11.9	54	5.0



**Final Financial Report  
to the  
Amur Leopard and Tiger Alliance**

**Improving Monitoring Accuracy of Amur Leopards in Southwest Primorye, Russia**

**Grant Amount:** GBP 23,647  
**Award Date:** April 3, 2018  
**Grant Period:** April 3, 2018 - January 31, 2019  
**Report Period:** April 3, 2018 - January 31, 2019  
**WCS Reference:** 111059 / 2RU81

Budget Item	Proposal Budget (£)	Proposal Budget (USD)	Actual Expenses (USD)*
<b>Salary</b>			
Field technician @ \$1500/month for 7 months	8,295	10,500	12,548
Data management specialist @ \$1745/month for 3 months	4,136	5,235	5,956
Per diem to set camera traps (\$10/day for 30 days total for 2 people)	474	600	749
<b>Travel</b>			
Fuel for 4 months of fieldwork @ 400 liters/month and 1 L = \$1	1,264	1,600	2,075
Partial vehicle repair costs and purchase of tires	3,160	4,000	2,635
<b>Supplies</b>			
Lithium batteries (12 batteries/camera x 128 cameras @\$1/battery)	1,213	1,536	2,026
Additional cameras for new sites (and replacement of lost cameras): 18 cameras @\$350/camera	4,977	6,300	7,009
18 supplemental SD memory cards @ \$9/each	128	162	267
<b>Total</b>	<b>£23,647</b>	<b>\$29,933</b>	<b>\$33,265</b>

\*The difference between the proposal budget and the actual expenditures is due to the fluctuation in the exchange rate from the time of the proposal to the time the grant was received.

Approved by:

Janine VanStanden  
Director of Global Finance

5/3/2019

Date