

The First Population Assessment of the World's Snow Leopards (PAWS)

Minutes of meetings and Action plans

Summary

Governments of all snow leopard range countries have strongly emphasized the need for a robust estimation of the global population of the species, and expansive monitoring of their populations. This report summarizes the discussions on Population Assessment of the World's Snow Leopards (PAWS) among range country Governments that took place in a high-level official GSLEP meeting in Bishkek, Kyrgyzstan, during the Global Snow Leopard Forum. This meeting was followed by a technical workshop on PAWS that saw the participation of more than 20 international and range country organizations. PAWS is to be implemented under the general oversight of the GSLEP Steering Committee. A technical panel comprised of international experts and statisticians will provide technical oversight, and the training and delivery will be provided by various organizations and institutions that will work closely with the GSLEP Secretariat. A general organizational structure of PAWS is provided along with a pragmatic timeline.

Introduction

Snow leopards are the icon of high mountains. Their habitats serve as water-towers for large parts of Asia, provide ecosystem services to more than a billion people, and sustain unique high-altitude cultures. Apart from being rare, their secretive behavior and difficult to access habitat make it difficult to visually observe and monitor the species. The species faces serious threats to its survival, such as poaching and illegal trade, retribution killing by local people due to predation on livestock, climate change, mining, and large-scale infrastructure development. Increasing threats to the species require concerted conservation effort including making the development paradigm in the mountains more ecologically responsible.

Despite decades of research, robust population estimates about the species are available only from habitat patches cumulatively covering 2% of their entire distribution range, which too are biased towards best habitats, making projections about their populations unreliable.

Recognizing this, Governments of all snow leopard range countries have strongly emphasized the need for more robust and expansive monitoring of snow leopard populations, as reflected in the Bishkek Declaration 2017 and the [Kathmandu Resolution 2017](#) related to the [Global Snow Leopard and Ecosystem Protection Program \(GSLEP\)](#).

The International Snow Leopard and Ecosystem Conservation Forum 2017 (SL Forum 2017) in Bishkek set the goal of developing a robust estimate of the global snow leopard population. At a high-level meeting of officials, range country governments decided that this effort to end the uncertainty surrounding the size of the world's snow leopard population was to be given high priority by GSLEP.

Taking into account the amount of effort and resources that are already being invested in estimating snow leopard populations at local sites where various national and international conservation organizations are operating, and the need to maintain a statistical rigor, a follow up meeting was conducted which saw the participation of scientists and conservationists from over 20 organizations. This ambitious effort, PAWS or Population Assessment of the World's Snow Leopards, is to be completed in the next five years.

High-level meeting of Senior Officials:

GSLEP Forum August 24th, 2017

(Closed Session: Senior officials and GSLEP Steering Committee Observer Members)

Following the articulation of the issue of global snow leopard populations in the [Kathmandu Resolution](#), a meeting was held during the Forum 2017 to discuss the lack of a scientifically robust estimate of the world's snow leopard population in the wild. The meeting sought to chalk out a way forward. The issue of downlisting conservation status of snow leopard from endangered to vulnerable was also highlighted during the meeting.

The scientific and spatial inadequacy of the current estimates of snow leopard populations – that vary widely between 3000 to 8000 individuals – was discussed. It was agreed that there is little evidence and no systematic assessments to help understand whether the global snow leopard population is increasing, decreasing or stable, and in absence of data, we might be losing populations without even knowing that they existed.

The need for a collaborative framework facilitated by GSLEP Secretariat was expressed, that would involve multiple organizations and Government bodies involved in field sampling, sharing of data centrally, analysis and reporting of the results. The initiative would be undertaken with the help and involvement of local rangers, community members, and students who would be trained. The program thus would also be expected to contribute to capacity building. The need for ownership of the initiative by the range country governments and getting the support of partnering conservation organizations was emphasized.

Strong concerns were raised about the lack of such basic data about snow leopards, given the risks it poses in case decisions were being made in its absence. The delegate from Pakistan urged for the need to maintain "Precautionary Principle of the Rio Declaration" while taking decisions on issues having insufficient data. Given that vulnerability of a species gets exacerbated with unpredictable environmental conditions as a result of climate change, it is even more important to have a robust estimate of snow leopard populations. Countries emphasized the need and offered support from the on-going initiatives within their snow leopard habitats. All countries also urged development of practical, user friendly methods that can be implemented in the field.

Minutes of the PAWS Workshop with conservation organizations:

GSLEP Forum August 27th, 2017

(Open Workshop: Attended by Government officials, universities, NGO staff, statisticians, snow leopard experts and researchers)

Following approval from the range country governments and a formal endorsement of the Bishkek Declaration 2017 highlighting the need for an effort to estimate the global snow leopard population, the GSLEP Secretariat convened a workshop of invited experts, conservationists and Government officials. The aim of the workshop was to discuss the idea of PAWS and potential steps involved in achieving the goal of systematically estimating the global snow leopard population.

A presentation was made about the need for Population Assessment of the World's Snow Leopards emphasizing on the urgency and purpose. Emphasis was laid on the ownership of the program by the range country governments via the endorsement of Kathmandu Resolution and Bishkek Declaration 2017.

Various approaches were presented and discussed. Ideas discussed by the group included the possibility of piloting the exercise in the existing GSLEP landscapes, on-going conservation sites or starting by choosing sites following a more randomized design across the entire snow leopard range. A three-stage process was also considered where, in the first stage, sign surveys and interviews across large landscapes could lead to developing maps of snow leopard distribution and spatially heterogeneous probability of use. In the second stage, collaborative efforts in select sites could focus on camera trapping and/or genetic surveys. The third step would involve identification of individuals followed by population estimation through systematic spatial capture recapture modeling.

Prof. David Borchers, head of Statistics at CREEM, University of St. Andrews, explained the critical need for valid statistical designs. Participants also proposed developing a program that can engage citizen scientists in data collection and management. The statisticians emphasized that occupancy alone should not be used as a parameter to monitor abundance as patchiness and heterogeneity of densities within sampled areas can lead to spurious inferences. To stratify snow leopard habitats, one can use existing knowledge as well as collect fresh information from the field. If stratification is considered difficult, then the study design can rely upon collecting data from ample number of suitably randomized sites to be able to do design-based inference. Considering that both detection and failure to detect animals at sample points is informative, a good design will require sampling in areas with unknown snow leopard distributions as well as potentially low density areas that may not produce large number of snow leopard captures, but will be important estimates global snow leopard populations.

It was also considered that instead of a single method, different methodologies be used in different habitats depending on the logistics. The issue of the size of the intensive sampling area using camera traps or genetics were discussed where it was noted that targeting small study areas with high densities often result in inflated estimates of abundance.

To achieve the goal of obtaining global snow leopard populations, a ballpark \$5-7 million was estimated to be required over a period of 3-5 years.

All workshop participants unanimously agreed that this effort would need a collaboration between ecologists and statisticians, and would be a compromise between an ideal design and practicalities of

the difficulty of the terrain. A pilot survey was proposed for informing the sampling design. With a statistically sound design one has an objective and scientifically defensible basis for inference that can accommodate differing effort and focus in different areas without resulting in biased inference. As a first step, a spatial mapping was proposed of the on-going sampling efforts and/or investments by various partners. As an immediate follow up, a SWOT analysis of all methods and protocols was proposed to offer most efficient methods to the on-ground data collection teams.

Professor Borchers' session covered the following aspects:

1. Define objectives
 - Current Abundance, distribution
 - Future trends in abundance and distribution
 - Population level (what does this look like – what is the definition of a SL population?), regional level, global level?
2. Define survey region
 - GSLEP landscapes only or global landscapes?
 - Need to define survey region before deciding where to put effort
 - Stratify the survey region for precision
 - By habitat
 - Differing abundance and distribution
 - Examine trends – future regions, high impact climate change, etc
 - By national boundaries
 - By GSLEP landscape or not / national priorities
 - SL population (if possible)
3. Calculate how much effort should be put into each region
 - Need about 20 (random) sites to get a feel for the variance of density
 - Stratify on the basis of expected abundance/density
 - Fragmented habitat makes the design complicated
 - Allocate effort in a way that minimizes expected uncertainty of estimates; subject to practical and logistic constraints, putting more effort where there is higher density often achieves this.
4. Model-based inference: fit a density surface model: e.g. make a model based on elevation (an explanatory variable) to predict density
 - Can reduce variance by 'explaining' variation in density due to the explanatory variable
 - Can estimate density at higher resolution than survey strata
 - Generally less robust than design-based inference: if the model is wrong, inference may be biased
5. Power analysis for trends is crucial, but less so for single surveys
6. Data integration
 - Probability of occupancy – informs stratification
 - Abundance (camera traps)
 - Abundance (genetics)
 - Tag data – integrate into camera traps and occupancy (difficult to integrate into genetic data)
 - Covariates / explanatory variables (can stratify on these: eg elevation, distance from water, competitors, prey, etc)

The workshop concluded with identification of the immediate next steps, primary one being that of developing an action plan and sub-committees and panels to focus on different aspects (e.g. survey design, on-ground sampling, fund-raising and government oversight)

Moving forward

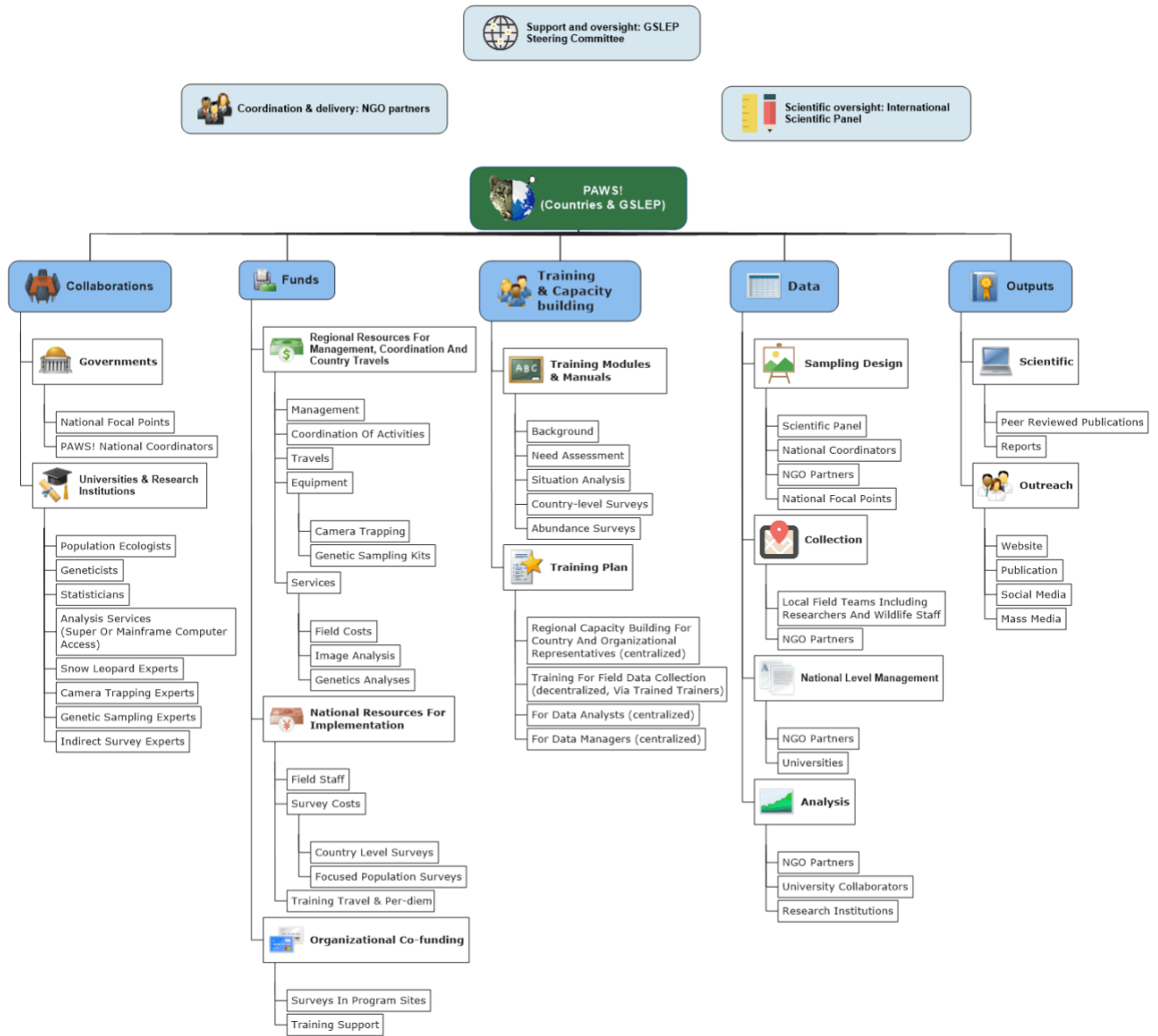
PAWS will be conducted under the general oversight of the Steering Committee of GSLEP.

For providing technical oversight and support, a panel comprising of statisticians, National Focal Points, and a few scientists, would be designated by the Steering Committee. Their primary role will be that of providing technical support and validating the credibility of the study design, data collection and analysis protocols, keeping in mind the field constraints.

Coordination and Delivery Committees will be created, and will include organizations and institutions who will work closely with the range countries to deliver on the specific goals of executing surveys and helping with subsequent data analyses. Organizations that have expressed an interest and support for the initiative include:

- 1 American University of Central Asia
- 2 NABU
- 3 Nature Conservation Foundation, India
- 4 National Trust for Nature Conservation, Nepal
- 5 Panthera
- 6 Patuxent Research Center, United States Geological Survey
- 7 Peking University
- 8 Shan Shui
- 9 Snow Leopard Conservancy
- 10 Snow Leopard Conservation Foundation
- 11 Snow Leopard Foundation in Kyrgyzstan
- 12 Snow Leopard Foundation, Pakistan
- 13 Snow Leopard Trust
- 14 Society for Conservation Biology Asia Section
- 15 University of St. Andrews
- 16 University of Massachusetts
- 17 University of Central Asia
- 18 Wildlife Conservation Society
- 19 WWF China
- 20 WWF India
- 21 WWF Mongolia
- 22 WWF Pakistan
- 23 WWF Russia

The following structure can be used to define the implementation of the PAWS:



Timeline

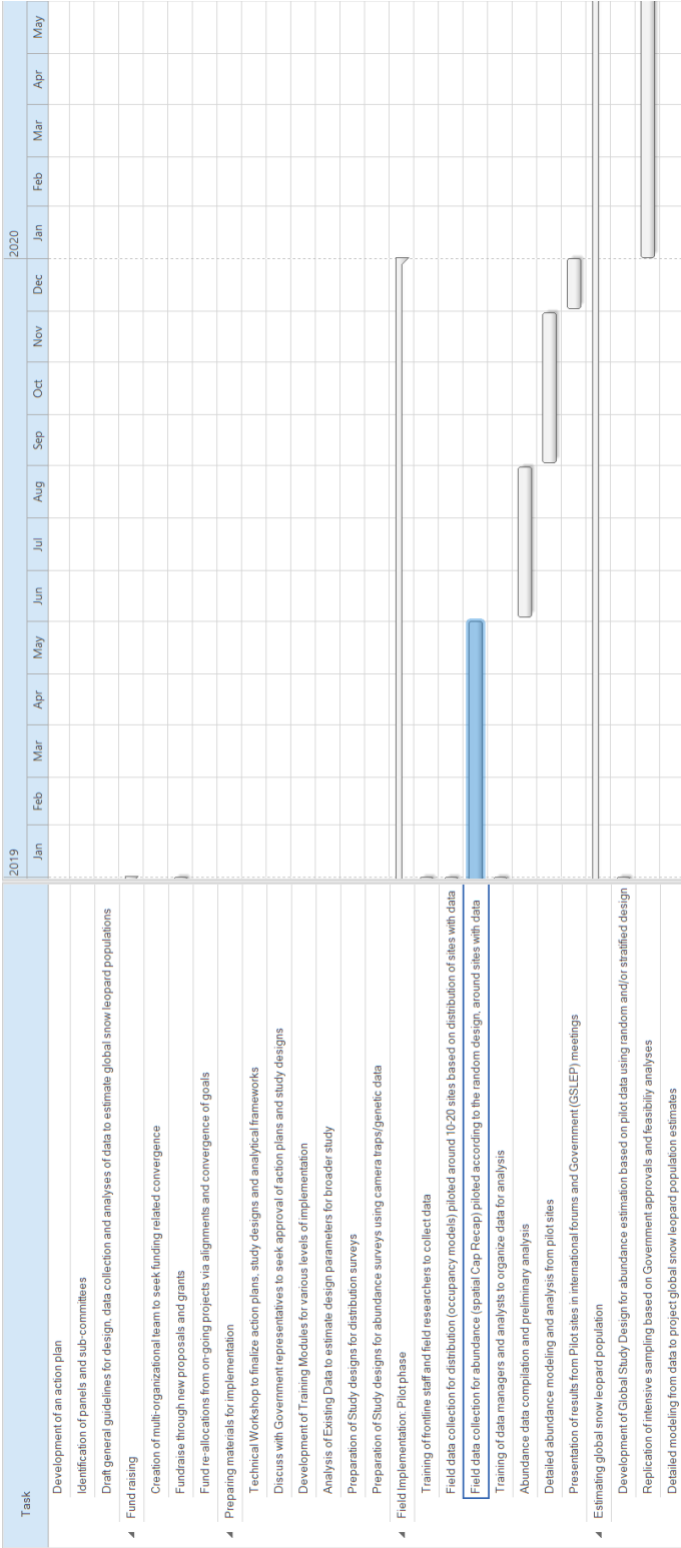
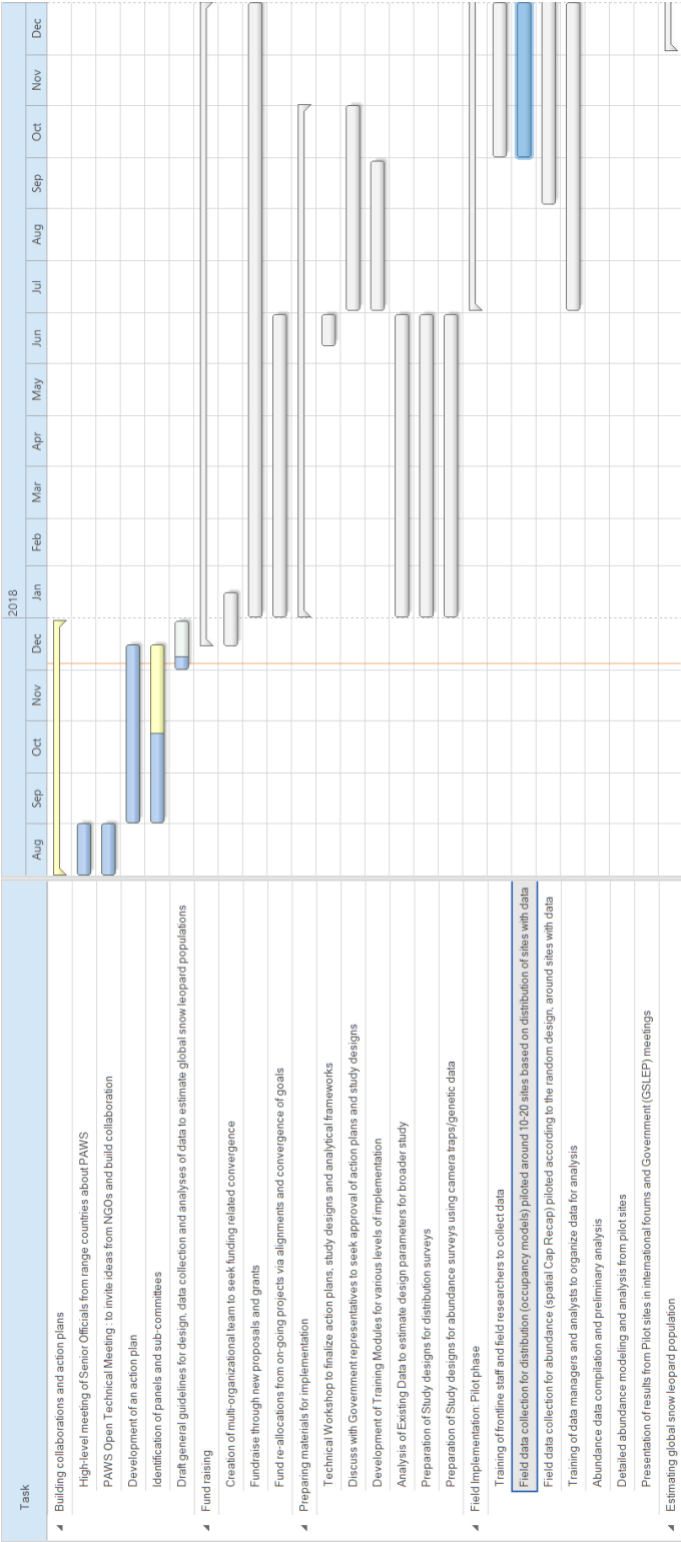
View as an interactive map with timelines [here](#):

- 1 Meeting on the need assessment of Population Assessment of the World's Snow Leopards: High-level meeting (August 24, 2017) of Senior Officials during the SL Forum 2017 between Government officials and GSLEP Steering Committee's observer member organizations. (August 2017)
- 2 PAWS Workshop: Open technical meeting to invite ideas from various organizations and snow leopard experts to materialize the goal into an actionable plan (August 2017)
- 3 Action Plan and identification of technical oversight committee (August-December 2017)
- 4 Draft Guidelines for design, data collection and analyses of data to estimate range-wide population of snow leopards (December 2017)
- 5 Creation of a multi-organizational teams to support various aspects of PAWS (December 2017-June 2018)
- 6 Fundraising and funds allocations from on-going projects to enable training, field data collection, data organization, analysis and reporting from pilot sites (January-December 2018)
- 7 Technical workshop to establish action plans, designs and analytical frameworks (June 2018)
- 8 Obtain Government support for implementation of surveys and approval of methods (July-October 2018)
- 9 Development of a training program and manuals for various levels (field rangers, students, NGOs, data managers and analysts) (July-September 2018)
- 10 Analysis of existing data to estimate parameters to develop study design for data collection (January-June 2018)
- 11 Study designs prepared to collect data on distribution of snow leopards (January-June 2018)
- 12 Study designs prepared to collect data on abundance of snow leopards using camera trapping and genetic data analysis (January-June 2018)
- 13 Training of field rangers and students to collect data in the field (October-December 2018)
- 14 Field data collection piloted in 10-20 sites based on on-going sampling and a representative number of sites sampled to inform about the variability in density (October-December 2018)
- 15 Training of data managers and analysts to organize data into formats that can be analyzed systematically (July-December 2018)
- 16 Abundance data compilation and preliminary analysis (June-August 2019)
- 17 Detailed population modeling and analysis of pilot sites (September-November 2019)
- 18 Presentation of results and from pilots to Governments and International community of donors, funding partners (December 2019)
- 19 Development of global study design for estimating the world's snow leopard population (December 2019)
- 20 Replication of intensive sampling in sites approved by range countries' governments with support from international organizations, conservationists and institutions (repeating steps 8 through 16) (January 2020-December 2021)
- 21 Detailed modeling from the data to project global snow leopard population estimates (January 2022)

Gantt Chart of proposed activities:

2017-2018

2017-2018



Appendix 2 (Attendees for PAWS! Workshop)

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