Training Manual for Long-term Monitoring of

UNGULATES

Wildlife Conservation Society

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Training Manual for Long-term Monitoring of Ungulates

Contributors

Paul R. Elsen, Sorosh Poya Faryabi, Gautam Surya, Zalmai Moheb, B. Alexander Simmons

With reference to methodologies described by

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Graphics designed by B. Alexander Simmons

2300 Southern Boulevard
Bronx, New York 10460
United States of America

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CONTENTS

1 INTRODUCTION

Climate change threatens biodiversity by altering the climate conditions under which species have evolved, forcing species to adapt, shift their ranges, or face local extinction[1]. Over the last few decades, climate change has already led to widespread range shifts[2], declines in species abundances[3], and full species-level extinctions[4]. These biodiversity losses have profound impacts on ecosystem structure, processes, and services, as well as multiple aspects of human well-being[5]. Wildlife species with ranges tightly linked to climate variables will be most impacted by climate change, and these species can serve as important indicators of changing climate conditions on the ground. Monitoring these species in the wild, and the habitats on which they depend, is thus essential for optimizing conservation planning to mitigate environmental, economic, and social vulnerabilities to climate change.

The availability of wild ungulate prey is one of the most important determinants of large carnivore density[6]. Ungulates also play an important role in maintaining ecosystems by influencing the vegetation structure, plant species composition and nutrient cycling[7]. Maintaining and monitoring ungulate populations is therefore an important objective of conservation management.

Effective conservation of vulnerable[8] carnivores, such as the snow leopard, demands efficient conservation of their mountain ungulate prey. Currently, almost no robust estimates of abundance and densities of snow leopard prey species, such as the Himalayan ibex, markhor and bharal, exist. Hunting, habitat modification, increased livestock grazing, disease and development are the major current threats faced by most mountain ungulate species[9]. It is important to have robust estimates of mountain ungulate populations to estimate the effectiveness of conservation interventions. Due to remoteness and lack of scientific expertise in most mountainous areas of the world, researchers suggest participatory monitoring of mountain ungulates with local people to complement scientific surveys[10]. The double observer survey is a simple, cheap and relatively fast method while also being statistically robust and

[1] Araujo, M. B., Science, C. R. (2006). How does climate change affect biodiversity? Science 313: 1396-1397.
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[9] McCarthy, T. M., Chapron, G. (2003). Snow leopard survival strategy. ISLT and SLN, Seattle.
[10] Singh, N. J., Milner-Gulland, E. J. (2011). Monitoring ungulates in Central Asia: current constraints and future potential. Oryx 45: 38-49.

sufficiently precise for ecological studies. In participatory monitoring efforts, it can provide a robust platform to plan long-term mountain ungulate population monitoring as well as scientific studies demanding robust population estimates.

Survey objectives

The ungulate monitoring protocol in this manual has been developed to track ungulate (e.g., urial, ibex, argali) population abundance and distribution changes in response to climate change. The methodology consists of standardized practices for recording direct observations of ungulates in the wild and has been designed to ensure reproducibility across survey teams and geographic areas.

Important considerations

When conducting long-term monitoring of ungulates, some foundational expertise is required. This training manual is not a replacement for a field guide. It is expected that at least one person conducting the surveys is skilled at identifying ungulates, classifying ungulates by sex and age group, and distinguishing different types of behaviors (e.g., resting, foraging). Additionally, the double-observer count method described in this manual is sensitive to population changes. Two independent surveys are required, under the following assumptions:

> *Each group of ungulates detected can be individually identified by the survey teams. Immediately after surveys are finished, the teams should discuss and compare their groups (composition, location, time of day) to minimize double counting.*

> *The surveyed population should be closed during the survey time (i.e., no individuals immigrating/emigrating during the survey period). Selected areas should be clearly delimited before surveying, and areas that can be completely surveyed in one day are preferred.*

> *The survey should generate simple random samples of all the ungulate groups in the population. Teams should ensure that the exact same area is surveyed to its maximum extent.*

How to use this manual

This manual provides step-by-step instructions for conducting ungulate surveys in the field.

Chapter 2, "Selecting a Site," outlines important considerations for choosing where to conduct the survey and how to create appropriate transects.

Chapter 3, "Preparations," discusses what surveyors should know before going into the field, such as the time and frequency of surveying, the number of surveyors required, and necessary equipment.

Chapter 4, "Field Setup," instructs surveyors on what to do once they arrive to the survey site and prepare to start the survey.

Chapter 5, "Field Methodology," provides step-by-step instructions for conducting the survey.

Chapter 6, "Reporting," gives additional detail on how to properly record the necessary data, such as how to classify ungulate groups.

Chapter 7, "Resources," lists some useful data, tools, and other resources available to surveyors for conducting the survey.

Finally, the Appendix contains copies of ungulate datasheets that surveyors can print and use in the field to record the necessary data in their study area.

2 SELECTING A SITE

The survey areas should be selected based on the basic habitat needs of the targeted species.

NOTE: Maps of ungulate occurrences or species distribution models are necessary for determining where to establish survey areas. If these resources are unavailable or unknown to the team, it may be useful to refer to data layers included in the Adapt Afghanistan web platform (https://adaptafghanistan.com) and in the Global Biodiversity Information Facility (https://gbif.org; see Chapter 7).

Create clusters of vantage points within an area that can be surveyed in one day. Try to keep the number of vantage points consistent for each survey area. When choosing areas and vantage points, keep in mind the following criteria:

Survey areas should be accessible and avoid potentially dangerous areas (e.g., areas of treacherous terrain or areas with possibilities of land mines).

Survey areas should include a combination of locations where the species are known to be present and absent (excluding wetland or glaciers).

Survey areas should be large (30-40 km^2) and easily delimited by prominent features in the landscape (e.g., mountain ranges, rivers).

Survey areas should be representative of the entire study area.

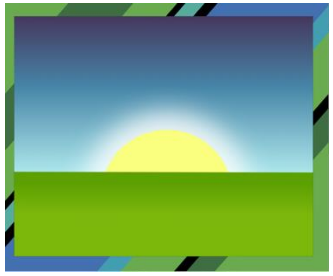
NOTE: The number of survey areas required may vary by the species being surveyed. As a guide:

For Marco Polo sheep, it is recommended to use a minimum of 5 vantage points per site.

For urial and ibex, the minimum recommended number of vantage points is 7 per site.

More vantage points may be necessary in areas with complex terrain or when population densities are high.

3 PREPARATIONS



Time

The survey should be conducted during daylight hours, starting when it is light enough to ensure excellent visibility (e.g., objects can be detected 2-3 km away) and generally concluding by midday. The exact timing of the surveys should consider the different start times of the two teams.

Duration

Daily surveys should not exceed 8 hours per team. Surveys should be conducted at a maximum walking speed of 2 km per hour.

Frequency

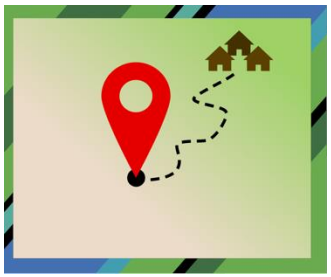
Surveys should be conducted once per year (twice per year if budget allows), and each survey season should not exceed 18 days.

Team

The double-observer count methodology described in this manual requires two teams consisting of three people each. Observer 1 serves as the primary observer, counting ungulates and measuring their distances. Observer 2 serves as the note-taker/reporter but can assist with observations if needed. Observer 3 serves as a general supervisor, ensuring that the survey is following the protocol, and may assist with observations as needed.

The two teams will survey the exact same areas each day. Team 1 will start surveying one hour before Team 2 starts surveying. It is crucial that the two teams remain independent from each other in their data collection. Team 2 should not observe where or how Team 1 is surveying their area. Team 2 does not need to take the same route as Team 1, but they must survey the same area from the same vantage points. If the two teams come into contact or need to communicate during the survey, they should not

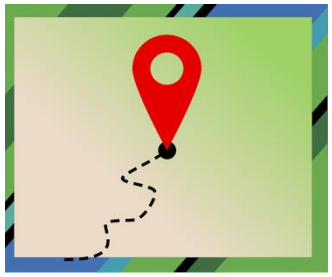
discuss their results. Once both teams are finished with surveying for the day, survey observations should be compared between the teams. It is assumed that both teams have a similar ungulate detection capacity and similar quality of equipment.



Arrival

It is important for the teams to arrive at the selected start point one day in advance and spend the night in close proximity.

4 FIELD SETUP



1. Navigate your GPS to the selected start point.

2. Turn on your GPS's track mode to measure the distance walked during the survey.

3. Before you begin, record the basic information about the survey:

- Date
- Team number
- Name of team members
- Start time of the survey
- Weather conditions
    - Percent cloud cover
    - Mist or fog (*high*, *low*, or *no wind*)
    - Wind (*high*, *low*, or *no wind*)

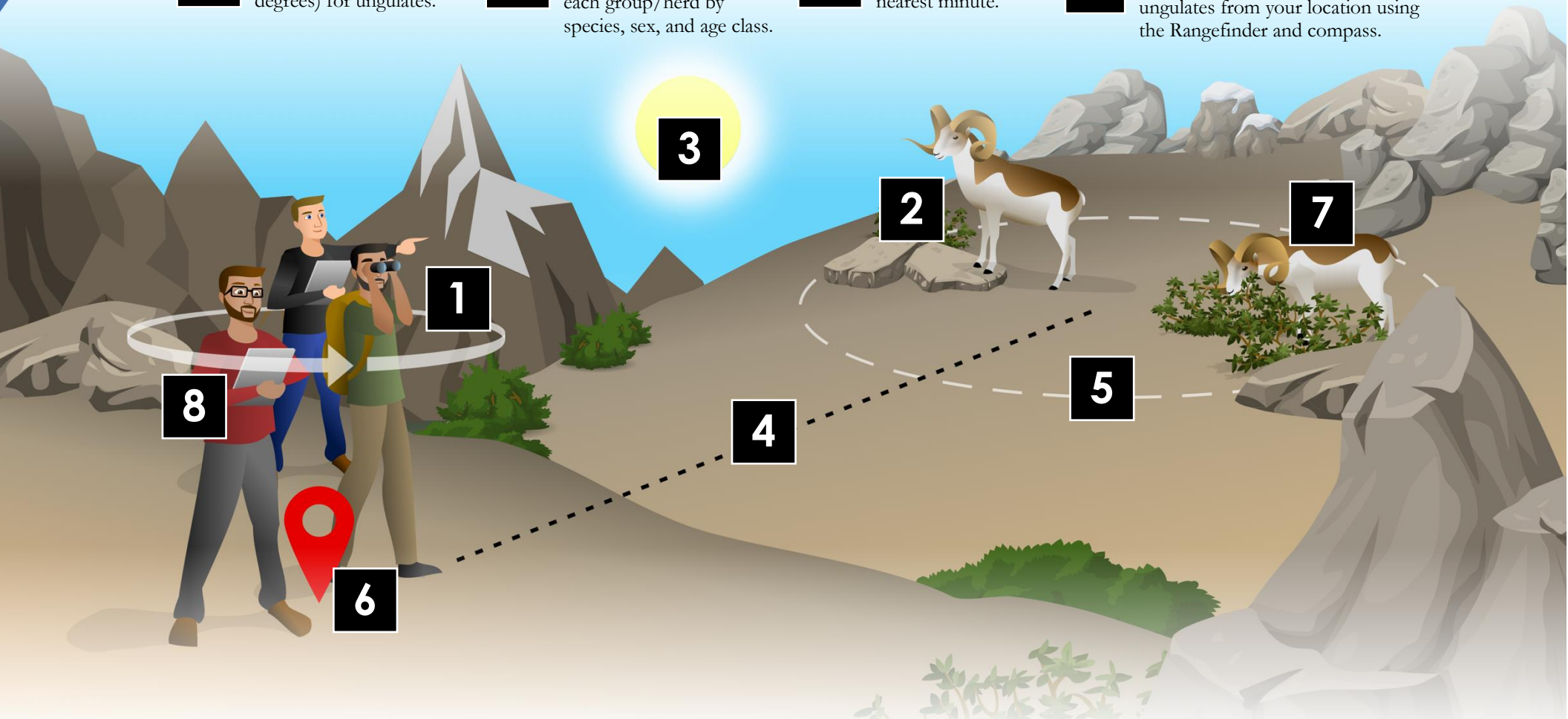
5 FIELD METHODOLOGY

1 At each vantage point, scan the entire area (360 degrees) for ungulates.

2 Record the number of ungulates observed in each group/herd by species, sex, and age class.

3 Record the time of observation to the nearest minute.

4 Record the distance and direction (in degrees) of each group of ungulates from your location using the Rangefinder and compass.



5 Record the location of each group of ungulates according to the topography scale.

6 Record your location at the time of observation (region or zone, GPS coordinates, altitude, vantage point).

7 Record any relevant comments about ungulate behavior, movement, their location, or notable conditions.

8 Repeat steps 1-7 at each vantage point. When finished for the day, record the end time of the survey and the weather conditions.

6 REPORTING

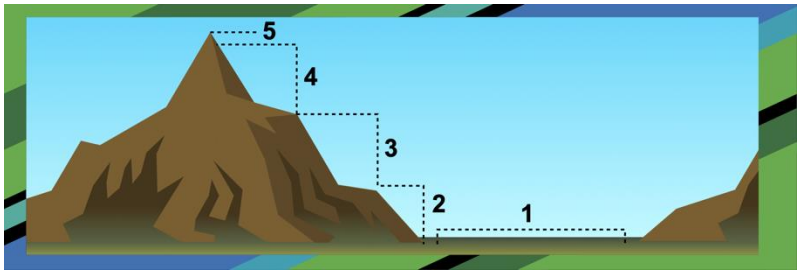
Classifying ungulates

Record each species of ungulates according to the following sex and age categories:

- Male > 4 years
- Male 2-4 years
- Female > 4 years
- Female 2-4 years
- Youngling 1-1.5 years
- Lamb < 1 year
- Unknown

Topography scale

When describing the topography of the area where ungulates are observed, select the most appropriate category based on the scale below, where 1 = floodplain or valley floor, 2 = the base of the mountain (lowest third), 3 = midway up the mountain (middle third), 4 = below the ridgeline or peak (top third), and 5 = mountaintop, peak, or ridge.



Ungulate comments

Report the ungulates' behavior in terms of what they are doing (sleeping, grazing, fighting, moving). If moving, note the direction they are traveling. Also note any unique features (e.g., broken horns, limping, any unusual or distinctive markings), whether there are young, and any other notable points.

Data management

When you return from the field, the two teams should consult with each other to compare notes and identify common and individual groups observed before beginning the next day's survey. Transfer all data from the paper datasheets into a digital spreadsheet (e.g., Microsoft Excel) and save the file.

7 RESOURCES

Adapt Afghanistan: An online repository of over 1,000 spatial data layers related to climate change vulnerability and resilience covering climate, natural hazards, ecosystems, biodiversity, hydrology, and local community sectors. https://adaptafghanistan.com

Global Biodiversity Information Facility (GBIF): An online repository of species occurrence locations. https://gbif.org

8 APPENDIX: SAMPLE DATASHEET

The following page is a sample datasheet surveyors can use to record the necessary data in the field. We recommend surveyors review the structure and content of the datasheet before going into the field. Surveyors should print as many copies of the datasheet as they might need to use based on the number of survey sites selected.

Date: ______________________ **Team number**: _____ **Names of team members**: ____

Start time: ______________________ **Cloud cover <u>at start</u>**: _________ % **Wind conditions <u>at start</u>** (circle one): High Low No wind

End time: ______________________ **Cloud cover <u>at end</u>**: _________ % **Wind conditions <u>at end</u>** (circle one): High Low No wind

Species	**Age and sex**							**Time** (HH:MM)	**Distance** (in m)	**Direction** (in deg.)	**Topo. scale**	**Region**	**GPS coord.**		**Altitude** (in m)	**Vantage point**	**Comments**
	Male > 4 yr	Male 2-4 yr	Female > 4 yr	Female 2-4 yr	Youngling 1-1.5 yr	Lamb < 1 yr	Unknown						Lat.	Long.			