Training Manual for Long-term Monitoring of

PIKAS

Wildlife Conservation Society

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Training Manual for Long-term Monitoring of Pikas

Contributors

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With reference to methodologies described by

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Elsen, P. R., Poya Faryabi, S., Surya, G., Grantham, H. S. (2021). *Indicators assessment protocol vulnerability assessment for the Panj-Amu River Basin*. Unpublished report. Wildlife Conservation Society, Bronx, NY.

Moheb, Z. (2019). *Pika and marmot long-term monitoring protocol for Wakhan and Bamyan National Parks*. Wildlife Conservation Society, Afghanistan.

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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.

Pikas (*Ochotona* spp.) are an herbivorous semi-fossorial species inhabiting high altitudes in Afghanistan[6]. They are considered a keystone species, playing an important role in providing ecosystem services to other species across their habitat[7]; Pikas are highly sensitive to changes in temperature, snow cover, and other climate features, making them highly susceptible to the impacts of climate change. Given their sensitivity, pikas have been considered a climate change indicator species worldwide[8].

Survey objectives

The pika long-term monitoring protocol in this manual has been developed to track pika population abundance and distribution changes in response to climate change. The methodology consists of standardized practices for recording direct and indirect observations of pikas in the wild and has been designed to ensure reproducibility across survey teams and geographic areas.

Important considerations

Different species of pika live in different habitats, thus requiring different monitoring protocols. This manual describes two different methods for surveying pikas: one based on the rock-dwelling large-eared pika (*Ochotona macrotis*) and one based on the field-dwelling Afghan pika (*Ochotona rufescens*). Surveyors should be aware of the type of pika they will be surveying and their habitat requirements and follow the appropriate methodology.

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[1] Araujo, M. B., Science, C. R. (2006). How does climate change affect biodiversity? Science 313: 1396-1397.
[2] Chen, I., Hill, J., Ohlemüller, R., Roy, D., Thomas, C. (2011). Rapid range shifts of species associated with high levels of climate warming. Science 333: 1024-1026.
[3] Root, T., Price, J., Hall, K., Schneider, S., Rosenzweig, C., Pounds, J. (2003). Fingerprints of global warming on wild animals and plants. Nature 421: 57-60.
[4] Pounds, J., Fogden, M., Campbell, J. (1999). Biological response to climate change on a tropical mountain. Nature 398: 611-615.
[5] Díaz, S., Fargione, J., Chapin, F. S., III, Tilman, D. (2006). Biodiversity loss threatens human well-being. PLoS Biology 4: 1300-1305.
[6] Habibi, K. (2003). Mammals of Afghanistan. Zoo Outreach Organization, US Fish and Wildlife Service.
[7] Lai, C. H., Smith, A. T. (2003). Keystone status of plateau pikas (*Ochotona curzoniae*): effect of control on biodiversity of native birds. Biodiversity and Conservation 12: 1901-1912.
[8] Rodhouse, T., Hovland, M. (2015). Pika Monitoring at Crater Lake National Park, Craters of the Moon National Monument and Preserve, Lassen Volcanic National Park, and Lava Beds National Monument. 2010-2014 Report. Natural Resource Data Series NPS/UCBN/NRDS-2015/782.

When conducting long-term monitoring of pikas, 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 pikas by sight and sound, classifying observed pikas by age group, and distinguishing different types of pika behaviors (e.g., resting, foraging). Additionally, the methodology requires some basic knowledge of different types of vegetation (e.g., grasses, forbs, shrubs) and the ability to identify evidence of ungulate grazing.

How to use this manual

This manual provides step-by-step instructions for conducting pika 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 pikas, burrows, ground cover, and topography.

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

Finally, the Appendix contains copies of pika 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 sites should be selected based on the species basic habitat needs. Rock-dwelling pikas (e.g., *Ochotona macrotis*) prefer talus areas along valleys where they can shelter under rocks. Field-dwelling pikas (e.g., *Ochotona rufescens*) prefer grassland areas in the vicinity of water bodies along valleys where they can burrow. Two to five survey sites should be selected in a given study region, with 15-20 point locations per survey site.

NOTE: Maps of pika occurrences or species distribution models are necessary for determining where to establish survey sites. 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).

Randomly select 12-15 points to survey in a single day.

The preferred approach would be to create random points using GIS (e.g., using the "Create Random Points" tool in ArcGIS Pro or an equivalent tool in QGIS, R, etc.; see Chapter 7).

NOTE: When selecting points, keep the following in mind:

Survey sites should be in valley bottoms and other gentle slopes (<35 degrees).

Survey sites should be in mid-elevations between 1900-4000 m (potentially higher or lower depending on the altitudinal range of the pika species being surveyed).

Survey sites should not be located near water bodies, cliff edges, or human settlements. However, some pikas have been observed near aylqs (areas where herders keep their sheep and goats), so some small, remote settlements may still be appropriate locations.

Survey sites should reflect different elevation ranges representative of the study area.

Survey points should be at least 500 m apart from each other.

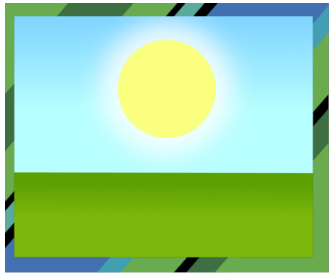
3 PREPARATIONS

Frequency

Surveys should be conducted annually or every two years to estimate annual turnover in site occupancy. You should aim to conduct surveys on the same dates as previous years during normal weather conditions. However, you may want to survey earlier than previous years if snowpack is low with little rainfall in the spring. You should survey later than normal in years with heavy snowpack and no rain to wash away the snow.

Duration

Surveys should be conducted for a minimum of 15 minutes (for little or no pika evidence) and a maximum of 30 minutes (for dense pika populations). Surveys will need to be conducted at the same site for at least two consecutive days.



Time

The survey should be conducted during the day when pikas are active above ground (7am-5pm).

Team

For **rock-dwelling pikas**, two teams of at least two surveyors are required. On the first day of monitoring, the two teams will survey different locations. On the second day, the teams will swap survey locations; Team 1 will survey the locations previously surveyed by Team 2, and vice versa. Each team must wait 24 hours before surveying a location that was previously surveyed.

For **field-dwelling pikas**, one team of at least two surveyors is required. After the team surveys one plot, they will need to return to the same plot at the same time the next day. A single plot should not be surveyed more than three days in a row.

Survey Equipment

- [x] Binoculars (2)
- [x] GPS unit (2)
- [x] Digital camera (2)
- [x] Compass (2)
- [x] Measuring tape (2)
- [x] Thermometer (2)
- [x] 15 m string, with 1 m markings (2)
- [x] Nails/poles (10)
- [x] Map of study area/survey sites
- [x] Notebook and pens
- [x] Paint
- [x] Batteries (as needed)
- [x] Solar battery charger (if needed)

! Additional equipment for communication, camping, and cooking in the field may be necessary

4 FIELD SETUP

1. Navigate your GPS to the selected point.

2. Randomly toss a pen in the air and let it fall onto the ground.

3. Walk 15 m in the direction of the tip of the pen and establish the center of the plot.

4. Determine if the habitat within the plot (12 m radius) is suitable for pikas. Sites occurring in areas with <10% of pika habitat should either be moved 50 m from the site or completely abandoned if the area is completely unsuitable for pikas. If changing or abandoning the area, document your rationale and take a photo of the area.

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

- Date
- Site name
- Patch name
- Plot number
- Number of surveyors
- Name of surveyors
- Start time of the survey
- GPS location of plot
- Elevation, slope, and aspect of plot
- Weather conditions
    - Percent cloud cover
    - Wind
      (*high*, *low*, or *no wind*)

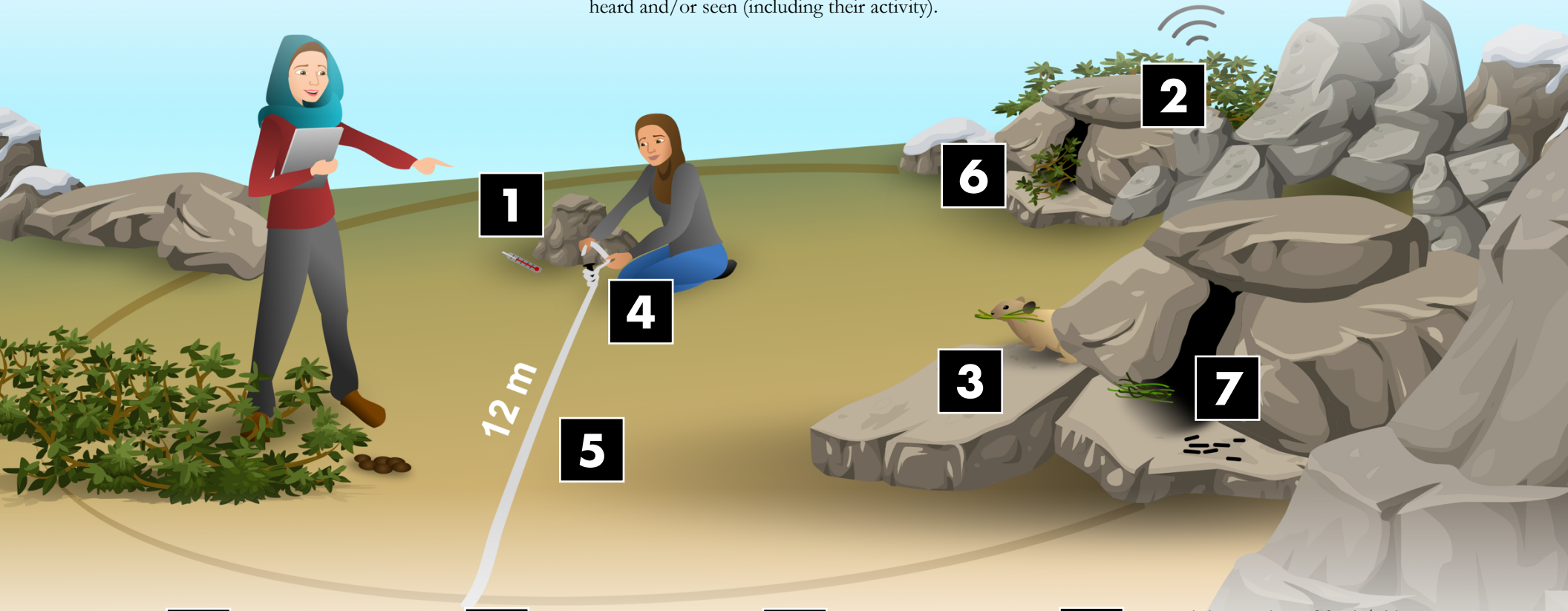
5 FIELD METHODOLOGY

Rock-dwelling pikas

1 Place a manual thermometer in a shadow at the center of the plot.

2 For at least 5 minutes, toss small rocks in a random direction and listen for any territory or alarm calls from pikas within 12 m of the plot. Record the number of adult and juvenile pikas heard and/or seen (including their activity).

3 For at least 5 minutes, silently search for pikas within 12 m of the plot. Record the number of adult and juvenile pikas heard and/or seen (including their activity).



4 Nail a pole into the ground at the center of the plot and tie a rope to the pole.

5 Use the rope to delineate a circular plot around the center pole with a 12 m radius.

6 Record the number of active and abandoned burrows within the plot.

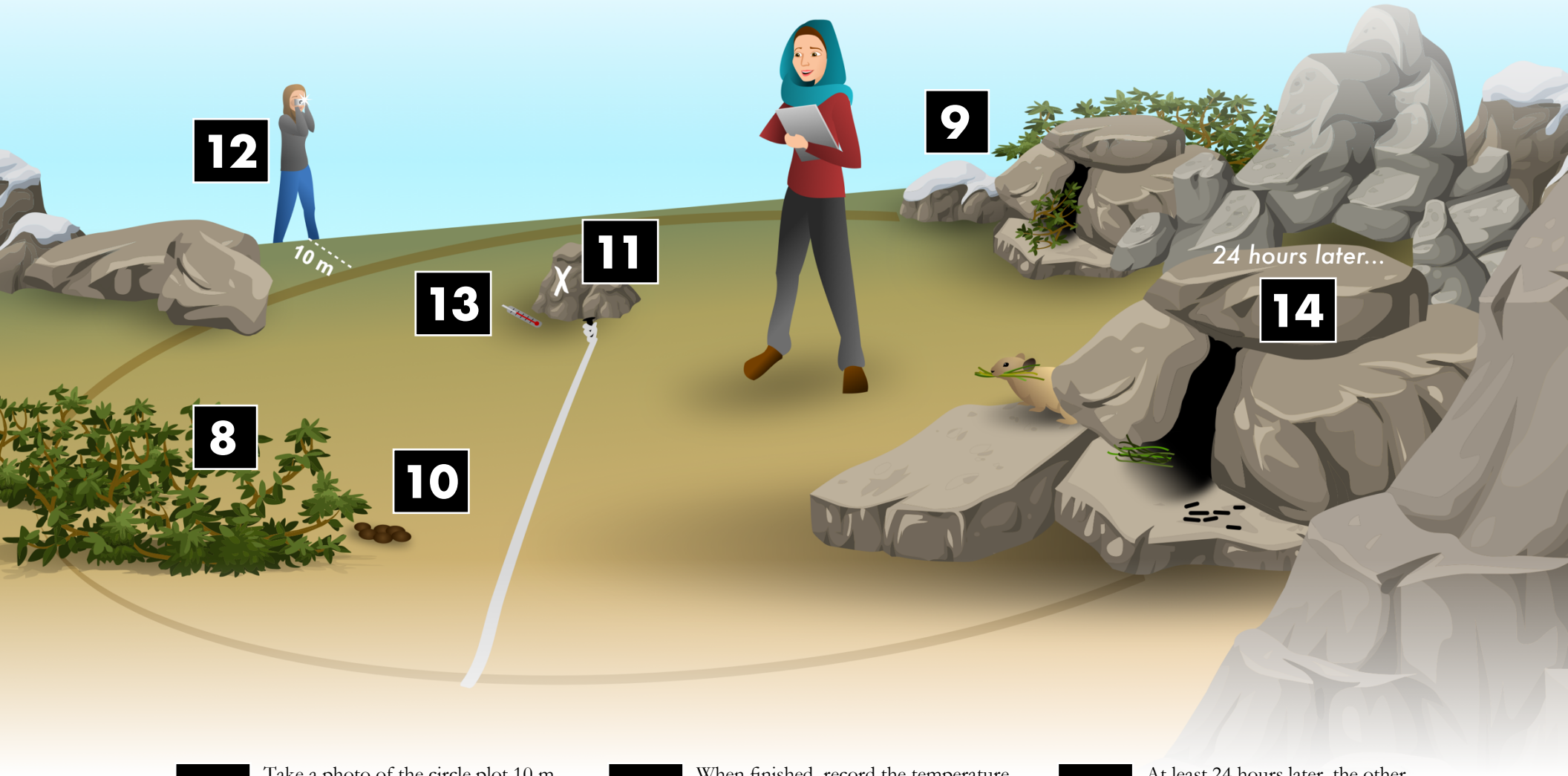
7 Record the number of fresh/old pellet groups and fresh/old hay piles within the plot. Include how you distinguished between fresh and old.

8 Estimate the percent ground cover within the plot.

9 Record the presence of snow within 100 m of the plot.

10 Record the intensity of grazing within the plot.

11 Mark the center of the plot for future relocation purposes (e.g., by painting on a prominent stone).



12 Take a photo of the circle plot 10 m from the edge of the rope.

13 When finished, record the temperature and end time of the survey.

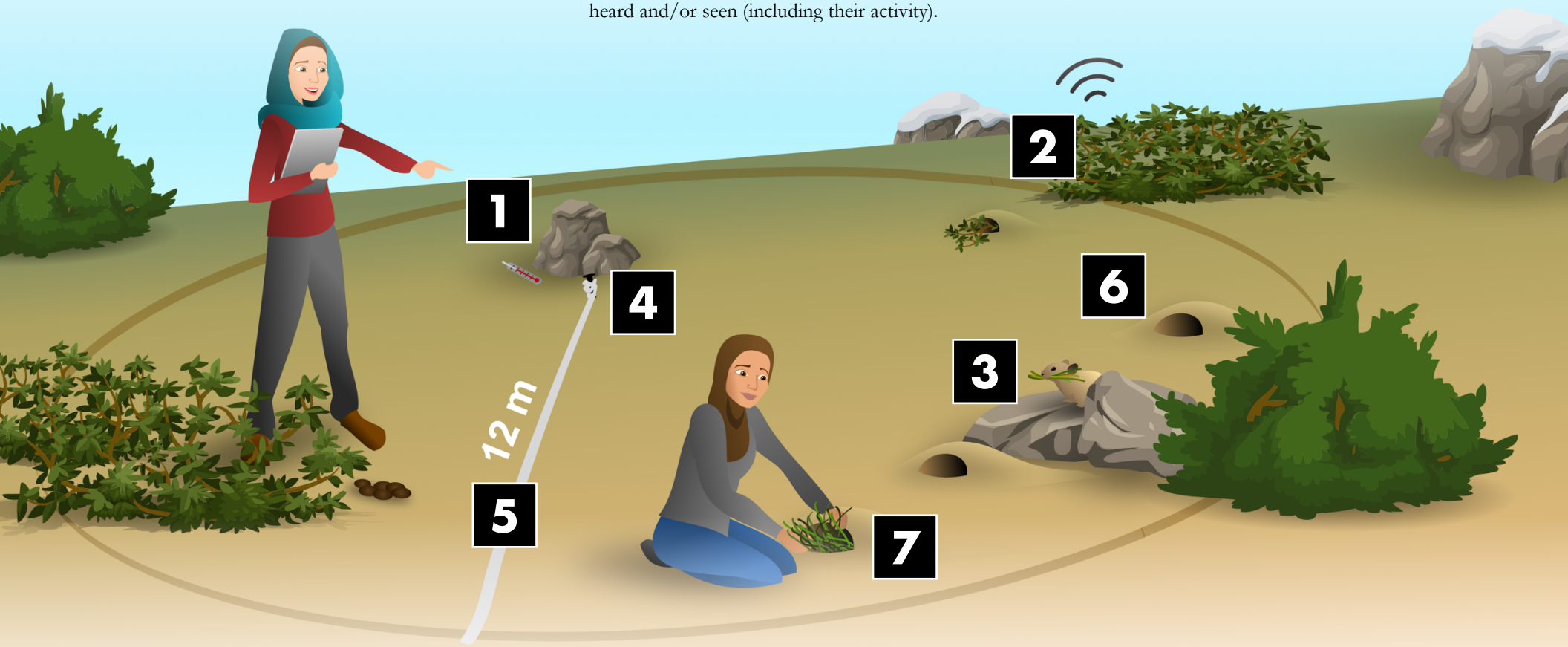
14 At least 24 hours later, the other team will repeat steps 1-13.

Field-dwelling pikas

1 Place a manual thermometer in a shadow at the center of the plot.

2 For at least 5 minutes, toss small rocks in a random direction and listen for any territory or alarm calls from pikas within 12 m of the plot. Record the number of adult and juvenile pikas heard and/or seen (including their activity).

3 For at least 5 minutes, silently search for pikas within 12 m of the plot. Record the number of adult and juvenile pikas heard and/or seen (including their activity).



4 Nail a pole into the ground at the center of the plot and tie a rope to the pole.

5 Use the rope to delineate a circular plot around the center pole with a 12 m radius.

6 Record the number of fresh and old burrow holes within the plot.

7 Cover the burrow holes with litter or other easy-to-remove materials. Record the number you've plugged-in and what material you used.

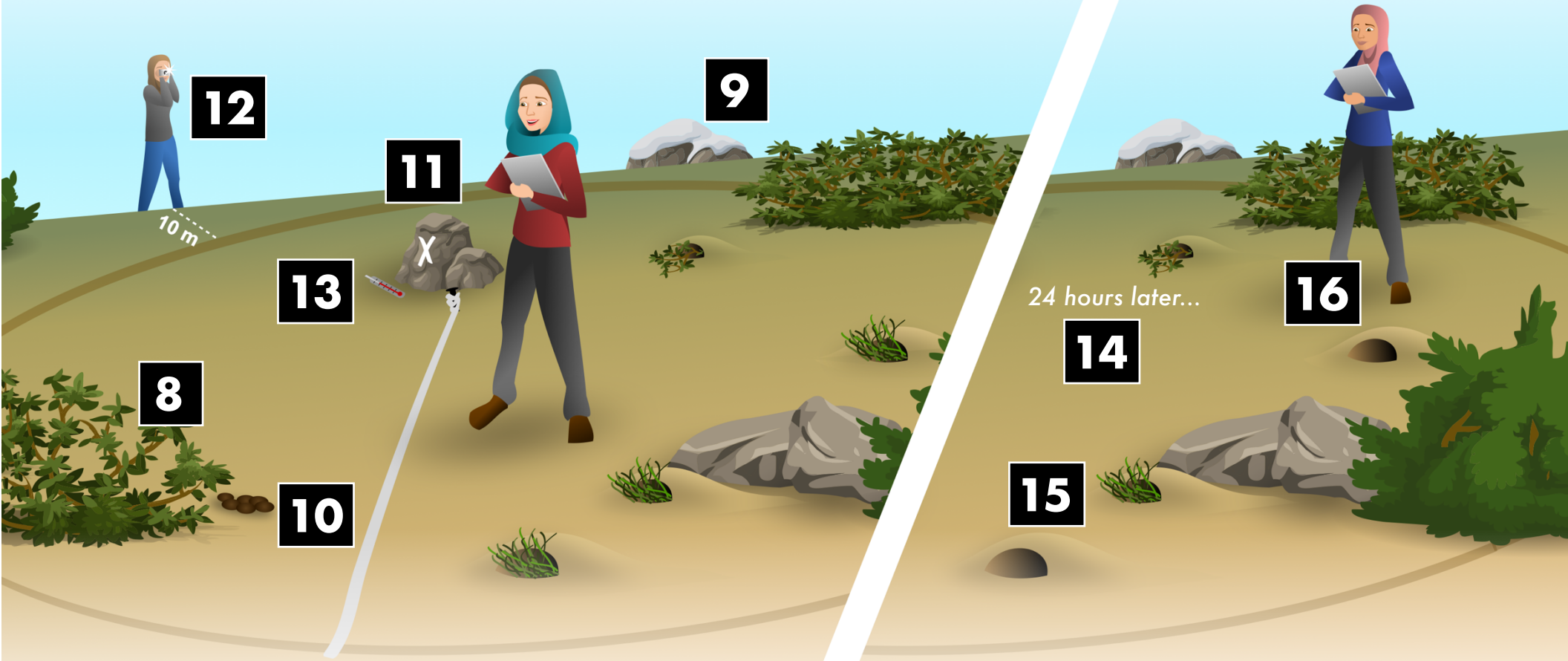
8 Estimate the percent ground cover within the plot.

9 Record the presence of snow within 100 m of the plot.

10 Record the intensity of grazing within the plot.

11 Mark the center of the plot for future relocation purposes (e.g., by painting on a prominent stone).

12 Take a photo of the circle plot 10 m from the edge of the rope.



13 When finished, record the temperature and end time of the survey.

14 After 24 hours, return to the plot and repeat steps 2-5.

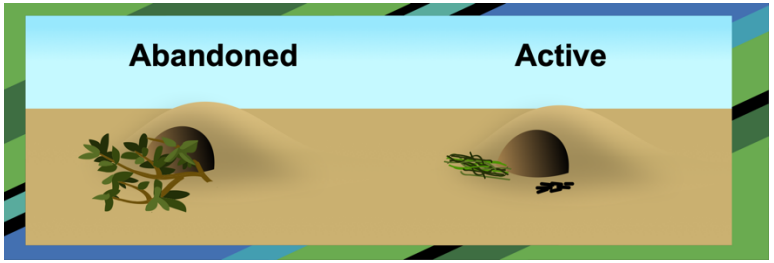
15 Record the number of burrow holes that remain covered and the number that have been re-opened.

16 If you plan to return a third day, cover the re-opened holes, record the number you've plugged-in, and repeat steps 14 and 15. If surveying is complete, do not cover the re-opened holes.

6 REPORTING

Classifying burrows

Abandoned burrows can be determined by the presence of debris at the entrance of the burrows. Active burrows have a clear entrance with no debris and may have fresh fecal pellets or hay piles near the entrance.



Classifying fecal pellets

Fresh pellets are typically dark brown, contain green plant material, and are mounted together by urine or mucous. Old pellets are dry, scattered, and have a gray color.

Classifying hay piles

To be considered a hay pile, there must be an accumulation of at least 10 separate sprigs of vegetation on top of each other.

Grazing

When describing the degree of grazing intensity within a plot, sue the following categories: (1) heavily grazed, (2) lightly grazed, or (3) no grazing. Use your best judgement when choosing a category.

Location topography

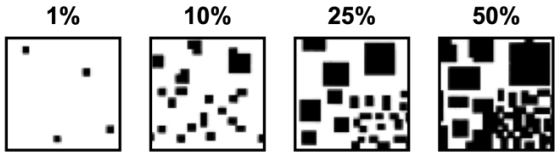
To record the aspect of the plot, stand at the center of the plot and see what direction the runoff water will flow. Take the compass bearings of that direction and record in degrees.

Ground cover

When describing the ground cover in a plot, indicate the percent of the area composed of the vegetation categories below:

- Graminoids (grass and sedges)
- Forbs (all flowering herbaceous plants)
- Shrubs (woody plants)
- Trees (woody plants taller than 5 m)
- Rocks (scree and talus)
- Barren land (dead vegetation, litter, dirt)
- Other (write in ground cover if none of the above)

Use your best judgement when estimating percent coverage. Below are some examples of different percent vegetation cover estimates when looking down from above:



Adapted from Kansas Geological Survey (1976). Criteria for Making and Interpreting a Soil Profile Description. University of Kansas.

Data management

When you return from the field, 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

Create Random Points: A tool for creating random points in ArcGIS Pro. https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/create-random-points.htm

8 APPENDIX: SAMPLE DATASHEETS

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

ROCK-DWELLING PIKAS

Site name: _____ **Patch name**: _____ **Plot No.**: _____

First Day

Date: _____ **Number of surveyors**: _____ **Names of surveyors**: _____

GPS coordinates: Lat: _____ , Long: _____ **Elevation**: _____ m **Slope**: _____ deg. **Aspect**: _____ deg.

Cloud cover: ____ % **Temperature**: _____ °C **Wind** (circle one): High Low No wind **Grazing** (circle one): Heavy Light None

Snow (circle one): Present Absent **Start time**: _____ **End time**: _____ **Photo number**: _____

No. of pikas heard	No. of adults seen	No. of juveniles seen	Description of pika activity	No. of abandoned burrows	No. of active burrows	No. of fresh hay piles	No. of old hay piles	No. of fresh pellets	No. of old pellets	Remarks

Ground cover: Graminoids ____ % Forbs ____ % Shrubs ____ % Trees ____ % Rocks ____ % Barren land ____ % Other (write in) ____ %

Second Day

Date: _____ **Number of surveyors**: _____ **Names of surveyors**: _____

Start time: _____ **End time**: _____

No. of pikas heard	No. of adults seen	No. of juveniles seen	Description of pika activity	No. of abandoned burrows	No. of active burrows	No. of fresh hay piles	No. of old hay piles	No. of fresh pellets	No. of old pellets	Remarks

Ground cover: Graminoids ____ % Forbs ____ % Shrubs ____ % Trees ____ % Rocks ____ % Barren land ____ % Other (write in) ____ %

GROUND-DWELLING PIKAS

Site name: _____ **Patch name**: _____ **Plot No.**: _____

1st DAY **Date**: _____ **Number of surveyors**: _____ **Names of surveyors**: _____

GPS coordinates: Lat: _____ , Long: _____ **Elevation**: _____ m **Slope**: _____ deg. **Aspect**: _____ deg.

Cloud cover: ____ % **Temperature**: _____ °C **Wind** (circle one): High Low No wind **Grazing** (circle one): Heavy Light None

Snow (circle one): Present Absent **Start time**: _____ **End time**: _____ **Photo number**: _____

No. of pikas heard	No. of adults seen	No. of juveniles seen	Description of pika activity	No. of abandoned burrows	No. of active burrows	No. of burrows plugged in	Remarks

Ground cover: Graminoids ____ % Forbs ____ % Shrubs ____ % Trees ____ % Rocks ____ % Barren land ____ % Other (write in) ____ %

2nd DAY **Date**: _____ **Number of surveyors**: _____ **Names of surveyors**: _____

Start time: _____ **End time**: _____

No. of pikas heard	No. of adults seen	No. of juveniles seen	Description of pika activity	No. of burrows still closed	No. of burrows re-opened	No. of burrows re-plugged in	Remarks

3rd DAY (optional) **Date**: _____ **Number of surveyors**: _____ **Names of surveyors**: _____

Start time: _____ **End time**: _____

No. of pikas heard	No. of adults seen	No. of juveniles seen	Description of pika activity	No. of burrows still closed	No. of burrows re-opened	Remarks