Training Manual for Long-term Monitoring of

BIRDS

Wildlife Conservation Society

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Training Manual for Long-term Monitoring of Birds

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 Unpublished report.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.

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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.

Birds play critical roles in creating and maintaining ecosystems and perform several critical functions such as pollination, seed dispersal, and nutrient cycling. This means that many important livelihoods that people depend on are directly supported by birds and healthy bird populations. Birds are also useful indicators of ecosystem health and potential climate change impacts, as they are widespread and easier to monitor than many other wildlife species. Thus, monitoring birds is an effective and typically cost-efficient way to understand the biodiversity and general ecosystem health of a given area, while also revealing climate changes that are difficult to detect in other species groups and through other means of monitoring (e.g., habitat surveys or remote sensing).

Survey objectives

The bird monitoring protocol in this manual has been developed to track terrestrial bird population abundance and distribution changes in response to climate change. The methodology consists of standardized practices for recording visual and auditory observations of birds in the wild and has been designed to ensure reproducibility across survey teams and geographic areas.

Important considerations

When conducting long-term monitoring of terrestrial birds, 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 birds by sight and sound (see Chapter 7). Additionally, the methodology has been developed with the intention that all birds within a community can be surveyed, so long as the routes are situated among a sample of all of the available habitat types and elevations present in the region.

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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.

How to use this manual

This manual provides step-by-step instructions for conducting bird 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 count individual birds estimate distances to unseen birds.

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

Finally, the Appendix contains copies of bird 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 (1) inclusion of a variety of habitats and elevations representative of the study region and (2) alignment with any ongoing field surveys.

NOTE: Maps of existing field survey sites and bird population locations 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; see Chapter 7).

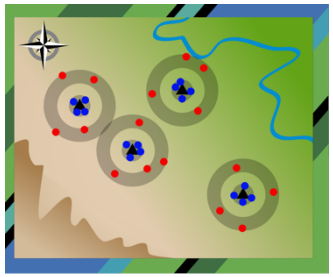
1. Identify other ongoing field survey locations (e.g., biomass and exclosure plot survey sites) to ensure that the line transects will be compatible with other field activities.

2. Create a 1 km boundary around existing field survey locations. This line demarks where the line transects can reasonably start from.

The preferred approach would be to generate buffers using GIS (e.g., using the "Buffer" tool in ArcGIS or an equivalent tool in QGIS, R, etc.; see Chapter 7).

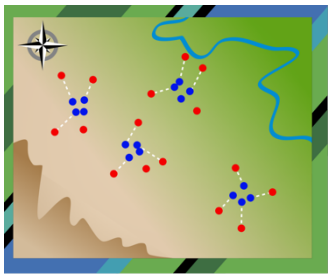
3. Create a 2 km wide band around existing field survey locations, beginning 3 km from the site and ending 5 km from the site. This band demarks the limits of where line transects should stop.

The preferred approach would be to generate buffers using GIS (e.g., using the "Buffer" tool in ArcGIS or an equivalent tool in QGIS, R, etc.; see Chapter 7).



4. Generate an equal number of random points within each of the two buffer zones.

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).

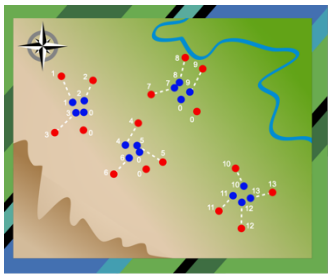


5. Select proximal pairs of start and end points for a transect line, keeping the following in mind:

Pairs of points should avoid dangerous terrain or waterbodies.

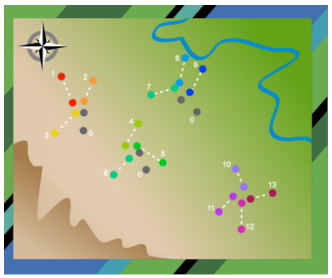
The elevation of the pairs of points should not differ by more than 400 m.

Pairs of points should be at least 3 km apart and not more than 5 km apart.



6. Once proximal pairs of start and end points are selected, each point should be given a new, unique line ID number. Some extra points will not be selected; for these points, give them a line ID of 0.

The preferred approach would be to add a new field in the attribute table of the spatial data file (e.g., shapefile) using GIS software.



7. Combine the start and endpoints into one, merging points according to their shared line ID number.

The preferred approach would be to combine start and endpoint shapefiles using GIS (e.g., using the "Merge" tool in ArcGIS Pro or an equivalent tool in QGIS, R, etc.; see Chapter 7).

8. For all point pairs with a line ID greater than 0, create a straight line between the start and endpoints.

The preferred approach would be to use GIS to convert the point spatial data (e.g., shapefile) into a line data file (e.g., shapefile) e.g., by using the "Points to Line" tool in ArcGIS Pro or an equivalent tool in QGIS, R, etc.; see Chapter 7).

NOTE: The lines resulting from Step 8 are the line transects the surveyors will walk to and where they will establish point count stations for bird surveys (see Chapter 5). These lines will vary in length, with a maximum distance of 5 km and a minimum distance of 3 km. These lines should be used as guidelines only. If the location of the generated transects are not suitable or practical in the field (e.g., due to impassable terrain or the presence of water bodies), deviations from the lines are acceptable and encouraged to facilitate ease of surveying.

3 PREPARATIONS

Time

The survey should be conducted just after dawn, when colors are just visible, and conclude by 10:00am.

Duration

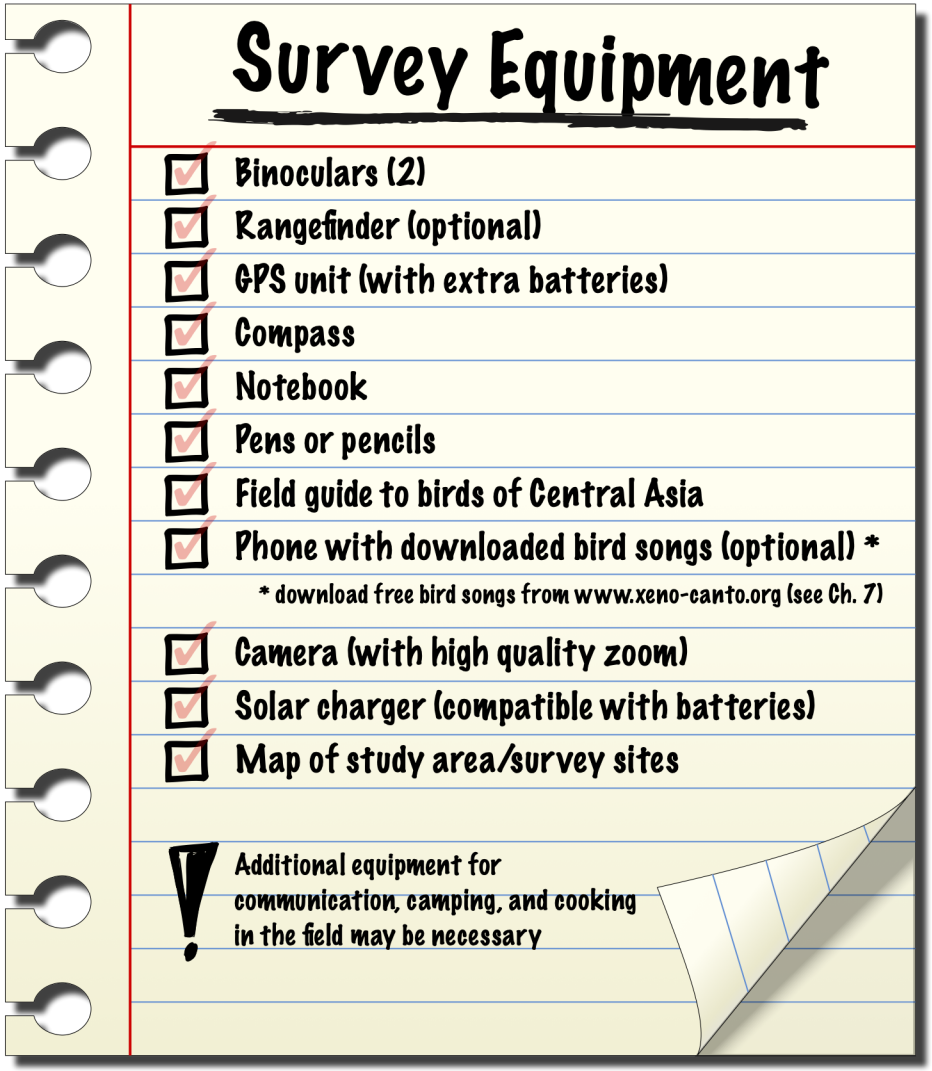
Each point along the transect should be surveyed for 10 minutes. Depending on the length of the transect, the time spent surveying a single transect can range from 2.2 to 3.5 hours (not including travel time between points).

Frequency

Surveys should be conducted at the same location at least twice per season, with at least a one-day gap between surveys.

Team

The point count methodology described in this manual requires a pair of observers standing at a predetermined fixed location and identifying all species seen and heard within a fixed amount of time. Observer 1 is the primary observer, responsible for recording bird counts. Observer 2 is a secondary observer, responsible for taking notes but can also observe when possible.


Survey Equipment
Binoculars (2)
Rangefinder (optional)
GPS unit (with extra batteries)
Compass
Notebook
Pens or pencils
Field guide to birds of Central Asia
Phone with downloaded bird songs (optional) *
* download free bird songs from www.xeno-canto.org (see Ch. 7)
Camera (with high quality zoom)
Solar charger (compatible with batteries)
Map of study area/survey sites
Additional equipment for communication, camping, and cooking in the field may be necessary

4 FIELD SETUP

1. Navigate your GPS to the selected start point of the transect.

NOTE: Ensure you are comfortable. Observers must be able to record species within 360 degrees of their position for 10 minutes. Observers must not move from their position until time is up at that location, and must not spend more than 10 minutes observing birds, even if they have not recorded everything at that location within the 10 minute period.

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

- Date
- Station ID
- Number of surveyors
- Name of surveyors (distinguish Observer 1 and Observer 2)
- Start time of the survey
- GPS location of the transect start point
- Weather conditions
    - Cloud cover (*clear*, *partly cloudy*, *cloudy*, or *rainy*)
    - Wind (*still*, *breezy*, or *windy*)

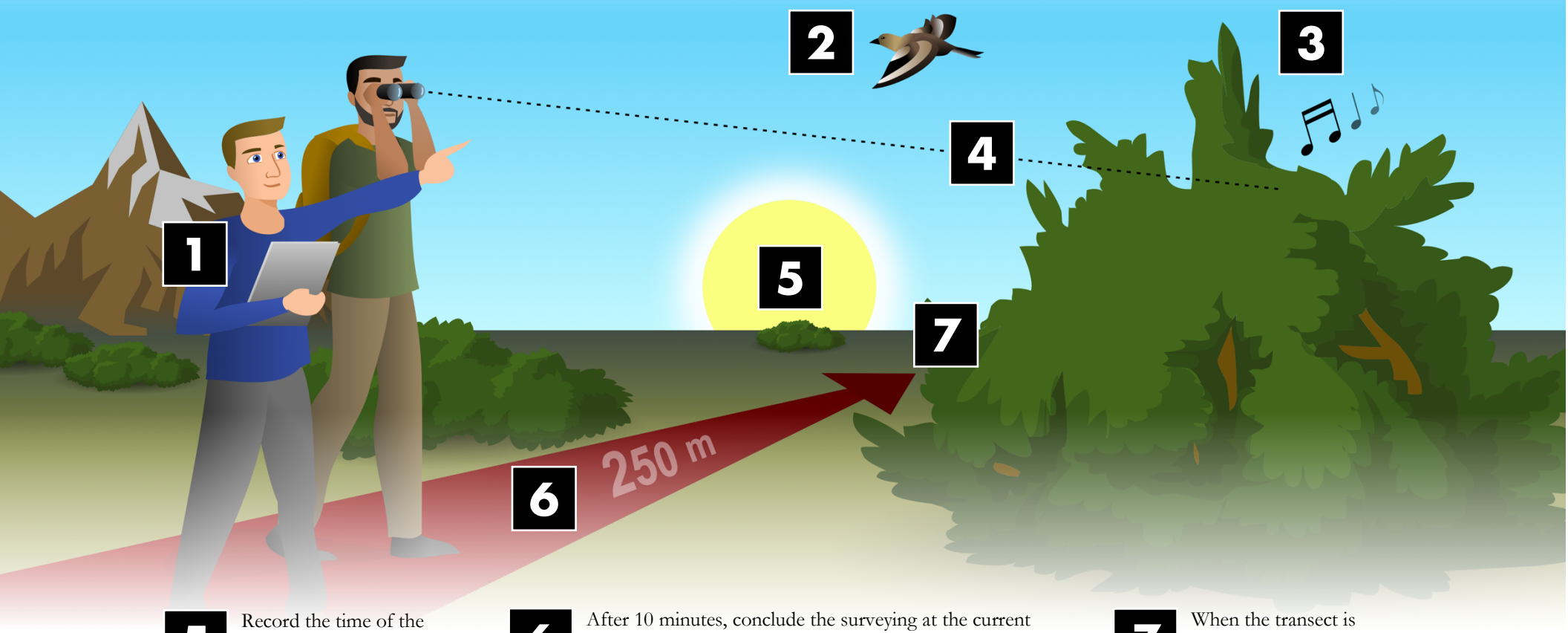
5 FIELD METHODOLOGY

1 Before you begin a point count, record the start time, Station ID, and GPS location.

2 Record each species of bird seen or heard and the number of individuals of each species.

3 Record whether the bird was identified by sight or sound.

4 Record the distance (in meters) to the bird or the source of the sound.



5 Record the time of the observation to the nearest minute.

6 After 10 minutes, conclude the surveying at the current location. Walk at least 250 m in the direction of the line transect before stablishing a new point station. Repeat steps 1-5 until you have reached the end of the transect.

7 When the transect is finished, record the end time of the survey.

6 REPORTING

Recording start time

The start time of the survey should be recorded at the start of the count.

Recording Station ID

The station ID should be recorded at the start of the count. The Station ID can be a GPS location number or some other unique identified (associated with GPS coordinates) that can distinguish the exact location of the point count.

Recording GPS location

Use the GPS to record the GPS location of the point count station. This is essential to assign species counts to particular locations and to find survey points again for repeat surveys later in a field season.

Recording species of birds

Birds should be identified to the highest taxonomic level whenever possible (i.e., species). If the exact species is unknown, note what you can tell about the bird (e.g., "unknown rosefinch").

Recording individuals

If multiple unique individuals or species are seen during the count at different times, enter them separately in the survey. Do not aggregate counts unless they are observed at the exact same time (e.g., a flock of three birds would be treated as one species entry with three individuals). Do not count individual birds more than once. When in doubt, err on the side of omitting a second observation of a bird that you may have previously seen. The secondary observer can assist the primary observer in tracking the movements of birds that have already been recorded.

Recording mode of observation

If a bird is heard but not seen, and later that same individual is seen, the prior mode of observation for that individual can be updated to "sight" instead of "sound" without creating a new entry for that individual.

Recording distance

Use a Rangefinder to measure the distance to where a bird was sighted. For birds that are heard but not seen, use the Rangefinder to measure the distance to an object near the suspected source of the sound (e.g., a rock or tree). There is no maximum limit to the distance that can be recorded. If not using a Rangefinder, the primary observer should practice estimating distances to objects before the survey to ensure accurate estimations.

Recording observation time

For each observation recorded, record the time of the observation to the nearest minute.

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

Merlin: A smart-phone app that can help with the identification of birds by sight and sound. https://merlin.allaboutbirds.org

Xeno-canto: A database of bird audio recordings that can help with the identification of birds by sound. https://xeno-canto.org

Buffer: A tool for creating a buffer of a specified distance around a point locality in ArcGIS Pro. https://pro.arcgis.com/en/pro-app/latest/tool-reference/analysis/buffer.htm

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

Merge: A tool for merging two spatial vector datasets together in ArcGIS Pro. https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/merge.htm

Points to Line: A tool for creating a line from two or more points in ArcGIS Pro. https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/points-to-line.htm

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: _____

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

Primary observer: _____ **Secondary observer**: _____

Station ID: _____

GPS coordinates: Lat _____ , Long _____

Cloud cover (circle one): Clear Partly cloudy Cloudy Rainy

Wind conditions (circle one): Still Breezy Windy

Species	**Number of individuals**	**Mode of observation** (V = visual, A = auditory)	**Distance** (meters)	**Time observed** (HH:MM)