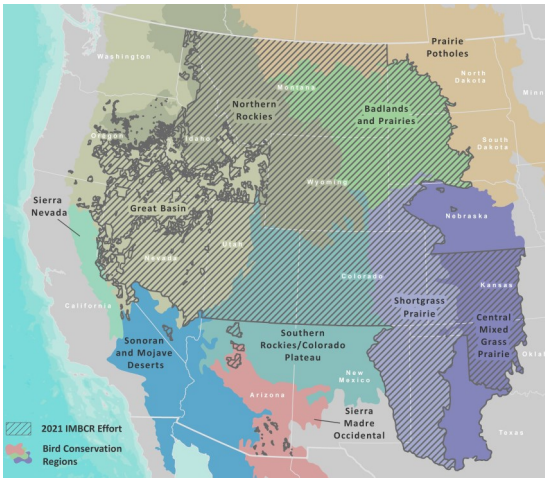
IMBCR: Sampling Design Recommendations & Sample Size Guidelines

PROGRAM OVERVIEW

Bird Conservancy and partners created the **Integrated Monitoring in Bird Conservation Regions** (IMBCR) program in 2008 in response to national recommendations for improving avian monitoring. Today, the IMBCR program is the second largest breeding bird monitoring program in North America, spanning the Great Plains to the Great Basin. The strength of the program lies in its partnership with multiple organizations: we pool monitoring resources among the partners in a spatially balanced, probabilistic framework, which promotes efficiencies and allows us to provide population estimates for over 300 species.

Every spring, trained observers visit up to 16 survey points within a 1-km^2 survey site per morning and record all birds seen and heard. They also record ocular vegetation estimates at each point, such as over and understory cover and height.

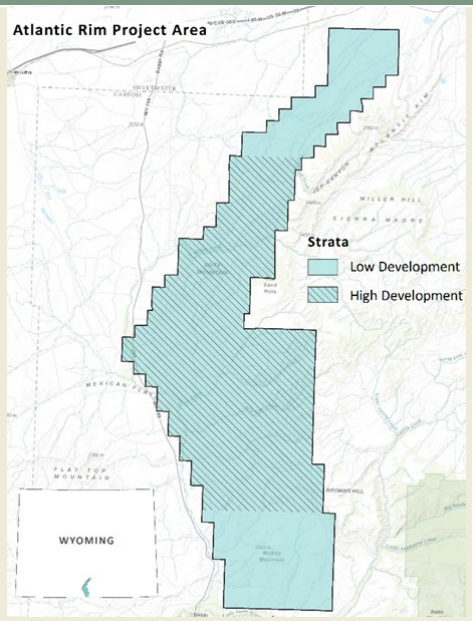


Extent of the IMBCR program as of 2021.

We stratify states or regions based on fixed attributes, such as management unit boundaries. Within a stratum, all lands and vegetation types are available for sampling. The sampling design is also nested, so that we have context for bird populations within a management unit for the surrounding state or region. Spatially balanced, random sample selection allows partners to adjust monitoring efforts from year to year while maintaining spatial coverage of a stratum.

TARGETED MONITORING PROJECTS

- In addition to the baseline monitoring effort, IMBCR partners also monitor in targeted areas with overlay projects to answer management questions or evaluate the effectiveness of conservation efforts for bird populations.
- Overlays use the same IMBCR field methods and sample selection, which allows us to leverage detection data from across the program to estimate population size for infrequently detected species and place them in regional context.
- When evaluating treatment effects, it's best to monitor birds pre-treatment and in a control stratum where no treatments are occurring. However, we can also compare population estimates in project areas to estimates on similar lands in the baseline monitoring effort as a "control" sample.
- To set up an overlay project, contact Bird Conservancy no later than 31 January of the proposed field season to discuss the project objectives, timeline, and expected outcomes. We will work together to design a monitoring project to meet your objectives.
- **Example:** The BLM wanted to determine population impacts from oil and gas activities on sagebrush birds of concern. We monitored within the Atlantic Rim Natural Gas area in south-central Wyoming, and compared songbird occupancy in the project area to the surrounding BLM lands for context.

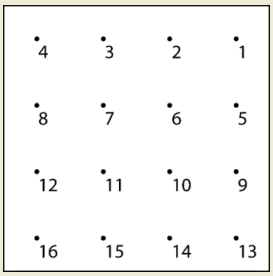


Atlantic Rim Project Area near Rawlins, WY (Van Lanen et al. 2018).

SAMPLING DESIGN RECOMMENDATIONS

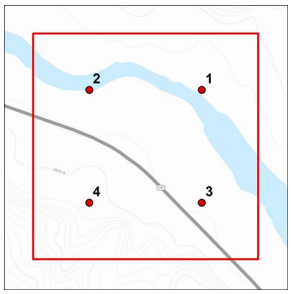
Overlay projects are designed to address specific management questions and their monitoring requirements are relatively short-term (e.g., examine bird response to an energy development project). Therefore, they are not integrated into the nested stratification of the baseline IMBCR program. In contrast, setting up a new stratum within the baseline monitoring effort is best if you wish to monitor an area indefinitely, like a national wildlife refuge. Setting up a new stratum within the existing IMBCR footprint can require substantial GIS work because existing strata may need to be re-stratified. Design guidelines for overlay projects and new baseline strata include:

- We define the sampling frame as the area to which you wish to make inference about bird populations.
- Stratification is useful if you wish to make inference about bird populations in subsets of the sampling frame, such as treated and untreated areas. However, the more strata you include, the larger the total sample size needed.
- We do not recommend stratifying based on vegetation conditions, which can change over time. Instead, consider stratifying based on ecological sites, elevation zones, etc.
- Sampling units are typically 1-km^2 grid cells, each containing 16 point count stations. However, we have flexibility for small or irregularly shaped project areas for which a 1-km^2 grid cell is too large.



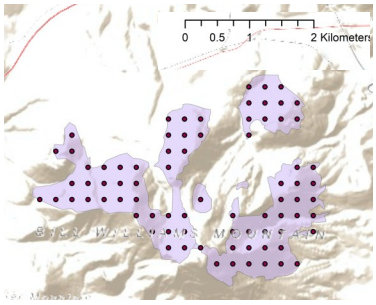
Standard 1-km^2 IMBCR sampling unit.

Example 1: The BLM and partners were interested in how tamarisk removal along the Dolores River affected bird populations. Because the project area was a linear corridor, we sampled in 0.25-km^2 grid cells to better target riparian habitat and birds.



A smaller 0.25-km^2 sampling unit.

Example 2: The USFS wants to determine bird response to fuels reduction treatments at Bill Williams Mountain in the Kaibab National Forest. Because the treatment areas are small, the individual point count station is the sampling unit rather than a grid cell.



Point-based sampling units.

SAMPLE SIZE GUIDELINES

We receive many questions about minimum sample size needed to answer management questions or to obtain robust population estimates. Below are suggested guidelines for determining sample size in an overlay project or new stratum. In general, we recommend surveying 10 1-km^2 grid cells the first year and then adjusting as needed. *However*:

- Larger sample sizes are likely needed for species of interest that occur at lower densities or are less detectable, and for project areas or strata with greater spatial heterogeneity.
- For less detectable species that also occur at low densities, population estimates may be uninformative even with large sample sizes.
- Simulations representing various potential sampling scenarios and ecological conditions can inform sampling effort along with existing data. Contact Bird Conservancy to discuss this option.
- If the overlay project is in an existing stratum, see if we already have sufficient detections and robust estimates for species of interest. If so, we will be able to leverage existing detections to inform estimates within the overlay project.
- Pilot studies can also help identify levels of sampling needed to obtain sufficient detections of species of interest and/or provide preliminary information on treatment effects to inform sampling for effectiveness monitoring.

ACKNOWLEDGEMENTS

IMBCR efforts are possible with support from numerous partner agencies and organizations. To see a list of current IMBCR partners and other program information, please visit our website: www.birdconservancy.org/what-we-do/science/monitoring/imbcr-program/

Bird Conservancy of the Rockies

For more information about IMBCR, please contact Jen: jennifer.timmer@birdconservancy.org

Integrated Monitoring in Bird Conservation Regions