IMBCR Population Estimates

What is IMBCR and how is it accomplished?

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. The strength of IMBCR lies in its partnership with multiple organizations: we pool monitoring resources in a spatially balanced, probabilistic framework, which promotes efficiencies in data collection and analysis, and allows us to provide population estimates for over 300 species. Within ecologically distinct Bird Conservation Regions (BCR), we create strata across public and private land based on fixed attributes, like state borders or management unit boundaries, and funding partner interest.

Figure 1. IMBCR extent in 2023.

Every spring, trained observers visit up to 16 survey points within a 1-km^2 sampling unit and record all birds seen and heard. They estimate a distance to each detection and record the minute interval of each detection; together, this information allows us to estimate detection probabilities and account for individuals present but not detected during a survey. Observers also record ocular vegetation estimates at each point, such as over and understory cover by species and average height.
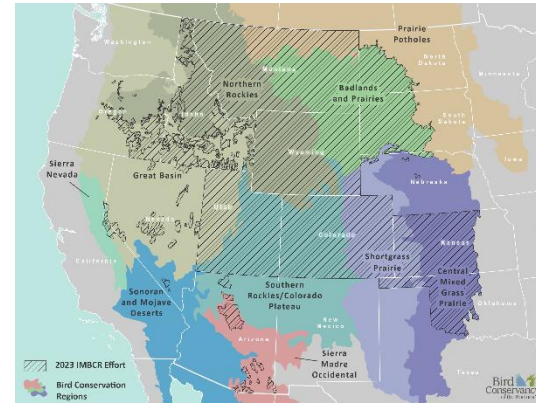
What do we get from IMBCR?

We provide several population metrics from the IMBCR program each year, and the nested design of IMBCR provides context for estimates within management units to surrounding regions. These estimates represent the best available information for making management and conservation decisions for breeding landbirds.

- **Density** - number of birds per square kilometer within a stratum. Densities tend to reflect local management actions or habitat conditions and thus, are more likely to change year to year.

- **Abundance** - total number of birds within a stratum (a population size). We multiply the density estimate by the stratum area to get abundance or the total number of individuals within a stratum.

- **Occupancy** - probability that plots of a given size are occupied by the species within the stratum (most species have a plot size of a 125-m radius, but a few wide-ranging species have a 1-km radius plot size). Think of occupancy as the proportion of surveyed points occupied by the species within a stratum.

- **Trend** - the population change per year based on density or occupancy. It's the estimated percent loss or gain each year for the population in a particular stratum. Although individual density and occupancy estimates have different units, trend modeled on either metric is interpreted the same: as percent change over time.

We also provide metrics that describe the robustness of the population estimates. The coefficient of variation (CV) is an indicator of reliability for density and occupancy estimates, and we recommend using estimates with CVs < 50% to inform management. We classify trend estimates as "robust" or supported if they have an f-value ≥ 0.9. The f-value is the probability that the true population change is in the direction of the percent change per year, or our confidence in the direction of the population change (e.g., f = 0.92 means we are 92% certain in the direction of the population change). Credible intervals are the upper and lower bounds containing the true population trend with 95% probability, and narrower intervals mean we are more certain of the magnitude of the population change.

How do I use estimates from IMBCR?

Density - determine potential population impacts for project planning by multiplying the density estimate by the project area (in km^2), which is the number of individuals that could be impacted by the project. Density can also be used to evaluate the effect of management or conservation actions on birds by comparing density estimates within specific strata to regional estimates for context.

Abundance – determine conservation responsibility for a management unit or specific stratum by dividing the abundance of a species for the management unit or stratum by the regional abundance. This represents the proportion of a regional population that resides within the management unit or stratum during the breeding season. For example, does your National Grassland provide breeding habitat for a relatively large proportion of the grasshopper sparrow population in the Northern Great Plains?

Occupancy – determine a species' range within a stratum by multiplying the occupancy estimate by the stratum area. Because occupancy estimates aren't as data-hungry as density estimates, we can track less-common species better with occupancy.

Trend - track and update Species of Greatest Conservation Need by state and other priority lists by examining trend estimates. Are populations of these species increasing or decreasing with certainty each year and in which strata or regions? If looking at trend estimates for a particular management unit or stratum, look at regional trend estimates for context to see how local trends compare to regional trends. Identify species of concern based on populations that are declining with certainty each year, especially for species with population concern elsewhere in their range.

Figure 2. Cassin's sparrow, a regional species of concern for BCR 18 (Brian Genge).

How do I access IMBCR estimates?

Approximate survey locations and detections, and density, occupancy, and trend estimates are available to the public on the new and improved Rocky Mountain Avian Data Center (RMADC). We recommend using the "Species" and "Stratum" filters to find estimates for species and management units of interest. Please note, this is a beta version of the RMADC and is a work in progress. In the annual IMBCR report, you can navigate via the Table of Contents to results for several management agencies and regions, which will tell you which stratum to filter on to access population estimates from the RMADC. Partners also have access to the raw data they fund or collect including detections and survey locations. IMBCR data are available to those outside of the IMBCR Partnership upon request and approval of a data sharing agreement. Please complete this form to request raw data.

What if I want to learn other things about bird populations?

We conduct additional analyses to address specific questions, such as the effectiveness of forest restoration treatments for promoting species richness. We use a variety of fine scale and landscape-level covariates to model bird-habitat relationships, community patterns, and other population parameters. For these analyses, we may use the baseline IMBCR data, which are collected each year, or we may use data collected in targeted monitoring projects (called overlays), which are designed to answer specific management or conservation questions.

For more information on IMBCR or accessing the population estimates, please email Jen at jennifer.timmer@birdconservancy.org.