IMBCR Population Estimates

What is IMBCR?

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 is its partnership with multiple organizations: pooling monitoring resources in a spatially balanced, probabilistic framework promotes efficiencies in data collection and analysis and provides population estimates for >300 species. Within ecologically distinct Bird Conservation Regions, we create strata across public and private land based on fixed attributes, like management boundaries.

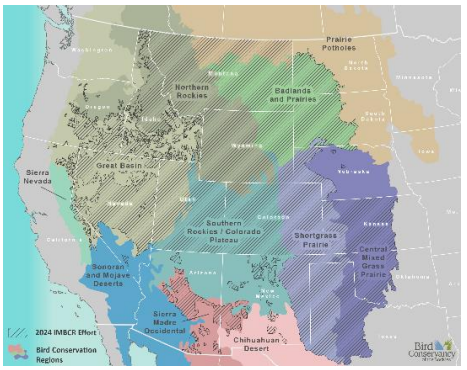

Figure 1. IMBCR extent in 2024.

Every spring, trained observers visit up to 16 survey points in 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; this allows us to 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 regional context for estimates within management units. These estimates represent the best available information for making management and conservation decisions for breeding landbirds.

- **Density** - number of birds/km^2 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 the total number of individuals within a stratum.
- **Occupancy** - probability that plots of a given size are occupied by at least 1 individual of the species within the stratum (most species have a plot size of a 125-m radius, but wide-ranging species have a 1-km radius plot size). Occupancy is useful for less common species with fewer detections.
- **Trend** - population change per year based on annual density or occupancy estimates. It's the estimated percent population loss or gain each year in a given stratum. Although individual density and occupancy estimates have different units, trend modeled on either metric is interpreted the same: percent change over time.

We also provide metrics that describe our confidence in 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 reliable 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 (e.g., f = 0.92 means we are 92% certain a population is increasing or decreasing). 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. 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 stratum by dividing the species' abundance for a stratum by the regional abundance. This represents the proportion of a regional population that resides within the 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.

Figure 3. Grasshopper sparrow, a species of concern for BCR 17.

Trend - track and update priority species lists (e.g., Species of Greatest Conservation Need) 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 stratum, look at regional trend estimates for context to see how local and regional trends compare. Identify species of concern based on populations that are declining with certainty each year, especially for species with concern elsewhere in their range.

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 Rocky Mountain Avian Data Center (RMADC). We recommend using the "Species" "Superstratum", and "Stratum" filters to find estimates for species and management units or regions of interest. 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.

IMBCR

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

Bird Conservancy of the Rockies