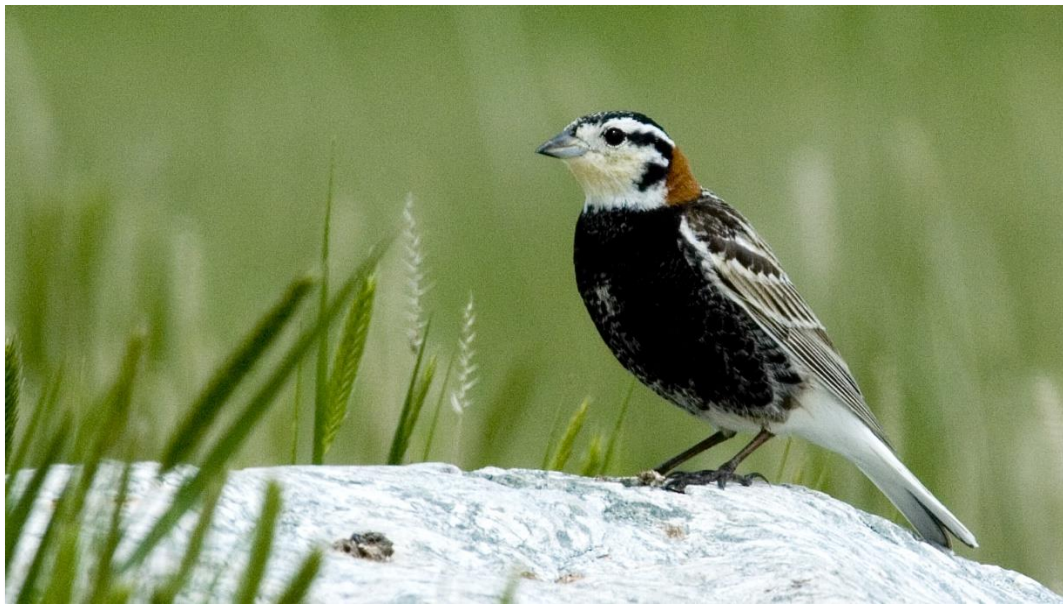




Northern Great Plains Joint Venture Grassland Bird Conservation Objectives 2016 – 2026



A Product of the Northern Great Plains Joint Venture Technical Committee January 2022

Acknowledgment – Dan Casey (NGPJV Coordinator from 2015 to 2020) and members of the Northern Great Plains Joint Venture and the Prairie Pothole Joint Venture Technical Committees conceived of this approach and established the logical framework in 2019. Section 1 of this document updates the original work with retrospective population trend estimates, updated species densities, assumptions, and rationales for decisions. Current members of the Northern Great Plains Joint Venture reviewed previous drafts and provided constructive feedback that greatly improved this document.

Lead Authors: Catherine Wightman, Kevin Ellison, Scott Somershoe, Jen Timmer, and Chris White

Cover Photo: Chestnut-collared Longspur by Bob Martinka. Used with permission.

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Introduction

The [Northern Great Plains Joint Venture](#) (NGPJV) is one of 22 Migratory Bird Joint Venture partnerships working to sustain lands for birds, other wildlife, and people across North America. The mission of the NGPJV is to support and implement protection, enhancement, and restoration of prairie grassland, shrub-steppe, wetland, and riparian ecosystems with an emphasis on sustaining and increasing populations of migratory and resident birds. Collectively, the Joint Ventures work to implement national and international bird conservation plans for waterfowl, waterbirds, shorebirds, and landbirds. The 2016 Partners in Flight Landbird Conservation Plan provides updated guidance for conserving populations of at-risk landbird species including several grassland birds that breed in the Northern Great Plains (Rosenberg et al. 2016). This document outlines the NGPJV process to step-down Partners in Flight's continental targets to regional targets to better focus effective habitat conservation actions.

There are many factors influencing bird population trends, including habitat loss on the breeding, migration, and wintering grounds, collisions with wind towers and windows, pesticides, domestic cats, and other factors known and unknown. The planning objectives presented here address habitat loss on the breeding grounds within the NGPJV geography only. While other factors may influence observed trends within the region, habitat loss is one of the drivers influencing grassland bird occurrence (Greer et al. 2016). This work focuses on habitat conservation because it is measurable, actionable, and proven effective. For example, habitat conservation actions on the breeding grounds are credited for increasing trends in waterfowl populations over the past five decades (North American Bird Conservation Initiative 2009, 2016). Partners in Flight (Andres et al. 2020) recommends setting numerical population and habitat objectives at multiple scales to:

1. Serve as the foundation for strategic conservation planning by establishing a biological target,
2. Provide a performance metric for assessing conservation accomplishments, and
3. Operate as a communications and marketing tool to demonstrate the need for conservation.

The NGPJV Technical Committee has undertaken a process to quantify population objectives for five declining grassland-obligate bird species representative of the region and the predicted amount of habitat conservation that would be required to achieve those population objectives, assuming that habitat loss on the breeding grounds is primarily responsible for observed trends. The population trends and associated habitat targets presented here will continue to be assessed and compared with range-wide trends to validate and modify assumptions over time. Section 1 of this document outlines the process for deriving explicit objectives. Section 2 outlines a process to track performance and to communicate conservation outcomes. Assumptions and calculation used to set targets are listed in Appendix I.

Section 1: Setting Objectives

Priority Species

The NGPJV has identified [26 priority species](#) based on population trends, habitat associations, and social importance to the region. Within the grassland biome, five songbird species are showing concerning declining trends and partners have elevated these five species for focused conservation action (Correll et al. 2016, Somershoe 2018). Target species include:

- Sprague's Pipit (*Anthus spragueii*)
- Chestnut-collared Longspur (*Calcarius ornatus*)
- Thick-billed Longspur (*Rhynchophanes mccownii*)
- Lark Bunting (*Calamospiza grammacus*)
- Baird's Sparrow (*Centronyx bairdii*)

Planning Timeframe for Objectives

For consistency with the Partners in Flight Conservation Plan (Rosenberg et al. 2016), NGPJV partners have adopted **2016-2026** as the 10-year planning timeframe for objectives. This allows adequate time for conservation actions and regional weather patterns to be reflected in bird population numbers while also allowing for timely course corrections, if future assessments suggest different approaches are warranted.

Current Population Estimates and Trends

NGPJV partners used species population estimates for this exercise as reported in the Partners in Flight Population Estimates Database, v3.1 for Bird Conservation Region 17 (BCR 17 - Plains and Badlands; Will et al. 2020; Table 1). BCR 17 covers the same geography as the NGPJV with very minimal exceptions near outer boundaries and is the planning geography for these objectives. The data source for the BCR 17 population estimates is primarily the Breeding Bird Survey, 2006-2015 (Sauer et al. 2019).

The NGPJV used population trend estimates as reported in the Partners in Flight [Avian Conservation Assessment Database](#) from 1970-2015 (Panjabi et al. 2020) to represent current and, in the absence of conservation actions, presumed future trends. Trend estimates are for BCR 17 only. NGPJV elected to use the Avian Conservation Assessment Database because these estimates have been updated, reviewed, and supported by the Partners in Flight scientific community. NGPJV partners also elected to use 45-year versus ~10-year trend estimates because the longer time frame helps to smooth out short-term fluctuations due to weather or other annual conditions that can inflate or over-emphasize trends in shorter-time frames.

Other data sources considered for trend estimates included the USGS Breeding Bird Survey (1966-2015), Bird Conservancy of the Rockies' Integrated Monitoring by Bird Conservation Region program (IMBCR; 2009 – 2015, Pavlacky et al. 2017), 2016 Partners in Flight Conservation Plan (2004-2014, Rosenberg et al. 2016), and the U.S. Fish and Wildlife Service's Conservation Plan for a subset of our priority species (2005-2015, Somershoe 2018).

Dampened Population Trends

NGPJV partners followed recommendations in the 2016 Partners in Flight Conservation Plan (Rosenberg et al. 2016) to calculate population trend targets to slow or stop declining population trends within BCR 17 by 2026 (Table 1). These trend targets assume that immigration and emigration are not significantly influencing population trends in BCR 17 during the breeding season. It will be important to monitor this assumption by comparing BCR 17 trends with trends at larger scales over time.

These targets include stabilizing trends for Sprague’s Pipit, Thick-billed Longspur, and Baird’s Sparrow by 2026. Confidence intervals around mean current trends for these species overlap zero, suggesting trends may already be stabilizing; therefore, partners felt stabilization was an achievable goal in BCR 17. Following Partners in Flight recommendations, targets are to slow the rate of decline by ~60% for Chestnut-collared Longspur and by ~45% for Lark Bunting in BCR 17 by 2026. The differences in expected population trajectories if current trends continue or if trends are dampened or stabilized are represented in Figure 1. It is important to note that 2026 Population Objectives still allow for some losses between 2016 - 2026 but should dampen the current steep declines.

Table 1. Population estimates, regional importance, current trends, and 2026 trend objectives for five priority grassland birds in Bird Conservation Region 17 (BCR 17).

NGPJV Priority Species	2016 Population Estimate	PIF category*	% of Global Population in BCR 17	Population Trend (%/year) in BCR 17 1970-2015	Trend lower 90% CI	Trend upper 90% CI	NGPJV 2026 trend objectives for BCR 17 (%/year)
Sprague's Pipit	64,000	Yellow D	5	-1.08	-3.26	1.00	0
Chestnut-collared Longspur	770,000	Yellow D	24	-4.06	-5.07	-3.03	-1.62
Thick-billed Longspur	85,000	Yellow D	10	-1.04	-4.23	2.23	0
Lark Bunting	6,100,000	CBSD	53	-2.47	-3.37	-1.49	-1.36
Baird's Sparrow	290,000	Yellow D	9	-0.55	-2.25	1.15	0

*PIF recommends slowing the rate of decline by 60-75% by 2026 for Yellow Watchlist species (Yellow D) and slowing the rate of decline by 45-60% by 2026 for Common Birds in Steep Decline (CBSD).

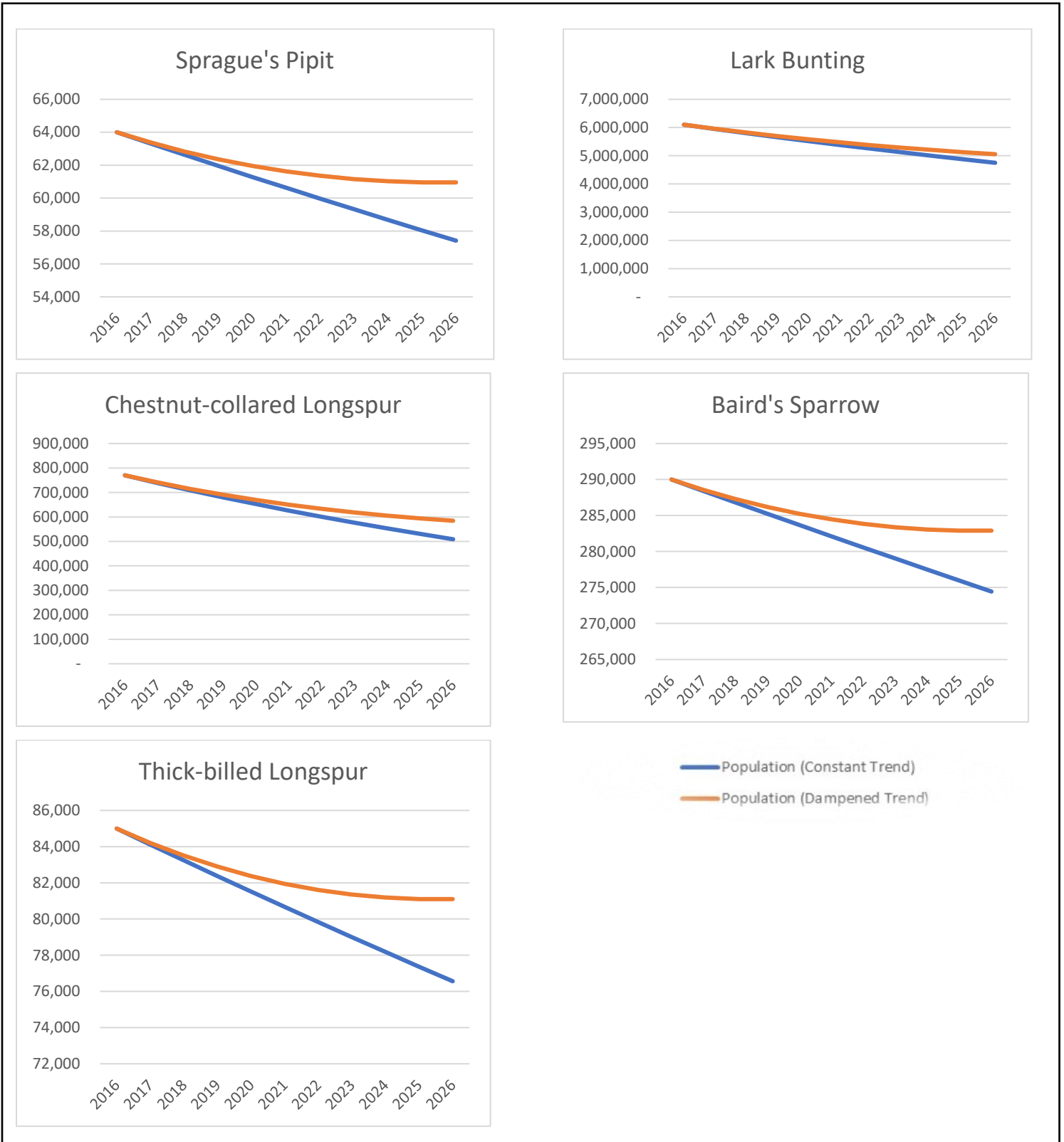


Figure 1. Population trajectories if trends remain constant (blue line) or are dampened (red line) between 2016 and 2026 for five priority grassland bird species in Bird Conservation Region 17.

Calculating Numerical Habitat Objectives

To achieve a dampened trend, conservation partners must address the factors responsible for the declining trends. NGPJV partners are focusing on habitat loss during the breeding season because this is one of the factors influencing population trends that is measurable, controllable, and proven effective (Greer et al. 2016, Pavlacky et al. 2019, Sather unpubl. data, Latif unpubl. data). Acres that address avoided loss (i.e., protect) or create new habitat (i.e., restore) will change the patterns of land use, presumably leading to a reduction in habitat loss and subsequent population declines. This assumption will need to be monitored over time as other factors in the full annual life cycle of these species, such as renewable energy development on breeding grounds or threats to migration or wintering habitat could be influencing observed population trends on the breeding grounds.

Recognizing that there are inherent annual differences in bird distribution and abundance for different species across the region, NGPJV partners elected to use a range of density estimates for each species to translate population objectives to habitat objectives. The IMBCR program estimates mean densities for species based on probabilistic sampling at point count locations across BCR 17 (Pavlacky et al. 2017). For this exercise, IMBCR mean density estimates were post-stratified by grassland habitat for Baird's Sparrow and Chestnut-collared Longspur and by grassland or sage shrubland habitat for Lark Bunting, Sprague's Pipit, and Thick-billed Longspur. NGPJV partners used post-stratified density estimates across BCR 17 for Chestnut-collared Longspur and Lark Bunting but used post-stratified densities by state within BCR 17 for Sprague's Pipit, Thick-billed Longspur, and Baird's Sparrow due to their more restricted occurrence across BCR 17 (Fig 2). NGPJV partners also used mean density estimates from a local, reference project in northeastern Montana conducted by the University of Montana (2016 – 2020; Sather, unpubl. data). All five priority species were present in this study area.

Habitat objectives were calculated per species as the range of acres needed to achieve population objectives given estimated mean densities (Table 2). Since these estimates are focused on breeding habitat, it is reasonable to assume that paired birds will occupy generally the same area of suitable habitat. Assuming a 1:1 sex ratio, calculated habitat acres were divided by 2 for each species to represent the number of acres required to support a territory or breeding pair. Based on these calculations, **approximately 1 – 2.5 million acres of conservation are required to meet trend objectives for all five priority grassland bird species in BCR 17 by 2026.**

These numbers also assume grassland conversion in the Northern Great Plains continues at a rate of ~0.45%/year (World Wildlife Fund 2021). If conversion rates were to increase, additional habitat acres would be needed to achieve population objectives. Habitat acre calculations do not differentiate between protection (avoided loss), restoration, or enhancement activities or the quality of the habitat.

Targeting Habitat Actions

Recognizing that the five priority bird species are uniquely specialized for different grassland types and conditions, NGPJV partners associated minimum acre targets within each major grassland type found within BCR 17 (Table 3). Regional focal areas were also identified for those species that are not found throughout BCR 17. For example, to effectively protect and/or enhance habitat for Thick-billed Longspur, conservation action needs to occur on at least 43,390 acres of perennial shortgrass in the BCR 17 portions of Montana or Wyoming. These acre targets assume lands are under a managed grazing

regime appropriate for the site (see Johnson et al. 2019). Ellison et al. (*In Prep*) are developing a tool to target specific conservation activities in areas most likely to positively affect priority birds using available bird distribution and land use and productivity models (Fink et al. 2020, Olimb and Robinson 2019, respectively). This tool will help NGPJV partners be more strategic when locating certain practices and allocating conservation funding. Ultimately, management practices and the surrounding landscape will impact the value of on-the-ground conservation actions for specific grassland birds and NGPJV partners will work with landowners and managers to recommend specific practices that will benefit grassland birds on a project-by-project basis.

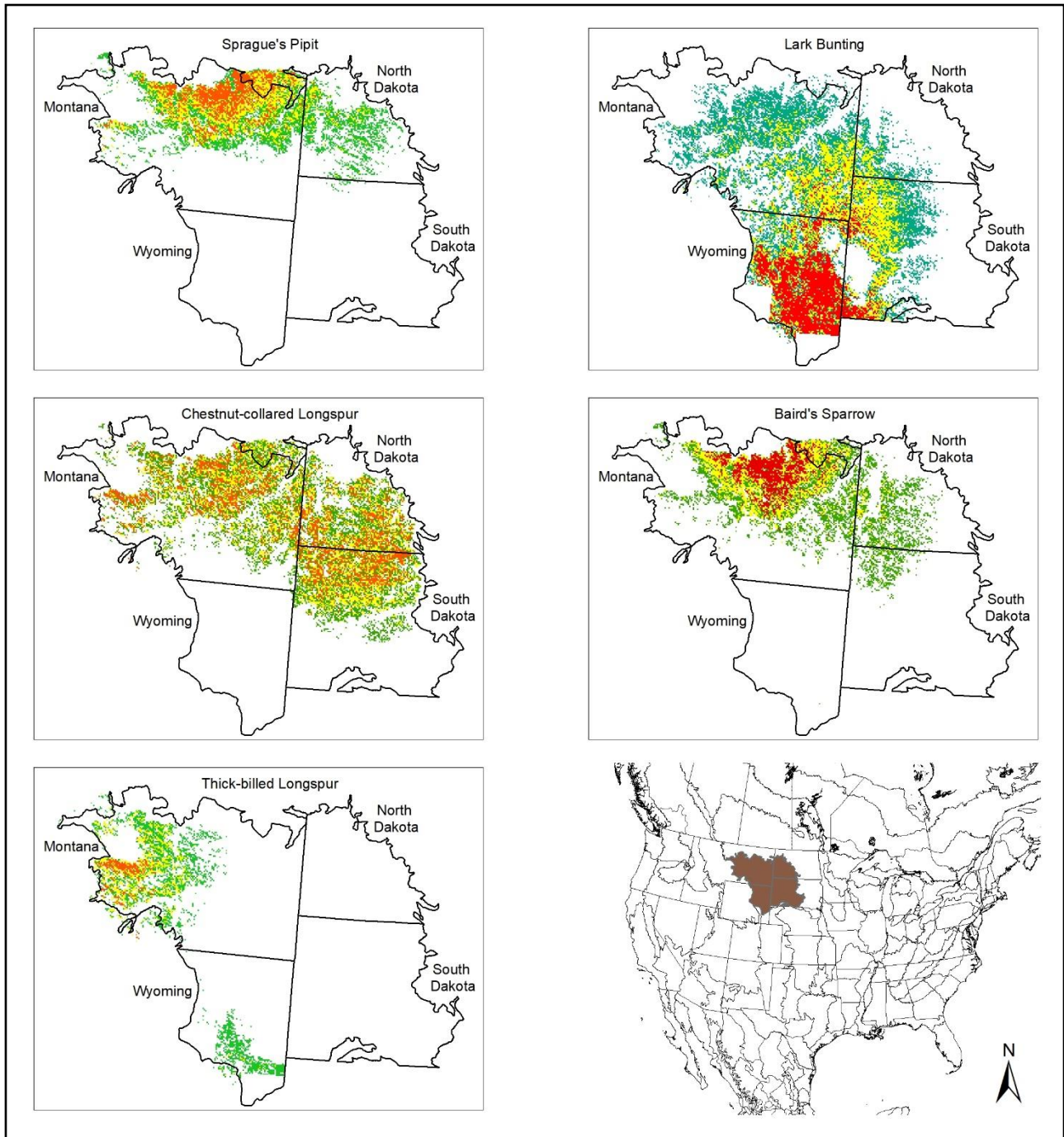


Figure 2. Distribution of highest abundance (25% core areas) to lower abundance (75% core areas) for five priority declining grassland birds in Bird Conservation Region 17 (BCR 17). BCR 17 x state polygons are depicted. Projects within 25-75% core areas are expected to positively impact species populations. Although not depicted here, some data suggest Chestnut-collared Longspur are found locally in parts of Wyoming-BCR 17, so this species is considered to have a BCR 17-wide distribution by NGPJV partners. *Data courtesy of Fink et al. 2020.*

Table 2. Summary of population trends and habitat objectives for five NGPJV Priority grassland bird species in Bird Conservation Region 17, 2016-2026.

<i>Species</i>	<i>Current population estimate (PIF 2015)</i>	<i>ACAD trend 1970-2015</i>	<i>10-year NGPJV population trend objective</i>	<i>2026 population objectives</i>	<i>Density per acre in occupied habitat*</i>	<i>Estimated additional acres to achieve 2026 population objective+</i>
Sprague’s Pipit	64,000	-1.08%	0.00%	60,954	0.004 - 0.16	22,125 – 221,250
Chestnut-collared Longspur	770,000	-4.06%	-1.62%	584,390	0.06 – 0.70	108,084 – 312,246
Thick-billed Longspur	85,000	-1.04%	0.00%	81,101	0.003 – 0.10	43,390 – 378,250
Lark Bunting	6,100,000	-2.47%	-1.36%	5,055,796	0.11 – 0.22	694,532 – 1,389,064
Baird’s Sparrow	290,000	-0.55%	0.00%	282,898	0.02 – 0.20	42,295 – 105,738
TOTAL						912,426 – 2,409,547

*Density estimates from Sather unpubl. data (male estimates adjusted for a 1:1 sex ratio; higher density estimates) and from IMBCR post-stratified by grassland and grassland or sage shrubland habitats within BCR 17 (lower density estimates).

+Acre calculations reflect bird territories and are adjusted to account for an assumed 1:1 sex ratio.

Table 3. Minimum acre targets to achieve NGPJV population trend objectives by 2026 by grassland type and general location and recommended conservation activity.

<i>Grassland Type</i>	<i>Minimum Acres Targets</i>	<i>Target Species</i>	<i>Focal areas for maximum impacts on priority species (see Fig. 2)</i>	<i>Recommended Activities (see Section 2 for description of activities)</i>
Perennial shortgrass	43,390	Thick-billed Longspur	BCR 17 in Montana and Wyoming	Protect, enhance
Native shortgrass	108,084	Chestnut-collared Longspur	BCR 17 wide	Protect, enhance, restore
Mixed grass	64,420	Sprague’s Pipit & Baird’s Sparrow	BCR 17 in Montana, North Dakota, and limited South Dakota	Protect, enhance, restore (CRP – tame for Baird’s Sparrow only)
Mixed grass/shrub-steppe	694,632	Lark Bunting	BCR 17 wide	Protect, enhance, restore
TOTAL minimum grassland acres	912,426	ALL		

Section 2: Estimating Species Response

Following the same assumptions in Section 1 that declining population trends are being driven primarily by habitat loss on the breeding grounds and that averting loss or restoring habitat on the breeding grounds will influence species abundance, NGPJV partners developed a process for estimating species abundance in response to habitat conservation actions. This process is based on current available science and will be revised as we learn more about how birds are responding to landscape changes. We anticipate that restoration will significantly increase species densities over time because much of the conversion in the region has occurred on relatively productive soils, suggesting that these areas will be productive grasslands.

Below, we consider each conservation mechanism – protect, restore, enhance – separately because we anticipate different species responses and there are differences in conservation longevity or duration for each action.

Protection

Protection is a conservation action that ensures the current land use and ecological characteristics will be maintained for a relatively long period of time. Some, but not all, protection instruments include a management component that is meant to enhance or maintain ecological function of the site. Enrollment of private lands in protection agreements is voluntary, however, compliance after enrollment can be legally enforced. Some lands may be protected through non-regulatory means, such as local cultural influences, and the NGPJV will be working to understand how to quantify these lands as protected in the future. Grasslands are positively associated with large-scale occupancy rates for all these priority species except Thick-billed Longspur. Shrublands are also positively associated with large-scale occupancy for Lark Bunting in the Northern Great Plains region, suggesting that maintaining existing rangelands will help maintain habitat for declining grassland bird species (Pavlacky et al. 2019).

Protection mechanisms:

- Perpetual Conservation Easements
- Term Conservation Easements or Leases (>= 30 years)
- Fee title acquisition by a federal or state agency or conservation-oriented organization for conservation purposes
- Non-regulatory, cultural protection (quantification to be determined)

Duration:

- Permanent or >= 30 years

Anticipated bird-habitat outcomes:

- Habitat loss is avoided
- Habitat may be improved
- Habitat is unlikely to change significantly except under extenuating circumstances (e.g., wildfire, prolonged drought, etc.)

Anticipated bird response:

- Current average abundance at site maintained
- Increases in average abundance are possible
- Decreases in average abundance are unlikely except under extenuating circumstances

Enhancement

Enhancements are conservation actions that support or improve ongoing ecosystem function through changes to land management. Many enhancement activities provide direct support to the land manager through improved rangeland infrastructure or grazing management assistance. This support helps ranchers remain profitable and sustainable and thereby reduces the likelihood of land use change to something less beneficial for birds, such as row crop agriculture or subdivision. Thus, investments made toward enhancement activities can effectively provide a level of voluntary protection. Benefits of range enhancements for increasing grassland bird abundance are unclear, although preliminary results suggest Sprague's Pipit may respond positively to grazing management enhancements on lands expiring from the Conservation Reserve Program, and Chestnut-collared Longspur and Baird's Sparrow may respond positively to grazing management enhancements on native grasslands (Sather, unpubl. data). Other preliminary research also suggests a positive response to grazing management for Lark Bunting and Chestnut-collared Longspur (Latif, unpubl. data).

Enhancement mechanisms:

- Grazing management plans, e.g., rest-rotation management
- Range Infrastructure to include:
 - Fences – wire, electric, virtual
 - Water – tanks, pumps (wind, solar, electric), pipelines
- Annual invasive grass treatments using grazing management or other non-toxic tools
- Existing tame pasture CRP renovation (e.g., grazing, native species plantings, etc.)

Duration:

- NRCS EQIP contracts = 3 years
- NRCS Grazing Plans = typically 5 years
- Fed/state/NGO agreements = typically 10 years
- Voluntary compliance after agreement expires

Anticipated bird-habitat outcomes:

- Habitat loss is avoided
- Habitat and range function is likely to be improved

Anticipated bird response:

- Current average abundance at site maintained
- Increases in average abundance are likely within 7 years of implementation for some practices and species
- Decreases in average abundance are unlikely except under extenuating circumstances
- Decreases in abundance or breeding productivity possible if herbicides are used to treat annual invasive grasses

Restoration

Restoration activities help transition impaired or non-natural systems to a more functional state. It typically involves replanting of native and naturalized vegetation, redistributing how water moves and is stored across the landscape, minimizing soil erosion, and managing disturbance agents, such as cattle. Restoration activities by definition are designed to improve the ecological functions of a site and are expected to positively influence bird abundance over time. Recent research suggests grassland reseeded increased Sprague's Pipit and Baird's Sparrow abundance incrementally within 7 years of reseeded (Ellison unpubl. data, Sather unpubl. data). However, Thick-billed Longspurs increased in abundance the first 1-2 years after reseeded, but declined dramatically in subsequent years, as the shortgrass structure they prefer became too dense (Sather, unpubl. data). This study focused on restoration areas with managed cattle grazing; responses of grassland birds will likely differ if consistently heavy grazing, mowing, or similar management practices are applied. Research also suggests a positive response to the presence of lands enrolled in the Conservation Reserve Program at the landscape scale by Baird's Sparrow, Chestnut-collared Longspur, and Lark Bunting (Pavlacky et al. 2019).

Restoration mechanisms:

- Rangeland reseeded (primarily native, increased seed diversity)
- Low-tech, process-based mesic restoration (e.g., Zeedyk structures or beaver dam analogs)
- Conservation Reserve Program (CRP) – native range plantings, especially those implemented under State Acres for Wildlife (SAFE) for declining grassland birds or similarly targeted initiatives
- Conservation Reserve Program (CRP) – tame pasture plantings on previously cropped acres
- Woody encroachment removal

Duration:

- NRCS EQIP contracts = 3 years
- CRP contracts = 10-15 years
- Fed/state/NGO agreements = typically 10 years

Anticipated bird-habitat outcomes:

- New habitat is created
- Establishment can take 2-3 years or longer depending on environmental conditions
- Habitat degradation unlikely but may vary by species and management, e.g., the value of a CRP stand for some grassland obligates may deteriorate over time depending on which mid-contract management activities are implemented

Anticipated bird response:

- Average abundance at site assumed to be negligible prior to restoration
- Average abundance at site highly likely to increase within 7 years of implementation for most grassland-associated wildlife
- Decreases in average abundance are unlikely except perhaps for Thick-billed Longspur or other species that benefit from cropland practices
- Some species, such as Sprague's Pipit, are unlikely to respond favorably to CRP tame pasture plantings but are expected to respond favorably to native range plantings with managed grazing

Calculating Species Response to Conservation Activities

Using the previous assessment as justification, NGPJV partners developed a simple calculation for estimating an annual, numerical response by each species to actions, if the action occurs in the appropriate grassland type in occupied habitat. Calculating species response will follow a logic process (Fig. 3). Projects outside of the mapped distribution of a species will be assumed to have no influence on that species (Fig. 2).

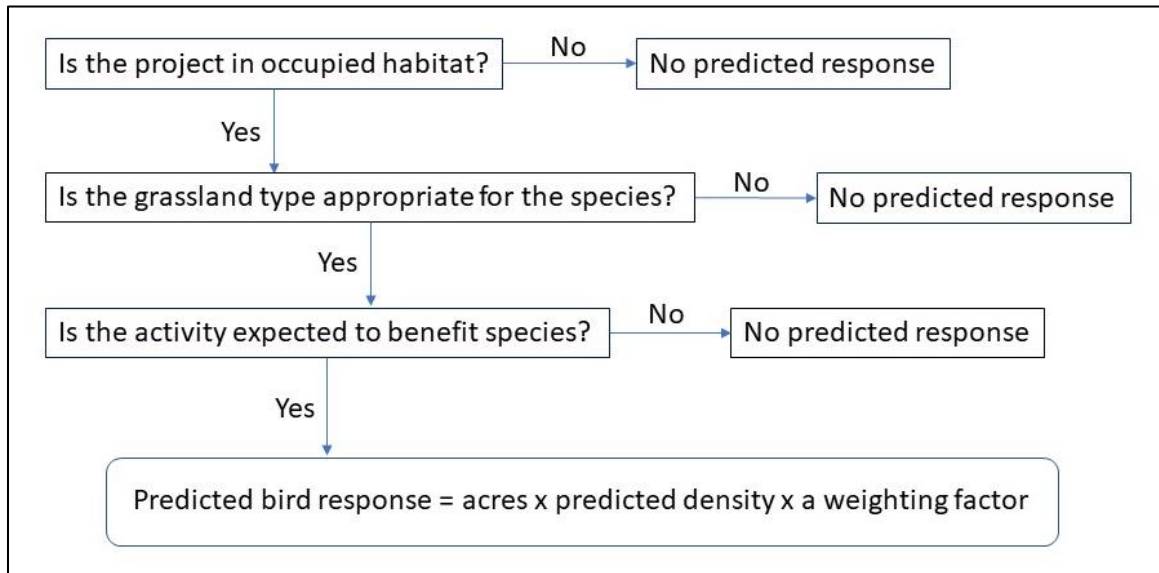


Figure 3. Logic process for predicting species response to grassland conservation actions.

Predicted density – Species-specific density estimates provided in Table 2 will be used as a predicted density range unless site-specific data are available.

Weighting factor – The weighting factor will depend on conservation activity and species. Based on the assumptions outlined above for each conservation activity, weighting factors are listed in Table 4.

Table 4. Weighting factors for assessing grassland bird responses to conservation action.

Action	Predicted outcome	Mechanism	Weight	Comments
Protect	Maintain	Easements, leases, & fee title	1.0	
Enhance	Voluntarily maintain, improve	Grazing management, fencing, water infrastructure	1.0	
		CRP renovation, annual invasive species management	</= 1.25	To be assigned on a species-specific, case-by-case basis in consultation with local biologists
Restore	Improve	Reseeding, low-tech, process-based restoration, new CRP plantings	0.5 year 1 0.75 year 3 1.0 year 7	Bird response expected to increase over time
		Woody encroachment removal	1.0	Bird response expected to be almost immediate

Adaptive Process

NGPJV partners will continue to refine and enhance methods for assessing species' responses to conservation action to include tracking responses over time and new information that better quantifies local abundance. For example, Bird Conservancy of the Rockies is creating a GIS tool that will predict bird response to grazing management or conservation easements based on local environmental conditions. Landscape context likely influences local bird abundance and NGPJV partners will work towards incorporating data on intactness and risk in future assessments. In the meantime, this document outlines a consistent process that NGPJV partners can use to provide an estimate of the potential impact of conservation projects in the region, and it will serve as a powerful communication tool.

Summary

The NGPJV's goal of conserving 1 – 2.5 million acres of grasslands in BCR 17 by 2026 is aggressive, yet achievable through the collective actions of all partners and stakeholders in the region. Estimated cost of achieving these objectives ranges from \$45 - \$120 million. The NGPJV will work to facilitate targeted activities by partners and stakeholders to help reach these objectives. The NGPJV will also track and monitor progress over time and will work to identify and incorporate additional science that will improve our planning. By maintaining and supporting high quality habitat on the breeding grounds, NGPJV partners will help build resilient lands that support grassland birds during a critical period of their life cycle.

References

- Andres, B. A., B. L. Altaman, A. M. Barteszevige, C. J. Beardmore, R. Dettmers, D. T. Jones-Farrand, E. J. Laurent, R. S. Mordecai, J. M. Tirpak, W. Vermillion, and J. A. Wheeler. 2020. Considerations for establishing bird population and habitat objectives to further conservation within habitat Joint Ventures. Partners in Flight Technical Series No. 9. Partners in Flight website: <https://partnersinflight.org/resources/pif-tech-series/>
- Correll, M., N. Drilling, A. Dwyer, L. George, A. Green, A. Panjabi, D. Pavlacky, Jr., L. Quattrini, A. Shaw, R. Sparks, E. Strasser, and A. Van Boer. 2016. Recommendations for grassland bird species conservation in the Northern Great Plains (NGP) Business Plan. Final Report. Bird Conservancy of the Rockies, Brighton, CO.
- Ellison, K., D. Casey, S.K. Olimb, P.E. Lendrum, C.S. Wightman, and M. Kauffman. *In Prep.* Spatial Prioritization for Grassland Conservation in the Great Plains. Publication to be determined.
- Fink, D., T. Auer, A. Johnston, M. Strimas-Mackey, O. Robinson, S. Ligocki, W. Hochachka, C. Wood, I. Davies, M. Iliff, and L. Seitz. 2020. eBird Status and Trends, Data Version: 2019; Released: 2020, Cornell Lab of Ornithology, Ithaca, New York. <https://doi.org/10.2173/ebirdst.2019>
- Green, A.W., D.C. Pavlacky Jr., and T.L. George. 2019. A dynamic multi-scale occupancy model to estimate temporal dynamics and hierarchical habitat use for nomadic species. *Ecology and Evolution* 9:793-803. DOI: 10.1002/ece3.4822.
- Greer, M. J., K.K. Bakker, and C.D. Dieter. 2016. Grassland bird response to recent loss and degradation of native prairie in central and western South Dakota. *The Wilson Journal of Ornithology*, 128(2), 278-289.
- Johnson, D.H., Igl, L.D., Shaffer, J.A., and DeLong, J.P., eds., 2019, The effects of management practices on grassland birds: U.S. Geological Survey Professional Paper 1842, <https://doi.org/10.3133/pp1842>.
- North American Bird Conservation Initiative, U.S. Committee, 2009. The State of the Birds, United States of America, 2009. U.S. Department of Interior: Washington, DC. 36 pages.
- North American Bird Conservation Initiative. 2016. The State of North America's Birds 2016. Environment and Climate Change Canada: Ottawa, Ontario. 8 pages. www.stateofthebirds.org
- Panjabi, A.O., W.E. Easton, P.J. Blancher, A.E. Shaw, B.A. Andres, C.J. Beardmore, A.F. Camfield, D.W. Demarest, R. Dettmers, R.H. Keller, K.V. Rosenberg, T. Will, and M.A. Gahbauer. 2020. Avian Conservation Assessment Database Handbook, Version 2020. Partners in Flight Technical Series No. 8.1. <http://pif.birdconservancy.org/acad.handbook.pdf>.
- Pavlacky D.C. Jr., P.M. Lukacs, J.A. Blakesley, R.C. Skorkowsky, D.S. Klute, B.A. Hahn, V.J. Dreitz, T.L. George, and D.J. Hanni. 2017. A statistically rigorous sampling design to integrate avian monitoring and management within Bird Conservation Regions. *PLoS ONE* 12(10): e0185924.
- Pavlacky, D. C., Jr., R. A. Sparks, A. Van Boer, A. W. Green and T. L. George. 2019. A species richness metric to quantify the response of grassland birds to the Conservation Reserve Program. Technical Report AG-3151-P-17-0222. Bird Conservancy of the Rockies, Brighton, Colorado, USA.

Rosenberg, K. V., J. A. Kennedy, R. Dettmers, R. P. Ford, D. Reynolds, J.D. Alexander, C. J. Beardmore, P. J. Blancher, R. E. Bogart, G. S. Butcher, A. F. Camfield, A. Couturier, D. W. Demarest, W. E. Easton, J.J. Giocomo, R.H. Keller, A. E. Mini, A. O. Panjabi, D. N. Pashley, T. D. Rich, J. M. Ruth, H. Stabins, J. Stanton, and T. Will. 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in Flight Science Committee. 119 pp.

Sauer, J. R., D. K. Niven, J. E. Hines, D. J. Ziolkowski, Jr, K. L. Pardieck, J. E. Fallon, and W. A. Link. 2019. The North American Breeding Bird Survey, Results and Analysis 1966 - 2019. Version 2.07.2019 USGS Patuxent Wildlife Research Center, Laurel, MD.

Somershoe, S. G. (editor). 2018. A Full Annual-Cycle Conservation Strategy for Sprague's Pipit, Chestnut-collared and McCown's Longspurs, and Baird's Sparrow. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Will, T., J.C. Stanton, K.V. Rosenberg, A.O. Panjabi, A.F. Camfield, A.E. Shaw, W.E. Thogmartin, and P.J. Blancher. 2020. Handbook to the Partners in Flight Population Estimates Database, Version 3.1. PIF Technical Series No 7.1. pif.birdconservancy.org/popest.handbook.pdf

World Wildlife Fund. 2021 Plowprint Report. World Wildlife Fund, Bozeman, MT.
<https://www.worldwildlife.org/projects/plowprint-report>

APPENDIX I: List of Assumptions and Calculations for Section 1

Assumptions

- Breeding habitat loss and degradation are primary drivers of declining trends for grassland birds.
- Immigration and emigration are not significantly influencing population trends in BCR 17 during the breeding season, excepting occasional seasonal impacts of extreme precipitation (Green et al. 2019).
- Conservation actions on the breeding grounds will positively affect population trends.
- Avoided loss, creation of new habitat, and improvement of existing habitat will lead to dampened population declines.
- There is a 1:1 sex ratio among breeding pairs.
- Grassland conversion will continue at a rate of 0.45/year in the region.
- Conservation actions will be on rangelands that are under grazing management appropriate for local conditions.

Calculations

NGPJV 2026 Trend Objectives

Chestnut-collared Longspur 60% dampened trend = Current population trend for BCR 17 x .40

Lark Bunting 45% dampened trend = current population trend for BCR 17 x .55

For other species, 2026 trend objective was set at zero.

Mean Density Estimates

UM estimates provided as males only. Estimates were multiplied by 2 for consistency with other estimates and calculations.

IMBCR estimates post-stratified by grass or grass and sage shrub transects for all species. Estimates were calculated across BCR 17 for Lark Bunting and Chestnut-collared Longspur but calculated by state X BCR 17 regions for Sprague's Pipit, Thick-billed Longspur, and Baird's Sparrow. Highest mean state X BCR 17 estimates were used in calculations.

All estimates originally calculated as birds/km². Converted to birds/acre by dividing by 247.

Population Objectives

If current trends continue = current population estimates X current trends

2026 Population objectives = current population estimates X dampened trends

Habitat Objectives

Habitat objectives for breeding pairs = [(# of birds in 2026 if trends are dampened - # of birds in 2026 if current trends continue) X high (low) density estimates]/2