Conservation Strategies for the Long-billed Curlew

Focal Areas, Desired Habitat Conditions and Best Management Practices

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American Bird Conservancy

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Executive Summary

Long-billed Curlew (curlew) populations have declined throughout much of their range. The species is on the American Bird Conservancy (ABC) Watch List, is a U.S. Fish and Wildlife Service (USFWS) Bird of Conservation Concern, is a Species of Concern in Canada, and was identified as a Species in Greatest Need of Conservation in the State Wildlife Action Plans of most states in which it breeds. Both the U.S. and Canadian Shorebird Plans list the species as "highly imperiled". Our intent with document was to move forward with several recommendations from the USFWS Status Assessment and Conservation Action Plan for the species. Our goals are to implement habitat protection, enhancement and management alternatives to ensure no net loss of Long-billed Curlew nesting habitat throughout its breeding range, and increase populations by 30% over 30 years (through 2043). We identified significant threats and opportunities, selected 12 continental and additional draft regional focal areas for curlew conservation, and present recommended best management practices (and standards) to implement at rangewide, ecoregional and focal area scales. The latter fall into five categories: 1) Manage grazing appropriately; 2) Halt habitat conversion; 3) Emphasize native grasses and forbs; 4) Avoid disturbance during sensitive periods; and 5) Adjust certain agricultural practices. Effective conservation of the Long-billed Curlew will require concerted efforts by agencies, non-government organizations, landowners and citizen scientists to ensure that important breeding sites and habitats are identified and managed to meet the habitat needs of the species. Tracking of opportunities, population and occupied habitat estimates, and conservation accomplishments will be facilitated by setting up a registry system for each of the continental and regional focal areas.

Acknowledgments

Much of the impetus and background came from the excellent Status Assessment prepared by Suzanne Fellows and Stephanie Jones of the U.S. Fish and Wildlife Service, and from a compilation of management effects compiled by the Northern Prairie Wildlife Research Center of the USGS, led by Jill Dechant, Doug Johnson and others. Tanya Luszcz and Dick Cannings provided key resources and comments regarding the Canadian portion of the bird's range. The leadership of the Intermountain West, Playa Lakes, Rainwater Basin and Northern Great Plains Joint Ventures have all highlighted the needs of the curlew as a conservation priority, and continue to provide support for improving the science and cooperation required for its conservation. David Younkman, Jay Carlisle, Mike Denny, Rob Cavallaro, Cole Lindsey, Sidra Blake, and Brad Andres provided input and comments to preliminary drafts of this document.

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Introduction

Long-billed Curlew (*Numenius americanus*) (curlew) populations have declined throughout much of their range, and no longer occupy much of the eastern portion of their historic range, which once reached the Great Lakes (Fellows and Jones 2009). Habitat conversion has been a primary factor in these declines, especially across the Great Plains, as native grassland habitats were converted to cropland. As much as 75% or more of the Great Plains grasslands in the U.S. and Canada (Pitt and Hooper 1994) have undergone such conversion. Certain agricultural habitats, most notably flood-irrigated or sub-irrigated hayfields, can provide important seasonal feeding habitats for curlews, but few are used for nesting, and most row crops are entirely unsuitable. Urban/suburban growth and energy development have also replaced, altered and fragmented habitat. Although livestock grazing can be compatible with the habitat needs of curlews, nest trampling can be an issue, and in many cases, the seasonality or intensity of grazing result in conditions not compatible with the needs of nesting curlews. Because of these trends and concerns, the Long-billed Curlew is on the ABC Watch List, is a U.S. Fish and Wildlife Bird of Conservation Concern, and was identified as a Species in Greatest Need of Conservation in the State Wildlife Action Plans of most states in which it occurs. Both the U.S. and Canadian Shorebird Plans list the species as "Highly Imperiled".

The U.S. Fish and Wildlife Service (Fellows and Jones 2009) and Environment Canada (2013) have compiled status assessment and conservation action (management) plans for the species which summarized the legal status, range, population status, habitat requirements and threats across its range in the U.S. and Canada. Those plans also provided sets of recommendations and priority actions, along with detailed state and provincial summaries of the species' status across its range in all seasons. Our intent with this document is not to reiterate the material presented in those documents, but rather to move forward with some of their recommendations, notably:

- Determine micro- and macro- habitats
- Improve curlew breeding habitat in North America including publishing recommendations as Best Management Practices
- Improve curlew breeding habitat and Best Management Practices - Northern Prairies.
- Improve curlew breeding habitat and Best Management Practices - Great Basin and sagebrush grasslands.
- Improve curlew breeding habitat and Best Management Practices - shortgrass prairies.
- Determine minimum habitat requirements.
- Develop habitat use models and use Long-billed Curlew survey information to identify locations of key sites.
- Adopt and implement best management practices for agricultural and industrial activities to manage human (impacts) at key sites.
- Develop conservation agreements with private landowners that focus on conservation of native grasslands at key sites.
- Ensure Long-billed Curlew needs are considered in any new or updated management plans for public grassland areas.

USFWS (2009) Status Assessment and Conservation Action Plan for the Long-billed Curlew

Environment Canada (2013) Management Plan for the Long-billed Curlew in Canada

Background

Long-billed Curlews currently breed from Texas to central British Columbia and from Nebraska to California, reaching their highest relative abundance in those parts of their range with intact grassland landscapes (Figure 1). Recent Breeding Bird Survey (BBS) data indicate a significant downward trend for North America as a whole. They are declining through much of the eastern portion of their range, with some regional increases in the central and western/northwestern portions (Figure 2).

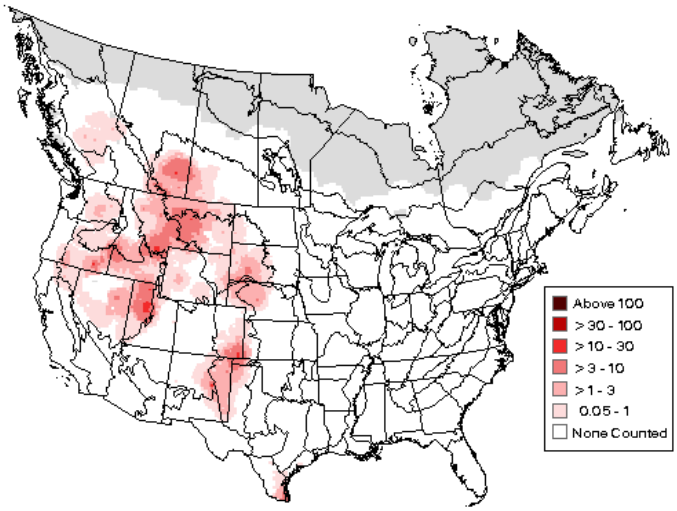


Figure 1. Current distribution and relative abundance of the Long-billed Curlew from BBS data, 2007-2011.

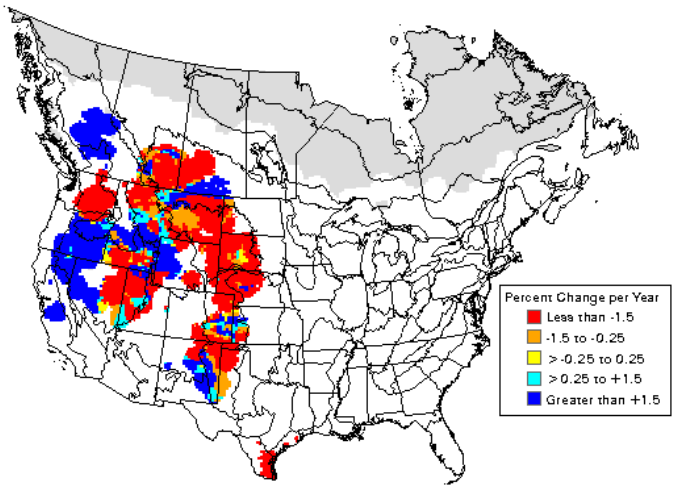


Figure 2. Long-billed Curlew population trend map, from Breeding Bird Survey data, 2007-2011.

Conservation Targets and Goal Statement

Our goal is to implement habitat protection, enhancement and management alternatives adequate to ensure no net loss of functional Long-billed Curlew habitat, throughout its breeding range in North America. Furthermore, to do this as part of a full life-cycle approach to conserving curlew populations throughout their range in the Americas, including important migration and wintering areas. As part of this conservation delivery, we will strive to build the tools necessary to assess progress against attainable population and habitat targets.

Population and Habitat Objectives

The U.S. Shorebird Plan (Brown et al. 2001) originally proposed an objective to increase the population of Long-billed Curlew by 30% from 20,000 to 28,500. The USFWS Status Assessment and Conservation Action Plan (Fellows and Jones 2009) revised the population estimate to approximately 160,000, but did not specifically retain the objective to increase the population by 30%. ABC and the Intermountain West Joint Venture (IWJV) used our Habitat and Populations Strategies (HABPOPS) database to develop another bottom-up (habitat-based) population estimate for the species, and to test whether a 30% increase is reasonable or achievable. We are now working to find ways to highlight those landscapes with the most potential for conservation success. Our bottom-up estimate of Long-billed Curlew populations in the IWJV portions of BCRs 9, 10 and 16 (235,000) exceeded, but fell within the 95% confidence interval of, the continental estimate (161,181; range 120,882 – 549,351) of Jones et al. (2008).

The 2013 IWJV Implementation Plan included assessment of the potential population effects of various conservation scenarios across a significant portion of the species' range. Our calculations included regional population estimates, but it is the percent (%) response, not necessarily the number of birds, that gives us an idea of the level of effort needed to stabilize or increase populations of the species. Previous conservation scenarios (Altman and Casey 2006) for seven agricultural habitat types, 24 grassland habitat types, and 11 shrub-steppe/savanna habitat types in the IWJV revealed that a 51% population increase could be achieved by converting 1.7 million ac of agricultural land to grassland; managing 5.7 million ac of currently occupied grassland habitats to increase nesting density; and manipulating 1.2 million ac of shrub-steppe and savanna to improve suitability and/or increase nesting densities. There are approximately 28.9 million ac of agricultural, grassland and shrub-steppe or savannah that we deemed at least partially suitable as breeding habitat for this species within the IWJV. Our combined scenario therefore represented treating 22% of the targeted habitats to produce a 51% increase in the population.

Converting 10% of the 17.1 million ac of suitable agricultural lands within the IWJV range of the Long-billed Curlew to moderately suitable grassland would yield about a 1% overall increase in the IWJV population, mostly because we estimate that less than 2% of the population currently nest in these agricultural habitats. In grassland habitats, our modeling predicted the greatest gain in curlew numbers would come from managing to raise densities in 5.7 million ac of occupied areas (a 42% population increase). Any management actions taken to improve grassland habitat conditions across significant portions of the species' range would likely increase both the amount of suitable habitat and the quality of occupied habitat (as expressed by increased bird densities) in combination. Continued scenario testing with our improved HABPOPS model

(http://data.prbo.org/partners/iwjv/iwjvmap.php) will allow us to refine these estimates of the amount of habitat needed to achieve population goals, and to track conservation successes.

Our modeling predicted that guided habitat manipulations on 27% of the 4.4 million ac of suitable shrub-steppe and savanna habitats (to emphasize grassland elements) would yield an 8% overall increase in the IWJV population, by nearly quadrupling the number of curlews in the population segment using these habitats. Although significant population increases could be achieved in these habitat types through shrub and tree removal/reduction, this is also the habitat where meeting the needs of other priority bird species dependent on sagebrush or juniper/pine habitats might take conservation priority (e.g. Greater Sage-Grouse, Brewer's Sparrow, Gray Flycatcher, Pinyon Jay).

Based on the HABPOPS outputs, the IWJV adopted the 30% trend-based objectives of the North American Shorebird Plan, applying them to our population estimates for each BCR-State polygon in BCRs 9, 10 and 16 within the joint venture (Table 1). The Playa Lakes Joint Venture has also developed specific habitat and population objectives for curlews in each state within BCR 18. Those are presented within our Recommended Actions and Management Guidelines by Ecoregion (page 32). There have been few other efforts to delineate curlew population or habitat objectives at ecoregional or finer scales, but broader objectives have been outlined by both the USFWS (Fellows and Jones 2009) and Environment Canada (2013).

Table 1. Estimates of Long-billed Curlew (LBCU) occupied acres, populations, and population objectives by state-BCR polygon within the IWJV.

Species	BCR	State	Occupied Acres	Population Estimate	% of BCR IWJV Population	Trend-based Objective	Population Objective
LBCU	9	CA	545,600	11,900	6%	1.3x	15,500
LBCU	9	ID	2,421,800	57,000	31%	1.3x	74,100
LBCU	9	NV	1,366,900	27,600	15%	1.3x	35,900
LBCU	9	OR	3,088,200	53,700	29%	1.3x	69,800
LBCU	9	UT	665,700	14,600	8%	1.3x	19,000
LBCU	9	WA	1,031,000	20,400	11%	1.3x	26,500
LBCU	9	WY	600	10	<1%	1.3x	10
Subtotal: BCR 9 in the IWJV			**9,119,800**	**185,210**			**240,810**
LBCU	10	CO	89,200	800	2%	1.3x	1,000
LBCU	10	ID	253,800	4,500	10%	1.3x	5,900
LBCU	10	MT	966,600	7,400	16%	1.3x	9,700
LBCU	10	OR	726,300	12,000	25%	1.3x	15,600
LBCU	10	UT	73,300	600	1%	1.3x	800
LBCU	10	WA	60,900	600	1%	1.3x	800
LBCU	10	WY	1,732,000	21,400	45%	1.3x	27,800
Subtotal: BCR 10 in the IWJV			**3,902,100**	**47,300**			**61,600**
LBCU	16	CO	5,900	100	1%	1.3x	130
LBCU	16	ID	1,500	30	<1%	1.3x	40
LBCU	16	NM	327,200	5,300	79%	1.3x	6,900
LBCU	16	UT	25,500	300	4%	1.3x	400
LBCU	16	WY	39,300	1,000	15%	1.3x	1,300
Subtotal: BCR 16 in the IWJV			**399,400**	**6,730**			**8,770**
Total: BCRs 9, 10 and 16 in the IWJV			**13,421,300**	**239,240**			**311,180**

Conservation Objectives

- Adopt continental and regional focal area as a geographic framework for directed, partnership-driven conservation of Long-billed Curlew breeding habitat on public and private lands.

- Identify key habitats occupied by Long-billed Curlews or suitable for restoration, and achieve no net loss of Long-billed curlew nesting habitat over the next 30 years (through 2043).

- Protect, restore and/or enhance enough grassland, shrub-steppe and agricultural habitats to achieve a 1% increase in Long-billed Curlew populations per year, toward an objective of increasing the population by 30% by 2043 (increase carrying capacity on 5.2 million acres).

- Based on the analyses done by the IWJV, annual conservation targets for BCRs 9, 10 and 16 should include the addition or improvement of:
    - 34,000 ac of agricultural habitats;
    - 114,000 ac of grassland habitats; and
    - 24,000 ac of shrub-steppe habitats with significant grassland elements.

- Support and adopt the long-term PLJV objectives of 5 million acres of shortgrass prairie, 1.2 million acres of mixed grass prairie, 80,000 acres of prairie dog towns, and 10,000 acres of playas conservation in BCRs 18 and 19.

- Achieve conservation on a minimum of 1.5 million acres of Long-billed Curlew breeding habitats by 2018.

- Establish a conservation registry for each continental and regional focal area which documents conservation opportunity and progress, including:
    - Long-billed Curlew population estimates (additional monitoring and inventory);
    - ownership and habitat summaries identifying opportunity and stewardship responsibility;
    - estimates of occupied acres;
    - identification of acreage under long-term stewardship (conservation estate);
    - identification of sites and acreage where best management practices and habitat restoration/enhancement have been applied; and
    - accomplishment reporting for partnerships.

Section I – Habitat Needs

Guided enhancement of agricultural, grassland and shrubsteppe habitats and landscapes for Long-billed Curlews requires knowledge of the specific habitat and landscape characteristics needed by the birds, at ecoregional scales. During their rangewide breeding season surveys in support of the USFWS 2009 status assessment, Saalfeld et al (2010) detected most curlews in shortgrass prairie (52%) and pasture grasslands (37%), finding negative correlations with coniferous forest and scrub-shrub, but positive correlations with wetland presence at landscape scales (Saalfeld et al. 2010).

Dechant et al (1999) provided a thorough summary of the rangewide variation in habitat selection by curlews (http://www.npwrc.usgs.gov/resource/literatr/grasbird/lbcu/lbcu.htm). Virtually all studies of have indicated that relatively short graminoid vegetation is among the key habitat variables selected by nesting curlews. Changes in vegetation height resulting from grazing, mowing, fertilization, and moisture (precipitation or irrigation) can all influence habitat selection and curlew nest success (Bicak et al. 1982, Redmond and Jenni 1986, Paton and Dalton 1994). Preferred grass heights have been described variously across the range as from <10 cm (Bicak et al 1982) to <30 cm (Pampush 1980). They also seem to require bare ground elements, some (though sparse) additional tall forb or shrub cover. Though they do nest in some areas far from permanent water sources, areas within 1-3 km of wetlands (playas, potholes, wet meadows) are preferred. As noted by Fellows and Jones (2009), habitat relationships seem to vary widely enough across the range of the species that it is difficult to derive uniform prescriptions. Here we present general themes, followed by summary tables from Dechant et al (1999) organized by ecoregion.

Following the tables, we identify significant threats and opportunities that deserve immediate action. We then present focal areas identified by ABC and our partners to represent priority areas for conservation implementation for curlews. Finally, we present recommended best management practices (and standards) to implement at rangewide, ecoregional and focal area scales, in order to achieve conservation objectives for the Long-billed Curlew across its breeding range.

Agriculture

Though they clearly prefer grasslands for nesting, Long-billed Curlews have been documented using a wide variety of agricultural habitats during the breeding season, seemingly preferring those that mimic the structure of native grasslands or which provide an abundance of invertebrate prey. Both native and non-native pastures, dry or irrigated, are used for nesting, particularly where fields have not been leveled for planting (some micro-topography seems necessary to facilitate awareness of approaching predators). Hay meadows are often used for feeding, but less so for nesting, although in certain portions of their range hay meadows seem to be the preferred habitat (R. Cavallaro, pers. comm.). Cropland, fallow and stubble are used rarely for nesting and variably for feeding, based on food resources available. Flood (or sub-) irrigated fields can provide favored feeding opportunities for adults and newly hatched broods; center-pivot and other overhead irrigation systems are not as likely to provide the saturated soils and food biomass that such sites provide. I

Grassland

Curlews nest in a wide variety of native and non-native grassland habitats, from the shortgrass prairies of the southern Great Plains, to the mixed grass prairies of the glaciated northern prairies, to stands of invasive cheatgrass throughout the Great Basin. Historically, Long-billed Curlews responded to the grassland habitat conditions provided under grazing by bison, prairie dogs and other ground squirrels, and relatively frequent fire. Because of their preference for relatively short (10-30 cm or less) and relatively sparse grass for nesting, they will often nest on sites grazed by livestock. While this means that they can be compatible with working rangelands, the timing and intensity of grazing can affect both overall habitat suitability and nest success. Within the low, sparse relatively level grasslands they prefer, curlews often select sites for nesting that are slightly taller vegetation, with more cover, and slightly elevated with respect to the surrounding area.

Shrub-steppe

Throughout much of the Great Basin, Northern Rockies and northwestern portions of the Northern Great Plains, curlews nest in shrub-steppe habitats, generally on sites with low shrub densities, a dominance of grass in the understory, and an open ground component. In many places they are using shrub-steppe areas cleared of shrubs for the purpose of improving livestock grazing. Throughout the Great Basin in particular, they occur in some of their highest densities in former shrub-steppe stands now dominated by cheatgrass. Ironically, in some areas efforts to eradicate the latter and restore the former may be to the detriment of curlew populations. Indeed, perhaps one of the only fortuitous aspects of the difficulty in slowing the spread of cheatgrass is that it does provide habitat for curlews.

Wetlands

Though they are highly reliant on wetlands during migration periods and during winter throughout much of their range, studies have varied widely on the importance of wetland habitats to Long-billed Curlews during the breeding season. Only one study (Faanes and Lingle 1995) indicated that curlews nested in higher densities in wet meadow than in upland prairie. Several authors have suggested that preferred nesting habitats must be within 1-3km of wetlands, and yet in many parts of the breeding range the only wetlands are ephemeral (e.g. playas), and the birds are apparently well adapted to cope with drier periods. Still, we can generally assume that the highest quality nesting landscapes do include wetland elements.

For each of the following summary tables, the following terminology has been used. “Idle” is used as a modifier (e.g., idle tallgrass) denotes undisturbed or unmanaged (e.g., not burned, mowed, or grazed) areas. “Idle” by itself denotes unmanaged areas in which the plant species were not mentioned. Examples of “idle” habitats include weedy or fallow areas (e.g., old fields), fencerows, grassed waterways, terraces, ditches, and road rights-of-way. “Tame” denotes introduced plant species (e.g., smooth brome, crested wheatgrass) that are not native to North American prairies. “Hayland” refers to any habitat that was mowed, regardless of whether the resulting cut vegetation was removed. “Burned” includes habitats that were burned intentionally or accidentally or those burned by natural forces (e.g., lightning). In situations where there are two or more descriptors (e.g., idle tame hayland), the first descriptor modifies the following descriptors.

For example, idle tame hayland is habitat that is usually mowed annually but happened to be undisturbed during the year of the study:

Habitat Relationships: Great Basin (BCR 9)

Author(s)	Location(s)	Habitat(s) Studied*
Sugden 1933	Utah	Pasture, wetland
Species-specific Habitat Characteristics: Preferred **flat, open country** of alkali flats and wetlands around the Great Salt Lake		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Forsythe 1972	Utah	Shrubsteppe, shrubsteppe pasture
Species-specific Habitat Characteristics: Nests were found in irrigated and non-irrigated grass pastures and salt flats; nests were built in **bunchgrasses**, clumps of **sedges** (*Carex* spp.), and stands of inland **saltgrass** (*Distichlis spicata*), or **saltwort** (*Salicornia rubra*).		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Allen 1980	Washington	Cropland, shrubsteppe
Species-specific Habitat Characteristics: Preferred to forage in dune and ridge areas where topographic and vegetational diversity were high; most nests were on **relatively flat ground**; of 59 nests, 5% were >100 cm from an object, 37% were 30-100 cm from an object, 31% were <30 cm from an object, and 27% abutted an object (e.g., big sagebrush [*Artemisia tridentata*] limbs, rocks, dirt mounds, horse manure, metal cans, bunchgrasses); preferred to nest (71% of 21 nests) in areas dominated by downy brome (*Bromus tectorum*) and Sandberg's bluegrass (*Poa sandbergii*) rather than in areas dominated by downy brome alone (29% of nests); did not nest in stands of downy brome containing substantial amounts of tumbling mustard (*Sisymbrium altissimum*), nor in areas dominated by wheatgrasses (*Agropyron* spp.); mean vegetation values at nest sites in downy brome/Sandberg's bluegrass were **<10 cm** downy brome height, **20 cm Sandberg's bluegrass** height, 6.7% coverage of live downy brome, 65% coverage of dead downy brome, 17% coverage of live Sandberg's bluegrass, and 4.6% coverage of dead Sandberg's bluegrass; mean coverage values at nest sites in areas dominated by downy brome were 14% coverage of live downy brome and 92% coverage of dead downy brome.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Pampush 1980, Pampush and Anthony 1993	Oregon	Cropland, idle, idle shortgrass, idle tame, shortgrass/tame pasture, shrubsteppe, tame hayland
Highest mean densities of nests occurred in areas of downy brome with patches of Sandberg's bluegrass intermixed; avoided areas of antelope bitterbrush (*Purshia tridentata*) and areas with dense forbs; nest density was negatively correlated with vegetation height and vertical density; **foraged in fallow fields and alfalfa (*Medicago sativa*) as long as vegetation was <30 cm tall**; compared to non-nest areas, nest areas were associated with **shorter vegetation** (24 cm vs. 29 cm at non-nest areas), grass with less variation in height, total vegetation with less variation in height, grass with higher vertical density (0.8 contacts vs. 0.2 contacts/5 cm height increment) in the 25-50 cm height increment, and shrubs with lower total vertical density (0.02 contacts vs. 0.05		

contacts/5 cm height increment).		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Bicak et al. 1982	Idaho	Shortgrass/tame pasture, tame pasture
Species-specific Habitat Characteristics: Used areas of short, recently grazed vegetation; curlew density was positively correlated with size of management unit, annual total animal unit months, and area of vegetation <10 cm tall; areas grazed by sheep alone or by sheep and cattle had more area of short grass (32% of area sampled was <10 cm tall) and higher densities of curlews than did areas grazed by cattle alone (19% of area sampled was <10 cm tall); **did not use areas that had not been grazed for >1 yr.**		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Redmond 1986	Idaho	Cropland, shortgrass Pasture
Species-specific Habitat Characteristics: Nested in **shortgrass pasture**; foraged in shortgrass pasture when vegetation was sparse (3.6 to 9.7 cm tall) but **traveled up to 10 km** from nesting sites to forage in agricultural areas when vegetation was dense (12 to 15.7 cm tall with areas 40 cm tall) due to abundant precipitation.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Paton and Dalton 1994	Utah	Shrub-steppe pasture, wetland
Species-specific Habitat Characteristics: Habitat patches containing nests had shorter vegetation (mean of 5.6 cm) than random habitat patches (mean of 9.0 cm), and **more bare ground 6-15 m from the nest** (mean of 34-36%) than random patches (mean of 38-39%); at nest sites, vegetation <3 m from the nest was taller (mean of 6.5 cm) than vegetation 6-15 m from the nest (mean of 4.9-5.5 cm) and there was **less bare ground <3 m from the nest** (mean of 18%) than >6 m from the nest (mean of 28-39%).		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Blake (2013)	se Washington, ne Oregon	Shrub-steppe, grassland, agriculture
Species-specific Habitat Characteristics: Nested primarily in grasslands with no shrub cover, grasslands with moderate shrub cover less extensively, and agriculture occasionally. Broods required structure, and used **short grassland with moderate shrub cover (5-30%) more than grasslands with no shrubs,** across all study areas. Alfalfa, barley and wheat were all used for nesting, and tilling before mid-June was detrimental to survival.		

Habitat Relationships: Northern Rockies (BCR 10)

Author(s)	**Location(s)**	**Habitat(s) Studied***
Bent 1962	Rangewide	Idle mixed-grass, idle shortgrass, mixed grass pasture, shortgrass pasture
Species-specific Habitat Characteristics: Required large, open prairie expanses; nested on grazed rangeland and in **damp, grassy hollows or slopes near bodies of water**.		
Author(s)	**Location(s)**	**Habitat(s) Studied***

Cochran and Anderson 1987	Wyoming	Shortgrass hayland, shortgrass pasture, tame hayland, tame pasture, woodland
Species-specific Habitat Characteristics: Preferred irrigated native hayland and pasture over tame hayland and pasture; nested in pastures and hayfields that had lower mean percent grass cover (20 vs. 32%), **higher mean percent forb cover** (16 vs. 3.5%), and were drier (45 vs. 3% of random locations characterized as 'dry') than unused pastures and hayfields; within pastures and hayfields containing nests, **nest sites had less bare ground and higher percent cover of grasses** (values not given) than random sites; preferred to nest on **hummocks >2.5 cm above the immediate surroundings;** percent coverages in native hayland and pasture were 24% grass, 24% sedge (*Carex*), 23% bare ground, 9.9% rush (*Juncus*), 7.8% forbs, and 0.8% moss (Latin name not given).		

Habitat Relationships: Potholes and Prairies (BCR 11)

Author(s)	**Location(s)**	**Habitat(s) Studied***
Timken 1969	South Dakota	Pasture
Species-specific Habitat Characteristics: Curlews were noted in idle pasture and in cattle pasture, but **not in sheep pasture**.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Owens and Myres 1973	Alberta	Cropland, idle mixed-grass, mixed grass hayland, mixed-grass pasture
Species-specific Habitat Characteristics: Were **more common in areas of mixed-grass** than in cultivated areas.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Stewart 1975	North Dakota	Idle shortgrass, mixed-grass pasture
Species-specific Habitat Characteristics: Used **shortgrass prairie and mixed-grass pasture**; some areas of shortgrass prairie that were used had prickly pear cactus (*Opuntia*) and an open shrub layer composed of big sagebrush and silver sagebrush (*Artemisia cana*); **preferred gently rolling terrain with gravelly soils.**		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Prescott et al. 1993	Alberta	Mixed-grass pasture, tame pasture, wetland, wetland (restored)
Species-specific Habitat Characteristics: Were present **only in continuously but lightly grazed mixed-grass pasture**; absent from early summer-grazed mixed-grass pasture, spring grazed tame pasture, and deferred-grazed (grazed after 15 July) mixed-grass pasture.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Prescott 1997	Alberta	Cropland, hayland, idle, idle mixed-grass pasture, shrubland, tame pasture, woodland

Species-specific Habitat Characteristics: Occurred (in decreasing order of abundance) in mixed-grass, mixed-grass within sandhills areas, planted cropland, and hayfields; were **absent from fallow cropland, stubble fields**, riparian areas, upland shrubland, and upland areas of deciduous trees.

Author(s)	Location(s)	Habitat(s) Studied*
McMaster and Davis 1998	Alberta, Manitoba, Sask.	Cropland, **Permanent Cover Program** (PCP; idle tame, tame hayland, tame pasture)

Species-specific Habitat Characteristics: Present in both cropland and PCP grassland; PCP cover included combinations of **wheatgrasses, brome** (*Bromus* spp.), **and alfalfa** (*Medicago* spp.).

Author(s)	Location(s)	Habitat(s) Studied*
Gratto-Trevor 1999	Alberta	Shortgrass pasture, wetland

Species-specific Habitat Characteristics: Were **more common on dry transects** (a dry transect was defined as intersecting wetlands along <5% of its length) than on wet transects.

Habitat Relationships: Northern Great Plains (BCR 17)

Author(s)	Location(s)	Habitat(s) Studied*
Johnsgard 1979, 1980	CO, KS, NE, NM, ND, OK, SD, TX	Cropland, idle mixed-grass, idle shortgrass, idle tallgrass, mixed-grass pasture, tallgrass pasture, tame hayland, wet meadow

Species-specific Habitat Characteristics: Nested on **shortgrass plains on gently rolling terrain** or on upland prairie slopes; in the sandhill grasslands region, **close proximity to wet meadows was important in nest-site selection**; nests frequently were placed next to cowpies; used wet meadows as foraging areas.

Author(s)	Location(s)	Habitat(s) Studied*
Kantrud and Kologiski 1982	CO, MT, NE.ND, SD, WY	Mixed-grass pasture, shortgrass pasture, shrubsteppe

Species-specific Habitat Characteristics: Preferred **lightly grazed areas with aridic ustoll and aridic borollic** soils, and heavily grazed areas with typic ustoll soils; plants that were more common than average within nesting habitat included clubmoss (*Selaginella densa*), **blue grama, fringed sagewort** (*Artemisia frigida*), and golden aster (*Chrysopsis villosa*); other common plants within breeding habitat included **bluebunch wheatgrass** (*Pseudoroegneria spicata*), **prairie sandreed** (*Calamovilfa longifolia*), **and Idaho fescue** (*Festuca idahoensis*).

Habitat Relationships: Playa Lakes and Southern Great Plains (BCRs 18, 19):

Author(s)	Location(s)	Habitat(s) Studied*
Graul 1971	Colorado	Shortgrass
Species-specific Habitat Characteristics: Nested in shortgrass prairie at the edge of a valley and near a hill; nest was lined with **buffalo grass** (*Buchloe* sp.) and lichen (*Parmelia molliuscula*); vegetation surrounding the nest was buffalo grass, **blue grama** (*Bouteloua gracilis*), and plains prickly pear (*Opuntia polyacantha*).		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Cole and Sharpe 1976	Nebraska	Idle, pasture
Species-specific Habitat Characteristics: Were present on areas that were grazed, and **absent from idle areas.**		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Bicak 1977	Nebraska	Mixed-grass hayland, mixed-grass pasture
Species-specific Habitat Characteristics: Areas used by curlews had **75% of total vertical vegetation density <10 cm high**, compared to 63% in non-use areas; **proximity of nest sites to foraging meadows** was more important in nest site selection than vegetation characteristics.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
McCallum et al. 1977	Colorado	Idle, mixed-grass, shortgrass
Species-specific Habitat Characteristics: Preferred to nest in **shortgrass prairie**; occasionally nested in fallow fields; 41% of 63 curlew observations were <91 m from water and **68% were <403 m from water**; avoided tall (measurements not provided) vegetation.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
King 1978	Colorado, Texas	Cropland, idle mixed-grass pasture, sand-sage grassland, shortgrass pasture
Species-specific Habitat Characteristics: Six of seven nests were in **areas dominated by buffalo grass (*Buchloe dactyloides*) and blue grama**; one nest was in an area dominated by sand dropseed (*Sporobolus cryptandrus*); six of seven nests were within 20 cm of a cowpie; mean **vegetation height at nests was 11 cm**; mean vegetation cover at nests was 72%; at 3 m from nests, mean vegetation height was 20.6 cm; did not use areas dominated by sand sagebrush (*Artemisia filifolia*) for nesting or foraging; **39% of curlew observations occurred within 400 m of standing water** (irrigation, stockponds); used shortgrass, mixed-grass, and weedy areas in slightly greater proportions (75% of 354 observations) than their availability (67% of the landscape); **use of areas with high structural diversity increased following hatching of eggs**.		
Author(s)	**Location(s)**	**Habitat(s) Studied***

Johnsgard 1979, 1980	CO, KS, NE, NM, ND, OK, SD, TX	Cropland, idle mixed-grass, idle shortgrass, idle tallgrass, mixed-grass pasture, tallgrass pasture, tame hayland, wet meadow
Species-specific Habitat Characteristics: Nested on **shortgrass plains on gently rolling terrain** or on upland prairie slopes; in the sandhill grasslands region, close **proximity to wet meadows** was important in nest-site selection; nests frequently were placed next to cowpies; used wet meadows as foraging areas		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Shackford 1987	Oklahoma	Colonies of burrowing mammals, cropland, idle, shortgrass pasture
Species-specific Habitat Characteristics: Used **native pastures near cultivated fields** (mostly planted to wheat); areas that were used had clay loam soils on 0-1% slopes; curlews with young **foraged in prairie dog (*Cynomys*) colonies**.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Shackford 1994	Oklahoma	Cropland, shortgrass, tame
Species-specific Habitat Characteristics: Curlews were observed in cropland, in shortgrass prairie, and in tame grassland; **two nests were found in cultivated fields**.		
Author(s)	**Location(s)**	**Habitat(s) Studied***
Faanes and Lingle 1995	Nebraska	Idle mixed-grass, idle shortgrass, Idle tallgrass, wet meadow
Species-specific Habitat Characteristics: Nested at **higher densities in wet meadow** than in upland prairie.		

Section II - Threats and Opportunities

Historical declines in Long-billed Curlew populations were in part due to unrestricted hunting, but habitat changes due to conversion, fragmentation and management have been a primary driver of population declines since the initial push west by pioneers. The conversion of native prairie to cropland which began then continues today. With it now are changes due to urbanization, energy exploration and development, livestock grazing, and changes in fire regimes. All can result in the loss of suitable breeding habitats, and some are irrevocable. But each type of threat may present an opportunity to implement strategic conservation for curlews.

Habitat Conversion. Perhaps the single biggest opportunity to stem the tide of continued Long-billed Curlew population declines is to prevent the further plowing of native prairie wherever it occurs within the species' range. There have been Farm Bill programs designed specifically for this purpose (e.g. Sodbuster, Grassland Reserve Program). Furthermore, the Conservation Reserve Program has been instrumental in returning tilled lands to permanent grass cover. Often these were planted with crested wheat or other grass mixes that typically have too robust a growth habitat to be used by curlews. Program adjustments that encourage the use of native grasses

interseeded with legumes and other forbs, or even burning, mowing, light disking or controlled grazing could benefit curlews and other grassland species reliant on shorter and more heterogeneous habitat structure (as cited by Playa Lakes JV Implementation Plan for Nebraska BCR 18). These landowner incentive programs have been effective for many grassland species, but their continued funding is in question, and indeed many CRP acreages are coming out of enrollment. It will be important to find new, innovative ways to provide incentives to continue such work.

Perhaps the single biggest opportunity to stem the tide of continued Long-billed Curlew population declines is to prevent the further plowing of native prairie wherever it occurs within the species' range.

Land Protection Needs. The protection of currently occupied Long-billed Curlew habitats, particularly large blocks of native grassland, is perhaps the most pressing conservation need for the species. Little has been done previously to delineate those areas most in need of protection. There are many government and non-government programs and organizations that focus on long-term stewardship agreements, conservation easements, or even acquisition of important habitat blocks. These tools can prevent habitat conversion, and with guidance, could be focused on the largest and highest quality blocks of occupied curlew habitat. Tools to identify those blocks, and to verify their use by curlews, can include the identification of focal areas, analysis of stewardship, and the incorporation of citizen science (including landowners and managers themselves) to identify occupied areas.

Fragmentation. In addition to habitat conversion, some curlew breeding habitats may become unsuitable as roads, other right-of-ways, buildings or energy exploration and development (e.g.drilling pads, wind turbines) reduce the size of habitat patches below the threshold at which curlews will use them. While more work needs to be done to describe these threshold levels, our efforts to identify key areas will help us work with land managers to reduce the threat of fragmentation. Work in Idaho indicated a minimum patch size of about 120 acres (Redmond et al. 1981). The revision of land use plans by federal agencies, notably the Bureau of Land Management, should provide opportunities to directly incorporate recommendations for curlew management in key areas.

Land Management Recommendations. Preferred management prescriptions will preserve or create large blocks of low-structure grassland (for nesting) mixed with or in proximity to wetlands or moister meadow habitats (for feeding and brood-rearing). Grazing should be managed to provide cover levels compatible with the needs of curlews; grazing systems (particularly late summer, fall or winter) that leave grass 10-30 cm in height have the best potential for use by curlews. Where nesting curlews are present, disturbance (e.g. mowing, fire, grazing, spraying, road-building, ORV use) should be avoided during the nesting season (15 Mar – 15 Jul, varying regionally).

Management recommendations and their rationale were compiled by Dechant et al. (1999), who cited the specific studies supporting their recommendations. We summarize those again here, and provide bulleted management recommendations on pages 25 and 26 of this document.

The foremost recommendation is to prevent conversion of upland prairie to cropland (Faanes and Lingle 1995). Breeding habitat should be protected from detrimental human activities, such as vehicular use, and shooting (Sugden 1933, Redmond and Jenni 1986). In Saskatchewan, abandonment of breeding sites by Long-billed Curlews was attributed to researcher disturbance (Maher 1973, 1974). Habitat areas need to be >3 times as large as a Long-billed Curlew territory, which averages about 14 ha (35 ac), in order for curlews to use them, providing an unoccupied buffer strip 300-500 m wide around the edge of suitable habitat (Redmond et al. 1981).

Tall, dense residual vegetation should be removed before the pre-laying period (March to April) so that adults do not have to leave their territories to forage (Redmond 1986; R. L. Redmond, University of Montana, Missoula, Montana, pers. Comm.). Removal of residual vegetation is especially important after years of above-normal precipitation. Haying and grazing can be used to provide the short vegetation and reduced vertical plant density preferred by nesting curlews, but should be timed so that short vegetation is available early in the season (Cochran and Anderson 1987). In southwestern Idaho, curlews avoided areas that had not been grazed within the past year (Bicak et al. 1982), but the timing and intensity of grazing necessary to provide needed habitat structure needs to be adjusted based on local environmental factors (rainfall, soil productivity; Bicak et al. 1982, Cochran and Anderson 1987, Bock et al. 1993). Grazing during the incubation period should be avoided; in Wyoming, nests in areas that were grazed during incubation had lower hatching success rates than nests in other areas (Cochran and Anderson 1987).

Burning can be used with caution where fire will improve habitat by reducing shrub coverage and increasing habitat openness (Redmond and Jenni 1986, Pampush and Anthony 1993). During the breeding season following a fall range fire in western Idaho, the estimated curlew breeding density increased 30% (Redmond and Jenni 1986).

Curlews often place their nests adjacent to cowpies, and in westcentral Wyoming it was therefore suggested that hayfields should not be dragged to break them down (Cochran and Anderson 1987). However, in Idaho, curlews did not show a preference for nesting near cowpies (Redmond and Jenni 1986), suggested that dragging may be acceptable in some areas where it meets other management objectives.

Section III - Focal Area Identification

ABC and our partners have identified primary (continental) and secondary (regional) focal areas within the breeding range of the curlew in the U.S. and Canada, meant to represent those areas where the best remaining habitat, densest populations and/or known conservation opportunities come together. We initiated this effort using the HABPOPS database built for the IWJV, which identified and mapped current estimated carrying capacity of the landscape within BCRs 9, 10 and 16, within the IWJV boundary (Fig. 3).

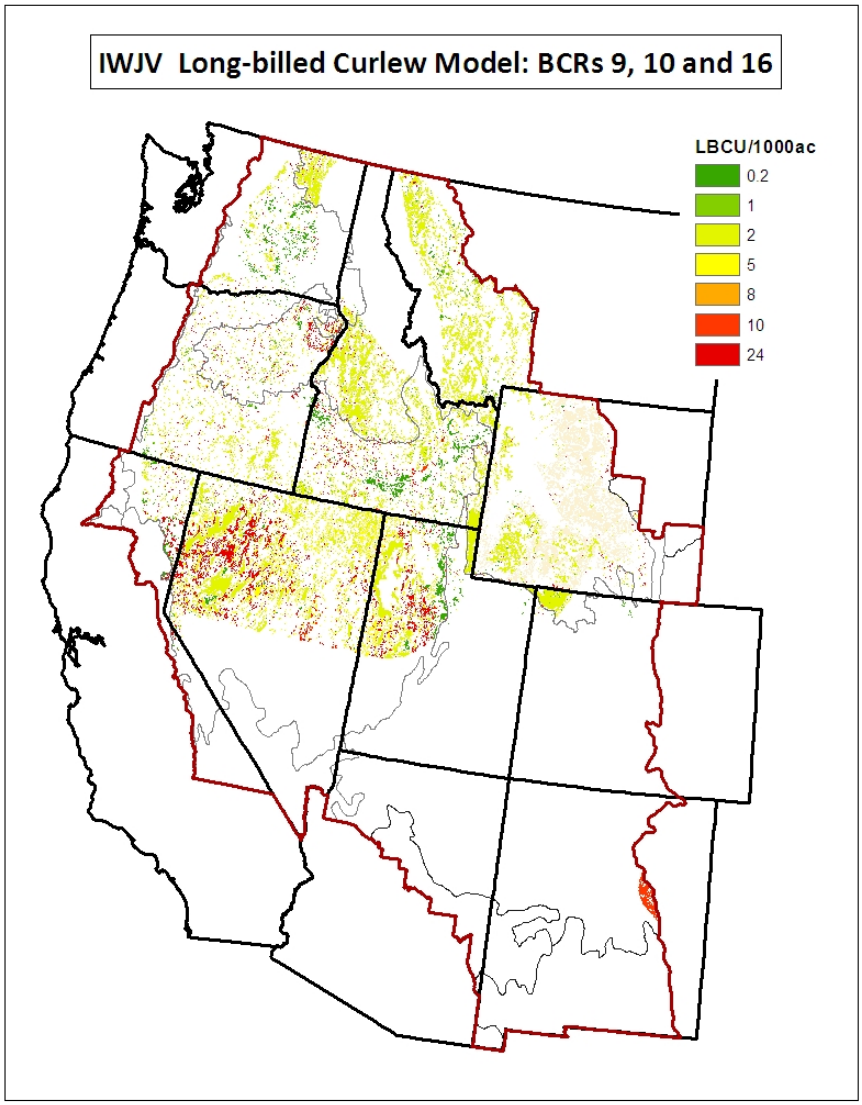


Figure 3. Long-billed Curlew habitat model, BCRs 9, 10 and 16 in the IWJV. Colors correspond to an index of the current estimated carrying capacity (estimated % occupancy) x (density) for the mapped vegetative associations in our HABPOPS model.

Figure 3 shows our current estimate of the carrying capacity of the vegetative associations in the Long-billed Curlew portion of our HABPOPS model, identifying those landscapes where we currently estimate carrying capacity to be the greatest. Areas toward the red end of the spectrum represent places where we have the most opportunity to protect existing populations; those at the green end of the spectrum represent areas where restoration and enhancement are most needed to increase carrying capacity.

Following the initial identification of "hotspots" using the HABPOPS model, we utilized the mapped results of relative abundance and trend as indicated by BBS data from 2001 through 2007 (Figures 1 and 2) to identify those areas where relative abundance was high, but populations trends were downward (Figure 4). These areas logically represent places where conservation action is most needed. We compared the resulting overlap in these data sets (BBS and HABPOPS)to develop a set of preliminary focal areas.

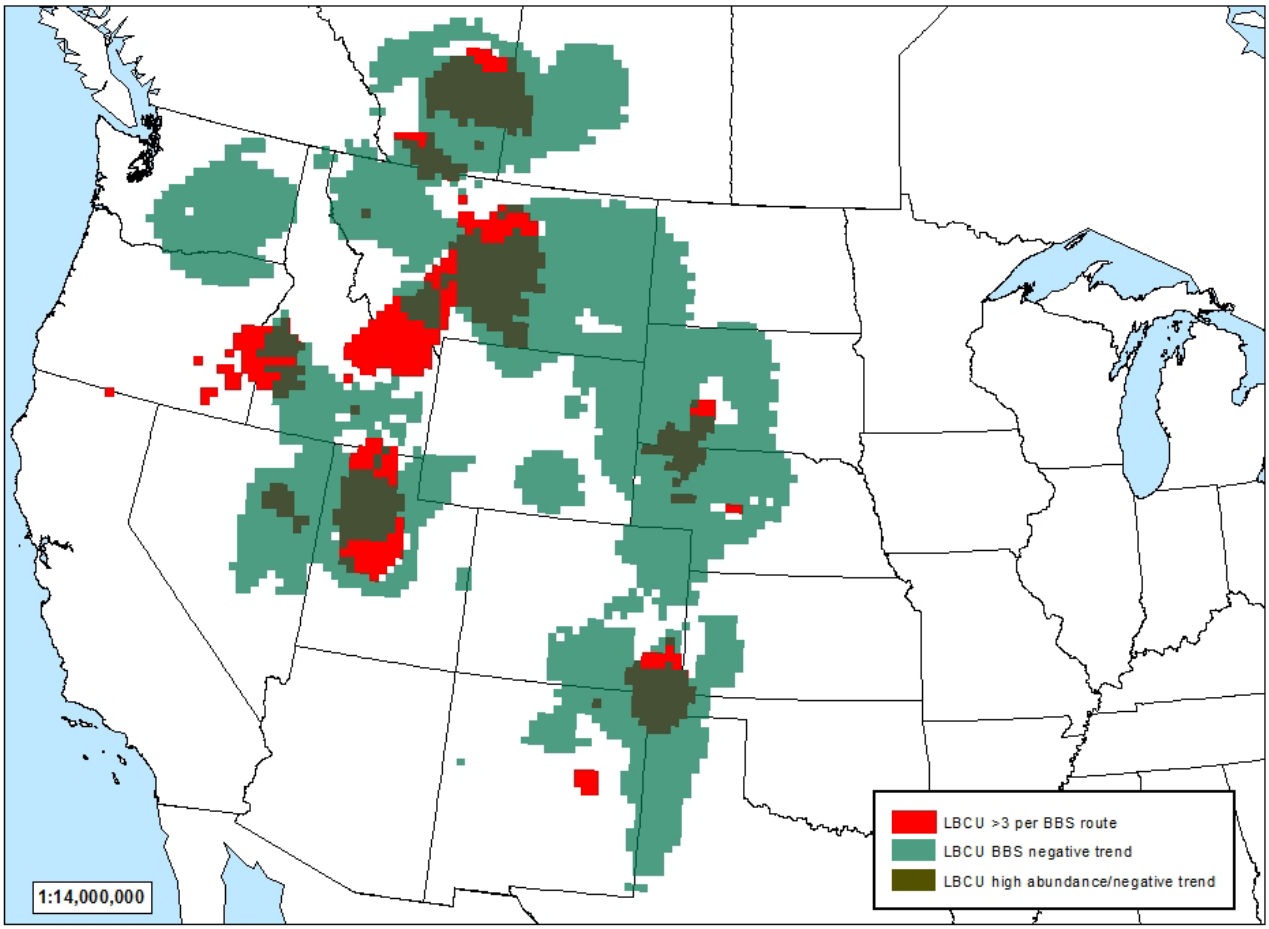


Figure 4. Relative abundance (>3 birds per route) and population trend (negative) from BBS data for the Long-billed Curlew, 2001-2007 (USGS data).

We selected 12 (Draft) continental or "primary" focal areas for Long-billed Curlew conservation (Figure 5). During the identification of these 12 draft primary focal areas, we also worked with partners on the state committees of the IWJV, and with partners in the Northern Great Plains and

Playa Lakes JVs, to identify regional "secondary" focal areas which represent population hotspots or high local interest in conservation. For example, additional focal areas in Montana were selected using the outputs of a predictive model developed by the Montana Natural Heritage Program and the Prairie Potholes Joint Venture. These regional focal areas are displayed in the figures associated with the Recommended Management Actions and Guidelines sections which follow.

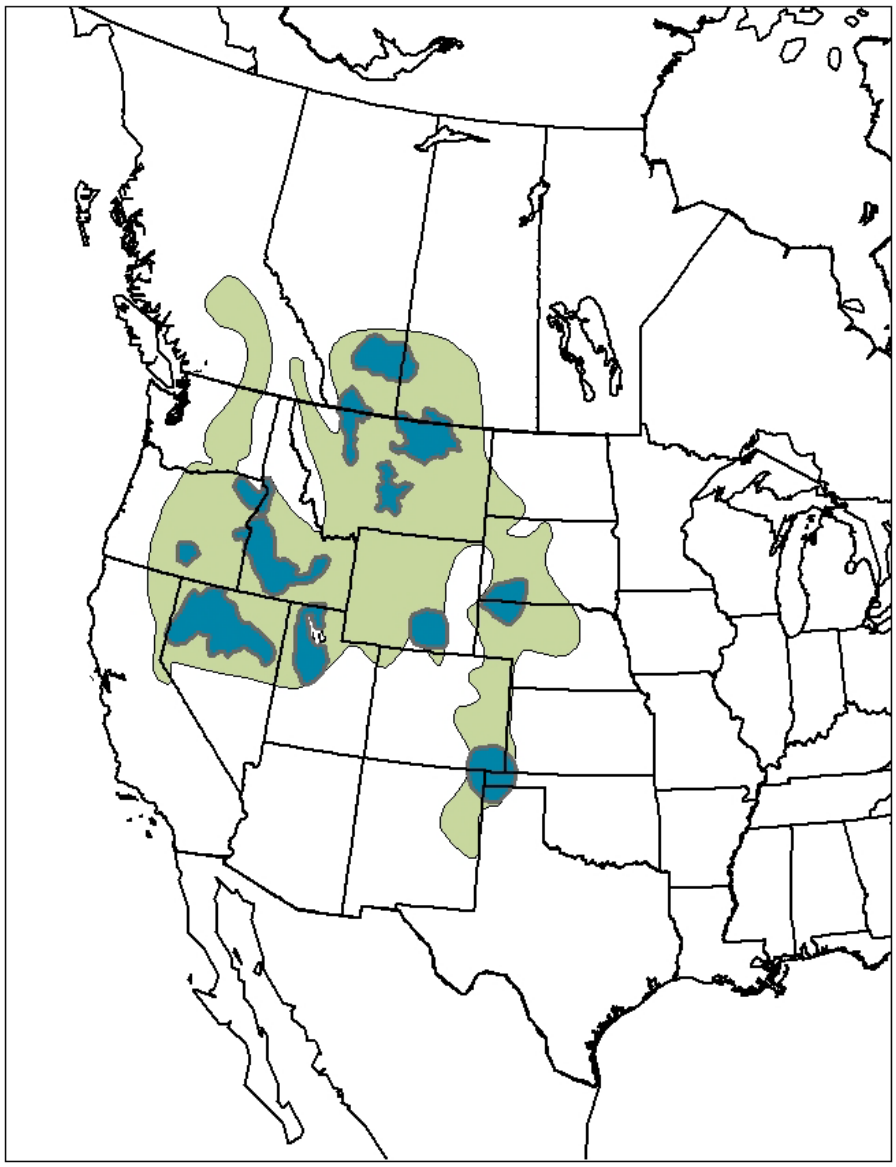


Figure 5. Primary (continental) focal areas (in blue) for Long-billed Curlew breeding habitat conservation, overlaid on the current breeding range of the species (in green).

Selection of these primary and secondary focal areas does not imply that management recommendations should not be implemented wherever breeding curlews occur. Indeed, ABC is working with regional partners (especially the Joint Ventures) to ensure that all interested parties will incorporate these guidelines into their management systems. But we do feel that these focal

areas will help catalyze action, and that tracking successes within them through a registry of sites will further help to delineate partner opportunities and responsibilities. We are setting up such a registry as part of the focal area designation process. The registry will include (at a minimum) summaries of the known and estimated habitat acreage and population of curlews for each area, and will identify currently protected lands, private and public ownership, and project tracking, along with information on the conservation partners and other stakeholders.

Section IV – Best Management Practices

The following set of recommended management actions and guidelines should be implemented wherever practicable within the breeding range of the Long-billed Curlew in North America. They are adapted from Dechant et al (1999) and Cannings (1999), and are meant to also benefit other grassland species associated with native grassland habitats. In every case, these guidelines will be most effective if implemented on landscapes already known to be inhabited by breeding curlews; ideally implementation should be accompanied by local surveys to verify important nesting or brood rearing areas. The timing of breeding, appropriate stocking rates, seed mixes and opportunities will vary regionally, as well as by site. We present these as overall guidance to land managers across the range of the species, but urge local partner cooperation and consultation during their implementation. This will help ensure that local expertise and other site management objectives are taken into account.

Manage Grazing Appropriately

- Remove tall, dense residual vegetation before the spring arrival/pre-laying period (graze in fall/winter). Target date: 15 March (adjusted regionally/locally)
- Adjust timing and intensity of grazing to leave grass cover 10-30 cm tall by the time of nest initiation. Target date: 15 April (adjusted regionally/locally).
- Retain 5% of grasses and forbs in taller condition (30-40 cm) for broods.
- Avoid grazing during the incubation and nestling period, to avoid potential for trampling. Target dates: 15 April – 15 July (adjusted regionally/locally)
- Do not drag hayfields to break up cowpies.

Halt Habitat Conversion

- Prevent conversion of grassland or shrub-steppe, particularly in landscapes with wetland elements.
- Maintain or manage for grassland block sizes of >120 acres.
- Manage the forest fringe to minimize/reverse forest encroachment using slashing or other suitable method.

Emphasize Native Grasses and Forbs

- Burn areas only where and when fire intensity will reduce shrub coverage and increase habitat openness without reducing the diversity of native grass and forbs.

- Avoid seeding with non-natives (e.g. crested wheatgrass).
- Use locally-appropriate native bunchgrass/forb seed mixes for restoration and revegetation efforts.
- Where necessary, manage taller non-native grass cover with grazing, mowing or fire to maintain low profile vegetation prior to the nesting season.

Avoid Disturbance during Sensitive Periods

- Protect breeding habitat of curlews from detrimental human activities, such as vehicular use, construction activities, and shooting.
- Do not construct additional roads in occupied curlew habitat unless there is no other practicable option. Limit road use during the breeding season (March 15-July 15).

Adjust Certain Agricultural Practices

- Reduce pesticide use on grasslands, especially near water, to maintain both terrestrial and aquatic invertebrates as a food sources.
- Avoid widespread pesticide applications aimed at controlling grasshoppers.
- Reduce herbicide use to maintain nesting, loafing, and brood-rearing cover.
- Postpone tilling until at least mid-June in those agricultural habitats used for nesting.
- Whenever possible and practicable, favor flood-irrigation of hay meadows over sprinkler systems.

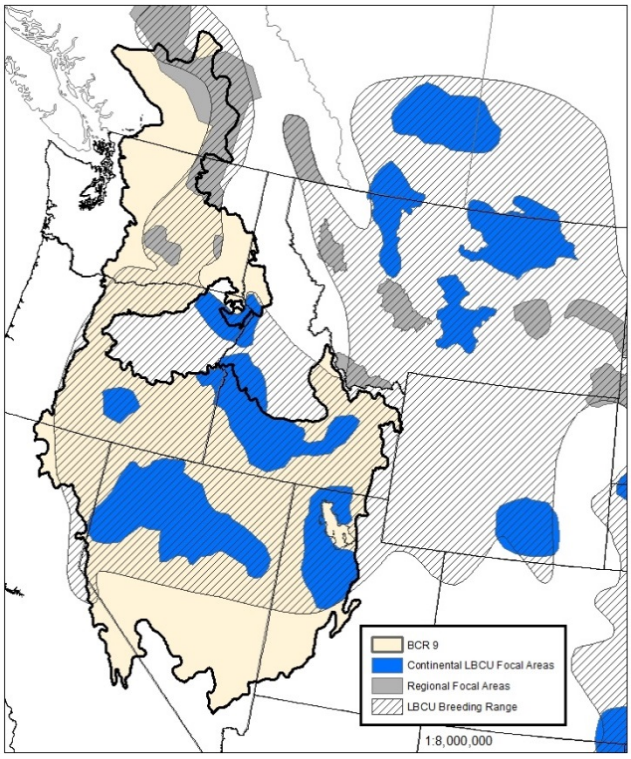
Recommended Management Actions and Guidelines by Ecoregion

Here we present some additional guidelines and actions specific to individual BCRs across the species' range. Each is accompanied by a map of the draft focal areas for that BCR. Typical spring arrival, nest initiation and fledging dates (Fellows and Jones 2009) are provided by state and province within each BCR. The quantity and quality of data identifying these seasonal benchmarks for implementing best management practices vary widely. For this reason, local data should be used whenever possible to adjust application of management actions (e.g. grazing, ORV restrictions) to match local breeding phenology.

Great Basin (BCR 9):

Identify partner organizations and individuals in primary focal areas in Idaho, Nevada, Oregon and Utah. Set up registry for each focal area to track opportunity and success. Refine and/or add secondary focal areas with local partners on a state by state basis (e.g. Boardman grasslands in Oregon, Hanford in Washington, Steptoe Valley in Nevada). Verify curlew occupancy through field surveys with agency, NGO or citizen scientists (e.g. eBird). Conservation in this region will be complicated by the high densities of curlews that can be found in some invasive cheatgrass stands. In addition to implementing the general guidelines above, strive to:

- Emphasize protection and enhancement of level or moderately level stands Sandberg's bluegrass, as a component of the vegetation, and where possible use this or shorter native grasses in seed mixes for restoration areas, avoiding *Agropyron* spp;
- Manage for preseason grass heights of 6-10 cm and bare ground cover of 35%;
- Maintain fallow and hayfields at heights of <30cm with mowing as needed to provide better foraging habitat during the nesting and brood-rearing period;
- Consider using sheep if necessary to meet grass height and bare ground objectives.



Northern Rockies (BCR 10):

Identify partner organizations and individuals in primary focal areas in British Columbia, Idaho, Montana, Oregon and Utah. Set up registry for each focal area to track opportunity and success. Refine and/or add secondary focal areas with local partners on a state by state basis (e.g. sw Wyoming). Verify curlew occupancy through field surveys with agency, NGO or citizen scientists (e.g. eBird). In addition to implementing the general best management practices, strive to:

- Manage irrigated and non-irrigated pastures and hayfields for 25 % grass cover;
- Identify the largest intact grassland stands in Intermountain valleys and take immediate steps to identify the best approaches to long-term protection.

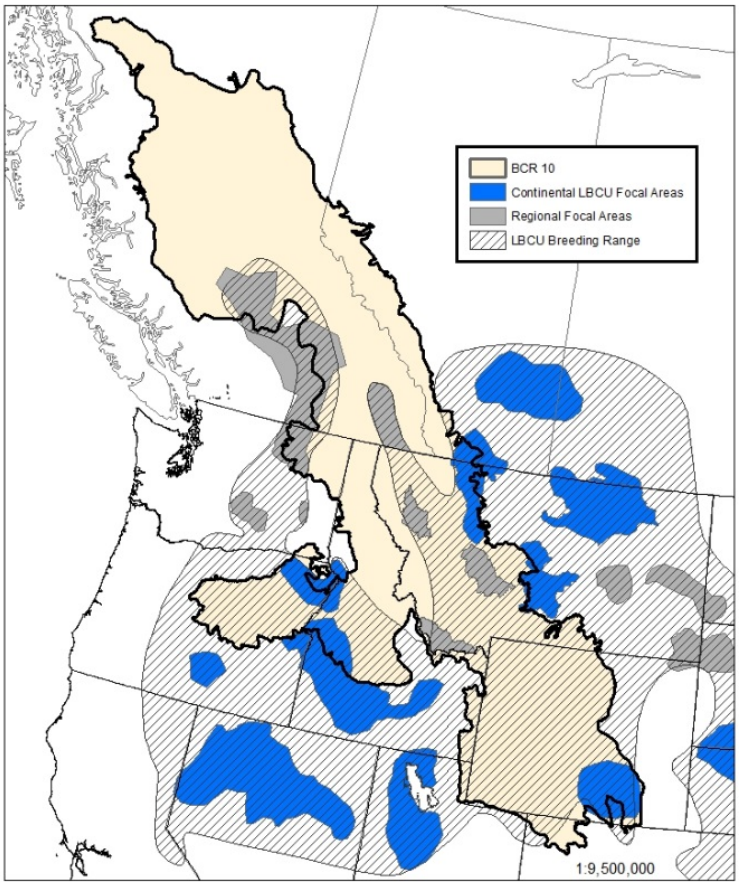


Figure 7. Northern Rockies BCR (BCR 10), with primary (blue) and secondary (gray) focal areas for Long-billed Curlew

Table 2. Approximate dates of spring arrival, nest initiation, and fledging for Long-billed Curlews, by state and province, BCR 10. Adapted from the compilation by Fellows and Jones (2009).

State/Province	Spring Arrival	Nest Initiation	Fledging
Colorado	1 April	15 April	15 July
Idaho	1 April	15 April	15 July
Montana	15 April	1 May	15 July
Oregon	15 March	15 April	15 July
Utah	15 March	10 May	10 August
Washington	10 March	1 April	30 June
Wyoming	15 April	5 May	5 July
Alberta	20 April	1 May	1 July
British Columbia	20 March	10 April	10 July

Potholes and Prairies (BCR 11):

Identify partner organizations and individuals in primary focal areas in Alberta, Montana, and Saskatchewan. Set up registry for each focal area to track opportunity and success. Refine and/or add secondary focal areas with local partners (e.g. southern Saskatchewan). Verify curlew occupancy through field surveys with agency, NGO or citizen scientists (e.g. eBird). In addition to implementing the general best management practices, strive to:

- Emphasize protection of sites with sandy soils and flat to rolling terrain;
- Avoid grazing in spring or late summer in mixed-grass pasture;
- Identify and protect habitat blocks of >120 ac and within ¼ mi of wetlands

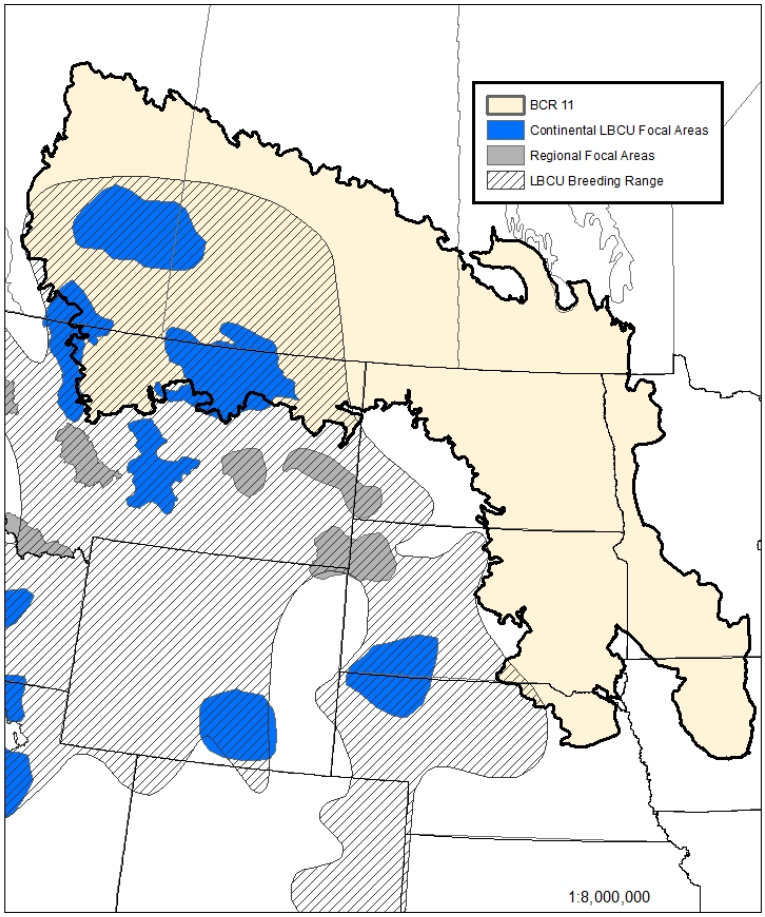


Figure 8. Potholes and Prairies BCR (BCR 11), with primary (blue) and secondary (gray) focal areas for Long-billed Curlew Conservation.

Table 3. Approximate dates of spring arrival, nest initiation, and fledgling for Long-billed Curlews, by state and province, BCR 11. Adapted from the compilation by Fellows and Jones (2009).

State/Province	Spring Arrival	Nest Initiation	Fledging
Montana	15 April	1 May	15 July
Nebraska	20 March	10 April	15 June
South Dakota	20 March	1 May	15 July
Alberta	20 April	1 May	1 July
British Columbia	20 March	10 April	10 July
Saskatchewan	15 April	5 May	5 July

Northern Great Plains (BCR 17):

Identify partner organizations and individuals in primary (continental) and secondary (regional) focal areas in Montana, Nebraska, North and South Dakota and Wyoming. Set up registry for each focal area to track opportunity and success. Refine and/or add secondary focal areas with local partners on a state by state basis. Verify curlew occupancy through field surveys with agency, NGO or citizen scientists (e.g. eBird). In addition to implementing the general best management practices, strive to:

- Manage for or emphasize sites dominated by bluebunch wheatgrass, prairie sandreed, and Idaho fescue.
- Identify and protect habitat blocks of >120 ac and within ¼ mi of wetlands.

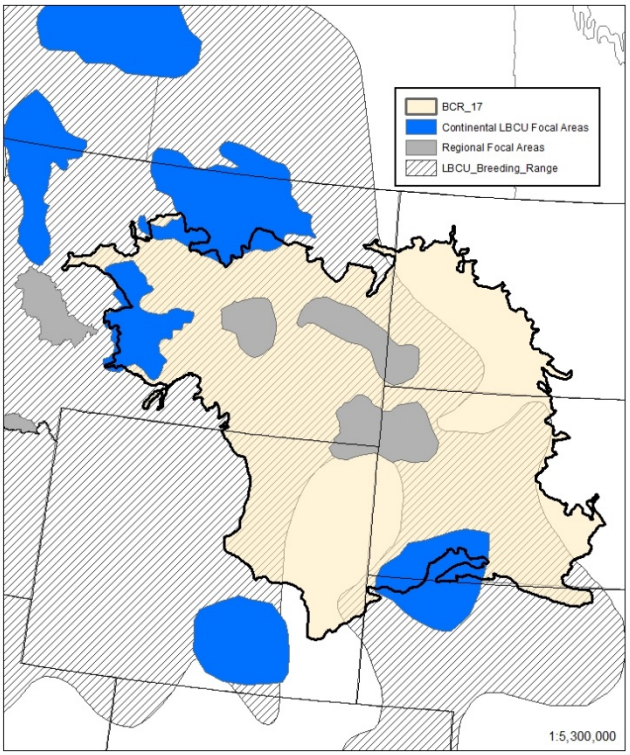


Figure 8. Northern Great Plains BCR (BCR 17), with continental and regional focal areas for Long-billed Curlew Conservation.

ABC received a grant in 2013 for an 18-mo effort to deliver Long-billed conservation in a 32-county area in MT, ND and SD. Using funding from the National Fish and Wildlife Foundation and the Northern Great Plains Joint Venture, we established a Conservation Specialist position, housed in the NRCS Field Office in Hettinger, ND, to deliver outreach and implementation. Targets are to engage with 300 landowners and deliver 6,250 ac of conservation action using NRCS conservation practices.

Table 4. Approximate dates of spring arrival, nest initiation, and fledging for Long-billed Curlews, by state, BCR 17. Adapted from the compilation by Fellows and Jones (2009).

State/Province	Spring Arrival	Nest Initiation	Fledging
Montana	15 April	1 May	15 July
Nebraska	20 March	10 April	15 June
North Dakota	20 March	20 April	15 July
South Dakota	20 March	1 May	15 July
Wyoming	15 April	5 May	5 July

Southern Great Plains (BCR 18, 19):

The Playa Lakes Joint Venture has prepared implementation plans for those portions of each state within BCR 18 (http://www.pljv.org/partners/planning). They include specific acreage and population goals for the species, based on a model in which one curlew is supported by 1,650 ac of shortgrass, of which no more than 220 are shrubland or woodland and no more than 51 ac of roads, within 1 mi of a wetland. While those plans acknowledged that more information is needed to improve their models, they called for the management of nearly 5 million acres of shortgrass prairie, and 1.15 million acres of mixed grass prairie, with a mix of short (e.g. 10 cm) and taller (i.e. 30-40 cm) grasses, few shrubs and in large blocks. They also recommend establishing nearly 80,000 more acres of prairie dog colonies, and maintain an additional 10,000 playas within the BCR. These objectives are further broken down by state within the BCR (Table 5), and exceed the areas included in our proposed primary focal areas.

The PLJV Implementation Plans recommend using managed grazing to create/enhance large blocks of shortgrass with heterogeneity and few shrubs near water sources. We recommend identifying those specific land parcels within our BCR 18 focal areas where progress toward these objectives can be made, and working with the Playa Lakes and Rainwater Basin JVs to implement necessary management and track successes within each focal area.

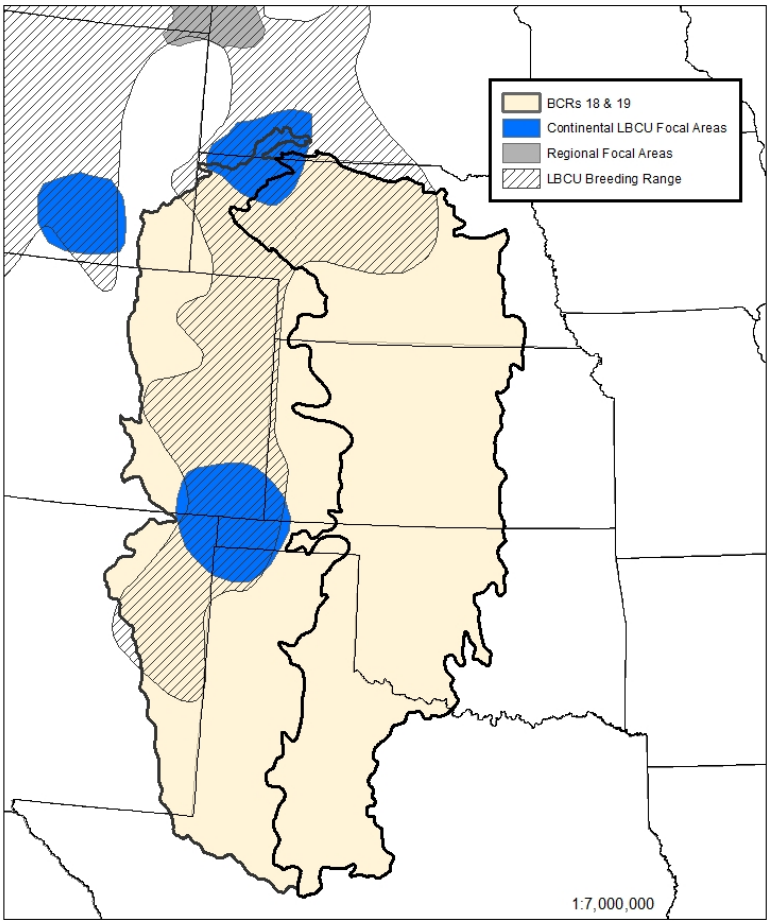


Figure 9. Southern Great Plains BCRs (18 and 19), with continental and regional focal areas for Long-billed Curlew Conservation.

Table 5. Playa Lakes Joint Venture habitat objectives for Long-billed Curlew Conservation in BCR 18.

State	Acres
CO	4.48 million ac shortgrass with few shrubs
KS	Convert 124,000 ac of agricultural land to shortgrass prairie
	Manage 214,621 ac of shortgrass in large blocks
NE	Manage 1,147,285 ac of mixed grass prairie for few shrubs
	Manage 436,307 ac of shortgrass
	Manage in large blocks (current estimates 600,472 ac mixed and 150,165 short in large blocks.
	Configure prairie dogs to make large blocks
NM	Manage 1,113,203 additional ac of shortgrass in blocks
OK	Add 38,671 ac of prairie dogs, primarily in Cimmaron County
	Manage 302,863 ac of prairie in large blocks
TX	2,267,171 shortgrass needed in large blocks

Table 6. Approximate dates of spring arrival, nest initiation, and fledging for Long-billed Curlews, by state, BCRs 18 and 19. Adapted from the compilation by Fellows and Jones (2009).

State/Province	**Spring Arrival**	**Nest Initiation**	**Fledging**
Colorado	1 April	15 April	15 July
Kansas	15 March	1 April	1 July
Nebraska	20 March	10 April	15 June
New Mexico	10 March	15 April	15 July
Oklahoma	15 March	1 May	1 July
Texas	10 March	15 April	20 June

Conclusions

Effective conservation of the declining Long-billed Curlew will require concerted efforts of agencies, NGOs, landowners and citizen scientists to ensure that important breeding sites and habitats are identified and managed to meet the habitat needs of the species. We have identified 12 primary (continental) focal areas for curlew conservation throughout their breeding range in North America. These were selected based on the modeling efforts, BBS relative abundance and trend mapping, and peer review. The identification of these areas was meant to reinforce, rather than replace the efforts of local and regional partnerships to account for and meet the needs of grassland nesting birds. The largest blocks of suitable/occupied curlew habitat within these focal areas should be targeted for long-term protection through fee-title purchase, conservation easement or management agreements. Those already in public ownership or stewardship need to be managed to provide the habitat conditions required by curlews.

Though they are highly reliant on native rangeland habitats, Long-billed Curlews also use multiple habitats on working lands, from pastures and hay meadows to certain cropland types. Land management prescriptions should account for meeting the needs of nesting curlews by providing a heterogeneous mixture of grass cover <30 cm tall, bare ground, and native forbs, particularly in proximity to seasonally flooded meadows or wetlands. Cost-share and landowner incentive programs (e.g. NRCS conservation practices under EQIP and WHIP) should be used to encourage management toward these objectives. Land management plans of the BLM and other land management agencies should account for and incorporate these recommendations in their alternatives for public land management direction. We will establish and maintain registries for each Long-billed Curlew focal area to identify opportunities and track conservation accomplishments

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