

BLM Final Research Report

PROJECT TITLE: An assessment of habitat use and quality for non-game shrubsteppe birds in Montana

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I. BACKGROUND:

Degradation of shrubsteppe habitats in Montana and throughout the intermountain west has generated conservation concern among biologists and land managers (e.g., Knick 1999 Northwest Science 73:53; Knick et al. 2003 Condor 105:611). In fact, sagebrush habitats are among the most imperiled ecosystems in North America (Mac et al. 1998 USDI report). Simultaneously, migratory songbird species that breed within shrubsteppe habitats show considerable long-term population declines, according to the North American Breeding Bird Survey. Such trends have prompted organizations such as Montana Fish, Wildlife and Parks, the Montana Natural Heritage Program, and Montana Partners in Flight to list several species of shrubsteppe songbirds, including the Brewer's Sparrow (*Spizella breweri*), and Sage Thrasher (*Oreoscoptes montanus*) as species of special concern. Currently, very little is known about the distribution and habitat needs of these species. To ensure the long-term persistence of non-game shrubsteppe birds, an especially critical need is additional information on the habitat features and spatial scales that influence the abundance and reproductive success of shrubsteppe avifauna.

II. STUDY OBJECTIVES:

Our study was conducted during May-August 2002-2005 on BLM and private lands in Carbon County, Montana, where fairly large tracts of sagebrush still exist. We focused on two primary research questions:

1) How do densities of non-game birds vary across gradients in habitat structure (e.g., shrub cover, height, and density)? To address this question, we measured densities and community composition of birds via territory mapping across eight different 25-30 ha study sites, and related this to differences in structural attributes of the sites.

2) Which areas within shrubsteppe habitats facilitate successful nesting?

To address this question, we located and monitored nests of non-game bird species, and examining nesting success in relation to habitat characteristics at multiple scales: the landscape, territory, and nest patch.

III. MAIN RESULTS:

We located and monitored a total of 1262 nests (Table 1). The primary source of nesting failure was nest predation. Only 4 nests (all Brewer's sparrow) were parasitized by brown-headed cowbirds, and none hatched any cowbird young. The main nest predator species (as documented by video evidence, depredations in progress, or sign left in nests) were bullsnakes, prairie rattlesnakes, loggerhead shrikes, common grackles, brown-headed cowbirds, and various rodent species. Other suspected nest predator species observed on the study sites included raccoons,

coyotes, pinyon jays, and magpies. Nests occasionally failed due to weather events that produced heavy rains or hail, and/or temporary flooding of the ephemeral washes.

Table 1. Number of non-game shrubsteppe bird nests located during 2002-2005, (and % nest success) by species. Number of nests found also approximately indexes relative abundance of each species in the study area, as nests other than Brewer's sparrow nests were often found incidentally.

Species	2002	2003	2004	2005	Total
Brewer's Sparrow	131(43)	203(48)	331(34)	295(60)	960(46)
Vesper Sparrow	19(53)	30(60)	46(35)	26(50)	121(47)
Lark Sparrow	9(22)	11(27)	27(30)	4(50)	51(29)
Western Meadowlark	1(0)	8(50)	12(25)	6(50)	27(37)
Sage Thrasher	3(67)	4(75)	23(39)	3(33)	33(46)
Loggerhead Shrike	2(0)	4(0)	6(50)	3(67)	15(33)
Mourning Dove	1(100)	3(0)	13(23)	n/a	17(24)
Lark Bunting	3(33)	n/a	4(25)	26(58)	33(52)
Spotted Towhee	1(0)	1(100)	1(0)	1(0)	4(25)
Green-Tailed Towhee	n/a	n/a	n/a	1(100)	1(100)
GRAND TOTAL					1262(45)

Only Brewer's sparrows were found at all eight study sites and in sufficient densities to conduct detailed analyses of habitat use and reproductive success in relation to habitat attributes at multiple spatial scales. We therefore focus on Brewer's sparrows for the remainder of this report.

Landscape Scale

At the landscape (25-30 ha site) scale, birds strongly and consistently preferred areas with higher shrub cover (Figure 1). Higher shrub cover plots were also settled earlier each year, further suggestive of an actual habitat preference ($F_{1,252} = 53.18, P < 0.001$).

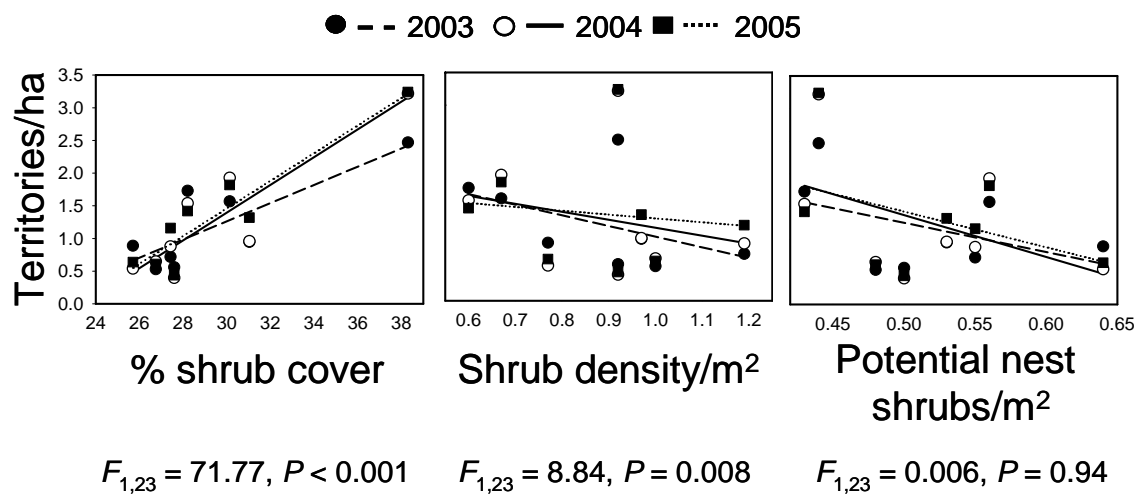


FIGURE 1. Brewer's Sparrow densities (territories/ha) during 2003-2005 in relation to 3 main shrubsteppe habitat attributes (shrub cover, shrub density and density of shrubs suitable for nesting).

Nesting success, however, showed no relationship with shrub cover, nor any of the main habitat variables measured (Figure 2).

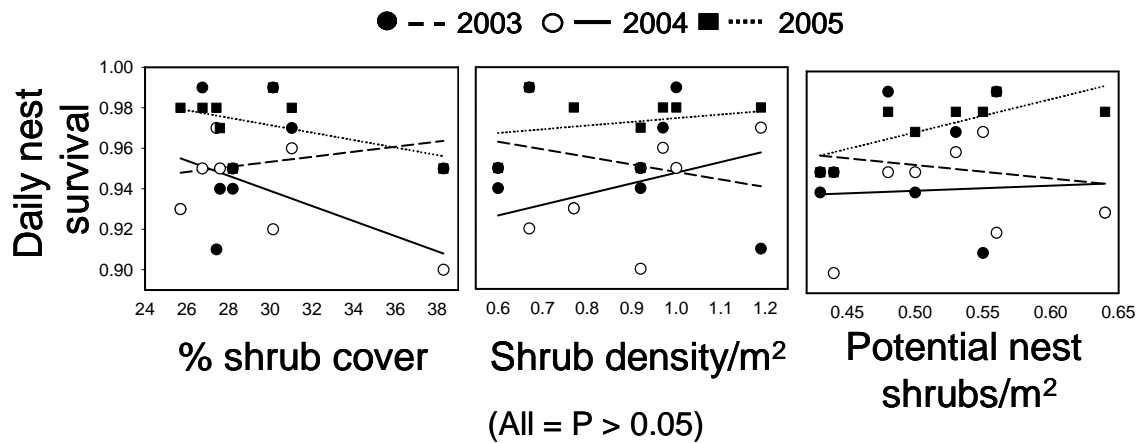


FIGURE 2. Brewer’s sparrow nesting success (as indexed by Mayfield daily nest survival estimates) during 2003-2005 in relation to 3 main shrubsteppe habitat attributes (shrub cover, shrub density and density of shrubs suitable for nesting) at the landscape scale.

We also examined actual seasonal reproductive success by intensively monitoring a subset of individually marked (color-banded) focal pairs during 2003-2005. Yet, seasonal reproductive success was also unrelated to landscape-scale habitat structure (Figure 3).

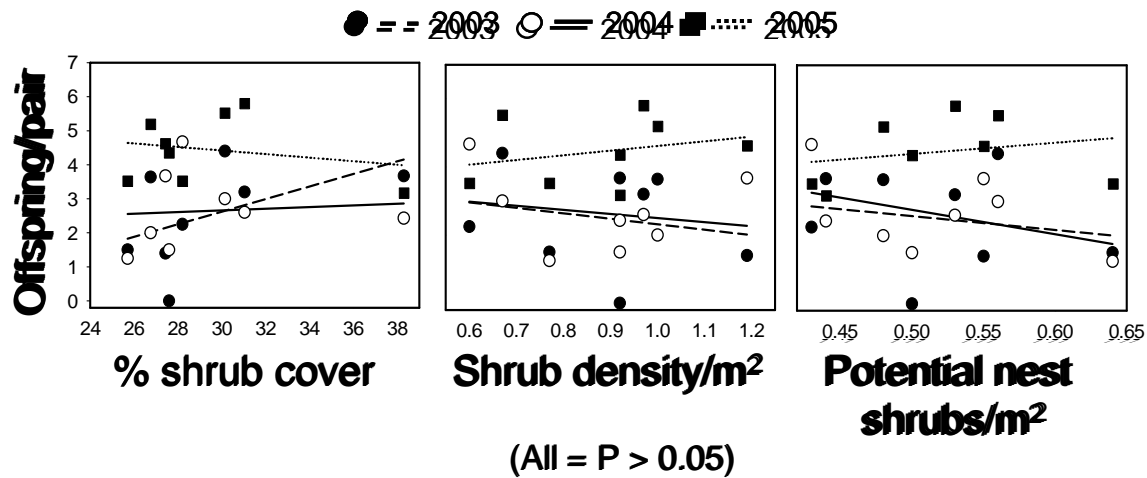


FIGURE 3. Brewer’s sparrow seasonal reproductive success during 2003-2005 in relation to 3 main shrubsteppe habitat attributes (shrub cover, shrub density and density of shrubs suitable for nesting) at the landscape scale.

However, two other fitness components measured during the study were positively correlated with landscape-scale shrub cover. Nestling mass (measured on day 6 for each nest, Figure 4) and the number of nesting attempts per pair per season (Figure 5) showed a positive relationship with percent shrub cover. Nestling mass is an important fitness component to consider because it may

enhance future survival prospects of young. Moreover, the ability of parents to attempt multiple nests during a season may help compensate for nests lost during periods of high nest predation, and/or may promote exceptional reproductive output during years of low nest predation. Clutch size and clutch mass were unrelated to any of the habitat attributes.

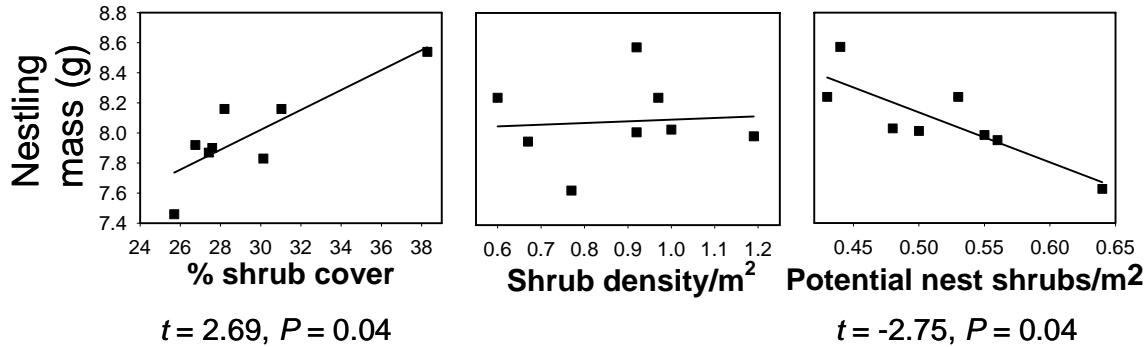


FIGURE 4. Brewer's Sparrow nestling mass at day 6 during 2005 in relation to 3 main shrubsteppe habitat attributes (shrub cover, shrub density and density of shrubs suitable for nesting) at the landscape scale.

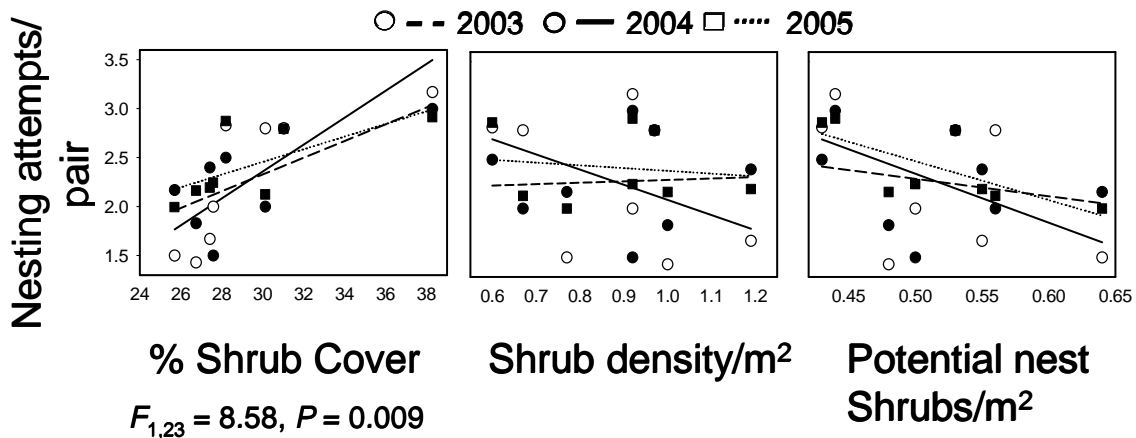


FIGURE 5. Brewer's Sparrow nesting attempts per pair per season during 2003-2005 in relation to 3 main shrubsteppe habitat attributes (shrub cover, shrub density and density of shrubs suitable for nesting) at the landscape scale.

Territory Scale

At the territory scale, birds chose territories containing higher shrub cover, shrub density, and potential nest shrub density than available on average within the study area (Figure 6). Only potential nest shrub density, however, was associated with higher seasonal reproductive success at the territory scale (Figure 7).

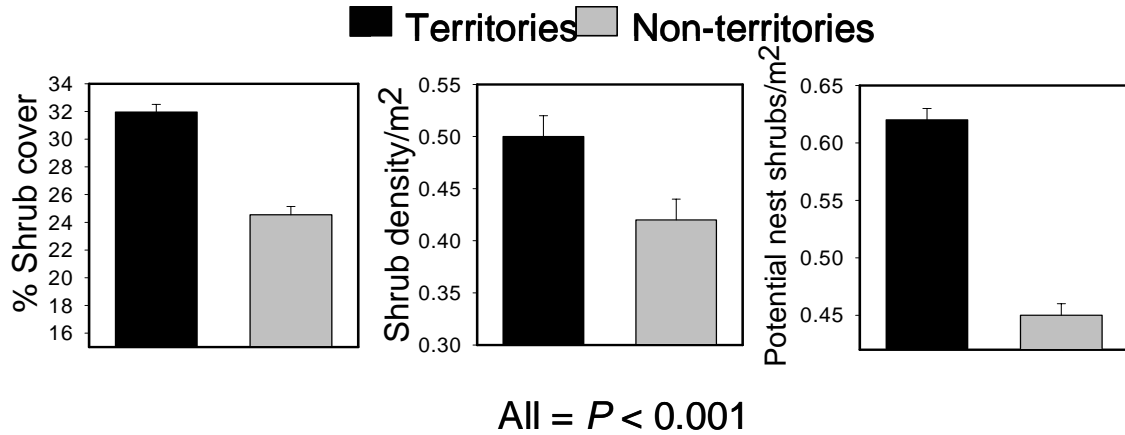


FIGURE 6. Habitat attributes within Brewer’s sparrow territories versus available areas without territories during 2003-2005.

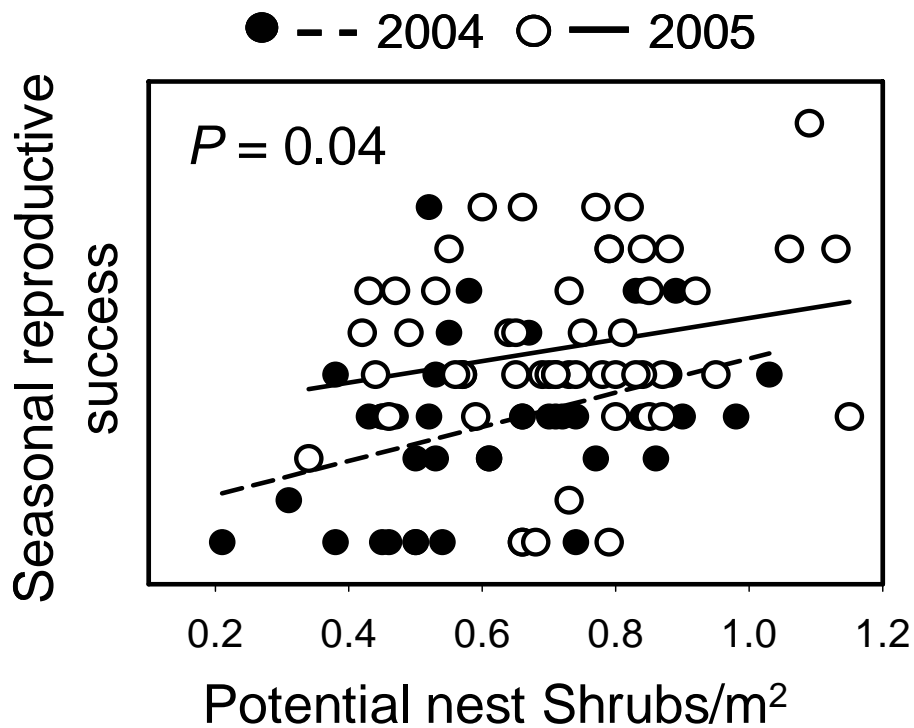


FIGURE 6. Seasonal reproductive success (total number of offspring fledged per pair) in relation to potential nest shrub densities within Brewer’s sparrow territories during 2004 and 2005.

Nest Patch Scale

Brewer’s sparrow nest patches (5-m radius) contained higher shrub densities and potential nest shrub densities than available on average (Figure 7). However, only potential nest shrub density was associated with increased nesting success (Figure 8).

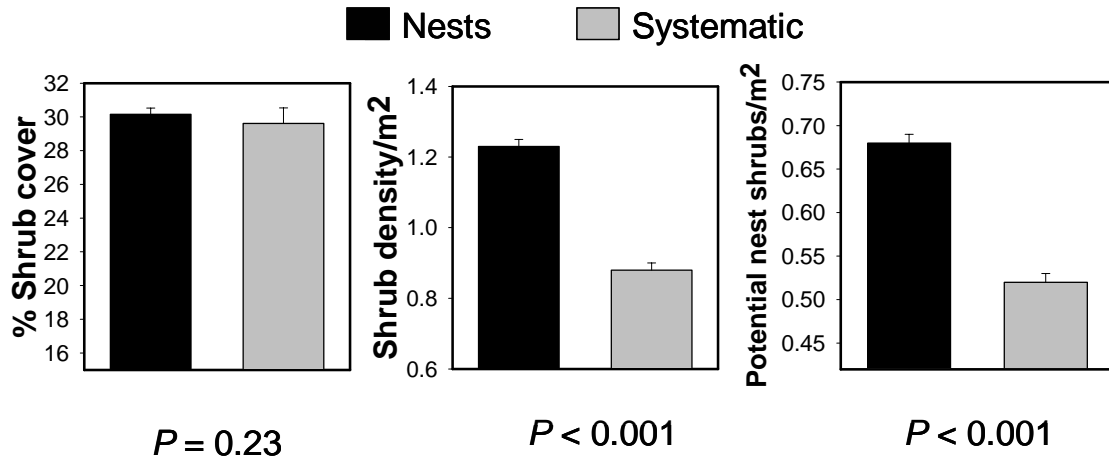


FIGURE 7. Habitat attributes within 5-m radius Brewer's sparrow nest patches versus systematically-sampled patches during 2003-2005.

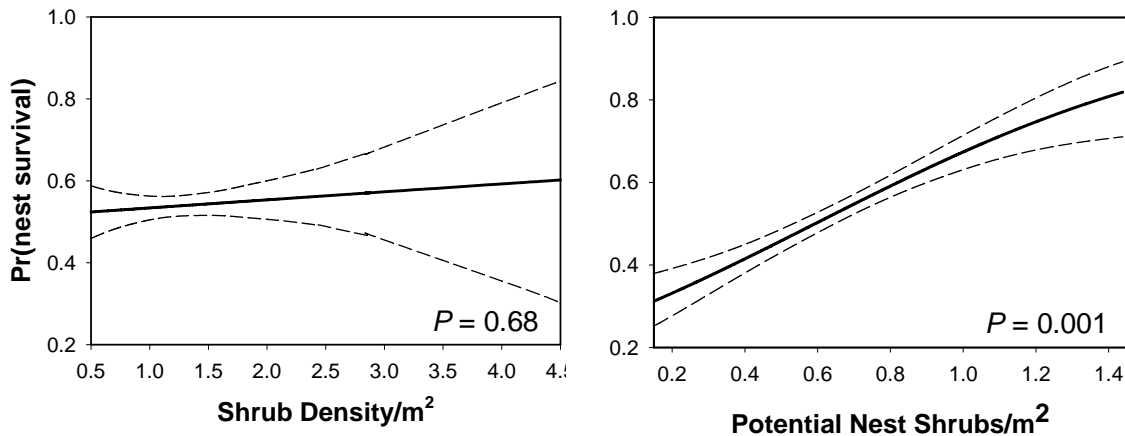


FIGURE 8. Probability of nest survival in relation to shrub density and potential nest shrub density during 2003-2005.

IV. SUMMARY AND MANAGEMENT IMPLICATIONS:

A wide variety of non-game bird species were found to utilize the study area for nesting. More in-depth analyses focused on habitat preferences and resulting fitness consequences in the most abundant of these species, the Brewer's sparrow, considered a "shrubsteppe obligate" and declining throughout its range.

We found that Brewer's sparrows preferred landscapes containing greater shrub cover, and that this preference was associated with greater offspring size and number of nest attempts within a season, but not higher nesting success. Habitat preferences at this scale may therefore reflect the quality of food resources rather than the probability of nest predation. At the smallest scale, birds preferred nest patches containing both higher shrub densities and potential nest shrub

densities, two attributes that are correlated in this system. However, only potential nest shrub densities were associated with greater nesting success. In areas of higher potential nest site densities, nest predators may need to search among a greater number of potential nest sites before finding actual sites, which may cause predators to abandon search efforts sooner. Such a scenario would likely result in a lower risk of nest predation. Few studies, however, have identified this habitat attribute as potentially important for avian reproductive success. Habitat preferences at the territory scale seemed to reflect a “best of all worlds” scenario in which habitat attributes with benefits at the larger (shrub cover) and smaller (shrub density) spatial scales were maximized.

In general, our study showed that the importance of habitat attributes can vary across spatial scales, and the utility of examining multiple fitness components across spatial scales to better understand habitat selection strategies.

Based on our results, management actions that are most likely to maintain healthy populations of Brewer’s sparrows (and likely other shrub-nesting sagebrush obligates) are as follows. Ideally, large tracts of intact, high shrub cover (and height) sagebrush should be maintained. These areas are likely to be those with higher moisture regimes and well-drained soils such as Dilworth Creek, where extremely high densities of Brewer’s sparrows were observed. Areas with high densities of potential nest shrubs should also be a priority, in order to facilitate nesting success. Potential nest shrubs tend to be of medium height, with a full, leafy, healthy crown and sufficient branch structure to contain “niches” for nest placement. A more quantified description of nest shrub attributes can be provided by ADC on request.

Finally, because sagebrush steppe takes a long time to regenerate, activities such as off-road motor vehicle use should be restricted to the fullest extent possible. An unsanctioned dirt bike race that ran through greater than 15 km of sagebrush occurred in the Hunt/Cub Creek areas in 2004, and caused extensive sagebrush damage and several nest abandonments.

Thank you for your support.