**Bird Monitoring in Echo Park**

**and Deerlodge Park,**

**Dinosaur National Monument –**

**2006-2010 Results**

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Tech. Report # M-TAMARISK-NPS06/10-01



**Rocky Mountain Bird Observatory**

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2. ***Education*** *is critical to the success of bird conservation.*
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# Executive summary

Riparian habitat supports the highest diversity of birds and other wildlife species of all habitat types in the western U.S. In the past century a non-native shrub, tamarisk (*Tamarix* spp.), has become one of the dominant plants in riparian habitat in the American West. This invasive shrub is known for displacing and preventing regeneration of native plant species and controlling its spread has become a major concern for land managers of the region. In 2001, a biological control experiment was initiated when the non-native tamarisk leaf beetle (*Diorhabda sp*) was released in the Upper Colorado River Basin in an effort to control tamarisk. It is currently believed that this beetle eats only tamarisk leaves throughout its life cycle.

In 2010, the Rocky Mountain Bird Observatory in cooperation with the National Park Service and the Tamarisk Coalition completed the fifth year of a project designed to monitor the response of riparian birds to the effects of the tamarisk leaf beetle in Dinosaur National Monument. For this project, five visits to 15 points at each survey location were made during the course of the breeding season. At Deerlodge Park, 651 birds representing 50 species were recorded. At Echo Park, 684 birds representing 40 species were recorded. Included in this report are density estimates for species with sufficient detections for all years of the project.

# Acknowledgements

We sincerely thank the Tamarisk Coalition and the National Park Service for making this project possible and for support before, during, and after the project. Tamara Naumann of the National Park Service drafted the cooperative agreement and is the project supervisor for the National Park Service. We are grateful to Michelle Giroir for conducting surveys.

The National Park Service and the Tamarisk Coalition provided equal amounts of funding for this project through an agreement with the Rocky Mountain Bird Observatory (NPS agreement #: RMBCP-01). This report fulfills requirements in Rocky Mountain Bird Observatory’s contract with the Tamarisk Coalition (M-TAMARISK-NPS06/10).

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# Introduction

In 2006, the National Park Service, the Tamarisk Coalition, and the Rocky Mountain Bird Observatory (RMBO) entered into a cooperative agreement to determine the effects of tamarisk leaf beetles on breeding bird populations in riparian areas in Dinosaur National Monument (DNM). Surveys were established at two locations (in Echo Park and Deerlodge Park) during a seven-year period after the tamarisk leaf beetle *(Diorhabda elongata)* was introduced and became established in the area. In 2006, RMBO established 15 point count stations in both Echo Park (treatment area) and Deerlodge Park (control area) (Appendix A and B). In 2006 through 2010, the point counts were conducted five times each during the breeding season (Table 1).

In 2010, in compliance with the agreement established with the National Park Service and the Tamarisk Coalition, RMBO is providing density estimates for individual bird species for which there are sufficient sample sizes. Data were analyzed for any species with at least 100 detections in both survey locations (Echo Park and Deerlodge Park) in DNM. Also, for species with 40 to 99 detections, we were able to combine data from DNM with another RMBO project taking place in riparian areas throughout the upper Colorado River basin to estimate global detection functions (Table 5).

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# Methods

The point-count stations were systematically placed at 250-meter intervals in each survey location to ensure that all available habitat was sampled. Observers conducted surveys on five separate days following protocol developed by the Rocky Mountain Bird Observatory (Hanni et al. 2009). The complete point-count survey protocol is available on RMBO’s website: http://www.rmbo.org/public/monitoring/protocols/PT\_Protocol\_final\_2009.pdf.

Application of distance theory requires that three critical assumptions be met: 1) all birds at and near the sampling location [distance = 0] are detected; 2) distances of birds are measured accurately; and 3) birds do not move in response to the observer’s presence. Our sampling protocol met the assumptions of Distance sampling theory reasonably well (Hanni et al. 2009).

We used Program Distance 6.0 (Thomas et al. 2010) to estimate the detection probability and density of each bird species. We fit the following functions to the distribution of distances for each species: Half normal key function with cosine series expansion, Uniform function with cosine series expansion, Hazard rate key function with cosine series expansion, and Hazard rate key function with simple polynomial series expansion (Buckland et al. 2001). The required sample size for estimating a detection function is at least 40 independent detections. We used Akaike’s Information Criterion (AIC) corrected for small sample size (AICc) and model selection theory to select the most parsimonious detection function for each species (Burnham and Anderson 2002).

# Results

All years of the project 15 point counts were conducted five times for a total of 75 point counts at each survey location (Table 1). At Echo Park in 2010, point counts were conducted between the dates of 15 May and 11 June. At Deerlodge Park in 2010, point counts were conducted between the dates of 18 May and 13 June. At both sites 2006 through 2009 the point counts have been conducted between the dates of 12 May and 16 June.

Table 1. Bird sampling periods and effort in Echo and Deerlodge parks, 2006-2010.

|  |  |  |  |
| --- | --- | --- | --- |
| **Study Area** | **Year** | **Dates Sampled** | **# point counts conducted** |
| Echo Park | 2006 | May 12, 13, June 1, 2, 10 | 75 |
| Deerlodge Park | 2006 | May 14,15, June 3, 4, 11 | 75 |
| Echo Park | 2007 | May 15, 16, June 2, 3, 15 | 75 |
| Deerlodge Park | 2007 | May 17,18, June 4, 5, 16 | 75 |
| Echo Park | 2008 | May 17, 18, June 1, 2, 16 | 75 |
| Deerlodge Park | 2008 | May 15, 16, June 3, 4 15 | 75 |
| Echo Park | 2009 | May 14, 15, June 3, 4, 13 | 75 |
| Deerlodge Park | 2009 | May 12, 13, June 1, 2, 12 | 75 |
| Echo Park | 2010 | May 15, 16, June 1,2,11 | 75 |
| Deerlodge Park | 2010 | May 18, 19, June 3,4, 13 | 75 |

Every year of the project more total birds and more birds per point have been recorded at Echo Park (Tables 2 & 3). However, species diversity has been higher at Deerlodge Park (n=37-50) than at Echo Park (n=40-44) three of five years including 2010. The species per point average has been consistently even with Echo Park averaging 5.4 to 6.3 species per point and Deerlodge Park averaging 5.4 to 5.9 species per point. However, the number of species per point average has been slightly higher at Echo Park three of five years including 2010. We provide a list of all species detected at both study sites with totals for each year and a total for all years in Table 4.

Table 2. Total birds and species detected and average number of birds and species detected per point count in Echo Park, 2006-2010.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | **# birds detected** | **Avg. # birds per point count** | **# species detected** | **Avg. species per point count** |
| 2006 | 589 | 7.7 | 40 | 5.8 |
| 2007 | 636 | 8.5 | 44 | 6.3 |
| 2008 | 777 | 10.3 | 40 | 5.9 |
| 2009 | 773 | 10.3 | 42 | 5.4 |
| 2010 | 684 | 9.1 | 40 | 5.9 |

Table 3. Total birds and species detected and average number of birds and species detected per point count in Deerlodge Park, 2006-2010.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | **# birds detected** | **Avg. # birds per point count** | **# species detected** | **Avg. species per point count** |
| 2006 | 502 | 6.7 | 39 | 5.4 |
| 2007 | 529 | 7.1 | 49 | 5.6 |
| 2008 | 727 | 9.7 | 49 | 5.9 |
| 2009 | 702 | 9.4 | 37 | 5.5 |
| 2010 | 651 | 8.7 | 50 | 5.7 |

Table 4. Bird species and numbers of individuals detected at Deerlodge and Echo Parks, 2006-2010.

| Species | Scientific Name | Park | 2006 | 2007 | 2008 | 2009 | 2010 | Total |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Canada Goose | *Branta canadensis* | Deerlodge | 6 | 2 | 0 | 4 | 0 | 12 |
|  |  | Echo | 6 | 15 | 0 | 10 | 0 | 31 |
| Gadwall | *Anas strepera* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 0 | 6 | 0 | 0 | 0 | 6 |
| Mallard | *Anas platyrhynchos* | Deerlodge | 0 | 0 | 1 | 0 | 1 | 2 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Shoveler | *Anas clypeata* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 0 | 8 | 0 | 0 | 1 | 9 |
| Common Merganser | *Mergus merganser* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 0 | 2 | 2 | 0 | 1 | 5 |
| Ring-necked Pheasant | *Phasianus colchicus* | Deerlodge | 0 | 1 | 0 | 0 | 0 | 1 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Great Blue Heron | *Ardea herodias* | Deerlodge | 0 | 0 | 1 | 0 | 1 | 2 |
|  |  | Echo | 0 | 0 | 0 | 5 | 0 | 5 |
| Turkey Vulture | *Cathartes aura* | Deerlodge | 5 | 0 | 15 | 1 | 12 | 33 |
|  |  | Echo | 1 | 0 | 0 | 0 | 0 | 1 |
| Bald Eagle | *Haliaeetus leucocephalus* | Deerlodge | 0 | 1 | 0 | 0 | 0 | 1 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Harrier | *Circus cyaneus* | Deerlodge | 3 | 0 | 0 | 0 | 0 | 3 |
|  |  | Echo | 3 | 0 | 3 | 0 | 2 | 8 |
| Cooper's Hawk | *Accipiter cooperii* | Deerlodge | 0 | 0 | 4 | 1 | 4 | 9 |
|  |  | Echo | 0 | 0 | 1 | 0 | 1 | 2 |
| Red-tailed Hawk | *Buteo jamaicensis* | Deerlodge | 0 | 1 | 1 | 3 | 1 | 6 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Eagle | *Aquila chrysaetos* | Deerlodge | 0 | 1 | 0 | 0 | 0 | 1 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| American Kestrel | *Falco sparverius* | Deerlodge | 5 | 1 | 1 | 0 | 2 | 9 |
|  |  | Echo | 0 | 1 | 0 | 0 | 0 | 1 |
| Peregrine Falcon | *Falco peregrinus* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 1 | 0 | 1 | 0 | 1 | 3 |
| Killdeer | *Charadrius vociferus* | Deerlodge | 2 | 1 | 0 | 0 | 0 | 3 |
|  |  | Echo | 0 | 1 | 0 | 0 | 0 | 1 |
| Spotted Sandpiper | *Actitis macularius* | Deerlodge | 11 | 10 | 3 | 1 | 2 | 27 |
|  |  | Echo | 1 | 5 | 9 | 16 | 6 | 37 |
| Eurasian Collared-Dove | *Streptopelia decaocto* | Deerlodge | 0 | 0 | 0 | 3 | 0 | 3 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Mourning Dove | *Zenaida macroura* | Deerlodge | 5 | 36 | 0 | 6 | 4 | 51 |
|  |  | Echo | 10 | 20 | 10 | 9 | 10 | 59 |
| White-throated Swift | *Aeronautes saxatalis* | Deerlodge | 0 | 1 | 3 | 0 | 4 | 8 |
|  |  | Echo | 17 | 24 | 98 | 68 | 25 | 232 |
| Black-chinned Hummingbird | *Archilochus alexandri* | Deerlodge | 0 | 1 | 1 | 0 | 2 | 4 |
|  |  | Echo | 0 | 0 | 0 | 1 | 0 | 1 |
| Broad-tailed Hummingbird | *Selasphorus platycercus* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 1 | 1 | 0 | 1 | 0 | 3 |
| Downy Woodpecker | *Picoides pubescens* | Deerlodge | 0 | 0 | 1 | 0 | 1 | 2 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Flicker | *Colaptes auratus* | Deerlodge | 22 | 34 | 9 | 3 | 6 | 74 |
|  |  | Echo | 0 | 0 | 1 | 3 | 1 | 5 |
| Western Wood-Pewee | *Contopus sordidulus* | Deerlodge | 0 | 1 | 19 | 0 | 19 | 39 |
|  |  | Echo | 0 | 0 | 1 | 0 | 1 | 2 |
| Gray Flycatcher | *Empidonax wrightii* | Deerlodge | 0 | 0 | 2 | 6 | 2 | 10 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Dusky Flycatcher | *Empidonax oberholseri* | Deerlodge | 2 | 0 | 1 | 0 | 1 | 4 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Say's Phoebe | *Sayornis saya* | Deerlodge | 0 | 0 | 5 | 0 | 9 | 14 |
|  |  | Echo | 6 | 13 | 11 | 16 | 20 | 66 |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | Deerlodge | 0 | 7 | 5 | 5 | 5 | 22 |
|  |  | Echo | 11 | 11 | 24 | 40 | 18 | 104 |
| Western Kingbird | *Tyrannus verticalis* | Deerlodge | 18 | 4 | 0 | 4 | 0 | 26 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Eastern Kingbird | *Tyrannus tyrannus* | Deerlodge | 2 | 0 | 0 | 0 | 0 | 2 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Plumbeous Vireo | *Vireo plumbeus* | Deerlodge | 0 | 2 | 3 | 0 | 4 | 9 |
|  |  | Echo | 17 | 10 | 18 | 15 | 22 | 82 |
| Warbling Vireo | *Vireo gilvus* | Deerlodge | 11 | 9 | 24 | 19 | 19 | 82 |
|  |  | Echo | 3 | 3 | 4 | 8 | 6 | 24 |
| Pinyon Jay | *Gymnorhinus cyanocephalus* | Deerlodge | 3 | 2 | 0 | 6 | 0 | 11 |
|  |  | Echo | 1 | 1 | 1 | 0 | 1 | 4 |
| Black-billed Magpie | *Pica hudsonia* | Deerlodge | 24 | 21 | 6 | 17 | 6 | 74 |
|  |  | Echo | 1 | 2 | 0 | 0 | 0 | 3 |
| Common Raven | *Corvus corax* | Deerlodge | 10 | 13 | 7 | 6 | 12 | 48 |
|  |  | Echo | 9 | 6 | 1 | 26 | 1 | 43 |
| Horned Lark | *Eremophila alpestris* | Deerlodge | 3 | 0 | 0 | 0 | 0 | 3 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Tree Swallow | *Tachycineta bicolor* | Deerlodge | 0 | 0 | 25 | 0 | 13 | 38 |
|  |  | Echo | 9 | 1 | 1 | 0 | 2 | 13 |
| Violet-green Swallow | *Tachycineta thalassina* | Deerlodge | 4 | 7 | 72 | 0 | 48 | 131 |
|  |  | Echo | 13 | 44 | 155 | 57 | 109 | 378 |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | Deerlodge | 0 | 12 | 0 | 0 | 0 | 12 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Cliff Swallow | *Petrochelidon pyrrhonota* | Deerlodge | 0 | 0 | 18 | 0 | 6 | 24 |
|  |  | Echo | 0 | 2 | 1 | 1 | 1 | 5 |
| Barn Swallow | *Hirundo rustica* | Deerlodge | 0 | 1 | 0 | 0 | 0 | 1 |
|  |  | Echo | 0 | 0 | 5 | 0 | 5 | 10 |
| Rock Wren | *Salpinctes obsoletus* | Deerlodge | 6 | 13 | 18 | 3 | 22 | 62 |
|  |  | Echo | 15 | 30 | 20 | 30 | 39 | 134 |
| Canyon Wren | *Catherpes mexicanus* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 8 | 3 | 2 | 4 | 2 | 19 |
| Bewick's Wren | *Thryomanes bewickii* | Deerlodge | 0 | 0 | 0 | 1 | 0 | 1 |
|  |  | Echo | 1 | 1 | 0 | 0 | 0 | 2 |
| House Wren | *Troglodytes aedon* | Deerlodge | 29 | 31 | 34 | 96 | 30 | 220 |
|  |  | Echo | 42 | 37 | 40 | 63 | 34 | 216 |
| Blue-gray Gnatcatcher | *Polioptila caerulea* | Deerlodge | 8 | 8 | 30 | 1 | 30 | 77 |
|  |  | Echo | 9 | 5 | 5 | 0 | 4 | 23 |
| Mountain Bluebird | *Sialia currucoides* | Deerlodge | 24 | 13 | 31 | 5 | 28 | 101 |
|  |  | Echo | 0 | 1 | 2 | 1 | 2 | 6 |
| American Robin | *Turdus migratorius* | Deerlodge | 27 | 38 | 43 | 38 | 52 | 198 |
|  |  | Echo | 6 | 18 | 1 | 0 | 2 | 27 |
| Sage Thrasher | *Oreoscoptes montanus* | Deerlodge | 0 | 2 | 0 | 0 | 0 | 2 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| European Starling | *Sturnus vulgaris* | Deerlodge | 24 | 10 | 21 | 248 | 15 | 318 |
|  |  | Echo | 0 | 1 | 0 | 0 | 0 | 1 |
| Virginia's Warbler | *Vermivora virginiae* | Deerlodge | 0 | 0 | 1 | 0 | 2 | 3 |
|  |  | Echo | 0 | 3 | 1 | 0 | 2 | 6 |
| Yellow Warbler | *Dendroica petechia* | Deerlodge | 31 | 31 | 24 | 35 | 23 | 144 |
|  |  | Echo | 97 | 65 | 61 | 80 | 73 | 376 |
| Black-throated Gray Warbler | *Dendroica nigrescens* | Deerlodge | 3 | 4 | 3 | 0 | 4 | 14 |
|  |  | Echo | 11 | 9 | 12 | 10 | 12 | 54 |
| Common Yellowthroat | *Geothlypis trichas* | Deerlodge | 0 | 0 | 0 | 1 | 0 | 1 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow-breasted Chat | *Icteria virens* | Deerlodge | 15 | 13 | 12 | 17 | 14 | 71 |
|  |  | Echo | 13 | 13 | 20 | 67 | 21 | 134 |
| Green-tailed Towhee | *Pipilo chlorurus* | Deerlodge | 0 | 5 | 4 | 2 | 7 | 18 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Spotted Towhee | *Pipilo maculatus* | Deerlodge | 13 | 22 | 47 | 33 | 41 | 156 |
|  |  | Echo | 52 | 54 | 61 | 51 | 57 | 275 |
| Chipping Sparrow | *Spizella passerina* | Deerlodge | 0 | 0 | 1 | 0 | 3 | 4 |
|  |  | Echo | 15 | 11 | 20 | 0 | 23 | 69 |
| Brewer's Sparrow | *Spizella breweri* | Deerlodge | 24 | 14 | 29 | 8 | 30 | 105 |
|  |  | Echo | 1 | 2 | 0 | 1 | 0 | 4 |
| Vesper Sparrow | *Pooecetes gramineus* | Deerlodge | 16 | 40 | 24 | 25 | 22 | 127 |
|  |  | Echo | 1 | 0 | 3 | 1 | 3 | 8 |
| Lark Sparrow | *Chondestes grammacus* | Deerlodge | 25 | 9 | 14 | 11 | 13 | 72 |
|  |  | Echo | 12 | 3 | 3 | 0 | 5 | 23 |
| Black-throated Sparrow | *Amphispiza bilineata* | Deerlodge | 0 | 1 | 0 | 4 | 0 | 5 |
|  |  | Echo | 1 | 1 | 0 | 0 | 0 | 2 |
| Song Sparrow | *Melospiza melodia* | Deerlodge | 9 | 6 | 9 | 0 | 9 | 33 |
|  |  | Echo | 22 | 25 | 23 | 19 | 25 | 114 |
| Western Tanager | *Piranga ludoviciana* | Deerlodge | 0 | 0 | 3 | 0 | 5 | 8 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Black-headed Grosbeak | *Pheucticus melanocephalus* | Deerlodge | 9 | 1 | 2 | 5 | 1 | 18 |
|  |  | Echo | 0 | 0 | 18 | 0 | 14 | 32 |
| Lazuli Bunting | *Passerina amoena* | Deerlodge | 9 | 13 | 21 | 31 | 28 | 102 |
|  |  | Echo | 129 | 152 | 117 | 167 | 111 | 676 |
| Red-winged Blackbird | *Agelaius phoeniceus* | Deerlodge | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  | Echo | 1 | 1 | 0 | 0 | 0 | 2 |
| Western Meadowlark | *Sturnella neglecta* | Deerlodge | 54 | 53 | 86 | 21 | 51 | 265 |
|  |  | Echo | 3 | 3 | 0 | 0 | 0 | 6 |
| Brewer's Blackbird | *Euphagus cyanocephalus* | Deerlodge | 9 | 4 | 4 | 4 | 3 | 24 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown-headed Cowbird | *Molothrus ater* | Deerlodge | 2 | 4 | 8 | 1 | 9 | 24 |
|  |  | Echo | 0 | 0 | 0 | 0 | 0 | 0 |
| Bullock's Oriole | *Icterus bullockii* | Deerlodge | 12 | 10 | 3 | 10 | 4 | 39 |
|  |  | Echo | 1 | 1 | 0 | 0 | 0 | 2 |
| Cassin's Finch | *Carpodacus cassinii* | Deerlodge | 11 | 0 | 0 | 0 | 0 | 11 |
|  |  | Echo | 2 | 0 | 0 | 0 | 0 | 2 |
| House Finch | *Carpodacus mexicanus* | Deerlodge | 6 | 3 | 20 | 10 | 19 | 58 |
|  |  | Echo | 28 | 20 | 11 | 0 | 11 | 70 |
| Lesser Goldfinch | *Spinus psaltria* | Deerlodge | 0 | 9 | 8 | 6 | 2 | 25 |
|  |  | Echo | 9 | 0 | 8 | 3 | 8 | 28 |
| American Goldfinch | *Spinus tristis* | Deerlodge | 0 | 3 | 0 | 0 | 0 | 3 |
|  |  | Echo | 0 | 1 | 2 | 0 | 2 | 5 |

We estimated densities for 33 species for all years of the project (Table 5). These species represent 83% of all species recorded at Echo Park and 66% of all species recorded at Deerlodge Park in 2009. The following species had the highest density estimates at Deerlodge Park in 2010 (listed in order from highest to lowest density):

1. Violet-green Swallow
2. American Robin
3. Lazuli Bunting
4. Yellow Warbler
5. Spotted Towhee
6. Western Wood-Pewee
7. European Starling
8. Blue-gray Gnatcatcher
9. Mountain Bluebird
10. House Wren

The following species had the highest density estimates at Echo Park in 2010:

1. Lazuli Bunting
2. Violet-green Swallow
3. Yellow Warbler
4. Spotted Towhee
5. Chipping Sparrow
6. Plumbeous Vireo
7. Song Sparrow
8. White-throated Swift
9. House Wren
10. Rock Wren

Table 5. Estimated densities of breeding birds in Deerlodge and Echo Parks in Dinosaur National Monument, 2006-20101.

| Species | Park | Year | D | LCL | UCL | %CV | n |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Spotted Sandpiper | Deerlodge | 2006 | 3.8 | 3.1 | 4.7 | 12 | 11 |
|  |  | 2007 | 3.1 | 2.5 | 3.8 | 12 | 10 |
|  |  | 2008 | 1.0 | 0.8 | 1.3 | 12 | 3 |
|  |  | 2009 | 0.3 | 0.3 | 0.4 | 12 | 1 |
|  |  | 2010 | 0.7 | 0.6 | 0.9 | 12 | 2 |
|  | Echo | 2006 | 0.3 | 0.3 | 0.4 | 12 | 1 |
|  |  | 2007 | 1.4 | 1.1 | 1.7 | 12 | 5 |
|  |  | 2008 | 1.7 | 1.4 | 2.1 | 12 | 9 |
|  |  | 2009 | 5.2 | 4.2 | 6.4 | 12 | 16 |
|  |  | 2010 | 2.1 | 1.7 | 2.6 | 12 | 6 |
| Mourning Dove | Deerlodge | 2006 | 1.6 | 1.5 | 1.8 | 5 | 5 |
|  |  | 2007 | 9.5 | 8.8 | 10.3 | 5 | 36 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 1.6 | 1.5 | 1.8 | 5 | 6 |
|  |  | 2010 | 1.3 | 1.2 | 1.4 | 5 | 4 |
|  | Echo | 2006 | 1.6 | 1.5 | 1.8 | 5 | 10 |
|  |  | 2007 | 4.6 | 4.2 | 5.0 | 5 | 20 |
|  |  | 2008 | 2.6 | 2.4 | 2.9 | 5 | 10 |
|  |  | 2009 | 2.6 | 2.4 | 2.9 | 5 | 9 |
|  |  | 2010 | 2.6 | 2.4 | 2.9 | 5 | 10 |
| White-throated Swift | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 1.3 | 1.0 | 1.5 | 12 | 1 |
|  |  | 2008 | 3.8 | 3.1 | 4.6 | 12 | 3 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 3.8 | 3.1 | 4.6 | 12 | 4 |
|  | Echo | 2006 | 15.0 | 12.3 | 18.5 | 12 | 17 |
|  |  | 2007 | 27.6 | 22.5 | 33.9 | 12 | 24 |
|  |  | 2008 | 54.1 | 20.5 | 143.0 | 59 | 98 |
|  |  | 2009 | 60.6 | 35.5 | 103.3 | 32 | 68 |
|  |  | 2010 | 21.3 | 15.5 | 29.3 | 19 | 25 |
| Northern Flicker | Deerlodge | 2006 | 18.2 | 11.9 | 27.9 | 26 | 22 |
|  |  | 2007 | 27.3 | 17.8 | 41.8 | 26 | 34 |
|  |  | 2008 | 4.6 | 3.0 | 7.0 | 26 | 9 |
|  |  | 2009 | 2.7 | 1.8 | 4.2 | 26 | 3 |
|  |  | 2010 | 3.6 | 2.4 | 5.6 | 26 | 6 |
|  | Echo | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 0.0 | - | - | - | 1 |
|  |  | 2009 | 1.8 | 1.2 | 2.8 | 26 | 3 |
|  |  | 2010 | 0.9 | 0.6 | 1.4 | 26 | 1 |
| Western Wood-Pewee | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 1.0 | 0.9 | 1.1 | 5 | 1 |
|  |  | 2008 | 15.6 | 14.3 | 16.9 | 5 | 19 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 12.6 | 11.6 | 13.8 | 5 | 19 |
|  | Echo | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 1.0 | 0.9 | 1.1 | 5 | 1 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 0.0 | - | - | - | 1 |
| Say's Phoebe | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 1.3 | 1.1 | 1.5 | 10 | 5 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 2.6 | 2.2 | 3.1 | 10 | 9 |
|  | Echo | 2006 | 2.0 | 1.7 | 2.3 | 10 | 6 |
|  |  | 2007 | 4.3 | 3.6 | 5.0 | 10 | 13 |
|  |  | 2008 | 2.6 | 2.2 | 3.1 | 10 | 11 |
|  |  | 2009 | 5.3 | 4.5 | 6.2 | 10 | 16 |
|  |  | 2010 | 6.6 | 5.6 | 7.7 | 10 | 20 |
| Ash-throated Flycatcher | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 3.4 | 2.9 | 4.1 | 11 | 7 |
|  |  | 2008 | 2.5 | 2.1 | 2.9 | 11 | 5 |
|  |  | 2009 | 2.5 | 2.1 | 2.9 | 11 | 5 |
|  |  | 2010 | 2.0 | 1.6 | 2.3 | 11 | 5 |
|  | Echo | 2006 | 4.4 | 3.7 | 5.3 | 11 | 11 |
|  |  | 2007 | 5.4 | 4.5 | 6.4 | 11 | 11 |
|  |  | 2008 | 10.8 | 9.1 | 12.9 | 11 | 24 |
|  |  | 2009 | 17.2 | 14.4 | 20.5 | 11 | 40 |
|  |  | 2010 | 7.4 | 6.2 | 8.8 | 11 | 18 |
| Plumbeous Vireo | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 3.2 | 2.5 | 4.2 | 16 | 2 |
|  |  | 2008 | 1.6 | 1.2 | 2.1 | 16 | 3 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 4.8 | 3.7 | 6.3 | 16 | 4 |
|  | Echo | 2006 | 22.4 | 17.2 | 29.2 | 16 | 17 |
|  |  | 2007 | 14.4 | 11.1 | 18.8 | 16 | 10 |
|  |  | 2008 | 16.0 | 12.3 | 20.9 | 16 | 18 |
|  |  | 2009 | 16.0 | 12.3 | 20.9 | 16 | 15 |
|  |  | 2010 | 27.2 | 20.9 | 35.5 | 16 | 22 |
| Warbling Vireo | Deerlodge | 2006 | 8.0 | 7.0 | 9.1 | 8 | 11 |
|  |  | 2007 | 7.2 | 6.3 | 8.2 | 8 | 9 |
|  |  | 2008 | 15.2 | 13.4 | 17.2 | 8 | 24 |
|  |  | 2009 | 12.8 | 11.2 | 14.5 | 8 | 19 |
|  |  | 2010 | 9.6 | 8.4 | 10.9 | 8 | 19 |
|  | Echo | 2006 | 2.4 | 2.1 | 2.7 | 8 | 3 |
|  |  | 2007 | 2.4 | 2.1 | 2.7 | 8 | 3 |
|  |  | 2008 | 2.4 | 2.1 | 2.7 | 8 | 4 |
|  |  | 2009 | 4.0 | 3.5 | 4.5 | 8 | 8 |
|  |  | 2010 | 4.8 | 4.2 | 5.4 | 8 | 6 |
| Black-billed Magpie | Deerlodge | 2006 | 8.3 | 7.2 | 9.7 | 9 | 24 |
|  |  | 2007 | 7.6 | 6.6 | 8.8 | 9 | 21 |
|  |  | 2008 | 1.9 | 1.6 | 2.2 | 9 | 6 |
|  |  | 2009 | 6.1 | 5.3 | 7.0 | 9 | 17 |
|  |  | 2010 | 2.3 | 2.0 | 2.6 | 9 | 6 |
|  | Echo | 2006 | 0.4 | 0.3 | 0.4 | 9 | 1 |
|  |  | 2007 | 0.8 | 0.7 | 0.9 | 9 | 2 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 0.0 | - | - | - | - |
| Common Raven | Deerlodge | 2006 | 1.7 | 1.2 | 2.3 | 19 | 10 |
|  |  | 2007 | 1.5 | 1.1 | 2.1 | 19 | 13 |
|  |  | 2008 | 0.7 | 0.5 | 0.9 | 19 | 7 |
|  |  | 2009 | 0.2 | 0.1 | 0.2 | 19 | 6 |
|  |  | 2010 | 2.0 | 1.4 | 2.9 | 22 | 12 |
|  | Echo | 2006 | 0.5 | 0.4 | 0.7 | 19 | 9 |
|  |  | 2007 | 0.3 | 0.2 | 0.5 | 19 | 6 |
|  |  | 2008 | 0.0 | - | - | - | 1 |
|  |  | 2009 | 3.2 | 2.4 | 4.4 | 19 | 26 |
|  |  | 2010 | 0.2 | 0.1 | 0.2 | 19 | 1 |
| Violet-green Swallow | Deerlodge | 2006 | 5.7 | 4.8 | 6.7 | 10 | 4 |
|  |  | 2007 | 9.9 | 8.4 | 11.7 | 10 | 7 |
|  |  | 2008 | 100.5 | 52.7 | 191.7 | 37 | 72 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 42.5 | 13.7 | 131.7 | 62 | 48 |
|  | Echo | 2006 | 17.0 | 14.4 | 20.0 | 10 | 13 |
|  |  | 2007 | 45.3 | 38.5 | 53.3 | 10 | 44 |
|  |  | 2008 | 176.9 | 132.6 | 236.1 | 17 | 155 |
|  |  | 2009 | 72.2 | 53.5 | 97.4 | 18 | 57 |
|  |  | 2010 | 114.7 | 85.9 | 153.1 | 17 | 109 |
| Rock Wren | Deerlodge | 2006 | 2.3 | 2.0 | 2.7 | 10 | 6 |
|  |  | 2007 | 3.7 | 3.2 | 4.3 | 10 | 13 |
|  |  | 2008 | 6.9 | 5.9 | 8.1 | 10 | 18 |
|  |  | 2009 | 1.4 | 1.2 | 1.6 | 10 | 3 |
|  |  | 2010 | 9.7 | 6.8 | 13.9 | 21 | 22 |
|  | Echo | 2006 | 5.5 | 4.7 | 6.5 | 10 | 15 |
|  |  | 2007 | 12.0 | 10.2 | 14.0 | 10 | 30 |
|  |  | 2008 | 8.8 | 7.5 | 10.2 | 10 | 20 |
|  |  | 2009 | 11.5 | 9.8 | 13.5 | 10 | 30 |
|  |  | 2010 | 15.2 | 10.8 | 21.4 | 21 | 39 |
| House Wren | Deerlodge | 2006 | 17.8 | 15.8 | 20.0 | 7 | 29 |
|  |  | 2007 | 22.0 | 19.6 | 24.7 | 7 | 31 |
|  |  | 2008 | 22.0 | 19.6 | 24.7 | 7 | 34 |
|  |  | 2009 | 56.1 | 49.9 | 63.1 | 7 | 96 |
|  |  | 2010 | 15.6 | 13.9 | 17.6 | 7 | 30 |
|  | Echo | 2006 | 29.1 | 25.9 | 32.7 | 7 | 42 |
|  |  | 2007 | 22.0 | 19.6 | 24.7 | 7 | 37 |
|  |  | 2008 | 24.2 | 21.5 | 27.1 | 7 | 40 |
|  |  | 2009 | 36.9 | 32.9 | 41.5 | 7 | 63 |
|  |  | 2010 | 18.5 | 16.4 | 20.8 | 7 | 34 |
| Blue-gray Gnatcatcher | Deerlodge | 2006 | 7.5 | 6.3 | 8.9 | 11 | 8 |
|  |  | 2007 | 8.5 | 7.2 | 10.2 | 11 | 8 |
|  |  | 2008 | 28.8 | 24.1 | 34.4 | 11 | 30 |
|  |  | 2009 | 1.1 | 0.9 | 1.3 | 11 | 1 |
|  |  | 2010 | 20.3 | 17.0 | 24.2 | 11 | 30 |
|  | Echo | 2006 | 8.5 | 7.2 | 10.2 | 11 | 9 |
|  |  | 2007 | 5.3 | 4.5 | 6.4 | 11 | 5 |
|  |  | 2008 | 4.3 | 3.6 | 5.1 | 11 | 5 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 2.1 | 1.8 | 2.6 | 11 | 4 |
| Mountain Bluebird | Deerlodge | 2006 | 20.5 | 16.6 | 25.3 | 13 | 24 |
|  |  | 2007 | 11.1 | 9.0 | 13.7 | 13 | 13 |
|  |  | 2008 | 21.4 | 16.7 | 27.4 | 15 | 31 |
|  |  | 2009 | 4.3 | 2.7 | 6.7 | 24 | 5 |
|  |  | 2010 | 18.8 | 14.8 | 24.0 | 15 | 28 |
|  | Echo | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.9 | 0.7 | 1.1 | 13 | 1 |
|  |  | 2008 | 1.7 | 1.4 | 2.1 | 13 | 2 |
|  |  | 2009 | 0.9 | 0.7 | 1.1 | 13 | 1 |
|  |  | 2010 | 1.7 | 1.4 | 2.1 | 13 | 2 |
| American Robin | Deerlodge | 2006 | 18.1 | 13.6 | 23.9 | 17 | 27 |
|  |  | 2007 | 23.1 | 17.5 | 30.6 | 17 | 38 |
|  |  | 2008 | 25.3 | 19.1 | 33.5 | 17 | 43 |
|  |  | 2009 | 23.8 | 18.0 | 31.5 | 17 | 38 |
|  |  | 2010 | 33.2 | 25.1 | 44.0 | 17 | 52 |
|  | Echo | 2006 | 3.6 | 2.7 | 4.8 | 17 | 6 |
|  |  | 2007 | 8.7 | 6.6 | 11.5 | 17 | 18 |
|  |  | 2008 | 0.7 | 0.5 | 1.0 | 17 | 1 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 1.4 | 1.1 | 1.9 | 17 | 2 |
| European Starling | Deerlodge | 2006 | 39.0 | 30.0 | 50.8 | 16 | 24 |
|  |  | 2007 | 14.4 | 11.0 | 18.7 | 16 | 10 |
|  |  | 2008 | 12.2 | 4.8 | 30.9 | 45 | 21 |
|  |  | 2009 | 486.6 | 349.7 | 677.2 | 20 | 248 |
|  |  | 2010 | 22.6 | 5.9 | 86.6 | 66 | 15 |
|  | Echo | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | 1 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 0.0 | - | - | - | - |
| Yellow Warbler | Deerlodge | 2006 | 45.1 | 40.7 | 50.0 | 5 | 31 |
|  |  | 2007 | 46.7 | 42.2 | 51.8 | 5 | 31 |
|  |  | 2008 | 25.0 | 22.6 | 27.8 | 5 | 24 |
|  |  | 2009 | 48.4 | 43.7 | 53.7 | 5 | 35 |
|  |  | 2010 | 30.1 | 27.1 | 33.3 | 5 | 23 |
|  | Echo | 2006 | 153.6 | 138.6 | 170.2 | 5 | 97 |
|  |  | 2007 | 81.8 | 73.8 | 90.7 | 5 | 65 |
|  |  | 2008 | 85.1 | 76.8 | 94.4 | 5 | 61 |
|  |  | 2009 | 123.6 | 111.5 | 136.9 | 5 | 80 |
|  |  | 2010 | 98.5 | 88.9 | 109.2 | 5 | 73 |
| Black-throated Gray Warbler | Deerlodge | 2006 | 2.2 | 1.7 | 2.9 | 15 | 3 |
|  |  | 2007 | 3.0 | 2.3 | 3.9 | 15 | 4 |
|  |  | 2008 | 2.2 | 1.7 | 2.9 | 15 | 3 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 3.0 | 1.6 | 5.6 | 29 | 4 |
|  | Echo | 2006 | 6.0 | 4.6 | 7.7 | 15 | 11 |
|  |  | 2007 | 6.0 | 4.6 | 7.7 | 15 | 9 |
|  |  | 2008 | 6.7 | 5.2 | 8.7 | 15 | 12 |
|  |  | 2009 | 7.5 | 5.8 | 9.6 | 15 | 10 |
|  |  | 2010 | 6.7 | 5.2 | 8.7 | 15 | 12 |
| Yellow-breasted Chat | Deerlodge | 2006 | 7.9 | 6.8 | 9.2 | 9 | 15 |
|  |  | 2007 | 6.9 | 5.9 | 8.0 | 9 | 13 |
|  |  | 2008 | 5.3 | 4.6 | 6.2 | 9 | 12 |
|  |  | 2009 | 4.8 | 4.1 | 5.5 | 9 | 17 |
|  |  | 2010 | 6.9 | 5.9 | 8.0 | 9 | 14 |
|  | Echo | 2006 | 6.4 | 5.5 | 7.4 | 9 | 13 |
|  |  | 2007 | 4.8 | 4.1 | 5.5 | 9 | 13 |
|  |  | 2008 | 5.8 | 5.0 | 6.8 | 9 | 20 |
|  |  | 2009 | 24.3 | 20.9 | 28.3 | 9 | 67 |
|  |  | 2010 | 8.5 | 7.3 | 9.8 | 9 | 21 |
| Spotted Towhee | Deerlodge | 2006 | 9.9 | 8.8 | 11.1 | 6 | 13 |
|  |  | 2007 | 19.8 | 17.7 | 22.2 | 6 | 22 |
|  |  | 2008 | 33.3 | 29.7 | 37.3 | 6 | 47 |
|  |  | 2009 | 25.2 | 22.5 | 28.2 | 6 | 33 |
|  |  | 2010 | 29.7 | 26.5 | 33.3 | 6 | 41 |
|  | Echo | 2006 | 40.5 | 36.1 | 45.4 | 6 | 52 |
|  |  | 2007 | 39.6 | 35.3 | 44.4 | 6 | 54 |
|  |  | 2008 | 45.0 | 40.1 | 50.4 | 6 | 61 |
|  |  | 2009 | 42.3 | 37.7 | 47.4 | 6 | 51 |
|  |  | 2010 | 45.0 | 40.1 | 50.4 | 6 | 57 |
| Chipping Sparrow | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 0.0 | - | - | - | 1 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 3.9 | 2.7 | 5.7 | 23 | 3 |
|  | Echo | 2006 | 29.4 | 20.2 | 42.7 | 23 | 15 |
|  |  | 2007 | 17.6 | 12.1 | 25.6 | 23 | 11 |
|  |  | 2008 | 31.3 | 21.5 | 45.6 | 23 | 20 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 31.3 | 21.5 | 45.6 | 23 | 23 |
| Brewer's Sparrow | Deerlodge | 2006 | 14.7 | 12.9 | 16.8 | 8 | 9 |
|  |  | 2007 | 8.3 | 7.3 | 9.5 | 8 | 1 |
|  |  | 2008 | 16.6 | 14.6 | 19.0 | 8 | 2 |
|  |  | 2009 | 4.5 | 3.9 | 5.1 | 8 | 5 |
|  |  | 2010 | 14.1 | 12.3 | 16.1 | 8 | 1 |
|  | Echo | 2006 | 0.6 | 0.6 | 0.7 | 8 | 1 |
|  |  | 2007 | 1.3 | 1.1 | 1.5 | 8 | 2 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 0.6 | 0.6 | 0.7 | 8 | 1 |
|  |  | 2010 | 0.0 | - | - | - | - |
| Vesper Sparrow | Deerlodge | 2006 | 11.2 | 8.6 | 14.4 | 15 | 16 |
|  |  | 2007 | 23.8 | 18.4 | 30.7 | 15 | 40 |
|  |  | 2008 | 15.6 | 12.1 | 20.2 | 15 | 24 |
|  |  | 2009 | 17.9 | 13.8 | 23.0 | 15 | 25 |
|  |  | 2010 | 13.4 | 10.4 | 17.3 | 15 | 22 |
|  | Echo | 2006 | 0.7 | 0.6 | 1.0 | 15 | 1 |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 2.2 | 1.7 | 2.9 | 15 | 3 |
|  |  | 2009 | 0.7 | 0.6 | 1.0 | 15 | 1 |
|  |  | 2010 | 0.7 | 0.6 | 1.0 | 15 | 3 |
| Lark Sparrow | Deerlodge | 2006 | 24.7 | 20.4 | 29.9 | 12 | 25 |
|  |  | 2007 | 6.2 | 5.1 | 7.5 | 12 | 9 |
|  |  | 2008 | 14.4 | 11.9 | 17.4 | 12 | 14 |
|  |  | 2009 | 10.3 | 8.5 | 12.5 | 12 | 11 |
|  |  | 2010 | 10.3 | 8.5 | 12.5 | 12 | 13 |
|  | Echo | 2006 | 12.4 | 10.2 | 14.9 | 12 | 12 |
|  |  | 2007 | 3.1 | 2.6 | 3.7 | 12 | 3 |
|  |  | 2008 | 3.1 | 2.6 | 3.7 | 12 | 3 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 4.1 | 0.3 | 55.0 | 51 | 5 |
| Song Sparrow | Deerlodge | 2006 | 9.8 | 8.1 | 11.9 | 12 | 9 |
|  |  | 2007 | 6.2 | 5.1 | 7.4 | 12 | 6 |
|  |  | 2008 | 7.4 | 6.1 | 8.9 | 12 | 9 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 8.6 | 7.1 | 10.4 | 12 | 9 |
|  | Echo | 2006 | 24.6 | 20.3 | 29.8 | 12 | 22 |
|  |  | 2007 | 17.2 | 14.2 | 20.9 | 12 | 25 |
|  |  | 2008 | 19.7 | 16.3 | 23.8 | 12 | 23 |
|  |  | 2009 | 16.0 | 13.2 | 19.4 | 12 | 19 |
|  |  | 2010 | 27.1 | 22.4 | 32.8 | 12 | 25 |
| Black-headed Grosbeak | Deerlodge | 2006 | 5.5 | 4.7 | 6.4 | 10 | 2 |
|  |  | 2007 | 0.7 | 0.6 | 0.8 | 10 | 4 |
|  |  | 2008 | 0.7 | 0.6 | 0.8 | 10 | 8 |
|  |  | 2009 | 2.7 | 2.3 | 3.2 | 10 | 1 |
|  |  | 2010 | 0.7 | 0.6 | 0.8 | 10 | 9 |
|  | Echo | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 10.3 | 8.7 | 12.0 | 10 | 18 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 8.9 | 7.6 | 10.4 | 10 | 14 |
| Lazuli Bunting | Deerlodge | 2006 | 13.1 | 11.7 | 14.8 | 7 | 9 |
|  |  | 2007 | 21.3 | 19.0 | 24.0 | 7 | 13 |
|  |  | 2008 | 27.9 | 24.8 | 31.4 | 7 | 21 |
|  |  | 2009 | 37.7 | 33.6 | 42.4 | 7 | 31 |
|  |  | 2010 | 32.8 | 28.4 | 37.9 | 9 | 28 |
|  | Echo | 2006 | 203.5 | 181.0 | 228.8 | 7 | 129 |
|  |  | 2007 | 215.0 | 191.2 | 241.8 | 7 | 152 |
|  |  | 2008 | 151.0 | 134.3 | 169.8 | 7 | 117 |
|  |  | 2009 | 252.8 | 223.1 | 286.3 | 8 | 167 |
|  |  | 2010 | 129.7 | 115.3 | 145.8 | 7 | 111 |
| Western Meadowlark | Deerlodge | 2006 | 30.3 | 28.3 | 32.4 | 4 | 54 |
|  |  | 2007 | 25.4 | 23.8 | 27.2 | 4 | 53 |
|  |  | 2008 | 20.5 | 17.4 | 24.1 | 10 | 86 |
|  |  | 2009 | 8.5 | 7.9 | 9.1 | 4 | 21 |
|  |  | 2010 | 26.0 | 24.3 | 27.8 | 4 | 51 |
|  | Echo | 2006 | 0.6 | 0.6 | 0.6 | 4 | 3 |
|  |  | 2007 | 1.8 | 1.7 | 1.9 | 4 | 3 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 0.0 | - | - | - | - |
| Bullock's Oriole | Deerlodge | 2006 | 15.5 | 12.9 | 18.5 | 11 | 12 |
|  |  | 2007 | 13.9 | 11.6 | 16.6 | 11 | 10 |
|  |  | 2008 | 3.1 | 2.6 | 3.7 | 11 | 3 |
|  |  | 2009 | 13.9 | 11.6 | 16.6 | 11 | 10 |
|  |  | 2010 | 6.2 | 5.2 | 7.4 | 11 | 4 |
|  | Echo | 2006 | 1.5 | 1.3 | 1.8 | 11 | 1 |
|  |  | 2007 | 1.5 | 1.3 | 1.8 | 11 | 1 |
|  |  | 2008 | 0.0 | - | - | - | - |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 0.0 | - | - | - | - |
| House Finch | Deerlodge | 2006 | 3.4 | 2.7 | 4.1 | 12 | 6 |
|  |  | 2007 | 1.7 | 1.4 | 2.1 | 12 | 3 |
|  |  | 2008 | 9.0 | 7.3 | 11.0 | 12 | 20 |
|  |  | 2009 | 3.9 | 3.2 | 4.8 | 12 | 10 |
|  |  | 2010 | 9.0 | 7.3 | 11.0 | 12 | 19 |
|  | Echo | 2006 | 11.8 | 9.6 | 14.5 | 12 | 28 |
|  |  | 2007 | 10.7 | 8.7 | 13.1 | 12 | 20 |
|  |  | 2008 | 5.0 | 4.1 | 6.2 | 12 | 11 |
|  |  | 2009 | 0.0 | - | - | - | - |
|  |  | 2010 | 4.5 | 3.7 | 5.5 | 12 | 11 |
| Lesser Goldfinch | Deerlodge | 2006 | 0.0 | - | - | - | - |
|  |  | 2007 | 22.0 | 17.1 | 28.4 | 15 | 9 |
|  |  | 2008 | 19.6 | 6.1 | 62.4 | 48 | 8 |
|  |  | 2009 | 12.2 | 9.5 | 15.8 | 15 | 6 |
|  |  | 2010 | 0.0 | - | - | - | 2 |
|  | Echo | 2006 | 22.0 | 17.1 | 28.4 | 15 | 9 |
|  |  | 2007 | 0.0 | - | - | - | - |
|  |  | 2008 | 19.6 | 15.2 | 25.3 | 15 | 8 |
|  |  | 2009 | 7.3 | 5.7 | 9.5 | 15 | 3 |
|  |  | 2010 | 7.3 | 5.7 | 9.5 | 15 | 8 |

1D = estimated density (birds/km2); LCL and UCL = lower and upper 90% confidence limits on D; %CV = percent coefficient of variation of D; n = number of independent detections (this is not the number of detections used to calculate density estimate; some observations may be truncated).

# Discussion

Attempting to determine the effects of the tamarisk leaf beetle on wildlife populations is a new and challenging endeavor for researchers in the western U.S. RMBO has been involved with another project taking place throughout the entire Upper Colorado River basin during the previous two breeding seasons (2009-2010) in cooperation with the Tamarisk Coalition to determine how birds are responding to the introduction. Preliminary results of that project are showing that it will take many years and an extensive survey effort to determine if the beetles are going to influence riparian bird populations. The results of this project in Dinosaur National Monument can be compared to this and other projects to determine the effects of the tamarisk leaf beetles; however, it will take additional effort and many years before conclusions can be made. In order to decrease the amount of time that inference can be made about the impact of beetles on birds at Echo Park, some measurements of the beetle population and the amount of defoliation will need to be recorded. RMBO will begin incorporating these measurements into the project protocol in 2011. Even when these measurements are included in data analysis, we cannot say how long it will take to determine the effects of beetles on birds at Echo Park.

Restoration of riparian areas in the western U.S. can have benefits to birds and all wildlife that are found in this vital habitat. However, if wildlife populations are not monitored to determine if the actions taking place on the landscape are having a positive influence, land managers will never know which decisions are achieving the desired results. We applaud the staff at Dinosaur National Monument for having the vision to include wildlife monitoring in their restoration efforts.

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**Appendix A. Point count locations in Echo Park**



**Appendix B. Point count locations in Deerlodge Park**