

Western Specialty: White-tailed Ptarmigan



Photo by Cole J. Wolf of Albuquerque, New Mexico:
Female White-tailed Ptarmigan (*Lagopus leucura*) in mid-summer plumage, Santa Barbara Ridge near Jicarita Peak, Taos County, New Mexico, 4 August 2012. This locale, west of Holman, Mora County, is a consistently reliable area for this species. In 1981, 43 White-tailed Ptarmigan from Colorado were translocated to this area of New Mexico to augment a native population whose status was tenuous. After 33 years, the translocation still appears successful, as detailed in this issue of *Western Birds* by Clait E. Braun and Sartor O. Williams III (pp. 233–243).

HISTORY AND STATUS OF THE WHITE-TAILED PTARMIGAN IN NEW MEXICO

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ABSTRACT: We reviewed the literature and observations of the occurrence and status of the White-tailed Ptarmigan (*Lagopus leucura*) in New Mexico. Historical reports were infrequent, likely because of an inadequate system for recording observations from the public, although by 1928 biologists had a good understanding of the distribution and status of the species in the state. By 1980, ptarmigan persisted in small numbers in the northern portion of the New Mexico range but were uncommon or absent in the southern portion of the range, prompting a transplant of White-tailed Ptarmigan from Colorado into the southern area in 1981. Following that successful transplant, observations initially increased and subsequently continued at a relatively low level with most reports coming from the southern portion but including others from throughout the historical range. White-tailed Ptarmigan are localized in suitable habitats, but their abundance in New Mexico may be affected by the decreasing size of alpine snowfields in summer, grazing in areas dominated by willow (*Salix* spp.), and the shift to a warmer and drier climate.

The White-tailed Ptarmigan (*Lagopus leucura*) occurs from Alaska south to New Mexico; its distribution is highly discontinuous and is most fragmented in the southern portion of its range (Braun et al. 1993). The abundance of the species is also quite variable (Braun, unpubl. data) and has been measured for only a few sites. Variation in abundance appears to depend on a site's characteristics, especially the abundance of late-lying snow patches and rock and boulder fields, as well as the presence of willows (*Salix* spp.), which may be affected by moisture regimes.

The ptarmigan was first reported in New Mexico by B. J. D. Irwin prior to 1866 in the Sangre de Cristo Mountains near Cantonment Burgwyn near present-day Taos (Coues 1866, 1875, Bendire 1892). Bailey (1928) suggested those records were from the Truchas Peaks area farther south, although similar habitat existed closer in the Wheeler Peak area; the collection locale—latitude 37° north—is the present New Mexico–Colorado border (Coues 1875). While the actual collection date of the reported specimens is unknown, it was likely 1856–1857, as Irwin was stationed in New Mexico (at Fort Union) for only a short period between August 1856 and December 1857 (Hume 1942). It is likely Irwin visited the Burgwyn area sometime before leaving New Mexico and arriving at Fort Buchanan near Tucson, Arizona, in December 1857; he did not return to northern New Mexico. Cantonment Burgwyn was abandoned by the U.S. Army in 1860. The present location of the specimen(s) is unknown.

Bailey (1928) offered a bleak description of the species' distribution and abundance in New Mexico in the earliest decades of the 20th century, as even extensive searches in some areas yielded few records. By 1928, however, specimen records and/or reports had accumulated from most or all of the known New Mexico distribution as it is understood today. Although its

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habitat is limited, the White-tailed Ptarmigan has persisted in New Mexico to the present in essentially the same areas as occupied in the late 1920s.

Our objectives are to report (1) on the occurrence of White-tailed Ptarmigan in New Mexico by two broad time intervals, separated by a transplant in 1981; (2) on efforts to locate extant populations before and after the transplant; (3) details of the transplant into the southern portion of the New Mexico range; and (4) estimate possible size of the area that the species could inhabit in the state. These data should be useful as the species is studied more intensively, the result of interest by some groups in the U.S. Fish and Wildlife Service in listing the White-tailed Ptarmigan as threatened or endangered because of a reduction projected from climate change.

METHODS

We searched the published literature, unpublished reports in the files of government agencies, and written reports of observations of White-tailed Ptarmigan maintained in the archives of the New Mexico Ornithological Society, inspected museum specimens (four that could be found), and, in 2004, Williams searched habitat appearing suitable on the basis of Braun's extensive field experience in Colorado. We included only conclusive reports from the historic range (Ligon 1927, Bailey 1928) and in areas where birds transported from Colorado were released (spring and fall 1981).

Broadcasting tape-recorded White-tailed Ptarmigan calls (Braun et al. 1973), in 1969, 1979, and 2006 Braun searched apparently suitable habitat (Braun 1969, 1970, 1971, 1979, 2006) as follows: 10–11 September 1969 with New Mexico Department of Game and Fish (NMDGF) personnel in the Wheeler Peak area including Simpson Peak, Taos Cone, and Mount Walter, and also in the Latir Peaks area on 12 September 1969. Ten years later, Braun and personnel of the NMDGF and the U.S. Forest Service (USFS) made similar searches in the Latir Peaks 3–4 August 1979 and on Mount Walter above Taos Ski Valley on 5 August 1979. Also in 1979 they visited the southern portion of the New Mexico distribution, surveying portions of the Pecos Wilderness (Jicarita Peak, Serpent Lake, Santa Barbara Divide, Horseshoe Lake, Barbara Peak) as well as portions of the Truchas Peaks (Truchas Lake) and south to Pecos Baldy from 7 to 9 August. Santa Fe Baldy and nearby Lake Peak were searched on 10 August. In 2006, broadcasting calls of a male White-tailed Ptarmigan, Braun and USFS personnel searched the area above Serpent Lake to Jicarita Peak and along the Santa Barbara Divide trail from 12 to 14 June.

Using methods detailed by Braun and Rogers (1971:21) and areal measurements from U.S. Geological Survey topographic maps, Braun estimated the area above tree line (elevation 3505 m) in the Sangre de Cristo Mountains of New Mexico, as Pat Gioannini of the New Mexico Section of the American Alpine Club did independently. The latter estimate was based on a computer program that counted pixels above 3505 m in the area from Santa Fe Baldy north to the Colorado line in the vicinity of Stateline Peak. We made no distinction between area possibly available from May through October and in winter (November–April), as knowledge of habitats used by White-tailed Ptarmigan in winter in New Mexico is lacking.

RESULTS

Pre-1981 Observations

Bailey (1904, 1905) provided the first detailed overview of the distribution and status of White-tailed Ptarmigan in New Mexico, reporting specimens and observations (some of the latter second-hand and several years old) from many of the peaks in the Sangre de Cristo Mountains now understood as ptarmigan locales. She (Bailey 1904) recognized a lower-elevation gap of “some 30-40 miles” (48–64 km) that separated the northern peaks (Wheeler Peak northward) from the southern peaks of the upper Pecos region, and noted the species seemed to be scarce or absent in the southern area and in low numbers in the north. Ligon (1927:127–129) reported essentially the same status in the mid-1920s, noting the species formerly occurred on about a dozen high peaks and ridges in the Sangre de Cristo Mountains but had been “exterminated” from the southern peaks (e.g., Pecos Baldy, Truchas Peaks), was faring poorly in the Wheeler Peak and Gold Hill areas, and seemed to be surviving best in the Costilla Peak area near the Colorado line. Ligon estimated the total amount of alpine habitat in New Mexico at “less than 20 square miles” (< 52 km²) but reported that excessive summer grazing by domestic sheep was destroying the habitat and suggested only about 100 birds remained.

Bailey (1928) summarized the available historical distributional data, including mapping the range as extending from Santa Fe Baldy and Pecos Baldy north to the Colorado line. By 1928, the species was understood to occur, or have occurred, in the Costilla Peaks area near the Colorado border, the Latir Peaks area, Gold Hill, and the Wheeler Peak area in the north, and the Santa Barbara Divide ridge (“Mora Pass”), Truchas Peaks, Pecos Baldy, and Santa Fe Baldy areas in the south, these encompassing the alpine areas of present day Taos, Colfax, Rio Arriba, Mora, and Santa Fe counties (Figure 1).

Ligon (1961:88) revisited historical information and added at least one more recent observation, a report of a female and brood on “Costilla Peak” in mid-July 1952; we suspect the location, given as the “head of Ricardo Creek” is more likely Little Costilla Peak, an isolated 3825-m mountain on the Taos–Colfax county line and east of the principal peaks, including (Big) Costilla Peak in Taos County. Ligon (1961) reported seeing ptarmigan in New Mexico on but two occasions, on Wheeler Peak (in the 1920s) and on Costilla Peak, where he collected two specimens in November 1926. He concluded the species was, by the early 1960s, restricted to a few peaks in the northern portion of the distribution. Lee (1967) reiterated that the ptarmigan appeared to be surviving only in the northern part of the distribution, from Wheeler Peak north.

Hubbard (1970) summarized known locales and listed several further observations, including in the Santa Fe Baldy area in the mid-1960s (letter from Braun), in the Latir Peaks area in April 1969, and on Costilla Peak in February 1970, and later (1978) reported one photographed of five seen on Wheeler Peak in September 1976. Hubbard (1978) summarized the overall status at that time as rare to uncommon and local, although formerly more widespread and numerous; he made no mention that the species was

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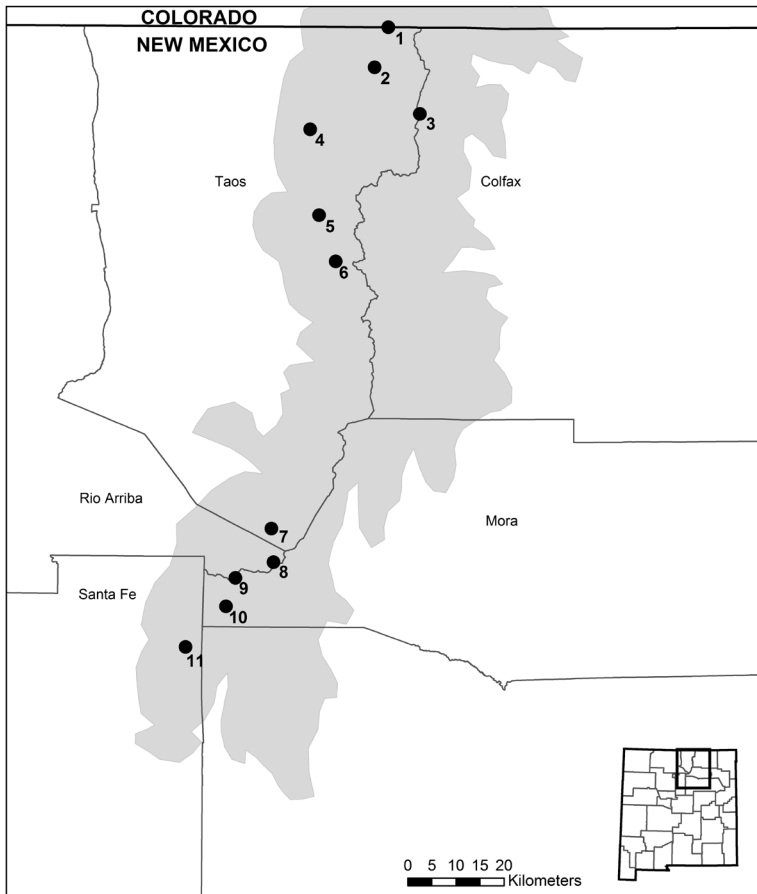


Figure 1. Principal peaks of the Sangre de Cristo Mountains in north-central New Mexico (shaded area, above 1600 m), which correspond to known White-tailed Ptarmigan locations. These locales are clustered in two groups, representing the northern and southern portions of species' distribution in the state. Northern portion: 1, Stateline Peak; 2, Costilla Peak; 3, Little Costilla Peak; 4, Latir Peaks; 5, Gold Hill; 6, Wheeler Peak (including Mount Walter). Southern portion: 7, Jicarita Peak (including Serpent Lake); 8, Santa Barbara Divide (including Mora Pass, Horseshoe Lake, Rincon Bonita, Middle Fork Lake, Barbara Peak); 9, Truchas Peaks; 10, Pecos Baldy; 11, Santa Fe Baldy (including Lake Peak). Elevations of peaks range from 3806 (Pecos Baldy) to 4012 m (Wheeler Peak).

extirpated from New Mexico, *contra* Wolfe et al. (2011).

An important report from the mid-1970s was of two birds in winter plumage on 27 January 1974 at the headwaters of Nambe Creek near Santa Fe Baldy (correspondence of 12 February 1974 and 4 March 1974 from S. R. Bryan Jr.); this represents the southernmost factual record of living ptarmi-

gan. A report of two seen on Santa Fe Baldy in November 1976 (*American Birds* 31:208) represented the last report from the southern portion of the New Mexico range prior to 1981. A report by R. T. Peterson of two on Stateline Peak on 10 August 1979 indicated the species was still present near the Colorado border. We dismiss one report from the mid-1970s from "near Chama," as the undetailed, second-hand observation of three birds on an unknown date in November 1974 was on Cumbres Pass in the San Juan Mountains of Colorado, not in New Mexico.

We located four museum specimens of the White-tailed Ptarmigan taken in New Mexico, all from Taos County. Three are in the U.S. National Museum (USNM 193236, adult male, 24 January 1904, 3.2 km north of Arroyo Seco; USNM 194589, adult male, 24 July 1904, 8 km south of Twining; USNM 194588, adult male, 6 August 1904, 8 km south of Twining), and one is in the Museum of Southwestern Biology at the University of New Mexico (MSB 891, yearling male, 19 June 1924, 32 km northeast of Taos at Wheeler Peak). We know of two additional Taos County specimens collected by J. S. Ligon on 28 November 1926 on Costilla Peak near the New Mexico-Colorado boundary (Ligon 1961). Those specimens were mounted and placed on exhibit at the Santa Fe office of the NMDGF (photograph in Ligon 1927), but their whereabouts today is unknown.

Braun initiated searches for ptarmigan in New Mexico in 1969; his field diary from work at Wheeler Peak on 10 and 11 September and at Latir Peak on 12 September 1969 does not mention finding any birds or sign (droppings or feathers) in those areas, although he found sign of the Dusky Grouse (*Dendragapus obscurus*) above treeline on Wheeler Peak. Three birds reported from Latir Peak in April 1969 (Hubbard 1970) were likely transients from farther north, owing to the general lack of willow habitat noted there on 1969 surveys. A decade later, however, J. P. Hubbard photographed two adults on Latir Peak on 6 August 1978, and K. J. Nelson of the USFS reported "broods and chicks" on both Latir Peak and Mount Walter in the Wheeler Peak area during August and September 1978.

In 1979, at the request of the NMDGF and the USFS, Braun searched for ptarmigan in New Mexico from 3 to 10 August. Areas investigated included the Latir and Wheeler Peak areas in the north and the Jicarita Peak, Truchas Peaks, Pecos Baldy, and Santa Fe Baldy (including Lake and Pentente peaks) areas in the south. He observed older winter ptarmigan sign on Latir Peak on 3 and 4 August and two broods (of five and three chicks) on Mount Walter above Horseshoe Lake on 5 August. Both adult females were captured, banded, photographed, and released; this was in the same area where K. J. Nelson reported broods and chicks in 1978 as well as one male on 29 June 1979 and a female with five chicks on 18 July 1979. On subsequent surveys of the area where Braun captured the two females with broods, Nelson found two additional adults in August. No ptarmigan or their sign were observed in any of the areas searched in the southern portion of the New Mexico range.

In 1980, M. R. Broschart (*in litt.*) reported he found three males in the Wheeler Peak area in late June 1980 by playing tape-recorded "challenge" calls of the White-tailed Ptarmigan. Nelson reported a pair of ptarmigan in the Heart Lake cirque of the Latir Peak area in 1980 as well as three

additional males in the Wheeler Peak area: one on the northeast ridge overlooking Lost Lake, one on the southeast side of La Cal Basin, and one on the ridge between Mount Walter and Simpson Peak. Nelson also observed a male on the east-facing slope of the saddle and ridge southeast of Gold Hill, and a female with one chick in the same area plus a male on the northeast slope of Gold Hill.

All sightings listed by Bailey (1904, 1905, 1928) and Ligon (1927, 1961) were from the northern mountains (Figure 1) from Wheeler Peak north to the Colorado State boundary. All known specimen records (6) from New Mexico are also from the northern mountains. From the southern mountains (Figure 1), before the 1960s there was no documentation, but there were second-hand reports of ptarmigan (Hubbard 1970). See Bailey (1904) for “Mora” Pass, and Bailey (1928:203) specifically mentioned reports from the “Truchas Peaks” in 1903 and from “peaks at the head of the Pecos” in 1919. Subsequently, prior to 1981, we know of only the two (1974, 1976) reports by Hubbard (1978), both at Santa Fe Baldy. Thus prior to 1981 there were at least 19 verifiable reports from the northern mountains versus at least five from the southern mountains.

The 1981 Transplant

The NMDGF, in cooperation with the USFS, formally requested a transplant of White-tailed Ptarmigan from Colorado in February 1981. The goal was to release birds into the southern portion of the New Mexico range, where there had been the fewest reports in recent years. That request was approved, and from 26 to 28 May 1981, 22 ptarmigan (11 mated pairs) captured in Colorado were released in the vicinity of the Santa Barbara Divide in the Pecos Wilderness of the Carson and Santa Fe national forests. An additional 21 birds (12 adult and yearling females, six adult and yearling males, and three young of the year) from Colorado were released into the same area on 10 September 1981 (Braun et al. 2011).

Post-1981 Observations

Following the 1981 transplants, reports increased in the southern portion of the range and continued in the northern portion. Some of these observations were reported by Wolfe et al. (2011) from Williams’s data collected while he was employed by the NMDGF. We found 50 separate observations of over 214 individual White-tailed Ptarmigan between 1982 and 2006. Of this total, 10 observations (38 individuals) were from the northern area (Figure 2) and 40 observations (176 individuals) were from the southern area (Figure 2). Reports of observations in the northern area were primarily from Wheeler Peak (including Mount Walter), Kachina Peak, Latir Peaks, and Stateline Peak. Those in the south were primarily in the area of Santa Barbara Divide including Jicarita Peak, Rincon Bonita, and Barbara Peak with some as far south as Santa Fe Baldy. The observations likely reflected the ptarmigan’s abundance, but their distribution was undoubtedly influenced by word of mouth from observers and may not represent the actual distribution. The largest group of up to 26 individuals was reported in 1983 in the vicinity of the 1981 releases (NMDGF 1983). Broods were observed in this area commonly, and Wolfe (2006) reported a nest on the summit of Barbara



Figure 2. White-tailed Ptarmigan breeding (near willows) and summer (near snowfields) habitats, Santa Barbara Ridge, New Mexico.

Photo by Cole J. Wolf

Peak in August 1993. An observation by J. R. Oldenettel on Santa Barbara Ridge in July 2005 was of a hen possibly brooding a newly hatched chick. The consistency in sightings and sign (feathers and/or droppings) continued through 2006.

In 2006 the USFS contracted Braun to examine habitats in the Serpent Lake, Santa Barbara Divide, and Jicarita Peak areas to devise a survey for presence or absence. On 13 June 2006, above Serpent Lake, he heard and observed two males, capturing and banding one, and along the trail to Jicarita Peak observed a pair. On 14 June, two males were calling above camp at the headwaters of the East Fork of the Rio Santa Barbara. Ptarmigan feathers and droppings were noted at several locations along the Santa Barbara Divide during this trip. Also in 2006, D. J. Cleary (*in litt.*) visited Little Costilla Peak but detected no ptarmigan. Similarly, E. R. Rominger observed none in the northern portion of the range during helicopter surveys for bighorn sheep (*Ovis canadensis*) on 15 and 16 July.

Birders began to visit the Santa Barbara Divide–Jicarita Peak area beginning in the early 2000s specifically to locate ptarmigan, and these “ptarmigan treks” continued almost annually to 2014, skipping only 2010 and 2011. On all of these treks, conducted in July or August, ptarmigan were encountered, and adults with young were noted in 2005, 2009, and 2012. Wolfe et al. (2011) listed observations of ptarmigan in New Mexico from 2007 through 2010.

DISCUSSION

The historic distribution of the White-tailed Ptarmigan in New Mexico included all of the alpine habitat of the Sangre de Cristo Mountains from Santa Fe Baldy north to the Colorado boundary, a distance of some 132 km (Bailey 1928, Ligon 1961). All of the reported areas of occupancy in New Mexico are within the distance the species moves in Colorado (Hoffman and Braun 1975, Giesen and Braun 1993). New Mexico records are few from the 1920s to the late 1960s, when interest in the species increased after initiation of studies in adjacent Colorado (Braun and Rogers 1971) and with the establishment in 1974 of an endangered-species program by NMDGF, which listed the ptarmigan as endangered in 1975.

Brasso and Emslie (2006) reported late Pleistocene fossils of *Lagopus* from Sandia Cave in Las Huertas Canyon on the Sandoval-Bernalillo County line. The fossils were closest in size to the White-tailed Ptarmigan. The location, in the Sandia Mountains, is less than 50 km south of Santa Fe Baldy.

Bailey (1904, 1905) and Ligon (1927) commented on the apparent poor condition of alpine habitats in New Mexico, which they assumed was the result of livestock grazing, primarily by domestic sheep. This activity, coupled with illegal hunting, was assumed to have reduced abundance of the species (e.g., Bailey 1928, Ligon 1961). Grazing by domestic sheep has been observed to cause the ptarmigan to change its patterns of movement in summer (Braun 1971), and localized overharvest has been documented (Braun and Rogers 1971). Therefore we believe that Bailey's and Ligon's conclusions have merit.

Habitats the White-tailed Ptarmigan uses in New Mexico (Figure 2) appear similar to those used in southern Colorado except for the reduced abundance of willows and the lack of late-lying snowfields and wet seeps. Their floristic composition parallels those to the north in Colorado as described by Braun (1971).

Alpine areas used by ptarmigan in New Mexico are small, disjunct, frequently linear, and contain unsuitable habitats. Thus large numbers of individuals should not be expected. Two independent estimates of the area above tree line (about 3505 m) in the Sangre de Cristo Mountains distribution of the species in New Mexico are similar—up to about 285 km². Only a fraction of this area is suitable, however. Some areas have extensive steep rocky cliffs with little vegetation. A liberal assessment, based on field studies along the Front Range, Collegiate Range, and San Juan Mountains in Colorado (Braun and Rogers 1971), is that from May through October about one-half of the total, about 143 km², could be suitable for ptarmigan, a figure almost three times as large as Ligon's (1927) estimate of 52 km².

The low density of the White-tailed Ptarmigan in New Mexico is due mostly to the small size of suitable alpine areas but probably also to the lack of shrub willows in the krummholz zone, especially in the drier locales such as Latir Peaks and Gold Hill, where snowfields do not linger into mid to late summer. Mat willow is locally common, especially in the Mount Walter area, and is likely the habitat most favorable for the species in the state. Thus the unavailability of taller willow in winter and spring suggest these are the periods limiting the White-tailed Ptarmigan in New Mexico, affecting overwinter survival and the

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number of possible breeding territories. On the basis of work in Colorado (Braun and Rogers (1971), we estimate the ptarmigan's population density in New Mexico in spring at 0.8 to 2.3 pairs/km² in occupied habitat. The best habitats in the state are in the Wheeler Peak area (especially Mount Walter) and farther north in the Costilla Peak area adjacent to occupied range in Colorado (because of probable linkage with Colorado populations). The best areas in the southern portion of the New Mexico distribution are those along the Santa Barbara Divide from Jicarita Peak to Barbara Peak.

White-tailed Ptarmigan can occupy most alpine areas in New Mexico in late spring and early summer. However, field investigations in 1969 and 1979 suggest that habitat can also be limiting in late summer and early fall because of the lack of late-lying snow fields and moist areas to provide succulent forage. In Colorado, grazing by domestic sheep tends to desiccate alpine vegetation in late summer and fall, causing ptarmigan to move farther upslope, if possible, or to steep rocky east- and north-facing slopes, which retain moisture and to which sheep have less access (Braun 1971).

The success of the releases of White-tailed Ptarmigan in New Mexico was expected from the success of transplants to Utah (Braun et al. 1978), an isolated area in Colorado (Hoffman and Giesen 1983), and California (Frederick and Gutiérrez 1992). Overall, the success of ptarmigan transplants within North America has been high (Kaler et al. 2010, Braun et al. 2011). Those releases were into suitable habitat, as they were also in New Mexico.

The number of observations of ptarmigan in New Mexico increased after the 1981 transplants, as did the locations where the birds were reported. The frequent absence of ptarmigan in some areas, such as Latir Peaks and Gold Hill in the north, Pecos Baldy and Santa Fe Baldy in the south, suggests fluctuations in abundance and distribution. In Colorado, these oscillations appear to have a period of 7–10 years but low amplitude (Braun et al. 1991). That pattern may prevail in New Mexico also. The best, most secure habitats for the species in the state appear to be in the north in the Mount Walter and Costilla Peak areas, where land ownership is mixed. Further legal protection for areas of mixed ownership important to White-tailed Ptarmigan may be needed.

Since 1966, nesting and hatching of the White-tailed Ptarmigan in Colorado has shifted earlier (Wang et al. 2002, Wann 2012). These changes could be profound farther south in the limited alpine habitats of New Mexico where population densities are low and occupancy is intermittent, as at Latir Peaks and Gold Hill. The scarcity of late-remaining snow fields and areas with taller or even mat willows, and the lack of connectivity of apparently suitable habitats in all alpine areas of New Mexico, suggest the effect of future changes in climate on the White-tailed Ptarmigan should be expressed and measurable in this state first.

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LITERATURE CITED

- Bailey, F. M. 1904. Additional notes on the birds of the upper Pecos. *Auk* 21:349–363.
- Bailey, F. M. 1905. Notes from northern New Mexico. *Auk* 23:316–318.
- Bailey, F. M. 1928. *Birds of New Mexico*. New Mexico Dept. Game and Fish, Santa Fe.
- Bendire, C. E. 1892. *Life histories of North American birds*. Smithsonian Inst., Washington, DC.
- Brasso, R. L., and Emslie, S. D. 2006. Two new late Pleistocene avifaunas from New Mexico. *Condor* 108:721–730.
- Braun, C. E. 1969. White-tailed Ptarmigan field surveys in New Mexico, 10–12 September 1969. Report to Colo. Dept. Game, Fish and Parks, Fort Collins, CO.
- Braun, C. E. 1970. Distribution and habitat of White-tailed Ptarmigan in Colorado and New Mexico. *Proc. Southwestern and Rocky Mountain Div., Am. Assoc. Adv. Sci.* 46:35.
- Braun, C. E. 1971. Habitat requirements of Colorado White-tailed Ptarmigan. *Proc. W. Assoc. State Game and Fish Commissioners* 51:284–292.
- Braun, C. E. 1979. White-tailed Ptarmigan field surveys in New Mexico, 3–10 August 1979. Report to Colo. Div. Wildlife, Fort Collins, CO.
- Braun, C. E. 2006. White-tailed Ptarmigan, Pecos Wilderness Area, trip report. 12–14 June 2006. Report to Grouse, Inc., and Carson National Forest, 208 Cruz Alta Rd., Taos, NM.
- Braun, C. E., and Rogers, G. E. 1971. The White-tailed Ptarmigan in Colorado. *Colo. Div. Game, Fish and Parks Tech. Publ.* 27.
- Braun, C. E., Nish, D. H., and Giesen, K. M. 1978. Release and establishment of White-tailed Ptarmigan in Utah. *Southwest. Nat.* 23:661–668.
- Braun, C. E., Schmidt Jr., R. K., and Rogers, G. E. 1973. Census of Colorado White-tailed Ptarmigan with tape-recorded calls. *J. Wildlife Mgmt.* 37:90–93.
- Braun, C. E., Stevens, D. R., Giesen, K. M., and Melcher, C. P. 1991. Elk, White-tailed Ptarmigan and willow relationships: A management dilemma in Rocky Mountain National Park. *Trans. N. Am. Wildlife and Nat. Resources Conf.* 56:74–85.
- Braun, C. E., Martin, K., and Robb, L. A. 1993. White-tailed Ptarmigan (*Lagopus leucurus*), in *The Birds of North America* (A. Poole and F. Gill, eds.), no. 68. *Acad. Nat. Sci., Philadelphia*.
- Braun, C. E., Taylor, W. P., Ebbert, S. E., Kaler, R. S. A., and Sandercock, B. K. 2011. Protocols for successful translocations of ptarmigan, in Gyrfalcons and Ptarmigan in a Changing World (R. T. Watson, T. J. Cade, M. Fuller, G. Hunt, and E. Potopov, eds.), vol. 2, pp. 339–348. *Peregrine Fund, Boise, ID*.
- Coues, E. 1866. List of the birds of Fort Whipple, Arizona: with which are incorporated all other species ascertained to inhabit the Territory; with brief critical and field notes, descriptions of new species, etc. *Proc. Acad. Nat. Sci. Philadelphia* 18:39–100.
- Coues, E. 1875. On the breeding-habits, nest, and eggs, of the White-tailed Ptarmigan (*Lagopus leucurus*). *Bull. U.S. Geol. Geogr. Surv. Territories; 2nd Ser.* 5:263–266.
- Frederick, G. P., and Gutiérrez, R. J. 1992. Habitat use and population characteristics of White-tailed Ptarmigan in the Sierra Nevada, California. *Condor* 94:889–902.

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- Giesen, K. M., and Braun, C. E. 1993. Natal dispersal and recruitment of juvenile White-tailed Ptarmigan in Colorado. *J. Wildlife Mgmt.* 57:72–77.
- Hoffman, R. W., and Braun, C. E. 1975. Migration of a wintering population of White-tailed Ptarmigan in Colorado. *J. Wildlife Mgmt.* 39: 485–490.
- Hoffman, R. W., and Giesen, K. M. 1983. Demography of an introduced population of White-tailed Ptarmigan. *Can. J. Zool.* 61:1758–1764.
- Hubbard, J. P. 1970. Check-list of the birds of New Mexico. New Mexico Ornithol. Soc. Publ. 3.
- Hubbard, J. P. 1978. Revised check-list of the birds of New Mexico. New Mexico Ornithol. Soc. Publ. 6.
- Hume, E. E. 1942. Ornithologists of the United States Army Medical Corps. Johns Hopkins Univ. Press, Baltimore.
- Kaler, R. S. A., Ebbert, S. E., Braun, C. E., and Sandercock, B. K. 2010. Demography of a reintroduced population of Evermann's Rock Ptarmigan in the Aleutian Islands. *Wilson J. Ornithol.* 122:1–14.
- Lee, L. 1967. White-tailed Ptarmigan, in *New Mexico Wildlife Management*, pp. 129–130. New Mexico Dept. Game and Fish, Santa Fe.
- Ligon, J. S. 1927. *The Wild Life of New Mexico: Its Conservation and Management.* New Mexico Dept. of Game and Fish, Santa Fe.
- Ligon, J. S. 1961. *New Mexico Birds and Where to Find Them.* Univ. of New Mexico Press, Albuquerque.
- New Mexico Department Game and Fish (NMDGF). 1983. Ptarmigans faring well. *New Mexico Wildlife Magazine* 28(6):13.
- Wang, G., Hobbs, N. T., Giesen, K. M., Galbraith, H., Ojima, D. S., and Braun, C. E. 2002. Relationships between climate and population dynamics of White-tailed Ptarmigan *Lagopus leucurus* in Rocky Mountain National Park, Colorado, USA. *Climate Res.* 23:81–87.
- Wann, G. T. 2012. Long-term demography of a White-tailed Ptarmigan population in Colorado. M S. thesis, Colo. State Univ., Fort Collins.
- Wolfe, D. H. 2006. Nesting documentation for the White-tailed Ptarmigan in the Sangre de Cristo Mountains, New Mexico. *Publ. Okla. Biol. Surv., 2nd Ser.,* 7:21–23.
- Wolfe, D. H., Larsson, L. C., Oldenettel, J. R., Walker, H. A., and Patten, M. A. 2011. Status of populations of the White-tailed Ptarmigan at the southern edge of its range, in *Gyrfalcons and Ptarmigan in a Changing World* (R. T. Watson, T. J. Cade, M. Fuller, G. Hunt, and E. Potopov, eds.), vol. 1, pp. 247–257. Peregrine Fund, Boise, ID.

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