Colorado Division of Parks and Wildlife
September 2012-September 2013

WILIDLIFE RESEARCH REPORT

State of:	Colorado	:	Division of Parks and Wildlife
Cost Center:	3420	:	Avian Research
Work Package:	0656	:	Columbian Sharp-tailed Grouse Conservation
Task No.:	N/A	:	Columbian sharp-tailed grouse chick and juvenile radio transmitter evaluation
Federal Aid Project No.	N/A		

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ABSTRACT

The Columbian sharp-tailed grouse (CSTG, *Tympanuchus phasianellus columbianus*) is one of six subspecies of sharp-tailed grouse in North America. Current distribution ranges from British Columbia to Colorado. CSTG currently occupy 10% of their former range due to habitat loss. Since the initiation of the Conservation Reserve Program (CRP), CSTG have increased in distribution and density. CRP fields have low plant species diversity when compared to native shrubland or mineland reclamation habitat. Therefore, managers desire to improve existing or historically enrolled CRP fields. Research techniques to evaluate the population response of CSTG to habitat treatments (via understanding chick and juvenile demographic parameters) do not exist. Therefore, the objectives of my study are to: 1) evaluate the capture and transmitter attachment technique for day-old CSTG chicks, 2) evaluate the capture and transmitter attachment technique for 30-day-old CSTG chicks, and 3) evaluate the capture technique for > 120 day-old CSTG juveniles. My study occurred near Hayden, Routt County, Colorado from April - August 2013. I captured CSTG in the spring using walk-in funnel traps, fit females with 12 g necklace-mounted radio transmitters, monitoring survival, and nesting effort. I captured chicks from successful females and radio-marked a sample with 0.65 g backpack style transmitter sutured along the dorsal midline between the wings. I monitored survival and movement daily. I conducted summary statistics and Kaplan-Meier function estimates with staggered entry for female and chick survival. I captured 36 female CSTG and monitored survival and productivity from April through August. I documented a 5-month female survival rate of 0.33 which is lower than previously reported. Eight nests yielded an apparent nest success of 37.5%. Eleven chicks in three broods were radio-marked with a mean chick mass was 15.98 g. The total handling time by brood was 35, 20, and 44 minutes. No chicks survived past 9 days-of-age. The primary cause of female mortality was due to the transmitter design causing crop impaction limiting the overall accomplishment of the study objectives. Future research in Colorado should use exclusively an elastic necklace design or in combination with a different transmitter design shown to be successful in other CSTG research.

WILDLIFE RESEARCH REPORT

COLUMBIAN SHARP-TAILED GROUSE CHICK AND JUVENILE RADIO TRANSMITTER EVALUATION

ANTHONY D. APA

PROJECT OBJECTIVES

My project goal is to evaluate trapping and transmitter attachment methods on CSTG that have been previously used on GRSG. My study objectives are to:

1. Evaluate the capture and transmitter attachment technique for day-old CSTG chicks.
2. Evaluate the capture and transmitter attachment technique for 30-day-old CSTG chicks.
3. Evaluate the capture technique for > 120 day-old CSTG juveniles.

If the techniques are successfully developed they will be used in a future research project.

INTRODUCTION

The Columbian sharp-tailed grouse (CSTG, *Tympanuchus phasianellus columbianus*) is one of 6 subspecies of sharp-tailed grouse in North America. Current distribution ranges from British Columbia in the northwest to Colorado in the southeast. In-between populations exist in Washington, Idaho, Wyoming, Montana (extirpated), Utah, and Nevada (reintroduced) and Oregon (reintroduced). It currently occupies 10% of its former range across western North America (U.S. Department of the Interior 2000) and habitat loss is cited as the primary reason for its decline (Yocom 1952, Giesen and Braun 1997, McDonald and Reese 1998, Schroeder et al. 2000). Since the establishment of the Conservation Reserve Program (CRP) in 1985, CSTG have increased in distribution and density primarily in Idaho, Utah, and Colorado (U.S. Department of the Interior 2000).

The CSTG (Mountain Sharp-tail) is a game species in Colorado, and is designated as a species of state special concern. Management efforts to increase distribution in un-occupied but historic range of CSTG have occurred via reintroductions into Oregon and Nevada from source populations in Idaho. Additional reintroduction efforts have occurred within Utah and Colorado. Specifically, Colorado Parks and Wildlife has conducted reintroduction efforts within historic range in Dolores and Grand Counties.

Overview of Potential Future Research - Although management efforts continue to expand the range of CSTG, there is interest in improving habitat quality within occupied range. Improving habitat quality could: 1) increase densities and occupancy, 2) improve habitat in vacant and/or low quality CRP in unoccupied to expand distribution and/or, 3) be used as habitat improvements to mitigate impacts related to other habitat loss issues on the landscape (e.g., oil and gas exploration and development).

Although research in Colorado (Boisvert 2002, Collin 2004) suggests that CRP is generally beneficial to CSTG (over other agricultural practices), adjacent higher quality habitats in native or mineland reclamation provide higher quality habitat resulting in more productive CSTG populations. Poor quality CRP, consists of 1-2 grass and < 3 forb species (Boisvert 2002), with the grass species being predominantly sod-forming species (e.g. intermediate wheatgrass (*Thinopyrum intermedium*) and smooth brome (*Bromus inermis*)). These species tend to dominate sites and do not provide high quality CSTG nesting and brood-rearing habitat (Boisvert 2002).

Dasmann (1964: 59) stated "To manage wildlife we must first manage the habitat." Thus habitat management can range from complete protection from disturbance to improving quality so that the wildlife populations can be productive, maintained, and/or optimized to increase its carrying capacity (Dasmann 1964). Although Dasmann (1964) was correct in his statements nearly 50 years ago, the wildlife-habitat relationship is complex and differs widely among species and landscapes. Although our understanding of the wildlife-habitat relationship has improved, knowledge has evolved to define and assess habitat quality as it relates to population growth rates, density, and demographic rates (Van Horne 1983, Knutsen et al 2006, Johnson 2007). This is paramount when attempting to couple habitat quality change with wildlife population demographic changes.

CSTG provide a unique opportunity to evaluate a population response to habitat quality change. CSTG are a highly productive, generalist species (Apa 1998) having centralized breeding locations and limited movements during the breeding season (Boisvert et al. 2005). This behavior allows managers to target habitat improvements in nesting and brood-rearing areas. Since CSTG are breeding and brood-rearing habitat generalists and more productive (when compared to greater sage-grouse [GRSG; *Centrocercus urophasianus*]; Apa 1998), these characteristics can facilitate a relatively rapid response to habitat management. This allows managers and researchers to work cooperatively in attempting to couple landscape level habitat quality improvements in coordination with the demographic and population response of CSTG.

More information is needed to evaluate the demographic and population response of CSTG to breeding and summer/fall habitat improvements through more rigorous estimates of chick and juvenile (> 5 weeks-of-age) survival, dispersal, and recruitment. The field methods to obtain those estimates exist for surrogate species, but not for CSTG. Transmitter attachment and capture methods have been developed to estimate GRSG chick survival from hatch to 50 days (Burkepile et al. 2002, Greg and Crawford 2009, Dahlgren et al. 2010, Thompson 2012), but only one study investigated approaches to estimate GRSG juvenile survival (> 50 days-of-age for estimates of dispersal and recruitment; Thompson 2012). Additionally, one study (Manzer and Hannon 2007) has developed the field techniques to estimate plains sharp-tailed grouse (*T. p. jamesi*; PSTG) chick survival from hatch to 30 days-of-age, but PSTG are approximately 100 g larger (Sisson 1976) than CSTG (Collins 2004) and are not a perfect surrogate for my proposed field method evaluation.

STUDY AREA

Study Area Specific to Pilot Research

My study was conducted near Hayden, Routt County, Colorado. It is interspersed with native sagebrush (*Artemisia tridentata spp.*)/grass or mountain shrub communities, dominated by private land that is currently, or was historically, enrolled in the Conservation Reserve Program. Primarily exotic grasses (smooth brome and intermediate wheatgrass) and forbs (alfalfa (Medicago sativa) dominate the habitat (Fig. 1). The average annual precipitation in Hayden, Colorado is 43.2 cm. The average minimum and maximum annual temperatures are -2.8^{o} C and 14.4^{o} C, respectively.

METHODS

Methods Specific to Pilot Research

Grouse Capture – I captured CSTG in the spring using walk-in funnel traps (Schroeder and Braun 1991) in the morning on dancing grounds and opened traps ½ hour before sunrise and closed/blocked them at the cessation of trapping each morning. I initiated trapping based upon the timing and peak of female attendance (Giesen 1987).

I fit females with a 12 g necklace-mounted radio transmitter (Model A3950, Advanced Telemetry Systems, Isanti, MN) equipped with a 4-hour mortality circuit having an 8.5 month nominal battery life. Each transmitter had its 16 cm antenna bent to lie down between the wings and down the back of the grouse. I classified grouse by gender (Snyder 1935, Henderson et al. 1967) and age (yearling or adult; Ammann 1944), placed them in a cotton bag, and for weighed them on an electronic balance. I fit all females with an individually numbered aluminum leg band (size 12) on the tarsus, and released them at the point of capture.

Nest Monitoring and Chick Capture - I monitored movements using triangulation from a ≥ 30 m distance (to minimize disturbance) using hand-held Yagi antenna attached to a receiver, and monitored nesting behavior to identify nest location. If a female was observed in the same location for two consecutive days, she was assumed to be incubating. I attempted a visual observations of the female, if vegetation concealment was conducive 7-10 days post-incubation confirmation and monitored nest fate using telemetry at a ≥ 30 m distance (24-26 day incubation period).

Once monitoring revealed a successful hatch (female movement away from the nest), I captured all chicks in the brood within 24 hours. I located females < 2 hours after sunrise during brooding and flushed the female. I captured all chicks by hand and confined them in a small cooler to maintain thermoregulation. I weighed (± 0.01 g) all chicks with an electronic scale and a random sample (depending on brood size) was selected for transmitter application. A 0.65 g backpack style (Model A1025; nominal battery life is 28 days; Advanced Telemetry Systems, Isanti, MN) transmitter was sutured along the dorsal midline between the wings (Burkepile et al. 2002, Dreitz et al. 2011, Manzer and Hannon 2007, Thompson 2012). Two 20-gauge needles were inserted subcutaneously and perpendicular to the dorsal mid-line, and monofilament suture (Braunamide: polyamide 3/0 thread, pseudo monofilament, non-absorbable, white) material was threaded through the needle barrel. I applied one drop of cryanocrylate glue on the knot, and released the chicks simultaneously at the brood site. Chick survival and movements were monitored 1-2 hours post-release to determine brood female affinity and post-handling chick behavior.

I monitored female and chick movements and survival daily until 14 days-of-age, by circling at a 25 m radius. I documented the position (i.e., distance) of radio-marked chicks in relation to the brood female, systematically searching the area for missing chicks/transmitters. I collected brood locations equally among 4 time periods: brooding (< 2 hour after sunrise or before sunset), morning (0800-1100), mid-day (1100-1400), and afternoon (1400-1800) throughout the study, increasing the location sampling period to every 1-3 days until the brood was 20-30 days of age.

I captured surviving juveniles at two different ages using spotlight techniques (Giesen et al. 1992, Wakkinen et al. 1992). The first capture was at 20-30 days-of-age. The chick transmitter was removed and the juvenile was fit with a 3.9 g back-pack style juvenile transmitter (Model A1080, nominal life 6-7 months; Advanced Telemetry Systems, Isanti, MN). The attachment method will be the same as described earlier for day-old-chicks (Burkepile et al. 2002, Dreitz et al. 2011, Manzer and Hannon 2007, Thompson 2012). I captured surviving juveniles 10-12 weeks following initial radio-marking in late-September and October, and fit juveniles with a12 g adult style necklace-mounted radio transmitter (Model A3950, Advanced Telemetry Systems, Isanti, MN) equipped with a 4-hour mortality circuit and have a nominal battery life of 8.5 months. I used techniques to capture juveniles using spotlight techniques described earlier.

Data Analysis - I conducted similar summary statistics and Kaplan-Meier (K-M) function estimates with staggered entry for female and chick survival (Kaplan and Meier 1958, Pollock et al. 1998).

RESULTS AND DISSCUSSION

Results - I captured 36 female CSTG (29 adults: 6 yearlings: 1 unknown) from 27 April - 8 May 2013 on 4 dancing grounds (Big Elk 1 & 3, Stokes Gulch 2, and Postivit). Adult and yearling female mass ($\bar{x}$ ± SE) was 669.5 ± 8.5 g (*n* = 29) and 660.8 ± 35.6 g (*n* = 6), respectively. From April through August, I documented 28 female mortalities resulting in a 5-month female survival rate of 0.33 ± 0.01 (Fig. 2). I censored one female due to a dropped radio-collar, and documented five instances of radio-collar attachment caused mortality. The mortalities resulted from the necklace attachment causing crop restriction and impaction.

I documented 8 nests and experience a 37.5% apparent nest success. Only 3 nests provided opportunities to trap and radio-mark chicks. Eleven chicks in three broods were radio-marked with a mean chick mass was 15.98 ± 0.86 g (range 13.3 - 21.0; *n* = 11). The total handling time by brood was 35, 20, and 44 minutes for each of 4, 2, and 5 chicks telemetered resulting in an average handling time of 8.7, 10, and 8.8 minutes/chick, respectively. No chicks survived past 9 days-of-age (Fig. 3). One brood survived only to two days due to the depredation of the brood female, and no chicks survived to test additional juvenile transmitter replacement and attachment techniques.

Discussion - Trapping commenced 13-17 days later than previously reported (Collins 2004). The adult:yearling capture ratio (4.8:1) was similar (5.0:1) to Collins (2004) but different (3.6:1) than reported by Boisvert (2002). Mass of adult and yearling females was similar to earlier research (Boivert 2002, Collins 2004). I experienced lower than reported survival, which is not explained by larger samples of yearling females or spring conditions that could cause breeding season stress. The low female survival rate was lower than reported by Collins (2004) (interpolated as 0.5-0.7 survival at 150 days post-capture). The reason for the lower survival rate was due to the transmitter design. Five mortalities were due to crop impaction caused by the transmitter necklace design. Although additional moralities could not be directly attributed to the necklace transmitter design the lower than normal survival rate is suspected as the casue of a majority of the mortality. I also considered that the necklace was fit too tight around the neck of the female, but previous research has not reported impacted crop issues with older non-elastic herculite poncho material (Amstrup 1980, Apa 1998) or other expandable or non-expandable necklace designs used previously in Colorado (Boisvert 2002, Collins 2004). Previous designs included an elastic necklace style (Model RI2BM4, Holohil Systems, LTD, Ontario, Canada) with weights of 15.2g and 12g or an unknown model style (assumed to be non-elastic necklace material) by and AVM Instrument Company, Ltd, Colfax, California weighing 14.5 g. There was no mention of impacted crop mortalities.

Upon further investigation, I contacted colleges in Idaho conducting CSTG research. In 2012, they experienced five mortalities resulting from an impacted crop (D. Musil and R. Smith, Idaho Department of Fish and Game, personal communication) that were related to the necklace design transmitter. The transmitter design used in 2012 was the necklace style ATS A3950. This was the only year this transmitter design was used. In 2013, the Idaho research project returned to a necklace design used previously, the ATS A4120. This transmitter design has the potting material formed into a cylindrical in shape rather than the disc shape of the ATS 3950. The disc shape causes a more restrictive necklace shape around the neck causing food in the crop to become restricted. To date, the Idaho research has not documented any instances of impacted crops, either currently or previously to the 2012 study year. This mortality rate did not allow the evaluation of several of my pilot project objectives, and future research in Colorado should use either the elastic necklace Holohil design exclusively or in combination with the ATS A4120.

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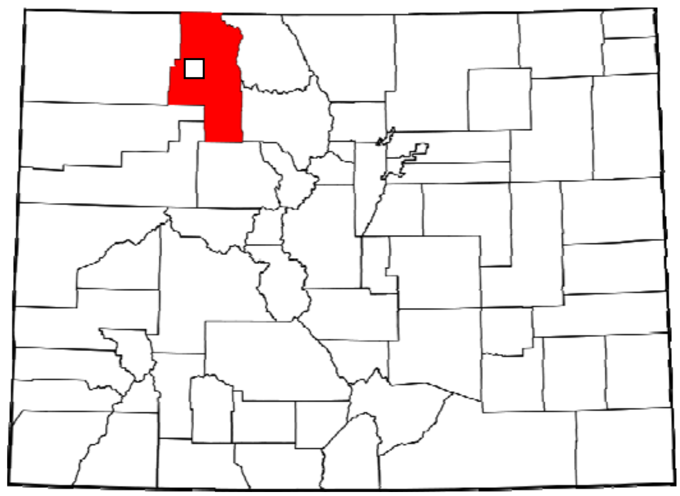

Figure 1. Columbian sharp-tailed grouse study area in Routt County, Colorado, 2013.

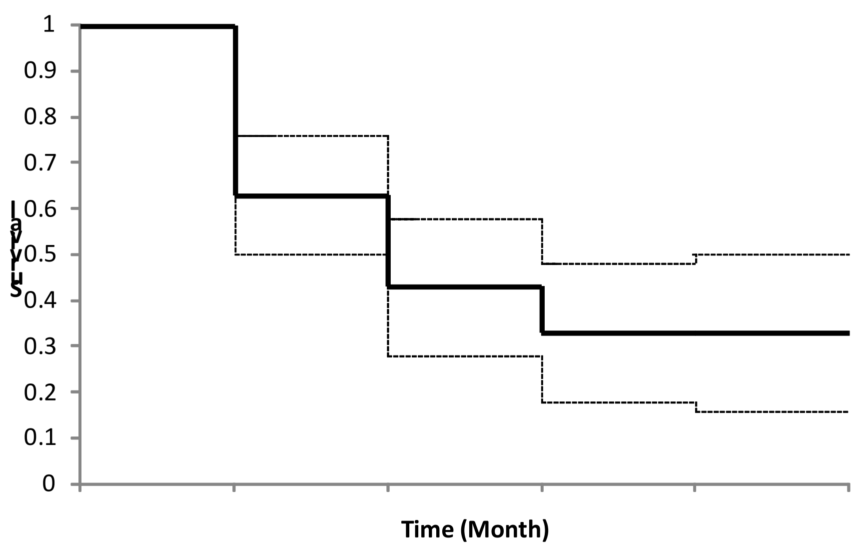

Figure 2. Kaplan-Meier product limit survival with staggered entry of female Columbian sharp-tailed grouse from April - August 2013 in Routt County, Colorado, 2013.

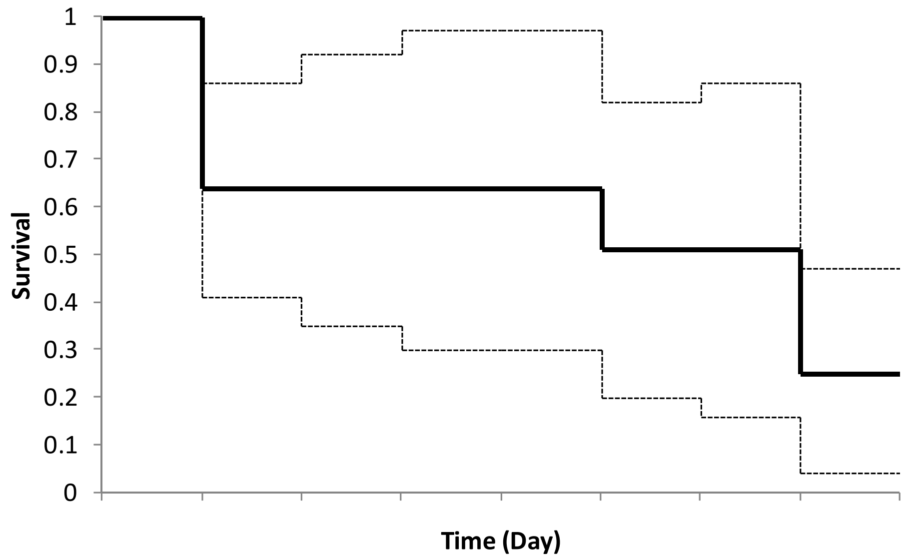

Figure 3. Kaplan-Meier product limit survival with staggered entry of Columbian sharp-tailed grouse chicks (n = 11) from 1 - 9 days-of-age in Routt County, Colorado, 2013.