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Evaluation of Three Nest Searching Methods for Ring-Necked Pheasant

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EVALUATION OF THREE NEST SEARCHING METHODS FOR RING-NECKED PHEASANT—Ring-necked pheasant (*Phasianus colchicus*) are a highly sought after game bird and as such, much research has been conducted regarding their ecology (Warner 1981, Trautman 1982, Johnson and Knue 1989). Perhaps the most investigated aspect of pheasant ecology is the species' reproductive season (e.g., Linder et al. 1960, Dumke and Pils 1979, Leif 1994) with many studies focusing on nesting habitat (Baskett 1947, Clark et al. 1999). Results from previous research have acknowledged the difficulty associated with locating pheasant nests in their preferred cover types (Hanson 1970, Evrard 2000). Studies of pheasant nesting ecology have been based on ability to locate nests (Schottler et al. 2008) and as such, a variety of methods have been employed for locating nests (Whiteside and Guthery 1983, Berthelsen et al. 1990, Evrard 2000). Methods used for locating pheasant nests include, but are not limited to, a cable chain device (Higgins et al. 1969, Evrard 2000), a rope drag technique (Duebbert and Kantrud 1974), radio telemetry (Dumke and Pils 1979, Whiteside and Guthery 1983), intensive ground searches (Stokes 1954, Labisky 1957), haying (Hanson 1970), and spring prescribed burning to find legacy pheasant nests (Schottler et al. 2008). Use of numerous methods for locating pheasant nests suggests that any one method is not useful across all research efforts.

Each method has advantages and disadvantages; utility of each depends on study objectives, study area, and available funds and manpower. The cable chain device is dependent upon the hen being present and flushing from the nest during nest searching efforts. This method has been used extensively in waterfowl studies, but to a lesser degree in pheasant studies (Barker et al. 1990, Evrard 2000, Fondell and Ball 2004). One potential explanation for why the cable chain device has not been used in more pheasant studies is that unlike ducks, pheasant can run from their nests prior to being flushed by the chain, resulting in lower nest location rates (Evrard 2000). In contrast to ducks, pheasants spend the majority of their lives on upland sites. This adds potential for flushing hens that are not nesting, resulting in time spent searching areas where a nest may not be present. However, the cable chain device provides an efficient tool for searching large areas of land in studies examining expansive treatment areas.

Intensive ground searching has been used extensively for locating pheasant nests (Evans and Wolfe 1967, George et al. 1979, Berthelsen et al. 1990). During our study, intensive ground searching consisted of several (2–5) field crew members spaced approximately 1.5 to 2.0 m apart (e.g., where one searcher's field of vision ended and the next searcher's field of vision began) using sticks to part the vegetation as they walked back and forth across plots until each plot was searched in its entirety. Unlike the cable chain device or use of telemetry, intensive ground searching does not require hens to be present during nest searching efforts; it is assumed that nests will be located regardless of hen presence or absence. Intensive ground searches are typically conducted on subplots within whole treatments due to the time required to adequately search an area. This method requires more field crew members than telemetry or chain dragging, but does not require the initial investment into a chain and vehicles or radio transmitters and telemetry equipment.

Radio telemetry may have limitations when the primary objective is to assess nesting ecology on specific treatments applied to portions of the landscape. Radio-tagged hens may not initiate nests within research plots, thus, useful data regarding treatment effects are not provided. In these instances, searching for nests in areas in which treatments have been applied may be more useful. However, telemetry-based nest searching methods may be the most efficient method to acquire data on pheasant habitat selection and use on a landscape scale. Limiting search efforts to selected plots on a landscape scale would likely lead to missed areas with nesting pheasants.

Motivation for this research project was rendered from observations of missed pheasant nests which occurred during a 5-yr study in which chain-dragging was used to locate nests of upland game birds and waterfowl. On multiple occasions, we observed hen pheasants jumping the chain as well as running in front of the chain. Because no study had evaluated the efficiency of the chain-drag method to locate pheasant nests, we wanted to evaluate the ability of the chain-drag method to locate pheasant nests on our research plots. Thus, our primary objective was to compare the effectiveness of different nest searching techniques in locating pheasant nests to maximize successful nest locations and better direct resources in future studies.

Our study was conducted on two parcels of privately owned lands near Hettinger, North Dakota in Adams County. Each parcel of land (193 ha each) had been enrolled in Conservation Reserve Program (CRP) for approximately 10 yrs. At the onset of the CRP contract, each parcel was established with cool season grasses and legumes that included intermediate wheatgrass (*Elymus hispidus*), crested wheatgrass (*Agropyron cristatum* Gaertn), alfalfa (*Medicago sativa*), and yellow sweetclover (*Melilotus officinalis*; Geaumont et al. 2010). The two parcels were comprised of different management treatments: 1) season-long grazing, 2) hay land, and 3) unmanipulated CRP. The sites totaled 64 ha of hay land, 64 ha of idle CRP land, and 258 ha of season-long pasture (Geaumont et al. 2010). The season-long treatment included a 129-ha pasture for each study site, grazed with Angus (*Bos taurus*) cattle from June to December with a targeted 50% forage disappearance. For a complete description of the original study design refer to Geaumont (2009).

The three nest searching techniques that we tested included chain dragging, intensive ground searching, and radio telemetry. We defined a nest as any depression containing egg remnants or ≥1 intact egg; all nest locations were recorded on hand-held Global Positioning System units. Our searches were timed to coincide with the peak nesting period of pheasants in the region (26 May 2011 to 22 June 2011; Geaumont 2009). We assessed the human resources needed to locate nests per unit time using each method and compared known nest locations among search methods to assess the ability of each searching techniques to locate nests that otherwise would not have been found. This was a blind study; searchers participating in each technique were not aware of nests located during other nest searching efforts.

We conducted chain dragging surveys over the entirety of our research plots two times during the peak pheasant nesting period. The first chain dragging event occurred from 31 May to 2 June and the second effort from 13–18 June 2012. We located nests using a modified chain dragging technique, similar to Higgins et al. (1969), to cover areas of permanent vegetation on our sites. Our modifications included the use of all-terrain vehicles (ATVs) versus jeeps, a single chain versus a double chain, and pulling the chain 8–10 kph versus 5–8 kph. We used two ATVs approximately 40 m apart to pull a chain (0.80-cm diameter) horizontally across the vegetation until the entirety of our research plots with permanent cover had been explored (Geaumont 2009). Due to previous observations of pheasants running prior to being flushed by the chain (Evrard 2000), we dragged the chain at slightly faster speeds compared to those used by Higgins et al. (1969). We used a single chain since the ATVs had limited horse-power to pull the chain through the vegetation at a consistent speed. When a hen flushed, the operator of each ATV stopped and actively searched for a nest. Our search efforts were limited to 10 min from the time that nesting hens were initially flushed. We limited chain dragging efforts to 0700–1300 hrs and we excluded areas that were searched using this technique from other search methods for ≥24 hrs.

We searched 96 randomly located 0.4-ha plots stratified by cover type (comprising approximately 10% of the available cover) using an intensive search method (Stokes 1954, Labisky 1957); each plot was searched once in its entirety. Specifically, we randomly selected and searched plots from 31 May to 22 June by teams of two to five individuals. Individuals were spaced at 1.5-m intervals and walked back and forth parting herbaceous vegetation until the entire plot was searched for nests. We conducted nest searching efforts primarily from 0800–1600 hrs. Further, we ensured that telemetry and ground searching crews alternated days at each of the two research sites to avoid possibly flushing nesting, radio-collared hens during the intensive ground searching method that may not immediately return to the nest for subsequent telemetry nest locations.

For the duration of both the chain dragging and intensive nest searching efforts, we monitored breeding hens equipped with 12.5-g necklace-type radio transmitters (Riley and Fistler 1992, Perkins et al. 1997). We captured pheasants previously using fall (2010) and spring (2011) nightlighting and winter bait-trapping (Labisky 1968, Dumke and Pils 1979, Perkins et al. 1997). Total trap effort for nightlighting and winter bait-trapping was 68 person-hrs. Following capture, we located collared hens at least once every five days during the previously identified peak nesting period. When a nesting hen was located, we monitored nesting status every 10 days to ensure that the hen had not initiated a new nest. We recorded telemetry locations from 0500–1800 hrs on research sites that had not been subjected to chain dragging or ground searching efforts within 24 hrs. We monitored status of collared hens throughout the duration of the nesting season.

We evaluated the efficiency of each method for locating nests by calculating raw detection rates (i.e., the number of instances when a nest was detected by a single survey method) and unique detection rates (i.e., the number of instances detection by a given method represented the only detection of the nest; Campbell 2004, Long et al. 2006). We compiled a detection history based on 11 days of chain dragging (95 hrs), 96 intensive search plots (172 hrs), and data from capturing and tracking 26 radio-collared hens (92 hrs).

We estimated detection rates of pheasant nests associated with each nest searching method by dividing the number of hours spent searching with each method by the total number of nests found via each method. We determined the total search time per pheasant nest located using each search technique to assess the efficiency of each method. The Institutional Animal Care and Use Committee at North Dakota State University approved all research protocols (Approval Numbers A11044 and A11034).

We located 62 pheasant nests from 25 May 2011 to 18 June 2011. Raw detection rates varied among the three methods. Chain dragging resulted in 13 active nests and a raw detection rate of 0.14 nests per person-hr (13 nests/ 95.25 search hrs). During our intensive searching, we surveyed all 96 sub-plots and located 32 nests, which resulted in a raw detection rate of 0.19 nests per hr (32 nests/172.45 search hrs). Telemetry had the highest detection rates per unit time, resulting in 23 active nest locations and a raw detection rate of 0.25 nests per person-hr (23 nests/92.2 search hrs). There were six nests found by more than one search method; one nest by telemetry and chain dragging, one by intensive ground search and telemetry, four nests by intensive ground search and chain dragging, each of which were not included in the unique detection totals. Use of the intensive ground searching method, resulted in 27 nest detections and a unique detection rate of 0.16 nests per person-hr. In comparison, eight nests were located during chain dragging for a unique detection rate of 0.08 nests per person-hr and 21 nests were located using telemetry for a unique detection rate of 0.23 nests per person-hr.

Each survey method successfully located pheasant nests. The least efficient of our three nest searching methods was chain dragging. On several occasions we observed hens running and flushing before the chain, similar to what Evrard

(2000) experienced, but were able to locate a nest regardless. Occurrence of hens running and flushing prior to physical contact with the chain appeared to decrease as hens moved from clutch development to incubation. In general, incubating hens were more reluctant to leave their nests than hens in the egg laying process. We noted that locating pheasant nests after flushing a hen required more time and effort than finding duck nests using the same technique.

In general, a greater number of nests were located using the intensive ground searching method than were located using the chain drag or telemetry techniques. Of 32 nests located, 11 were previously depredated, one hatched prior to being located, and 10 were assumed inactive; inactive nests consisted primarily of abandoned or "dump" nests (Baskett 1947, Evans and Wolfe 1967, Martin and Geupel 1993). The benefit of intensive ground searching is the assumption that all nests are located, regardless of hen presence or absence and allows a more accurate estimate of nest densities. Both telemetry and chain dragging require hens to be present to locate nests, potentially leading to an underestimation of nest densities.

Time required to search one hectare of land for pheasant nests was approximately 4.06 ± 0.39 ha per person-hr for chain dragging and 0.24 ± 0.01 ha per person-hr for intensive ground searching. Chain dragging was most efficient for covering large expanses of land, but researchers should consider the lower nest detection probabilities associated with this method. Although intensive ground searching resulted in the greatest number of raw and unique nest detections, use of radio telemetry proved to be the most time-efficient technique of locating pheasant nests over either of the other methods.

If study objectives include analyzing landscape-scale use of available nesting cover, telemetry may be an effective method because it allows birds to travel freely and their nests to be located regardless of habitat structure, topography, or additional physical inhibitors of the other methods. Additionally, for site-specific studies assessing pheasant nest success or nesting ecology, use of telemetry is likely the most beneficial and least disruptive technique for monitoring female pheasants. To assess density of pheasant nests over small geographic areas for subsequent use in extrapolating abundance estimates to broader geographic areas, researchers may consider intense ground searching methods. Lastly, chain dragging may be most time-efficient for nest searching over broad geographic areas or when logistical constraints (e.g., limited manpower) limit use of intensive nest searching or radio telemetry methods.

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