Wildlife Society Bulletin

Perspectives on wildlife conservation and sustainable use

Volume 33, Number 4 Published by The Wildlife Society (ISSN-0091-7648) Winter 2005

Tracking Recovery of the Painted Bunting

Mixed pine-oak site, above (home range = 7.1 ha) and maritime shrub site (home range = 3.1 ha), both on Sapelo Island, Georgia

Also
Spotlighting wolves, ungulates, predators

Evaluation of supplemental feeding to reduce predation of duck nests in North Dakota

Michael R. Conover, Richard L. King, Jr., Jaime E. Jimenez, and Terry A. Messmer

Abstract During 1996 we examined whether providing predators with supplemental food would reduce predation on duck nests at 10 North Dakota sites. We randomly selected 5 sites to serve as treatment sites where supplemental food (chicken eggs) was provided at feeding stations during the duck-nesting season. The remaining 5 sites served as controls with no supplemental food. During Experiment 1 we distributed approximately 320 chicken eggs/site/week during May and early June, but daily survival rates (DSR) of nests at treatment sites ($\bar{x}$=0.891, SE=0.018) and control sites ($\bar{x}$=0.939, SE=0.001) did not differ ($F_{1,4}$=6.54, P=0.06). During Experiment 2, we distributed 1,600 chicken eggs/site/week in late June and July, but DSR at treatment sites ($\bar{x}$=0.941, SE=0.016) and control sites ($\bar{x}$=0.954, SE=0.008) again were similar ($F_{1,4}$=0.72, P=0.44). Our results indicate that supplemental feeding of predators is ineffective at reducing predation rates on upland duck nests.

Key words ducks, egg depredation, nest success, Prairie Pothole Region, predation, supplemental feeding, waterfowl

Upland-nesting ducks in the Prairie Pothole Region (PPR) of North America experience high rates of nest failure due to predation (Cowardin and Johnson 1979, Klett et al. 1988, Sargeant and Raveling 1992). In the PPR the primary mammalian predators of duck eggs are red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), Franklin's ground squirrel (*Spermophilus franklinii*), and badger (*Taxidea taxus*; Johnson et al. 1989, Sargeant and Arnold 1984, Sargeant and Raveling 1992). Waterfowl managers have implemented various management strategies and continually search for new techniques to reduce the impact of these predators on nest success. Reduction of predator populations through intensive trapping has been effective at reducing predation on waterfowl nests (Balser et al. 1968, Duebbert and Lokemoen 1980, Garrettson and Rohwer 2001), but public concern regarding the use of lethal predator control has prompted managers to seek nonlethal alternatives (Messmer et al. 1999).

Nonlethal management strategies primarily restrict predator access to nests or reduce the ability of predators to locate nests. Examples include the establishment of dense nesting cover (DNC), use of electric fences, construction of islands, and placement of elevated nesting structures (Conover 2001). These techniques have proven successful in several studies, but the high costs associated with some of the techniques and site restrictions curtail their utility.

Supplemental feeding of predators has been suggested as a possible alternative technique for protecting nesting waterfowl from predators. The basis for this recommendation stems from several studies reporting that nest predation rates may be influenced by the abundance of alternative prey

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Wildlife Society Bulletin 2005, 33(4):1330–1334 Peer refereed

(Pehrsson 1986, Summers 1986, Beintema and Muskens 1987). For example, the nesting success of blue-winged teal (*Anas discors*) in a waterfowl management area of northwest Iowa was correlated with an index of small-mammal abundance (Byers 1974). Similarly, Pehrsson (1986) found that years of high duckling production were correlated with high numbers of small mammals.

Unfortunately, direct research on the effectiveness of supplemental feeding to enhance the success of nesting birds is scant (Jimenez and Conover 2001). Crabtree and Wolfe (1988) reported that they reduced striped skunk depredation of waterfowl nests along a dike in Utah by distributing commercial mink chow and carp (*Cyprinus carpio*). Unfortunately, this study had only 1 treatment and 1 control area; the lack of replicates limits inference of the results. Greenwood et al. (1998) conducted a similar study in the PPR by providing a mixture of fish offal and sunflower seeds on sites adjacent to waterfowl nesting areas. They compared nest success of upland-nesting ducks on these treatment sites to other untreated (control) sites but failed to detect a difference in nest success between treatment and control areas. However, evidence at depredated nests suggested that predation by striped skunks may have been reduced on treatment areas, but compensatory nest predation by other species negated any benefits to nesting waterfowl that might have resulted from reduced skunk predation (Greenwood et al. 1998).

We evaluated whether distribution of chicken eggs reduces predation on duck nests in North Dakota. We predicted that swamping areas with eggs would reduce the incentive of predators to hunt for duck nests.

Methods

We selected 10 sites (each 10.4 km^2) in north-central North Dakota and paired them based on proximity. The 2 sites in each pair were >5 km apart, with all pairs located >15 km apart. We termed the 2 sites that were paired together a location. Each site was centered on a field >66 ha where DNC had been established >5 years prior to the study. Dense nesting cover was dominated by tall wheatgrass (*Agropyron elongatum*), alfalfa (*Medicago sativa*), and smooth brome (*Bromis inermis*). The remaining land within each site was predominantly used for pasture or row crops.

We randomly selected 1 site of each pair as the treatment site while the other served as a control site. At each treatment site, we established 64 feeding stations where chicken eggs would be distributed. Feeding stations consisted of a 1-m-diameter patch of ground cleared of vegetation. We placed these in areas where predators were likely to frequent (e.g., culverts, roadsides, trails, fencerows, and shelterbelts) and monitored them for supplemental food replacement during both experiments. We intentionally avoided placing feeding stations within DNC to prevent attracting predators to these areas.

Striped skunk (*Mephitis mephitis*) were a major predator of duck nests in our study sites.

Experiment 1

We conducted this experiment during May and June 1996. We placed 5 chicken eggs at each of the 64 stations at each treatment site (32 eggs/km^2). We revisited each station every 5–7 days and replaced all depredated or missing eggs for the duration of the experiment.

We searched for upland duck nests on each study site using a chain drag pulled between 2 all-terrain vehicles (Higgins et al. 1969). Nest searches were conducted in 4 randomly selected plots (16 ha each) within DNC of each site beginning in early May, with each site searched 3 times over the next month. We placed a 1.2-m bamboo stake 4 m from each located nest to aid in relocating it on future dates. We revisited nests every 7–10 days until we determined the fate of each nest. We calculated daily survival rates (DSR) of nests using Johnson's (1979) modification of the Mayfield method (Mayfield 1961).

Each site served as our experimental unit, and we combined all duck nests located within a site to determine a single DSR for that site. We used a 2-way analysis of variance (treatments versus locations) in a randomized block design to determine whether DSR varied among either treatments or locations (Little and Hills 1978). We considered differences to be statistically significant if $P<0.05$.

Experiment 2

The success of Experiment 1 may have been limited by the number of eggs we distributed. To test this we conducted a second experiment starting in mid-June after the fate of all nests in Experiment 1 had been determined. For this experiment we distributed 25 chicken eggs at each of the 64 feeder stations at each treatment site. This equaled 1,600 eggs at each treatment site or 160 eggs/km^2 and represented a 500% increase over the number of eggs used in Experiment 1. As in the first experiment, we visited all feeding stations every 5-7 days, and we replaced all missing or depredated eggs until the experiment ended.

We searched the same areas for new duck nests using the same search methods employed in Experiment 1. We again searched each site for duck nests 3 times from mid-June through mid-July. Once we found a new nest, we marked it and determined its fate as described previously. We did not use nests from Experiment 1 in this experiment. We conducted data analyses and statistical tests as described in Experiment 1. We also used a paired Student's *t*-test to determine whether DSR differed between Experiments 1 and 2.

Results

Experiment 1

During this experiment, we visited each feeder station 7-8 times. On all but our first visit, we found that >90% of the chicken eggs at all feeder stations had been depredated or removed. Hence, predators were depredating >290 chicken eggs weekly from each treatment site, and we were distributing an equal number each week. We distributed >2,000 chicken eggs at each treatment site during this experiment.

We located 247 duck nests, of which we used 239 in DSR calculations. Nests of blue-winged teal accounted for 47% of the total nests found. The remaining nests consisted of mallard (*A. platyrhynchos*; 22%), gadwall (*A. strepera*; 16%), northern shoveler (*A. clypeata*; 10%), northern pintail (*A. acuta*; 4%), and green-winged teal (*A. crecca*; 1%). Daily survival rates did not differ ($F_{1,4}=6.54$, $P=0.06$) between treatment ($\bar{x}=0.891$, SE=0.018) and control sites ($\bar{x}=0.939$, SE=0.001). There also were no differences in DSR among locations ($F_{4,4}=6.54$, $P=0.06$).

We saw tracks of striped skunk, raccoon, fox, and badger at feeding stations during Experiment 1. We observed striped skunks eating eggs at feeding stations on 3 occasions. We did not detect any evidence of avian predators visiting feeding stations.

Experiment 2

We visited feeding stations 3 times during this experiment and found on each visit that >90% of the eggs at each treatment site had been removed or depredated. Hence, we distributed >4,500 eggs at each treatment site in this experiment.

We located 147 duck nests in the latter half of June and July and used 144 to calculate DSR. Gadwall nests (50%) were the most common, followed by blue-winged teal (27%), northern shoveler (13%), mallard (6%), and northern pintail (4%). Some of these ducks, especially gadwalls, probably were late nesters, while others (e.g., blue-winged teal) probably were renesters.

Daily survival rates did not differ ($F_{1,4}=0.72$, $P=0.44$) between treatment sites ($\bar{x}=0.940$, SE=0.016) and control sites ($\bar{x}=0.958$, SE=0.008). There also were no differences in DSR among locations ($F_{4,4}=0.34$, $P=0.83$). When treatment and control sites were combined, DSR in Experiment 1 ($\bar{x}=0.916$, SE $=0.012$) and Experiment 2 ($\bar{x}=0.949$, SE=0.009) did not differ ($t_9=1.90$, $P=0.09$). During Experiment 2 we observed tracks of striped skunk, raccoon, fox, and badger at feeding stations. Interestingly, skunks excavated dens at 4 feeding stations. As in the first experiment, we detected no evidence of avian predators visiting feeding stations.

Discussion

In Experiment 1 we did not detect a difference in DSR between treatment and control sites. There was only 1 treatment site where DSR was higher than its paired control site. It is possible to argue that Experiment 1 failed to reduce nest depredation because we did not distribute enough eggs to deter all of the local predators. To test this we increased the number of chicken eggs initially distributed per treatment site from 320 to 1,600 (154 eggs/km^2). Yet again, there was no difference in DSR between treatment and control sites, but control sites had a slightly higher DSR than treatment sites. Hence, we concluded that the distribution of chicken eggs during the nesting season did not reduce depredation of upland duck nests. Furthermore, at a cost of $1 for a dozen eggs, the cost to weekly bait a site with 1,500 eggs was $122, with labor costs for distributing eggs adding to this expense. Hence, even if distributing more eggs were effective in reducing nest predation, it may not be a cost-efficient method of doing so.

We deliberately placed all our feeder stations far from the DNC to shift the foraging behavior of local predators away from the DNC, where ducks were nesting, to areas where our feeder stations were located. This did not seem to happen to any meaningful extent (at least from the perspective of a duck biologist) because predation rates on duck nests located in DNC were similar at treatment and control sites.

Previous supplemental feeding studies have used fish and pet food (Crabtree and Wolfe 1988) or fish offal and sunflower seeds (Greenwood et al. 1998) and obtained only limited or no success in reducing nest depredation. We used chicken eggs because we believed that predators might have a specific hunger for eggs and they would satiate on eggs after eating a certain number of them. We hoped that by creating numerous feeding stations where eggs were always available, predators would have no reason to spend time hunting for duck nests. Apparently, this did not happen.

Conover (2001) noted that supplemental feeding is most successful in resolving short-term wildlife damage problems. Duck eggs are available for only a few weeks each year. Hence, reducing nest predation is the type of short-term problem that should have been resolvable through supplemental feeding. Why then was this technique so unsuccessful in our experiments? Perhaps the problem results from the unique nature of eggs. Most foods that predators obtain in late spring and summer will spoil in a few days. Hence, there is little reason for a predator to kill more than it can immediately eat. Eggs, however, are different. If buried or cached in a cool place, eggs will remain nutritious for weeks. For this reason, predators, even if satiated, may continue to hunt for eggs as a means of guarding against potential food shortages in the future. Foxes in particular are well known to cache eggs (Sargeant et al. 1998). Therefore, supplemental feeding may fail to reduce nest depredation if satiated predators are still motivated to cache eggs. Another reason supplemental feeding may have failed to reduce nest depredation is that hunting for duck nests may just be an activity that predators engage in even if satiated.

Management implications

From an ethical standpoint, supplemental feeding of predators is an ideal solution to the problem of excessive nest predation because predators are being rewarded for their good behavior (i.e., not depredating duck nests). For this reason, it often is proposed as an alternative to lethal control of predators. Our results indicated that supplemental feeding may benefit predators (those in our treatment sites ate large numbers of chicken eggs) but the technique does not help ducks nest successfully.

Acknowledgments. The United States Fish and Wildlife Service's (USFWS) Devils Lake Wetland Management District granted us permission to work on its lands and provided logistical support in the field. USFWS officials J. Alfonso, K. Tompkins, and N. Powers, and county managers B. Johnson and S. Kahan provided valuable help. V. Leikas allowed us to work on his property. This research was funded by the Delta Waterfowl Foundation, Jack H. Berryman Institute, International Association of Fish and Wildlife Agencies, Utah Agricultural Experiment Station, and the United States Fish and Wildlife Service.

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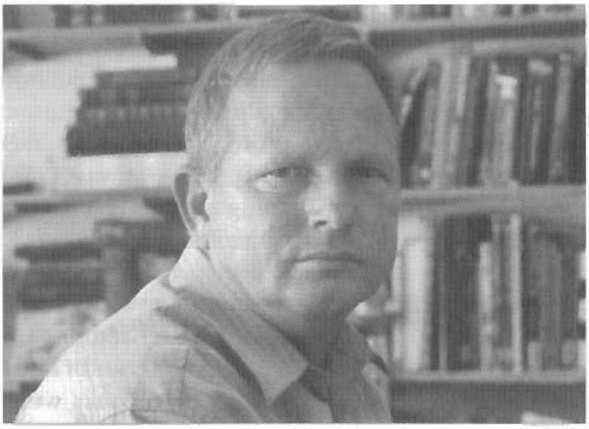

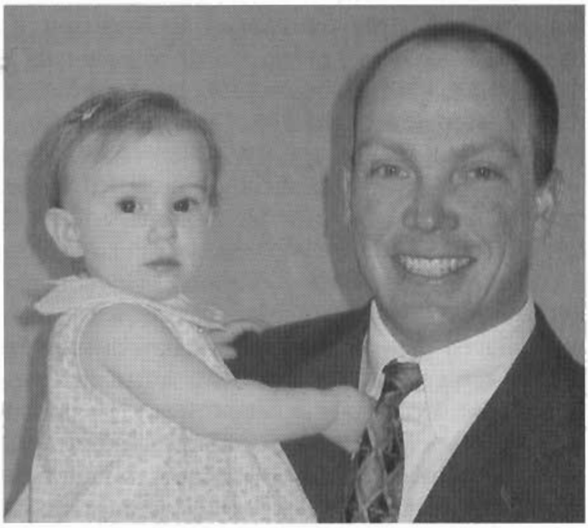

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Associate editor: *Haukos*