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NESTING AND BROOD REARING Nebraska versus Minnesota

A total of 48 greater prairie-chicken (GPC) nests were located in Nebraska and 22 in Minnesota in 2013. Nest success in Nebraska was 35.4% (17/48). Nest success was 54.5% (12/22) in northwestern Minnesota in 2013. These are slightly higher than last year, 30.0% and 50.0% respectively. The accepted standard for nest success in upland game birds is 50%. This figure implies that nests are found and destroyed by nest predators at random. Less than 50% implies that the conditions are such that nests are more likely to being found and a higher rate implies conditions make nests less susceptible or more secure. In Nebraska as occurs in Wisconsin, Minnesota, North Dakota and South Dakota all the nests of resident radio-marked hens were located within 1 mile of a booming ground.

The increase in success in 2013 is thought to be related to the late nesting season which resulted in more vegetative growth before hens started incubating resulting in more secure cover. Both Minnesota and Nebraska experienced drought conditions in 2012 which reduced vegetative growth and residual in 2013. The late breeding peak resulted in us finding fewer nests in 2013 (66 versus 111) as nests were initiated 2-3, weeks later leaving less time for renesting.

Forty-six (95.8%) of the 48 nests located in Nebraska in 2013 were found in sandhill pastureland the other two were located in hay meadows. This is comparable to 2012 where 55 (90.4%) were located in sandhill pastureland, 5 (7.9%) in hay meadows and 3 (4.8%) in CRP grasslands. The dominant plant species at prairie-chicken nests in Nebraska were grasses and dominated by little bluestem, Panicum or switchgrass. red top and Kentucky blue grass. No unusually small clutches or partially destroyed nests were found in 2013.

Of the 22 nests located in 2013 in Minnesota, 13 (59.1%) were located in CRP grasslands, 6 (27.3%) in pastureland and 3 (13.5%) in WMAs. In 2012 a total of 46% of the 44 nests were in located in CRP, 50% in "Native Prairie" and 4% in other, 1 in a hayfield and the other in standing wheat. Last year was the first time in 20 years that the percentage of nests in CRP was less than the percentage in "Native Prairie".

The number of nests in CRP in the past has been as high as 72%. The dominant plant species at nests in Minnesota were Kentucky blue grass, red top, brome, quack grass.

In Nebraska all of the nests found in 2013 and 2012 (n=111) were located on private land and in Minnesota 95.5% (21/22) and 90.1% (40/44) respectively were found on private land. In Wisconsin in 2006 the year of the first translocation all of the nests (n=27) were found on land owned and managed by WIDNR. This was the last year nesting research was conducted on GPC by STCP in Wisconsin.

The reason for the higher nest success in Minnesota and Wisconsin is believed to be related to the better cover created by the grass cover in Minnesota especially by exotic cool season sod grasses which seem to create better residual than the bare sand native bunch grass cover common in Nebraska.

Number of Chicks Fledged Nebraska and Minnesota 2013

Of the radio-marked hens in Nebraska in 2013 that had successful nests 52.9% (9/17) fledged chicks and the average number of chicks fledged was 5.4/hen (Range 1-9). In Minnesota 54.4% (6/11) of the radio-marked hens that had successful nests fledged at least one chick. The average number of chicks fledged in Minnesota was 4.5 chicks/hen (n=17, range 1-12). All of these numbers are higher than last year. A chick was considered fledged at 6 weeks of age because this is the age at which they can survive without a brood hen.

After two breeding seasons nest success has been higher in Minnesota than Nebraska, but the overall percent of hens that fledge chicks has been higher in Nebraska and so has the number of chicks fledged/hen. However, both average brood sizes are lower than historical average brood sizes from the literature at 6.3 chicks/hen.

Based on the production numbers the overall production for 100 nesting hens in Nebraska was about 20% higher than Minnesota (83 chicks fledged per 100 hens versus 69 chicks fledged/100 hens) and both are more productive than Wisconsin (41 chicks/100 hens). The latter is based on data collected on the Buena Vista in 2006. These results show that it is not only nesting success that drives production but just as important is the percent of hens that fledge chicks and the number of chicks fledged per hen. This relationship also showed up in the model developed with pen-reared Attwater's prairie-chickens (APC) that was recently submitted for publication Pratt et al, (In Press). The difference between the number of chicks fledged today and pre-1985 should be cause for concern.

It needs to be reemphasized that long term research on average brood sizes indicates that the number of chicks fledged per radio-marked GPC hen in northwestern Minnesota has been declining significantly for 19 years (1992-2010). Information covering the period 1965-2006 in North Dakota shows that sharp-tailed grouse (*Tympanuchus phasianellus*) average brood sizes have also declined significantly for the past 42 years. Data courtesy the NDGF Department.

These data also indicate that at 6 weeks of age broods exceeding 6 chicks have become rare. Warner et al (1999) also reported that chick survival based on average brood sizes in pheasants has declined from the early 1950's to the early 1990's from 7.7 to 4.2.

The reason(s) for these declines in brood sizes are not known at this time but raise serious concerns that some factor(s) is affecting the survival of young chicks. This now becomes even more important now that we know that hens in Nebraska fledge more chicks and are more productive on the average than hens in Minnesota and Wisconsin. It is obvious that more information will be needed to better understand the factors influencing this pattern. At this time the higher number of chicks fledged in Nebraska appears to be related to more insects but we do not know why there are more insects especially grasshoppers.

GENERAL MOVEMENTS

Past research by STCP on genetics and dispersal in PCG2B has dramatically changed the overall philosophy of prairie grouse management. The results of this research have led to the fact that our concept of the size of the area necessary to sustain a prairie grouse population was way too small. (Toepfer 2006). It has also led to the realization that connectivity has to be reestablished between fragmented populations.

Briefly these small populations have to be reconnected to larger populations and bird numbers increased in order to sustain genetic diversity or they will not be viable long term. More birds require large management areas with a dramatic increase in the amount of the necessary grassland habitat. Genetic research tells us how many prairie chickens we need and the Nebraska results are beginning to tell us how much grassland we need and hopefully how to maintain it so both people and grassland wildlife can make a living off the same lands.

The information on a large number of young of the year especially natal dispersal is unique to research conducted by the author with STCP. When STCP started PCG2B this was considered the number one gap in our knowledge of prairie chicken ecology. The general pattern in prairie chickens is that immatures are more mobile than adults and hens are more mobile than cocks. This movement pattern has now been well established in small isolated populations (Halfmann 2002, Toepfer 2003). We now need to understand how dispersal works in a large self-sustaining GPC population.

The radio-marked prairie grouse in Nebraska are much more mobile than any prairie grouse that I have followed in the upper Midwest. The habitat in the upper Midwest is a scatter pattern of grassland cover (CRP and state owned grassland reserves) in a landscape dominated by plowed land. This is in contrast to the sand hills where the landscape consists of large expanses of hills with grass (30 million acres) and little plowed land. It is estimated by NGPC (Vodehnal pers. comm.) that at times in a good year the sand hills supports an autumn greater prairie-chicken population of over a million birds.

In Nebraska all movements autumn to winter by sex and age were greater than those seen in the radio-marked prairie-chickens in Minnesota. This was especially true for the hens during the winter which were 2-3 times greater than their counterparts in Minnesota. The movements of young of the year cocks are also greater in Nebraska than Minnesota but not the adult cocks.

Adult cocks have a strong year round tie to their territories on their home booming grounds or the one they displayed on the previous spring. Hence they tend to stay as close as conditions permit and as a result are the least mobile cohort. Hens have no such bond to a booming ground or nest site outside the breeding season and hence range farther to meet their needs, their priority is food and cover. Immature cocks tend to wander until they establish a home booming territory which can happen in the autumn, early spring or even later during the breeding peak. All dispersing radioed birds in Minnesota and Nebraska were located within a mile of a booming ground and none were observed alone.

At least 10 radioed hens in Nebraska migrated. All were adults and all moved over 10 miles to and from their 2012 nest sites. All moved to center pivot corn-fields during the winter and then returned back to their nesting areas in March 2013. Seven adult hens that were not found during the autumn and winter aerial searches showed up at their previous years nesting areas in March 2013. This author has no idea as to where they were but likely some of them moved outside of our aerial search radius of 50 miles. One radio-marked sharp-tail hen also migrated over 30 miles

Five young of the year hens in Nebraska moved 10-41 miles from their natal area to corn-fields but these moves were one way as none returned to their natal area. Some young of the year cocks moved up to 3 miles to nearby corn-fields but most shifted to areas near booming grounds where ranchers were feeding cattle. What is surprising is that many of the birds that moved over 10-41 miles did not have to move that far to find corn fields or especially ranchers feeding cattle. The hens disappeared from the sandhill grasslands in mid-October in both 2012 and now in 2013 when it was still mild and no snow on the ground.

The fact that adult hens returned from wintering areas to their previous year's nesting area the following spring and young of year did not suggests that tradition may be involved in these long range moves. This is something that young of the year hens would lack in their first winter and it is even possible that they follow adult hens to their wintering areas. Both adult hens and immature hens disappear at the same time leaving the cocks behind. However the magnitude of the movements seen in hens suggests a great deal of mixing of birds over a very large area. It will be interesting to see if this pattern occurs again this winter and spring. Movement patterns and moves of this magnitude have only occasionally been documented in greater prairie chickens.

The movements in spring from the booming grounds captured on were greater for immatures than adults and greater for hens than cocks. And without exception all of the within spring movements were greater for prairie chickens in Nebraska than Minnesota

and the difference was greatest for immatures. The dramatically smaller dispersal moves in Minnesota and Wisconsin reflect less grassland habitat and the closer proximity of grassland to agricultural feeding areas.

Based on one year of data it is apparent that a portion of the adult hen population in our study area is migrating to winter feeding areas. Historically researchers including Hamerstrom's have indicated that in the past when there were more birds GPC were migratory and that the hens were more likely to migrate than cocks. This is exactly what we have seen so far in Nebraska.

Not all hens make large winter movements. Some adult hens in Nebraska like the adult cocks remained within 2 miles of their nest sites and fed where ranchers were feeding their cattle. In 2012-13 there were five such hens, two are still alive and neither has made a significant move from last year's known range.

Minnesota

All of the cocks in Minnesota remained within 2 miles of their booming grounds in 2013. All but two radioed hens wintered within 4 miles of their summer areas. One young of the year radioed hen wintered 8 miles from her natal area and returned in mid-April. A second radioed hen also a young of the year dispersed 6 miles to a wintering area and remained there and eventually nested.

Natal Dispersal

Natal dispersal movements were 3 times greater for hens in Nebraska than in Minnesota (9.48 versus 2.94 miles) and greater but not by much for cocks in Nebraska (1.08 versus 0.80 miles). The large difference in hen moves is likely related to the greater distances that immature hens moved to find winter food in Nebraska. The similarity in dispersal in young cocks relates to their tendency to establish on nearby booming grounds which are much closer typically within a mile of their natal areas or where their mother nested. However based on the number that move and the magnitude of their movements seen in Nebraska and lack thereof in Minnesota it is felt that natural dispersal in prairie grouse today is being influenced by the presence of agriculture.

Without exception all of the radio-marked hens and cocks in Nebraska fed either in center pivot corn-fields or where ranchers fed their cattle. The birds move so much more in Nebraska because they can and they have to move farther to find a winter food source than birds in Minnesota. Yet in winters with deep snow GPC in Minnesota will move farther to find food and migrate but distances are relatively short 3-10 miles. In Minnesota there is more plowed land than grassland and in Nebraska there is much more grass than plowed land. The maximum distance moved by a radioed hen in Minnesota in 2012-2013 was 8 miles. However in the past a handful of radio-marked young of the year Minnesota hens have dispersed 20-40 miles. But such moves unlike Nebraska were not common.

One thing we learned in following lots of radioed prairie chickens is that when dispersing they will find and join with other prairie chickens especially young of the year. If they establish they will remain and if not they move on to another group. Eventually they will join up with other birds and over the course of autumn and winter can associate with a lot of different individuals. Prairie-chickens find other prairie-chickens. In this sense dispersal of young of year is a social process rather than a function of habitat selection. Young of year prairie chicken cannot go wherever it wants as it has to fit in and deal with the birds that are already in a given area. .

Movements of hens may be influenced by the cocks especially adults and even sharp-tailed grouse (Toepfer 1988, Toepfer and Eng 1988). Cocks especially adults tend to dominate hens in common feeding areas and movement patterns suggest that hens may avoid interacting with cocks unless they have to on the booming ground and when winter snow reduces the availability of food. When snow covers food there are fewer feeding areas available and at this time hens may be forced to join up with the cocks and compete for food. Sharp-tailed grouse can also influence movements because they dominate prairie chickens in feeding situation even though they are smaller than prairie chickens. .

Size of Dispersal Area

The area of the combined dispersal movements of the radioed marked birds in Nebraska in 2012-13 covered 1,123 square miles (Fig 1). This is over 4.5 times larger than the dispersal range seen in Minnesota (234 sq miles) 2012-13 and 15 times that seen in 2006-2007 in Wisconsin where birds never left the Buena Vista (71 square miles). The maximum distance dispersed of 45 miles observed in Nebraska would result in an area covering 6,360 square miles. The size of the dispersal seen in Nebraska from a management perspective is somewhat daunting when one thinks about how can we maintain grassland habitat for prairie grouse over such a large area of private land.

Daily Movements

Daily movements were also greater in Nebraska than Minnesota but have not been quantified at this time. A number of birds regularly made moves of a mile or more from night roosting areas to feed in center pivot corn-fields. They would fly to their feeding area in the morning, feed than day loaf nearby, feed again in the evening and then return to a night roosting area. This very movement pattern was also observed in Minnesota but the moves from night roosting to feeding usually did not exceed a half-mile. One young radioed cock in Nebraska moved 1.25 miles just about every day in late March from his booming grounds to the nearest corn field to feed. These movements stopped when it warmed up and the bird began to display in the evening. Both prairie-chickens in Nebraska and Minnesota do not use the same night roosting area on successive nights.

It was thought that because of the drought in 2012, and subsequent increase in the quantity of wild sunflowers and rose hisps in 2013 that more radioed GPC would not leave the sandhills. But the pattern has been the same as last year when most of radioed birds started to disappear in late October. It is suspected that adult hens and young of year hens have left the grasslands to more preferred easier obtainable foods associated with agriculture activity or where ranchers are feeding their cattle.

As in 2012-13 we will have to fly to find missing birds and it is thought that some will be found significant distances from their capture sites. We are still missing 18 radioed birds from 2012 that were never found during our flights out 50 miles from their capture site in 2012-2013. Some of these birds will probably never be found due to radio failure or destruction by predators but they should still be functioning and we will continue to look for them until 125% of their expected battery life runs out.

Insects and Broods

It is thought that the number of chicks fledged may relate to differences in insect numbers and types between different communities. The Minnesota landscape in contrast to Nebraska is a checkerboard of grassland and agricultural land a mix of soybeans, corn, wheat and beets. The Nebraska study area is dominated by grassland cover with only scattered center pivot fields of corn. This means that in contrast to Minnesota not as many prairie chickens or insects in Nebraska are exposed directly to agricultural chemicals. This means that there may be more insects in Nebraska than Minnesota and young prairie grouse especially the very young eat insects (Rumble et al. 1988). See Syrowitz (2013) for review of literature on galliformes broods and insects.

Booming Grounds and Agriculture

Prairie-chicken cocks select areas for booming that are open and with short cover so they can see and be seen. There is very little agriculture in the Rock County, Nebraska study area and this is reflected in the number of booming grounds on plowed ground – none. In Nebraska of 41 booming grounds observed none were in agriculture, 24 (58.3%) were on grazed “Native Prairie” and 17 (41.5%) were in hay meadows. In Minnesota in 2013 of 64 booming grounds, 39 (60.9%) were on plowed land, 12 (18.8%) in pastures, 9 (14.1%) in “Native Prairie” 3 (4.7%) in hayfields and 1 (1.6%) on the Ada airport runway. In Wisconsin of 18 booming grounds 10 (55.5%) were on plowed ground, and 8 (44.5%) were on some type of grass sod (mowed or pasture).

In Minnesota and Wisconsin radioed cocks spend a significant portion of their lives on the booming grounds in agricultural fields. Many cocks and some non-brood hens have been known to spend much of the summer feeding and even regularly night roosting in agricultural fields typically soybeans and beets. None of the radio cocks or hens in our Nebraska study area spent any time during the summer in agricultural fields.

GPC Blood Samples 2013

This summer and autumn 3cc of whole blood was taken from the jugular of 46 prairie grouse night lighted in Nebraska and Minnesota. This total includes 17 prairie grouse (1 cock, 2 hens, and 14 young of the year) in Minnesota and 29 prairie grouse (2 cocks, 2 hens and 25 young of the year) in Nebraska. Young of the year were favored because they did not have any contact with agricultural fields. This was especially true in Nebraska where most of the birds were miles from agricultural fields. However all the radioed birds in Minnesota were within at least a mile of one or more agricultural fields. This will also allow us to recapture the survivors and resample them next summer and see if they have been exposed to any of these chemicals.

It is possible that prairie-chickens in Nebraska could pick up chemicals from the corn etc fed by ranchers to their cattle in winter pastures. It is hoped that we can look at these samples for pesticides especially the neonicotinoids. It is hypothesized that a comparison between northwestern Minnesota where such chemicals are heavily used in contrast to Nebraska may give us insight into how widespread these chemicals are and if they are finding their way into prairie-chickens.

Food

Food and cover especially the proximity of night roosting cover to food is the main factor that influences movements of prairie-chickens. Food habits of the birds in Nebraska based on the concept that they spend the breeding season, summer and most of autumn in the sandhills suggests they are dependent upon grasses, forbs, seeds and insects for food. In 2013 grasshoppers were again more abundant in Nebraska than in Minnesota. Insects are heavily used by young prairie grouse and brood hens (Rumble et al. 1988) and for a review of the literature see Syrowitz (2013).

Birds captured in native habitat during summer appeared to have insects and vegetation in their crops. Most of the birds captured during the autumn had rose hips and seeds in their crops, some had corn kernels and those from mowed meadows had vegetation in their crops probably clover. Likewise, many of the dropping collected from night roosts contained rose seeds and/or had a reddish hue indicating the birds were feeding heavily on rose hips. They are probably a very important common natural food in the sandhills and they are a grazing increaser.

The production of fleshy hips was poor in 2012 due to the drought and in 2013 they were abundant as were wild sunflowers. Older local ranchers indicated that they have never seen so many sunflowers or rose hips. Where some of these birds are getting corn at this time is not known but a likely source would be a nearby rancher had fed or was feeding cattle.

The use of rose hips in Nebraska is emphasized by the crop contents of a radio-marked adult cock prairie chicken found dead this November. This bird had 96 rose hips, one grasshopper and a few green leaves in his crop. The contents weighed 82 grams or

about 8% of the birds weight. This would be equivalent to 16 pounds added to a 200 pound man. The largest amount ever recorded in a prairie chicken crop was an APC which had 115 grams of green leaves or 12% of the bird's body weight.

In Minnesota North Dakota and Wisconsin without exception all of the radio-marked birds fed in agriculture fields during autumn, winter and early spring (Toepfer 1988, Eng and Toepfer 1988, Rosenquist 1996, Toepfer 2003). In the northern Midwest this means soybeans, corn wheat, beets and a few sunflowers and in Wisconsin corn, soybeans and buckwheat the latter planted by WIDNR. Prairie-chickens have an observed feeding preference for sunflowers followed by soybeans, wheat and/or corn (Toepfer 2003).

Winter survival of prairie chickens increases in open winters and with the presence of food above a snow cover such as standing corn or unharvested sunflowers. The presence of unharvested sanding corn increased winter survival in the blizzard winters of 1996-97 in Minnesota by 27%. The ears on standing corn however have gotten higher over the years and today are too tall for prairie-chickens to reach that is unless snow blows and accumulates in the rows or it is knocked down by deer or humans (Toepfer 2003).

Numerous ranchers in Nebraska have indicated that during winter when it gets cold and especially when snow covers the ground that flocks of 100 or more prairie grouse fly into the center pivot picked corn fields or where they feed their cattle. In Nebraska to prevent soil erosion of the sandy soil agricultural fields are left unplowed until spring. Consequently if not grazed by cattle there is more waste grain available than in Minnesota and Wisconsin where it has become a common practice to plow fields during the autumn in preparation for spring planting burying a lot of the waste grains..

In Nebraska most of harvested corn-fields have cattle put in them to feed on the waste corn. Eventually the cattle reduce the amount of waste corn and the birds move to different fields or out. In winter 2012-2013, three radio-marked GPC hens fed in center pivot corn-fields and night roosted in adjacent grasslands cover near Atkinson. This is some 30 miles from where they were caught in April. Eventually the cattle removed the waste corn and these three birds left, two have yet to be found again and one showed up in April at her 2012 nest area.

At this point it seems safe to say that prairie-chickens in Nebraska during cold seasons also prefer foods associated with agriculture either as waste in fields or where cattle are being fed. One has to wonder what they survived on before agriculture arrived and it is likely that they did not exist in the densities seen in past and recently in Minnesota. It is pretty well accepted that prairie-chicken numbers were greatly increased when Europeans arrived and began to plow the prairie and plant crops especially corn.

In 2012 I reported that the droppings collected in November from the night roosts of radioed birds were very small and dry and unlike any I have ever seen. My initial reaction was that something may be wrong with the radioed bird however similar

droppings were found in night roosts of non-radioed birds. In 2013 the droppings in night roosts of radio-marked GPC in November in Nebraska appeared normal. At this time it is not known what causes this but it is speculated that drought conditions dried food items and metabolic moisture was at a minimum. Prairie-chickens do drink water but do not have to like some birds (pigeons, doves) as they get their water from their food.

Fence and Electric Transmission Wire Mortality

Fence mortality or collisions with fences is perceived as a major mortality factor for prairie grouse especially for lesser prairie-chickens and sage grouse. In some portions of the county fences are being marked so birds can see them and avoid flying into them. We have not encountered such high mortality in Wisconsin, Minnesota or North Dakota and now in Nebraska where the density of barbed wire fences is high.

Collision with electric transmission wires is of greater concern but the real question is these mortality factors like hunting is either compensatory or additive. In Wisconsin it was estimated that 4-14% of annual mortality was due to collisions with electric transmission lines (Toepfer 2003). Population trends say these losses were compensatory and there is no need to mark fences.

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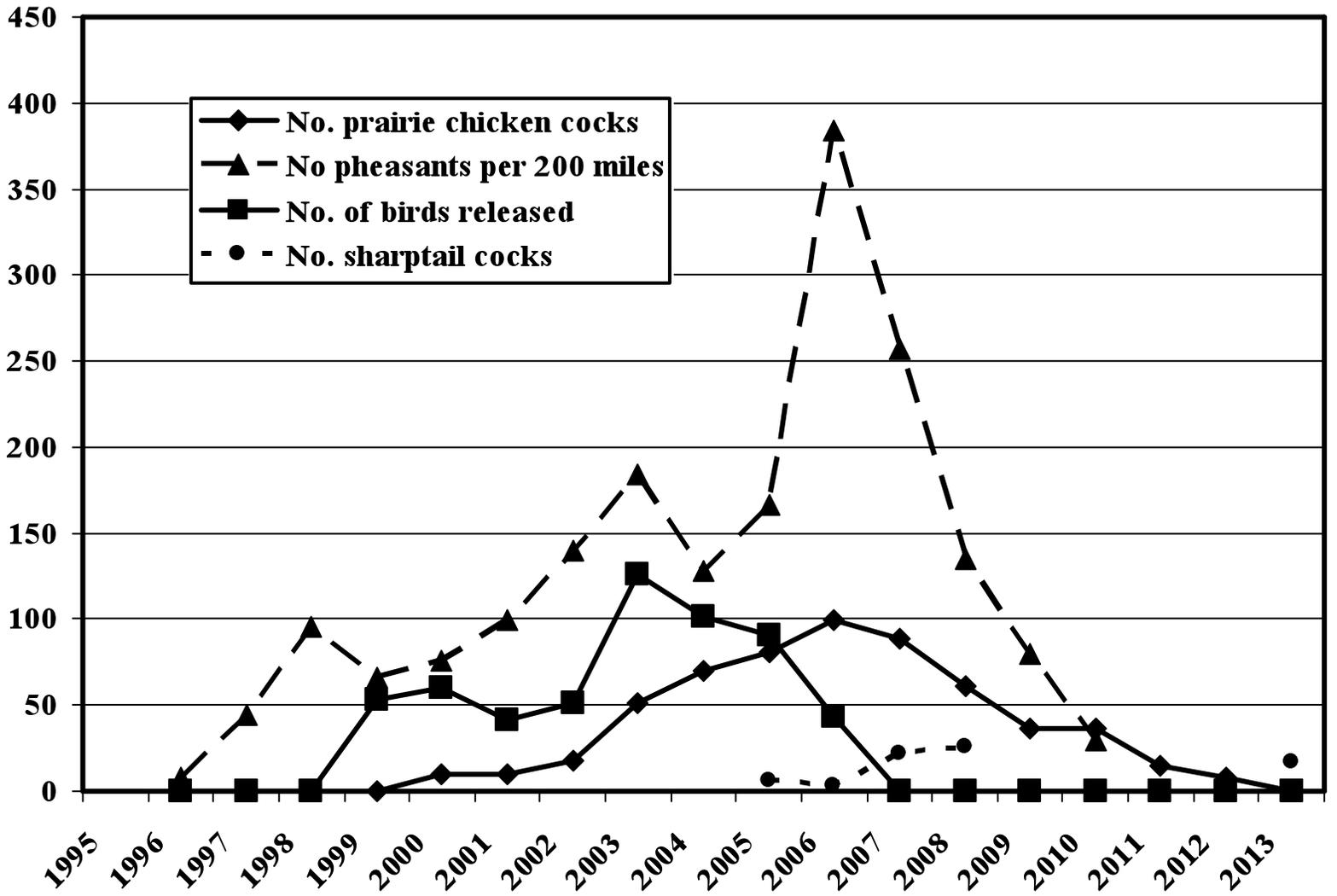
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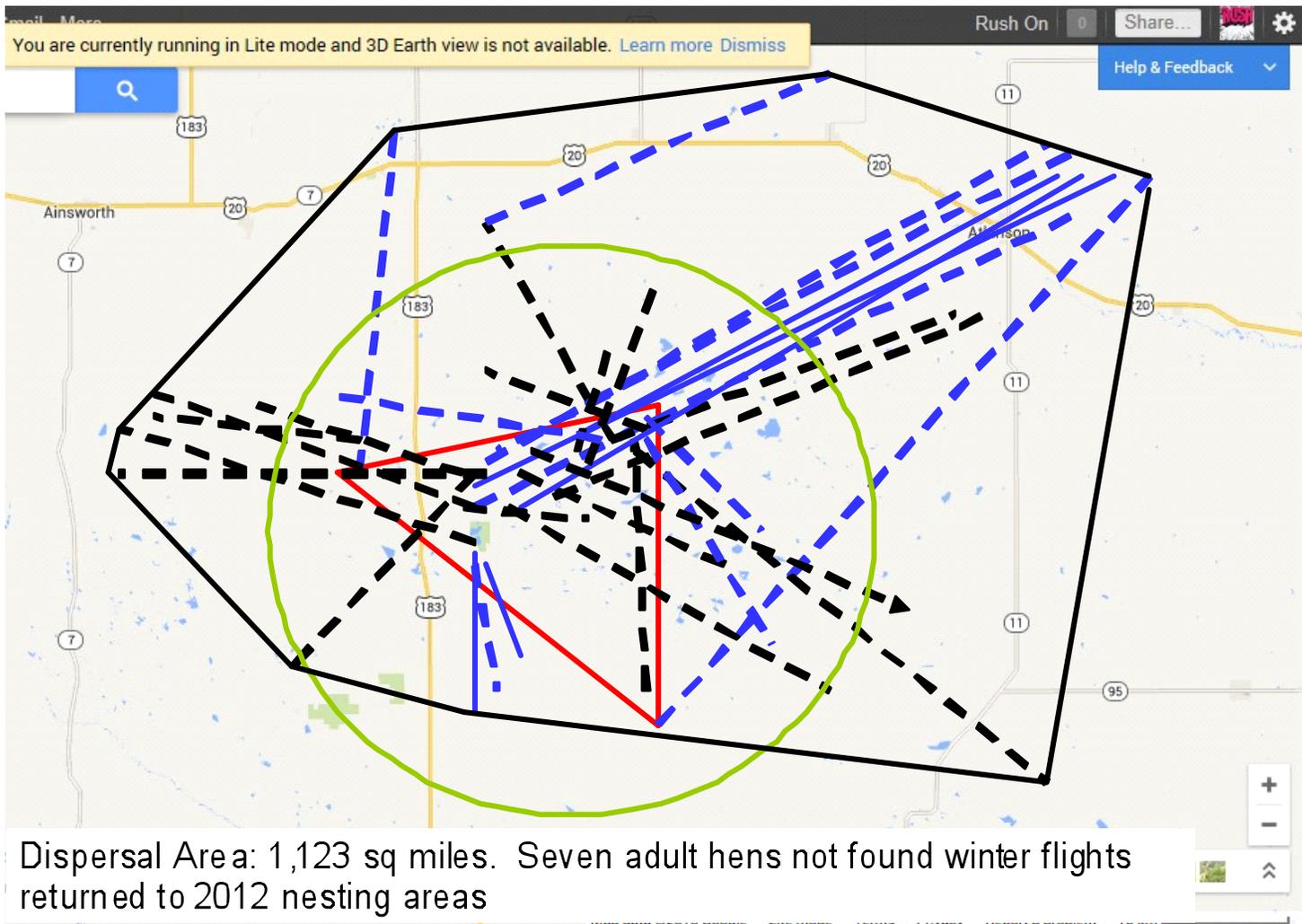
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Population trends for greater prairie chickens, sharp-tailed grouse, ring-necked pheasants and number of birds released in vicinuity of Laq qui Parle, Wildlife Management Area west central Minnesota, 1996-2013.



Winter and spring dispersal areas combined for radio-marked hens – STCP study area Rock County Nebraska 2012 and 2013. Red area indicates where birds were trapped. Green circle is a radius of 15 miles. Solid blue lines indicate 1-way winter movements. Dashed blue lines indicate migration. Black dashed line indicates area of breeding season dispersal for hens in 2013.