

Observer effect on a rural mail carrier survey population index

Douglas A. Robinson, Jr., William E. Jensen, and Roger D. Applegate

Abstract Population trends of small-game species as determined from rural mail carrier surveys (RMCSs) have been historically indexed as count/distance traveled by observers. However, this index might not accurately depict population trends if the number of participating observers changes over time. We examined 32 years of Kansas October RMCS data to determine the most appropriate index of population of the northern bobwhite (*Colinus virginianus*). Significant declines in the number of participating observers altered the relationship between the count/distance traveled and year and should be accounted for by incorporating it into the index of count/distance traveled.

Key words *Colinus virginianus*, northern bobwhite, observer effect, population trends, rural mail carrier survey

Rural Mail Carrier Surveys (RMCS) are inexpensive tools for developing indices of wildlife population trends. These surveys have been used for 30 or more years by many states to track trends in various gamebird and mammal populations (Greeley et al. 1962, Preno and Labisky 1971, Warner 1981, Trautman 1982). There are numerous variables that can potentially influence RMCS and other roadside surveys (Greeley et al. 1962, Bibby et al. 1992, Sauer et al. 1994, Kendall et al. 1996), the most important of which are the total number of participating observers (hereafter observers) and the total distance traveled for all observers (hereafter km) each year. Population indices used in analyses of RMCS trends are often measured as number of individuals counted/unit distance traveled (Trautman 1982, Wells and Sexson 1982, Applegate and Williams 1998). However, different trend analysis methods (Thomas and Martin 1996) may result in different estimates of population trends.

Previous analysis of Kansas RMCS data indicated that northern bobwhite (*Colinus virginianus*, here-

after bobwhite) population indices declined over the past several decades (Applegate and Williams 1998). These results were obtained by using the traditional RMCS index of count/unit distance traveled (Trautman 1982, Wells and Sexson 1982, Applegate and Williams 1998). However, the number of observers participating in the survey has declined over the sampling period (Pearson correlation, $r = -0.960$, $P < 0.001$, $n = 32$, Figure 1). From Figure 1, it is apparent that number of observers and number of bobwhites counted are correlated over the sampling period and indeed the relationship is positive and significant (Pearson correlation, $r = 0.849$, $P < 0.001$, $n = 32$). The declining number of participating observers over time can potentially alter accuracy of yearly population indices, and thus its relative influence on the traditional population index necessitates investigation. Here, we examine the influence of the total number of participating observers on October bobwhite population indices (total count/total km) by using Pearson and partial correlation analysis (Sokal and Rohlf 1995).

Authors' address: Research and Survey Office, Kansas Department of Wildlife and Parks, P. O. Box 1525, Emporia, KS 66801-1525, USA. Present address for Douglas A. Robinson, Jr.: Box 4050, Division of Biological Sciences, Emporia State University, Emporia, KS 66801, USA. Present address for William E. Jensen: Division of Biology and Kansas Cooperative Fish and Wildlife Research Unit, Kansas State University, Manhattan, KS 66506, USA. E-mail address for Roger D. Applegate: rogera@wp.state.ks.us.

Methods

The Kansas RMCS occurs annually during the third weeks of January, April, and July and during the second of week of October. Counts are made for 5 consecutive days by volunteer rural mail carriers making deliveries. These carriers record their observations on postage-paid cards that are returned at the end of each survey period. In addition to wildlife observations, carriers record the average daily miles traveled during the period and the counties where they made their observations.

We examined 32 years (1966-1997) of RMCS data, which were pooled from statewide surveys for October. October RMCS data were used because Wells and Sexson (1982) reported that data from this month were the best predictors of bobwhite harvest variables. First we determined the relationship between count/km and year with Pearson correlation analysis. Then we examined the same relationship but controlled for yearly variation in number of observers by using partial correlation analysis. If the results of the Pearson and partial correlation analyses differed in significance, then the count/km index was deemed inappropriate for examining yearly population trends. If the scenario from above was true, then a new index of count/km that included variation associated with

the number of observers was created and its relationship with year examined by using Pearson correlation analysis.

Results and discussion

Pearson correlation analysis of the yearly trend in bobwhite count/km indicated a significant negative relationship ($r=-0.758, P<0.001, n=32$). However, when the number of observers was controlled for in the partial correlation analysis, the relationship between count/km and year was positive, but not significant ($r=0.279, P=0.128, n=32$). Because the number of observers altered the relationship between the count/km index and year, an index of count/distance traveled/observer was created. Pearson correlation results indicated that the relationship between count/distance traveled/observer was negative and significant ($r=-0.626, P<0.001, n=32$), but this relationship was not as strong as the one between count/km and year. Although there was a decline in strength of the relationship, the index of count/km/observer more accurately depicted the yearly population trend because it accounted for yearly variation in distance traveled and number of participating observers. In retrospect, population declines reported from RMCS surveys based on the index of individual animals

seen/unit distance traveled (Applegate and Williams 1998) may be overestimated.

Factors influencing the downward trend in number of participating observers, although perhaps related to observer interest, were influenced by factors inherent in the United States postal system in Kansas and the distribution of materials for the survey (Kansas Department of Wildlife and Parks, unpublished data). For example, the number of post offices included in the survey decreased from 330 in 1966 to 327 in 1983 and to 314 in 1998. Thus, the number of rural mail routes might

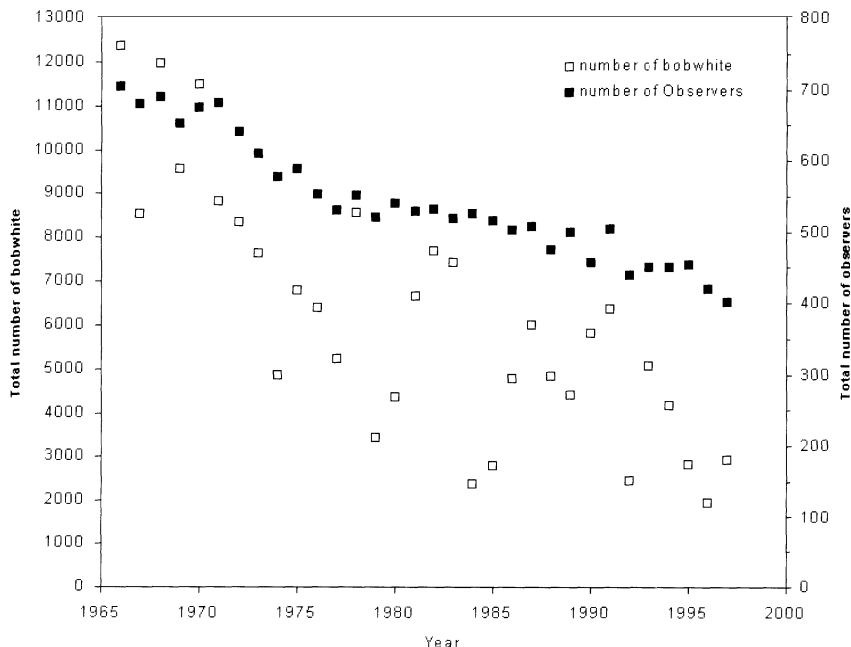


Figure 1. Yearly trends in statewide total count of northern bobwhites (*Colinus virginianus*) and the total number of participating observers in the Kansas Rural Mail Carrier Survey, 1966-1997.



Rural mail carriers contribute valuable wildlife observations for examining population trends.

have decreased during the survey period due to urbanization of some formerly rural areas. This trend is reflected in the number of routes reporting short round-trip distances (≤ 19 km; Kansas Department of Wildlife and Parks, unpublished data).

Our findings indicate an important influence of observer effort, measured here as the total number of participating observers, on the total number of bobwhites counted/total km traveled during the Kansas October RMCS. Managers using RMCS as wildlife trend indices should examine yearly trends in participating observers. If participation does not remain the same over the survey period, number of participating observers should be incorporated into the count/unit distance index.

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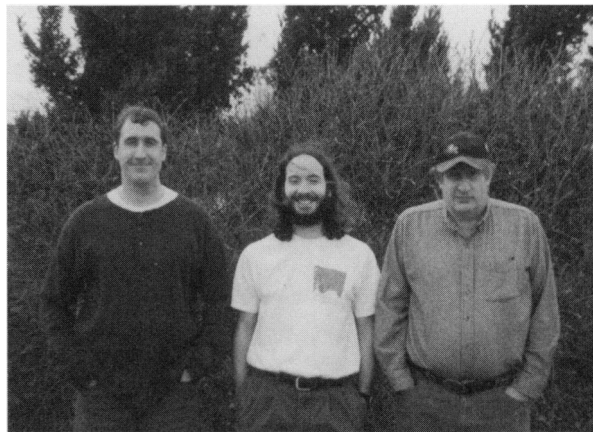
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Douglas A. Robinson, Jr. (center) earned his B.S. in biological sciences at the State University of New York College at Brockport and is currently finishing his M.S. in biological sciences at Emporia State University. **William E. Jensen** (left), received his B.S. in fisheries and wildlife at the University of Missouri, Columbia; his M.S. in biological sciences at Emporia State University; and is currently pursuing a Ph.D. at Kansas State University. **Roger D. Applegate** (right) is small-game coordinator with Kansas Department of Wildlife and Parks. He received a B.S. from Western Illinois University and an M.S. from the University of Illinois. He started his 30+-year career with the Illinois Natural History Survey and has worked with a wide range of game and nongame species in the Midwest, Southeast, and New England. His primary professional interest is population management and ecology.

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