DISCUSSION

Conformance with other survey trends has been used by several authors as the basis for determining the effectiveness of a survey to estimate grouse abundance. For example, Ammann and Ryel (1963) noted that evaluation of grouse surveys was complicated by the lack of field tests on areas of known grouse populations, by the manner in which index values were obtained, by the probability of chance errors, and by the lack of randomness of the sample.

They concluded that the only recourse to estimate effectiveness was through comparison of one grouse survey with another using correlation or regression techniques. Dorney et al. (1968) had earlier reported that winter flush counts provided an apparently reliable census technique, since they found a correlation coefficient of 0.96 between flush counts and roadside drumming counts. Gates et al. (1968) compared the results of a new grouse survey with results of established surveys. The authors assumed that the new survey provided a good estimate of grouse numbers since results from all surveys were similar. Gullion (1966) determined that the roadside drumming count provided a rough forecast of the size of the fall population available for hunting, based upon a highly significant correlation between drumming and harvest. Thus, conclusions about grouse abundance have usually been drawn by comparing results among independent surveys.

Limitations of Indexes

Complex analyses seem inappropriate for extensively applied ad hoc field techniques of this type. Sampling design must be heavily compromised and few external variables can be controlled. Relation of indexes to true density generally is unknown. In deference to these limitations we do not attempt detailed comparisons of surveys. We accept consistency between surveys as being indicative of a joint value for following major population trends or showing general population level. In the absence of definitive comparative population data, this consistency helps evaluation of individual survey methods.

Obviously a sequential seasonal aspect characterizes our surveys, each following in an annual cycle, but precision is far too low to attempt a seasonal "numbers game".

The temptation exists to attempt prediction through regression analysis, especially harvest estimation, perhaps using multiple regression embracing several surveys. Such efforts even if of low precision may be instructive, but may also be misleading as exemplified by Norton et al. (1961).

Naive methods have rightly been widely criticized for use in survey work and can be so challenged here. The objections arise primarily in how these are applied and the conclusions drawn from them. It is believed that applied as in Wisconsin the results find some shelter under the umbrella of the well-known and basic Central Limit Theorem. Walker and Lev (1953:143) comment as follows: "... for a wide variety of populations, statistics based on large random samples are distributed normally. This applies to nearly all populations which are likely to be considered in practice..." This statement suggests that our surveys, which, in effect, are aggregations over wide areas of numerous local estimations, should tend to give robust results. Admittedly our sampling is not random and is often poorly distributed, but consistency between years minimizes bias error when results are stated in an index format.

Problems with "Correct" Methods

Sophisticated "correct" methods face the truly stupendous problem of defining a usable sampling frame. Besides basic model assumptions having to be met, population strata or ranges are virtually impossible to realistically delineate for statewide utility. In practice delineation of any boundaries is arbitrary, nonconsistent, and variable both seasonally and over longer periods. Habitat and general land use through the range varies both quantitatively and qualitatively. Topographic features and access avenues for survey purposes further compromise application of closely prescribed field techniques.

These considerations are of high impact at the state level because of the relatively enormous areas involved. Even the simplest possible design using a systematic mile grid, for example, would number over 50,000 points and the path total connecting such points would be about 100,000 miles. Such commitments are vastly beyond reach. This highlights the appeal of exploiting existing field deployment of personnel and also demonstrates the futility of attempting to represent this vast area by a very few local high precision efforts no matter how excellently done. Leopold (1933:169) stated "In censusing a large area, it is harder to select representative samples than to count the game thereon. Samples... must be numerous..."

Indexes yield a census when the index condition, which is subject to measurement, varies with the population which is not.

Either indexes or samples can be used to determine population trends in time." Bump, et al. (1947:676) stated "Enough has been said to make it apparent that no one census method applicable to all conditions is to be found."

Evaluation

We recommend simple plotting of survey data from the more consistently performing surveys. Conjectures can then be made on trends rather than attempting to calculate "precise" values. Typically, the gross confidence limits, if calculated would leave one with coarse estimates anyway. Conclusions are most confidently drawn when most indexes reflect a similar change. For example, a northern forest forecast for the 1973-74 hunting season would have been crystal clear. Every index suggested a marked decline in grouse abundance. Wildlife managers could have reported with confidence (and most did), that northern grouse numbers had declined substantially. By the next hunting season (1974-75) managers could have concluded that grouse abundance had further declined and was at a very low level. Survey results were mixed preceding the 1975-76 season. Some indexes indicated a further decline and others indicated a slight increase in grouse numbers. However, it was evident from the trends that grouse numbers were still at a very low level. If an actual increase had occurred, it would probably have been too slight for sportmen collectively to detect. A forecast for 1975-76 would thus again emphasize a very low population level.

When trends of various surveys disagree greatly, those that have shown the greater consistency may be given greater weight. The roadside drumming index showed the most consistent pattern of change, and agreed most commonly with other survey indexes, particularly harvest estimates. Trends shown by the 10-week brood survey appeared quite similar to the other surveys, except in 1970, which was the first year for this revised brood survey.

Survey trends were markedly more highly correlated in the north than in the southern portion of Wisconsin. Statewide estimates were derived from the aggregation of northern and southern data. Thus, the estimates of grouse abundance were best for the northern...
forest, second statewide, and poorest for the southern portion of Wisconsin. The better agreement among northern surveys was most likely due to the greater amplitude of grouse fluctuations in the North. Keith (1963) concluded that evidence for greater fluctuations at higher latitudes was widely reported, but inconclusive. He subscribed to Leopold's (1933) theory that fluctuations are greater on large, continuous tracts than on small, dispersed, or discontinuous blocks of habitat. Northern forest habitat in Wisconsin meets both criteria. It occurs at a higher latitude and consists of a much more extensive and continuous habitat than occurs in southern Wisconsin.

A limitation of extensive surveys is that they usually cannot accurately be applied to localized areas due to the greater variation inherent to characteristics of small units.

Art of the Possible

Conducting state level surveys is truly the "art of the possible". Typically, budgets are low, manpower is short, and logistics can be complex. Ad hoc methods, therefore, become the "possible" alternative and management personnel must school themselves to accept their relative nature and limited information content. Agonizing over this qualified state when our management effort usually uses a broad brush may represent a misplaced concern. Even though ad hoc, conscientiously carrying out these surveys enables a documentary record to be posted which can serve as a guide of the field situation.

Continuing efforts should be made to take advantage of any opportunity for improvement that may present itself. Any technique in addition to those discussed that has wide potential for utilization at relatively low cost should be exploited. There are many ways to represent status or abundance and a wide spectrum of information levels. A hierarchy of these may be simple presence in the state (or county); qualitative, as rare or common; a ranking, as major to minor; indexes of abundances or trends as used here; hard number estimates on large units; and complete enumeration on small units. All of these provide useful information in the sense that lacking a higher level of information, the next lower step becomes useful.

Estimation of relative grouse abundance appears to be practical and data can be obtained at different periods of the year. Major changes should be evident in both the northern and the southern range and minor changes will be frequently indicated in the northern indexes. While the indexes use numerical values, no attempt should be made to utilize these as true density representations; this is true even for the harvest estimates.

Wisconsin's grouse survey system provides wildlife managers with perspective as well as an estimate of grouse status. Carrying out the surveys helps managers to maintain a degree of field contact with grouse populations and habitats. Good continuity of survey information of several types provides long-term records so that current levels of grouse abundance can be related to those of previous years.

It is recommended that the surveys described here be continued as a sustained minimum effort until higher level techniques can be brought into reach.

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