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BOBWHITE AND THE "NEW" BIOLOGY

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Abstract: Phrases and concepts familiar to traditional wildlife managers like carrying capacity, annual surplus, and edge are being replaced in the literature and at conferences by terms such as biodiversity, metapopulations, and fragmentation. I raise the question of whether this new vocabulary merely represents trendy buzzwords of the 1980's, or is it relevant to bobwhite management in the 1990's and beyond? Some aspects of the "new" biology appear to differ from traditional wildlife management primarily with respect to scale, and may therefore be applicable in dealing with relatively isolated populations in dissected habitats. Others, however, reflect more basic differences in philosophies and agendas. Implications for future bobwhite management are discussed.

Key words: conservation biology, landscape ecology, management, northern bobwhite.

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Those of us old enough to remember the First National Bobwhite Quail Symposium in 1972 are familiar with such terms as carrying capacity, edge effect, annual surplus, travel lanes, huntable populations, interspersions, succession, and inversity. These phrases and concepts have been part of the lexicon of quail biologists since the days of Stoddard, Leopold, and Errington. Nowadays, however, at conferences or in the literature we are more likely to hear about biodiversity, fragmentation, metapopulations, minimum viable populations, population vulnerability analysis, connectivity, heterogeneity, and patch dynamics. This is clearly not the vocabulary of traditional wildlife management, but rather of what might be called the "new" biology, consisting primarily of Landscape Ecology, Restoration Ecology, and Conservation Biology. The question I would pose is: Are these terms and concepts merely trendy buzzwords of the 1980's, or are they relevant to bobwhite management in the 1990's and beyond? At first glance, they may seem to be just fancy new ways of saying the same old thing (e.g., corridors instead of travel lanes, heterogeneity instead of interspersions). On closer inspection, however, certain of the new terms connote a somewhat different perspective related primarily to scale. By scale, I mean the relative size (extent) of the geographic area of concern and the relative detail (resolution) with which information about it is conveyed. Other aspects of the "new" biology appear to reflect more basic differences in general philosophies of wildlife management. The following essay evolved in large measure from stimulating discussions with colleagues R. Gates, W. D. Klimstra, M. McKee, and A. Woolf.

PERSPECTIVE

When habitat was abundant and well distributed, bobwhite research and management often concentrated on site conditions or local situations. Traditional approaches to habitat management (e.g., Ellis et al. 1969, Landers and Mueller 1986) and evaluation (Baskett et al. 1980, Schroeder 1985) generally focused on discrete areas without regard to their orientation in physical space. Population research and management likewise often ignored spatial aspects (e.g., Errington 1945, Kabat and Thompson 1963, Roseberry and Klimstra 1984). However, present-day land use has eliminated or dissected much upland habitat leaving remaining habitats distributed in relatively isolated patches separated by tracts of inhospitable land or other barriers, a phenomenon known as habitat fragmentation (Wilcove et al. 1986:237). This and other associated trends have necessitated a broader perspective in dealing with current management issues and problems.

Habitat fragmentation is a problem most commonly associated with forests and forest communities (Burgess and Sharpe 1981, Harris 1984). However, the increasingly patchy aspect of upland wildlife habitat is a growing concern as well (Roseberry and Klimstra 1984, Kenney 1985, Temple 1992). Earlier, less intensive agriculture, with its small fields, diverse cropping patterns, and network of hedgerows and brushy fencerows provided bobwhite with (in the new vernacular) a fine-grained, heterogeneous landscape characterized by a high degree of connectivity. Such landscapes facilitated exchange of individuals and genetic material between and among neigh-

boring coveys and groups of coveys. In contrast, rural landscapes today are often homogeneous and coarse-grained where the land is flat and fertile, and extensively invaded by exurban development where it is not (Forman and Godron 1986). In many parts of the upper Midwest, bobwhite now occupy a mosaic of small, relatively isolated patches of habitat separated from similar areas by physical barriers or large expanses of bare ground.

Implicit in this situation is a net loss of habitat for bobwhite and attendant decline in abundance that has been documented throughout much of their range (Brennan 1991). But what about populations that occupy the patches of remaining habitat? Are they at greater risk because of their relative isolation as earlier suggested by Roseberry and Klimstra (1984); and if so, do they require special attention? To address this question, Gilpin and Soulé (1986) introduced the concept of Population Vulnerability Analysis (PVA), also referred to as Population Viability Analysis (Murphy et al. 1990). This approach identifies 4 primary sets of factors that affect the relative vulnerability or viability of local populations: (1) genetic, (2) demographic/life history, (3) environmental, and (4) spatial (Shaffer 1981, 1987; Gilpin 1987; Murphy et al. 1990).

At the Second National Bobwhite Quail Symposium, Klimstra (1982) warned that because living conditions for bobwhite were changing, existing knowledge might not always be sufficient to address new situations and problems. This is especially evident when attempting to apply PVA to relatively isolated bobwhite populations in dissected landscapes. For example, there has been scant research on the genetics of wild bobwhite, especially population genetics (Gutiérrez et al. 1983, Ellsworth et al. 1989). Important parameters such as relative plasticity, gene flow, and susceptibility to inbreeding are largely unknown. In addition, there are aspects of population dynamics that are not well understood for isolated populations, e.g., the role of ingress in maintaining population stability, the potential impact of concentrated hunting and predation, and implications of possible cyclic fluctuations. Certain demographic characteristics of bobwhite, especially their high annual population turnover, would seem to increase the vulnerability of small, isolated populations. Peak autumn densities are routinely reduced 50-80% by late winter—a seemingly dangerous situation for such groups. On the positive side, bobwhite can achieve high reproductive output and rapid population growth under

favorable conditions. However, conditions are not always favorable due to climatic stochasticity and habitat perturbations. In the Midwest, severe winters periodically depress populations to very low levels (Roseberry and Klimstra 1984); droughts produce similar effects in the Southwest (Lehmann 1984). As Shaffer (1987) noted, susceptibility to stochastic, catastrophic events increases the vulnerability of small, relatively isolated populations. Coupled with the vicissitudes of weather, bobwhite occupy habitat that is transitory by nature. They need a relatively small amount of dense vegetation for protective cover and a proportionately larger amount of early successional vegetation for roosting, feeding, nesting, and brood rearing (Rosene 1969). This combination creates an inherently unstable situation. Early successional vegetation requires a moderate amount of periodic disturbance for creation and maintenance, whereas the persistence of heavy cover requires that disturbance not be too frequent or too extensive. Bobwhite habitat thus can be adversely affected by too much human disturbance, or not enough; a tenuous situation for small, relatively isolated populations.

The viability of local populations depends not only on their own attributes, but also on certain spatial and temporal characteristics of neighboring habitat patches and resident populations (i.e., the metapopulation). The distribution of habitat patches, their degree of connectivity, patterns of occupancy, and turnover rates (extinction and recolonization) are aspects of habitat evaluation that are relatively new to wildlife managers. Likewise, movements of individuals between patches and identification of source and sink populations are relatively recent concerns. However, the increasingly patchy nature of upland habitat demands that increased attention be given to the spatial structure of habitats and populations.

Site management skills and approaches will continue to play an important role in future bobwhite management. It is clear, however, that certain management issues and problems must be addressed from a broader (i.e., landscape or regional) perspective. Strategic planning often requires assessment of habitat over relatively large areas. Even site management (e.g., recommendations to landowners regarding Conservation Reserve Program fields) requires consideration of area-wide habitat conditions. Therefore, quail biologists will need to incorporate certain concepts of Landscape Ecology into their thinking. They will also need to exploit the emerging tech-

nologies of remote sensing, computer-aided Geographical Information Systems, and habitat modeling.

PHILOSOPHIES

Thus far I have talked about aspects of the "new" biology that differ from traditional wildlife management principally with respect to scale or perspective, i.e., site or local vs. landscape or regional. However, there appear also to be more basic differences involving philosophies and agendas (Temple et al. 1988). This was the subject of a provocative series of essays appearing in the *Wildlife Society Bulletin* (Anonymous 1989, Bolen 1989, Capen 1989, Edwards 1989, Teer 1989, Wagner 1989). Basically, traditional wildlife management has been criticized for (1) concentrating on single species rather than biodiversity or communities, (2) overemphasizing consumptive use and game species, and (3) stressing the practical while ignoring theory. As I have stated before (Roseberry 1982), the third criticism may have some validity, but I will not dwell on that here. Instead, I would like to focus on the first 2 related criticisms, i.e., overemphasis of single species and consumptive use research and management.

First of all, we should not be apologetic about our concern for the welfare of an individual species. Despite all the talk about biodiversity and ecosystems, many within the ranks of the "new" biology are also strong advocates for particular species or groups of species, be it California condor (*Gymnogyps californianus*), red-cockaded woodpecker (*Picoides borealis*), or neotropical warblers. Granted, the bobwhite is not an endangered species, but it may be threatened as a viable game species in the not too distant future (Brennan 1991). Furthermore, certain game-bird species, including the bobwhite, are valuable sentinels for monitoring highly disturbed agrarian ecosystems (Potts 1986, Warner 1992).

Nor should we apologize for our interest in a particular game species, or for consumptive use in general. That natural resource management has benefitted greatly from sportsmen's dollars and support is a legitimate, if sometimes overstated, argument. In many parts of the country, areas initially saved or acquired primarily as game habitat represent the only substantial tracts of land not intensively developed, plowed, or logged. In addition, research on exploited species has contributed significantly to our general understanding of population ecology. It is also true that many of us were initially attracted

to the profession by an interest in hunting—hence a preoccupation with consumptive use is somewhat understandable.

We must realize, however, that it will no longer necessarily be "business as usual" in dealing with natural resource agencies. As Bob Dylan said, "The times they are a-changin'." And to keep up with the times, Wagner (1989:359) felt the wildlife profession must "...make a commitment to the full range of values which society assigns to wildlife resources..." Many state agencies have already begun to do just that by adding nongame programs and even changing their names to reflect broader constituency interests (Bolen 1989). Changes are also taking place in the classroom where future wildlife biologists are even now being trained and educated. This is typified by the recent comment of a wildlife educator (and past editor of the *Wildlife Society Bulletin*): "I spend more classroom time on concepts such as population viability, founder effect, island biogeography, habitat fragmentation, and biodiversity and less time on traditional topics such as harvestable surplus, carrying capacity, and inversivity" (Capen 1989:336).

Even the formerly sacrosanct concept of edge is being reexamined (Reese and Ratti 1988, Yahner 1988). As Hunter (1987:66-67) pointed out: "...the admonishment to 'avoid fragmenting forests' is almost directly contrary to 1 of the oldest ideas of game management, namely to 'create more edge'." Nowhere is this more evident than in midwestern National Forests such as the Mark Twain, Shawnee, and Hoosier where attempts to manage for upland wildlife have come into direct conflict with those wishing to manage for forest interior species. Admittedly, the call for increased biodiversity but reduced fragmentation sometimes leaves wildlife managers scratching their heads at the seeming paradox. This again gets back to the matter of spatial scale, however. What constitutes diversity, heterogeneity, and fragmentation often depends on whether the situation is viewed from a local, landscape, or regional perspective (Meentemeyer and Box 1987, Wiens 1989).

Wildlife managers in the future will likely be required to justify their actions more in terms of "the big picture." Just as there are often practical advantages to considering area-wide conditions when making site recommendations, there may be philosophical reasons as well. In commenting on the appropriateness of Aldo Leopold's (1949) land ethic for the 1990's, Decker et al. (1991:6) wrote: "Landowners and resource managers must

understand the significance of geographic scale [and] move their consideration from the small scale of a property to the larger scale of ecologically significant geographic areas." This does not mean that quail biologists and quail hunters should not continue to work for and promote the welfare of the bobwhite. Especially as it can be demonstrated that land-use practices conducive to bobwhite abundance also benefit a large community of other species and, indeed, the land itself (Roseberry and Klimstra 1984). We must recognize, however, that certain traditional management prescriptions may not always be appropriate or justified in every situation (e.g., "wildlife" openings in otherwise unbroken old-growth forests). On the other hand, some "new" management initiatives (e.g., restoration of former prairie or savannah areas) offer substantial potential benefit for bobwhite.

Our country's wildlife resource base-game and nongame alike-is being progressively eroded by an expanding human population and by those who could not care less about conserving it. Therefore, I would tend to agree with Anonymous (1989) and Bolen (1989) that despite some very real and fundamental differences in priorities, there is sufficient commonality of purpose-and that purpose is sufficiently important-to make an alliance of traditional "wildlifers" and "new" biologists essential if we are to salvage at least a portion of what remains of our natural heritage.

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