FOREST GROUSE AND MOUNTAIN QUAIL INVESTIGATIONS

a final report

for work completed during the summer of 1992

prepared by

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I. PURPOSE AND ORGANIZATION OF THE REPORT.

This report is a summary of work conducted on forest grouse and mountain quail during the spring and summer of 1992. The main purpose of this report is for review by the staff of California Department of Fish and Game (CDFG) and collaborating state and federal agencies. Methods and findings are discussed briefly for each species investigated, and recommendations are provided for follow-up activities. Other documents resulting from this work include Bland (1992a), Bland (1992b), Bland (in prep.) and Bland and Layne (in prep.).

II. SIERRA BLUE GROUSE.

Methods:

Locations of hooting sites: Surprisingly little information was readily available on the locations of traditional blue grouse hooting sites in California (Bland 1992a). Several potential areas were suggested by CDFG, Forest Service (USFS), and National Park Service (USNPS) personnel however, and these areas were searched between April 15th and May 26th, 1992. The areas searched were located within Lassen Volcanic National Park (LVNP), Lassen National Forest (LNF), Yosemite National Park (YNP), Sierra National Forest (SiNF), Sequoia/Kings Canyon National Parks (SeNP) and Sequoia National Forest (SeNF). Within the suggested areas, sites with south-tending slopes and open canopies of red or white fir were searched in particular. The investigator walked from the bottom of such slopes to the top, playing recorded female grouse calls every 200 to 500 m, and listening for male grouse to respond. When male grouse were detected, the approximate number of grouse was assessed, and their location marked on a topographic map. An effort was made to find hooting groups in both harvested and unharvested forests.

Establishing Hoot Count Transects: Three pairs of hooting groups were chosen for intensive study. One hooting group from each pair was located in a National Forest (managed forest), and the other in a nearby National Park (unmanaged forest). The northern-most pair was located in the Lassen Region (LVNP and LNF), a central pair was located in the Yosemite Region (YNP and SiNF), and a southern pair in the Sequoia Region (SeNP and SeNF) (Figure 1). The exact location of each hoot count transect is provided in Appendix 4. Aerial photographs of transects, where available, were deposited with the Wildlife Management Division of CDFG in Sacramento.

The approximate perimeter of each hooting group was first assessed by walking quietly through the area and determining each bird's approximate location. Then, with a compass and measuring wheel, a 1,000 m transect was laid out so it bisected the group into

eastern and western halves. Eleven listening stations (trees), spaced 100 m apart along the transect line were then marked with yellow Trailite Markers (Forestry Suppliers, Jackson, MS), labeled with the initials `CDFG,' and numbered in sequence from 1 through 11 (Figure 2). The species and diameter (DBH) of station trees were recorded, and the locations of the transect and its listening stations were recorded on an aerial photograph. A more detailed explanation of the methods used to establish hoot count transects has been provided elsewhere (Bland 1992b).

Hoot Counts: Hoot counts were conducted between May 9th and June 5th. The peak in hooting activity for Sierra blue grouse is commonly thought to occur during the month of May. Previous studies have shown that during the hooting season virtually all territorial male blue grouse within audible range make themselves evident to an observer after as few as six independent counts (Stirling 1966).

Initially, hoot counts were conducted throughout daylight hours, but after May 15th a marked decline was observed in mid-day activity so thereafter counts were conducted only at dawn and dusk. Beginning at the first (or 11th) station, the observer made note of the approximate location of all audible males on a *Hoot Count Data Form* (Figure 3). Recorded female "whinny" (Stirling and Bendell 1970) and "cackle" (Hannon 1980) calls were then broadcast in all directions to stimulate additional males to hoot. The locations of additional males were likewise recorded. Recorded calls were used sparingly, and in short bouts so the observer could hear responding males. Some males were so aggressive that if recorded calls had been played for longer periods the birds would have traveled hundreds of meters to investigate the calls, thus biasing the observer's impression of where the bird's territory was located. To minimize this effect, locations of more vocal (aggressive) males were recorded *before* playing recorded calls, and afterward calls were played to stimulate less aggressive males to reveal themselves.

After the approximate locations of hooting males around the first station were recorded, the observer located each bird and marked the tree it had been hooting from or near (birds were occasionally observed hooting from the ground). The 'hoot tree tags' used for this purpose were numbered sequentially, and placed about 1m up from the base of each hoot tree (Figure 2). The species and DBH of hoot trees were recorded on a *Hoot Tree Data Form* (Figure 4), and the location of each hoot tree was recorded on an aerial photograph. The aerial photographs used were enlargements (ca. 1cm = 50m) of 9in x 9in black and white negatives (USGS EROS Center, Sioux Falls, SD).

After completing a census of the first station, the observer moved to the next listening station in secession, repeating the above procedure at each station. If rainfall or wind speeds would have been excessive at more than three stations the count would have been postponed until at a later date, but such adverse conditions never

occurred. A more detailed step-by-step procedure for conducting hoot counts has been provided elsewhere (Bland 1992b).

Hoot Count Data Analysis: The number of territorial males along each transect was determined by `spot-mapping' (Williams 1936, Svensson 1970). The `minimum territory' of a male was delineated by projecting lines between the outer-most hoot trees in which it had been observed (Appendix 1). The aerial photo overlays (or summaries of *Hoot Count Data Forms* when photographs were not available) used to determine the number of grouse territories in each hooting group are attached as Appendix 1. It is important to note the process for determining numbers of territorial males in hoot groups was somewhat subjective. Its precision would have improved with additional data (hoot trees/runs), but only slightly. Thus, the territorial boundaries determined this year may need to be altered slightly in successive years. As more data are accumulated, minimum known territories will increase in area, and the precision of boundary designations will improve.

Rarely, it appeared as though an additional male may have been present during one of the transect runs. With the technique used, such males were assumed to be non-territorial interlopers or territorial males that had inadvertently been counted twice (eg., followed recorded calls along the transect). Since individual males were not marked during this investigation it was not possible to identify birds as individuals when observed.

Habitat Analysis: Habitat characteristics were measured within the hooting territories of all territorial male grouse. The center of a grouse's territory was designated subjectively in the field as a central point between the hoot trees in which the bird had been observed. Four 100m data-collection 'radians' were projected from the territory center, each oriented in a different cardinal compass direction. 'Vegetation plot centers' (VPC's) were then established every 20m along each radian, resulting in the array of vegetation sampling points depicted in Figure 5. Twenty sampling points was found to be a statistically adequate sample size by using Daubenmire's (1959) 'running means' technique on several of the parameters measured. Several habitat parameters were measured at each VPC (Appendix 2). Canopy cover was measured by taking 4 sample readings from a spherical densiometer (Forestry Suppliers, Jackson, MS). Cover classes for litter, grasses/sedges, herbs, and woody shrubs were classified within four $0.1m^2$ 'Daubenmire rectangles' (Daubenmire 1959). The 4 rectangles were placed 1m from the VPC, each in a different cardinal compass direction. The frequency and basal area of canopy trees near VPCs were sampled with the point-centered quarter technique (Cottam and Curtis 1956). Other parameters measured at VPCs included: number of cut stumps within a 20m x 40m area, aspect, slope, depth of twigs, and depth of soil humus (*A* horizon). More precise definitions of the parameters and cover classes used are provided in Appendix 2. Two photographs were

taken of the vegetation profile at the mid-point of each radian. A $1m^2$ white panel was erected at the radian mid-point, with the plane of the panel oriented up and down slope. Photographs were taken of the front and back sides of the panel from a distance of 20 m. These photographs (8 for each territory) will be used to produce idealized vegetation profiles of hooting territories, similar to those provided by Bendell and Elliott (1967) for blue grouse habitats on Vancouver Island (Figure 6).

Time and manpower were not sufficient to permit an analysis of vegetation in areas which were not occupied by territorial grouse. Such data will be desirable, however, to determine the degree to which habitats selected by territorial male grouse differ from other available habitats. Future research on Sierra blue grouse habitats should include a comparison of occupied and unoccupied habitats. Such information could be collected as an extension of this study by collecting additional data at: 1) station trees within a hooting group where no grouse has established a territory, 2) randomly- or systematically-located points beyond the periphery of the hooting group, or 3) randomly- or systematically-located points throughout a large area of forest.

Results:

At this time, only a portion of the data on Sierra blue grouse habitats has been analyzed. A full account is anticipated for future publication (Bland and Layne, in prep.). Preliminary results are presented here.

Surveys for territorial males in suggested areas: Table 1 indicates the number of hooting males detected at each site in relation to the distance, area, and observation time. Topographic maps indicating the locations of survey routes and hooting grouse are provided in Appendix 3.

Overall, territorial blue grouse were not particularly abundant. Sixty-nine and a half hrs of foot surveys in suggested areas produced only 40 hooting individuals, in 14 hooting groups. The groups were not evenly distributed through what appeared to be good habitat. Most groups were composed of from 1 to 5 hooting individuals. Few territorial males were found in stands where signs of timber harvest were evident, but several territories were found at the very perimeter of harvested areas. Where birds were found deep within harvested areas, such as on the upper west-facing slope of West Prospect Peak (Hat Creek Ranger District, LNF), it was apparent that scattered clusters of large firs and Jeffrey pines had been left standing after harvest. The early literature on blue grouse habitats, which originated primarily from coastal Canada (eg., Bendell and Elliott 1966, 1967), emphasized that the highest densities of grouse were found in harvested stands. The findings of this investigation, however, correspond more closely with more recent work in coastal Alaska (Doerr et al. 1984) where much higher

densities were observed in old-growth forests.

A majority of hooting groups were located at the upper portions of slopes, often within a few hundred meters of a ridge or plateau. This may have been in part a result of more extensive timber harvest at lower elevations. However, territorial grouse probably prefer the naturally open stands that grow in the patchily-distributed soils of upper slopes. By establishing themselves on upper slopes, hooting grouse can also take advantage of downslope drafts to effectively increase the range of their calls.

The apparent preference of Sierra blue grouse for unharvested stands was reflected in the proportion of hooting groups found inside and outside National Parks and Wilderness Areas. Although 58% of the surveyed area (60.8 out of 104km) lied outside park and wilderness boundaries, 21 (51%) of the 41 hooting grouse observed were located within park or wilderness boundaries, 13 (32%) were no more than 2 km outside park or wilderness boundaries, and only 7 (17%) were more that 2 km beyond park boundaries. The greatest distance any individual was found from a park or wilderness area was 3.5 km.

The relative abundance of blue grouse in parks and wilderness areas may be due in part to the fact that the national parks included in this study were generally located at higher elevations than managed forests, and fir forests at the elevation of the parks tended to be more open. However, the apparent abhorrence of territorial Sierra blue grouse for harvested stands should receive more serious consideration.

From the general observations made during these surveys, the habitats used by territorial male Sierra blue grouse can be characterized as being open, mature, *Abies/Pinus* forests on or near ridges between 5,500 and 9,000ft elevation, in areas where snowpack is likely to melt early because of southerly aspect, open canopy, or poorly insulated substrate.

Numbers of territorial grouse along hoot count transects:

The estimated number of grouse holding territories along 1km hoot count transects ranged from 3 to 5 (Table 2). Smaller groups were found during initial surveys, but they were not used for hoot count transects because more individuals were required for the statistical analysis of grouse habitats. Individuals with territories located beyond audible range of the 1 km transect would have gone uncounted, so groups larger than 5 may also have been present. An effort was made to orient transects so they came near all individuals in a group, but since all individuals were not known this was a subjective process.

Because of the linear nature of hoot count transects, the data from these counts most accurately reflect the density of hooting males within a rectangular area bisected by the transect, rather than the total number of hooting grouse in a resident group. The typical maximum distance hooting males were heard from the transect

was about 150m (1-1/2 listening stations), so hoot counts covered a maximum area of about 30 ha (300m x 1,000m). Local variations in topography and vegetation make it impossible to state the exact area censused in each case, but 30 ha can be considered a maximum. For the same reasons, densities calculated for transect areas can be considered minimum estimates.

Many previous studies have assumed the total population of blue grouse to be twice the number of hooting males, even though the ratio of hooting males to non-territorial males and females were not known. Assuming a (maximum) census area of 30ha for this investigation, the (minimum) density of territorial male grouse within the 6 hooting groups investigated ranged from 10 to 17/100ha (Table 2). Further assuming that there were 3 non-territorial or juvenile males for every territorial male (Boag 1966), and a sex ratio of 1:1 (Bendell and Zwickel 1984), the (minimum) population density of grouse *within hooting groups* would range from 80 to 140/100ha. Table 3 indicates these figures fall well within the range of density estimates reported elsewhere, though it is often difficult to determine whether published data were taken from within hooting groups or over larger areas. An extensive literature search revealed no previous estimates of population densities for Sierra blue grouse.

This investigation provided insufficient information to assess the densities of Sierra blue grouse over large areas, such as Forest Districts. However, specific recommendations for addressing this question have been presented elsewhere (Bland 1992b).

Habitat characteristics of grouse territories: Habitat characteristics of 26 male grouse territories were documented during this study. A thorough habitat analysis is planned for a future publication (Bland and Layne, in prep.). One habitat feature that has been analyzed tentatively is the occurrence of large trees in blue grouse territories, which differed markedly in territories within harvested and unharvested forest (Figure 7). In both harvested and unharvested forests, the number of young trees (< 27.9cm DBH) declined with age, as a natural result of competition. However, the frequency of tress between 28 and 122cm DBH ('saw timber') was much greater, as one would expect, in unharvested stands: 40 to 75% versus 15 to 55%. Likewise, the frequency of massive trees (>122cm DBH) ranged from 10 to 30% in unharvested stands but never exceeded 5% in harvested stands. While these differences are typical of sylvicultural practice, these findings suggest that sylviculture, as it has been practiced in the Sierra Nevada, may have a pronounced effect on blue grouse populations. A tentative analysis of the data collected during this study suggests a distinct positive relationship between the densities of territorial grouse and the relative frequency of trees with DBHs greater than 28cm (Figure 8).

Recommendations:

Recommendations for conservation and management of Sierra blue grouse resulting from this investigation have been presented

elsewhere (Bland 1992b).

III. COASTAL BLUE GROUSE.
Methods: The methods used for this roadside count were the same as those used at the site between 1964 and 1976 (Bauer 1967, CDFG unpublished data). The roadside count technique does not allow density estimation, but it does serve as an index to grouse abundance. The Mendocino Pass roadside count was re-initiated after a lapse of 15 years to determine if significant changes had occurred in the abundance of blue grouse in the vicinity of Mendocino Pass. This year's count was conducted on May 20th from 07.00 to 09.55. The sky was slightly overcast, the air was calm, and temperatures ranged from 43 F at 07.00 to 62 F at 09.55.
Results: A total of 18 hooting grouse were detected. Because the count was conducted on a single occasion only, it is likely that some grouse went undetected. Furthermore, because the transect follows a winding road, and the relative locations of detected grouse were not recorded, it is likely that some individuals were counted more than once. This year's total of 18 birds was considerably higher than the 1964-1976 average of 12.6 birds. Greater numbers of hooting grouse were detected in only 4 of the 13 previous counts. The status of blue grouse along Mendocino Pass Road appears to be good.
Recommendations: The Mendocino Pass area should be designated as one of the survey sites recommended in the *MPFGC* (Bland, in prep.). Thereafter, the traditional roadside count should be discontinued. The combination survey/hoot count technique recommended by Bland (in prep.) will provide much more reliable data. Data collected with the traditional roadside count is seriously flawed because only a single sample is taken each spring, and because it is not possible to determine whether individual hooting males were counted more that once. As a result, the 9 years of data collected previously fluctuate so widely (SD=6.9, CDFG unpublished data), with no discernable pattern, that they are of questionable value.

IV. RUFFED GROUSE.
Methods: The objective of this project was to initiate annual counts of ruffed grouse along roadside transects in order to: 1) determine the distributional limits of ruffed grouse in California, 2) document environmental factors which might limit their distribution, and 3) monitor distributional expansions or contractions of California's ruffed grouse population.

Four 20-mile roadside census routes were established at the periphery of ruffed grouse range in northwestern California (Bland 1992c). The routes ran along secondary automobile roads extending through the known distribution of ruffed grouse (Yocum 1978) and into outlying areas. The first route extended northeast along highway 96, from Bluff Creek Campground toward Lone Pine Bar. The second extended from Hawkins Bar on Highway 299 along Denny Road toward

Jim Jam Ridge. The third extended north from Hayfork along Big Creek Road toward White Bar picnic area. The fourth extended south from Bridgeville toward Alderpoint.

Counts of drumming grouse were conducted according to Bland (1992c), and the standard roadside drumming count technique (Petraborg et al. 1953, Dorney et al. 1958, Gullion 1966). Each count began at 05.30 on days with little or no precipitation or wind, and continued for no more than 3hr. The investigator stopped at 20 sites along the each route which appeared to provide potential ruffed grouse habitat. Stops were no less than 1 mile apart. At each stop the investigator recorded the exact odometer reading, and the location of the site on a topographic map. He then walked several meters into the habitat to listen for drumming grouse. The total number of drums heard during a four minute listening period was recorded at each site, as were weather conditions and plant phenology (following Gullion 1966: Figure 1).

Results: Each of the four roadside transects was censused once between 12 May and 15 May, 1992. No ruffed grouse were detected along any of the routes. According to information gathered from local contacts the routes had been established in generally good ruffed grouse habitat. However, these contacts also indicated that the peak drumming period may occur earlier in the year, between the last week of March and the second week of April. Recommendations: It is apparent that an 'extensive' survey such as the one attempted here is not, by itself, an effective means of determining the status of ruffed grouse in California. Although this kind of survey was logistically feasible with the one week of manpower allocated to ruffed grouse this year, it assumed a knowledge of the biology, ecology, and distributional patterns of ruffed grouse which does not currently exist for the species in California. Henceforth, the ruffed grouse 'Action Plan' presented in *A Management Plan for Forest Grouse in California* (Bland in prep.) should be implemented to the greatest degree possible. The plan includes a phased introduction of a local informant network, inter-agency cooperation, determination of drumming phenology and population centers, population and habitat monitoring, investigations of populations and habitats, and application of the findings to population and habitat management.

V. MOUNTAIN QUAIL.

Methods: During blue grouse hoot count surveys the number of mountain quail heard calling or observed at each blue grouse listening station was recorded. These numbers can not be considered a census because the ratio of calling to silent mountain quail was not known. Furthermore, some calling individuals may have been counted more than once. These numbers can, however, be considered an index to the relative abundance of mountain quail in the vicinity of the blue grouse hoot count transects. By tracking these indexes over time it may be possible to infer local trends in the abundance of mountain

quail. The primary objective of the study, however, was to count hooting blue grouse, so the sites and methods used were not optimal for assessing the abundance of mountain quail. The vegetation at blue grouse hooting sites generally consists of open, mature, stands of true firs. The highest densities of breeding mountain quail, on the other hand, occur in large forest openings with little overstory and an abundance of woody shrubs. Since blue grouse often establish hooting territories at the edge of forest openings (Bendell and Elliott 1967, Martinka 1972), mountain quail do sometimes breed in close proximity to blue grouse.

Results: Sierra Nevada Mountains: The number of mountain quail detected along the six 1 km transects ranged from 0 to 21 (Table 4). As would be expected, quail detections tended to increase as the proportion of forest openings increased (Figure 9).

No seasonal peak was detected in calling activity during the period of study, May 9th through June 4th. Furthermore, the number of quail detected per hour of effort during morning counts was not significantly different from that detected during evening counts (4.0 versus 3.6 birds/hour respectively).

Mendocino Pass: Twenty mountain quail were observed or heard along the Mendocino roadside transect for coastal blue grouse. Six valley quail were also observed along the northern half of the transect, where the elevation is lower and open pastures more common.

Recommendations: A series of mountain quail monitoring transects should be established in good breeding habitat throughout the species' range in California. Annual spot mapping of breeding territories along these transects might be considered, with caution, for determining breeding densities. Should spot mapping be determined too time-consuming, a simple index count might be adequate for detecting trends in the abundance of mountain quail. Since mountain quail breed at maximum densities in successional habitats, the vegetation at transect sites should be accurately recorded when transects are first established, and then monitored over time. Vegetative characteristics of particular interest might include overstory canopy cover, basal area of trees, and the height and percent canopy cover of woody shrubs. The areal coverage of different categories of vegetation in the vicinity of transects should be determined and monitored from aerial photographs. The area covered by such categories as dense forest, open forest, dense shrub and open shrub would be of particular interest.

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