PROGRESS REPORT

Tests of Efficient Methods for Assessing Mountain Quail Abundance

CDFW Grant No. P1580057

Game Bird Research Group
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The stated objectives of this project are to: 1) quantify the temporal patterns of Mountain Quail (MOQU) vocalizations by auditory sampling; 2) model the influence of environmental conditions on the audibility of mountain quail vocalizations; and 3) develop an auditory distance decay function for use in mountain quail density estimation. All tasks required to be completed by July 31st, 2016 (tasks 1 and 2), have been completed in accordance with the timeline set forth in the grant agreement.

Field surveys and vocalization sampling of mountain quail

As this project was nearing implementation, CDFW made 13 automated recording units (ARUs) available, making it possible to collect much higher quality vocalization data than possible with the field methods originally proposed. Use of these recorders necessitated that the broad-scale field surveys originally proposed be traded-off for setting up and maintaining ARU arrays (and requisite weather stations). Surveys were therefore limited to three sites where ARU arrays were deployed. Each array consisted of 4 ARUs and a small weather station.

Sites with relatively high densities of singing MOQU were sought within an approximately 170 km^2 area in the 2013 Rim Fire burn area (Stanislaus National Forest, Fig. 1). Sites comprised of one of three general habitat types were considered: closed-canopy forest, open woodland, and chaparral. Single ARUs were deployed at prospective survey sites for 7-10 days to rapidly assess relative MOQU abundance - as well as gather data on the onset of the MOQU singing season. The sites ultimately selected as survey sites also had topographies that facilitated deployment of ARU arrays - essentially heads of small valleys where sound propagation was uninterrupted by terrain (Figs. 2-4). Geographic locations of the survey sites and ARUs are given in Table 1.

Systematic auditory sampling began on April 15th and continued through June 22nd, the date the first MOQU brood was observed. Territorial fidelity ceases after chicks have fledged, although males continue to sing as they move elsewhere. During systematic sampling, ARUs were serviced (batteries and memory cards refreshed) on an approximately 10-day schedule. Routine servicing of ARUs required more than 4,000 miles of travel by automobile. During the 69-day period of systematic auditory sampling, ARUs were programmed to record continuously

(successive 1-hour files), every day from one hour before sunrise until 5 hours after sunrise, and again from 5 hours before sunset until one hour after sunset. Altogether, the 12 ARUs collected a total of 9,936 hours of systematic audio recordings, which occupy 2.2 TB of computer memory. Individual sound files are too large (and uninformative) to submit with this report. Weather data (temperature, wind speed and direction, and relative humidity) were sampled every five minutes, 24 hours/day, during the same period.

Table 1. Locations of survey sites and automated recording units (ARUs).

Survey site	ARU	Latitude, Longitude (WGS 84)
Woodland	1	N37.93022, W120.13496
	2	N37.92634, W120.13248
	3	N37.92590, W120.13728
	4	N37.92907, W120.12970
Chaparral	5	N37.88930, W120.00861
	6	N37.88937, W120.00498
	7	N37.89040, W120.00672
	8	N37.88889, W120.00620
Forest	9	N37.96634, W120.08921
	10	N37.96455, W120.08894
	11	N37.96582, W120.09258
	12	N37.96708, W120.09382

Progress on additional tasks

In addition to completing tasks 1 and 2 by the required date, some preliminary data analyses (task 3) have also been completed. Figure 5 shows how we are using Raven software to compare "arrival times" of MOQU vocalizations at each ARU comprising an array. We have also begun using Sound Finder software to estimate points of origin for calls, based on differences in arrival times. Figure 6 illustrates the distribution of MOQU "queerk" calls recorded during two 10-minute sample periods on the morning of May 2nd, 2016. Preliminary analysis of sonograms indicates many male quail have unique voices, greatly facilitating the attribution of recorded calls to specific territorial males (Figure 6).

Figure 1. The general location of survey sites in Tuolumne Co. (Stanislaus National Forest).

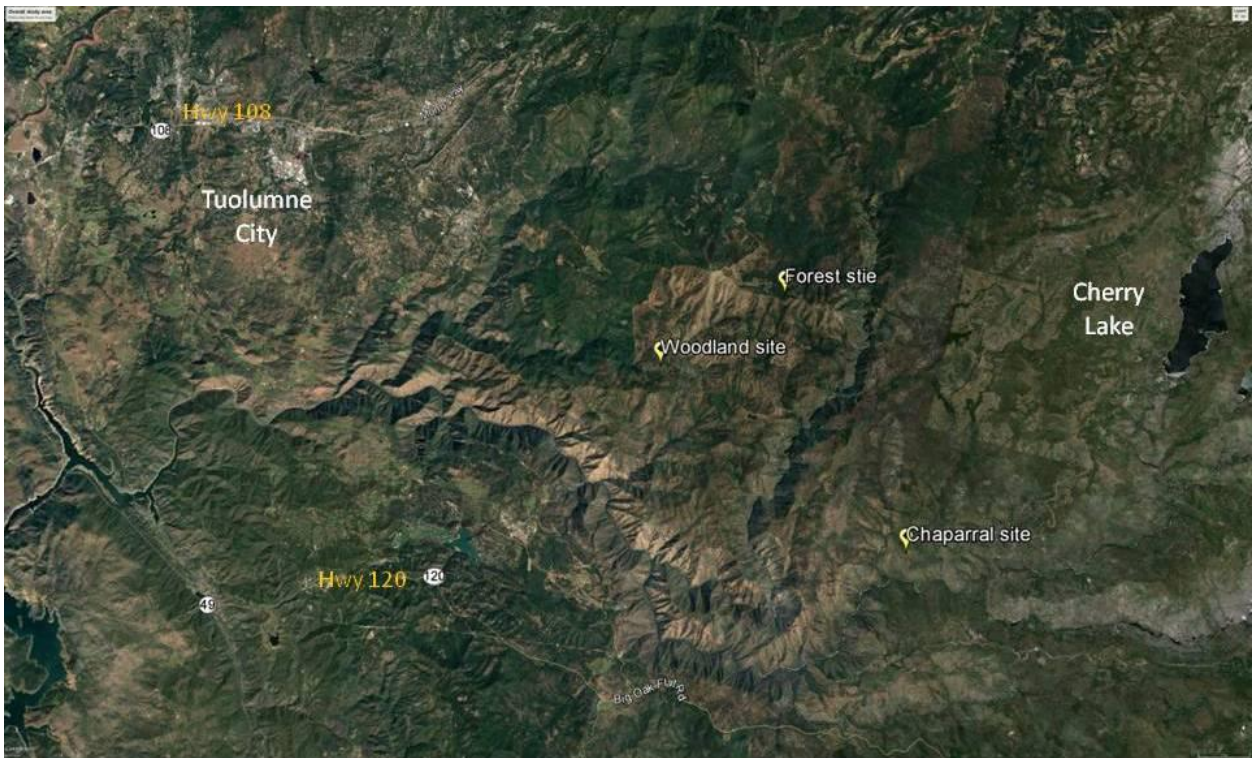

Figure 2. The woodland site.

Figure 3. The forest site.

Figure 4. The chaparral site.

Figure 5. Raven software is used to determine differences in arrival time across an array.

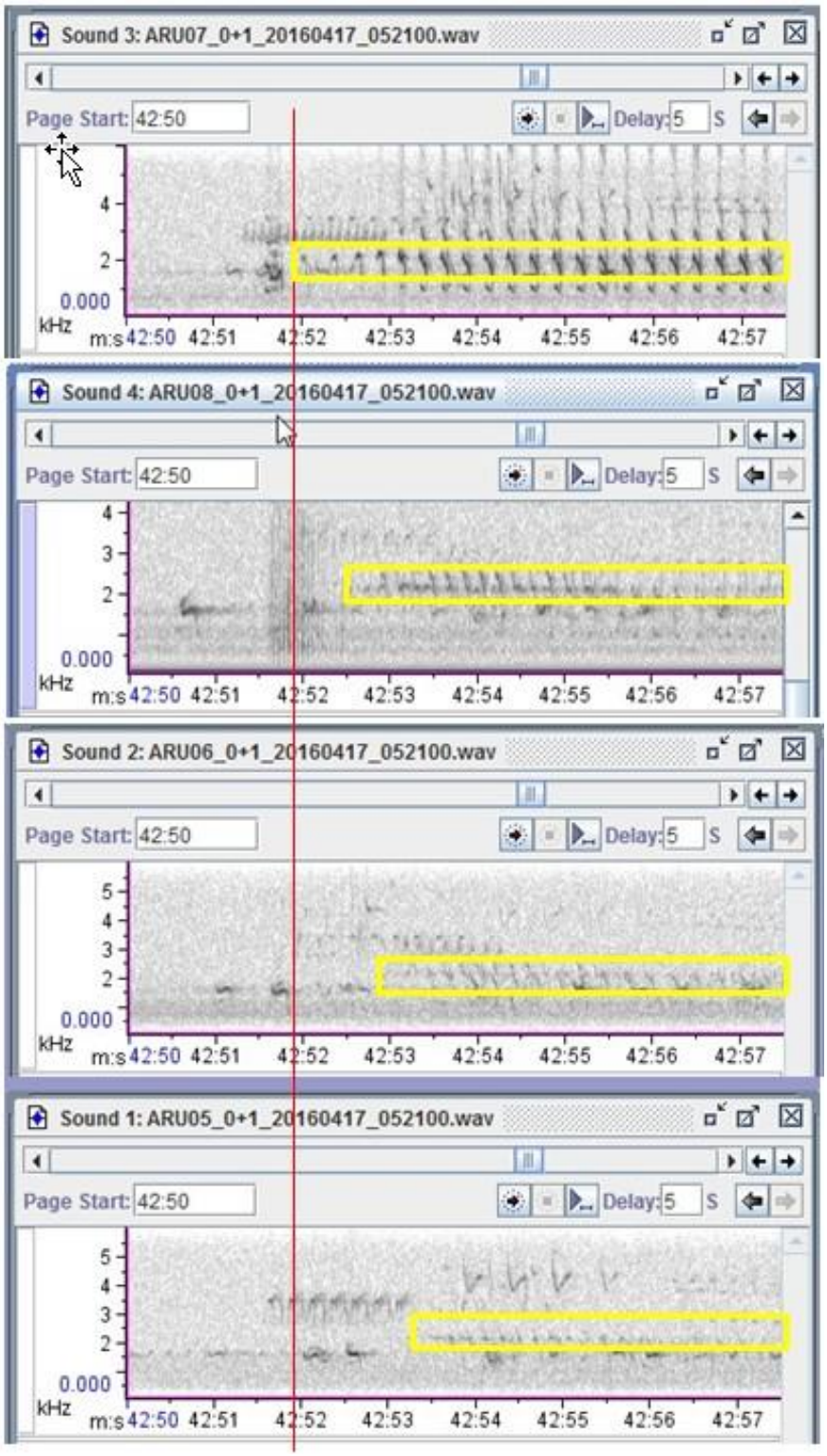

Figure 6. Distribution of MOQU “queerk” calls recorded during two 10-minute sample periods on the morning of May 2nd, 2016. Inset sonograms show individual males have unique voices.