

Upland Stamp Account Grant Application, FY 2015/16

1. Grant Name/Project Title: Habitat distribution modeling for the Sooty Grouse at its southern limit on the north coast of California.

2. Applicant Contact Information: Game Bird Research Group, c/o James Bland, 310-962-7938, Bland_jim@yahoo.com or gamebirdresearch@gmail.com.

3. Issue/Problem Statement: Historically, the Sooty Grouse (*Dendragapus f. fuliginosus*) occurred along California's Coast Ranges as far south as the Russian River in central Sonoma County (Grinnell 1915, Fig. 1). Seventy years ago, Grinnell and Miller (1944) reported it had apparently "disappeared from [the] southern portion of [this] range." Burrige (1995) suggested "a sharp decline [in Sonoma Co.] in the 1950s ... coincident with heavy logging of fir trees." The species' distribution and status have not been duly assessed south of Humboldt and Trinity counties, even though it is hunted throughout the area except in Sonoma County. The Forest Service attempted to monitor population trends with an annual roadside count from 1964 through 1976 along Mendocino Pass Road (FS Hwy 7, northeastern Mendocino Co.). Bland (1993) conducted this count in 1992, after a lapse of 16 years, and concluded the lack of detectable trends in the 17 years of data was probably because the original counting procedures were inappropriate for a communally breeding species. CDFW records (Bland 1997) include only 5 breeding season point locations across the region (March-June; 3 in Mendocino Co., 2 in Sonoma Co.). The U. S. Geological Survey's Breeding Bird Survey detected Sooty Grouse on only one of 12 routes surveyed annually in the region (Ukiah route, www.pwrc.usgs.gov/bbs). The Sonoma County Breeding Bird Atlas (Burrige 1995) cites only 3 breeding season locations in Sonoma County. The eBird database (www.ebird.org), an increasingly popular online archive of sightings by bird watchers, includes 11 breeding season locations south of Humboldt and Trinity Counties since 1983 (4 in Mendocino Co., 2 in Lake Co., 5 in Sonoma Co.). In total, fewer than 40 presumed breeding sites (areas where males have been heard hooting) are documented south of Humboldt and Trinity Counties (Fig. 2).

It is important to inventory breeding sites of the Sooty Grouse because, where the species occurs at low density, it breeds communally, gathering year after year at the same sites (Bendell and Elliott 1967, Lewis 1985, Bland 2013a). These are core habitats, and identifying them is essential for managing local populations of Sooty Grouse.

Sooty Grouse populations in California's northern Coast Ranges are a southern peninsular extension of the species' continental range. The species appears to be vulnerable to extirpation in peninsular habitats, perhaps because habitat conditions become increasingly marginal toward the tip of the peninsula (Bendell and Zwickel 1984). Bland (2013b), for example, found that Mt Pinos Sooty Grouse (*D. f. howardi*) was recently extirpated from the southern end of the Sierra Nevada Mountains, a southward peninsular extension of that subspecies' historic range. In order to forestall a similar extirpation at the southern end of the northern Coast Ranges, remaining breeding sites should be identified and managed in a manner that ensures Sooty Grouse occupancy.

4. Project Description: Recent developments in habitat distribution modeling (Dunning et. al

1995, Phillips et al. 2006) allow researchers to evaluate habitat composition at occupied sites (and thereby characterize habitat attributes for management purposes) as well as model (predict) habitat suitability elsewhere across a region. The Game Bird Research Group (GBRG) proposes to: 1) attain accurate coordinate locations for a sample of territorial male Sooty Grouse throughout Mendocino, Glenn, Lake, and Sonoma counties (Fig. 2), and 2) create a habitat suitability model that predicts the locations of additional breeding sites throughout the region. The work would build upon habitat modeling techniques developed for Sierra Sooty Grouse by GBRG's founder, as a contract research biologist for CDFW (State Wildlife Grant T-16-1, Bland and Gardner 2013).

Location coordinates will be attained at all sites mentioned in the Problem Statement above, as well as other sites encountered or suggested as field work progresses (except where access onto private land can not be attained. Most existing records were attained by private citizens from public roads). Each site will likely accommodate 3-10 territorial males (Bland 1993, 2013a). The investigator will drive to each site and listen for hooting males from the roadside. If no hooting is detected, a recorded female cackle call will be broadcast with a portable MP3 player and amplified speakers. Recorded female calls stimulate quiet males to hoot (Stirling and Bendell 1966), and have been used effectively to census low-density Sooty Grouse populations elsewhere in California (Bland 1993, 2013a, 2013b). If on-foot access is permitted, the investigator will record location coordinates with a hand-held GPS unit from under each grouse's songpost tree. Otherwise, each male's location will be estimated by triangulation from two or more points along an access road. This procedure will be repeated at ~500-m intervals along all roads within an approximately 2-km radius of the original site, where suitable habitat is present.

A patch-scale habitat suitability model will be developed for male breeding habitat, based on the point locations attained and available GIS resource layers, using ArcGIS10 (Esri Corporation, Redlands, CA) and Maxent (Phillips et al. 2006) computer software. Many of the GIS layers recently used to model Sierra Sooty Grouse (*D. f. sierrae*) habitat (Bland and Gardner 2013) will likely be effective for modeling coastal habitats (e.g., 10-m digital elevation model, California Wildlife Habitat Relations/CALVEG vegetation polygons, U. S. Geological Survey stream and road shape files, U. S. Forest Service/CA Fire and Resource Assessment Program timber harvest polygons).

5. Expected Benefits:

The field survey will result in a catalog (representative sample) of Sooty Grouse breeding territories throughout Mendocino, Glenn, Lake, and Sonoma counties. Previously unknown sites will be documented, and sites currently known will be documented with greater precision. These data will contribute significantly to CDFW's statewide range map for Sooty Grouse.

Habitat suitability modeling will provide two main benefits, or products. Modeling will result in a spatially-explicit "heat map" of habitat suitability, on which all habitat patches will be ranked by color to indicate their relative suitability as male breeding habitat (Fig. 3). The map will make future searches more efficient by enabling researchers to focus on the most suitable areas. In the future, a population monitoring program could also be implemented at the most suitable sites. The modeling process will also identify a list of habitat attributes (features of GIS layers) that best discriminate between occupied and random sites at the patch scale (contribute most to the statistical model). These constitute the characteristic, or discriminatory, patch-scale

features of Sooty Grouse habitat in a region. Where habitat managers wish to improve or maintain Sooty Grouse breeding habitat, the values for these features can be optimized.

In addition to providing a final report to CDFW, a draft manuscript of scientific findings will be provided, ready for submission to a regional peer-reviewed scientific journal.

If this project is funded, GBRG would apply for UGBA funds in successive years to conduct follow-through projects including: 1) use of the habitat model to identify additional breeding sites, 2) assessment of micro-scale (plot-scale) habitat features in coastal habitats (including recommendations for micro-scale habitat management), or 3) implementation of a regional population monitoring program. Funding would be sought from additional sources at that time, using successful completion of the present project to bolster our request.

6. Itemized Budget:

Item	Description	Cost
Personnel		
PI's salary	5 mo @ \$6,000/mo	\$30,000
Operating expenses *		
Est. campground fees		\$300
Est. mileage	4,500 mi @ \$0.575/mi	\$2,587
Grant Administration		
Overhead, GBRG	12 %	\$3,946
Total Cost:		\$36,833

* All equipment will be provided by the PI (vehicle, GPS unit, computer, computer software).

7. Schedule:

	Calendar Year 2016											
	CDFW 16/16					CDFW 16/17						
	J	F	M	A	M	J	J	A	S	O	N	D
Field survey					■	■	■					
Data analysis and modeling						■	■					
Report and manuscript preparation								■	■			

8. Organizational capacity:

GBRG is a tax-exempt corporation dedicated to studying and monitoring California's upland game birds. Unlike more familiar nonprofit organizations, GBRG is a non-membership corporation established for scientific purposes, and aspires to remain small, focused, and efficient. GBRG's corporate documents, including Articles of Incorporation and IRS tax-exempt

certification, can be viewed at www.gamebirdresearch.org. The corporation's founder and principal investigator, James Bland, has conducted several game bird research projects for CDFW over the past 20 years. GBRG has submitted a second application for UGBA funds to study Mountain Quail. We do have the capacity to conduct the two studies simultaneously. During the month of May, when the optimal census period for both species overlaps, GBRG could employ and train another collaborator to conduct censuses. If both studies are funded, the schedules indicated for each project would need to be extended by approximately two months but costs would not change.

9. References:

- Bauer, R.O. 1967. Blue grouse habitat management plan. US Forest Service, Mendocino National Forest.
- Bendell, J. F., and P. W. Elliott. 1967. Behaviour and the regulation of numbers in Blue Grouse. Can. Wildl. Serv. Rpt. Ser. No. 4. Ottawa.
- Bendell, J. F., and F. C. Zwickel. 1984. A survey of the biology, ecology, abundance, and distribution of the Blue Grouse (genus *Dendragapus*), in Third Int. Grouse Symp. (P. J. Hudson and T. W. I. Lovel, eds.), pp. 163-192. World Pheasant Assoc., Reading, UK.
- Bland, J. D. 1993. Forest grouse and mountain quail investigations: a final report for work completed during the summer of 1992. Unpublished Report to California Department of Fish and Wildlife. Wildlife Management Division, California Department of Fish and Wildlife, 1812 Ninth St, Sacramento, CA 95811.
- Bland, J. D. 1997. Biogeography and conservation of blue grouse (*Dendragapus obscurus*) in California. *Wildlife Biology* 3:270.
- Bland, J. D. 2013a. Estimating the number of territorial males in low-density populations of the Sooty Grouse. *Western Birds* 44:279-293.
- Bland, J. D. 2013b. Apparent extirpation of the Sooty Grouse from the sky islands of south-central California. *Western Birds* 44:294-308.
- Bland, J. D., and S. Gardner. 2013. Habitat assessment and monitoring protocol for Sooty Grouse (*Dendragapus fuliginosus*) in the Sierra Nevada. State Wildlife Grant T-16, Segment 1 (F07AF00074). Unpublished report, Wildlife Branch, California Department of Fish and Wildlife, 1812 Ninth St, Sacramento, CA 95811.
- Burridge, B. 1995. Sonoma County Breeding Bird Atlas. Madrone Audubon Society, Santa Rosa, CA.
- Dunning, J. B., D. J. Stewart, B. J. Danielson, B. R. Noon, T. L. Root, R. H. Lamberson, and E. E. Stevens. 1995. Spatially explicit population models: current forms and future uses. *Ecological Applications* 5:3-11.
- Grinnell, J. 1915. A Distributional List of the Birds of California. *Pac. Coast Avifauna* 11.
- Grinnell, J., and A. H. Miller. 1944. The Distribution of the Birds of California. *Pac. Coast Avifauna* 27.
- Lewis, R. R. 1985. Do Blue Grouse form leks? *Auk* 102:180-184.
- Phillips, S. J., R. P. Anderson, and R. E. Schapire. 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190:231-259.
- Stirling, I., and J. F. Bendell. 1966. Census of Blue Grouse with recorded calls of a female. *J. Wildlife Manage.* 30:184-187.

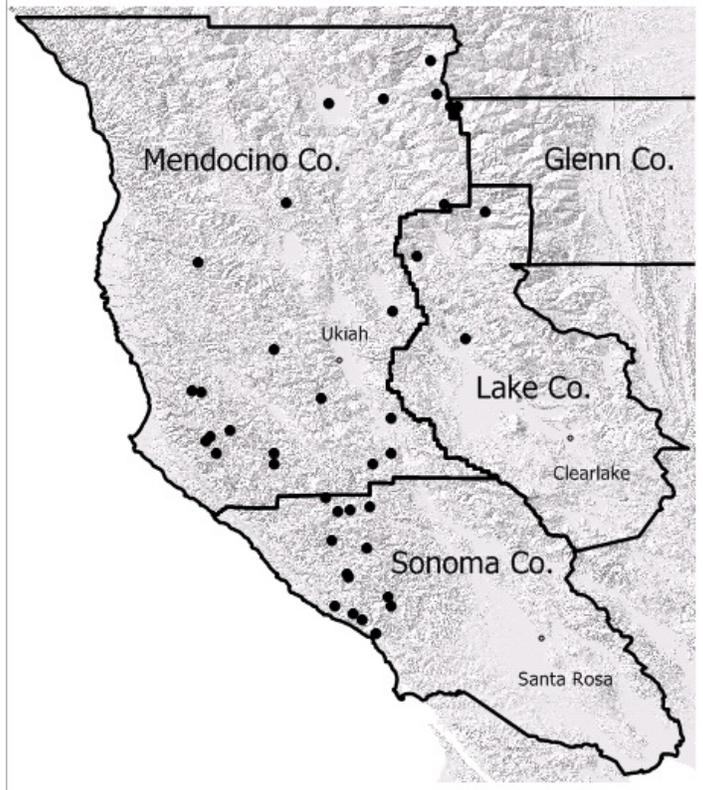
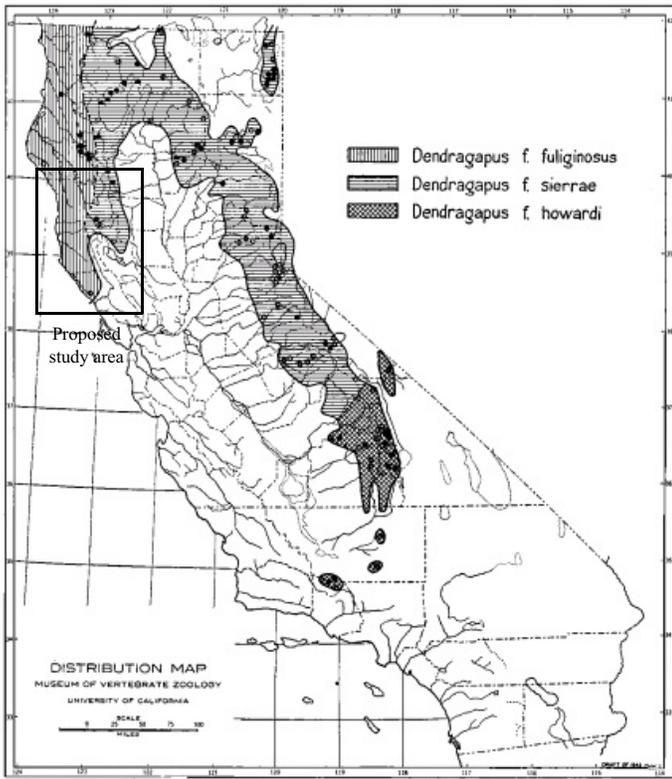


Figure 1. Historic range of Sooty Grouse in California (Grinnell and Miller 1944).

Figure 2. Historic breeding locations for Sooty Grouse in the proposed study area.

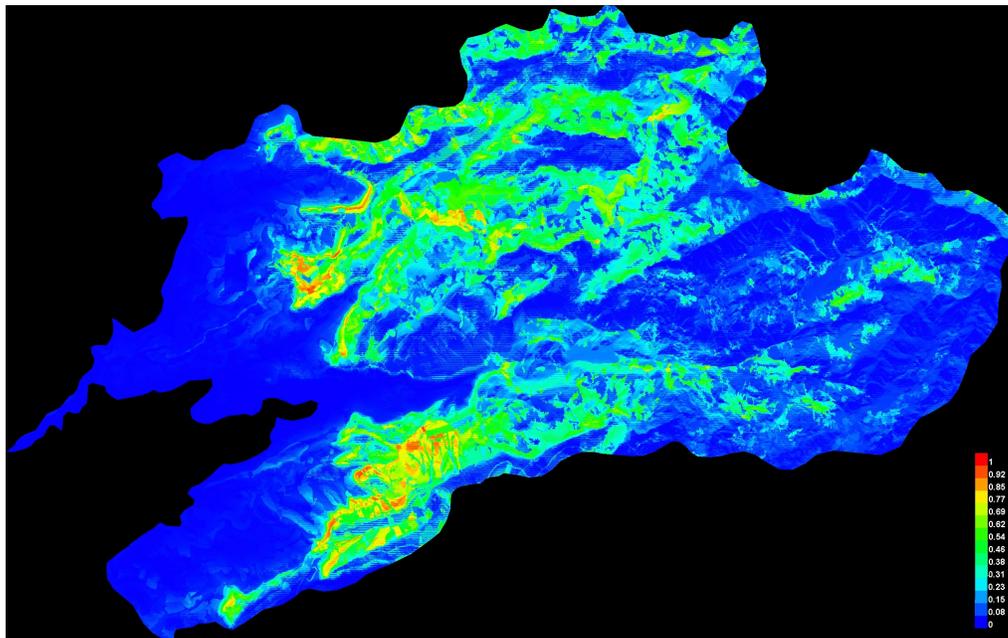


Figure 3. Habitat suitability model for Sierra Sooty Grouse (Bland and Gardner 2013).