

# California Department of Fish and Wildlife

## Resident Upland Game Bird and Small Game Mammal Harvest Survey 2018-2019



2018-2019 California Upland Game Bird Stamp Art Contest, white-tailed ptarmigan  
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## **Introduction**

From 1948-2010, the California Department of Fish and Wildlife (hereafter, the Department) conducted a “Game Take Hunter Survey” (GTHS) to estimate hunters’ harvest and participation in California. The GTHS was a mail-based survey sent to a random sample of people who purchased a hunting license. These surveys provided information on the number of each species harvested and the time spent by each hunter in the field by county, providing information on hunter success and harvest trends. The GTHS included all game, non-game, and furbearing species that can be hunted and was the only method for estimating harvest of resident upland game birds through 2010.

In more recent years, technological advances in automated license systems and changes to survey methodology have changed how biologists conduct these harvest surveys. For example, the advent of the Automated License Data System (ALDS) in the early 2000s allowed the Department to report species-specific harvest based on tag returns (big game species) and permit reports (greater sage-grouse). Hunters can now submit tags and permit reports directly through ALDS. Consequentially, the utility of the mail-based GTHS declined while postal costs increased, and after a statewide budget crisis, the survey was discontinued after 2010. Another example of changing survey methodology is the Migratory Harvest Information Program (HIP), administered annually by the United States Fish and Wildlife Service in cooperation with CDFW. The HIP estimates the harvest of migratory game birds (waterfowl, doves, band-tailed pigeons, rails, coots and gallinules, and Wilson’s snipe). However, neither ALDS nor HIP surveys provide estimates of resident upland game bird or small game harvest and hunt effort (with the exception of greater sage-grouse reporting in ALDS, mentioned above).

A need remains to estimate harvest for resident upland game birds and small game mammals in California, and the Department has investigated several different approaches for conducting these surveys. In 2014, the Department contracted with Responsive Management to conduct a Survey of Small Game, Upland Birds, and other Wildlife. Responsive Management conducted both a telephone survey with a response rate of 28%, and an email survey with a response rate of 11%.

In 2017, the Department developed an internet-based survey specific to resident upland game birds and small game mammals. This survey targeted the upland game

bird hunters from the Spring 2016 turkey season to the Spring 2017 turkey season. Responsive Management's harvest report, the previous GTHS reports, and the subsequent internet survey report are available on the Department's Upland Game Bird Hunting website, <https://wildlife.ca.gov/Hunting/Upland-Game-Birds>. In 2019, Department staff conducted a survey for resident upland game birds and small game mammals, targeting upland game bird hunters in the 2018-2019 hunting season.

### **Survey Overview**

The Department evaluated different survey techniques, along with their implementation costs and potential sources of bias, and ultimately chose to develop an on-line survey for a random pool of hunters with Upland Game Bird Validations. This on-line survey relies on the hunter's email address in order to direct the hunter to the survey website. The hunter is required to provide their GO-ID number to ensure that only those responses from randomly selected hunters are recorded. While all holders of hunting licenses in California are automatically assigned an individual GO-ID number in ALDS, the submission of an email address to the department is optional, thus not all upland game bird hunters in California could be randomly surveyed by email. However, there is a consistently increasing trend of hunters who use email, and in 2018-2019 60% of those hunters who purchased an Upland Game Bird Validation through ALDS voluntarily provided an email address. This is an increase of 16% from the 44% of upland game bird hunters that provided email addresses in 2016-2017. Because we expect that the number of hunters who provide email address will continue to increase, and because many hunters who purchased an Upland Game Validation in the 2018-2019 license year could be reached via email, we were comfortable with email and the internet as the approach to conduct this survey, while mindful of potential sources of bias.

Prior to drawing the random sample from the pool of hunters with email addresses on file, we investigated the potential for age bias among respondents, as the use of email is relatively new in comparison to recreational hunting. We determined age for all hunters with Upland Game Bird validations for 2018-2019, and compared mean age between two groups, those that provided an email address and those that did not

(Fig. 1). Due to the similarity in mean age for hunters between these groups ( $\leq 2$  years) in our second on-line harvest survey, we were satisfied that our choice to sample those hunters that provided emails would not introduce substantial age bias among our survey respondents.

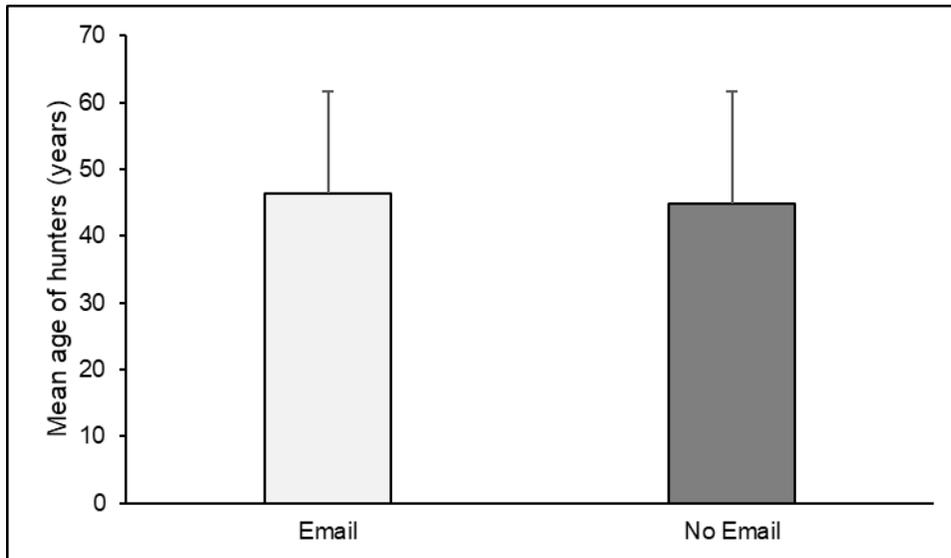


Figure 1: Mean age  $\pm$  standard deviation for upland game bird hunters who provided email addresses versus those who did not provide email addresses.

In California, a hunting license is required to hunt resident and migratory upland game birds and small game mammals. The state also requires hunters to purchase an Upland Game Bird Validation when hunting upland game birds. Department staff chose to group resident upland game birds and small game mammals into one survey, and focus the random sample on hunters with upland game bird validations. We acknowledge that this limits the inference of our results for small game mammals to those hunters that were also hunting upland game birds.

We randomly chose 10,000 hunters with email addresses for our sample, using the equation in Dillman (2000:206).

$$Ns = \frac{(Np)(p)(1-p)}{(Np-1)\left(\frac{B}{C}\right)^2 + (p)(1-p)}$$

Where:

$Ns$  = sample size that completed the survey

$Np$  = total population of interest: 157,702 (all upland game hunters in 2018-2019).

$p$  = 0.5

$B$  = acceptable amount of sampling error (< 2 points)

$C$  = Z statistic for desired confidence interval (at 95%, 1.96)

If  $B = 0.02$ , or 2%, the findings of 95 of 100 surveys would fall within 2 percentage points of each other. For example, if we ask hunters their age, and the mean age is 52.3, then for 95 out of 100 different surveys the sample estimate would be between 50.3 and 54.3.

To obtain results with our predetermined sampling error of  $B = 0.02$ , we solved the above equation to determine the number of survey respondents required ( $n = 2,365$ ). We assumed a response rate for on-line surveys of 25%, based on communication with wildlife departments in other states. Thus, the number required for our pool of randomly selected hunters should be 9,460, which we rounded up to 10,000 hunters. We sent this random sample a link to a page on the Department website that asked them to report harvest location and number (Appendix 1).

## Results

We received 1,159 responses from our random sample. Of the respondents, 53% ( $n = 613$ ) hunted resident upland game birds and small game mammals, and 47% ( $n = 546$ ) did not hunt, hunted only migratory upland game birds, or only hunted on licensed game bird clubs, and were thus excluded from further analysis. We estimated the harvest and hunter effort by extrapolating the number reported by the hunters using the number of respondents ( $n = 1,159$ ) divided by the number of upland game validated hunters ( $n = 157,702$ , 0.74%).

Most hunters who hunted resident upland game birds and small game mammals in 2018-2019 were male (Fig. 2). The mean age of hunters was 49.34, younger than those who did not hunt (56.48), but older than the mean age (45.83) from the random pool of 10,000 hunters. Hunters that did not respond to the survey were younger, on average, than those who responded (Fig. 3).

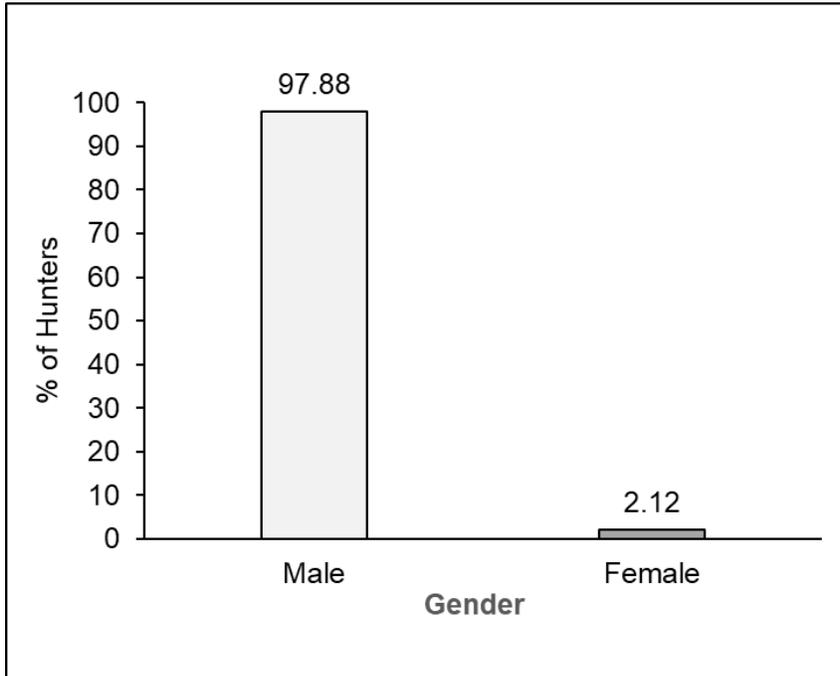


Figure 2: Gender of survey respondents.

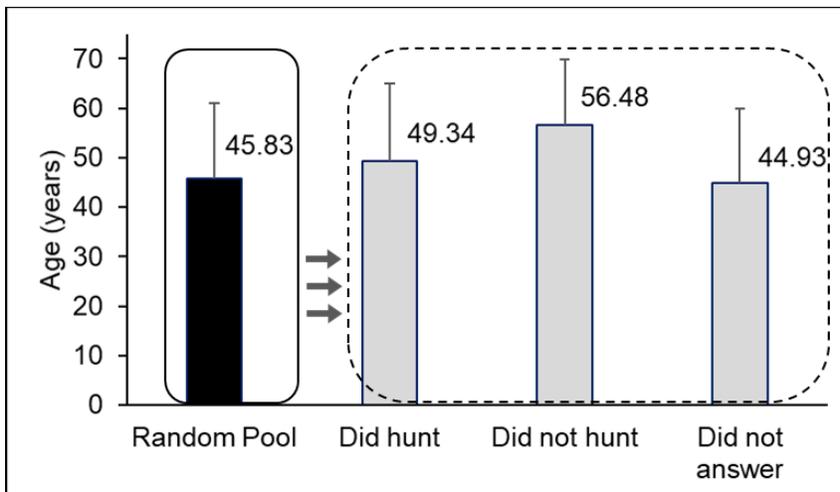


Figure 3: Mean age  $\pm$  standard deviation of surveyed hunters who hunted, did not hunt, or did not answer the survey.

## Sample Error

We determined sampling error from a rearrangement of Dillman's (2000) equation:

$$B = \left( \sqrt{\frac{\frac{(Np)(p)(1-p)}{N_s} - (p)(1-p)}{(Np-1)}} \right) (1.96)$$

$N_s$  = sample size that completed the survey, 1,159

$Np$  = total population of interest: 157,702 (total upland game hunters in the 2018-2019 hunting season).

$p$  = 0.5

$C$  = Z statistic for desired confidence interval (at 95%, 1.96)

$B$  = 0.0286, or, 2.86 percentage points.

Thus, we calculated that the sampling error rate for our survey is  $\pm 2.86\%$ .

## Results by species

We asked hunters to report on nine resident upland game bird species: mountain, California, and Gambel's quail, chukar, ring-necked pheasant, ruffed grouse, white-tailed ptarmigan, sooty grouse, and wild turkey (Table 1). For wild turkey, we asked hunters to specify the hunting season in which turkey was hunted: Fall 2018 or Spring 2019. We asked hunters if they hunted white-tailed ptarmigan, with the intent to contact those hunters for specific information. Only two hunters indicated that they had hunted white-tailed ptarmigan, and of these only one responded to our follow-up email with harvest and hunter effort information. The Department issues permits for greater sage-grouse, however, no permits were issued in the 2018-2019 hunting season, thus the species is not represented in this report.

In addition to resident upland game birds, we asked hunters to report on small game mammals. Specifically, we asked about rabbit (cottontail, brush, and pygmy), jackrabbit (white-tailed and black-tailed combined), and tree squirrel (all species). We did not ask hunters to differentiate between or among species for these three groups.

Table 1. Statewide estimated harvest and hunter effort from 2018-2019 Resident Upland Game Bird and Small Game Mammal Harvest Survey.

Species	Harvest	Hunters	Avg. bag per hunter	Days hunted	Avg. days hunted
Mountain quail	65,176	19,866	3.28	86,675	4.36
California quail	315,268	35,105	8.98	157,430	4.48
Gambel's quail	6,939	2,585	2.68	9,117	3.53
Chukar	8,844	5,306	1.67	18,505	3.49
Ring-necked pheasant	38,235	17,688	2.16	60,550	3.42
Ruffed grouse	3,265	1,497	2.18	8,572	5.73
White-tailed ptarmigan*	2	1	2	1	1
Sooty grouse	1,768	2,993	0.59	8,708	2.91
Wild turkey Fall 2018	7,075	14,967	0.47	47,215	3.15
Wild turkey Spring 2019	22,179	34,969	0.63	127,767	3.65
Rabbit**	46,807	7,620	6.14	36,602	4.80
Jackrabbit***	23,948	7,212	3.32	37,146	5.16
Tree squirrel****	23,812	7,075	3.37	36,602	5.17

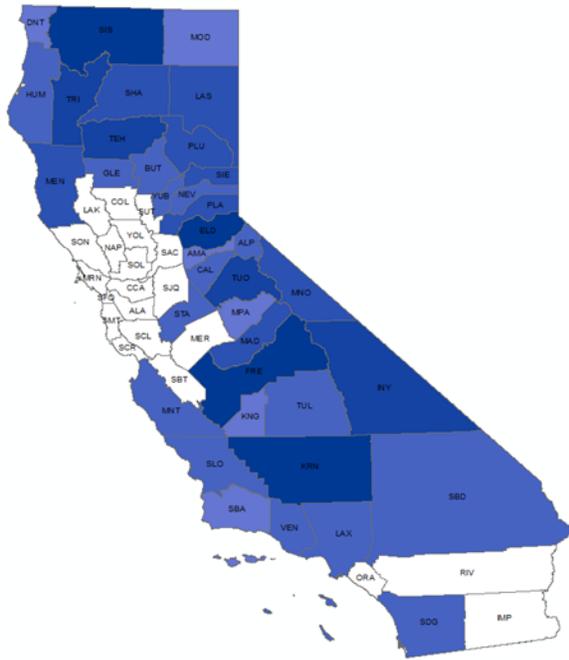
\* Reporting raw results from one hunter's survey response.

\*\* Cottontail, brush, and pygmy combined.

\*\*\* White-tailed and black-tailed combined.

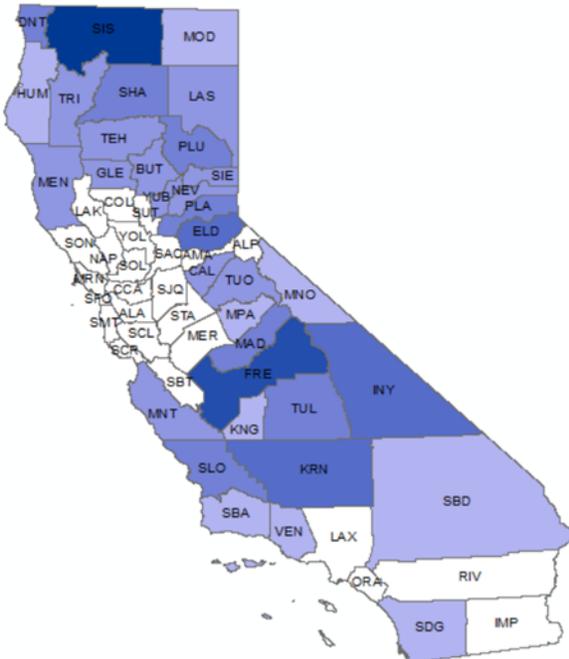
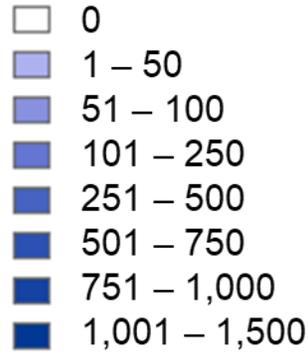
\*\*\*\* All species.

## County-level results



### Mountain quail

#### Number of hunters



#### Number of birds harvested

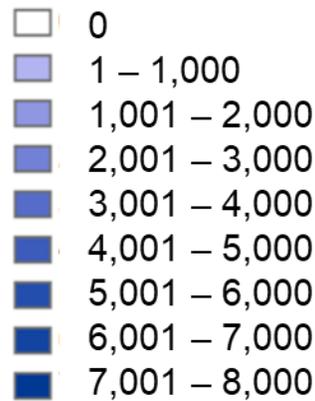
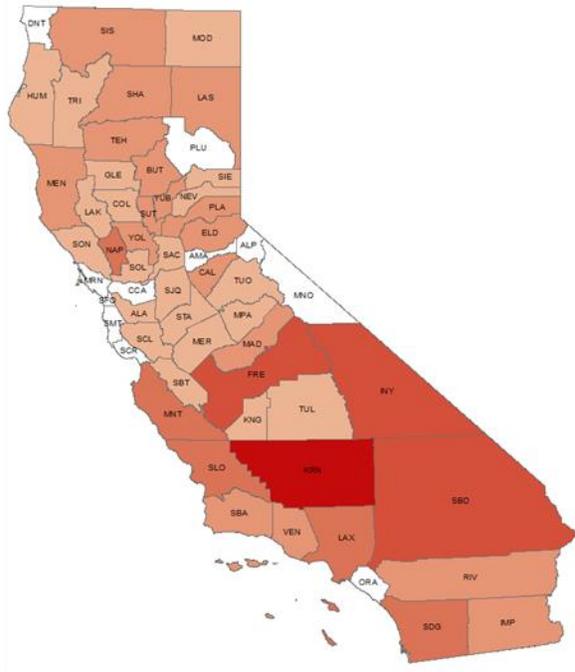
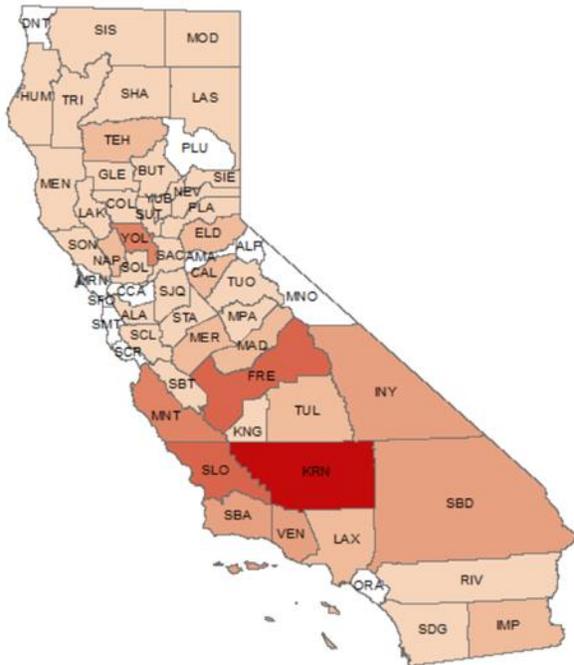
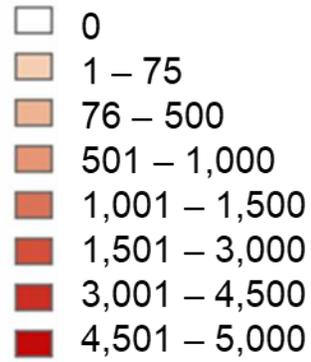


Figure 4: Estimated number of hunters and harvest for mountain quail (*Oreortyx pictus*)



### California quail

Number of hunters



Number of birds harvested

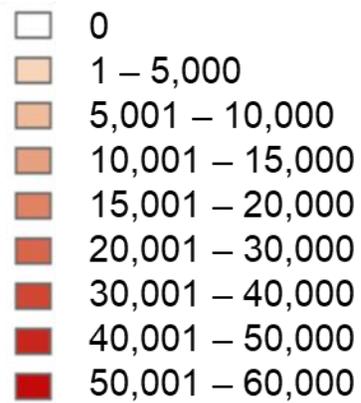
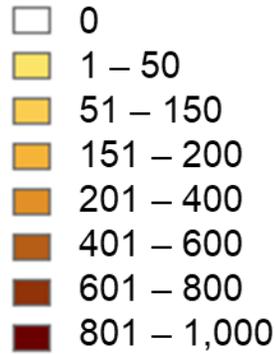


Figure 5: Estimated number of hunters and harvest for California quail (*Callipepla californica*).



### Gambel's quail

#### Number of hunters



#### Number of birds harvested

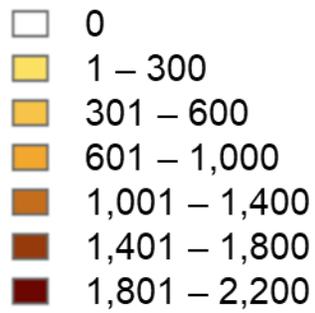
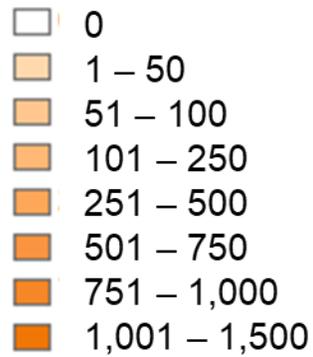


Figure 6: Estimated number of hunters and harvest for Gambel's quail (*Callipepla gambelii*).



## Chukar

### Number of hunters



### Number of birds harvested

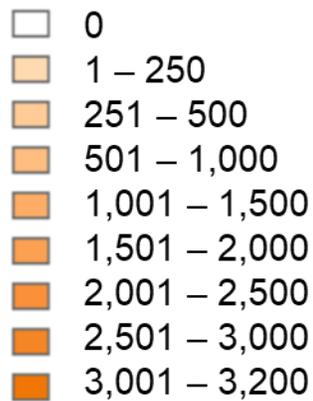
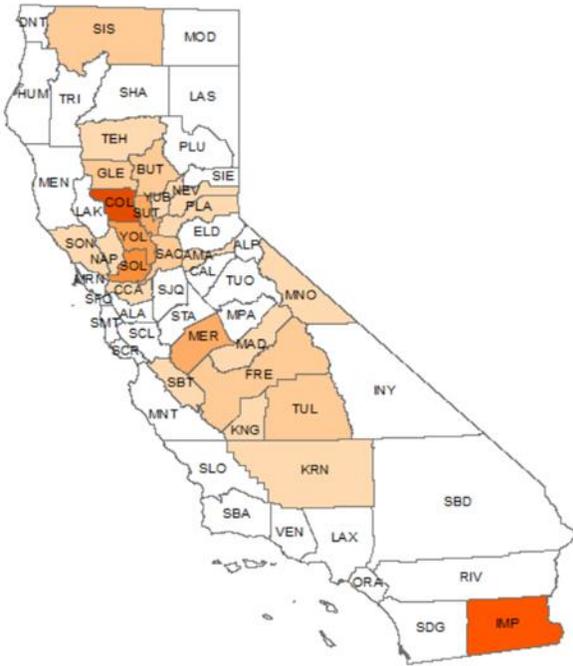
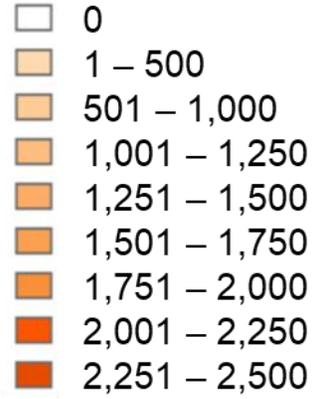


Figure 7: Estimated number of hunters and harvest for chukar (*Alectoris chukar*).



### Ring-necked pheasant

#### Number of hunters



#### Number of birds harvested

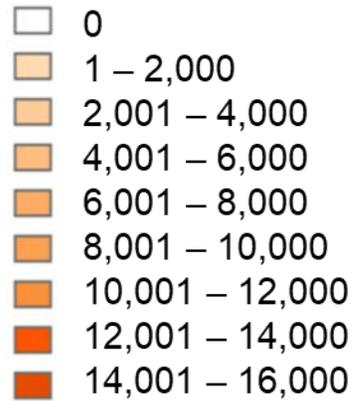
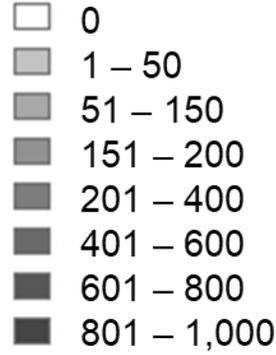


Figure 8: Estimated number of hunters and harvest for ring-necked pheasant (*Phasianus colchicus*).



### Ruffed grouse

#### Number of hunters



#### Number of birds harvested

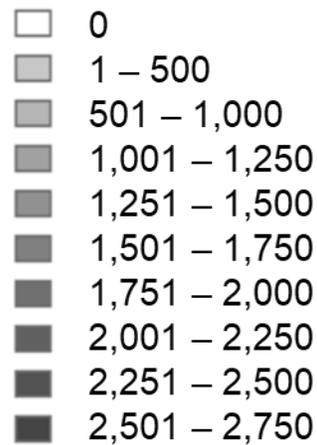
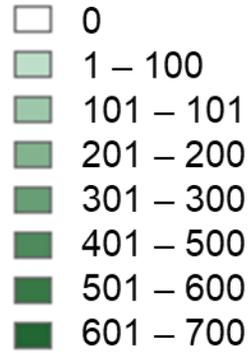


Figure 9: Estimated number of hunters and harvest for ruffed grouse (*Bonasa umbellus*).



### Sooty grouse

#### Number of hunters



#### Number of birds harvested

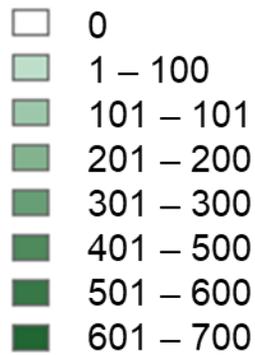
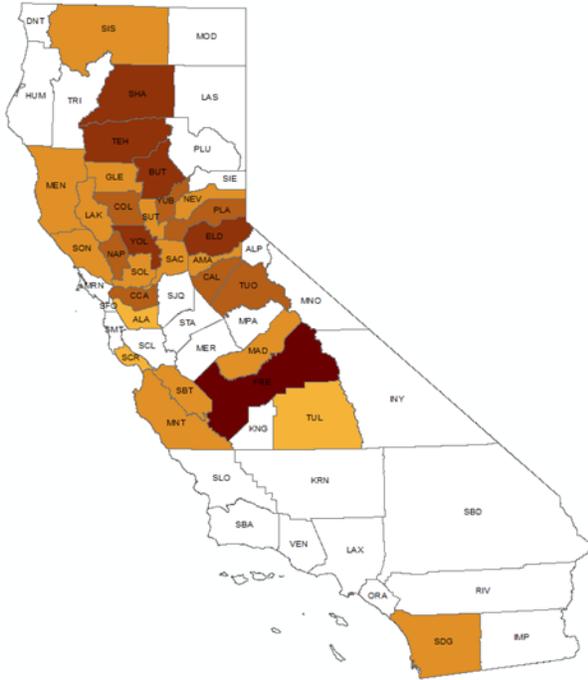
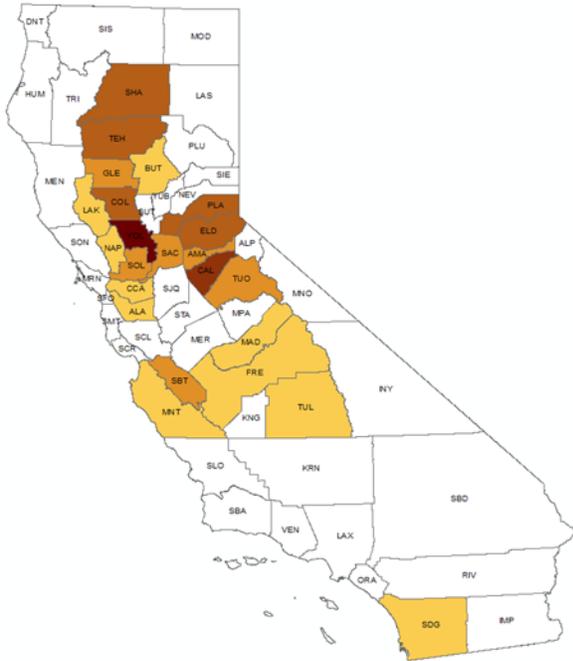
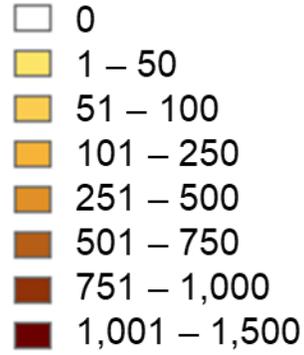


Figure 10: Estimated number of hunters and harvest for sooty grouse (*Dendragapus fuliginosus*).



### Wild turkey Fall 2018

Number of hunters



Number of birds harvested

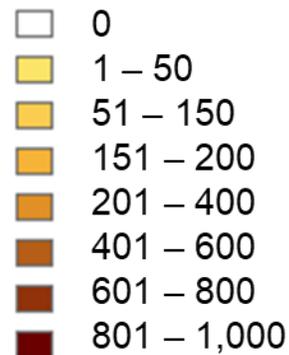
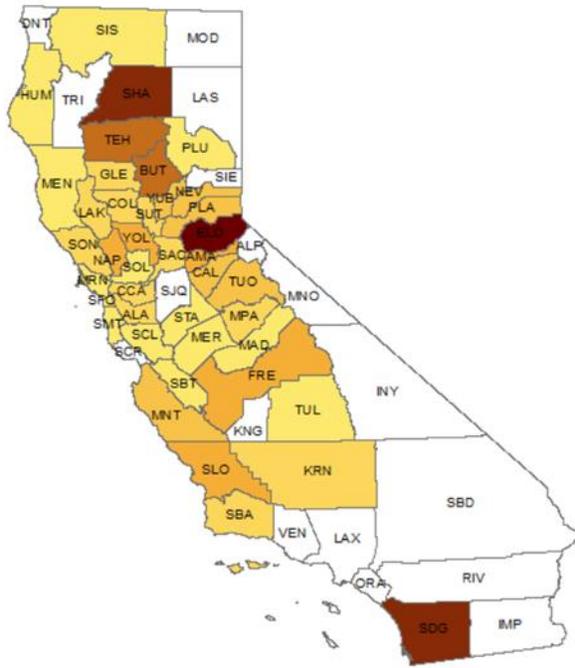
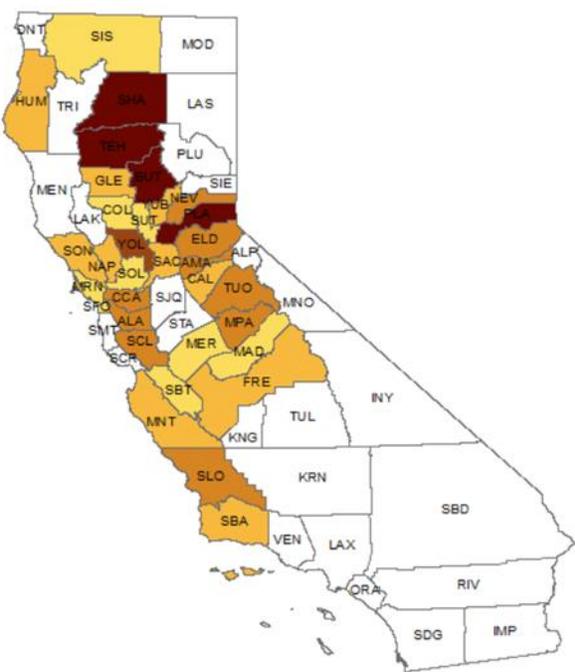
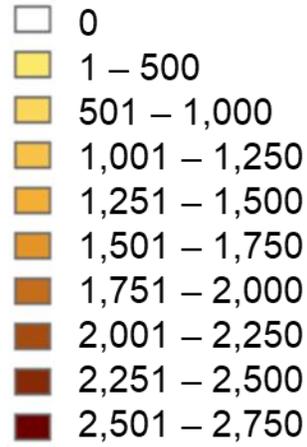


Figure 11: Estimated number of hunters and harvest for wild turkey (*Meleagris gallopavo*) in Fall 2018.



### Wild turkey Spring 2019

#### Number of hunters



#### Number of birds harvested

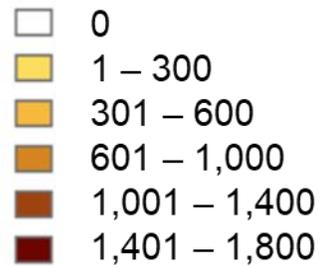
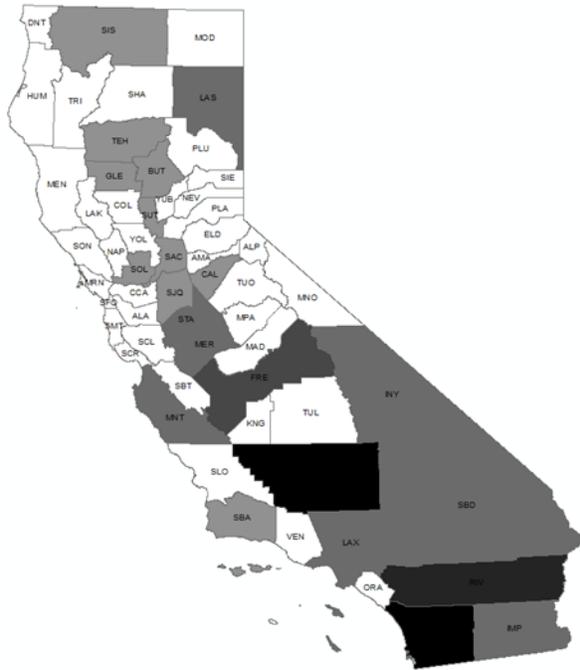
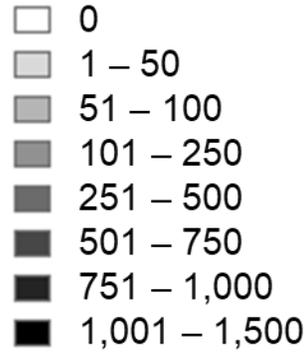


Figure 12: Estimated number of hunters and harvest for wild turkey (*Meleagris gallopavo*) in Spring 2019.



Rabbit (cottontail, brush, and pygmy combined)

Number of hunters



Number of rabbits harvested

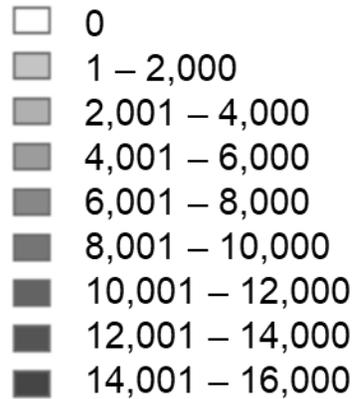
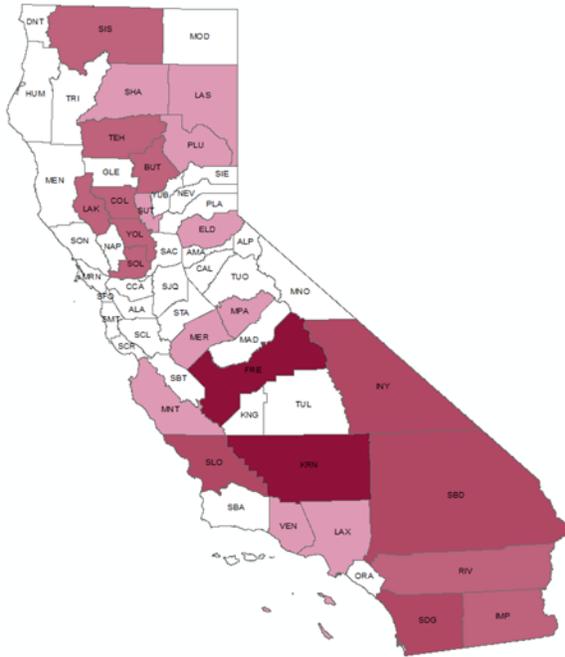
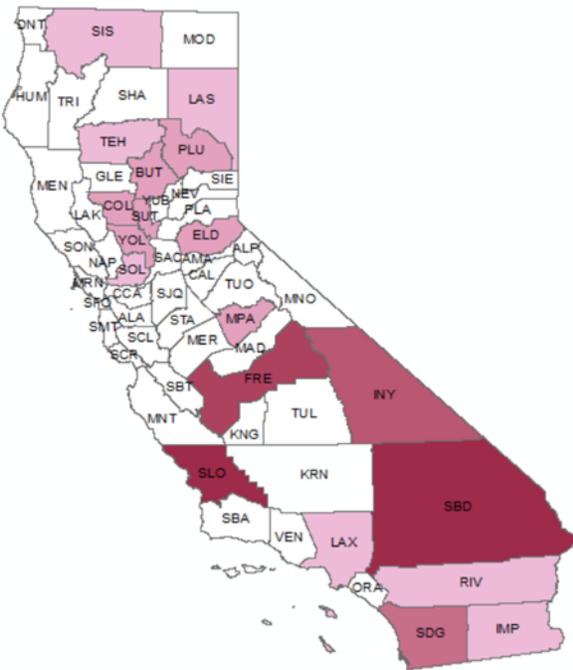
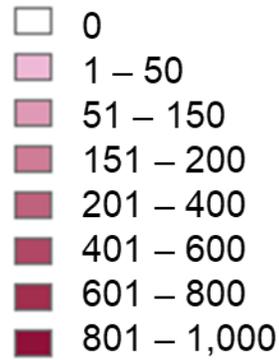


Figure 13: Estimated number of hunters and harvest for rabbit (cottontail, brush, and pygmy combined).



Jackrabbit (white-tailed and black-tailed combined)

Number of hunters



Number of jackrabbits harvested

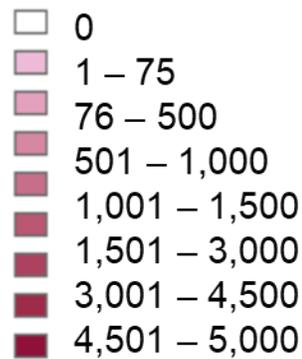
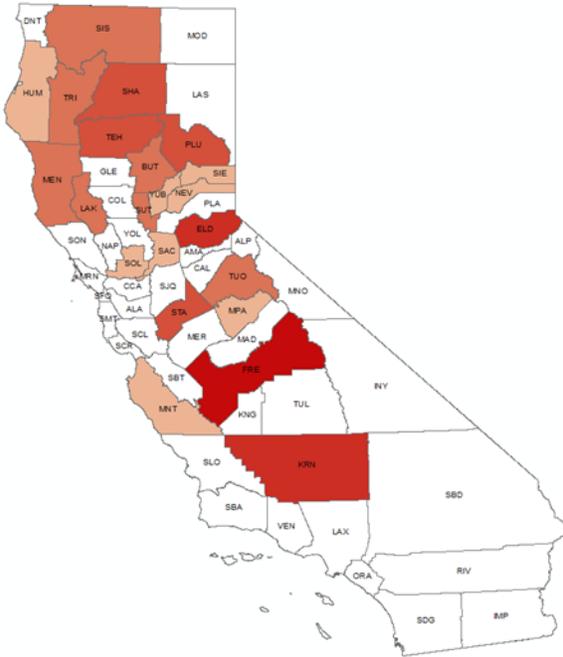
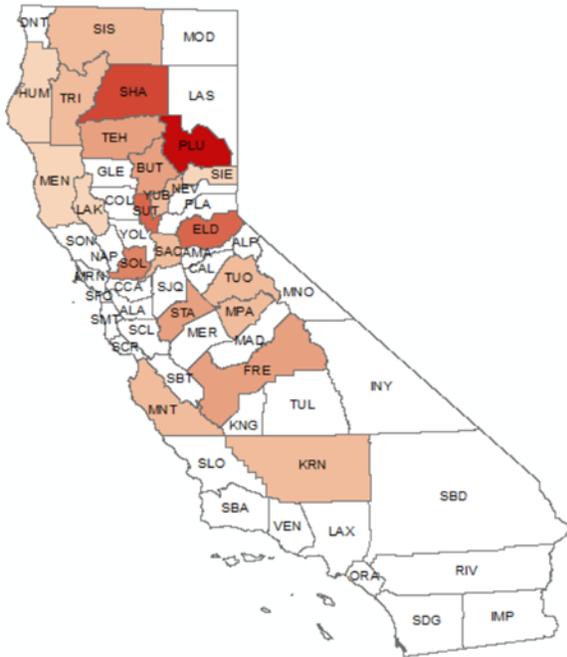
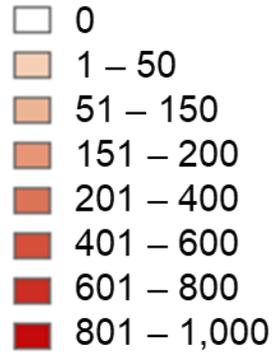


Figure 14: Estimated number of hunters and harvest for jackrabbit (both white-tailed and black-tailed).



### Tree squirrel (all species)

#### Number of hunters



#### Number of squirrels harvested

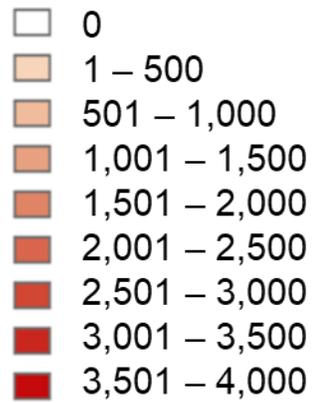


Figure 15: Estimated number of hunters and harvest for tree squirrel (all species).

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county.

County	Mountain quail harvest	Mountain quail hunters	Mountain quail days	California quail harvest	California quail hunters	California quail days
Alameda	0	0	0	816	408	408
Alpine	0	272	544	0	0	0
Amador	0	136	136	0	0	0
Butte	1,361	272	952	2,313	544	2,177
Calaveras	1,361	272	1,225	6,395	680	1,769
Colusa	0	0	0	680	272	680
Contra Costa	0	0	0	0	0	0
Del Norte	2,449	139	1,089	0	0	0
El Dorado	3,946	1,497	3,402	7,484	544	2,313
Fresno	5,987	1,361	6,803	29,663	2,313	10,613
Glenn	1,089	272	408	1,361	272	544
Humboldt	136	408	544	272	272	408
Imperial	0	0	0	7,075	952	5,307
Inyo	3,130	952	2,721	12,654	1,769	13,607
Kern	3,402	1,361	4,082	58,237	4,898	22,995
Kings	136	136	136	408	136	136
Lake	0	0	0	1,089	272	544
Lassen	1,089	680	2,313	2,449	544	1,497
Los Angeles	0	272	680	7,892	1,361	3,946
Madera	2,857	544	1,497	7,075	544	3,130
Marin	0	0	0	0	0	0
Mariposa	816	136	136	816	408	1,089
Mendocino	1,633	544	1,089	2,449	680	1,769
Merced	0	0	0	6,667	272	1,633
Modoc	680	136	136	544	136	136
Mono	816	544	2,177	0	0	0
Monterey	1,497	408	952	19,866	1,225	4,218
Napa	0	0	0	9,933	1,225	6,803
Nevada	1,769	408	3,402	1,905	272	1,769
Orange	0	0	0	0	0	0
Placer	2,041	680	2,585	3,130	544	1,497
Plumas	2,585	680	4,490	0	0	0
Riverside	0	0	0	1,633	816	2,313
Sacramento	0	0	0	1,769	408	544

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Mountain quail harvest	Mountain quail hunters	Mountain quail days	California quail harvest	California quail hunters	California quail days
San Benito	0	0	0	4,762	272	1,089
San Bernardino	408	272	2,041	14,287	2,041	10,069
San Diego	408	408	544	680	1,225	4,898
San Francisco	0	0	0	0	0	0
San Joaquin	0	0	0	1,361	272	816
San Luis Obispo	2,993	408	816	22,315	1,361	6,667
San Mateo	0	0	0	0	0	0
Santa Barbara	272	136	272	11,974	952	6,123
Santa Clara	0	0	0	544	272	544
Santa Cruz	0	0	0	0	0	0
Shasta	2,993	544	7,620	2,993	544	816
Sierra	1,497	680	3,946	1,361	136	1,633
Siskiyou	7,484	1,361	10,205	2,585	544	3,130
Solano	0	0	0	272	136	136
Sonoma	0	0	0	2,721	272	680
Stanislaus	0	272	816	2,177	408	1,633
Sutter	0	0	0	2,993	380	2,041
Tehama	1,905	952	2,721	7,756	952	5,851
Trinity	1,769	952	5,579	544	408	2,449
Tulare	2,721	408	1,089	5,034	408	2,585
Tuolumne	1,905	816	2,585	1,633	272	1,633
Ventura	272	272	3,130	14,287	952	9,253
Yolo	0	0	0	19,458	544	2,313
Yuba	1,769	272	3,810	952	680	1,225

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Gambel's quail harvest	Gambel's quail hunters	Gambel's quail days
Alameda	0	0	0
Alpine	0	0	0
Amador	0	0	0
Butte	0	0	0
Calaveras	0	0	0
Colusa	0	0	0
Contra Costa	0	0	0
Del Norte	0	0	0
El Dorado	0	0	0
Fresno	0	0	0
Glenn	0	0	0
Humboldt	0	0	0
Imperial	2,177	680	3,402
Inyo	816	272	680
Kern	1,769	408	1,361
Kings	0	0	0
Lake	0	0	0
Lassen	0	0	0
Los Angeles	0	0	0
Madera	0	0	0
Marin	0	0	0
Mariposa	0	0	0
Mendocino	0	0	0
Merced	0	0	0
Modoc	0	0	0
Mono	0	0	0
Monterey	0	0	0
Napa	0	0	0
Nevada	0	0	0
Orange	0	0	0
Placer	0	0	0
Plumas	0	0	0
Riverside	1,497	272	1,225
Sacramento	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Gambel's quail harvest	Gambel's quail hunters	Gambel's quail days
San Benito	0	0	0
San Bernardino	680	816	2,041
San Diego	0	136	408
San Francisco	0	0	0
San Joaquin	0	0	0
San Luis Obispo	0	0	0
San Mateo	0	0	0
Santa Barbara	0	0	0
Santa Clara	0	0	0
Santa Cruz	0	0	0
Shasta	0	0	0
Sierra	0	0	0
Siskiyou	0	0	0
Solano	0	0	0
Sonoma	0	0	0
Stanislaus	0	0	0
Sutter	0	0	0
Tehama	0	0	0
Trinity	0	0	0
Tulare	0	0	0
Tuolumne	0	0	0
Ventura	0	0	0
Yolo	0	0	0
Yuba	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Chukar harvest	Chukar hunters	Chukar days	Ring-necked pheasant harvest	Ring-necked pheasant hunters	Ring-necked pheasant days
Alameda	0	0	0	0	0	0
Alpine	0	0	0	0	0	0
Amador	0	0	0	0	136	272
Butte	0	0	0	544	816	2,177
Calaveras	0	0	0	0	0	0
Colusa	0	0	0	3,402	2,449	6,395
Contra Costa	0	0	0	272	136	136
Del Norte	0	0	0	0	0	0
El Dorado	0	0	0	0	0	0
Fresno	0	0	0	1,225	544	2,721
Glenn	0	0	0	952	680	3,130
Humboldt	0	0	0	0	0	0
Imperial	0	0	0	3,674	2,041	6,531
Inyo	3,130	1,089	5,034	0	0	0
Kern	2,993	1,497	5,579	1,633	272	680
Kings	0	0	0	272	136	136
Lake	0	0	0	0	0	0
Lassen	1,497	816	1,769	0	0	0
Los Angeles	0	0	0	0	0	0
Madera	0	0	0	272	136	136
Marin	0	0	0	0	0	0
Mariposa	0	0	0	0	0	0
Mendocino	0	0	0	0	0	0
Merced	1,089	136	1,361	4,082	1,497	6,667
Modoc	0	0	0	0	0	0
Mono	136	136	136	0	0	0
Monterey	0	0	0	0	0	0
Napa	0	0	0	0	0	0
Nevada	0	0	0	0	0	0
Orange	0	0	0	0	0	0
Placer	0	0	0	680	136	408
Plumas	0	0	0	0	0	0
Riverside	0	0	0	0	136	0
Sacramento	0	0	0	0	408	816

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Chukar harvest	Chukar hunters	Chukar days	Ring-necked pheasant harvest	Ring-necked pheasant hunters	Ring-necked pheasant days
San Benito	0	272	1,089	0	0	0
San Bernardino	0	1,361	3,538	0	136	136
San Diego	0	0	0	0	0	0
San Francisco	0	0	0	0	0	0
San Joaquin	0	0	0	1,633	952	2,993
San Luis Obispo	0	0	0	136	136	136
San Mateo	0	0	0	0	0	0
Santa Barbara	0	0	0	0	0	0
Santa Clara	0	0	0	0	0	0
Santa Cruz	0	0	0	0	0	0
Shasta	0	0	0	0	0	0
Sierra	0	0	0	0	0	0
Siskiyou	0	0	0	3,810	952	3,674
Solano	0	0	0	11,021	1,769	8,436
Sonoma	0	0	0	0	136	0
Stanislaus	0	0	0	0	0	0
Sutter	0	0	0	1,497	1,361	7,075
Tehama	0	0	0	136	272	408
Trinity	0	0	0	0	0	0
Tulare	0	0	0	952	680	1,905
Tuolumne	0	0	0	0	0	0
Ventura	0	0	0	0	0	0
Yolo	0	0	0	2,041	1,633	5,443
Yuba	0	0	0	0	136	136

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Ruffed grouse harvest	Ruffed grouse hunters	Ruffed grouse days	Sooty grouse harvest	Sooty grouse hunters	Sooty grouse days
Alameda	0	0	0	0	0	0
Alpine	0	0	0	136	136	408
Amador	0	0	0	0	0	0
Butte	0	0	0	0	0	0
Calaveras	0	0	0	0	0	0
Colusa	0	0	0	0	0	0
Contra Costa	0	0	0	0	0	0
Del Norte	408	136	680	680	136	680
El Dorado	0	0	0	0	0	0
Fresno	0	0	0	408	272	816
Glenn	0	0	0	0	0	0
Humboldt	0	136	272	0	136	136
Imperial	0	0	0	0	0	0
Inyo	0	0	0	0	136	136
Kern	0	0	0	0	0	0
Kings	0	0	0	0	0	0
Lake	0	0	0	0	0	0
Lassen	0	0	0	0	136	136
Los Angeles	0	0	0	0	0	0
Madera	0	0	0	0	0	0
Marin	0	0	0	0	0	0
Mariposa	0	0	0	0	0	0
Mendocino	0	0	0	0	136	272
Merced	0	0	0	0	0	0
Modoc	0	0	0	0	0	0
Mono	0	0	0	544	680	2,313
Monterey	0	0	0	0	0	0
Napa	0	0	0	0	0	0
Nevada	0	0	0	0	0	0
Orange	0	0	0	0	0	0
Placer	0	0	0	0	0	0
Plumas	0	0	0	0	136	680
Riverside	0	0	0	0	0	0
Sacramento	0	0	0	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Ruffed grouse harvest	Ruffed grouse hunters	Ruffed grouse days	Sooty grouse harvest	Sooty grouse hunters	Sooty grouse days
San Benito	0	0	0	0	0	0
San Bernardino	0	0	0	0	0	0
San Diego	0	0	0	0	0	0
San Francisco	0	0	0	0	0	0
San Joaquin	0	0	0	0	0	0
San Luis Obispo	0	0	0	0	0	0
San Mateo	0	0	0	0	0	0
Santa Barbara	0	0	0	0	0	0
Santa Clara	0	0	0	0	0	0
Santa Cruz	0	0	0	0	0	0
Shasta	0	0	0	0	136	544
Sierra	0	0	0	0	272	680
Siskiyou	2,585	816	6,259	0	544	1,633
Solano	0	0	0	0	0	0
Sonoma	0	0	0	0	0	0
Stanislaus	0	0	0	0	0	0
Sutter	0	0	0	0	0	0
Tehama	0	0	0	0	0	0
Trinity	272	408	1,361	0	0	0
Tulare	0	0	0	0	0	0
Tuolumne	0	0	0	0	136	272
Ventura	0	0	0	0	0	0
Yolo	0	0	0	0	0	0
Yuba	0	0	0	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Wild turkey Fall 2018 harvest	Wild turkey Fall 2018 hunters	Wild turkey Fall 2018 days
Alameda	136	136	272
Alpine	0	0	0
Amador	272	408	1,497
Butte	136	816	1,769
Calaveras	680	544	1,361
Colusa	544	544	1,633
Contra Costa	136	544	1,361
Del Norte	0	0	0
El Dorado	408	816	2,177
Fresno	136	1,089	5,307
Glenn	272	272	408
Humboldt	0	0	0
Imperial	0	0	0
Inyo	0	0	0
Kern	0	0	0
Kings	0	0	0
Lake	136	408	3,266
Lassen	0	0	0
Los Angeles	0	0	0
Madera	136	408	952
Marin	0	0	0
Mariposa	0	0	0
Mendocino	0	408	680
Merced	0	0	0
Modoc	0	0	0
Mono	0	0	0
Monterey	136	272	680
Napa	136	544	544
Nevada	0	272	544
Orange	0	0	0
Placer	544	544	1,089
Plumas	0	0	0
Riverside	0	0	0
Sacramento	272	408	544

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Wild turkey Fall 2018 harvest	Wild turkey Fall 2018 hunters	Wild turkey Fall 2018 days
San Benito	272	272	408
San Bernardino	0	0	0
San Diego	136	408	2,177
San Francisco	0	0	0
San Joaquin	0	0	0
San Luis Obispo	0	0	0
San Mateo	0	0	0
Santa Barbara	0	0	0
Santa Clara	0	0	0
Santa Cruz	0	136	136
Shasta	408	816	3,674
Sierra	0	0	0
Siskiyou	0	408	816
Solano	272	272	680
Sonoma	0	408	1,361
Stanislaus	0	0	0
Sutter	0	408	1,361
Tehama	544	952	5,171
Trinity	0	0	0
Tulare	136	136	272
Tuolumne	272	680	1,769
Ventura	0	0	0
Yolo	952	952	3,538
Yuba	0	680	1,769

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Wild turkey Spring 2019 harvest	Wild turkey Spring 2019 hunters	Wild turkey Spring 2019 days
Alameda	816	544	1,089
Alpine	0	0	0
Amador	816	1,361	3,674
Butte	1,633	1,769	5,987
Calaveras	544	1,089	2,041
Colusa	272	544	1,361
Contra Costa	680	544	1,361
Del Norte	0	0	0
El Dorado	952	2,585	5,443
Fresno	544	1,497	6,939
Glenn	544	544	3,674
Humboldt	408	272	952
Imperial	0	0	0
Inyo	0	0	0
Kern	0	544	1,361
Kings	0	0	0
Lake	0	952	1,633
Lassen	0	0	0
Los Angeles	0	0	0
Madera	272	272	1,905
Marin	272	136	544
Mariposa	680	544	3,266
Mendocino	0	136	1,361
Merced	272	136	408
Modoc	0	0	0
Mono	0	0	0
Monterey	408	1,089	3,538
Napa	544	1,497	5,034
Nevada	952	1,089	3,402
Orange	0	0	0
Placer	1,769	1,225	4,490
Plumas	0	136	408
Riverside	0	0	0
Sacramento	408	680	1,225

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Wild turkey Spring 2019 harvest	Wild turkey Spring 2019 hunters	Wild turkey Spring 2019 days
San Benito	272	272	680
San Bernardino	0	0	0
San Diego	0	2,449	11,838
San Francisco	272	136	408
San Joaquin	0	0	0
San Luis Obispo	680	1,361	3,402
San Mateo	0	136	136
Santa Barbara	544	680	1,361
Santa Clara	816	408	2,041
Santa Cruz	0	0	0
Shasta	1,497	2,313	11,566
Sierra	0	0	0
Siskiyou	272	408	1,089
Solano	136	136	816
Sonoma	408	952	2,993
Stanislaus	0	136	136
Sutter	272	544	2,041
Tehama	1,633	1,905	13,879
Trinity	0	0	0
Tulare	0	136	136
Tuolumne	952	1,225	6,259
Ventura	0	0	0
Yolo	1,225	1,361	4,218
Yuba	408	1,225	3,674

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Rabbit harvest	Rabbit hunters	Rabbit days	Jackrabbit harvest	Jackrabbit hunters	Jackrabbit days
Alameda	0	0	0	0	0	0
Alpine	0	0	0	0	0	0
Amador	0	0	0	0	0	0
Butte	136	136	136	544	272	680
Calaveras	544	136	272	0	0	0
Colusa	0	0	0	680	272	408
Contra Costa	0	0	0	0	0	0
Del Norte	0	0	0	0	0	0
El Dorado	0	0	0	544	136	408
Fresno	15,920	680	4,490	2,721	816	6,123
Glenn	136	136	136	0	0	0
Humboldt	0	0	0	0	0	0
Imperial	136	272	816	408	272	408
Inyo	1,769	408	3,946	2,313	544	2,313
Kern	6,531	1,089	4,218	4,490	816	2,993
Kings	0	0	0	0	0	0
Lake	0	0	0	0	272	272
Lassen	680	272	952	408	136	272
Los Angeles	816	272	1,633	136	136	136
Madera	0	0	0	0	0	0
Marin	0	0	0	0	0	0
Mariposa	0	0	0	544	136	136
Mendocino	0	0	0	0	0	0
Merced	1,089	272	680	0	136	272
Modoc	0	0	0	0	0	0
Mono	0	0	0	0	0	0
Monterey	544	272	272	0	136	136
Napa	0	0	0	0	0	0
Nevada	0	0	0	0	0	0
Orange	0	0	0	0	0	0
Placer	0	0	0	0	0	0
Plumas	0	0	0	544	136	1,361
Riverside	4,082	952	2,993	136	272	1,633
Sacramento	408	136	272	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Rabbit harvest	Rabbit hunters	Rabbit days	Jackrabbit harvest	Jackrabbit hunters	Jackrabbit days
San Benito	0	0	0	0	0	0
San Bernardino	6,395	408	3,130	3,130	408	1,769
San Diego	3,538	1,089	8,708	1,769	408	2,313
San Francisco	0	0	0	0	0	0
San Joaquin	544	136	1,361	0	0	0
San Luis Obispo	0	0	0	3,266	408	4,490
San Mateo	0	0	0	0	0	0
Santa Barbara	136	136	136	0	0	0
Santa Clara	0	0	0	0	0	0
Santa Cruz	0	0	0	0	0	0
Shasta	0	0	0	0	136	5,443
Sierra	0	0	0	0	0	0
Siskiyou	0	136	136	136	272	544
Solano	0	136	136	272	272	1,769
Sonoma	0	0	0	0	0	0
Stanislaus	2,313	272	408	0	0	0
Sutter	1,089	136	408	952	136	680
Tehama	0	136	1,361	136	272	1,497
Trinity	0	0	0	0	0	0
Tulare	0	0	0	0	0	0
Tuolumne	0	0	0	0	0	0
Ventura	0	0	0	0	136	680
Yolo	0	0	0	816	272	408
Yuba	0	0	0	0	0	0

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Tree squirrel harvest	Tree squirrel hunters	Tree squirrel days
Alameda	0	0	0
Alpine	0	0	0
Amador	0	0	0
Butte	1,089	272	680
Calaveras	0	0	0
Colusa	0	0	0
Contra Costa	0	0	0
Del Norte	0	0	0
El Dorado	2,041	680	1,633
Fresno	1,497	816	7,484
Glenn	0	0	0
Humboldt	136	136	136
Imperial	0	0	0
Inyo	0	0	0
Kern	952	680	1,361
Kings	0	0	0
Lake	272	272	408
Lassen	0	0	0
Los Angeles	0	0	0
Madera	0	0	0
Marin	0	0	0
Mariposa	544	136	136
Mendocino	408	272	544
Merced	0	0	0
Modoc	0	0	0
Mono	0	0	0
Monterey	816	136	272
Napa	0	0	0
Nevada	0	136	408
Orange	0	0	0
Placer	0	0	0
Plumas	3,538	544	6,531
Riverside	0	0	0
Sacramento	680	136	408

Table 2. Estimated harvest, number of hunters, and number of days hunted for each species by county (continued).

County	Tree squirrel harvest	Tree squirrel hunters	Tree squirrel days
San Benito	0	0	0
San Bernardino	0	0	0
San Diego	0	0	0
San Francisco	0	0	0
San Joaquin	0	0	0
San Luis Obispo	0	0	0
San Mateo	0	0	0
Santa Barbara	0	0	0
Santa Clara	0	0	0
Santa Cruz	0	0	0
Shasta	2,585	408	3,674
Sierra	272	136	544
Siskiyou	544	272	272
Solano	1,633	136	1,089
Sonoma	0	0	0
Stanislaus	1,089	408	2,449
Sutter	2,177	272	2,721
Tehama	1,361	544	2,449
Trinity	544	272	1,225
Tulare	0	0	0
Tuolumne	680	272	1,633
Ventura	0	0	0
Yolo	0	0	0
Yuba	952	136	544

## **Discussion and Improvements to the Survey**

Both the sampling error rate and the value used to extrapolate the harvest and hunter effort are dependent on the sample size. Our goal for a sampling error of  $\leq 2\%$  required a sample of 2,365 respondents, and we received responses from 1,159 hunters, which increased the sample error to 2.86%. To increase the response rate and reach the target sample size of respondents, and thus decrease the error, we held the survey open for two months and encouraged responses through follow-up emails. Our response rate (12%) was higher than that of the previous GTHSs, and lower than that of Responsive Management and the HIP. Our response rate was also slightly lower than that of the 2016-2017 Resident Upland Game Bird Survey (15%). We intended to send the email out once Spring Turkey season ended for 2018, in order to reduce memory bias while reducing confusion with reporting turkey (below). Due to delays in development, the survey was sent to hunters in late July, as opposed to July 1<sup>st</sup>. To address these issues, we intend to move the start of the survey to the beginning of July with the next survey and increase the number of hunters contacted to 15,000.

With respect to upland game birds, we found that hunters were confused about reporting dove harvest, specifically mourning and white-winged dove and band-tailed pigeon. We chose to focus our first and second on-line surveys on resident upland game birds (quail, chukar, ring-necked pheasant, grouse, and wild turkey) because the HIP survey already assesses hunter effort and harvest for doves and other migratory upland game bird species. We reviewed and tallied all comments in the survey with regards to dove. Forty hunters responded that they hunted dove only, and seven hunters reported that they hunted dove in addition to resident upland game birds.

California has a small population of white-tailed ptarmigan, an upland game species with a short general season (1 week) and small bag limit (2 birds). No hunter reported hunting white-tailed ptarmigan in the 2016-2017 survey, however, we expect that harvest may have occurred and was not represented in our survey sample. Due to concerns that extrapolations of the raw data for this species could suggest an overestimation of the true harvest, we rephrased the question in the 2018-2019 harvest survey to ask if they had attempted to hunt white-tailed ptarmigan so that we could contact those hunters directly for additional information. For all other upland game bird

and small game mammals, hunters were asked how many individuals they harvested, the county of harvest, and the number of days spent hunting. We monitored responses while the survey was active, in part to determine when reminder emails were needed, and to sort out those hunters that hunted white-tailed ptarmigan and contact them directly. Thus, we provided raw data for that white-tailed ptarmigan, as opposed to extrapolated values. We intend to approach white-tailed ptarmigan harvest and hunter effort similarly in the next survey.

### **Acknowledgements**

This survey would not have been possible without the help of the License and Revenue Branch (LRB), the Database and Technology Division (DTD), and the Office of Communications, Education, and Outreach (OCEO). Tony Straw (LRB) provided upland game bird validation lists necessary for our random sample and sent the email out to the hunters. Angie Barlow, Amita Patel, and Roger Harness (DTD) worked with Upland Game Program staff to design the survey on the California Fish and Wildlife website. OCEO staff assisted with developing the email that was sent to the hunters. Jennifer Benedet (R3 Coordinator) and Alex Heeran (Human Dimensions of Wildlife Conservation Coordinator) provided insight to the survey design.

### **Literature Cited**

Dillman, D. A. 2000. Mail and Internet Surveys. John Wiley and Sons, New York, USA.

# Appendix 1. On-line Harvest Survey

Home | Hunting | Upland Game Birds | Harvest Survey

## Resident Upland Game Bird and Small Game Harvest Survey 2018-2019

You have been randomly selected to complete this survey because you purchased a CDFW upland game bird hunting validation. Please complete this survey, *whether you hunted small game or not*. The information you provide is kept confidential by the Department and will be used only for the purpose of conducting this survey. Your response is important to the survey effort, and the information you provide helps the Department estimate harvest and improve our management of the species you hunt.

The following resident Upland Game Bird and Small Game species are included in this survey:

- Mountain quail
- California quail
- Gambel's quail
- Chukar\*
- Ring-necked pheasant\*
- Ruffed grouse
- Sooty grouse
- Fall wild turkey (2018)\*
- Spring wild turkey (2019)\*
- Cottontail, brush, and pygmy rabbit
- Jackrabbit (all species)
- Tree squirrel (all species)

\* Note: we are collecting information on wild birds; please **do not include** those birds harvested on licensed game bird clubs.



### Learn more about...

- Pheasant
- Band-tailed Pigeon

### Related Information

- Search for a Licensed Guide (Fishing and Hunting)
- Upland Game Management

### Contact Us

If you have questions, or problems completing the survey, please contact:

**Katherine Miller**  
Email: [katherine.miller@wildlife.ca.gov](mailto:katherine.miller@wildlife.ca.gov)

### Instructions

**Step 1:** Please enter your GO ID, a unique 10-digit number printed on your hunting license. This will ensure that a single response is recorded for those participants that have been randomly selected in the survey sample. Your responses will remain anonymous.

**Step 2:** Did you hunt?

Tell us whether you hunted in license year 2018/2019 (July 2018 to June 2019). If you answer No, you can scroll to the bottom of the page and click Submit: you're done!

**Step 3:** Provide your harvest information:

If you answered Yes in Step 2, please continue the survey. The Department is collecting harvest information by species and county. Providing your total harvest by county allows the Department to have a better understanding of the distribution of harvest for each species throughout the state. For each species, please enter the number you harvested by county, and the number of days hunted. If you hunted a species in multiple counties, use the subsequent entries to enter the information. Please include upland small game opportunistically harvested while on hunting trips for waterfowl, upland game, etc. (days hunted = 1). **Please include upland game bird and small game species which you hunted even if you were unsuccessful; this will improve our estimation of hunter effort.**

**For example:** If you hunted California quail in Inyo County for 2 days, jackrabbit in Kern County for one day, and wild turkey during the spring season in San Luis Obispo County, you would make three entries (as below) for each combination of the species and the county where you hunted.

**Entry 1: Species/County**

**Species:** California quail

**County:** Inyo

**Number of Days Hunted:** 2

**Number Harvested:** 2

**Entry 2: Species/County**

**Species:** Jackrabbit

**County:** Kern

**Number of Days Hunted:** 1

**Number Harvested:** 1

**Entry 3: Species/County**  
**Species:** wild turkey (spring)  
**County:** San Luis Obispo  
**Number of Days Hunted:** 3  
**Number Harvested:** 2

GO ID Number

Did you hunt in license year 2018/2019 (July 2018-June 2019)?

- Yes  
 No

Select the species hunted, the county in which you hunted, and the number of days hunted and the number of birds harvested. Include hunting effort even if you were unsuccessful. Do not include species harvested on licensed game bird clubs.

**Entry 1: Species/County**

Species

County

Number of Days Hunted

Number Harvested

Continues with sets to Entry 15 . . .

**Entry 15: Species/County**

Species

County

Number of Days Hunted

Number Harvested

Did you hunt white-tailed ptarmigan?

- Yes  
 No

Please provide any additional comments:

I'm not a robot



Submit

If the hunter selected “No”, the comments box and the Submit button move up the webpage, negating unnecessary scrolling:

California Department of  
**Fish and Wildlife**

Home Fishing Hunting Licensing Conservation Learning

GO ID Number  
5443892

Did you hunt in license year 2018/2019 (July 2018–June 2019)?  
 Yes  
 No

Please provide any additional comments:

I'm not a robot reCAPTCHA Privacy - Terms

Submit

Once the hunter has clicked on Submit, the following message appears:

Thank You!

Your submission has been received.

Wildlife Branch - Game Management  
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(916) 445-0411