

AVIAN INVENTORY OF YOSEMITE NATIONAL PARK (1998-2000)

FINAL REPORT

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EXECUTIVE SUMMARY

This document constitutes the final report of The Institute for Bird Populations' three-year Avian Inventory of Yosemite National Park. The inventory was designed to provide park managers with comprehensive, scientifically credible information about the distribution and relative abundance of the avifauna occurring within park boundaries. Specifically, we sought to achieve the following goals:

- a) document the occurrence of at least 90% of the bird species currently believed to occur in Yosemite National Park;
- b) estimate the species richness of each of about 30 bird-habitat types that are based on the major terrestrial plant communities within the park;
- c) describe the distribution and relative abundance of at least 90% of the bird species currently believed to occur in the park as a function of the various bird-habitat types, and
- d) provide summary information necessary to develop a general monitoring strategy and design that can be implemented in the park.

We used timed point counts, coupled with detailed habitat descriptions of each point count location, as our primary means of surveying birds. We used the generalized survey protocol to conduct point counts at 2,646 locations across the length and breadth of the park. We recorded a total of 21,072 individual bird detections, 10,220 of which were within a 50m radius of the observer. Additional surveys using slightly different methodologies were conducted at 197 point count stations in developed locations throughout the park (campgrounds, picnic areas, stables, etc.) and at 46 montane meadows at varying elevations across the park (detailed results from montane meadow surveys are not in the body of this report, but are presented in Appendix One).

We documented 149 species (105% of the 142 locally extant species on our predicted species list) in the park during the 1998-2000 field seasons, including 15 species not included on our predicted species list. Ninety-nine species were detected within a 50m radius during at least one point count. We present the relative abundance (average number of detections per hectare surveyed) of each of these 99 species in tabular form. We then use these detection rates and GIS-based park habitat data to produce predicted distribution and relative abundance maps of each of the 82 species detected five times or more during point counts. For species detected fewer than five times, we provide maps indicating the precise location of each detection.

For the two habitats represented by the most points in our surveys of developed areas (Red Fir and Ponderosa Pine Mixed Conifer) we compare species detection rates in developed areas versus areas sampled by our generalized protocol. We report that several species are significantly over-represented in developed areas (most notably Brown-headed Cowbird which is a nest parasite, and Steller's Jay, which is a nest predator), while numerous others are significantly under-represented in developed areas.

For frequently detected species in well-surveyed habitats, we also use multiple logistic regression to describe the relationship between the likelihood of detection within the 50 m point count circle and each of a suite of ten predictor variables describing habitat characteristics of that

circle. We provide logistic regression models describing habitat relationships for 21 species in one or more habitats.

We conclude by suggesting four guidelines for prioritizing future avian monitoring efforts in the park, and outlining five specific projects that would fulfill those priorities.

INTRODUCTION

This document constitutes the draft final report of The Institute for Bird Populations' three-year Avian Inventory for Yosemite National Park. The inventory was designed to provide park managers with comprehensive, scientifically credible information about the distribution and relative abundance of the avifauna occurring within park boundaries. Specifically, we sought to achieve the following goals:

- a) document the occurrence of at least 90% of the bird species currently believed to occur in Yosemite National Park;
- b) estimate the species richness of each of about 30 bird-habitat types that are based on the major terrestrial plant communities within the park;
- c) describe the distribution and relative abundance of at least 90% of the bird species currently believed to occur in the park as a function of the various bird-habitat types, and
- d) provide summary information necessary to develop a general monitoring strategy and design that can be implemented in the park.

Compared to many national parks, Yosemite's avifauna is already relatively well-known (Beedy 1982, Beedy and Granholm 1985, Gaines 1992, Fister 1993, DeSante et al. 2000). Existing information, however, is nevertheless inadequate for developing a scientifically credible, spatially extensive avian monitoring program in the park. Developing such a program requires quantitative, up-to-date, park-wide distribution and relative abundance data for the majority of species occurring within the park. Our study was initiated to address this need.

METHODS

Development of a predicted species list

Prior to our 1998 pilot field season, we used published and unpublished literature (Grinnell and Miller 1944, Beedy and Granholm 1985, Gaines 1992, DeSante 1995, DeSante et al. 1996) to develop a list of 144 bird species that are known or believed to occur in the park, either as breeders (130 species), as non-breeding summer residents (ten species), or as transients or winter visitors (four species). We used the list as a training tool for our survey crews, and also as a benchmark against which to measure our success at documenting the presence of 90% of the park's bird species.

Sampling strategy

We used information in Gaines (1992) and personal experience to identify 31 major avian habitat types within the park. Our habitat classification system proved to be very similar to the Major Terrestrial Natural Plant Communities classification system described in the Yosemite National Park Vegetation Management Plan and utilized for creating the Yosemite Plant Communities GIS layer. We therefore adopted the 28 habitats of the park's Major Terrestrial Plant Communities classification system (Fig. 1) as our bird-habitat classification system.

With the assistance of Jan van Wagtenonk at the Yosemite Field Station, we randomly selected UTM coordinates of 20 point count transect ‘starting points’ within 2 km of a road or trail, for each of the 28 habitat types. This 2 km buffer described a sampling frame that included 83% of the park’s total area (Fig. 2). We then eliminated any starting points that were within 3000 m of another starting point, yielding a final list of 3-18 starting points for transects within each habitat type. The number of starting points within a given habitat was thus a function of the total area and patchiness of that habitat within the park. Because we were concerned that relatively low-elevation, riparian areas had been under-sampled in 1999, we added four additional transects in 2000 that were sited deliberately along the Merced River.

Additionally, during the 2000 field season we conducted 14 point count transects (comprising 9-17 point counts each) in ‘developed’ areas—including campgrounds, picnic areas and stables— at varying elevations throughout the park (Fig. 3), in order to describe the effects of human activities on bird communities. Unlike the other point count transects, these locations were not randomly chosen, but rather were deliberately sited in areas where human impacts were likely to be most evident.

Finally, our work with the Monitoring Avian Productivity and Survivorship (MAPS) program, as well as other projects in the Sierra, has demonstrated that meadows play a particularly important role in the ecology of Sierra Nevada birds. Not only are some Sierra bird species meadow-obligate breeders, but the young of numerous species that do not actually breed in meadows congregate in them after fledging, to molt and fatten prior to undertaking fall migration (Siegel et al. *in review*). Meadows also serve young and adults of many species as the major fall migration stopping locations in the Sierra. Finally, the densities of many forest-dwelling species are often greatest near meadow edges. Our generalized habitat sampling protocol would have inadequately surveyed montane meadow habitat, because of its spatially restricted, patchy nature throughout the park. Our generalized protocol would have also failed to describe late-summer habitat use by post-breeding birds. We therefore established a more intensive survey protocol for meadows, involving both point counts and/or mist-netting at 46 montane meadows throughout the park. We conducted these intensive meadow surveys in conjunction with similar work at Sequoia/Kings Canyon National Park and at Stanislaus, Sierra, and Sequoia National Forests. The rationale, methods, and results of these intensive meadow surveys are described in detail in **Appendix One (Establishing a Southern Sierra Meadows Important Bird Area: results from meadow surveys at Stanislaus, Sierra, and Sequoia National Forests, and Yosemite and Sequoia/Kings Canyon National Parks)**.

Field methods

We used timed, fixed-radius point counts (Hutto et al. 1986, Ralph et al. 1993, Siegel 2000), coupled with detailed habitat descriptions of each point count location, as our primary means of surveying birds. Additionally, in 2000 we recorded the estimated horizontal distance between the observer and each bird detected, so that our data could also be analyzed using the Variable Circular Plot (VCP) method, which the NPS Inventory and Monitoring Program recently recommended for avian monitoring efforts in the parks (Fancy and Sauer 2000). In order to allow pooling of point count data across the two years of this study in which generalized

point count surveys were conducted (1999 and 2000), however, we have restricted analyses in this report to the fixed radius data.

We conducted a transect of approximately ten point counts spaced 250m apart (points were placed 150-250m for developed area surveys) in a randomly chosen cardinal direction from each starting point, which was located in the field with topographic maps and a hand-held GPS unit. Transects were conducted by two-person teams, comprised of a designated point count observer and a designated vegetation observer. The point count observer flagged the trail from point to point as the transect was conducted; the vegetation observer then followed the train of flagging, collecting vegetation data at the indicated point count locations. Vegetation observers were careful to remain at least 250m behind the point count observer, to avoid influencing bird activity during the count. As a safety consideration, point count and vegetation observers remained in radio contact for the duration of the transect. Observers occasionally encountered a river, cliff, or other barrier that prevented them from completing a transect along the intended compass bearing; in these cases they returned to the last successfully completed point, and then turned 90° clockwise to continue the transects. If this bearing was obstructed as well, they turned 270° from the original bearing.

Point counts began within ten minutes of local sunrise, and continued until 3.5 hours after local sunrise. Counts lasted five minutes, with birds detected within a 50m radius recorded separately from birds detected at greater distances—we therefore simultaneously conducted 50m radius *and* unlimited radius point counts. Flyovers— defined as birds that flew over the top of the vegetation canopy, never touched down in the observer’s field of view, and did not appear to be foraging, displaying, or behaving in any other way that might suggest a link to the habitat below— were recorded separately from other detections. Birds thought to have been previously recorded at another point were marked accordingly on the data forms. A final GPS reading was recorded at the location of the last point count; the precise locations of second through penultimate point counts on each transect were determined by interpolating between the starting and ending coordinates, accounting for any changes in compass bearing that were made due to obstacles along the way.

Vegetation descriptions entailed collecting data on vegetation structure and composition within a 50m radius circular plot centered on each survey point, and then assigning a primary habitat classification to the plot (classifications were based on Yosemite’s Major Terrestrial Natural Plant Communities, along with an additional category for recently burned areas). Plots occasionally straddled more than one distinct habitat type; in these cases observers classified the point as being dominated by the habitat that covered the larger portion of the circle, and then also recorded the ‘secondary’ habitat present in the plot. We also recorded total cover, average height, and species composition of four vegetation layers (ground-cover, understory, sub-canopy and canopy) at 10, 20, 30, 40, and 50m in each cardinal direction from the central point, as well as summary plot characteristics such as aspect, slope, and the presence of running or standing water.

Crew members were also instructed to complete “Rare Bird Report Forms”, including descriptions of the birds’ appearance and behavior and UTM coordinates, whenever they detected species thought to be rare or difficult to sample in the park. These reports covered not

only birds detected during point counts, but also birds detected while sampling vegetation, hiking between transects, relaxing at camp in the evening, or at any other time during the season.

Training and testing

At the beginning of the 1999 and 2000 field season, our field crew underwent an intensive two-week training program onsite in the park. Crew members, who generally had prior experience birding and conducting biological fieldwork, were trained in visual and aural bird identification, distance estimation, plant identification, orienteering, backcountry safety, and project protocols. Bird identification skills were honed by spending days in the field birding and practicing point counts with experienced trainers, and then reviewing at night with the aid of field guides, taped songs and calls, and an instructional CD-ROM. At the end of the two-week training period, crew members were given a rigorous exam involving the identification of 80-100 taped calls and songs, as well as 20-30 photographic images. Crew members were not permitted to conduct point counts (they worked solely as vegetation observers instead) until they passed the exam, which required a near-perfect score. A second exam was administered a few weeks later, to give a second chance to individuals who failed the first exam.

Data analysis

All data were entered into dBASE databases, which were then checked for errors using an array of automated and manual data verification routines. Copies of these databases will be submitted to park personnel along with this report; additional copies of the databases, as well as the paper data forms, will be stored at The Institute for Bird Populations.

Within each habitat, each species' relative abundance was calculated as

$$\frac{(d_{50}/p_{hab})}{0.7854},$$

where d_{50} is the total number of 50m radius detections tallied at all points in that habitat, p_{hab} is the total number of points sampled within that habitat type, and 0.7854 is the portion of a hectare covered by a 50m radius circle. We generated distribution and relative abundance maps for each species detected within a 50m radius at least five times during point counts, by projecting habitat-specific indices of relative abundance onto the park's plant communities GIS layer. For a given species, the average relative abundance calculated from all points sampled within a given habitat was thus assigned to all patches of that habitat type in the GIS layer.

Species richness for each habitat was estimated using the computer program EstimateS (Colwell 1997), which computes species richness estimates using a comprehensive suite of user-specified, alternative models. Model selection is discussed in the Results section below.

Chi-square tests were used to test for differences in unlimited-radius detection rates between points dominated by the same habitat type in developed areas versus undeveloped areas. We analyzed unlimited-radius results, rather than 50 m radius results, because the relatively

small number of developed area point counts yielded rather restricted 50 m radius sample sizes for most species.

We used multiple logistic regression to describe the relationship between the likelihood of birds being detected within the 50 m point count circle and a generalized set of predictor variables describing habitat characteristics of that circle. Candidate predictor variables in the models included the following:

- 1) Extent of standing water: Square meters of standing water in the 50 m count circle.
- 2) Running water index: Coded value describing largest course of running water within the 50 m count circle: 0 = none, 1= trickle, 2 = very small stream, 3 = small stream, 4 = large stream.
- 3) Downed wood index: Coded values indicating extent of downed wood greater than 20 cm wide within the count circle: 0 = none, 1= one to five pieces, 2 = five or more pieces.
- 4) Snag density index: Coded value indicating the number of snags in the 50 m count circle: 0 = none, 1 = one to three, 2 = three or greater. Snags were defined as completely dead trees greater than 1.5 m tall and greater than 20 cm dbh.
- 5) Canopy cover: Visual estimation of percent cover in the vegetation layer that includes all vegetation greater than 10 m above ground.
- 6) Subcanopy cover: Visual estimation of percent cover in the vegetation layer between 4-10 m above ground, even where there is no vegetation higher than 10 m above ground.
- 7) Black Oak cover: Percent cover of Black Oak (canopy and/or subcanopy) within the 50 m count circle.
- 8) Live Oak cover: Percent cover of Live Oak (canopy and/or subcanopy) within the 50 m count circle.
- 9) Understory cover: Visual estimation of percent cover in the vegetation layer (including shrub species as well as tree species) between 0.5 and 4 m above ground.
- 10) Ceanothus cover: Percent cover of *Ceanothus* shrubs (most commonly Deer Brush or Snow Bush) within the 50 m count circle.

We performed forward stepwise logistic regression (Hosmer and Lemeshow 1989, Pavlacky and Anderson 2001) to determine the effect of each predictor variable on the likelihood of recording individual species. The inclusion threshold set at $p < 0.1$, but factors whose p -value did not reach the significance threshold were left in the model if they did not worsen the Akaike's Information Criterion (AIC; Akaike 1973). We only accepted models in which the model chi-square statistic was significant ($p > 0.05$), indicating that the model was significantly better than one with coefficients set equal to zero. Logistic regressions were habitat specific (e.g. only included data from one habitat type), and were only performed for habitats in which at least 50 point counts were conducted. Within a given habitat, logistic regressions were only performed for species that were detected at least 25 times.

Statistical significance for all tests described in this report was set at $p < 0.05$, except for the inclusion threshold for predictor variables in the logistic regression models (see above). All statistical tests were two-tailed, and were performed using Systat (SPSS Inc. 1997).

RESULTS AND DISCUSSION

Scope of work accomplished

We recorded a total of 21,072 individual bird detections (10,220 within a 50m radius of the observer) at 2,646 individual point counts using our generalized sampling protocol in 1999 and 2000 (Fig. 4). Additional point counts were conducted using a slightly different methodology at montane meadows in 1998 and 1999 (see Appendix One) and at ‘developed’ sites in 2000 (discussed below).

Transects were generally about 2.25 km long, and the ten or so points that comprised them were rarely all classified as being dominated by the same habitat type. More typically, a transect would extend across two or three distinct habitats. The largest share of our sampling points (494 points) were dominated by Lodgepole Pine, but eight other habitats were represented by 100 or more points, and most habitats were represented by at least 30 points (Table 1). Three habitats (Giant Sequoia, Interior Live Oak, and White Alder) are restricted to very small areas in the park, and consequently were sampled with too few points to provide meaningful inferences about avian community structure.

For most habitats, point count locations were very well distributed geographically across the park. Figures 5-33 indicate the spatial extent of each habitat type within the park (as mapped in the park GIS database) and the locations of each point count classified in the field as being dominated by that habitat type.

Bird species detected in the park

We documented a total of 149 species (105% of the 142 locally extant species on our predicted species list) in the park during the 1998-2000 field seasons (Table 2). Some of the species we detected were never actually seen or heard during point counts, but instead were captured or detected at MAPS stations during the three-year inventory, or more commonly, detected at other times by our inventory crew members while they were hiking or camping. We detected 17 species not included on our predicted species list (Table 2). We failed to detect 10 species that were included on the list: Harlequin Duck, Prairie Falcon, Killdeer, Long-eared Owl, Cliff Swallow, Varied Thrush, Grasshopper Sparrow, Golden-crowned Sparrow, House Finch, and House Sparrow.

We consider species that were detected fewer than five times during regular point counts (the species marked with bold type in Table 2, plus the ten species on our predicted species list that we never detected) to be either rare in the park, or inadequately sampled by our generalized protocol. Accordingly, the locations where each of these species was detected are indicated in Figures 34-40. These species that were rarely or never detected generally fall into one or more of the following eight categories:

1) *Winter residents, absent during the breeding season:*

The seasonal timing of our surveys prevented us from documenting the presence of these species.

- 2) *Nocturnal species:*
Our survey was designed exclusively to inventory diurnal birds. Although several of Yosemite's resident owl species probably are legitimately rare within the park, the anecdotal nature of our detections during this survey prevents us from drawing any conclusions.
- 3) *Diurnal raptors:*
Raptors in forested habitat are not well surveyed by point counts, which rely primarily on detections of vocalizing birds. Some of these species, like Golden Eagle and Peregrine Falcon, are legitimately rare in the park, but others may simply be difficult to survey.
- 4) *Species that occur in the park only as transients or vagrants:*
We detected numerous species that occur in the park only as a) transient visitors, or b) vagrant individuals far from their normal breeding range (e.g. American Redstart, Indigo Bunting).
- 5) *Aquatic species:*
As with nocturnal species, our survey was not designed to inventory these species, and the anecdotal nature of our detections during this survey prevents us from drawing any inferences. Nevertheless, most of these species probably are legitimately rare within the park.
- 6) *Low elevation, west slope species:*
Many of our very infrequently detected species require foothill habitat that is poorly represented within the park (e.g. Western Kingbird, California Thrasher).
- 7) *East slope species:*
Some of our very infrequently detected species are most strongly tied to habitats east of the Sierran crest (e.g. Brewer's Sparrow, Savannah Sparrow); such areas are poorly represented in the park.
- 8) *Species tied to other localized habitats within the park:*
Some species, such as White-tailed Ptarmigan or European Starling, may be relatively abundant but only in fairly localized places in the park. Our randomized sampling system resulted in a few of these species being more or less overlooked.

A few species that were detected fewer than five times do not fit neatly into any of these categories. Examples include Willow Flycatcher and Swainson's Thrush, both of which are known to have declined drastically throughout their Sierra ranges during the last century, and Pygmy Nuthatch, which we were surprised to detect at only two locations in the park.

General survey results

Ninety-nine species were detected within a 50m radius during at least one point count. Table 3 presents the average number of detections per hectare, or relative abundance, of each of

these 99 species, in each of the 29 habitat types. The totals in Table 3 are based only on birds detected within the 50m radius; flyovers and birds detected at distances greater than 50 m were not included in the calculations. In seven instances our crews recorded birds that were well out of their normal habitat or elevational range: a Hutton's Vireo in Lodgepole Pine habitat, a Warbling Vireo in Barren habitat, a Winter Wren in Mountain Hemlock habitat, a Black-throated Gray Warbler in Barren habitat, Spotted Towhee in Barren habitat and Lodgepole Pine habitat, and a Purple Finch in Lodgepole Pine habitat. These detections are reflected in Table 3, but we nevertheless stress that they do not represent these species' normal distributions within the park, and they are consequently not reflected in the species distribution maps we have produced (see below). Even aside from these truly aberrant detections, many species were detected in low numbers (sometimes just one or two individuals) in habitats where they probably do not actually breed, but rather utilize in low numbers as upslope dispersers after breeding or fledging. Because these detections are reflected in the species distribution maps (see below) the maps should be interpreted with some degree of caution for species in habitats where they were detected at densities below about 0.01 individuals per hectare, as indicated in Table 3.

Table 4 presents park habitats ranked according to the average number of birds (all species pooled) detected within a 50 m radius of the observer at all the sampling points within that habitat. Montane meadow appears to be the most densely populated habitat in the park, a remarkable result given the habitat's relative lack of vertical structure. Of note also is that Black Oak and Quaking Aspen, two other habitats of general concern throughout the Sierra, appear to be the third and fourth most densely populated habitats in the park. Perhaps not surprisingly, the least populated habitats are those found at the highest elevations.

Distribution and relative abundance maps of each species detected five times or more during point counts are presented in Figures 41-127. While we believe the distribution and relative abundance maps represent a large step forward in elucidating the species-habitat relationships of Yosemite's avifauna, they are far from perfect. Species abundance maps such as these are by necessity based on a variety of assumptions that may not be entirely reliable, and as such can be misleading if the assumptions and limitations of the models and data that generated the maps are not kept in mind (Conroy and Noon 1996). The maps presented here are based on models that contain just a single habitat variable—dominant habitat type. For the majority of species the output of these simple models appears to be quite realistic, if somewhat coarse. For a handful of species, however, the maps are somewhat misleading. In particular, aquatic species such as Mallard, Common Merganser and American Dipper are poorly described by models that are based on terrestrial, rather than aquatic, habitats. The fact that we most often detected Mallards in habitats classified as Ponderosa Pine, for example, should not be interpreted as meaning that Mallards are widely distributed across the park's Ponderosa Pine forests, as Fig. 41 may appear to suggest. Rather, we detected the birds near ponds or lakes that just happened to be surrounded by Ponderosa Pine forest. Similarly, because White-crowned Sparrows occur in montane meadow habitat, Fig. 113 suggests they are present on the floor of Yosemite Valley, part of which is mapped as montane meadow. In reality, White-crowned Sparrows no longer breed in the Valley, although they did until early in the last century. Additionally, we must reiterate that species detected in particular habitats at densities below about 0.01 individuals per hectare (Table 3), are mapped as occurring in habitats that they may only rarely visit, and may never use for breeding.

Finally, when interpreting the maps, it is also important not to conclude that a species completely shuns a particular habitat, just because we failed to detect any individuals there. This is particularly important for relatively rare or secretive species. For example, we detected Pine Grosbeak at low densities in both Whitebark Pine habitat and Mountain Hemlock habitat, but not in 'Whitebark Pine-Mountain Hemlock' habitat, where they surely also occur. Similarly, species that vocalize infrequently are often under-counted by point counts, and this appears to have been the case with Red-breasted Sapsucker, which we believe is more abundant in low- to mid-elevation habitats than the data presented in Table 3 or Figure 54 indicate.

Summary point count results from each habitat, (in order, roughly, from lower to higher elevations) including complete species lists, number of points with unlimited-radius and 50m radius detections, and average number of individuals detected per hectare are presented in Tables 5-33.

Table 34 summarizes the number of species actually detected in each habitat where we conducted at least 14 point counts (but generally many more; see Table 1), and also presents the total number of species estimated to be present, according to four alternate models provided in the software program EstimateS (Colwell 1997). Some method of correcting the raw species counts in Table 34 is necessary, because a) even the most comprehensive survey is likely to miss some rare or secretive species (Nichols et al. 1998), and b) the number of species detected is likely to be confounded by the number of points sampled. The EstimateS software computes ten different species richness estimators, each based on a unique model from the rapidly growing literature on this subject. However several of the models produced estimators that appeared unrealistic to us, because in some cases they were smaller than the actual number of species detected, in some cases they were unrealistically larger than the actual number of species detected, or in some cases they suggested that very similar habitats harbored drastically different numbers of species. Only four models produced estimates that consistently appeared to be biologically realistic: ACE (Abundance-based Coverage Estimator; Chao, Ma and Yang 1993; Chazdon et al. 1998), ICE (Incidence-based Coverage Estimator; Lee and Chao 1994; Chazdon et al. 1998); Chao1 (Chao 1 Richness Estimator; Chao 1984), and Jack1 (First-order Jackknife richness estimator; Burnham and Overton 1978, 1979; Smith and van Belle 1984, Palmer 1991).

The presentation of four different species richness estimators may be somewhat unsatisfying, but at this point the ecological literature reflects no clear consensus as to which species richness extrapolation methods are preferable, and under what circumstances they might be preferable (Colwell and Coddington 1994, Boulinier et al. 1998, Chazdon et al. 1998, Keating and Quinn 1998). Although the different models' point estimates of species richness vary considerably for some habitats, the rank order of habitats according to their estimated species richness is relatively consistent between models (Table 34). We averaged ranks from each of the four models to produce an 'overall' species richness rank for each habitat, relative to the other habitats (Table 34). In general the ranks suggest the intuitive result that mid-elevation habitats are the most species rich, with Ponderosa Pine-Mixed Conifer harboring the most species, followed fairly closely by Montane Chaparral, Jeffrey Pine, Red Fir, Lodgepole Pine and Montane Meadow. The least species-rich habitats appear to be the highest elevation forests:

Western Juniper, Mountain Hemlock, Whitebark Pine-Mountain Hemlock, Whitebark Pine, and Whitebark Pine-Lodgepole Pine.

Our finding that Montane Chaparral is among the most species-rich habitats in the park (rank=2; Table 34), and indeed, also exhibits one of the higher densities of birds (rank = 8; see Table 4) has particularly important management implications, both within and beyond the park's boundaries. Perhaps more than any other major habitat type, the presence and extent of Montane Chaparral is highly sensitive to forest management actions, which can promote or discourage chaparral growth. Such actions include fire suppression, prescribed burning, and a host of silvicultural practices, such as clear-cutting, selective logging, herbicide application, and brush removal.

The 'overall' habitat-specific species richness estimates correlate weakly but significantly with the number of points surveyed in each habitat ($R^2 = 0.20$, $n = 26$, $p = 0.024$; Fig. 129). This does not necessarily indicate a failure of the models to adequately correct for sampling effort, however. The habitats that we sampled most frequently were the habitats that are most spatially extensive across the park, and therefore may indeed harbor the largest numbers of distinct ecological niches for birds. For example, Lodgepole Pine, as the most spatially extensive habitat in the park, occurs across a broad elevational range, and therefore serves as habitat to species that frequent mid-high elevation interior forest, as well as species wedded to sparsely wooded areas near timberline. We believe that Figure 130, which reflects the ACE-based species richness estimates, provides a relatively good, albeit coarse, picture of how species richness likely varies across the park. Our choice of the ACE estimator was arbitrary however; we have no reason to believe it is superior to any of the other three estimators presented in Table 34. While point estimates for some habitats differ substantially according to which estimator is used, we stress again that the overall pattern of relative species richness across the park's habitats is largely unaffected by the choice of species richness estimator.

Developed area survey results

We established transects comprising 9-17 point count locations at each of the 14 developed areas we surveyed (Table 35). Most of the 197 points were classified as Lodgepole Pine or Ponderosa Pine Mixed Conifer, but ten other habitats were represented by at least one point (Table 36). For each of the two most extensively sampled habitats, we used chi-square tests to test for differences in the detection rates of species in developed areas versus undeveloped areas sampled during the general survey. At points dominated by Lodgepole Pine (Table 37), five bird species were significantly under-represented ($p < 0.05$) on developed area point counts: Dusky Flycatcher, Clark's Nutcracker, Townsend's Solitaire, Fox Sparrow, and Pine Siskin. Six other species were significantly over-represented in developed areas: Steller's Jay ($p < 0.01$), Common Raven ($p < 0.05$), Red-breasted Nuthatch ($p < 0.05$), Chipping Sparrow ($p < 0.01$), Brewer's Blackbird ($p < 0.01$), and Brown-headed Cowbird ($p < 0.01$).

These results may be somewhat complicated by the relatively broad altitudinal range and spectrum of ecological conditions in which Lodgepole Pine grows (Weeden 1996). Our highest altitude developed area sampling points were in the Tuolumne Meadows vicinity, around 8,600', whereas a portion of the general survey Lodgepole Pine point counts were conducted near tree-

line— where Clark’s Nutcracker and Pine Siskin are often particularly conspicuous. It is tempting to conclude that the other under-represented species (Dusky Flycatcher, Townsend’s Solitaire, and Fox Sparrow) are all affected by a dearth of shrub understory around the developed areas, as they are all shrub- or ground-nesting species. However, Chipping Sparrow, another species that often nests in shrubs or other understory vegetation, is *over*-represented in the developed areas.

As for the other four species over-represented at developed areas dominated by Lodgepole Pine, Red-breasted Nuthatch is difficult to explain, but Steller’s Jay, Brewer’s Blackbird, and Brown-headed Cowbird are all well known to be attracted to humans and/or pack animals. The increased density of Steller’s Jay and Brown-headed Cowbird are of particular ecological significance, as Steller’s Jay commonly preys upon the eggs and nestlings of other bird species, and Brown-headed Cowbird is a nest parasite implicated in declines of several songbird species.

At points dominated by Ponderosa Pine Mixed Conifer (Table 38), 14 species were significantly under-represented in developed areas: Mountain Quail ($p<0.01$), Dusky Flycatcher ($p<0.05$), Cassin’s Vireo ($p<0.01$), Mountain Chickadee ($p<0.01$), Golden-crowned Kinglet ($p<0.05$), Townsend’s Solitaire ($p<0.01$), Nashville Warbler ($p<0.01$), Yellow-rumped Warbler ($p<0.01$), Black-throated Gray Warbler ($p<0.01$), Hermit Warbler ($p<0.01$), Spotted Towhee ($p<0.01$), Fox Sparrow ($p<0.05$), and Lazuli Bunting ($p<0.05$). Five species were significantly over-represented in developed areas: Steller’s Jay, American Robin, Song Sparrow, Red-winged Blackbird, and Brewer’s Blackbird ($p<0.01$ for all five species). All five species are all well known to occur commonly in developed areas.

Three species (Dusky Flycatcher, Townsend’s Solitaire, and Fox Sparrow) were thus significantly under-represented at developed areas in both Lodgepole Pine and Ponderosa Pine Mixed Conifer habitat. Steller’s Jay and Brewer’s Blackbird were over-represented at developed areas in both habitats.

Intra-habitat correlates of avian species presence

Habitat-specific logistic regression yielded statistically significant models for 21 individual bird species in one or more habitats. Unfortunately there is no way to reliably incorporate the information from these models into our species distribution maps (Figs. 41-127), without having parkwide information (as opposed merely to having information at each of our sampling points) on each of our ten predictor habitat variables. Nevertheless, we believe these models will be useful to researchers seeking information on the habitat preferences of particular species, and even more importantly, to land managers interested in predicting the likely effects of habitat changes on particular bird species. Our models describing the effects of habitat variables on detection probability are presented below.

Ponderosa Pine Mixed Conifer. Within Ponderosa Pine Mixed Conifer habitat, the likelihood of detecting fourteen species was significantly affected by one or more of the habitat variables we examined (Table 39).

Hairy Woodpecker: The odds of detecting Hairy Woodpecker increased 146% with every one-unit increase in the snag density index, but were unaffected by the other nine habitat variables we investigated.

Cassin's Vireo: When controlling for each variable in the selected model, the odds of detecting Cassin's Vireo increased 3% with every 1% increase in canopy cover, 17% with every 1% increase in Live Oak cover, and 91% with every one-unit increase in the downed wood index. Detection odds decreased 3% for every 1% increase in subcanopy cover.

Steller's Jay: Detection odds decreased 39% with every one-unit increase in the snag density index, decreased 33% with every 1% increase in *Ceanothus* cover, and decreased 9% with every 1% increase in Live Oak cover.

Mountain Chickadee: Detection odds increased 92 % with every one-unit increase in the snag density index.

Red-breasted Nuthatch: Detection odds increased 3% with every 1% increase in canopy cover, and increased 104% with each one-unit increase in the snag density index.

Brown Creeper: Detection odds increased 103% with each one-unit increase in the downed wood index, and decreased 8% with each 1% increase in Black Oak cover.

American Robin: Detection odds increased 12% with every 1% increase in Live Oak cover, and decreased 2% with every 1% increase in subcanopy cover.

Nashville Warbler: Detection odds increased 106% with every one-unit increase in the snag density index, and increased 8% with every 1% increase in Black Oak cover.

Yellow-rumped Warbler: Detection odds decreased 14% with every 1% increase in Live Oak cover, and decreased 9% with every 1% increase in *Ceanothus* cover.

Black-throated Gray Warbler: Detection odds increased 20% with every 1% increase in Live Oak cover, increased 2% with every 1% increase in canopy cover, and decreased 7% with every 1% increase in subcanopy cover.

Hermit Warbler: Detection odds increased 3% with every 1% increase in subcanopy cover, increased 54% with every one-unit increase in the snag density index, and decreased 10% with every 1% increase in Live Oak cover.

Western Tanager: Detection odds increased 12% with every 1% increase in Live Oak cover, and increased 69% with every one-unit increase in the snag density index.

Spotted Towhee: Detection odds increased 262% with every one-unit increase in the snag density index, increased 10% with every 1% increase in Black Oak cover, and increased 3% with every 1% increase in *Ceanothus* cover. Detection odds decreased 2%

with every 1% increase in canopy cover, decreased 53% with every 1-unit increase in the downed wood index, and decreased 2% with every 1% increase in subcanopy cover.

Black-headed Grosbeak: Detection odds increased 7% with every 1% increase in Live Oak cover, increased 2% with every 1% increase in understory cover, and increased 5% with every 1% increase in Black Oak cover.

Montane Chaparral: Within Montane Chaparral habitat, the probabilities of detecting two species were significantly affected by one or more of the habitat variables examined (Table 40).

Fox Sparrow: Detection odds increased 3% with every 1% increase in understory cover.

Dark-eyed Junco: Detection totals decreased 4% with every 1% increase in *Ceanothus* cover.

White Fir Mixed Conifer: Within White Fir Mixed Conifer habitat, the likelihood of detecting 12 species was significantly affected by one or more of the habitat variables we examined (Table 41).

Dusky Flycatcher: Detection odds increased 8% with every 1% increase in *Ceanothus* cover. Detection odds decreased 62% with every one-unit increase in the snag density index, and decreased 36% with every one-unit increase in the running water index.

Warbling Vireo: Detection odds increased 8% with every 1% increase in *Ceanothus* cover, and increased 16% with every 1% increase in Live Oak cover.

Steller's Jay: Detection odds increased 177% with every one-unit increase in the downed wood index.

Mountain Chickadee: Detection odds increased 81% with every one-unit increase in the snag density index, increased 8% with every 1% increase in Live Oak cover, and increased 4% with every 1% increase in *Ceanothus* cover. Detection odds decreased 1% with every 1% increase in subcanopy cover.

Red-breasted Nuthatch: Detection odds decreased 62% with every one-unit increase in the running water index, and increased 2% with every 1% increase in subcanopy cover.

Brown Creeper: Detection odds decreased 2% with every 1% increase in subcanopy cover.

Golden-crowned Kinglet: Detection odds decreased 27% with every one-unit increase in the running water index, and decreased 19% with every 1% increase in Live Oak cover. Detection odds increased 2% with every 1% increase in canopy cover.

Nashville Warbler: Detection odds increased 17% with every 1% increase in Live Oak cover, and increased 10% with every 1% increase in Black Oak cover.

Yellow-rumped Warbler: Detection odds increased 2% with every 1% increase in subcanopy cover. Detection odds decreased 45% with every one-unit increase in the running water index, and decreased 2% with every 1% increase in understory cover.

Hermit Warbler: Detection odds decreased 34% with every one-unit increase in the running water index, and increased 3% with every 1% increase in *Ceanothus* cover.

Western Tanager: Detection odds increased 128% with every square meter increase in the extent of standing water, and increased 75% with every one-unit increase in the snag density index.

Fox Sparrow: Detection odds increased 13% with every 1% increase in *Ceanothus* cover, and increased 3% with every 1% increase in understory cover. Detection odds decreased 58% with every one-unit increase in the snag density index, and decreased 60% with every square meter increase in the extent of standing water.

White Fir: Within White Fir habitat, the likelihood of detecting just one species was significantly affected by one or more of the habitat variables we examined (Table 42).

Golden-crowned Kinglet: Detection odds increased 6% with every 1% increase in subcanopy cover.

Jeffrey Pine: Within Jeffrey Pine habitat, the likelihood of detecting three species was significantly affected by one or more of the habitat variables we examined (Table 43).

Mountain Chickadee: Detection odds increased 131% with every one-unit increase in the snag density index, and decreased 41% with every one-unit increase in the running water index.

Nashville Warbler: Detection odds increased 38% with every 1% increase in Black Oak cover, increased 85% with every one-unit increase in the running water index, and increased 14% with every 1% increase in *Ceanothus* cover.

Fox Sparrow: Detection odds increased 9% with every 1% increase in understory cover, and decreased 39% with every 1% increase in Black Oak cover.

Jeffrey Pine-Red Fir: Within Jeffrey Pine-Red Fir habitat, the likelihood of detecting three species was significantly affected by one or more of the habitat variables we examined (Table 44).

Mountain Chickadee: Detection odds decreased 4% with every 1% increase in canopy cover.

Yellow-rumped Warbler: Detection odd increased 5% with every 1% increase in canopy cover, and decreased 66% with every one-unit increase in the snag density index.

Dark-eyed Junco: Detection odds increased 11% with every 1% increase in *Ceanothus* cover.

Red Fir: Within Red Fir habitat, the likelihood of detecting seven species was significantly affected by one or more of the habitat variables we examined (Table 45).

Dusky Flycatcher: Detection odds decreased 53% with every one-unit increase in the running water index, decreased 48% with every one-unit increase in the downed wood index, decreased 3% with every 1% increase in subcanopy cover, and decreased 2% with every 1% increase in canopy cover.

Red-breasted Nuthatch: Detection odds decreased 44% with every one-unit increase in the running water index, and increased 2% with every 1% increase in subcanopy cover.

Brown Creeper: Detection odds increased 2% with every 1% increase in shrub cover, and increased 71% with every one-unit increase in the downed wood index.

Golden-crowned Kinglet: Detection odds increased 3% with every 1% increase in canopy cover, increased 53% with every one-unit increase in the snag density index, and increased 131% with every square meter increase in the extent of standing water.

Yellow-rumped Warbler: Detection odds increased 2% with every 1% increase in subcanopy cover, and decreased 26% with every one-unit increase in the running water index.

Western Tanager: Detection odds decreased 2% with every 1% increase in canopy cover.

Fox Sparrow: Detection odds decreased 67% with every one-unit increase in the downed wood index, and decreased 2% with every 1% increase in canopy cover.

Lodgepole Pine: Within Lodgepole Pine habitat, the likelihood of detecting seven species was significantly affected by one or more of the habitat variables we examined (Table 46).

Dusky Flycatcher: Detection odds decreased 39% with every one-unit increase in the running water index.

Mountain Chickadee: Detection odds decreased 27% with every one-unit increase in the running water index, and increased 35% with every one-unit increase in the snag density index.

Brown Creeper: Detection odds increased 187% with every one-unit increase in the downed wood index, increased 39% with every square meter increase in the extent of standing water, and increased 2% with every 1% increase in canopy cover.

Yellow-rumped Warbler: Detection odds increased 3% with every 1% increase in canopy cover, increased 60% with every one-unit increase in the downed wood index, and increased 32% with every one-unit increase in the snag density index.

Fox Sparrow: Detection odds increased 5% with every 1% increase in understory cover. Detection odds decreased 4% with every 1% increase in subcanopy cover, and decreased 43% with every one-unit increase in the running water index.

Dark-eyed Junco: Detection odds increased 2% with every 1% increase in subcanopy cover, and increased 37% with every square meter increase in the extent of standing water.

Cassin's Finch: Detection odds decreased 3% with every 1% increase in understory cover, and increased 2% with every 1% increase in subcanopy cover.

Mountain Hemlock: Within Mountain Hemlock habitat, the likelihood of detecting three species was significantly affected by one or more of the habitat variables we examined (Table 47).

Mountain Chickadee: Detection odds decreased 6% with every 1% increase in understory cover, and increased 2% with every 1% increase in canopy cover.

Yellow-rumped Warbler: Detection odds increased 74% with every one-unit increase in the downed wood index, and increased 2% with every 1% increase in subcanopy cover.

Cassin's Finch: Detection odds increased 2% with every 1% increase in understory cover.

Subalpine Meadow: Within Subalpine Meadow habitat, the likelihood of detecting three species was significantly affected by one or more of the habitat variables we examined (Table 48).

Yellow-rumped Warbler: Detection odds increased 206% with every one-unit increase in the downed wood index, and increased 7% with every 1% increase in subcanopy cover.

White-crowned Sparrow: Detection odds increased 135% with every one-unit increase in the running water index, increased 478% with every square meter increase in the extent of standing water, and increased 7% with every 1% increase in understory cover.

Dark-eyed Junco: Detection odds increased 16% with every 1% increase in subcanopy cover, and increased 152% with every one-unit increase in the downed wood index. Detection odds decreased 83% with every one-unit increase in the snag density index.

Several interesting patterns are evident in these results. In many habitats (e.g. Ponderosa Pine Mixed Conifer, White Fir Mixed Conifer, Jeffrey Pine, Lodgepole Pine) one or more cavity-nesting species, including Mountain Chickadee, Red-breasted Nuthatch, and Hairy Woodpecker, exhibited higher detection probabilities where snag density was greater. We suspect similar relationships hold for other cavity-nesting species and habitat types as well, but

most cavity-nesting species in most habitats failed to meet our threshold requirement of detecting at least 25 individuals in a given habitat in order to perform logistic regression analysis.

Similarly, Brown Creeper, which nests underneath exfoliating bark (often, but not always on snags) showed strong correlations with the downed wood index, and indeed, was the only species to do so rather consistently.

In several low- to mid-elevation habitats, a larger Black Oak component in the forest was strongly associated with increased probability of detecting several species, including Nashville Warbler, Black-headed Grosbeak, and Spotted Towhee. Interestingly, increasing proportions of Live Oak also indicated greater probability of detecting several species, including not just Black-throated Gray Warbler, which we expected, but also Cassin's Vireo, Warbling Vireo, American Robin, Nashville Warbler, Western Tanager, and Black-headed Grosbeak. Several other species-- including Steller's Jay, Brown Creeper, Golden-crowned Kinglet, Yellow-rumped Warbler, and Hermit Warbler-- exhibited the opposite relationship, apparently shying away from habitats with significant Live Oak components.

Of the 14 species that exhibited relationships with the running water index, 12 exhibit negative relationships. This might be explained by a noise effect; observers were likely unable to hear some birds singing near larger streams. The two species that responded positively to the running water index (White-crowned Sparrow in Subalpine/Alpine Meadow and Nashville Warbler in Jeffrey Pine habitat); we would have expected both to be more common near riparian vegetation in the two respective habitats.

Many species appeared to respond positively to increasing proportions of understory cover and/or *Ceanothus* cover, a finding that is consistent with results from elsewhere in the Sierra (Verner and Larsen 1989, Siegel and DeSante *in review*). This was most consistently true for Fox Sparrow, but other species that exhibited a positive relationship with one of these variables in one or more habitats included Dusky Flycatcher, Brown Creeper, Warbling Vireo, Nashville Warbler, Hermit Warbler, Black-headed Grosbeak, Spotted Towhee, White-crowned Sparrow, Dark-eyed Junco (though it's detection correlated negatively with *Ceanothus* cover within the Montane Chaparral habitat), and Cassin's Finch. Many of these species commonly build their nests in or under shrubs, and may therefore benefit directly from increased nesting opportunities. Denser understory growth is also often correlated with a more open canopy structure, and some species may be attracted by this rather than by thicker understory growth *per se*.

CONCLUSIONS AND RECOMMENDATIONS FOR LONG-TERM AVIAN MONITORING IN THE PARK

The data presented in this report provide scientifically defensible baseline information against which to assess future changes in bird populations and communities throughout the park. We highly recommend that the park follow up on these efforts by implementing one or more long-term, spatially extensive avian monitoring programs as soon as possible.

Numerous authors have outlined why natural resource monitoring is important; one of the more concise, broadly applicable statements comes from Davis (1993):

“What to monitor, and the appropriate level of accuracy, varies from area to area, but the basic reasons for monitoring are the same everywhere. They are to:
-determine present and future health of natural area ecosystems.
-establish empirical limits of variation in natural area resources.
-diagnose abnormal conditions to identify issues in time to develop effective mitigation, and
-identify potential agents of change.”

Well designed projects will additionally fulfill two distinct primary goals that have been articulated for monitoring *in the national parks*: 1) to provide park personnel with information relevant to park management issues, and 2) to collect information valuable in a regional context, as a ‘reference of high quality resources’ for comparison with data gathered outside the park (Siegel and Kuntz 2000).

The many varied habitats of Yosemite host a large and diverse array of species, and no avian monitoring program could adequately monitor all of them. We therefore suggest four complementary objectives (in no particular order) for prioritizing avian monitoring efforts in Yosemite:

- 1) *Continue to support ongoing projects with a history of success and multiple, consecutive years of data already collected.*
- 2) *Use the information on spatial patterns of relative abundance presented in this report as baseline information for tracking temporal patterns of relative abundance throughout the park, at least for the more common species in the more extensive habitats.*
- 3) *Focus effort on habitats and species that are least well known.*
- 4) *Focus effort on habitats and species that are most likely to be affected by park management decisions.*

Specific projects that would further each objective are discussed below.

Objective 1) Continue to support ongoing projects with a history of success and multiple consecutive years of data already collected.

In order to monitor the vital rates (productivity and survivorship) as well as population trends of Yosemite’s landbirds, The Institute for Bird Populations has operated five constant-effort mist-netting stations along an elevation gradient in Yosemite since 1993 (one since 1990) (DeSante et al. 2000). Monitoring vital rates provides critical information about the viability of populations and the stage in the life cycle where population change is effected. Because of the confounding nature of source-sink dynamics, monitoring vital rates provides a clearer index of habitat quality than monitoring presence/absence or even density or abundance. Moreover, environmental stressors and management actions affect vital rates directly and usually without time-lags. Thus, monitoring vital rates should be a key component of any monitoring program

that aims to track the ecological processes that lead from environmental stressors to population responses. Because year-to-year continuity is essential for mark-recapture studies that monitor survival rates, sustaining this on-going study should be the park's top avian monitoring priority.

Additionally, previous survey efforts in the park produced baseline population information for two bird species of management concern, Great Gray Owl and Spotted Owl, in the 1980s. We recommend taking advantage of this existing information by once again conducting systematic, spatially extensive surveys of these two species, and determining how populations have fared over the intervening years. This recommendation is discussed further under Objective No. 3, below.

Objective 2) Use the information on spatial patterns of relative abundance presented in this report as baseline information for tracking temporal patterns of relative abundance throughout the park, at least for the more common species in the more extensive habitats.

We believe the most cost-effective way to fulfill this objective would be to implement an annual survey of trailside VCP point counts. Yosemite has a particularly well-developed trail network, and the trails are quite well distributed across elevation zones and habitat types. Trailside point counts would be much more efficient, in terms of manpower and cost, than were the off-trail point counts we conducted for our Avian Inventory (which had a somewhat different set of objectives). During our off-trail transects, our crew members were able to complete an average of about ten point counts before 3.5 hours after sunrise. Because traveling on trails is so much easier, however, a single observer can complete at least 14 points in the same amount of time. Moreover, because hiking on trails is so much safer than off-trail hiking, a pair of observers could split up during the morning. They would camp together for safety reasons, and then each morning they would start at a pre-selected point on a trail, and head in opposite directions from one another, conducting 14 point counts each at 250m intervals. A pair of observers could thus complete 28 trailside point counts each morning, compared with only 10 points during off-trail work. A two-person crew should be able to complete at least 60 transects of 14 trailside points each (840 total points) in a single season. An additional advantage of trailside point counts is that point count locations could be relocated in successive years much more quickly and with a much higher degree of precision.

Segments of trail 6.75 km long (the length of two abutting 14 point transects) could be randomly selected throughout the park, using GIS. The crew would collect vegetation data (including a gross habitat classification, as well as more nuanced data describing habitat structure and composition, per cent cover of several vegetation layers, etc.) at each of the survey points during the first year of the project, and then again at some pre-determined interval—perhaps every five years.

We recommend surveying the same 60+ trailside routes as a pilot project for three consecutive years. These three years of study will provide an indication of the annual variance to expect from the counts. Power analysis could then be used to test the program's ability to detect declines or increases in populations over time, given the current sample scheme. If statistical power does not prove adequate for enough species, the sampling scheme could be adjusted at that time.

Objective 3) Focus effort on species and habitats that are least well-studied.

Nocturnal birds

Our Avian Inventory was designed specifically to sample diurnal birds. Although we documented the presence of many nocturnal species, the number of detections was generally quite low, and the information we gathered can only be considered anecdotal. We therefore recommend conducting targeted inquiries into the distribution, status, and population trends of nocturnal birds within the park.

We recommend implementing a park-wide survey component specifically to target small owls. While Spotted Owl and Great Gray Owl have (deservedly) received a great deal of attention in recent years, very little is known about the distribution and ecology of the Sierra's small owls—particularly Flammulated Owl and Northern Saw-whet Owl, but to a lesser extent the other species as well. As for efforts to get beyond habitat requirements and actually monitor population trends, reliable Breeding Bird Survey (BBS) trend data in the Sierra Nevada geographic province exist for only a single nocturnal species—Common Nighthawk (Siegel and DeSante 1999).

Recent efforts elsewhere in the state to develop standardized survey protocols for the small owls (Ralph and Sakai 2000) provide a useful starting point for formulating a survey protocol and strategy appropriate for the park.

We also recommend a systematic, park-wide survey effort aimed at the park's 'large' owl species of management concern, Great Gray Owl and Spotted Owl. Beck and Winter (2000) have recently produced a new, standardized protocol for surveying Great Gray Owls. This past spring we used the protocol to survey fourteen sites on Sierra National Forest with records of historic or suspected Great Gray Owl occurrences, and had great success—we documented the presence of two apparently unmated birds, and six pairs (Siegel, 2001). We propose building on the work conducted by van Riper in the 1980s, by taking another 'snapshot' of the Yosemite population two decades later. Similarly, park-wide Spotted Owl surveys have not been conducted for twelve years (Gould and Norton 1993). Repeating these historic surveys could provide valuable insight into population trends during the intervening years and, if the project is designed thoughtfully, could simultaneously produce much-needed information addressing the effects of fire management on Spotted Owl habitat suitability (see objective 4, below).

Subalpine/alpine communities

Very little is known about the population trends of high-elevation birds in the Sierra, as subalpine and alpine areas are acutely under-sampled by both the BBS and MAPS, because of the paucity of roads. This troubling lack of information alone is cause enough to focus some monitoring resources on high-elevation birds within the park. There are additional reasons for focusing efforts on these communities, however. High-elevation habitats, especially in the park, have seen fewer anthropogenic changes than other parts of the Sierra. Looking at underlying population trends of the birds that inhabit these regions may provide important insights into effects of climate change and, for long-distance migrants, effects of changes on the wintering grounds. These sorts of insights are much harder to tease apart in other places in the Sierra,

where habitat changes associated with a wide variety of management practices, such as fire suppression, timber harvest, and livestock grazing, may also affect avian population trends.

Appropriate studies could be spatially extensive or intensive, and involve demographic monitoring (either through constant-effort mist netting or nest monitoring) or be restricted to monitoring populations trends and improving understanding of habitat relationships. The project suggested under Objective 2 (above) could potentially fulfill this need if particular emphasis were placed on sampling subalpine and alpine communities.

4) *Focus effort on habitats and species that are most likely to be affected by park management decisions.*

No land management decisions in the park are likely to have more important implications for birds and their habitats across large swaths of the park than fire management policies. Fire regime is likely to have tremendous short-term and long-term implications for several guilds of birds, including those that forage or nest in snags, those that depend on a shrub understory for nesting, and those that require unbroken expanses of interior forest. Surprisingly few studies have directly investigated these impacts, and fewer still have been conducted anywhere in the Sierra Nevada. Notable exceptions include Granholm's (1982) unpublished dissertation, and a long-running study in the northern Sierra (Bock and Lynch 1970, Bock et al. 1978, Raphael et al. 1987), which documented largescale post-fire changes in the structure of several foraging and nesting guilds, as snags decayed and shrub cover increased. The authors report the curious result that primary cavity-nesting species declined in the years after the fire, but secondary cavity-nesters did not. They caution, however, that the small size of their study plots limits the potential for extrapolation of their results to other places in the Sierra. Improved understanding of both the short-term and long-term effects of fire on avian community structure in Sierra ecosystems would be tremendously valuable for predicting the effects of land management decisions, particular those that affect fire regimes, on Sierra bird species.

National parks and wilderness areas provide important natural laboratories for studying the effects of natural fire (as well as prescribed burns and other measures intended to reduce the risk of stand-replacing fires) on birds, because of the absence of confounding factors such as timber harvesting and grazing (Siegel et al. *in review*). Yosemite, in particular, provides exceptional opportunities for studying the effects of different fire management policies on avifauna, because relationships between fire management and forest structure and composition have been well studied within the park.

We recommend focusing research on the effects of fire and fire management policies on breeding bird communities within the park. Efficiency could be maximized by carefully designing research to dovetail with existing efforts to study ecological impacts of fire and fire management activities. Efforts could focus on the impacts of fire regime on particular high priority species (e.g. Spotted Owl), or could look more broadly at parameters such as nest success or species compositions across the larger avian community. Our finding that Montane Chaparral, which is highly sensitive to fire regime, is among the most species-rich habitats in the park further underscores the value of focusing effort on the effects of fire.

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LITERATURE CITED

- Akaike, H. 1973. Information theory as an extension of the maximum likelihood principle. Pages 267-281 *in* Second international symposium on information theory (B. N. Petrov and F. Csaki, Eds.). Akademiai Kiado, Budapest.
- Beck, T. W. and J. Winter. 2000. Survey protocol for the Great Gray Owl in the Sierra Nevada of California.
- Beedy, E. C. 1982. Bird community structure in coniferous forests of Yosemite National Park. Ph.D. dissertation, University of California, Davis.
- Beedy, E. C. and S. T. Granholm. 1985. Discovering Sierra birds: western slope. Yosemite Natural History Association and Sequoia Natural History Association, CA.
- Bock, C. E. and J. F. Lynch. 1970. Breeding bird populations of burned and unburned conifer forest in the Sierra Nevada. *Condor* 72:182-189.
- Bock, C. E., M. Raphael and J. H. Bock. 1978. Changing avian community structure during early post-fire succession in the Sierra Nevada. *Wilson Bulletin* 90:119-123.
- Boulinier, T., J. D. Nichols, J. R. Sauer, J. E. Hines, and K. H. Pollack. 1998. Estimating species richness: the importance of heterogeneity in species detectability. *Ecology* 79:1018-1028.
- Burnham, K. P. and W. S. Overton. 1978. Estimation of the size of a closed population when capture probabilities vary among animals. *Biometrika* 65:623-633.
- Burnham, K. P. and W. S. Overton. 1979. Robust estimation of population size when capture probabilities vary among animals. *Ecology* 60:927-936.
- Chao, A. 1984. Non-parametric estimation of number of classes in a population. *Scandinavian Journal of Statistics* 11:265-270.
- Chao, A., M.-C. Ma, and M. C. K. Yang. 1993. Stopping rules and estimation for recapture debugging with unequal failure rates. *Biometrika* 80:193-201.
- Chazdon, R. L., R. K. Colwell, J. S. Denslow, and M. R. Guariguata. 1998. Statistical methods for estimating species richness of woody regeneration in primary and secondary rainforests of NE Costa Rica. *Pp.* 285-309 in F. Dallmeier and J. A. Comiskey, eds. *Forest biodiversity research, monitoring and modeling: conceptual background and Old World case studies.* Parthenon Publishing, Paris.
- Colwell, R. K. 1997. EstimateS: Statistical estimation of species richness and shared species from samples. Version 5. User's Guide and application published at: <http://viceroy.eeb.uconn.edu/estimates>.

- Colwell, R. K. and J. A. Coddington. 1994. Estimating terrestrial biodiversity through extrapolation. *Philosophical Transactions of the Royal Society (Series B)* 345:101-118.
- Conroy, M. J. and B. R. Noon. 1996. Mapping of species richness for conservation of biological diversity: conceptual and methodological issues. *Ecological Applications* 6:763-773.
- Davis, G. E. 1993. Design elements of monitoring programs: the necessary ingredients for success. *Environmental Monitoring and Assessment* 26:99-105.
- DeSante, D. F. 1995. The status, distribution, abundance, population trends, demographics, and risks of the landbird avifauna of the Sierra Nevada mountains. The Institute for Bird Populations, Point Reyes Station, CA.
- DeSante, D. F., P. Pyle and D. R. O'Grady. 2000. The 1999 annual report of the monitoring avian productivity and survivorship (MAPS) program in Yosemite National Park. The Institute for Bird Populations, Point Reyes Station, CA.
- DeSante, D. F., P. Pyle and B. L. Walker. 1996. The 1995 annual report of the monitoring avian productivity and survivorship (MAPS) program in Yosemite National Park. The Institute for Bird Populations, Point Reyes Station, CA.
- Fancy, S. G. and J. R. Sauer. 2000. Recommended methods for inventorying and monitoring landbirds in national parks. National Park Service Inventory and Monitoring Program.
- Fister, K. 1993. Field checklist of the birds of Yosemite National Park. The Yosemite Association.
- Gaines, D. 1992. Birds of Yosemite and the east slope, revised edition. Artemisia Press, Lee Vining, CA.
- Gould, G. I. and K. M. Norton. 1993. Spotted Owl distribution and abundance in Yosemite National Park, 1988-1989. CA Dept. of Fish and Game, Nongame Bird and Mammal Section report. Tech. Rep. 1993-3.
- Granholm, S. L. 1982. Effects of surface fires on birds and their habitat associations in coniferous forests of the Sierra Nevada, California. Ph.D. Thesis, University of California, Davis.
- Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna No. 27. Cooper Ornithological Society, Berkeley, CA.
- Hosmer, D. W. and S. Lemeshow. 1989. Applied logistic regression. John Wiley and Sons, New York.
- Hutto, R. L., S. M. Pletschet, and P. Hendricks. 1986. A fixed-radius point count method for nonbreeding and breeding season use. *Auk* 103:593-602.

- Keating, KA; Quinn, JF. 1998. Estimating species richness: the Michaelis-Menten model revisited. *Oikos* 81:411-416.
- Lee, S.-M. and A. Chao. 1994. Estimating population size via sample coverage for closed capture-recapture models. *Biometrics* 50:88-97.
- Nichols, J. D., T. Boulinier, J. H. Hines, K. H. Pollock, and J. R. Sauer. 1998. Inference methods for spatial variation in species richness and community composition when not all species are detected. *Conservation Biology* 12:1390-1398.
- Palmer, M. W. 1991. Estimating species richness: the second-order jackknife reconsidered. *Ecology* 72:1512-1513.
- Pavlacky, D. C. Jr. and S. H. Anderson. 2001. Habitat preferences of pinyon-juniper specialists near the limit of their geographic range. *Condor* 103:322-331.
- Ralph, C. J., G. R. Geupel, P. Pyle, T. E. Martin, and D. F. DeSante. 1993. A handbook of field methods for monitoring landbirds. Gen. Tech. Rep. PSW-GTR-144. Albany, CA: Pacific Southwest Research Station, USDA Forest Service.
- Ralph, C. J. and W. Sakai. 2000. Redwood Sciences Laboratory small owl survey procedure. Redwood Sciences Laboratory, Bird Monitoring Program.
- Raphael, M. G., M. L. Morrison and M. P. Yoder-Williams. 1987. Breeding bird populations during twenty-five years of postfire succession in the Sierra Nevada. *Condor* 89:614-626.
- Siegel, R. B. 2000. Methods for monitoring landbirds: a review commissioned by Seattle City Light's Wildlife Research Advisory Committee. Tech. Rep. NPS/NRNOCA/NRTR/00-03. Sedro Woolley, WA, USDI NPS, Pacific West Region.
- Siegel, R. B. 2001. Surveying Great Gray Owls on southern Sierra Nevada forests: results from the 2001 field season. The Institute for Bird Populations, Point Reyes Station, CA.
- Siegel, R. B. and D. F. DeSante. 1999. Draft avian conservation plan for the Sierra Nevada bioregion: a report to California Partners in Flight. The Institute for Bird Populations, Point Reyes Station, CA.
- Siegel, R. B. and D. F. DeSante. *In review*. Effects of mechanical forest thinning on Sierra Nevada birds. *Journal of Wildlife Management*.
- Siegel, R. B., S. Jackson, and J. Liebes. *In review*. Short- and long-term effects of stand-replacing fire on a Sierra Nevada bird community. *Auk*.

- Siegel, R. B. and R. C. Kuntz II. 2000. Designing a landbird monitoring program at North Cascades National Park Service Complex: summary recommendations from a September 2000 workshop. Tech. Rep. NPS/NRNOCA/NRTR/00-04. Sedro Woolley, WA, USDI NPS, Pacific West Region.
- Siegel, R. B., R. L. Wilkerson, and D. F. DeSante. *In review*. A rapid, inexpensive protocol for surveying birds at montane meadows: assessing site importance for breeding and post-breeding birds. Proceedings of the 2001 California Riparian Habitat and Floodplains Conference.
- Smith, E. P. and van Belle, G. 1984. Nonparametric estimation of species richness. *Biometrics* 40:119-129.
- SPSS Inc. 1997. SYSTAT 7.0 for Windows. SPSS, Inc.
- Verner, J. and T. A. Larson. 1989. Richness of breeding bird species in mixed-conifer forests of the Sierra Nevada, California. *Auk* 106:447-463.
- Weeden, N. F., Jr. 1996. A Sierra Nevada flora. Wilderness Press, Berkeley.

Table 1. Summary point count results-- relative abundance. Note that calculations for Giant Sequoia, White Alder, and Interior Live Oak are based on very small numbers of points sampled. Habitats are listed roughly from higher to lower elevations, with Recent Burn added at the end.

| Habitat | No. of points sampled | Unlimited-radius detections ^a | Unlimited-radius detections per point | 50-m radius detections ^a | Detections per hectare ^b |
|---------------------------------|-----------------------|--|---------------------------------------|-------------------------------------|-------------------------------------|
| Barren | 80 | 232 | 2.90 | 97 | 1.54 |
| Subalpine/Alpine Meadow | 136 | 746 | 5.49 | 332 | 3.11 |
| Whitebark Pine | 140 | 386 | 2.76 | 189 | 1.72 |
| Whitebark Pine-Mountain Hemlock | 39 | 143 | 3.67 | 70 | 2.29 |
| Whitebark Pine-Lodgepole Pine | 75 | 402 | 5.36 | 211 | 3.58 |
| Mountain Hemlock | 104 | 594 | 5.71 | 349 | 4.27 |
| Western Juniper | 39 | 259 | 6.64 | 103 | 3.36 |
| Western White Pine | 48 | 323 | 6.73 | 187 | 4.96 |
| Lodgepole Pine | 494 | 3098 | 6.27 | 1654 | 4.26 |
| Montane/Alpine Riparian Shrub | 38 | 160 | 4.21 | 101 | 3.38 |
| Quaking Aspen | 27 | 279 | 10.33 | 142 | 6.70 |
| Red Fir | 277 | 2762 | 9.97 | 1320 | 6.07 |
| Jeffrey Pine-Red Fir | 73 | 652 | 8.93 | 308 | 5.37 |
| Jeffrey Pine | 138 | 1265 | 9.17 | 513 | 4.73 |
| Montane Meadow | 107 ^c | 1041 | 9.73 | 637 | 7.58 |
| White Fir | 50 | 503 | 10.06 | 251 | 6.39 |
| White Fir Mixed Conifer | 261 | 2762 | 10.58 | 1222 | 5.96 |
| Giant Sequoia | 8 | 96 | 12.00 | 53 | 8.44 |
| Douglas-fir Mixed Conifer | 32 | 236 | 7.38 | 135 | 5.37 |
| Montane Chaparral | 76 | 823 | 10.83 | 367 | 6.15 |
| Black Oak | 39 | 422 | 10.82 | 209 | 6.82 |
| Ponderosa Pine Mixed Conifer | 228 | 2581 | 11.32 | 1194 | 6.67 |
| Ponderosa Pine | 19 | 223 | 11.74 | 96 | 6.43 |
| White Alder | 2 | 20 | 10.00 | 7 | 4.46 |
| Canyon Live Oak | 46 | 320 | 6.96 | 152 | 4.21 |
| Interior Live Oak | 1 | 15 | 15.00 | 8 | 10.19 |
| Foothill Pine | 14 | 123 | 8.79 | 38 | 3.46 |
| Mixed Chaparral | 32 | 366 | 11.44 | 177 | 7.04 |
| Recent Burn | 23 | 240 | 10.43 | 98 | 5.43 |
| All habitats pooled | 2646 | 21072 | 7.96 | 10220 | 4.92 |

^aTotals do not include flyovers (see text for definition).

^bCalculation based on 50-m radius detections only.

^cIncludes 14 regular transect points and 93 points conducted using our modified meadow survey protocol. Meadow points surveyed in 1998 are not included in these totals, because a slightly different protocol was used.

Table 2. All bird species detected by IBP staff in Yosemite, 1998-2000. Species in bold type were detected fewer than five times during off-trail point count transects. Asterisks indicate species that were not included in our original list of predicted species.

- | | | |
|--|---|---|
| <p>1. Pied-billed Grebe* 2. Great Blue Heron 3. Turkey Vulture 4. Mallard 5. Ring-necked Duck* 6. Bufflehead* 7. Common Merganser 8. Osprey 9. Bald Eagle* 10. Northern Harrier* 11. Sharp-shinned Hawk 12. Cooper's Hawk 13. Northern Goshawk 14. Red-tailed Hawk 15. Golden Eagle 16. American Kestrel 17. Peregrine Falcon 18. White-tailed Ptarmigan 19. Blue Grouse 20. Mountain Quail 21. California Quail 22. Virginia Rail 23. American Coot* 24. Spotted Sandpiper 25. Common Snipe* 26. California Gull 27. Band-tailed Pigeon 28. Mourning Dove 29. Flammulated Owl 30. Western Screech-Owl 31. Great Horned Owl 32. Northern Pygmy-Owl 33. Spotted Owl 34. Great Gray Owl 35. Northern Saw-whet Owl 36. Common Nighthawk 37. Common Poorwill 38. Black Swift 39. Vaux's Swift 40. White-throated Swift 41. Anna's Hummingbird 42. Calliope Hummingbird 43. Rufous Hummingbird 44. Belted Kingfisher 45. Acorn Woodpecker 46. Williamson's Sapsucker 47. Red-breasted Sapsucker 48. Nuttall's Woodpecker 49. Downy Woodpecker 50. Hairy Woodpecker</p> | <p>51. White-headed Woodpecker 52. Black-backed Woodpecker 53. Northern Flicker 54. Pileated Woodpecker 55. Olive-sided Flycatcher 56. Western Wood-Pewee 57. Willow Flycatcher 58. Hammond's Flycatcher 59. Gray Flycatcher* 60. Dusky Flycatcher 61. Pacific-slope Flycatcher 62. Black Phoebe 63. Ash-throated Flycatcher 64. Western Kingbird 65. Cassin's Vireo 66. Hutton's Vireo 67. Warbling Vireo 68. Steller's Jay 69. Western Scrub-Jay 70. Clark's Nutcracker 71. Common Raven 72. Horned Lark 73. Tree Swallow 74. Violet-green Swallow 75. N. R.-winged Swallow 76. Barn Swallow 77. Mountain Chickadee 78. Ch.-backed Chickadee 79. Oak Titmouse 80. Bushtit 81. Red-breasted Nuthatch 82. White-breasted Nuthatch 83. Pygmy Nuthatch 84. Brown Creeper 85. Rock Wren 86. Canyon Wren 87. Bewick's Wren 88. House Wren 89. Winter Wren 90. American Dipper 91. Golden-crowned Kinglet 92. Ruby-crowned Kinglet 93. Blue-gray Gnatcatcher 94. Western Bluebird 95. Mountain Bluebird 96. Townsend's Solitaire 97. Swainson's Thrush 98. Hermit Thrush 99. American Robin 100. Wrentit</p> | <p>101. California Thrasher* 102. European Starling 103. American Pipit 104. Cedar Waxwing* 105. Orange-crowned Warbler 106. Nashville Warbler 107. Yellow Warbler 108. Yellow-rumped Warbler 109. Blk.-throated Gray Warbler 110. Townsend's Warbler 111. Hermit Warbler 112. American Redstart* 113. MacGillivray's Warbler 114. Common Yellowthroat 115. Wilson's Warbler 116. Yellow-breasted Chat* 117. Western Tanager 118. Green-tailed Towhee 119. Spotted Towhee 120. California Towhee 121. Chipping Sparrow 122. Brewer's Sparrow* 123. Black-chinned Sparrow 124. Black-throated Sparrow* 125. Savannah Sparrow 126. Fox Sparrow 127. Song Sparrow 128. Lincoln's Sparrow 129. White-crowned Sparrow 130. Dark-eyed Junco 131. Black-headed Grosbeak 132. Lazuli Bunting 133. Indigo Bunting* 134. Red-winged Blackbird 135. Western Meadowlark 136. Yellow-headed Blackbird* 137. Brewer's Blackbird 138. Brown-headed Cowbird 139. Bullock's Oriole 140. Gray-crowned Rosy-Finch 141. Pine Grosbeak 142. Purple Finch 143. Cassin's Finch 144. Red Crossbill 145. Pine Siskin 146. Lesser Goldfinch 147. Lawrence's Goldfinch 148. American Goldfinch* 149. Evening Grosbeak</p> |
|--|---|---|

Table 3. Relative abundance of all species detected within a 50m radius of the observer during at least one point count.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|------------------|------------------|-----------------|------------------|------------------------|-------------|----------------|-------------------|--------------------|---------------|----------------------|--------------------|----------------------|--------------------|
| | Mallard | Common Merganser | Northern Goshawk | Red-tailed Hawk | American Kestrel | White-tailed Ptarmigan | Blue Grouse | Mountain Quail | Spotted Sandpiper | Band-tailed Pigeon | Mourning Dove | White-throated Swift | Anna's Hummingbird | Calliope Hummingbird | Rufous Hummingbird |
| Barren | -- | -- | -- | -- | -- | -- | 0.016 | 0.048 | 0.048 | -- | -- | -- | -- | -- | 0.048 |
| Subalpine/Alpine Meadow | 0.009 | -- | -- | -- | -- | -- | -- | -- | 0.019 | -- | -- | -- | -- | -- | -- |
| Whitebark Pine | -- | -- | -- | -- | -- | 0.009 | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| Whitebark Pine-Mountain Hemlock | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Whitebark Pine-Lodgepole Pine | -- | -- | -- | -- | -- | -- | -- | -- | 0.017 | -- | -- | -- | -- | -- | 0.051 |
| Mountain Hemlock | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.012 | -- | -- | 0.012 | 0.012 | 0.037 |
| Western Juniper | -- | -- | -- | -- | -- | -- | 0.065 | -- | -- | 0.033 | -- | -- | 0.131 | 0.033 | -- |
| Western White Pine | -- | -- | -- | -- | -- | -- | 0.027 | -- | -- | -- | -- | -- | 0.027 | 0.212 | -- |
| Lodgepole Pine | -- | 0.005 | -- | -- | -- | -- | 0.013 | 0.015 | 0.034 | -- | -- | -- | 0.005 | 0.003 | 0.034 |
| Montane/Alpine Riparian Shrub | -- | -- | -- | -- | -- | -- | 0.034 | -- | -- | -- | -- | -- | 0.034 | -- | -- |
| Quaking Aspen | -- | -- | -- | -- | -- | -- | 0.047 | -- | -- | -- | -- | -- | 0.047 | -- | -- |
| Red Fir | -- | -- | -- | 0.005 | -- | -- | 0.014 | -- | -- | -- | -- | 0.005 | 0.009 | 0.005 | -- |
| Jeffrey Pine-Red Fir | 0.035 | -- | -- | -- | -- | -- | 0.017 | 0.017 | -- | -- | -- | -- | -- | -- | -- |
| Jeffrey Pine | -- | -- | -- | -- | -- | -- | 0.009 | 0.065 | -- | 0.009 | -- | -- | 0.138 | 0.046 | 0.009 |
| Montane Meadow | -- | -- | -- | -- | -- | -- | -- | -- | 0.119 | -- | -- | -- | -- | -- | -- |
| White Fir | -- | -- | 0.025 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.025 | 0.025 | -- |
| White Fir Mixed Conifer | -- | -- | -- | -- | -- | -- | 0.010 | 0.010 | -- | 0.010 | -- | -- | 0.010 | 0.010 | -- |
| Giant Sequoia | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Douglas-fir Mixed Conifer | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.040 | -- | -- |
| Montane Chaparral | 0.034 | -- | -- | -- | 0.017 | -- | 0.017 | 0.050 | -- | -- | -- | -- | 0.050 | -- | -- |
| Black Oak | -- | -- | -- | -- | -- | -- | 0.065 | -- | -- | 0.033 | 0.033 | 0.163 | 0.033 | -- | -- |
| Ponderosa Pine Mixed Conifer | -- | -- | -- | -- | -- | -- | -- | 0.073 | 0.006 | 0.006 | 0.017 | 0.034 | 0.039 | -- | -- |
| Ponderosa Pine | 0.067 | -- | -- | -- | -- | -- | -- | 0.134 | -- | -- | 0.067 | -- | 0.402 | -- | -- |
| White Alder | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | -- | 0.028 | -- | -- | -- | -- | -- | 0.028 | -- | 0.055 | -- | 0.028 | 0.166 | -- | -- |
| Interior Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Foothill Pine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.182 | -- | -- |
| Mixed Chaparral | -- | -- | -- | -- | -- | -- | 0.040 | 0.040 | -- | 0.040 | -- | -- | 0.199 | 0.080 | -- |
| Recent Burn | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.055 | -- | 0.055 | -- | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|------------------------|------------------------|------------------|------------------|-------------------------|-------------------------|------------------|---------------------|------------------------|--------------------|----------------------|------------------|--------------------------|--------------|
| | Acorn Woodpecker | Williamson's Sapsucker | Red-breasted Sapsucker | Downy Woodpecker | Hairy Woodpecker | White-headed Woodpecker | Black-backed Woodpecker | Northern Flicker | Pileated Woodpecker | Olive-sided Flycatcher | Western Wood-Pewee | Hammond's Flycatcher | Dusky Flycatcher | Pacific-slope Flycatcher | Black Phoebe |
| Barren | -- | 0.016 | -- | -- | -- | -- | -- | -- | -- | -- | 0.016 | -- | 0.016 | -- | -- |
| Subalpine/Alpine Meadow | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.009 | -- | 0.234 | -- | -- |
| Whitebark Pine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.109 | -- | -- |
| Whitebark Pine-Mountain Hemlock | -- | -- | -- | -- | -- | -- | -- | 0.033 | -- | -- | -- | -- | 0.131 | -- | -- |
| Whitebark Pine-Lodgepole Pine | -- | -- | -- | -- | 0.017 | -- | 0.017 | -- | -- | -- | -- | -- | 0.272 | -- | -- |
| Mountain Hemlock | -- | 0.024 | -- | -- | 0.024 | -- | -- | -- | -- | -- | 0.024 | -- | 0.306 | -- | -- |
| Western Juniper | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.098 | 0.033 | -- | 0.229 | -- | -- |
| Western White Pine | -- | -- | -- | -- | 0.080 | 0.027 | -- | -- | -- | -- | -- | -- | 0.133 | 0.027 | -- |
| Lodgepole Pine | -- | 0.018 | -- | -- | 0.018 | 0.005 | 0.003 | 0.018 | -- | 0.015 | 0.028 | 0.005 | 0.245 | -- | -- |
| Montane/Alpine Riparian Shrub | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.101 | -- | 0.335 | -- | -- |
| Quaking Aspen | -- | -- | -- | 0.047 | -- | 0.094 | -- | 0.094 | -- | 0.189 | 0.141 | 0.047 | 0.472 | -- | -- |
| Red Fir | -- | 0.009 | 0.014 | 0.005 | 0.078 | 0.064 | 0.005 | 0.060 | 0.009 | 0.046 | 0.037 | 0.037 | 0.234 | 0.005 | -- |
| Jeffrey Pine-Red Fir | -- | -- | -- | 0.017 | 0.087 | 0.070 | -- | 0.052 | -- | 0.035 | 0.087 | 0.035 | 0.349 | -- | -- |
| Jeffrey Pine | 0.009 | -- | -- | -- | 0.037 | 0.074 | 0.037 | 0.092 | -- | 0.111 | 0.083 | 0.018 | 0.175 | -- | -- |
| Montane Meadow | -- | -- | -- | 0.024 | 0.012 | -- | -- | 0.024 | -- | 0.048 | 0.119 | -- | 0.500 | -- | -- |
| White Fir | -- | -- | -- | -- | 0.102 | 0.102 | -- | 0.102 | -- | 0.025 | 0.076 | 0.178 | 0.102 | 0.025 | -- |
| White Fir Mixed Conifer | -- | -- | 0.005 | -- | 0.117 | 0.068 | -- | 0.034 | 0.020 | 0.073 | 0.034 | 0.127 | 0.185 | 0.068 | -- |
| Giant Sequoia | 0.159 | -- | -- | -- | 0.159 | -- | -- | -- | -- | -- | 0.159 | 1.114 | 0.159 | -- | -- |
| Douglas-fir Mixed Conifer | -- | -- | -- | -- | 0.119 | 0.040 | -- | 0.040 | -- | 0.040 | 0.040 | 0.080 | 0.040 | -- | -- |
| Montane Chaparral | -- | -- | -- | -- | 0.034 | 0.117 | -- | 0.017 | -- | 0.067 | 0.017 | 0.067 | 0.318 | -- | -- |
| Black Oak | -- | -- | -- | 0.065 | -- | -- | -- | 0.065 | -- | 0.033 | 0.261 | -- | 0.098 | -- | -- |
| Ponderosa Pine Mixed Conifer | 0.067 | 0.006 | -- | 0.017 | 0.162 | 0.123 | -- | 0.106 | 0.028 | 0.011 | 0.117 | 0.089 | 0.145 | 0.011 | 0.006 |
| Ponderosa Pine | 0.067 | -- | -- | -- | 0.201 | 0.134 | -- | 0.067 | -- | 0.067 | -- | 0.201 | 0.134 | -- | -- |
| White Alder | -- | -- | -- | -- | -- | 1.273 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | 0.083 | -- | -- | -- | -- | 0.028 | -- | 0.028 | -- | -- | 0.111 | 0.028 | -- | -- | -- |
| Interior Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.273 | -- | -- | -- | -- |
| Foothill Pine | -- | -- | -- | -- | 0.091 | -- | -- | 0.273 | -- | -- | 0.091 | -- | -- | -- | -- |
| Mixed Chaparral | 0.199 | -- | -- | -- | -- | -- | -- | 0.080 | -- | -- | 0.119 | 0.040 | 0.040 | -- | 0.040 |
| Recent Burn | -- | -- | -- | -- | 0.111 | 0.111 | 0.111 | 0.055 | -- | 0.055 | 0.055 | -- | 0.332 | -- | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|----------------|----------------|----------------|---------------|-------------------|--------------------|--------------|--------------|----------------------|----------------------|--------------------|----------------------|---------|-----------------------|
| | Ash-throated Flycatcher | Cassin's Vireo | Hutton's Vireo | Warbling Vireo | Steller's Jay | Western Scrub-Jay | Clark's Nutcracker | Common Raven | Tree Swallow | Violet-green Swallow | N. R.-winged Swallow | Mountain Chickadee | Ch.-backed Chickadee | Bushtit | Red-breasted Nuthatch |
| Barren | -- | -- | -- | 0.016 | 0.080 | -- | 0.095 | -- | -- | 0.016 | -- | 0.143 | -- | -- | -- |
| Subalpine/Alpine Meadow | -- | -- | -- | -- | -- | -- | 0.019 | 0.019 | -- | -- | -- | 0.159 | -- | -- | -- |
| Whitebark Pine | -- | -- | -- | -- | 0.009 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Whitebark Pine-Mountain Hemlock | -- | -- | -- | -- | 0.098 | -- | 0.098 | -- | -- | -- | -- | 0.163 | -- | -- | -- |
| Whitebark Pine-Lodgepole Pine | -- | -- | -- | -- | 0.017 | -- | 0.424 | -- | -- | -- | -- | 0.509 | -- | -- | -- |
| Mountain Hemlock | -- | -- | -- | -- | 0.061 | -- | 0.171 | -- | -- | -- | -- | 0.563 | -- | -- | 0.049 |
| Western Juniper | -- | -- | -- | -- | 0.065 | -- | 0.098 | -- | -- | -- | -- | 0.261 | -- | -- | -- |
| Western White Pine | -- | -- | -- | -- | 0.133 | -- | 0.186 | -- | -- | -- | -- | 0.849 | -- | -- | 0.265 |
| Lodgepole Pine | -- | 0.013 | 0.013 | -- | 0.072 | -- | 0.077 | -- | -- | 0.005 | -- | 0.536 | -- | -- | 0.034 |
| Montane/Alpine Riparian Shrub | -- | 0.034 | -- | 0.101 | -- | -- | 0.101 | -- | -- | 0.067 | -- | 0.134 | -- | -- | -- |
| Quaking Aspen | -- | -- | -- | 0.377 | 0.047 | -- | -- | -- | 0.047 | 0.094 | -- | 0.377 | -- | -- | 0.047 |
| Red Fir | -- | 0.051 | -- | 0.120 | 0.161 | -- | 0.009 | 0.005 | -- | -- | -- | 0.680 | -- | -- | 0.207 |
| Jeffrey Pine-Red Fir | -- | 0.700 | -- | 0.087 | 0.209 | -- | -- | -- | -- | -- | -- | 0.698 | -- | -- | 0.122 |
| Jeffrey Pine | 0.009 | 0.055 | -- | 0.037 | 0.212 | -- | 0.046 | -- | -- | -- | -- | 0.572 | -- | -- | 0.074 |
| Montane Meadow | -- | 0.024 | -- | 0.309 | 0.190 | -- | -- | -- | -- | 0.012 | -- | 0.595 | -- | -- | 0.059 |
| White Fir | -- | 0.255 | -- | 0.178 | 0.153 | -- | -- | -- | -- | -- | -- | 0.407 | -- | -- | 0.153 |
| White Fir Mixed Conifer | -- | 0.117 | -- | 0.171 | 0.224 | -- | -- | 0.015 | -- | -- | -- | 0.434 | 0.010 | -- | 0.161 |
| Giant Sequoia | -- | 0.159 | -- | 0.159 | 0.159 | -- | -- | 0.125 | -- | -- | -- | 0.477 | -- | -- | 0.159 |
| Douglas-fir Mixed Conifer | -- | 0.159 | 0.040 | 0.080 | 0.279 | -- | -- | 0.040 | -- | -- | -- | 0.318 | -- | -- | 0.159 |
| Montane Chaparral | -- | 0.050 | 0.017 | 0.067 | 0.184 | -- | -- | -- | -- | 0.017 | -- | 0.469 | -- | -- | 0.034 |
| Black Oak | -- | 0.196 | -- | 0.229 | 0.392 | -- | -- | -- | 0.065 | 0.098 | 0.033 | 0.196 | -- | -- | 0.065 |
| Ponderosa Pine Mixed Conifer | -- | 0.302 | 0.011 | 0.095 | 0.285 | -- | -- | 0.011 | -- | -- | -- | 0.223 | 0.028 | -- | 0.195 |
| Ponderosa Pine | -- | 0.201 | -- | -- | 0.067 | -- | -- | -- | -- | -- | -- | 0.134 | -- | 0.134 | 0.067 |
| White Alder | -- | -- | -- | -- | 0.637 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | -- | 0.166 | 0.028 | 0.055 | 0.443 | -- | -- | 0.028 | -- | -- | -- | 0.055 | -- | 0.028 | -- |
| Interior Live Oak | -- | 1.273 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Foothill Pine | -- | 0.182 | -- | -- | -- | 0.091 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mixed Chaparral | -- | 0.080 | 0.119 | -- | 0.159 | 0.119 | -- | -- | -- | -- | -- | -- | -- | 0.119 | 0.040 |
| Recent Burn | -- | -- | -- | 0.111 | 0.111 | -- | -- | -- | -- | -- | -- | 0.498 | -- | -- | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|---------------|-----------|-------------|---------------|------------|-------------|-----------------|--------------------|----------------------|-----------------------|------------------|-------------------|----------------------|---------------|
| | White-breasted Nuthatch | Brown Creeper | Rock Wren | Canyon Wren | Bewick's Wren | House Wren | Winter Wren | American Dipper | G.-crowned Kinglet | Ruby-crowned Kinglet | Blue-gray Gnatcatcher | Western Bluebird | Mountain Bluebird | Townsend's Solitaire | Hermit Thrush |
| Barren | 0.032 | -- | 0.016 | -- | -- | -- | -- | -- | 0.016 | -- | -- | -- | -- | 0.016 | -- |
| Subalpine/Alpine Meadow | -- | 0.019 | 0.009 | -- | -- | -- | -- | -- | 0.037 | -- | -- | -- | 0.037 | -- | -- |
| Whitebark Pine | -- | -- | 0.055 | -- | -- | -- | -- | -- | -- | 0.009 | -- | -- | 0.027 | 0.009 | 0.009 |
| Whitebark Pine-Mountain Hemlock | -- | 0.033 | 0.033 | -- | -- | -- | -- | -- | 0.033 | -- | -- | -- | -- | -- | 0.065 |
| Whitebark Pine-Lodgepole Pine | 0.034 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.017 | 0.017 |
| Mountain Hemlock | 0.024 | 0.098 | -- | -- | -- | -- | 0.012 | 0.012 | 0.110 | 0.012 | -- | -- | -- | 0.037 | 0.098 |
| Western Juniper | -- | 0.033 | 0.033 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.065 | 0.098 |
| Western White Pine | 0.133 | 0.292 | -- | -- | -- | -- | -- | -- | 0.053 | -- | -- | -- | -- | 0.053 | -- |
| Lodgepole Pine | 0.026 | 0.101 | 0.005 | -- | -- | 0.003 | -- | -- | 0.077 | 0.034 | -- | -- | 0.010 | 0.052 | 0.062 |
| Montane/Alpine Riparian Shrub | -- | -- | -- | -- | -- | -- | -- | -- | 0.034 | -- | -- | -- | 0.034 | -- | 0.067 |
| Quaking Aspen | -- | -- | -- | -- | -- | -- | -- | -- | 0.236 | -- | -- | 0.189 | -- | 0.047 | -- |
| Red Fir | 0.064 | 0.340 | -- | -- | -- | 0.005 | 0.023 | 0.005 | 1.007 | 0.009 | -- | 0.005 | -- | 0.101 | 0.069 |
| Jeffrey Pine-Red Fir | 0.017 | 0.174 | -- | -- | 0.017 | -- | 0.035 | -- | 0.384 | -- | -- | -- | -- | 0.140 | 0.070 |
| Jeffrey Pine | 0.028 | 0.055 | 0.018 | -- | 0.009 | 0.009 | -- | -- | 0.120 | -- | -- | 0.009 | -- | 0.101 | -- |
| Montane Meadow | -- | 0.155 | -- | -- | -- | -- | 0.012 | -- | 0.250 | 0.012 | -- | -- | -- | -- | 0.107 |
| White Fir | -- | 0.331 | -- | 0.025 | -- | -- | 0.051 | -- | 1.095 | -- | -- | 0.025 | -- | -- | -- |
| White Fir Mixed Conifer | 0.020 | 0.259 | -- | -- | -- | 0.005 | 0.093 | -- | 0.883 | -- | -- | 0.015 | -- | 0.068 | 0.044 |
| Giant Sequoia | -- | 0.159 | -- | -- | -- | -- | 0.318 | -- | 1.432 | -- | -- | -- | -- | -- | -- |
| Douglas-fir Mixed Conifer | 0.040 | 0.279 | -- | 0.040 | -- | -- | 0.080 | -- | 0.438 | -- | -- | -- | -- | 0.119 | -- |
| Montane Chaparral | 0.017 | 0.184 | -- | -- | 0.034 | 0.235 | -- | -- | 0.084 | -- | 0.050 | 0.034 | -- | 0.067 | -- |
| Black Oak | -- | 0.065 | -- | -- | -- | 0.098 | -- | -- | 0.033 | -- | -- | -- | -- | -- | -- |
| Ponderosa Pine Mixed Conifer | 0.011 | 0.285 | 0.011 | -- | 0.017 | 0.022 | 0.045 | 0.006 | 0.123 | -- | 0.011 | -- | -- | 0.045 | 0.011 |
| Ponderosa Pine | -- | 0.134 | -- | -- | -- | -- | 0.067 | -- | 0.201 | -- | -- | -- | -- | -- | -- |
| White Alder | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | -- | 0.028 | -- | 0.083 | -- | -- | 0.055 | -- | -- | -- | 0.083 | -- | -- | -- | -- |
| Interior Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Foothill Pine | -- | -- | 0.273 | 0.091 | 0.273 | 0.091 | -- | -- | -- | -- | 0.364 | -- | -- | -- | -- |
| Mixed Chaparral | -- | -- | -- | 0.040 | 0.119 | 0.040 | -- | -- | 0.080 | -- | 0.239 | 0.040 | -- | -- | -- |
| Recent Burn | -- | 0.388 | -- | -- | 0.055 | 0.111 | -- | -- | 0.055 | -- | -- | -- | -- | 0.055 | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|---------|-------------------|----------------|---------------|---------------------|-------------------|----------------|-----------------------|-----------------------------|----------------|-------------------|------------------------|------------------|-----------------|
| | American Robin | Wrentit | European Starling | American Pipit | Cedar Waxwing | Or.-crowned Warbler | Nashville Warbler | Yellow Warbler | Yellow-rumped Warbler | Black-throated Gray Warbler | Hermit Warbler | American Redstart | MacGillivray's Warbler | Wilson's Warbler | Western Tanager |
| Barren | 0.111 | -- | -- | 0.064 | -- | -- | 0.064 | -- | 0.064 | 0.016 | -- | -- | 0.016 | -- | 0.048 |
| Subalpine/Alpine Meadow | 0.365 | -- | -- | 0.037 | -- | -- | -- | -- | 0.337 | -- | -- | -- | -- | 0.009 | -- |
| Whitebark Pine | 0.009 | -- | -- | 0.064 | -- | -- | -- | -- | 0.136 | -- | -- | -- | -- | -- | -- |
| Whitebark Pine-Mountain Hemlock | 0.065 | -- | -- | 0.033 | -- | -- | -- | -- | 0.326 | -- | -- | -- | -- | -- | -- |
| Whitebark Pine-Lodgepole Pine | 0.068 | -- | -- | -- | -- | -- | -- | -- | 0.289 | -- | -- | -- | -- | -- | -- |
| Mountain Hemlock | 0.098 | -- | -- | -- | -- | -- | -- | -- | 0.686 | -- | -- | -- | -- | -- | -- |
| Western Juniper | -- | -- | -- | -- | -- | -- | 0.098 | -- | 0.229 | -- | 0.033 | -- | 0.098 | 0.065 | -- |
| Western White Pine | 0.133 | -- | -- | -- | -- | -- | 0.027 | -- | 0.504 | -- | -- | -- | -- | 0.053 | 0.080 |
| Lodgepole Pine | 0.121 | -- | -- | -- | -- | 0.005 | 0.023 | -- | 0.607 | -- | 0.010 | -- | 0.026 | 0.005 | 0.013 |
| Montane/Alpine Riparian Shrub | 0.067 | -- | -- | -- | -- | -- | -- | 0.067 | 0.235 | -- | -- | -- | 0.101 | 0.168 | -- |
| Quaking Aspen | 0.141 | -- | -- | -- | -- | -- | 0.660 | -- | 0.047 | 0.141 | 0.047 | -- | 0.141 | 0.990 | 0.189 |
| Red Fir | 0.124 | -- | -- | -- | -- | -- | 0.051 | 0.009 | 0.694 | 0.023 | 0.097 | -- | 0.051 | 0.009 | 0.170 |
| Jeffrey Pine-Red Fir | 0.105 | -- | -- | -- | -- | -- | 0.105 | -- | 0.576 | -- | 0.262 | -- | 0.105 | -- | 0.174 |
| Jeffrey Pine | 0.092 | -- | -- | -- | 0.009 | -- | 0.378 | -- | 0.258 | 0.074 | 0.092 | -- | 0.101 | 0.018 | 0.111 |
| Montane Meadow | 0.464 | -- | 0.012 | -- | -- | 0.012 | 0.024 | 0.024 | 0.738 | -- | 0.024 | -- | 0.024 | 0.143 | 0.107 |
| White Fir | 0.076 | -- | -- | -- | -- | -- | 0.127 | 0.076 | 0.688 | 0.025 | 0.306 | -- | 0.178 | 0.051 | 0.280 |
| White Fir Mixed Conifer | 0.093 | -- | -- | -- | -- | -- | 0.220 | 0.010 | 0.478 | 0.024 | 0.317 | -- | 0.083 | 0.010 | 0.215 |
| Giant Sequoia | 0.159 | -- | -- | -- | -- | -- | 0.318 | -- | -- | -- | 0.637 | -- | 0.955 | -- | -- |
| Douglas-fir Mixed Conifer | -- | -- | -- | -- | -- | -- | 0.995 | -- | 0.199 | 0.279 | 0.199 | -- | -- | -- | 0.199 |
| Montane Chaparral | 0.034 | -- | -- | -- | -- | -- | 0.335 | 0.067 | 0.302 | -- | 0.050 | -- | 0.151 | 0.050 | 0.101 |
| Black Oak | 0.326 | -- | -- | -- | -- | -- | 0.784 | 0.131 | 0.131 | 0.163 | 0.098 | -- | 0.326 | 0.163 | 0.033 |
| Ponderosa Pine Mixed Conifer | 0.246 | 0.022 | -- | -- | -- | 0.006 | 0.519 | 0.039 | 0.262 | 0.201 | 0.279 | -- | 0.117 | 0.050 | 0.296 |
| Ponderosa Pine | -- | -- | -- | -- | -- | -- | 0.670 | -- | 0.469 | 0.201 | 0.134 | -- | 0.067 | 0.067 | 0.268 |
| White Alder | 0.637 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | 0.138 | 0.083 | -- | -- | -- | -- | 0.249 | -- | 0.055 | 0.526 | 0.028 | -- | 0.083 | 0.138 | 0.471 |
| Interior Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.546 | -- | -- | -- | -- | -- |
| Foothill Pine | 0.091 | 0.091 | -- | -- | -- | -- | 0.364 | -- | -- | -- | -- | -- | -- | -- | -- |
| Mixed Chaparral | 0.040 | 0.398 | -- | -- | -- | 0.080 | 0.796 | -- | 0.040 | 0.199 | 0.040 | -- | 0.080 | 0.080 | -- |
| Recent Burn | 0.221 | -- | -- | -- | -- | -- | 0.221 | -- | 0.277 | -- | -- | -- | 0.221 | -- | 0.332 |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | | | | | | | |
|---------------------------------|--|----------------|------------------|-----------------------|------------------------|-------------|--------------|-------------------|-----------------------|-----------------|-----------------------|----------------|----------------------|--------------------|----------------------|
| | Green-tailed Towhee | Spotted Towhee | Chipping Sparrow | Black-chinned Sparrow | Black-throated Sparrow | Fox Sparrow | Song Sparrow | Lincoln's Sparrow | White-crowned Sparrow | Dark-eyed Junco | Black-headed Grosbeak | Lazuli Bunting | Red-winged Blackbird | Brewer's Blackbird | Brown-headed Cowbird |
| Barren | -- | 0.016 | -- | -- | -- | 0.032 | -- | -- | 0.032 | 0.223 | -- | -- | -- | -- | -- |
| Subalpine/Alpine Meadow | -- | -- | -- | -- | -- | -- | 0.075 | 0.028 | 0.374 | 0.524 | -- | -- | 0.028 | 0.234 | -- |
| Whitebark Pine | -- | -- | -- | -- | -- | 0.009 | -- | -- | 0.118 | 0.373 | -- | -- | -- | 0.009 | -- |
| Whitebark Pine-Mountain Hemlock | -- | -- | -- | -- | -- | -- | -- | -- | 0.033 | 0.555 | -- | -- | -- | -- | -- |
| Whitebark Pine-Lodgepole Pine | -- | -- | -- | -- | -- | -- | -- | -- | 0.085 | 0.883 | -- | -- | -- | -- | -- |
| Mountain Hemlock | -- | -- | -- | -- | -- | 0.012 | -- | -- | 0.012 | 0.784 | -- | -- | -- | 0.024 | -- |
| Western Juniper | 0.065 | 0.033 | -- | -- | -- | 0.424 | -- | -- | -- | 0.816 | 0.033 | -- | -- | -- | -- |
| Western White Pine | -- | -- | -- | -- | -- | 0.106 | -- | -- | -- | 0.716 | -- | -- | -- | 0.027 | -- |
| Lodgepole Pine | 0.026 | 0.003 | 0.015 | -- | -- | 0.085 | -- | 0.015 | 0.046 | 0.856 | -- | -- | 0.005 | -- | -- |
| Montane/Alpine Riparian Shrub | -- | -- | -- | -- | -- | 0.034 | 0.034 | -- | 0.637 | 0.637 | -- | -- | -- | 0.067 | -- |
| Quaking Aspen | 0.141 | -- | -- | -- | -- | 0.330 | -- | -- | -- | 0.849 | -- | 0.141 | -- | -- | -- |
| Red Fir | 0.023 | -- | 0.014 | -- | -- | 0.184 | 0.005 | 0.032 | -- | 0.630 | 0.009 | 0.009 | -- | -- | -- |
| Jeffrey Pine-Red Fir | 0.052 | 0.035 | 0.035 | -- | -- | 0.279 | -- | -- | -- | 0.645 | -- | -- | -- | -- | -- |
| Jeffrey Pine | 0.037 | 0.129 | 0.009 | -- | -- | 0.406 | 0.009 | -- | -- | 0.535 | 0.009 | 0.018 | -- | 0.055 | -- |
| Montane Meadow | -- | 0.036 | 0.095 | -- | -- | 0.059 | 0.214 | 0.428 | 0.071 | 1.297 | 0.012 | -- | 0.048 | 0.702 | 0.036 |
| White Fir | -- | 0.102 | -- | -- | -- | 0.204 | -- | 0.051 | -- | 0.484 | -- | 0.025 | -- | -- | -- |
| White Fir Mixed Conifer | -- | 0.039 | 0.020 | -- | -- | 0.224 | 0.010 | 0.015 | -- | 0.673 | 0.073 | -- | -- | -- | 0.005 |
| Giant Sequoia | -- | 0.159 | -- | -- | -- | 0.477 | -- | -- | -- | 0.796 | 0.159 | -- | -- | -- | -- |
| Douglas-fir Mixed Conifer | -- | 0.080 | -- | -- | -- | 0.040 | -- | -- | -- | 0.318 | 0.398 | 0.040 | -- | -- | -- |
| Montane Chaparral | 0.151 | 0.385 | 0.050 | -- | -- | 0.955 | -- | -- | -- | 0.553 | 0.084 | 0.168 | -- | 0.017 | -- |
| Black Oak | -- | 0.424 | -- | -- | -- | 0.196 | 0.065 | -- | -- | 0.392 | 0.359 | 0.131 | -- | 0.392 | -- |
| Ponderosa Pine Mixed Conifer | -- | 0.290 | 0.022 | -- | -- | 0.084 | 0.028 | -- | -- | 0.575 | 0.307 | 0.112 | -- | 0.134 | 0.022 |
| Ponderosa Pine | -- | 0.536 | 0.067 | -- | -- | 0.134 | -- | -- | -- | 0.536 | 0.134 | 0.134 | 0.134 | -- | -- |
| White Alder | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.273 | 0.637 | -- | -- | -- | -- |
| Canyon Live Oak | -- | -- | -- | -- | -- | -- | 0.028 | -- | 0.055 | 0.166 | 0.388 | 0.083 | 0.028 | -- | -- |
| Interior Live Oak | -- | 2.546 | -- | -- | -- | -- | -- | -- | -- | -- | 2.546 | -- | -- | -- | -- |
| Foothill Pine | -- | 0.546 | -- | -- | 0.273 | -- | -- | -- | -- | -- | -- | 0.091 | -- | -- | -- |
| Mixed Chaparral | -- | 1.074 | -- | 0.040 | -- | 0.040 | -- | -- | -- | 0.358 | 0.477 | 0.358 | -- | -- | -- |
| Recent Burn | 0.055 | 0.055 | 0.166 | -- | -- | 0.388 | -- | 0.111 | -- | 0.554 | 0.055 | 0.277 | 0.166 | -- | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 3 cont.

| HABITAT | AVERAGE NO. OF DETECTIONS PER HECTARE ^a | | | | | | | | |
|---------------------------------|--|-------------------------|---------------|--------------|----------------|---------------|-------------|------------------|------------------|
| | Bullock's Oriole | Gray-crowned Rosy-Finch | Pine Grosbeak | Purple Finch | Cassin's Finch | Red Crossbill | Pine Siskin | Lesser Goldfinch | Evening Grosbeak |
| Barren | -- | 0.159 | -- | -- | 0.064 | -- | -- | -- | -- |
| Subalpine/Alpine Meadow | -- | -- | 0.056 | -- | 0.290 | -- | 0.140 | -- | -- |
| Whitebark Pine | -- | 0.082 | 0.009 | -- | 0.191 | -- | 0.073 | -- | -- |
| Whitebark Pine-Mountain Hemlock | -- | 0.098 | -- | -- | 0.229 | 0.131 | 0.098 | -- | -- |
| Whitebark Pine-Lodgepole Pine | -- | 0.102 | 0.017 | -- | 0.289 | 0.119 | 0.340 | -- | -- |
| Mountain Hemlock | -- | 0.024 | 0.037 | -- | 0.490 | 0.012 | 0.355 | -- | -- |
| Western Juniper | -- | -- | -- | -- | 0.163 | -- | 0.033 | -- | -- |
| Western White Pine | -- | -- | 0.027 | -- | 0.371 | 0.027 | 0.371 | -- | -- |
| Lodgepole Pine | -- | 0.003 | 0.026 | 0.010 | 0.381 | 0.005 | 0.260 | 0.005 | -- |
| Montane/Alpine Riparian Shrub | -- | 0.034 | -- | -- | 0.201 | 0.034 | -- | -- | -- |
| Quaking Aspen | -- | -- | -- | -- | 0.141 | -- | -- | -- | -- |
| Red Fir | -- | -- | 0.018 | 0.014 | 0.142 | 0.041 | 0.165 | -- | 0.009 |
| Jeffrey Pine-Red Fir | -- | -- | -- | -- | 0.052 | -- | 0.052 | -- | 0.017 |
| Jeffrey Pine | -- | -- | -- | -- | 0.083 | -- | 0.018 | -- | -- |
| Montane Meadow | 0.012 | -- | -- | -- | 0.107 | -- | 0.238 | -- | -- |
| White Fir | -- | -- | -- | -- | 0.127 | -- | 0.076 | -- | -- |
| White Fir Mixed Conifer | -- | -- | -- | 0.020 | 0.020 | -- | 0.049 | -- | 0.015 |
| Giant Sequoia | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Douglas-fir Mixed Conifer | -- | -- | -- | 0.040 | -- | -- | -- | -- | 0.080 |
| Montane Chaparral | -- | -- | -- | 0.017 | 0.168 | -- | -- | 0.017 | -- |
| Black Oak | -- | -- | -- | 0.033 | 0.196 | -- | -- | 0.131 | -- |
| Ponderosa Pine Mixed Conifer | -- | -- | -- | 0.045 | 0.045 | 0.045 | 0.017 | -- | -- |
| Ponderosa Pine | -- | -- | -- | 0.067 | 0.134 | -- | -- | 0.201 | -- |
| White Alder | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Canyon Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | 0.028 |
| Interior Live Oak | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Foothill Pine | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mixed Chaparral | -- | -- | -- | 0.040 | -- | -- | -- | 0.676 | -- |
| Recent Burn | -- | -- | -- | -- | -- | -- | -- | -- | -- |

^aAverages based on birds detected within 50-m of the point count observer. Flyovers and birds detected at times other than during point counts are excluded.

Table 4. Park habitats ranked by the average number of birds detected per ha based on 50 m radius point counts, at all sampling points within that habitat.

| Rank | Habitat ^a | Detections per ha |
|------|---------------------------------|-------------------|
| 1 | Montane Meadow | 7.58 |
| 2 | Mixed Chaparral | 7.04 |
| 3 | Black Oak | 6.82 |
| 4 | Quaking Aspen | 6.70 |
| 5 | Ponderosa Pine Mixed Conifer | 6.67 |
| 6 | Ponderosa Pine | 6.43 |
| 7 | White Fir | 6.39 |
| 8 | Montane Chaparral | 6.15 |
| 9 | Red Fir | 6.07 |
| 10 | White Fir Mixed Conifer | 5.96 |
| 11 | Recent Burn | 5.43 |
| 12 | Jeffrey Pine-Red Fir | 5.37 |
| 13 | Douglas-fir Mixed Conifer | 5.37 |
| 14 | Western White Pine | 4.96 |
| 15 | Jeffrey Pine | 4.73 |
| 16 | Mountain Hemlock | 4.27 |
| 17 | Lodgepole Pine | 4.26 |
| 18 | Canyon Live Oak | 4.21 |
| 19 | Whitebark Pine-Lodgepole Pine | 3.58 |
| 20 | Foothill Pine | 3.46 |
| 21 | Montane/Alpine Riparian Shrub | 3.38 |
| 22 | Western Juniper | 3.36 |
| 23 | Subalpine/Alpine Meadow | 3.11 |
| 24 | Whitebark Pine-Mountain Hemlock | 2.29 |
| 25 | Whitebark Pine | 1.72 |
| 26 | Barren | 1.54 |

^aHabitats with fewer than 14 sampling points have been omitted.

Table 5. Summary results from 23 point counts in Recent Burn habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mountain Quail | 5 | 0.304 | 0 | 0.000 |
| American Coot | 1 | 0.043 | 0 | 0.000 |
| Mourning Dove | 2 | 0.087 | 1 | 0.055 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.043 | 1 | 0.055 |
| Acorn Woodpecker | 1 | 0.043 | 0 | 0.000 |
| Hairy Woodpecker | 6 | 0.304 | 2 | 0.111 |
| Wh.-headed Woodpecker | 3 | 0.174 | 2 | 0.111 |
| Blk.-backed Woodpecker | 1 | 0.087 | 1 | 0.111 |
| Northern Flicker | 5 | 0.261 | 1 | 0.055 |
| Unidentif. Woodpecker | 3 | 0.130 | 0 | 0.000 |
| Olive-sided Flycatcher | 5 | 0.217 | 1 | 0.055 |
| Western Wood-Pewee | 10 | 0.696 | 1 | 0.055 |
| Dusky Flycatcher | 5 | 0.348 | 5 | 0.332 |
| Unidentified <i>Empidonax</i> | 1 | 0.043 | 0 | 0.000 |
| Warbling Vireo | 2 | 0.087 | 2 | 0.111 |
| Steller's Jay | 8 | 0.478 | 2 | 0.111 |
| Mountain Chickadee | 12 | 0.739 | 7 | 0.498 |
| Red-breasted Nuthatch | 5 | 0.261 | 0 | 0.000 |
| Brown Creeper | 10 | 0.522 | 5 | 0.388 |
| Bewick's Wren | 1 | 0.043 | 1 | 0.055 |
| House Wren | 3 | 0.174 | 2 | 0.111 |
| Golden-crowned Kinglet | 2 | 0.087 | 1 | 0.055 |
| Townsend's Solitaire | 2 | 0.130 | 1 | 0.055 |
| Hermit Thrush | 2 | 0.087 | 0 | 0.000 |
| American Robin | 5 | 0.304 | 2 | 0.221 |
| Nashville Warbler | 4 | 0.217 | 4 | 0.221 |
| Yellow-rumped Warbler | 8 | 0.522 | 4 | 0.277 |
| Hermit Warbler | 1 | 0.043 | 0 | 0.000 |
| MacGillivray's Warbler | 5 | 0.304 | 4 | 0.221 |
| Western Tanager | 9 | 0.609 | 4 | 0.332 |
| Green-tailed Towhee | 1 | 0.043 | 1 | 0.055 |
| Spotted Towhee | 3 | 0.130 | 1 | 0.055 |
| Chipping Sparrow | 3 | 0.174 | 2 | 0.166 |
| Fox Sparrow | 7 | 0.565 | 3 | 0.388 |
| Lincoln's Sparrow | 3 | 0.130 | 2 | 0.111 |
| Dark-eyed Junco | 15 | 1.130 | 10 | 0.554 |
| Black-headed Grosbeak | 3 | 0.130 | 1 | 0.055 |
| Lazuli Bunting | 5 | 0.391 | 4 | 0.277 |
| Red-winged Blackbird | 1 | 0.217 | 1 | 0.166 |
| Brown-headed Cowbird | 1 | 0.043 | 0 | 0.000 |
| Pine Grosbeak | 1 | 0.043 | 0 | 0.000 |
| Pine Siskin | 1 | 0.043 | 0 | 0.000 |
| All species pooled | | 10.426 | | 5.423 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 6. Summary results from 32 point counts in Mixed Chaparral habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Blue Grouse | 1 | 0.031 | 1 | 0.040 |
| Mountain Quail | 11 | 0.406 | 1 | 0.040 |
| Band-tailed Pigeon | 1 | 0.031 | 1 | 0.040 |
| Mourning Dove | 0 | 0.000 | 0 | 0.000 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 4 | 0.156 | 4 | 0.199 |
| Calliope Hummingbird | 1 | 0.063 | 1 | 0.080 |
| Unidentif. Hummingbird | 1 | 0.031 | 1 | 0.040 |
| Acorn Woodpecker | 9 | 0.375 | 4 | 0.199 |
| Hairy Woodpecker | 2 | 0.063 | 0 | 0.000 |
| Wh.-headed Woodpecker | 1 | 0.031 | 0 | 0.000 |
| Northern Flicker | 5 | 0.188 | 1 | 0.080 |
| Western Wood-Pewee | 4 | 0.250 | 2 | 0.119 |
| Hammond's Flycatcher | 1 | 0.031 | 1 | 0.040 |
| Dusky Flycatcher | 2 | 0.094 | 1 | 0.040 |
| Unidentified <i>Empidonax</i> | 1 | 0.031 | 1 | 0.040 |
| Black Phoebe | 1 | 0.031 | 1 | 0.040 |
| Cassin's Vireo | 6 | 0.219 | 1 | 0.080 |
| Warbling Vireo | 3 | 0.094 | 3 | 0.119 |
| Steller's Jay | 12 | 0.625 | 3 | 0.159 |
| Western Scrub-Jay | 7 | 0.281 | 2 | 0.119 |
| Common Raven | 1 | 0.031 | 0 | 0.000 |
| Mountain Chickadee | 3 | 0.125 | 0 | 0.000 |
| Bushtit | 1 | 0.094 | 1 | 0.119 |
| Red-breasted Nuthatch | 6 | 0.188 | 1 | 0.040 |
| Canyon Wren | 1 | 0.063 | 1 | 0.040 |
| Bewick's Wren | 4 | 0.156 | 2 | 0.119 |
| House Wren | 3 | 0.094 | 1 | 0.040 |
| Golden-crowned Kinglet | 2 | 0.063 | 2 | 0.080 |
| Blue-gray Gnatcatcher | 3 | 0.219 | 3 | 0.239 |
| Western Bluebird | 1 | 0.063 | 1 | 0.040 |
| Townsend's Solitaire | 1 | 0.031 | 0 | 0.000 |
| Swainson's Thrush | 1 | 0.031 | 0 | 0.000 |
| American Robin | 3 | 0.125 | 1 | 0.040 |
| Wrentit | 15 | 0.938 | 8 | 0.398 |
| Orange-crowned Warbler | 1 | 0.063 | 1 | 0.080 |
| Nashville Warbler | 14 | 0.938 | 12 | 0.796 |
| Yellow-rumped Warbler | 1 | 0.031 | 1 | 0.040 |
| Blk.-throated G. Warbler | 7 | 0.250 | 5 | 0.199 |
| Hermit Warbler | 3 | 0.125 | 1 | 0.040 |
| MacGillivray's Warbler | 2 | 0.063 | 2 | 0.080 |
| Unidentified Warbler | 1 | 0.031 | 1 | 0.040 |
| Western Tanager | 6 | 0.219 | 2 | 0.080 |
| Spotted Towhee | 25 | 1.563 | 19 | 1.074 |
| Black-chinned Sparrow | 1 | 0.031 | 1 | 0.040 |
| Fox Sparrow | 2 | 0.094 | 1 | 0.040 |
| Song Sparrow | 1 | 0.063 | 0 | 0.000 |
| Dark-eyed Junco | 10 | 0.531 | 7 | 0.358 |
| Black-headed Grosbeak | 18 | 0.781 | 10 | 0.477 |
| Lazuli Bunting | 9 | 0.594 | 7 | 0.358 |
| Purple Finch | 1 | 0.031 | 1 | 0.040 |

| | | | | |
|---------------------------|---|---------------|---|--------------|
| Cassin's Finch | 2 | 0.063 | 0 | 0.000 |
| Pine Siskin | 0 | 0.000 | 0 | 0.000 |
| Lesser Goldfinch | 8 | 0.719 | 5 | 0.676 |
| Evening Grosbeak | 0 | 0.000 | 0 | 0.000 |
| All species pooled | | 11.442 | | 7.047 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 7. Summary results from 14 point counts in Foothill Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Mountain Quail | 4 | 0.429 | 0 | 0.000 |
| White-throated Swift | 3 | 0.571 | 0 | 0.000 |
| Anna's Hummingbird | 2 | 0.143 | 2 | 0.182 |
| Acorn Woodpecker | 2 | 0.357 | 0 | 0.000 |
| Downy Woodpecker | 1 | 0.071 | 0 | 0.000 |
| Hairy Woodpecker | 1 | 0.071 | 1 | 0.091 |
| Wh.-headed Woodpecker | 1 | 0.071 | 0 | 0.000 |
| Northern Flicker | 5 | 0.571 | 3 | 0.273 |
| Western Wood-Pewee | 1 | 0.143 | 1 | 0.091 |
| Dusky Flycatcher | 1 | 0.143 | 0 | 0.000 |
| Ash-throated Flycatcher | 1 | 0.071 | 0 | 0.000 |
| Cassin's Vireo | 1 | 0.143 | 1 | 0.182 |
| Steller's Jay | 5 | 0.429 | 0 | 0.000 |
| Western Scrub-Jay | 6 | 0.500 | 1 | 0.091 |
| Common Raven | 1 | 0.071 | 0 | 0.000 |
| Mountain Chickadee | 1 | 0.071 | 0 | 0.000 |
| Oak Titmouse | 1 | 0.071 | 0 | 0.000 |
| Rock Wren | 2 | 0.286 | 2 | 0.273 |
| Canyon Wren | 3 | 0.214 | 1 | 0.091 |
| Bewick's Wren | 5 | 0.500 | 3 | 0.273 |
| House Wren | 1 | 0.071 | 1 | 0.091 |
| Blue-gray Gnatcatcher | 3 | 0.286 | 3 | 0.364 |
| Townsend's Solitaire | 1 | 0.071 | 0 | 0.000 |
| American Robin | 1 | 0.214 | 1 | 0.091 |
| Wrentit | 2 | 0.143 | 1 | 0.091 |
| Nashville Warbler | 6 | 0.643 | 2 | 0.364 |
| Western Tanager | 2 | 0.143 | 0 | 0.000 |
| Spotted Towhee | 9 | 0.929 | 5 | 0.546 |
| California Towhee | 1 | 0.071 | 0 | 0.000 |
| Black-throated Sparrow | 4 | 0.357 | 3 | 0.273 |
| Dark-eyed Junco | 1 | 0.071 | 0 | 0.000 |
| Black-headed Grosbeak | 4 | 0.286 | 0 | 0.000 |
| Lazuli Bunting | 4 | 0.429 | 1 | 0.091 |
| Lesser Goldfinch | 1 | 0.143 | 0 | 0.000 |
| All species pooled | | 8.783 | | 3.458 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 8. Summary results from 1 point count in Interior Live Oak habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Mountain Quail | 1 | 1.000 | 0 | 0.000 |
| Wh.-headed Woodpecker | 1 | 1.000 | 0 | 0.000 |
| Western Wood-Pewee | 1 | 1.000 | 1 | 1.273 |
| Cassin's Vireo | 1 | 1.000 | 1 | 1.273 |
| Nashville Warbler | 1 | 2.000 | 0 | 0.000 |
| Blk.-throated G. Warbler | 1 | 2.000 | 1 | 2.546 |
| Western Tanager | 1 | 1.000 | 0 | 0.000 |
| Spotted Towhee | 1 | 2.000 | 1 | 2.546 |
| Black-headed Grosbeak | 1 | 4.000 | 1 | 2.546 |
| All species pooled | | 15.000 | | 10.184 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 9. Summary results from 46 point counts in Canyon Live Oak habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Common Merganser | 1 | 0.022 | 1 | 0.028 |
| Mountain Quail | 15 | 0.435 | 1 | 0.028 |
| Band-tailed Pigeon | 4 | 0.196 | 1 | 0.055 |
| White-throated Swift | 2 | 0.130 | 1 | 0.028 |
| Anna's Hummingbird | 6 | 0.130 | 6 | 0.166 |
| Acorn Woodpecker | 6 | 0.283 | 1 | 0.083 |
| Hairy Woodpecker | 1 | 0.022 | 0 | 0.000 |
| Wh.-headed Woodpecker | 1 | 0.022 | 1 | 0.028 |
| Northern Flicker | 2 | 0.043 | 1 | 0.028 |
| Pileated Woodpecker | 1 | 0.022 | 0 | 0.000 |
| Unidentif. Woodpecker | 1 | 0.022 | 1 | 0.028 |
| Western Wood-Pewee | 7 | 0.261 | 3 | 0.111 |
| Hammond's Flycatcher | 1 | 0.022 | 1 | 0.028 |
| Dusky Flycatcher | 1 | 0.022 | 0 | 0.000 |
| Cassin's Vireo | 7 | 0.196 | 6 | 0.166 |
| Hutton's Vireo | 1 | 0.022 | 1 | 0.028 |
| Warbling Vireo | 2 | 0.130 | 1 | 0.055 |
| Steller's Jay | 23 | 0.826 | 11 | 0.443 |
| Western Scrub-Jay | 1 | 0.022 | 0 | 0.000 |
| Common Raven | 1 | 0.022 | 1 | 0.028 |
| Mountain Chickadee | 5 | 0.130 | 2 | 0.055 |
| Bushtit | 1 | 0.022 | 1 | 0.028 |
| Red-breasted Nuthatch | 4 | 0.087 | 0 | 0.000 |
| Brown Creeper | 2 | 0.043 | 1 | 0.028 |
| Canyon Wren | 5 | 0.109 | 3 | 0.083 |
| House Wren | 1 | 0.043 | 0 | 0.000 |
| Winter Wren | 3 | 0.065 | 2 | 0.055 |
| Golden-crowned Kinglet | 1 | 0.022 | 0 | 0.000 |
| Blue-gray Gnatcatcher | 1 | 0.065 | 1 | 0.083 |
| Townsend's Solitaire | 1 | 0.022 | 0 | 0.000 |
| American Robin | 10 | 0.217 | 5 | 0.138 |
| Wrentit | 5 | 0.174 | 2 | 0.083 |
| Nashville Warbler | 13 | 0.370 | 9 | 0.249 |
| Yellow-rumped Warbler | 3 | 0.130 | 2 | 0.055 |
| Blk.-throated G. Warbler | 18 | 0.609 | 15 | 0.526 |
| Hermit Warbler | 1 | 0.022 | 1 | 0.028 |
| MacGillivray's Warbler | 4 | 0.109 | 3 | 0.083 |
| Western Tanager | 11 | 0.348 | 4 | 0.138 |
| Spotted Towhee | 18 | 0.652 | 13 | 0.471 |
| Song Sparrow | 1 | 0.022 | 1 | 0.028 |
| White-crowned Sparrow | 1 | 0.043 | 1 | 0.055 |
| Dark-eyed Junco | 5 | 0.130 | 5 | 0.166 |
| Black-headed Grosbeak | 17 | 0.478 | 12 | 0.388 |
| Lazuli Bunting | 4 | 0.109 | 3 | 0.083 |
| Red-winged Blackbird | 1 | 0.022 | 1 | 0.028 |
| Purple Finch | 1 | 0.022 | 0 | 0.000 |
| Lesser Goldfinch | 2 | 0.043 | 1 | 0.028 |
| All species pooled | | 6.958 | | 4.210 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
⁴Based on average number of birds detected within a 50 m radius.

Table 10. Summary results from 2 point counts in White Alder habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Wh.-headed Woodpecker | 1 | 1.000 | 1 | 1.273 |
| Western Wood-Pewee | 1 | 0.500 | 0 | 0.000 |
| Steller's Jay | 1 | 2.000 | 1 | 0.637 |
| American Dipper | 0 | 0.000 | 0 | 0.000 |
| American Robin | 1 | 0.500 | 1 | 0.637 |
| Yellow Warbler | 1 | 1.000 | 0 | 0.000 |
| Western Tanager | 1 | 0.500 | 0 | 0.000 |
| Song Sparrow | 1 | 0.500 | 0 | 0.000 |
| Dark-eyed Junco | 1 | 1.000 | 1 | 1.273 |
| Black-headed Grosbeak | 1 | 0.500 | 1 | 0.637 |
| Lazuli Bunting | 1 | 0.500 | 0 | 0.000 |
| Brewer's Blackbird | 1 | 2.000 | 0 | 0.000 |
| All species pooled | | 10.000 | | 4.457 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 11. Summary results from 19 point counts in Ponderosa Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|--------------------------|---|--|---|---|
| Mountain Quail | 10 | 0.789 | 2 | 0.134 |
| Mourning Dove | 1 | 0.053 | 1 | 0.067 |
| White-throated Swift | 1 | 0.158 | 0 | 0.000 |
| Anna's Hummingbird | 2 | 0.316 | 2 | 0.402 |
| Acorn Woodpecker | 2 | 0.105 | 1 | 0.067 |
| Hairy Woodpecker | 3 | 0.211 | 2 | 0.201 |
| Wh.-headed Woodpecker | 3 | 0.158 | 2 | 0.134 |
| Northern Flicker | 4 | 0.211 | 1 | 0.067 |
| Pileated Woodpecker | 1 | 0.053 | 0 | 0.000 |
| Unidentif. Woodpecker | 2 | 0.105 | 0 | 0.000 |
| Olive-sided Flycatcher | 1 | 0.053 | 1 | 0.067 |
| Western Wood-Pewee | 3 | 0.211 | 0 | 0.000 |
| Hammond's Flycatcher | 3 | 0.158 | 3 | 0.201 |
| Dusky Flycatcher | 3 | 0.158 | 2 | 0.134 |
| Ash-throated Flycatcher | 1 | 0.053 | 0 | 0.000 |
| Cassin's Vireo | 3 | 0.263 | 2 | 0.201 |
| Warbling Vireo | 1 | 0.053 | 0 | 0.000 |
| Steller's Jay | 9 | 0.684 | 1 | 0.067 |
| Western Scrub-Jay | 1 | 0.053 | 0 | 0.000 |
| Common Raven | 3 | 0.158 | 0 | 0.000 |
| Mountain Chickadee | 5 | 0.421 | 1 | 0.134 |
| Bushtit | 1 | 0.105 | 1 | 0.134 |
| Red-breasted Nuthatch | 10 | 0.526 | 1 | 0.067 |
| Brown Creeper | 3 | 0.158 | 2 | 0.134 |
| Rock Wren | 1 | 0.053 | 0 | 0.000 |
| Bewick's Wren | 2 | 0.105 | 0 | 0.000 |
| Winter Wren | 1 | 0.105 | 1 | 0.067 |
| Golden-crowned Kinglet | 2 | 0.211 | 2 | 0.201 |
| Townsend's Solitaire | 1 | 0.053 | 0 | 0.000 |
| American Robin | 2 | 0.105 | 0 | 0.000 |
| Wrentit | 1 | 0.053 | 0 | 0.000 |
| Nashville Warbler | 10 | 0.947 | 7 | 0.670 |
| Yellow-rumped Warbler | 5 | 0.526 | 5 | 0.469 |
| Blk.-throated G. Warbler | 6 | 0.579 | 1 | 0.201 |
| Hermit Warbler | 2 | 0.263 | 1 | 0.134 |
| MacGillivray's Warbler | 1 | 0.105 | 1 | 0.067 |
| Wilson's Warbler | 1 | 0.053 | 1 | 0.067 |
| Western Tanager | 5 | 0.316 | 4 | 0.268 |
| Spotted Towhee | 7 | 0.526 | 6 | 0.536 |
| Chipping Sparrow | 3 | 0.158 | 1 | 0.067 |
| Fox Sparrow | 3 | 0.263 | 2 | 0.134 |
| Dark-eyed Junco | 6 | 0.474 | 5 | 0.536 |
| Black-headed Grosbeak | 8 | 0.474 | 2 | 0.134 |
| Lazuli Bunting | 2 | 0.263 | 2 | 0.134 |
| Red-winged Blackbird | 1 | 0.211 | 1 | 0.134 |
| Western Meadowlark | 1 | 0.053 | 0 | 0.000 |
| Brown-headed Cowbird | 1 | 0.053 | 0 | 0.000 |
| Purple Finch | 3 | 0.158 | 1 | 0.067 |
| Cassin's Finch | 1 | 0.105 | 1 | 0.134 |
| Pine Siskin | 0 | 0.000 | 0 | 0.000 |
| Lesser Goldfinch | 2 | 0.316 | 2 | 0.201 |

| | | | | |
|---------------------------|---|---------------|---|--------------|
| Evening Grosbeak | 0 | 0.000 | 0 | 0.000 |
| All species pooled | | 11.741 | | 6.432 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 12. Summary results from 228 point counts in Ponderosa Pine Mixed Conifer habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Pied-billed Grebe | 1 | 0.004 | 0 | 0.000 |
| Mallard | 4 | 0.057 | 3 | 0.067 |
| Red-tailed Hawk | 1 | 0.004 | 0 | 0.000 |
| Blue Grouse | 1 | 0.004 | 0 | 0.000 |
| Mountain Quail | 88 | 0.561 | 12 | 0.073 |
| Spotted Sandpiper | 1 | 0.004 | 1 | 0.006 |
| Band-tailed Pigeon | 1 | 0.009 | 1 | 0.006 |
| Mourning Dove | 4 | 0.022 | 2 | 0.017 |
| Northern Pygmy-Owl | 1 | 0.004 | 0 | 0.000 |
| White-throated Swift | 5 | 0.066 | 3 | 0.034 |
| Anna's Hummingbird | 7 | 0.031 | 7 | 0.039 |
| Unidentif. Hummingbird | 1 | 0.004 | 1 | 0.006 |
| Belted Kingfisher | 1 | 0.004 | 0 | 0.000 |
| Acorn Woodpecker | 18 | 0.114 | 7 | 0.067 |
| Red-breasted Sapsucker | 1 | 0.004 | 1 | 0.006 |
| Unidentified Sapsucker | 5 | 0.022 | 0 | 0.000 |
| Downy Woodpecker | 3 | 0.013 | 3 | 0.017 |
| Hairy Woodpecker | 37 | 0.193 | 26 | 0.162 |
| Wh.-headed Woodpecker | 33 | 0.162 | 20 | 0.123 |
| Northern Flicker | 54 | 0.263 | 17 | 0.106 |
| Pileated Woodpecker | 15 | 0.070 | 5 | 0.028 |
| Unidentif. Woodpecker | 11 | 0.053 | 2 | 0.011 |
| Olive-sided Flycatcher | 27 | 0.127 | 2 | 0.011 |
| Western Wood-Pewee | 59 | 0.329 | 19 | 0.117 |
| Hammond's Flycatcher | 17 | 0.088 | 16 | 0.089 |
| Dusky Flycatcher | 30 | 0.158 | 24 | 0.145 |
| Pacific-slope Flycatcher | 5 | 0.022 | 2 | 0.011 |
| Unidentified <i>Empidonax</i> | 6 | 0.026 | 3 | 0.017 |
| Black Phoebe | 2 | 0.009 | 1 | 0.006 |
| Cassin's Vireo | 75 | 0.408 | 47 | 0.302 |
| Hutton's Vireo | 2 | 0.009 | 2 | 0.011 |
| Warbling Vireo | 30 | 0.171 | 15 | 0.095 |
| Steller's Jay | 112 | 0.781 | 38 | 0.285 |
| Western Scrub-Jay | 2 | 0.009 | 0 | 0.000 |
| Common Raven | 5 | 0.026 | 1 | 0.011 |
| Violet-green Swallow | 1 | 0.009 | 0 | 0.000 |
| Mountain Chickadee | 64 | 0.421 | 32 | 0.223 |
| Ch.-backed Chickadee | 3 | 0.022 | 3 | 0.028 |
| Unidentified Chickadee | 1 | 0.004 | 1 | 0.006 |
| Red-breasted Nuthatch | 97 | 0.596 | 26 | 0.195 |
| White-breasted Nuthatch | 6 | 0.026 | 2 | 0.011 |
| Brown Creeper | 60 | 0.316 | 42 | 0.285 |
| Rock Wren | 2 | 0.009 | 2 | 0.011 |
| Canyon Wren | 5 | 0.022 | 0 | 0.000 |
| Bewick's Wren | 3 | 0.013 | 3 | 0.017 |
| House Wren | 4 | 0.026 | 2 | 0.022 |
| Winter Wren | 12 | 0.053 | 8 | 0.045 |
| American Dipper | 1 | 0.004 | 1 | 0.006 |
| Golden-crowned Kinglet | 24 | 0.145 | 21 | 0.123 |
| Blue-gray Gnatcatcher | 1 | 0.009 | 1 | 0.011 |
| Western Bluebird | 1 | 0.004 | 0 | 0.000 |

| | | | | |
|--------------------------|-----|-------|----|-------|
| Townsend's Solitaire | 35 | 0.175 | 8 | 0.045 |
| Hermit Thrush | 3 | 0.018 | 1 | 0.011 |
| American Robin | 68 | 0.469 | 34 | 0.246 |
| Wrentit | 8 | 0.035 | 4 | 0.022 |
| Orange-crowned Warbler | 2 | 0.009 | 1 | 0.006 |
| Nashville Warbler | 103 | 0.697 | 71 | 0.519 |
| Yellow Warbler | 13 | 0.075 | 5 | 0.039 |
| Yellow-rumped Warbler | 55 | 0.412 | 30 | 0.262 |
| Blk.-throated G. Warbler | 45 | 0.276 | 30 | 0.201 |
| Hermit Warbler | 62 | 0.408 | 41 | 0.279 |
| MacGillivray's Warbler | 27 | 0.140 | 19 | 0.117 |
| Wilson's Warbler | 8 | 0.044 | 7 | 0.050 |
| Western Tanager | 102 | 0.588 | 46 | 0.296 |
| Spotted Towhee | 63 | 0.390 | 40 | 0.290 |
| Chipping Sparrow | 6 | 0.026 | 4 | 0.022 |
| Fox Sparrow | 22 | 0.145 | 11 | 0.084 |
| Song Sparrow | 15 | 0.088 | 3 | 0.028 |
| Lincoln's Sparrow | 2 | 0.009 | 0 | 0.000 |
| White-crowned Sparrow | 1 | 0.004 | 0 | 0.000 |
| Dark-eyed Junco | 90 | 0.627 | 68 | 0.575 |
| Black-headed Grosbeak | 86 | 0.478 | 46 | 0.307 |
| Lazuli Bunting | 23 | 0.127 | 16 | 0.112 |
| Red-winged Blackbird | 10 | 0.092 | 0 | 0.000 |
| Brewer's Blackbird | 12 | 0.180 | 9 | 0.134 |
| Brown-headed Cowbird | 7 | 0.031 | 4 | 0.022 |
| Bullock's Oriole | 1 | 0.004 | 0 | 0.000 |
| Purple Finch | 17 | 0.088 | 8 | 0.045 |
| Cassin's Finch | 14 | 0.092 | 4 | 0.045 |
| Red Crossbill | 1 | 0.035 | 1 | 0.045 |
| Pine Siskin | 3 | 0.031 | 1 | 0.017 |
| Evening Grosbeak | 2 | 0.013 | 0 | 0.000 |

| | | | | |
|---------------------------|--|---------------|--|--------------|
| All species pooled | | 11.316 | | 6.670 |
|---------------------------|--|---------------|--|--------------|

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 13. Summary results from 39 point counts in Black Oak habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|--------------------------|---|--|---|---|
| Mallard | 1 | 0.077 | 0 | 0.000 |
| Blue Grouse | 4 | 0.103 | 2 | 0.065 |
| Mountain Quail | 12 | 0.385 | 0 | 0.000 |
| Spotted Sandpiper | 3 | 0.077 | 0 | 0.000 |
| Band-tailed Pigeon | 1 | 0.026 | 1 | 0.033 |
| Mourning Dove | 2 | 0.051 | 1 | 0.033 |
| White-throated Swift | 1 | 0.128 | 1 | 0.163 |
| Anna's Hummingbird | 2 | 0.051 | 1 | 0.033 |
| Unidentif. Hummingbird | 1 | 0.026 | 1 | 0.033 |
| Acorn Woodpecker | 4 | 0.128 | 0 | 0.000 |
| Downy Woodpecker | 1 | 0.026 | 0 | 0.000 |
| Hairy Woodpecker | 4 | 0.103 | 2 | 0.065 |
| Wh.-headed Woodpecker | 1 | 0.026 | 0 | 0.000 |
| Northern Flicker | 8 | 0.205 | 2 | 0.065 |
| Olive-sided Flycatcher | 4 | 0.154 | 1 | 0.033 |
| Western Wood-Pewee | 12 | 0.410 | 6 | 0.261 |
| Dusky Flycatcher | 3 | 0.077 | 3 | 0.098 |
| Pacific-slope Flycatcher | 2 | 0.051 | 0 | 0.000 |
| Cassin's Vireo | 9 | 0.308 | 5 | 0.196 |
| Warbling Vireo | 8 | 0.359 | 5 | 0.229 |
| Steller's Jay | 21 | 0.846 | 7 | 0.392 |
| Tree Swallow | 1 | 0.051 | 1 | 0.065 |
| Violet-green Swallow | 1 | 0.077 | 1 | 0.098 |
| N. R.-winged Swallow | 1 | 0.026 | 1 | 0.033 |
| Mountain Chickadee | 10 | 0.385 | 4 | 0.196 |
| Red-breasted Nuthatch | 4 | 0.128 | 1 | 0.065 |
| Brown Creeper | 3 | 0.077 | 2 | 0.065 |
| House Wren | 2 | 0.077 | 2 | 0.098 |
| Golden-crowned Kinglet | 1 | 0.026 | 1 | 0.033 |
| Western Bluebird | 1 | 0.026 | 0 | 0.000 |
| Townsend's Solitaire | 1 | 0.026 | 0 | 0.000 |
| Hermit Thrush | 1 | 0.051 | 0 | 0.000 |
| American Robin | 13 | 0.487 | 10 | 0.326 |
| Wrentit | 1 | 0.026 | 0 | 0.000 |
| Nashville Warbler | 16 | 0.872 | 15 | 0.784 |
| Yellow Warbler | 2 | 0.128 | 2 | 0.131 |
| Yellow-rumped Warbler | 6 | 0.179 | 3 | 0.131 |
| Blk.-throated G. Warbler | 7 | 0.333 | 4 | 0.163 |
| Hermit Warbler | 8 | 0.231 | 3 | 0.098 |
| MacGillivray's Warbler | 9 | 0.308 | 8 | 0.326 |
| Wilson's Warbler | 3 | 0.128 | 3 | 0.163 |
| Western Tanager | 8 | 0.231 | 1 | 0.033 |
| Spotted Towhee | 11 | 0.538 | 9 | 0.424 |
| Fox Sparrow | 9 | 0.436 | 4 | 0.196 |
| Song Sparrow | 3 | 0.103 | 2 | 0.065 |
| Dark-eyed Junco | 11 | 0.564 | 7 | 0.392 |
| Black-headed Grosbeak | 12 | 0.436 | 8 | 0.359 |
| Lazuli Bunting | 4 | 0.205 | 2 | 0.131 |
| Red-winged Blackbird | 4 | 0.205 | 0 | 0.000 |
| Brewer's Blackbird | 2 | 0.308 | 2 | 0.392 |
| Purple Finch | 3 | 0.077 | 1 | 0.033 |

| | | | | |
|------------------|---|-------|---|-------|
| Cassin's Finch | 3 | 0.154 | 3 | 0.196 |
| Red Crossbill | 0 | 0.000 | 0 | 0.000 |
| Pine Siskin | 0 | 0.000 | 0 | 0.000 |
| Lesser Goldfinch | 3 | 0.179 | 3 | 0.131 |
| Evening Grosbeak | 3 | 0.128 | 0 | 0.000 |

All species pooled **10.823** **6.826**

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 14. Summary results from 76 point counts in Montane Chaparral habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|--------------------------|---|--|---|---|
| Mallard | 1 | 0.026 | 1 | 0.034 |
| Red-tailed Hawk | 0 | 0.000 | 0 | 0.000 |
| American Kestrel | 2 | 0.026 | 1 | 0.017 |
| Blue Grouse | 3 | 0.039 | 1 | 0.017 |
| Mountain Quail | 30 | 0.566 | 3 | 0.050 |
| Band-tailed Pigeon | 1 | 0.013 | 0 | 0.000 |
| White-throated Swift | 1 | 0.039 | 0 | 0.000 |
| Anna's Hummingbird | 3 | 0.039 | 3 | 0.050 |
| Unidentif. Hummingbird | 1 | 0.013 | 1 | 0.017 |
| Belted Kingfisher | 1 | 0.013 | 0 | 0.000 |
| Acorn Woodpecker | 4 | 0.066 | 0 | 0.000 |
| Red-breasted Sapsucker | 1 | 0.013 | 0 | 0.000 |
| Downy Woodpecker | 0 | 0.000 | 0 | 0.000 |
| Hairy Woodpecker | 5 | 0.079 | 2 | 0.034 |
| Wh.-headed Woodpecker | 8 | 0.145 | 4 | 0.117 |
| Northern Flicker | 10 | 0.145 | 1 | 0.017 |
| Olive-sided Flycatcher | 14 | 0.250 | 3 | 0.067 |
| Western Wood-Pewee | 15 | 0.211 | 1 | 0.017 |
| Hammond's Flycatcher | 5 | 0.066 | 4 | 0.067 |
| Dusky Flycatcher | 26 | 0.395 | 16 | 0.318 |
| Pacific-slope Flycatcher | 1 | 0.013 | 0 | 0.000 |
| Black Phoebe | 1 | 0.013 | 0 | 0.000 |
| Ash-throated Flycatcher | 1 | 0.013 | 0 | 0.000 |
| Unidentified Flycatcher | 1 | 0.013 | 1 | 0.017 |
| Cassin's Vireo | 4 | 0.066 | 3 | 0.050 |
| Hutton's Vireo | 1 | 0.013 | 1 | 0.017 |
| Warbling Vireo | 4 | 0.079 | 3 | 0.067 |
| Steller's Jay | 25 | 0.421 | 9 | 0.184 |
| Western Scrub-Jay | 2 | 0.053 | 0 | 0.000 |
| Clark's Nutcracker | 2 | 0.026 | 0 | 0.000 |
| Common Raven | 1 | 0.013 | 0 | 0.000 |
| Tree Swallow | 0 | 0.000 | 0 | 0.000 |
| Violet-green Swallow | 2 | 0.026 | 1 | 0.017 |
| Mountain Chickadee | 30 | 0.737 | 20 | 0.469 |
| Bushtit | 1 | 0.079 | 1 | 0.101 |
| Red-breasted Nuthatch | 16 | 0.250 | 1 | 0.034 |
| White-breasted Nuthatch | 4 | 0.066 | 1 | 0.017 |
| Brown Creeper | 9 | 0.158 | 8 | 0.184 |
| Rock Wren | 3 | 0.039 | 0 | 0.000 |
| Bewick's Wren | 5 | 0.079 | 2 | 0.034 |
| House Wren | 10 | 0.316 | 7 | 0.235 |
| Golden-crowned Kinglet | 5 | 0.079 | 4 | 0.084 |
| Blue-gray Gnatcatcher | 3 | 0.039 | 3 | 0.050 |
| Western Bluebird | 3 | 0.039 | 2 | 0.034 |
| Townsend's Solitaire | 13 | 0.184 | 4 | 0.067 |
| American Robin | 9 | 0.171 | 2 | 0.034 |
| Wrentit | 2 | 0.026 | 0 | 0.000 |
| Nashville Warbler | 31 | 0.618 | 19 | 0.335 |
| Yellow Warbler | 3 | 0.079 | 2 | 0.067 |
| Yellow-rumped Warbler | 20 | 0.368 | 13 | 0.302 |
| Blk.-throated G. Warbler | 1 | 0.013 | 0 | 0.000 |

| | | | | |
|---------------------------|----|---------------|----|--------------|
| Hermit Warbler | 8 | 0.132 | 2 | 0.050 |
| MacGillivray's Warbler | 15 | 0.211 | 9 | 0.151 |
| Wilson's Warbler | 5 | 0.066 | 3 | 0.050 |
| Unidentified Warbler | 1 | 0.013 | 1 | 0.017 |
| Western Tanager | 17 | 0.276 | 6 | 0.101 |
| Green-tailed Towhee | 11 | 0.211 | 9 | 0.151 |
| Spotted Towhee | 27 | 0.645 | 17 | 0.385 |
| Chipping Sparrow | 3 | 0.053 | 3 | 0.050 |
| Brewer's Sparrow | 1 | 0.013 | 0 | 0.000 |
| Black-chinned Sparrow | 1 | 0.013 | 0 | 0.000 |
| Fox Sparrow | 44 | 1.421 | 32 | 0.955 |
| Dark-eyed Junco | 29 | 0.605 | 25 | 0.553 |
| Black-headed Grosbeak | 9 | 0.145 | 5 | 0.084 |
| Lazuli Bunting | 13 | 0.263 | 10 | 0.168 |
| Red-winged Blackbird | 1 | 0.013 | 0 | 0.000 |
| Western Meadowlark | 1 | 0.013 | 0 | 0.000 |
| Brewer's Blackbird | 2 | 0.039 | 1 | 0.017 |
| Gr.-crowned Rosy-Finch | 1 | 0.013 | 0 | 0.000 |
| Purple Finch | 1 | 0.026 | 1 | 0.017 |
| Cassin's Finch | 11 | 0.224 | 7 | 0.168 |
| Pine Siskin | 3 | 0.066 | 0 | 0.000 |
| Lesser Goldfinch | 5 | 0.105 | 1 | 0.017 |
| Evening Grosbeak | 1 | 0.026 | 0 | 0.000 |
| All species pooled | | 10.825 | | 6.155 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 15. Summary results from 32 point counts in Douglas-fir Mixed Conifer habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Blue Grouse | 1 | 0.031 | 0 | 0.000 |
| Mountain Quail | 4 | 0.125 | 0 | 0.000 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.031 | 1 | 0.040 |
| Hairy Woodpecker | 3 | 0.094 | 3 | 0.119 |
| Wh.-headed Woodpecker | 1 | 0.031 | 1 | 0.040 |
| Northern Flicker | 4 | 0.125 | 1 | 0.040 |
| Pileated Woodpecker | 2 | 0.063 | 0 | 0.000 |
| Olive-sided Flycatcher | 4 | 0.125 | 1 | 0.040 |
| Western Wood-Pewee | 2 | 0.094 | 1 | 0.040 |
| Hammond's Flycatcher | 2 | 0.063 | 2 | 0.080 |
| Dusky Flycatcher | 1 | 0.031 | 1 | 0.040 |
| Unidentified <i>Empidonax</i> | 1 | 0.031 | 0 | 0.000 |
| Black Phoebe | 1 | 0.031 | 0 | 0.000 |
| Cassin's Vireo | 8 | 0.281 | 4 | 0.159 |
| Hutton's Vireo | 1 | 0.031 | 1 | 0.040 |
| Warbling Vireo | 4 | 0.125 | 2 | 0.080 |
| Steller's Jay | 8 | 0.375 | 6 | 0.279 |
| Common Raven | 1 | 0.031 | 1 | 0.040 |
| Mountain Chickadee | 7 | 0.344 | 5 | 0.318 |
| Unidentified Chickadee | 1 | 0.063 | 0 | 0.000 |
| Red-breasted Nuthatch | 13 | 0.406 | 4 | 0.159 |
| White-breasted Nuthatch | 1 | 0.031 | 1 | 0.040 |
| Brown Creeper | 7 | 0.250 | 6 | 0.279 |
| Canyon Wren | 2 | 0.063 | 1 | 0.040 |
| Winter Wren | 4 | 0.125 | 2 | 0.080 |
| Golden-crowned Kinglet | 8 | 0.344 | 8 | 0.438 |
| Townsend's Solitaire | 4 | 0.156 | 2 | 0.119 |
| American Robin | 2 | 0.063 | 0 | 0.000 |
| Nashville Warbler | 20 | 1.125 | 17 | 0.995 |
| Yellow-rumped Warbler | 6 | 0.250 | 5 | 0.199 |
| Blk.-throated G. Warbler | 9 | 0.438 | 5 | 0.279 |
| Hermit Warbler | 8 | 0.375 | 3 | 0.199 |
| Western Tanager | 11 | 0.375 | 5 | 0.199 |
| Spotted Towhee | 5 | 0.156 | 2 | 0.080 |
| Fox Sparrow | 2 | 0.063 | 1 | 0.040 |
| Dark-eyed Junco | 10 | 0.406 | 7 | 0.318 |
| Black-headed Grosbeak | 9 | 0.406 | 8 | 0.398 |
| Lazuli Bunting | 1 | 0.031 | 1 | 0.040 |
| Purple Finch | 2 | 0.063 | 1 | 0.040 |
| Pine Siskin | 2 | 0.063 | 0 | 0.000 |
| Evening Grosbeak | 1 | 0.063 | 1 | 0.080 |
| All species pooled | | 7.377 | | 5.377 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 16. Summary results from 8 point counts in Giant Sequoia habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Acorn Woodpecker | 1 | 0.125 | 1 | 0.159 |
| Unidentified Sapsucker | 0 | 0.000 | 0 | 0.000 |
| Hairy Woodpecker | 2 | 0.250 | 1 | 0.159 |
| Olive-sided Flycatcher | 1 | 0.125 | 0 | 0.000 |
| Western Wood-Pewee | 1 | 0.125 | 1 | 0.159 |
| Hammond's Flycatcher | 7 | 1.125 | 6 | 1.114 |
| Dusky Flycatcher | 1 | 0.125 | 1 | 0.159 |
| Cassin's Vireo | 2 | 0.250 | 1 | 0.159 |
| Warbling Vireo | 1 | 0.125 | 1 | 0.159 |
| Steller's Jay | 3 | 0.500 | 1 | 0.159 |
| Common Raven | 1 | 0.125 | 0 | 0.000 |
| Mountain Chickadee | 3 | 0.500 | 2 | 0.477 |
| Red-breasted Nuthatch | 6 | 0.750 | 1 | 0.159 |
| Brown Creeper | 1 | 0.125 | 1 | 0.159 |
| Winter Wren | 4 | 0.625 | 2 | 0.318 |
| Golden-crowned Kinglet | 6 | 1.125 | 6 | 1.432 |
| American Robin | 4 | 0.625 | 1 | 0.159 |
| Nashville Warbler | 3 | 0.500 | 2 | 0.318 |
| Yellow-rumped Warbler | 1 | 0.250 | 0 | 0.000 |
| Hermit Warbler | 6 | 1.250 | 3 | 0.637 |
| MacGillivray's Warbler | 6 | 0.875 | 5 | 0.955 |
| Western Tanager | 4 | 0.500 | 0 | 0.000 |
| Spotted Towhee | 1 | 0.125 | 1 | 0.159 |
| Fox Sparrow | 4 | 0.500 | 3 | 0.477 |
| Lincoln's Sparrow | 1 | 0.125 | 0 | 0.000 |
| Dark-eyed Junco | 4 | 1.125 | 4 | 0.796 |
| Black-headed Grosbeak | 1 | 0.125 | 1 | 0.159 |
| All species pooled | | 12.000 | | 8.432 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 17. Summary results from 261 point counts in White Fir Mixed Conifer habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mallard | 1 | 0.004 | 0 | 0.000 |
| Unidentified Accipiter | 0 | 0.000 | 0 | 0.000 |
| Blue Grouse | 3 | 0.011 | 2 | 0.010 |
| Mountain Quail | 60 | 0.310 | 2 | 0.010 |
| Band-tailed Pigeon | 3 | 0.023 | 2 | 0.010 |
| Mourning Dove | 1 | 0.004 | 0 | 0.000 |
| Northern Pygmy-Owl | 1 | 0.004 | 0 | 0.000 |
| Black Swift | 0 | 0.000 | 0 | 0.000 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 2 | 0.008 | 2 | 0.010 |
| Calliope Hummingbird | 2 | 0.008 | 2 | 0.010 |
| Unidentif. Hummingbird | 2 | 0.008 | 2 | 0.010 |
| Red-breasted Sapsucker | 4 | 0.015 | 1 | 0.005 |
| Unidentified Sapsucker | 1 | 0.004 | 0 | 0.000 |
| Hairy Woodpecker | 40 | 0.157 | 24 | 0.117 |
| Wh.-headed Woodpecker | 32 | 0.134 | 12 | 0.068 |
| Blk.-backed Woodpecker | 2 | 0.011 | 0 | 0.000 |
| Northern Flicker | 35 | 0.146 | 7 | 0.034 |
| Pileated Woodpecker | 22 | 0.088 | 4 | 0.020 |
| Unidentif. Woodpecker | 12 | 0.054 | 3 | 0.015 |
| Olive-sided Flycatcher | 44 | 0.192 | 15 | 0.073 |
| Western Wood-Pewee | 27 | 0.115 | 7 | 0.034 |
| Hammond's Flycatcher | 25 | 0.123 | 22 | 0.127 |
| Dusky Flycatcher | 52 | 0.253 | 32 | 0.185 |
| Pacific-slope Flycatcher | 14 | 0.069 | 13 | 0.068 |
| Unidentified <i>Empidonax</i> | 6 | 0.023 | 5 | 0.024 |
| Unidentified Flycatcher | 1 | 0.004 | 1 | 0.005 |
| Cassin's Vireo | 42 | 0.184 | 24 | 0.117 |
| Warbling Vireo | 44 | 0.245 | 28 | 0.171 |
| Steller's Jay | 93 | 0.556 | 28 | 0.224 |
| Common Raven | 9 | 0.042 | 2 | 0.015 |
| Mountain Chickadee | 110 | 0.732 | 62 | 0.434 |
| Ch.-backed Chickadee | 2 | 0.011 | 2 | 0.010 |
| Red-breasted Nuthatch | 129 | 0.678 | 27 | 0.161 |
| White-breasted Nuthatch | 8 | 0.034 | 4 | 0.020 |
| Brown Creeper | 59 | 0.264 | 48 | 0.259 |
| Canyon Wren | 3 | 0.011 | 0 | 0.000 |
| House Wren | 2 | 0.008 | 1 | 0.005 |
| Winter Wren | 35 | 0.153 | 17 | 0.093 |
| Golden-crowned Kinglet | 151 | 0.862 | 135 | 0.883 |
| Ruby-crowned Kinglet | 1 | 0.004 | 0 | 0.000 |
| Western Bluebird | 2 | 0.015 | 2 | 0.015 |
| Townsend's Solitaire | 48 | 0.234 | 12 | 0.068 |
| Hermit Thrush | 29 | 0.146 | 8 | 0.044 |
| American Robin | 53 | 0.257 | 17 | 0.093 |
| Nashville Warbler | 55 | 0.383 | 34 | 0.220 |
| Yellow Warbler | 3 | 0.011 | 2 | 0.010 |
| Yellow-rumped Warbler | 127 | 0.801 | 75 | 0.478 |
| Blk.-throated G. Warbler | 11 | 0.046 | 5 | 0.024 |
| Hermit Warbler | 117 | 0.640 | 58 | 0.317 |
| MacGillivray's Warbler | 25 | 0.130 | 13 | 0.083 |

| | | | | |
|---------------------------|-----|---------------|----|--------------|
| Wilson's Warbler | 6 | 0.023 | 2 | 0.010 |
| Unidentified Warbler | 2 | 0.008 | 0 | 0.000 |
| Western Tanager | 102 | 0.525 | 37 | 0.215 |
| Green-tailed Towhee | 1 | 0.004 | 0 | 0.000 |
| Spotted Towhee | 17 | 0.069 | 7 | 0.039 |
| Chipping Sparrow | 5 | 0.027 | 3 | 0.020 |
| Fox Sparrow | 68 | 0.429 | 33 | 0.224 |
| Song Sparrow | 1 | 0.008 | 1 | 0.010 |
| Lincoln's Sparrow | 8 | 0.031 | 3 | 0.015 |
| Dark-eyed Junco | 125 | 0.866 | 89 | 0.673 |
| Black-headed Grosbeak | 37 | 0.169 | 14 | 0.073 |
| Brown-headed Cowbird | 1 | 0.004 | 1 | 0.005 |
| Purple Finch | 12 | 0.054 | 4 | 0.020 |
| Cassin's Finch | 8 | 0.042 | 4 | 0.020 |
| Red Crossbill | 2 | 0.011 | 0 | 0.000 |
| Pine Siskin | 8 | 0.046 | 7 | 0.049 |
| Evening Grosbeak | 9 | 0.054 | 2 | 0.015 |
| All species pooled | | 10.585 | | 5.967 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 18. Summary results from 50 point counts in White Fir habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Northern Goshawk | 1 | 0.020 | 1 | 0.025 |
| Blue Grouse | 1 | 0.040 | 0 | 0.000 |
| Mountain Quail | 9 | 0.200 | 0 | 0.000 |
| Unidentified Owl | 2 | 0.040 | 1 | 0.025 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.020 | 1 | 0.025 |
| Calliope Hummingbird | 1 | 0.020 | 1 | 0.025 |
| Hairy Woodpecker | 10 | 0.220 | 4 | 0.102 |
| Wh.-headed Woodpecker | 5 | 0.120 | 3 | 0.102 |
| Blk.-backed Woodpecker | 1 | 0.020 | 0 | 0.000 |
| Northern Flicker | 7 | 0.160 | 4 | 0.102 |
| Pileated Woodpecker | 0 | 0.000 | 0 | 0.000 |
| Olive-sided Flycatcher | 6 | 0.120 | 1 | 0.025 |
| Western Wood-Pewee | 5 | 0.160 | 3 | 0.076 |
| Hammond's Flycatcher | 7 | 0.160 | 6 | 0.178 |
| Dusky Flycatcher | 4 | 0.100 | 3 | 0.102 |
| Pacific-slope Flycatcher | 1 | 0.020 | 1 | 0.025 |
| Unidentified <i>Empidonax</i> | 1 | 0.020 | 1 | 0.025 |
| Cassin's Vireo | 12 | 0.280 | 9 | 0.255 |
| Warbling Vireo | 10 | 0.220 | 7 | 0.178 |
| Steller's Jay | 19 | 0.460 | 5 | 0.153 |
| Common Raven | 0 | 0.000 | 0 | 0.000 |
| Mountain Chickadee | 29 | 0.860 | 14 | 0.407 |
| Red-breasted Nuthatch | 26 | 0.720 | 5 | 0.153 |
| White-breasted Nuthatch | 1 | 0.020 | 0 | 0.000 |
| Brown Creeper | 14 | 0.320 | 11 | 0.331 |
| Canyon Wren | 1 | 0.020 | 1 | 0.025 |
| Winter Wren | 3 | 0.060 | 2 | 0.051 |
| Golden-crowned Kinglet | 32 | 1.100 | 30 | 1.095 |
| Western Bluebird | 1 | 0.020 | 1 | 0.025 |
| Townsend's Solitaire | 3 | 0.060 | 0 | 0.000 |
| Hermit Thrush | 4 | 0.080 | 0 | 0.000 |
| American Robin | 11 | 0.280 | 3 | 0.076 |
| Nashville Warbler | 4 | 0.140 | 3 | 0.127 |
| Yellow Warbler | 4 | 0.100 | 2 | 0.076 |
| Yellow-rumped Warbler | 26 | 0.960 | 17 | 0.688 |
| Blk.-throated G. Warbler | 1 | 0.020 | 1 | 0.025 |
| Hermit Warbler | 13 | 0.340 | 8 | 0.306 |
| MacGillivray's Warbler | 7 | 0.180 | 6 | 0.178 |
| Wilson's Warbler | 1 | 0.040 | 1 | 0.051 |
| Western Tanager | 19 | 0.540 | 10 | 0.280 |
| Spotted Towhee | 5 | 0.100 | 4 | 0.102 |
| Chipping Sparrow | 1 | 0.020 | 0 | 0.000 |
| Fox Sparrow | 15 | 0.460 | 7 | 0.204 |
| Lincoln's Sparrow | 1 | 0.060 | 1 | 0.051 |
| Dark-eyed Junco | 25 | 0.920 | 15 | 0.484 |
| Black-headed Grosbeak | 1 | 0.020 | 0 | 0.000 |
| Lazuli Bunting | 1 | 0.020 | 1 | 0.025 |
| Purple Finch | 1 | 0.020 | 0 | 0.000 |
| Cassin's Finch | 5 | 0.120 | 4 | 0.127 |
| Pine Siskin | 3 | 0.060 | 3 | 0.076 |

All species pooled

10.060

6.386

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 19. Summary results from 107 point counts in Montane Meadow habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mallard | 0 | 0.000 | 0 | 0.000 |
| Mountain Quail | 8 | 0.084 | 0 | 0.000 |
| Spotted Sandpiper | 11 | 0.178 | 8 | 0.119 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Belted Kingfisher | 1 | 0.009 | 0 | 0.000 |
| Acorn Woodpecker | 1 | 0.019 | 0 | 0.000 |
| Red-breasted Sapsucker | 3 | 0.028 | 0 | 0.000 |
| Unidentified Sapsucker | 1 | 0.009 | 0 | 0.000 |
| Downy Woodpecker | 2 | 0.028 | 1 | 0.024 |
| Hairy Woodpecker | 2 | 0.019 | 1 | 0.012 |
| Wh.-headed Woodpecker | 1 | 0.009 | 0 | 0.000 |
| Northern Flicker | 8 | 0.084 | 2 | 0.024 |
| Pileated Woodpecker | 2 | 0.019 | 0 | 0.000 |
| Unidentif. Woodpecker | 7 | 0.065 | 1 | 0.012 |
| Olive-sided Flycatcher | 15 | 0.159 | 4 | 0.048 |
| Western Wood-Pewee | 20 | 0.224 | 8 | 0.119 |
| Dusky Flycatcher | 38 | 0.486 | 32 | 0.500 |
| Unidentified <i>Empidonax</i> | 2 | 0.019 | 1 | 0.012 |
| Black Phoebe | 1 | 0.009 | 0 | 0.000 |
| Unidentified Flycatcher | 2 | 0.019 | 1 | 0.012 |
| Cassin's Vireo | 2 | 0.019 | 2 | 0.024 |
| Warbling Vireo | 28 | 0.383 | 19 | 0.309 |
| Steller's Jay | 25 | 0.308 | 13 | 0.190 |
| Clark's Nutcracker | 2 | 0.019 | 0 | 0.000 |
| Common Raven | 1 | 0.009 | 0 | 0.000 |
| Tree Swallow | 0 | 0.000 | 0 | 0.000 |
| Violet-green Swallow | 1 | 0.009 | 1 | 0.012 |
| Mountain Chickadee | 49 | 0.953 | 30 | 0.595 |
| Red-breasted Nuthatch | 18 | 0.224 | 4 | 0.059 |
| White-breasted Nuthatch | 1 | 0.009 | 0 | 0.000 |
| Brown Creeper | 13 | 0.150 | 11 | 0.155 |
| Canyon Wren | 1 | 0.009 | 0 | 0.000 |
| Winter Wren | 1 | 0.009 | 1 | 0.012 |
| Golden-crowned Kinglet | 15 | 0.206 | 15 | 0.250 |
| Ruby-crowned Kinglet | 1 | 0.009 | 1 | 0.012 |
| Townsend's Solitaire | 1 | 0.009 | 0 | 0.000 |
| Hermit Thrush | 26 | 0.327 | 8 | 0.107 |
| American Robin | 40 | 0.617 | 24 | 0.464 |
| European Starling | 1 | 0.009 | 1 | 0.012 |
| Orange-crowned Warbler | 1 | 0.009 | 1 | 0.012 |
| Nashville Warbler | 5 | 0.056 | 2 | 0.024 |
| Yellow Warbler | 1 | 0.019 | 1 | 0.024 |
| Yellow-rumped Warbler | 48 | 0.738 | 42 | 0.738 |
| Blk.-throated G. Warbler | 1 | 0.009 | 0 | 0.000 |
| Hermit Warbler | 1 | 0.019 | 1 | 0.024 |
| MacGillivray's Warbler | 5 | 0.056 | 2 | 0.024 |
| Wilson's Warbler | 11 | 0.121 | 10 | 0.143 |
| Unidentified Warbler | 4 | 0.047 | 2 | 0.036 |
| Western Tanager | 13 | 0.150 | 8 | 0.107 |
| Spotted Towhee | 4 | 0.037 | 3 | 0.036 |
| Chipping Sparrow | 13 | 0.131 | 8 | 0.095 |

| | | | | |
|---------------------------|----|--------------|----|--------------|
| Fox Sparrow | 6 | 0.065 | 5 | 0.059 |
| Song Sparrow | 20 | 0.262 | 13 | 0.214 |
| Lincoln's Sparrow | 40 | 0.607 | 28 | 0.428 |
| White-crowned Sparrow | 15 | 0.178 | 6 | 0.071 |
| Dark-eyed Junco | 70 | 1.355 | 56 | 1.297 |
| Unidentified Sparrow | 2 | 0.019 | 1 | 0.012 |
| Black-headed Grosbeak | 2 | 0.019 | 1 | 0.012 |
| Red-winged Blackbird | 3 | 0.065 | 2 | 0.048 |
| Brewer's Blackbird | 20 | 0.617 | 20 | 0.702 |
| Brown-headed Cowbird | 3 | 0.037 | 2 | 0.036 |
| Bullock's Oriole | 1 | 0.009 | 1 | 0.012 |
| Purple Finch | 1 | 0.009 | 0 | 0.000 |
| Cassin's Finch | 12 | 0.140 | 8 | 0.107 |
| Pine Siskin | 14 | 0.206 | 12 | 0.238 |
| All species pooled | | 9.725 | | 7.582 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 20. Summary results from 138 point counts in Jeffrey Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Sharp-shinned Hawk | 0 | 0.000 | 0 | 0.000 |
| Red-tailed Hawk | 1 | 0.007 | 0 | 0.000 |
| American Kestrel | 0 | 0.000 | 0 | 0.000 |
| Blue Grouse | 3 | 0.022 | 1 | 0.009 |
| Mountain Quail | 49 | 0.457 | 5 | 0.065 |
| Band-tailed Pigeon | 1 | 0.007 | 1 | 0.009 |
| Northern Pygmy-Owl | 1 | 0.007 | 0 | 0.000 |
| Black Swift | 0 | 0.000 | 0 | 0.000 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 13 | 0.109 | 13 | 0.138 |
| Calliope Hummingbird | 4 | 0.036 | 4 | 0.046 |
| Rufous Hummingbird | 1 | 0.007 | 1 | 0.009 |
| Unidentif. Hummingbird | 2 | 0.014 | 2 | 0.018 |
| Acorn Woodpecker | 3 | 0.022 | 1 | 0.009 |
| Williamson's Sapsucker | 1 | 0.007 | 0 | 0.000 |
| Red-breasted Sapsucker | 2 | 0.014 | 0 | 0.000 |
| Hairy Woodpecker | 8 | 0.058 | 4 | 0.037 |
| Wh.-headed Woodpecker | 13 | 0.094 | 8 | 0.074 |
| Blk.-backed Woodpecker | 4 | 0.043 | 3 | 0.037 |
| Northern Flicker | 25 | 0.203 | 10 | 0.092 |
| Pileated Woodpecker | 1 | 0.007 | 0 | 0.000 |
| Unidentif. Woodpecker | 4 | 0.029 | 0 | 0.000 |
| Olive-sided Flycatcher | 43 | 0.355 | 11 | 0.111 |
| Western Wood-Pewee | 32 | 0.297 | 8 | 0.083 |
| Hammond's Flycatcher | 2 | 0.014 | 2 | 0.018 |
| Dusky Flycatcher | 39 | 0.348 | 19 | 0.175 |
| Unidentified <i>Empidonax</i> | 1 | 0.007 | 0 | 0.000 |
| Ash-throated Flycatcher | 1 | 0.007 | 1 | 0.009 |
| Cassin's Vireo | 14 | 0.123 | 6 | 0.055 |
| Warbling Vireo | 8 | 0.080 | 4 | 0.037 |
| Steller's Jay | 61 | 0.594 | 21 | 0.212 |
| Clark's Nutcracker | 8 | 0.094 | 4 | 0.046 |
| Common Raven | 2 | 0.014 | 0 | 0.000 |
| Violet-green Swallow | 1 | 0.007 | 0 | 0.000 |
| Mountain Chickadee | 66 | 0.891 | 37 | 0.572 |
| Red-breasted Nuthatch | 34 | 0.319 | 7 | 0.074 |
| White-breasted Nuthatch | 8 | 0.072 | 2 | 0.028 |
| Brown Creeper | 8 | 0.058 | 6 | 0.055 |
| Rock Wren | 3 | 0.022 | 2 | 0.018 |
| Bewick's Wren | 4 | 0.029 | 1 | 0.009 |
| House Wren | 1 | 0.014 | 1 | 0.009 |
| American Dipper | 0 | 0.000 | 0 | 0.000 |
| Golden-crowned Kinglet | 14 | 0.138 | 12 | 0.120 |
| Western Bluebird | 2 | 0.014 | 1 | 0.009 |
| Mountain Bluebird | 2 | 0.014 | 0 | 0.000 |
| Townsend's Solitaire | 24 | 0.188 | 10 | 0.101 |
| Hermit Thrush | 2 | 0.022 | 0 | 0.000 |
| American Robin | 28 | 0.232 | 10 | 0.092 |
| Wrentit | 1 | 0.007 | 0 | 0.000 |
| Cedar Waxwing | 1 | 0.007 | 1 | 0.009 |
| Nashville Warbler | 48 | 0.659 | 29 | 0.378 |

| | | | | |
|---------------------------|----|--------------|----|--------------|
| Yellow-rumped Warbler | 49 | 0.551 | 23 | 0.258 |
| Blk.-throated G. Warbler | 12 | 0.094 | 7 | 0.074 |
| Hermit Warbler | 13 | 0.167 | 8 | 0.092 |
| MacGillivray's Warbler | 18 | 0.167 | 11 | 0.101 |
| Wilson's Warbler | 3 | 0.022 | 2 | 0.018 |
| Western Tanager | 27 | 0.225 | 11 | 0.111 |
| Green-tailed Towhee | 7 | 0.065 | 4 | 0.037 |
| Spotted Towhee | 20 | 0.174 | 13 | 0.129 |
| Chipping Sparrow | 1 | 0.007 | 1 | 0.009 |
| Fox Sparrow | 66 | 0.768 | 34 | 0.406 |
| Song Sparrow | 1 | 0.007 | 1 | 0.009 |
| Lincoln's Sparrow | 1 | 0.007 | 0 | 0.000 |
| Dark-eyed Junco | 73 | 0.826 | 43 | 0.535 |
| Black-headed Grosbeak | 5 | 0.036 | 1 | 0.009 |
| Lazuli Bunting | 3 | 0.022 | 2 | 0.018 |
| Red-winged Blackbird | 1 | 0.007 | 0 | 0.000 |
| Brewer's Blackbird | 1 | 0.043 | 1 | 0.055 |
| Purple Finch | 1 | 0.007 | 0 | 0.000 |
| Cassin's Finch | 14 | 0.138 | 8 | 0.083 |
| Pine Siskin | 3 | 0.022 | 2 | 0.018 |
| Lesser Goldfinch | 3 | 0.022 | 0 | 0.000 |
| Evening Grosbeak | 2 | 0.014 | 0 | 0.000 |
| All species pooled | | 9.160 | | 4.725 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 21. Summary results from 73 point counts in Jeffrey Pine-Red Fir habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mallard | 1 | 0.027 | 1 | 0.035 |
| Blue Grouse | 3 | 0.041 | 1 | 0.017 |
| Mountain Quail | 10 | 0.151 | 1 | 0.017 |
| Unidentif. Hummingbird | 0 | 0.000 | 0 | 0.000 |
| Unidentified Sapsucker | 1 | 0.014 | 0 | 0.000 |
| Downy Woodpecker | 1 | 0.027 | 1 | 0.017 |
| Hairy Woodpecker | 6 | 0.082 | 5 | 0.087 |
| Wh.-headed Woodpecker | 5 | 0.082 | 3 | 0.070 |
| Northern Flicker | 6 | 0.110 | 3 | 0.052 |
| Pileated Woodpecker | 4 | 0.055 | 0 | 0.000 |
| Unidentif. Woodpecker | 7 | 0.096 | 2 | 0.035 |
| Olive-sided Flycatcher | 11 | 0.151 | 2 | 0.035 |
| Western Wood-Pewee | 13 | 0.205 | 4 | 0.087 |
| Hammond's Flycatcher | 1 | 0.027 | 1 | 0.035 |
| Dusky Flycatcher | 19 | 0.342 | 17 | 0.349 |
| Pacific-slope Flycatcher | 0 | 0.000 | 0 | 0.000 |
| Unidentified <i>Empidonax</i> | 1 | 0.014 | 1 | 0.017 |
| Cassin's Vireo | 4 | 0.055 | 4 | 0.070 |
| Warbling Vireo | 9 | 0.123 | 5 | 0.087 |
| Steller's Jay | 25 | 0.466 | 9 | 0.209 |
| Common Raven | 1 | 0.014 | 0 | 0.000 |
| Mountain Chickadee | 45 | 1.233 | 25 | 0.698 |
| Red-breasted Nuthatch | 33 | 0.658 | 5 | 0.122 |
| White-breasted Nuthatch | 3 | 0.055 | 1 | 0.017 |
| Brown Creeper | 11 | 0.164 | 9 | 0.174 |
| Bewick's Wren | 1 | 0.027 | 1 | 0.017 |
| Winter Wren | 3 | 0.041 | 2 | 0.035 |
| Golden-crowned Kinglet | 22 | 0.342 | 19 | 0.384 |
| Townsend's Solitaire | 12 | 0.233 | 7 | 0.140 |
| Hermit Thrush | 10 | 0.164 | 3 | 0.070 |
| American Robin | 12 | 0.288 | 4 | 0.105 |
| Nashville Warbler | 7 | 0.110 | 6 | 0.105 |
| Yellow-rumped Warbler | 39 | 0.740 | 28 | 0.576 |
| Hermit Warbler | 17 | 0.356 | 11 | 0.262 |
| MacGillivray's Warbler | 14 | 0.233 | 6 | 0.105 |
| Western Tanager | 24 | 0.479 | 10 | 0.174 |
| Green-tailed Towhee | 3 | 0.055 | 3 | 0.052 |
| Spotted Towhee | 3 | 0.041 | 2 | 0.035 |
| Chipping Sparrow | 4 | 0.068 | 2 | 0.035 |
| Fox Sparrow | 25 | 0.534 | 14 | 0.279 |
| Lincoln's Sparrow | 1 | 0.014 | 0 | 0.000 |
| Dark-eyed Junco | 43 | 0.767 | 33 | 0.645 |
| Black-headed Grosbeak | 4 | 0.068 | 0 | 0.000 |
| Purple Finch | 1 | 0.014 | 0 | 0.000 |
| Cassin's Finch | 7 | 0.096 | 3 | 0.052 |
| Pine Siskin | 2 | 0.041 | 2 | 0.052 |
| Evening Grosbeak | 2 | 0.027 | 1 | 0.017 |
| All species pooled | | 8.930 | | 5.370 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
⁴Based on average number of birds detected within a 50 m radius.

Table 22. Summary results from 277 point counts in Red Fir habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Common Merganser | 1 | 0.004 | 0 | 0.000 |
| Bald Eagle | 0 | 0.000 | 0 | 0.000 |
| Sharp-shinned Hawk | 1 | 0.004 | 0 | 0.000 |
| Unidentified Accipiter | 0 | 0.000 | 0 | 0.000 |
| Red-tailed Hawk | 1 | 0.004 | 1 | 0.005 |
| Blue Grouse | 8 | 0.029 | 3 | 0.014 |
| Mountain Quail | 53 | 0.235 | 0 | 0.000 |
| Band-tailed Pigeon | 0 | 0.000 | 0 | 0.000 |
| Common Nighthawk | 1 | 0.004 | 0 | 0.000 |
| White-throated Swift | 1 | 0.004 | 1 | 0.005 |
| Anna's Hummingbird | 2 | 0.007 | 2 | 0.009 |
| Rufous Hummingbird | 1 | 0.004 | 1 | 0.005 |
| Unidentif. Hummingbird | 1 | 0.004 | 1 | 0.005 |
| Acorn Woodpecker | 1 | 0.007 | 0 | 0.000 |
| Williamson's Sapsucker | 3 | 0.011 | 2 | 0.009 |
| Red-breasted Sapsucker | 6 | 0.022 | 3 | 0.014 |
| Unidentified Sapsucker | 5 | 0.018 | 1 | 0.005 |
| Downy Woodpecker | 3 | 0.011 | 1 | 0.005 |
| Hairy Woodpecker | 32 | 0.123 | 16 | 0.078 |
| Wh.-headed Woodpecker | 25 | 0.094 | 14 | 0.064 |
| Blk.-backed Woodpecker | 1 | 0.004 | 1 | 0.005 |
| Northern Flicker | 27 | 0.119 | 11 | 0.060 |
| Pileated Woodpecker | 6 | 0.025 | 2 | 0.009 |
| Unidentif. Woodpecker | 20 | 0.072 | 2 | 0.009 |
| Olive-sided Flycatcher | 33 | 0.137 | 9 | 0.046 |
| Western Wood-Pewee | 30 | 0.112 | 8 | 0.037 |
| Hammond's Flycatcher | 8 | 0.032 | 7 | 0.037 |
| Dusky Flycatcher | 61 | 0.274 | 45 | 0.234 |
| Pacific-slope Flycatcher | 1 | 0.004 | 1 | 0.005 |
| Unidentified <i>Empidonax</i> | 6 | 0.022 | 5 | 0.023 |
| Unidentified Flycatcher | 1 | 0.004 | 0 | 0.000 |
| Cassin's Vireo | 10 | 0.047 | 8 | 0.051 |
| Warbling Vireo | 24 | 0.137 | 18 | 0.120 |
| Steller's Jay | 86 | 0.426 | 30 | 0.161 |
| Clark's Nutcracker | 4 | 0.025 | 2 | 0.009 |
| Common Raven | 5 | 0.025 | 1 | 0.005 |
| Mountain Chickadee | 166 | 1.621 | 102 | 0.680 |
| Red-breasted Nuthatch | 141 | 0.711 | 38 | 0.207 |
| White-breasted Nuthatch | 17 | 0.076 | 10 | 0.064 |
| Brown Creeper | 71 | 0.336 | 58 | 0.340 |
| Rock Wren | 1 | 0.004 | 0 | 0.000 |
| Canyon Wren | 1 | 0.004 | 0 | 0.000 |
| House Wren | 2 | 0.007 | 1 | 0.005 |
| Winter Wren | 13 | 0.047 | 5 | 0.023 |
| Unidentified Wren | 1 | 0.004 | 1 | 0.005 |
| American Dipper | 1 | 0.004 | 1 | 0.005 |
| Golden-crowned Kinglet | 170 | 0.939 | 153 | 1.007 |
| Ruby-crowned Kinglet | 3 | 0.011 | 2 | 0.009 |
| Western Bluebird | 4 | 0.018 | 1 | 0.005 |
| Townsend's Solitaire | 53 | 0.227 | 17 | 0.101 |
| Hermit Thrush | 55 | 0.256 | 13 | 0.069 |

| | | | | |
|---------------------------|-----|--------------|-----|--------------|
| American Robin | 53 | 0.224 | 24 | 0.124 |
| Nashville Warbler | 17 | 0.083 | 11 | 0.051 |
| Yellow Warbler | 1 | 0.007 | 1 | 0.009 |
| Yellow-rumped Warbler | 165 | 1.032 | 112 | 0.694 |
| Blk.-throated G. Warbler | 4 | 0.022 | 4 | 0.023 |
| Hermit Warbler | 26 | 0.116 | 20 | 0.097 |
| MacGillivray's Warbler | 14 | 0.072 | 8 | 0.051 |
| Wilson's Warbler | 5 | 0.018 | 2 | 0.009 |
| Western Tanager | 68 | 0.300 | 32 | 0.170 |
| Green-tailed Towhee | 5 | 0.022 | 4 | 0.023 |
| Spotted Towhee | 3 | 0.011 | 0 | 0.000 |
| Chipping Sparrow | 10 | 0.047 | 2 | 0.014 |
| Fox Sparrow | 65 | 0.336 | 32 | 0.184 |
| Song Sparrow | 1 | 0.004 | 1 | 0.005 |
| Lincoln's Sparrow | 12 | 0.069 | 6 | 0.032 |
| Dark-eyed Junco | 140 | 0.744 | 100 | 0.630 |
| Black-headed Grosbeak | 5 | 0.018 | 2 | 0.009 |
| Lazuli Bunting | 2 | 0.011 | 2 | 0.009 |
| Pine Grosbeak | 3 | 0.014 | 3 | 0.018 |
| Purple Finch | 10 | 0.047 | 2 | 0.014 |
| Cassin's Finch | 43 | 0.220 | 23 | 0.142 |
| Red Crossbill | 5 | 0.043 | 4 | 0.041 |
| Pine Siskin | 33 | 0.188 | 24 | 0.165 |
| Evening Grosbeak | 3 | 0.014 | 2 | 0.009 |
| All species pooled | | 9.977 | | 6.072 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 23. Summary results from 27 point counts in Quaking Aspen habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Mallard | 1 | 0.037 | 0 | 0.000 |
| Blue Grouse | 3 | 0.111 | 1 | 0.047 |
| Mountain Quail | 5 | 0.259 | 0 | 0.000 |
| Band-tailed Pigeon | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.037 | 1 | 0.047 |
| Unidentif. Hummingbird | 2 | 0.074 | 2 | 0.094 |
| Downy Woodpecker | 1 | 0.037 | 1 | 0.047 |
| Hairy Woodpecker | 1 | 0.037 | 0 | 0.000 |
| Wh.-headed Woodpecker | 4 | 0.148 | 2 | 0.094 |
| Northern Flicker | 5 | 0.185 | 2 | 0.094 |
| Olive-sided Flycatcher | 7 | 0.444 | 2 | 0.189 |
| Western Wood-Pewee | 9 | 0.333 | 3 | 0.141 |
| Hammond's Flycatcher | 1 | 0.037 | 1 | 0.047 |
| Dusky Flycatcher | 8 | 0.481 | 7 | 0.472 |
| Warbling Vireo | 11 | 0.556 | 8 | 0.377 |
| Steller's Jay | 8 | 0.370 | 1 | 0.047 |
| Clark's Nutcracker | 2 | 0.074 | 0 | 0.000 |
| Tree Swallow | 1 | 0.037 | 1 | 0.047 |
| Violet-green Swallow | 1 | 0.074 | 1 | 0.094 |
| Mountain Chickadee | 15 | 1.037 | 6 | 0.377 |
| Red-breasted Nuthatch | 7 | 0.370 | 1 | 0.047 |
| Brown Creeper | 1 | 0.037 | 0 | 0.000 |
| Golden-crowned Kinglet | 3 | 0.222 | 3 | 0.236 |
| Western Bluebird | 4 | 0.259 | 3 | 0.189 |
| Mountain Bluebird | 1 | 0.037 | 0 | 0.000 |
| Townsend's Solitaire | 2 | 0.074 | 1 | 0.047 |
| Hermit Thrush | 3 | 0.148 | 0 | 0.000 |
| American Robin | 4 | 0.222 | 2 | 0.141 |
| Nashville Warbler | 11 | 0.778 | 8 | 0.660 |
| Yellow-rumped Warbler | 3 | 0.222 | 1 | 0.047 |
| Blk.-throated G. Warbler | 2 | 0.111 | 2 | 0.141 |
| Hermit Warbler | 1 | 0.037 | 1 | 0.047 |
| MacGillivray's Warbler | 5 | 0.222 | 3 | 0.141 |
| Wilson's Warbler | 15 | 0.926 | 14 | 0.990 |
| Western Tanager | 4 | 0.148 | 4 | 0.189 |
| Green-tailed Towhee | 3 | 0.111 | 3 | 0.141 |
| Chipping Sparrow | 1 | 0.074 | 0 | 0.000 |
| Fox Sparrow | 11 | 0.519 | 7 | 0.330 |
| White-crowned Sparrow | 1 | 0.037 | 0 | 0.000 |
| Dark-eyed Junco | 15 | 0.889 | 12 | 0.849 |
| Lazuli Bunting | 2 | 0.148 | 1 | 0.141 |
| Red-winged Blackbird | 1 | 0.074 | 0 | 0.000 |
| Cassin's Finch | 5 | 0.296 | 2 | 0.141 |
| Evening Grosbeak | 0 | 0.000 | 0 | 0.000 |
| All species pooled | | 10.329 | | 6.691 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 24. Summary results from 38 point counts in Montane/Alpine Riparian Shrub habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Blue Grouse | 1 | 0.026 | 1 | 0.034 |
| Mountain Quail | 1 | 0.026 | 0 | 0.000 |
| Rufous Hummingbird | 1 | 0.026 | 1 | 0.034 |
| Unidentif. Hummingbird | 0 | 0.000 | 0 | 0.000 |
| Unidentified Sapsucker | 1 | 0.026 | 0 | 0.000 |
| Wh.-headed Woodpecker | 1 | 0.053 | 0 | 0.000 |
| Western Wood-Pewee | 3 | 0.079 | 3 | 0.101 |
| Dusky Flycatcher | 8 | 0.263 | 8 | 0.335 |
| Cassin's Vireo | 1 | 0.026 | 1 | 0.034 |
| Warbling Vireo | 1 | 0.079 | 1 | 0.101 |
| Steller's Jay | 1 | 0.184 | 0 | 0.000 |
| Clark's Nutcracker | 6 | 0.237 | 2 | 0.101 |
| Violet-green Swallow | 1 | 0.053 | 1 | 0.067 |
| Mountain Chickadee | 6 | 0.211 | 3 | 0.134 |
| Golden-crowned Kinglet | 2 | 0.053 | 1 | 0.034 |
| Mountain Bluebird | 1 | 0.026 | 1 | 0.034 |
| Hermit Thrush | 5 | 0.184 | 2 | 0.067 |
| American Robin | 3 | 0.158 | 1 | 0.067 |
| Yellow Warbler | 1 | 0.053 | 1 | 0.067 |
| Yellow-rumped Warbler | 6 | 0.237 | 5 | 0.235 |
| MacGillivray's Warbler | 2 | 0.105 | 1 | 0.101 |
| Wilson's Warbler | 5 | 0.132 | 5 | 0.168 |
| Western Tanager | 1 | 0.053 | 0 | 0.000 |
| Green-tailed Towhee | 1 | 0.026 | 0 | 0.000 |
| Fox Sparrow | 1 | 0.053 | 1 | 0.034 |
| Song Sparrow | 1 | 0.026 | 1 | 0.034 |
| White-crowned Sparrow | 16 | 0.816 | 14 | 0.637 |
| Dark-eyed Junco | 17 | 0.684 | 13 | 0.637 |
| Brewer's Blackbird | 1 | 0.053 | 1 | 0.067 |
| Gr.-crowned Rosy-Finch | 1 | 0.026 | 1 | 0.034 |
| Cassin's Finch | 5 | 0.158 | 5 | 0.201 |
| Red Crossbill | 1 | 0.026 | 1 | 0.034 |
| Pine Siskin | 2 | 0.053 | 0 | 0.000 |
| All species pooled | | 4.211 | | 3.392 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 25. Summary results from 494 point counts in Lodgepole Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mallard | 3 | 0.020 | 0 | 0.000 |
| Common Merganser | 3 | 0.018 | 1 | 0.005 |
| Northern Goshawk | 1 | 0.002 | 0 | 0.000 |
| Unidentified Hawk | 1 | 0.002 | 0 | 0.000 |
| Blue Grouse | 8 | 0.020 | 3 | 0.013 |
| Mountain Quail | 28 | 0.073 | 5 | 0.015 |
| Spotted Sandpiper | 16 | 0.069 | 9 | 0.034 |
| Band-tailed Pigeon | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 2 | 0.004 | 2 | 0.005 |
| Calliope Hummingbird | 1 | 0.002 | 1 | 0.003 |
| Rufous Hummingbird | 9 | 0.026 | 9 | 0.034 |
| Unidentif. Hummingbird | 12 | 0.026 | 12 | 0.034 |
| Williamson's Sapsucker | 12 | 0.028 | 5 | 0.018 |
| Red-breasted Sapsucker | 1 | 0.002 | 0 | 0.000 |
| Unidentified Sapsucker | 2 | 0.004 | 1 | 0.003 |
| Hairy Woodpecker | 14 | 0.028 | 7 | 0.018 |
| Wh.-headed Woodpecker | 5 | 0.010 | 2 | 0.005 |
| Blk.-backed Woodpecker | 1 | 0.002 | 1 | 0.003 |
| Northern Flicker | 22 | 0.045 | 7 | 0.018 |
| Pileated Woodpecker | 1 | 0.002 | 0 | 0.000 |
| Unidentif Woodpecker | 7 | 0.016 | 1 | 0.003 |
| Olive-sided Flycatcher | 27 | 0.057 | 6 | 0.015 |
| Western Wood-Pewee | 28 | 0.069 | 8 | 0.028 |
| Hammond's Flycatcher | 2 | 0.004 | 2 | 0.005 |
| Dusky Flycatcher | 127 | 0.289 | 86 | 0.245 |
| Unidentified <i>Empidonax</i> | 6 | 0.012 | 4 | 0.010 |
| Cassin's Vireo | 7 | 0.020 | 4 | 0.013 |
| Warbling Vireo | 12 | 0.026 | 5 | 0.013 |
| Steller's Jay | 66 | 0.174 | 23 | 0.072 |
| Clark's Nutcracker | 73 | 0.231 | 20 | 0.077 |
| Common Raven | 3 | 0.006 | 0 | 0.000 |
| Violet-green Swallow | 1 | 0.006 | 1 | 0.005 |
| Mountain Chickadee | 214 | 0.757 | 132 | 0.536 |
| Red-breasted Nuthatch | 30 | 0.077 | 11 | 0.034 |
| White-breasted Nuthatch | 22 | 0.051 | 10 | 0.026 |
| Brown Creeper | 44 | 0.101 | 35 | 0.101 |
| Rock Wren | 7 | 0.018 | 2 | 0.005 |
| House Wren | 1 | 0.002 | 1 | 0.003 |
| Golden-crowned Kinglet | 26 | 0.071 | 23 | 0.077 |
| Ruby-crowned Kinglet | 12 | 0.036 | 9 | 0.034 |
| Unidentified Kinglet | 1 | 0.002 | 1 | 0.003 |
| Mountain Bluebird | 6 | 0.012 | 4 | 0.010 |
| Townsend's Solitaire | 61 | 0.136 | 18 | 0.052 |
| Hermit Thrush | 88 | 0.233 | 21 | 0.062 |
| American Robin | 75 | 0.192 | 35 | 0.121 |
| Orange-crowned Warbler | 2 | 0.004 | 2 | 0.005 |
| Nashville Warbler | 17 | 0.047 | 8 | 0.023 |
| Yellow-rumped Warbler | 267 | 0.848 | 192 | 0.670 |
| Hermit Warbler | 6 | 0.016 | 3 | 0.010 |
| MacGillivray's Warbler | 15 | 0.030 | 10 | 0.026 |
| Wilson's Warbler | 3 | 0.006 | 2 | 0.005 |

| | | | | |
|---------------------------|-----|--------------|-----|--------------|
| Western Tanager | 16 | 0.038 | 5 | 0.013 |
| Green-tailed Towhee | 12 | 0.028 | 9 | 0.026 |
| Spotted Towhee | 1 | 0.002 | 1 | 0.003 |
| Chipping Sparrow | 11 | 0.026 | 6 | 0.015 |
| Savannah Sparrow | 3 | 0.008 | 3 | 0.010 |
| Fox Sparrow | 61 | 0.172 | 30 | 0.085 |
| Song Sparrow | 3 | 0.006 | 0 | 0.000 |
| Lincoln's Sparrow | 7 | 0.014 | 6 | 0.015 |
| White-crowned Sparrow | 38 | 0.103 | 14 | 0.046 |
| Dark-eyed Junco | 298 | 1.043 | 221 | 0.856 |
| Unidentified Sparrow | 1 | 0.002 | 1 | 0.003 |
| Black-headed Grosbeak | 3 | 0.006 | 0 | 0.000 |
| Lazuli Bunting | 1 | 0.002 | 0 | 0.000 |
| Red-winged Blackbird | 4 | 0.012 | 1 | 0.005 |
| Brown-headed Cowbird | 1 | 0.002 | 0 | 0.000 |
| Gr.-crowned Rosy-Finch | 1 | 0.002 | 1 | 0.003 |
| Pine Grosbeak | 8 | 0.022 | 8 | 0.026 |
| Purple Finch | 11 | 0.036 | 3 | 0.010 |
| Cassin's Finch | 142 | 0.502 | 94 | 0.381 |
| Red Crossbill | 2 | 0.012 | 1 | 0.005 |
| Pine Siskin | 89 | 0.285 | 64 | 0.260 |
| Lesser Goldfinch | 2 | 0.006 | 2 | 0.005 |
| Evening Grosbeak | 2 | 0.004 | 0 | 0.000 |
| All species pooled | | 6.265 | | 4.264 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 26. Summary results from 48 point counts in Western White Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Blue Grouse | 3 | 0.063 | 1 | 0.027 |
| Mountain Quail | 3 | 0.063 | 0 | 0.000 |
| Spotted Sandpiper | 1 | 0.021 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.021 | 1 | 0.027 |
| Rufous Hummingbird | 5 | 0.167 | 5 | 0.212 |
| Unidentif. Hummingbird | 1 | 0.021 | 1 | 0.027 |
| Hairy Woodpecker | 4 | 0.083 | 3 | 0.080 |
| Wh.-headed Woodpecker | 2 | 0.042 | 1 | 0.027 |
| Northern Flicker | 2 | 0.042 | 0 | 0.000 |
| Unidentif. Woodpecker | 1 | 0.021 | 0 | 0.000 |
| Olive-sided Flycatcher | 3 | 0.063 | 0 | 0.000 |
| Western Wood-Pewee | 1 | 0.021 | 0 | 0.000 |
| Dusky Flycatcher | 9 | 0.208 | 5 | 0.133 |
| Pacific-slope Flycatcher | 1 | 0.021 | 1 | 0.027 |
| Cassin's Vireo | 1 | 0.021 | 0 | 0.000 |
| Warbling Vireo | 1 | 0.021 | 0 | 0.000 |
| Steller's Jay | 7 | 0.250 | 4 | 0.133 |
| Clark's Nutcracker | 12 | 0.313 | 7 | 0.186 |
| Mountain Chickadee | 31 | 1.104 | 21 | 0.849 |
| Red-breasted Nuthatch | 8 | 0.271 | 6 | 0.265 |
| White-breasted Nuthatch | 9 | 0.208 | 4 | 0.133 |
| Brown Creeper | 12 | 0.313 | 9 | 0.292 |
| Golden-crowned Kinglet | 3 | 0.063 | 2 | 0.053 |
| Townsend's Solitaire | 10 | 0.229 | 2 | 0.053 |
| Hermit Thrush | 4 | 0.083 | 0 | 0.000 |
| American Robin | 5 | 0.167 | 3 | 0.133 |
| Nashville Warbler | 1 | 0.021 | 1 | 0.027 |
| Yellow-rumped Warbler | 21 | 0.688 | 13 | 0.504 |
| Hermit Warbler | 1 | 0.042 | 0 | 0.000 |
| MacGillivray's Warbler | 2 | 0.042 | 0 | 0.000 |
| Wilson's Warbler | 1 | 0.042 | 1 | 0.053 |
| Western Tanager | 4 | 0.083 | 3 | 0.080 |
| Chipping Sparrow | 1 | 0.021 | 0 | 0.000 |
| Fox Sparrow | 8 | 0.208 | 4 | 0.106 |
| Dark-eyed Junco | 21 | 0.875 | 16 | 0.716 |
| Brewer's Blackbird | 1 | 0.021 | 1 | 0.027 |
| Pine Grosbeak | 1 | 0.021 | 1 | 0.027 |
| Cassin's Finch | 9 | 0.354 | 8 | 0.371 |
| Red Crossbill | 1 | 0.021 | 1 | 0.027 |
| Pine Siskin | 10 | 0.396 | 8 | 0.371 |
| All species pooled | | 6.735 | | 4.966 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 27. Summary results from 39 point counts in Western Juniper habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Blue Grouse | 4 | 0.128 | 1 | 0.065 |
| Mountain Quail | 8 | 0.256 | 0 | 0.000 |
| Band-tailed Pigeon | 1 | 0.026 | 1 | 0.033 |
| Anna's Hummingbird | 3 | 0.103 | 3 | 0.131 |
| Rufous Hummingbird | 2 | 0.051 | 1 | 0.033 |
| Unidentif. Hummingbird | 2 | 0.077 | 0 | 0.000 |
| Northern Flicker | 1 | 0.026 | 0 | 0.000 |
| Olive-sided Flycatcher | 9 | 0.231 | 3 | 0.098 |
| Western Wood-Pewee | 1 | 0.051 | 1 | 0.033 |
| Dusky Flycatcher | 12 | 0.333 | 7 | 0.229 |
| Pacific-slope Flycatcher | 1 | 0.026 | 0 | 0.000 |
| Warbling Vireo | 2 | 0.051 | 0 | 0.000 |
| Steller's Jay | 11 | 0.333 | 2 | 0.065 |
| Clark's Nutcracker | 7 | 0.231 | 2 | 0.098 |
| Violet-green Swallow | 1 | 0.051 | 0 | 0.000 |
| Mountain Chickadee | 16 | 0.462 | 8 | 0.261 |
| Red-breasted Nuthatch | 1 | 0.026 | 0 | 0.000 |
| White-breasted Nuthatch | 3 | 0.077 | 0 | 0.000 |
| Brown Creeper | 4 | 0.103 | 1 | 0.033 |
| Rock Wren | 3 | 0.077 | 1 | 0.033 |
| Golden-crowned Kinglet | 2 | 0.051 | 0 | 0.000 |
| Townsend's Solitaire | 6 | 0.179 | 2 | 0.065 |
| American Robin | 8 | 0.205 | 3 | 0.098 |
| Nashville Warbler | 8 | 0.256 | 3 | 0.098 |
| Yellow-rumped Warbler | 8 | 0.308 | 5 | 0.229 |
| Hermit Warbler | 1 | 0.026 | 1 | 0.033 |
| MacGillivray's Warbler | 7 | 0.179 | 3 | 0.098 |
| Wilson's Warbler | 3 | 0.077 | 2 | 0.065 |
| Western Tanager | 4 | 0.128 | 0 | 0.000 |
| Green-tailed Towhee | 6 | 0.154 | 2 | 0.065 |
| Spotted Towhee | 2 | 0.077 | 1 | 0.033 |
| Chipping Sparrow | 1 | 0.051 | 0 | 0.000 |
| Fox Sparrow | 22 | 0.795 | 10 | 0.424 |
| Song Sparrow | 1 | 0.026 | 0 | 0.000 |
| White-crowned Sparrow | 1 | 0.026 | 0 | 0.000 |
| Dark-eyed Junco | 24 | 0.923 | 15 | 0.816 |
| Black-headed Grosbeak | 2 | 0.051 | 1 | 0.033 |
| Cassin's Finch | 10 | 0.385 | 4 | 0.163 |
| Pine Siskin | 1 | 0.026 | 1 | 0.033 |
| All species pooled | | 6.642 | | 3.365 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 28. Summary results from 104 point counts in Mountain Hemlock habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mountain Quail | 4 | 0.048 | 0 | 0.000 |
| Band-tailed Pigeon | 1 | 0.010 | 1 | 0.012 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 1 | 0.010 | 1 | 0.012 |
| Calliope Hummingbird | 1 | 0.010 | 1 | 0.012 |
| Rufous Hummingbird | 3 | 0.029 | 3 | 0.037 |
| Unidentif. Hummingbird | 2 | 0.019 | 2 | 0.024 |
| Williamson's Sapsucker | 2 | 0.029 | 1 | 0.024 |
| Hairy Woodpecker | 2 | 0.019 | 2 | 0.024 |
| Northern Flicker | 1 | 0.010 | 0 | 0.000 |
| Olive-sided Flycatcher | 2 | 0.019 | 0 | 0.000 |
| Western Wood-Pewee | 2 | 0.019 | 2 | 0.024 |
| Dusky Flycatcher | 29 | 0.308 | 23 | 0.306 |
| Unidentified <i>Empidonax</i> | 1 | 0.010 | 1 | 0.012 |
| Steller's Jay | 10 | 0.135 | 3 | 0.061 |
| Clark's Nutcracker | 25 | 0.385 | 9 | 0.171 |
| Mountain Chickadee | 47 | 0.740 | 31 | 0.563 |
| Red-breasted Nuthatch | 4 | 0.048 | 3 | 0.049 |
| White-breasted Nuthatch | 6 | 0.058 | 2 | 0.024 |
| Brown Creeper | 8 | 0.087 | 7 | 0.098 |
| Rock Wren | 1 | 0.010 | 0 | 0.000 |
| Winter Wren | 1 | 0.010 | 1 | 0.012 |
| American Dipper | 1 | 0.010 | 1 | 0.012 |
| Golden-crowned Kinglet | 9 | 0.096 | 8 | 0.110 |
| Ruby-crowned Kinglet | 2 | 0.019 | 1 | 0.012 |
| Townsend's Solitaire | 10 | 0.096 | 3 | 0.037 |
| Hermit Thrush | 34 | 0.365 | 8 | 0.098 |
| American Robin | 8 | 0.096 | 6 | 0.098 |
| Yellow-rumped Warbler | 53 | 0.760 | 41 | 0.686 |
| MacGillivray's Warbler | 1 | 0.010 | 0 | 0.000 |
| Fox Sparrow | 2 | 0.029 | 1 | 0.012 |
| Lincoln's Sparrow | 1 | 0.010 | 0 | 0.000 |
| White-crowned Sparrow | 6 | 0.077 | 1 | 0.012 |
| Dark-eyed Junco | 61 | 0.885 | 44 | 0.784 |
| Brewer's Blackbird | 1 | 0.019 | 1 | 0.024 |
| Gr.-crowned Rosy-Finch | 1 | 0.019 | 1 | 0.024 |
| Pine Grosbeak | 1 | 0.029 | 1 | 0.037 |
| Cassin's Finch | 44 | 0.702 | 28 | 0.490 |
| Red Crossbill | 2 | 0.019 | 1 | 0.012 |
| Pine Siskin | 31 | 0.462 | 18 | 0.355 |
| All species pooled | | 5.716 | | 4.268 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 29. Summary results from 75 point counts in Whitebark Pine-Lodgepole Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Golden Eagle | 0 | 0.000 | 0 | 0.000 |
| Blue Grouse | 1 | 0.013 | 0 | 0.000 |
| Spotted Sandpiper | 1 | 0.027 | 1 | 0.017 |
| Rufous Hummingbird | 3 | 0.040 | 3 | 0.051 |
| Hairy Woodpecker | 3 | 0.040 | 1 | 0.017 |
| Blk.-backed Woodpecker | 1 | 0.013 | 1 | 0.017 |
| Dusky Flycatcher | 20 | 0.293 | 15 | 0.272 |
| Steller's Jay | 3 | 0.053 | 1 | 0.017 |
| Clark's Nutcracker | 31 | 0.707 | 12 | 0.424 |
| Mountain Chickadee | 34 | 0.667 | 24 | 0.509 |
| White-breasted Nuthatch | 4 | 0.080 | 2 | 0.034 |
| Rock Wren | 2 | 0.027 | 0 | 0.000 |
| Townsend's Solitaire | 3 | 0.040 | 1 | 0.017 |
| Hermit Thrush | 8 | 0.120 | 1 | 0.017 |
| American Robin | 5 | 0.080 | 4 | 0.068 |
| Nashville Warbler | 2 | 0.040 | 0 | 0.000 |
| Yellow-rumped Warbler | 30 | 0.520 | 14 | 0.289 |
| MacGillivray's Warbler | 1 | 0.013 | 0 | 0.000 |
| Western Tanager | 1 | 0.013 | 0 | 0.000 |
| Chipping Sparrow | 1 | 0.013 | 0 | 0.000 |
| Fox Sparrow | 1 | 0.013 | 0 | 0.000 |
| Lincoln's Sparrow | 1 | 0.013 | 0 | 0.000 |
| White-crowned Sparrow | 12 | 0.187 | 3 | 0.085 |
| Dark-eyed Junco | 48 | 1.067 | 33 | 0.883 |
| Gr.-crowned Rosy-Finch | 7 | 0.107 | 6 | 0.102 |
| Pine Grosbeak | 1 | 0.013 | 1 | 0.017 |
| Cassin's Finch | 35 | 0.707 | 15 | 0.289 |
| Red Crossbill | 2 | 0.093 | 2 | 0.119 |
| Pine Siskin | 17 | 0.360 | 12 | 0.340 |
| All species pooled | | 5.359 | | 3.584 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 30. Summary results from 39 point counts in Whitebark Pine-Mountain Hemlock habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| White-tailed Ptarmigan | 1 | 0.026 | 0 | 0.000 |
| Spotted Sandpiper | 1 | 0.026 | 0 | 0.000 |
| White-throated Swift | 0 | 0.000 | 0 | 0.000 |
| Unidentif. Hummingbird | 1 | 0.026 | 1 | 0.033 |
| Northern Flicker | 1 | 0.026 | 1 | 0.033 |
| Dusky Flycatcher | 5 | 0.128 | 4 | 0.131 |
| Steller's Jay | 1 | 0.077 | 1 | 0.098 |
| Clark's Nutcracker | 15 | 0.462 | 3 | 0.098 |
| Mountain Chickadee | 7 | 0.282 | 3 | 0.163 |
| White-breasted Nuthatch | 1 | 0.026 | 0 | 0.000 |
| Brown Creeper | 2 | 0.051 | 1 | 0.033 |
| Rock Wren | 1 | 0.026 | 1 | 0.033 |
| Golden-crowned Kinglet | 1 | 0.026 | 1 | 0.033 |
| Mountain Bluebird | 1 | 0.026 | 0 | 0.000 |
| Townsend's Solitaire | 2 | 0.051 | 0 | 0.000 |
| Hermit Thrush | 9 | 0.282 | 2 | 0.065 |
| American Robin | 3 | 0.077 | 2 | 0.065 |
| American Pipit | 1 | 0.026 | 1 | 0.033 |
| Yellow-rumped Warbler | 13 | 0.436 | 7 | 0.326 |
| Wilson's Warbler | 1 | 0.026 | 0 | 0.000 |
| Fox Sparrow | 1 | 0.026 | 0 | 0.000 |
| White-crowned Sparrow | 2 | 0.077 | 1 | 0.033 |
| Dark-eyed Junco | 17 | 0.616 | 13 | 0.555 |
| Gr.-crowned Rosy-Finch | 2 | 0.077 | 2 | 0.098 |
| Pine Grosbeak | 0 | 0.000 | 0 | 0.000 |
| Cassin's Finch | 13 | 0.487 | 6 | 0.229 |
| Red Crossbill | 1 | 0.103 | 1 | 0.131 |
| Pine Siskin | 5 | 0.179 | 2 | 0.098 |
| All species pooled | | 3.671 | | 2.288 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 31. Summary results from 140 point counts in Whitebark Pine habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| White-tailed Ptarmigan | 1 | 0.007 | 1 | 0.009 |
| Mountain Quail | 4 | 0.036 | 0 | 0.000 |
| Rufous Hummingbird | 1 | 0.007 | 1 | 0.009 |
| Unidentif. Hummingbird | 4 | 0.036 | 4 | 0.045 |
| Dusky Flycatcher | 16 | 0.150 | 11 | 0.109 |
| Warbling Vireo | 1 | 0.007 | 0 | 0.000 |
| Steller's Jay | 3 | 0.021 | 1 | 0.009 |
| Clark's Nutcracker | 43 | 0.493 | 16 | 0.218 |
| Common Raven | 1 | 0.014 | 1 | 0.018 |
| Mountain Chickadee | 15 | 0.136 | 9 | 0.091 |
| White-breasted Nuthatch | 3 | 0.021 | 0 | 0.000 |
| Brown Creeper | 1 | 0.007 | 0 | 0.000 |
| Rock Wren | 9 | 0.086 | 5 | 0.055 |
| Ruby-crowned Kinglet | 1 | 0.007 | 1 | 0.009 |
| Western Bluebird | 1 | 0.007 | 0 | 0.000 |
| Mountain Bluebird | 2 | 0.021 | 2 | 0.027 |
| Townsend's Solitaire | 6 | 0.043 | 1 | 0.009 |
| Hermit Thrush | 6 | 0.050 | 1 | 0.009 |
| American Robin | 2 | 0.014 | 1 | 0.009 |
| American Pipit | 6 | 0.057 | 5 | 0.064 |
| Nashville Warbler | 1 | 0.007 | 0 | 0.000 |
| Yellow-rumped Warbler | 16 | 0.164 | 9 | 0.136 |
| Wilson's Warbler | 2 | 0.014 | 1 | 0.009 |
| Fox Sparrow | 2 | 0.021 | 1 | 0.009 |
| White-crowned Sparrow | 22 | 0.250 | 10 | 0.118 |
| Dark-eyed Junco | 52 | 0.521 | 34 | 0.373 |
| Brewer's Blackbird | 1 | 0.007 | 1 | 0.009 |
| Gr.-crowned Rosy-Finch | 6 | 0.107 | 4 | 0.082 |
| Pine Grosbeak | 1 | 0.007 | 1 | 0.009 |
| Cassin's Finch | 31 | 0.300 | 15 | 0.191 |
| Red Crossbill | 0 | 0.000 | 0 | 0.000 |
| Pine Siskin | 14 | 0.121 | 8 | 0.073 |
| Evening Grosbeak | 0 | 0.000 | 0 | 0.000 |
| All species pooled | | 2.739 | | 1.699 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 32. Summary results from 136 point counts in Subalpine/Alpine Meadow habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|-------------------------------|---|--|---|---|
| Mallard | 1 | 0.007 | 1 | 0.009 |
| Mountain Quail | 2 | 0.015 | 0 | 0.000 |
| Spotted Sandpiper | 6 | 0.051 | 2 | 0.019 |
| Unidentif. Hummingbird | 3 | 0.022 | 3 | 0.028 |
| Hairy Woodpecker | 1 | 0.007 | 0 | 0.000 |
| Northern Flicker | 3 | 0.022 | 0 | 0.000 |
| Pileated Woodpecker | 1 | 0.007 | 0 | 0.000 |
| Olive-sided Flycatcher | 2 | 0.015 | 0 | 0.000 |
| Western Wood-Pewee | 3 | 0.022 | 1 | 0.009 |
| Dusky Flycatcher | 33 | 0.294 | 22 | 0.234 |
| Unidentified <i>Empidonax</i> | 3 | 0.022 | 2 | 0.019 |
| Cassin's Vireo | 1 | 0.007 | 0 | 0.000 |
| Warbling Vireo | 1 | 0.007 | 0 | 0.000 |
| Steller's Jay | 3 | 0.037 | 0 | 0.000 |
| Clark's Nutcracker | 23 | 0.184 | 2 | 0.019 |
| Common Raven | 1 | 0.015 | 1 | 0.019 |
| Mountain Chickadee | 30 | 0.309 | 12 | 0.159 |
| Red-breasted Nuthatch | 1 | 0.007 | 0 | 0.000 |
| White-breasted Nuthatch | 3 | 0.022 | 0 | 0.000 |
| Brown Creeper | 2 | 0.015 | 2 | 0.019 |
| Rock Wren | 3 | 0.029 | 1 | 0.009 |
| Golden-crowned Kinglet | 3 | 0.029 | 3 | 0.037 |
| Mountain Bluebird | 5 | 0.037 | 4 | 0.037 |
| Townsend's Solitaire | 4 | 0.029 | 0 | 0.000 |
| Hermit Thrush | 22 | 0.176 | 0 | 0.000 |
| American Robin | 30 | 0.463 | 22 | 0.365 |
| American Pipit | 4 | 0.044 | 2 | 0.037 |
| Yellow-rumped Warbler | 43 | 0.522 | 31 | 0.337 |
| MacGillivray's Warbler | 1 | 0.007 | 0 | 0.000 |
| Western Tanager | 1 | 0.007 | 0 | 0.000 |
| Chipping Sparrow | 2 | 0.015 | 0 | 0.000 |
| Fox Sparrow | 1 | 0.007 | 0 | 0.000 |
| Song Sparrow | 6 | 0.110 | 3 | 0.075 |
| Lincoln's Sparrow | 5 | 0.044 | 2 | 0.028 |
| White-crowned Sparrow | 58 | 0.684 | 30 | 0.374 |
| Dark-eyed Junco | 68 | 0.824 | 38 | 0.524 |
| Red-winged Blackbird | 5 | 0.059 | 3 | 0.028 |
| Brewer's Blackbird | 16 | 0.404 | 10 | 0.234 |
| Gr.-crowned Rosy-Finch | 3 | 0.022 | 0 | 0.000 |
| Pine Grosbeak | 6 | 0.074 | 4 | 0.056 |
| Cassin's Finch | 37 | 0.500 | 16 | 0.290 |
| Red Crossbill | 1 | 0.007 | 0 | 0.000 |
| Pine Siskin | 27 | 0.294 | 12 | 0.140 |
| Lesser Goldfinch | 1 | 0.007 | 0 | 0.000 |
| All species pooled | | 5.481 | | 3.105 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.

³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.

⁴Based on average number of birds detected within a 50 m radius.

Table 33. Summary results from 80 point counts in Barren habitat.

| Species ¹ | No. points with detections ² | Unlimited-radius detections per point ² | No. points with 50-m radius detections ³ | Individuals detected per hectare ⁴ |
|---------------------------|---|--|---|---|
| Northern Goshawk | 1 | 0.013 | 0 | 0.000 |
| Unidentified Hawk | 1 | 0.013 | 0 | 0.000 |
| Blue Grouse | 1 | 0.013 | 1 | 0.016 |
| Mountain Quail | 10 | 0.175 | 1 | 0.048 |
| Spotted Sandpiper | 1 | 0.038 | 1 | 0.048 |
| California Gull | 0 | 0.000 | 0 | 0.000 |
| Band-tailed Pigeon | 0 | 0.000 | 0 | 0.000 |
| Anna's Hummingbird | 0 | 0.000 | 0 | 0.000 |
| Rufous Hummingbird | 3 | 0.038 | 3 | 0.048 |
| Unidentif. Hummingbird | 0 | 0.000 | 0 | 0.000 |
| Acorn Woodpecker | 1 | 0.013 | 0 | 0.000 |
| Williamson's Sapsucker | 1 | 0.013 | 1 | 0.016 |
| Hairy Woodpecker | 2 | 0.025 | 0 | 0.000 |
| Olive-sided Flycatcher | 2 | 0.025 | 0 | 0.000 |
| Western Wood-Pewee | 2 | 0.025 | 1 | 0.016 |
| Dusky Flycatcher | 5 | 0.063 | 1 | 0.016 |
| Warbling Vireo | 1 | 0.013 | 1 | 0.016 |
| Steller's Jay | 6 | 0.100 | 3 | 0.080 |
| Clark's Nutcracker | 15 | 0.213 | 6 | 0.095 |
| Violet-green Swallow | 3 | 0.063 | 1 | 0.016 |
| Mountain Chickadee | 10 | 0.225 | 6 | 0.143 |
| Red-breasted Nuthatch | 1 | 0.013 | 0 | 0.000 |
| White-breasted Nuthatch | 1 | 0.025 | 1 | 0.032 |
| Brown Creeper | 1 | 0.013 | 0 | 0.000 |
| Rock Wren | 6 | 0.075 | 1 | 0.016 |
| Golden-crowned Kinglet | 1 | 0.013 | 1 | 0.016 |
| Mountain Bluebird | 1 | 0.013 | 0 | 0.000 |
| Townsend's Solitaire | 5 | 0.063 | 1 | 0.016 |
| Hermit Thrush | 3 | 0.038 | 0 | 0.000 |
| American Robin | 7 | 0.138 | 5 | 0.111 |
| American Pipit | 3 | 0.063 | 2 | 0.064 |
| Nashville Warbler | 3 | 0.088 | 3 | 0.064 |
| Yellow-rumped Warbler | 11 | 0.175 | 4 | 0.064 |
| Blk.-throated G. Warbler | 1 | 0.013 | 1 | 0.016 |
| MacGillivray's Warbler | 2 | 0.038 | 1 | 0.016 |
| Western Tanager | 3 | 0.038 | 3 | 0.048 |
| Spotted Towhee | 2 | 0.025 | 1 | 0.016 |
| Fox Sparrow | 7 | 0.150 | 2 | 0.032 |
| White-crowned Sparrow | 7 | 0.113 | 1 | 0.032 |
| Dark-eyed Junco | 18 | 0.363 | 10 | 0.223 |
| Lazuli Bunting | 1 | 0.025 | 0 | 0.000 |
| Gr.-crowned Rosy-Finch | 9 | 0.138 | 8 | 0.159 |
| Purple Finch | 1 | 0.013 | 0 | 0.000 |
| Cassin's Finch | 9 | 0.200 | 4 | 0.064 |
| Red Crossbill | 0 | 0.000 | 0 | 0.000 |
| Pine Siskin | 0 | 0.000 | 0 | 0.000 |
| Lesser Goldfinch | 1 | 0.013 | 0 | 0.000 |
| All species pooled | | 2.914 | | 1.547 |

¹All detected species are presented, including flyovers (see text for definition).

²Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
³Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
⁴Based on average number of birds detected within a 50 m radius.

Table 34. Number of species detected in each habitat, and habitat-specific species richness estimates and ranks obtained using four different computer models (ACE, ICE, CHAO1, and JACK1). See text for descriptions and citations for the estimators.

| Habitat ^a | No. species detected ^b | Species Richness Estimator | | | | Species Richness Rank | | | | |
|---------------------------------|-----------------------------------|----------------------------|------|-------|-------|-----------------------|-----|-------|-------|---------|
| | | ACE | ICE | CHAO1 | JACK1 | ACE | ICE | CHAO1 | JACK1 | Overall |
| Ponderosa Pine-Mixed Conifer | 77 | 84.5 | 89.4 | 82.6 | 91.9 | 1 | 1 | 1 | 1 | 1 |
| Montane Chaparral | 68 | 77.0 | 87.1 | 79.5 | 86.8 | 5 | 2 | 2 | 2 | 2 |
| Jeffrey Pine | 65 | 80.7 | 83.5 | 78.2 | 81.9 | 2 | 3 | 4 | 3 | 3 |
| Red Fir | 66 | 75.0 | 78.3 | 79.4 | 80.0 | 6 | 4 | 3 | 5 | 4 |
| Lodgepole Pine | 67 | 77.5 | 78.1 | 76.0 | 80.0 | 4 | 6 | 5 | 4 | 5 |
| Montane Meadow | 56 | 79.0 | 78.3 | 72.8 | 76.9 | 3 | 5 | 6 | 6 | 6 |
| Canyon Live Oak | 46 | 62.3 | 68.9 | 69.3 | 63.6 | 7 | 7 | 8 | 10 | 7 |
| Black Oak | 53 | 56.8 | 63.1 | 57.8 | 65.7 | 10 | 10 | 11 | 7 | 8 |
| White Fir | 46 | 57.4 | 63.0 | 72.7 | 61.7 | 9 | 11 | 7 | 12 | 9 |
| White Fir-Mixed Conifer | 59 | 61.2 | 62.1 | 60.1 | 64.0 | 8 | 13 | 9 | 9 | 10 |
| Mixed Chaparral | 48 | 55.9 | 66.4 | 53.6 | 64.7 | 11 | 9 | 13 | 8 | 11 |
| Ponderosa Pine | 46 | 55.2 | 62.5 | 58.1 | 62.1 | 13 | 12 | 10 | 11 | 12 |
| Barren | 40 | 55.4 | 61.8 | 51.9 | 58.9 | 12 | 14 | 14 | 13 | 13 |
| Subalpine/Alpine Meadow | 42 | 54.5 | 52.7 | 56.4 | 55.9 | 14 | 16 | 12 | 14 | 14 |
| Montane/Alpine Riparian Shrub | 31 | 43.0 | 68.5 | 39.1 | 52.5 | 20 | 8 | 22 | 15 | 15 |
| Quaking Aspen | 41 | 46.3 | 50.1 | 46.1 | 51.6 | 16 | 18 | 15 | 16 | 16 |
| Western White Pine | 38 | 49.0 | 50.7 | 45.2 | 50.8 | 15 | 17 | 17 | 17 | 17 |
| Recent Burn | 40 | 45.5 | 48.2 | 46.1 | 50.5 | 18 | 19 | 16 | 18 | 18 |
| Jeffrey Pine-Red Fir | 42 | 44.6 | 48.0 | 43.7 | 49.9 | 19 | 20 | 18 | 19 | 19 |
| Foothill Pine | 34 | 42.6 | 53.2 | 41.0 | 49.8 | 22 | 15 | 20 | 20 | 20 |
| Douglas-fir Mixed Conifer | 39 | 46.2 | 46.6 | 43.1 | 48.7 | 17 | 22 | 19 | 21 | 21 |
| Western Juniper | 38 | 42.8 | 46.0 | 40.7 | 47.8 | 21 | 23 | 21 | 22 | 22 |
| Mountain Hemlock | 37 | 41.0 | 45.4 | 38.9 | 44.9 | 23 | 24 | 23 | 23 | 23 |
| Whitebark Pine-Mountain Hemlock | 26 | 37.7 | 47.5 | 35.2 | 37.7 | 25 | 21 | 26 | 25 | 24 |
| Whitebark Pine | 30 | 39.8 | 41.9 | 37.4 | 39.9 | 24 | 25 | 25 | 24 | 25 |
| Whitebark Pine-Lodgepole Pine | 28 | 35.8 | 38.2 | 37.8 | 36.9 | 26 | 26 | 24 | 26 | 26 |

^aHabitats with fewer than fourteen sampling points (Interior Live Oak, White Alder, and Giant Sequoia) have been omitted.

^bExcludes flyovers and species detected only at times other than during point counts.

Table 35. 'Developed area' transects established and surveyed in 2000.

| Name | Location | No. Points |
|--------------|------------------------------------|------------|
| Dev01 | Mirror Lake | 9 |
| Dev02 | Sunnyside Campground | 12 |
| Dev03 | Upper/Lower Pines Campground | 12 |
| Dev04 | Curry Village | 17 |
| Dev05 | Yosemite Lodge | 17 |
| Dev06 | Hetch Hetchy Campground and Corral | 13 |
| Dev07 | Wawona Campground | 15 |
| Dev08 | Crane Flat Campground | 15 |
| Dev09 | Tamarack Flat Campground | 16 |
| Dev10 | Foresta | 13 |
| Dev11 | Yosemite Creek Campground | 14 |
| Dev12 | White Wolf Campground and Corral | 15 |
| Dev13 | Tuolumne Meadows Campground | 16 |
| Dev14 | Tuolumne Meadows Stable and Lodge | 13 |
| Total | | 197 |

Table 36. Habitat classifications of developed area point counts.

| Habitat | No. of Points |
|------------------------------|---------------|
| Lodgepole Pine | 62 |
| Red Fir | 24 |
| Jeffrey Pine Red Fir | 1 |
| Jeffrey Pine | 2 |
| Low Elevation/Montane Meadow | 4 |
| Douglas-fir Mixed Conifer | 8 |
| Black Oak | 6 |
| Ponderosa Pine Mixed Conifer | 67 |
| White Alder | 2 |
| Canyon Live Oak | 5 |
| Foothill Pine | 8 |
| Recent Burn | 8 |

Table 37. Species detection rates from 'developed area' surveys conducted in areas dominated by Lodgepole Pine (62 total points) compared with species detection rates at Lodgepole Pine dominated sampling points from the spatially extensive, 'parkwide' survey (494 total points). Totals are based on unlimited-radius point counts.

| Species | No. Points with Detections | | chi-square | Signif. Level |
|------------------------------|----------------------------|------------|-------------|------------------|
| | Developed-Area | Parkwide | | |
| Mallard | 0 | 3 | 0.09 | n.s. |
| Common Merganser | 0 | 3 | 0.09 | n.s. |
| Northern Goshawk | 0 | 1 | 1.52 | n.s. |
| Blue Grouse | 0 | 7 | 0.11 | n.s. |
| Mountain Quail | 2 | 28 | 0.24 | n.s. |
| Spotted Sandpiper | 0 | 16 | 1.04 | n.s. |
| Anna's Hummingbird | 0 | 2 | 0.39 | n.s. |
| Calliope Hummingbird | 0 | 1 | 1.52 | n.s. |
| Rufous Hummingbird | 0 | 9 | 0.28 | n.s. |
| Williamson's Sapsucker | 1 | 12 | 0.00 | n.s. |
| Red-breasted Sapsucker | 0 | 1 | 1.52 | n.s. |
| Nuttall's Woodpecker | 1 | 0 | 1.52 | n.s. |
| Hairy Woodpecker | 2 | 14 | 0.05 | n.s. |
| White-headed Woodpecker | 0 | 5 | 0.01 | n.s. |
| Black-backed Woodpecker | 0 | 1 | 1.52 | n.s. |
| Northern Flicker | 4 | 22 | 0.14 | n.s. |
| Pileated Woodpecker | 0 | 1 | 1.52 | n.s. |
| Olive-sided Flycatcher | 1 | 27 | 0.95 | n.s. |
| Western Wood-Pewee | 8 | 28 | 3.41 | n.s. |
| Hammond's Flycatcher | 0 | 2 | 0.39 | n.s. |
| Dusky Flycatcher | 5 | 127 | 6.50 | p<0.05 |
| Cassin's Vireo | 0 | 7 | 0.11 | n.s. |
| Warbling Vireo | 1 | 12 | 0.00 | n.s. |
| Steller's Jay | 19 | 66 | 9.66 | p<0.01 |
| Clark's Nutcracker | 1 | 73 | 6.22 | p<0.05 |
| Common Raven | 3 | 3 | 5.64 | p<0.05 |
| Violet-green Swallow | 0 | 1 | 1.52 | n.s. |
| Mountain Chickadee | 27 | 214 | 0.01 | n.s. |
| Oak Titmouse | 1 | 0 | 1.52 | n.s. |
| Red-breasted Nuthatch | 9 | 30 | 4.46 | p<0.05 |
| White-breasted Nuthatch | 0 | 22 | 1.75 | n.s. |
| Brown Creeper | 7 | 44 | 0.13 | n.s. |
| Rock Wren | 0 | 7 | 0.11 | n.s. |
| House Wren | 0 | 1 | 1.52 | n.s. |
| Golden-crowned Kinglet | 0 | 26 | 2.23 | n.s. |
| Ruby-crowned Kinglet | 0 | 12 | 0.59 | n.s. |
| Blue-gray Gnatcatcher | 1 | 0 | 1.52 | n.s. |
| Mountain Bluebird | 0 | 6 | 0.05 | n.s. |
| Townsend's Solitaire | 0 | 61 | 6.57 | p<0.05 |
| Hermit Thrush | 5 | 88 | 2.57 | n.s. |
| American Robin | 13 | 75 | 0.83 | n.s. |
| Orange-crowned Warbler | 0 | 2 | 0.39 | n.s. |
| Nashville Warbler | 0 | 17 | 1.16 | n.s. |
| Yellow-rumped Warbler | 42 | 267 | 1.62 | n.s. |
| Hermit Warbler | 2 | 6 | 0.47 | n.s. |
| MacGillivray's Warbler | 1 | 15 | 0.05 | n.s. |
| Wilson's Warbler | 0 | 3 | 0.09 | n.s. |
| Western Tanager | 5 | 16 | 2.24 | n.s. |

Table 37, cont.

| | | | | |
|-----------------------------|-----------|-----------|---------------|------------------|
| Green-tailed Towhee | 0 | 12 | 0.59 | n.s. |
| Spotted Towhee | 0 | 1 | 1.52 | n.s. |
| Chipping Sparrow | 10 | 11 | 24.63 | p<0.01 |
| Savannah Sparrow | 0 | 3 | 0.09 | n.s. |
| Fox Sparrow | 1 | 61 | 4.77 | p<0.05 |
| Song Sparrow | 0 | 3 | 0.09 | n.s. |
| Lincoln's Sparrow | 1 | 7 | 0.19 | n.s. |
| White-crowned Sparrow | 0 | 38 | 3.71 | n.s. |
| Dark-eyed Junco | 53 | 298 | 5.13 | n.s. |
| Black-headed Grosbeak | 0 | 3 | 0.09 | n.s. |
| Blue Grosbeak | 0 | 1 | 1.52 | n.s. |
| Lazuli Bunting | 0 | 1 | 1.52 | n.s. |
| Red-winged Blackbird | 1 | 4 | 0.01 | n.s. |
| Brewer's Blackbird | 17 | 0 | 126.63 | p<0.01 |
| Brown-headed Cowbird | 3 | 1 | 10.65 | p<0.01 |
| Gray-crowned Rosy-Finch | 0 | 1 | 1.52 | n.s. |
| Pine Grosbeak | 0 | 8 | 0.19 | n.s. |
| Purple Finch | 0 | 11 | 0.48 | n.s. |
| Cassin's Finch | 11 | 142 | 2.04 | n.s. |
| Red Crossbill | 0 | 2 | 0.39 | n.s. |
| Pine Siskin | 3 | 89 | 5.01 | p<0.05 |
| Lesser Goldfinch | 0 | 2 | 0.39 | n.s. |
| Evening Grosbeak | 0 | 2 | 0.39 | n.s. |

Table 38. Species detection rates from ‘developed area’ surveys conducted in areas dominated by Ponderosa Pine Mixed Conifer forest (67 total points) compared with species detection rates at Ponderosa Pine Mixed Conifer dominated sampling points from the spatially extensive, ‘parkwide’ survey (228 total points). Totals are based on unlimited-radius point counts.

| Species | No. Points with Detections | | chi-square | Signif. Level |
|-------------------------------|----------------------------|------------|--------------|------------------|
| | Developed-Area | Parkwide | | |
| Pied-billed Grebe | 0 | 1 | 0.42 | n.s. |
| Mallard | 0 | 4 | 0.24 | n.s. |
| Red-tailed Hawk | 0 | 1 | 0.42 | n.s. |
| Blue Grouse | 0 | 1 | 0.42 | n.s. |
| Mountain Quail | 1 | 88 | 22.42 | p<0.01 |
| Spotted Sandpiper | 2 | 1 | 1.27 | n.s. |
| Band-tailed Pigeon | 0 | 1 | 0.42 | n.s. |
| Mourning Dove | 0 | 4 | 0.24 | n.s. |
| Northern Pygmy-Owl | 0 | 1 | 0.42 | n.s. |
| White-throated Swift | 0 | 5 | 0.46 | n.s. |
| Anna's Hummingbird | 0 | 7 | 0.97 | n.s. |
| Belted Kingfisher | 1 | 1 | 0.01 | n.s. |
| Acorn Woodpecker | 7 | 18 | 0.15 | n.s. |
| Red-breasted Sapsucker | 0 | 1 | 0.42 | n.s. |
| Downy Woodpecker | 0 | 3 | 0.06 | n.s. |
| Hairy Woodpecker | 6 | 37 | 1.41 | n.s. |
| White-headed Woodpecker | 9 | 33 | 0.00 | n.s. |
| Northern Flicker | 12 | 54 | 0.54 | n.s. |
| Pileated Woodpecker | 0 | 15 | 3.21 | n.s. |
| Olive-sided Flycatcher | 4 | 27 | 1.19 | n.s. |
| Western Wood-Pewee | 13 | 59 | 0.64 | n.s. |
| Hammond's Flycatcher | 0 | 17 | 3.79 | n.s. |
| Dusky Flycatcher | 1 | 30 | 5.64 | p<0.05 |
| Pacific-slope Flycatcher | 4 | 5 | 1.34 | n.s. |
| Black Phoebe | 3 | 2 | 2.12 | n.s. |
| Cassin's Vireo | 4 | 75 | 13.03 | p<0.01 |
| Hutton's Vireo | 0 | 2 | 0.01 | n.s. |
| Warbling Vireo | 3 | 30 | 2.76 | n.s. |
| Steller's Jay | 55 | 112 | 9.37 | p<0.01 |
| Western Scrub-Jay | 0 | 2 | 0.01 | n.s. |
| Common Raven | 5 | 5 | 2.83 | n.s. |
| Violet-green Swallow | 0 | 1 | 0.42 | n.s. |
| Mountain Chickadee | 6 | 64 | 7.19 | p<0.01 |
| Chestnut-backed Chickadee | 0 | 3 | 0.06 | n.s. |
| Red-breasted Nuthatch | 2 | 97 | 22.98 | p<0.01 |
| White-breasted Nuthatch | 2 | 6 | 0.07 | n.s. |
| Brown Creeper | 23 | 60 | 0.91 | n.s. |
| Rock Wren | 0 | 2 | 0.01 | n.s. |
| Canyon Wren | 3 | 5 | 0.33 | n.s. |
| Bewick's Wren | 0 | 3 | 0.06 | n.s. |
| House Wren | 0 | 4 | 0.24 | n.s. |
| Winter Wren | 4 | 12 | 0.01 | n.s. |
| American Dipper | 0 | 1 | 0.42 | n.s. |
| Golden-crowned Kinglet | 1 | 24 | 3.98 | p<0.05 |
| Blue-gray Gnatcatcher | 0 | 1 | 0.42 | n.s. |
| Western Bluebird | 0 | 1 | 0.42 | n.s. |
| Townsend's Solitaire | 0 | 35 | 9.03 | p<0.01 |
| Hermit Thrush | 2 | 3 | 0.15 | n.s. |

Table 38, cont.

| | | | | |
|----------------------------------|-----------|------------|--------------|------------------|
| American Robin | 36 | 68 | 7.73 | p<0.01 |
| Wrentit | 0 | 8 | 1.24 | n.s. |
| Orange-crowned Warbler | 0 | 2 | 0.01 | n.s. |
| Nashville Warbler | 0 | 103 | 28.99 | p<0.01 |
| Yellow Warbler | 1 | 13 | 1.15 | n.s. |
| Yellow-rumped Warbler | 4 | 55 | 7.65 | p<0.01 |
| Blk.-throated Gr. Warbler | 0 | 45 | 11.96 | p<0.01 |
| Hermit Warbler | 1 | 62 | 14.84 | p<0.01 |
| MacGillivray's Warbler | 2 | 27 | 3.28 | n.s. |
| Wilson's Warbler | 2 | 8 | 0.03 | n.s. |
| Western Tanager | 24 | 102 | 0.77 | n.s. |
| Spotted Towhee | 5 | 63 | 8.28 | p<0.01 |
| Chipping Sparrow | 0 | 6 | 0.71 | n.s. |
| Fox Sparrow | 0 | 22 | 5.24 | p<0.05 |
| Song Sparrow | 21 | 15 | 24.03 | p<0.01 |
| Lincoln's Sparrow | 0 | 2 | 0.01 | n.s. |
| White-crowned Sparrow | 0 | 1 | 0.42 | n.s. |
| Dark-eyed Junco | 17 | 90 | 2.46 | n.s. |
| Black-headed Grosbeak | 25 | 86 | 0.00 | n.s. |
| Lazuli Bunting | 0 | 23 | 5.53 | p<0.05 |
| Red-winged Blackbird | 10 | 10 | 7.00 | p<0.01 |
| Western Meadowlark | 1 | 0 | 0.42 | n.s. |
| Brewer's Blackbird | 29 | 12 | 51.16 | p<0.01 |
| Brown-headed Cowbird | 4 | 7 | 0.52 | n.s. |
| Bullock's Oriole | 1 | 1 | 0.01 | n.s. |
| Purple Finch | 0 | 17 | 3.79 | n.s. |
| Cassin's Finch | 1 | 14 | 1.38 | n.s. |
| Red Crossbill | 0 | 1 | 0.42 | n.s. |
| Pine Siskin | 0 | 3 | 0.06 | n.s. |
| Lesser Goldfinch | 1 | 0 | 0.42 | n.s. |
| Evening Grosbeak | 0 | 2 | 0.01 | n.s. |

Table 39. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Ponderosa Pine Mixed Conifer habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|-----------------------|------------------------|-------------|------------|-----------------|----------|
| Hairy Woodpecker | | -3.35 | | | |
| | Snag density index | 0.90 | 2.46 | 2.54 | 0.011 |
| Cassin's Vireo | | -3.28 | | | |
| | Canopy cover | 0.03 | 1.03 | 3.60 | <0.001 |
| | Live Oak cover | 0.16 | 1.17 | 3.77 | <0.001 |
| | Subcanopy cover | -0.03 | 0.97 | -3.18 | 0.001 |
| | Downed wood index | 0.65 | 1.91 | 1.94 | 0.053 |
| Steller's Jay | | -5.4 | | | |
| | Snag density index | -0.49 | 0.61 | -2.04 | 0.041 |
| | Live Oak cover | -0.10 | 0.91 | -1.90 | 0.057 |
| | <i>Ceanothus</i> cover | -0.39 | 0.67 | -1.85 | 0.064 |
| Mountain Chickadee | | -2.79 | | | |
| | Snag density index | 0.65 | 1.92 | 2.16 | 0.031 |
| Red-breasted Nuthatch | | -4.43 | | | |
| | Canopy cover | 0.03 | 1.03 | 2.78 | 0.005 |
| | Snag density index | 0.71 | 2.04 | 2.03 | 0.042 |
| Brown Creeper | | -2.38 | | | |
| | Downed wood index | 0.71 | 2.03 | 2.15 | 0.032 |
| | Black Oak cover | -0.08 | 0.92 | -1.85 | 0.065 |
| American Robin | | -1.62 | | | |
| | Live Oak cover | 0.11 | 1.12 | 2.76 | 0.006 |
| | Subcanopy cover | -0.02 | 0.98 | -1.84 | 0.066 |
| Nashville Warbler | | -2.13 | | | |
| | Snag density index | 0.72 | 2.06 | 3.23 | 0.001 |
| | Black Oak cover | 0.07 | 1.08 | 3.11 | 0.002 |
| Yellow-rumped Warbler | | -1.39 | | | |
| | Live Oak cover | -0.15 | 0.86 | -2.22 | 0.026 |
| | <i>Ceanothus</i> cover | -0.10 | 0.91 | -1.55 | 0.122 |

Table 39, cont.

| | | | | |
|---------------------------|-------|------|-------|--------|
| Blk.-throated Gr. Warbler | -1.88 | | | |
| Subcanopy cover | -0.07 | 0.93 | -3.98 | <0.001 |
| Live Oak cover | 0.18 | 1.20 | 3.39 | 0.001 |
| Canopy cover | 0.02 | 1.02 | 2.69 | 0.007 |
| Hermit Warbler | -2.75 | | | |
| Subcanopy cover | 0.03 | 1.03 | 3.20 | 0.001 |
| Live Oak cover | -0.11 | 0.90 | -2.17 | 0.030 |
| Snag density index | 0.43 | 1.54 | 1.65 | 0.100 |
| Western Tanager | -2.52 | | | |
| Live Oak cover | 0.12 | 1.12 | 3.48 | 0.001 |
| Snag density index | 0.52 | 1.69 | 2.10 | 0.035 |
| Spotted Towhee | -1.67 | | | |
| Snag density index | 1.29 | 3.62 | 3.13 | 0.002 |
| Black Oak cover | 0.10 | 1.10 | 3.07 | 0.002 |
| Downed wood index | -0.76 | 0.47 | -1.86 | 0.063 |
| Canopy cover | -0.02 | 0.98 | -1.78 | 0.075 |
| <i>Ceanothus</i> cover | 0.03 | 1.03 | 1.75 | 0.080 |
| Subcanopy cover | -0.02 | 0.98 | -1.71 | 0.088 |
| Black-headed Grosbeak | -2.34 | | | |
| Understory cover | 0.02 | 1.02 | 2.08 | 0.038 |
| Live Oak cover | 0.07 | 1.07 | 2.01 | 0.045 |
| Black Oak cover | 0.04 | 1.05 | 1.83 | 0.067 |

Table 40. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Montane Chaparral habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|-----------------|------------------------|-------------|------------|-----------------|----------|
| Fox Sparrow | | -2.05 | | | |
| | Understory cover | 0.03 | 1.03 | 2.63 | 0.009 |
| Dark-eyed Junco | | -0.33 | | | |
| | <i>Ceanothus</i> cover | -0.04 | 0.96 | -1.95 | 0.052 |

Table 41. Results of stepwise logistic regression predicting the occurrence of commonly detected species in White Fir Mixed Conifer habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | P |
|------------------------|------------------------|-------------|------------|-----------------|-------|
| Dusky Flycatcher | | -0.88 | | | |
| | <i>Ceanothus</i> cover | 0.08 | 1.08 | 3.23 | 0.001 |
| | Snag density index | -0.98 | 0.38 | -3.45 | 0.001 |
| | Running water index | -0.45 | 0.64 | -1.67 | 0.094 |
| Warbling Vireo | | -2.56 | | | |
| | <i>Ceanothus</i> cover | 0.07 | 1.08 | 3.03 | 0.002 |
| | Live Oak cover | 0.15 | 1.16 | 2.35 | 0.019 |
| Steller's Jay | | -3.91 | | | |
| | Downed wood index | 1.02 | 2.77 | 1.95 | 0.051 |
| Mountain Chickadee | | -1.83 | | | |
| | Snag density index | 0.59 | 1.81 | 2.33 | 0.020 |
| | Subcanopy cover | -0.01 | 0.99 | -1.92 | 0.055 |
| | Live Oak cover | 0.07 | 1.08 | 1.77 | 0.077 |
| | <i>Ceanothus</i> cover | 0.04 | 1.04 | 1.67 | 0.096 |
| Red-breasted Nuthatch | | -2.45 | | | |
| | Running water index | -0.98 | 0.38 | -1.81 | 0.071 |
| | Subcanopy cover | 0.02 | 1.02 | 1.69 | 0.091 |
| Brown Creeper | | -0.90 | | | |
| | Subcanopy cover | -0.02 | 0.98 | -2.36 | 0.018 |
| Golden-crowned Kinglet | | -0.035 | | | |
| | Running water index | -0.32 | 0.73 | -2.68 | 0.007 |
| | Canopy cover | 0.02 | 1.02 | 2.47 | 0.013 |
| | Live Oak cover | -2.16 | 0.81 | -2.28 | 0.023 |
| Nashville Warbler | | -2.16 | | | |
| | Live Oak cover | 0.16 | 1.17 | 2.08 | 0.038 |
| | Black Oak cover | 0.09 | 1.10 | 1.82 | 0.070 |
| Yellow-rumped Warbler | | -0.91 | | | |
| | Running water index | -0.59 | 0.55 | -3.00 | 0.003 |
| | Subcanopy cover | 0.02 | 1.02 | -3.01 | 0.003 |
| | Understory cover | -0.02 | 0.98 | -2.31 | 0.021 |

Table 41, cont.

| | | | | |
|--------------------------|-------|------|-------|--------|
| Hermit Warbler | -2.00 | | | |
| Running water index | -0.41 | 0.66 | -2.18 | 0.029 |
| <i>Ceanothus</i> cover | 0.03 | 1.03 | 1.58 | 0.113 |
| Western Tanager | -2.71 | | | |
| Snag density index | 0.56 | 1.75 | 1.76 | 0.078 |
| Extent of standing water | 0.82 | 2.28 | 1.34 | 0.181 |
| Fox Sparrow | -2.01 | | | |
| <i>Ceanothus</i> cover | 0.12 | 1.13 | 3.52 | <0.001 |
| Understory cover | 0.03 | 1.03 | 3.00 | 0.003 |
| Snag density index | -0.87 | 0.42 | -2.58 | 0.010 |
| Extent of standing water | -0.92 | 0.40 | -2.04 | 0.042 |

Table 42. Results of stepwise logistic regression predicting the occurrence of commonly detected species in White Fir habitat.

| Species | | | | |
|------------------------|-------------|------------|-----------------|----------|
| Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
| Golden-crowned Kinglet | -0.94 | | | |
| Subcanopy cover | 0.06 | 1.06 | 2.12 | 0.034 |

Table 43. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Jeffrey Pine habitat.

| Species | | | | |
|------------------------|-------------|------------|-----------------|----------|
| Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
| Mountain Chickadee | -1.80 | | | |
| Snag density index | 0.84 | 2.31 | 2.55 | 0.011 |
| Running water index | -0.53 | 0.59 | -1.84 | 0.066 |
| Nashville Warbler | -2.27 | | | |
| Black Oak cover | 0.32 | 1.38 | 3.03 | 0.002 |
| Running water index | 0.62 | 1.85 | 2.62 | 0.009 |
| <i>Ceanothus</i> cover | 0.13 | 1.14 | 2.59 | 0.010 |
| Fox Sparrow | -3.71 | | | |
| Understory cover | 0.08 | 1.09 | 4.73 | <0.001 |
| Black Oak cover | -0.50 | 0.61 | -2.01 | 0.044 |

Table 44. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Jeffrey Pine-Red Fir habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|-----------------------|------------------------|-------------|------------|-----------------|----------|
| Mountain Chickadee | | 0.58 | | | |
| | Canopy cover | -0.04 | 0.96 | -2.76 | 0.006 |
| Yellow-rumped Warbler | | -0.97 | | | |
| | Canopy cover | 0.05 | 1.05 | 3.18 | 0.001 |
| | Snag density index | -1.08 | 0.34 | -2.37 | 0.018 |
| Dark-eyed Junco | | -0.47 | | | |
| | <i>Ceanothus</i> cover | 0.10 | 1.11 | 1.85 | 0.065 |

Table 45. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Red Fir habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|------------------------|--------------------------|-------------|------------|-----------------|----------|
| Dusky Flycatcher | | 0.87 | | | |
| | Running water index | -0.76 | 0.47 | -2.30 | 0.022 |
| | Downed wood index | -0.66 | 0.52 | -2.27 | 0.023 |
| | Subcanopy cover | -0.03 | 0.97 | -1.87 | 0.061 |
| | Canopy cover | -0.02 | 0.98 | -1.50 | 0.134 |
| Red-breasted Nuthatch | | -2.18 | | | |
| | Running water index | -0.59 | 0.56 | -2.09 | 0.037 |
| | Subcanopy cover | 0.02 | 1.02 | 1.99 | 0.047 |
| Brown Creeper | | -2.79 | | | |
| | Understory cover | 0.02 | 1.02 | 2.81 | 0.005 |
| | Downed wood index | 0.53 | 1.71 | 1.79 | 0.071 |
| Golden-crowned Kinglet | | -1.40 | | | |
| | Canopy cover | 0.03 | 1.03 | 3.90 | <0.001 |
| | Snag density index | 0.43 | 1.53 | 3.27 | 0.024 |
| | Extent of standing water | 0.84 | 2.31 | 1.38 | 0.168 |
| Yellow-rumped Warbler | | -0.70 | | | |
| | Subcanopy cover | 0.02 | 1.02 | 2.22 | 0.027 |
| | Running water index | -0.30 | 0.74 | -2.05 | 0.040 |
| Western Tanager | | -1.21 | | | |
| | Canopy cover | -0.02 | 0.98 | -2.10 | 0.036 |
| Fox Sparrow | | 0.40 | | | |
| | Downed wood index | -1.20 | 0.33 | -3.39 | 0.001 |
| | Canopy cover | 0.03 | 0.98 | -2.12 | 0.034 |

Table 46. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Lodgepole Pine habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|-----------------------|--------------------------|-------------|------------|-----------------|----------|
| Dusky Flycatcher | | -1.21 | | | |
| | Running water index | -0.50 | 0.61 | -3.46 | 0.001 |
| Mountain Chickadee | | -1.05 | | | |
| | Running water index | -0.32 | 0.73 | -3.0 | 0.003 |
| | Snag density index | 0.30 | 1.35 | 2.06 | 0.040 |
| Brown Creeper | | -4.65 | | | |
| | Downed wood index | 1.05 | 2.87 | 3.20 | 0.001 |
| | Extent of standing water | 0.33 | 1.39 | 2.26 | 0.024 |
| | Canopy cover | 0.02 | 1.02 | 2.25 | 0.025 |
| Yellow-rumped Warbler | | -1.84 | | | |
| | Canopy cover | 0.03 | 1.03 | 4.29 | <0.001 |
| | Downed wood | 0.47 | 1.60 | 2.76 | 0.006 |
| | Snag density index | 0.28 | 1.32 | 1.79 | 0.073 |
| Fox Sparrow | | -2.72 | | | |
| | Understory cover | 0.05 | 1.05 | 4.27 | <0.001 |
| | Subcanopy cover | -0.04 | 0.96 | -2.64 | 0.008 |
| | Running water index | -0.56 | 0.57 | -2.31 | 0.021 |
| Dark-eyed Junco | | -0.67 | | | |
| | Subcanopy cover | 0.02 | 1.02 | 3.11 | 0.002 |
| | Extent of standing water | 0.31 | 1.37 | 2.07 | 0.035 |
| Cassin's Finch | | -1.12 | | | |
| | Understory cover | -0.04 | 0.97 | -3.50 | <0.001 |
| | Subcanopy cover | 0.02 | 1.02 | 1.91 | 0.056 |

Table 47. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Mountain Hemlock habitat.

| Species | Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
|-----------------------|-------------------|-------------|------------|-----------------|----------|
| Mountain Chickadee | | -0.259 | | | |
| | Understory cover | -0.06 | 0.94 | -2.75 | 0.006 |
| | Canopy cover | 0.02 | 1.02 | 1.81 | 0.071 |
| Yellow-rumped Warbler | | -1.53 | | | |
| | Downed wood index | 0.55 | 1.74 | 1.69 | 0.090 |
| | Subcanopy cover | 0.02 | 1.02 | 1.63 | 0.103 |
| Cassin's Finch | | -1.51 | | | |
| | Understory cover | 0.02 | 1.02 | 1.65 | 0.099 |

Table 48. Results of stepwise logistic regression predicting the occurrence of commonly detected species in Subalpine/Alpine Meadow habitat.

| Species | | | | |
|--------------------------|-------------|------------|-----------------|----------|
| Habitat variables | Coefficient | Odds ratio | <i>t</i> -ratio | <i>p</i> |
| Yellow-rumped Warbler | -2.38 | | | |
| Downed wood index | 1.12 | 3.06 | 3.36 | 0.001 |
| Subcanopy cover | 0.07 | 1.07 | 1.99 | 0.046 |
| White-crowned Sparrow | -4.25 | | | |
| Running water index | 0.86 | 2.35 | 3.67 | <0.001 |
| Extent of standing water | 1.76 | 5.78 | 2.85 | 0.004 |
| Understory cover | 0.06 | 1.07 | 2.33 | 0.020 |
| Dark-eyed Junco | -1.69 | | | |
| Subcanopy cover | 0.15 | 1.16 | 3.73 | <0.001 |
| Snag density index | -1.76 | 0.17 | -3.10 | 0.002 |
| Downed wood index | 0.93 | 2.52 | 2.19 | 0.030 |

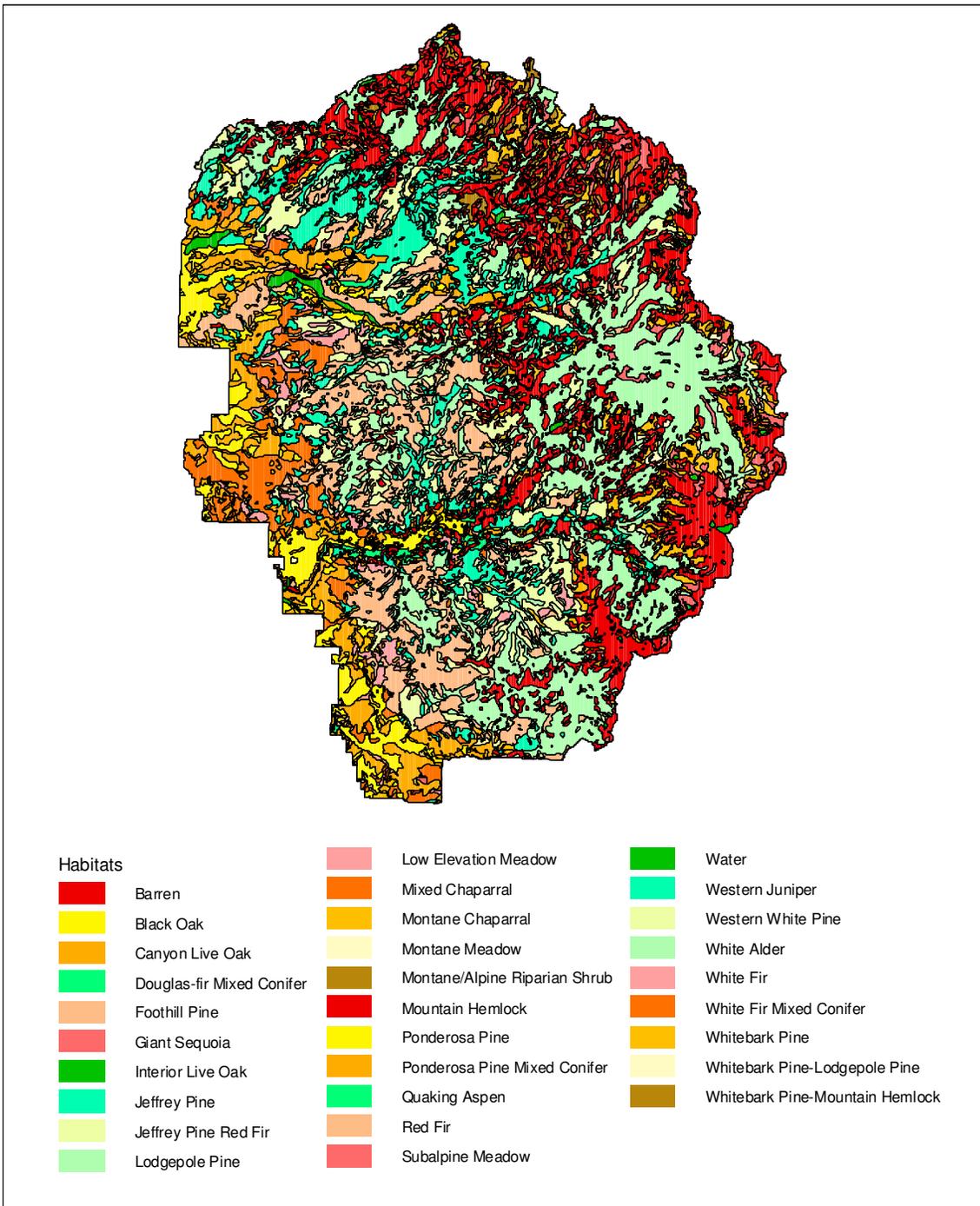


Figure 1. Yosemite habitat classifications system utilized for this project.

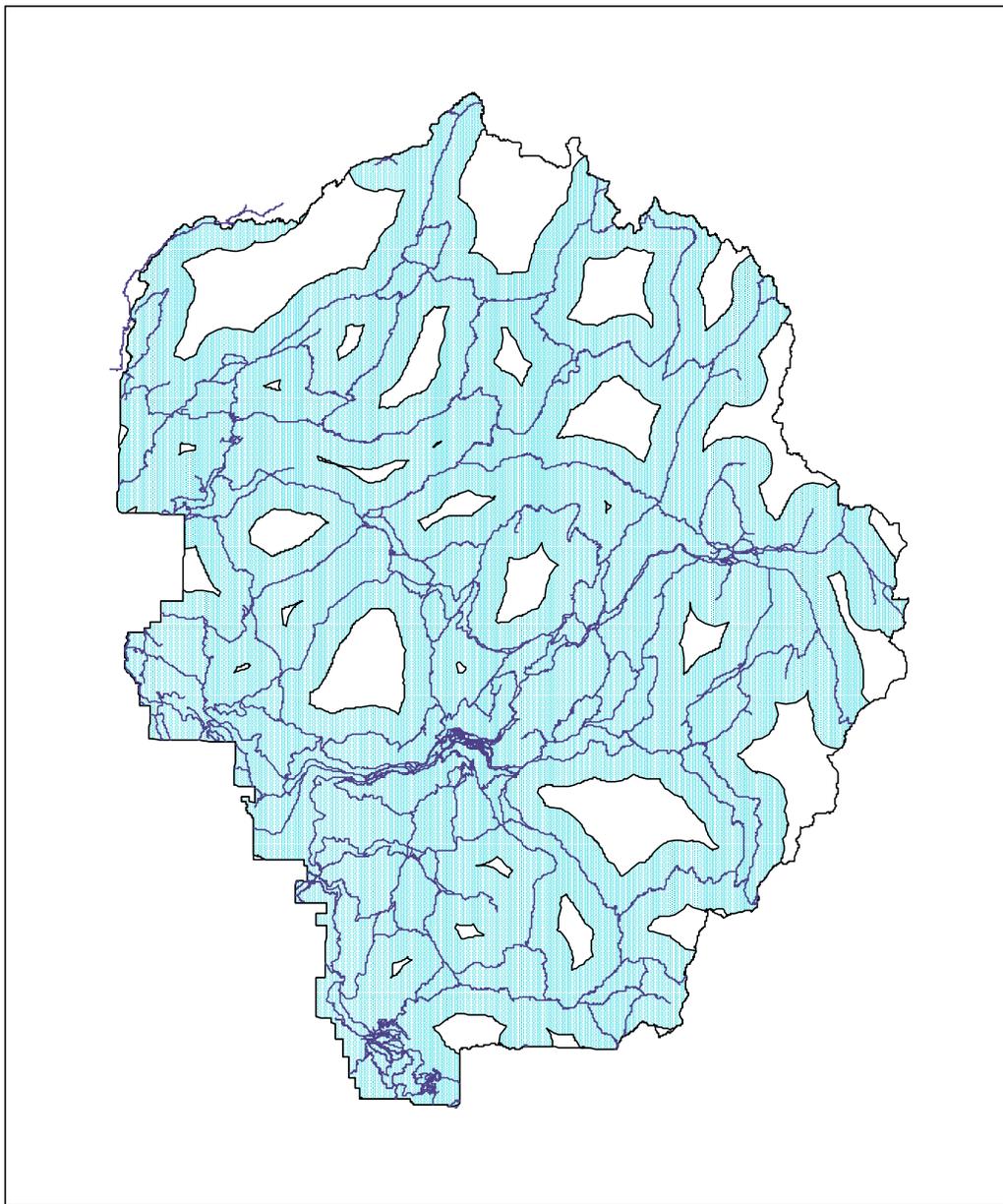


Figure 2. Blue shading indicates areas of the park within 2 km of a road or trail; roads and trails are represented with solid blue lines.

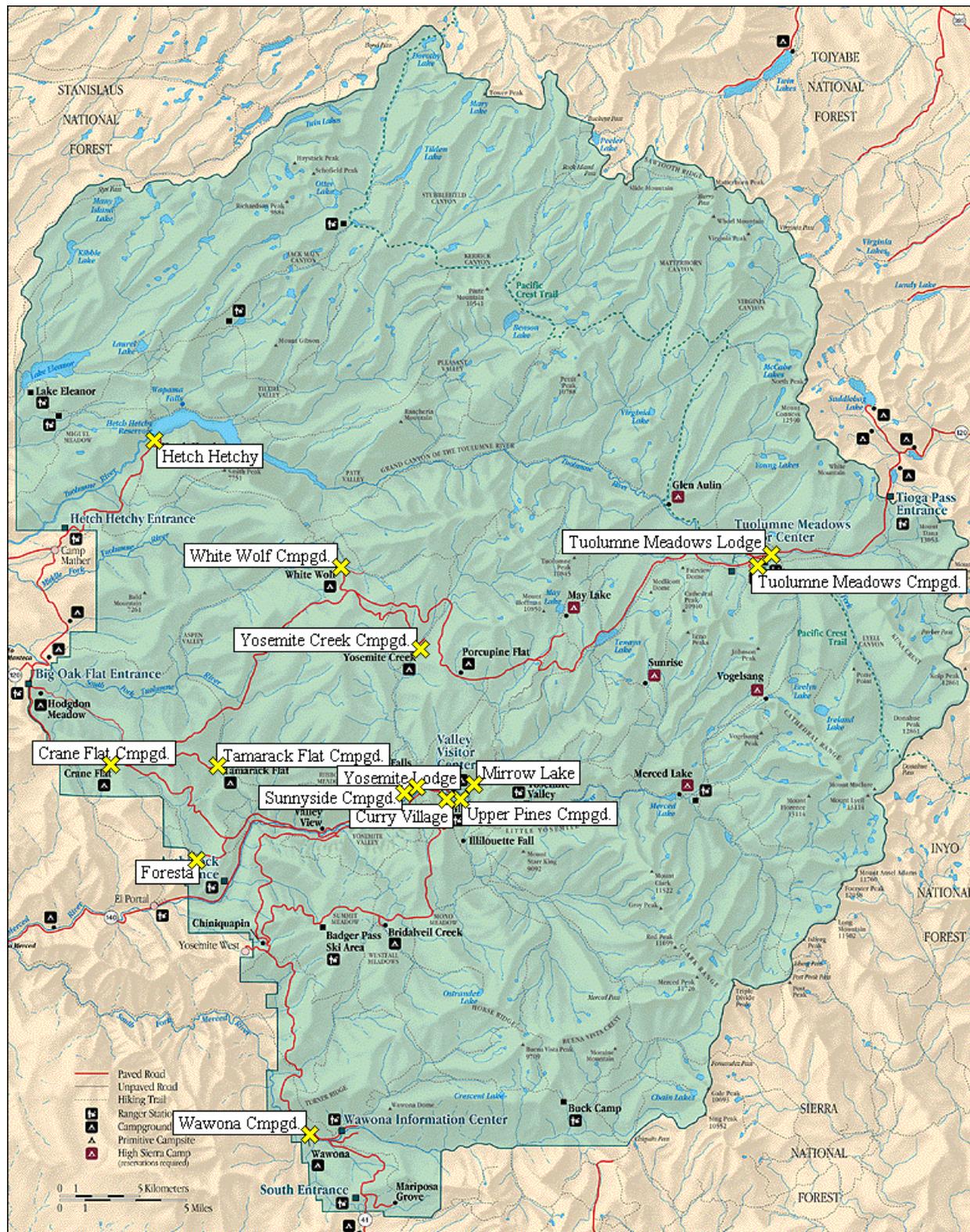


Figure 3. Developed area survey sites.

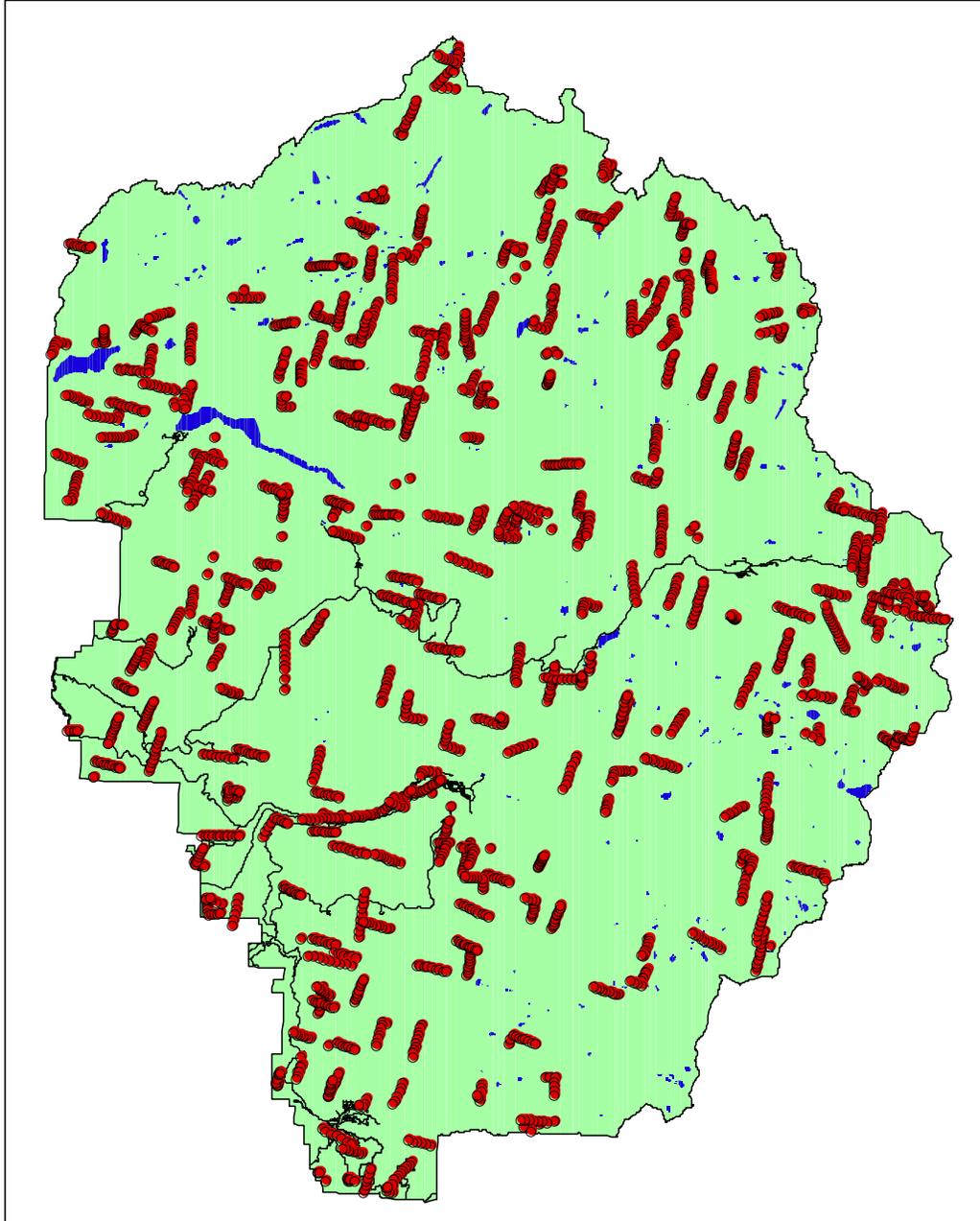


Figure 4. Point count locations throughout the park. Montane meadow point counts, which employed a somewhat different methodology, are not shown.

Habitat: Recent Burn

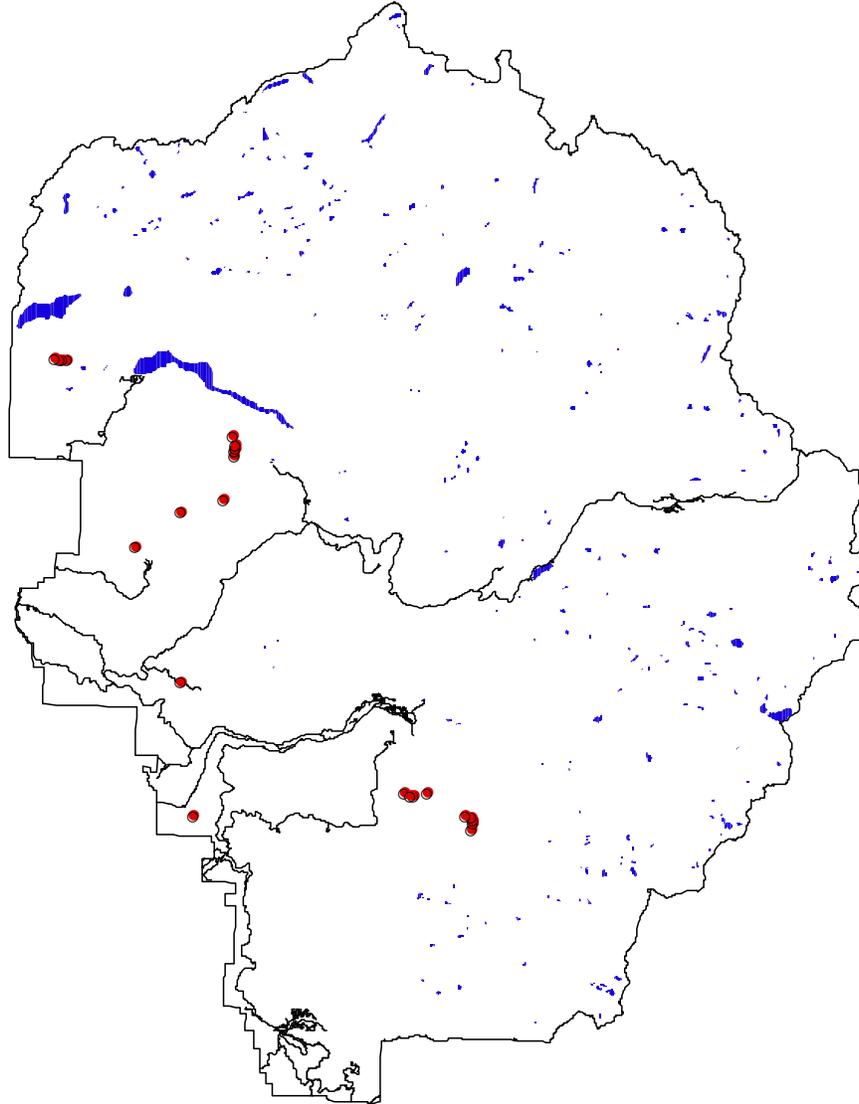


Figure 5. Red circles indicate point count locations at which the observer classified the habit as 'Recent Burn' a category not included in the park's GIS-based habitat map.

Habitat: Mixed Chaparral

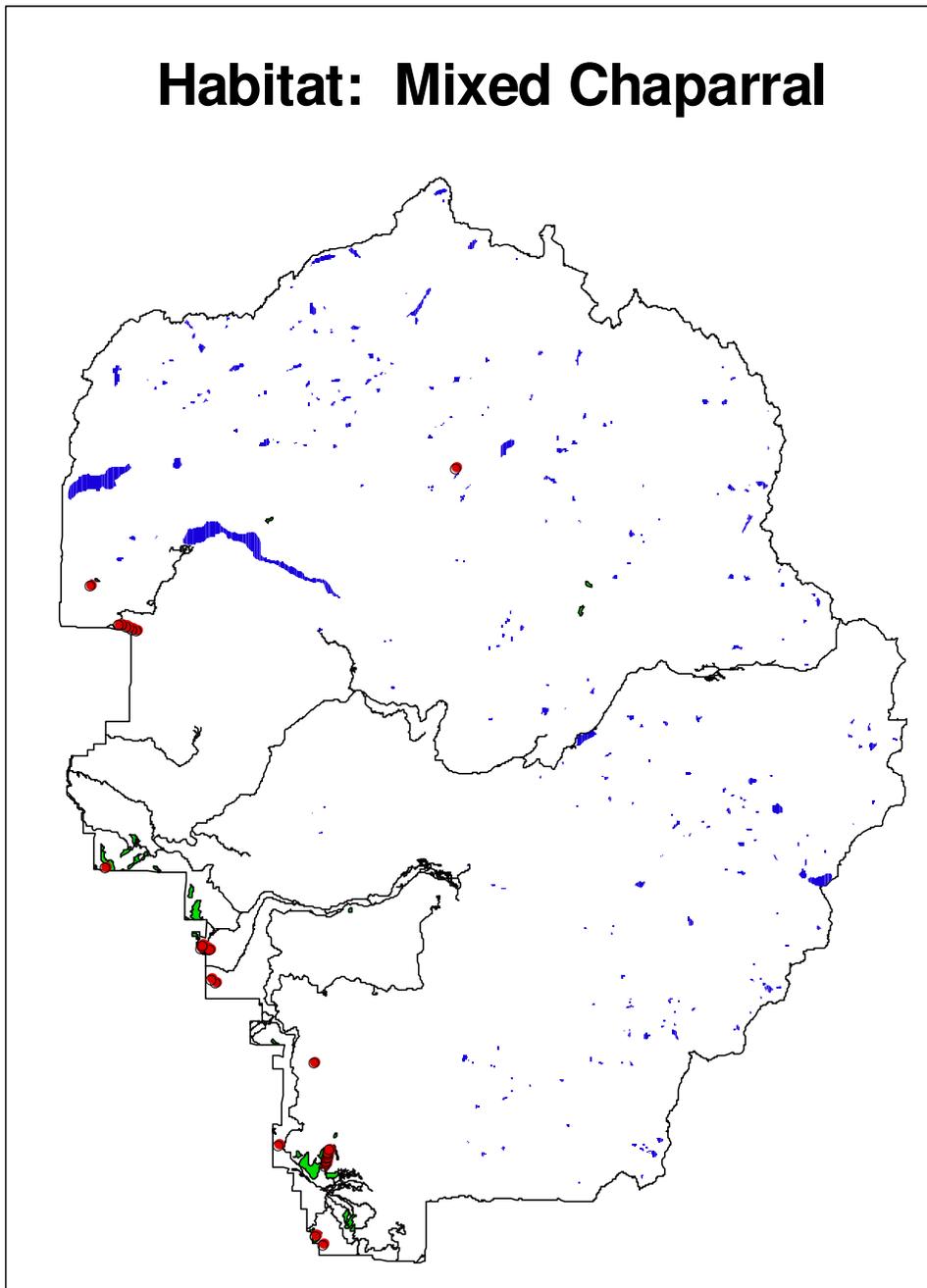


Figure 6. Green shading indicates areas mapped as 'Mixed Chaparral' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Mixed Chaparral'.

Habitat: Foothill Pine

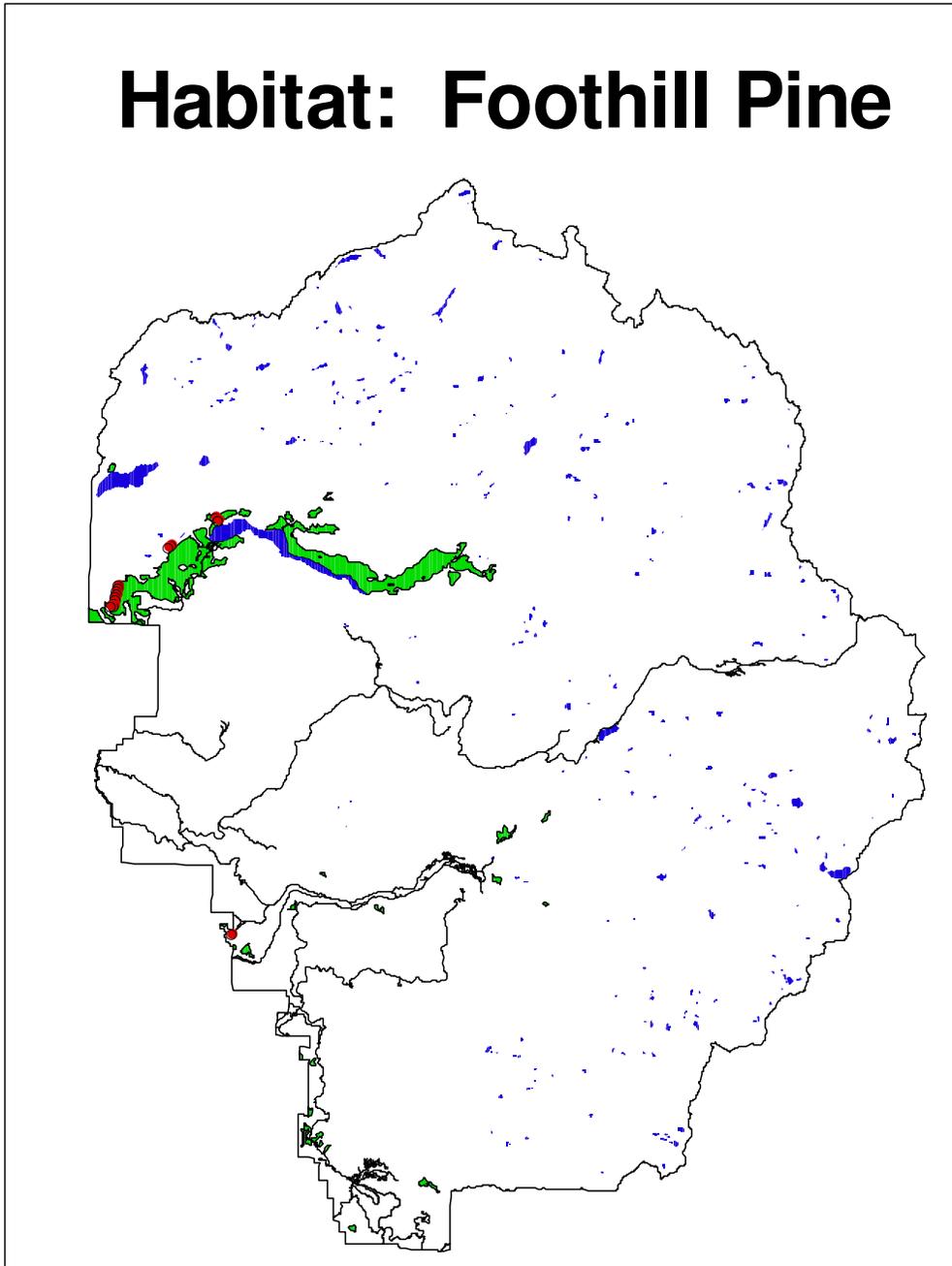


Figure 7. Green shading indicates areas mapped as 'Foothill Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Foothill Pine'.

Habitat: Interior Live Oak

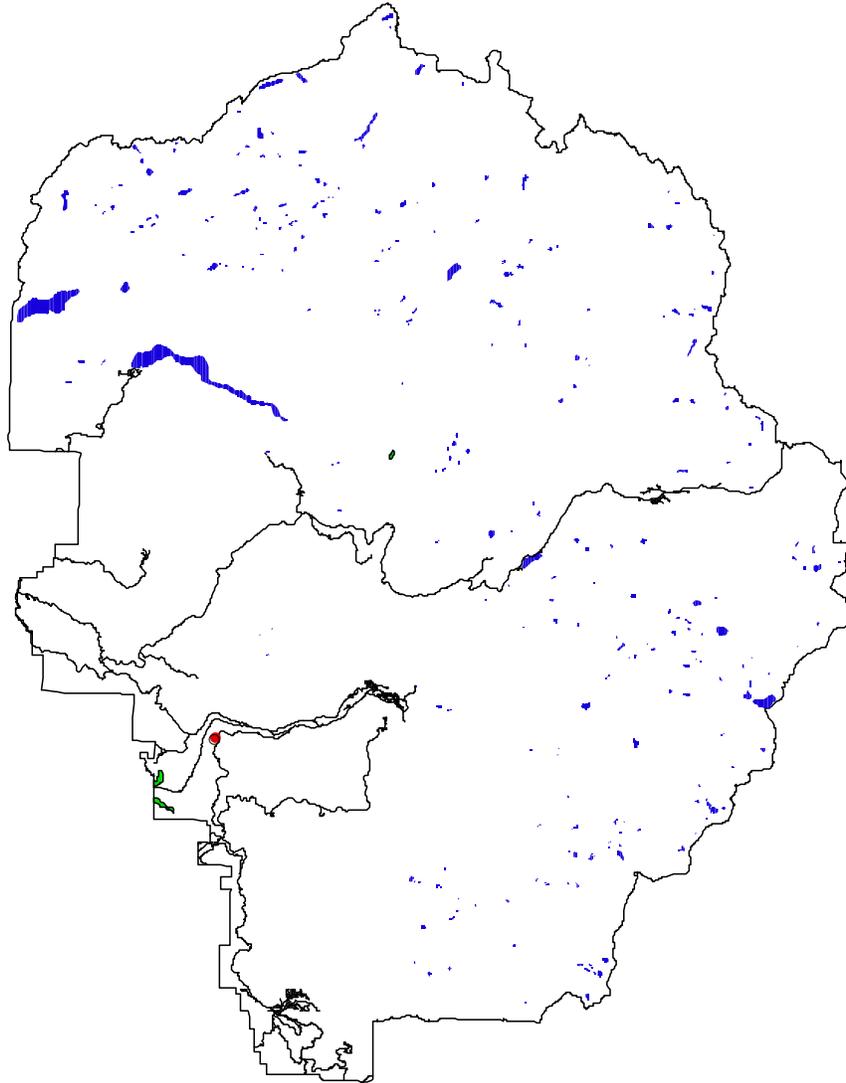


Figure 8. Green shading indicates areas mapped as 'Interior Live Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Interior Live Oak'.

Habitat: Canyon Live Oak

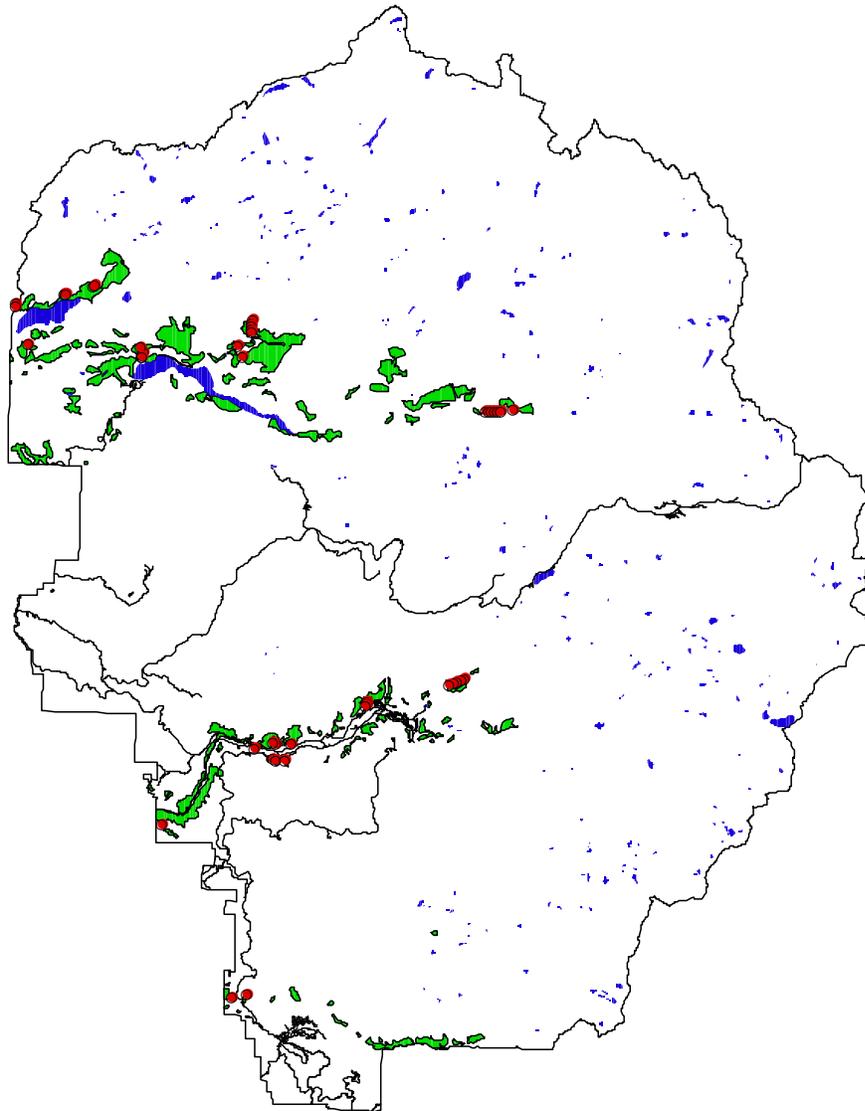


Figure 9. Green shading indicates areas mapped as 'Canyon Live Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Canyon Live Oak'. 109

Habitat: Jeffrey Pine

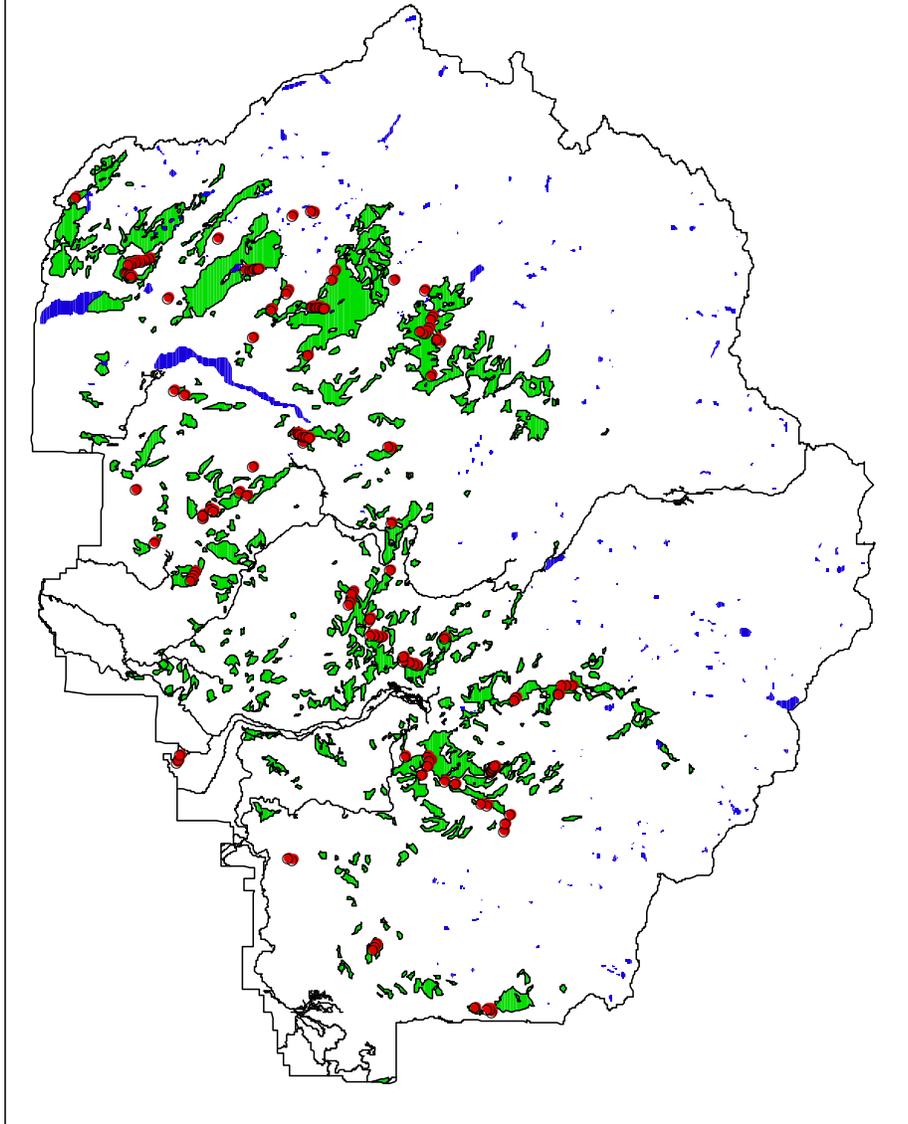


Figure 20. Green shading indicates areas mapped as 'Jeffrey Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine'.

Habitat: White Alder

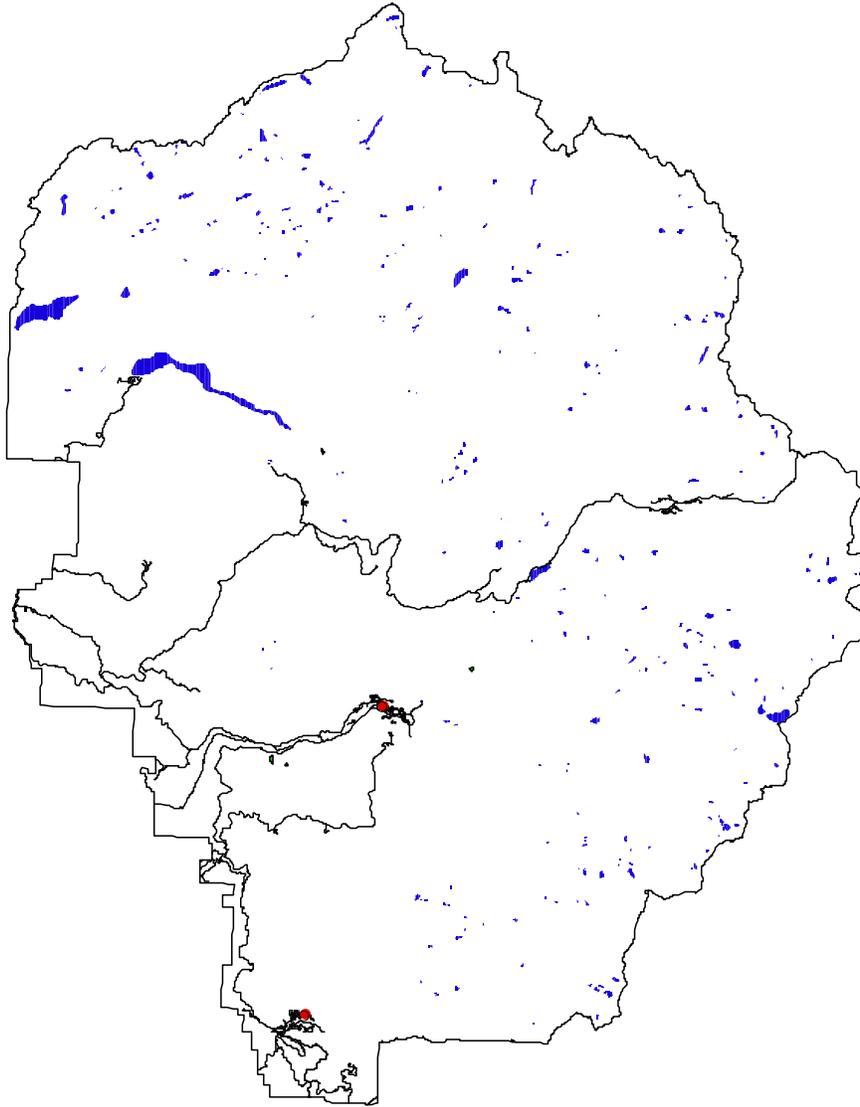


Figure 10. Green shading indicates areas mapped as 'White Alder' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Alder'.

Habitat: Ponderosa Pine

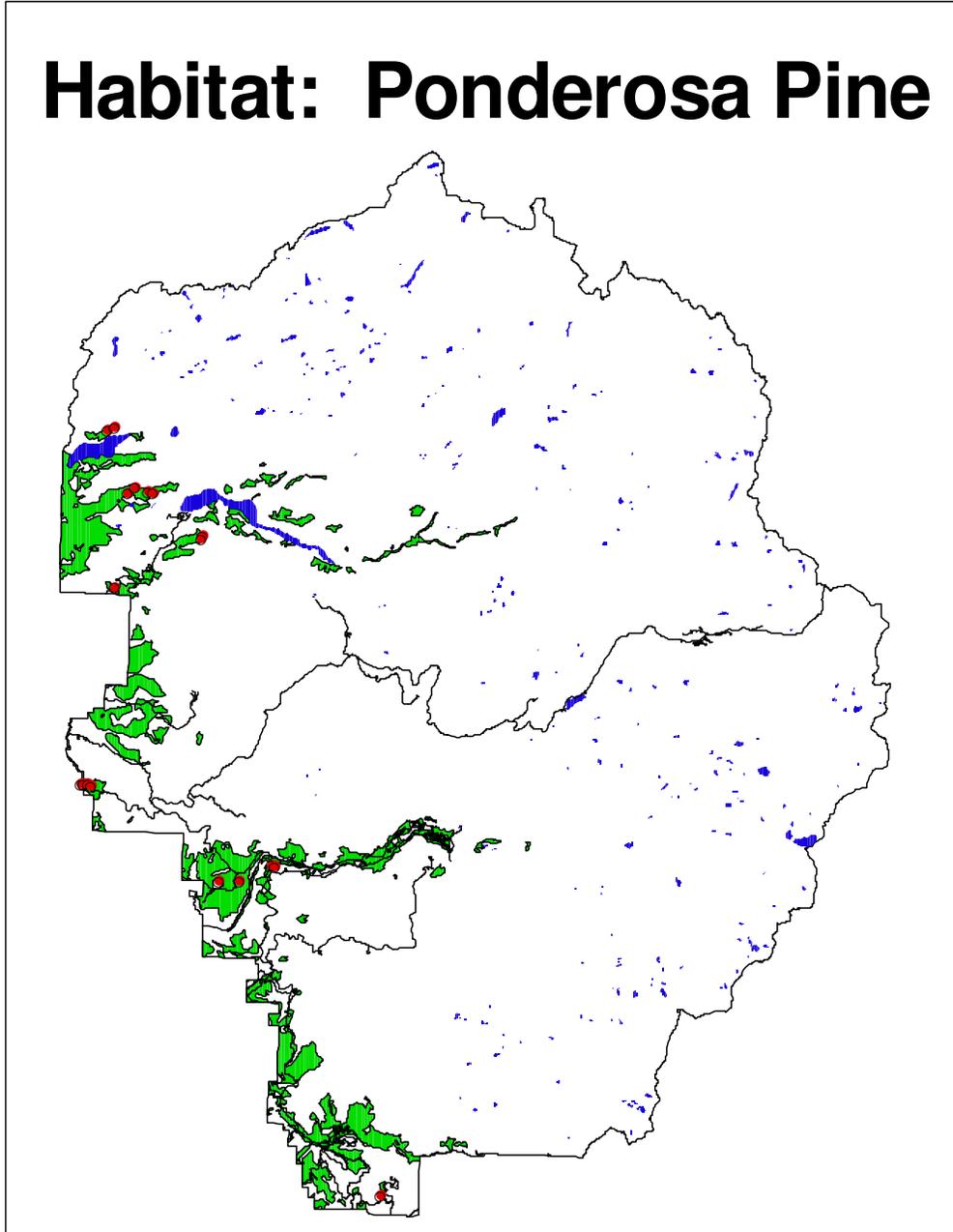


Figure 11. Green shading indicates areas mapped as 'Ponderosa Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Ponderosa Pine'.

Habitat: Ponderosa Pine Mixed Conifer

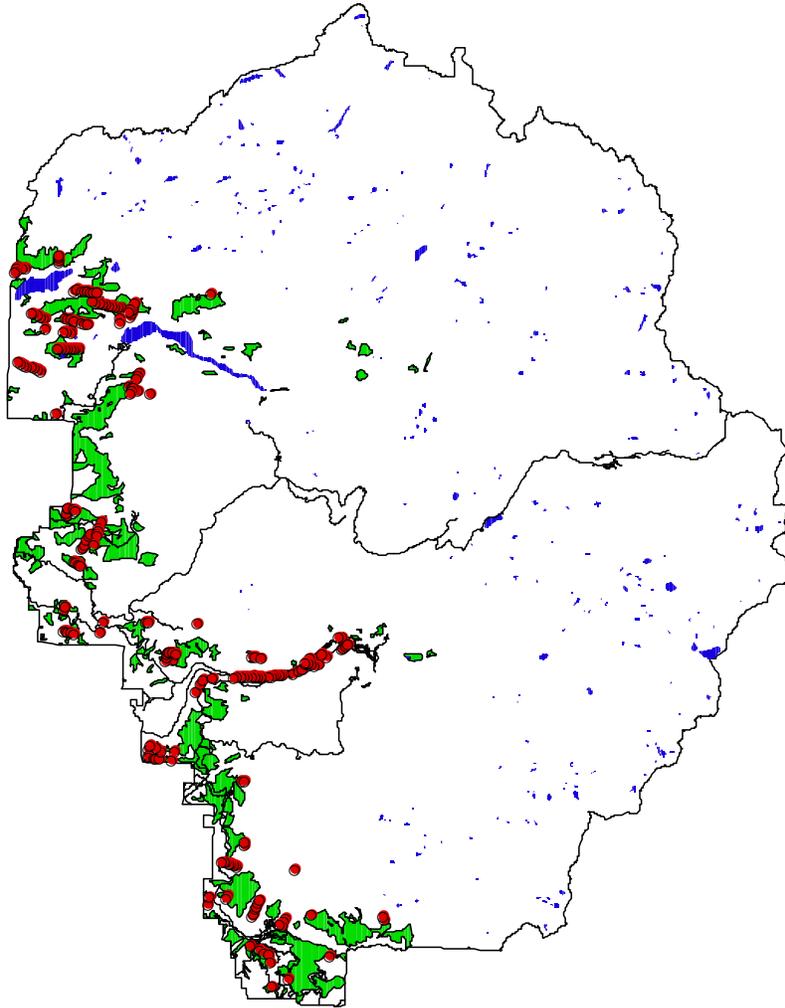


Figure 12. Green shading indicates areas mapped as 'Ponderosa Pine-Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Ponderosa Pine-Mixed Conifer'.

Habitat: Black Oak

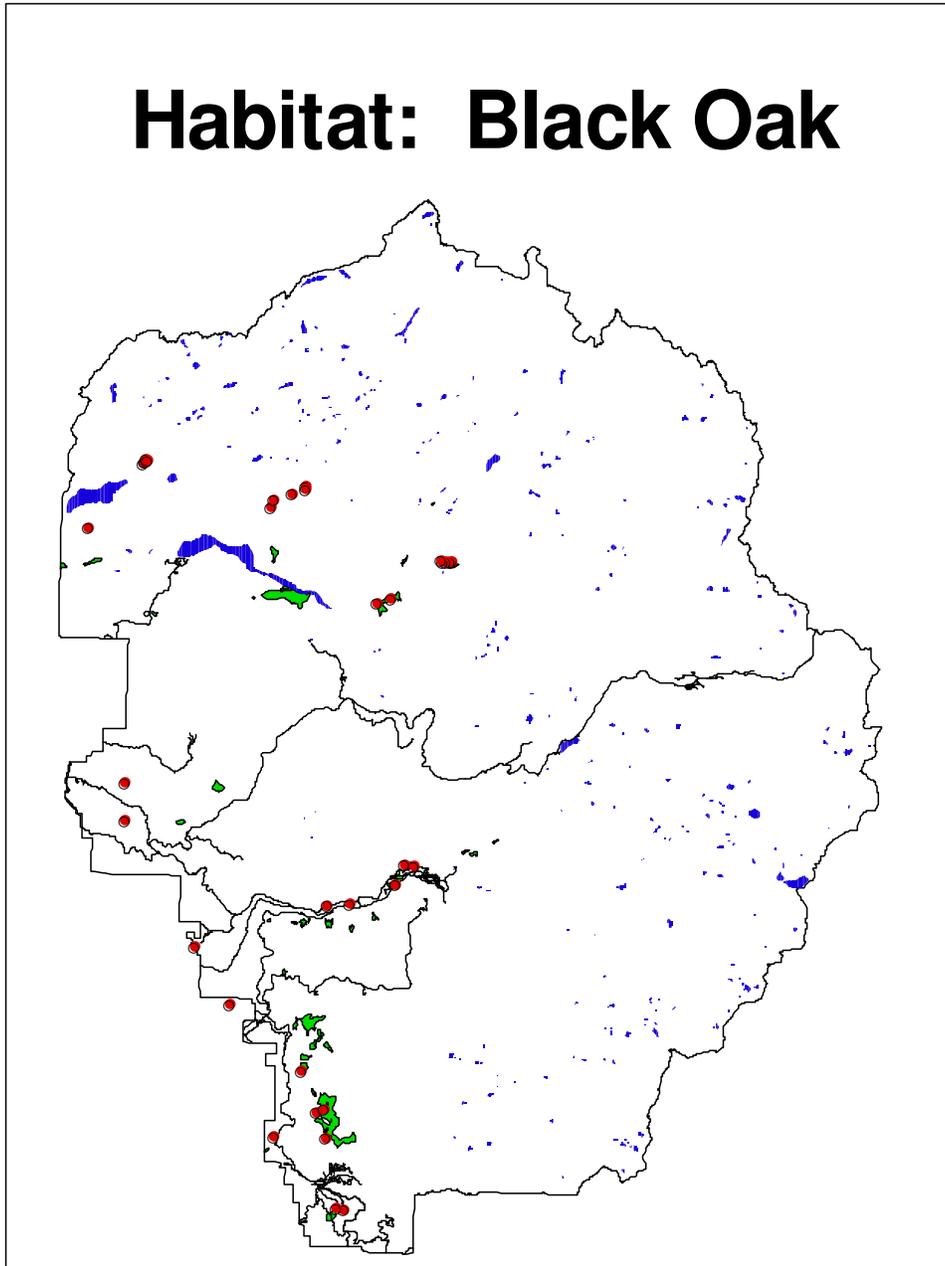


Figure 13. Green shading indicates areas mapped as 'Black Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Black Oak'.

Habitat: Montane Chaparral

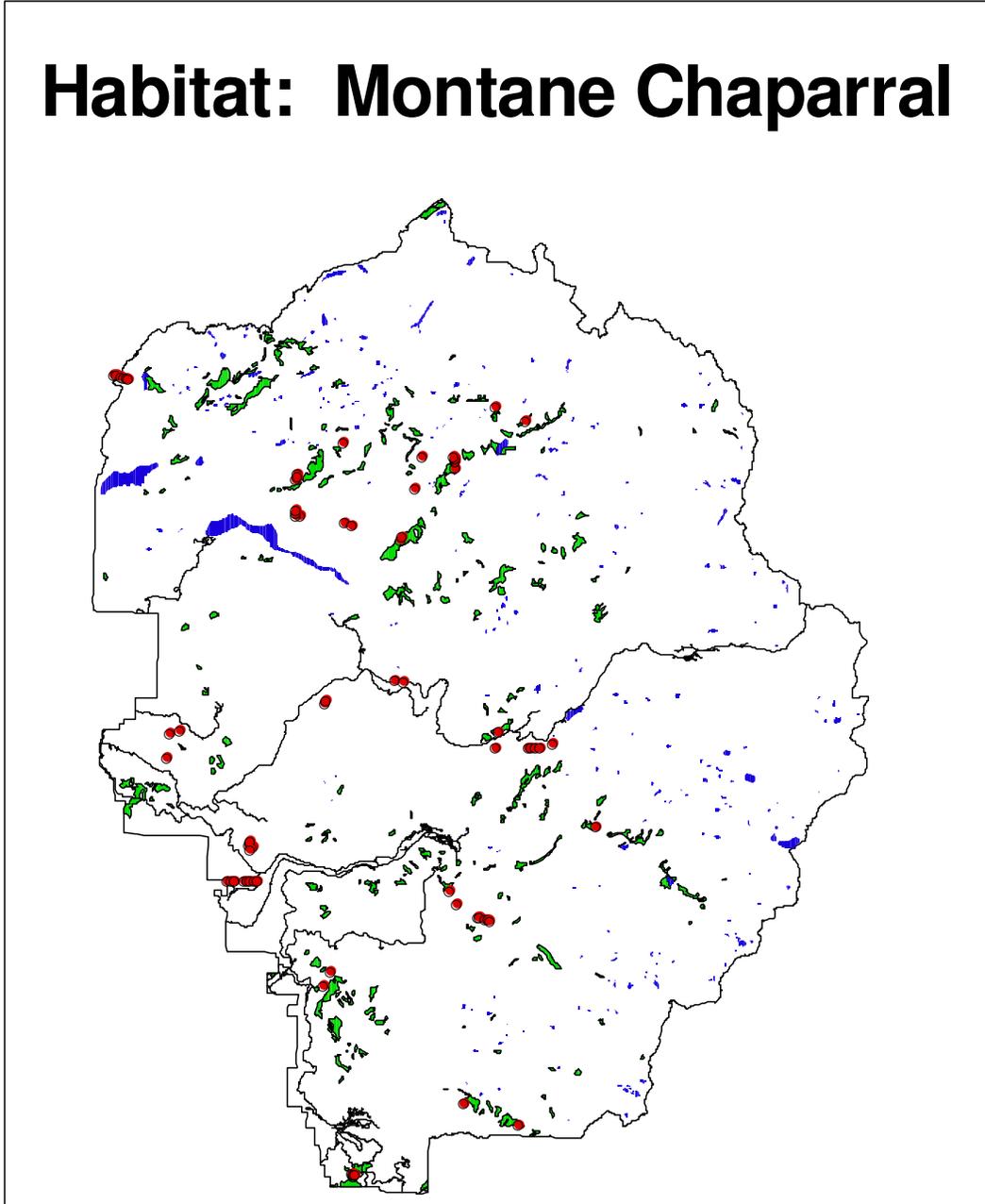


Figure 14. Green shading indicates areas mapped as 'Montane Chaparral' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Montane Chaparral'.

Habitat: Douglas-fir Mixed Conifer

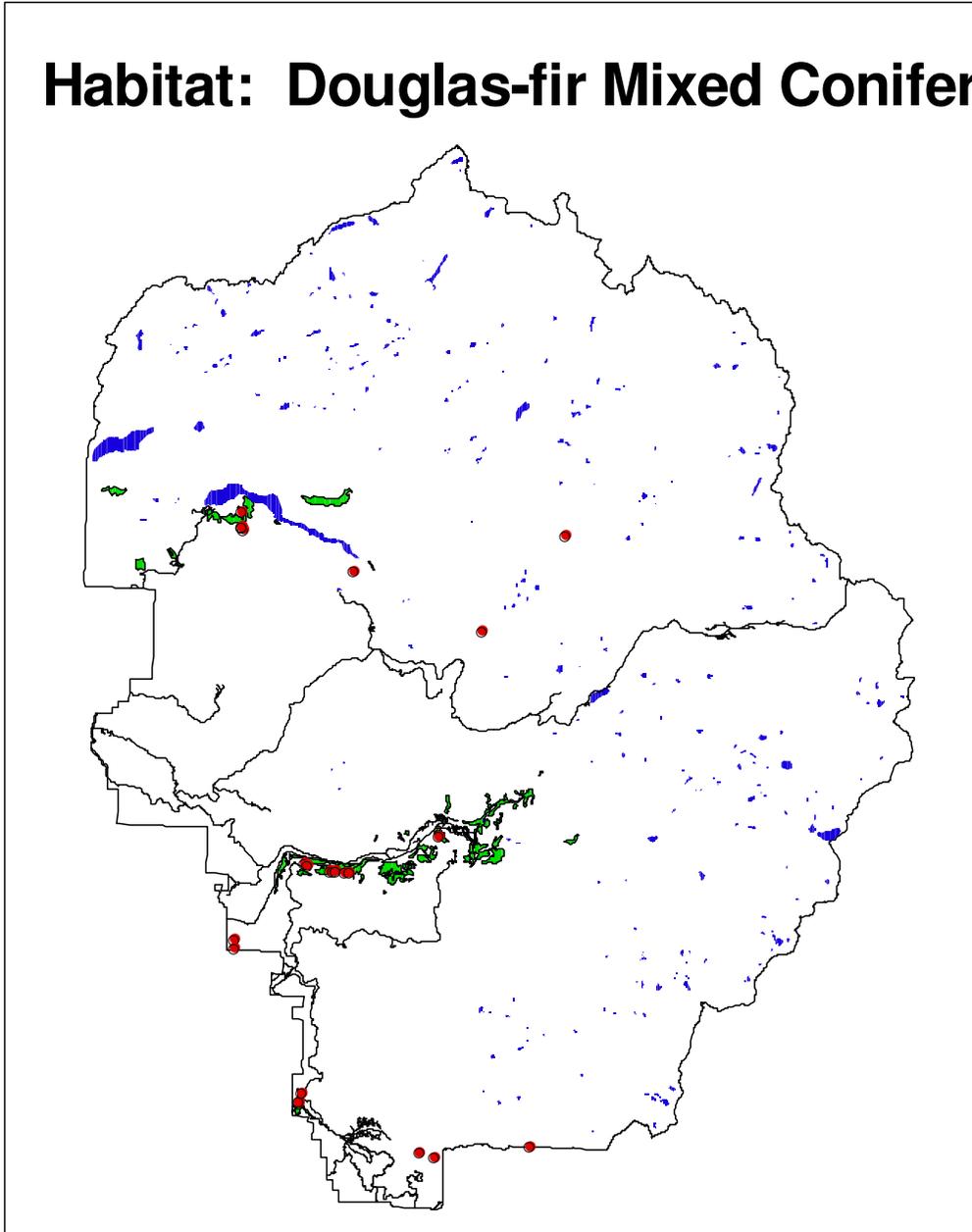


Figure 15. Green shading indicates areas mapped as 'Douglas-fir Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Douglas-fir Mixed Conifer'.

Habitat: Giant Sequoia

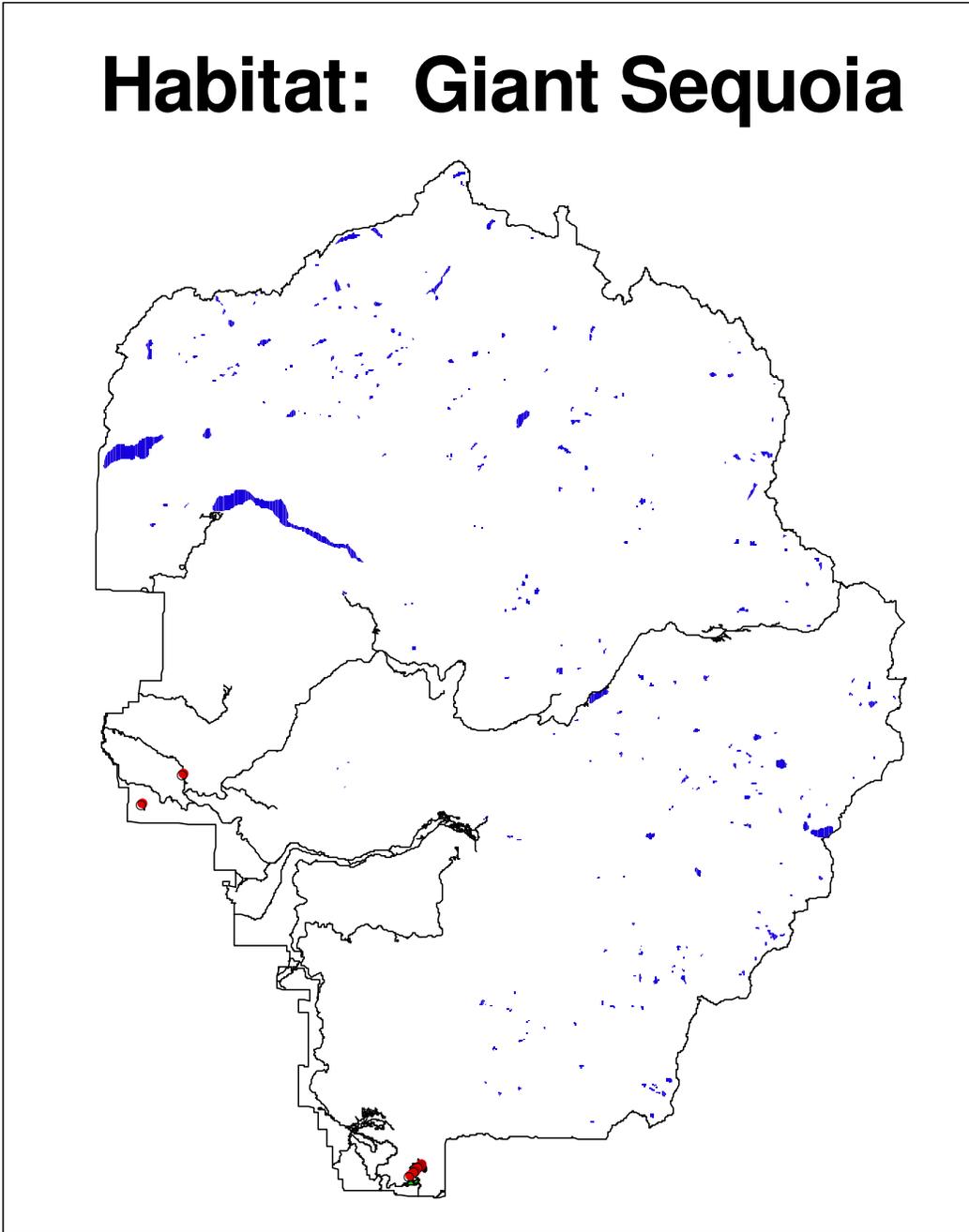


Figure 16. Green shading (largely obscured by red circles) indicates areas mapped as 'Giant Sequoia' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Giant Sequoia'.

Habitat: White Fir Mixed Conifer

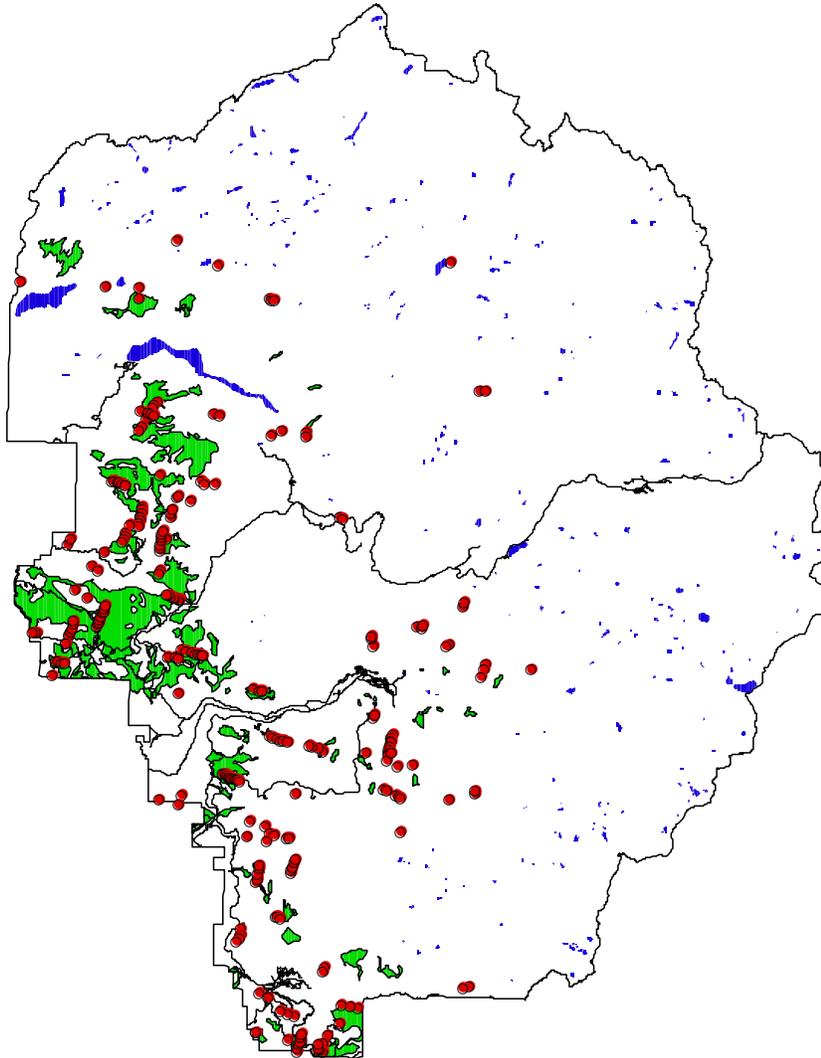


Figure 17. Green shading indicates areas mapped as 'White Fir Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Fir Mixed Conifer'.

Habitat: White Fir

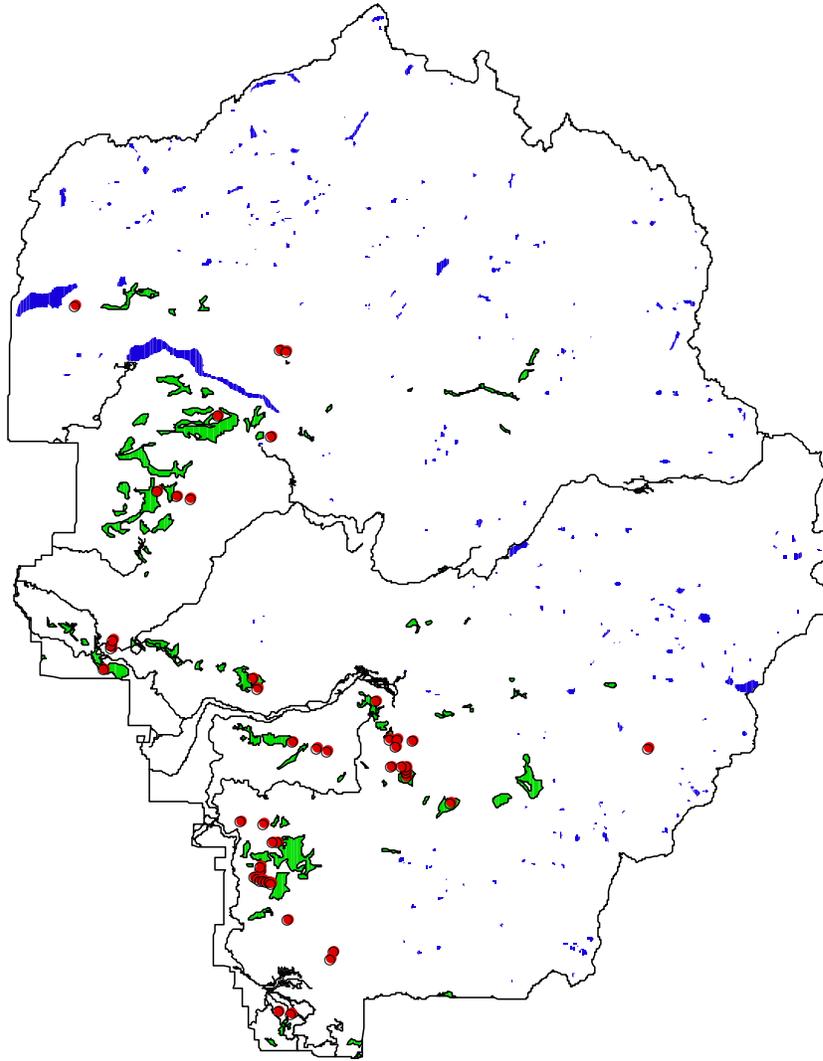


Figure 18. Green shading indicates areas mapped as 'White Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Fir'.

Habitat: Montane Meadow

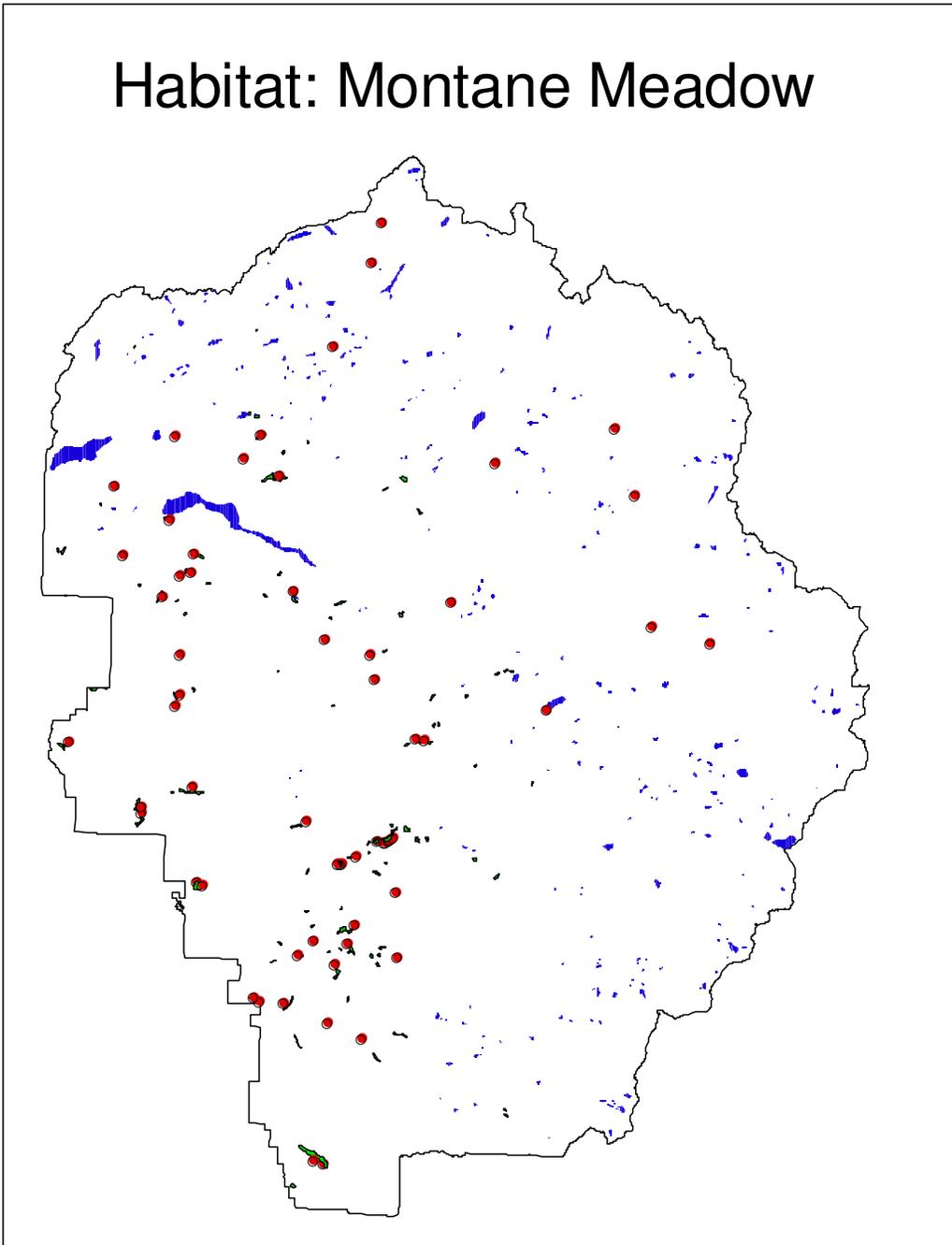


Figure 19. Green shading (largely obscured by red circles) indicates areas mapped as 'Montane Meadow on the park's GIS coverage. Red circles indicate meadows where multiple points counts were conducted. 119

Habitat: Whitebark Pine-Lodgepole Pine

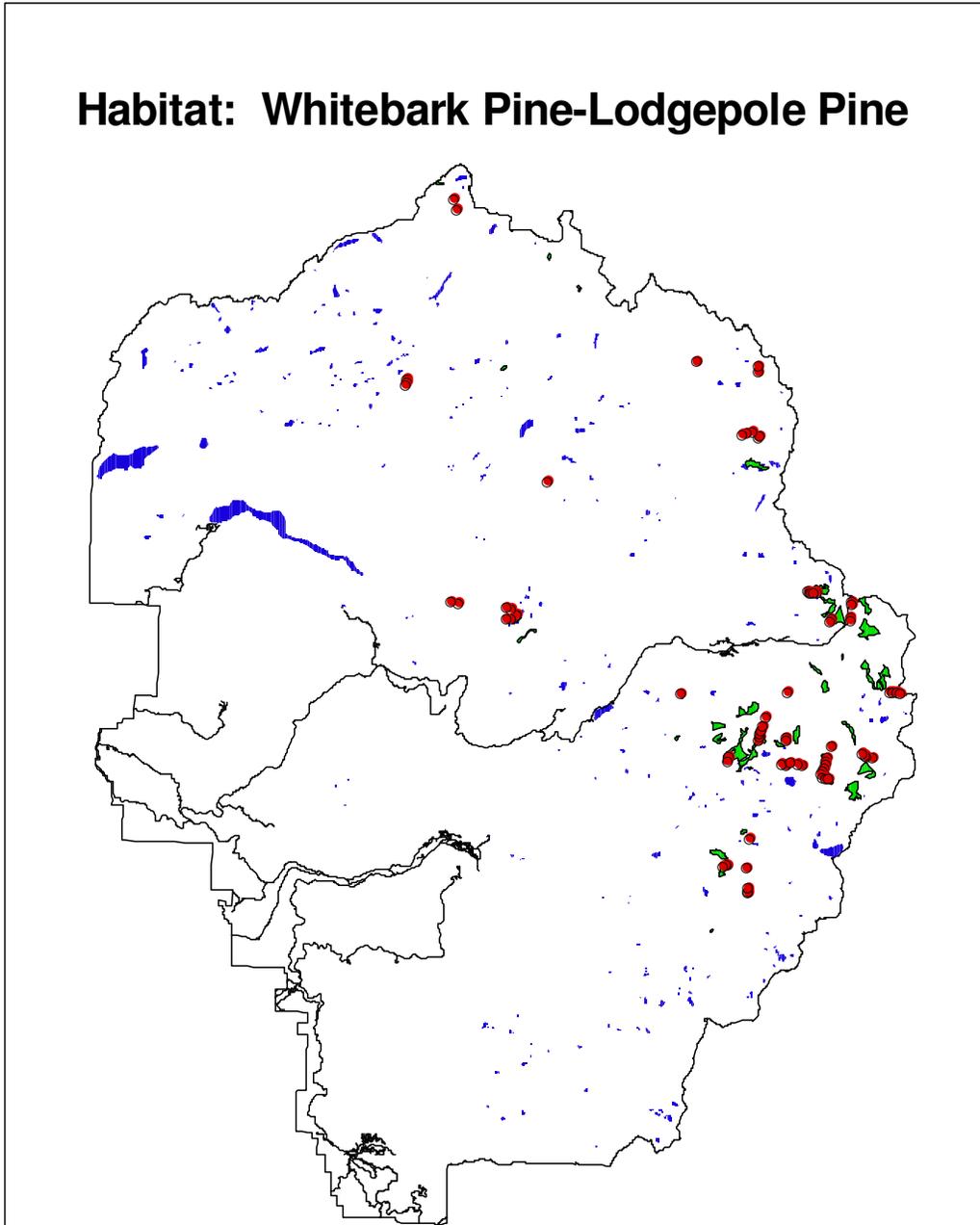


Figure 29. Green shading indicates areas mapped as 'Whitebark Pine-Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Lodgepole Pine'.

Habitat: Jeffrey Pine

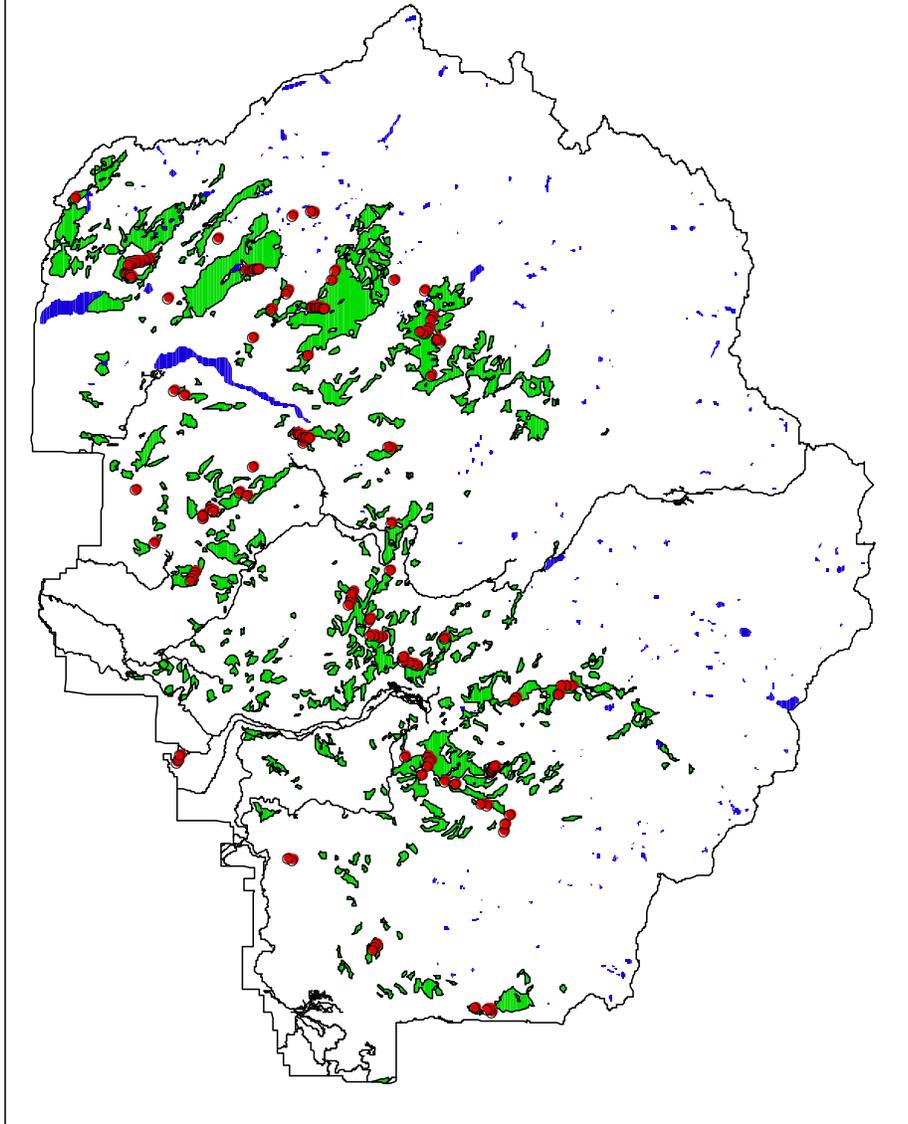


Figure 20. Green shading indicates areas mapped as 'Jeffrey Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine'.

Habitat: Jeffrey Pine-Red Fir

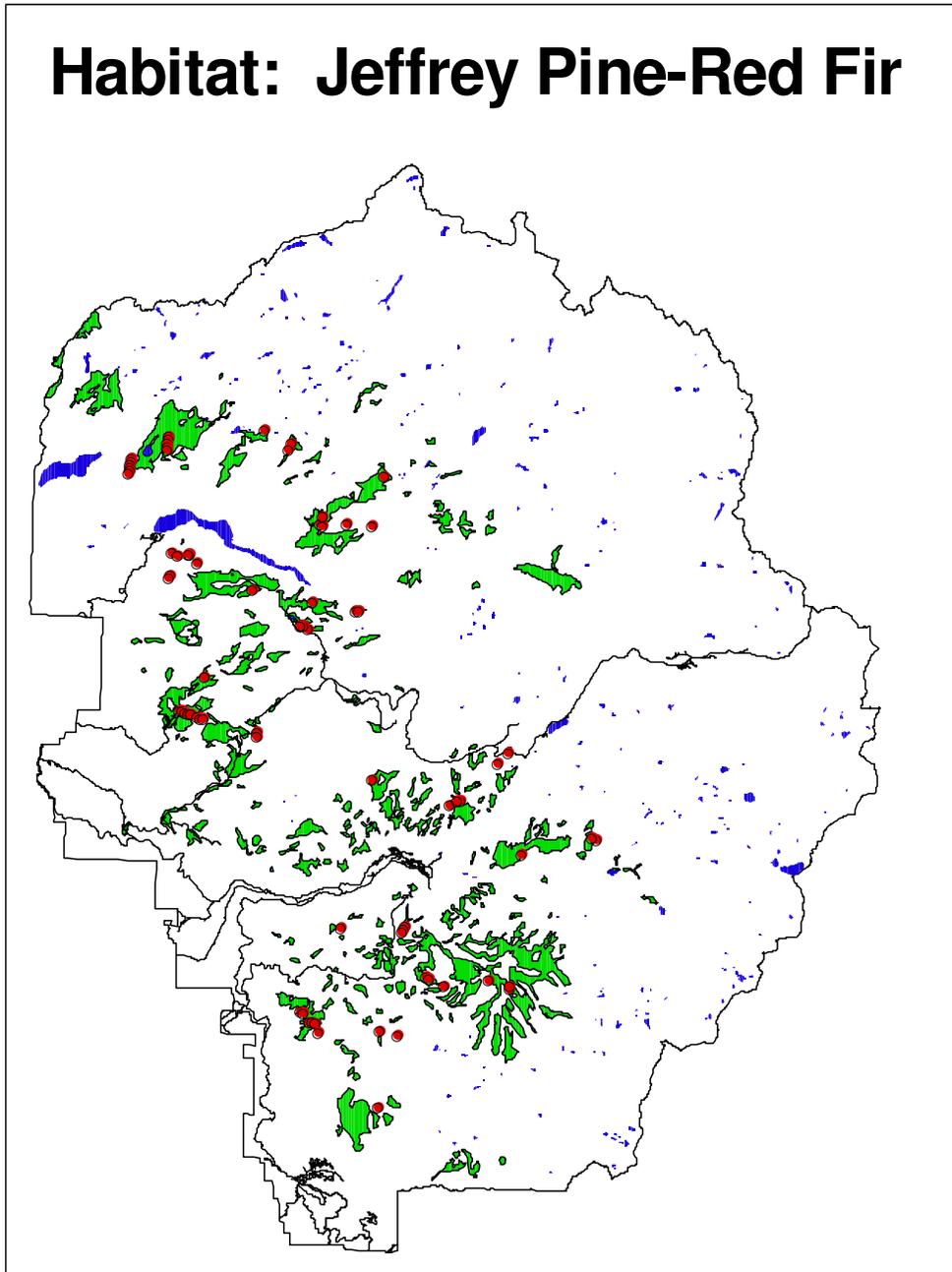


Figure 21. Green shading indicates areas mapped as 'Jeffrey Pine-Red Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine-Red Fir'.

Habitat: Red Fir

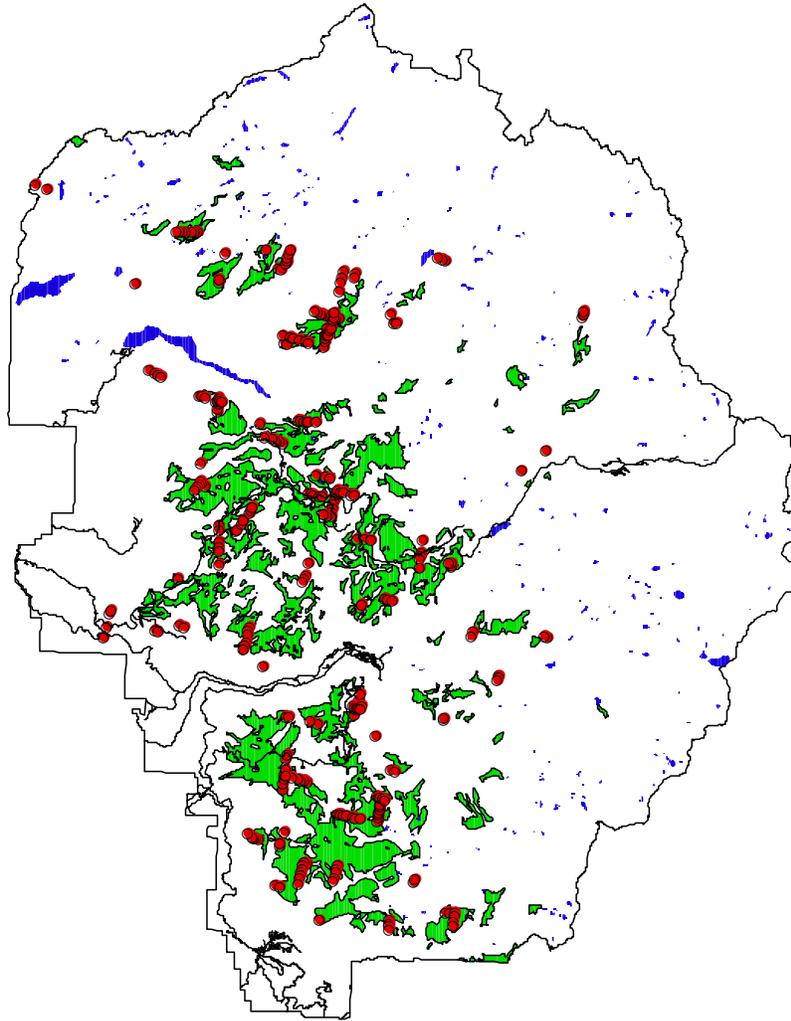


Figure 22. Green shading indicates areas mapped as 'Red Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Red Fir'.

Habitat: Quaking Aspen

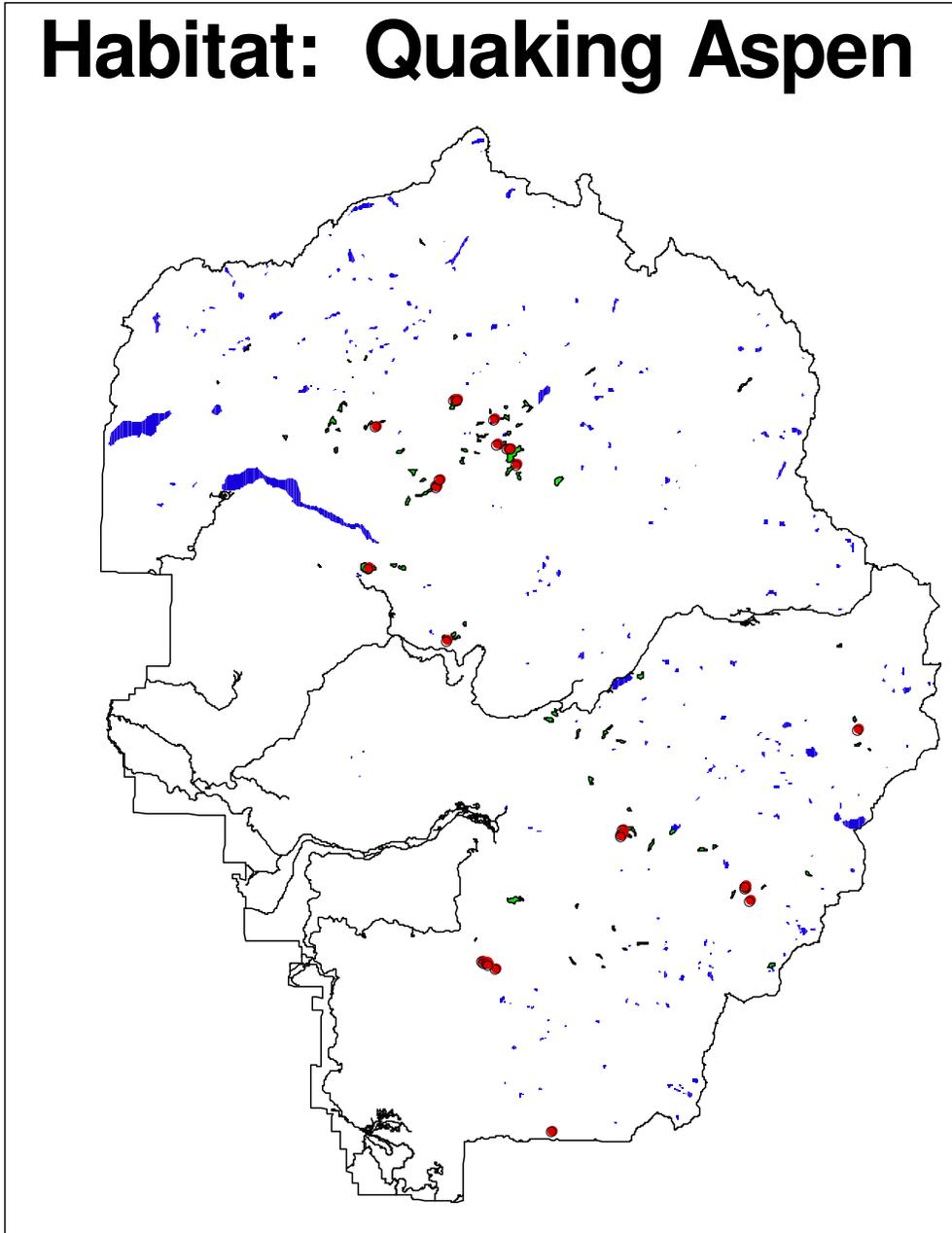


Figure 23. Green shading indicates areas mapped as 'Quaking Aspen' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Quaking Aspen'.

Habitat: Montane/Alpine Riparian Shrub

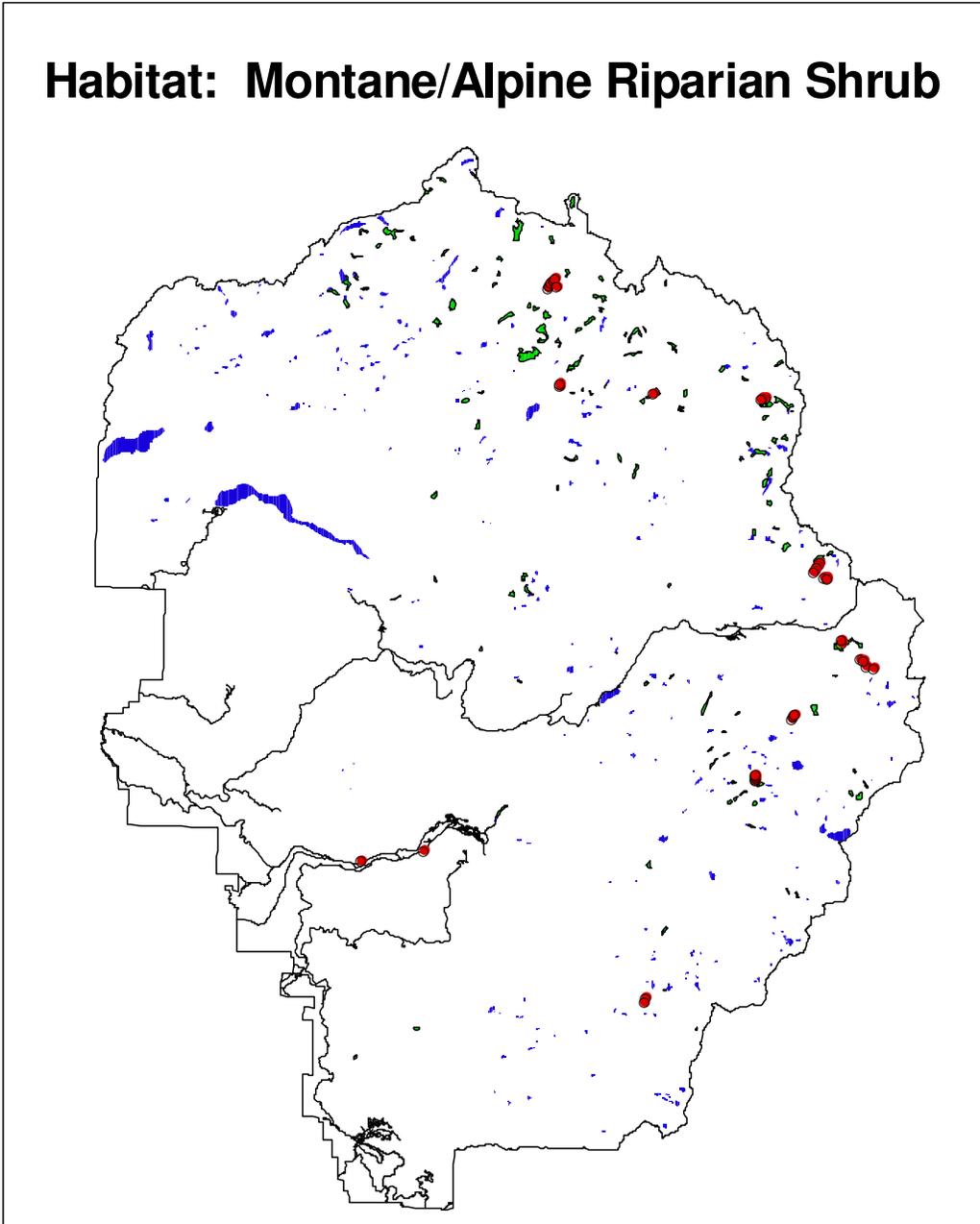


Figure 24. Green shading indicates areas mapped as 'Montane/Alpine Riparian Shrub' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Montane/Alpine Riparian Shrub'.

Habitat: Lodgepole Pine

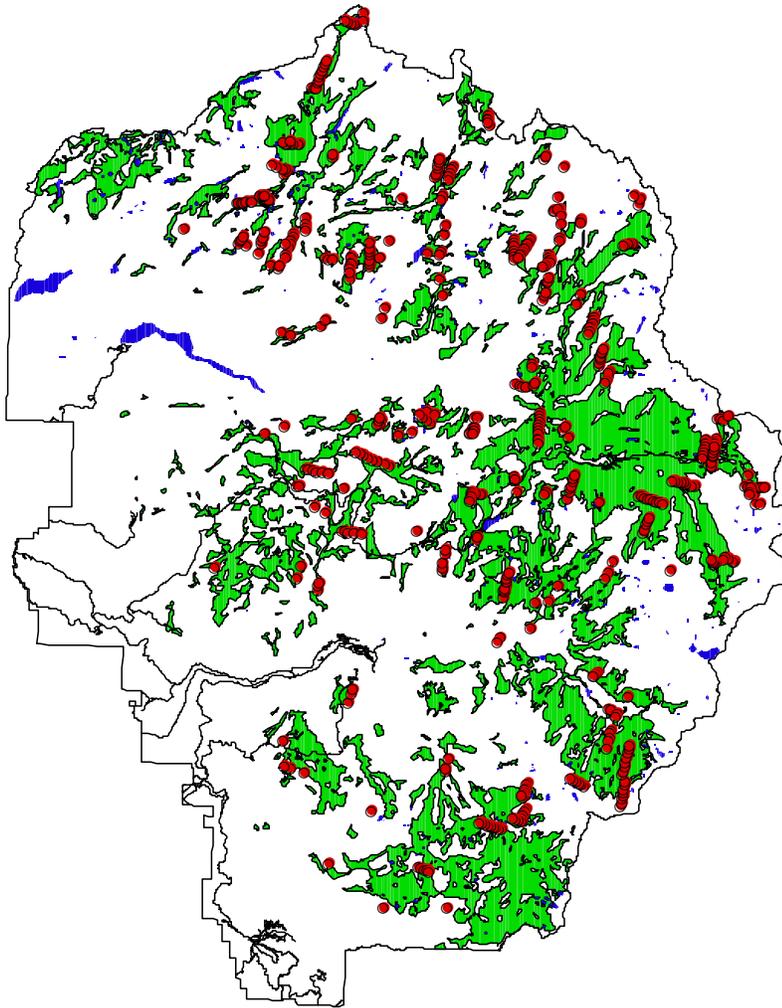


Figure 25. Green shading indicates areas mapped as 'Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Lodgepole Pine'.

Habitat: Western White Pine

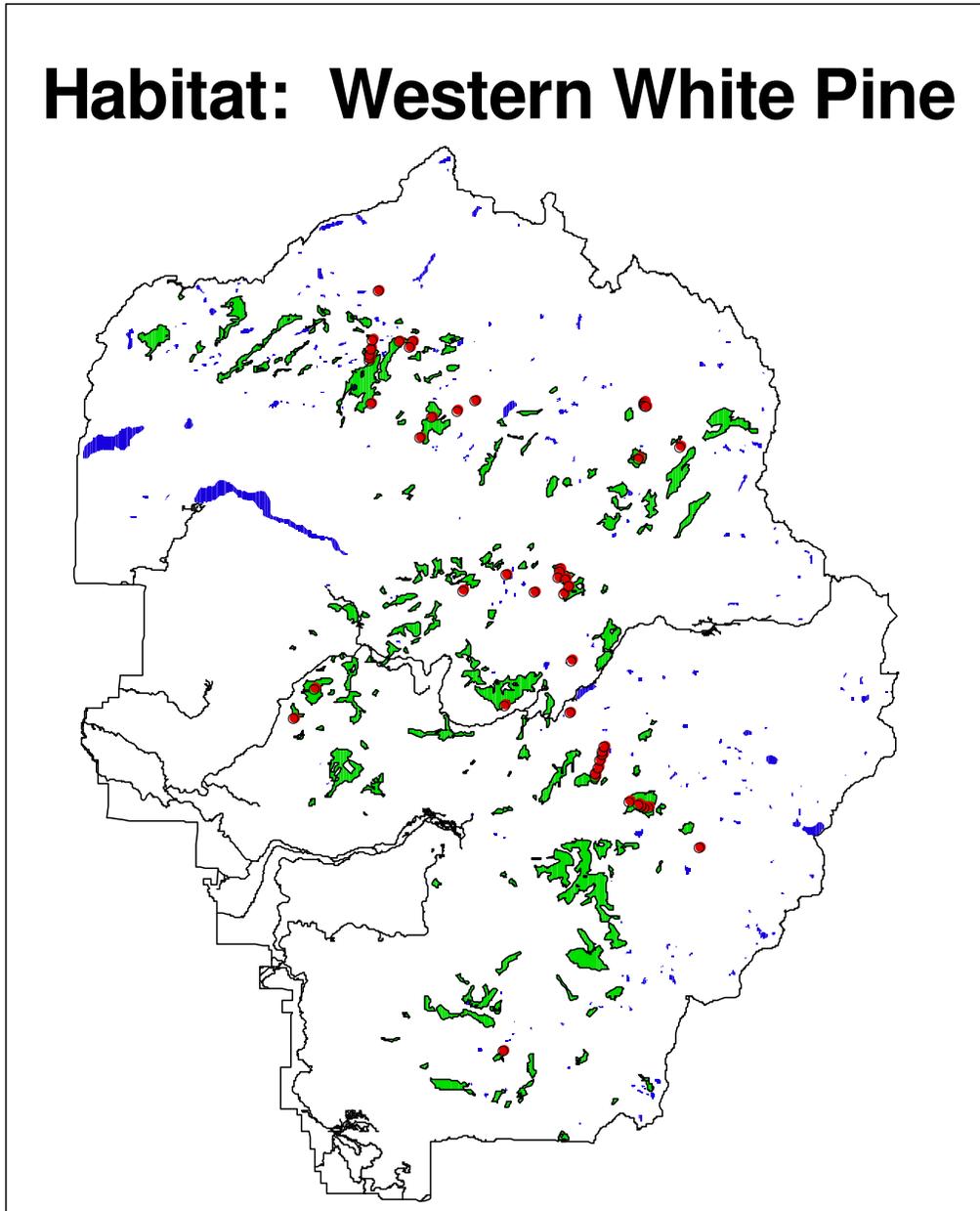


Figure 26. Green shading indicates areas mapped as 'Western White Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Western White Pine'.

Habitat: Western Juniper

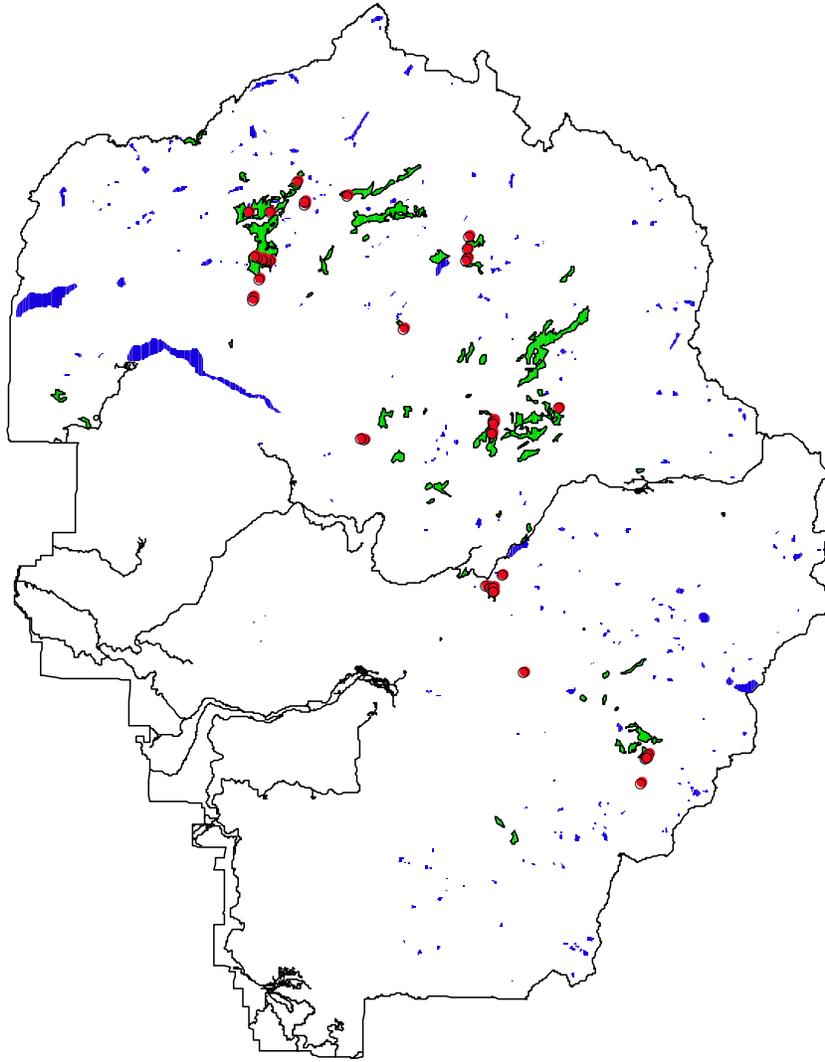


Figure 27. Green shading indicates areas mapped as 'Western Juniper' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Western Juniper'.

Habitat: Mountain Hemlock

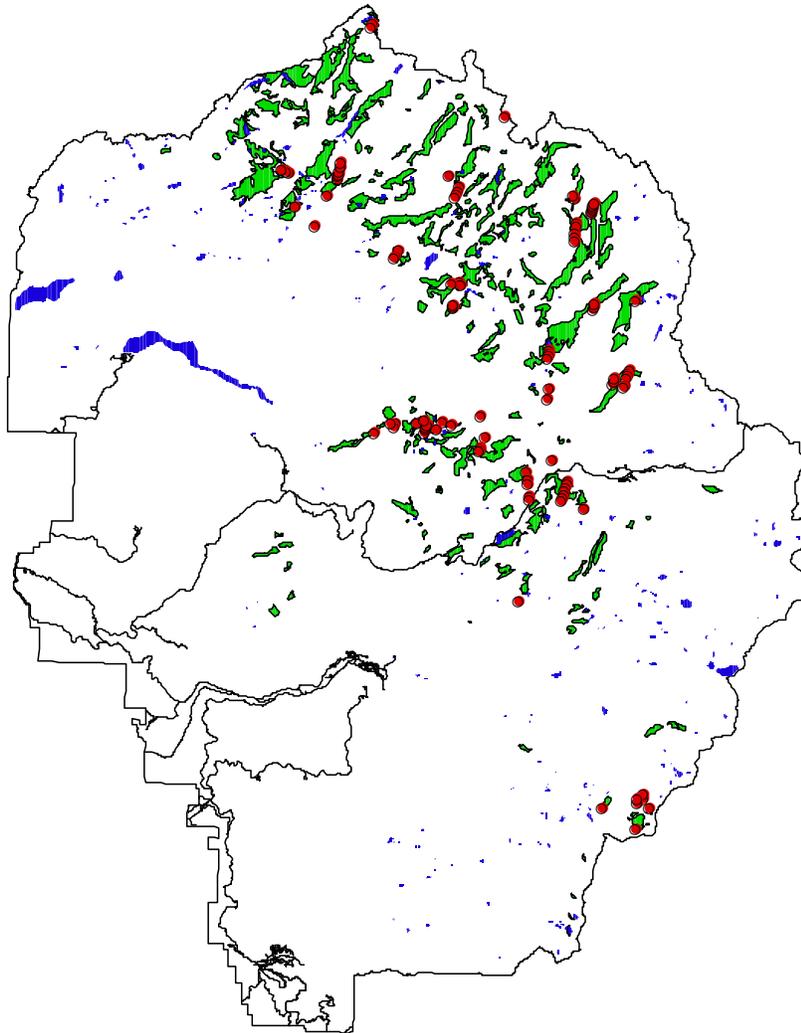


Figure 28. Green shading indicates areas mapped as 'Mountain Hemlock' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Mountain Hemlock'. 128

Band-tailed Pigeon

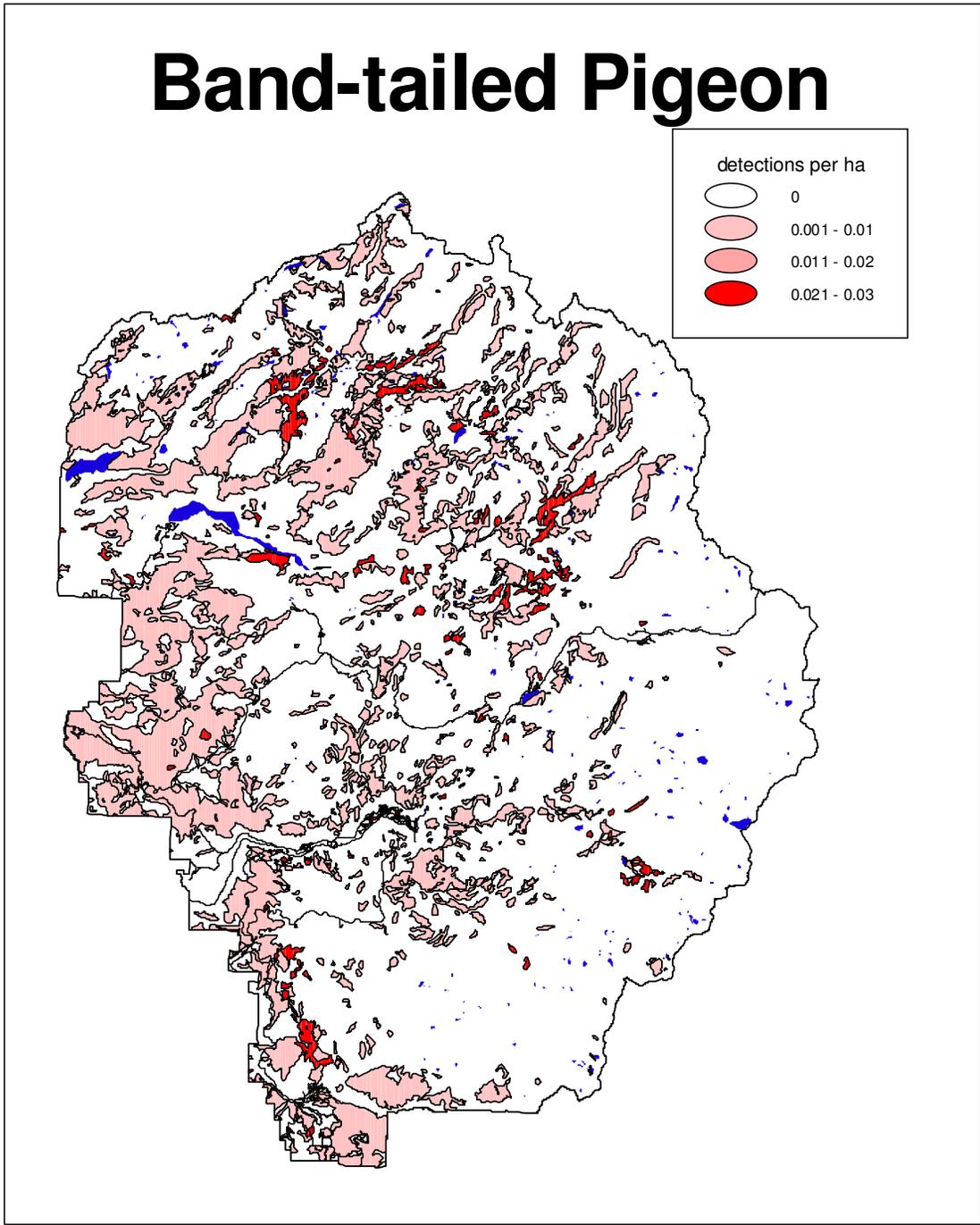


Figure 46. Band-tailed Pigeon distribution and relative abundance in the park.

Common Merganser

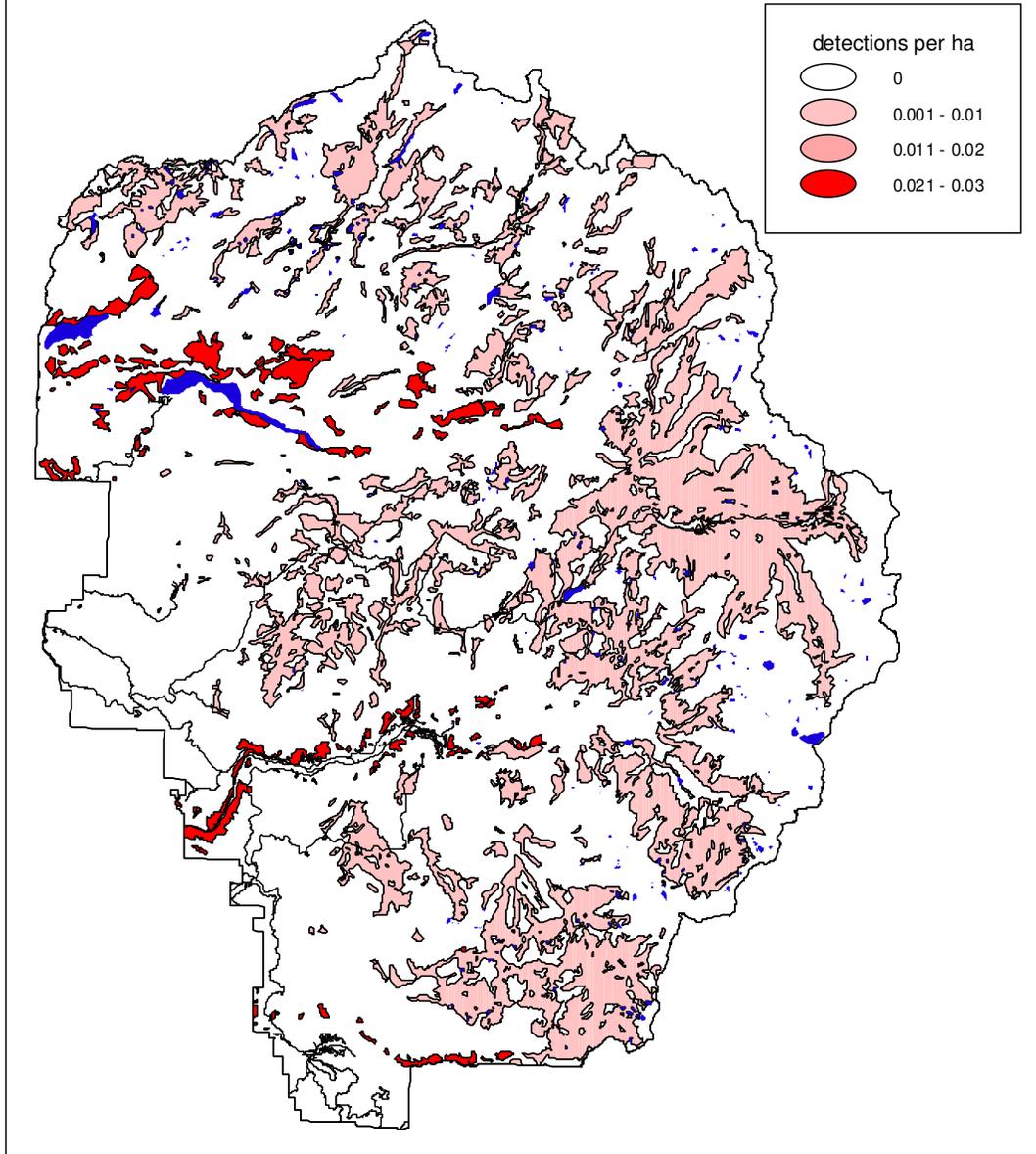


Figure 42. Common Merganser distribution and relative abundance in the park.

Blue Grouse

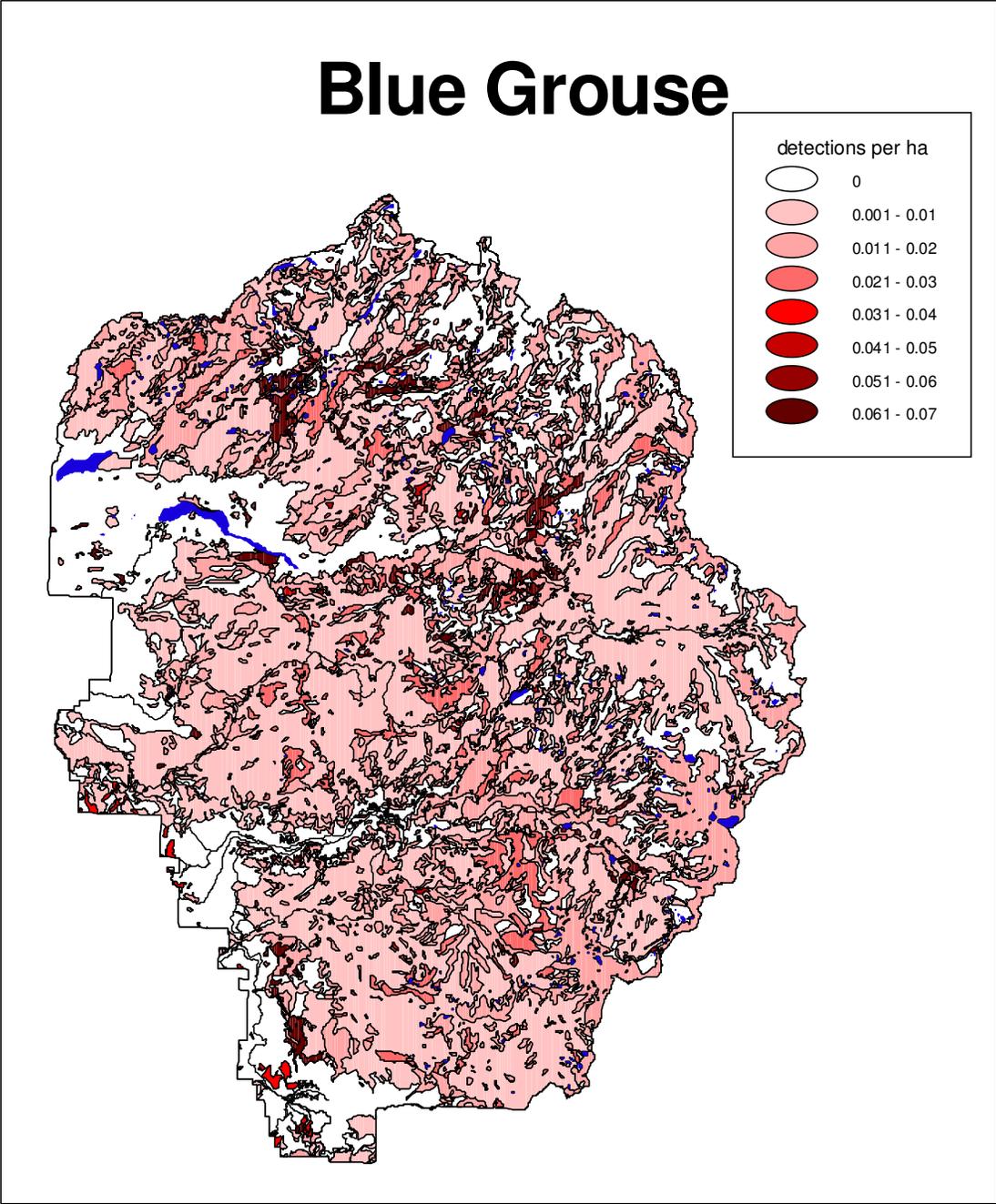


Figure 43. Blue Grouse distribution and relative abundance in the park.

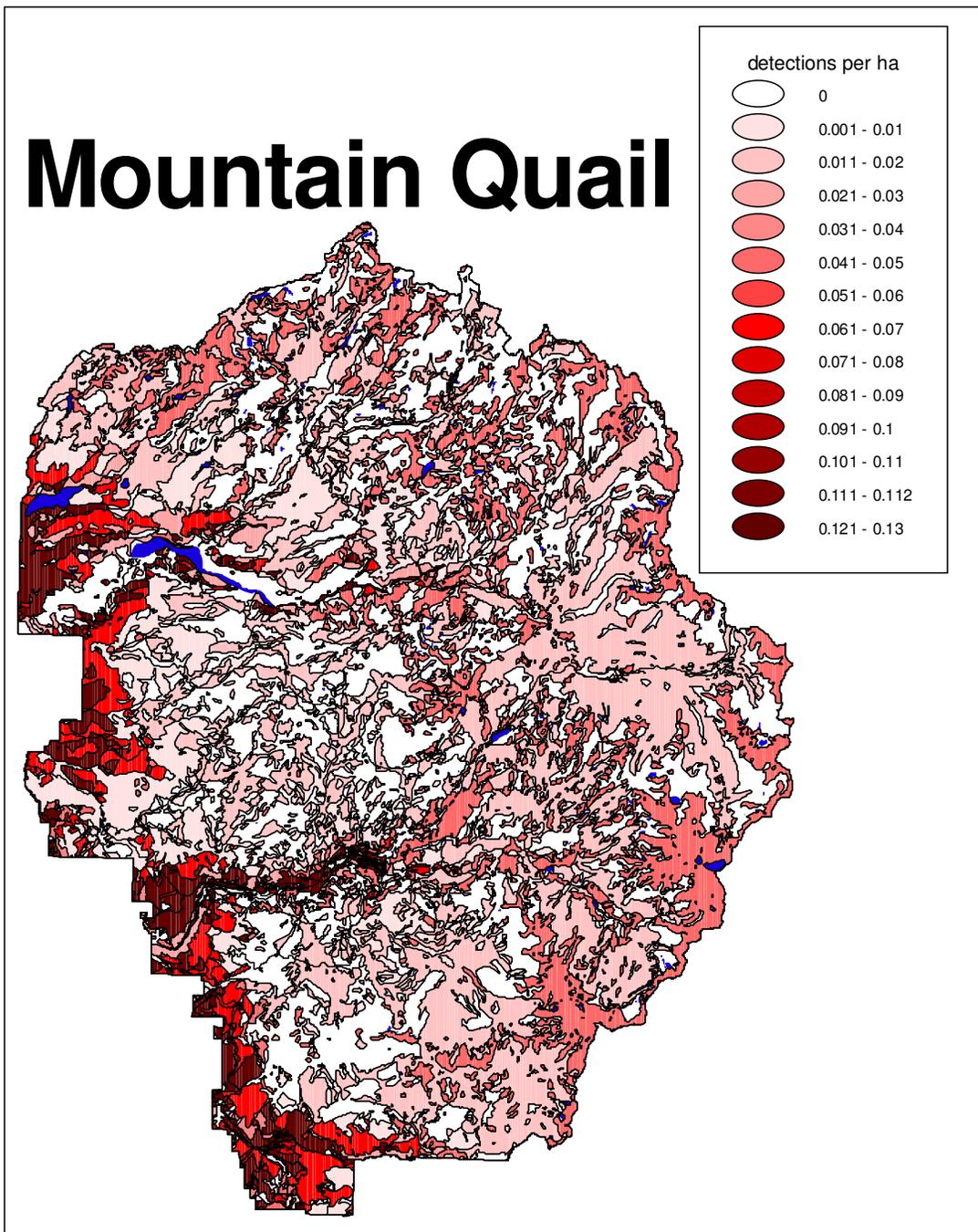


Figure 44. Mountain Quail distribution and relative abundance in the park.

Habitat: Whitebark Pine-Lodgepole Pine

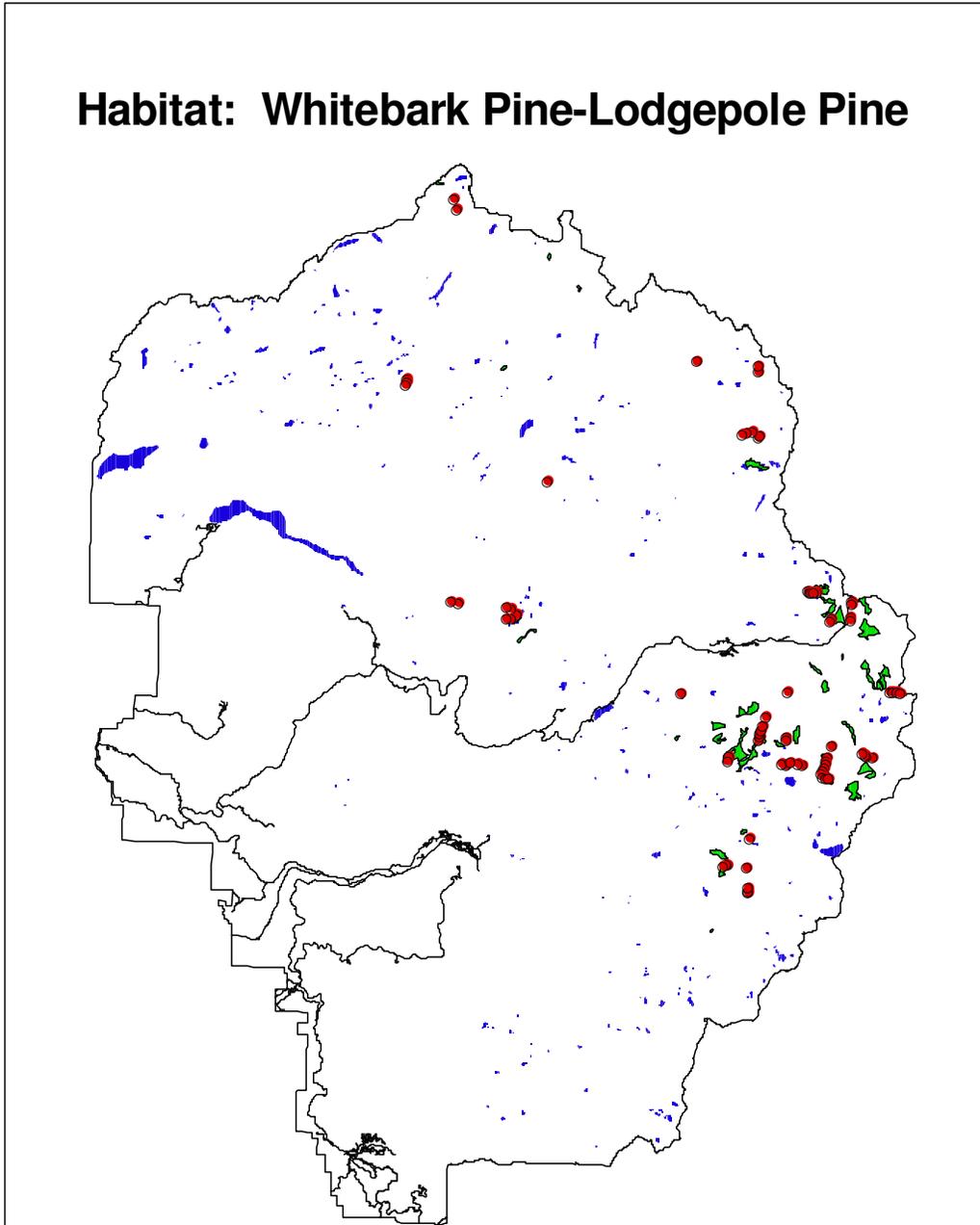


Figure 29. Green shading indicates areas mapped as 'Whitebark Pine-Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Lodgepole Pine'.

Habitat: Whitebark Pine-Mountain Hemlock

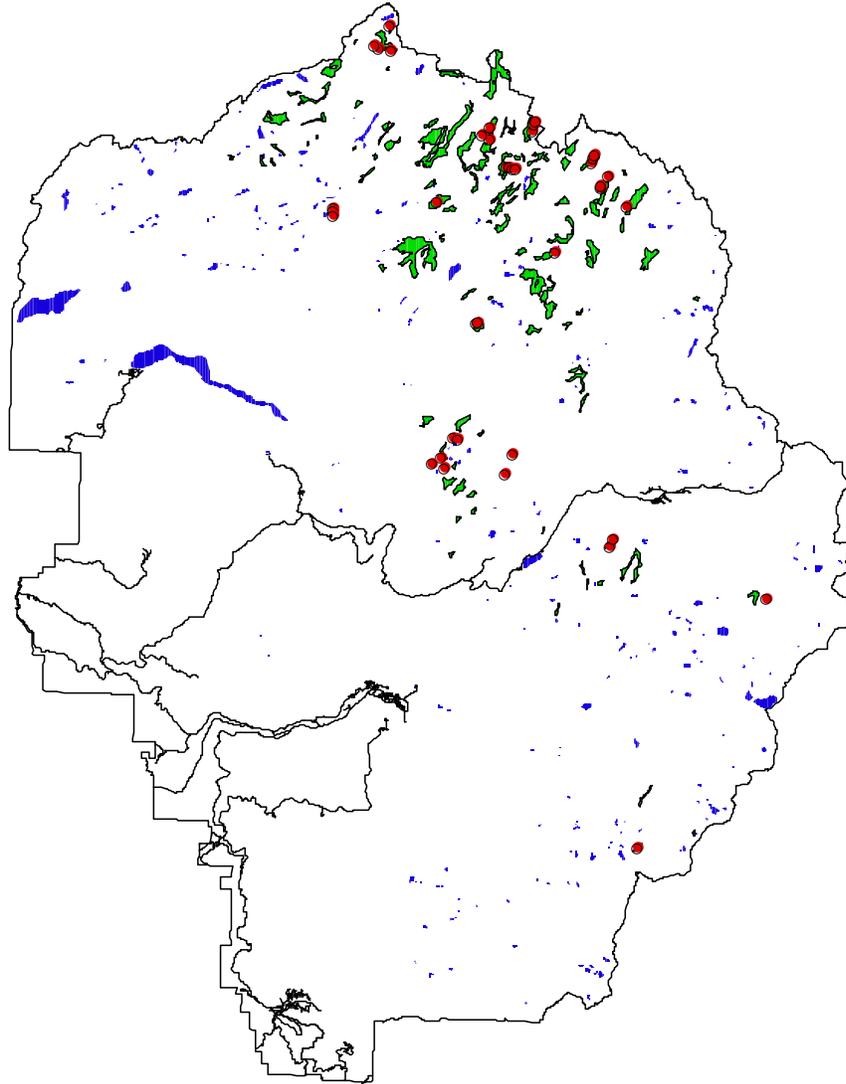


Figure 30. Green shading indicates areas mapped as 'Whitebark Pine-Mountain Hemlock' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Mountain Hemlock'.

Habitat: Whitebark Pine

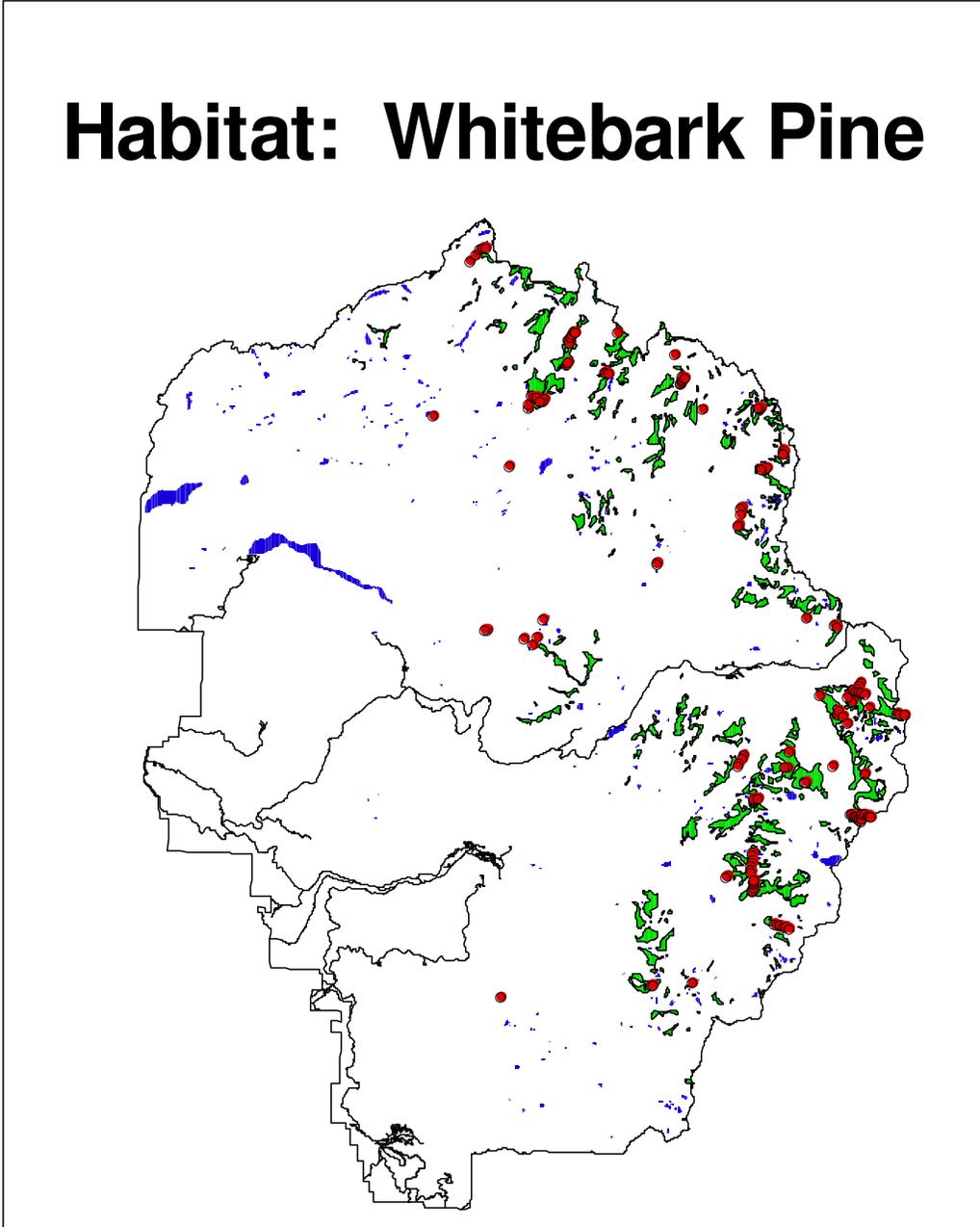


Figure 31. Green shading indicates areas mapped as 'Whitebark Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine'

Habitat: Subalpine/Alpine Meadow

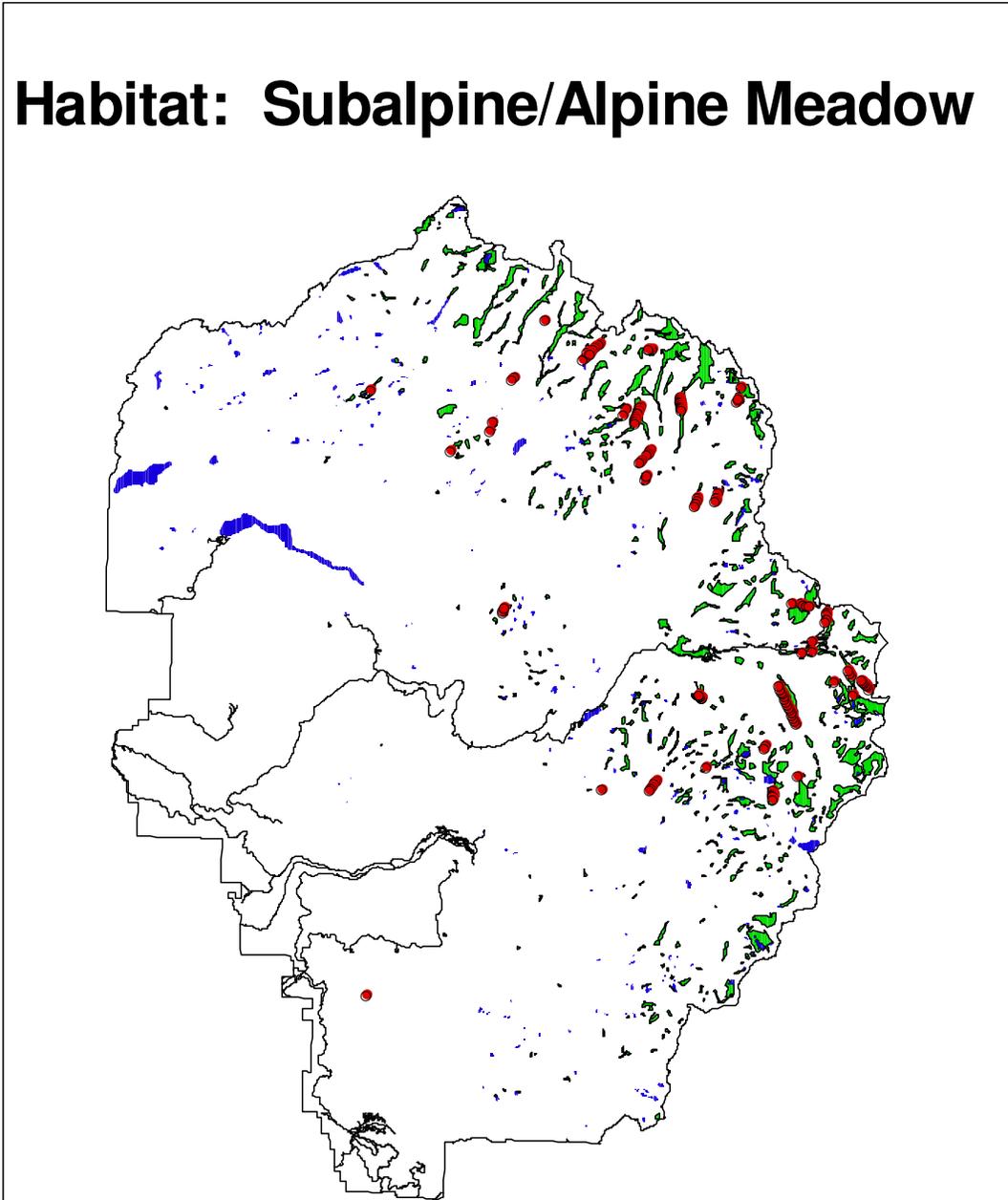


Figure 32. Green shading indicates areas mapped as 'Subalpine/Alpine Meadow' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Subalpine/Alpine Meadow'.

Habitat: Barren

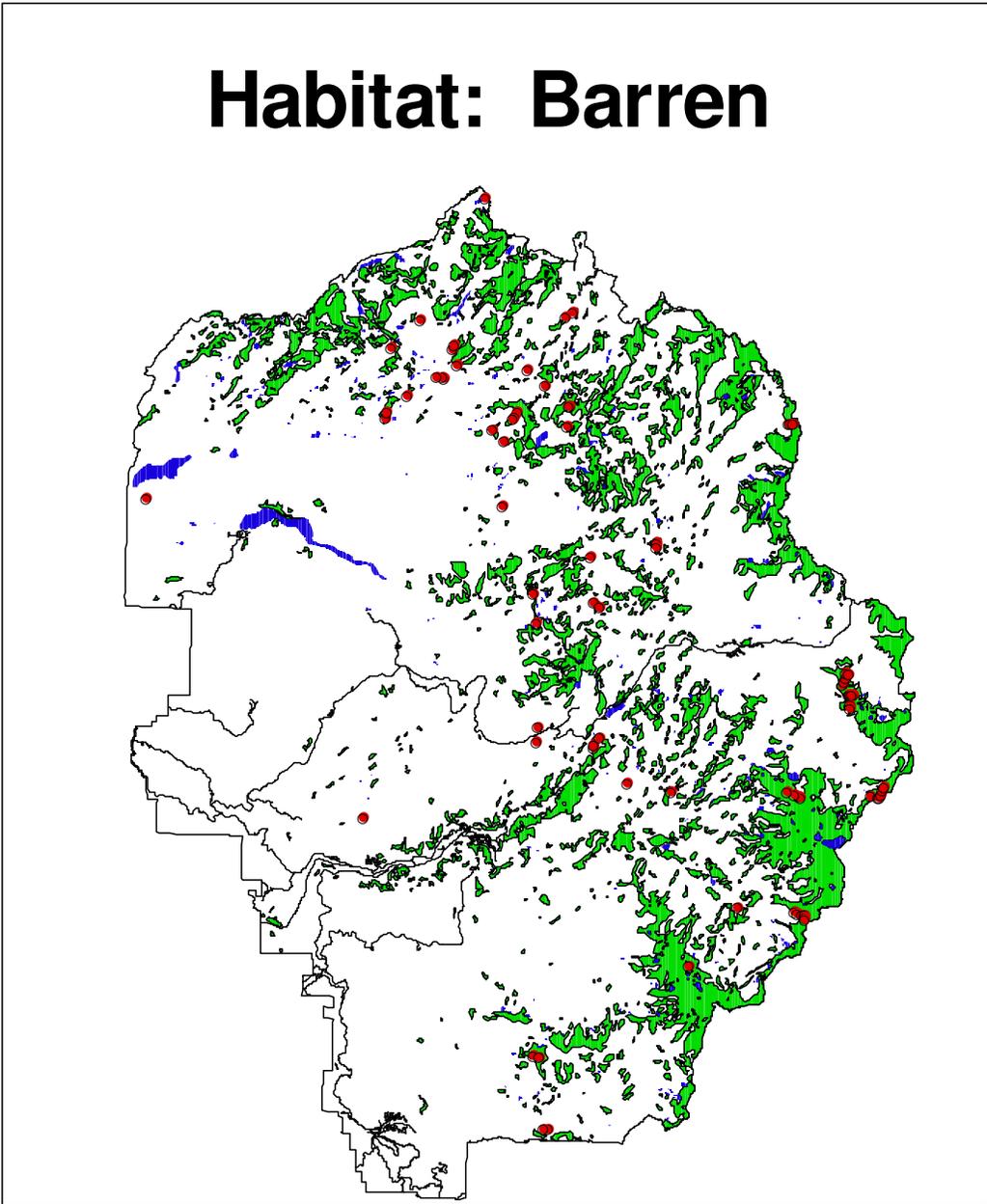


Figure 33. Green shading indicates areas mapped as 'barren' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'barren'.

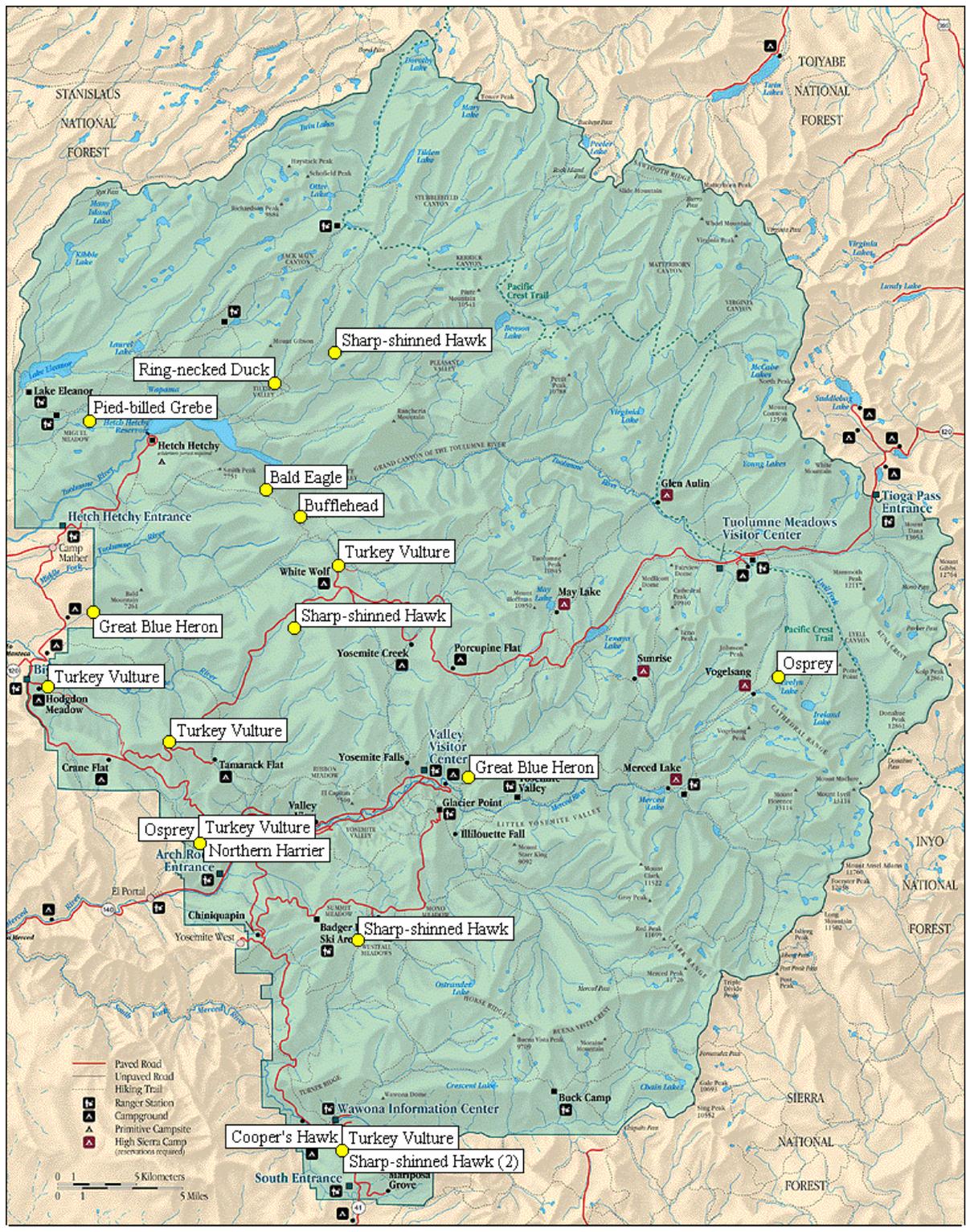


Figure 34. Locations of detections for species detected fewer than five times during point counts: **Pied-billed Grebe—Cooper’s Hawk.**

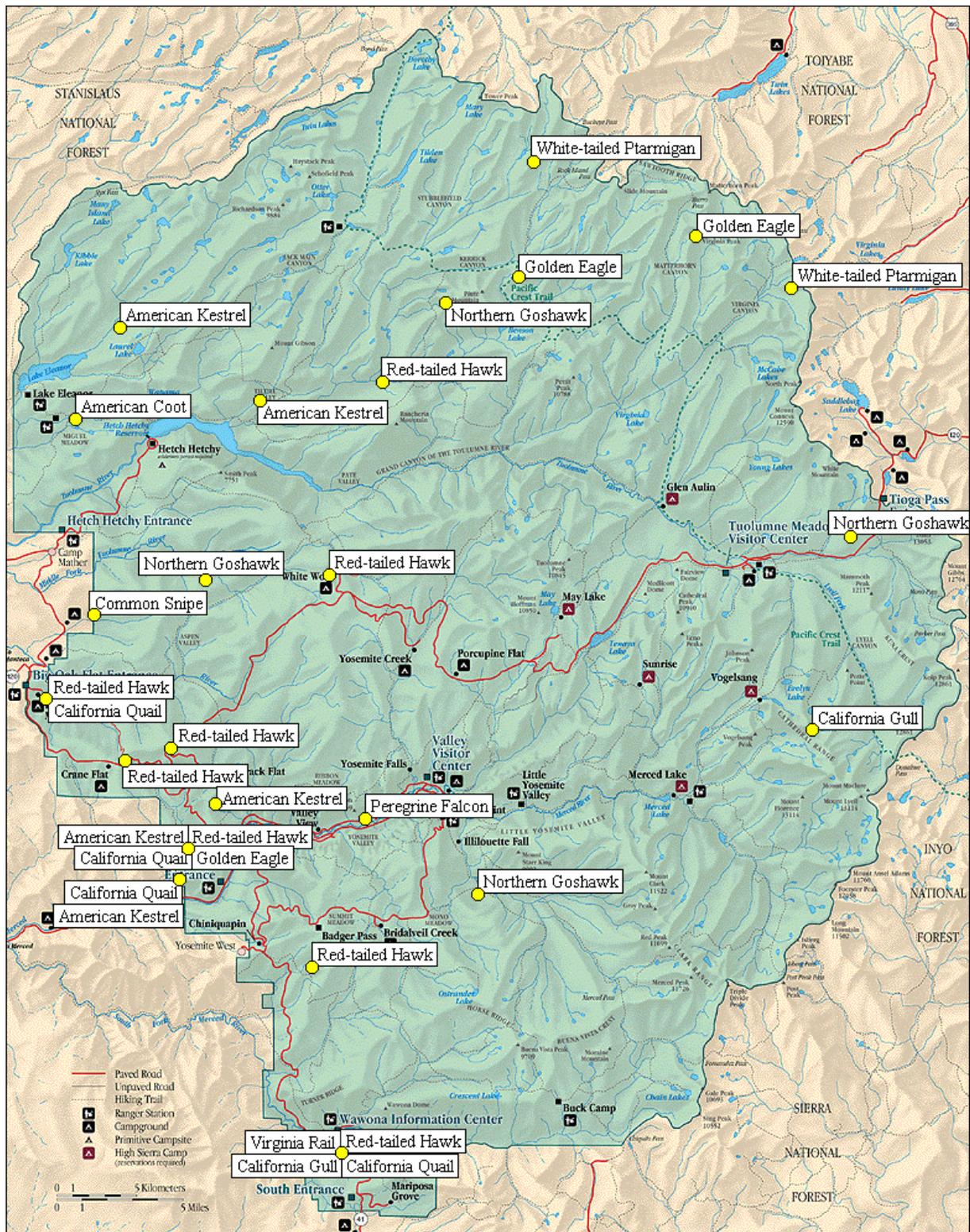


Figure 35. Locations of detections for species detected fewer than five times during point counts: **Red-tailed Hawk—California Gull.**

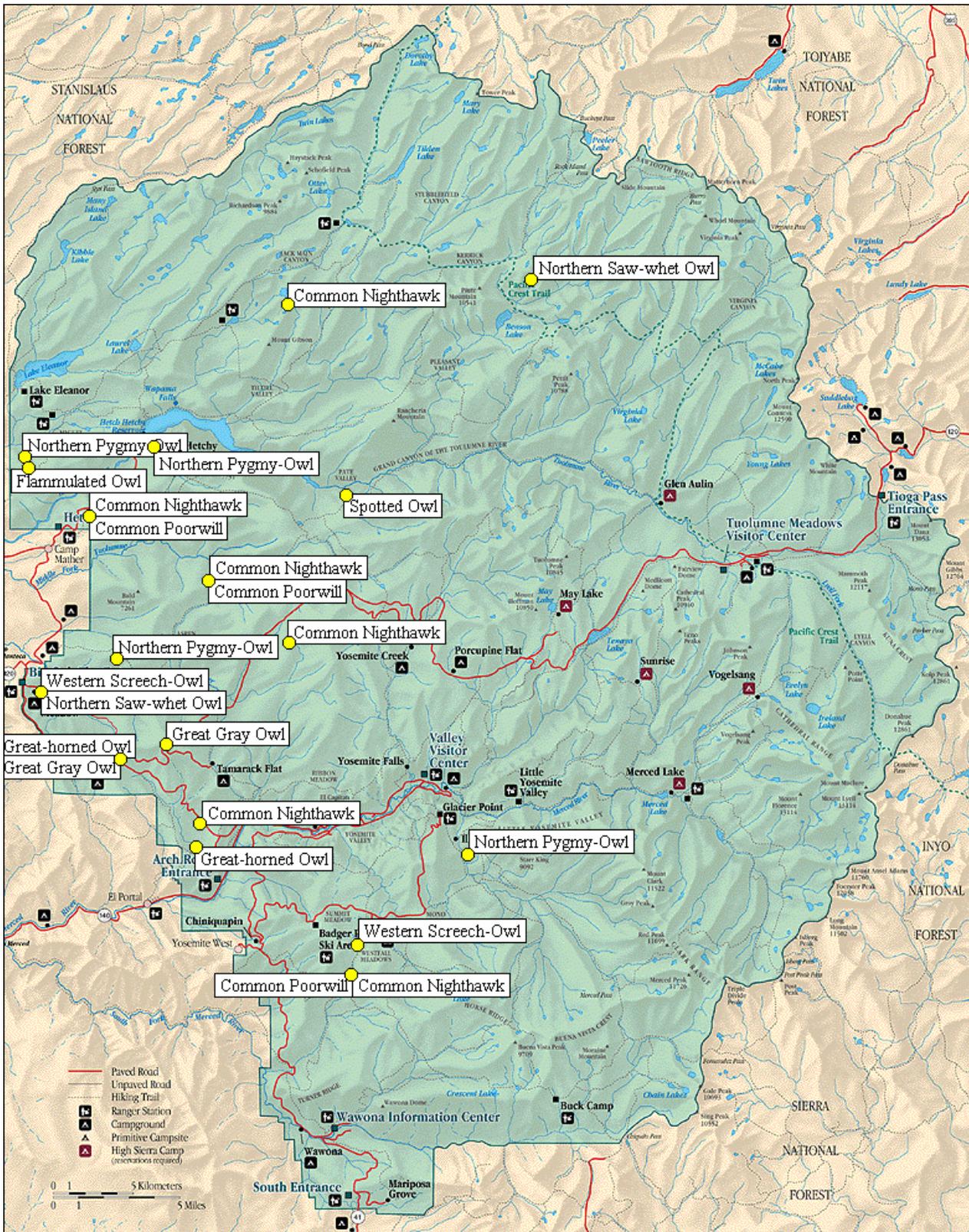


Figure 36. Locations of detections for species detected fewer than five times during point counts: **Western Screech-Owl—Common Poorwill.**

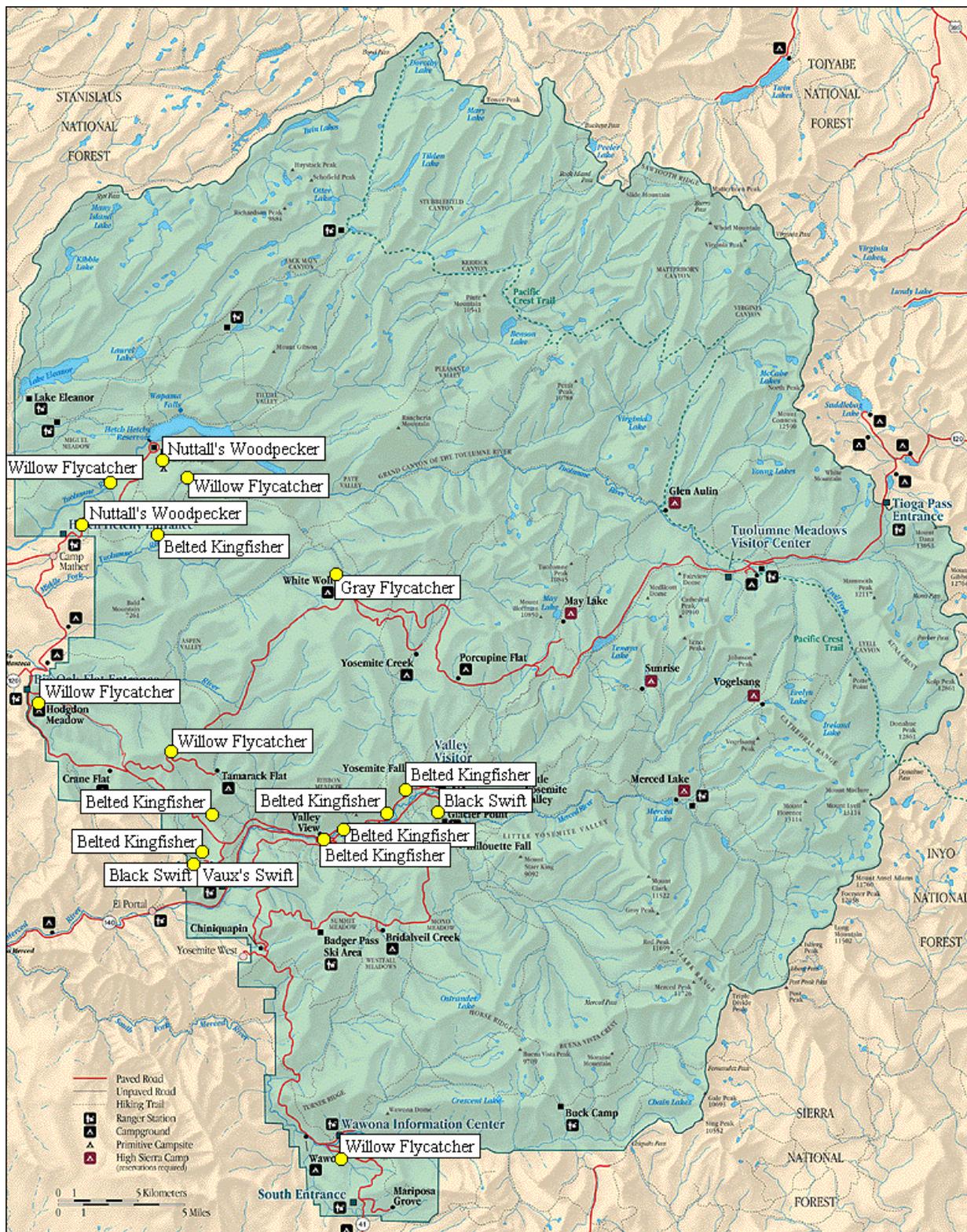


Figure 37. Locations of detections for species detected fewer than five times during point counts: **Black Swift—Gray Flycatcher.**

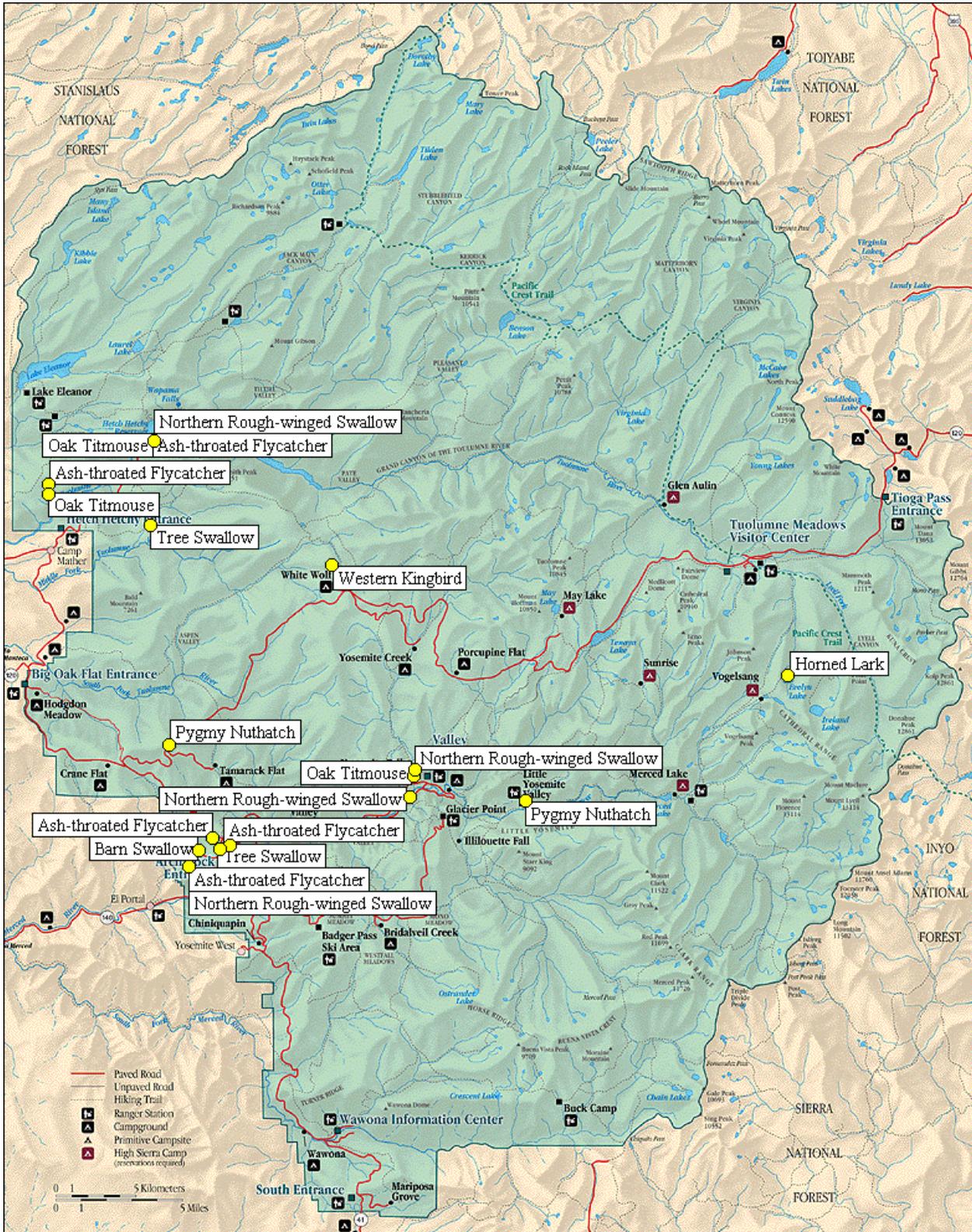


Figure 38. Locations of detections for species detected fewer than five times during point counts: **Ash-throated Flycatcher—Pygmy Nuthatch.**

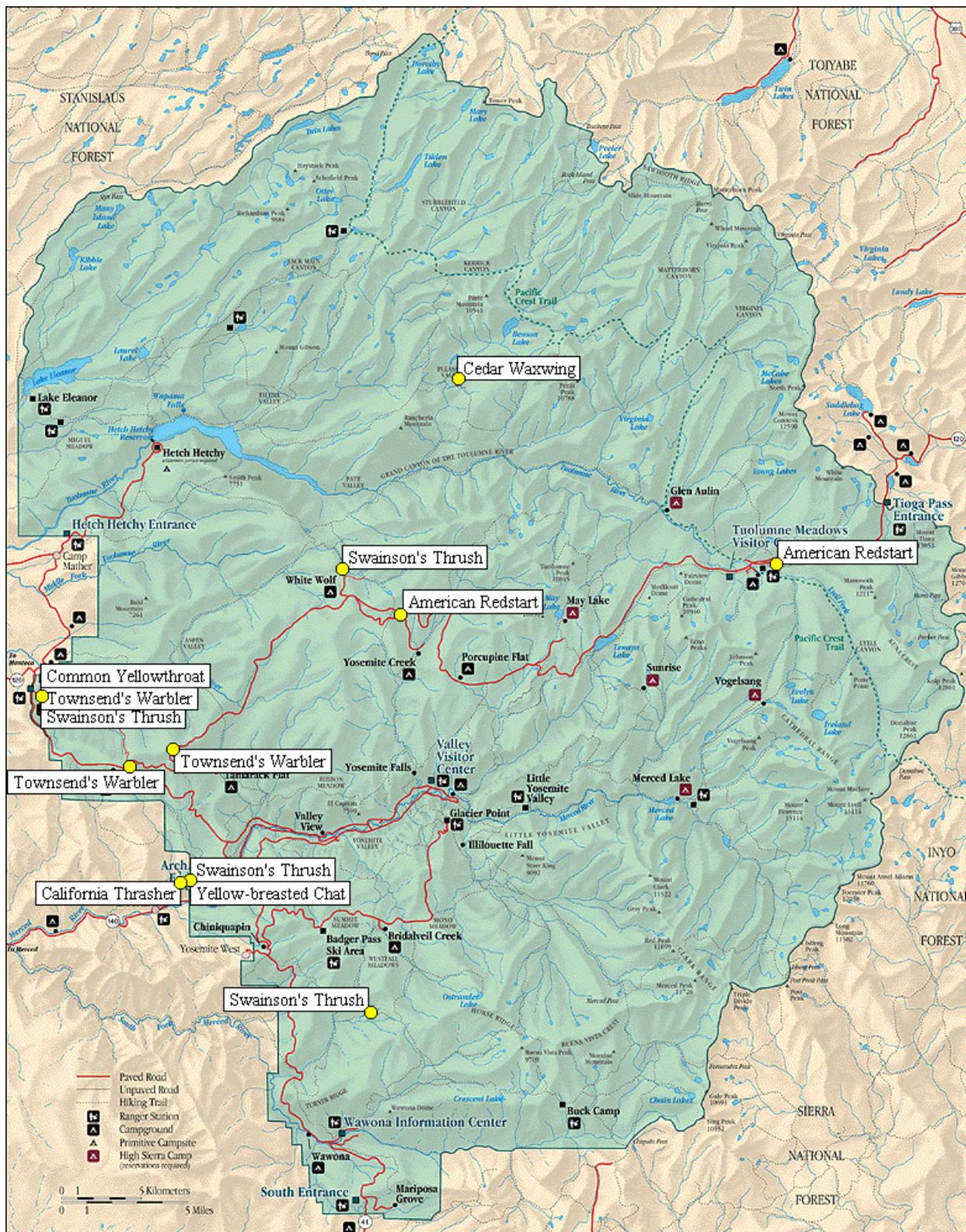


Figure 39. Locations of detections for species detected fewer than five times during point counts: **Swainson's Thrush—Yellow-breasted Chat.**

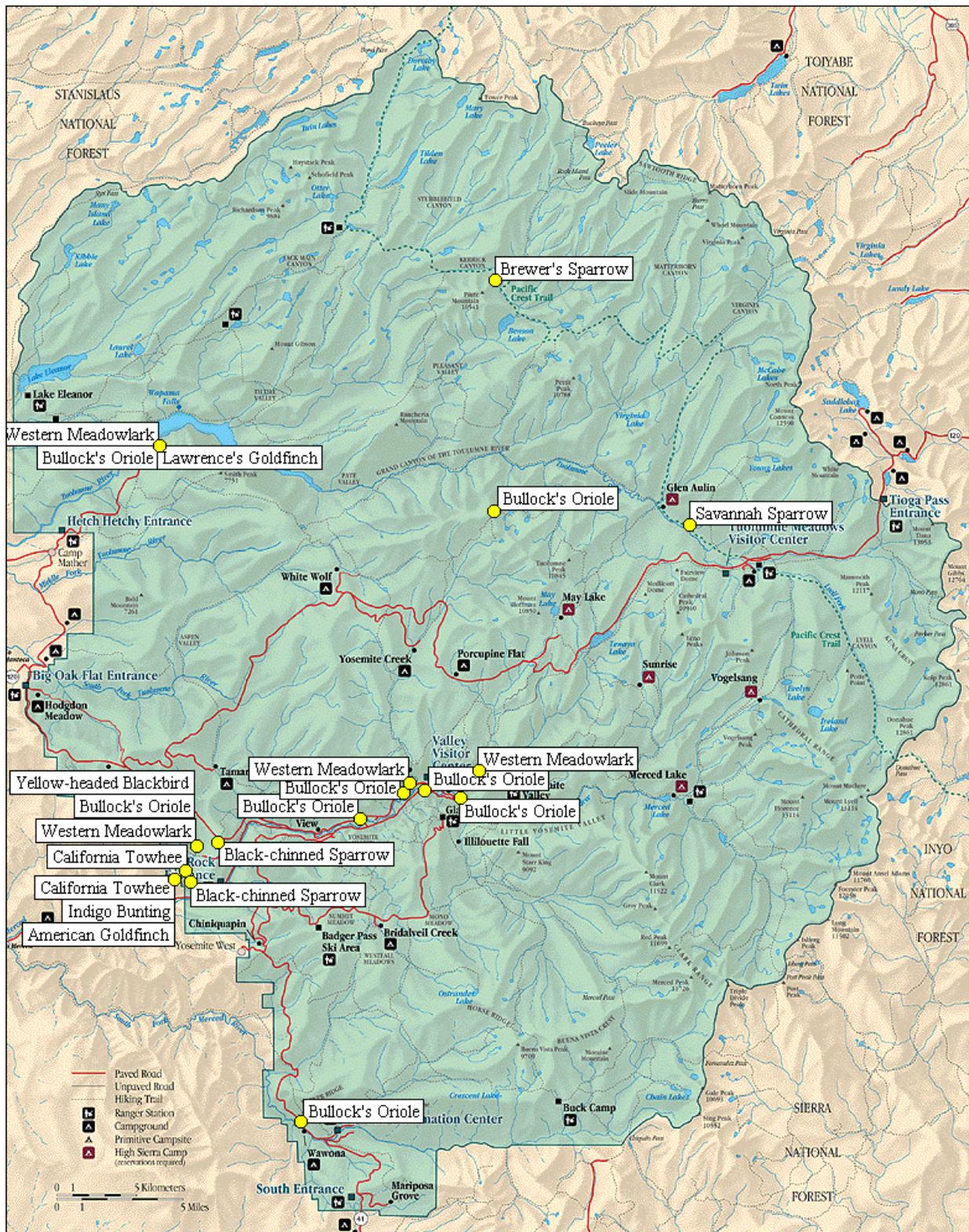


Figure 40. Locations of detections for species detected fewer than five times during point counts: **California Towhee—American Goldfinch.**

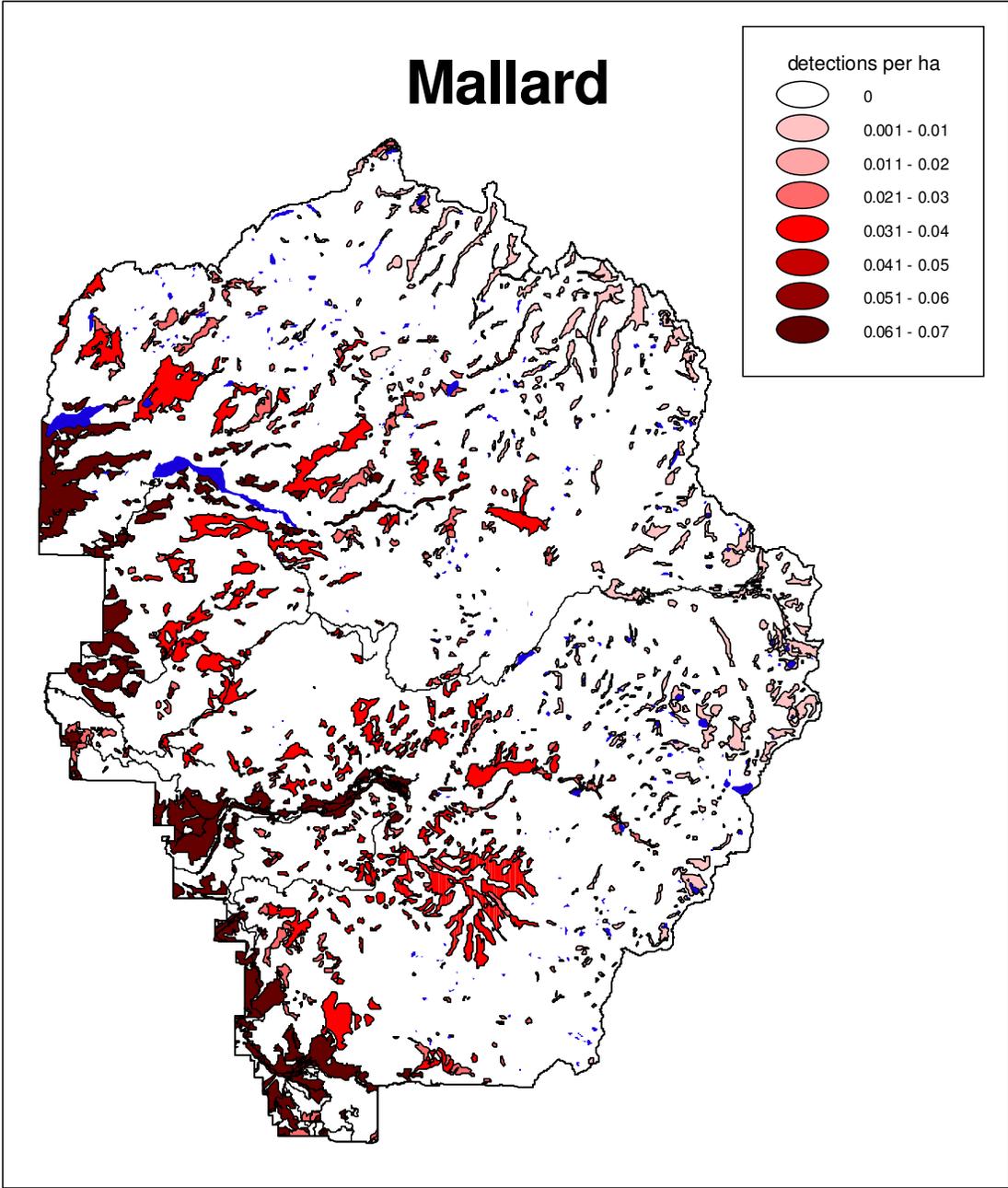


Figure 41. Mallard distribution and relative abundance in the park.

Common Merganser

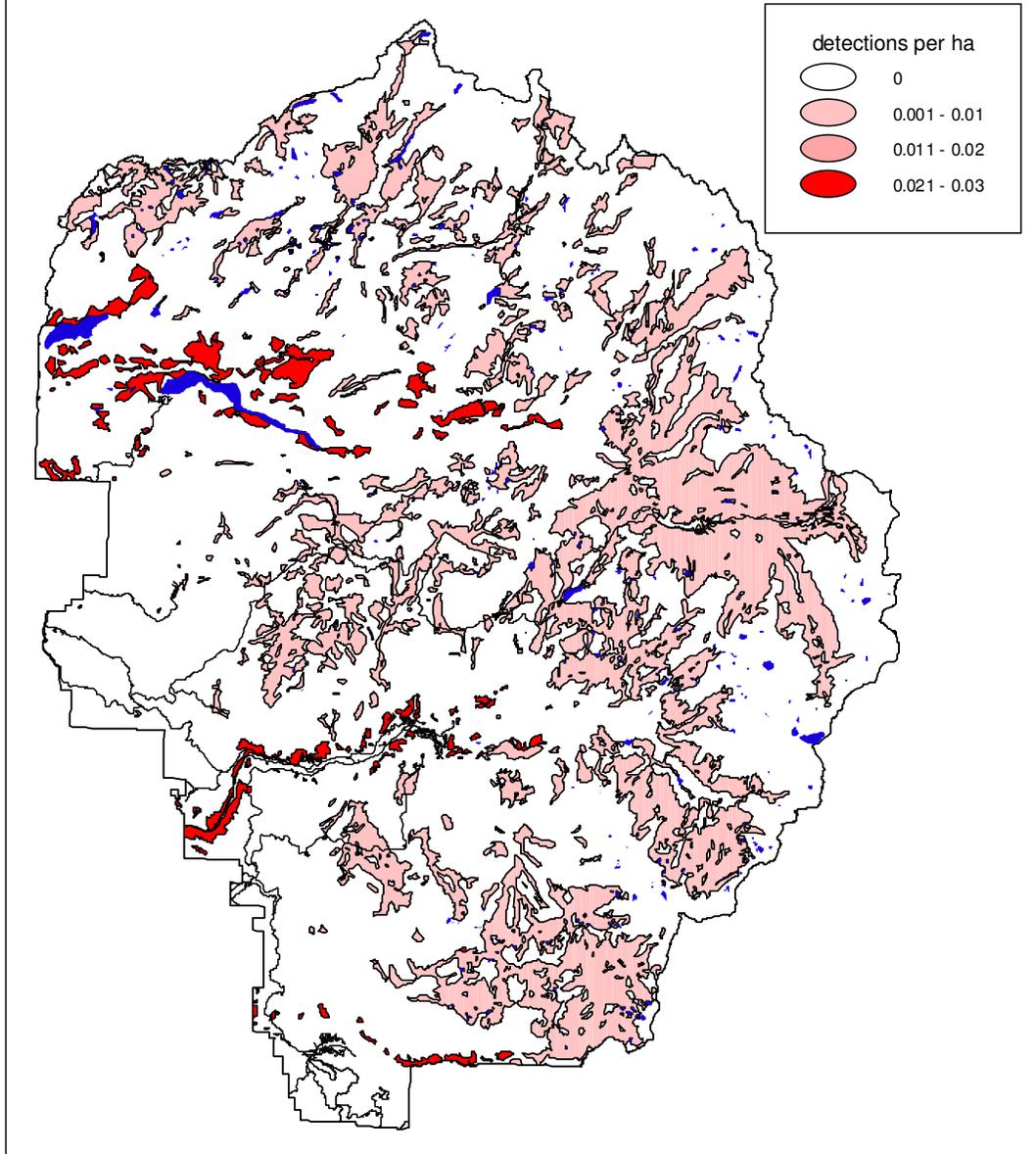


Figure 42. Common Merganser distribution and relative abundance in the park.

Blue Grouse

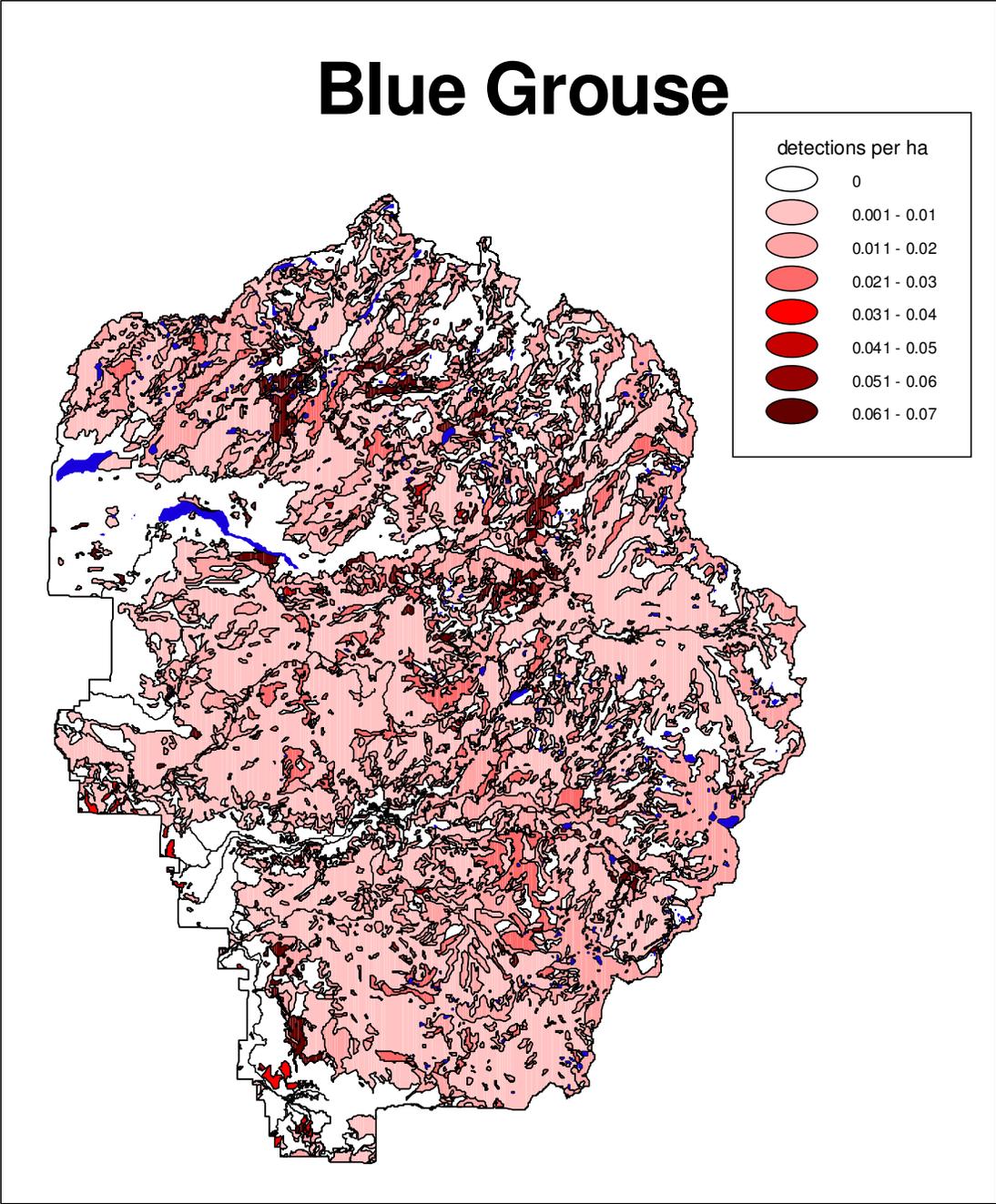


Figure 43. Blue Grouse distribution and relative abundance in the park.

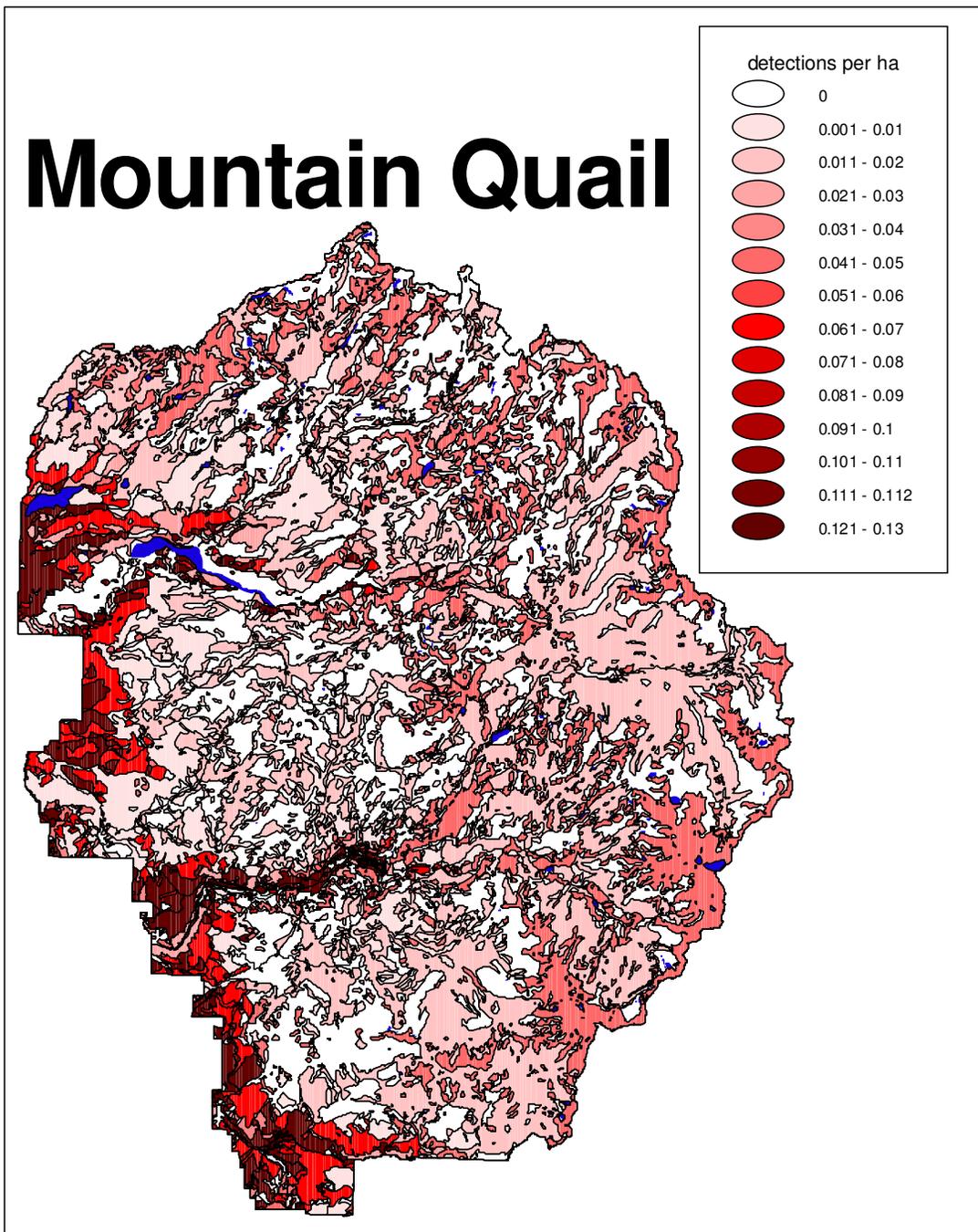


Figure 44. Mountain Quail distribution and relative abundance in the park.

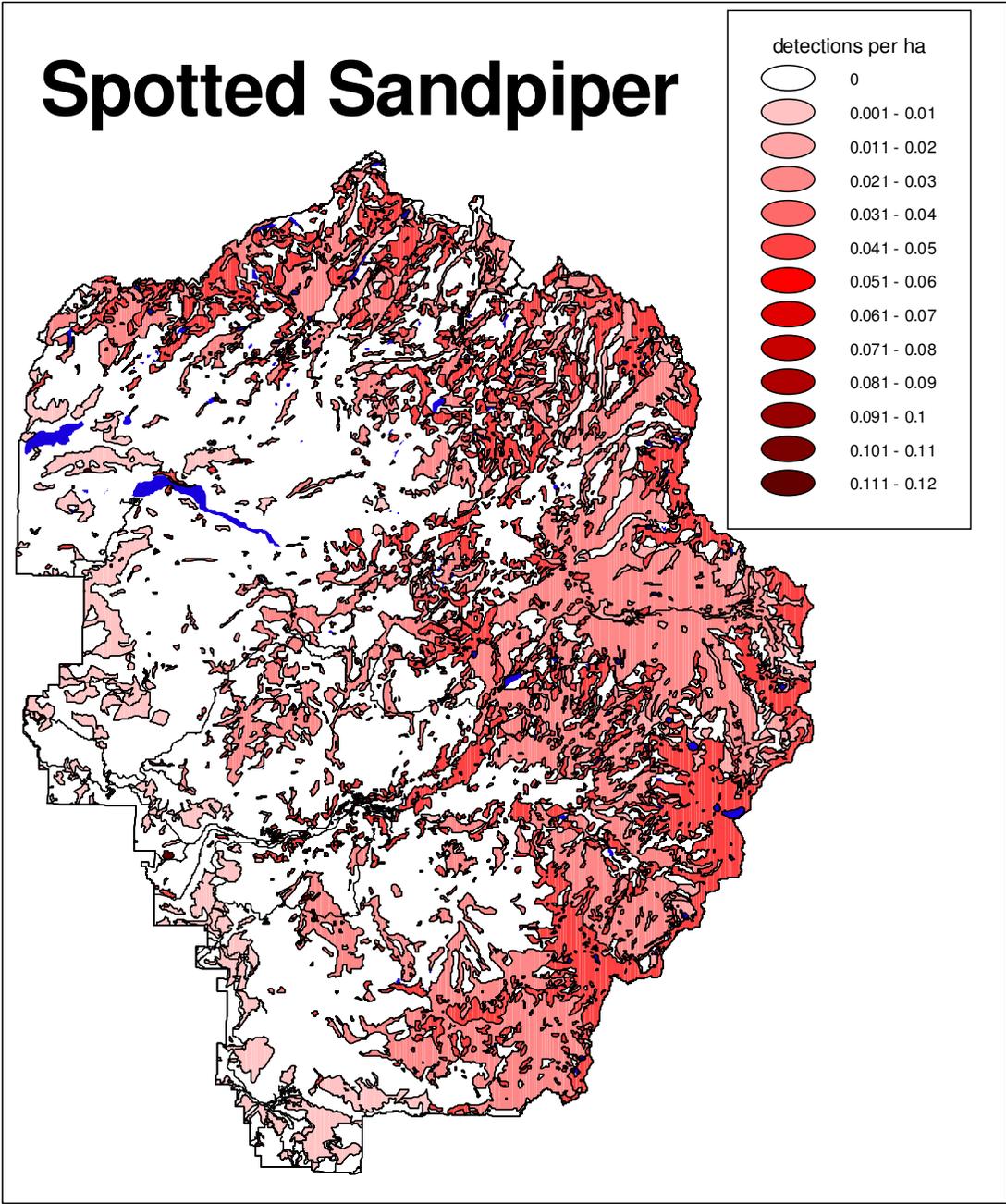


Figure 45. Spotted Sandpiper distribution and relative abundance in the park.

Rufous Hummingbird

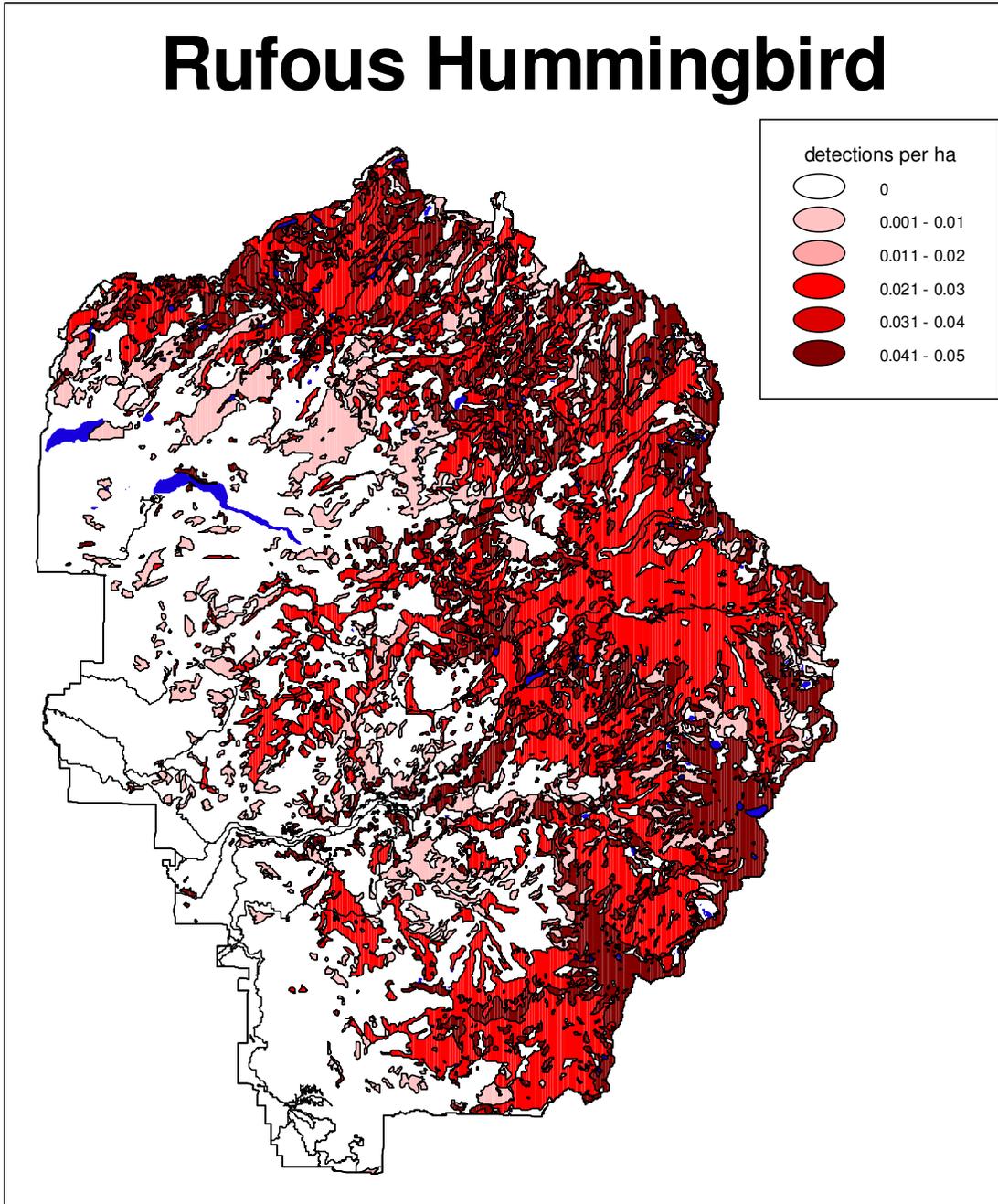


Figure 51. Rufous Hummingbird distribution and relative abundance in the park.

Band-tailed Pigeon

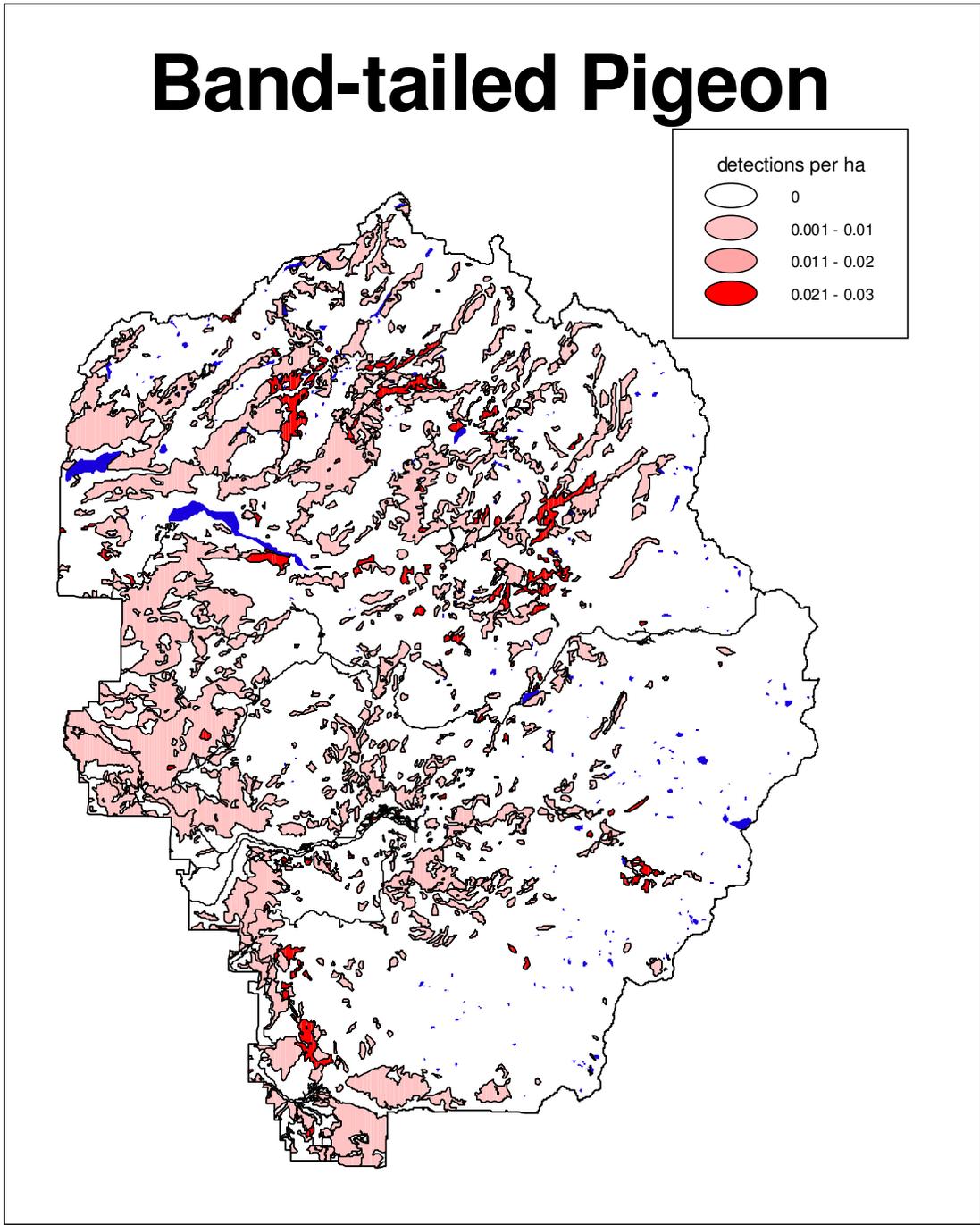


Figure 46. Band-tailed Pigeon distribution and relative abundance in the park.

Mourning Dove

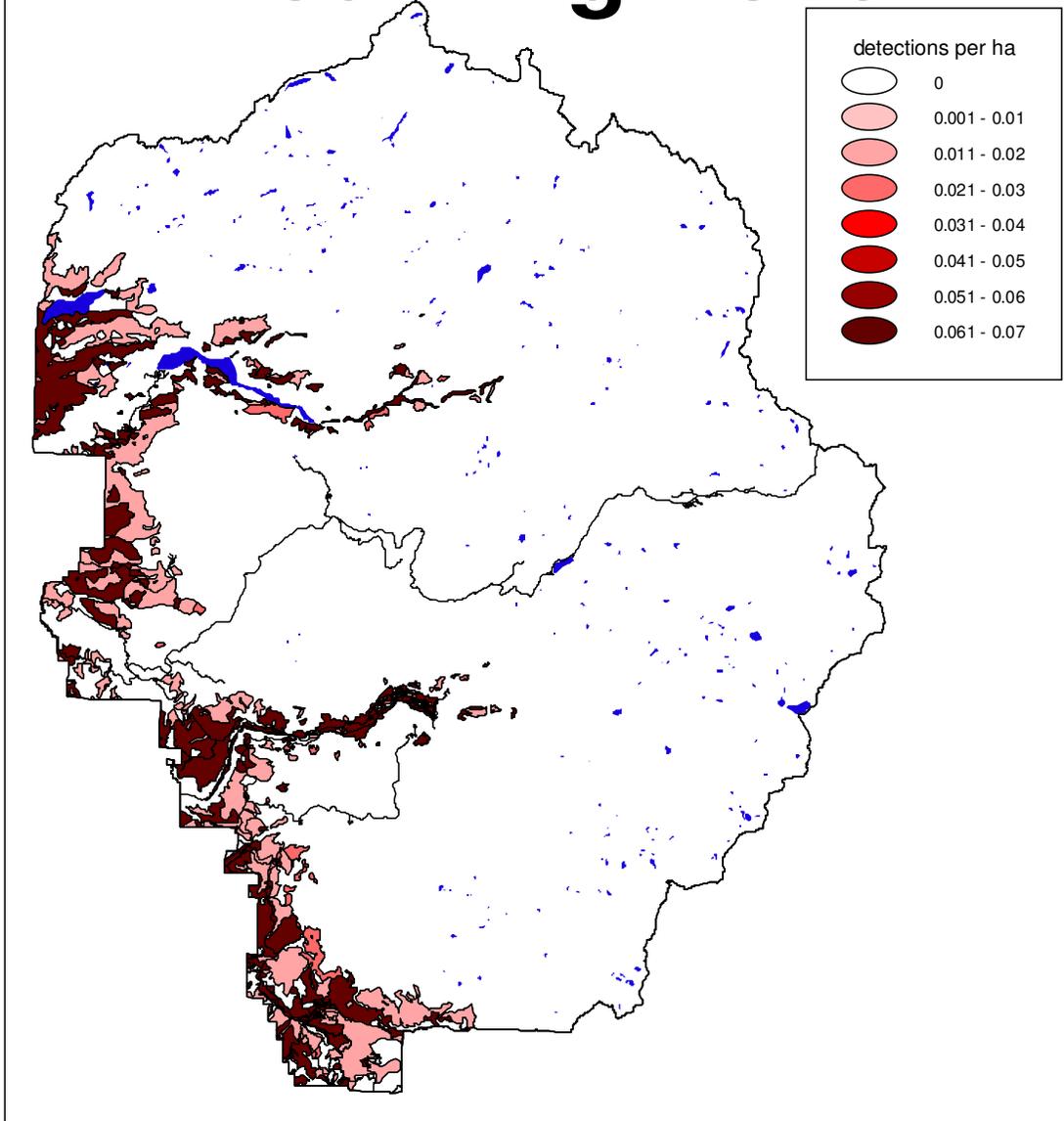


Figure 47. Mourning Dove distribution and relative abundance in the park.

White-throated Swift

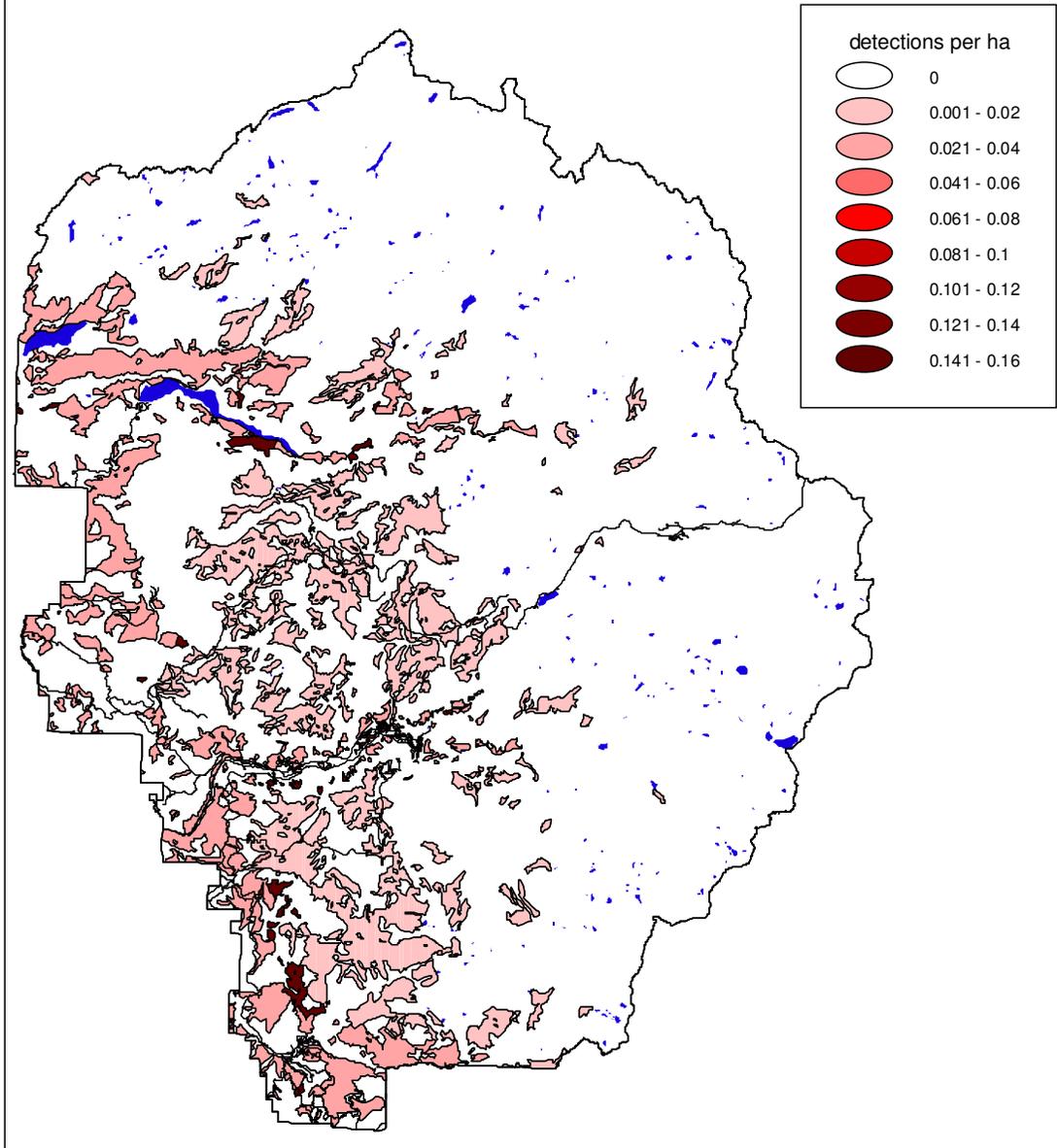


Figure 48. White-throated Swift distribution and abundance in the park.

Anna's Hummingbird

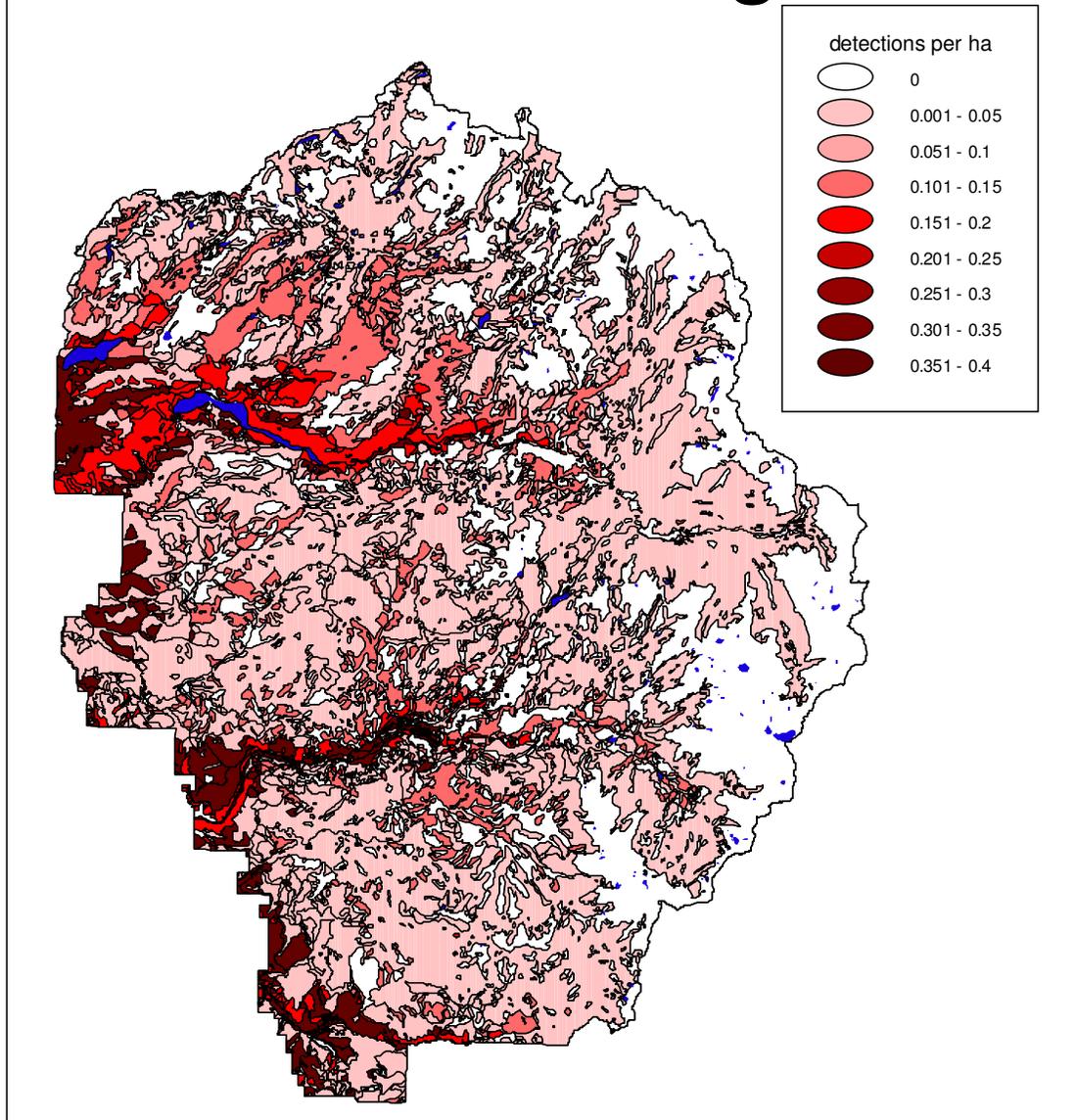


Figure 49. Anna's Hummingbird distribution and relative abundance in the park.

Calliope Hummingbird

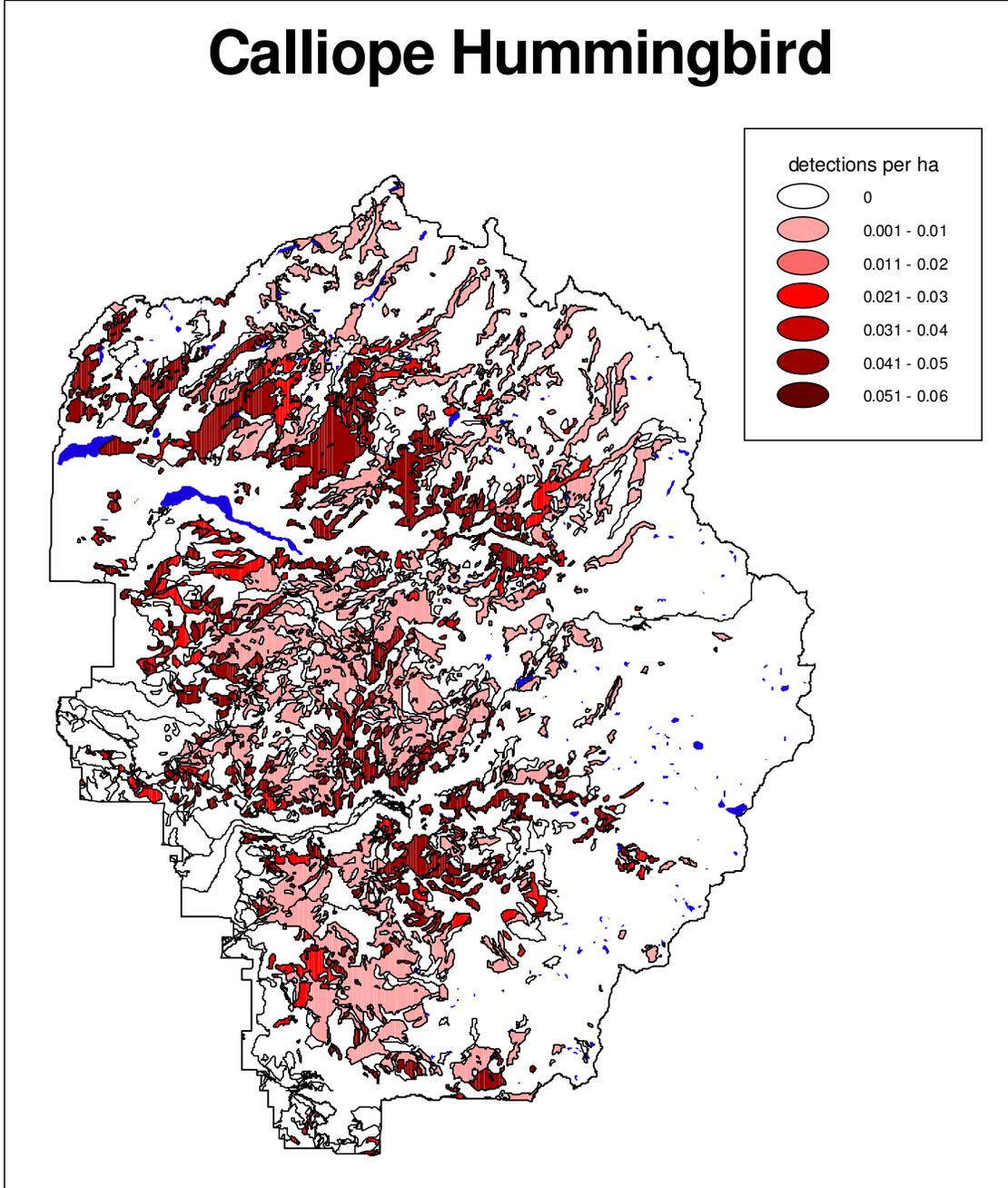


Figure 50. Calliope Hummingbird distribution and relative abundance in the park.

Olive-sided Flycatcher

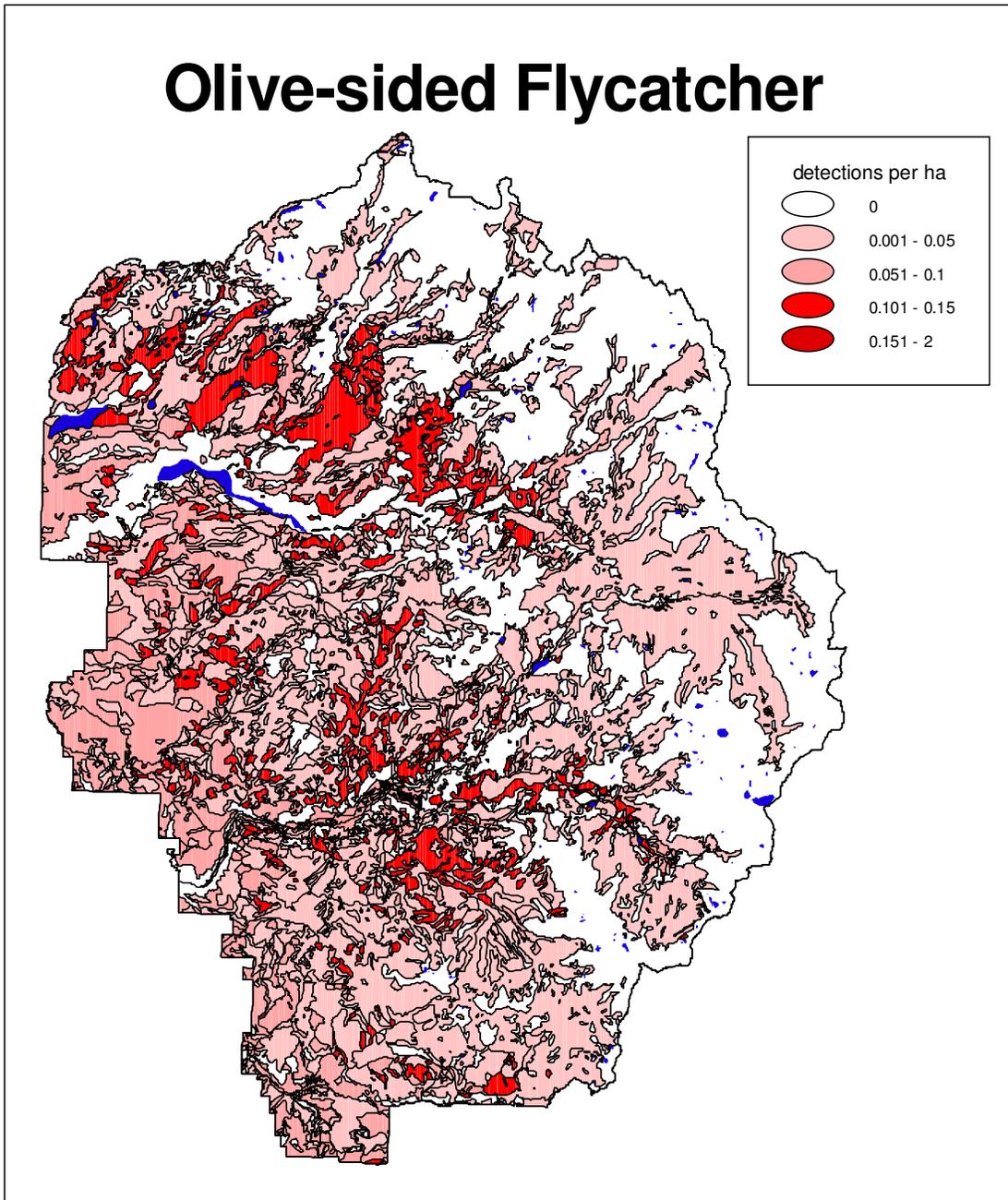


Figure 61. Olive-sided Flycatcher distribution and relative abundance in the park.

Rufous Hummingbird

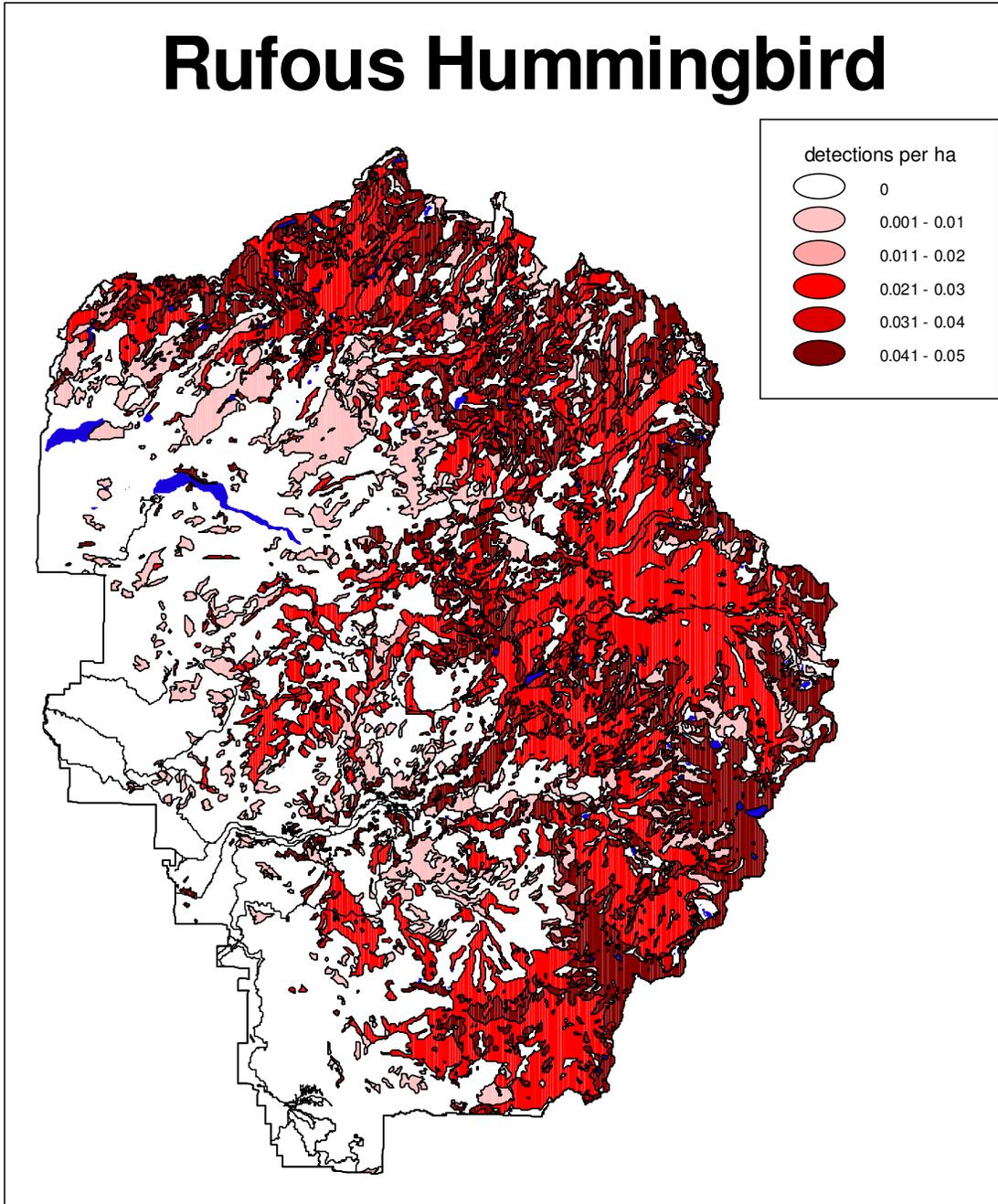


Figure 51. Rufous Hummingbird distribution and relative abundance in the park.

Acorn Woodpecker

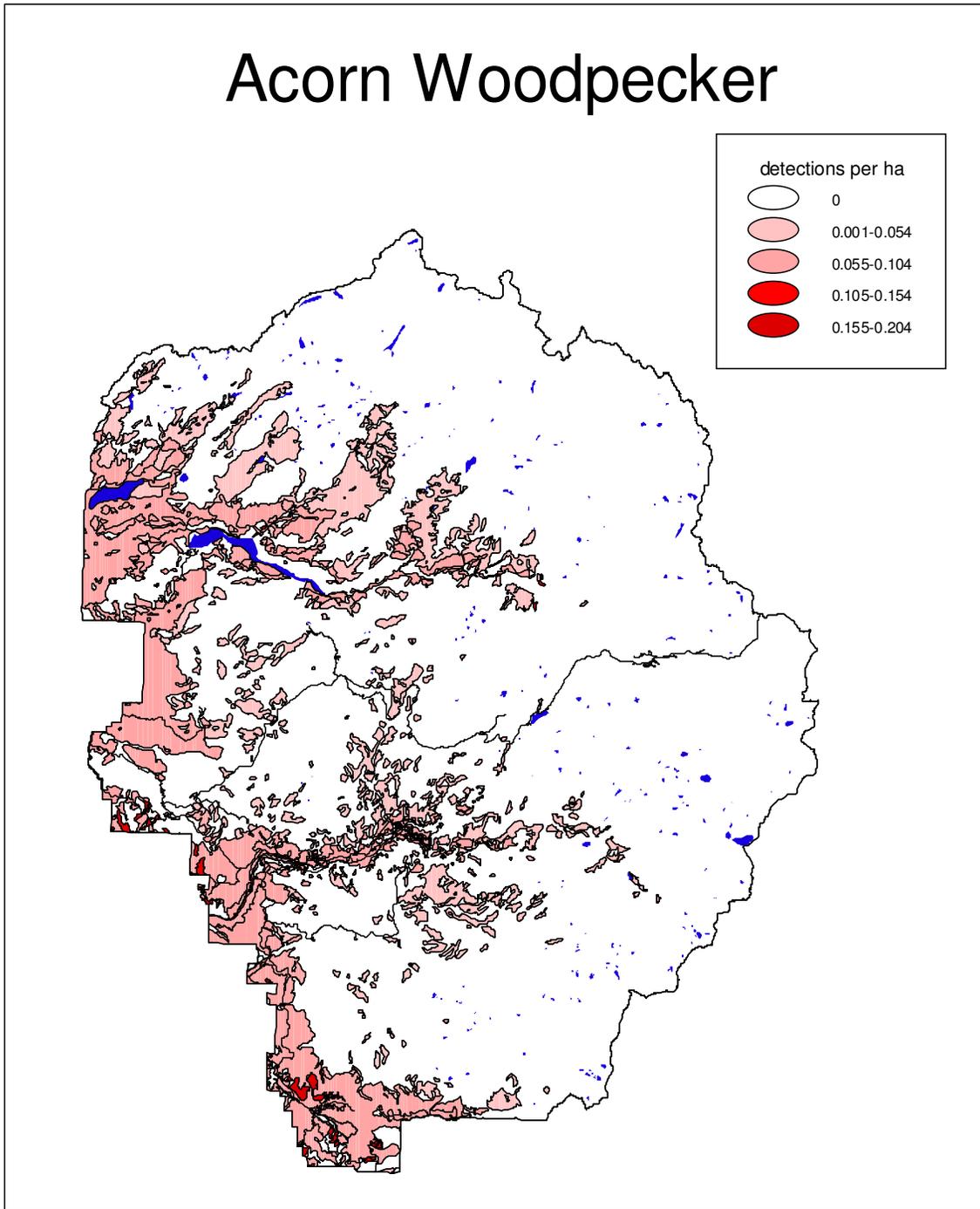


Figure 52. Acorn Woodpecker distribution and relative abundance in the park.

Williamson's Sapsucker

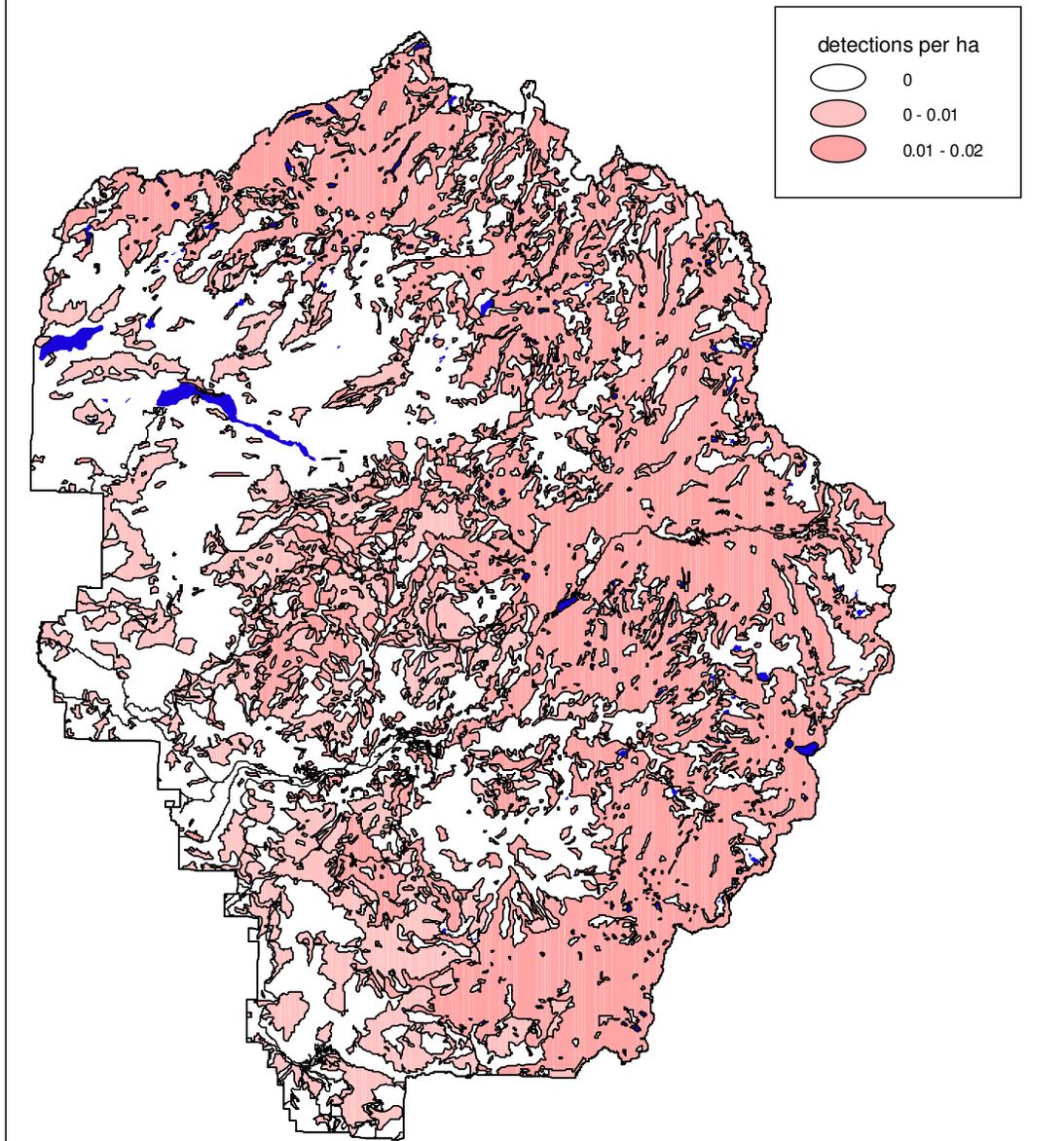


Figure 53. Williamson's Sapsucker distribution and relative abundance in the park.

Red-breasted Sapsucker

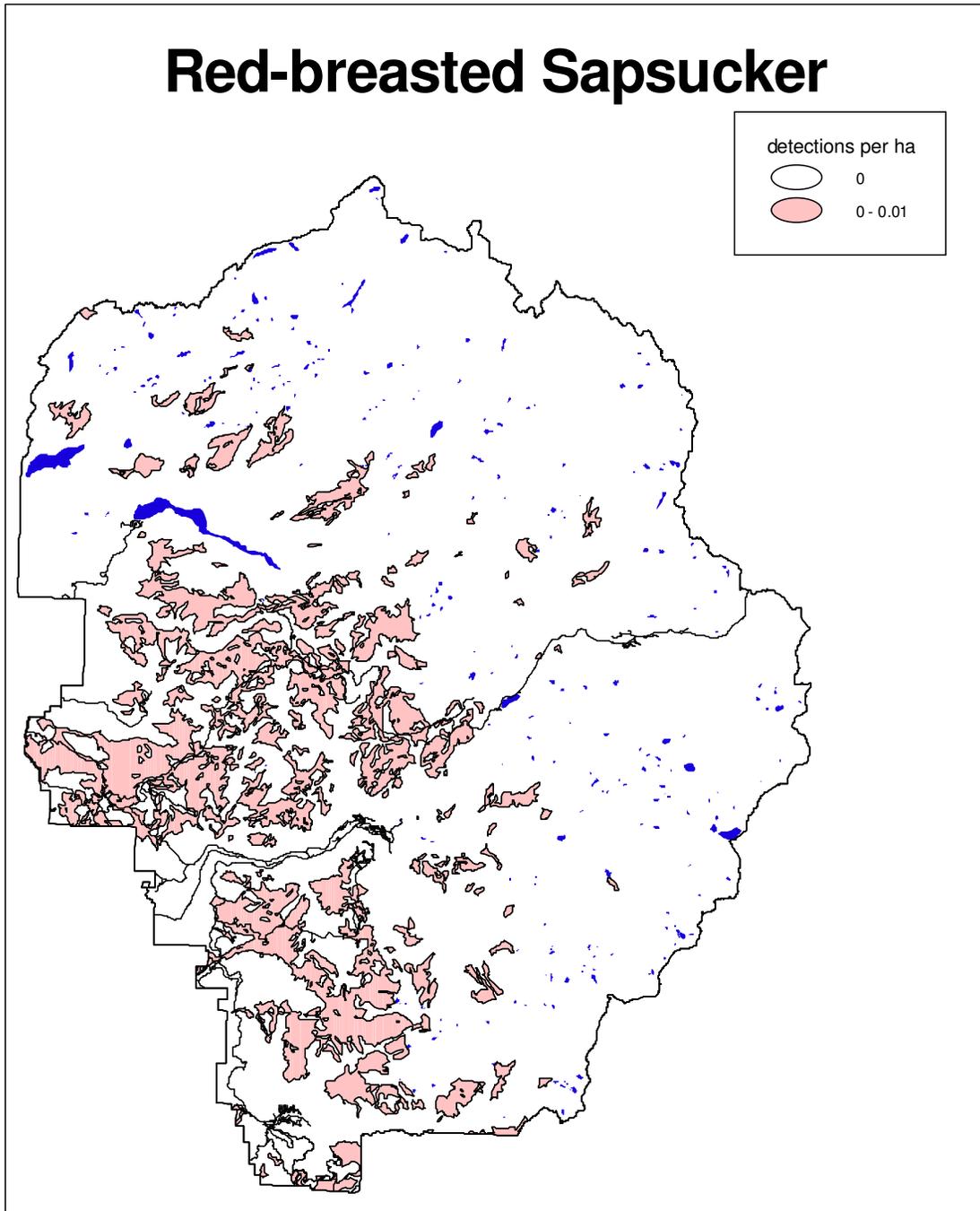


Figure 54. Red-breasted Sapsucker distribution and relative abundance in the park.

Downy Woodpecker

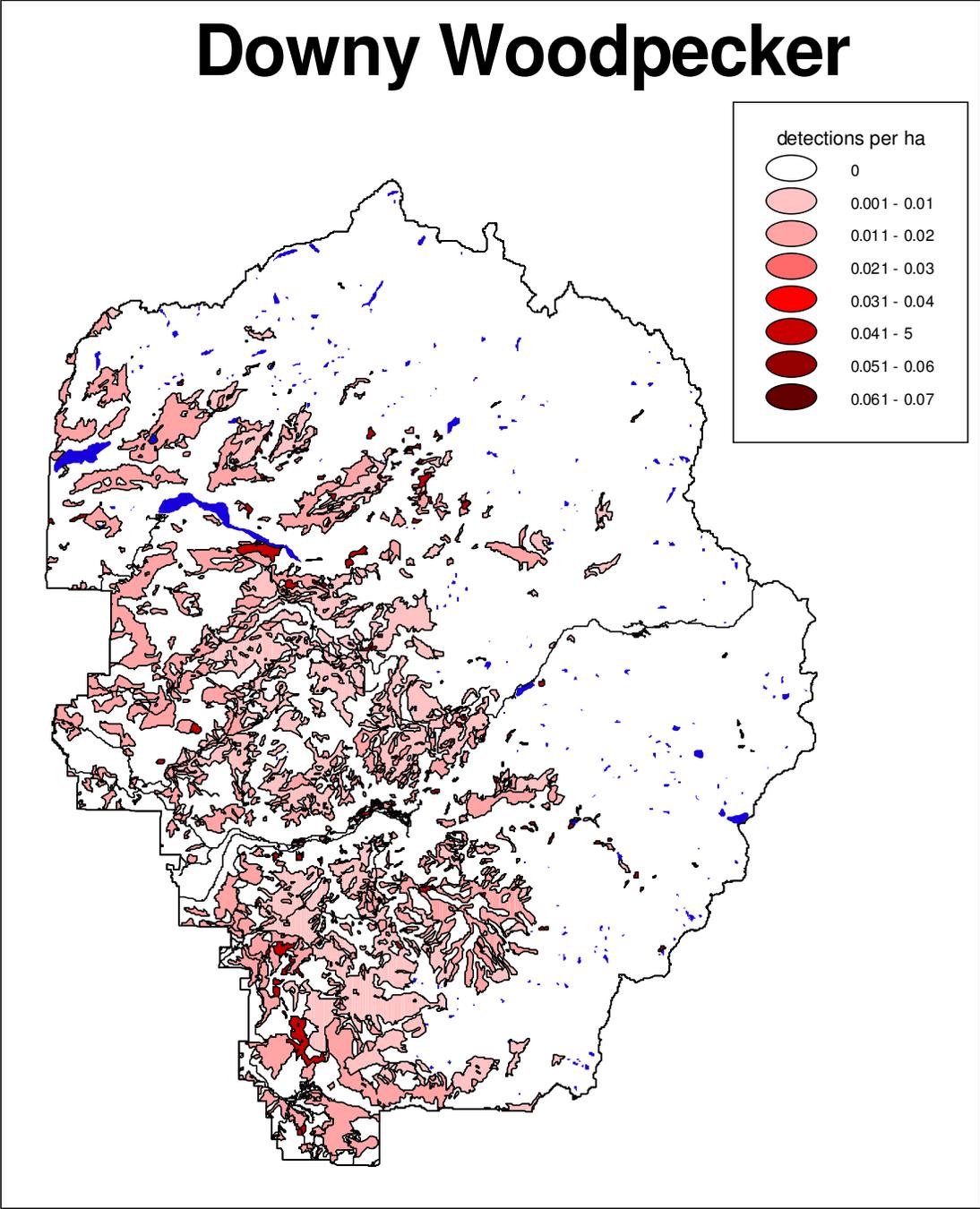


Figure 55. Downy Woodpecker distribution and relative abundance in the park.

Hairy Woodpecker

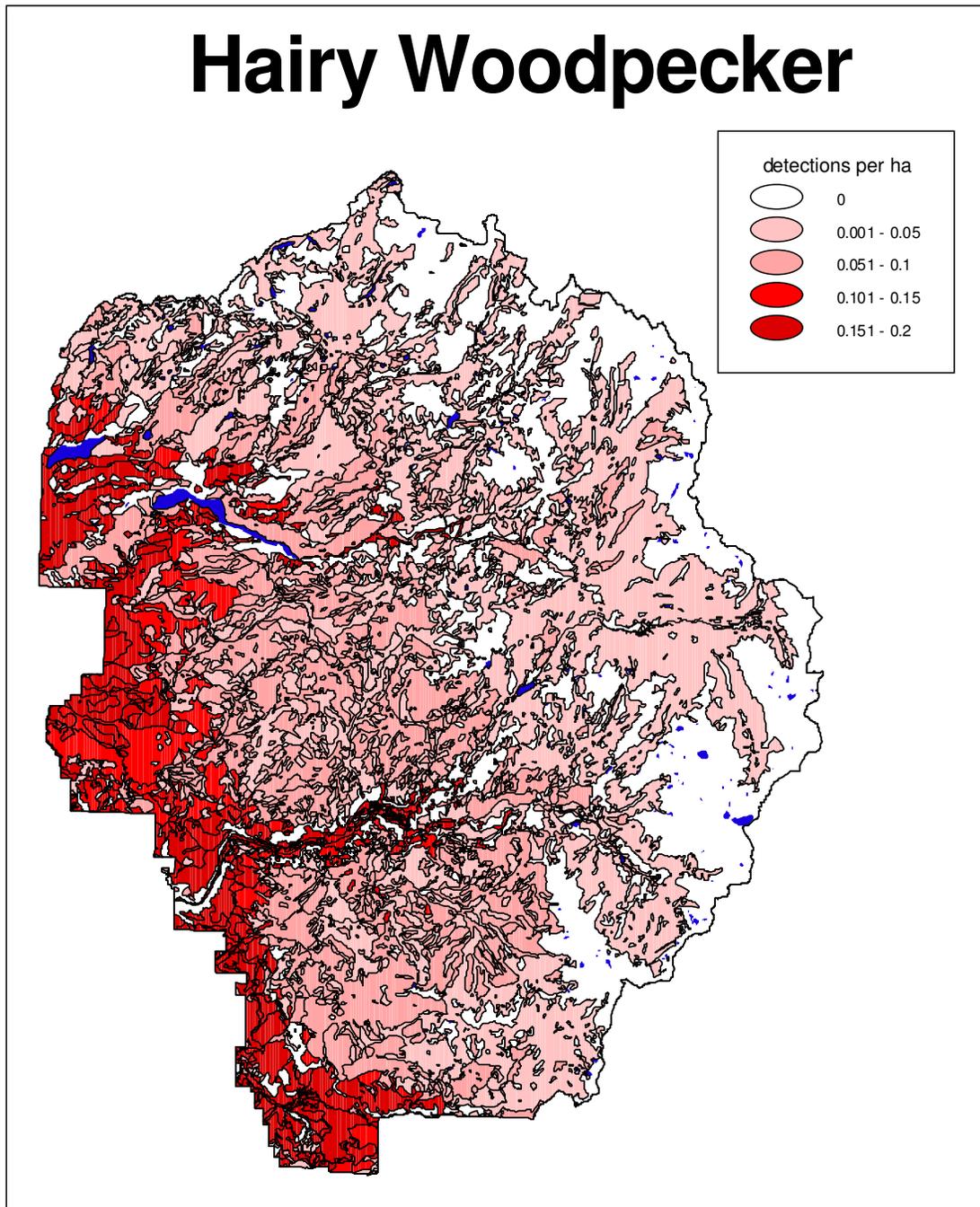


Figure 56. Hairy Woodpecker distribution and relative abundance in the park.

White-headed Woodpecker

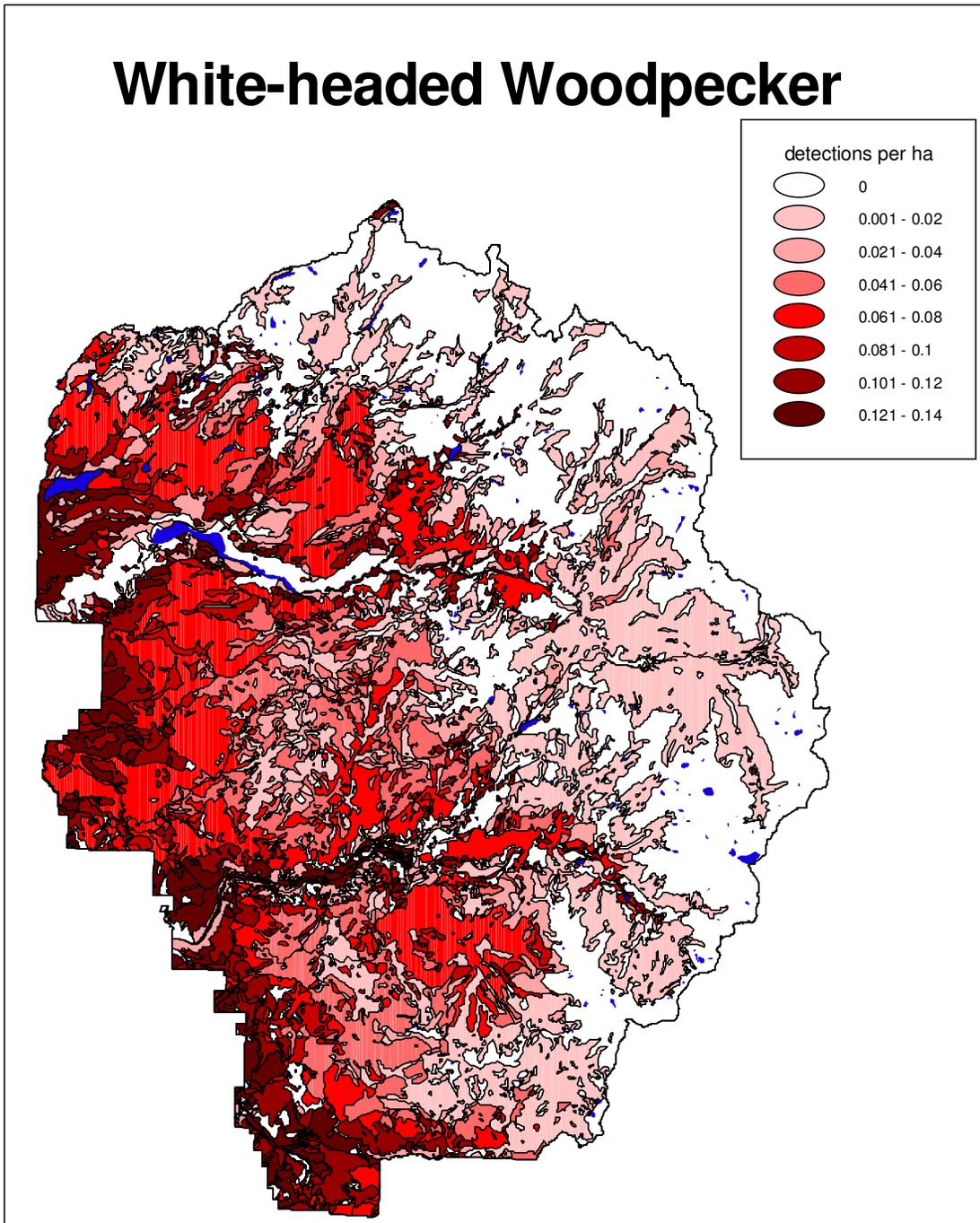


Figure 57. White-headed Woodpecker distribution and relative abundance in the park.

Black-backed Woodpecker

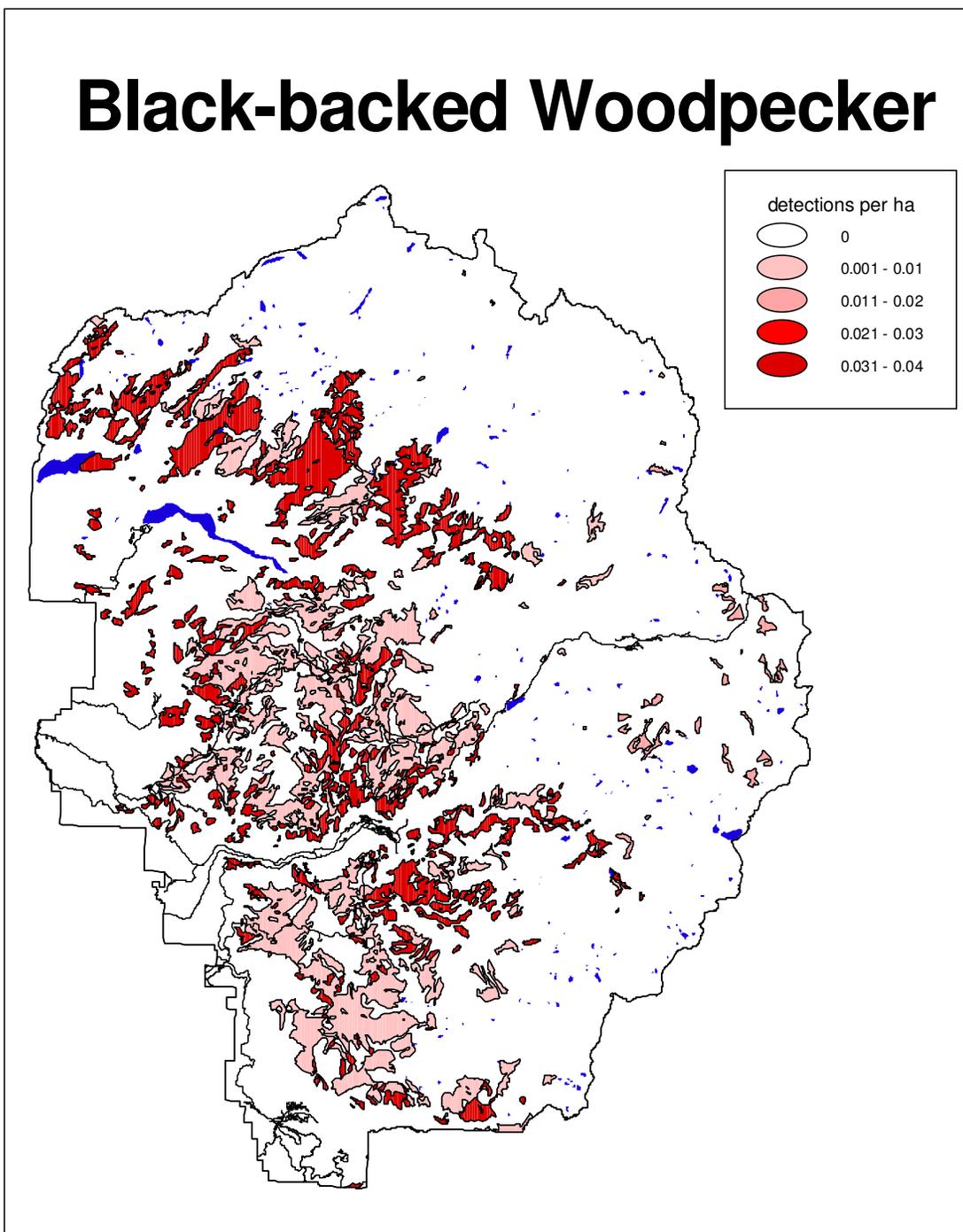


Figure 58. Black-backed Woodpecker distribution and relative abundance in the park.

Northern Flicker

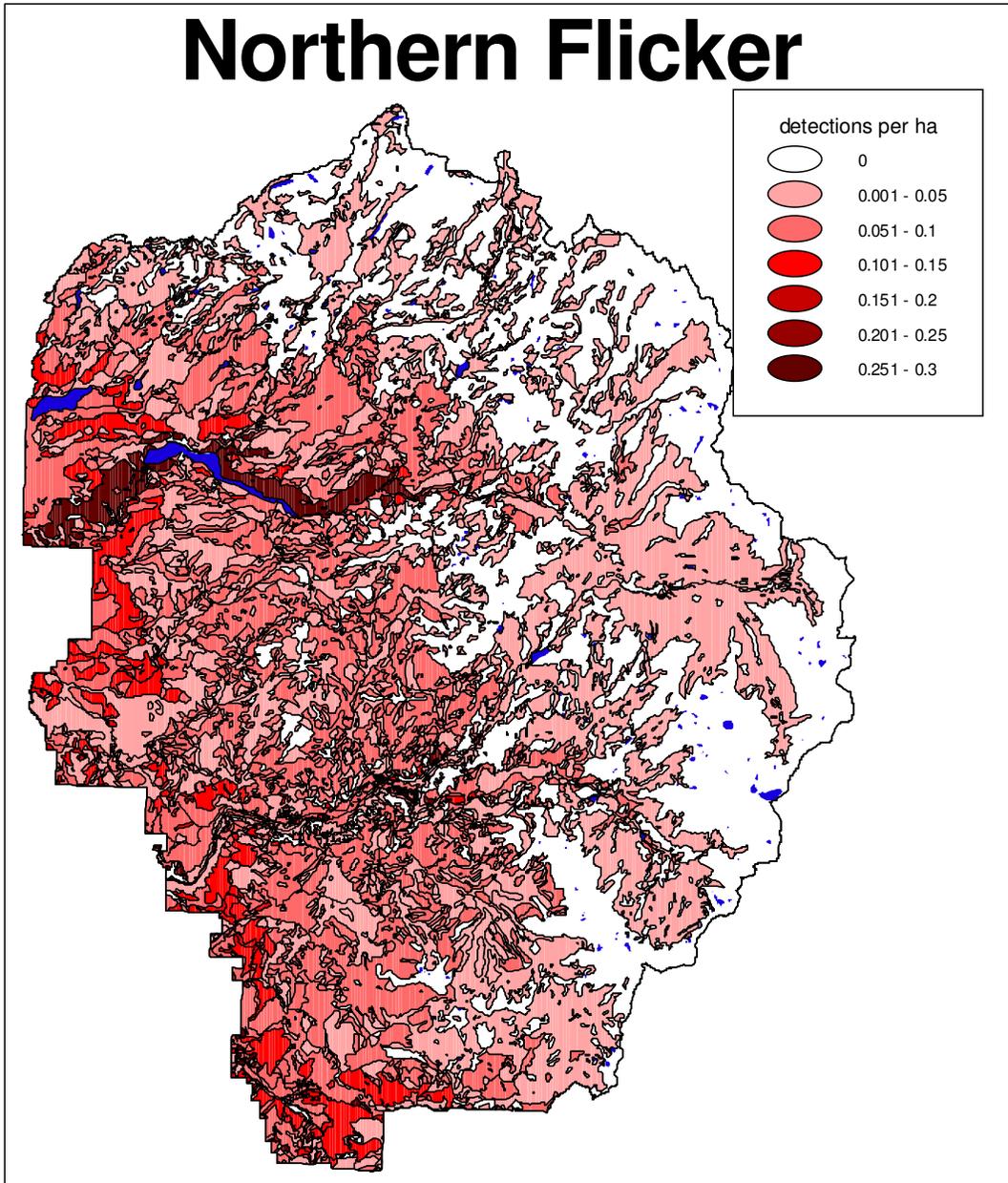


Figure 59. Northern Flicker distribution and relative abundance in the park.

Pileated Woodpecker

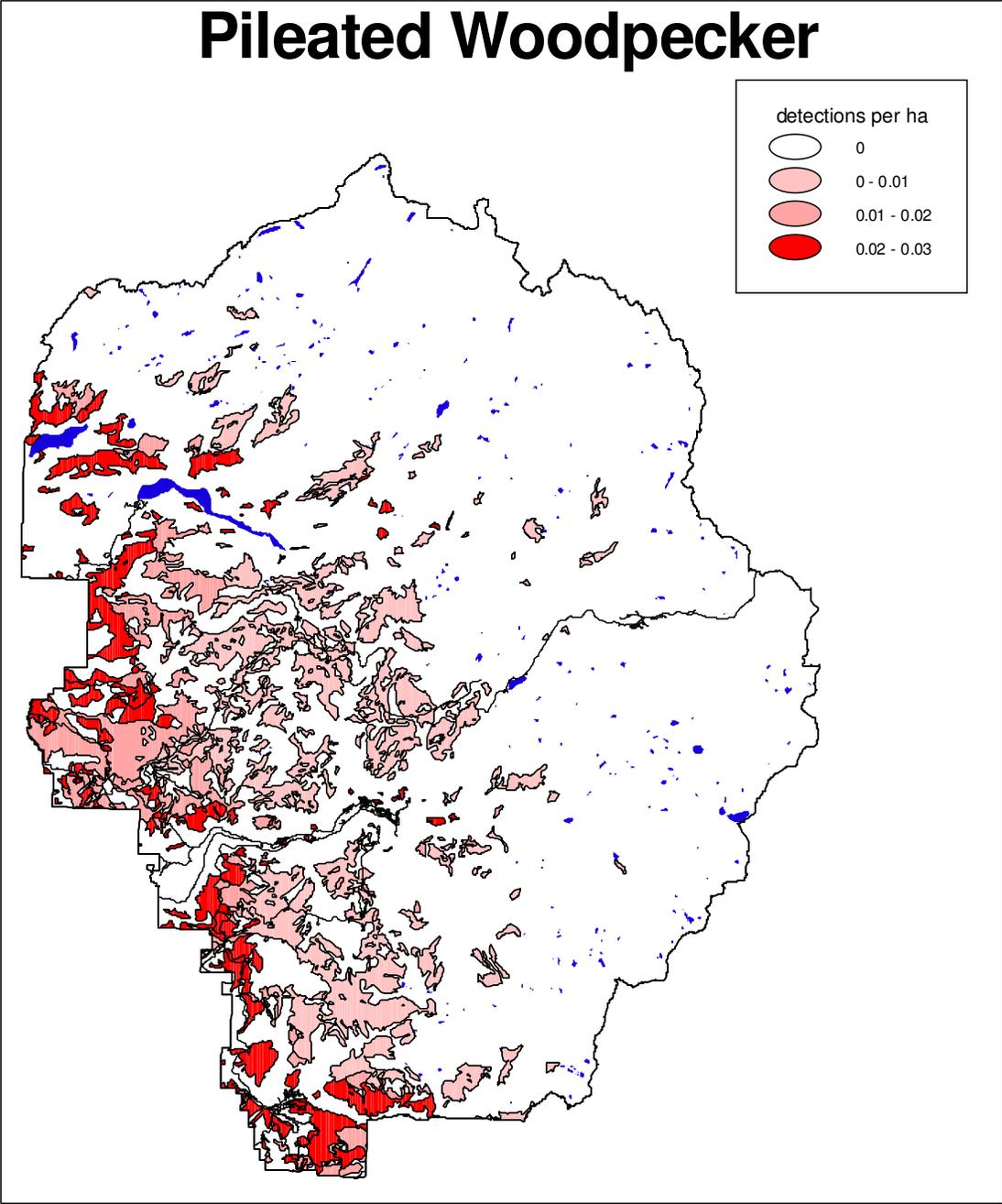


Figure 60. Pileated Woodpecker distribution and relative abundance in the park.

Chestnut-backed Chickadee

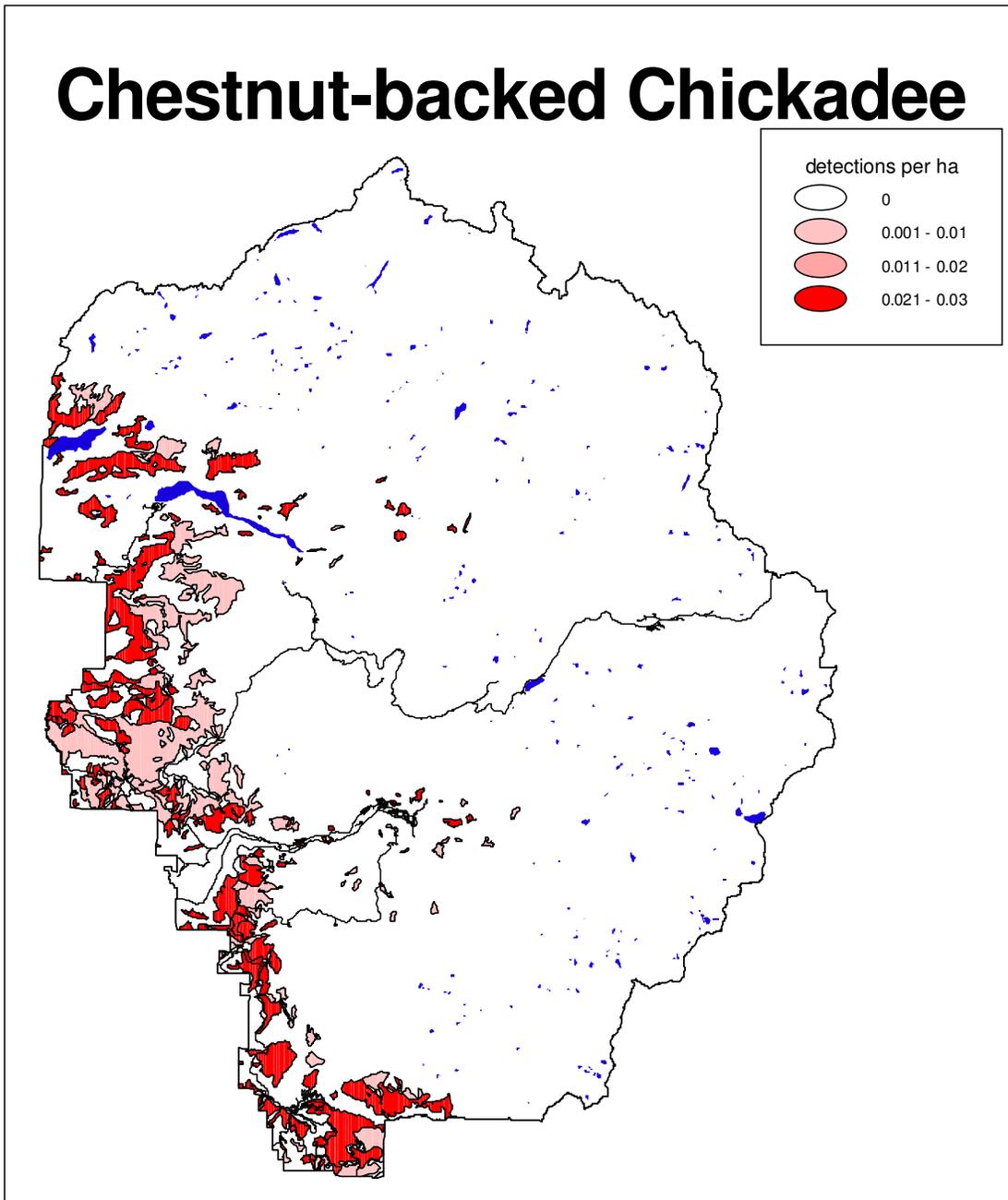


Figure 76. Chestnut-backed Chickadee distribution and relative abundance in the park.

Olive-sided Flycatcher

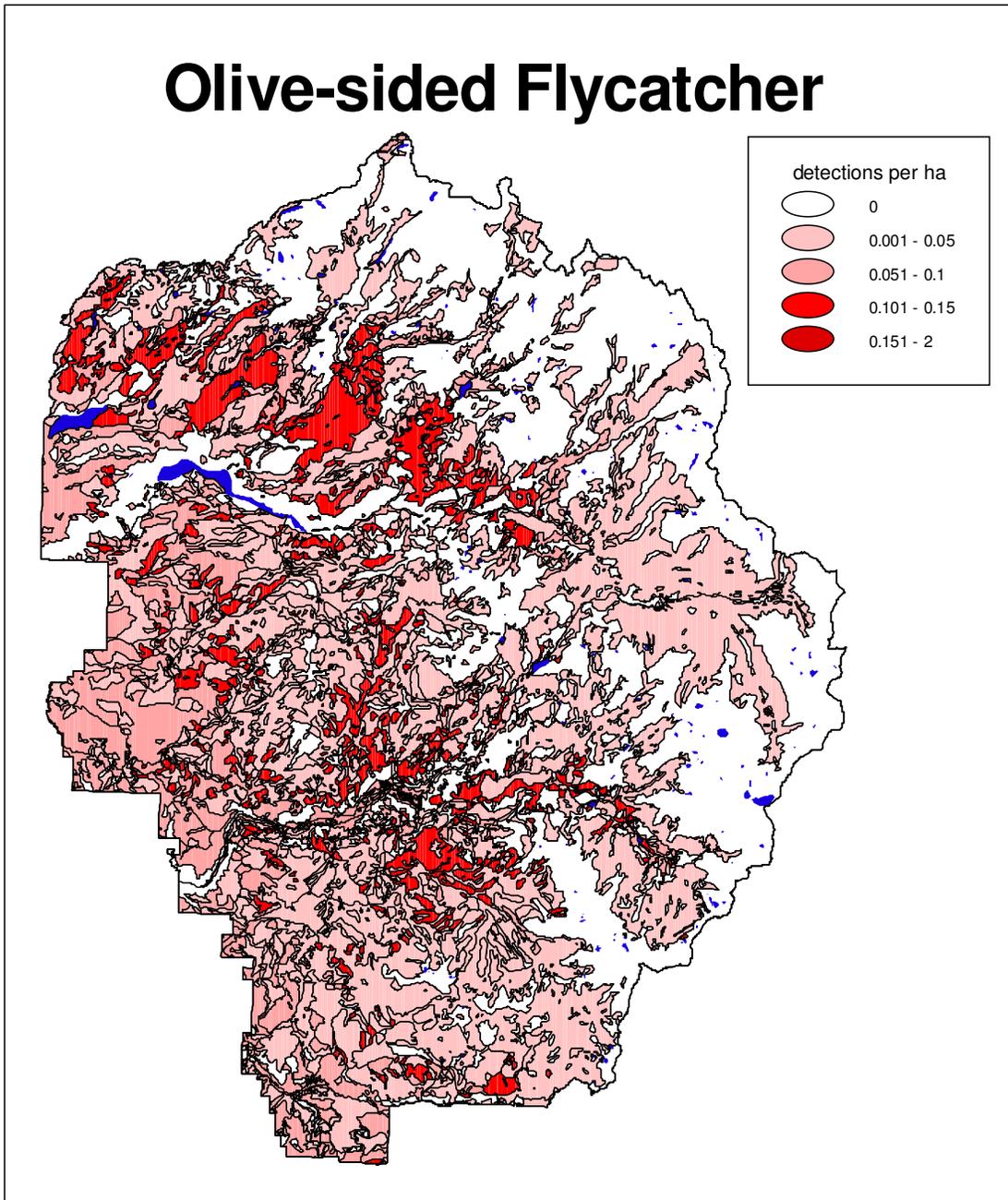


Figure 61. Olive-sided Flycatcher distribution and relative abundance in the park.

Western Wood-Pewee

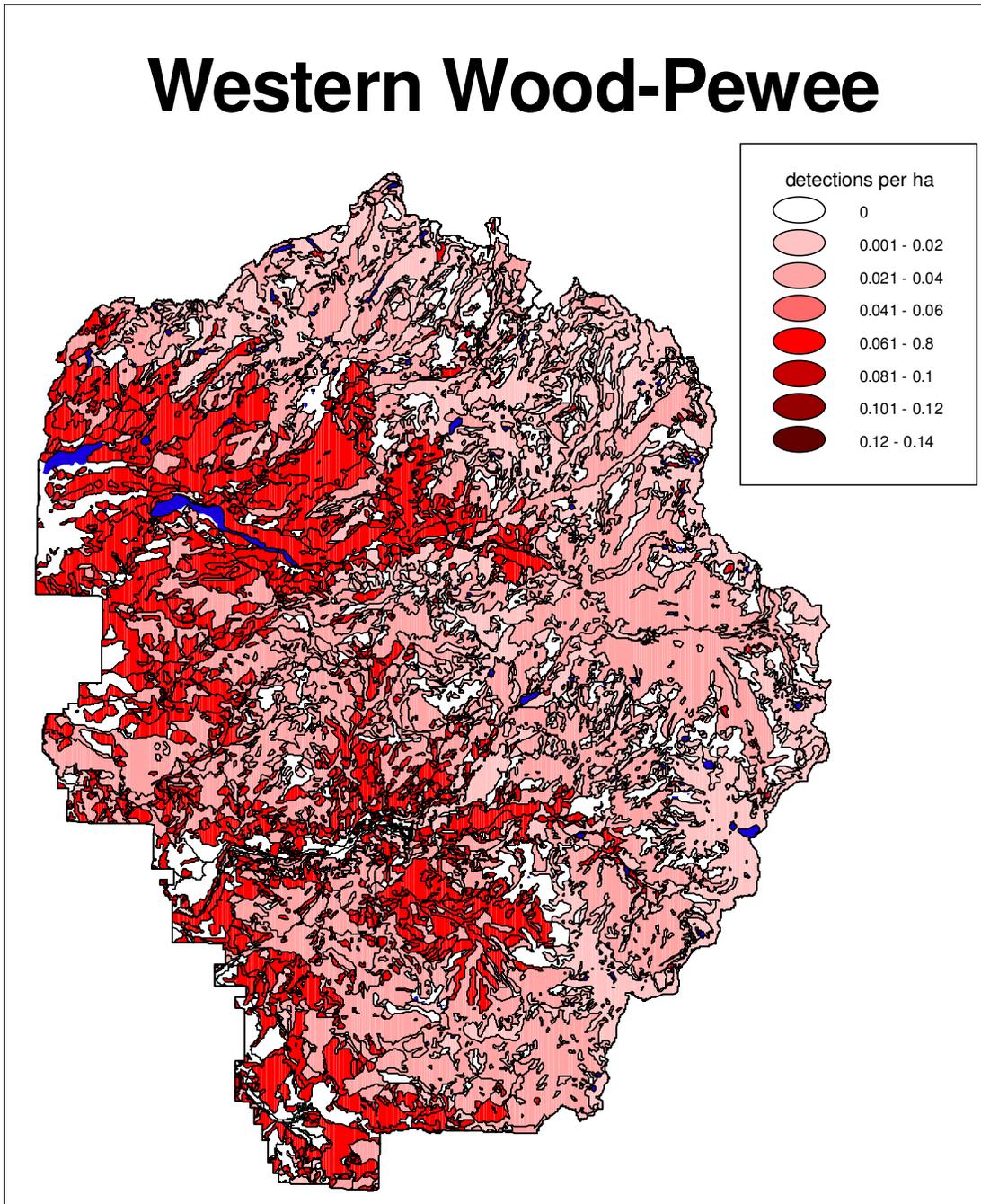


Figure 62. Western Wood-Pewee distribution and relative abundance in the park.

Hammond's Flycatcher

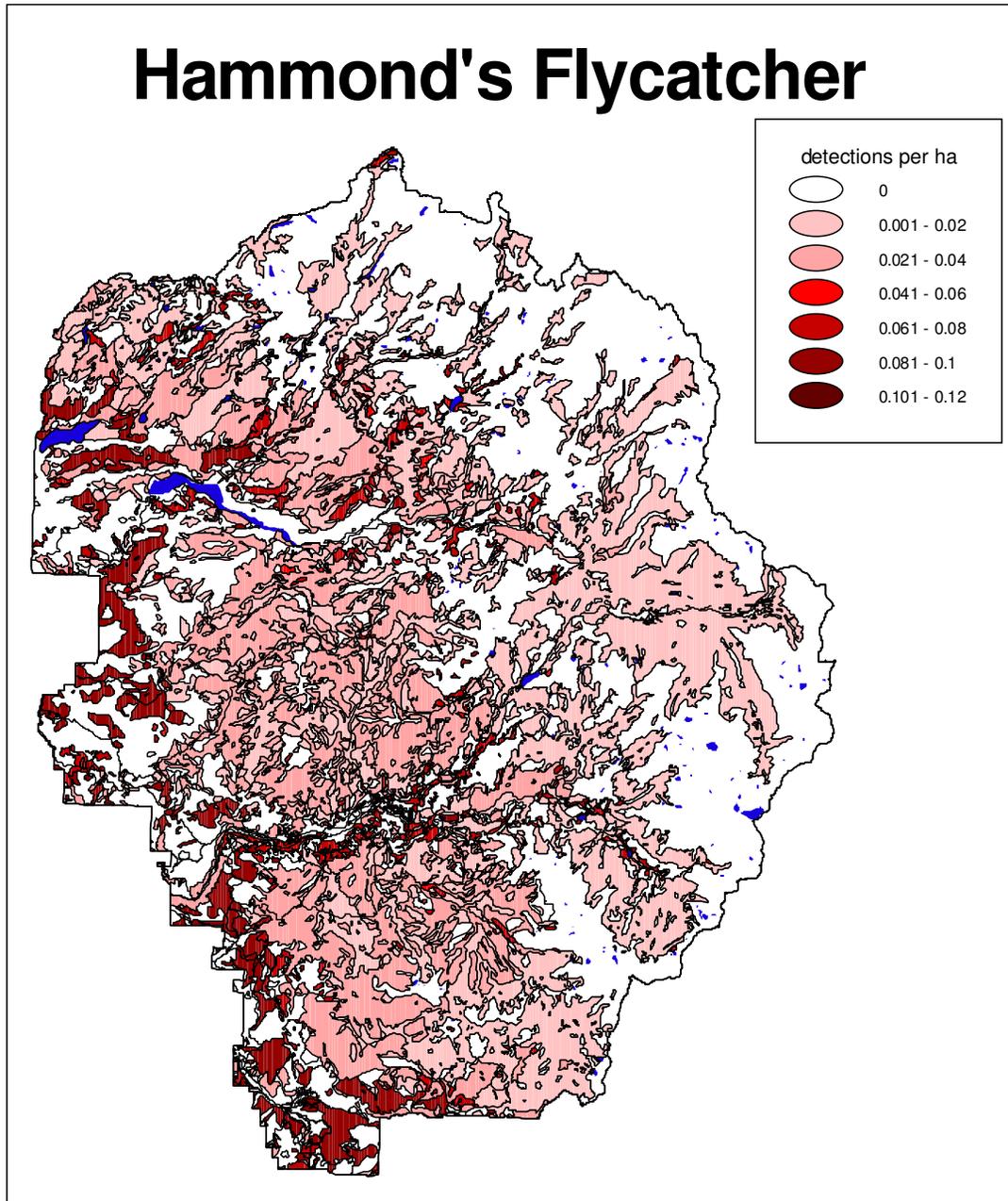


Figure 63. Hammond's Flycatcher distribution and relative abundance in the park.

Dusky Flycatcher

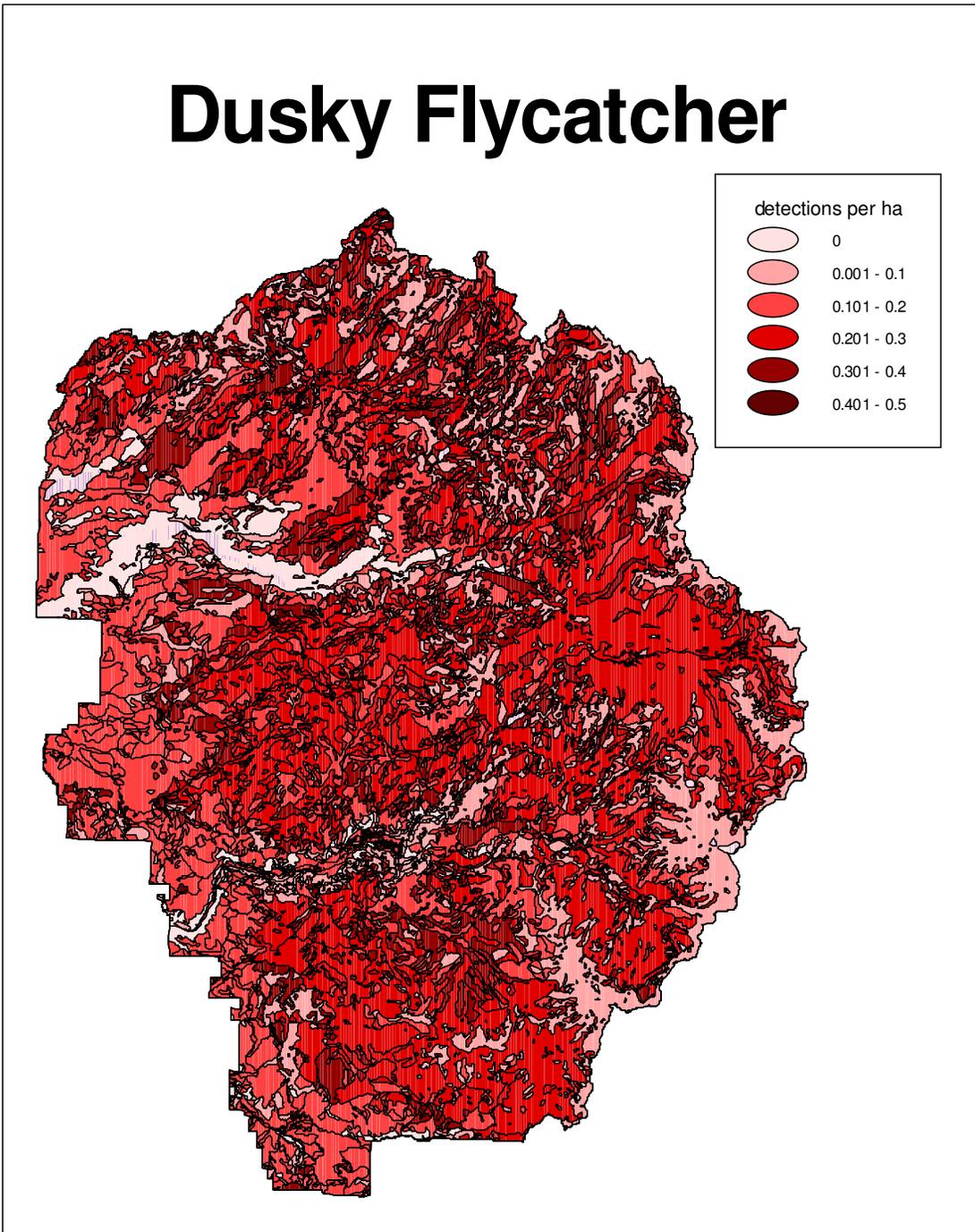


Figure 64. Dusky Flycatcher distribution and relative abundance in the park.

Pacific-slope Flycatcher

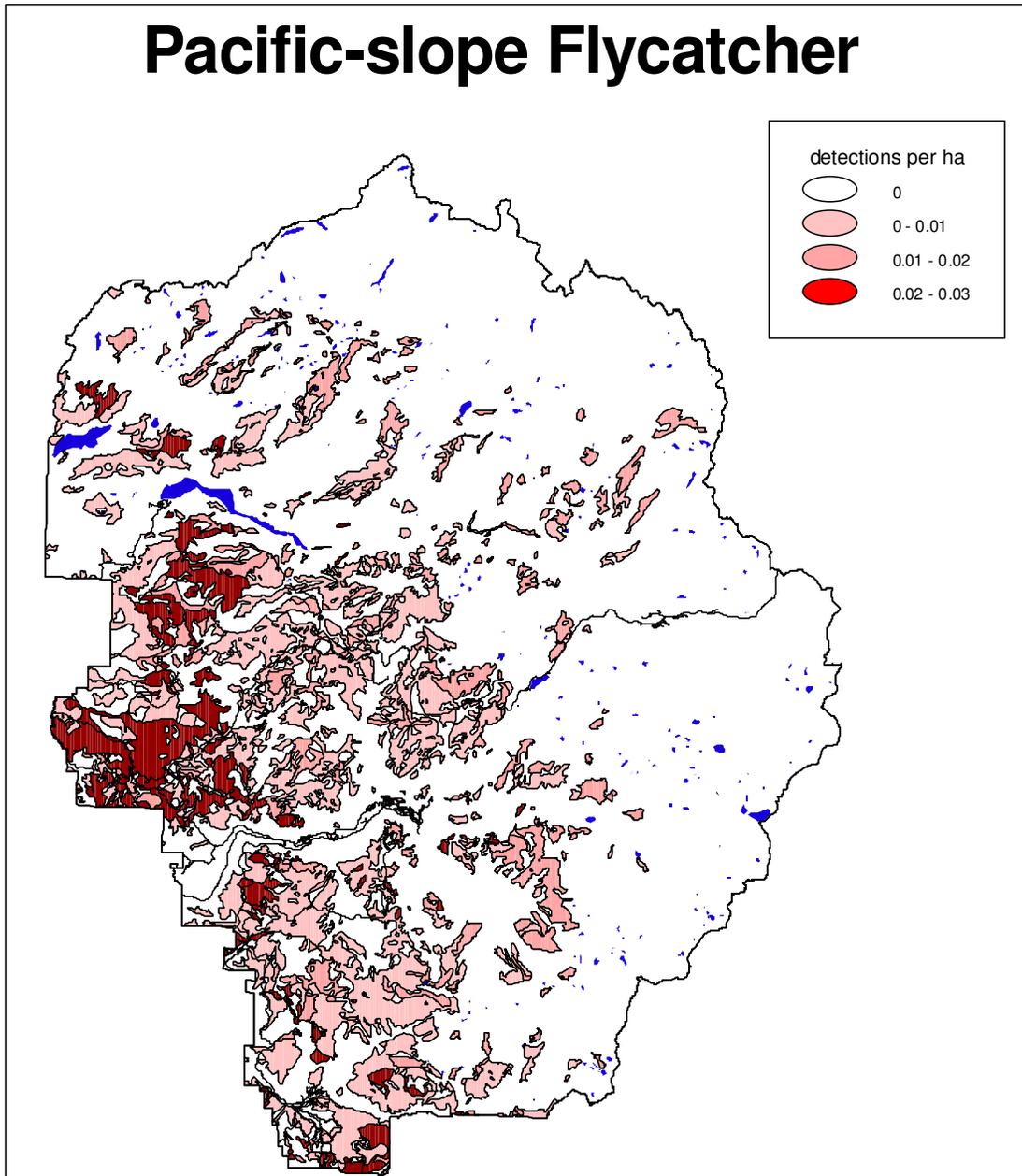


Figure 65. Pacific-slope Flycatcher distribution and relative abundance in the park.

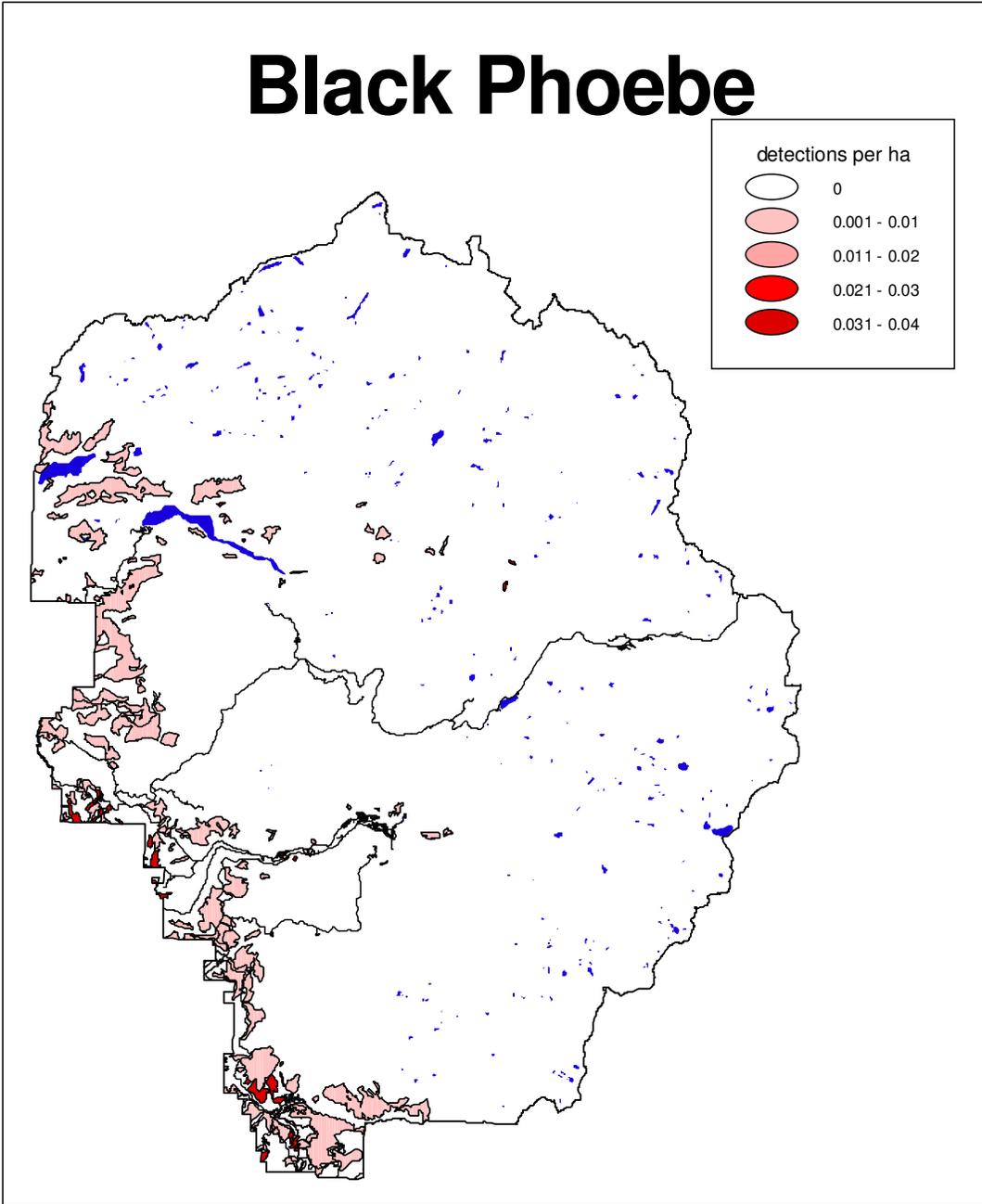


Figure 66. Black Phoebe distribution and relative abundance in the park.

Cassin's Vireo

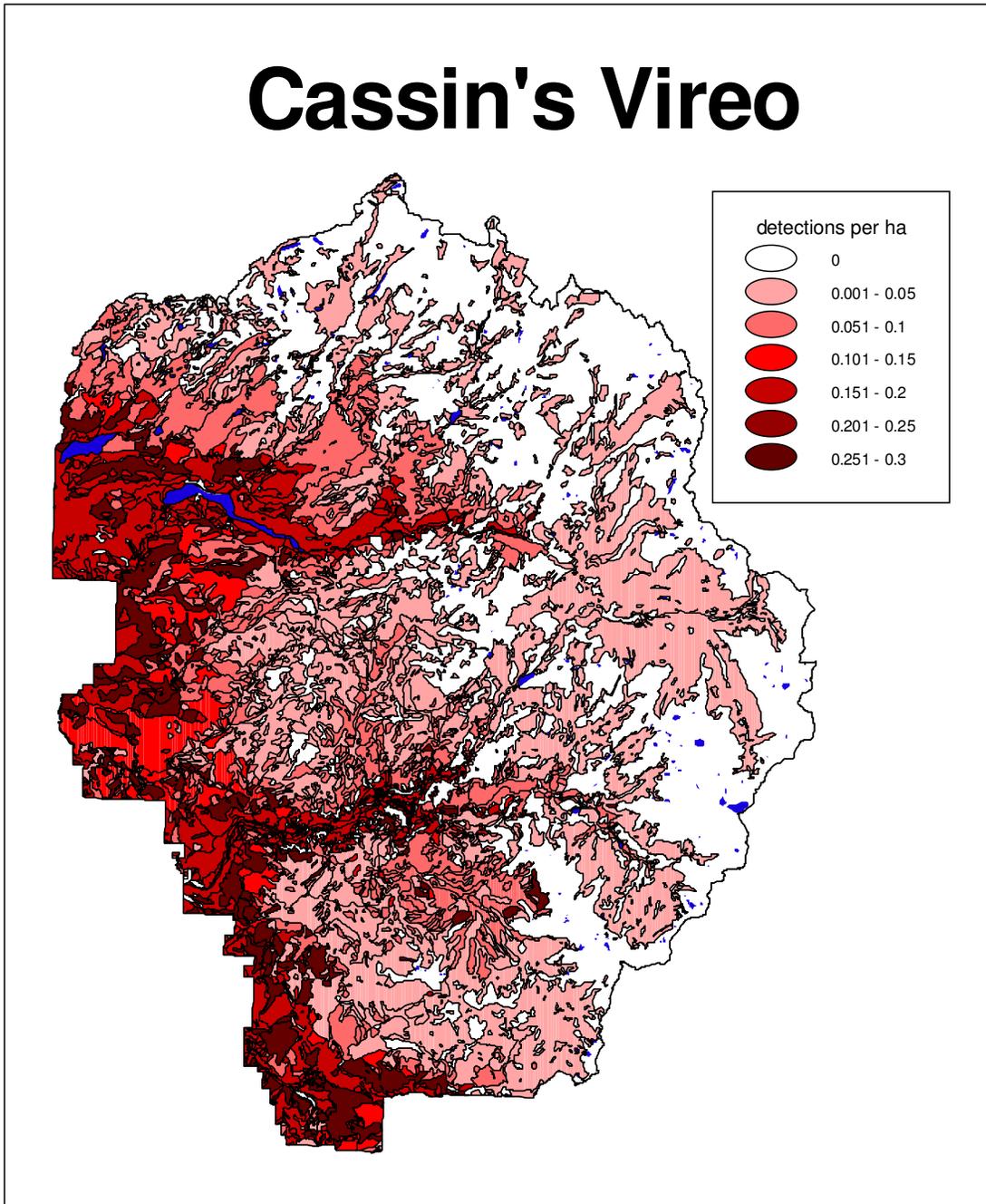


Figure 67. Cassin's Vireo distribution and relative abundance in the park.

Hutton's Vireo

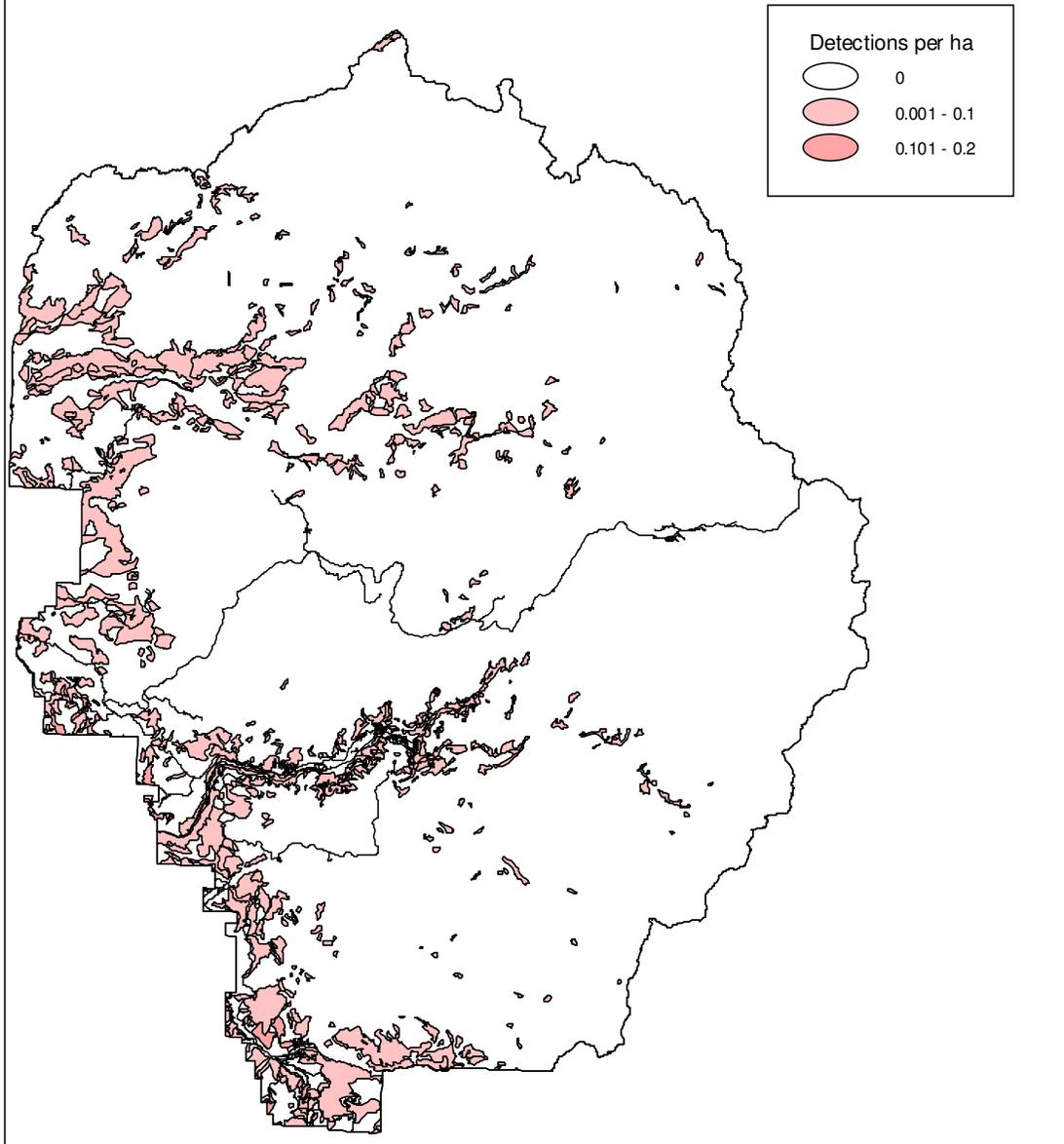


Figure 68. Hutton's Vireo distribution and relative abundance in the park.

Warbling Vireo

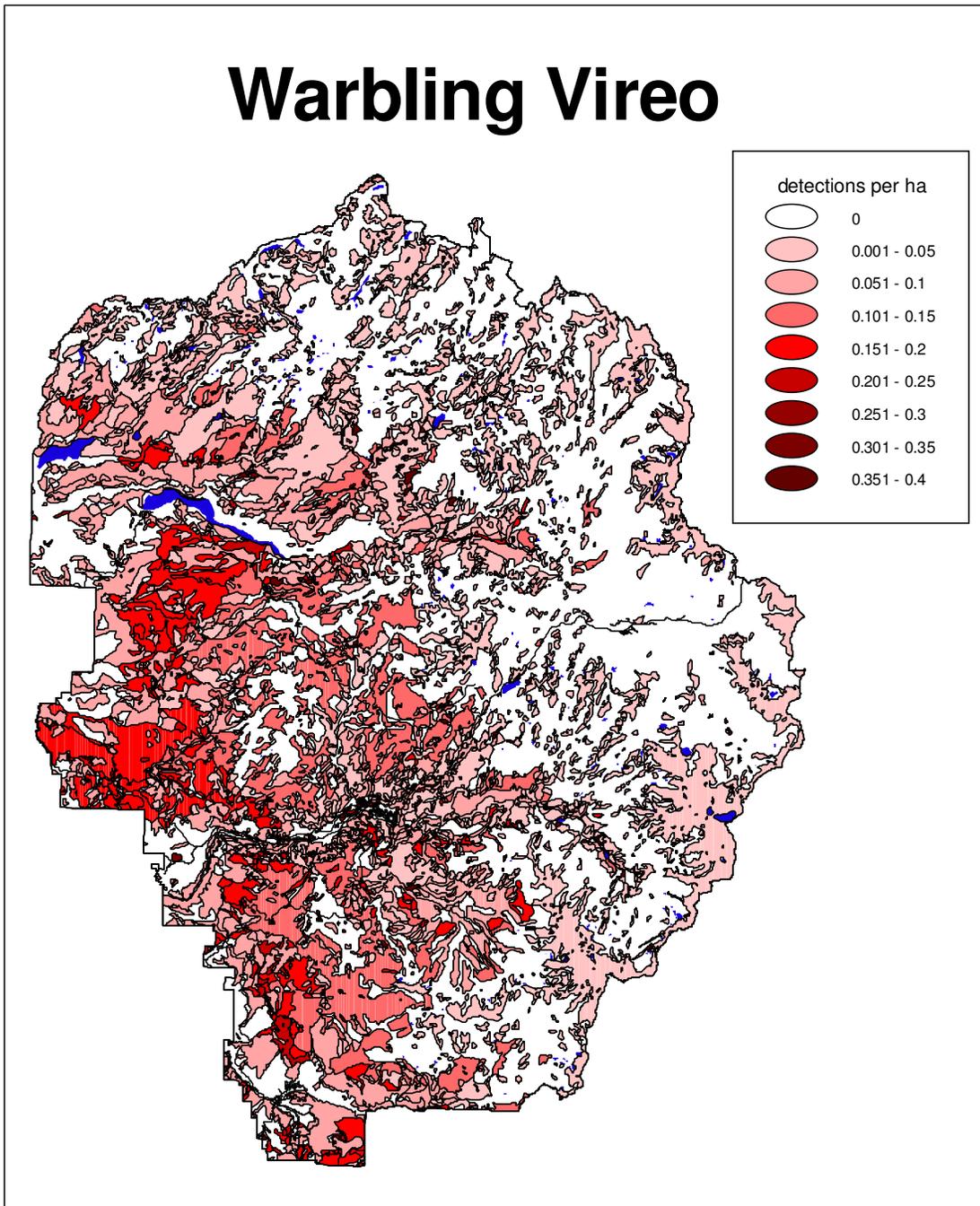


Figure 69. Warbling Vireo distribution and relative abundance in the park.

Steller's Jay

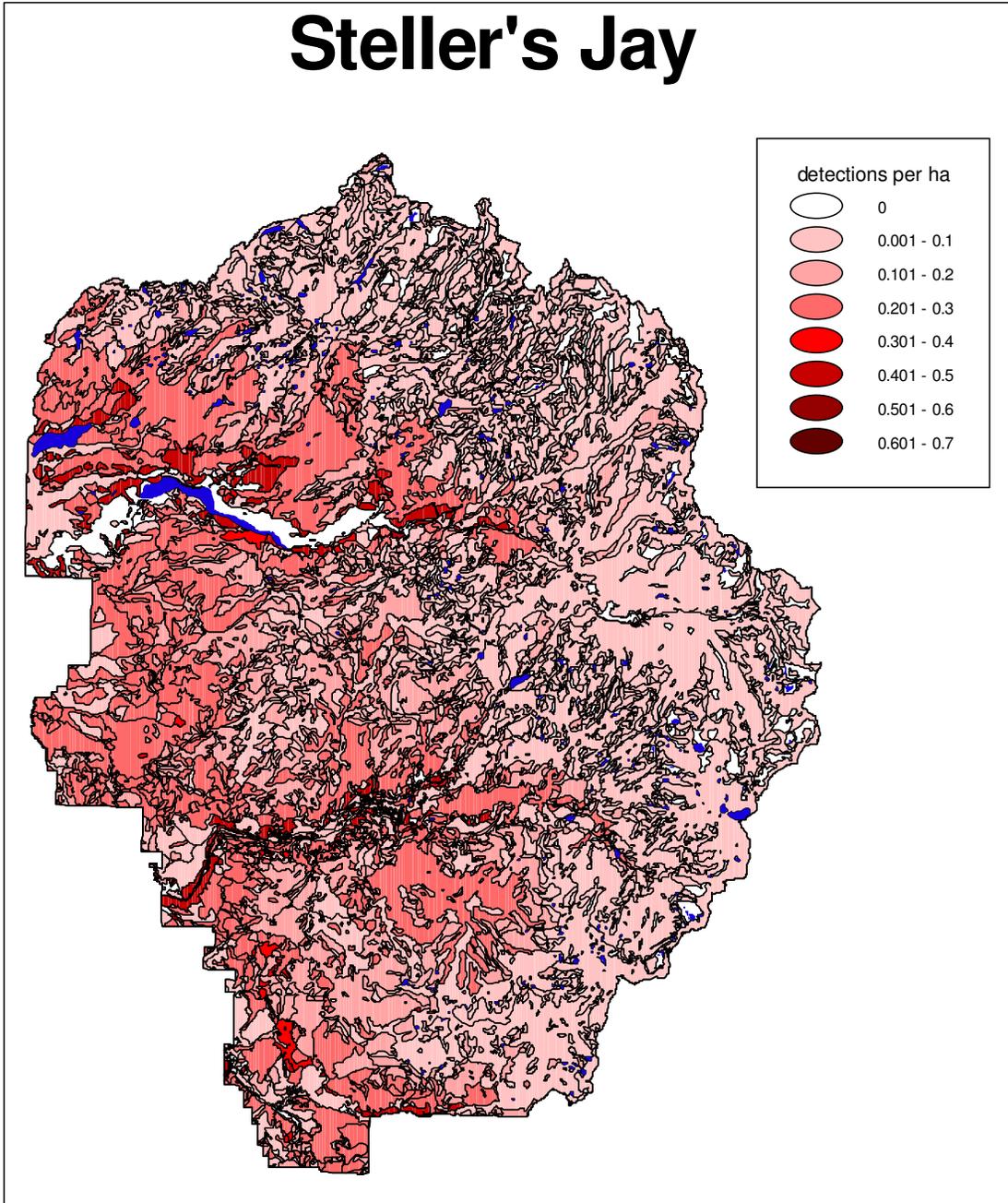


Figure 70. Steller's Jay distribution and relative abundance in the park.

Western Scrub-Jay

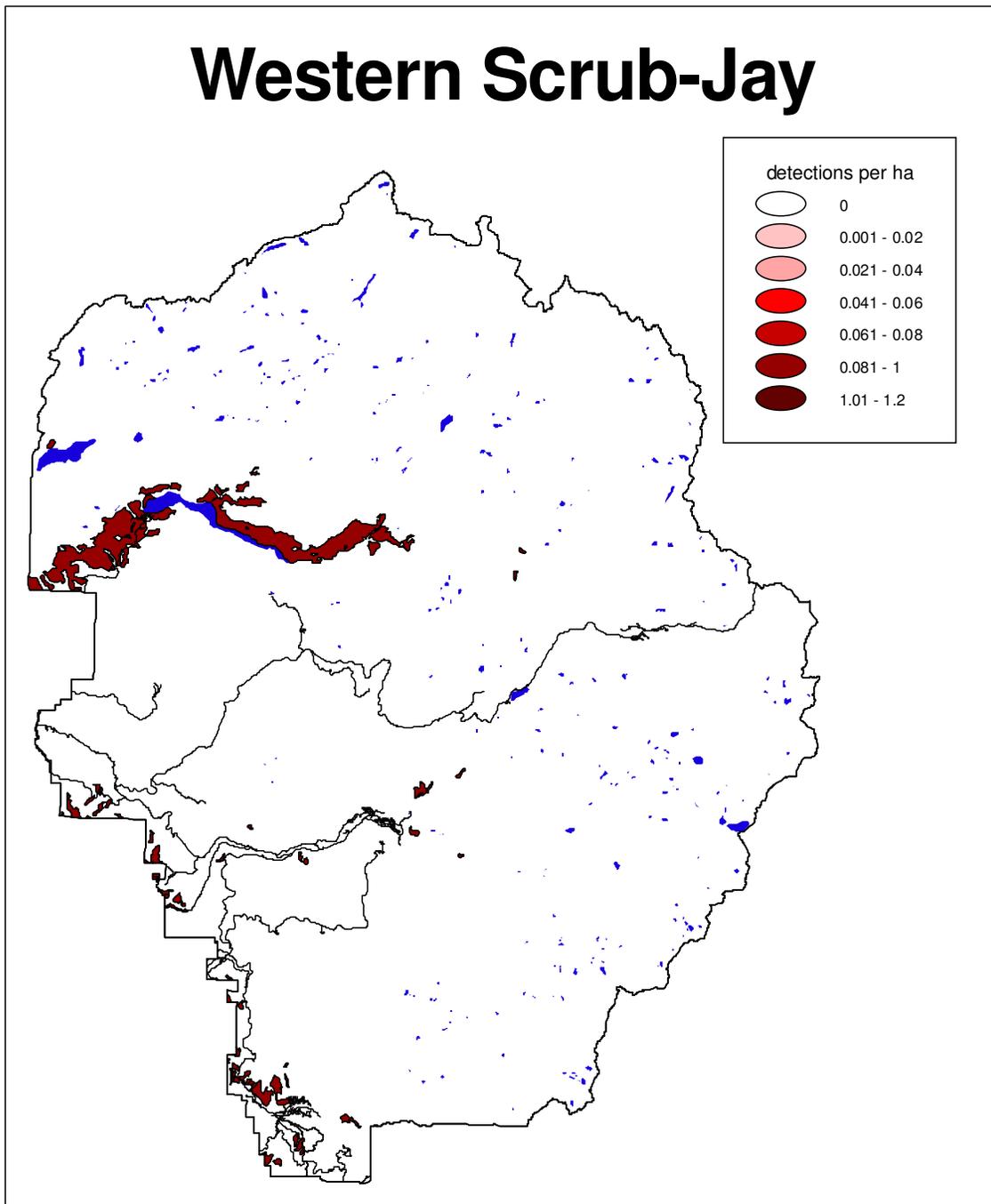


Figure 71. Western Scrub-Jay distribution and relative abundance in the park.

Clark's Nutcracker

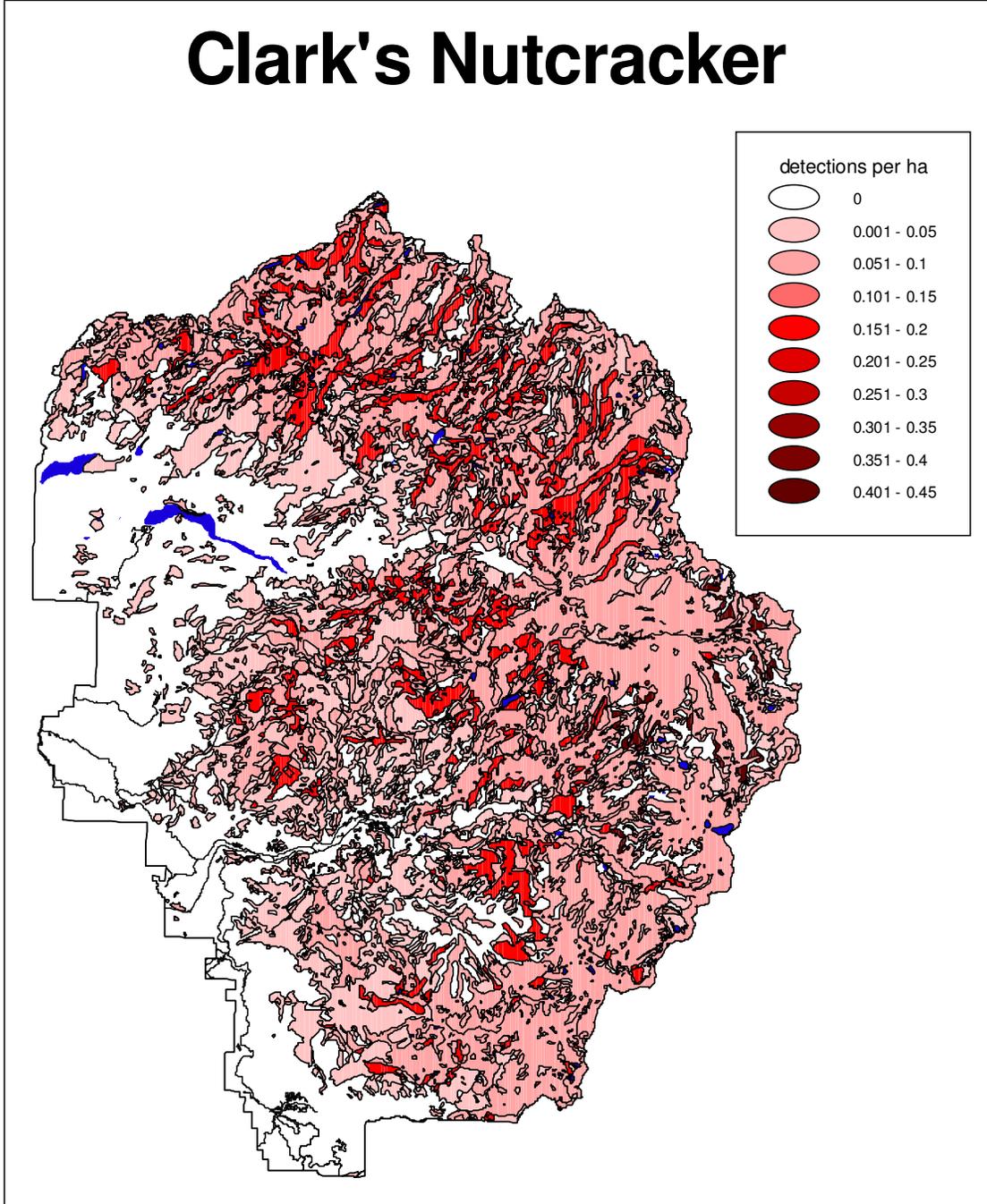


Figure 72. Clark's Nutcracker distribution and relative abundance in the park.

Common Raven

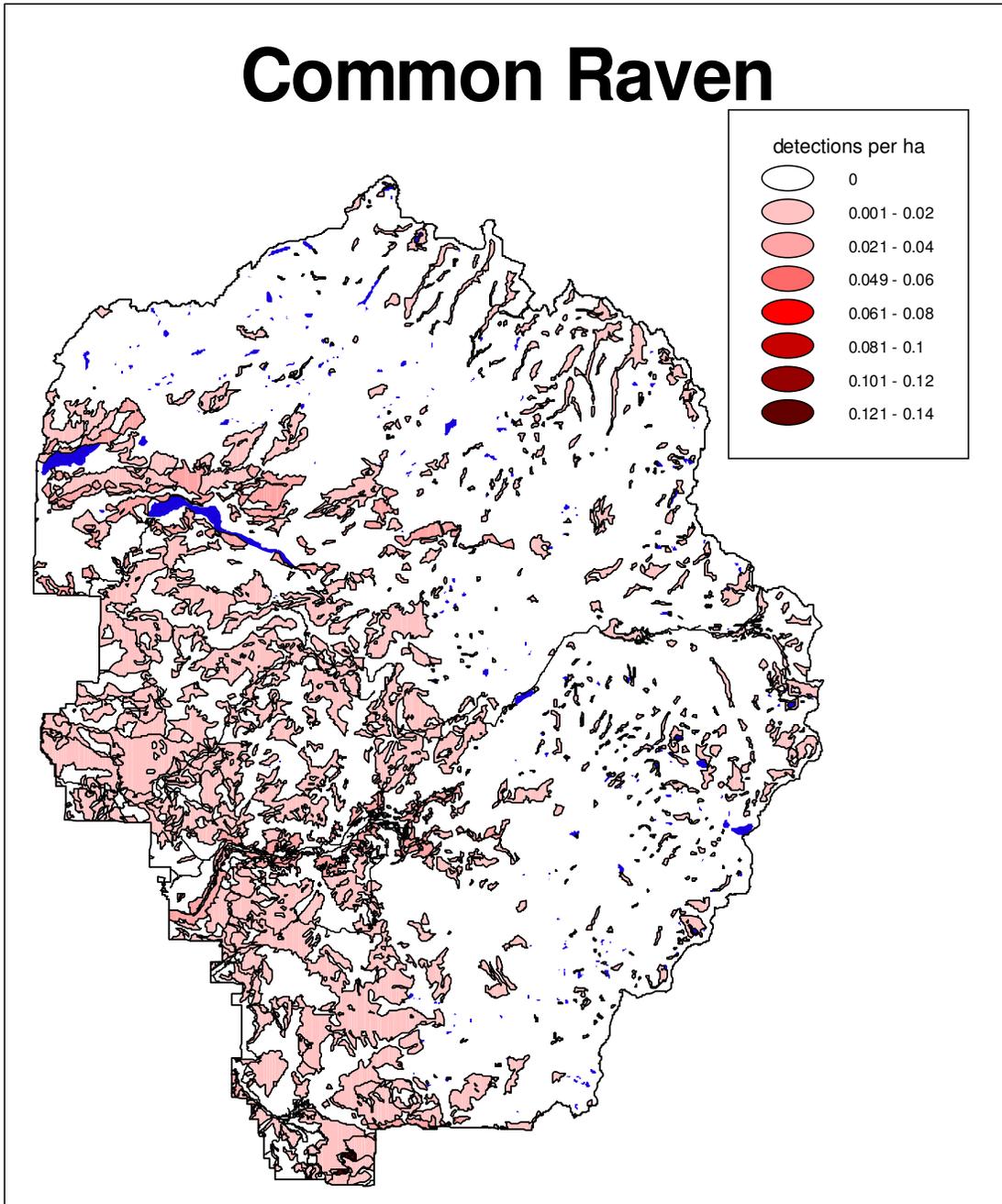


Figure 73. Common Raven distribution and relative abundance in the park.

Violet-green Swallow

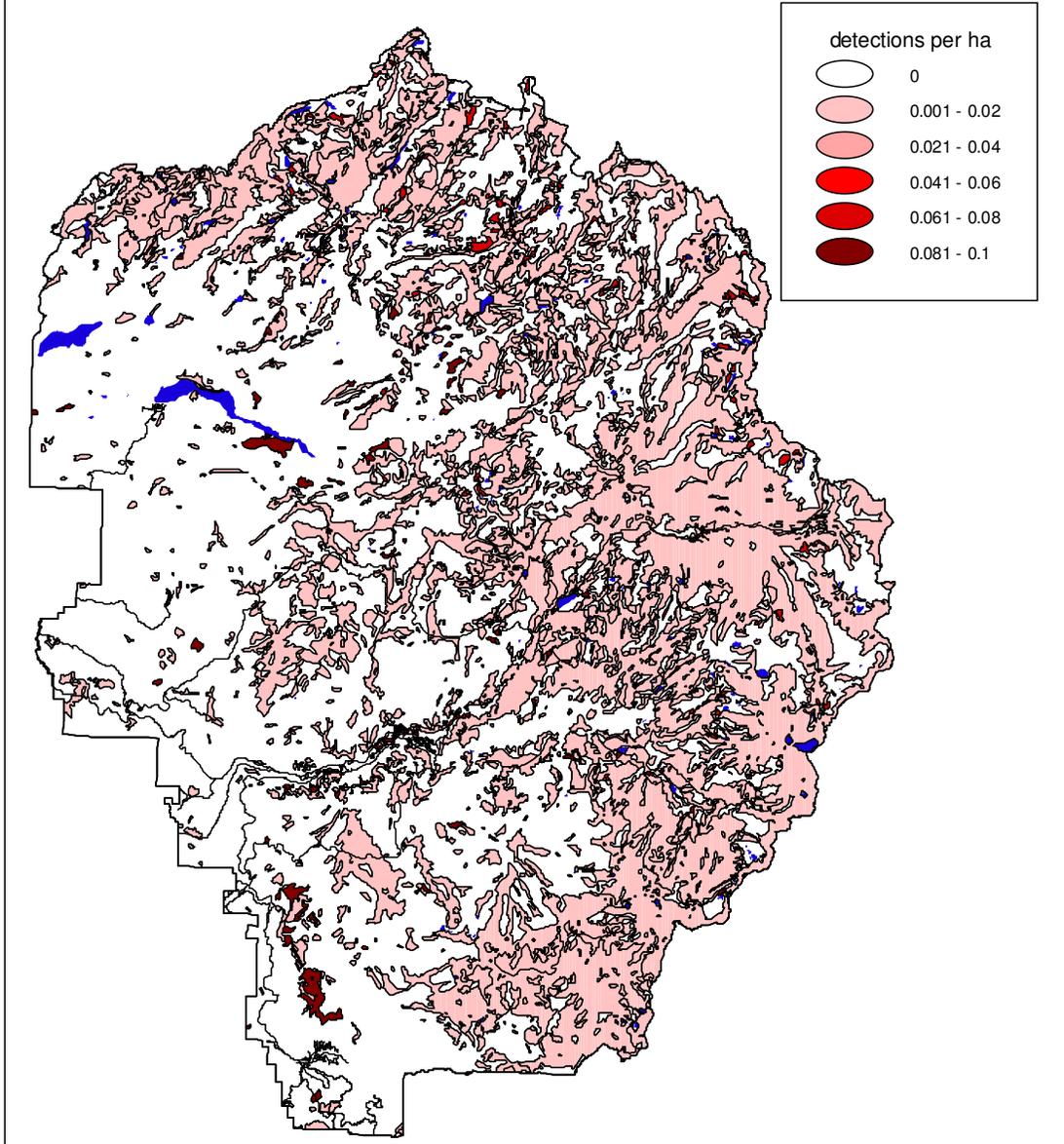


Figure 74. Violet-green Swallow distribution and relative abundance in the park.

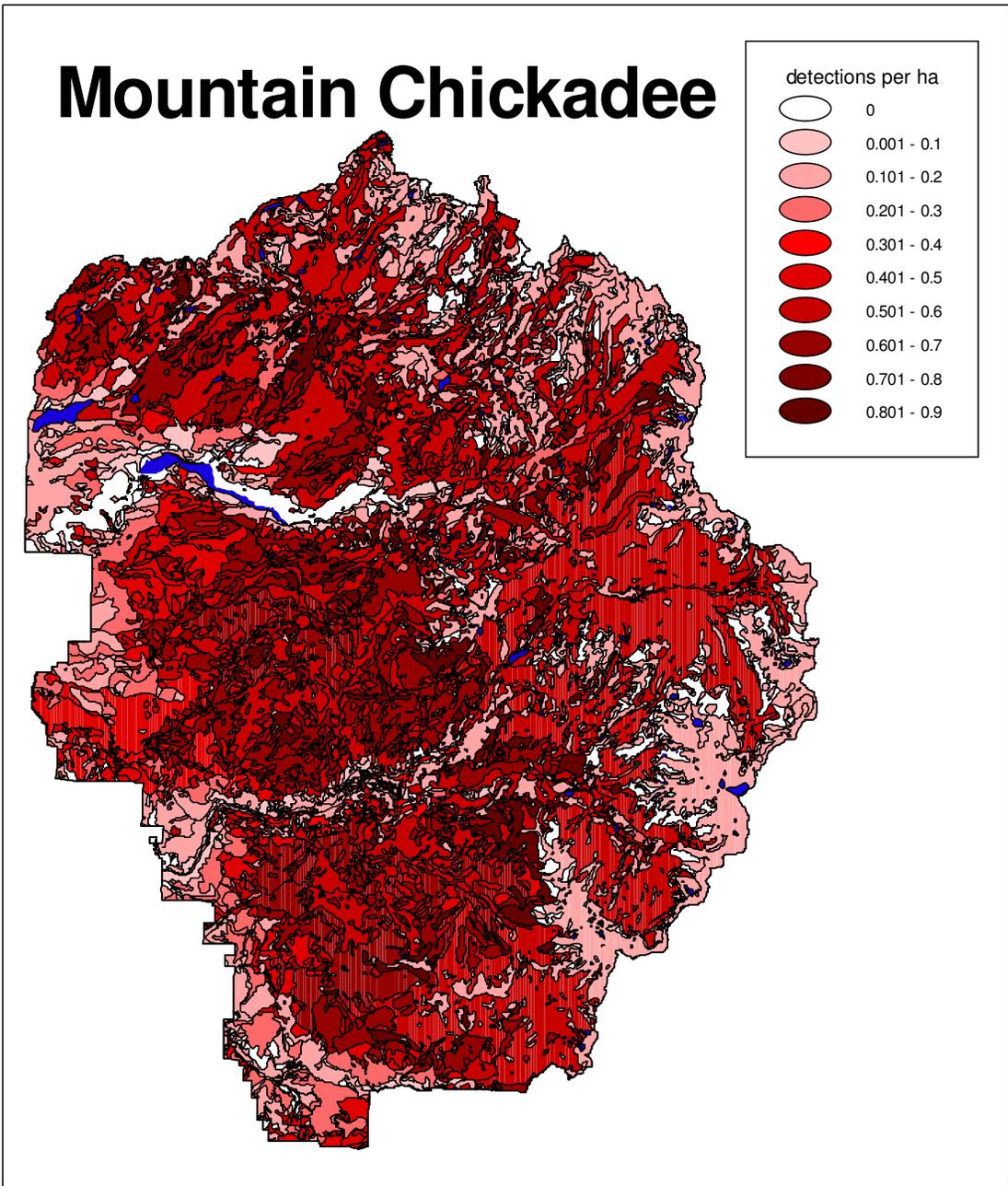


Figure 75. Mountain Chickadee distribution and relative abundance in the park.

American Dipper

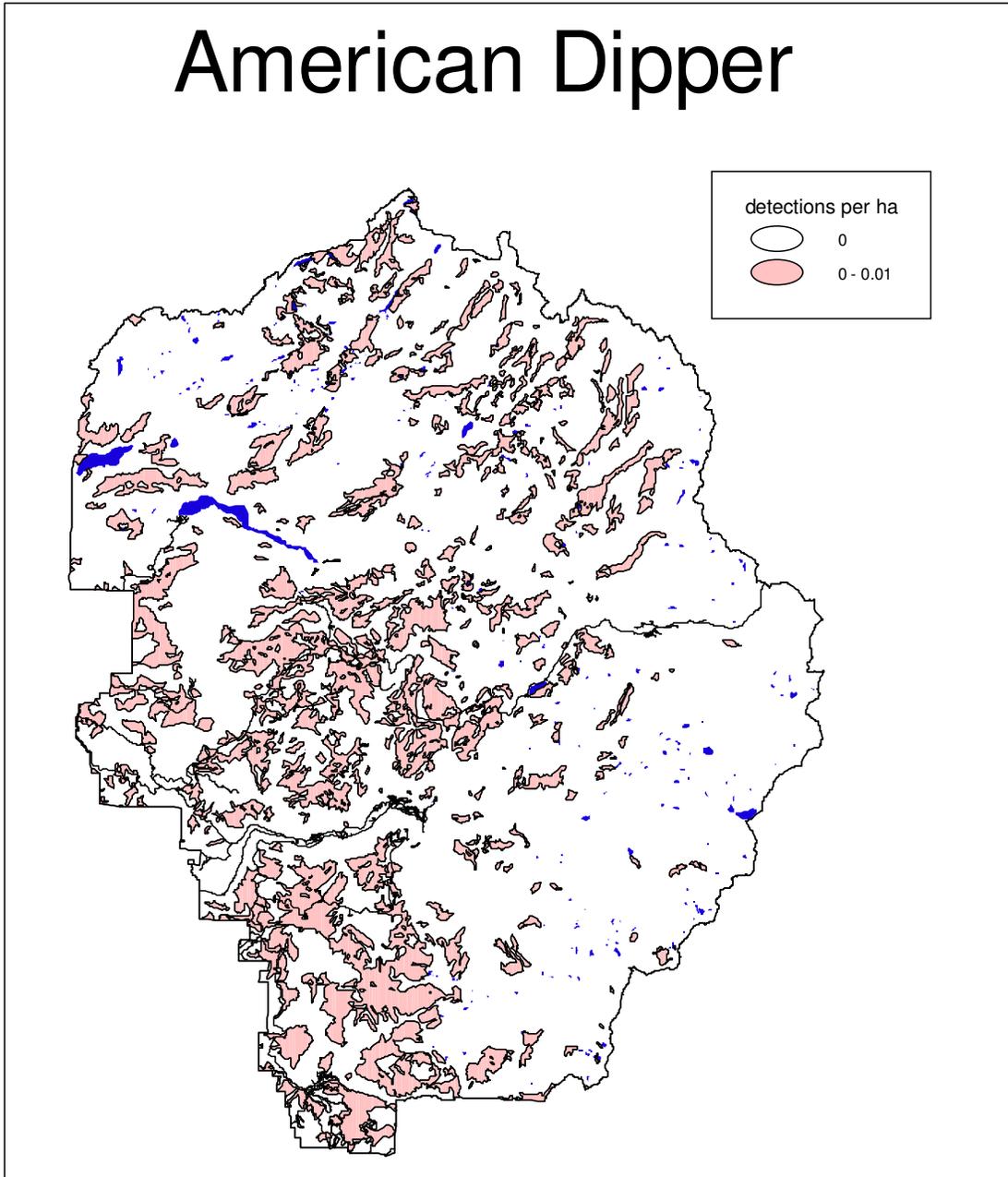


Figure 86. American Dipper distribution and relative abundance in the park.

Chestnut-backed Chickadee

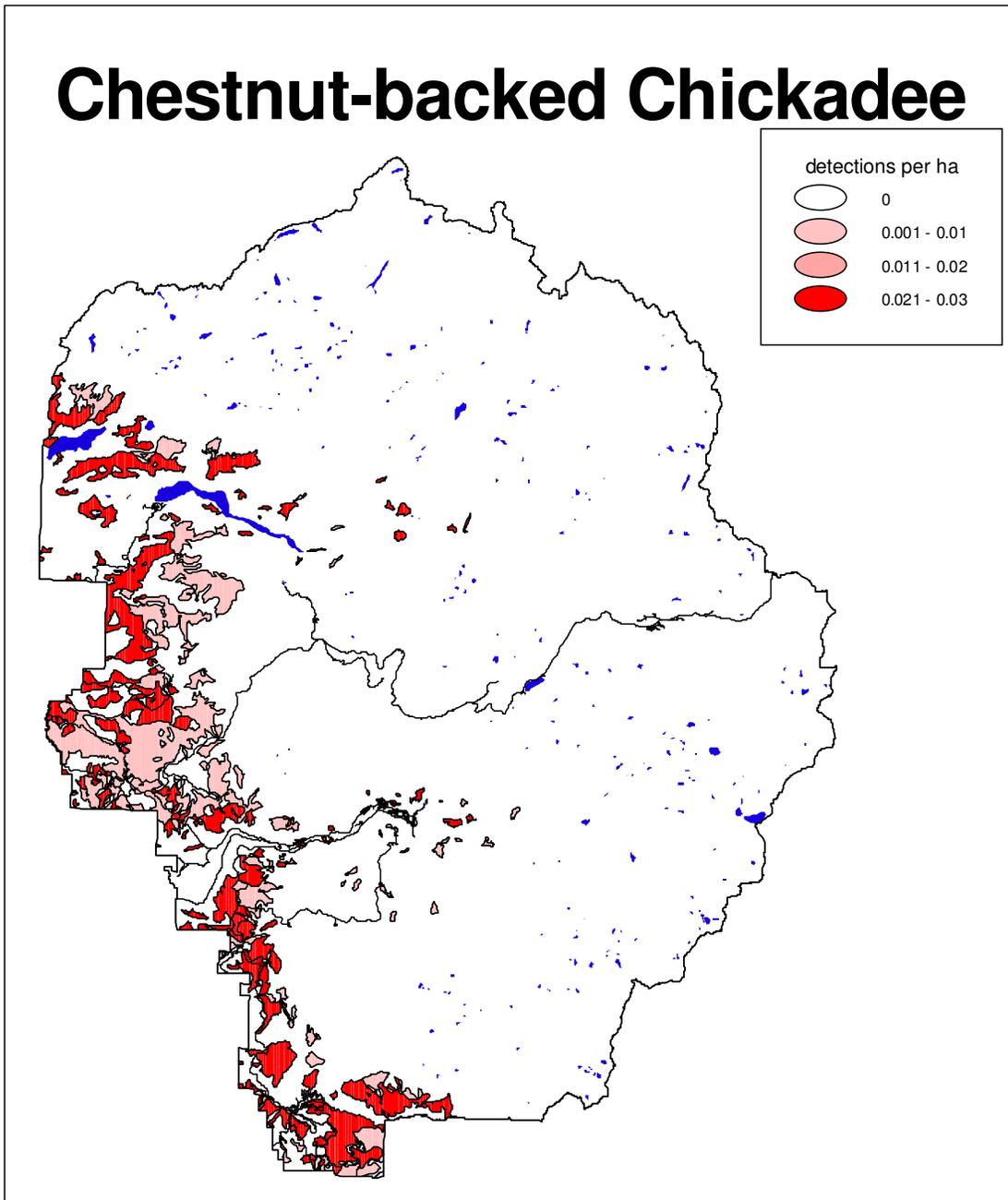


Figure 76. Chestnut-backed Chickadee distribution and relative abundance in the park.

Bushtit

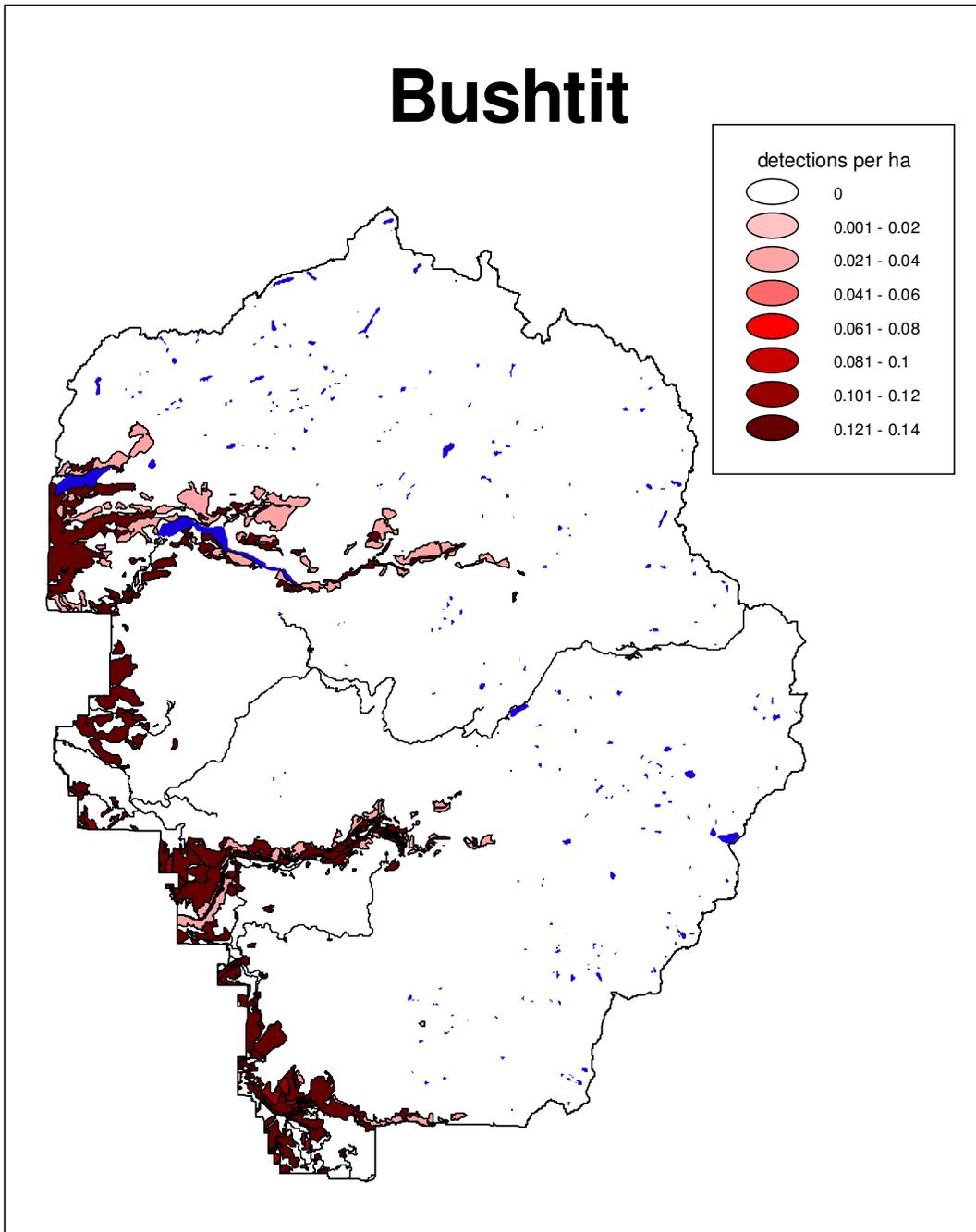


Figure 77. Bushtit distribution and relative abundance in the park.

Red-breasted Nuthatch

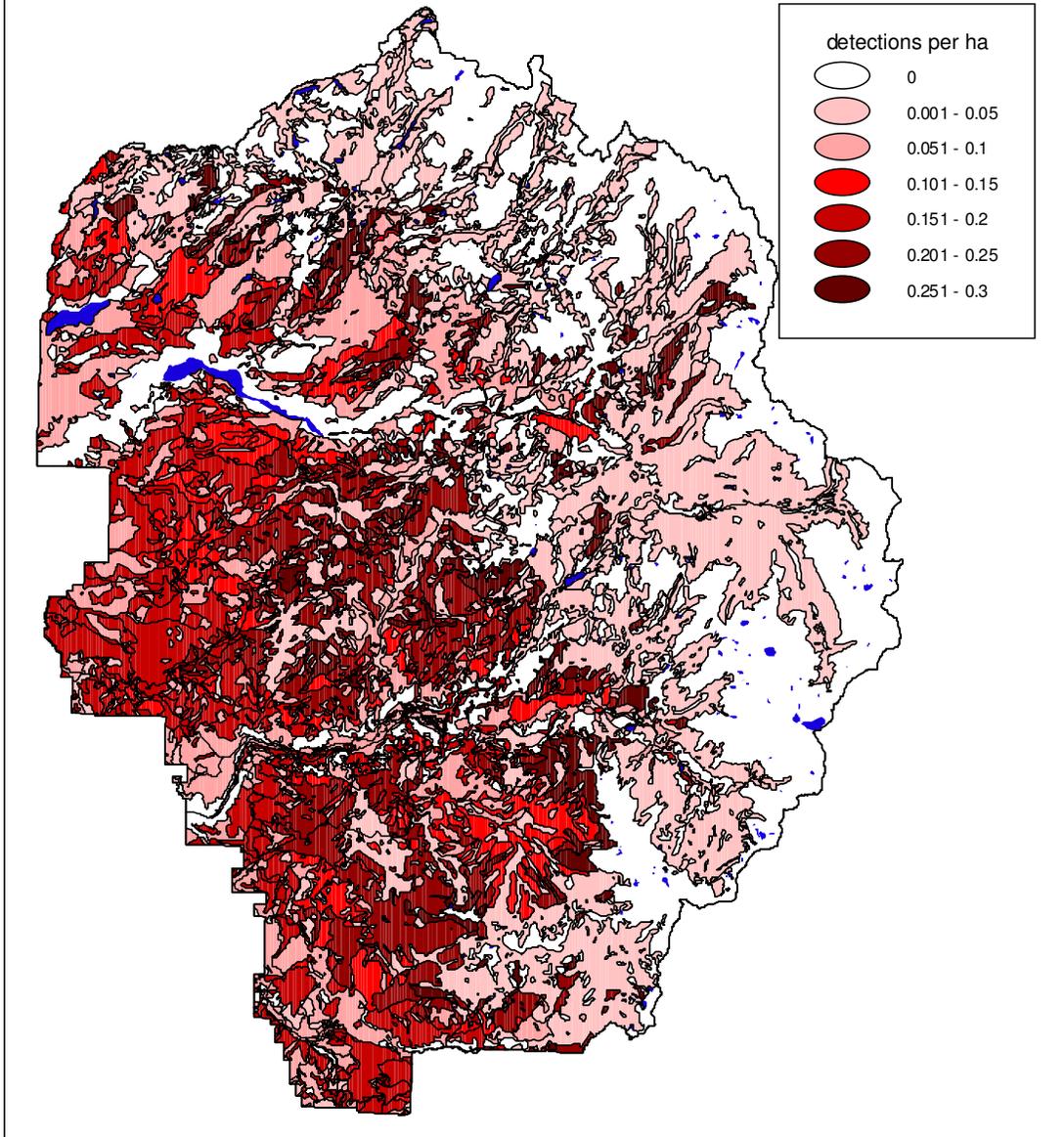


Figure 78. Red-breasted Nuthatch distribution and relative abundance in the park.

White-breasted Nuthatch

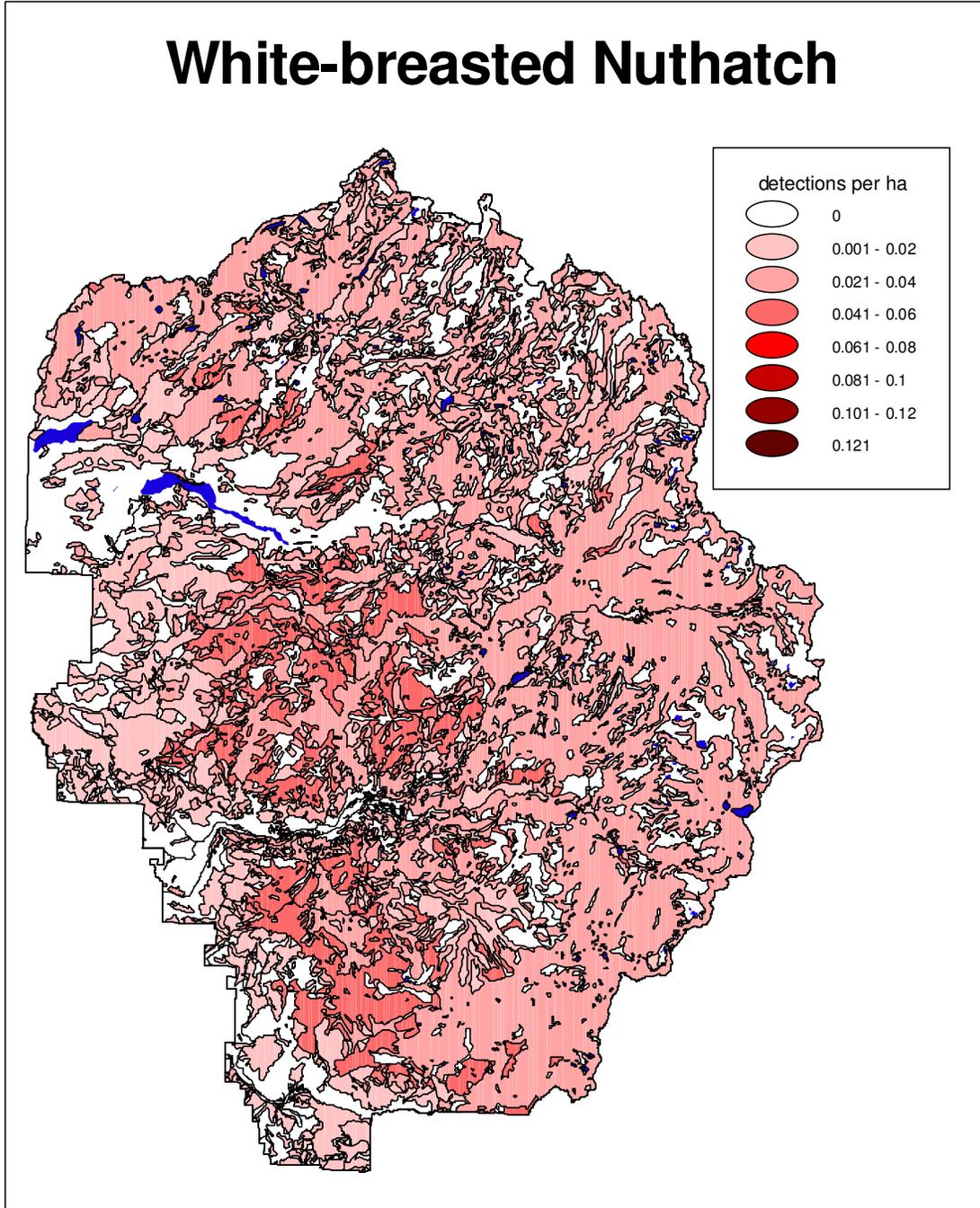


Figure 79. White-breasted Nuthatch distribution and relative abundance in the park.

Brown Creeper

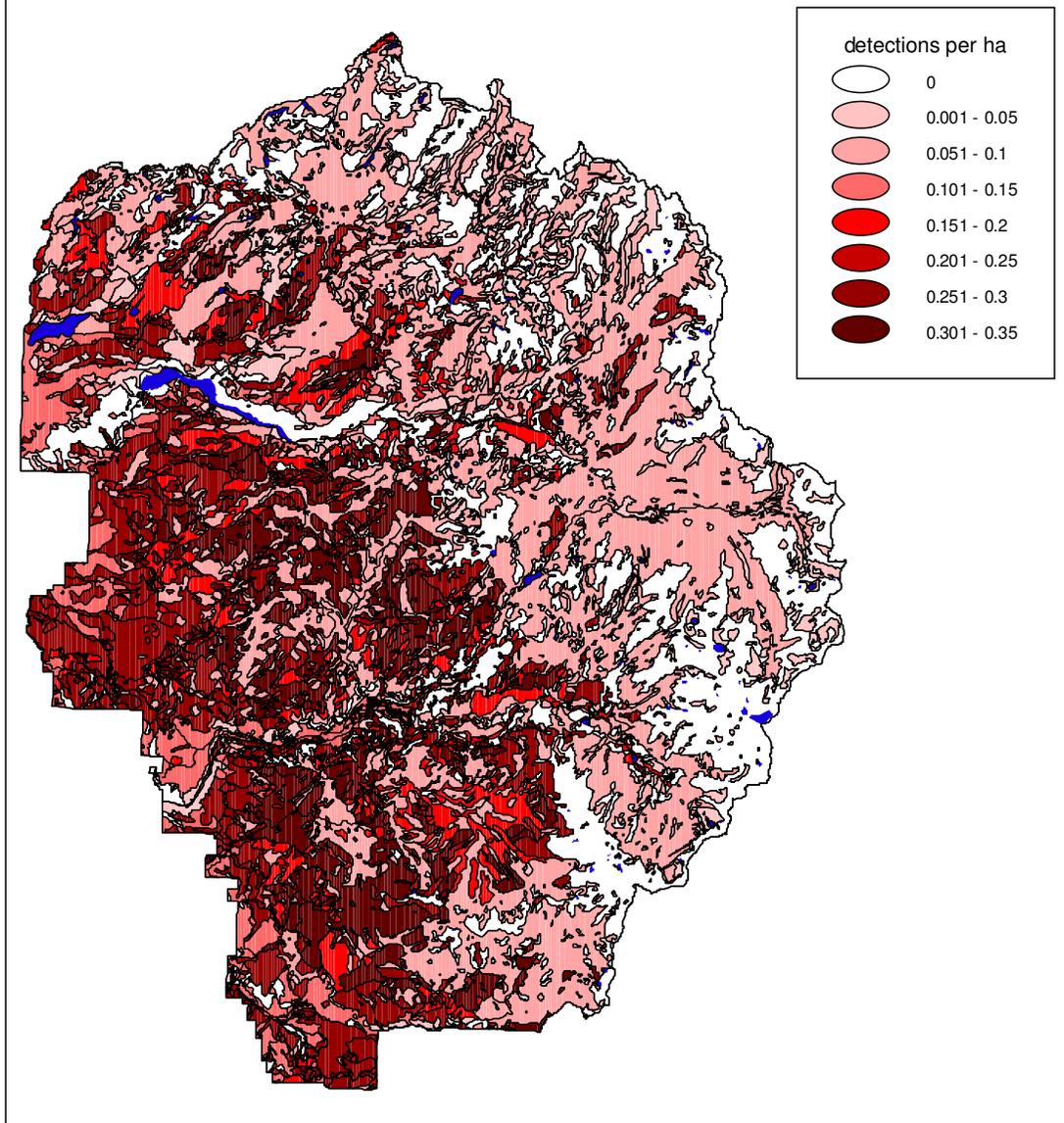


Figure 80. Brown Creeper distribution and relative abundance in the park.

Rock Wren

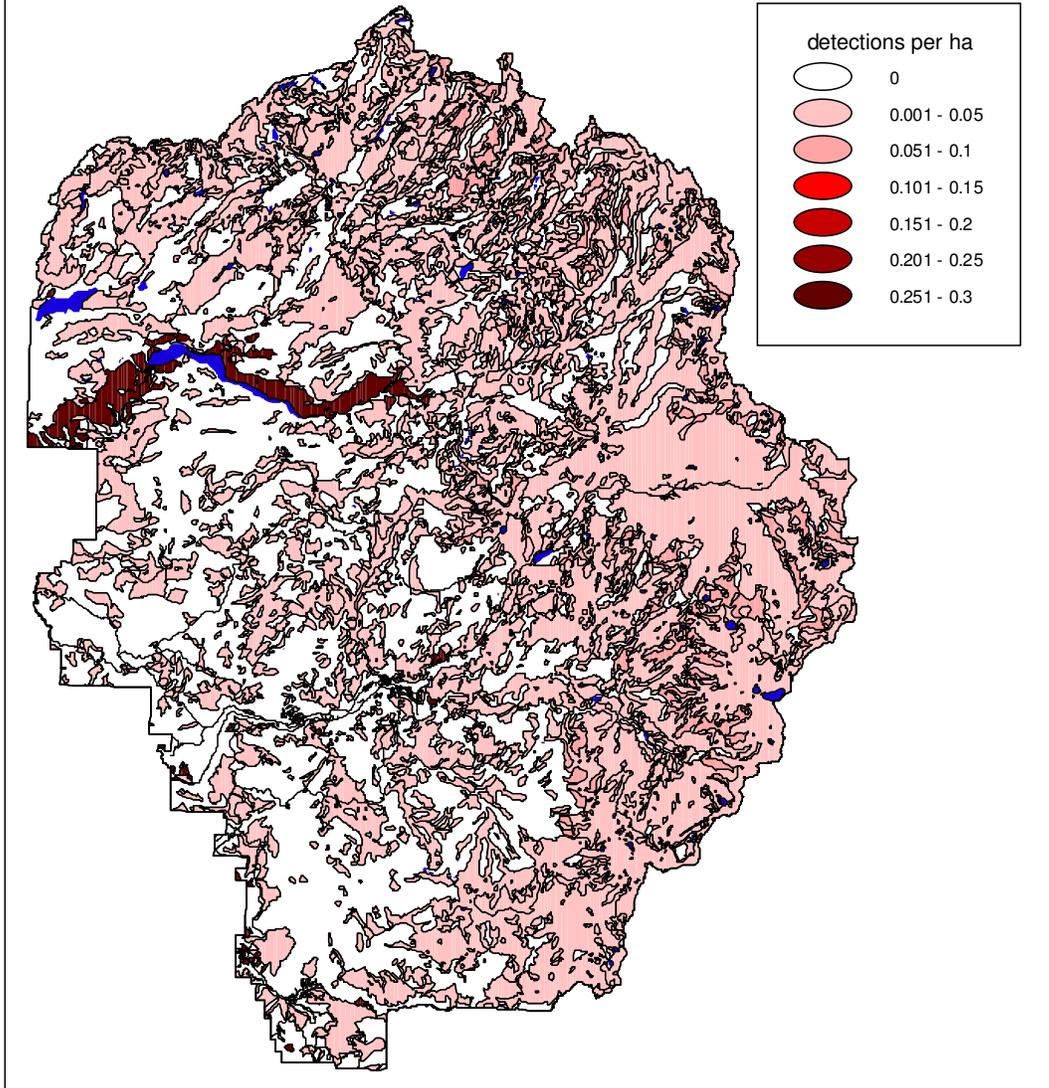


Figure 81. Rock Wren distribution and relative abundance in the park.

Canyon Wren

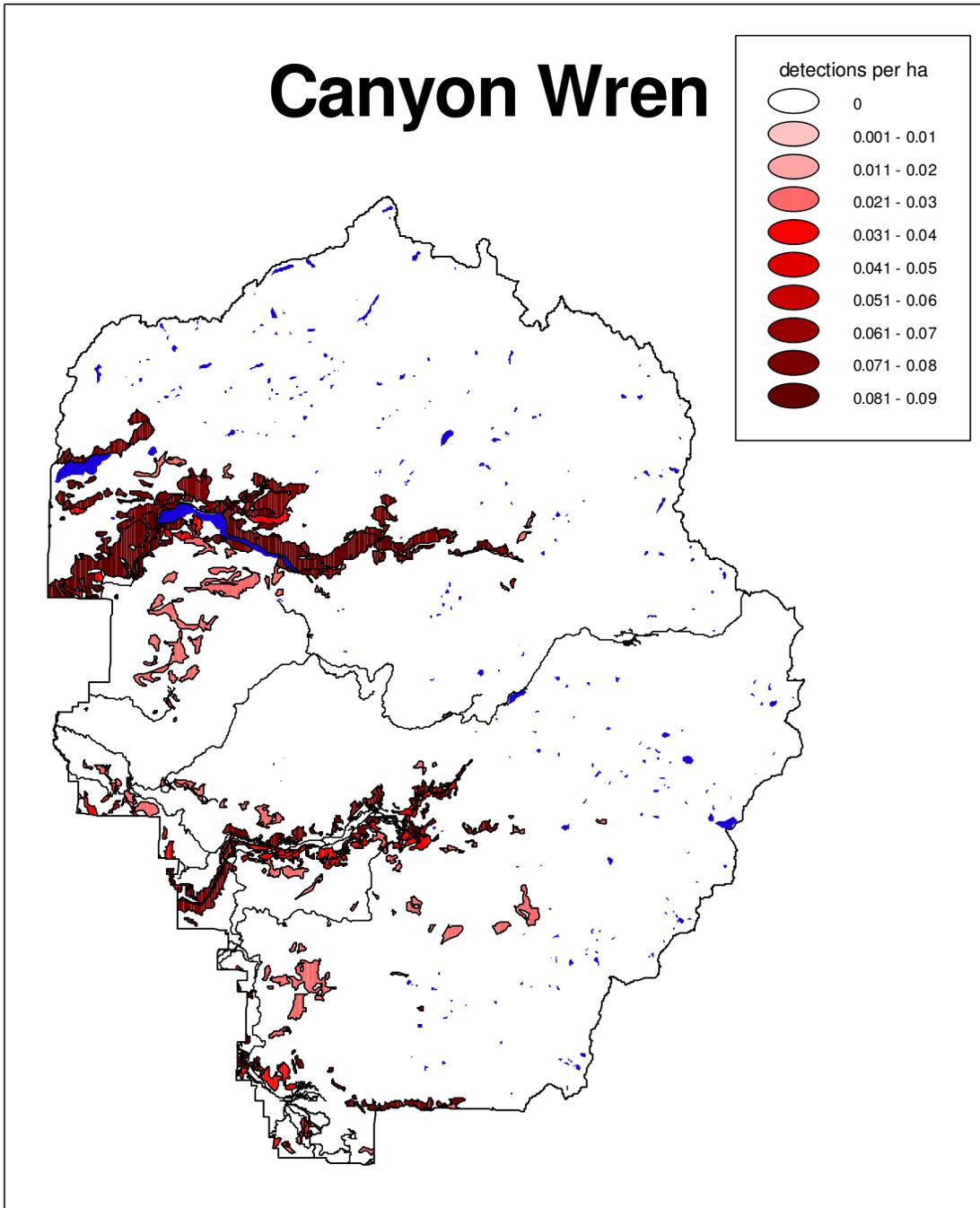


Figure 82. Canyon Wren distribution and relative abundance in the park.

Bewick's Wren

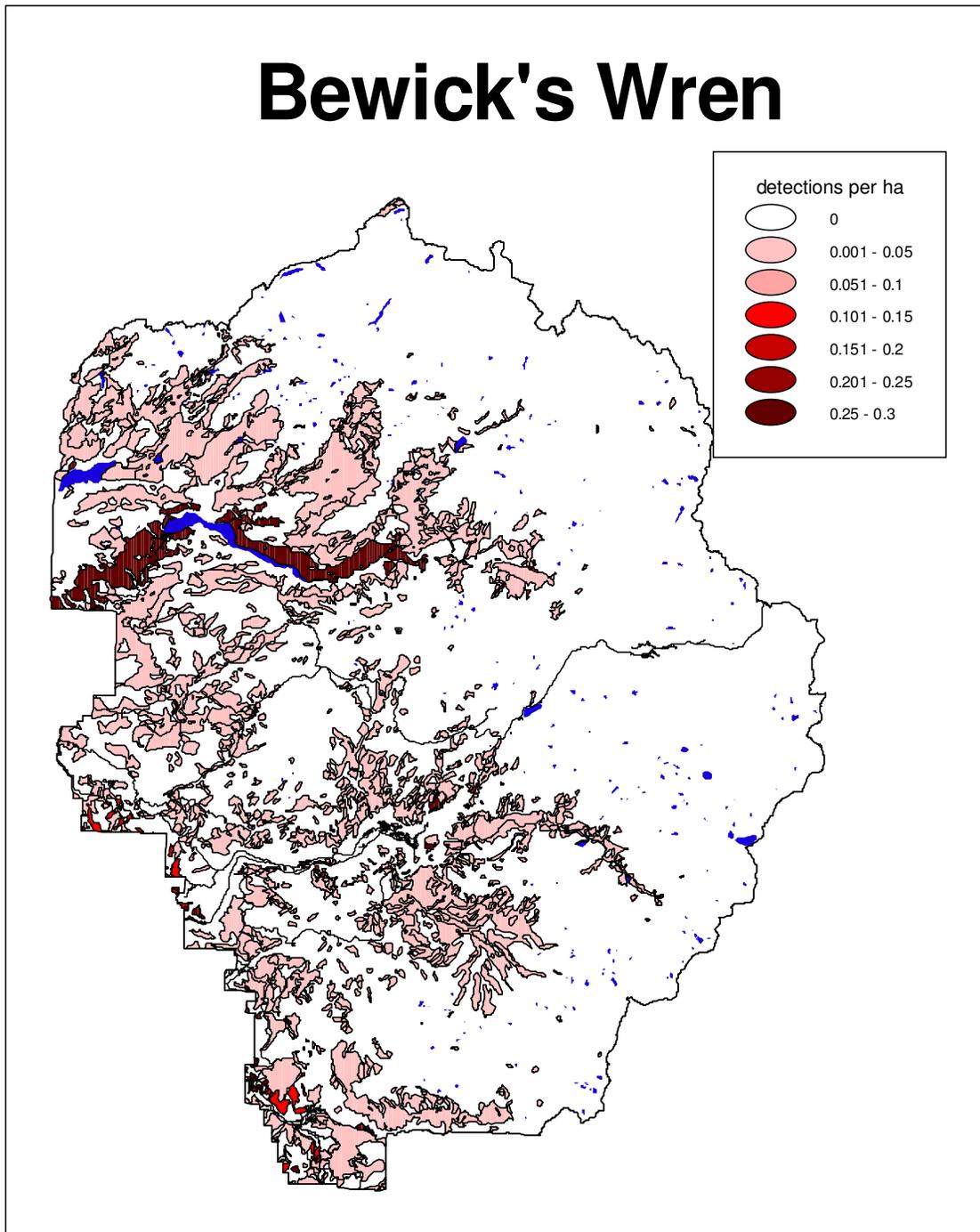


Figure 83. Bewick's Wren distribution and relative abundance in the park.

House Wren

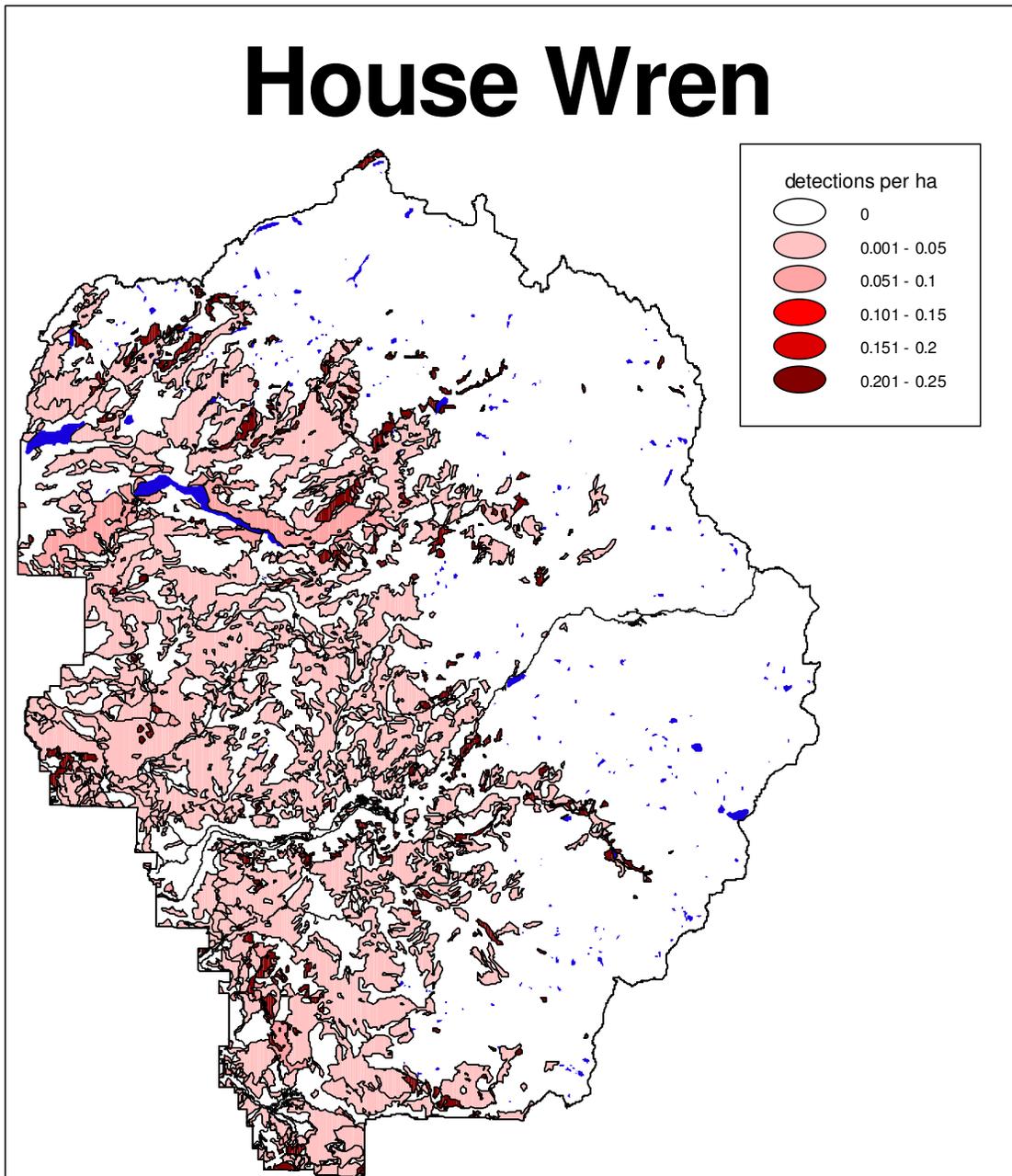


Figure 84. House Wren distribution and relative abundance in the park.

Winter Wren

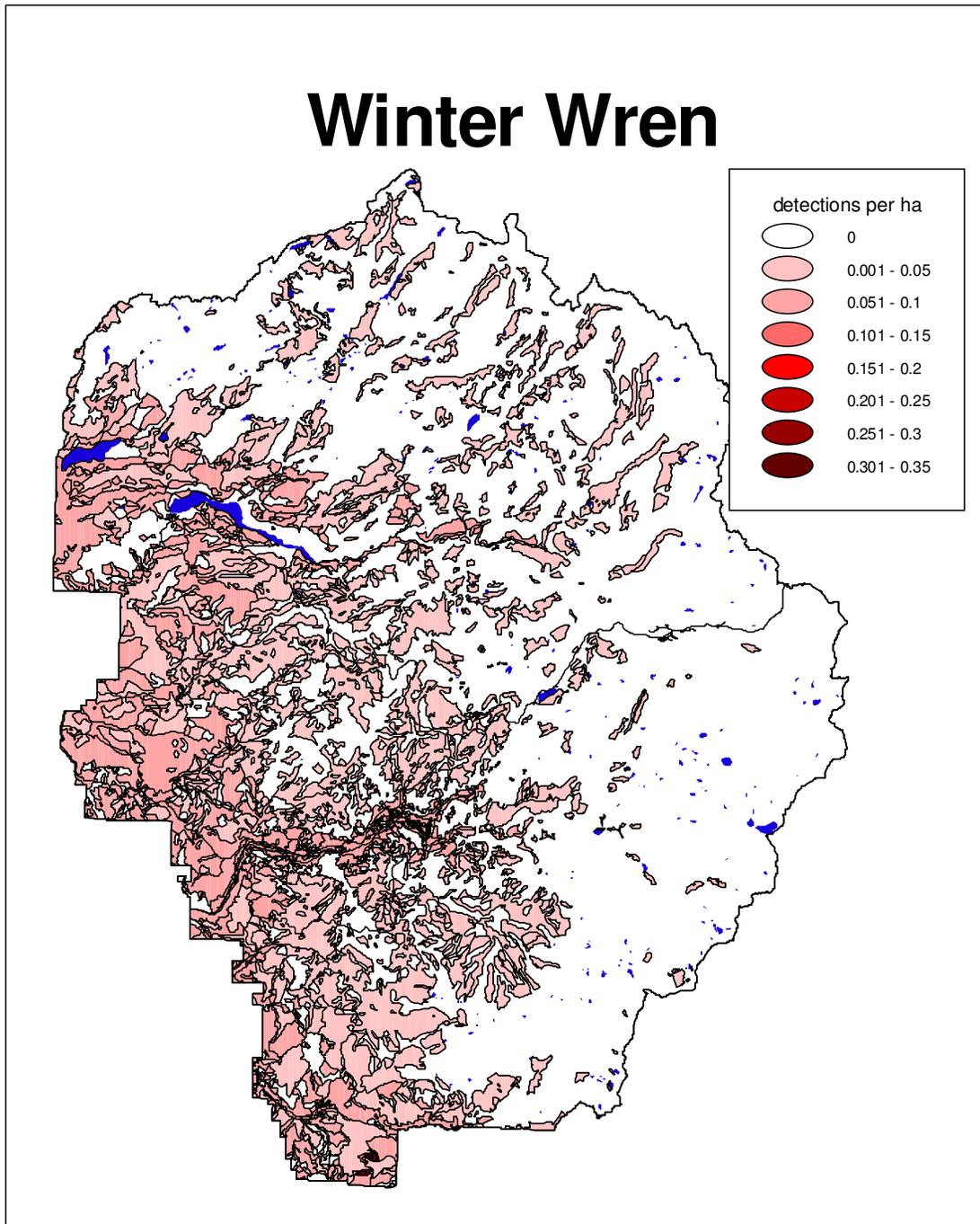


Figure 85. Winter Wren distribution and relative abundance in the park.

Black-throated Gray Warbler

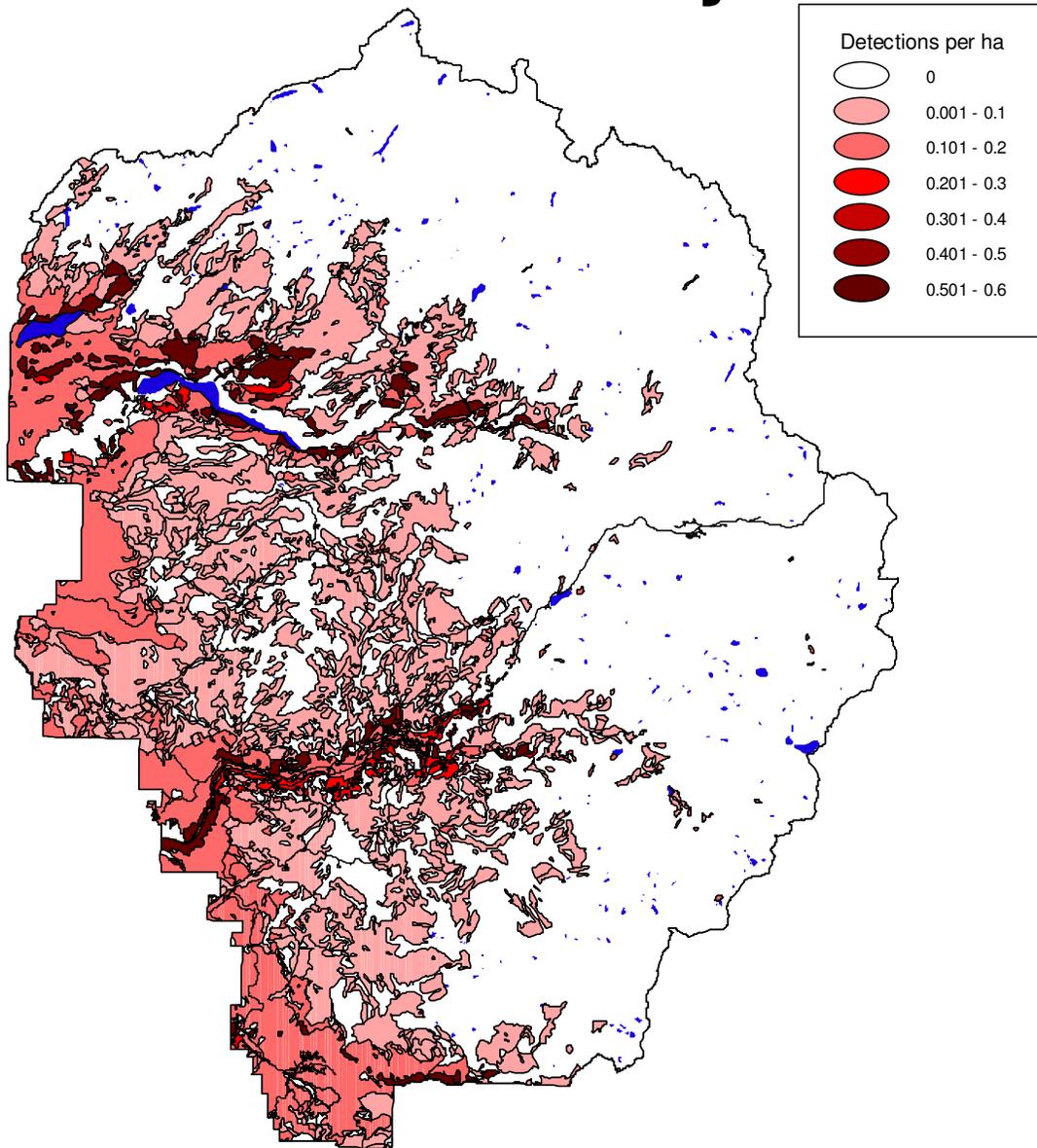


Figure 101. Black-throated Gray Warbler distribution and relative abundance in the park.

American Dipper

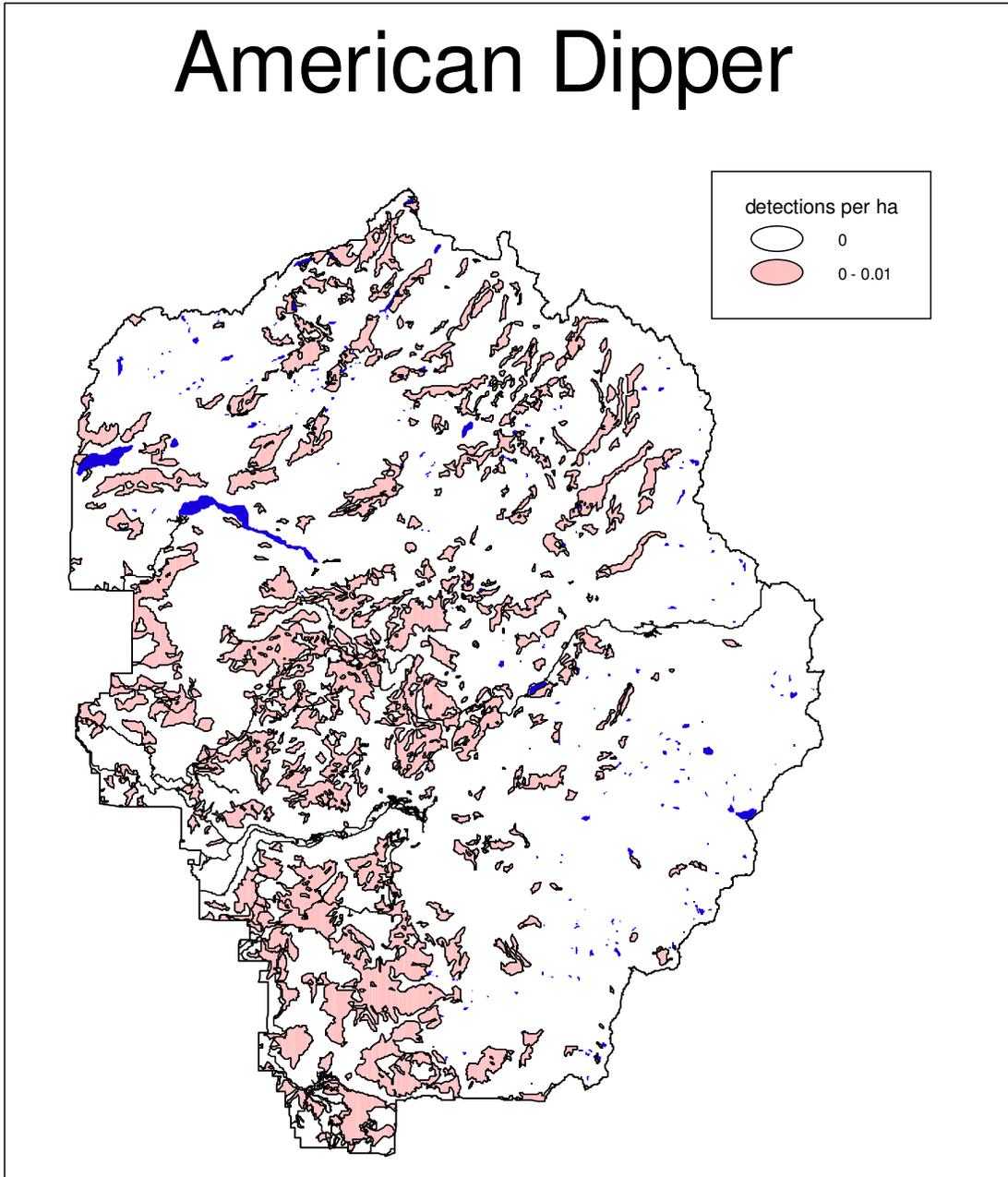


Figure 86. American Dipper distribution and relative abundance in the park.

Golden-crowned Kinglet

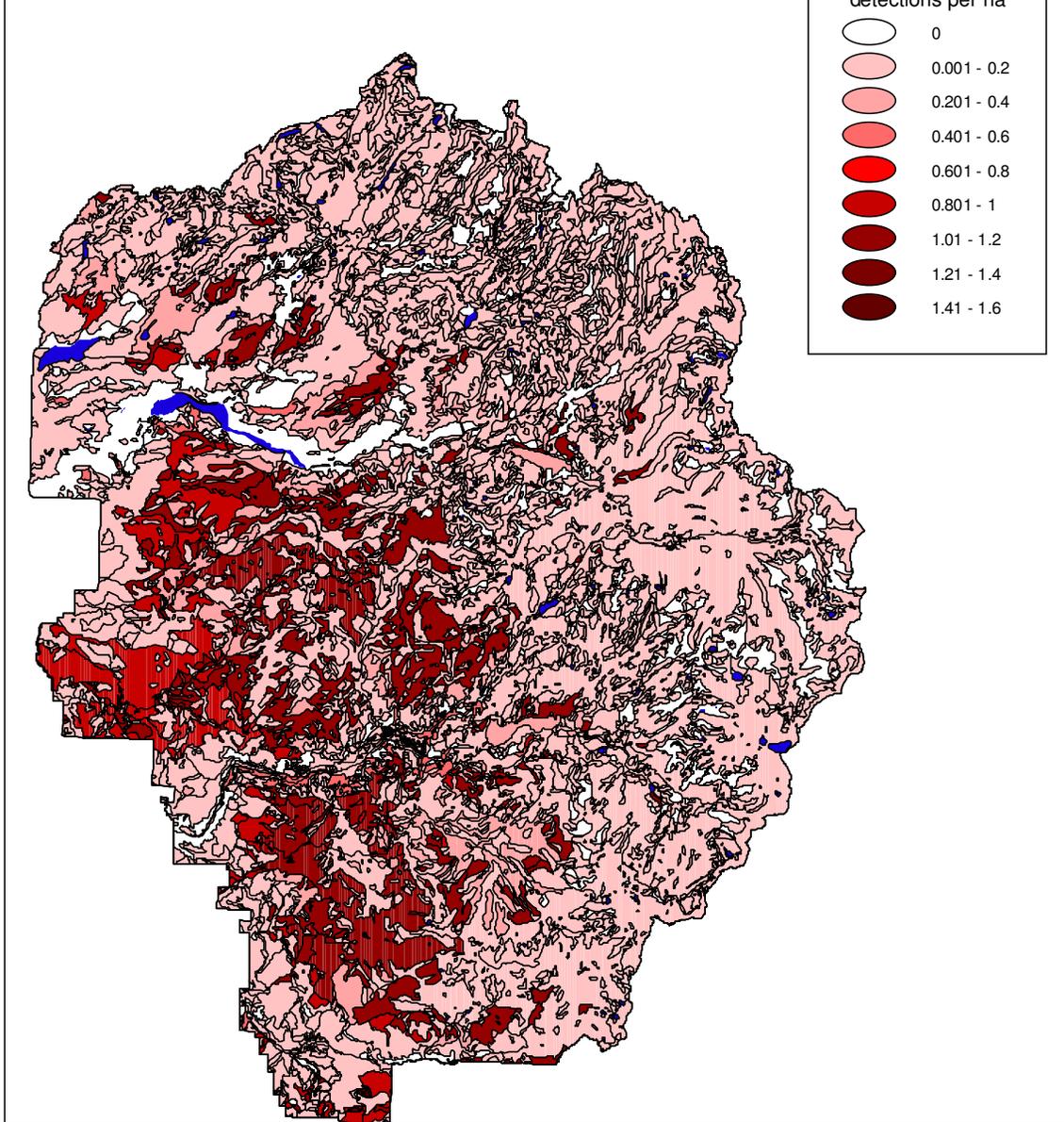


Figure 87. Golden-crowned Kinglet distribution and relative abundance in the park.

Ruby-crowned Kinglet

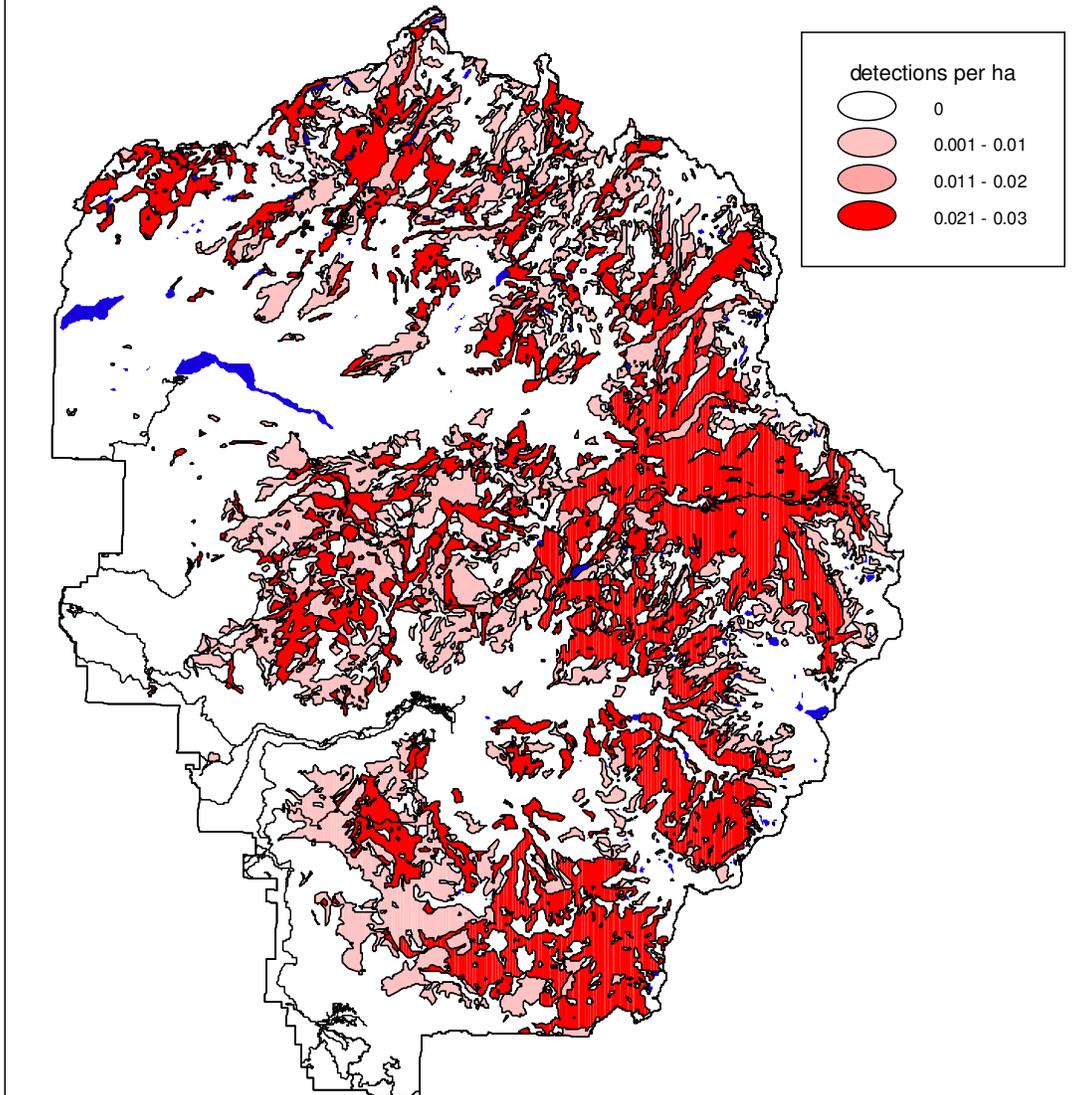


Figure 88. Ruby-crowned Kinglet distribution and relative abundance in the park.

Blue-gray Gnatcatcher

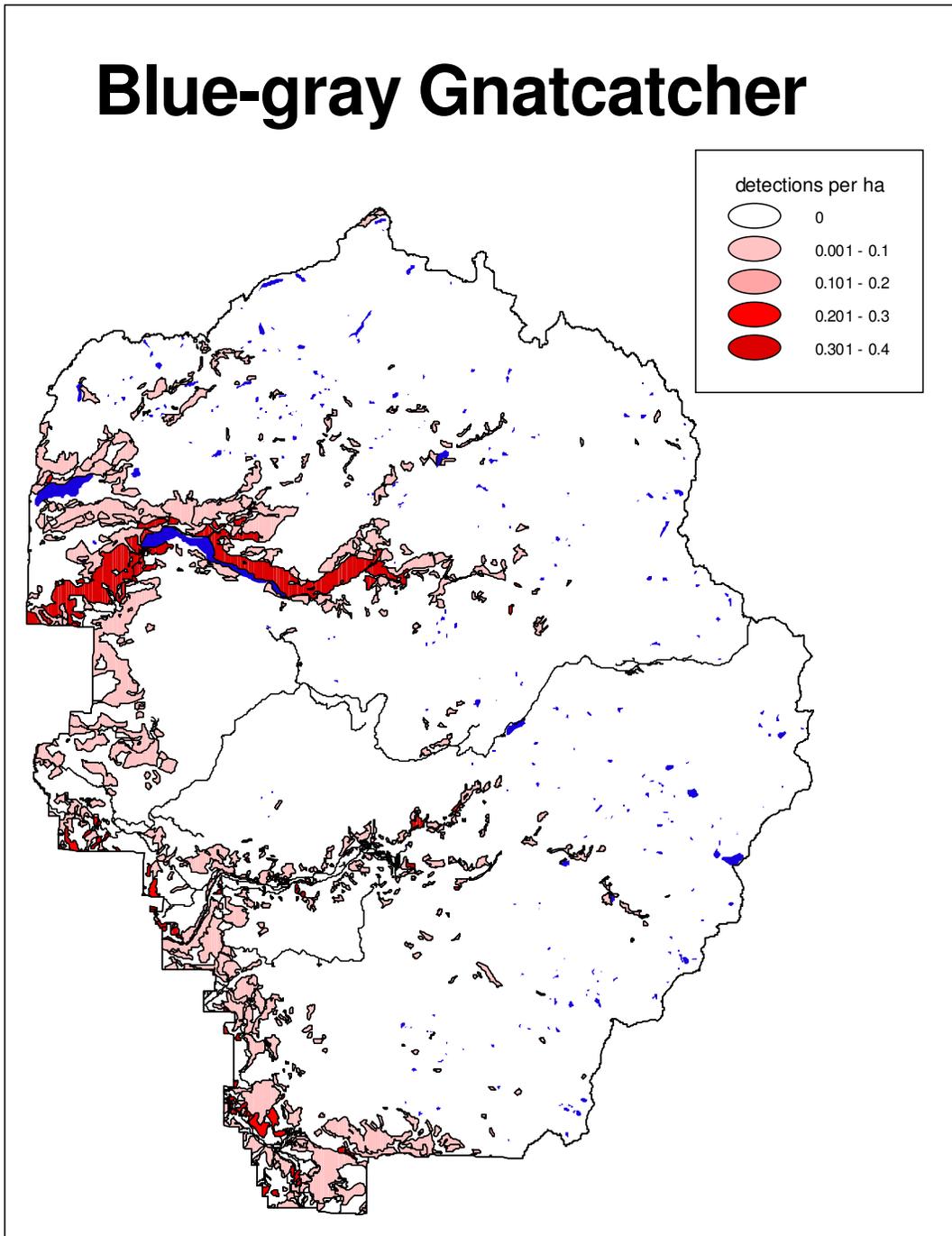


Figure 89. Blue-gray Gnatcatcher distribution and relative abundance in the park.

Western Bluebird

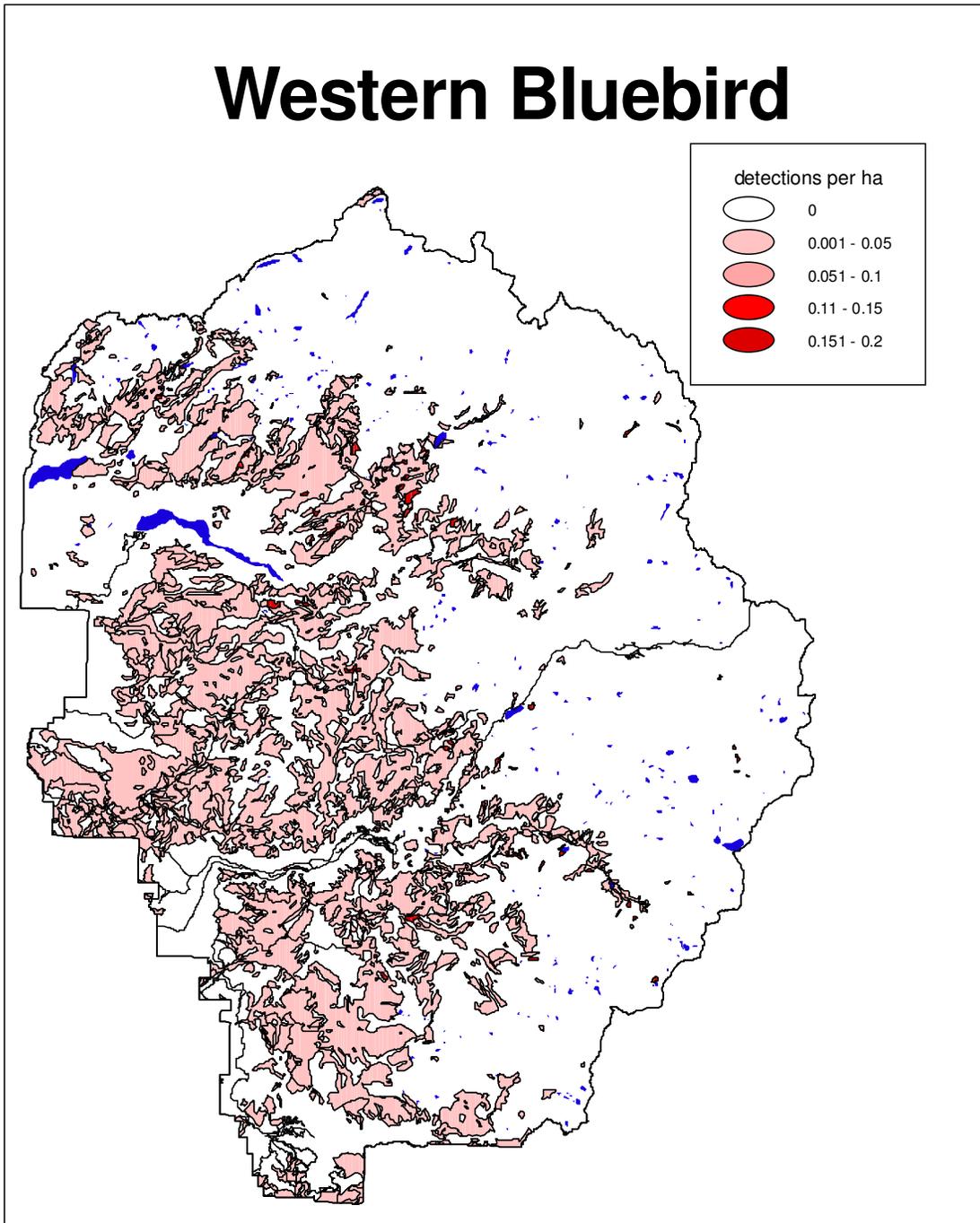


Figure 90. Western Bluebird distribution and relative abundance in the park.

Mountain Bluebird

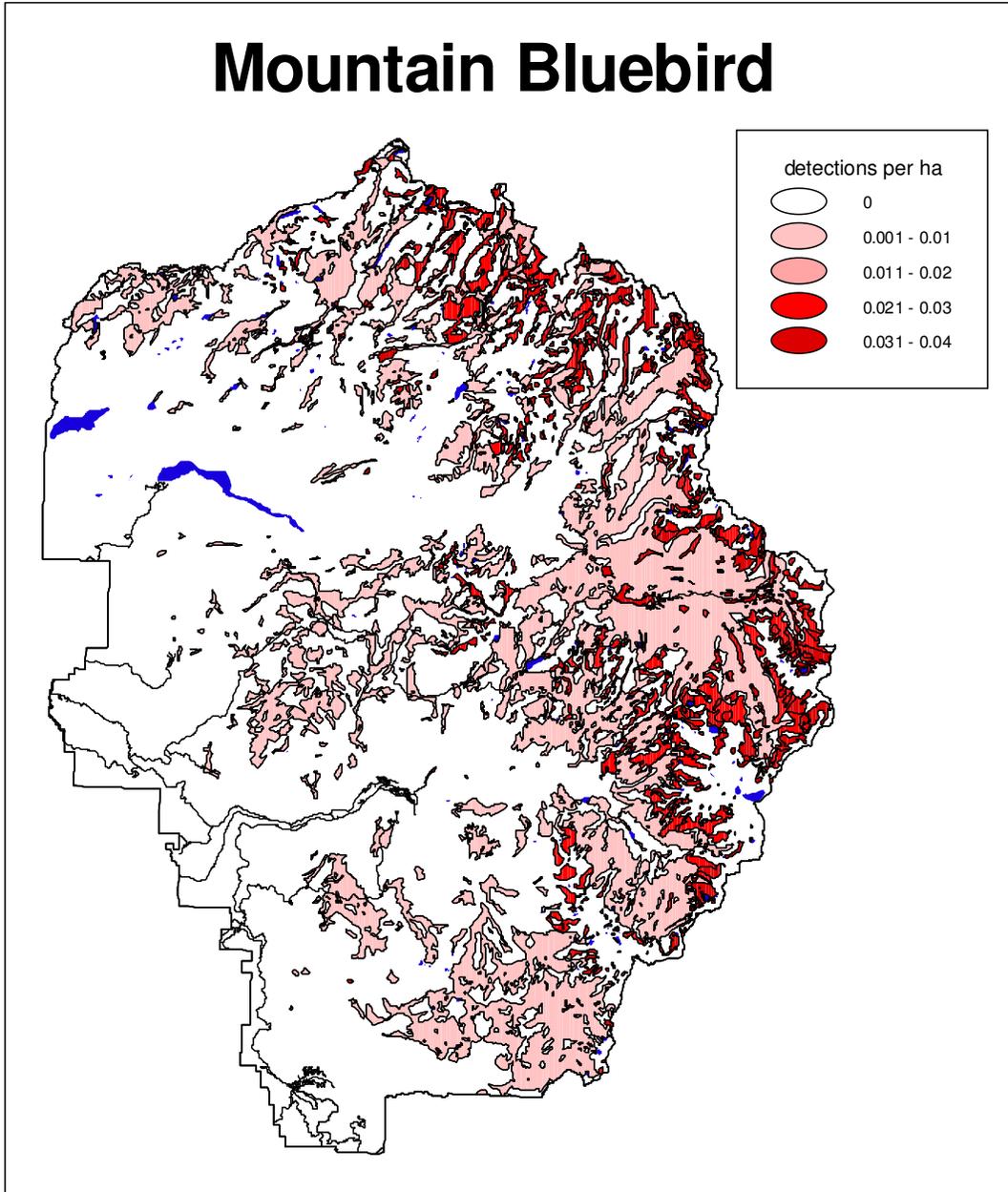


Figure 91. Mountain Bluebird distribution and relative abundance in the park.

Townsend's Solitaire

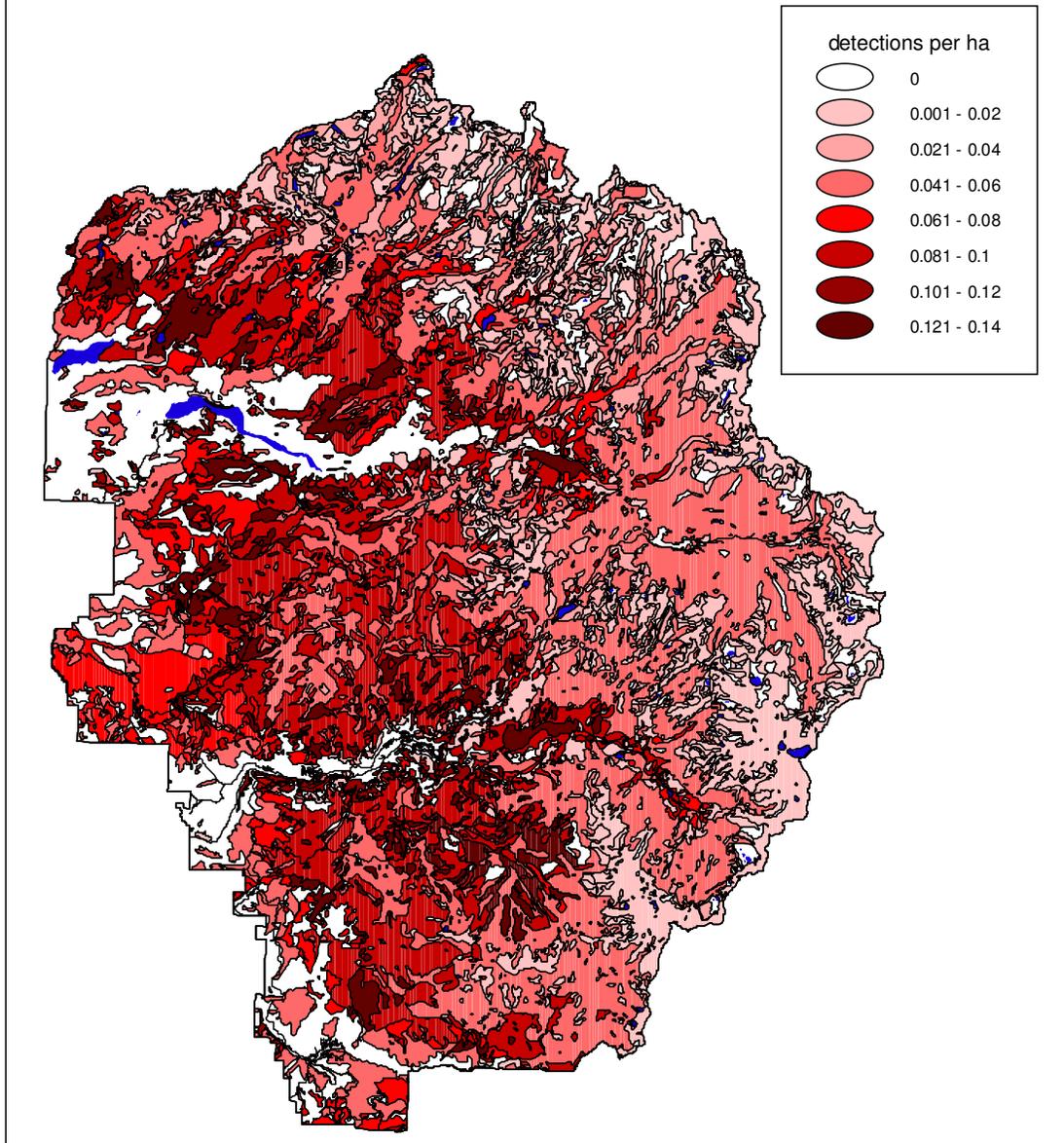


Figure 92. Townsend's Solitaire distribution and relative abundance in the park.

Hermit Thrush

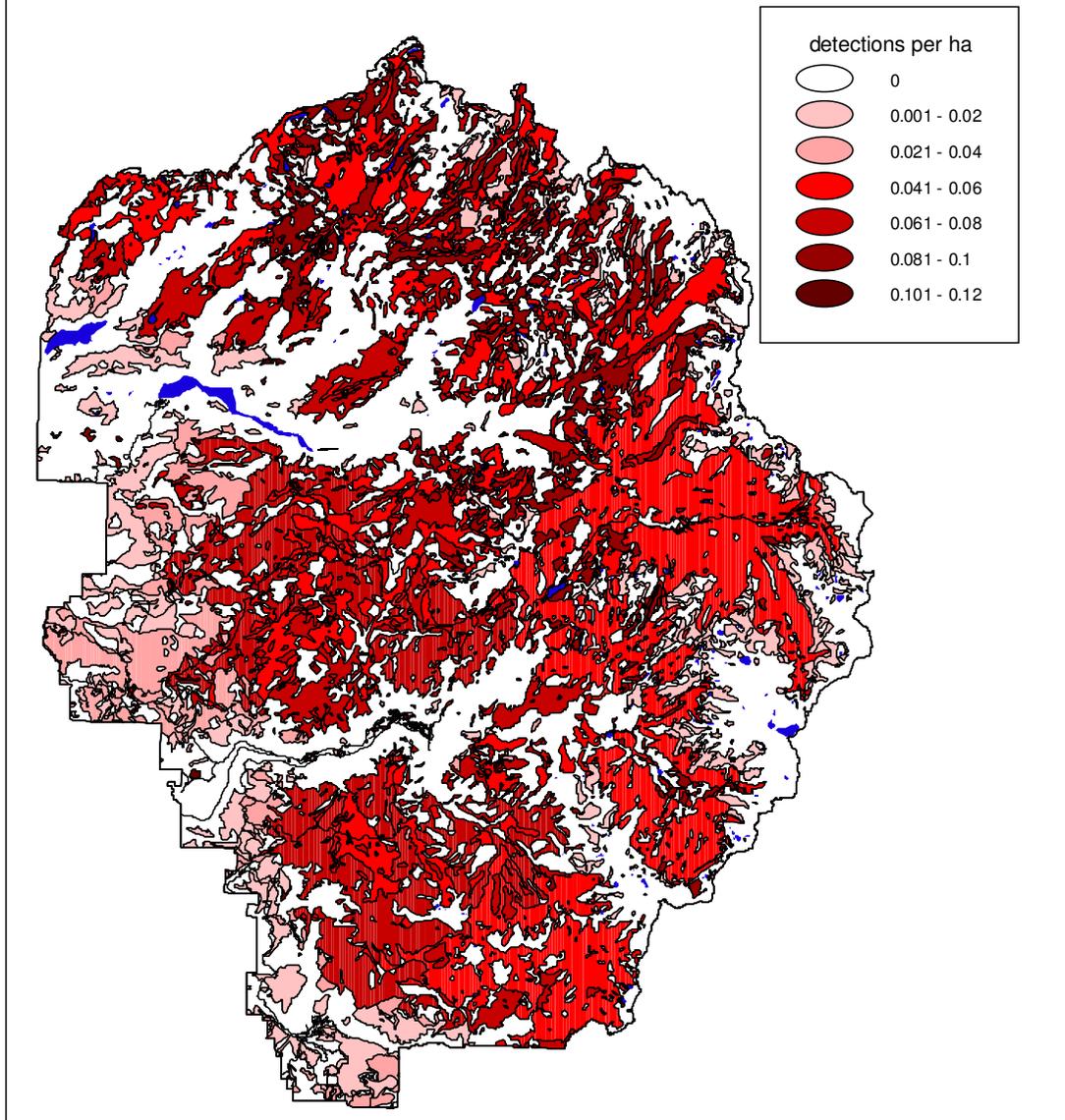


Figure 93. Hermit Thrush distribution and relative abundance in the park.

American Robin

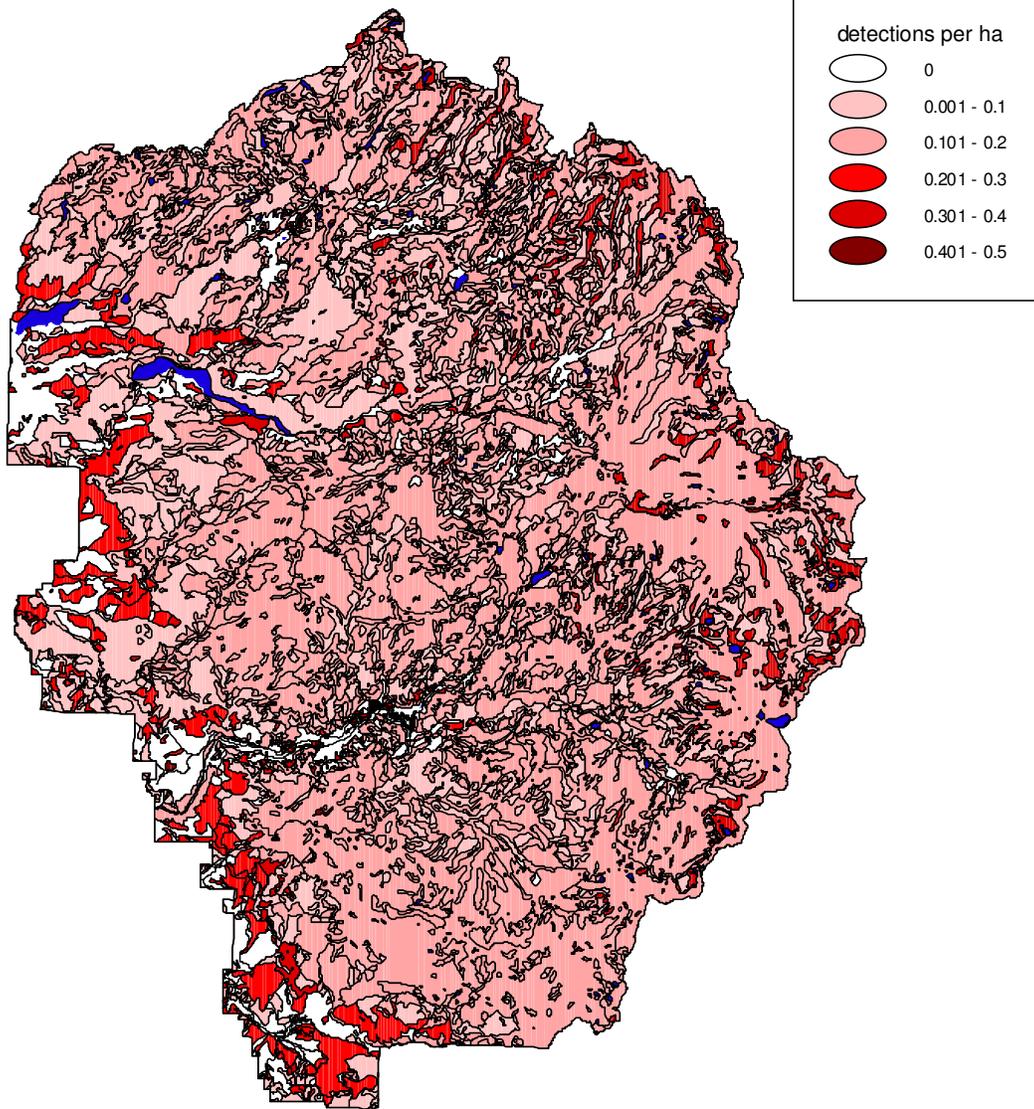


Figure 94. American Robin distribution and relative abundance in the park.

Wrentit

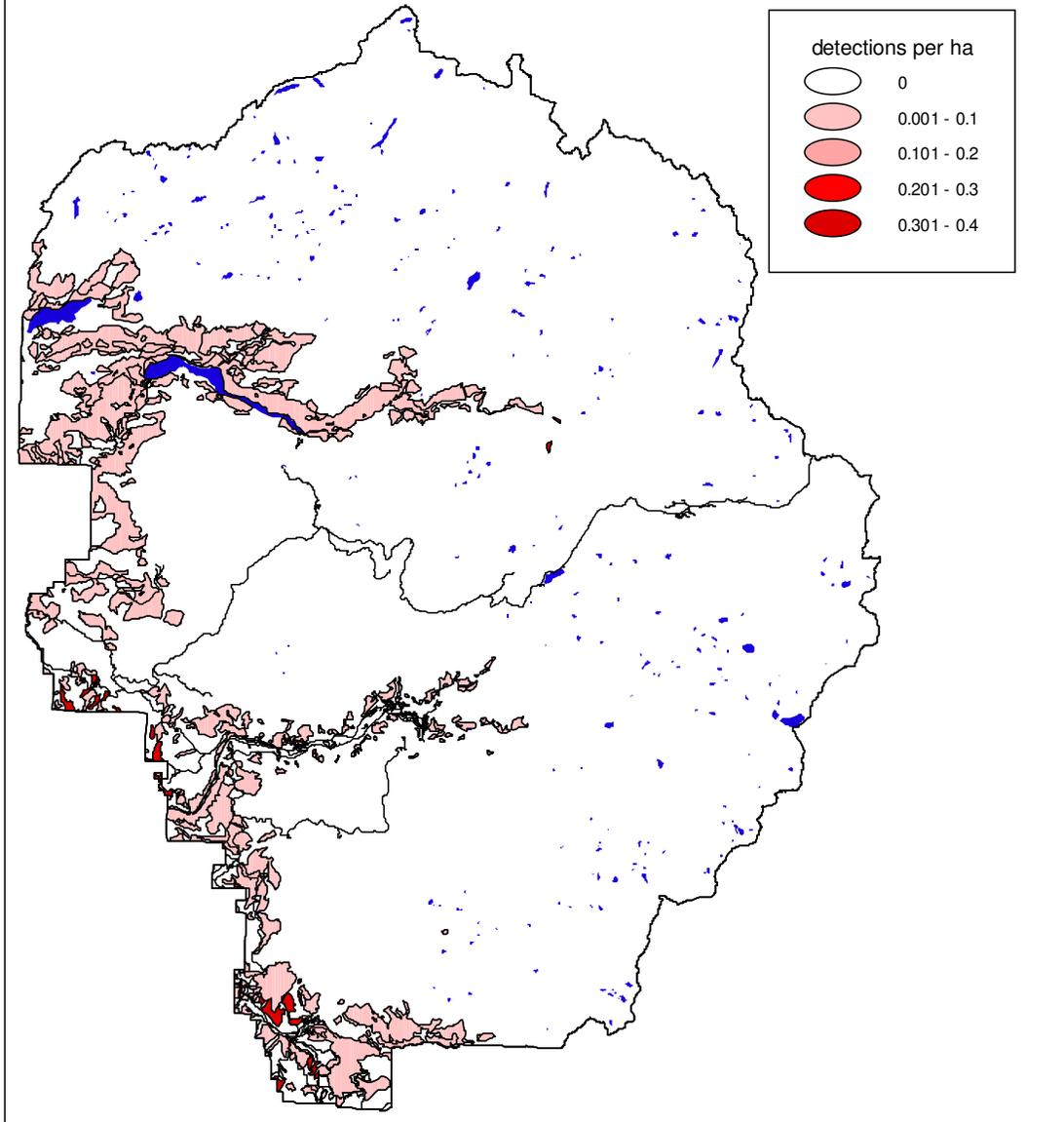


Figure 95. Wrentit distribution and relative abundance in the park.

American Pipit

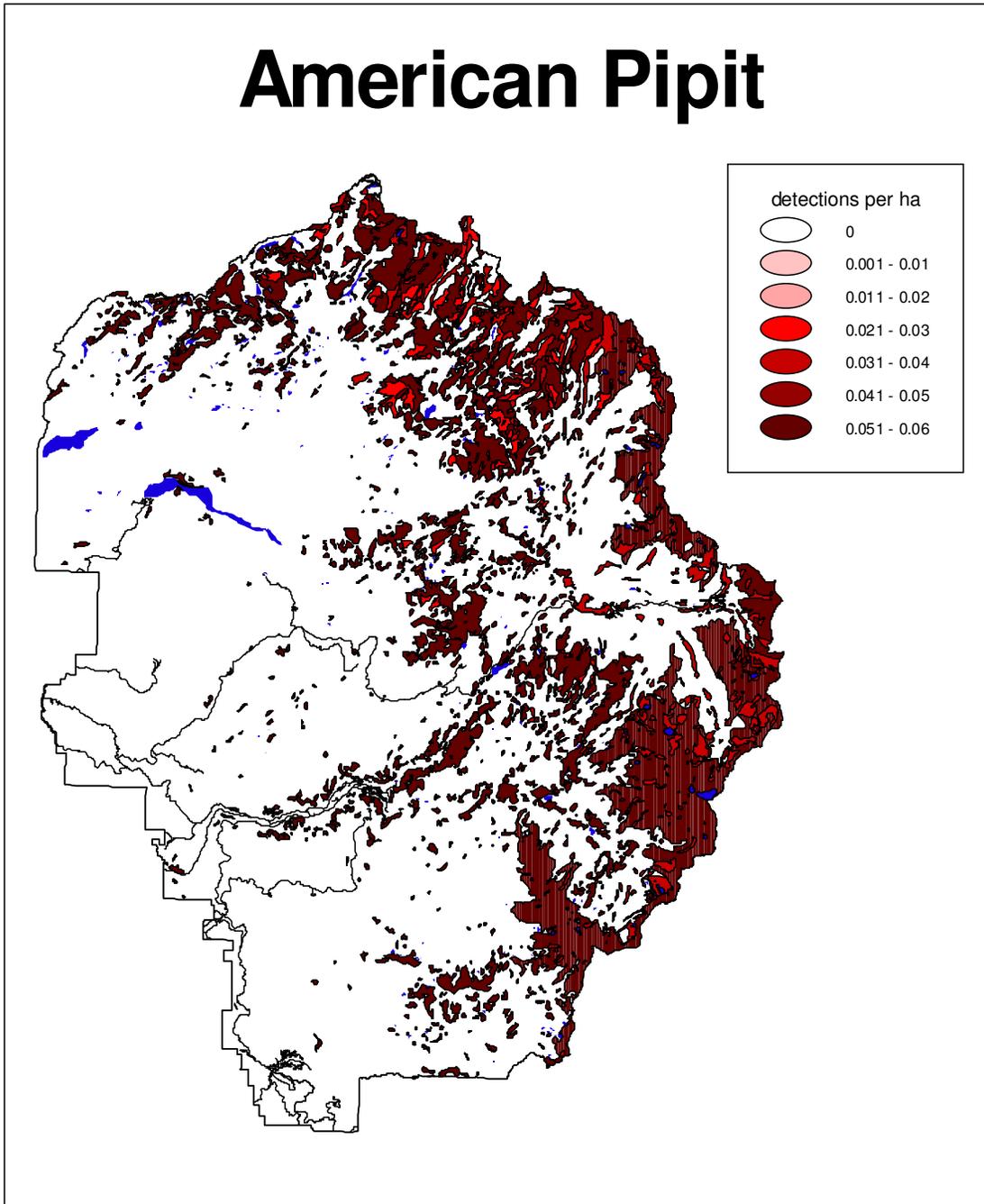


Figure 96. American Pipit distribution and relative abundance in the park.

Orange-crowned Warbler

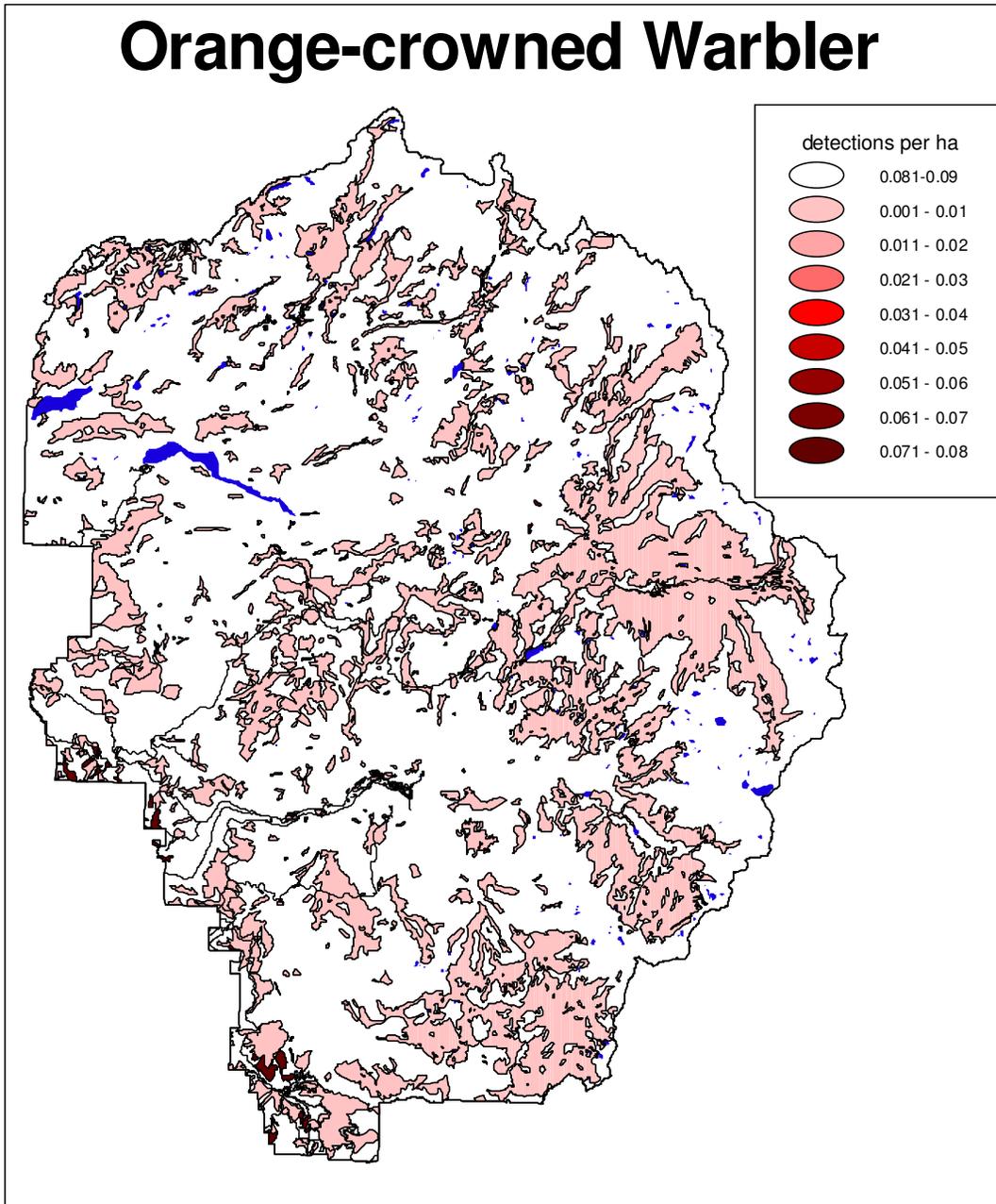


Figure 97. Orange-crowned Warbler distribution and relative abundance.

Nashville Warbler

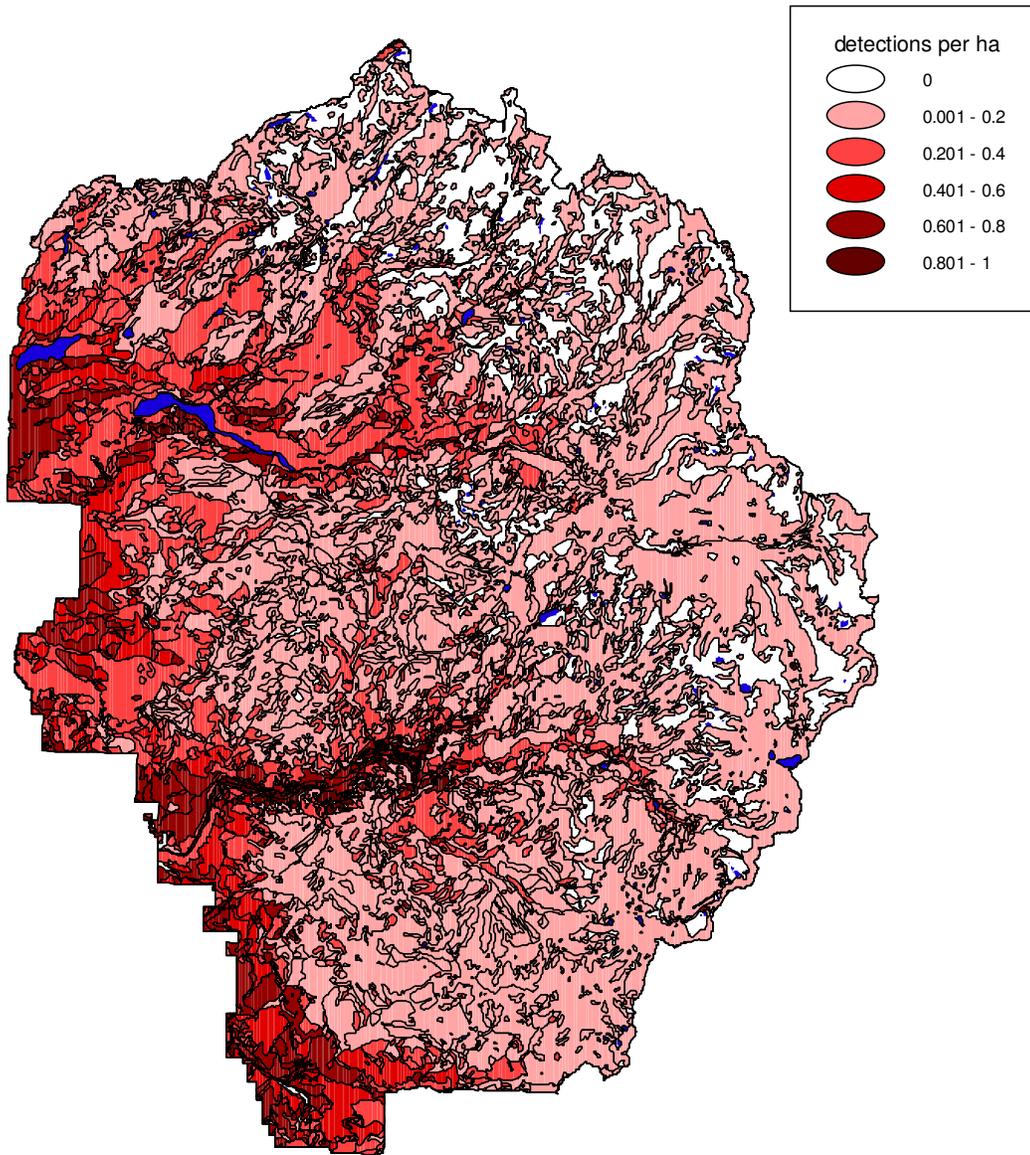


Figure 98. Nashville Warbler distribution and relative abundance in the park.

Yellow Warbler

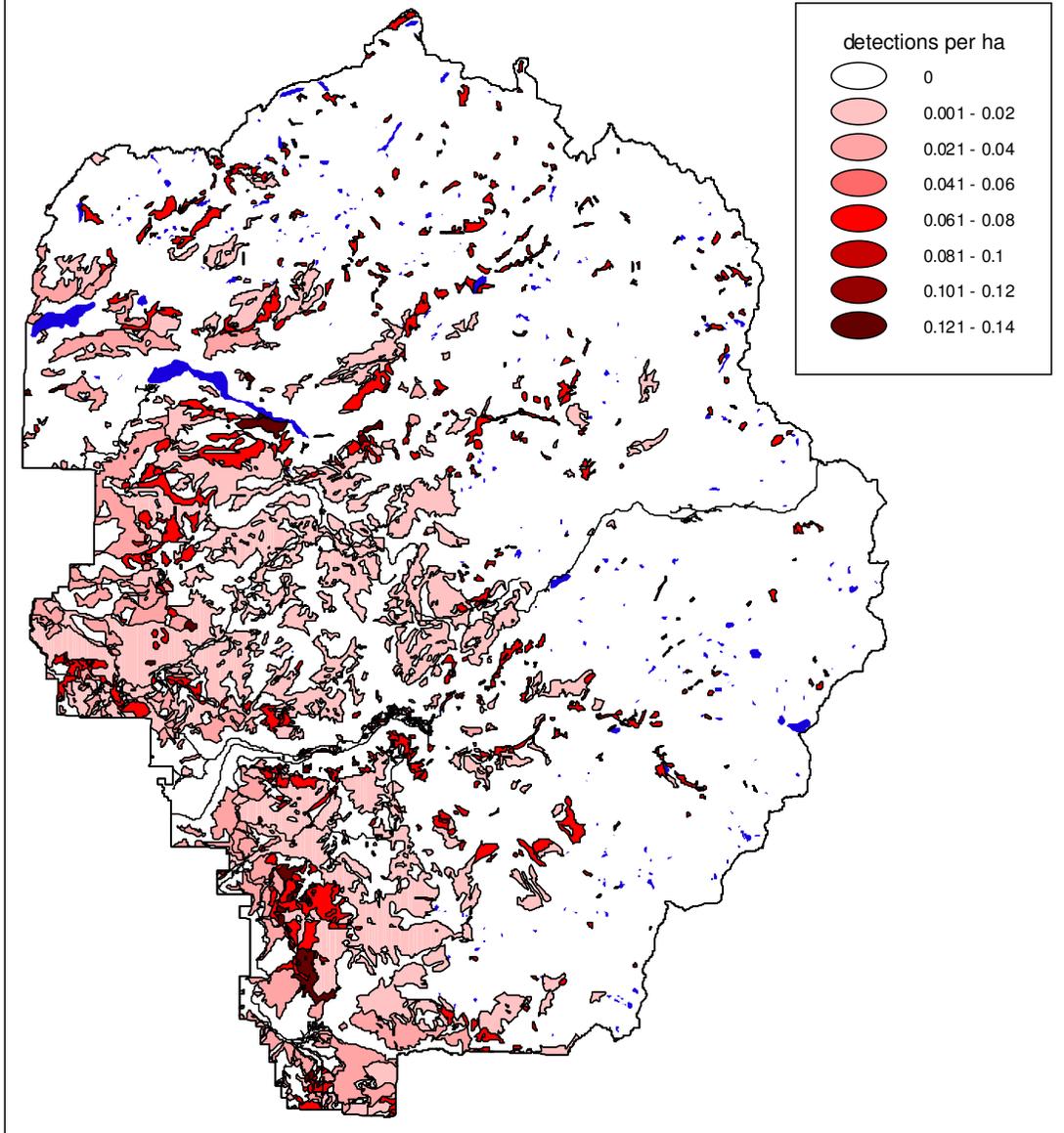


Figure 99. Yellow Warbler distribution and relative abundance in the park.

175199

Yellow-rumped Warbler

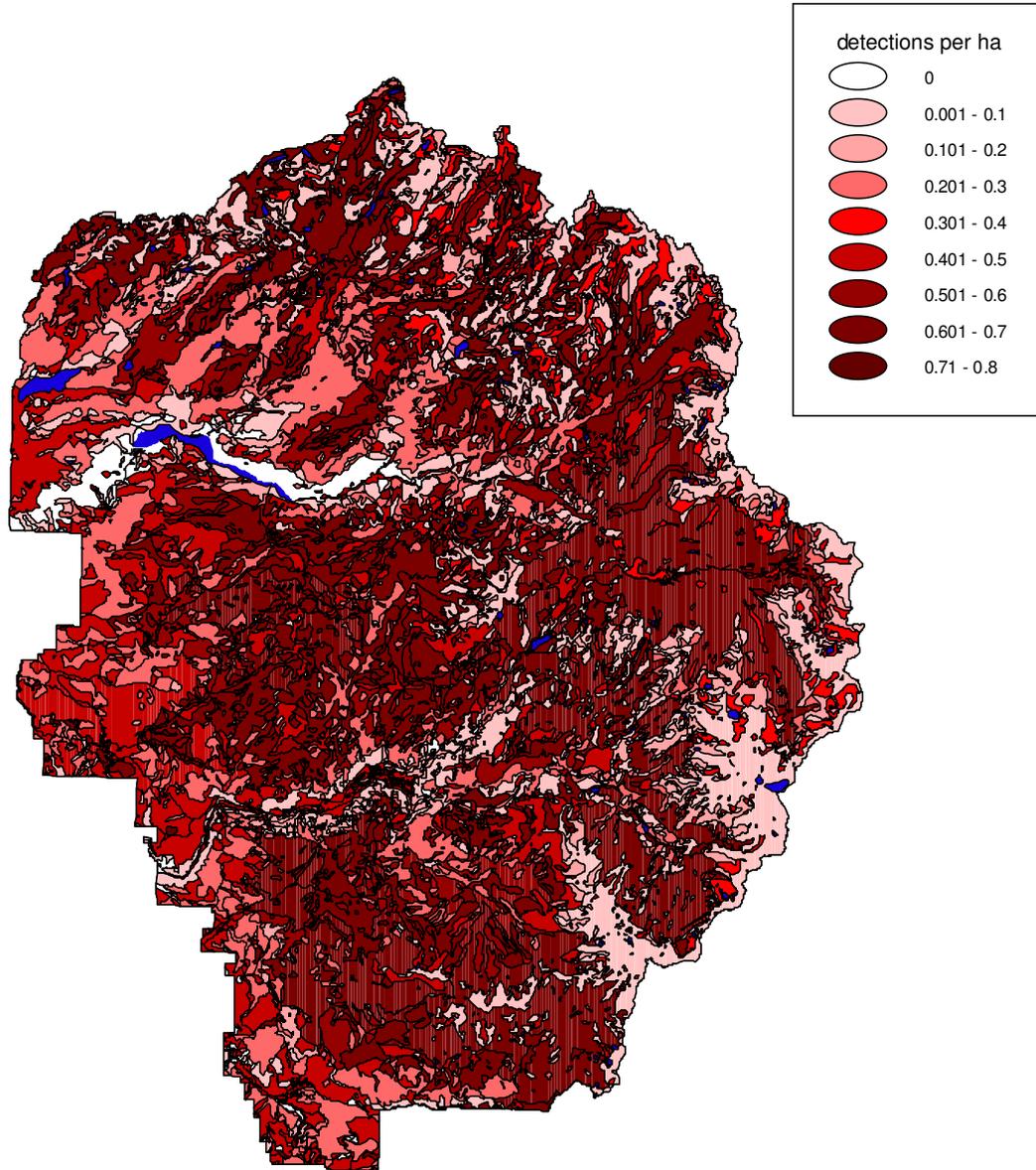


Figure 100. Yellow-rumped Warbler distribution and relative abundance in the park.

Lazuli Bunting

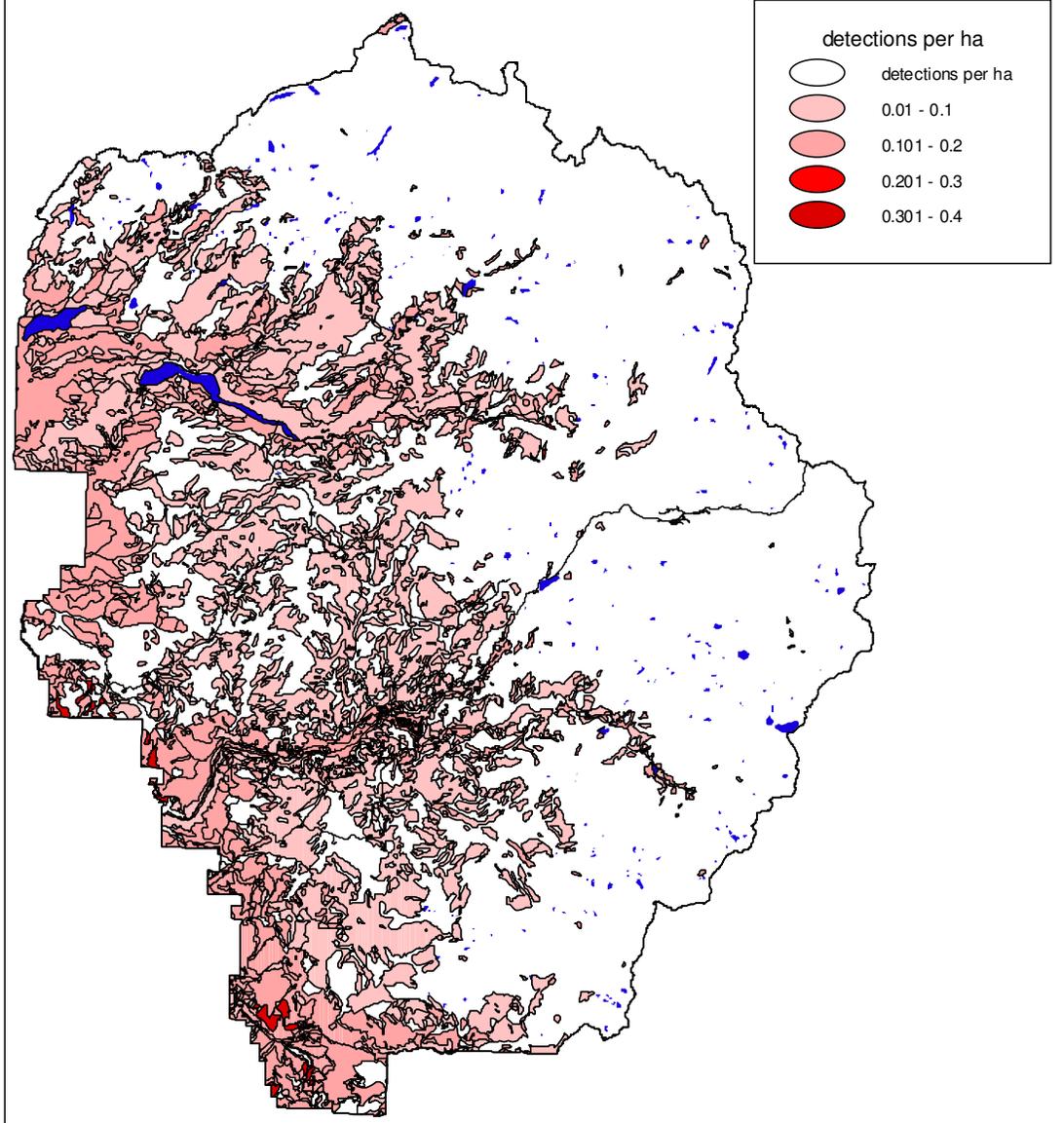


Figure 116. Lazuli Bunting distribution and relative abundance in the park.

Black-throated Gray Warbler

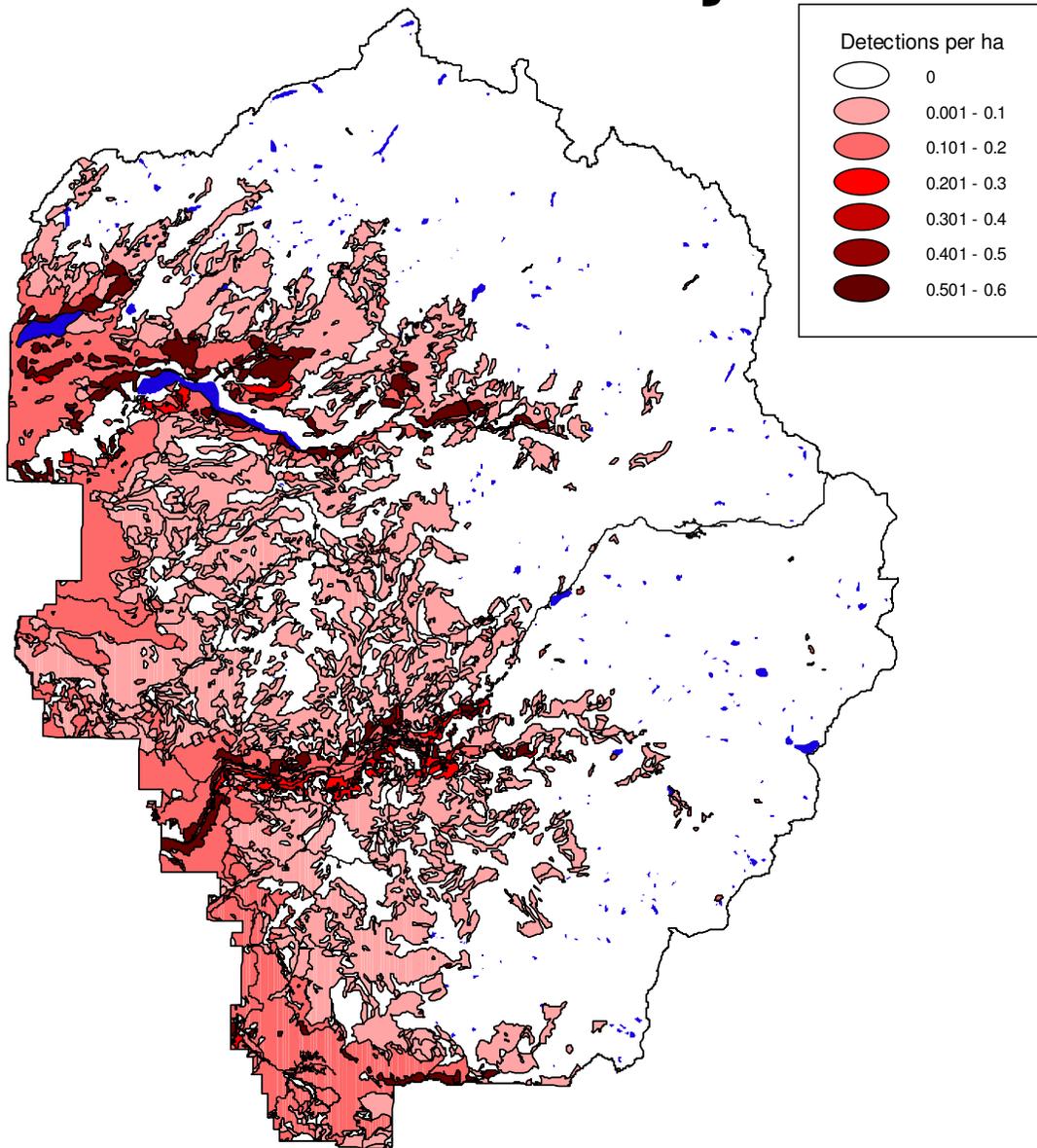


Figure 101. Black-throated Gray Warbler distribution and relative abundance in the park.

Hermit Warbler

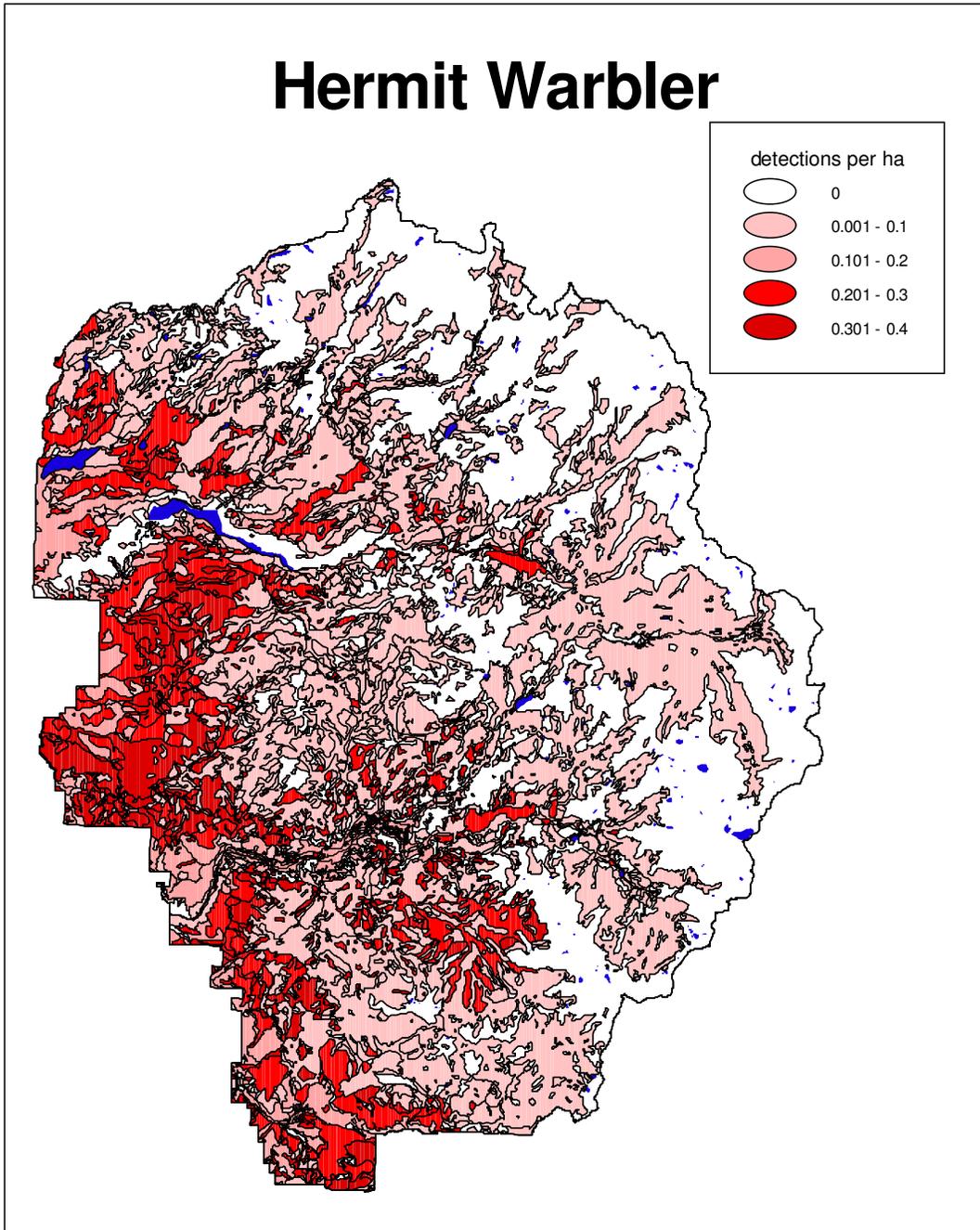


Figure 102. Hermit Warbler distribution and abundance in the park.

MacGillivray's Warbler

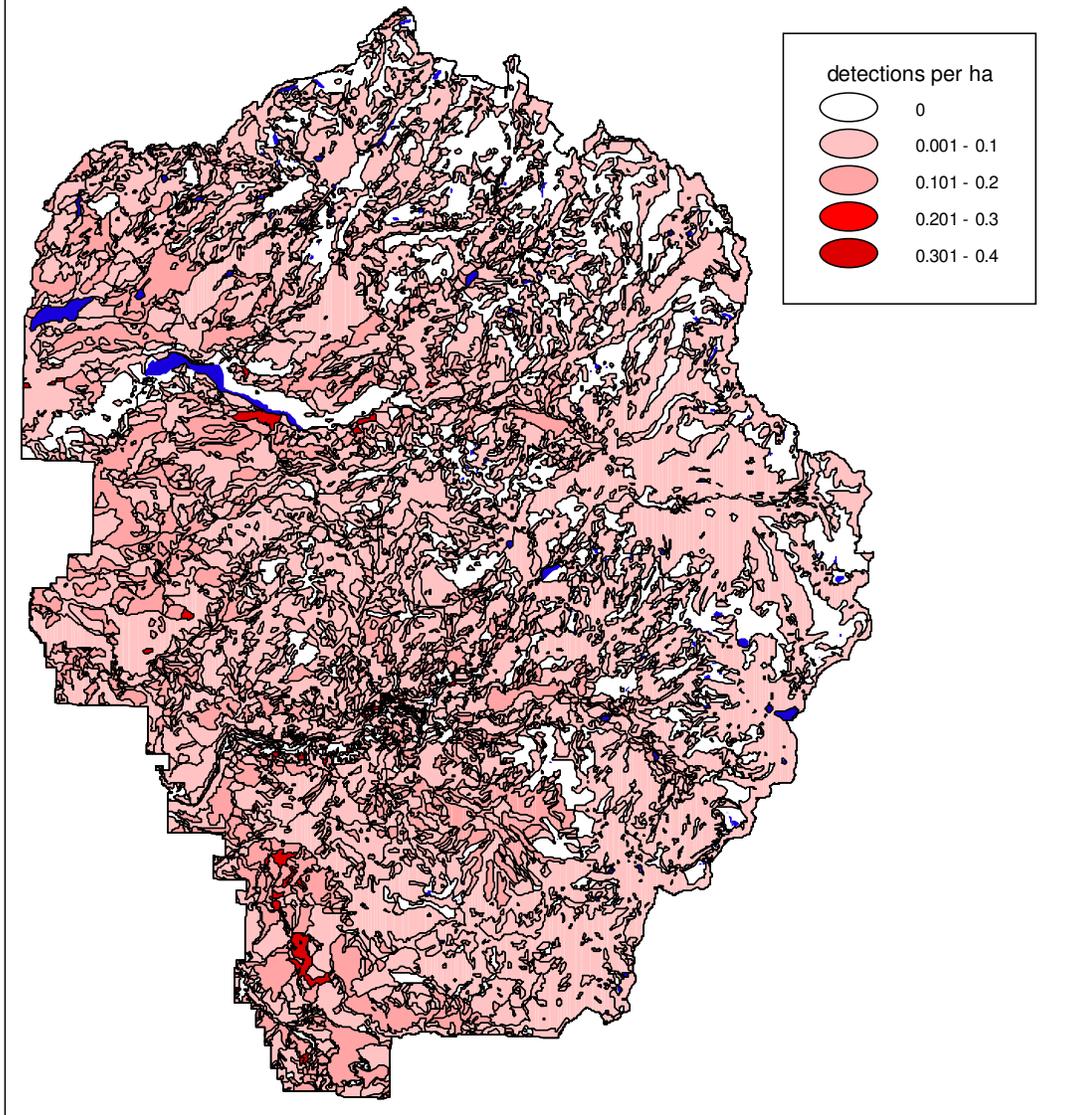


Figure 103. MacGillivray's Warbler distribution and relative abundance in the park.

Wilson's Warbler

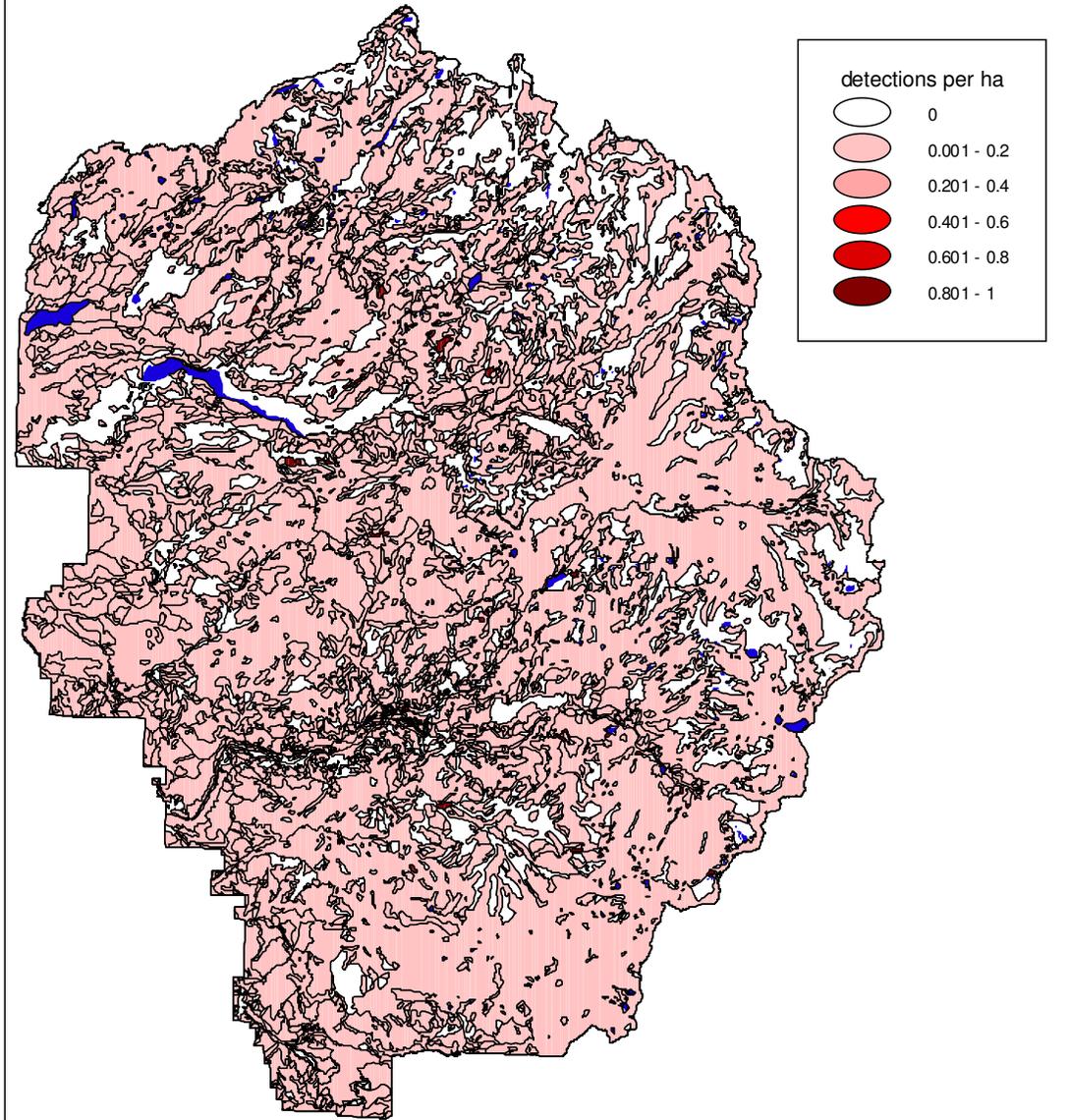


Figure 104. Wilson's Warbler distribution and relative abundance in the park.

Western Tanager

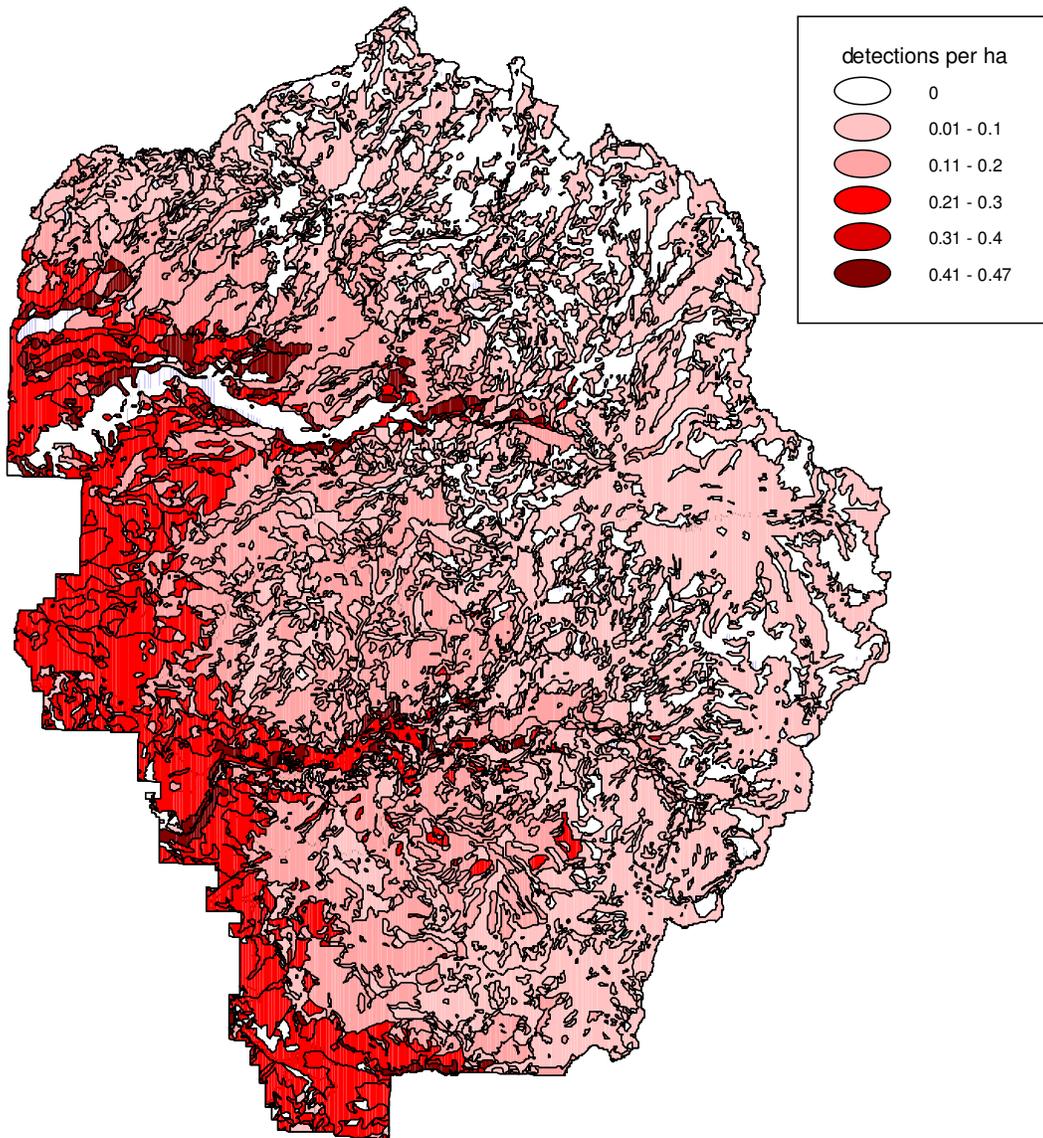


Figure 105. Western Tanager distribution and relative abundance in the park.

Green-tailed Towhee

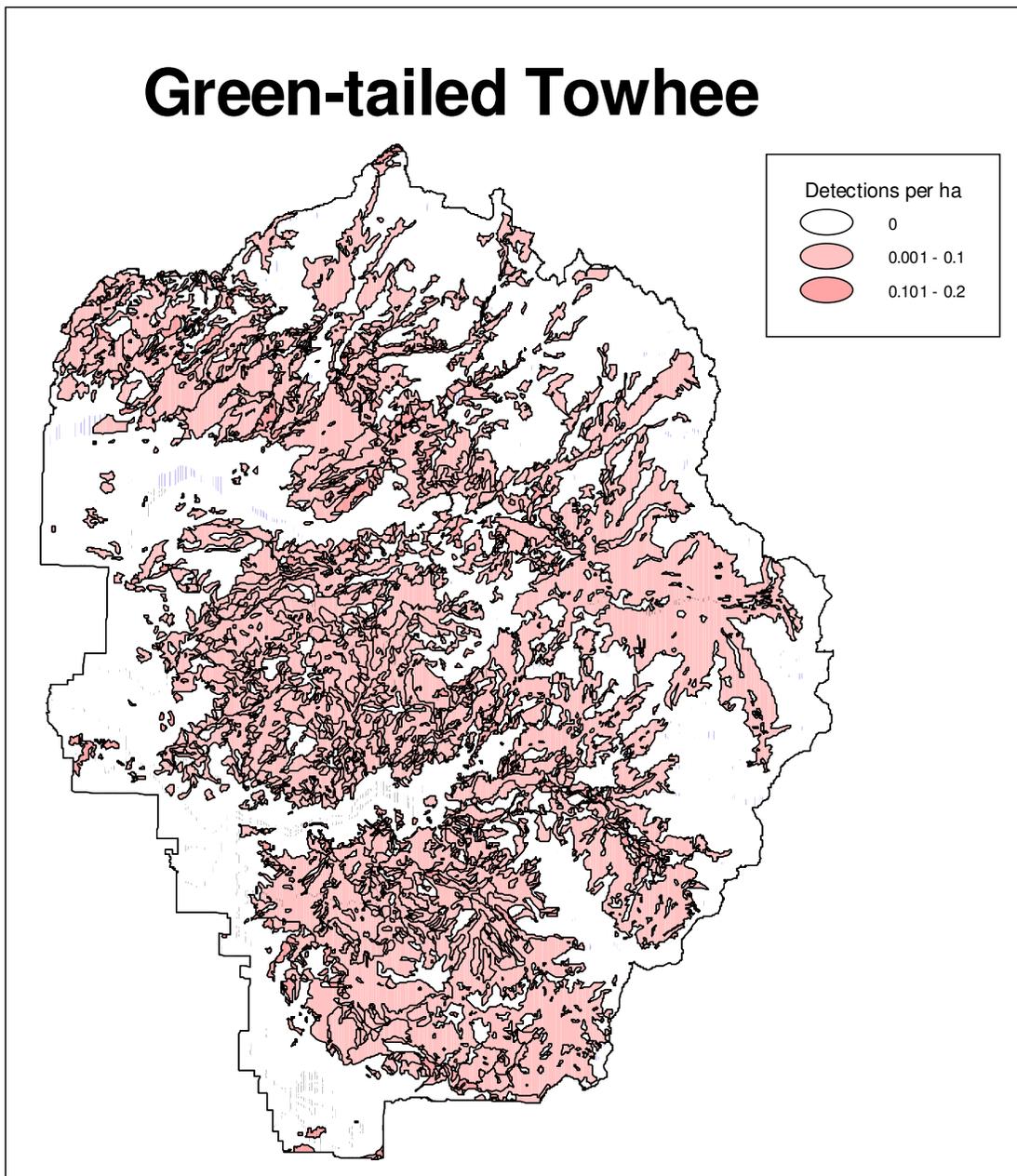


Figure 106. Green-tailed Towhee distribution and relative abundance in the park.

Spotted Towhee

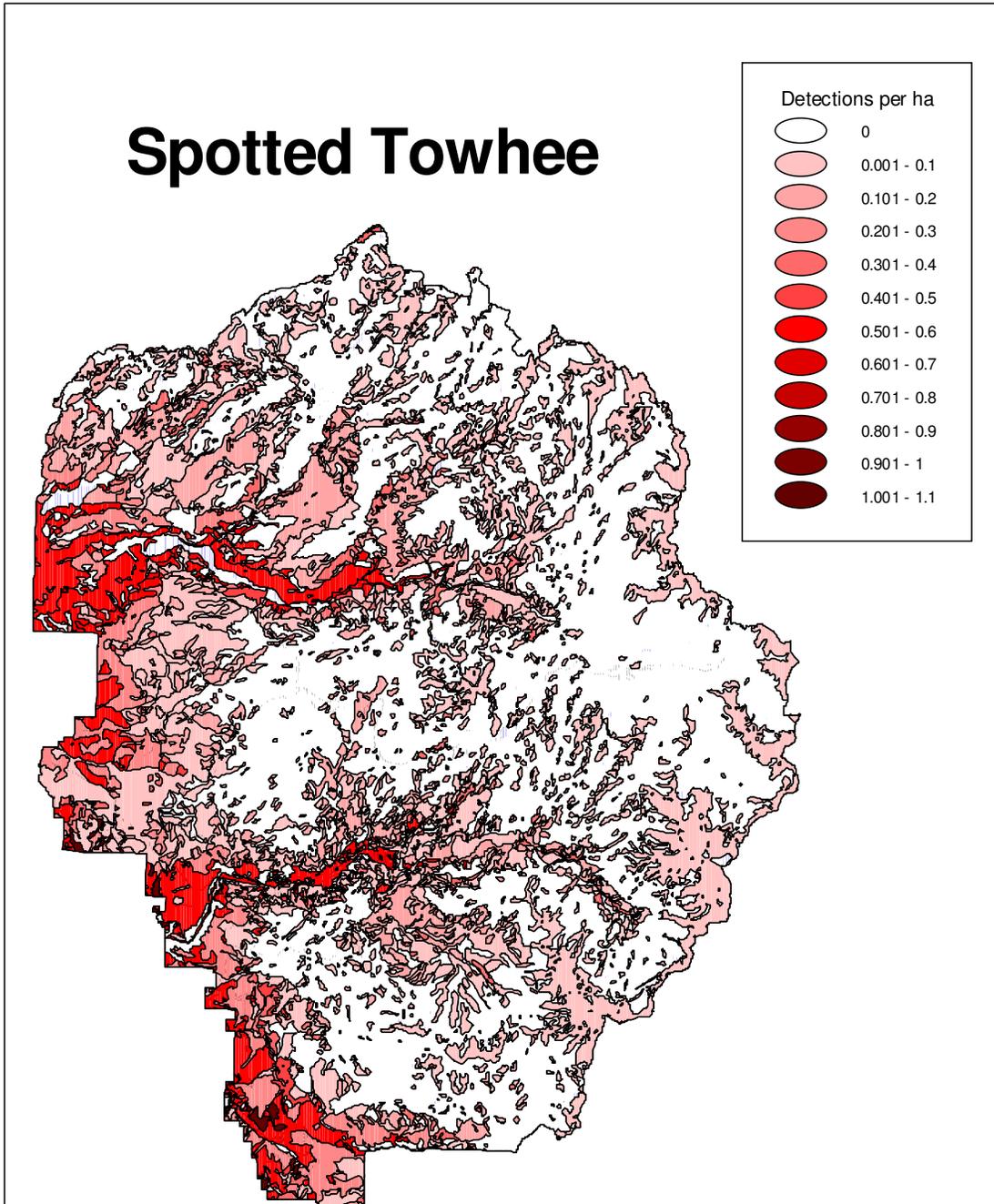


Figure 107. Spotted Towhee distribution and relative abundance in the park.

Chipping Sparrow

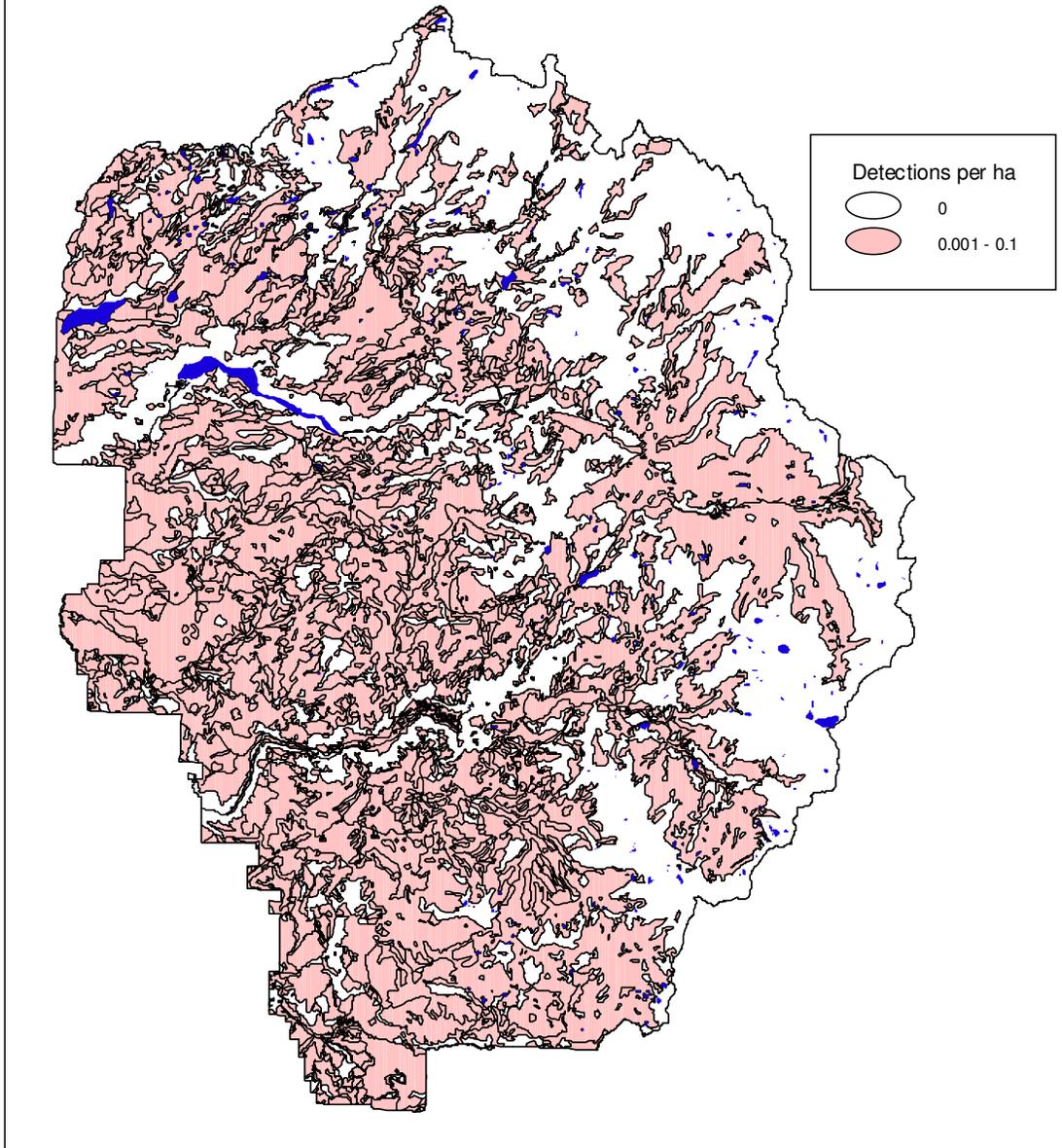


Figure 108. Chipping Sparrow distribution and relative abundance in the park.

Black-throated Sparrow

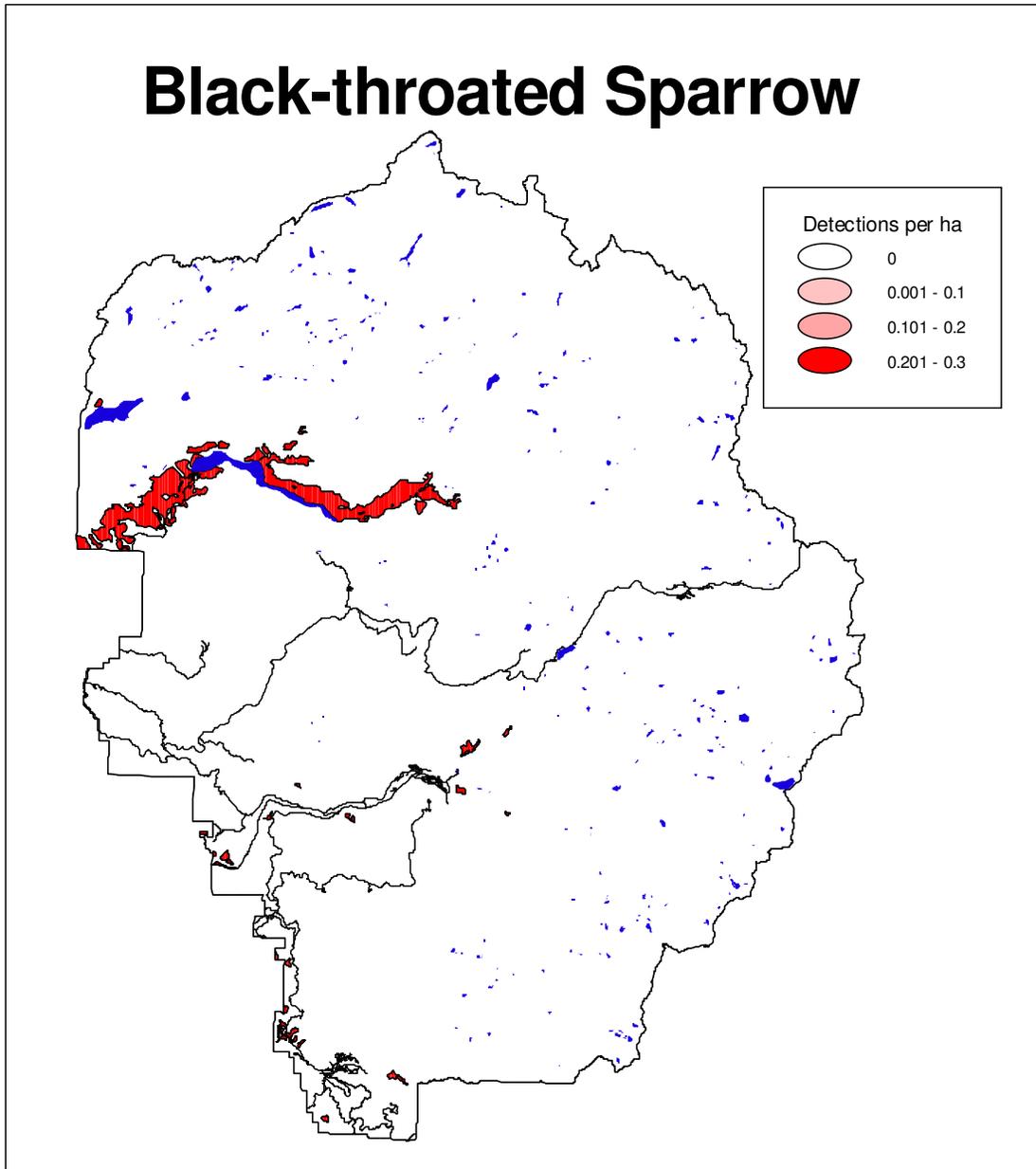


Figure 109. Black-throated Sparrow distribution and relative abundance in the park.

Fox Sparrow

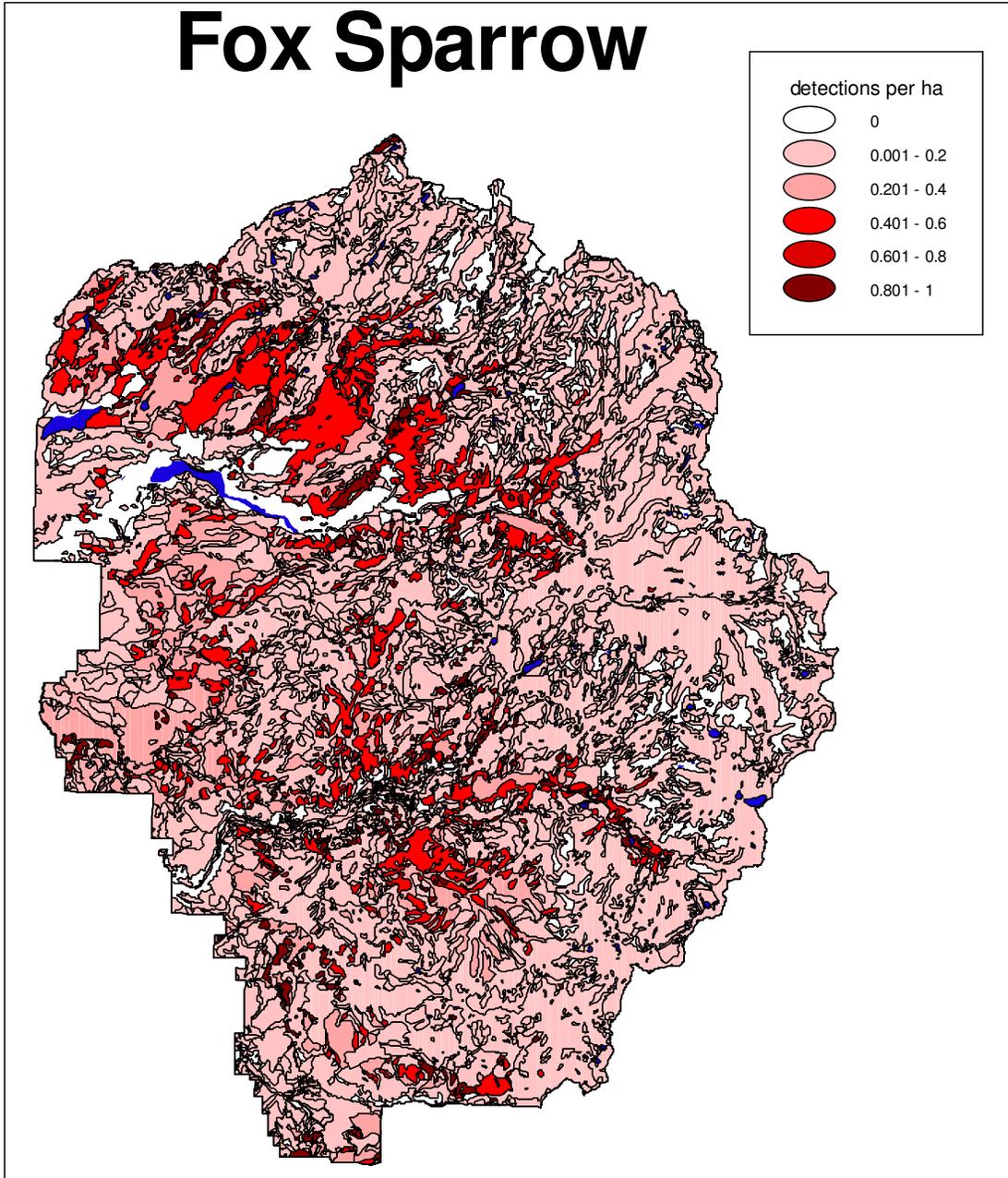


Figure 110. Fox Sparrow distribution and relative abundance in the park.

Song Sparrow

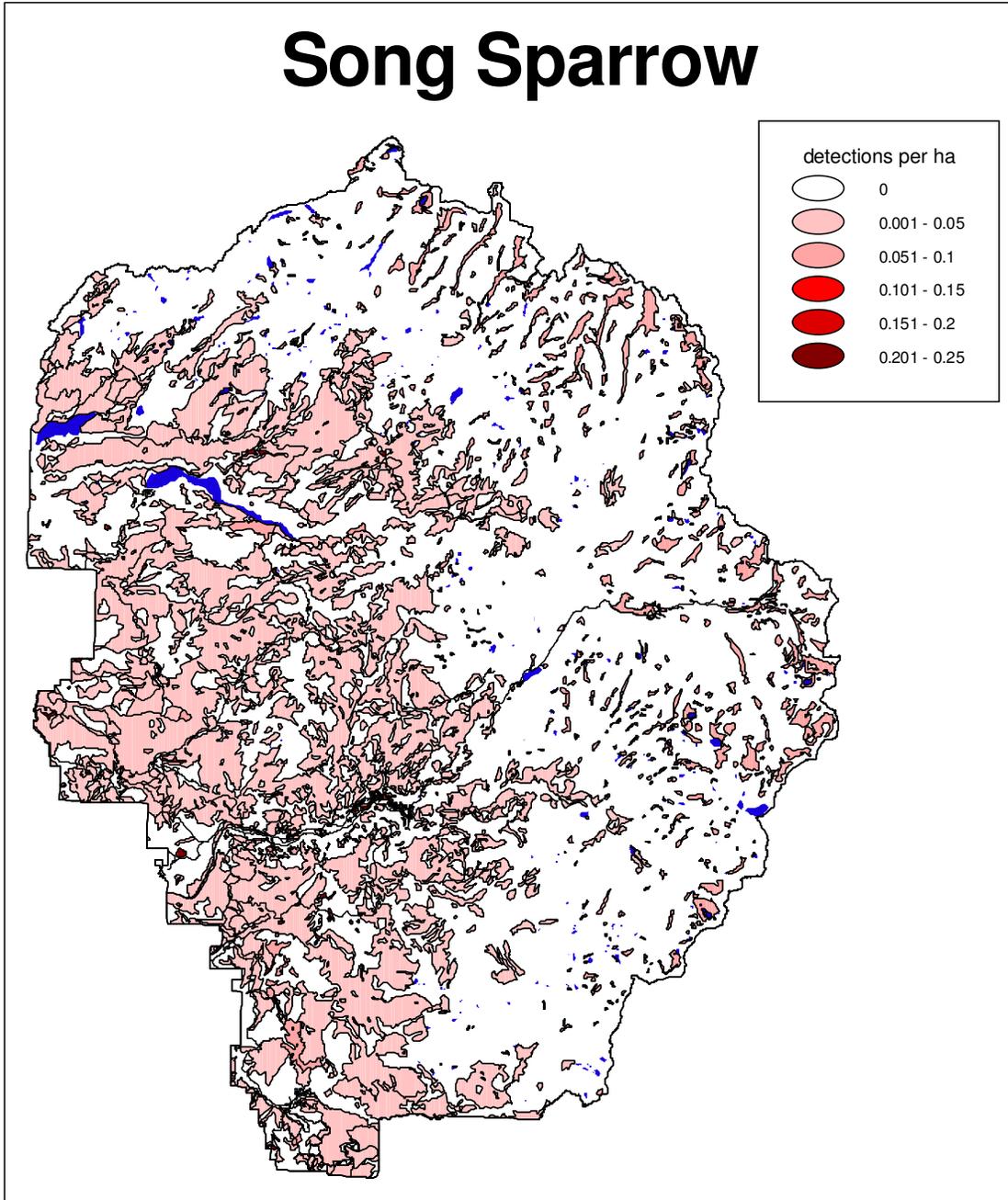


Figure 111. Song Sparrow distribution and relative abundance in the park.

Lincoln's Sparrow

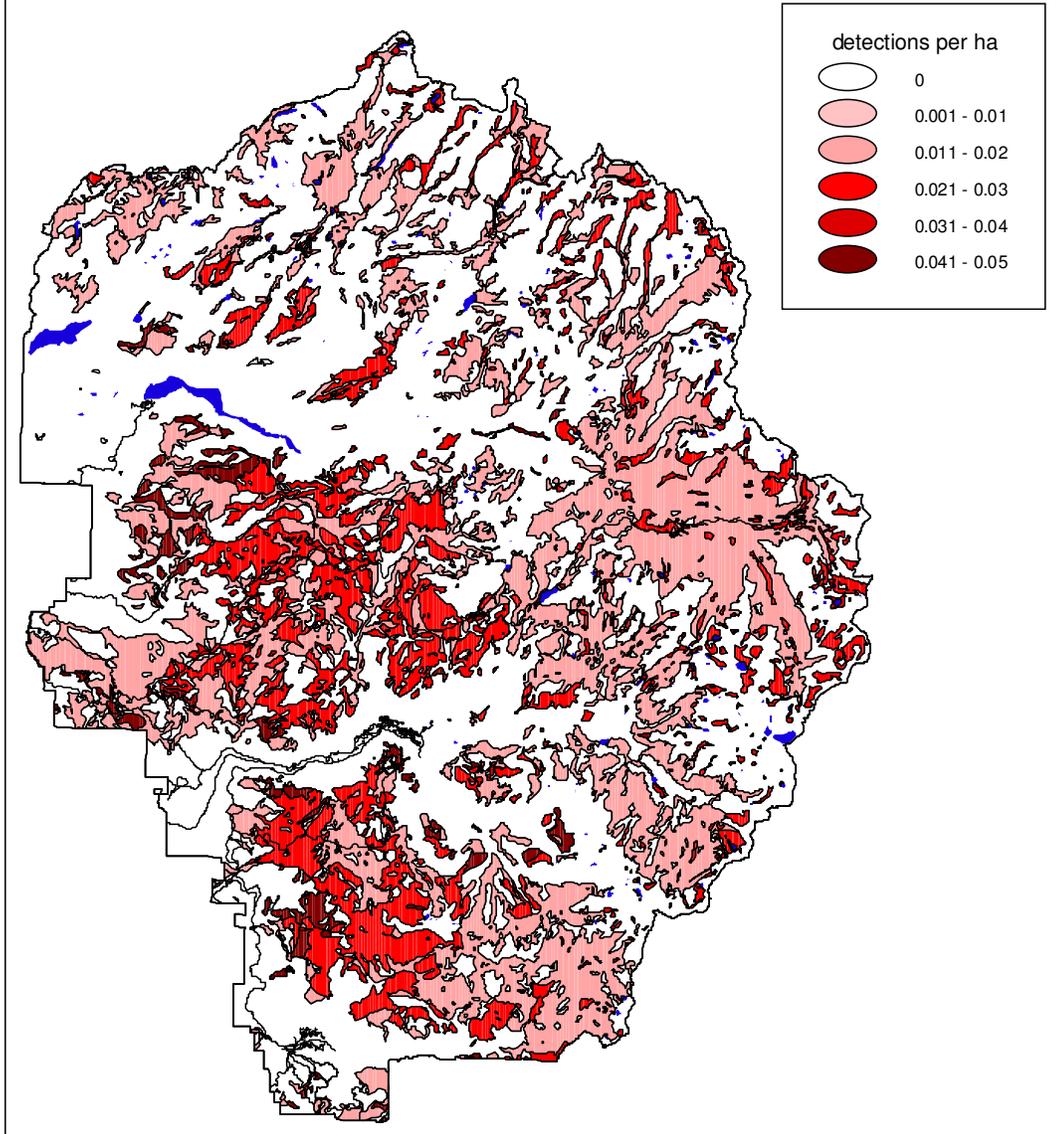


Figure 112. Lincoln's Sparrow distribution and relative abundance in the park.

White-crowned Sparrow

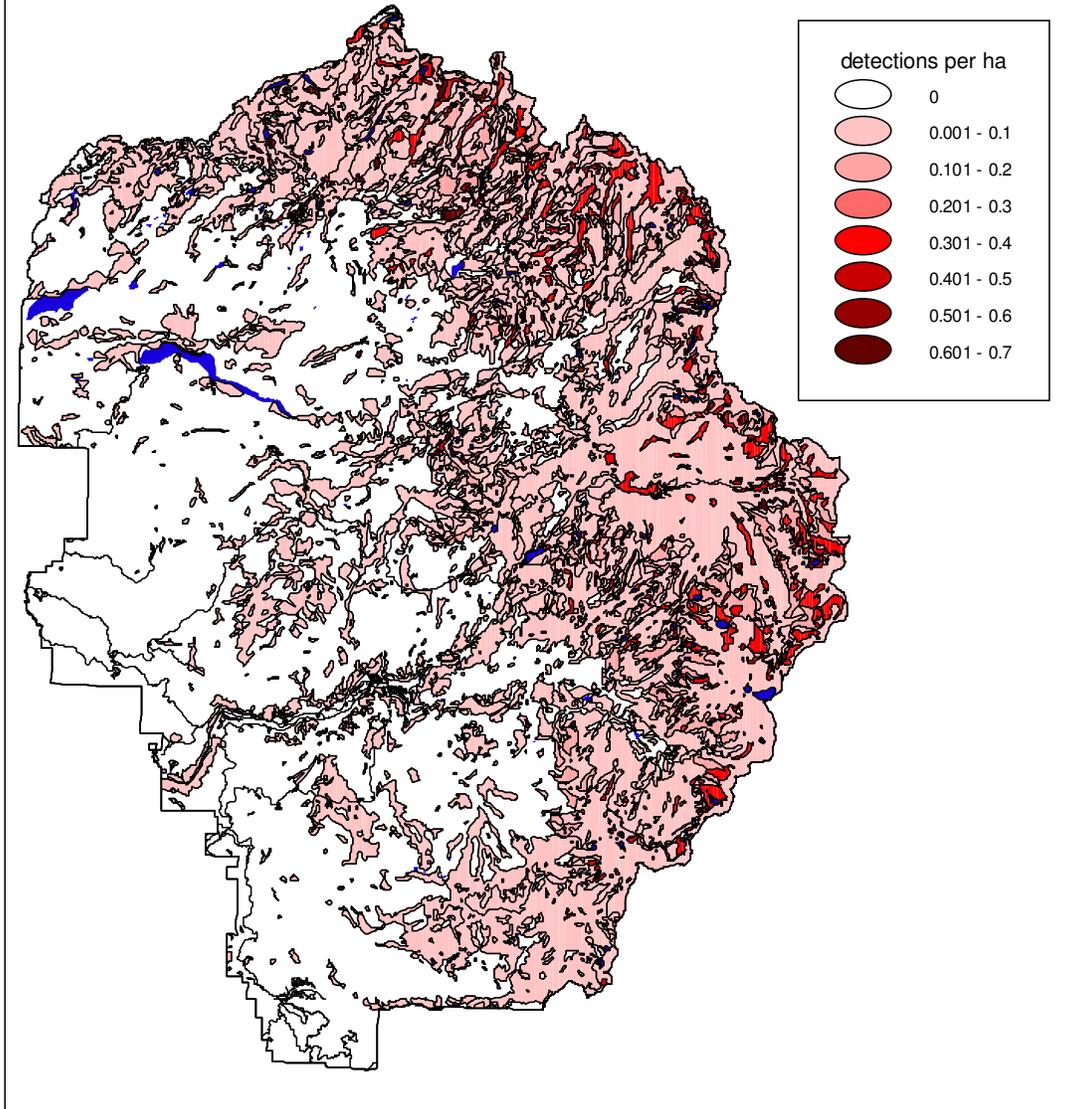


Figure 113. White-crowned Sparrow distribution and relative abundance in the park.

Dark-eyed Junco

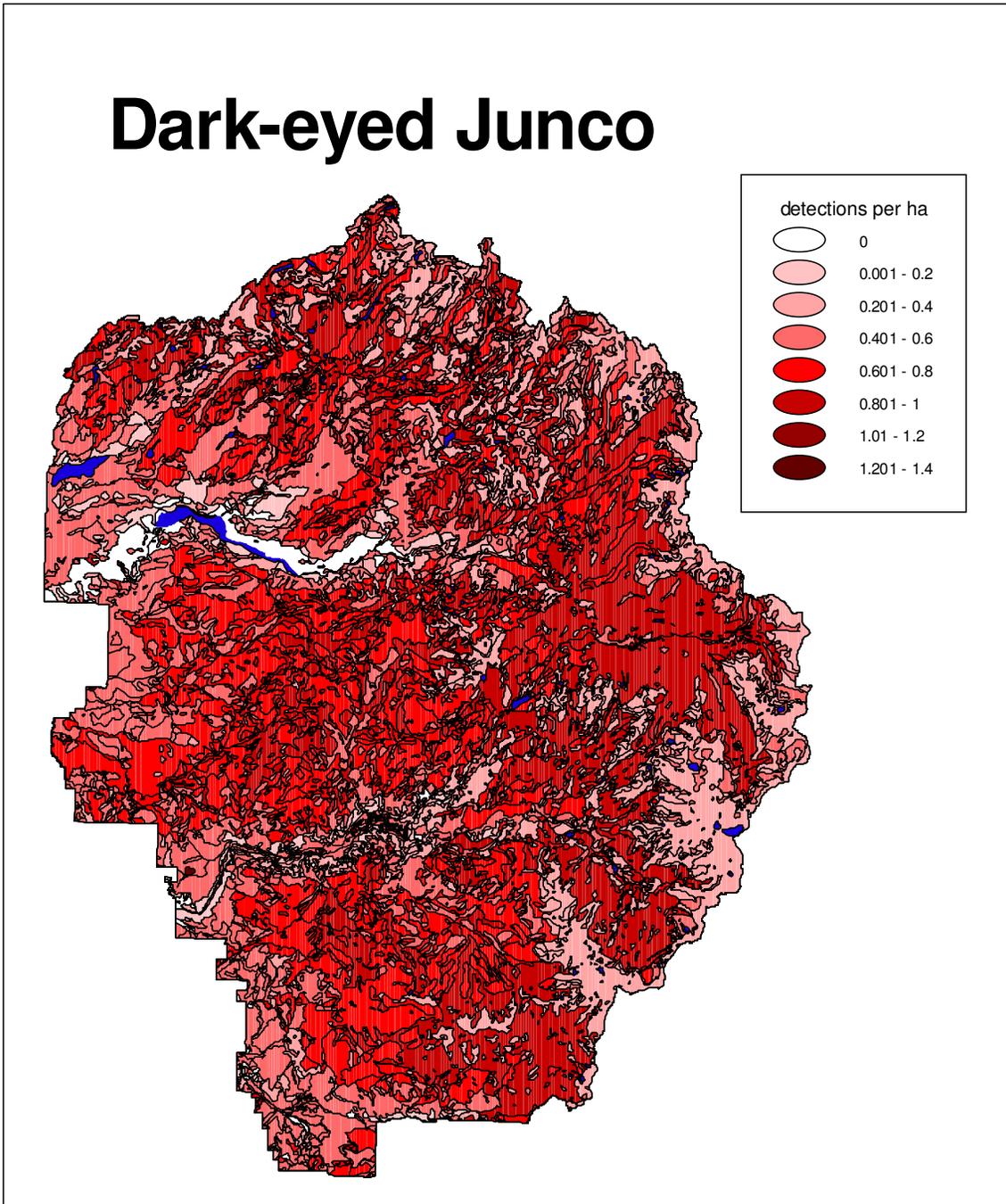


Figure 114. Dark-eyed Junco distribution and relative abundance in the park.

Black-headed Grosbeak

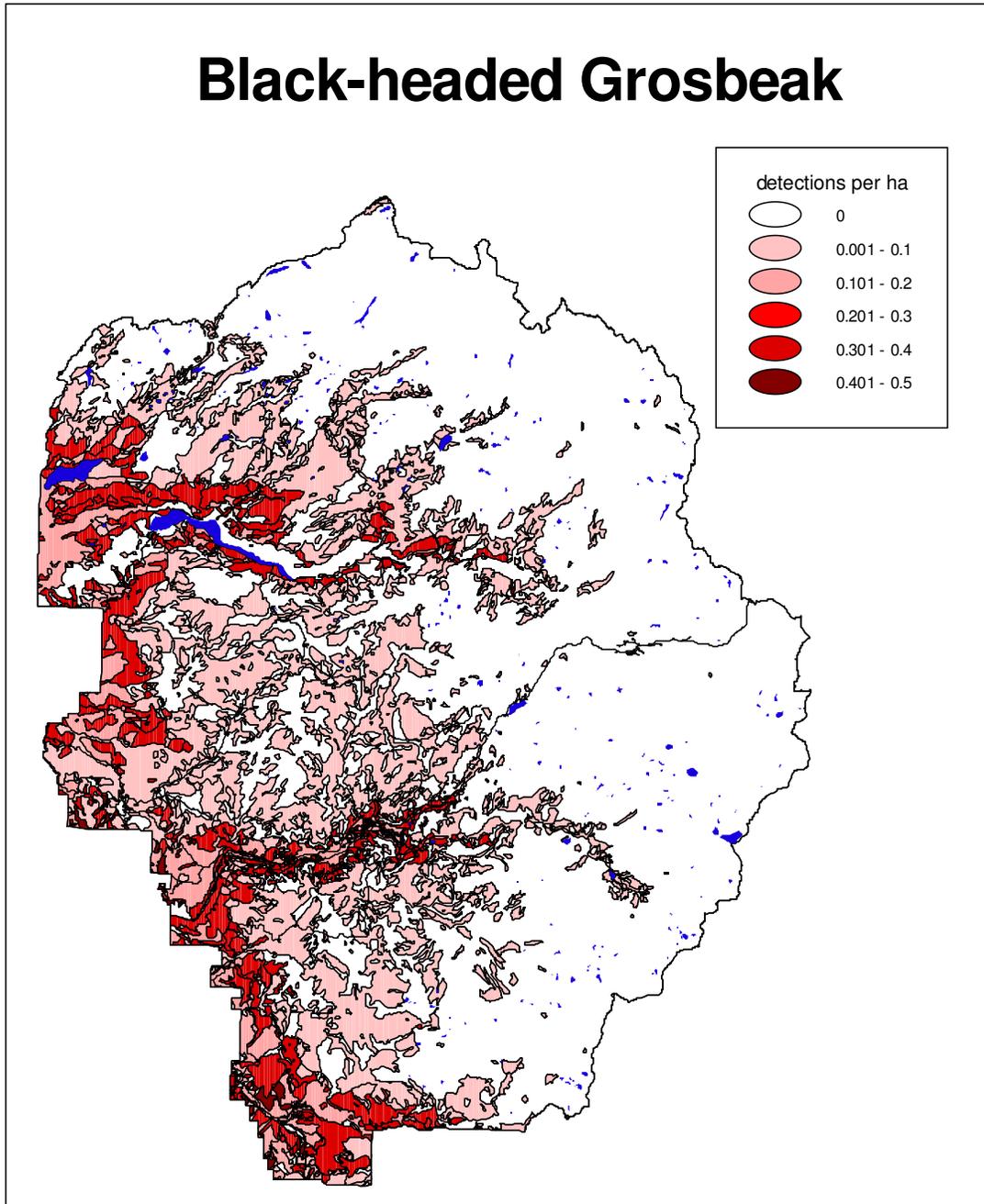


Figure 115. Black-headed Grosbeak distribution and relative abundance.

Lesser Goldfinch

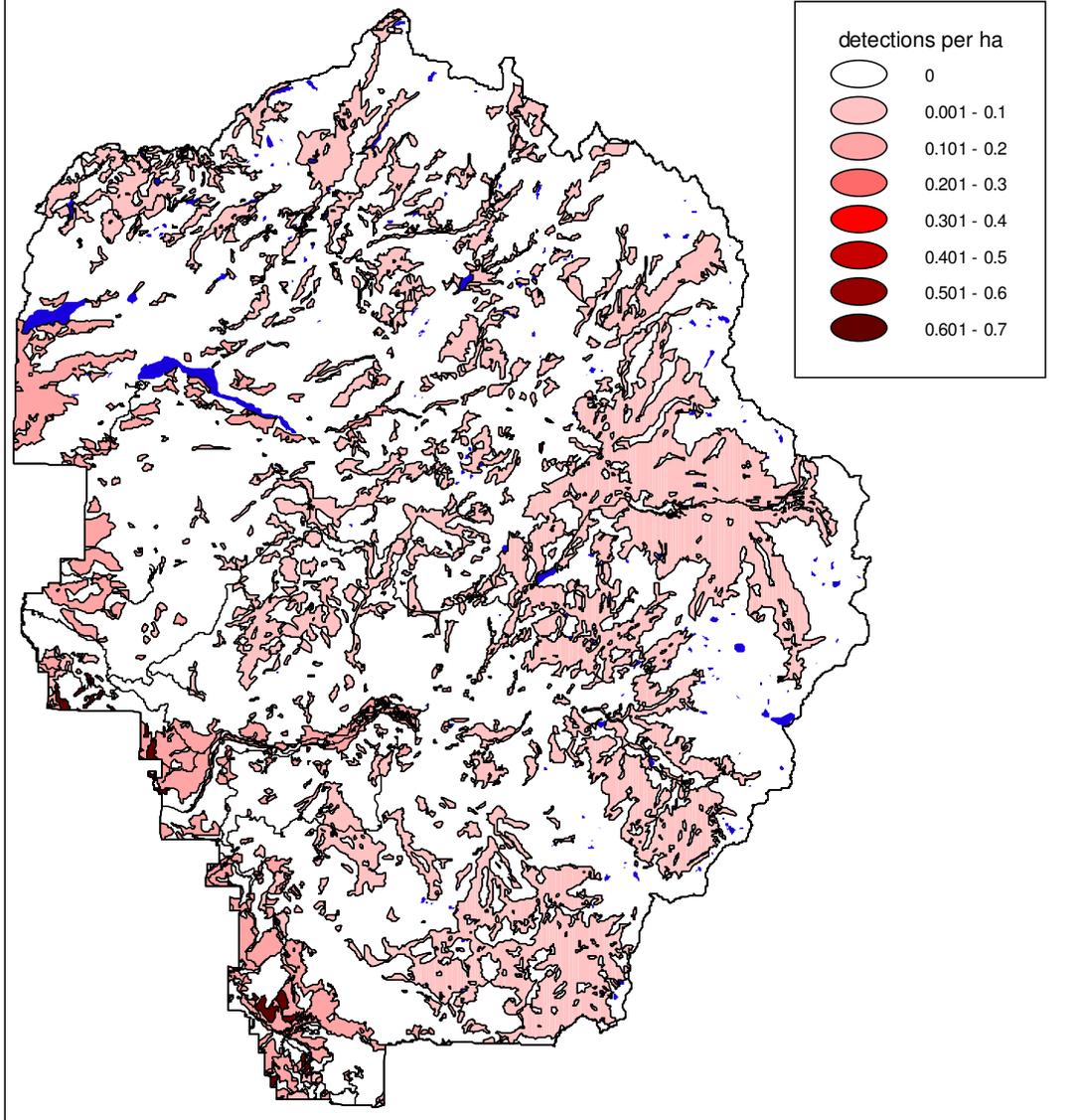


Figure 126. Lesser Goldfinch distribution and relative abundance in the park.

Lazuli Bunting

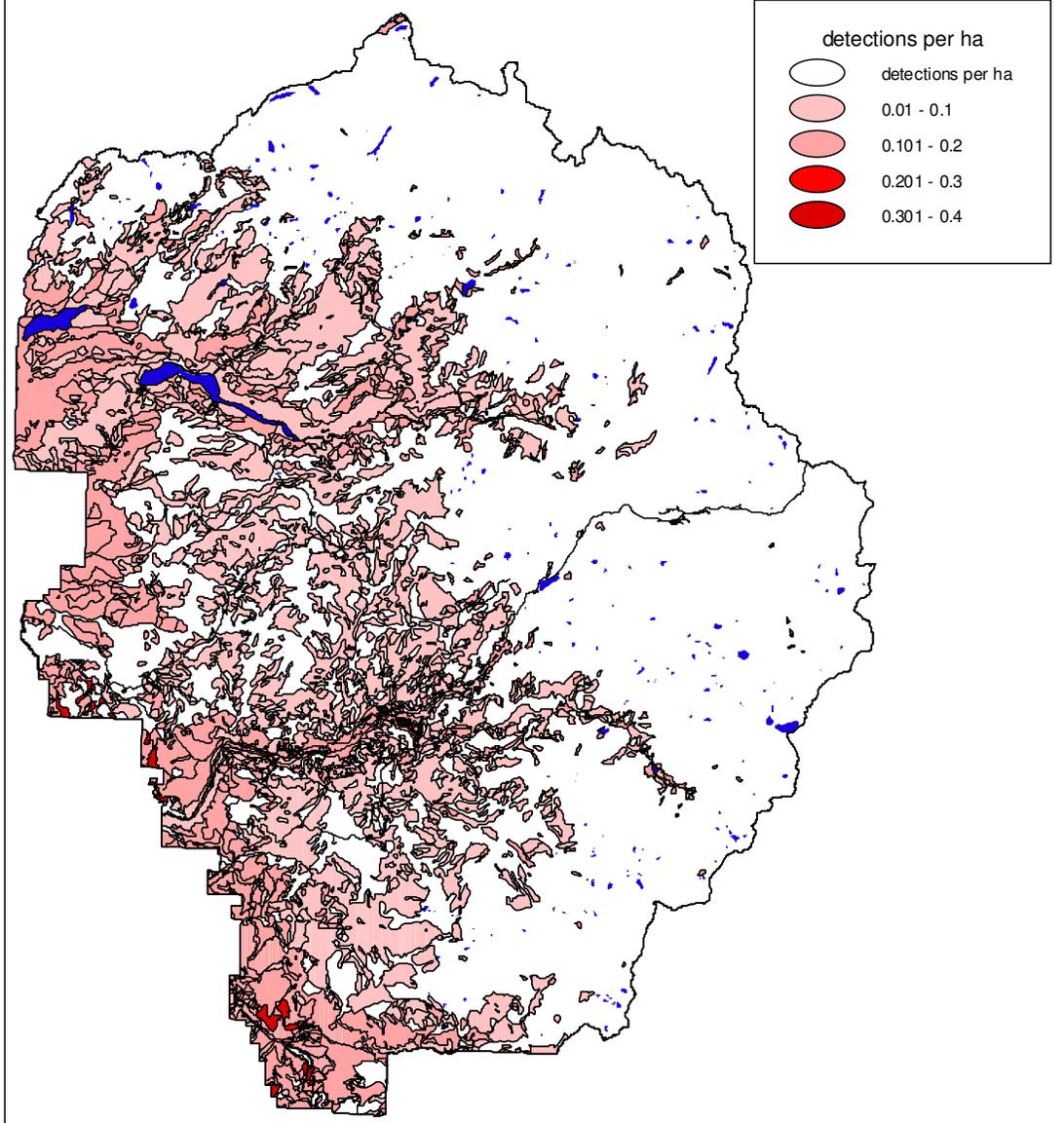


Figure 116. Lazuli Bunting distribution and relative abundance in the park.

Red-winged Blackbird

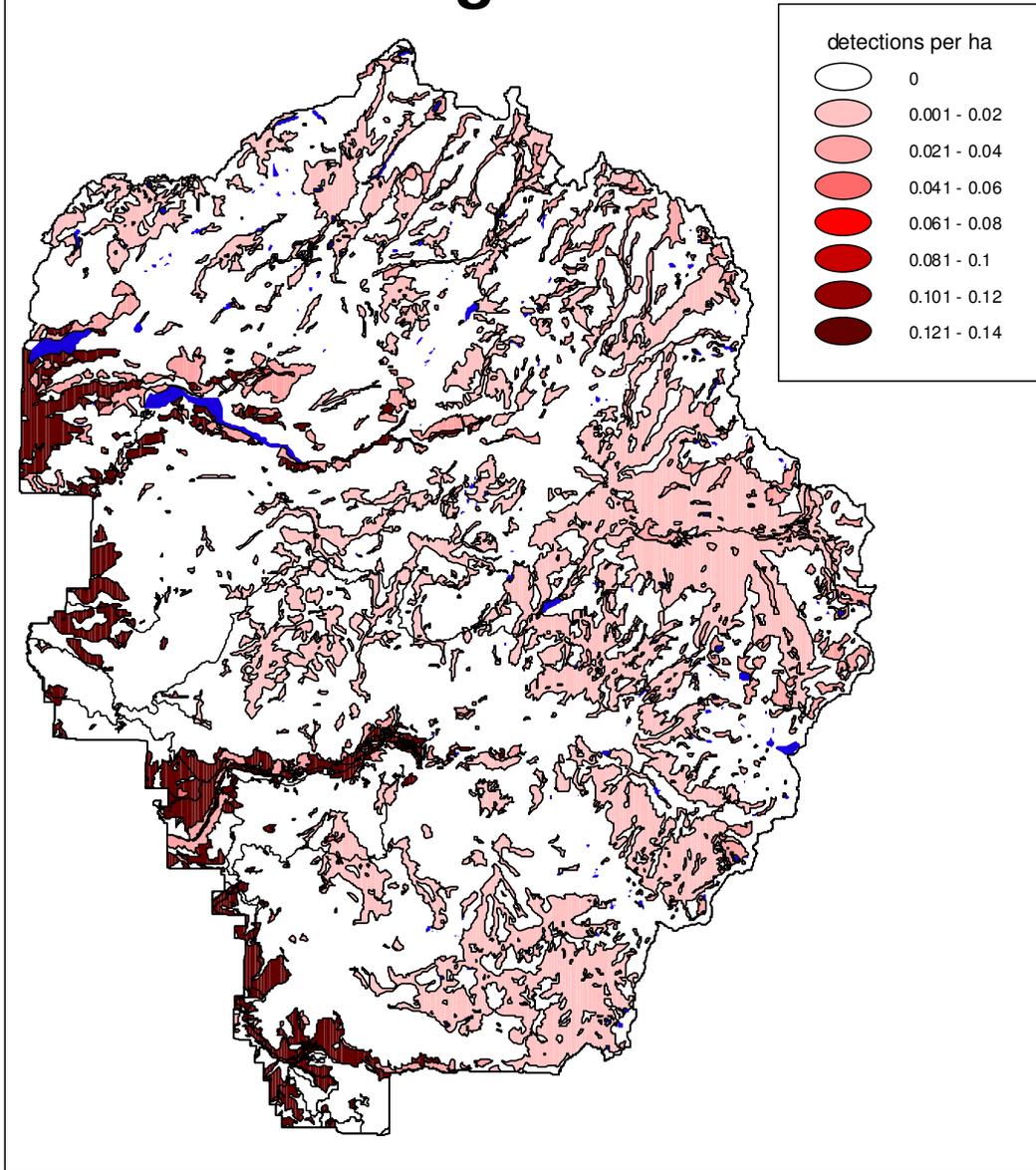


Figure 117. Red-winged Blackbird distribution and relative abundance in the park.

Brewer's Blackbird

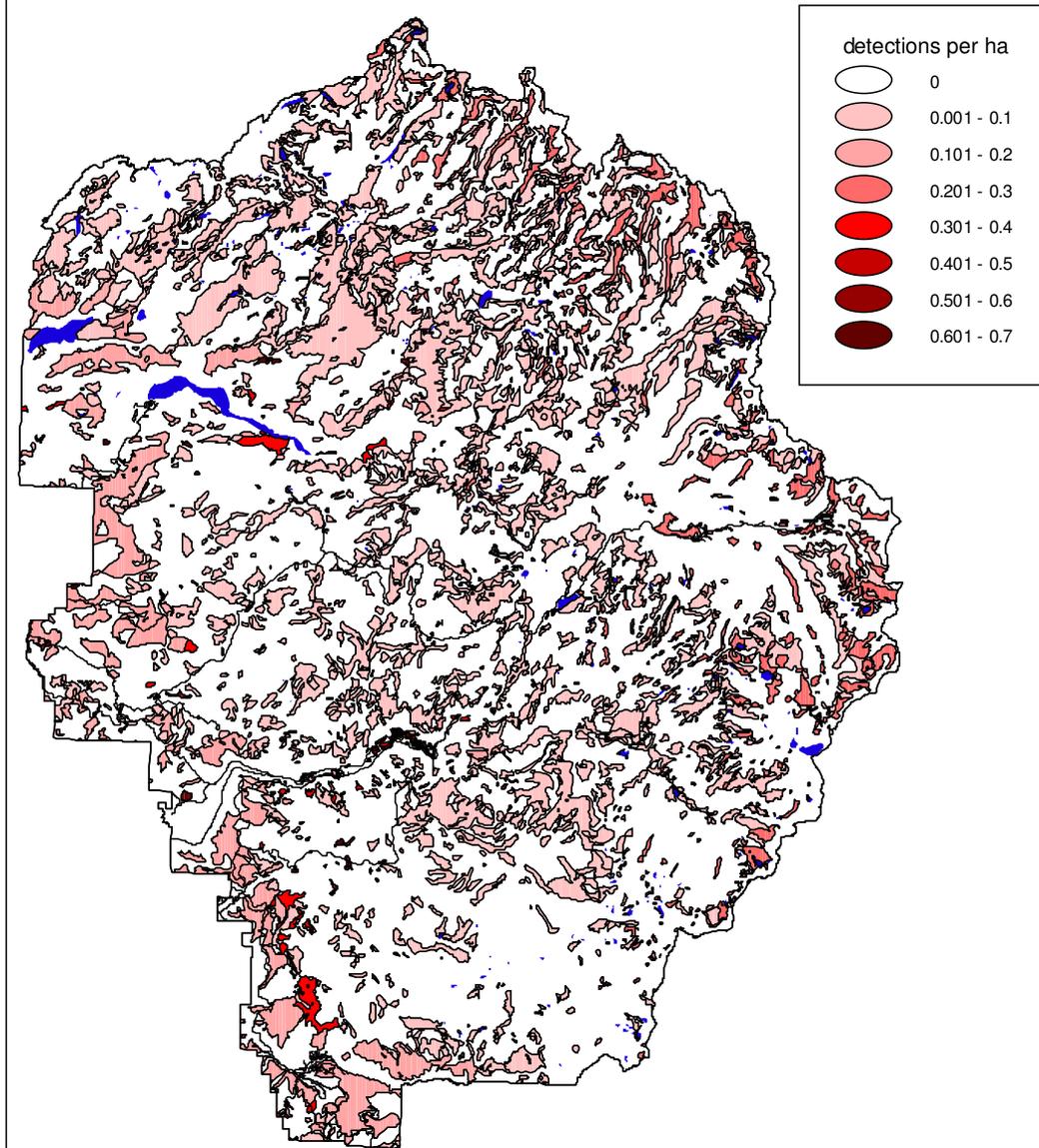


Figure 118. Brewer's Blackbird distribution and relative abundance in the park.

Brown-headed Cowbird

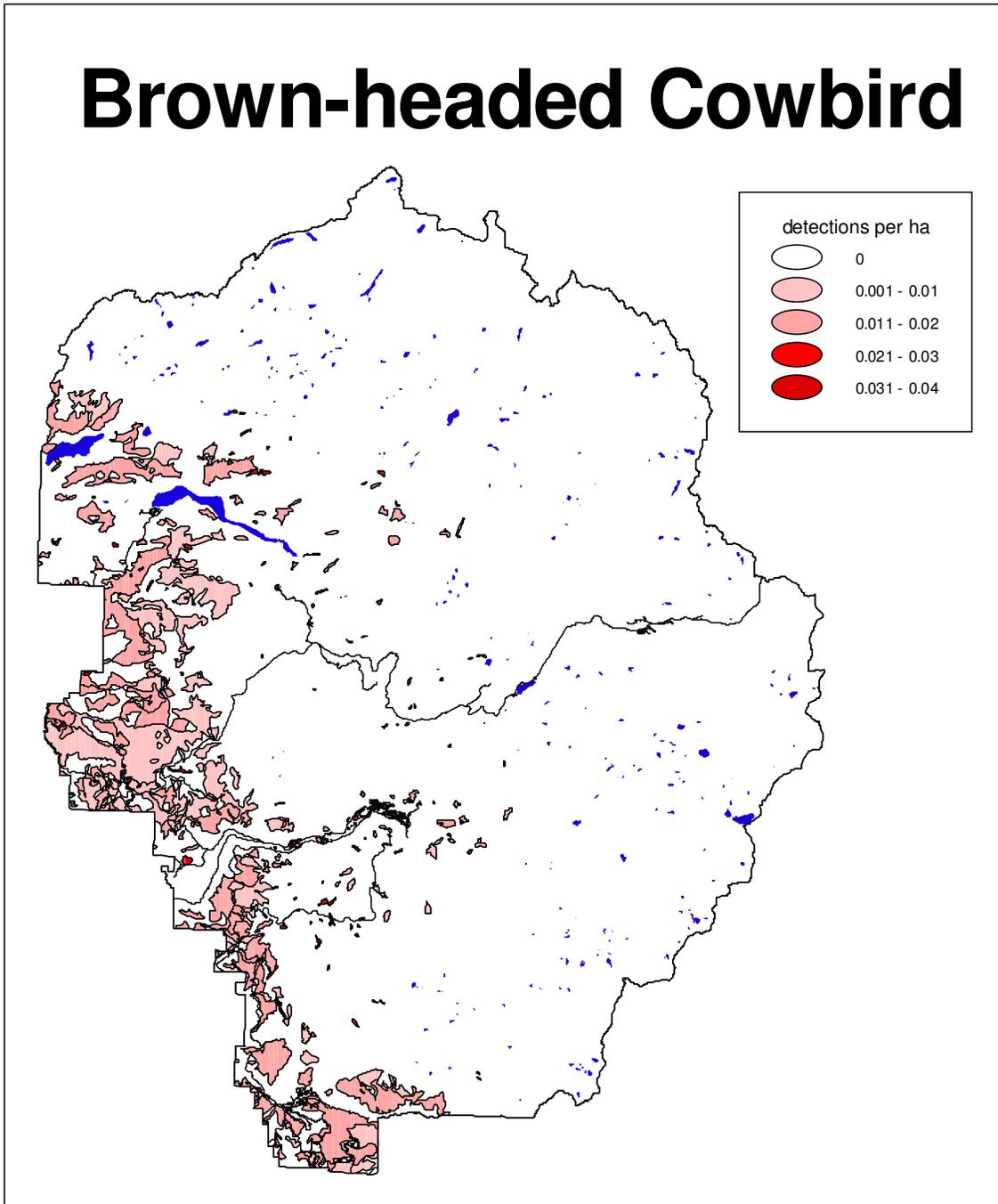


Figure 119. Brown-headed Cowbird distribution and relative abundance in the park.

Gray-crowned Rosy-Finch

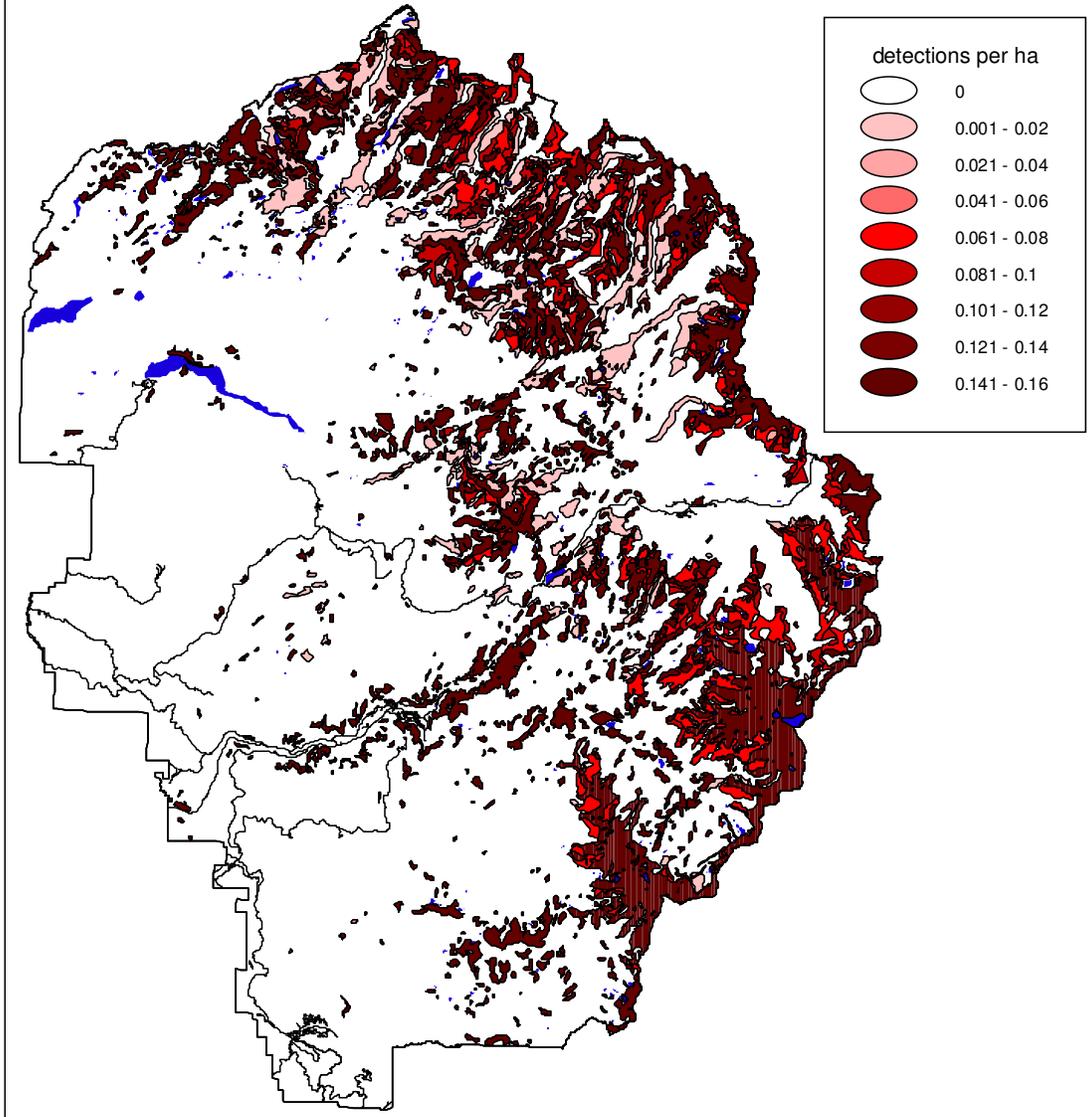


Figure 120. Gray-crowned Rosy-Finch distribution and relative abundance in the park.

Pine Grosbeak

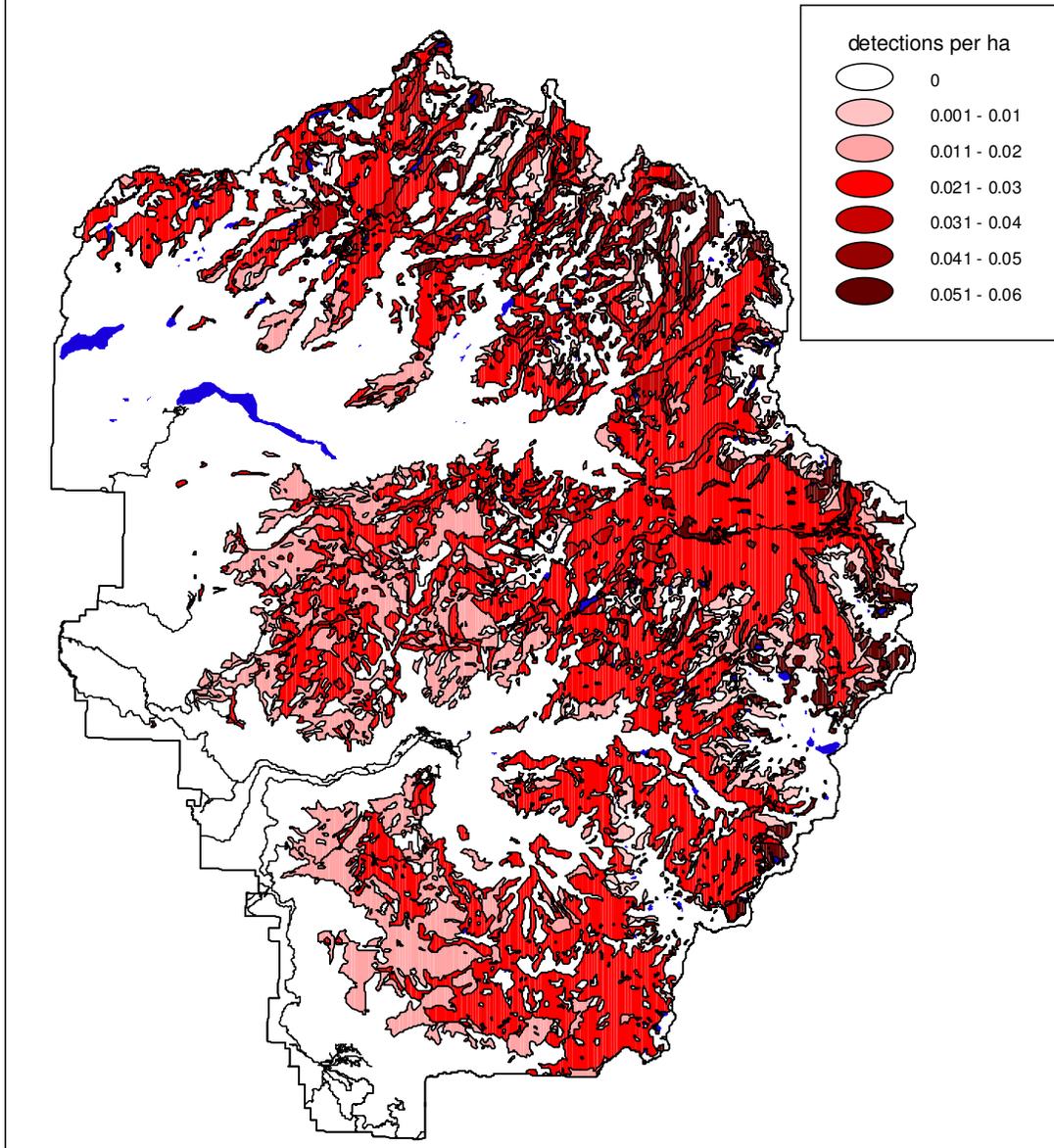


Figure 121. Pine Grosbeak distribution and relative abundance in the park.

Purple Finch

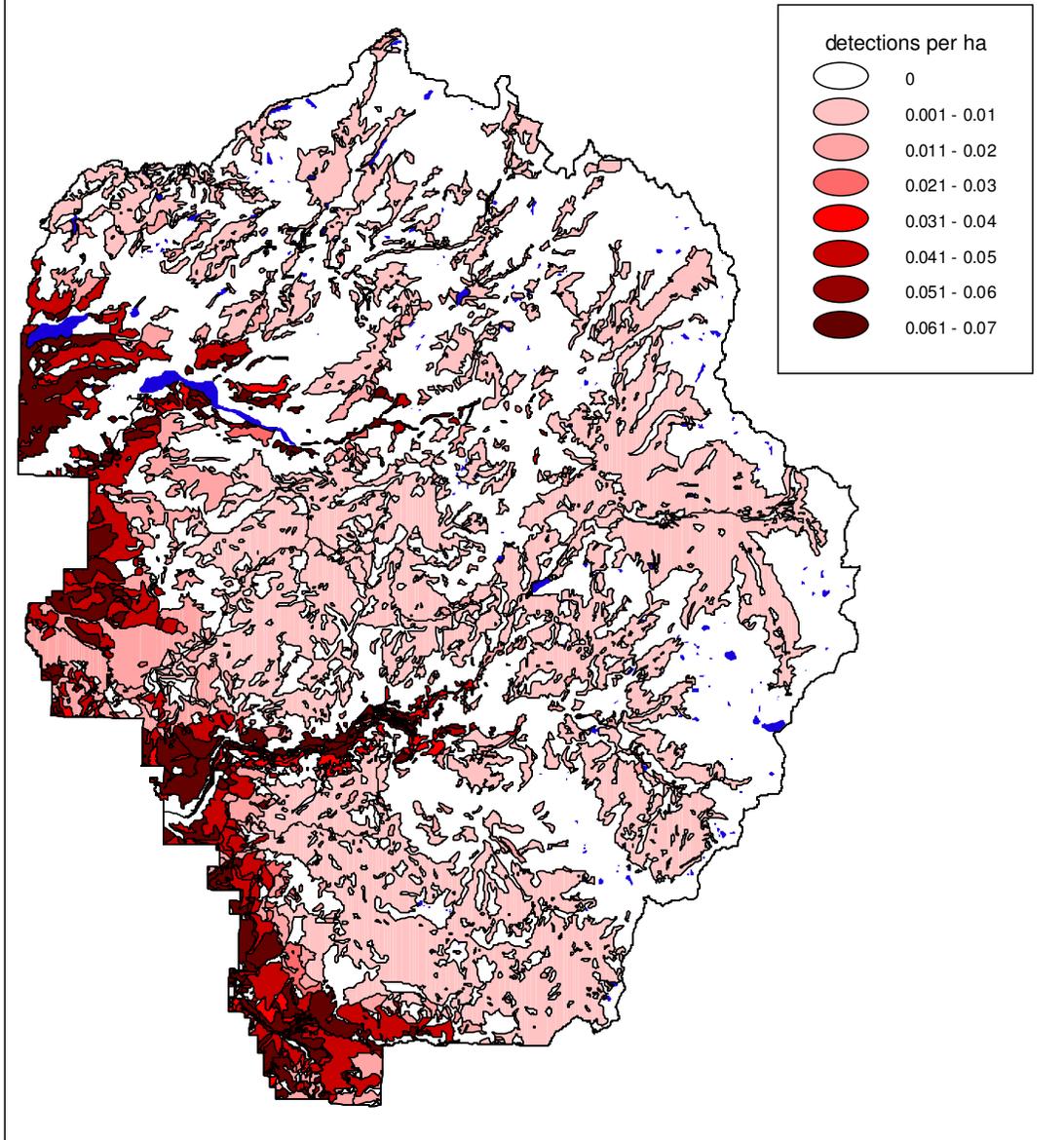


Figure 122. Purple Finch distribution and relative abundance in the park.

Cassin's Finch

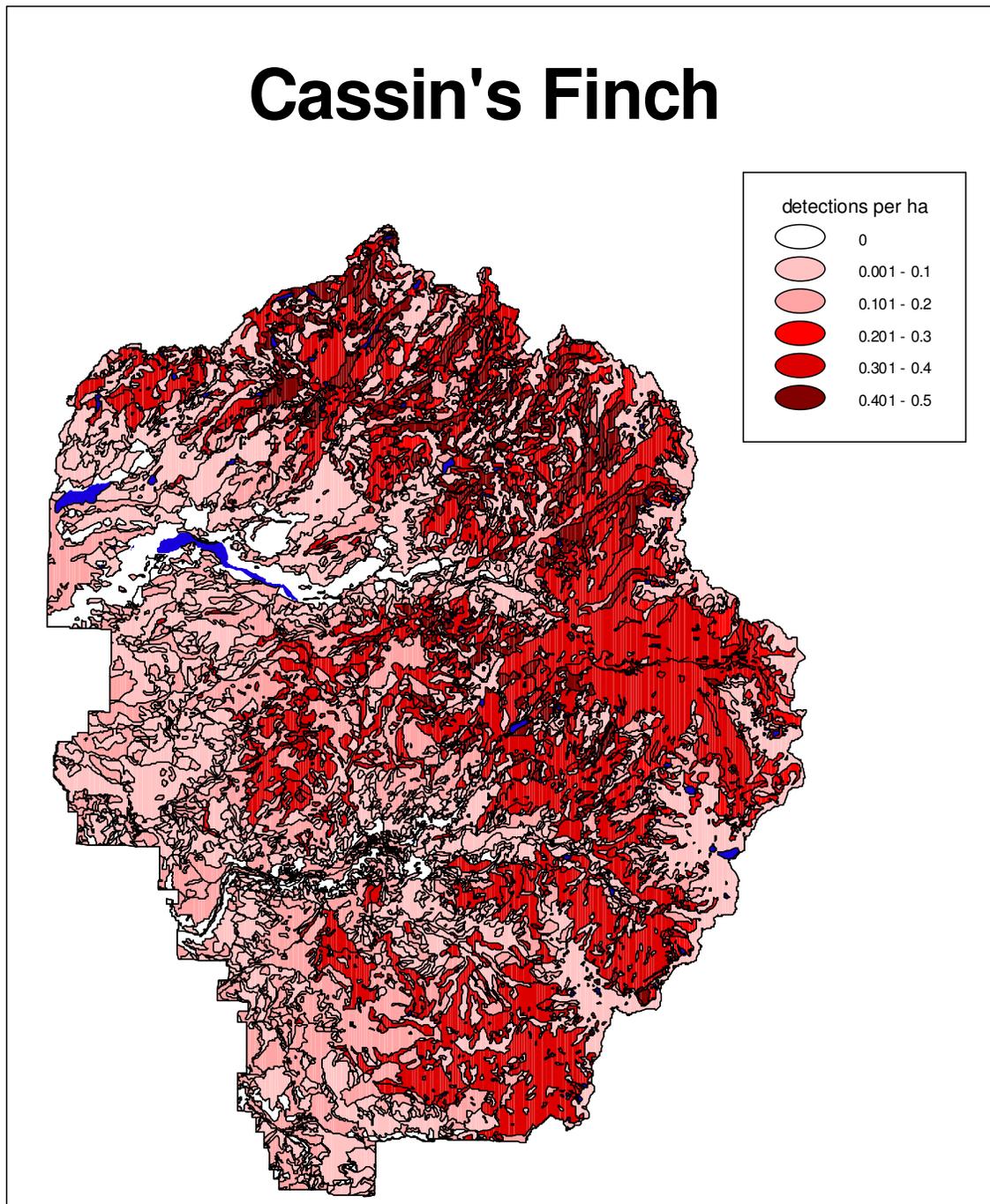


Figure 123. Cassin's Finch distribution and relative abundance in the park.

Red Crossbill

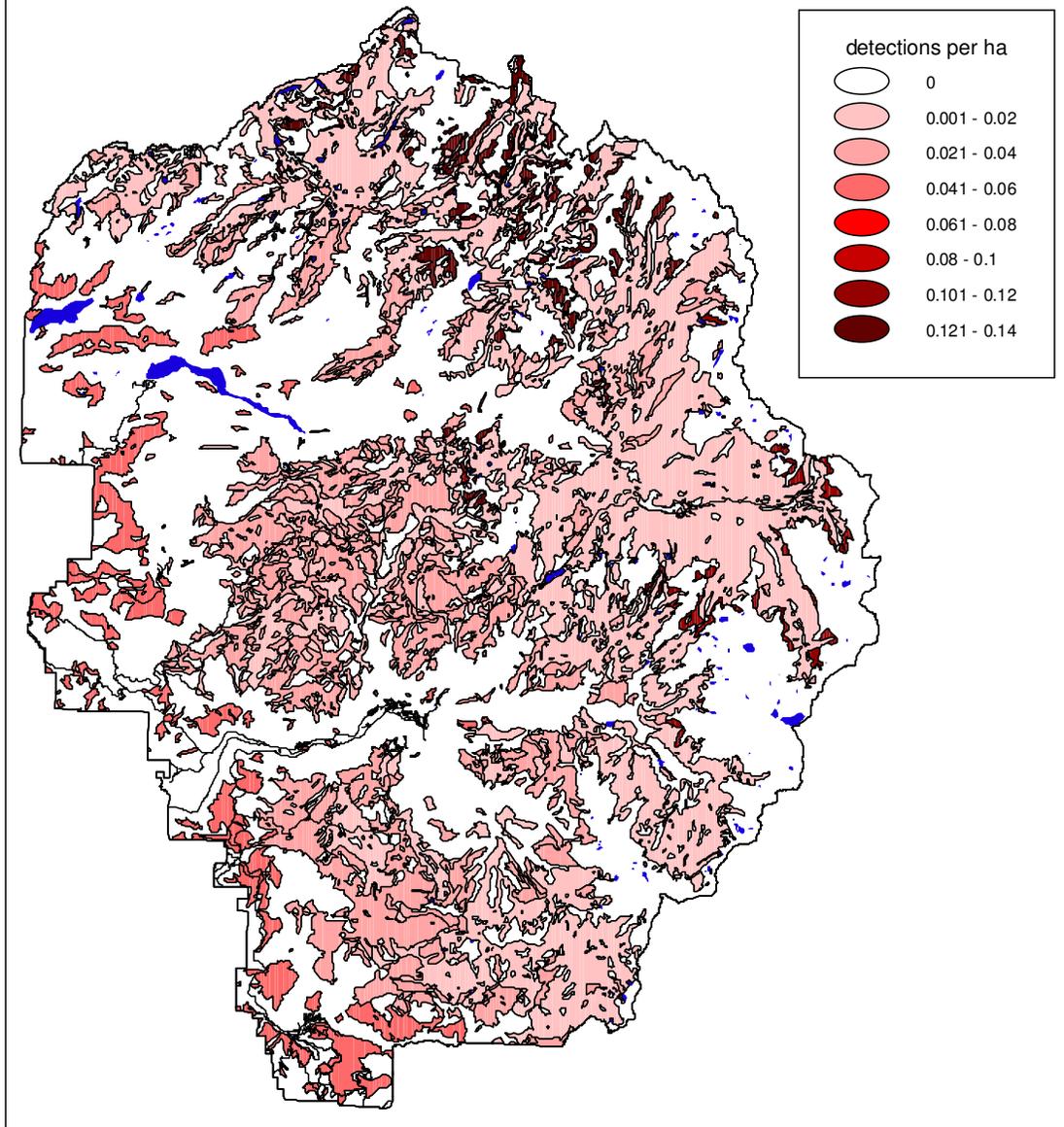


Figure 124. Red Crossbill distribution and relative abundance in the park.

Pine Siskin

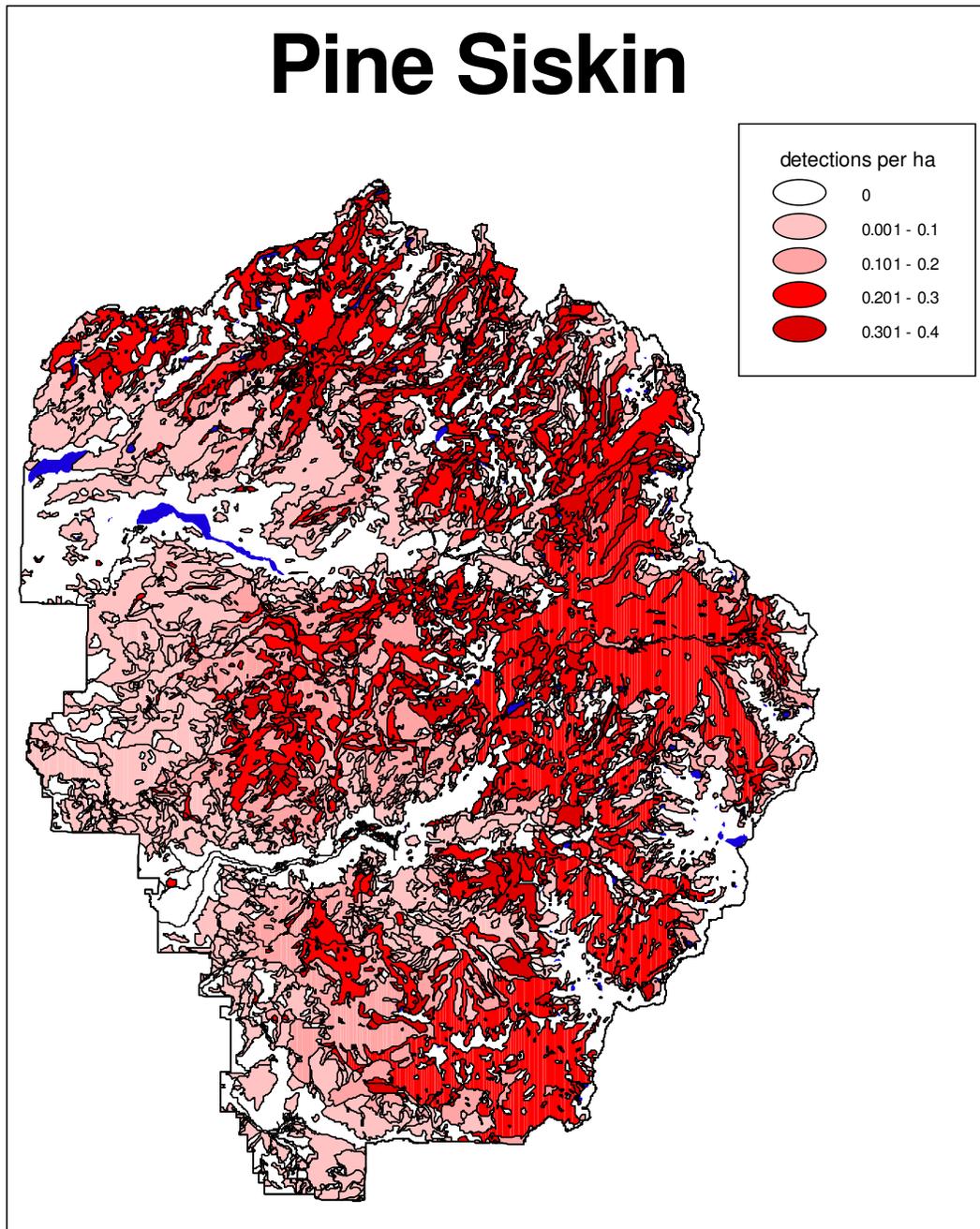


Figure 125. Pine Siskin distribution and relative abundance in the park.

Species Richness

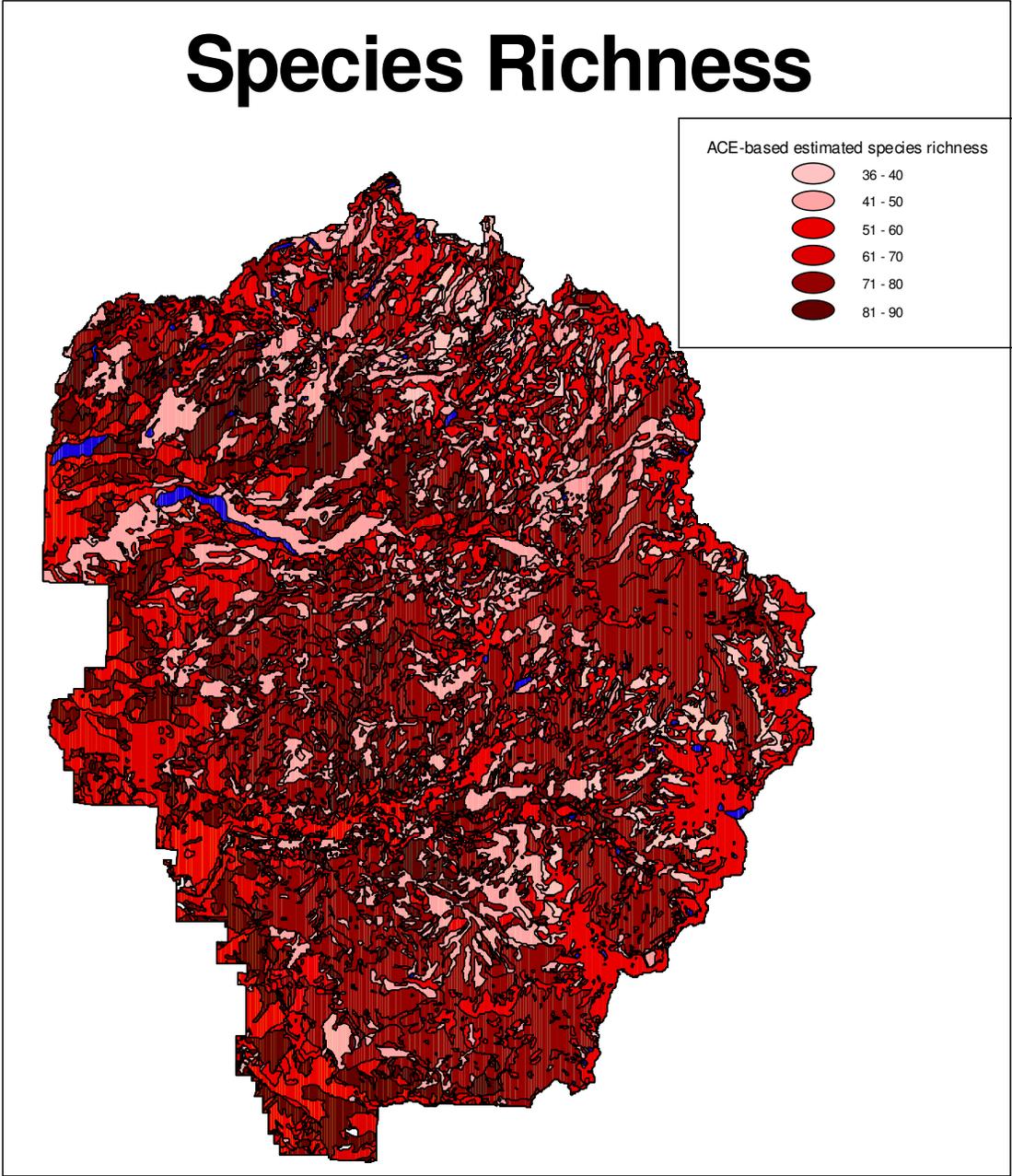


Figure 130. Estimated species richness across the park.

Lesser Goldfinch

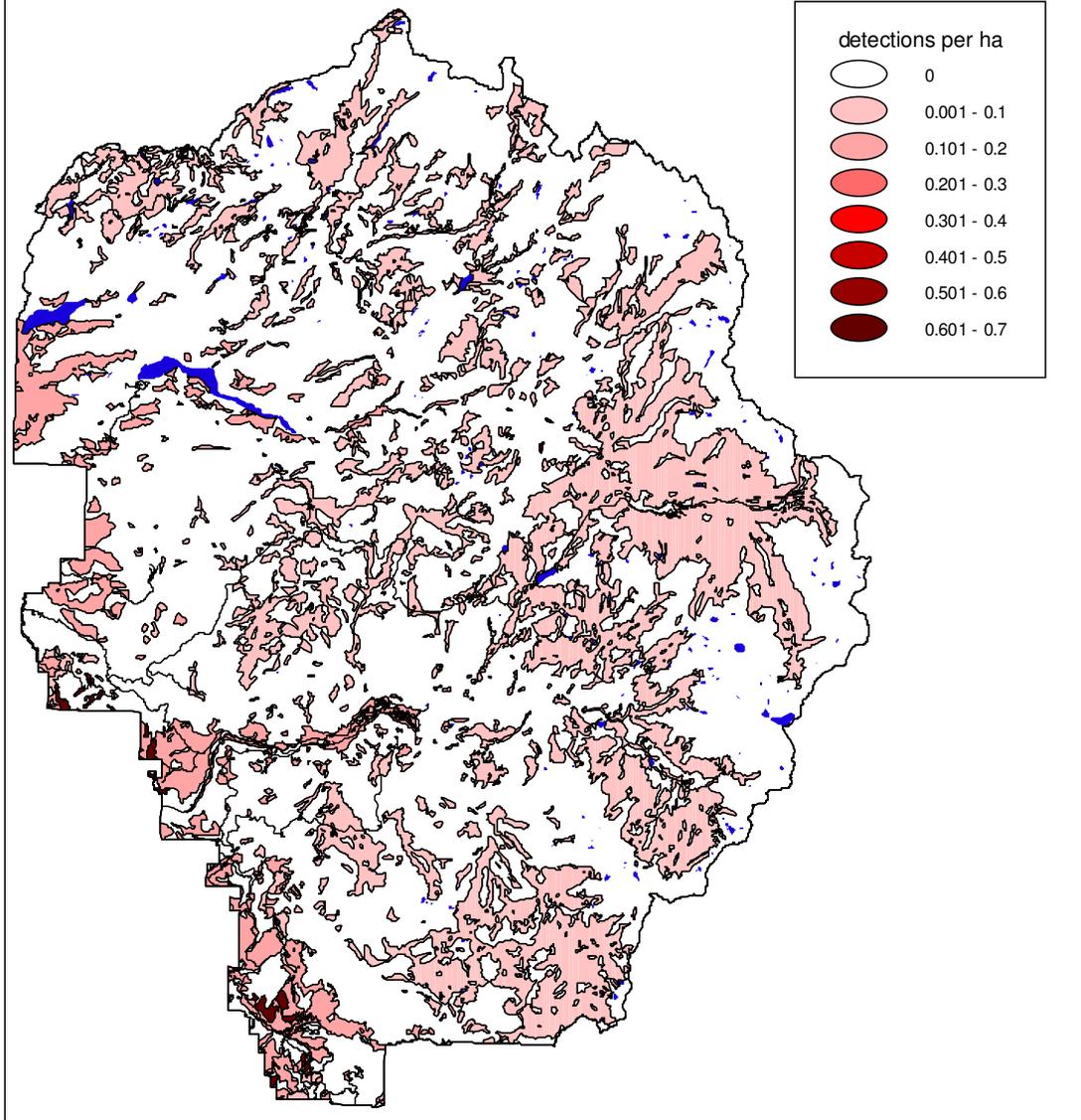


Figure 126. Lesser Goldfinch distribution and relative abundance in the park.

Evening Grosbeak

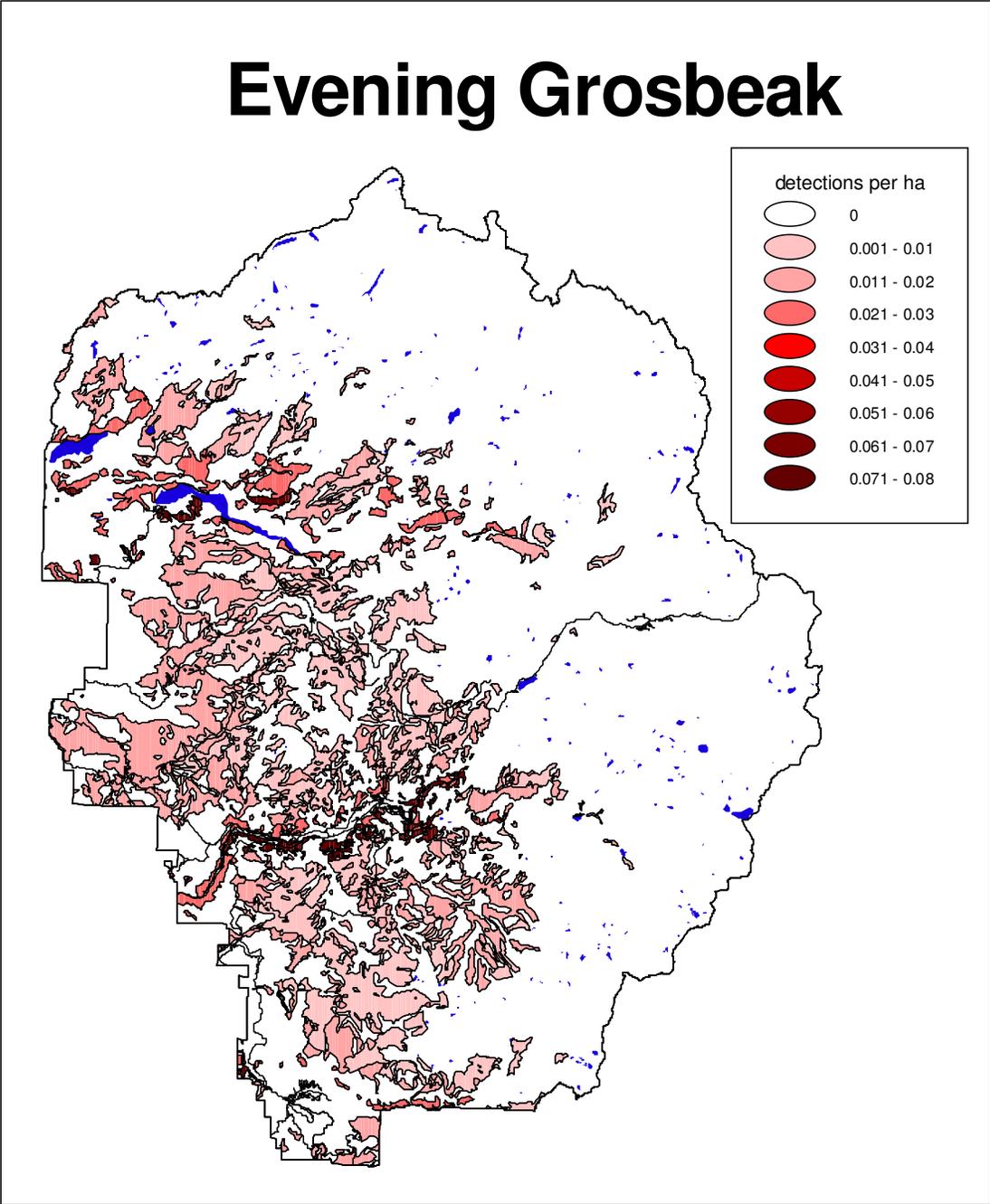


Figure 127. Evening Grosbeak distribution and relative abundance in the park.

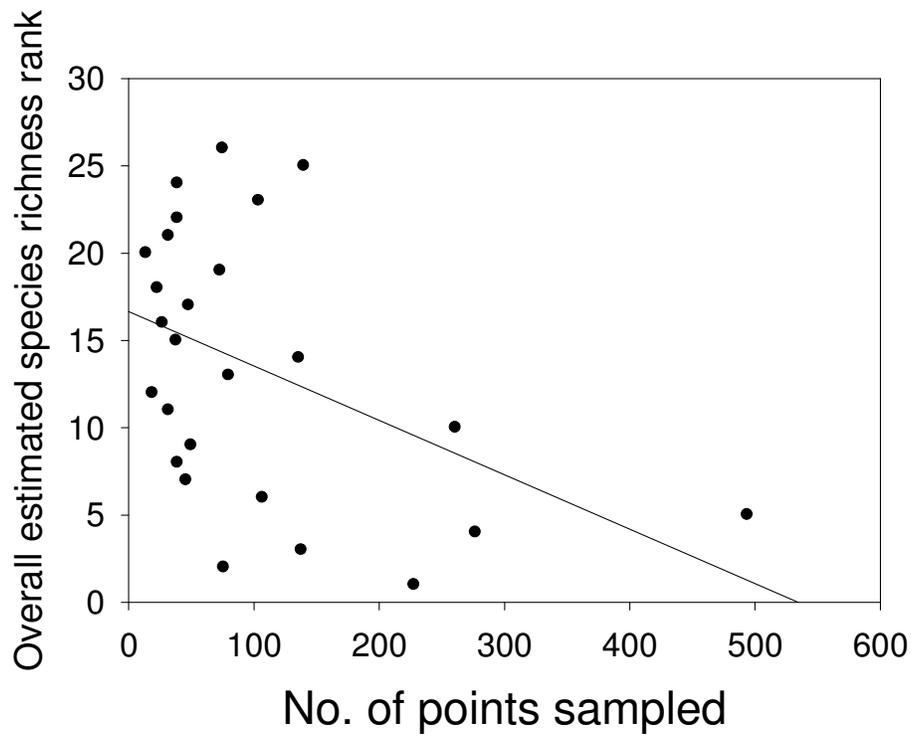


Figure 128. Relationship between number of points sampled and ‘overall’ species richness rank (see Table 33).

Species Richness

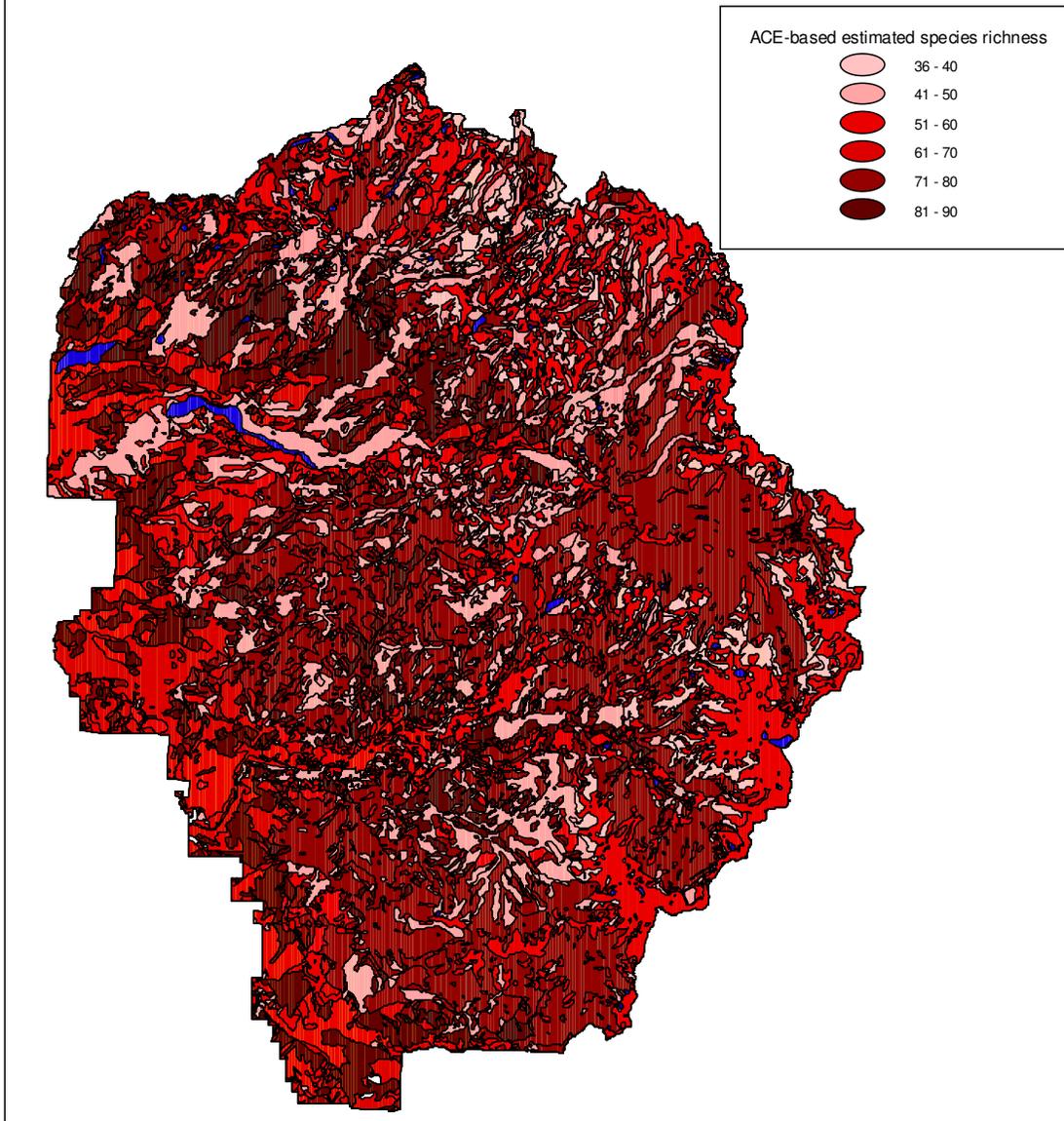


Figure 130. Estimated species richness across the park.