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 ares, 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;
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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 Wagtendonk 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 transact 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 that 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 al. 1998), ICE (Incidence-based Coverage Estimator; Lee and Chao 1994; Chazdon et al 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 thee 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 affects 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 prababilities 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 discuss 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, then 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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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**

[a]Totals do not include flyovers (see text for definition).
[b]Calculation based on 50-m radius detections only.
[c]Includes 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.

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
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
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

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	--	--

[a]Averages 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	--	--

[a]Averages 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	--	--	--

[a]Averages 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	--

[a]Averages 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

[a]Averages 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	--	--

[a]Averages 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	--	--	--	--	--	--	--	--	--

[a]Averages 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

[a]Habitats 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

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

[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

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

[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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 *Empidonax*	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**

[1]All detected species are presented, including flyovers (see text for definition).
[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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**

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

[2]Flyovers are excluded from totals. Values of zero indicate species that were detected only as flyovers.
[3]Flyovers and individuals estimated to be greater than 50 m from the observer are excluded.
[4]Based 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

[a]Habitats with fewer than fourteen sampling points (Interior Live Oak, White Alder, and Giant Sequoia) have been omitted.
[b]Excludes 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	*t*-ratio	*p*
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
Ceanothus 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
Ceanothus 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
Ceanothus 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	*t*-ratio	*p*
Fox Sparrow	-2.05			
Understory cover	0.03	1.03	2.63	0.009
Dark-eyed Junco	-0.33			
Ceanothus 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	*t*-ratio	**P**
Dusky Flycatcher	-0.88			
Ceanothus 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			
Ceanothus 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
Ceanothus 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
Ceanothus 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			
Ceanothus 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	*t*-ratio	*p*
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	*t*-ratio	*p*
Mountain Chickadee	-1.80			
Snag density index	0.84	2.31	2.55	0.011
Running water index	-0.53	0.59	-184	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
Ceanothus 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	*t*-ratio	*p*
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			
Ceanothus 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	*t*-ratio	*p*
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	*t*-ratio	*p*
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	*t*-ratio	*p*
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	*t*-ratio	*p*
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

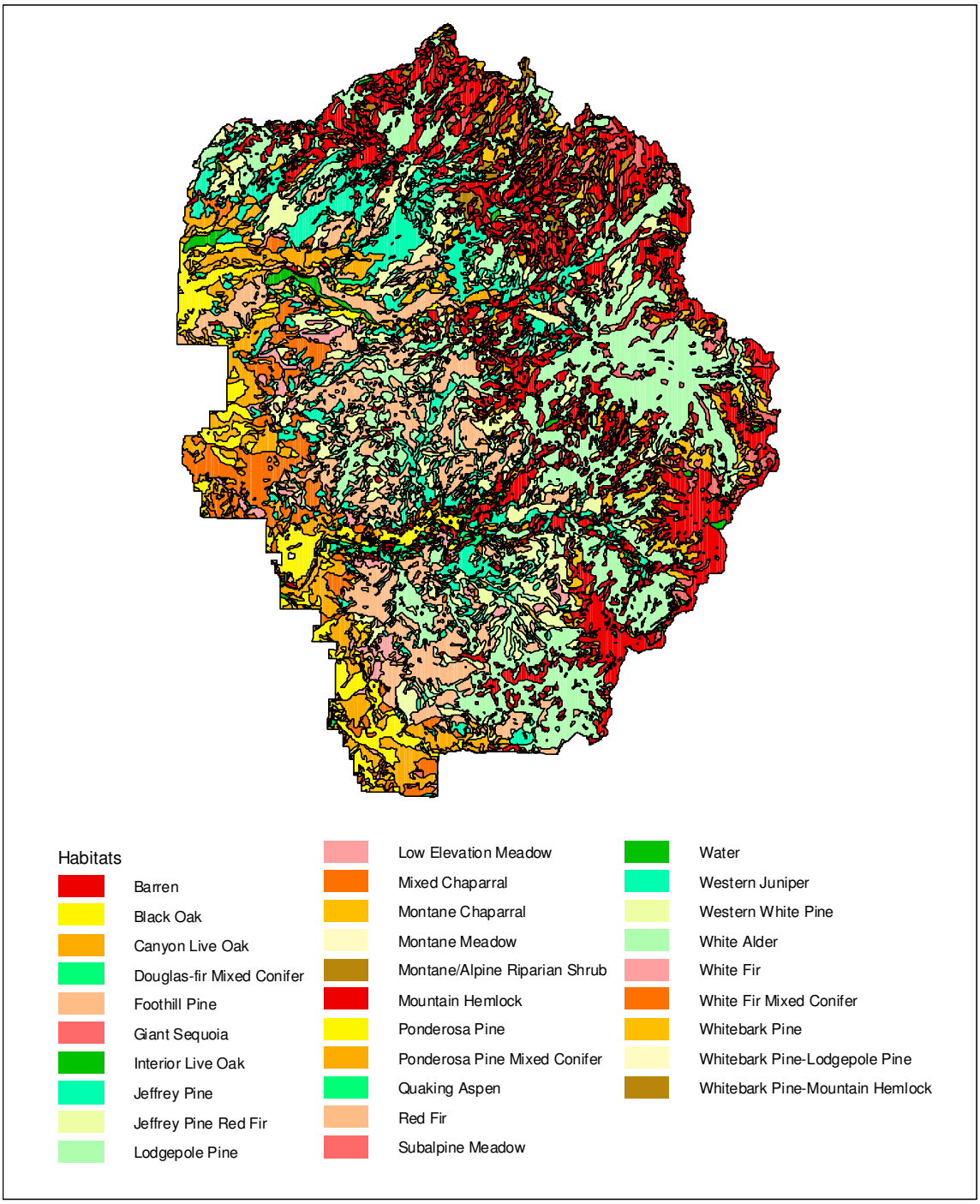

Figure 1. Yosemite habitat classifications system utilized for this project.

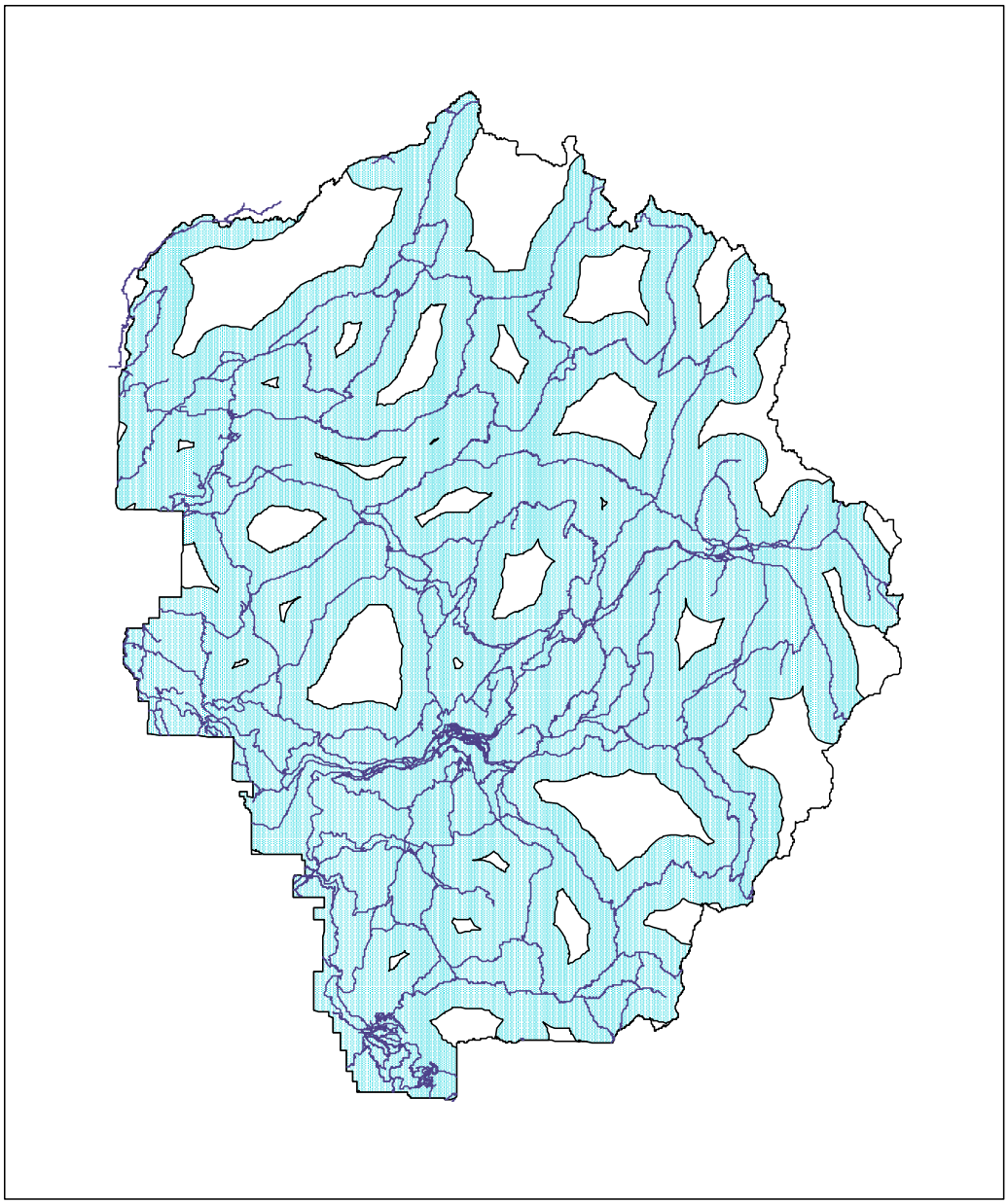

Figure 2. Blue shading indicates areas of the park within 2 km of a road or trail; roads and trails are represented with solid blue lines.

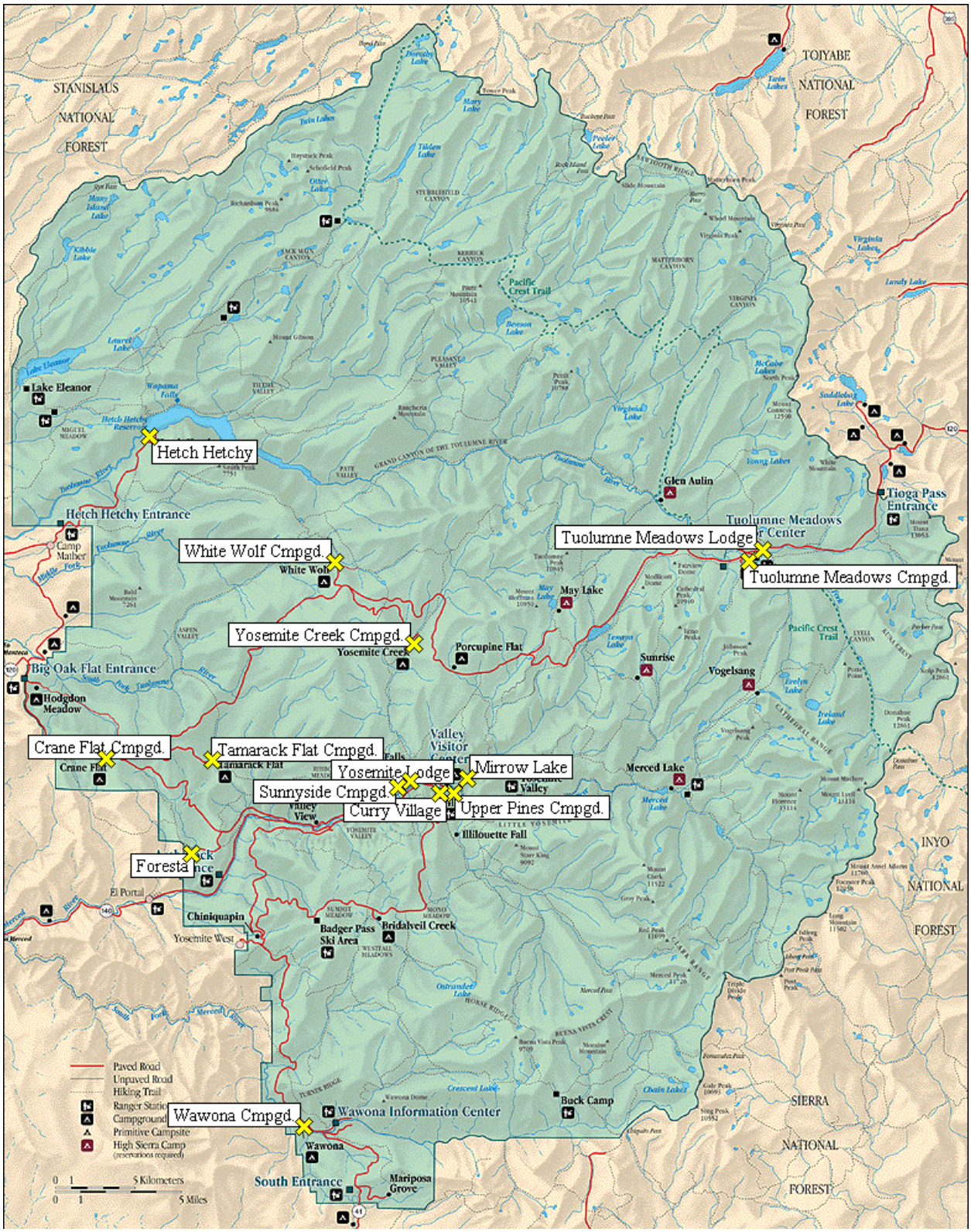

Figure 3. Developed area survey sites.

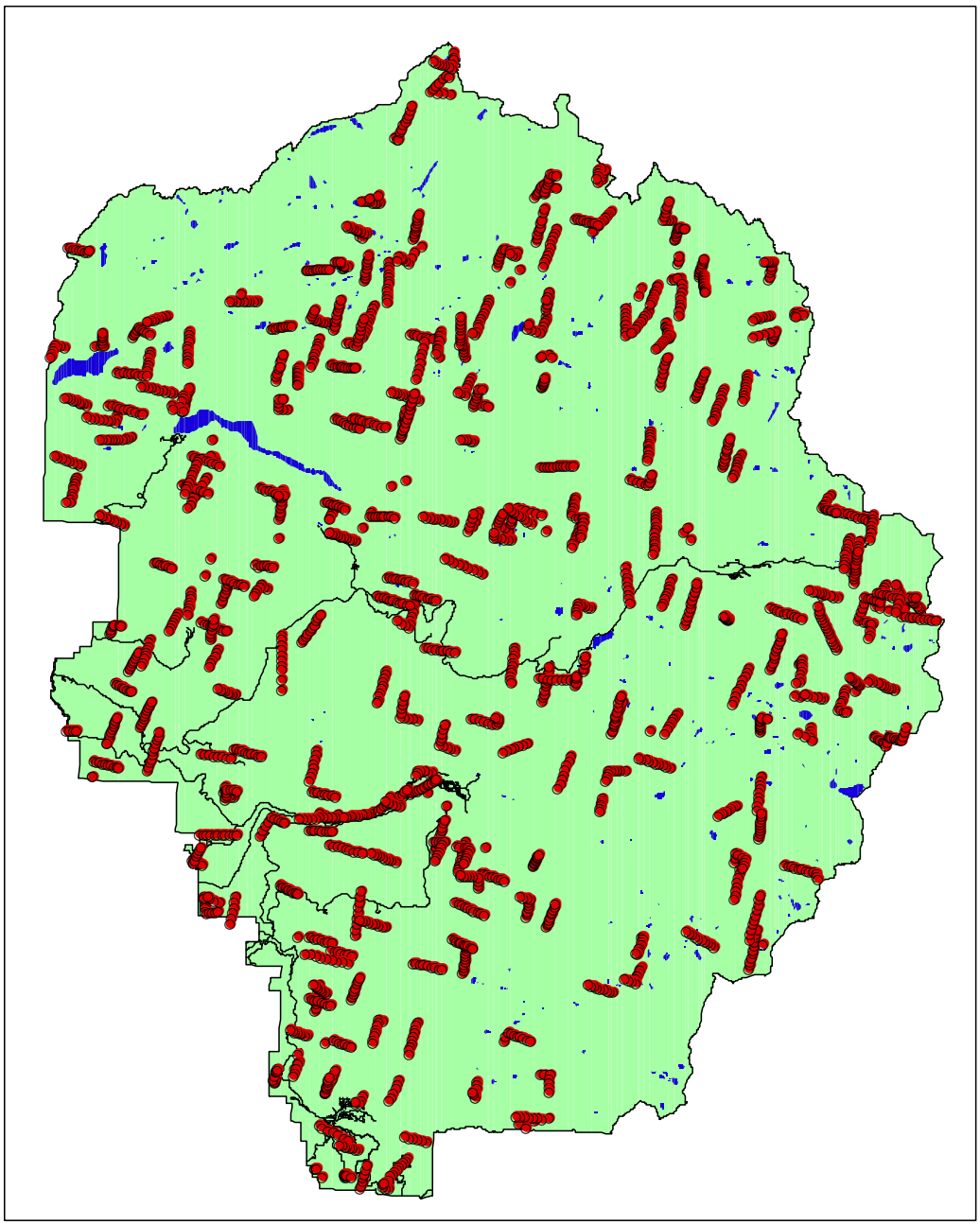

Figure 4. Point count locations throughout the park. Montane meadow point counts, which employed a somewhat different methodology, are not shown.

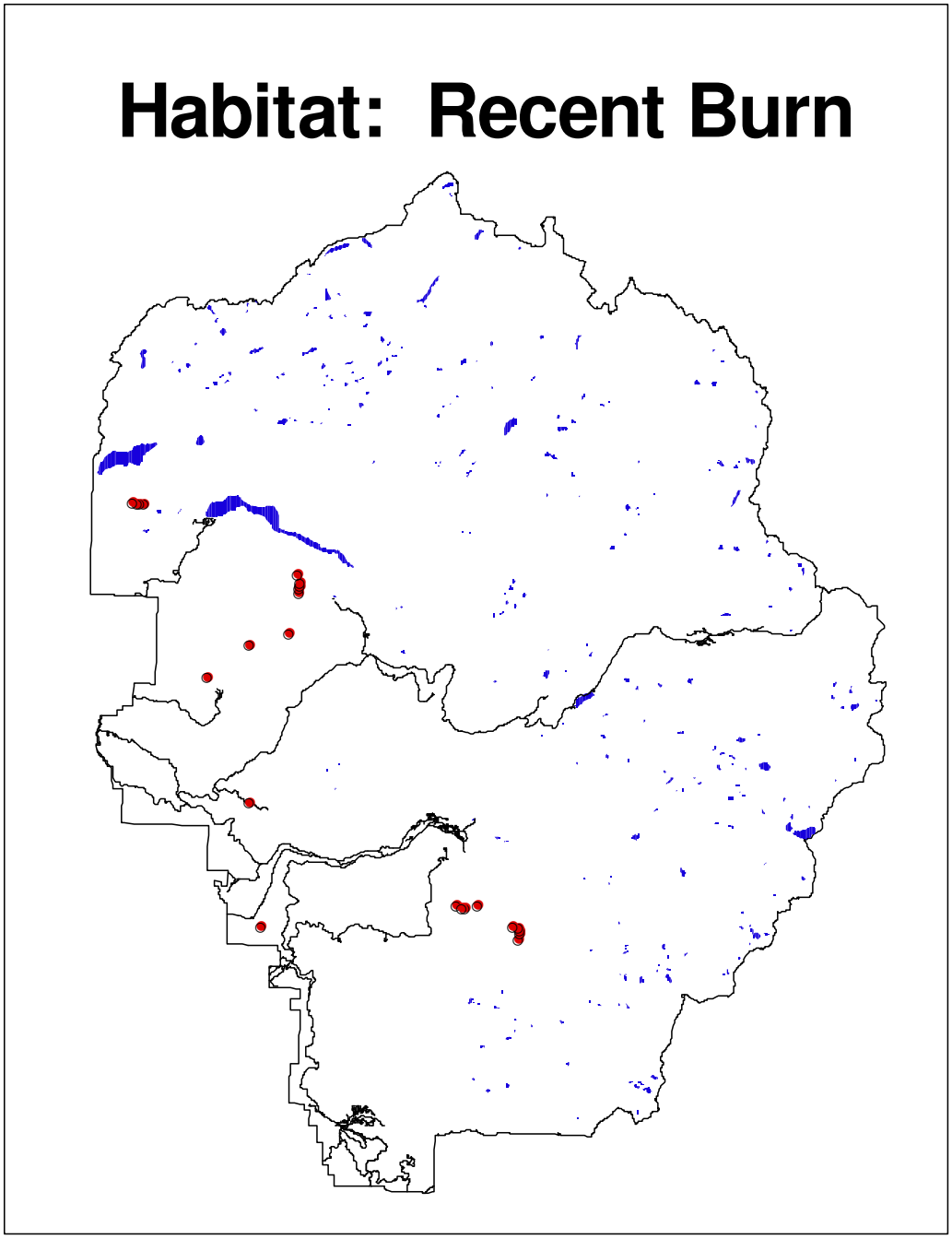

Figure 5. Red circles indicate point count locations at which the observer classified the habit as 'Recent Burn' a category not included in the park's GIS-based habitat map.

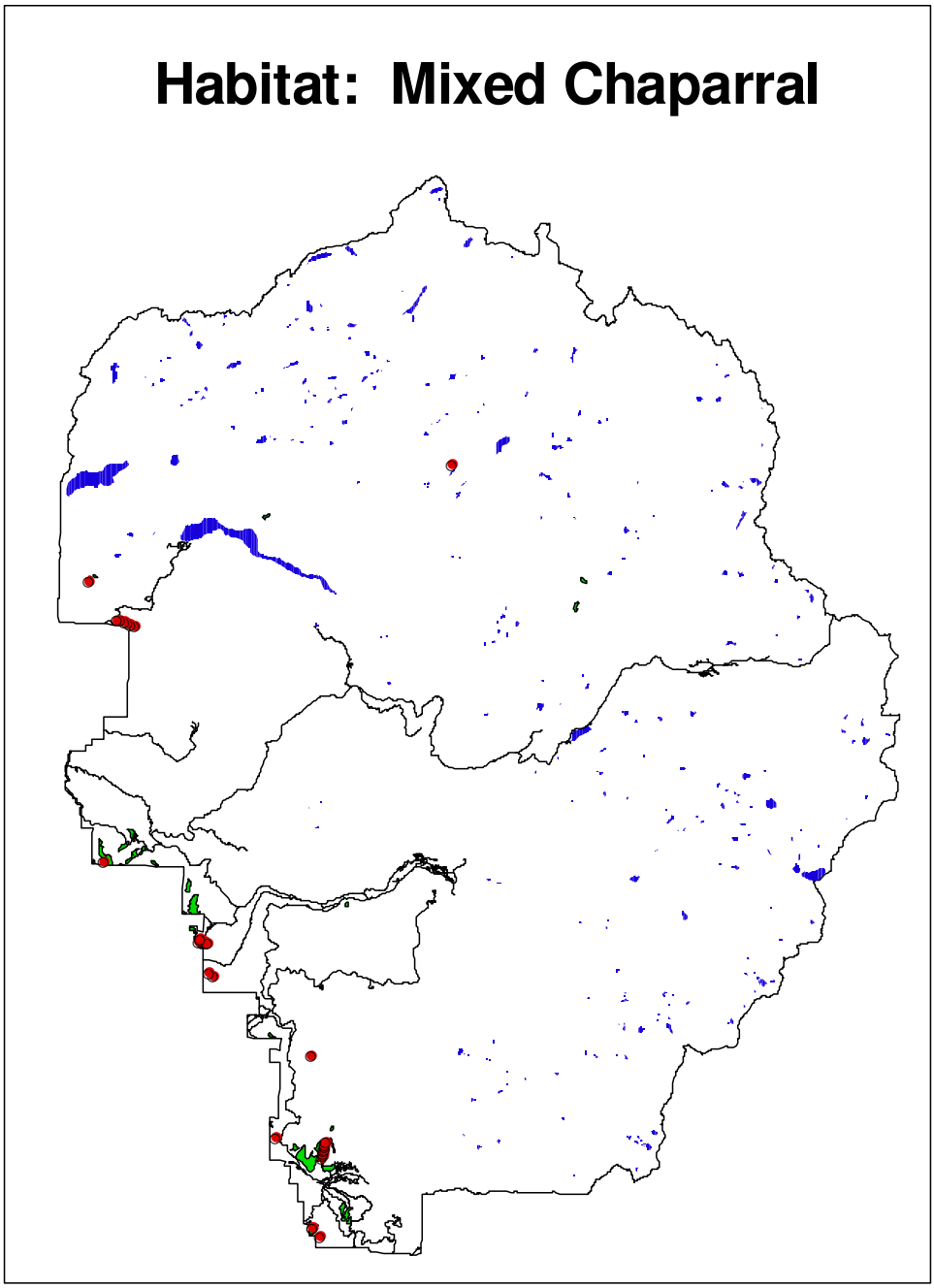

Figure 6. Green shading indicates areas mapped as 'Mixed Chaparral' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Mixed Chaparral'.

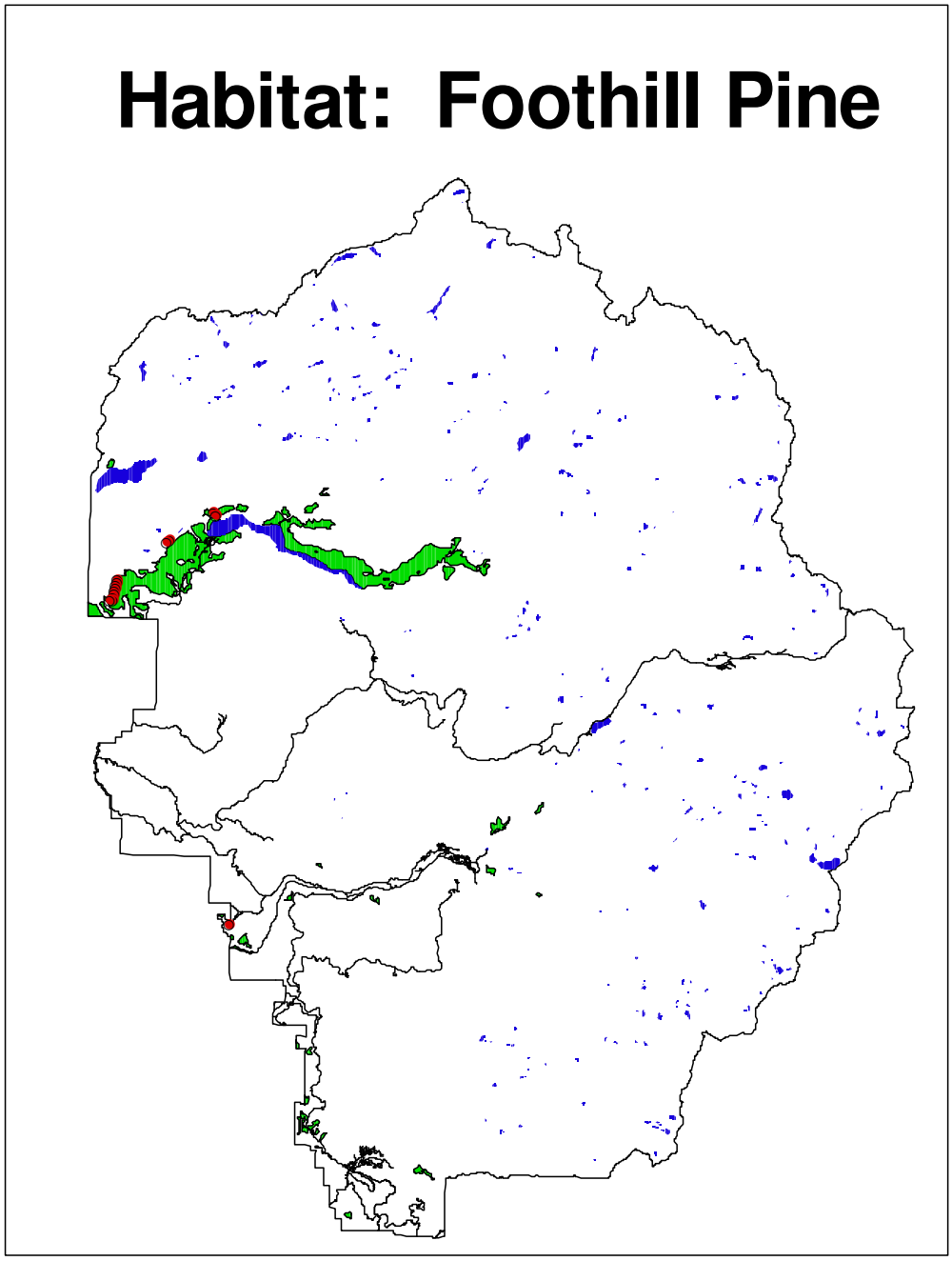

Figure 7. Green shading indicates areas mapped as 'Foothill Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Foothill Pine'.

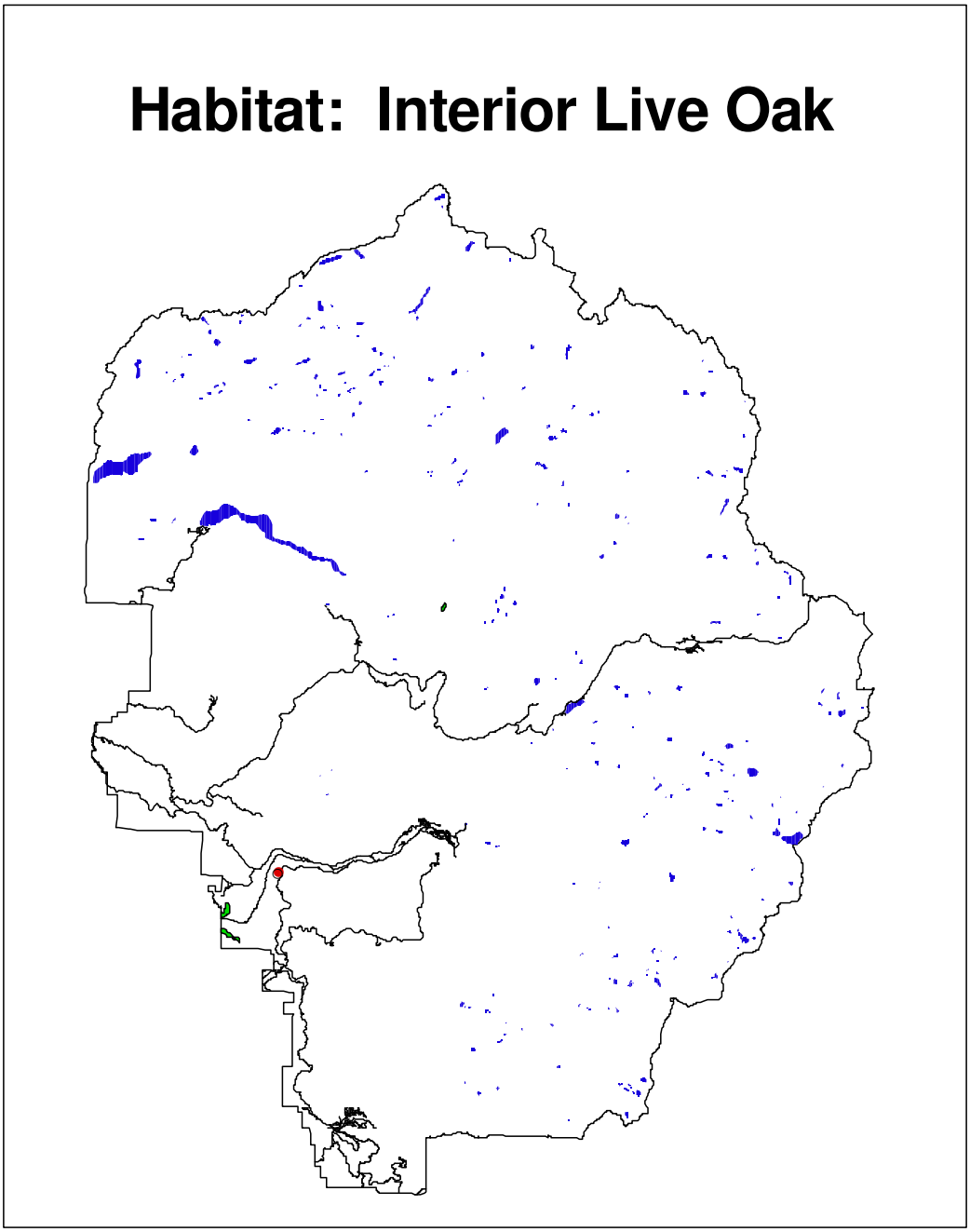

Figure 8. Green shading indicates areas mapped as 'Interior Live Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Interior Live Oak'.

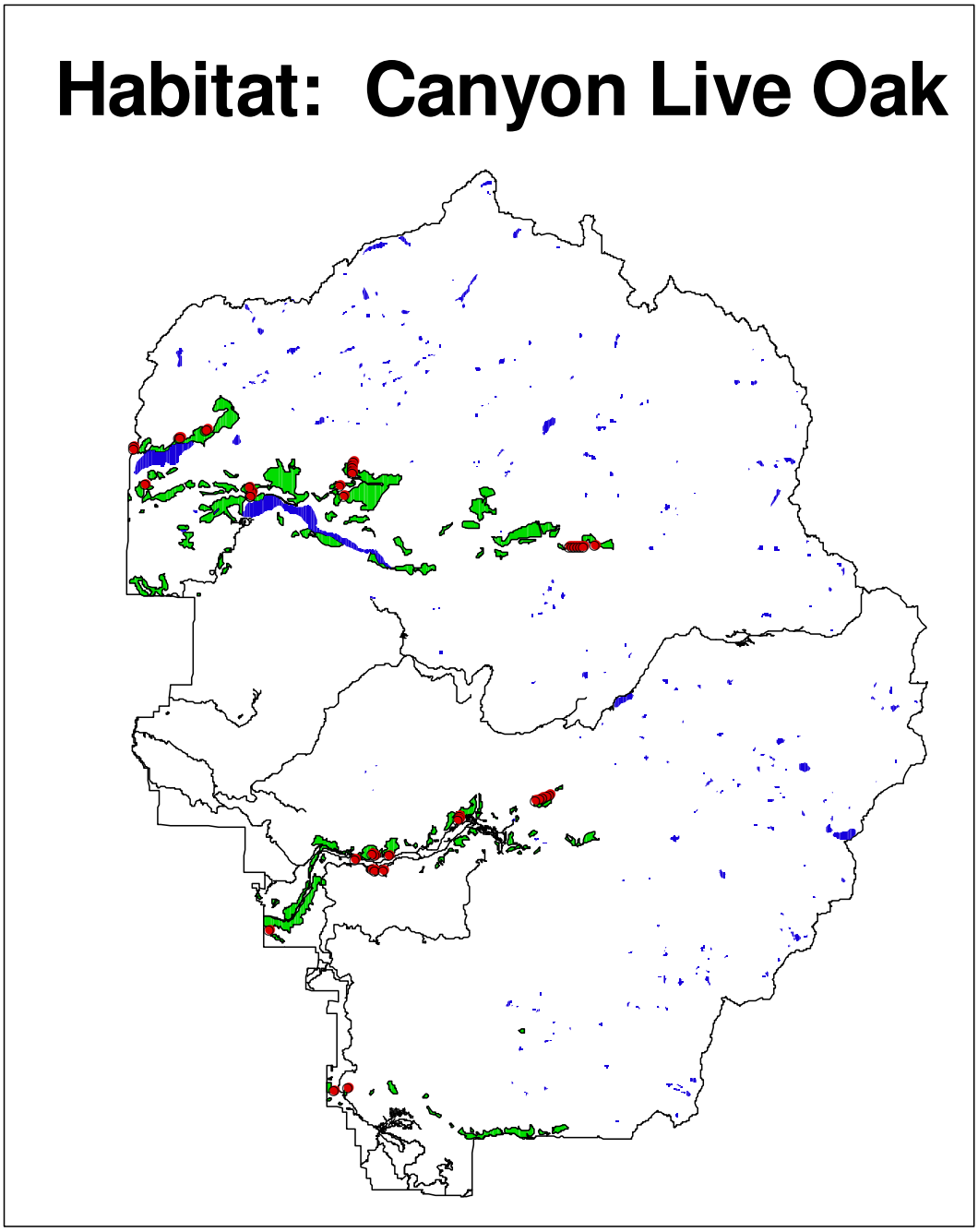

Figure 9. Green shading indicates areas mapped as 'Canyon Live Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Canyon Live Oak'.

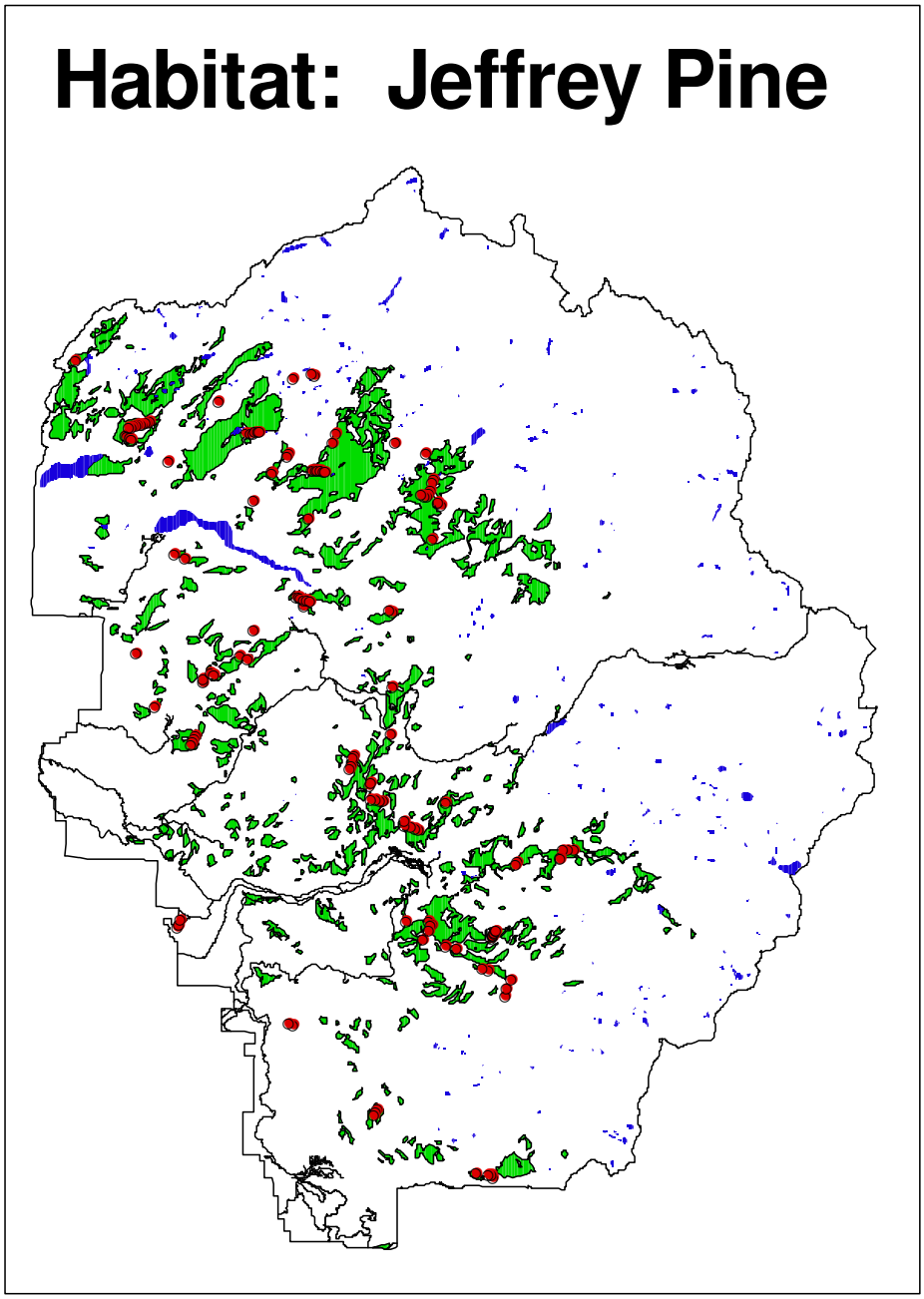

Figure 20. Green shading indicates areas mapped as 'Jeffrey Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine'.

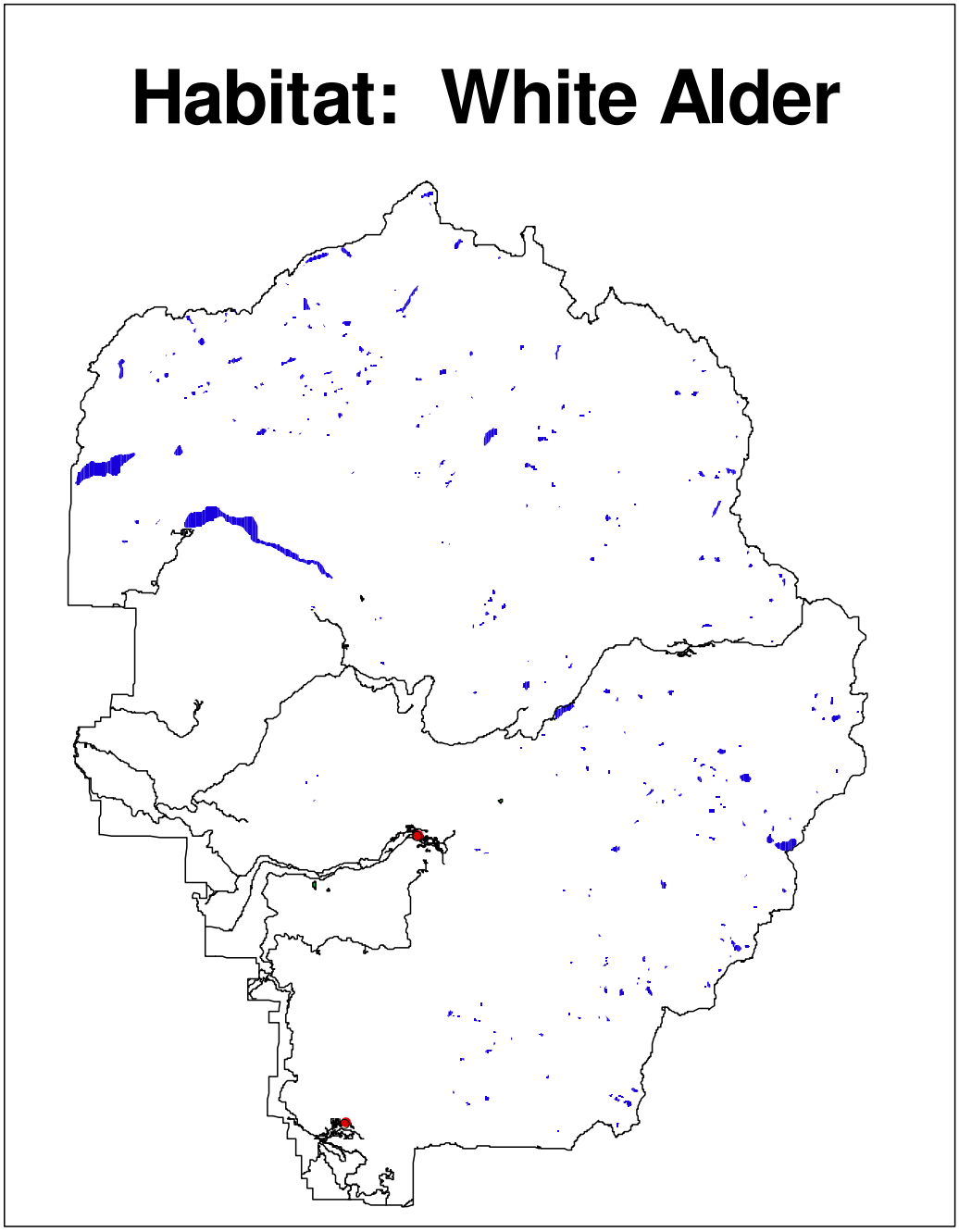

Figure 10. Green shading indicates areas mapped as 'White Alder' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Alder'.

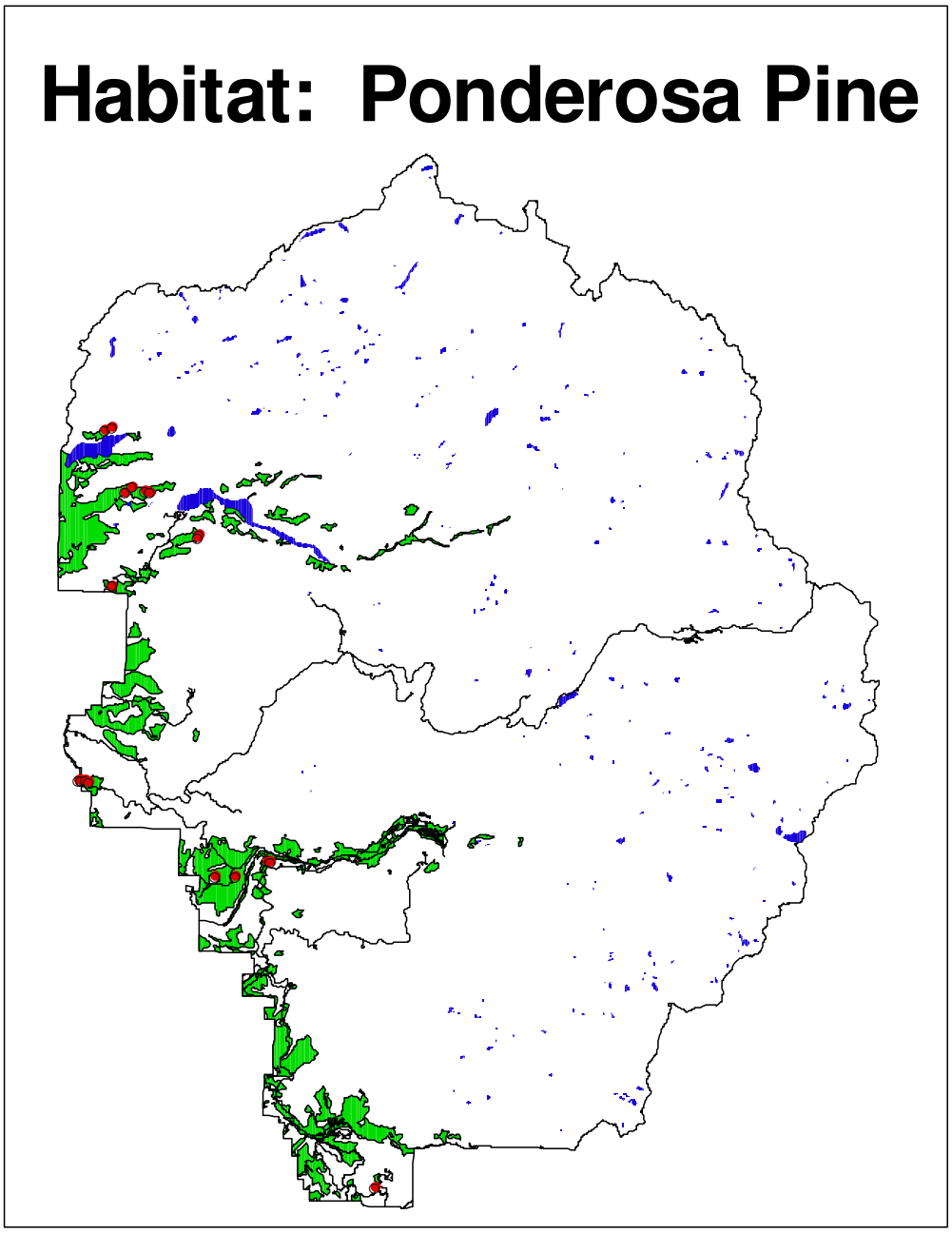

Figure 11. Green shading indicates areas mapped as 'Ponderosa Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Ponderosa Pine'.

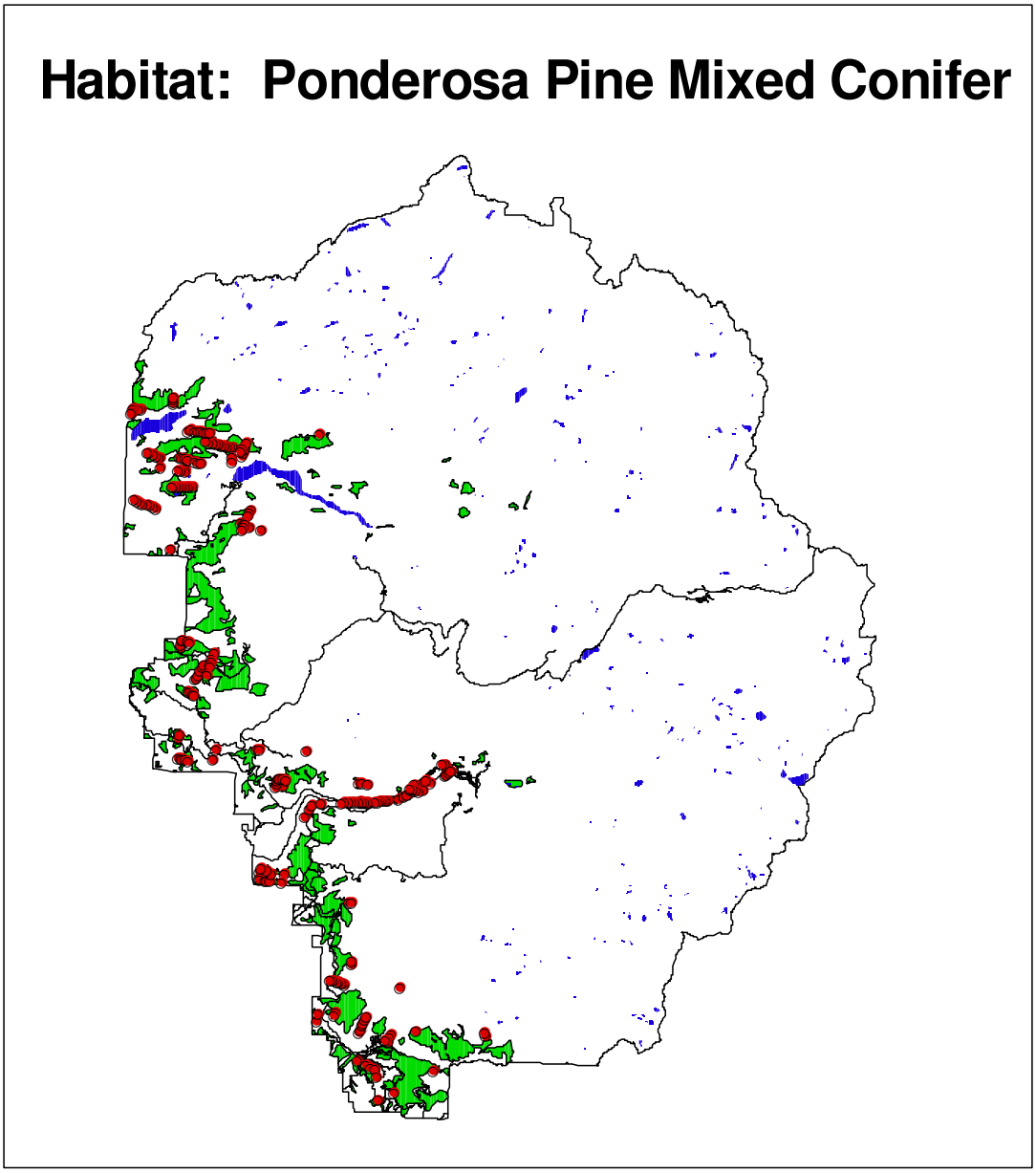

Figure 12. Green shading indicates areas mapped as 'Ponderosa Pine-Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Ponderosa Pine-Mixed Conifer'.

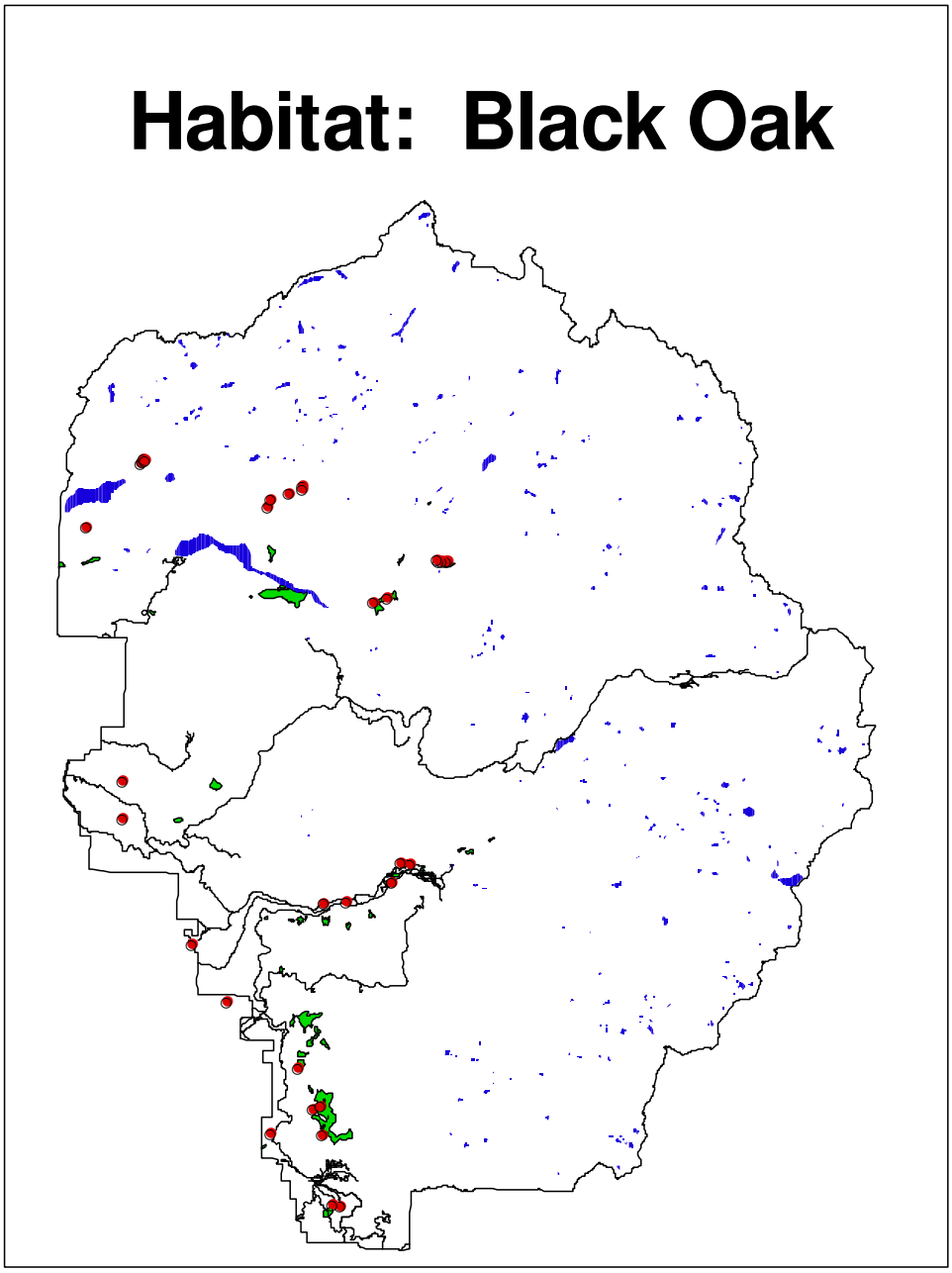

Figure 13. Green shading indicates areas mapped as 'Black Oak' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Black Oak'.

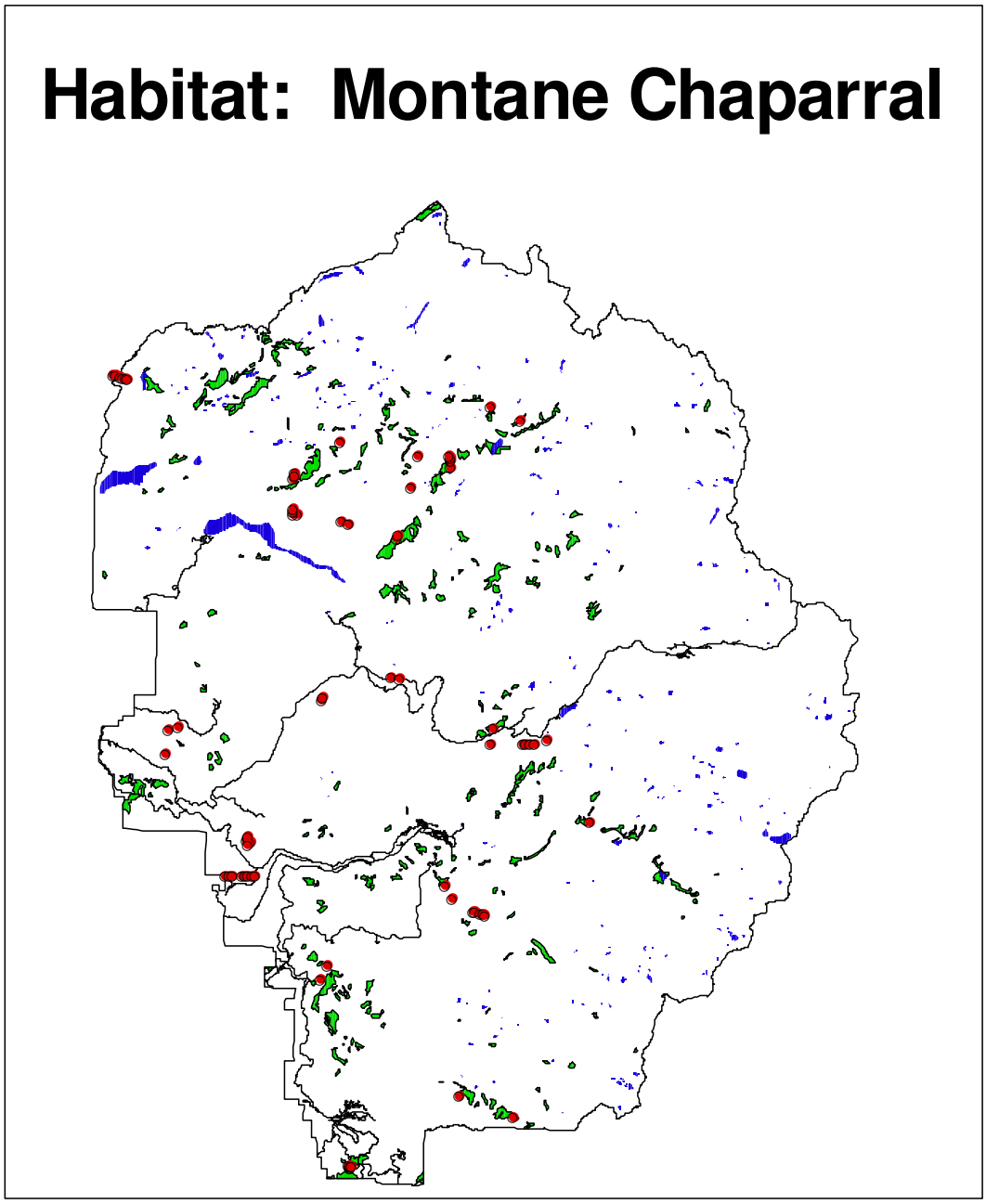

Figure 14. Green shading indicates areas mapped as 'Montane Chaparral' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Montane Chaparral'.

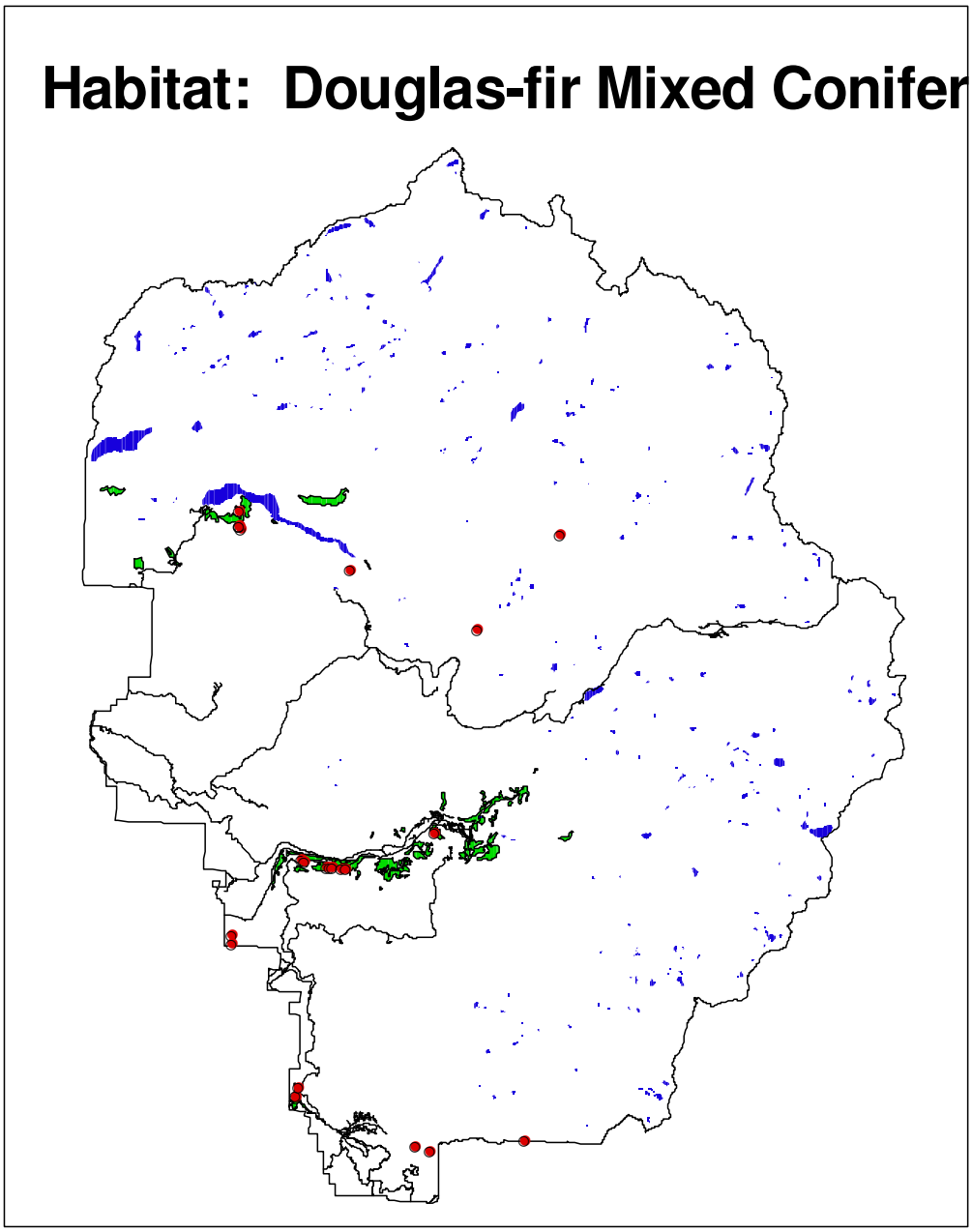

Figure 15. Green shading indicates areas mapped as 'Douglas-fir Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Douglas-fir Mixed Conifer'.

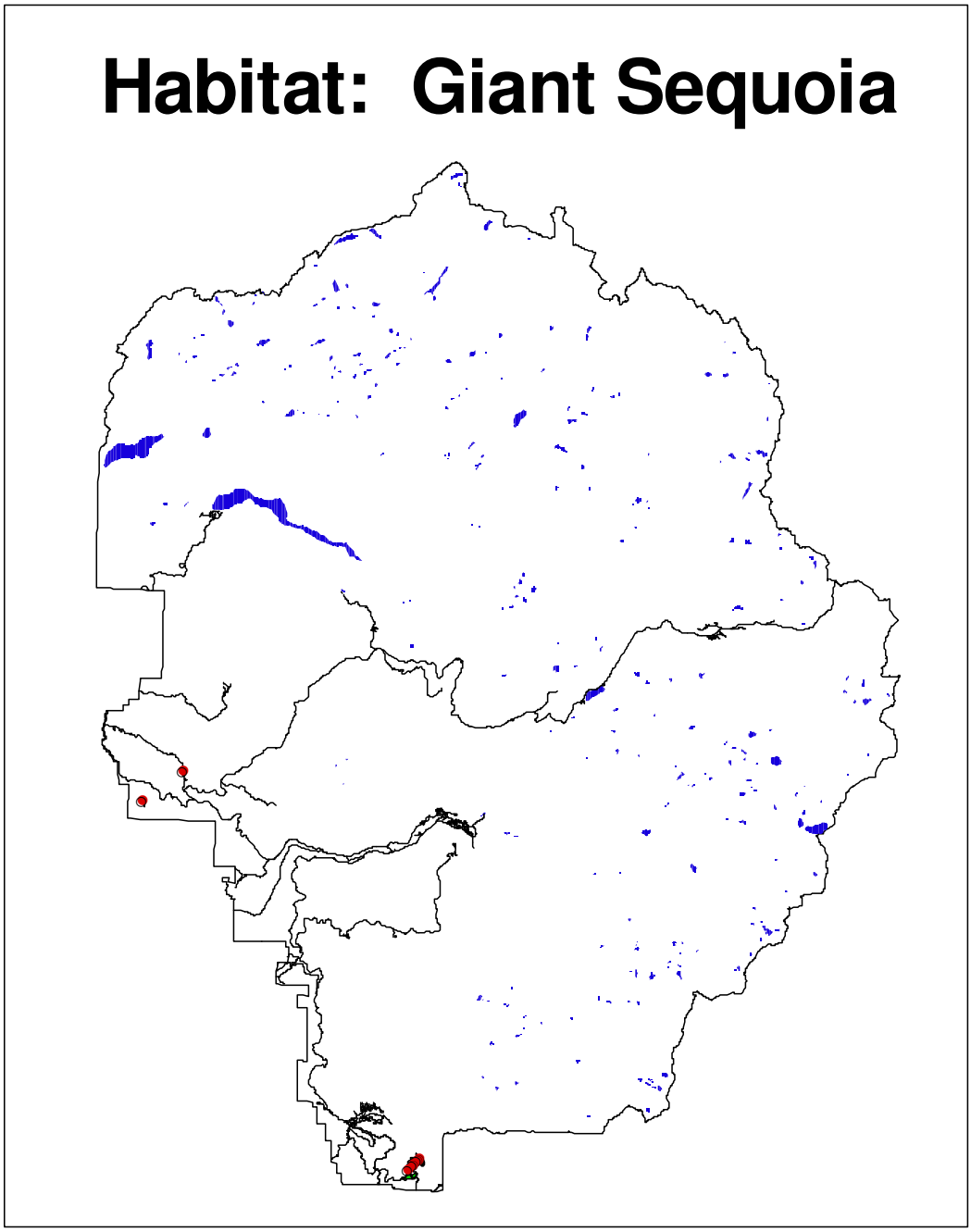

Figure 16. Green shading (largely obscured by red circles) indicates areas mapped as ' Giant Sequoia' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Giant Sequoia'.

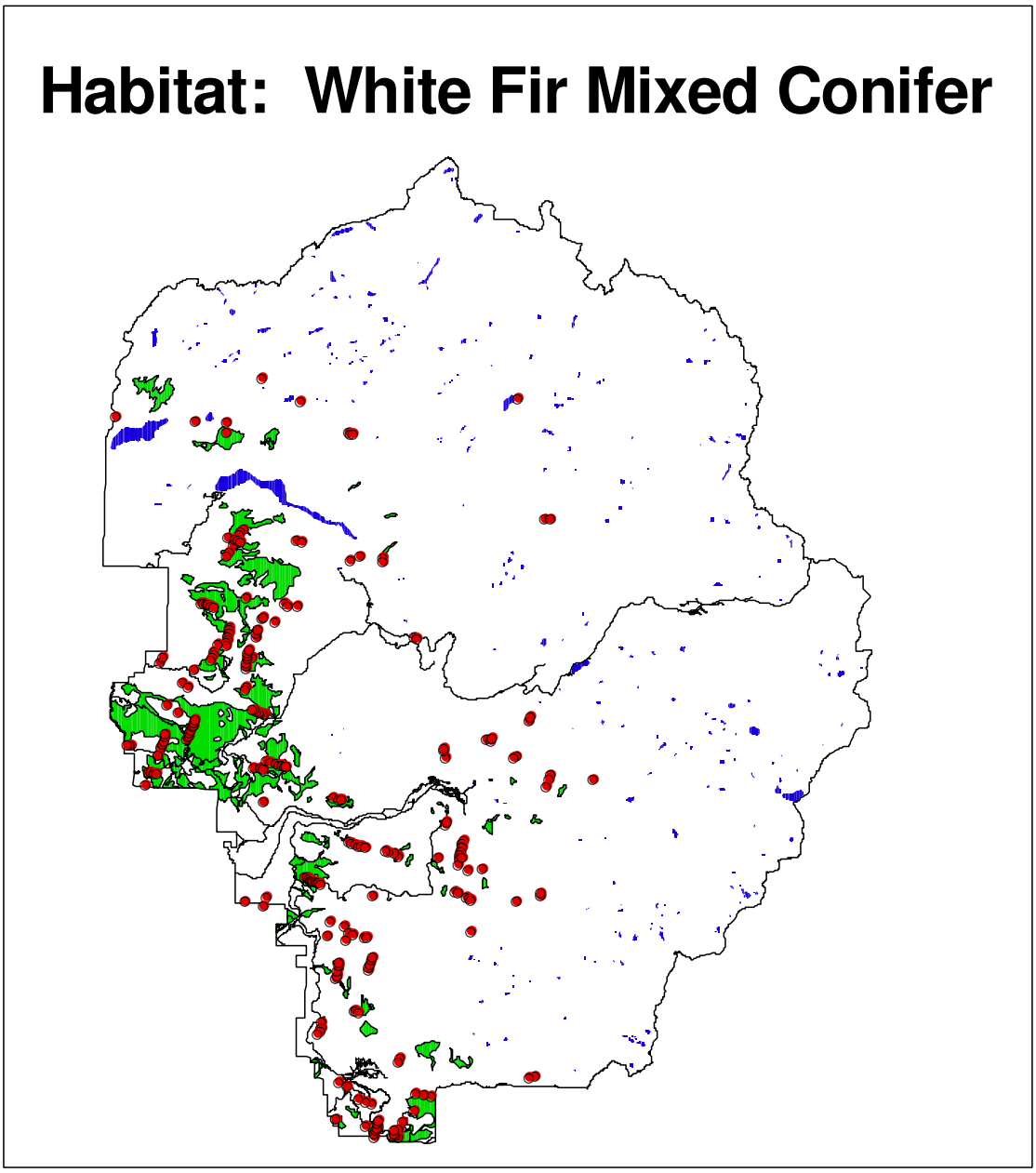

Figure 17. Green shading indicates areas mapped as 'White Fir Mixed Conifer' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Fir Mixed Conifer'.

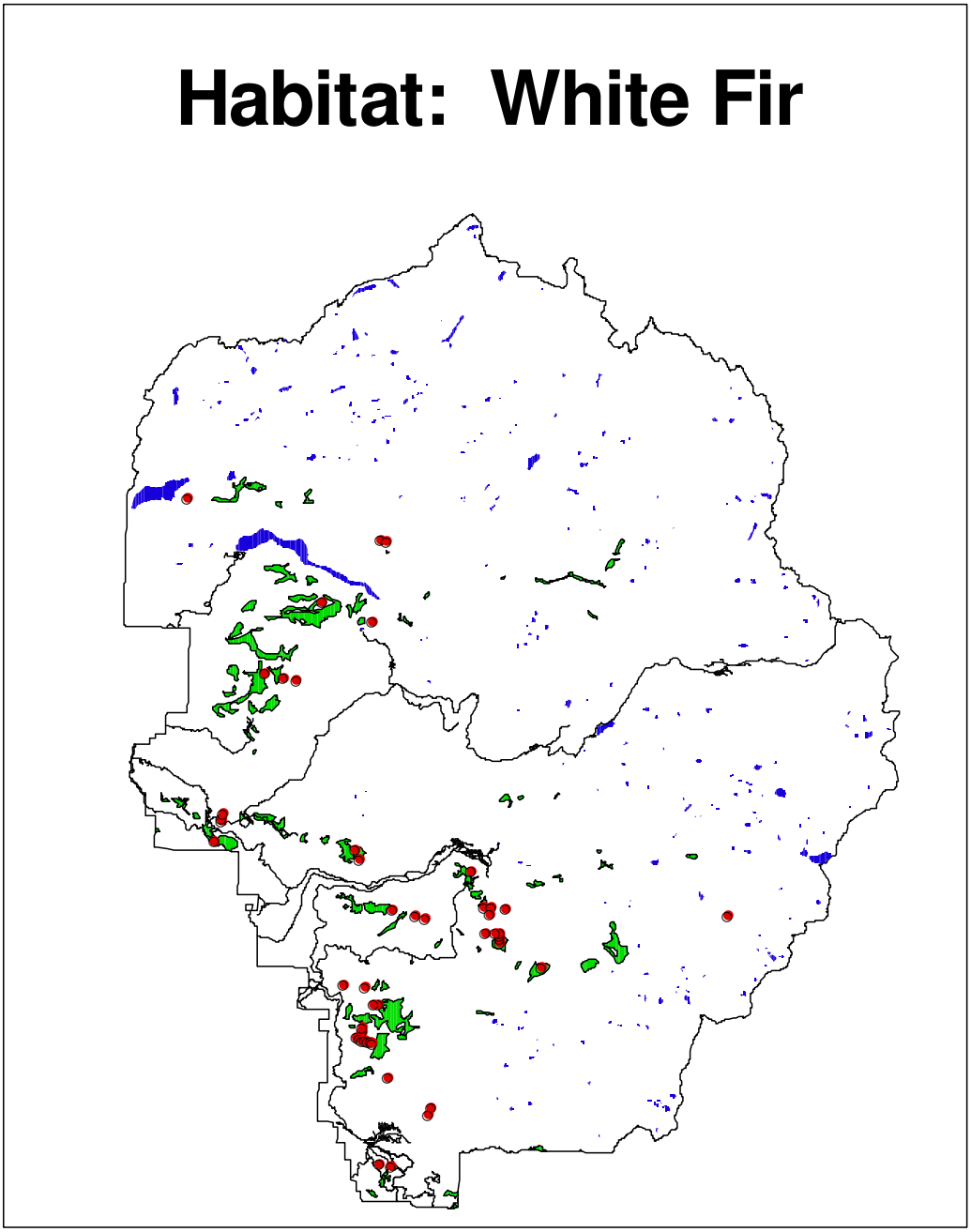

Figure 18. Green shading indicates areas mapped as 'White Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'White Fir'.

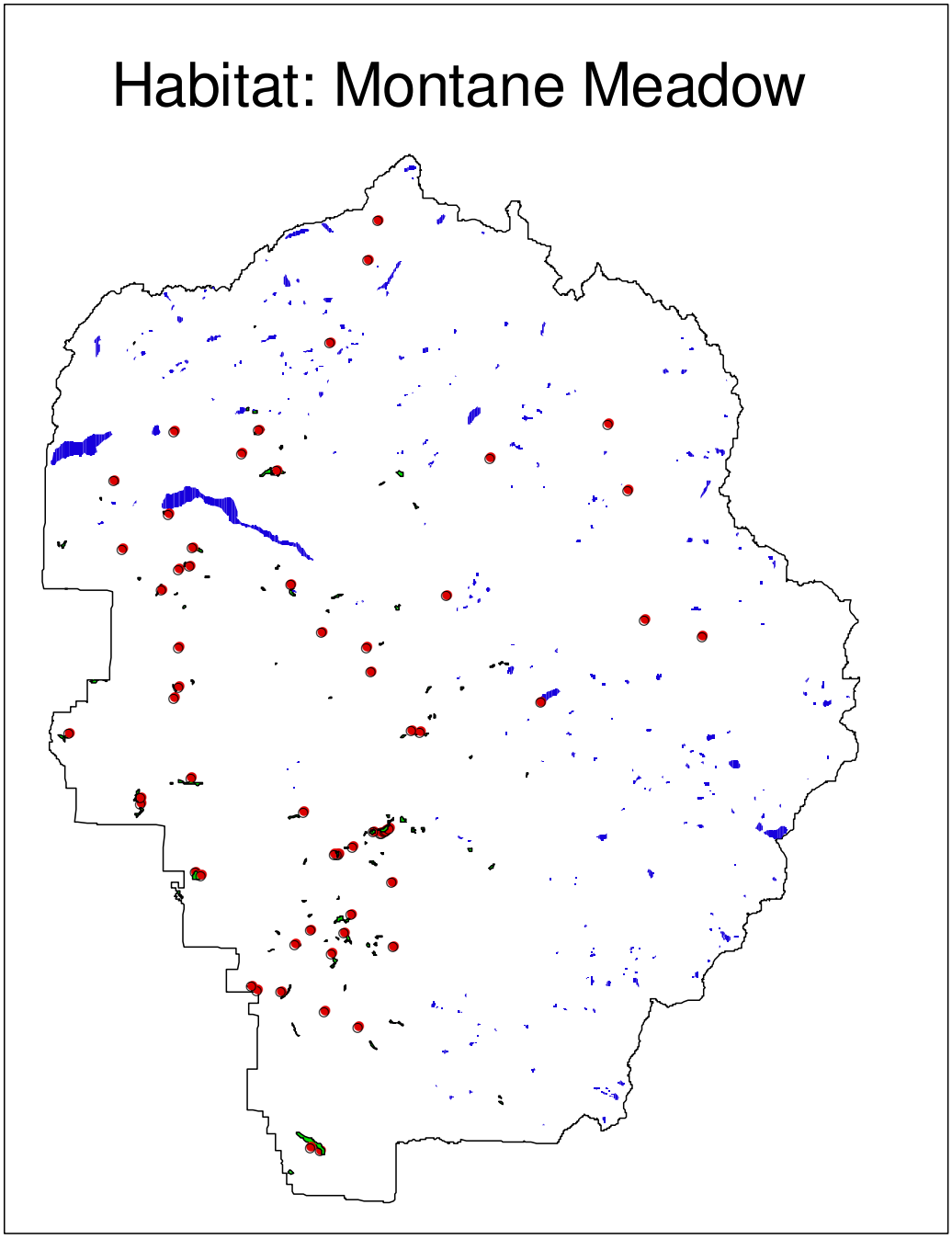

Figure 19. Green shading (largely obscured by red circles) indicates areas mapped as 'Montane Meadow on the park's GIS coverage. Red circles indicate meadows where multiple points counts were conducted.

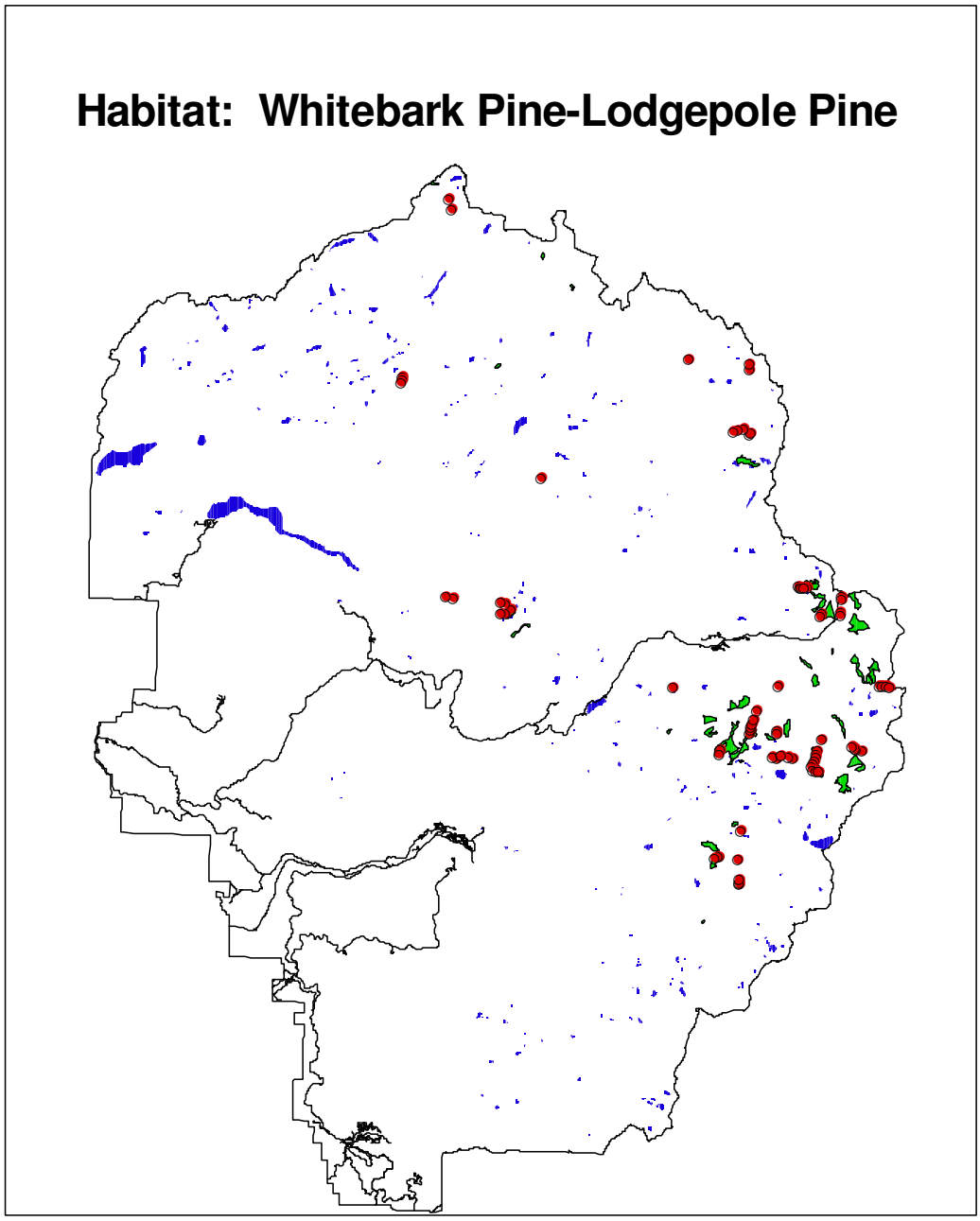

Figure 29. Green shading indicates areas mapped as 'Whitebark Pine-Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Lodgepole Pine'.

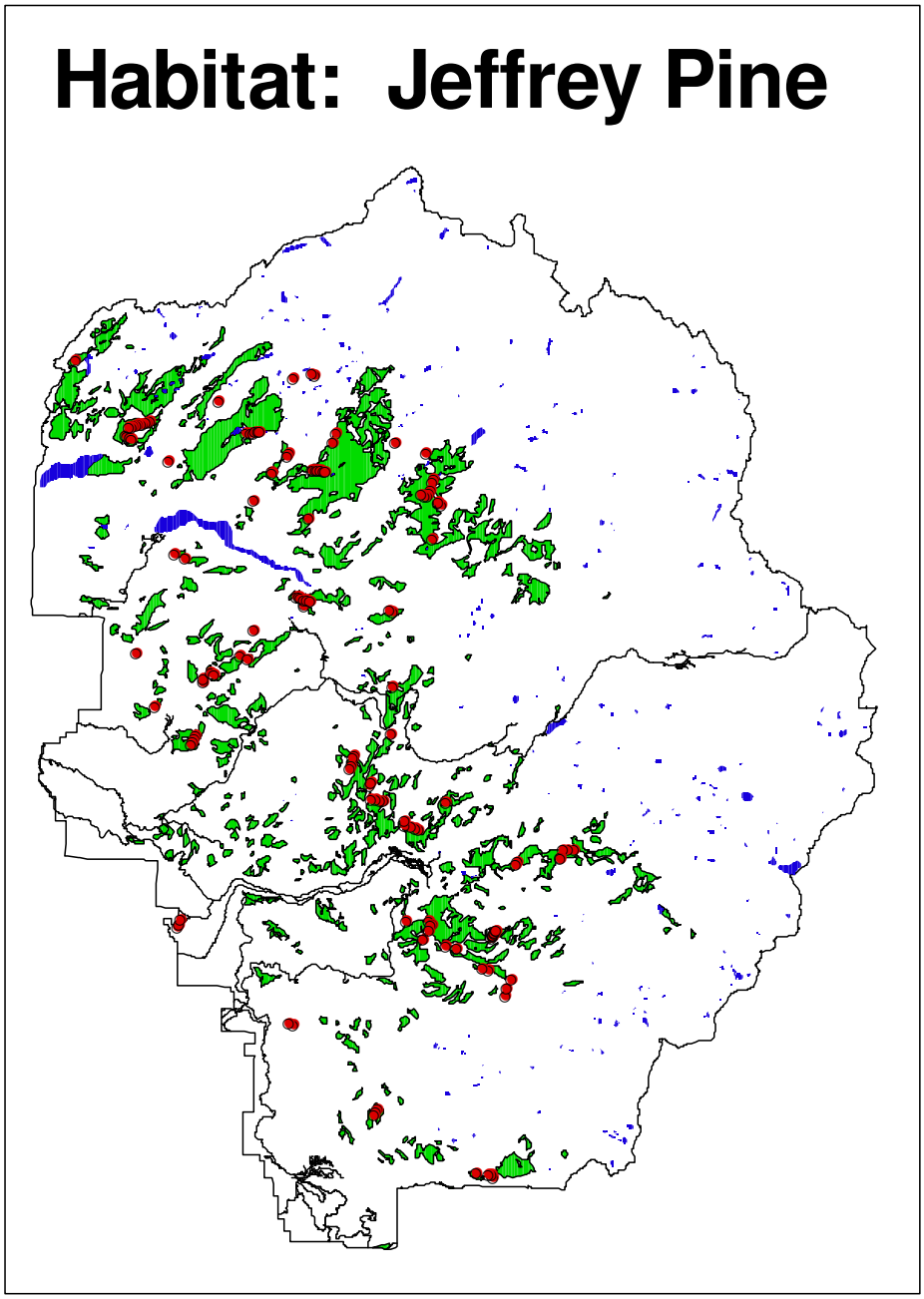

Figure 20. Green shading indicates areas mapped as 'Jeffrey Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine'.

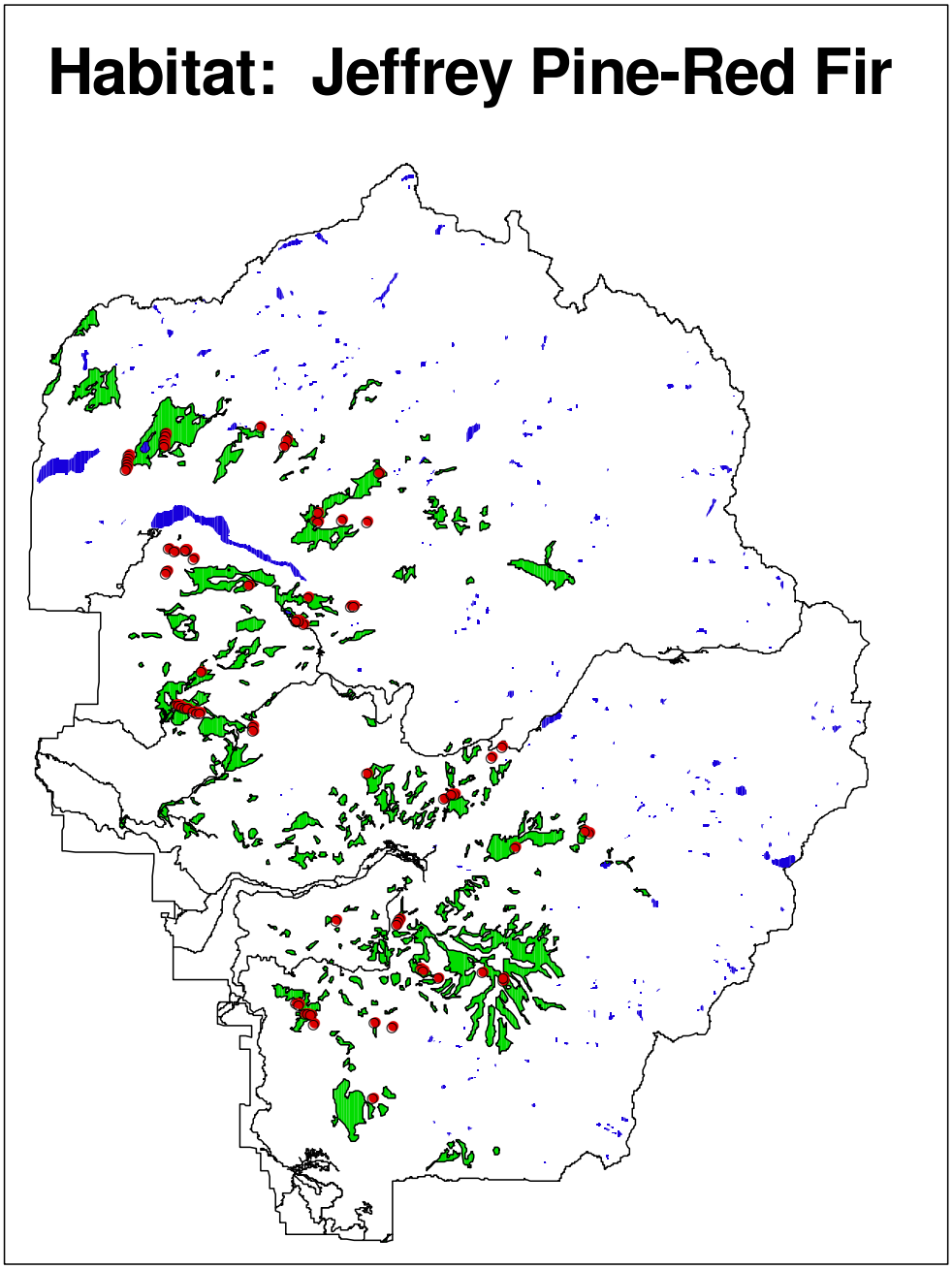

Figure 21. Green shading indicates areas mapped as 'Jeffrey Pine-Red Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Jeffrey Pine-Red Fir'.

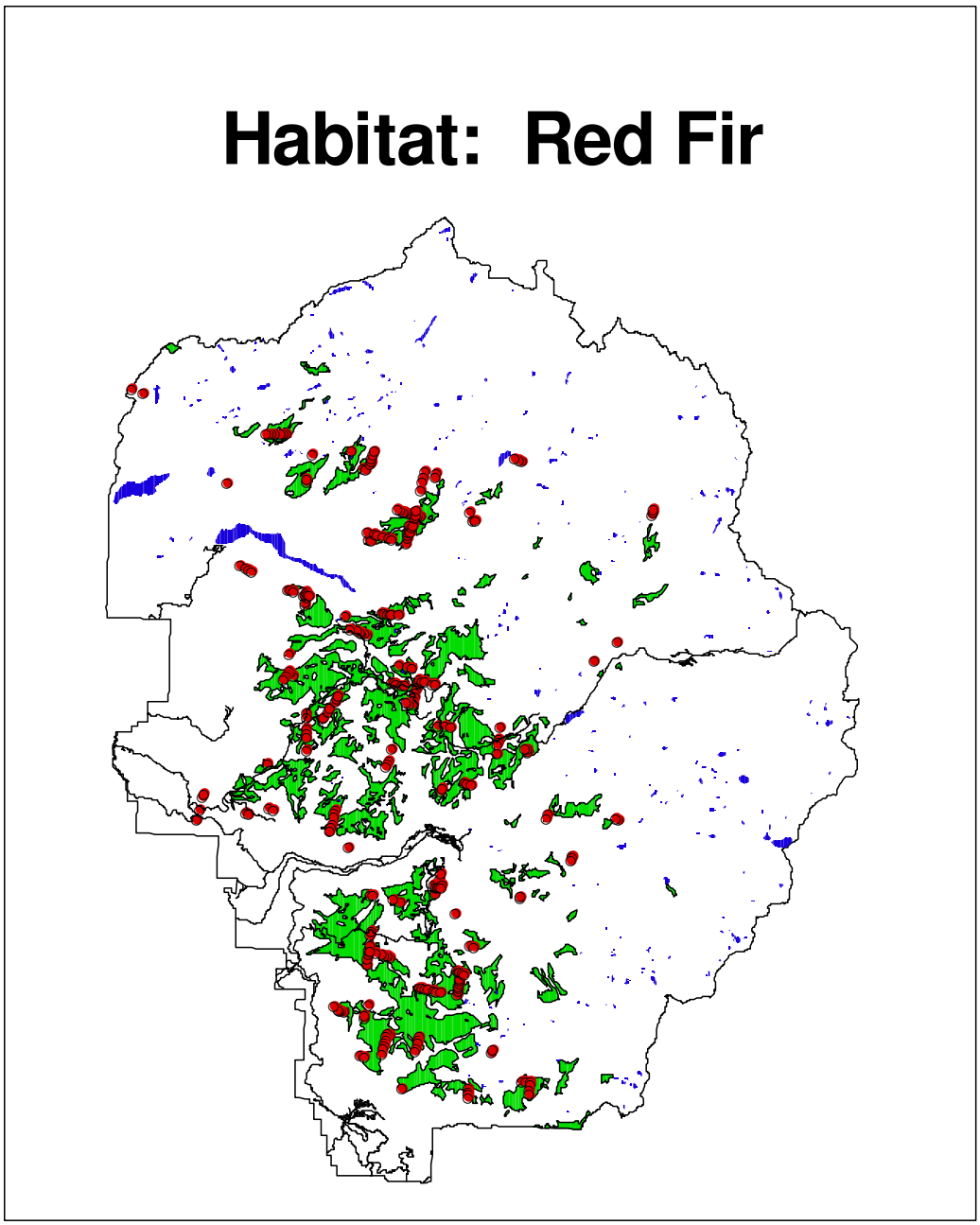

Figure 22. Green shading indicates areas mapped as 'Red Fir' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Red Fir'.

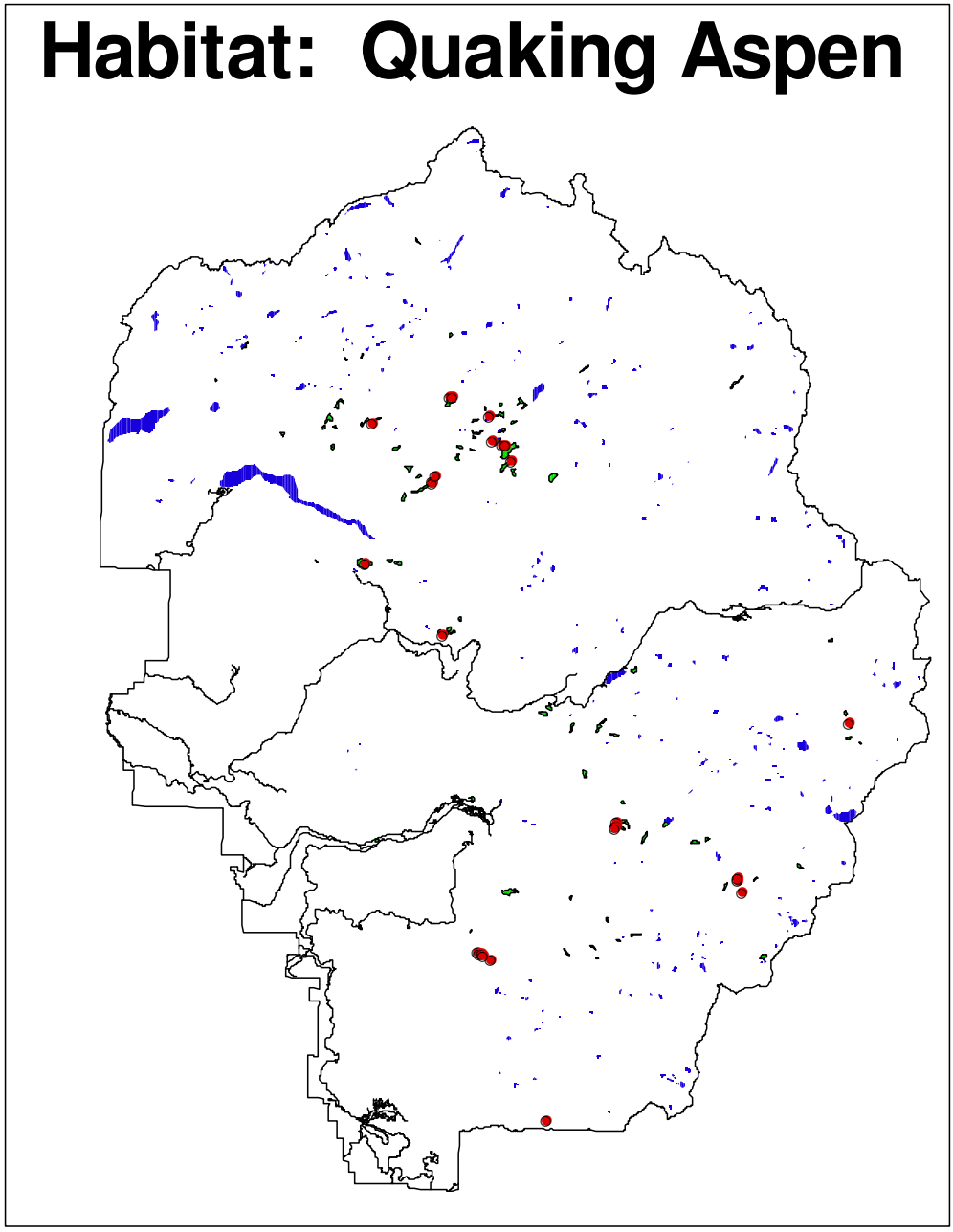

Figure 23. Green shading indicates areas mapped as 'Quaking Aspen' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Quaking Aspen'.

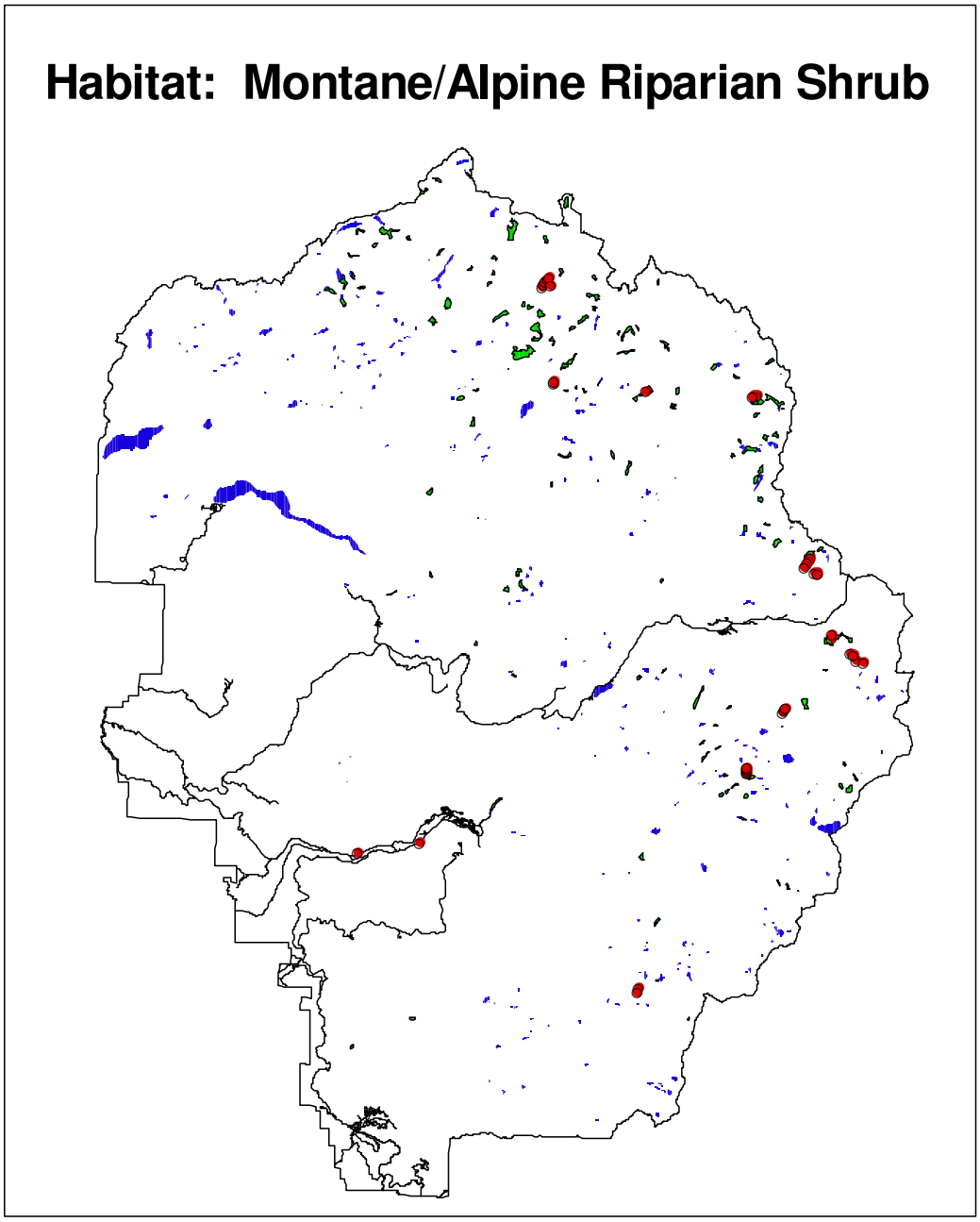

Figure 24. Green shading indicates areas mapped as 'Montane/Alpine Riparian Shrub' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Montane/Alpine Riparian Shrub'.

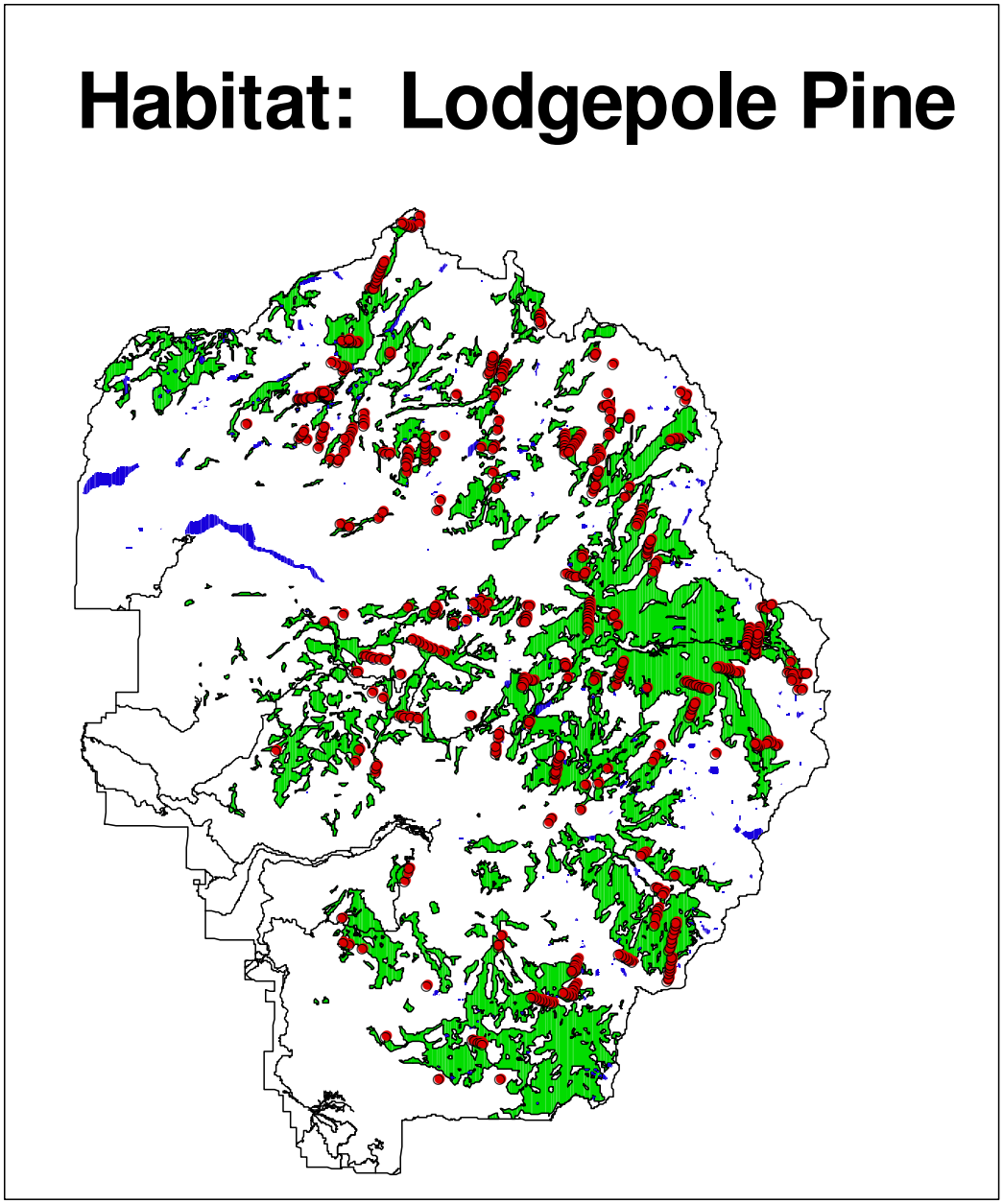

Figure 25. Green shading indicates areas mapped as 'Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Lodgepole Pine'.

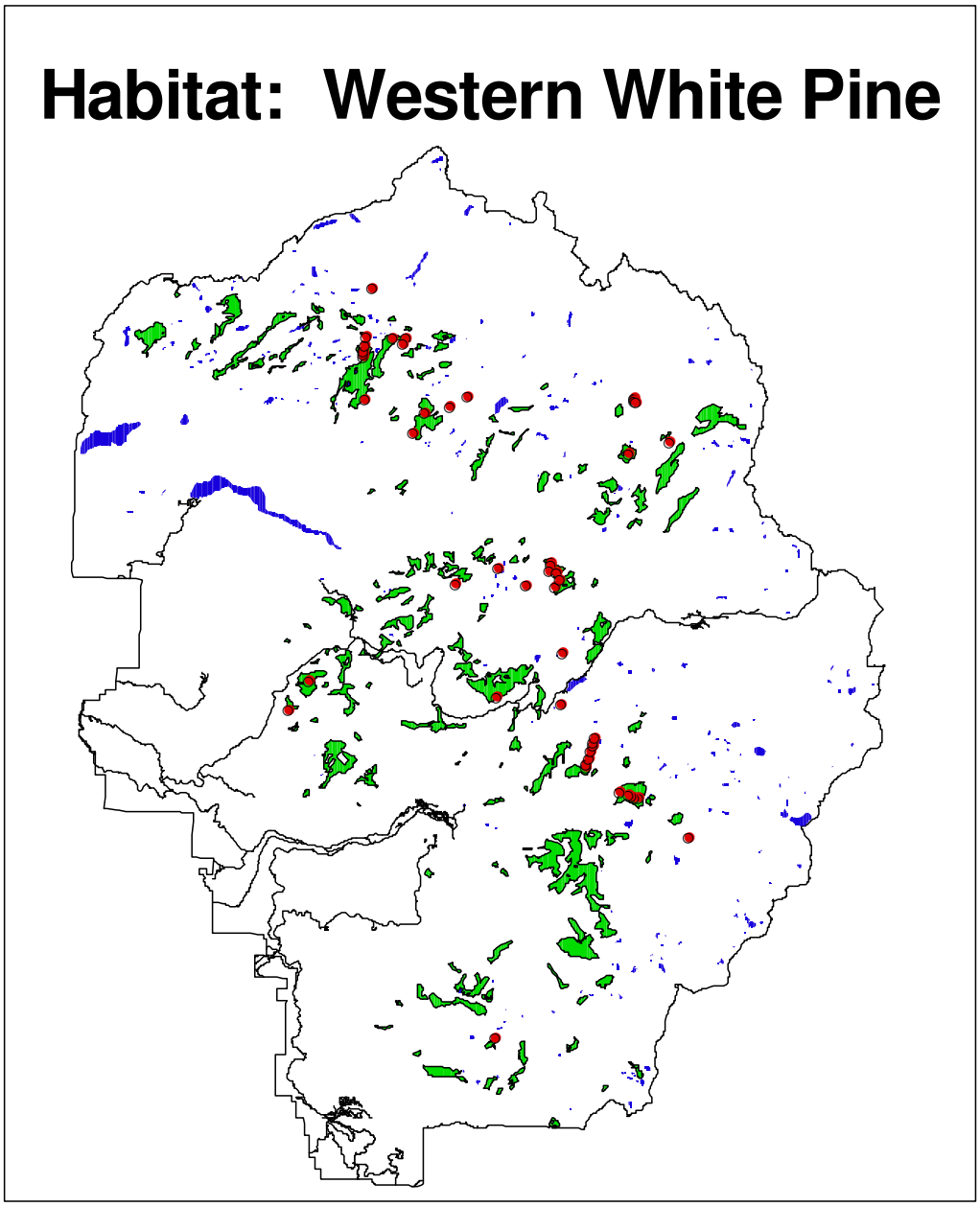

Figure 26. Green shading indicates areas mapped as 'Western White Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Western White Pine'.

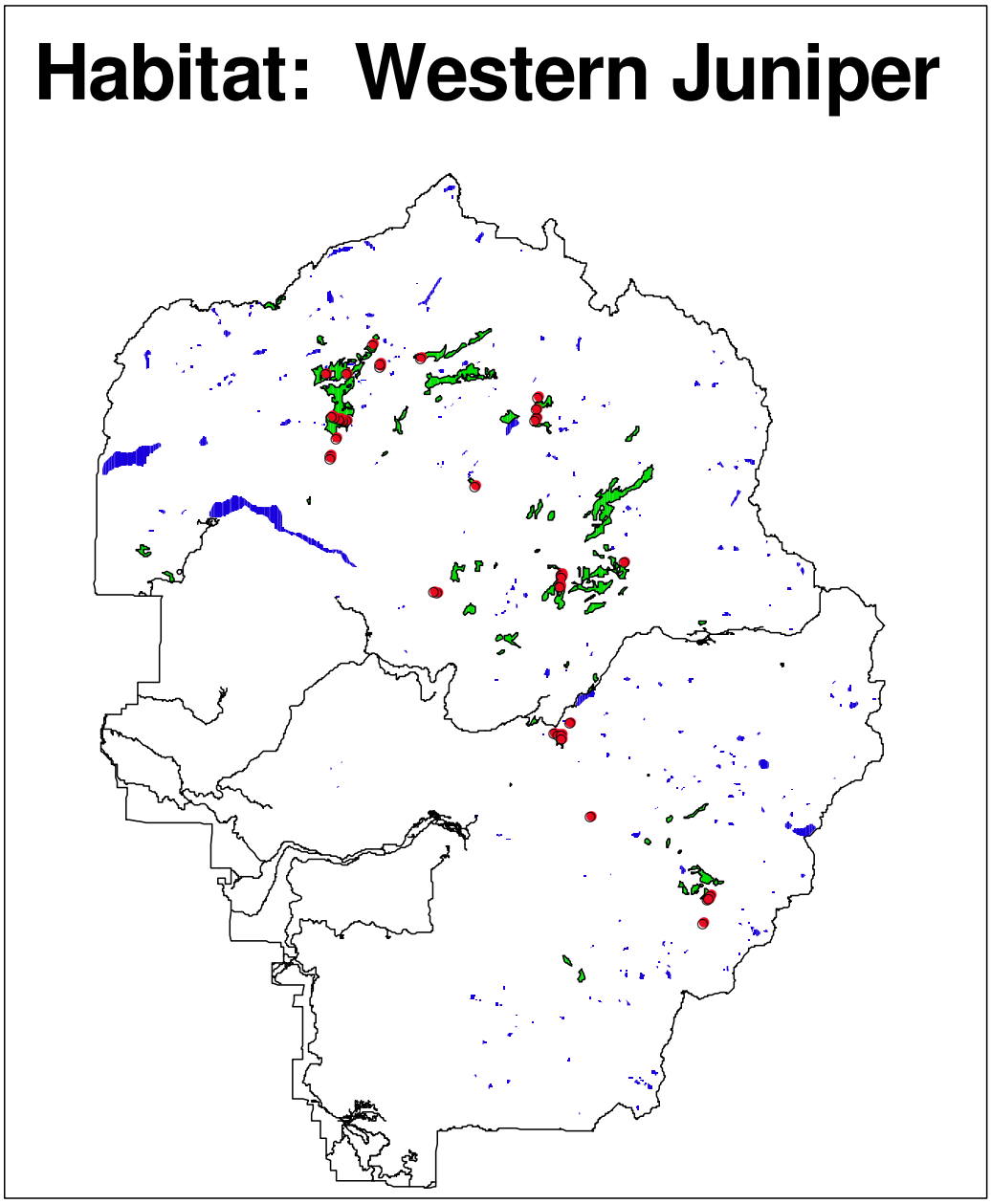

Figure 27. Green shading indicates areas mapped as 'Western Juniper' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Western Juniper'.

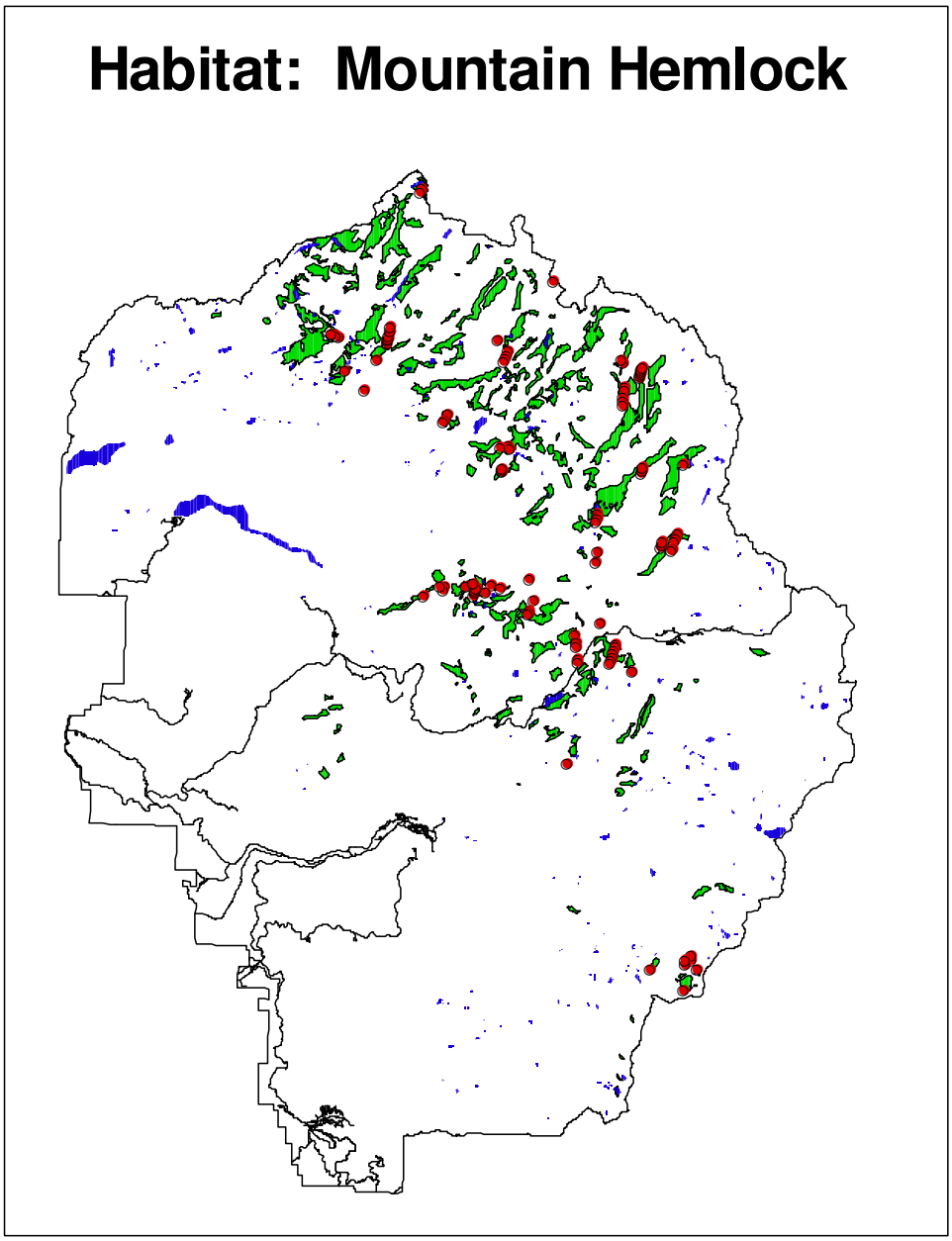

Figure 28. Green shading indicates areas mapped as 'Mountain Hemlock' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Mountain Hemlock'.

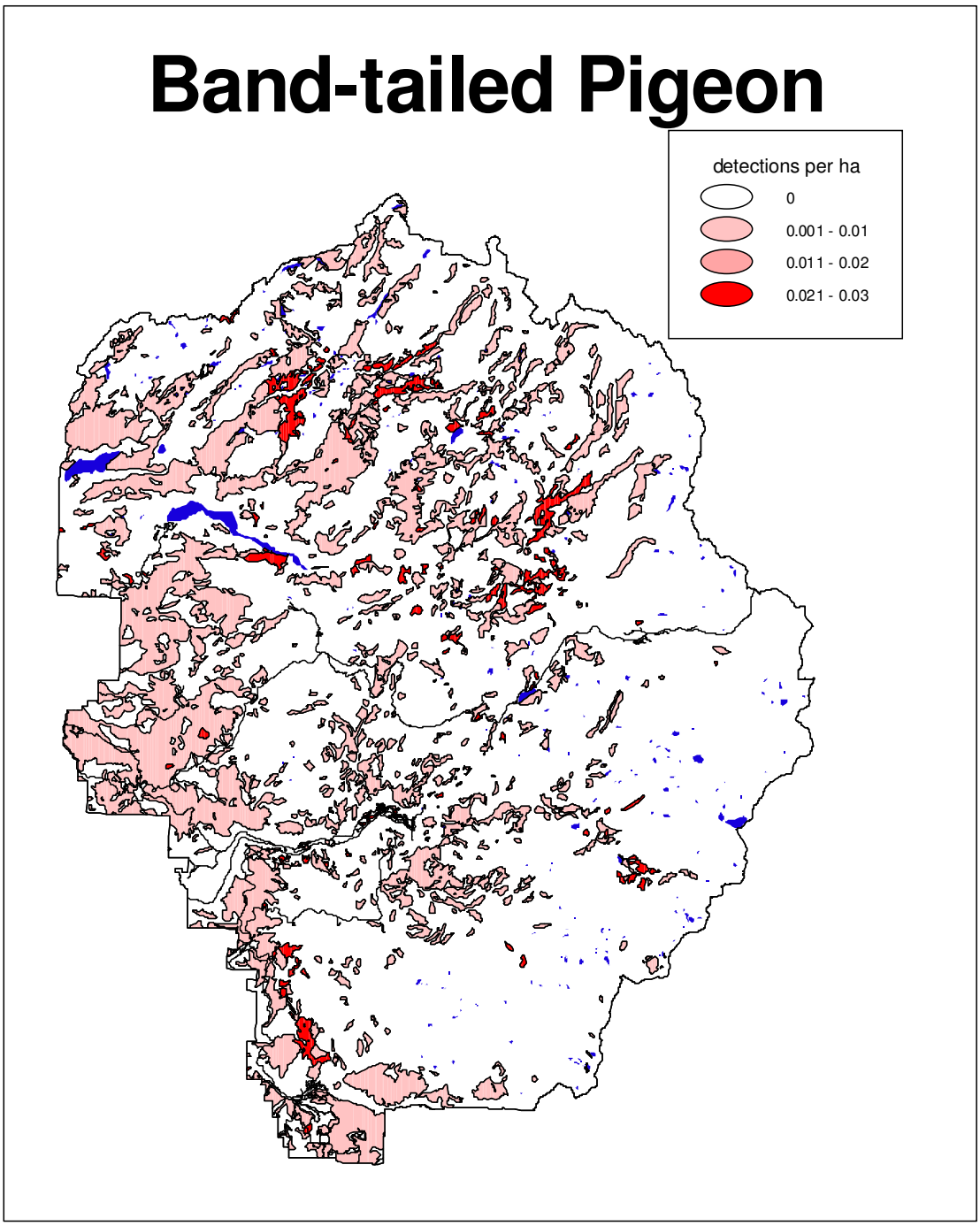

Figure 46. Band-tailed Pigeon distribution and relative abundance in the park.

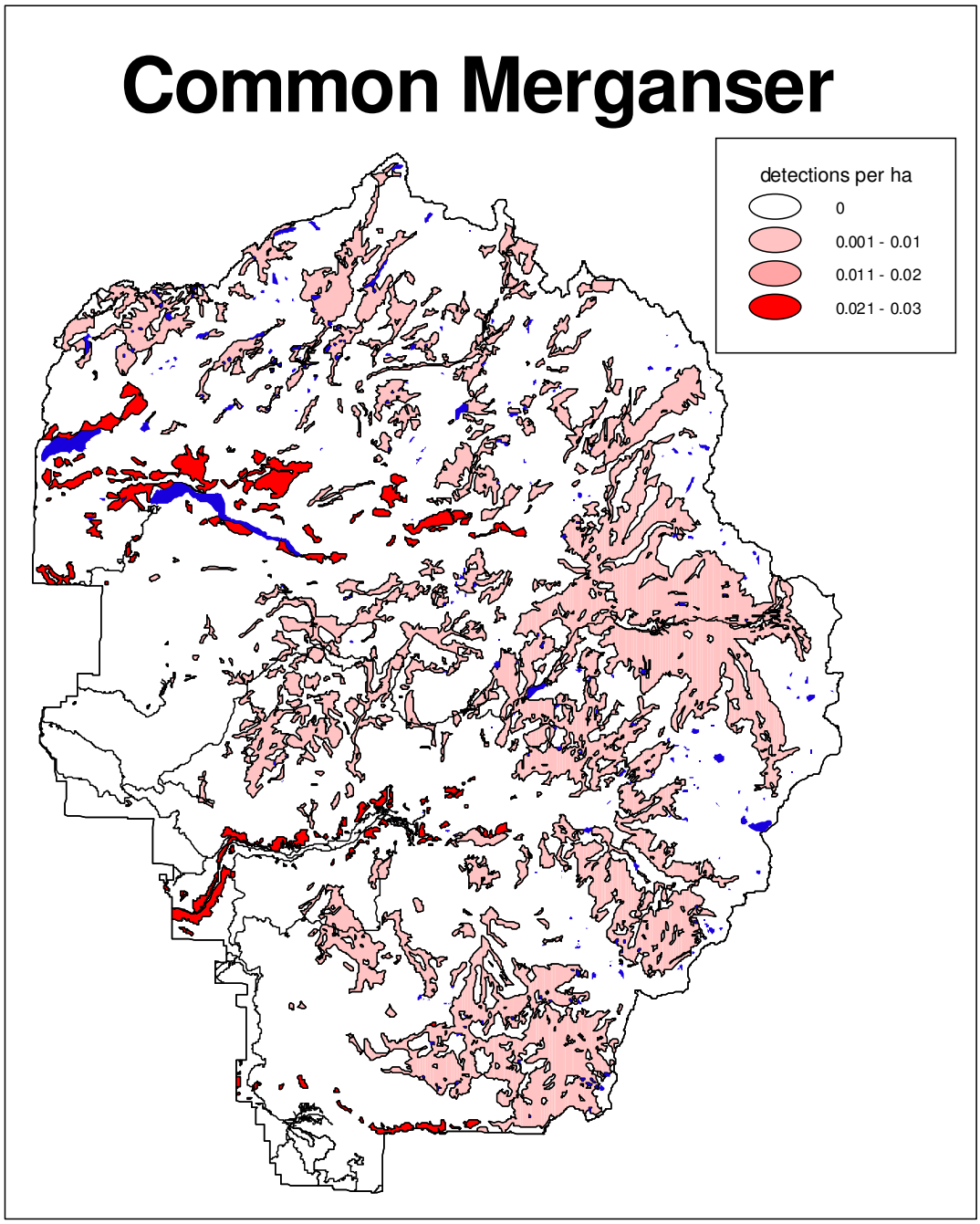

Figure 42. Common Merganser distribution and relatative abundance in the park.

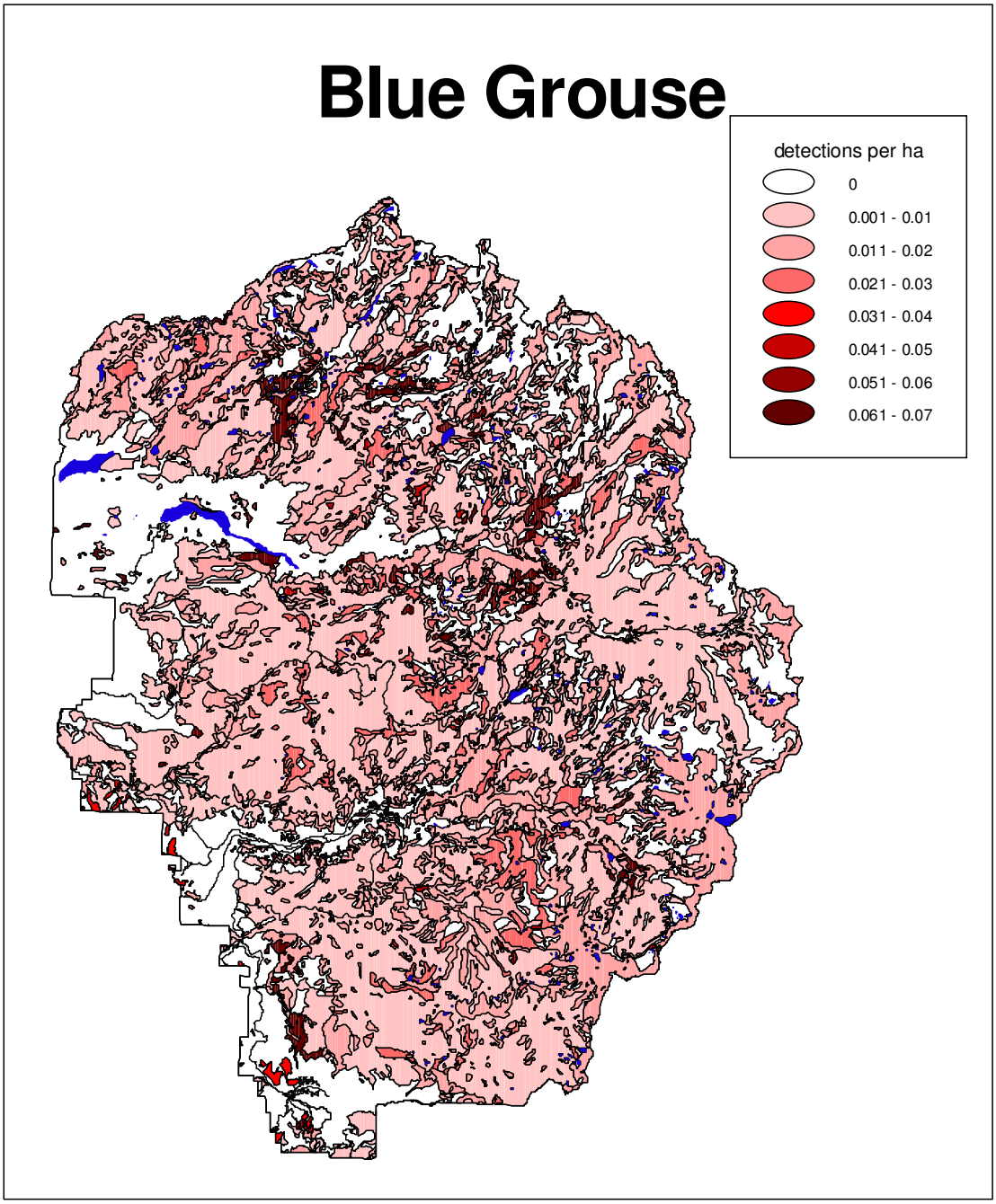

Figure 43. Blue Grouse distribution and relative abundance in the park.

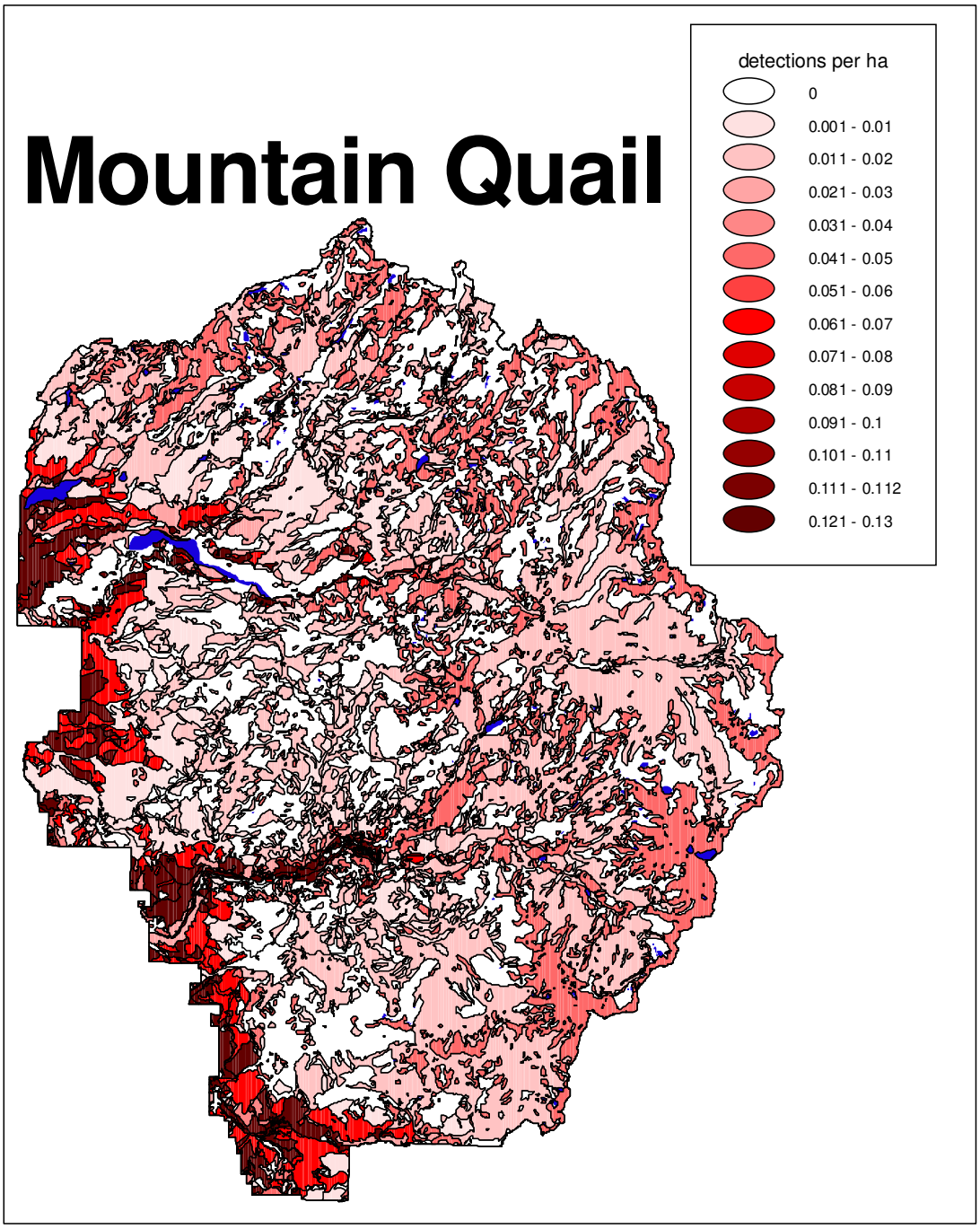

Figure 44. Mountain Quail distribution and relative abundance in the park.

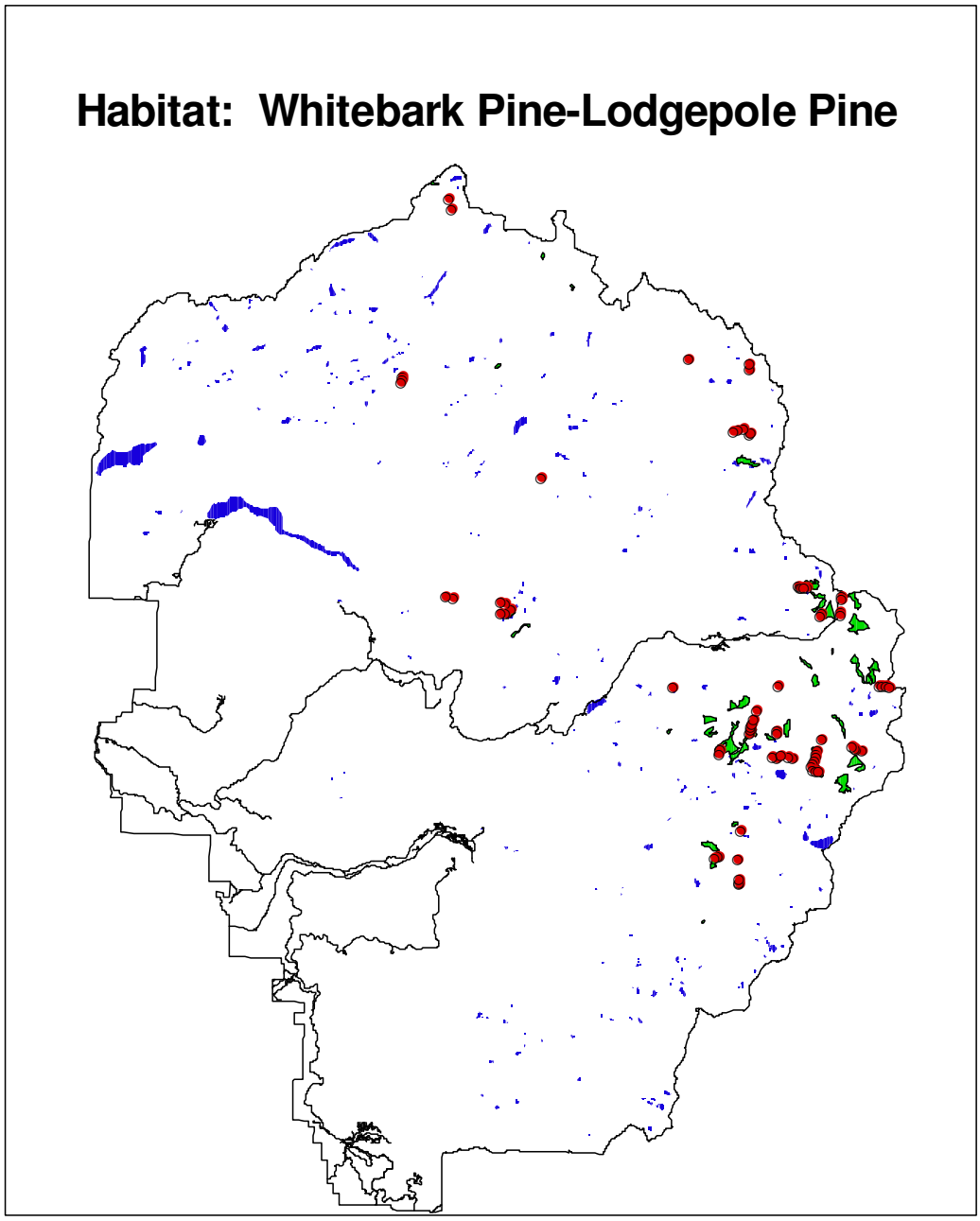

Figure 29. Green shading indicates areas mapped as 'Whitebark Pine-Lodgepole Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Lodgepole Pine'.

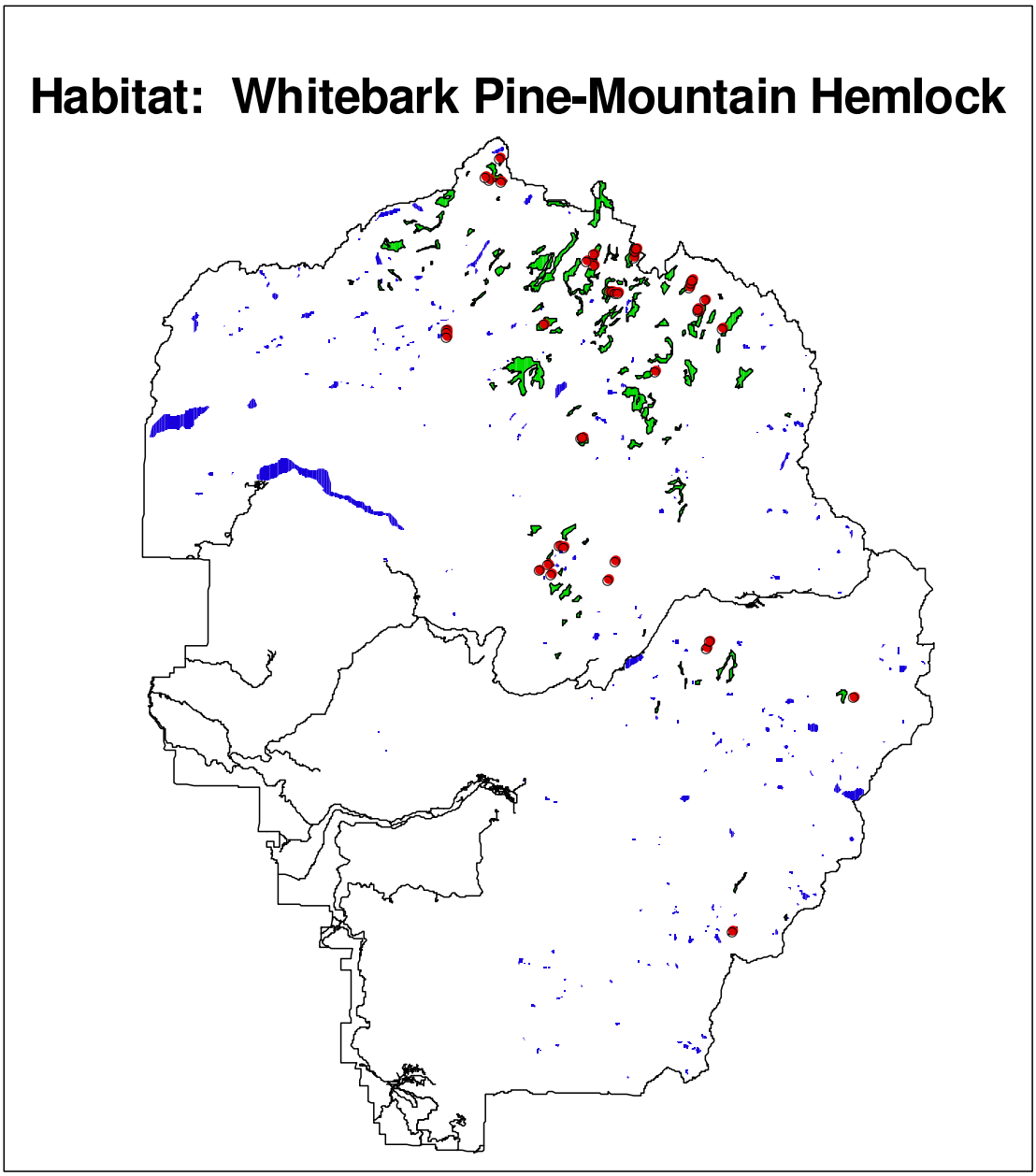

Figure 30. Green shading indicates areas mapped as 'Whitebark Pine-Mountain Hemlock' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine-Mountain Hemlock'.

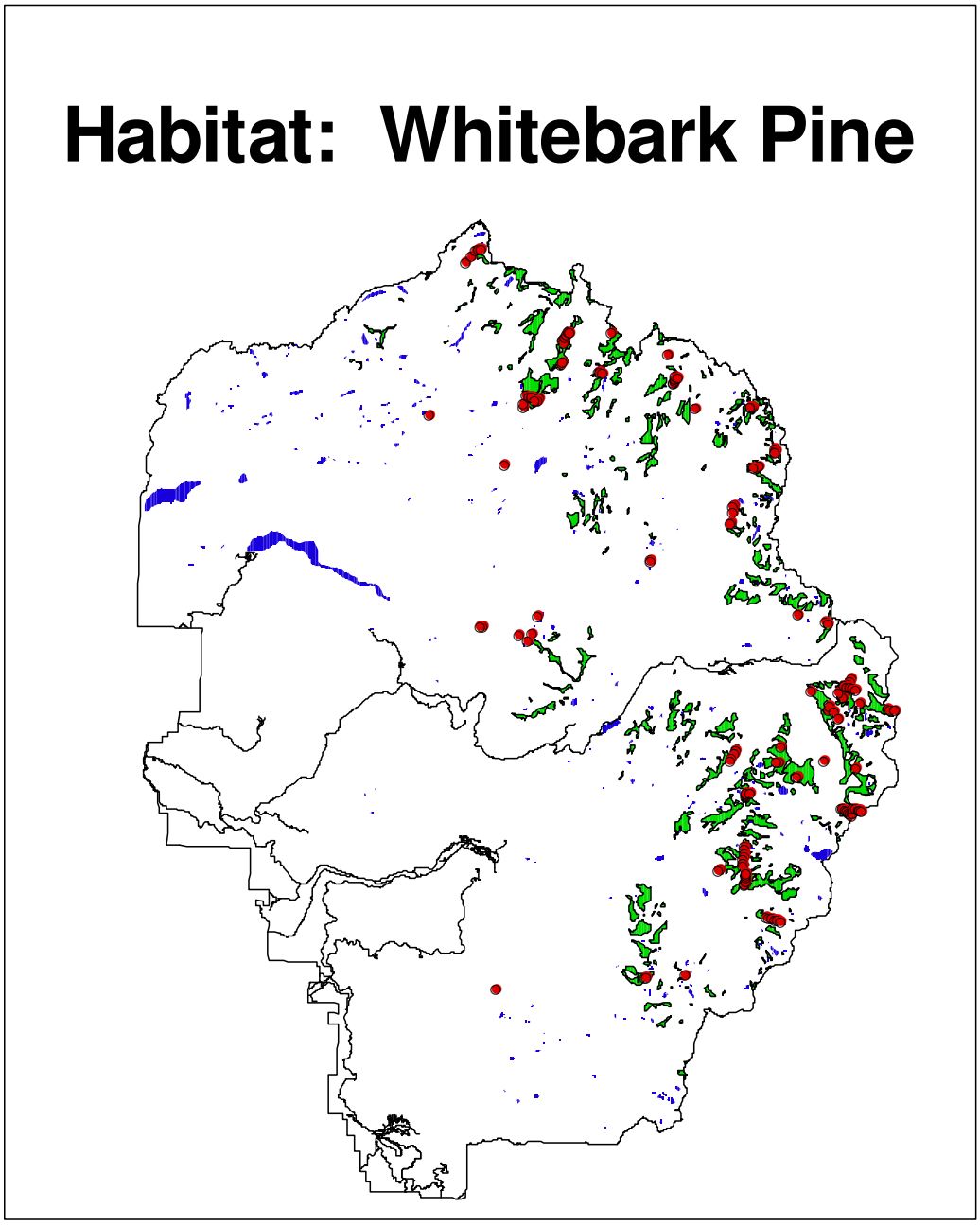

Figure 31. Green shading indicates areas mapped as 'Whitebark Pine' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Whitebark Pine'.

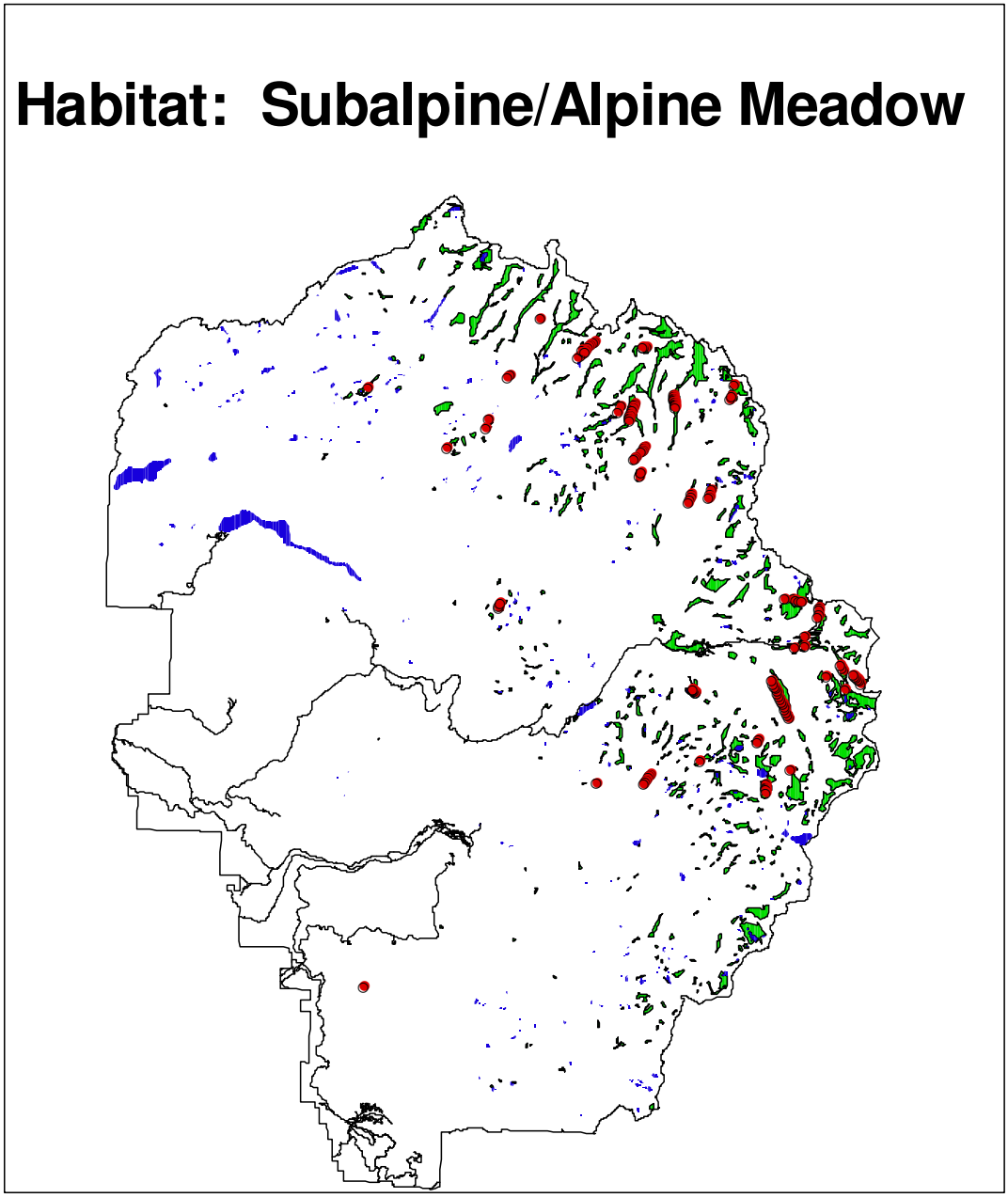

Figure 32. Green shading indicates areas mapped as 'Subalpine/Alpine Meadow' on the park's GIS coverage. Red circles indicate point count locations at which the observer classified the habitat as 'Subalpine/Alpine Meadow'.

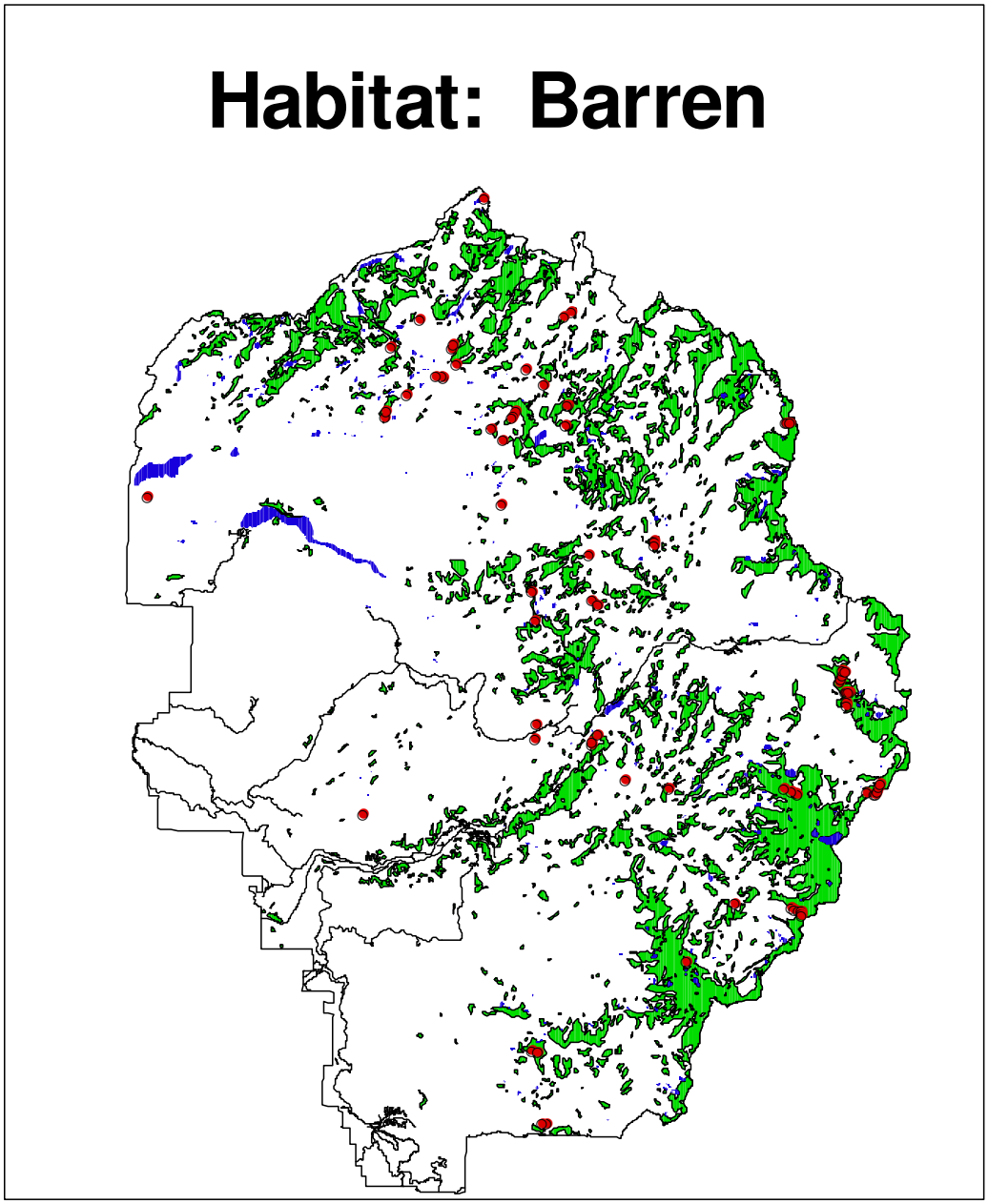

Figure 33. Green shading indicates areas mapped as 'barren' on the park's GIS coverage. Red circles indicate point count loations at which the observer classified the habitat as 'barrer

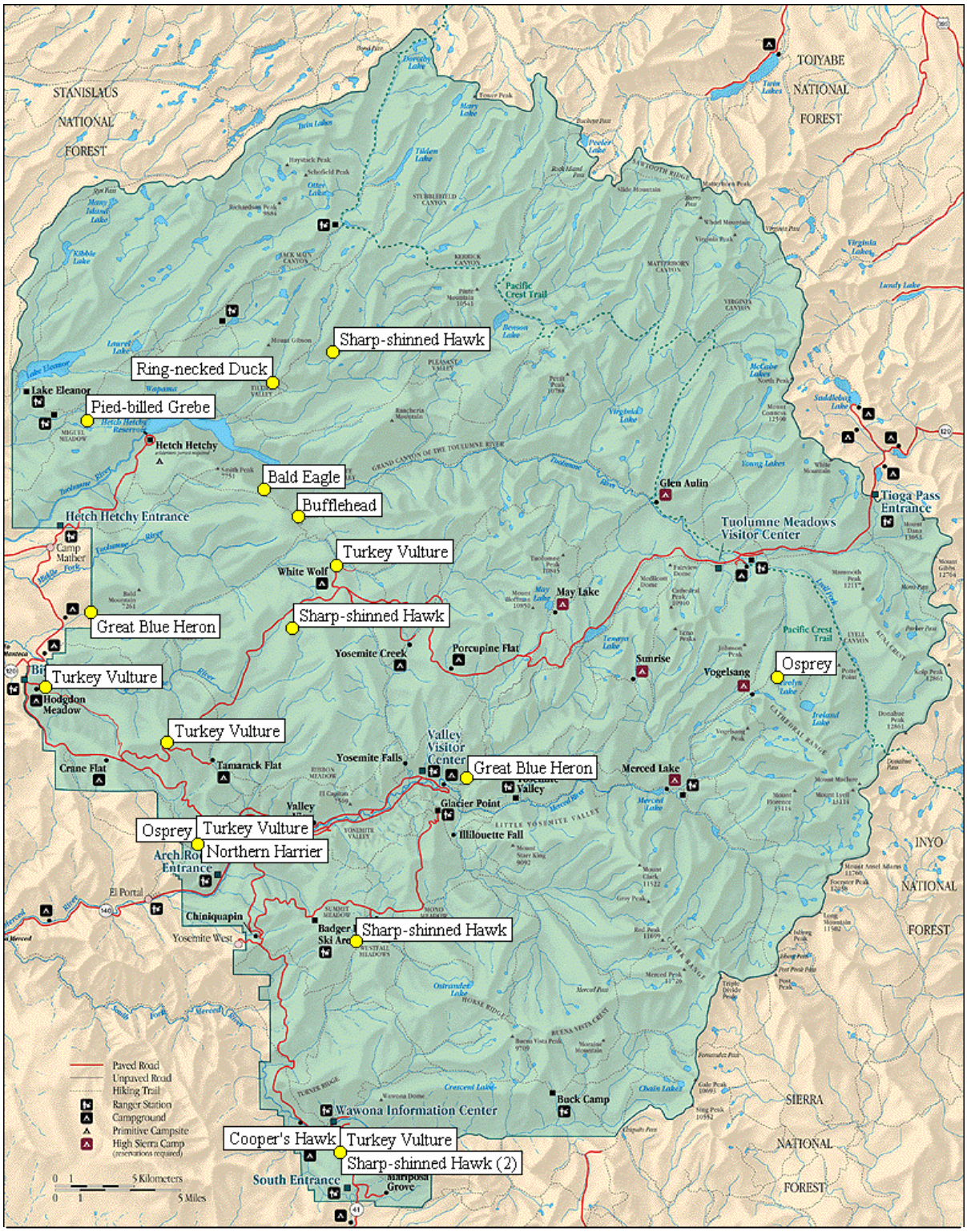

Figure 34. Locations of detections for species detected fewer than five times during point counts: **Pied-billed Grebe—Cooper's Hawk**.

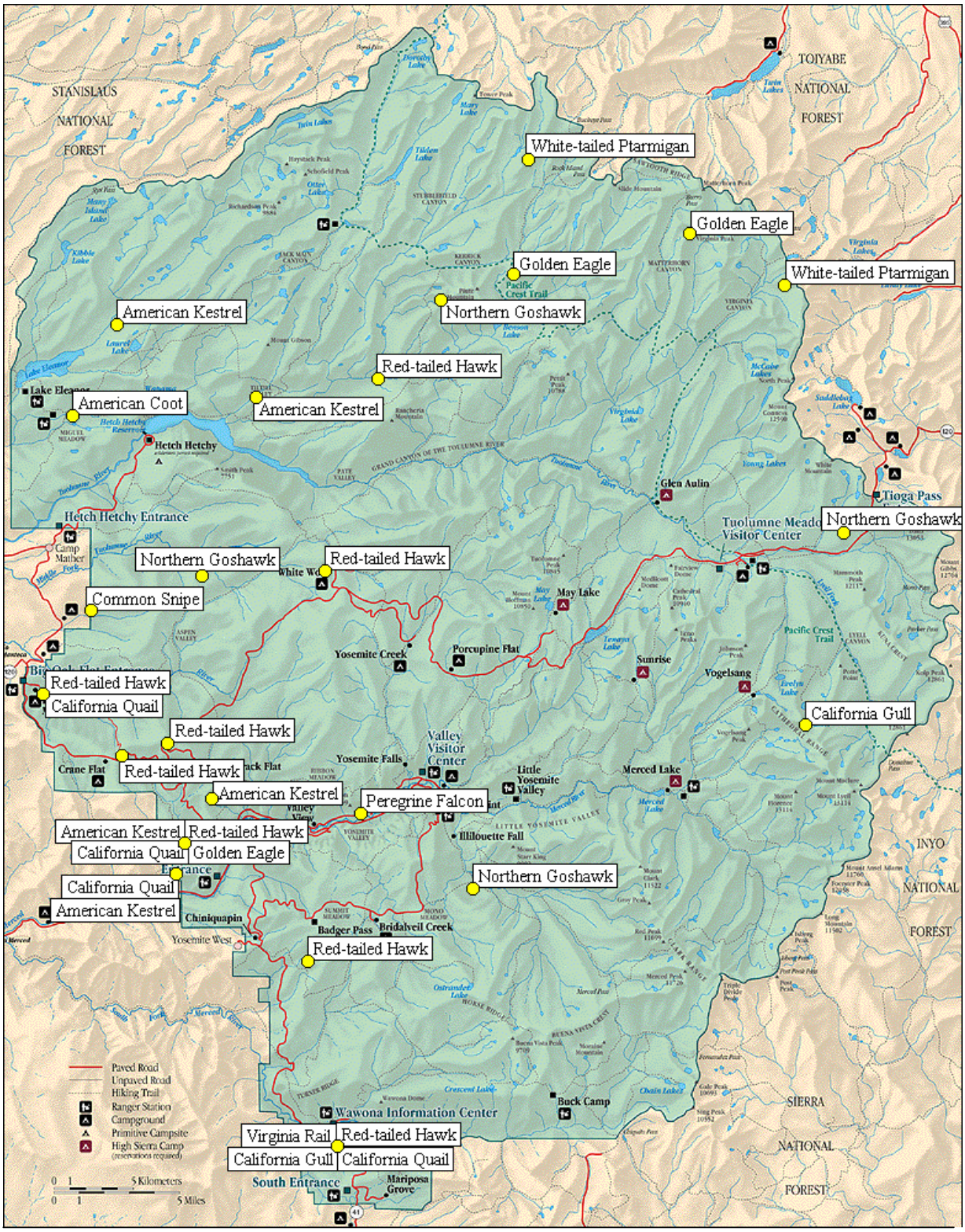

Figure 35. Locations of detections for species detected fewer than five times during point counts: **Red-tailed Hawk—California Gull**.

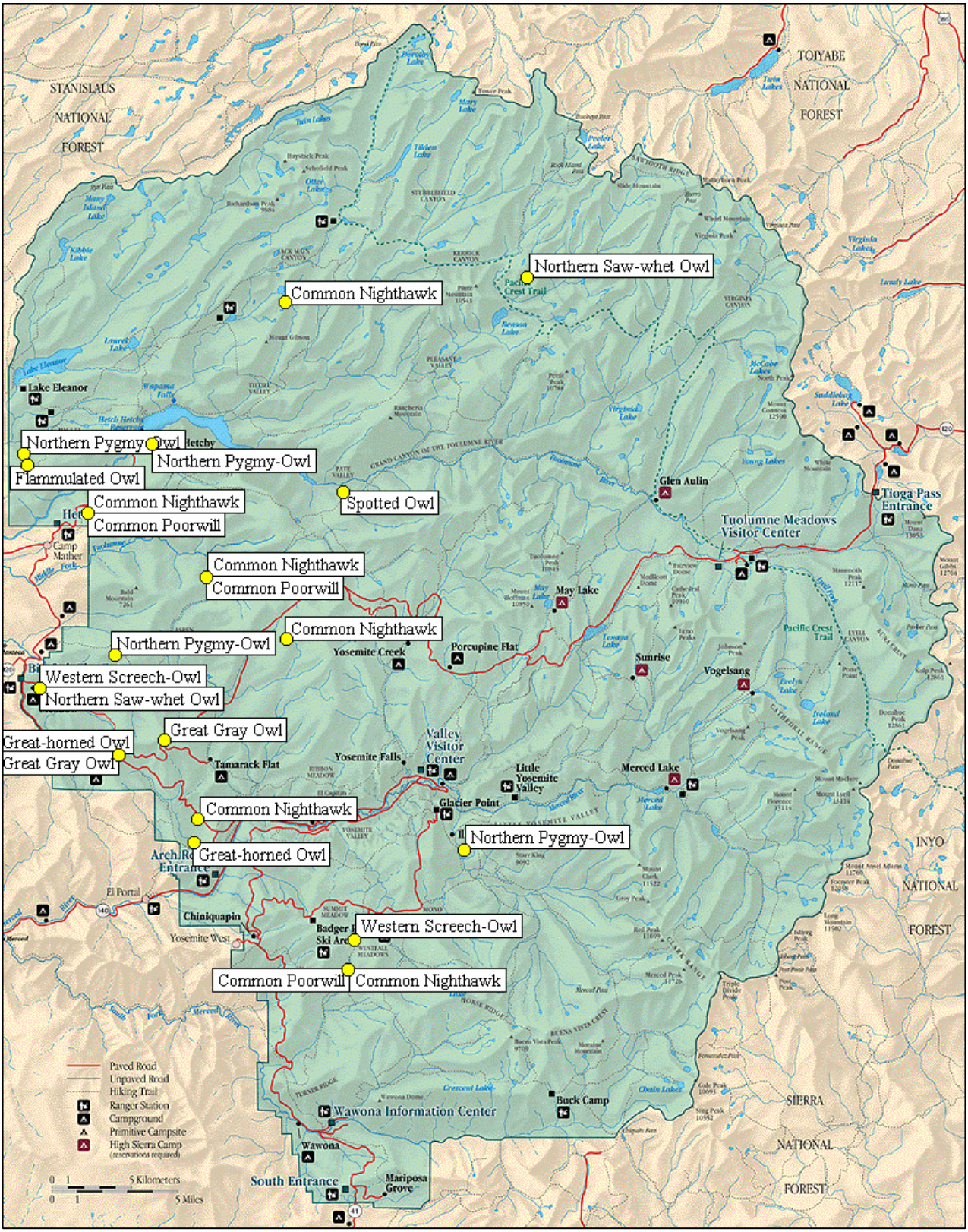

Figure 36. Locations of detections for species detected fewer than five times during point counts: **Western Screech-Owl—Common Poorwill**.

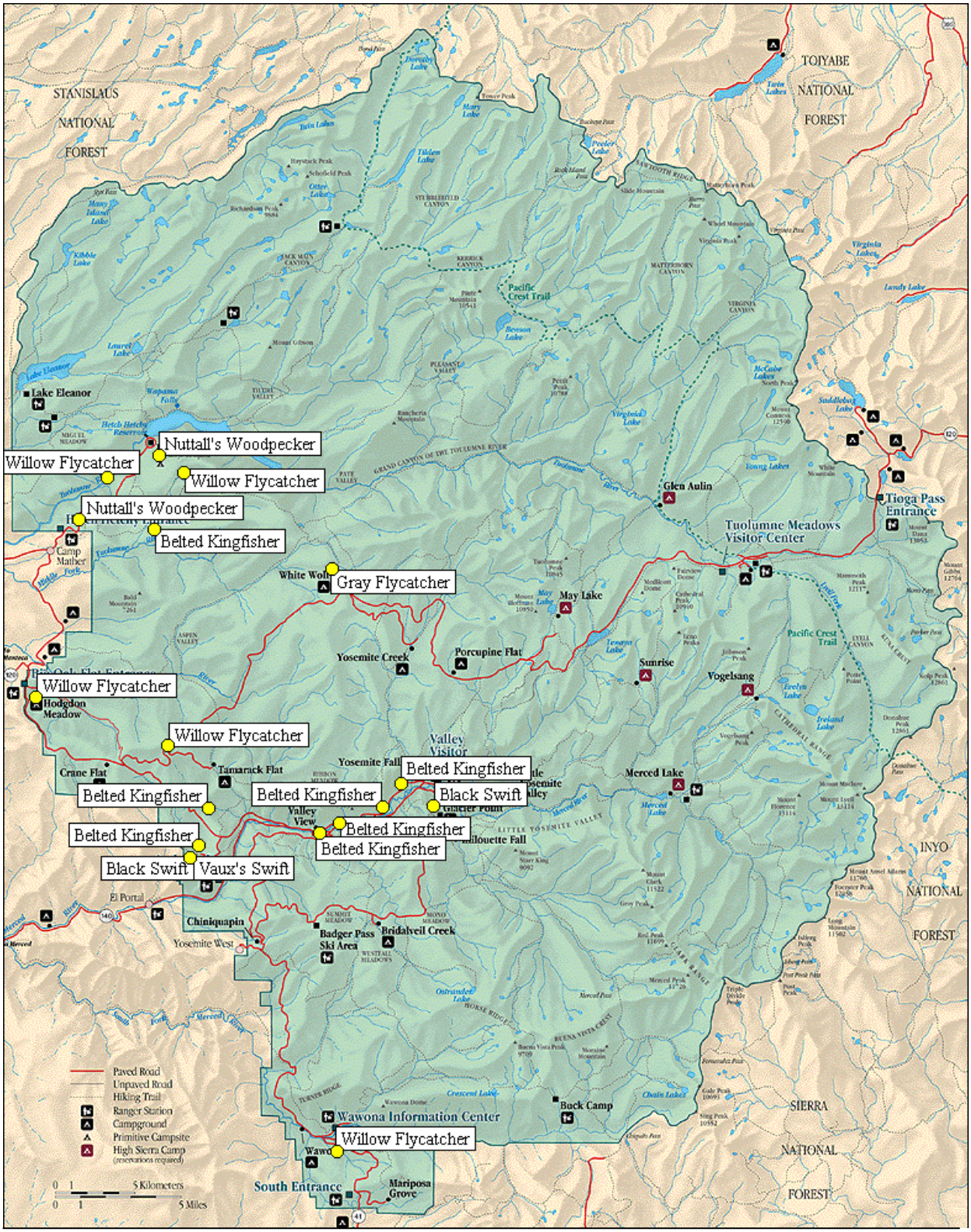

Figure 37. Locations of detections for species detected fewer than five times during point counts: **Black Swift—Gray Flycatcher**.

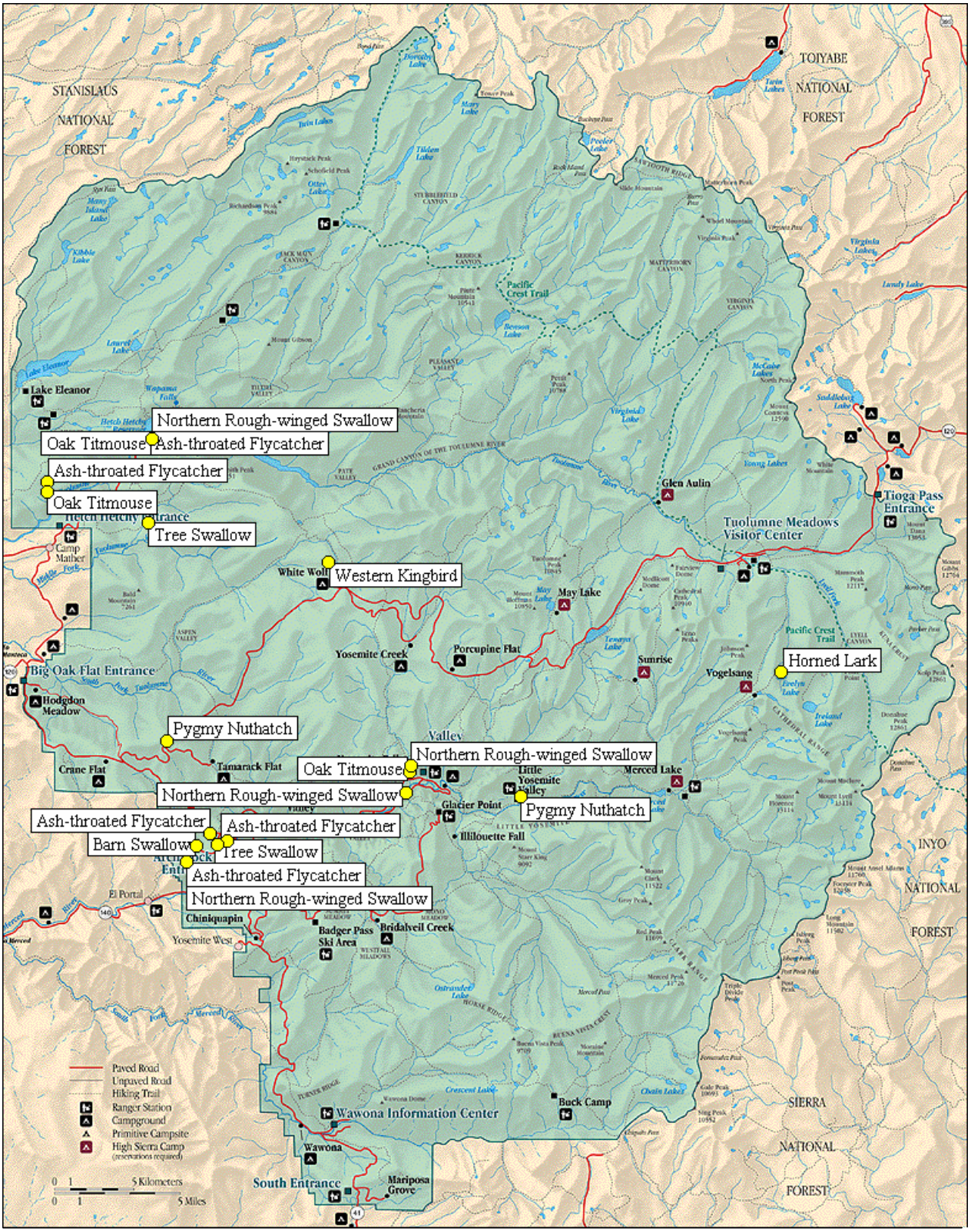

Figure 38. Locations of detections for species detected fewer than five times during point counts: **Ash-throated Flycatcher—Pygmy Nuthatch**.

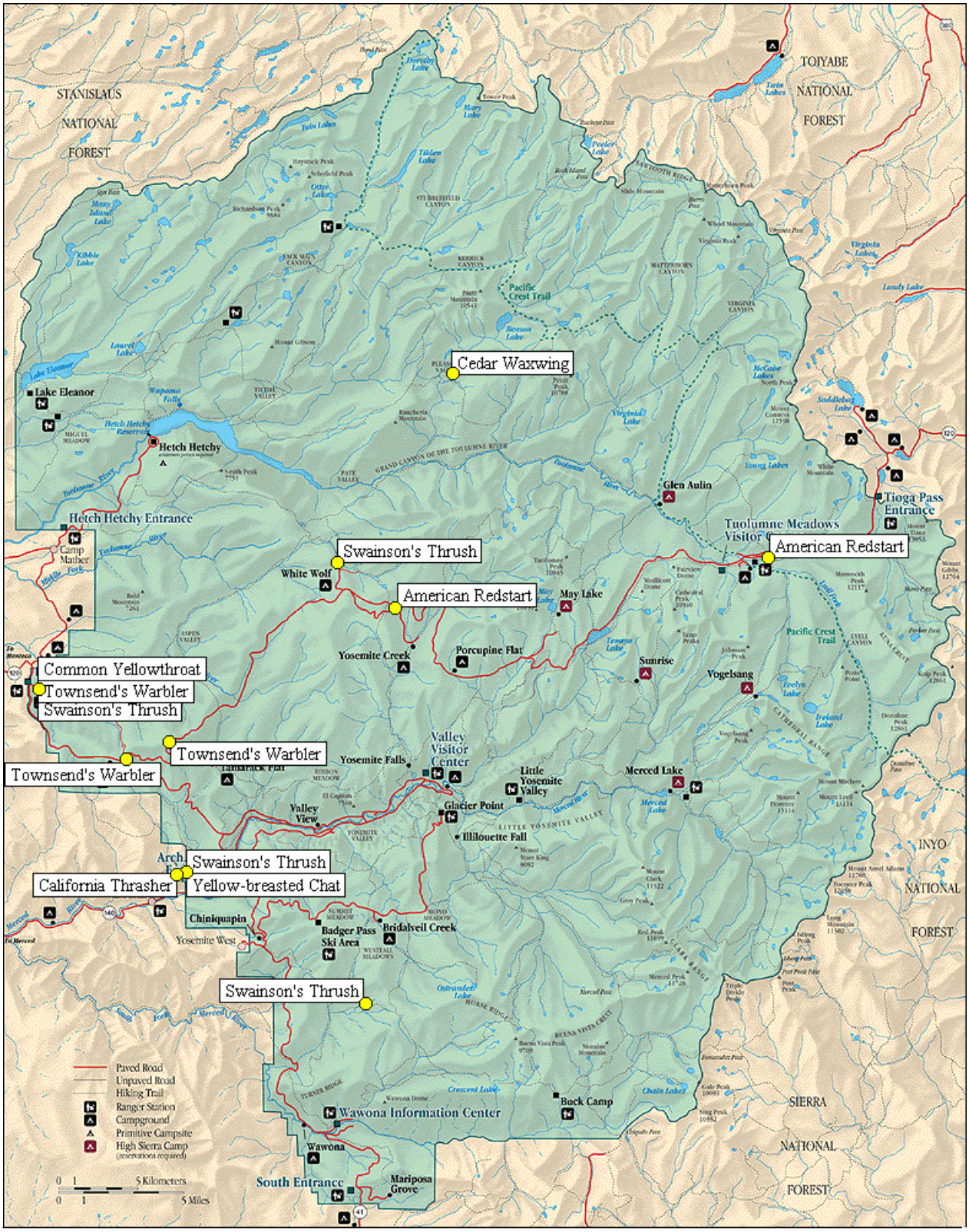

Figure 39. Locations of detections for species detected fewer than five times during point counts: **Swainson's Thrush—Yellow-breasted Chat**.

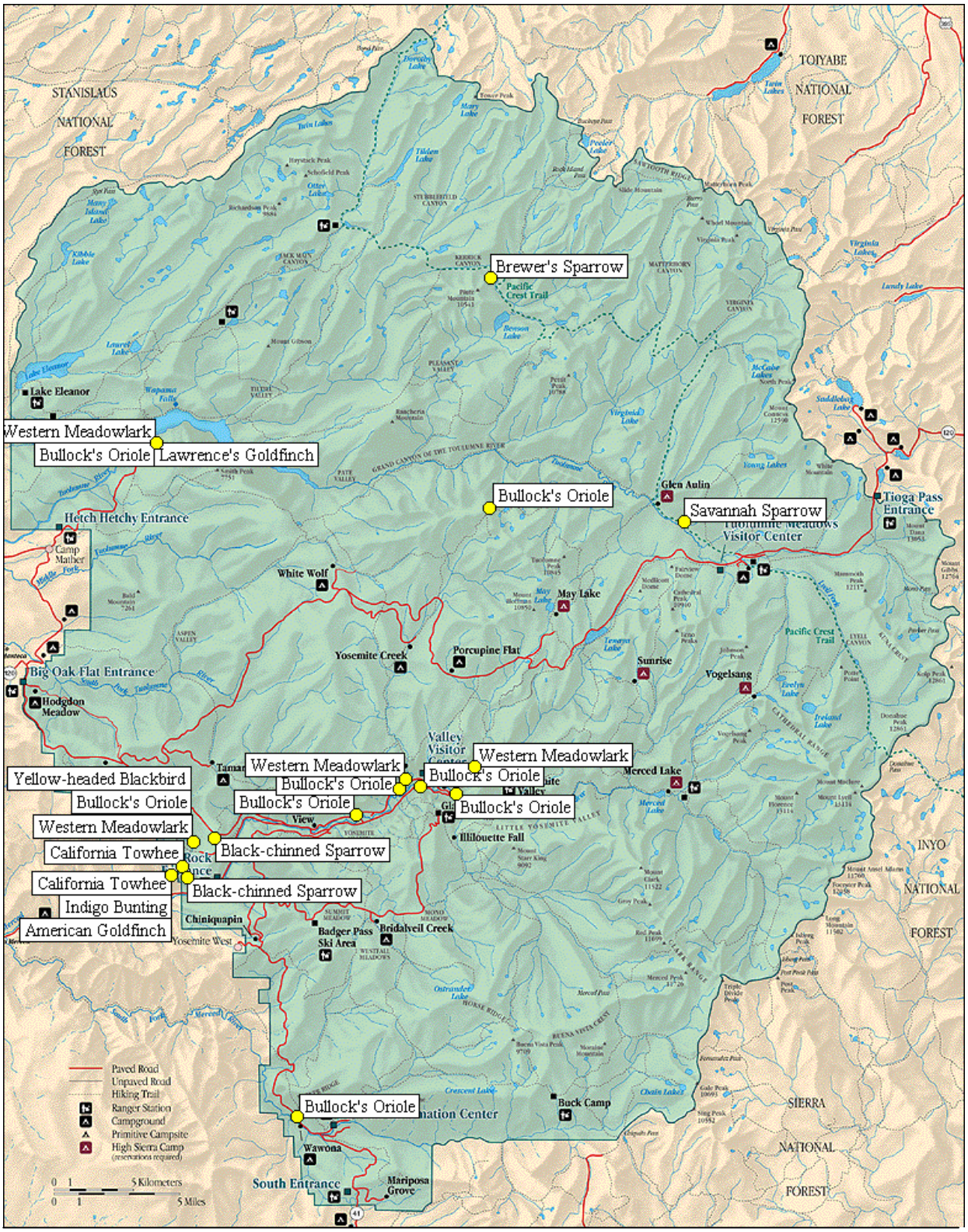

Figure 40. Locations of detections for species detected fewer than five times during point counts: **California Towhee—American Goldfinch**.

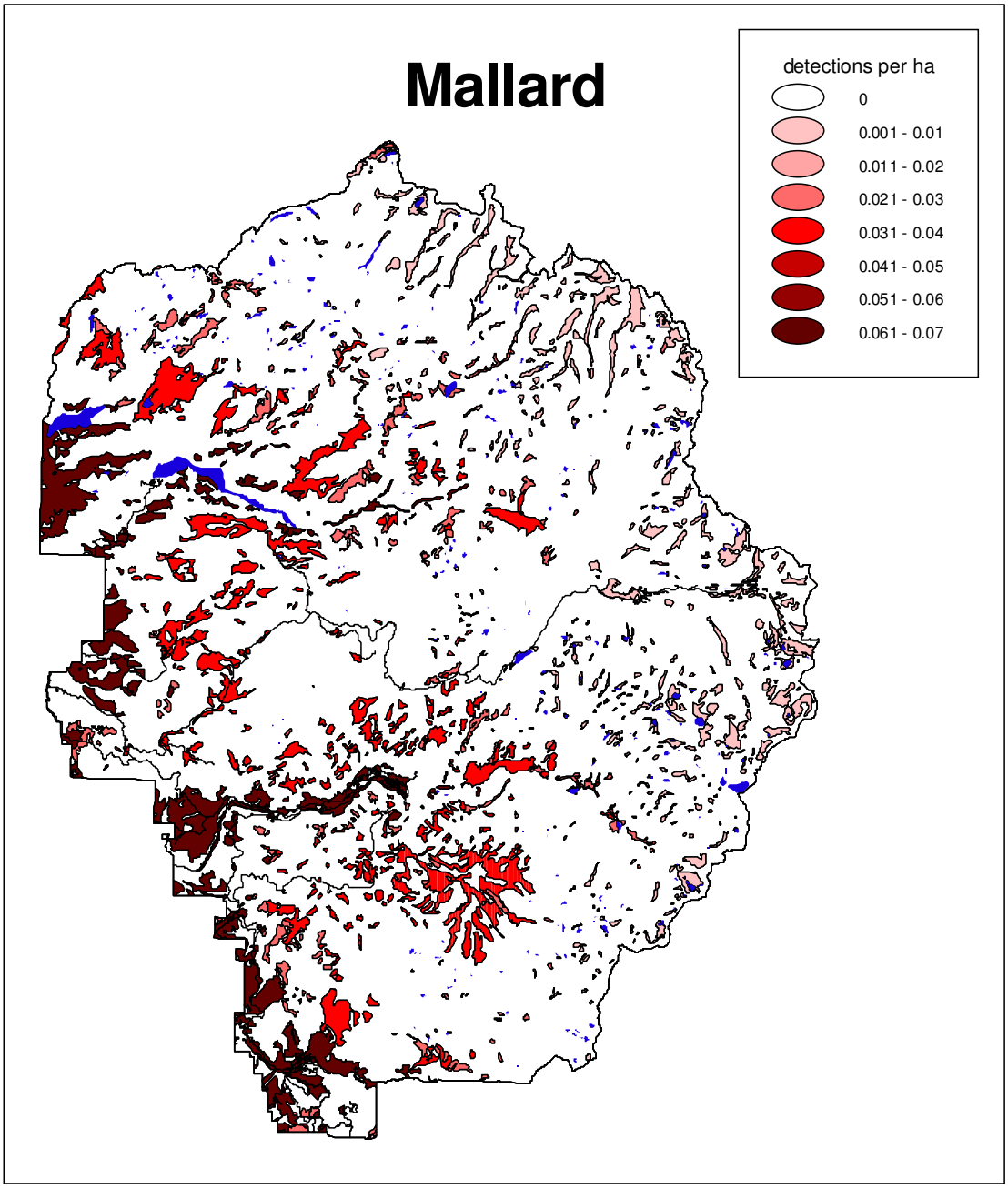

Figure 41. Mallard distribution and relative abundance in the park.

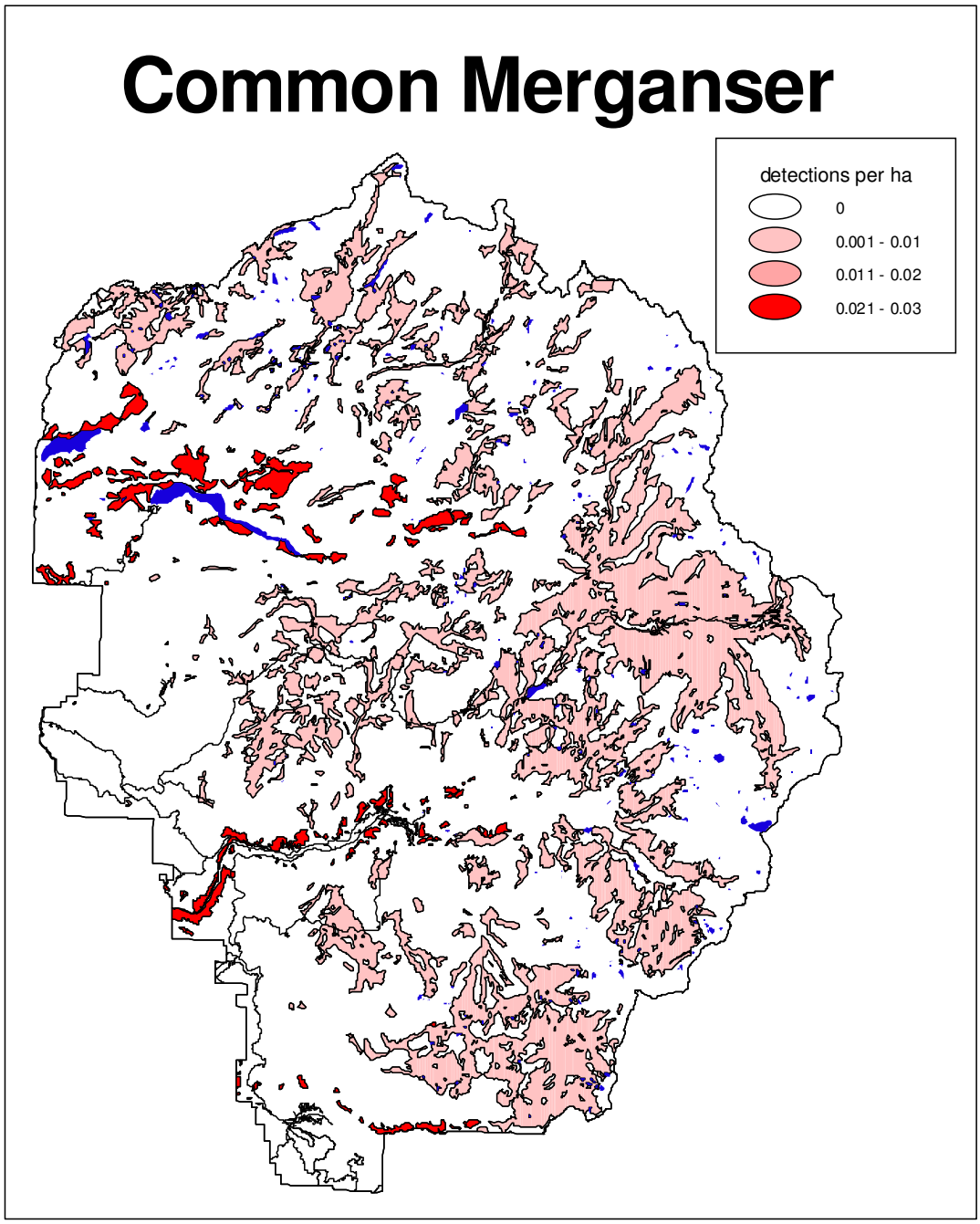

Figure 42. Common Merganser distribution and relatative abundance in the park.

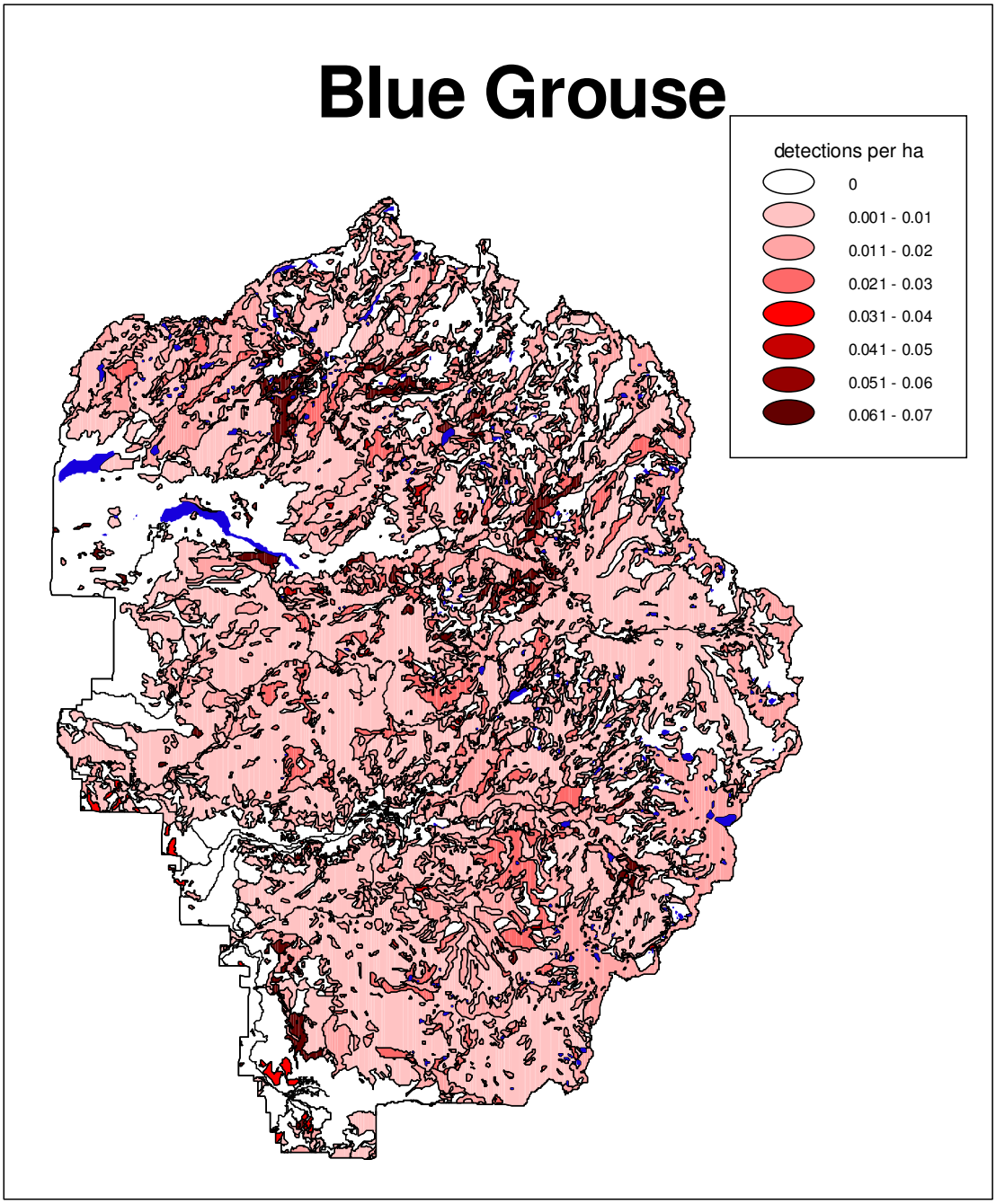

Figure 43. Blue Grouse distribution and relative abundance in the park.

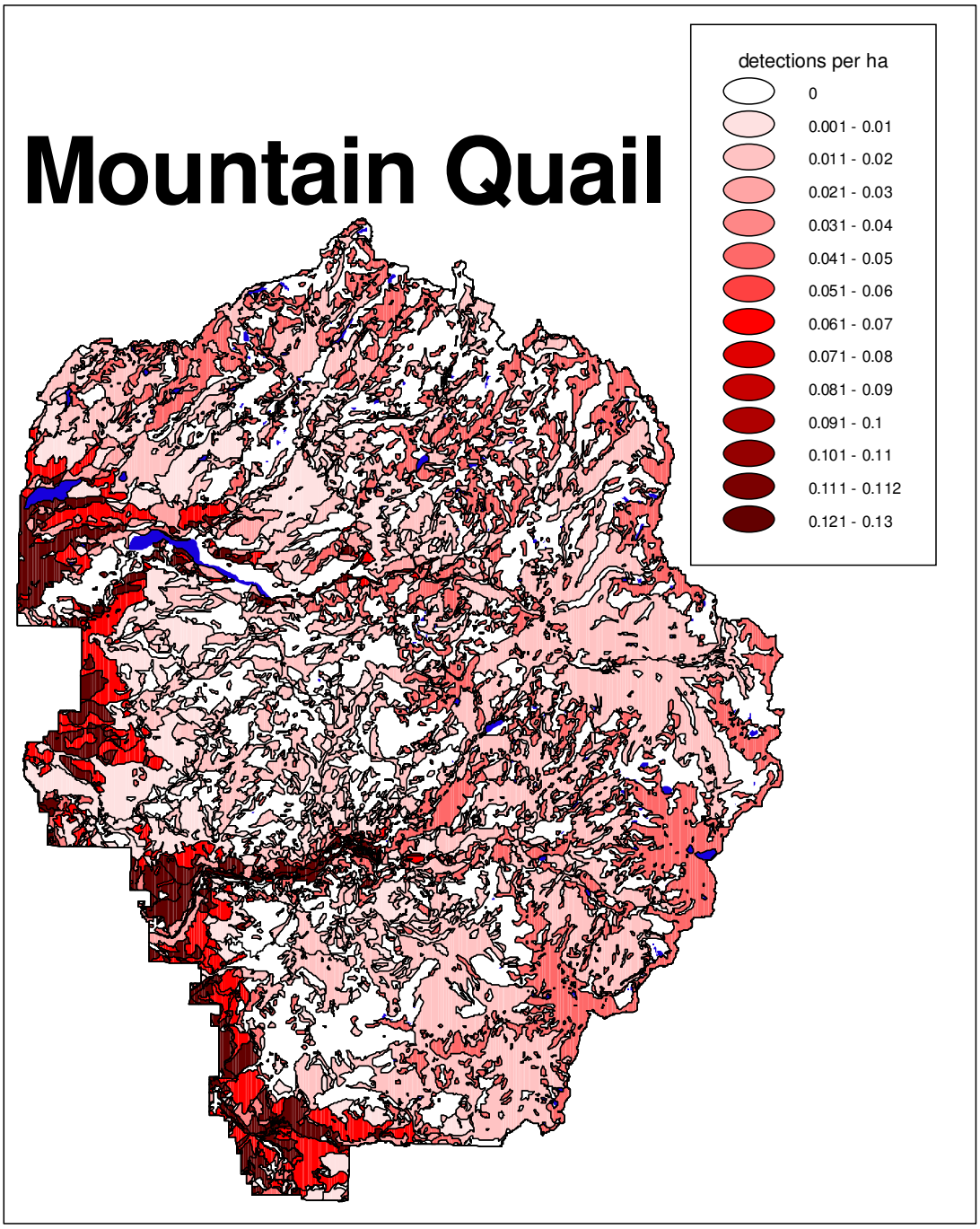

Figure 44. Mountain Quail distribution and relative abundance in the park.

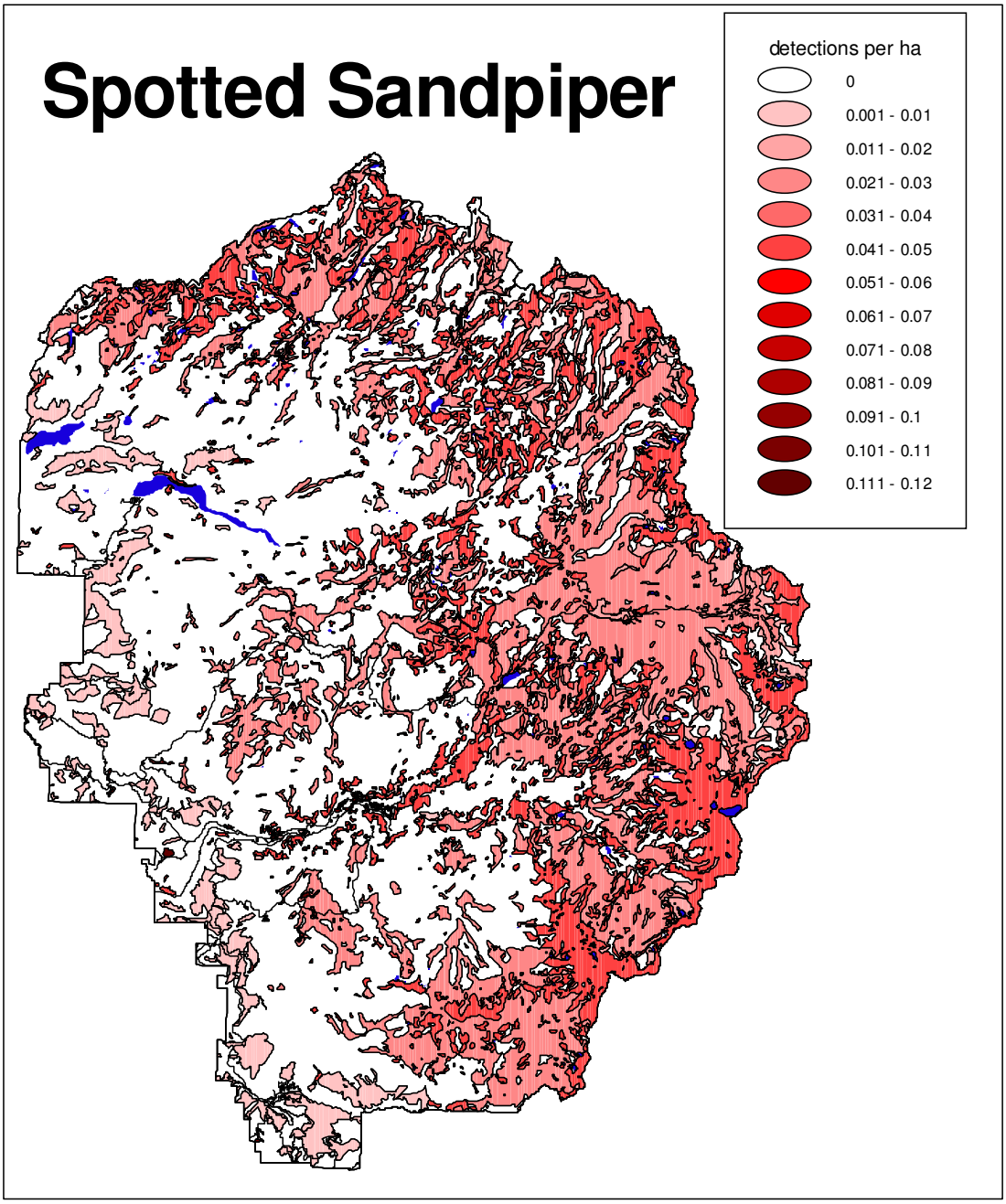

Figure 45. Spotted Sandpiper distribution and relative abundance in the park.

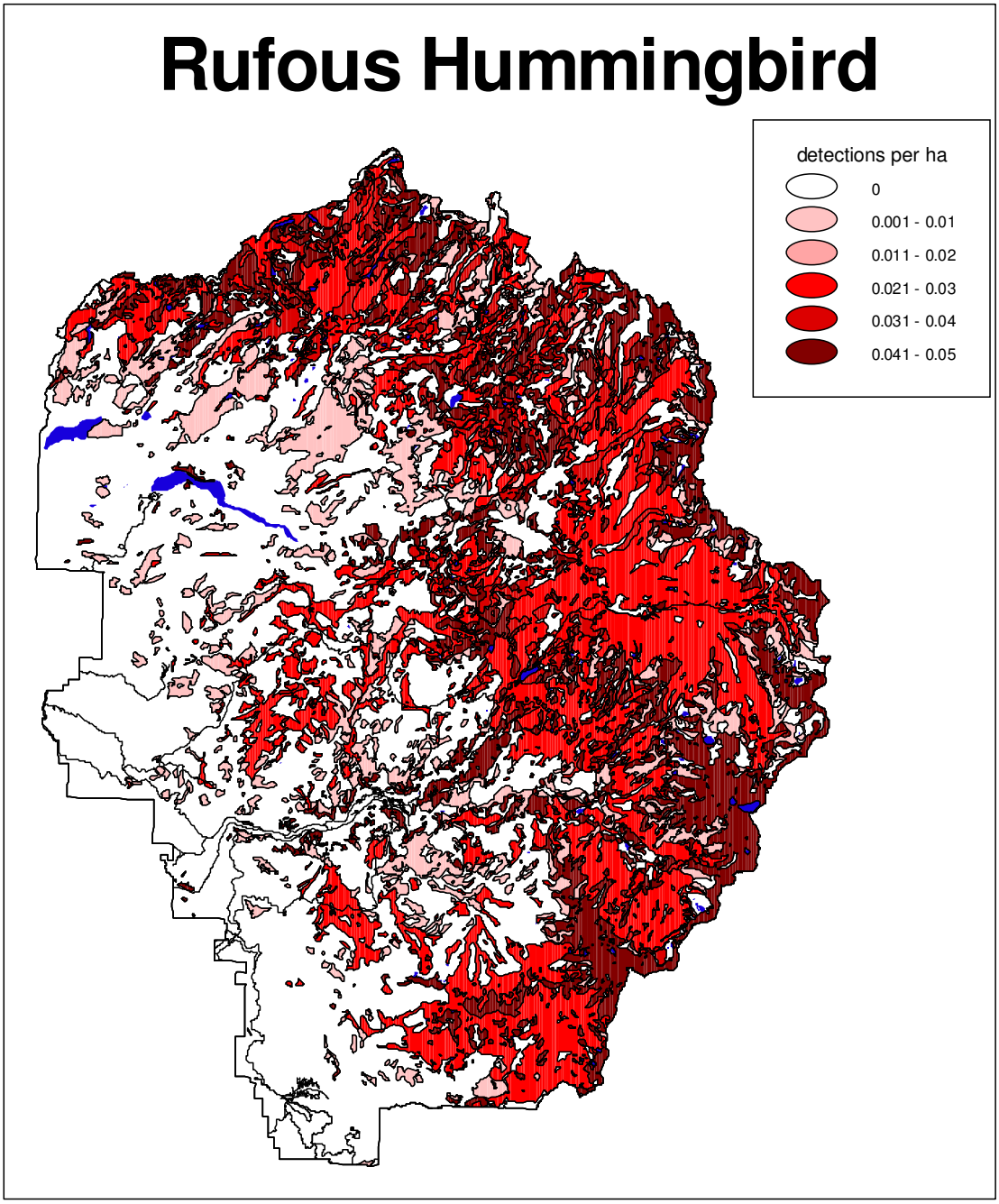

Figure 51. Rufous Hummingbird distribution and relative abundance in the park.

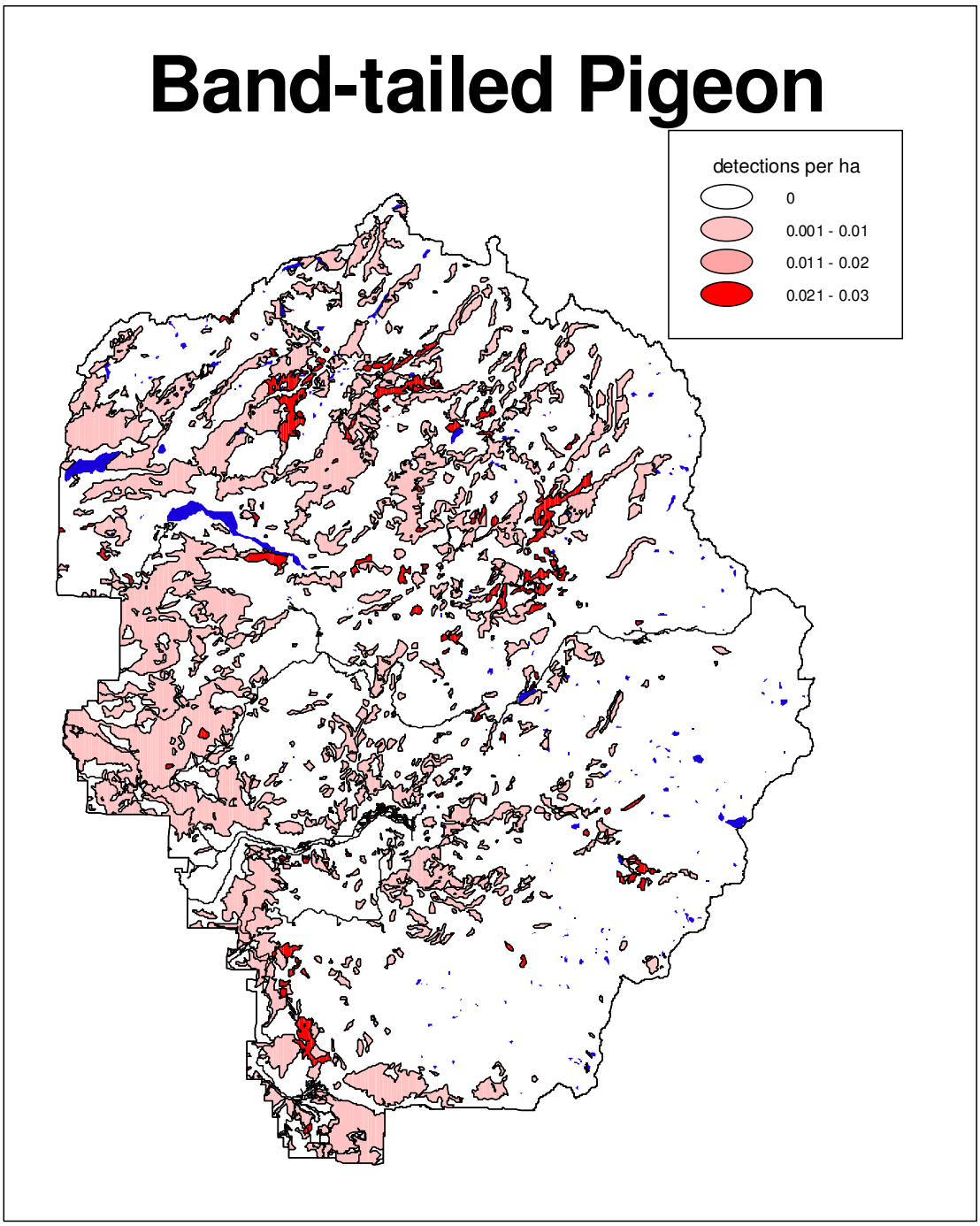

Figure 46. Band-tailed Pigeon distribution and relative abundance in the park.

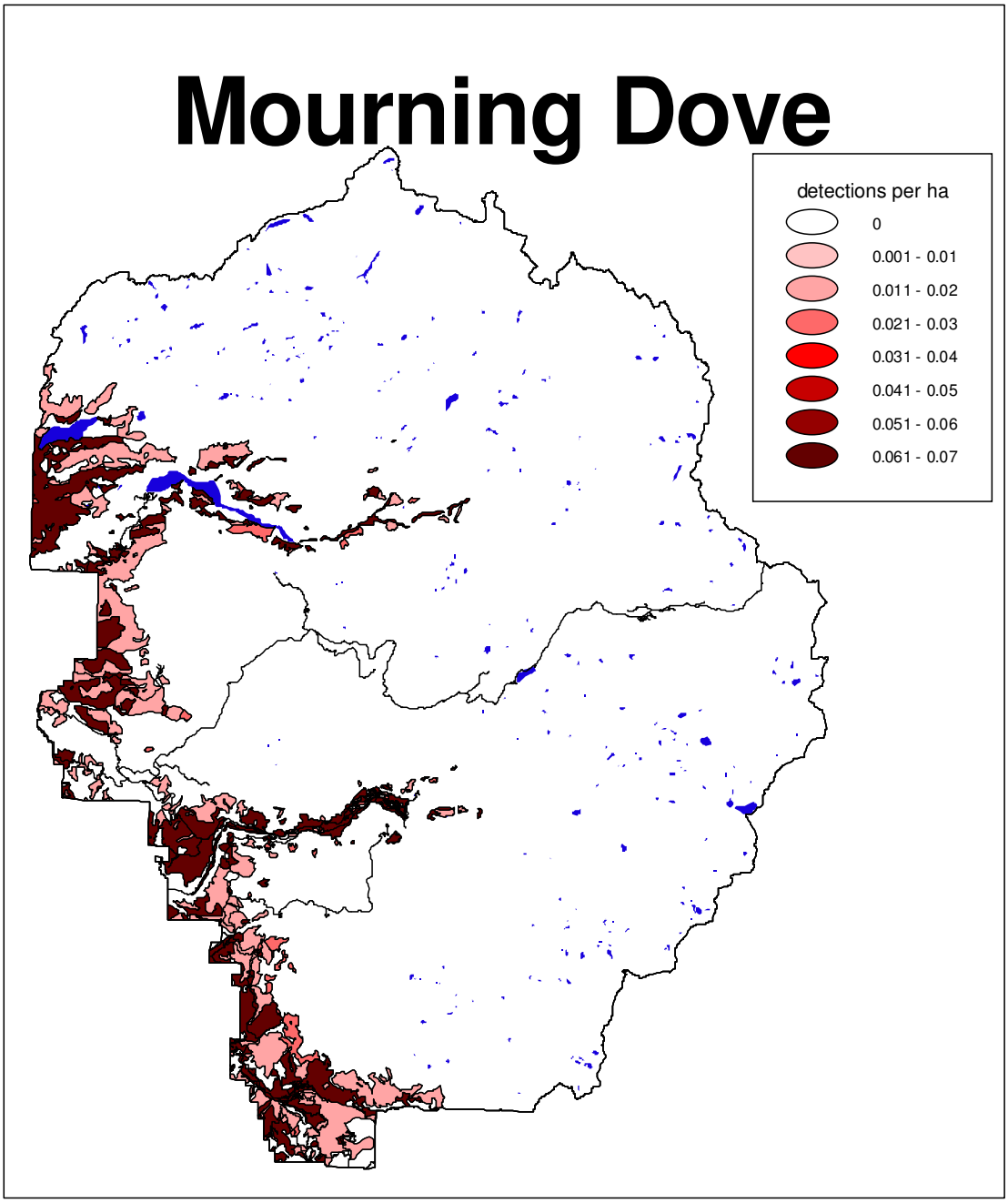

Figure 47. Mourning Dove distribution and relative abundance in the park.

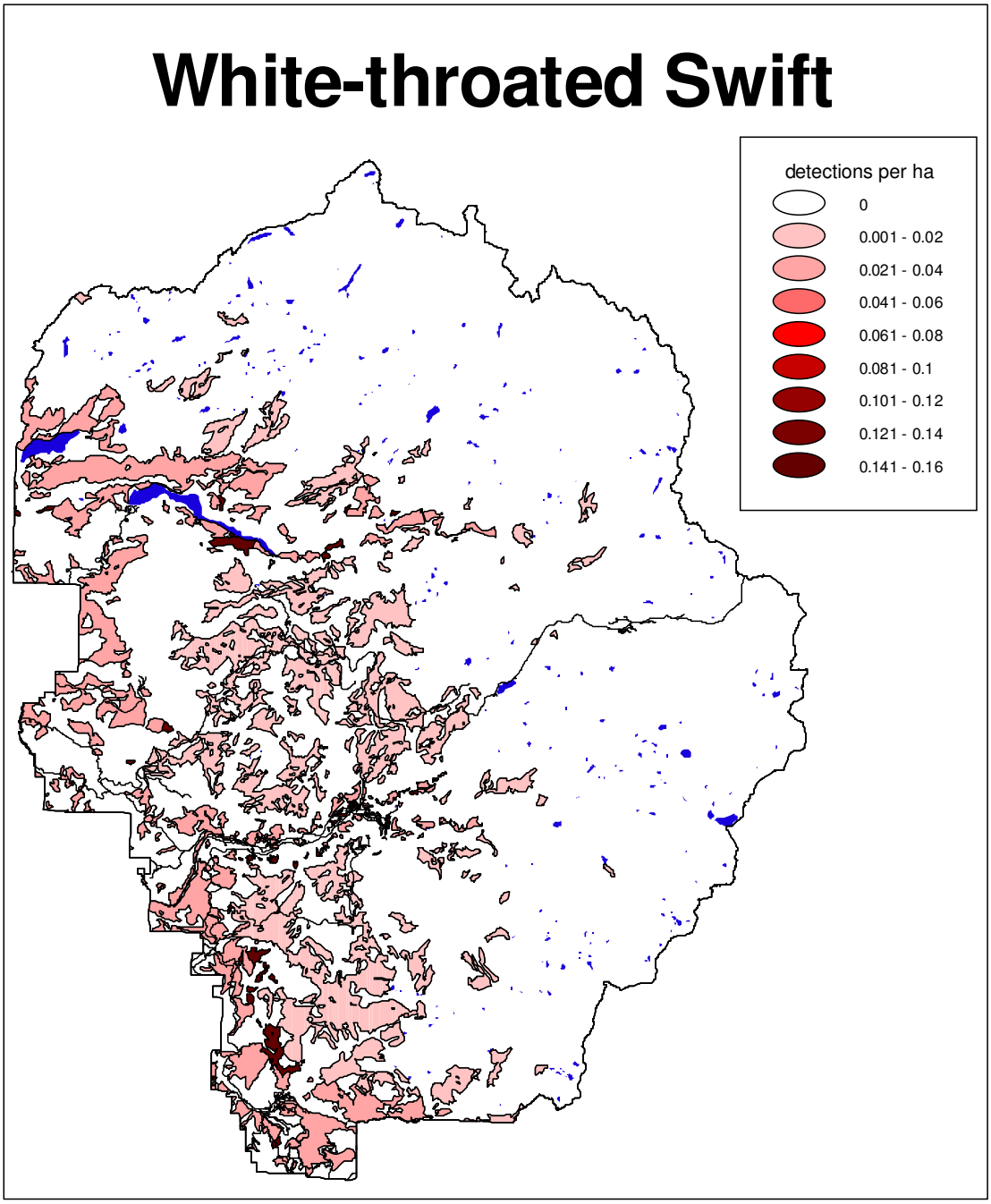

Figure 48. White-throated Swift distribution and abundance in the park.

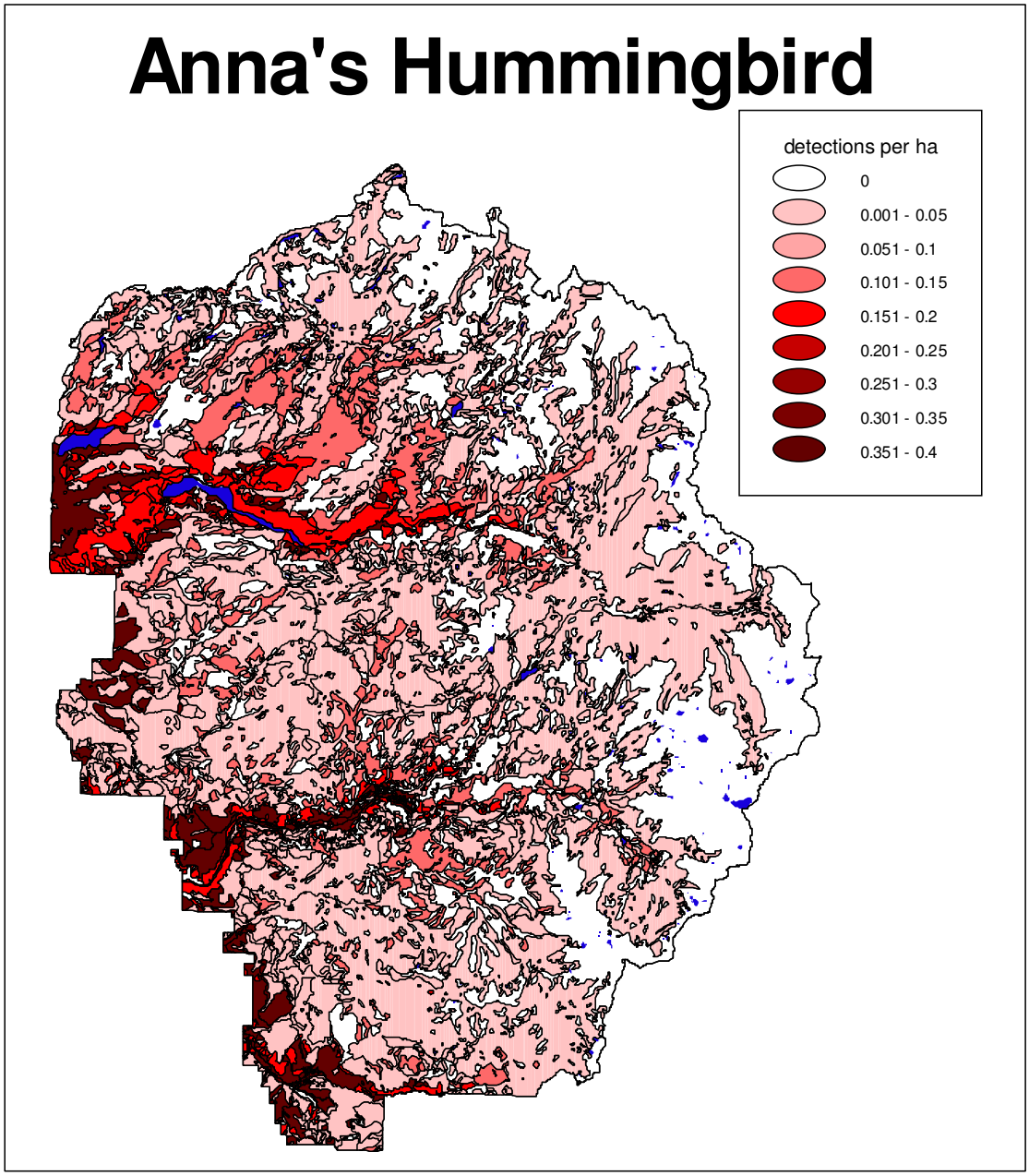

Figure 49. Anna's Hummingbird distriubution and relative abundance in the park.

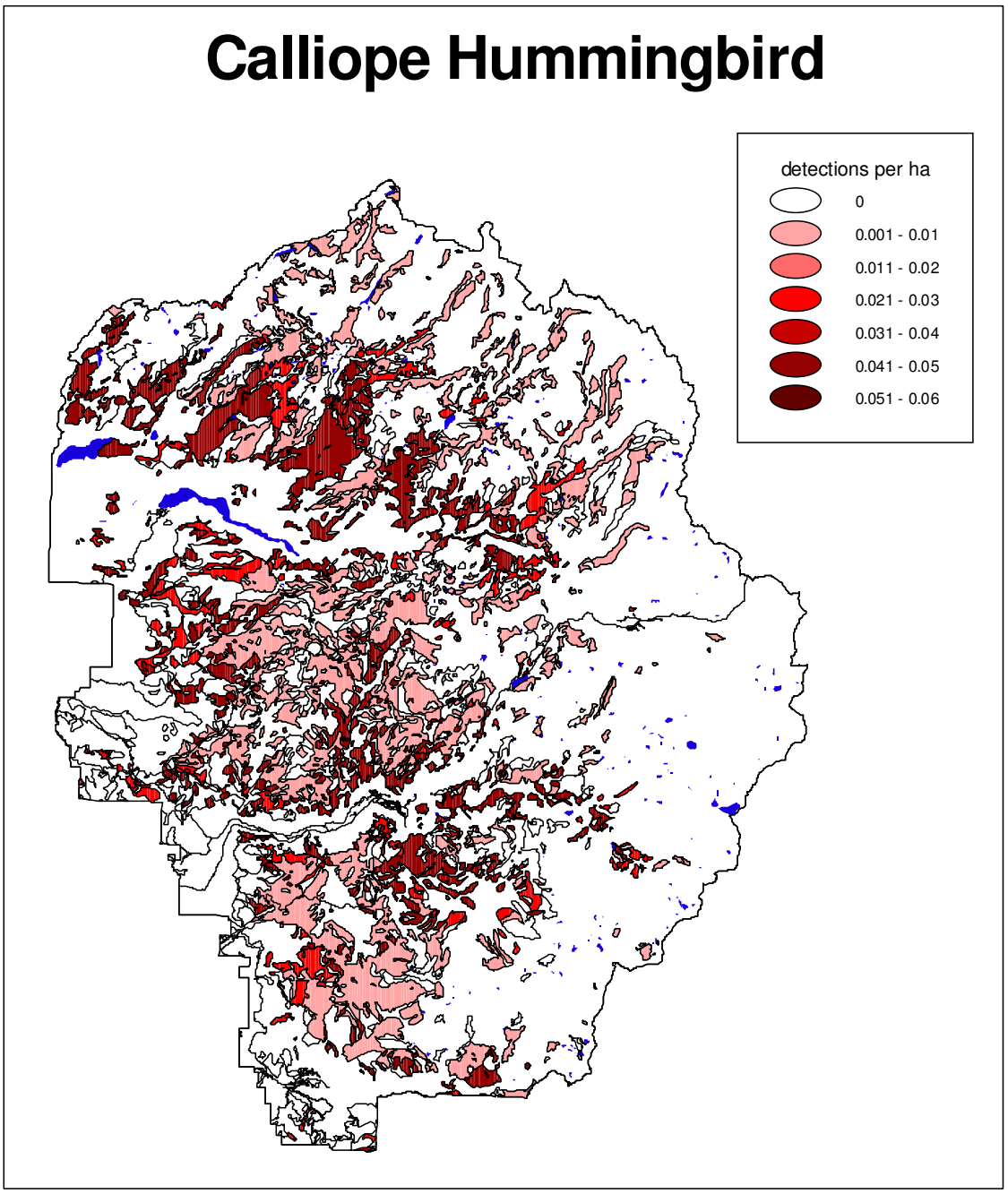

Figure 50. Calliope Hummingbird distribution and relative abundance in the park.

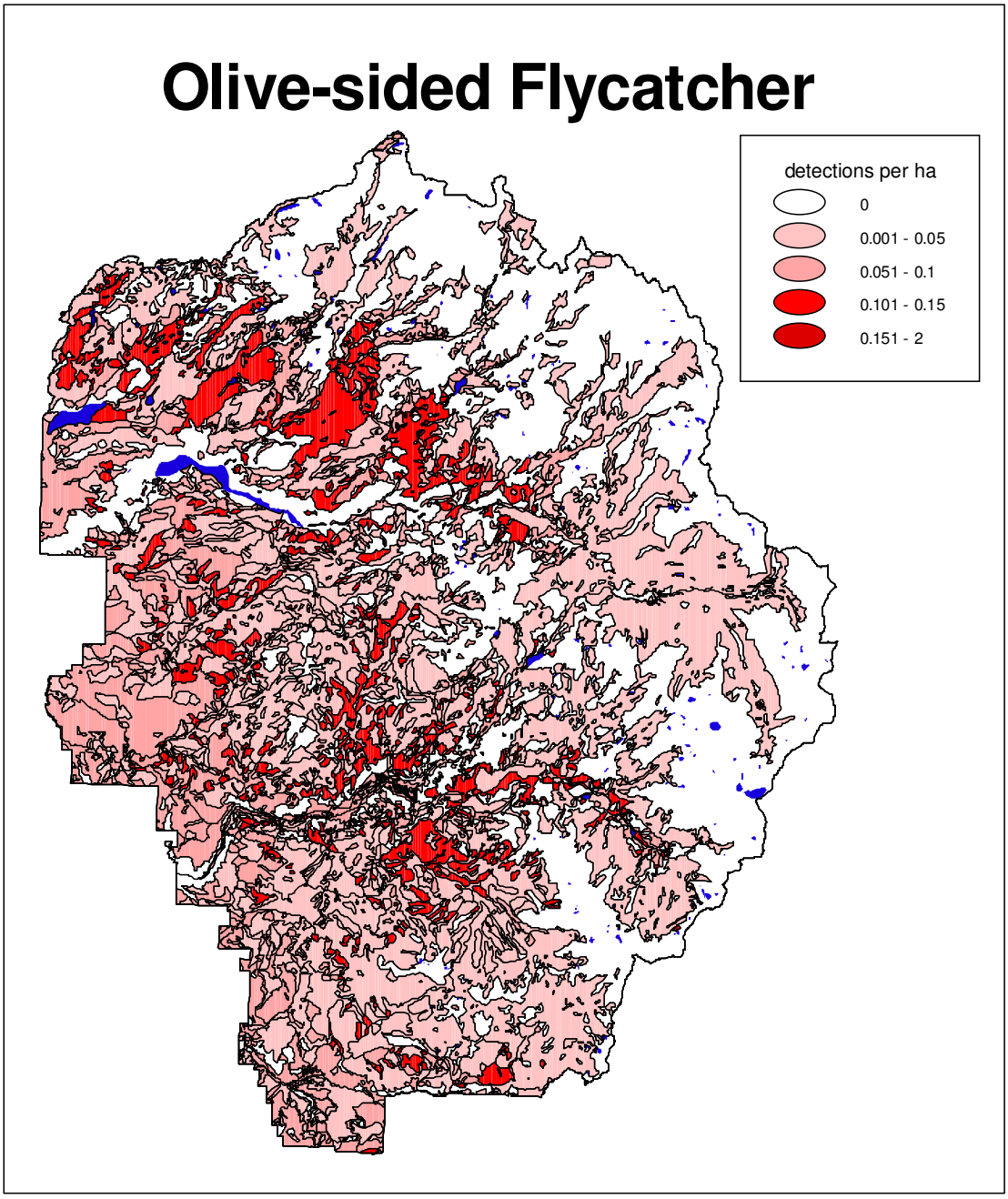

Figure 61. Olive-sided Flycatcher distribution and relative abundance in the park.

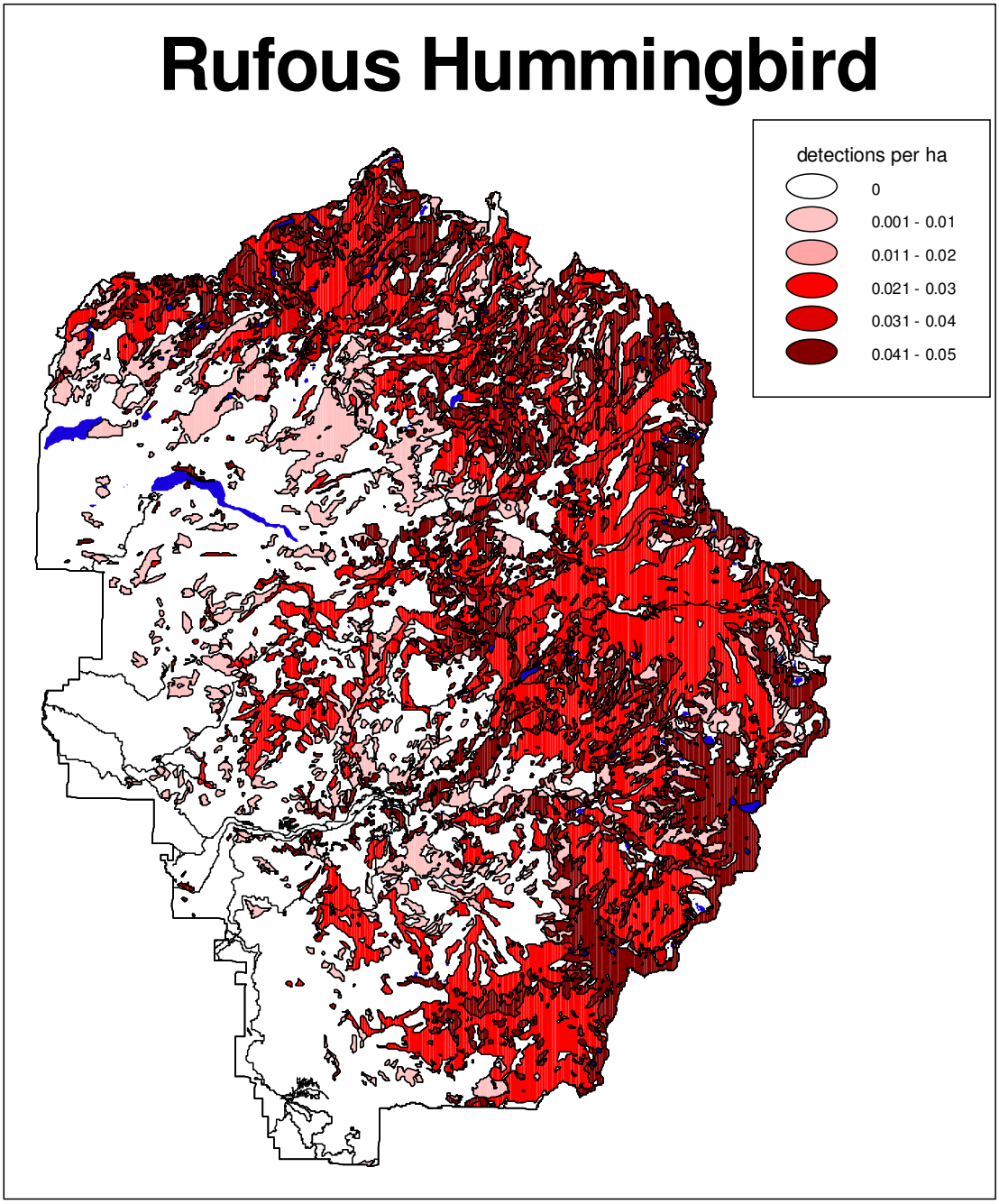

Figure 51. Rufous Hummingbird distribution and relative abundance in the park.

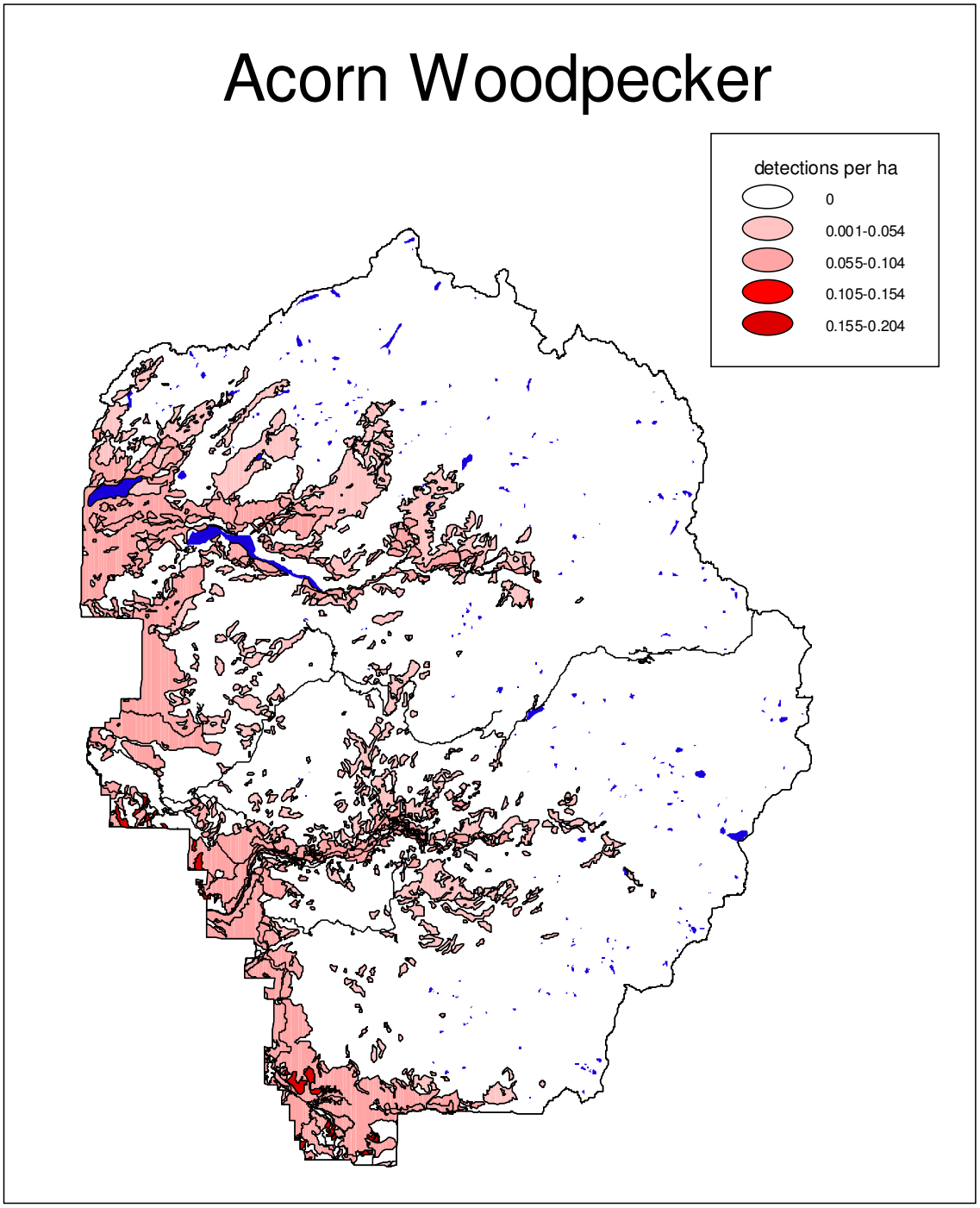

Figure 52. Acorn Woodpecker distribution and relative abundance in the park.

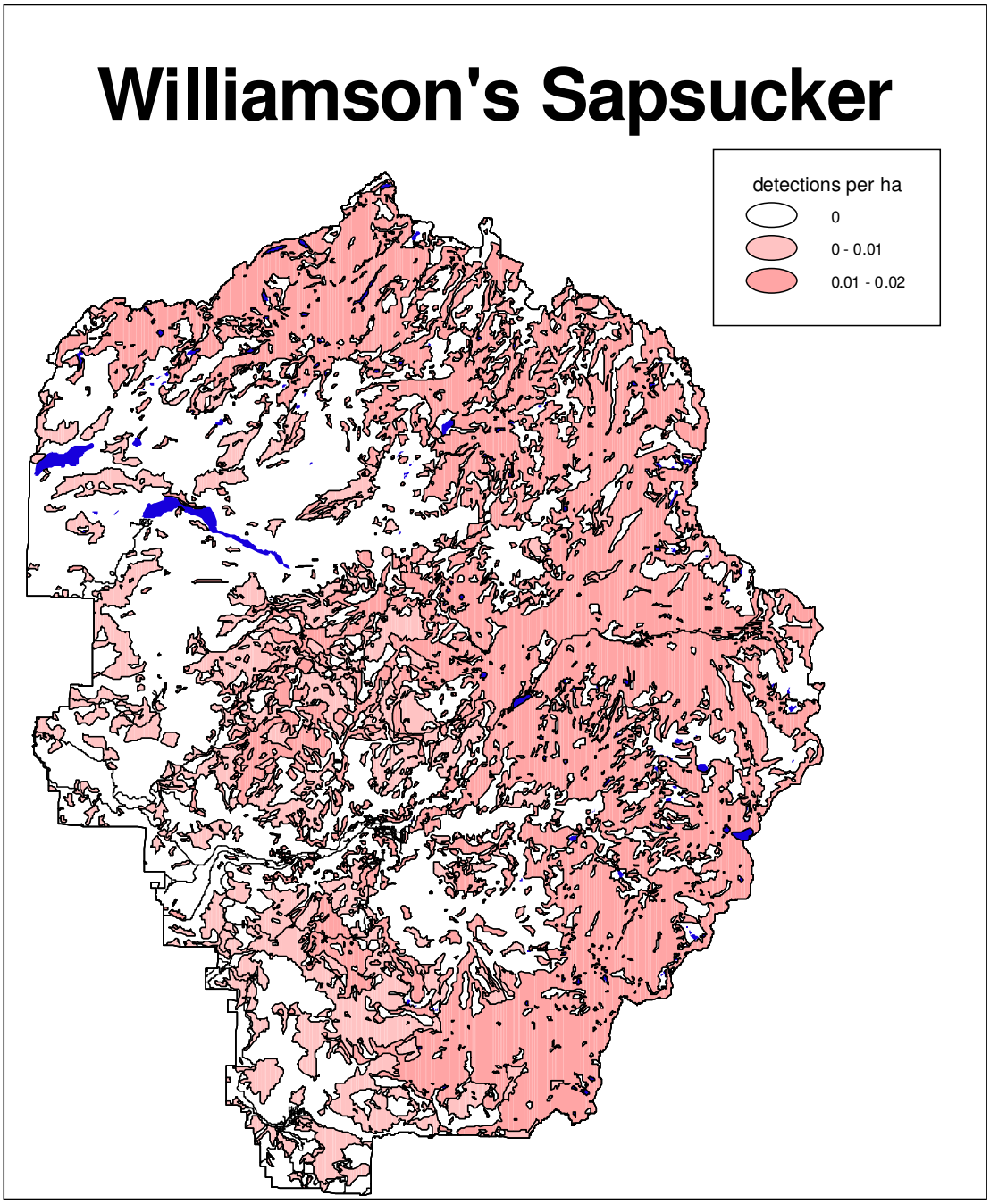

Figure 53. Williamson's Sapsucker distribution and relative abundance in the park.

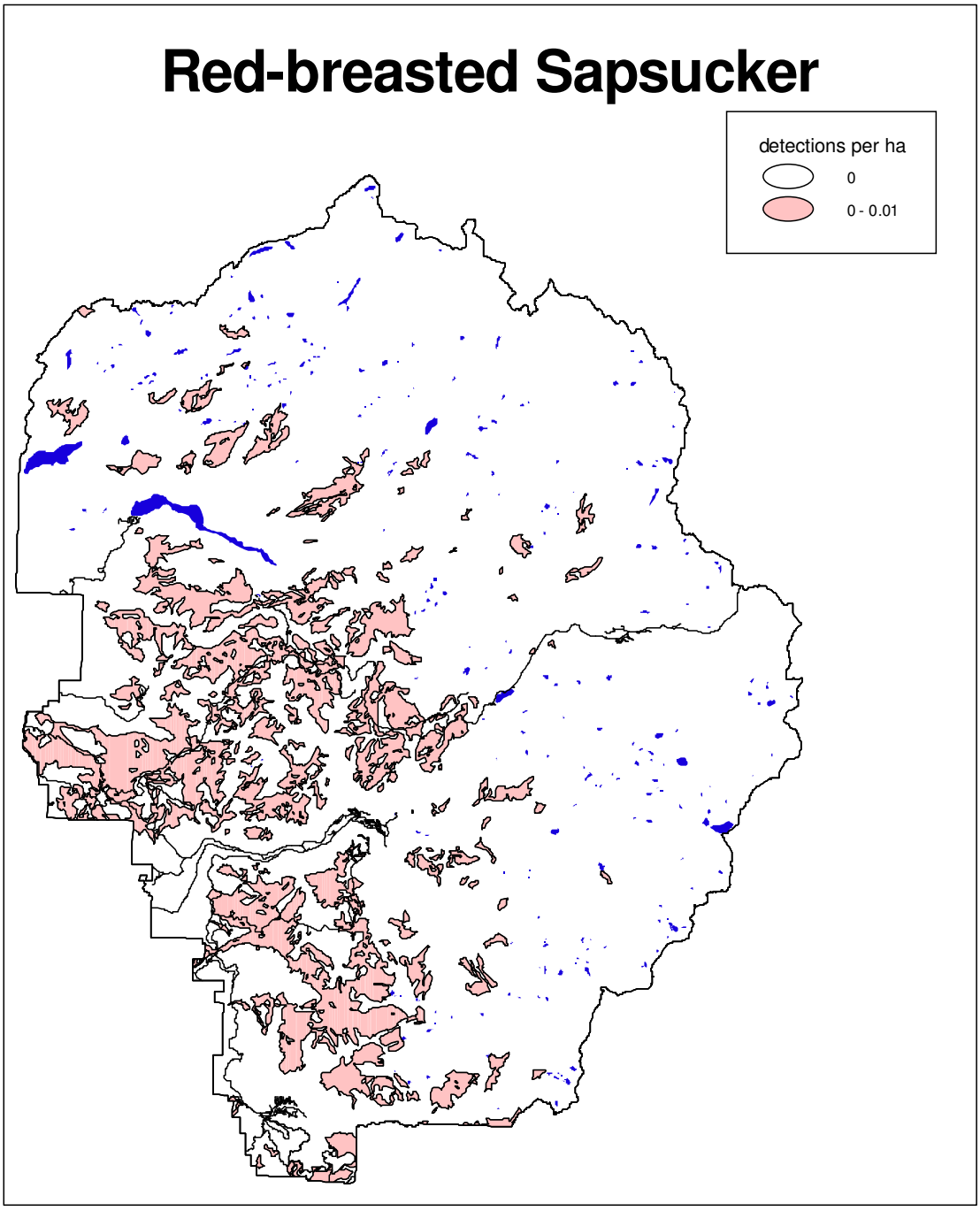

Figure 54. Red-breasted Sapsucker distribution and relative abundance in the park.

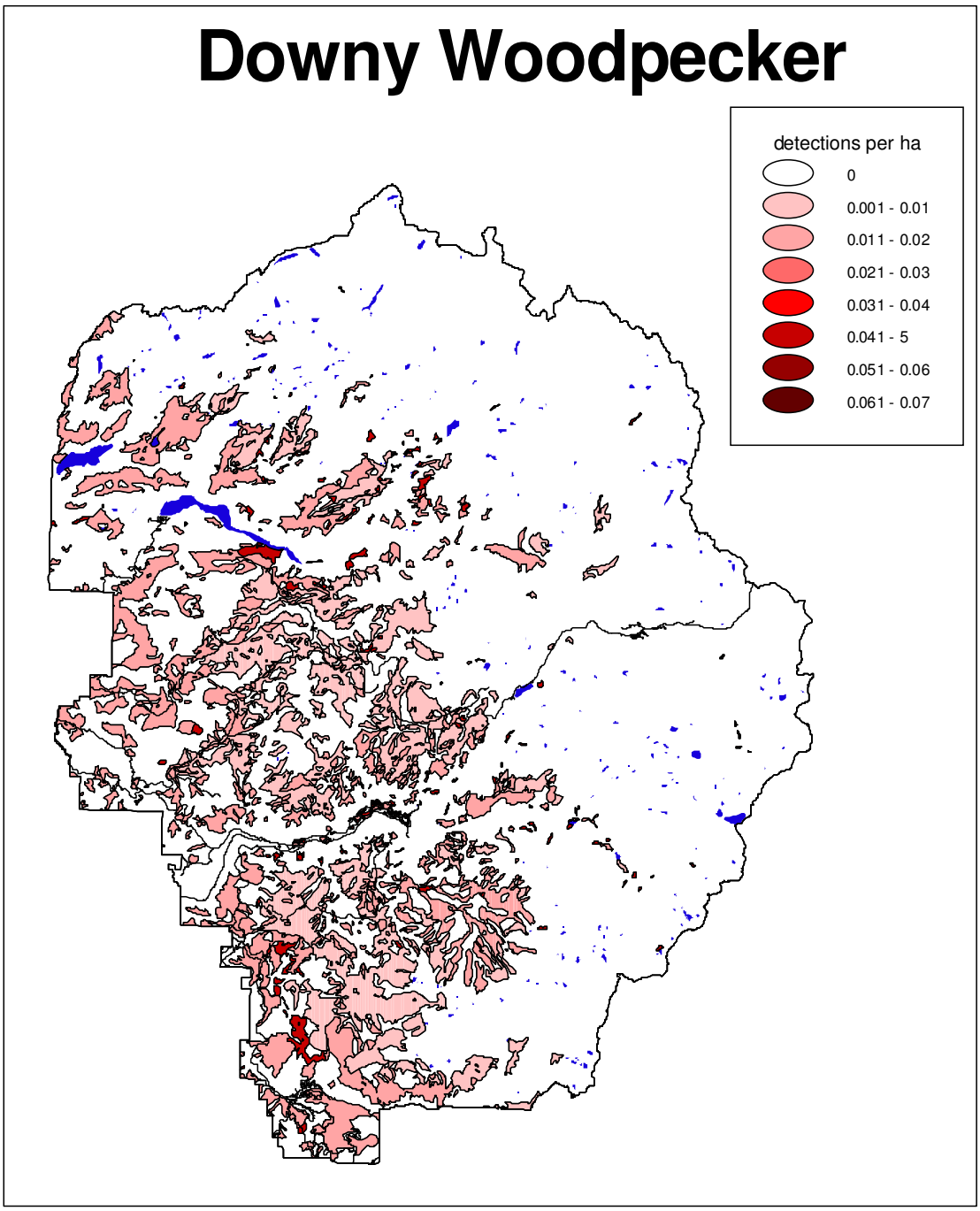

Figure 55. Downy Woodpecker distribution and relative abundance in the park.

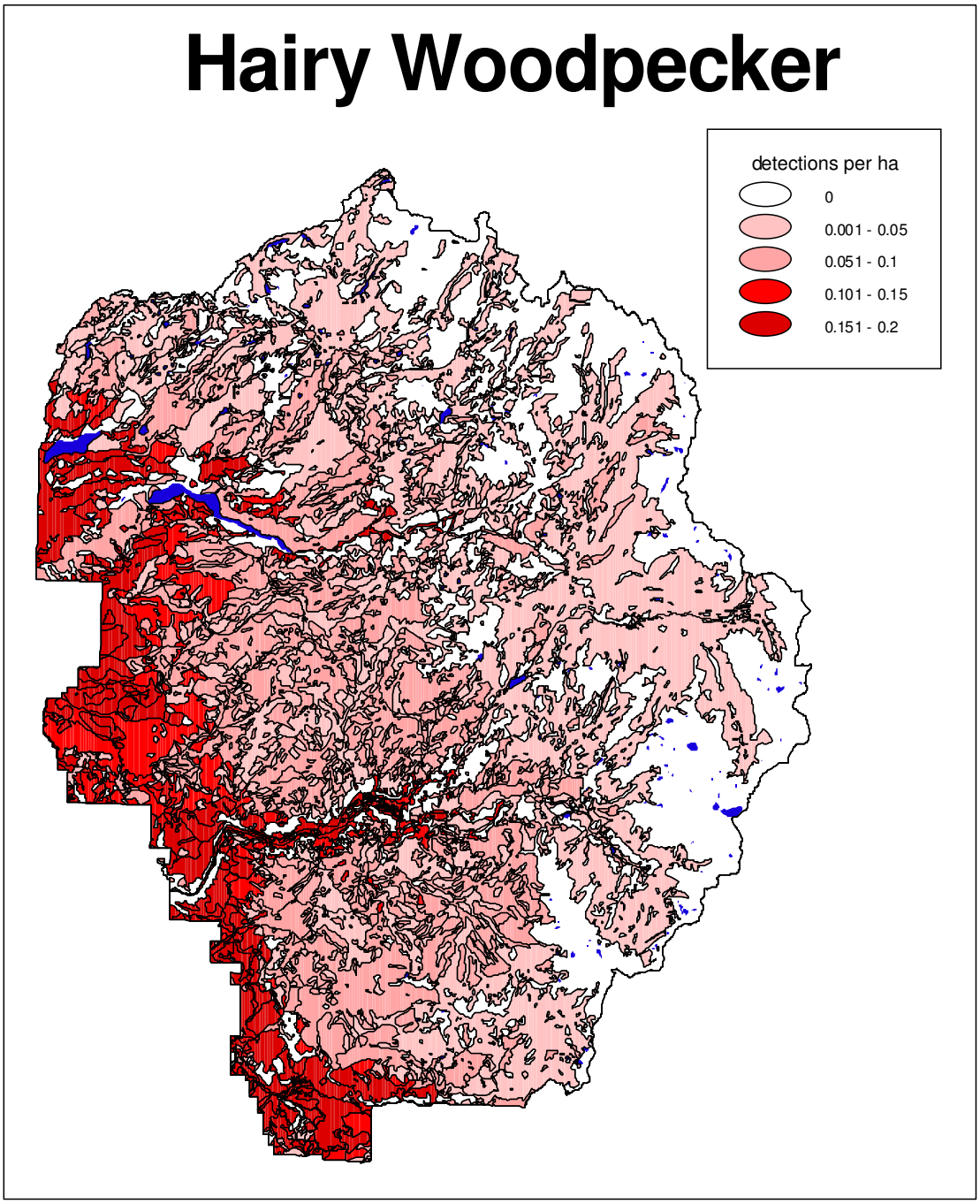

Figure 56. Hairy Woodpecker distribution and relative abundance in the park.

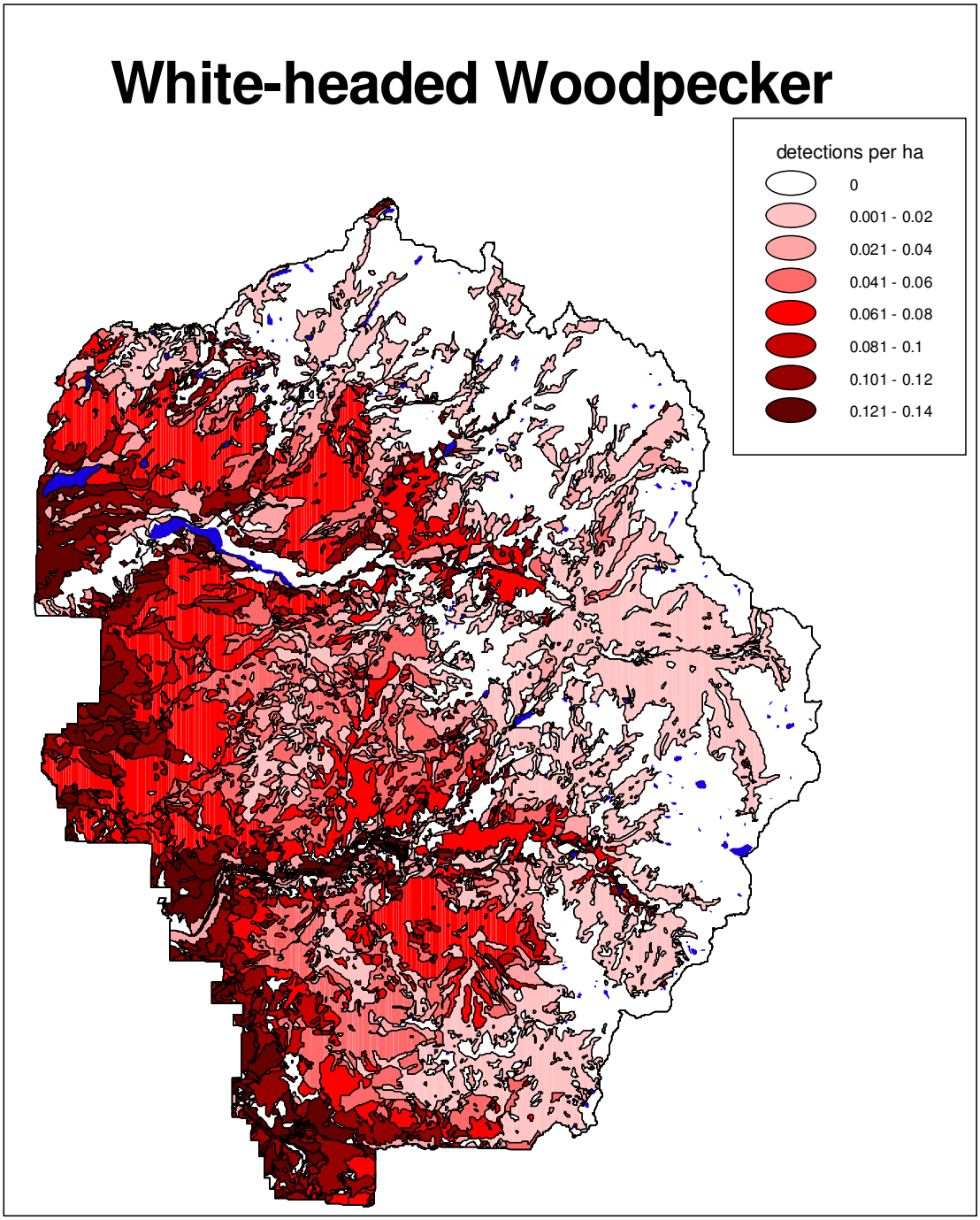

Figure 57. White-headed Woodpecker distribution and relative abundance in the park.

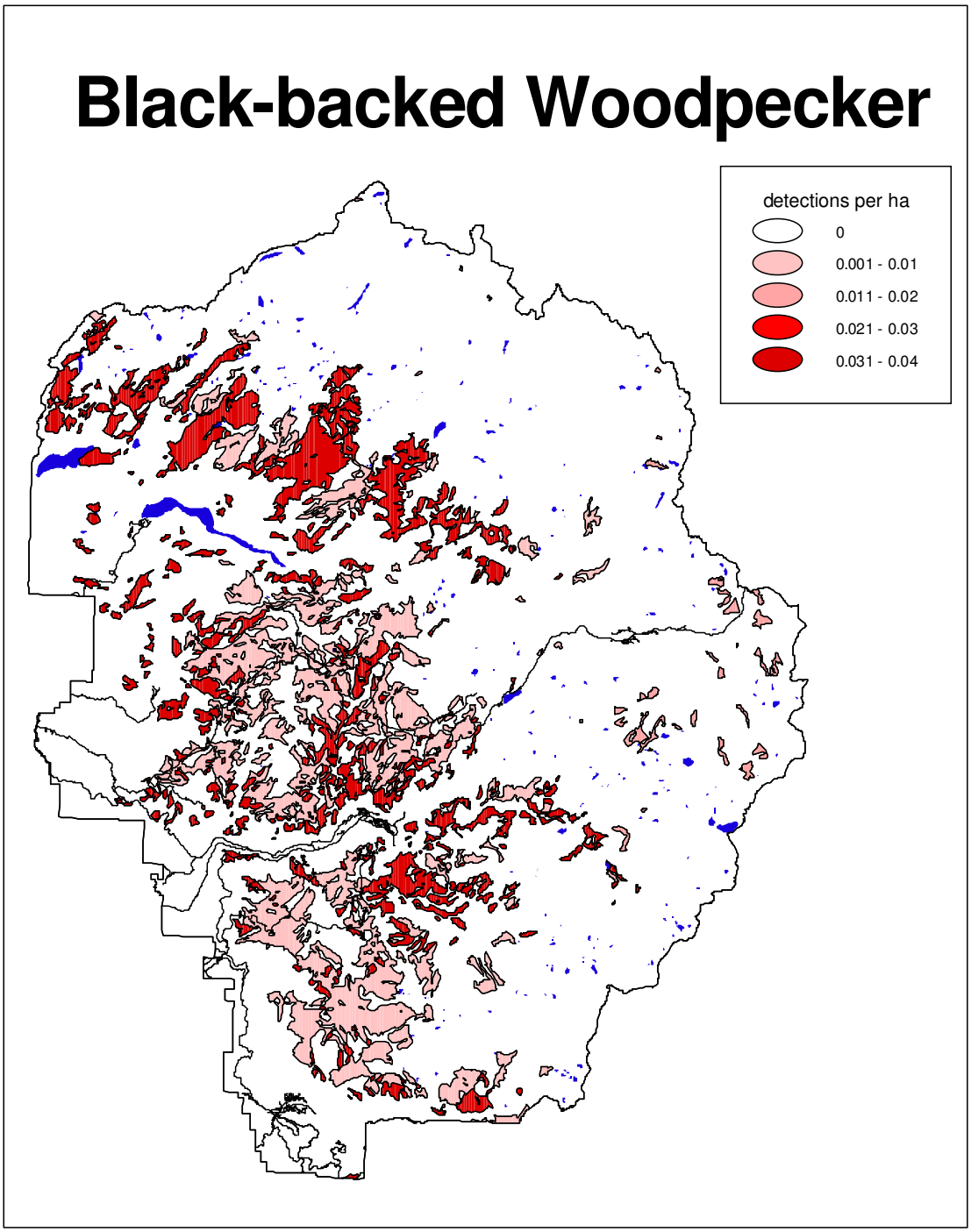

Figure 58. Black-backed Woodpecer distribution and relative abundance in the park.

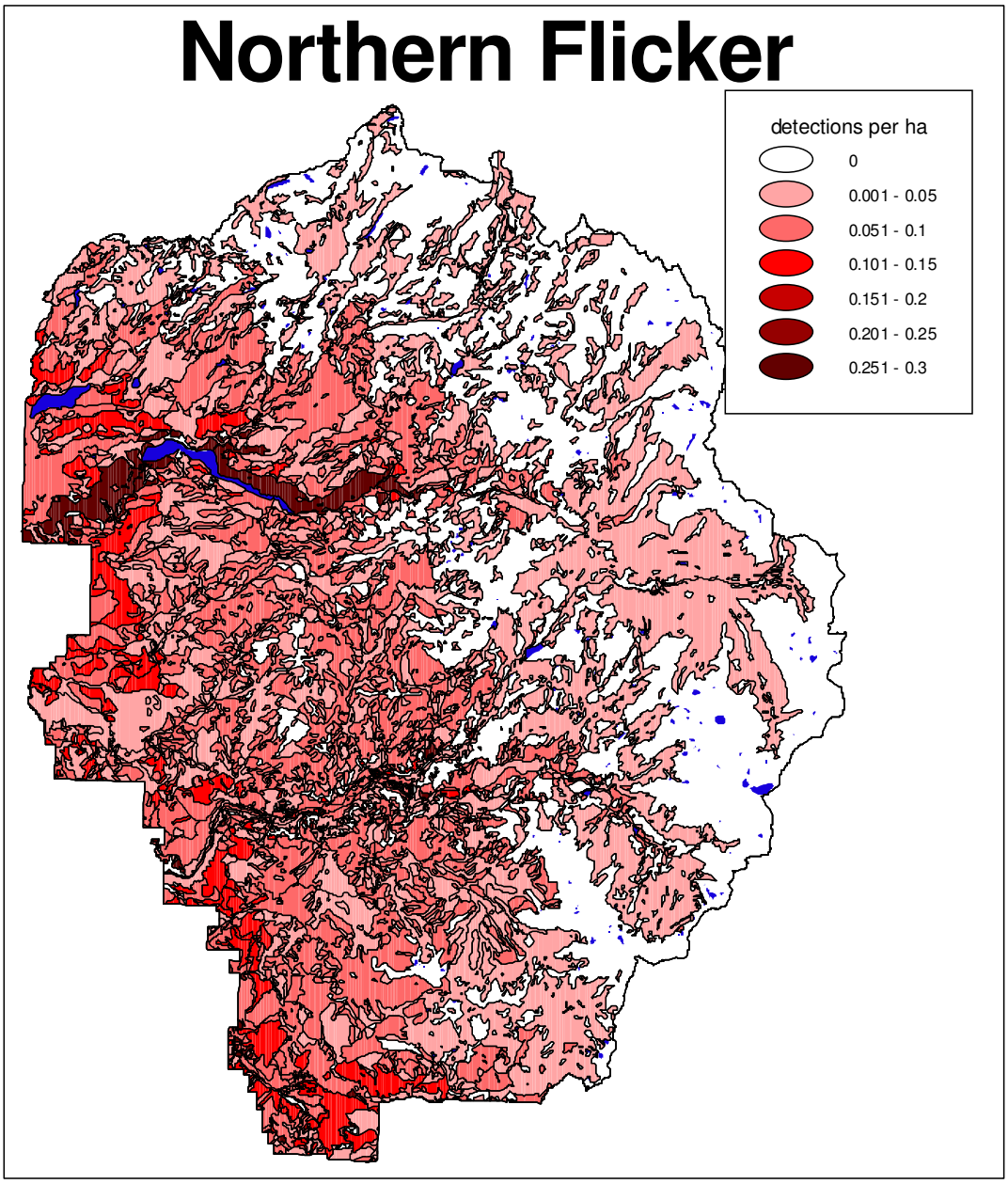

Figure 59. Northern Flicker distribution and relative abundance in the park.

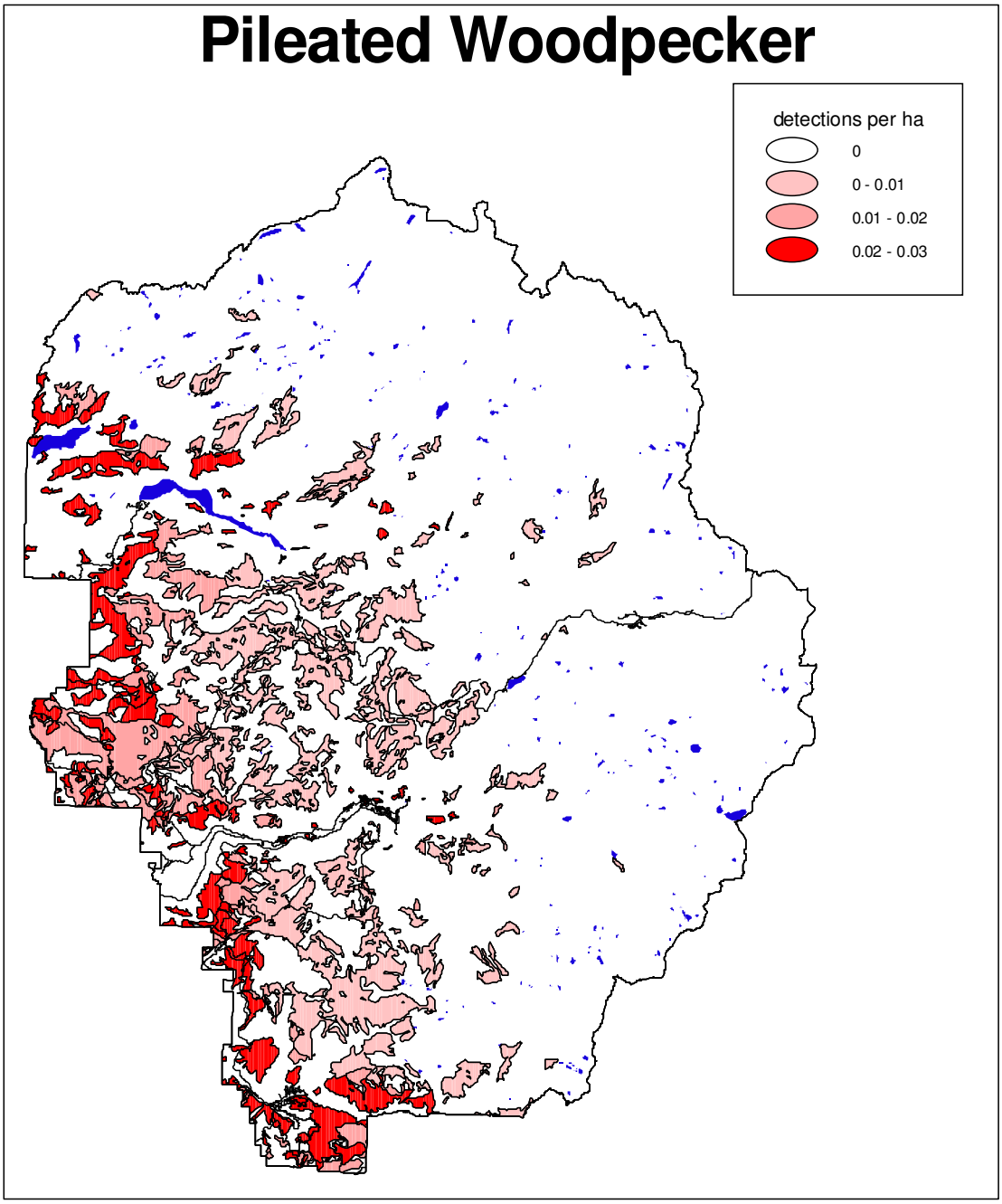

Figure 60. Pileated Woodpecker distribution and relative abunance in the park.

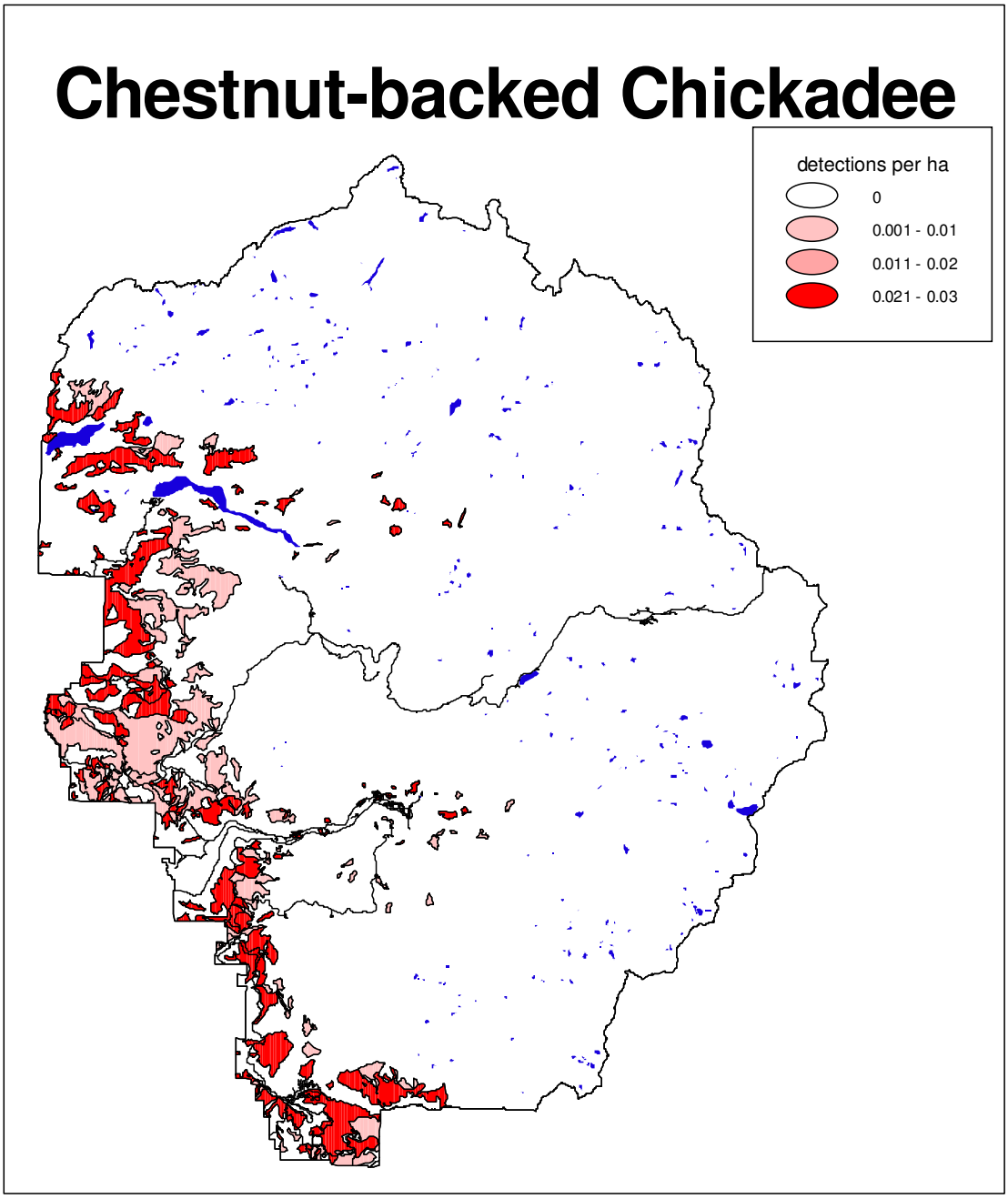

Figure 76. Chestnut-backed Chickadee distribution and relative abundance in the park.

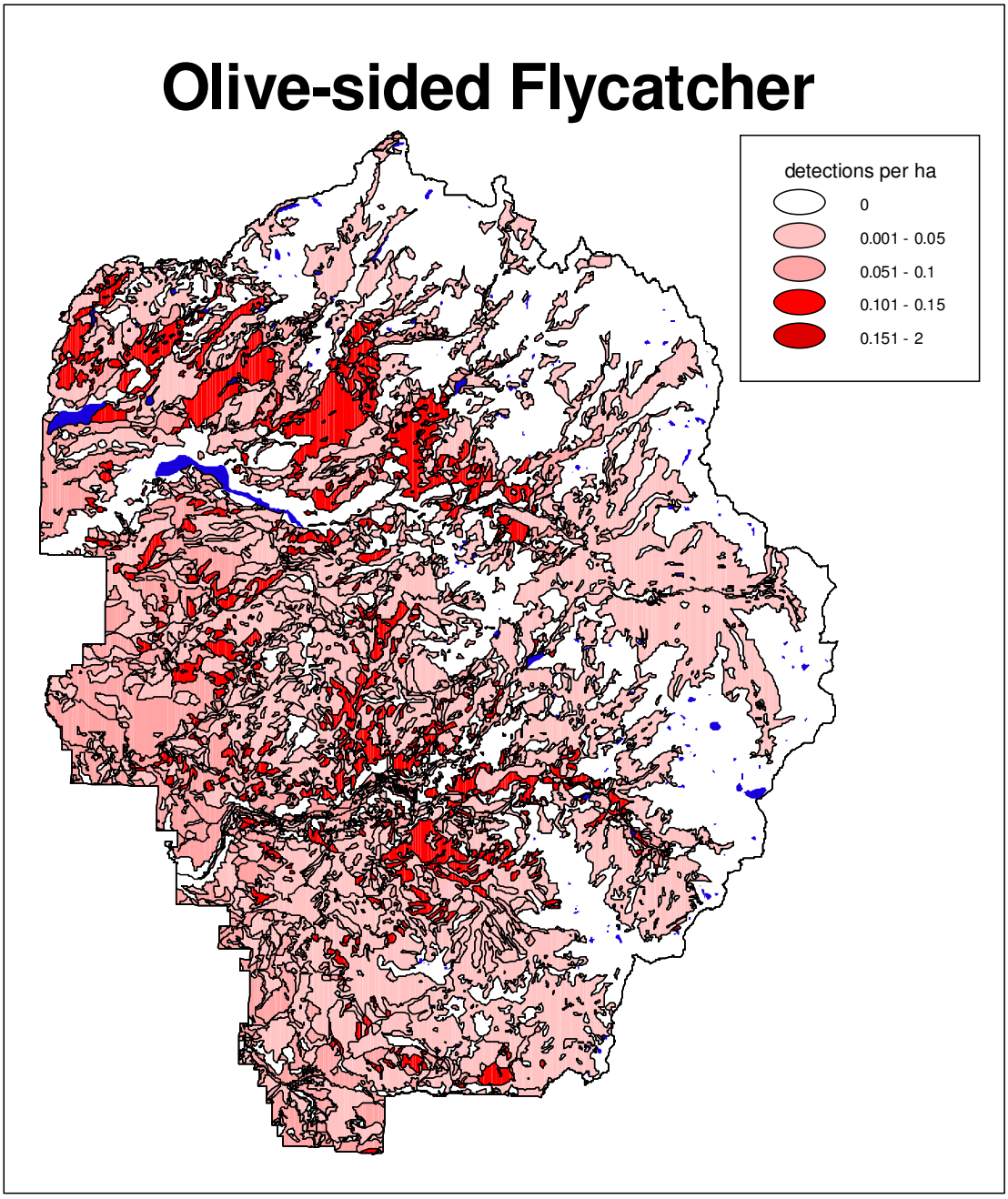

Figure 61. Olive-sided Flycatcher distribution and relative abundance in the park.

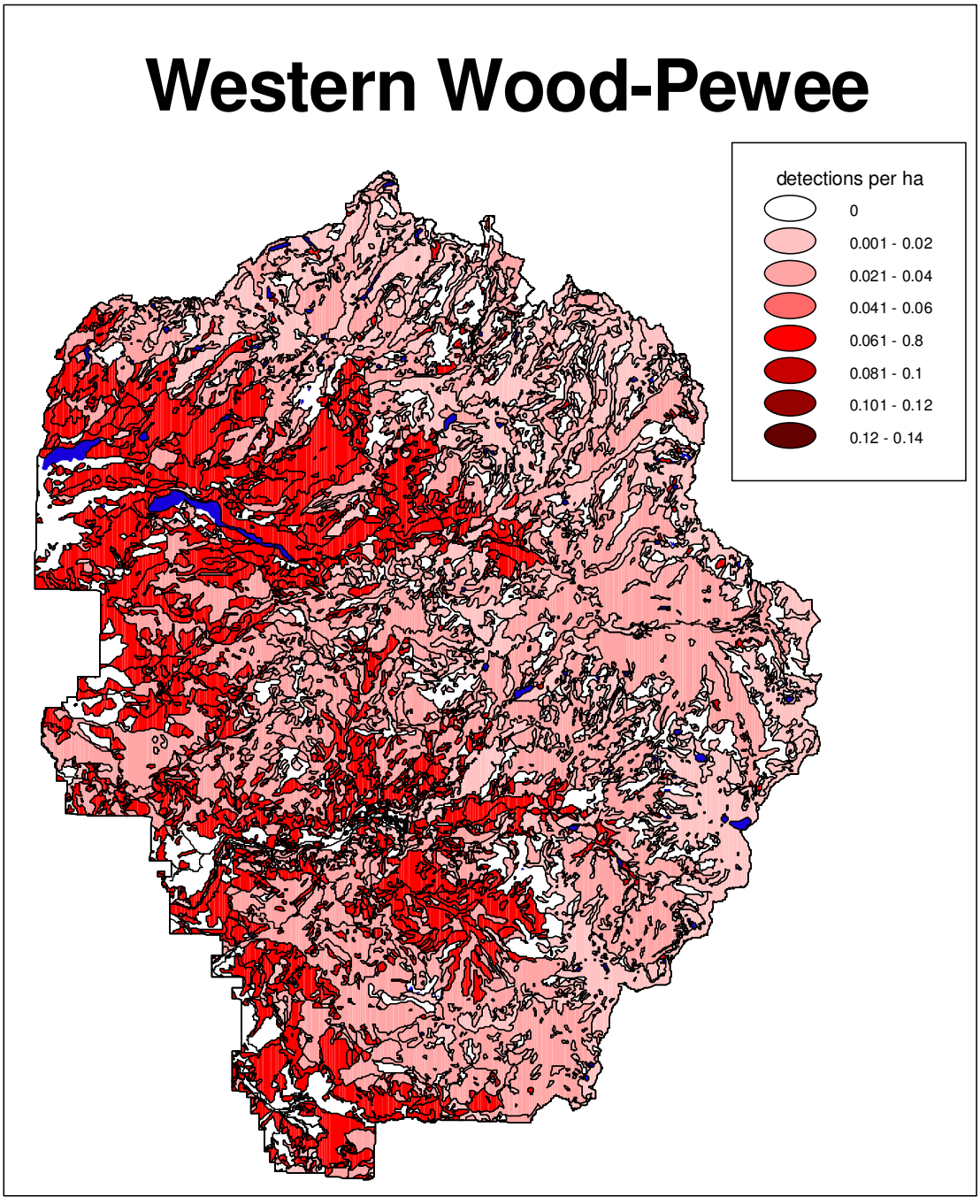

Figure 62. Western Wood-Pewee distribution and relative abundance in the park.

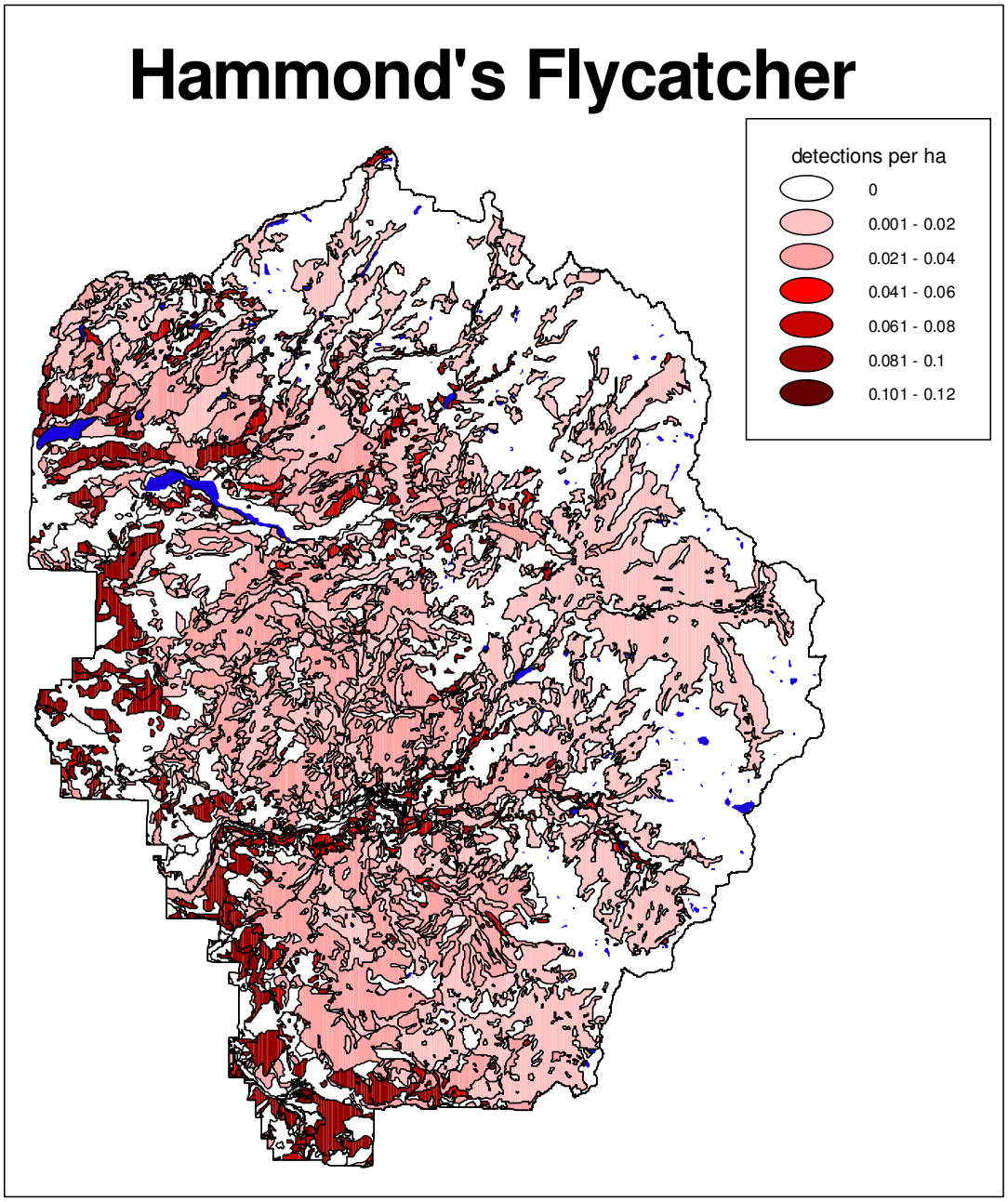

Figure 63. Hammond's Flycatcher distribution and relative abundance in the park.

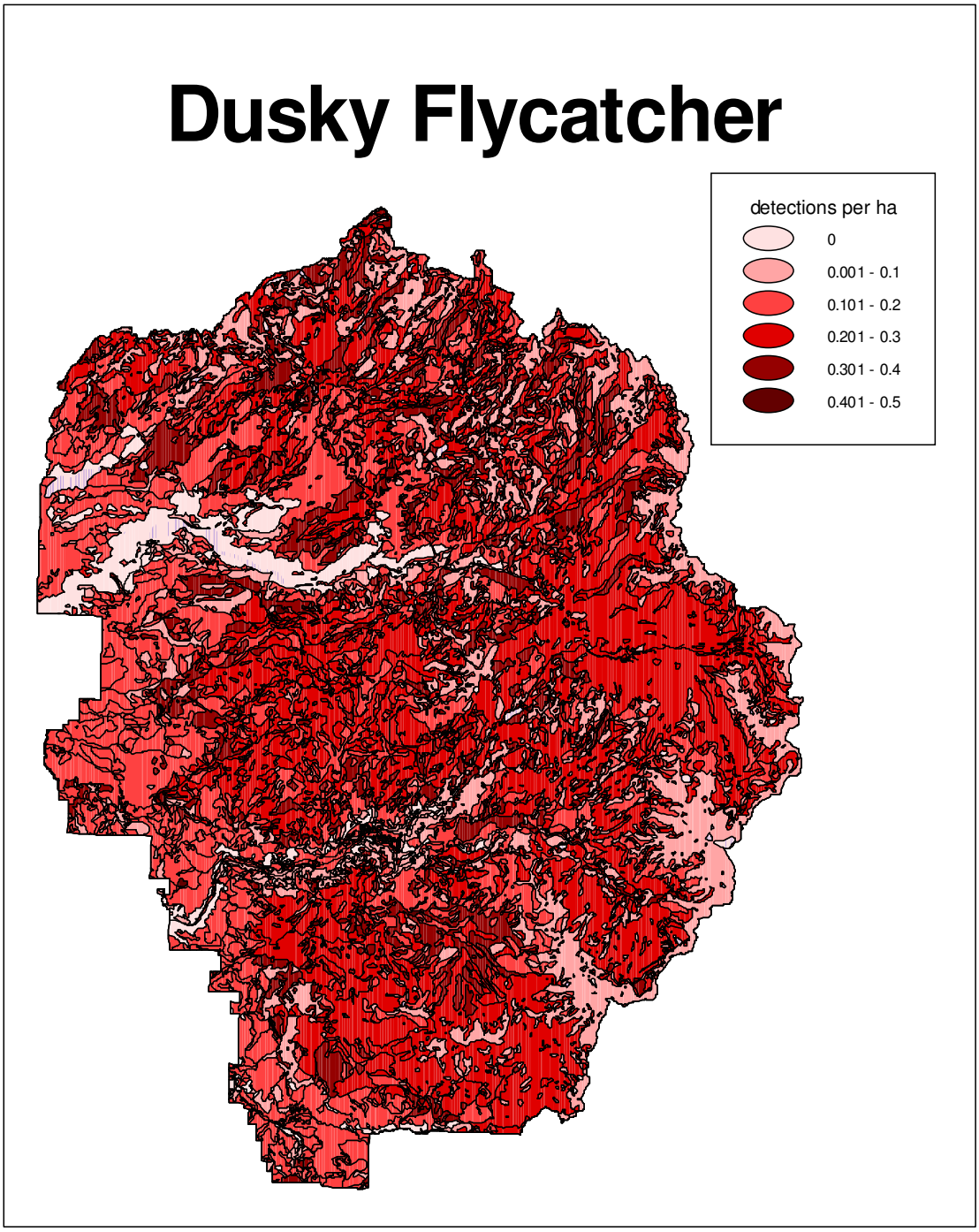

Figure 64. Dusky Flytatcher distribution and relative abundance in the park.

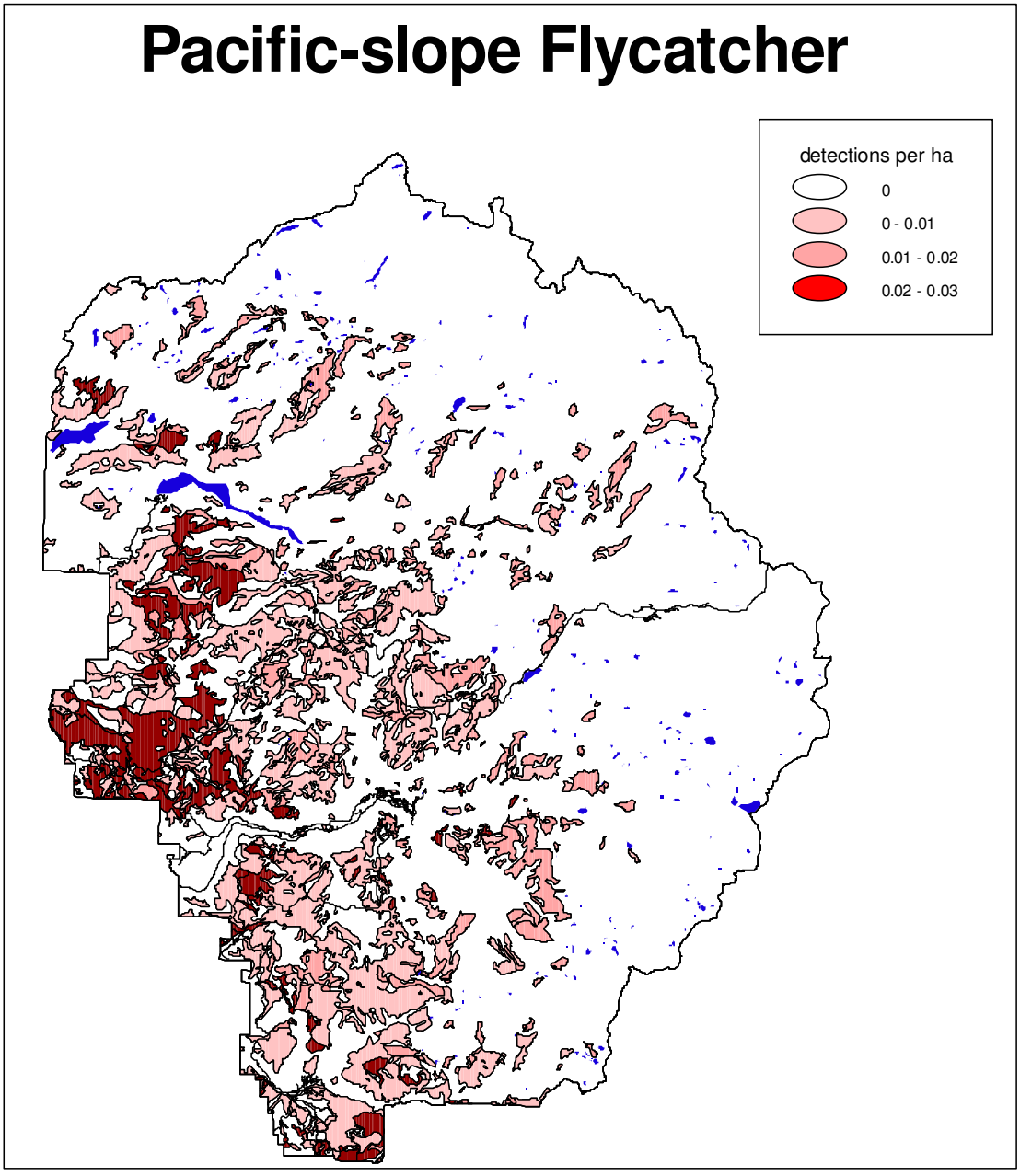

Figure 65. Pacific-slope Flycatcher distribution and relative abunance in the park.

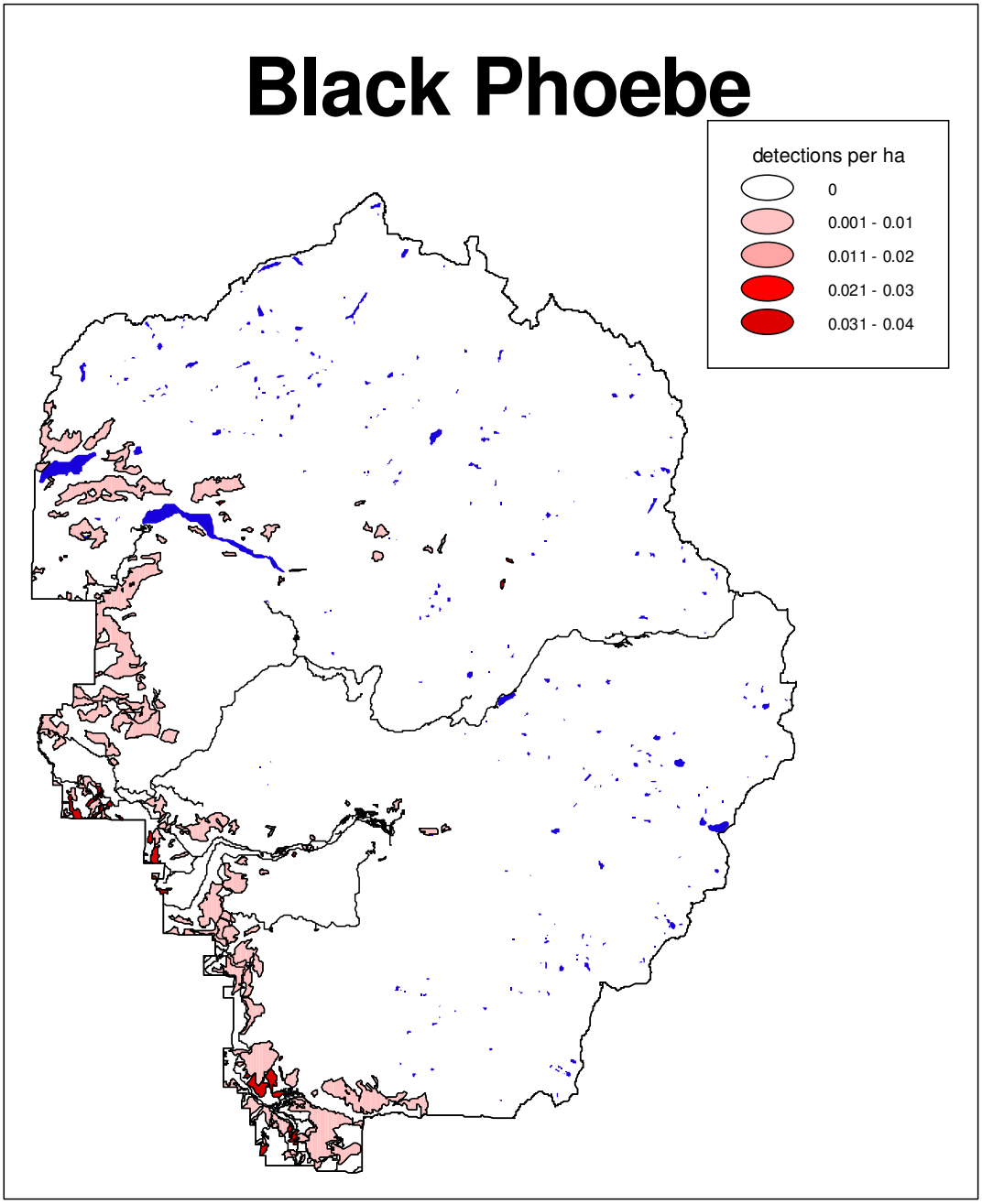

Figure 66. Black Phoebe distribution and relative abundance in the park.

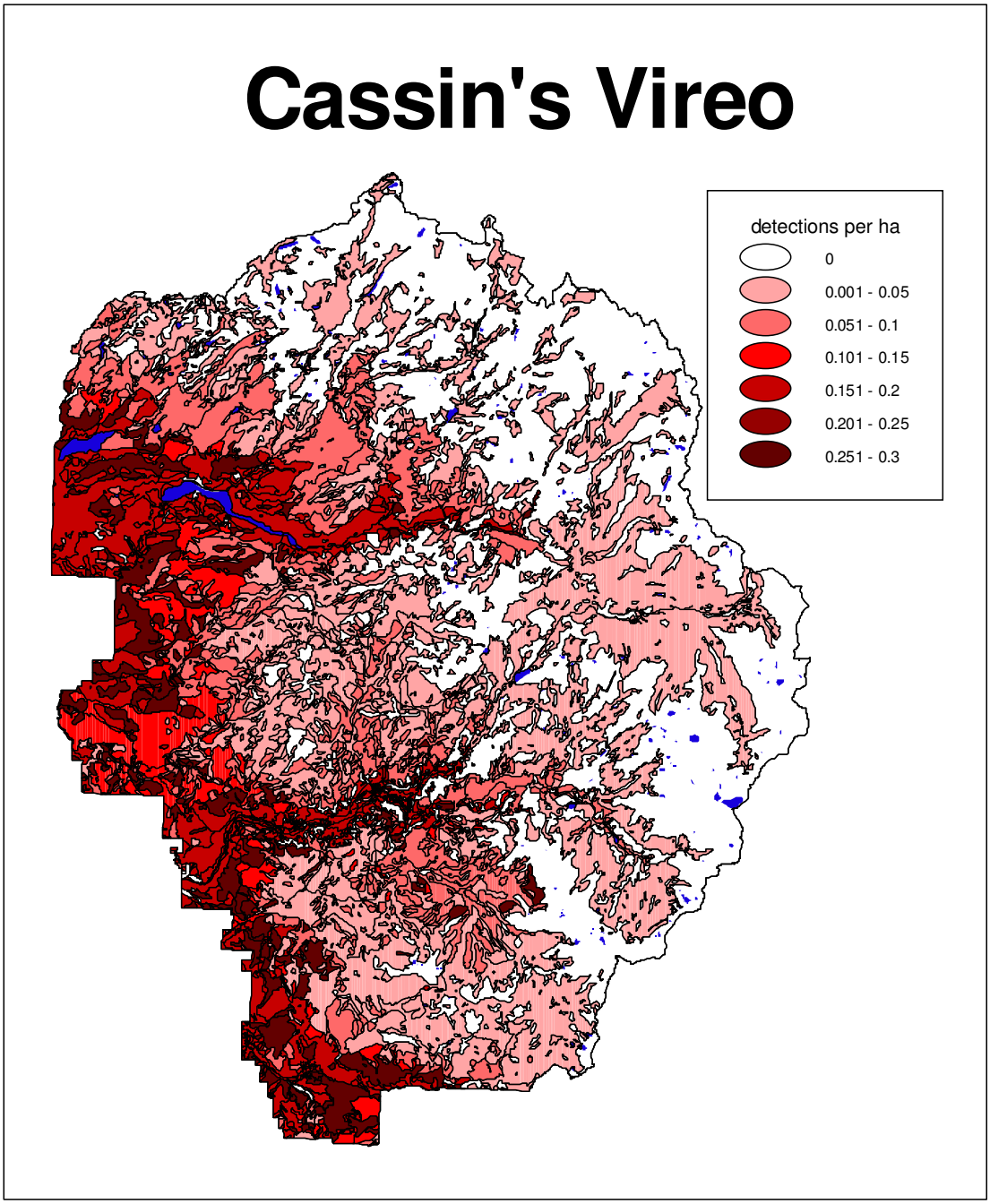

Figure 67. Cassin's Vireo distribution and relative abundance in the park.

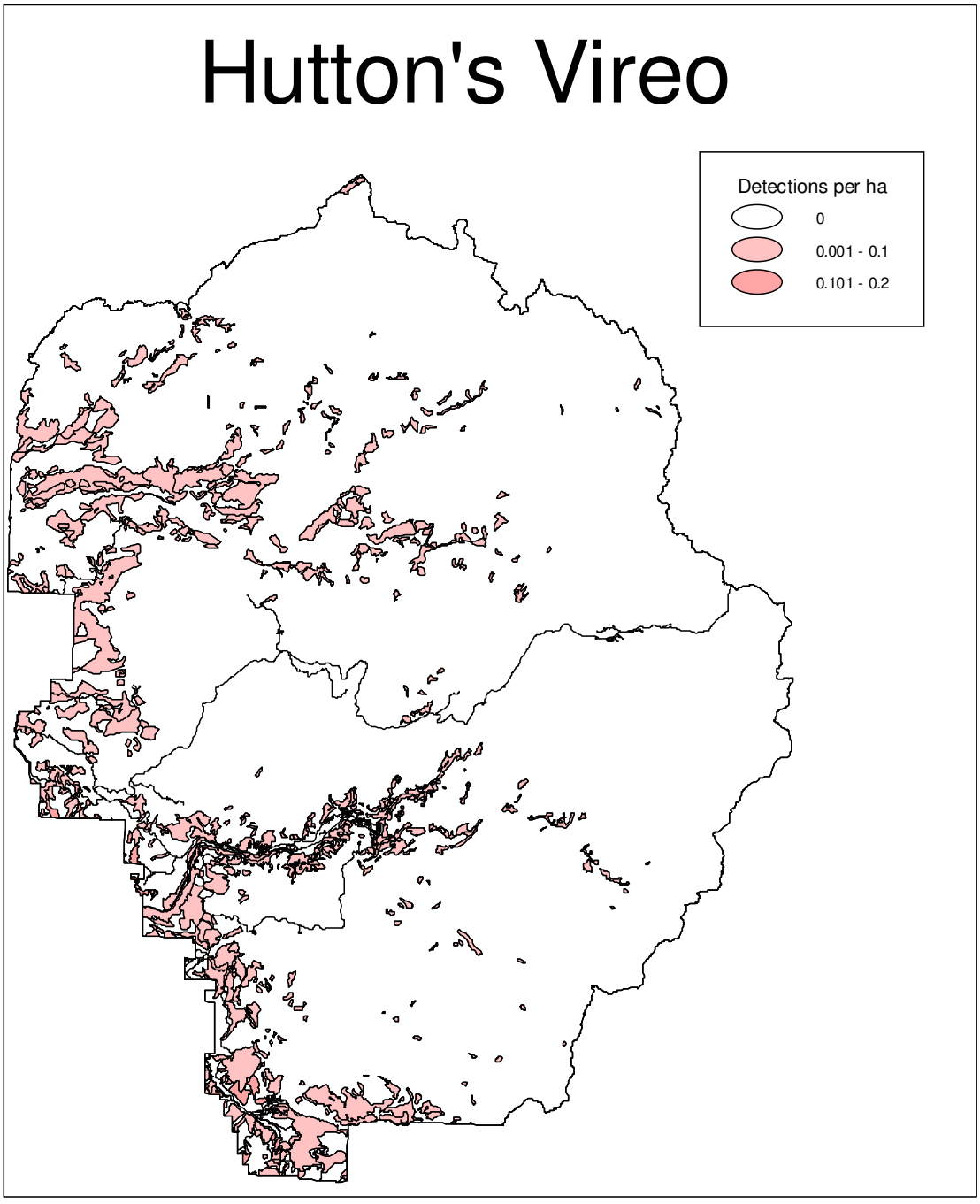

Figure 68. Hutton's Vireo distribution and relative abundance in the park.

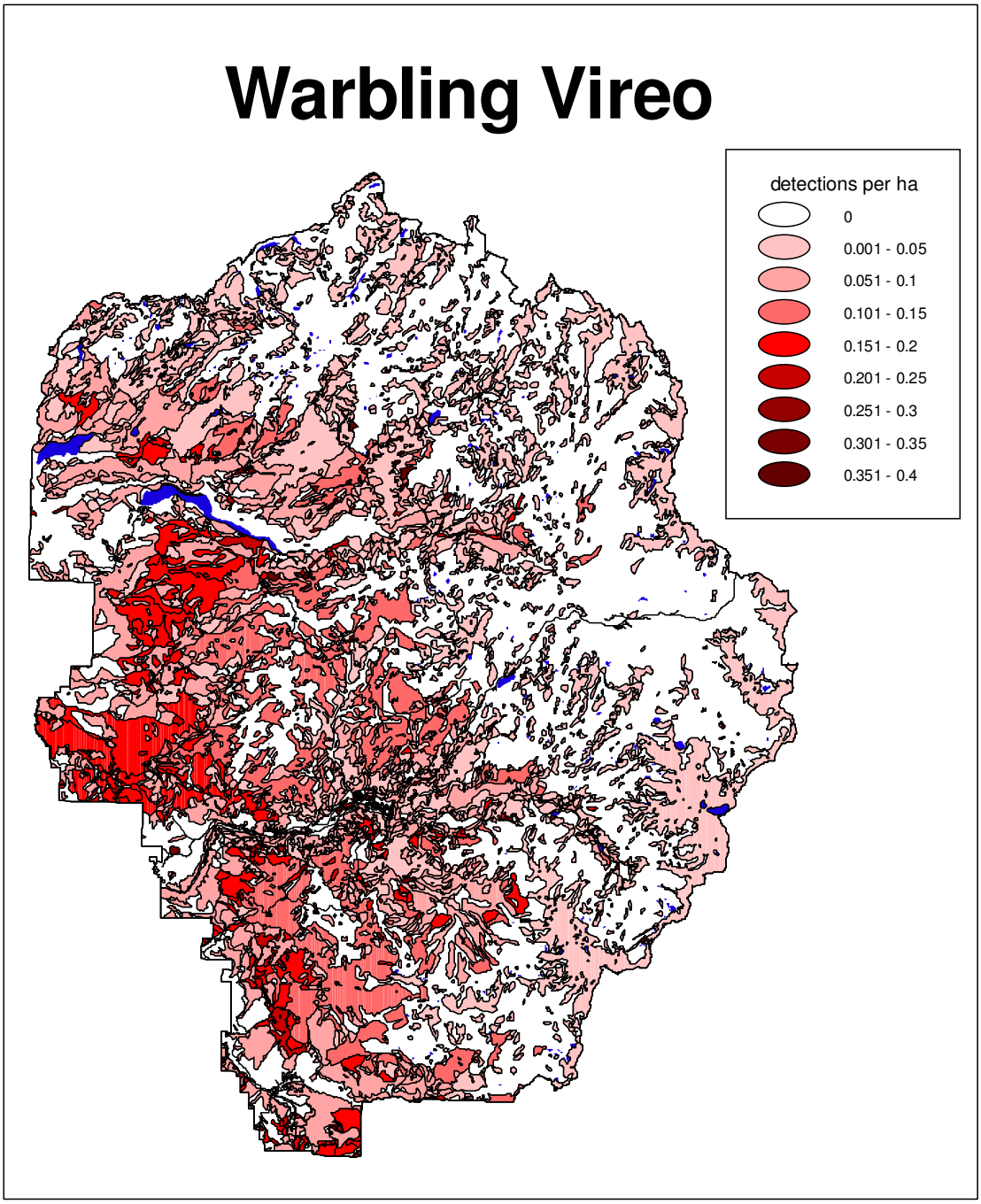

Figure 69. Warbling Vireo distribution and relative abundance in the park.

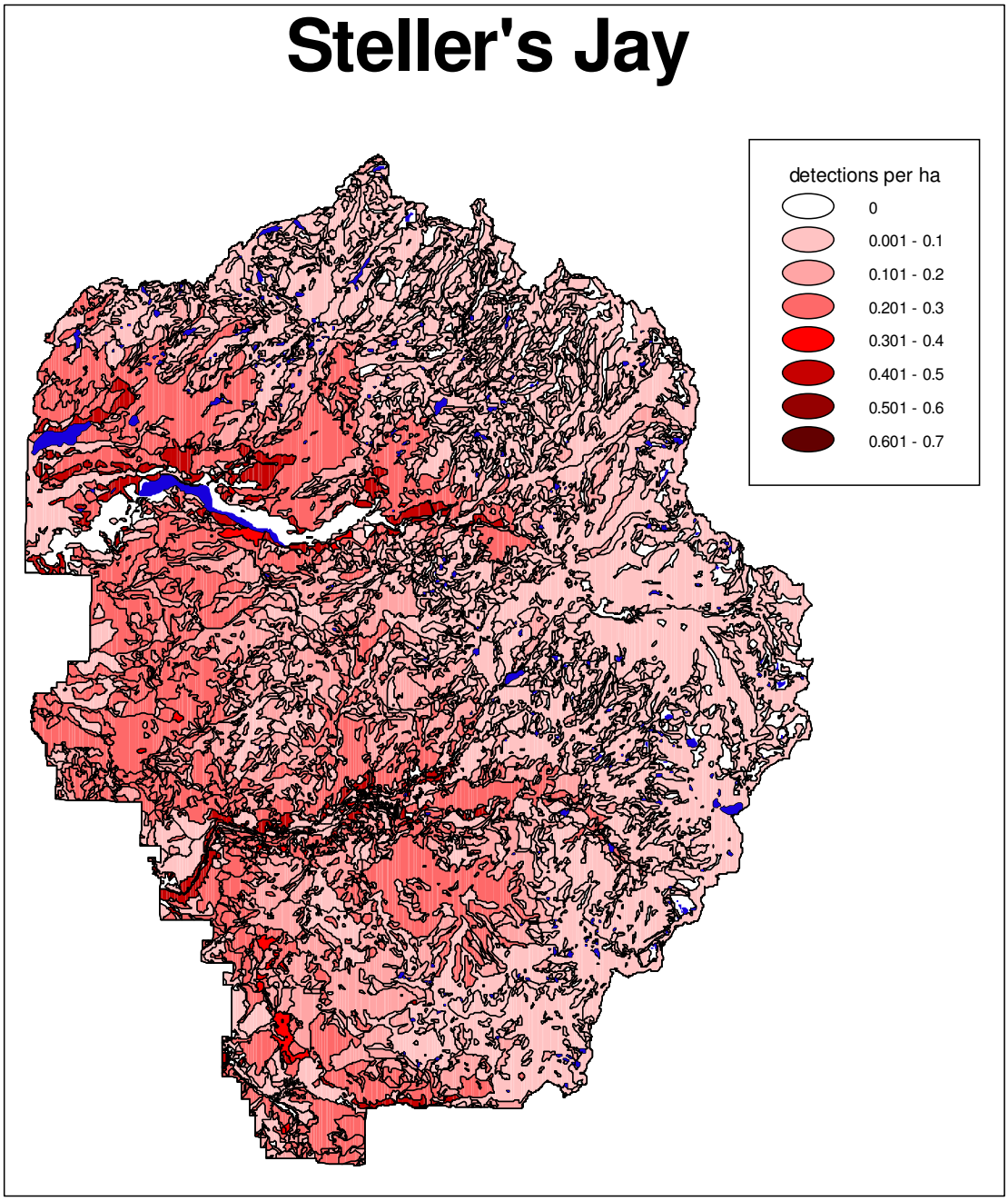

Figure 70. Steller's Jay distribution and relative abundance in the park.

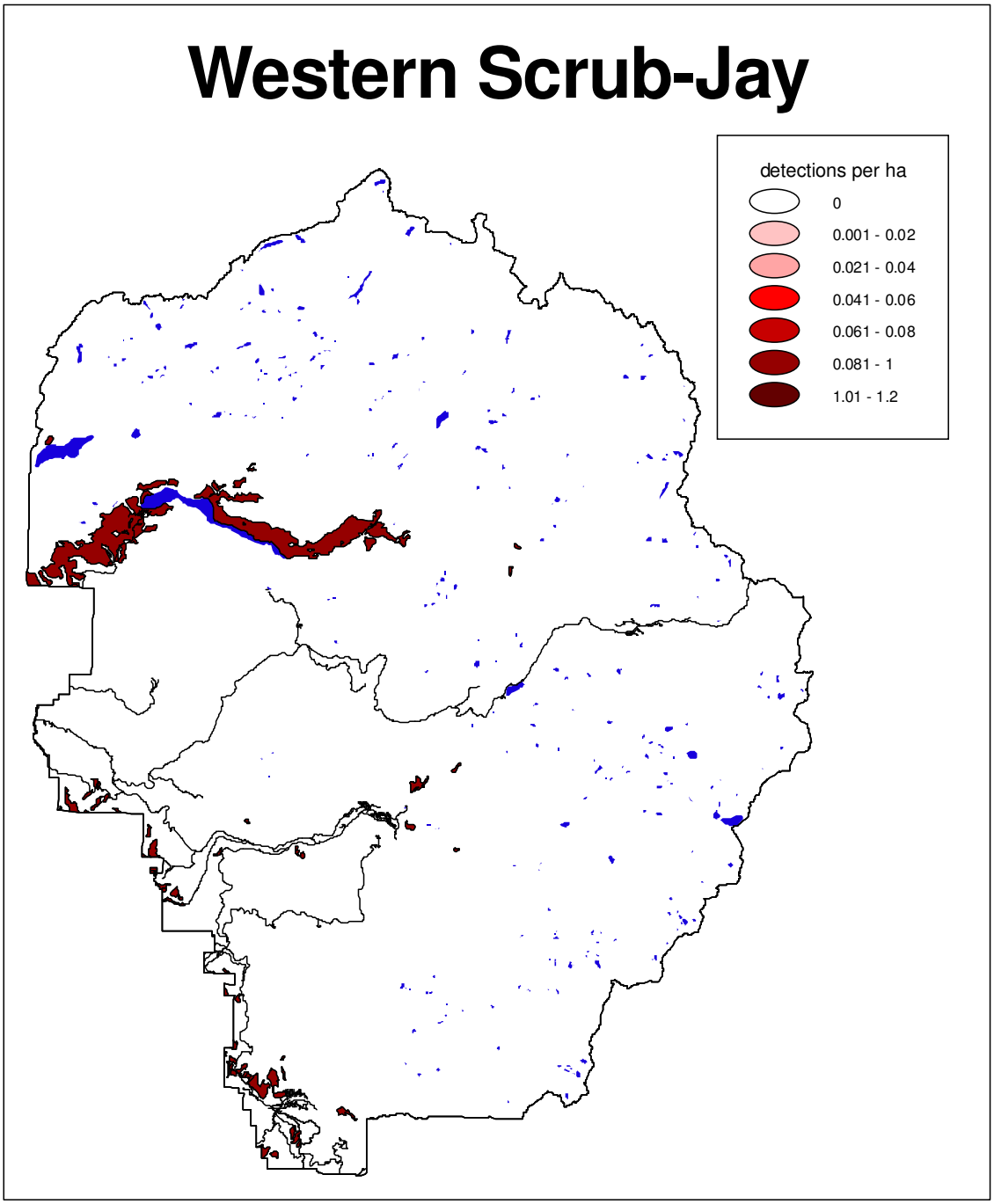

Figure 71. Western Scrub-Jay distribution and relative abundance in the park.

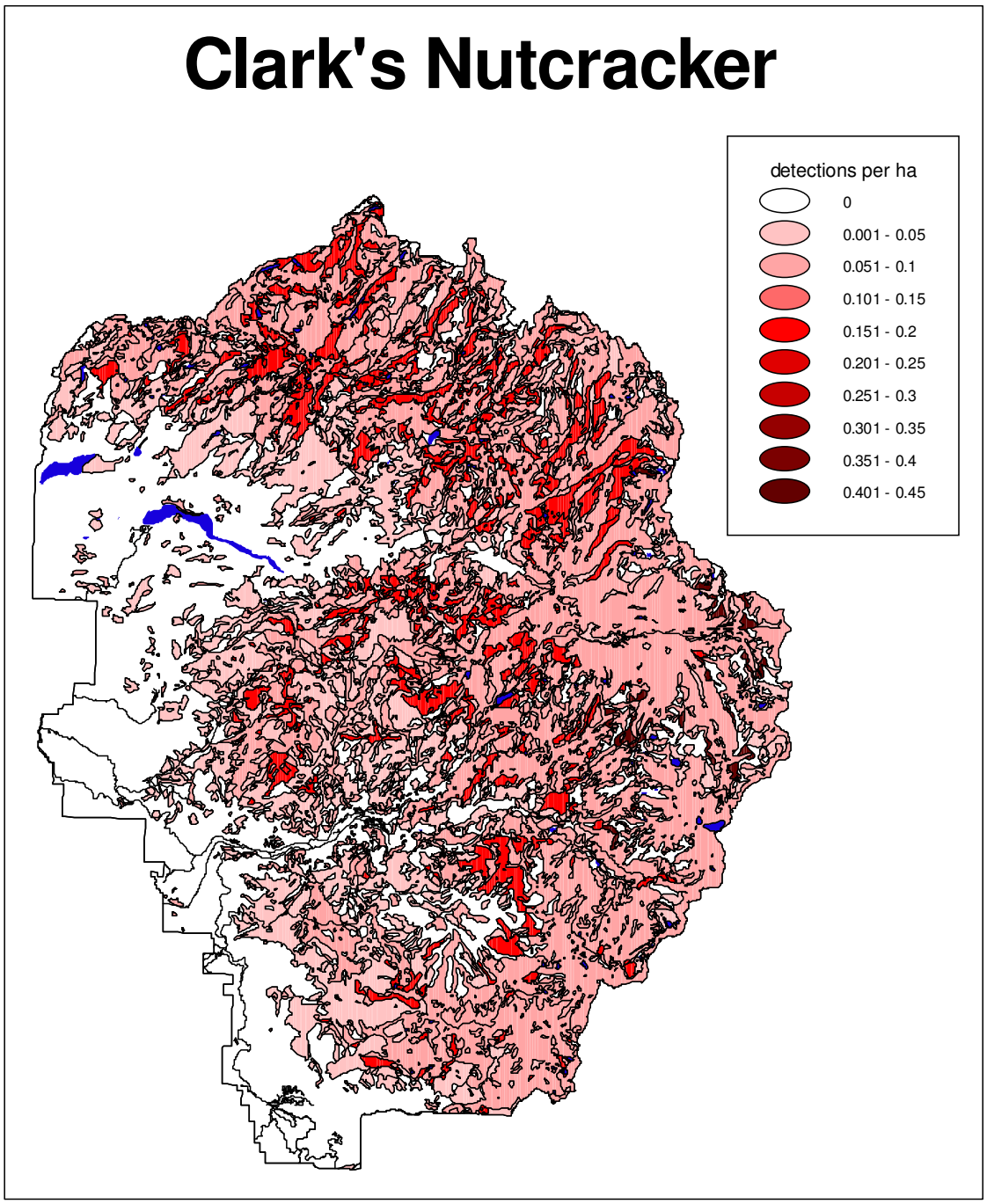

Figure 72. Clark's Nutcracker distribution and relative abundance in the park.

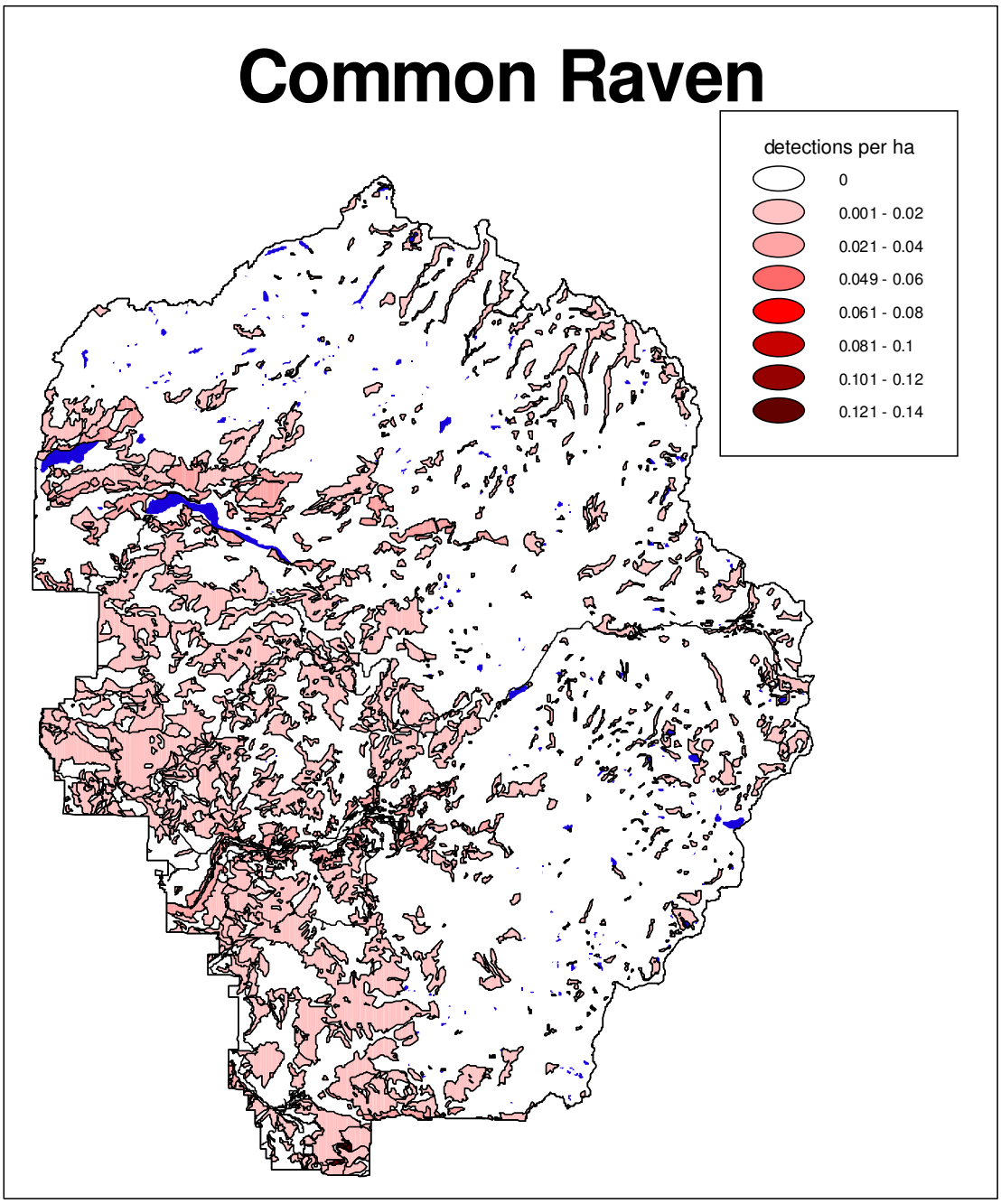

Figure 73. Common Raven distribution and relative abundance in the park.

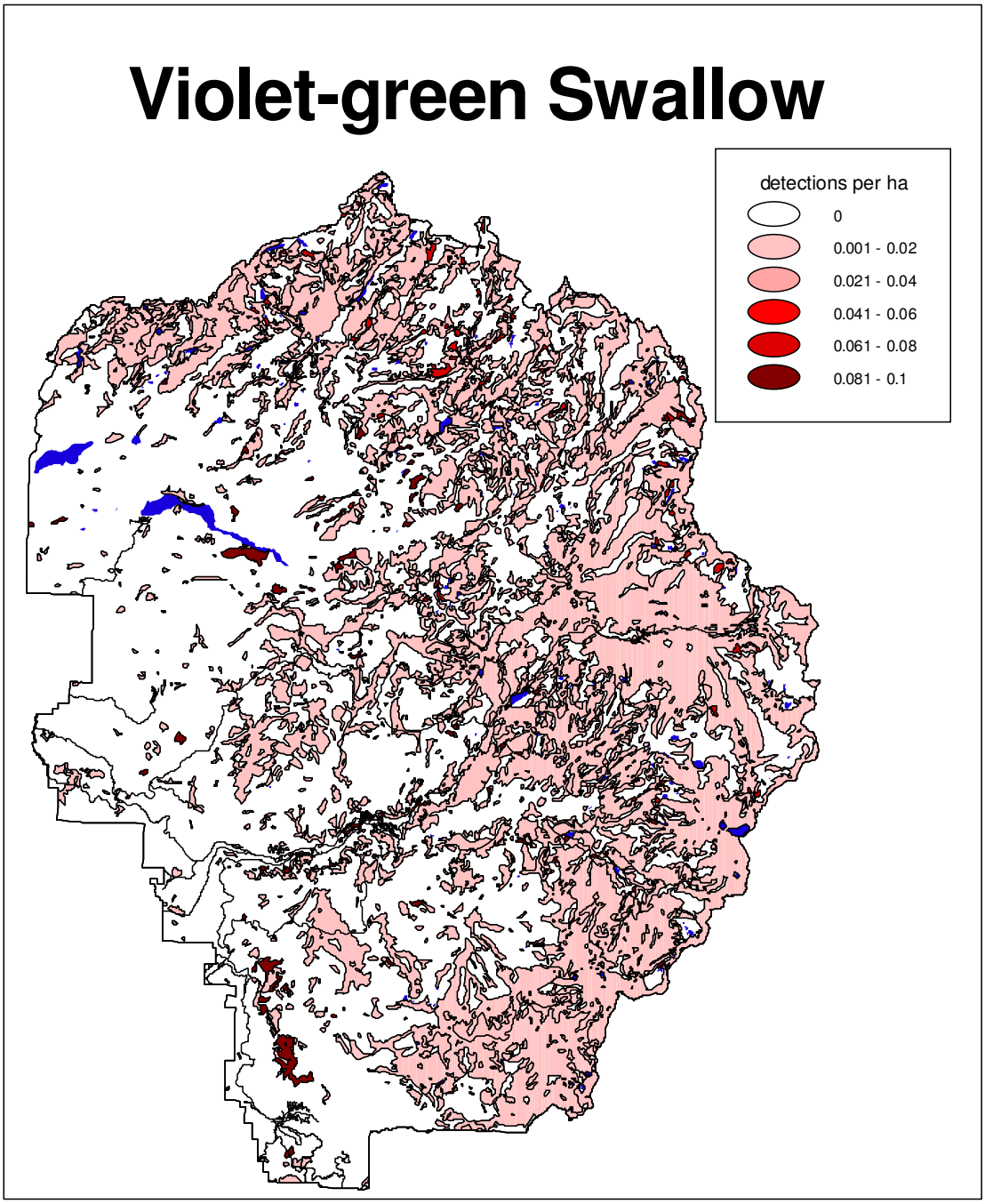

Figure 74. Violet-green Swallow distribution and relative abundance in the park.

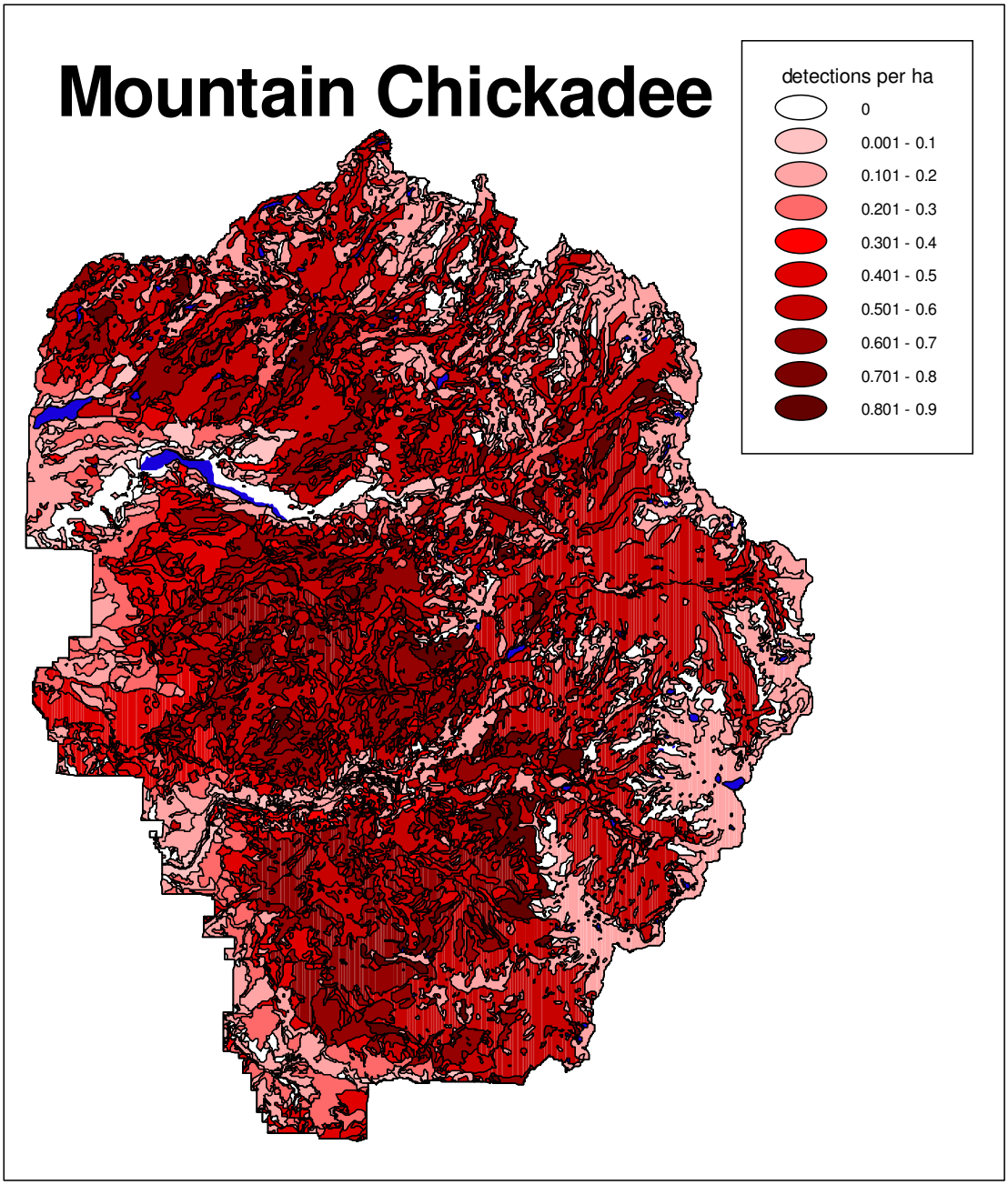

Figure 75. Mountain Chickadee distribution and relative abunance in the park.

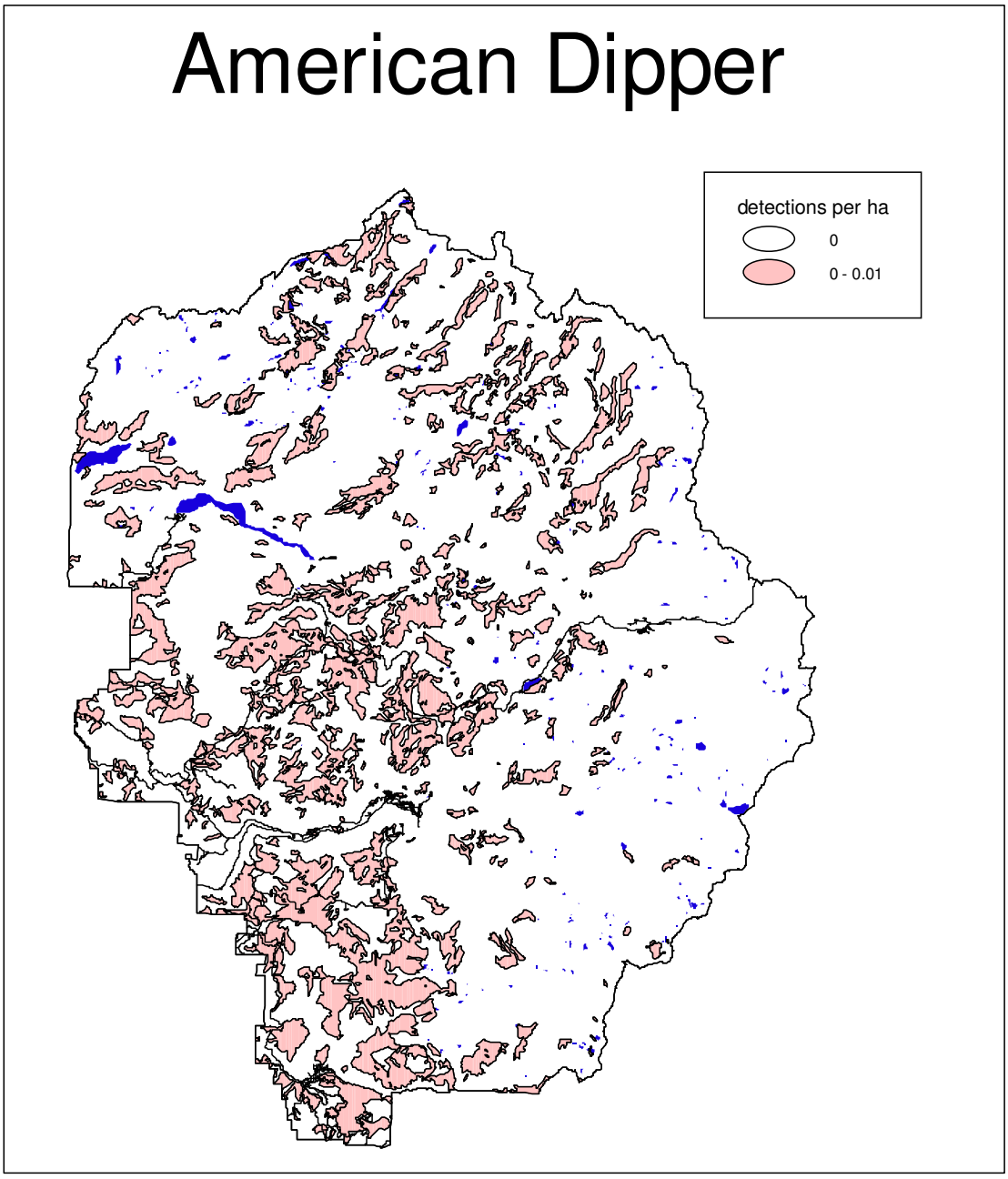

Figure 86. American Dipper distribution and relative abundance in the park.

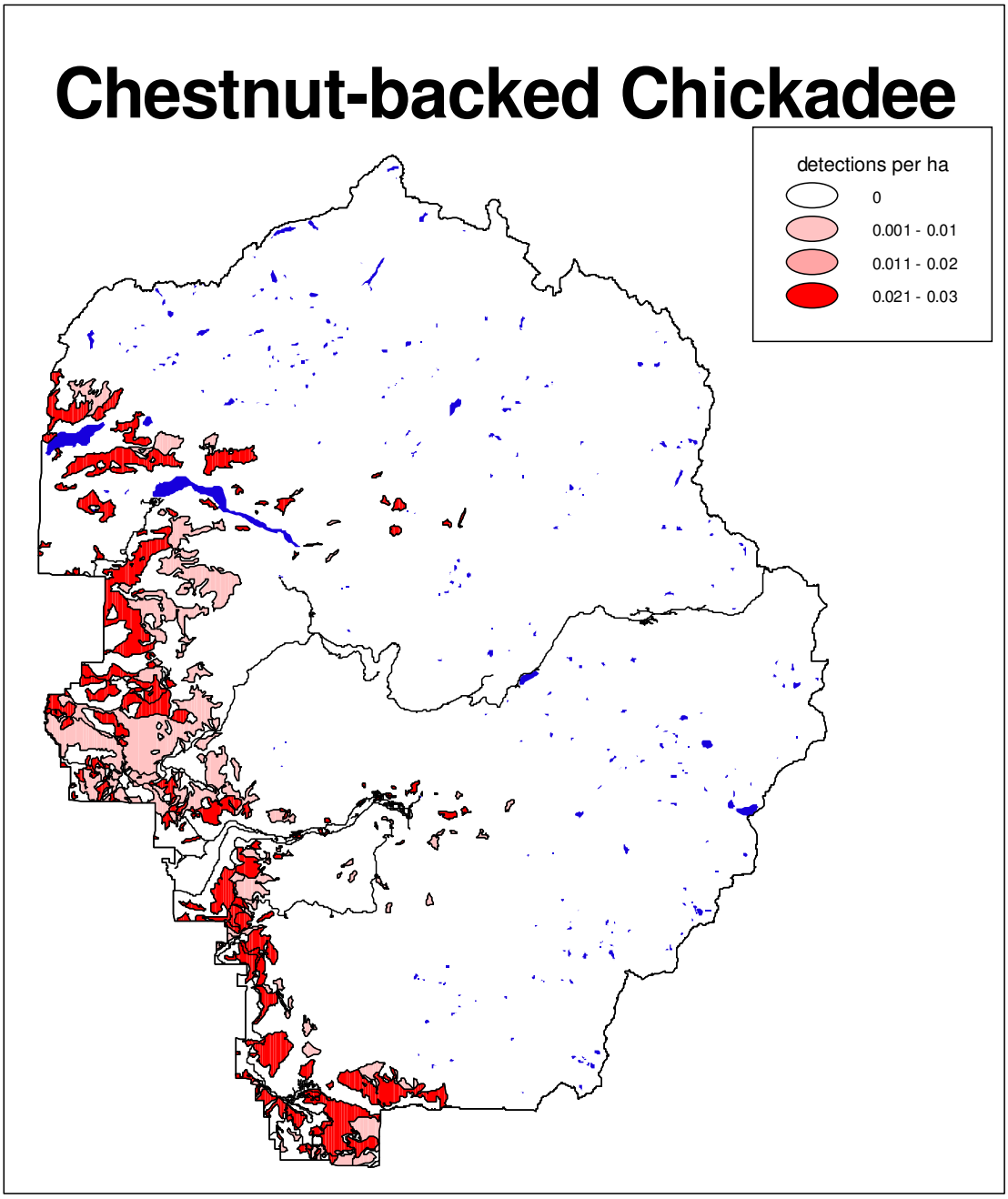

Figure 76. Chestnut-backed Chickadee distribution and relative abundance in the park.

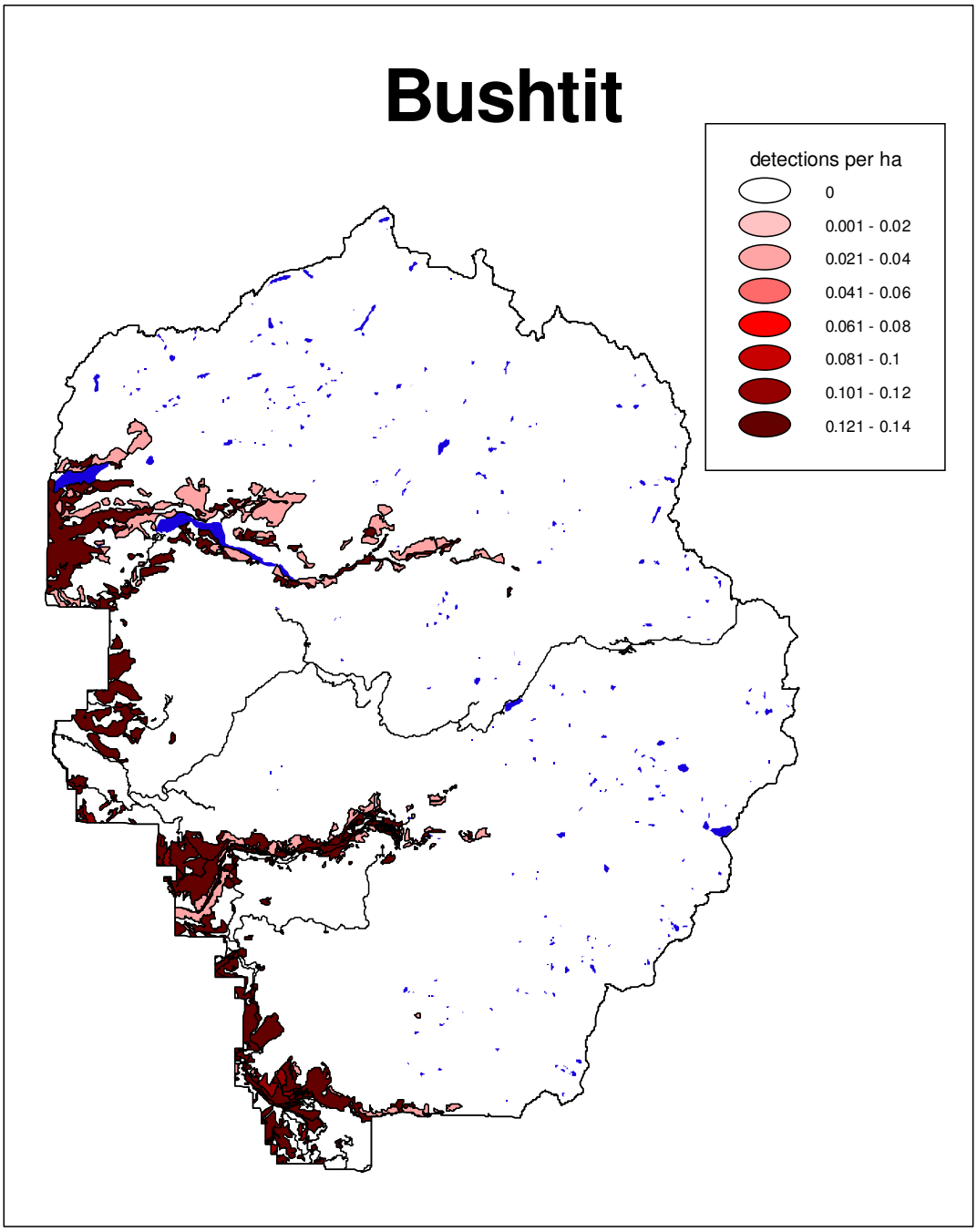

Figure 77. Bushtit distribution and relative abundance in the park.

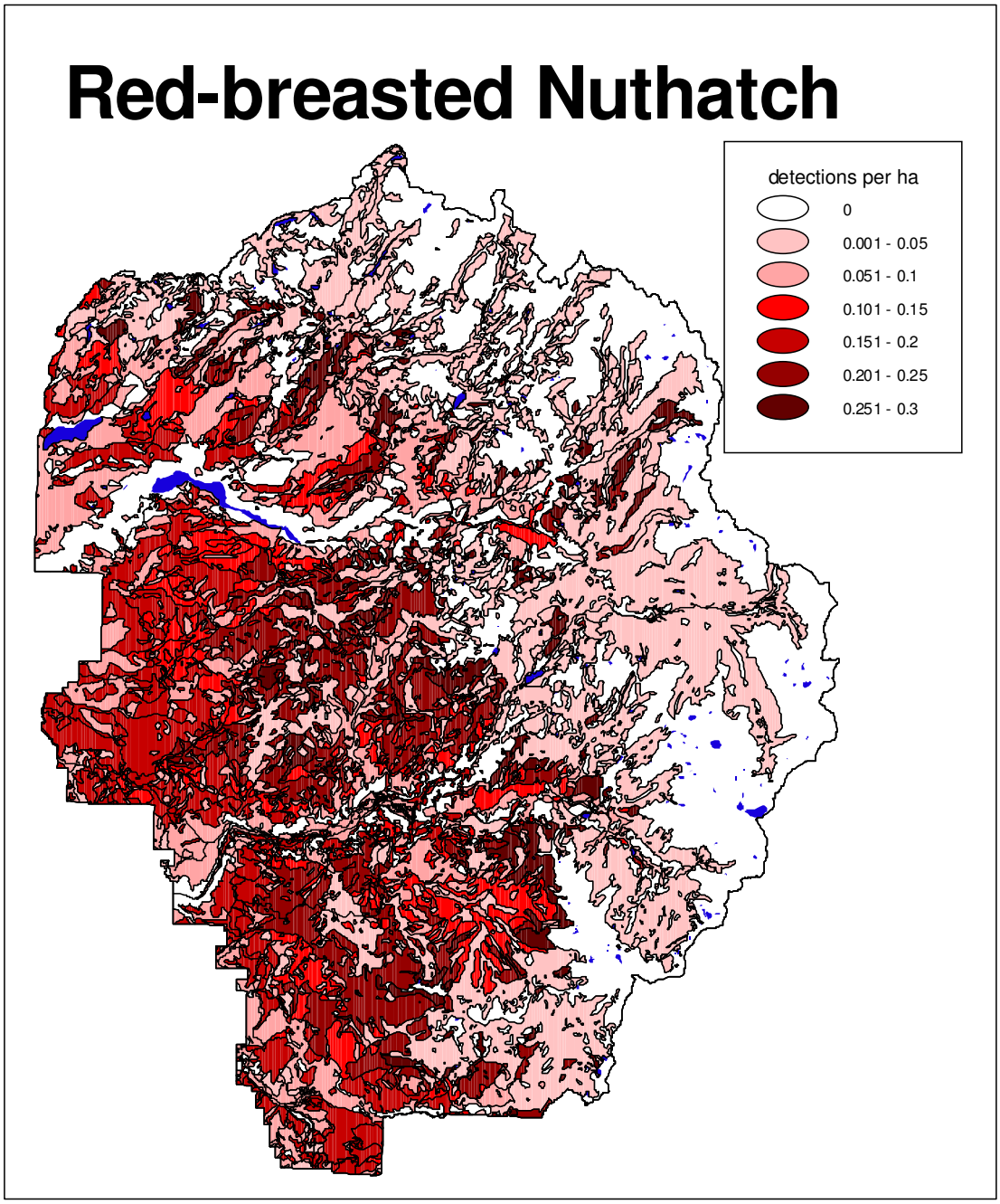

Figure 78. Red-breasted Nuthatch distribution and relative abundance in the park.

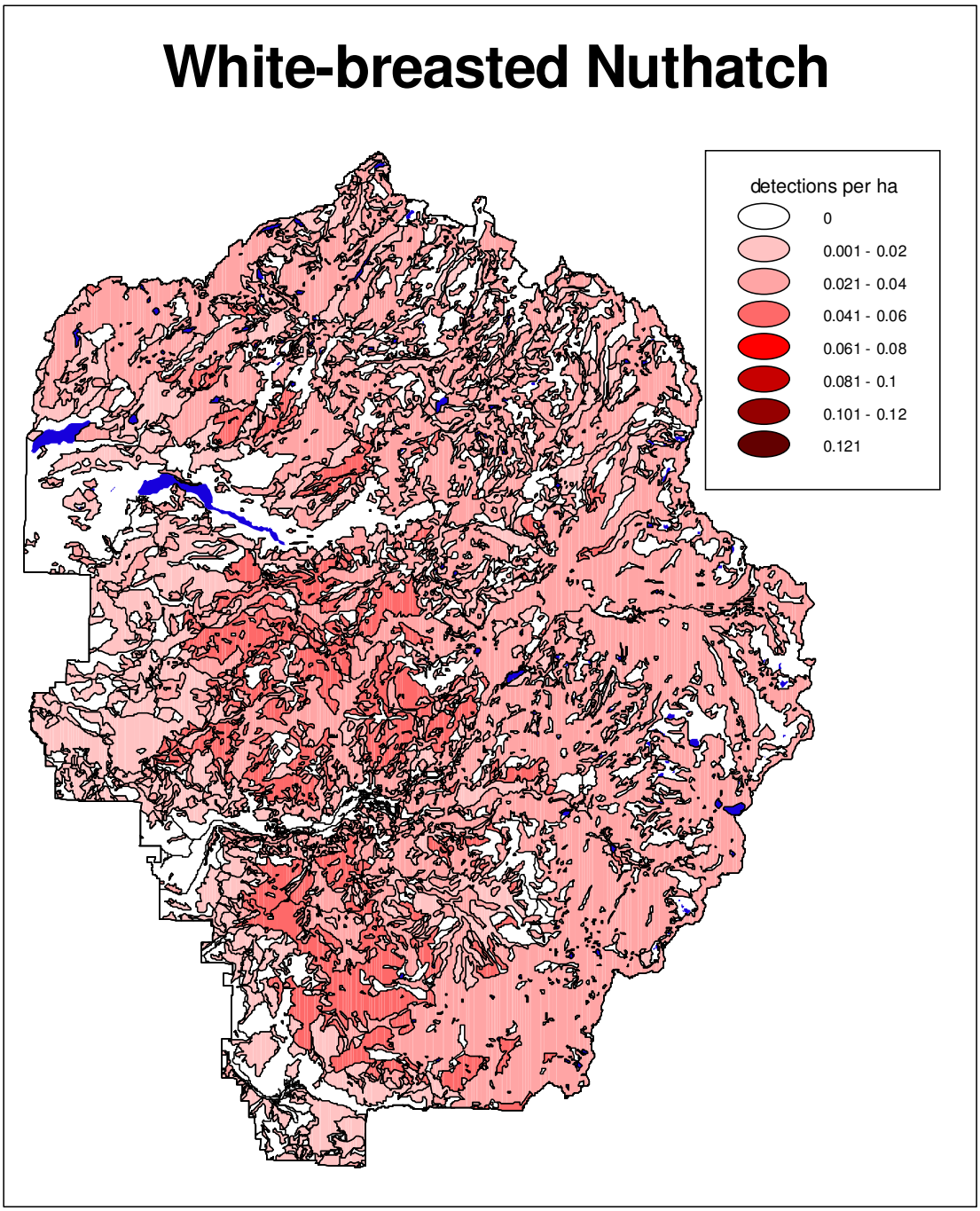

Figure 79. White-breasted Nuthatch distribution and relative abundance in the park.

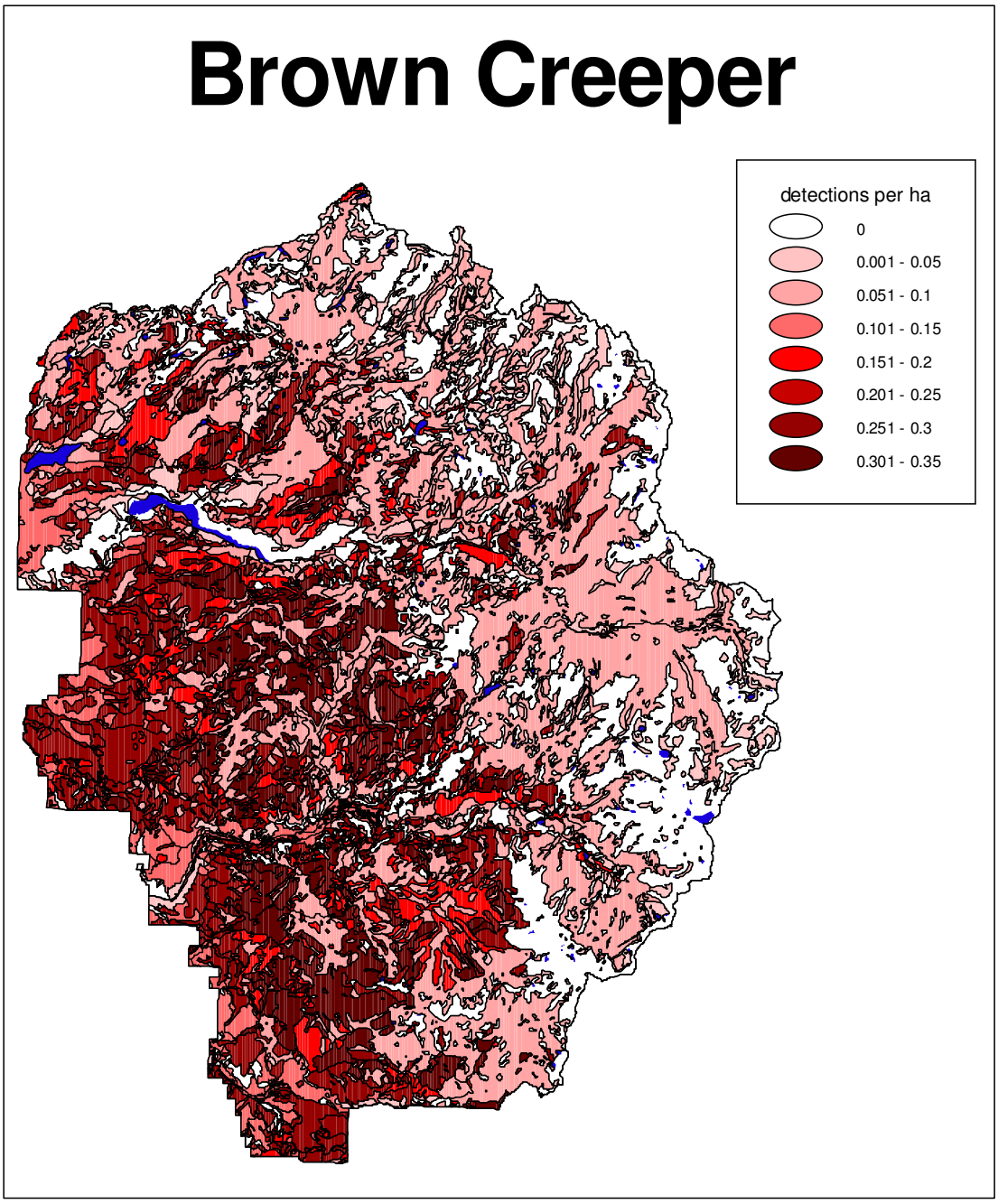

Figure 80. Brown Creeper distribution and relative abundance in the park.

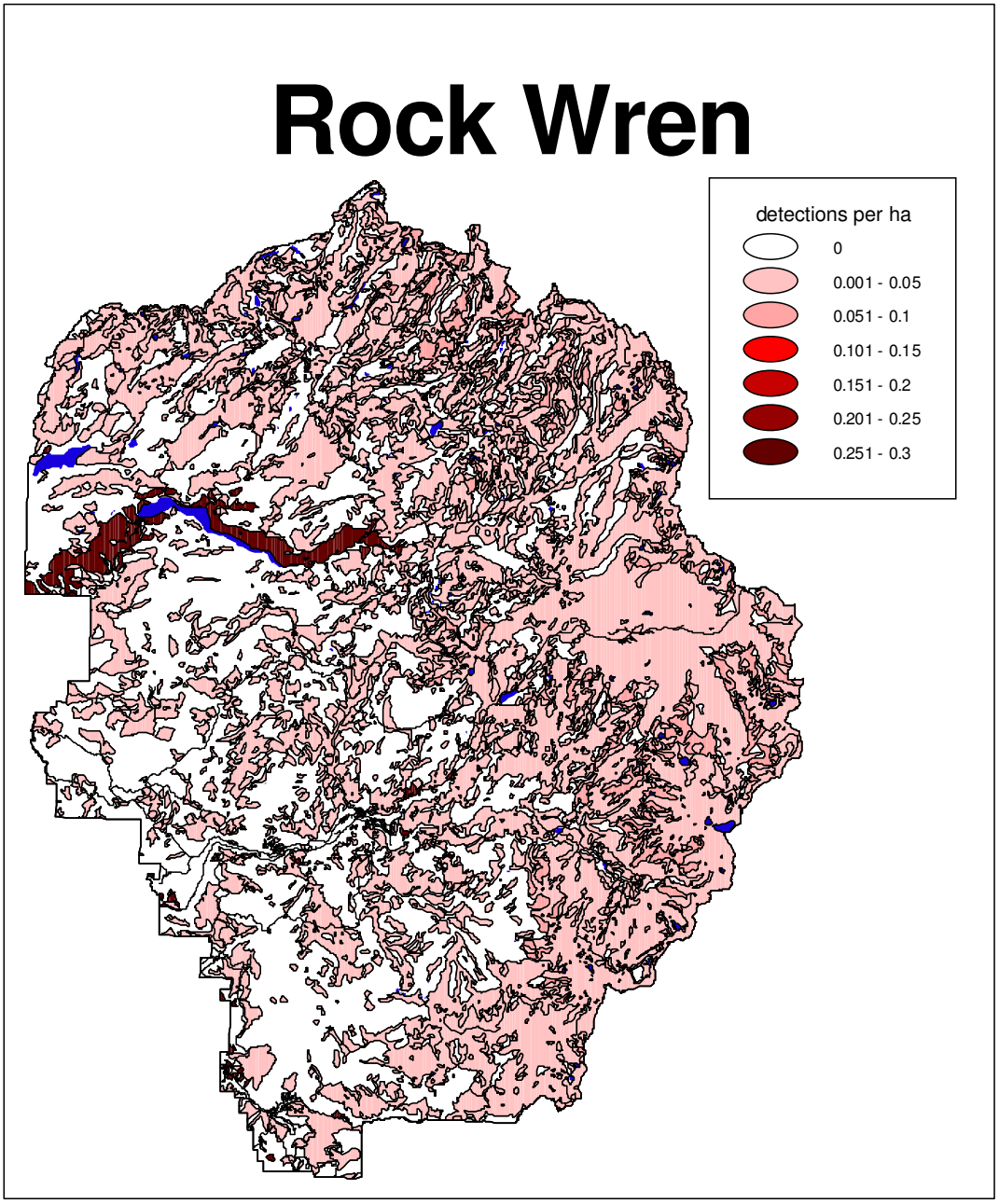

Figure 81. Rock Wren distribution and relative abundance in the park.

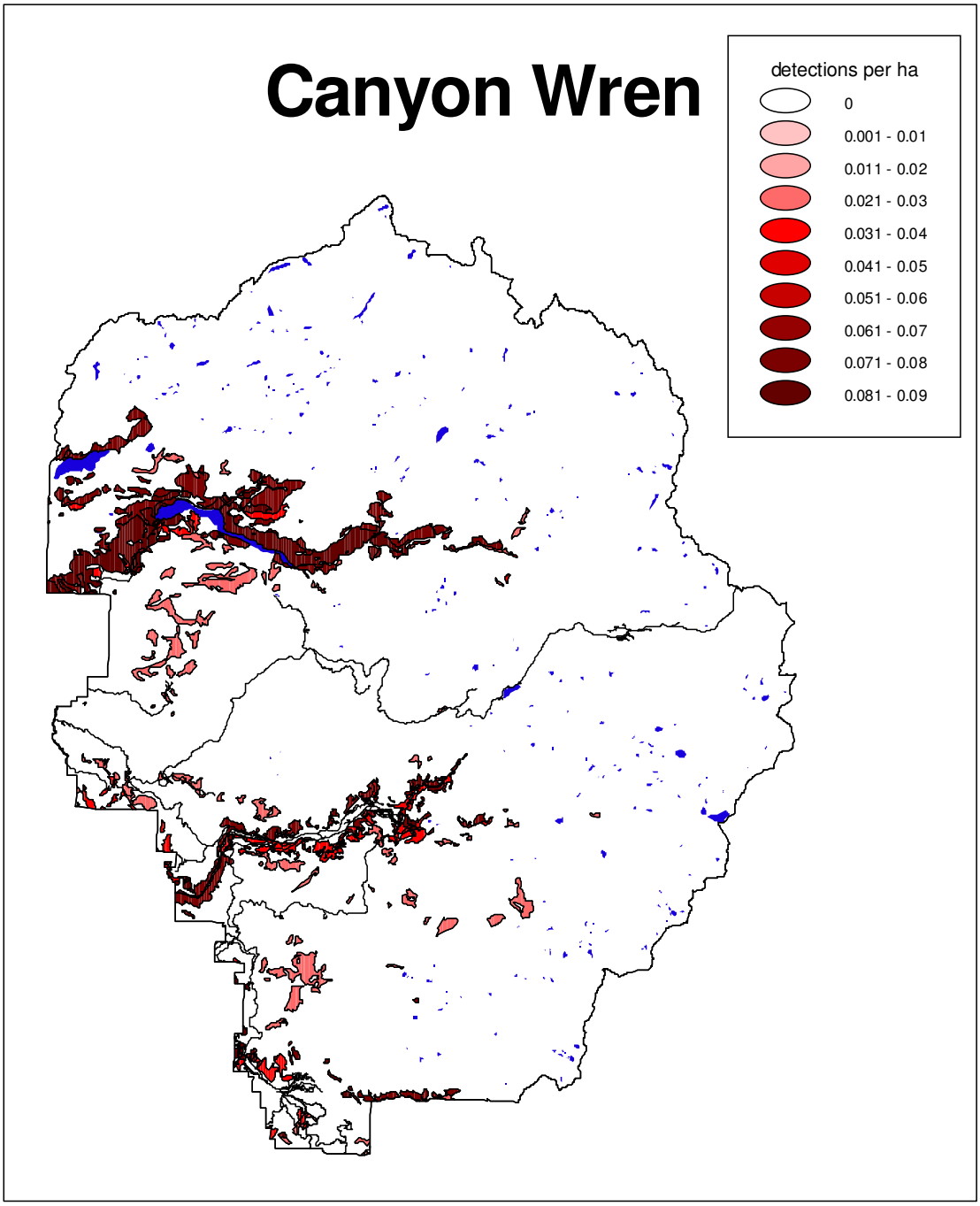

Figure 82. Canyon Wren distribution and relative abundance in the park.

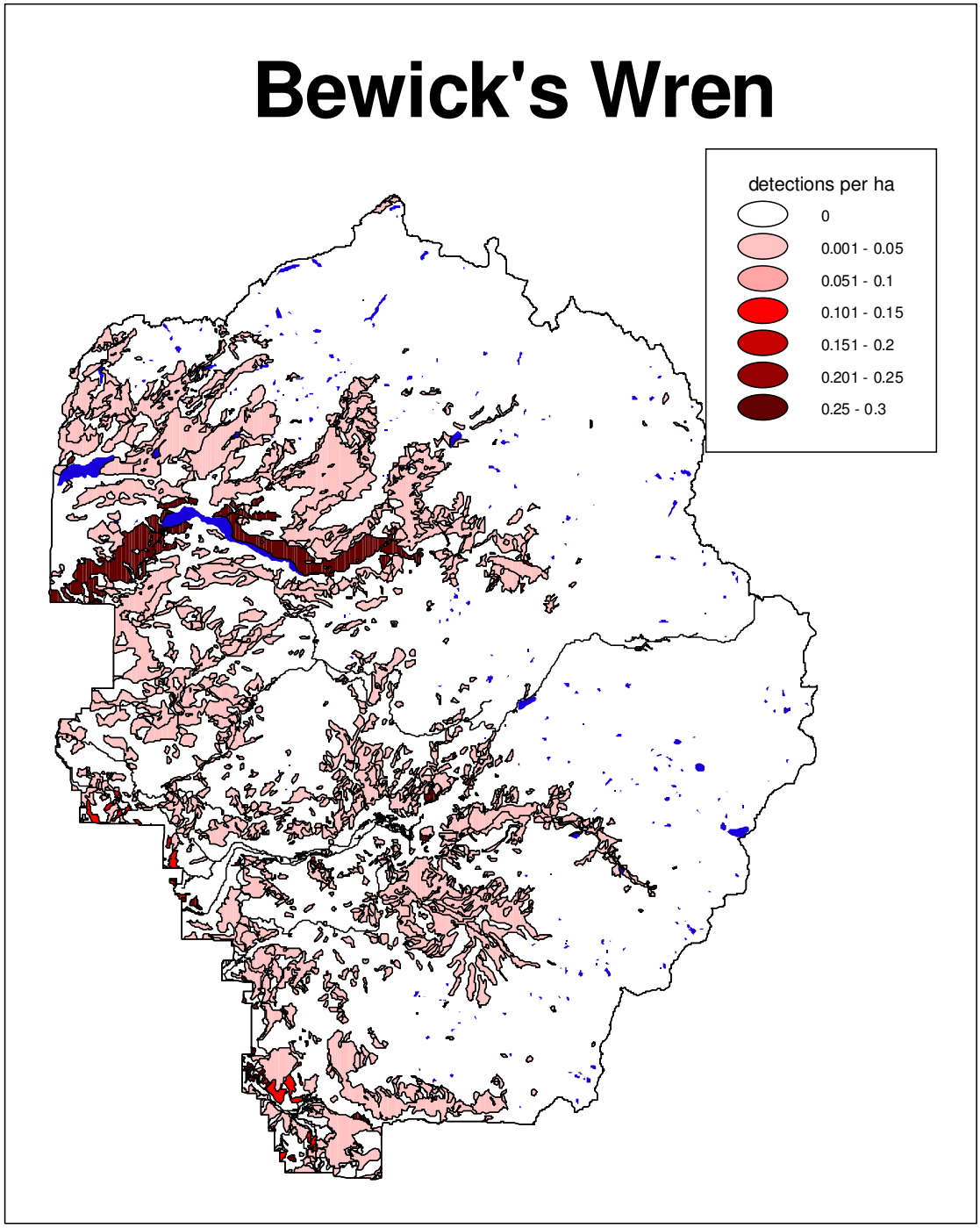

Figure 83. Bewick's Wren distriubtion and relative abundance in the park.

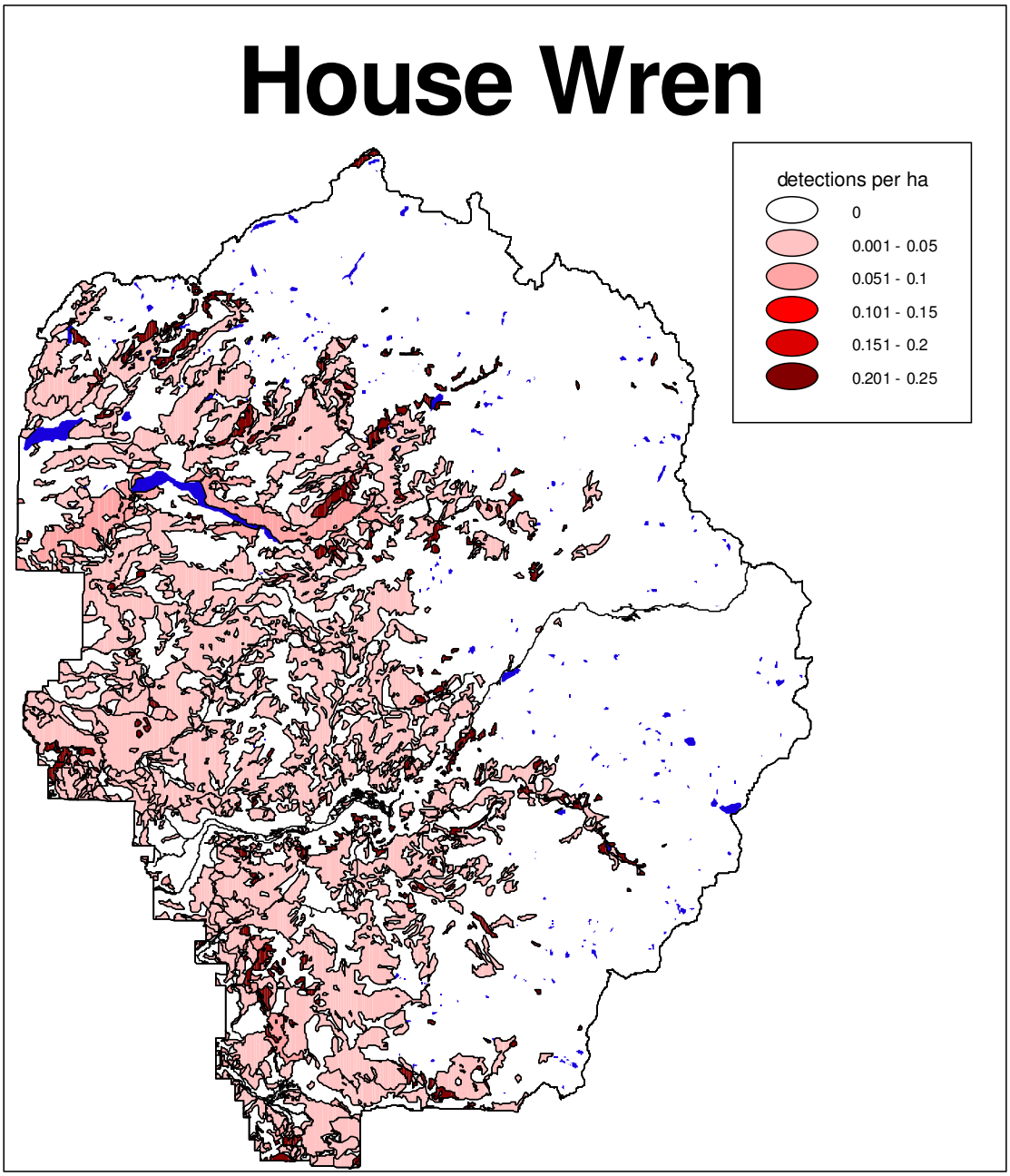

Figure 84. House Wren distribution and relative abundance in the park.

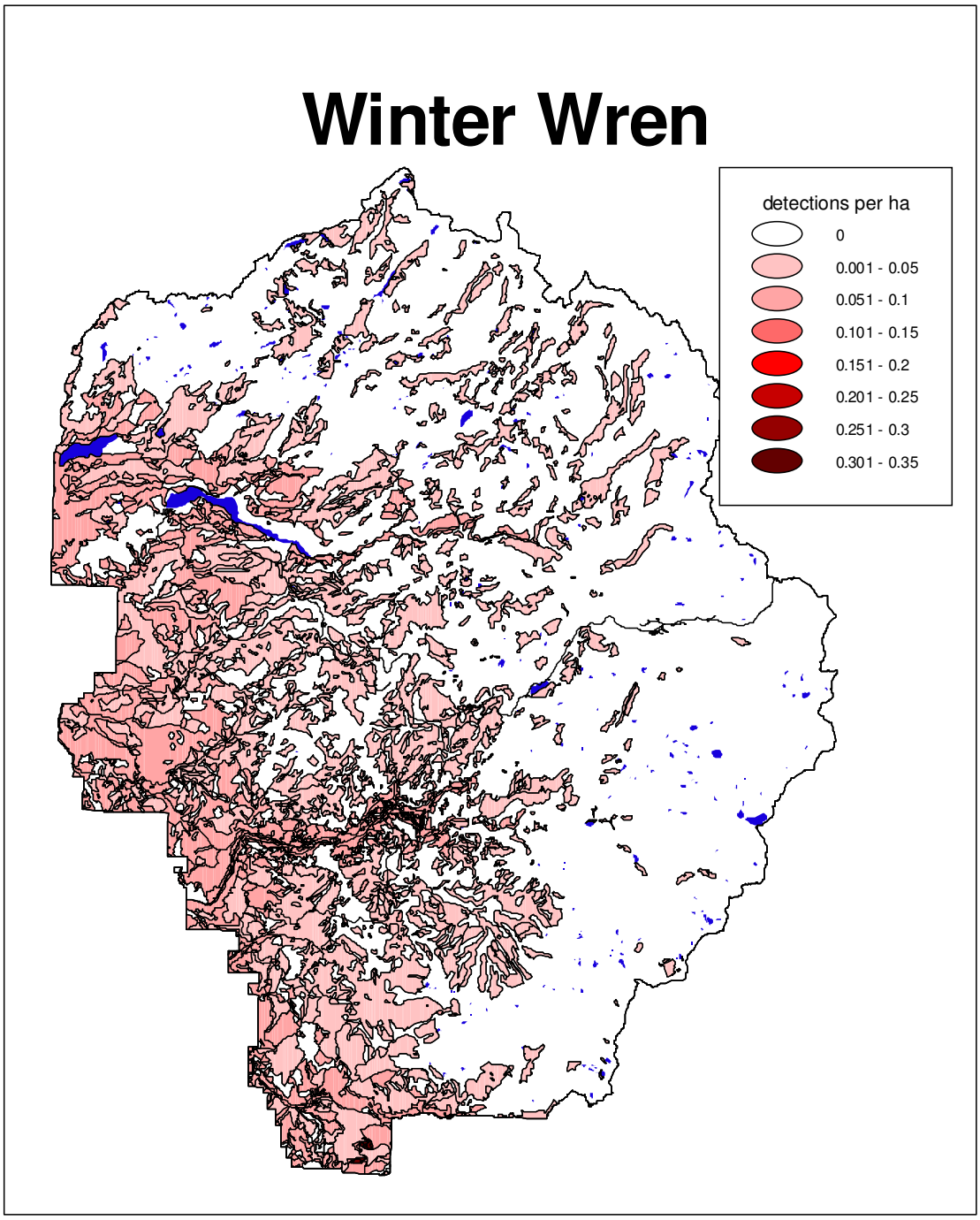

Figure 85. Winter Wren distribution and relative abundance in the park.

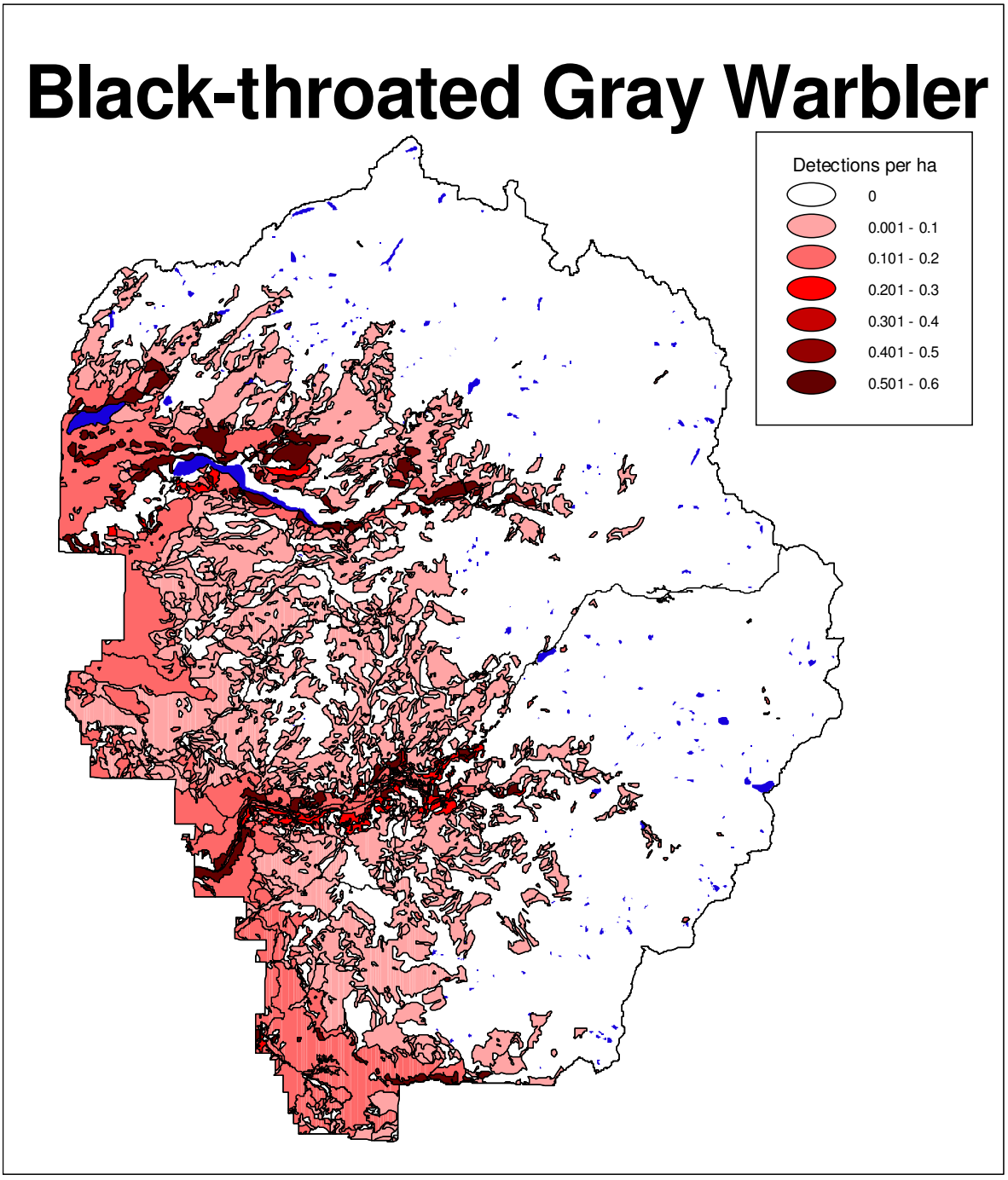

Figure 101. Black-throated Gray Warbler distribution and relative abundance in the park.

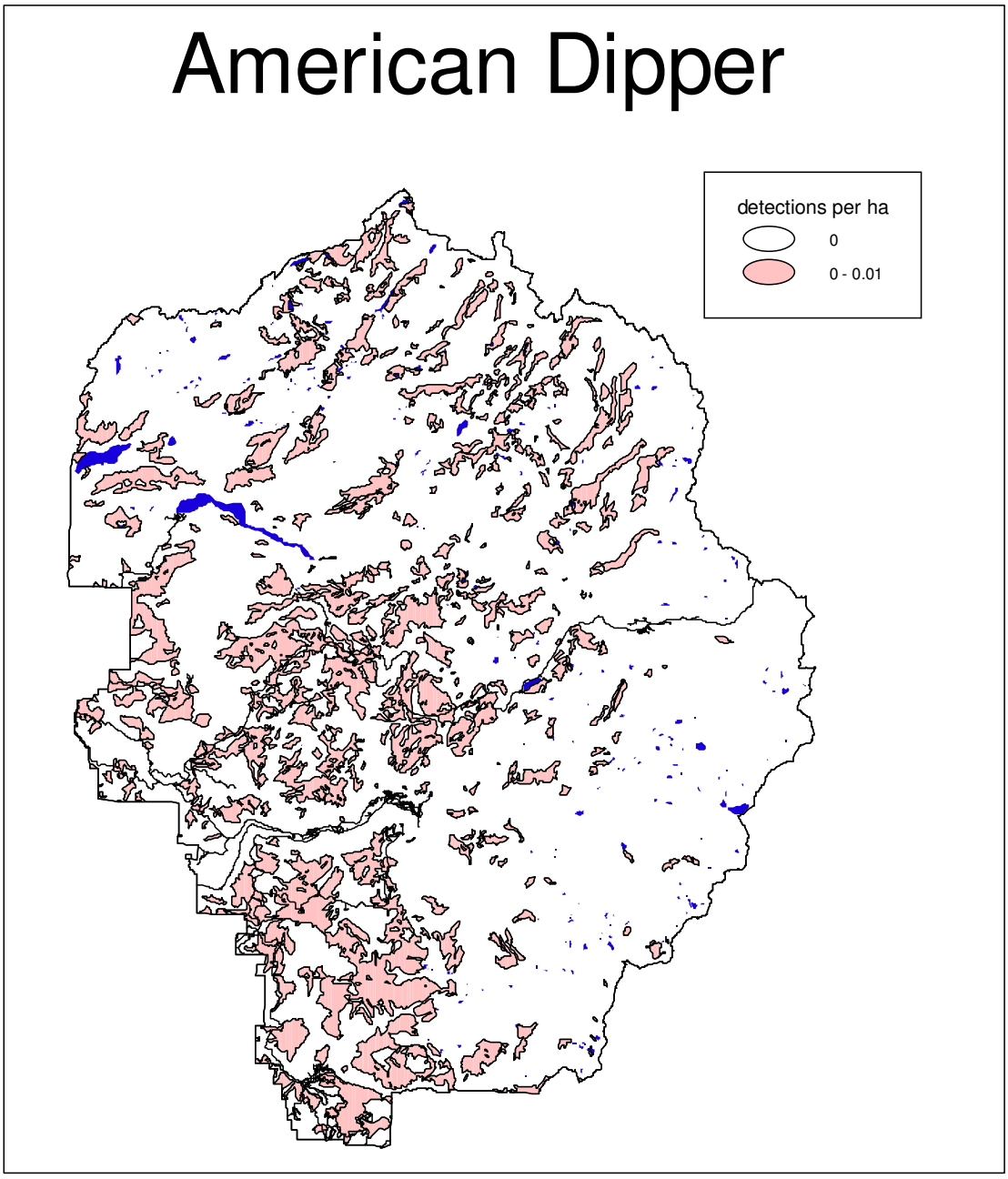

Figure 86. American Dipper distribution and relative abundance in the park.

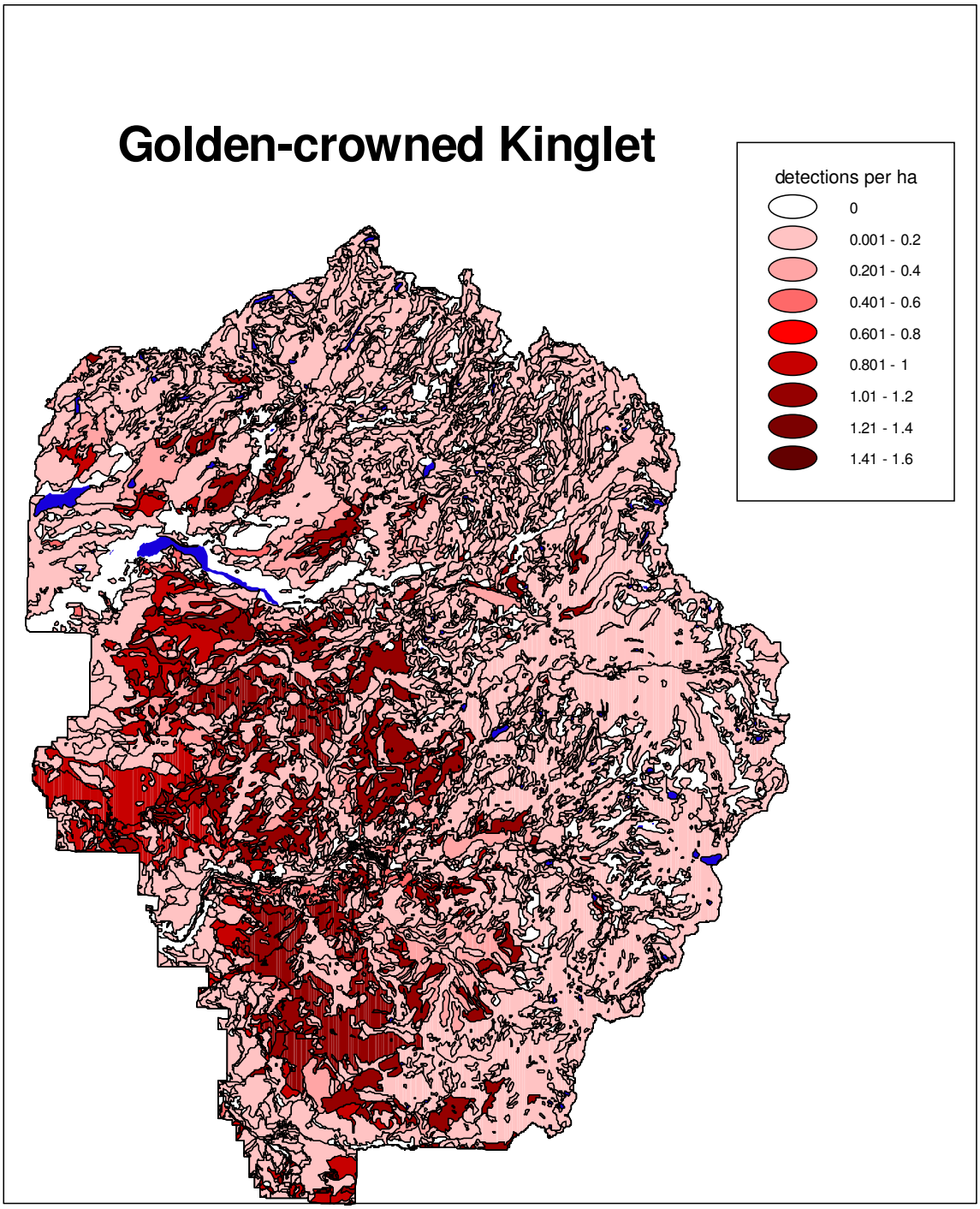

Figure 87. Golden-crowned Kinglet destribution and relative abundance in the park.

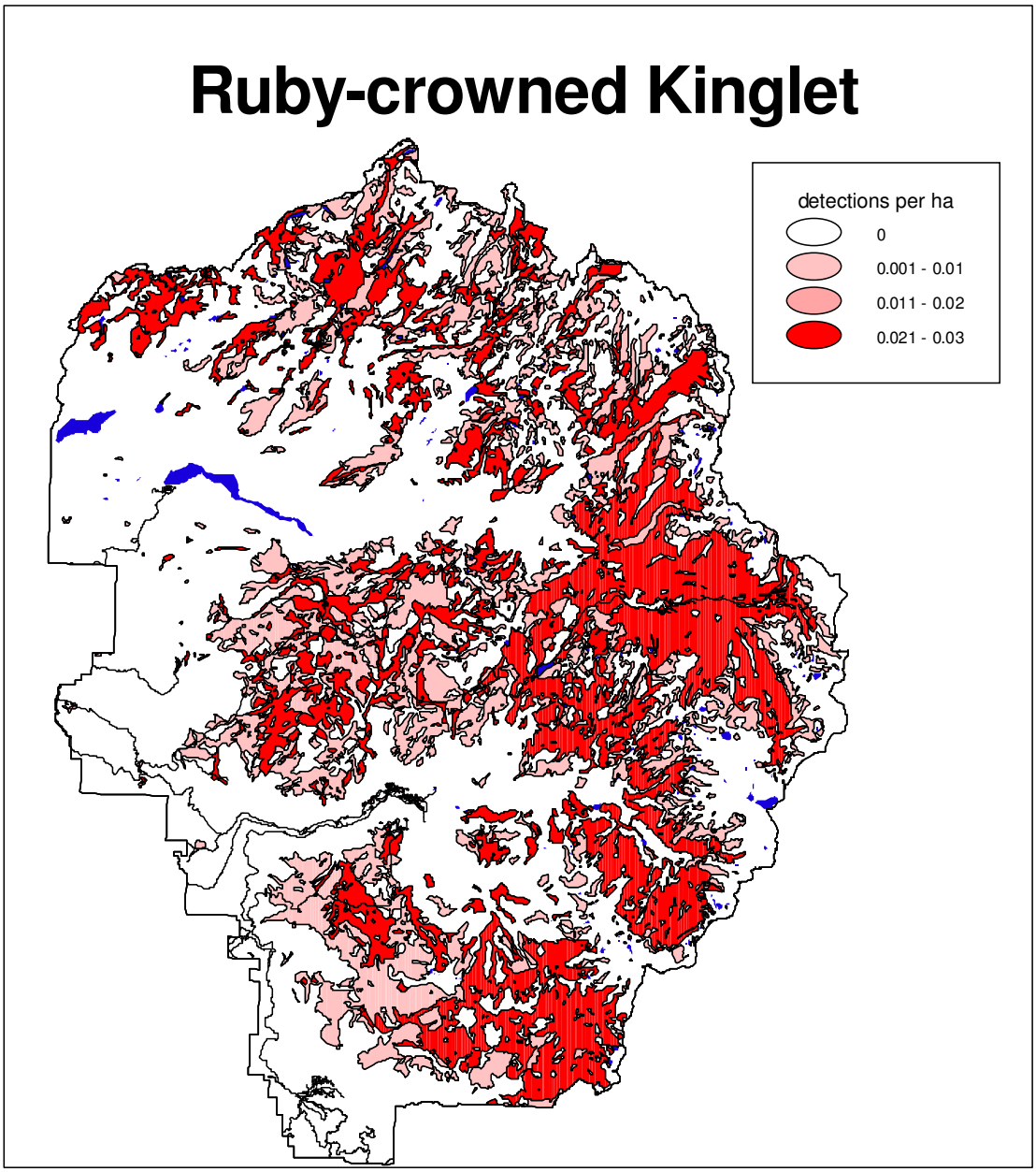

Figure 88. Ruby-crowned Kinglet distribution and relative abundance in the park.

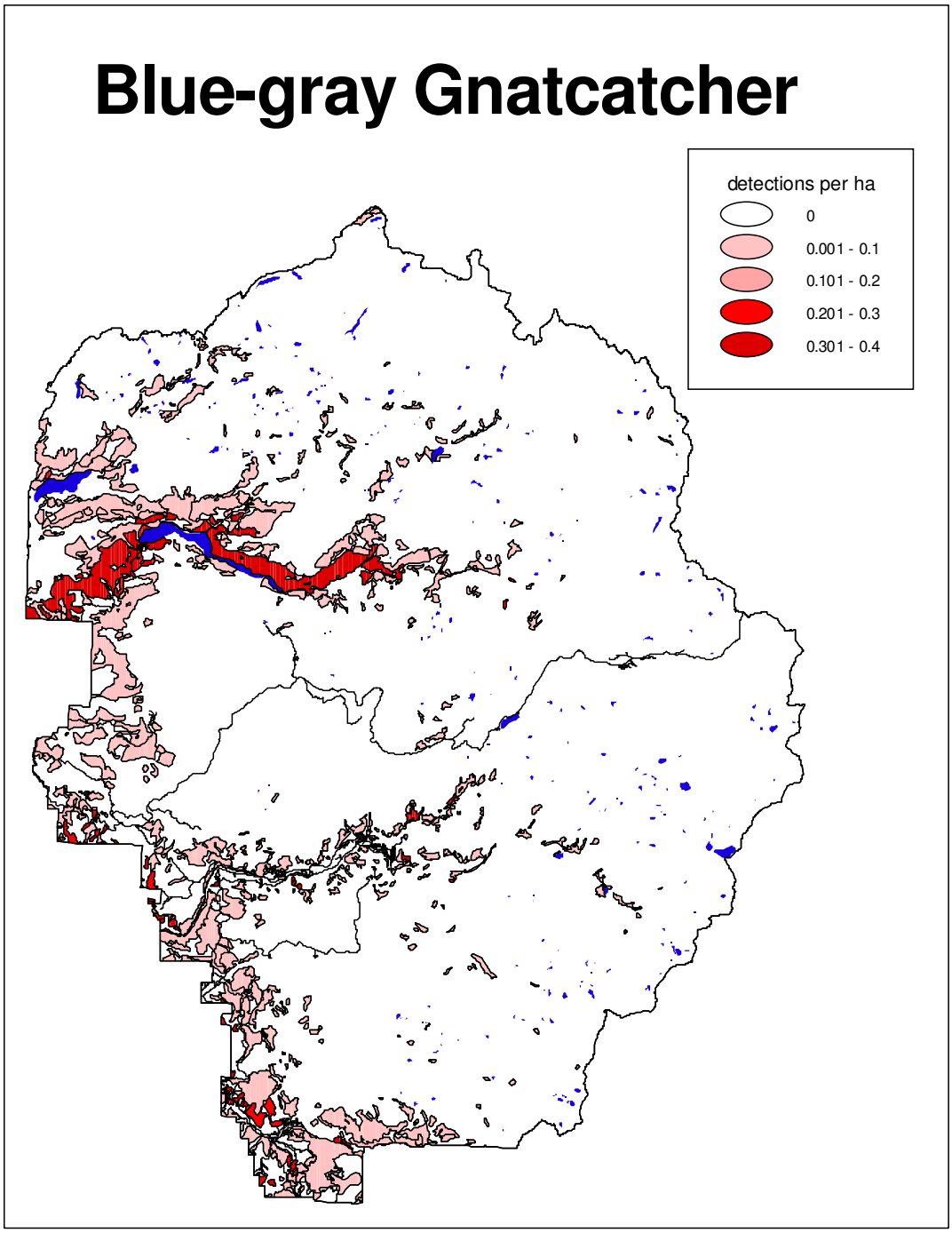

Figure 89. Blue-gray Gnatcatcher distribtution and relative abundance in the park.

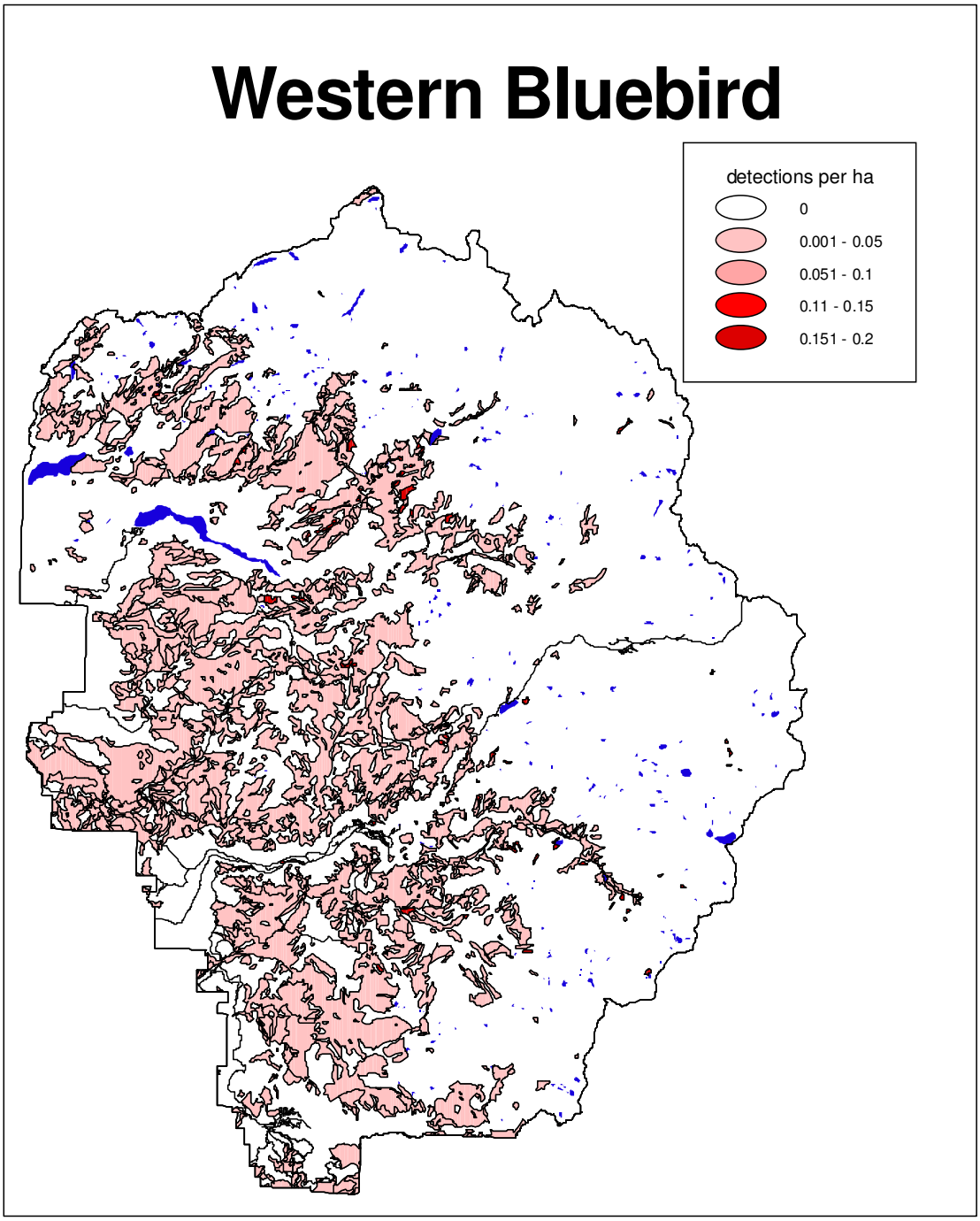

Figure 90. Western Bluebird distribution and relative abundance in the park.

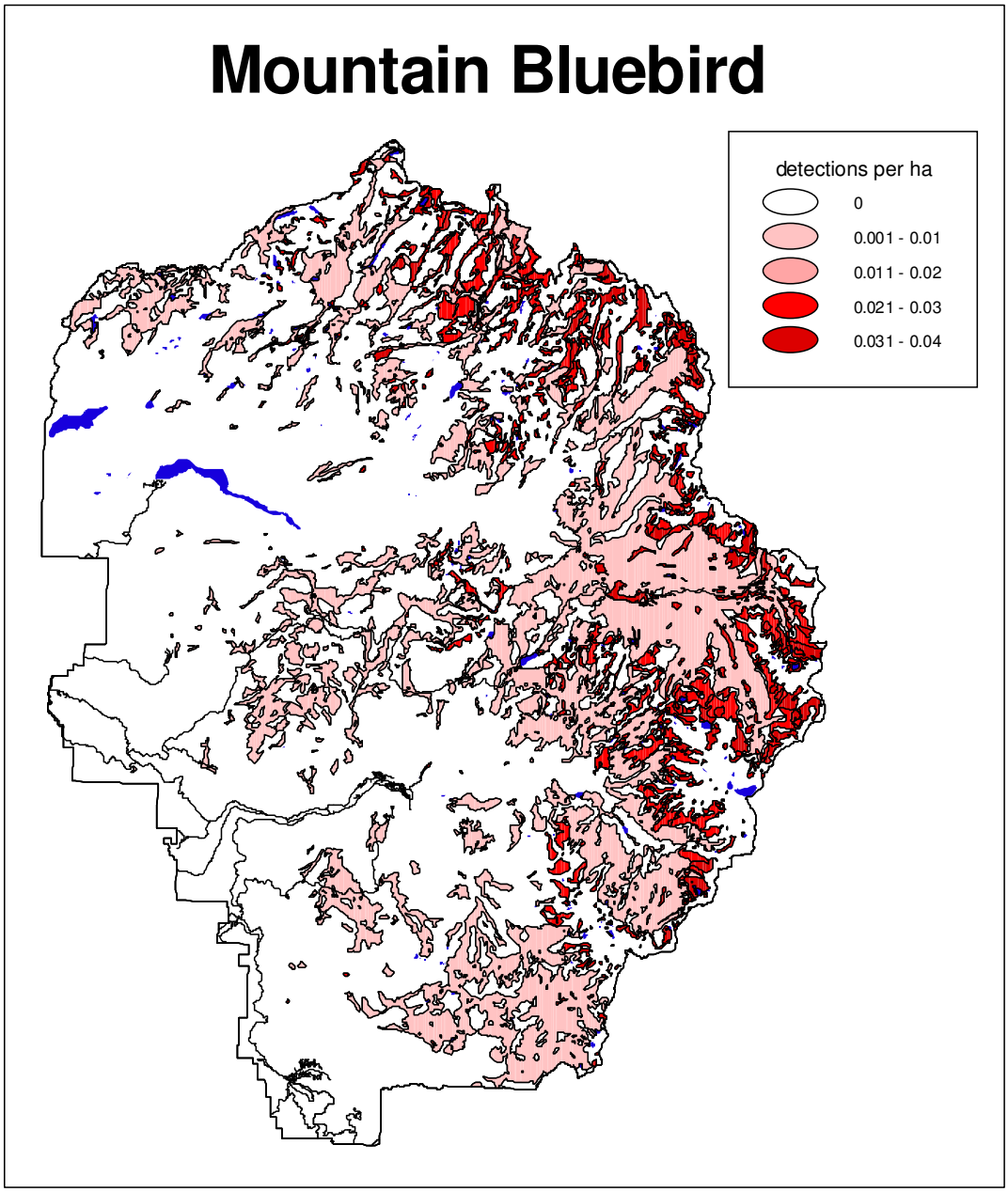

Figure 91. Mountain Bluebird distribution and relative abundance in the park.

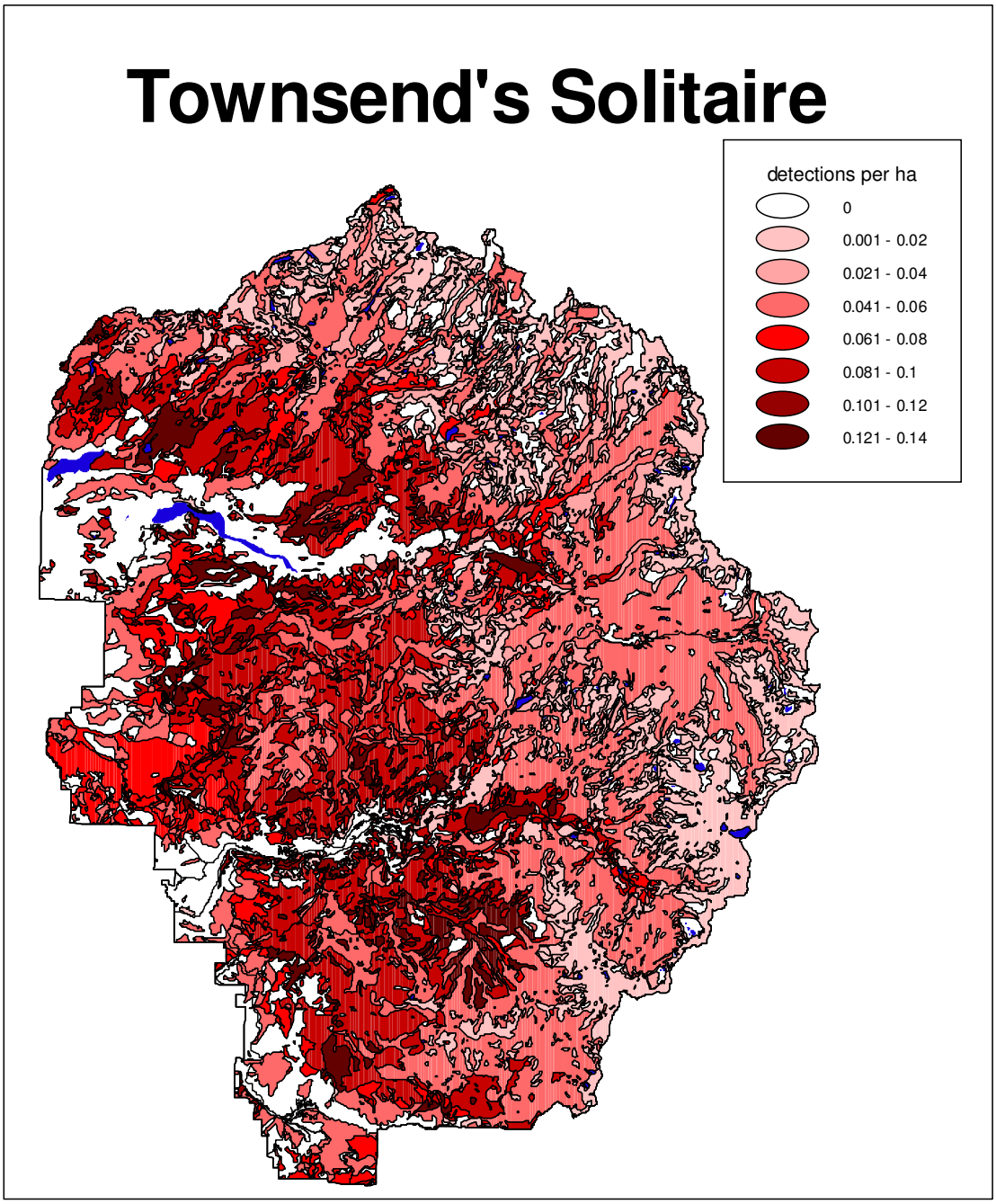

Figure 92. Towsend's Solitaire distribution and relative abundance in the park.

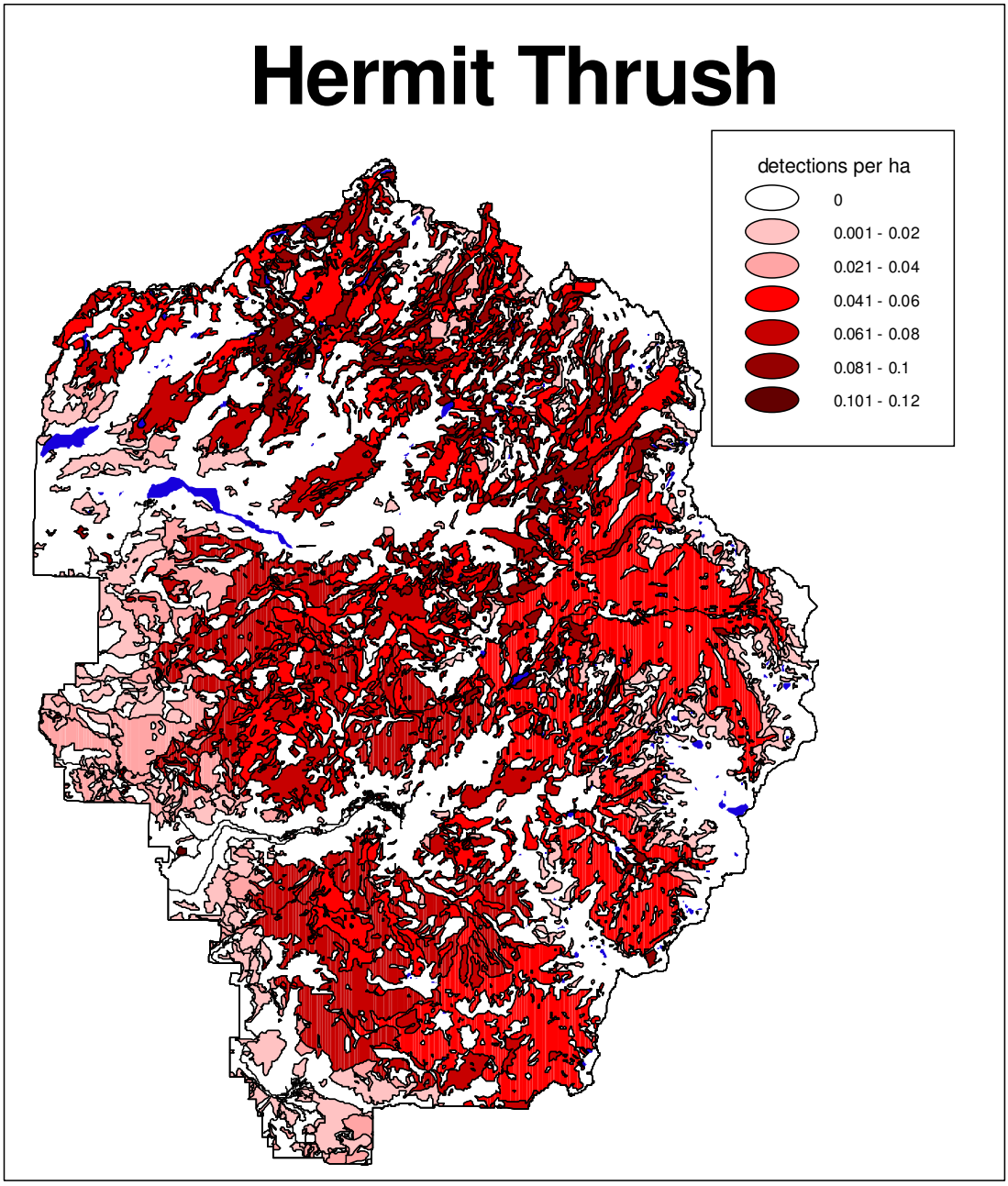

Figure 93. Hermit Thrush distribution and relative abundance in the park.

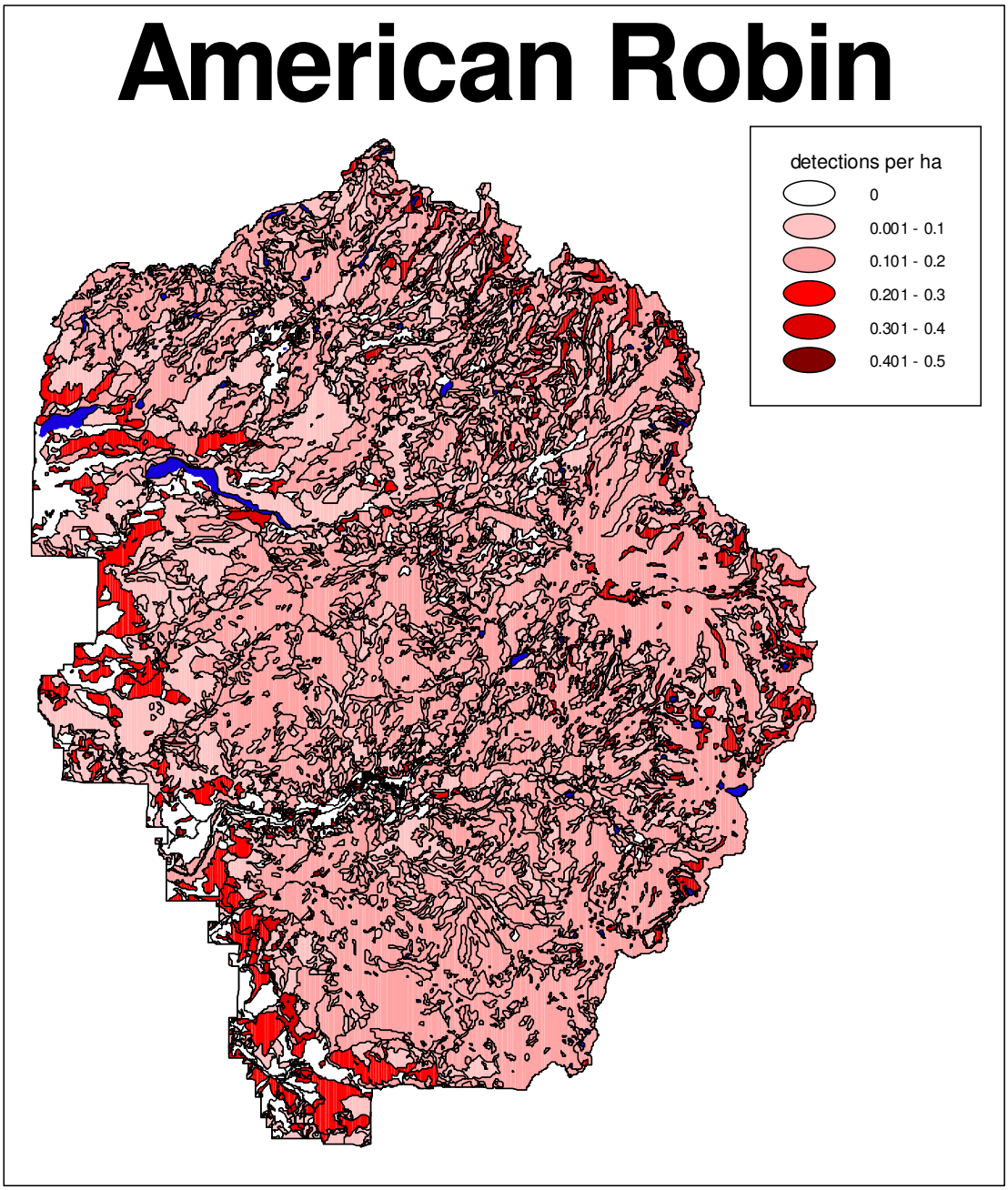

Figure 94. American Robin distribution and relative abundance in the park.

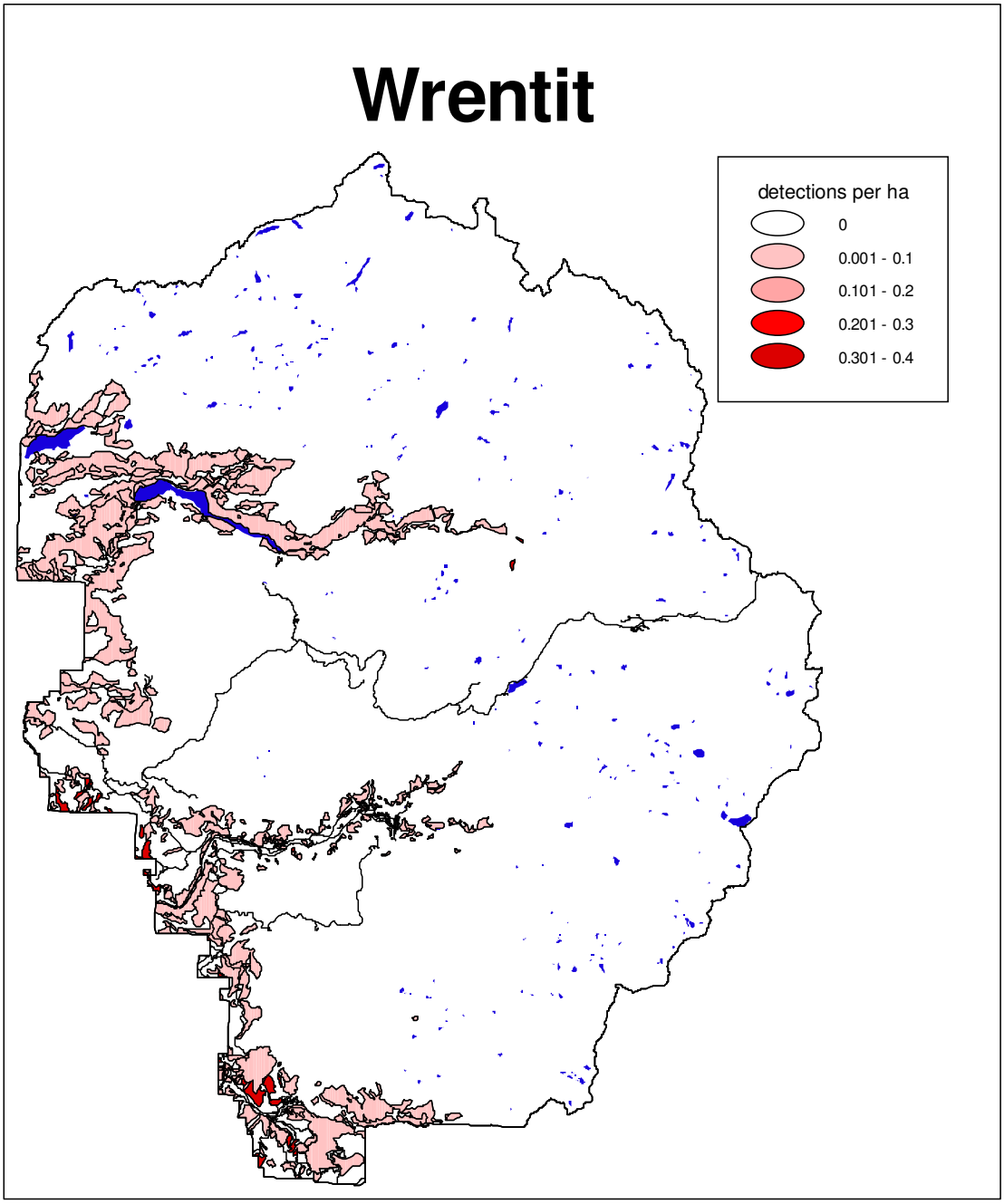

Figure 95. Wrentit distribution and relative abundance in the park.

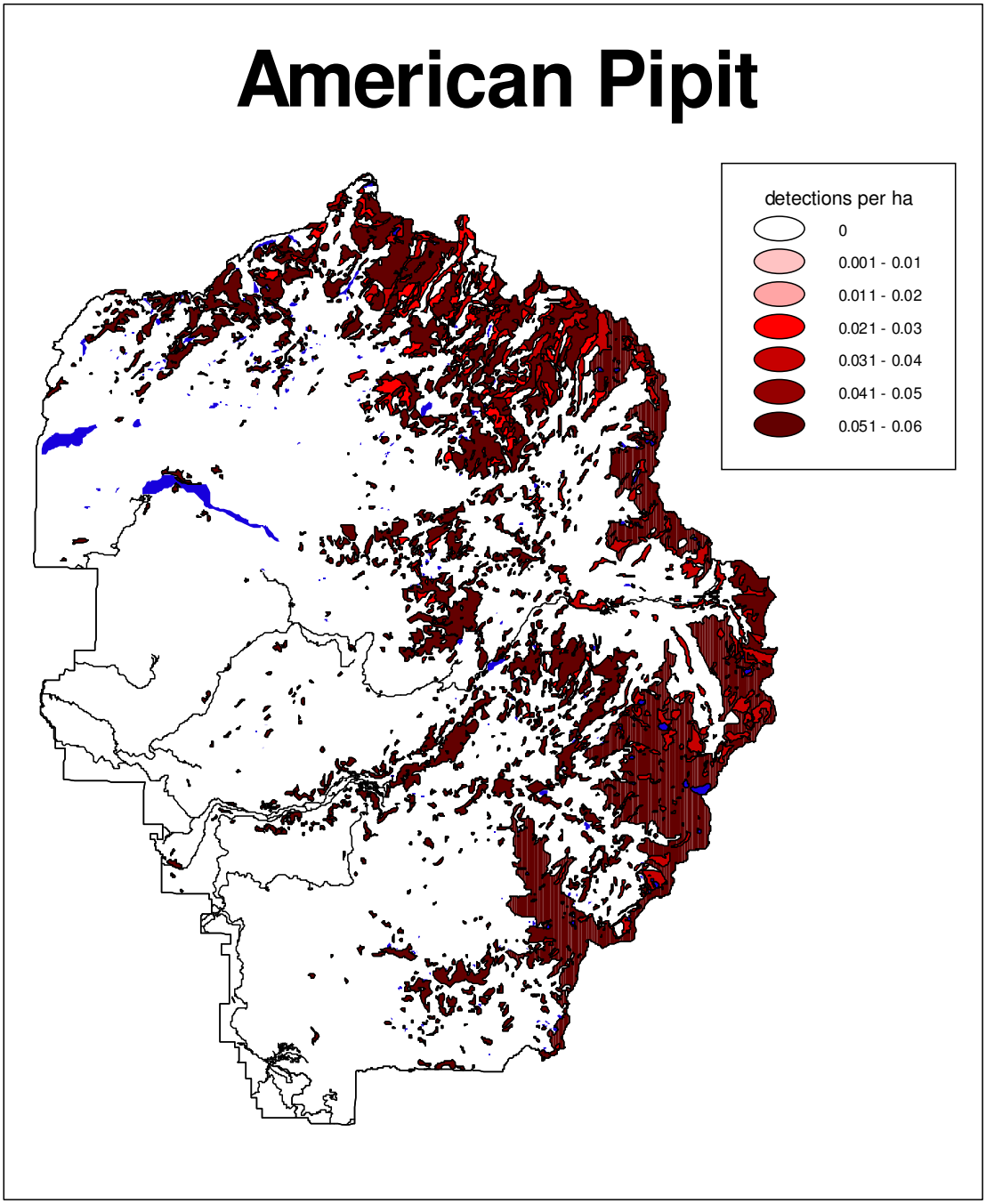

Figure 96. American Pipit distribution and relative abundance in the park.

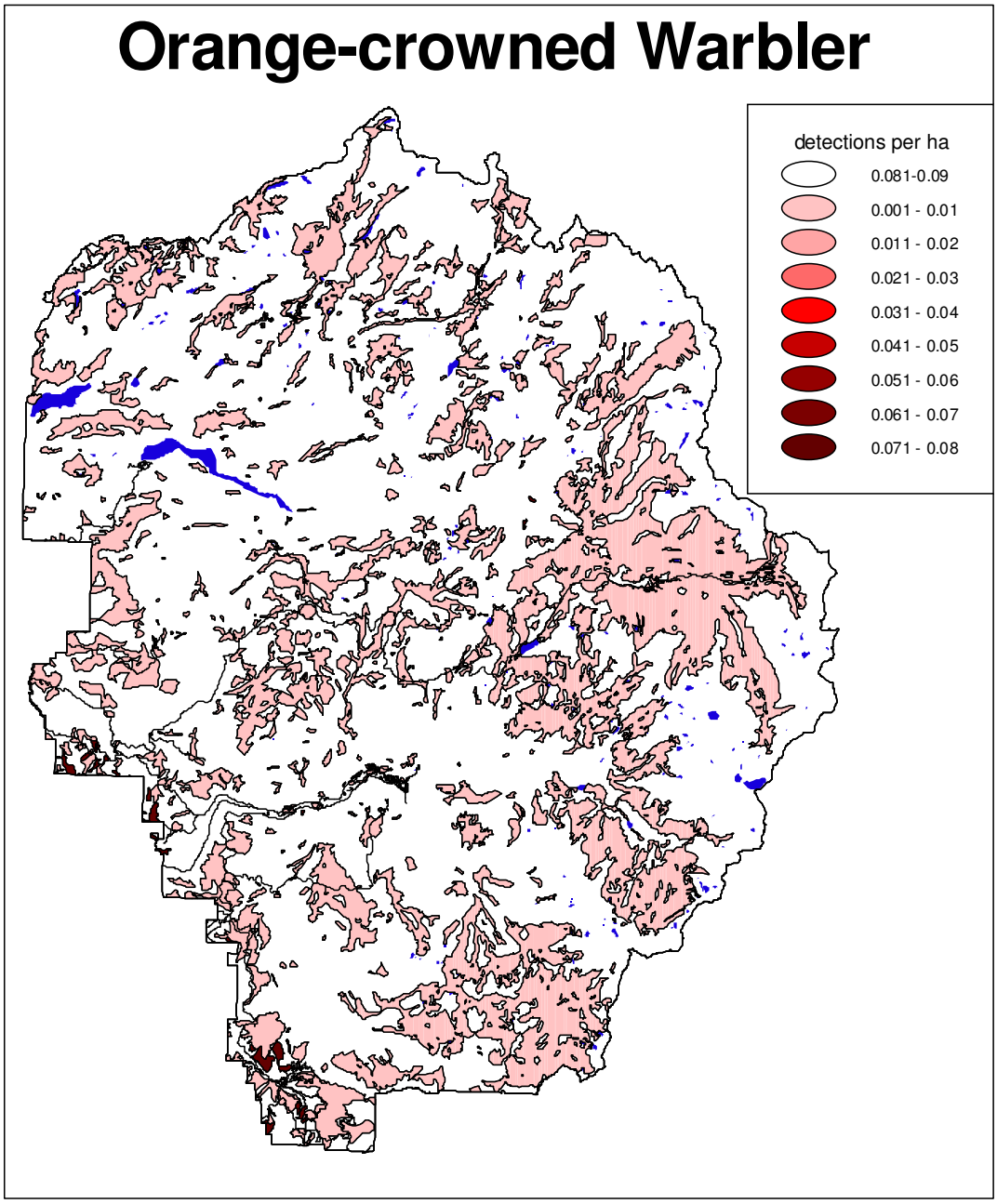

Figure 97. Orange-crowned Warbler distribution and relative abundance.

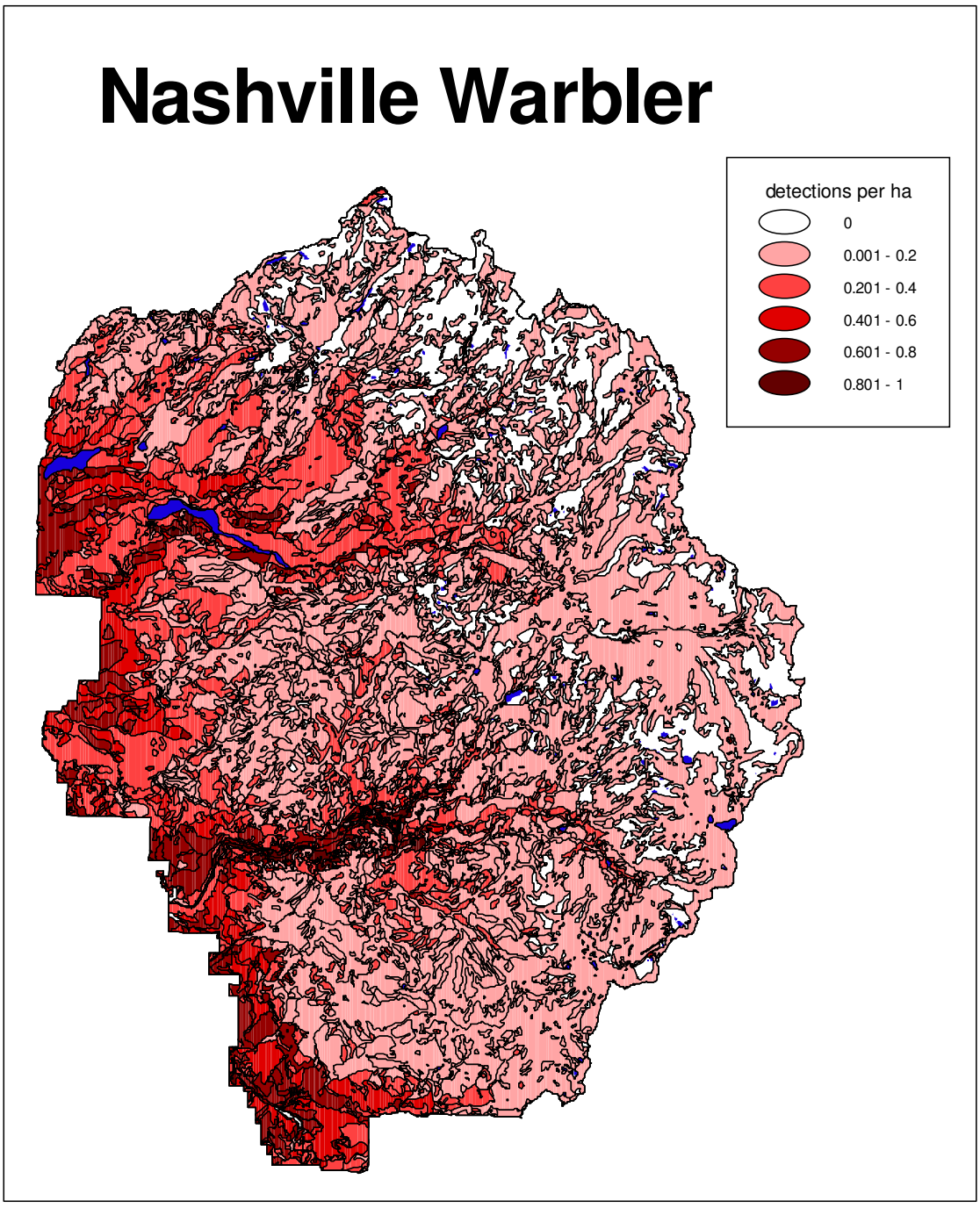

Figure 98. Nashville Warbler distribution andf relative abundance in the park.

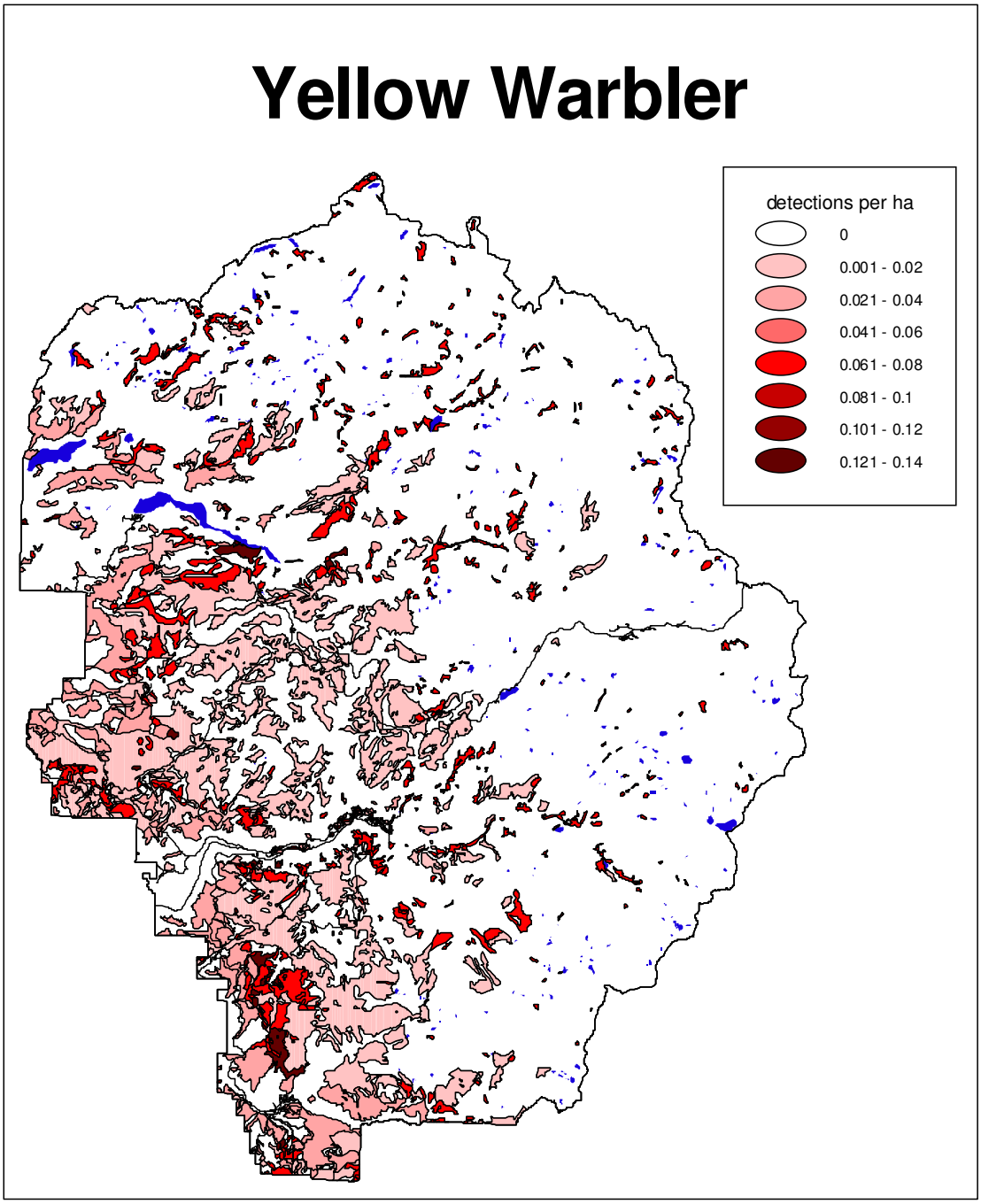

Figure 99. Yellow Warbler distribution and relative abundance in the park.

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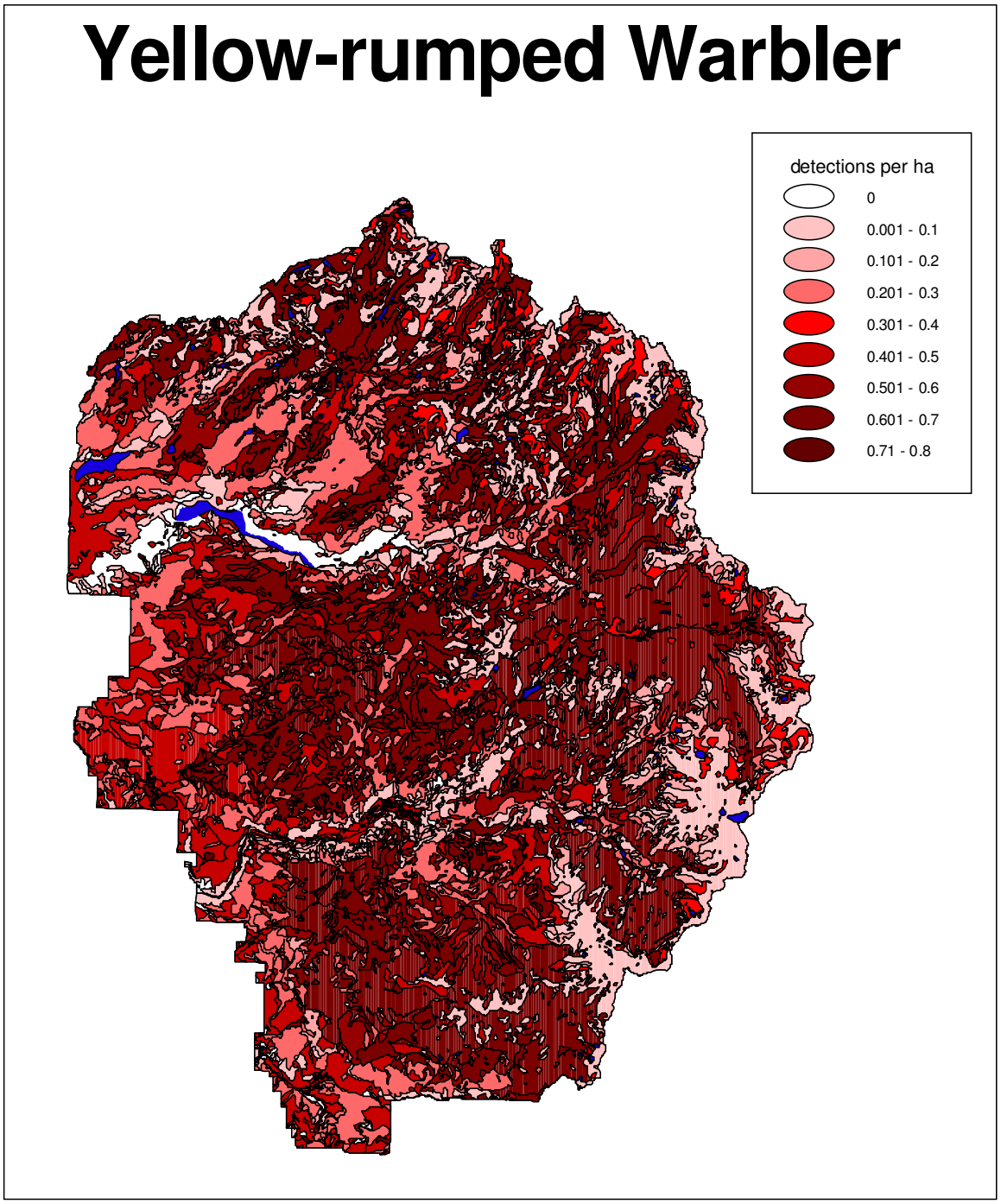

Figure 100. Yellow-rumped Warbler distribution and relative abundance in the park.

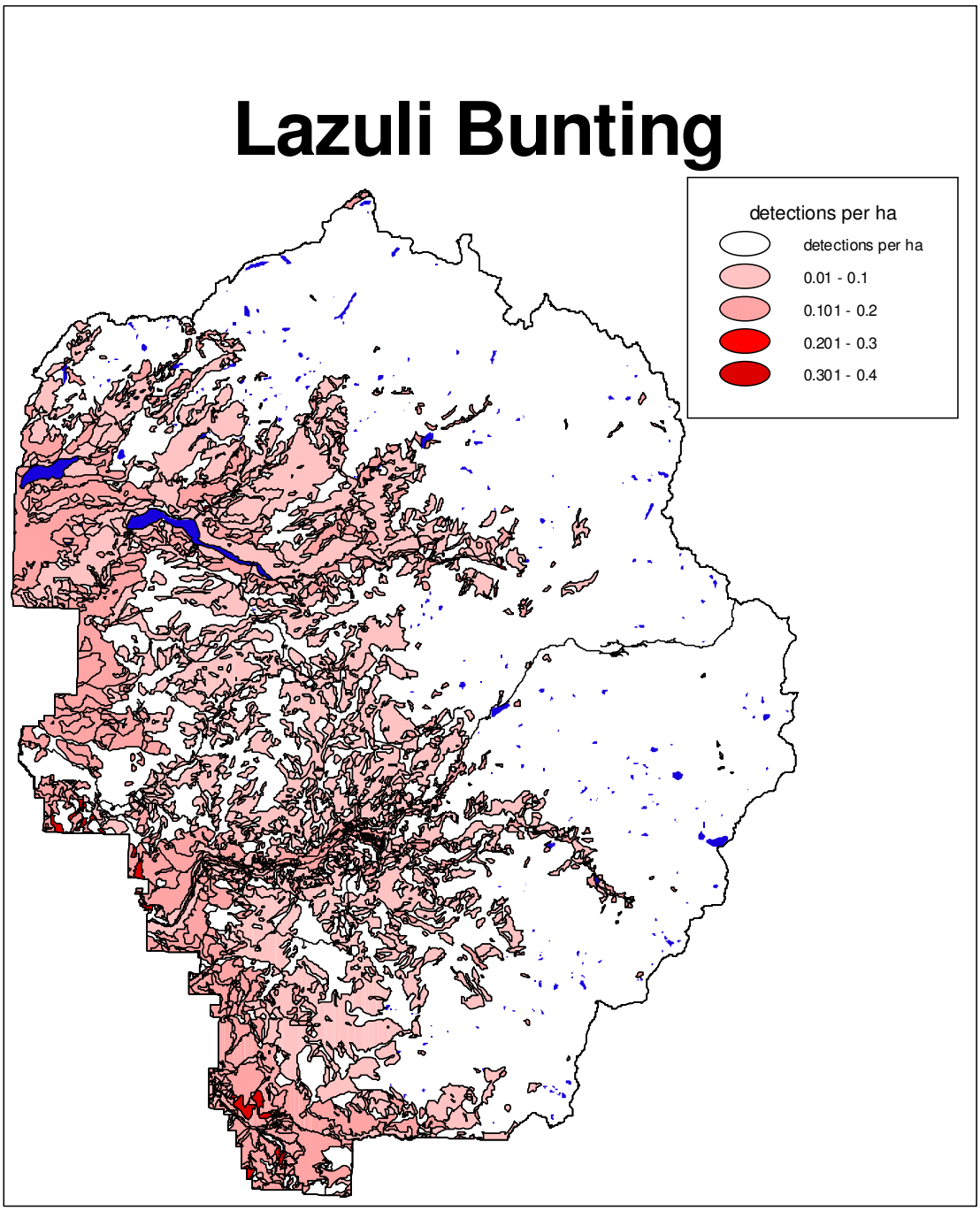

Figure 116. Lazuli Bunting distribution and relative abundance in the park.

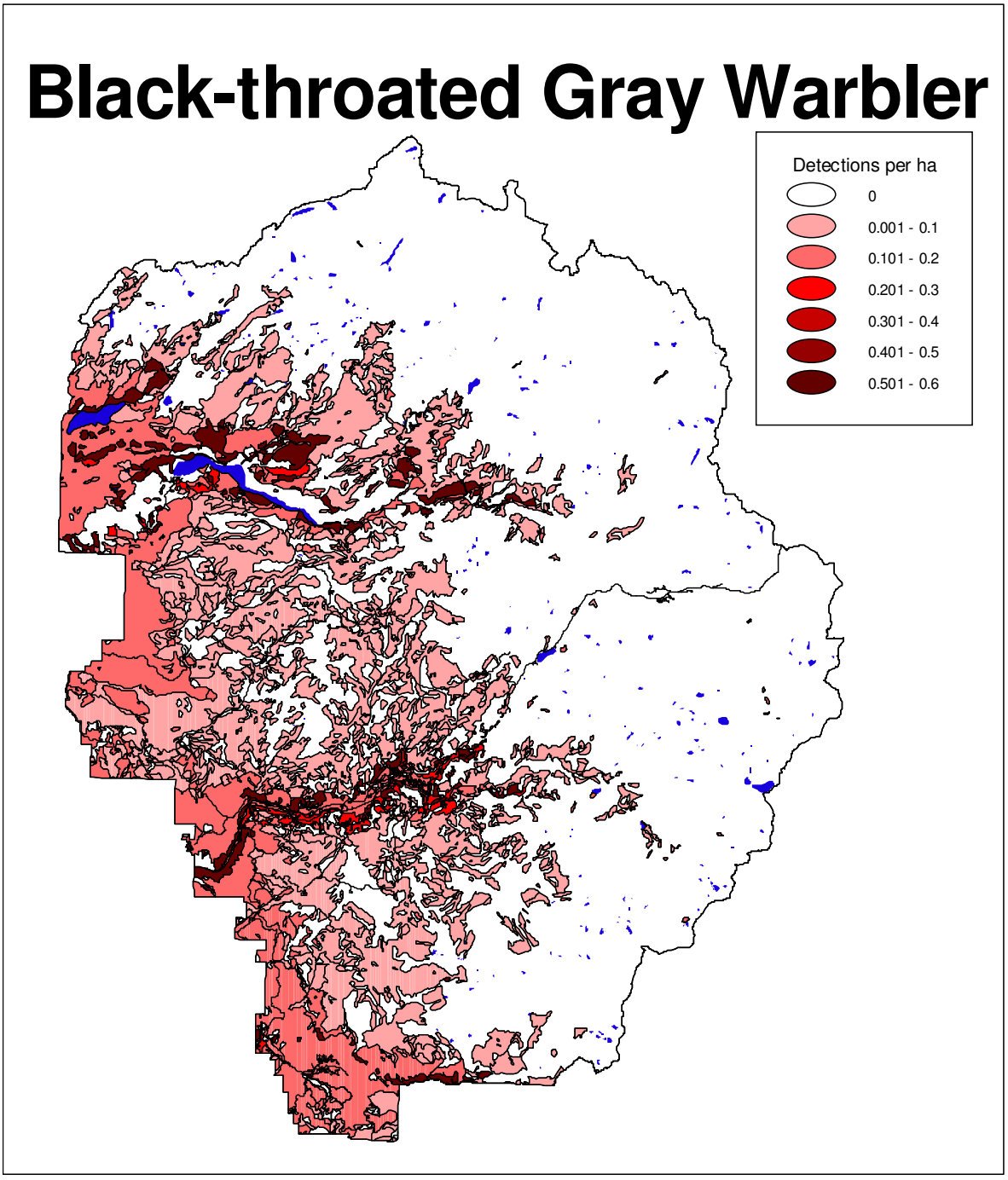

Figure 101. Black-throated Gray Warbler distribution and relative abundance in the park.

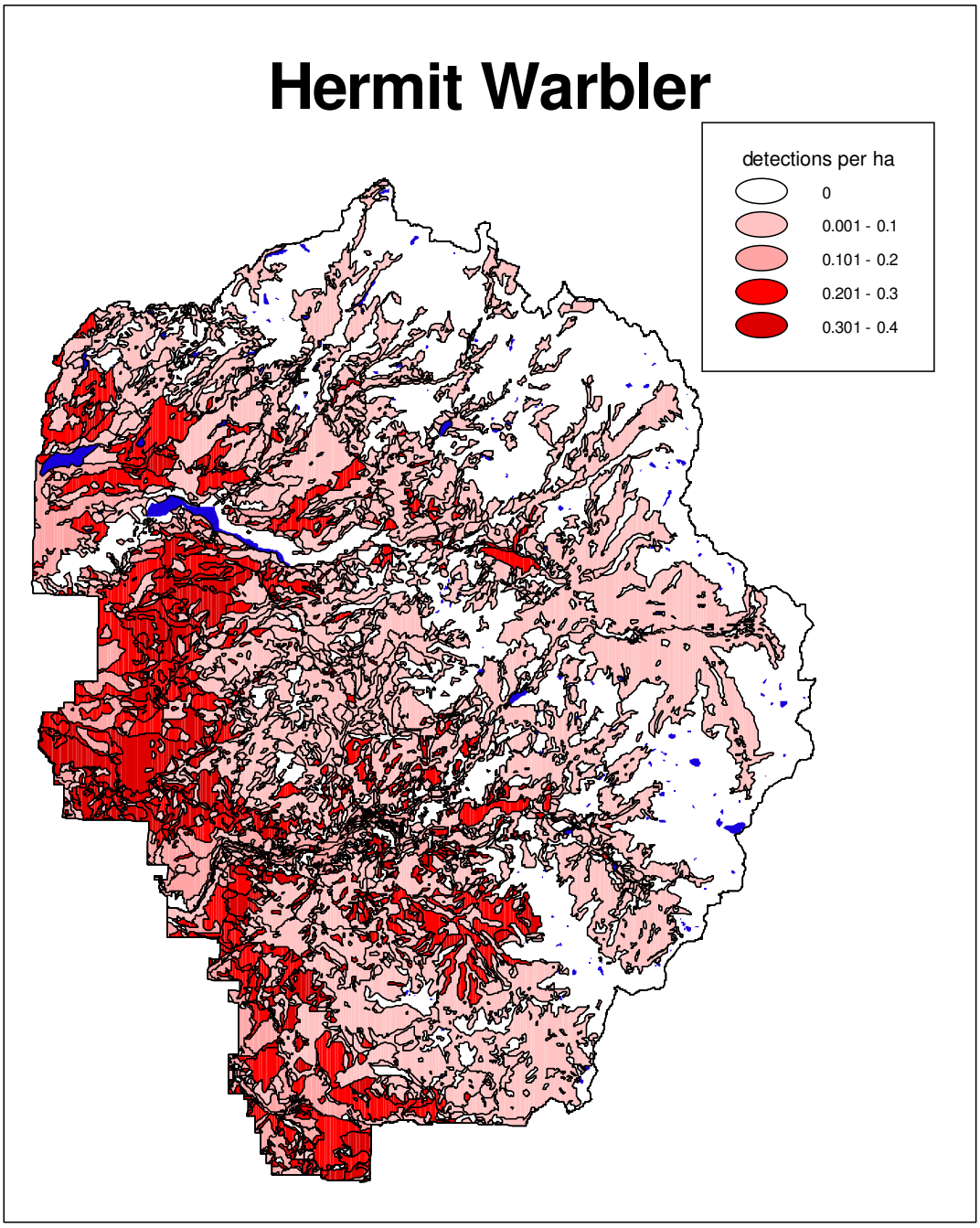

Figure 102. Hermit Warbler distribution and abundance in the park.

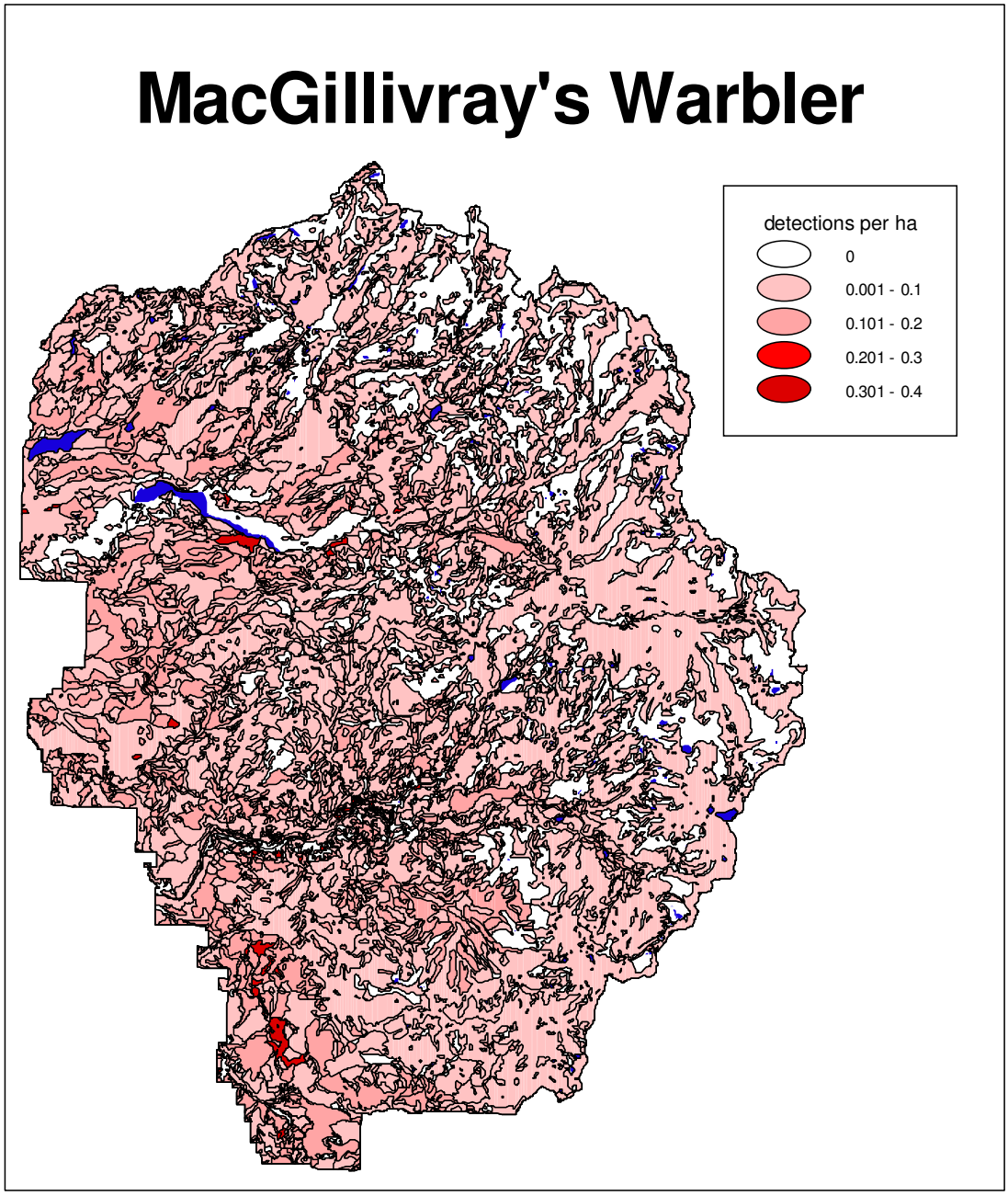

Figure 103. MacGillivray's Warbler distribution and relative abundance in the park.

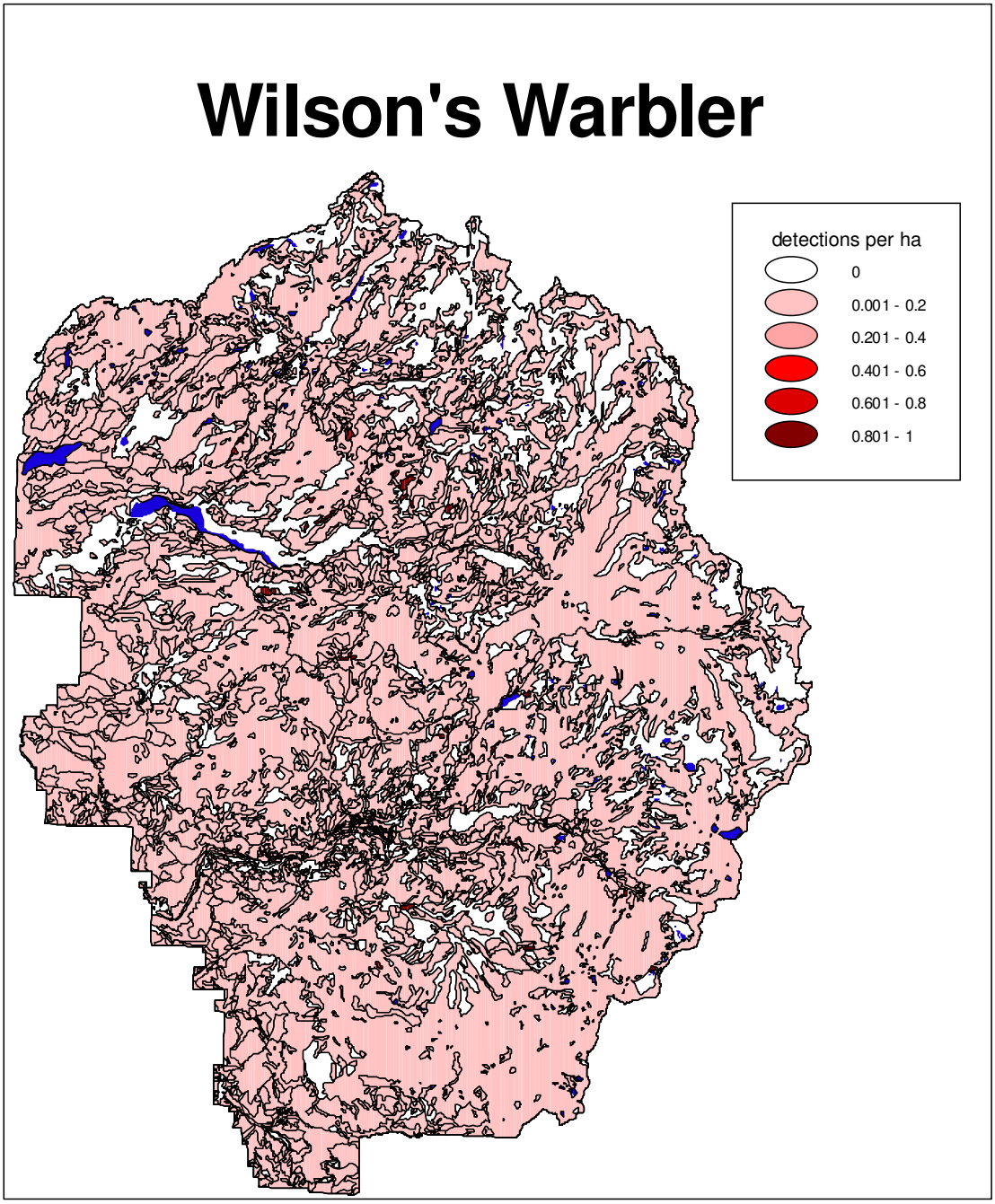

Figure 104. Wilson's Warbler distribution and relative abundance in the park.

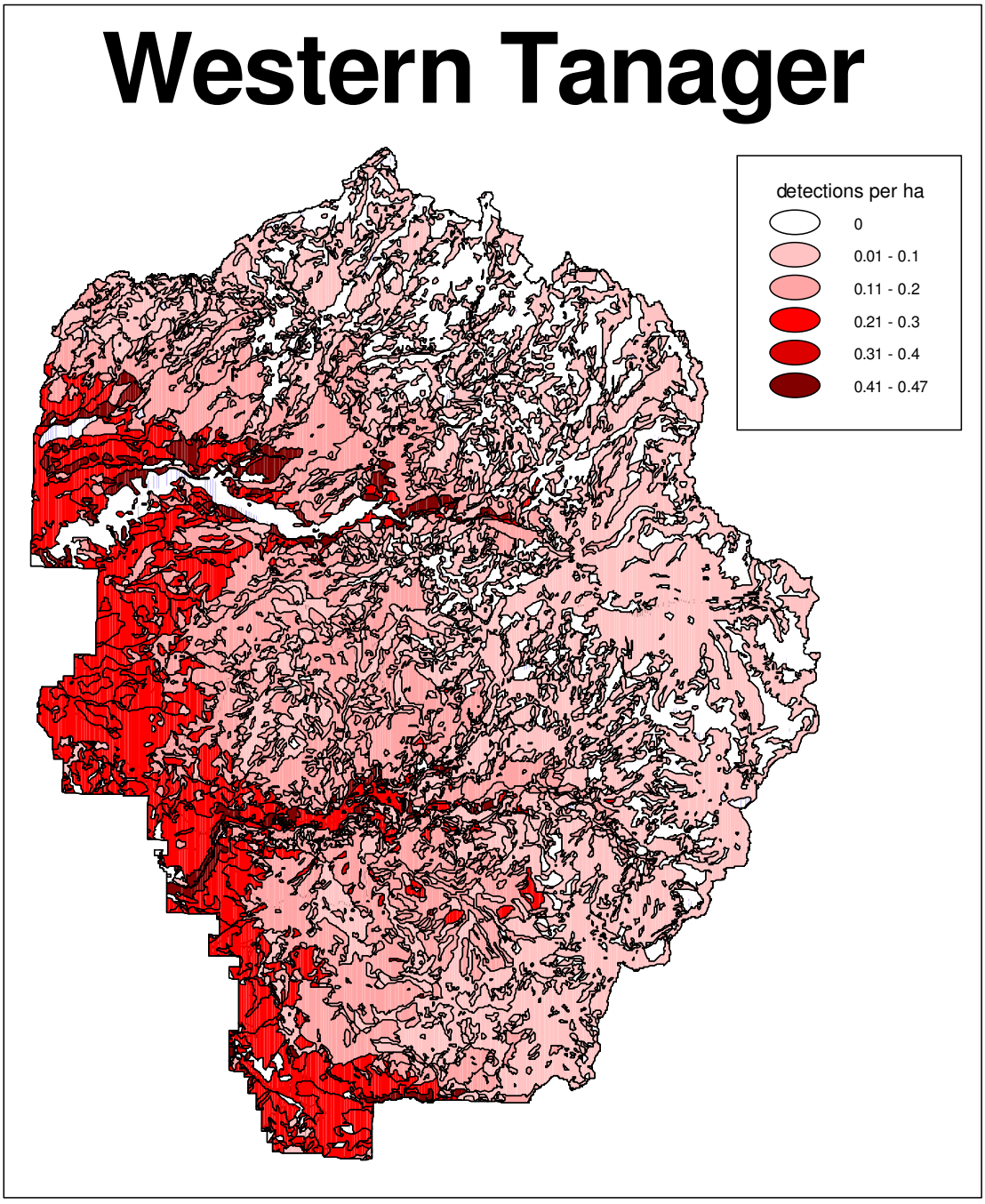

Figure 105. Western Tanager distribution and relative abundance in the park.

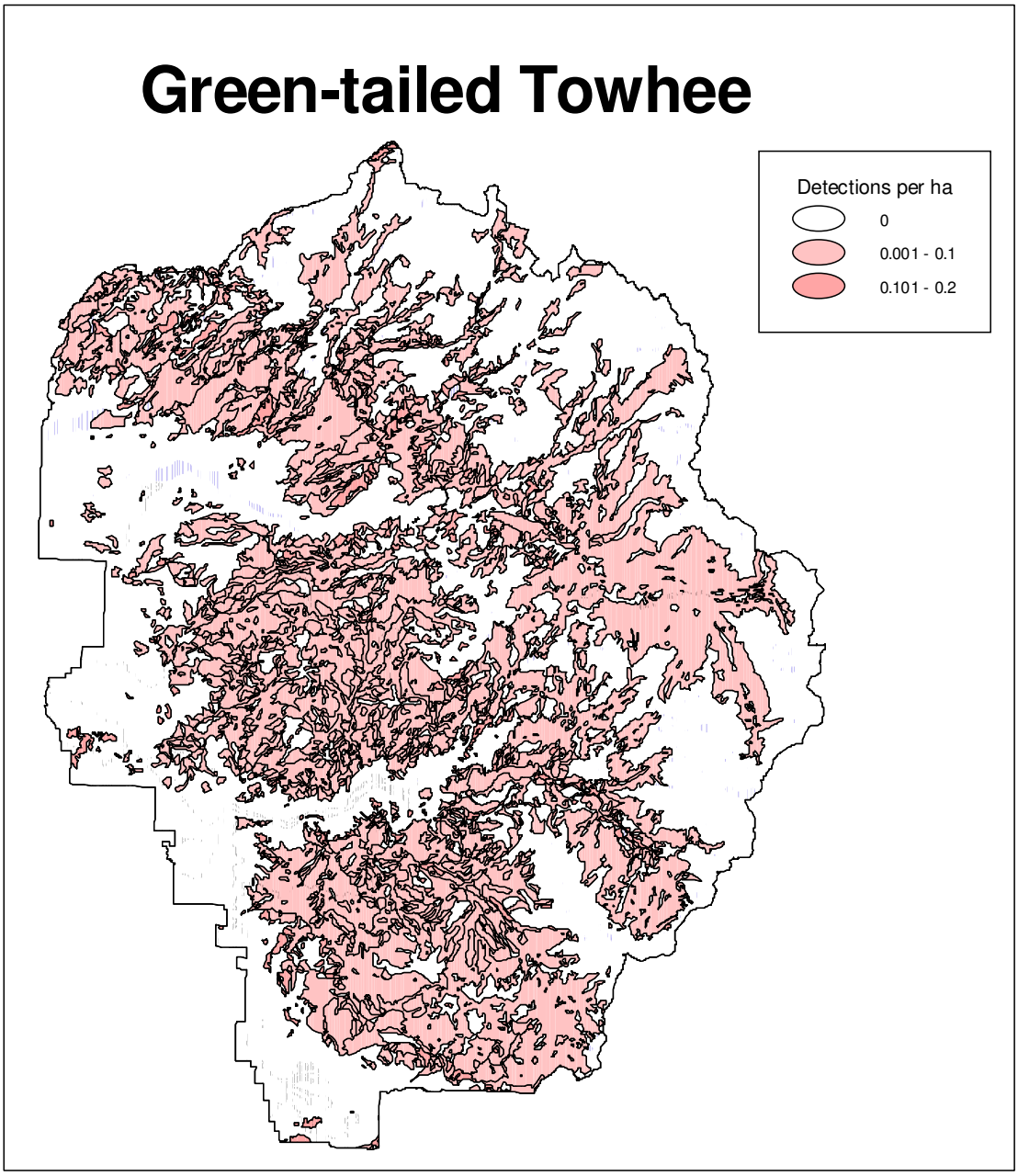

Figure 106. Green-tailed Towhee distribution and relative abundance in the park.

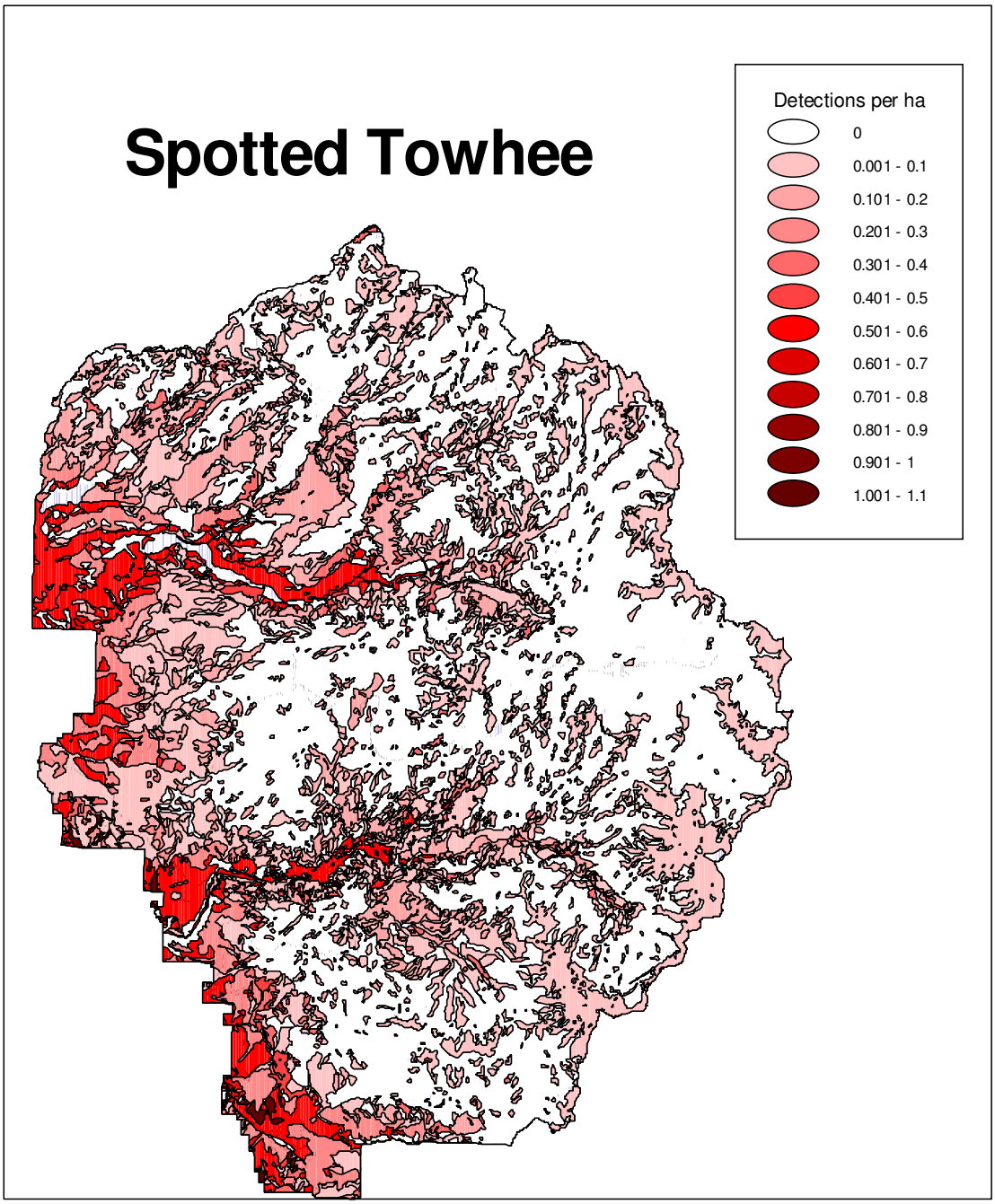

Figure 107. Spotted Towhee distribution and relative abundance in the park.

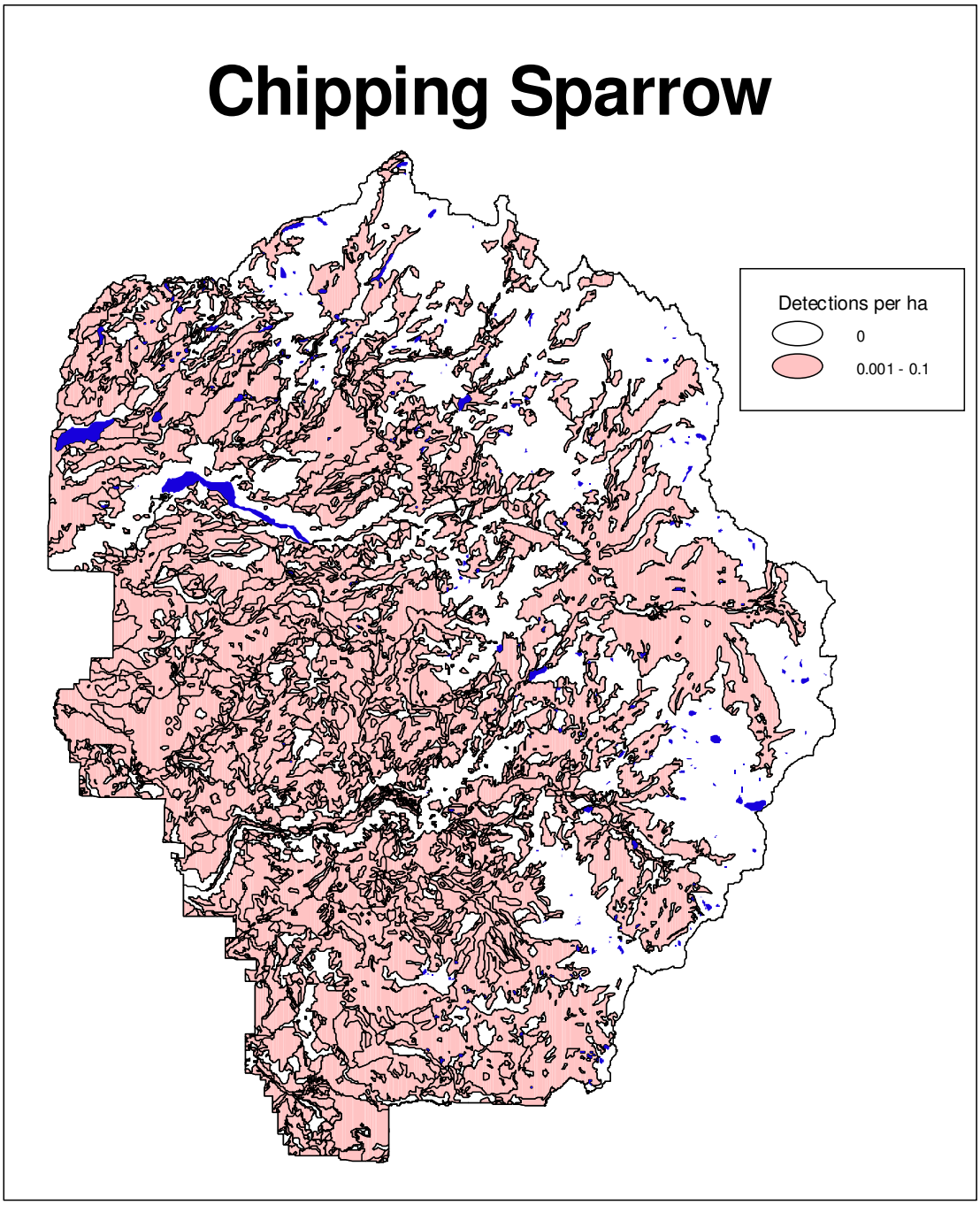

Figure 108. Chipping Sparrow distribution and relative abundance in the park.

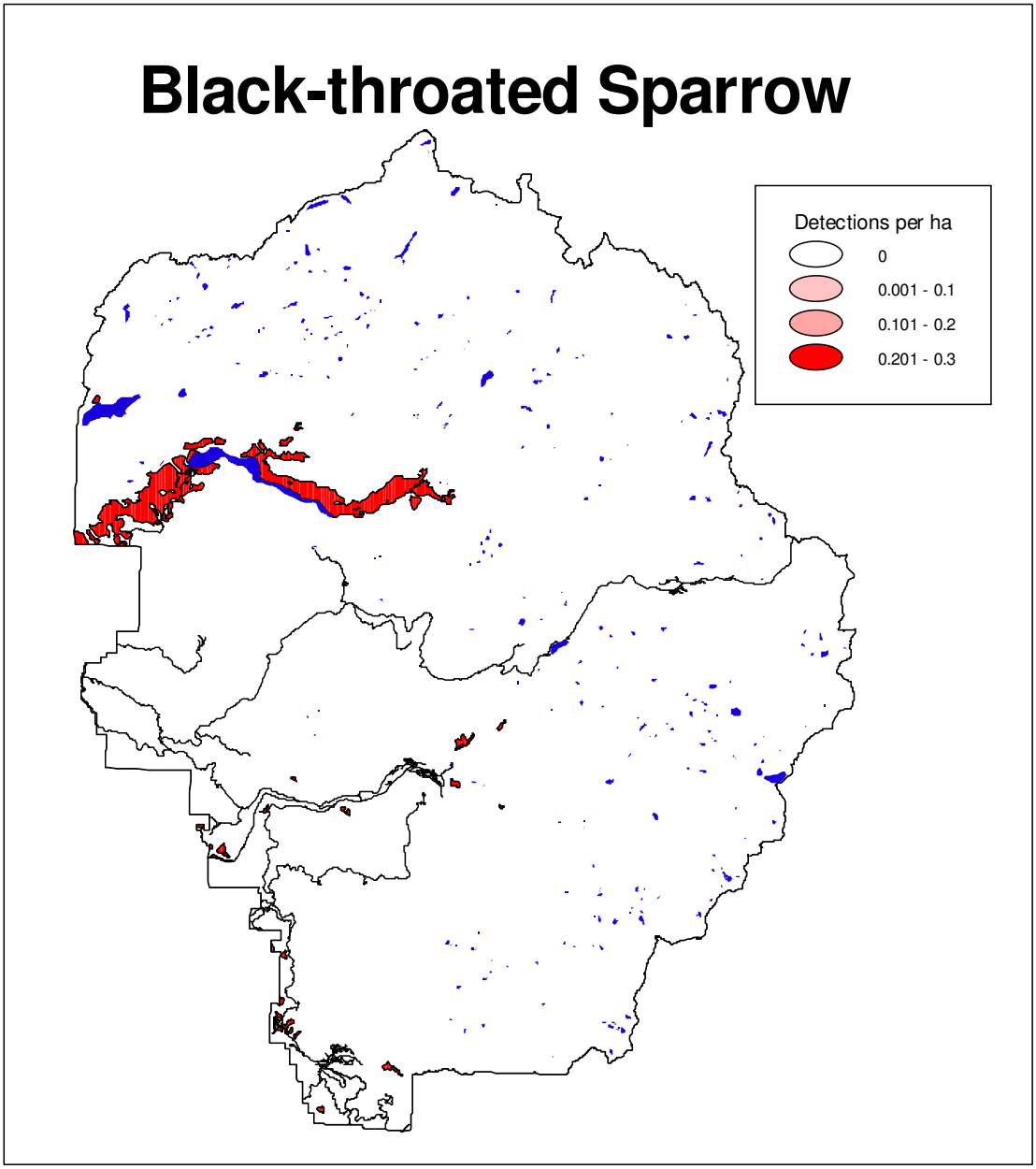

Figure 109. Black-throated Sparrow distribution and relative abundance in the park.

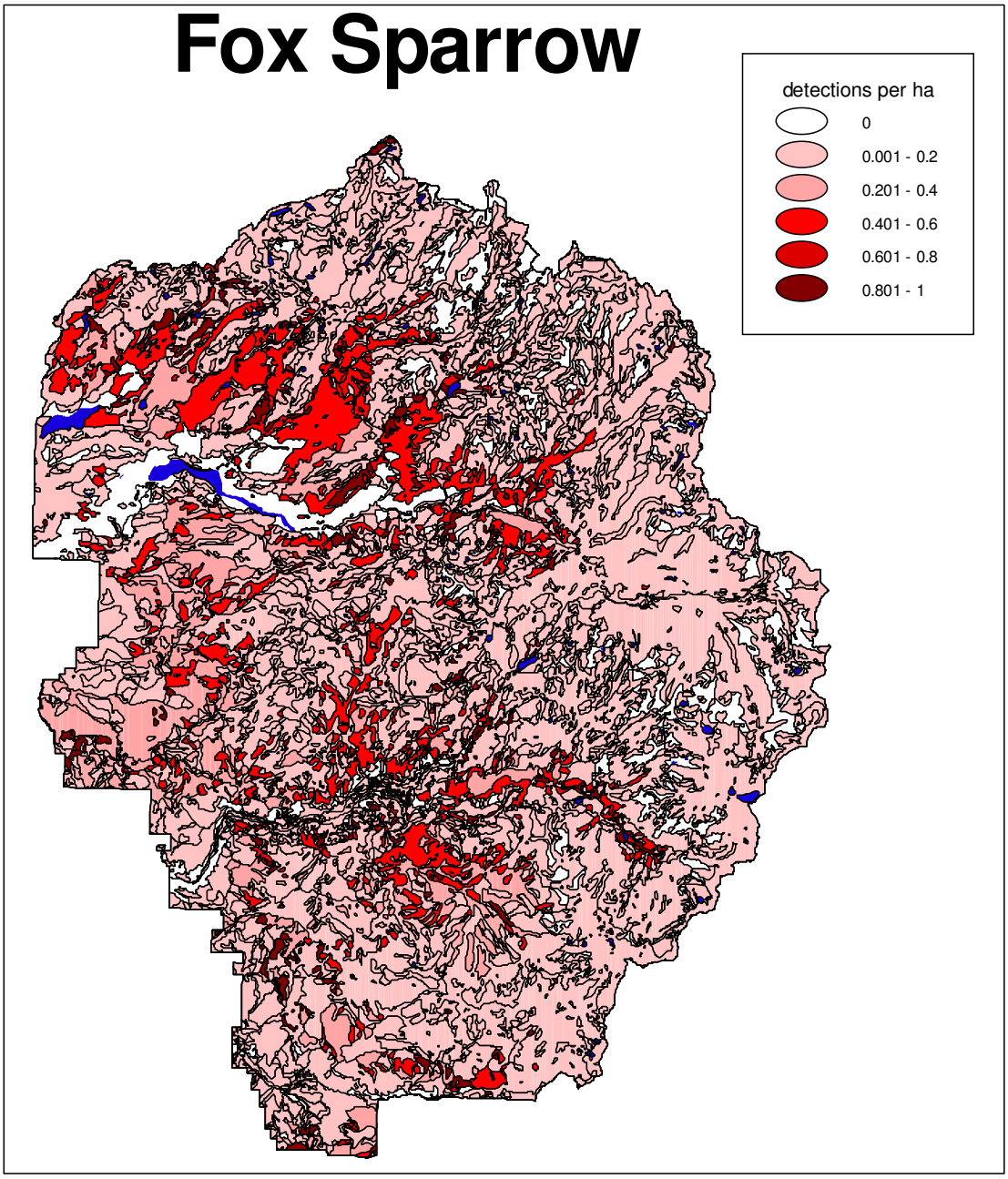

Figure 110. Fox Sparrow distribution and relative abundance in the park.

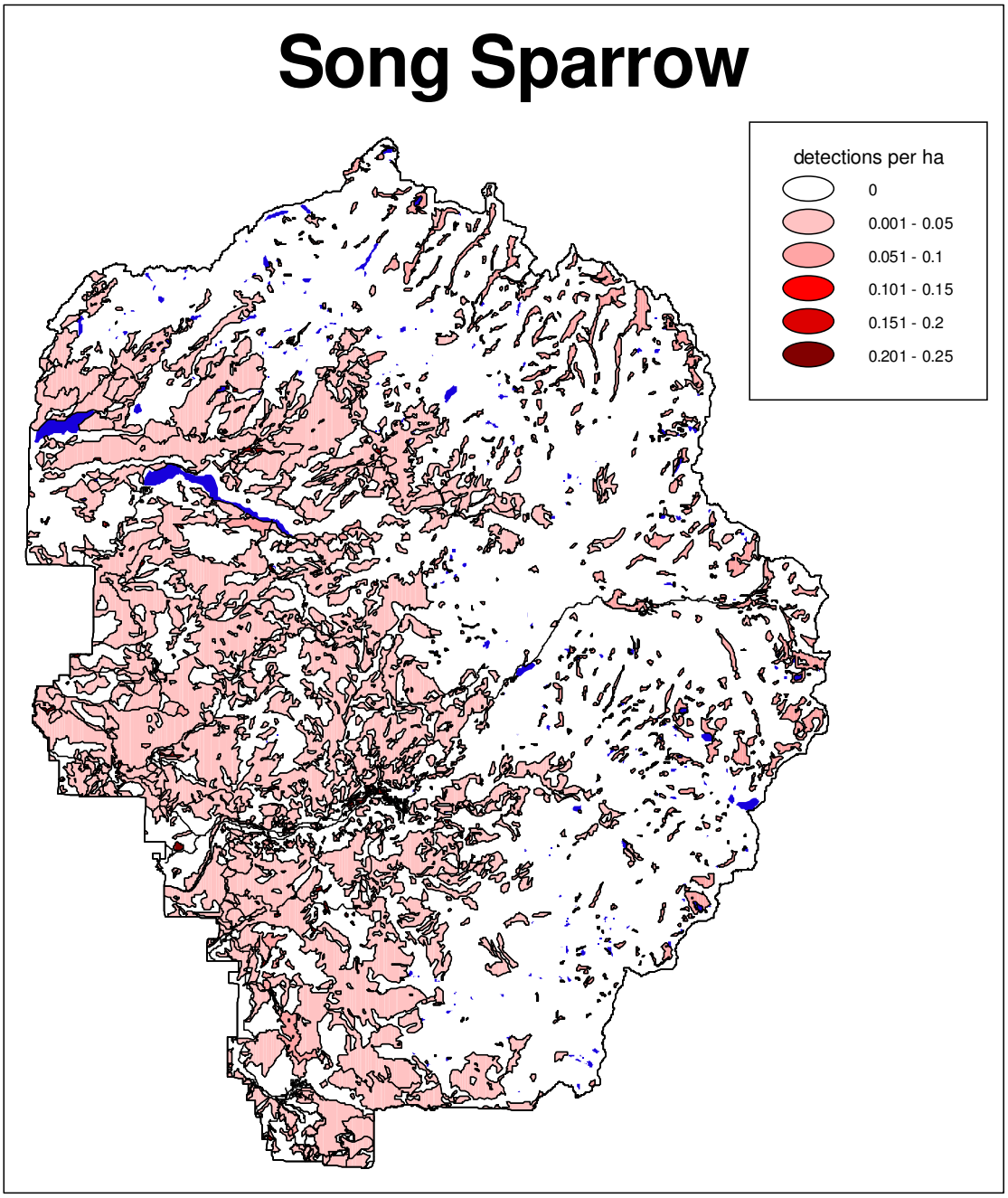

Figure 111. Song Sparrow distribution and relative abundance in the park.

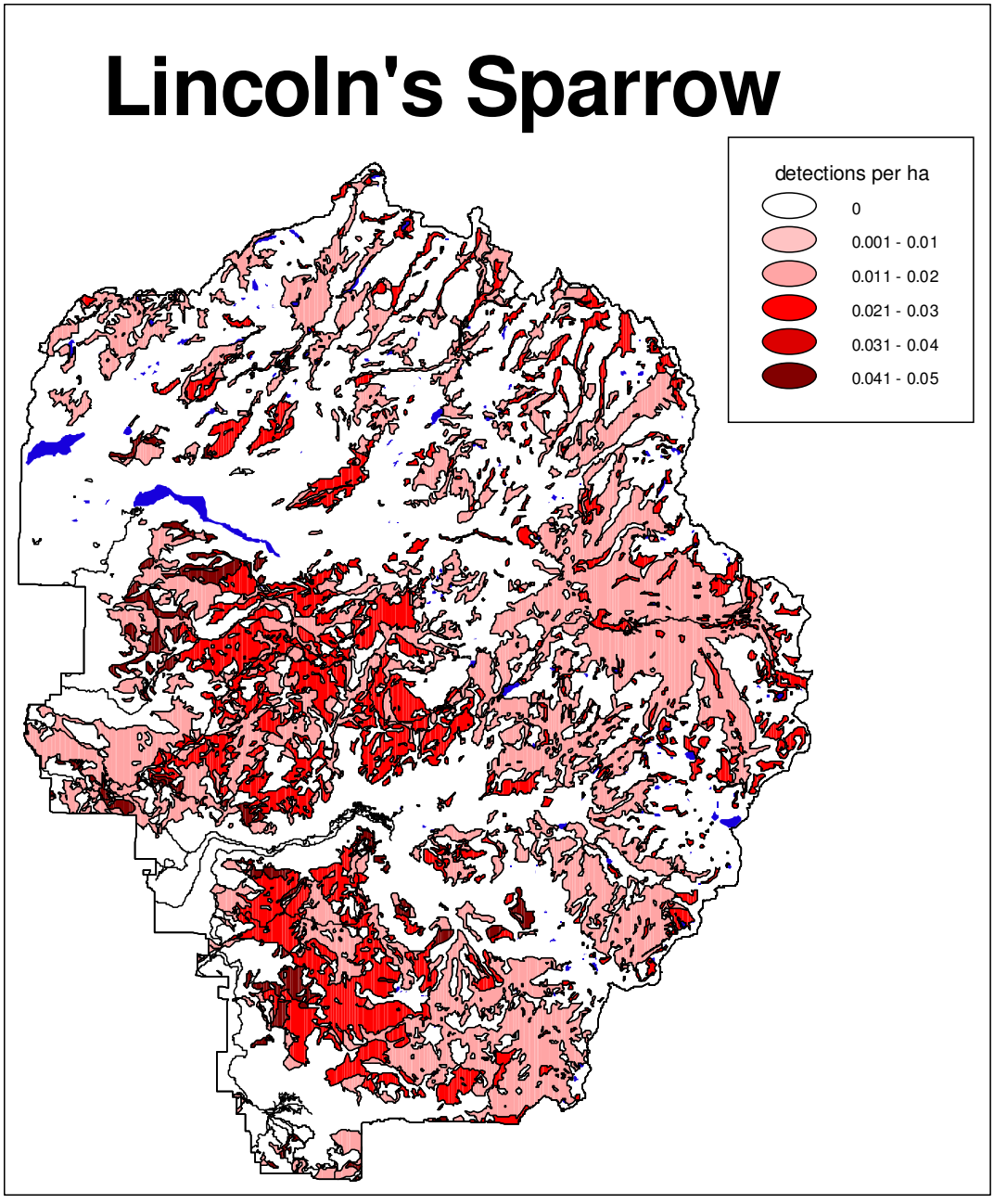

Figure 112. Lincoln's Sparrow distribution and relative abundance in the park.

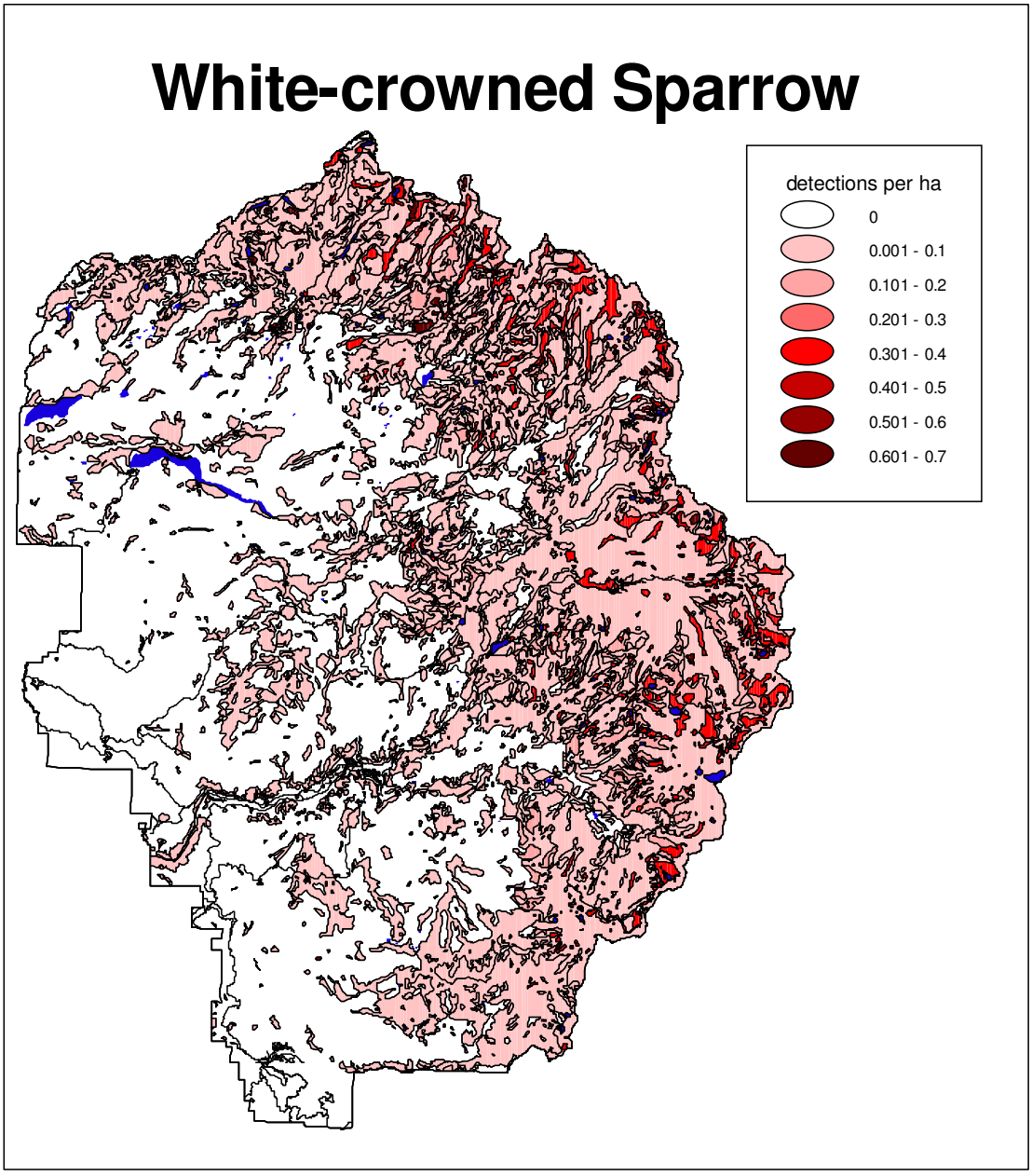

Figure 113. White-crowned Sparrow distribution and relative abundance in the park.

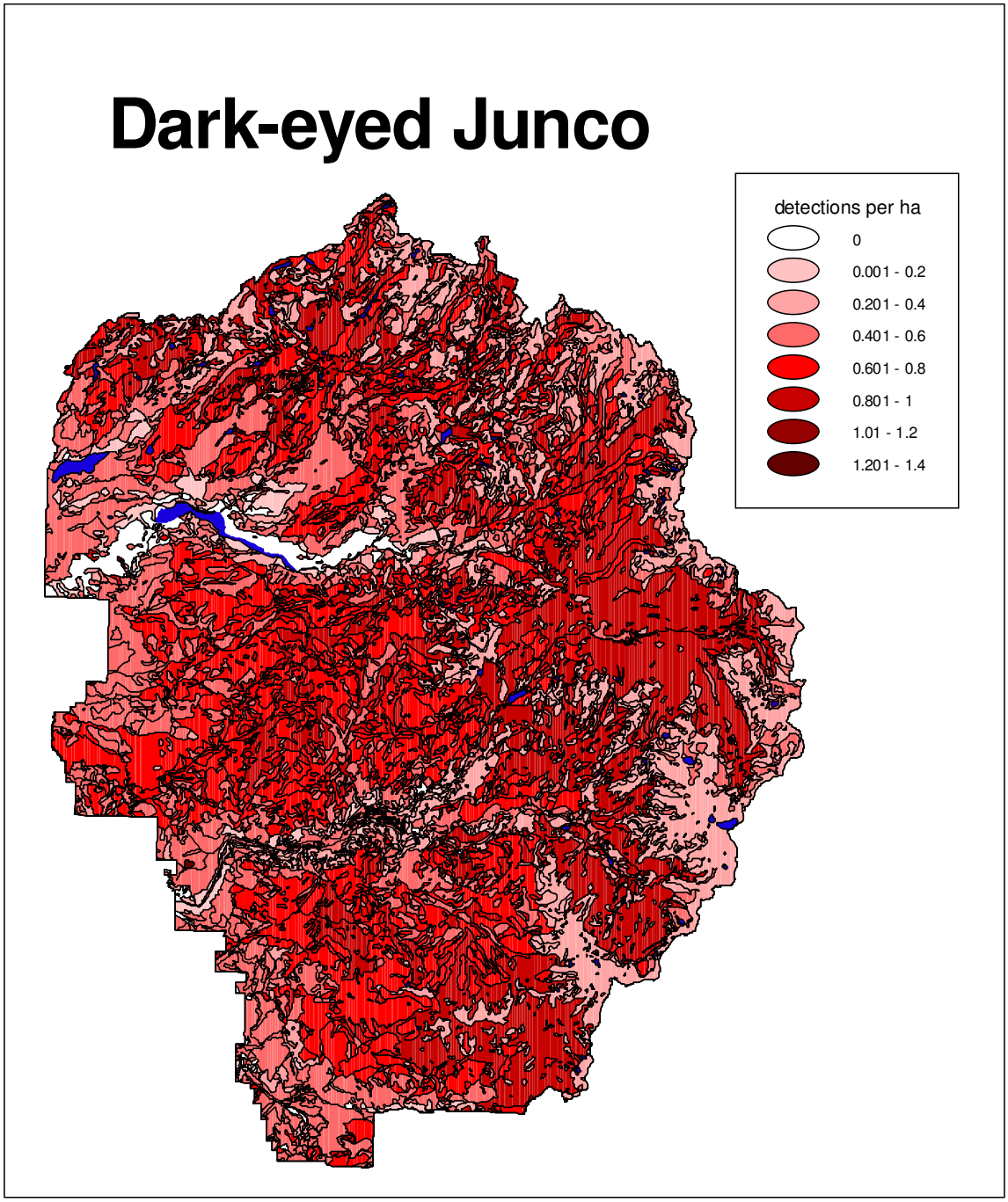

Figure 114. Dark-eyed Junco distribution and relative abundance in the park.

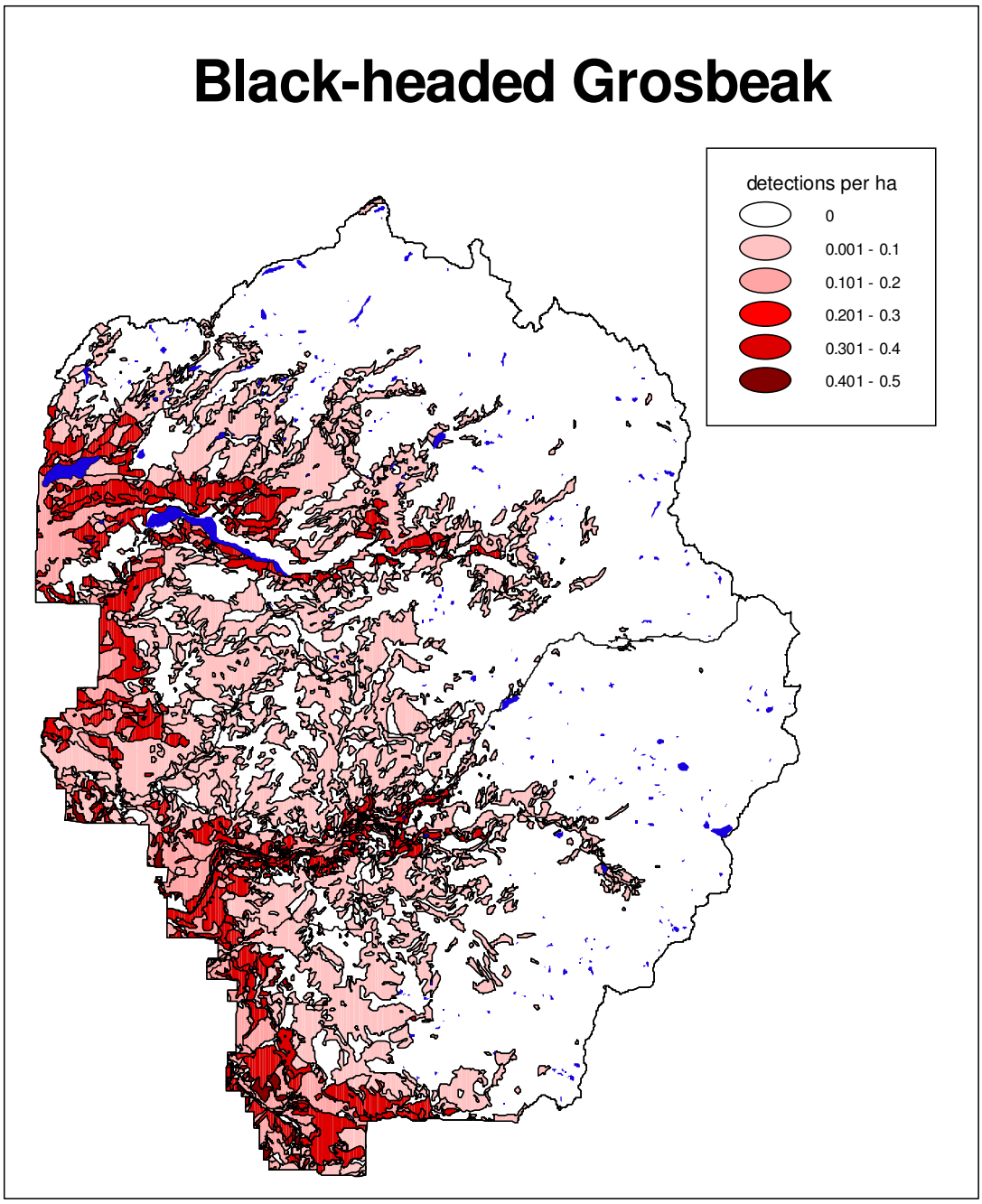

Figure 115. Black-headed Grosbeak distribution and relative abundance.

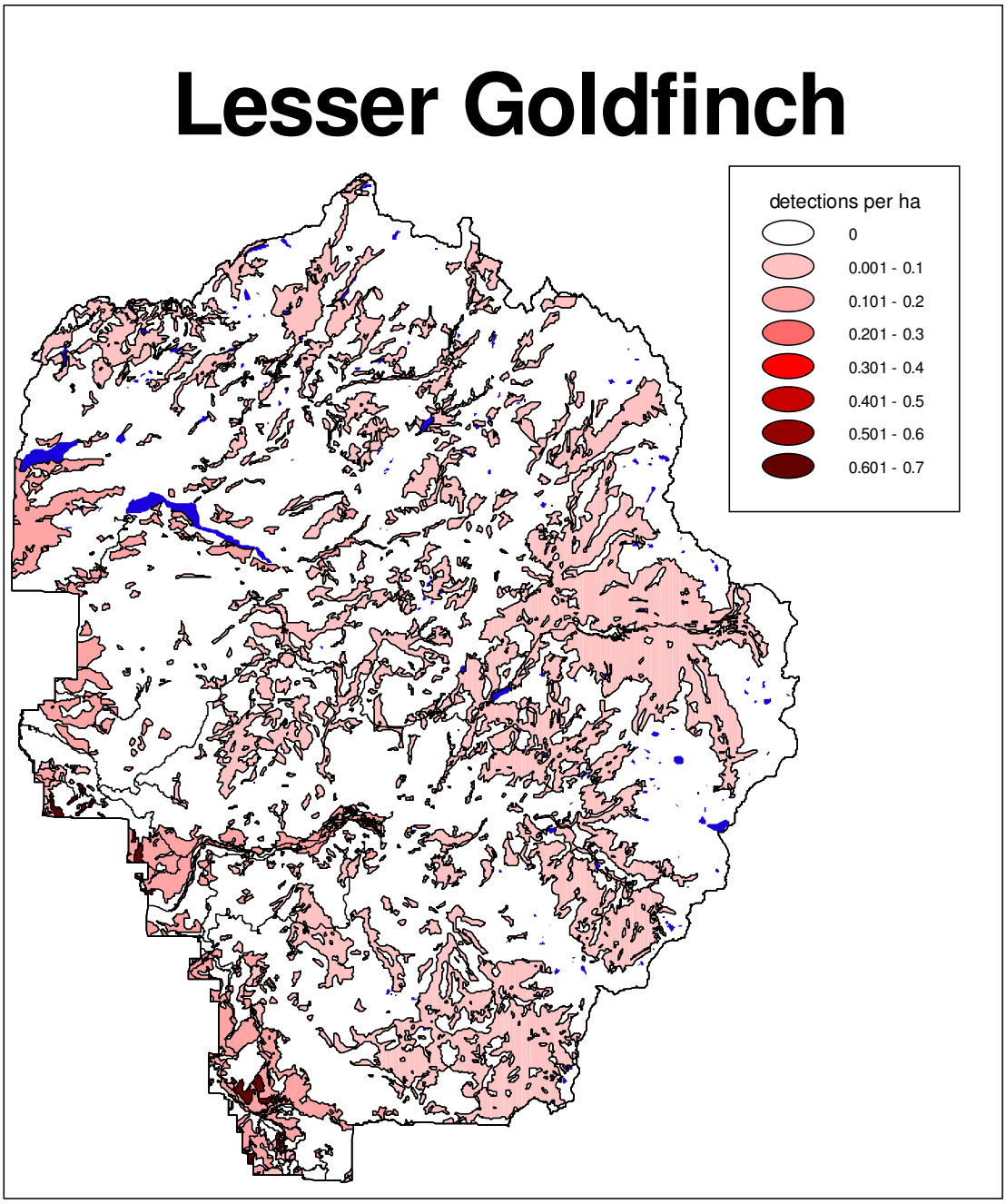

Figure 126. Lesser Goldfinch distribution and relative abundance in the park.

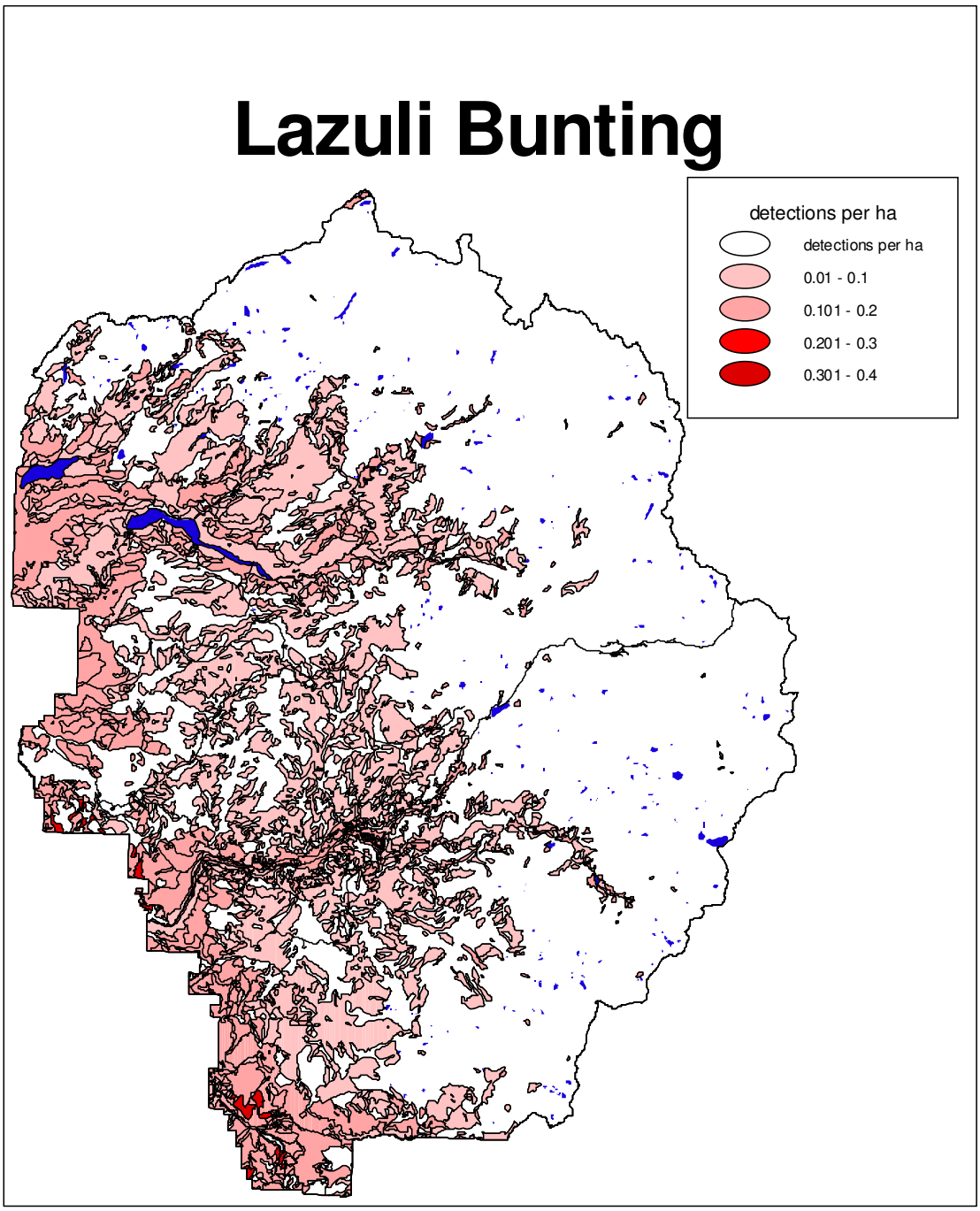

Figure 116. Lazuli Bunting distribution and relative abundance in the park.

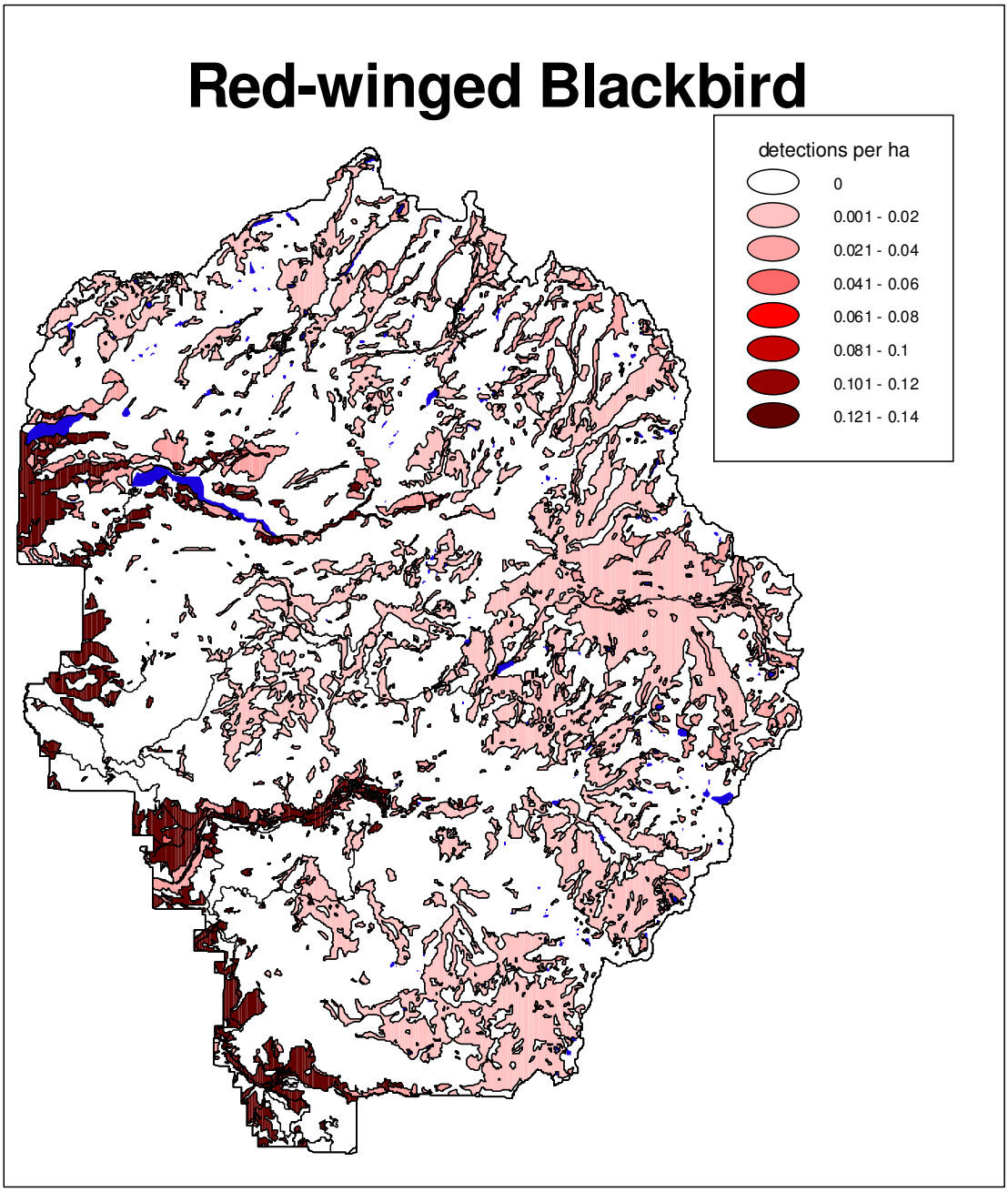

Figure 117. Red-winged Blackbird distribution and relative abundance in the park.

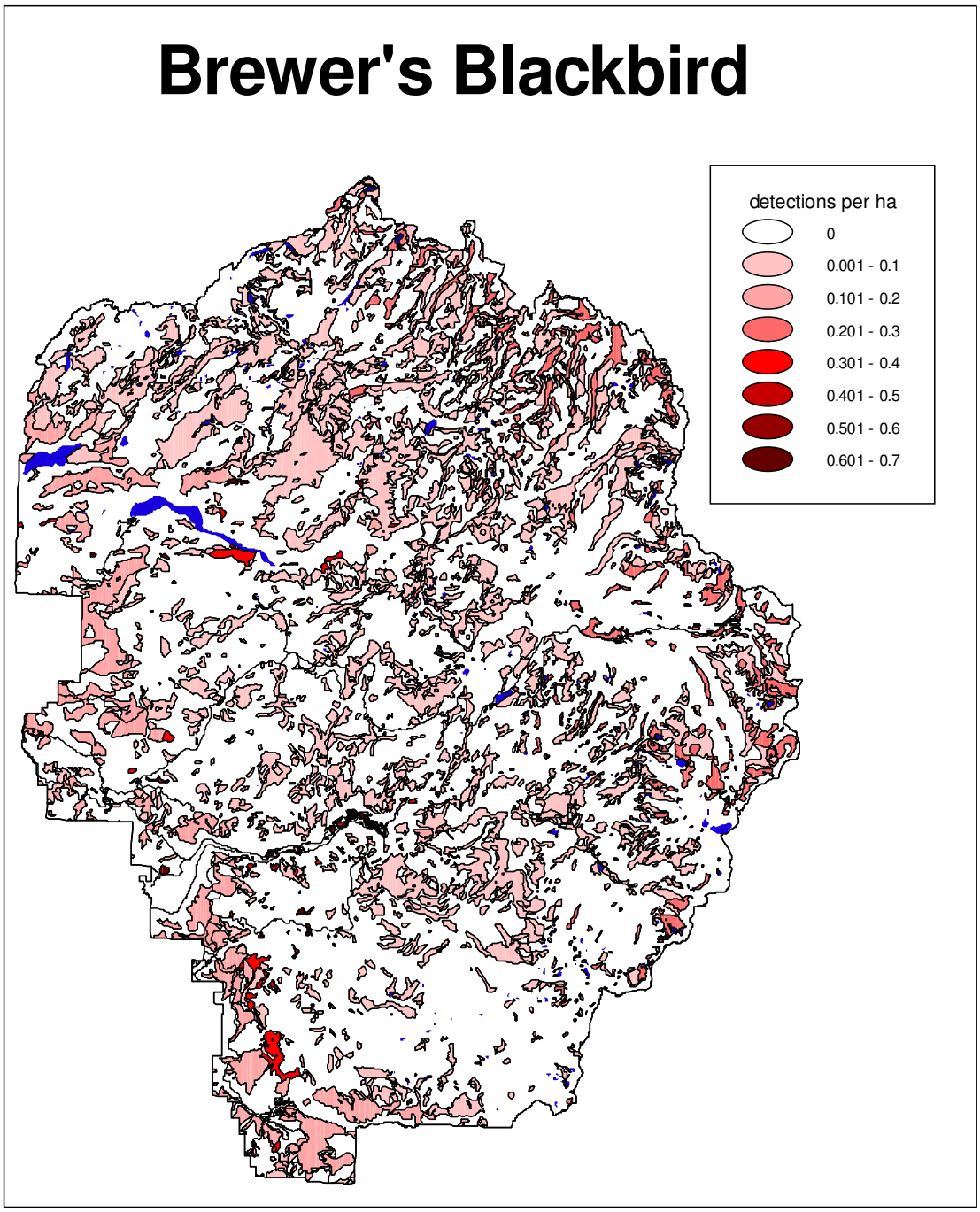

Figure 118. Brewer's Blackbird distribution and relative abundance in the park.

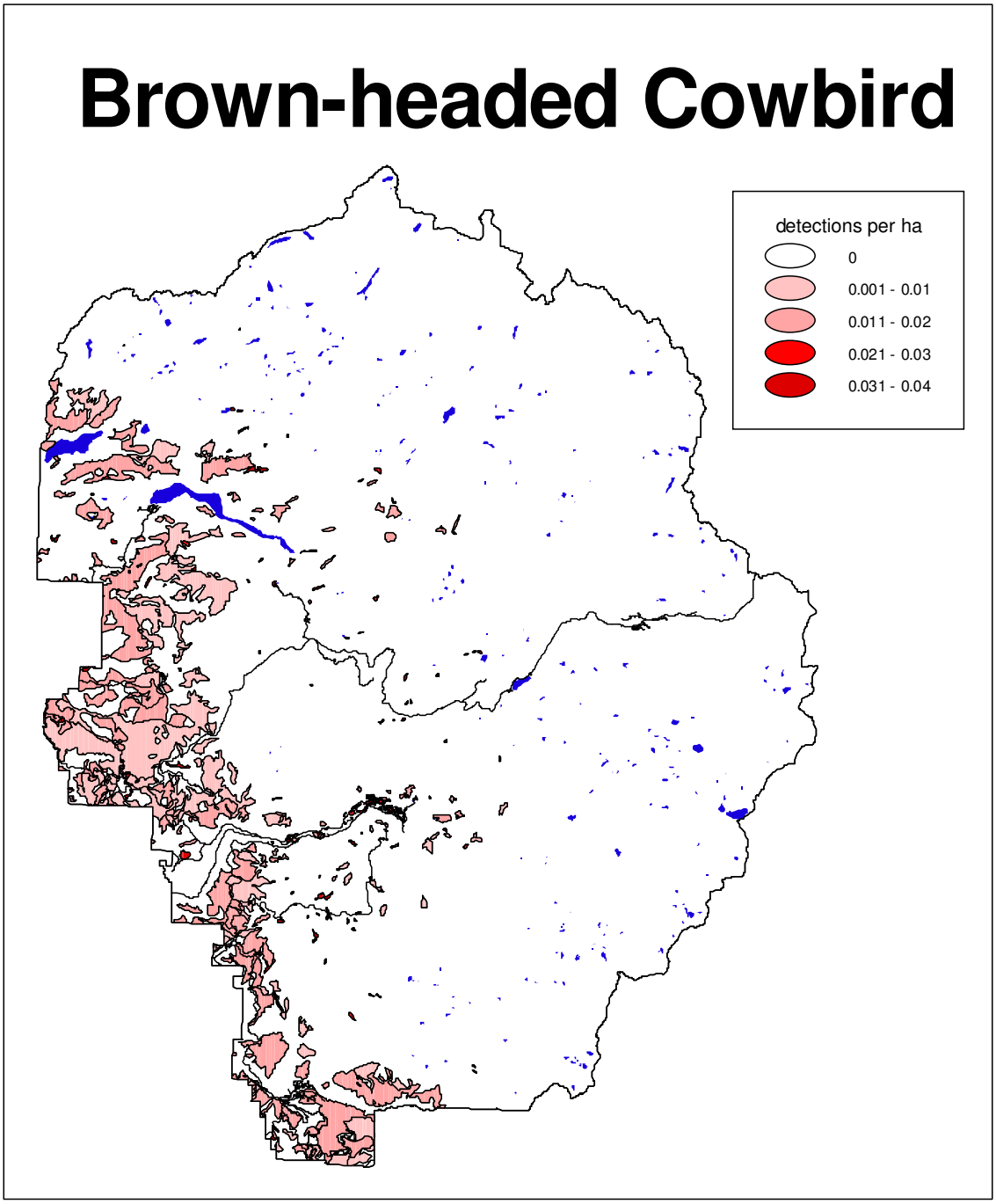

Figure 119. Brown-headed Cowbird distribution and relative abundance in the park.

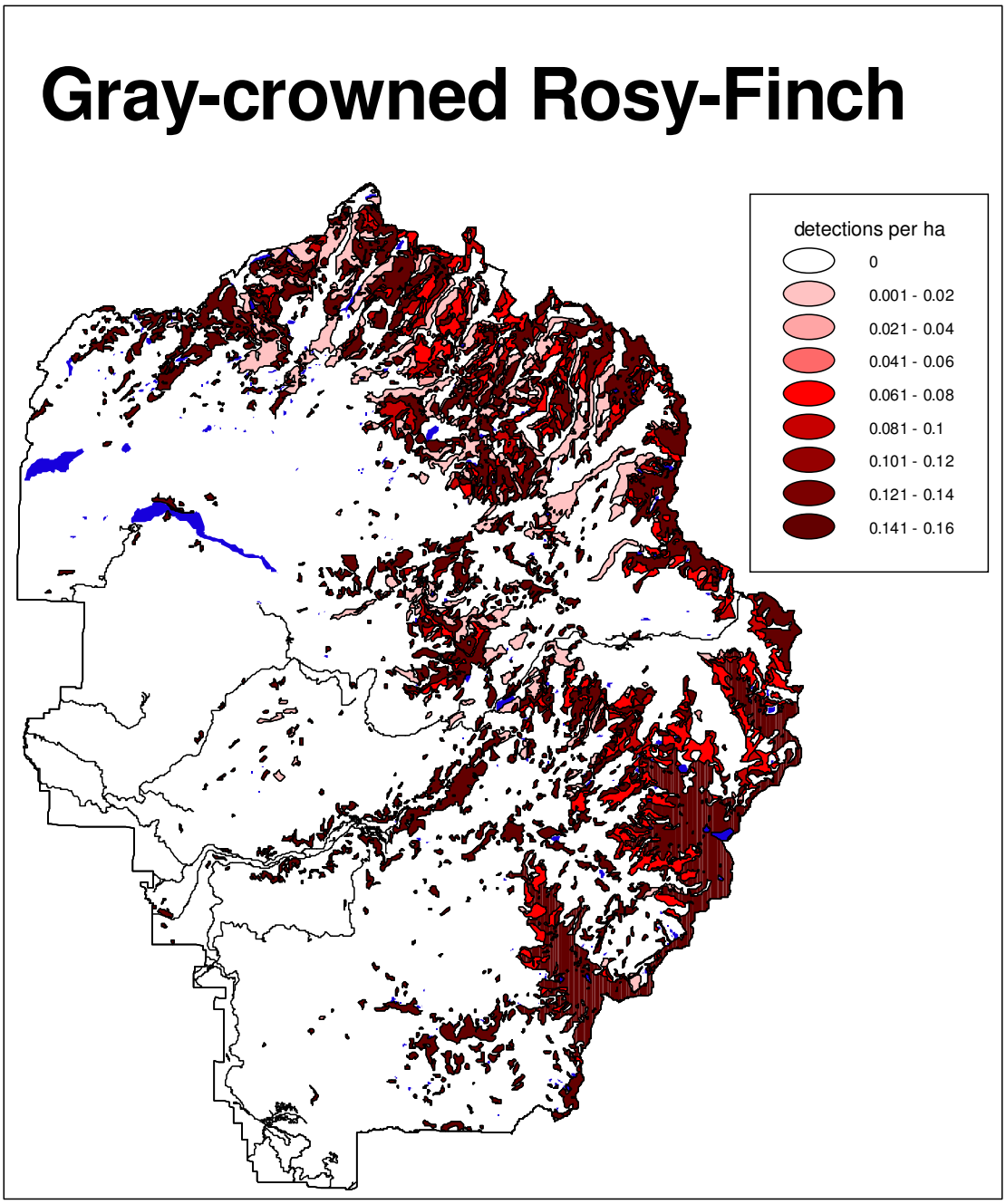

Figure 120. Gray-crowned Rosy-Finch distribution and relative abundance in the park.

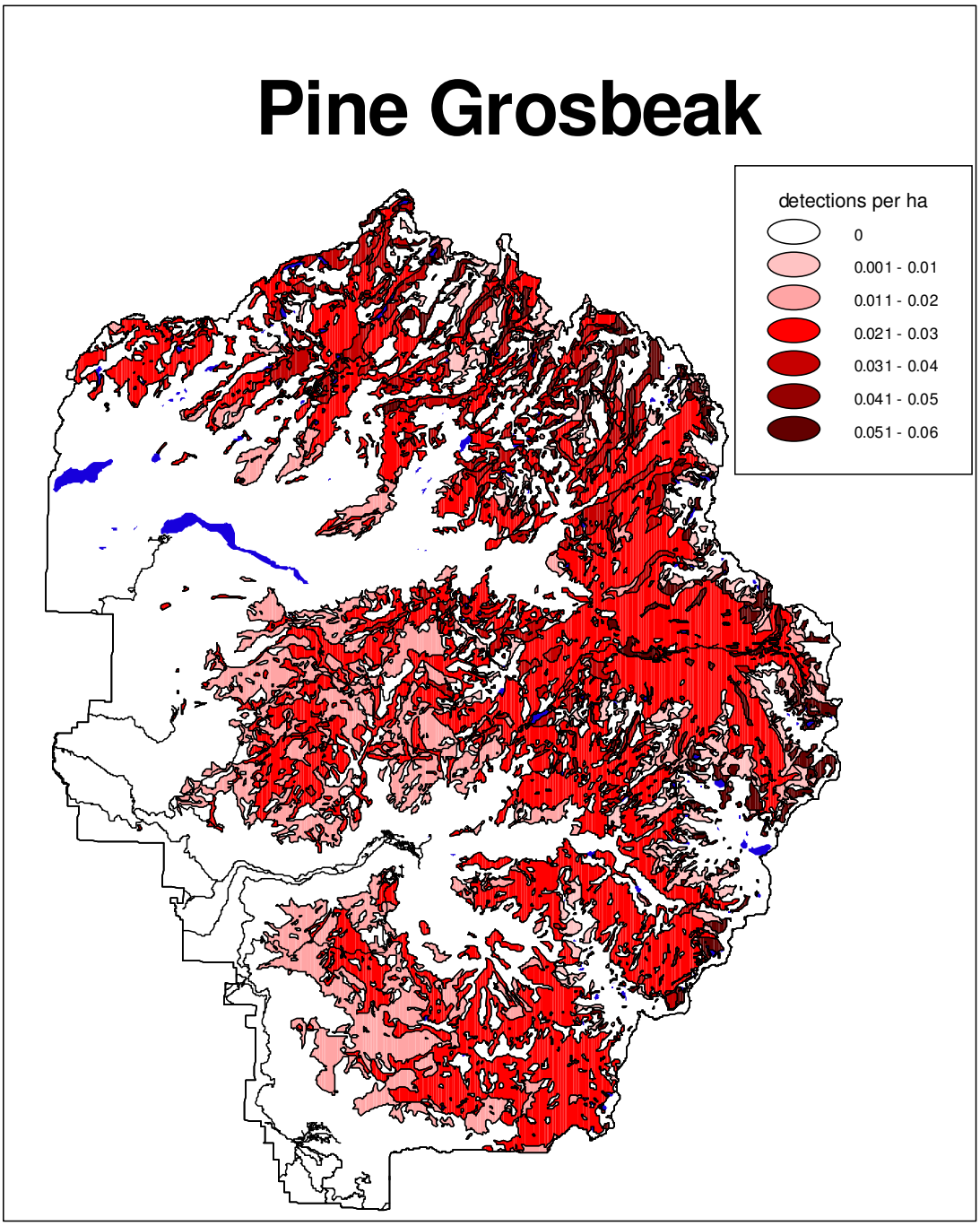

Figure 121. Pine Grosbeak distribution and relative abundance in the park.

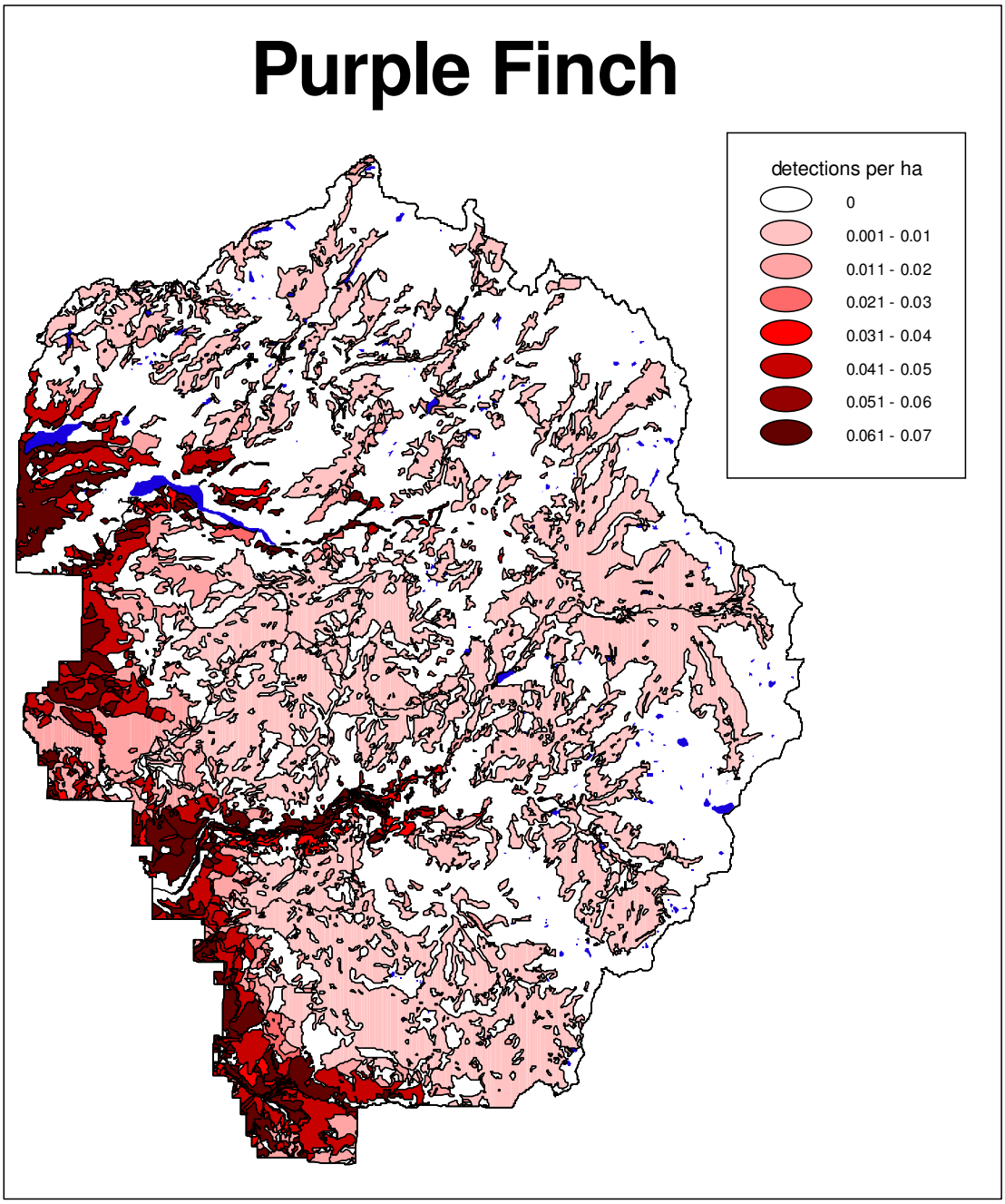

Figure 122. Purple Finch distribution and relative abundance in the park.

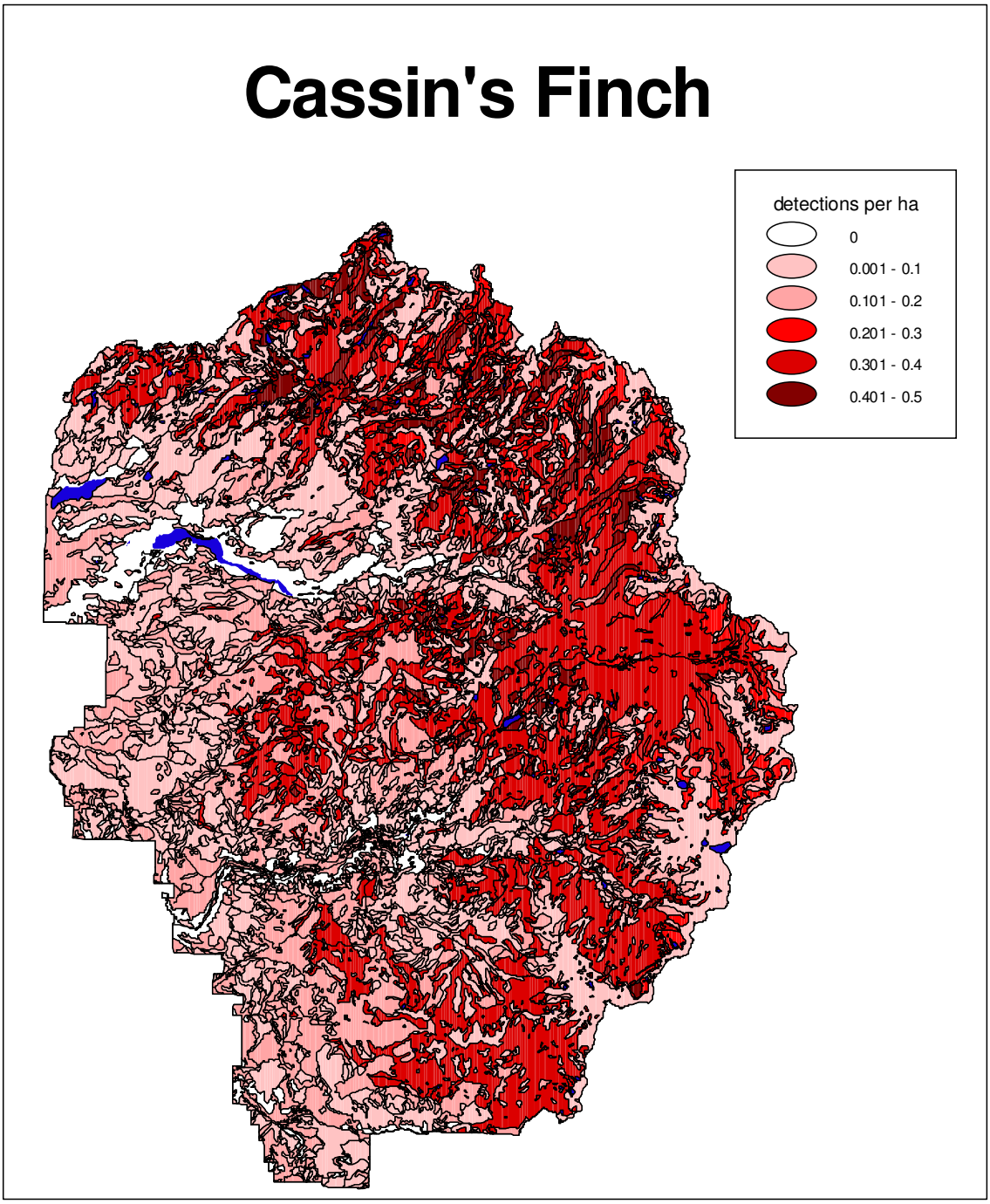

Figure 123. Cassin's Finch distribution and relative abundance in the park.

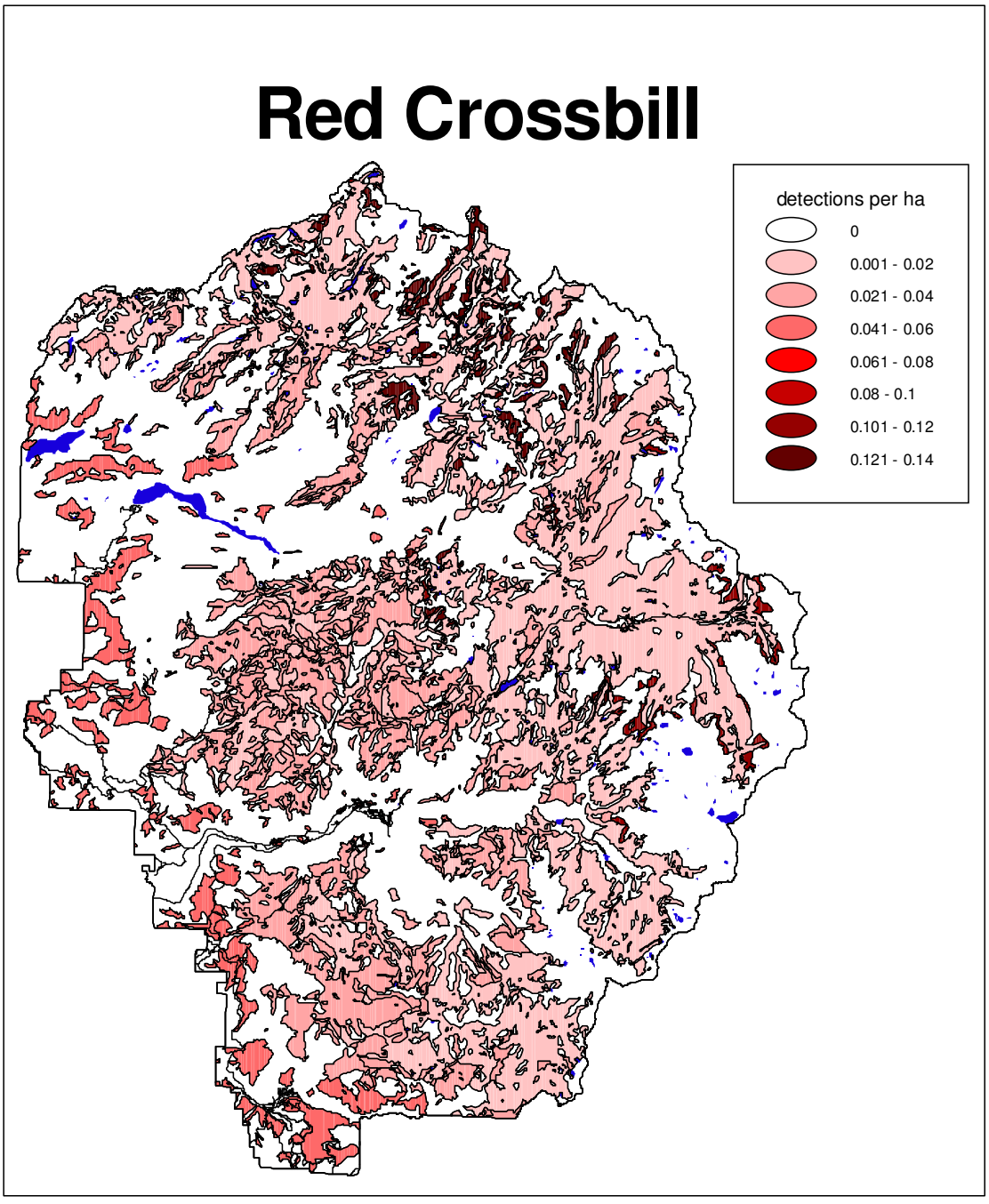

Figure 124. Red Crossbill distribution and relative abundance in the park.

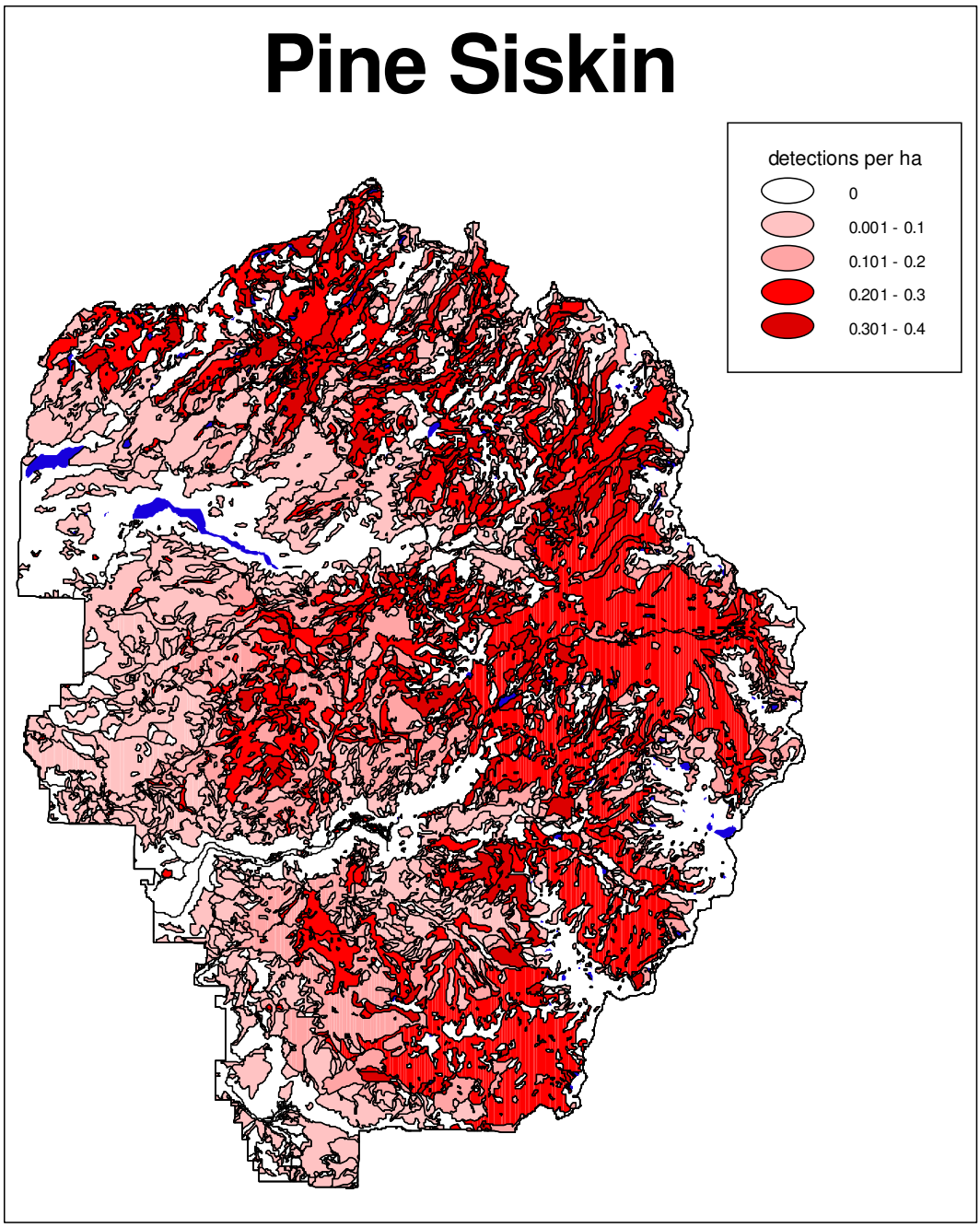

Figure 125. Pine Siskin distribution and relative abundance in the park.

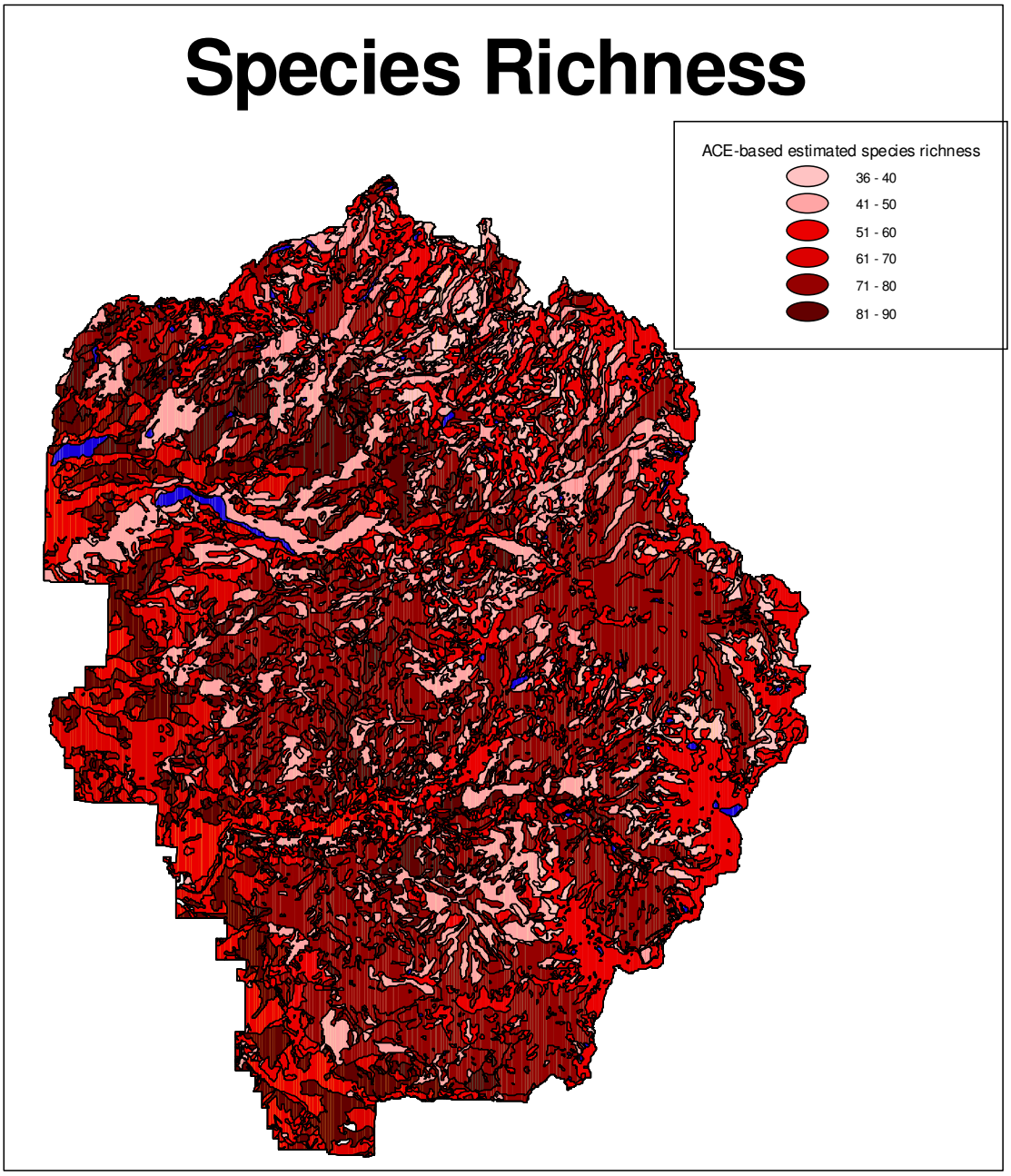

Figure 130. Estimated species richness across the park.

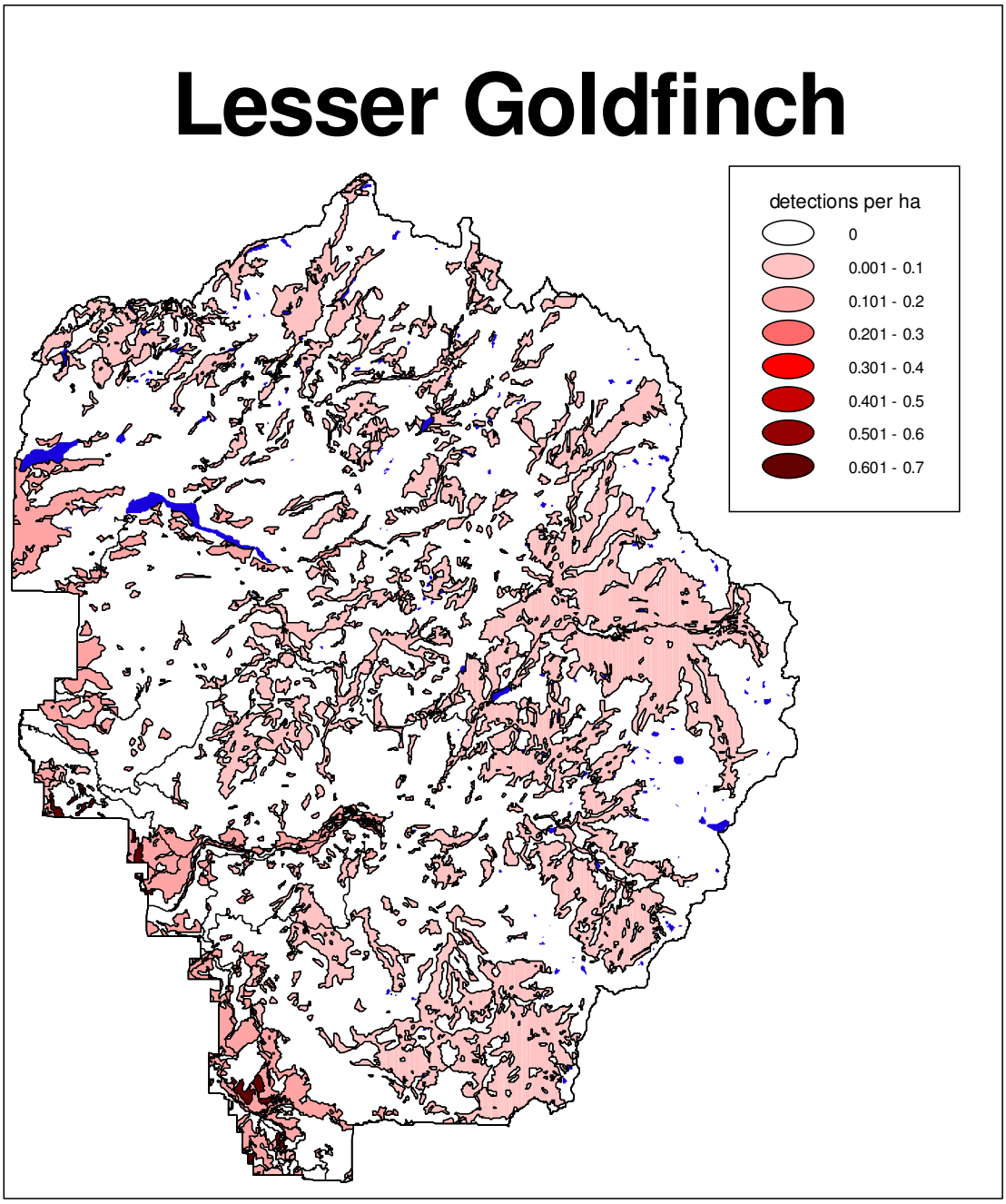

Figure 126. Lesser Goldfinch distribution and relative abundance in the park.

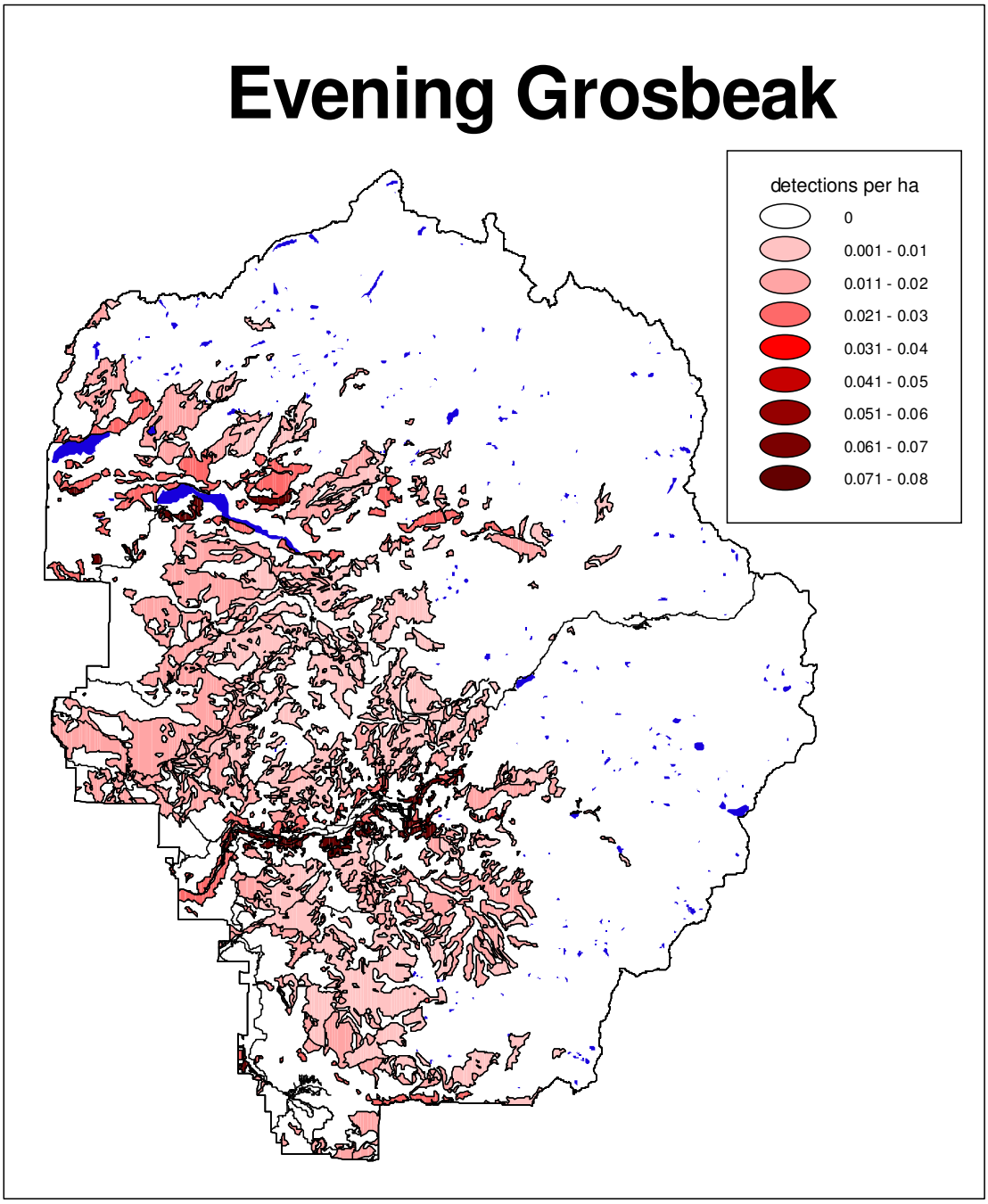

Figure 127. Evening Grosbeak distribution and relative abundance in the park.

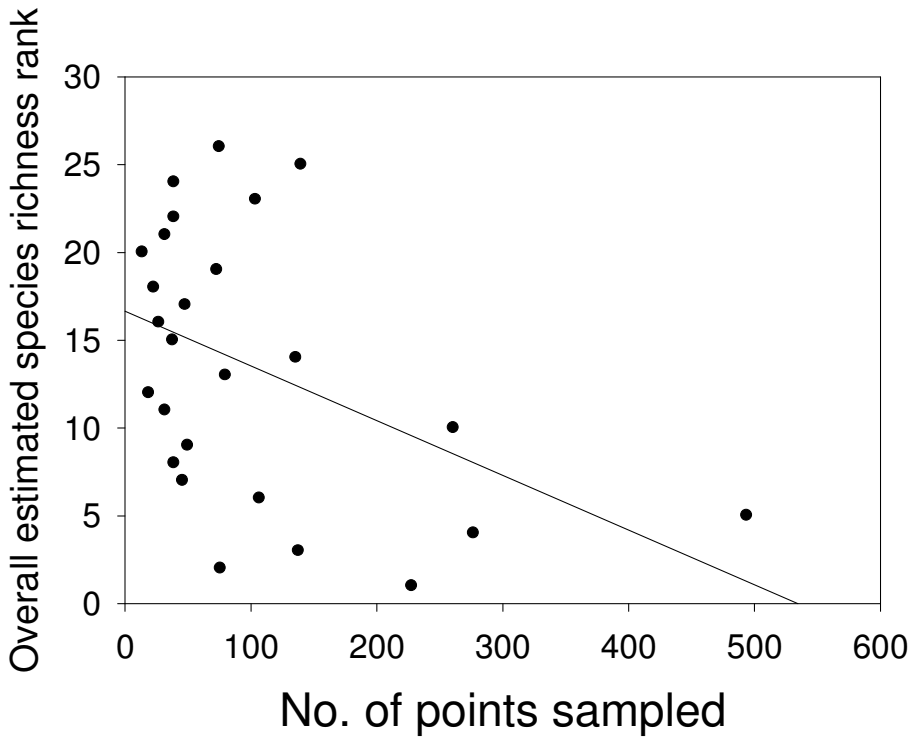

Figure 128. Relationship between number of points sampled and 'overall' species richness rank (see Table 33).

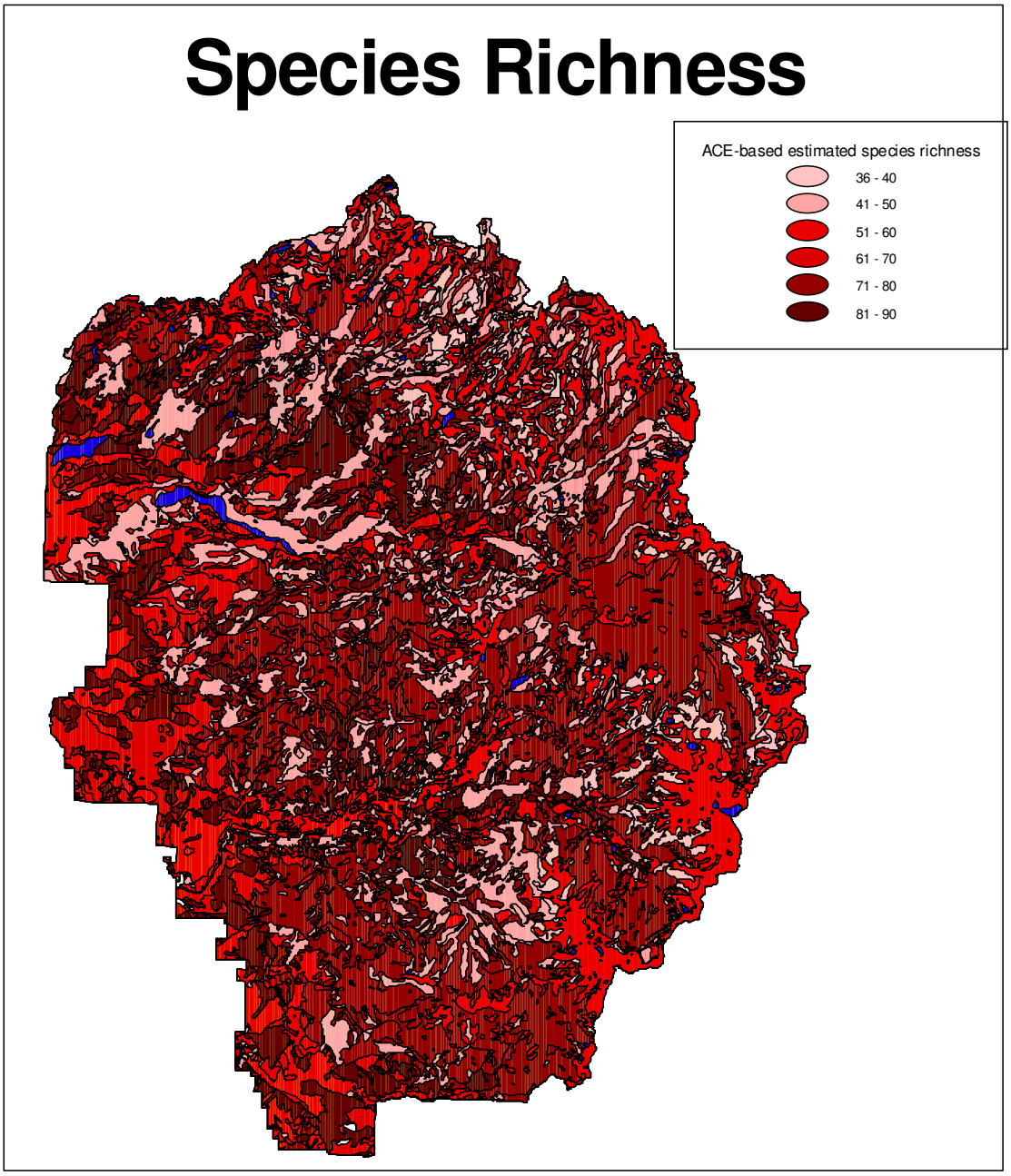

Figure 130. Estimated species richness across the park.