Golden Gate Bird Alliance

University of California, San Francisco

Bird Abundance and Diversity Monitoring at Mount Sutro Open Space Preserve, San Francisco

2025 Report

Anna's Hummingbird, ©2025, Eildert Beeftink

Bird Abundance and Diversity Monitoring at Mount Sutro Open Space Preserve, San Francisco

2025 Annual Report

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1. Introduction

Mount Sutro Open Space Preserve (OSP) is a 61-acre parcel of protected land owned by the University of California, San Francisco (UCSF). Located in the heart of San Francisco, the reserve takes its name from a 900-foot hill, itself named after former mayor and businessman Adolph Sutro. Prior to its afforestation in the 1880s with blue gum eucalyptus, Monterey pine, and Monterey cypress, Mt. Sutro supported a chaparral ecosystem. Over the past 150 years, the area has developed into a eucalyptus-dominated urban forest, now recognized as a well-loved green refuge for city residents.

Nearly 150 years old, the forest at Mt. Sutro is approaching the end of its natural lifespan. Over recent decades, forest health and resilience have declined sharply, raising concerns for both the ecosystem and the safety of visitors and nearby residents. In response, UCSF published a 20-year Vegetation Management Plan in March 2018, outlining four key priorities: (1) enhancing the safety of visitors and adjacent areas, (2) improving forest health and resilience, (3) enhancing the preserve's aesthetic value, and (4) maintaining and ensuring public access. Vegetation management interventions began in the fall of 2018 and are ongoing.

In early 2019, UCSF commissioned the Golden Gate Bird Alliance (GGBA) to monitor the effects of the vegetation management activities on local bird populations. GGBA subsequently initiated monthly bird surveys in March 2019, which are scheduled to continue through the end of 2026. The overarching goal of this project is to provide a detailed assessment of how different vegetation management practices affect bird abundance, diversity, and community composition in various parts of the forest. The present report focuses on the results from the 2025 bird surveys, contextualizes these findings within previous years' data, and examines trends in bird abundance, diversity, and phenology.

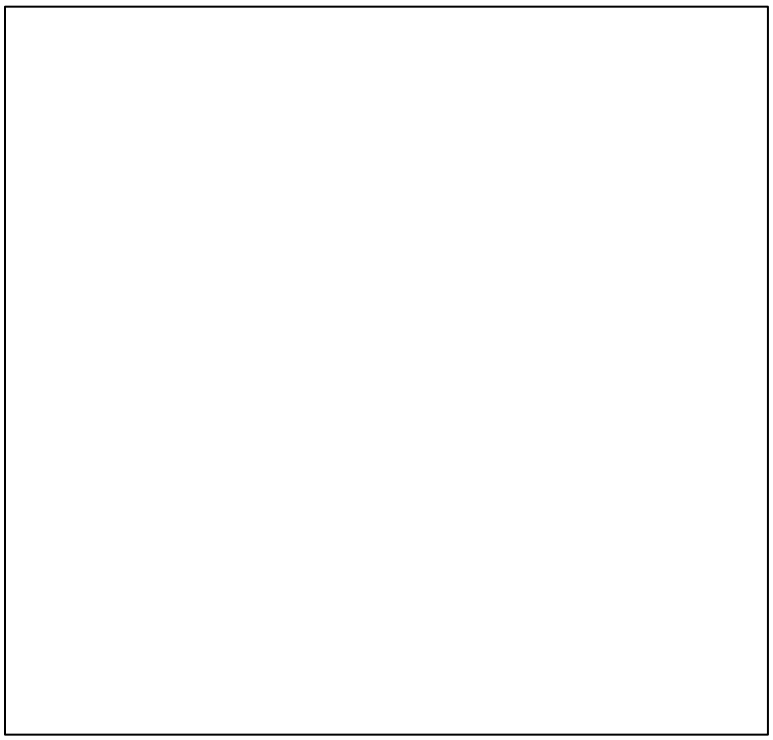

Figure 1: Map of Mount Sutro Open Space Preserve
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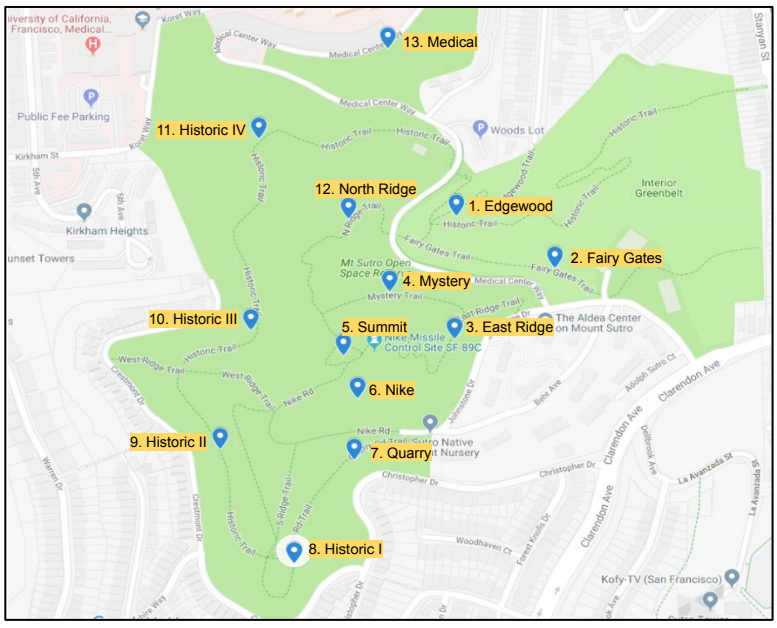


Figure 2: Map of the thirteen survey points located within Mount Sutro Open Space Preserve.

2. Methods

2a. Study Area

In consultation with UCSF, 13 survey points were designated to be surveyed for birds during each visit to Mt. Sutro OSP (Figure 2). Surveys are conducted as stationary area searches and occur twice per month. Each point is surveyed for 5–20 minutes per visit. The starting point for each survey date is determined using a random number generator (1–13), ensuring that each starting point is unique for that day. Subsequent points are then surveyed in numerical order, beginning with the randomly selected starting point.

2b. Survey Protocol

Surveys begin one hour after sunrise. When multiple observers are present, they remain together and function as a single surveyor. No playback or "pishing" is used. The surveyor may pause the clock briefly to investigate songs, calls, or signs of breeding activity. Binoculars are used for visual observation and species identification. The surveyor remains at the designated plot location for the allotted time and records all birds observed. Species are identified using the four-letter American Ornithological Society (AOS) banding code. Each individual bird is annotated with a single letter indicating the mode of detection: song (S), visual (V), or call (C). If a bird is observed in multiple ways (e.g., seen and heard), observations are recorded according to the following priority: S > V > C. For example, if an individual bird is first seen and marked "V" but is later heard singing, the notation is updated to "S." Surveyors track bird movements carefully to avoid double-counting individuals, both within and between plots. If there is uncertainty about whether a bird is the same individual, a note is added in the "Notes and Flyovers" section of the data sheet. In addition to bird observations, the surveyor records time, temperature, wind, and cloud cover. Local weather data are obtained via a weather app using GPS-pinned location with information from The Weather Channel (https://weather.com).

2c. Recording of Behaviors

If observed birds display any of the following behaviors, the corresponding column is checked:

- Foraging: Individual observed foraging.

- Flock: Individual observed in a flock.
- Copulation: Copulation observed. *Probable breeding behavior*.
- Display: Breeding display observed. *Probable breeding behavior*.
- Pair: Two birds believed to be a mated pair observed, or courtship behavior observed. *Probable breeding behavior*.
- Carry Material: Individual observed carrying nest material. *Confirmed breeding behavior*.
- Carry Food: Individual observed carrying food. *Confirmed breeding behavior*.
- Nest: Active nest found. *Confirmed breeding behavior*.
- Fledgling: Dependent fledgling observed (being fed by adults, begging, or with fledgling-length tail). *Confirmed breeding behavior*.

Definitions of breeding behavior categories:

- Probable breeding behavior: Copulation, a pair observed in suitable nesting habitat, courtship behavior, or breeding displays.
- Confirmed breeding behavior: Carrying nesting material, carrying food, active nest, or dependent fledglings.

2d. Ambiguous species

For data collection and entry, surveyors use four-letter alpha codes instead of full species names. When species cannot be reliably identified in the field, additional codes are used to record ambiguous observations.

- RU/ALHU – Allen's Hummingbird (ALHU) and Rufous Hummingbird (RUHU) are challenging to distinguish visually. Beginning in 2020, a combined listing (RU/ALHU) was introduced for months when both species may be present. Surveyors make every effort to identify the species; however, if identification is uncertain, the bird is recorded as RU/ALHU. If either RUHU or ALHU is positively identified at a plot in addition to an undifferentiated RU/ALHU, the RU/ALHU observation is not counted toward the total number of species observed.

Additional codes are used for other ambiguous or uncertain observations:

- HUMM – unidentified member of the hummingbird family (*Trochilidae*)

- NWWA – unidentified member of the New World warbler family (*Parulidae*)
- RB/BHGR – Rose-breasted or Black-headed Grosbeak
- UNKW – unidentified species of the wren family (*Troglodytidae*)
- WOOD – unidentified species of the woodpecker family (*Picidae*)
- ZONO – unidentified New World sparrow of the genus *Zonotrichia*

None of these ambiguous observations were included in the statistical analyses of the survey data. Whenever one of these codes appeared, the corresponding record was removed from the dataset prior to analysis.

2e. Data Analysis

Field data were recorded on standardized datasheets and subsequently entered into Microsoft Excel for organization and preliminary validation. All statistical analyses and visualizations were conducted in R Studio (R version 4.2.3, "Shortstop Beagle"; The R Foundation for Statistical Computing, 2023) on a 64-bit macOS platform.

The statistical methodologies used in this study, organized by figure, are as follows:

- **Figure 4**: Survey events were defined as unique combinations of survey date and survey point. For each year, survey events were randomly reordered 1,000 times, and cumulative species richness was calculated for each permutation. The final curves represent the mean cumulative richness across permutations, while shaded bands indicate ±1 standard deviation attributable to survey sequence, providing a robust estimate of sampling completeness.
- **Figure 5**: Mean species richness per survey point was calculated as the average number of species detected per visit within each year, with ±1 standard deviation reflecting within-year variability. Total richness was calculated as the cumulative number of unique species recorded per survey point per year.
- **Figure 6**: Annual mean species richness per visit was calculated across all survey points. Temporal trends were evaluated using linear regression, with year as a continuous predictor and visit-level species richness as the response variable. Pearson correlation coefficients (r) and associated p-values were computed to assess the strength and significance of trends. Reported annual change values correspond to regression slopes (species per year).
- **Figure 9**: Species included in this analysis were detected in at least four years and had a minimum of ten individuals per year. Monthly counts per species were analyzed

using Poisson regression models, with year as a continuous predictor, to estimate temporal trends. Model outputs included estimated annual percent change, slope, and associated p-value, and trend direction was classified as increasing or decreasing based on model slope.

- **Figure 11**: First arrival and last departure dates were recorded for 14 migratory species each year. Mean dates and standard deviations were calculated across years. Trends in arrival and departure dates were assessed using correlation analyses for each species. No significant temporal trends were detected.
- **Figure 12**: Mean species abundances per month were used to calculate Bray–Curtis dissimilarities among months. Hierarchical clustering was performed on the resulting dissimilarity matrix to group months based on community composition. Branch heights indicate compositional dissimilarity, and four seasonally distinct clusters were identified for subsequent analyses.
- **Figure 13**: Bird community diversity at each survey point was quantified using Shannon diversity, calculated as

$$H' = -\sum_{i=1}^{S} p_i \ln(p_i)$$

where p_i is the proportion of individuals belonging to species i and S is the total number of species observed. Shannon values were converted to the Effective Number of Species (ENS) using

$$ENS = e^{H'}$$

to express diversity in units of species equivalents. Seasonal ENS trajectories were calculated per survey point and mean seasonal ENS across all survey points was computed for each season. Temporal trends in ENS were analyzed using a linear mixed-effects model, with season as a fixed effect and survey point as a random effect to account for repeated measures.

- **Tables 1-4**: For each survey point, seasonal trends in community diversity were quantified using the Effective Number of Species (ENS) calculated from Shannon diversity (see Figure 13). Linear regression models were fitted to ENS values for each survey point and season, with year as a continuous predictor. Tables report the mean annual change in ENS, associated p-values, and R^2 values, indicating the strength and significance of temporal trends. Positive changes and significant p-values are highlighted for clarity.

3. Results

3a. Species Richness

In 2025, 68 bird species were recorded in the study area: the highest annual total to date (Figure 3). Observed species richness in Mt. Sutro OSP has increased over time, potentially due to improved observer familiarity with individual birds, habitat enhancements, or natural annual fluctuations in migration and population dynamics driven by climate and other large-scale factors. The anomalously low annual total for 2019 (47 species) can be attributed to the fact that surveys efforts were only initiated in the middle of March.

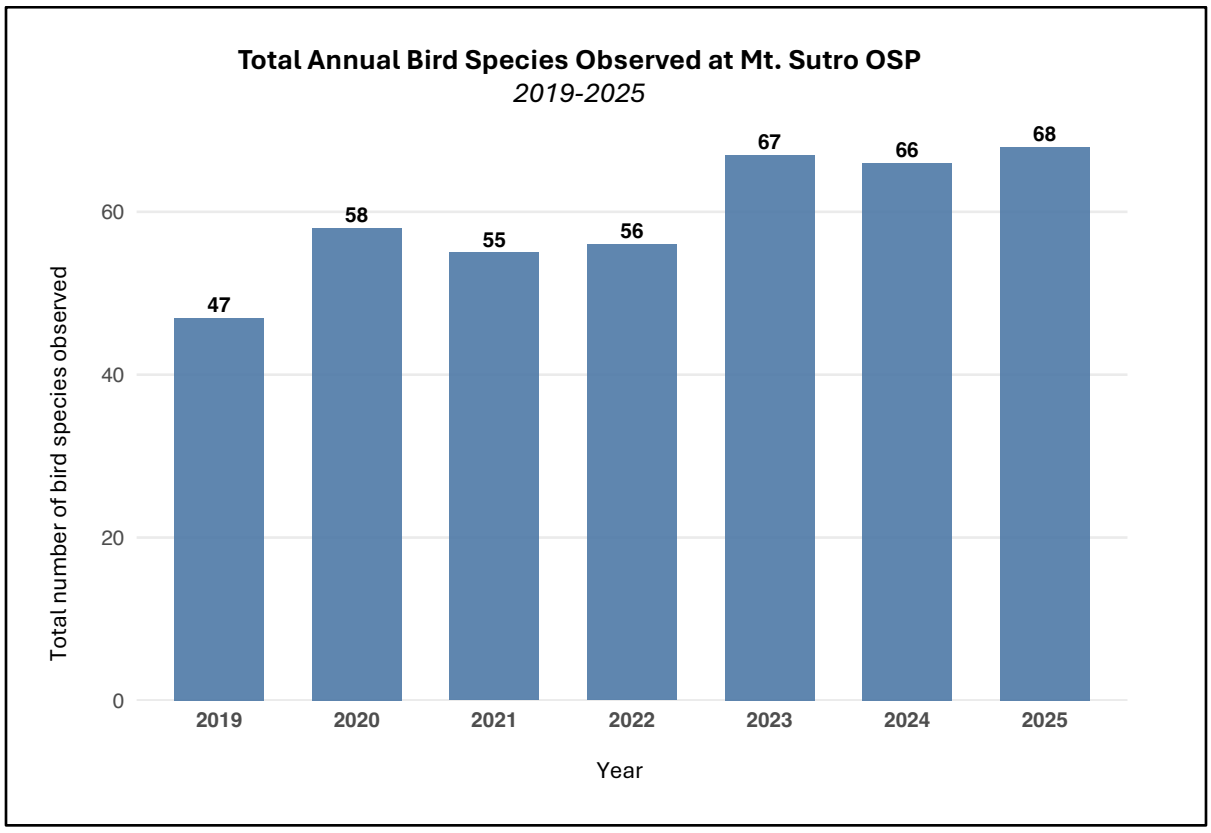


Figure 3: Total number of bird species observed in Mount Sutro Open Space Preserve from 2019 to 2025. Surveys were conducted monthly at 13 designated plots. The lower species richness recorded in 2019 (47 species) likely reflects the fact that surveys were initiated only in the second half of March. Subsequent years show consistently higher species counts, reaching 68 species in 2025.

For the present report, species accumulation curves were used to assess the completeness of species detection for 2020–2025, ensuring that survey efforts have adequately captured the bird community at Mt. Sutro OSP (Figure 4). Data from 2019 were excluded because surveys began in March, resulting in an incomplete dataset for that year. As can be seen in Figure 4, the accumulation curves for all remaining survey years level off satisfactorily, indicating that most species present were detected. This observation provides confidence in the dataset and supports the reliability of subsequent analyses.

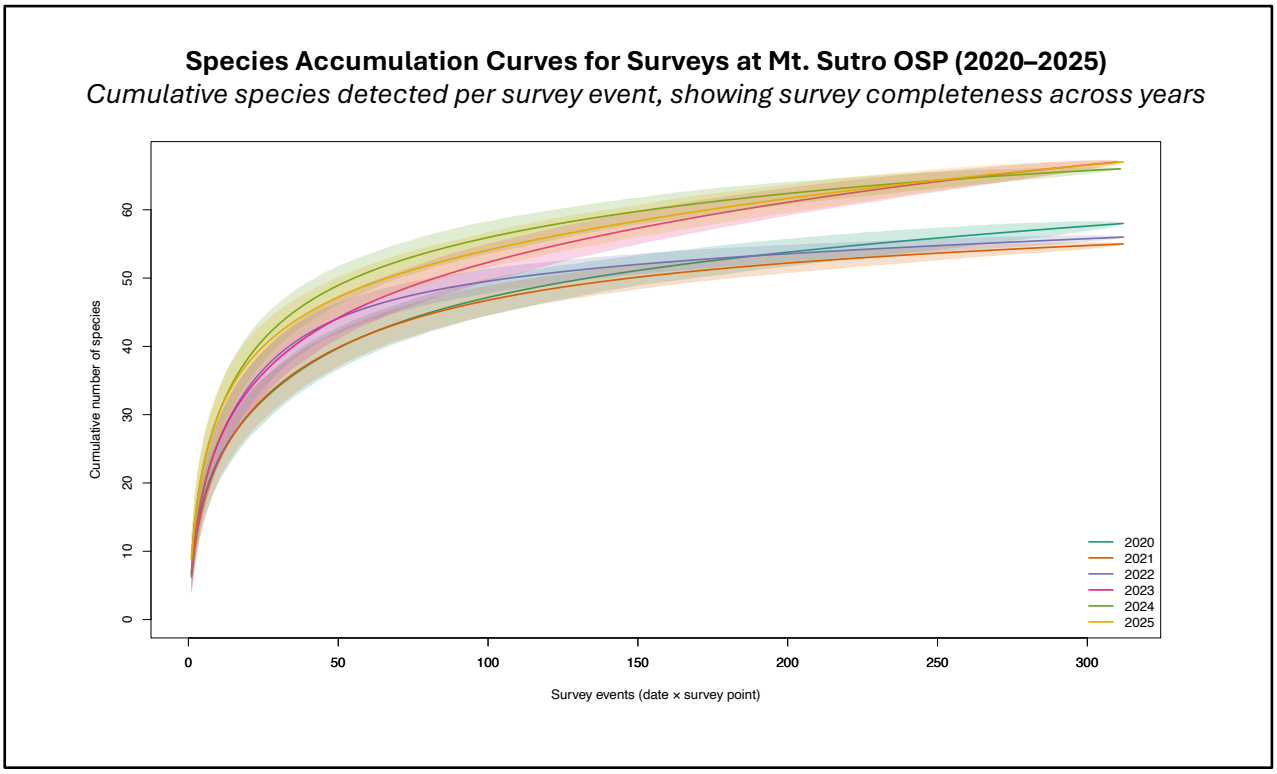


Figure 4: Species accumulation curves for 2020-2025 surveys at Mt. Sutro OSP**.** The curves show the cumulative number of species detected as survey effort increased, with each survey event defined as a unique date × survey point. For each year, the colored lines represent the mean accumulation across 1,000 randomized survey orders; shaded bands indicate variability due to survey sequence. The rapid initial increase followed by a gradual leveling off suggests that most species present in the preserve were detected, indicating that survey efforts have been sufficient to capture most species.

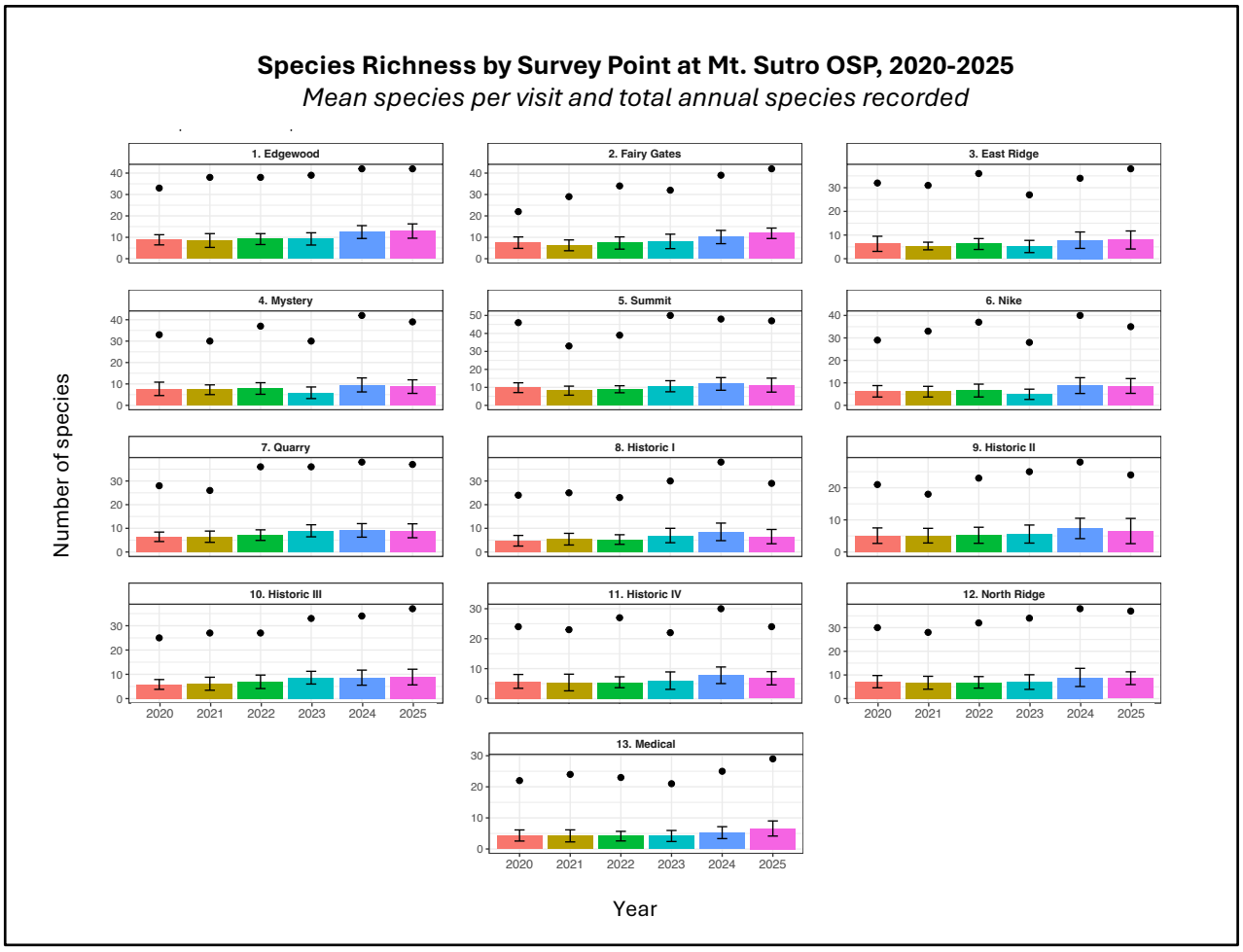


Figure 5: For each survey point and year, mean species richness per visit was calculated as the average number of species detected across all survey events conducted at that point within the year. Error bars represent ±1 standard deviation among visits, reflecting within-year variability in observed richness. Total species richness per survey point was calculated as the cumulative number of unique species recorded across all survey events at that point during the year. Mean values summarize typical per-visit richness, while total counts provide an estimate of overall species detected at each location.

As in previous years, the “Summit” and “Edgewood” survey points had the highest species richness in 2025, each recording over 40 species, with “Fairy Gates” also surpassing 40 species—making 2025 the second consecutive year in which at least three survey points recorded 40 or more species (Figure 5). In contrast, “Medical,” “Historic II,” and “Historic IV” consistently had the lowest richness, all recording between 20 and 30 species. While “Historic I” and “Historic IV” experienced a notable decline in richness from 2024 to 2025 (39 → 29 and 30 → 24 species, respectively), “Medical” showed an increase over the same period (25 → 29 species).

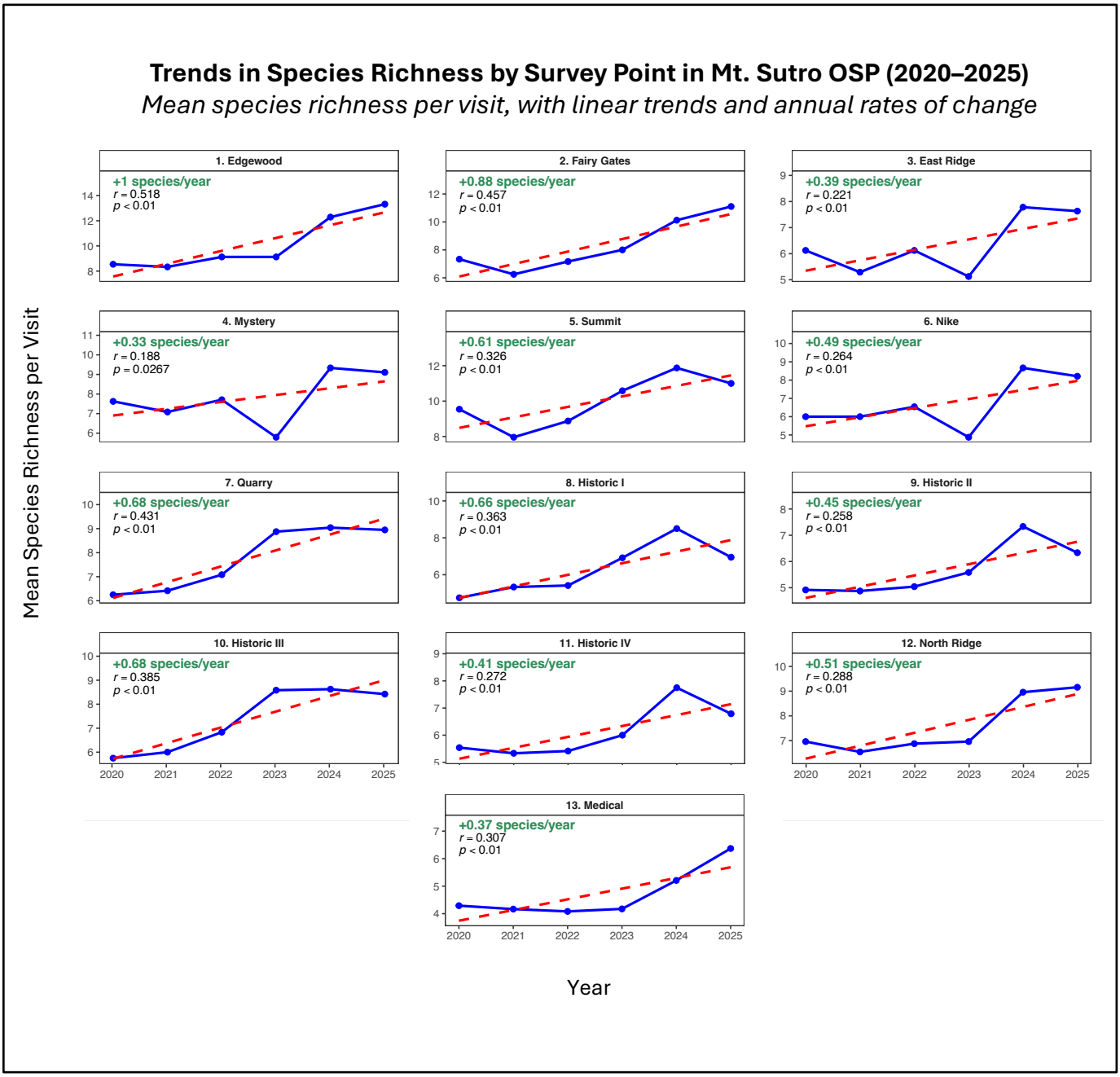


Figure 6: Trends in mean bird species richness per visit across 13 survey points in Mt. Sutro OSP from 2020 to 2025. Blue points and connecting lines represent observed annual mean richness, while red dashed lines show linear regression trends. Colored annotations indicate mean annual change in richness (species/year), and *r* and *p* values report correlation strength and statistical significance based on visit-level data.

Temporal analysis of survey point species richness reveals that mean species detected per point per visit has increased across all plots from 2020 to 2025, despite year-to-year variability at individual points (Figure 6). Mean annual increases range from 0.33 species at "Mystery" to 1.0 species at "Edgewood." Regression analysis confirms these trends are statistically significant ($p < 0.01$ for most points). As with overall Mt. Sutro OSP species richness patterns, multiple factors may contribute to these increases, including observer experience, vegetation management interventions, and natural population dynamics. Future analyses incorporating fine-scale vegetation management data will hopefully help elucidate the drivers of this observed increase in species richness.

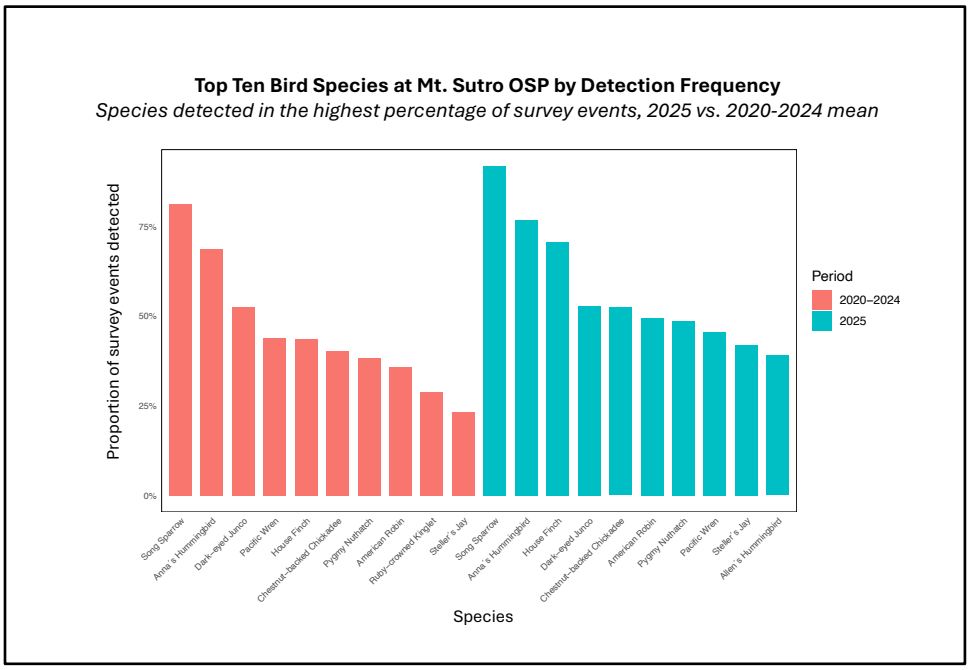


Figure 7: Top ten bird species at Mount Sutro Open Space Preserve by detection frequency in 2025 compared with 2020–2024. The y-axis shows the percentage of survey events in which each species was detected, where a survey event is defined as a unique combination of survey date × survey point**.** Species with red bars represent the top ten for the pooled period 2020–2024, ordered from highest to lowest detection frequency (left to right), while species with blue bars represent the top ten for 2025, similarly ordered.

3b. Abundance

Bird abundance was assessed using two complementary metrics: (1) detection frequency—the percentage of survey events in which a species was detected—and (2) proportional abundance—the percentage of all detected individuals represented by each species. Detection frequency reveals remarkable consistency in the most abundant species over time (Figure 7). Nine of the top ten species from 2020-2024 remain in the 2025 top ten list. Ruby-crowned Kinglet is the sole species to drop out, replaced by Allen's Hummingbird. Three species maintained identical rankings across both periods: Song Sparrow (#1), Anna's Hummingbird (#2), and Pygmy Nuthatch (#7). Detection rates for the most common species increased between periods. During 2020-2024, Song Sparrow was detected in approximately 78% of survey events, while the tenth-ranked Steller's Jay appeared in 23% of surveys. In 2025, Song Sparrow detection frequency rose to 85%, while the tenth-ranked Allen's Hummingbird was detected in 38% of surveys.

Proportional abundance analysis yields results largely consistent with detection frequency patterns (Figure 8). The two metrics agree on nine of the top ten species in 2025, with several species occupying identical or nearly identical rankings. Cedar Waxwing represents a notable exception: absent from the detection frequency list, it ranks second in proportional abundance. This discrepancy reflects the species' irruptive behavior—it may be entirely absent in some years but arrive in large numbers during others. In 2025, Cedar Waxwing's high ranking stems almost entirely from concentrated activity during April and May, when 558 individuals were detected across just two months. Temporal comparison of annual top ten lists from 2020-2025 reveals further consistency. These six years draw from a pool of only 13 species, eight of which appear in every year's top ten. The five exceptions are Common Raven (absent 2023-2025), Ruby-crowned Kinglet (absent 2020, 2025), Allen's Hummingbird (2025 only), Wilson's Warbler (2024 only), and Cedar Waxwing (2025 only). The top ten species collectively represent 66.0-76.5% of all detections, with a notable trend: their combined proportion has declined over time, from 76.5% in 2021 to 66.0% in 2024. This suggests increasing evenness in the bird community, with detections distributed more broadly across species. Seasonal diversity analysis (Figure 13) confirms this pattern, showing significant increases in both Shannon diversity and Effective Number of Species (ENS) across the study area over time.

Top Ten Species in Mt. Sutro OSP, 2020-2025

Relative abundance based on proportion of all individuals detected across 13 survey plots

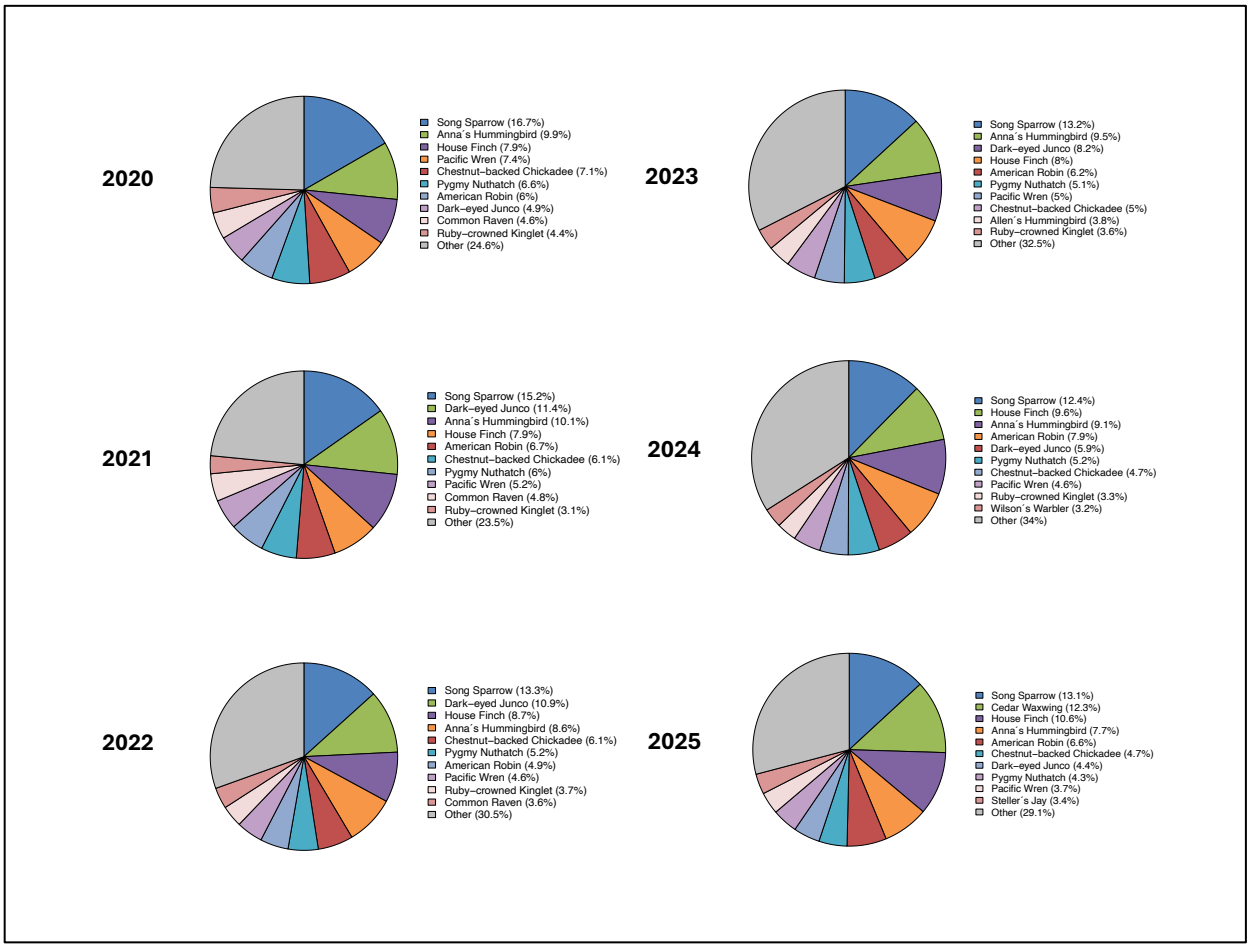


Figure 8: Combined pie charts showing the ten most abundant bird species in Mt. Sutro OSP from 2020 to 2025, based on each species' proportion of all individuals detected across 13 survey plots. The "Other" category represents the combined proportion of remaining species.

Figure 9 shows abundance trends for 25 common bird species at Mt. Sutro OSP from 2020-2025, based on monthly individual counts. To ensure robust regression analysis, only species detected in at least four of six years with a minimum of ten annual detections were included. Sixteen species show upward trends in abundance, thirteen significantly so. The steepest increases occurred in Cedar Waxwing (+77.3% annually), Allen's Hummingbird (+42.3%), Lesser Goldfinch (+39.4%), and California Scrub-Jay (+34.4%). Cedar Waxwing's

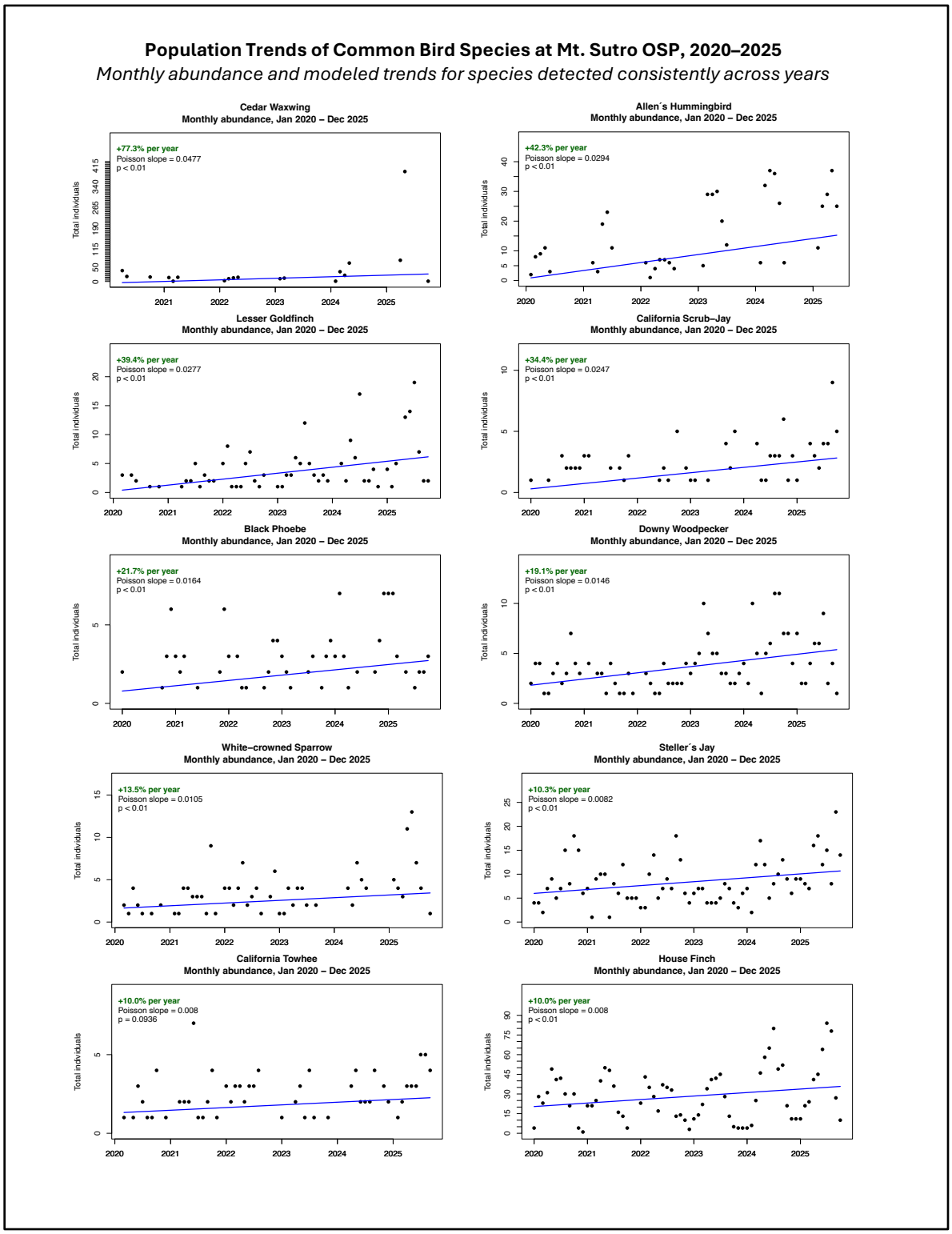
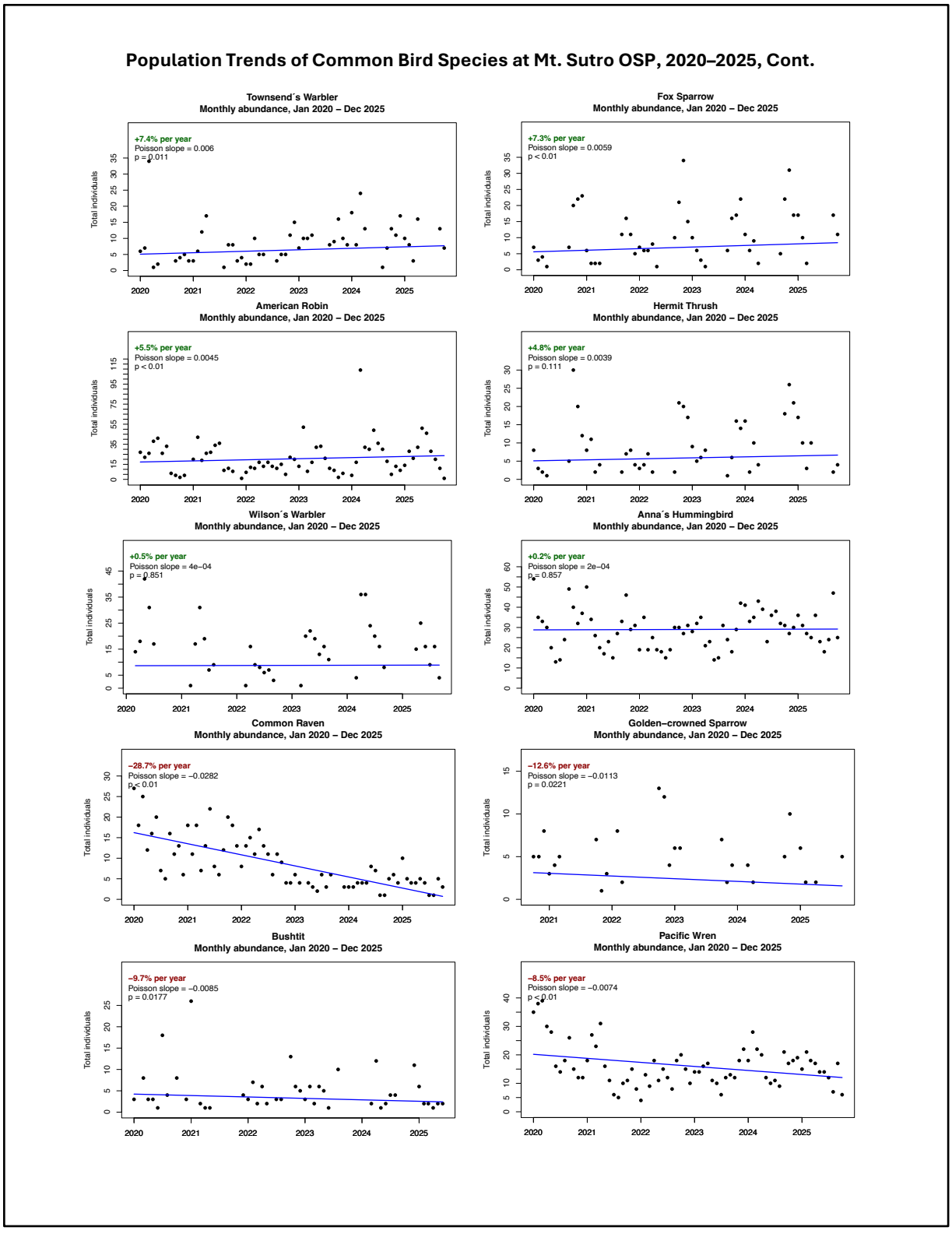


Fig. 9: See caption on page 18.



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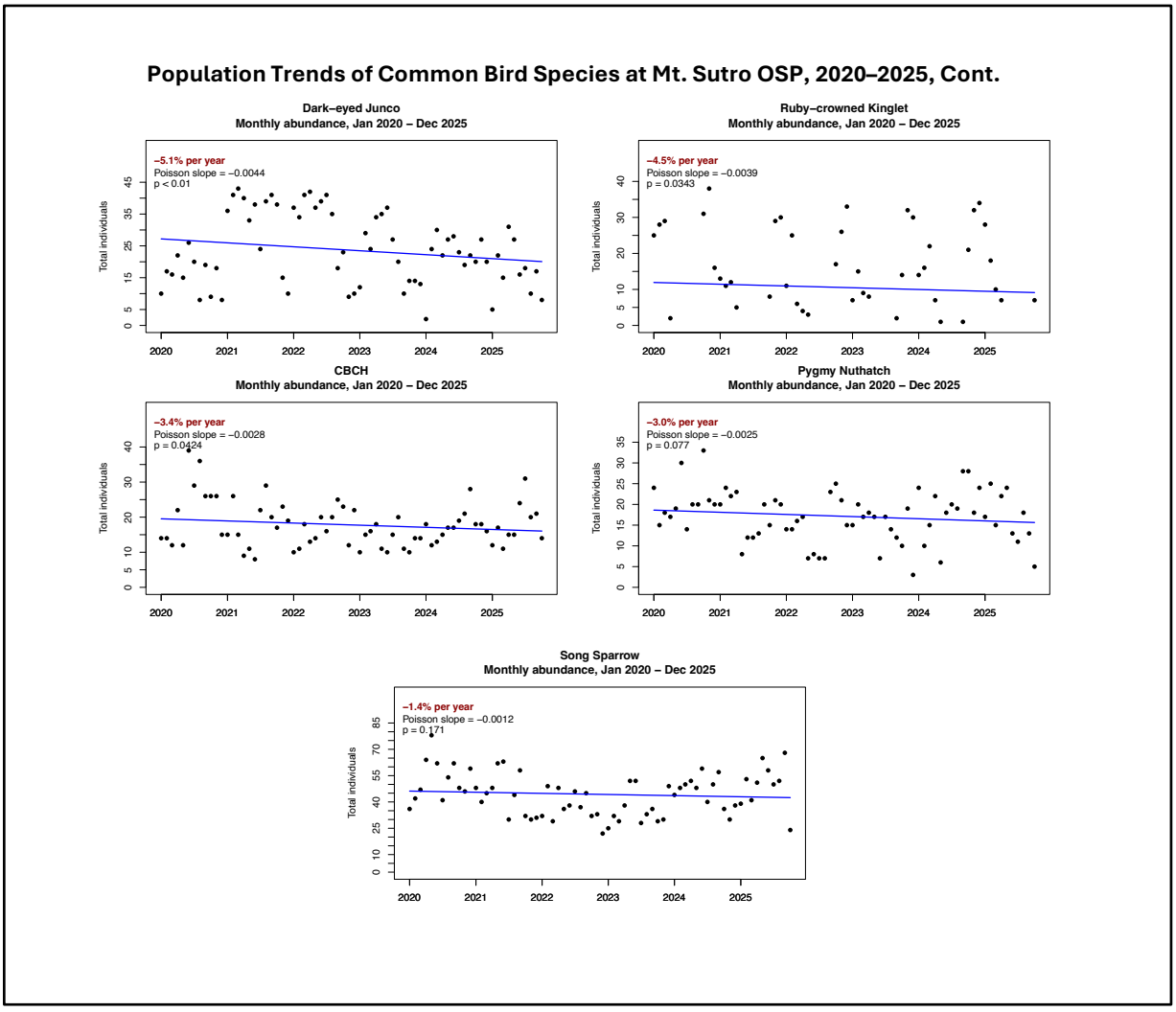


Figure 9: Monthly abundance trends for 25 bird species at Mt. Sutro Open Space Preserve from January 2020 through December 2025. Species were included only if they were detected in at least four years during the study period and had a minimum annual total of ten individuals in every year, ensuring sufficient data for reliable trend estimation. Points show observed monthly counts, the blue line indicates the fitted temporal trend, and annotations report the estimated annual percent change from a Poisson regression model along with associated slope and p-value. Green and red trend labels indicate increasing and decreasing population trajectories, respectively.

dramatic increase stems primarily from roving flocks visiting the reserve during April and May 2025, reflecting the species' irruptive behavior. The other three species are associated with semi-open habitats rather than closed-canopy forest. Their increases may correlate with forest opening under vegetation management—a hypothesis that future analyses integrating fine-scale vegetation data may help elucidate.

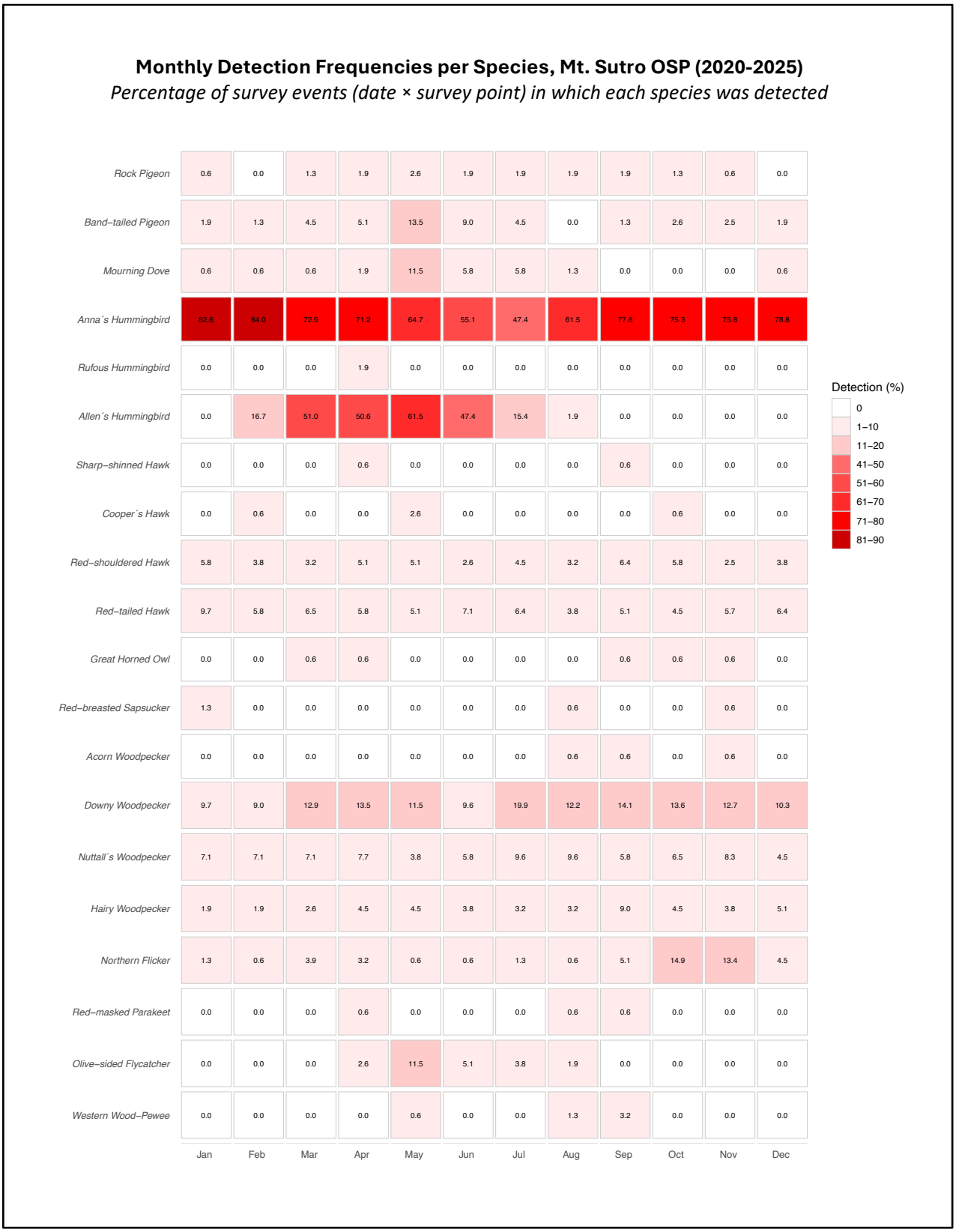
Nine species declined over the study period, seven significantly. With the exception of Common Raven, declining species showed more moderate rates of change than increasing species. Common Raven experienced the steepest decline (-28.7% annually), followed by Golden-crowned Sparrow (-12.6%) and Bushtit (-9.7%). Whether these declines reflect changing conditions within Mt. Sutro OSP, external population fluctuations, or stochastic variation remains unclear. Notably, Pacific Wren declined 8.5% annually. This species is strongly associated with dense forest conditions and has locally adapted to eucalyptus forests. Long-term, Pacific Wren is expected to decline as vegetation management opens the canopy, though whether the current trend represents an early signal of this response requires further monitoring.

3c. Seasonality and Diversity

Figure 10 displays heat maps of bird species detection patterns at Mt. Sutro OSP. For each month, species detections across 2020-2025 are expressed as a percentage of unique survey events (defined as a unique date-location combination). Darker red shading indicates higher detection rates.

The heat maps reveal pronounced seasonality for many species: some visit primarily during summer (potentially for breeding), others overwinter in the preserve, and still others pass through during spring and/or autumn migration. Figure 11 illustrates this seasonality by plotting the earliest and latest annual detection dates for 14 highly seasonal species, serving as proxies for arrival and departure times, alongside mean dates across 2020-2025.

Not all species exhibit clear seasonal patterns. Those with very low detection rates are better characterized as accidental or casual visitors rather than seasonal migrants or residents. Appendix B categorizes all species into phenological groups—residents, seasonal species, and casual/rare visitors—based on explicit quantitative criteria.



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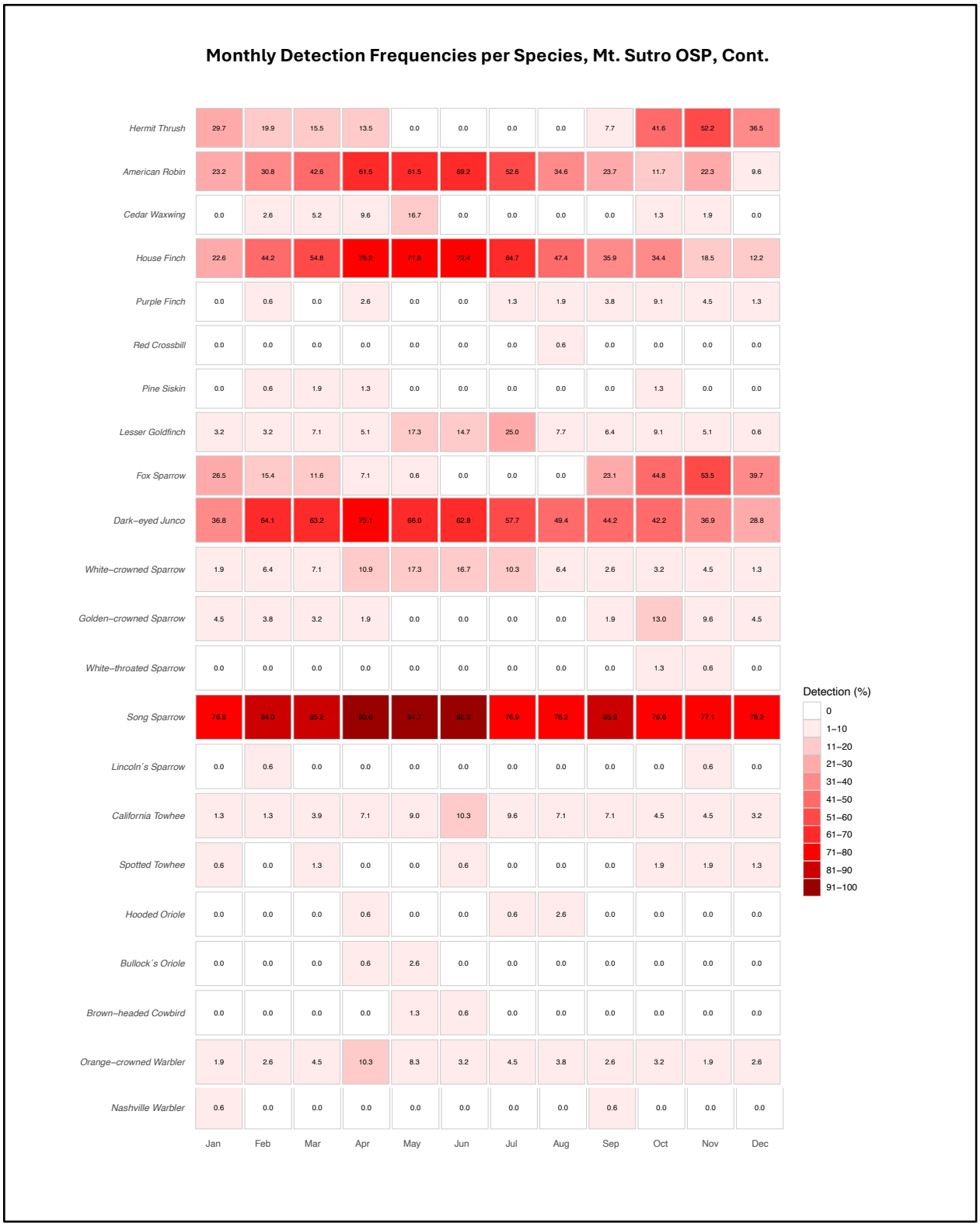

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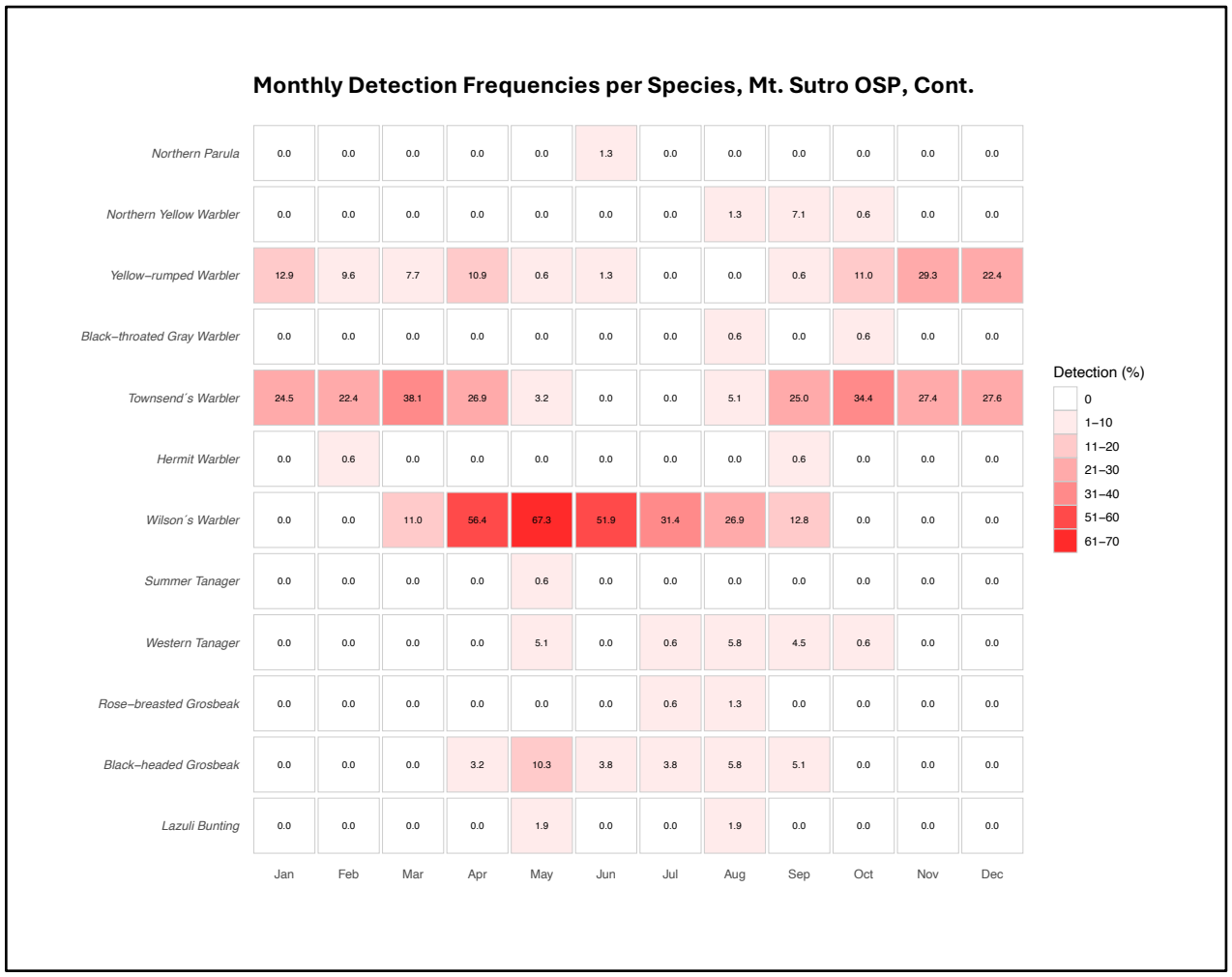

Fig. 10: Heat maps showing monthly detection frequency for bird species recorded at Mt. Sutro, California, from 2020 through 2025. Each row represents a species (ordered taxonomically), and each column represents a calendar month. A "survey event" is defined as a unique combination of survey date and survey point. Cell color intensity reflects the percentage of survey events in which a species was detected during each month (white = 0%; darker red = higher detection frequency), and numeric labels indicate exact percentage values. Species are distributed across multiple panels to maintain readability while preserving taxonomic order.

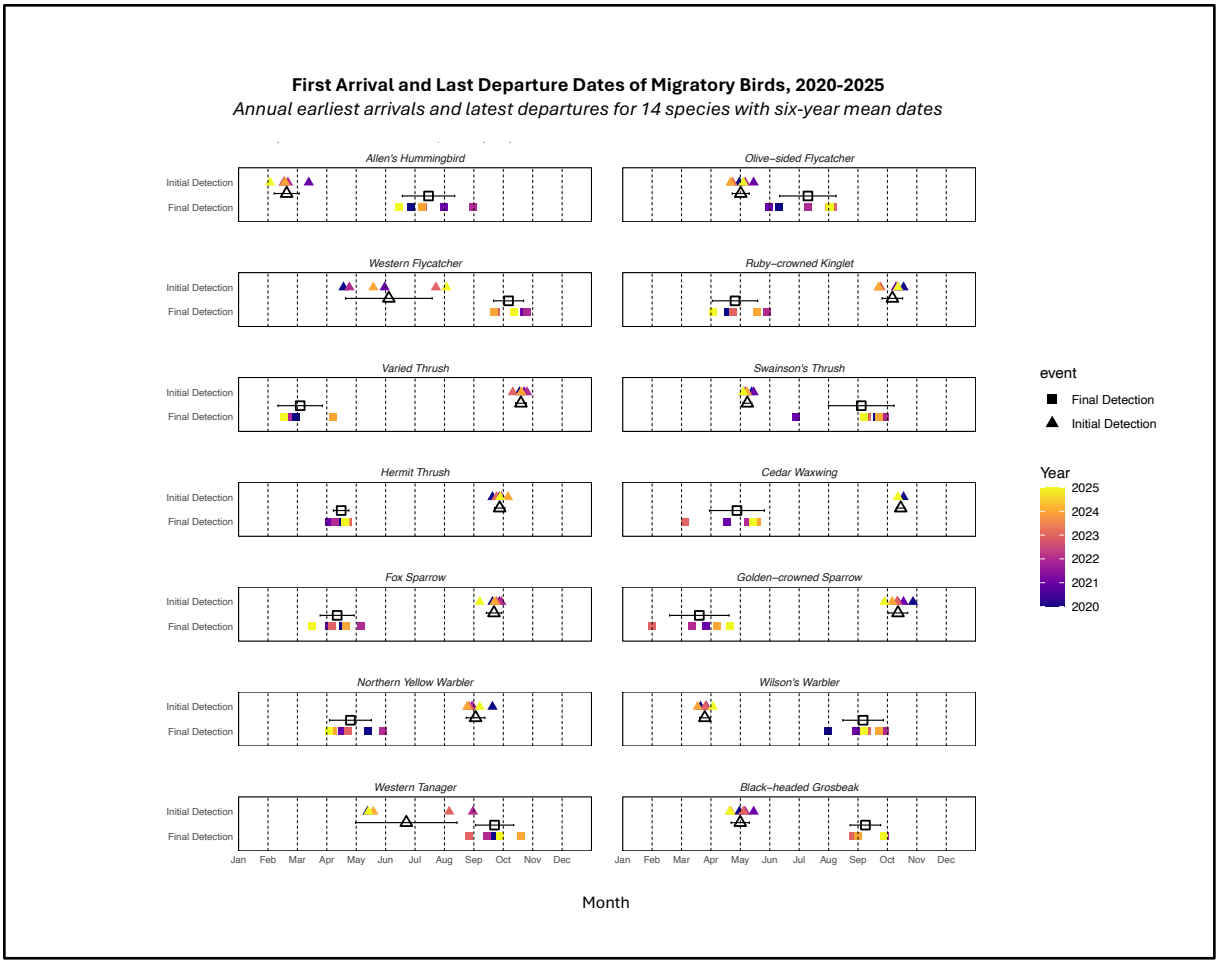

Figure 11: First arrival and last departure dates for 14 migratory bird species at Mt. Sutro Open Space Preserve, 2020–2025. Colored symbols show earliest arrival dates (triangles) and latest departure dates (squares) for each year, while black symbols indicate mean dates ± standard deviation. Correlation analyses were performed for each species to test for trends in arrival and departure dates over the six-year period; no significant trends were detected.

When many species in a location exhibit seasonal occurrence patterns, the overall bird community composition necessarily varies by season. Under these conditions, diversity assessments should treat each season as a distinct community rather than averaging across the annual cycle. To identify discrete seasonal communities at Mt. Sutro OSP and define their temporal boundaries, we performed hierarchical clustering on monthly bird composition data (Figure 12). This analysis revealed four distinct seasons, each characterized by recognizably different species assemblages: October–January (“winter”), February–April (“spring”), May–August (“summer”), and September (“autumn”). Subsequent Shannon diversity analyses respect these natural divisions by treating each season separately.

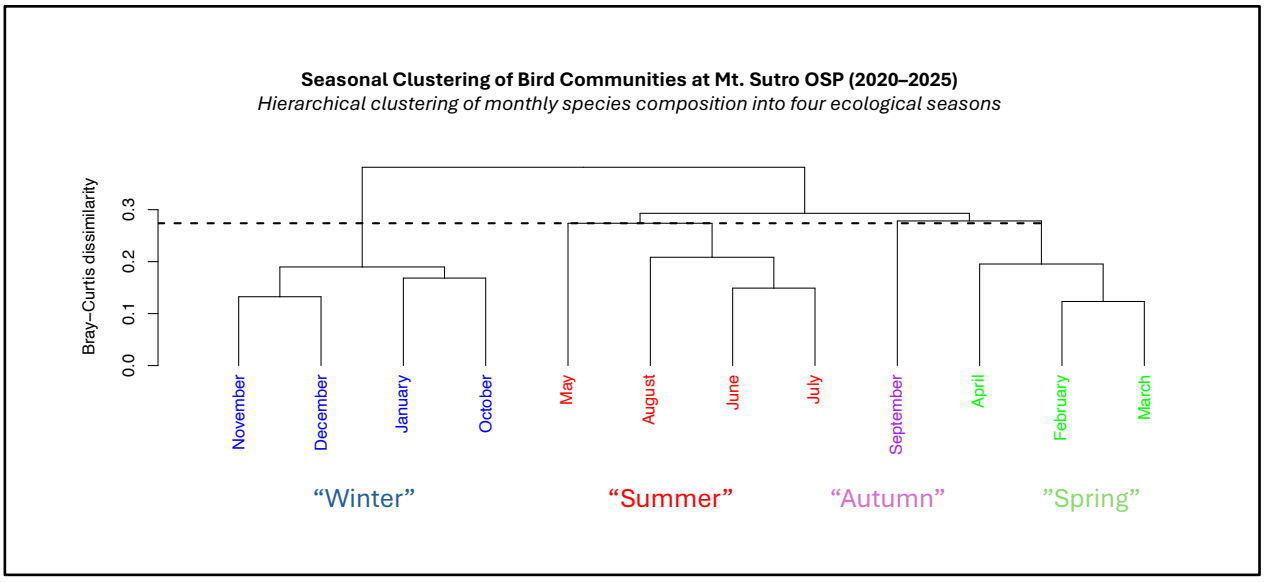

Figure 12: Monthly bird community composition was analyzed using Bray-Curtis dissimilarity and hierarchical clustering with average linkage. The dendrogram reveals four ecologically distinct seasons based on species composition similarity: “winter” (October–January, blue), “spring” (February–April, green), “summer” (May–August, red), and “autumn” (September, purple). The horizontal dashed line indicates the cut height defining the 4-season solution. These seasonal groupings were adopted for subsequent diversity analyses throughout this report.

We calculated Shannon diversity values for each survey point in each season from 2020 to 2025 and subsequently converted these values to Effective Number of Species (ENS) scores (Figure 13). The Shannon diversity index quantifies species diversity by accounting for both species richness and evenness, but its values are expressed on a logarithmic scale, which can be less intuitive. Converting Shannon values to ENS transforms them into the number of equally abundant species that would produce the same diversity value, providing a more interpretable measure of biodiversity. We then plotted seasonal ENS trajectories for all thirteen survey points and fitted trend lines to estimate the mean annual change in ENS. Baseline ENS values varied significantly among seasons, with spring and autumn exhibiting higher diversity than summer and winter. This seasonal increase is likely attributable to the influx of migratory species during the spring and autumn. Despite these differences in baseline ENS, all four seasons showed similarly significant increases, corresponding to an average rise of 0.466 species per year. Overall, although avian diversity at Mt. Sutro Open Space Preserve fluctuates seasonally, it has demonstrated a consistent upward trend since the start of the surveys.

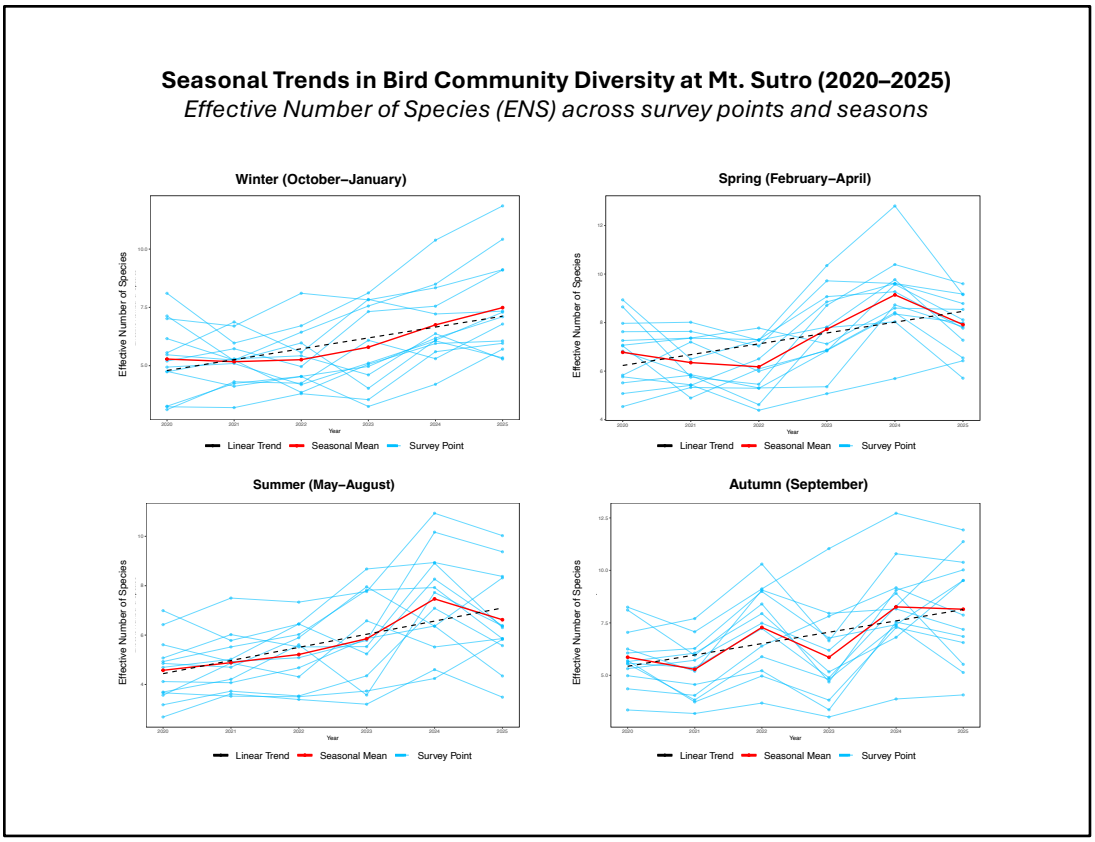

Figure 13: Effective Number of Species (ENS), calculated as the exponential of Shannon diversity, is shown across four seasonal plots. Each plot displays ENS trajectories for all thirteen survey points within a single season: Winter (October–January), Spring (February–April), Summer (May–August), and Autumn (September). Blue lines represent individual survey points, red lines show the seasonal mean ENS across all points, and black dashed lines indicate model-predicted temporal trends from a linear mixed-effects model with survey point as a random intercept. ENS increased significantly over time ($\beta = 0.466$ species per year, $t = 5.92$, $p < 0.001$), with similar rates of increase across all seasons (season × year interaction: $p > 0.05$). Seasonal baseline differences were significant: Spring and Autumn showed higher mean ENS than Winter ($\beta = 1.39$, $t = 7.31$, $p < 0.001$; $\beta = 0.83$, $t = 4.34$, $p < 0.001$, respectively), while Summer did not differ significantly from Winter.

Finally, we ranked the thirteen survey points for each season according to their mean annual change in ENS (Tables 1–4). All thirteen plots showed increases in ENS across all four seasons, though not all gains were statistically significant. Seasonal "leaders" in diversity growth varied: in winter, "Edgewood" gained nearly a full species per year (+0.973), while in spring, "Historic III" exhibited a similar increase (+0.957). During summer, "Fairy Gates" led with +1.007 species per year, and in autumn, "Summit" topped the rankings with an annual rise of +1.064 species. These results highlight both the overall upward trend in avian diversity at Mt. Sutro OSP and the seasonal variation in the pace of growth among survey points.

Rankings of Survey Points by Mean Annual Change in Species Diversity

Mean annual change in Effective Number of Species (ENS) by season and survey point

Winter (October-January)

Rank	Survey plot	Mean annual change ENS	*p*-value	R^2
1	1. Edgewood	+0.973	0.047	0.668
2	2. Fairy Gates	+0.889	0.012	0.824
3	10. Historic III	+0.781	0.013	0.817
4	11. Historic IV	+0.727	<0.01	0.963
5	8. Historic I	+0.662	<0.01	0.846
6	13. Medical	+0.587	0.017	0.797
7	5. Summit	+0.432	0.011	0.833
8	7. Quarry	+0.349	0.137	0.464
9	12. North Ridge	+0.180	0.403	0.179
10	9. Historic II	+0.166	0.298	0.263
11	6. Nike	+0.148	0.382	0.194
12	3. East Ridge	+0.107	0.638	0.061
13	4. Mystery	+0.043	0.901	0.004

Summer (May-August)

Rank	Survey plot	Mean annual change ENS	*p*-value	R^2
1	2. Fairy Gates	+1.007	0.049	0.661
2	1. Edgewood	+0.821	0.021	0.772
3	7. Quarry	+0.696	0.030	0.729
4	8. Historic I	+0.654	0.046	0.672
5	6. Nike	+0.626	0.118	0.496
6	5. Summit	+0.533	0.078	0.581
7	3. East Ridge	+0.484	0.133	0.469
8	10. Historic III	+0.448	0.075	0.589
9	4. Mystery	+0.424	0.234	0.329
10	12. North Ridge	+0.390	0.220	0.345
11	13. Medical	+0.377	0.063	0.621
12	11. Historic IV	+0.263	0.306	0.256
13	9. Historic II	+0.194	0.235	0.328

Spring (February-April)

Rank	Survey plot	Mean annual change ENS	*p*-value	R^2
1	10. Historic III	+0.957	0.010	0.840
2	9. Historic II	+0.919	0.018	0.787
3	5. Summit	+0.664	0.198	0.373
4	2. Fairy Gates	+0.630	0.236	0.327
5	1. Edgewood	+0.467	0.087	0.559
6	3. East Ridge	+0.454	0.144	0.451
7	6. Nike	+0.392	0.288	0.273
8	7. Quarry	+0.315	0.193	0.379
9	8. Historic I	+0.307	0.403	0.179
10	4. Mystery	+0.270	0.071	0.560
11	11. Historic IV	+0.230	0.360	0.210
12	13. Medical	+0.136	0.472	0.136
13	12. North Ridge	+0.059	0.864	0.008

Autumn (September)

Rank	Survey plot	Mean annual change ENS	*p*-value	R^2
1	5. Summit	+1.064	0.015	0.806
2	6. Nike	+1.011	0.071	0.598
3	7. Quarry	+0.982	0.018	0.791
4	1. Edgewood	+0.637	0.176	0.402
5	12. North Ridge	+0.537	0.191	0.383
6	2. Fairy Gates	+0.528	0.133	0.469
7	3. East Ridge	+0.469	0.235	0.328
8	4. Mystery	+0.438	0.426	0.164
9	11. Historic IV	+0.394	0.300	0.261
10	10. Historic III	+0.356	0.341	0.226
11	8. Historic I	+0.266	0.490	0.126
12	9. Historic II	+0.214	0.513	0.114
13	13. Medical	+0.143	0.163	0.421

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Tables 1-4: Rankings of the thirteen Mt. Sutro Open Space Preserve survey points based on mean annual change in Effective Number of Species (ENS) from 2020–2025, shown separately for winter (October–January), spring (February–April), summer (May–August), and autumn (September). Positive changes in ENS are highlighted in green. P-values from trend analyses are reported for each survey point, with significant results shown in green and non-significant results in red. R^2 values indicate the proportion of variation in ENS explained by time, allowing comparison of the strength and consistency of diversity trends across seasons and locations.

3d. Breeding

In 2025, surveys recorded the highest number of confirmed breeding species since the start of the monitoring program, with 17 confirmed breeders (Figure 14). The combined number of probable and confirmed breeding species, 23, remained slightly below those for the preceding years (2023: 24 species; 2024: 25 species). The Olive-sided Flycatcher, a California Species of Special Concern, was once again confirmed as a breeding species in 2025. Between 2023 and 2025, the composition of the breeding bird community remained largely consistent, with 20 of the 30 species consistently present as probable or confirmed breeders during this period. No new species were added to the breeding pool in 2025; however, the observation of probable breeding behavior in Hutton's Vireo suggests a potential return of this species as a breeder after an apparent absence of two years.

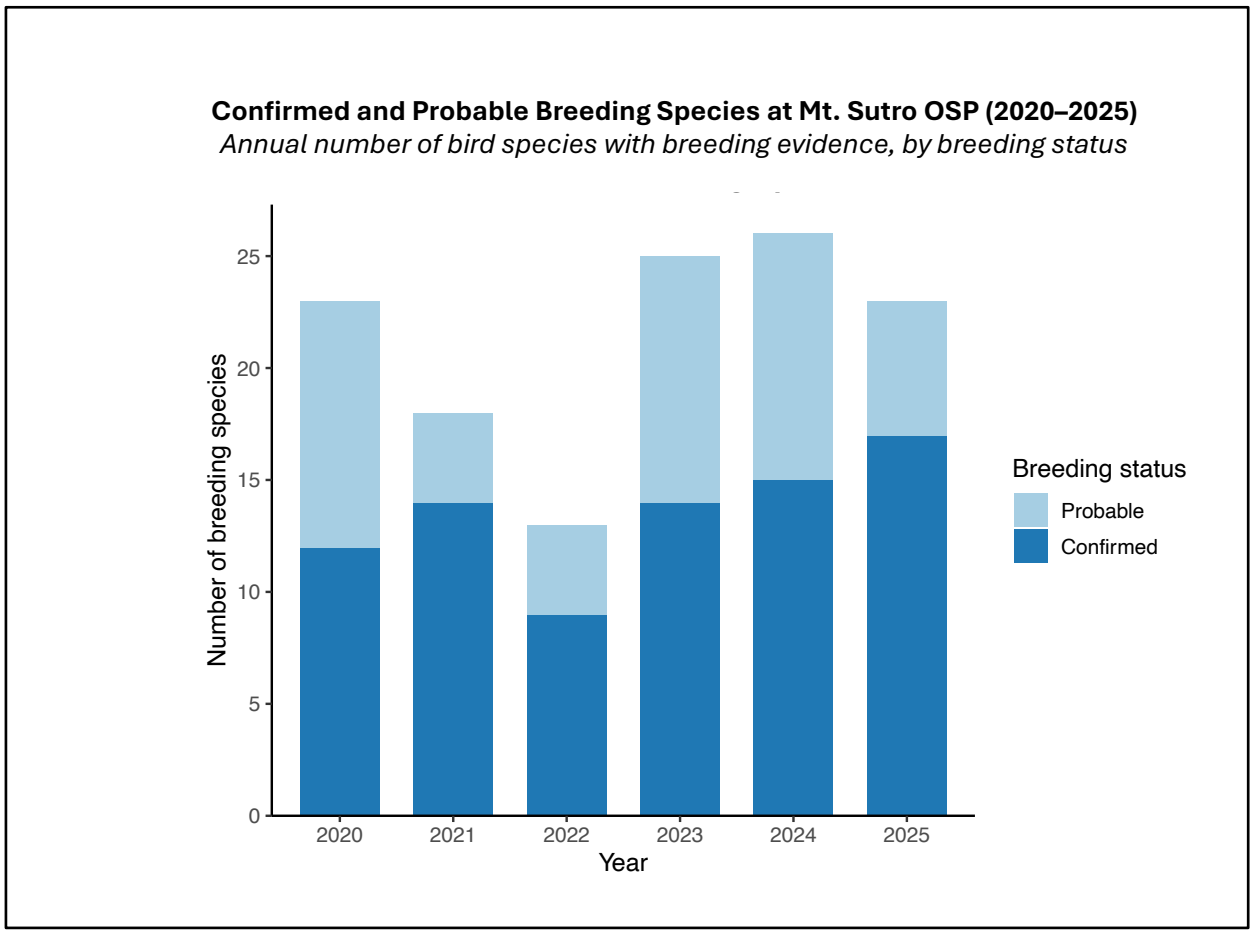


Figure 14: Confirmed and Probable Breeding Species at Mt. Sutro OSP (2020-2025). Number of bird species with confirmed and probable breeding evidence at Mt. Sutro Open Space Preserve, 2020–2025. For each year, species are counted once based on the highest breeding status attained; confirmed breeders are shown at the base of each bar, with probable breeders stacked above.

Annual List of Confirmed and Probable Breeding Bird Species at Mt. Sutro OSP

2019–2025

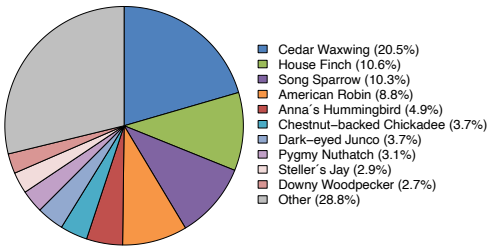
2019	2020	2021	2022	2023	2024	2025
					Rock Dove	
					Band-tailed Pigeon	Band-tailed Pigeon
				Mourning Dove	Mourning Dove	Mourning Dove
Allen's Hummingbird	Allen's Hummingbird	Allen's Hummingbird	Allen's Hummingbird	Allen's Hummingbird	Allen's Hummingbird	Allen's Hummingbird
Anna's Hummingbird	Anna's Hummingbird	Anna's Hummingbird	Anna's Hummingbird	Anna's Hummingbird	Anna's Hummingbird	Anna's Hummingbird
				Rufous Hummingbird		
				Cooper's Hawk		
Red-shouldered Hawk	Red-shouldered Hawk					
				Red-tailed Hawk	Red-tailed Hawk	Red-tailed Hawk
Downy Woodpecker	Downy Woodpecker	Downy Woodpecker		Downy Woodpecker	Downy Woodpecker	Downy Woodpecker
				Nuttall's Woodpecker	Nuttall's Woodpecker	Nuttall's Woodpecker
		Hairy Woodpecker		Hairy Woodpecker	Hairy Woodpecker	Hairy Woodpecker
				Northern Flicker		
					Black Phoebe	
Olive-sided Flycatcher				Olive-sided Flycatcher	Olive-sided Flycatcher	Olive-sided Flycatcher
Hutton's Vireo	Hutton's Vireo		Hutton's Vireo			Hutton's Vireo
	Warbling Vireo					
Steller's Jay	Steller's Jay	Steller's Jay	Steller's Jay	Steller's Jay	Steller's Jay	Steller's Jay
Common Raven	Common Raven	Common Raven	Common Raven	Common Raven	Common Raven	Common Raven
Chestnut-backed Chickadee	Chestnut-backed Chickadee	Chestnut-backed Chickadee	Chestnut-backed Chickadee	Chestnut-backed Chickadee	Chestnut-backed Chickadee	Chestnut-backed Chickadee
Bushtit	Bushtit	Bushtit		Bushtit	Bushtit	Bushtit
Pygmy Nuthatch	Pygmy Nuthatch	Pygmy Nuthatch		Pygmy Nuthatch	Pygmy Nuthatch	Pygmy Nuthatch
Pacific Wren	Pacific Wren	Pacific Wren			Pacific Wren	
American Robin	American Robin	American Robin	American Robin	American Robin	American Robin	American Robin
	Swainson's Thrush		Swainson's Thrush			
House Finch	House Finch	House Finch		House Finch	House Finch	House Finch
				Lesser Goldfinch	Lesser Goldfinch	Lesser Goldfinch
Dark-eyed Junco	Dark-eyed Junco	Dark-eyed Junco	Dark-eyed Junco	Dark-eyed Junco	Dark-eyed Junco	Dark-eyed Junco
	White-crowned Sparrow	White-crowned Sparrow		White-crowned Sparrow	White-crowned Sparrow	White-crowned Sparrow
Song Sparrow	Song Sparrow	Song Sparrow	Song Sparrow	Song Sparrow	Song Sparrow	Song Sparrow
California Towhee	California Towhee	California Towhee	California Towhee	California Towhee		California Towhee
	Spotted Towhee					
Orange-crowned Warbler	Orange-crowned Warbler				Orange-crowned Warbler	
Wilsons' Warbler	Wilsons' Warbler	Wilsons' Warbler	Wilsons' Warbler	Wilsons' Warbler	Wilsons' Warbler	Wilsons' Warbler
	Black-headed Grosbeak	Black-headed Grosbeak				

Table 5: All bird species with documented breeding behavior at the thirteen survey points in Mt. Sutro Open Space Preserve, 2019–2025. Confirmed breeders are shown in black, and species with only probable breeding evidence are shown in gray.

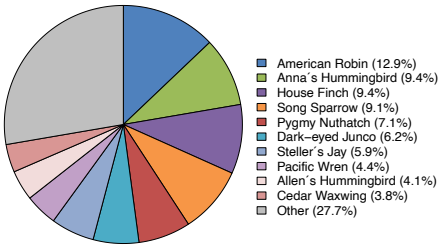
Appendix A: Top Ten Species by Survey Point, 2025

Species ranked by proportion of total detected individuals

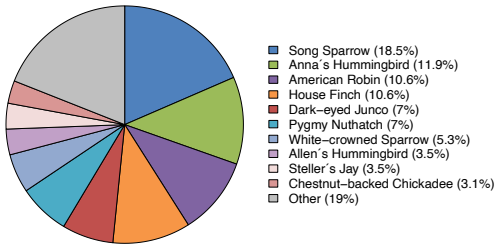
1. Edgewood



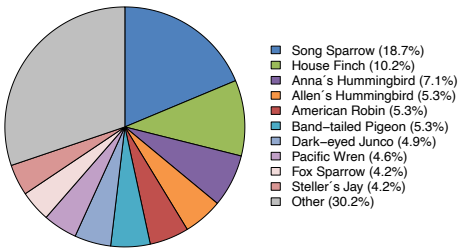
2. Fairy Gates



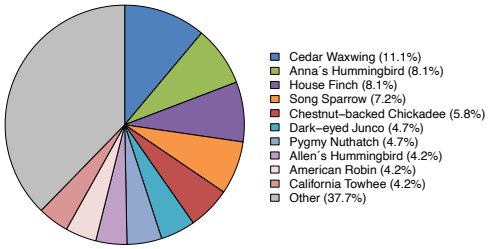
3. East Ridge



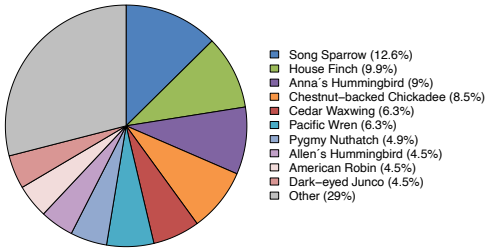
4. Mystery



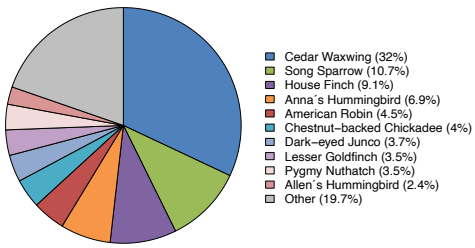
5. Summit



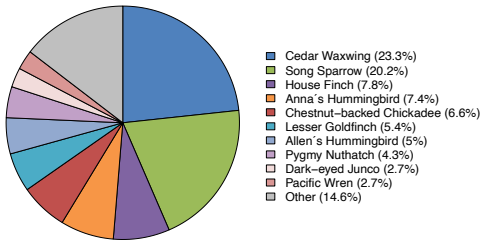
6. Nike



7. Quarry



8. Historic I



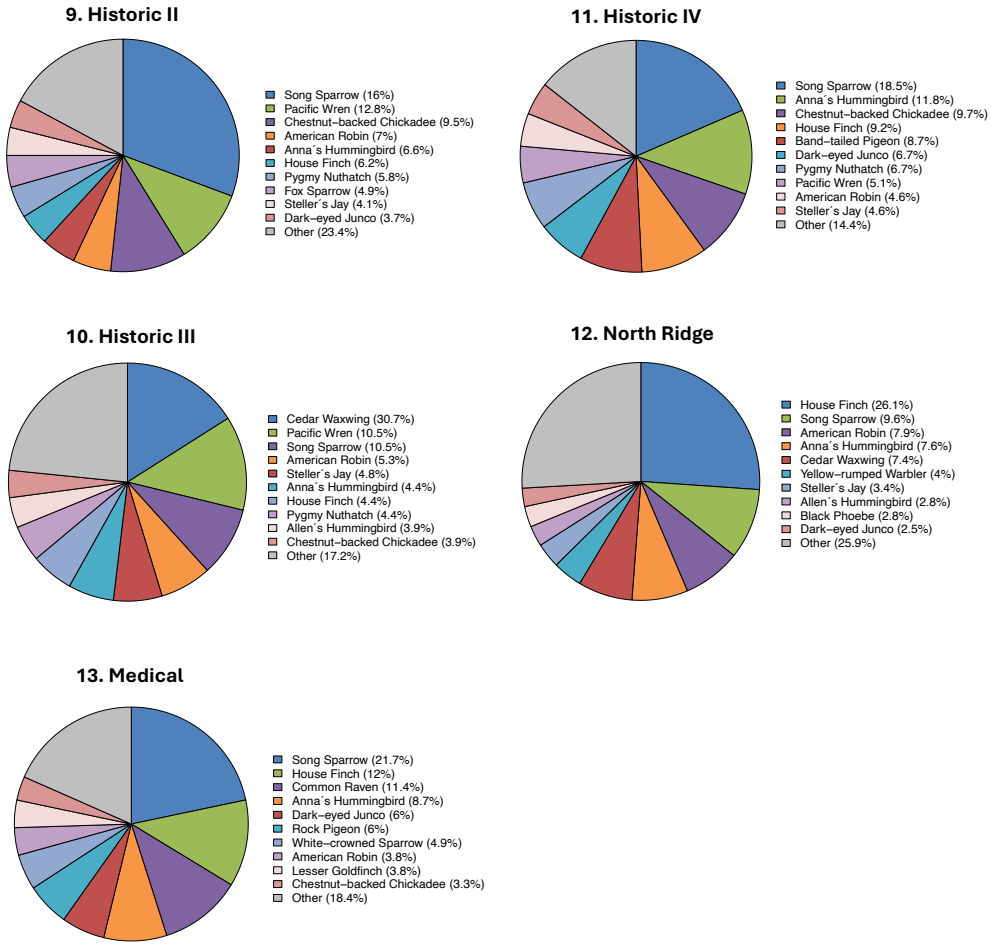


Figure A: Combined pie charts showing the ten most abundant bird species for all 13 survey points in 2025, based on each species' proportion of all individuals detected. The "Other" category represents the combined proportion of remaining species.

Appendix B: Phenological status of bird species in Mt. Sutro OSP

B1. Resident species

Species with no more than one consecutive month without detections

Common name	**Scientific name**
Rock Pigeon*	*Columba livia*
Band-tailed Pigeon**	*Patagioenas fasciata*
Anna's Hummingbird**	*Calypte anna*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk**	*Buteo jamaicensis*
Downy Woodpecker**	*Dryobates pubescens*
Nuttall's Woodpecker*	*Dryobates nuttallii*
Hairy Woodpecker*	*Leuconotopicus villosus*
Northern Flicker*	*Colaptes auratus*
Black Phoebe**	*Sayornis nigricans*
Hutton's Vireo**	*Vireo huttoni*
Steller's Jay**	*Cyanocitta stelleri*
California Scrub-Jay	*Aphelocoma californica*
Common Raven**	*Corvus corax*
Chestnut-backed Chickadee**	*Poecile rufescens*
Bushtit**	*Psaltriparus minimus*
Pygmy Nuthatch**	*Sitta pygmaea*
Brown Creeper	*Certhia americana*
Pacific Wren**	*Troglodytes pacificus*
American Robin**	*Turdus migratorius*
House Finch**	*Haemorhous mexicanus*
Lesser Goldfinch**	*Spinus psaltria*
Dark-eyed Junco**	*Junco hyemalis*
White-crowned Sparrow**	*Zonotrichia leucophrys*
Song Sparrow**	*Melospiza melodia*
California Towhee**	*Melozone crissalis*
Orange-crowned Warbler*	*Leiothlypis celata*

** Confirmed breeding
* Probable breeding

B2. Seasonal species

Species with two or more consecutive months without detections

Common name	Scientific name	Consecutive months without detection (2020-2025)
Allen's Hummingbird**	*Selasphorus sasin*	5 (September – January)
Mourning Dove*	*Zenaida macroura*	2 (September – October)
Olive-sided Flycatcher**	*Contopus cooperi*	7 (September – March)
Western Flycatcher	*Empidonax difficilis*	5 (November – March)
American Crow	*Corvus brachyrhynchos*	4 (November – February)
Ruby-crowned Kinglet	*Corthylio calendula*	3 (June – August)
Red-breasted Nuthatch	*Sitta canadensis*	4 (December – March)
Northern House Wren	*Troglodytes aedon*	2 (March – April)
Varied Thrush	*Ixoreus naevius*	5 (May – September)
Swainson's Thrush**	*Catharus ustulatus*	7 (October - April)
Hermit Thrush	*Catharus guttatus*	4 (May – August)
Cedar Waxwing	*Bombycilla cedrorum*	4 (June – September)
Purple Finch	*Haemorhous purpureus*	2 (May – June)
Fox Sparrow	*Passerella iliaca*	3 (June – August)
Golden-crowned Sparrow	*Zonotrichia atricapilla*	4 (May – August)
Spotted Towhee*	*Pipilo maculatus*	3 (July – September)
Northern Yellow Warbler	*Setophaga petechia*	9 (November – July)
Yellow-rumped Warbler	*Setophaga coronata*	2 (July – August)
Townsend's Warbler	*Setophaga townsendi*	2 (June – July)
Wilson's Warbler**	*Cardellina pusilla*	5 (October – February)
Western Tanager	*Piranga ludoviciana*	6 (November – April)
Black-headed Grosbeak**	*Pheucticus melanocephalus*	6 (October – March)

** Confirmed breeding
* Probable breeding

B3. Casual and rare visitors

Species with fewer than three average detections per year

Common name	Scientific name	Mean individuals detected annually
Rufous Hummingbird*	*Selasphorus rufus*	0.5
Sharp-shinned Hawk	*Accipiter striatus*	0.3
Coopers' Hawk	*Astur cooperii*	1.0
Great Horned Owl	*Bubo virginianus*	0.8
Red-breasted Sapsucker	*Sphyrapicus ruber*	0.7
Acorn Woodpecker	*Melanerpes formicivorus*	0.3
Red-masked Parakeet	*Psittacara erythrogenys*	2.2
Western Wood-Pewee	*Contopus sordidulus*	1.3
Warbling Vireo	*Vireo gilvus*	1.2
Golden-crowned Kinglet	*Regulua satrapa*	1.8
Blue-gray Gnatcatcher	*Polioptila caerulea*	1.2
Bewick's Wren	*Thryomanes bewickii*	0.8
Western Bluebird	*Sialia mexicana*	0.2
Red Crossbill	*Loxia curvirostra*	0.3
Pine Siskin	*Spinus pinus*	1.3
White-throated Sparrow	*Zonotrichia albicollis*	0.8
Lincoln's Sparrow	*Melospiza lincolnii*	0.2
Hooded Oriole	*Icterus cucullatus*	0.3
Bullock's Oriole	*Icterus bullockii*	1.0
Brown-headed Cowbird	*Molothrus ater*	0.5
Nashville Warbler	*Leiothlypis ruficapilla*	0.3
Northern Parula	*Setophaga americana*	0.3
Black-throated Gray Warbler	*Setophaga nigrescens*	0.3
Hermit Warbler	*Setophaga occidentalis*	0.3
Summer Tanager	*Piranga rubra*	0.3
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	0.5
Lazuli Bunting	*Passerina amoena*	1.2

* Probable breeding

Confirmed breeding: confirmed as a breeding species in at least one year over the period 2019-2025

Probable breeding: recorded as a probable breeding species in at least one year over the period 2019-2025