

CZU Bird Study: 2022 Summary

Prepared for

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This report contains selected results from the CZU bird study, an ongoing three-year investigation into how breeding bird populations have responded to the CZU Lightning Complex Fire in 2020. The selected results in this report focus on how bird populations have continued to change by making comparisons between the first and second years following the fire.



KEY FINDINGS

- **There were significantly more individuals and more species within the burn this year than in 2021.** This suggests a) bird populations within the burn are recovering, and b) the vegetation structure within the burn has changed and now supports a greater diversity of species than in 2021.
- **The relative abundance of two major groups of birds increased significantly within the burn since 2021.**

Four species of ground nesting birds that prefer a dense understory increased, likely as a result of a much denser understory that was present throughout the burn in 2022. These species include California Quail, Dark-eyed Junco, Wilson’s Warbler, and Orange-crowned Warbler. Four common resident species—Chestnut-backed Chickadee, Brown Creeper, Pacific Wren, and Bewick’s Wren—also increased, which may indicate ongoing recolonization of the habitats within the burn.



Wilson’s Warbler with nest material.

- **Three species declined in relative abundance within the burn since 2021.**

Two of these species—Acorn Woodpecker and Band-tailed Pigeon—are major consumers of oak mast and may have declined due to a scarcity of this food resource as oaks can take several years to produce mast after a fire (Glover 1953, Johnson and Wauer 1977). After dramatically increasing in 2021, Lazuli Bunting declined significantly in 2022. This species is known to rapidly respond to changes in the available habitat in California (Coston 2007, Unitt 2004, Greene et al. 2020), and the immediate increase and subsequent decline suggests it is a “fire following” species in the Santa Cruz Mountains.



Lazuli Bunting nest with young.

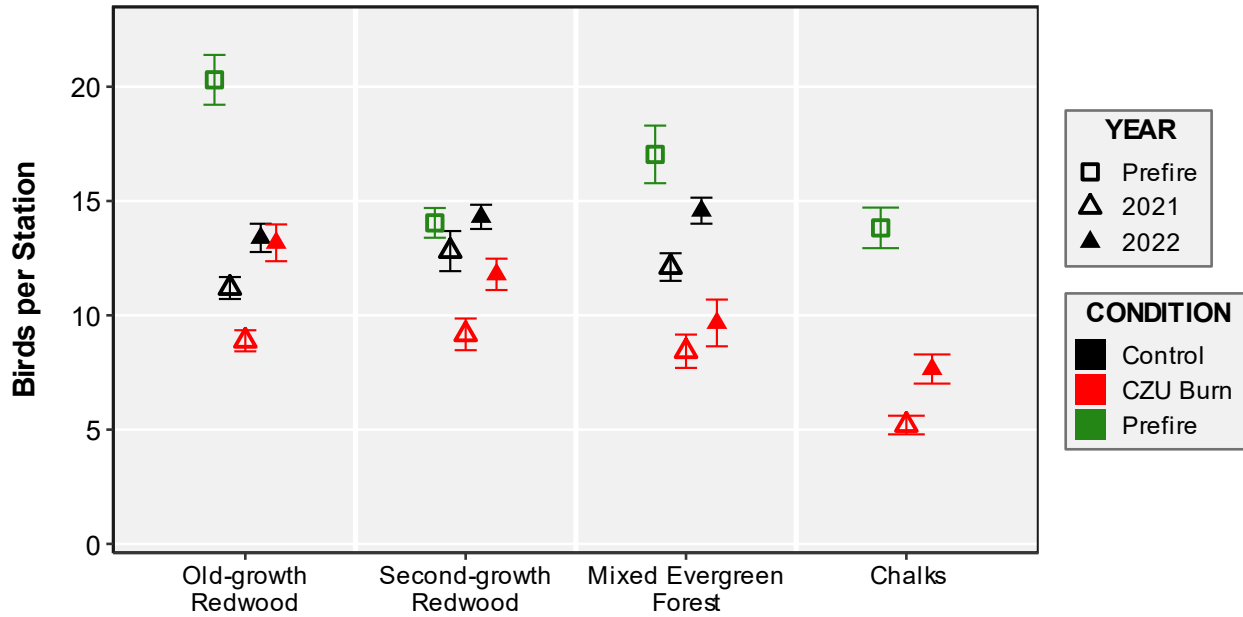


Figure 1. The average number of **individuals** detected on surveys increased significantly since 2021 in old-growth and second-growth redwood forest, and the chalks in both CZU burn and control areas (Table 1). *The mean and standard error are shown.*

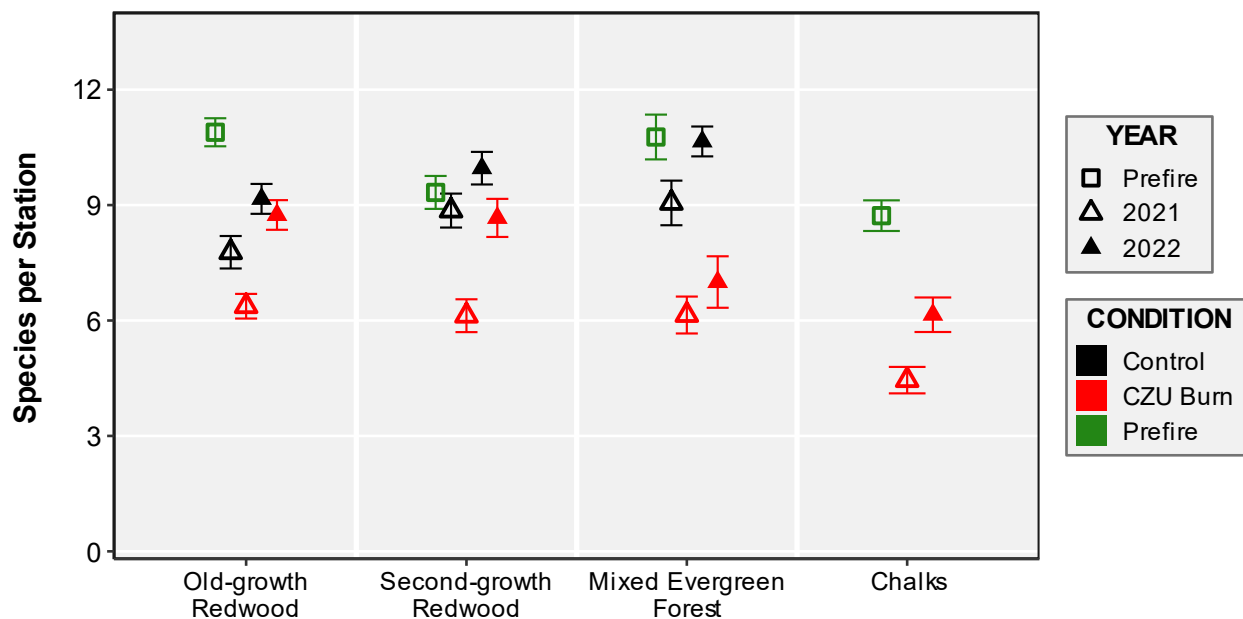


Figure 2. The average number of **species** detected on surveys increased significantly since 2021 in old-growth and second-growth redwood forest, and the chalks in the CZU burn, and increased significantly in old-growth forest and mixed evergreen forest in control areas (Table 2). *The mean and standard error are shown.*

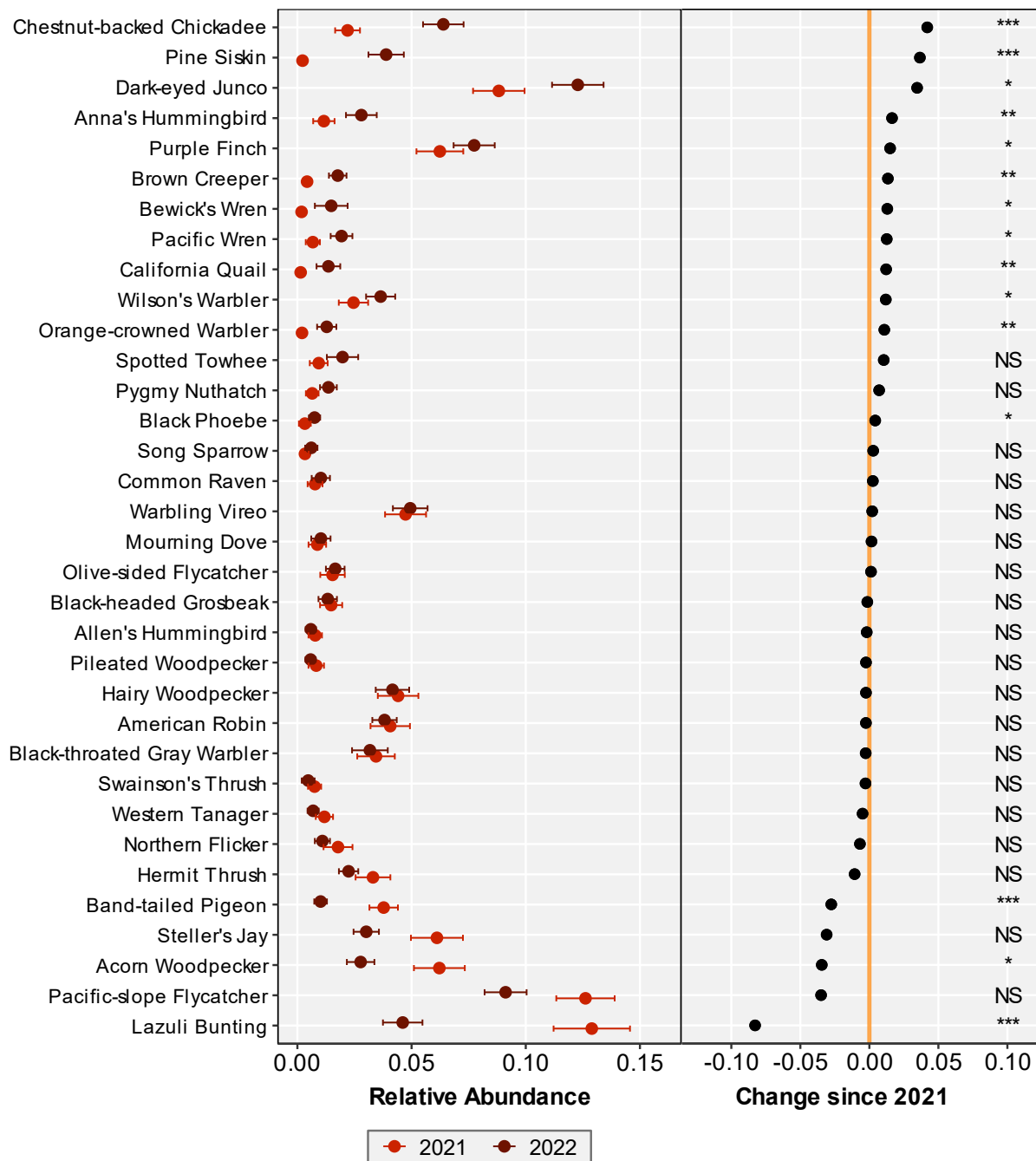


Figure 3. The **relative abundance** of many species in the burn has changed significantly since 2021. Species increasing in relative abundance primarily were ground nesting birds that prefer a dense understory as well as common, resident species. Three species that declined included two birds that consume oak mast and one that may be a fire following species in the Santa Cruz Mountains. *The mean and standard error are shown. Statistical results from Wilcoxon rank sum test comparing 2021 and 2022 relative abundance in all habitats pooled: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, NS = not significant.*

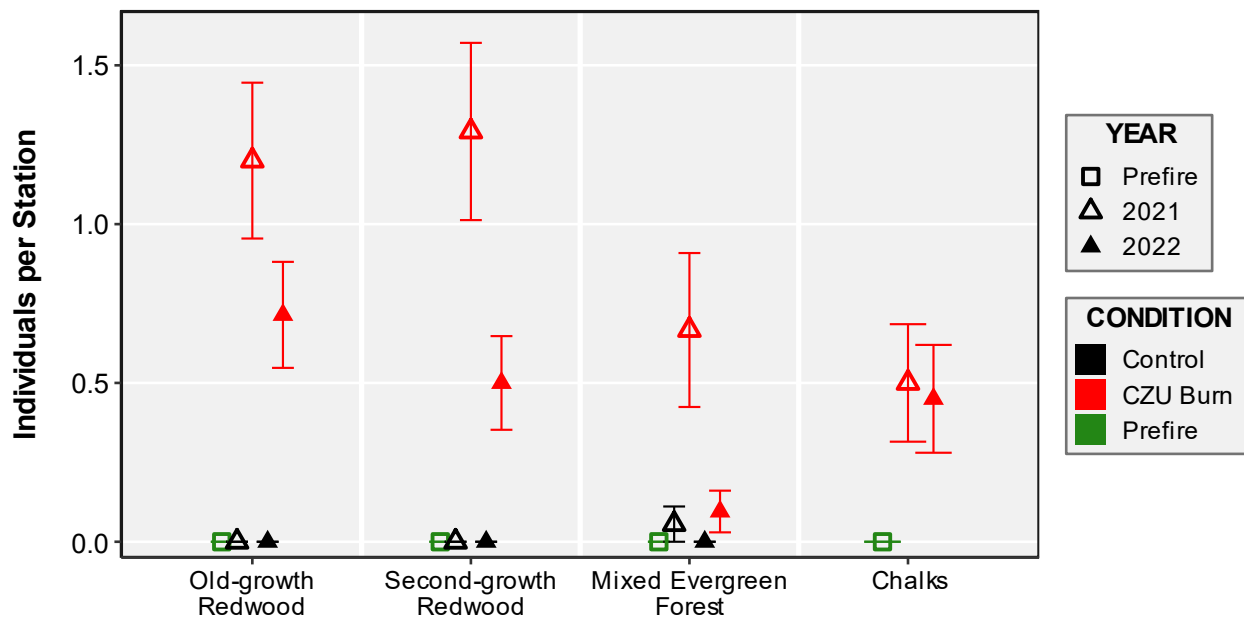


Figure 4. After a dramatic increase in the first year following the burn, **Lazuli Buntings** decreased significantly in second-growth redwood and mixed evergreen forest (Table 3). *The mean and standard error are shown.*

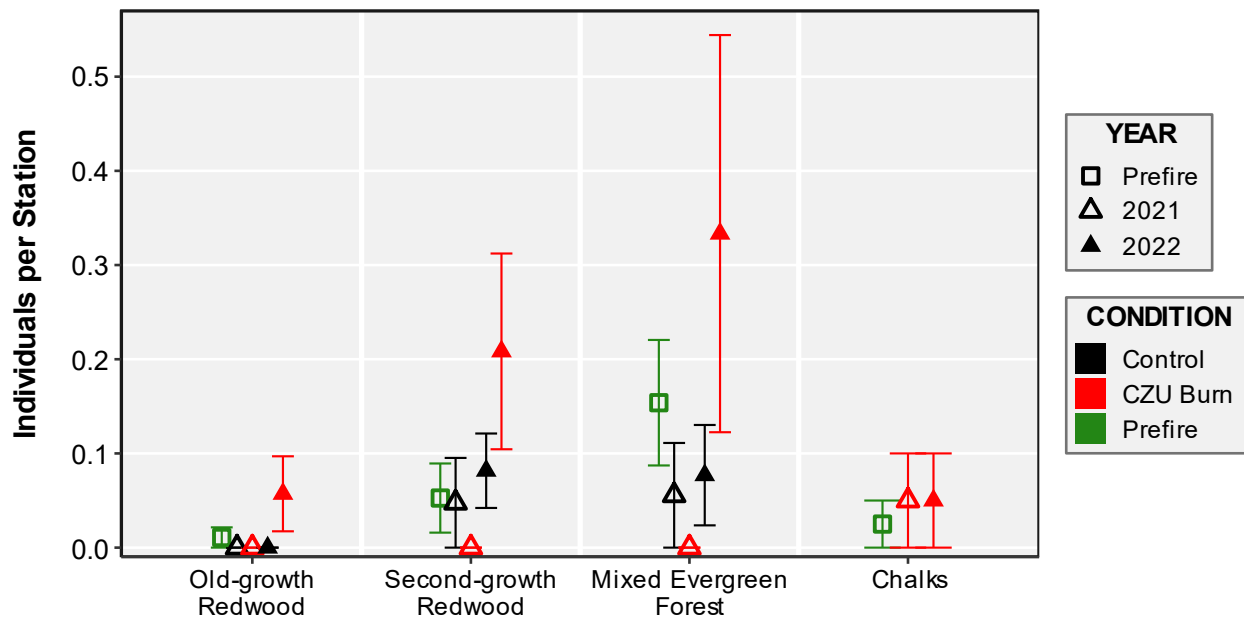


Figure 5. **California Quail** were significantly more abundant in the burn than in 2021 (Table 3). The dense understory and low canopy cover that now exists in old-growth and second-growth redwood forest, and mixed evergreen forest has made these formerly underutilized habitats more suitable for quail and other chaparral species. *The mean and standard error are shown.*

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METHODS

See Rinkert (2021) for a description of the study design, survey methodology, and data management and analysis. Additional point-count stations were surveyed in 2022, but otherwise few changes were made to the study design. All statistical testing conducted in this report used Wilcoxon rank sum tests.

SELECTED RESULTS

Table 1. Comparing the average total individuals detected on surveys between 2021 and 2022.

| Total Individuals | P-value | Result | Change |
|------------------------|---------|--------|----------|
| <i>CZU Burn</i> | | | |
| Old-growth redwood | <0.001 | *** | Increase |
| Second-growth redwood | 0.014 | * | Increase |
| Mixed evergreen forest | 0.442 | NS | None |
| Chalks | 0.004 | ** | Increase |
| <i>Control Areas</i> | | | |
| Old-growth redwood | 0.010 | * | Increase |
| Second-growth redwood | 0.034 | * | Increase |
| Mixed evergreen forest | 0.012 | * | Increase |

Table 2. Comparing the average number of species detected on surveys between 2021 and 2022.

| Total Species | P-value | Result | Change |
|------------------------|---------|--------|----------|
| <i>CZU Burn</i> | | | |
| Old-growth redwood | <0.001 | *** | Increase |
| Second-growth redwood | 0.001 | ** | Increase |
| Mixed evergreen forest | 0.381 | NS | None |
| Chalks | 0.007 | ** | Increase |
| <i>Control Areas</i> | | | |
| Old-growth redwood | 0.024 | * | Increase |
| Second-growth redwood | 0.138 | NS | None |
| Mixed evergreen forest | 0.035 | * | Increase |

Table 3. Comparing the abundance of two species in the CZU burn between 2021 and 2022.

| Species | P-value | Result | Change |
|-------------------------|---------|--------|----------|
| <i>California Quail</i> | | | |
| Old-growth redwood | 0.160 | NS | None |
| Second-growth redwood | 0.041 | * | Increase |
| Mixed evergreen forest | 0.081 | NS | None |
| Chalks | 1.000 | NS | None |
| <i>Lazuli Bunting</i> | | | |
| Old-growth redwood | 0.194 | NS | None |
| Second-growth redwood | 0.024 | * | Decline |
| Mixed evergreen forest | 0.049 | * | Decline |
| Chalks | 0.832 | NS | None |