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Visualizing Animal Fire Responses

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Derived from an ENVS 429 project by Ashley Spencer-Olsen, Baleigh Rumsey, Leif Dickens, Ian Lewis, and Michael Ginster

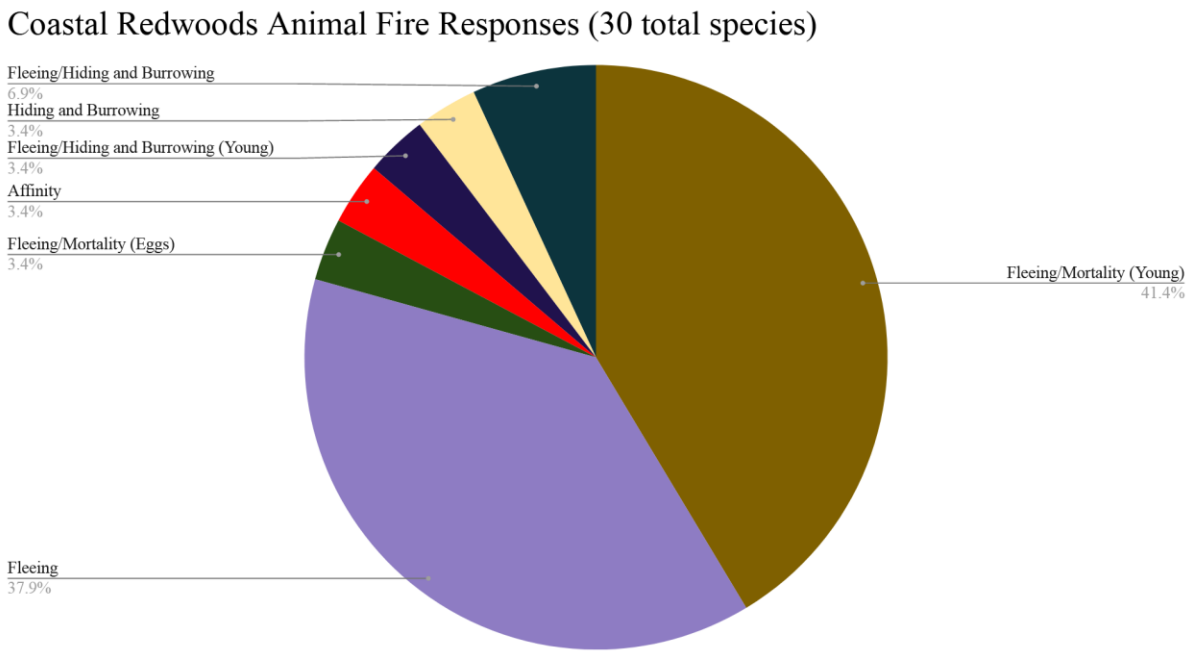
Introduction

This assembly of pie charts is rooted in an ENVS 429 project that sought to create a comprehensive classification for the immediate during-fire responses of animals. The original ENVS 429 project was based on a pair of papers (2018 & 2019) by Dr. Juli G. Pausas (with Dr. Catherine L. Parr co-authoring the 2018 paper) that sought to understand the relationships between organisms and fire, in particular animals. The 2018 paper, *Towards an understanding of the evolutionary role of fire in animals*, focused on how fire regimes shape animal evolution and behavior while the 2019 paper, *Generalized fire response strategies in plants and animals*, seeks to create a broader fire response strategy system that can be applied to both plants and animals. Both papers were motivated to varying degrees by a relative lack of knowledge about animal fire responses, which also prompted our group in part to specifically focus on animals. Over the course of our project, we narrowed our classification system to focus solely on animals and their responses during an active fire (vs. during-fire and post-fire responses) largely due to time constraints. This led to classifications in the Pausas system that fell outside of these criteria being removed from our system. We also renamed multiple Pausas terms that we found vague or esoteric and added new terms that we felt Pausas had left out. We then researched five example ecosystems to display proportions of fire responses among different types of animals within those ecosystems. One of my primary roles in the group, beyond researching coastal redwoods ecosystems, was to visualize our fire response data using a series of pie charts.

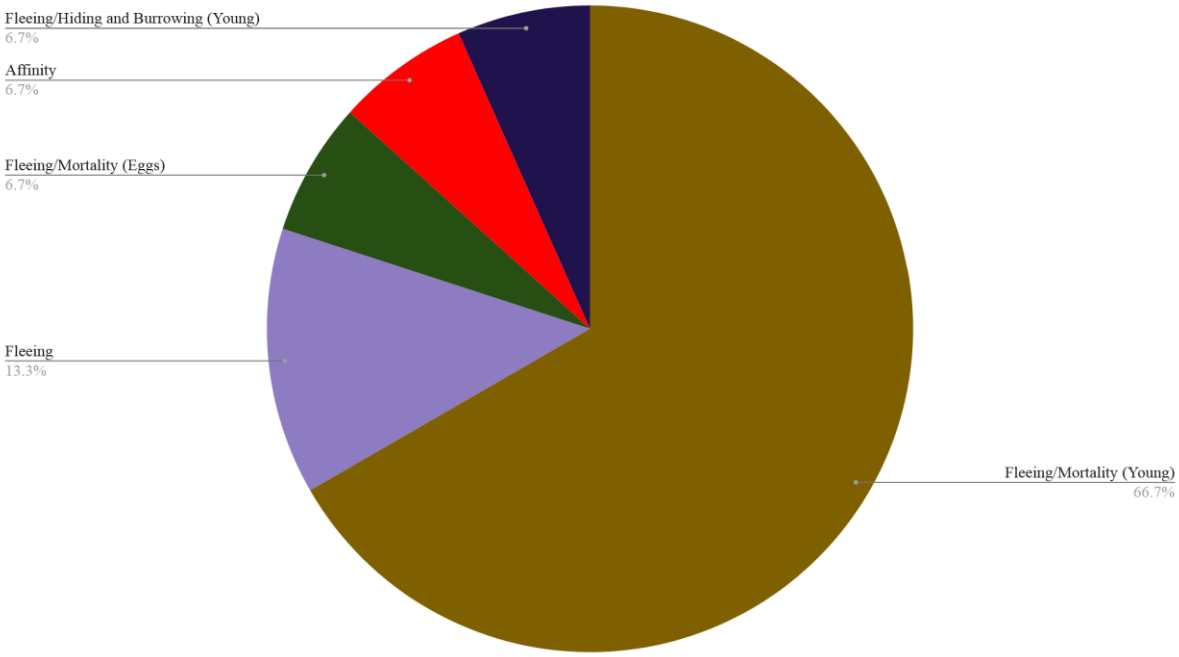
After being steered into a graphic design direction by my advisor, Dr. Michael Medler, I started to make adjustments to my charts based on the principles outlined by Edward Tufte. Some concepts, such as chartjunk and some aspects of friendly graphic design, made me realize that my chart needed revisions, with the former leading me to shift the 3D charts into 2D and the latter prompting me to shift the font to Serif (vs. the initial sans-serif font). Other concepts, such as most aspects of friendly graphic design and data-ink ratio, justified existing aspects of my pie charts. From this point, I was connected to web accessibility engineer Carly Gerard via Dr. Julie Dugger. Through this connection, I received multiple resources on how to design accessible pie charts. The most important of these resources was WebAIM's color contrast checker, which showed me how poorly many of my pie chart slices contrasted with each other and the chart backgrounds. Using WebAIM's color contrast checker, I was able to significantly improve the color contrast between slices of each pie chart, allowing me to resolve visual accessibility issues to the best of my ability.

However, from an accessibility perspective, my charts are still not optimal. A handful of slice-slice and slice-background pairings are still below the recommended 3:1 contrast ratio, at least one of which is a red-green slice-slice pairing. However, given the sheer amount of slice types and slice-slice/slice-background pairings, it was impossible to eliminate every single pairing that was below the 3:1 ratio. An alternative idea posed by Carly Gerard would have been to create a chart where every slice was separated from each other, which in theory would mean that each slice only needs a 3:1 ratio with the background. However, in practice, this created images that were far more confusing to read and difficult to visualize in Google Slides. The process of spacing the slides out made the chart larger in Google Sheets, meaning that more condensing would be required to move it into Google Slides. Attempts at minimizing this spacing led to slices with gaps thin enough to make contrast across these gaps an issue again, defeating the entire purpose of reformatting. Furthermore, the clearly assigned tags in my current charts were moved into a legend at the bottom when I tried the alternative approach, which goes against the principles of friendly graphic design outlined by Tufte and overall makes the chart more difficult to process. The alternative approach, as a whole, would have sacrificed the general legibility of the chart in favor of making certain components better for a slim minority of viewers, which was not a tradeoff I was willing to make.

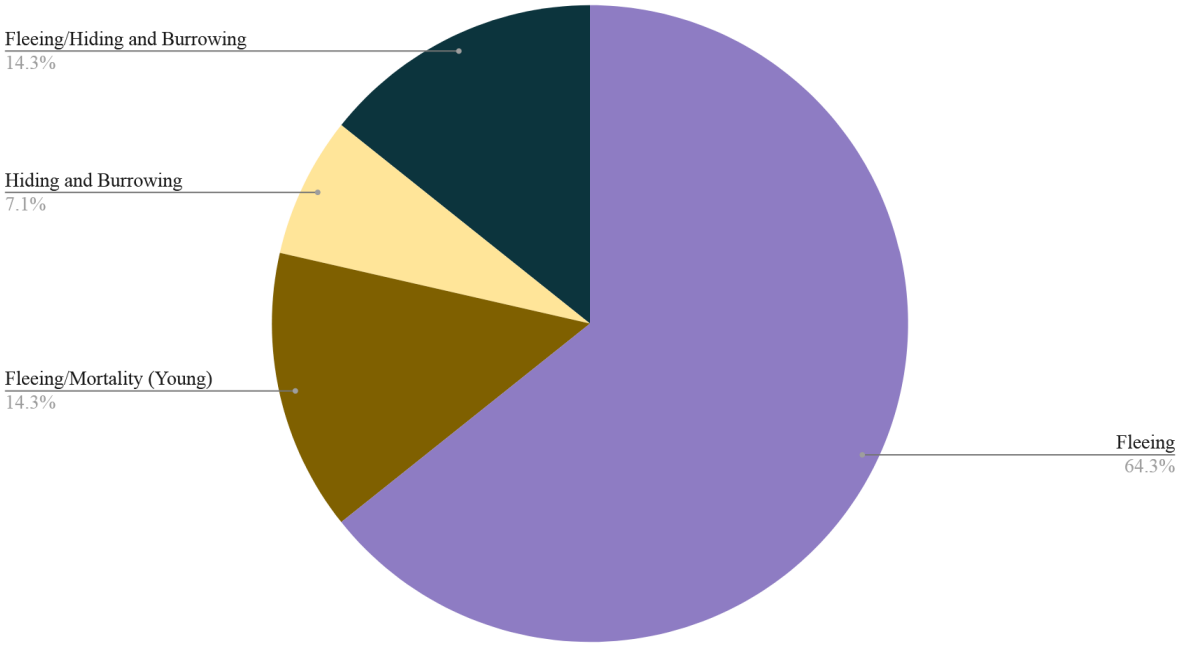
Coastal Redwoods Ecosystem Pie Charts



Coastal Redwoods Bird Fire Responses (15 species)

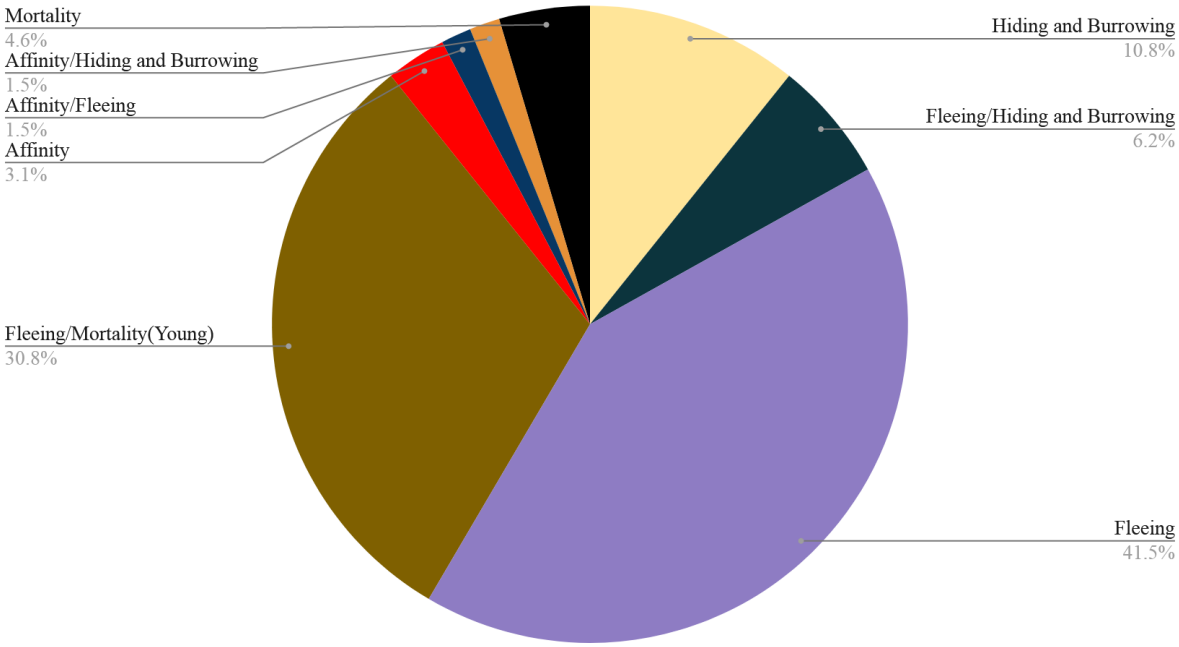


Coastal Redwoods Mammal Fire Responses (14 species)

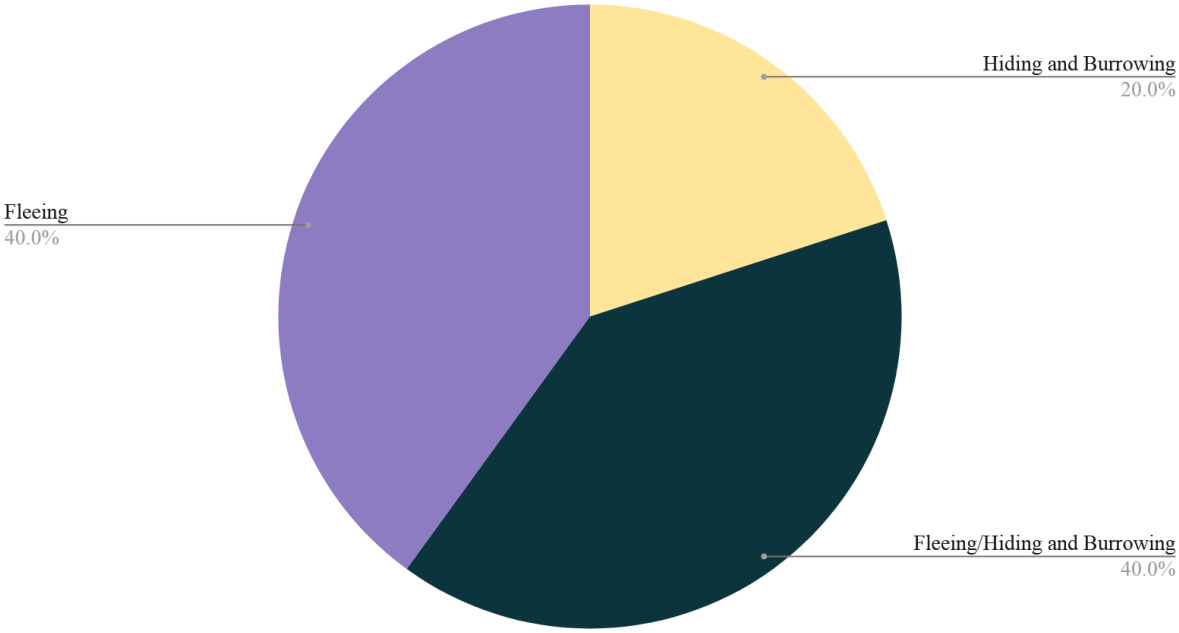


Mediterranean Climate Ecosystem Pie Charts

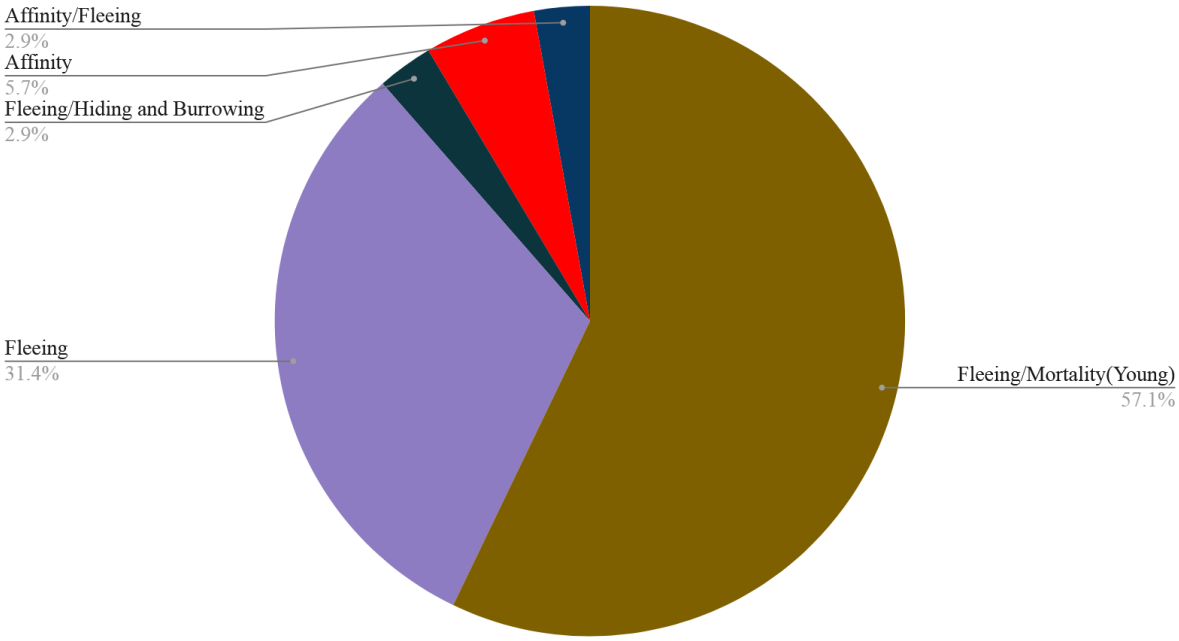
Mediterrenean Climate Animal Fire Responses (65 total species)



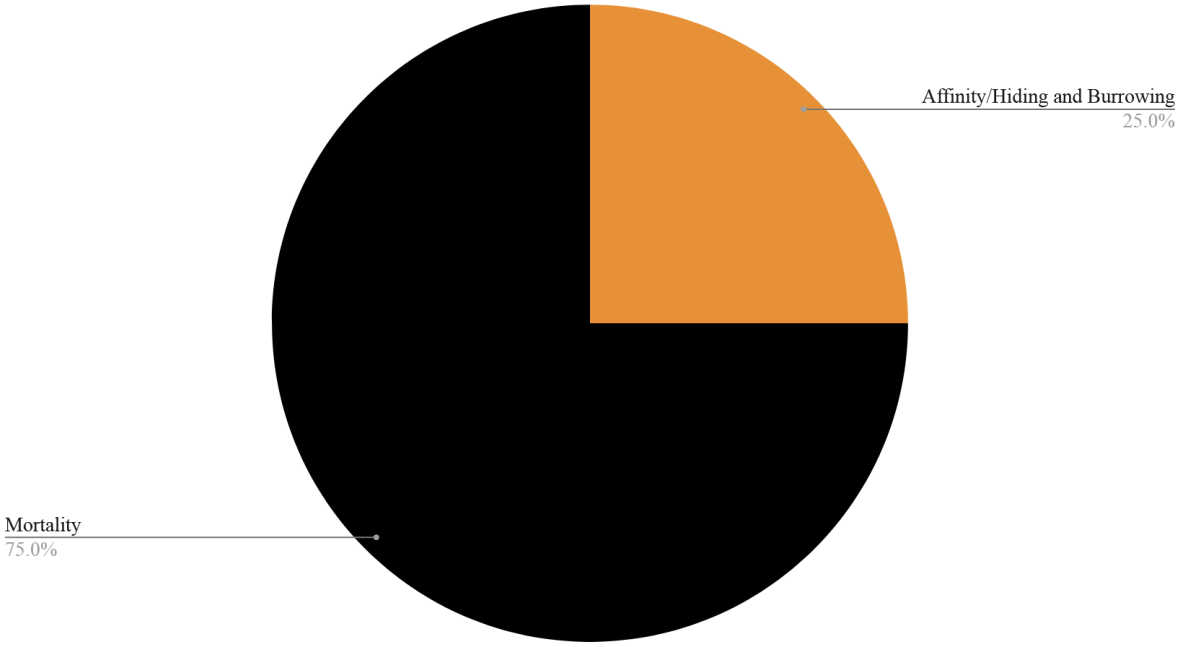
Mediterranean Climate Amphibian Fire Responses (5 species)



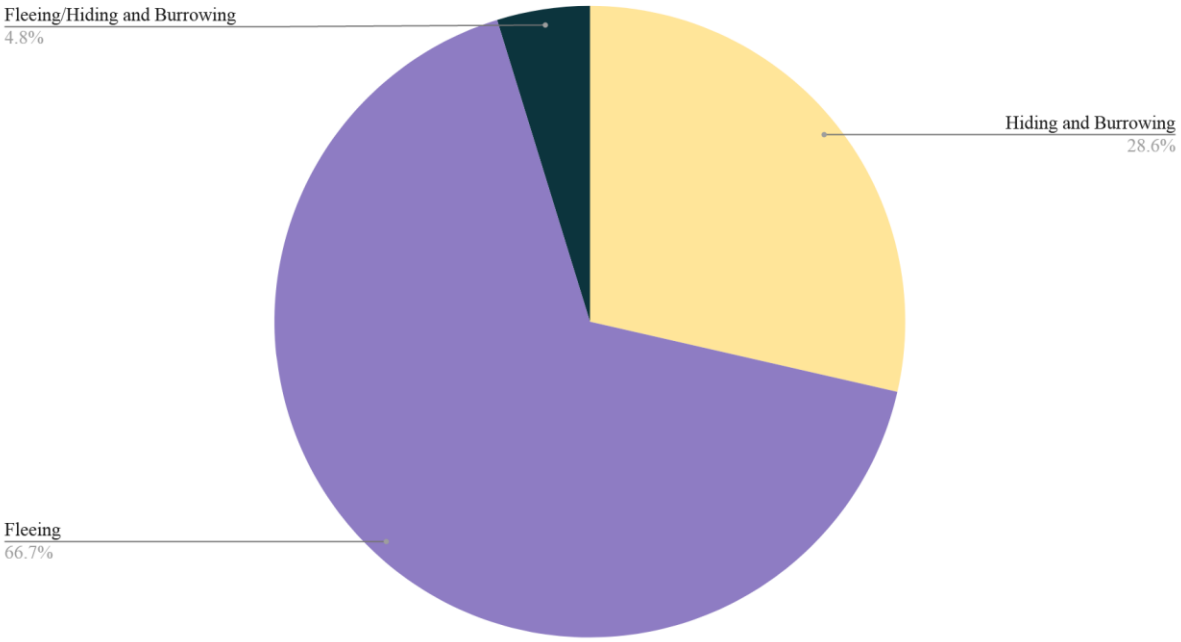
Mediterranean Climate Bird Fire Responses (35 species)



Mediterranean Climate Insect Fire Responses (4 species)

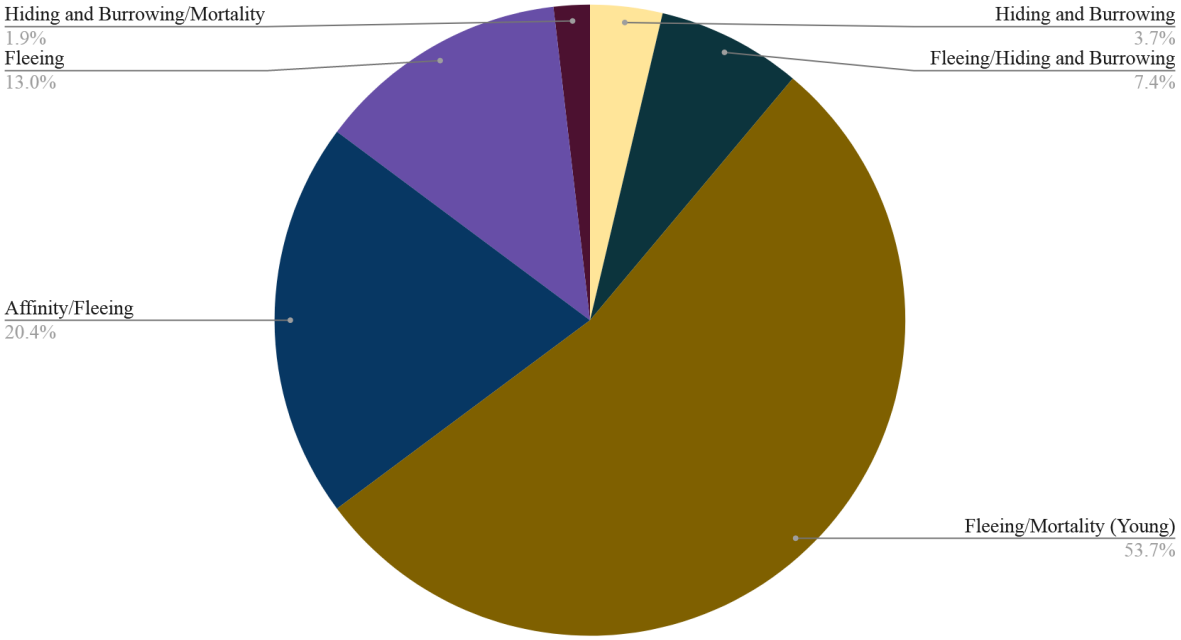


Mediterranean Climate Mammal Fire Responses (21 species)

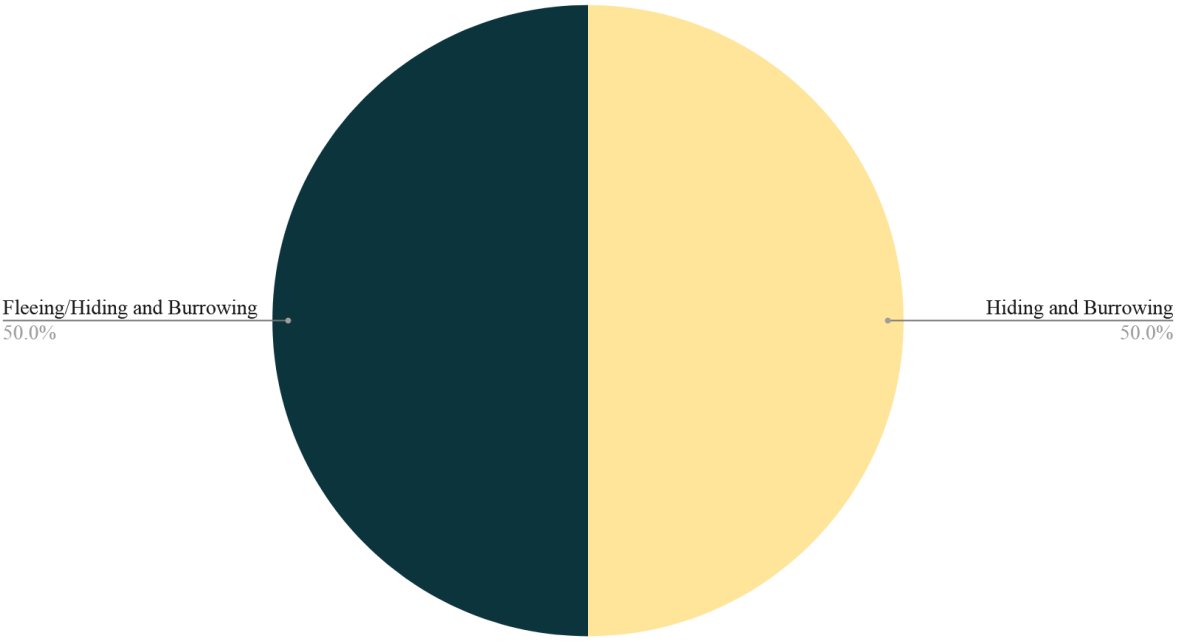


North Pacific Forest Ecosystem Pie Charts

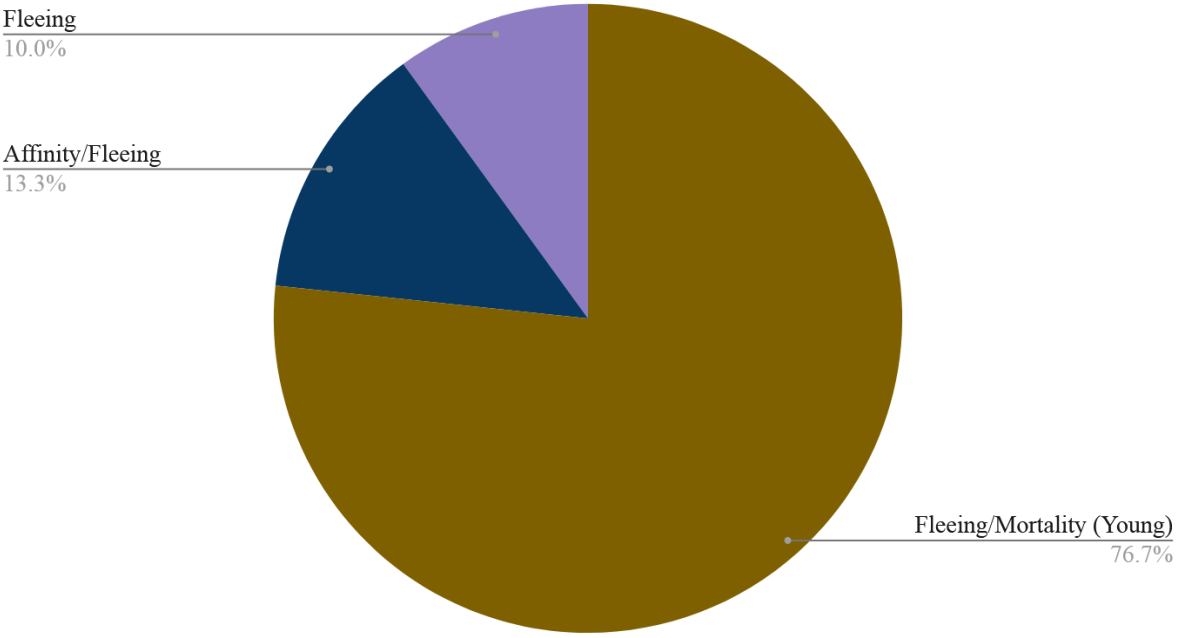
North Pacific Forest Animal Fire Responses (54 total species)



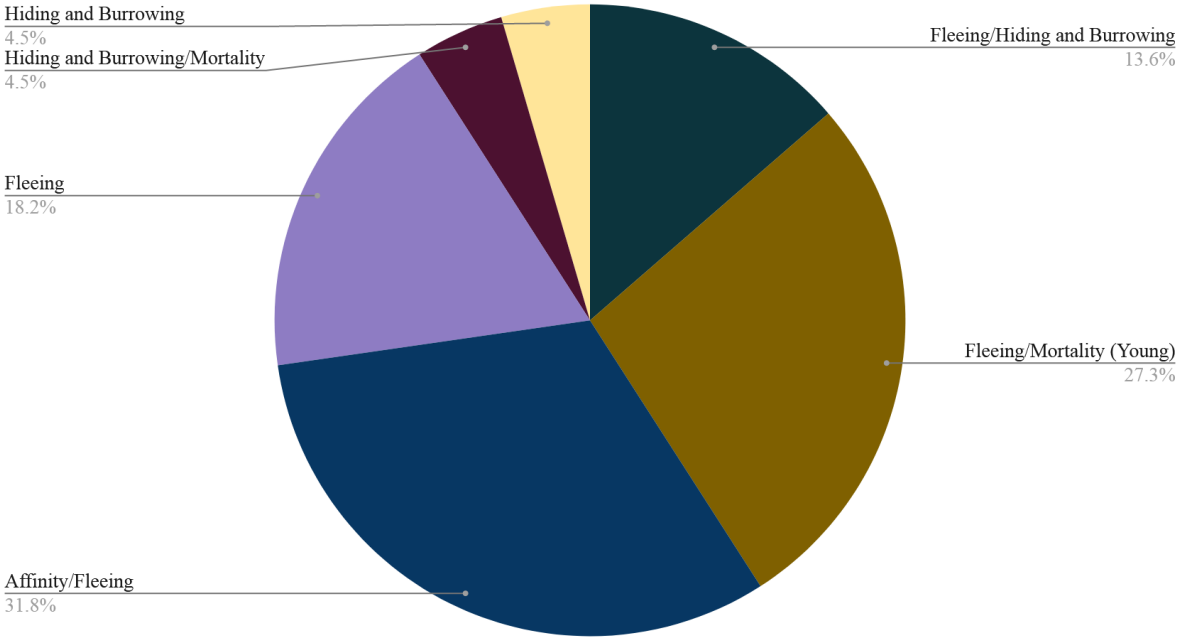
North Pacific Forest Amphibian Fire Responses (2 species)



North Pacific Forest Bird Fire Responses (30 species)

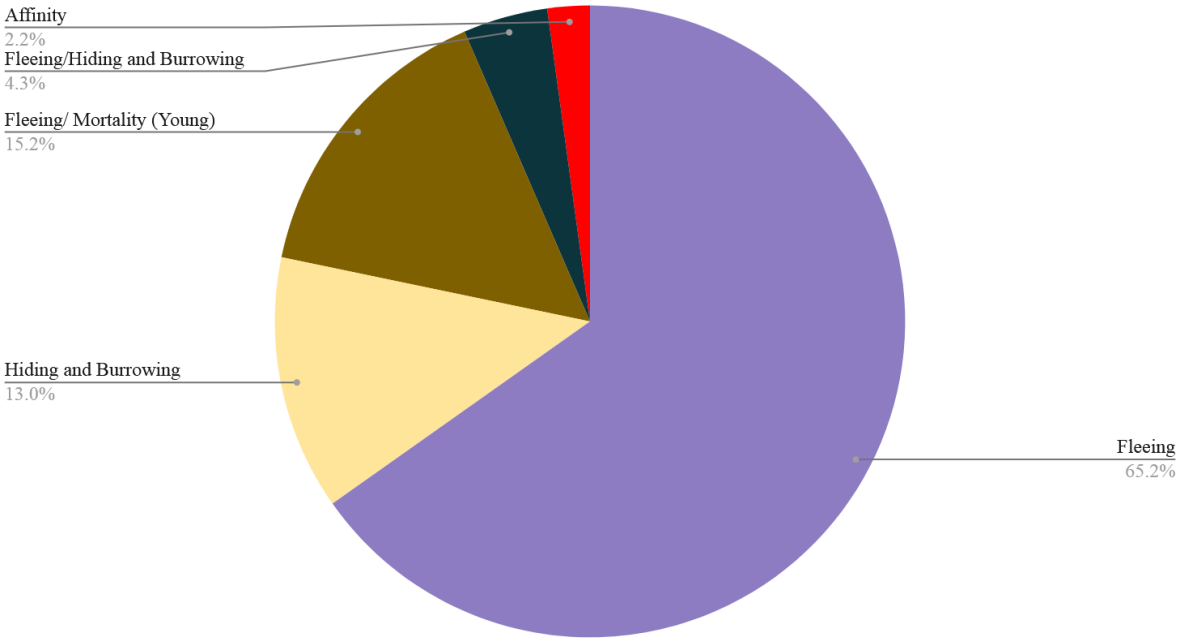


North Pacific Forest Mammal Fire Responses (22 species)

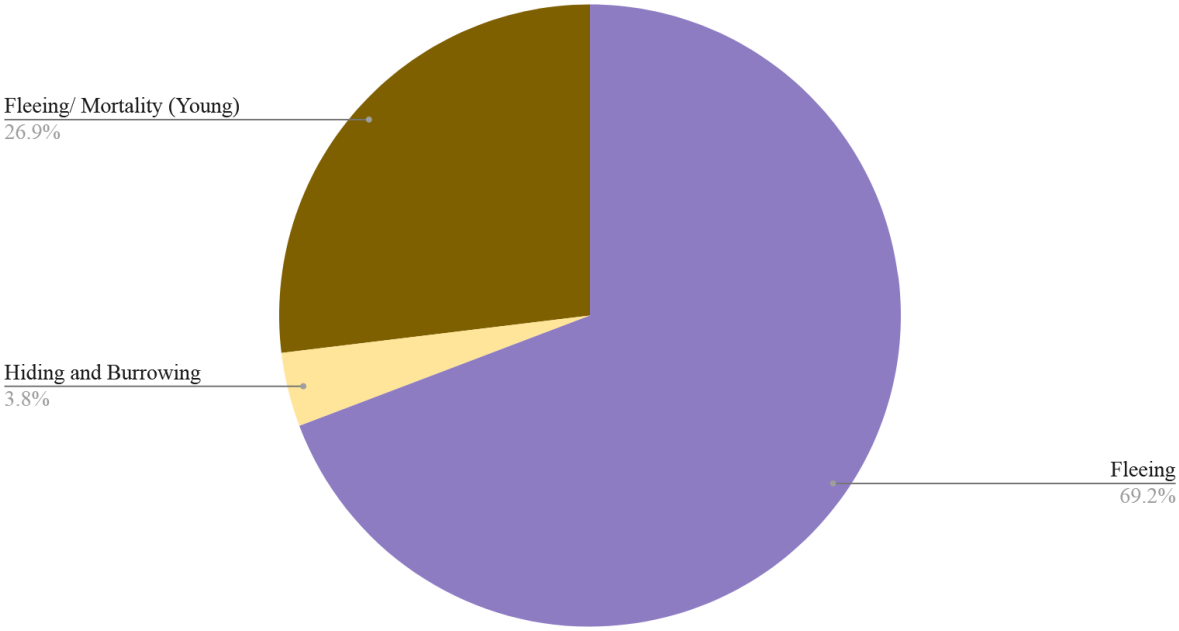


Semi-Desert/Desert Grassland Ecosystem Pie Charts

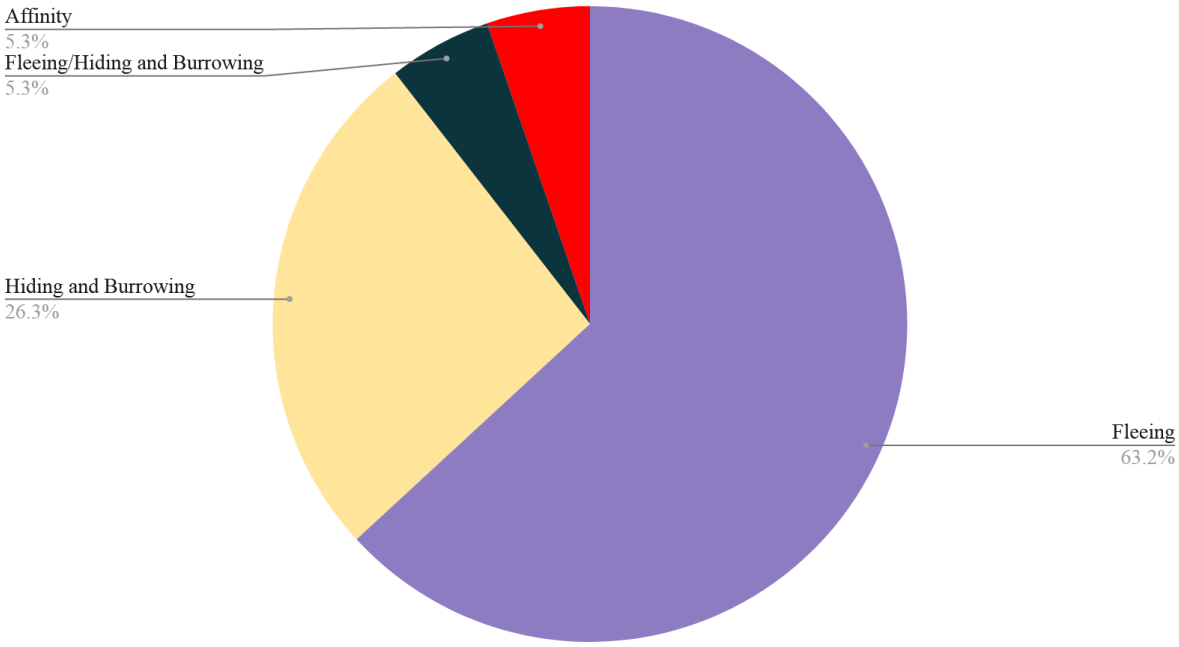
Semi-Desert/Desert Grassland Animal Fire Responses (46 total species)



Semi-Desert/Desert Grassland Bird Fire Responses (26 species)

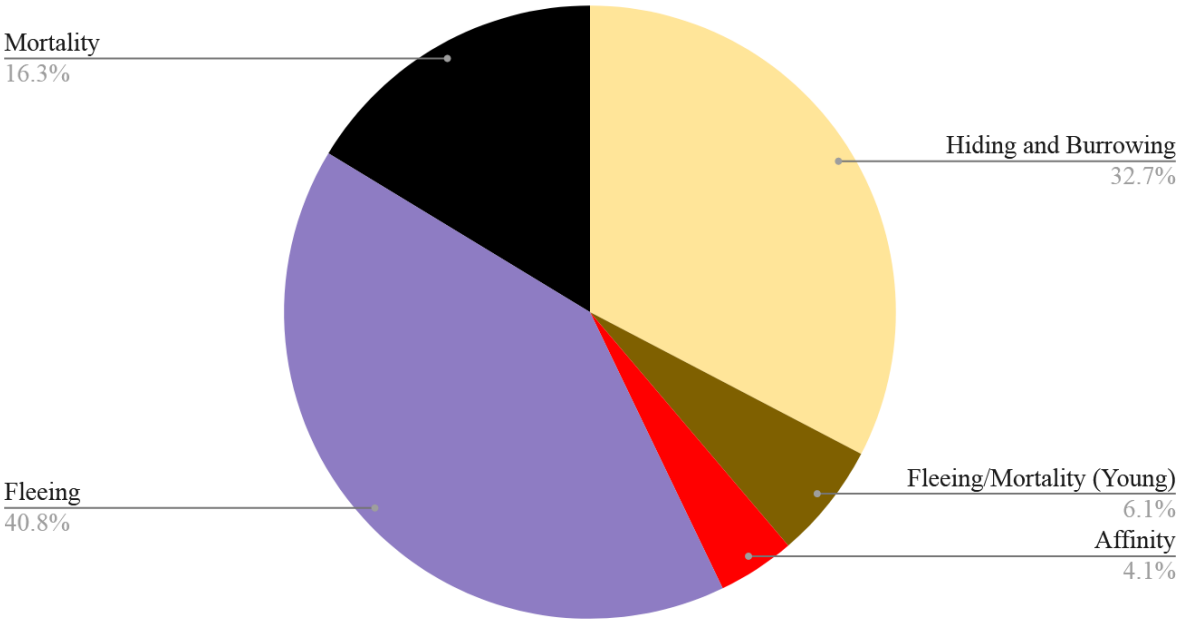


Semi-Desert/Desert Grassland Mammal Fire Responses (17 species)



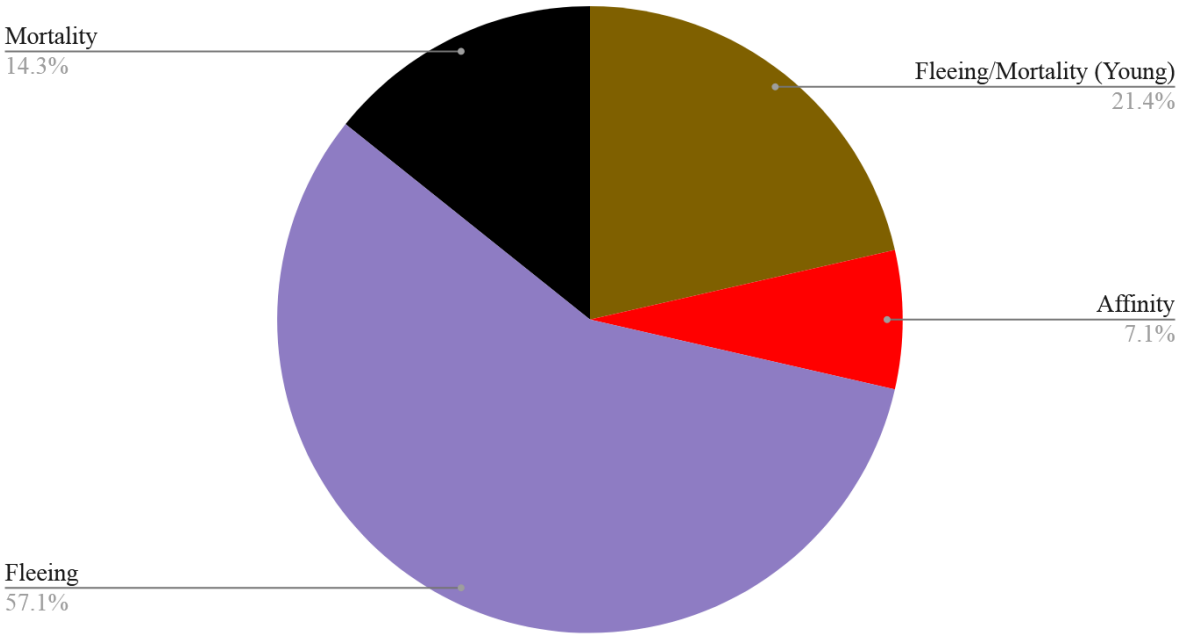
Chaparral Ecosystem Pie Charts

Chapparal Animal Fire Responses (49 total species)

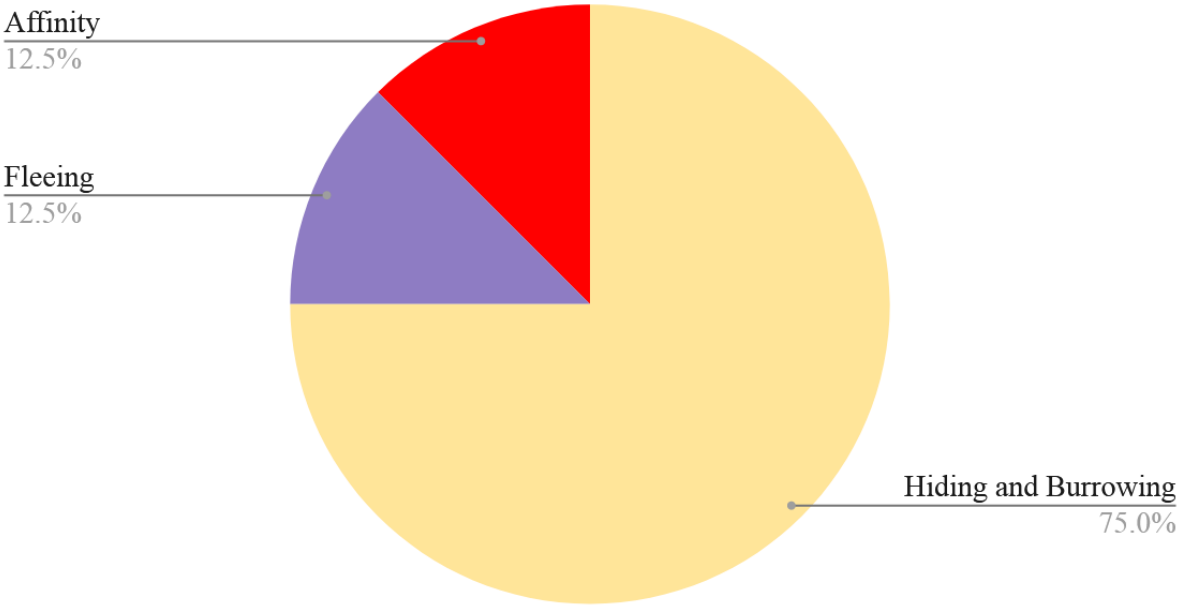


Chapparal Amphibian Fire Responses (2 species)

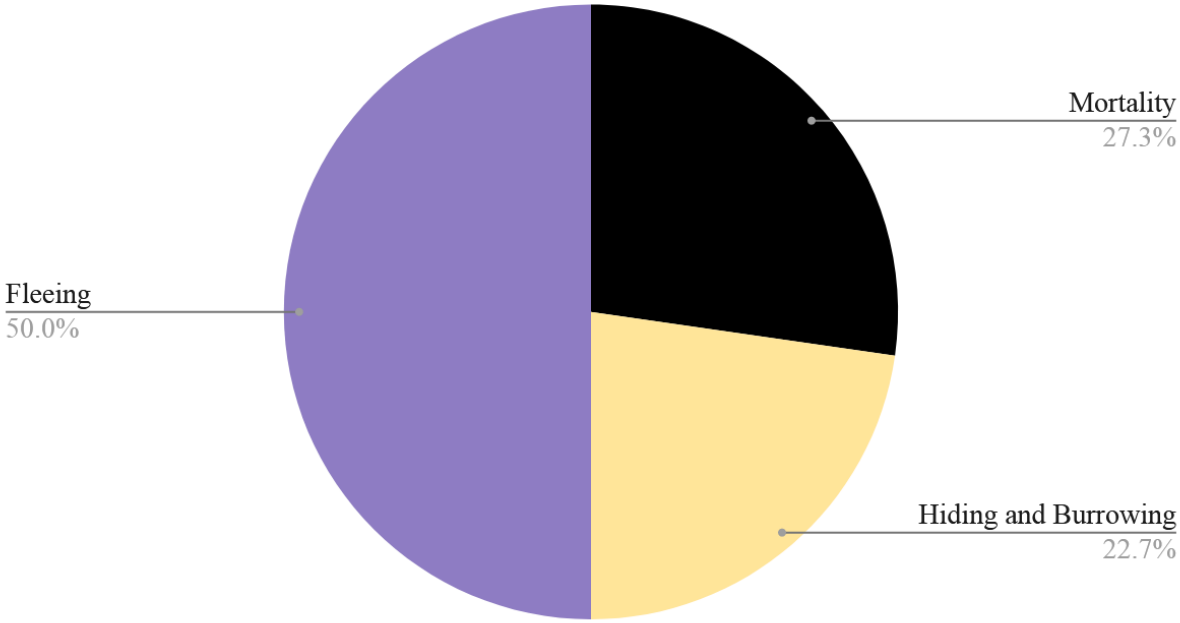
Chapparal Bird Fire Responses (14 species)



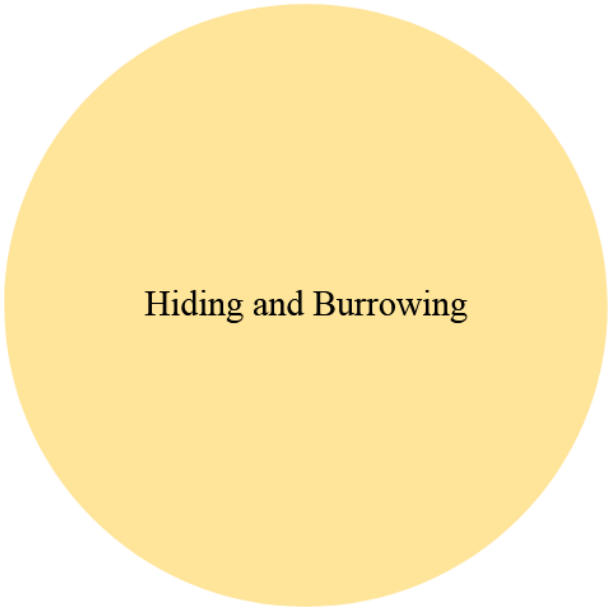
Chapparal Insect Fire Responses (8 species)



Chapparal Mammal Fire Responses (22 species)



Chapparal Reptile Fire Responses (3 species)



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