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## **Identifying Critical Marine Foraging Habitat of Marbled Murrelets (*Brachyramphus marmoratus*) in South Puget Sound**

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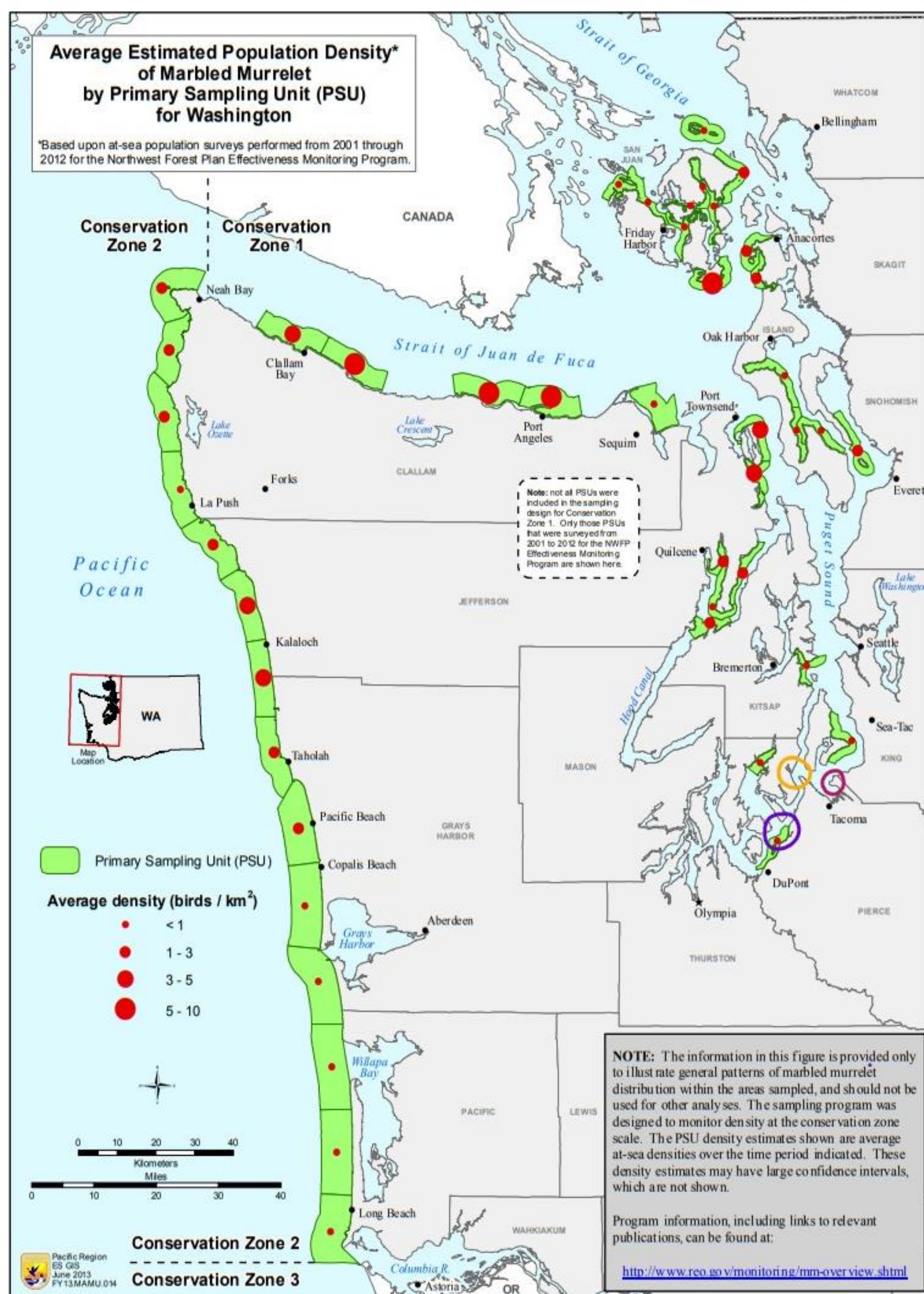
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# Identifying Critical Marine Foraging Habitat of Marbled Murrelets (*Brachyramphus marmoratus*) in South Puget Sound

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University of Puget Sound

## Introduction

- Human impacts are increasingly affecting the conservation status of many of the world's species, particularly those less capable of adapting to rapidly changing environments. Seabirds are one of the most endangered groups of birds in the world due to the synergistic impacts of climate change, pollution, human disturbance, bycatch, and overfishing.
- Marbled Murrelets (MAMUs; *Brachyramphus marmoratus*) are small diving seabirds currently listed as Endangered by Washington State and Threatened by the federal government.
- As such, their habitat selection and population distribution are two important metrics by which to measure their response to altered environmental conditions, including their habitat-use patterns.



**Figure 1. Average estimated at-sea population density of Marbled Murrelets by primary sampling unit (map from Falxa et al. 2013).** Circled are areas encompassing the major sites covered in my study; Browns Point Lighthouse (yellow), Chamber's Bay and Sunnyside Beach (purple), and Gig Harbor Lighthouse (orange).

- Despite their protected status, MAMU populations continue to decline, particularly in the Pacific Northwest. While the marine distribution and habitat use patterns of MAMUs have been well studied throughout most of WA, there is a significant knowledge gap regarding their use of South Puget Sound.

## Research Objectives

- Determine whether the waters around Browns Point Lighthouse, Point Fosdick, the mouth of Gig Harbor, and the mouth of Chambers Creek are consistently used marine hotspots for MAMUs.
- Conduct an interannual comparison of marine habitat usage of the Browns Point Lighthouse hotspot by MAMUs.
- Assess whether boat interactions influence murrelet behavior at each marine hotspot
- Assess whether MAMU activity patterns are influenced by time of day and/or stage of tidal cycle.
- Determine whether there is a relationship between the presence of harbor porpoises and the presence of MAMUs.

This research complements Max Merrill's '23 concurrent study of MAMU marine habitat usage and foraging behavior at Browns Point Lighthouse and Bryce Poplawsky's '22 previous survey work.

## Methods

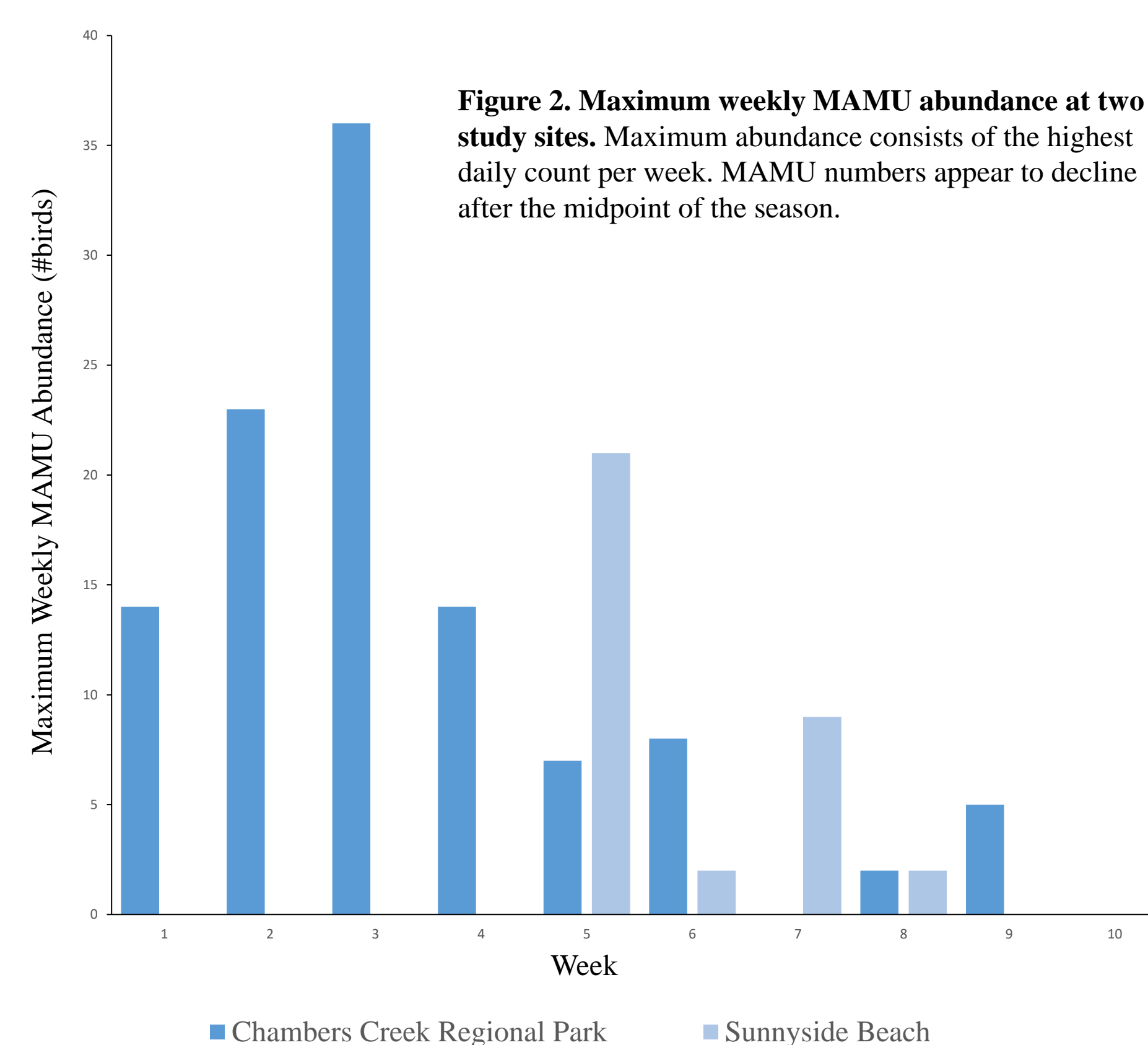
- From late May to early August, we conducted shore-based and kayak-based observations at five locations: Browns Point Lighthouse, Point Fosdick, Chambers Creek Regional Park, Sunnyside Beach, and the mouth of Gig Harbor.
- During shore-based surveys, we made an instantaneous count every 30 minutes of the number and location of MAMUs on the water and their on-water behavior (foraging or resting). Instantaneous and continuous counts of harbor porpoises at each site were also made.
- As part of the Hodum lab team, I participated in three full days of observations at Browns Point Lighthouse, from sunrise to sunset, to characterize activity patterns throughout the day.



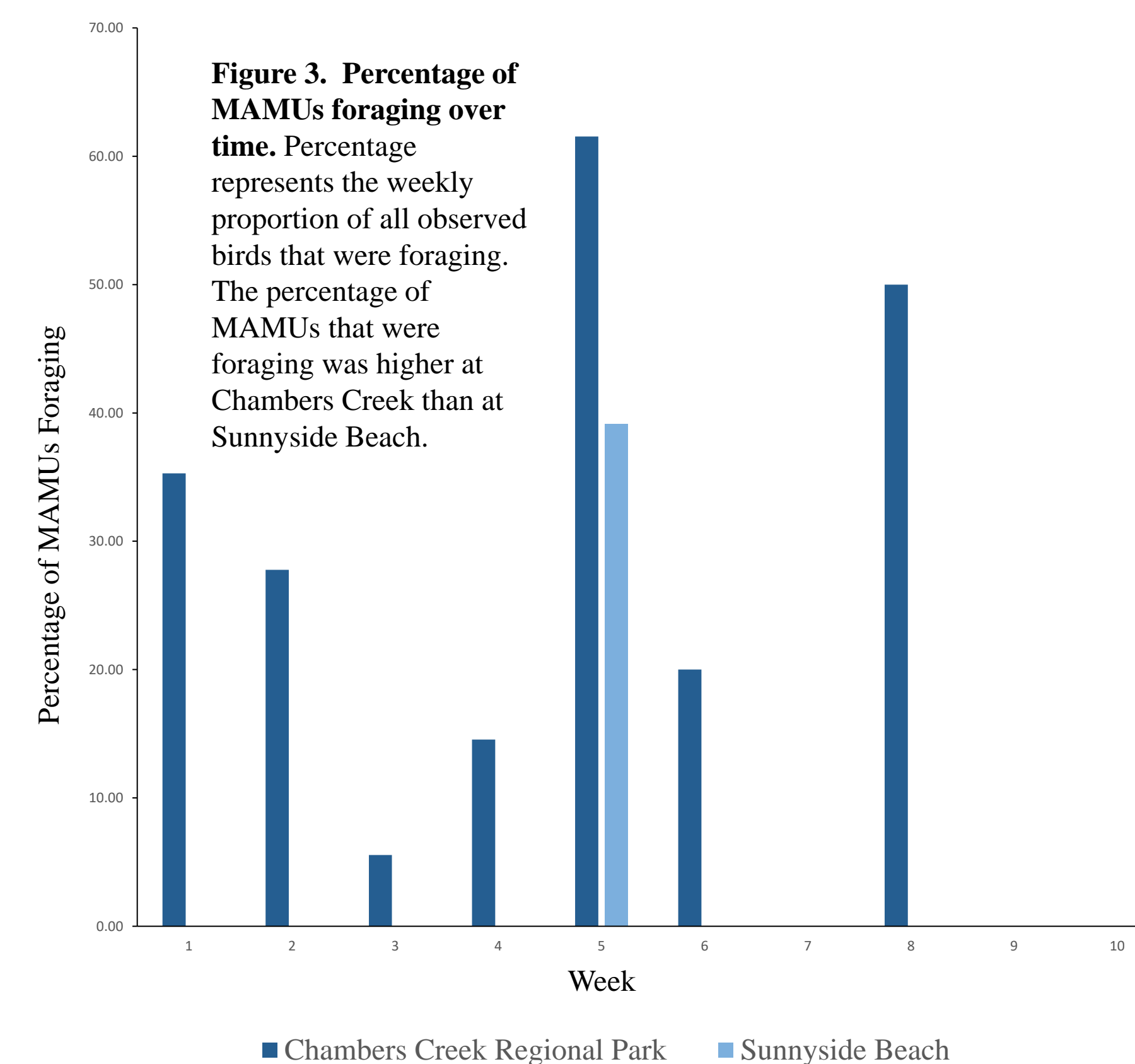
Photo credits: Joachim Bertrands, Cornell Lab of Ornithology (above) and Peter Hodum (right)

## Results

- The survey results indicated that Browns Point is the most heavily and consistently used of the five sites by MAMUs for foraging.



**Figure 2. Maximum weekly MAMU abundance at two study sites.** Maximum abundance consists of the highest daily count per week. MAMU numbers appear to decline after the midpoint of the season.



**Figure 3. Percentage of MAMUs foraging over time.** Percentage represents the weekly proportion of all observed birds that were foraging. The percentage of MAMUs that were foraging was higher at Chambers Creek than at Sunnyside Beach.

## References

Falxa, G., M.G. Raphael, J. Baldwin, D. Lynch, S.L. Miller, S.K. Nelson, S.F. Pearson, C. Strong, T. Bloxton, M. Lance, and R. Young. 2013. Marbled Murrelet effectiveness monitoring Northwest Forest Plan, 2011 and 2012 summary report. Northwest Forest Plan Interagency Regional Monitoring Program. 27 p.

## Conclusions

- The results of our collective observations suggest that South Puget Sound is currently being utilized by MAMUs for foraging as well as general habitat.
- The timeframe for this usage is consistent with Bryce Poplawsky's data from the previous year.



## Future Directions

- Data from shore-based and kayak-based observations will be used to create a spatial density distribution map for each site.
- I will compare the density distribution map for Browns Point from the 2022 season with those of Bryce Poplawsky's '22 senior thesis research.
- I will compare abundance estimates for each site using Chi-squared analyses and characterize minimum distances for behavioral responses of murrelets to boat traffic. These results will improve our understanding of the status of these sites as potential foraging hotspots for MAMUs in South Puget Sound.
- Harbor porpoise data will be analyzed to determine if there is a correlation between harbor porpoise and MAMU abundances.
- My land-based observations contribute to ongoing long-term research surrounding critical marine habitat for MAMUs in South Puget Sound.

## Acknowledgements

I would like to thank my research partner Max Merrill, Puget Sound alumnus Bryce Poplawsky '22, and Prof. Peter Hodum.

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