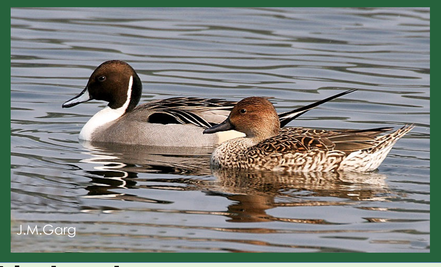
2024

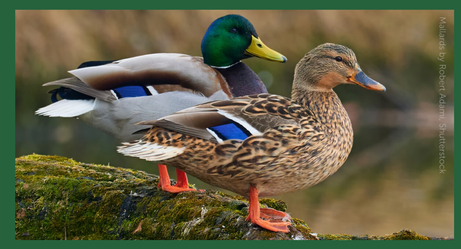
Climate Change and Its Effect on Spring Migrating Waterfowl

Xander Gonsalves
xg8@humboldt.edu



Climate Change and Its Effect on Spring Migrating Waterfowl

Xander Gonsalves – xg8@humboldt.edu
Cal Poly Humboldt Wildlife Department - 1 Harpst St, Arcata CA



Abstract

- Climate change is one of worlds greatest threat to ecosystems and biodiversity.
- Rising temperatures could have increased impact on migratory waterfowl during spring migration periods.
- I went out a did point counts at three different locations (Arcata Marsh, Hookton Slough, Salmon Creek), measured temperature and other environmental factors and waterfowl abundance.
- There was no significant impact by temperature on waterfowl abundance.
- Further Research could be done over a longer period of time to measure the impacts climate change and rising temperatures could have on migration timing during the spring.

Introduction

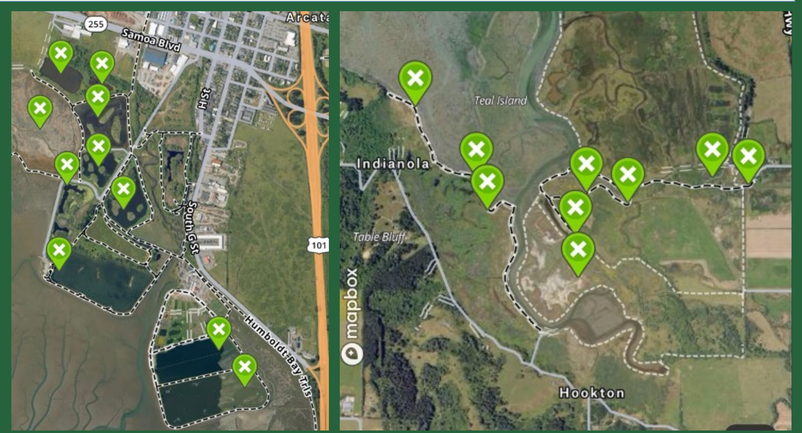
POI: How climate change and rising temperatures could be affecting waterfowl and their spring migrations back to the nesting grounds.
Main Objective: To determine when peak migrations is occurring in Humboldt County in migratory waterfowl in relation to temperature.
Hypotheses: If rising temperatures are causing wintering waterfowl to migrate earlier, there will be a higher abundance of nesting waterfowl compared to wintering waterfowl.
Predictions: Rising temperatures will cause wintering waterfowl to go north to the nesting grounds earlier in the year. There will also be a higher abundance of waterfowl species known to nest in California later in the year.

Study Area

The study area was at the Arcata Marsh and Wildlife Sanctuary (hereafter referred to as the Arcata Marsh, 40.856612, -124.098053, Figure on the left) and at the Humboldt Bay National Wildlife Refuge in Humboldt County, California, USA (40.685997, -124.210393, Figure on the right).

Methods

I visited each study site once a week at about thirty minutes after sunrise to do point count survey at each pond that will last until I counted every waterfowl on the pond. There 10 point locations at the Arcata Marsh and 8 at the Humboldt Bay refuge. I recorded climate information that includes temperature, windspeed, cloud cover and precipitation. Point count surveys included the recording of sighted waterfowl species and sex.



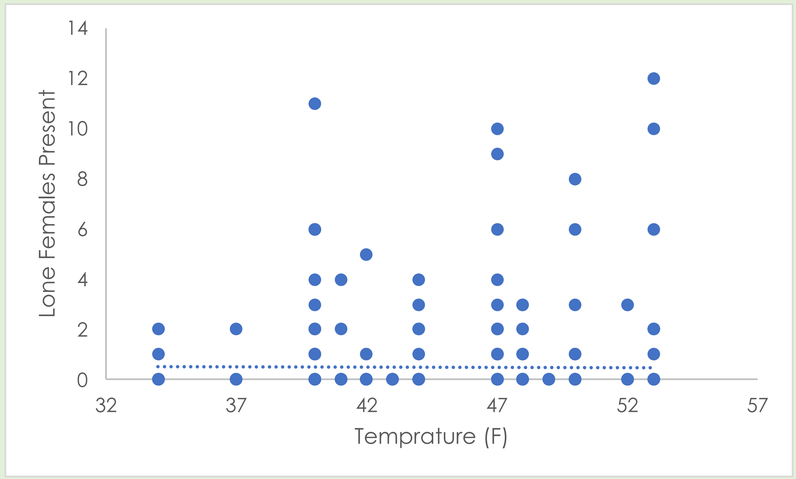


Figure 1. Lone Females present at different temperatures (n=256)

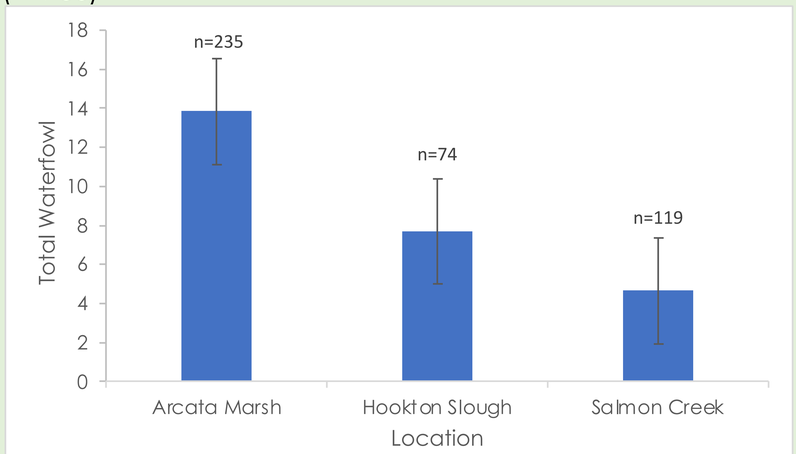


Figure 2. Total average of waterfowl at all three locations that were sampled.

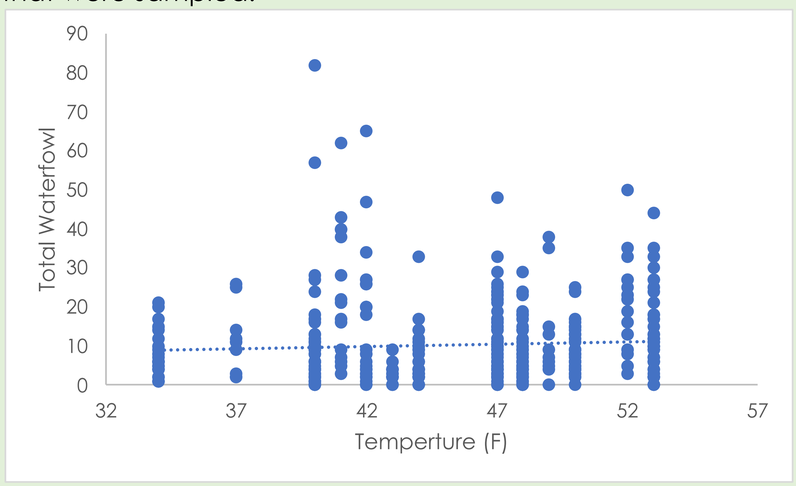


Figure 3. Total waterfowl present at different temperatures

Results

The only response variable that shows significant correlation with temperatures and waterfowl abundance was lone females (SE= 1.725, P= .000436) while all other response variables did not show any significance. Wind and cloud cover also showed significance for waterfowl abundance across all response variables with wind having a positive correlation and could cover having a negative correlation(Table 2.). Location also mattered with the highest abundance being at the Arcata Marsh being double both Hookton Slough and Salmon Creek (Figure 2.).

Table 2. Estimate, Std. Error and P-Values for location, time, temperatures, wind and cloud cover for total waterfowl abundance.

	Estimate	Std. Error	P-Value
Hookton Slough	0.047	0.056	0.397
Salmon Creek	0.380	0.039	<0.001
Time start	<0.001	<0.001	<0.001
Temp	0.003	0.004	0.405
Wind	0.167	0.026	<0.001
Cloud Cover	-0.057	0.016	<0.001

Discussion

Research shows that climate change is having an effect on migratory birds. This is shown through behavioral changes (Anderson et al. 2022) and loss of habitat needed to complete their reproductive cycles (Sillet and Holmes 2002). It is important to know exactly when waterfowl would be migrating north and south so that habitat can be properly managed and available for use at the right time. Although the data did not show much significance for temperatures having an effect on waterfowl abundance, it did show a correlation in lone females. As temperatures increased lone female presence decreased showing that they had made breeding pairs and/or could possibly starting their process to nest. This could be a key sign showing that migration is happening and the nesting season is starting. Further research could be done over a longer period of time to properly collect enough data to show how exactly temperatures could effect migratory waterfowl and their migrations back north.

Management Implications

With all the research done about waterfowl moving south, we have learned where the essential nesting or molting grounds are (Greenwood et al. 1995), when they normally show up to key habitat areas (O'Neal et al. 2012), as well as population numbers to help determine harvest limits (Nicols et al. 2007). It would be important to know all of this information also for the migration back north to the nesting grounds so that not only can we manage for waterfowl in the fall migrations but we can manage for the spring migration back north to help boost nesting success.

Acknowledgements

I would like to thank Dr. Ange Baker and Dr. Nick Kerhoulas for reviewing and editing my paper, along with support from friends and family.

Literature Cited

-Anderson, K., C. A. Davis, G. Harris, and D. A. Haukos. 2022. Changes in waterfowl migration phenologies in central North America: Implications for future waterfowl conservation. PLOS ONE 17.
-Greenwood, R. J., A. B. Sargeant, D. H. Johnson, L. M. Cowardin, and T. L. Shaffer. 1995 Factors associated with duck nest success in the prairie pothole region of Canada. Wildlife monographs.
-Nichols, J. D., M. C. Runge, F. A. Johnson, and B. K. Williams. 2007. Adaptive Harvest Management of North American waterfowl populations: A brief history and future prospects. Journal of Ornithology 148:343–349.
-O'Neal, B. J., J. D. Stafford, and R. P. Larkin. 2012. Stopover duration of fall-migrating dabbling ducks. The Journal of Wildlife Management 76:285–293.
-Robinson, R. et al. 2009. Travelling through a warming world: Climate change and Migratory Species. Endangered Species Research 7:87–99.
-Sillett, T. S., and R. T. Holmes. 2002. Variation in survivorship of a migratory songbird throughout its annual cycle. Journal of Animal Ecology 71:296–308.