Water Quality and Biodiversity Across Socioeconomic Gradients at King County Lake Beaches

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Introduction

A subset of lakes monitored through the King County Lake Stewardship Program were examined in terms of their water quality, their macrophyte and macroinvertebrate diversity, and their users' perception of water quality. The presence of socioeconomic and cultural barriers in lakes will be studied as they relate to cultivating a healthy lake ecosystem. This project combines different themes together that are relevant and may be of concern for King County: water quality, biodiversity, and environmental equity. Through an inclusive approach, the conservation of biodiversity will be emphasized towards audiences of different socioeconomic backgrounds, where everyone's voice may be heard.

Study Question and Hypothesis

The project was conducted with the aim of answering the following question:

- Are people from marginalized socioeconomic backgrounds more likely to live near lakes with poorer water quality and biodiversity?
  - The hypothesis is that marginalized communities are more likely to reside near lakes with poorer water quality and biodiversity. This is based on studies that show the linkage between economic inequality and biodiversity loss (Dietz, 2003). Along with cases of poor water conditions in places of lower income levels (Brandon, 2014).

Methods

The study methods conducted throughout this project go as follows:

- Spatial analysis via GIS allowed for the assessment of demographical and socioeconomic information through the 12 beach sites studied.
- Water quality attributes of the sites were obtained in order to assess their water quality, including the presence of fecal coliforms within the past 10 years.
- Field sampling was performed in order to determine the biodiversity of each site by identifying the different macrophyte species present. Littoral macroinvertebrate data obtained was also used.
- Surveys were also conducted in order to assess the users' perception of the importance of finding water quality information.
- Beach user surveys at 4 beaches were also conducted in order to assess the users' perception of the importance of accessing water quality information.

Results & Discussion

Based on the observations, a positive correlation amongst macrophyte and macroinvertebrate biodiversity is expected. However, the resulting data was insufficient in providing a strong correlation due to the limitation of 12 sampling sites. Moreover, the following data represents possible connections that can be furtherly assessed in future studies:

Biodiversity Along Socioeconomic Gradient

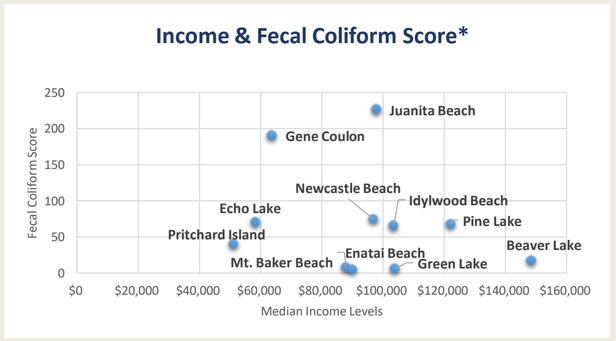
- Macrophyte species count versus income levels did not coincide throughout the 12 sites.
- Likewise, the biodiversity of littoral macroinvertebrate families did not reflect upon different socioeconomic settings.
  - The sample size conducted did not show a significant trend, although a more expansive study will need to be assessed for consistency.

Macrophyte species count vs. macroinvertebrate organism count:

- At a 95% confidence interval, the value shows no significant correlation between the two metrics (p-value= 0.068). This may be due to the limited amount of sampling conducted.
- Beaver lake had highest number of macroinvertebrate organisms found and the most variety in macrophytes.
- Green lake had least amount of macroinvertebrate organisms present and only 2 different macrophyte species present at measured location.

Fecal Coliform Bacteria:

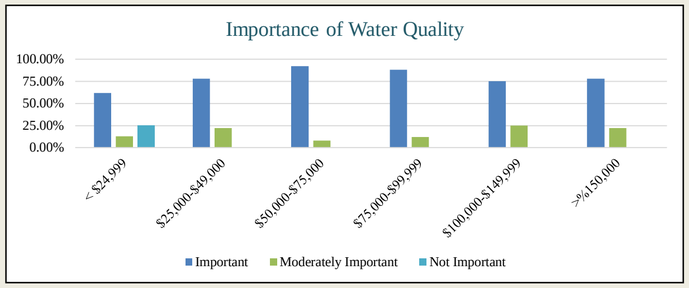
- Juanita Beach has the most substantial presence of fecal coliforms, despite being in an economically advantaged setting. This may demonstrate that in lakes monitored through King County, the presence of bacteria in public waters is not correlated with areas of lower socioeconomic levels.
- Mt. Baker and Green Lake had the lowest presence of fecal coliforms.



* The fecal coliform score was created by counting the number of days of moderate and high concern for each site throughout a 10 year period. In achieving its weight, days of moderate concern were multiplied by a factor of 2 and high concern by a factor of 3.These values were added for each site, giving a scale score.

Perspectives on Water Quality Across the Socioeconomic Gradient

- Users surveyed throughout income levels generally demonstrated high concern with finding information about their lakes' water quality.
  - Two users residing from lower income levels noted their lack of concern for water quality. This may be due to the lack of information accessible to those users, which could furtherly increase their exposure to contaminated water.



Conclusion

- Due to the limitations of 12 sampling sites, the resulting data was insufficient in proving strong correlations amongst fecal coliform presence, and macrophyte/macroinvertebrate biodiversity across the socioeconomic gradient.
- Partial data obtained appears to have parameters coincide; however, future studies will need to be assessed.
- Across the socioeconomic gradient, people from King County were predominantly inclined to seek information about their water quality and are consequently less likely to expose themselves to poorer water quality levels.

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References

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