

Lake Invaders!

Land Use, Asian Clams, and Algae Blooms

Shan Ogir
Nipmuc Nation
University of Massachusetts Boston

Introduction

The Nipmuc nation are the freshwater people of Massachusetts. Fishing has been an important cultural aspect for the Nipmuc people. Once tribal waters, Webster and Quinsigamond Lakes were fished and enjoyed by my people. Now that these lakes are primarily residential, we must pay to have access to what once was our tribal fishing grounds. Recently, Massachusetts freshwater lakes have reached hazardous levels of harmful bacteria and algal blooms. The Nipmuc Nation are interested in restoring Webster and Quinsigamond Lakes back to proper health for tribal use. **How do invasive clams and algae blooms negatively impact Smallmouth Bass in Webster and Quinsigamond Lakes?**

What is this all about?

- Increases in clam and algae populations are caused by increased nutrients, such as nitrogen
- Asian Clams and algae blooms decrease dissolved oxygen levels when present in high numbers
- Webster and Quinsigamond Lakes have seen increases in Asian Clam populations and algae blooms due to increases in nutrient levels
- Dissolved oxygen (DO) levels in Webster and Quinsigamond Lakes are low enough to cause concern for aquatic vertebrates, specifically Smallmouth Bass (0-3 mg/L)
- Agriculture, industrial, and residential runoff have potentially contributed to the increases in nutrient levels
- The overall aim of my project is to identify the sources of excess nutrients leading to large algae blooms and Asian Clam population booms in Webster and Quinsigamond Lakes**

Lake Invaders: Asian Clams and Algae Blooms

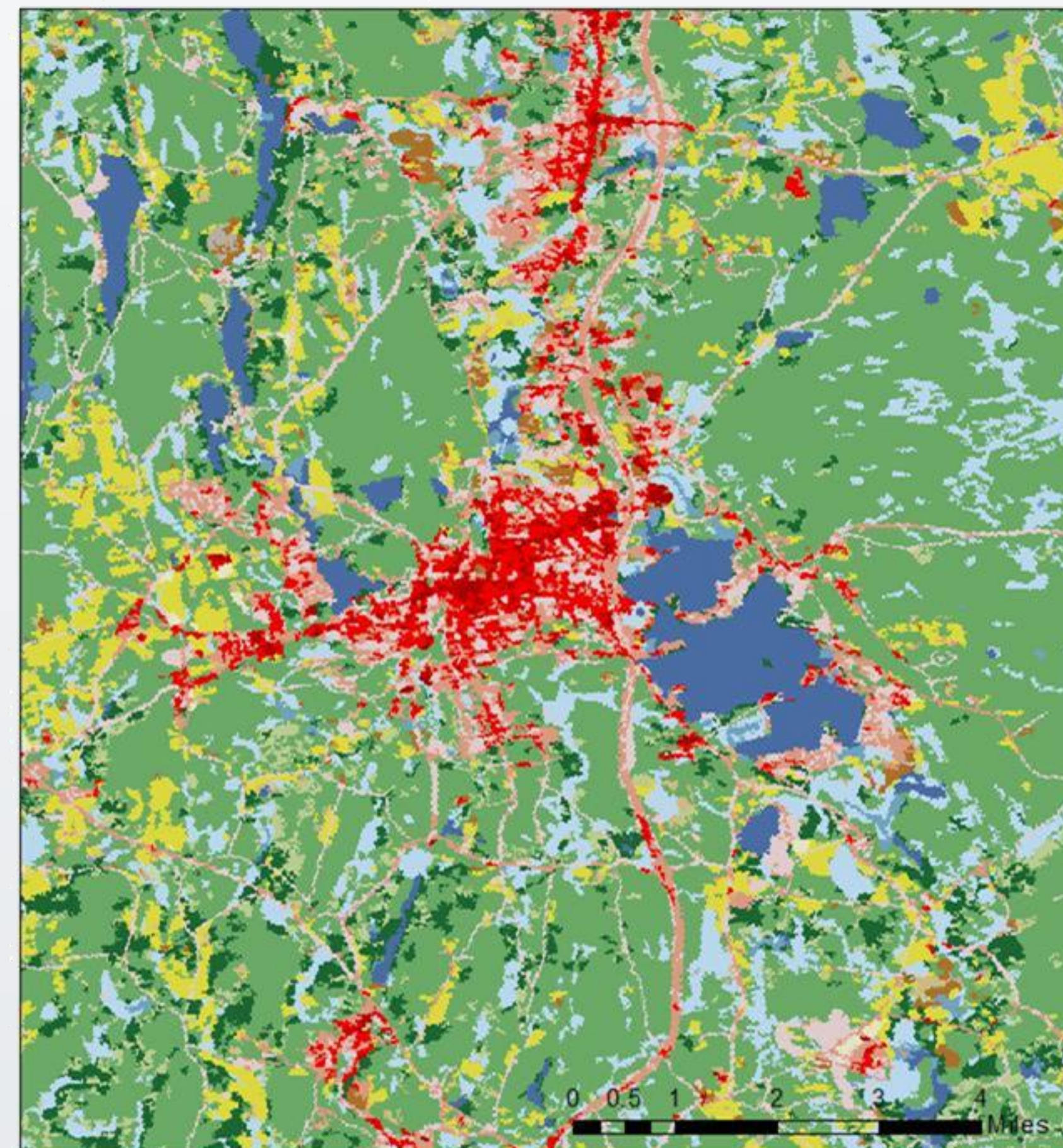
Algae blooms

- Decomposition of algae blooms consumes a greater quantity of oxygen compared to the oxygen deposited into the environment from photosynthesizing algae
- Human activities potentially attributing to algae blooms: Storm water runoff, agriculture runoff, industrial and business runoff, and sewage seepage

Asian clams

- Native to China, the clams were brought to the U.S. in the 1930s
- Found in several hot spot locations in Lake Quinsigamond and scattered throughout Webster Lake
- Able to self reproduce, and spread quickly in environments with high nutrients
- Efficient filter feeders, they eat many of the micro plants impacting Smallmouth Bass prey's food source

Webster Lake



Worcester County, MA: Lake Quinsigamond

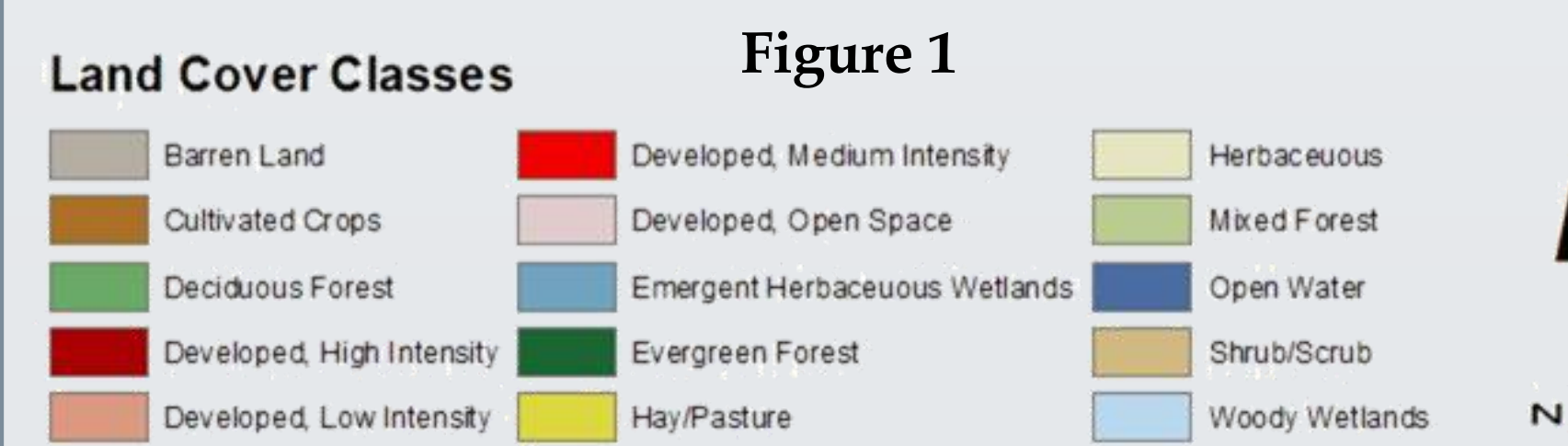
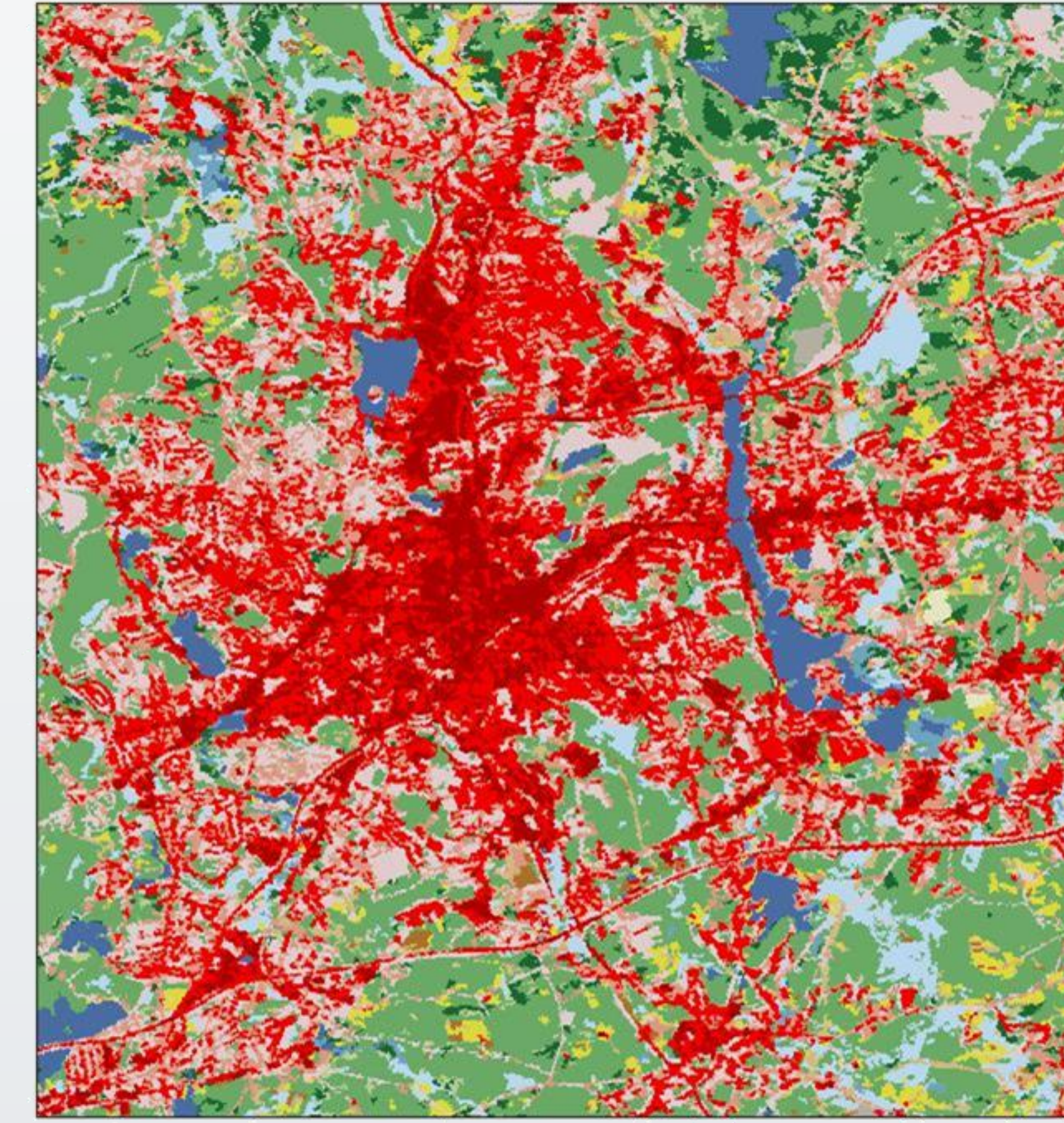
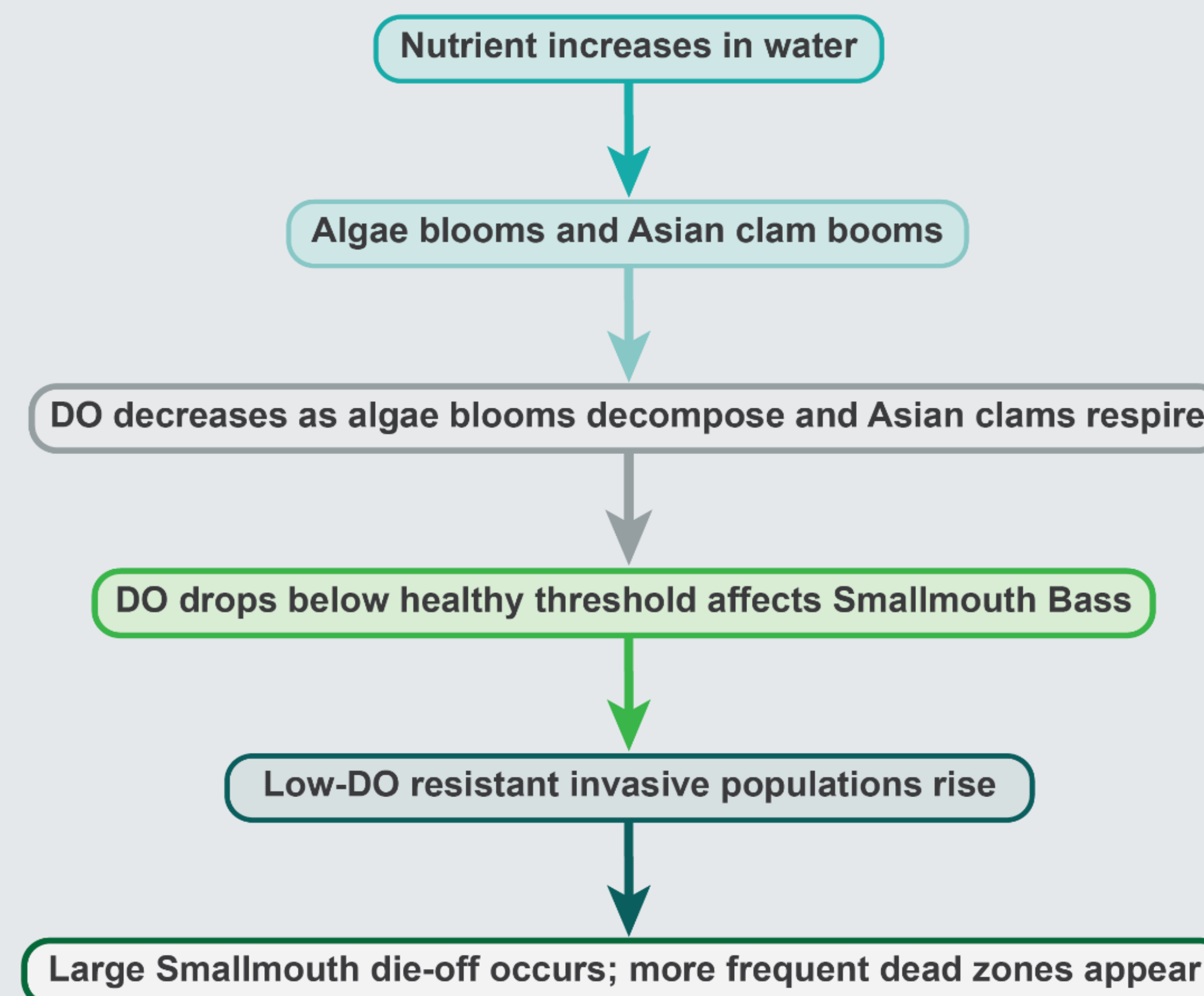


Figure 2



Acknowledgements

First and foremost, I want to thank my mother (Nicole Ogir) and father (Leshan Ogir) for supporting and giving me all the tools and information I needed to get through this research. I also want to thank my tribe and Grandfather for helping get me to this internship and providing key information. I acknowledge my awesome mentor (James Fischer) for making this research experience.



Fish-kill and Deadzones: All bass-ically are issues!

- Fish-kill:** Localized die-off of fish species caused by common stress factors such as drought, algae blooms, crowding in aquatic areas, and increases in water temperature
- Dead zones:** An aquatic area where no life activity exists and Caused by eutrophication, oxygen depletion, and algae blooms

The victims: Smallmouth Bass (*Micropterus dolomieu*)

- Native species to Quinsigamond and Webster Lakes
- Secondary consumers: eaten by other predators and feast upon primary and some secondary consumers
- Live best in rocky conditions with an average dissolved oxygen level of 5-5.5 mg/L
- Sensitive to disruptions in freshwater environment

DO & Land Use

- Runoff from industrial, agricultural, and residential enters Webster and Quinsigamond Lakes, increasing nutrient levels(see figure 1 and 2): Nitrate levels in Lake Quinsigamond: .3-1.5
- DO levels in Lake Quinsigamond: average of 2.8
- DO levels Webster Lake: fluctuating between -0.3-9
- Asian clam hotspots in Lake Quinsigamond: Half moon cove and Sunset beach
- Webster Lake Asian clam locations: Beacon park, Checkerberry shore, Point breeze, Marks cove, Bates cove

Analysis/Conclusions

- The cause of these invasive species and algae blooms are nutrient increases in Webster and Quinsigamond Lakes
- Land usage such as industrial, agricultural, and residential spaces surround the two lakes and produce nutrient-filled runoff into Lakes Webster and Quinsigamond
- Fish-kills have occurred in Webster lake in the past, and Lake Quinsigamond has the potential for a fish-kill event due to low DO levels
- Smallmouth Bass are an indicator for local aquatic vertebrate health as smallmouth bass are sensitive to changes in the aquatic environment
- The decomposition process of algae blooms and DO-consumption by Asian clams are causing a lack of DO in my two lakes of focus
- Fishing is big in the Nipmuc culture and we are interested in restoring the water quality at our once owned tribal Lakes

References

- Wayne W. Carmichael, G. H Elder, Hunter, P. R, Codd G. A., and Oberemm, A. et al. n.d. *Algal Blooms in Fresh Water - River, Algal, Freshwater, Effects, Important, Salt, System, Plants, Source.*
- DPW&P Lakes and Ponds Program. 2018. "Lake Quinsigamond Water Quality Report."
- Moulton, Cyrus. 2018. "Worcester Gets Clearer Picture of Health of Its Lakes."
- Rounds, S.A., Wilde, F.D., and Ritz, G.F. 2013. "Dissolved oxygen (ver. 3.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A6.2"

