Improving Water Quality is NOT a Load of Carp!

(Carpe Diem Posterum)

Kevin Kaufman

High School Sciences

Okoboji High School

2019 Extern at the DNR Fish Hatchery in Spirit Lake Iowa

Part I: Overview of Workplace

The Iowa Department of Natural Resources (DNR) manages fish and wildlife programs, ensures the health of Iowa's forests and prairies, and provides recreational opportunities in Iowa's state parks. Just as importantly, the DNR carries out state and federal laws that protect air, land and water through technical assistance, permitting and compliance programs. The DNR also encourages the enjoyment and stewardship of natural resources among Iowans through outreach and education. The DNR's mission is to conserve and enhance Iowa's natural resources in cooperation with individuals and organizations to improve the quality of life in Iowa and ensure a legacy for future generations.

Part II: Workplace Focus

Sixteen fish management offices in Iowa ensure quality fishing in Iowa's lakes, ponds, rivers and streams. Biologists and technicians from these offices create fish habitat, accessible shorelines, ***improved water quality*** and much more. Ongoing work in water quality restoration has identified a hidden problem that may be contributing far more to the deterioration of water quality than previously recognized. Large populations of carp can directly and indirectly affect water quality, water clarity, aquatic habitat, and species richness within a lake system. Management of carp is key, within lake systems, to improve water quality.

Part III: Introduce the Problem

The problem is improving water system restoration projects, post carp infestation, through ***more efficient carp population controls***.

Introduced in the 1890's, carp are considered an invasive species and are notorious for altering natural ecosystems. They vigorously roil the water and bottom substrate, uproot and disturb submerged vegetation while searching for food, and during spawning seasons, which increases turbidity, making it difficult for many native fish to survive and dramatically reduces aquatic vegetation. Sight feeding species, such as walleye, bluegill and black bass, populations are reduced when a clear lake becomes turbid. Their actions significantly disrupt the local food chain. Carp also stir up bottom, nutrient rich, phosphorus-containing sediments, which contributes to algae blooms, which can lead to fish kills through release of toxins and/or a decline in oxygen levels due to decomposition.

Due to their long life cycles, ability to breed in the worst water quality conditions, lack of natural predators, and rapid breeding, carp control can be both difficult and expensive.

Part IV: Background

- Introduction to invasive species
  - Link to Iguanas Wreaking Havoc in Florida
  - Link to Armadillo Challenge Activity and Discussion
- How carp affect water systems
  - Mike Hawkins "Lost Island Lake Restoration Project" presentation
- An understanding of sex determination and karyotyping
  - Link to YY Males (1)
  - Link to YY Males (2)
- Polyploidism
  - Link to "What is a Triploid Fish?"
- Students will research and collaborate on various carp population control methods investigating advantages and disadvantages of each. Such as:
- Reproduction self-destruction through non-genetically modified sterilization such as Trojan YY males or Triploid fish, Various physical/electrical/acoustic fish barriers, Barriers that disrupt water flow affecting egg development, Vertical drop barriers, Organized carp harvests with economic incentives for food and fertilizers, Virus infestation harmful only to carp, Whole lake fish eradication with Rotenone, Poisons that target only carp, Genetically engineered hybridization, Quarantined water systems, Rotating fish wheels.

Part V: Workplace Solution

In the Iowa Great Lakes area, the DNR has yet to achieve a sustainable solution for water system restoration post carp infestation as baseline models are needed. It continues to improve as studies continue. As of now, they are employing various physical and electrical fish barriers. An unforeseen problem with this approach is that desirable fish escape the water system and then are not able to re-enter. There are also issues of maintenance, engineering, flooding and reinvestment of time, manpower and money. A successful solution resides in controlling carp reproduction, which expands into wetland management, and carp access potentials.

Part VI: Educational Pathways

Post-secondary education would center around majors such as Environmental Sciences or Animal Ecology and then specializing within. Arguably the best post-secondary institute for Fisheries management is at Oregon State. Also at the top of the list, and closer to Iowa, are SDSU and Minnesota-Twin Cities.A plus is completing a masters degree. A recommended additional career pathway is seasonal work at the DNR. Seasonal workers are seen as actually completing a long-term interview.

Which ever pathway taken, an education that allows one to acquire 21st Century Skills is essential for working at the DNR.