

The background is a light teal color with a gradient. It is decorated with several realistic water droplets of various sizes, some with highlights and shadows, scattered across the top and right sides.

# EFFECTS OF NITRIFYING BACTERIA IN LIMITING CYANOBACTERIA GROWTH

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# PROBLEMATIC PONDS





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# HAB'S AND CHAB'S

(HARMFUL ALGAL BLOOMS AND CYANOBACTERIA HARMFUL ALGAE BLOOMS)

- DECREASES BIODIVERSITY
- OVERTAKES A WATERBODY
- CAN PRODUCE A CYANOTOXIN
  - MICROCYSTIN
  - DAMAGES THE HUMAN LIVER
- NEGATIVE EFFECTS TO WATER TREATMENT PLANTS



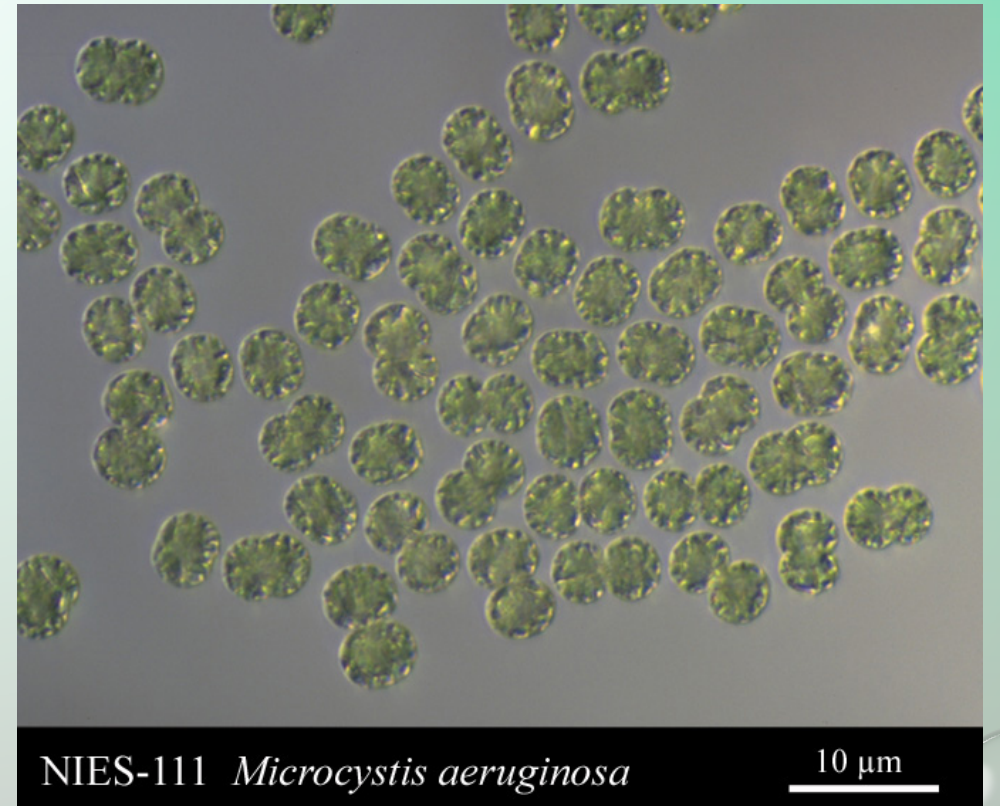
October 3<sup>rd</sup>, 2017  
Lake Erie  
~700 Square Miles  
Problems?





# MICROCYSTIS AERUGINOSA

- CYANOBACTERIA
- COMMON IN FRESH WATER
- > 25 DEGREES CELSIUS
- MORE SALT TOLERANT
- CONTAINS GAS VESICLES
- FASTER GROWING THEN GREEN ALGAE





# CURRENT SOLUTION

- COPPER PRODUCTS
  - COPPER SULFATE
  - CHELATED COPPER
- RESTRICTIONS
  - SIZE
  - AMOUNT
  - TIME
- DRAWBACKS WITH TREATING

# DRAW BACKS

- THE COPPER CAUSES THE CELL TO LYSE
  - ANY TOXIN INSIDE IS RELEASED
- POSITION IN THE WATER BODY IS THROUGHOUT
  - ALL DIES FROM TREATMENT CAN LEAD TO DISSOLVED OXYGEN CRASH



# POSSIBLE SOLUTION

- PROACTIVE TREATMENTS
- NITRIFYING AND DENITRIFYING BACTERIA
- CAUSE AVAILABLE NITROGEN TO BE LESS USABLE
- TEMPORARILY BIND PHOSPHOROUS

# PRELIMINARY OBSERVATIONS



The image on the left was taken on June 8<sup>th</sup>, the middle image was taken on June 14<sup>th</sup>, and the right image was taken on June 26<sup>th</sup>. The visual biomass decreased nearly 100%



# OBJECTIVES

- TO DETERMINE IF NITRIFYING AND DENITRIFYING BACTERIA CAN USE ENOUGH NITROGEN IN AN AQUATIC SYSTEM TO CREATE A MEASURABLE DECREASE OF AVAILABLE NITROGEN.
- EVALUATE THE EFFECTIVENESS OF NITRIFYING AND DENITRIFYING BACTERIA TO OUTCOMPETE CYANOBACTERIA FOR NITROGEN AND PHOSPHOROUS IN AN AQUATIC SYSTEM

# NATURALAKE BIOSCIENCES

- SUMMER SLAM AND WATER COLUMN CLARIFIER
- CYCLES OUT NITROGEN
- BINDS PHOSPHORUS TEMPORARILY





# NITROGEN CYCLE

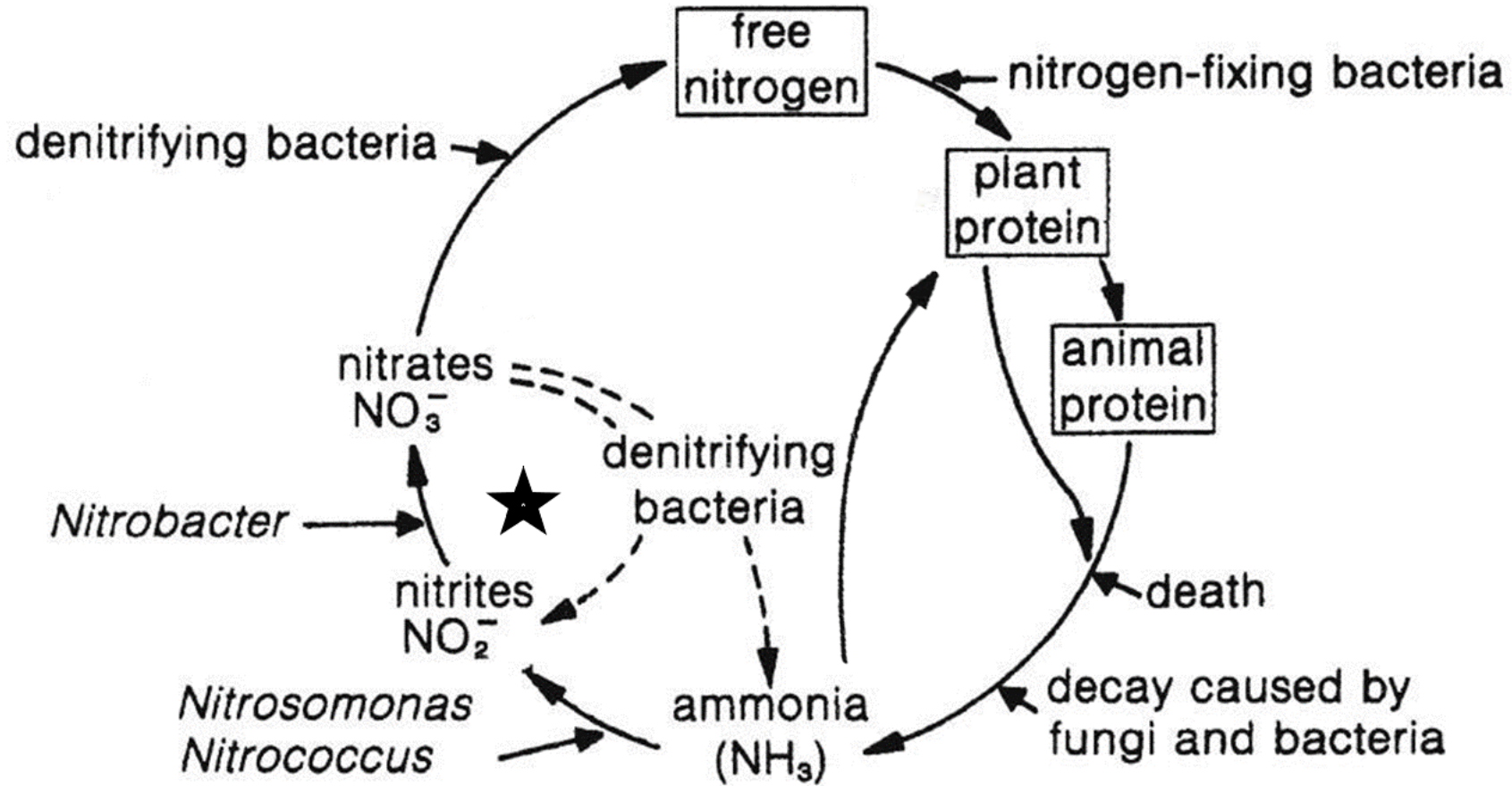


Fig. 229 Nitrogen cycle.

# METHODS

- CONTROLLED ENVIRONMENT
  - HEAT
  - LIGHT
  - AIRFLOW
  - DISSOLVED OXYGEN
- USING A MESOCOSM
- TWO OBJECTIVES BEING LOOKED AT





# OBJECTIVE 1

- WATER COLUMN CLARIFIER AND SUMMER SLAM
- “ORGANIC WASTE CONTROL”- PER THE LABEL (WCC)
- “REDUCES SLUDGE AND CLARIFIES WATER” PER THE LABEL (SS)
- BOTH OF THESE PRODUCTS CYCLE THE NITROGEN AND BIND THE PHOSPHOROUS

## OBJECTIVE 2

- *MICROCYSTIS AERUGINOSA*
- COMPETING WITH SS AND WCC
- SEVEN DAY SET UP
- VACUUM FILTRATION TECHNIQUE FOR BIOMASS



# EXPECTATIONS

- DECREASE IN AVAILABLE NITROGEN AND PHOSPHOROUS IN OBJ. 1 AND OBJ. 2
- DECREASE IN BIOMASS OF *MICROCYSTIS AERUGINOSA* IN OBJ. 2

# WHY IS THIS IMPORTANT

- PREVENTION OF GROWTH
- LESS RESTRICTIONS
- ALTERNATIVE TREATMENT OPTIONS
- LOOKING AT NEW SCIENCES



# ACKNOWLEDGMENTS

- AQUAWEED CONTROL INC.
- UNIVERSITY OF MICHIGAN-FLINT
- NATURALAKE BIOSCIENCES- A DIVISION OF AQUAFIX
- SOCIETY OF LAKE MANAGEMENT PROFESSIONALS



# QUESTIONS





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