



# **Lifecycle, Temperature and Nutrients**

**National Nutrient Reuse and Recovery Forum**

**Phil Dick**

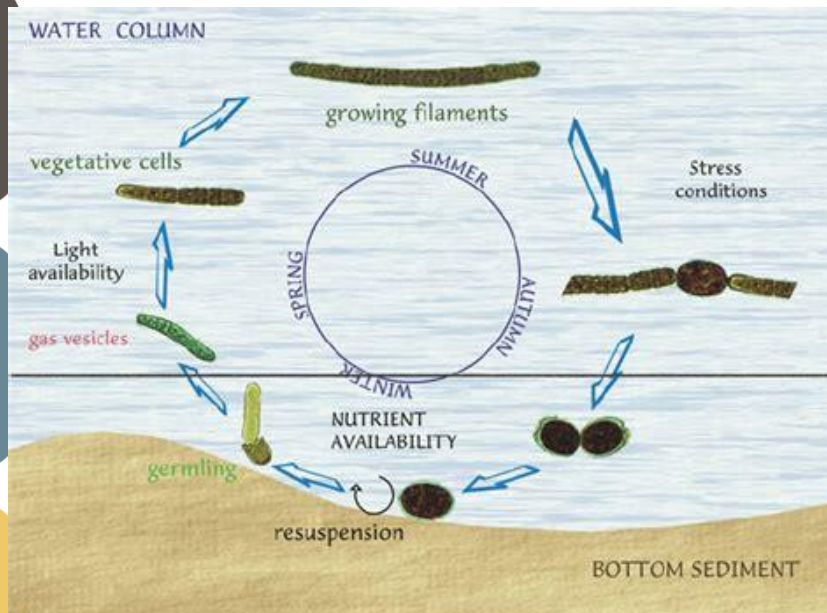
**March 8, 2018**



# Climate Change Action Plan



# The Life Cycle of Cyanobacteria

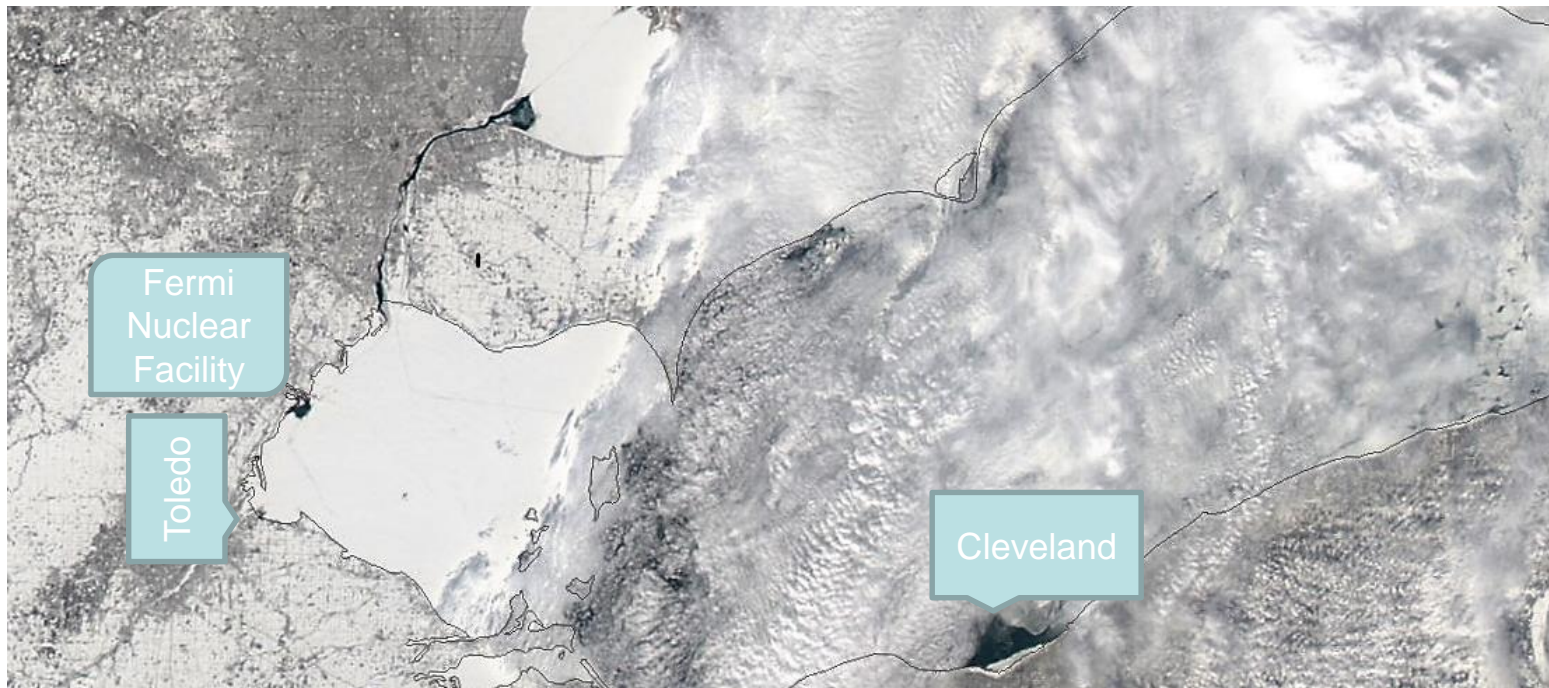


- Germination is induced by a combination of pH, temperature, and increasing day length
- The gas vesicle population is generated during May and June
- Vegetative cells conversion happens in mid-summer (July/August)
- Low temperature inhibits germination
- Turbidity inhibits filament growth

Source: IRENE KARLSSON ELFGRE, 2003

Source: Ruth Kaplan-Levy, IOLR, 2012

# Germination is Temperature Dependent



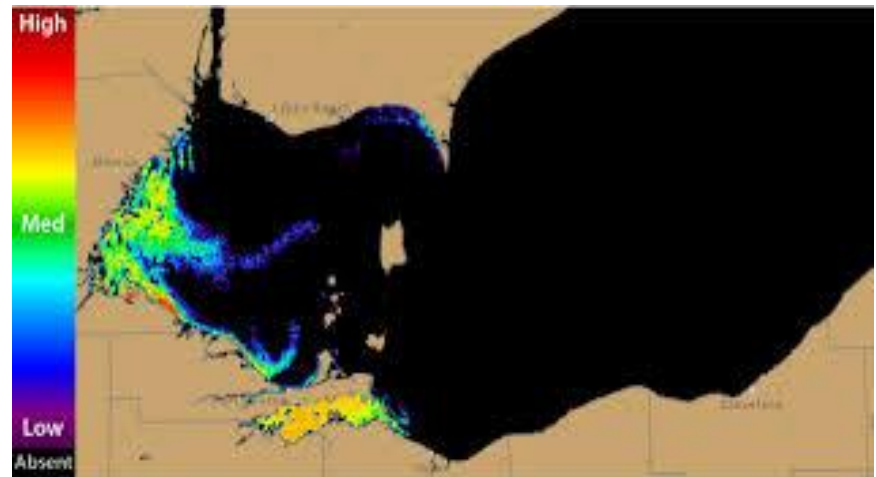
Temperature (56F) is a variable for P activation and water temperature is a catalyst for germination.

Source: NASA Earth Observatory, Winter 2018

# Temperature Accelerates, Turbidity Inhibits



Source: Ecowatch, 2018



Source:  
National Oceanic and Atmospheric Administration (NOAA),  
2018

# Temperature can also Inhibit the Bloom



Source:  
NOAA,  
2018