AgriSim: A User-Friendly Learning Tool for Farmers to Prevent Harmful Algae Blooms

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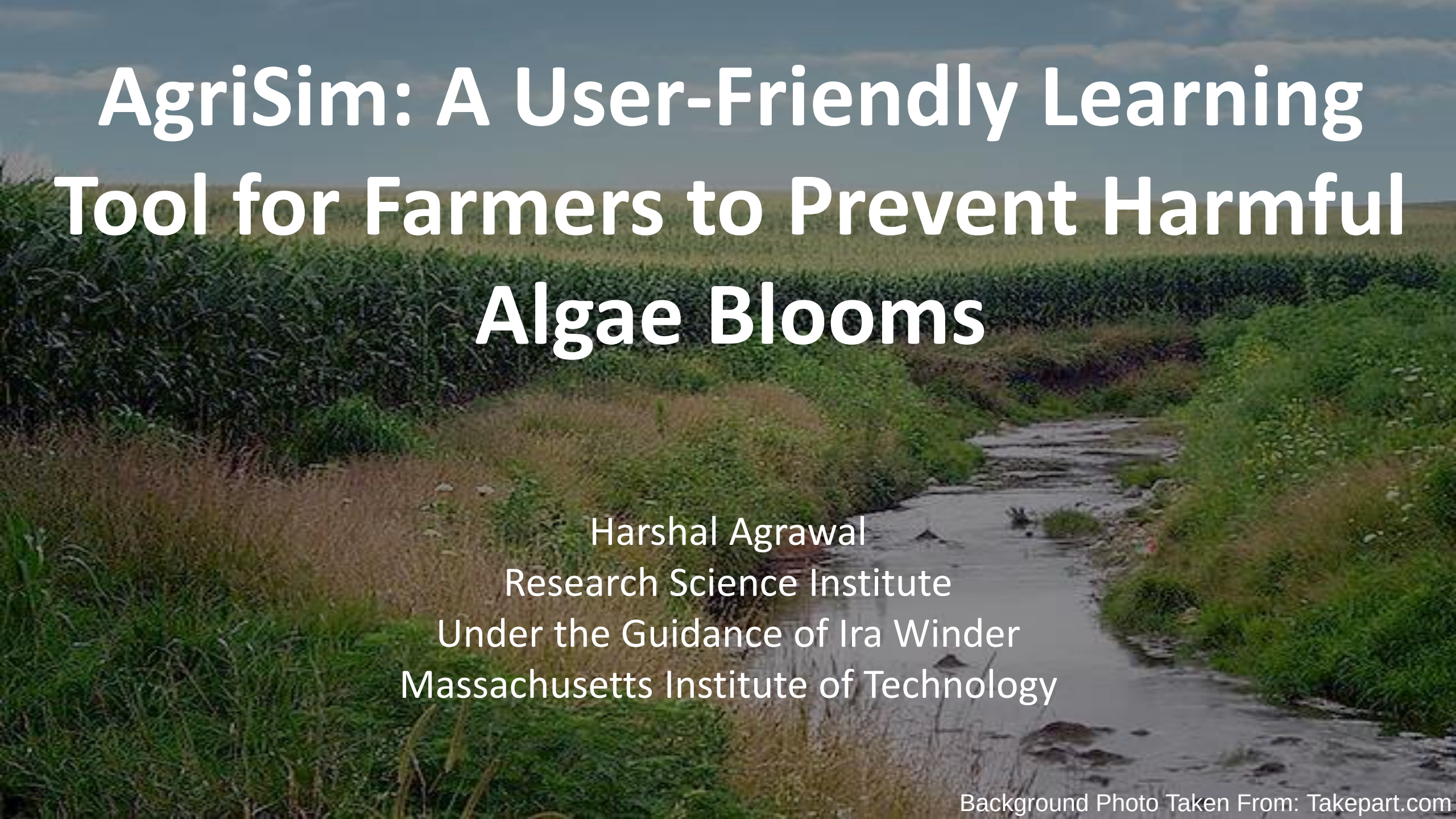


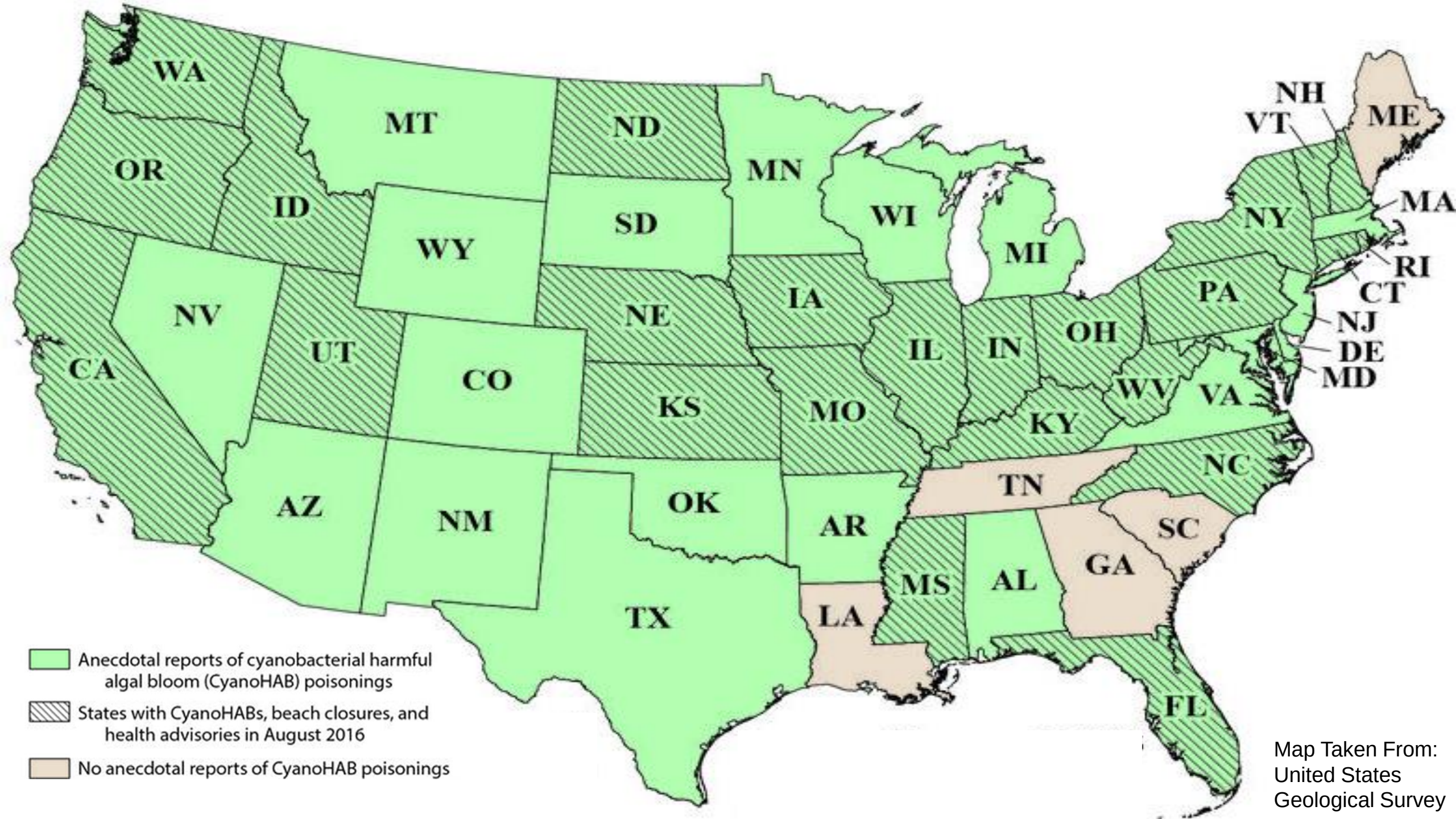
Background Photo Taken From: Takepart.com

What are Algae?

Photo Taken From: ucresearch.tumblr.com

What are Harmful Algae Blooms?

Photo Taken From: nationalgeographic.com

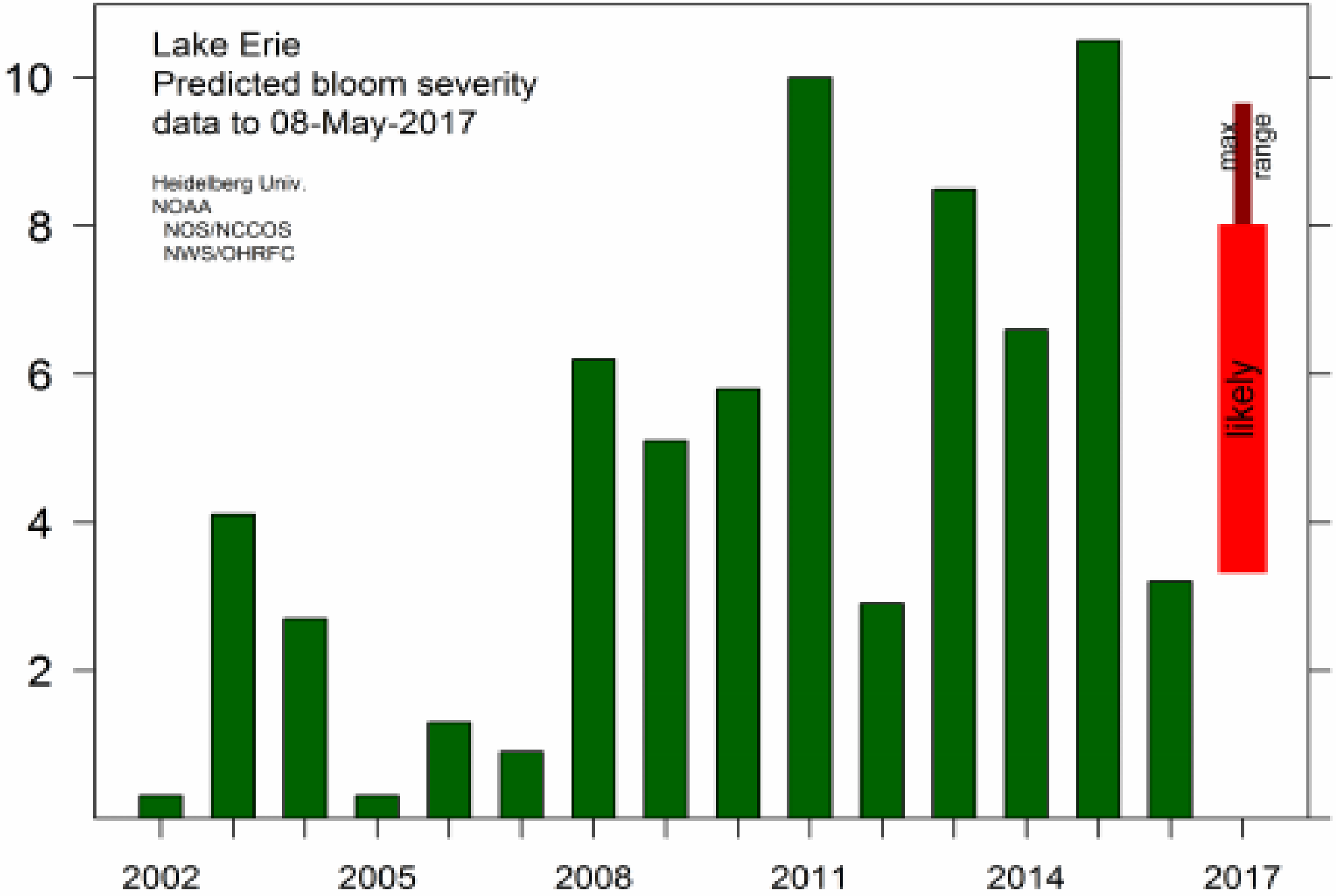


Map Taken From:
United States Geological Survey

Why are Algae Blooms Harmful?

Photos Taken From: hollabackhealth.com, nationalgeographic.com, and clipartpanda.com


Photo Taken From: The National Oceanic and Atmospheric Administration
Case Study: Lake Erie
TOLEDO
CLEVELAND
NOAA
NASA



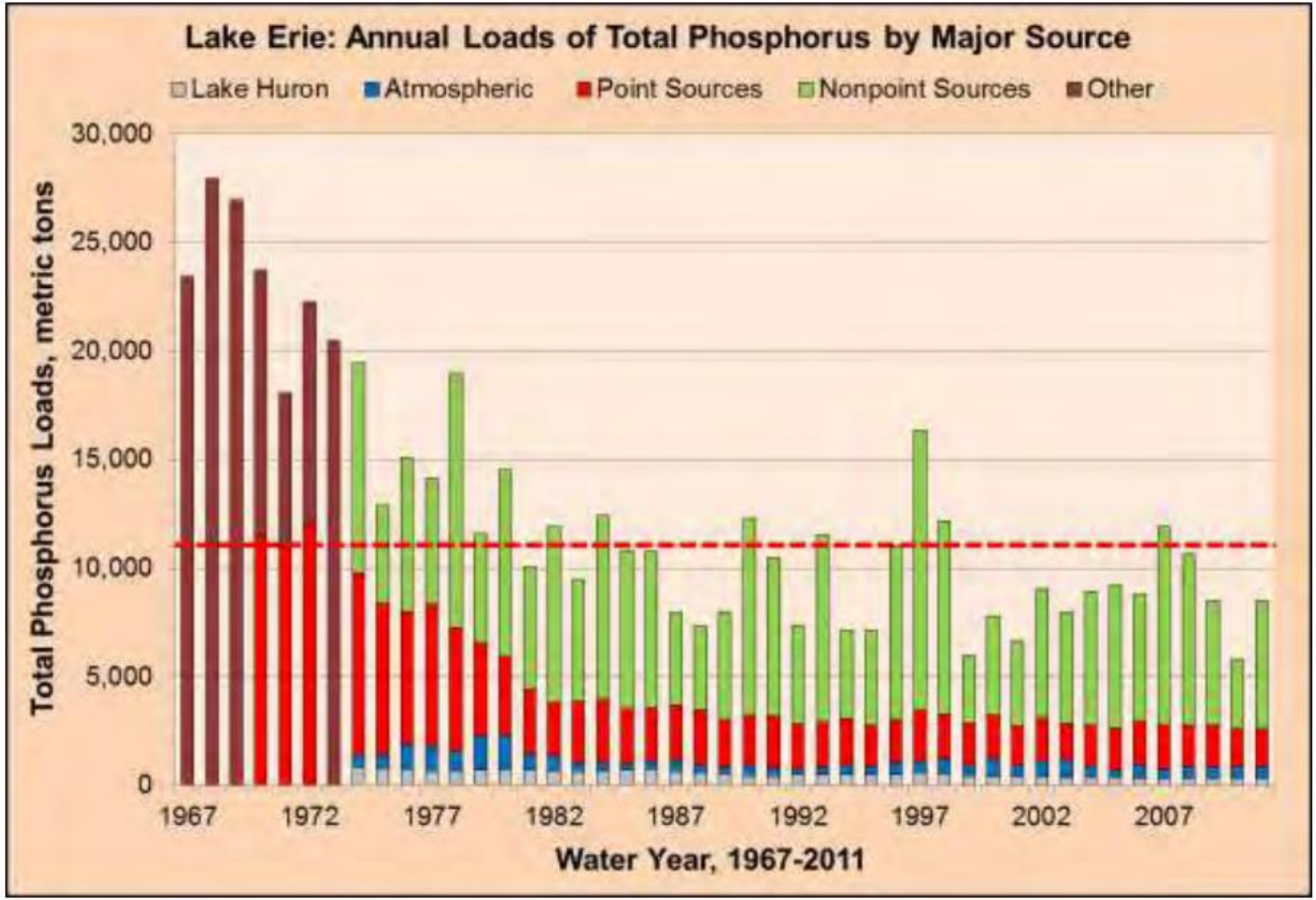
Graph Taken From: lakeerieialgae.com (graph presents data from NOAA and Heidelberg Univ.)

Photos Taken From: Michigan State University, hollabackhealth.com, nationalgeographic.com, and clipartpanda.com

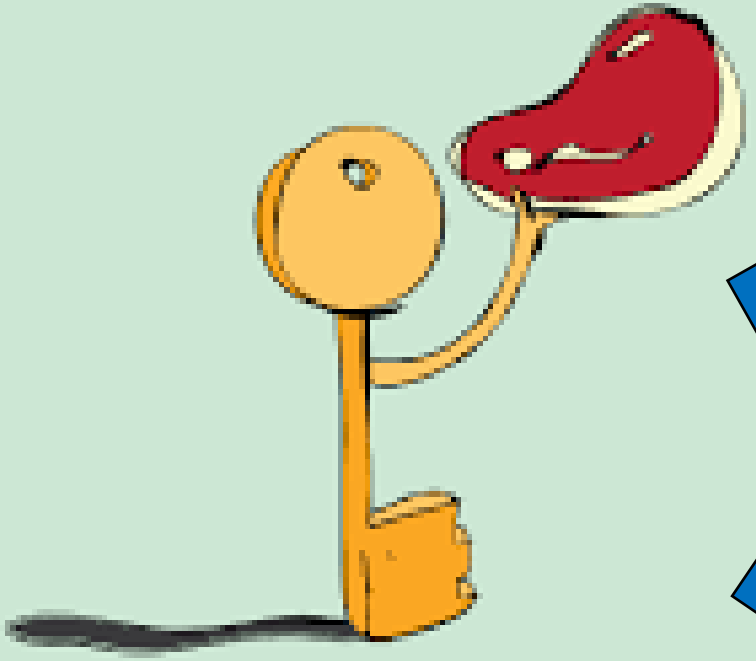
Factors Influencing the Growth of HARMFUL ALGAL BLOOMS

Most Harmful Algal Blooms (HABs) flourish under high light conditions as well as when elevated levels of phosphorous are present. Urban and agricultural run-off as well as leaking septic systems and other sources of wastewater into shallow, stagnant water can create an environment for algae to flourish. Zebra mussels selectively feed and filter out other algae, which enables HABs to flourish.

Sea Grant Michigan
Produced by Michigan Sea Grant College Program
www.miseagrant.umich.edu MICHU-10-742



Graph Taken From: Ohio Lake Erie Phosphorus Task Force II Final Report



Key Stakeholders

Farmers

State Government

Governmental Perspective

Farmer Perspective

Vegetated Buffer Strip


Soil & Water
Assessment Tool
SWAT
IT'S COMPLICATED
Photo Taken From: TAMU.edu

AgriSim

Stage 1: Fertilizer Application

Input:

- Fertilizer Type (NPK) - User
- Application Rate (kg/ha) – User

Model Output:

- Phosphorus added to soil solution pool (kg P/ha)

AgriSim

Stage 2: Rainfall Event

Input:

- Rainwater Depth (mm H_20) – User
- SCS Curve Number – User

Model Output:

- Accumulated Runoff (mm H_20)

AgriSim

Stage 3: Nutrient Polluted Runoff

Input:

- Phosphorus added to soil solution pool (kg P/ha)
- Soil Bulk Density (mg/m^3) – User
- Phosphorus Soil Partitioning Coefficient (m^3/mg) - User
- Accumulated Runoff (mm H_20)

Model Output:

- Intial Phosphorus Lost in Surface Runoff per Hectare (kg P/ha)

AgriSim

Stage 4:Vegetative Buffer Strip Filtration

Input:

- Type of Buffer Strip (High/Low/None) – User
- Initial Phosphorus Lost in Surface Runoff per Hectare (kg P/ha)
- Farm Size (hectares)

Model Output:

- Additional Costs ($)
- Final Phosphorus Lost in Surface Runoff per Hectare (kg P/ha)

AgriSim

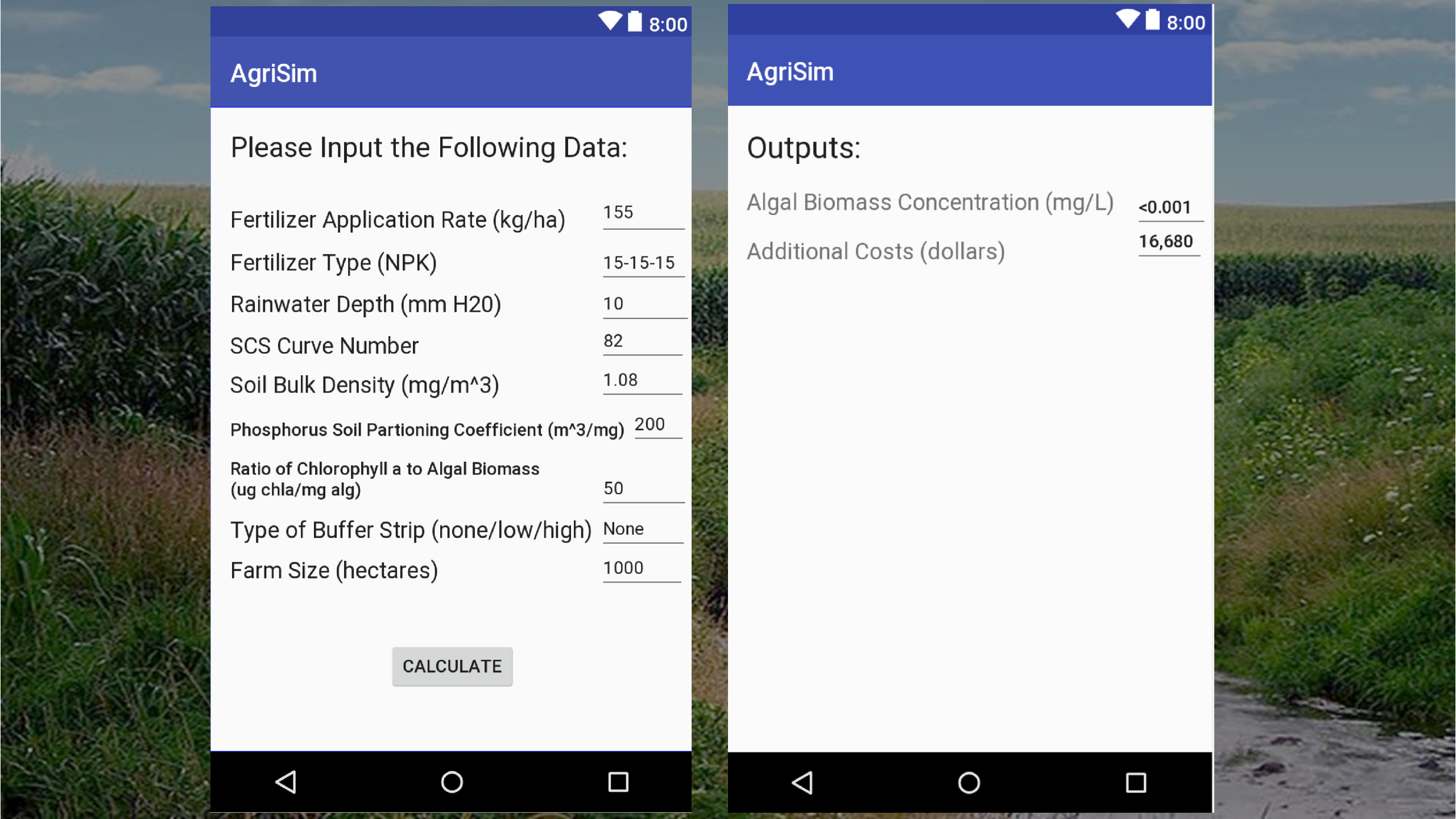
Stage 5: Harmful Algae Bloom

Input:

- Final Phosphorus Lost in Surface Runoff per Hectare (kg P/ha)
- Ratio of Chlorophyll a to Algal Biomass (ug chla/mg alg) - User

Model Output:

- Algal Biomass Concentration (mg alg/L)


8:00
AgriSim
Please Input the Following Data:
Fertilizer Application Rate (kg/ha)
155
Fertilizer Type (NPK)
15-15-15
Rainwater Depth (mm H20)
10
SCS Curve Number
82
Soil Bulk Density (mg/m^3)
1.08
Phosphorus Soil Partioning Coefficient (m^3/mg)
200
Ratio of Chlorophyll a to Algal Biomass
(ug chla/mg alg)
50
Type of Buffer Strip (none/low/high)
None
Farm Size (hectares)
1000
CALCULATE
8:00
AgriSim
Outputs:
Algal Biomass Concentration (mg/L)
<0.001
Additional Costs (dollars)
16,680

Acknowledgments:

- Mentor, Mr. Ira Winder, MIT IDSS
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- MIT, RSI, and CEE

Photos Taken From: Takepart.com