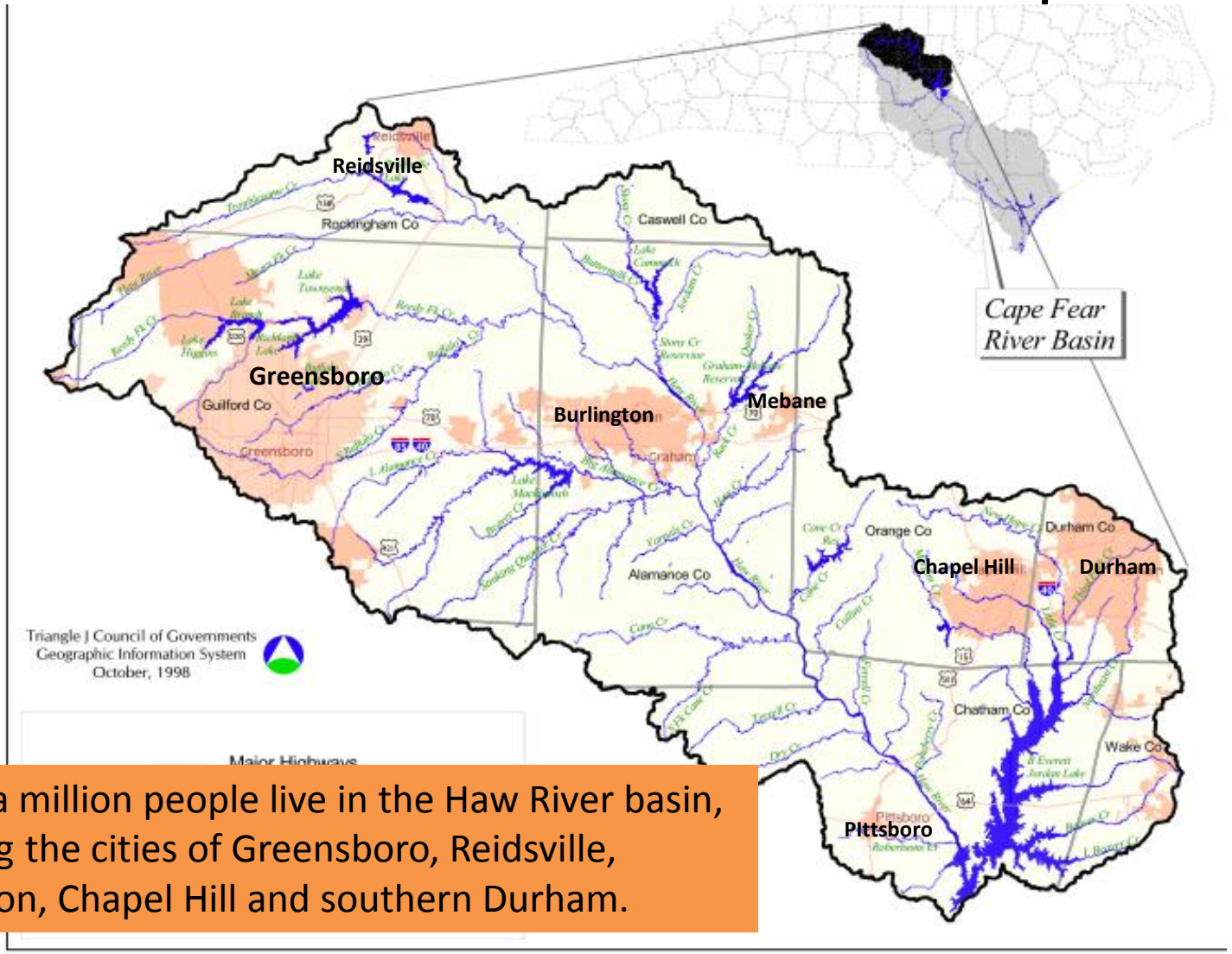
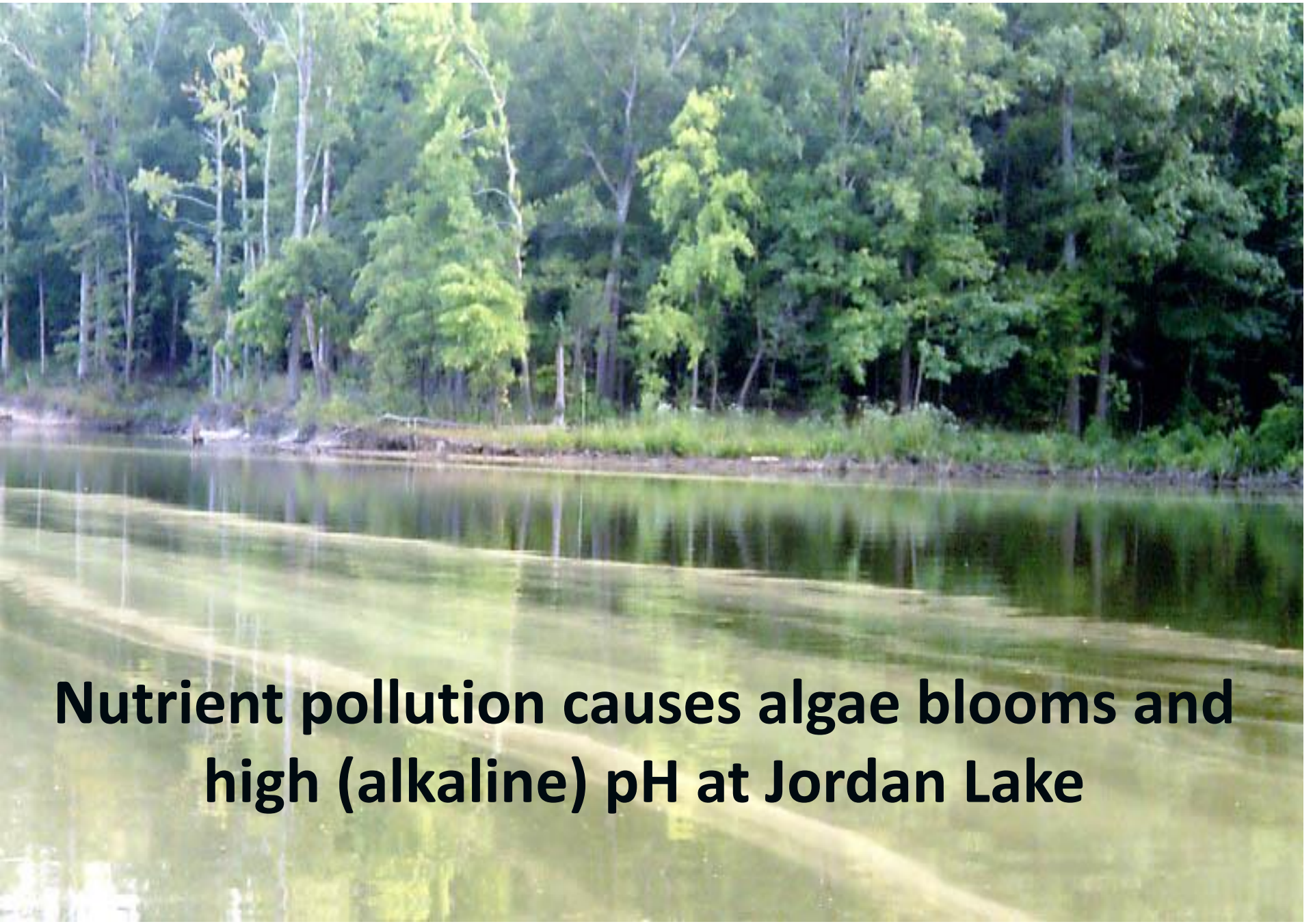
Jordan Lake Impaired Waters Status and Effectiveness of SolarBees

Report to Chatham County Board of Commissioners
from Environmental Review Advisory Board February 15, 2016

Jordan Lake has an excess of nutrients (nitrogen and phosphorus) from the stormwater and wastewater from cities and lands upstream.



Almost a million people live in the Haw River basin, including the cities of Greensboro, Reidsville, Burlington, Chapel Hill and southern Durham.


Nutrient pollution causes algae blooms and
high (alkaline) pH at Jordan Lake

Water Quality Impacts of Nutrient Pollution

Jordan Lake is the source of drinking water for over 300,000 people, and used for recreation by 1 million people per year

- Green algae at normal levels are essential to food chain of healthy aquatic system. But an excess can cause stress to aquatic organisms through low nighttime oxygen.

- Night to day swings in pH (caused by algae production during sunlight hours) is detrimental to fish and other aquatic life.

- Blue green algae (called “nuisance” algae) and their byproducts cause objectionable taste and odors in drinking water triggering customer complaints and added treatment costs. They can produce cyanotoxins that cause sickness or rashes from body contact such as swimming.

Jordan Lake was listed in 2002 as an EPA "Impaired Water." Federal and State Rules to reduce pollution were finally passed into law in 2009, and included reductions of nitrogen and phosphorus from all sources in the 8 county watershed, including wastewater and stormwater.

Approaches to Reducing Excessive Algae Caused by Nutrient Pollution

- **At the source – the Jordan Lake Rules were enacted to:**
  <> Reduce new sources of nutrients coming into the lake.
  <> Reduce nutrients from wastewater treatment plants and over time.
  <> Begin addressing existing nutrient pollution from stormwater.

- **In-lake water mixing technologies (such as SolarBees)**
  <> These methods are based on suppressing algae growth
  <> This has been done in very small lakes with some success, but never in large reservoirs like the 14,000 acre Jordan Lake.
  <> Even if successful in reducing algae, these technologies do not reduce nutrient pollution, but simply send it on downstream.

The NC legislature put the Jordan Lake rules on hold in 2014 for a costly experiment with SolarBees

SolarBee Demonstration at Jordan Lake

Concept

- They target control of blue-green algae by moving cells from one depth to another in “light zone” thus disrupting growth (not true for green algae)
- Gentle mixing by the 15 ft. diameter paddles continually moves blue-green algae through depths
- Powered by solar panels

NC Legislature funded demonstration of SolarBees at Jordan Lake for $1.6 million

Installed in July, 2014

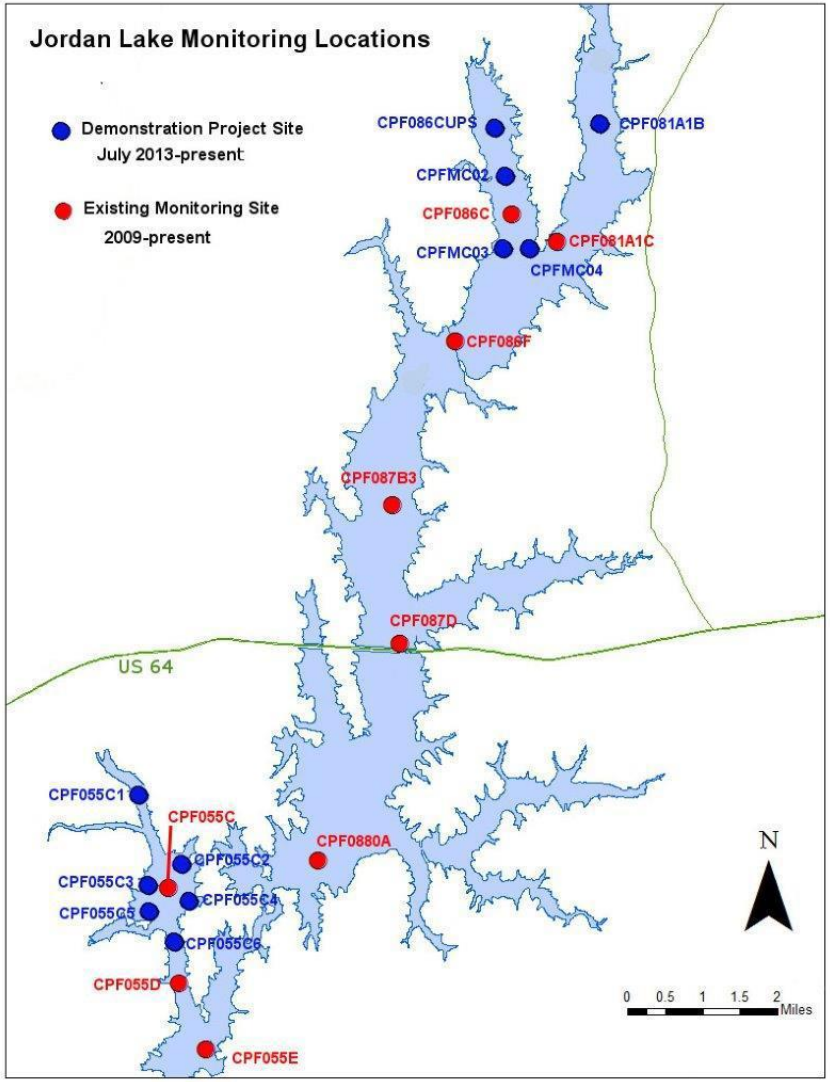
12 on Haw River Arm

24 on Morgan Creek Arm

Both photos were taken in February,2015 when high waters damaged or unmoored several SolarBees at Jordan Lake.

DEQ Preliminary Report on Results 9/15

- NC Dept of Environmental Quality (DEQ) measured water quality for Chlorophyll *a* and *pH* at "paired sites" from August 2014 – August 2015
- Limitations to the location of paired sites justified by DEQ by use of historical data and testing
- Measured twice per month during the growing season (April – September)
- Measured once per month the rest of year



Results Do Not Show Effectiveness of SolarBees in reducing algae growth at Jordan Lake demonstration sites

- "**No statistically significant differences in *pH*** at all three project treatment versus control site comparisons during SolarBee deployment."
- **"No statistically significant differences in *Chl a*** concentrations at the two project treatment versus control site comparisons in Morgan Creek versus New Hope Creek during SolarBee deployment."
- **"No statistical differences in relative abundances of blue green algae and green algae** at the three project treatment versus control site comparisons"
- **"The Haw River project area site had higher percent exceedances for both pH and *Chl a* than its control site."**

% Exceedances Keep Jordan Lake on the EPA "Impaired Waters" List

- **28%** for *pH* and 74% for *Chl a* at the two Morgan Creek sites
- **37%** for *pH* and 42% for *Chl a* at the Haw River Arm site

Medora Corp. Explanation

- Dr. Kenneth Hudnell, of Medora Corp, the North Dakota based company that makes SolarBees, told ERAC member, Dr. Fran DiGiano:
  - Presumption at start of test was that blue green algae dominated
  - But DEQ data showed did not dominate
  - If blue green do not dominate, then Chl-*a* will not be lowered by their selective removal with SolarBees
  - Medora believes testing needs to continue because each year of growth is different

DEQ Report Contradicts Medora Claim

- **Blue green algae were NOT in far lower numbers than historical data indicate**

- The Report states “this algal group dominated community composition at all sites over the majority of the 11 month time period, **representing more than 50% of the algal community and as much as 97%”.**

Is Continued Study Justified?

- DEQ Report states “Results for the study are still considered to be preliminary due to the limited 1 year project period, inherent environmental variability, and the extension of the project through 2018.” The cost for the extension of the SolarBee demonstration is another $1.5 million.

- The Chatham County Environmental Review Advisory Committee believes it is reasonable to question whether two more growing seasons will yield algal growth dynamics that differ from DEQ’s initial findings.

- **Further delays in implementation of the Jordan Lake rules are likely to result in continued water quality degradation in Jordan Lake.**

A healthy Jordan Lake is essential to the future of Chatham County.

The ERAC believes that the BOC should challenge the NC Legislature's decision to extend the SolarBee Demonstration Project which continues to delay implementation of the Jordan Lake Rules.

Questions?