



Monitoring TMDL Effectiveness

Robert Voss

Factors Impacting Success

Pollutant and Scale

- Wide scale nutrient pollution vs localized PS or NPS impacts
- Affects ability to observe success
 - Larger scales require long implementation times or very high intensity of practices over short time frames
- Localized impacts can achieve success more quickly



Planning for Success

Is a TMDL needed? Path for Direct Implementation?

- Modeling needed no matter which path is chosen
- Conduct studies based on permit expiration
 - New limits ready at time of renewal.
- Antidegradation process
- SRF/BIL funding process



Factors Impacting Success

Quantifying the problem

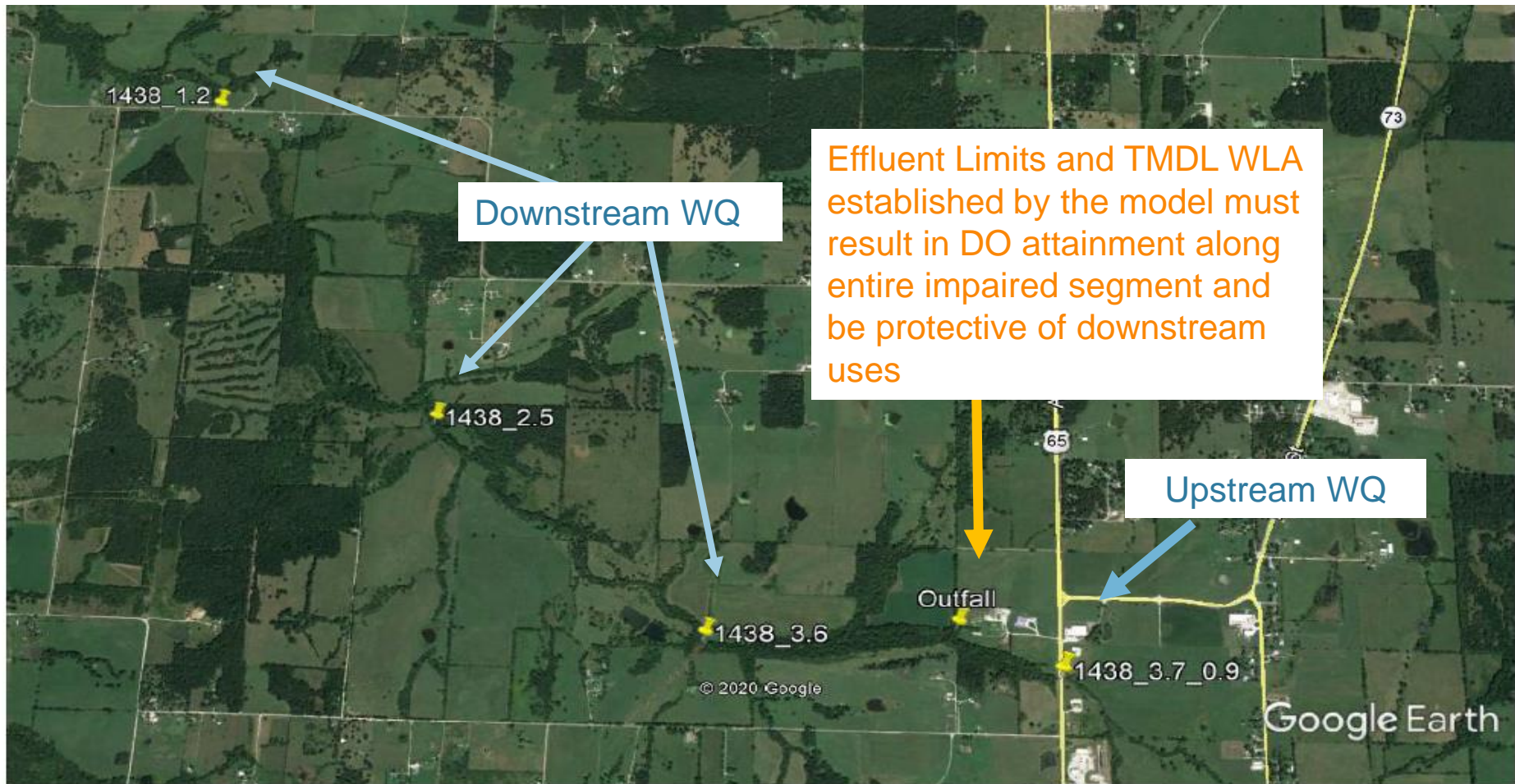
- Problem characterization = measurable progress?
 - Do you have sufficient data?
- Does it translate to TMDL or modeling?
 - Response variable and nutrients
 - LDC vs modeling

Assessment

- Numeric vs. narrative
- Timing, Frequency and Volume of data
- Can we assess response variable rather than nutrient concentrations?



Planning for Success



Modelers and field staff must coordinate on location and data needs of the model. Time studies during critical conditions!

Cave Springs Branch

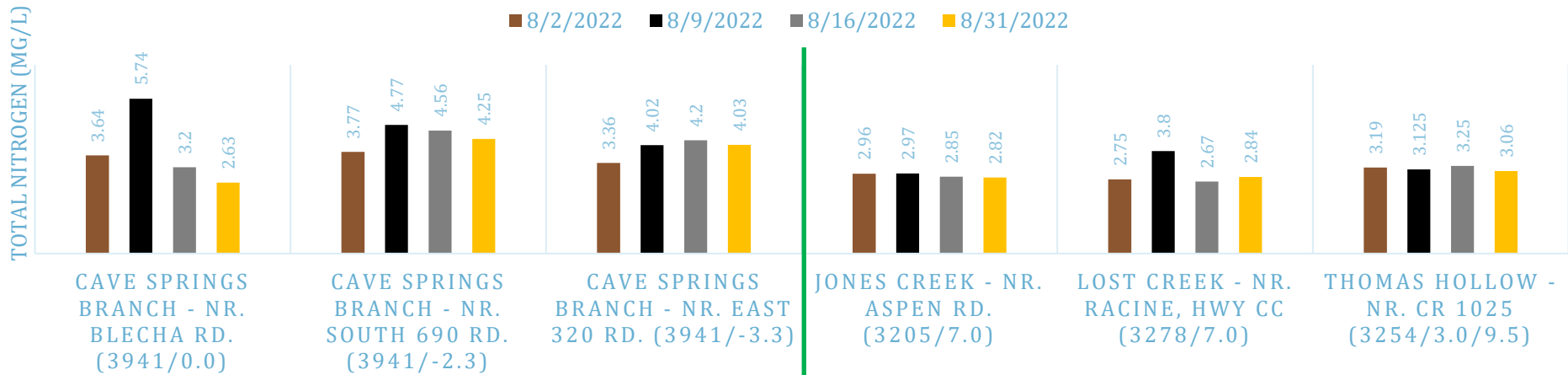
Quantifying the problem

- 1990s – Ammonia toxicity, chronically high nutrients, gross narrative violations for algae, listed for nutrients causing excessive algal growth
- Assessed under narrative criteria
- TMDL resulted in unachievable ecoregion TN and TP targets
- CAM established.
- Facility progressively installed better treatment, nutrients started trending down
- Recently conducted 4 week intensive study: sondes, nutrients, filamentous algae estimates, and benthic chl-a

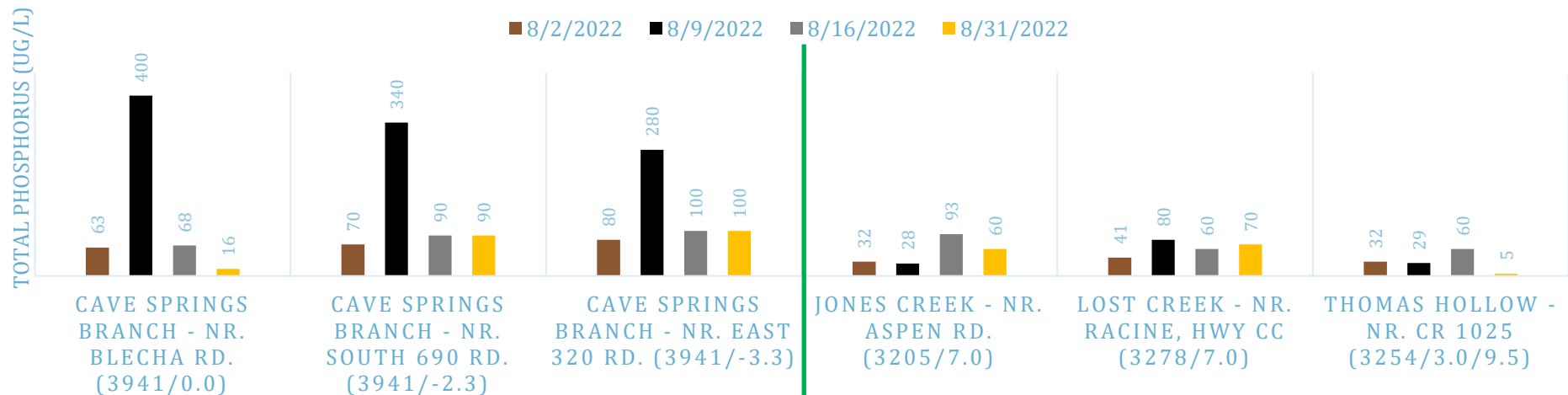


Outcome – Cave Springs Branch

TOTAL NITROGEN

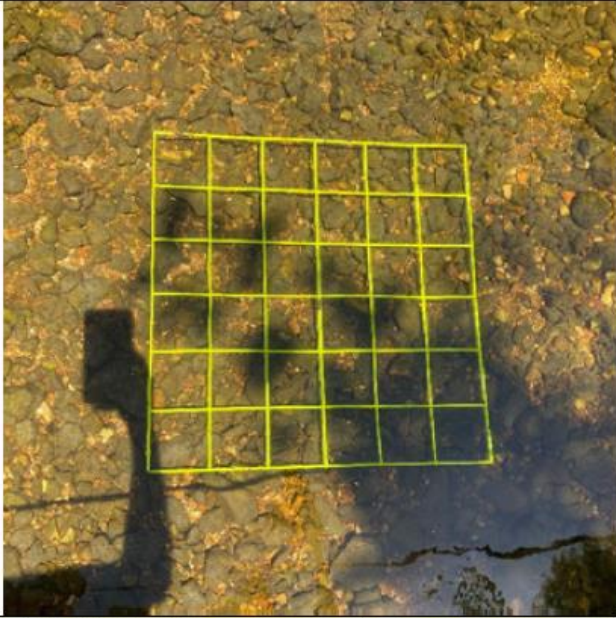


TOTAL PHOSPHORUS

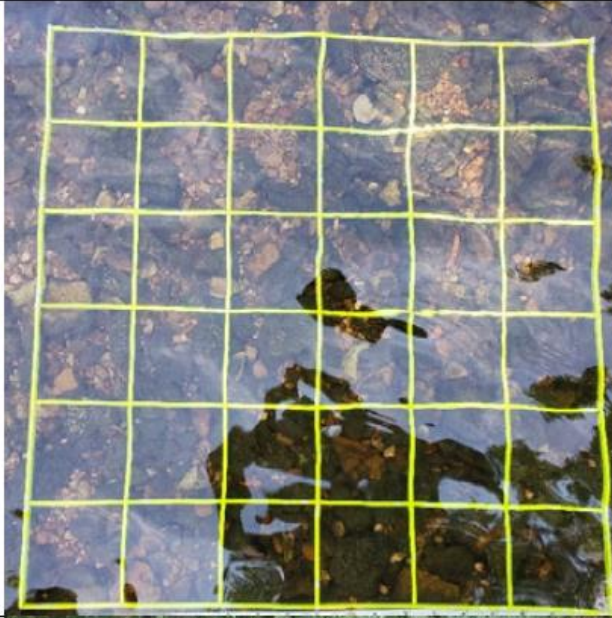


Outcome – Cave Springs Branch

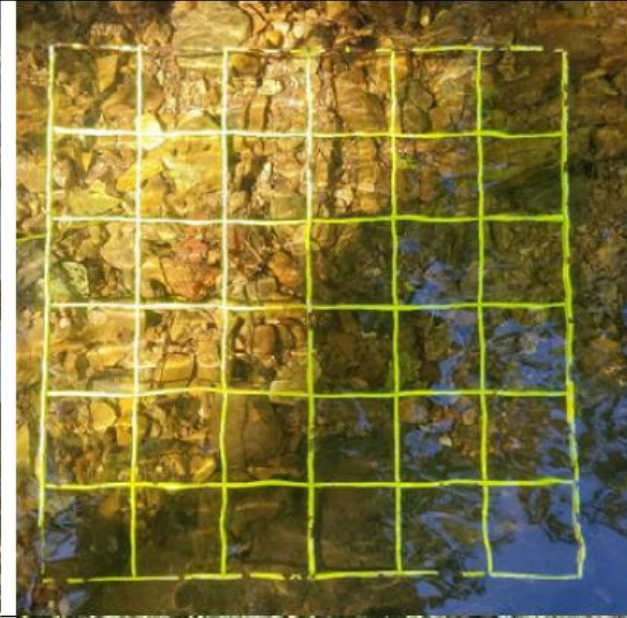
Week 1



Week 3

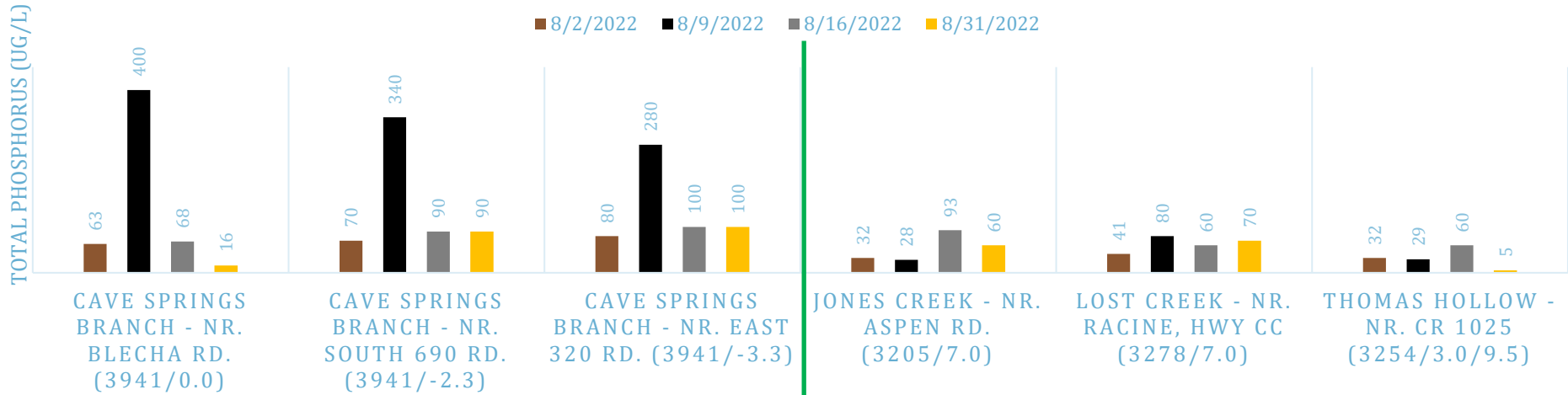


Week 4

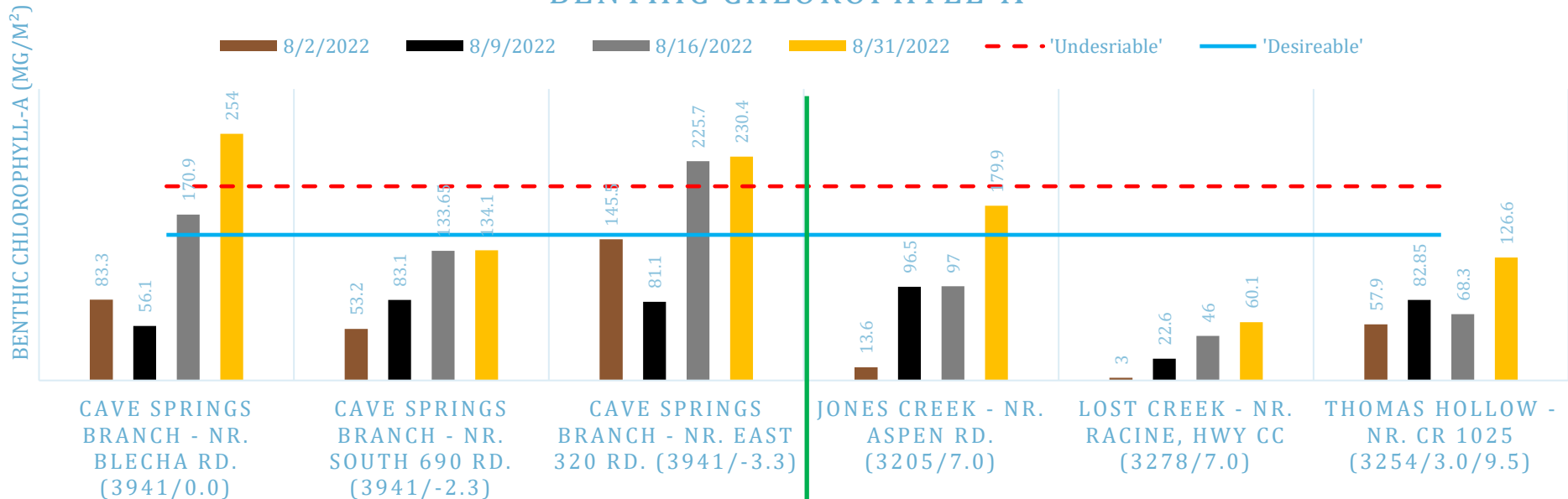


Outcome – Cave Springs Branch

TOTAL PHOSPHORUS



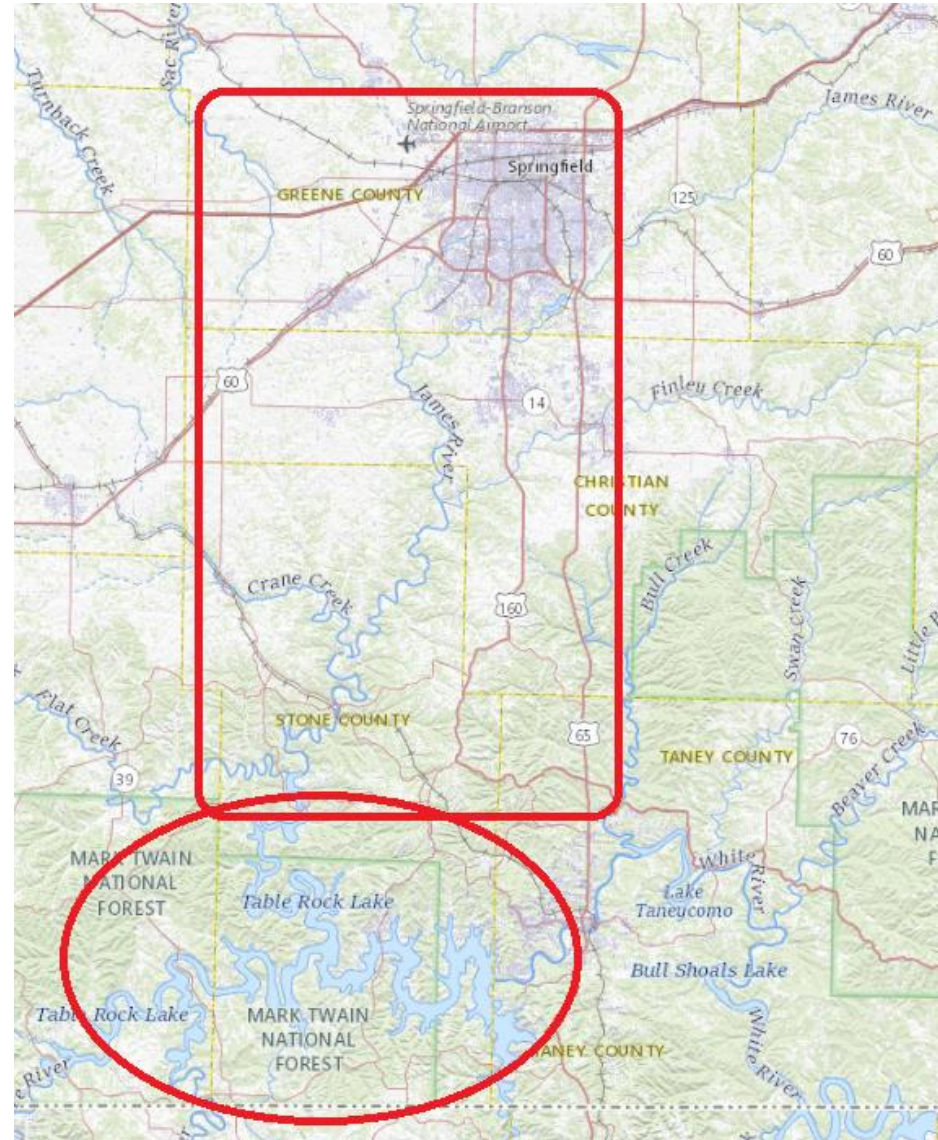
BENTHIC CHLOROPHYLL-A



James River

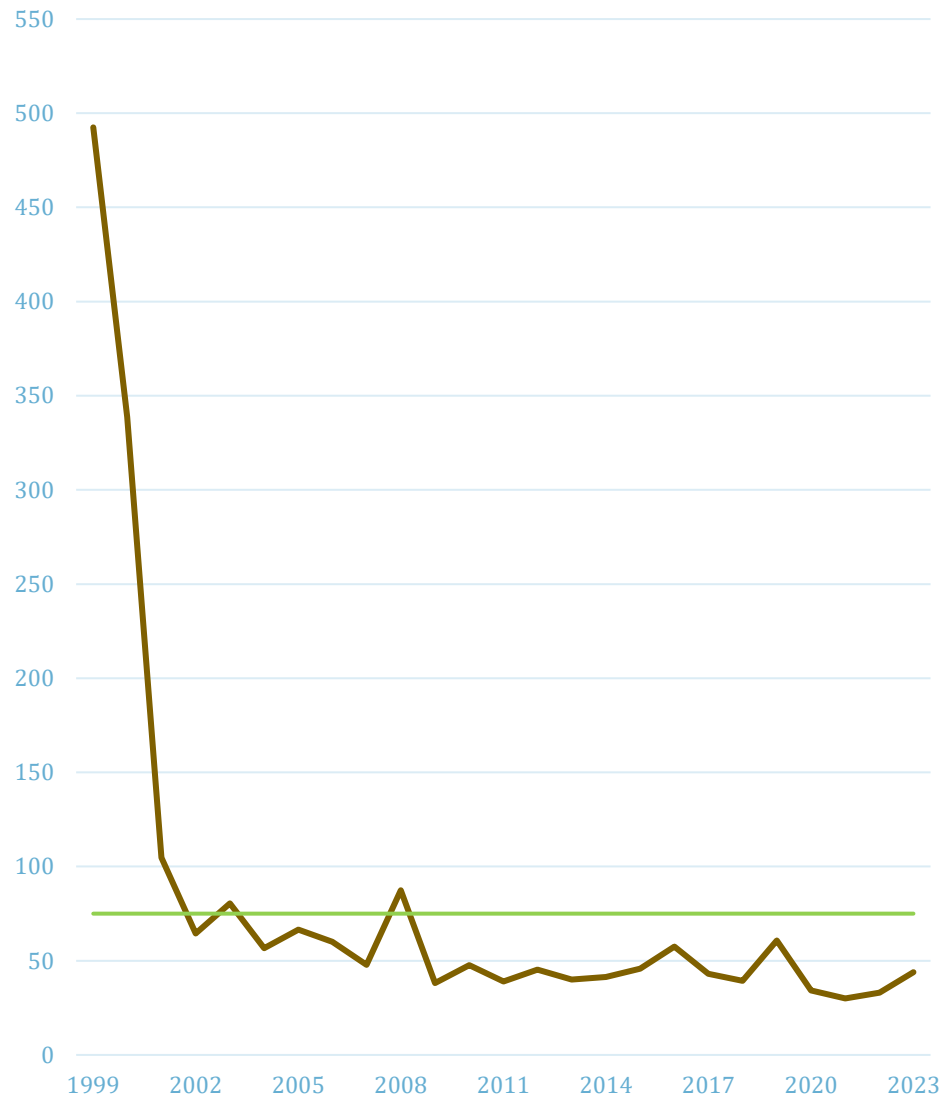
Quantifying the problem:

- Table Rock Lake (TRL) listed for nutrients causing excessive algal growth
- Assessed under narrative criteria
- Subsequently developed Site specific nutrient criteria for the reservoir; TN, TP, Chl-a
- TMDL for James River addressing algae and clarity issues in that arm of the lake.
- TMDL resulted in TP and TN targets of 0.075 and 1.5 mg/l
- TRL Watershed rule for TP dischargers @ 0.5 mg/l

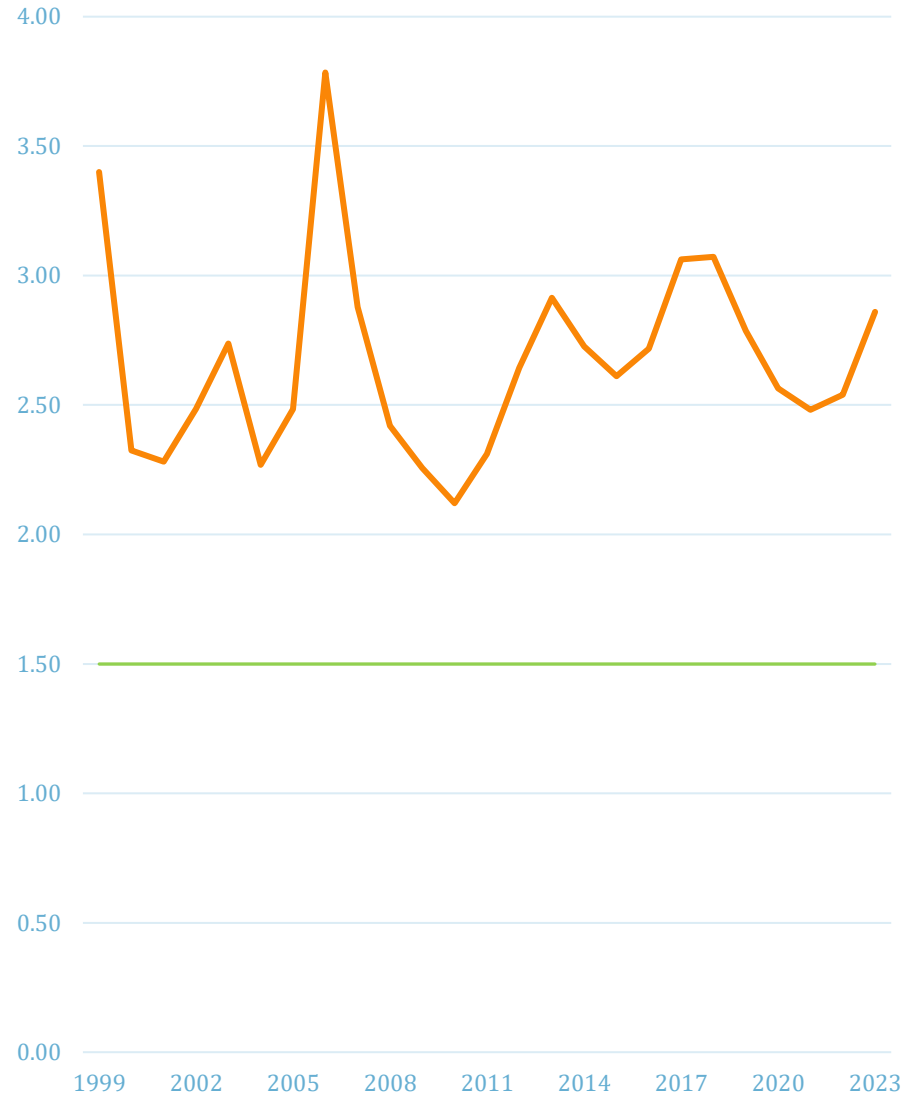


Outcome – James River

James River - Average TP ($\mu\text{g/l}$)



James River - Average TN (mg/l)



Evaluate and Adapt

Achievable targets = Success

Sometimes TMDL revisions are necessary
(consent decree TMDLs?)

