Numeric Nutrient Criteria Development
April 2016 Update

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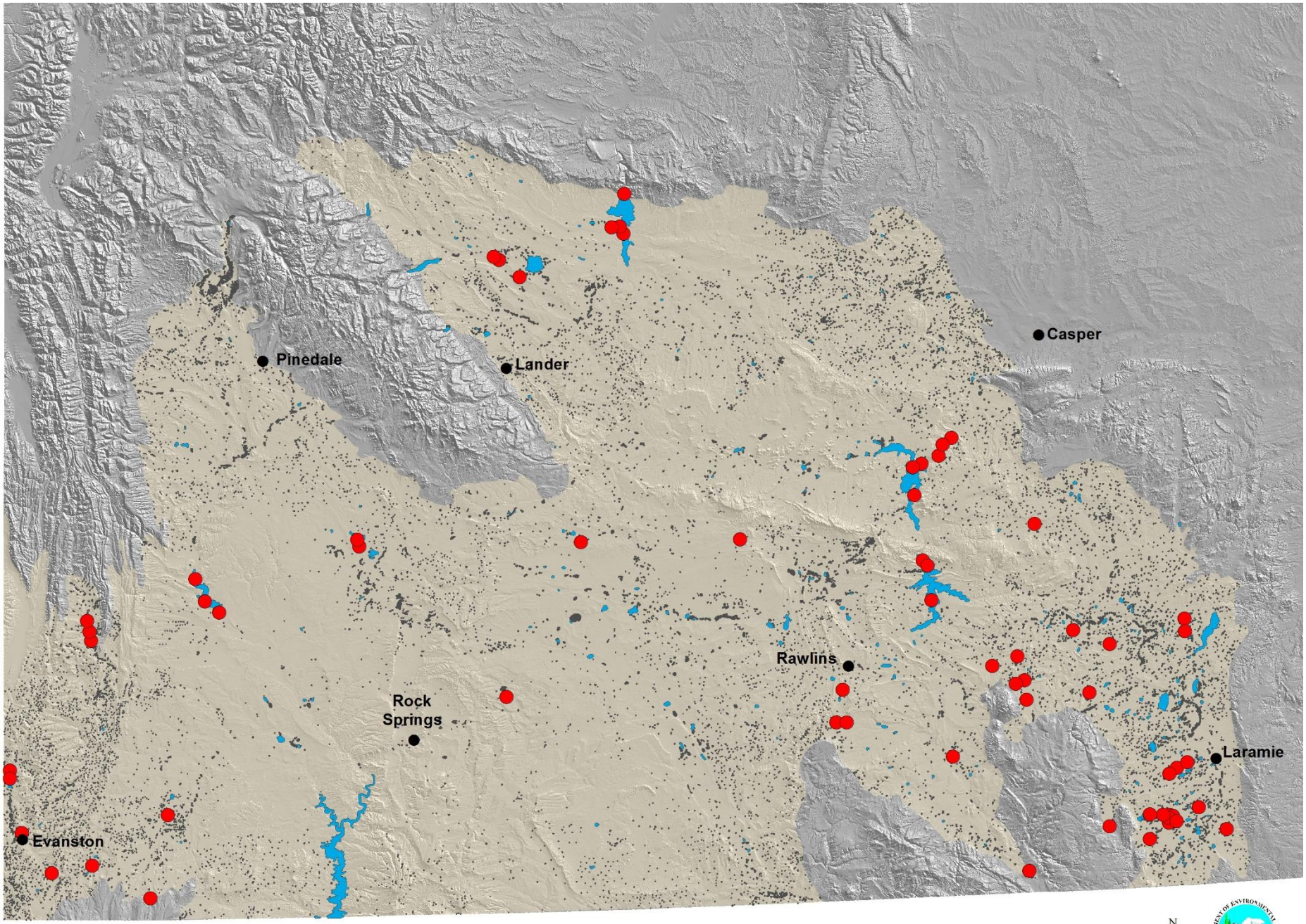
Nutrient Work Group – April 5, 2016

Background

- WDEQ 2008 Nutrient Criteria Development Plan
  - Develop TP and TN criteria protective of aquatic life and recreation with chlorophyll-a as primary response indicator

  - First develop criteria for lakes/reservoirs
- Lakes/reservoirs in Wyoming Basin selected for nutrient criteria development in 2013
  - Perennial reservoirs, ≥10 acres and >0.5 m max. depth
  - Target of 287 lakes (20,724 total lakes in Wyoming Basin)
  - Focused spatial/temporal monitoring in 2013-2014
    - Physicochemical, chlorophyll-a, phytoplankton

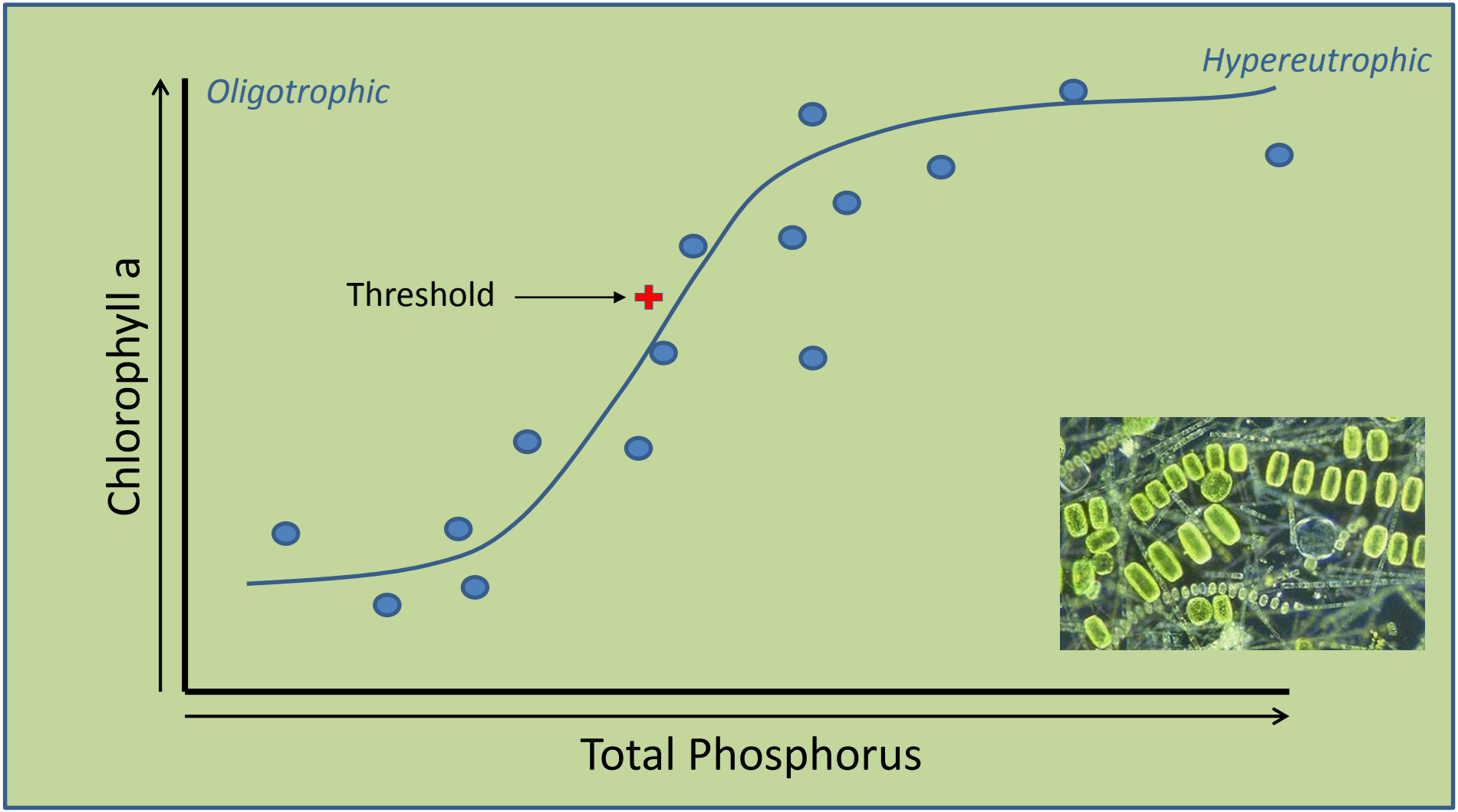

Casper
Pinedale
Lander
Rawlins
Rock Springs
Laramie
Evanston
Non-Target Lakes (20,437)
Target Lakes (287)
Sample Sites (2008-2014)
0
12.5
25
50 Miles
N
WYOMING

Background (cont.)

- Final dataset
  - 2008-2014 time period
  - Data represent June 1 – October 15 period
  - 67 monitoring sites that represent 52 lakes
  - Represents ¼ of the target population
- Nutrient criteria development began in 2014
- TP and TN criteria protective of aquatic life
- Use multiple-lines of evidence
- Focus on the stressor-response approach (most applicable to setting aquatic life criteria)
  - Use phytoplankton (algae) to derive thresholds for use in criteria development

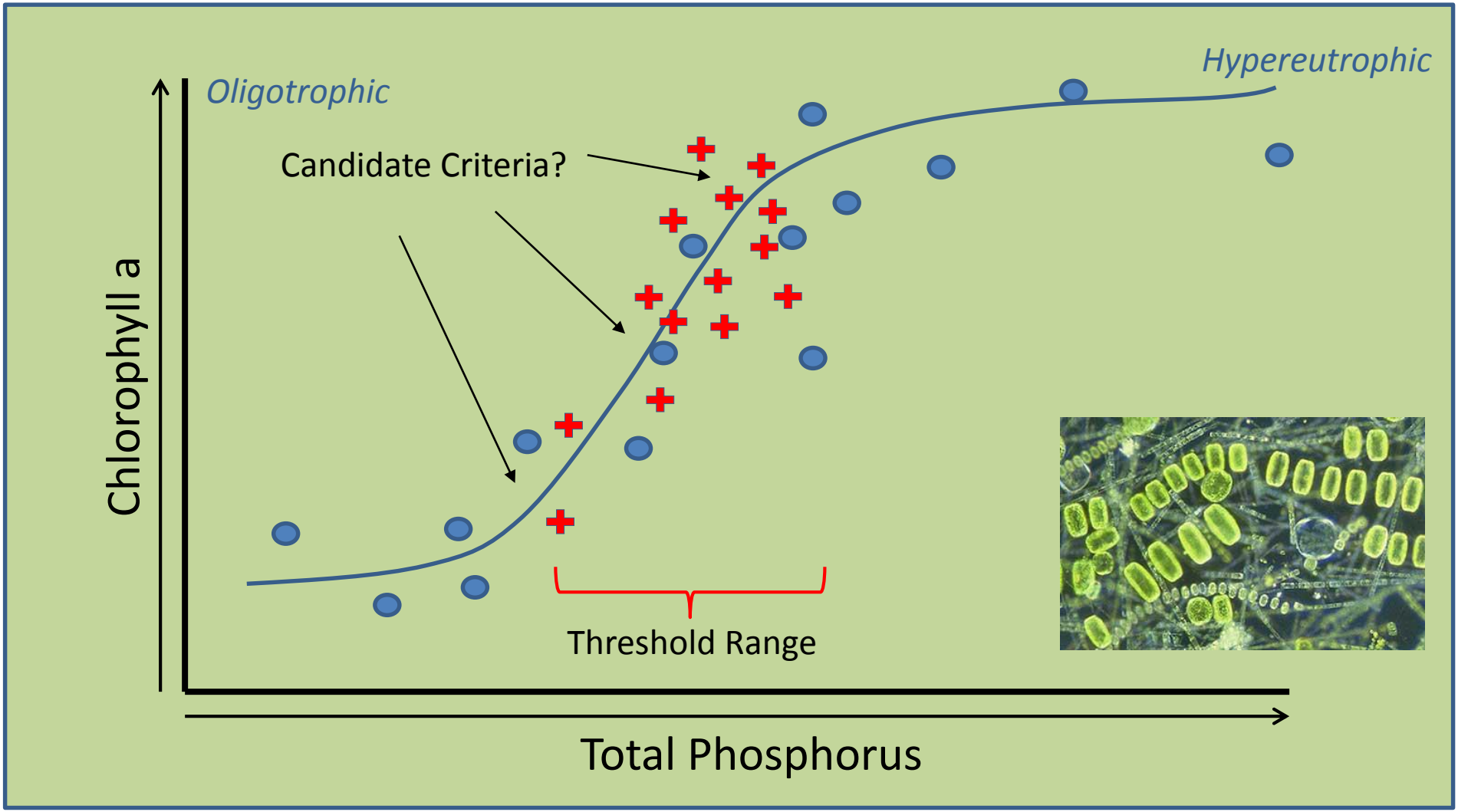
Stressor-Response (Review)

- Used to detect adverse shifts in the phytoplankton community along the nutrient gradient (thresholds) based on actual data/conditions
- Uses relationships of chlorophyll-α/phytoplankton metrics to nutrients



Stressor-Response (Review)

- Directly links candidate nutrient thresholds to shifts in the phytoplankton community (pre-cursors to criteria)
- Uses relationships of chlorophyll-α/phytoplankton metrics to nutrients



Draft Nutrient Thresholds – Stressor Response Analyses

- Nutrient Thresholds = Statistically and Ecologically Significant Shifts in Phytoplankton Community/Attributes

Laramie Plains

	Range	Mean	25th %ile	75th %ile
Chlorophyll α (µg/L)	2 - 12	7.1	5.8	9.0
Total Phosphorus (µg/L)	35 - 75	53.5	47.5	60.0
Total Nitrogen (µg/L)	900 - 2200	1590.4	1070.0	2189.3

Non-Laramie Plains

	Range	Mean	25th %ile	75th %ile
Chlorophyll α (µg/L)	3 - 19	11.3	7.0	15.0
Total Phosphorus (µg/L)	25 - 95	56.6	45.0	67.5
Total Nitrogen (µg/L)	524 - 1025	893.2	777.0	1011.5

Southwest

	Range	Mean	25th %ile	75th %ile
Chlorophyll α (µg/L)	5 - 27	11.4	6.3	15.8
Total Phosphorus (µg/L)	30 - 91	54.7	41.8	60.0
Total Nitrogen (µg/L)	226 - 619	434.4	271.5	583.0

- Nutrient Thresholds = Used as part of multiple-lines of evidence to establish criteria

Nutrient Criteria Development - Status

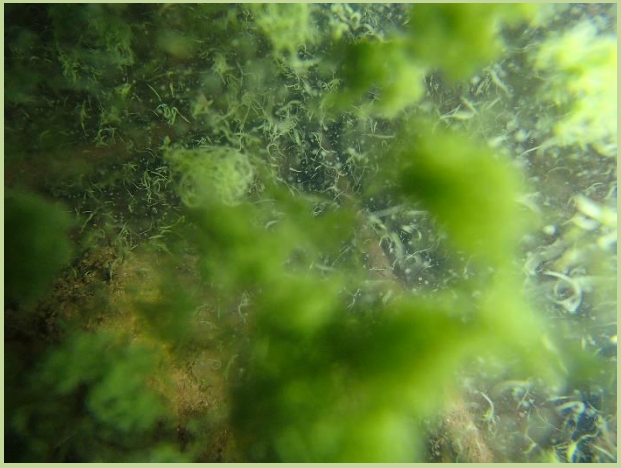
- Wyoming Basin lakes nutrient criteria development
  - Incorporate scientific literature thresholds
  - Nutrient technical sub-group review
  - External peer review
  - Refinement of stressor-response and scientific literature thresholds
  - Use multiple-lines of evidence approach to develop numeric criteria
- Bighorn Basin lakes nutrient criteria development
  - Continued data collection on reservoirs
  - Evaluate data to determine best approach(es) to criteria development
- Large Reservoir nutrient criteria development
  - Continued data collection on large reservoirs
  - Continued data collection on major tributaries, inflows, and/or outflows via USGS/WDEQ contract
- SE Wyoming lakes nutrient criteria development
  - Continued data collection on reservoirs
- Stream/river nutrient criteria development
  - Continued data collection on streams and rivers

Cyanobacteria - Public Reservoirs 2013-2015

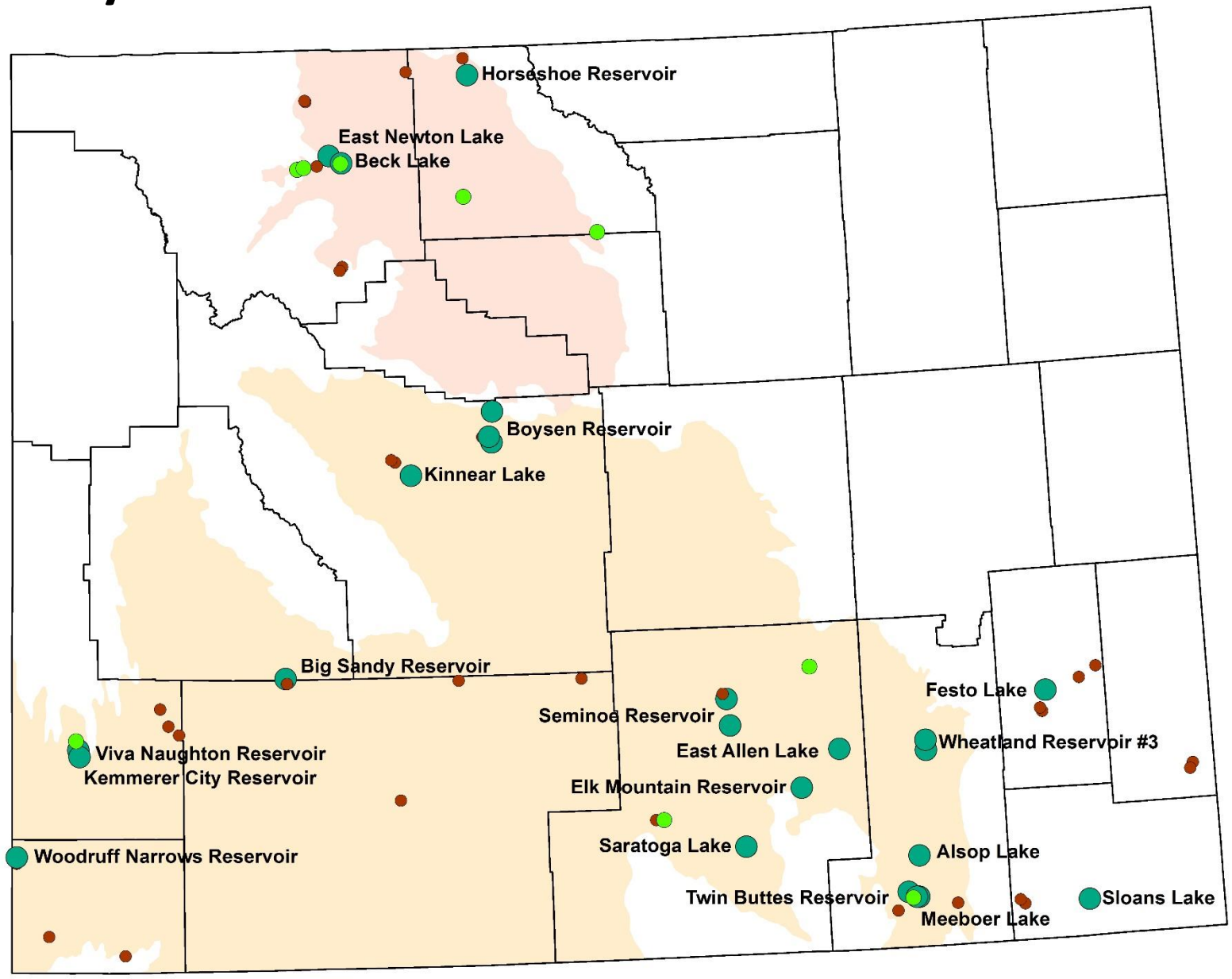
Risk of HABS	Cyanobacteria (cells/mL)
Low	< 20,000
Moderate	20,000 to 100,000
High	100,000 to 10,000,000
Very High	> 10,000,000

Based on World Health Organization (1999) guidelines
These are only general guidelines

Increases in Cyanobacteria densities → Increased risk for HABS



Cyanobacteria - Public Reservoirs 2013-2015



Nutrient Criteria Questions

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