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Nutrient Criteria for Lakes - 2014

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July 30, 2014

40 years
Missouri Department of Natural Resources
Celebrating 40 years of taking care of Missouri's natural resources.

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Truman Lake, June, 2014

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Truman Lake,
July, 2014

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Where we have been so far

- 2005: Nutrient Criteria Plan developed and agreed to by EPA. Stakeholder committee organized.
- 2009: Numeric Nutrient Criteria (NNC) for Lakes approved by Clean Water Commission, submitted to EPA.
- 2011: EPA disapproves most of the rule.
- 2012: DNR proposes alternative NNC, not accepted by stakeholders.
- 2014: Answer to EPA disapproval drafted.

Response to EPA

- Identification of designated uses (DU) to support in lakes
- Default DU: AQL, HHP, WBC-B, SCR
- More sensitive DU: DWS, WBC-A
- Support of DU affected by response variables (Chl-a, Secchi Depth)
- Response variables can be predicted (with a little uncertainty) by nutrient concentration
- Use of lake classification to target specific DU

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Drinking Water Supply (DWS)

- Algae blooms (high Chl-a) increase water treatment expenses
- Associated with taste and odor issues in water
- Risk of toxins when cyano-bacteria are present
- Threshold of 10 µg/L

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Whole Body Contact (WBC)

- WHO guidelines: Small risk of skin rash or illness at 10 µg/L Chl-a
- Secchi Depth
  - No universal guidelines
  - Low transparency associated with aesthetic, safety issues
  - Distinct change points in response to nutrient concentrations in Missouri lake data

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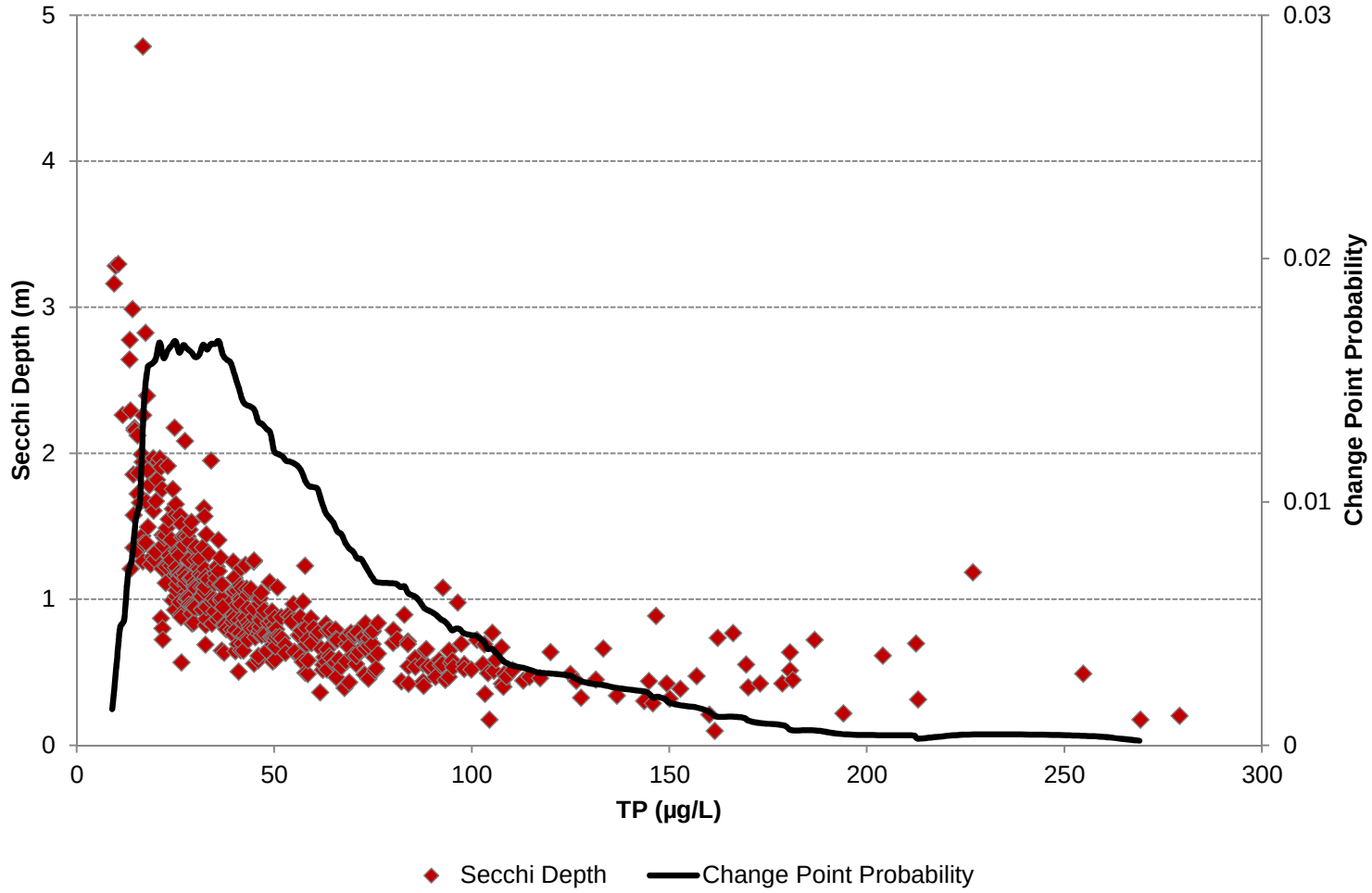
Secchi Depth Response to TP in Plains



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Aquatic Life Protection (AQL)

- Total biomass increases with higher nutrient load
- Too much nutrient load diminishes biodiversity and produces algae blooms
- Threshold between these conditions depends on bio-regional and hydrologic variables

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Recommendations from MDC and UMC

Lake Ecoregion	Chl-a (µg/L)	Secchi Depth (cm)
Plains	30	60
Ozark Border	22	70
Ozark Highlands	15	90

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Human Health Protection (HHP) and Secondary Contact Recreation (SCR)

- HHP: Insufficient data to establish relationship
- SCR: Assumption that risk is substantially lower than for WBC

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Reconciling Conflicting Designated Uses

- CWA: Water bodies must support their most sensitive use
  - Toxics: Use impaired when concentration exceeds tested thresholds
  - Nutrients are not the same as toxics (except for NH_3-N)

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Reconciling Conflicting Designated Uses

- AQL (Warm Water Habitat): “Waters in which naturally-occurring water quality and habitat conditions allow the maintenance of a wide variety of warm-water biota”
- In some Missouri Lakes, this is achieved with higher nutrient load than what is desirable for DWS or WBC.

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Use of Lake Classification to Determine NNC

- L1 – Drinking Water Supply
  - Max Chl-a limit = 10 µg/L
- L2 – Large Reservoirs
  - Variation from dam site to upper reaches
  - Possible Mechanistic Modeling
- L3 – Other Lakes
  - Prevailing use depends on WBC as an existing use

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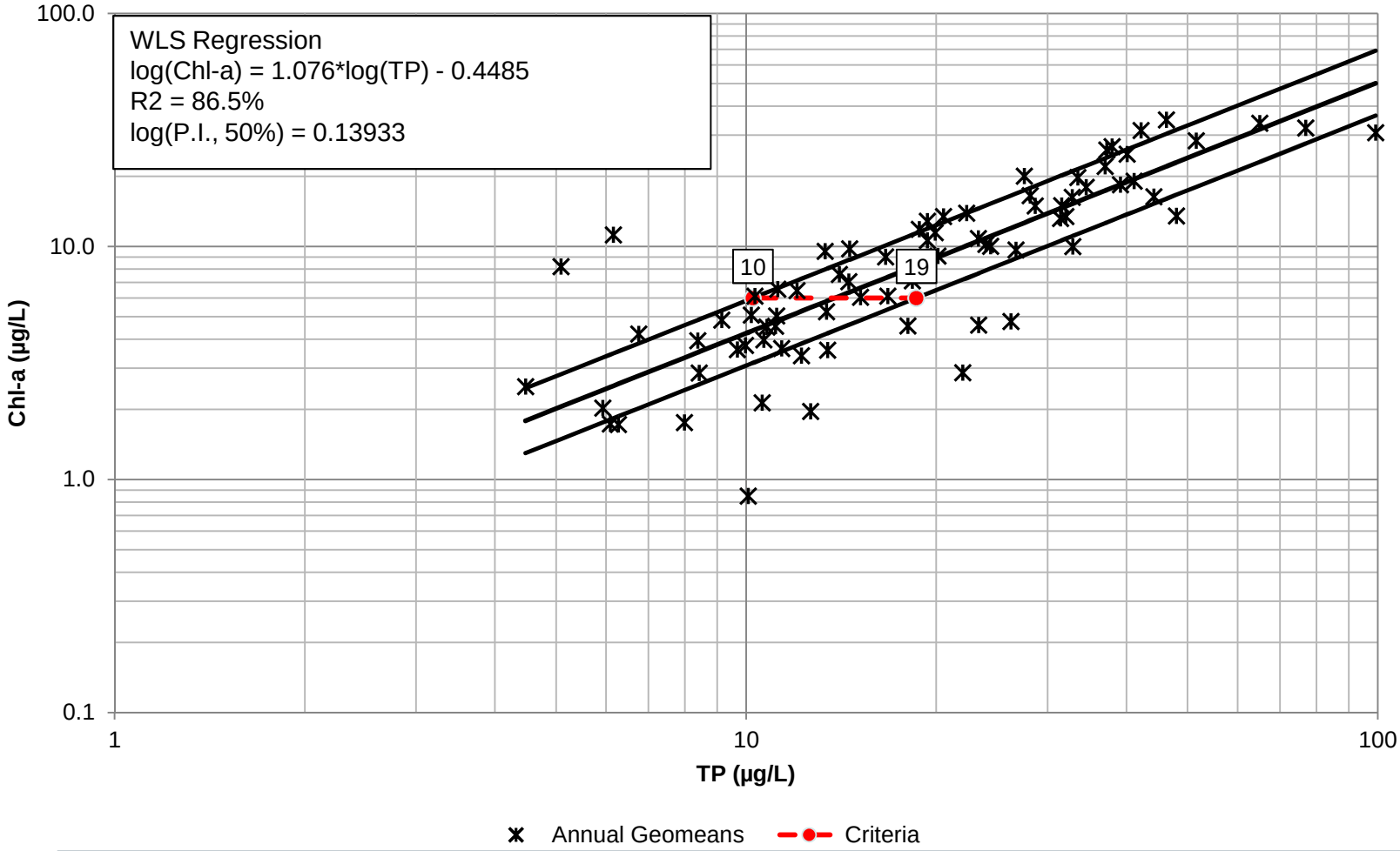
Criteria Calculation



Questions?