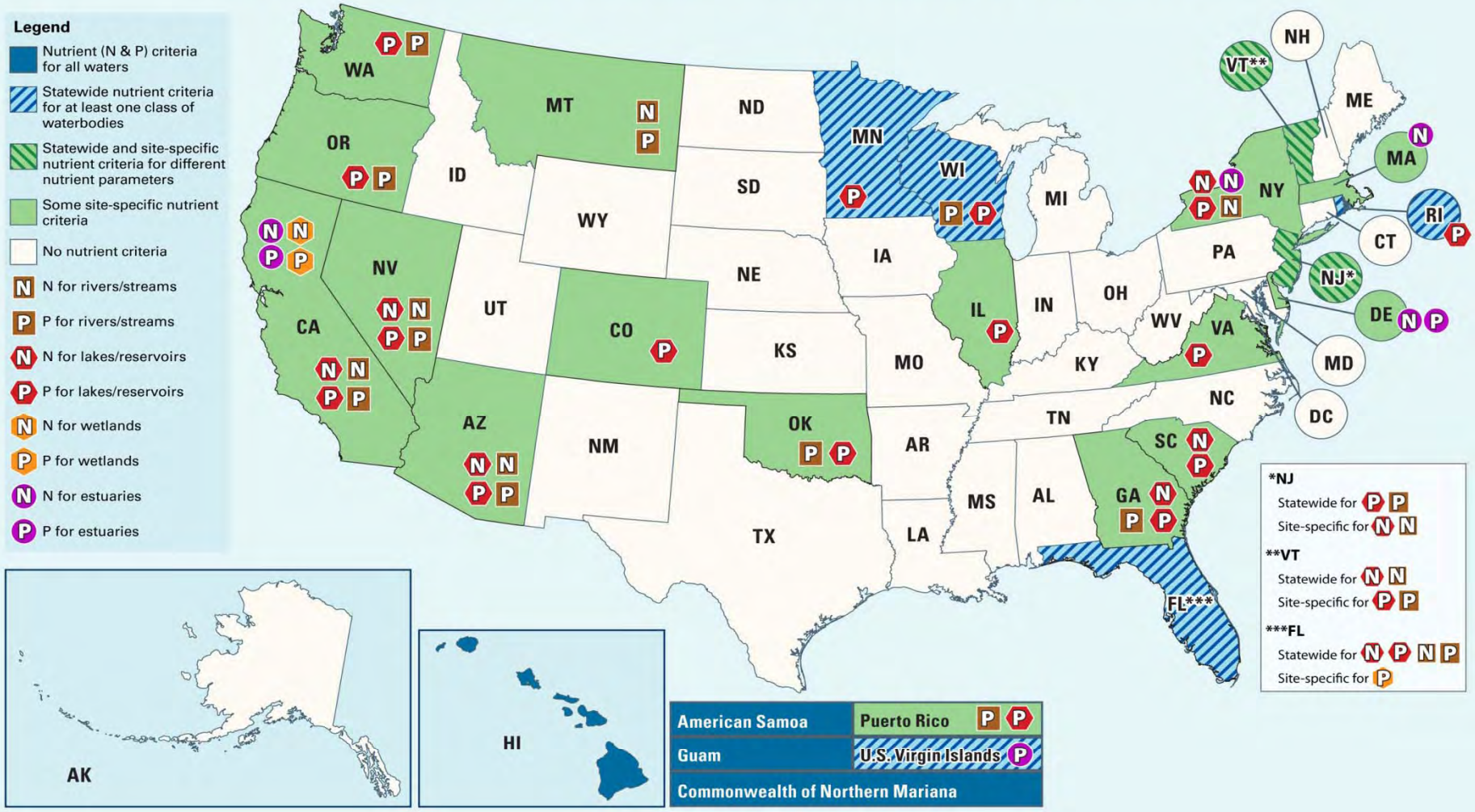
# Status of Numeric Nutrient Criteria Development

Dana Thomas, Ph.D.
EPA/OW/OST/HECD/Ecological and Health Processes Branch

# Progress Toward Clean Water Act Adopted Numeric Nutrient Criteria



# Statutory and Regulatory Framework

- CWA section 304(a)
  - EPA shall develop and publish criteria for water quality that accurately reflect the latest scientific knowledge
- 40 CFR part 131.11(a)
  - States must adopt water quality criteria that protect the designated use; these must be based on sound scientific rational
- 40 CFR part 131.10(b)
  - State water quality standards must provide for the attainment and maintenance of the water quality standards of downstream waters
- CWA section 303(c)
  - EPA must approve or disapprove new or revised State water quality standards; EPA can also make determinations whether new or revised standards are necessary

# Advantages of Numeric Nutrient Criteria

- Most States have narrative criteria
  - *"Nutrients shall not result in excess algal growth or other undesirable impacts (e.g., odor, scum)."*
  - *"In no case shall nutrient concentrations in a body of water be altered so as to cause an¡ mbalance¡ n natural populations of aquatic flora or fauna."*
- Numeric criteria are easier to implement for:
  - *Monitoring, Assessment and Listing (Impaired Waters List)*
  - *Pollutant Limits (NPDES permits)*
  - *Remediation (TMDLs)*
  - *Across watershed partnerships*

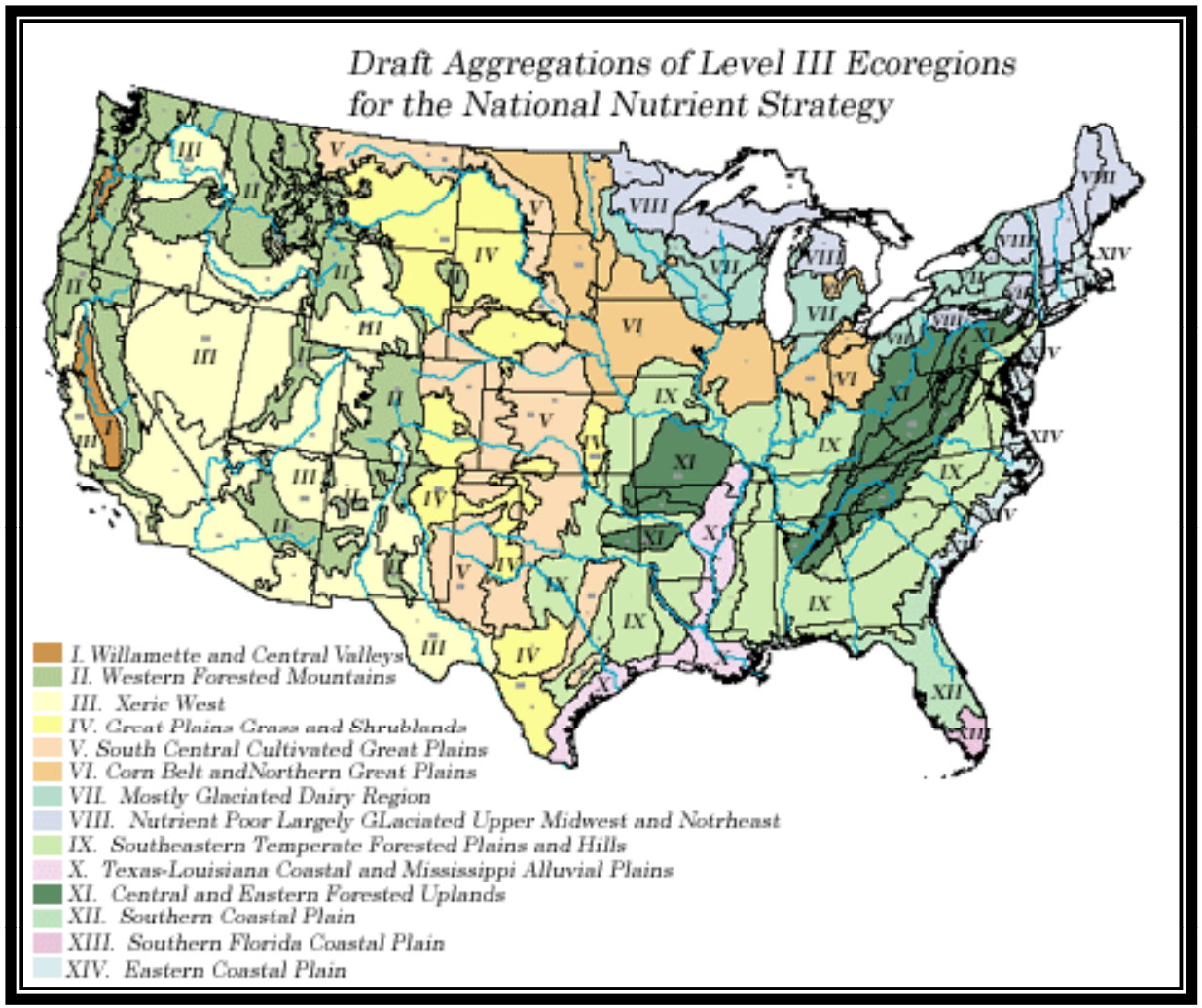
# EPA's National Nutrient Criteria Program

- 1998: National Nutrient Strategy
  - Created national and regional nutrient criteria programs
  - Emphasized science and creating technical capacity in developing numeric nutrient criteria
- Published Technical Guidance Manuals
  - Rivers/Streams - 2000
  - Lakes/Reservoirs - 2000
  - Estuaries and Coastal – 2001
  - Wetlands - 2007
  - Stressor-Response Approaches - 2010
- Published Nutrient Criteria Recommendations 2000-01
  - By Ecoregion: 13 Rivers/Streams, 12 Lakes/Reservoirs, 1 Wetland
  - Reference approach; Utilized ambient monitoring data

# EPA's National Nutrient Criteria Program

- 2001: OST policy memo
  - Requested that each State develop a plan to outline their schedule for adopting numeric nutrient criteria
  - States could prioritize waters (threatened or impaired)
  - States should consider impairment of downstream waters
    - 46 States have Mutually Agreed Upon Plans; 12 don't have schedules
    - Defined EPA's expectations for numeric criteria
- 2007: OW policy memo
  - Encouraged States to accelerate their efforts to adopt numeric nutrient criteria
  - Recommended that States focus first on high priority waters
  - Committed to providing direct assistance to States

# EPA's CWA 304(a) Ecoregional Criteria



# EPA's 304(a) 2000-01 Ecoregional Criteria Recommendations for Lakes and Reservoirs

| Parameter | II | III | IV | V | VI | VII | VIII | IX | XI | XII | XIII | XIV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP µg/L | 8.75 | 17.00 | 20.00 | 33.00 | 37.5 | 14.75 | 8.00 | 20.00 | 8.00 | 10.00 | 17.50 | 8.00 |
| TN mg/L | 0.10 | 0.40 | 0.44 | 0.56 | 0.78 | 0.66 | 0.24 | 0.36 | 0.46 | 0.52 | 1.27 | 0.32 |
| Chl *a* µg/L | 1.90 | 3.40 | 2.00 | 2.30 | 8.59 | 2.63 | 2.43 | 4.93 | 2.79 | 2.60 | 12.35 | 2.90 |
| Secchi (m) | 4.50 | 2.70 | 2.00 | 1.30 | 1.36 | 3.33 | 4.93 | 1.53 | 2.86 | 2.10 | 0.79 | 4.50 |

# EPA's 304(a) 2000-01 Ecoregional Criteria Recommendations for Rivers and Streams

| Parameter | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | XIV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP µg/L | 47.00 | 10.00 | 21.88 | 23.00 | 67.00 | 76.25 | 33.00 | 10.00 | 36.56 | 128.00 | 10.00 | 40.00 | 31.25 |
| TN mg/L | 0.31 | 0.12 | 0.38 | 0.56 | 0.88 | 2.18 | 0.54 | 0.38 | 0.69 | 0.76 | 0.31 | 0.90 | 0.71 |
| Chl *a* µg/L | 1.80 | 1.08 | 1.78 | 2.40 | 3.00 | 2.70 | 1.50 | 0.63 | 0.93 | 2.10 | 1.61 | 0.40 | 3.75 |
| Turbity FTU/ NTU | 4.25 | 1.30 | 2.34 | 4.21 | 7.83 | 6.36 | 1.70 | 1.30 | 5.70 | 17.50 | 2.30 | 1.90 | 3.04 |

# How to Derive Numeric Nutrient Criteria?

- Multiple approaches available
  - Classification
  - Reference Condition Approaches
  - Stressor-Response Approaches
  - Scientific Literature and Expert Judgment
  - Mechanistic Models
  - Multiple Lines of Evidence

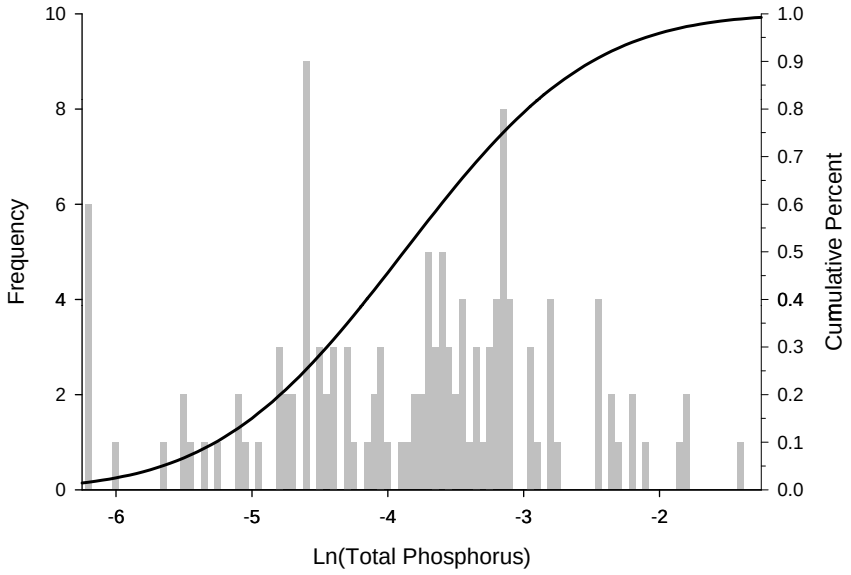
# Classification of Waters: Reduces Variability

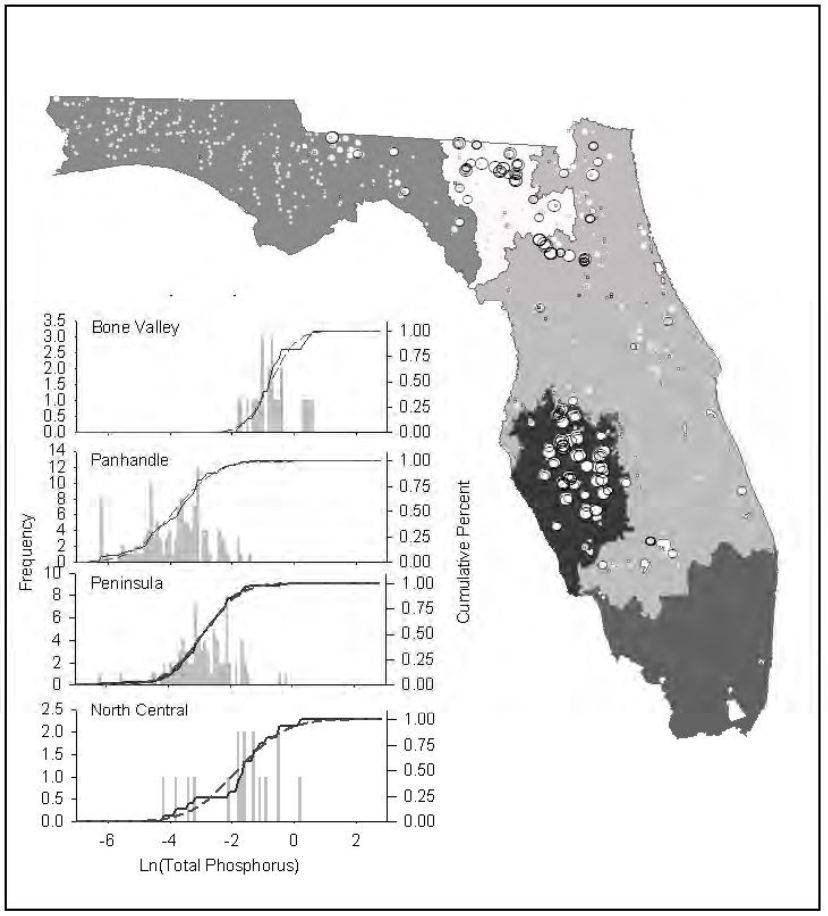
- Lakes
  - Designated Uses: recreation, potable water, fishing
  - Residence Time: long or short
  - Geochemical Factors: color, alkalinity
- Streams
  - Designated Uses:  warm or cold water fishery
  - Stream Order: wadeable, non-wadeable
  - Geochemical Factors: color, geology

# Reference Condition Approaches

- Use concentration data from selected Reference Waters
  - Similar waterbodies or historical condition of site
    - Paleolimnological information (indicators in sediment cores)
    - Historical data
    - Areas with minimal human disturbance in surrounding land use
    - Modeled reference conditions
- Select an upper percentile of the distribution of data to reflect the confidence that these reference sites are representative of conditions that support designated uses (guidance used 75$^{th}$ percentile)

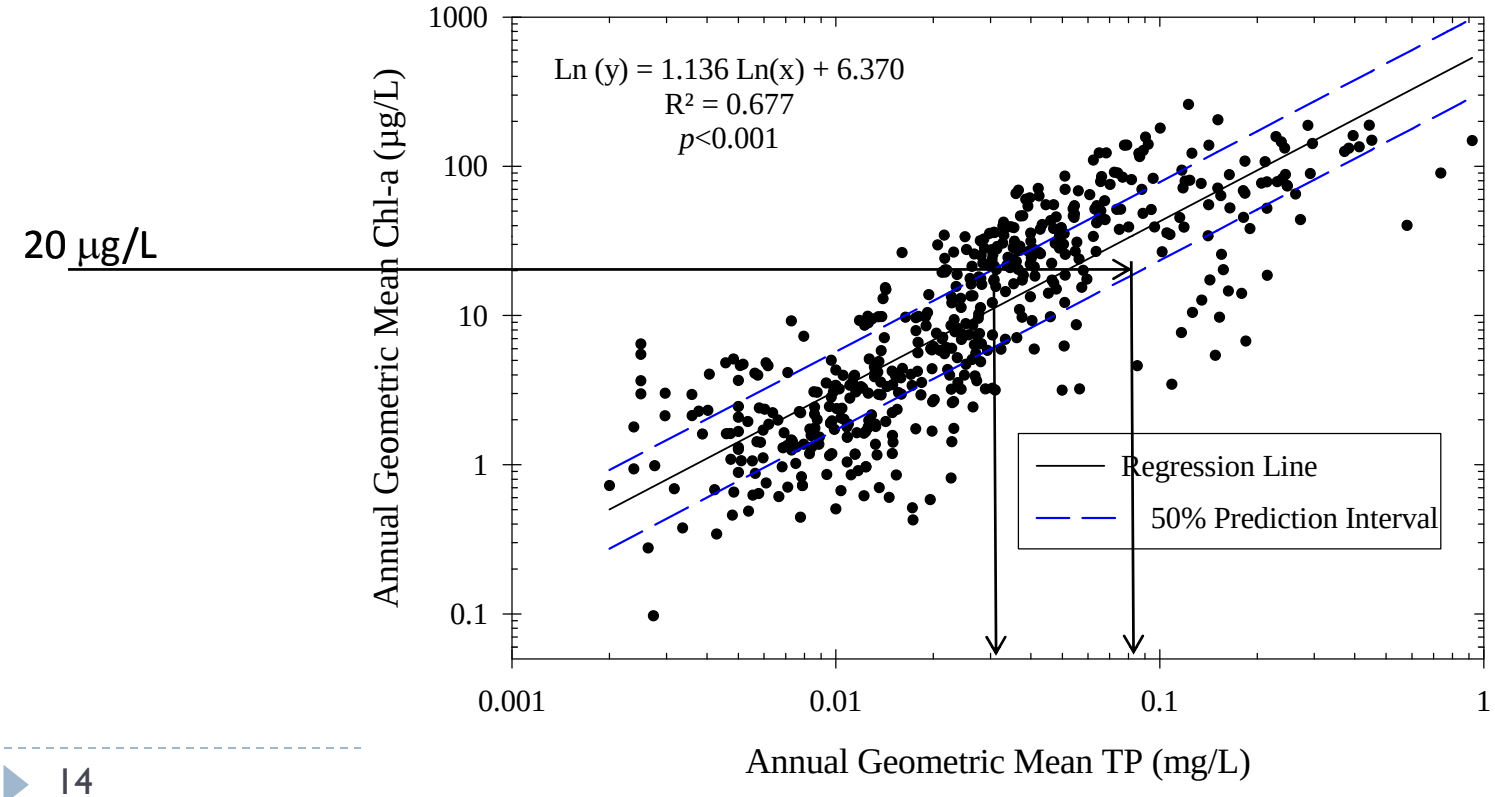
# Examples of Statistical Distributions



# Stressor-response Approaches

- Determine TN or TP criterion concentrations from prediction intervals of the regression with chl-a
- Need a target chl-a concentration



# Technical Approaches range in terms of level of complexity

- Scientific literature

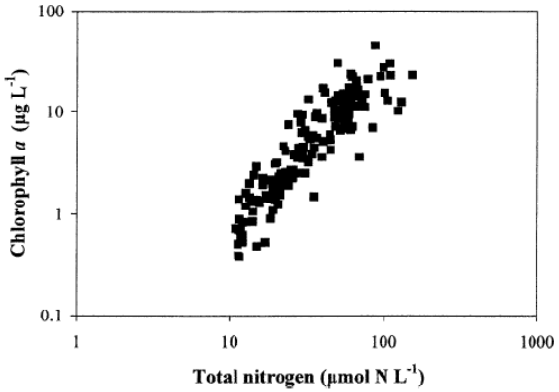



Fig. 1. Relationship between annual mean Chl *a* and annual mean TN concentrations in estuarine and coastal marine ecosystems.

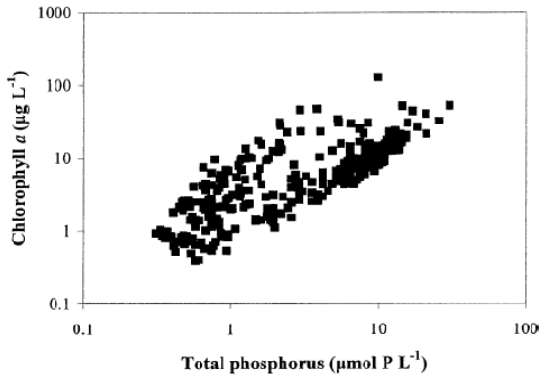
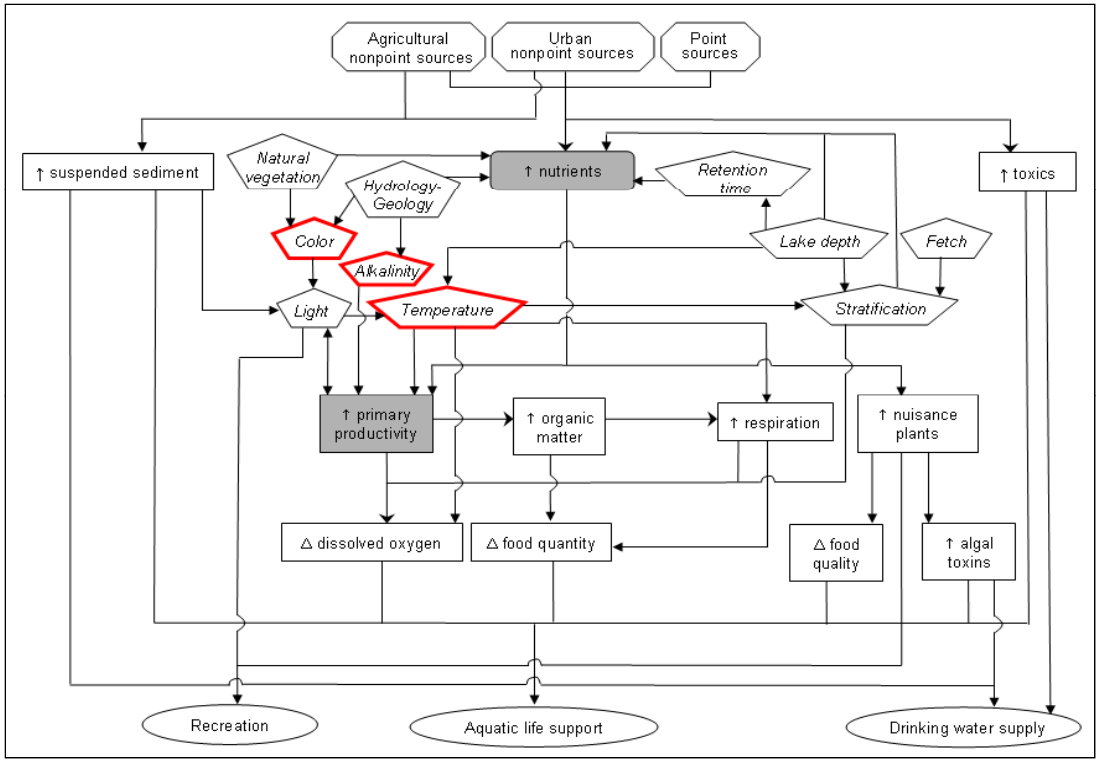
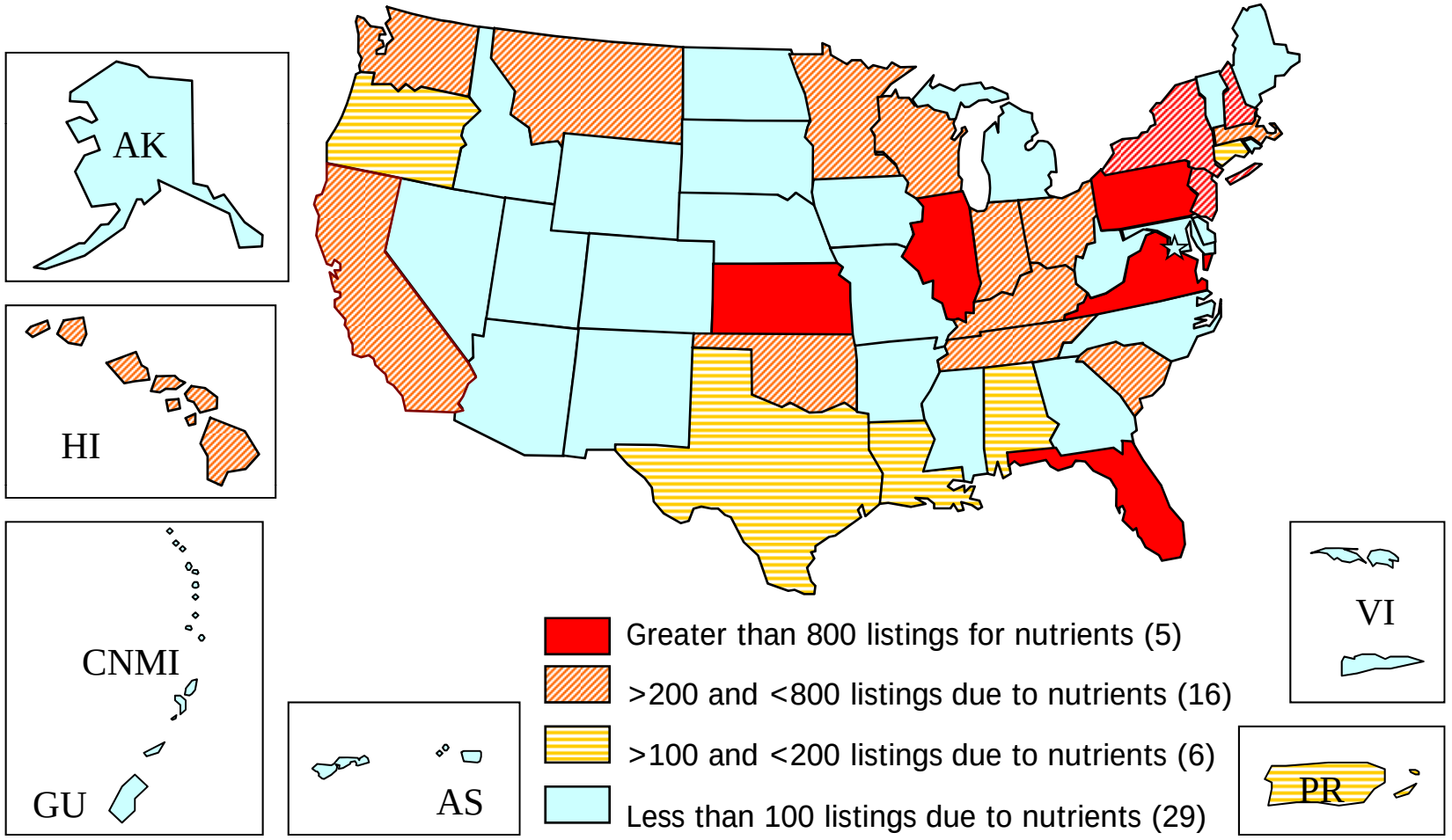



Fig. 2. Relationship between annual mean Chl *a* and annual mean TP concentrations in estuarine and coastal marine ecosystems.

- Mechanistic modeling

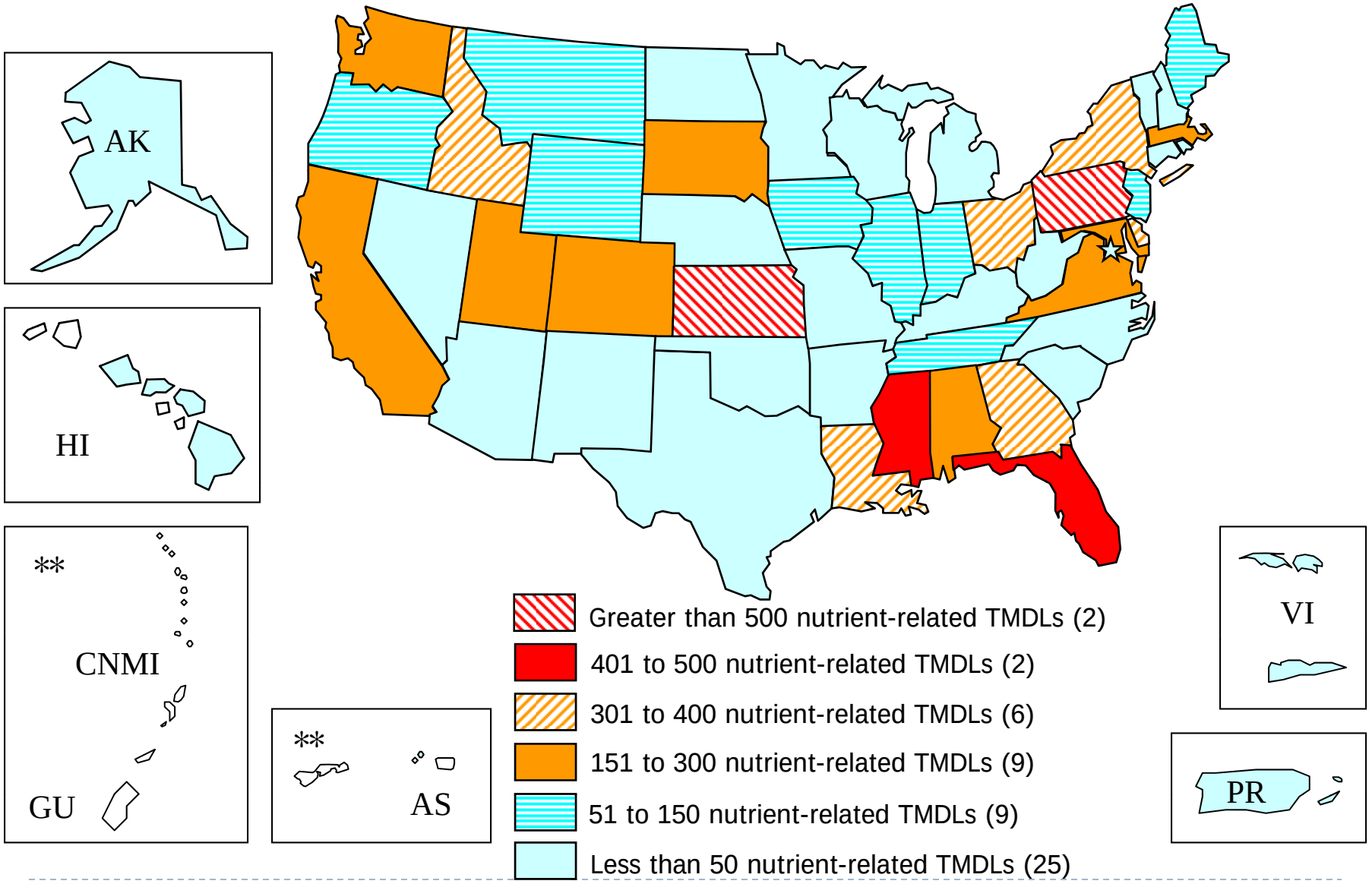


# CWA section 303(d) Listed Nutrient-related Impairments




**Based on information in Expert Query (ATTAINS) as of 10/23/2009. Of 75,675 impairments nationwide, 15,101 (20%) are due to nutrient-related defined as 'nutrients, organic enrichment/oxygen depletion, noxious plants, algal growth, and ammonia'. This data is based on the most recent 303(d) list data available in ATTAINS.**

# The number of nutrient-related TMDLs completed is very inconsistent from State to State






Based on information in Expert Query (ATTAINS) as of 01/14/2010. 7,261 TMDLs were nutrient-related. Nutrient-related is defined as 'nutrients, organic enrichment/oxygen depletion, noxious plants, algal growth, and ammonia'. ** CNMI, GU, and AS have no nutrient-related TMDLs

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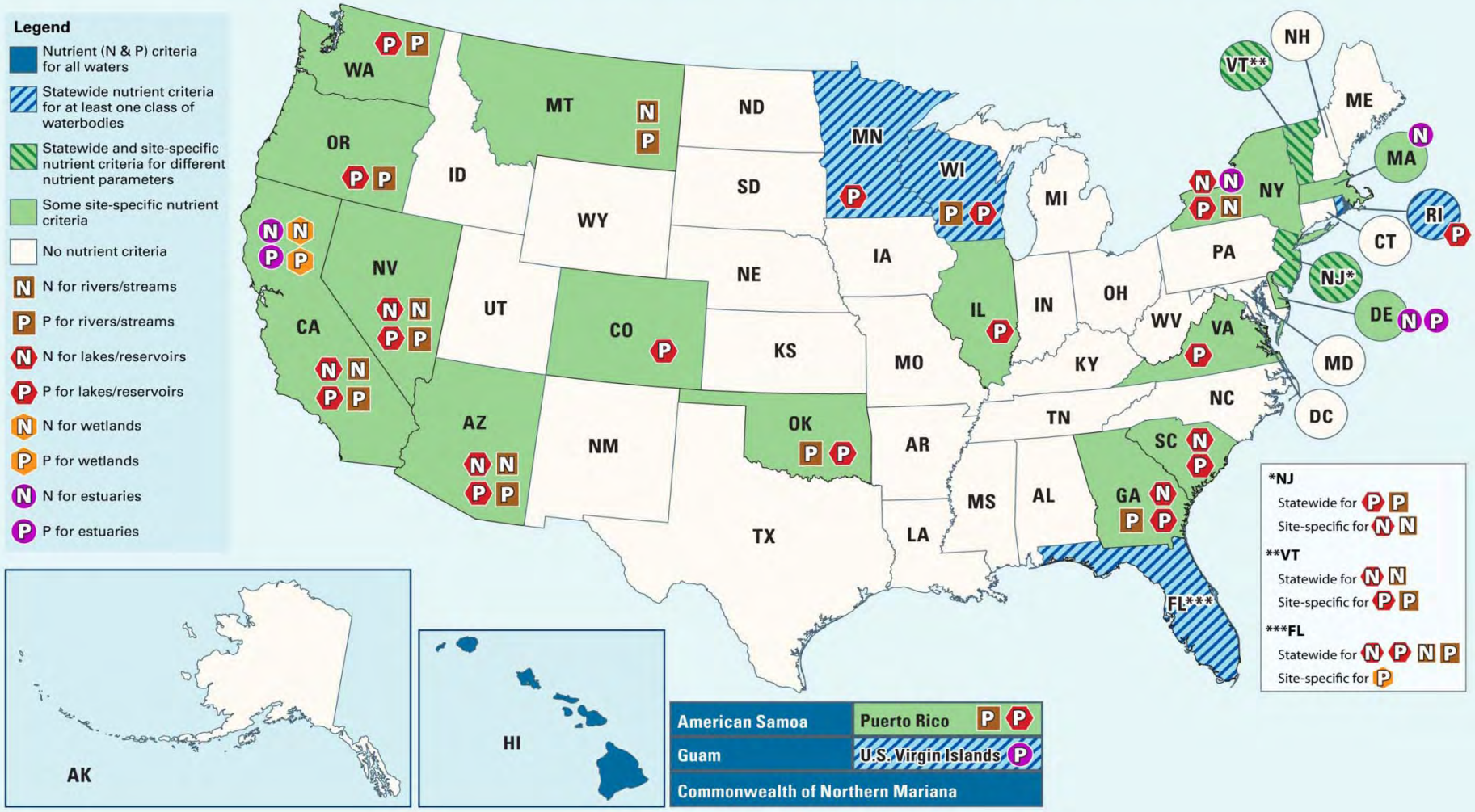

# 2009 Inspector General Report

- EPA Needs to Accelerate Adoption of Numeric Nutrient Water Quality Standards
  - States have been slow to adopt numeric nutrient criteria
  - EPA needs to ensure that States consider the impact of nutrient pollution on downstream waters in other States
  - EPA did not adequately monitor and measure program progress to support accountability
- Corrective Action Plan
  - Develop list of selection factors to prioritize States
  - Revise internal Program Activity Measures
  - Revise nutrient criteria website
  - Publish biennial Progress Reports

# Current Events

- Federal rulemaking effort in Florida
  - CWA section 303(c)(4)(B) determination that numeric criteria were needed for Class I, II and III lakes, streams, estuaries and coastal waters
  - Final numeric criteria were established in November 2010 for lakes and most flowing waters, effective March 2012
  - Second phase of rulemaking to establish numeric criteria for estuaries, coastal waters and southern inland flowing waters will be final in August 2012
- Federal TMDL for Chesapeake Bay in 2010
- Ongoing State Partnerships in Mississippi River Basin

# Litigation and Petitions

- Mississippi River Basin Petition – July 2008
  - For numeric criteria for all 50 States, or as a start the 10 stem states: MN, WI, IL, IA, MO, AR, KY, TN, MS, LA
  - Sierra Club Petition in support with 40,000+ signatures
- Notice of Intent to Sue
  - Wisconsin – Fall 2009
  - Kansas – Spring 2010
  - Missouri – Summer 2010
- NRDC petition to redefine secondary treatment

# Current Efforts to Support States

- Continuing to build technical capacity for criteria development
  - N-STEPS (Nutrient Scientific Technical Exchange Partnership and Support)
    - http://n-steps.tetratech.ffx.com/
    - Or just google, n steps
  - Analyzing State data sets
  - Peer reviews of State draft criteria
  - Webcasts on technical approaches
  - Online bibliography of scientific journal articles

# Questions?

- For more information:
  - http://water.epa.gov/scitech/swguidance/waterquality/standards/criteria/aqlife/pollutants/nutrient/index.cfm
  - Or just google, EPA Nutrients.