

Nutrient Criteria For Colorado's Waters

- Need and National Interest
- Water Quality Use Impacts
- Colorado Strategy
 - Lakes/Reservoirs
 - Rivers/Streams
- Implementation
 - Criteria and Standards
 - Source Control

Clean Water Act

- Water quality standards shall be adopted for substances that could reasonably be expected to interfere with those designated uses adopted by the State

Section 303(C)(2)(B)

Nationwide Effort Over the Last Decade

- Hypoxic (dead zone) in coastal waters
- Excessive enrichment of inland waters
- EPA's effort at identifying protective levels [304(a) Criteria] by Ecoregion in 2000-02
- State Efforts

Nutrient Enrichment - Water Supply Impacts

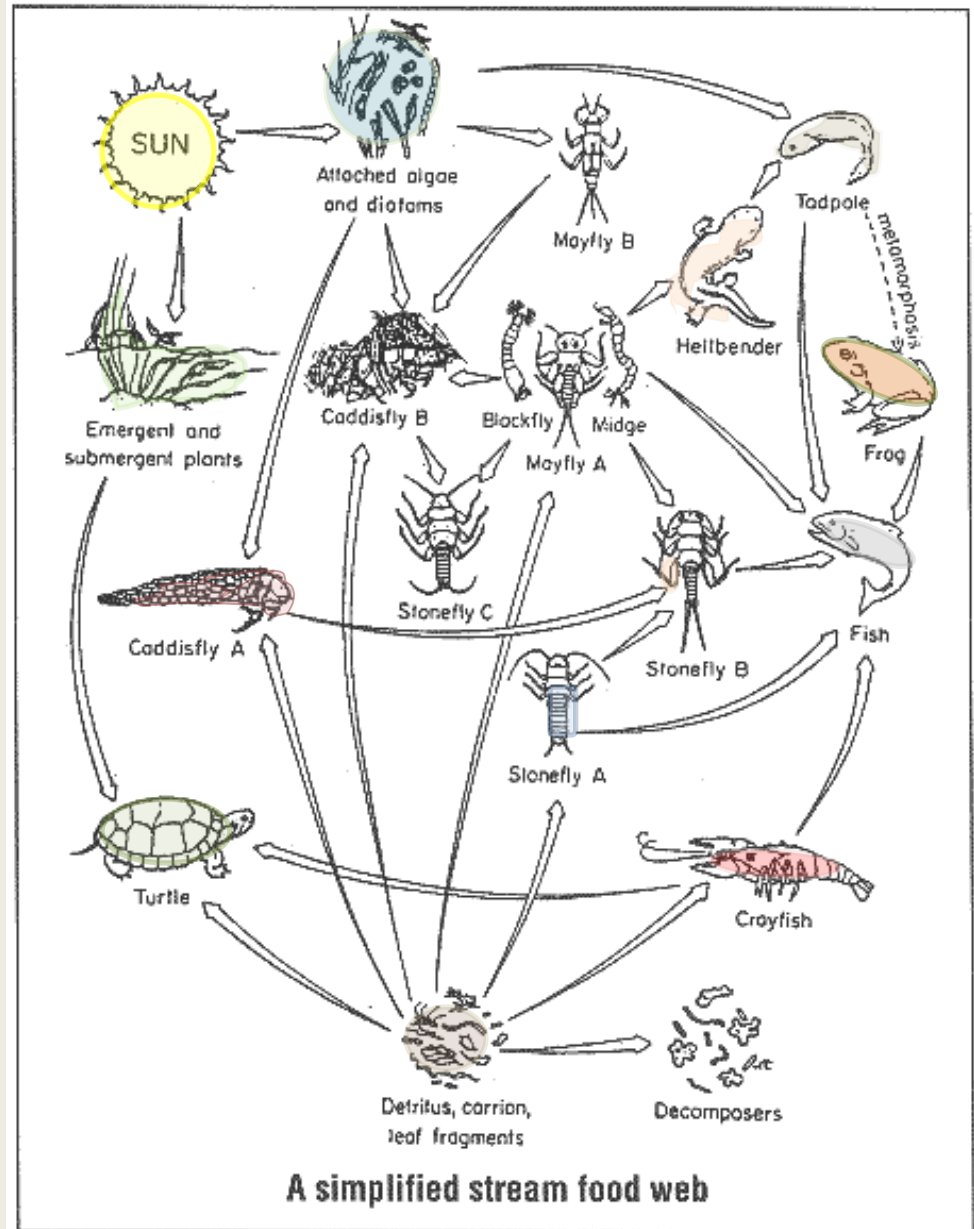
Water Supply

- Increased carcinogenic disinfection by-products
- Taste and odor



Nutrient Enrichment

– General aquatic life impacts



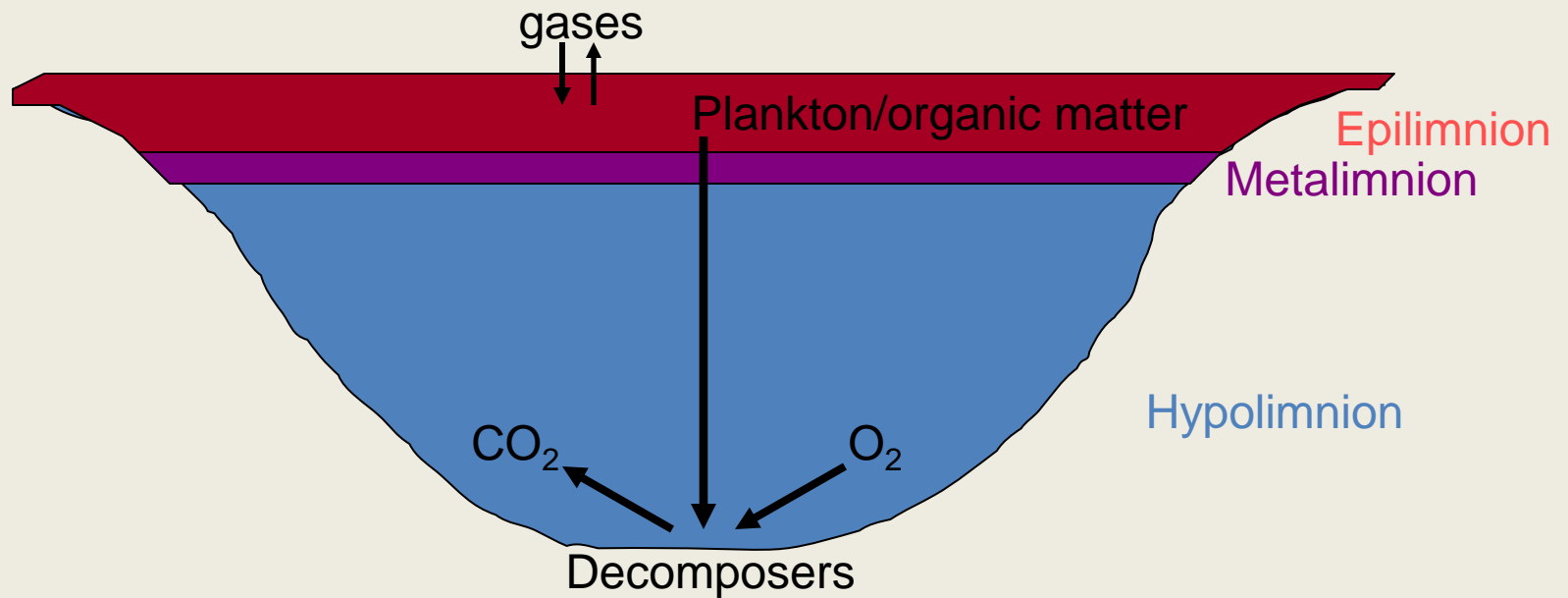
Nutrient Enrichment – Recreation and Aquatic Life Impacts

- Increased algae blooms
- Most noticeable in lakes and reservoirs
- Affects public perception
- Leads to severe reductions of dissolved oxygen in the bottom layers



Nutrient Enrichment

Lakes and Reservoirs Summer Stratification Process

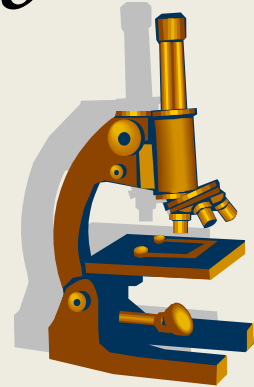


Nutrient Enrichment - Agricultural Use Impacts

- Impacts to water diversions
- Excessive attached vegetation

Colorado Strategy

- Criteria based on best possible science
- Implementation strategies that take into account cost of treatment, feasibility and environmental trade offs



Criteria Development Strategies

<i>Use Category</i>	<i>Lakes and Reservoirs</i>
<i>Aquatic Life</i> <i>Recreation & Aesthetics</i>	<i>Select Chlorophyll a level that balances:</i> <i>1) productivity of managed sport fisheries,</i> <i>2) sustainability of the aquatic community</i> <i>3) recreational and aesthetic values</i>
<i>Water Supply</i>	<i>Direct Use Water Supply Reservoirs:</i> <i>Chlorophyll a standard aimed at limiting the potential for disinfection by-product formation</i>

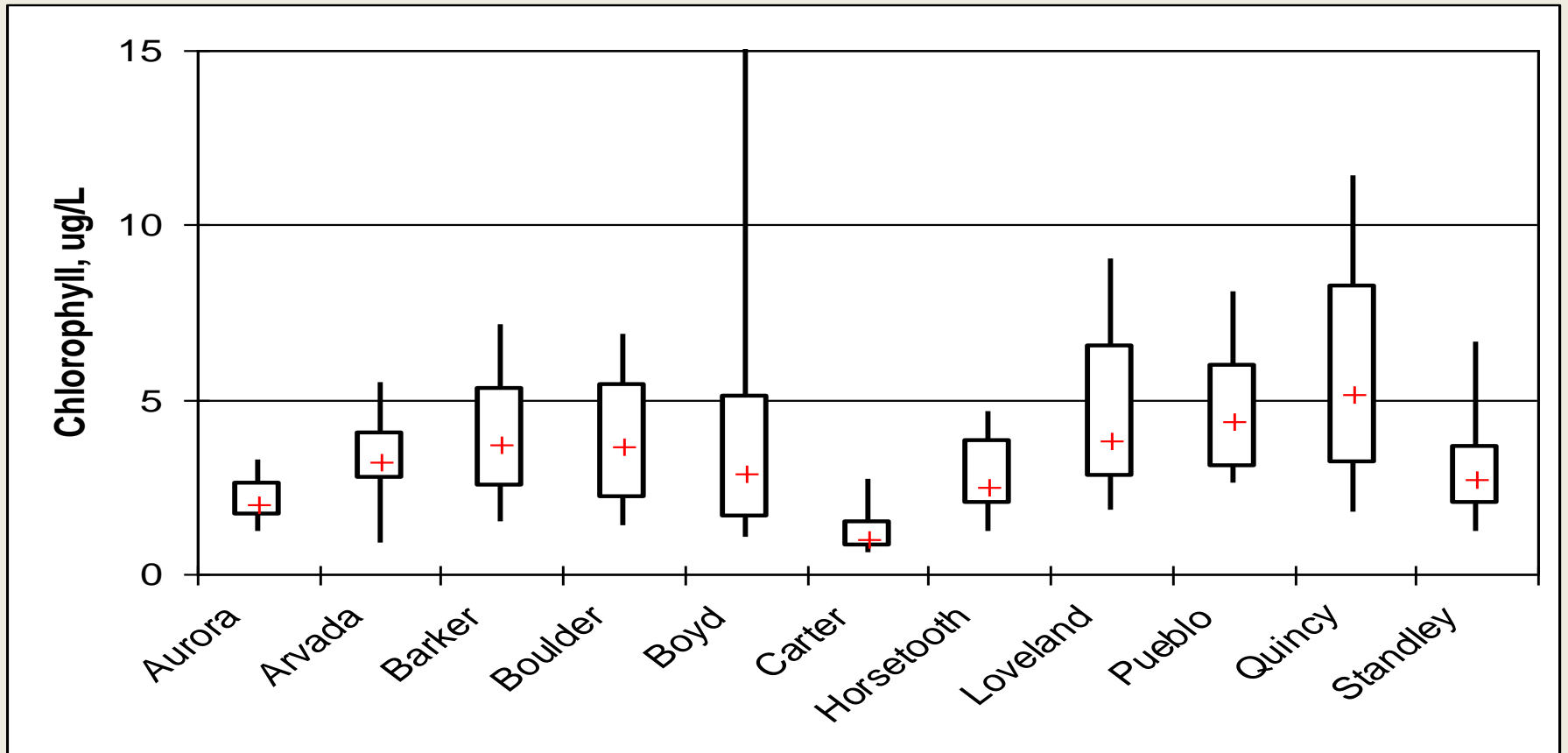
<i>Use Category</i>	<i>Rivers and Streams</i>
<i>Aquatic Life</i>	<i>N and P standards based on response of biological assessment measurements</i>
<i>Recreation & Aesthetics</i>	<i>Chlorophyll a standard based on user surveys done by other states.</i>
<i>Water Supply</i>	<i>Nothing at this time.</i>

Lakes and Reservoirs

Initial Methods

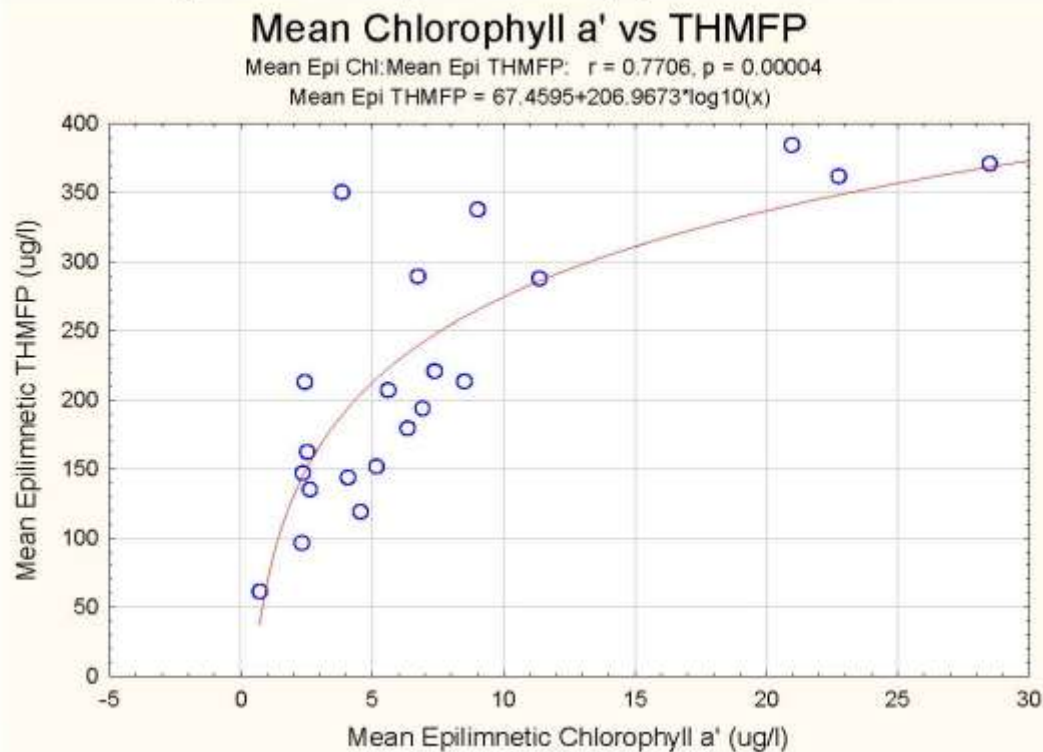
Trophic State (OECD)	Chlorophyll, ug/L	Secchi Depth, m
Oligotrophic	<2.5	>6
Mesotrophic	2.5 – 8	6 – 3
Eutrophic	8 – 25	3 – 1.5
Hyper-eutrophic	>25	<1.5

Front Range Reservoirs Summer Algal Abundance



Nutrient Enrichment High Quality Water Supply Reservoirs

Figure 3.8: Mean epilimnetic chlorophyll *a* verses THMFP



Initial Proposed Criteria Lakes and Reservoirs

Classification	Aquatic Life			High Quality Water Supply
	Chlorophyll (ug/L)	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Chlorophyll (ug/L)
Cold water biota	8	0.02	0.41	5
Warm water biota	20	0.08	0.85	
80th percentile of summer average				

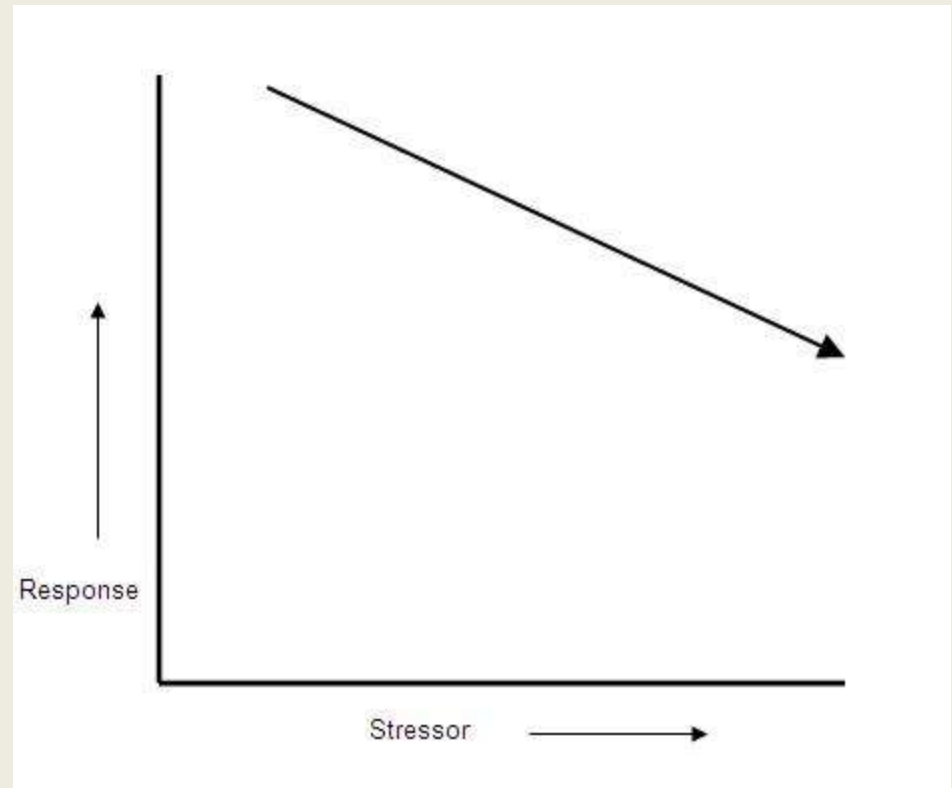
Nutrient Enrichment Rivers and Streams

- Proposed N and P standards based on response of biological assessment measurements.
- Multi-Metric Index (MMI) of biological condition using Macroinvertebrates



Stressor Response Relationship

- Increase stressor =>
Decrease response
- Stressor = Nutrients
 - TN and TP
- Response = Biological Condition
- Select threshold based on acceptable level of response



Revised Proposed Criteria Rivers and Streams

Classification	Aquatic Life		Recreation
	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)	Chlorophyll * (mg/m²)
Cold water biota	0.11	0.40	150
Warm water biota	0.16	2.0	
* attached algae			

Proposed Implementation Activities and Schedule

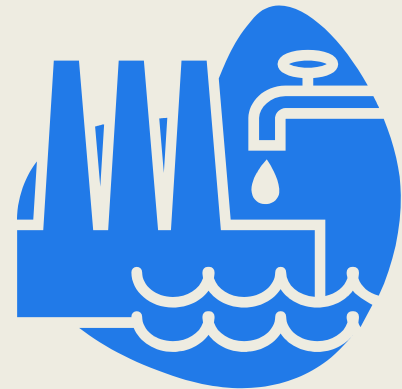
- Numerical Criteria
 - Lakes and Reservoirs
 - Rivers and Streams
- Implementation
 - Standards, Variances and Compliance Schedules
 - Phosphorus
 - Nitrogen
 - Stormwater Sources
 - Nonpoint Sources

Nutrient Numeric Criteria

- Lakes and Reservoirs
 - Aquatic Life and Recreation
 - High Quality Water Supply
- Rivers and Streams
 - Aquatic Life
 - Recreation

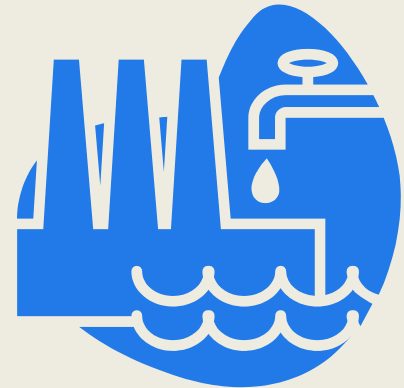
Implementation – Point Sources

- *New* Discharger Specific Variance Provisions
 - Limits of technology
 - Economics
 - Other consequences
- Site Specific Standards where needed
- Compliance Schedules



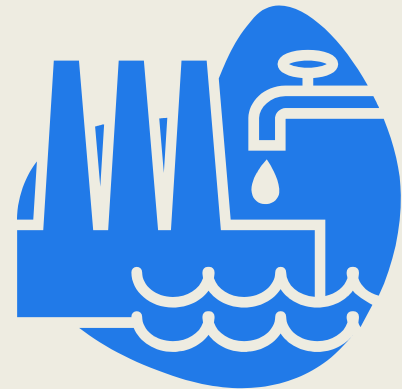
Implementation - Point Sources

- Phosphorus Control
 - “Limit of Technology”



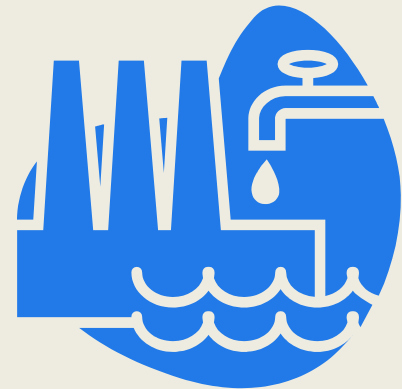
Implementation - Point Sources

- Nitrogen Control
 - “Limit of Technology”



Implementation - Point Sources

- Storm Water
 - No effluents limits unless impaired.

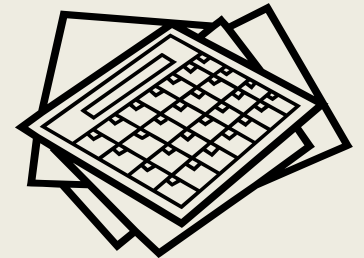


Implementation – Nonpoint Sources

- Nutrient loading source
- Future standards?
- Best Management Practices

Implementation Schedule

- WQCC Rulemaking Hearing - June 2011
 - Phosphorus effective **Jan 2012**
 - Basin by basin over next 4-yrs (2013-2016)
 - Nitrogen effective **Jan 2017**
 - Basin by basin over next 4-yrs (2018-2021)



Questions?

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