

Nutrients: WQ Standards and Permitting

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Effects of Excess Nutrients

- ▶ Phytoplankton algae in open water
- ▶ Attached algae; floating algae
- ▶ Rooted vegetation
- ▶ Aesthetic effects on recreation
- ▶ Water supplies: THM, taste & odor
- ▶ Aquatic-life: fisheries $\uparrow\downarrow$ habitat $\uparrow\downarrow$
D.O. at night \downarrow diversity \downarrow



WQ Standards: Now

Narrative Criterion [307.4(e)]:

“Nutrients ... shall not cause excessive growth of aquatic vegetation which impair an existing, attainable, or designated use.”



Nutrient Limits in Permits

▶ Total phosphorus:

>1.0 mg/L - ~ 6 permits

1.0 mg/L - ~ 39 permits

0.5 mg/L - ~ 7 permits

One with 0.15 mg/L TP

▶ Total nitrogen:

One issued, one proposed with 6 mg/L TN

One proposed with 8 mg/L TN



Why Have Nutrient Criteria?

- ▶ Assess monitoring data (impaired?)
- ▶ Evaluate proposed discharge permits
- ▶ Set targets for TMDLs
- ▶ Meet federal mandates



EPA Mandate for Nutrient Standards

- ▶ National strategy 1998
- ▶ EPA national criteria
- ▶ Streams, lakes/reservoirs, estuaries
- ▶ Based on historical monitoring data
- ▶ Criteria = 25th percentile for TP, TN,
or chlorophyll *a*



To Meet EPA TP Criteria

358 major discharges to Texas streams	TP criterion set at 25 th percentile	TP criterion = 0.05 mg/L
TP limit: mg/L	% of discharges	% effluent instream
None - .20	16%	0 - 25%
0.10 - 0.20	9%	26 - 50%
0.07 - 0.10	13%	51 - 75%
0.05 - 0.07	34%	76 - 99%
0.05	28%	100%



TCEQ Nutrient Criteria: Development

- Submit plans to EPA in 2001, 2006
- Convene advisory workgroup
- Reservoirs first, then streams & estuaries
- Develop separately for each reservoir
- Set on historical conditions in main pool
- Allow for variability – upper conf. interval
- Option 1: chlorophyll *a*
- Option 2: chl *a* plus TP, transparency



TCEQ Nutrient Criteria: Proposal

- ▶ Publicly proposed for 93 reservoirs
- ▶ Along with many other standards revisions
- ▶ Plus revisions of implementation procedures
- ▶ Comment period: 1/18/10 – 3/17/10
- ▶ Public hearing: 3/11/10
- ▶ Targeted adoption date: 7/14/10
- ▶ See hot items on TCEQ home page



Nutrient Criteria: Examples

Reservoir	Chl <u>a</u> ($\mu\text{g/L}$) Stand-alone	Chl <i>a</i> ($\mu\text{g/L}$)	TP (mg/L)	Transparency (meters)
Tawakoni	37.2	33.3	0.05	0.89
Eagle Mtn	25.4	23.0	0.07	0.80
Cedar Creek	30.4	27.8	0.07	0.80
Livingston	23.0	20.6	0.16	0.67
Lewisville	18.5	16.4	0.06	0.60
Houston	12.4	10.8	0.18	0.28
Travis	3.7	3.3	0.03	3.13



Permitting Procedures to Address Nutrients

In Proposed Standards Implementation Procedures
Applied to domestic permits – especially increases

Reservoirs – predict effects on “main pool”

Reservoirs – assess local impacts:

Apply site-specific screening factors:

- Level of concern – low, moderate, high
- “Weight-of-evidence”

Streams – assess local impacts: (as for reservoirs)



Reservoirs – Nutrient Criteria

Evaluating Discharges

Evaluate % increase predicted in TP in main pool:

- Estimate TP loading in discharge
- Apply simple, “whole-reservoir” model
- Predict % increase in TP conc.
- Relate increase in TP to chl *a*



Reservoirs – Local Screening Factors

- Size of discharge (quantitative)
- Distance from reservoir (quantitative)
- Sensitivity: water clarity (quantitative or qualitative)
- Sensitivity: observed vegetation responses
- Sensitivity: shading by brush and trees
- Consistency with similar permits (qualitative)
- Local dispersion, mixing (quantitative or qualitative)
- Impact on main pool (quantitative)
- Listed as a nutrient concern in WQ inventory?



Reservoirs – Local Impacts

Screening Factor Example: Water Clarity

<u>Concern level</u>	<u>Qualitative</u>	<u>Quantitative Secchi (m)</u>
Low	Turbid ...	< 0.75
Moderate	... not murky	0.76 to 1.27
High	... high transparency	> 1.28



Streams – Screening Factors

- Size of discharge (quantitative)
- Instream dilution (quantitative)
- Sensitivity: type of bottom (qualitative)
- Sensitivity: depth (qualitative)
- Sensitivity: water clarity (qualitative or quantitative)



Streams – Screening Factors

- Sensitivity: observations of aquatic vegetation
- Sensitivity: shading by tree canopy (qualitative)
- Streamflow sustainability (qualitative)
- Extent of pools and impoundments (qualitative)
- Consistency with other permits (qualitative)
- Listed as a concern in WQ Inventory?



Nutrients – Typical TP Limits

Proposed Standards Implementation Procedures:

<u>Permitted Flow (MGD)</u>	<u>TP Limit (mg/L)</u>
< 0.5	1.0
0.5 – 3.0	1.0 – 0.5
> 3.0	0.5



