





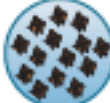
National Estuarine Eutrophication Assessment

NOAA's National Centers for Coastal Ocean Science

Eugene Wordenhoff 7.7.25

Survey of Estuaries

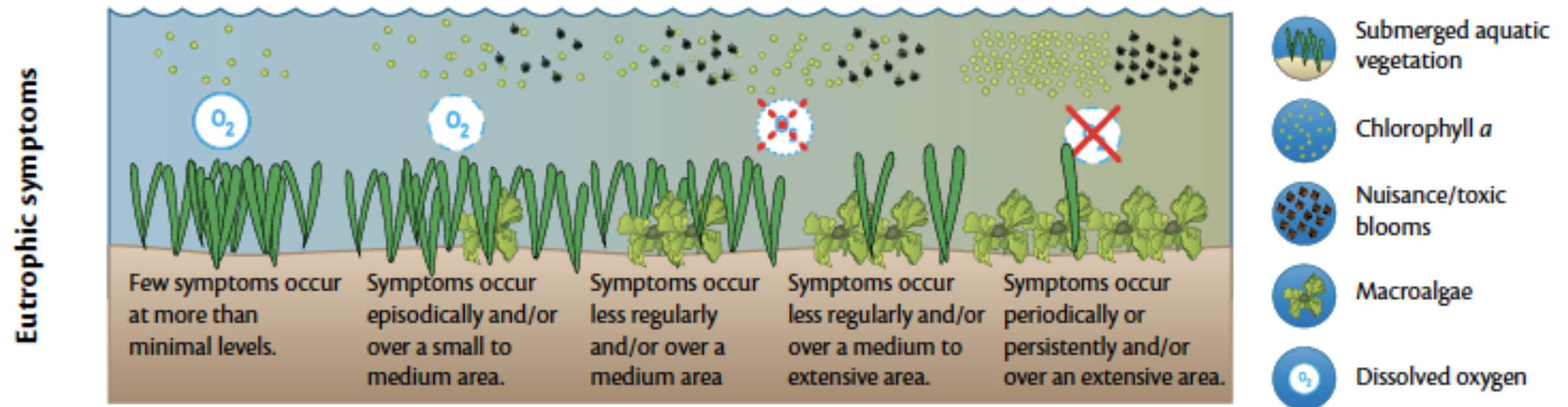
Ratings used in the NEAA Update

Symptom	Parameters	Expression								
		Low			Moderate			High		
Chlorophyll <i>a</i> (phytoplankton) 	Spatial coverage: High >50% Moderate 25–50% Low 10–25% Very low 0–10% Frequency: Episodic Periodic Persistent Typical high concentration ($\mu\text{g L}^{-1}$) in an annual cycle determined as the 90 th percentile value. Concentration: High >20 $\mu\text{g L}^{-1}$ Medium 5–20 $\mu\text{g L}^{-1}$ Low 0–5 $\mu\text{g L}^{-1}$	Low symptom expression: Conc. Coverage Frequency low any any medium mod. - v. low episodic high low - v. low episodic			Moderate symptom expression: Conc. Coverage Frequency medium high episodic medium moderate periodic high low - v. low periodic high moderate episodic			High symptom expression: Conc. Coverage Frequency medium high periodic high mod. - high periodic high high episodic		
Macroalgae 	Frequency of problem: Episodic (occasional/random) Periodic (seasonal, annual, predictable) Persistent (always/continuous) Causes a detrimental impact on any natural resource.	No macroalgal bloom problems have been observed.			Episodic macroalgal bloom problems have been observed.			Periodic or persistent macroalgal bloom problems have been observed.		
Dissolved oxygen 	Spatial coverage: High >50% Moderate 25–50% Low 10–25% Very low 0–10% Frequency: Episodic Periodic Persistent Typical low concentration (determined as the 10 th percentile value) in an annual cycle. State: Anoxia 0 mg L^{-1} Hypoxia 0–2 mg L^{-1} Biol. stress 2–5 mg L^{-1}	Low symptom expression: State Coverage Frequency anoxia mod. - low episodic anoxia very low periodic hypoxia low - v. low periodic hypoxia moderate episodic stress any episodic stress mod. - v. low periodic			Moderate symptom expression: State Coverage Frequency anoxia high episodic anoxia low periodic hypoxia moderate periodic hypoxia high episodic stress high periodic			High symptom expression: State Coverage Frequency anoxia moderate - high periodic hypoxia high periodic		
Submerged aquatic vegetation 	Magnitude of change: High >50% Moderate 25–50% Low 10–25% Very low 0–10% A change in SAV spatial area observed since 1990.	The magnitude of SAV loss is low to very low.			The magnitude of SAV loss is moderate.			The magnitude of SAV loss is high.		
Nuisance/toxic blooms 	Duration: Persistent, seasonal, months, variable, weeks, days, weeks to seasonal, weeks to months, or days to weeks Frequency: Episodic, periodic, or persistent Causes detrimental impact on any natural resources.	Blooms are either a) short in duration (days) and periodic in frequency; or b) moderate in duration (days to weeks) and episodic in frequency.			Blooms are either a) moderate in duration (days to weeks) and periodic in frequency; or b) long in duration (weeks to months) and episodic in frequency.			Blooms are long in duration (weeks, months, seasonal) and periodic in frequency.		

*For further technical documentation of the methods, refer to Bricker et al. 1999 and Bricker et al. 2003.

Overall Eutrophic Condition

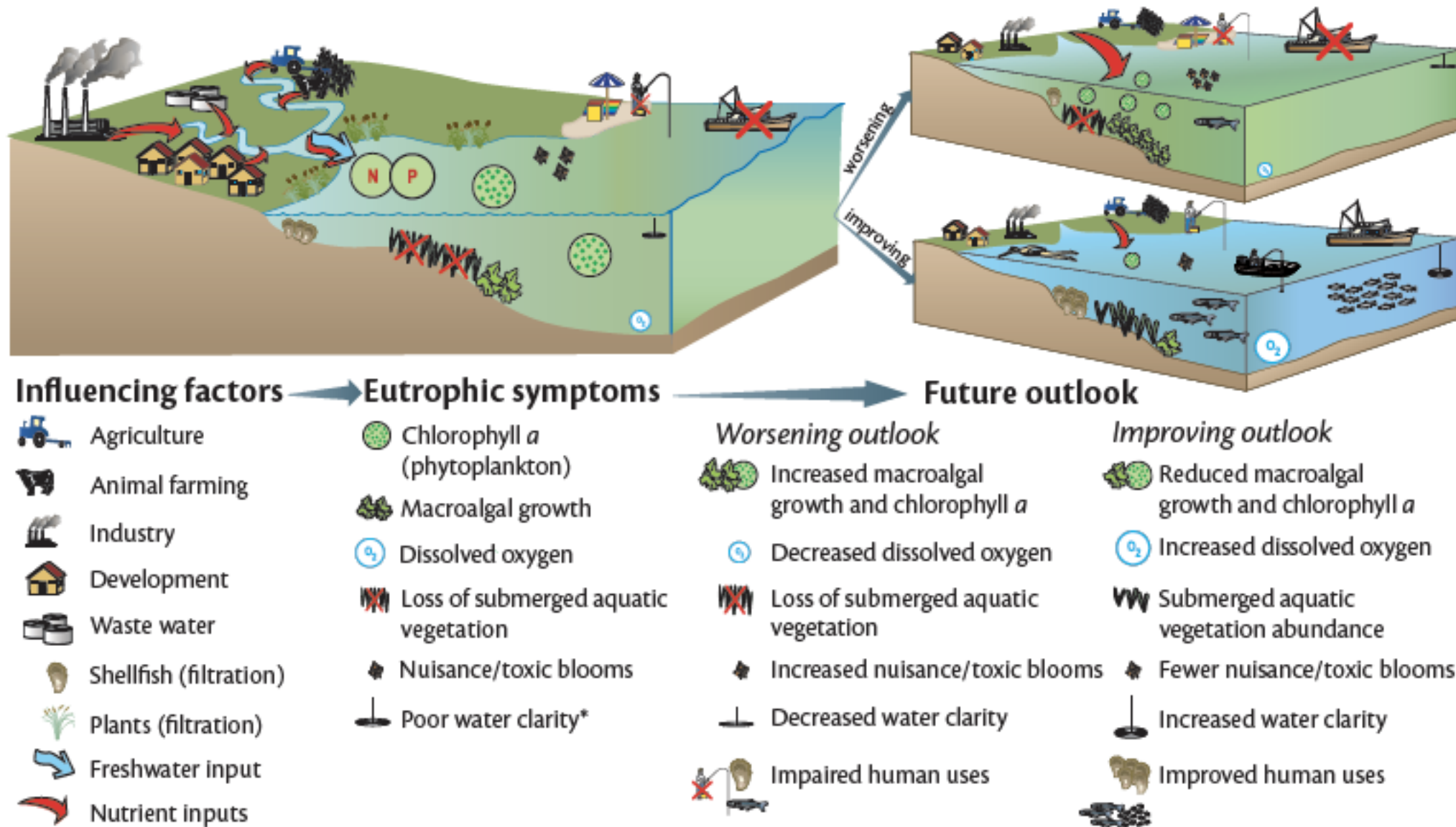
Evolution from Healthy to Eutrophic



Marco canals evolving to eutrophication

Overall Eutrophic Condition

Evolution from Healthy to Eutrophic








Marco outlook is worsening

Overall Eutrophic Condition

Evolution from Healthy to Eutrophic

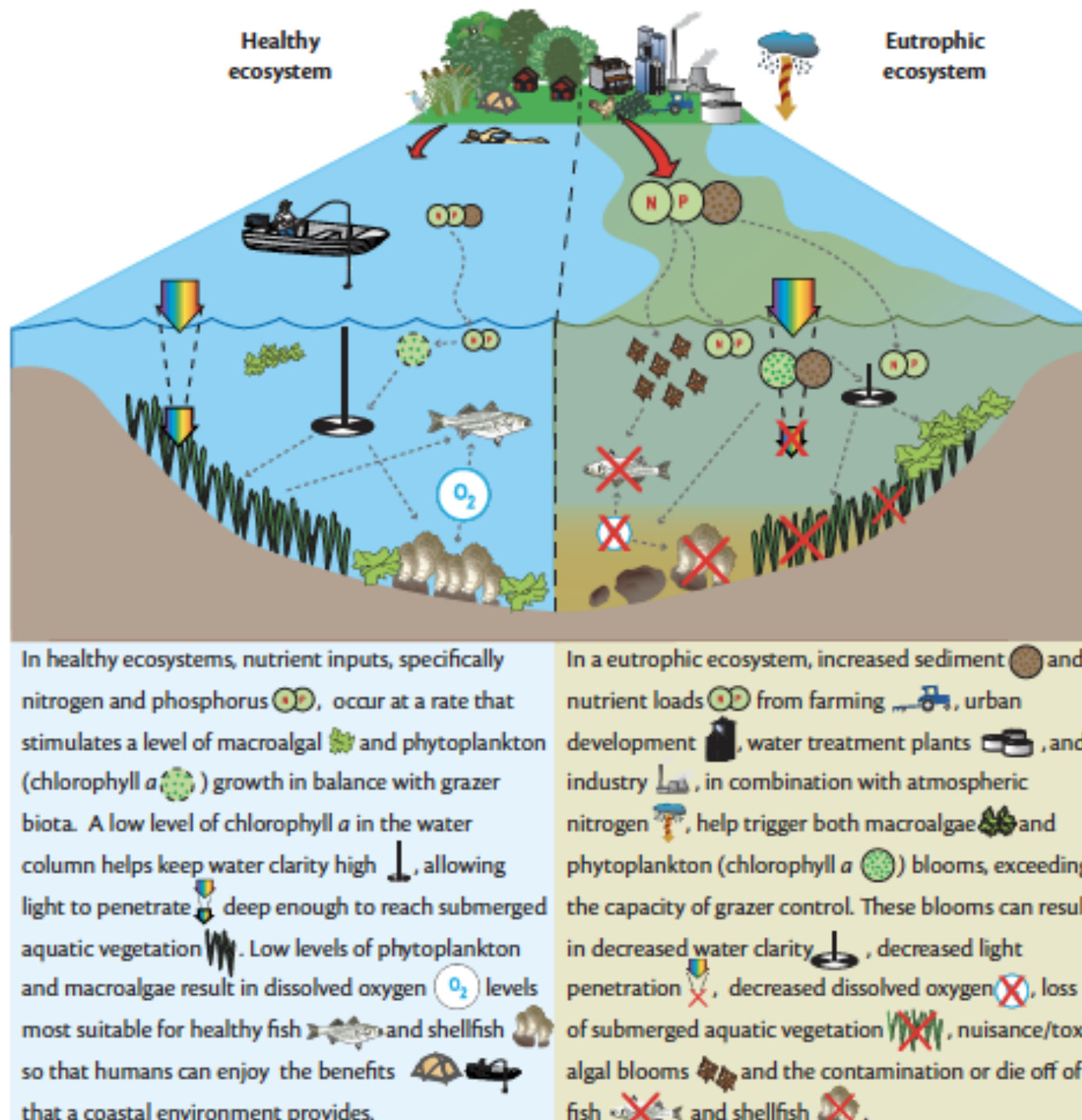
Figure 2.2. A description of the eutrophic symptoms included in this assessment.

Primary symptoms		Description
	Chlorophyll <i>a</i> (Phytoplankton)	A measure used to indicate the amount of microscopic algae (phytoplankton) growing in a water body. High concentrations can lead to low dissolved oxygen levels as a result of decomposition.
	Macroalgal blooms	Large algae commonly referred to as "seaweed." Blooms can cause losses of submerged aquatic vegetation by blocking sunlight. Additionally, blooms may smother immobile shellfish, corals, or other habitat. The unsightly nature of some blooms may impact tourism due to the declining value of swimming, fishing, and boating.
Secondary symptoms		Description
	Dissolved oxygen	Low dissolved oxygen is a eutrophic symptom because it occurs as a result of decomposing organic matter (from dense algal blooms), which sinks to the bottom and uses oxygen during decay. Low dissolved oxygen can cause fish kills, habitat loss, and degraded aesthetic values, resulting in the loss of tourism and recreational water use.
	Submerged aquatic vegetation	Loss of submerged aquatic vegetation (SAV) occurs when dense algal blooms caused by excess nutrient additions (and absence of grazers) decrease water clarity and light penetration. Turbidity caused by other factors (e.g., wave energy, color) similarly affects SAV. The loss of SAV can have negative effects on an estuary's functionality and may impact some fisheries due to loss of a critical nursery habitat.
	Nuisance/toxic blooms	Thought to be caused by a change in the natural mixture of nutrients that occurs when nutrient inputs increase over a long period of time. These blooms may release toxins that kill fish and shellfish. Human health problems may also occur due to the consumption of contaminated shellfish or from inhalation of airborne toxins. Many nuisance/toxic blooms occur naturally, some are advected into estuaries from the ocean; the role of nutrient enrichment is unclear.

Key eutrophic symptoms

Overall Eutrophic Condition

Evolution from Healthy to Eutrophic



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