Nutrient Criteria Framework
Endpoints Breakout Group

Fish-Shellfish-Macrobenthos Group

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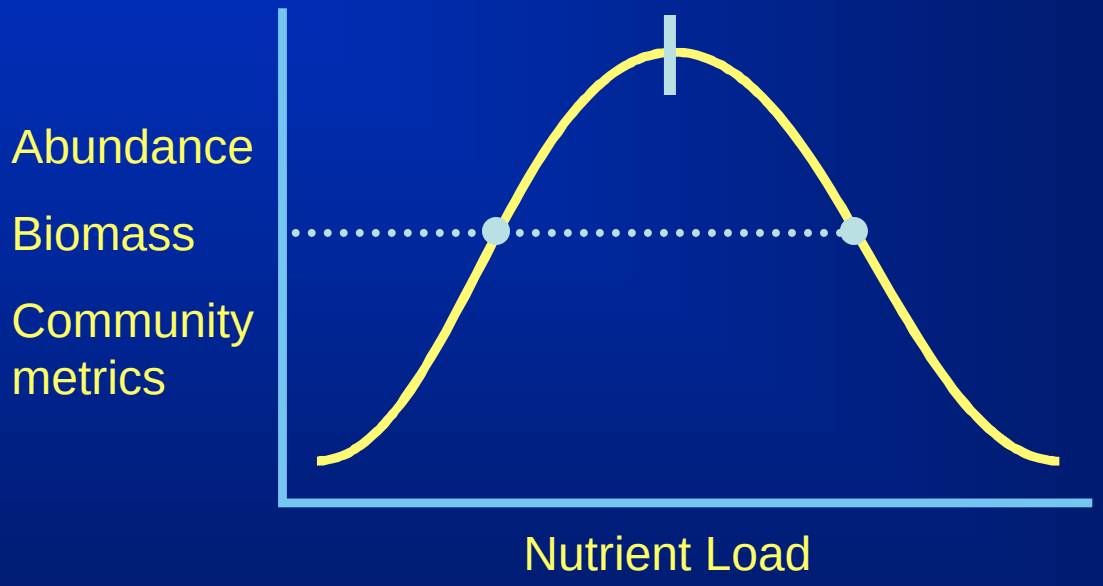
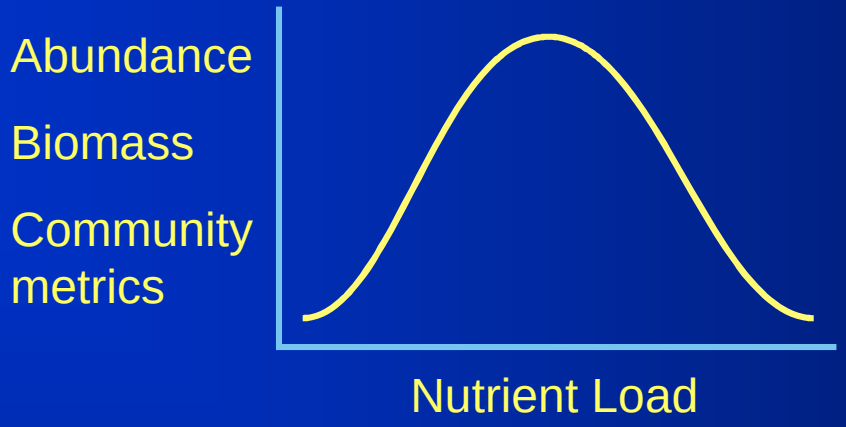
Overview:

Expected response to nutrient loading is non-linear, perhaps bell-shaped, where X is nutrient load and the endpoints Y are univariate (abundance, biomass) or multivariate (community structure).



The peak does not necessarily represent optimal or natural conditions.

A single observation could lie on either side of the peak.

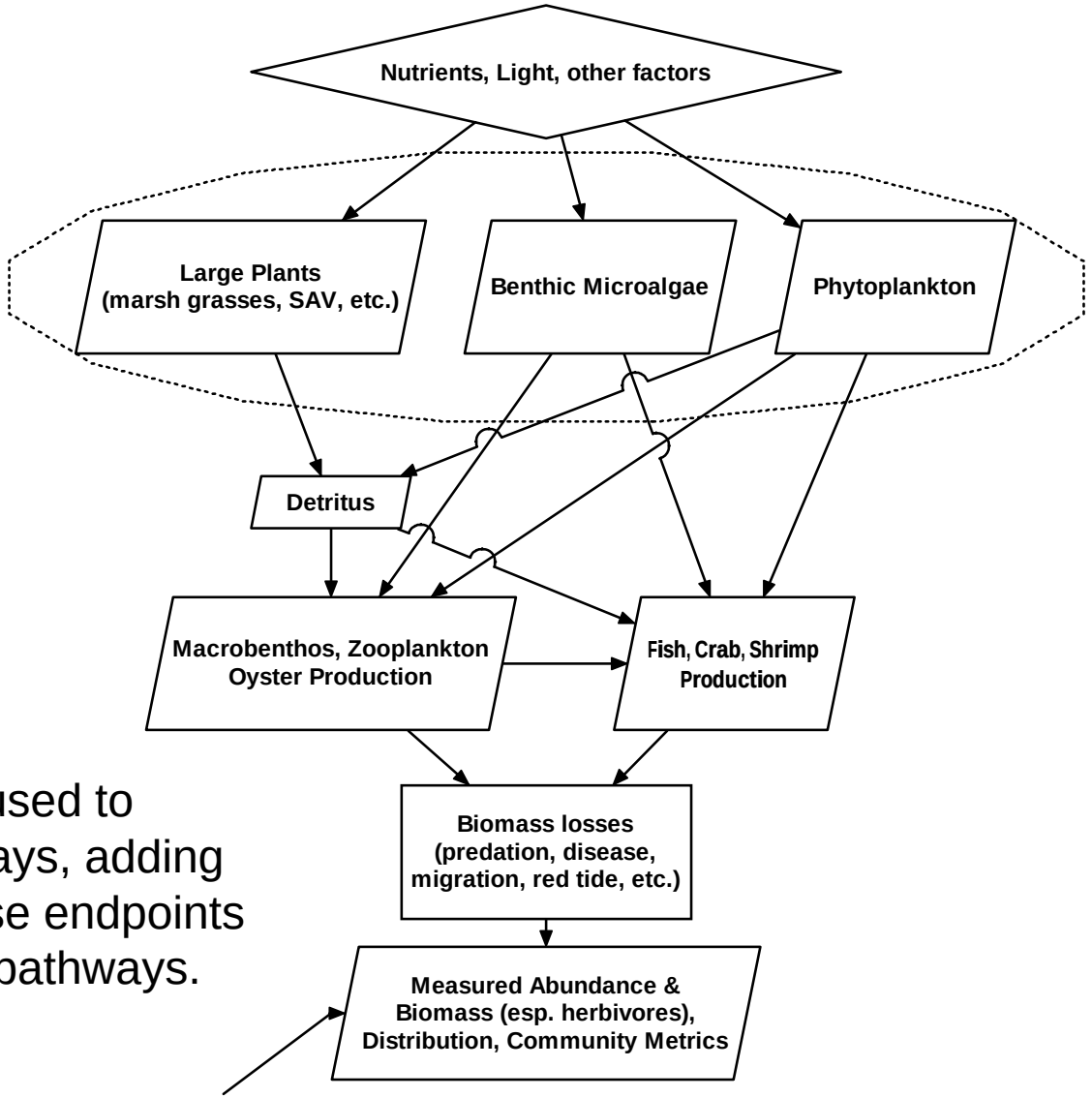


Mechanisms that Explain the Curve:

1. Enrichment/toxicity paradigms. These result in characteristics of a disturbed community, and we can identify those characteristics. An example is hypoxia effects.

2. Succession Theory. Disturbed communities have pioneer species (r-selected life history strategies, small, near-surface infauna, high abundances, low diversity) and undisturbed communities have climax species (k-selected, large, deeper dwelling infauna, low abundances, higher diversity - to a point).

Nitrogen Pathways

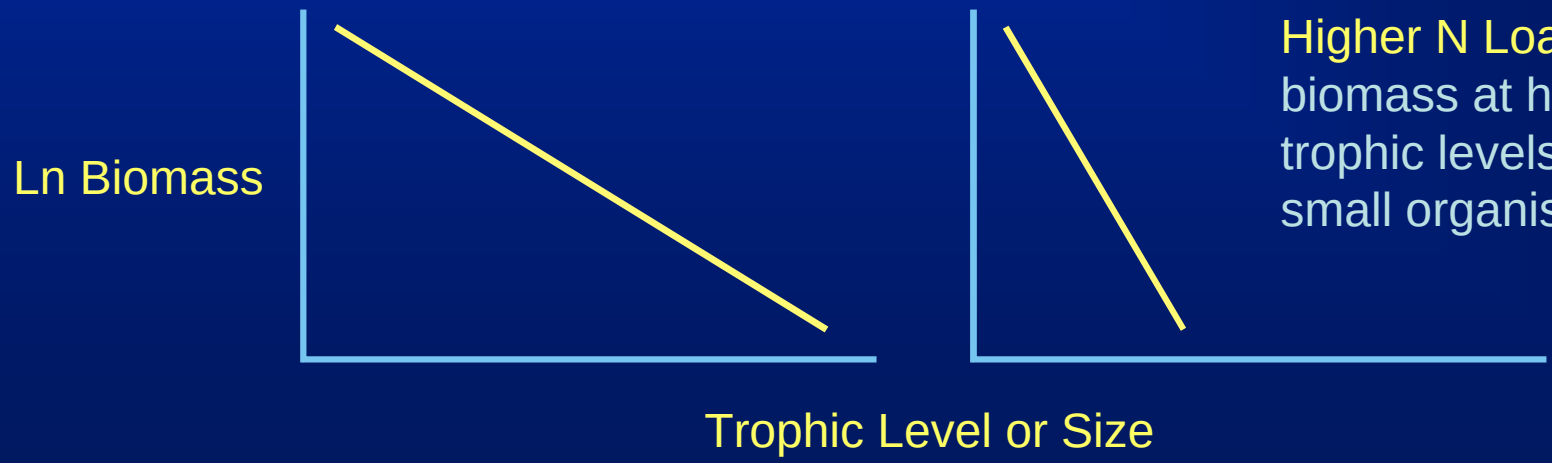


Stable isotopes can be used to identify dominant pathways, adding *defendable* value to those endpoints that fall along dominant pathways.

Fish-Shellfish-Macrobenthos Indicators:

No animals are directly linked to nutrients - the first link is with herbivores (i.e., mullet, oysters, zooplankton). Many benthic animals have limited mobility, are affected by deposition of phytoplankton and detritus, and integrate effects from the overlying water over long periods of time. The priority list of endpoints is:

1) Herbivore abundance and biomass
2) Macrobenthos and zooplankton community structure, abundance, distribution, biomass, and *biomass-spectrum slope* (graphs below).
3) Fish/shrimp/crab community structure, abundance, distribution, biomass, and biomass-spectrum slope.



Higher N Load: Less biomass at higher trophic levels (more small organisms).

Other Conclusions:

Community structure analysis . . .

1) Requires species-level data.

2) Is needed to identify regime shifts over time (these may occur even under constant loading conditions!)

3) Can be multivariate to identify degradation due to eutrophication, or can be univariate in an index-of-biotic-integrity approach (such indices are estuary-specific).

4) May include examination of community heterogeneity over space and time.

Faunal surveys should be included in the monitoring design.