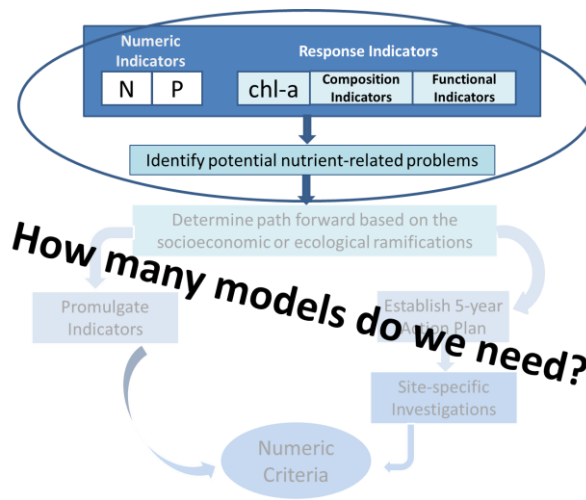


Ecological Classification Schemes

Why?

- Accounts for influence of natural environmental gradients (covariates) on linkages between nutrients and designated uses
- Creates “bins” or Groups of sites that allow for regional numeric criteria or indicators
- Reduces among site variation in background N & P concentrations or nutrient-related water quality indicators
- Makes interpretation of nutrient-related water quality indicators more precise by accounting for key covariates
- Increases the number of classes inherently provides more accurate sites description, but also decreases the utility of classification schemes as a communication and management tool



How?

A Priori Designations

- Often the starting point
- Based on well-established research that demonstrates fundamentally different biological responses to nutrients along natural environmental gradients
- Develop sampling plan with classification schemes in mind.

Empirical Categorization

- Examine distributions of nutrients concentrations among reference sites
- Work backward from models that relate biological or functional indicators of eutrophication to [N] or [P]
 - A useful classification scheme will improve these relationships
- Sometimes these analyses provide insight into situations where regional relationships are particularly inaccurate (or accurate)
 - This distinction could help weight the confidence placed in regional N & P or response indicators

Common Classification Schemes

Comment [JDO1]: Note: We could conduct cursory evaluations of several of the measures proposed in this section before our meeting.

Major Classes of Flowing and Flat Waters

- i.e., lakes, streams, rivers, wetlands, and Great Salt Lake
- **Almost always important for creating nutrient criteria and related programs**
- Excessive nutrients causes very different effects in lakes and streams
- Sometimes sub-categorization to refine major classes, for instance:
 - Large vs. small streams (e.g., Montana) wadeable vs nonwadeable
 - Mountain vs. valley streams (e.g., Colorado)
 - Lake Acidity or Clarity (e.g., Florida)
 - Others?

Natural Environmental Gradients

Pre-existing Geographical Classifications

- i.e., Ecoregions, watersheds. Others?
- To date, these have not been strong classes in Utah

Cold-water vs. Warm-water Fishery

- Major ecological distinctions
 - Although there are many transitional cool-warm waters that are difficult to categorize.
- Direct tie to current uses

Streams

- **Slope**
 - i.e., high vs. low gradient, mountain vs. valley
 - Slope is often correlated to human activities and sources of nutrients (people like to farm and live on flat ground).
 - Determines substrate characteristics & bed stability,
 - Affects residence time
 - Could use DEMs and GIS so that we would not have to rely on field measures
- **Underlying Lithology**
 - Particularly important for phosphorous
- **Channel Shading**
 - Affects how primary production responds to nutrients
 - Among-stream variance is both natural and human-caused, which can be difficult to decouple
- **Others?**

Lakes and Reservoirs

Comment [JDO2]: Almost all of our data are from reservoirs not lakes

- **Temperature**
 - Particularly important to distinguish between lakes that stratify and lakes that don't
 - Use elevation and/or size and/or depth as surrogate?

- **Residence Time**
 - Important but often unknown
 - Size as surrogate?
- **Clear vs. Colored** (see Florida report)
 - Not clearly defined in Utah
- **Reservoir vs. Lake**
 - While dams are clearly human-caused, it may be prudent to consider these classes independently
 - Permitted under Clean Water Act due to permanent/irreversible hydrological modifications
 - Reference conditions reservoirs do not exist
 - Many natural lakes have smaller water control structures, difficult to classify
 - Drainage vs seepage lakes

Important Considerations

- If these classes are going to be used to create different numeric criteria, they must be scientifically defensible
 - This would absolutely be part of EPA's review and approval process
 - Perhaps less rigor will be acceptable if numeric are "indicators"?
- It can be easier to account for environmental gradients (covariates) continuously than by creating classification bins
 - This is much easier to do with response indicators(assessments) than numeric indicators
- Water quality based criteria must provide reasonable assurance that they are protective of existing uses
 - In nearly all cases this means that "approvable" criteria range from really low to really low (at least from the perspective of POTWs)
 - Following the standards setting process, other areas of nutrient-reduction rules need to define reasonable implementation processes; this will be part of the management classification scheme discussion

Proposal

- Look into whether the following classification scheme needs to be further refined:
 - Lakes/Reservoirs
 - Rivers/Streams
- Postpone (Second Phase of Nutrient Work)
 - Great Salt Lake
 - Wetlands
- Forward the following to the workgroup next week:
 - "Refined" background documents
 - Specific examples developed elsewhere (i.e., Florida, CO, Montana)

- A proposal of analyses that we can conduct prior to our next meeting
- Request comment on our proposed approach, particularly materials that we could develop to guide our discussion about whether further classifications are warranted