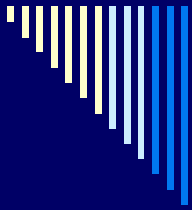


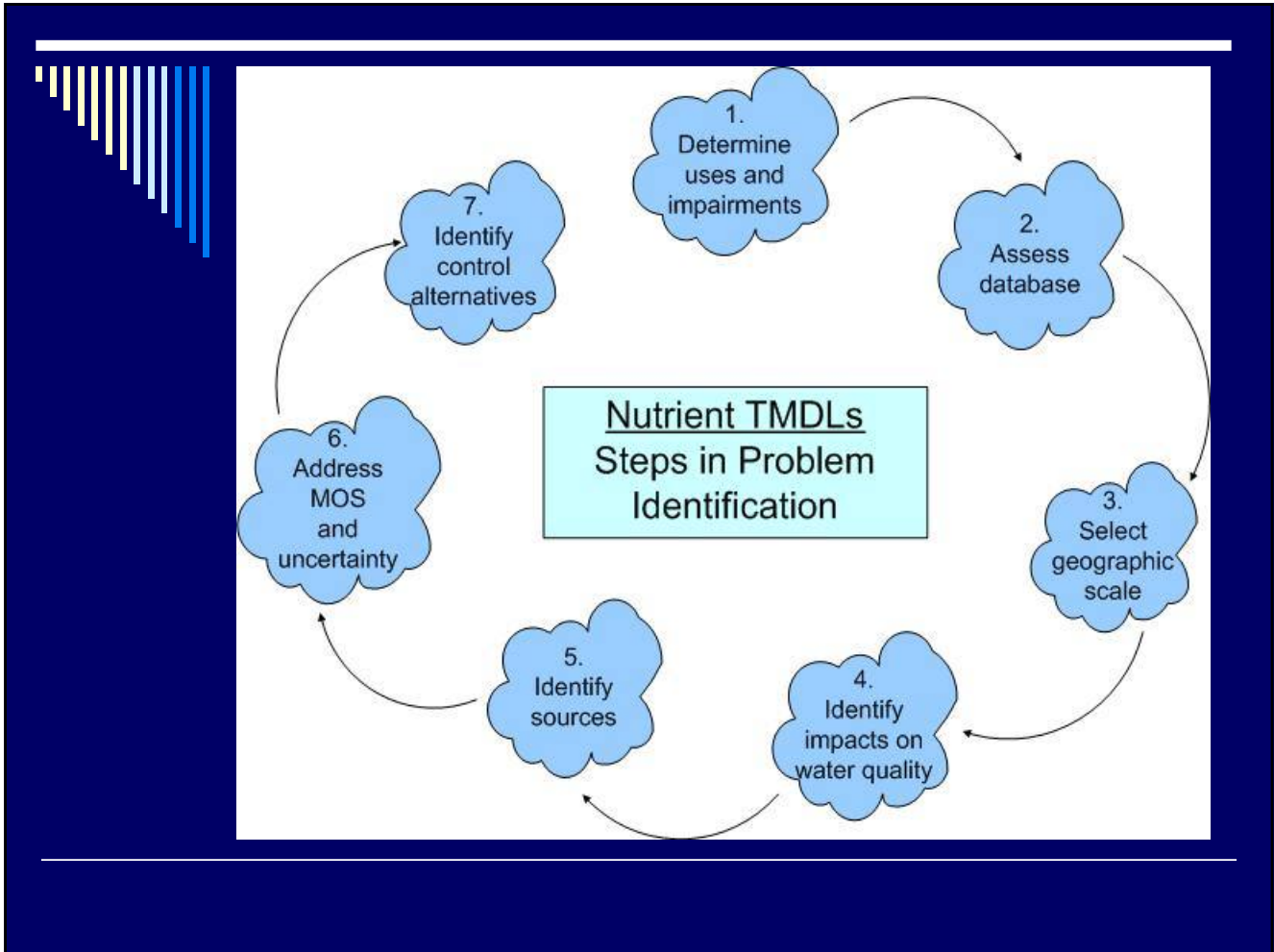
Problem Identification

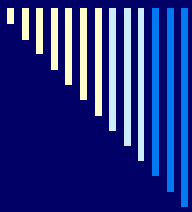
Fred Andes
Barnes & Thornburg
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Steps in Problem Identification

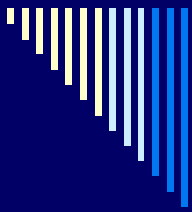
- 1 - Determine uses and impairments
 - 2 - Assess database
 - 3 - Select geographic scale
 - 4 - Identify impacts on water quality
 - 5 - Identify sources
 - 6 – Determine how to address margin of safety and uncertainty
 - 7 - Identify control alternatives
-





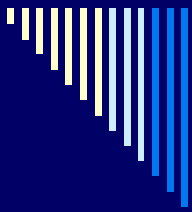
1. Uses and Impairments - Questions

- ❑ What nonattainment of standards caused the listing?
 - ❑ What data or qualitative analyses were used to support the decision?
 - ❑ Where in the waterbody are the designated uses supported, and where are they impaired?
 - ❑ How are the criteria expressed – narrative or numeric?
-



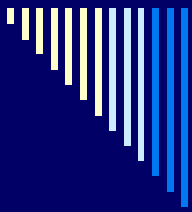
Uses and Impairments – More Questions

- What are the critical conditions, in terms of flow and season, during which the designated uses are not supported?
 - How do nutrients affect the use?
 - Are there additional use-related concerns, such as protection of endangered species?
-



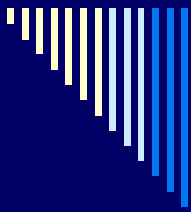
2. Data Issues

- Determine what data are available, and what data will need to be collected
 - Data set should include the following:
 - Water quality measurements
 - Waterbody size and shape information
 - Waterbody flow and residence times
 - Tributary locations and contributions
 - Biological information
-



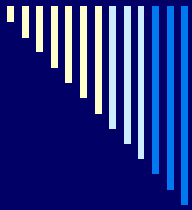
More Data Issues

- Data set should include the following:
 - Watershed land uses & land use issues
 - Temperature and precipitation data
 - Soil surveys and geologic information
 - Topographical information
 - Maps of watershed
 - Information on related assessment and planning efforts in study area
-



3. Geographic Scale

- Geographic scale of TMDL will be a function of:
 - Type of impairment
 - Type of waterbody
 - Scale of related assessment and planning efforts already underway
 - Selection of scale may involve tradeoffs between comprehensiveness in addressing all uses and sources, and precision of analysis
-



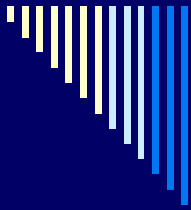
Scale Considerations

- When impairment is at bottom of watershed, consider addressing entire watershed, using screening-level assessment methods
 - When impairment occurs throughout watershed, conduct analysis for smaller, more homogeneous analytical units
-



4. Identify Temporal Impacts

- Consider temporal variations in discharge rates, receiving water flows, and designated use impacts
 - Consider time scale issues at each state of TMDL process, including:
 - Selection of water quality indicators
 - Assessment of sources
 - Linking loadings to water quality indicators
-



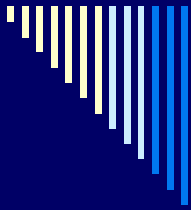
5. Identify Sources

- Understand relative magnitude of various sources, including identifying when loading occurs and how nutrients enter the waterbody
 - In addition to analysis of known point and nonpoint sources, do qualitative assessment of sediment cycling, groundwater sources and atmospheric sources
 - Try to determine limiting nutrient
 - Identify specific role that nutrients play in affecting the designated use, in relation to other possible stressors
-



6. Determine How to Address Margin of Safety and Uncertainty

- Consider use of adaptive management concepts, when appropriate, to address uncertainty in estimating loadings, predicting water quality response, and estimating effectiveness of management measures
 - When using models, consider various analytical techniques that can be used to address inherent uncertainty in predictions
 - Consider various methods to incorporate implicit or explicit margin of safety (MOS) into TMDL calculations
-



7. Identify Control Alternatives

- Try to reach general level of understanding concerning relative load reductions needed from point vs. nonpoint sources, and whether uncontrollable sources are a significant factor
 - If no level of control is predicted to achieve the designated use, undertake UAA to consider appropriateness of WQS
 - Identify and stress opportunity to take advantage of other watershed protection efforts, and encourage involvement of stakeholders
-