Public Values and Technical Analysis in Environmental Decisions

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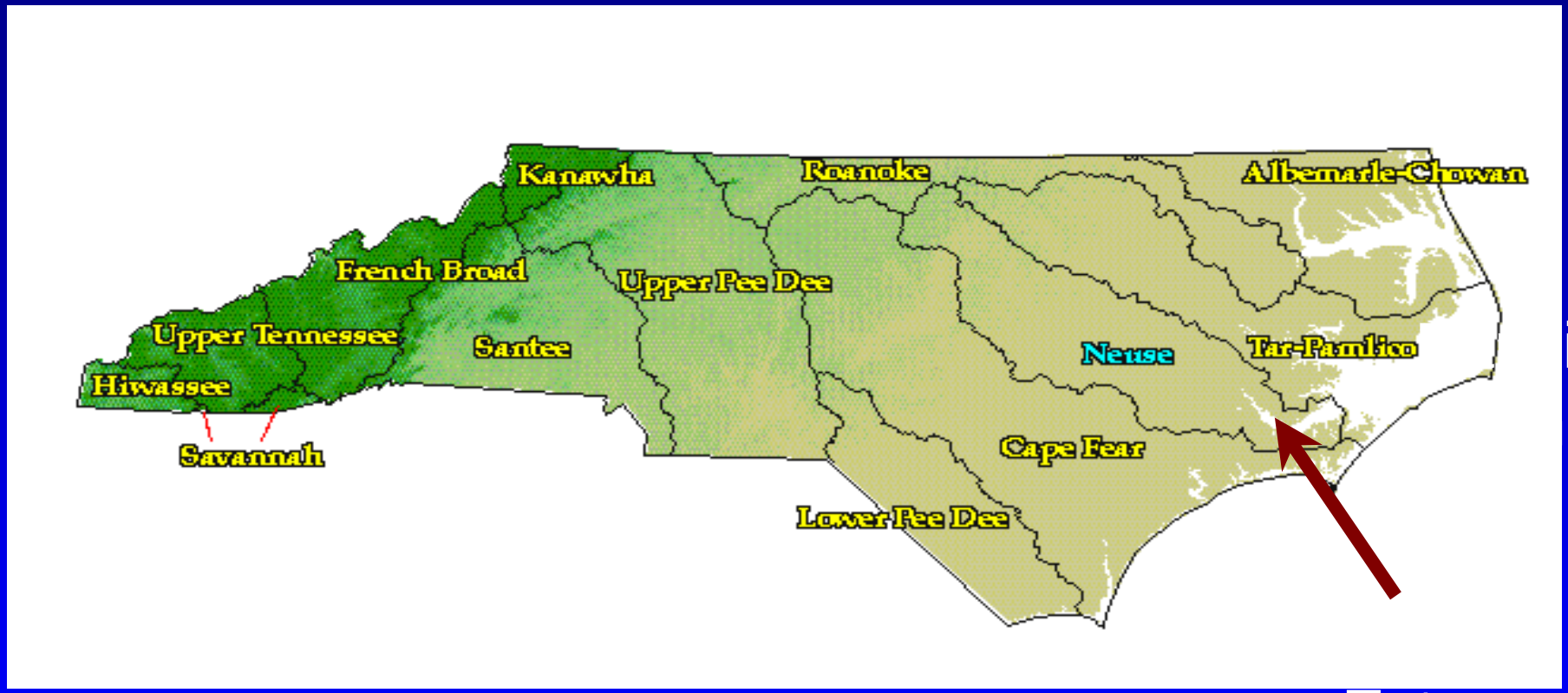
Neuse Watershed in North Carolina



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Estuary

Water quality degradation in the Neuse River estuary

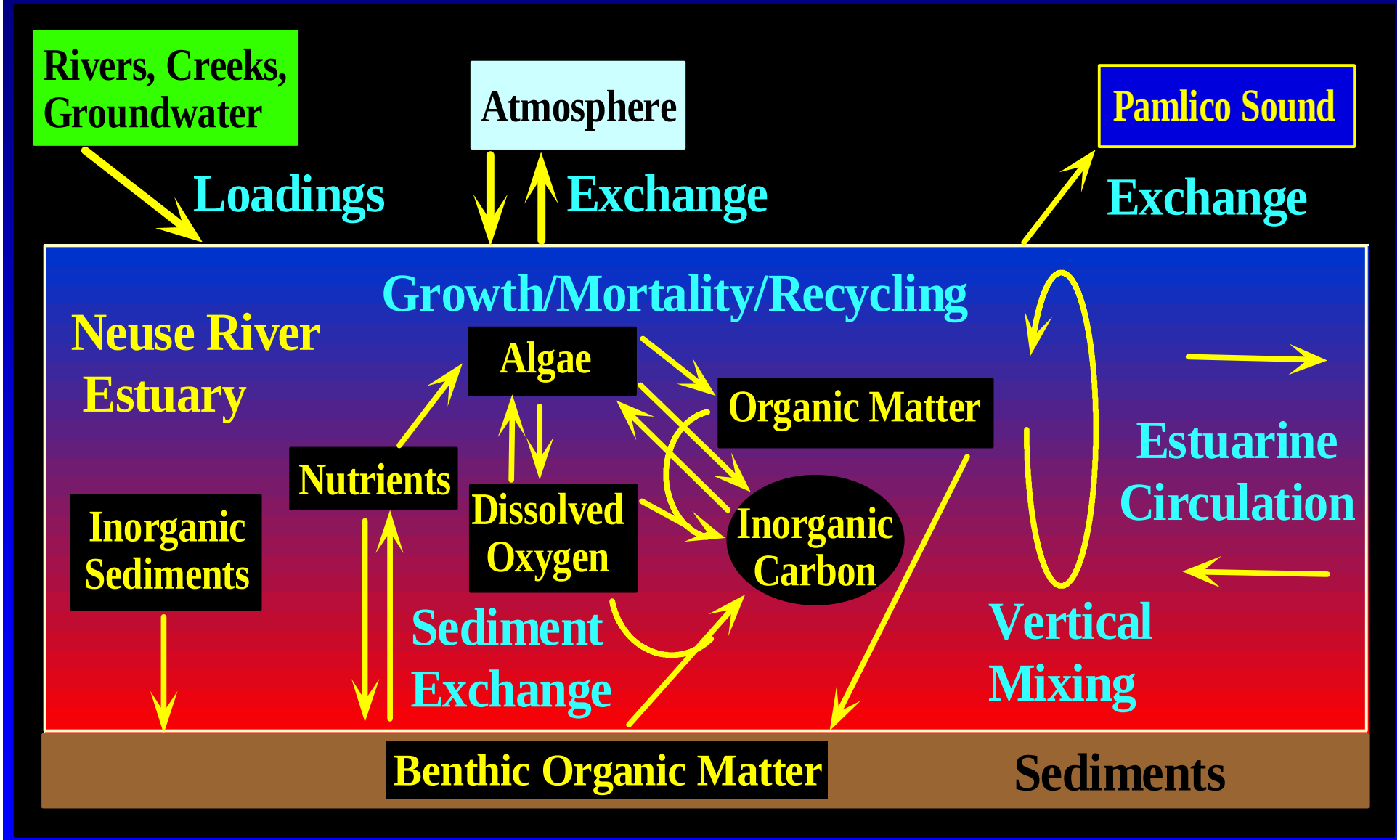
- Excessive algal blooms
- Low dissolved oxygen
- Massive fish kills
- Outbreaks of toxic microorganisms

→ 30% Nitrogen Load Reduction

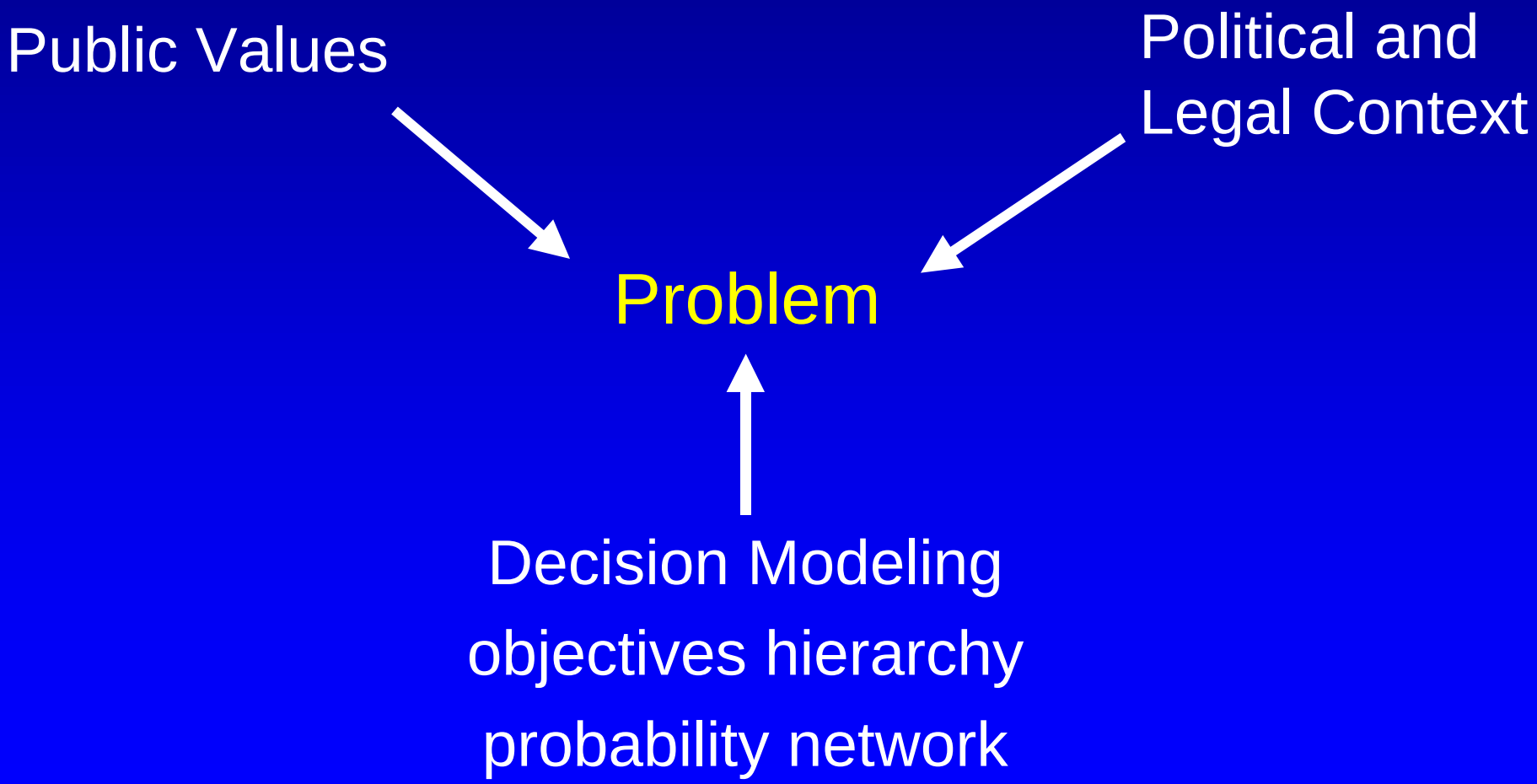
ModMon

- Modeling effects of management actions on estuary
- Monitoring actual effects of management action (or inaction)

Neuse Estuary Eutrophication Model



Integrated Framework



Decision Analytic Approach

- Elicit stakeholder concerns
- Develop a probabilistic model to link proposed actions to concerns
- Evaluate alternative management strategies

Objectives Hierarchy

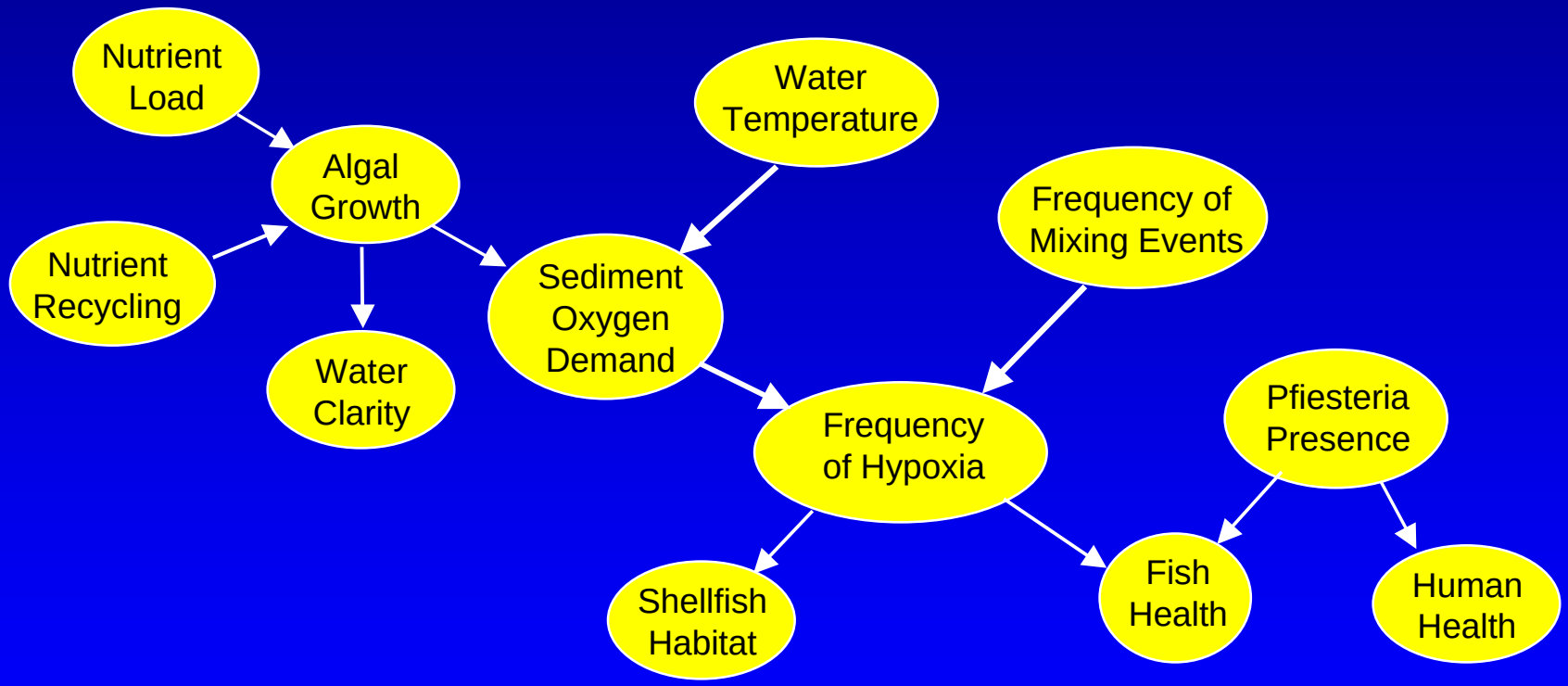
- Ends – measures
- Means
- Process

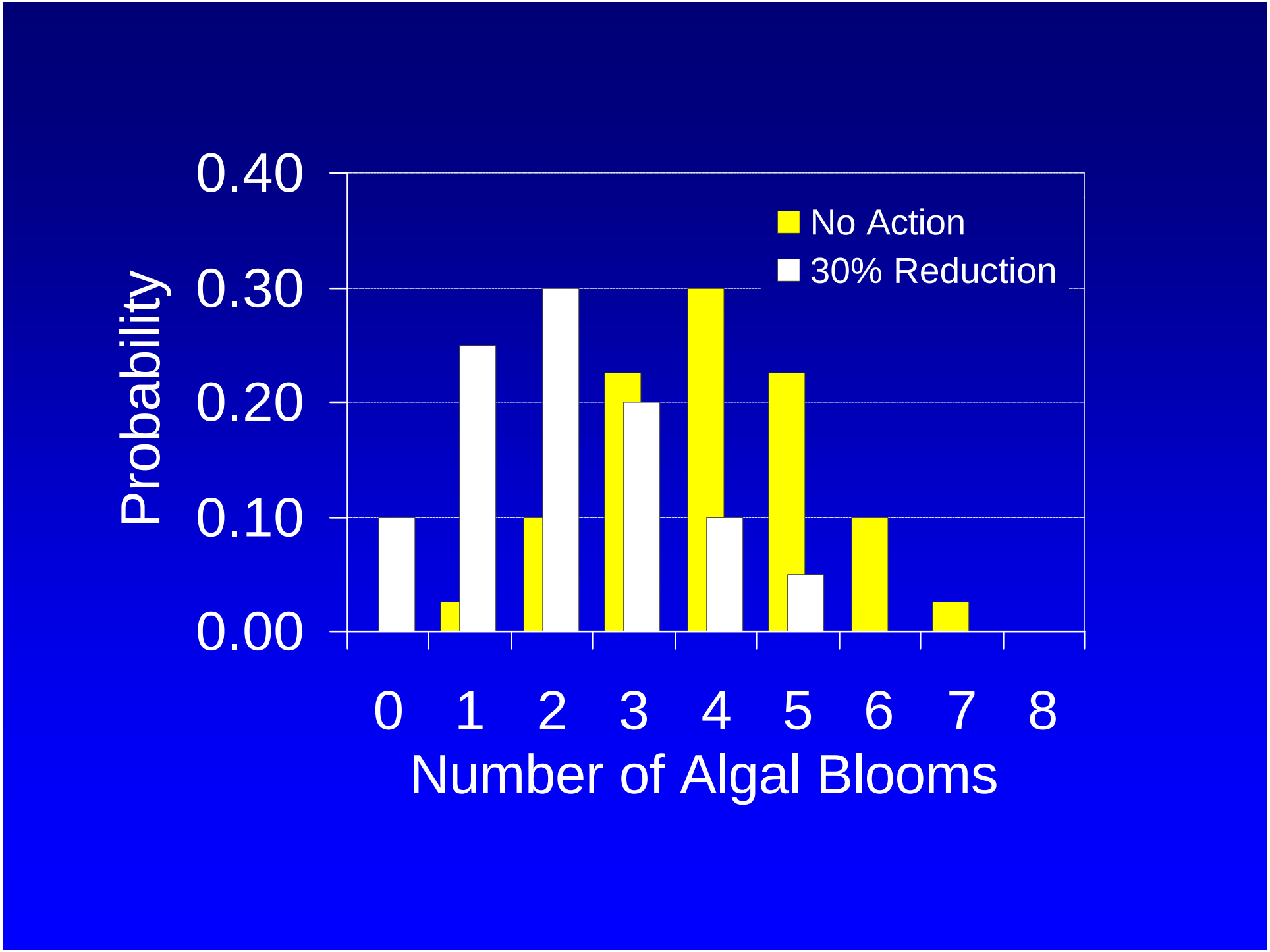
ENDS	MEASURES
Water quality	Clarity
	Taste, odor
	Chlorophyll a
	Dissolved Oxygen
	Algal toxins
Biological quality	
Plant	Algae
Submerged aquatic vegetation	
Animal	
Fish	Abundance
	Diversity
	Fish kills
	Lesions
	Size of harvest
Shellfish (edible)	Abundance
	Distribution
Human health	
Fecal coliform bacteria	
Other pathogens (e.g., *Pfiesteria*)	

Means (ex.)

- Control sediment to tributaries
- Control timing of peak flows
- Control growth upstream through urban planning
- Control overfishing
- Permit nutrient trading

A *probability network* is a graphical model that expresses the relationships among the important variables in a system.




0.40
0.30
0.20
0.10
0.00
Probability
No Action
30% Reduction
0 1 2 3 4 5 6 7 8
Number of Algal Blooms

Cultural Objectives

- Preserve sites of Native American or European significance
- Reduce hostility among interest groups
- Improve river's aesthetic qualities - water clarity

Economic Objectives

- Viable commercial fishing
- Revenue from river-based recreation
- Revenue from tourism
- Riverfront property values

Recreation/Health Objectives

- Safe for body contact recreation
- Edible finfish and shellfish
- Optimize submerged aquatic vegetation for fish reproduction and boating

Citizen Involvement Objectives

- Public education on personal impacts on WQ
- Realistic expectations for improvement
- Evidence that public input is used

Fairness Objectives

- Fair allocation of cleanup costs
- Efficient expenditure for cleanup
- Widespread participation

“Balance” Objectives

- Sustainability of both human and environmental processes
- Environmental health vs. economic development
- Upstream/downstream commitment
- Pollution prevention vs. clean-up costs

Public Values and Technical Analysis

- Probability network model big improvement over original
- BUT, ModMon narrowly focused on biophysical goals, not social
- Spatial scale - not whole watershed

Political/legal process

- TMDL - % reduction, margin of safety based on Chl a standard
- Relevance of chl a standard to biological (economic, cultural) endpoints?
- 3 models, stakeholder participation
- DWQ → EPA → ?state legislature

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