

Assessing Multi-Stressor Impacts on Environmental Conditions of the Delaware River Estuary

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Acknowledgements

The DuPont Delaware River study is a collaborative effort between scientists and engineers at BB&L, Integral Consulting, and DuPont. Team members include:

Integral Consulting - Judi Durda, Betsy Day, and Damian Preziosi

BB&L - Tim Iannuzzi and Dave Ludwig

DuPont - Amanda DeSantis, Bob Hoke, Bart Ruiter, Dick Schwer, and Ralph Stahl

Objectives of Study

- ◆ Base on sound peer-review science
 - Science Advisory Team
- ◆ Characterize current condition of Delaware River Estuary
- ◆ Identify potential physical, chemical and biological stressors
- ◆ Integrate data into a regional risk assessment framework (Landis et al., 2005)
- ◆ Identify and prioritize regional and facility specific data gaps
- ◆ Engage regulatory community
- ◆ Ultimately, contribute to overall restoration of River

Why Do This?

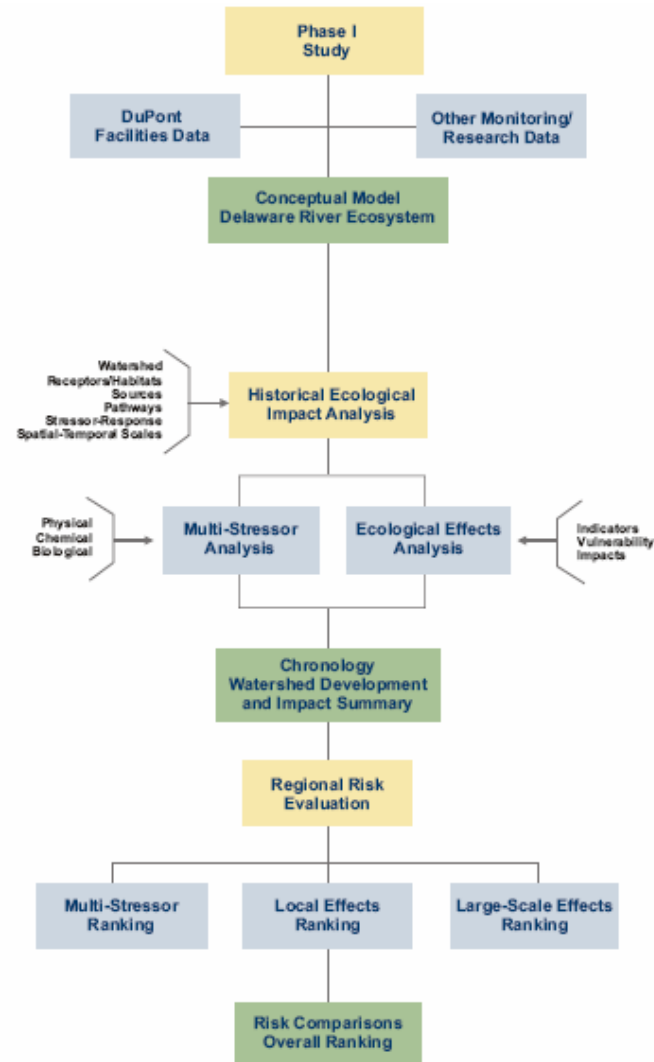
- ◆ Because the Delaware River Estuary is:
 - An urban river impacted by multiple stressors
 - Subject to management under a number of regulatory programs
- ◆ Because realistic and effective restoration actions cannot be developed without understanding:
 - What is impaired
 - What is the cause(s)
 - How cause and effect are linked

Benefits of the Study

- ◆ Augment existing initiatives by synthesizing the wealth of information collected to date:
 - Data/information clearinghouse
- ◆ Facilitate on-going programmatic initiatives by committing resources and increasing public/private awareness
- ◆ Aid in decision-making:
 - Focus efforts
 - Data to support regulatory agency initiatives
 - Data to support DuPont facility-specific efforts

Overall Phase I Study Approach

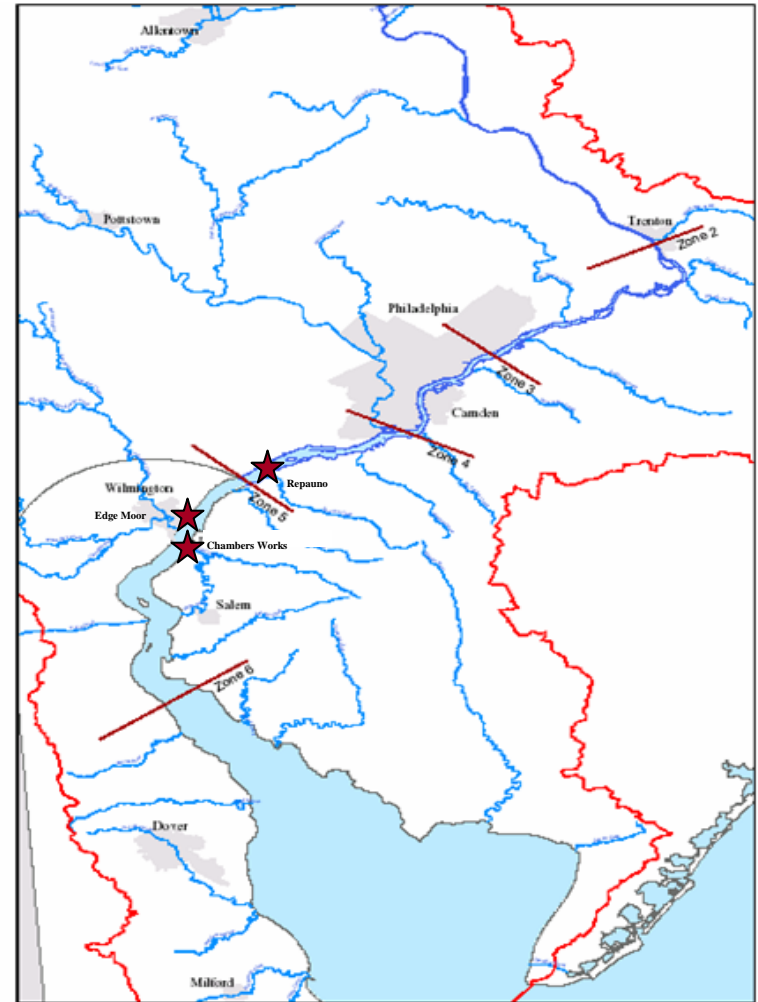
- ◆ Historical ecology
- ◆ Stressor evaluation
- ◆ Regional risk Assessment
- ◆ Relative Rankings
- ◆ Prioritization



Study Area Boundary

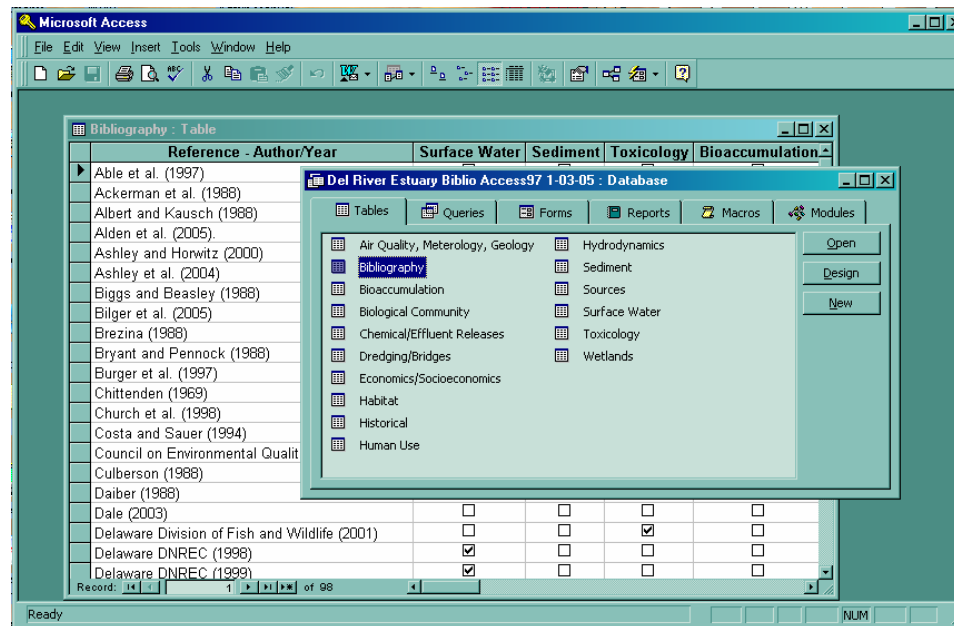


DRBC – Delaware River Estuary Zone Designations

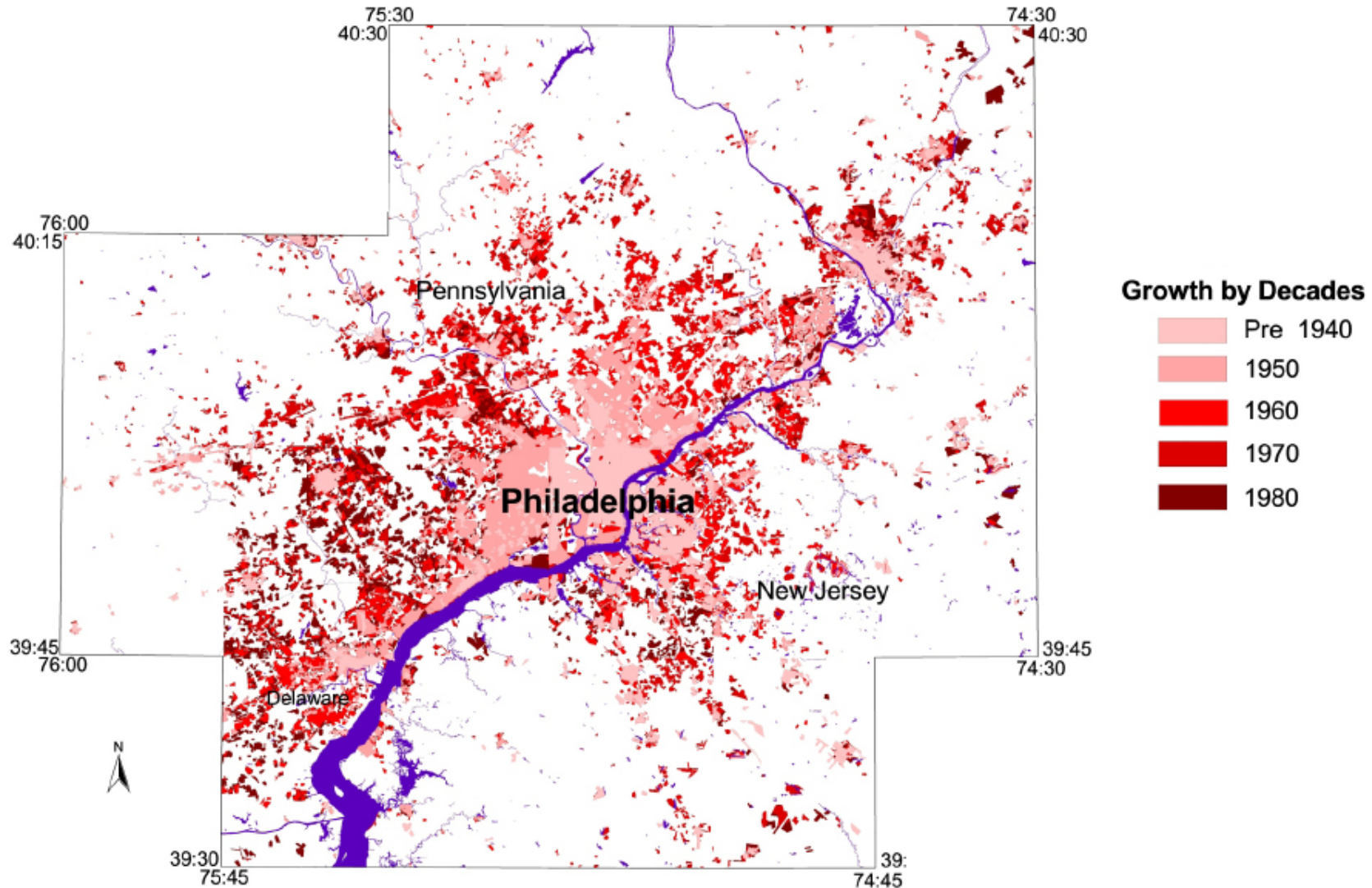


Extensive Data Compilation - Project Bibliography

- ◆ Searchable bibliography of data/information sources
- ◆ Citation and summary of contents for each source
- ◆ Shared with regional stakeholders



Urbanization - Key Historical Stressor in the Delaware River Estuary



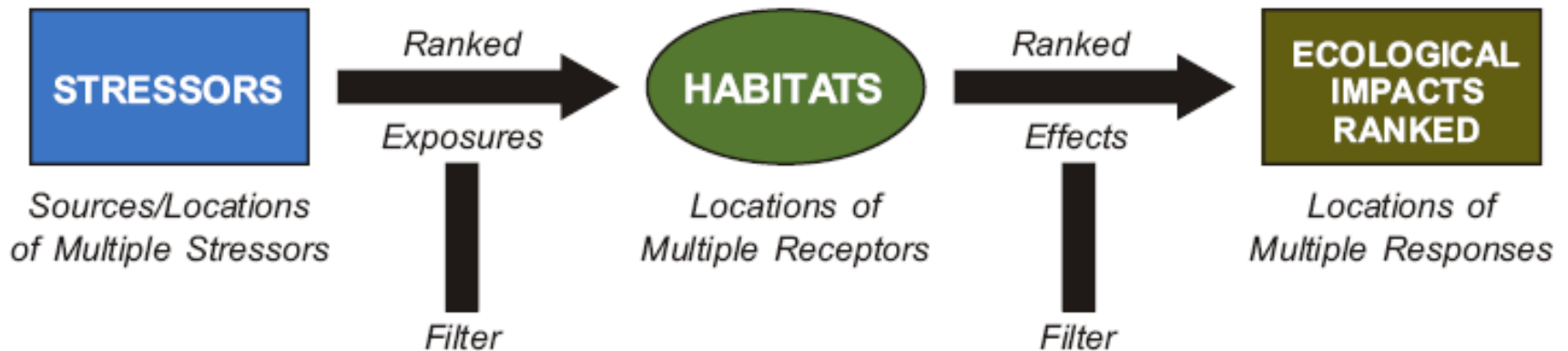
Example of Relative Ranking of Regional Stressors

Stressor Category	Stressor	Relative Stressor Strength				
		Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Physical	Water Volume (based on total water withdrawal)					
	Water Volume (based on consumptive water use)					
	Water Volume (based on dredging-induced tidal height increase)					
	Water Temperature					
	Salinity					
	Suspended Solids					
	Sedimentation					
	Barriers to Fish Access Habitat Loss					
Chemical	Petroleum, PAHs, and Related					
	PCBs					
	Dioxins and Furans					
	Pesticides					
	Metals					
	Nutrients					
	Dissolved Oxygen					
	Other Chemicals					
Biological	Invasive Species					
	Reduction of Local Stocks					
	Pathogens (based on oyster disease)					

Combine Ecology and Stressor Information

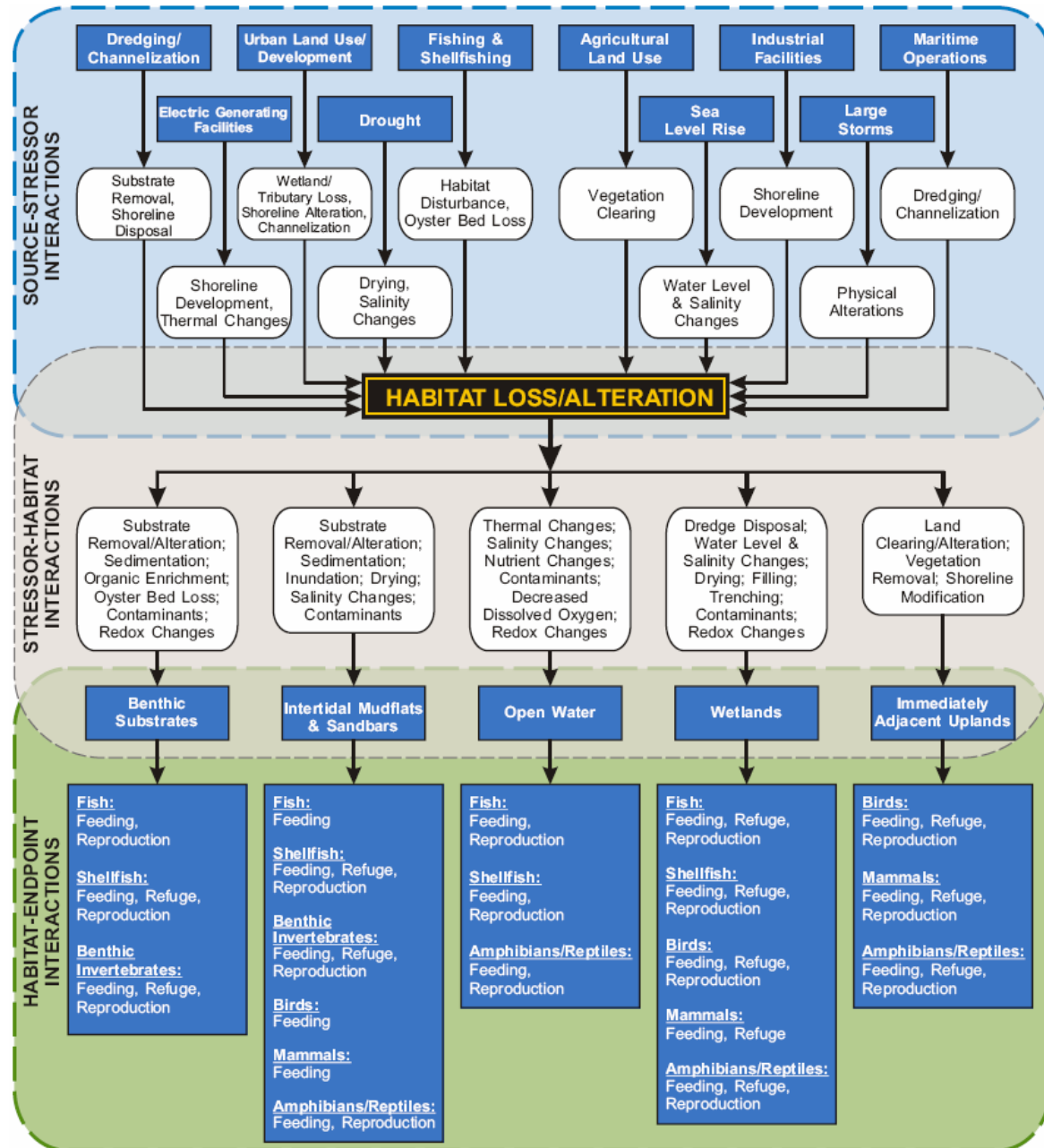
- ◆ Identified a diversity of habitats, receptors, stressors
- ◆ Need to combine information in a meaningful way
- ◆ Chose the relative risk model (RRM) as tool (Landis et al., 2005)
 - Adaptation of traditional ERA paradigm
 - Accounts for multiple and diverse stressors
- ◆ Key steps in RRM
 - Conceptual model development
 - Stressor ranking
 - Relative risk calculations

Overview of Regional Risk Assessment Approach

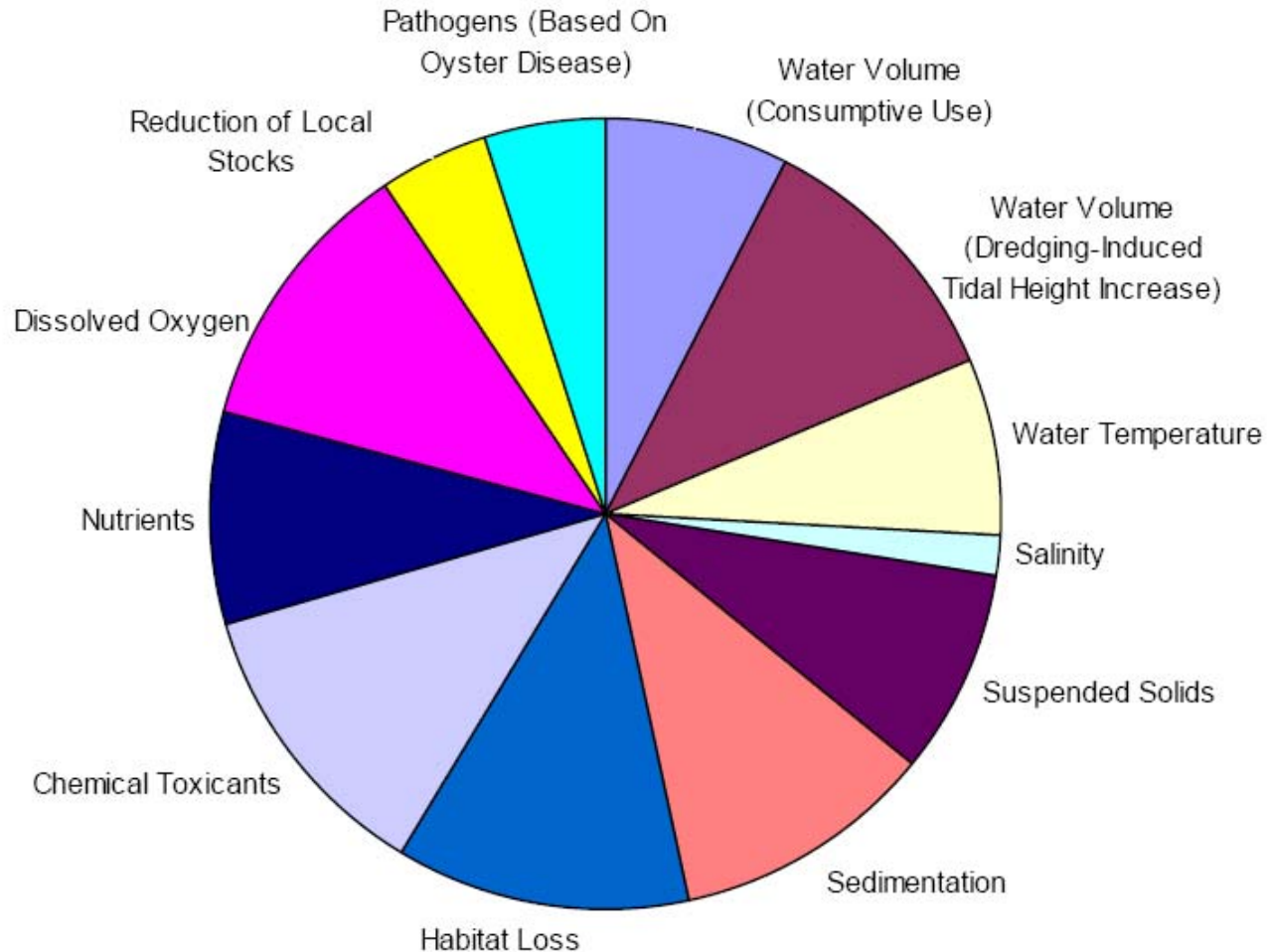


SOURCE:
ADAPTED FROM
LANDIS AND WIEGERS (2005)

Example Conceptual Model



Example of a Regional Risk Assessment Result



Next Steps

- ◆ Integrate stressor, habitat and receptor information into the regional risk assessment model
- ◆ Identify and prioritize regional and local data gaps
- ◆ Continue to engage regulatory and larger stakeholder community
- ◆ Support collaborative effort to develop a common regional adaptive approach



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