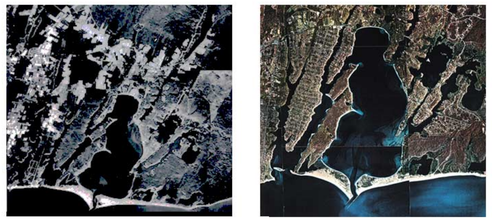
Waquoit Bay watershed ecological risk assessment project: Using science to support management

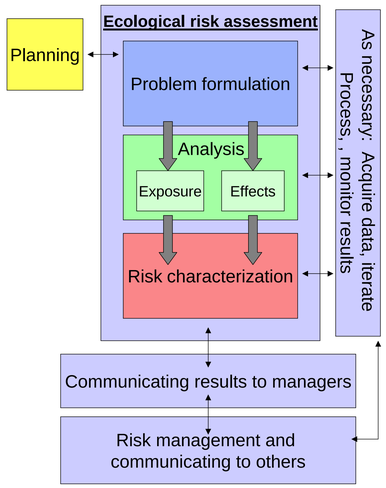
Dow, D. D., J. L. Bowen, V. Serveiss, and J. Valiela

1. INTRODUCTION



1938 1991

The watershed of Waquoit Bay has become rapidly urbanized. To assess and devise management actions to address these issues we used the ecological risk assessment process:



2. PLANNING

Management Goal

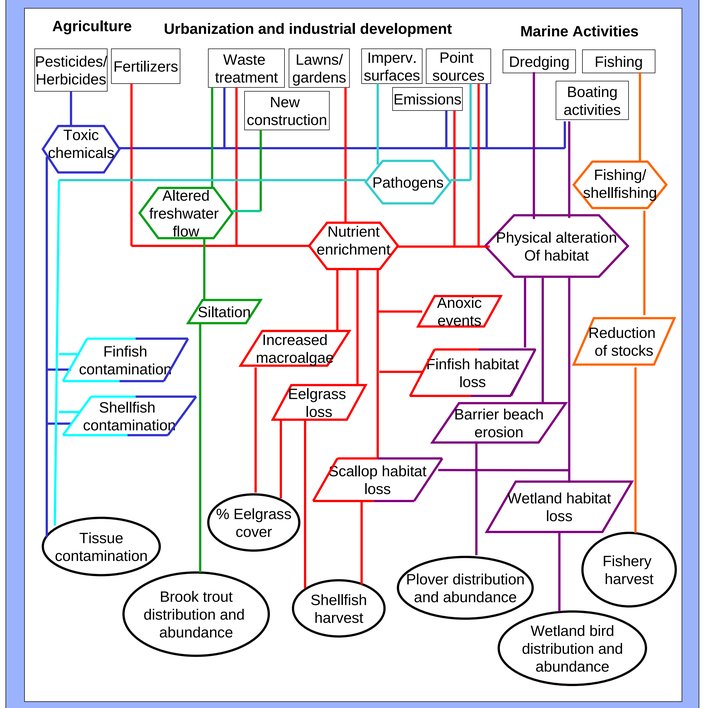
"Reestablish and maintain water quality and habitat conditions in Waquoit Bay and associated wetlands, freshwater rivers, and ponds to: (1) support diverse, self-sustaining commercial, recreational, and native fish and shellfish populations and (2) reverse ongoing degradation of ecological resources in the watershed."

Management objectives

Prevent eutrophication
Reduce hypoxia and anoxia
Prevent contamination of water and sediments
Restore and maintain native fish populations
Reestablish viable eelgrass beds
Protect shellfish resources
Reduce nuisance algal growth
Maintain diversity of biotic communities

3. PROBLEM FORMULATION

Conceptual models help formulate testable hypotheses about the interaction between stressors and endpoints. We selected eelgrass area and scallop harvest as assessment endpoints.

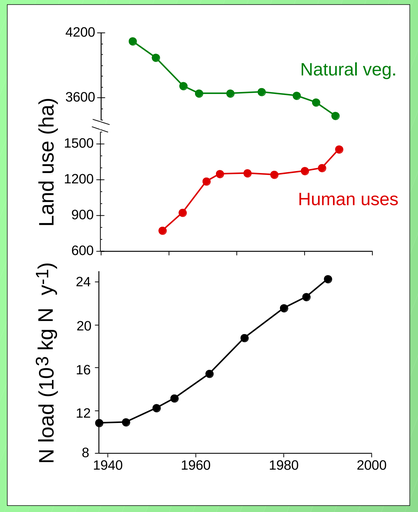


Assessment endpoints	Stressors: Chemical pollution	Altered freshwater flow	Nutrient enrichment	Alteration of habitat	Fishing pressure	pathogens
Migratory fish	1	2	3	1	3	1
Stream species	1	2	2	1	3	1
Wetland habitat	1	3	2	2	1	1
Estuary trophic status	1	1	5	1	1	1
Eelgrass habitat	1	1	5	2	1	2
Benthic diversity	1	1	5	2	2	1
Estuarine nursery grounds	1	1	5	1	1	1
Totals	**8**	**12**	**28**	**13**	**13**	**9**

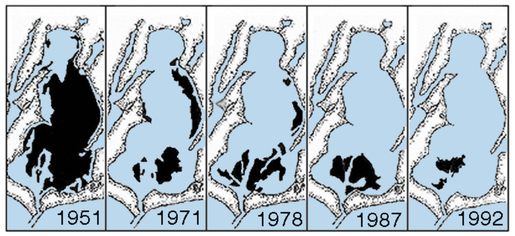
Values based on best judgement of scientists, and range from 1 =low impact to 5= high impact.

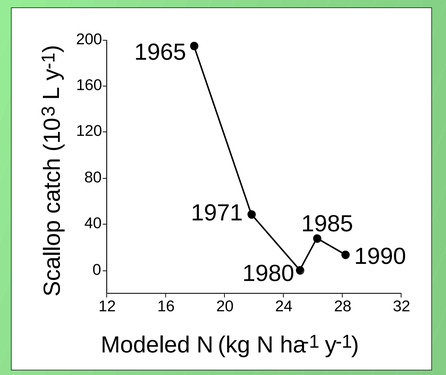
4. ANALYSIS

Exposure: Changes in land use leads to increases in N loads across decades



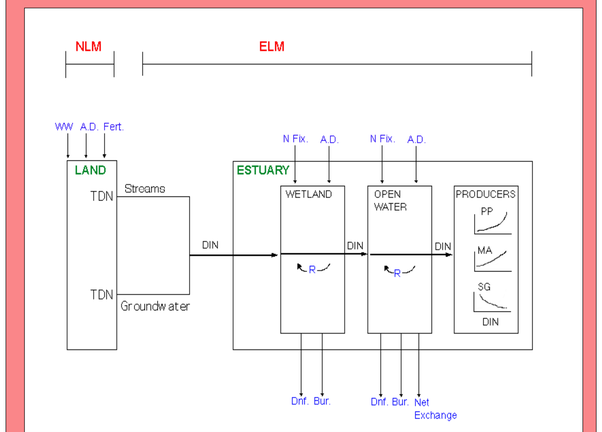
Effects: Increases in N loads result in decreases in the area of eelgrass beds, and in the amount of scallops harvested.





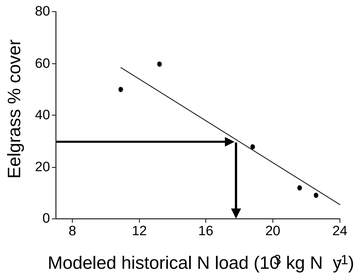
5. RISK CHARACTERIZATION

Use models (NLM and ELM) to develop links between nitrogen loading and ecological endpoints for example eelgrass area



Predict impact of N loads on eelgrass by:

1. Determine the desired % eelgrass cover
2. Calculate N loads corresponding to selected eelgrass area.



3. Use models to assess possible scenarios to reduce in N loads.

6. CONCLUSIONS

Ecological risk assessment provided a method to identify the relative impact of stressors, and synthesize information on measures of effect and assessment endpoints to produce a strategy for management and mitigation of effects of stressors.