Sediment Processes in the Columbia River Estuary Conceptual Model

Ronald Thom, Walter Pearson, Amy Borde, Gregory Williams, Martin Miller, Richard Ecker

Battelle Marine Sciences Laboratory

Pacific Northwest National Laboratory

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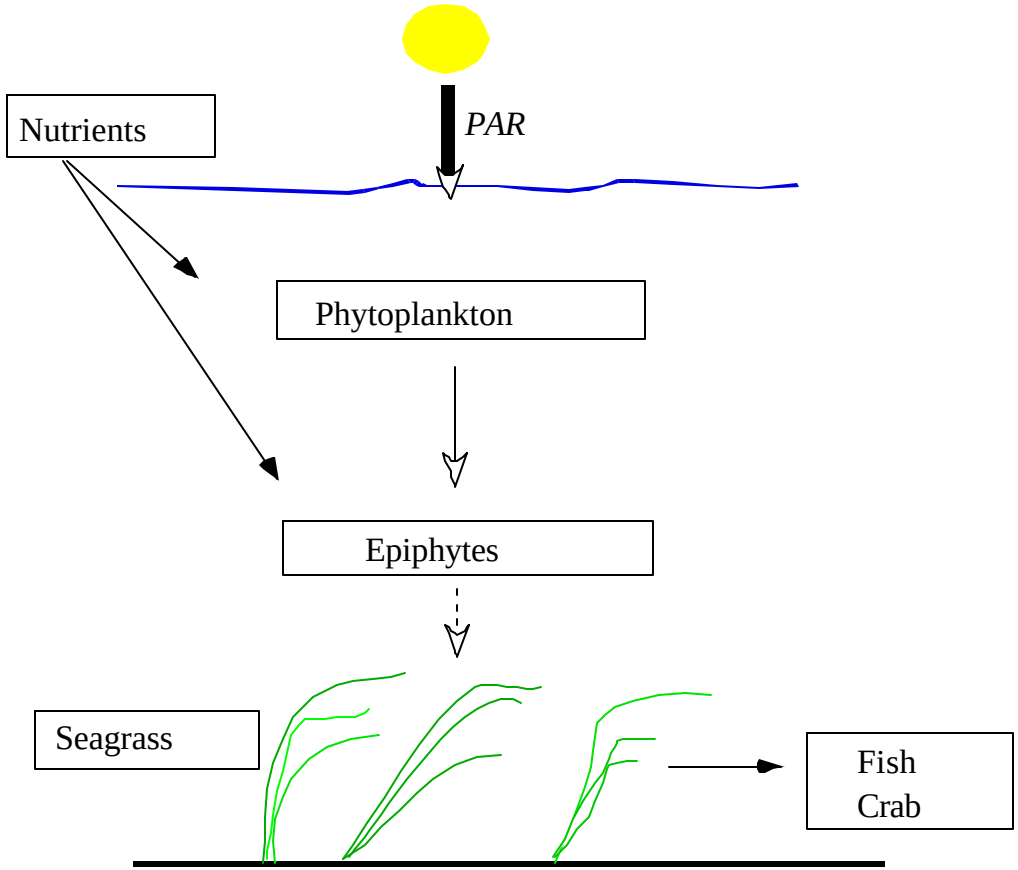
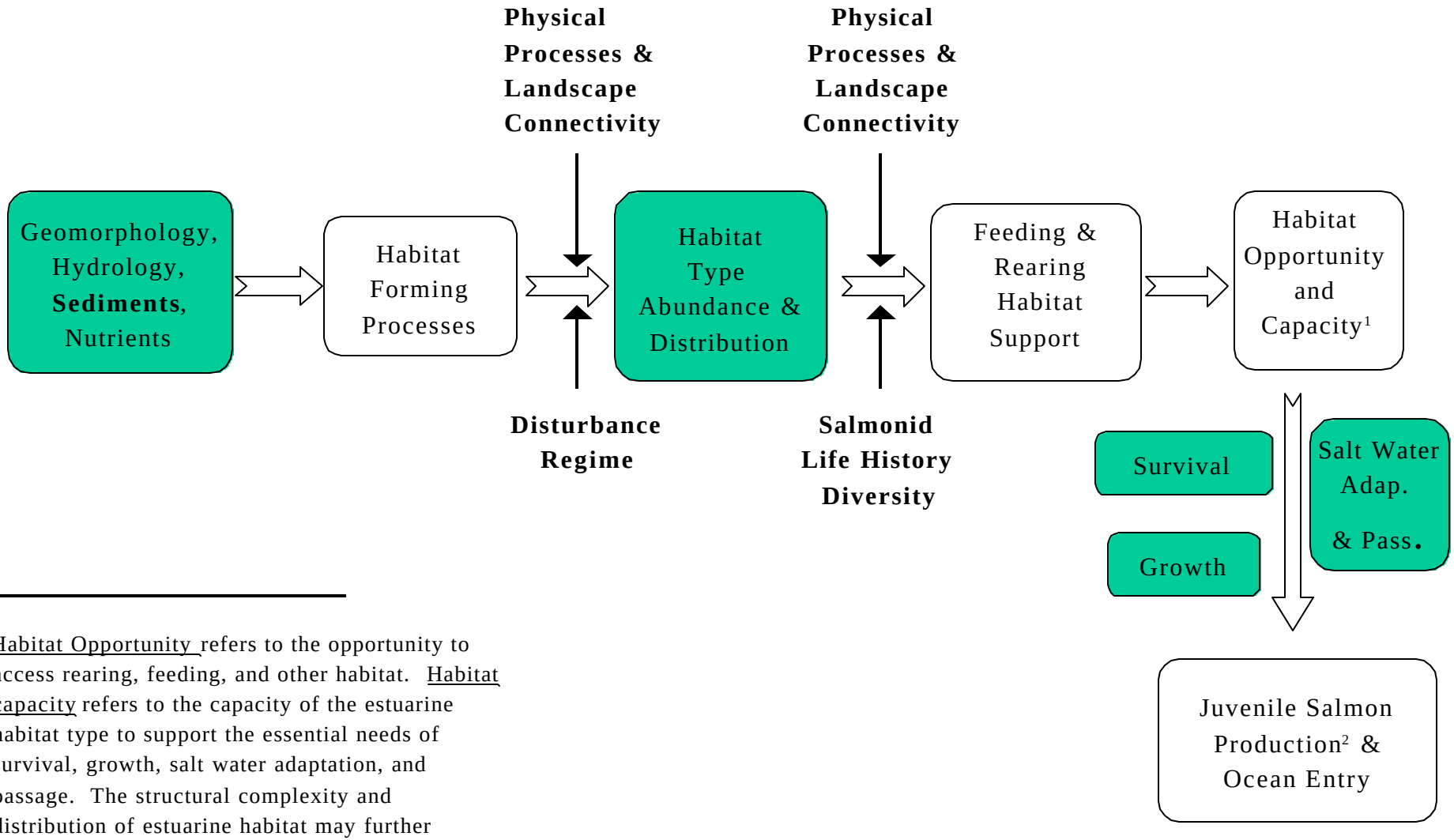
Conceptual Model Definition and Purpose

- **Definition**
  - Organizes understanding of system
  - Provides system-level perspective
  - Offers views of complexity
  - Centered in juvenile salmon
  - Habitat based
- **Purpose**
  - Provide an integrated picture of the major ecosystem components
  - Provide roadmap linking ecological responses to potential sources of impacts
  - Direct potential modeling points
  - Inform decision-making about avoiding, minimizing and compensating for impacts
  - Identify uncertainties
  - Aid in development of adaptive management plan
  - Use in development of Properly Functioning Ecosystem (PFC)

Chesapeake Bay Model
(from Dennison et al.)



Integrated Model for Juvenile Salmonids



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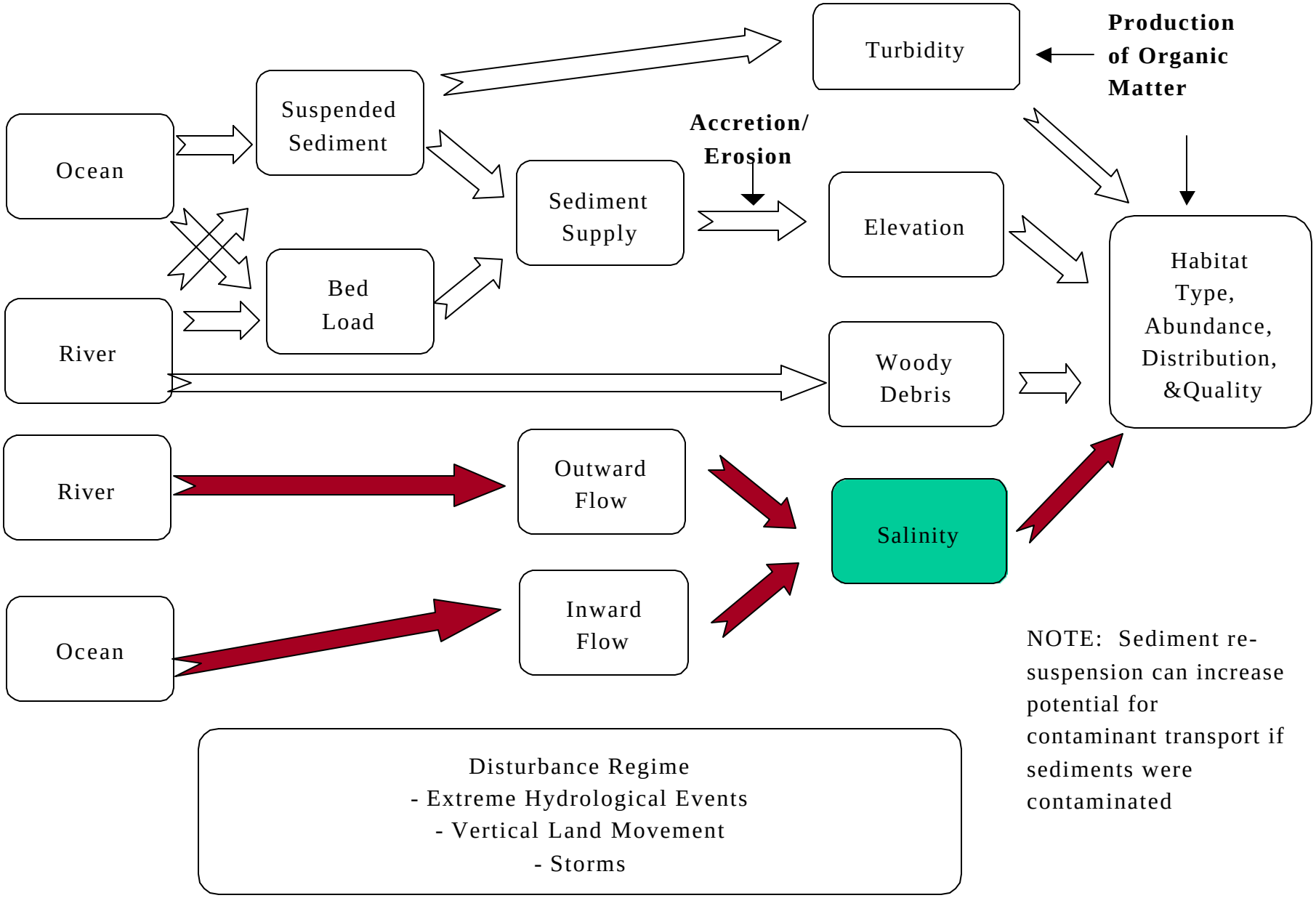
[1] Habitat Opportunity refers to the opportunity to access rearing, feeding, and other habitat. Habitat capacity refers to the capacity of the estuarine habitat type to support the essential needs of survival, growth, salt water adaptation, and passage. The structural complexity and distribution of estuarine habitat may further determine whether it provides functional refugia from predators.

[2] Salmonid Production refers to increase in biomass which is a function of growth and survival of fish.

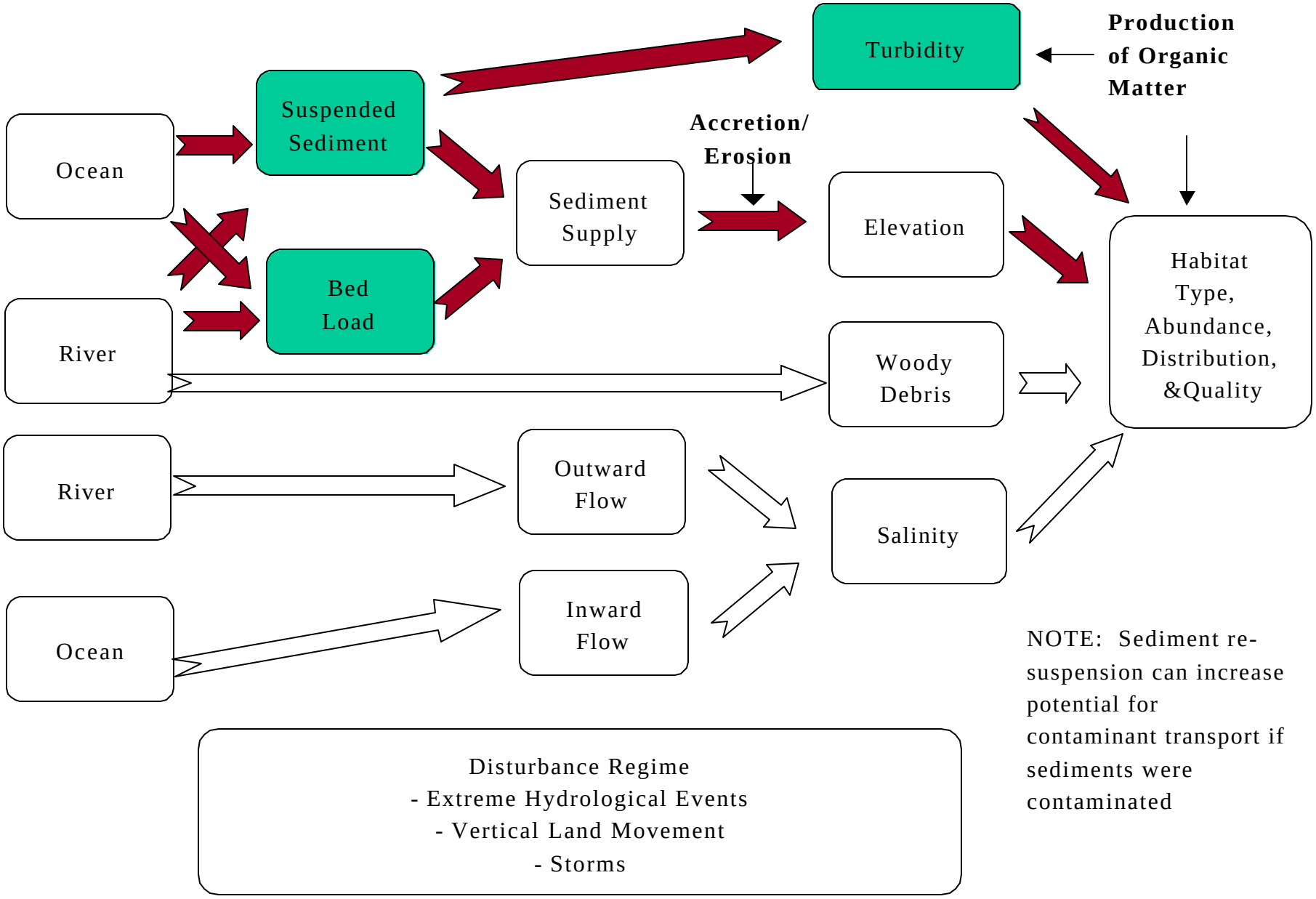
Sediment Processes in the Model

	Submodel
Bedload	**Habitat Forming Processes**
	Disturbance
Erosion/Accretion	**Habitat Forming Processes**
	Disturbance
Suspended Sediment	**Habitat Forming Processes**
	Disturbance
	Survival
	Primary Productivity
Turbidity	**Habitat Forming Processes**
	Survival
	Primary Productivity
	Disturbance
	Growth
	Adult Migration

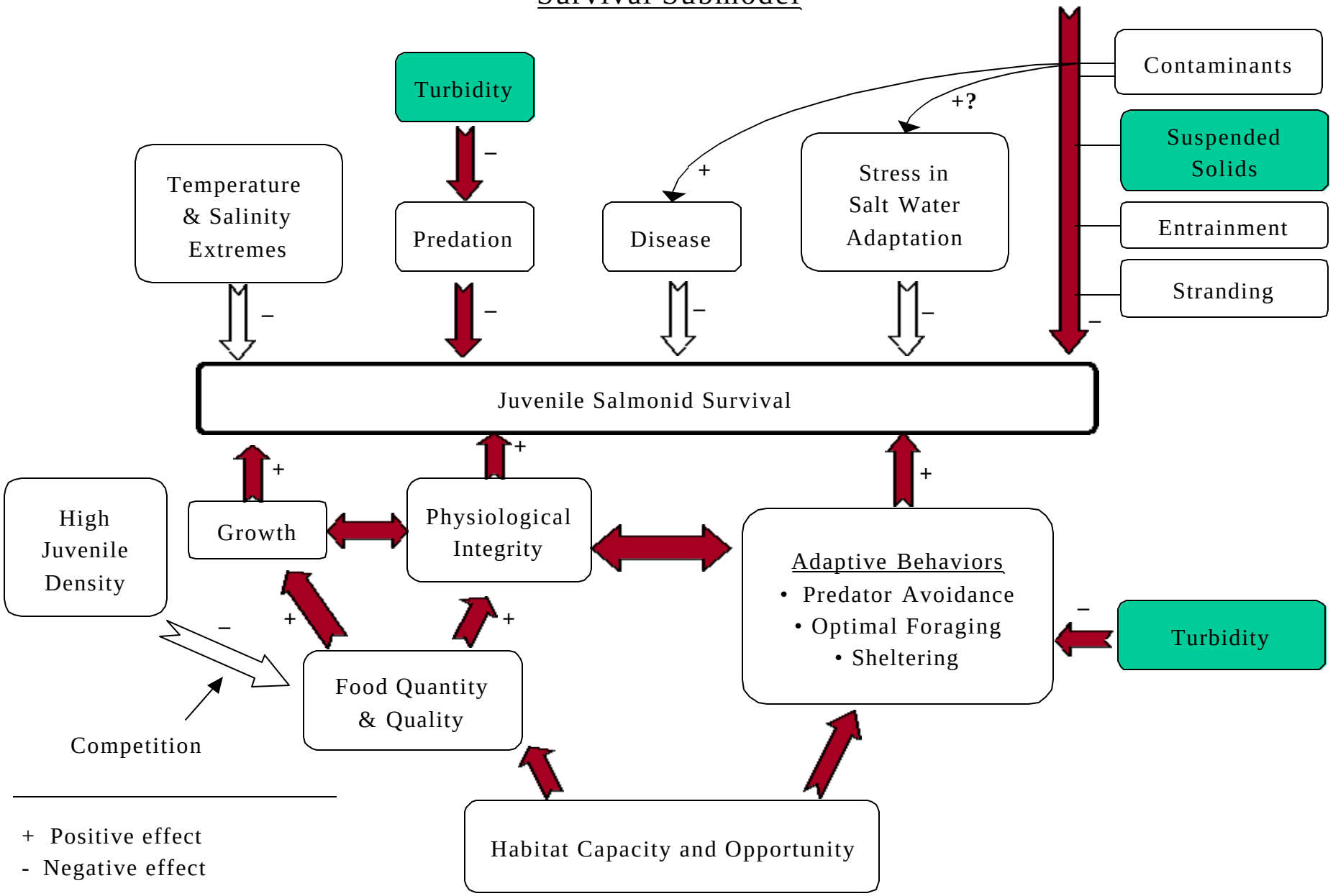
Habitat Forming Processes Submodel



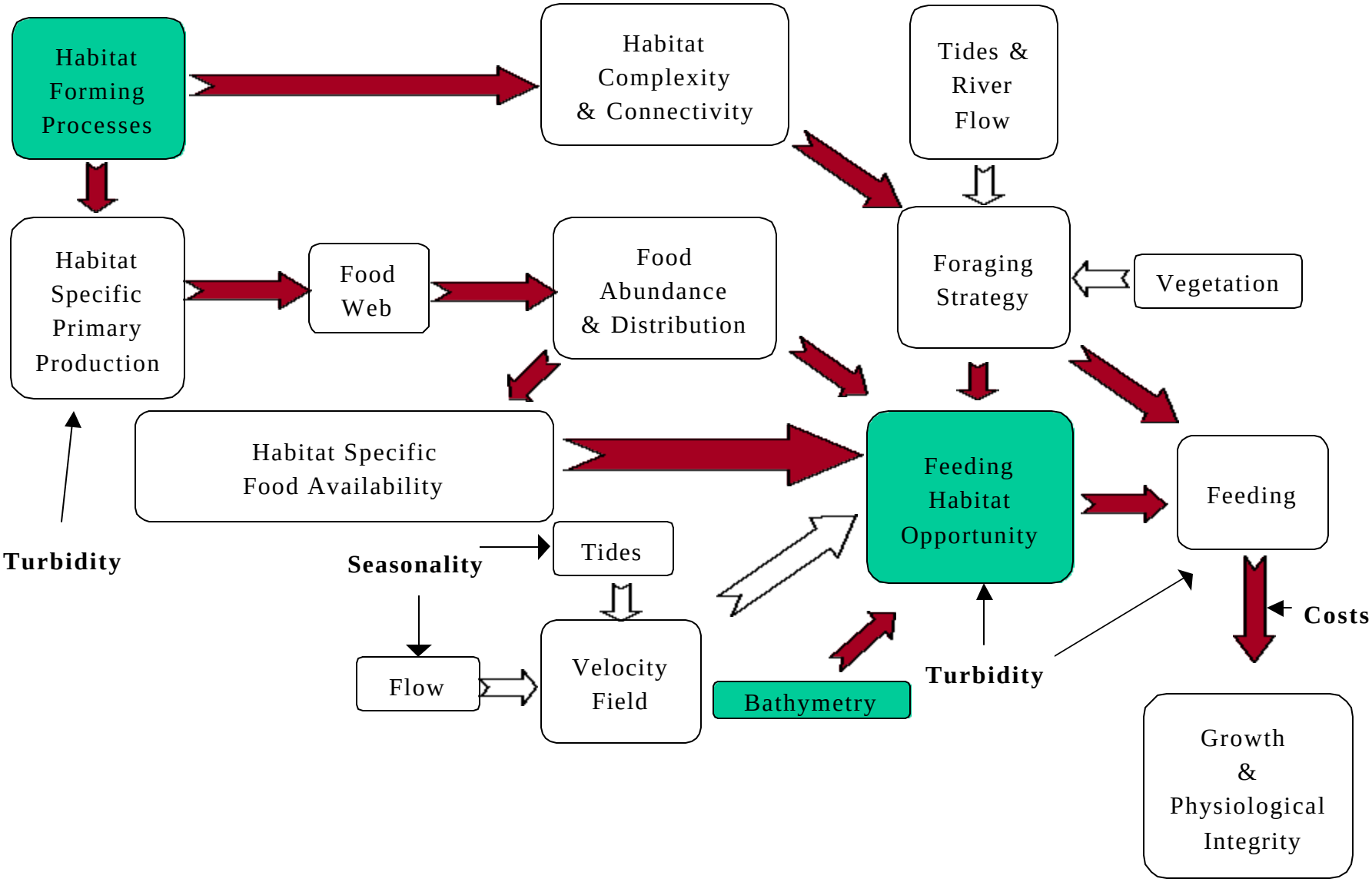
Habitat Forming Processes Submodel



Survival Submodel



Growth Submodel



Sediment-Ecosystem General Connections

Bedload	**Benthic community in channel and river bottom**
Erosion/Accretion	**Elevation and morphology of side slope and adjacent flats**
	Structure of benthic plant and animal communities
Suspended Sediment and Turbidity	**Water properties**
	Benthic and pelagic primary productivity
	Fish feeding
	Fish predation
	Fish migration

General Summary

Sediment factors and processes control habitat forming processes, ecosystem processes, community structure and capacity and opportunity for salmon, predation, migration

Project Physical Effects Summary

- **No effect on the sediment budget**
- **Slight effect on dynamics of bedload**
- **Some erosion at side slopes and adjacent flats**
- **No effect on native shorelines and habitats**
- **Short term effects on turbidity and suspended solids**
- **ETM will reposition (related to salinity changes)**

Ecosystem Response Summary

- **Shift in bedload dynamics links to channel and river bottom community structure**
  - ***Presently a dynamic system; historically very dynamic***
- **Side slope and flat morphology link to adjacent flats community structure and processes, salmon feeding opportunity**
  - ***Altered bathymetry in limited regions***
  - ***Historically dynamic side slopes***
- **Turbidity links to water column and benthic primary productivity, fish predation, salmon feeding capacity and opportunity and migration**
  - ***Turbidity increase limited to dredging/disposal period***
  - ***Shift in ETM location predicted***