Community Earth Ecosystem Modeling for NGoM

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OBJECTIVES

1. Provide a common suite of interconnected numerical models to be used in predicting the path and fate of oil products and oil-contaminated sediment.
2. Produce hydrodynamic, transport, and water quality drivers for selected ecosystem effect modeling.

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Justification

Numerical models offer understanding and management of ecosystem effects from oil contamination, e.g.

- Integrating knowledge into a testable, holistic framework (synthesis)
- Predicting future ecosystem effects. (stochastic results from an ensemble of forcing processes)

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Earth Ecosystem Models

Earth Ecosystem Models integrate the complex human, natural, chemical, and physical interactions of ecosystems as they respond to human and natural system perturbations.

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Earth System Models are a class of models that integrate components and processes beyond the physical, dynamical systems present in climate models, with the intention of accurately representing the complex human, natural, chemical, and physical interactions that contribute and respond to climate.

NSF, http://www.nsf.gov/geo/sees/easm/

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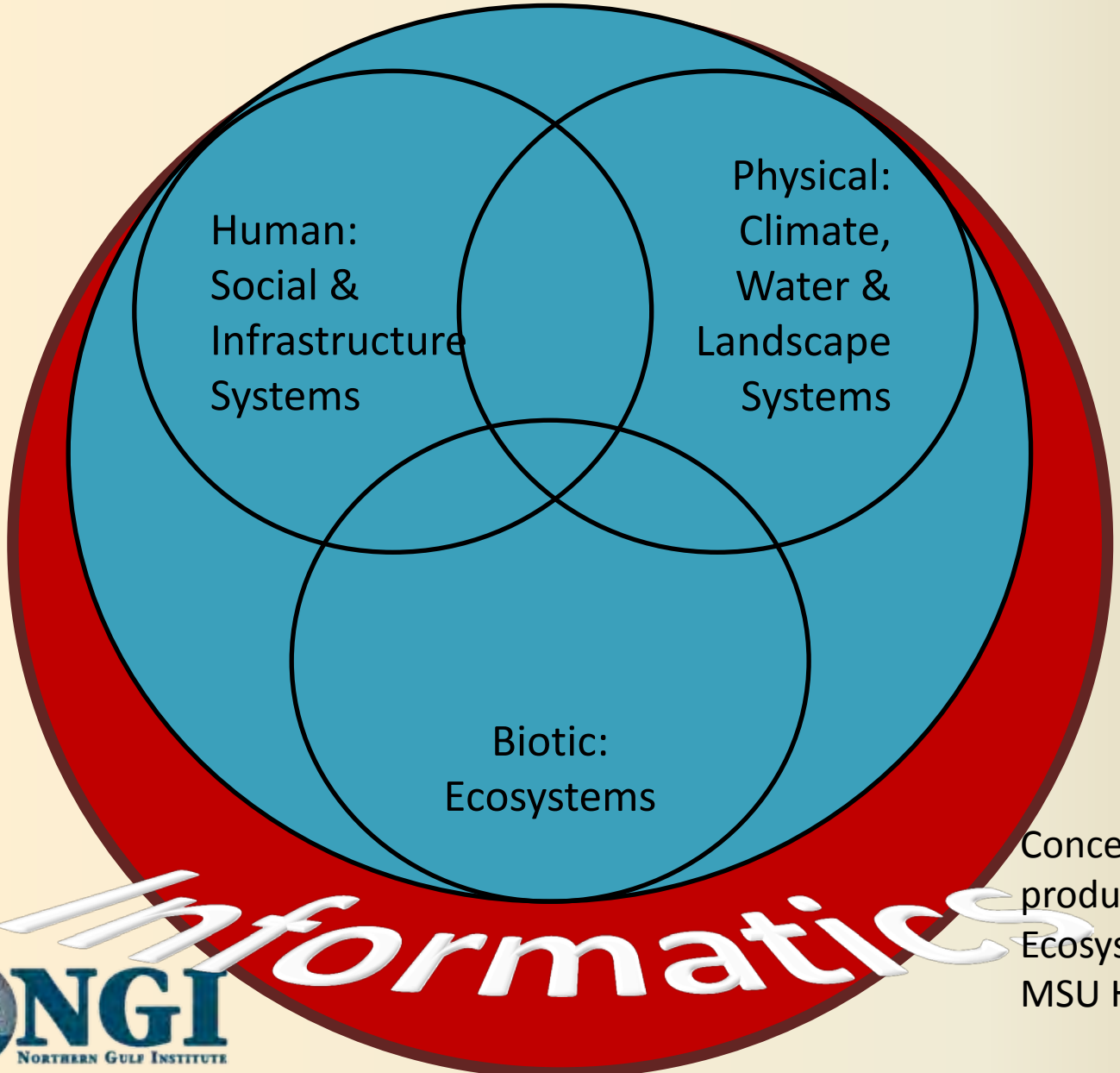
The NGI Conceptual Earth Ecosystem Model: Level 1



Conceptual model is the product of the NGI Ecosystem Team and MSU H_3O Group

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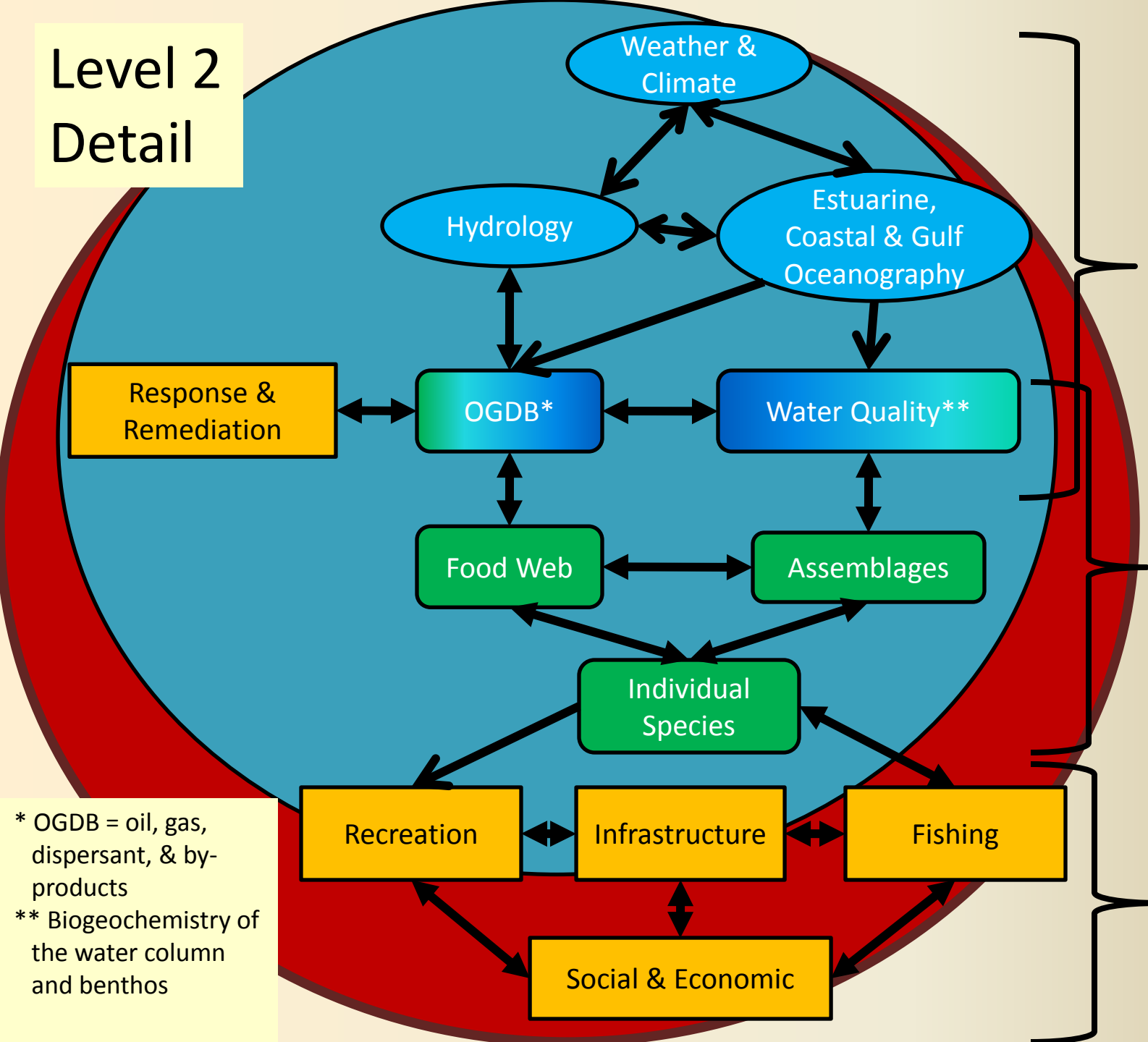
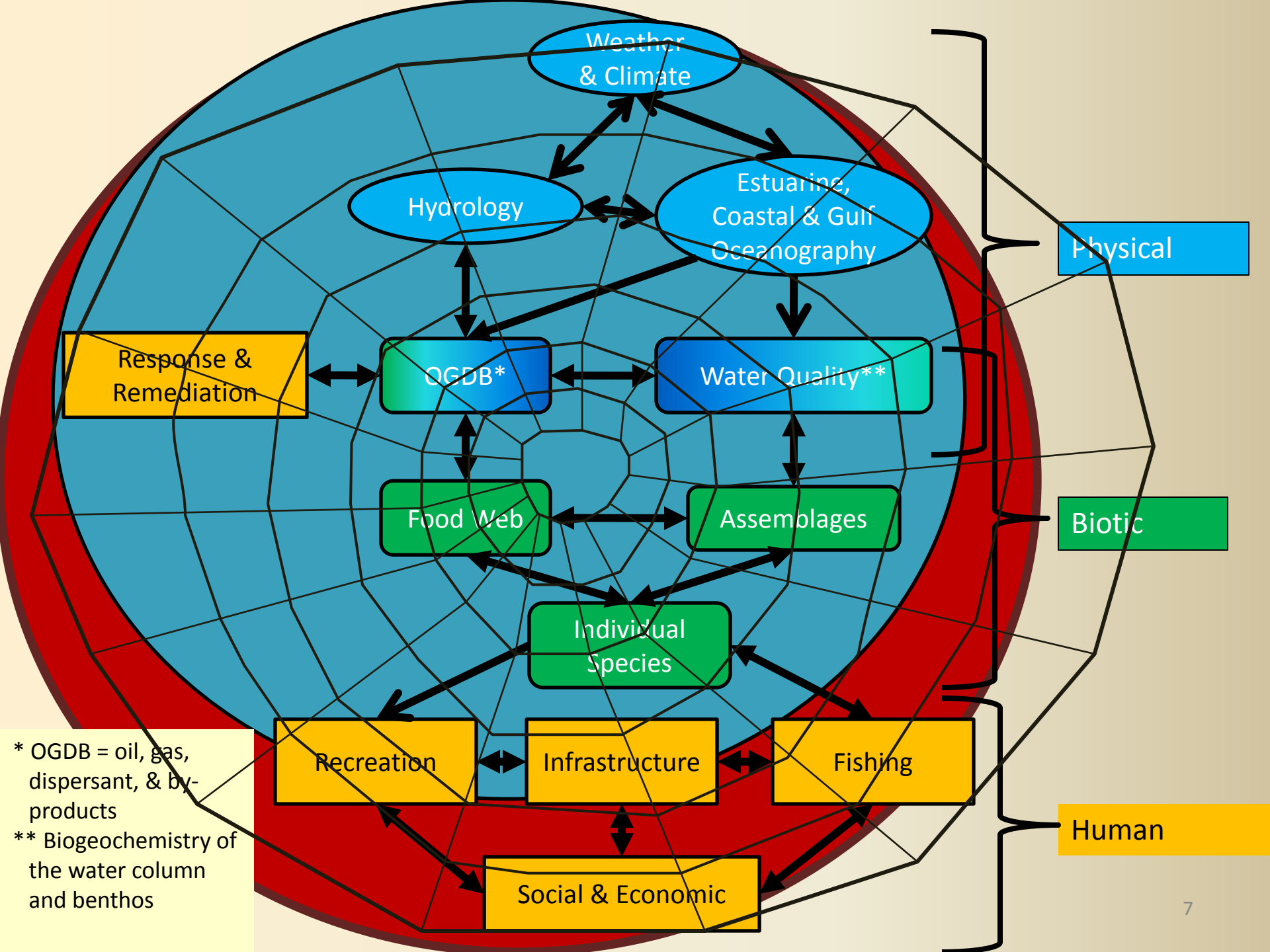
Level 2 Detail



* OGDB = oil, gas, dispersant, & by-products

** Biogeochemistry of the water column and benthos



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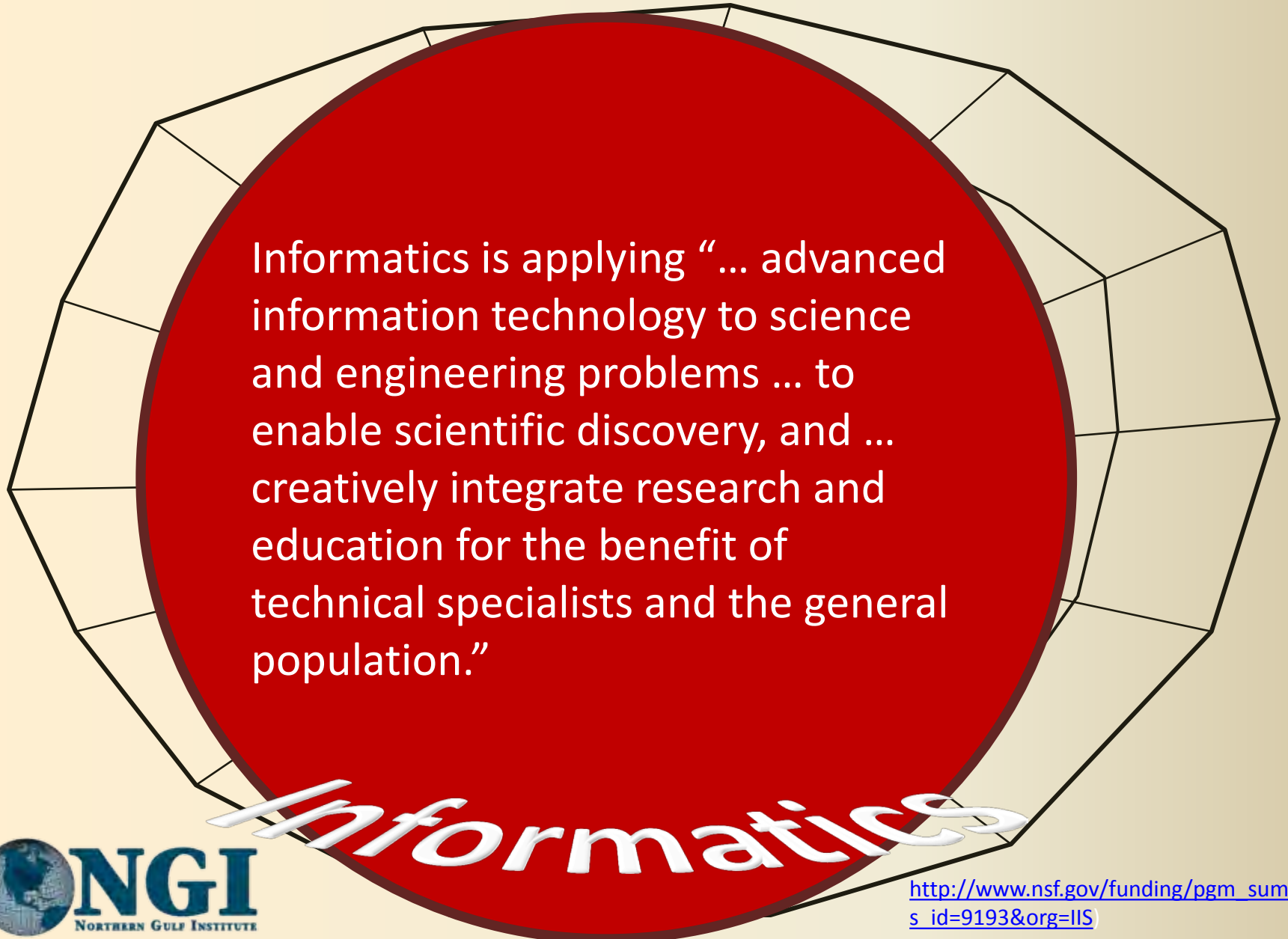
** Biogeochemistry of the water column and benthos

Informatics



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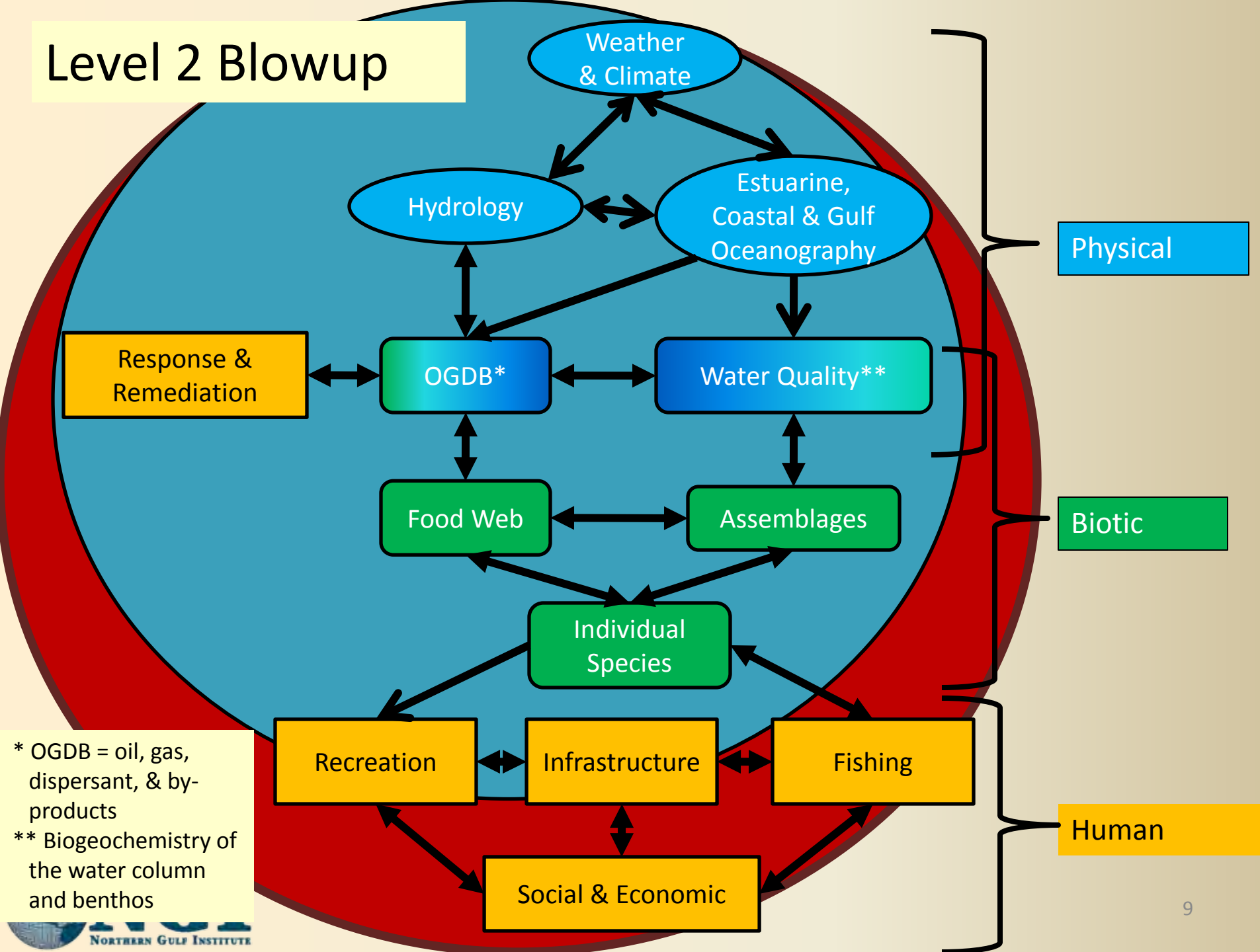
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=9193&org=IIS

Level 2 Blowup



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** Biogeochemistry of the water column and benthos

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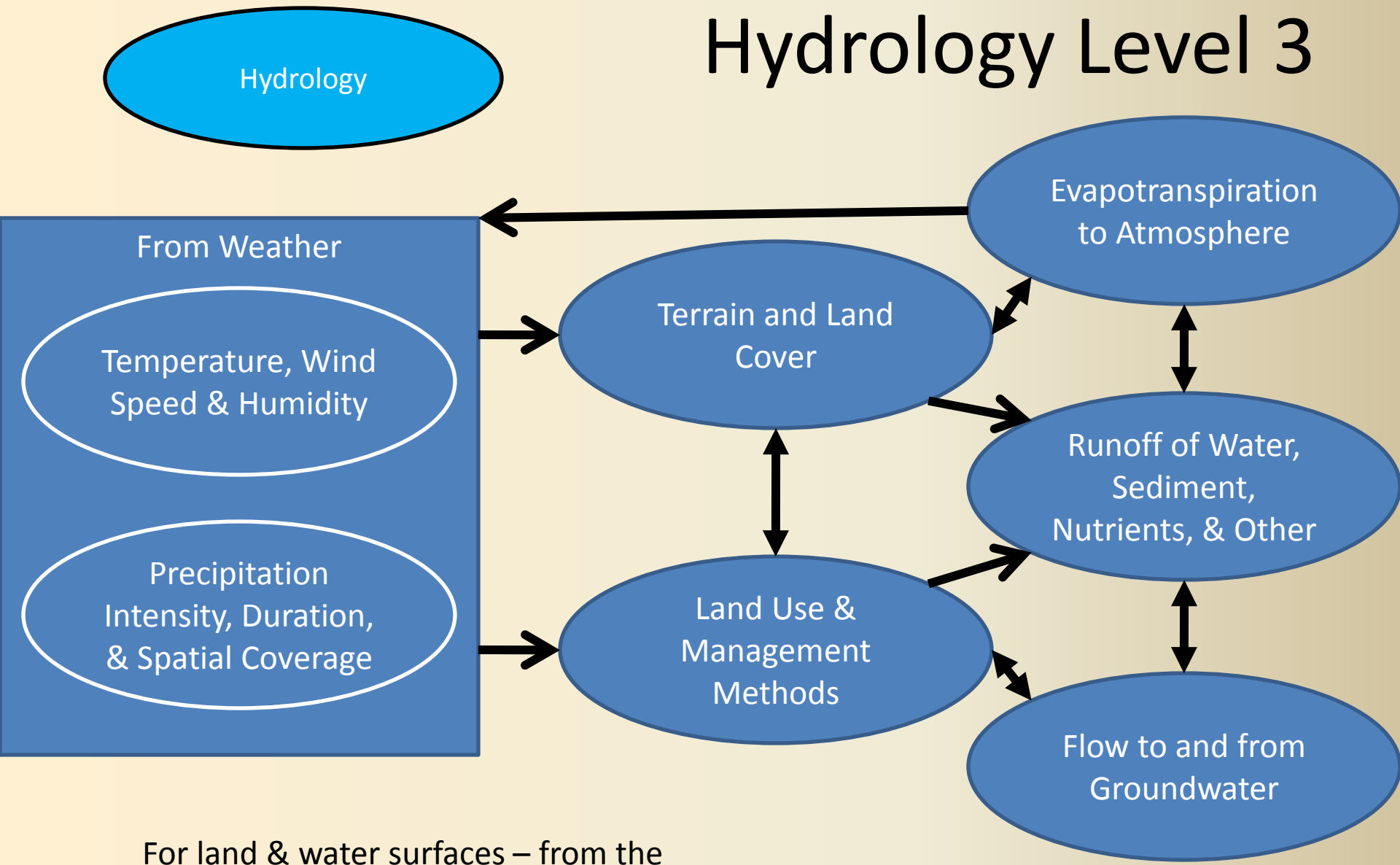
Hydrology Level 3



For land & water surfaces – from the watershed to the sea

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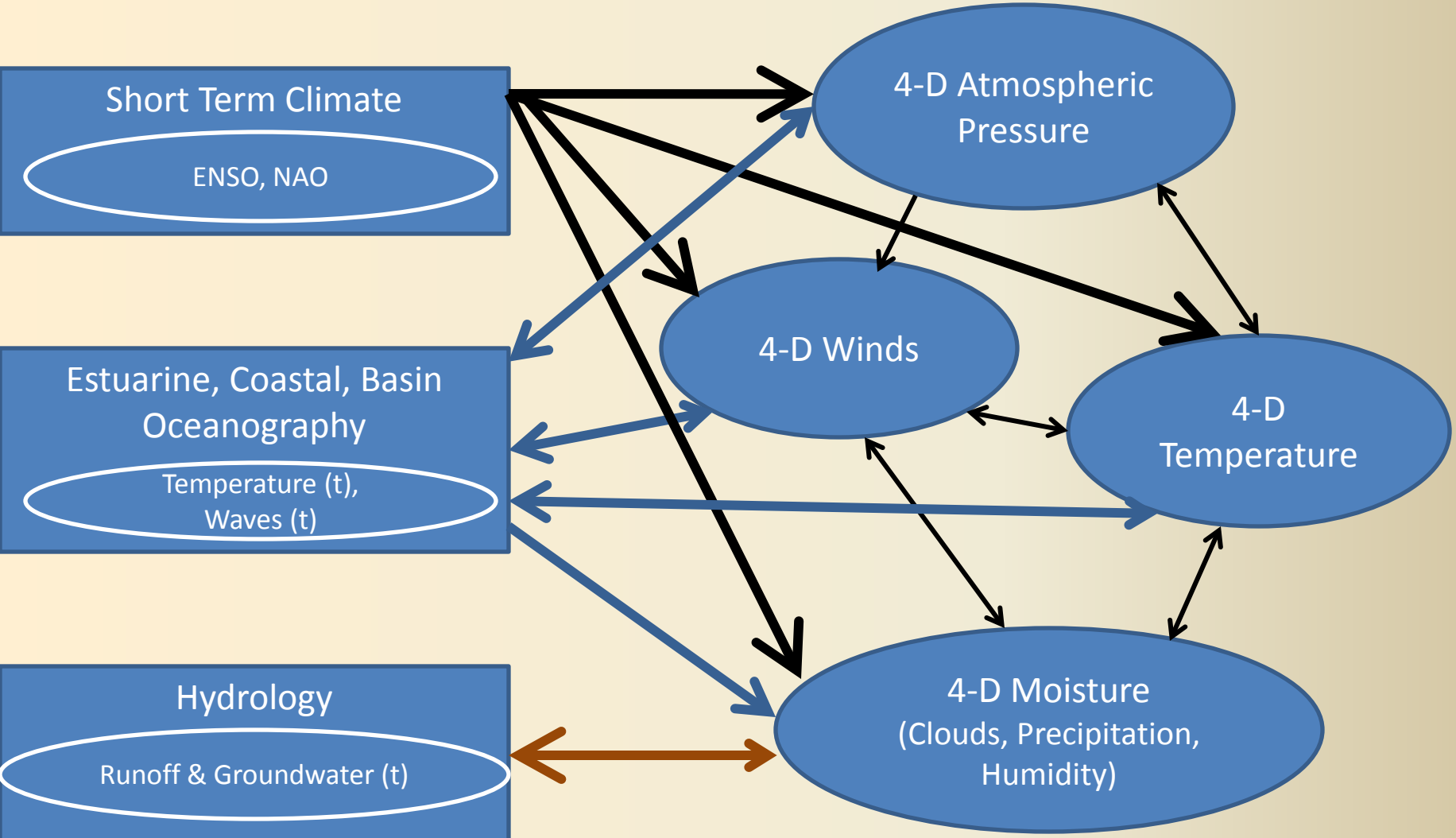
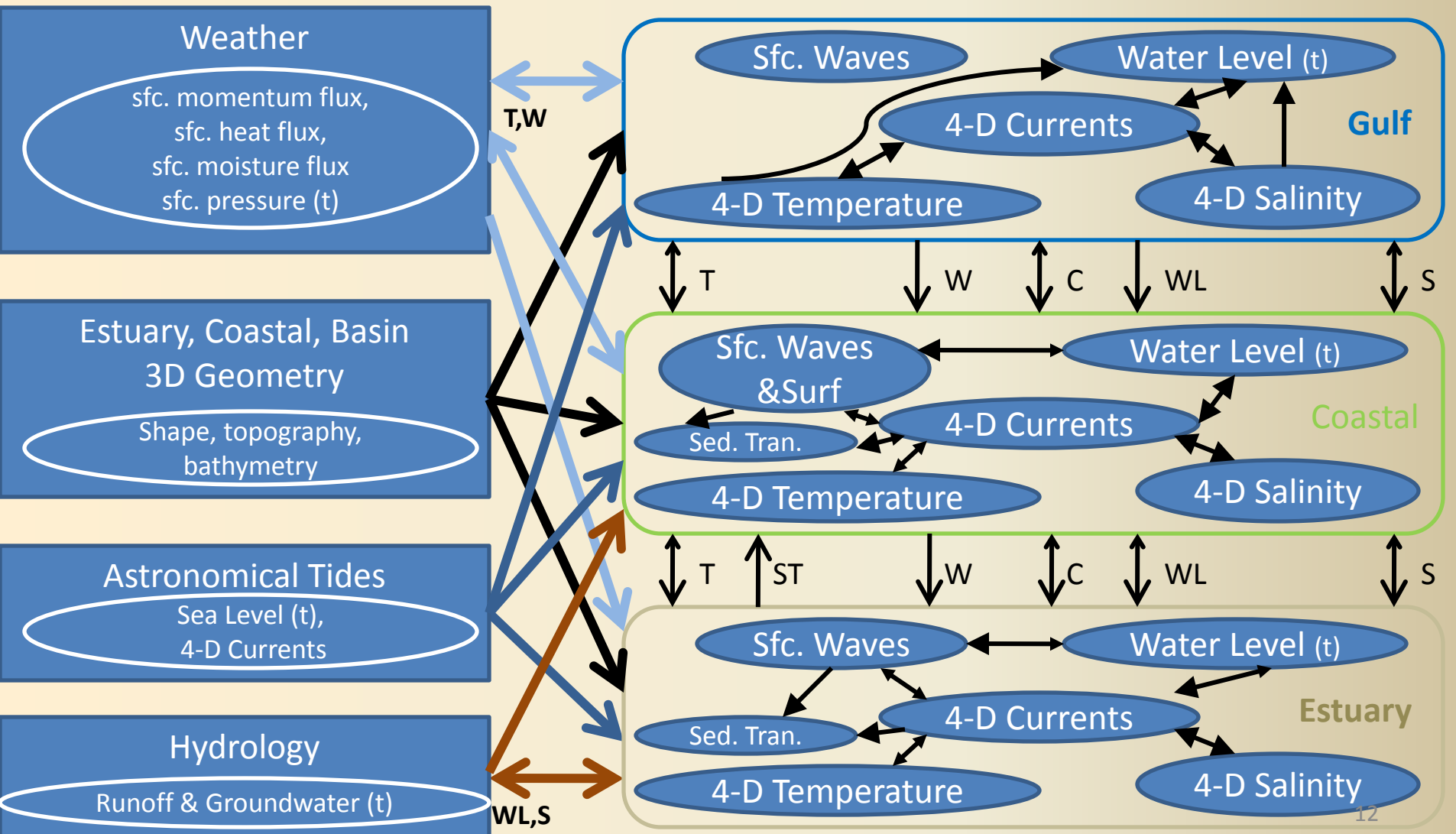
Weather & Climate

Weather & Climate Level 3



Estuarine, Coastal & Gulf Oceanography

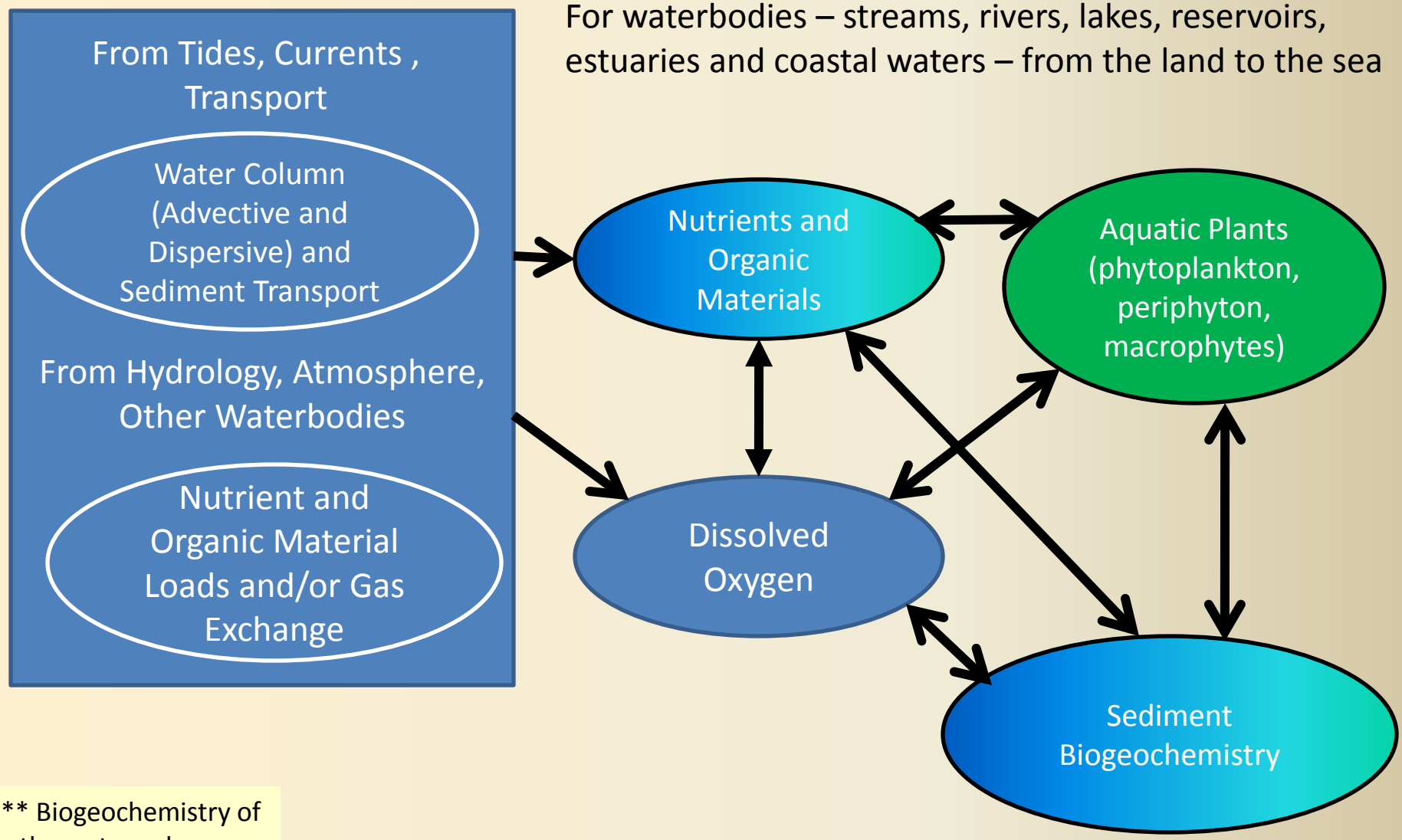
Estuarine, Coastal, &Gulf Oceanography Level 3



Water Quality Level 3

Water Quality**

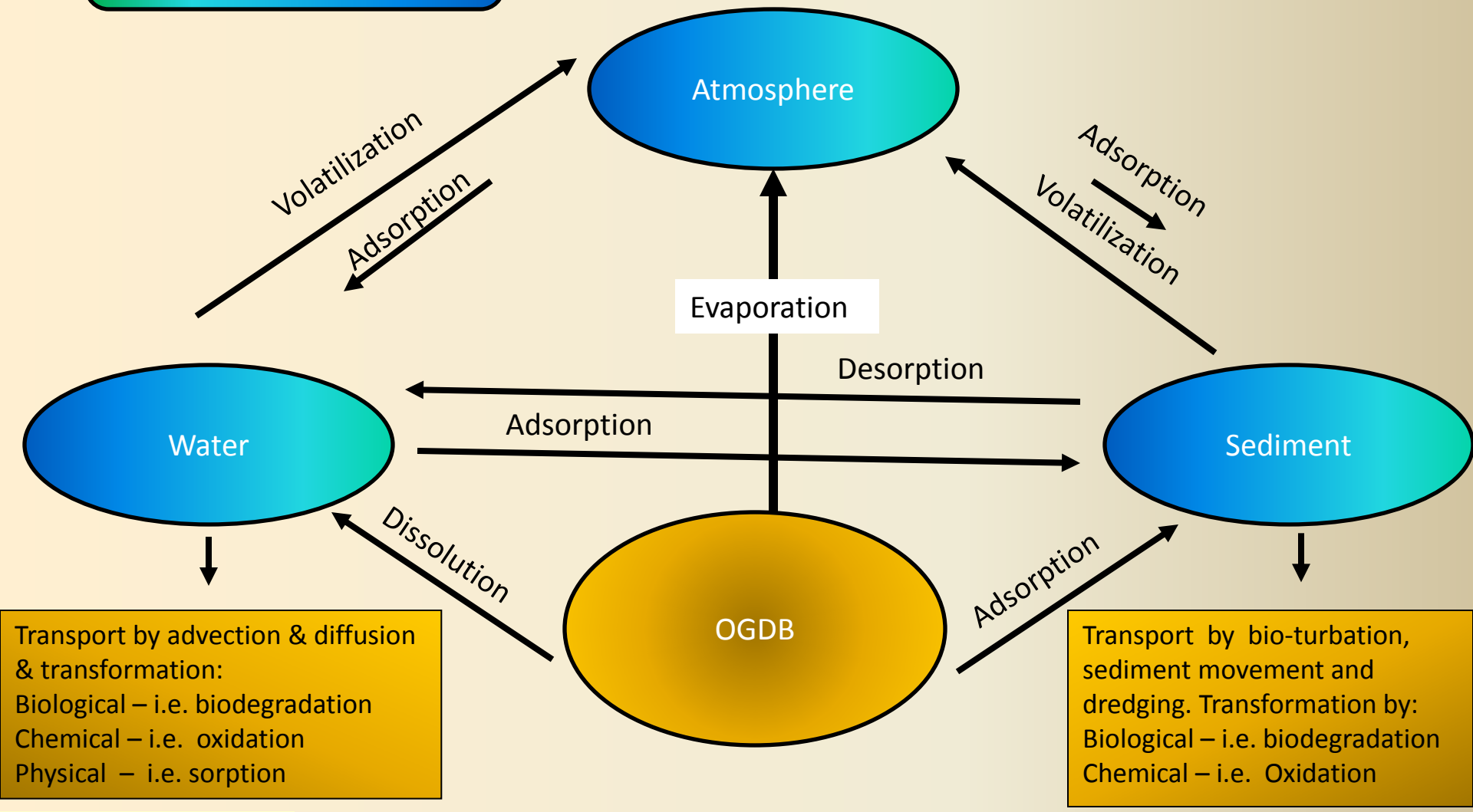
For waterbodies – streams, rivers, lakes, reservoirs, estuaries and coastal waters – from the land to the sea



** Biogeochemistry of the water column and benthos

OGDB* Transport

OGDB Transport Level 3

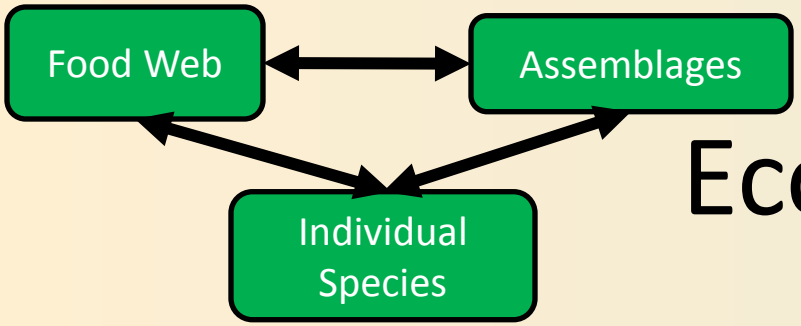


Transport by advection & diffusion & transformation:
Biological – i.e. biodegradation
Chemical – i.e. oxidation
Physical – i.e. sorption

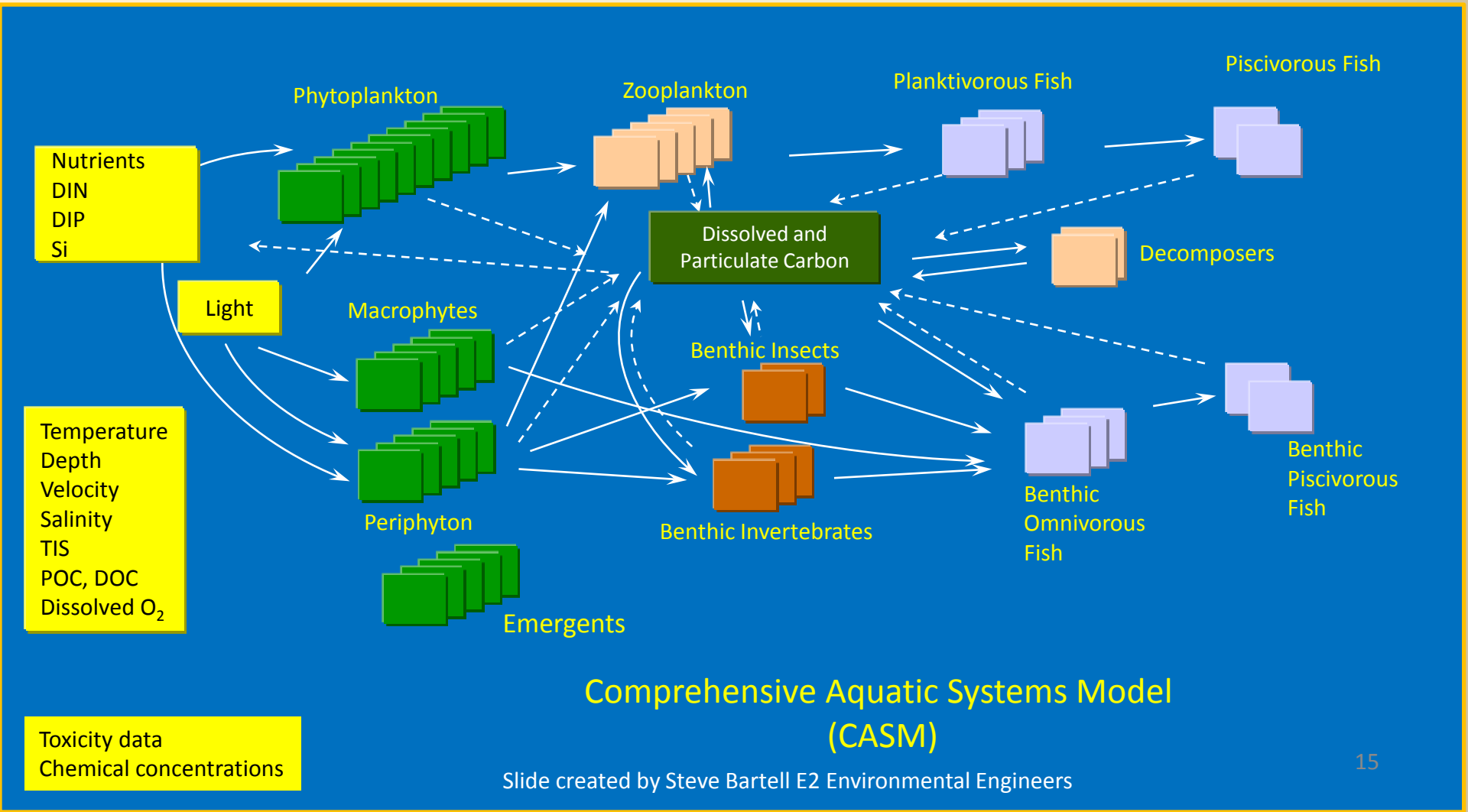
Transport by bio-turbation, sediment movement and dredging. Transformation by:
Biological – i.e. biodegradation
Chemical – i.e. Oxidation

* OGDB = oil, gas, dispersant, & by-products

Source: Mark Bricka, MSU



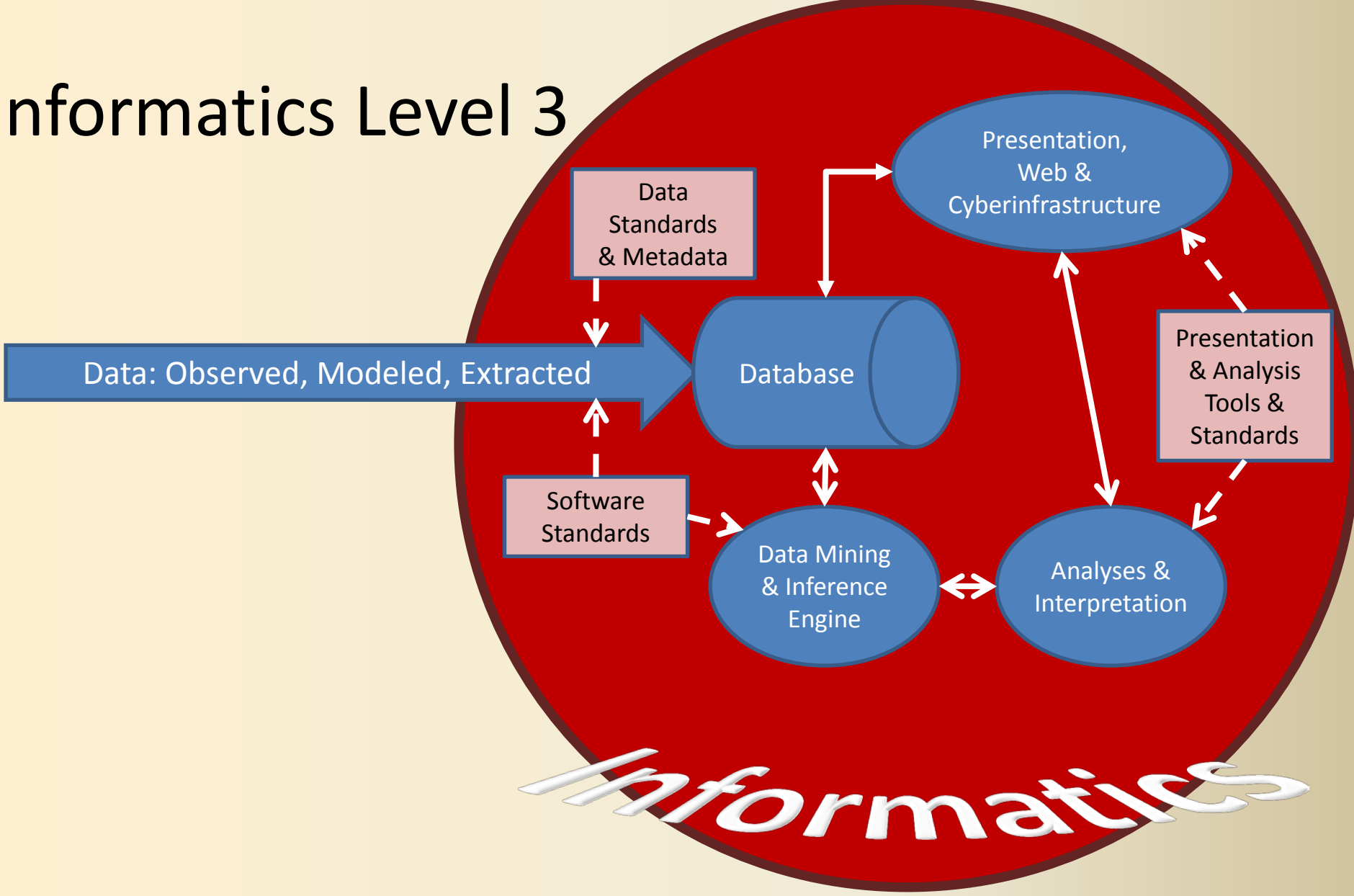
Ecosystem Level 3 & 4)



Comprehensive Aquatic Systems Model (CASM)

Slide created by Steve Bartell E2 Environmental Engineers

Informatics Level 3



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