

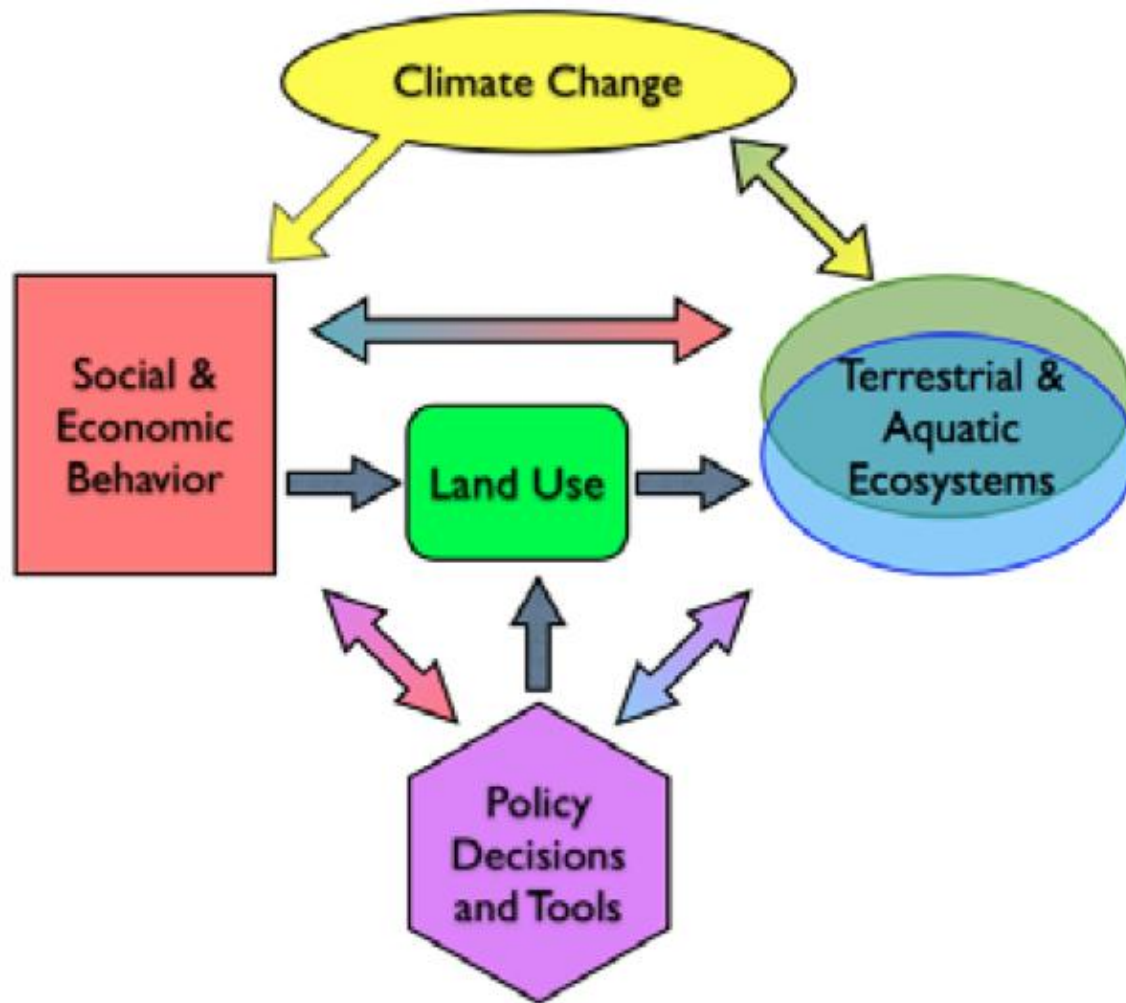
Integrated Assessment Model

Overarching

Question

How will the interaction of climate change and land use alter hydrological processes and nutrient transport from the landscape, internal processing and eutrophic state within the Lake and what are the implications for adaptive management strategies?

To investigate the impacts of climate and land use change on the region's economy and ecological infrastructure, and evaluate potential adaptation strategies, an **IA Model of the Lake Champlain Basin** will be developed based on **spatially-explicit modeling of ecosystem services**.



IA Model will:

1. Connect inputs and outputs of **independently defined models** developed from research on terrestrial, aquatic, and socioeconomic system response to regional climate and land use change scenarios.
2. Integrate via **semantic annotation** of the model types, the concepts they observe, and their corresponding spatial, temporal, and conceptual contexts.
3. Explicitly address **uncertainty and scale-mismatches** through an array of advanced techniques from neural networks, Bayesian statistics, agent-based models, and process-based models.
4. Result in **tangible impacts on watershed planning** to improve resilience and reduce the vulnerability that human communities and supporting ecosystems face as the result of destabilizing climate drivers.

Integrated Modeling Platform

ARIES: ARtificial Intelligence for **E**cosystem **S**ervices

- **Assessment** toolkit for ecosystem services (ES) and their values.
- Not a single model, but an **intelligent system** that customizes models to user goals.
- A mapping process for ecosystem service **provision, use, and flow**.
- Includes both **deterministic** and **probabilistic** models to inform decision-makers of likelihood of possible outcomes.
- **Web-based**, customizable for specific user groups, geographic areas and policy goals.
- Target **audience** includes researchers, governmental decision makers and policy makers, business environment and various public-private sustainability initiatives.

Integrated Modeling Platform

Areas of
provision of ES
and biodiversity

Flow paths
between provision
and use areas

Areas of use of ES
& biodiversity where
beneficiaries are
located

Provision Sheds



Benefit Sheds

Integrated Modeling Platform

Multi-scale variability (context)

SPATIAL

Vector vs. raster, projections, resolutions

TEMPORAL

Continuous vs. discrete, regular vs. irregular

STRUCTURAL

Aggregation, choice of variables

Multi-representation

Deterministic

Probabilistic

Classifications

Measurements

Rankings

Currencies

Binary

Explicit Semantics

Multi-paradigm

Agent-
based

DDE,
process-
based

Bayesian
networks

Static (GIS)

...

Semantically annotated data & models -> True Modularity, Substitutability
Content mediation and propagation -> Automatic Scaling & Matching

Integrated Modeling Platform

