Chesapeake Bay Application of the Marine InVEST Tool

Presentation to

Fisheries Goal Implementation Team

Howard Townsend and Ariana Sutton-Grier

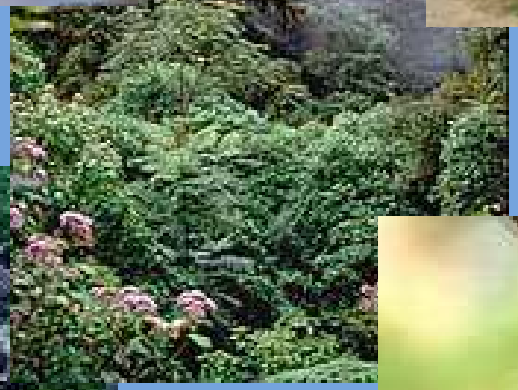
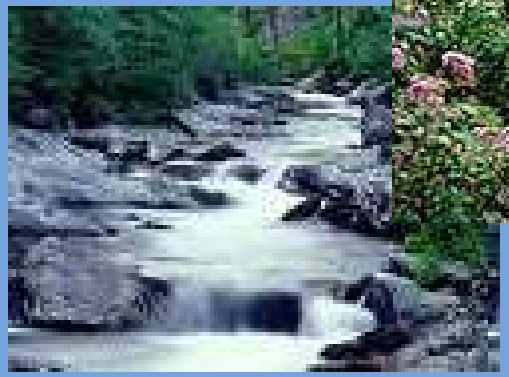
NOAA Chesapeake Bay Office

Ecosystem services

Are the wide array of goods and services
of value to people



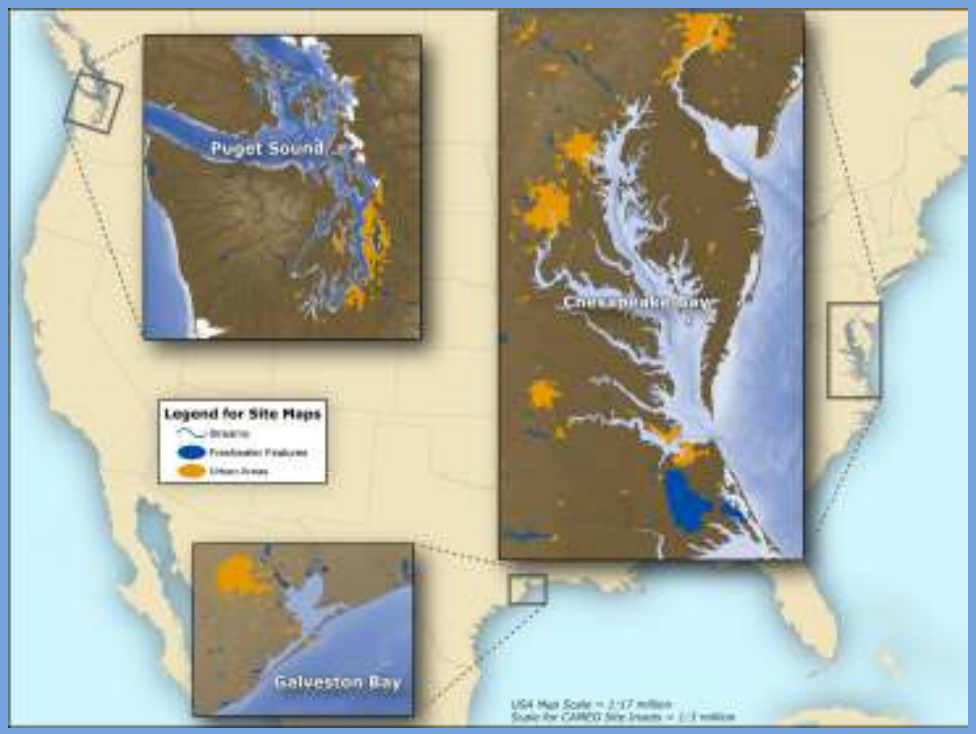


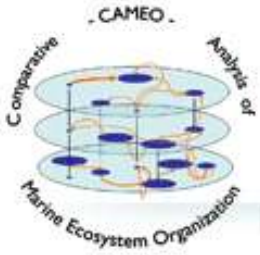
What is Marine InVEST?

- InVEST = **I**ntegrated **V**aluation of **E**cosystem **S**ervices and **T**rade-offs
- A **decision support tool** that is scenario-based to demonstrate the trade-offs in ecosystem services with different management decisions.
- Models fish production, aquaculture, habitat quality (nursery habitat model coming soon).
- Includes valuation (economic or non-monetary) to help make decisions.

Chesapeake Bay InVEST



- Linked watershed-marine ecosystem service models to evaluate coastal management strategies.
- Assess the importance of including watershed-based activities in the management of coastal and marine ecosystem services.
- Develop general set of linked watershed-marine models and apply them in three diverse sites—Puget Sound, **Chesapeake Bay** and Galveston Bay.



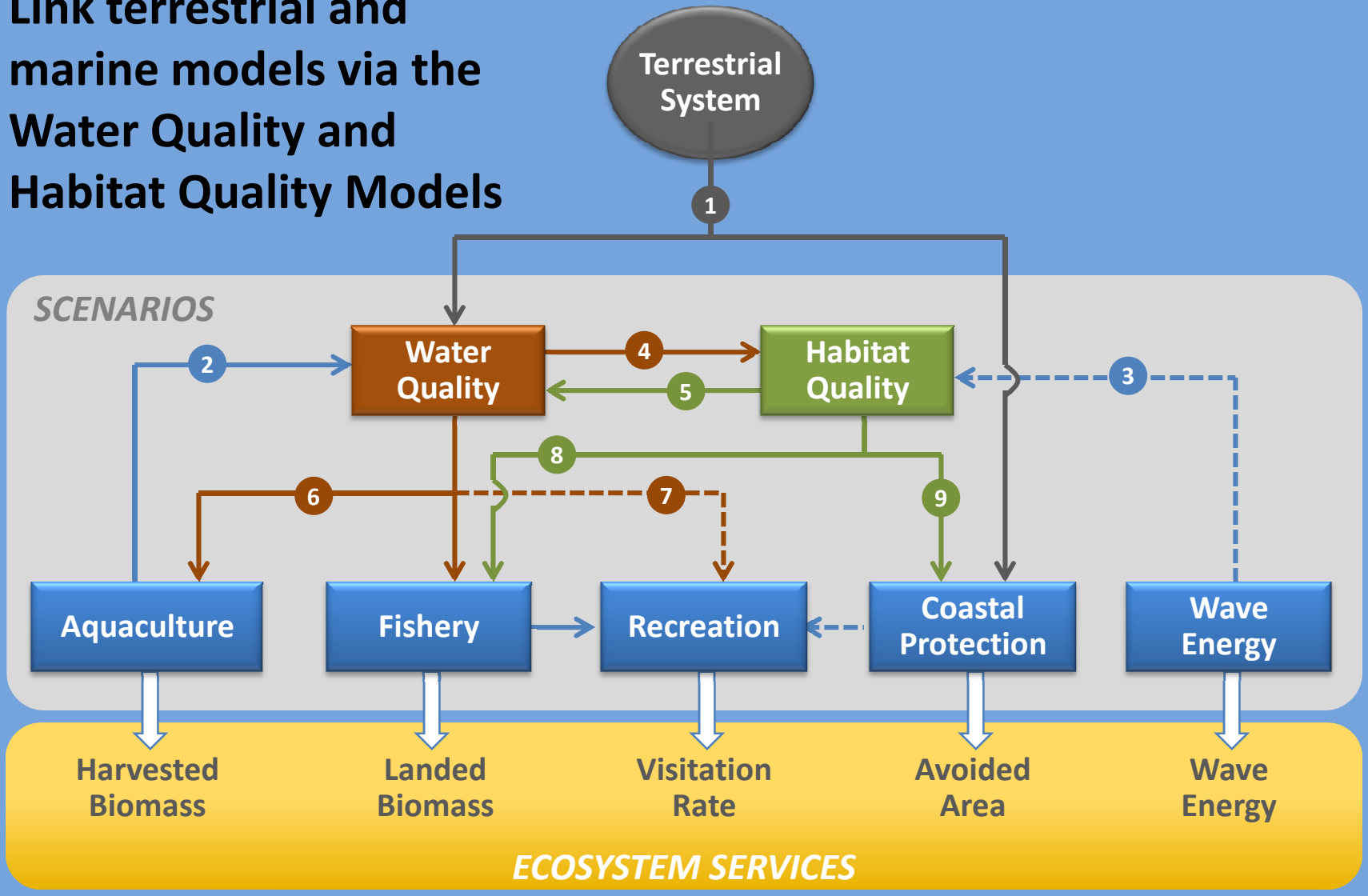
CAMEO

COMPARATIVE ANALYSIS OF MARINE ECOSYSTEM ORGANIZATION

CAMEO Project

- Compare how management-induced changes in ecosystem structure and processes affect the provisioning of different ecosystem services within and between sites (Puget Sound, Chesapeake Bay, and Galveston Bay).
- Ask how incorporating the effects of watershed-based activity into management decisions changes marine system responses?
- Project duration - 2 years

Link terrestrial and marine models via the Water Quality and Habitat Quality Models



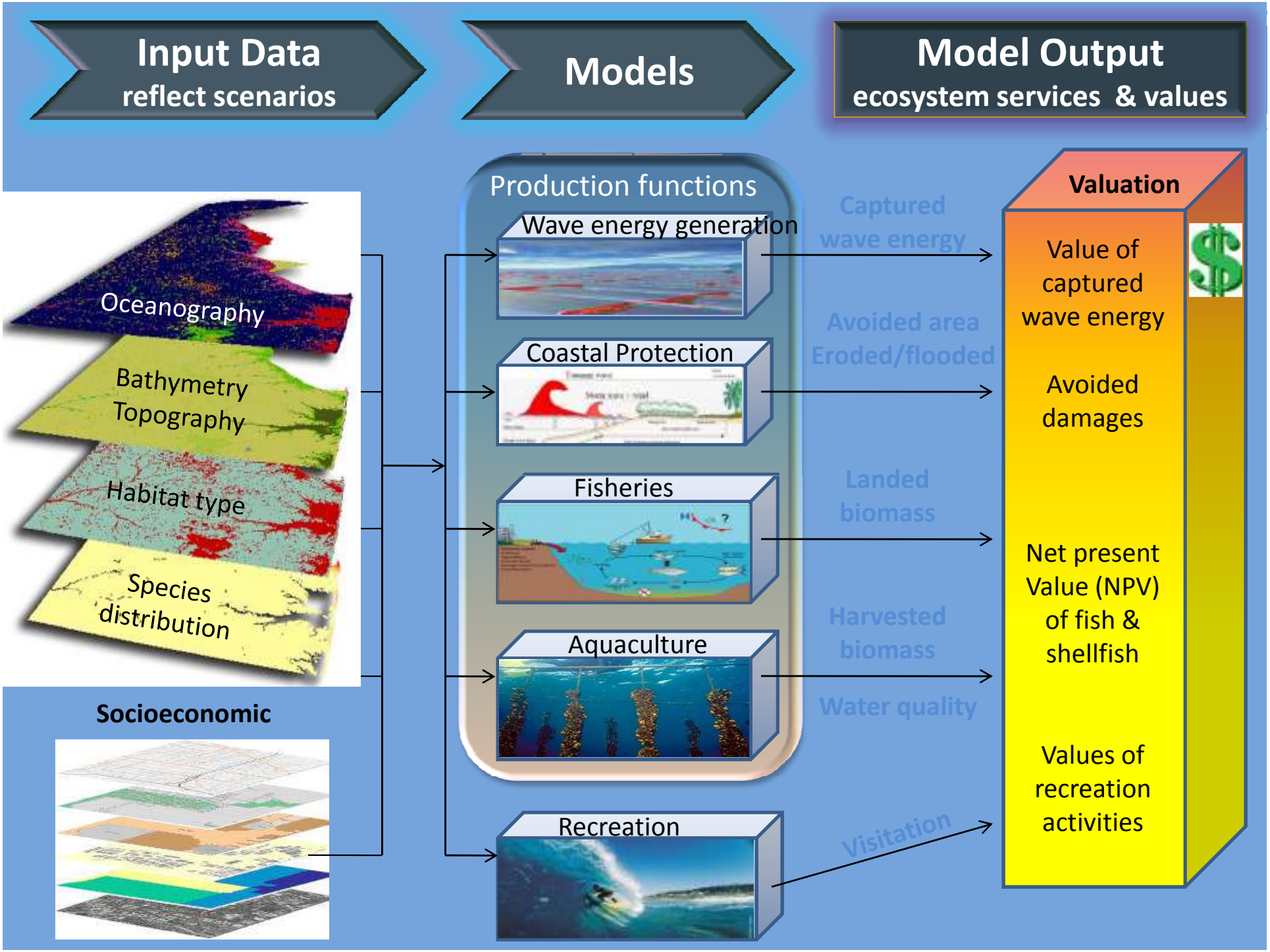
Models in Development:

Wind Energy

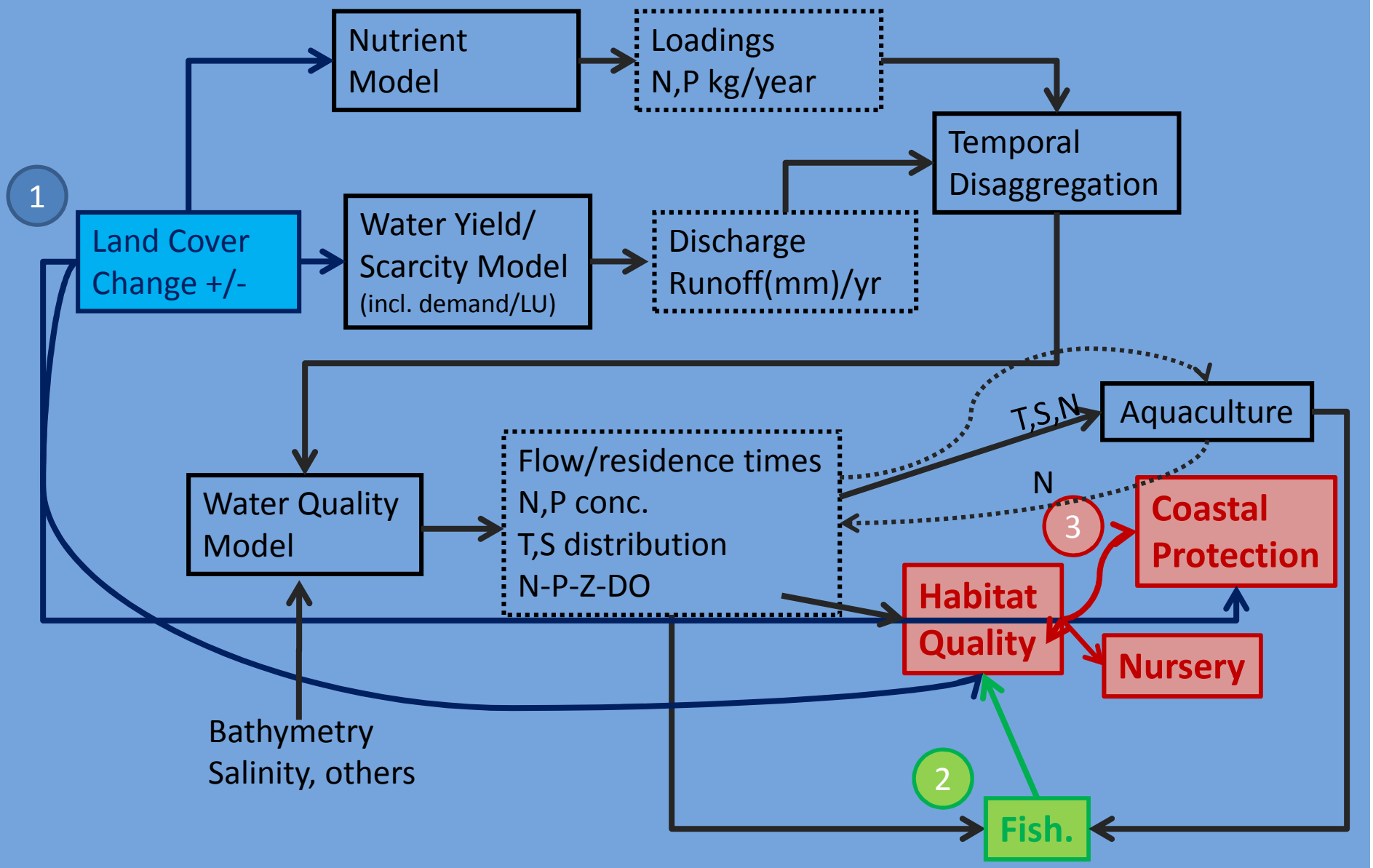
Biodiversity

Carbon storage

Filtration


Input Data
reflect scenarios
Models
Model Output
ecosystem services & values
Oceanography
Bathymetry
Topography
Habitat type
Species
distribution
Socioeconomic
Production functions
Wave energy generation
Coastal Protection
Fisheries
Aquaculture
Recreation
Captured
wave energy
Avoided area
Eroded/flooded
Landed
biomass
Harvested
biomass
Water quality
Visitation
Valuation
Value of
captured
wave energy
Avoided
damages
Net present
Value (NPV)
of fish &
shellfish
Values of
recreation
activities

What we are planning to do model with the Marine InVEST tool



Species and Ecosystem Services to Compare

Site	Species	Ecosystem Service
Puget Sound	Chinook Dungeness Crab Oysters Geoducks	WildFisheries - oysters, crabs, chinook AquaCulture - Oysters, Coastal Protection - habitats - salt marsh, oysters, seagrass
Chesapeake Bay	Striped Bass Blue Crab E.Oyster,	WildFisheries - oysters, crabs, bass Aquaculture - Oysters, Coastal Protection - habitats - oyster, SAV, salt marsh
Galveston Bay	White and Brown Shrimp Blue Crab SeaTrout R.Drum,Oysters	WildFisheries - oysters,crab,shrimp, drum Aquaculture - Oysters, Coastal Protection - habitats - salt marsh, seagrass, oyster

Coastal Protection = avoided erosion/flooded; flood depth (all)

Connection to Goal Implementation Team

- Do you see using this model in your work? If so, how?
- Can this model help address the policy challenges in the Bay?
- What management questions or alternative management strategies are being proposed that this model help with?
- Are there other users we should talk to about this model?

- Development of the Marine InVEST Tool is supported by the CAMEO program. CAMEO is funded by a joint NSF and NOAA grant

- Program will support fundamental research to understand complex dynamics controlling ecosystem structure, productivity, behavior, resilience, and population connectivity, as well as effects of climate variability and anthropogenic pressures on living marine resources and critical habitats.

- CAMEO encourages the development of multiple approaches, such as ecosystem models and comparative analyses of managed and unmanaged areas (e.g., marine protected areas) that can ultimately form a basis for forecasting and decision support.

natural capital PROJECT

ALIGNING ECONOMIC FORCES WITH CONSERVATION

Collaborators

Co-PIs

Mary Ruckelshaus, Natural Capital Project/ Stanford University
Anne Guerry, Natural Capital Project/ Stanford University
Gretchen Daily, Stanford University
Phil Levin, NOAA Fisheries Northwest Fisheries Science Center
Mark Plummer, NOAA Fisheries Northwest Fisheries Science Center
Howard Townsend, NOAA Fisheries Chesapeake Office

Postdocs

Katie Arkema, Stanford University
Jodie Toft, Stanford University
CK Kim, Stanford University
Tom Minello, NOAA Fisheries Galveston Laboratory
Matt Marsik, CAMEO Postdoc
David Sutherland, CAMEO Postdoc
Georgi Spridonov, CAMEO Postdoc at NCBO
Ariana Sutton-Grier, AAAS Postdoc