

HyspIRI Input to Models



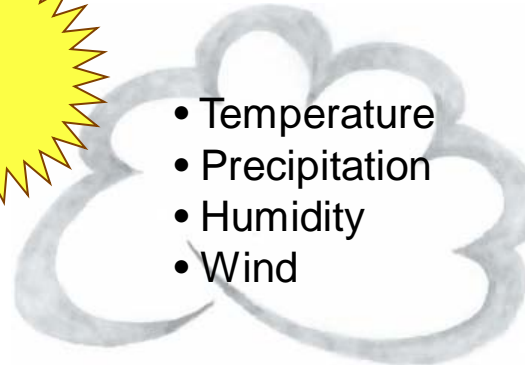
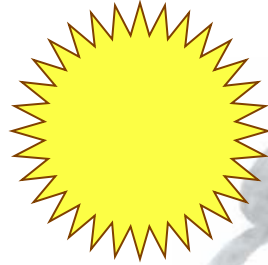
K. Fred Huemmrich

GSFC HyspIRI Symposium on Ecosystem Data Products

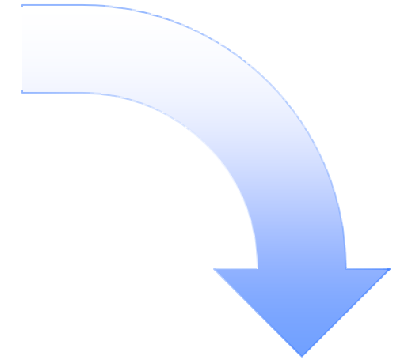
May 4, 2010

Climate – Ecosystem Feedbacks

Climate Change

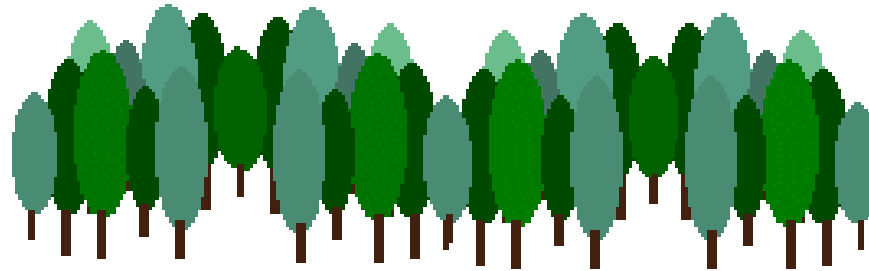


- Temperature
- Precipitation
- Humidity
- Wind



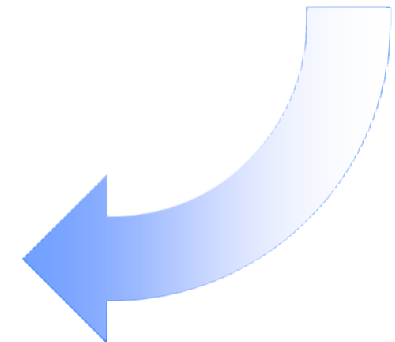
Ecosystem Response

- Reproduction, Recruitment, Mortality
- Species Interactions
- Species Distribution & Composition
- Photosynthesis, Respiration, Biomass



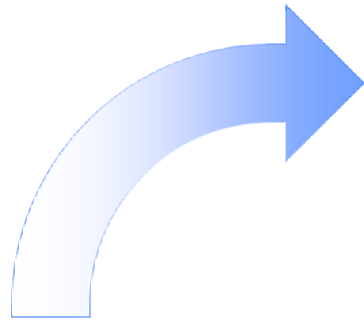
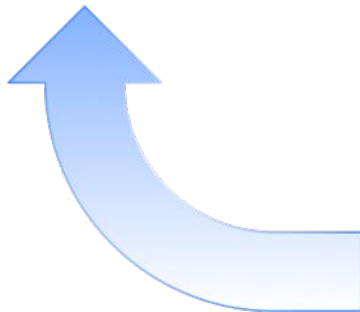
Biophysical & Biogeochemical Changes

- Carbon Storage
- Canopy Roughness & Phenology
- Surface Albedo
- Evapotranspiration
- Trace Gas Fluxes

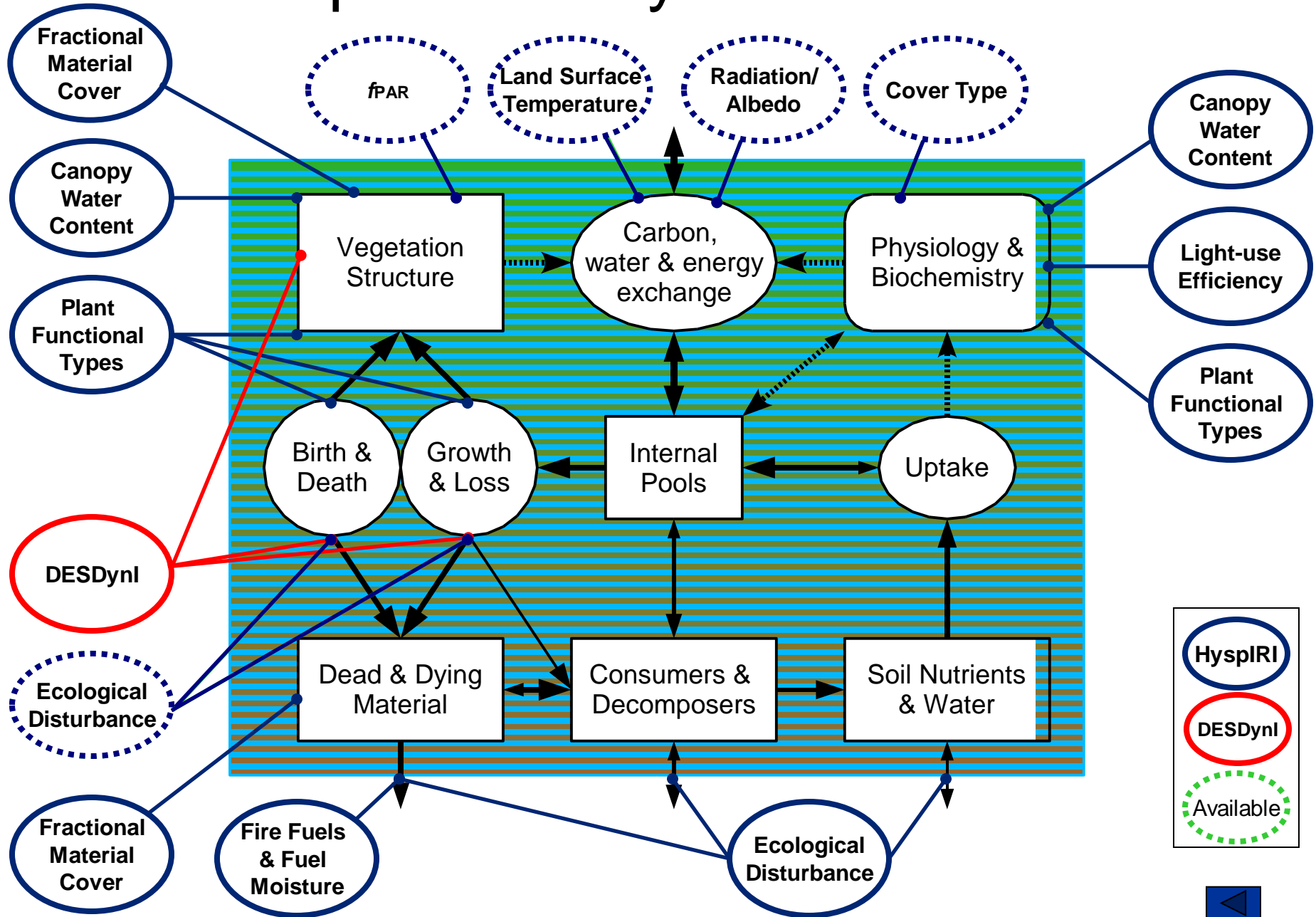


Change in Climate Forcing

- Concentrations of Greenhouse Gases & Aerosols
- Energy Balance (e.g. latent and sensible heat fluxes, albedo)



Conceptual Ecosystem Flux Model



Modeling Approaches

- Diagnostic models
 - Describes fluxes, e.g. Light Use Efficiency models
 - Inputs from HypsIRI include
 - PRI
 - Chlorophyll concentrations
 - Canopy water content
 - fPAR
 - Albedo
 - Radiometric surface temperature

Diagnostic models

- Diagnostic models and HyspIRI
 - Mission too short to directly observe climate change effects
 - VSWIR will not provide a dense time series
 - Merge with temporally frequent broadband data to improve temporal resolution
 - Output at spatial scale appropriate for land management
 - Provides validation data sets for prognostic models
 - Use to develop and test algorithms that can feed into prognostic models
 - e.g. examining effect of foliage N content on photosynthetic stress responses in different plant functional types

Modeling Approaches

- Prognostic models
 - Can be utilized to provide predictions and projections
- HyspIRI produced input data fields
 - New types of data for inputs, e.g. better descriptions of Plant Functional Types
 - Provide seasonally changing input values
 - Higher spatial resolution and improved classification provide better understanding of mixtures

HyspIRI Model Inputs

- Leaf nitrogen
 - photosynthetic rates
- Disturbances
 - Thinning and diffuse disturbances
 - May have important effects on carbon and water fluxes
- Species distributions (functional biodiversity)
- Biomass in low stature ecosystems (grasslands, shrublands, etc.)
 - Cover types with the largest areas
 - May be significant biomass changes with increased shrubs

Plant Functional Types

- PFT often defined based on landcover classification
 - HyspIRI will produce improved landcover classifications
- PFT can be defined by direct measurement of a suite of variables such as:
 - Green/nongreen fractions
 - Maximum photosynthetic rate
 - Photosynthetic efficiency
 - Green leaf area
 - Foliage Nitrogen
 - Leaf water content
 - Pigment concentrations
 - Albedo
 - Sensitivity to climate change (e.g., inferring rooting depth from stress responses)

Conclusions/Issues

- Model improvements occur through
 - Improved algorithms
 - Utilization of new types of information
 - Improved accuracy of input data fields
 - More and better data for validation
- How do we facilitate using HypsIRI data to improve models?
 - Development of ways to organize and manage the huge data volumes from HypsIRI
 - Ability to extract level 2+ data for study sites
 - Standardized gridding of global products
 - Cloud-free composites
 - Tools to make it easy to link HypsIRI data with other data products