CASA-CQUEST Modeling for Carbon Cycle Assessments in Forested Ecosystems of the United States

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National Climate Assessment   NASA Products and Capabilities
Ames CASA Model Schematic

(a) Soil Moisture Balance and Plant Functional Types

(b) Ecosystem Production Nutrient Mineralization

CASA global NPP validation versus observed NPP estimates ($n = 1927$ from IGBP-DIS; Olson et al., 1997)

$$NPP = Sr \times EVI \times e_{max} \times T \times W$$
CASA Model Prediction of Global NPP from 2000 to 2009

NPP Trend (g C m\(^{-2}\) yr\(^{-1}\))
Storage of carbon in U.S. forests predicted from satellite data, ecosystem modeling, and inventory summaries

Climatic Change
DOI 10.1007/s10584-008-9462-5
CASAC QUEST – A Decision Support System for Carbon Accounting

**User Defined Profile**
- Region of Interest
- Time Frame
- Biophysical Management
- Climate Scenario

**Outputs:**
- Landscape-to-continental scale predictive maps of above and below ground distributions of sequestered carbon for different climate scenarios

**Inputs include**
- continental-scale land cover, NDVI, FPAR, elevation, soils, and climate data...

**Multi-scale Validation Information**

**Data Sources**
- NASA / NGA SRTM Elevation
- NASA MODIS Products
- Leaf Biomass
- Cropland NPP
- VEMAP & Daymet (UMT) Climate data
- USFS Forest Inventory and Analysis Data
- National Resource Analysis Data
- Ames Research Center

**Related Projects**
- Natural Resources Conservation Service (NRCS)
NCA Partnership

About TACCINO

The Template for Assessing Climate Change Impacts and Management Options (TACCIMO) is a web-based tool that connects forest planning to current climate change science. The formation of TACCIMO was rooted in the need for a standardized, credible, and concise science delivery tool relevant to forest planning and management.

What TACCIMO Delivers - Access to the most current climate change projections and science, including the likely range of projected future climate for any state, county, or National Forest and dynamically linked peer-reviewed scientific statements describing effects and management adaptation options. For Forest Service users, TACCIMO additionally connects climate change science with relevant planning language.

Who Should Use TACCIMO - Federal, state, and private land managers with diverse information needs related to climate change. Certain content is developed specifically for USDA Forest Service planners to assist with climate change analysis for projects and forest plan revisions.

Who is Developing TACCIMO - USDA Forest Service scientists from both the Eastern and Western Forest Environmental Threat Assessment Centers and forest planners from the Southern and Pacific Southwest Regions of the National Forest System.

1. Planning
   - Management conditions and capabilities to address climate change

2. Science
   - Physical and biological impacts of climate change and potential management options

3. TACCIMO Report
   - Customized and synthesized account of science and needed planning

Water Supply Stress Index Model (WaSSI)

Overview & Applicability

The WaSSI model is a tool that models local watershed stress by comparing water supply and demand in a particular area. The area is limited to a specific zipcode, which is linked to one of the 2100+ 8-digit Hydrologic Unit Codes (HUCs) in the lower 48 states, as defined by the US Geological Survey (USGS). WaSSI can be used to examine the historical water stress index for a given area, or can be used to predict future changes in water stress. The model incorporates natural and anthropogenic effects into its predictions of supply and demand. The modeling tool may be useful in facilitating integrated assessment of climate change adaptation and mitigation strategies across multiple watersheds and agencies, but would be substantially strengthened by the ability to forecast water stress across an integrated landscape larger than that defined by a zipcode (see Information on Tool Restrictions and Limitations, below).
Carbon fluxes in ecosystems of Yellowstone National Park predicted from remote sensing data and simulation modeling.
MODIS EVI Trend Results 2000-2011
(Source: Shuang Li, 2012)