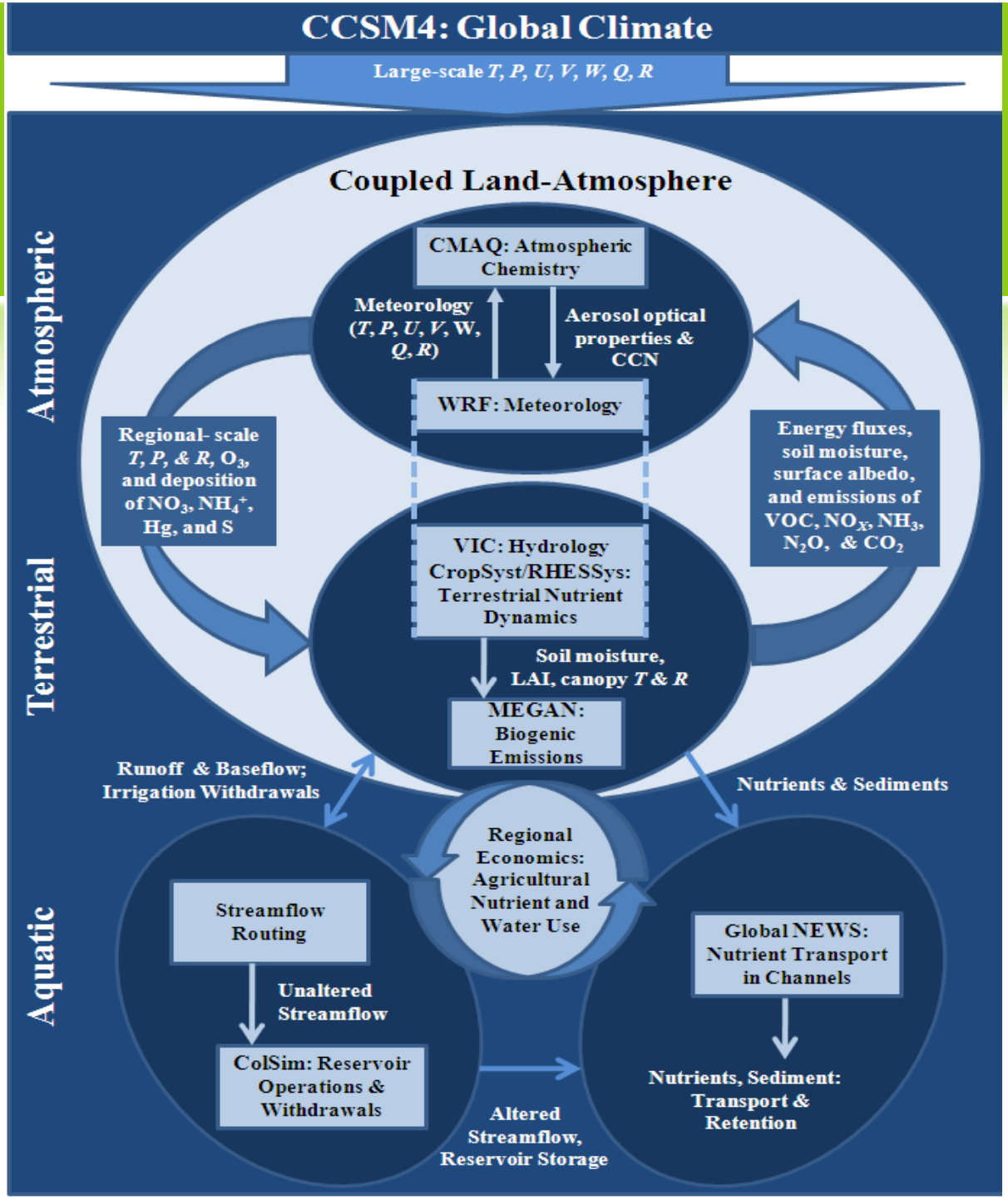
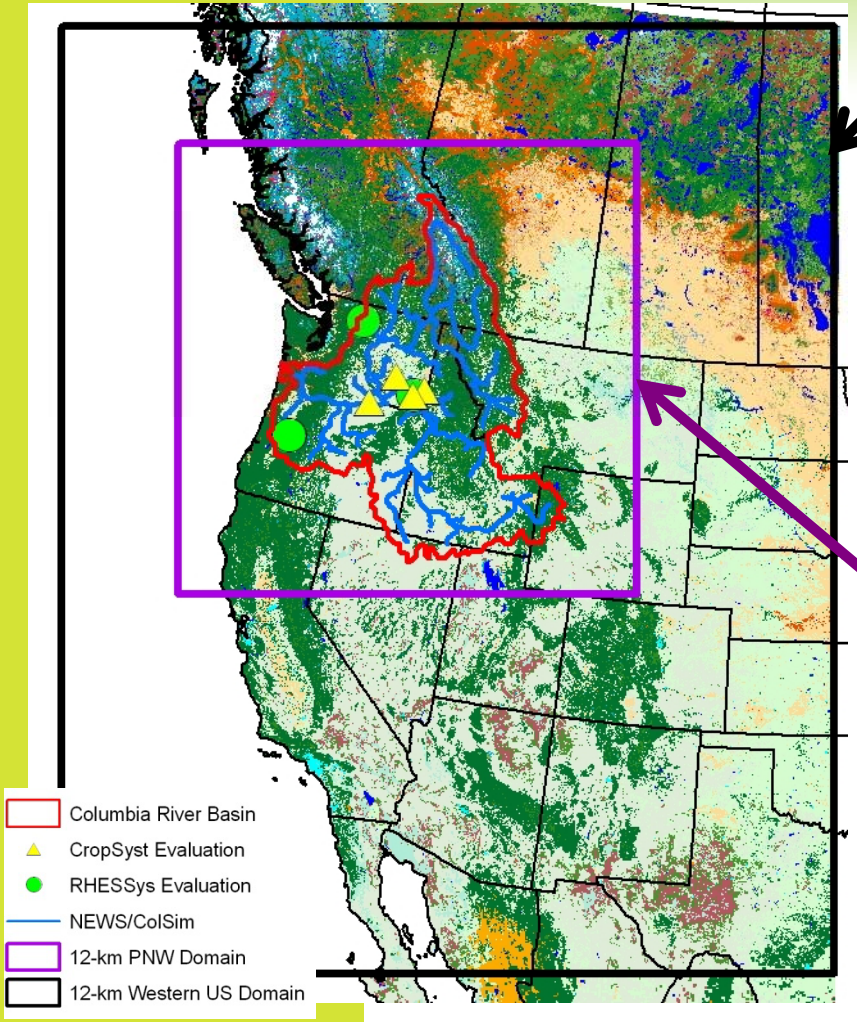
Model Integration via the CESM flux coupler and Model Domains

February 2013, BioEarth All-Hand Meeting

BioEarth

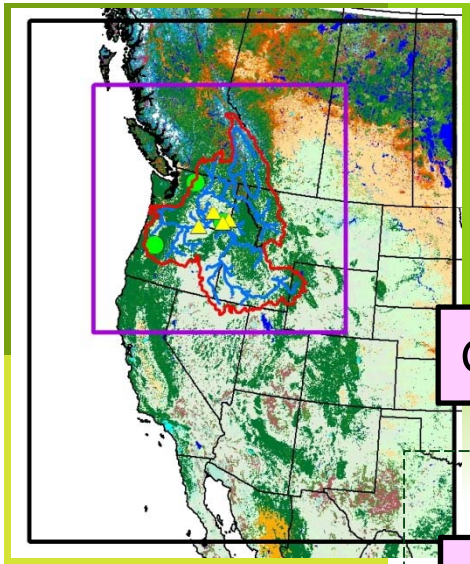

CCSM4: Global Climate
Large-scale T, P, U, V, W, Q, R
Coupled Land-Atmosphere
Atmospheric
Terrestrial
Aquatic
CMAQ: Atmospheric Chemistry
Meteorology (T, P, U, V, W, Q, R)
Aerosol optical properties & CCN
WRF: Meteorology
Regional- scale T, P, & R, O3, and deposition of NO3, NH4+, Hg, and S
Energy fluxes, soil moisture, surface albedo, and emissions of VOC, NOX, NH3, N2O, & CO2
VIC: Hydrology
CropSyst/RHESSys: Terrestrial Nutrient Dynamics
Soil moisture, LAI, canopy T & R
MEGAN: Biogenic Emissions
Runoff & Baseflow; Irrigation Withdrawals
Nutrients & Sediments
Regional Economics: Agricultural Nutrient and Water Use
Streamflow Routing
Unaltered Streamflow
ColSim: Reservoir Operations & Withdrawals
Altered Streamflow, Reservoir Storage
Global NEWS: Nutrient Transport in Channels
Nutrients, Sediment: Transport & Retention

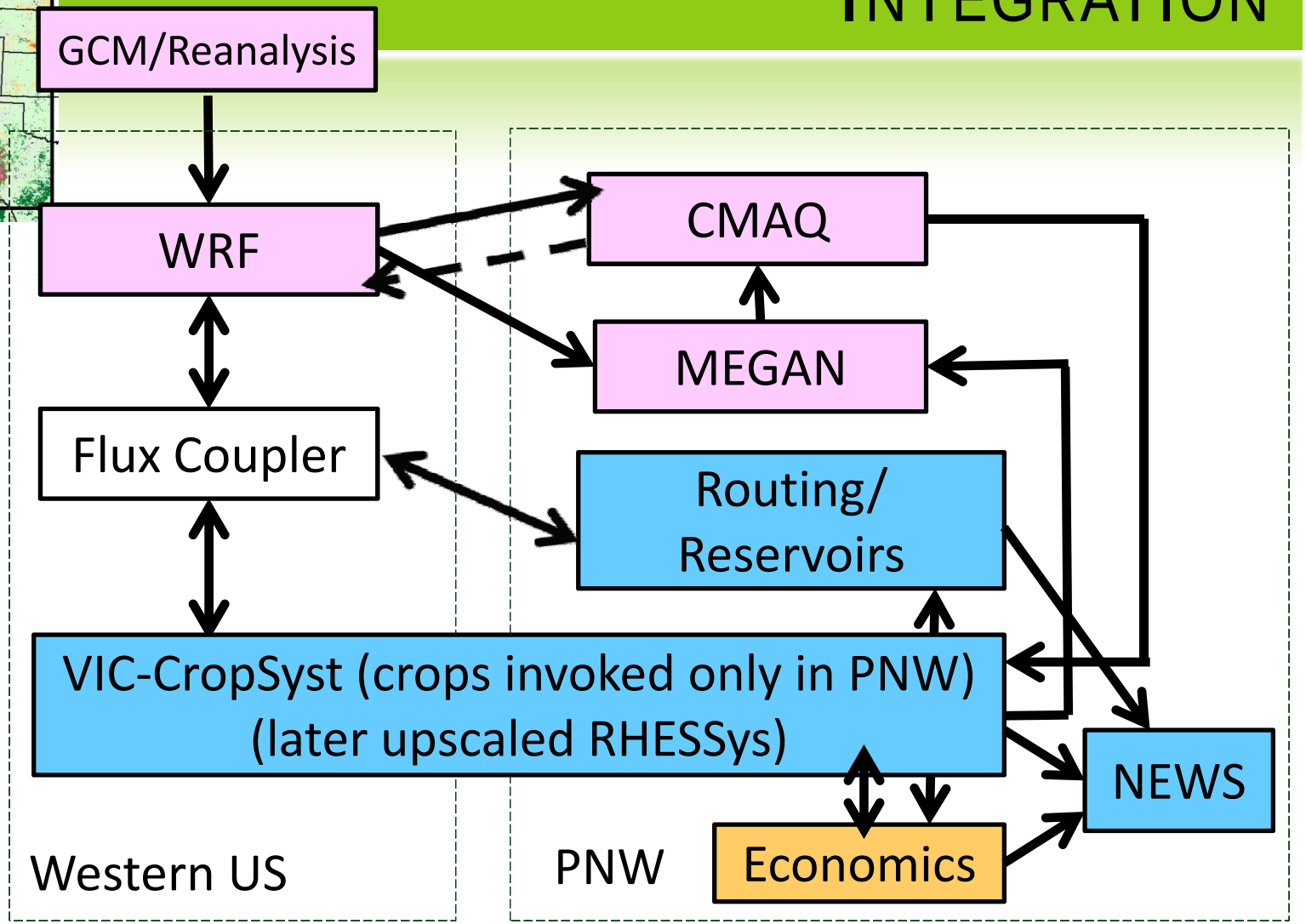
SELECTVE DOMAINS



- Western US Domain:
  - 233 x 285 12 km x 12 km cells
  - All WRF(-NOAH) and WRF-VIC runs
  - Including the southeastern US allows for more comprehensive ENSO analysis
  - Offline CMAQ simulations for a few weekly periods and possibly a few years
- PNW Domain
  - Subset of 12 km x 12 km cells
  - Coupled model simulations
  - Long-term (~30 years) offline simulations

Fully-Coupled BioEarth: Selective Domains and Model Integration





Year 3 Milestones (Project Period 4/1/2011 – 3/31/2016)

- WRF-(VIC-CropSyst) using CESM flux coupler (by end of 2013)
  - Testing of WRF-VIC over western US domain using older VIC version – spring 2013 (PNNL)
  - Updating WRF-VIC using new VIC and testing over western US – spring and summer 2013 (UW/PNNL)
  - Completion of VIC-CropSyst coupling – spring 2013 (WSU)
  - Calibration of new VIC over western us with focused calibration of VIC-CropSyst over PNW using NLDAS2 land cover– spring and summer 2013 (WSU)
  - Incorporation of VIC-CropSyst via flux coupling and testing – summer and fall 2013 (WSU)
- WRF-(CMAQ-MEGAN)-(VIC-CropSyst)
  - Incorporate MEGAN online –summer 2013 (WSU)
  - Implement CMAQ (including SMOKE) – fall 2013 and spring 2014 (WSU)
  - Testing of fully-coupled model – summer 2014 (WSU)
  - For evaluation: nitrogen and oxygen isotopic analysis of historic NADP Samples – through fall 2013 (WSU

Year 3 Milestones (Project Period 4/1/2011 – 3/31/2016)

- RHESSys upscaling
  - Forest ecosystem upscaling strategy – spring and summer 2013 (UCSB)
  - Grassland ecosystem upscaling strategy – spring through fall 2013 (WSU)
  - Incorporate subsurface thermodynamics and full energy balance snow model – summer through fall 2013 (WSU/UCSB)
  - Carbon stock initialization – spring and summer 2013 (WSU)
  - Implementation, calibration, and evaluation of regional-scale upscaled RHESSys (fall 2013 through 2014) (WSU)
- Routing, reservoirs, and nutrient transport
  - Routing included into flux coupler – spring 2013 (UW)
  - Reservoir scheme developed and included – spring and fall 2013 (WSU)
  - Downscale, test, and apply NEWS-DIN at sub-basin scale, integrate an explicit wetland component into sub-basin NEWS-DIN model – through spring 2014 (WSU)

Year 3 Milestones (Project Period 4/1/2011 – 3/31/2016)

- Economics
  - Continue to fine tune the GAMS based non-spatially explicit partial equilibrium model.
    - Aggregation and disaggregation procedure for integration with biophysical models.
  - Settle on crop yield specific water and nitrogen parameters.
  - Identify data on future climate variability for stochastic model.
  - Identify how to test if simple Python based model works as a foundation for developing the agent based model.
- Communications
  - Host 2 stakeholder workshops during year 3
  - Design electronic communication forum for interactions between scientists and stakeholders
  - Continue evaluation of stakeholder-researcher perceptions of model development process

Year 3 Milestones (Project Period 4/1/2011 – 3/31/2016)

- Cyberinfrastructure
  - Support for BioEarth Communications
    - Forum – largely abandoned due to lack of use
    - Teleconferencing – done
  - Support for BioEarth Codes
    - Code acquisition: Next step is **for PIs to archive their codes as used in the underlying modeling experiment(s)**
    - Code storage via subversion: **Construct a training package by end of March and optionally conduct a *subversion* tutorial by May 2013**
    - Work-flow: **demonstrations and implementation spring/summer 2013**
  - System support and maintenance
    - Aeolus connection to central HPC: **Report to the team the resolution of this issue and the plan and related timetable by the end of March.**
    - Aeolus upgrades: **Funds and specifications/requirements are being sorted out and the upgrade should occur by fall of 2013.**