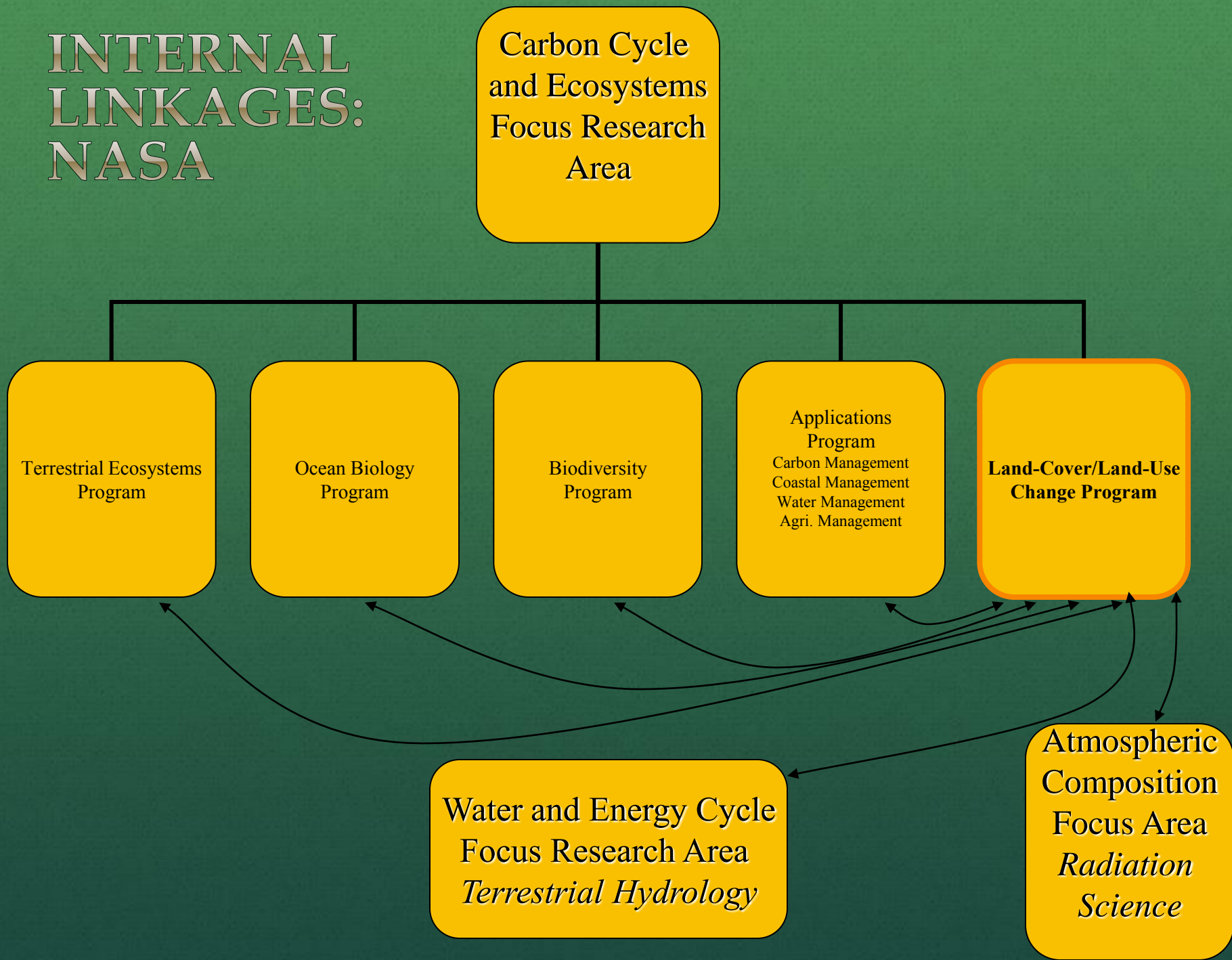


# NASA's Land-Cover/Land Use Change Program: Update

Garik Gutman,  
NASA Headquarters  
Manager, LCLUC Program

Note: The TE agenda has been modified

# INTERNAL LINKAGES: NASA



# LCLUC Program Status at a Glance

- 2011: 15-th anniversary; celebrated last spring
- Budget “stability”: same all 15 years
  - With episodic losses, like 15% cut this year
- Nationally
  - Partner with USGS on Landsat activities
    - Global Land Survey datasets
  - Support of USGCRP LUIWG
  - NRC Land-use modeling review
- Internationally
  - IGBP-IHDP/Global Land Project
  - GTOS/GOFC-GOLD support
    - Regional programs and networks
  - GEO/CEOS
    - WG on cal/val
    - Land Surface Imaging constellation



# Program Components

Total 30-40 projects

- Detection/Monitoring/Observations
- LCLUC Predictive Modeling
- LCLUC impact on
  - Carbon Cycle
  - Water Cycle
  - Climate, Environment, Biodiversity
- Drivers of Change
- Climate impact on LCLUC
- Vulnerability, Impacts and Adaptation
- Synthesis studies



External NASA Earth Science  
LCLUC-related programs  
contributing to LCLUC Program:

Carbon Cycle

USPI

IDS

NIP



# Direct Readout Ground Stations: Getting Ready for NPP



Pat Coronado,  
GSFC

## Land Applications

- Fire detection and Corrected Reflectance science algorithms for the generation of fire perimeter mapping products for strategic fire mapping and resource planning. US Forest Service Remote Sensing Application Center (RSAC), the National Inter-agency Fire Center (NIFC), and the Canadian Forest Service.
- Burn Scar and NDVI algorithm for fire damage assessment by RSAC.
- USDA uses MODIS NDVI/EVI and LST algorithms to operationally and continually monitor drought/crop health on the US sun belt.

- 30 countries have EOS/NPP direct readout capabilities.
- 50% owned by government agencies and organizations
- 35% owned by educational institutions, 15% owned by the commercial sector
- These support an estimated 3000 individual users world-wide
- 100% of DB sites use at least one of NASA's DR algorithms/tools.
- 85% of these ground stations support real-time applications.
- 40% of DB sites have developed additional algorithms for their own applications using locally-generated Level-1 data

# LDCM Update

System Integration Review (SIR) was held on September 6-9, 2011 at Orbital

## Operational Land Imager (OLI)

- Instrument calibration is complete. Instrument performance is excellent
- All environmental testing was successfully completed

## OLI delivered to Orbital

- Integration activities will start this month

## Thermal Infrared Sensor (TIRS)

- Current delivery date to Orbital is January 3, 2012

Need to maintain December 2012 LRD at all costs because launch window is December 1-30, 2012; Atlas V manifest is very crowded in 2013 – the only open slot is October 2013 at VAFB. This is a 10 month delay.



OLI arrival to Orbital

Overall: LDCM is ready to formally move into the implementation Phase D and proceed to Launch.

# LCLUC Data Initiatives

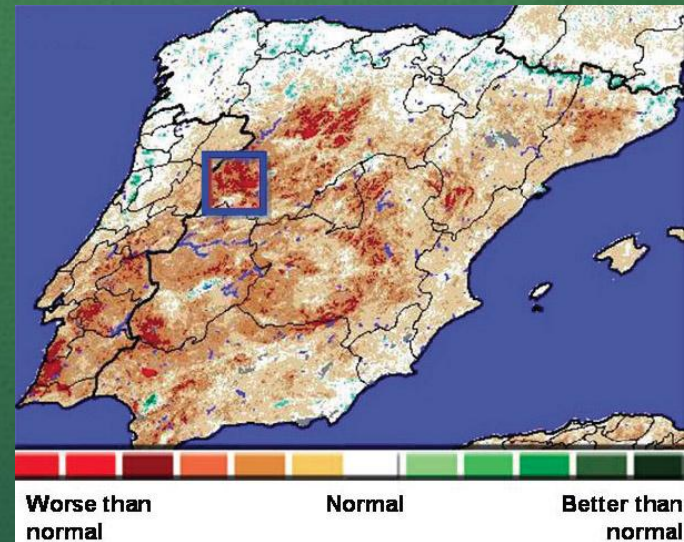
- NASA's new collaboration facility for the NASA Earth science community: NASA Earth Exchange (NEX) web portal
  - state-of-the-art supercomputing
  - Earth system modeling
  - remote sensing data from NASA and other agencies
    - All GLS data have been downloaded
  - scientific social networking platform to deliver a complete work environment in which users can
    - explore and analyze large Earth science data sets
    - run modeling codes
    - collaborate on new or existing projects
    - share results within and/or among communities
- All LCLUC projects are listed on the NEX site -- PI's are encouraged to register
- Fine Resolution Data Initiative
- Global Land Surveys (GLS) Initiative - incomplete yet but much is already available at USGS



Rama Nemani,  
NASA Ames

# LCLUC Agriculture Component

- Applications-supported project:
  - Global Agricultural Monitoring: Enhancing the agricultural monitoring and crop forecasting capabilities of the Foreign Agricultural Service using MODIS
- 10 new projects (global and regional)



NDVI anomaly image created using MODIS data collected between May 25 and June 9 2005 compared to the mean NDVI for this time-step between 2000 and 2004. The entire Iberian Peninsula was clearly stressed due to the drought in 2005. Reds/Brown represent the regions where vegetation is thin and less dense than average, while tiny flecks of green show where vegetation is healthier than average.



Name	Affiliation	Title
Brown de Colstoun	NASA GSFC (with UMD)	Using Landsat Global Land Survey Data to Measure and Monitor <u>Worldwide</u> Urbanization
Seto	Yale University (+ U. Wisconsin and Arizona State U.)	Multi-Scale and Multi-Sensor Analysis of Urban Cluster Development and Agricultural Land Loss in <u>China and India</u>
Curran	Stanford U. (+ U. Arizona and U. Texas Austin)	Socio-economic and political drivers of oil palm expansion in <u>Indonesia</u>
Mustard	Brown University	Rates and Drivers of Land Use Land Cover Change in the Agricultural Frontier of Mato Grosso, <u>Brazil</u>
Coe	The Woods Hole Research Center	Linking Historical and Future Land-Use Change to the Economic Drivers and Biophysical Limitation of Agricultural Expansion in the Brazilian Cerrado
Roy	South Dakota State U. (+ USGS)	Changing Field Sizes of the <u>Conterminous United States</u> , a Decennial Landsat Assessment

Name	Affiliation	Title
Radeloff	U. Wisconsin	200 years of land use and land cover changes and their driving forces in the Carpathian basin in <u>Central Europe</u>
Xiao	U. Oklahoma	Quantifying changes in agricultural intensification and expansion in <u>monsoon Asia</u> during 2000-2010
Hansen (with Apps)	South Dakota State U.	Advancing methods for <u>global</u> crop area estimation
De Fries	Columbia U.	Multi-sensor Fusion to Determine Climate Sensitivity of Agricultural Intensification in <u>South Asia</u>
Slayback	NASA GSFC/SSAI	The impact of disappearing tropical <u>Andean</u> glaciers on pastoral agriculture
Bounoua	NASA GSFC	A Satellite Supported Inverse Biophysical Modeling Approach for the Detection of Irrigated Agricultural Land and the Determination of the Amount of Irrigation in <u>Arid and Semi Arid Regions.</u>
Milesi	NASA Ames/CA State U.	Mapping of Urban Expansion Using Multi-Decadal Landsat and Nightlights Data Over <u>North America</u>

# Ongoing Projects

- Climate impact on land use, adaptation (final year)
- Agriculture, Urbanization
- Carbon Cycle
- US Participating Investigator (USPI)
  - Sentinel program
- Recent selections to start next year
  - Synthesis (2)
  - Wetlands Vulnerability, Impacts, Adaptation (5)
- Note: Not a single synthesis proposal on Central Asia or SE Asia was selected
  - Need more interactions on synthesis formulation, expectations

# Selections From LCLUC-2010 Round

<b>Name</b>	<b>Affiliation</b>	<b>Title</b>
<b>Radeloff</b>	<b>U. Wisconsin</b>	<b>Synthesis of studies on institutional change and LCLUC effects on carbon, biodiversity, and agriculture after the collapse of the Soviet Union</b>
<b>Bergen</b>	<b>U. Michigan</b>	<b>Regional Synthesis: LCLUC over Changing Socio-Economic Eras in the Former Soviet Union and Eastern Bloc</b>
<b>Hess</b>	<b>U. CA Santa Barbara</b>	<b>Land and resource use on the Amazon floodplain under evolving management systems and environmental change: Fish, forests, cattle, and settlements</b>
<b>Simard</b>	<b>JPL</b>	<b>Vulnerability assessment of mangrove forests in the Americas</b>
<b>Vorosmarty</b>	<b>City College, U. New York</b>	<b>Global-scale assessment of threatened river delta systems: Evaluation of connections between the continental land mass and ocean through integrated remote sensing and process modeling</b>
<b>Yeo</b>	<b>U. Maryland</b>	<b>Mapping and Monitoring of Wetland Dynamics for Improved Resilience and Delivery of Ecosystem Services in the Mid-Atlantic Region</b>
<b>Yu</b>	<b>U. Puerto Rico</b>	<b>Vulnerability and adaptive management of tropical coastal wetlands in the context of land use and climate changes</b>

# Synthesis: Putting Together a “Big Picture”

- Enhancing the Conceptual Underpinning of LCLUC Science
  - Summarizes state-of-the-art knowledge
  - Compiles available relevant datasets and research studies
  - Advances our understanding of the processes, drivers and impacts of LCLUC
  - Develops new understanding and conceptual framework
- Possible Components
  - Theory and Hypothesis testing
  - Compilation and comparative analyses
  - Data integration and model development
  - Identify in data and research gaps and proposed ways to fill these gaps and new research areas
  - Articulating/publishing refined or new conceptual framework for an aspect of LCLUC



# Future Solicitations

- ◎ ROSES-2011: LCLUC for Early Career Scientists (short) proposals (similar to NIP; requirements differ)
  - ◎ Step-1 due Dec 1, Step-2 due Jun 1
- ◎ ROSES-2011 IDS: Impacts of Urbanization on the Environment
  - ◎ LOI due Oct 18, 2011; proposals due Jan 19, 2012

# Education and Outreach

- Bringing in early career scientists (ECS) into the program
  - Continue with ECS sessions at LCLUC ST meetings
  - Keep training as an integral part of each international LCLUC ST meeting
  - New Trans-Atlantic Training Initiative (US-EU-Russia-Ukraine)
- PR and interactions with a wider community
  - New Facebook LCLUC page
  - New brochure

# Programmatic Issues

- Keep social science component in LCLUC projects an integral part of the LCLUC proposals
- Balance the program thematically and geographically
- Foster global products generation
  - Develop synthesis of global forest products from GLS projects
  - Develop global land-use products (Urban, Ag) for use in models
- Keep LCLUC 2-step calls on a regular, annual basis
  - Step-1 Dec 1, Step-2 June 1
- Continue the twice-a-year ST meetings structure



# LCLUC Science Team Meetings

## Washington: Cherry Blossom

2007: Climate/Carbon

2008: Joint CC&E Focus Area meeting

2009: LCLUC impacts on climate

2010: GLS LCLUC products

2011: 15<sup>th</sup> Anniversary (review/update)

2011/9: Agriculture (Joint CC&E FA)

2012: *Urban*

2013: *Wetlands*



## International: Fall-Winter

2007: Drylands (NEESPI/MAIRS)

Urumqi, China

2009/1: Tropics (MAIRS)

Kohn Kaen, Thailand

2009/9: Drylands (MAIRS/NEESPI)

Almaty, Kazakhstan

2010: Boreal/Temperate (NEESPI)

Tartu, Estonia

2011: *Tropics (MAIRS)*

*Hanoi, Vietnam*

2012: *Drylands (NEESPI/MAIRS)*

*Samarkand, Uzbekistan*

2013: *Borela/Temperate (NEESPI)*

*Copenhagen, Denmark*



Thanks for attending the  
“bonus” ST LCLUC meeting!  
Enjoy Alexandria’s Fall Colors

