

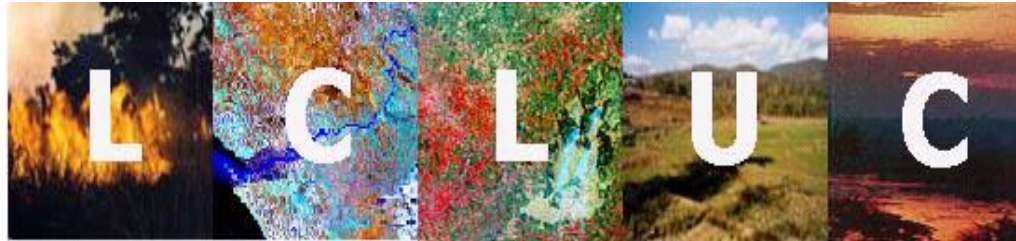


NASA's Land Cover Land Use Change Program

- **Status of the LCLUC program**
 - **Introduction**
 - **LCLUC ST Team, organizing ourselves**
 - **The Land Change book**
 - **Landsat issues**
 - **CCSPO LULCC Interagency Working Group**
 - **Major regional projects**
 - **LCLUC-related projects and NRA's**



NASA Land Cover and Land Use Change



- LCLUC is an interdisciplinary scientific theme within NASA's Earth Science Program of the Science Mission Directorate (SMD).

The ultimate vision of this program is to:

- *develop the capability to perform repeated global inventories of land-use and land-cover from space, to develop the scientific understanding and models necessary to simulate the processes taking place, and evaluate the consequences of observed and predicted changes.*
- **further our understanding of the consequences of land-use and land-cover changes on environmental goods and services, the carbon and water cycles and providing the science underpinning for improved management of natural resources**
- **improve understanding of human interaction with the environment, and thus provide a scientific foundation for sustainability, vulnerability and resilience of land systems and their use.**
- **<http://lcluc.gsfc.nasa.gov/>**



NASA LCLUC Program - Building Blocks

<ul style="list-style-type: none">• Forcing Factors (Processes)<ul style="list-style-type: none">– Climate and Ecological Drivers– Socioeconomic Drivers	<ul style="list-style-type: none">• Technique Development<ul style="list-style-type: none">– Remote Sensing R and D– In-situ data collection - surveys / validation / process studies– Data Management
<ul style="list-style-type: none">• Responses and Consequences<ul style="list-style-type: none">– Land cover conversion, abandonment– Land use intensification– Land degradation– Landscape fragmentation	<ul style="list-style-type: none">• Satellite Observations<ul style="list-style-type: none">– Long -term measurements<ul style="list-style-type: none">• Landsat series L7>LDCM• AVHRR.>MODIS>NPP (VIIRS)– Experimental missions<ul style="list-style-type: none">• EO-1 - hyperspectral– Commercial Data Buy<ul style="list-style-type: none">• Ikonos - hyperspatial• Geocorrected Global Landsat Database
<ul style="list-style-type: none">• Modeling and Implications<ul style="list-style-type: none">– LCLUC modeling & projections– Coupled modeling of LCLUC with biogeochemical and water cycles– Modeling land-atmosphere interactions– Climate impacts on land use	

LCLUC Internal Program Linkages

- LCLUC is a science theme cross cutting the Science Focus Areas
- Being an element of the “Carbon and Ecosystems” Focus Area, it has strong links to the Water Cycle Focus Area and is developing links to other programs, such as Climate Variability.
- LCLUC has links to Applications Priorities: Carbon Management, Coastal Management, Water Management, Ecological Forecasting

Assembling the LCLUC Team

Science Team consists of LCLUC research funded through various elements in NASA programs but administered under LCLUC Theme

- LCLUC Program
- LBA Program
- EOS Program
- IDS Program
- REASON Program
- Carbon Cycle Program
- Water Cycle Program



How We Organize Ourselves

- Science Team Meetings
 - program status and feedback from the PI's
 - reporting, exchanging ideas
 - Identifying programmatic gaps, discussing new directions
- Regional network support and topical workshops
- Outreach: brochure, web site , significant results for management, mentioning/acknowledgments in publications, videos
- Science: books, publications in peer-reviewed literature, special workshops and conferences, sessions at symposia
- Data: LCLUC program facilitates provision of data to projects

Past LCLUC-Related Meetings

- **CEOS Land Cover Validation Workshop**
 - Boston University, Boston, Ma, 2 - 5 February, 2004
- **Regional GOF-C-GOLD Workshop**
 - St.Petersburg, Russia, 23 - 26 February, 2004
- **GOF-C-GOLD Land Cover Implementation Team Meeting**
 - Friedrich Schiller University, Jena, Germany, 2-4 March, 2004
- **A joint GOF-C/GOLD Fire and CEOS LVP Workshop**
 - EUMETSAT, Darmstadt, Germany, 23 – 25 March, 2004
- **EARSEL Land Use/Cover workshop**
 - Dubrovnik, Croatia, May, 2004
- **GOF-C-GOLD/FAO Workshop on Harmonization of Global LC Products**
 - FAO Rome, Italy, 14-16 July, 2004
- **5th Meeting of Southern Africa Fire Network (SAFNET)**
 - Mangochi, Malawi, 9 - 13 August, 2004
- **Burnt Area Validation Meeting**
 - Freemantle, Australia, 18-22 October, 2004
- **Regional GOF-C-GOLD Workshop: Fire network in Northern Eurasia**
 - Moscow, Russia, 17 November, 2004
- **GOF-C-GOLD South America Network (REDLATIF) Regional Fire Meeting**
 - Santiago, Chile, 29 - 30 November 2004
- **AGU Fall meeting sessions**

Upcoming LCLUC Relevant Meetings

- **International Conference on Land-Cover and Land-Use Processes in the North East Asia Region**, Harbin, China, February, 2005
- **Remote Sensing and Data Fusion Over Urban Areas and Remote Sensing of Urban Areas**, Tempe Arizona, March 2005
- **Sessions at the International Symposium of Remote Sensing of Environment, and Northern Eurasia Regional Information Network (NERIN) Workshop**, St. Petersburg, Russia, June 2005
- **Modelling Land Use Change - 45th ESRA Congress**, Amsterdam, the Netherlands, August 2005
- **Workshop on Fire Effects**, EARSEL SIG Fire, Zaragoza, Spain, June 2005
- **International Conference on Land Degradation and Desertification**, Germany, September 2005

Reporting



- The Web site: <http://lcluc.gsfc.nasa.gov>
 - submit all to *Deirdre Smith*
 - Project Abstracts
 - Progress reports (cc: to me by e-mail)
 - Sensitive info - to me by separate e-mail
 - Digital copies of conf. present.&posters
 - Significant results (4-slide presentations)
 - Lists of publications and references
 - Project metadata and data set links
- Submit these materials on an ongoing basis to ensure to accurately reflects all the great work you are doing + updated contact info
- PI's are encouraged to host their own websites to showcase their results in more detail and to make their data sets available- provide links.
- The website also posts LCLUC and LCLUC-related: Announcements, Events, Job Openings, News Items
- Outreach(discoveries, journal covers, etc.)

LCLUC NASA's Land Cover Land Use Change Program

Home Introduction Strategy Implementation Products Resources Search

LCLUC is an interdisciplinary scientific theme within NASA's Earth Science Enterprise (ESE).

LCLUC Goals:

- To develop the capability to perform repeated global inventories of land-use and land-cover from space,
- To develop the scientific understanding and models necessary to simulate the processes taking place
- Evaluate the consequences of observed and predicted changes
- Further the understanding of the consequences of land-use and land-cover changes on environmental goods and services, the carbon and water cycles and the management of natural resources
- To improve understanding of human interaction with the environment, and thus provide a scientific foundation for sustainability, vulnerability and resilience of land systems and their use.

LCLUC Key Science Questions:

- Where are land cover and land use changing, what is the extent and over what time scale?
- What are the causes and what are the consequences of LCLUC?
- What are the projected changes of LCLUC and their potential impacts?
- What are the impacts of climate variability and changes on LCLUC and what is the potential feedback?

LCLUC Announcements and Events

New Publication

Global and Regional Vegetation Fire Monitoring from Space: Planning a Coordinated International Effort
For details, click [here](#).

ALL LCLUC Announcements

LCLUC ST Tropical and Subtropical Workshop Draft Agenda
11/19/2001 - 11/21/2001 College Park, MD
Download Agenda as [PDF](#) OR [MS Word](#) Format
Download Logistics as [PDF](#) OR [MS Word](#) Format

LCLUC ST Temperate and Boreal Workshop Draft Agenda
10/29/2001 - 10/31/2001 College Park, MD
Download Agenda as [PDF](#) OR [MS Word](#) Format
Download Logistics as [PDF](#) OR [MS Word](#) Format

ALL LCLUC Events

LCLUC Related Announcements and Events

Related Announcements:

- **Call for papers**

For International Symposium: LUCC Contribution to Asian Environmental Problems (12/2001, Tokyo). Details at <http://shiba.iis.u-tokyo.ac.jp/LUCC/sympo>.

ALL LCLUC Related Announcements

Related Events:

- **3rd International Symposium: Remote Sensing of Urban Areas**
6/11/2002 - 6/13/2002 Istanbul, Turkey

ALL LCLUC Related Events

Job Announcements

Browse [Job Opportunities](#)

Contact Information

- Project Management
- Principal Investigators

Products and Data

- Project Abstracts
- Annual Progress Reports
- Significant Project Results
- Data Access
- Strategy and Planning Documents

References and Resources

- Resources
- Funding
- Related Sites
- Transparent World Initiative Document Description in PDF Format.
- LCLUC NRA 2000 [Selectees](#)

Proposal Review

[Join our team of proposal reviewers](#)

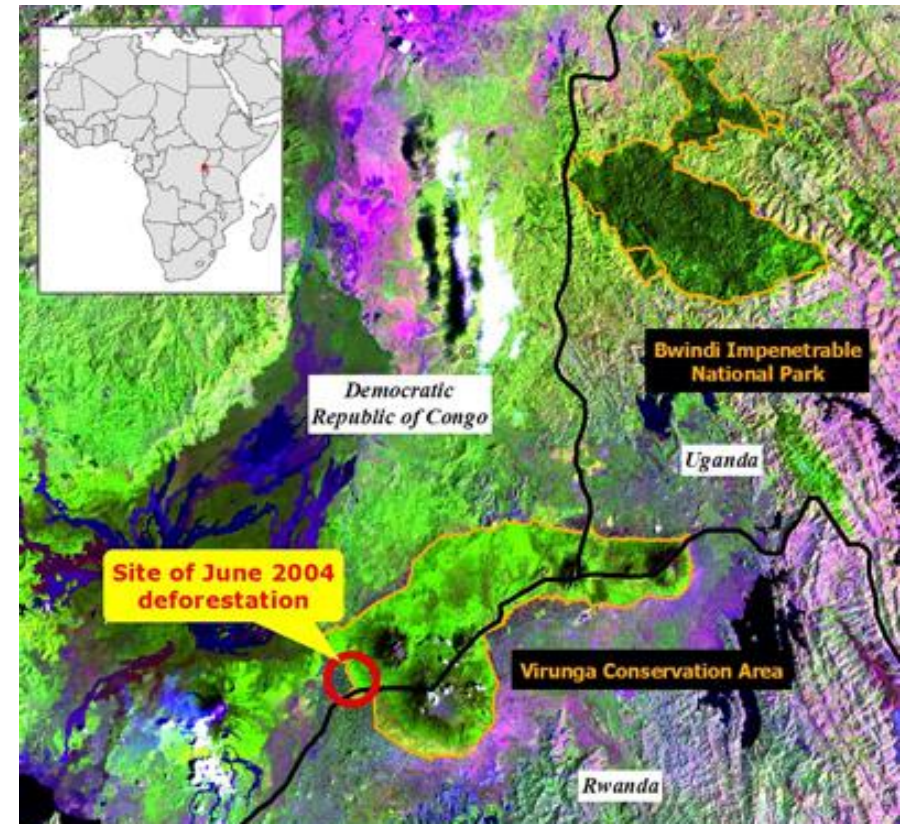
- "Remote sensing is the only tool that we have to efficiently monitor these remote parks," says Nadine Laporte, head of the Africa Program at WHRC. "Satellite imagery allows park managers to update park property boundaries, map forest habitat, and look at encroachment of the park by comparing images from two different dates."

The most useful imagery that NASA provides for high-resolution surveys comes from the Landsat satellite and the ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) instrument on the Terra satellite. The resolution from these satellites allows scientists to identify deforestation fronts and map habitats. Commercial very high-resolution imagery can see ground areas as small as 1 to 4 meters, but most parks find these images still too expensive.

- "The use of NASA derived products to document the state of the protected areas in the tropics is still limited, but it is a tremendous contribution to conserving biodiversity," says Laporte. "The recent working agreement between NASA and IUCN to advance conservation through the use of NASA data sets is certainly great news." The World Conservation Union (IUCN) is considered the world's premiere source of information on the environment.



Gorillas in the Midst of Extinction



The LCLUC Book – Published!

- **Land Change Science: Observing, Monitoring, and Understanding Trajectories of Change on the Earth's Surface – 26 Chapters**
 - SECTION I. LCLUC concepts, national and international programs
 - SECTION II. Observations of LCLUC: Case Studies
 - SECTION III. Cross Cutting Themes, Impacts, and Consequences
 - SECTION IV. Methodological issues, modeling
 - SECTION V. Synthesis and Lessons: Biophysical Change and Beyond
- Published in October 2004



Data Issues

- *NASA promotes the free and open sharing of data*
- **LCLUC expects its PI's to make their data and products available to the broader community**
- Data systems and services are currently one of the biggest challenges to earth observation systems
- New approaches to data services through REASON projects
- LCLUC data
 - Data sharing is encouraged
 - Some of Landsat data may be provided through GSFC Land Cover Project Office (aka Landsat Project Office)

REASON Serving the Community

TRFIC has done a large area assessment with Landsat data (with the help of the Landsat-7 team at GSFC and partners at EDC) of Aceh Province Indonesia.



Before Tsunami



After Tsunami

High-Resolution Details



The 'before' image was taken by Space Imaging's IKONOS satellite on January 10, 2003 and the 'after' image was taken on December 29, 2004, 3 days after the tsunami event.

These IKONOS images are of Aceh, on the northwestern tip of Sumatra, Indonesia

LCLUC and Observations

- **Observations of LC/LU are an important aspect of the program for**
 - Empirical, Process and Impact studies
 - Monitoring rates of change
 - Initiating/evaluating land cover change models
- **LCLUC recognizes the need for international coordination of observations and contributes to the IGOS process**
 - A strong supported of the Global Terrestrial Observing Systems / Global Observation of Forest Cover-Global Observation of Landcover Dynamics (GOFC/GOLD) Project
 - A new emerging IGOS Theme - Integrated Global Observation of Land (IGOL)
- **Recent developments in the Global Earth Observations (US GEO / International GEOSS) program design**
 - LCLUC will be looking for opportunities to participate in GEO and GEOSS

Landsat Update

- Observations from Landsat are critical to the LCLUC Program Objectives – developing the capability for periodic inventories of LC/LU from space
- Landsat-like sensor will be on NPOESS ~2009-2010
- The bridging mission was recently canceled
- Landsat-7: Three quarters of data are intact - at the edge of the scan there are gaps. New, improved products are available at USGS
- Landsat-5 is still functioning but is close to its end
- If L-5 is gone and L-7 fails – data gap
- Landsat Data Gap Study Team considers other sources of Landsat-like observations to mitigate the potential data gap during forthcoming 5 years

CCSP/LULCC Interagency Activities

US Climate Change Science Program (CCSP)

- Focus on short-term deliverables
- Providing decision-making/management resources
- Land-Use/Land Cover Change element
 - LULCC interagency working group (LUIWG)
(consisting of representatives from Federal Agencies)
 - Chapter 6 in CCSP Strategy

<http://www.climatechange.gov/Library/stratplan2003/final/ccspstratplan2003-chap6.htm>

The NASA LCLUC Program's Contribution to the US CCSP

- **Purpose of LUIWG**
 - **Interagency coordination**
 - **Securing resources**
 - **Joint agency solicitation (NASA-USDA in ROSES-2005)**
- **LUIWG activities**
 - **Monthly housekeeping meetings**
 - **LULCC representation at CCSP meetings**
 - **Inventory of projects by agencies**
 - **Preparation of Implementation Plans**
 - **Preparation of workshops**
 - **Linkages to other CCSP elements**
- **LULCC Steering Group (LSG) has been formed**
 - **The purpose of the Steering Group is to provide broad-based scientific and application input to the LUIWG in developing the research program**

Major Regional Initiatives With LCLUC Elements

- NACP: North American Carbon Project
- LBA: Regional Field Campaign in Amazon
- NEESPI: Northern Eurasia Earth Science Partnership Initiative
- CARPE: Central African Regional Project for Environment (CARP) in Congo Basin in Partnership with US AID

LBA: The Regional Field Campaign in Amazon

- The field campaign is finishing: LBA Phase II is in its final stage
- Significant results
 - **Excellent examples of land cover modeling based on socioeconomic drivers, and some excellent examples of land cover mapping.**
 - **Better depiction of the explicit linkages between patterns and processes, between satellite and ground observations, and between scales**
 - **Improved land cover classification using a consistent spectral mixture analysis and decision tree classifier on co-registered LANDSAT MSS, TM, and ETM+ data**
- Challenges
 - **Regional estimates of logging area and carbon effects using remotely sensed data**
 - **Prediction of fire risk for logged areas of water quality in regions of explosive land-use change**
 - **A comprehensive dynamic LUCC model, which could be applied basin wide, yet at fine scales at which the LUCC processes occur**
- New opportunity for LBA data analysis and synthesis
 - **To be announced in a couple of weeks, due date end of April**



NEESPI

Northern Eurasia Earth Science Partnership Initiative

The Northern Eurasia Earth Science Partnership Initiative (NEESPI) is designed to establish a large-scale, international, interdisciplinary program aimed at developing a better understanding of the interactions between ecosystem, atmosphere, and human dynamics in northern Eurasia in support of international science programs with particular relevance to U.S. Climate Change Science Program interests and funding priorities.

NEESPI Science Plan Phase I
Version is complete

@ <http://neespi.gsfc.nasa.gov>

CARBON, ENERGY & WATER CYCLES
TERRESTRIAL ECOSYSTEM DYNAMICS
Glaciers; Tundra; Boreal Forests; Forest/Steppe;
Arid Ecosystems; Aquatic Ecosystems



Linking to Global Projects

- Global Carbon Project (GCP)
- Global Water System Project (GWSP)
- Global Energy-Water Experiment (GEWEX)
- Global Land Project (GLP)
- Integrated Land Ecosystem – Atmosphere Processes Study (ILEAPS)
- Climate and Cryosphere (CliC) Project

NASA Contribution to NEESPI

- Lead the Remote Sensing component
- Facilitate RS data provision to Science Team
- Support US participants in NEESPI activities
- Assist in developing collaborative links with in-country scientists of Northern Eurasia
- Fund peer-reviewed selected proposals

LCLUC-Related Projects and NRA's

- IDS, EOS, REASON continue**
- Carbon Cycle LCLUC projects are starting**
- Water Cycle under review – selections in March**
- ROSES-2005 solicitation**
 - LBA Data Analysis**
 - Pay attention to ACCESS**
 - LULCC (NASA-USDA)**
 - Due dates – mid-spring**
 - Full Proposals for LULCC due end of summer**
 - LULCC projects' start – Jan 1, 2006**

Future

- LCLUC ST meetings: Fixed dates for 3 years in advanced under consideration – mid-April
- NEESPI ST meeting – immediately after the LCLUC
- Solicitations will be announced through annual omnibus announcements (ROSES)
- No LCLUC solicitation next year
- Watch for other programs with LCLUC-related topics

Personal Notes

- 1-pager significant results – also important
- Help in reviewing
- Fewer surprises: Any request to NASA – keep me informed
- Communication preference: e-mail



"Didn't you get my e-mail?"

谢谢

спасибо