

LCLUC Program: evolution and science focii

Chris Justice

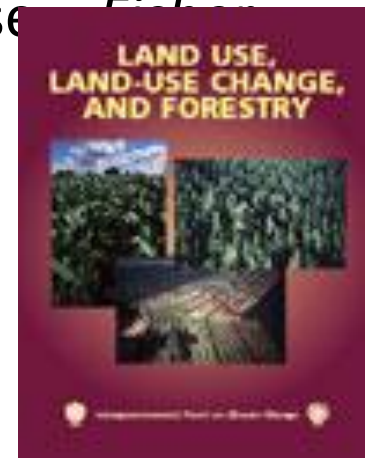
LCLUC Program Scientist

Initial Program Emphasis I

- Impacts of LCLUC on **ecosystem goods and services**
 - Biogeochemical cycling – Carbon/Nitrogen (deforestation, fire, agricultural intensification, grass/shrub) - *Skole, Matson, Wessman, Johnson, McGuire*
 - Forest Management and Carbon – Stand Age, Biomass, Harvesting, Rotation and Disturbance – *Harmon, Krankina, Shugart, Houghton,*
 - Biodiversity - *Hansen*
 - Water Resources, Water quality (N/P) and land use *Fisher*
Mustard, Smith

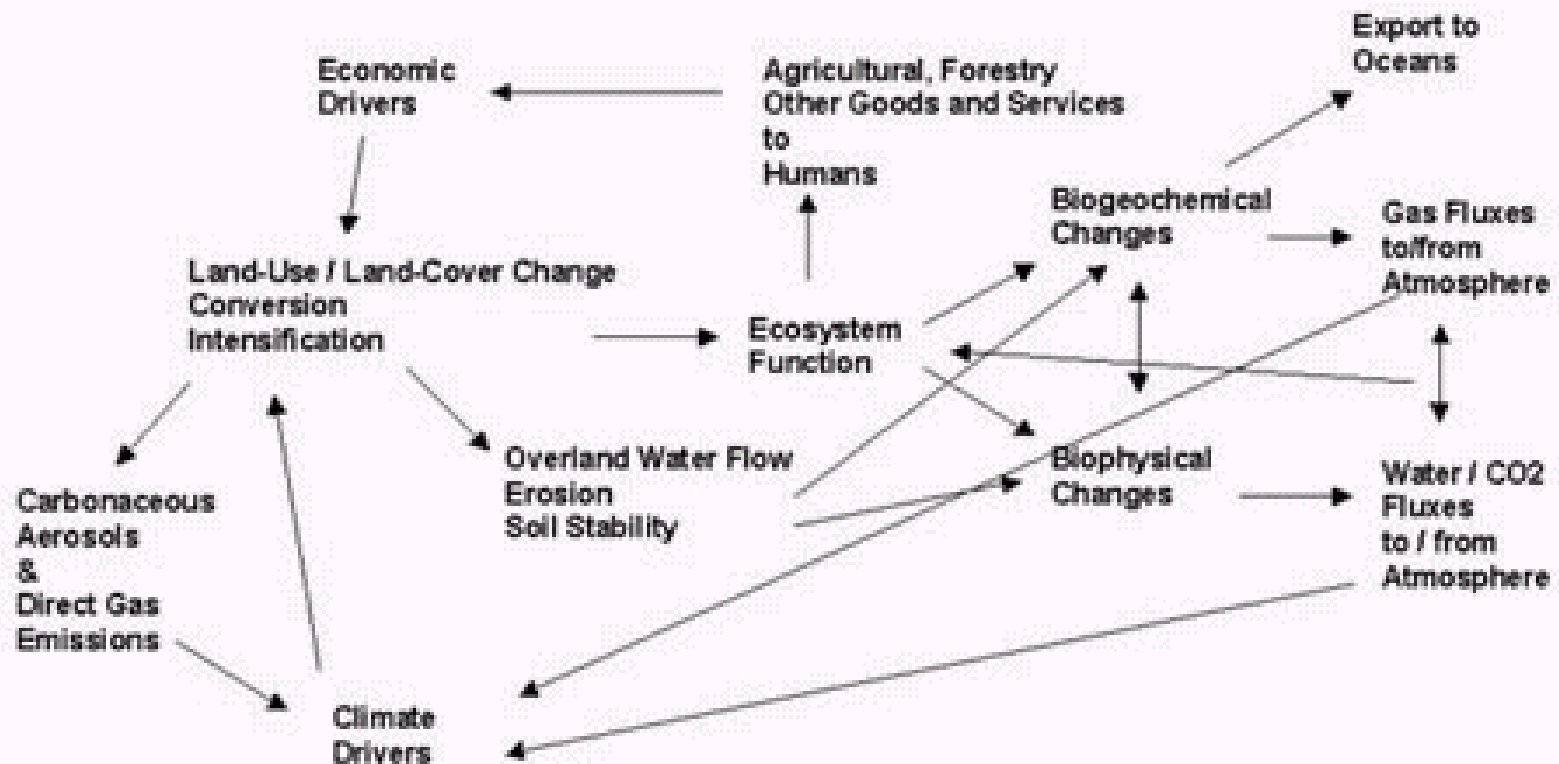
Responding to an Emerging Land Use Carbon Emphasis

IPCC, Watson et al 2000



Early Program Construct - emphasis on BioGeochemical Cycles and Ecosystems Goods and Services

Interactions of Land-Use/Land-Cover Change



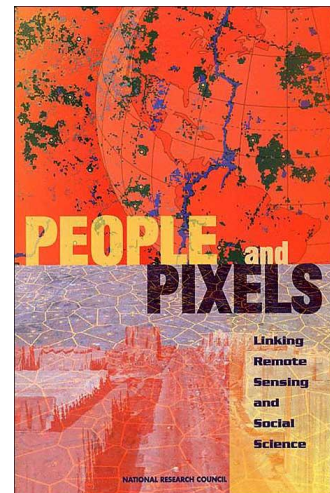
Initial Program Emphasis II

- Case studies on **the process of change**
 - Thailand - *Rindfuss, Skole*
 - Mexico – *Turner*
 - Amazonia - *Moran, Walker*
 - Ecuador –*Bilsborrow*
 - Guatemala - *Sader,*
 - China rapid Urban Expansion – *Kaufman*

Collection of socioeconomic data – household survey

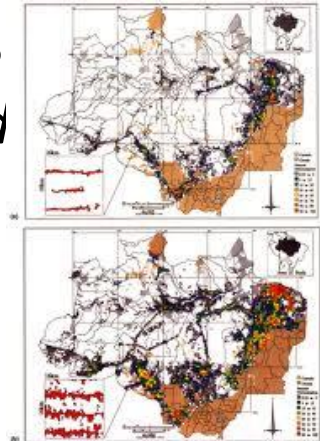
Indication of policy impacts on land use

NRC, Comm. HDGC, 1998



Initial Program Emphasis III

- Regional Forest Monitoring Studies from “ Pattern to Process” – beyond Landsat Pathfinder
 - Amazon (Pre - LBA) – logging, ranching and fire – *Skole, Nepstad*
 - Africa (Miombo post-SAFARI 92) savannah / woodland systems / fire – *Desanker, Roy*
 - SE Asia (expansion of LUCC SEARIN into GOF-C-GOLD) – *Skole,*
 - Congo Basin (augmenting USAID CARPE) - *Saatchi, Laporte*
 - Boreal Systems (Post BOREAS/Pre-NEESPI, Alaska, S W. Russia, - *Ranson, McGuire, Sun, Shugart, Conard*

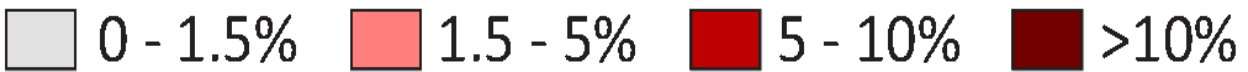
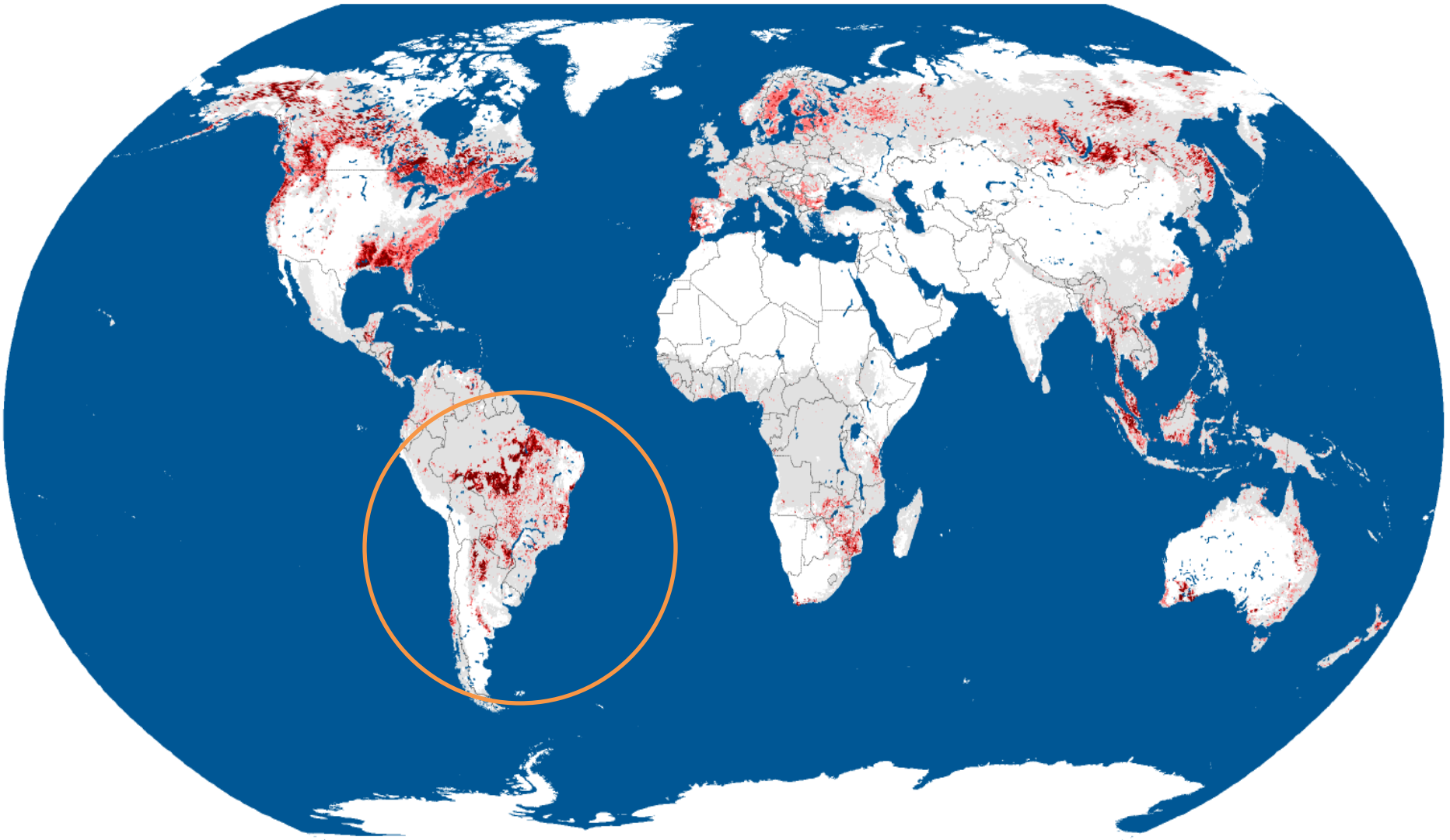


Skole and Tucker 1993

Mapping and Monitoring

- Method development
 - Land Cover (AVHRR) > Continuous Fields
 - Mixture modeling
 - Microwave mapping capabilities
 - *MODIS Land Cover*
- Classification and Change Detection Approaches
 - Decision Trees, SVM's
 - Combined MODIS and Landsat analysis
 - Satellite Image Automated Mapping (SIAM)
- Development of GLS and associated regional data sets (SE Asia, Boreal, South America) - towards a global Landsat scale land cover
- Evaluation of international constellation options

Percent forest cover loss, 2000 to 2005



Hansen et al

LCLUC and Modeling

- Improved Land Cover parameterization of
 - Biogeochemical Cycle Models – *Wessman, Li,*
 - Ecosystem Models – *Desanker, Shugart*
 - Hydrological Models – *Lettenmaier, Shiklomanov, Eshelman, Anderson, Davidson, Gitelson*
 - Global and Regional Climate and Flux Models – *Dickinson, Pielke, Bonan, Small, Chen*
 - Aerosol Dust Models – *Monroe, Sokolik*
- Development of improved Land Use Models
 - Simulation / Scenarios / Projections – *Goetz, Brown,*

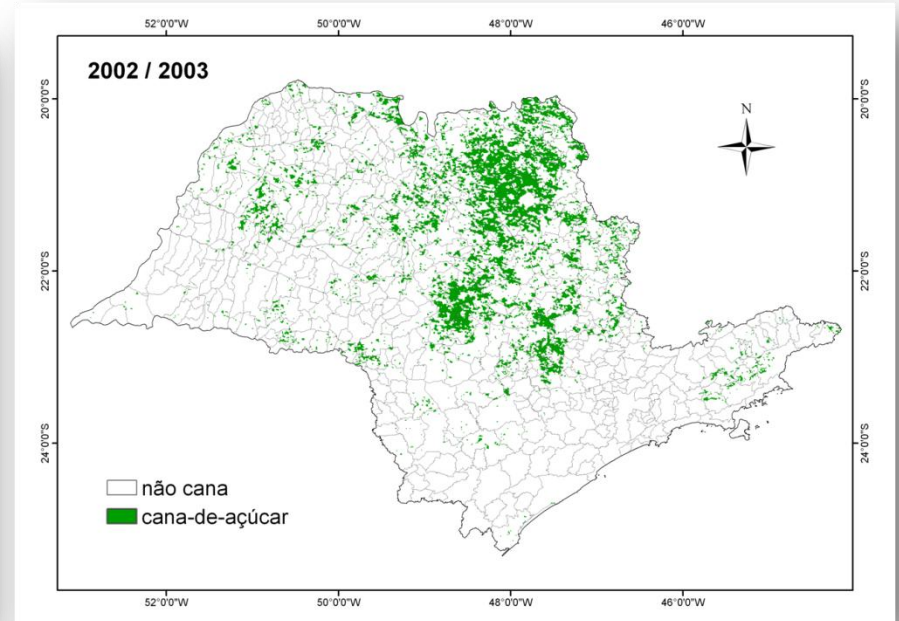
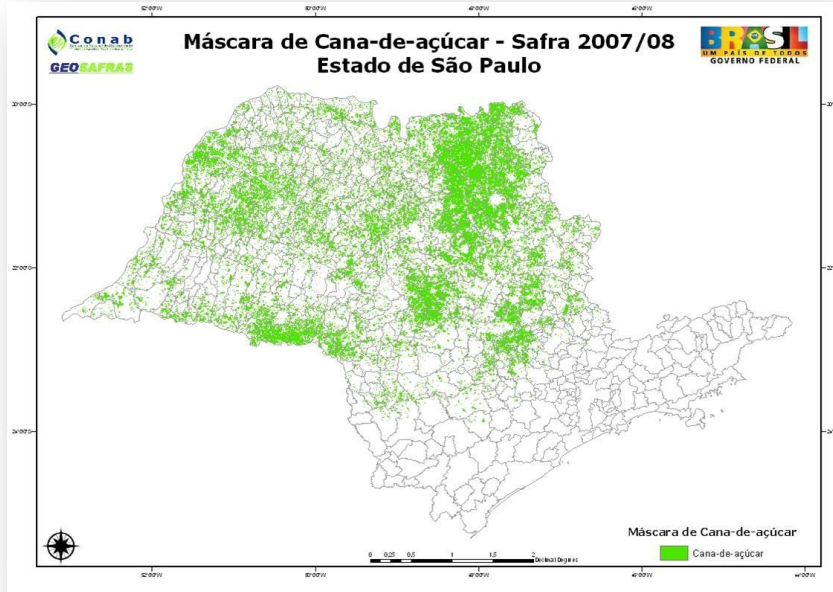
Climate/LU Interactions

- Impacts of LCLUC on Regional Climate
 - Radiative Forcing, Precipitation, Aerosols
- Impacts of Climate Change on LCLUC:
adaptation – agriculture
- *Land Use Systems - Vulnerability/Resilience*

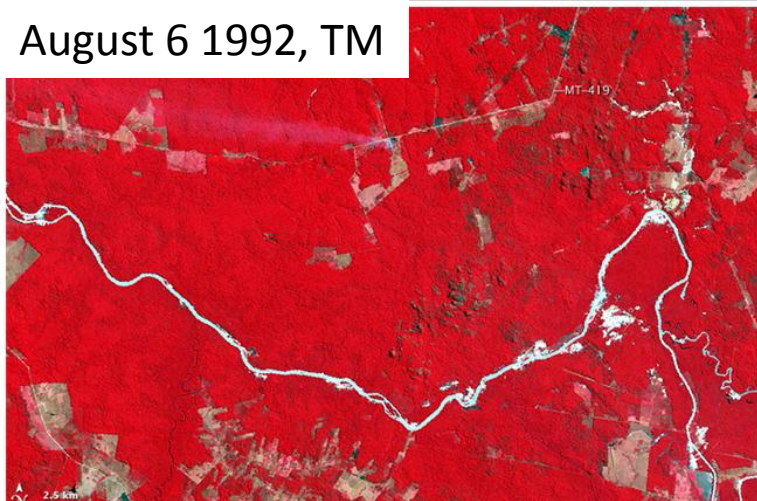
Thematic Focused Investments

- Urban Expansion - *Elvidge, Schneider, Brown, Bounoua, Christensen, Imhoff, Lacey*
 - Global City Lights > Human footprint
 - Monitoring and Modeling Urban Change - Pearl River > China Urban Mapping
 - Global Megacities
- Coastal Zone, Mangroves and Wetlands – *Simard, Giri,*
- Agricultural Land Use Change (GOFC/GOLD, GEO) – expansion / intensification / abandonment (policy aspects) – *Curran, Radeloff, Henebry, Foley, Fox*
 - Soybeans, Biofuels (S. America) – Expansion
 - Oil Palm Plantations (SE Asia) – Expansion
 - Increasing Crop Yields (Africa) – Intensification
 - Former Soviet Union - Abandonment

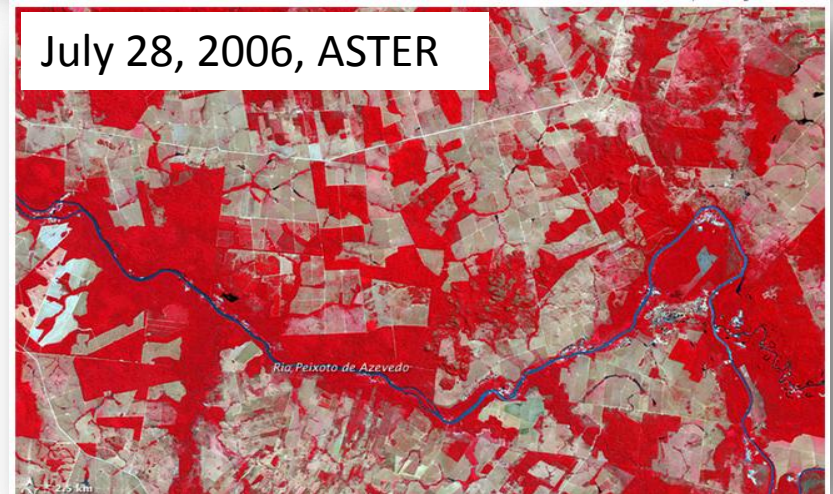
Agricultural land use change



August 6 1992, TM



July 28, 2006, ASTER



LCLUC Funding Rotation

Impacts

Drivers

Modeling

LCLUC and Climate

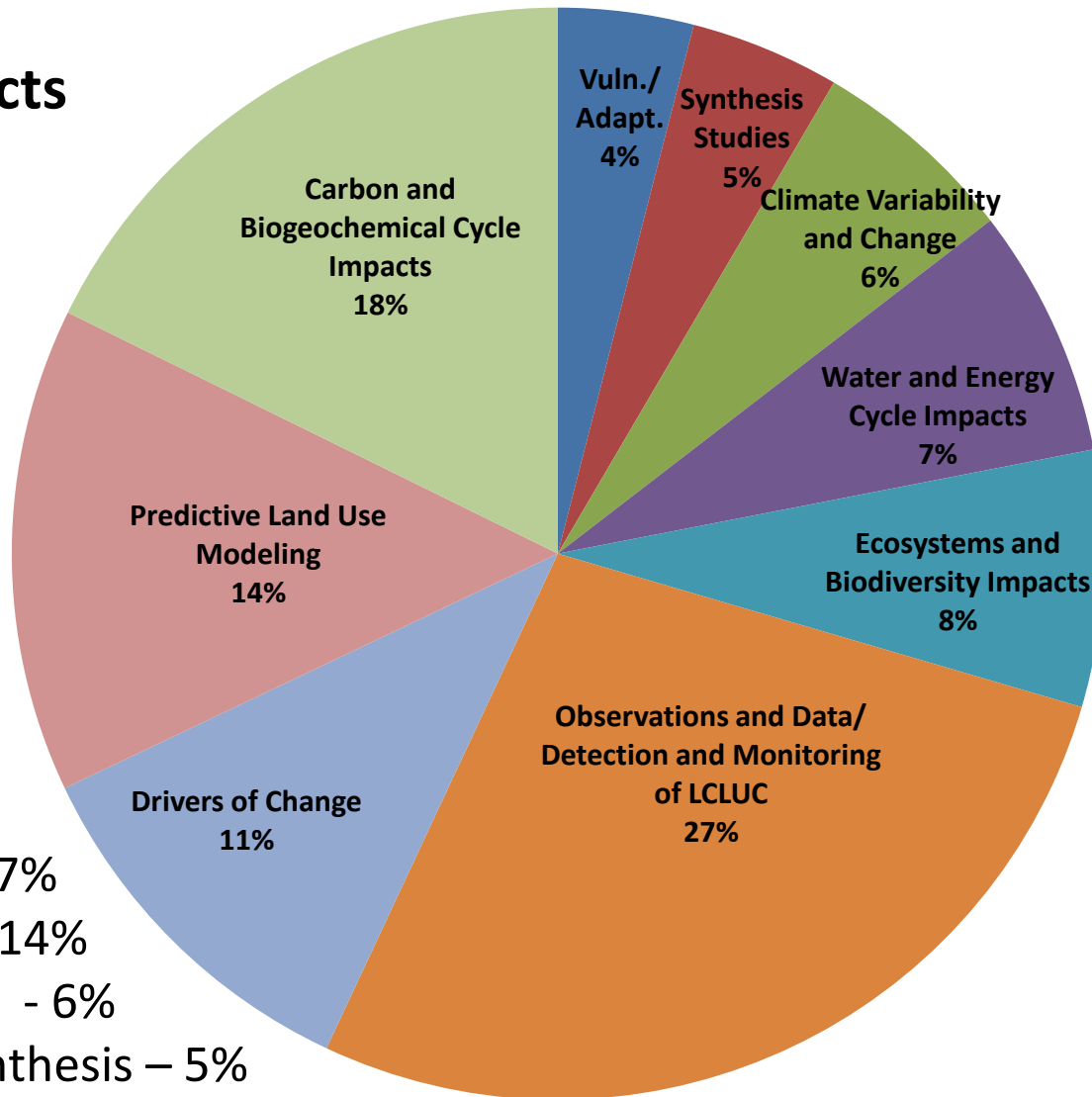
Adaptation / Vulnerability

Case Study Synthesis

- With Different Thematic and Regional Emphases

LCLUC Program Funding 1997- 2011

180 PI projects



Impacts - 33%
Monitoring – 27%
LU Modeling – 14%
LU and Climate - 6%
Case Study Synthesis – 5%
Vulnerability/Adaptation – 4%

PI's with Repeat Funding

Three Funding Cycles

- Brown
- DeFries
- Conard
- Curran
- Fisher
- Gitelson
- Goetz
- A. Hansen
- M. Hansen
- Krankina
- McGuire
- Mustard
- Saatchi
- Skole
- Turner
- Wessman

Two Funding Cycles

- Aizen
- Bilsborrow
- Desanker
- Fox
- Harmon
- Hope
- Houghton
- Johnson
- Kaufman
- Laurance
- Loveland
- Matson
- Moran
- Nepstad
- Ojima
- Ozdogan
- Qi
- Radeloff
- Ranson
- Sader
- Shiklomanov
- Shugart
- Smith
- Townshend
- Walker

Strengthening International Programs

- GOFC / GOLD – international coordination of observations (LCLUC emphasis on satellite observations)
 - GOFC/GOLD Regional Networks – strengthening LCLUC regional science - (START)
- Global Earth Observing System of Systems
- Global Land Project

Strengthening the Land Use Component of Regional Science Initiatives

- LBA – *Skole, Moran, Nepstad, Laurance*
- Northern Eurasia (NEESPI) – *Bergen, Krankina, Soja, Sun, Ojima, Li, Lettenmaier, Conard, Aizen*
- Monsoon Asia (MAIRS) – *Jain, Tian, Qi*

Possible Future Emphases

- Land Use Scenarios and Climate Adaptation
- Land Use, Food and Water Supply
- Social Impacts of LCLUC – vulnerability
- LCLUC Product Development
 - Global Landsat Products and 30yr Landsat Data Stacks
 - Fine Resn data for land use studies
 - Landsat constellation prototyping – LDCM/Sentinel 2
 - Automated Change Detection
 - Land Use Data Sets – crop, rotation, tilling, etc