

7/17/2006

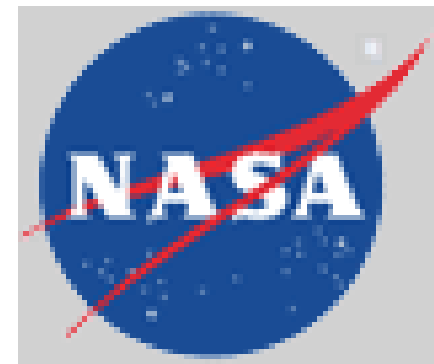
Olga N. Krankina, OSU

NEELDA

(Northern Eurasia Landcover Dynamics Analysis)

7/17/2006

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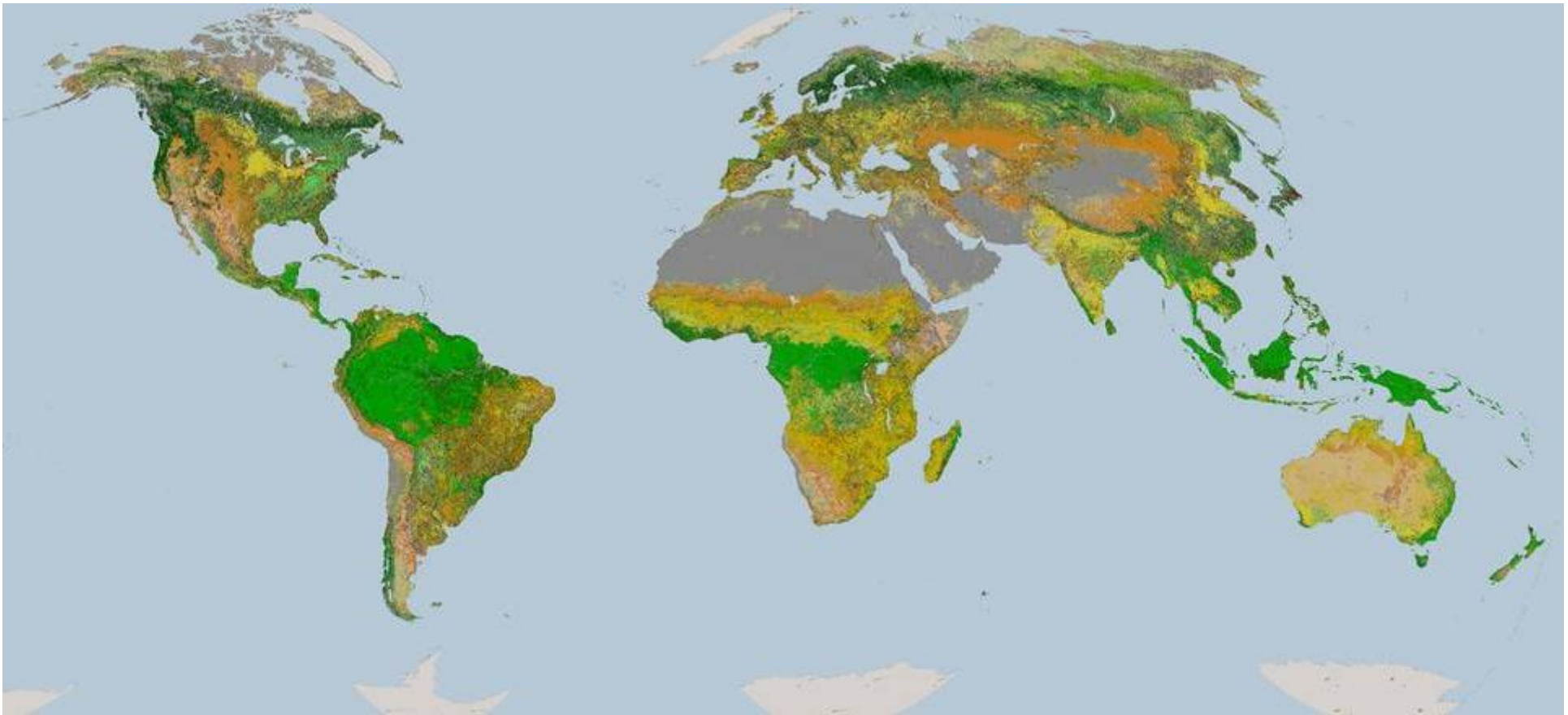


● WHAT?

- Develop a system for monitoring and validating the distribution and change in land cover across Northern Eurasia (Разработать систему мониторинга и валидации карт растительного покрова и его изменений)

● WHY?

- All maps are lies, some lie more than others (Все карты лгут, одни – больше, другие – меньше)
- Which maps work better for specific applications? (Какие карты лучше применять для конкретных задач?)
- It is possible to make a better map for Northern Eurasia (Есть возможность для создания лучших карт для Северной Евразии)



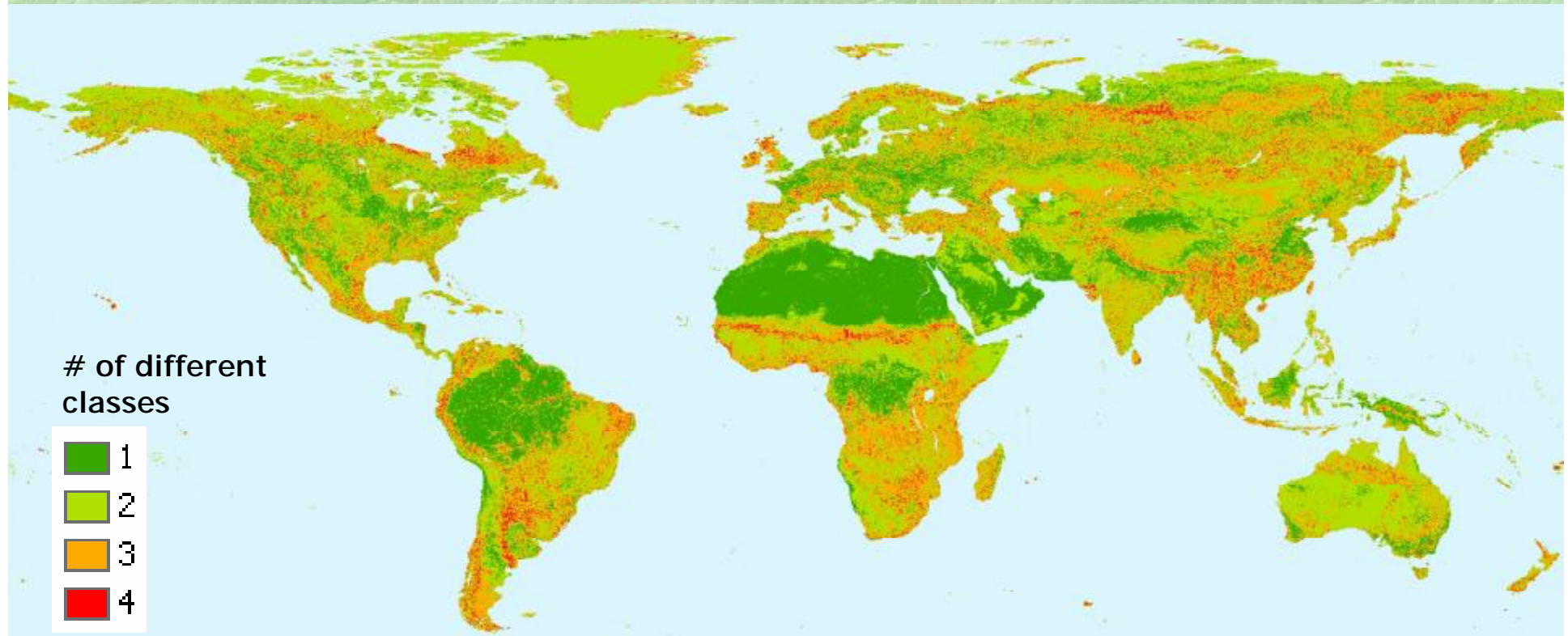
0	Water
1	Evergreen Needleleaf Forest
2	Evergreen Broadleaf Forest
3	Deciduous Needleleaf Forest
4	Deciduous Broadleaf Forest
5	Mixed Forests
6	Closed Shrublands
7	Open Shrublands
8	Woody Savannas
9	Savannas
10	Grasslands
11	Permanent Wetlands
12	Croplands
13	Urban and Built-Up
14	Cropland/Natural Vegetation Mosa
15	Snow and Ice
16	Barren or Sparsely Vegetated

MODIS 2001 Land Cover Map

Image credit: Curtis Woodcock, BU

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Agreement among land cover products

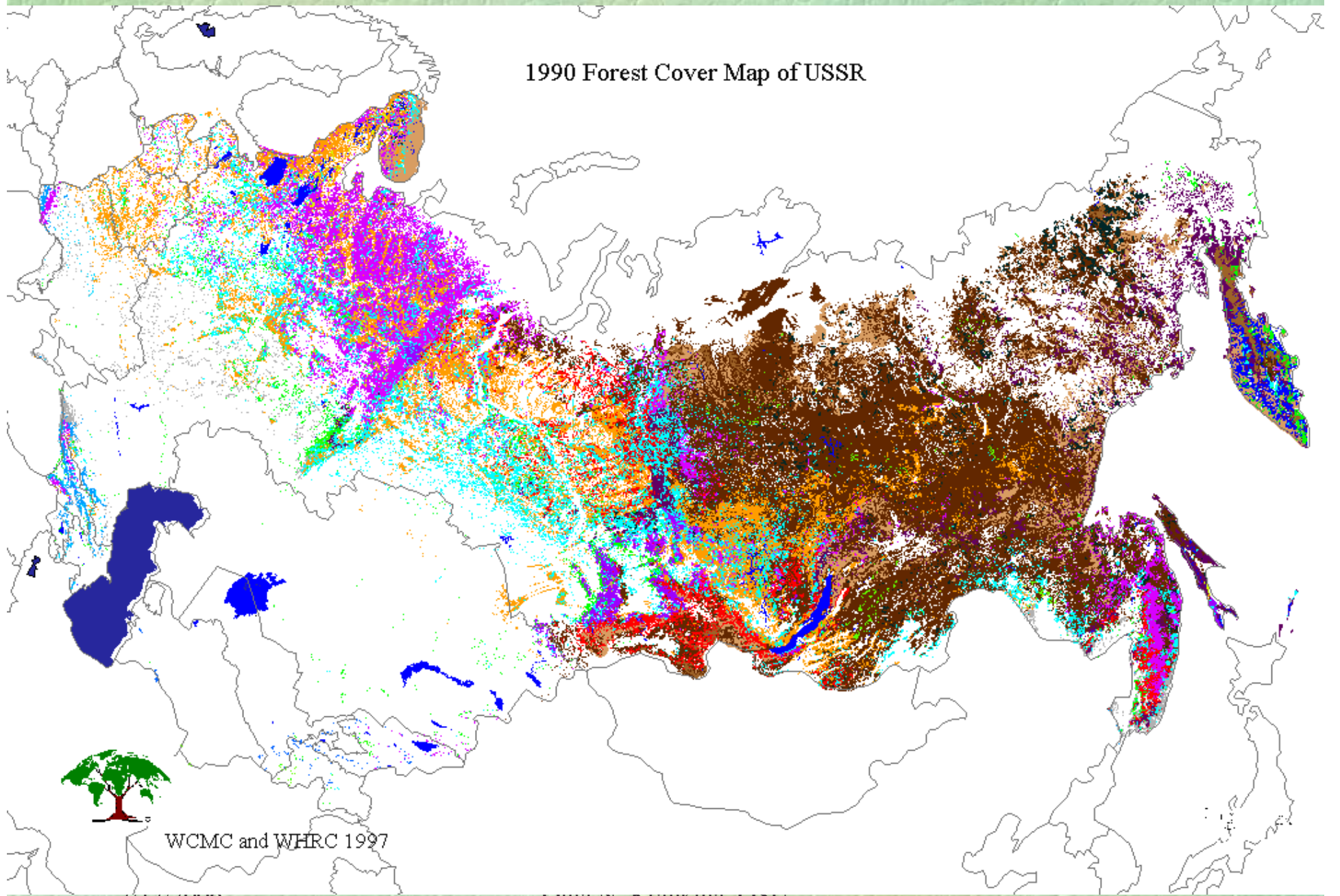


Describes number of different classes for each pixel in GLC2000, MODIS, IGBP-DIS, UMD based on a generalized legend (Image credit: M. Herold & C. Schmullius, GOFC-GOLD Land Cover Implementation Team Project Office)

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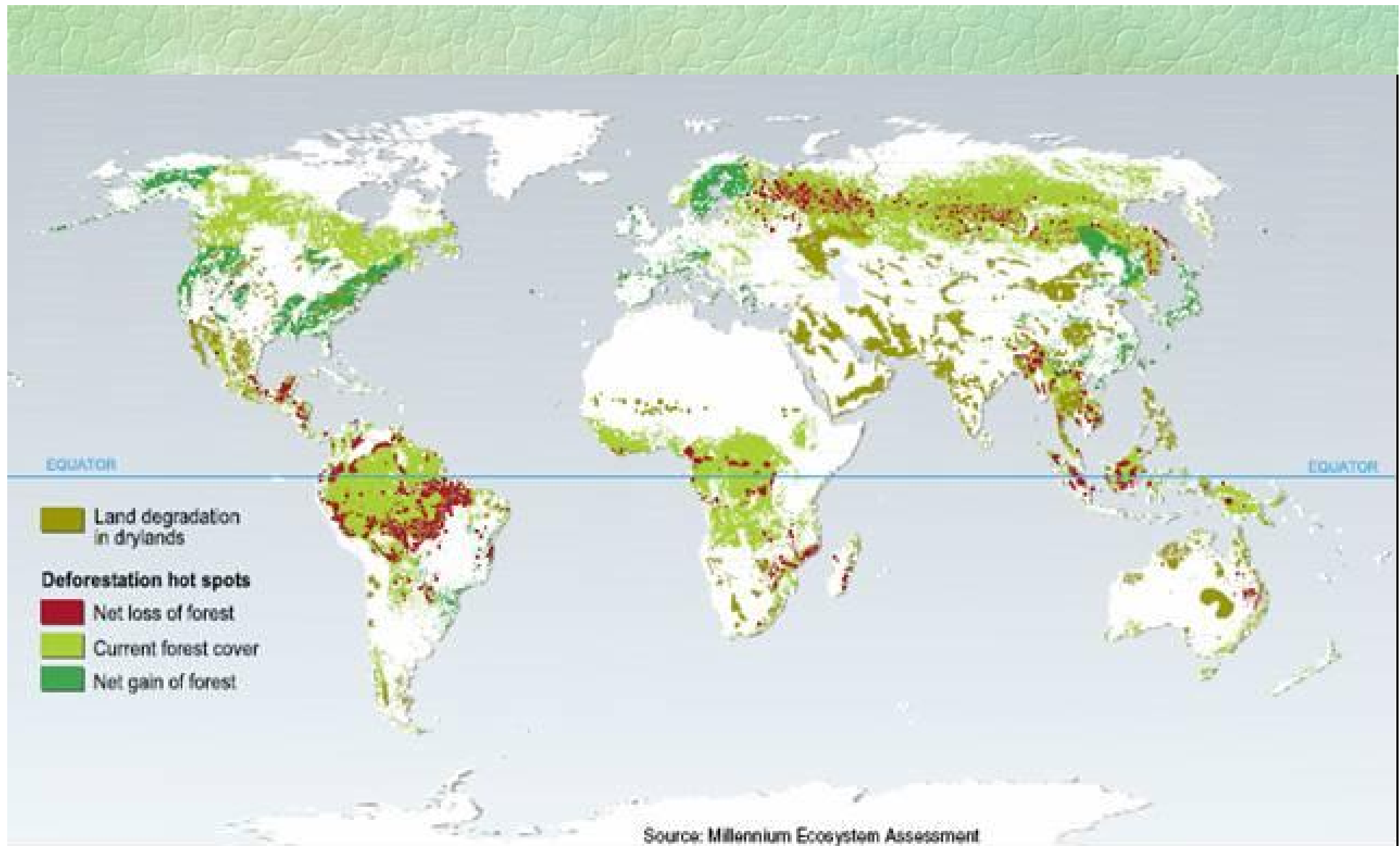
1990 Forest Cover Map of USSR



WCMC and WHRC 1997

7/17/2000

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Areas undergoing high rates of land cover change between 1980 and 2000 (Millenium Ecosystem Assessment, 2005).

7/17/2006

Olga N. Krankina, OSU

● The Team

- US
 - Oregon State University - Olga N. Krankina
 - NASA Goddard Space Flight Center – Jeff Masek and Jeff Morisette
 - Boston University - Mark Friedl and Curtis Woodcock
 - University of Maryland - Ivan Csiszar, Guoqing Sun, and Tatiana Loboda
 - USDA FS Pacific Northwest Research Station – Warren Cohen
- Eurasia
 - Space Research Institute, Russian Academy of Sciences, Moscow – Eugeny Lupian, Sergey Bartalev, Dmitry Ershov
 - Center for Information Technologies Development, Moscow – Alexander Maslov and Natalia Vandysheva
 - Institute of Monitoring of Climatic and Ecological Systems, Tomsk – Evgeny Gordov
 - V.N. Sukachev Institute of Forest, Krasnoyarsk – Slava Kharuk
 - Institute of Biology, Komi Scientific Center, Syktyvkar – Vladimir Elsakov
 - Institute of Sustainable Development of Ukraine, Kiev – Mykola Zalogin

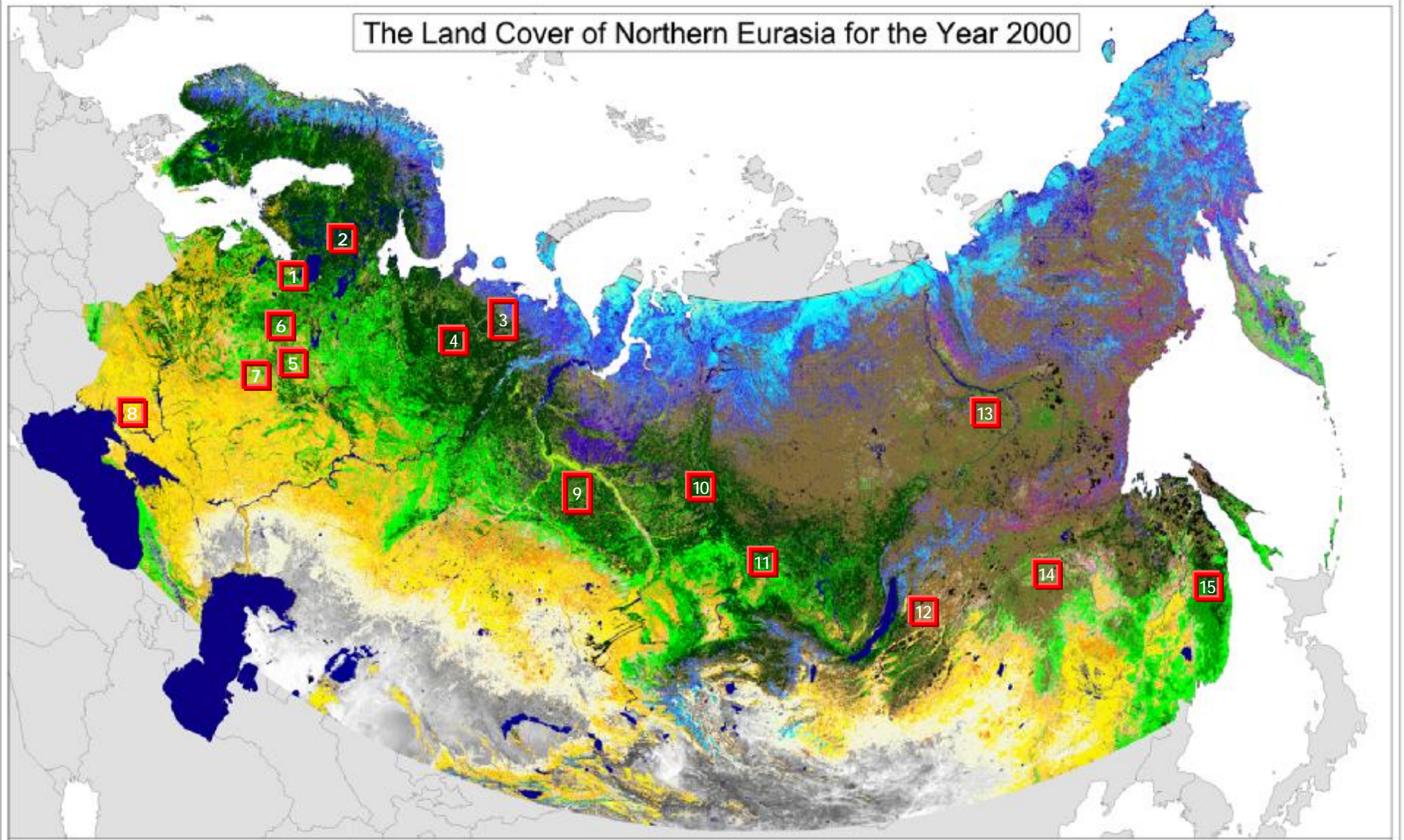


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Approach

- Combine remote sensing data (Landsat, MODIS) and local knowledge of land-cover conditions and change to validate and improve land cover / land-cover change products for Northern Eurasia
 - establish a set of test sites for land cover / change analysis
 - use these sites to validate global and regional land cover / change products
 - develop methods for continental mapping of vegetation disturbance
 - produce a new, updated land cover map for Northern Eurasia based on MODIS data

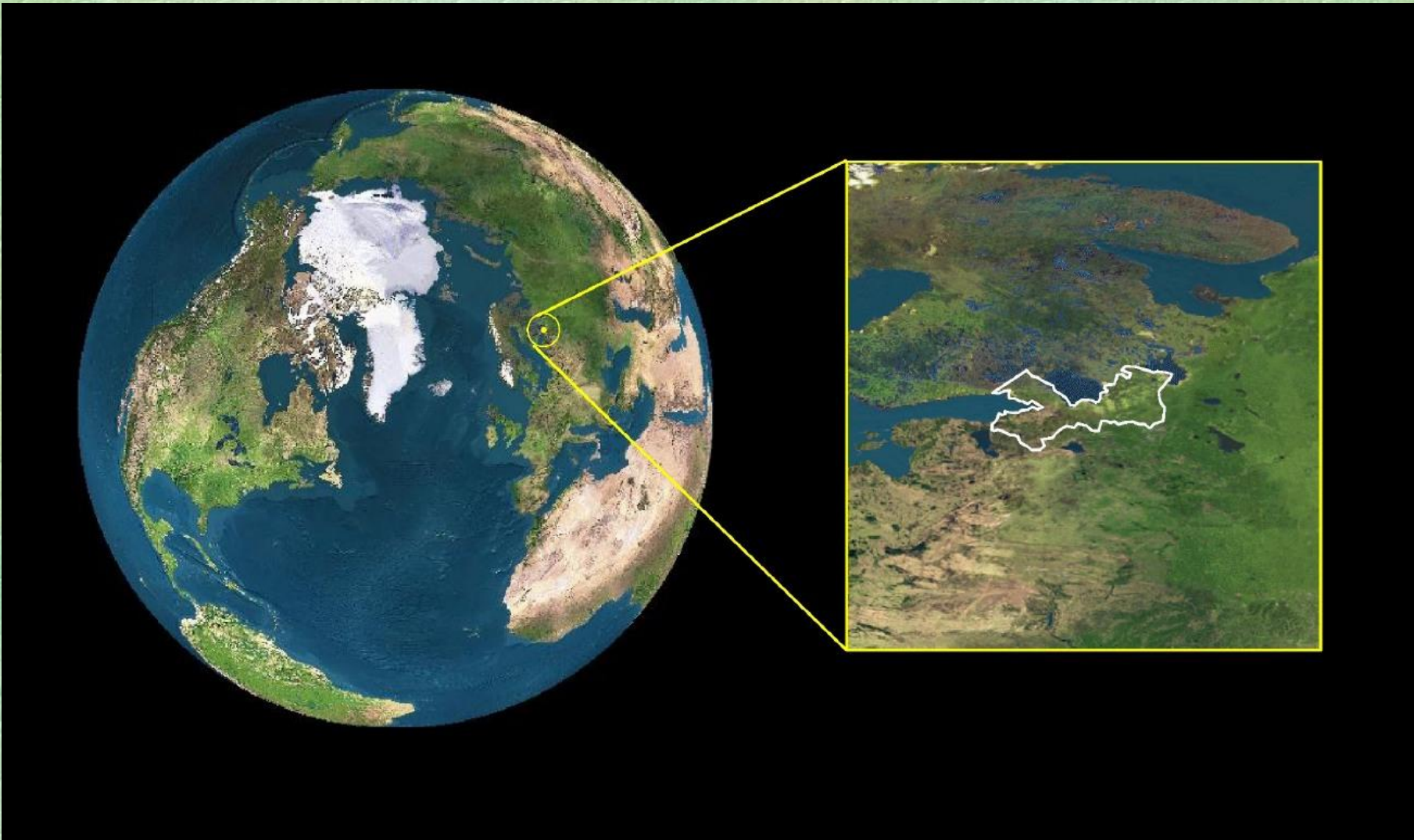
The Land Cover of Northern Eurasia for the Year 2000



Location of NELDA test sites (Map was created at EC JRC as part of GLC 2000 project, Bartalev et al. 2003)

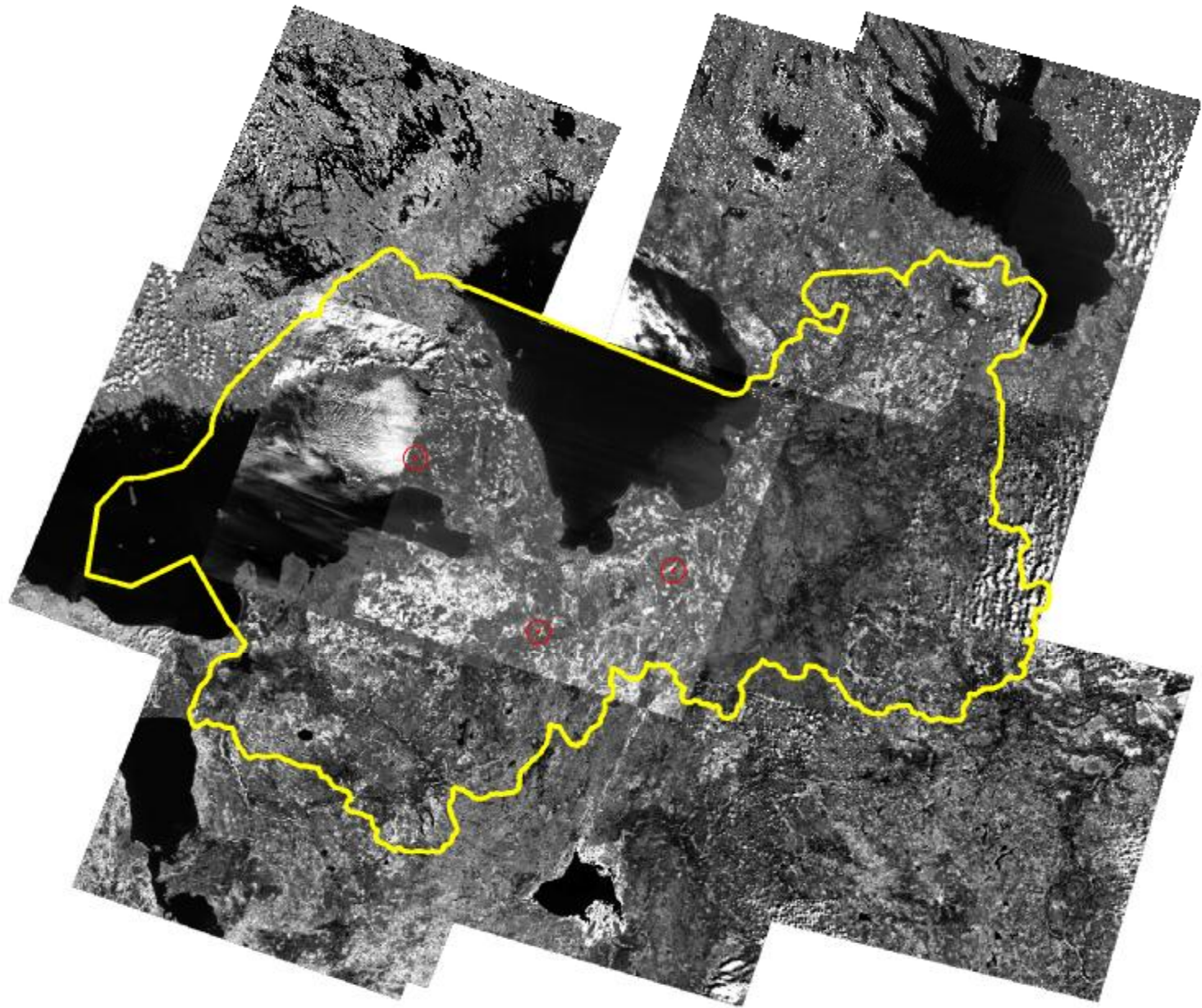
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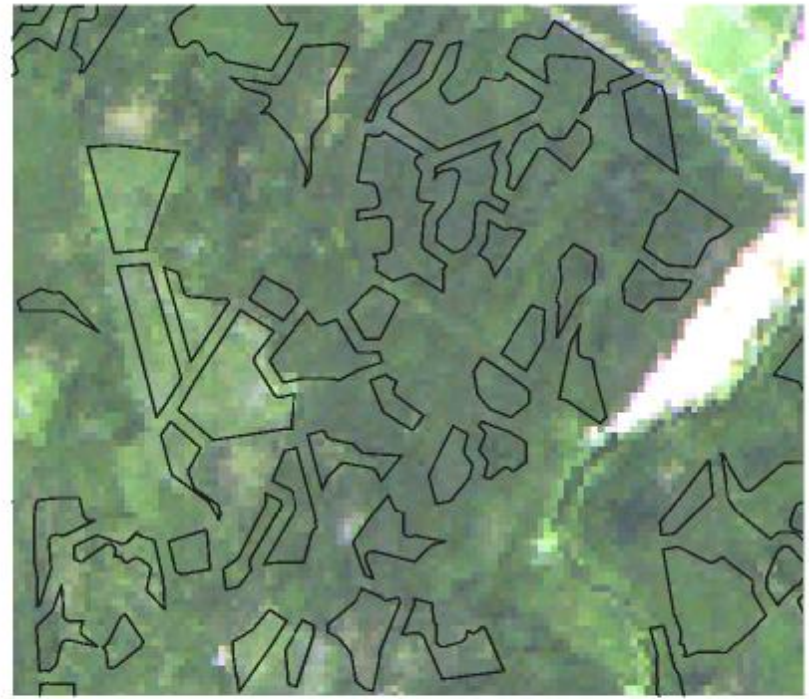
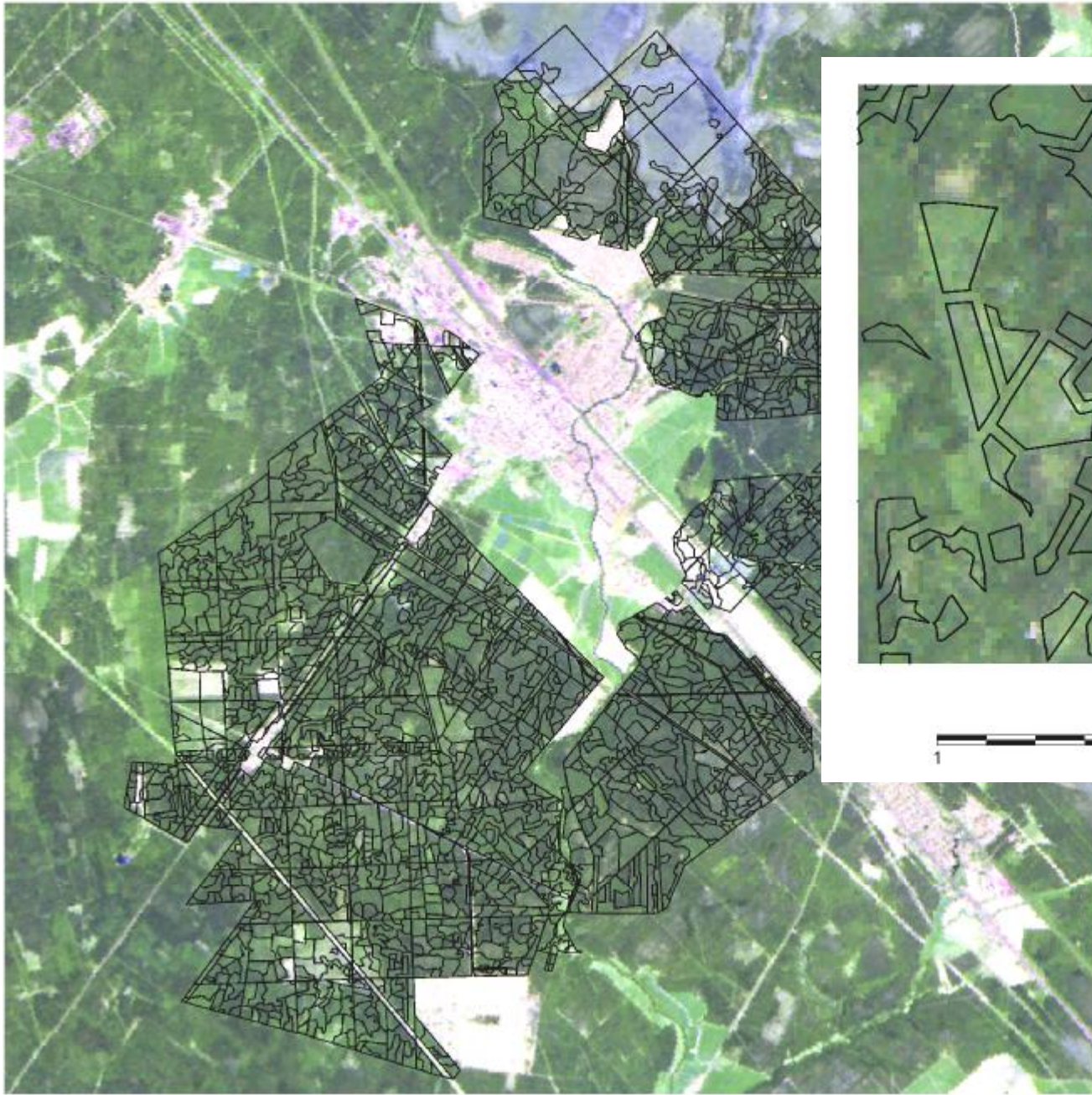
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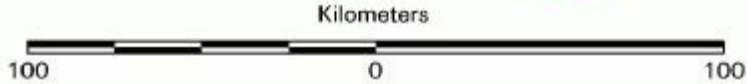
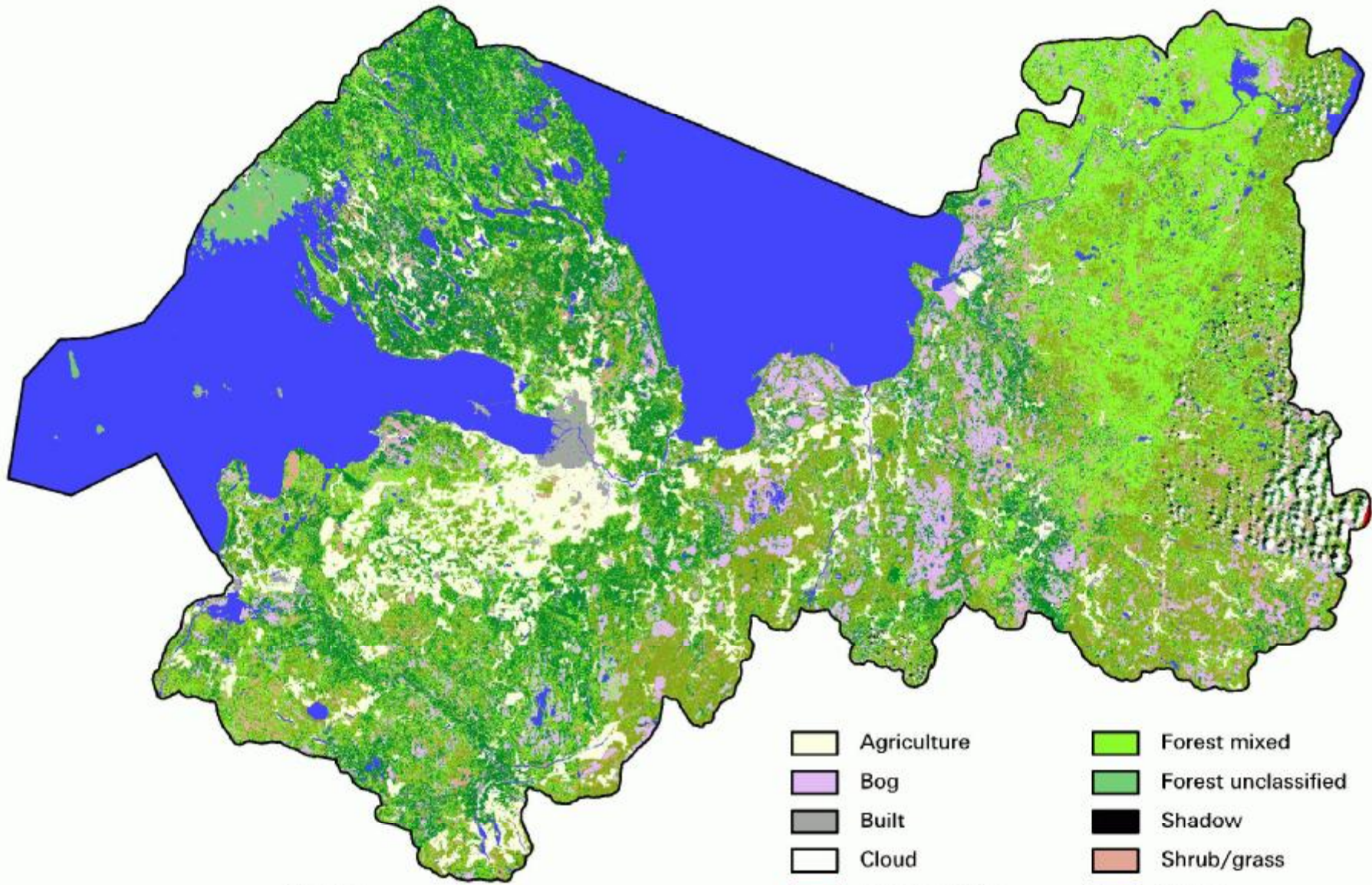


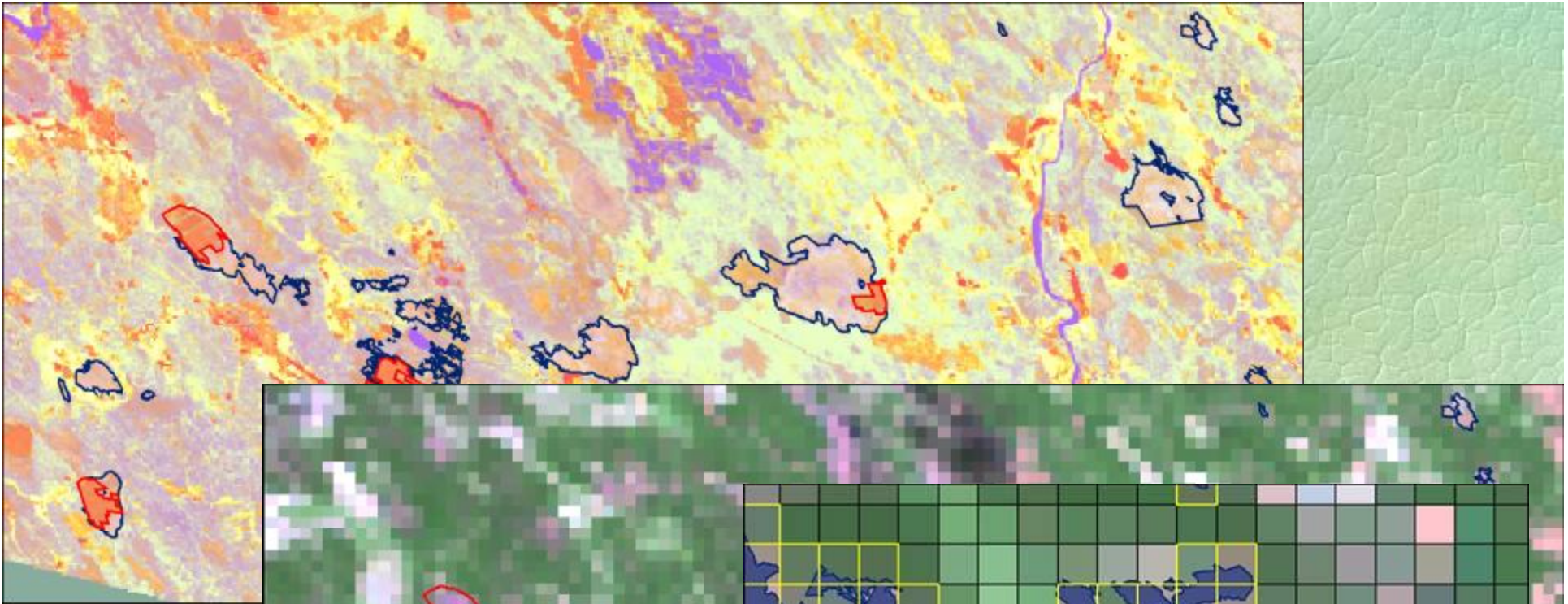
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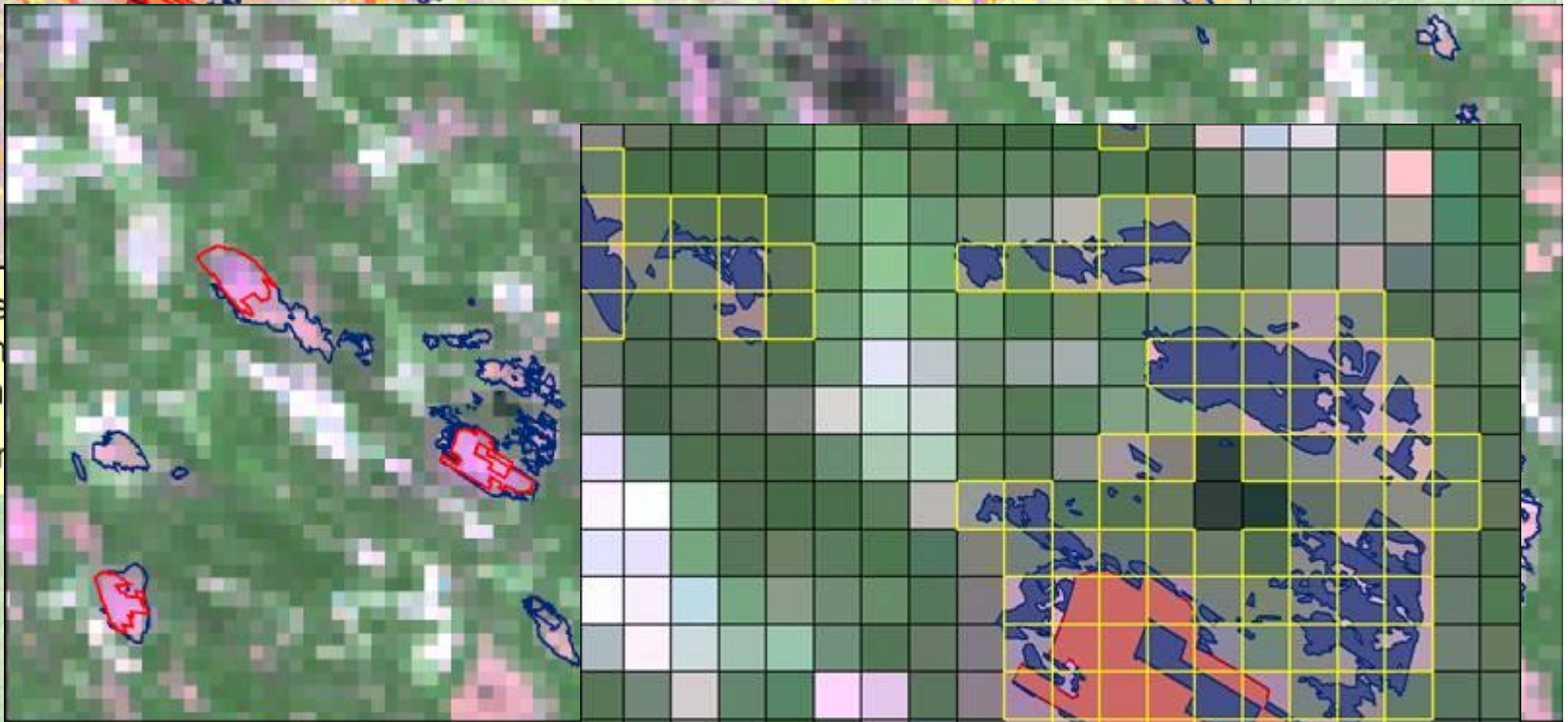
100 0 100 200 Kilometers







Landsat TM subset
Tasseled Cap transform
Spatial Resolution
Reference Peatlands



MODIS MOD43B4 subset (h19v02)
Julian Day 145; Collection 4
Spatial Resolution: 1 km; Projection

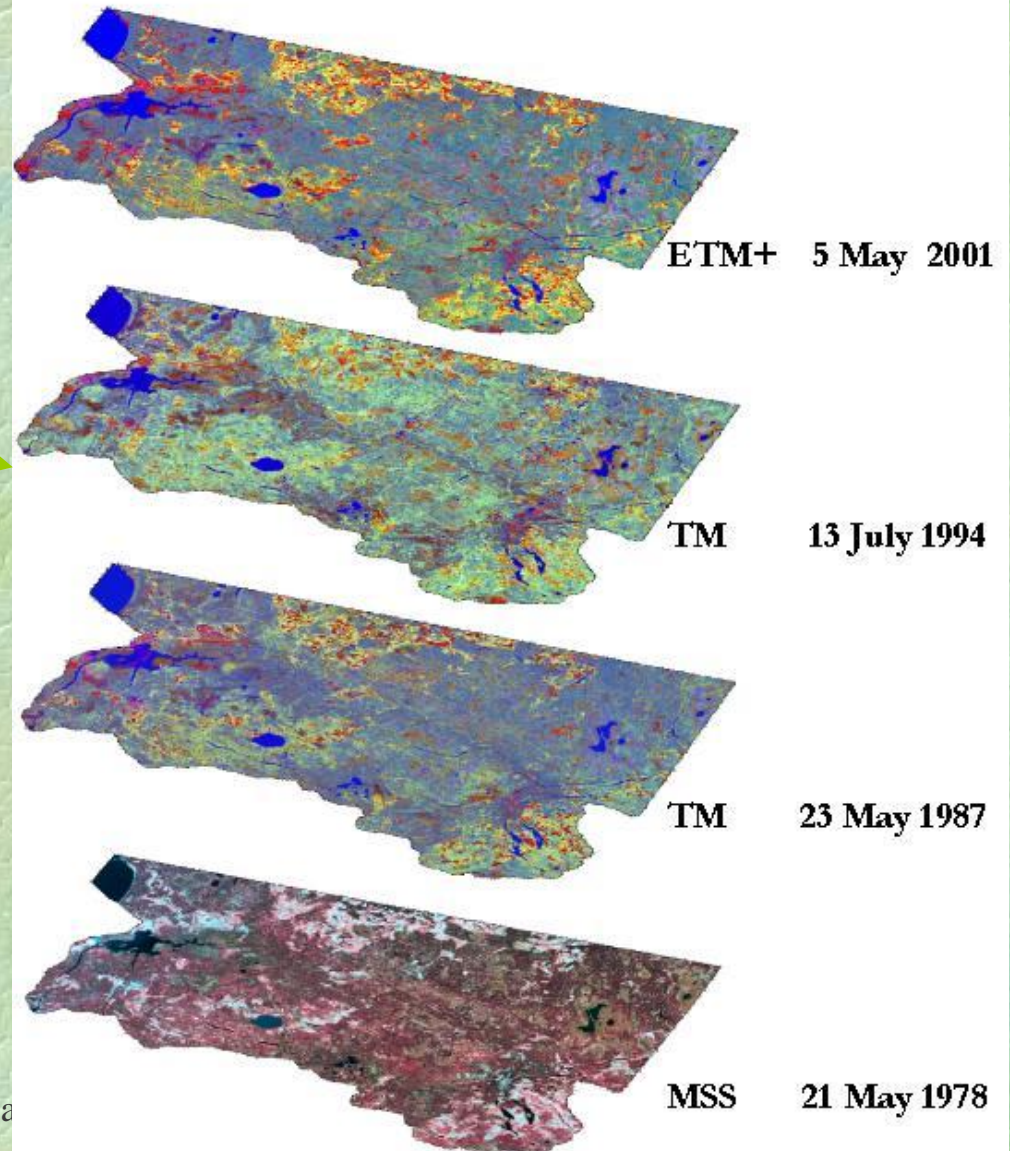
Reference Peatlands: — unmined — mined

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7
10
S

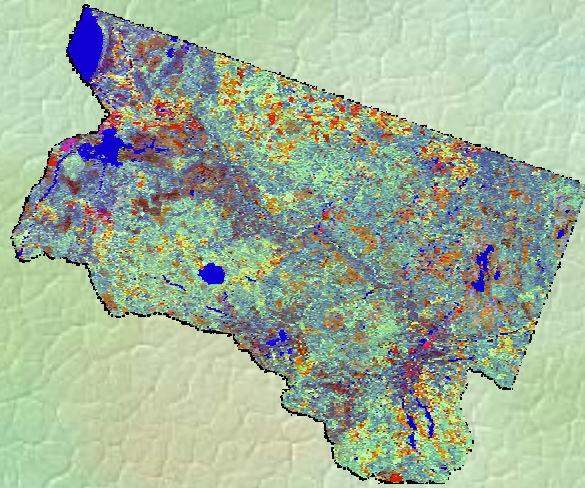


**Landsat imagery (path 185 row 19)
used in change detection**



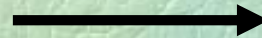
Each stack of
images included
3-4 dates
(or layers)

Disturbance Index Transformation



3 Band Tasseled Cap Image

Standardized with reference to
its mean value

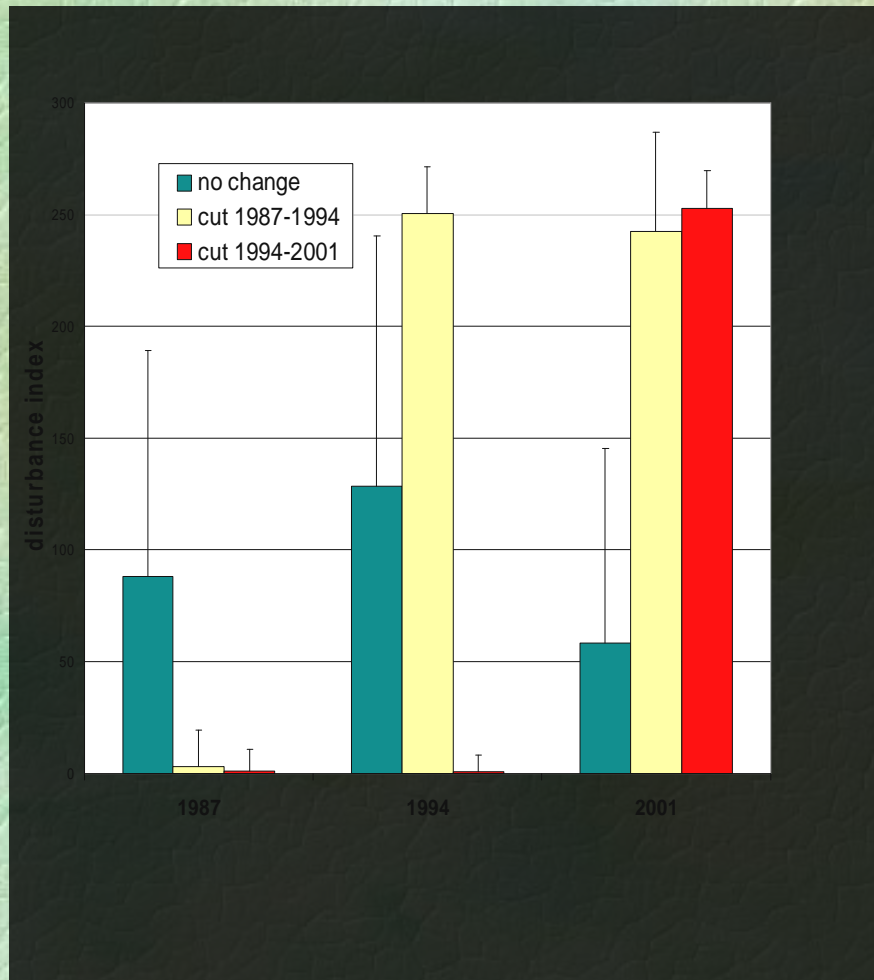


“Disturbance Index” Transformation

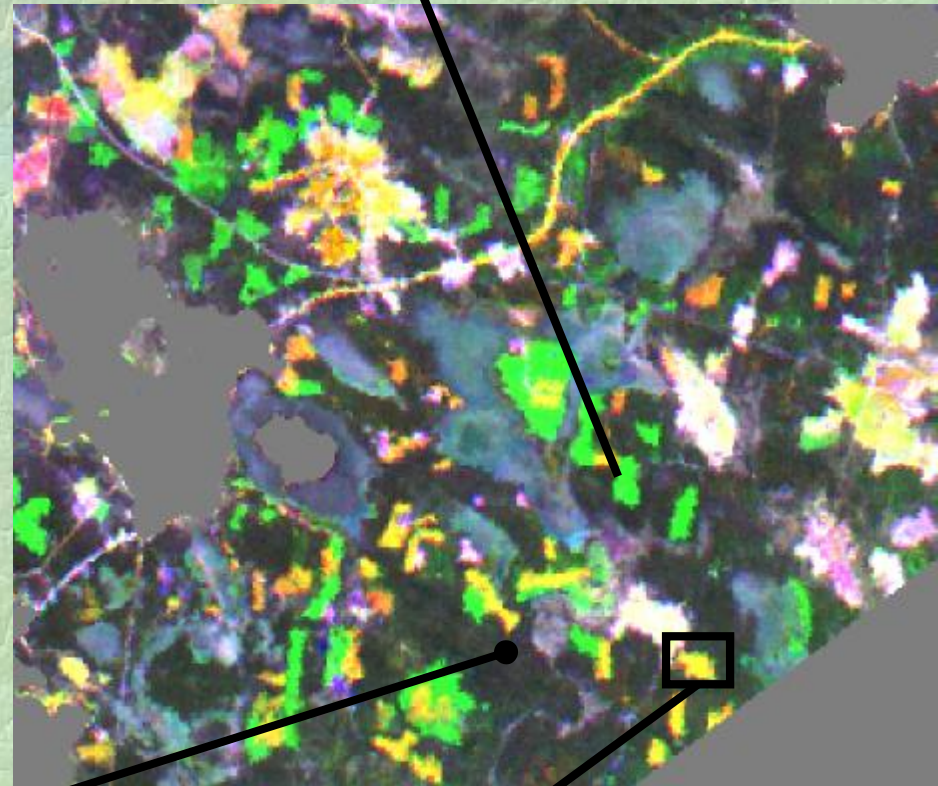
$$\text{Brightness} - (\text{Greenness} + \text{Wetness}) = \text{Disturbance Index}$$

Recently disturbed forests exhibit a higher brightness reflectance value, while greenness and wetness are typically lower.

Classification of disturbed sites by time intervals



Cut 1994-2001



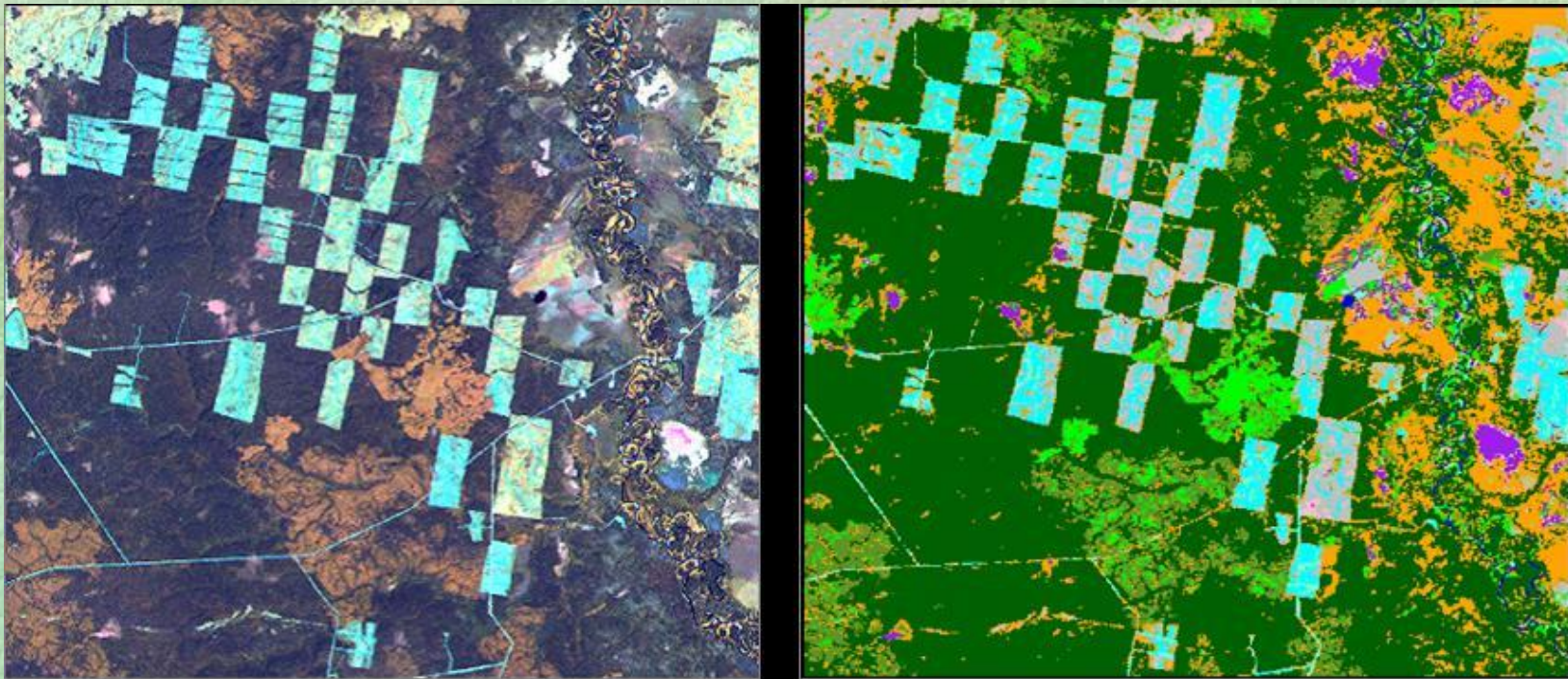
Undisturbed

Cut 1987-1994

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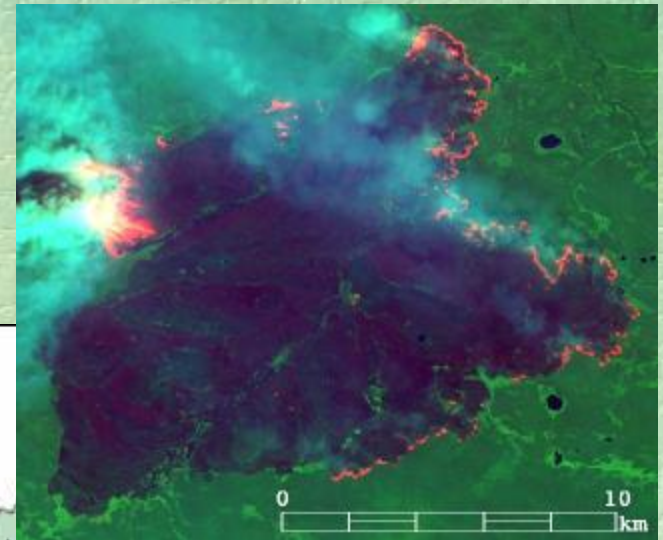
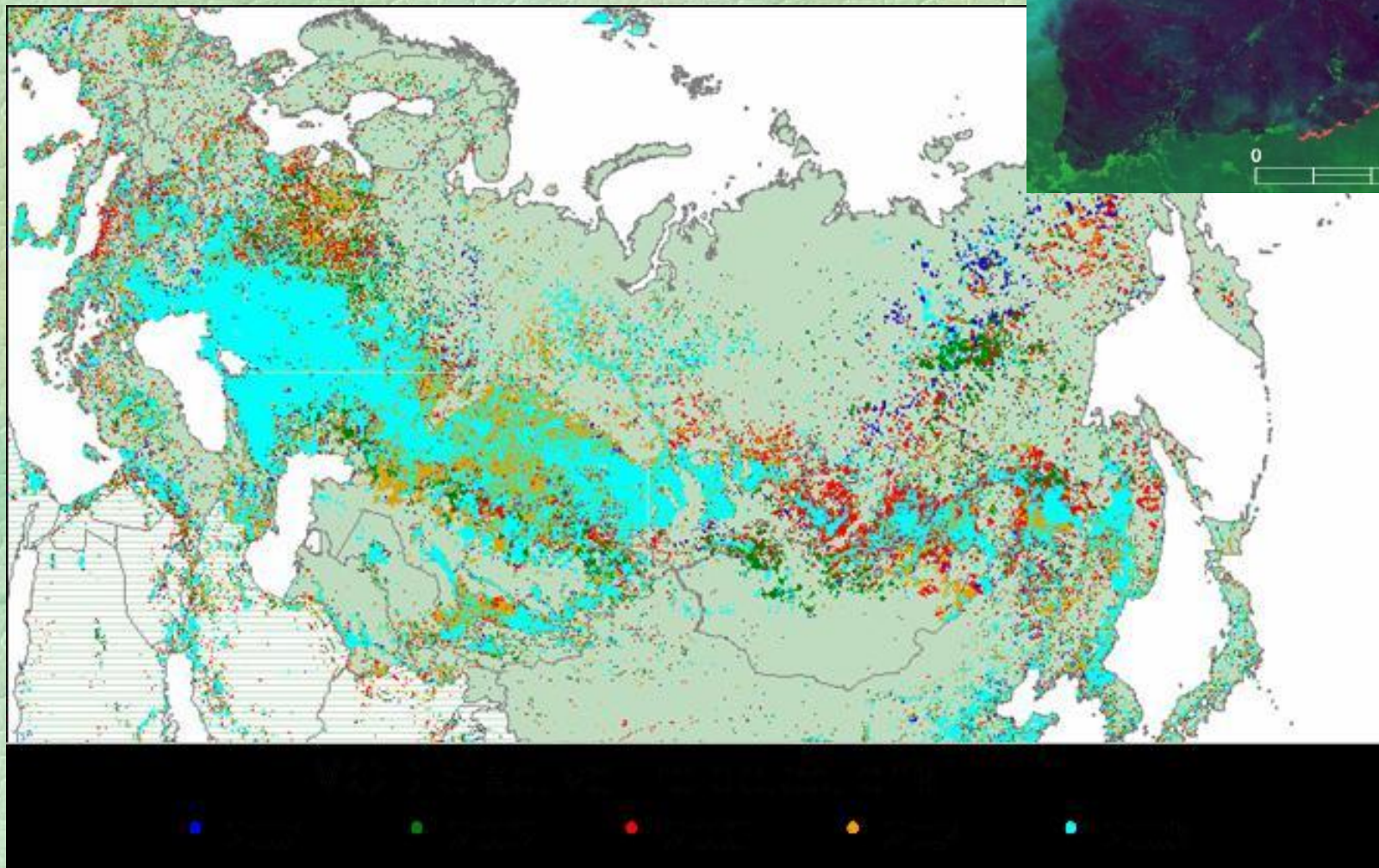
Timber harvest



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Fire



Burnt forest – 25 million ha



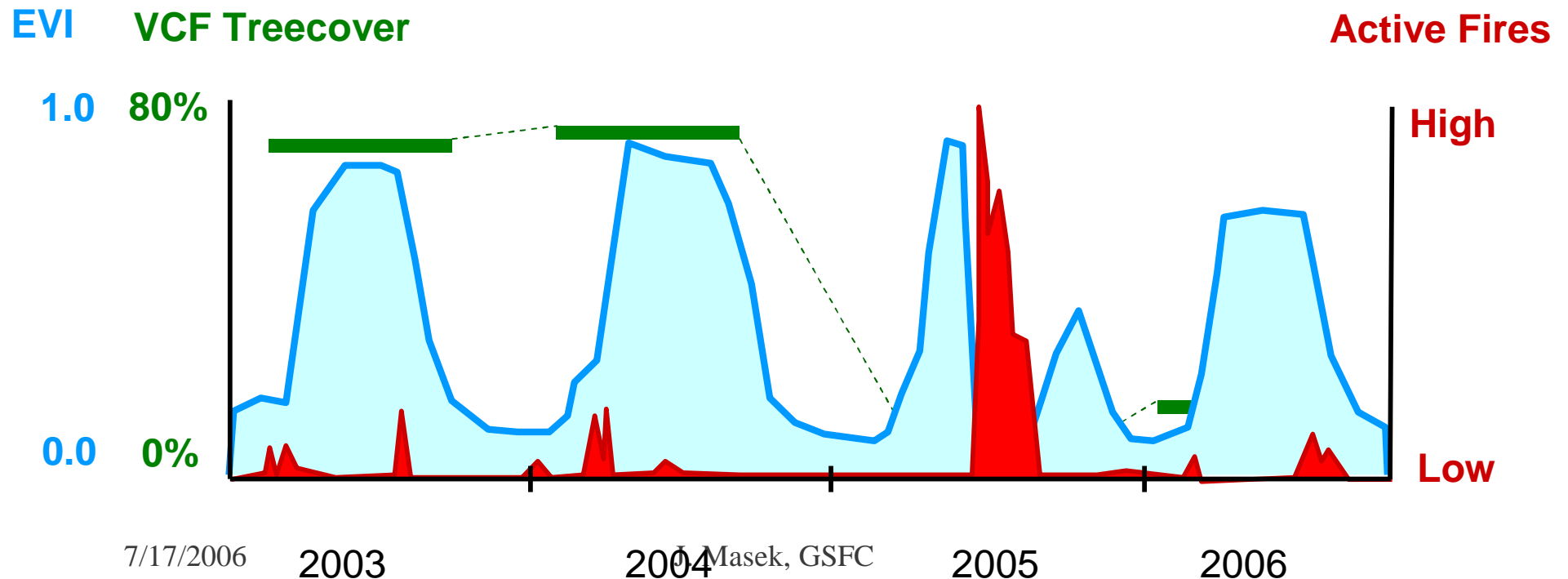
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NELDA Objective: Continental Forest Disturbance Maps

Several global MODIS products relate directly to ecosystem disturbance:

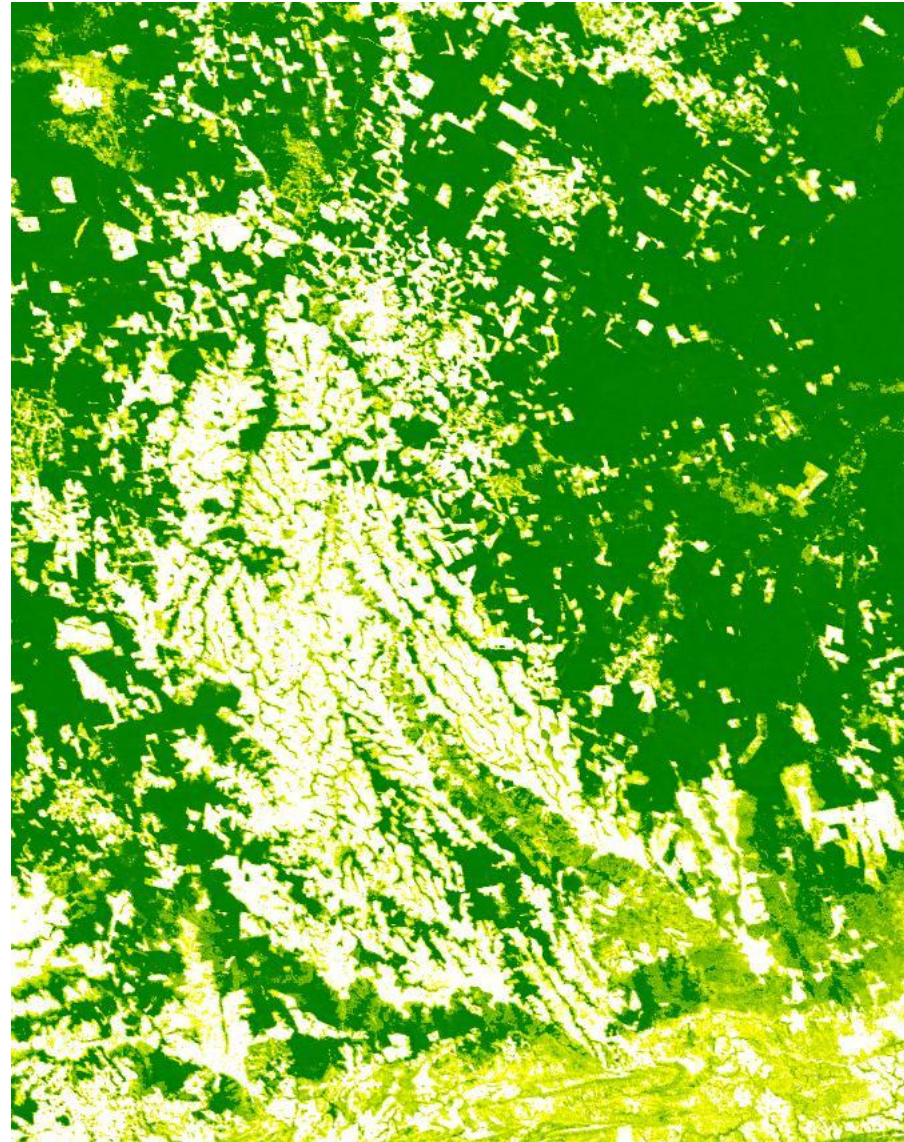
- Vegetation Continuous Fields (VCF) %Treecover/Herbaceous/Bare
- EVI / NDVI Vegetation Indices
- Active Fires, Burned Area

How can we use interannual records of these indicators to identify disturbance location, type, timing, and severity?



Example: MODIS VCF Treecover, Brazilian Amazon

Interannual changes from
2000-2002 correspond to recent
Forest clearing



7/17/2006
Courtesy Matt Hansen, SDSU

J. Marsh, GSFC

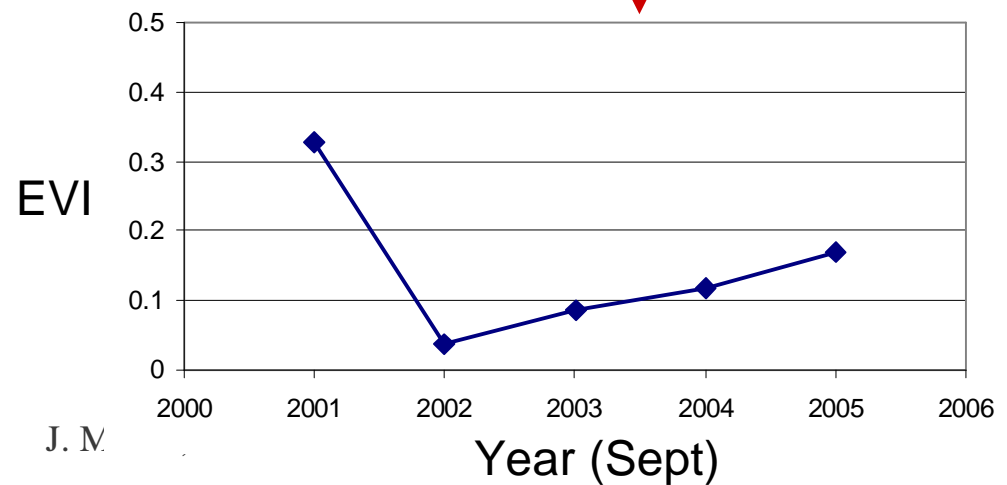
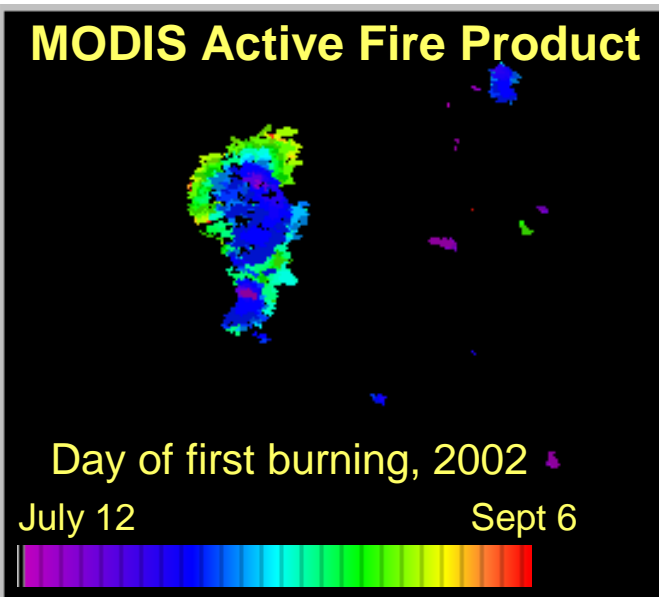
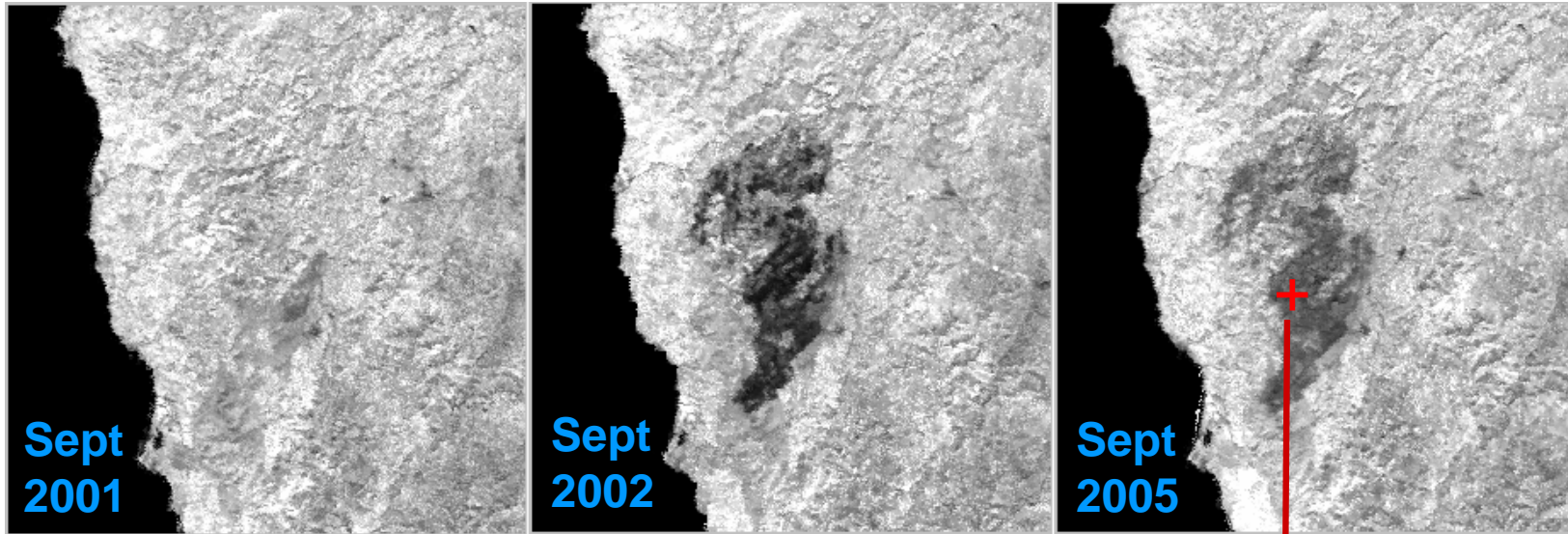
2000

2001

2002

Example: Biscuit Fire Extent and Recovery, Oregon 2002

MODIS Enhanced Vegetation Index (EVI) Product



Approach to Mapping Northern Eurasian Disturbance

1. Use NELDA test sites as high-resolution “truth” for typical forest disturbances in Northern Eurasia (fire, harvest/logging, insect damage, pollution damage)
2. Develop time series metrics for assessing probability of rapid changes in forest structure
 - Canopy leaf area (MODIS LAI, EVI product)
 - Canopy shadow fraction (MODIS SWIR reflectance)
 - Fractional tree cover (MODIS VCF product)
 - Fire activity (MODIS Active fire product)
3. Merge these indicators using a “fuzzy” or “voting” method to determine timing, type, and extent for forest disturbance at a regional (1-10km) scale.

Development of a New Land Cover Map of Northern Eurasia Using MODIS

Objective:

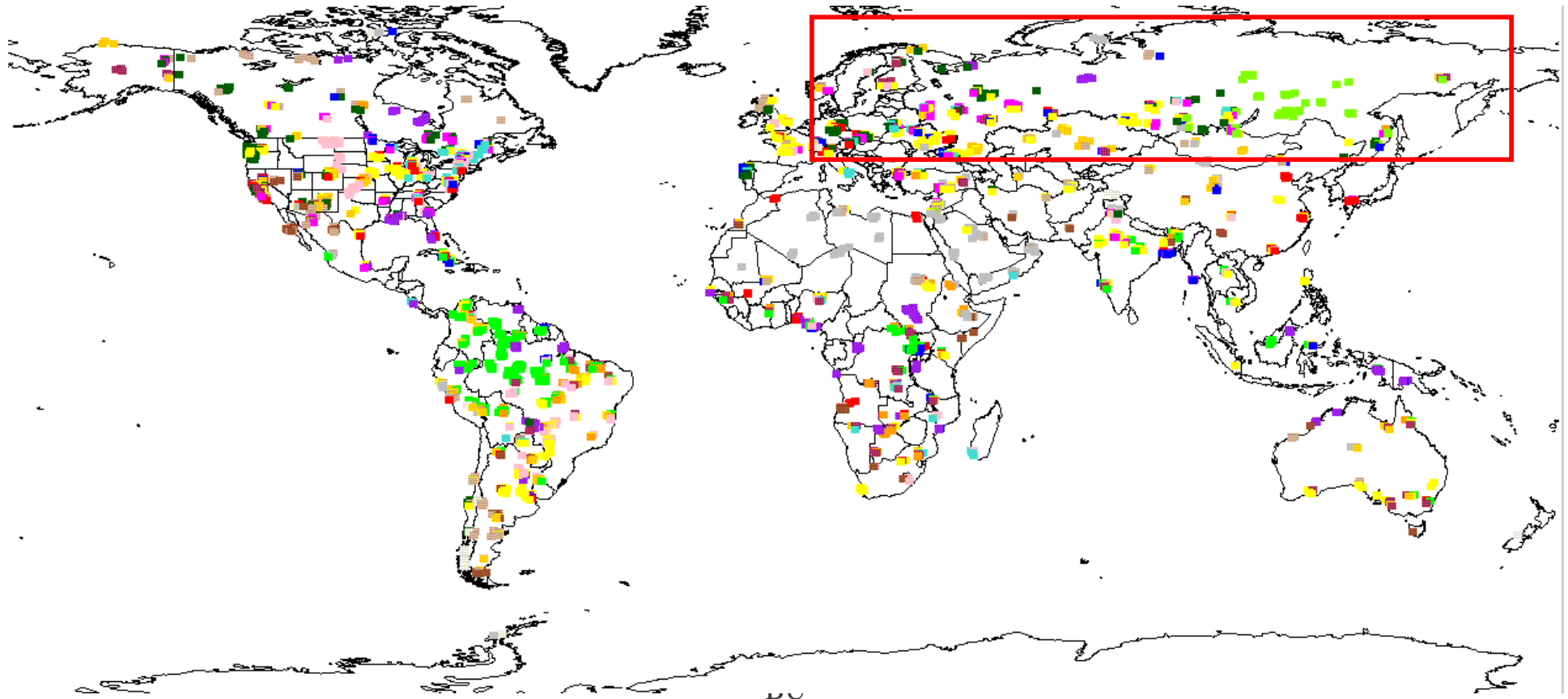
- Use MODIS data in association with training site data to create a map circa ~2005

Approach

- Modify MOD12 algorithm for regional processing
- Refine & augment MODIS site database
- Use LCCS classification system
- Validate using network of test sites

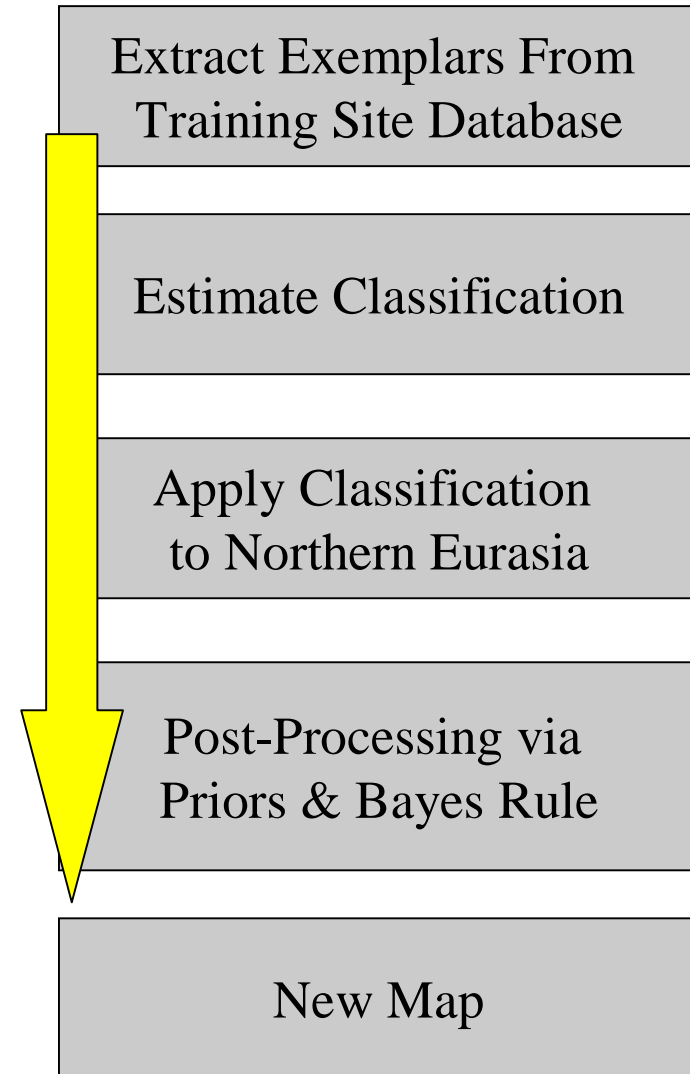
Training Site Development

- Live Database ~ 2300 sites globally
 - Northern Eurasia: ~200 sites
- Will *refine* and *augment* in support of LCCS
 - w/help from Russian collaborators (distinct from test sites)



MODIS Land Cover Processing Chain

- MODIS Data:
 - *Temporal and spectral information*
 - *32-day composites*
 - *500 m*
- Inputs
 - *Surface Reflectance (NBAR)*
 - *View-angle corrected surface reflectance*
 - *7 land bands*
- Enhanced Vegetation Index (EVI)
 - *Computed from NBARs*
- Annual Metrics
 - *Min, max, mean for each band, plus EVI*



Expected results

- 15 test sites
- MODIS-derived disturbance/ land-cover change map for Northern Eurasia for the period 2000-2006
- New regional land-cover map
- Strengthen the user community and serve as basis for future projects



Prospective new NELDA sites

- 14 additional sites proposed
- Cover additional vegetation types and regions within Northern Eurasia

NELDA contributes to broader regional and global programs

 NEESPI

 GOFC-GOLD

- NERIN (Northern Eurasia Regional Information Network)

Regional NERIN workshop

**NELDA Project:
Validation of Land Cover Maps and
Future Expansion of Test Site Network**

*(Проект NELDA: Валидация карт
растительного покрова и расширение
сети тестовых участков)*

July 8, 2006, Tomsk, Russia

GOFC-GOLD GLOBAL OBSERVATION OF FOREST AND LAND COVER DYNAMICS

Home > Regional Networks > NERIN

NERIN - Региональная Информационная Сеть по Северной Евразии

English: <http://www.fao.org/gtos/gofc-gold/net-NERIN.html> (оригинал данного сайта на английском языке)

Северная Евразия - крупнейший массив суши, расположенный вне тропиков, и обладающий самыми большими запасами органического углерода, а также являющийся областью активного изменения землепользования. Данный регион - один из основных источников неопределенности во многих крупномасштабных оценках, включая оценки поверхности земли, запасов и потоков углерода.



Основная цель NERIN - это содействие и координация проведения и поставки широкому кругу пользователей в Северной Евразии наблюдений за Системой Земли. NERIN также сотрудничает с агентствами по земле- и лесопользованию для обеспечения непрерывных высококачественных наблюдений для практических приложений и управления.

Сеть NERIN тесно связана с Инициативой Партнерства по наукам о Земле в Северной Евразии (NEESPI), которая является международной региональной программой научных исследований в области наук о Земле.

NERIN является неформальной сетью ученых и других специалистов, а также научных учреждений, сетей и проектов, работающих по тематике GOFC-GOLD и NEESPI.

На сайте размещены отчеты и другие материалы с семинаров NERIN, проведенных в 2001, 2004 и 2005 (отчет и копии докладов) годах. Новый сетевой проект NELDA планируется начать в 2006 году; семинар по проекту NELDA запланирован на 8 июля в рамках конференции ENVIROMIS-2006 в Томске, (1-8 июля 2006 г.).

В настоящее время NERIN собирает информацию о содержании, качестве, состоянии и других характеристиках доступных наборов данных, необходимых для поддержки новых исследований в Северной Евразии. Доступен [поиск по базе метаданных](#). Также приветствуется [пополнение](#) этой базы. Источники данных дистанционных наблюдений по Северной Евразии можно найти в [ссылках](#) и [каталогах](#) GOFC-GOLD.

Контактная и дополнительная информация



GINGER

Northern Eurasia Regional Information Network