Final Report

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“NELDA: Monitoring and Validating the Distribution and Change in Land Cover across Northern Eurasia”

Principal Investigator: Olga N. Krankina
Department of Forest Science
Oregon State University
Corvallis, OR  97331
Phone:  541-737-1780; Fax: 541-737-1393
E-mail: krankinao@fsl.orst.edu

Co-Investigators: Jeffrey G. Masek
NASA Goddard Space Flight Center
Code 923/Biospheric Sciences
Greenbelt, MD 20771
Phone: (301) 614-6629
E-mail: Jeffrey.Masek@nasa.gov

Mark A. Friedl
Department of Geography and Environment
Boston University
Phone: 617-353-5745
E-mail: friedl@bu.edu

Curtis E. Woodcock
Department of Geography and Environment,
Boston University
E-mail: curtis@bu.edu

Ivan A. Csiszar, Tatiana Loboda, Guoqing Sun
Department of Geography
University of Maryland
College Park, 20742
Telephone: 301 405 8891; Fax: 301 314 6503
E-mail: tloboda@hermes.geog.umd.edu

Jeffrey T. Morisette
NASA Goddard Space Flight Center
Mail code 614.5, Bldg. 32, Rm S036H
Greenbelt MD  20771
STATEMENT OF ACCOMPLISHMENT

Project results are presented at the dedicated web site http://www.fsl.orst.edu/nelda/index.html and reported in publications listed below. Two major papers in review are attached to this report. The major project accomplishments include:

1. **Development of new MODIS-based land cover map of the NELDA study region** (NELC) was completed at Boston University. As part of this activity, we have:
   a. Developed a LCCS-compliant consensus classification scheme working with the rest of the team and our Russian collaborators.
   b. Created a training database for supervised classification of MODIS over the NELDA study region. In support of our mapping algorithms, we have leveraged training sites available from the MODIS land cover project for use in NELDA mapping. To this end, sites falling within the NEESPI region were cross-walked to the NELDA classification, with an accompanying confidence parameter to assist quality assessment. In addition, New sites were added in classes that were weakly represented and sites were removed that were assessed to have poor quality. The resulting database includes a total of 461 sites.
   c. Compilation of ancillary dataset to improve representation of vegetation for the NELDA region. The input data layers used for this exercise are still being determined, but will probably include a combination of seasonal precipitation, seasonal temperature, elevation, and growing degree days.
   d. Development and implementation of an hierarchical schema to classify the study region using the NELDA based on the LCCS classification system and using a modified version of the MODIS Land Cover Type classification algorithm. Mapping methods and results were prepared for publication in Remote Sensing of Environment (Sulla-Menashe et al. 2010) and presented at several meetings (see publications). The new map and associated documentation is available for downloading at NELDA project site.

2. **UMD team completed Landsat-based mapping of land cover and its change at three test sites**. Site reports are available at http://www.fsl.orst.edu/nelda/sites/index.html. Results from Chita site were used in Pflugmacher et al. (in review), two additional sites (Amur and Sikhote-Alin) will be included in planned publications.

3. **OSU team completed the work at 7 test sites** including own work at the St. Petersburg site and collaborative effort with regional experts at 6 additional sites:
   a. Carpathians (Tobias Kuemmerle et al.)
   b. Komi (Vladimir Elsakov)
   c. Vasyugan (Tomsk) (Egor Dyukarev)
Landsat-based mapping of landcover was completed at all 7 sites while change detection was performed at 3 of these sites. The accuracy of land cover and change maps was evaluated with independent ground data and agreement matrices were developed. Site reports are available at project web site. Work at Mongolian site was supported primarily with APN funding. Furthermore 2 additional sites (Khanty-Mansi and Yoshkar-Ola) have initiated land cover mapping and plan to join the network of NELDA test sites in the future.

4. **Two coarse resolution maps of land cover GLC2000 and MODIS-IGBP v4 were cross-compared and validated for the high-latitude part of Northern Eurasia** (Krankina et al. 2010). Assessment of the impact of the choice of base land cover map on projected carbon balance indicated a significant effect which is commonly overlooked by modelers.

5. **Validation of four coarse-resolution land cover maps** currently available for the Northern Eurasia region showed major differences among maps and varied accuracies in comparison with test site results. The paper reporting map assessment at 6 sites (Pflugmacher et al. in review) also developed methods for using Landsat resolution maps for validating coarse resolution products. In summary, pixel-level agreement between global maps and test sites ranged from 0.67-0.74, and kappa ranged from 0.41-0.52 indicating fair to moderate agreement. The representation of tree-dominated classes was more accurate than other life form types while differences in the classification of non-tree classes accounted for most of the disagreement among global datasets. Accuracy estimates for uniform land cover and sampling units between 2 x 2 and 5 x 5 coarse resolution pixel blocks were 7-45% higher than pixel-level results. This indicates that commonly used accuracy estimates for global maps are too optimistic for common mixtures of cover types. The choice of evaluation criteria and sampling unit can lead to significantly different estimates of map accuracy. Knowledge of biases in different global products is important for their applications in global assessments and informing policy decisions. Analysis of NELC map in comparison with other available products at 10 currently completed test sites is being prepared for publication.

**PUBLICATIONS**

**Peer-reviewed papers**


Presentations at science meetings


2. O. Krankina and C. Woodcock. “The future direction of LCLUC validation activities” Spring NASA LCLUC Science Team Meeting, 03.31– 04.02, 2009, Bethesda North Marriott, Maryland


