

RLC AVHRR-DERIVED LAND COVER, FORMER SOVIET UNION, 15-KM, 1984-1993

Summary:

This data set consists of 15-km-resolution land cover data for the land area of the Former Soviet Union (FSU). There are sixty land cover classes distinguished in this data set, thirty-eight of which are forest cover classes. The data set is useful for stratification of the FSU into general sub-regions of land cover for subsequent study using higher resolution satellite data.

The data are provided in several different file formats, including binary raster data in Idrisi format, ASCIIGRID raster data in ASCII format (easily imported into ArcInfo), and a graphic map in JPEG format (see Figure 1). Please read all documentation before using these files.



Figure 1. Land cover map, 15-km-resolution, for the land area of the FSU

Data Citation:

Cite this data set as follows:

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1. Data Set Overview:

Data Set Contents:

This data set consists of 15-km-resolution land cover data for the land area of the FSU. Sixty land cover classes are distinguished.

Related Data Sets:

See other Russian Land Cover data sets.

Title of Investigation:

Measuring Changes to Russian Forest Over the Last 25 Years

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Future Modifications and Plans:

Not available.

2. Data Characteristics:

Study Area:**Spatial Coverage:**

Min. X: 19.816

Max. X: 190.096

Min. Y: 35.2389

Max. Y: 75.0

In degrees west longitude and north latitude

Spatial Resolution:

1000 meters

Projection:

Lambert Azimuthal Equal Area

Grid Description:

Cols: 626

Rows: 1637

Resolution: 1000 meters

Temporal Coverage:

Not applicable

Parameter or Variable:

Table for: dlcmap.img

Variable	Description	Units	Instrument	Range
LAND COVER	land cover classes	Unitless	AVHRR	Not applicable

LAND COVER footnote: See companion file [ftp://daac.ornl.gov/data/russian_land_cover/land_cover/comp/dlcmap_legend.txt] for text file of table contents.

CLASS	PRIMARY	SECONDARY	TERTIARY
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1	"Tundra confused with desert"	Other desert	Sand desert
2	Tundra	Polar desert	Not present
3	Tundra	Northern/maritime taiga	Not present
4	Tundra	Polar desert	Wooded tundra
5	Tundra	Wooded tundra	Northern / maritime taiga
6	Tundra	Wooded tundra	-
7	Tundra	Northern/maritime taiga	Wooded tundra
8	Mild/hot warm grass/shrub	Sand desert	Other
9	Tundra	Wooded tundra	Northern / maritime taiga
10	Tundra	Northern/maritime taiga	Main boreal forest
11	Mild/hot grass/shrublands	Tundra	Sand desert
12	Northern/mar. taiga	Tundra	Not present
13	Tundra	Wooded tundra	Northern / maritime taiga
14	Mild/hot warm grass/shrub	Cool/cold shrublands	Sand desert
15	Northern/maritime taiga	Tundra	Main boreal conifers
16	Northern/maritime taiga	Tundra	Main boreal conifers
17	Main boreal conifers	Cool snowy grass/shrubs	Conifers
18	Northern/maritime taiga	Cool farmlands	Cool snowy grasslands
19	Northern/maritime taiga	Tundra	Wooded tundra
20	Tundra	Northern/maritime taiga	Wooded tundra
21	Northern/maritime taiga	Main boreal forest	Tundra
22	Cool/cold shrublands	Cool snowy grasslands	Mild hot warm grass/ shrub
23	Northern/maritime taiga	Tundra	Main boreal conifers
24	Northern/maritime taiga	Tundra	Main boreal forest
25	Cool/cold shrub	Mild/hot shrublands	Cool snowy grasslands
26	Northern/maritime taiga	Main boreal conifers	Tundra
27	Cool farmlands	Cool snowy grasslands	Main boreal forest
28	Northern/maritime taiga	Tundra	Wooded tundra
29	Main boreal conifers	Northern/maritime taiga	Tundra
30	Northern/maritime taiga	Main boreal conifers	Tundra
31	Wooded tundra	Tundra	Main boreal conifers.
32	Main boreal conifers	Tundra-taiga	Tie
33	Northern/maritime taiga	Main boreal conifers	Cold steppe
34	Cool snowy grasslands	Cool/cold shrublands	Cool
35	Main boreal conifers	Northern/maritime taiga	Tundra
36	Wooded tundra	Cold steppe	Tundra
37	Main boreal conifers	Cool snowy grasslands	Cool farmlands
38	Main boreal conifers	Cold steppe	Northern/maritime taiga
39	Main boreal conifers	Northern/maritime taiga	Tundra
40	Mild/hot warm grass/shrub	Mild/hot farmlands	Cool croplands
41	Cool farmlands	Cool snowy grasslands	Grasslands /croplands
42	Northern/mar. taiga	Tundra	Main boreal conifers
43	Main boreal conifers	Snowy non-boreal conifers	So dry taiga
44	Main boreal conifers	So dry taiga	Tundra
45	Main boreal conifers	Cool farms	Siberian boreal taiga

46	Main boreal conifers	Conif./decid. forests	Mires
47	Main boreal conifers	Conif./decid. forests	Mires
48	Mild/hot farmlands	Regrowing woods/crops	Conifers
49	Snowy nonboreal conifers	So dry taiga	Tundra
50	Main boreal conifers	Cold steppe	Northern/maritime taiga
51	Cool farmlands	Grassland / croplands	Cool snowy grasslands
52	Regrow. Woodlands/crops	So. dry taiga	Cool snowy grasslands
53	So dry taiga	Snowy non-boreal conifers	Main boreal forest
54	Mild/hot farmlands	Cool farms-regr woodlands	Tie
55	Main boreal conifers	Sib. Larch taiga	Snowy non-boreal conif. for
56	Snowy non-boreal conifers	Main boreal conifer	Southern dry taiga
57	Conif/decid forest	Regrow wood/crops	Cool snowy grasslands
58	Regrow woodlands/crops	Cool farms	Grass/croplands
59	Cool farm	Regrw woods/crop	Conif./decid. forest
60	Snowy nonboreal conifers	Regrw woods/crop	Conif./decid. forest

Table for: dlcmap.dat

Variable	Description	Units	Instrument	Range
LAND COVER	land cover classes	Unitless	AVHRR	Not applicable

LAND COVER footnote: The sixty land cover classes distinguished in this data set are listed above. See companion file

[ftp://daac.ornl.gov/data/russian_land_cover/land_cover/comp/dlcmap_legend.txt] for text file of table contents.

Data Organization

Please read all documentation before using these files:

ftp://daac.ornl.gov/data/russian_land_cover/land_cover/comp/dlcmap_readme.txt

Granule Name or Description:

dlcmap.img

Data Format:

A binary raster image depicting land cover in Idrisi format. Note: must be converted to an *rst file when using version 3.2 of Idrisi. Use the Idrisi File Conversion (16/32) utility available in the file pulldown menu to convert to the new format. Also note that the Idrisi v. 2 image documentation file, dlcmap.doc, MUST be present for the binary data to be read by Idrisi.

Sample Data Record:

Not applicable.

Granule Name or Description:

dlcmap.dat

Data Format:

ASCIIGRID version of the binary raster data (dlcmap.img). This data file was created by converting the Idrisi binary file (dlcmap.img) using Idrisi export utilities. Note: it was necessary to first convert the *.img file to a *.rst file and the *.doc file to a *.rdc file to match the new file format and naming convention of raster data supported by Idrisi 3.2.

Sample Data Record:

Not applicable.

3. Application and Derivation:

Typical Application of Data

Regional-, national-, and sub-national-level forest and land use change assessments. Stratification of the FSU into general sub-regions of land cover for subsequent study using higher resolution satellite data.

Theory of Measurements

Not available

Derivation Techniques and Algorithms**Formulae:**

Not available

Processing Steps:

We assembled a ten-year Global Vegetation Index (GVI) time series data set covering 1984 to 1993 for the region of the FSU. Data from the NOAA First Generation Weekly Composite products were re-mapped from a Polar Stereographic to a Platte Carree map projection. These data, with data from the NOAA second-generation weekly composite product, were read into both Idrisi and ERDAS software formats.

The inverse of the standard GVI equation (Kidwell 1990) was used to convert the scaled Normalized Difference Vegetation Index (NDVI) data values to the bright-land byte range. For instance, the transformation converted an NDVI value of 0.0 to a new value of 90, creating a minimum and maximum range from 90 to 163. Thus, a pixel with a value of 163 is equivalent to an NDVI of 0.63.

We then created a matrix with a common Platte Carree map projection and resolution (2,500 x 904 cells or pixels). Data from spring 1984 through the first week of April 1985 were re-projected using the algorithms in Kidwell (1990). The resulting data set had 48 to 53 weeks for each of the 10 years from 1984 to 1993. The data in these 510 weeks were then averaged into 120 months (12 months/yr for 10 years). The 120 monthly data were used to create a continuous FSU land surface, which crossed the international dateline (E. and W. longitude 180o) and had a size of 1183 columns by 277 rows.

A 12-month data set was created from the 10-year, 120-month data set by averaging together, for example, all of the January data to create a 10-year January average. Then, all of the February data and data for the following months were averaged to create an image with 12 bands. Averaging with maximum monthly GVI values reduces the effects of inter-satellite mis-calibration, sensor drift, orbital slippage, and noise in the data. These degrading effects upon AVHRR data have been thoroughly documented and are well known (Goward et al. 1991, 1993, Tateishi and Kajiwara 1991, Eastman and Fulk 1993). In general, using a long time series and a long averaging period reduces the amount of noise in the data.

Water pixels were deleted with a mask created from a re-projected hydrographic data set digitized from a 1:8,000,000 scale Russian base map (Main Geodesy and Cartography Organization for Ministries of the USSR 1990). This hydrographic data set, containing coastlines, islands, and major inland water bodies, was selected because of its size and ease of use. A comparison of coastlines between the Digital Chart of the World (DCW) by Environmental Systems Research Institute (ESRI) (1993) and the 1:8,000,000 scale map yielded an aerial difference of less than 0.1 (10%) of a GVI pixel.

Because most of the degrading effects in the data were related to low winter sun angles for this boreal region, we chose to eliminate from the analysis December, January, and February. These months are the times of extreme cold for the vast majority of the region of the FSU, during which vegetation is inactive.

Processing Changes:

Not available

Special corrections/Adjustments:

Not available

Calculated Variables:

Not available

Graphs and Plots Used in Analysis:

Not available

4. Quality Assessment:

Data Usage Guidance:

Errors and Limitations:

Error Sources:

Not available

Limitations of the Data:

Not available

Known Problems with the Data:

Not available

Quality Assessment Activities:

Not available

Other Relevant Information about the Study:

Not available

5. Acquisition Materials and Methods:

Source or Platform Collection Environment:

NOAA satellites carrying AVHRR sensor

Source or Platform Program Management:

Not available

Source or Platform Mission Objectives:

Coverage Information:

Not available

Attitude Characteristics:

Not available

Data Collection System:

Not available

Communication Links:

Not available

List of Sensors or Instruments:

AVHRR

Ground Segment Information:

Data Acquisition and Processing:

Not available

Latitude Crossing Times:

Not available

Sensor or Instrument Descriptions

Key Variables:

Not available

Principles of Operation:

Not available

Sensor or Instrument Measurement Geometry:

Not available

Manufacturer of Sensor or Instrument:

Not available

Calibration:

Specifications:

Not applicable

Tolerance:

Not applicable

Frequency of Calibration:

Not applicable

Other Calibration Information:

Not applicable

Data Acquisition Methods:

The source satellite imagery data were acquired from the USGS/EROS Data Center, Sioux Falls, South Dakota, U.S.A. A USSR forest map was used to aid in classification of these data (Garsia 1990) (See section REFERENCES).

Observations**Data Notes:**

Not available

6. Data Description and Access:

Data Access:

This data set is available from the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Data Archive Center:**Contact for Data Center Access Information:**

E-mail: uso@daac.ornl.gov

Telephone: +1 (865) 241-3952

FAX: +1 (865) 574-4665

Product Availability:

Data can be accessed electronically on the ORNL DAAC's anonymous FTP site or from the DAAC's search and order system. Data files are also available by request from uso@daac.ornl.gov.

Reading the Media:

Not available

Software and Analyses Tools:

Idrisi

7. References:

The published reference for the source data is as follows:

Stone, T. A., R. A. Houghton, and P. Schlesinger. 2000. Map of the Former Soviet Union Based Upon a Time Series of 15 km Resolution NOAA AVHRR Data. In *Disturbance in Boreal Forest Ecosystems: Human Impacts and Natural Processes*, USDA Gen. Tech Report NC-209. International Boreal Forest Research Association 1997, Duluth, Symposium Proceedings. pp. 67-80.

Other references used here include the following:

Eastman, R. J., and M. Fulk. 1993. Long Sequence Time Series Evaluation using Standardized Principal Components. *Photogr. Eng. and Remote Sensing* 49(8):1307-1312.

ESRI. 1993. Digital Chart of the World for use with Arc Info Software. Redlands, California.

Garsia, M. G (ed.). 1990. "Forests of the USSR," Scale 1: 2,500,000, Forest Cartography Department of All-Union State Planning - Research Institute "Sojuzgiprolezhov" GUGK: Moscow, USSR.

Goward, S. N., B. Markham, D. G. Dye, W. Dulaney, and J. Yang. 1991. Normalized Difference Vegetation Index Measurements from the Advanced Very High Resolution Radiometer, *Remote Sens. of the Environ.* 35:257-277.

Goward, S. N., D. G. Dye, S. Turner, and J. Yang. 1993. Objective assessment of the NOAA Global Vegetation Index Data Product. *International Journal of Remote Sensing* 14(18):3365-3394.

Kidwell, K.D. (ed.). 1990. Global Vegetation Index Users Guide. NOAA/NESDIS, Nat. Climatic Data Center, Washington, D.C.

Main Geodesy and Cartography Organization for Ministries of the USSR. 1990. Physical Geography of the Soviet Union. Map at 1:8,000,000 scale.

Tateishi, R. and K. Kajiwara. 1991. Landcover Monitoring in Asia by NOAA GVI Data. *Geocarto Intl.* 6(4):53-64.

8. Glossary and Acronyms:

Glossary:

Not applicable

Acronyms:

Acronym Definition

ASCII	American Standard Code for Information Interchange
AVHRR	Advanced Very High Resolution Radiometer
DCW	Digital Chart of the World
ESRI	Environmental Systems Research Institute
GVI	Global Vegetation Index
JPEG	Joint Photographic Experts Group
NDVI	Normalized Difference Vegetation Index
NOAA	National Oceanic and Atmospheric Administration

9. Document Information:

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