

Digitization of the Map "Vegetation of the Soviet Union, 1990"

by

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September 23, 1993

A Report to the

Northeastern Forest Experiment Station
USDA Forest Service, Global Change Research Program,
Radnor, Pennsylvania

A digital version of the map, a Dbase IV file with the polygon numbering system, and a list of tree species in the Former Soviet Union from the map Vegetation of the Soviet Union, by the Institute of Geography, Siberian Dept. of the USSR Academy of Sciences, scale 1:4,000,000, 1990, are provided as products from this work.

I. INTRODUCTION

The map is labelled as a "Vegetation Map" although others have suggested that it is, rather, a potential vegetation map. We feel that it is not a potential vegetation map. For instance, there are marks on the maps for categories such as "drained marshes with agriculture" and for "previously irrigated ... lands". To our knowledge there is no accompanying text to go with the map.

Users are cautioned that maps at this scale and from the former Soviet Union are open to many biases. First, these maps may well be more "Art" than science and their pedigree is completely unknown to us. Our experience with other Russian and Soviet maps lead us to be very cautious in their use particularly when trying to develop numeric or quantitative estimates of forest or other types of land cover. Second, the map projection for the base maps are not well known. To our knowledge the projection of this map is equidistant conic with two standard parallels (42° Lat. and 62° Lat.) and is based on the Krassovsky spheroid. Third, some Russian forestry experts feel that the map may be of questionable use for examining potential vegetation (Alexeyev pers. comm) and suggest that 1954 Potential Vegetation Map and accompanying two volume text produced by the Komarov Botanical Institute of St. Petersburg (Leningrad) is more useful. Lastly, the tradition of Russian vegetation science is at the local scale and not at the state or continental scale.

There are several reasons why this map is difficult to digitize. Map polygon boundaries

are not well defined; the color mix of polygons and boundaries are difficult to separate. For instance, rivers and some polygon boundaries are the same color. There are also islands that appear to be unclassified as they do not take on any adjoining landcover color or category. Also, some class label numbers are inconsistent and do not exist in the legend. Similarly, there are categories in the legend that do not appear to exist in the map. We know of no accuracy assessment done on this map. Until recently only maps of 1:500,000 or smaller scale were available, so field checking this map is highly difficult and unlikely to have occurred. Maps available with larger scales did not have latitude and longitude coordinates attached.

The polygons in this map are labeled according to a alpha-numeric system that is replicated in English in the spreadsheet file and cross-referenced to the vector file provided to the USFS with our own sequential numbering system. However, there is a considerable amount of symbolic annotation (dithering) in the map that we have not digitized as the symbols cross the boundaries of polygons. Some of this symbolic notation is related to various soil types and the presence of forest "glades" of particular tree species. Without any accompanying map text it is difficult to know if the map creators intended a separate class for the numeric portion of classes (eg. # 140) comprising several alphanumeric subclasses (eg. # 140a, # 140b, # 140c). In all instances where polygons were labelled as strictly numeric classes on the map and not in the translated legend, those polygons were labelled as unclassified in the digitized map. There are about 370 different landcover classes in the map and 11,824 distinct polygons.

Finally, in this map as in almost all cartographic products, the polygons are discreet entities, land cover categories do not blend into one another. In nature, vegetation types and forms tend to go through gradual transitions from one group of plant species to another. This gradual transition is lost in cartographic products when a line is drawn that separates two units of land cover. Maps that are produced from satellite data are generally raster products that do not define well-bounded polygons and, in a sense, may be more representative of nature.

II. Methods for Digitizing the Vegetation Map

The original maps were loaned to us by Dmitri Varlyguin who was then a Visiting Fellow at the George Perkins Marsh Institute of Clark University, Worcester Massachusetts. The original maps, all well worn, were digitized and later photographically reproduced so that we have permanent copies. The map digitizing was done as a collaborative effort by David Kicklighter, The Ecosystems Center, Marine Biological Laboratory, Woods Hole, and Peter Schlesinger of the WHRC. The equipment used was a SUN SPARC I and UNIX-based ArcInfo^(c) 6.0 software for data entry of all 4 map sheets. Each sheet is about 85 by 110 cm. As each map sheet was digitized separately there are 4 separate vector files on the accompanying floppy disks. It appears that each map sheet is based on the same projection but each with a different map origin and were not intended that the four sheets be merged into one map. Total map area is 3.7 m². All editing and polygon labelling was done at the WHRC in the DOS-environment using 386 and 486 computers and the ROOTSPRO^(c) digitizing system by Peter Schlesinger and Chris Ernst. The translation of the majority of the legend was undertaken by Dmitri Varlyguin (Kicklighter et al. in prep).

The possible delivery data formats choices are: IDRISI vector, ERDAS [not recommended as it is tedious, cumbersome, and large], ArcInfo UNGEN, ARC, .E00 or DLG formats. The digital files are accompanied by a database file in Dbase IV 1.1 format listing the various digital codes, map identification values, and their corresponding descriptions as translated from the map legend.

III. TREE SPECIES LIST

This list below is from Vegetation of the USSR (1990) digitized by the Woods Hole Research Center (WHRC) and accompanies the digital map file and spreadsheet file intended as input to a Dbase IV 1.1 file. In the following section we have listed all tree species and their physiographic region from the maps. Grasses and other non-tree plant species are not included below although they are in the original map legend. Several of the tree species listed here have different Latin species names. Older and alternative names for the more important tree species are found in Nikolov and Helmisaari (1992).

Tree species of the Former Soviet Union from the map Vegetation of the Soviet Union, 1990.

1. Polar Desert

no tree species

2. Tundra

Plains

Arctic

North ?Betula nana, Betula exilis, Salix pulchra, Salix reptans, Salix glauca, Salix lanata

South ?Betula nana, Betula exilis, Salix pulchra, Salix reptans, Salix glauca, Salix phylicifolia, Salix lapponum, Salix lanata

Mountain Tundra

?Betula nana, Betula rotundifolia, Betula middendorffii, Pinus pumila

3. Altitudinal Vegetation of Tundra etc.

?Betula litwinowii, Fagus orientalis, Acer trautvetteri, Pinus kochiana, Quercus macranthera, Juniperus hemisphaerica, Juniperus sabina

4. Dark Conif., Light Conif., Small Leaved Forest and Open Woodlands

Plains

Boreal Forest and Open Woodlands- Pre-Tundra

?Betula czerepanovii, Pinus sylvestris, Picea obovata, Larix sibirica, Larix gmelinii, Larix cajanderi

Boreal Forest and Open Woodlands- North Taiga

?*Picea abies*, *Betula nana*, *Picea obovata*, *Larix sibirica*, *Pinus sylvestris*,
Larix gmelinii, *Larix cajanderi*, *Betula czerepanovii*

Boreal Forest and Open Woodlands- Middle Taiga

?*Picea abies*, *Picea obovata*, *Abies sibirica*, *Pinus sibirica*, *Pinus sylvestris*, *Larix gmelinii*, *Larix cajanderi*

Boreal Forest and Open Woodlands- South Taiga

?*Picea abies*, *Picea obovata*, *Abies sibirica*, *Tilia cordata*, *Abies nephrolepsis*, *Picea ajanensis*, *Pinus sibirica*, *Larix gmelinii*, *Larix sibirica*,
Pinus sylvestris

Boreal Forest and Open Woodlands-Sub Taiga

?*Picea abies*, *Quercus robur*, *Fraxinus excelsor*, *Picea obovata*, *Abies sibirica*, *Ulmus glabra*, *Picea ajanensis*, *Abies nephrolepsis*, *Tilia cordata*,
Betula pendula, *Larix sibirica*, *Larix gmelinii*, *Quercus mongolica*, *Betula davurica*, *Populus tremula*

Steppe Forests

?*Pinus sylvestris*, *Quercus robur*, *Betula pendula*, *Populus tremula*, *Betula davurica*, *Betula platyphylla*

Mountains

Boreal Forest and Open Woodlands-Open Woodlands under Talus

?*Picea obovata*, *Abies sibirica*, *Pinus sibirica*, *Picea ajanensis*, *Abies nephrolepsis*, *Pinus pumila*, *Betula lanata*, *Larix gmelinii*, *Larix cajanderi*

Boreal Forest and Open Woodlands-Mtn. Taiga

?*Picea obovata*, *Pinus sibirica*, *Larix sibirica*, *Abies sibirica*, *Picea ajanensis*, *Abies nephrolepsis*, *Tilia cordata*, *Quercus robur*, *Populus tremula*, *Pinus koraiensis*, *Pinus sylvestris*, *Larix gmelinii*, *Betula pendula*,
Pinus pumila, *Betula exilis*, *Betula middendorffi*, *Abies nephrolepsis*,
Betula lanata

Dark Conif. Forests Outside of the Boreal Region

?*Picea abies*, *Abies alba*, *Fagus sylvatica*, *Abies normanniana*, *Picea orientalis*, *Fagus orientalis*, *Picea schrenkiana*, *Abies sibirica*, *Populus tremula*, *Malus sieversii*, *Juniperus pseudosabina*, *Pinus pallasiana*,
Quercus pubescens, *Pinus pitysua*, *Pinus kochiana*, *Carpinus orientalis*
[hornbeam]

5. Broadleaf Forest

Plains

?Fagus sylvatica, Quercus petraea, Carpinus betulus, Acer pseudoplatanus, Quercus robur, Picea Abies, Tilia tomentosa, Continus coggygia [smoke tree], Prunus spinosa, Quercus mongolica, Pinus sylvestris, Fraxinus excelsior, Tilia taquetii, Pinus koraiensis

Foothills and Mtns.

?Fagus sylvatica, Quercus petraea, Carpinus betulus, Acer pseudoplatanus, Quercus robur, Picea Abies, Abies alba, Tilia tomentosa, Tilia cordata, Continus coggygia [smoke tree], Prunus spinosa, Quercus mongolica, Pinus sylvestris, Fraxinus excelsior, Tilia taquetii, Pinus koraiensis, Fagus orientalis, Carpinus caucasia, Acer laetum, Quercus pubescens, Acer hycanum, Acer mono, Betula davurica, Quercus macranthera, Ulmus glabra, Quercus imertia, Quercus hartwissiana, Tilia begonifolia, Quercus castaneifolia, Betula costata, Juglans regia, Malus sieversii, Acer turkestanica, Acer semenovii

Meadow and Steppe meadows

?Quercus robur, Quercus pubescens, Betula pendula, Populus tremula, Larix sibirica, Pinus sylvestris, Larix gmelinii, Betula platyphylla

Typical Steppes

6. Steppes and Secondary Communities

Plains

Typical Steppes
Desertified

Foothills and Mountains

?Juniperus pseudosabina, Betula pendula

Altitudinal

7. Deserts

Plains

North
Middle
South

Foothills and Mountains

Altitudinal

8. Open Wood, Shrub, Dwarf Shrub Communities with Ephemeral covers (Savanoids)

Foothills and Mountains

?Acer turkestanicum, Juniperus seravschanica, Pistacia vera, Acer semenovii, Acer pubescens, Malus sieversii

9. Open Wood and Mountain Xerophytic- Steppe veg. (Phryganoid)

Mountain

?Juniperus turkestanica, Juniperus semiglobosa, Juniperus joestidissima, Juniperus polycarpus, Juniperus turcomanica, Juniperus schugnanica

10. Bogs

?Betula nana, Pinus sibirica, Betula exilis, Larix gmelinii, Pinus sylvestris, Larix sibirica, Betula pubescens, Larix cajanderi, Picea abies, Picea obovata, Alnus glutinosa, Fraxinus excelsior

11. Shrub Vegetation

?Betula humilis, Betula exilis, Betula ovalifolia, Betula fruticosa, Salix brachypoda, Salix abscondita

12. Halophytic Vegetation

13. Floodplain Communities, Anthropic Meadows, Agriculture

?Salix phylicifolia, Salix lapponum, Salix viminalis, Salix lanata, Salix reptans, Betula pendula, Larix sibirica, Picea obovata, Picea sibirica, Pinus sylvestris, Picea abies, Abies sibirica, Larix gmelinii, Populus suaveolens, Quercus robur, Tilia cordata, Alnus glutinosa, Populus nigra, Populus alba, Ulmus laevis, Ulmus carpinifolia, Quercus pendunculifolia, Ulmus carpinifolia, Quercus mongolica, Ulmus japonica, Fraxinus mandshurica, Populus pruinosa, Salix alba

14. Other

Ice and Glaciers

Agric. lands replacing dried-up bogs

Ancient irrigated agricultural lands

Solonchak lakes w/o vegetation (salt mud flats)

IV. TREE SPECIES SORTING BY REGION

Below we have broken down all tree species from the map legend by genus and numbers of regions in which they occur.

Abies 5 species over 15 ecoregions

Abies alba in 2 ecoregions

Abies nephrolepsis 5 ecoregions

Abies normanniana

Abies semeovii

Abies sibirica 6 ecoregions

Acer 8 species over 11 ecoregions

Acer hycanum

Acer laetum

Acer mono

Acer pseudoplatanus 2 ecoregions

Acer pubescens

Acer semenovii 2 ecoregions

Acer trautvetteri

Acer turkestanica 2 ecoregions

Alnus 1 species over 2 ecoregions

Alnus glutinosa 2 ecoregions

Betula 15 species over 34 ecoregions

Betula costata

Betula czerepanovii

Betula davurica 3 ecoregions

Betula exilis 5 ecoregions

Betula fruticosa 2 ecoregions

Betula humilis

Betula lanata 2 ecoregions

Betula litwinowii

Betula middendorffii 2 ecoregions

Betula nana 5 ecoregions

Betula ovalifolia

Betula pendula 6 ecoregions

Betula platyphylla 2 ecoregions

Betula pubescens

Betula rotundifolia

Carpinus 3 species over 4 ecoregions

Carpinus betulus 2 ecoregions

Carpinus caucasia
Carpinus orientalis

Continus 1 species over 2 ecoregions
Continus coggygia 2 ecoregions

Fagus 2 species over 6 ecoregions
Fagus orientalis 3 ecoregions
Fagus sylvatica 3 ecoregions

Fraxinus 2 species over 5 ecoregions
Fraxinus excelsior 4 ecoregions
Fraxinus mandshurica

Juglans 1 species over 1 ecoregion
Juglans regia

Juniperus 10 species over 11 ecoregions
Juniperus hemisphaerica
Juniperus joestidissima
Juniperus polycarpos
Juniperus pseudosabina 2 ecoregions
Juniperus sabina
Juniperus schugnanica
Juniperus semiglobosa
Juniperus seravschanica
Juniperus turcomanica
Juniperus turkestanica

Larix 3 species over 23 ecoregions
Larix cajanderi 5 ecoregions
Larix gmelinii 10 ecoregions
Larix sibirica 8 ecoregions

Malus 1 species over 3 ecoregions
Malus sieversii 3 ecoregions

Picea 6 species over 23 ecoregions
Picea abies 8 ecoregions
Picea ajanensis 4 ecoregions
Picea obovata 8 ecoregions
Picea orientalis
Picea schrenkiana
Picea sibirica

Pinus 8 species over 26 ecoregions
Pinus kochiana 2 ecoregions
Pinus koraiensis 3 ecoregions
Pinus pallasiana
Pinus pityusa
Pinus pumila 3 ecoregions
Pinus sibirica 5 ecoregions
Pinus sylvestris 10 ecoregions

Pistacia 1 species in 1 ecoregion
Pistacia vera

Populus 5 species in 9 ecoregions
Populus alba
Populus nigra
Populus pruinosa
Populus suaveolens
Populus tremula 5 ecoregions

Prunus 1 species in 2 ecoregions
Prunus spinosa 2 ecoregions

Quercus 9 species in 22 ecoregions
Quercus castaneifolia
Quercus hartwissiana
Quercus imertia
Quercus macranthera 2 ecoregions
Quercus mongolica 4 ecoregions
Quercus pendunculifolia
Quercus petraea 2 ecoregions
Quercus pubescens 3 ecoregions
Quercus robur 7 ecoregions

Salix 10 species in 18 ecoregions
Salix abscondita
Salix alba
Salix brachypoda
Salix glauca 2 ecoregions
Salix lanata 3 ecoregions
Salix lapponum 2 ecoregions
Salix phylicifolia 2 ecoregions
Salix pulchra 2 ecoregions

Salix reptans 3 ecoregions
Salix viminalis

Tilia 4 species in 10 ecoregions
Tilia begonifolia
Tilia cordata 5 ecoregions
Tilia taquetii 2 ecoregions
Tilia tomentosa 2 ecoregions

Ulmus 4 species in 6 ecoregions
Ulmus carpinifolia 2 ecoregions
Ulmus glabra 2 ecoregions
Ulmus japonica
Ulmus laevis

V. REFERENCES

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VI. ACKNOWLEDGEMENTS

This research was supported in part by funds provided by the Northeastern Forest Experiment Station of the USDA Forest Service, Global Change Research Program, Radnor, Pennsylvania. Additional support has been through the John D. and Catharine T. MacArthur Foundation.