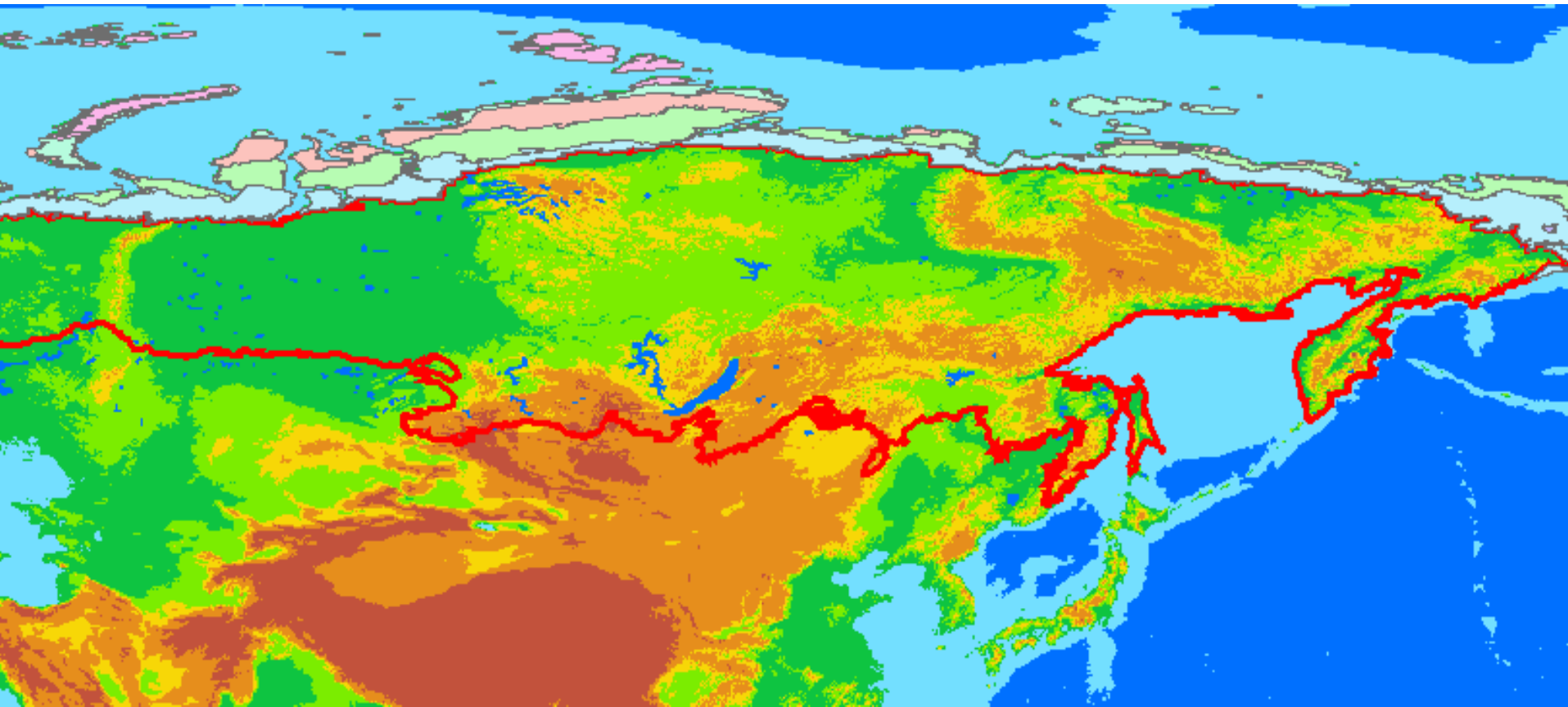


General Principles of CBVM Legend with an Example from North Eurasia

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Boreal biom in Northern Eurasia



Basic concepts and draft of the CBVM legend

Some basic principles of vegetation classification applied for **Vegetation Map of Europe** could be taken into account for hierarchical system of mapping units in **CBVM**

1. The structure, physiognomy and ecology of the plant cover.
2. Division vegetation into 2 categories: **zonal** and **azonal** types.
3. Biogeographical principle (including vegetation types in zones, subzones and geographical sectors, bioclimatic sectors).
4. Species composition of dominant (highest) layer.
5. Floristic criteria. The characteristic species combinations and further floristic differentiation on the basis of geographical and site variability. Syntaxonomy with the use of Braun-Blanquet system.
6. Specific combinations of plant communities.

Highest levels of subdivisions of vegetation

At the highest levels, the CBVM should reflect the most essential regularities common for boreal zone of both continents (Eurasia and North America).

The first level of legend should include largest types of vegetation defined on the basis of structure, physiognomy, ecology of the plant cover and zonality.

ZONAL AND EXTRA-ZONAL VEGETATION

- A Arctic polar deserts (High Arctic tundras)
- B Arctic tundras
- C Alpine and subnival vegetation within the boreal zone
- D Subalpine prostrate tree, shrub and tall-forb vegetation, including subalpine open woodlands within the boreal zone
- E Subarctic open woodlands, including subarctic shrub and dwarf-shrub vegetation
- F Boreal and oro-boreal coniferous (and mixed small-leaved-coniferous) forests
- G Oceanic dwarf shrub heaths
- H Extrazonal temperate vegetation within boreal zone

AZONAL VEGETATION WITHIN BOREAL ZONE

- I Costal vegetation
- K Mires
- L Swamp and fen forests
- M Flood-plain vegetation

At the second level, the largest ecological-physiognomic subdivisions of boreal vegetation should be demonstrated.

Boreal forests (F) should be divided into three main categories according to predominance of trees of certain life form in the highest layer.

These categories correspond to higher syntaxa of the Braun-Blanquet at level of orders

F.1. Boreal dark-coniferous and mixed dark-coniferous-light-coniferous forests (the order *Piceetalia excelsae*)

F.2. Boreal light coniferous forests (the orders *Ledo-Laricetalia*, *Lathyro humilis-Laricetalia*, *Cladonio-Vaccinietalia*)

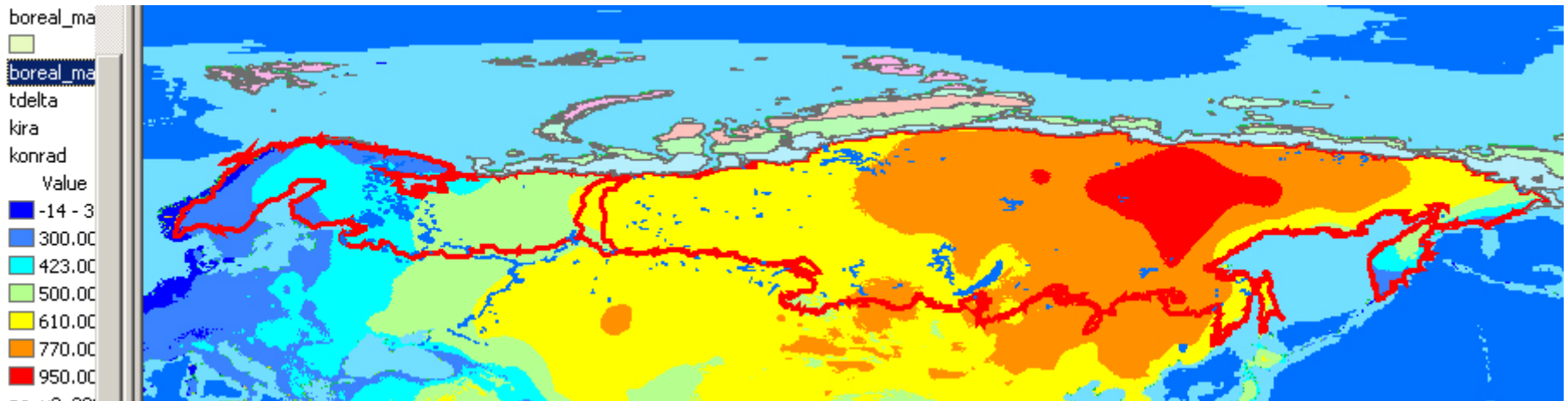
F.3. Boreal small-leaved forests of boreal type (*Brachypodio-Betuletea pendulae*)

- At the third level, the biogeographical principle of sectoral geographical should be applied.
- This principle is based on orographic and bioclimatic differentiation of boreal zone.
- Floristic principle could be applied at this level too because it is closely linked with geographical and bioclimatic criteria.
- Subdivisions of boreal forests of the third hierarchical level correspond to alliances and suballiances of Braun-Blanquet system.

Orographic regions: 1) Plains, lowlands and low plateaus,
2) Mountains

Bioclimatic sectors: *oceanic, suboceanic, moderately continental, continental, ultracontinental*

Bioclimatic sectors in boreal zone
*oceanic, sub-oceanic, sub-continental, continental and
ultra-continental*
Data based on Conrad's continentality index



F.1. Boreal and oro-boreal coniferous (and mixed small-leaved-coniferous) forests

- F.1.1. European spruce forests (Picea abies, Picea abies x Picea obovata), partly with Pinus sylvestris, locally with birch (Betula pubescens s .l., B. pendula), alder (Alnus incana) or mixed forests*
- F.1.2. West pre-Urals-West-Middle-Siberian dark-coniferous forests (Picea obovata, Pinus sibirica, Abies sibirica), partly with Betula pubescens, B. pendula, Pinus sylvestris and Larix sibirica*
- F.1.3. Urals oro-boreal dark coniferous forests (Abies sibirica, Pinus sibirica, Picea obovata)*
- F.1.4. South Siberian oro-boreal dark coniferous forests (Abies sibirica, Pinus sibirica) partly with Picea obovata, Betula pendula and Populus tremula.*
- F.1.6. East Asian sub-Pacific oro-boreal dark coniferous forests (Picea jezoensis, Abies nephrolepis).*

At the forth level, the biogeographical principle of subzonal differentiation of boreal zone could be applied at least for zonal types of vegetation.

- Northern boreal coniferous and small-leaved open forests and their analogs in mountains
- Middle boreal coniferous forests and their analogs in mountains
- South boreal dark-coniferous and mixed forest and their analogs in mountains
- Continental hemiboreal forests and their analogs in mountains

The fifth level of hierarchy of legend should include sub-regional (predominated in landscapes) vegetation units and combinations

Several principles could be used there.

- Principle of “the dominant species in higher layer”
- Floristic criteria.
- Ecologic criteria
- Specific combinations of plant communities

F.1.1. European spruce forests (Picea abies, P. obovata, Picea abies x Picea obovata), partly with Pinus sylvestris, locally with birch (Betula pubescens s .l., B. pendula), alder (Alnus incana) or mixed forests

F.1.1.1. Northern boreal types

F.1.1.1.1. North European open moss-rich spruce forests (Picea abies, in the east Picea abies x P. obovata, P. obovata) with Pinus sylvestris, Betula pubescens, B. pubescens subsp. czerepanovii, alternating with open pine and spruce forests on peaty soils and with aapa mires

F.1.1.1.2. Northeast European open spruce forests (Picea abies x Picea obovata, P. obovata) with Pinus sylvestris, Betula pubescens, B. pubescens subsp. czerepanovii, with dwarf shrubs, mosses and lichens (Vaccinium myrtillus, Empetrum hermaphroditum, Hylocomium splendens, Dicranum fuscescens, Polytrichum commune, Sphagnum girgensohnii, Cladina spp.)

F.1.1.1.3. Northeast European open hygrophilous birch-spruce forests (Picea obovata, Betula pubescens subsp. czerepanovii) with dwarf shrubs, sedges and mosses (Ledum palustre, Carex globularis, Polytrichum commune, Spagnum spp.)

F.1.6. East Asian sub-Pacific oro-boreal dark coniferous forests (*Picea jezoensis*, *Abies nephrolepis*)

- F.1.6.1. Northeast Asian (Kamchatka) oro-boreal spruce forests (*Picea jezoensis*) partly with *Betula ermanii*, *Larix gmelinii*, with dwarf shrubs, herbs and mosses (*Cornus suecica*, *Linnaea borealis*, *Oxalis acetosella*, *Dryopteris expansa*, *Hylocomium splendens*, *Ptilium crista-castrensis*)
- F.1.6.2. Sakhalinian-South Okhotian oro-boreal spruce forests (*Picea jezoensis*) with dwarf shrubs and mosses (*Vaccinium vitis-idaea*, *Cornus canadensis*, *Calamagrostis purpurea*, *Hylocomium splendens*, *Hylocomium splendens*, *Rhytidiadelphus triquetrus*).
- F.1.6.3. East Asian oro-boreal fir-spruce forests (*Picea jezoensis*, *Abies nephrolepis*) with *Betula ermanii*, *Acer ukurunduense*, *Weigela middendorffiana*, with dwarf shrubs and mosses (*Cornus canadensis*, *Maianthemum bifolium*, *M. dilatatum*, *Aconitum umbrosum*, *Hylocomium splendens*, *Pleurozium schreberi*).

Some other basic questions for discussion

How many units of lowest hierarchical level may be represented in CBVM?

CBVM at scale 1:7500000 should include no more than 280-300 low-level units for Eurasia

Current draft of legend for **F Boreal and oro-boreal coniferous (and mixed small-leaved-coniferous)** forests in Eurasia includes about 100 units for lowest hierarchical level and 27 units at next to last one.

So, the basic (the lowest) level should be very generalized and include units very close to subzonal subdivisions.

What minimal size of polygon should be applied for CBVM?

Minimal size of polygon on map sheet should be 0.5cm x 0.5 cm
(37.5km x 37.5km = 1406.25 sq. km)

Principles of technical accompaniment for CBVM development

- GIS – platforms and techniques
- the use of thematic maps of relief and climate
- the use of satellite images (Landsat – 7, Terra-Modis, Spot, etc) as a basis for distinguishing and correction of boundaries of primary and secondary vegetation types.

Some tasks for international team of the project

1. Definition of principles for vegetation categories and hierarchy of CBVM legend.
2. Development of pilot version of legend.
3. Adoption of set of accompanied CBVM small-scale thematic maps (maps of zonal, sectoral, bioclimatic subdivision, soil map, geomorphologic map, map of disturbances of vegetation, map of protected areas in boreal zone and other ecological maps).
4. Organization of joint work of vegetation classification (e.g. syntaxonomy of boreal vegetation with the Braun-Blanquet approach).
5. Organization of joint expeditions in key areas of circum-boreal zone.

Thank you for attention!

