Proposed Land Cover Legend for the Northern Euroasia Land Dynamics Analysis (NELDA)

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The purpose of NELDA map is to provide consistent charecterization of land cover in boreal and temperate regions of Northern Eurasia for addressing a wide range of important science questions from effects of land-use on the global carbon cycle, surface energy, and water balance, to climate controls on vegetation productivity and natural disturbance, to understanding social and economic causes and consequences of land-use and land-cover change.

Overall Strategy:

The intent of the proposed legend above is to provide consistency in the datasets submitted for use in NELDA from regional collaborators. These datasets are expected to be land cover maps based on high resolution imagery (such as SPOT or Landsat, on the order of 20-50m spatial resolution). To use the datasets we need consistency in terms of legends across sites. The legend presented here is based on LCCS (Land Cover Classification System http://www.glcn-lccs.org/) with the exceptions of few cases that were not possible to match with the LCCS classification scheme. The intent is for all datasets to include at least the level of detail included in the "baseline legend". Individual investigators will provide additional levels of detail as appropriate in their study sites using the kinds of descriptors included in the "Possible Additional Distinctions" lists. Please let us know if there are additional variables that should be included in these lists. *Note that it is not expected that all combinations of land covers included in the proposed legend are expected to occur at each of the NELDA sites! Whether or not each class exists in the area needs to be decided by the individual investigators for the site.*

There are a few possible inconsistencies related to land use, as opposed to land cover. For example, most crops are herbaceous land covers. However, in almost all applications, it is important to know which areas are cultivated and which are not. So the addition of a C*ultivated Lands* category is included for this purpose. Note that given the approach taken, orchards or other non-herbaceous crops would be mapped according to the dominant life form of the vegetation (i.e., trees or shrubs). Additionally, we have defined "tree dominated" land cover classes to include all areas with tree cover as low as 15%. Note that the understory vegetation can be characterized using additional distinctions. Also note that there is the opportunity for non-tree dominated classes to include distinctions that recognize the presence of trees within other land cover classes (at percentages lower than 15%).

The tree cover categories use the same breakpoints used in LCCS, greater than 65% tree cover is "closed" and 65% - 15% is called "open". Note that areas with less than 15% tree cover in the legend above, unless the dominant vegetation is herbaceous or shrubs the area would have to be mapped as *Bare and Sparse Vegetated.*

Proposed NELDA Land Cover Legend

Baseline Legend[1]

Possible Additional Distinctions

Tree Dominated

Needleleaved	Evergreen	Closed[2]
		Open[3]
	Deciduous	Closed
		Open
Broadleaved	Evergreen	Closed
		Open
	Deciduous	Closed
		Open
Mixed		Closed
		Open

Cover Detail
Mortality (yes/no, if yes what %)
Species
Wetland (yes/no)
Understory Characteristics (Shrubs or Herbaceous > 15%)
Managed Plantation (Tree Farm/Orchard)
Presence of Build up > 15% (yes/no)

Shrub Dominated

Broadleaved	Closed
	Open
Needleleaved	Closed
	Open
Mixed	Closed
	Open

Cover Detail
Mortality (yes/no, if yes what %)
Species
Wetland (yes/no)
Leaf Longevity – Deciduous or Evergreen
Tundra (yes/no)
Trees < 15 % and >5% Present/not Present
Managed Plantations (Vineyard, for example)
Tree Regeneration (yes/no)
Presence of Build up > 15% (yes/no)

[1] The assumption is to use high resolution imagery (20 – 50 meters) and minimum mapping unit 1 – 2 hectares
[2] Closed >(> 65) %
[3] Open (65-15)%

Baseline Legend ***Possible Additional Distinctions***

Herbaceous Dominated

Closed

Open

- Species (grasses, lichens, mosses, etc)
- Mortality (yes/no)
- Wetland (yes/no)
- Tundra (yes/no)
- Pasture (yes/no)
- Cultivated Lands
- Trees or shrubs < 15 % and >5%
- Present/not Present
- Presence of Build up > 15% (yes/no)

Bare Land and Sparse Vegetation

- Bare (Vegetation < 5%)
- Sparse Vegetated (Vegetation < 15% and > 5%)
- Presence of Build up > 15% (yes/no)
- Cultivated Lands
- Wetlands (yes/no)

Permanent Snow and Ice

Water

Class Definitions

General life form and dominance definitions

Trees and shrubs : A condition of height separate trees from shrubs. Plants higher than 5 meters are generally classified as trees. However, a plant with physiognomic aspect of a tree can be classified as tree even when the height is lower than 5 meters but higher than 3 meters.
Woody plants that are lower than 5 meters and higher than 0.3 m are classified as shrubs. However, plants with a clear phyniognomic aspect of a shrub can be classified as shrubs even when the height is higher than 5 meters and lower than 7 (for example *Coryllus* spp.).

Life form dominance: The dominance of a life form is defined as the life form of the top canopy layer ranging from trees to shrubs to herbaceous plants. This condition is considered in conjunction with the *"cover"* parameter ranging from closed to open (LCCS). For example, a landscape where the top canopy layer is represented by trees with canopy cover < 15%, can not be tree dominated, others life form will be dominant. However, a landscape with a top canopy layer represented by trees with canopy cover > 15% (for example 20%) and a sub layer represented by shrubs with a canopy cover of 40% will still be classified as "Tree Dominated". The top layer prevails over all the other existing sub layers. As additional distinctions is then possible to indicate the "Understory Characteristics"

Baseline Legend

Tree Dominated:

Needleleaved Evergreen Closed. The main layer consists of needleleaved evergreen closed trees. The crown cover is more than (70-60)%. The height is in the range of >30 - 3m

Needleleaved Evergreen Open The main layer consists of needleleaved evergreen woodland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of >30 - 3m.

Needleleaved Deciduous Closed The main layer consists of needleleaved deciduous closed trees. The crown cover is more than (70-60)%. The height is in the range of >30 - 3m.

Needleleaved Deciduous Open The main layer consists of needleleaved deciduous woodland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of >30 - 3m.

Broadleaved Evergreen Closed The main layer consists of broadleaved evergreen closed trees. The crown covers more than (70-60)%. The height is in the range of >30 - 3m.

Broadleaved Evergreen Open The main layer consists of broadleaved evergreen woodland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of >30 - 3m.

Broadleaved Deciduous Closed The main layer consists of broadleaved deciduous closed trees. The crown cover is more than (70-60)%. The height is in the range of >30 - 3m.

Broadleaved Deciduous Open The main layer consists of broadleaved deciduous woodland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of >30 - 3m.

Mix (not able to be defined according to LCCS)
Areas dominated by trees where neither deciduous (broadleaved or needleleaved) nor evergreen (broadleaved or neeldeleaved) species represent > 75% of the cover present.

Shrub Dominated:

Broadleaved closed The main layer consists of broadleaved thicket. The crown cover is more than (70-60)%. The height is in the range of 5 - 0.3m.

Broadleaved open The main layer consists of broadleaved shrubland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of 5 - 0.3m.

Needleleaved closed The main layer consists of needleleaved thicket. The crown cover is more than (70-60)%. The height is in the range of 5 - 0.3m.

Needleleaved open The main layer consists of needleleaved shrubland. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified. The height is in the range of 5 - 0.3m.

Mix Areas dominated by shrubs where neither deciduous (broadleaved or needleleaved) nor evergreen (broadleaved or needleleafead) species represent > 75% of the cover present.

Herbaceous Dominated

Herbaceous Vegetation Closed The main layer consists of closed herbaceous vegetation. The crown cover is more than (70-60)%. The height is in the range of 3 - 0.03m but may be further defined into a smaller range.

Herbaceous Vegetation Open The main layer consists of open herbaceous vegetation. The crown cover is between (70-60) and (20-10)%. The openness of the vegetation may be further specified.

Bare Land and Sparse Vegetation
Primarily non-vegetated areas containing less than 15% vegetation cover during at least 10 months a year. A further distinction is possible in Bare, for areas with less than 5% of vegetation, and Sparse Vegetated for areas with vegetation cover more than 5% and less than 15%.

Snow and Ice
The land cover consists of perennial snow and ice for a period > 11 months

Water
The land cover consists of perennial natural waterbodies where water is present > 11 months.

Possible Additional Distinctions

Cover Detail
The "*Open*" land cover density class can be further subdived into "*Open*" (65% - 40%), or "*Very Open*" (40% - 15%).

Mortality (yes/no)
Significant presence (>50% cover) of standing and downed dead trees (or other dominant life form - shrubs or herbaceous plants). If yes, you can specify the percentage of dead plant cover.

Species
Dominant species defining the land cover

Wetland (yes/no)
Land with water table near/at/above soil surface for enough time to promote wetland or aquatic processes.

Understory Characteristics
Presence of a sub layer (shrubs or herbaceous) with cover > 15%

Managed (Plantation/Tree Farm/Orchard)
Areas where the natural vegetation has been removed or modified and replaced by other types of vegetative cover of anthropogenic origin.

Tundra (yes/no)
Conditions characteristic of tundra

Pasture (yes/no)
Herbaceous vegetation accounts for 75-100% of the cover. Include areas planted for livestock grazing or the production of seed or hay crop. Woody species can be present (<15 % cover).

Cultivated Lands
Peak herbaceous vegetation accounts for 75-100% of the cover; can be less if the image is taken early in vegetation season. Areas used for the production of graminoid (wheat, barely, oats, and rice) and non-graminoids (corn, soybeans, vegetables) to be specified if possible.

Tree Regeneration
Areas with presence of young tree vegetation in a transition phase. The height of the vegetation is lower than 5 meters.

Presence of Build up (Urban Areas)
The land cover consists of built up areas where buildings or man-made structures cover more than 15% of the area.