FGDC-STD-005-2008 (Version 2)

NATIONAL VEGETATION CLASSIFICATION STANDARD, VERSION 2

Vegetation Subcommittee
Federal Geographic Data Committee

February 2008

Federal Geographic Data Committee

Established by Office of Management and Budget Circular A-16, the Federal Geographic Data Committee (FGDC) promotes the coordinated development, use, sharing, and dissemination of geographic data.

The FGDC is composed of representatives from the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, the Interior, Justice, Labor, State, and Transportation, the Treasury, and Veteran Affairs; the Environmental Protection Agency; the Federal Communications Commission; the General Services Administration; the Library of Congress; the National Aeronautics and Space Administration; the National Archives and Records Administration; the National Science Foundation; the Nuclear Regulatory Commission; the Office of Personnel Management; the Small Business Administration; the Smithsonian Institution; the Social Security Administration; the Tennessee Valley Authority; and the U.S. Agency for International Development.

Additional Federal agencies participate on FGDC subcommittees and working groups. The Department of the Interior chairs the committee.

FGDC subcommittees work on issues related to data categories coordinated under the circular. Subcommittees establish and implement standards for data content, quality, and transfer; encourage the exchange of information and the transfer of data; and organize the collection of geographic data to reduce duplication of effort. Working groups are established for issues that transcend data categories.

For more information about the committee, or to be added to the committee's newsletter mailing list, please contact:

Federal Geographic Data Committee Secretariat
c/o U.S. Geological Survey
590 National Center
Reston, Virginia 22092
Facsimile: (703) 648-5755
Internet (electronic mail): fgdc@usgs.gov
World Wide Web: http://www.fgdc.gov

ACKNOWLEDGEMENT

The Federal Geographic Data Committee Vegetation Subcommittee would like to acknowledge the valuable contributions of the Ecological Society of America's Vegetation Classification Panel. This draft standard is based on the minimum requirements of the Panel's Guidelines for Describing Associations and Alliances of the U.S. National Vegetation Classification, Version 4.0 (Jennings et al. 2006) with modifications to satisfy the needs of Federal agencies

[DSP1]

Figures **Page**

2.1 Vegetation classification criteria for the US NVC ……16
3.1 An illustration of strata showing growth forms of individual plants as may be found in a plot……. 29
3.2 Flow of information through the peer-review process for formal recognition of a vegetation type……..... 44
3.3 Relationship of the peer-review process to the NVC…….. 45

Tables

2.1 Conceptual Categories and Level One of the NVC Hierarchy……10
2.2 Comparison of Revised Hierarchy for Natural Vegetation with the 1997 Hierarchy……....12
2.3 Revised Hierarchy for Natural Vegetation with Example…….. 14
2.4 Summary of Criteria and Rationale for the Natural Vegetation Hierarchy…… 17
2.5 Revised Hierarchy for Cultural Vegetation with Examples…… 19
3.1 Comparison of commonly used cover-abundance scales…… 26
3.2 Example of describing growth forms first, then subdividing into size classes……. 27
3.3 Example of describing strata first, then subdividing by growth forms…….. 28
3.4 A crosswalk of strata categories with common growth form and size class categories…….. 30
3.5 Required topical sections for monographic description of vegetation types…… 37

B.1 Relation of USNVC to land cover classifications…….. 64
B.2 Relation of NRCS Natural Resources Inventory classification to the NVC...66

C.1 Multilingual version of the natural hierarchy……..67

D.1.1 Information required in the field plot record…….. 68
D.1.2 Information required for the plot vegetation…….. 69
D.1.3 Information required for the plot location……... 70
D.1.4 Information about the plot environment (reserved)…… 70
D.2.1 Metadata about the plot and the plot observation……... 71
D.2.2 Metadata about the methods used to collect the field data……. 72
D.2.3 Metadata about the human sources of the field data……... 72
D.2.4 Metadata about references for other sources of plot data……73
D.3.1 Information about each assignment of a plot to a vegetation type…….. 75

E.1a General growth forms……... 76
E.1b Specific growth forms…….. 77

J.1 A brief comparison of NVC pasture types to the European Braun-Blanquet classification……117

K.1 A process for estimating canopy cover of a single stratum from the cover values of individual species occurring in that stratum…….. 118

and growth forms; for example, whether species are dominant, character, or indicator.

f. Type Concept. Provide a concise paragraph describing the overall concept of the type based on the structure, composition, environmental setting, and geographic range. (See items g through l below.)

g. Floristics (for mid and lower units). Species composition and average cover for species should be provided in the following summary form:

   i. A table of floristic composition showing constancy and mean cover. All species should be listed that have more than 20% constancy, and diagnostic species should be identified. List species in descending order of constancy, then cover.

   ii. Compositional variability of the type across the range of its classification plots. A discussion of possible subunits or variants may be useful, especially for future refinement of type concepts.

h. Taxonomic usage in floristic tables should include reference to a taxonomic standard so as to define the meaning associated with a name. Reference to accepted name in USDA PLANTS or ITIS, coupled with the specific date of observation of the website, is sufficient.

i. Physiognomy. Provide a summary of the physiognomy, structure, and dominant species, including an assessment of the physiognomic variability of the type.

j. Dynamics. To the degree possible, provide a summary of the successional status of the type and the disturbance factors that influence stability and within-plot variation for the type. Describe the extent to which this information is known and the limitations and assumptions of the assessment.

k. Environmental description. Provide a description of important factors such as climate, elevation (in meters), landscape context, slope aspect, slope gradient, geology, soils, hydrology, and any other environmental factors thought to be determinants of the biological composition or structure of the type.

l. Description of the range. To the extent possible, provide a brief textual description (not a list of places) of the total range (present and historic) of the type. List national and subnational (states, provinces, or counties) jurisdictions of occurrence across the entire range of the type. Distinguish between areas where the type: (a) definitely occurs; (b) probably occurs; or (c) does not occur and is believed to have historically occurred.

m. Identify field plots. Identify plots used to define the type and indicate where the plot data are archived and the associated plot identifiers. All plot records used shall conform to the standards for classification plots.

Level 1 (Formation class)

Class names are based on the very broad growth forms that correspond to global moisture/temperature regimes. The single name helps identify the broad grouping of growth forms that correspond to particular moisture/temperature conditions. A parenthetical set of names is included to guide general users to the main kind of vegetation included in the class. The level is organized by decreasing complexity and cover of the vegetation, reflecting increasingly stressful site factors. Given the wide overlap in use of the terms "Forest" and "Woodland" we use both terms to indicate that the class definition encompasses all mesomorphic (i.e. broad-leaved or needle-leaved) trees of varying height and canopy spacing.

Examples:

Mesomorphic Tree Vegetation (Forest & Woodland)
Mesomorphic Shrub & Herb Vegetation (Shrubland & Grassland)
Xeromorphic Shrub & Herb Vegetation (Semi-Desert)
Hydromorphic Vegetation (Aquatic Vegetation)

Level 2 (Formation subclass)

The subclass name reflects the structure, physiognomy and environmental factors that characterize the subclass. The primary environmental factor is macroclimate. Physiognomic terms are sometimes more specific than the class name (e.g., scrub versus shrubland where the vegetation may include tall xeromorphic tree-like plants such as tall cacti). All such terms, if used, should be defined.

Examples:

Tropical Dry Forest
Mediterranean Scrub and Grassland
Cool Semi-Desert Scrub and Grassland
Saltwater Aquatic Vegetation

Level 3 (Formation)

The formation name reflects the structure, physiognomy and environmental factors that characterize the formation. The primary environmental factors are soil moisture conditions and elevation. Physiognomic terms are sometimes more specific than the class or subclass name. All physiognomic terms should be defined in the vegetation type description.

Examples:

Tropical Evergreen Sclerophyll Forest
Mediterranean Scrub
Cool Semi-Desert Sparse Vegetation
Marine & Estuarine Aquatic Vegetation

c. The NVC Peer Review Board may structure a peer review process that is different for the various levels of the hierarchy; e.g., a different process may be needed for upper levels (which are global in definition), mid levels (often national to regional in definition), and lower levels (regional to local in definition), but this shall be left to the discretion of the Board.

d. The Peer Review Board is responsible for ensuring that the criteria specified in this standard are followed. This Board shall adhere to the scientific and technical principles of the NVC and it shall ensure the good order and scientific credibility of the classification.

e. Investigators wishing to contribute to the NVC by proposing changes to the classification shall submit their methods and results to the Peer Review Board.

f. The Peer Review Board shall maintain publicly available Proceedings of all official actions. Full descriptions of types shall constitute the NVC primary literature and shall be published in the Proceedings. The Proceedings shall contain official changes to the list of NVC associations and alliances, and it shall include the required supporting information for all changes made to the list.

g. Peer reviewers shall have sufficient regional expertise to understand how a given proposed change to the NVC would affect related associations and alliances.

h. Investigators proposing revisions to the NVC shall use a defined template for type descriptions that can be readily reviewed.

i. Investigators who describe types shall place their proposed types within the context of existing NVC types so as to determine whether the type under consideration is distinct, or whether their proposal will instead refine or upgrade the definition of a type or types already on the list.

j. The peer review process should occur in a reasonable time frame, and should balance the need for improvement to the quality and to the stability of the NVC.

Bush, G.W. 2003. Amendment of Executive Orders, and Other Actions, in Connection With the Transfer of Certain Functions to the Secretary of Homeland Security (Executive Order 13286). Federal Register 68: 10619–10633. http://www.fas.org/irp/offdocs/eo/eo-13286.htm. [Accessed 11/19/2007].

Canadian National Vegetation Classification (CNVC) Technical Committee. 2005. Goals, Principles and Priorities of the Canadian National Vegetation Classification. 17 pp incl. appendices. http://cnvc-cnvc.ca.

Clinton, W.L. 1994. Coordinating geographic data acquisition and access: the national spatial data infrastructure (Executive Order 12906). Federal Register 59: 17671–17674. http://www.fgdc.gov/publications/documents/geninfo/execord.html. [Date accessed unknown].

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31. Washington, DC: U.S. Department of Interior, Fish and Wildlife Service. 131 p.

Cronquist, A., A.H. Holgren, N.H. Holgren, and J.L. Reveal. 1972. Intermountain Flora, Vol. 1. The New York Botanical Gardens. New York. 270p.

Curtis, J.T. 1959. The vegetation of Wisconsin: an ordination of plant communities. 2000 University of Wisconsin Press, Madison, Wisconsin, USA. 657 p.

Daubenmire, R.F. 1959. A canopy-coverage method of vegetation analysis. Northwest Science 33:43-64.

Daubenmire, R.F. 1968. Plant Communities: a textbook of plant synecology. New York: Harper and Row. 300p.

Di Gregorio, Antonio; Jansen, Louisa J.M. 1996. FAO Land Cover Classification: A dichotomous, Modular-Hierarchical Approach. Rome, Italy: Food and Agriculture Organization of the United Nations. 11 p.

Domin, K. 1928. The relations of the Tatra mountain vegetation to the edaphic factors of the habitat: a synecological study. Acta Botanica Bohemica 6/7:133-164.

Drake, J. and D. Faber-Langendoen. 1997. An alliance-level classification of the vegetation of the Midwestern United States. A report prepared by The Nature Conservancy Midwest Conservation Science Department for the University of Idaho Cooperative Fish and Wildlife Research Unit. The Nature Conservancy Midwest Regional Office, Minneapolis, Minnesota, USA.

Driscoll, R.E. et al. 1984. An ecological land classification framework for the United States. USDA Forest Service, Misc. Pub. 1439. Washington, DC: U.S. Department of Agriculture, Forest Service.

Eyre, F.H. 1980. Forest cover types of the United States and Canada. Washington, DC: Society of American Foresters.

Faber-Langendoen, D., and J. Drake. 1996. An initial description of Alliances of the Midwest. The Nature Conservancy Midwest Regional Office.

Faber-Langendoen, D., D. Tart, A. Gray, B. Hoagland, Otto Huber, C. Josse, S. Karl, T. Keeler-Wolf, D. Meidinger, S. Ponomarenko, J-P. Saucier, Alejandro Velázquez-Montes, A. Weakley. 2007 (in prep). Guidelines for an integrated physiognomic – floristic approach to vegetation classification. Hierarchy Revisions Working Group, Federal Geographic Data Committee, Vegetation Subcommittee, Washington, DC.

Krajina, V.J. 1933. Die Pflanzengesellschaften de Mlynica-Tales in den Vysoke Tatry (Hohe Tatra). Mit besonderer Berücksichtigung der ökologischen Verhältnisse. Botan. Central., Beih. Abt. II, 50:774-957; 51:1-224.

Küchler, A.W. 1969. Natural and cultural vegetation. The Professional Geographer 21: 383-385.

Lincoln, R, G. Boxshall, and P. Clark. 1998. A dictionary of ecology, evolution and systematics. New York: Cambridge University Press. 361p.

McCune, B., J.B. Grace, and D.L. Urban. 2002. Analysis of ecological 2163 communities. MjM Software Design, Gleneden Beach, Oregon, USA.

Michener, William K., James W. Brunt, John J. Helly, Thomas B. Kirchner, Susan G. Stafford, 1997. Nongeospatial metadata for the ecological sciences. Ecological Applications 7:330–342.

Mucina, L. 1997. Conspectus of classes of European vegetation. Folia Geobotanica et Phytotaxonomica 32:117-172.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley,New York.

National Resources Inventory (NRI). 2003. Handbook of Instruction for Remote Data Collection, Chapter 13 – Land Cover / Use. Natural Resources Conservation Service. USDA, Washington, DC.

NatureServe. 2006. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. U.S.A.

OMB. 1990. Circular A-16: Coordination of Geographic Information and Related Spatial Data Activities. Office of Management and Budget. Washington DC.

OMB. 1998. Circular A-119: Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities. Office of Management and Budget. Washington DC. Available at: http://www.whitehouse.gov/omb/ circulars/ a119/a119.html#1

OMB. 2002. Circular A-16: Coordination of Geographic Information and Related Spatial Data Activities. Office of Management and Budget. Washington DC. Available at: http://www.whitehouse.gov/omb/ circulars/a016/a016_rev.html

Peet, R. K., T. R. Wentworth, and P. S. White. 1998. The North Carolina Vegetation Survey protocol: a flexible, multipurpose method for recording vegetation composition and structure. Castanea 63:262-274.

Pfister, R. D. and S. F. Arno. 1980. Classifying forest habitat types based on potential climax vegetation. Forest Science 26:52-70.

Pignatti, S., E. Oberdorfer, J.H.J. Schaminee, and V. Westhoff. 1994. On the concept of vegetation class in phytosociology. Journal of Vegetation Science 6:143-152.

PLANTS Data Base - PLANTS. 1995. USDA Natural Resources Conservation Service, National Plants Data Center, Baton Rouge, LA.

Pyle, R.L. 2004. Taxonomer: a relational data model for managing information relevant to taxonomic research. PhyloInformatics 1:1-54.

Raunkiaer, C. 1934. The life forms of plants and statistical plant geography. Clarendon, Oxford.

Table 2: Floristic table of the Sporobolus heterolepis - Schizachyrium scoparium - (Carex scirpoidea) / (Juniperus horizontalis) Herbaceous Association; Little Bluestem Alvar Grassland, NVC identifier code CEGL005234. For species in > 10% of stands for a total of 17 field plots. Species nomenclature is according to Gleason and Cronquist (1991).

Species by Layer	Constancy	Avg. Cover	Range of Cover, Where Present *
Geum triflorum	18	0.1	0.3 - 0.3
Hedyotis longifolia	18	0.5	0.3 - 5
Hypericum kalmianum	41	0.1	0.3 - 0.3
Hypericum perforatum	29	0.1	0.3 - 0.3
Muhlenbergia glomerata	12	0.1	1 - 2
Panicum spp.	35	1.0	0.3 - 5
Poa compressa	47	5.0	0.3 - 55
Polygala senega	12	0.1	0.3 - 1
Potentilla fruticosa	71	2.0	0.3 - 8
Prunella vulgaris	24	0.1	0.3 - 0.3
Rhamnus alnifolia	12	0.1	0.3 - 2
Rhus aromatica	18	0.2	0.3 - 3
Saxifraga virginiensis	12	0.1	0.3 - 0.3
Schizachyrium scoparium	71	8.0	0.3 - 38
Scirpus cespitosus	12	2.0	1 - 25
Senecio pauperculus	88	2.0	0.3 - 23
Sisyrinchium mucronatum	18	0.1	0.3 - 1
Solidago juncea	12	0.1	0.3 - 0.3
Solidago ohioensis	12	1.0	0.3 - 16
Solidago ptarmicoides	76	0.5	0.3 - 3
Solidago spp.	18	0.1	0.3 - 0.3
Sporobolus heterolepis	53	12.0	0.3 - 76
Sporobolus neglectus/vaginiflorus	24	2.0	0.3 - 25
Zigadenus elegans var. glaucus	29	0.1	0.3 - 2
MOSS LAYER			
Gloeocapsa /rock surface algae	47	12.0	5 - 60
Nostoc commune	41	2.0	0.3 - 18
Trentepohlia spp	29	0.1	0.3 - 0.3
Ditrichum flexicaule	24	0.1	0.3 - 3
Pseudocalliergon turgescens	18	1.0	0.3 - 15
Schistidium rivulare	24	0.5	0.3 - 10
Tortella spp.	41	3.0	0.3 - 29
Tortella tortuosa	12	0.5	0.3 - 10
Cladina rangiferina	18	0.1	0.3 - 0.3
Cladina spp.	12	0.1	0.3 - 0.3
Cladonia pyxidata	29	0.1	0.3 - 1
Cladonia spp.	18	0.1	0.3 - 2
Peltigera spp. (P. rufescens?)	12	0.1	0.3 - 0.3

Table 2: Floristic table of the Sporobolus heterolepis - Schizachyrium scoparium - (Carex scirpoidea) / (Juniperus horizontalis) Herbaceous Association; Little Bluestem Alvar Grassland, NVC identifier code CEGL005234. For species in > 10% of stands for a total of 17 field plots. Species nomenclature is according to Gleason and Cronquist (1991).

Species by Layer	Constancy	Avg. Cover	Range of Cover, Where Present *
Placynthium nigrum	24	0.2	0.3 - 2
Xanthoparmelia spp.	12	0.1	0.3 - 0.3

* Each species may not be present in every plot; the range of values is derived only from plots where the species has been found.

Dynamics: Not documented.

Environment: These grasslands occur on very shallow, patchy soils (usually less than 20 cm deep, averaging about 6 cm deep) on flat limestone and dolostone outcrops (pavements). Soils are loams high in organic matter. This community often has a characteristic soil moisture regime of alternating wet and dry periods; they can have wet, saturated soils in spring and fall, combined with summer drought in most years. In large patches over 20 ha (50 acres) this grassland often occurs as a small-scale matrix, with smaller patches of other alvar communities occurring within the larger patch of little bluestem alvar grassland, forming a landscape mosaic (Reschke et al. 1998).

Table 3. Physical environment of the Sporobolus heterolepis - Schizachyrium scoparium - (Carex scirpoidea) / (Juniperus horizontalis) Herbaceous Association; Little Bluestem Alvar Grassland, NVC identifier code CEGL005234.

Continuous Variables	Average	Range
Elevation (m)	186.0	178-209
Slope Gradient (degrees)	0.5	0 - 3
Organic Horizon Depth (cm)	1.0	0 - 8
Average Field pH	7.8	7.3 - 9
Soil Depth (cm)	4.0	1 - 9
Exposed Bedrock (%)	18.0	0 - 75
Large Rock, Surficial (% > 10 cm)	7.0	0 - 35
Small Rock, Surficial (% 0.2 - 2 cm)	10.0	0 - 72
Sand, Surficial (%)	0.0	0 - 0
Bare Soil, Surficial (%)	0.5	0 - 5
Litter (%)	2.0	0 - 12
Down Wood (% > 1 cm dbh)	0.1	0 - 1
Water (%)	0.1	0 - 1
Categorical Variables	Category	Number of

Table 3. Physical environment of the Sporobolus heterolepis - Schizachyrium scoparium - (Carex scirpoidea) / (Juniperus horizontalis) Herbaceous Association; Little Bluestem Alvar Grassland, NVC identifier code CEGL005234.

Continuous Variables	Average	Range
		Plots (%)
Slope Aspect	Flat	7 (41)
Slope Aspect	South	6 (35)
Slope Aspect	Northeast	2 (12)
Slope Aspect	West	1 (6)
Slope Aspect	North	1 (6)
Topographic Position	High, level	5 (28)
Topographic Position	Low, level	4 (24)
Topographic Position	Midslope	2(12)
Topographic Position	Other	4 (24)
Topographic Position	No Value	2 (12)
Soil Moisture	Periodically Inundated	7 (41)
Soil Moisture	Moist	4 (24)
Soil Moisture	Somewhat Moist	3 (17)
Soil Moisture	Dry	1 (6)
Soil Moisture	Extremely Dry	1 (6)
Soil Moisture	No Value	1 (6)

DISTRIBUTION:

Range: The little bluestem alvar grassland type is found primarily in the upper Great Lakes region of the United States and Canada, in northern Michigan, and in Ontario on Manitoulin Island and vicinity, on the Bruce Peninsula, and at a few sites further east in the Carden Plain and Burnt Lands.

Nations: CA US

States/Provinces: Michigan, Ontario

USFS Ecoregions: 212H:CC, 212Pc:CCC

PLOT SAMPLING AND ANALYSIS:

Location of archived plot data: Spreadsheet files with compiled vegetation data from plots and structural types are available from The Nature Conservancy's Great Lakes Program Office or from the state or provincial Heritage Programs. Original field forms are filed at state/provincial Heritage Programs. Plot data access forthcoming (2004) at www.vegbank.org.

Factors affecting data consistency: See "Methods," below.

Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological land classification for southern Ontario: First approximation and its application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

McCune, B., and M.J. Mefford. 1995. Multivariate analysis of ecological data, PC-ORD version 3.0. MjM Software, Gleneden Beach, Oregon, USA.

Reschke, C., R. Reid, J. Jones, T. Feeney, and H. Potter, on behalf of the Alvar Working Group. 1998. Conserving Great Lakes Alvars. Final Technical Report of the International Alvar Conservation Initiative. December 1998. The Nature Conservancy, Great Lakes Program, Chicago, IL. 119 pp. plus 4 appendices.

Author of Description: C. Reschke and Don Faber-Langendoen