

We Do Not See The Same Landscape  
Perspectives and Development of A Common Spatial Framework  
By  
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Definition: A Spatial Framework is a mapped set of geographic regions that supports agency programs or studies. (McMahon et al. 2001).

At local to landscape spatial scales vegetation and soil configuration and structure can change dynamically. Since the research I have done has been carried out at local to sub-regional scales, I have been wondering how these dynamics change at regional to national scales. Each region is relatively homogenous and distinct from adjoining regions.

Spatial framework distinctions are of two types:

1. Specific characteristics of interest
  - a) Political
  - b) Hydrological Units
  - c) GAP analysis
  - d) University of Maryland Land Cover
  - e) NRCS STATSGO
  - f) Olsen's World Ecosystems Complex
  - g) Matthews Vegetation Types Map
  - h) Modified Matthews Vegetation Types Map
  - i) National Land Cover Data set
  
2. Broader categories of resource potential
  - a) Quantitative vs. Weight-of-Evidence (Qualitative) Methods
  - b) Visual Pattern Recognition vs. Data-Driven Perspectives

#### Visual Pattern Recognition

- a) Bailey's Ecoregions: Bailey (1995, 1996) delineated 52 ecoregions at the finest province level, increased from 30 in his original Bailey (1983) version. Other, different ecoregions, based on other criteria and for other purposes, have been specified by Holdridge (1947), Walter and Box, Thornwaite, Koppen and many others. Because the delineation is based on subjective criteria, there are as many sets of ecoregions as there are experts.
- b) Holdridge Life Zones: The Life Zones were devised using three indicators: biotemperature (based on the growing season length and temperature); mean annual precipitation; and a potential evapotranspiration ratio, linking biotemperature with annual precipitation to define humidity provinces.
- c) US EPA: Omernick's 1987 aquatic ecoregions were based on perceived patterns of a combination of causal and integrative factors, including land use, land surface form, potential natural vegetation, and soils. Although delineated

for national-level studies of water resources, Omernick's 76 national ecoregions have been borrowed for many other kinds of ecological studies as well.

- d) The National Resources Conservation Service (NRCS) has developed a version of ecoregions called Major Land Resource Areas (MLRAs). MLRAs are much finer than most of the other types of ecoregions, for example, there are 78 MLRAs in the 13 southeastern states. MLRA boundaries are drawn with regard to edaphic and physiographic relationships, but are still subjective.

#### Data-Driven Perspectives

- a) National map clustered on elevation, edaphic, and climate variables into 3000 ecoregions using similarity colors: Clustering is data-driven and empirical. This objectivity means that one obtains the same result every time, given the same data and a request for the same number of clusters. This is in contrast to regions drawn by expert opinion.

#### Hybrid Approach: Qualitative and Quantitative

##### Common Ecoregions Map: Towards a Common Spatial Framework

- Regions are areas within which abiotic and biotic capacities and potentials are similar.
- Foster an ecological understanding of a landscape's terrestrial and aquatic resources.
- Provide the basis for interagency coordination and collaboration in the design and implementation of ecosystem research, assessment, and management.
- Fully integrated Peer-reviewed (participating agencies) National Map developed with common objectives.

## Citations

Common Ecoregions Map: McMahon et al. (2001) Environ. Manage. 28:293-316  
<http://www.statlab.iastate.edu/soils/cer/>

Gap Analysis Program (GAP): Land cover mapping for the Gap Analysis Program (GAP) is conducted on a state-by-state basis. One of the goals of the Program is regional analysis of land cover, vertebrate habitat, and conservation. Therefore, it is critical that each individual state's land cover products be consistent with products developed by their neighboring states. Some states stratified their data by biological, ecological, edaphic, or physiographic regions prior to beginning the classification work. Most commonly, stratification was done using Bailey's Ecoregions, Omernik's Ecoregions or the NRCS STATSGO soils data. The 'Other' category includes a variety of stratification techniques, most of which utilize (at least in part) the spectral information from the Landsat data in the delineation of subset boundaries  
<http://www.calmit.unl.edu/gapmap/>

Global digital elevation model (DEM) <http://edcdaac.usgs.gov/gtopo30/hydro/apps.html>

North American Commission for Environmental Cooperation  
<http://www.cec.org/home/index.cfm?varlan=english>

Hydrological Units  
[water.usgs.gov/GIS/huc.html](http://water.usgs.gov/GIS/huc.html)

Bailey Ecoregion map (source: Global View CD-ROM; Global Ecosystems Database, Ecosystem and Global Change Program, National Geophysical Data Center, Boulder, Colorado 80303, USA; 1994)

Bailey, R. G. 1983. Delineation of ecosystem regions. Environmental Management 7: 365-373.

[http://www.fs.fed.us/land/ecosysmgmt/ecoreg1\\_home.html](http://www.fs.fed.us/land/ecosysmgmt/ecoreg1_home.html)

Holdridge Life Zones map (source: Leemans, Rik, 1990. Holdridge Life Zones of the World. Global data sets collected and compiled by the Biosphere Project, Working Paper, IIASA-Laxenburg, Austria)

<http://www.grid.unep.ch/data/grid/gnv5.html>

The data set shows the Holdridge Life Zones of the World, a combination of climate and vegetation (ecological) types, under current, so-called "normal" climate conditions, as well as under a presumed doubling of atmospheric CO<sub>2</sub>. The data set has a spatial resolution of one-half degree latitude/longitude, and a total of 38 life-zone classes, which are listed on the accompanying legend sheet.

Major Land Resource Areas  
<http://www.statlab.iastate.edu/soils/MLRAweb/mlra/>

Matthews Vegetation map (source: Global Land-Use Datasets; Global Ecosystems Database, Ecosystem and Global Change Program, NASA Goddard Institute for Space Studies, New York, New York 10025, USA; Matthews, E., 1983. Global vegetation and land use: New high-resolution databases for climate studies. *Journal of Climate and Applied Meteorology* 22: 474-487; King, A.W., W.M. Post, and S.D. Wullschleger, 1997. The potential response of terrestrial carbon storage to changes in climate and atmospheric carbon dioxide. *Climatic Change* 35: 199-227

<http://www.grid.unep.ch/data/grid/gnv2.html>

The Matthews Vegetation data set comes from a global map of vegetation types, which was compiled from up to 100 existing map sources at the Goddard Institute of Space Studies (GISS), Columbia University, in New York. It shows the predominant vegetation type (one out of 32 classes) within each one degree-square latitude/longitude grid cell. Matthews Cultivation Intensity data set is based on existing maps of vegetation and satellite imagery, and it shows the percentage of each one-degree square latitude/longitude grid cell that is under cultivation, versus the percentage of natural vegetation, including five classes.

McMahon et al. (2001) *Environ. Manage.* 28:293-316

Modified Matthews Vegetation Map source: Gibbs, H.K. 2001. Global quantification of human-induced changes in global vegetation and associated climatic parameters. M.S. Thesis, The Ohio State University, Columbus, Oh.

National Land Cover Dataset Map (MLRC)

Vogelmann et al. 2001. *Photogrammetric Eng. Remote Sens.* 67:650-661.

Olson's World Ecosystem Complexes map (source: Global View CD-ROM; Global Ecosystems Database, Ecosystem and Global Change Program, National Geophysical Data Center, Boulder, Colorado 80303, USA; 1994: Olson, J.S., J.A. Watts and L.J. Allison, 1982. Carbon in Live Vegetation of Major World Ecosystems. ORNL-5862, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA

<http://www.grid.unep.ch/data/grid/gnv1.html>

The data set was compiled from patterns of pre-agricultural vegetation, modern aerial surveys and intensive biomass data from research sites. According to the authors, some of the uses of the Major Ecosystems Complexes data set are as a reference base to interpret the role of vegetation in global CO<sub>2</sub> cycling; a basis for improved estimates of carbon content of soil and vegetation; and a means of correcting estimates of carbon released into the atmosphere in recent times due to continuing changes in vegetation patterns.

Omericks Ecoregions map

Omernick's 1987 aquatic ecoregions were based on perceived patterns of land use, land surface form, potential natural vegetation, and soils. Although delineated for national-level studies of water resources, Omernick's 76 national ecoregions have been borrowed for many other kinds of ecological studies.

## STATSGO

[http://www.essc.psu.edu/soil\\_info/index.cgi](http://www.essc.psu.edu/soil_info/index.cgi)

UMD Global Land Cover Classification map (source: Hansen, M., DeFries, R., Townshend, J. R. G. and Sohlberg, R., 2000, Global land cover classification at 1km resolution using a decision tree classifier, *International Journal of Remote Sensing*. 21: 1331-1365. DeFries, R., Hansen, M., Townshend, J. R. G. and Sohlberg, R., 1998, Global land cover classifications at 8 km spatial resolution: The use of training data derived from Landsat imagery in decision tree classifiers, *International Journal of Remote Sensing*; 19 (16): 3141-3168

<http://gaia.umiacs.umd.edu:8811/landcover/projDesc.html>

156 scenes of 1-km AVHRR were used to derive a global land cover classification product. The product was derived by testing several metrics that describe the temporal dynamics of vegetation over an annual cycle. These metrics have the potential to be used as input variables to a global land cover classification. The tested metrics are based on 1) the ratio between surface temperature and NDVI, 2) seasonal metrics derived from the NDVI temporal profile such as length of growing season, 3) a rule-based approach that determines cover type through a series of hierarchical trees based on surface temperature and NDVI values, and 4) annual mean, maximum, minimum, and amplitude values for all optical and thermal channels in the AVHRR Pathfinder Land (PAL) data. These metrics were applied to 1984 PAL data at 8km resolution to derive a global land cover classification product using a decision tree classifier.

## Clustered Map

<http://research.esd.ornl.gov/~hnw/esri98/>

<http://www.esd.ornl.gov/projects/clustering/>

<http://research.esd.ornl.gov/~hnw/borders/>

Hargrove, W.W., F.M. Hoffman, and T.L. Sterling. August 2001. The Stone SouperComputer. *Scientific American*.

Hargrove, W.W., and F.M. Hoffman. 1999. Using multivariate clustering to characterize ecoregion borders. *Computers in Science and Engineering* 1(4):18-25.