

Proposal: Mapping Riparian and Upland Vegetation with the Gradient Nearest Neighbor (GNN) Method

Janet L. Ohmann, PNW Research Station, USDA Forest Service
(janet.ohmann@orst.edu)
7 April 2003

We propose to:

- Modify the GNN method to provide improved information for riparian areas by using:
 - Intensified FIA field plot sample (100 plots in Yaquina Basin)
 - Satellite imagery from stratification and mapping study (Landsat, IKONOS, IRS)
- Include nonforest areas
- Include both riparian areas and uplands (?)

What is GNN?

- A method of vegetation mapping that integrates field plot, Landsat, and other spatial data to map forest vegetation over broad regions.
- Developed and tested for forest land in coastal Oregon.
- The GNN method consists of two major steps:
 - (1) *Direct gradient analysis*: For the plot locations, we develop a statistical model that predicts a suite of vegetation attributes (response variables) from a suite of environmental and spectral attributes (explanatory variables).
 - (2) *Imputation*: We use the statistical model to identify the 'nearest neighbor plot' for each pixel, and assign the vegetation data from the plot to the pixel.
- End result: a map where each pixel is attributed with tree species, sizes, and densities present.

Advantages of GNN maps for ecological analysis and assessment:

- Rich in detail: fine (25-m) spatial resolution, multiple continuous variables.
- Analysis flexibility: user-defined vegetation variables and classifications can be applied.
- Accuracy:
 - Excellent at regional level: range of variability, landscape proportions.
 - Reasonably portrays fine-scale heterogeneity.
 - Site-level accuracy is similar to other Landsat-based maps.
 - Slightly less accurate for riparian areas, but can be improved by incorporating a better field sample of riparian areas.
- Appropriately used for planning and policy analysis at broad scales (perhaps as small as 5th-field hydrologic units), not to guide local management decisions.

Costs of implementing GNN

- Most of the cost of a GNN map is associated with plot and spatial database development. For the Yaquina we already have mapped environmental data. Satellite data will be provided by the stratification and mapping study. Vegetation data will be provided by FIA for 100 field plots.
- Once the databases are in place, GNN is potentially more efficient to apply than traditional image classification methods because satellite bands are used directly and no image classifications are performed.
- Additional time will be required to test GNN application to nonforest land uses and to a new riparian field plot configuration.

For more information on GNN:

- Ohmann, J.L.; Gregory, M.J. 2002. Canadian Journal of Forest Research 32:725-741.
- www.fsl.orst.edu/clams/gnn