

Using Land Surface Phenology for National Mapping of the Occurrence and Health of Evergreen and Deciduous Forests

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Unsupervised statistical multivariate clustering of specially processed, smoothed MODIS Normalized Difference Vegetation Index (NDVI) Land Surface Phenology data every 8 days over an 11-year period produces a series of detailed annual national maps of phenologically defined vegetation types at 231m resolution. Because these vegetation types were discriminated by their dynamic phenological behavior through time, the resulting vegetation types maps typically show more detail than those produced statically using imagery from only one or a few dates. When higher levels of division are specified, the map classes also resolve types of vegetation disturbances. Trends and changes in these vegetation types can be tracked across this 11-year period. Examining the constancy of these phenological ecoregion (or "phenoregion") classifications at a particular location from year to year produces a national map showing the persistence of vegetation, regardless of vegetation type.

Using spectral unmixing methods and annual satellite phenology data, separate national maps of evergreen and deciduous forests can be produced. A trend analysis on these separated evergreen and deciduous forests shows locations where these forests are thriving or declining during the last decade. Such national evergreen and deciduous decline maps show disturbances from multiple insect, disease, abiotic, and anthropogenic factors causing chronic or lasting decline in these forests, including hemlock woolly adelgid, mountain pine beetle, wildfire, tree harvest, and forest conversion for urbanization.