

# BIGFOOT LEAF AREA INDEX SURFACES FOR NORTH AND SOUTH AMERICAN SITES, 2000-2003

## Summary:

The BigFoot project gathered leaf area index (LAI) data for nine EOS Land Validation Sites located from Alaska to Brazil from 2000 to 2003. Each site is representative of one or two distinct biomes, including the Arctic tundra; boreal evergreen needleleaf forest; temperate cropland, grassland, evergreen needleleaf forest, and deciduous broadleaf forest; desert grassland and shrubland; and tropical evergreen broadleaf forest. LAI was measured at plots within each site for at least two years using standard direct and optical methods at each site. Direct measurement approaches included periodic area harvest for non-forest sites and application of allometric equations to tree diameter data for forest sites. LAI was also estimated indirectly using the Li-Cor LAI-2000 Plant Canopy Analyzers (Gower et al. 1999). LAI was measured three times each year at the forest sites and four to six times at other sites depending upon the phenology of LAI development for a given ecosystem. To develop LAI surfaces at any given site, the Landsat ETM+ image closest in date to maximum LAI was chosen as a reference and images from other dates radiometrically normalized to it. Each LAI surface has a grain of 25 meters and covers a 7 x 7 km extent. The data set consists of the LAI surface images in standard geotiff format, an accompanying text file that provides metadata specific to the image (such as projection, data type, class names, etc.), and associated auxiliary and world files.

Site	Site Location	Biome	2000	2001	2002	2003
<b>NOBS</b>	BOREAS NSA, Canada	boreal forest	<b>X</b>	<b>X</b>	<b>X</b>	
<b>AGRO</b>	Bondville, Illinois, USA	cropland (corn and soybean)	<b>X</b>			
<b>HARV</b>	Harvard Forest LTER, Massachusetts, USA	temperate mixed forest	<b>X</b>	<b>X</b>	<b>X</b>	
<b>KONZ</b>	Konza Prairie LTER, Kansas, USA	tallgrass prairie	<b>X</b>	<b>X,X</b>		
<b>CHEQ</b>	Park Falls, Wisconsin, USA	temperate mixed forest			<b>X</b>	
<b>METL</b>	Cascades, Oregon, USA	temperate needleleaf forest			<b>X</b>	
<b>SEVI</b>	Sevilleta LTER, New Mexico, USA	desert			<b>X,X,X,X</b>	<b>X,X,X,X</b>
<b>TAPA</b>	Tapajos, Brazil	tropical broadleaf evergreen forest			<b>X</b>	
<b>TUND</b>	Barrow, AK, USA	arctic tundra			<b>X</b>	

Additional information on LAI measurements and surface development can be found on the BigFoot website at <http://www.fsl.orst.edu/larse/bigfoot/index.html>.

BigFoot Project Background:

Reflectance data from MODIS, the Moderate Resolution Imaging Spectrometer onboard NASA's Earth Observing System (EOS) satellite Terra (<http://landval.gsfc.nasa.gov/MODIS/index.php>), is used to produce several science products including land cover, LAI, and net primary production (NPP). The overall goal of the BigFoot Project was to provide validation of these products. To do this, BigFoot combined ground measurements, additional high-resolution remote-sensing data, and ecosystem process models at nine flux tower sites representing different biomes to evaluate the effects of the spatial and temporal patterns of ecosystem characteristics on MODIS products. BigFoot characterized up to a 7 x 7 km area (49 MODIS pixels) surrounding the CO<sub>2</sub> flux towers located at each of the nine sites. We collected multi-year in situ measurements of ecosystem structure and functional characteristics related to the terrestrial carbon cycle. Our sampling design allowed us to examine scales and spatial pattern of these properties and the inter-annual variability and validity of MODIS products and provided for a field-based ecological characterization of the flux tower footprint. BigFoot was funded by NASA's Terrestrial Ecology Program.

## Data Citation:

### Cite this data set as follows:

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## References:

Cohen, W.B., Maier-Sperger, T.K., Turner, D.P, Ritts, W.D., Pflugmacher, D., Kennedy, R.E., Kirschbaum, A., Running, S.W., Costa, M., and Gower, S.T. *In press*. MODIS Land Cover and LAI Collection 4 Product Quality across Nine Sites in the Western Hemisphere. IEEE Transaction on Geoscience and Remote Sensing.

Cohen, W.B., T.K. Maier-Sperger, S.T. Gower, and D.P. Turner. 2003. An improved strategy for regression of biophysical variables and Landsat ETM+ data. *Remote Sensing of Environment* 84:561-571.

Cohen, W.B., T.K. Maier-Sperger, Z. Yang, S.T. Gower, D.P. Turner, W.D. Ritts, M. Berterretche, and S.W. Running. 2003. Comparisons of land cover and LAI estimates derived from ETM+ and MODIS for four sites in North America: a quality assessment of 2000/2001 provisional MODIS products. *Remote Sensing of Environment*. 88:221-362.

Gower, S.T., Kucharik, C.J., and J.M. Norman. 1999. Direct and indirect estimation of leaf area index, fAPAR and net primary production of terrestrial ecosystems. *Remote Sensing of Environment* 70:29-51.

## Data Format:

These land surface data were produced from Landsat ETM+ imagery to characterize LAI at the nine BigFoot / EOS Land Validation Sites. Each LAI surface has a grain of 25 meters and covers a 7 x 7 km extent. For each site there is a leaf area index surface image in standard geotiff format, an accompanying text file that provides metadata specific to the image (such as projection, data type, class names, etc.), and associated auxiliary and world files.

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