LITERATURE-DERIVED PARAMETERS FOR THE BIOME-BGC TERRESTRIAL ECOSYSTEM MODEL

Summary:

Ecosystem simulation models use descriptive input parameters to establish the physiology, biochemistry, structure, and allocation patterns of vegetation functional types, or biomes. For single-stand simulations, it is possible to measure required input parameters; however, as spatial resolution increases, data availability decreases, and generalized biome parameterizations are then required. Undocumented parameter selection and unknown model sensitivity to parameter variation for larger-resolution simulations are currently the major limitations to global and regional modeling. This data set contains documented input parameters of major natural temperate biomes in the United States for use with the BIOME-BGC Terrestrial Ecosystem Model, a process-based ecosystem simulation model. The sensitivity of BIOME-BGC (BioGeoChemistry) model outputs to variations in these input parameters was evaluated by White et al. (2000). Parameter groups in this data set include the following: turnover and mortality; allocation; carbon to nitrogen ratios(C:N); the percent of plant material in labile, cellulose, and lignin pools; leaf morphology; leaf conductance rates and limitations; canopy water interception and light extinction; and the percent of leaf nitrogen in Rubisco (i.e., ribulosebisphosphate-1,5-carboxylase/oxygenase). Input parameters may also be useful in other process-based models.

The data are presented in five files and are in a format suitable for statistical analysis by means of a wide variety of statistical analysis packages. The data represent various aspects of primary production for a number of plant species found in natural temperate biomes. Data for each species were compiled from literature to allow direct comparison and calculation of mean, standard deviation, etc., among differing instances of data collection for a given species in similar conditions.

More information can be found at:
http://www.cfc.umt.edu/ntsg/EcosystemModeling/BiomeBGC/EI_white_etal.pdf.

Data Citation:

Cite this data set as follows:

White, M. A., P. E. Thornton, S. W. Running, and R. R. Nemani. 2002. Literature-Derived Parameters for the BIOME-BGC Terrestrial Ecosystem Model. Data set. Available on-line [http://www.daac.ornl.gov] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. doi:10.3334/ORNLDAAC/652.

References:

White, M. A., P. E. Thornton, S. W. Running, and R. R. Nemani. 2000. Parameterization and Sensitivity Analysis of the BIOME-BGC Terrestrial Ecosystem Model: Net Primary Production Controls. Earth Interactions 4(3):1-85.

Data Format:

The Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC) for Biogeochemistry Dynamics organized and formatted these data for long-term archive. Tables in Appendix A (White et al. 2000) were grouped according to similar formats and placed into a spreadsheet format and stored as ASCII comma-separated-value (.csv) files. Missing values are represented by -999. Additional columns, including table number, parameter description, unit of measure, and foliage nature, were added to the spreadsheets so that each row was fully documented. The 19 tables were grouped into 5 files as follows:

Spreadsheet

1 A.2.1 New fine root carbon to new leaf carbon allocation
1 A.2.2 New stem carbon to new leaf carbon allocation
1 A.2.3 New live wood carbon to new total wood carbon allocation
1 A.2.4 Coarse root carbon to stem carbon allocation
1 A.3.1 Leaf carbon to nitrogen ratio
1 A.3.2 Litter carbon to nitrogen ratio
1 A.3.3 Fine root carbon to nitrogen ratio
1 A.3.5 Dead wood carbon to nitrogen ratio
2 A.4.1 Fine root fractions
2 A.4.2 Litter fractions
3 A.4.3 Dead wood fractions
1 A.5.1 Specific leaf area
1 A.5.2 All-sided to projected leaf area index ratio
4 A.6.4 Leaf water potential at initial and final reduction to stomatal conductance
5 A.6.5 Vapor pressure deficit at initial and final reduction to stomatal conductance
1 A.7.1 Water interception coefficient
1 A.7.2 Light extinction coefficient

Spreadsheet 1 <White_spreadsheet1.csv>

- `Table:` table in the original paper
- `Parameter:` parameter measured
- `Abbreviation:` parameter abbreviation
- `Units:` units of measure for a particular parameter
- `Foliage Nature:` generalized groupings of the plants found in each table
- `Species:` species analyzed
- `Value:` numerical finding associated with a given species, parameter, and reference
- `Source:` paper or researcher from which the data were compiled

Spreadsheet 2 <White_spreadsheet2.csv>

- Abbreviation:parameter abbreviation
- Units: units of measure for a particular parameter
- Foliage Nature:generalized groupings of the plants found in each table
- Species: species analyzed
- Labile: percent of water and acid-soluble material in the fine roots of a particular species, allowing the final summation to equal 100 percent
- Cellulose: percent cellulose of the fine roots of a particular species
- Lignin: the remaining percent of the fine root fraction and it may include extraneous suberin
- Source: paper or researcher from which the data were compiled

Spreadsheet 3 <White_spreadsheet3.csv>

- Parameter: parameter measured
- Abbreviation:parameter abbreviation
- Units: units of measure for a particular parameter
- Foliage Nature:generalized groupings of the plants found in each table
- Species: species analyzed
- Lignin calculated value of lignin, extraneous suberin, etc., for dead wood of a given species
- Cellulose value allowing the summation to 100 percent for dead wood fractions of a given species
- Source paper or researcher from which the data were compiled

Spreadsheet 4 <White_spreadsheet4.csv>

- Parameter: parameter measured
- Abbreviation:parameter abbreviation
- Units: units of measure for a particular parameter
- Foliage Nature:generalized groupings of the plants found in each table
- Species: species analyzed
- Initial: predawn leaf water potential at which initial reduction to stomatal conductance occurs
- Final: predawn leaf water potential at which final reduction to stomatal conductance occurs
- Source: paper or researcher from which the data were compiled

Spreadsheet 5 <White_spreadsheet5.csv>

- Parameter: parameter measured
- Abbreviation:parameter abbreviation
- Units: units of measure for a particular parameter
- Foliage Nature:generalized groupings of the plants found in each table

- Species: species analyzed
- Initial: vapor pressure deficit at initial stomatal closure
- Final: vapor pressure deficit at final stomatal closure
- Source: paper or researcher from which the data were compiled

A file of the references associated with citations in the tables is also included as a companion file ftp://daac.ornl.gov/data/global_vegetation/model_parameters/comp/White_References.rtf.

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