# NPP Tundra: Toolik Lake, Alaska, 1982, R1

## Get Data

Revision date: August 28, 2013

## Summary:

This data set contains one text file (.csv format) that provides productivity data for four contrasting tundra vegetation types studied during 1982 near Toolik Lake in the northern foothills of the Brooks Range on the North Slope of Alaska (68.63 N 149.72 W). The vegetation types include a "tussock" tundra containing graminoids, deciduous shrubs, and evergreen shrubs; a "shrub" tundra dominated by deciduous willow shrubs; a "heath" tundra of evergreen shrubs; and a "wet" tundra site containing rhizomatous graminoids. The study sites were selected to represent extreme examples of the wide range of local plant growth forms in the region.

Living above- and below-ground biomass were sampled on three occasions during the growing season using randomly located quadrats ranging in size from 10 x 20 cm to 50 x 50 cm. Production and biomass of most tissues were determined by harvest methods, with additional separate determinations of stem secondary growth and below-ground rhizome growth as components of net primary production (NPP). Elemental content of above-ground samples was analyzed. Production, biomass, and elemental content of roots were not determined. Leaf area index (LAI) was measured using a LI-COR leaf area meter.

NPP, excluding fine roots, was estimated at 37, 99, 278, and 475 g/m$^2$/year, at the heath, wet, tussock, and shrub sites, respectively. Inclusion of estimated production by roots increased these NPP figures to 140, 200, 430, and 780 g/m$^2$/year, respectively. LAI was similarly ranked.

**Revision Notes:** This data set has been revised to add root biomass values, update total biomass to include root biomass values, add NPP values for plant community components (vascular plants, nonvascular plants, below-ground stems/rhizomes, and roots), and revise NPP values which exclude root NPP to be inclusive of all plant community components except roots for each type of tundra. Please see the Data Set Revisions section of this document for detailed information.

## Additional Documentation

The NPP data collection contains field measurements of biomass, estimated NPP, and climate data for terrestrial grassland, tropical forests, temperate forest, boreal forest, and tundra sites worldwide. Data were compiled from published literature for intensively studied and well-documented individual field sites and from a number of previously compiled multi-site, multi-biome data sets of georeferenced NPP estimates. The principal compilation effort (Olsen et al., 2001) was sponsored by the NASA Terrestrial Ecology Program. For more information, please visit the NPP web site at http://daac.ornl.gov/NPP/npp_home.shtml.

## Data Citation:

**Cite this data set as follows:**

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This revised data set was originally published as:

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Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

## Table of Contents:



## 1. Data Set Overview:

**Project:** Net Primary Productivity (NPP)

Productivity of four contrasting vegetation types was studied during 1982 near Toolik Lake, Alaska, USA. Above-ground biomass and below-ground stem/rhizome biomass were measured on three occasions during the growing season; for (1) a "tussock" tundra containing graminoids, deciduous shrubs and evergreen shrubs, (2) a "shrub" tundra dominated by deciduous willow shrubs, (3) a "heath" tundra of evergreen shrubs, and (4) a "wet" tundra site containing rhizomatous graminoids. The study sites were selected to represent extreme examples of the wide range of local plant growth forms.

Vegetation was sampled using randomly located quadrats ranging from 10 cm x 20 cm to 50 cm x 50 cm in size. LAI was measured using a LI-COR leaf area meter.

The study areas were mostly located close to Toolik Lake, in the northern foothills of the Brooks Range on the North Slope of Alaska (68.63 N 149.72 W). The wet tundra site was about 15 km farther to the south (68.45 N 149.37 W). By road, the Toolik Lake research station is 210-km south of Prudhoe Bay airport, and 570-km north of the city of Fairbanks. Tussock tundra is the dominant vegetation form in the region, but there are extensive areas of wet sedge tundra, drier heath tundra on ridge tops and other well-drained sites, and riparian willow communities.

Climate is typical of arctic regions, with a mean annual air temperature of about -7 C and low precipitation (200-400 mm, half falling as snow). The snow-free growing season extends from late May to mid-September, but freezing temperatures are possible at any time. The entire region is underlain by continuous permafrost which exerts a major influence on the distribution, structure, and function of ecosystems.

Field work at Toolik Lake is continuing on a variety of habitat types under the Arctic Long-Term Ecological Research (LTER) project, which has further detailed data available on its web site. Studies include re-sampling of plots harvested in 1982, as well as nitrogen and phosphorus fertilization experiments and carbon flux measurements. The Toolik Field Station is administered by the Institute of Arctic Biology, University of Alaska, Fairbanks.

The NPP measurements for vascular plants and below-ground stems were calculated from three independent measures: (1) apical leaf and stem growth; (2) secondary stem growth; and (3) below-ground rhizome growth. NPP estimates for nonvascular plants and roots were derived from published literature.

NPP, excluding fine roots, was estimated at 37, 99, 278, and 475 g/$m^2$/year, at the heath, wet, tussock, and shrub sites, respectively. Inclusion of estimated production by roots, based on research done in similar sites elsewhere (Wielgolaski et al., 1981), increased these NPP figures to 140, 200, 430, and 780 g/$m^2$/year, respectively. Leaf area index was similarly ranked.

Table 1. ANPP, BNPP, and TNPP values reported in various data sources

| File Name or Description | Data Source(s) | Sub-Site | ANPP | BNPP | TNPP |
|---|---|---|---|---|---|
| | | | gC/$m^2$/year | | |
| tlk_npp_r1_csv | Shaver and Chapin (1991)[1,2,3] | tlk - tussock tundra | 132.1 | 71.3 | 204.3 |
| | | tlk - wet tundra | 47 | 47.5 | 95 |
| | | tlk- heath tundra | 17.6 | 47.5 | 66.5 |
| | | tlk - shrub tundra | 225.6 | 142.5 | 370.5 |
| GPPDI_ClassB_NPP_2363_R1.csv | Olson et al. (2012a) based on Shaver and Chapin (1991)[2,3] | Class B 1589 (MI 2344) (tussock) | 130 | 70 | 200 |
| | | Class B 1589 (MI 2343) (wet) | 50 | 50 | 100 |
| | | Class B 1589 (MI 2342) (heath) | 20 | 50 | 70 |
| | | Class B 1598 (MI 2345) (shrub) | 230 | 140 | 370 |
| EMDI_ClassB_NPP_933_v2.csv | Olson et al. (2012b) based on Shaver and Chapin (1991)[2,3] | Class B 1589 (average of three sites - tussock, wet, and heath) | 67 | 59 | 123 |

Notes: NA = Not available. MI = Measurement identification number. The differences in NPP values reported in this table are mainly due to differences in calculation methods, as explained in these notes. Please consult original references for details. Revised data sets (R1, R2,v1, v2, etc) are accompanied by ORNL DAAC Data Set Change Information files. Please see the corresponding documentation for reasons why the data values were revised [1]For this table, NPP data from the original data source were converted from grams of dry weight per meter square per year to grams of carbon per meter square per year using a conversion factor of 0.475. [2]ANPP-C includes NPP of vascular plants + NPP of below-ground stems from Shaver and Chapin (1991) plus NPP of nonvascular plants for tussock, wet, and shrub tundra from Oechel and Van Cleve (1986) and for heath tundra from Wielgolaski et al. (1981). [3]BNPP-C estimates for tussock tundra were estimated by extrapolation from values given in Wielgolaski et al. (1981); estimates for wet, shrub, and heath tundra are from Wielgolaski et al. (1981) from sites of similar growth form composition and above-ground production.

## 2. Data Description:

**Spatial Coverage**

**Site:** Toolik Lake, Alaska, USA

**Site boundaries:** (All latitude and longitude given in decimal degrees)

| Site (Region) | Westernmost Longitude | Easternmost Longitude | Northernmost Latitude | Southernmost Latitude | Elevation (m) |
|---|---|---|---|---|---|
| Toolik Lake, Alaska, USA | -149.72 | -149.37 | 68.63 | 68.45 | NA |

**Site Information**

This study was conducted at four sites of contrasting tundra vegetation types near Toolik Lake including a tussock tundra, a deciduous shrub-dominated riparian tundra, an evergreen heath tundra, and a wet sedge tundra. The study sites were selected to represent extreme examples of the wide variation in plant growth form composition that is typical of northern ecosystems.

The tussock tundra, the most common vegetation type of the northern foothills of the Brooks Range, occurs on gently rolling topography with silty to gravelly soils, both glaciated and unglaciated. The soils are always moist and are unevenly covered with an organic mat 0-20 cm thick. The microtopography is dominated by tussocks of *Eriophorum vaginatum*, which may be 10-30 cm tall.

The wet sedge tundra site is located on limestone parent material in a former floodplain of the Atigun River about 15 km south of Toolik Lake. This type of tundra forms a broad expanse on the Arctic Coastal Plain. It is characterized by minimal topographic relief, high soil water content (often with standing surface water through much of the summer), a peaty organic mat 10-20 cm thick over a silty mineral soil, shallow depth of soil thaw (25-30 cm), and low plant stature (usually <20-30 cm). Soil frost phenomena such as ice-wedge polygons are common.

The heath tundra site is similar to the vegetation found on exposed, well-drained ridges and bluffs on the North Slope. The topography is flat, but the soil is rocky, with a very thin (< 1 cm) organic mat at the surface. The area is nearly surrounded, and probably underlain, by an extensive, frost-active boulder field that is drained by the outlet stream from Toolik Lake. The height of the vegetation is <10 cm, usually <5 cm.

The shrub tundra site is similar to the tall (1-4 m) stands of willows and other deciduous shrubs that commonly occur on gravelly river bars and well-drained floodplains throughout the North Slope. The shrub site is located on a well-drained, gentle slope (<5°) between two small streams that drained the tussock tundra surrounding Toolik Lake. The gravelly soil is covered by a thin (2-4 cm) moss/organic mat.

Weather data have been collected at Toolik Lake Field Weather Station (68.63 N, 149.6 W) from June 1988 to present time but are not included in this data set. Data collected include air temperature, relative humidity and wind speed at 1 and 5 m, wind direction at 5 m, global solar radiation, photosynthetically active radiation, barometric pressure, precipitation, soil temperatures, lake temperature, lake depth, evaporation pan depth, and pan water temperature. Hourly data and daily summaries are available from the Arctic Long-Term Ecological Research site.

**Spatial Resolution**

The study plots were 10 x 20 cm, 20 x 20 cm, and 50 x 50 cm in size.

**Temporal Coverage**

Above-ground vascular and nonvascular plant biomass, below-ground stem mass, and LAI measurements were made in 1982. Elemental concentrations were determined from the biomass samples. Root biomass data are derived from samples collected in 1978 from tundra of similar growth form composition and above-ground production near Eagle Summit, Alaska (Miller et al., 1982).

**Temporal Resolution**

Above-ground vascular and nonvascular plant biomass, below-ground stem mass, and LAI measurements were made at each site on three occasions in 1982 (i.e., late May-early June, late July-early August, and late August-early September). Only annual data are provided in this data set. Root biomass samples for each type of tundra were collected only once; the time required to separate the below-ground organic material in eight strata precluded additional replication (Miller et al., 1982).

NPP estimates are derived from several sources (Oechel and Van Cleve, 1986; Shaver and Chapin, 1991; and Wielgolaski et al, 1981). NPP values are based on plant dry matter accumulation and are expressed as $g/m^2/yr$.

**Data File Information**

Table 2. Data file in this data set archive

| FILE NAME | TEMPORAL COVERAGE | FILE CONTENTS |
|---|---|---|
| tlk_npp_r1.csv | 1982/01/01 - 1982/12/31 | Above- and below-ground biomass, LAI, and elemental concentration data and NPP estimates for four tundra sites near Toolik Lake, Alaska, USA |

**NPP Data**. Above- and below-ground biomass, NPP, LAI, and elemental concentration data for the four Toolik Lake sites are provided in one file (Table 2). The data set is a text file (.csv format). The first 17 lines are metadata; data records begin on line 18. The variable values are comma separated. The value -999.9 is used to denote missing values. Biomass and NPP units are in $g/m^2$ and $g/m^2/yr$ (dry matter weight), respectively. LAI is expressed as $m^2/m^2$. Elemental concentrations of nitrogen and phosphorus are presented as percentages of dry mass in biomass samples.

Table 3. Column headings in NPP file

| COLUMN HEADING | DEFINITION | UNITS | SOURCE |
|---|---|---|---|
| Site | Site where data were gathered (code refers to site identification) | Text | ORNL |
| Treatmt | Type of tundra studied | Text | |
| Year | Year in which data were collected | Numeric | |
| Mn | Month in which data were collected | | |
| Dy | Day on which data were collected | | |
| LAI | Leaf area index | $m^2/m^2$ | Figure 2, Shaver and Chapin (1991) |
| AGbio_vasc | Above-ground live biomass of all vascular plants | $g/m^2$ | Table 1, Shaver and Chapin (1991) |
| AGbiomass | Above-ground live biomass of vascular + nonvascular plants | | |
| BGbiomass_stem | Biomass of below-ground live stems/rhizomes | | |
| BGbiomass_root | Biomass of live + dead roots below green moss layer (based on research by Miller et al., 1982 done in similar sites elsewhere) | $g/m^2$ | Table 11, Shaver and Chapin (1991) |
| Totbiomass | Total above- plus below-ground live biomass of vascular + nonvascular plants ABbiomass + BGbiomass_stem + BGbiomas_roots | $g/m^2$ | Table 11, Shaver and Chapin (1991) |
| vasc_NPP | NPP of above-ground vascular plants | $g/m^2/yr$ | Table 11, Shaver and Chapin (1991) |
| nonvasc_NPP | NPP of above-ground nonvascular plants [values for tussock, wet, and shrub tundra assume same production: biomass ratios as for mosses in boreal forests (Oechel and Van Cleve, 1986); values for heath tundra from Wielgolaski et al. (1981) from sites of similar growth form composition and above-ground production] | | |
| bg_stem_NPP | NPP of below-ground stems | | |
| root_NPP | NPP of roots [value for tussock tundra estimated by extrapolation from values given in Wielgolaski et al. (1981); values for wet, shrub, and heath tundra from Wielgolaski et al. (1981) from sites of similar | | |

| | | | |
|---|---|---|---|
| | growth form composition and above-ground production] | | |
| TNPP_excl_roots | Total NPP excluding roots (above-ground vascular + above-ground nonvascular + below-ground stem) | | |
| TNPP_incl_roots | Total NPP including roots (above-ground vascular + above-ground nonvascular + below-ground stem + roots) | | |
| N_AGbio | Total nitrogen concentrations in biomass (proportion of dry mass). Concentrations are calculated as total elemental mass divided by total mass. | % | Table 10, Shaver and Chapin (1991) |
| P_AGbio | Total phosphorus concentrations in biomass (proportion of dry mass). Concentrations are calculated as total elemental mass divided by total mass. | % | |

Sample NPP Data Record

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Site,Treatmt,Year, Mn, Dy, LAI [units m2/m2], AGbio_vasc, AGbiomass, BGbiomass_stem,
BGbiomass_root, Totbiomass [g/m2], vasc_NPP, nonvasc_NPP, bg_stem_NPP, root_NPP,
TNPP_excl_roots, TNPP_incl_roots [g/m2/year], N_AGbio, P_AGbio [units %]

tlk, tussock, 1982,,-999.9, -999.9, 1.1, 374.1, 707.6, 481.5, 400, 1590, 144, 120, 14, 150, 278,
430, 0.9, 0.09 ...
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## 3. Data Application and Derivation:

The accumulation of biomass, or NPP, is the net gain of carbon by photosynthesis that remains after plant respiration. While there are many fates for this carbon, this data set accounts for apical leaf and stem growth, secondary stem growth, below-ground rhizome growth, and root turnover. These are considered the major components of NPP.

The aim of this research was to determine whether vegetation types that differ in their dominant plant growth form also differ in their production to biomass ratio and overall patterns of elemental use. The annual biomass data for the Toolik tundra sites are provided for comparison with models and estimation of NPP.

## 4. Quality Assessment:

At the time this data set was produced, there were a few gaps pertaining to above-ground production and biomass relationships in Alaskan arctic ecosystems. Three important gaps remained to be filled included: (1) changes in below-ground stem/rhizome biomass from early- to peak-season; (2) root biomass, root production, and elements in roots; and (3) production and element cycling by mosses and lichens. Each of these gaps in the data set is important enough to affect the specific conclusions about the role and importance of plant growth forms to element cycling in the Arctic. In each case, the investigators were able to apply knowledge from other research to estimate how their conclusions might change if such data were available from the present study (Shaver and Chapin, 1991).

Shaver and Chapin (1991) were consistently able to detect statistically significant changes in biomass between harvests for individual tissues, for whole species, for species lumped by growth form, and for the whole vegetation at all four sites. Their sample size was larger than in many previous studies of tundra vegetation; typically these previous studies have included fewer replicates but used quadrats of similar size. For these reasons, the investigators think that results of their secondary calculations are reliable.

**Sources of Error**

Meaningful estimates of variance could not be calculated for many of the variables used to make comparisons among sites. A lack of variance estimates, or even replicate values, is typical of most whole-vegetation primary production and nutrient budget studies. One is forced to rely, then, on one's confidence in the original biomass and concentration data or the regression equations from which most of the rest of the variables are calculated. In the Arctic, the biomass measurements are usually far more variable than the elemental concentrations (Shaver et al., 1986) or the data used to calculate secondary stem growth (Shaver, 1986); it is primarily for this reason that Shaver and Chapin (1991) have presented the biomass data in some detail, with error estimates. The variance in their data is quite similar to previous studies.

## 5. Data Acquisition Materials and Methods:

LAI

At each quadrat harvest, the area of a subsample of leaves of each species was measured using a LI-COR leaf area meter. After drying and weighing, the mass per unit area of the subsample was calculated. Total leaf area per quadrat was then calculated by dividing leaf mass per quadrat by mass per unit area. LAI was calculated by dividing leaf area per quadrat by the quadrat area.

Biomass

Most of the data and samples came from three quadrat harvests of the vegetation at each site in 1982, one harvest in late May-early June (before any new growth had started), one in late July-early August (after most of the apical stem and leaf growth had ended), and the third in late August-early September (during the period of deciduous leaf fall and presumably after much of the end-of-season nutrient resorption and storage had occurred). The quadrat harvests were used to determine total above-ground biomass and below-ground stem/rhizome mass, by species and growth form. At all three harvests, only living plant biomass was sampled.

Samples were obtained by collecting all above-ground biomass and below-ground stems and rhizomes in 20 x 20 cm quadrats, located randomly along line transects within the tussock tundra, evergreen heath tundra, and wet sedge tundra sites. Normally, four or five quadrats are collected along each of four transects at each site or treatment. Above-ground biomass was considered "within" the quadrat if it was associated with a meristem that is within the quadrat. Because the plants were much larger in the shrub site, 10 randomly located 50 x 50 cm quadrats were used to sample the woody shrubs, with a 10 x 20 cm area in one comer sampled for herbaceous species, mosses, and lichens.

Each quadrat was first sorted into species and then into tissue type. Depending on the harvest, tissue types could be broad categories (i.e., above and below) or more detailed (i.e., inflorescences, new growth, old growth, etc). The separated samples were dried for several days at approximately 65 degrees C and then weighed. The dry weight for each quadrat, species, and tissue type was recorded. Finally, the samples from all quadrats in a transect were combined according to tissue type. Samples were then returned to Woods Hole for nutrient analysis.

No attempt was made to collect roots quantitatively in these harvests. Instead, data from samples collected in 1978 from tundra of similar growth form composition and above-ground production near Eagle Summit, Alaska were used (Miller et al., 1982).

NPP

Total NPP estimates for vascular plants and below-ground stems were calculated from three independent measures: (1) apical leaf and stem growth, calculated by difference in average mass between harvests; (2) secondary stem growth, calculated from old stem biomass plus regressions of stem mass per unit length vs. stem age; and (3) below-ground rhizome growth, calculated from leaf production rate, tiller density, and mass per internode. The method for measuring stem secondary growth as a component of NPP is described in detail in Shaver (1986) and summarized in Shaver and Chapin (1991). Apical rhizome growth was estimated in all four sites as the sum of two measures: (1) newly produced current year's rhizome tip biomass and (2) internode biomass that was added to the stem base of each graminoids tiller as new leaves produced at the apical meristem for the dominant graminoids species in the tussock and wet sites (*Eriophorum vaginatum*, *E*. *angustifolium*, *Carex bigelowii*, and *C*. *aquatilisi*). Details are given in Shaver and Chapin (1991).

NPP estimates for nonvascular plants for tussock, wet, and shrub tundra assume same production-biomass ratios as for mosses in boreal forests (Oechel and Van Cleve, 1986); estimates for heath tundra are from Wielgolaski et al. (1981) from sites of similar growth form composition and above-ground production.

NPP estimates for roots at the tussock tundra were estimated by extrapolation from values given in Wielgolaski et al. (1981); estimates for wet, shrub, and heath tundra are from Wielgolaski et al. (1981) from sites of similar growth form composition and above-ground production.

Nutrient Concentrations in Biomass

The dried samples from the quadrat harvest were analyzed for total N and P using standard Technicon AutoAnalyzer methods (Kedrowski, 1983), and for K, Ca, and Mg by atomic absorption spectroscopy. The elemental concentrations were then applied to the biomass data to calculate the amounts of each element in each tissue type for each species, site, and harvest. Only N and P data are presented in this data set.

## 6. Data Access:

This data set is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

### Data Archive Center:

E-mail: uso@daac.ornl.gov
Telephone: +1 (865) 241-3952

## 7. References:

Olson, R.J., K.R. Johnson, D.L. Zheng, and J.M.O. Scurlock. 2001. Global and Regional Ecosystem Modeling: Databases of Model Drivers and Validation Measurements. ORNL Technical Memorandum TM-2001/196. Oak Ridge National Laboratory, Oak Ridge, Tennessee, U.S.A.

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Olson, R.J., J.M.O. Scurlock, S.D. Prince, D.L. Zheng, and K.R. Johnson (eds.). 2012a. NPP Multi-Biome: Global Primary Production Data Initiative Products, R2. Data set. Available on-line [http://daac.ornl.gov] from the Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. doi:10.3334/ORNLDAAC/617

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Wielgolaski, F.E. 1980. Tundra plant structure and production in relation to the environment. International Journal of Biometeorology 24(1): 23-30.

Wielgolaski, F.E., L. C. Bliss, J.C. Svoboda, and G. Doyle. 1981. Primary production of tundra, pp 187-226. IN: Bliss, L. C. , O. W. Heal, and J. J. Moore, eds. Tundra ecosystems: a comparative analysis. Cambridge University Press, Cambridge, England.

## 8. Data Set Revisions:

**Revision Summary:**

The data file **tlk_npp.txt** has been revised to add root biomass, update total biomass to include root biomass values, add NPP values for plant community components (vascular plants, nonvascular plants, below-ground stem/rhizomes, and roots), and revise NPP values excluding roots to be consistent with the values reported in Table 11 on Page 20 of Shaver and Chapin (1991). These changes were made to all four sub-sites in this data file (tussock, wet, heath, and shrub tundra sites). The data file was converted to comma-separated-value (.csv) format (**tlk_npp_r1.csv**).

All other data values in the data file are consistent with Shaver and Chapin (1991). Average values of LAI and nutrient content of above-ground biomass are not affected.

**Data File Changes:**

Root biomass values derived from Miller et al. (1982) were added to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | BGbiomass_root ($g/m^2$) | |
| Tussock | NR | 400 |
| Wet | NR | 1,000 |
| Heath | NR | 530 |
| Shrub | NR | 1,000 |

Total biomass values were revised to add root biomass to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | Totbiomass_root ($g/m^2$) | |
| Tussock | 1,189.1 | 1,590 |
| Wet | 527.2 | 1,527 |
| Heath | 422 | 952 |
| Shrub | 2,355.8 | 3,355 |

NPP values for vascular plants were added to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | vasc_NPP ($g/m^2/yr$) | |
| Tussock | NR | 144 |
| Wet | NR | 51 |
| Heath | NR | 32 |
| Shrub | NR | 303 |

NPP values for nonvascular plants were added to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | nonvasc_NPP ($g/m^2/yr$) | |
| Tussock | NR | 120 |
| Wet | NR | 30 |
| Heath | NR | 5 |
| Shrub | NR | 170 |

NPP values for below-ground stems/rhizomes were added to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | bg_stem_NPP ($g/m^2/yr$) | |
| Tussock | NR | 14 |
| Wet | NR | 18 |
| Heath | NR | 0 |
| Shrub | NR | 2 |

NPP values for roots were added to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991).

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | root_NPP ($g/m^2/yr$) | |
| Tussock | NR | 150 |
| Wet | NR | 100 |
| Heath | NR | 100 |
| Shrub | NR | 300 |

Total NPP values, excluding roots, were reviesed to be consistent with Table 11 on Page 20 of Shaver and Chapin (1991). NPP values for nonvascular plants were added to tussock and wet tundra data, and NPP values for nonvascular plants and below-ground stems/rhizomes were added to heath and shrub tundra data.

| Sub-site | Uncorrected in tlk_npp.txt | Corrected in tlk_npp_r1.csv |
|---|---|---|
| | NPP_excl_root ($g/m^2/yr$) | |
| Tussock | 158 | 278 |
| Wet | 69 | 99 |
| Heath | 32 | 37 |
| Shrub | 305 | 475 |

Notes: NR = not reported. See Guide document for parameter definitions and footnotes.

The data values in **tlk_npp_r1.csv** are now correct.

**Related Data Sets**:

NPP data for Toolik Lake are included in (1) the combined Global Primary Production Data Initiative (GPPDI) data, Class B Tundra Biome sites (Olson et al., 2012a) and (2) the Ecosystem Model-Data Intercomparison (EMDI) worldwide NPP data set and driver data for comparison with models, Class B Tundra Biome sites (Olson et al., 2012b). However, the revisions described herein do not affect data values in GPPDI Class B or EMDI Class B data files. Therefore, no Class B files were changed (see file list below).

There are no Tundra Biome sites in Class A site or Class C site data files of either GPPDI or EMDI (Olson et al, 2001). Thus, no Class A or Class C files are affected.

There are no changes to the following files:

EMDI_ClassB_NPP_933_v2.csv
EMDI_ClassB_Site_933_v2.csv
EMDI_ClassB_Summary_933.csv
GPPDI_ClassB_NPP_2363_R1.csv
GPPDI_ClassB_Flags_2363.csv

**Data User Action:** If you downloaded this data set before August 28, 2013, you should download it again.

**Revision History:**

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