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[Data](#)
[Tools](#)
[Help](#)
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Data

[DAAC Home](#) > [Data](#) > [Regional/Global](#) > [Net Primary Production \(NPP\)](#) > [Data Set Documentation](#)

NPP Grassland: Tullgarnsnaset, Sweden, 1968-1969, R1

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Revision date: November 20, 2014

Summary:

This data set contains three ACSII files (.txt format). Two files contain above-ground biomass data for two ungrazed seashore meadow plots dominated by the saltmeadow rush *Juncus gerardii* at Tullgarnsnaset, near Stockholm, Sweden (approximately 59.20 N, 17.50 E). There is one file for each plot. The third data file contains monthly and annual climate data from weather station near Stockholm (59.4 N, 18.0 E) for the period 1951-1990.

Measurements of above-ground live biomass and total dead matter were made approximately monthly from April 1968 to April 1969. Below-ground biomass was also measured, but the data are not reported in this data set.

Annual above-ground net primary production (ANPP) was estimated by several calculation methods, including peak total live plus current dead matter; sum of species maxima (biomass + dead material); single square clippings; and variations of these equations. The rate of disappearance of dead material and mortality were also determined. Mean ANPP estimates ranged from 324 g/m²/yr (max live + dead) to 430 g/m²/yr (taken as the mean of the two sites accounting for disappearance of dead matter).

Revision Notes:

Only the documentation for this data set has been modified. The data files have been checked for accuracy and are identical to those originally published in 1997.

Additional Documentation:

The Net Primary Productivity (NPP) data collection contains field measurements of biomass, estimated NPP, and climate data for terrestrial grassland, tropical forest, temperate forest, boreal forest, and tundra sites worldwide. Data were compiled from the 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 (Olson 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.html.

Data Citation:

Cite this data set as follows:

Wallentinus, H.G., and G. Tyler. 2014. NPP Grassland: Tullgarnsnaset, Sweden, 1968-1969, R1. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/196>

This data set was originally published as:

Wallentinus, H.G., and G. Tyler. 1997. NPP Grassland: Tullgarnsnäset, Sweden, 1968-1969. Data set. Available on-line [<http://daac.ornl.gov>] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A.

Table of Contents:

- [1 Data Set Overview](#)
- [2 Data Description](#)
- [3 Applications and Derivation](#)
- [4 Quality Assessment](#)
- [5 Acquisition Materials and Methods](#)
- [6 Data Access](#)
- [7 References](#)

1. Data Set Overview:

Project: Net Primary Productivity (NPP)

Productivity of two seashore meadow plots dominated by the saltmeadow rush *Juncus gerardii* were studied at Tullgarnsnaset, near Stockholm, Sweden. The study site (approximately 59.20 N, 17.50 E) is located just above sea level on the Naset peninsula, about 45-km southwest of Stockholm. It is typically grazed by cattle, with a growing season of about 210 days.

Measurements of above-ground live biomass and total dead matter were made at the two ungrazed sites (sites 2 and 4) approximately monthly from April 1968 to April 1969. Detailed data for at least five species categories are available in the literature. Below-ground biomass was measured, but the data are not reported.

Annual above-ground net primary production (ANPP) was estimated by several methods, including peak total live plus current dead matter; sum of species maxima (biomass + dead material); single square clippings; and variations of these equations. The rate of disappearance of dead material and mortality were also determined. Mean ANPP estimates ranged from 324 g/m²/yr (max live + dead) (Wallentinus, 1973) to 430 g/m²/yr (taken as the mean of the two sites accounting for disappearance of dead matter) (Esser et al., 2013; Scurlock and Olson, 2012; Wallentinus, 1973). ANPP was also calculated from the mean estimates of the two sites (accounting for disappearance of dead matter) and converted to gC/m²/yr using a conversion factor of 0.45 (Olson et al., 2013a; b). The Olson et al. (2013a; b) value generally agrees with the higher Wallentinus (1973) value; the difference is due to rounding.

In the absence of a long-term climate data set for this site, an alternative climate data set is provided for Stockholm, Sweden (59.4 N 18.0 E).

2. Data Description:

Spatial Coverage

Site: Tullgarnsnaset, Sweden

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

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Elevation (m)
Tullgarnsnaset, Sweden	17.50	17.50	59.20	59.20	0.15

Site Information

Temporal Coverage

Above-ground biomass measurements were made from 1968/04/12 through 1969/04/24. Climate data are available from 1951/01/01 through 1990/12/31.

Temporal Resolution

Above-ground biomass measurements were made approximately monthly. All biomass estimates are based on plant dry matter accumulation, expressed as g/m². Climate data are expressed as monthly and annual precipitation amounts (mm) and monthly and annual average maximum/minimum temperature (C). Monthly and annual climatic means are provided for the 1951-1990 period.

Data File Information

Table 2. Data files and descriptions

FILE NAME	TEMPORAL COVERAGE	FILE CONTENTS
tll1_npp.txt	1968/04/12 - 1969/04/24	Above-ground biomass data for an ungrazed seashore meadow (site no. 2) at Tullgarnsnaset, Sweden
tll2_npp.txt	1968/04/12 - 1969/04/24	Above-ground biomass data for an ungrazed seashore meadow (site no. 4) at Tullgarnsnaset, Sweden
		Monthly and annual climate data from weather station

tll_cii.txt	1951/01/01 - 1990/12/31	near Stockholm (stc), Sweden
-------------	-------------------------	------------------------------

NPP Data. Above-ground biomass estimates for Tullgarnsnaet are provided in two files, one for each study site. The data sets are ASCII files (.txt format). The first 18 lines are metadata; data records begin on line 19. The variable values are delimited by semicolons. The value -999.9 is used to denote missing values. All biomass units are in g/m² (dry matter weight).

COLUMN HEADING	DEFINITION	UNITS
Site	Site where data were gathered (code refers to site identification)	Text
Treatmt	Long term management of site (code refers to treatment described in metadata in data file; number refers to study site)	
Year	Year in which data were collected	Numeric
Mn	Month in which data were collected	
Dy	Day on which data were collected	
Tyear	Date in decimal year (year plus the Julian date divided by 365)	
AGbiomass	Monthly above-ground living biomass	g/m ²
Stdead	Monthly above-ground standing dead biomass	
litter	Monthly litter biomass	
AGtotmatter	Monthly total above-ground biomass (live + dead + litter material)	

Sample NPP Data Record <tll1_npp.txt>

```
tll;lngt_1 ;1968;04;12;1968.282;-999.9;-999.9; 356.9; 356.9
tll;lngt_1 ;1968;05;22;1968.392; 44.7; 1.8; 352.0; 398.5
tll;lngt_1 ;1968;06;16;1968.460; 164.0; 3.7; 221.4; 389.1
...
```

Sample NPP Data Record <tll2_npp.txt>

```
tll;lngt_2 ;1968;04;12;1968.282;-999.9;-999.9; 466.9; 466.9
tll;lngt_2 ;1968;05;22;1968.392; 61.0; 2.1; 456.8; 519.9
tll;lngt_2 ;1968;06;16;1968.460; 182.4; 4.5; 260.0; 446.9 ...
```

Climate Data. The climate data set is an ASCII file (.txt format). The first 18 lines are metadata; data records begin on line 19. The variable values are delimited by semi-colons. The value -999.9 is used to denote missing values.

COLUMN HEADINGS	DEFINITION
Site	3-character code for the weather station based on the first three consonants in the site name (e.g., stc for the weather station near Stockholm (stc), Sweden)
Temp (Temporal)	Indicates whether the values in that row are either long-term (i.e, multi-year) or annual data for the specified parameter. For multi-year, the values are: mean=mean values (monthly and annual) calculated for the years of data as noted in the documentation numb=number of years of data included in a reported mean value stdv=standard deviation of a mean value Annual data: 19XX=monthly and annual parameter values for the specified year (e.g., 1972)
Parm	Parameter, indicates the meteorological data reported in that row. prec-total precipitation for the month or year tmax=maximum temperature for the month or year reported in degrees C tmin=minimum temperature for the month or year reported in degrees C

Description of specific Temp and Parm data values:

Long-term data:

site;mean;prec;

Multi-year mean of total precipitation for each month [Jan, Feb, Mar, ..., Dec] and mean of total annual precipitation across all years [Year] (mm)

site;mean;tmax;

Multi-year mean of maximum temperature for each month [Jan, Feb, Mar, ..., Dec] and mean of annual maximum temperature across all years [Year] (C)

site;mean;tmin;

Multi-year mean of minimum temperature for each month [Jan, Feb, Mar, ..., Dec] and mean of annual minimum temperature across all years [Year] (C)

... site; numb and stdv; repeat for prec, tmax, and tmin;

Annual data:

site;19XX;prec;

Total precipitation for each month [Jan, Feb, Mar,.....Dec] and total precipitation for the year 19XX [Year] (mm)

site;19XX;tmax;

Maximum temperature for each month [Jan, Feb, Mar,.....Dec] and maximum for the year 19XX [Year] (C)

site;19XX;tmin;

Minimum temperature for each month [Jan, Feb, Mar,.....Dec] and minimum for the year 19XX [Year] (C)

... site;19XX;(prec, tmax, and tmin); repeat for reported years.

Annual data missing value note: If a monthly parm value is missing, the parm value for [Year] is also set to missing (-999.9).

Sample Climate Data Record

```
stc ;mean;prec; 38.9; 30.1; 25.1; 29.9; 30.0; 46.6; 68.4; 68.1; 53.8; 52.0; 51.6; 46.1; 537.0
stc ;mean;tmax; -0.2; -0.4; 2.9; 8.0; 14.7; 19.8; 21.3; 19.8; 15.3; 9.9; 4.3; 1.2; 21.7
stc ;mean;tmin; -4.6; -5.4; -3.3; 0.8; 5.9; 11.0; 12.9; 12.6; 8.7; 4.9; 0.5; -2.6; -6.6
stc ;numb;prec; 36; 36; 36; 37; 37; 37; 37; 36; 36; 36; 37; 35; 32
stc ;numb;tmax; 36; 36; 36; 37; 37; 37; 37; 36; 36; 37; 37; 35; 33
stc ;numb;tmin; 36; 36; 36; 37; 37; 37; 37; 36; 36; 37; 37; 35; 33
stc ;stdv;prec; 17.3; 17.5; 14.6; 14.5; 19.6; 24.8; 46.8; 35.2; 28.4; 35.2; 21.5; 24.7; 105.4
stc ;stdv;tmax; 2.7; 3.2; 2.5; 1.5; 1.3; 1.5; 1.5; 1.5; 1.2; 1.2; 1.7; 2.2; 1.3
stc ;stdv;tmin; 2.7; 3.2; 2.5; 1.5; 1.3; 1.5; 1.5; 1.5; 1.2; 1.2; 1.7; 2.2; 2.5
stc ;1951;prec; 35.0; 48.0; 44.0; 30.0; 4.0; 62.0; 45.0; 69.0; 55.0; 3.0; 49.0; 29.0; 473.0
stc ;1951;tmax; -0.6; 1.3; 0.3; 8.4; 12.7; 18.8; 20.7; 21.0; 16.8; 11.1; 6.1; 4.3; 21.0
stc ;1951;tmin; -5.0; -3.7; -5.9; 1.2; 3.9; 10.0; 12.3; 13.8; 10.2; 6.1; 2.3; 0.5; -5.9
...
```

Where,

Temp (temporal) - specific year or long-term statistic:

mean = mean based on all years

numb = number of years

stdv = standard deviation based on all years

Parm (parameter):

prec = precipitation for month or year (mm)

tmax = mean maximum temperature for month or year (C)

tmin = mean minimum temperature for month or year (C)

3. Data Application and Derivation:

The accumulation of biomass, or NPP, is the net gain of carbon by photosynthesis that remains after plant respiration. Annual above-ground net primary production was estimated for the seashore meadows by several calculation methods, including peak total live plus current dead matter; sum of species maxima (biomass + dead material); single square clippings; and variations of these equations. The long-term effect of grazing on species composition and productivity was also analyzed (Wallentinus, 1973).

The grassland monthly biomass dynamics data for the Tullgarnsna site are provided for comparison with models and estimation of NPP. Climate data are provided for use in driving ecosystem/NPP models.

4. Quality Assessment:

Comparisons with other investigations were made. See Wallentinus (1973) for discussion.

Sources of Error

Since the plots that were clipped were not distributed randomly, statistical analysis was not advised. In spite of this, data for standard deviation and standard error were calculated when possible to give an idea of the variation of the material. Also, since the squares in each clipping site were laid side by side in two strains, a clipping error in one square could cause a corresponding error in the neighboring square (Wallentinus, 1973).

5. Data Acquisition Materials and Methods:

Site description

The Tullgarnsnaset seashore meadows are located on the Näset peninsula on the northern Baltic Sea, about 45-km southwest of Stockholm, near the Royal Palace of Tullgam. The salinity of the seawater is 5-6.5 parts per hundred. The sites on the seashore meadow chosen for clipping vegetation had their lowest point at 15 cm above the statistical mean water level.

The grassland is classified as a modified Bailey ecoregion oceanic meadow (#241). The quantitatively most important species clipped were *Juncus gerardii*, *Plantago maritima*, *Agrostis stolonifera*, *Festuca rubra*, and *Glaux maritima*. Grazing of the seashore meadow by cattle typically occurs from the beginning of June until the end of September, except inside fenced enclosures during this study.

Soil type is heavy clay (sand/silt/clay 0.20/0.20/0.60). Soil carbon content is 0.5-3.0% OM (5-10 cm), 0-0.4% (10-20 cm).

The sampling areas consisted of six squares, 25 x 25-cm each, lying side by side in two rows, making a total area of 50 x 75 cm (3/8 m²).

Methods

On the seashore meadow, two sampling areas were chosen. At each area, one site was fenced and one site was left to be grazed. The grazed sites were numbered 1 and 3 and the ungrazed sites 2 and 4. Only data from ungrazed sites (#2 and #4) are presented here.

Living, dead, and decomposing plant material was harvested by repeated clipping during the growing season from April 1968 to April 1969. Four sets of squares were clipped on each clipping day, one set in each site. Each set consisted of six squares, 25 x 25-cm, lying side by side in two rows, making a total area of 50 x 75 cm (3/8 m²). The clipping sites were not chosen at random because of the patchiness of the vegetation.

Above-ground biomass (green material), current dead material (material that had died between two clippings), and litter (material that had died before the preceding clipping) were collected. The above-ground material were separated into species vegetation and litter. The species vegetation was divided into green matter and current dead matter. Samples were dried (+85 degrees C). Regrowth in the clipped squares was studied in October.

Annual ANPP was calculated according to various methods: peak biomass plus dead matter; sum of species maxima; and increments of biomass plus dead matter. Several methods were used to account for disappearance of dead matter. Below-ground biomass was harvested and measured, but data are not reported herein.

Climate data

The climate data accompanying this NPP data set was compiled from a weather station near Stockholm, Sweden (59.4 N, 18.0 E) for the period 1951-1990. The precise location of the weather station is not available. The elevation of the weather station is thought to be 52 m.

A climate data set is provided for Stockholm, Sweden (59.4 N, 18.0 E) because a long-term climate data set for the Tullgarnsnaset site was not available.

For a given month, the maximum value of the daily Tmax for that month and the minimum value of the Tmin for that month is provided. For the year, the maximum value of the monthly Tmax is the annual Tmax and for the year the minimum value of the monthly Tmin values is the annual Tmin. Daily precipitation amount is summed to yield a monthly precipitation amount and the monthly precipitation is summed to provide an annual precipitation amount.

The multi-year mean monthly Tmax is the average of the Tmax values for that month for each year of the record. For example the mean monthly Tmax for April is the mean of each April's Tmax for the observation period of record. Mean monthly Tmin and Mean monthly precip amount are calculated similarly.

6. Data Access:

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

Data Archive:

Web Site: <http://daac.ornl.gov>

Contact for Data Center Access Information:

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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Additional Sources of Information:

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 - Field Campaigns
 - Validation
 - Regional/Global
 - Model Archive
- Data**
 - Complete Data Set List
 - Search for Data
 - Field Campaigns
 - Validation
 - Regional/Global
 - Model Archive
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