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Shrubland Species Cover, Biometric, Carbon and Nitrogen Data, Southern Idaho, 2014

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Documentation Revision Date: 2017-12-21

Data Set Version: V1

Summary

This dataset provides the results of the characterization of shrubland vegetation at two study areas in southern Idaho, USA: the Reynolds Creek Experimental Watershed (RCEW) and Hollister. Data were collected in September and October 2014. In each study area, several 10-m x 10-m plots were randomly established that are representative of the local dominant vegetation types. Measurements are reported for both plot and individual shrub attributes. Plot measurements include shrub density and biometric data, percent shrub cover derived from line intercept transects, percent plant species and bare ground cover derived from photo analysis, and average LAI. Measurements for selected individual shrubs include height, width, length, number of stems, and LAI. Leaf samples were collected for determining LAI, specific leaf area (SLA), carbon and nitrogen concentrations, and isotopic nitrogen and carbon.

There are eight data files in comma-separated (.csv) format with this dataset. In addition, there are 835 plot photos included as companion files.

Figure 1. Typical plot photo for ground cover estimates and location of LAI measurements. A rangepole with GPS and a camera boom was positioned at 2-meter intervals along plot transects. This photo is from the Hollister, Sagebrush01 plot, and the Sagebrush01_5_4 sampling point.

Citation

Glenn, N.F., L.P. Spaete, R. Shrestha, A. Li, N. Ilangakoon, J. Mitchell, S.L. Ustin, Y. Qi, H. Dashti, and K. Finan. 2017. Shrubland Species Cover, Biometric, Carbon and Nitrogen Data, Southern Idaho, 2014. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1503

Table of Contents

1. Data Set Overview

This dataset provides the results of the characterization of shrubland vegetation at two study areas in southern Idaho, USA: the Reynolds Creek Experimental Watershed (RCEW) and near Hollister. Data were collected in September and October 2014. In each study area, several 10-m x 10-m plots were randomly established that are representative of the local dominant vegetation types. Measurements are reported for both plot and individual shrub attributes. Plot measurements include shrub density and biometric data, percent shrub cover derived from line intercept transects, percent plant species and bare ground cover derived from photo analysis, and average LAI. Measurements for selected individual shrubs include height, width, length, number of stems, and LAI. Leaf samples were collected for determining LAI, specific leaf area (SLA), carbon and nitrogen concentrations, and isotopic nitrogen and carbon.

Related Dataset:

Ilangakoon, N., N. Glenn, and L. Spaete. 2017. LiDAR Data, DEM, and Maximum Vegetation Height Product from Southern Idaho, 2014. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1532

Acknowledgements:

2. Data Characteristics

Spatial Coverage: Two sites in Southwestern Idaho, USA: Reynolds Creek Experimental Watershed (RCEW) and Hollister, Idaho

Spatial Resolution: Measurements were made on 10 x 10-m plots

Temporal Coverage: 2014-09-16 to 2014-10-17

Temporal Resolution: One-time measurements

Study Area (All latitude and longitude given in decimal degrees)

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Southwestern Idaho, USA: Reynolds Creek Experimental Watershed (RCEW) and Hollister	-116.7973311	-114.6888979	43.20984103	42.2990094

Data File Information:

There are eight csv data files in this dataset. There are also 835 plot photos included as companion files, provided in **Idaho_field_shrub_photos.zip**.

Plots were numbered and plot locations are named by the plot number and transects which ran north to south at 1, 3, 5, 7, & 9 meters from the southwest corner, and according to where the samples were taken along each transect at 2, 4, 6, and 8 meters.

Example plot and location: Plot= Bitterbrush01, Plot location= Bitterbrush1_1_2.

Table 1. **Data files and descriptions**

File name	Description
Idaho_Shrub_Plot_LAI_All.csv	LAI measurements taken at 20 points along the transects in each plot
Idaho_Shrub_Plot_LAI_Plot_Mean.csv	Mean LAI for each plot
Idaho_Shrub_RTK_GPS_PhotoPlot_LAI_Points.csv	Location of the 20 points along the transects where LAI measurements and plot photos were taken. Includes photo file name for each point.
Idaho_Shrub_Photo_Plot_Species_Cover.csv	Species coverage determined from plot photo analysis for each plot
Idaho_Shrub_Line_Intercept_Shrub_Cover.csv	Species coverage determined using line intercept method along the transects in each plot
Idaho_Shrub_Density.csv	Species, height, and width of all shrubs in each plot
Idaho_Shrub_Individuals	Measurements made on individual randomly-chosen dominant species shrubs in the plots
Idaho_Shrub_RTK_GPS_Plot_Corners.csv	GPS locations of the plot corners

Table 2. **Idaho_Shrub_Plot_LAI_All.csv**

Provides LAI measurements taken at 20 points along the transects in each plot. There are no missing values.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and Hollister

year	YYYY	The year the data were collected (all are 2014)
plot		The plot name
location		The location along the transect each sample LAI was taken in each 10-m x 10-m plot. Samples were taken along each transect at 2, 4, 6, and 8 meters (locations are illustrated as red dots in Figures 1 and 2)
average_above_par	µmol m-2s-1	Average above canopy photosynthetically active radiation
average_below_par	µmol m-2s-1	Average below canopy photosynthetically active radiation
tau		Tau: the ratio of below canopy PAR measurements to the most recent above canopy PAR value
lai		LAI: the area of leaves per unit area of soil surface
leaf_distribution		The distribution of leaf angles within a canopy (default value =1)
beam_fraction		The ratio of direct beam radiation coming from the sun to radiation coming from all ambient sources (e.g. atmosphere or reflected from other surfaces)
zenith_angle		The angle the sun makes with respect to the zenith, or the point in the sky directly overhead, vertical to where you stand. Calculated using time of day and latitude and longitude
latitude_lai	Degrees	Latitude used for LAI calculation. Do not use for location
longitude_lai	Degrees	Longitude used for LAI calculation. Do not use for location

Table 3. Variables in the file **Idaho_Shrub_Plot_LAI_Plot_Mean.csv**

Provides the mean LAI from LAI measurements made at the 20 points in the plots (refer to Table 4)**.** There are no missing values.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and Hollister
year	YYYY	The year the data were collected (all are 2014)
plot		The plot name
average_above_par	µmol m-2s-1	The average of the average above canopy photosynthetically active radiation for the plot
average_below_par	µmol m-2s-1	The average of the average below canopy photosynthetically active radiation for the plot
average_tau		The average Tau for the plot (Tau: the ratio of below canopy PAR measurements to the most recent above canopy PAR value)
average_lai		The average LAI for the plot (LAI: the area of leaves per unit area of soil surface)
leaf_distribution		The average leaf distribution for the plot (The distribution of leaf angles within a canopy (default value =1))
average_beam_fraction		The average beam fraction for the plot (The ratio of direct beam radiation coming from the sun to radiation coming from all ambient sources (e.g. atmosphere or reflected from other surfaces))
zenith_angle		The average zenith area for the plot (the angle the sun makes with respect to the zenith, or the point in the sky directly overhead, vertical to where you stand. Calculated using time of day and latitude and longitude)
latitude_lai	Degrees	Latitude used for LAI calculation. Do not use for location
longitude_lai	Degrees	Longitude used for LAI calculation. Do not use for location

Table 4. Variables in the file **Idaho_Shrub_RTK_GPS_PhotoPlot_LAI_Points.csv**

Provides the RTK GPS points where LAI measurements and photos were taken. There are no missing values.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and HollisterD

year	YYYY	The year the data were collected (all are 2014)
plot		The plot name
lai_sample_point		The location along the transect in 10 x 10 m plots where each LAI sample was obtained. Transects ran north to south at 1, 3, 5, 7, & 9 meters from the southwest corner. Samples were taken along each transect at 2, 4, 6, and 8 meters
northing	Meters	Northing UTM zone 11N NAD83 datum
easting	Meters	Easting UTM zone 11N NAD83 datum
longitude	Decimal Degrees	Longitude in WGS84 of photo plot and LAI transect sample
latitude	Decimal Degrees	Longitude in WGS84 of photo plot and LAI transect sample
elevation	Meters	Elevation in ortho height [NAVD88 (computed using (Geoid2012a)]
photo_id		Photo number used for photo plot species cover. Photos are provided in **Idaho_field_shrub_photos.zip**.

Table 5. Variables in the file **Idaho_Shrub_Photo_Plot_Species_Cover.csv**

Provides species coverage at the plots determined from photo analysis. There are no missing values. Symbols for plant species (e.g., CHVI8) are from the USDA, NRCS, PLANTS Database.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and Hollister. Photos were collected on 1 m transects at red dots- 2, 4, 6, and 8 meters (Refer to Figure 2)
Year	YYYY	The year the data were collected (all are 2014)
Plot		The plot name
cover_ARTRL	%	Percent coverage of plot from 0-100 of sagebrush live
cover_ARTRD	%	Percent coverage of plot from 0-100 of sagebrush dead
cover_CHVI8L	%	Percent coverage of plot from 0-100 of rabbitbrush live
cover_CHVI8D	%	Percent coverage of plot from 0-100 of rabbitbrush dead
cover_PUTRL	%	Percent coverage of plot from 0-100 of bitterbrush live
cover_PUTRD	%	Percent coverage of plot from 0-100 of bitterbrush dead
cover_ UnShL	%	Percent coverage of plot from 0-100 of unknown shrub live
cover_UnShD	%	Percent coverage of plot from 0-100 of unknown shrub dead
cover_TESP2	%	Percent coverage of plot from 0-100 of horsebrush
cover_ BRTE	%	Percent coverage of plot from 0-100 of cheatgrass
cover_POSE	%	Percent coverage of plot from 0-100 of sandberg's bluegrass
cover_ELEL	%	Percent coverage of plot from 0-100 of squirreltail
cover_AGDE	%	Percent coverage of plot from 0-100 of desert wheatgrass
cover_PSSP	%	Percent coverage of plot from 0-100 of bluebunch wheatgrass
cover_UnGr	%	Percent coverage of plot from 0-100 of unknown grass
cover_DWD	%	Percent coverage of plot from 0-100 of dead woody debris
cover_Forb	%	Percent coverage of plot from 0-100 of forbes
cover_Bare	%	Percent coverage of plot from 0-100 of bare soil

cover_Rock	%	Percent coverage of plot from 0-100 of rocks or stone
cover_Moss	%	Percent coverage of plot from 0-100 of moss
cover_Body	%	Percent coverage of plot from 0-100 of person taking picture
cover_Litter	%	Percent coverage of plot from 0-100 of organic material not DWD
cover_Scat	%	Percent coverage of plot from 0-100 of animal scat

Table 6. Variables in the file **Idaho_Shrub_Line_Intercept_Shrub_Cover.csv**

Species coverage determined using line intercept method along the transects. Data not provided are represented as -9999.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and Hollister, ID. Coverage was determined along five transects (green lines in Figure 2)
year	YYYY	The year the data were collected (all are 2014)
plot		The plot name
sagebrush_dead	%	Percent coverage of plot from 0-1 of sagebrush dead
sagebrush_live	%	Percent coverage of plot from 0-1 of sagebrush live
bitterbrush_dead	%	Percent coverage of plot from 0-1 of bitterbrush dead
bitterbrush_live	%	Percent coverage of plot from 0-1 of bitterbrush live
rabbitbrush_dead	%	Percent coverage of plot from 0-1 of rabbitbrush dead
rabbitbrush_live	%	Percent coverage of plot from 0-1 of rabbitbrush live
snowberry_dead	%	Percent coverage of plot from 0-1 of snowberry dead
snowberry_live	%	Percent coverage of plot from 0-1 of snowberry live
unknown_dead	%	Percent coverage of plot from 0-1 of unknown shrub dead
unknown_live	%	Percent coverage of plot from 0-1 of unknown shrub live
Total_Shrub_Cover	%	Percent coverage of plot from 0-1 of all shrubs

Table 7. Variables in the file **Idaho_Shrub_Density.csv**

Provides shrub density at the plots. There are no missing values.

Variable ID	Units	Description
study_area		Study area where the data were collected: Reynolds Creek Experimental Watershed (RCEW) and Hollister
year		The year the data were collected (all are 2014)
plot		The plot name
plot_transect		The species name_transect number. The transect interspace (blue and white areas in Figure 2) where the shrub height and width data were collected from: 0-1 m, 1-3 m, 3-5 m, 5-7 m, 7-9 m, and 9-10 m
species		The shrub species indicated as live (L) or dead (D). First letter is shrub species (S = sagebrush, B = bitterbrush, R =rabbitbrush, H = horsebrush, Service = Serviceberry (only Live), Juniper = Juniper and U = Unknown Shrub) and last letter is Live or Dead (i.e. SL = Sagebrush Live)
height	cm	The maximum height of the shrub not including flowering or seed stocks
major_width	cm	The maximum width of each shrub
minor_width	cm	The width perpendicular to the major width

Table 8. Variables in the file **Idaho_Shrub_Individuals.csv**

Provides measurements made from six random individual dominant species at the plots. Missing values or those not provided are reported as -9999.

Variable ID	Units	Description
study_area		Study area where the data were collected. Reynolds Creek Experimental Watershed (RCEW) and Hollister
year	YYYY	The year the data were collected (all are 2014)
plot		The plot name
individual		Measurements taken from six random shrubs (individuals) in the 10 m x 10 m plots.
species		The species of the shrub sampled (Sagebrush, Bitterbrush, Rabbitbrush)
easting	Meters	Easting UTM zone 11N NAD83 datum
northing	Meters	Northing UTM zone 11N NAD83 datum
longitude	Decimal Degrees	Longitude in WGS84 of individual samples
latitude	Decimal Degrees	Latitude in WGS84 of individual samples
elevation	meters	Elevation in Ortho Height [NAVD88 (computed using (Geoid2012a)]
height	cm	The maximum height of the shrub not including flowering or seed stocks.
shrub_max_width	cm	The maximum width of each shrub.
width_perpendicular_to_max	cm	The width perpendicular to the major width.
average_diameter	cm	Average diameter of stem measured at soil surface. Each stem was measured and then averaged for each individual.
number_stems		Number of stems leaving the ground for each individual
lai		LAI: the area of leaves per unit area of soil surface taken for each individual
total_leaf_area		The total leaf area of a subset of leaves taken from each individual shrub. Each subset was selected based on an ocular assessment of leaf size distribution in the field.
wet_weight	mg	The weight of the leaf samples used for total leaf area calculation before drying (obtained from leaf samples of the six shrubs)
dry_weight	mg	The weight of the leaf samples used for total leaf area calculation after drying for 48 hrs at 70 degrees C (obtained from leaf samples of the six shrubs)
sla	m2/g	Specific Leaf Area (SLA)
c	%	Percent Carbon per 100 gram sample (obtained from leaf samples of the six shrubs)
d13c	‰ PDB	d13C (‰ PDB) (obtained from leaf samples of the six shrubs)
n	%	Percent nitrogen per 100 gram sample (obtained from leaf samples of the six shrubs)
d15n	‰ AIR	d15N (‰ AIR) (obtained from leaf samples of the six shrubs)
Note		Any comments regarding the processing of leaf samples.

Table 9. Variables in the file **Idaho_Shrub_RTK_GPS_Plot_Corners.csv**

Provides the RTK GPS of the plot corners. There are no missing values.

Variable ID	Units	Description
study_Area		Study area where the data were collected. Reynolds Creek Experimental Watershed (RCEW) and Hollister
year	YYYY	The year the data were collected (all are 2014)

plot		The plot name
Plot_Corner		The plot corner (NE, NW, SW, SE)
northing	Meters	Northing UTM zone 11N NAD83 datum
easting	Meters	Easting UTM zone 11N NAD83 datum
longitude	Decimal Degrees	Longitude in WGS84 of plot corner
latitude	Decimal Degrees	Longitude in WGS84 of plot corner
elevation	Meters	Elevation in Ortho height [NAVD88 (computed using (Geoid2012a)]

3. Application and Derivation

This vegetation field plot data can be used to investigate rangeland ecosystem dynamics. The sampling design is well-suited for multi-scale vegetation analyses with remote sensing.

4. Quality Assessment

An independent data quality assessment was not performed. Data sheets were reviewed for completeness, including transcription errors.

5. Data Acquisition, Materials, and Methods

Study Areas

There were two study areas located in southwestern Idaho: Reynolds Creek Experimental Watershed (RCEW) (http://criticalzone.org/reynolds/about/) and Hollister. Forty two 10 x 10-m plots were established in the two study areas. Data were collected between September 16, 2014 and October 17, 2014.

Plot Establishment

Plots were randomly located and corners were marked with half inch rebar. From the initial point, an additional point was located either east or west 10 m and then the final two corners were established to the north of this axis. Real time kinematic (RTK) GPS locations of each corner were collected using a Topcon HiperV RTK GPS. A base GPS was used to collect a static position for at least two hours and a rover GPS unit was used to collect plot locations. The static locations were post processed using OPUS and Magnet Tools was used to apply post processed locations to the GPS locations.

Within each plot, five (5) transects were established at 1, 3, 5, 7, and 9 meters from the southwest corner. Four sampling points were identified (every two meters) along each transect, providing a total of twenty gridded sampling points throughout the plot (see Figure 2).

Plots were named by the dominate plant species and numbered consecutively. Plot sampling points are named by the plot number, transect number (which ran north to south at 1, 3, 5, 7, 9 meters from the southwest corner), and location along transect (at 2, 4, 6, and 8 meters). Example plot and location: Plot= Bitterbrush01, Plot location= Bitterbrush1_1_2.
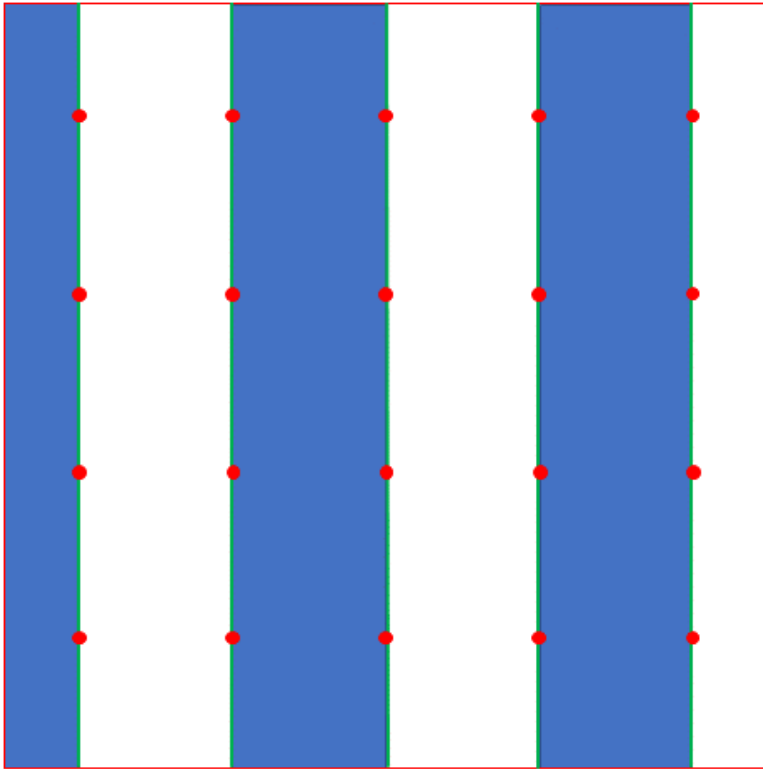
Figure 2. Plots were 10 by 10 meters with transects at 1, 3, 5, 7, and 9 meters. Sampling points were located every 2 meters along each transect.

Measurements at Sampling Points

Photos for ground cover

Plot photos were taken along the transects at the 2, 4, 6, and 8 m sampling points. A rangepole was positioned with a camera boom extending easterly (at each red dot). Locations were recorded with RTK GPS.

Plant species and bare ground percent cover were derived from photo plot analysis.

LAI measurements

LAI measurements were collected at each of the 20 sampling points along the transects using an AccuPAR LP – 80.

Measurements along Transects

Line intercept transects

Species coverage (percent) was derived from line intercept transects. Start and stop locations along 1-m transects were recorded for each shrub species. For example, if there were a sagebrush directly below the transect from 40 cm to 160 cm and a rabbitbrush from 90 cm to 150 cm, the beginning and ending of each would be recorded regardless of overlap.

Species density

Species density was derived by counting all the shrubs between the 0 and 1 m transect line, 1 to 3, 3 to 5, 5 to 7, 7 to 9, and 9 to 10 m lines. The species, major width, and minor width were recorded.

Measurements from individual shrubs

Six individual, random shrubs were chosen for measurements at the plots from the inter-transect areas. Dominant species were selected. At sagebrush plots, a sagebrush was selected, at rabbitbrush plots, a rabbitbrush was selected.

LAI

LAI was also determined for the six individuals. Ten measurements were taken above canopy and 10 below canopy for each shrub. Special care was taken to ensure that light and cloud characteristics remained similar for each measurement.

Specific Leaf Area

Green leaf samples randomly clipped from different portions of each individual random shrub. Samples were scanned with an Epson V600 scanner to determine total leaf area. Samples were then weighed, oven-dried at 70 degrees C for 48 hours, and weighed again to get weight and dry weights respectively. Total leaf area was divided by dry weight to derive SLA.

Foliar carbon and nitrogen

Carbon and Nitrogen were determined for each individual shrub (six random shrubs) using the SLA samples. Samples were ground in a Wiley mill and foliar N and C concentration were measured using a thermo Delta V Plus IRMS (for isotopic nitrogen and carbon) coupled to a Costech ECS 4010 elemental analyzer (Stable Isotope Laboratory, Boise State University).

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Shrubland Species Cover, Biometric, Carbon and Nitrogen Data, Southern Idaho, 2014

Contact for Data Center Access Information:

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

7. References

USDA, NRCS. 2017. The PLANTS Database (http://plants.usda.gov, 30 November 2017). National Plant Data Team, Greensboro, NC 27401-4901 USA.

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