

## Information on Data Collection and Organization from the SGS-LTER

This data package was produced by researchers working on the Shortgrass Steppe Long Term Ecological Research Project. This project was supported by National Science Foundation from 1982-2014. This data package includes one or more tab-delimited data tables, tab-delimited files that denote header definitions and data types for each column, and detailed metadata within an Ecological Metadata Language document (i.e. XML). Example image files of plots, digital datasheets, or schematics of the experimental design may also be included when applicable.

Background information on the SGS-LTER project is contained in related series of objects within the Digital Collections of Colorado and the Colorado State University archives. Together data packages and other background information, and items such as images, proposals, and reports contribute to a comprehensive SGS-LTER collection.

The data tables and associated EML documents represent components of the LTER data package, which may be discovered and accessed through secondary repositories serving specific ecosystem science domains (e.g. PASTA (LTER Network Repository), DataONE, or The Knowledge Network for BioComplexity).

*The following information is copied from the SGS-LTER field protocols to provide specific details on how these data were collected.*

### **ARS #03 Vegetation Sampling for Humus Experiment** **(Overlaid on Ecosystem Stress Area, ESA)**

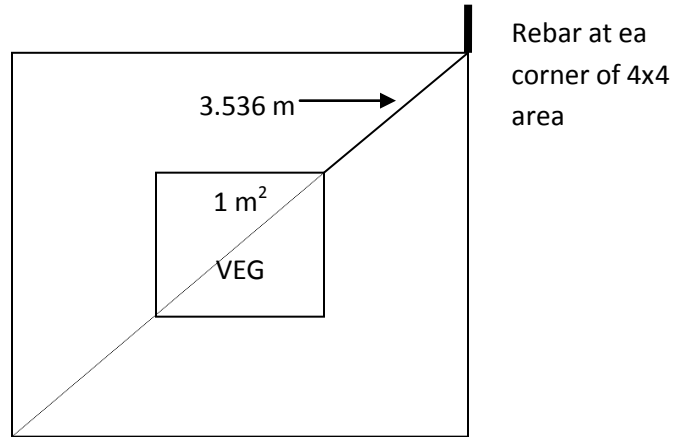
**Principal Investigator:** Ingrid Burke

**Study Objective:** to collect plant species composition and above ground NPP for the humus project.

**Study Area Location (please see following page):** This sampling is conducted on transects overlaid onto the historical ESA plot treatments to the west of the LTER Headquarter Buildings and to the north of WCR 114. It is important to record both the historical treatment and recent humus treatment on each data sheet when sampling.

#### **Experimental Design:**

- 2 blocks (east and west)
- 4 historical treatments in each block
- 3 transects in each treatment
- 6 plots with new sub-treatments in each transect
- Sample once per year at end of growing season
- Individual sample size is 1 m<sup>2</sup>



### Humus Plot Layout

2 reps (blocks) → E = East, W= West (historic ESA treated plots)

3 transects in each block → 1,2,3

6 sub-plots within each transect → 1,2,3,4,5,6 sub-plots are marked in the field with an engraved orange cap on the sw corner rebar of 3 m<sup>2</sup> area sub-plot.

Plot nomenclature example:

EN11

East, Nitrogen, transect 1, control

<p>This area not used for study.</p> <p>Humus treatments codes for sub-plots</p> <p>1=Control</p> <p>2=Sugar</p> <p>3=Lignin</p> <p>4=Sawdust</p> <p>5=Lignin + Sugar</p> <p>6=Sawdust + Sugar</p>	<p><b>E Nitrogen</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/3/6/1/2 <b>2</b></p> <p>1/2/6/3/4/5 <b>3</b></p>
<p><b>E Water + Nitrogen</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/1/3/6/5/2 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>	<p><b>E Water</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>2/1/6/3/5/4 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>
<p><b>E Control</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/3/6/1/2 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>	<p><b>W Water + Nitrogen</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/3/6/1/2 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>
<p><b>W Water</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/1/3/6/2 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>	<p><b>W Nitrogen</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/3/6/1/2 <b>2</b></p> <p>5/4/3/6/2/1 <b>3</b></p>
<p><b>W Control</b></p> <p>3/5/4/2/6/1 <b>1</b></p> <p>4/5/3/6/1/2 <b>2</b></p> <p>4/5/3/6/2/1 <b>3</b></p>	<p>This area not used for study</p>

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**Equipment:**

Meter square quadrat frame

Point frame

Data sheets (one for density and basal cover; one for canopy cover)

Plant ID reference material

Digital camera

Nails for plot markers

Meter tape

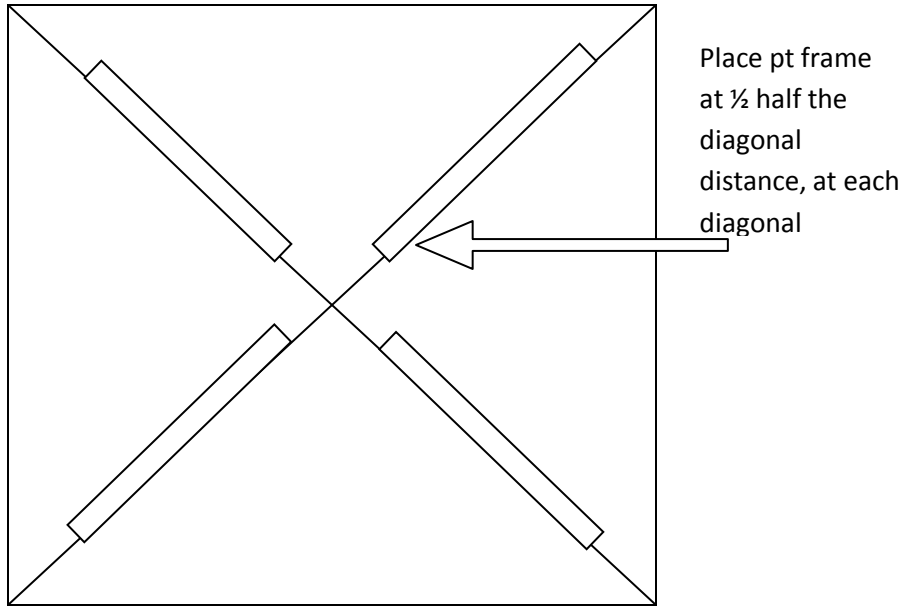
**Density sampling (number of individuals of each species/m<sup>2</sup>):**

Count all the individuals for each species in a 1 m<sup>2</sup> quadrat in the center of each of the 144 – 4 x 4 m plot. The corners of the center of the plot are marked by 4 nails. If a nail is missing or out of place, use the measurements along the diagonals to locate the corner of the plot and re-install the nail.

For bunchgrass (i.e. STCO) count the individual plants, not the tillers. For single stemmed grasses (i.e. AGSM), count each tiller. For all dicots and sedges, count individuals. Count by 1's up to 30. After 30, begin counting by 10's. Use a string or wire to divide the quadrat into quarters, which will make counting more manageable.

**Basal Cover Sampling (m<sup>2</sup>/m<sup>2</sup>):**

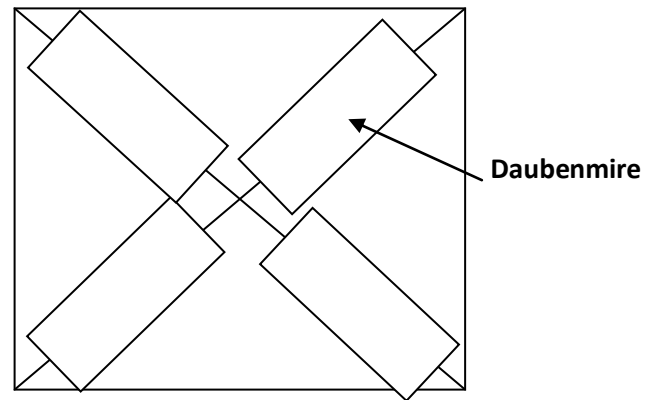
Use a 10 point frame to estimate cover in each 1 m<sup>2</sup> quadrat in which density was estimated. The point frame should be placed in 4 different locations, along each diagonal, as shown in the diagram, in each quadrat. Flip a coin to decide which direction the points should face. You may use the same directions for every diagonal in every quadrat. This will provide a total of 40 point contacts for each quadrat. The categories to records are plant species (use codes), litter, bare ground, and rocks. Be very critical about what the contact is. The accuracy of the methods is determined by how carefully contacts are made. Record only what the exact tip of the point touches at the soil surface. You may need to ignore a hit on a leaf to reach the soil surface. Do not penetrate the soil surface. All points must hit inside the quadrat.



**Density and Point Frame Datasheet:**

**Canopy Cover Sampling (Daubenmire cover classes, note added 2007):**

Locate each of 4 quadrats centered on a diagonal of the 1 m<sup>2</sup> plot half way between the center and a corner of the plot (see figure). In each quadrat, estimate canopy cover (the projection of the canopy of all the individuals of each species onto the soil surface) using the following set of cover classes record the projected canopy cover. For each Daubenmire quadrat you will record on the Canopy Cover datasheet the cover class (1, 2, 3, 4, 5, or 6)



Cover Classes: **1**=0-5%, **2**=6-15%, **3**=16-25%, **4**=26-40%  
**5**=41-60%, **6**=>60%

**Canopy Cover Data Sheet:**

<b>Humus Experiment Canopy Cover</b>	
Date:	Recorder:

Daubenmire Cover Classes: **1**=0-5%, **2**=6-15%, **3**=16-25%, **4**=26-40%, **5**=41-60%, **6**=>60%

Block (E, W)	ESA Treatment (W, N, C, W/N)	Transect # (1-3)	Sub-Plot # (1-6)	Daub Quadrat # (1-4)	Species	Canopy Class Code (1-6)

**Biomass Sampling (using digital photography) ( $\text{g}/\text{m}^2$ ):**

Take an image of each of the 144 quadrats as nearly vertical as possible. Use a ladder to get high enough to get the entire  $1 \text{ m}^2$  quadrat from a bird's eye view in the image. Record the image number on the datasheet for that plot. Record image numbers and memory cards number(s) that contain the images for this project in the orange digital camera log book. Label the memory card with Humus, Year, along with other project titles for which data are on that memory card.

**QAQC Instructions:**

IMPORTANT –When starting a block-treatment, one person will be in charge of checking off plots as the data are collected from each transect. Make sure all 6 quadrats from each combination of treatments are sampled and labeled correctly, then move onto the next transect for sampling. Also be sure to record the block and historical treatment, as well as the image number on each data sheet. Collate the data sheets by transect and then block. Make sure everything is there before leaving the block. When all the sampling is done, there should be 8 different packets of data sheets, each clipped together and containing 18 datasheet (3 transects x 6 quadrats per block).

**ARS #03 Humus Experiment – Soil Coring**  
**(Overlaid on Ecosystem Stress Area, ESA)**

**Principal Investigator: Indy Burke**

**Study Objective:** to assess soil properties and biogeochemical processes

**Study Area Location (please use the provided maps for vegetation sampling):** This sampling is conducted on transects overlaid onto the historical ESA plot treatments to the west of the LTER Headquarter Buildings and to the north of WCR 114. It is important to record both the historical treatment and recent humus treatment on each data sheet when sampling.

**Experimental Design for Soil Coring:**

- 2 blocks (east and west)
- 4 historical (ESA) treatments in each block
- 3 transects in each treatment
- 6 plots with Humus treatments (carbon additions) in each transect
- 1 core in each plot to be taken between individual plants
- 2 segments for each core - Individual sample core size is 10 cm deep to be split into two equal parts of 0-5 cm and 5-10 cm, 6.65 cm diameter; OR two 10 cm deep cores split into two parts if using a 5 cm diameter core (combine the two upper core parts in one sample bag, the two lower sample cores in another)
- Fill in the holes with soil taken from near the plots

**Equipment:**

Short soil Corers (6.65cm diameter), marked at 10 cm deep.

Pin flags (~20)

Sledge Hammers

Clippers

Cafeteria tray with measured tick marks for 0cm, 5cm, and 10 cm to cut the segments out of the cores

Wide metal spackle knife for cutting coil segments

Kitchen tablespoon and table knife for getting soils out of corers and/or out of the core holes if soil conditions are very wet or very dry

288 Medium Sized Paper Bags (pre-labeled) OR smaller bags (these samples will be small!)

Shovel

**Sample Label:**

**Date:** DD-MM-YYYY

**Block:** E or W

**ESA TRT:** ESA-C, ESA-N, ESA-W, or ESA-NW

**TRANSECT:** T-1, T-2, or T-3 (T1 is eastern most transect)

**PLOT:** P-Con, P-Sug, P-Saw, P-Lig, P-Sug/Lig, P-Sug/Saw

**DEPTH:** 0-5 or 5-10

**CORE DIAMETER:** W = wide (6.65cm), N = narrow (5 cm)

Starting from the SE corner of each plot, place a pin flag at 0.5 m north and 2.75 m west. (NOTE: if something makes the first set of coordinates unusable (ant hill, etc.) use the alternate coordinates of 1.25 m north and 0.75 m west. Please note on sample bags if core comes from this alternate coordinates. Locate the closest area of soil between plants. Remove any litter on the soil surface. (NOTE if it's between plants there really should not be a need to clip vegetation, but if it is impossible to



avoid capturing some aboveground vegetation do clip it down to the crown level, but leave any roots in place.)

Core the soil sample at least to 10 cm deep. Carefully push sample out of corer (start at the cutting edge and push towards the top of the core bit – soil slides out easier this way) and place on the cafeteria tray. Cleanly cut off any soil below or deeper than the 10 cm mark. Then, cut the core into a 0-5cm segment and a 5-10 cm segment. Please fill in the holes with soil, if possible taken from near the plot. Bag and label these two samples separately! If the soils are very dry and tend to fall out of the corer, please make note of that on the sample bag. Place samples in garage drying oven at 55 degrees centigrade for 3 days. E-mail [beckyr@warnercnr.colostate.edu](mailto:beckyr@warnercnr.colostate.edu) when sampling is complete.

**QAQC Instructions: Sample once in 2008 with all cores collected within one week.** It is very important that you use the correct core with the correct diameter (6.65 cm OR two cores/plot using a 5 cm diameter core) and split two segments out of each core at the correct depths (0-5 cm, 5-10cm). It's ok to use one size corer in some plots and another size in other plots as long as the core diameter is marked on the sample bags. Make sure that all samples have been taken before leaving the site. Be sure soil core samples are stored in the drying oven at 55 degrees C. Be careful to not tear sample bags on the drying oven shelves.