

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 (SGS-LTER) 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 data package and SGS-LTER collection, 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 #06 A -- Herbaceous Long Term Net Primary Production

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Study Objectives: Monitor long-term net above ground primary production of the shortgrass steppe community.

What to know before you start sampling:

- ✓ ***You have been shown the locations of LTNPP sampling***
- ✓ ***You have been instructed how to layout transects and plots in the ungrazed areas in Owl Creek and ESA***
- ✓ ***You have been instructed on how the ridge in site 24 will be clipped differently for the ARS***
- ✓ ***You have noted what to clip and what not to clip ****OLD-STANDING DEAD ON THE RIDGE IN SECTION 24 SHOULD BE COLLECTED FIRST FOR ARS SAMPLES*******
 - ***clip live plus recent dead (one sample of current-year's growth) by functional group as defined by ARS***
 - ***for old standing dead (last year's growth, usually grey) For RIDGE, SECTION 24 ONLY- FIRST collect 'old' standing dead (biomass NOT produced in the current year and usually grey). For all other sites (sec 25, esa, owl creek, swale and mid-slope in sec 24) the standing old dead is sorted out the same way, but not saved.***
 - ***no litter, no lichen, no OPPO***
 - ***only current years growth, on shrubs this is green material plus new stem growth***
- ✓ ***You have been trained to identify old versus new growth of shrub and grass/forb groups***
- ✓ ***You have been provided labels and various sample bags***
- ✓ ***Cages are moved the following spring not the current year.***
- ✓ ***You have been instructed on how to inventory and deliver bags to the sample prep lab at CSU***

- ✓ ***You have the sample check-off sheet***
- ✓ ***You have been instructed on what to do if you see a grub-kill or any other disturbances (ant mound, etc.)***
- ✓ **IF YOU HAVE NOT RECEIVED INSTRUCTIONS ON IDENTIFICATION AND COLLECTION OF**
 1) live, 2) recent dead, 3) old standing dead, 4) litter (not collected for biomass), 5) lichen (not collected for biomass), 6) shrub recent year growth THEN **STOP** AND DO NOT CLIP.

Study Area Locations: There are 6 sites: ridgetop (ridge), midslope (mid), swale, ESA (replicate 1 not 2; see 1D ARS #3 ESA map), Section 25 (SEC 25), and owl-creek (OC). Each location has 15 plots. There are 3 transects with 5 plots in each transect. Plots in the grazed locations are protected by cages. The 50 m transects and cages for LTNPP should be relocated 1m north or south every new LTER iteration (i.e. every 6 years to lessen the effects of long term destructive sampling while keeping soils, habitat, etc. the same.) In 2009 (2008-2014 funding cycle) move the transects and cages 1m south for the LTNPP harvest the next year and re-stake the cages. Plots in all locations are chosen randomly each year. The 3 transects are marked by rebar or plates. Measure the distance to the random location of the five plots along each transect. **See appendix for "Directions for CPER Study Sites Map" ARS #6 sampling locations.**

Experimental Design:

- 6 sites
- 3 transects at each site
- 5 plots on each transect
- Sample once per year at end of growing season
- Individual sample size is .25 m² circle.

Clipping Protocol:

Clip just above crown-level for all individuals, except for shrubs. Clip only current year growth of shrubs, usually grows from an older woodier branch (see Mark for description). DO NOT clip cactus or collect lichen (see cactus protocol below). All live plus recent dead material needs to be harvested from the plot. For the ridge in **section 24 OLD-STANDING DEAD will also be collected.** This means that all old-standing-dead are put in one bag for each plot by species. Old-standing-dead is "standing", NOT the LITTER that is lying on the surface of the ground. Both recent dead and old standing-dead are standing and both are dead, but they are not the same, and need to be collected differently. Recent dead and green are combined, because they were both produced in the current year. Old-standing dead is not included in samples from other LTNPP sites. It should be sorted out the same way but it is not saved. Old-dead is not included in any samples (the gray colored material). You can brush the basal old-dead material away from the clipped material with your fingers and sort out other taller stems. -- check your plot over before moving to next one.

Plots are clipped by functional group as defined by ARS (see plant list on next pages). It is usually easier to first clip species other than BOGR and BUDA. First clip and bag the forbs (both perennial and annual together, FORB), then any shrubs (SHRB - Arfr, Atca, Gusa, Chna, Eref, Cela and Yugl), then any cool-season annual grasses (CSAG, but rare most years), then cool-season perennial grasses (CSPG, which includes the carex and be sure to get all the carex out). You may remember the cool season perennial grasses (CSPG) as A S S O (Agsm, Stco, Sihy, Orhy and Carex). Lastly, you are left with warm-season perennial grasses (WSPG, mostly BOGR and BUDA). DO NOT CLIP ANY CACTUS or COLLECT LICHEN.

Do not clip on an ant mound or large disturbance. Note all small mammal, ant, and any other disturbances on the bag. Place all envelopes or small bags from each plot into the largest sample bag from that plot. This is usually, but not always, the BOGR bag. If there happens to be two or more large bags from one plot, try to keep them together. If there are, for example, two or three bags for one species, label the bags "1 of 2 or 3, 2 of 2 or 3, and 3 of 3".

CAN OTHER PEOPLE UNDERSTAND YOUR WRITING???

Example Label for LTNPP (Labels will be provided):

STUDY	LTNPP
DATE (month, day, yr)	08 01 93
SITE	SWALE
TRANSECT #-PLOT #	T-2 P-3
Functional Group CODE	FORB, SHRB, CSAG, CSPG, WSPG,

BOBU

QAQC Instructions:

IMPORTANT: In the field at the end of each site, gather all bags together and sort by transect. Then check that all plots are there for each transect, and they are labeled correctly and accounted for. This entails more than just counting that there are 5 plots for each of the 3 transects---are there two labeled the same? ---are all envelopes in the large bag labeled with the same site and transect-plot numbers? * Use the check off sheet

IMPORTANT: When drying bags in the oven, temperature must be 55°C--not more and not less. Arrange bags by date placed in oven. Be careful not to rip bags on metal shelves.

Sample Check Off and Delivery Instructions:

IMPORTANT: Organize the samples bags by project and then location and then put them in a larger bag to be transported to the SGS-LTER Sample Prep Lab. Double check that all of the transects and plots sampled from one location are being transported to the SGS-LTER Sample Prep Lab together. Label the larger bags with the year the samples were collected, the name of the project, and the plot numbers from which the samples were collected. Make sure that the larger bags are tied down in the back of the pick-up truck when they are being transported to CSU campus. Keep an inventory of what bags have been brought to campus and what bags remain in the drying oven.

					Functional Group Code (FORB, SS= sub-shrub, CSAG= cool season (CS) annual grass, CSPG = cool season (CS) perennial grass, WSPG=warm season (WS) perennial grass)
			Habit (P=Perennial, A=Annual, Bi=Biennial; Growth Form (G=Grass, F=Forb, SS=Sub Shrub)	(C=cool, W=Warm Season)	
Grasses Acronym	Common Name	Scientific Name			
Agsm	western wheatgrass	Agropyron smithii	PG	CS	CSPG
Arlo	red threeawn	Aristida longiseta	PG	WS	WSPG
Bogr	blue grama	Bouteloua gracilis	PG	WS	BOBU
Brte	cheatgrass	Bromus tectorum	AG	CS	CSAG
Buda	Buffalograss	Buchloe dactyloides	PG	WS	BOBU
Cafi	threadleaf sedge	Carex filifolia	PG	CS	CSPG
Cael	needleleaf sedge	Carex eleocharis	PG	CS	CSPG
Disp	inland saltgrass	Distichlis spicata	PG	WS	WSPG
Muto	ring muhly	Muhlenbergia torreyi	PG	WS	WSPG
Orhy	Indian ricegrass	Oryzopsis hymenoides	PG	CS	CSPG
Sihy	bottlebrush squirreltail	Sitanion hystrix	PG	CS	CSPG
Spai	alkali sacaton	Sporobolus airoides	PG	WS	WSPG
Spcr	sand dropseed	Sporobolus cryptandrus	PG	WS	WSPG
Stco	needle and thread	Stipa comata	PG	CS	CSPG
Vuoc	sixweeks fescue	Vulpia octoflora	AG	CS	CSAG

Forbs and Shrubs

Arfr	fringed sagewort	Artemisia frigida	PSS	CS	SS
Asbi	two-grooved milkvetch	Astragalus bisulcatus	PF	CS	FORB
Cela	common winter fat	Ceratoides lanata	PSS	CS	SS
Chin	ragleaf goosefoot	Chenopodium incanum	AF	WS	FORB
Chle	narrowleaf goosefoot (lambquarters)	Chenopodium leptophyllum	AF	WS	FORB
Chvi	hairy goldenaster	Chrysopsis villosa	PF	WS	FORB
Chna		Chrysothamnus nauseosus	PS	WS	SS
Ciun	rubber rabbitbrush				
	wavyleaf thistle	Cirsium undulatum	PF	WS	FORB

Clse	Rocky Mountain beeplant	Cleome serrulata	AF	WS	FORB
Coum	common bastard toadflax	Comandra umbellata	PF	CS	FORB
Coar**	field bindweed	Convolvulus arvensis	PF	WS	FORB
Covi	purple mammillaria (pincushion cactus)	Coryphantha vivipara	PSS	CAM	SS
Crmi	plains cryptantha	Cryptantha minima	AF	CS	FORB
Cyac	stemless spring parsley	Cymopterus acaulis	PF	CS	FORB
Cymo	mountain spring parsley	Cymopterus montanus	PF	CS	FORB
Dege	Geyer (plains) larkspur	Delphinium geyeri	PF	CS	FORB
Depi	pinnata tansymustard	Descurania pinnata	AF	CS	FORB
Dypa	prairie dogweed (fetid marigold)	Dyssodia papposa	AF	WS	FORB
Ecvi*	hedgehog cactus	Echinocereus viridiflorus	PS	CAM	N/A
Eref	spreading wildbuckwheat	Eriogonum effusum	PSS	CS	SS
Evnu	Nuttal's evolvulus	Evolvulus nuttallianus	PF	WS	FORB
Gaco	scarlet gaura	Gaura coccinea	PF	CS	FORB
Grsq	curlycup gumweed	Grindelia squarrosa	PF or BiF	WS	FORB
Gusa	broom snakeweed	Gutierrezia sarothrae	PSS	CS	SS
Hasp	ironplant tansyaster	Haplopappus spinulosus	PF	WS	FORB
Hepe	prairie sunflower	Helianthus petiolaris	PF	WS	FORB
Ipla	looseflowered gilia Iran summer	Ipomopsis laxiflora	AF to BiF	WS	FORB
Kosc	cyperus	Kochia scoparia	AF	WS	FORB
Lare	blueburr stickseed	Lappula redowskii	AF	CS	FORB
Lede	prairie pepperweed	Lepidium densiflorum	AF or BiF	CS	FORB
Lemo	common starlily or mountain lily	Leucocrinum montanum	PF	CS	FORB
Lipu	dotted gayfeather	Liatris punctata	PF	WS	FORB
Liin	narrowleaf gromwell	Lithosperma incisum	PF	CS	FORB
Lupu	rusty lupine	Lupinus pusillus	AF	CS	FORB
Lyju	rush skeletonweed	Lygodesmia juncea	PF	WS	FORB
Mata	tansyleaf aster	Machaeranthera tanacetifolia	AF	WS	FORB
Meof	yellow sweetclover	Melilotus officinalis	AF or BiF	WS	FORB
Mili	linearleaved four- o'clock	Mirabilis linearis	PF	WS	FORB
Oeal	prairie evening primrose	Oenothera albicaulis	AF	WS	FORB
Oppo	plains prickly pear	Opuntia polyacantha	PS	CAM	N/A

Oxla	lambert loco (crazyweed)	Oxytropis lambertii	PF	CS	FORB
Oxse	silky loco	Oxytropis sericea	PF	CS	FORB
PAME	foliose lichen	Pamelias sp.	LICHEN		N/A
Peal	white penstemon	Penstemon albidus	PF	CS	FORB
Pean	narrowleaved penstemon	Penstemon angustifolius	PF	CS	FORB
Piop	plains bahia	Picradeniopsis oppositifolia	PF	WS	FORB
Plpa	woolly plantain (Indianwheat)	Plantago patagonica	AF	CS	FORB
Pool*	common purslane	Portulaca oleracea	AF	WS	FORB
Pste	slimflower scurfpea (wild alfalfa)	Psoralea tenuiflora	PF	WS	FORB
Raco	prairie coneflower	Ratibida columnifera	PF	WS	FORB
Ruve	veiny dock	Rumex venosus	PF	CS	FORB
Saib	Russianthistle	Salsola iberica	AF	WS	FORB
Scbr	Britton's skullcap	Scutellaria brittonii	PF	WS	FORB
Setr	prairie groundsel	Senecio tridenticulatus	PF	CS	FORB
Sial	tumbling hedgemustard	Sisymbrium altissimum	AF	CS	FORB
Sonu	silky sophora	Sophora nuttalliana	PF	WS	FORB
SpcO	scarlet globemallow	Sphaeralcea coccinea	PF	CS	FORB
Tapa	prairie fameflower	Talinum parviflorum	PF	WS	FORB
Taof	common dandelion	Taraxacum officinale	PF	CS	FORB
Thfi	threadleaf greenthread	Thelesperma filifolium	PF	CS	FORB
Thme	rayless greenthread	Thelesperma megapotamicum	PF	CS	FORB
Togr	largeflower townsendia	Townsendia grandiflora	PF	CS	FORB
Troc	prairie sipderwort	Tradescantia occidentalis	PF	CS	FORB
Vebr	bigbract verbena	Verbena bracteata	PF	WS	FORB
Yugl	small soapweed	Yucca glauca	PSS	CS	SS

Check-off Sheet:

ridge	Mid-slope	swale	Sec 25	Owl Creek	ESA
T-1, P-1	T-1, P-1	T-1, P-1	T-1, P-1	T-1, P-1	T-1, P-1
T-1, P-2	T-1, P-2	T-1, P-2	T-1, P-2	T-1, P-2	T-1, P-2
T-1, P-3	T-1, P-3	T-1, P-3	T-1, P-3	T-1, P-3	T-1, P-3
T-1, P-4	T-1, P-4	T-1, P-4	T-1, P-4	T-1, P-4	T-1, P-4
T-1, P-5	T-1, P-5	T-1, P-5	T-1, P-5	T-1, P-5	T-1, P-5
T-2, P-1	T-2, P-1	T-2, P-1	T-2, P-1	T-2, P-1	T-2, P-1
T-2, P-2	T-2, P-2	T-2, P-2	T-2, P-2	T-2, P-2	T-2, P-2
T-2, P-3	T-2, P-3	T-2, P-3	T-2, P-3	T-2, P-3	T-2, P-3
T-2, P-4	T-2, P-4	T-2, P-4	T-2, P-4	T-2, P-4	T-2, P-4
T-2, P-5	T-2, P-5	T-2, P-5	T-2, P-5	T-2, P-5	T-2, P-5
T-3, P-1	T-3, P-1	T-3, P-1	T-3, P-1	T-3, P-1	T-3, P-1
T-3, P-2	T-3, P-2	T-3, P-2	T-3, P-2	T-3, P-2	T-3, P-2
T-3, P-3	T-3, P-3	T-3, P-3	T-3, P-3	T-3, P-3	T-3, P-3
T-3, P-4	T-3, P-4	T-3, P-4	T-3, P-4	T-3, P-4	T-3, P-4
T-3, P-5	T-3, P-5	T-3, P-5	T-3, P-5	T-3, P-5	T-3, P-5

