

Sonoran Desert Network

Upland Vegetation and Soils Protocol



Trip Summary Report
Casa Grande Ruins National Monument
May 12 and 18, 2011

Purpose: To briefly summarize the 2011 field season of uplands vegetation and soils monitoring at Casa Grande Ruins NM.

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Vital signs and other parameters sampled during this visit

- Vegetation cover
- Species/life form frequency
- Soil aggregate stability and bulk density
- Biological soil crust cover
- *NEW* Columnar cacti density by height class (see below)
- *NEW* Fuels incorporated into soil cover measures (see Appendix A)

A brief description of each vital sign and parameter can be found in Appendix A.

Sampling highlights/notes

- Three uplands monitoring plots were established at the request of CAGR resource staff in areas adjacent to archeological sites that had recently been disturbed during cultural resource protection activities. Specifically, each of the three sites had sustained disturbance in the form of road use or vehicle tracks utilized for access and bringing materials to each site. Compaction of soils and destruction/disturbance of biological soil crust cover were of main concern.
 - Re-vegetation efforts will be implemented at each site later this year by CAGR. Restoration activities will include loosening of soil with a harrow, planting salvaged plants, and broadcasting native seeds.
 - The objective of these *subjectively* placed plots is to track recovery and re-vegetation efforts at each site. Vegetation cover and frequency, soil stability, soil bulk density and biological soil cover were sampled at each site. Plots were marked with rebar at the corners and with sunken nails at transect ends. Permanent repeat photo locations were established at each corner.
 - One plot each was established along the disturbed “road” sites at each of three sites. The plots were laid out such that the long axis (50 m) was parallel to the road and the interior transects (6 × 20 m) each spanned across the road perpendicularly.
 - More plots may be added at other sites in 2012, after protection activities have ended.
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Sampling results

Three plots were established this year (Appendix B). Plots were established in the Desert elevation zone:

Strata	Elevation (feet)	Strata	Number of plots
Desert	<2,500	100	3
Thornscrub	2,501–3,700	200	0
Semi-desert Grassland and Chaparral	3,701–4,500	300	0
Madrean Oak Woodland	4,501–6,000	400	0
Temperate Deciduous Forest and Coniferous Forest	>6,000	500	0

How are plot names assigned?

The first three numbers of the plot name signify the sampling stratum in which it is located. In this protocol, the strata used are combinations of elevation and rock-fragment classes. For example, plots in the 400 strata are considered to be within the elevation band typically associated with Madrean Oak Woodland. Soil rock-fragment classes are based on rock-fragment modifiers from the most recent soil survey. The 1, 2 or 3 in the “ones place” of the assigned strata is associated with a rock-fragment percentage.

Rock-fragment percentage	Number
<35%	1
35–90%	2
>90%	3

For example, for plot 402_014, the plot is in the Madrean Oak Woodland stratum (402) and the soil rock fragment is 35-90% (402). The last three digits in the plot name (014, in this case) are determined by a randomization algorithm RRQR and are sampled in numerical order.

What’s ahead?

Data have been entered into the SODN access database and error-checked. Later this year, we may continue to add more plots in other disturbed areas. Once all plots are complete and data entry finished, we will analyze the data and write a summary report. These summary reports are typically published by June of the year following sampling.

We will establish a schedule for re-sampling the plots based on times and dates of re-vegetation efforts, this to be jointly decided with the CAGR resource staff.

In November 2008, three randomized plots were established at the main park unit. During the following February (2009), three more plots were established at the Adamsville unit. In 2013, these will be re-sampled, and a status and trends report will be published in the NPS Natural Resource Technical Report Series, summarizing the results over these two sampling periods.

Data from the three sites subjectively located in culturally sensitive areas will be analyzed separately from the standard randomized plot data; however, the two data sets can be compared to give context and to gauge change at the impacted sites in relation to non-impacted sites.

Appendix A: Descriptions of vital signs and associated parameters collected during this sampling trip.

Vegetation cover—Vegetative cover of common perennial species is an effective and traditional monitoring approach for plant populations. Cover is the percentage of ground surface covered by vegetation material, providing both an absolute and relative measure of species and lifeform abundance. This approach allows determination of status and detection of trend within a single species of interest, facilitating the use of “keystone” and “indicator” species, as well as providing focused information on species of management concern (e.g., established exotic invasive species, “flagship” species such as saguaro cacti). Determining the foliar cover of all common perennial species permits direct contrasts of species of interest and ensures that information is not lost if future research or management objectives focus on a species that is currently a lower priority.

Species/Life form frequency—Plant frequency is the number of times a plant species/lifeform is encountered in a given number of plots or sample points, providing a measure of the occurrence and distribution of species within a landscape or strata of interest. Frequency provides an effective index of change over time and space and can efficiently provide information on species/lifeforms that are uncommon or that have highly variable year-to-year distributions, such as most desert annuals.

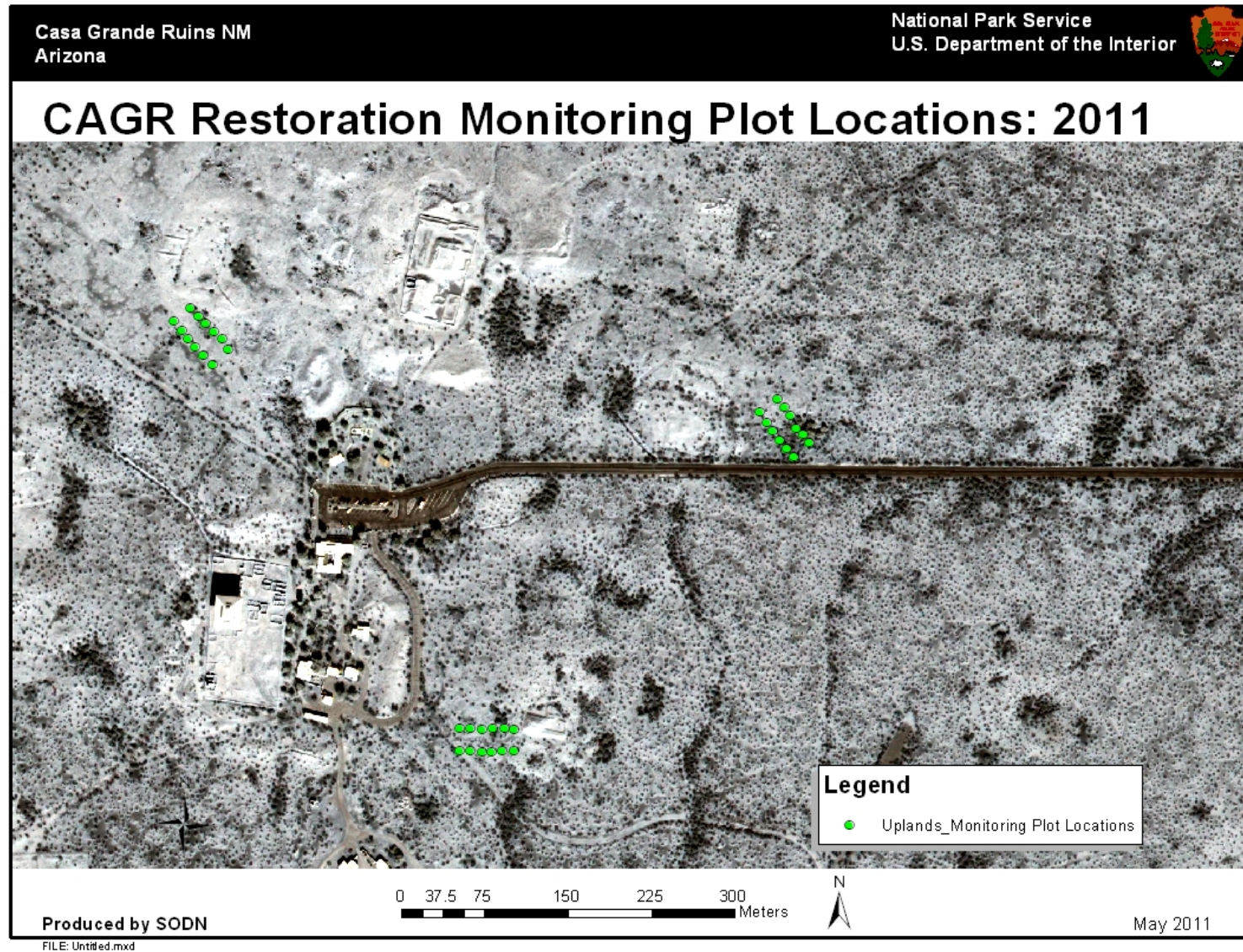
Density—Columnar cacti (saguaro, organpipe, and senita) and ocotillo are tallied by height class within each of the five frequency subplots at each sampling location. Density will be given as number of individuals/hectare.

Fuels measures—Fuels measures have been incorporated into the monitoring design by replacing “Litter” as a basal cover category on the line-intercept with L0, L1, L2, L3 and L4. Each of these new categories represents different size classes of fuels, from leaves and needles up through 1,000-hour fuels over 3" in diameter. Fuels are recorded along each of the six transects.

Soil aggregate stability and bulk density—Surface soil aggregate stability is the resistance of soil aggregates on and near the soil surface to degradation. Soil aggregate stability provides both an indicator of site disturbance and site resistance to soil erosion and provides insights into soil water-holding capacity and infiltration rates. Soil bulk density is the mass per unit volume of the bulk soil matrix. Due to the destructive sampling techniques, bulk density will only be re-measured if observations indicate disturbances such as fire, landslide, or severe erosion. Bulk densities that are high or low for a given type of soil material can indicate stability and susceptibility of a site to erosion and other impacts like drought.

Soil and biological crust cover—Soil cover is the percentage of material (e.g., litter, duff, bedrock, gravel, rocks, vegetation, and biological soil crusts) covering the soil surface and provides an absolute and relative measure of these objects that influence erosion resistance. Biological soil crust cover is similar in concept, with the categories of interest being growth forms for all soil lichens. Bryophytes and cyanobacteria serve profoundly different ecological functions but are difficult to identify in the field. Therefore, they are identified to the morphological group level.

Appendix B: Map of plot sampling locations.



Site C photos: May 18, 2011



Photo point 1Y: Transect 1 from 0m, 0m corner



Photo point 1X: 50 m baseline taken from 0m, 0m corner



Photo point 2: taken from 0m, 20m corner



Photo point 3: taken from 50m, 20m corner



Photo point 4: taken from 50m, 0m corner

Site D photos: May 18, 2011

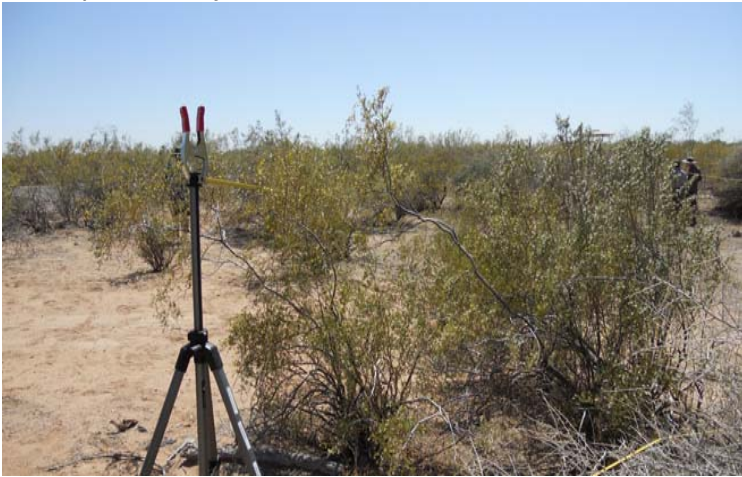


Photo point 1Y: Transect 1 from 0m, 0m corner



Photo point 1X: 50 m baseline taken from 0m, 0m corner



Photo point 2: taken from 0m, 20m corner



Photo point 3: taken from 50m, 20m corner



Photo point 4: taken from 50m, 0m corner

Site G photos: May 12, 2011



Photo point 1Y: Transect 1 from 0m, 0m corner



Photo point 1X: 50 m baseline taken from 0m, 0m corner



Photo point 2: taken from 0m, 20m corner



Photo point 3: taken from 50m, 20m corner

NOTE: Photos from this site appear to have been mislabeled. We will return to the site at our next convenience to remedy this.