

# PROTOCOL FOR CAP LTER EXTENSIVE SURVEY FIELD DATA COLLECTION

**Diane Hope and Corinna Gries**

**(this is based on the UFORE FOREST SURVEY devised by Baltimore LTER's  
DAVE NOWAK and  
Updated with the input from several CAP-LTER PIs and field experience)**

Teams will consist of 4 people with a cell phone and university vehicle as well as identification.

- 1) Locate plot center in field with GPS according to lat/long data. If you're unable to access plot, report back to Diane Hope or Corinna Gries.
- 2) Permission to access. Most sites will already have permission arranged – however in some instances site owners may not have given explicit permission. So ALWAYS check that it's okay to carry out the survey - if people are home/in a building on the site, explain what you are doing, ask if they got the letter & make sure that they are okay with you going ahead. If there's no one around, go ahead, provided you don't need to access 'sensitive' areas e.g. back yards, behind locked gates.
- 3) Plots are square 30 m x 30 m. At plot center, establish plot dividing ropes (dividing plot into four quadrants with ropes laid out due N,S,E,W). Set up the tripod.
- 4) Start filling out data sheet:

## **Land use (see attachment) – Corinna: do we need to revise this?**

Percent of the plot area that is in the land use using the LTER landuse categories 1 - 6.  
This will mostly be 100%, but some plots will fall on a border e.g. 60% residential lot, 40% street.

## **Record plot characteristics & check map (OR make new one if land use changed):**

- Date, Crew names (NOT just initials), Plot ID
- Short description of plot – 20 word limit (key words only)
- Current weather (and record if there was a recent rain event)
- Description of roadways close to the plot: Freeways/Expressways; Major Roads Collector Streets; Local Streets/ cul-de-sac; Dirt road
- Check whether all the surface types and permanent features (buildings, light poles, walkways, fences, walls, driveway edges etc) on the plot match with the map. IF ANYTHING DOES NOT MATCH...
- Measure (using tape) and GPS the location of any new or changed objects
- Draw on the map any alterations (make sure there are accompanying measurements i.e. if a new wall, how long it is & how far from the nearest other permanent features)

IF the land use and plot features have completely changed (i.e. desert or vacant lot has been developed): i) Make a detailed sketch map of all the permanent surface features and surface cover types on the plot (including buildings, pool, shape of

yard, pavement), ii) Using the tape, measure the length of features and their distance from other key objects, iii) GPS the location of all permanent surface objects. [*Corinna – are we still do this?: Each delimited area gets an ID number assigned. In the database (datasheet) these numbers will then be associated with the other information for each area*]

Permanent features/surface types are:

- Building (including use, materials, roof types (tar paper, shingle, red tile, etc))
- roads, parking lots, sidewalks, etc.
- Vegetation (general cover only, details are below)
- mulch (bark chips, gravel etc.)
- cement
- asphalt/blacktop
- wood
- other impervious
- soil (natural or graded - color, approx. grain size (i.e., silt, sand, gravel))
- rock - (color, hand sample (from distinctly different units)) If site is on an alluvial fan, rock size/type distribution should be noted.
- water (pool, pond, canal, natural)
- 

(N.B. List to be expanded as other land cover types are encountered.)

**Landscape practices:** (*judged visually*) [*Corinna – modifications/additions re. landscape functional types here??*]

- turf is usually overseeded during the winter
- Does the landscape have a natural or manicured appearance? Is the landscape maintained professionally? Are plants in the landscape healthy and vigorous? Are there any symptoms or signs of abiotic or biotic injury?
- Watering regimes: drip or trickle, overhead spray, flood, or hand watering. Estimate cover of different irrigation types as a % of the whole plot.

**Cover estimates:** (*Corinna – are we still going to do this? I seem to remember visual estimates were not accurate & it was better to get surface cover %'s from the plot maps.*)

**[Plot tree Cover (%)** – the amount of tree canopy covering the plot, estimated at between 0 to 100%, to the nearest 10% (include canopy of trees overhanging into the plot, but stem outside).

Definition of a tree: Tree according to species list in database

**Shrub cover (%)** – the amount of shrub canopy covering the plot, estimated at between 0 to 100%, to the nearest 10%

**Herbaceous/ground cover (%)**– the amount of herbaceous/ground cover on the plot, estimated at between 0 to 100%, to the nearest 10%

**Cactus cover (%)** - estimated at between 0 to 100%, to the nearest 10%

**Open ground(%)** bare soil, gravel and rock

**Other (%)**: all non pervious surfaces on the plot (e.g. asphalt, concrete, roof)]

**Vegetation (2000 - Chris Martin & Sam Scheiner; additions 2005 Les Landrum)**  
The location of each SPECIES is recorded with GPS and given an ID# unique to the plot. One example of every species on the plot is:-

- **photographed digitally** (against a beige cloth background, with ID number AND a scale bar visible)
- a **small sample collected** & placed in white acid-free paper envelope which is numbered with the sample ID (including site, ID# and sampling date). These samples are returned to the Herbarium for air-drying and pressing within 1-2 days of collection.

**Additional vegetation measurements: [Corinna – any changes needed here??]**

#### **Trees**

- **DBH** (diameter at breast height of 4.5 ft) measured in cm
- **DGH** (diameter at ground height) measured if tree too small or stems too numerous at breast height
- **Number of stems** at 4.5 ft (if multi-stemmed dbh is average of all stems or take at ground height)
- **Tree height** done directly if small or using clinometer if large
- **Crown architecture** described (list on field sheet)
- **Crown dimensions measured** (width in N-S & E-W directions, height to crown)
- **Shape and whether pruned/natural** (see field sheet)
- **Estimates of tree health: % missing from a perfect circle or oval AND For the remaining leaves estimate condition (as the dead parts in %):**
  - o Excellent < 1%
  - o Good 1 –10%
  - o Fair 11 – 25%
  - o Poor 26 – 50%
  - o Critical 51 – 75%
  - o Dying 76 – 99%
  - o Dead no leaves

**Classify as:** street tree/shade tree/accent tree/screen tree/naturalized or volunteer tree (latter for urban sites only)

#### **Cacti and Succulents**

Measure, height, width in N-S & E-W directions, stem diameter

**Shrubs and perennial groundcover – DEPENDS WHETHER URBAN OR NATIVE (Corinna which ornamental grasses and climbers will we include here?)**

**Urban plots: Every individual of every species recorded and measured, as described above.**

ID # , Shrub Height, width, Shrub shape and pruned/natural

### **In desert plots:**

- Five individuals of each species (chosen at random, at least one in each quadrant where possible) are recorded according to the protocol for urban plots (GPS location of each, height, width, stem diameter, shape)
- In addition individuals for each species are counted for each quadrant of the plot (that is, four numbers of individuals for each species for each plot are recorded)
- Ornamental, non-native species are measured as well.

(NB On initial survey in 2000, some field crews did not treat *Sphaeralcea* (Globe mallow) as a perennial shrub – we recommend it always be included as such on future surveys.

**Herbaceous** – Place one 1m<sup>2</sup> quadrat (randomly?) in each quadrant of the plot (i.e. NW, NE, SW, SE). List, every species in each quadrat. Photograph & collect one sample of every species present at the whole site.

### **SOIL SAMPLING**

Collect samples in following order:

- 1) ONE surface soil sample for – soil seed bank, pollen (& prokaryotes?) sample
  - Photograph soil surface to be sampled before sample taken, camera on 50mm lens, include North arrow scale bar.
  - take this sample IMMEDIATELY after set-up of plot center
  - scratch undisturbed (i.e. UNTRAMPLED) surface soil
  - from approx. 12” x 12” surface area
  - 1 m North of plot center (or nearest location of open bare soil surface)
  - DO NOT SAMPLE UNDER A BUSH/TREE
  - Put soil in Whirlpack bag, seal & label
- 2) Bulk density 2” soil core
  - carefully take an intact core to a DEPTH OF 10 CM ONLY – note this is NOT the whole depth of the corer – if it goes all the way in, REMOVE THE SOIL & RE-TAKE THE SAMPLE.
  - 1 m North of plot center IF no danger of hitting irrigation/power lines
  - OR nearest location to plot center with similar/suitable ground cover
  - DO NOT push/compact the sample in any way when removing from corer
  - RED cap on TOP; BLUE cap on BOTTOM
- 3) 1” soil cores for chemical analysis
  - collect x 4 samples, 10m North, South, East and West of plot center
  - OR nearest similar/suitable locations to those points\*
  - DO NOT sample where there may be irrigation/power lines\*
  - place BLUE cap on BOTTOM; RED cap on TOP
  - \* IF cannot use soil corer, take sample with hand trowel from a 4” x 4 “ surface area, to a depth of 3” – 4 “

- label each core, write on tape stuck to plastic liner
  - keep bottom (BLUE CAP) down for carrying
- 4) Mycorrhizal soil sample – *at 70-90 of sites (representative sub-set of the total - Jean is sending the list of which sites):*
- collect x 5 soil samples using a hand trowel
  - for each sample dig to depth of 5 – 6 inches from a 4 x 4 inch square area
  - collect samples under 5 well-established shrubs and/or trees or just under what's available if the vegetation is sparse (sample same tree/shrub more than once if no others on plot)
  - choose representative species of shrub/tree if there is a variety of species
  - on plots with no veg. sample at 9.5 m North, East and West of plot center
  - after each sample, clean the trowel with 70% ethanol to disinfect (use plastic spray bottle, wipe with paper first to remove soil)
  - put sample in QUART-SIZE FREEZER-TYPE Zip-Loc bag (should be around ½ full)
  - label bag **WITH THE NAME OF THE SHRUB/TREE SPECIES FROM WHICH THE SAMPLE WAS COLLECTED UNDER (THIS IS V. IMPORTANT)**
  - LOG LOCATION OF EVERY SAMPLE with the GPS

### **Arthropods - Sweep net sample (William Cook & Stan Faeth)**

1) Take 3 sweep net samples. Identify plant to species where possible.

2) At each site, select plant species on which to conduct sweeps by:

a) including the dominant plant species in at least one of the sweep sets,

and

b) selecting additional species so as to facilitate comparisons of communities on the same plant in different habitat types. This can be accomplished by preferentially sweeping on the following species where they occur, and particularly in the following landscape types:

Bougainvillea spp. (in mesic and xeric residential neighborhoods)

Citrus spp. (in mesic yards and in orchards, i.e. agriculture)

Encelia farinosa (in desert sites and xeric yards)

Larrea tridentata (in desert sites and xeric yards)

Nerium oleander (commercial sites, mesic yards, xeric yards)

Cupressus (commercial sites, mesic yards)

Olea (commercial sites, mesic yards)

Prosopis spp. (agriculture, desert, mesic, xeric)

3) The following items should **ALWAYS** be specifically noted:

- a) When a single plant species was used more than once at a site
- b) If less than three sweep sets were conducted
- c) If no arthropods were collected

d) if 3b) or 3c) apply, provide a comment re: why

[4] The following items should be kept in mind for data entry (to talk to Corinna about, but not critical for the field workers):

- a) In cases where same plant species was used > 1 time, we need to be able to differentiate the sweep sets in the archival computer files
- b) If no arthropods were collected at a site, we need a way to have "zeroes" entered into the database. This time I had to notice the absence of any listed zeroes, and hunt them down via the paper records.
- c) Any notes from 3) above should be entered electronically.]

### **Photos**

#### **Ground photos**

- SLR camera (Minolta) mounted on tripod take pictures into 4 cardinal directions with 50mm lens @ ~1.5 m above ground level, plus one 'synoptic' view (with 28mm lens) of plot from outside plot boundary, plus one vertical view of ground (with 50mm lens) from appr. 1 m height @ plot center (for Rainey). RECORD roll number and picture number for each one ON THE FIELD SHEET.

#### **Plant photos**

- take a digital camera photograph of every plant species in the plot. Use a white cloth background AND SCALE BAR in EVERY shot.

### **Humans (originally Elizabeth K. Burns –revised by David Casagrande**

*Still to be decided: At which sites, over what distance, for how long & which sites get revisited?*

(Time Allocation Spot Surveys / Behavior Trace Observations (revised Feb 11, 2004)

B	bagging biomass
BF	bird feeding
BS	baby strolling
BW	bird watching
BY	bicycling
C	composting
CE	collecting edible vegetation
CH	cleaning house outside (windows, etc.)
CU	cutting grass
CY	cleaning or sweeping yard, driveway or sidewalk
DW	actively discouraging wildlife
EC	Entering or exiting car
EH	Entering or exiting house
ES	erecting structures
EX	Exercising – other than jogging
F	fertilizer application
H	herbicide spraying

HC	hanging clothes to dry
IS	insect spraying
J	jogging
L	littering
NY	non-yard work (car repair, carpentry, etc.)
PC	picnicking/barbequeing
PF	picking flowers
PL	playing
PR	pest removal (mammals/birds)
PT	planting
PU	pruning
R	raking
RS	roller skating/blading
SI	sitting (relaxing, reading, etc.)
SK	skateboarding
ST	standing / waiting
T	talking
TR	taking out trash or recyclables
U	unleashed pets allowed out
VR	large vegetation removal
W	walking
WA	watering
WD	walking dog
WG	weeding garden or potted plants
WY	weeding yard

**Trace Behavior Surveys Only**

TV	trampling vegetation
SC	soil compaction

**Equipment**

**NEED METAL DETECTOR??**

Cell phone

Trimble 'Pro XRS' GPS unit

Compass (\$10)

Clipboard & data sheets & drafting paper (grid)

Clinometer (\$90)

50 m tape measure (\$25)

Calculator (\$10)

GPS unit

GIS map of plot with coordinates

Portable mini-met sensors for recording temp, humidity, windspeed

Minolta SLR Camera & tripod

Digital camera

**Vegetation sampling:**

Diameter tape (\$15)

**Soil sampling:**

Soil recovery probe 2" diameter: \$145.00

Liners \$1.65 ea.

Caps \$7.00 per 100

Slide hammer \$130.00

Shovel

Pick

Small garden trowel

Tools for the soil corer (crescent wrenches, WD 40, etc)

**Litter bags:**

100% nylon cloth (20x20cm)

1 mm mesh cloth (20x20cm)

stainless steel staples

wooden dowels (200)

numbered aluminum tags

**Insect sampling:**

1 insect net (sweep net, available from BioQuip), 15" diameter opening

3 glass jars with lid, filled about 1/3 with 70% EtOH

label on outside of each jar

waterproof permanent ink pen for labeling jars

**Plant Genera List**

**Trees**

Acacia (acacia)

Brachychiton (bottle tree)

Cercidium (palo verde)

Citrus (citrus)

Dalbergia (Indian rosewood)

Eucalyptus (eucalyptus)

Ficus (fig)

Fraxinus (ash)

Gleditsia (honey locust)

Lysiloma (fern of the desert)

Jacaranda (jacaranda)

Morus (mulberry)

Olea (olive)

Olneya (ironwood)



Parkinsonia (Mexican palo verde)  
Phoenix (date palm)  
Pinus (pine)  
Pistacia (pistache)  
Pithecellobium (Texas ebony)  
Platanus (sycamore)  
Populus (cottonwood)  
Prunus (flowering plum)  
Pyrus (flowering pear)  
Prosopis (mesquite)  
Quercus (oak)  
Rhus (sumac)  
Schinus (pepper tree)  
Syagrus (queen palm)  
Ulmus (elm)  
Washingtonia (fan palm)

**Cactus and succulent:**

Agave (agave)  
Aloe (aloe)  
Carnegiea (saguaro)  
Ferrocactus  
Opuntia (cactus)

**Shrubs:**

Asparagus (asparagus fern)  
Baccharis (Desert Broom)  
Bougainvillea (bougainvillea)  
Caesalpinia (bird-of-paradise)  
Calliandra (fairy duster)  
Carissa (natal plum)  
Cassia (cassia)  
Cynodon (bermuda grass)  
Dalea (indigo bush)  
Dasylirion (sotol, Desert Spoon)  
Encelia (brittlebush)  
Fouquieria (ocotillo)  
Gazania (gazania)  
Hibiscus (hibiscus)  
Hesperaloe (red yucca)  
Juniperus (juniper)  
Lantana (lantana)  
Myoporum (myoporum)  
Leucophyllum (Texas sage)  
Ligustrum (privet)  
Myrtus (myrtle)  
Nandina (heavenly bamboo)  
Nerium (oleander)  
Pittosporum (mockorange)  
Plumbago (plumbago)  
Pyracantha (pyracantha)  
Rosmarinus (rosemary)  
Ruellia (ruellia)  
Thevetia (yellow oleander)  
Xylosma (shiny xylosma)  
Yucca (yucca)

## **LTFR Phase Two**

### **Land Use Classifications**

#### 1. *Urban or Built-Up Land*

##### **A. Residential**

##### 1. *Single family*

- i. *Xeric*
- ii. *Mesic*
- iii. *Mixed*

##### 2. *Multi-Family*

- i. *Xeric*
- ii. *Mesic*
- iii. *Mixed*

##### **B. Non-Residential**

- 1. *Institutional* (schools, churches, public facilities, etc.)
- 2. *Commercial* (malls, office buildings, etc.)
- 3. *Industrial* (landfill, utility power stations, etc.)
- 4. *Mining*
- 5. *Large Assembly Areas* (includes stadiums, fairgrounds, etc.)

##### **C. Graded, *under construction***

#### 2.

*Open*

- A. Golf Course**
  - 1. Xeric
  - 2. Mesic
  - 3. Mixed
- B. Parks**
  - 1. Xeric
  - 2. Mesic
  - 3. Mixed
- C. Vacant**
  - 1. Xeric
  - 2. Mesic
  - 3. Mixed
- D. Forest**
- E. Desert**

3. *Agricultural Land*

- A. Cropland**
  - 1. *Active Cropland*
  - 2. *Fallow Cropland*
- B. Pasture**
  - 1. *Active Pasture*
  - 2. *Fallow Pasture*
- C. Orchards**
- D. Feeding Operations**
- E. Horse Ranches**
- F. Other Agricultural**

4. *Water*

- A. Streams, Rivers, Canals**
- B. Lakes**
- C. Reservoirs**

5. *Riparian Zone*

- A. Vegetated**
- B. Un-vegetated**

6. *Transportation*

- A. Highway**
- B. Major Roads**
- C. Streets**
- D. Airport**
- E. Railroad**
- F. Rights of Ways**

*Note: Ambiguous uses default to more general level category*