

## BOSQUE ECOSYSTEM MONITORING PROGRAM

# Study Site Set Up & Concept Map

### Study Site Background

Each study site is set up as a rectangle with the north/south length of 200 meters (m) and an east/west width of 100 m. Sites, typically located between the river and the levee, should be representative of the forest composition in the area. To minimize disturbances and the potential for vandalism, study sites should be selected in areas of low human impact, though this is not always possible.

Study sites are set up using the same design; this makes it possible to make valid comparisons among sites. All sites are monitored using the same methods and during the same week. Following standard procedures is critical to the success of the program.

Each study site is comprised of 10 vegetation plots, 10 litterfall tubs, 20 pitfall traps, five wells and two rain gauges (see image). Some sites have three temperature loggers.

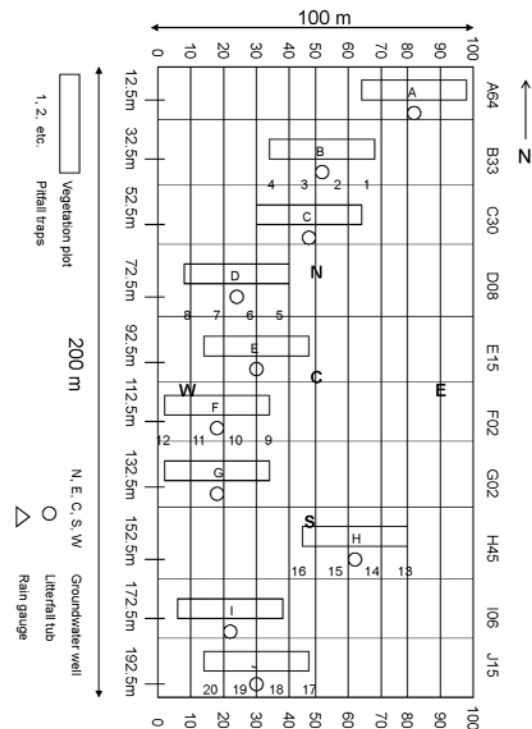
Before going to the field, some work must be done in the lab to prepare field equipment. Rubber litterfall tubs (circular horse feed bins with a 35 centimeter [cm] diameter bottom, 42 cm diameter top and 10 cm depth) need at least three 1-inch (in) diameter holes drilled into them so water can drain out. Tubs are labeled with the tub letter on the inside at least twice, and "research, do not disturb" is written on the inside lip if needed. White out and white paint pens work well for this.

For pitfall traps, drill a ¼-in hole into the bottom of a number of cups. Also, cut ½-in thick 5 x 5-in square wooden pieces and drill 8 x 2 ½-in deck screws into each corner. Spray paint these to help preserve the wood and camouflage them.

For rain gauges, install a metal mounting bracket to each 8-foot (ft)-long pressure treated wooden posts so that when rain gauge is inserted into bracket, top of gauge is about 2 inches above top of post.

Finally, obtain 10 random numbers between 0 and 70 (if width is 100 m [because of 30 m veg plots]) and create a preliminary site map showing relative locations of

vegetation plots and wells (see image).



### Study Site Set Up Materials

- six 50 m tapes and four 100 m tapes
- at least two compasses
- several copies of initial map
- clipboards and pencils
- at least 40 blue flags, 20 orange flags, 20 white flags, 10 green flags and 5 yellow flags
- Sharpies
- 60 pieces of 1 ft x 5/8 in-long rebar
- blue and orange spray paint
- hammer
- Impress-O-Tags
- 10 rubber litterfall tubs, drilled and labeled
- 30 1 ft-long wooden stakes
- 20 16 ounce (oz) Solo cups (TP16) with holes
- 20 solid 16 oz Solo cups (TP16)
- 20 lids (626TP) for Solo cups
- 20 pitfall trap wooden lids
- trowels

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- two rain gauges
- two posts with metal brackets installed
- shovel
- auger with 3 in-wide bucket
- vegetable oil
- temperature data loggers and cases
- screwdriver
- laptop computer and cable
- data logger software

### Study Site Set Up Directions

Select an area fitting the criteria outlined in the background section listed above. Measure out the site's shape to see if it will fit in the proposed location. Using compasses and tapes, determine the top 100 m and the side 200 m boundaries, leaving tapes on the ground. Check angles by laying out all four boundaries if possible. Make adjustments as necessary.

Mark off the side boundaries with white flags at 12.5 m, 32.5 m, 52.5 m, 72.5 m, etc. to 192.5 m (see image).

### Marking locations

Vegetation transects: Go to the white flag at 12.5 m along the western boundary. Use the first number from your random number list to determine the distance of how far into the study site to proceed east for the A veg plot (in this case, 64 m).

Carefully, using a compass to maintain the correct angle, head east and place a blue pin flag at the location determined by the random number. Label this flag with its transect letter corner of veg plot it represents (for example "A SW"). Measure out 5 m north and mark your NW corner of the veg plot with a blue flag labeled "A NW."

Maintaining the correct angle using a compass, walk 30 meters east to place your SE corner of the vegetation plot, marking it with a blue flag labeled "A SE." Measure out 5 m north and mark your NE corner with a blue flag labeled "A NE." Leave your measuring tape on the ground.

Litterfall tubs: At the 15 m mark of your tape, go 1 m

south and install a green flag with the letter tub on it ("A" in this case).

Return to western boundary and move to the white flag at 32.5 m. Note the second random number and repeat steps outlined in "Vegetation transects" and "Litterfall tubs." Be careful to maintain the correct east-west angle using a compass!

Pitfall traps: For transect B, with your 30 m tape on the ground for the south vegetation line, go 1 m south of the "B SW" blue flag and place an orange flag labeled "4." Walk east 10 meters along your 30 m line, head 1 m south and place a second orange flag here labeled "3." Go another 10 m along your 30 m line, head 1 m south and put another orange flag labeled "2." Install the fourth and orange flag labeled "1" 1 m south of the "B SE" corner.

Install flags for pitfall traps along transects D, F, H and J, noting the trap numbers (see image).

Groundwater wells: The center well is usually at the center of the site, at the 100 m mark on the north/south boundary and 50 m mark on the east/west boundary (see image). Using tapes and compasses, measure out this location and mark with a yellow flag with a "C" on it. Again, using tapes and compasses, measure out 40 m north, south, east and west for the four additional wells. Mark these locations with yellow flags labeled with the appropriate letter of the well (N, S, E, W). Move location of the well slightly (up to 2 m away) if necessary.

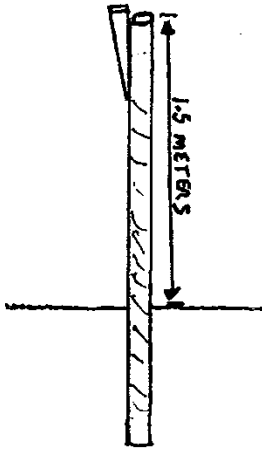
Weather stations: Under a dense canopy, use the auger to dig a hole so that 1.5 m of the post will remain above ground once it is set (see image). Set post securely in ground and pack soil around post with the end of the shovel. Ideally, install the post so that the gauge will face south so that in winter months, ice will have a better chance of melting.

Place rain gauge in bracket and pour vegetable oil in gauge. Record that amount on data sheet. Oil is placed in the gauge to limit loss of water to evaporation.

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Repeat process for rain gauge to be placed in open area.

For sites that will have temperature loggers, record on the logger and outside and inside of the case "BEMP: 505-898-6388" with a Sharpie.

Using the laptop computer, follow the directions and launch the data logger for one hour intervals using Celsius. Title each logger as appropriate:

"your site name, canopy 2m high"

"your site name, canopy subsurface"

"your site name, open subsurface"

Place loggers within their protective cases and then in their proper locations. One is located 2 m high on the north side of a tree under dense canopy. The other two loggers are both buried under 2 cm of soil: one under dense canopy and the other in an open area. To make it easier to find them, buried loggers should be placed a specific distance from a secure and visible object like the open rain gauge post. Carefully measure and record where the loggers are, especially the buried ones.

### Installing equipment

Pound 1 ft x 5/8 in-long rebars where each blue or orange flag has been placed. Paint rebar blue or orange (according to flag color) and tag blue rebar according to what corner you are at ("A NE" or whatever) using Impress-O-Tags. Bury tags in dirt.

Install litterfall tubs where green flags are located. Place litterfall tub on ground and pound in three 1-foot long wooden stakes around tubs to secure its location.

Within six inches of the orange rebar, dig a hole with a trowel to so lid of the cup is flush with the surface of the soil. Install the holey cup and place the solid one into that one. Place the plastic lid on the top cup. If the soil does not come right up to the edge of the lid, re-dig the hole. Cover the closed cups with the appropriate wood lid. Ensure the correct number is on the underside, labeled with a Sharpie. Press the wood lid down into the ground.

FACT: The first established BEMP site was Alameda in 1996!