Monthly Monitoring Field Directions

Background
The Bosque Ecosystem Monitoring Program (BEMP) collects core monitoring data on a monthly basis at each of our 33 sites. Our core datasets are:

- Depth to groundwater
- Leaf litterfall
- Precipitation
- Depth to water in the nearby ditch or drain

Five wells at each site are used to measure depth to groundwater, which plays a critical role in vegetation health (especially cottonwoods, willows, and wetland species) and is also important in monitoring water cycle and evapotranspiration dynamics.

Precipitation is monitored using two gauges, one located in an open area and one under the forest canopy. Oil is placed in the gauge to limit loss of water due to evaporation.

A rubber tub is placed just to the south, at the center, of each of the ten vegetation transects to collect plant litterfall. In the lab, leaves, wood, and reproductive parts of the ten most common canopy species are dried, sorted, and identified. This dataset is useful in evaluating primary productivity, native and exotic species composition, reproductive effort, senescence, and can provide early indicators of plant stress before mortality occurs (e.g., leaf drop in summer).

Materials Needed
- vegetable oil
- monthly monitoring data sheet, clipboard, and pen
- 10 lunch-size paper bags labeled A through J and with the site name and date
- Sharpie
- Site maps
- Water level meter (“beeper”)
- Key for well locks

Pre-field Prep
Gather information from the previous month about any equipment at the site that needs maintenance or replacement. For information on how to prep site equipment, refer to the site setup protocol document.

General Instructions
If a data point is not able to be collected, note that on the datasheet as missing and include the reason in the comments. *Missing data not zeros and are entered differently.*

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Using the Water Level Meter, aka: Beeper

The "beeper" is a water level meter that emits a loud noise when the probe at the end of the measuring tape hits water. We use this instrument to measure the distance to the top of the water in the wells and the ditch.

To turn the meter on, turn the sensitivity knob and a beep will sound. On the back of the spool, below the handle, is a knob that loosens the spool. Unscrew the knob, and slowly lower the probe into the well. The measuring tape is color-coded—black for centimeters, red for meters. **Unspool the tape slowly and keep track of each meter that passes—the centimeter count restarts at each meter.** When the meter beeps, reel in the tape until the alarm stops. Continue to lower and raise the probe slowly to determine the exact point at which it begins beeping—this is the surface of the water. When you have determined the level of the surface of the water, read the tape vertically (don't fold it over the edge of the well) from the appropriate location:

- black notch at the top of the groundwater well
- white or black arrow on the downstream side of the bridge or culvert over the ditch. This mark is generally at the bottom part of the bridge (by your feet), not on the railing.

Image: The notch is sawed into the well and then marked with black sharpie.

Using fingers to keep the tape from dragging across the well's edge, raise and guide the tape back onto the spool while keeping the tape flat. Place the metal probe into the holster next to the handle. It is very important to keep the tape flat, to avoid bending the tape too far, and avoid dropping the probe on to the ground.

Turn off the beeper and use the knob to lock the spool back in place.

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Well monitoring directions

1. Gently remove the well cap and note what well you are at by looking on the inside of the cap or on the well.
2. Beep the well, reading to the nearest half-centimeter. If the beeper stops going down into the well easily, try to figure out if it can pass by the obstruction or not. If it feels like you can pass by the obstruction (often roots), note this on your data sheet. If the beeper does not beep at all but will not go further down, take a reading there and note it on your data sheet (the number and whether or not you got a beep). See if there is mud or dirt on the bottom of your sensor and note that on the data sheet, too.
3. Place the cap back on the well ***gently*** so that it can be easily removed the next time the well is used. If you have a locking cap, generally, three turns of the cap will sufficiently lock it in place. If it keeps on spinning and not locking, hold the base in place and continue turning the lock. Ensure that the cap is on tightly (but not too tight!) so that pressure transducers will not be stolen.

Ditch Monitoring

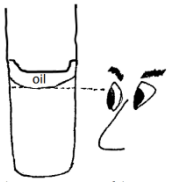
Beep on the downstream side of the structure (culvert or bridge) from which you are reading the water level of the ditch.

An arrow notes the location of where to beep the ditch. It is either at your feet in the middle of the structure or at the top of the railing if on a bridge (see image). Each site has a specific, consistent monitoring point.

Precipitation Monitoring

1. Locate rain gauge. Note if the gauge is the open or canopy one.
2. Reading the gauge at eye level (see image 2), determine the amount of precipitation. Looking at the two numbers above and below the water level, count the number of dashes and determine the interval that each dash represents. Be sure to only record the water (NOT oil) level. The top line of liquid is the oil, which floats above the water. The line of oil/water interface, at the bottom of the meniscus of the oil, is where the precipitation level is read (see drawing). Record in both inches and millimeters on data sheet.

Read gauge at eye level (image not to scale)



3. If it is hard to distinguish the difference between oil and water, lightly shake the gauge so you get some bubbles and then let it settle before taking your reading.
4. If there is anything large in the gauge like a bug or leaf, note this on the data sheet.
5. If there is ice in the gauge, and if you have time, hold the gauge under your arm or somewhere warm to enable the ice to melt before taking a reading. If you don't have time, note that the rain gauge had ice in it.
6. If the gauge was tampered with, note "no data" on the data sheet and also note that it was tampered with. Missing data is entered differently than zero (no rain).
7. Empty the entire contents of the rain gauge and clean it out the best you can. Pour between 0.05 and 0.1 inch of oil in the rain gauge and place it back in its stand. Record the amount of oil in the rain gauge in either millimeters or inches on your data sheet.
8. Find the other rain gauge and repeat instructions.

<u>Litterfall Monitoring</u>

1. Locate tubs using the site map.
2. At each tub, place the paper bag (labeled with the site name, date of collection including the year, and tub letter) into the center of your tub.
3. Pick up the plant and woody material and place it into the bag.
4. Pick out the small pieces of plant material from the dirt and place those into your bag. If you must, pick up the tub to empty the contents into the bag. *Note:* BEMP staffers can decide when not to include a leaf from the tub, such as one that is obviously not from the current year and has blown in – is decomposed or very lacy from being eaten.
5. When there is a stick lying across the tub, break off ends that are outside of the tub area and only include portions that fall within the perimeter of the tub. If there is a large stick that cannot be broken at the edges of the tub, mark the edges of where it lies across your tub using a Sharpie. Label the portion of the stick **that was inside the tub** with the site name, tub letter and collection date.
6. Do not include any vegetation that is still connected to the ground but falling over the tub, even if it is a plant that is dead. If it is still connected to the ground, do not pull or break it.
7. If a tumbleweed or kochia has blown into the tub, remove that from the tub – do not collect this. It is OK to collect kochia and tumbleweed pieces that have fallen into the tub once the whole kochia and/or tumbleweed have been removed.
8. Record on datasheet that each tub was emptied and note if any tubs were unusual (moved, turned upside down, missing, replaced, etc.)

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Community science oversight

Because BEMP is a community science organization, K-12 students usually assist with monthly monitoring. To ensure data quality, BEMP staff members, undergraduate or graduate students who have been thoroughly trained and tested on field procedures oversee the involvement of the K-12 students. Quality is controlled by assuring that students are:

- beeping the well correctly
- reading rain gauges properly
- holding the bag over the tub and putting all plant material from the tub into the bag
- recording data correctly (although usually this task is reserved for BEMP staff or undergraduate interns only)

Double check before leaving

- Do you have all the bags? Are they all labeled correctly?
- Do the groundwater data make sense? To double check this, graph the groundwater data in the field to compare them to previous months.
- Do the rain data seem logical?

Other information on datasheet

1. Land acknowledgement: start with a land acknowledgement. This land was forcibly taken from Indigenous Peoples and the impacts of displacement are still impactful today; we are also intruding into the home of plants and animals; respect is critical.
2. Safety: Observation is important. Be mindful of risks from weather, especially high winds, debris, other people, etc. If you ever feel unsafe, gather your group and leave. Monitoring can happen another day.
3. Weather: what is the current weather? What are other field observations?
4. Outreach: how many adult and student volunteers are there?

Data storage

1. Take all ten bags back to the lab at UNM. Dry them in drying ovens at 60°C for 48 hours.
2. Inventory the bags to make sure all the bags from all the sites are collected.
3. When the bags are done drying, place them in a sealed plastic bag until they are ready to be processed.