Purpose and Scope: General instructions for completing the APHIS Form 2060 are covered in each specific Environmental Monitoring Plan (EMP). Several of the blocks in the Form require the sample collector to take measurements. This SOP gives step-by-step instructions on how to take those measurements. If the EMP provides instructions for any of these measurements, then those instructions take precedence over the instructions in this SOP. The following measurements are covered in this SOP:

1. Distance
2. Direction
3. Wind Speed
4. Air Temperature and Humidity
5. Soil Type
6. Land Slope
7. Water Velocity
8. Dissolved Oxygen and Water Temperature

Supplies Required: To request sampling supplies, contact the monitoring supplies coordinators, Lisa Mosser (305) 278 4902, or Richard King (305) 278 2905, Center for Plant Health Science and Technology, Miami, or email the Environmental Monitoring Supplies Checklist to lisa.k.mosser@usda.gov or richard.a.king@usda.gov.

1. Distance

1.1 Purpose and Scope: This measurement is required to determine the distance between the treatment site and the sample collection site and might also be needed to determine the size of a pond or the width of a stream.

1.2 Supplies Required:

1.2.1 map (USGS Quadrangle 1:24000, optional)

1.2.2 compass (optional)

1.2.3 field log book

1.3 Measuring Distance:

1.3.1 If distance can be measured directly, do so. Simply pacing off a straight line between the two points of interest, and multiplying the number of paces by the number of feet in your stride is one convenient method of measurement.

1.3.2 If you cannot directly measure the distance, and you have a map with a scale large enough to make an accurate determination of distance, then locate the points of interest on the map and measure the distance between two points on the map and convert it to feet using the map scale.

1.3.3 If you can do neither 1.3.1 or 1.3.2, then simply estimate the distance and make a note in the Remarks block of the 2060 Form that distance was an estimate.

2. Measuring Direction

2.1 Purpose and Scope: This measurement, combined with the distance, is required to determine the location of the sample collection site in relation to the treatment site. This measurement is also used in combination with the wind direction to define wind characteristics at the time of a treatment. The wind direction will affect the location of spray drift.

2.2 Supplies Required:

2.2.1 compass

2.2.2 field log book.

2.3 Measuring Wind Direction:

2.3.1 Wind direction should be taken within a half-mile of the area that is being monitored.

2.3.2 Determine the direction the wind is coming from by standing in an open area, at least 100 feet from tall obstructions such as a forest edge. Observe the direction that light objects (e.g., ribbon, smoke, dust, grass) drift when in the air.

2.3.3 Face directly into the wind.

2.3.4 Hold the compass flat on the palm of your hand, making sure the needle swings freely. Make sure no iron or steel objects are too close to the compass (these objects may attract the magnetic needle and alter the reading). Do not take compass directions from inside a car, or while standing in the bed of a pickup truck.

2.3.5 Orient the compass so that the sighting (the line oriented along the long axis of the compass body--see Figure 1 below) is also pointing directly into the wind.

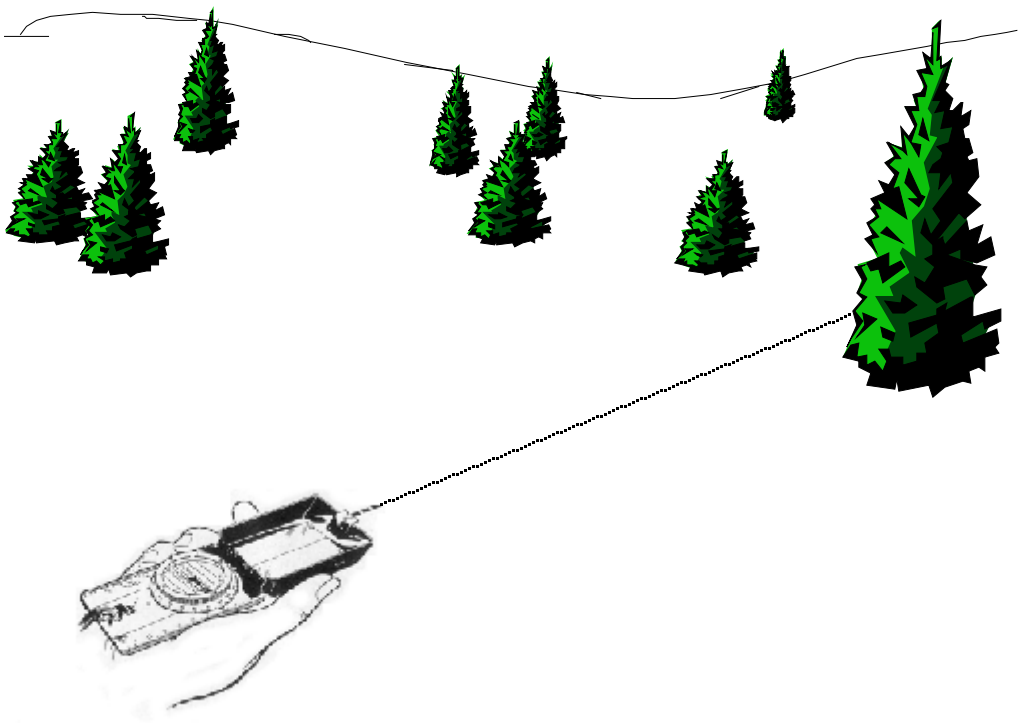

Figure 1. Taking a compass bearing when sighting on a landmark.

2.3.6 Without changing the position of the compass, carefully turn the dial until the orienting arrow on the dial and the magnetic needle are lined up.

2.3.7 The wind direction, or "bearing", is now the degree reading indicated at the index pointer. Use degree readings rather than general direction designations. Using degrees instead of general direction designations increases the accuracy of the monitoring data and avoids the confusion some people have in labeling the proper direction.

2.3.8 If the wind is changing directions frequently, take readings at least every 15 minutes, before, during and after the treatment. Record each measurement in the field log book along with the time it was taken.

2.4 Measuring Direction to Sample Collection Site: The convention for measuring direction is FROM the treatment site TO the sample collection site

2.4.1 Stand at the edge of the treatment block closest to the sample collection site.

2.4.2 Follow steps 2.3.4 through 2.3.7 above, except instead of facing into the wind, sight the compass on the point where the sample was collected.

3. Measuring Wind Speed:

3.1 Purpose and Scope: This measurement, combined with the wind direction, is required to define wind characteristics at the time of a treatment. Wind speed will affect distance and amount of spray drift.

3.2 Supplies Required:

3.2.1 anemometer (wind gauge)

3.2.2 field log book.

3.3 Measuring Wind Speed:

3.3.1 The measurement should be taken near the same location where the wind direction was measured (section 2.3.1 to 2.3.3). Try to gain as much altitude as possible when taking the reading (i.e., stand in the bed of a pick-up truck). Make sure you are facing directly into the wind because variations of more than 20° to either side of the wind direction will reduce the accuracy of the wind speed reading.

3.3.2 Orient the anemometer so that air can pass through the back of the "impeller" housing, allowing the blades of the impeller to rotate. Line it up as carefully.

3.3.3 Hold the anemometer in a vertical position in front of you and take a wind reading from the display (see Figure 2 below).

3.3.4 Each wind speed reading should be taken for 15 seconds. Record the range of wind speeds in your field log book. Wind speed should be measured: 1) 15 minutes before treatment commences; 2) as treatment begins; 3) at five minute intervals during treatment; and 4) five minutes after treatment ends.

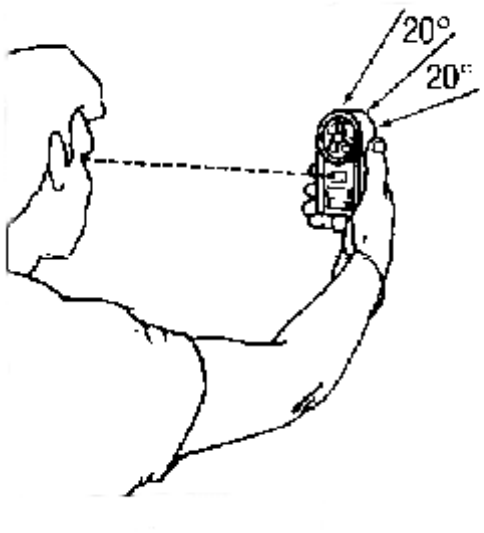

Figure 2. Anemometer must be held in a vertical position facing directly toward the wind.

4. Measuring Air Temperature and Humidity

4.1 Purpose and Scope: These measurements are taken because air temperature and humidity may affect how much spray drift occurs.

4.2 Supplies Required:

4.2.1 thermometer

4.2.2 field log book.

4.3 Air Temperature:

4.3.1 Place the thermometer in a shaded spot and allow it to equilibrate before the treatment commences. Record the air temperature during the treatment in the field log book.

4.4 Humidity:

5.2.1 No instruments will be provided for measuring humidity. Instead you should contact a local weather/news service and obtain the average humidity value for the day. Observed weather reports available from the National Weather Service can provide

additional useful information (https://www.weather.gov/forecastmaps).

5. Determining Soil Composition

5.1 Purpose and Scope: The composition of soil affects its permeability. Highly permeable soils allow rapid leaching to groundwater, impermeable soils are susceptible to run-off following rain or irrigation. Soils are composed of sand (most permeable), silt and clay (least permeable). Sand, silt, clay and loam are the four terms used to classify soil. Depending on the percentage of silt, sand and clay in the soil, these four terms are combined to produce the spectrum of soil classifications. These classifications are as follows: sand, loamy sand, sandy loam, loam, silt, silt loam, clay loam, silty clay loam, sandy clay, silty clay and clay.

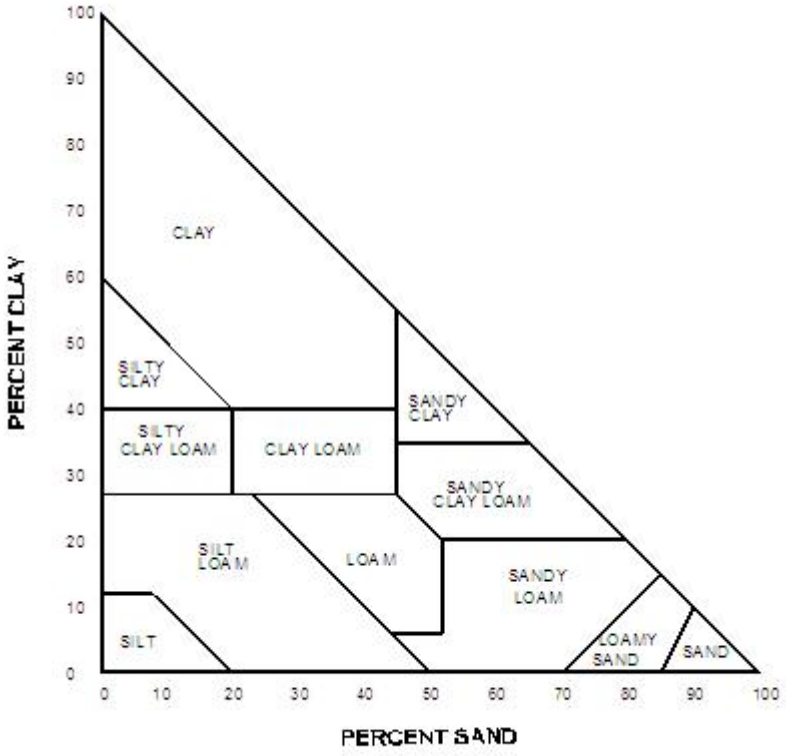

Figure 3. Soil classifications based on percent of clay, sand and silt.

The figure above provides a graphical explanation of which description is appropriate for a given soil sample. Accurate determinations of percent sand, clay and silt can only be done in the

laboratory. For the purpose of filling out the Form 2060, an estimate of the soil composition will be adequate. A method for estimating the soil composition follows.

5.2 Supplies Required:

5.2.1 county soil survey map

5.2.2 field log book.

5.3 Estimate of Soil Composition:

5.3.1 Obtain a copy of the county soil survey map from the county agriculture extension agent, and read off the soil composition type for the location being characterized by the APHIS Form 2060. Also, if the information is available on the map, record the depth of the bedrock at that location.

5.3.2 Confirm the soil composition by wetting a soil sample to the consistency of a workable putty and roll it into a ball with a diameter of about half an inch.

5.3.3 Hold the ball between your thumb and forefinger and gradually press your thumb forward in order to squeeze out a ribbon of soil.

5.3.4 If the ribbon forms easily and remains long and flexible, the soil is probably a clay or silty clay; if it breaks easily under its own weight, it probably is a clay loam or silty clay loam; if a ribbon is not formed, the soil is probably a silt loam, sandy loam or sand. Record your results in the field log book, noting whether the ribbon test confirmed the county soil survey map reading.

6. Land Slope

6.1 Purpose and Scope: This measurement is taken primarily to evaluate the potential for runoff from the treatment site to the sample collection site. The steeper the slope (decline), the more likely runoff could occur.

6.2 Supplies Required:

6.2.1 protractor with a whole at the center (origin)

6.2.2 straight piece of stiff wire (about 5 inches long) with one end bent back on itself (straighten paper clip)

6.2.3 field log book.

6.3 Estimation of Land Slope: Often a visual estimate of the slope from the treatment site to the sample collection site is acceptable. Simply record the estimated degrees below horizontal as negative degrees (for a decline) or the estimated degrees above horizontal as positive degrees (for an incline), in the field log book. In some instances, field personnel can also estimate the change in elevation over a measured distance. Face directly towards the upward trending slope and pick a representative location on the ground that is exactly at eye level. Pace off the distance to the eye level location. Your height is the "rise" measurement and the distance is the "run" measurement. Record the estimated elevation change in units of rise over run. This method results in poor estimations if used facing downhill. If the EMP calls for a more accurate measure, then follow the steps below:

6.3.1 Insert the wire into the hole in the protractor such that the wire hangs freely when the protractor is held up on its edge (when the flat edge of the protractor is horizontal, the hanging wire should cross the arc of the protractor at the 90° mark--see Figure 4 below).

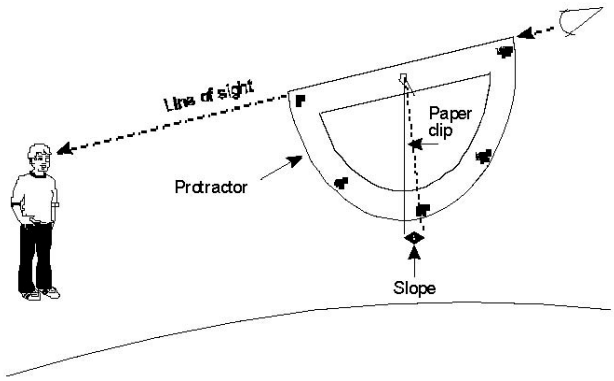

Figure 4. Estimate the slope of a line to a point at eye level above the sample location.

6.3.2 While standing at the edge of the treatment site, sight along the flat edge of the protractor (along the 0° to 180° axis) to a spot that would be at your eye level at the sample collection site.

6.3.3 Read off the number of degrees between the 90° mark and the mark where the wire is hanging (be sure the wire swings freely in the hole in the protractor). Remember to record positive degrees for an incline and negative degrees for a decline.

7. Water Surface Velocity

7.1 Purpose and Scope: This measurement will provide information as to how far down stream pesticide residues might flow over a given time. The dilution rate can be estimated when the volume of the stream is known. Recent and real time flow rates, expressed as discharge, can be obtained for thousands of gauging stations from the U.S. Geological Survey (http://waterdata.usgs.gov/nwis/rt).

7.2 Supplies Required:

7.2.1 Float (an object buoyant enough to be visible when floating but not so light as to be affected by the wind, e.g., a stick).

7.2.2 Stopwatch.

7.3 Estimate of Water Surface Velocity:

7.3.1 Pace off the distance between two landmarks on one bank of the stream.

7.3.2 Toss the float into midstream, at a location upstream from the landmarks.

7.3.3 Start the stopwatch when the float passes the first landmark and stop it when the float passes the second landmark.

7.3.4 Calculate the water surface velocity in units of feet per minute.

8. Dissolved Oxygen and Water Temperature

8.1 Purpose and Scope: Measurement of dissolved oxygen along with water temperature will provide information on water quality. Knowing the water quality is important when trying to evaluate the potential impact of pesticide residues on aquatic species.

8.2 Supplies Required:

8.2.1 SOP EM - 21 *Measurement of Dissolved Oxygen in Water Samples*

8.2.2 thermometer

8.2.3 field log book.

8.3 Measuring Dissolved Oxygen and Water Temperature:

8.3.1 Submerge the measuring end of the thermometer (the bulb) into the water body, allow it to equilibrate for about a minute, and record the temperature.

8.3.2 Measure the dissolved oxygen by following the guidelines in SOP EM - 21 *Measurement of Dissolved Oxygen in Water Samples.*