

## Correction Factors for Sap Flow Measurements

### Wound Diameter

#### *Equipment Required:*

- Callipers
- Dissecting blade
- Hand lens or dissecting microscope

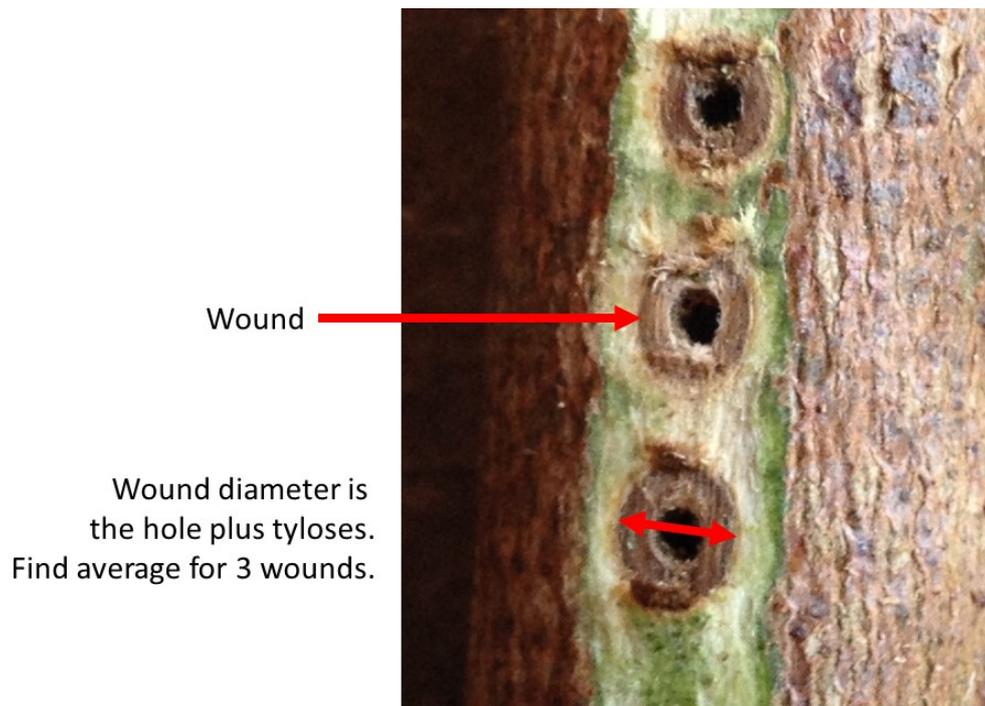
Wounding is an inevitable consequence of drilling into the plant and inserting the sensor probes. For accurate sap flow data, it is critical that wounding is measured and corrected for in converting heat pulse velocity into sap flux density and sap flow.

The wound should be visually observable once the sensor probes have been carefully removed from the plant. You may need to scrape away, or remove, the bark with a dissecting blade to visually see the wound on the sapwood.

The wound is the hole where the sensor is inserted into the plant plus a ring, or donut, shape surrounding the hole. This is tyloses – or cell death to prevent infections from entering the plant.

Measure the wound diameter with a set of callipers. Measure the average of the three wounds from the three sensor probes.

Wound diameter value should range between 0.17 and 0.3 cm (centimetres).



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## Sapwood Fresh Volume, Weight and Dry Weight

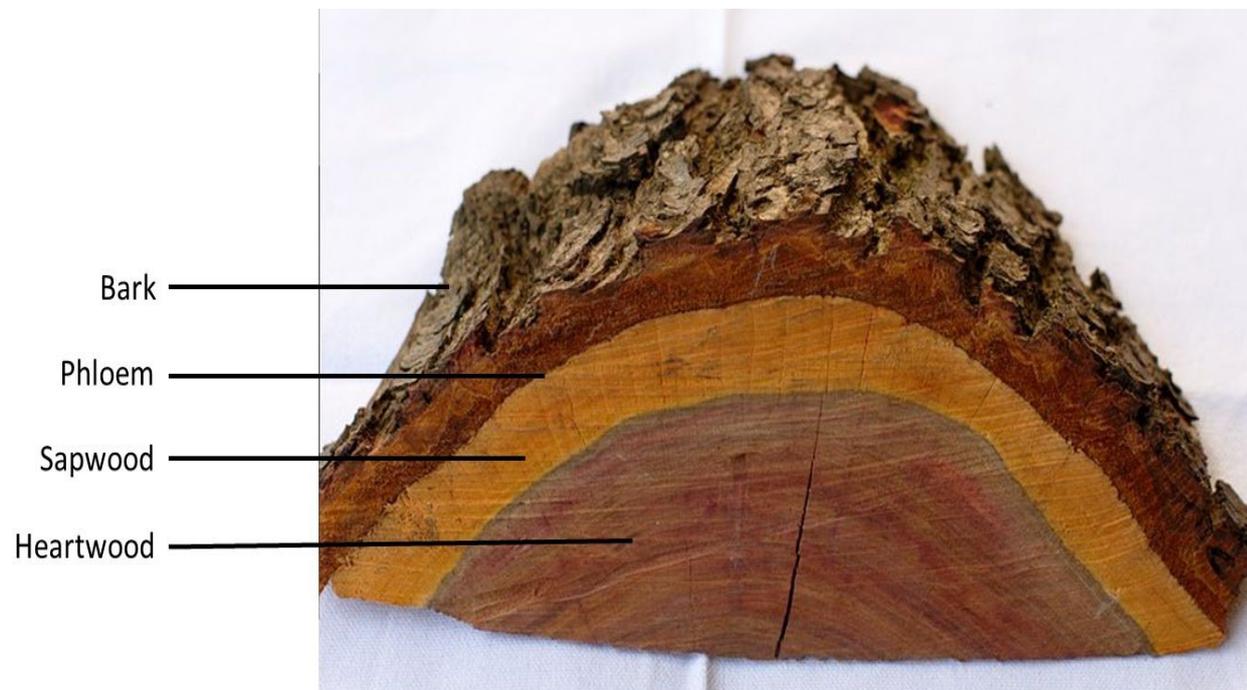
### *Equipment Required:*

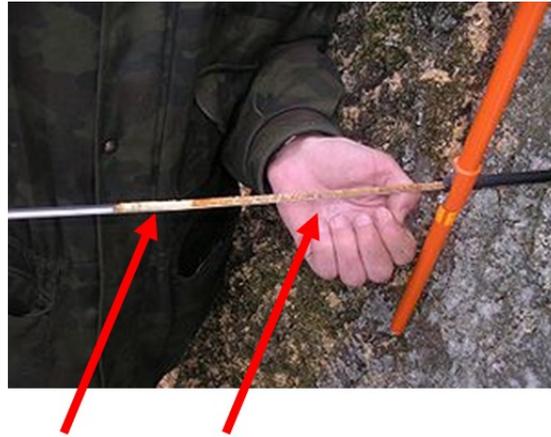
- Increment borer
- Secateurs
- Dissecting blade
- Callipers
- 3 or 4 decimal point weigh scale
- Drying oven

The sapwood fresh volume, weight and oven dry weight is measured to determine the wood bulk density and gravimetric moisture content of sapwood.

A sample of sapwood must be collected from your measured plant. For large trees, a sample can be collected using an increment borer. For small stems, a sample can be collected using secateurs and a dissecting blade.

It is important that only sapwood is sampled. Do not measure bark and/or heartwood.





Sapwood and heartwood sample from an increment borer. Only measure sapwood.

### *Sapwood Fresh Weight*

Immediately following the collection of the sapwood sample, it is important that the weight of the sample is measured.

Ideally, the sample should be weighed immediately. However, in the field this may not be possible. Therefore, wrap the sample in parafilm or other material to prevent desiccation. Place the sample in a zip lock bag and into an Esky or ice container. You need to ensure that moisture loss is minimised.

### *Sapwood Fresh Volume*

Immediately following measuring sapwood fresh weight, it is important that the shape, or volume, is measured.

With a sample from an increment borer, you can carefully cut the ends of the sapwood core to create a cylindrical shape. With a set of callipers, measure the height and diameter of the cylinder and calculate volume.

With a sample from a small stem or wood section, it may be possible to cut the sample into a cube, cuboid or cylinder to measure the volume.

Often, the shape will be irregular. For these samples, the volume can be determined following Archimedes' principle.

### *Sapwood Oven Dry Weight*

Place the sample in a drying oven at a temperature of 70 °C to remove all moisture from the sample. Depending on the moisture content of the sample, it may take several hours or a couple of days to remove all moisture.

Every few hours, remove the sample from the drying oven and re-weigh. Once the weight is no longer decreasing, then all moisture has been dried from the sample. This is the oven dry weight.



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## Stem Diameter, Bark Depth and Sapwood Depth

### *Equipment Required:*

- Diameter tape
- Callipers
- Increment borer

It is critical to measure the size of the plant to convert sap flux density into volumetric, or whole-plant, sap flow.

Measure the diameter of the plant where the sap flow sensor was installed with either a diameter tape for large trees or callipers for small stems.

Measure the bark depth, or radius, of your plant.

Measure the sapwood radius, or depth, at the location where the sap flow sensor was installed. Ideally, a cut stem is the most accurate approach to measure sapwood radius. For small stems a pair of secateurs can cut the stem. For large trees a chainsaw, operated by a qualified technician, may be required. Only operate a chainsaw under appropriate supervision and training.

Where it is not possible to cut a large tree, an increment borer can be used to measure sapwood radius. With the increment borer, sample to at least halfway into the tree. Remove the core and measure the sapwood length.

Note that sapwood depth may be irregular around the circumference of the tree. You may need to measure at several circumferential locations to better understand the distribution of sapwood.

Uniform sapwood depth



Irregular, or non-uniform, sapwood depth



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