

## Mesocosm building walkthrough

The first step was to prepare the tanks. Tanks have three key values:

1. Minimum water level
2. Average water level
3. Maximum water level

Minimum water level is defined by a toilet flush device.

Maximum water level is limited by a small hole drilled in the tank through which the excess water can flow freely.

Average water level is controlled by an electronic regulating device. A pipe is fitted into a hole drilled through the tank wall at the appropriate level, and water flows through this pipe to a siphon. Mesocosms built for low amplitude of water table fluctuation have only the maximum and minimum level controls.

As the dimensions vary according to the treatment, various pieces of various sizes have to be prepared to set up the mesocosms. The following pages give the specifications and part lists for the nine treatments. The nine 'parts list' pages are designed to be printed separately, and used as checklists. They are the actual sheets we provided to the technical service that prepared all the pieces (pictures were added later).

## Parts list

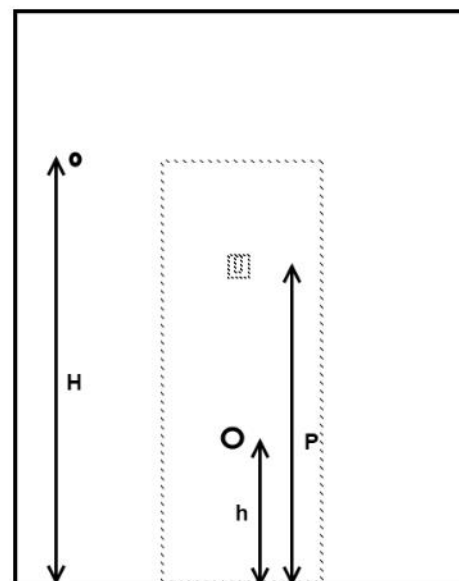
### Treatment

**Water level:**      **High (-4 cm)**

**Amplitude:**        **Low**

### Tank metrics

- Minimum level : 34 cm
  - Overflow (H) : 38 cm
  - Hole filter (h) : no hole
- diameter: 3.5 mm



### PVC tube

- Flush device slot (P): 42 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 16 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required:

## Parts list

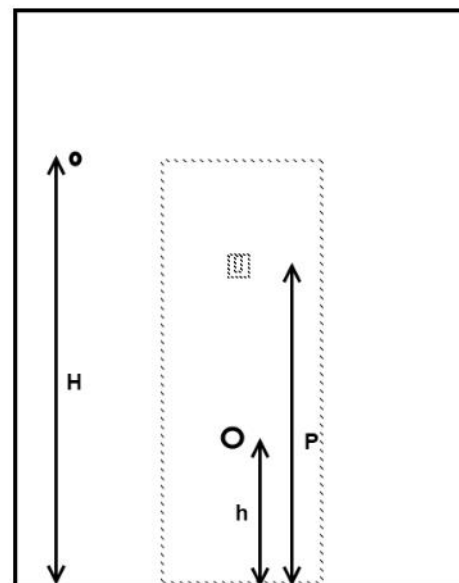
### Treatment

**Water level:**        **High (-4 cm)**

**Amplitude:**        **Medium**

### Tank metrics

- Minimum level : 31 cm
- Overflow (H) : 41 cm                      diameter: 3.5 mm
- Hole filter (h) : 36 cm



### PVC tube

- Flush device slot (P): 41.5 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 16.5 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required: pierced tube, mesh filter, L tube, O-ring

## Parts list

### Treatment

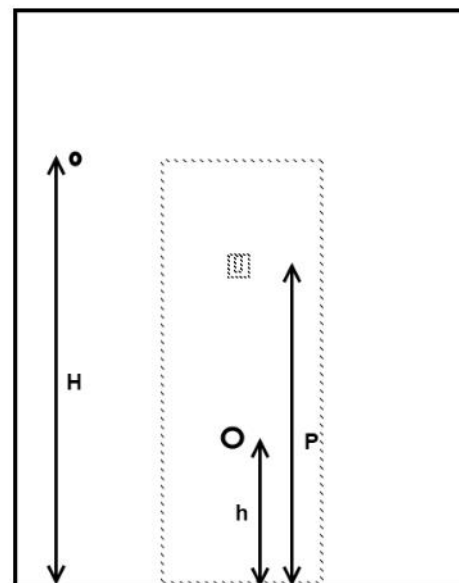
**Water level:**        **High (-4 cm)**

**Amplitude:**        **High**

### Tank metrics

- Minimum level : 23.5 cm
- Overflow (H) : 48.5 cm
- Hole filter (h) : 36 cm

diameter: 3.5 mm



### PVC tube

- Flush device slot (P): 34 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 24 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required: pierced tube, mesh filter, L tube, O-ring

## Parts list

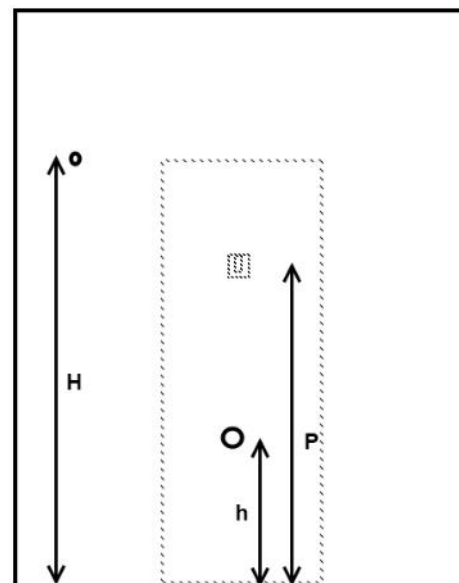
### Treatment

**Water level: Medium (-15 cm)**

**Amplitude: Low**

### Tank metrics

- Minimum level : 23 cm
  - Overflow (H) : 27 cm
  - Hole filter (h) : no hole
- diameter: 3.5 mm



### PVC tube

- Flush device slot (P): 33.5 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 24.5 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required:

## Parts list

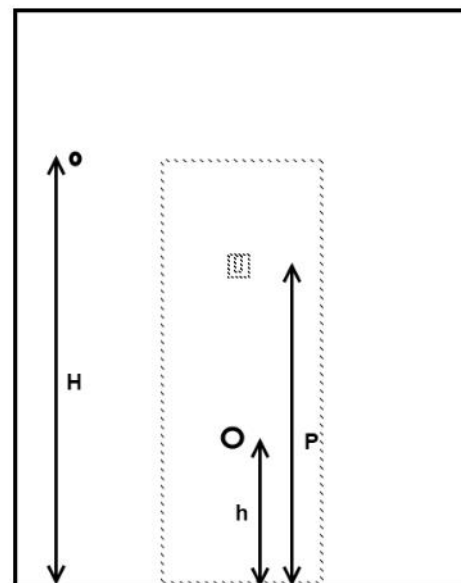
### Treatment

**Water level:**        **Medium (-15 cm)**

**Amplitude:**        **Medium**

#### Tank metrics

- Minimum level : 20 cm
- Overflow (H) : 30 cm                      diameter: 3.5 mm
- Hole filter (h) : 25 cm



#### PVC tube

- Flush device slot (P): 30.5 cm

#### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 27.5 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



#### Water output

Required: pierced tube, mesh filter, L tube, O-ring

## Parts list

### Treatment

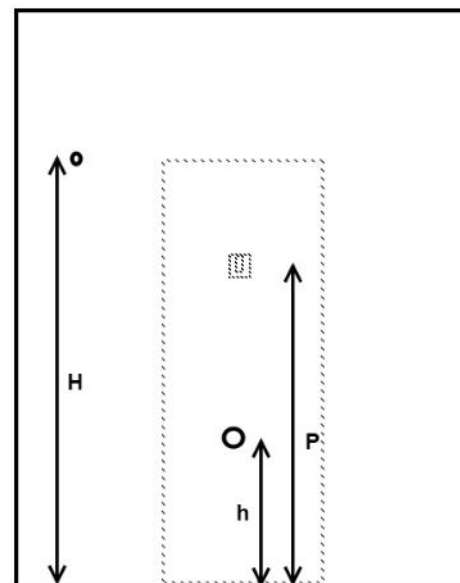
**Water level:**        **Medium (-15 cm)**

**Amplitude:**        **High**

### Tank metrics

- Minimum level : 12.5 cm
- Overflow (H) : 37.5 cm
- Hole filter (h) : 25 cm

diameter: 3.5 mm



### PVC tube

- Flush device slot (P): 23 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 34 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required: pierced tube, mesh filter, L tube, O-ring

## Parts list

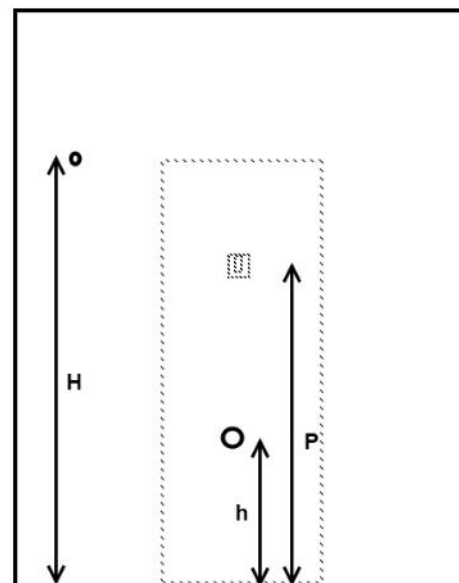
### Treatment

**Water level:**      **Low (-25 cm)**

**Amplitude:**        **Low**

### Tank metrics

- Minimum level : 13 cm
- Overflow (H) : 17 cm      diameter: 3.5 mm
- Hole filter (h) : no hole



### PVC tube

- Flush device slot (P): 23.5 cm

### Water input

- Flush device
- L stainless steel pipe: 12 cm
- U stainless steel pipe: 34.5 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



### Water output

Required:



## Parts list

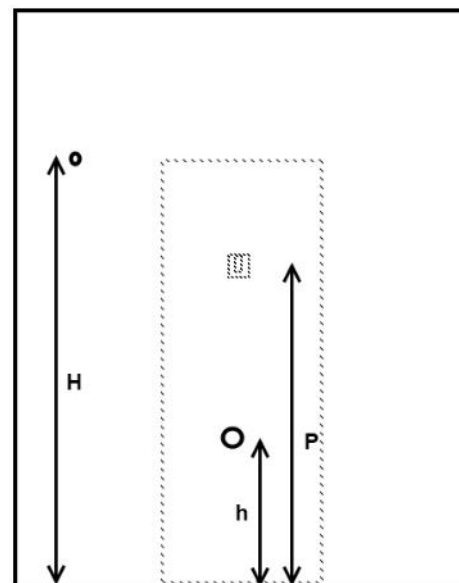
### Treatment

**Water level:**      **Low (-25 cm)**

**Amplitude:**        **Medium**

#### Tank metrics

- Minimum level : 10 cm
- Overflow (H) : 20 cm      diameter: 3.5 mm
- Hole filter (h) : 15 cm



#### PVC tube

- Flush device slot (P): 19 cm

#### Water input

- Flush device
- L stainless steel pipe: 10 cm
- U stainless steel pipe: 39 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



#### Water output

Required: pierced tube, mesh filter, L tube, O-ring

## Parts list

### Treatment

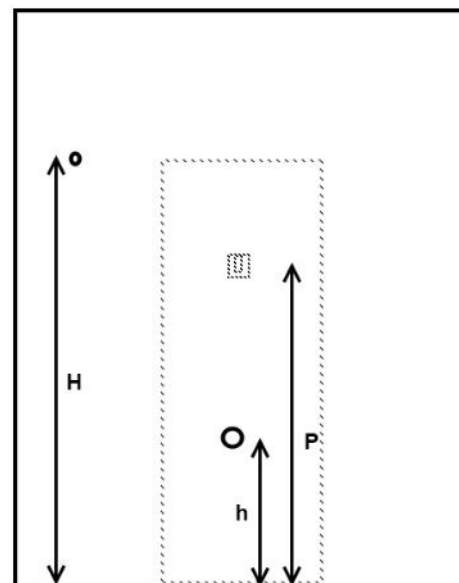
**Water level:**      **Low (-25 cm)**

**Amplitude:**        **High**

#### Tank metrics

- Minimum level : 2.5 cm
- Overflow (H) : 27.5 cm
- Hole filter (h) : 15 cm

diameter: 3.5 mm



#### PVC tube

- Flush device slot (P): 19 cm

#### Water input

- Flush device
- L stainless steel pipe: 10 cm
- U stainless steel pipe: 39 cm
- Black plastic tube: 7.5 cm
- Silicone pipe: 4 cm
- T connector for black plastic tube



#### Water output

Required: pierced tube, mesh filter, L tube, O-ring

The second step was to prepare the location where the experiment would take place. In the photograph below, the ground has been flattened and the wooden frame holding the lids installed. The lids are securely attached to the frame with iron wires passing through holes in the edges of the lids and screw eyes inserted between each pair of lids. The ends of the wires can be seen on the sides of the nearest lids.





We then collected peat and *Sphagnum*.



Peat was extracted using a peat corer (above). In this case a Wardenaar peat profile sampler (Eijkelkamp) was being used, but we also tried a cylindrical double corer (Buttler *et al.* 1998). The cores were placed in the PVC tubes in the field, then brought to the experiment location (below).



The tanks and PVC tubes were then installed at the experiment location, with all the plumbing that had previously been prepared.



In the photograph above, a detail of the water input is presented. The water comes from the black pipe (top left), then through the two stainless steel pipes (connected to each other with a silicone pipe). The lengths of the stainless steel pipes depend on the treatment (length is given in each 'Parts List' sheet). The flush device is attached to the PVC tube at the desired height with a PVC slot manufactured in the laboratory. The height of the flush device depends on the desired minimum water level. The activation threshold of the flush device can be fine-adjusted using the white vertical screw connecting the transparent float and the blue switch.

The maximum water level is simply constrained by a small hole drilled in the blue tank.

The next two pictures show more general views of the installation. In the first of these, an exhaust pipe is displayed. This is an L-shaped stainless steel pipe plugged into a small plastic tube that contains a mesh filter. It is used to filter the water evacuated by the pumps. This pipe will be connected through the black O-ring that can be seen on the front face of the blue tank (the front face is facing to the left in the photograph).

In the second picture, the long horizontal black pipe provides the water input to each tank.







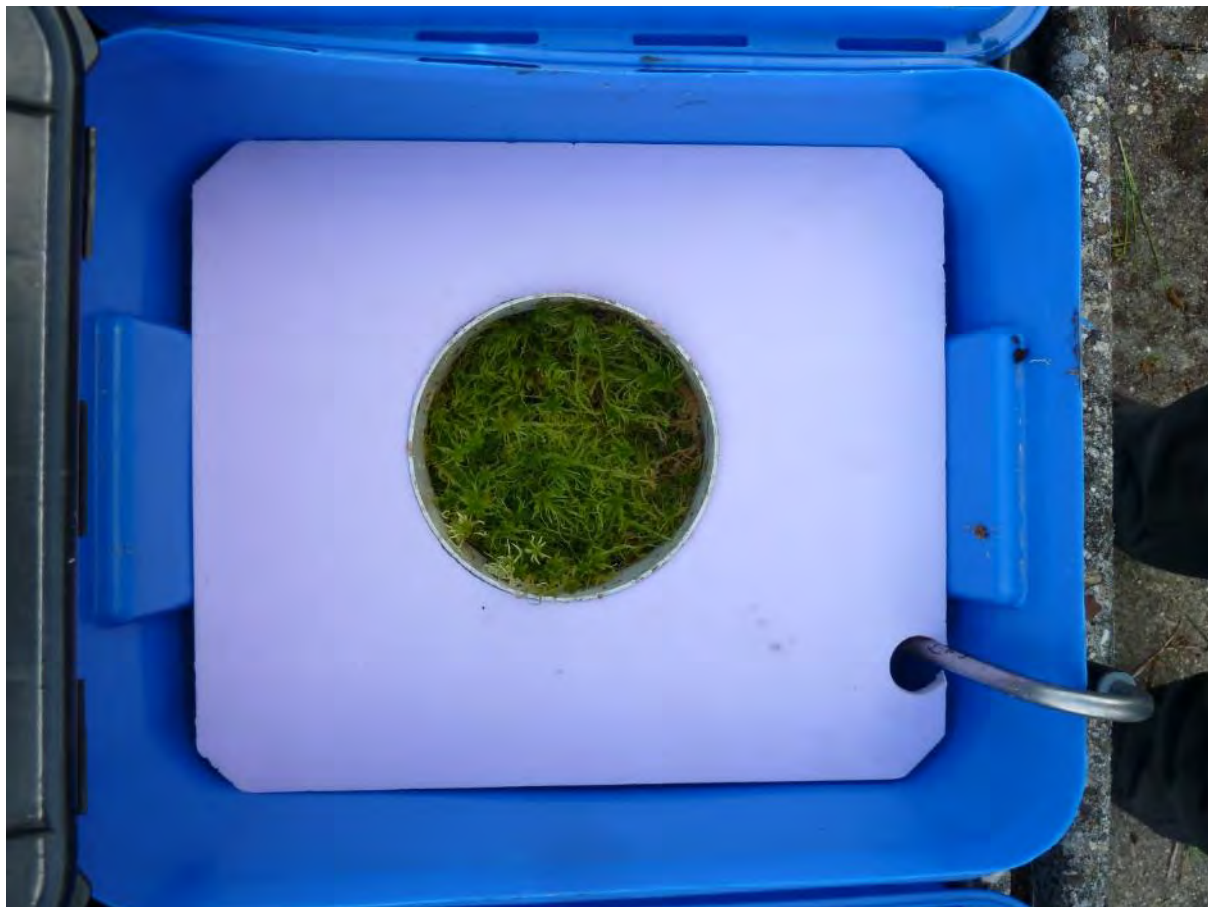
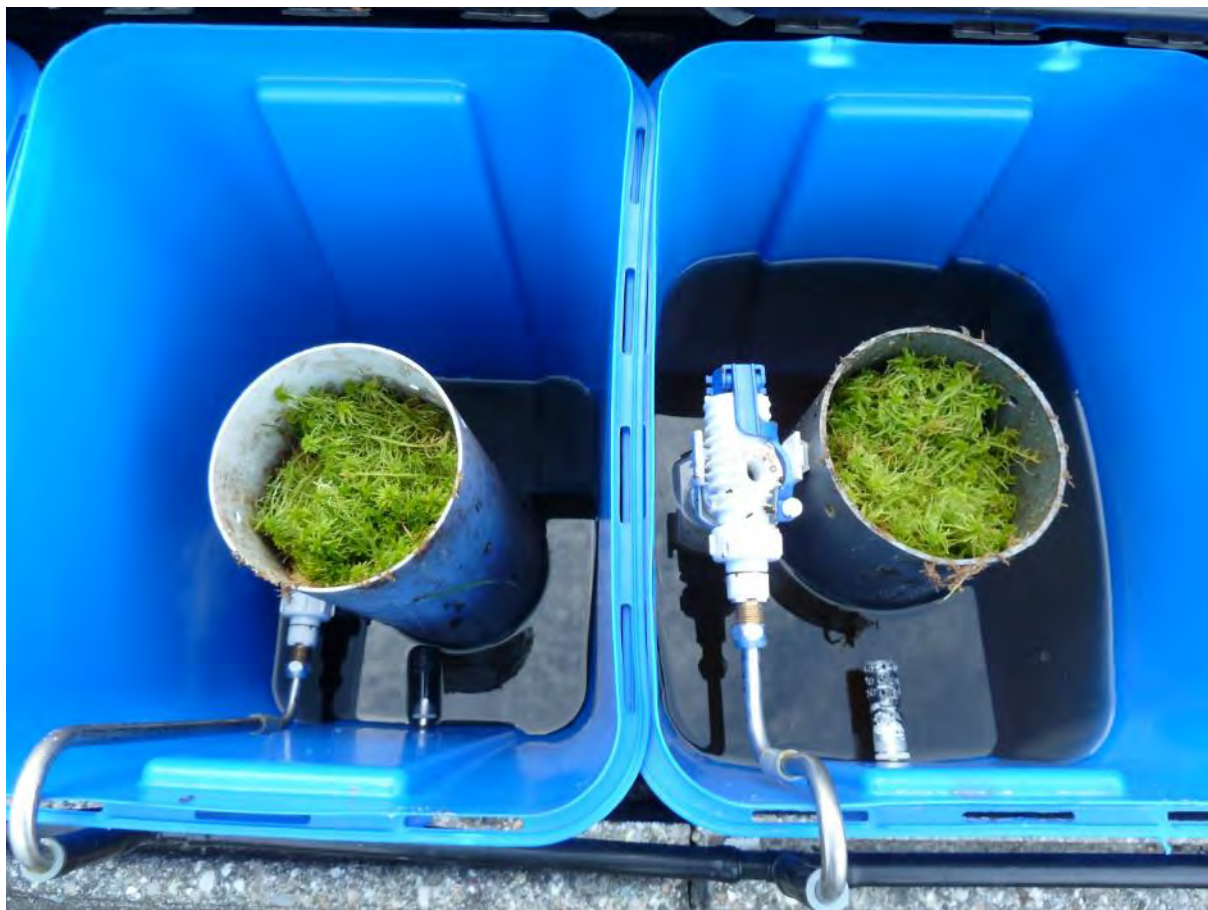
We then collected *Sphagnum* using a home-made *Sphagnum* corer.



The *Sphagnum* layers were then placed on top of the peat cores which had already been installed in the PVC tubes. Finally, we fitted a Styrofoam collar to each mesocosm. This covered the space between the PVC tube and the tank, and its function was to protect the PVC tube from direct sunlight.







The flush devices that are used to maintain the minimum water levels in the mesocosms are supplied from equipment housed in a small garden shed sited on made-up ground adjacent to the experiment location, giving a hydraulic head of approximately 4 m.





The equipment installed in the shed is shown in the photograph below. Water from the blue tank flows through the filtration cartridge (black vertical tube), then through a UV lamp fitting designed for fish tanks (grey device on the floor) for sterilisation, before exiting to the mesocosms. A valve is placed between the cartridge and the UV lamp.





The photograph below was taken from the doorway of the shed. The black pipe is used as a sheath to protect the smaller pipe in which the water is actually flowing. This pipe runs from the UV lamp inside the shed to the water input circuit of the mesocosms. It was subsequently buried under the pavement.





When the tanks, peat cores and *Sphagnum* layers had been installed and the water supply was in place, we worked on the system for water level manipulation. In the picture below, the small hole that determines the maximum water level is visible on the upper right of the tank wall. The water that is pumped out exits through a filter via the stainless steel exhaust pipe, as already described.



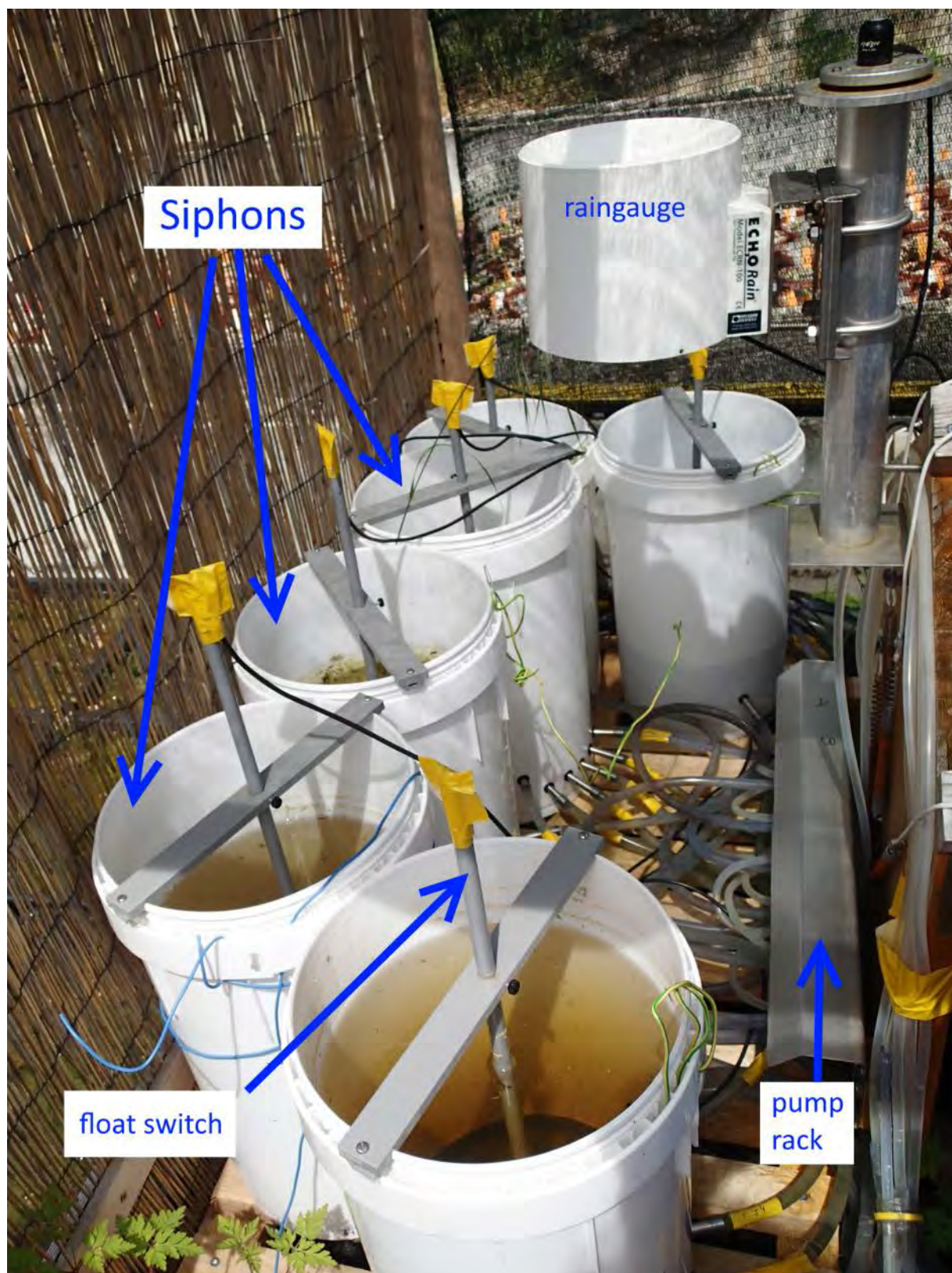


Each of the mesocosms built to provide high- or medium-amplitude water level fluctuations is connected to one of the six siphons. The photograph below shows how confusing the operation can become as the connecting pipes are gathered. Therefore, it is crucial to label each pipe at both ends, as we did on the yellow labels that can be seen in the picture.





The next picture shows the six siphons (one for each treatment, except for the three 'low-amplitude' treatments). Water arrives from the mesocosms to the appropriate siphon, which contains a float switch. To lower the water level when necessary, one pump is connected to each siphon. We installed the pumps on a rack with a small roof to protect them from rain and sun. Switches and pumps are connected through an electronic device.





Finally, we installed a removable bamboo side-shade and a green synthetic cloth mesh above the mesocosms. The cloth removed 50 % of the incident sunlight. The aim was both to limit excessive heating in summer and to keep animals out of the system. The pyranometer is located beneath the shading system, next to the mesocosms.

