

Rootwave Trials (Rootwave Pro technology)

The ENNIS Project is trialling Rootwave as an organic method to control invasive plant species on Exmoor. The aim is to trial it on knotweed, skunk cabbage, montbretia and giant hogweed.

How it works

- Rootwave Pro treats weeds by forcing an electric current through the weed using a high voltage. The current flow causes a rapid rise in temperature which damages the weed's cellular structure above and below the ground. The weed can then be left to naturally compost.
- A treatment lance is used to position the electrode tip at the weed's stem for approximately thirty seconds, delivering a voltage up to 5 kV at 50 Hz.
- When activated, the electrical energy provided by the power module flows to the treatment lance, through the weed, through the soil, into the treatment return and back to the power module.
- It does not target surrounding plants or soil, is residue and chemical free and organic.
- It cannot be used when it is physically raining, wet ground conditions are fine.
- Only sites that can be accessed by vehicle which can transport the Rootwave machine and generator can be treated. The Rootwave machine is transported to the site on the back of a 4x4 or Gator due to its size and weight.
- Only sites that can be reached from the machine using the available cable (27m) can be treated. There may be different lengths of cable available at an extra cost.
- The operator should be able to access the site without standing in or crossing the river. The Rootwave machine cannot be operated while standing in water or treating a site on the opposite bank.



Photos to show some knotweed before and three weeks after Rootwave treatment.

Frequently Asked Questions

Q1. What are the costs of setting up the system?

Currently it costs approximately £12,000 to buy a Rootwave Pro machine and generator. You also need dielectric safety boots for each operator which cost approximately £100 each. There are also several accessories for the machine available at an additional cost including different shaped electrodes.

Q2. What Insurance Cover is required?

As Rootwave Pro is a new piece of technology, insurance cover must be confirmed with the relevant insurers. After much liaison Exmoor National Park Authority's insurers confirmed that storage of the machine at our depot and operation by a certified member of staff or contractor was covered. It is important to understand that this is not the standard process for covering loss or damage to the machine while in use by a contractor however it was agreed with our insurers on this occasion. Normally, the contractor would be expected to have insurance cover for loss or damage to the machine while in their use.

The contractors were expected to have their own public liability insurance for these trials. Operation of the Rootwave Pro machine was added as a new item to two of our contractor's insurance as a result. However, one of our contractors was not able to get Rootwave included on their public liability insurance. It appears that insurers who are more specialised in this line of work are more likely to provide Rootwave cover.

Q3. Is training an added cost or does this come as standard when buying the equipment? Is training something we can do in house if we have one fully trained staff member or does every staff member need to go on a full training course?

Only those who are trained and certified by the manufacturers Ubiquitek can operate the Rootwave machine (for insurance purposes). Ubiquitek provided training for ten people as part of the package when we got the machine.

Q4. What results have you seen so far?

We started our Rootwave trials in 2017 working with the manufacturers Ubiquitek to complete a single treatment a year on some Japanese knotweed sites. One observation that was made after these treatments were completed is that the remaining knotweed at these sites showed signs of stress, throwing out many small shoots and struggling to reach a similar stand height to that which was present before the treatment took place. One treatment a year was not enough, and the decision was taken to purchase our own Rootwave machine in 2019 so that we could work with local contractors to increase the frequency of treatments and trial it on other INNS including Himalayan knotweed, montbretia, skunk cabbage and giant hogweed.

Due to several setbacks 2020 was the first year we were able to carry out multiple treatments on our trial sites. It is too early to determine if multiple Rootwave Pro treatments a year are effective in controlling the Exmoor Non-Native Invasive Species. However, what we have seen so far in 2020 has given some very interesting results.

Japanese and Himalayan knotweed

Each knotweed site reacted differently to each of the treatments. Several of the sites continued to show vigorous growth, throwing out many little shoots, despite receiving a second treatment this

year. The third treatments were carried out at the end of the growing season in November so the effect of these will not be seen until 2021. Other sites reacted much better to the second treatment with little regrowth appearing. For one site our contractors reported very little regrowth after its first ever treatment. We are not sure why each site reacted differently, but we feel it may be down to factors such as light availability (shading), soil substrate and moisture availability.

Skunk cabbage

The skunk cabbage sites were visited three times throughout 2020 and treated where required. At all but one of the sites everything apart from some of the central shoots had died back after the second treatment. At the other site, where there was a single plant, the skunk cabbage had completely died back with nothing growing above ground.

Giant hogweed

The giant hogweed sites were visited three times throughout 2020 and treated where required. Giant hogweed leaves were found growing on site a month after the first treatment was completed. Due to the size of the plant it was clear the contractors needed to treat both the main stem of the plant and the basal leaves.

Montbretia

Carrying out the montbretia treatments proved to be more difficult due to the nature of the plant's growth. The long spear shaped leaves and dense clumps formed by the montbretia made it very difficult to carry out the treatment. The first attempt with the straight rod-shaped electrode, which came with the machine, took 40 minutes to treat two clumps. The electrode was getting entangled in the leaves and falling out due to its design, halting the treatment because the machine needed to be reset.

Ubiquetek were commissioned to trial different shaped electrodes to try and speed up the treatment. The arrow-shaped electrode was purchased because it had a bigger surface area and the new design meant it could no longer fall out of the treatment lance. On trialling the arrow-shaped electrode the treatment appeared to be much quicker. No, further attempts were carried out in 2020 but it was clear at least two treatments a year would be required because of the regrowth found where the trials had taken place.

This year, it will be very interesting to see how the multiple Rootwave treatments carried out in 2020 will affect the growth of the Exmoor Non-Native Invasive Species in 2021.

Q5. Can we use it all year round or only in dry conditions?

It cannot be used when it is physically raining but wet ground conditions are fine. It is probably most effective during the growing season when there is more moisture in the plant, but it can be used all year round.

Q6. Is the system safe for staff to use on hills or is it most effective on flat land?

It is safe to use on hills but you need to choose sites that are accessible by a 4x4 vehicle or gator that can transport the machine and generator. If the vegetation is tall you may need to cut it to a lower height before treating to minimize the risk of the treated stems falling on top of the operator. The operator may struggle in some remote areas if the vehicle cannot be driven close enough to the infestation because the cable attaching the electrode to the machine is only 27m long. There may be longer cables available, but you would have to enquire further about this.

Q7. Are you comparing Rootwave against other non-chemical alternatives (e.g. hot foam, hot water, steam, etc)?

No, we are not using these methods as typically they are used on hard surfaces and therefore were not appropriate for our project on Exmoor.

Q8. Was Rootwave compared against conventional herbicides?

We have been successfully treating knotweed with glyphosate for the last 15 years on Exmoor. At this stage we feel that the different methods of control are all useful to have in the 'toolkit' and wouldn't recommend one method over another as it depends on the suitability of the site.

Q9. Do you have any concerns about potential impacts on non-target species such as soil invertebrates?

According to the manufacturers it does not target surrounding plants or soil. However, care needs to be taken near watercourses as it may have an effect on aquatic species if used on banks where the roots of the plants touching the water. Harm to aquatic life is mentioned in the training handout. According to the manufacturers, Ubiquitek, population of microbes living in the region surrounding the plants roots may be temporarily reduced (studies in progress). Worms may come to the surface during treatment and some worms in the strongest current path between the treated weed and the Treatment Return may not survive.

Q10. Is it suitable to use on bracken?

You could use it on bracken, but it would depend on the size of the stand. It would be very time consuming because the electrode must touch each stem. There are different electrode heads available (at an additional cost) including a T-shape to treat more stems at one time but treating a large bracken stand would still be very onerous. To make an impact on the invasive species we are focusing on we estimate it will take at least 3-4 treatments a year over several years and we feel this may be the same for bracken. It may be a useful tool to use in sensitive areas where sprays are inappropriate but will need a long term management plan to make a difference. We are not trialling Rootwave on Bracken.

Q11. Is it suitable to use on Himalayan balsam?

ENPA is not trialling Rootwave on Himalayan balsam. According to the manufacturers Rootwave works best on annuals and on species with a higher moisture content meaning it should be effective. However, we feel it would not be practical to use on Himalayan balsam because it tends to grow in large stands and the electrode must touch each stem. There are different electrode heads available (at an additional cost) including a T-shape to treat more stems at one time but treating a large area of Himalayan balsam would still be very onerous.

Q12. Is it suitable to use on "woody" species such as Rhododendron and Laurel?

We are not trialling Rootwave Pro on any "woody" species and suggest you get in touch with the manufacturers, Ubiquitek, if you are interested to find out more about this. When discussed it was suggested that Rootwave may be effective on younger "woody" plants if a higher voltage (5000 volts) was used and the electrode was held to each plant for longer. For Japanese knotweed the electrode is held to each plant for approximately 30 seconds.