

KNOTWEED CONTROL
PRELIMINARY SUMMARY
WARREN CONSERVATION COMMISSION

OCT. 1, 2019

Knotweed is a pernicious and highly successful invasive plant that displaces more ecologically valuable native species. Initially confined to the Mad River flood plain where it has become pervasive, small colonies of the plant are increasingly found along our roadways and upland fields. The Warren Conservation Commission, with support from the Board of Selectmen and the citizens of the Town, undertook our first knotweed control plan this past summer targeting the roadside infestations in an attempt to reduce the spread of this invasive plant. What follows is a summary of that work and what we learned. Given our limited experience, we are unable to make definitive conclusions so we only offer up our observations and preliminary assessments.

To address eradication/control we scoured the Internet and talked to a number of folks doing battle with Japanese Knotweed. After our first year attacking the problem, here is a summary of our progress.

It's hard to get rid of knotweed because the roots remain viable after the tops have been removed. It's perennial. Each year the tops die back in winter to re-grow in summer. The stored energy of the plant is in the roots and remains viable for a long time. The longer the infestation has been around the bigger and stronger the rootstock i.e. the more energy exists to support future growth.

The roots and rhizomes are the most challenging part of the plant. The roots are usually brown with a reddish center, which are used in making tinctures. The rhizomes come from the roots and form new stalks. They are where new growth each year starts. The roots are very viable, even small parts of the root, which may break off. These roots are the diameter of a pencil to the size of your arm. They are hard to kill and appear to persist even after prolonged drying. They quickly sprout new shoots when exposed to light and water.

The rhizomes are the size of a straw, white and easily break into sections. They will grow if planted immediately. However, subjected to a few days of drying they wither and die. Rhizomes can traverse up to 10 meters horizontally and once they emerge the stock goes vertical.

Treatment

Manual extraction of knotweed: Cut stalks 6 to 12 inches above the ground. Remove stalks for drying. Extract the root ball and all the side roots. Even the small root and rhizome pieces, which break off, are viable if left in the ground. Dispose of the root material.

For large established plots of knotweed, where manual extraction is not practical, regular continuous mowing of the new shoots can exhaust the rootstock if done year after year. During the growing season 3 or 4 week intervals are recommended treatment. Mowing on flat ground, weed whacking on rough ground, manual extraction of the shoots or animal grazing all appear to work, although it can take multiple years. (We have tracked a number of sites where mowing did work and there is little evidence that mowing spreads knotweed. Riverside park for one has a 8 ft wall of knotweed next to the mowed section, where knotweed doesn't exist.)

Animal grazing is a proven technique that is supported by in-depth research. Kimberly Hagen, the UVM/USDA ag-extension agent focused on grazing strongly supports animal grazing for invasive control. She has first hand knowledge and is ready to support communities who want to develop a grazing program. Cows, sheep and goats are all good options for invasive control. In the Valley there already are examples of grazing controlling knotweed. The Kenyon fields that border the Mad River are great examples. The fence line, that keeps the animals out of the river, completely defines the knotweed border., solid knotweed from the fence to the river but NO knotweed in the field.

How Long Does it Take

Our estimate is that it will take roughly as long as the infestation has been growing. If caught early, maybe it will only take a year or two, let the knotweed grow for 5 years and it will take at least 5 years of constant mowing to eradicate. 20 years = 20 years of work. This is a rough preliminary estimate. We will learn more as our work continues.

Disposal of Knotweed

Shoots: The upper part of the knotweed dies very quickly when cut and exposed to dry conditions and sun (in 3 to 5 days). The more tender the shoots or rhizomes the faster it seems to die and are no longer viable.

Control Techniques

In general, eradication of a patch of knotweed requires removal or smothering until the roots are exhausted from lack of nutrients.

Manual Extraction

Removal: Cut the stalks the faster they die. Laying shoots, no roots attached, on the ground for a week usually is enough at which time they can be stacked up. (Possibly for composting or burning). I'm working on an idea now for how to stack them up when green.

Roots: Very difficult problem as the roots dry out and die very slowly. I don't have many suggestions yet, so all we do is pile in a heap on top of heavy black plastic so they can't do any more harm. The Town of Warren has knotweed dump on the road into the Sugarbush Snowmaking Pond off Rt 100. Feel free to take roots there.

Smothering

In early spring cut the shoots back to the ground. Cover with non-penetrable membrane, which extends more than 10 ft from edge of infestation. Secure in place. Monitor that shoots do not penetrate or extend beyond the membrane. The membrane will need to be in place for two to three years or longer for long standing infestations.

Observations:

Folks in the center of Town battling knotweed near the river have been mowing sections and adding lime to adjust the pH of the soil. Knotweed appears to like acid soil. I have begun trying lime at a couple of sites. My guess right now is that the higher pH creates a less than ideal growing sites and weakens the knotweed.

Spreading Knotweed

Knotweed does not move easily, it requires transportation services. The two main methods of transport are trucking and flooding. In New England knotweed does not appear to spread via seeds. There is some evidence that seeds are viable in warmer climates. Essentially knotweed requires external transportation to move from place to place.

Gravel and soil infected with knotweed are constantly being moved around the Valley for road building, culvert maintenance, leach field development and any construction activity that requires gravel or soil. In the Mad River Valley this is process that creates most of the new knotweed sites. It appears that almost all the gravel pits in the Valley are contaminated to some degree.

The erosion from flooding is the other important transport system that is used by knotweed, which is why it has so thoroughly covered the banks of the Mad River from Warren to the Winoski as well as many other rivers in Vermont.

Two Videos on Control:

<https://mrvtv.com/584613-2/>

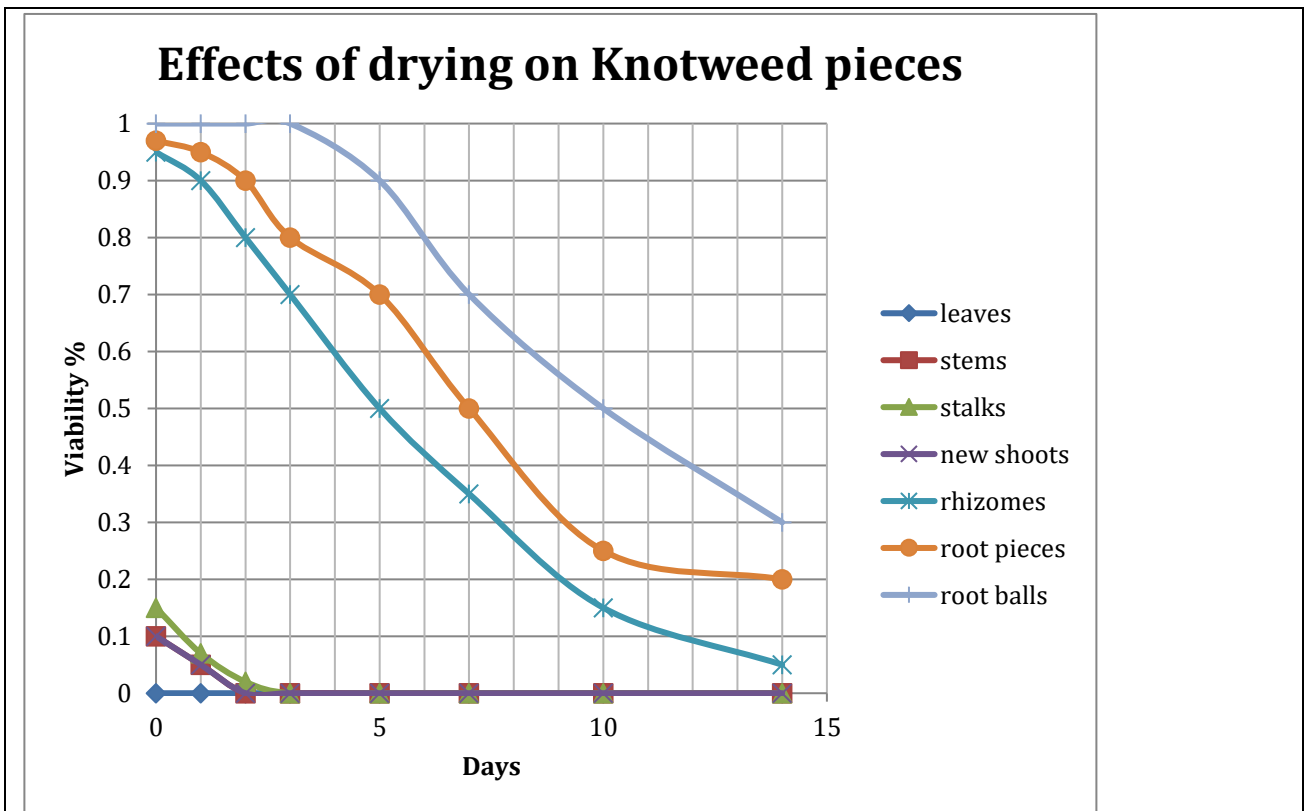
<https://mrvtv.com/582639-2/>

Knotweed Lab Project
2020 Program

WCC attempted in 2020 to address some of the critical question related to Japanese knotweed control that have remained unanswered. Principally they revolve around the viability of the basic plant parts, how can they be neutralized, how do you clean up contaminated soils, and how this knowledge supports “standard” control protocols. This project was conducted by Jito Coleman and Avery Montgomery.

#1: How viable each part of the knotweed plant (new sprouts, leaves, stalks, rhizomes, roots, root balls) when extracted and dried.

Process: Pieces of knotweed were extracted and dried for a number of days (1 to 14) outside during the summer, in whatever weather we had. These pieces were then planted and watered. Monitoring of the newly potted plants went on for up to 6 weeks. Records of the effects have been generalized in the graph below.



The viability of the above ground knotweed parts, to re-sprout, is completely suppressed with a few days of drying. In fact the tops pieces usually become non-viable as soon as they are cut down.

However the below ground vegetative parts have much more lasting viability and require longer drying times. The bigger root balls can take months to sufficiency dry out and die.

Observation:

- Re-sprouting from the roots elements took between 2 and 4 weeks. New sprouts needed regular watering to remain viable.
- Repotted large root balls continued to sprout new shoots even after the initial shoots were removed.

#2: What happens when contaminated ditch gravel is spread as fill?

Process: In mid Aug. 2019 a load of contaminated gravel was delivered to a newly constructed access road in East Warren. Our team watched the site and extracted viable new shoots when they arose. The first signs of new knotweed growth were within 3 weeks. All new shoots were picked or extracted. In the spring of 2020, the site was revisited and a smaller number of shoots were springing up. They were dug out to get every piece of root and shoot. In every case, a small piece of root was found as the source of the new shoot. We continued to monitor the site and dig up new shoots carefully so that we got the host root segments. By Sept 2020 there were no new shoots. We will continue to monitor the site.

Site notes: gravel was spread less than 4" deep on the new road. Knotweed was more prevalent along the edges.

#3: Developing an On-Site drying method.

Process: The effort to manual extraction of knotweed from a site would be enhanced significantly if an on-site drying method could be developed so that materials would not have to be transported. In our experience this would more than triple our effectiveness.

A method that was developed was using 4 stakes in a 3 x 3 ft square. At the base, some barrier between the first knotweed stalks/roots and the ground should be established. We used plastic, old dried up knotweed stalks, tree limbs or whatever was around. The extraction of the knotweed stalks, by pulling up the stalks, was the easiest and fastest method. With the drying rack (Called 4-Square) kept the root portion of the plant above the ground. The stalks were stacked in alternating layers with the roots exposed to the air and sun to facilitate drying. About 6 or 7 of these structures were used on the larger treated infestations.

In a few cases the root balls at the end of the stalks would re-sprout, but since they were up in the air, they were unlikely to spread.

Miscellaneous Tests and observations:

- Root segments were extracted and immediately put into water. They remained in water for a couple of weeks, after which they were evaluated and planted. In every case it appears that they were non-viable, i.e. they had drowned.
- On a section of a major infestation, a roll of ½" x ½" wire mesh was laid down to evaluate it's ability to choke off knotweed growth. This small test is still on-going and does show some ability to stop knotweed maturity by choking off the larger stalks. It is not clear that this is a viable method and it was quite expensive. 400 sq ft of wire mesh was more than \$50.