DSV control strategy at FWG for 2010-2011

Reports from the Sunday volunteer group: 2007 | 2006

Dog-strangling Vine (a.k.a. Pale Swallowwort)

Cynanchum rossicum (= ***Vincetoxicum rossicum***)

This plant is highly invasive. It will thrive in shade, sun and all soil conditions, spread rapidly, reduce or eliminate other plants, and is extremely difficult to control. If you see this plant in your garden, REMOVE IT IMMEDIATELY.

For more details about swallowwort, see FWG invasive species fact sheet | Feuillet d'info JÉF, plantes envahissantes [PDF]

New in 2006:
Use of the invasive pale swallowwort by birds and small mammals
How to dispose of Dog-strangling Vine

DSV images

Description

Swallow-wort belongs to the Milkweed family (Asclepiadaceae). It is a perennial, twining vine growing up to 2 m in height, with small pinkish to dark maroon 5-lobed flowers that start to appear in late May to early June. Opposite leaves are ovate, dark green, smooth, and shiny. The seed pods begin appearing in late June and are mature by mid to late July. Each pod produces numerous wind-borne silky-haired seeds.

How to dispose of Dog-strangling Vine

We were recently asked, via our web site, what to do with swallowwort plants once you've pulled it up or dug it up. The stems and leaves can be composted, of course, but it's not a good idea to compost either roots or seeds, as either might produce new plants. Our questioner was also concerned about putting the bags of plants out with the garbage as she did not want to inadvertently spread them to other locations.

After a bit of research, by both the questioner and FWG people, here's what we found out.

- According to the city forester, all plant material collected by the city — that is all yard waste put out for special collection — is taken to the Trail Road facility, where it is subjected to high temperature (55°C) for 15 days. This treatment should kill seeds (and roots) and prevent propagation.

Experts tell us that this treatment should work for most noxious species. Large compost piles can generate intense heat. However, it would be better if conditions were more controlled. Higher temperatures would be better and would mean less time needed to destroy seeds, and shorter time means less chance of seeds "escaping." If one could heat the seeds ABOVE 100°C for about 10-20 minutes, this would do the job in short order.

- Ed Lawrence recommends putting seeds of noxious plants into paper bags, allowing them to dry out, then burning them in a fireplace or fire pit. This would work very well for backyard infestations as one or two bags would probably be enough to hold all the seeds

  But don't forget the roots!

- Soaking seeds for several days in alcohol or gas is an effective way to ensure that they will never germinate. However, obviously one has the problem of getting rid of the soaked seeds afterwards. Again, useful for very small quantities only.

- Yet another method is to boil the seeds for about 10 minutes. This could be done on an outside fireplace (firepit) or a barbecue, gas stove, camp stove, whatever produces heat sufficient to boil the seeds.

- The easiest disposal method, and one that will work for larger quantities, is to place the seeds (or whole plants) in a heavy-duty plastic garbage bag, add water to soak well, close the bag and leave it in the sun for a few months. The resulting stew can then be safely disposed of in compost piles (or garbage).

- Seeds can be stored in water until they rot (several months).

Control experiments at the FWG

Mechanical tilling: In spring 2007, as part of an effort to expand our Butterfly Meadow, we rototilled an area where there was a lot of DSV. We thought the tiller would break up DSV roots, but we weren't sure whether that would prevent them from growing back as root nodes (the critical growing area) might not be damaged.

We rented a hand-operated tiller (our local Home Depot people recommended a machine that would be capable of turning over dense turf and dealing with DSV roots rather than one intended for tilling garden beds). Two volunteers tilled two areas of the Butterfly Meadow. In one of these areas, they were limited on one side by tree roots (we didn't want to risk killing the trees). After the tilling, one volunteer spent an evening looking for DSV root nodes in the tilled areas and removing them.

We planted both areas with native wildflowers and were surprised at the results. Tilling seemed to have done enough damage to prevent regrowth of most existing DSV plants. Of course, there were seeds in the soil and DSV is growing back, but it is meeting a lot of competition from the native plants that are flourishing in this area.

In 2008, a larger area was tilled, using the same sort of hand-operated machine. This time, volunteers spent a huge amount of time sifting the top layer of turned soil using a mesh frame (about 1 cm grid). By fall, the native plants they put in were doing very well and we couldn't see any DSV.

In 2009, Agriculture and Agri-Foods Canada very kindly helped with rototilling of an area

next to the birch grove. They tilled in spring and again in the fall. Volunteers also sifted part of the area, but the tilling removed a considerable amount of DSV. We expect to plant this are in 2010.

Mulch: We have tried a number of materials as mulch. Thick leaf cover, landscape cloth or multiple layers of newspapers are all fairly effective when used around the base of trees and shrubs - areas where DSV seems especially dense. Although some plants grow through the mulch, growth is considerably less than in un-mulched areas nearby.

Research elsewhere has shown some success with heavy plastic sheeting placed over mowed or cut plants and left in place for at least 1 year. However, if the plastic is torn allowing light to penetrate, the plants will readily grow.

At the FWG in July 2005, we placed a large tarpaulin over most of the north bank of our Amphibian Pond. This bank is quite steep, so digging out DSV plants was impractical. It has been difficult to keep the tarpaulin anchored securely. We used pieces of heavy coathanger bent into loops and pressed into the ground through the edge of the tarp. These frequently come loose and the tarp has torn in several areas. Monitoring is obviously needed.

In July 2006, although some DSV had grown through holes, no plants could be seen under intact parts of the tarpaulin. And no seedlings were visible, meaning that last year's seeds did not germinate under the tarp.

We took advantage of the mild weather in October and November to pull back one corner of the tarp and start planting shrubs. We put in a number of dogwoods - planted about 2 feet apart.

In spring 2007, we removed the rest of the tarp. Only a few DSV plants were growing under it; we dug these out along with others along the edge of the cleared area and planted the slope with Wild Raisin (*Viburnum cassinoides*).

In 2006, we also used newspaper as mulch in some areas, especially immediately surrounding trees where there are hundreds of DSV seedlings and little or no other plant species. We place several sections of newspaper up against the tree trunk, then overlap subsequent sections working outward. The idea is to eliminate DSV near and under some trees where the seeds seem to accumulate.

Mowing: Some areas have been mowed twice a season in an attempt to stop seed production and dispersal. We try to time the mowing to occur when the plants are starting to form pods on the theory that they've used a lot of resources at that point and the roots might be somewhat depleted - so cutting the plants will do the most damage. In the last few years, this has unfortunately coincided with bird nesting season and mowing has been delayed as a result. Again, monitoring is required and a second mowing later in the summer may be necessary if the plants grow back sufficiently to start producing seeds.

Cutting: In areas where mowing is not feasible, we tried cutting off the flower heads before they set seed, hoping to reduce the overall impact of seed dispersal and, in several areas, contain the amount of new growth. However, we found the plants re-sprout rapidly below the cut, sending up new flower heads, requiring more cutting in the same areas three or even four times. As with other control methods mentioned, this is impractical for widespread infestations.

In 2006, two of our volunteers bought a scythe and tried it out on DSV. This old-fashioned method of cutting works well - especially when the swallowwort is young and still standing

upright. As with all cutting, it's necessary to go back over previously cut areas when the plants grow back, but this method is much quicker than using a weed whipper or clippers (and much kinder to our backs).

This method is especially good in fields where we want to save grasses, vetch, goldenrods, etc. We can cut around these and also cut the DSV low enough to remove its flowers, but save most of the grass.

In 2007, we started cutting DSV much earlier, knowing we'd have to go back over the same fields later. By mid-June, we had cut all major stands of DSV and started recutting some areas. By the end of June the DSV plants were harder to cut as they had begun to twine together.

As of 10 July, many previously uncut plants have formed seed pods. Cutting is much more difficult as the plants tend to wrap around the scythe. All cut plants with pods now have to be picked up for disposal off site. In fields previously cut with a scythe, DSV plants are still upright, are blooming, but have not produced seeds.

Chemicals: Research elsewhere shows that glyphosate might be useful if applied repeatedly and over several growing seasons. However, results are variable and depend on a variety of conditions. Herbicides also kill ALL vegetation in the area of application, leaving the ground open to other invasive species.

Bio-control offers the best hope for managing widespread invasions, but this is still in the early research stage.

Recent discoveries and new information

YELLOWING OF DSV LEAVES: This is the result of some sort of chlorosis (lack of chlorophyll in the leaves). This could be caused by many things including root or stem predators/herbivores, bacterial or viral diseases, lack of nutrients (unlikely if healthy ones are nearby), or toxic levels of something from heavy metals, nitrogen (i.e. too much fertilizer, or dog excrement), petroleum products, herbicide, etc., etc.

It is also entirely possible that it is a genetic problem, just like the lack of pigment production in the flowers or, say, sickle-cell anemia in humans. A spontaneous mutation is a possibility, or it might be a mutation that is present in the population at very low frequencies and rarely found in living plants in any population where the gene may occur.

If there is only one plant in a large population suspect the later. If there are more plants then the herbivore/disease reason is more likely

DSV SEEDS

- Seed germination in DSV takes place in both early fall and in spring (May). One study done in New York State determined that a significant number of seeds produced in August and early Sept. were able to quickly germinate. They speculated that the climatic conditions in fall are generally good enough to allow seedlings to quickly establish and successfully overwinter which then gives them an advantage over other plants, both DSV and other species, which germinate in the spring. However, another study reported greater germination in seeds that overwintered in a field.

  However, "In North America, some swallow-wort seeds lack dormancy and will germinate without stratification; but, greater germination percentages are obtained when seeds are subjected to stratification."

  In a study done in 2001 by Naomi Cappuccino from Carleton University, seeds were collected in early November and the high germination rate in those freshly collected

seeds was noted. She also collected seeds in mid-October and "stored them at 4°C, for 12 weeks". These too had both a high germination rate (45%) and high polyembryony (55%) "when grown for 7 weeks in a greenhouse" with light for 14 hours and darkness for 10 hours.

- Studies have shown that in general fruit development occurs around late June and continues to mid-August when the seeds are fully ripe and begin dispersing.
- Most studies have shown that seed production is influenced by the amount of light the plants receive. Plants growing in heavy shade produced few flowers (but the plants themselves were far taller than ones in open sunny sites) and IN GENERAL didn't produce seeds, although this doesn't mean NO seeds are produced from shaded sites (see below). The downside is that these plants will persist for many years (some reports suggest decades) waiting to exploit conducive conditions such as the canopy opening up or clearing of the forested site.
- One study in NYS found that seeds produced in shady conditions were generally (but not always) heavier than seeds produced in the sun, and could not disperse as far. Lighter seeds were able to disperse further but were unable to germinate as successfully in areas of heavy grass whereas heavier seeds had a better germination rate in these conditions.
- Naomi Cappuccino did a study showing that heavier seeds in greenhouse conditions, germinate later. Her study also showed that seeds collected in Nov. from an old field site (FWG) and given 14 hours of daylight in a greenhouse but no cold treatment, had a 44.6% germination rate (this is considered good - or bad, depending on your perspective!).
- Cold storage of seeds for various lengths of time but generally at about 4°C, has been tested and the success rates tallied, but I don't see how that really helps us. As one author noted, the conditions in a lab would not necessarily mimic the environmental conditions in the field. Therefore any studies done in highly controlled environments, while interesting for determining germination rates, wouldn't have much immediate application for us. However, one study, (apparently unpublished) noted that storing seeds in cold wet conditions for 10 days actually increased germination. Does this mean that a prolonged cool, wet period in late summer will increase seed germination?
- Regarding the fact that not all DSV seeds germinate at the same time, it has been noted: "The staggered emergence of seedlings may also be adaptive in environments with large temporal variability in climatic conditions and predation, especially for single seeds which have been dispersed over a great distance and are founders of new populations."
- Polyembryony (which occurs in plants other than DSV)plays a big role in the successful spread of this plant. Not all DSV seeds produce two to 4 embryos, however, a study showed that of 2090 seeds collected in an open site measuring a square metre, approx. 4680 embyros were produced. A square metre in a shaded site yielded 1,330 seeds with an approx. number of 2980 embryos. However, *dense* shade appears to prohibit the production of many or any seeds.
- Several studies have looked at the germination rate of seeds that were self-pollinated as compared to seeds that were open pollinated only to find that rates were very similar. In one study self-pollination was achieved by bagging flowers, conditions were otherwise identical. In Naomi's study, the tests were conducted on greenhouse grown plants.
- Finally, it appears that nobody yet knows much about the dynamics of the DSV seed bank.

References

Sources for the above information include the references listed below and communications with several scientists involved with the study of DSV.

- Di Tommaso, Antonio, Frances Lawlor and Stephen J. Darbyshire. 2005. The biology of invasive alien plants in Canada. 2. *Cynanchum rossicum* (Kleopow)

Borhidi [= *Vincetoxicum rossicum* (Kleopow) Barbar.] and *Cynanchum louiseae* (L.) Kartesz & Gandhi [= *Vincetoxivum nigrum* (L.) Moench]. *Canadian Journal of Plant Science*, 85(1): 243-263.

- DiTommaso, Antonio, Daniel C. Brainard and Bradley Webster. 2005. Seed characteristics of the invasive alien vine *Vincetoxicum rossicum* are affected by site, harvest date, and storage duration. *Canadian Journal of Botany*, 83: 102-110.
- Lawlor, Frances. 2002. *Element stewardship abstract for Vincetoxicum nigrum (L.) Moench. and Vincetoxicum rossicum (Kleopow) Barbarich*. The Nature Conservancy.
- St. Denis, Melissa and Naomi Cappuccino. 2004. Reproductive biology of *Vincetoxicum rossicum* (Kleo.) Barb. (Asclepeadaceae), an invasive alien in Ontario. *Journal of the Torrey Botanical Society*, 131(1): 8-15.

For more information

- FWG invasive species fact sheet | Feuillet d'info JÉF, plantes envahissantes [PDF]
- www.swallow-wort.com
- Invasive Plants of the Eastern United States — Swallow-Worts

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Our e-mail address