Pale (*Vincetoxicum rossicum*) & Black (*Vincetoxicum nigrum*) Swallow-wort : Best Management Practices

SUMMARY: This guide provides an overview on the invasive perennial vines, pale swallow-wort (*Vincetoxicum rossicum*) and black swallow-wort (*Vincetoxicum nigrum*) including why they are pervasive threats in New York state, their biology and distribution ranges, how to identify them and top management techniques. Due to the difficulty of controlling widespread populations, early detection and rapid response is the only way to eradicate populations. Communication with managers show that interspersed, suspended combination spraying of herbicide is the most popular control technique, however, long term effectiveness is unclear. Biocontrol may be the only long term solution however additional research is required to understand the effectiveness against swallow-wort.

Biology & Habitat

Identification

o Herbaceous twining vine, growing 3-6 ft in height
o Opposite, shiny dark green leaves in spaced clusters
o Colored flowers <¼ inch blooming in late spring or early summer
o Flowers are purple-black (*V. nigrum*) or light maroon (*V. rossicum*), star shaped flowers
o Flowers are narrower at the base in width than in length
o Produce long slender green seed pods in June
o Seeds resemble common milkweed (*Asclepias syriaca*) [10]

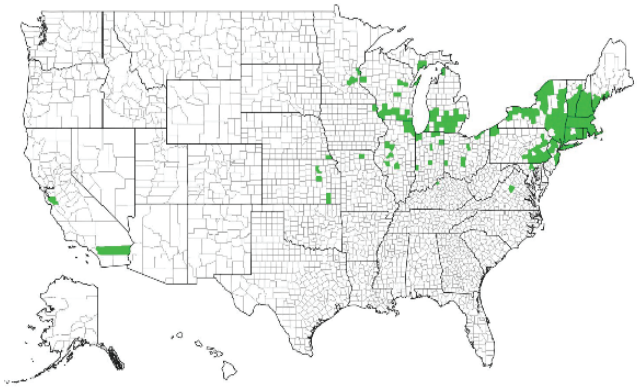
Dispersal

o Both vegetative and sexually reproducing [4]
o Tillers (segmented shoots) from penetrating buds at the root crown
    o Allows for perennial habit
o Produces axillary tillers if primary stem is damaged [4]
o Disturbance by human activity, flooding, animals or wind facilitate dispersal [8]
o Wind-dispersed achenes [11]
    o Primary form of dispersal [4]
    o Seeds from taller plants travel further distances [11]
    o As many as 6 clonal seedlings can be produced from 1 seed [4]

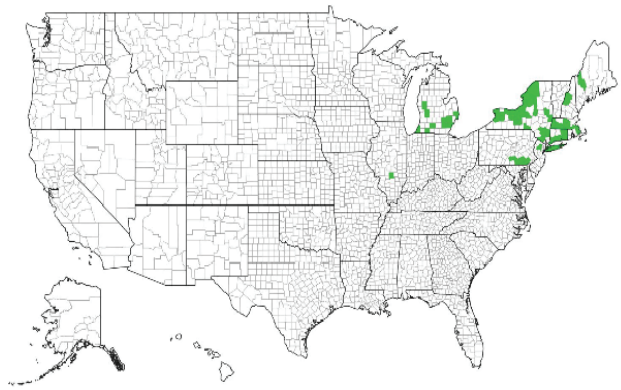
Current Distribution

o Pale swallow-wort was introduced into North America from Ukraine about 120 years ago [4]
o Black swallow-wort originated in the Mediterranean region [7]
o Prefers sun but will tolerate shade [8,9]
o Gravelly, high lime concentration soils [8]
o Grows in gardens, hedges, deciduous/mixed forest, agricultural lands, fields [4]

Black and Pale swallow-wort flowers
Retrived from: http://news.cornell.edu



Black Swallow-wort Distribution Credit: EDDmapS 2018



Pale Swallow-wort Distribution Credit: EDDmapS 2018

Impacts

Ecological	Economic/Human	Pale Swallow-wort Only
Invaded old fields have lower net arthropod diversity than old fields with natives [1]	Roots contain vincetoxin, poisonous to humans and mammals [2, 3]	Documented as a massive management problem in cropping systems: no-till corn and soybean fields [4]
Strangles and shades out neighboring desirable vegetation [5]	Deters hikers, backpackers and others from going outdoors [6]	Host to insect pests and alternate host to *Cronartium fr.*, a rust fungus that attacks pines [7]
Displaces milkweed, decreasing availability for monarch butterflies [24]	Animals eat native plants, therefore reducing populations [2, 3, 8]	
Suppresses forest regeneration [4]	Believed to decrease property values [6]	

Mechanical Management

Population reduction and containment should be prioritized over eradication efforts, followed up by ecosystem restoration. Swallow-wort management is tedious and can be expensive depending on the control technique. Therefore, early detection and rapid response is critical to prevent an infestation from becoming established.

Experiments investigating the annual emergence and longevity of swallow-wort seeds at different burial depths showed that seeds only survive for two years, suggesting that preventing seed production for more than three years will exhaust the local seedbank [12]. This research also found that seeds need to be buried at least 10 cm deep to prevent seedling emergence. This method is most practical in natural areas with high seed density; in low seed density areas, disturbance may encourage growth of undesired plants [12]. Additionally, macroinvertebrates and earthworms may move seeds in the soil impacting the effectiveness of this treatment method.

Pale swallow-wort flowers https://www.invasive.org

Black swallow-wort flowers http://www.sleloinvasives.org

Mowing: Mowing can dampen seed pod production, however, it does not eliminate growth and is highly ineffective at reducing the population [9]. Repeated mowing will reduce plant height but will not affect rhizome growth or overall cover [4]. If this method is used, it is important to mow when plants are in flower but before seed production and dispersal. This is not a recommended control method and should only be used in large stands to prevent seed production.

Manual Removal: Manual removal was observed as more effective than glyphosate treatments in control. However, neither are recommended in large stands. (S. Bonanno, personal observation, NY Nature Conservancy). Another method is the manual removal of seed pods from established plants which prevents further seed dissemination, although multiple harvests may be necessary [4]. A primary limitation to both digging and manual removal methods is that they are incredibly tedious and time intensive.

Chemical Management

Pale swallow-wort management site in the SLELO PRISM. Roundup was applied by Mike Parks and Ed Miller via foliar spray one year previous to this picture.
PC: Sam Schultz

Pale swallow-wort management site in Green Lakes State Park
PC: Sam Schultz

Recommended Herbicides: Triclopyr kills native grasses and is an irritant to skin and damaging to the eyes. Additionally, the oil form of triclopyr can volatize on days that 83°F or hotter. These factors contribute to glyphosate being recommended over triclopyr [8]. Both are systemic and non-selective [6, 8]. Therefore, leaves should be coated, allowing the chemical to be transported to its roots [6]. However, there is no significant difference in swallowwort biomass observed when comparing herbicides [4].

Recommended Timing: Timing is key when chemically treating pale and black swallow-wort. Parks and Miller, have observed that shaded plants die earlier in the season than those in direct sunlight and therefore more likely to drop their seeds earlier. Herbicides must be applied before seeds are released, typically late July through August, to be effective. Control is best achieved by repeated applications of alternating methods of management to prevent buildup of resistance. They recommend focusing on control over eradication of infestations because there is no guaranteed method of treating every plant before seed dispersal [6].

Common Application Techniques

Wiper application: Use a sponge tip wick/cloth glove applicator, common method for glyphosate [10].

Backpack sprayers: These are used for foliar applications to be used with glyphosate and triclopyr. Application days should be rain free and low wind conditions with no predicted rain within the specified time frame after application [6]. Foliar sprays have been observed to be effective in reducing cover and biomass, and therefore are the most effective method of herbicide application [6]. Plots treated with glyphosate (10.4 kg/ha) at the early flowering stage and triclopyr (2.6 kg/ha) at early fruit formation showed a 73% reduction in cover compared with untreated control plots.

'Clip n Drip' method: This method involves clipping off the stem base and dripping herbicide on the cut stem area. This method is surgical and therefore time consuming. Ginenthal [8], reported less than optimal long term results. Cut-stem applications of glyphosate have been seen to be more effective than treatments with triclopyr at all applied concentrations ranging from 1.9 to 8.3 kg/ha in concentration [4].

Biological Controls

A number of biological agents are being evaluated to determine their effectiveness as well as their host specificity. It is possible that none of the agents will work alone and it is believed, that more than one type of agent will be required to reduce population size [13]. However, combinations of agents have not been assessed for biological control in impact studies nor modelling [13].

Hypena opulenta https://en.wikipedia.org

Hypena opulenta is the only biological control agent currently approved for field release [9]. Its effectiveness on reducing swallow-wort densities depends on light conditions, herbivory and plant community composition [14]. This agent reduces swallow-wort seed production and aboveground biomass and may effect plant survival, after multiple seasons [13]. However, limitations do exist: the moth prefers forested areas while swallowwort is most abundant in open areas with ample light [9]. Additionally, plants are more tolerant to herbivory as light levels increase [15, 16]. Effectiveness of the biocontrol is still being accessed by field studies [9].

Abrostola asclepiadis is a leaf feeding moth distributed across Europe and associated with white swallow-wort (*Vincetoxicum hirundinaria*) [14]. It is not approved for field release and is still under study. Of eighty-three tested native plants the moth feeds solely on swallow-wort species [17, 18]. The moth colonizes and eats plant leaves in both field and forested habitats, unlike *H. opulenta* [14]. It completely defoliates plants at low larval densities [14], reducing seed production but not impacting survival rates of swallow-wort [13].

Abrostola asclepiadis https://www.lepinet.fr

Euphranta connexa https://diptera.info/

Euphranta connexa can colonize also open-fields, unlike *H. opulenta* [19-21]. Females oviposit in developing seed follicles [22]. It feeds on developing seeds then matures and exits the follicle [20]. All seeds are usually destroyed within an attacked follicle, resulting in swallow-wort population declines over many seasons. However, this biological control is only recommended for slow growing swallow-wort populations [13, 23]

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NYISRI New York Invasive Species Research Institute

Cornell CALS College of Agriculture and Life Sciences

Compiled and written by Naomi Haber