

Plant Assessment Form

For use with the “Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands”
by the California Exotic Pest Plant Council and the Southwest Vegetation Management Association
(Warner et al. 2003)

Printable version, February 28, 2003
(Modified for use in Arizona, 07/02/04)

Table 1. Species and Evaluator Information

Species name (Latin binomial):	<i>Cynoglossum officinale</i> L. (USDA 2005)
Synonyms:	None identified in USDA (2005).
Common names:	Houndstongue, hound's tongue, sheep lice, woolmat, beggar's lice, gypsyflower
Evaluation date (mm/dd/yy):	04/30/04
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Committee review date:	10/22/04 and 03/02/05
List date:	03/02/05
Re-evaluation date(s):	

Table 2. Scores, Designations, and Documentation Levels

Question		Score	Documentation Level	Section Scores	Overall Score & Designations
1.1	Impact on abiotic ecosystem processes	U	Other published material	<p>“Impact”</p> <p>Section 1 Score:</p> <p>C</p>	<p>“Plant Score”</p> <p>Overall Score:</p> <p>Low</p> <p>Alert Status:</p> <p>None</p>
1.2	Impact on plant community	B	Reviewed scientific publication		
1.3	Impact on higher trophic levels	C	Reviewed scientific publication		
1.4	Impact on genetic integrity	D	Other published material		
				<p>“Invasiveness”</p> <p><i>For questions at left, an A gets 3 points, a B gets 2, a C gets 1, and a D or U gets=0. Sum total of all points for Q2.1-2.7:</i></p> <p>15 pts</p> <p>Section 2 Score:</p> <p>B</p>	<p>Something you should know.</p>
2.1	Role of anthropogenic and natural disturbance	B	Other published material		
2.2	Local rate of spread with no management	B	Observational		
2.3	Recent trend in total area infested within state	C	Observational		
2.4	Innate reproductive potential	A	Other published material		
2.5	Potential for human-caused dispersal	B	Other published material		
2.6	Potential for natural long-distance dispersal	B	Reviewed scientific publication		
2.7	Other regions invaded	A	Other published material		
				<p>“Distribution”</p> <p>Section 3 Score:</p> <p>D</p>	
3.1	Ecological amplitude	D	Other published material		
3.2	Distribution	D	Observational		

Table 3. Documentation

<p>Question 1.1 Impact on abiotic ecosystem processes</p>	<p>Score: U Doc'n Level: Other pub.</p>
<p>Identify ecosystem processes impacted: It is unclear how houndstongue populations impact natural fire regimes in ecosystems adapted to fire.</p>	
<p>Rationale: It is unclear how the presence of houndstongue may alter the fire regime of a given site, and it is unclear how a historical fire regime might affect the presence or abundance of houndstongue at a given site.</p>	
<p>It has been suggested that the exclusion or alteration of natural processes, such as fire and flooding, can encourage the establishment and persistence of houndstongue on prairie sites in Colorado (Rice and Randall 1999). On a western juniper (<i>Juniperus occidentalis</i>)/mountain mahogany (<i>Cercocarpus</i> spp.)/bluebunch wheatgrass site in northeastern Oregon, houndstongue established 5 years after a wildfire of moderate severity, but did not establish on a similar site that was severely burned (Johnson 1998). Houndstongue did not occur in any of these communities at the time in which historic fire regimes were functioning, but established since fire exclusion began. More information is needed about ecosystems in which houndstongue is likely to be invasive in North America.</p>	
<p>Sources of information: See cited literature; also see Zouhar (2002).</p>	
<p>Question 1.2 Impact on plant community composition, structure, and interactions</p>	<p>Score: B Doc'n Level: Rev. sci. pub.</p>
<p>Identify type of impact or alteration: Houndstongue can establish rapidly and form dense monocultures in disturbed habitats. Populations of houndstongue displace native plant species and hinder the re-establishment of valuable range species.</p>	
<p>Rationale: Houndstongue can form relatively dense stands on disturbed ground, but studies have shown that houndstongue seedlings have a comparatively low growth rate and are not strongly competitive. Interspecific competition severely reduces the dry weight of 1st and 2nd year houndstongue plants (Upadhyaya et al. 1988).</p>	
<p>Generalist herbivores play a positive role in the population dynamics of houndstongue by reducing competition from grasses in coastal dunes in the Netherlands (Prins and Nell 1990). Similarly, in exclosure studies in northeastern Oregon, percent canopy cover houndstongue increased over a 30-year period under grazing pressure from both cattle and wildlife (Riggs et al. 2000). These studies suggest, therefore, that planting and maintaining competitive species can effectively control houndstongue, although more research is needed.</p>	
<p>Sources of information: See cited literature; also see Rice et al. (1999) and Zouhar (2002).</p>	
<p>Question 1.3 Impact on higher trophic levels</p>	<p>Score: C Doc'n Level: Rev. sci. pub.</p>
<p>Identify type of impact or alteration: Houndstongue is unpalatable to livestock and causes poisoning in horses and cattle (for example, see Stegelmeier et al. 1996). Some studies report minor herbivory by rabbits and Rocky Mountain mule deer, and insect species.</p>	
<p>Rationale: Houndstongue is most damaging on rangelands because it is toxic to livestock (Stegelmeier et al. 1996). Generally, the fresh plant is avoided by livestock because it is considered unpalatable, although domestic sheep graze the leaves with no apparent negative effects. Green houndstongue plants have a distinctive odor that discourages animals from eating it, but when dried it becomes more palatable (Knight et al. 1984, Baker et al. 1989). Houndstongue contains various pyrrolizidine alkaloids (PAs), whose concentrations are highest during its rosette stage and decrease as the plant matures (Knight <i>et al</i> 1984). Pyrrolizidine alkaloids are known to cause liver damage or failure in livestock. Kedzie-Webb and Sheley (1999) suggest that PAs are toxic to horses and cattle but not to domestic sheep. Poisoning can occur when houndstongue is cut and dried with harvested hay, or when animals are confined to a small</p>	

area lacking desirable forage. Most livestock poisonings occur from ingestion of contaminated hay or feed. Any level of houndstongue contamination in feed should be considered potentially lethal for all livestock (Prins and Nell 1990). The barbed seeds of houndstongue readily attach to wool and fur. The seeds can also attach to the eyelashes of animals and cause eye damage, and the foliage may cause dermatitis (Kedzie-Webb and Sheley 1999). It is unknown whether the toxic effects of houndstongue observed in domestic livestock are similar in native ungulate populations in the wild.

Houndstongue plants have a distinctive odor that discourages animals from eating it, but when dried it becomes more palatable. One study reports light use of houndstongue by Rocky Mountain mule deer in winter in Montana (Kufeld et al. 1973). A three-year study by Prins and Nell (1990) in the coastal dunes of the Netherlands indicates only low levels of leaf herbivory by rabbits on houndstongue, and no root consumption by rabbits was found. It is not normally eaten by rabbits (Boorman and Fuller 1984), though rabbits have been observed digging up taproots in winter (De Jong et al. 1986). Houndstongue is listed as the only food plant for the confused Haploa moth or (*Haploa confusa*), which is common in tallgrass prairie habitats in east-central Illinois during the month of July (Lindroth 1987). From June to November, larvae of the oligophagous Lepidopteran, *Ethmia bipunctella*, are the most important herbivores on houndstongue. Captive mice eat nutlets, but it is unknown whether this occurs in wild settings (Zouhar 2002).

Sources of information: See cited literature.

Question 1.4 Impact on genetic integrity *Score: D Doc'n Level: Other pub.*

Identify impacts: Hybridization of houndstongue has been reported in Europe, but not in North America.

Rationale: There are no plants in the genus *Cynoglossum* in Arizona.

Sources of information: Kearney and Peebles (1960) and Upadhyaya et al. (1988).

Question 2.1 Role of anthropogenic and natural disturbance in establishment *Score: B Doc'n Level: Other pub.*

Describe role of disturbance: Houndstongue colonizes disturbed sites.

Rationale: Houndstongue is shade tolerant (Upadhyaya and Cranston 1991) but grows best in full sunlight, if sufficient water and nutrients are available. Houndstongue was significantly ($p < 0.05$) positively associated with closed canopies at Mammoth campground in Yellowstone National Park. Here it was more consistently found under high canopy cover than any other nonnative species. Similarly, Lacey and Lacey (1985) describe occurrences of houndstongue in areas of thick litter accumulation (as might be found under a forest with high canopy cover) (Allen and Hansen 1999).

Historic overgrazing by livestock and native ungulates encourages invasion by houndstongue (Rice and Randall 1999). Grazed range provides an environment where gaps are repeatedly created and therefore suitable sites for establishment are usually available (van der Meijden et al. 1992 in Zouhar 2002). Where it has established on disturbed sites such as roads and around old buildings, it may persist indefinitely, as is evidenced by its continued presence in abandoned mining towns in southwestern Montana, even after 45 to 77 years of recovery (Knapp 1991). It has been suggested that the exclusion or alteration of natural processes, such as fire and flooding, can encourage the establishment and persistence of houndstongue on prairie sites in Colorado (Rice and Randall 1999).

Sources of information: See cited literature.

Question 2.2 Local rate of spread with no management *Score: B Doc'n Level: Obs.*

Describe rate of spread: Increases, but less rapidly than doubling in <10 years.

Rationale: Although seed dispersal occurs slowly over time, colonization of disturbed sites can take place quickly.

Sources of information: Score based on inference by Working Group members.	
Question 2.3 Recent trend in total area infested within state	<i>Score: C Doc'n Level: Obs.</i>
Describe trend: With treatment, the trend is stable or slightly decreasing (L. Moser, personal communication, 2004).	
Rationale: A small population at the Arizona Snowbowl parking lot has persisted but not spread over several years. Hand control methods of digging rosettes with shovels and pulling bolting plants have resulted in a decline in numbers but not eradication at the site. No new sites have been noted getting established along trails in the vicinity.	
Sources of information: Personal communication with L. Moser (Botanist, U.S. Department of Agriculture, Forest Service, Coconino National Forest, Flagstaff, Arizona, 2004).	
Question 2.4 Innate reproductive potential	<i>Score: A Doc'n Level: Other pub.</i>
Describe key reproductive characteristics: Houndstongue is a biennial or short-lived perennial forb, which exclusively reproduces by seed.	
Rationale: Seedlings are usually strongly clustered around parent plants in densities of up to 405 seedlings per ft ² (4500/m ²). Plants produce a range of 174 to 1823 nutlets/plant and seeds may remain viable up to 3 years.	
Sources of information: Zouhar (2002) and Rutledge and McLendon (Undated).	
Question 2.5 Potential for human-caused dispersal	<i>Score: B Doc'n Level: Other pub.</i>
Identify dispersal mechanisms: Nutlets break off at maturity, easily spread by clinging to animals' fur and human clothing. Spread along transportation corridors such as highways, railroads and trails.	
Rationale: Houndstongue seeds are covered in a spiny husk and possess a protruding barb that enables the seed to adhere to humans and domestic animals thus promoting long-distance dispersal. Arizona Snowbowl parking lot population was probably established by human dispersal on vehicle tires, grading equipment, or personal articles since there is no known population within a hundred miles and the area is not grazed by domestic livestock (B. Phillips, personal communication, 2004).	
Sources of information: Zouhar (2002). Also considered personal communication with B. Phillips (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, 2004).	
Question 2.6 Potential for natural long-distance dispersal	<i>Score: B Doc'n Level: Rev. sci. pub.</i>
Identify dispersal mechanisms: Most seeds fall within close proximity from the parent plant soon after ripening; however, some seeds remain on plants for up to two years, especially in sheltered habitats (e.g. scrub), thus creating an above-ground seed bank. Spiny nutlets are picked up by animals to disperse to new areas.	
Rationale: In one experiment, many nutlets were found within 2 m of parent plant, and in another study, the majority of houndstongue seeds (75%) fell into an area of radius 5 inches (12 cm) around the parent plant. Some houndstongue seeds remain on plants well into the winter (Boorman and Fuller 1984, DeJong et al. 1990, De Clerck-Floate 1997). These seeds are dispersed slowly over time by attaching to animal wool and hair. Evidence from a study in British Columbia indicates that cattle are important dispersers of houndstongue seed, picking up about 65% of seeds per stalk in grazed paddocks (De Clerck-Floate 1997). European studies, however, suggest that animal dispersal is rare in houndstongue and wind is considered to be the primary dispersal mechanism. The greatest recorded dispersal distance was 4.6 feet (1.4 m). Although Boorman and Fuller (1984) suggest that with such limited primary dispersal range, even rare dispersal events by animals could be important. Dispersal via streams and irrigation ditches is unlikely due to the high specific gravity of houndstongue seeds (Upadhyaya et al. 1988).	

Sources of information: Zouhar 2002.

Question 2.7 Other regions invaded *Score: A Doc'n Level: Other pub.*

Identify other regions: Found in a number of ecological types in Utah that are similar to types in Arizona not currently invaded.

Rationale: The center of origin of houndstongue is thought to be the mountains of western Asia and eastern Europe. Houndstongue also occurs in apparently natural communities in Great Britain. One account suggests houndstongue was introduced to North America as a crop seed contaminant from Europe. Herbarium specimens of houndstongue were collected in Ontario as early as 1859 and in the western provinces between 1922 and 1934. As of 1988, houndstongue occurred in all provinces in Canada except Prince Edward Island and Newfoundland. It appeared to be most abundant in southern British Columbia and Ontario. Houndstongue occurs throughout the contiguous U.S. in all but six southern states. Its occurrence has not been reported in Alaska or Hawaii. Houndstongue is reported as a problem plant in natural areas and parks in several states including Michigan, Missouri, Indiana, Colorado, and Oregon.

From Welsh et al. (1987): In Utah, houndstongue may be found in sagebrush (*Artemisia* spp.), pinyon-juniper (*Pinus* spp.-*Juniperus* spp.), cottonwood (*Populus* spp.), mountain brush, quaking aspen (*Populus tremuloides*), ponderosa pine, and spruce-fir (*Picea* spp.-*Abies* spp.) communities. It is a minor component in Gambel oak (*Quercus gambelii*) communities in central and northern Utah. On preserves in Colorado, houndstongue has been reported in shortgrass prairie, narrowleaf cottonwood/red-osier dogwood (*Populus angustifolia*/*Cornus sericea*) riparian forests, and riparian meadows. Plants are found at 1480 to 3000 m in Utah.

In Arizona could possibly establish in Great Basin desertscrub, Great Basin conifer woodland, southwestern interior riparian, montane wetlands, and plains and Great Basin shrub-grassland.

Sources of information: See cited literature; also see Zouhar (2002). Also see The Atlas of the Vascular Plants of Utah (available online at: <http://www.gis.usu.edu/Geography-Department/utgeog/utvatlas/ut-vascatlas.html>; accessed on February 10, 2004).

Question 3.1 Ecological amplitude *Score: D Doc'n Level: Other pub.*

Describe ecological amplitude, identifying date of source information and approximate date of introduction to the state, if known: In Grand Canyon National Park, houndstongue is found at about 2460 m. At the Arizona Snowbowl it is found at about 2940 m. The northernmost limit of the species is about 68°N. This plant is primarily found in temperate regions, and it often occurs in areas with hot dry summers and cold winters. It is commonly found in ponderosa pine and Douglas fir plant communities. Houndstongue thrives on gravelly, somewhat limy soils (between 2 to 50% calcium carbonate).

Rationale: Although houndstongue's potential ecological amplitude is broad, it currently has only been documented from one ecological tyoe in Arizona (see Worksheet B).

Sources of information: Zouhar (2002), Welsh et al. (1987), and SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: <http://seinet.asu.edu/collections>; accessed February 10, 2004). Also considered personal communication with B. Phillips 2004 (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, 2004).

Question 3.2 Distribution *Score: D Doc'n Level: Obs.*

Describe distribution: In Arizona populations occur on the North Rim of the Grand Canyon and at Arizona Snowbowl parking lot at the top of the Snowbowl Road in the San Francisco Peaks area. The potential population in the Santa Catalina Mountains requires confirmation.

Rationale: Distribution is at present limited.

Sources of information: SEINet (Southwest Environmental Information Network), Arizona herbaria specimen database (available online at: <http://seinet.asu.edu/collections>; accessed February 10, 2004), personal communication with B. Phillips 2004 (Zone Botanist, U.S. Department of Agriculture, Forest Service, Coconino, Kaibab, and Prescott National Forests, 2004), and Southwest Exotic Plant Mapping Program (SWEMP)-Cain Crisis map (available online at: <http://cain.nbii.gov/cgi-bin/mapserv?map=../html/cain/crisis/crisismaps/crisis.map&mode=browse&layer=state&layer=county>; accessed on February 10, 2004).

Worksheet A. Reproductive Characteristics

Complete this worksheet to answer Question 2.4.

Reaches reproductive maturity in 2 years or less	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Dense infestations produce >1,000 viable seed per square meter	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Populations of this species produce seeds every year.	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seed production sustained for 3 or more months within a population annually	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Seeds remain viable in soil for three or more years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Viable seed produced with <i>both</i> self-pollination and cross-pollination	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Has quickly spreading vegetative structures (rhizomes, roots, etc.) that may root at nodes	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	1 pt.
Fragments easily and fragments can become established elsewhere	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	2 pt.
Resprouts readily when cut, grazed, or burned	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	1 pt.
Total pts: 8		Total unknowns: 0	
Score : A			

Note any related traits:

Worksheet B. Arizona Ecological Types

(sensu Brown 1994 and Brown et al. 1998)

Major Ecological Types	Minor Ecological Types	Code*
Dunes	dunes	
Scrublands	Great Basin montane scrub	
	southwestern interior chaparral scrub	
Desertlands	Great Basin desertscrub	
	Mohave desertscrub	
	Chihuahuan desertscrub	
	Sonoran desertscrub	
Grasslands	alpine and subalpine grassland	
	plains and Great Basin shrub-grassland	
	semi-desert grassland	
Freshwater Systems	lakes, ponds, reservoirs	
	rivers, streams	
Non-Riparian Wetlands	Sonoran wetlands	
	southwestern interior wetlands	
	montane wetlands	
	playas	
Riparian	Sonoran riparian	
	southwestern interior riparian	
	montane riparian	
Woodlands	Great Basin conifer woodland	
	Madrean evergreen woodland	U
Forests	Rocky Mountain and Great Basin subalpine conifer forest	
	montane conifer forest	D
Tundra (alpine)	tundra (alpine)	

*A means >50% of type occurrences are invaded; B means >20% to 50%; C means >5% to 20%; D means present but ≤5%; U means unknown (unable to estimate percentage of occurrences invaded).

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