INDIANA

NON-NATIVE PLANT INVASIVENESS RANKING FORM

ASSESSMENT FOR INVASIVE PLANTS NOT IN TRADE
Form version date: July 10, 2009

Scientific name:	Vicia cracca L. s.l. (includes: Vicia cracca L. subsp. cracca, V. cracca subsp tenuifolia (Roth) Gaudin, V. villosa subsp pseudocracca (Bertol.) Ball, V. villosa var. varia (Host) Corb., V. villosa Roth var. villosa) USDA Plants Code: VICRC, VICRT, VIVIP, VIVIV, VIVIV8
Common names:	Bird vetch, cow vetch, winter vetch, bramble vetch, tufted vetch, shaggy vetch
Native distribution:	Europe
Date assessed:	January 15, 2010
Assessors:	Ellen Jacquart
Reviewers:	Stuart Orr
Date Approved:	September 21, 2012

Indiana Invasiveness Rank: Moderate (Relative Maximum Score 50.00-69.99)

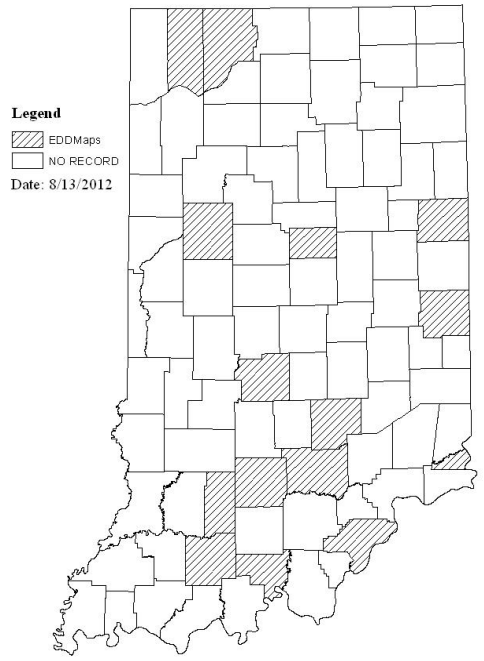
Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (30)	13
2	Biological characteristic and dispersal ability	25 (25)	19
3	Ecological amplitude and distribution	25 (25)	13
4	Difficulty of control	10 (10)	3
	Outcome score	100 (90)[b]	48[a]
	Relative maximum score †		53.33
	Indiana Invasiveness Rank §	Moderate (Relative Maximum Score 50.00-69.99)	

* For questions answered "unknown" do not include point value in "Total Answered Points Possible." If "Total Answered Points Possible" is less than 70.00 points, then the overall invasive rank should be listed as "Unknown."
†Calculated as 100(a/b) to two decimal places.
§Very High >80.00; High 70.00−80.00; Moderate 50.00−69.99; Low 40.00−49.99; Insignificant <40.00

A. DISTRIBUTION (KNOWN/POTENTIAL):

A1.1. Has this species been documented to persist without cultivation in IN? (reliable source; voucher not required)	
☒	**Yes – continue to A2.2**
☐	No – continue to A2.1

A2.1. What is the likelihood that this species will occur and persist outside of cultivation given the climate in Indiana? (obtain from occurrence data in other states with similar climates)	
☐	Likely – continue to A2.2
☐	Not likely



Documentation:

Sources of information: Range maps compiled from PLANTS database, http://plants.usda.gov/java/; Indiana CAPS database, http://extension.entm.purdue.edu/CAPS/index.html; Indiana IPSAWG reports (unpublished); and EDDMapS reports, http://eddmaps.org/.
Vicia cracca and V. villosa are two European species in different subsections of section Cracca; differentiated by subtle perianth morphologies and life durations (see Sect. 2.4) (Tutin & Heywood, 1968; Aarssen et al., 1986; Leht, 2005). Additionally, both species have complicated infra-specific taxonomies (Tutin & Heywood, 1968; Roti-Michelozzi, 1986). Both species are reported to be widespread throughout the Northeast and New York State (USDA, 2010; Weldy & Werier, 2010); although Aarssen et al. (1986) state that V. cracca is the most common. A critical review of herbarium specimens is needed to fully elucidate the occurrence and distribution of these taxa in our area.
Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010.

If the species does not occur and is not likely to occur in Indiana, then stop here as there is no need to assess the species

A2.2. Describe the potential or known suitable habitats within Indiana (underlined). Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

Aquatic Habitats	**Wetland Habitats**	**Upland Habitats**
Rivers/streams	Marshes	Forest
Natural lakes and ponds	Fens	**Savannas**
Reservoirs/impoundments*	Bogs	Barrens
	Shrub swamps	**Prairies**
	Forested wetlands/riparian	**Cultivated***
	Beaches/dunes	**Old Fields***
	Ditches*	**Roadsides***

Other potential or known suitable habitats within Indiana: waste places, ballast grounds.

Documentation:
Sources of information:
Brown, 1879; Uva et al., 1997; Seefeldt et al., 2007; Brooklyn Botanic Garden, 2010.

B. INVASIVENESS RANKING

Questions apply to areas similar in climate and habitats to Indiana unless specified otherwise.

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes and System-Wide Parameters (e.g. fire regime, geomorphological changes (erosion, sedimentation rates), hydrologic regime, nutrient and mineral dynamics, light availability, salinity, pH)

A.	No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years.	0
B.	Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability)	3
C.	Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl)	7
D.	Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology and/or hydrology, affects fire frequency, alters soil pH, or fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)	10
U.	Unknown	

Score 7

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
As all members of Fabaceae, it has been demonstrated to increase soil nitrogen levels via symbiotic bacteria in their root nodules. One study also found an average of 87% of sites under Vicia villosa transmitted less than 1% of unobstructed sunlight (Teasdale & Daughtry, 1993).
Sources of information:
Brown et al., 1993; Teasdale & Daughtry, 1993; Zomlefer, 1994.

1.2. Impact on Natural Community Structure

A.	No perceived impact; establishes in an existing layer without influencing its structure	0
B.	Influences structure in one layer (e.g., changes the density of one layer)	3
C.	Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer)	7
D.	Major alteration of structure (e.g., covers canopy, eradicating most or all layers below)	10
U.	Unknown	

Score 3

Documentation:
Identify type of impact or alteration:
Has been shown to increase the density of the herb layer.
Sources of information:
Teasdale & Daughtry, 1993; authors' pers. obs.

1.3. Impact on Natural Community Composition

A.	No perceived impact; causes no apparent change in native populations	0
B.	Influences community composition (e.g., reduces the number of individuals in one or more native species in the community)	3
C.	Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)	7
D.	Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)	10
U.	Unknown	

Score 3

Documentation:
Identify type of impact or alteration:
One study found reduction of grass emergence under Vicia cracca (Teasdale et al., 2003), thus suggesting species is at least reducing the number of individuals of one or more native species in the community. These results agree with observations of the authors. While the species does certainly alter community composition, it is usually found in old fields in association with other non-native species.
Sources of information:
Teasdale & Daughtry, 1993; Teasdale et al., 2003; authors' pers. obs.

1.4. Impact on other species or species groups (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades. Examples include reduction in nesting/foraging sites; reduction in habitat connectivity; injurious components such as spines, thorns, burrs, toxins; suppresses soil/sediment microflora; interferes with native pollinators and/or pollination of a native species; hybridizes with a native species; hosts a non-native disease which impacts a native species)

A.	Negligible perceived impact	0

B.	Minor impact	3
C.	Moderate impact	7
D.	Severe impact on other species or species groups	10
U.	Unknown	

Score: U

Documentation:
Identify type of impact or alteration:
No studies on the impact to other species located.
Sources of information:

Total Possible: 30
Section One Total: 13

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction

A.	No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction).	0
B.	Limited reproduction (fewer than 10 viable seeds per plant AND no vegetative reproduction; if viability is not known, then maximum seed production is less than 100 seeds per plant and no vegetative reproduction)	1
C.	Moderate reproduction (fewer than 100 viable seeds per plant - if viability is not known, then maximum seed production is less than 1000 seeds per plant - OR limited successful vegetative spread documented)	2
D.	Abundant reproduction with vegetative asexual spread documented as one of the plants prime reproductive means OR more than 100 viable seeds per plant (if viability is not known, then maximum seed production reported to be greater than 1000 seeds per plant.)	4
U.	Unknown	

Score: 4

Documentation:
Describe key reproductive characteristics (including seeds per plant):
One study found stems to have an average of 10-40 flowers per inflorescence with 2-6 seeds per pod (Aarssen et al., 1986). Thus individual seed production could easily exceed 1000 seeds per plant.
Sources of information:
Aarssen et al., 1986; authors' pers. obs.

2.2. Innate potential for long-distance dispersal (e.g. bird dispersal, sticks to animal hair, buoyant fruits, pappus for wind-dispersal)

A.	Does not occur (no long-distance dispersal mechanisms)	0
B.	Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations)	1
C.	Moderate opportunities for long-distance dispersal (adaptations exist for long-distance dispersal, but studies report that 95% of seeds land within 100 meters of the parent plant)	2
D.	Numerous opportunities for long-distance dispersal (adaptations exist for long-distance dispersal and evidence that many seeds disperse greater than 100 meters from the parent plant)	4
U.	Unknown	

Score: 2

Documentation:
Identify dispersal mechanisms:
Seeds taken by mammals and birds (endozoochory) but some may be digested.
Sources of information:

Yocom & Harris, 1953; Aarssen et al., 1986; O'Leske et al, 1996.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contaminated compost, land and vegetation management equipment such as mowers and excavators, etc.)

A.	Does not occur	0
B.	Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient)	1
C.	Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent)	2
D.	High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful)	3
U.	Unknown	

Score 3

Documentation:
Identify dispersal mechanisms:
Vicia cracca s.l. used as a grazing or conserved fodder (hay/silage) crop, a green manure, or ground cover/mulches in no-till planted rows in fields, orchards, organic farms; and hairy vetch mulch used as N fertilizer and weed control for vegetable production (Teasdale & Daughtry, 1993; Kelly et al., 1995; Sainju et al., 2003). Used less today due to its weedy nature; when it is used it is oftentimes not allowed to set seed. Formerly reported from ballast dumping grounds (Brown, 1879). Seeds could also be readily dispersed by mowing and farming equipment.

Sources of information:
Brown, 1879; Teasdale & Daughtry, 1993; Kelly et al., 1995; Sainju et al., 2003; authors' pers. obs..

2.4. Characteristics that increase competitive advantage, such as shade tolerance, ability to grow on infertile soils, perennial habit, fast growth, nitrogen fixation, allelopathy, etc.

A.	Possesses no characteristics that increase competitive advantage	0
B.	Possesses one characteristic that increases competitive advantage	3
C.	Possesses two or more characteristics that increase competitive advantage	6
U.	Unknown	

Score 6

Documentation:
Evidence of competitive ability:
Species fixes nitrogen. Vicia cracca s.l. has demonstrated allelopathic effects (White et al., 1989; Kamo et al., 2003; Hill et al., 2007) (V. cracca- perennial, V. villosa- annual or biennial) (Tutin & Heywood, 1968;Aarssen et al., 1986; Leht, 2005). Some cultivars of V. villosa may persist for more than one year. Frost- and winter-resistant cultivars mentioned as "hibernating" in one Russian study (Lakhanov & Muzalevskaya, 1980); and Aarssen et al. (1986) state that V. villosa has a high degree of winter hardiness and fall-germinating specimens overwinter as seedlings. Both species reportedly not specialized in their substrate requirements (Aarssen et al., 1986), and can grow on nutrient poor soils..
Sources of information:
Tutin & Heywood, 1968; Lakhanov & Muzalevskaya, 1980; Aarssen et al., 1986; White et al., 1989; Kamo et al., 2003; Leht, 2005; Hill et al., 2007; authors' pers. obs..

2.5. Growth vigor

A.	Does not form thickets or have a climbing or smothering growth habit	0
B.	Has climbing or smothering growth habit, forms a dense layer above shorter vegetation,	2

forms dense thickets, or forms a dense floating mat in aquatic systems where it smothers other vegetation or organisms

U. Unknown

Score 2

Documentation:
Describe growth form:
Vicia cracca s.l. has a climbing habit (Aarssen et al., 1986) and sometimes exhibits a smothering growth habit.
Sources of information:
author's personal observations; Aarssen et al., 1986

2.6. Germination/Regeneration

A. Requires open soil or water and disturbance for seed germination, or regeneration from vegetative propagules. 0
B. Can germinate/regenerate in vegetated areas but in a narrow range or in special conditions 2
C. Can germinate/regenerate in existing vegetation in a wide range of conditions 3
U. Unknown (No studies have been completed)

Score 2

Documentation:
Describe germination requirements:
Germination rates for Vicia cracca and V. villosa have been reported as high as 82% and 98% respectively following scarification, although a small percentage of seeds germinated without any treatment. Seeds usually found germinating in open soil.
Sources of information:
Aarssen et al., 1986.

2.7. Other species in the genus invasive in Indiana or elsewhere

A. No 0
B. Yes 3
U. Unknown

Score 0

Documentation:
Species:
Vicia benghalensis, V. faba, V. grandiflora, V. hirsuta, V. lathyroides, V. laxiflora, V. monantha, V. narbonensis, V. pannonica, V. peregrina, V. sativa, V. sepium, V. tetrasperma reported from the northeast; Vicia sativa and V. tetrasperma listed as a weeds by Uva et al, 1997; no Vicia species listed as invasive in NY or elsewhere.

Uva et al., 1997; Mehrhoff, 2003; Brooklyn Botanic Garden, 2010; CJISST, 2010; Weldy & Werier, 2010; U.S.D.A. NRCS, 2010.

Total Possible 25
Section Two Total 19

3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION

3.1. Density of stands in natural areas in the northeastern USA and eastern Canada (use same definition as Gleason & Cronquist which is: "The part of the United States covered extends from the Atlantic Ocean west to the western boundaries of Minnesota, Iowa, northern Missouri, and southern Illinois, south to the southern boundaries of Virginia, Kentucky, and Illinois, and south to the Missouri River in Missouri. In Canada the area covered includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of

latitude")

A. No large stands (no areas greater than 1/4 acre or 1000 square meters) 0
B. Large dense stands present in areas with numerous invasive species already present or disturbed landscapes 2
C. Large dense stands present in areas with few other invasive species present (i.e. ability to invade relatively pristine natural areas) 4
U. Unknown

Score 0

Documentation:
Identify reason for selection, or evidence of weedy history:
No large stands reported from the Northeast. Authors' personal observations suggest that while vicia spp. can be locally quite common, they do not form large stands, except where planted.
Sources of information:
Authors' pers. obs.

3.2. Number of habitats the species may invade

A. Not known to invade any natural habitats given at A2.2 0
B. Known to occur in two or more of the habitats given at A2.2, with at least one a natural habitat. 1
C. Known to occur in three or more of the habitats given at A2.2, with at least two a natural habitat. 2
D. Known to occur in four or more of the habitats given at A2.2, with at least three a natural habitat. 4
E. Known to occur in more than four of the habitats given at A2.2, with at least four a natural habitat. 6
U. Unknown

Score 2

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.2.
Sources of information:
Brown, 1879; Uva et al., 1997; Seefeldt et al., 2007; Brooklyn Botanic Garden, 2010.

3.3. Role of disturbance in establishment

A. Requires anthropogenic disturbances to establish. 0
B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances. 2
C. Can establish independent of any known natural or anthropogenic disturbances. 4
U. Unknown

Score 2

Documentation:
Identify type of disturbance:
Readily establishes in areas with natural or anthropogenic disturbance.
Sources of information:
Seefeldt et al., 2007; authors' pers. obs.

3.4. Climate in native range

A. Native range does not include climates similar to Indiana 0
B. Native range possibly includes climates similar to at least part of Indiana 1

C. Native range includes climates similar to those in Indiana 3
U. Unknown

Score 3

Documentation:
Describe what part of the native range is similar in climate to Indiana:
The native range of both species includes northern Europe (Tutin & Heywood, 1968). Vicia cracca reported to be expanding along Alaskan roadsides (Seefeldt et al., 2007) and reported as naturalized as far north as Alberta (Aarssen et al., 1986). Vicia villosa reported naturalized as far north as Alaska and sothern Canada (Aarssen et al., 1986).
Sources of information:
Tutin & Heywood, 1968; Aarssen et al., 1986; Seefeldt et al., 2007.

3.5. Current introduced distribution in the northeastern USA and eastern Canada (see question 3.1 for definition of geographic scope)

A. Not known from the northeastern US and adjacent Canada 0
B. Present as a non-native in one northeastern USA state and/or eastern Canadian province. 1
C. Present as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. 2
D. Present as a non-native in 4–8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., "Noxious" or "Invasive") in 1 northeastern state or eastern Canadian province. 3
E. Present as a non-native in >8 northeastern USA states and/or eastern Canadian provinces. and/or categorized as a problem weed (e.g., "Noxious" or "Invasive") in 2 northeastern states or eastern Canadian provinces. 4
U. Unknown

Score 4

Documentation:
Identify states and provinces invaded:
Both species reported from all northeastern states and provinces.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Aarssen et al., 1986; U.S.D.A. NRCS, 2010.

3.6. Current introduced distribution of the species in natural areas in Indiana

A. Present in no Indiana counties 0
B. Present in 1-10 Indiana counties 1
C. Present in 11-20 Indiana counties 2
D. Present in 21-50 Indiana counties 3
E. Present in more than 50 Indiana counties or on Federal noxious weed list 4
U. Unknown

Score 2

Documentation:
Describe distribution:
See A1.1.
Sources of information:
Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010.

Total Possible 25
Section Three Total 13

4. DIFFICULTY OF CONTROL

4.1. Seed banks

A. Seeds (or vegetative propagules) remain viable in soil for less than 1 year, or does not make viable seeds or persistent propagules. 0
B. Seeds (or vegetative propagules) remain viable in soil for at least 1 to 10 years 2
C. Seeds (or vegetative propagules) remain viable in soil for more than 10 years 3
U. Unknown

Score 2

Documentation:
Identify longevity of seed bank:
Seed banking of Vicia cracca- viable for at least 2.5 years (Van Assche et al., 2003) but less than 5 years (Roberts & Boddrell, 1985; Thompson et al., 1993).
Sources of information:
Roberts & Boddrell, 1985; Thompson et al., 1993; Van Assche et al., 2003

4.2. Vegetative regeneration

A. No regrowth following removal of aboveground growth 0
B. Regrowth from ground-level meristems 1
C. Regrowth from extensive underground system 2
D. Any plant part is a viable propagule 3
U. Unknown

Score 1

Documentation:
Describe vegetative response:
Vicia cracca when perennial could presumably resprout from roots. Vicia cracca has been reported to have strong vegetative growth in response to previous year burning.
Sources of information:
Aarssen et al., 1986.

4.3. Level of effort required

A. Management is not required: e.g., species does not persist without repeated anthropogenic disturbance. 0
B. Management is relatively easy and inexpensive: e.g. 10 or fewer person-hours of manual effort (pulling, cutting and/or digging) can eradicate a 1 acre infestation in 1 year (infestation averages 50% cover or 1 plant/100 ft^2). 2
C. Management requires a major short-term investment: e.g. 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/year using mechanical equipment (chain saws, mowers, etc.) for 2-5 years to suppress a 1 acre infestation. Eradication is difficult, but possible (infestation as above). 3
D. Management requires a major investment: e.g. more than 100 person-hours/year of manual effort, or more than 10 person hours/year using mechanical equipment, or the use of herbicide, grazing animals, fire, etc. for more than 5 years to suppress a 1 acre infestation. Eradication may be impossible (infestation as above). 4
U. Unknown

Score 0

Documentation:
Identify types of control methods and time-term required:
Vicia villosa is listed as a weed by Uva et al, 1997; V. cracca is noted as "persistent and difficult to control" (Aarssen et al., 1986). Neither species listed as invasive by Mehrhoff et al., 2003 nor CJISST, 2010. No studies delineating specific management costs or time have been located. Chemical Control: Vicia cracca- complete control was achieved with rates of clopyralid, dicamba plus diflufenzopyr, triclopyr, and 2,4-D that were a fourth to an eighth of the full registered rate (Seefeldt et al., 2007). Vicia cracca- combinations of metribuzin

and metolachlor, and thifensulfuron methyl/tribenuron methyl when used in combinations with MCPA amine provide good control (Ivany, 2001). Both species reportedly controlled with alachor, clopyrlid, diphenamid, propyzamide, glyphosate, et al., for a complete list see Aarssen et al. (1986). BioControl: Numerous viral, fungal, insect and nematode pests have been recorded on these species, (Blanton, 1939; Aarssen et al., 1986); but no studies have been found demonstrating their use as dedicated biocontrol. Fire Control: Vicia cracca has been reported to have strong vegetative growth the year following burning (Aarssen et al., 1986).
Sources of information:
Blanton, 1939; Tutin & Heywood, 1968; Aarssen et al., 1986; Roti-Michelozzi, 1986; Uva et al., 1997; Ivany, 2001; Mehrhoff et al., 2003; Leht, 2005; Seefeldt et al., 2007; CJISST, 2010; USDA, 2010; Weldy & Werier, 2010.

Total Possible	10
Section Four Total	3
Total for 4 sections Possible	90
Total for 4 sections	48

References for species assessment:

Aarssen, L. W., I. V. Hall & K. I. N. Jensen. 1986. The biology of Canadian weeds 76. Vicia angustifolia, Vicia cracca, Vicia sativa, Vicia tetrasperma, and Vicia villosa. Canadian J. Plant Science. 66(3):711-738.

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Brooklyn Botanic Garden. 2010. AILANTHUS database. [Accessed January 12, 2010].

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Brown, R. E., G. E. Varvel & C. A.Shapiro. 1993. Residual effects of interseeded hairy vetch on soil-nitrate-nitrogen levels. Soil Science Society America Journal. 57(1):121-124.

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Hill, E. C., M. Ngouajio & M. G. Nair. 2007. Allelopathic potential of hairy vetch (Vicia villosa) and cowpea (Vigna unguiculata) methanol and ethyl acetate extracts on weeds and vegetables. Weed Technology. 21(2):437-444.

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Mehrhoff, L. J., J. A. Silander, Jr., S. A. Leicht, E. S. Mosher and N. M. Tabak. 2003. IPANE: Invasive Plant Atlas of New England. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA. <www.ipane.org> [Accessed January 12, 2010].

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Roberts, H. A. & J. E. Boddrell. 1985. Survival and seasonal pattern of seedling emergence in some Leguminosae. Annals Applied Biology. 106(1):125-132.

Roti-Michelozzi, G. 1986. Biosystematic studies on the Vicia villosa complex in Europe. Candollea. 41(2):399-412.

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Seefeldt, S. S., J. S. Conn, B. E. Jackson & S. D. Sparrow. 2007. Response of seedling bird vetch (Vicia cracca) to six herbicides. Weed Technology. 21(3):692-694.

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United States Department of Agriculture, National Resources Conservation Service. 2010. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. < http://plants.usda.gov/> [Accessed January 12, 2010].

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