ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

Botanical name: *Coronilla varia* L.
Common name: crownvetch
Assessors:

Timm Nawrocki Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798	Helen I. Klein Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2798
Lindsey A. Flagstad Research Technician Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2786	Matthew L. Carlson, Ph.D. Associate Professor Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, Alaska 99501 (907) 257-2790

Reviewers:

Gino Graziano Natural Resource Specialist Plant Materials Center, Division of Agriculture, Department of Natural Resources, State of Alaska 5310 S. Bodenburg Spur, Palmer, Alaska, 99645 (907) 745-4469	Jeff Conn, Ph. D. Research Agronomist Agricultural Research Service, U.S. Department of Agriculture 319 O'Neil Building, 905 Koyukuk St. – UAF Campus, Fairbanks, Alaska 99775 (907) 474-7652
Robert L. DeVelice, Ph. D. Vegetation Ecologist Chugach National Forest, Forest Service, U.S. Department of Agriculture 3301 C Street, Suite 300 Anchorage, Alaska 99503 (907) 743-9437	Whitney Rapp Katmai, Lake Clark, Alagnak, and Aniakchak Planning, Research Permitting, GIS/GPS, and Invasive Species National Park Service, U.S. Department of the Interior P.O. Box 7 King Salmon, Alaska, 99613 (907) 246-2145

Date: 2/25/2011
Date of previous ranking, if any: 5T

OUTCOME SCORE:

CLIMATIC COMPARISON
This species is present or may potentially establish in the following eco-geographic regions:

Pacific Maritime	Yes
Interior-Boreal	Yes
Arctic-Alpine	Yes

INVASIVENESS RANKING	**Total** (total answered points possible[1])	**Total**
Ecological impact	40 (40)	26
Biological characteristics and dispersal ability	25 (25)	17
Ecological amplitude and distribution	25 (25)	17
Feasibility of control	10 (7)	6
Outcome score	100 (97)[b]	66[a]
Relative maximum score[2]		**68**

[1] For questions answered "unknown" do not include point value for the question in parentheses for "total answered points possible."
[2] Calculated as a/b × 100

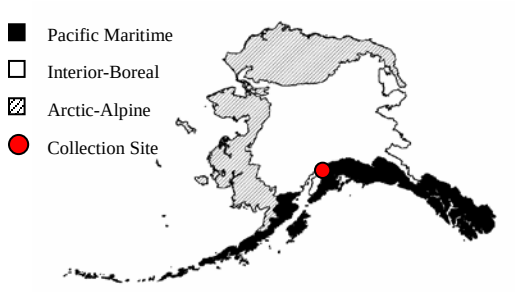
A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

☒ Yes - continue to 1.2
☐ No - continue to 2.1

1.2. From which eco-geographic region has it been collected or documented (see inset map)? Proceed to Section B. INVASIVNESS RANKING

☐ Pacific Maritime
☒ Interior-Boreal
☐ Arctic-Alpine



Documentation: *Coronilla varia* has been documented from Anchorage in the Interior-Boreal ecogeographic region of Alaska (AKEPIC 2011).

2.1. Is there a 40 percent or higher similarity (based on CLIMEX climate matching, see references) between climates where this species currently occurs and:

a. Juneau (Pacific Maritime region)?
☒ Yes – record locations and percent similarity; proceed to Section B.
☐ No

b. Fairbanks (Interior-Boreal region)?
☐ Yes – record locations and percent similarity; proceed to Section B.
☐ No

c. Nome (Arctic-Alpine region)?
☒ Yes – record locations and percent similarity; proceed to Section B.
☐ No

If "No" is answered for all regions; reject species from consideration

Documentation: *Coronilla varia* has been documented from Vancouver, British Columbia, and Helsinki, Finland, which have 40% and 41% climatic similarities with Juneau, respectively (CLIMEX 1999, Klinkenberg 2010, Jyväskylä University Museum 2011). It is known to grow in several locations in Belarus, Ukraine, and Russia that have 40% or greater climatic similarities with Nome (CLIMEX 1999, Luneva and Budrevskaya 2006).

B. INVASIVENESS RANKING

1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

a.	No perceivable impact on ecosystem processes	0
b.	Has the potential to influence ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability)	3
c.	Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl)	7
d.	Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or	10

affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species)

e. Unknown U

Score **7**

Documentation: The extensive rhizomes of *Coronilla varia* reduce soil erosion (Losure et al. 2009). Roots are associated with bacteria that fix atmospheric nitrogen; thus, infestations significantly increase the availability of nitrogen in the soil (Tu 2003, Symstad 2004). The addition of nitrogen to the soil favors the establishment or increase of non-native species (Symstad 2004), which may delay natural successional processes (Gucker 2009). Removal of *Coronilla varia* does not immediately return nutrient cycling patterns to their pre-invasion states (Symstad 2004).

1.2. Impact on Natural Community Structure

a. No perceived impact; establishes in an existing layer without influencing its structure 0

b. Has the potential to influence structure in one layer (e.g., changes the density of one layer) 3

c. Has the potential to cause significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7

d. Likely to cause major alteration of structure (e.g., covers canopy, eliminating most or all lower layers) 10

e. Unknown U

Score **5**

Documentation: *Coronilla varia* can climb over shrubs and outshade underlying vegetation (Tu 2003). Monospecific stands limit the establishment of native trees and shrubs (Gucker 2009). This species increases the density of canopy layers and reduces the density of underlying layers (Tu 2003, Gucker 2009). However, populations in Alaska appear to cause moderate changes to community structure and have not been observed climbing shrubs or trees (Rasy pers. comm.).

1.3. Impact on Natural Community Composition

a. No perceived impact; causes no apparent change in native populations 0

b. Has the potential to influence community composition (e.g., reduces the population size of one or more native species in the community) 3

c. Has the potential to significantly alter community composition (e.g., significantly reduces the population size of one or more native species in the community) 7

d. Likely to cause major alteration in community composition (e.g., results in the extirpation of one or more native species, thereby reducing local biodiversity and/or shifting the community composition towards exotic species) 10

e. Unknown U

Score **7**

Documentation: Populations of *Coronilla varia* reduce the diversity and cover of native plant species (Symstad 2004). This species outshades underlying vegetation and reduces native plant populations (Tu 2003).

1.4. Impact on associated trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)

a.	Negligible perceived impact	0
b.	Has the potential to cause minor alteration (e.g., causes a minor reduction in nesting or foraging sites)	3
c.	Has the potential to cause moderate alteration (e.g., causes a moderate reduction in habitat connectivity, interferes with native pollinators, or introduces injurious components such as spines, toxins)	7
d.	Likely to cause severe alteration of associated trophic populations (e.g., extirpation or endangerment of an existing native species or population, or significant reduction in nesting or foraging sites)	10
e.	Unknown	U

Score **7**

Documentation: *Coronilla varia* produces high quality forage and is consumed by livestock, deer, elk, and rabbits. It provides cover for small mammals and ground-nesting birds (Tu 2003, Gucker 2009). Plants contain nitroglycosides that are toxic to horses when consumed in large quantities; these nitroglycosides may be toxic to other non-ruminants as well (Tu 2003, Campbell 2006, Gucker 2009). Many insects feed on *Coronilla varia*. Flowers are insect pollinated (Gucker 2009), and the presence of this species may alter native plant-pollinator interactions.

Total Possible	40
Total	**26**

2. Biological Characteristics and Dispersal Ability

2.1. Mode of reproduction

a.	Not aggressive (produces few seeds per plant [0-10/m^2] and not able to reproduce vegetatively).	0
b.	Somewhat aggressive (reproduces by seed only [11-1,000/m^2])	1
c.	Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed [<1,000/m^2])	2
d.	Highly aggressive (extensive vegetative spread and/or many seeded [>1,000/m^2])	3
e.	Unknown	U

Score **3**

Documentation: *Coronilla varia* reproduces sexually by seeds and vegetatively by rhizomes (Losure et al. 2009). Seed production is usually low (Gucker 2009), but the number of seeds produced per plant has not been quantified. While seeds are important for establishing new populations, existing populations primarily expand by extensive vegetative reproduction (Losure et al. 2009).

2.2. Innate potential for long-distance dispersal (wind-, water- or animal-dispersal)

a.	Does not occur (no long-distance dispersal mechanisms)	0
b.	Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations)	2
c.	Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit coats, etc.)	3
d.	Unknown	U

Score **2**

Documentation: Most seeds land near the parent plant, but some are dispersed long distances in the excrement of deer or other animals (Gucker 2009).

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sale of species, use as forage or for revegetation, dispersal along highways, transport on boats, common contaminant of landscape materials, etc.).

a.	Does not occur	0
b.	Low (human dispersal is infrequent or inefficient)	1
c.	Moderate (human dispersal occurs regularly)	2
d.	High (there are numerous opportunities for dispersal to new areas)	3
e.	Unknown	U

Score **2**

Documentation: *Coronilla varia* most often escapes into natural areas from sites where it has been intentionally planted (Gucker 2009). It has been planted as an ornamental ground cover and pasture plant and for erosion control, mine reclamation, and soil fertilization (Tu 2003, Losure et al. 2009). It is a contaminant in alfalfa seed (Gucker 2009).

2.4. Allelopathic

a.	No	0
b.	Yes	2
c.	Unknown	U

Score **2**

Documentation: Leachate from seeds of *Coronilla varia* caused shortening of roots and shoots, absence of root hair growth, and necrotic root tips in many tested plant species (McKee et al. 1971). Shoot extract from *Coronilla varia* significantly inhibited the germination of *Bromus inermis* and *Festuca elatior* (Stowe 1979).

2.5. Competitive ability

a.	Poor competitor for limiting factors	0
b.	Moderately competitive for limiting factors	1
c.	Highly competitive for limiting factors and/or able to fix nitrogen	3
d.	Unknown	U

Score **3**

Documentation: *Coronilla varia* is highly competitive, and dense populations can exclude other plant species. The roots are associated with nitrogen-fixing bacteria (Gucker 2009).

2.6. Forms dense thickets, has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation.

a.	Does not grow densely or above surrounding vegetation	0
b.	Forms dense thickets	1
c.	Has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation	2
d.	Unknown	U

Score **1**

Documentation: *Coronilla varia* forms dense patches of trailing stems in which few other species can survive (Losure et al. 2009). The stems can climb over surrounding vegetation, including shrubs (Tu 2003); however, this species has not been observed with a climbing growth habit in Alaska (Rasy pers. comm.).

2.7. Germination requirements

a.	Requires sparsely vegetated soil and disturbance to germinate	0
b.	Can germinate in vegetated areas, but in a narrow range of or in special conditions	2
c.	Can germinate in existing vegetation in a wide range of conditions	3
d.	Unknown	U
	Score	**0**

Documentation: *Coronilla varia* is intolerant of shade (Tu 2003) and is unlikely to establish under closed canopies. This species establishes best in sparsely vegetated open areas; seedling establishment is low in undisturbed vegetation (Gucker 2009).

2.8. Other species in the genus invasive in Alaska or elsewhere

a.	No	0
b.	Yes	3
c.	Unknown	U
	Score	**3**

Documentation: *Coronilla valentina* is a non-native shrub that occasionally escapes cultivation in California (DiTomaso and Healy 2007).

2.9. Aquatic, wetland, or riparian species

a.	Not invasive in wetland communities	0
b.	Invasive in riparian communities	1
c.	Invasive in wetland communities	3
d.	Unknown	U
	Score	**1**

Documentation: *Coronilla varia* invades stream banks (Gucker 2009).

Total Possible	25
Total	**17**

3. Ecological Amplitude and Distribution

3.1. Is the species highly domesticated or a weed of agriculture?

a.	Is not associated with agriculture	0
b.	Is occasionally an agricultural pest	2
c.	Has been grown deliberately, bred, or is known as a significant agricultural pest	4
d.	Unknown	U
	Score	**4**

Documentation: *Coronilla varia* grows as a weed in agricultural fields in southern Russia (Luneva 2009). In the U.S., it has been intentionally grown as an ornamental ground cover and

pasture plant and for erosion control, mine reclamation, and soil fertilization (Tu 2003, Losure et al. 2009).

3.2. Known level of ecological impact in natural areas

a.	Not known to impact other natural areas	0
b.	Known to impact other natural areas, but in habitats and climate zones dissimilar to those in Alaska	1
c.	Known to cause low impact in natural areas in habitats and climate zones similar to those in Alaska	3
d.	Known to cause moderate impact in natural areas in habitat and climate zones similar to those in Alaska	4
e.	Known to cause high impact in natural areas in habitat and climate zones similar to those in Alaska	6
f.	Unknown	U

Score **1**

Documentation: *Coronilla varia* has invaded native grassland prairies and dunes in the central U.S., where it outshades and displaces native vegetation (Tu 2003, Gucker 2009). It reduces the establishment of native trees and shrubs (Gucker 2009). In Kentucky, *Coronilla varia* reduces the establishment and flowering of the endangered *Solidago shortii* (Walck et al. 1999, Gucker 2009).

3.3. Role of anthropogenic and natural disturbance in establishment

a.	Requires anthropogenic disturbance to establish	0
b.	May occasionally establish in undisturbed areas, readily establishes in naturally disturbed areas	3
c.	Can establish independently of natural or anthropogenic disturbances	5
e.	Unknown	U

Score **2**

Documentation: Once established, populations of *Coronilla varia* can spread to vegetated areas by rhizomes, where they outshade and displace native species (Gucker 2009). However, in Alaska, *Coronilla varia* has only occurred in anthropogenically disturbed areas (AKEPIC 2011, Graziano pers. obs.).

3.4. Current global distribution

a.	Occurs in one or two continents or regions (e.g., Mediterranean region)	0
b.	Extends over three or more continents	3
c.	Extends over three or more continents, including successful introductions in arctic or subarctic regions	5
e.	Unknown	U

Score **5**

Documentation: *Coronilla varia* is native to the Mediterranean region of Europe, southwest Asia, and North Africa (Tu 2003). It has been introduced to North America and New Zealand (Tu 2003, Landcare Research 2011). This species grows in subarctic regions of coastal Norway as far north as 63.3°N (Vascular Plant Herbarium Trondheim 2011).

3.5. Extent of the species' U.S. range and/or occurrence of formal state or provincial listing

a.	Occurs in 0-5 percent of the states	0
b.	Occurs in 6-20 percent of the states	2
c.	Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., "Noxious," or "Invasive") in one state or Canadian province	4
d.	Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces	5
e.	Unknown	U

Score **5**

Documentation: *Coronilla varia* grows in all states of the U.S. except North Dakota. It also grows in much of southern Canada (USDA 2011). It is not considered a noxious weed in any states of the U.S. or provinces of Canada.

Total Possible 25
Total **17**

4. Feasibility of Control

4.1. Seed banks

a.	Seeds remain viable in the soil for less than three years	0
b.	Seeds remain viable in the soil for three to five years	2
c.	Seeds remain viable in the soil for five years or longer	3
e.	Unknown	U

Score **U**

Documentation: No viable seeds were found in the soil of *Coronilla varia* populations in Iowa (Losure et al. 2009). In other areas, however, seedlings have been observed in controlled sites after several years of monitoring (Tu 2003). Reports of the amount of time seeds remain viable vary from just 2 years to 15 years or more (Gucker 2009).

4.2. Vegetative regeneration

a.	No resprouting following removal of aboveground growth	0
b.	Resprouting from ground-level meristems	1
c.	Resprouting from extensive underground system	2
d.	Any plant part is a viable propagule	3
e.	Unknown	U

Score **3**

Documentation: Plants can propagate from rhizome fragments and stem fragments that contain at least one node (Losure et al. 2009).

4.3. Level of effort required

a.	Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance)	0
b.	Management is relatively easy and inexpensive; requires a minor investment of human and financial resources	2
c.	Management requires a major short-term or moderate long-term investment of human and financial resources	3

d.	Management requires a major, long-term investment of human and financial resources	4
e.	Unknown	U

Score **3**

Documentation: Manual removal or covering with opaque material may eradicate small populations as long as all stem, root, and rhizome fragments are removed (Tu 2003, Gucker 2009). Mowing several times per growing season is thought to prevent the spread of *Coronilla varia* (Cortés-Burns and Flagstad 2009). Herbicide application is the most effective method for control. Foliar applications of 2, 4-D amine, 2% glyphosate, 2% triclopyr, or 0.25% clopyralid with 0.5% surfactant have proven successful (Tu 2003). Control measures will likely need to be repeated for several years. Controlled sites should be monitored, as plants can regenerate from stem and rhizome fragments (Losure et al. 2009).

Total Possible	7
Total	**6**
Total for four sections possible	97
Total for four sections	**66**

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