

**Predicting invasive plant response to climate change: Prioritization and mapping of new potential threats to Alberta's biodiversity**  
(Chai et al. 2014)

**Supplemental Information: Alberta non-native plant invasiveness ranking form**  
(Adapted from Carlson et al. 2008)

Full report available at <http://www.biodiversityandclimate.abmi.ca>

Scientific name:	<i>Cotoneaster integerrimus/ Mespilus cotoneaster/ Cotoneaster cotoneaster</i>
Common name:	European cotoneaster
Assessor:	Shauna-Lee Chai
Reviewers:	Peter Rice
Date:	October 30, 2013

Outcome score:

A. Climatic Comparison

This species is present or may potentially establish in the following natural regions:

	Collected in Alberta regions	CLIMEX similarity in 1975	CLIMEX similarity in 2050
Boreal	No	0.874	0.902
Parkland	No	0.885	0.870
Foothills	No	0.866	0.871
Grassland	No	0.863	0.873
Rocky Mountains	No	0.880	0.867
Shield	No	0.794	0.870

B. Invasiveness Ranking

	Total (Total answered <sup>1</sup> points possible)	Total score
1. Ecological impact	40(40)	9
2. Biological characteristic and dispersal ability	25(25)	17
3. Ecological amplitude and distribution	25(20)	8
4. Feasibility of control	10(6)	6
Outcome score	100(91) <sup>b</sup>	<sup>a</sup> 40
Relative maximum score <sup>2</sup>	44	<i>Weakly Invasive</i>

<sup>1</sup>For questions answered "unknown" do not include point value for the question in parentheses for "Total answered points possible."

<sup>2</sup>Calculated as a/b x 100.

A. Climatic Comparison:

1.1 Has this species ever been collected or documented in Alberta?

Yes – continue to 1.2

No – continue to 2.1

1.2 Which natural region has it been collected or documented? Proceed to section B. Invasiveness Ranking.

Boreal

Rockies

Grassland

Foothills

Parkland

Shield

Documentation:

Sources of information: ANPC Rogues gallery, ACIMS, PLANTS database, GBIF

2.1 Is there a 70 percent or higher similarity (based on CLIMEX climate matching) between climates anywhere the species currently occurs and

a. Boreal -Yes

b. Rockies - Yes

c. Grassland - Yes

d. Foothills - Yes

e. Parkland - Yes

f. Shield- Yes

-If “no” is answered for all regions, reject species from consideration

Documentation:

Sources of information:

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B. Invasiveness Ranking

1. Ecological Impact

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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, reduces open water that are important to waterfowl)   | 7 |
| d. May cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology; hydrology; or affects fire frequency, 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) 10

u. Unknown

Score:3

Documentation: Cotoneasters can successfully compete for moisture and light, displacing native species (Cotoneaster 2005)

Identify ecosystem processes impacted:

Rationale:

Sources of information:

### 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, eradicating most or all layers below) 10
- u. Unknown

Score: 3

Documentation: shrub. 2 m tall. Cotoneasters can successfully compete for moisture and light, displacing native species (Cotoneaster 2005)

Identify type of impact or alteration:

Rationale:

Sources of information:

### 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 number of individuals in one or more native species in the community) 3
- c. Has the potential to 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. Likely to cause 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: outcompetes other species

Identify type of impact or alteration:

Rationale:

Sources of information:

- 1.4 Impact on higher 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 3
  - c. Has the potential to cause moderate alteration (minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins) 7
  - d. Likely to cause severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites) 10
  - u. Unknown

Score:0

Documentation:

Identify type of impact or alteration:

Rationale:

Sources of information:

Total Possible:40

Total:9

## 2. Biological Characteristics and Dispersal Ability

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### 2.1 Mode of reproduction

- a. Not aggressive reproduction (few [0-10] seeds per plant and no vegetative reproduction) 0
- b. Somewhat aggressive (reproduces only by seeds (11-1,000/m<sup>2</sup>)) 1
- c. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed, <1,000/m<sup>2</sup>) 2
- d. Highly aggressive reproduction (extensive vegetative spread and/or many seeded, >1,000/m<sup>2</sup>) 3
- u. Unknown

Score:3

Documentation: high seed abundance (USDA Plants database)

Describe key reproductive characteristics (including seeds per plant):

Rationale:

Sources of information:

### 2.2 Innate potential for long-distance dispersal (bird dispersal, sticks to animal hair, buoyant fruits, 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) 2

- c. Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit-coats, etc.) 3
- u. Unknown

Score:3

Documentation:Fruits are eaten by birds and dispersed in droppings (Cottoneaster 2005)

Identify dispersal mechanisms:

Rationale:

Sources of information:

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, contamination, etc.)

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

Score: 3

Documentation: available commercially

Identify dispersal mechanisms:

Rationale:

Sources of information:

2.4 Allelopathic

- a. no 0
- b. yes 2
- u. unknown

Score:0

Documentation: USDA PLANTS database

Describe effect on adjacent plants:

Rationale:

Sources of information:

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 nitrogen fixing ability 3
- u. Unknown

Score:1

Documentation: Cotoneasters can successfully compete for moisture and light, displacing native species (Cottoneaster 2005)

Evidence of competitive ability:

Rationale:

Sources of information:

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

- a. No 0
- b. Forms dense thickets 1
- c. Has climbing or smothering growth habit, or otherwise taller than the surrounding vegetation 2
- u. Unknown

Score:1

Documentation:densely interwoven branches (Cotoneaster 2005)

Describe growth form:

Rationale:

Sources of information:

2.7 Germination requirements

- a. Requires open soil and disturbance to germinate 0
- b. Can germinate in vegetated areas but in a narrow range or in special conditions 2
- c. Can germinate in existing vegetation in a wide range of conditions 3
- u. Unknown

Score:2

Documentation: scarification of seed required (Slabaugh, P. & Shaw, N. 2008)

Describe germination requirements:

Rationale:

Sources of information:

2.8 Other species in the genus invasive in Alberta or elsewhere

- a. No 0
- b. Yes 3
- u. Unknown

Score:3

Documentation: About 30 species are in cultivation as popular garden shrubs and they have been increasingly reported as escapees, e.g. Rock cotoneaster, franchet cotoneaster, Himalayan cotoneaster (Cotoneaster 2005). INVADERS Database System lists nine cotoneaster taxa for the five northwest states (WY, MT, ID, OR, WA) though none of 39 distribution records suggest significant invasiveness. Although I have been studying weed plants in the interior northwest for 44 years and have done a number of new invaders risk assessments I have never encountered a report of cotoneasters being invasive (Rice pers. comm.).

Species:

Sources of information:

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
- u. Unknown

Score: 1

Documentation: The natural habitats of cotoneaster are rocky slopes and forests at elevations below 2500 meters.

Can tolerate range of moisture regimes (Wennerberg, 2004).

Describe type of habitat:

Rationale:

Sources of information:

Total Possible:25

Total:17

### 3. Distribution

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- 3.1 Is the species highly domesticated or a weed of agriculture
  - a. No 0
  - b. Is occasionally an agricultural pest 2
  - c. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
  - u. Unknown

Score:4

Documentation:commercial garden species

Identify reason for selection, or evidence of weedy history:

Rationale:

Sources of information:

- 3.2 Known level of ecological impact in natural areas
  - a. Not known to cause impact in any other natural area 0
  - b. Known to cause impacts in natural areas, but in dissimilar habitats and climate zones than exist in regions of Alberta 1
  - c. Known to cause low impact in natural areas in similar habitats and climate zones to those present in Alberta 3
  - d. Known to cause moderate impact in natural areas in similar habitat and climate zones 4
  - e. Known to cause high impact in natural areas in similar habitat and climate zones 6
  - u. Unknown

Score:1

Documentation: Although cotoneasters are not yet considered a serious problem in Garry oak and associated ecosystems, their potential for invasiveness is not known (Cotoneaster 2005)

Identify type of habitat and states or provinces where it occurs:

Sources of information:

- 3.3 Role of anthropogenic and natural 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 disturbances 3
- c. Can establish independent of any known natural or anthropogenic disturbances 5
- u. Unknown

Score:unknown

Documentation:

Identify type of disturbance:

Rationale:

Sources of information:

#### 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
- u. Unknown

Score:3

Documentation: Europe, Asia, North America

Describe distribution:

Rationale:

Sources of information:

#### 3.5 Extent of the species Canada range and/or occurrence of formal state or provincial listing

- a. 0-5 percent of the states/provinces 0
- b. 6-20 percent of the states/provinces 2
- c. 21-50 percent, and/or state/province listed as a problem weed (e.g., “Noxious,” or “Invasive”) in 1 state or Canadian province 4
- d. Greater than 50 percent, and/or identified as “Noxious” in 2 or more states or Canadian provinces 5
- u. Unknown

Score:0

Documentation: In BC and Massachusetts (GBIF). Not noxious/regulated anywhere!

Identify provinces invaded:

Rationale:

Sources of information:

Total possible:20

Total:8

#### 4. Feasibility of Control

##### 4.1 Seed banks

- a. Seeds remain viable in the soil for less than 3 years 0
- b. Seeds remain viable in the soil for between 3 and 5 years 2
- c. Seeds remain viable in the soil for 5 years and more 3

u. Unknown

Score:0

Documentation:seed bank is shortlived (cotoneaster 2005)

Identify longevity of seed bank

Rationale:

Sources of information:

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
- u. Unknown

Score:2

Documentation: apomixes-asexual reproduction without fertilisation. offspring are clones-plantlet, bulbils. Can resprout from shallow roots (Cottoneaster 2005)

Describe vegetative response:

Rationale:

Sources of information:

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; requires a minor investment in human and financial resources 2
- c. Management requires a major short-term investment of human and financial resources, or a moderate long-term investment 3
- d. Management requires a major, long-term investment of human and financial resources 4
- u. Unknown

Score:4

Documentation: roots re-sprout. Control by physical or chemical means (Cotoneaster 2005)

Identify types of control methods and time-term required:

Rationale:

Sources of information:

Total Possible: 10

Total: 6

Total for 4 sections Possible: 91

Total for 4 sections: 40

References:

Carlson, M. 2008. Invasiveness Ranking System for Non-Native Plants of Alaska. USDA. Available at: [http://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/fsbdev2\\_037575.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_037575.pdf)

The Global Biodiversity Information Facility: GBIF Backbone Taxonomy, 2013-07-01.  
Accessed via <http://www.gbif.org/species/3025576> on 2013-11-05

USDA PLANTS database

Cotoneaster 2005. INVASIVE SPECIES IN GARRY OAK AND ASSOCIATED ECOSYSTEMS IN BRITISH COLUMBIA.

Slabaugh, P. & Shaw, N. 2008. Cotoneaster Medik.:cotoneaster. In: Bonner, Franklin T.; Karrfalt, Robert P., eds. The Woody Plant Seed Manual. Agric. Handbook No. 727. Washington, DC. U.S. Department of Agriculture, Forest Service. p. 442-446.

Wennerberg, S. 2004. USDA Plant Guide:Cotoneaster.

#### Notes

The taxonomy of cotoneaster species is extremely uncertain and confounded with a large and uncounted number of horticultural materials. Dickoré & Kasperek (2010) state “Alien Cotoneaster species are commonly cultivated and naturalising in temperate and subtropical regions almost worldwide. While also attracting attention as sometimes notorious invasives, however, methodical and systematic consistency of the adventive record seems often deficient.” Dickoré & Kasperek also writes that Sennikov (2009) recognizes 21 adventive species. In their summary abstract Dickoré & Kasperek conclude “Of an estimated total of only 50–70 Cotoneaster species worldwide, about 20, mainly chinese species have been found escaping from cultivation in Central Europe. Presently, about ten species must be considered fully naturalised and, locally at least, invasive.” Wikipedia cites the Flora of Northwest Europe “Many species have escaped from cultivation and become invasive weeds where climatic conditions are suitable for them, such as the many Chinese species naturalised in northwestern Europe” (Rice pers. comm.).

Cotoneasters are found in forests, shrublands, grasslands and rocky areas. They tolerate partial shade and a wide range of environmental conditions, from moist woodlands to open areas having thin, rocky soils. In dry areas, they prefer coastal conditions where cool fogs reduce transpiration (cotoneaster 2005). It does well in full and partial sun. The natural habitats of cotoneaster are rocky slopes and forests at elevations below 2500 meters.

It is a species ‘to be assessed’ in Alberta for the Weed Control Act, but it seems its invasiveness is low and it is absent from Canada except in BC.

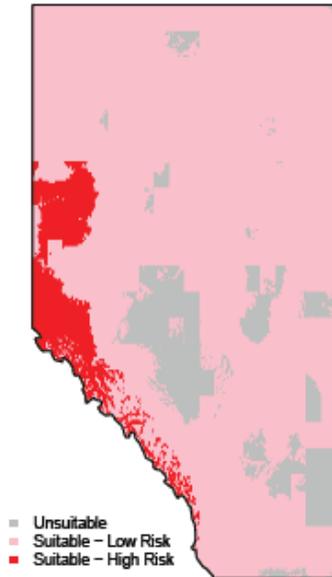
#### Score Interpretation

While different users will have different concepts of what constitutes various levels of invasiveness (e.g., what is “highly invasive” vs. “moderately invasive” may differ among management agencies), we divided the ranks into six blocks in Appendix A. We consider species with scores  $\geq 80$  as “Extremely Invasive” and species with scores 70–79 as “Highly Invasive;” both of these groups are composed of species estimated to be very threatening to Alberta. Species with scores of 60–69 as

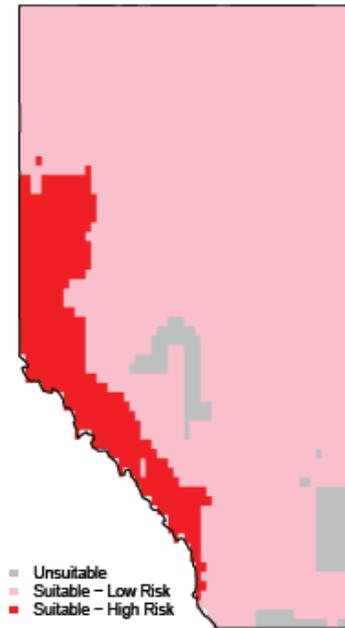
“Moderately Invasive” and scores of 50–59 represent “Modestly Invasive” species; both of these groups still pose significant risks to ecosystems. Species with scores of 40–49 are “Weakly Invasive”, and <40 are considered “Very Weakly Invasive.” These last two groups generally have not been shown to significantly alter ecosystem processes and communities elsewhere and probably do not require as much attention as the other species.

Species Distribution Models  
Current=1975, future=2050

**Current Climate --- Binary**

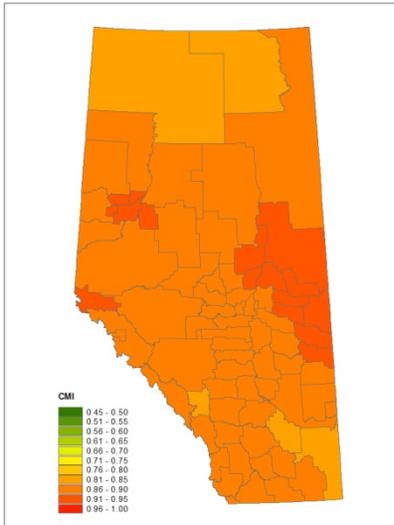


**Future Climate --- Binary**



CLIMEX climate match

1975



2050

