

COSEWIC
Assessment and Status Report

on the

Yukon Wild Buckwheat
Eriogonum flavum var. *aquilinum*

in Canada



SPECIAL CONCERN
2017

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC. 2017. COSEWIC assessment and status report on the Yukon Wild Buckwheat *Eriogonum flavum* var. *aquilinum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 32 pp. (<http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1>).

Production note:

COSEWIC would like to acknowledge Allan Harris and Robert Foster for writing the status report on Yukon Wild Buckwheat, *Eriogonum flavum* var. *aquilinum*, in Canada, prepared under contract with Environment and Climate Change Canada. This report was overseen and edited by Jana Vamosi, Co-chair of the COSEWIC Vascular Plants Specialist Subcommittee, with significant input from Bruce Bennett, former Co-chair of COSEWIC Vascular Plants and current COSEWIC Vascular Plants Specialist Subcommittee member.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAAC sur L'ériogone du Nord (*Eriogonum flavum* var. *aquilinum*) au Canada.

Cover illustration/photo:

Yukon Wild Buckwheat — Photo credit: Allan Harris.

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Catalogue No. CW69-14/758-2018E-PDF

ISBN 978-0-660-26676-3



COSEWIC Assessment Summary

Assessment Summary – November 2017

Common name

Yukon Wild Buckwheat

Scientific name

Eriogonum flavum var. *aquilinum*

Status

Special Concern

Reason for designation

This perennial plant is restricted in Canada to a handful of sites in the southwestern Yukon. It occurs on dry, south-facing grassland slopes, which are uncommon relicts of the vast steppes of unglaciated Beringia. Despite apparently low recruitment, the number of mature individuals remains stable. This species could become Threatened as rapid climate change brings increased precipitation and encroachment of the grasslands by native trees and shrubs.

Occurrence

Yukon

Status history

Designated Special Concern in November 2017.



COSEWIC Executive Summary

Yukon Wild Buckwheat *Eriogonum flavum* var. *aquilinum*

Wildlife Species Description and Significance

Yukon Wild Buckwheat is a perennial herb with basal leaves that form a compact mat up to about 35 cm wide. The stems and leaves are covered with a dense layer of short, whitish hairs and arise from a stout, woody caudex (underground stem). The flowers are bright yellow and arranged in an umbel at the end of the stem. Yukon Wild Buckwheat is of Beringian origin and endemic to unglaciated areas of Yukon and Alaska. Species of buckwheat have been used medicinally by First Nations people.

Distribution

The range of Yukon Wild Buckwheat is restricted to southwestern Yukon and east-central Alaska. The two populations are separated by about 400 km. The Canadian range is confined to an area between Sekulmun and Aishihik lakes and extends about 8 km from north to south and 4.5 km east to west. Within this area, Yukon Wild Buckwheat has been found on 23 patches of grassland, corresponding with five subpopulations, ranging in size from 21 ha to less than 0.1 ha.

Habitat

Yukon Wild Buckwheat inhabits grassland communities on dry, south-facing slopes. The Canadian population occurs at elevations of 900 to 1000 m on well-drained sandy or silty soils with gravel and cobbles. Vegetation is low and relatively sparse.

Biology

Little is known about the biology of Yukon Wild Buckwheat. It is a long-lived perennial herb. Flowering occurs in June and July and seeds mature in late July. Larger plants have several hundred individual flowers each of which can produce a single seedlike achene, but seedlings are rare and the recruitment rate is apparently low. Vegetative reproduction also occurs but is apparently uncommon. The achenes lack specialized dispersal structures and long distance dispersal is probably rare. Yukon Wild Buckwheat is probably pollinated by a wide range of insects including bumblebees, solitary bees, flies, butterflies, and moths. It is adapted to dry, open habitats and apparently intolerant of shading and heavy competition with grasses and other plants.

Population Sizes and Trends

Yukon Wild Buckwheat in Canada consists of a single population composed of five subpopulations. In 2016, the total number of mature individuals was estimated at 22,721 plants in the 11 sites that were sampled. No comprehensive trend data are available but the few abundance estimates available between 2004 and 2016 suggest that the population is stable.

Threats and Limiting Factors

An increase in habitat damage by Wood Bison and feral horses may threaten Yukon Wild Buckwheat, although the impacts of these species are unknown. Invasive plants are another potential threat. Trembling Aspen has invaded some grasslands in southwestern Yukon over the last 60 to 80 years, possibly caused by warmer and wetter conditions associated with climate change, but aspen invasion may be limited by rapid drainage on the steep slopes. Yukon Wild Buckwheat is probably limited by the scattered distribution of grasslands within its extent of occurrence and its apparent low recruitment rate and limited dispersal capability.

Protection, Status and Ranks

All known Canadian occurrences of Yukon Wild Buckwheat are on Champagne and Aishihik First Nations lands. It has no legal protection at the federal or territorial level in Canada, nor is it listed under the US *Endangered Species Act*. Yukon Wild Buckwheat was assessed by COSEWIC as Special Concern in November 2017. It is ranked as imperilled (at the variety level) globally (G5T2) and critically imperilled in Canada (N1). It is critically imperilled (S1) in Yukon and imperilled (S2) in Alaska.

TECHNICAL SUMMARY

Eriogonum flavum var. *aquilinum*

Yukon Wild Buckwheat

Ériogone du Nord

Range of occurrence in Canada (province/territory/ocean): Yukon

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2011) is being used)	Unknown but estimated at > 20 years.
Is there a continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals	n/a
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. n/a b. n/a c. n/a
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	40 km ² (COSEWIC guidelines state that if EOO is less than IAO, EOO should be changed to make it equal to IAO to ensure consistency with the definition of IAO as an area within EOO. The actual EOO is 23.6 km ² .)
Index of area of occupancy (IAO) (Always report 2x2 grid value).	40 km ²

Is the population “severely fragmented” i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	a. No b. No
Number of “locations”* (use plausible range to reflect uncertainty if appropriate)	1-5. All plants are within an area of less than 40 km ² where a single threatening event such as changes in land use could rapidly affect all individuals, yet no threats are imminent.
Is there a decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] decline in number of subpopulations?	No
Is there an [observed, inferred, or projected] decline in number of “locations”**?	No
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Unknown. Wood Bison have changed the habitat but implications for Yukon Wild Buckwheat are unknown.
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of “locations”**?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	N Mature Individuals
1	8,867
2	282
3	10,045**
4	3,500**
5	27
Total	22,721
** partial count	

* See Definitions and Abbreviations on [COSEWIC website](#) and [IUCN](#) (Feb 2014) for more information on this term

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations, or 10% within 100 years]?	Not done.
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Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species? Yes. See Appendix 1.
8.1 Invasive non-native/alien species
8.2 Problematic native species
11.1 Habitat shifting and alteration (specifically aspen invasion associated with climate change).
These threats are considered plausible but poorly understood. Therefore, the overall impact was calculated as unknown or negligible.
What additional limiting factors are relevant? Apparent low reproduction, limited ability to disperse.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Imperilled (S2) in Alaska
Is immigration known or possible?	Possible
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Yes
Are conditions deteriorating in Canada? ⁺	Unknown
Are conditions for the source population deteriorating? ⁺	Unknown
Is the Canadian population considered to be a sink? ⁺	No
Is rescue from outside populations likely?	No. The species has limited dispersal capability and patches of suitable habitat are widely disjunct

Data Sensitive Species

Is this a data sensitive species? No.

Status History

COSEWIC: Designated Special Concern in November 2017.

⁺ See [Table 3](#) (Guidelines for modifying status assessment based on rescue effect)

Status and Reasons for Designation:

Status: Special Concern	Alpha-numeric codes: Not applicable
Reasons for designation: This perennial plant is restricted in Canada to a handful of sites in the southwestern Yukon. It occurs on dry, south-facing grassland slopes, which are uncommon relicts of the vast steppes of unglaciated Beringia. Despite apparently low recruitment, the number of mature individuals remains stable. This species could become Threatened as rapid climate change brings increased precipitation and encroachment of the grasslands by native trees and shrubs.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Projected declines are hard to estimate and unlikely to meet thresholds.
Criterion B (Small Distribution Range and Decline or Fluctuation): Although the EOO and IAO are below thresholds for Endangered and the species exists in only 5 subpopulations, there are insufficient data to infer population or habitat declines.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Exceeds thresholds.
Criterion D (Very Small or Restricted Population): Although there are only five locations, it is not thought to be prone to threats capable of reducing the population to critically endangered status within 1-2 generations..
Criterion E (Quantitative Analysis): Not done.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2017)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



Environment and
Climate Change Canada
Canadian Wildlife Service

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Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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2017

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific name: *Eriogonum flavum* Nuttall var. *aquilinum* Reveal

Synonyms: none

English common names: Yukon Wild Buckwheat (Reveal 2005), Umbrella Plant, Yellow Eriogonum, Alpine Golden Buckwheat

French common name: Ériogone du Nord (Brouillet *et al.* 2010)

Family name: Polygonaceae (Buckwheat Family)

Major plant group: Angiosperm – Eudicot flowering plant

Eriogonum is a tetraploid genus and has undergone rapid evolution, with over 200 species in western North America (Reveal 2005). Three varieties of *Eriogonum flavum* have been described: var. *piperi* is common and widespread from southern British Columbia and Alberta south to Oregon and Wyoming; var. *flavum* occurs in the prairies from southern Alberta and Manitoba south to South Dakota and Colorado; and *Eriogonum flavum* var. *aquilinum* occurs in Yukon and Alaska (Reveal 2005). *Eriogonum flavum* var. *aquilinum* is closely related to var. *flavum*. The two varieties are “marginally distinct” and were probably isolated from each other during the Pleistocene (Reveal 2005).

Eriogonum flavum var. *aquilinum* was first collected in east-central Alaska in 1960 and described in 1967 (Reveal 1967).

Morphological Description

Yukon Wild Buckwheat is a perennial herb with basal leaves that form a compact mat up to about 35 cm wide (Figures 1 and 2). The stems and leaves are covered with a dense layer of short, whitish hairs and arise from a stout, woody caudex (underground stem) and orange taproot. The stems are leafless and up to about 15 cm tall. The leaves are 1.0 to 3.5 cm long, untoothed, and narrowly elliptic or slightly wider near the tip. The flowers are bright yellow and arranged in an umbel at the end of the stem. Flowers lack petals but have four sepals 3-5 mm long. The achenes (seedlike fruits) are light brown and 3 to 5 mm long with sparse hairs at the tip (Hultén 1968; Cody 1996; Reveal 2005; Nawrocki *et al.* 2013).



Figure 1. Yukon Wild Buckwheat. Aishihik Lake, Yukon. June 2016 (A. Harris photo).



Figure 2. Solitary bee (probably *Andrena transnigra*) on Yukon Wild Buckwheat. Aishihik Lake, Yukon. June 2016 (A. Harris photo).

Population Spatial Structure and Variability

No genetic or morphological studies have been completed for Yukon Wild Buckwheat and the relationship between Canadian subpopulations and those in Alaska are unknown.

The Canadian range of Yukon Wild Buckwheat is within an area of about 40 km² and no subpopulation is separated by more than about 3 km from its nearest neighbouring subpopulation. There are patches of apparently suitable habitat in intervening areas and no apparent dispersal barriers among Canadian subpopulations.

Canadian and Alaskan populations are separated by about 400 km. Suitable habitat between southwestern Yukon and Alaska is widely scattered and occurs in small patches. No additional Yukon subpopulations have been discovered despite multiple surveys of apparently suitable habitat (Bennett pers. comm. 2016).

Designatable Units

The Canadian population of Yukon Wild Buckwheat comprises a single designatable unit within the Northern Mountains Ecological Area (COSEWIC 2015). All occurrences are in similar habitat within a maximum distance of about 3 km of each other.

Special Significance

Yukon Wild Buckwheat is endemic to Beringia and restricted to unglaciated areas of Yukon and Alaska. Yukon Wild Buckwheat and some other species of buckwheat (*Eriogonum* spp.) have been used medicinally by First Nations people (Reveal 2005; Bennett 2015).

DISTRIBUTION

Global Range

The global range of Yukon Wild Buckwheat is restricted to patches of grassland and rocky slopes in southwestern Yukon and east-central Alaska (Figure 3).

In Alaska, the species is known from nine occurrences on the upper Yukon and Porcupine rivers (Nawrocki *et al.* 2013; Fulkerson pers. comm. 2017). On the Yukon River, the plants occur on bluffs and cliffs along about 240 km of the river between Eagle and Circle, all but about 64 km of which is in Yukon – Charley National Preserve (Parker 1995; Nawrocki *et al.* 2013). The Porcupine River occurrence is about 170 km north of the Yukon River.

The Alaska and Yukon populations are separated by about 400 km (Figure 3).

The global extent of occurrence of Yukon Wild Buckwheat is about 36,800 km² as measured by minimum convex polygon. About 16,000 km² (44%) of the global range (as measured by convex polygon) is in Canada.



Figure 3. Global range of Yukon Wild Buckwheat (Yukon CDC; Nawrocki *et al.* 2013).

Canadian Range

Canadian range of Yukon Wild Buckwheat is confined to an area between Sekulmun and Aishihik lakes in southwestern Yukon. This area is on a Champagne and Aishihik First Nations settlement land parcel held in fee simple (R-02A). Yukon Wild Buckwheat in Canada consists of a single population composed of five subpopulations. Subpopulations are defined in this report using habitat based plant element occurrence delimitation standards (NatureServe 2004), under which occurrences are lumped into a single subpopulation if separated by less than 1 km, or if separated by 1 to 3 km with no break in suitable habitat between them exceeding 1 km.

The range extends about 8 km from north of Poplar Lake, south to within about 1.7 km of Sekulmun Lake and extends 4.5 km east to west. Within this area, Yukon Wild Buckwheat has been found on 23 patches of grassland ranging in size from less than 0.1 ha to 21 ha.

Extent of Occurrence and Area of Occupancy

The extent of occurrence (EOO) of Yukon Wild Buckwheat in Canada is 23.6 km² as measured by a minimum convex polygon encompassing all known sites. The index of area of occupancy (IAO) is 40 km² (ten grid squares) based on a 2 km x 2 km grid. COSEWIC guidelines state that if EOO is less than IAO, EOO should be changed to make it equal to IAO to ensure consistency with the definition of IAO as an area within EOO.

Search Effort

The first Canadian collection of Yukon Wild Buckwheat was made in 1981 at the north end of Aishihik Lake but remained unreported until referenced in Cody (1994) (Bennett 2015; Yukon Conservation Data Centre 2016). The site was rediscovered in June 2004 by Yukon Environment botanists during a targeted search when two subpopulations were discovered (Bennett 2015; Yukon Conservation Data Centre 2016).

Since 2004, helicopter surveys of potential habitat were completed. Additional sites were discovered during surveys in 2011, 2013, 2014, 2015, and 2016 (Table 1).

Table 1. Yukon Wild Buckwheat subpopulation estimates, Yukon. Sites indicated “H&F” were surveyed by Harris and Foster in 2016. Sites indicated “CWS” were surveyed by Canadian Wildlife Service biologists in 2016.

Subpopulation (Element Occurrence)	Sites (Source Features)	Area (ha)	Year Discovered	2004	2016	Notes
1 (153)	396	0.5	1981	300*	363	H&F
	372	2.8	1981	>5000*	8504**	CWS
2 (212)	451	0.3	2004	300*	282	CWS
3 (214)	475	0.4	2004	150-200		
	453	4.4	2004	10,000*	8756**	H&F
	479	0.9	2004	230		
	478	0.4	2004	150-200		
	480	0.9	2004	300-350	973	H&F
	476	< 0.1	2004	50*		
	477	0.1	2004	50-100*		
	2470	0.1	2004	65*	44	Estimated 30 in 2011
	483	< 0.1	2004	35		
	482	< 0.1	2004	5		
	481	0.1	2004	500*		
	3665	< 0.1	2016		75	H&F. Called “2016-01” in field notes.

Subpopulation (Element Occurrence)	Sites (Source Features)	Area (ha)	Year Discovered	2004	2016	Notes
	3666	0.1	2016		197	H&F. Called "2016-02" in field notes.
4 (946)	2788	20.7	2013		2752**	CWS. Estimated more than 100 plants in 2013 but only part of slope was surveyed.
	3495	3.6	2015			"Small sparsely populated patch" in 2015.
	3494	1.5	2015			Estimated 100 plants in 2015.
	2469	0.4	2011			Estimated 500-700 plants in 2011.
	3226	2.0	2014			Estimated 500-1000 plants in 2014.
	3662	2.0	2016		748	CWS. Originally two patches but combined as a single polygon. Called CWS 2016 01 and 02 in field notes
5 (1444)	3364	0.2	2016		27	CWS
Minimum population estimate				17,135	22,721	

* estimated, ** estimated by subsampling

Extensive ground surveys including more than 400 sites have been completed over the last decade in the area between Aishihik Lake and the Alaskan population, many of which were specifically in search of Yukon Wild Buckwheat and other rare plants including Yukon Draba (*Draba yukonensis*), Yukon Podistera (*Podistera yukonensis*), Dawson Wallflower (*Erysimum angustatum*), and Spiked Saxifrage (*Micranthes spicata*) (Figure 4) (Bennett pers. comm. 2016). Although many of the surveys were conducted in suitable habitat, no new subpopulations of Yukon Wild Buckwheat have been discovered other than those stated above. Targeted surveys for Yukon Wild Buckwheat were conducted in suitable habitat in May and June 2014 on the Canadian portion of the Yukon River upstream of occurrences at Eagle, Alaska, and on the Porcupine River upstream of Alaska occurrences (6.5 days search effort total) (Dar pers. comm. 2016).

Yukon Wild Buckwheat is unlikely to be mistaken for other species. It is a showy perennial species inhabiting open grasslands. There are no other species of *Eriogonum* in Yukon, Alaska, or northern British Columbia and no similar species likely to be confused with this species (Bennett pers. comm. 2016).

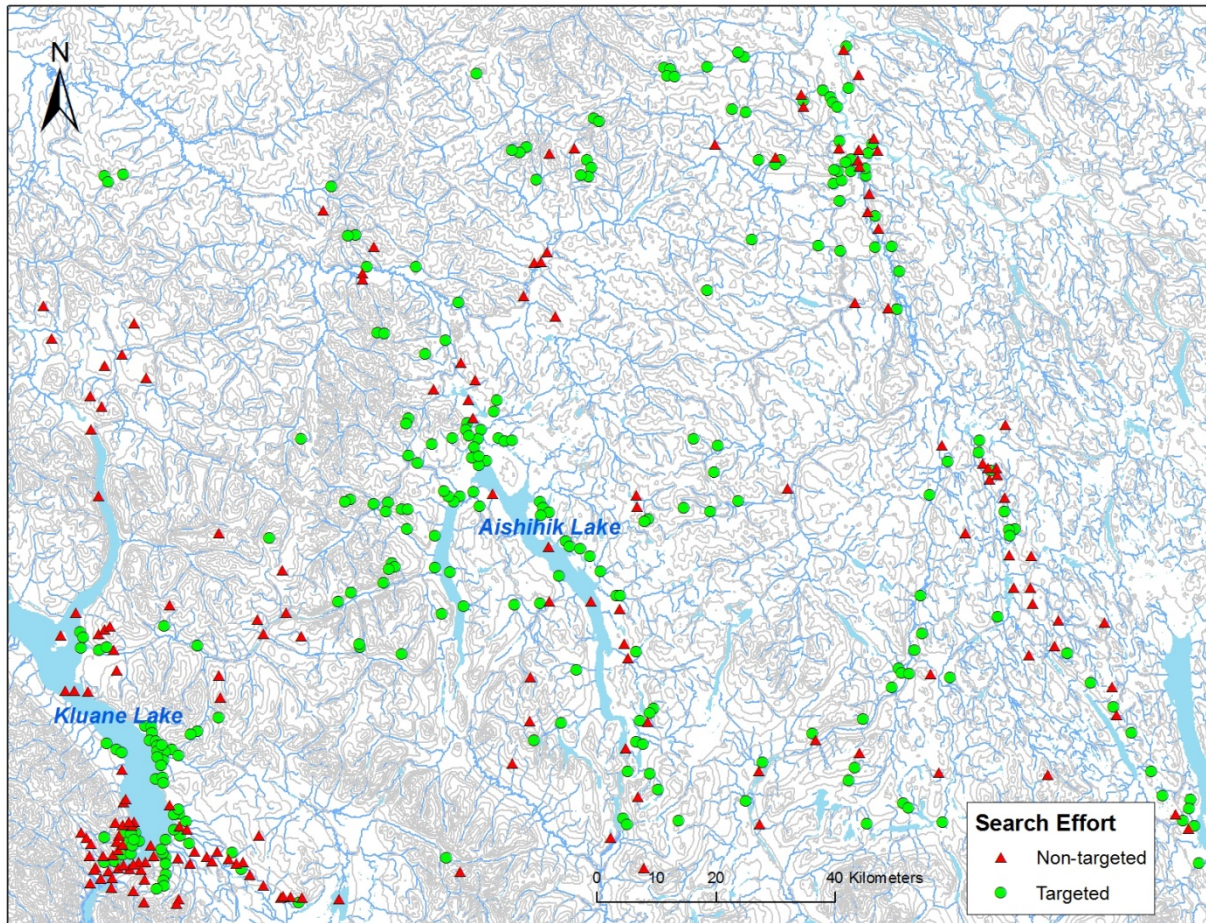


Figure 4. Search effort for Yukon Wild Buckwheat and other rare plants in southwestern Yukon (from Yukon CDC and CWS data).

HABITAT

Habitat Requirements

Yukon Wild Buckwheat inhabits grassland communities on dry slopes in the Boreal High Bioclimate Zone (Environment Yukon 2016). At Aishihik Lake, the plants occur at elevations of 900 to 1000 m on well-drained sandy or silty soils with gravel and cobbles (Figures 5 and 6). One site is on a bedrock hill capped with silty sand (Figure 7). The slopes range from 20° to 45° and were generally south-facing with aspect ranging from 140° to 275° (Vetter 2000; Yukon Conservation Data Centre 2016). The grasslands are surrounded by White Spruce (*Picea glauca*) and Trembling Aspen (*Populus tremuloides*) forest and woodland.



Figure 5. Yukon Wild Buckwheat habitat. Aishihik Lake, Yukon. June 2016 (R. Foster photo).



Figure 6. Yukon Wild Buckwheat habitat. Aishihik Lake, Yukon. June 2016. Note the trails from large herbivores traversing the slope and Arctic Ground Squirrel burrows (R. Foster photo).



Figure 7. Yukon Wild Buckwheat habitat. Aishihik Lake, Yukon. June 2016 (R. Foster photo).



Figure 8. Trembling Aspen clone at edge of grassland. Aishihik Lake, Yukon. June 2016 (A. Harris photo).

Vegetation of the grasslands is low and relatively sparse. Total vegetation cover averages 50% to 75% (Vetter 2000). Plants associated with Yukon Wild Buckwheat include Prairie Sagewort (*Artemisia frigida*), Thread-leaved Sedge (*Carex filifolia*), Purple Reedgrass (*Calamagrostis purpurascens*), Glaucous Bluegrass (*Poa glauca*), Gorman's Beardtongue (*Penstemon gormanii*), Hood's Phlox (*Phlox hoodii*), Snowy Cinquefoil (*Potentilla nivea*), Rose Chamaerhodos (*Chamaerhodos erecta*), Tufted Fleabane (*Erigeron caespitosus*), and Eurasian Junegrass (*Koeleria asiatica*) (Vetter 2000; Bennett pers. comm. 2016; Yukon Conservation Data Centre 2016). Aspen clones and White Spruce are typically found at the base of the slopes and sometimes occur within the grassland. Most Yukon Wild Buckwheat plants are in full sun.

Exposed soil within the grasslands from Arctic Ground Squirrel (*Spermophilus parryii*) burrows and runways and Wood Bison (*Bison bison athabasca*) and feral Horse (*Equus ferus caballus*) trails is common. Wolf (*Canis lupus*) dens on some of the slopes also create exposed soil (Jung pers. comm. 2017).

Yukon Wild Buckwheat uses similar habitat in Alaska on south-facing bluffs and rock cliffs along the Yukon and Porcupine rivers (Parker 1995). Sites include rocky bluffs, rubble slopes, and vertical cliffs, with gravel and fine alluvial deposits. Large and healthy plants are found on both bedrock and fine soils (Parker 1995).

Habitat Trends

Grasslands in southwestern Yukon may be shrinking and becoming more fragmented as forest cover increases (Conway 2012; Conway and Danby 2014). The area of grassland in the Kluane Lake area (80 km west of Aishihik Lake) decreased by about a third between 1947 and 2007 as Trembling Aspen invaded south-facing slopes. Grasslands also became more fragmented during this period. Aspen establishment was associated with warmer spring temperatures and greater precipitation during this time period (Conway 2012; Conway and Danby 2014).

Although detailed monitoring has not been done, grassland habitat at Aishihik Lake does not appear to have contracted significantly. Invasion of trees and shrubs is probably restricted by extremely dry conditions on very steep slopes (Vetter 2000). In contrast with many of the Kluane grasslands, steep slopes cause rapid drainage and reduce the effects of increased precipitation (Conway 2012). Aspen are found at the base and edges of grassland patches and occasionally as islands on the slopes (Figure 8). Vetter (2000) concluded that the area of grassland appeared to be stable in the early 1980s due to the absence of young trees. Browsing by Snowshoe Hare (*Lepus americanus*) (Vetter 2000) and Wood Bison (Foster and Harris pers. obs.) may also limit the spread of aspen at Aishihik Lake.

Wood Bison were reintroduced to the Aishihik Lake area in the late 1980s (see **Threats**). Large herbivore tracks, trails (Figure 6), dung, and damage to aspen saplings were evident at all sites surveyed in 2016 during the current study. Habitat changes and their impacts on Yukon Wild Buckwheat have not yet been determined. Habitat data presented in Vetter (2000) were collected in 1981, before Wood Bison were reintroduced.

All-terrain vehicle trails are present on the crests of some of the slopes but are rarely found on the steep slopes where most Yukon Wild Buckwheat habitat is found.

BIOLOGY

There have been few studies on the biology of Yukon Wild Buckwheat and the following section is based on observations made during rare plant surveys in Yukon (Yukon Conservation Data Centre 2016) and Alaska (Parker 1995) rather than systematic studies. Studies on other *Eriogonum* species are cited when no other data are available.

Life Cycle and Reproduction

Yukon Wild Buckwheat is a perennial herb. The typical lifespan is unknown but the large size of some of the cushions (> 40 cm), each consisting of multiple stems, suggests that it is a long-lived species (Parker 1995). Some shrubby *Eriogonum* species in California were found to be more than 100 years old (Anderson 2006). The age at which plants reach maturity is also unknown but many species of *Eriogonum* flower in their first year (Meyer 2008).

Flowering occurs in June and July (Bennett pers. comm. 2016) and seeds mature in late July (Parker 1995). The flowers are mostly bisexual. Over 90% of plants at Aishihik Lake were flowering in late June 2016 (Harris and Foster pers. obs.). Larger plants had 70 or more flowering stems, each with 25 or more individual flowers. In contrast, only about 50% of plants in Alaska had flowering stems (Parker 1995). Each flower has a single ovary and can produce a single seed (Meyer 2008).

Seed viability in *Eriogonum* is highly variable, ranging from 60% in ten perennial species in Utah (Meyer and Paulsen 2000) to less than 1% in other species (Anderson 2006). Seeds lack a mechanism to prevent germination in the first year and are therefore unlikely to persist in the seed bank (Meyer and Paulsen 2000).

Vegetative reproduction by spreading of the branches from the caudex also occurs in Yukon Wild Buckwheat, but is apparently uncommon (Parker 1995; Nawrocki *et al.* 2013). Some perennial species of *Eriogonum* can reproduce by fragmentation (Anderson 2006).

The recruitment rate appears to be low with no seedlings observed at Aishihik Lake in 2004, 2013, or 2016 (Yukon Conservation Data Centre 2016), or during an Alaska study (Parker 1995). Recruitment in Brandegees Wild Buckwheat (*Eriogonum brandegeei*, a native species of Colorado) is apparently rare and occurs only under favourable conditions (Anderson 2006). The range of sizes of Yukon Wild Buckwheat at Aishihik Lake suggests that regular recruitment does occur (assuming plants grow at similar rates). In 2016, about one third of plants were less than 15 cm in diameter, about 60% were 15 to 30 cm in diameter, and about 5% of cushions were over 30 cm in diameter.

The generation time of Yukon Wild Buckwheat is unknown but the apparent lack of recruitment between the 2004 and 2016 surveys suggests that most individuals are at least 15 years old. Twenty years is suggested as a conservative estimate of the average age of individuals in the population.

Yukon Wild Buckwheat is probably pollinated by a wide range of insects as are other *Eriogonum* species (Anderson 2006; Meyer 2008). *Eriogonum* flowers are not specialized for a particular group of pollinators but offer pollen and a small amount of nectar accessible to many insect species (Anderson 2006). Insects observed visiting Yukon Wild Buckwheat flowers at Aishihik Lake in 2016 included Two Form Bumblebee (*Bombus bifarius*), a solitary bee (probably Black-banded Miner Bee, *Andrena transnigra*; Family Andrenidae) (Figure 2), a hover fly (Family Syrphidae), and a bee fly (*Anastoechus c.f. barbatus*; Family Bombyliidae) (Harris and Foster pers. obs.). Two Form Bumblebees were seen visiting flowers on several occasions, some with corbiculae filled with yellow pollen, suggesting they may function as pollinators. The solitary bee also had visible yellow pollen adhering to its body. Other insects observed visiting Yukon Wild Buckwheat flowers at Aishihik Lake include Variable Checkerspot (*Euphydryas chalcedona*) and several moth species (Cannings pers. comm. 2016).

Physiology and Adaptability

Yukon Wild Buckwheat has a restricted range and is adapted to dry, open habitats on south-facing slopes. The covering of woolly hairs on the leaves and stems of Yukon Wild Buckwheat is probably an adaptation to reduce water loss or reduce herbivory. Other species of *Eriogonum* reduce water loss by rapidly closing the stomata when humidity decreases (Anderson 2006).

Some species of *Eriogonum* respond positively to disturbance and most do not compete well with dense perennial grasses (Anderson 2006; Meyer 2008). Some species are tolerant of light grazing (Ladyman 2006).

Although no studies have been completed on Yukon Wild Buckwheat, other species of *Eriogonum* have been successfully propagated by seed (Meyer 2008) or cuttings (Anderson 2006). *Eriogonum* seeds are easily collected and established by direct seeding or in nurseries.

Dispersal and Migration

Seed dispersal has not been studied but the achenes of Yukon Wild Buckwheat lack hooks (for dispersal on animals) or wings (to aid wind dispersal) and long distance dispersal is probably rare. Dispersal by rain, gravity, or short-distance scattering by wind is more likely (Reveal 2005; Anderson 2006).

Migration is probably limited by the patchy distribution of grassland habitat in Yukon and Alaska. Pollen records suggest that grassland habitat in southwestern Yukon was never widespread during the last 10,000 years (Keenan and Cwynar 1992).

Interspecific Interactions

As with other species of *Eriogonum* (Young-Mathews 2012), Yukon Wild Buckwheat flowers may be locally important sources of nectar for insects (see **Life Cycle and Reproduction**). The achenes of Sulphur-flower Buckwheat (*Eriogonum umbellatum*) are a food source for birds and small mammals (Young-Mathews 2012).

No sign of insect feeding damage was noted on Yukon Wild Buckwheat during 2016 surveys, but aphids (Homoptera) have been photographed on the leaves at Aishihik Lake (Cannings pers. comm. 2016). Insect feeding damage consisting of minute holes on the leaves was documented on Alaska subpopulations of Yukon Wild Buckwheat (Parker 1995).

A few Yukon Wild Buckwheat plants had been lightly browsed, possibly by Arctic Ground Squirrel or Snowshoe Hare in 2016, but most plants showed no signs of browsing. Evidence of these mammals was present at all sites.

Evidence of Wood Bison was present at all sites at Aishihik Lake in 2016, including trails crossing the slopes, damage to aspen saplings, dung, and wallows. Horse tracks and dung were observed at some sites. Mule Deer (*Odocoileus hemionus*), Moose (*Alces americanus*), and Woodland Caribou (*Rangifer tarandus*) use the slopes in winter and Grizzly Bear (*Ursus arctos*) in the summer (Jung pers. comm. 2017). No direct sign of damage to Yukon Wild Buckwheat plants by these species was observed, but see **Habitat Trends and Threats** for further discussion.

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

In 2016, all plants were counted at smaller sites ($n=8$). Sites 372 and 453 (Table 1) were subsampled by walking parallel transects (25 m approximate spacing) up and down the slope and counting plants within 1.5 m of either side of the transect centre line. Total numbers of plants at these sites were estimated by multiplying the density of Yukon Wild Buckwheat plants by the total area of the habitat polygon. Site 2788 was subsampled by three field staff that walked a portion of the patch and estimated the total number of plants using a combination of extrapolation and visual estimates (Dar pers. comm. 2016). For the four new sites discovered in the present study, the polygon area was calculated by measuring the area of a convex polygon enclosing all the plants.

Plants at some sites (indicated “H&F” in Table 1) were assigned to one of three size classes (< 15 cm tall, 15-30 cm tall, > 30 cm tall) and classified as flowering or nonflowering (i.e., had not flowered in 2016).

Abundance

In 2016, a total of 22,721 plants was counted or estimated in the 11 sites that were sampled (Table 1). The percentage of individuals that were classified as flowering was very high and nearly uniform throughout the sites, ranging from 98-100% (mean = 98.8%), such that this number of plants can be considered a reasonable estimate of the number of mature individuals. The 12 sites that were not surveyed in 2016 had a total minimum estimate of 2,270 plants in the 2004 to 2015 surveys (Table 1).

Fluctuations and Trends

No comprehensive trend data are available for Yukon Wild Buckwheat but the six sites with 2004 and 2016 abundance estimates had roughly similar numbers (Table 1). The species is apparently a long-lived perennial with low rates of recruitment and probably does not undergo extreme fluctuations.

Rescue Effect

Rescue effect is unlikely given the distance to Alaska populations (> 400 km), the widely scattered distribution of suitable habitat in the intervening landscape, and the apparent limited dispersal capability of the achenes.

THREATS AND LIMITING FACTORS

Threats

Direct threats facing Yukon Buckwheat assessed in this report were organized and evaluated based on the IUCN-CMP (World Conservation Union-Conservation Measures Partnership) unified threats classification system (Master *et al.* 2012). Threats are defined as the proximate activities or processes that directly and negatively affect the population. Results on the impact, scope, severity, and timing of threats are presented in tabular form in Appendix 1.

The threats assessment rates this species as having a very low level of range-wide threat (see Appendix 1). Where potential risks have been identified, the most serious plausible threats are from reintroduced Wood Bison, invasive plants and aspen invasion associated with climate change. However, these threats are poorly understood and their impacts are currently unknown or negligible. Other plausible threats have also been identified: agriculture, gathering, and recreational use. However, there is a higher level of uncertainty around the severity and imminence of these threat factors. Therefore, they fall under the category of “threats where the imminence and harm are both hypothetical but possible” (COSEWIC 2011). All threats are listed below under their corresponding IUCN threats classification scheme headings (Master *et al.* 2012).

IUCN Threat 8. Invasive and other problematic species and genes

8.1 Invasive non-native/alien species

Invasive plants have not yet been documented in Yukon Wild Buckwheat habitat at Aishihik Lake (Bennett pers. comm. 2016) so the calculated impact of this threat is currently negligible, but some invasive plants are spreading along roads in southwestern Yukon. Invasive species that could threaten Yukon Wild Buckwheat include Narrow-leaved Hawksbeard (*Crepis tectorum*), White Sweet Clover (*Melilotus albus*), Smooth Brome (*Bromus inermis*), Spotted Knapweed (*Centaurea stoebe*), and Crested Wheatgrass (*Agropyron cristatum*), which invade dry open habitats (Bennett pers. comm. 2016; Environment Yukon 2011). Potential vectors include recreational vehicles, bison, and bison harvesting equipment. Grasslands on south facing slopes are among the warmest and driest microclimates in the Boreal High Bioclimate Zone and may be more susceptible to colonization by invasive species from more temperate climates than other habitats (Flagstad *et al.* 2012)

8.2 Problematic native species

Wood Bison are a potential future threat to Yukon Wild Buckwheat. A total of 170 Wood Bison were released in the Nisling River Valley between 1986 and 1992, and the herd is growing quickly in the absence of natural predators and has expanded its range to include the Aishihik Lake area (Government of Yukon 2012). The herd had increased to about 1200 animals by 2011 (Government of Yukon 2012) and 1470 in 2014 (Jung and Egli 2014). No evidence of grazing by bison on Yukon Wild Buckwheat has been reported, but trampling of seedlings may affect recruitment. Tracks, trails, wallows, and dung from Wood Bison and other large herbivores were evident at all sites surveyed in 2016 (Figure 6).

Continued increases in the bison population may threaten Yukon Wild Buckwheat if increased use of the slopes causes increased trampling, erosion, facilitates invasion of weeds, or otherwise alters the physical environment or vegetation community.

Yukon Wild Buckwheat probably evolved with large herbivores and may be tolerant of the presence of horses and bison. Steppe Bison (*Bison priscus*), Woolly Mammoths (*Mammuthus primigenius*), and horses (*Equus* spp.) inhabited Beringia for much of the Pleistocene (Harrington 2008; Shapiro *et al.* 2004) but declined as grasslands were replaced by boreal forest when the climate became warmer and wetter. Horses (including *Equus lambei*) were present in Yukon from about 200,000 to 35,000 years ago (Harrington 2002). As with other grassland plants, moderate populations of large herbivores could benefit Yukon Wild Buckwheat by reducing competition with other plants, slowing the invasion of aspen, and creating seeding microsites (e.g., Knapp *et al.* 1999). The calculated impact from large herbivores is thus unknown. A vegetation monitoring program at Aishihik Lake involving bison exclosures is underway but results are not yet available (Schroeder pers. comm. 2017).

IUCN Threat 11. Climate Change and severe weather

11.1 Habitat shifting and alteration.

Habitat models in the Alaska range of Yukon Wild Buckwheat predict that climate change effects will vary depending on ecoregion but that there will be little net change in steppe habitat (Boucher *et al.* 2016; Fulkerson pers. comm. 2017), such that the calculated impact of this threat is unknown. Climate models predict warmer temperatures and increased but variable precipitation. Forests on south facing slopes may be replaced by steppe where increased evapotranspiration is not offset by increased precipitation. Conversely, tree cover may increase in wetter areas. The Yukon River area could see a small amount of habitat loss, while the Forty Mile area could see a small amount of gain (Boucher *et al.* 2016; Fulkerson pers. comm. 2017).

Detailed climate models are not available for Yukon, but increased precipitation and warmer temperatures over the last 60-80 years may have allowed Trembling Aspen to invade grassland habitat in southwestern Yukon (Conway 2012; Conway and Danby 2014) potentially representing a loss of Yukon Wild Buckwheat habitat. Aspen invasion at Aishihik Lake grasslands has not been studied, but the steep slopes and rapid drainage may maintain dry soils and mitigate the effects of increased precipitation.

IUCN Threat 2. Agriculture and aquaculture

2.3 Livestock farming and ranching

Horses have used the grasslands at Aishihik Lake for at least 70 years. Champagne and Aishihik First Nations people used horses before the Aishihik road and airport were built in 1941. Both feral and domestic horses inhabited the area and wild colts were caught for use by families in Aishihik. The feral herd persisted until the early 1970s and were last seen in the Nisling area (about 50 km north of Aishihik Lake) around this time (Jim pers. comm. 2017). Domestic horses presently in the Aishihik area have a direct bloodline from the feral horses (Jim pers. comm. 2017). The impacts on the plants and its habitat are unknown but Yukon Wild Buckwheat probably evolved with large herbivores and may tolerate (or even benefit from) their presence. The calculated impact is considered negligible.

IUCN Threat 5. Biological Resource Use

5.2 Gathering terrestrial plants

Yukon Wild Buckwheat has been used medicinally by First Nations people at Aishihik Lake (Bennett 2015), but levels of use and impacts on the population are considered negligible.

IUCN Threat 6. Human Intrusions and Disturbance

6.1 Recreational activities

All-terrain vehicle trails are present along the crests of some slopes adjacent to Yukon Wild Buckwheat habitat. The slopes where Yukon Wild Buckwheat occurs are generally too steep for all-terrain vehicles and unlikely to incur impacts (and the calculated impact is negligible).

Limiting Factors

Yukon Wild Buckwheat is probably limited by the scattered distribution of grasslands within its extent of occurrence and its apparent low recruitment rate and limited dispersal capability.

Number of Locations

For the purposes of COSEWIC assessment, a 'location' is an area in which a single threatening event can rapidly affect all individuals present (COSEWIC 2015). Determining locations depends upon interpretation of threats. As detailed under **Threats**, no threats are considered both high magnitude and imminent but some are plausible. All known plants of Yukon Wild Buckwheat are within an area about 8 km by 4.5 km where a single threatening event such as changes in land use could rapidly affect all individuals. However, no threats are of sufficient magnitude and/or immediacy to warrant defining locations such that each of the 5 subpopulations could conceivably represent one location (for a total of 5 locations). The number of locations is therefore estimated to range from 1-5.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Yukon Wild Buckwheat has no legal protection or status in Canada or the USA. It is not covered by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES).

Non-Legal Status and Ranks

Yukon Wild Buckwheat was assessed by COSEWIC as Special Concern in November 2017. The conservation status ranks for Yukon Wild Buckwheat are (NatureServe 2016):

Global:	Imperilled at the variety level (G5T2)
Canada:	Critically imperilled (N1)
United States:	Imperilled (N2)
Yukon:	Critically imperilled (S1)
Alaska:	Imperilled (S2)

Habitat Protection and Ownership

All known Canadian occurrences of Yukon Wild Buckwheat are on a Champagne and Aishihik First Nations settlement land parcel held in fee simple (R-02A).

ACKNOWLEDGEMENTS

Champagne and Aishihik First Nation granted the report writers permission to survey their traditional lands. The report writers thank Michael Jim and Graham Boyd for facilitating the permission. Michael also provided information on the history of the area.

Bruce Bennett was invaluable in identifying survey sites and other information and providing access to the B.A. Bennett Yukon Herbarium. His help is greatly appreciated by the authors. The report writers thank Syd Cannings and Saleem Dar at the Canadian Wildlife Service and Randi Mulder at the Yukon Department of Environment for providing previous survey data. The report writers wish to thank Randi and Bruce for their hospitality.

Justin Fulkerson provided information on Alaska occurrences of Yukon Wild Buckwheat. Syd Cannings, Joel Kits, and Cory Sheffield identified insect photographs. Robert Anderson, Jennifer Doubt, and Lyndsey Sharp at the Canadian Museum of Nature searched herbarium specimens.

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Allan Harris is a biologist with over 25 years' experience in northern Ontario. He has a B.Sc. in Wildlife Biology from the University of Guelph and an M.Sc. in Biology from Lakehead University. After spending seven years as a biologist with Ontario Ministry of Natural Resources, he co-founded Northern Bioscience, an ecological consulting company based in Thunder Bay, Ontario. Together with Rob Foster, Al has authored or coauthored dozens of scientific papers, technical reports, and popular articles, including COSEWIC status reports for the False-foxglove Sun Moth, Red-tailed Leafhopper, Monarch, Gold-edged Gem, Nuttall's Sheep Moth, Lake Huron Grasshopper, Riverine Clubtail, Laura's Clubtail, Rapids Clubtail, Gibson's Big Sand Tiger Beetle, Northern Barrens Tiger Beetle, Powesheik Skipperling, Mormon Metalmark, Weidemeyer's Admiral, Bogbean Buckmoth, Hop-tree Borer, Georgia Basin Bog Spider, Broad-banded Forestsnail, Nahanni Aster, Crooked-stem Aster, Bluehearts, Drooping Trillium and Small-flowered Lipocarpha. Al also authored the Ontario provincial status report for Woodland Caribou, and has authored or coauthored national and provincial recovery strategies for vascular plants and birds.

Robert Foster is co-founder and principal of Northern Bioscience, an ecological consulting firm offering professional consulting services supporting ecosystem management, planning, and research. Dr. Foster has a B.Sc. in Biology from Lakehead University and a D. Phil in Zoology from the University of Oxford. Rob has worked as an ecologist in Canada for over 25 years and has conducted numerous insect surveys for protected areas planning and environmental assessments in Ontario, as well as Manitoba, Minnesota, Quebec, Alberta, and British Columbia. Rob has authored or coauthored over twenty COSEWIC status reports including 15 insects, 5 vascular plants, a spider, a land snail, and a bird.

COLLECTIONS EXAMINED

B.A. Bennett Herbarium Yukon (BABY): searched by Bruce Bennett, Curator.

Canadian Museum of Nature (CANM): searched by Lyndsey Sharp, Collections Technician, Botany Research and Collections.

Appendix 1. Threats Assessment Calculator results for Yukon Wild Buckwheat (*Eriogonum flavum* var. *aquilinum*) in Canada.

The threat classification below is based on the International Union of Conservation Networks (IUCN) and Conservation Measures Partnership (CMP) unified threats classification system. For a detailed description of the threat classification system, see the Open Standards website (Open Standards 2017). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is calculated from scope and severity. For details, see Salafsky *et al.* (2008) and Master *et al.* (2009, 2012).

Species or Ecosystem	Yukon Wild Buckwheat (<i>Eriogonum flavum</i> var. <i>aquilinum</i>)		
Scientific Name			
Element ID		Elcode	
Assessor(s):	10/03/2017 Del Meidinger (Facilitator & Vascular Plants co-chair); Jana Vamosi (Vascular Plants co-chair); Allan Harris (report writer); Syd Cannings & Saleem Dar (CWS); Daniel Brunton, James Pojar, Karen Samis, Bruce Bennett (Vascular Plants SSC); Lori Schroeder (U of Alberta); Joanna James (COSEWIC Secretariat)		
References:			

Threat Impact		Level 1 Threat Impact Counts	
		high range	low range
A	Very High	0	0
B	High	0	0
C	Medium	0	0
D	Low	0	0

Calculated Overall Threat Impact:

Assigned Overall Threat Impact: U = Unknown

Impact Adjustment Reasons: There are threats, but how the threats manifest themselves are unknown. Bison/invasives are the biggest potential threats. No evidence of decline in the last 15 years.

Overall Threat Comments Generation time is estimated as 20 years. Explanation: populations were surveyed in 2004 and in 2016. Age structure in the population was noted, however there was no evidence of recruitment (seedlings) therefore one can expect that individuals are at least 15 years old. 20 years was suggested as a conservative estimated and accepted by participants on the call. Land ownership and landuse is the same for the entire population (all individuals within the same R block, no mining claims), which also falls within First Nation land.

Threat	Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1 Residential & commercial development					
1.1 Housing & urban areas					
1.2 Commercial & industrial areas					
1.3 Tourism & recreation areas					
2 Agriculture & aquaculture	Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
2.1	Annual & perennial non-timber crops						
2.2	Wood & pulp plantations						
2.3	Livestock farming & ranching		Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	Free-ranging and feral horses use Yukon Wild Buckwheat habitat. Yukon Wild Buckwheat distribution occurs entirely on First Nation land. There are very few free-ranging horses, although some do exist near villages (less likely on steep slopes where Yukon Wild Buckwheat is more common). ~12 feral horses exist in the area, and some outfitters also have free-ranging horses.
2.4	Marine & freshwater aquaculture						
3	Energy production & mining						
3.1	Oil & gas drilling						
3.2	Mining & quarrying						The substrate where Yukon Wild Buckwheat is found is suitable for quarrying (gravel pits), however there are no proposals at this time.
3.3	Renewable energy						
4	Transportation & service corridors						
4.1	Roads & railroads						Yukon Wild Buckwheat does not occur within 20 m of roads.
4.2	Utility & service lines						
4.3	Shipping lanes						
4.4	Flight paths						
5	Biological resource use		Negligible	Restricted (11-30%)	Negligible (<1%)	High (Continuing)	
5.1	Hunting & collecting terrestrial animals						
5.2	Gathering terrestrial plants		Negligible	Restricted (11-30%)	Negligible (<1%)	High (Continuing)	Medicinal use. First Nations peoples are known to harvest Yukon Wild Buckwheat for medicinal purposes, however this activity doesn't seem to be having a negative impact on Yukon Wild Buckwheat populations.
5.3	Logging & wood harvesting						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
5.4	Fishing & harvesting aquatic resources						
6	Human intrusions & disturbance		Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	
6.1	Recreational activities		Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	All-terrain vehicle trails are present adjacent to habitat. There is no evidence of damage caused by recreational vehicles (ATVs, 4x4 trucks, snowmobiles), although it remains a threat as the potential for increased activity exists.
6.2	War, civil unrest & military exercises						
6.3	Work & other activities						
7	Natural system modifications						
7.1	Fire & fire suppression						Fire suppression is not an issue for this species because wild fires are allowed to burn, except near the villages. In addition, there is not a lot of fire fuel in this habitat. There is evidence of shrub encroachment, however this shouldn't affect Yukon Wild Buckwheat due to the steep slopes where it is likely to be found.
7.2	Dams & water management/use						
7.3	Other ecosystem modifications						
8	Invasive & other problematic species & genes		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
8.1	Invasive non-native/alien species/diseases		Negligible	Negligible (<1%)	Unknown	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Invasive plants are a potential threat. See also 2.3 - horses. There are no invasive plant species currently present at sites where Yukon Wild Buckwheat is found. <i>Crepis tectorum</i> could encroach on the area as an invasive plant but is unlikely to have a negative impact on Yukon Wild Buckwheat. Sweet Clover also has the potential to quickly invade native plant communities. Vectors include recreational vehicles, bison and bison harvesting equipment.
8.2	Problematic native species/diseases		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	Re-introduced Wood Bison present at all occurrences. Recent research suggests that grazing by bison is increasing the diversity of plant communities. There is a possibility that this could increase competition with other plant species however this is unlikely because this ecosystem is adapted to grazing from extinct Steppe Bison. It was noted that Steppe Bison could have had different grazing habits compared to the Wood Bison, however the threat of trampling from these two bison species is likely similar.
8.3	Introduced genetic material						
8.4	Problematic species/diseases of unknown origin						
8.5	Viral/prion-induced diseases						
8.6	Diseases of unknown cause						
9	Pollution						
9.1	Domestic & urban waste water						
9.2	Industrial & military effluents						
9.3	Agricultural & forestry effluents						
9.4	Garbage & solid waste						
9.5	Air-borne pollutants						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
9.6	Excess energy						
10	Geological events						
10	Volcanoes						
10	Earthquakes/tsunamis						
10	Avalanches/landslides						
11	Climate change & severe weather		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	
11	Habitat shifting & alteration		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	Habitat models suggest steppe habitat will increase if dry conditions prevail but aspen will invade if precipitation increases. Aspen has invaded some grasslands in SW Yukon within the last 80 years. Long-term climate change projections indicate warmer temperatures and increased precipitation, which could lead to aspen encroachment, however it is unclear how specific sites will be affected, especially because the slope at Yukon Wild Buckwheat sites is particularly steep and unsuitable for woody encroachment.
11	Droughts						
11	Temperature extremes						
11	Storms & flooding						
12	Other impacts						
Classification of Threats adopted from IUCN-CMP, Salafsky <i>et al.</i> (2008).							