

Recovery Strategy for the Verna's Flower Moth (*Schinia verna*) in Canada

Verna's Flower Moth



2016



Government
of Canada

Gouvernement
du Canada

Canada

Recommended citation:

Environment Canada. 2016. Recovery Strategy for the Verna's Flower Moth (*Schinia verna*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vi + 18 pp.

For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)¹.

Cover illustration: © Gary G. Anweiler

Également disponible en français sous le titre
« Programme de rétablissement de l'héliotin de Verna (*Schinia verna*) au Canada »

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2016. All rights reserved.
ISBN 978-0-660-04375-3
Catalogue no. En3-4/226-2016E-PDF

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

¹ <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment is the competent minister under SARA for the Verna's Flower Moth and has prepared this strategy, as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Provinces of Alberta, Saskatchewan, and Manitoba as per section 39(1) of SARA.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Verna's Flower Moth and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When the recovery strategy identifies critical habitat, there may be future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within federal protected areas be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on federal lands outside of federal protected areas, the Minister of the Environment must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For critical habitat located on non-federal lands, if the Minister of the Environment forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, and not effectively protected by the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to extend the prohibition against destruction of critical habitat to that portion. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

² <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

Acknowledgments

This document was written by Gary Anweiler and updated by Victoria Snable, Environment Canada, Canadian Wildlife Service. The following persons are acknowledged for providing information used in the preparation of this report: Medea Curteanu and Sharilyn Westworth, Environment Canada, Canadian Wildlife Service for unpublished Alberta survey information; Gary Anweiler, for information on Verna's Flower Moth in Alberta; Dr. Chris Schmidt, Canadian Food Inspection Agency (CFIA); Dr. Felix Sperling and Danny Shpeley, University of Alberta E.H. Strickland Entomological Museum, for access to specimens and data in their care; Dr. Mike Pogue for information on the identity of the Washington State *Schinia* specimen; Dr. Richard Westwood, University of Winnipeg, for information regarding the Manitoba site surveys; Chris Friesen, Manitoba Conservation, for information about the Manitoba colony site; Gerry Rosset, Spruce Woods Provincial Park, Manitoba, for information on the Manitoba colony location; Chuck Harp, Littleton, CO, for information regarding *Schinia* in general. Reviews of earlier versions of the document provided by Pat Fargey (Alberta Environment & Sustainable Resource Development), and Colin Murray (Manitoba Conservation Data Centre) are greatly appreciated.

Executive Summary

The Verna's Flower Moth is a small day-flying moth that is difficult to identify. It has only been found in Canada in grazed native grassland pasture in the southern Prairie Provinces. Only two of these observations are recent, with a single individual observed at each location in 2000 and 2007. Recent searches (since 2007) at the known sites have failed to find any Verna's Flower Moths. Data on distribution, population dynamics, and ecology is very limited for this species. Verna's Flower Moth was listed as Threatened under the *Species at Risk Act* in 2009.

Verna's Flower Moths are dependent upon one or more species of the genus *Antennaria*, a small native composite plant, for all stages of its life cycle. They have a relatively low reproductive rate, laying only a few unusually large eggs with a single generation per year.

The primary threats to Verna's Flower Moth are those which contribute to the damage or loss of the larval host plants. This mainly occurs in the prairies through the loss and fragmentation of grazed native grasslands as a result of crop production. Secondary threats include severe over-grazing, invasion and establishment of exotic plants, and alteration or suppression of natural grazing and/or fire regimes. All of these threats are largely speculative, given the limited information available on the species and are based on the species' reliance on *Antennaria* for all stages of their life cycle, as well as the assumption that the species could occur in native pasture across much of the Prairie Ecozone.

There are unknowns regarding the feasibility of recovering Verna's Flower Moth; approaches to address these unknowns are presented in this recovery strategy. The population and distribution objective for Verna's Flower Moth is to confirm occupancy at the two recent occurrences in Canada and, if confirmed, to maintain occupancy at these two occurrences as well as at any newly-discovered occurrences. Recovery planning will be carried out through three broad strategies: inventory and monitoring; research; habitat assessment, management and conservation.

Critical habitat has not been identified for the Verna's Flower Moth in this recovery strategy. There is currently insufficient information available on this species' distribution and specific habitat requirements to identify critical habitat. A schedule of studies has been developed to identify critical habitat for the Verna's Flower Moth.

One or more Action Plans for the Verna's Flower Moth will be posted on the Species at Risk Public Registry by 2021.

Recovery Feasibility Summary

Under the *Species at Risk Act* (SARA) (Section 40), the competent minister is required to determine whether the recovery of the listed species is technically and biologically feasible. Based on the following four criteria that Environment Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Verna's Flower Moth. In keeping with the precautionary principle, a recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Unknown. Verna's Flower Moths are known from 5 locations in Canada, only two of which are recent occurrences. Single specimens have been collected at two separate locations in Alberta in 2000 and 2007 and may each represent a population. However, surveys in recent years of sites where Verna's Flower Moths were previously recorded have failed to locate any individuals. These surveys have been limited in their extent with some carried out in adverse conditions and are likely not sufficient to determine the presence or absence of the species at surveyed locations. Additional and more intensive surveys of potential suitable habitat may result in the observation of Verna's Flower Moths at previous capture locations, and additional new populations in previously un-surveyed or poorly surveyed habitat (COSEWIC 2005).

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Unknown. The absence of Verna's Flower Moths from sites during surveys where the host plant, *Antennaria*, is flowering suggests that the specific habitat requirements for Verna's Flower Moth survival and recovery are not yet understood. Therefore, it is unknown if sufficient suitable habitat is or could be made available to support the species. More information regarding specific habitat requirements are needed to guide habitat management practices.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Unknown. Information regarding the severity and causality of most of the possible threats to the species is lacking. Further research on the impacts of these threats is required, as outlined in this recovery strategy.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Unknown. As there is a lack of information regarding Verna's Flower Moth, its specific habitat requirements, threats, as well as difficulty demonstrating occupancy of this species, it is not known at this time if recovery techniques are available in order to achieve the population and distribution objectives.

Table of Contents

| | |
|--|-----|
| Preface..... | i |
| Acknowledgments..... | ii |
| Executive Summary..... | iii |
| Recovery Feasibility Summary..... | iv |
| 1. COSEWIC Species Assessment Information..... | 1 |
| 2. Species Status Information..... | 1 |
| 3. Species Information..... | 2 |
| 3.1 Species Description..... | 2 |
| 3.2 Population and Distribution..... | 3 |
| 3.3 Needs of the Verna's Flower Moth..... | 5 |
| 4. Threats..... | 6 |
| 4.1 Threat Assessment..... | 6 |
| 4.2 Description of Threats..... | 6 |
| 5. Population and Distribution Objectives..... | 9 |
| 6. Broad Strategies and General Approaches to Meet Objectives..... | 10 |
| 6.1 Actions Already Completed or Currently Underway..... | 10 |
| 6.2 Strategic Direction for Recovery..... | 11 |
| 6.3 Narrative to Support the Recovery Planning Table..... | 12 |
| 7. Critical Habitat..... | 13 |
| 7.1 Identification of the Species' Critical Habitat..... | 13 |
| 7.2 Schedule of Studies to Identify Critical Habitat..... | 13 |
| 8. Measuring Progress..... | 13 |
| 9. Statement on Action Plans..... | 14 |
| 10. References..... | 15 |
| Appendix A: Effects on the Environment and Other Species..... | 18 |

1. COSEWIC* Species Assessment Information

Date of Assessment: May 2005

Common Name (population): Verna's Flower Moth

Scientific Name: *Schinia verna*

COSEWIC Status: Threatened

Reason for Designation: This moth is found only in the Canadian prairies, with one extant site in southeastern Alberta. The species is known historically from very few locations despite its relatively large size, distinctive markings and day-flying habit. It has a small total range in suitable native prairie that is fragmented and declining in quality and extent.

Canadian Occurrence: Alberta, Saskatchewan, Manitoba

COSEWIC Status History: Designated Threatened in May 2005.

*COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

The Verna's Flower Moth (*Schinia verna*) has a global conservation status of Unrankable (GU), and a national status in Canada of Critically Imperiled (N1). This species is found in all of the Prairie Provinces where it has a status of S1 (Critically Imperiled) in Manitoba, SH (Possibly Extirpated) in Saskatchewan, and SNR (Unranked) in Alberta (NatureServe 2014). Verna's Flower Moth has not been recorded outside of Canada (COSEWIC 2005).

The species is listed as Threatened under the *Species at Risk Act* (SARA). It is listed as Endangered in Manitoba under the *The Endangered Species and Ecosystems Act*. It is not listed under provincial legislation in Saskatchewan or Alberta.

3. Species Information

3.1 Species Description

The Verna's Flower Moth is a member of the Order Lepidoptera (butterflies and moths), Family Noctuidae (owlet or cutworm moths). It is one of about 150 North American species belonging to the subfamily Heliiothinae or flower moths, many of which are colourful in appearance and cryptic against the flowers on which they feed and rest (Hardwick 1996). The Verna's Flower Moth was first described in 1983 by D. Hardwick, even though the first specimen collected was in 1929 (Hardwick 1983).



Figure 1. Adult Verna's Flower Moth © Gary G. Anweiler

Adult Verna's Flower Moths are relatively small with a stout body and wingspan of around 20 mm (COSEWIC 2005). They have a rapid, buzzing flight pattern (G. Anweiler, pers. comm. 2014). Male and female Verna's Flower Moth share similar appearances with the dorsal surface of the forewing olive-brown in colour with dull red-brown bands and cream-white patches (Figure 1; Hardwick 1983). The forewing margin has white and grey stripes. The ventral surface of the forewing is white, with black markings closer to the base of the wing. The dorsal hindwing is black and white with a margin that is black with many small white spots. The ventral hindwing is all white with very few dark markings present (Hardwick 1983; COSEWIC 2005).

The Verna's Flower Moth is a diurnal (day-flying) moth. It has one generation per year with a brief flight period from late May to early June (COSEWIC 2005). Adult flower moths are short-lived and may only survive for seven days (Hardwick 1996). Eggs are large and translucent and are deposited individually within the flowering head of the larval host plant, pussytoes (*Antennaria* spp.). The larvae hatch within three days and have 5-6 instars over a period of approximately 17 days (Hardwick 1983).

The mature larvae is pale greenish-white with a yellow-green band across each body segment with rows of prominent black spots along the back and sides (Hardwick 1996). The mature larvae pupate and overwinter in the ground in a shallow tube, with the adults emerging the following spring (Hardwick 1983).

Verna's Flower Moths can be difficult to identify in-flight, and can be mistaken for the more common White-spotted Midget (*Eutricopis nexilis*) that has similar habitat requirements and also feeds on *Antennaria*. These two flower moths can be differentiated by the coloring on the ventral side of the forewings: in Verna's Flower Moth these are black and white in coloration, while the White-spotted Midget has distinctive pink spots (COSEWIC 2005).

3.2 Population and Distribution

Verna's Flower Moth has only been found in Canada in the southern Prairie Provinces, from southwestern Manitoba to southeastern Alberta. There are five reported occurrences of Verna's Flower Moths, only 2 of which are recent (Figure 2; COSEWIC 2005; ASRD and ACA 2008). There are no known occurrences of Verna's Flower Moth outside of Canada. Reports of the collection of a possible Verna's Flower Moth from Washington State (COSEWIC 2005) is now believed to belong to a related but undescribed species (M. Pogue, pers. comm., 2010).

The earliest record of Verna's Flower Moth is from the Medicine Hat, Alberta area in 1929. In 1979 a total of 18 specimens were collected near Glenboro, Manitoba (now Spruce Woods Provincial Park), and in 1980, one specimen was collected near Saskatoon, Saskatchewan. These three occurrences are considered historical as the most recent observations of Verna's Flower Moth at these sites occurred more than 30 years ago. Recently, single specimens have been collected at two separate locations in Alberta: near Jenner in the Red Deer River Valley in 2000, and near Alliance in 2007 (Table 1).

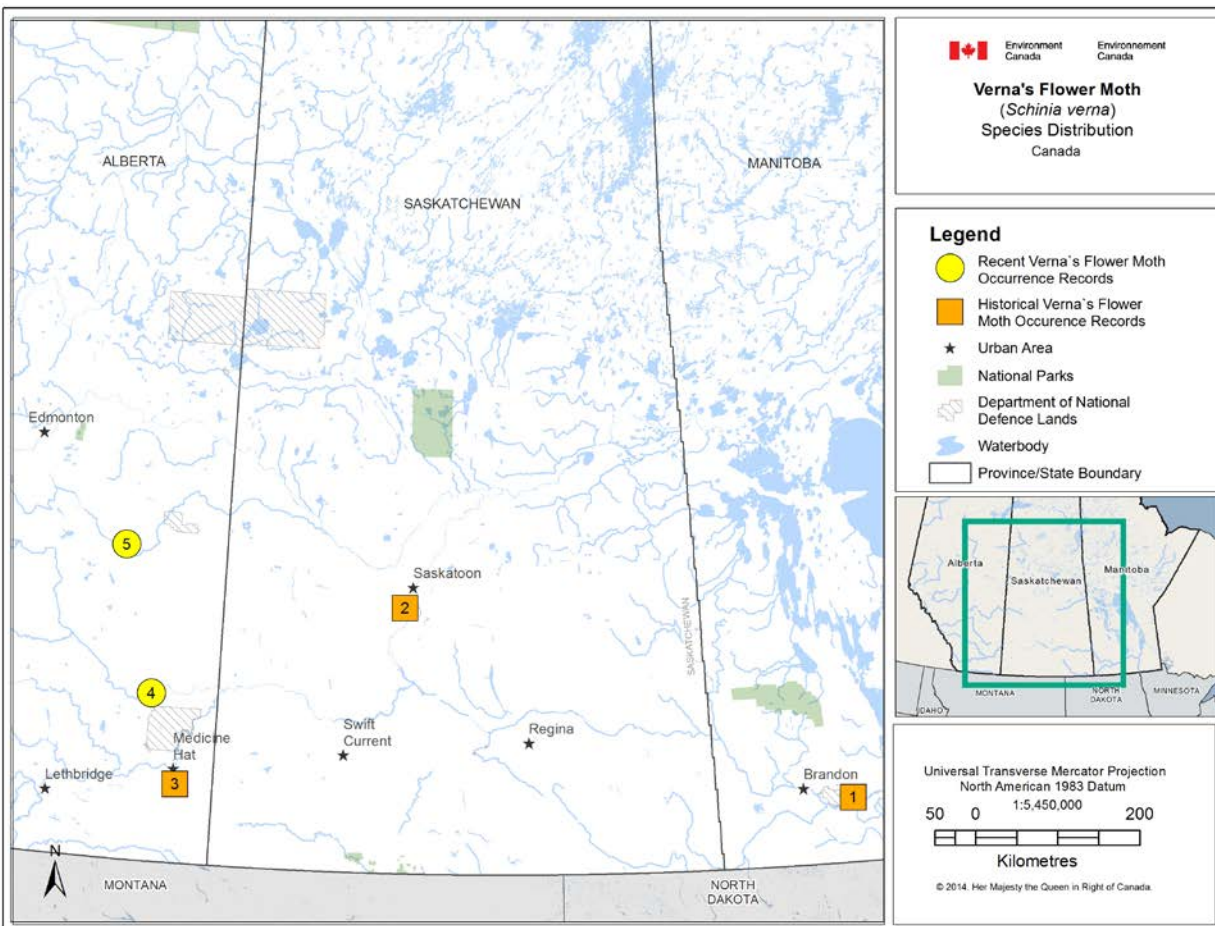


Figure 2: Occurrences of Verna's Flower Moth in Canada. Yellow circles represent occurrences where the species has been observed since 2000. Orange squares represent historical occurrences, where the species was last observed >30 years ago.

Table 1. Summary of Verna's Flower Moth occurrences in Canada.

| Map Label | Location | Province | Year | # Individuals |
|-----------|---|----------|------|---------------|
| 1 | Spruce Woods Provincial Park, North of Glenboro | MB | 1979 | 18 |
| 2 | Saskatoon | SK | 1980 | 1 |
| 3 | Medicine Hat | AB | 1929 | 1 |
| 4 | Red Deer River Valley, North of Jenner | AB | 2000 | 1 |
| 5 | Northwest of Alliance | AB | 2007 | 1 |

Recent surveys for Verna's Flower Moths have failed to locate any specimens, despite the availability of apparently suitable habitat (COSEWIC 2005; Westwood 2010). Surveys conducted in 2010 at the two locations in southern Alberta (Jenner and Alliance) where Verna's Flower Moths have recently been recorded did not locate any individuals, however, these surveys were limited in extent (M. Curteanu pers. comm., 2010). Surveys conducted in 2010 at four sites in the Aspen Parkland and Grassland Eco-regions in Alberta and Saskatchewan were also not successful at observing any Verna's Flower Moths (Westworth 2012). Additional opportunistic surveys along roadsides in recent years in Alberta and central Saskatchewan containing the host plant, *Antennaria*, did not result in observations or captures of Verna's Flower Moths (G. Anweiler, pers. comm., 2014).

In Manitoba, field surveys in 2009, 2010, 2013, and 2014 in the mixed grass prairie region were conducted for Verna's Flower Moth and other prairie lepidopteran species. In 2010, 2013, and 2014 these surveys included areas within Spruce Woods Provincial Park, where Hardwick captured the type specimens in 1979 (Westwood 2010; Murray 2014). Surveys completed in 2014 also included visiting sites identified by Westwood (2010) during his surveys as having *Antennaria* species present as well as other sites identified for *Antennaria* presence. In some cases, complete surveys could not be undertaken due to access issues on private lands (C. Murray pers. comm., 2014). Verna's Flower Moths were not found during these surveys even though *Antennaria* plants were recorded throughout many of the survey areas (Friesen and Murray 2010; C. Murray pers. comm., 2014).

At the remaining two historic sites (Saskatoon and Medicine Hat) the actual locations where the single specimens were collected are not known and thus have not been re-surveyed.

Canadian Abundance

The current population size and trend for the Verna's Flower Moth is unknown given that the most recent records of this species have been the collection of a single specimen at two separate locations.

Verna's Flower Moth is a seemingly rare species that has only been observed in a small area of the total available, apparently suitable habitat. It is possible that the Verna's Flower Moth, similar to other species of Lepidoptera, occurs at low densities, experiences high larval mortality and large population fluctuations. Swengel and Swengel (1999) found that the population abundance of the Phlox Flower Moth (*Schinia indiana*) varied greatly from year to year, impacting the ability to find the species in the right locations at the right timing. There is potential that the same is true of Verna's Flower Moth population dynamics (COSEWIC 2005).

3.3 Needs of the Verna's Flower Moth

Habitat requirements

Habitat information for Verna's Flower Moth is available from three of the locations where it has been found. Verna's Flower Moth inhabits native prairie grassland that is sparsely vegetated and supports one or more species of pussytoes (COSEWIC 2005). Species of pussytoes that have been found in association with Verna's Flower Moth are: *Antennaria aprica*, *A. neodioica*, *A. neglecta*, and *A. parvifolia* (Hardwick 1983; ASRD and ACA 2008). At survey sites in Manitoba, *A. parvifolia* and *A. neglecta* were usually found growing together in the same area (Westwood 2010). These sites have all been located near river systems and treed areas (Hardwick 1983; COSEWIC 2005). Other plant species found where Verna's Flower Moths were observed and thought to be characteristic of its habitat are: Three-flowered Avens (*Geum triflorum*), Prairie Crocus (*Anemone patens*), Fleabane (*Erigeron* spp.) and Mouse-eared Chickweed (*Cerastium arvense*) (ASRD and ACA 2008; Westwood 2010).

Antennaria are small, mat-forming perennial forbs that grow in dense patches over a large area or in smaller clumps (Westwood 2010). Livestock grazing likely reduces the height of the overstory, thereby enabling *Antennaria* to produce flowers. All three sites where the location of the specimens is known were experiencing some grazing pressure at the time of survey (Hardwick 1983; ASRD and ACA 2008). Therefore, some degree of grazing is likely required for Verna's Flower Moth habitat as the larvae rely on *Antennaria* flowers for food and the adults for nectar (ASRD and ACA 2008).

Verna's Flower Moths have been found only in the Prairie Ecozone. The Glenboro, MB and Saskatoon, SK sites are in the Aspen Parkland Ecoregion, and the Medicine Hat, Jenner, and Alliance sites are found in the Mixed Grassland Ecoregion.

Oviposition (egg laying) and nutritional resources

Verna's Flower Moth eggs are deposited directly into the flowering heads of *Antennaria* plants, which are then consumed by the larvae (Hardwick 1983). Adult Verna's Flower Moths have also been observed feeding on *Antennaria* plants (G. Anweiler, pers. obs.). It is not known if the adult moths will use other spring flowers as a nectar source or if they rely solely on *Antennaria* for feeding. *Antennaria* are common plants found throughout the Prairies, therefore it is likely that other factors besides host plant availability is limiting the distribution and abundance of Verna's Flower Moth.

4. Threats

4.1 Threat Assessment

Table 2. Threat Assessment Table

| Threat | Level of Concern ^a | Extent | Occurrence | Frequency | Severity ^b | Causal Certainty ^c |
|--|-------------------------------|------------|-----------------------|----------------------|-----------------------|-------------------------------|
| Habitat Loss or Degradation | | | | | | |
| Conversion of native habitat to crop and forage production | Medium | Widespread | Current / Historical | Continuous | Unknown | Low |
| Severe overgrazing | Medium | Localized | Current | Seasonal | Unknown | Low |
| Exotic, Invasive, or Introduced Species | | | | | | |
| Invasion, and establishment of exotic plants | Low | Widespread | Current | Continuous | Unknown | Low |
| Changes in Ecological Dynamics or Natural Processes | | | | | | |
| Alteration or suppression of natural fire regimes | Low | Localized | Current | Seasonal | Unknown | Low |
| Climate and Natural Disasters | | | | | | |
| Stochastic events | Low | Widespread | Current / Anticipated | Continuous / Unknown | Unknown | Unknown |

^a *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table.*

^b *Severity: reflects the population-level effect (high: very large population-level effect, moderate, low, unknown).*

^c *Causal certainty: reflects the degree of evidence that is known for the threat (high: available evidence strongly links the threat to stresses on population viability; medium: there is a correlation between the threat and population viability e.g. expert opinion; low: the threat is assumed or plausible).*

4.2 Description of Threats

Threats are listed in order of decreasing concern. There is little information available on the ecology of, and threats to, Verna's Flower Moth. The potential threats to this species described below are based on the knowledge that Verna's Flower Moths rely on *Antennaria* during their larval and adult stages. The primary threats to Verna's Flower Moth are those which contribute to the damage or loss of the larval host plants. This primarily occurs in the prairies through the loss and fragmentation of native, grazed grasslands as a result of crop production (COSEWIC 2005). Other secondary threat factors identified that may affect Verna's Flower Moth are severe over-grazing, invasion and establishment of exotic plants, and alteration or suppression of natural grazing

and/or fire regimes (COSEWIC 2005). However, given the scant information about the distribution and occurrence of this species, these secondary threats are largely speculative, based on the assumption that the species could occur in native pasture across much of the Prairie Ecozone.

Conversion of native habitat to crop and forage production

Cultivation of native grassland for agricultural purposes results in the loss and degradation of habitat that supports flowering populations of one or more *Antennaria* species. The absence of flowering *Antennaria* would result in the loss of potential habitat for Verna's Flower Moth as they rely on these plants during the larval and adult life stages for food. Tillage of the land during production would also disrupt and possibly result in mortality of the pupal stage that burrow in the ground in a shallow tube.

In Alberta and Saskatchewan, about 57% and 79% of native grasslands have been lost, primarily, though not exclusively, to agriculture in the past century (Nernberg and Ingstrup 2005). By 1996, cropland, summer fallow and improved pasture accounted for about 70% of all land use in the Canadian prairies (Agriculture and Agri-Food Canada 2000). While most of the prime land was converted long ago, some conversion has continued to occur in recent years. Between 1985 and 2001, about 6-8% and 8-11% of remaining native grasslands were converted to other uses within different grassland ecoregions of Saskatchewan and Alberta, respectively (Watmough and Schmoll 2007).

Severe overgrazing

Antennaria species rely on grazing in order to produce flowering mats that are needed for Verna's Flower Moths. Grazing pressure removes the taller overstory grasses, allowing the low-growing *Antennaria* species below to bloom. The loss or reduction of grazing on fields would result in the absence of flowering *Antennaria* species, which are required as food sources for Verna's Flower Moth larval and adult stages (COSEWIC 2005). *Antennaria* plants are not typically used as forage as they are low in protein and energy and hard to access (Fryer 2011). Their presence is often seen as an indicator of overgrazing when found in large blooming mats. In North Dakota, studies found that Field Pussy-toes (*Antennaria neglecta* Greene) favoured conditions of heavy grazing, increasing as grazing pressures were increased (Patton and Nyren, 2012).

While *Antennaria* benefits from some grazing, extreme overgrazing, especially during periods of drought, can result in the loss or change in the composition of the plant community allowing weedy species to move in and take over. In situations where grazing reaches a critical level, it can result in the loss of *Antennaria* species (ASRD and ACA 2008) potentially removing or reducing the availability of the larval and adult host plants for Verna's Flower Moth.

Ungulate grazing is a necessary natural process in maintaining healthy and diverse grassland ecosystems (SK PCAP, 2008). Grazing management that prevents the

landscape from becoming unhealthy or improves the ecological health status benefits numerous species on the landscape (Adams et al. 2005). In order to effectively manage livestock grazing, it is necessary to operate and maintain infrastructure such as fencing, water sources, and salting locations to achieve the goal of rangeland health. Livestock do not graze in a uniform manner resulting in areas of low, high and moderate utilization that provide a patchy bio-diverse rangeland which meets the habitat requirements for many species. As such, grazing and the maintenance of the infrastructure supporting it may be a beneficial management practice for the Verna's Flower Moth.

Verna's Flower Moths spend a large portion of their life as a pupae underground in a shallow tube. Trampling by cattle and other livestock may cause mortality of the pupae. (COSEWIC 2005). This may be particularly important in situations of severe to critical overgrazing.

Invasion, and establishment of exotic plants

Exotic and introduced forage species, such as Leafy Spurge (*Euphorbia esula*), Crested Wheat Grass (*Agropyron cristatum*) and Sweet Clover (*Melilotus* sp.), can out-compete native species, eventually taking over and altering ecosystem dynamics (Gordon 1998; Henderson and Naeth 2005). The presence of tall invasive plants can create a thick overstory that it is not conducive to the flowering of the *Antennaria* species. In Alberta, recent severe prolonged droughts on severely overgrazed lands resulted in weedy species such as Pasture Sage (*Artemisia frigida* Willd.) replacing native vegetation (ASRD and ACA 2008).

Alteration or suppression of natural fire regimes

Fire is an important disturbance regime in grasslands across the Canadian prairies, both from human activities and natural causes (i.e. lightning). However, humans have altered the natural fire cycle and resulted in changes to the frequency of fires, the timing of fires and the severity or extent of fires (Samson et al 2004; Smith and McDermaid 2014). Often human activities have resulted in fewer fires, which result in higher litter loads. In these cases, when a fire does occur, it is often larger in extent and intensity.

Pussytoes can tolerate and often dominate following low to moderate severity fires. Bataineh et al. (2006) found that following a fire on Coconino National Forest, Colorado, Small-leaf Pussytoes were absent from plots that experienced high intensity fire, while on plots that had low to moderate fires, small-leaf pussytoes were a dominate vegetation species. High severity fires may temporarily or permanently remove the host plant for Verna's Flower Moth, rendering it unsuitable for the species needs. Fires may also cause direct mortality of Verna's Flower Moths during the spring and summer months when they are present as eggs, larvae and adults. The pupal stage may be able to withstand fires, including those of higher intensity as they remain burrowed underground for the majority of the year (COSEWIC 2005).

Stochastic events

Verna's Flower Moth relies on a single genus of host plant for feeding and egg laying and has a relatively short summer flight period. Therefore, it may be more prone to local extinctions from random (stochastic) events (i.e., severe storms and winter conditions, droughts, or fires), than are species that have wider habitat needs, relying on a range of host plants and have stable populations (Tscharntke et al. 2002; Nilsson et al. 2008). Genetic effects attributed to habitat fragmentation, isolation, and stochastic events have been identified as possibly playing a significant role in local extinctions of Lepidoptera (Packer and Owen 2001).

5. Population and Distribution Objectives

There is limited information available on the abundance and distribution of Verna's Flower Moth. This species is only known from two recent observations in Canada, where one individual was captured at each site. Since these recent observations, Verna's Flower Moths have not been observed during more recent surveys. It should be noted that these more recent surveys were limited in their extent and may have been hampered by unfavourable weather conditions. Verna's Flower Moth is also difficult to identify in the field, and may be easily confused with the White-spotted Midget, unless captured to observe the ventral side of the wings. Consequently, comprehensive surveys under favourable conditions that cover a longer time period to ensure that they encompass the adult flight period are needed to confirm the presence of Verna's Flower Moth at these locations. Surveys should also be conducted at other sites with potentially suitable habitat to determine the extent of the Canadian distribution. As a result of the lack of information available on populations of Verna's Flower Moth, it is not currently feasible to establish quantitative population and distribution objectives.

The population and distribution objective for Verna's Flower Moth is to maintain occupancy at the two recent occurrences in Canada (should they be confirmed) and any newly-discovered occurrences.

6. Broad Strategies and General Approaches to Meet Objectives

6.1 Actions Already Completed or Currently Underway

Very little is known about the biology and ecology of the Verna's Flower Moth and demonstrating occupancy of the species is very difficult. However, since the completion of the COSEWIC status report in 2005 a few surveys have been undertaken and one additional occurrence in Alliance, Alberta has been confirmed.

Monitoring and Assessment

- 2007 - Lepidoptera surveys conducted by lepidopterist, Gary Anweiler, near Alliance, Alberta during the adult flight period confirmed the the occurrence of one individual at this location.
- 2010 - Environment Canada conducted Verna's Flower Moth surveys targeted at at the Alliance and Jenner locations (M. Curteanu pers. comm., 2010) as well as in the Aspen Parkland and Grassland Eco-regions in Alberta and Saskatchewan (Westworth 2012).
- 2007 to 2014 – opportunistic roadside surveys for Verna's Flower Moth were conducted in locations with blooming *Antennaria* species present in Alberta and Saskatchewan (G. Anweiler, pers. comm., 2014).
- 2009, 2010, 2013, and 2014 - Manitoba surveyed several sites in the mixed grass prairie region, including the location where the type specimens were found near Spruce Woods Provincial Park, Manitoba in 1979 (Westwood 2010; Murray 2014; C. Murray pers. comm., 2014).

6.2 Strategic Direction for Recovery

Table 3. Recovery Planning Table

| Threat or Limitation | Priority ^d | Broad Strategy to Recovery | General Description of Research and Management Approaches |
|--|-----------------------|---|--|
| Population Inventory and Monitoring | | | |
| Knowledge gaps: Species Range and Distribution | High | Address gaps in knowledge of Verna's Flower Moth range and distribution in Canada | <ul style="list-style-type: none"> • Survey during the adult flight period at sites where the species has been previously recorded to confirm occupancy as well as at other sites with potentially suitable habitat and determine the extent of the Canadian distribution. • Coordinate Verna's Flower Moth monitoring programs with those for other Lepidoptera in the Canadian Prairies. |
| Research | | | |
| Knowledge gaps: Species Biology | High | Address gaps in knowledge on the biology of Verna's Flower Moth and its threats | <ul style="list-style-type: none"> • Fill important knowledge gaps on Verna's Flower Moth life history (e.g., additional host plant requirements for larvae and adults, temperature and moisture levels, microhabitat requirements, threat factors, etc.). |
| Habitat Assessment, Management and Conservation | | | |
| All threats | High | Identify threats and develop mitigation techniques to ensure availability of suitable habitat | <ul style="list-style-type: none"> • Determine and implement beneficial management practices to achieve conservation of suitable habitat, and mitigation of threats. • Collaborate with land owners, land managers, government agencies and other relevant parties to promote, coordinate and implement habitat management and conservation efforts. • Integrate Verna's Flower Moth habitat management and stewardship efforts with those for other prairie species at risk in Canada. |

^d "Priority" reflects the degree to which the approach contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.

6.3 Narrative to Support the Recovery Planning Table

Population Inventory and Monitoring

Known occurrences of Verna's Flower Moth make up a small portion of the potential suitable habitat available throughout the Prairie Provinces. The vast majority of suitable habitat has never been surveyed for Verna's Flower Moths or has only been searched superficially and/or under less than ideal conditions. The adults have a brief flight period in spring, and surveys must be timed accordingly to ensure that survey effort is timed with *Antennaria* blooming. Consequently, it is likely that more intensive and extensive surveys of poorly surveyed or un-surveyed habitat in the southern Prairie Provinces will confirm the occupancy of previously identified occurrences and/or identify previously unreported occurrences of Verna's Flower Moths. Surveys for Verna's Flower Moth should be combined with surveys for other SARA-listed lepidoptera that occupy the same habitat type.

As Verna's Flower Moths can be difficult to identify in the field and are not known to be abundant, effective survey methods will need to be developed. This may include the use of several live-catch Malaise traps in addition to, or instead of hand-netting surveys to increase the probability of finding Verna's Flower Moths (G. Anweiler, pers. comm., 2014).

Research

Effective recovery and management of Verna's Flower Moth will require a good understanding of its life history and its habitat characteristics. Although the basic life history of the moth has been described from captive individuals (Hardwick 1983), there is little information on the habitat characteristics that Verna's Flower Moths require. The influence of climatic factors (e.g. moisture and temperature extremes, frost free days, etc.), grazing history, soil litter characteristics, etc. on Verna's Flower Moths are unknown. The species of *Antennaria* that are used as host plants by the Verna's Flower Moths also needs to be confirmed. Data is also needed as to whether or not plant blossoms other than those of the host plant, if any, are used as a nectar source by adult Verna's Flower Moths. This information is important to further our understanding of this species, and ensure that research and recovery efforts are best placed.

Habitat Assessment, Management and Conservation

Once occupied habitat is located, all threats need to be identified. Once each threat to the species and/or its habitat is identified and their relative importance to the population understood, mitigation techniques and beneficial management practices can be developed and implemented.

7. Critical Habitat

7.1 Identification of the Species' Critical Habitat

Critical habitat is defined in the *Species at Risk Act* (Subsection 2(1)) as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species”.

Critical habitat has not been identified for the Verna's Flower Moth in this recovery strategy. There is currently insufficient information available on this species' distribution and specific habitat requirements to identify critical habitat. Occupancy of the species has not been re-confirmed at the two recent locations in Alberta where only one individual was captured, nor at the location in Manitoba where the type specimens were collected in 1979. Additional surveys of these locations, as well as other locations with suitable habitat need to be carried out to confirm the species presence and identify specific habitat needs of the species. These studies are outlined below in the schedule of studies to identify critical habitat for Verna's Flower Moth.

7.2 Schedule of Studies to Identify Critical Habitat

Table 4. Schedule of Studies to Identify Critical Habitat for Verna's Flower Moth

| Description of Activity | Rationale | Timeline |
|---|---|-----------|
| Survey the locations where Verna's Flower Moth have been previously recorded | Confirm occupancy of the species at previously recorded locations | 2015-2017 |
| Identify and survey potentially suitable habitat for Verna's Flower Moth in the Prairies | Determine the presence of Verna's Flower Moth at additional locations | 2015-2017 |
| Identify environmental parameters at known colony locations once confirmed (i.e. soil type, moisture levels, landform, annual temperature and moisture level, vegetation composition) | Determine specific habitat requirements for Verna's Flower Moth | 2015-2017 |

8. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives.

Progress towards meeting the population and distribution objectives, must be reported within five years after this recovery strategy is finalized. Success of recovery strategy implementation will be measured against the following indicator:

- Occupancy at the two recent occurrences in Alberta (if confirmed) and any newly-discovered occurrences have been maintained.

9. Statement on Action Plans

One or more action plans for the Verna's Flower Moth will be completed by 2021. Efforts with other organizations working in grasslands should be coordinated to benefit multiple species at risk inhabiting this ecosystem.

10. References

- Adams, B. W., G. Ehlert, C. Stone, M. Alexander, D. Lawrence, M. Willoughby, D. Moisey, C. Hincz, and A. Burkinshaw. 2005. Rangeland Health Assessment for Grassland, Forest and Tame Pasture. Public Lands and Forests Division, Alberta Sustainable Resource Development. Pub No. T/044. 112 pp
- Agriculture and Agri-Food Canada. 2000. Prairie agricultural landscapes: a land resource review. Prairie Farm Rehabilitation Administration, Agriculture and Agri-Food Canada, Regina, Saskatchewan. 180 pp.
- Alberta Sustainable Resource Development (ASRD) and Alberta Conservation Association (ACA). 2008. Status of the Verna's Flower Moth (*Schinia verna*) in Alberta. Alberta Sustainable Resource Development, Wildlife Status Report No. 65, Edmonton, AB.
- Bataineh, Amanda L., B.P. Oswald, Bataineh, M. Mohammad; H.M. Williams, D.W. Coble. 2006. Changes in understory vegetation of a ponderosa pine forest in northern Arizona 30 years after a wildfire. *Forest Ecology and Management*. 235(1-3): 283-294. [65009]
- COSEWIC 2005. COSEWIC assessment and status report on the Verna's Flower Moth *Schinia verna* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 19 pp. (www.sararegistry.gc.ca/status/status_e.cfm).
- Friesen, C. and C. Murray. 2010. Rare Species Surveys and Stewardship Activities by the Manitoba Conservation Data Centre, 2009. Report No. 2009-04. Manitoba Conservation Data Centre, Winnipeg, Manitoba. 20 pp.
- Fryer, J.L. 2011. (Revised from Matthews, Robin F. 1993.) *Antennaria parvifolia*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/>.
- Gordon, D.R. 1998. Effects of invasive, non-indigenous plant species on ecosystem processes: lessons from Florida. *Ecological Applications* 8: 975-989.
- Henderson, D.C., and M.A. Naeth. 2005. Multi-scale impacts of crested wheatgrass invasion in mixed-grass prairie. *Biological Invasions* 7:639-650.
- Hardwick, D.F. 1983. A new species of *Schinia* (Noctuidae) from southern Manitoba and Saskatchewan with descriptions of its life history. *J. Lep. Soc.* 37:18-23.
- Hardwick, D.F. 1996. A Monograph to the North American Heliothentinae (Lepidoptera: Noctuidae). Published privately. 281 pp.
- Murray, C. 2014. Manitoba Conservation Data Centre Surveys and Stewardship Activities, 2013. Report No. 2014-01. Manitoba Conservation Data Centre, Winnipeg, Manitoba. v+40 pp.
- NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: <http://www.natureserve.org/explorer>. (Accessed: July 7, 2014).

- Nernberg, D. and D. Ingstrup. 2005. Prairie Conservation in Canada: The Prairie conservation action plan experience. USDA Forest Service. General Technical Report PSW-GTR-191.
- Nilsson, S.G., M. Franzen and E. Jönsson. 2008. Long-term land-use changes and extinction of specialised butterflies. *Insect Conservation and Diversity* 1: 197-207.
- Packer, L. and R. Owen. 2001. Population genetic aspects of pollinator decline. *Conservation Ecology* 5: 4.
- Patton, B. and A. Nyren. 2012. Long-term grazing intensity research in the Missouri Coteau Region of North Dakota. Central Grasslands Research Extension Center Annual Report. 15 pp.
- Samson, F.B., Knopf, F.L. and W.R. Ostlie. 2004. Great Plains ecosystems: Past, present, and future. *Wildlife Society Bulletin* 32:6-15
- Saskatchewan Prairie Conservation Action Plan Greencover Committee. 2008. Native Grassland and Forest, Rangeland Health Assessment, 62 pp.
- Smith, B. and G.J. McDermid. 2014. Examination of fire-related succession within the dry mixed-grass subregion of Alberta with the use of MODIS and Landsat. *Rangeland Ecological Management* 67:307-317.
- Swengel, A.B. and S.R. Swengel. 1999. Observations on *Schinia Indiana* and *Schinia ucens* in the Midwestern United States (Lepidoptera: Noctuidae). *Holarctic Lepidoptera* 6(1):11-21.
- Tscharntke, T., I. Steffan-Dewenter, A. Kruess and C. Thies. 2002. Characteristics of insect populations on habitat fragments: A mini review. *Ecological Research* 17: 229–239.
- Young, Mark. 1997. *The Natural History of Moths*. Poyser Natural History. London. 271 pp.
- Watmough, M.D. and M.J. Schmoll. 2007. Environment Canada's Prairie and Northern Region Habitat Monitoring Program Phase II. Recent habitat trends in the Prairie Habitat Joint Venture. Technical Report Number 493. Environment Canada, Canadian Wildlife Service, Edmonton, Alberta Canada.
- Westwood, R. 2010. Verna's Flower Moth (*Schinia verna*) surveys in the vicinity of Spruce Woods Provincial Park, Manitoba. Progress Report to: Environment Canada, Canadian Wildlife Service. Contract # K4E21-10-0285. August 10, 2010.
- Westworth, S. 2012. Determination of the presence (or current absence), distribution, and habitat associations of the threatened Verna's Flower Moth (*Schinia verna*). Environment Canada, Canadian Wildlife Service. Internal Report. 10 pp.

Personal Communications

Colin Murray, Project Biologist and Geomatics, Manitoba Conservation Data Centre, Manitoba. 2014.

Gary Anweiler, Associate, University of Alberta, Strickland Entomology Museum, Alberta. 2014.

Medea Curteanu, Wildlife Biologist, Canadian Wildlife Service, Environment Canada, Alberta. 2010.

Mike Pogue, Research Entomologist, United States Department of Agriculture, Washington. 2010.

Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#)³. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s⁴ (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The two recent occurrences of Verna's Flower Moth occur in a small proportion of the potential range for the species based on habitat availability and distribution of *Antennaria* species, which serve as its host. It is possible that further populations of Verna's Flower Moth will be discovered within the Prairie Ecozone, thus management for this species will likely be beneficial to many other species at risk in this ecosystem, such as: Ord's Kangaroo Rat (*Dipodomys ordii*), Western Harvest Mouse (*Reithrodontomys megalotis dychei*), Eastern Yellow-bellied Racer (*Coluber constrictor*), Burrowing Owl (*Athene cunicularia*), Loggerhead Shrike (*Lanius ludovicianus excubitorides*), Common Nighthawk (*Chordeiles minor*), Sprague's Pipit (*Anthus spragueii*), Small-flowered Sand-verbena (*Tripterocalyx micranthus*), Tiny Cryptantha (*Cryptantha minima*), Smooth Goosefoot (*Chenopodium subglabrum*), Slender Mouse-ear-cress (*Halimolobos virgata*), and Gold-edged Gem (*Schinia avemensis*). Coordination of efforts with recovery for other prairie species should be achieved to ensure resources are well placed.

³ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

⁴ <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1>