

COSEWIC
Assessment and Update Status Report

on the

Western harvest mouse
Reithrodontomys megalotis

Megalotis subspecies (*Reithrodontomys megalotis megalotis*)
Dychei subspecies (*Reithrodontomys megalotis dychei*)

in Canada



Photo/image by Michael Hames

Megalotis subspecies - SPECIAL CONCERN
Dychei subspecies - ENDANGERED
2007

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:

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Previous report:

David W. Nagorsen. 1994. COSEWIC status report on the Western harvest mouse *Reithrodontomys megalotis megalotis* and *Reithrodontomys megalotis dychei* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-20 pp.

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COSEWIC would like to acknowledge Pontus Lindgren for writing the status report on the Western harvest mouse *Reithrodontomys megalotis megalotis* and *Reithrodontomys megalotis dychei* in Canada, prepared under contract with Environment Canada, overseen and edited by Mark Brigham, Co-chair, COSEWIC Terrestrial Mammals Species Specialist Subcommittee.

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Western harvest mouse — Image by Michael Hames.

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COSEWIC Assessment Summary

Assessment Summary – April 2007

Common name

Western harvest mouse *megalotis* subspecies

Scientific name

Reithrodontomys megalotis megalotis

Status

Special Concern

Reason for designation

This subspecies has a limited range, and a small extent of occurrence and area of occupancy. However, the extent of occurrence and area of occupancy appear to be constant. Its principal native habitat in the Okanagan as well as old fields is declining. Furthermore, old apple orchards where the mouse has been caught are being converted to vineyards. Dispersal distance is limited and the likelihood of rescue effect is small. Extensive sampling has revealed the occurrence of the mouse at more localities. 61,000 hectares of suitable habitat is protected.

Occurrence

British Columbia

Status history

Designated Special Concern in April 1994 and in April 2007. Last assessment based on an update status report.

Assessment Summary – April 2007

Common name

Western harvest mouse *dychei* subspecies

Scientific name

Reithrodontomys megalotis dychei

Status

Endangered

Reason for designation

This subspecies has a limited range and has been found at only one location in the past 40 years; this location is isolated from others. Dispersal distance is limited and the population fluctuates. This species is commonly found in owl pellets in the USA, but none have been reported in owl pellets (including burrowing owls) in Suffield or other areas in southeast Alberta, despite substantial sampling. Owl pellet analysis is an excellent means of sampling for these mice.

Occurrence

Alberta

Status history

Species considered in April 1994 and placed in the Data Deficient category. Re-examined in April 2007 and designated Endangered. Last assessment based on an update status report.



COSEWIC
Executive Summary

Western harvest mouse
Reithrodontomys megalotis

Megalotis subspecies (*Reithrodontomys megalotis megalotis*)
Dychei subspecies (*Reithrodontomys megalotis dychei*)

Species information

The western harvest mouse (*Reithrodontomys megalotis*) has a body mass of approximately 11 g and averages 136 mm in total length, half of which is its tail. This brownish mouse has a faint dark dorsal stripe which runs the length of its body from head to tail, and has whitish fur on its belly. This species has prominent naked ears, a tail that is sparsely furred and white feet. It is similar in appearance to the larger and more common deer mouse and house mouse; however, juvenile deer mice are most often grey in colour and house mice have tails that are completely naked.

Distribution

The western harvest mouse occurs at its northernmost limit within the prairie grasslands of southern British Columbia (BC) and southeastern Alberta (AB). It is widespread throughout the central and western US, as well as Mexico.

Habitat

The western harvest mouse is associated with dry shrub-steppe habitats, apparently preferring areas with extensive cover, either in the form of tall grasses or shrubs such as antelope bitterbrush or sagebrush. This mouse occurs in many habitats, including dry gullies bordering grasslands and shrub-steppe rangelands, old fields, ponderosa pine forests, and both grazed and ungrazed sagebrush and antelope bitterbrush habitats.

Biology

This nocturnal mouse is omnivorous, but mainly eats seeds, new plant growth, and invertebrates such as caterpillars and moths. Western harvest mice live above ground and build small grass nests on the ground or up to 1 m above ground in shrubs. Females can breed at the age of four months and may have up to five litters per season

with an average litter size of 3. Although they can live for 18 months, most do not live past six months. Western harvest mice appear to be able to enter torpor to cope with cold temperatures. Some researchers speculate that they hibernate, although this may not occur within southern BC as this species has been captured during all months of the year. In Canada, owls are the only formally confirmed predator of western harvest mice, but other likely predators include prairie rattlesnakes, hawks, jays, shrikes, raccoons, foxes, weasels, skunks, badgers and coyotes. The dispersal distance of western harvest mouse is generally restricted to less than 300 m. Dispersal has been documented along road right-of-ways; however, roads appear to be avoided, and may limit dispersal.

Population sizes and trends

In the US, the western harvest mouse is a dominant member of grassland small mammal communities, reaching densities of 60 animals/ha within suitable habitat. In Canada, this species is naturally rare and occurs at low densities, typically comprising less than 10% of the small mammal community. Population densities as high as 80 animals/ha have been recorded in BC. Western harvest mice populations appear to peak in late fall or early winter and decline to low levels in midsummer. There are no data available on population size or trends at either a provincial or national level.

Limiting factors and threats

Western harvest mice are susceptible to habitat change resulting from fire, but populations can recover quickly provided there is suitable unburnt habitat nearby. Habitat fragmentation and loss caused by grazing, cultivation and other agricultural activities, and urban development, are likely the most significant threats to populations in Canada.

Special significance of the species

The BC and Alberta populations of western harvest mice are the northernmost distributions of two distinct subspecies separated by the Rocky Mountains. Although these subspecies are common and widespread throughout much of the US, marginal populations may contribute unique genetic attributes to a species' gene pool, and therefore enhance the genetic diversity and ability of the entire species to adapt to new conditions.

Existing protection

In 1994, COSEWIC assessed the BC subspecies (*R. m. megalotis*) as Special Concern and the Alberta subspecies (*R. m. dychei*) as Data Deficient in Alberta in 1994. Due to its limited range and apparent rarity, the BC government lists the western harvest mouse as *Vulnerable* (i.e., *Blue Listed*). The provincial rank for this species is S2S3, implying that this mouse is imperiled to uncommon. BC has over 63,000 ha of suitable habitat within protected areas (including parks, reserves, and land trusts).

However, many of these areas may be too small and/or separated beyond the dispersal distance of the mouse and, consequently, the viability of populations within this network of protected areas is unknown. Several Indian Reserves may contain significant amounts of western harvest mouse habitat. A lack of information in Alberta has resulted in the provincial government classifying the species as *Status Undetermined*. The few localities with confirmed presence of western harvest mice results in a provincial rank of S1, implying that this mouse is critically imperiled. Protected habitats are found within the Suffield National Wildlife Area (45,900 ha) and Writing-On-Stone Provincial Park (1,718 ha). Prior to the mid-1990s when western harvest mice were trapped in the Suffield National Wildlife Area, this mouse had not been recorded in the province since 1966.



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

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.



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

**Update
COSEWIC Status Report**

on the

Western harvest mouse
Reithrodontomys megalotis

Megalotis subspecies (*Reithrodontomys megalotis megalotis*)

Dychei subspecies (*Reithrodontomys megalotis dychei*)

in Canada

2007

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SPECIES INFORMATION

Name and classification

Western harvest mice (*Reithrodontomys megalotis* Baird) belong to the Order Rodentia and Family Cricetidae and there are five species in this genus which occur in the US and Canada. Of these, only the western harvest mouse occurs in Canada. Although as many as 17 subspecies of western harvest mouse have been proposed (Hall 1981), a comprehensive taxonomic review is required to substantiate this (Nagorsen 1990). Two subspecies, designated based on morphology only, *R. m. megalotis* and *R. m. dychei*, occur in Canada, reaching their northern limits in southern British Columbia (BC) and Alberta, respectively.

Morphological description

With an average mass of 11.0 g (range 8.0-15.0; Nagorsen 2005), the western harvest mouse is one of the smallest mice in North America (Banfield 1974, Forsyth 1999). Total length is 136 mm (range: 116-151), of which nearly half is a sparsely furred, bicoloured tail that is white ventrally (Cahalane 1961, Nagorsen 2005). This mouse has prominent naked ears, tawny pelage, buff sides, white to deep grey undersides, a dark mid-dorsal stripe that runs from the forehead to tail, and white hind feet (Banfield 1974, Burt and Grossenheider 1976, Nagorsen 2005).

The western harvest mouse may be confused with larger deer mice (*Peromyscus maniculatus*) and house mice (*Mus musculus*; Nagorsen 2005). A juvenile deer mouse of comparable size to a western harvest mouse can be distinguished by its dull grey pelage, and a house mouse can be distinguished by its naked tail (Nagorsen 2005).

Designatable units

Within Canada there are two recognized designatable units (subspecies) for the western harvest mouse. The subspecies *R. m. megalotis* and *R. m. dychei* are found within southern BC and Alberta, respectively.

DISTRIBUTION

Global range

The western harvest mouse is endemic to North America and found throughout much of west-central Mexico and the west and central US. The species occurs at its northern limit in southwestern Canada (Hall 1981; Fig. 1).

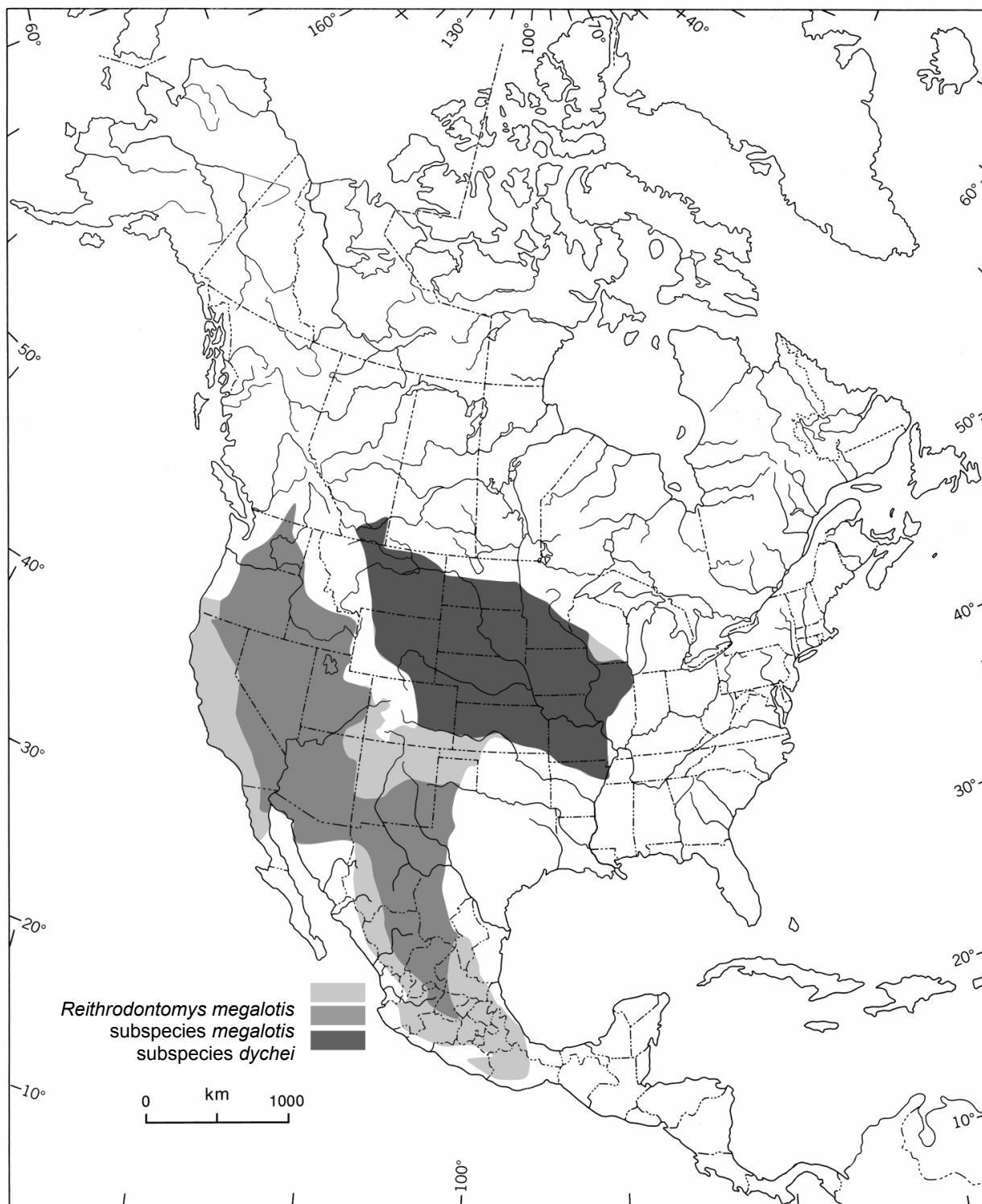


Figure 1. Distribution of western harvest mouse within North America (adapted from Hall 1981 and Reynolds *et al.* 1999).

Canadian range

The Canadian distribution of the western harvest mouse is restricted to the intermontane grasslands of south-central BC (*R. m. megalotis*) and the dry mixed grass prairie of southeastern Alberta (*R. m. dychei*; Fig. 2). The Canadian range accounts for less than 1% of the total range. The BC and Alberta populations account for only 0.3 and 1.7% of the total range of *R. m. megalotis* and *R. m. dychei*, respectively. The Extent of Occurrences (EO) for *R. m. megalotis* and *R. m. dychei*, respectively are estimated at 2,850 and 459 km² based on the locations at which they have been trapped recently and historically (COSEWIC Secretariat based on data from P.M.F. Lindgren). Likewise, the Area of Occupancies (AO) is approximately 108 and 156 km².

British Columbia

Western harvest mice occur throughout the Okanagan Valley, as far north as Vernon, and in the Similkameen River valley, as far north as Keremeos (Nagorsen 1995). The mouse has not been captured in the central Okanagan near Kelowna, suggesting that the Vernon population is isolated from populations to the south (Fig. 2). The mouse is also absent from adjacent valleys, including the Thompson and Kettle River valleys (Nagorsen 1995). However, low trapping success (Sullivan and Sullivan 2004) makes the absence of records an unreliable means of assessing distribution. For example, absence from the Kelowna area is based on four transects and 600 trap-nights, from the Thompson River Valley based on two transects and 300 trap-nights, and from the Kettle River Valley based on four transects and 600 trap-nights (Nagorsen 1995; Table 1).

Table 1. Recent records providing distribution and demographic data for the western harvest mouse.

Location	Year	Trap-nights	Individuals captured	Source
British Columbia				
Prairie Valley (Summerland)	1999 to 2003	27,300	321	Sullivan 2004, Sullivan and Sullivan 2006a
Ag. Canada Research Station (Summerland)	1993-1995	11,600	347	Sullivan and Sullivan 2004
Osoyoos and Oliver	1994-1996	10,192	346	W. Klenner, unpub. data
Keremeos	1990	150	3	Nagorsen 1995
Thompson River Valley	1991	300	0	Nagorsen 1995
Kelowna	1992	600	0	Nagorsen 1995
Kettle River Valley	1990, 1992	600	0	Nagorsen 1995
Alberta				
Suffield National Wildlife Area	1994-1996	48,578	95	Reynolds <i>et al.</i> 1999
Southeastern Alberta (14 localities)	1982-2005	6,000+	0	D. Gummer, pers. comm.

Alberta

Little is known about the distribution of western harvest mice within Alberta. The mouse has been documented at only four localities. Prior to 1994, its distribution was based on three museum specimens collected near Milk River, Medicine Hat, and in the Pinhorn Grazing Reserve near Manyberries (Moore 1952, Smith 1993). During 1994 and 1995, 95 western harvest mice were captured along the South Saskatchewan River within the Canadian Forces Base Suffield National Wildlife Area (Reynolds *et al.* 1999; Table 1), extending the distribution range north by 80 km (Engley and Norton 2001).

With the exception of the Suffield records (Reynolds *et al.* 1999), the species has not been documented in Alberta since 1966. The lack of intervening records stands in spite of numerous surveys (D. Gummer, pers. comm.; Table 1) and extensive analysis of owl pellets (Schowalter 2004, R. Poulin and R. Schmelzeisen, pers. comm.) collected from within the supposed range of this species in Alberta. The analysis of owl pellets represents an excellent means of sampling for these mice. These data suggest that western harvest mice are extremely rare in Alberta and that the harvest mice sampled within the Suffield National Wildlife Area may be part of a disjunct northern population, isolated from the Montana population by at least 150 km (Fig. 2).

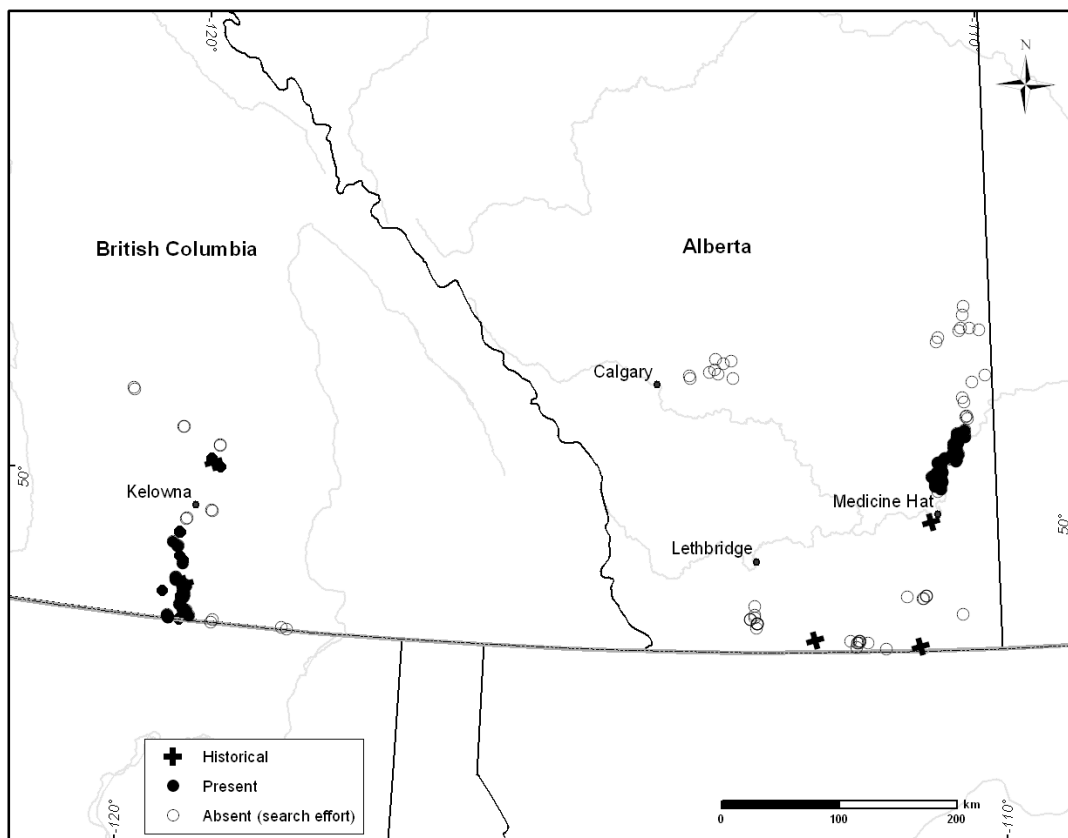


Figure 2. Distribution of the western harvest mouse in Canada based on trapping records. Historical localities in Alberta were documented in 1951 and 1966.

HABITAT

Habitat requirements

Little is known about the detailed habitat requirements of the western harvest mouse. Information about habitat preference has been inferred from the types of habitats where the mouse is most often captured. This species prefers habitats characterized by tall herbaceous cover (Kaufman and Fleharty 1974, Moulton *et al.* 1981, Davis *et al.* 2000). In the western US and Mexico, these mice inhabit grasslands, shrub-steppe, edge habitats bordering agricultural areas, coastal salt marshes, and riparian habitats (Webster and Jones 1982). Although western harvest mice have been found at elevations up to 4,000 m in Mexico, in Canada, the mouse is confined to lower elevations (Nagorsen 1994).

British Columbia

In BC, the western harvest mouse is restricted to valley bottoms, or south-facing slopes (up to 780 m) of the South Okanagan Basin, South Okanagan Highland, Okanagan Range, and North Okanagan Basin ecosections (British Columbia Ministry of Environment 2005a, Meidinger and Pojar 1991). Suitable habitats within these ecosections include the very dry and hot subzones of the Bunchgrass, Ponderosa Pine, and Interior Douglas-fir Biogeoclimatic Zones (Nagorsen 1995, Meidinger and Pojar 1991). These areas are shrub-steppe grasslands with abundant tall grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and shrubs such as sagebrush (*Artemisia tridentata*), and antelope bitterbrush (*Purshia tridentata*) (Nagorsen 1994, 2005).

Nagorsen (1995) reported that most western harvest mice were captured in dry gullies with dense shrub cover that border grassland and shrub-steppe rangeland (n=16 animals).

At Prairie Valley (near Summerland, BC), 58.9% of the 321 western harvest mice were captured in old fields, 20.6% in sagebrush habitats, 15.6% in conventional apple orchards, 2.2% in riparian areas, 1.6% in Ponderosa pine (*Pinus ponderosa*) forests, 0.9% in hedgerows, and 0.3% in dwarf apple orchards (Sullivan 2004, Sullivan and Sullivan 2006a; Table 1). Western harvest mice occurred at densities of up to 10/ha in old fields and an unmanaged apple orchard, and up to 5/ha in sagebrush habitats (Sullivan and Sullivan 2005 and 2006b). Mean density during fall-winter months ranged from 54.3/ha in old fields, which had abundant alfalfa (*Medicago sativa*) and grass cover, to 4.7/ha in old fields with no alfalfa and limited grass cover. Consequently, habitat quality is inferred to increase with a well-developed and abundant herb layer. In a study at the Agriculture Canada Summerland Research Station, western harvest mice were captured on two irrigated old fields; abandoned for ≥ 25 years (Sullivan and Sullivan 2004; Table 1).

W. Klenner (unpubl. data; Table 1) found that western harvest mice occurred at relatively high densities (up to 22/ha) within ungrazed shrub-steppe habitats dominated

by antelope bitterbrush (livestock excluded for at least 25 years). The amount of this habitat in the Okanagan is limited. Similar habitats that had been burned in 1991 (3 years prior to sampling) supported a western harvest mouse population, although at reduced densities (up to 13/ha). The mouse was also frequently captured in heavily grazed habitats (little grass cover) dominated by sagebrush or antelope bitterbrush (W. Klenner, unpubl. data). These results suggest that, although preferring well-developed grass cover found in habitats without heavy grazing, the western harvest mouse is able to persist, or at least disperse, through grazed habitats, as long as there is enough cover provided by shrubs such as antelope bitterbrush or sagebrush.

Alberta

The only information on habitat associations of western harvest mice within Alberta comes from small mammal surveys conducted within the Suffield National Wildlife Area (Reynolds *et al.* 1999; Table 1). Based on these records, this mouse is strongly associated with low relief, flat, or gently undulating grasslands with sandy soils and an associated dense cover of vegetation, particularly shrubs. While most captures were within grasslands, six mice were captured within a cottonwood forest with dense shrub cover. The mouse appears to require habitats with abundant overhead cover. No captures were made in wet habitats.

Habitat trends

British Columbia

The amount of shrub-steppe habitat available for the western harvest mouse in the Okanagan Valley has been declining over the past 70 years because of the combined effects of cattle grazing, agriculture, and urbanization. In a recent analysis of antelope bitterbrush shrub-steppe habitat, Wood (2003), calculated the rate of loss (primarily due to vineyard development) to be 90 ha/year during 1995-2001. The rate of habitat loss increased to 220 ha/year during 2001-2003. Based on this rate, antelope bitterbrush habitat will be completely eliminated from the South Okanagan - Similkameen within the next 18 years (Wood 2003). Grazing presumably affects habitat quality by altering natural grassland plant species composition and cover (Tisdale 1947). Within the southern Okanagan, intensive grazing occurred in the late 1880s (Cannings *et al.* 1987) and continues today (Wikeem and Wikeem 2004). Vegetation management practices associated with agriculture (e.g., mowing and herbicide application) are assumed to decrease the habitat quality for western harvest mice, which are associated with abundant cover. However, this mouse appears somewhat flexible in habitat use and has been captured within conventional and organic orchards in the Okanagan, although at lower densities compared to habitats with abundant cover such as old fields (Sullivan 2004, Sullivan and Sullivan 2005, 2006a and b). Habitat loss related to the rapidly expanding cities of Penticton, Kelowna, and Vernon likely poses the most significant threat to western harvest mouse habitat. Over the past 30 years, the human population of the Okanagan-Similkameen river basin has more than doubled, which represents the fastest growth rate among the 23 major river basins in Canada (Statistics Canada

2003). From 1971 to 2001, the human population in the Okanagan-Similkameen basin increased by 137% to 285,145 (Statistics Canada 2003). It is anticipated that the Regional District of Okanagan-Similkameen will experience considerable growth in the next 20 years. The projected trend is for a 30% increase in population during 2004-2021 (South Okanagan Regional Growth Strategy 2006).

Alberta

Given the current state of knowledge about western harvest mice in Alberta, evaluation of habitat trends is only speculative. It is likely that Alberta's history of cultivation and grazing (Coupland 1987), as well as urbanization around cities, will jeopardize habitat quality for small mammals in a similar manner as for BC.

Habitat protection/ownership

British Columbia

Suitable habitat for the western harvest mouse occurs in several protected areas (including parks, ecological reserves, and land trusts) located throughout the Okanagan and Similkameen River valleys. While these protected areas may be free from various forms of development and disturbance, except for the ecological reserves, many are still grazed by domestic livestock. These protected areas total 94,903 ha, with 67% of this area (63,567 ha) suitable for western harvest mice (Table 2). The six protected areas that contribute the majority of western harvest mouse habitat are Kalamalka Lake Protected Area (1,806 ha), Okanagan Mountain Park (6,247 ha), White Lake Grasslands Protected Area (3,741 ha), Vaseux Protected Area (1,983 ha), Snowy Protected Area (1,653 ha), and the South Okanagan Grasslands Protected Area (8,052 ha). In addition, approximately 38,700 ha are managed by the Nature Trust of British Columbia and include both privately owned and long-term lease agreements (2,700 ha) as well as Crown grazing tenures (36,000 ha). Many of these protected areas are likely separated by distances greater than the dispersal ability of the mouse (Nagorsen 1994).

Federal lands that contain western harvest mouse habitat include the 325 ha Agriculture Canada Summerland Research Station. Also, 17 Indian Reserves, totalling over 45,000 ha, may include habitat suitable for this mouse (Table 3). Nagorsen (1994) suggested that many of these reserves include low elevation grasslands that are relatively undisturbed and, therefore, have high potential to contain suitable habitat. The state of Indian Reserves, especially near Osoyoos is likely quite different now and the potential for finding mice has likely declined (D. Fraser, pers. comm.)

Table 2. Protected areas (PA) containing suitable habitat for western harvest mice within British Columbia.

Name of protected area	Total area (ha)	Area of suitable ¹ habitat (ha)	% suitable ¹ habitat
Kalamalka Lake Park ²	978	978	100
Kalamalka Lake PA ²	3,231	1,806	56
Okanagan Lake Park ²	98	65	66
Okanagan Mountain Park ²	10,462	6,247	60
Inkaneep Park ²	21	21	100
White Lake Grasslands PA ²	3,741	3,741	100
Vaseux Protected Area ²	2,015	1,983	98
Johnstone Creek Park ²	38	14	37
Keremeos Columns Park ²	57	4	7
Snowy PA ²	25,889	1,653	6
South Okanagan Grasslands PA ³	9,370	8,052	86
Trout Creek Ecological Reserve ²	68	68	100
Hayne's Lease Ecological Reserve ²	101	101	100
Campbell-Brown Ecological Reserve ⁴	104	104	100
Mahoney Lake Ecological Reserve ²	30	30	100
Nature Trust - private or long-term lease ⁵	2,700	2,700	100
Nature Trust - Crown grazing tenure ⁵	36,000	36,000	100
TOTAL	94,903	63,567	67

¹ Suitable habitat as defined by Nagorsen (1995) (i.e., biogeoclimatic units = BGxh1, PPxh1, IDFxh1, and IDFxh1a)

² Adapted from Wikeem and Wikeem 2004

³ Adapted from British Columbia Ministry of Water, Land and Air Protection (2003a, b, c, and d)

⁴ Adapted from British Columbia Ministry of Environment (2005b)

⁵ C. McNaughton pers. comm.

Table 3. Indian Reserves within, or adjacent to, known distribution of western harvest mice within British Columbia¹.

Reserve name	Total area (ha)
Blind Creek 6	161.0
Blind Creek 6a	0.1
Chopaka 7 & 8	1,573.8
Duck Lake 7	179.1
Keremeos Forks 12 & 12a	954.1
Lower Similkameen 2	1,293.7
Mission Creek 8	2.0
Narcisse's Farm 4	750.3
Osoyoos 1	12,987.6
Osoyoos 3	64.7
Penticton 1	18,539.8
Penticton 2	13.1
Priest's Valley 6	33.6
Range 13	6,768.1
Salmon River 1	1,559.3
Tsinstikeptum 9	339.0
Tsinstikeptum 10	641.8
TOTAL	45,861.1

¹ Source = ATK coordinator, COSEWIC Secretariat.

Alberta

The Suffield National Wildlife Area likely supports a significant population of western harvest mice at the northern range limit for this species. Over 45,900 ha of western harvest mouse habitat is federally protected along the South Saskatchewan River within the Canadian Forces Base Suffield National Wildlife Area since its official designation in June 2003. In 1992, a small mammal survey (5 transects, 888 trap-nights) in Writing-On-Stone Provincial Park (1,718 ha) failed to capture any western harvest mice (D. Gummer, pers. comm). However, this protected area should still be considered as providing potential habitat. The distance that separates the Suffield National Wildlife Area and Writing-On-Stone Provincial Park (over 150 km) makes dispersal between these two areas unlikely.

BIOLOGY

The western harvest mouse has not been studied comprehensively and most information is derived from studies conducted in the US. Within Canada, the only studies providing insight into the biology of the western harvest mouse are those of Sullivan (e.g., Sullivan 2004, Sullivan and Sullivan 2006a) and Klenner (unpubl. data). Nagorsen (2005) summarized the species biology.

Life cycle and reproduction

The western harvest mouse is nocturnal and forages primarily on the ground for seeds and invertebrates (e.g., caterpillars and moths; Cahalane 1961, Whitaker and Mumford 1972, Meserve 1977, Johnson and Gaines 1988, Jekanoski and Kaufman 1995). The mouse frequently climbs shrubs (as high as 1 m) in search of seeds, flowers, and invertebrates, and climbs grass stalks to harvest seeds (Cahalane 1961, Meserve 1977, Jekanoski and Kaufman 1995). In coastal California, up to 50% of western harvest mouse spring food consisted of flowers and seeds (Meserve 1976). Arthropods (primarily lepidopterans) made up to 30% of the diet (Meserve 1976).

Western harvest mice can live for up to 18 months in the wild; however, few survive more than six months (Nagorsen 2005). Females are reproductive beginning at four to 12 months of age. Gestation is 21 – 24 days with an average of 4.1 embryos (range of 1 – 9) and 2.6 young (range of 1 – 7; Hayssen *et al.* 1993, Nowak 1999). The maximum number of litters per season is four or five (Hayssen *et al.* 1993). Young are 1 – 1.5 g at birth, 7 – 8 mm in length (Jackson 1961), and are weaned at approximately 20 days (Hayssen *et al.* 1993). Generation time is estimated to be 6 months.

Based on an intensive study in southern BC, western harvest mice bred from March to November producing a variable number of litters per year. The proportion of breeding males was 75% of the population in three old-field and sagebrush habitats and 42.9% in an organic orchard (Sullivan and Sullivan 2005 and 2006b). Early juvenile survival (an index relating recruitment of young into the trappable population to the

number of lactating females) ranged from three young per pregnant female in old fields to five in the organic orchard and to six in sagebrush habitats (Sullivan and Sullivan 2005 and 2006b).

Nests are spherical or cup-shaped, approximately 7.5 – 12.5 cm in diameter (Webster and Jones 1982, Wilson and Ruff 1999), and usually occur in shrubs up to 1 m above the ground (Webster and Jones 1982) but occasionally in burrows or on the ground (Birkinholz 1967). In general, nests are placed in shrubs and are composed of plant material with an outer layer of coarsely woven grasses and fibrous plant material and an inner layer of softer plant material such as down or dandelion fluff (Wilson and Ruff 1999).

Predation

Possible predators of western harvest mice include owls (Marti 1974, Cannings 1987), hawks, jays, shrikes, prairie rattlesnakes, raccoons, foxes, weasels, skunks, badgers and coyotes (Brant 1962, Kaufman *et al.* 1993, Brillhart and Kaufman 1994, Forsyth 1999, Wilson and Ruff 1999). Cannings (1987) found that western harvest mice made up <5% of the diet of northern saw-whet owls (*Aegolius acadicus*) in southern BC.

Physiology

Western harvest mice enter a shallow state of torpor when starved and exposed to cold temperatures in a laboratory setting (Thompson 1985). The ability to enter torpor under natural conditions is likely important for the survival of individuals in Canada due to the cold temperatures experienced by these mice at the northern periphery of their distribution (Nagorsen 2005). Although an ability to hibernate has been suggested (O'Farrell 1974), this mouse has been captured throughout the year in BC (Sullivan and Sullivan 2004).

Dispersal

O'Farrell (1978) estimated a mean home range of 1.12 ha while Meserve (1977) found home ranges between 0.44 and 0.56 ha. Dispersal distances of western harvest mice are generally <300 m (Brant 1962, Clark *et al.* 1988, Skupski 1995); however, long-distance movements of 375-3200 m have been reported for some individuals (Clark *et al.* 1988). Males generally move farther than females (Clark *et al.* 1988, Skupski 1995). Of five animals moving >1 km, daily average movement distance to reach the new site was 135 m (direct linear distance; Clark *et al.* 1988).

Individuals displaced by up to 300 m returned to their home areas (Fisler 1966). However, Kozel and Fleharty (1979) found that no mice returned after having been transported to the other side of a road on the edge of their home range.

Documented range expansions of the western harvest mouse in Illinois and Indiana indicate the potential for dispersal when appropriate habitats are available, for

example along road rights-of-ways (Whitaker and Mumford 1972, Ford 1977). Western harvest mice had the highest recruitment and immigration rates of any small mammal species trapped during a study near Summerland, BC (Sullivan and Sullivan 2006b). This suggests that they should be capable of colonizing new areas of suitable habitat.

Western harvest mice have been observed to use the runways constructed by sympatric rodents, including those of the genus *Microtus* and *Sigmodon* (Hall 1946). However, harvest mice do not appear to assist with runway maintenance (Pearson 1959).

Interspecific interactions

Western harvest mice may compete locally with other similar sized rodents such as deer mice, house mice, and montane voles (*Microtus montanus*) (Johnson and Gaines 1988, Heske *et al.* 1994, Fa *et al.* 1996, Stapp 1997). In grassland communities of California, Heske *et al.* (1984) found that in years when California voles (*Microtus californicus*) were abundant, harvest mice became locally extinct. Removal of kangaroo rats (*Dipodomys* spp.) in Arizona resulted in higher densities of harvest mice (Skupski 1995). In BC, montane voles may be important competitors (Sullivan and Sullivan 2004). Competition with deer mice, the dominant mouse in habitats with western harvest mice, is less likely since these species appear to exploit different microhabitats (Cahalane 1961, Kaufman *et al.* 1988).

Grazing by domestic livestock decreases cover and food availability and therefore has a negative impact on western harvest mouse habitat. In eastern Colorado, Moulton *et al.* (1981) found that western harvest mice were not present on grazed sagebrush habitats but were common in ungrazed areas. Although this mouse may prefer the cover provided within ungrazed habitats, it is found on grazed sites in BC, when abundant shrub cover is present (W. Klenner, pers. comm.).

Adaptability

The potential for western harvest mice to enter torpor when faced with a lack of food and extreme cold (Thompson 1985), its high rates of reproduction (Bancroft 1967, Hayssen *et al.* 1993) and recruitment (Sullivan and Sullivan 2006b), and dispersal ability (Whitaker and Mumford 1972, Ford 1977), combine to make it adaptable to stochastic events in its environment. Given adequate connectivity among suitable patches of habitat, these mice appear to be resilient to local extirpation events. For example, despite being susceptible to fire (Kaufman *et al.* 1988), this mouse is a common resident throughout the fire-dependent grasslands of most of North America, and occurred at relatively high densities (up to 13/ha) just 3 years after a fire in southern BC (W. Klenner, pers. comm.).

POPULATION SIZES AND TRENDS

Search effort

Trapping has been the primary method used to determine the presence/absence and abundance estimates for this species in Canada. Search effort is most often described in terms of trap-nights. Kill trapping along transects was commonly used to determine presence/absence (e.g., Reynolds *et al.* 1999), whereas 1 ha live-trapping grids were used to estimate abundance (e.g., Sullivan and Sullivan 2004, W. Klenner unpubl. data). Nagorsen (1995) used a combination of live- and kill- trapping along 500 m transects to assess presence/absence throughout BC.

Abundance

Even at a localized scale (e.g., 1 ha trapping grids), there are few estimates of western harvest mouse abundance. Although densities as high as 60 animals/ha have been reported in grasslands in the US (Whitford 1976), the mouse is naturally rare within Canada, typically comprising <10% of the total number of small mammals within a given habitat (Nagorsen 1995, Cannings *et al.* 1999, Reynolds *et al.* 1999). There are no provincial or national estimates of abundance.

British Columbia

At Prairie Valley (near Summerland), mean density of western harvest mice over fall-winter months ranged from 4.7/ha in poor-quality habitat, to 54.3/ha in high-quality habitat (Sullivan and Sullivan 2006a; Table 1). During December 1994, density in an irrigated field reached 80 individuals within a 1 ha trapping grid; the mean (\pm S.E.) annual density within this habitat was 29.2/ha (\pm 23.5) (Sullivan and Sullivan 2004; Table 1).

Near Osoyoos and Oliver, up to 22 individuals were found within a 1 ha grid during a single trap session (2 consecutive nights of trapping). Although a formal analysis of these data is not complete, population density estimates likely peaked at ca. 40/ha (W. Klenner, unpubl. data; Table 1).

Alberta

Western harvest mice were the second and third most frequently captured small mammal species during surveys carried out within the Suffield National Wildlife Area during 1994 and 1995, respectively (Reynolds *et al.* 1999). No mice were captured in 1996. Given that it required three years and 48,578 trap-nights of sampling effort to capture 95 western harvest mice, which represented approximately 5% of the total small mammals captured (95 out of 2,050), it is clear that this mouse occurs at low density in the study area (Reynolds *et al.* 1999). Between 1982 and 2005, over 6,000 trap-nights along 69 survey transects (14 localities) throughout southeastern Alberta did not yield a single western harvest mouse (D. Gummer, pers. comm.). In addition, several projects

involving an analysis of owl pellets collected throughout southern Alberta have identified the remains of several thousand small mammals, none of which were western harvest mice (Schowalter 2004, R. Poulin and R. Schmelzeisen, pers. comm.). These data provide strong evidence for the rarity of this subspecies in Alberta.

Fluctuations and trends

Dramatic seasonal fluctuations have been reported for western harvest mice in BC. During several multi-year studies, population densities have been consistently reported to peak during the fall and winter months and drop off sharply during midsummer (Sullivan and Sullivan 2004, 2005, 2006a, W. Klenner, unpubl. data). A 4-year study did not detect any multi-annual cycle (Sullivan and Sullivan 2005); however, density fluctuated between years (10 to 40/ha; W. Klenner, pers. comm.). Within Alberta, the number of harvest mice captured within the Suffield National Wildlife Area also varied, ranging from 80 in 1994, to 15 in 1995, and zero in 1996. While sampling effort was not equal among years it was of a similar magnitude (Reynolds *et al.* 1999).

Rescue effect

Because the western harvest mouse is considered common within the two states that border the BC and Alberta populations (Washington and Montana, respectively; NatureServe 2005, see existing protection or other status designations below), the potential for a rescue effect does exist. This potential is enhanced by the dispersal ability (Whitaker and Mumford 1972, Ford 1977) and high rates of recruitment (Sullivan and Sullivan 2006b) reported for this mouse. However, in the event of a significant population decline or local extirpation within Canada, a successful rescue effect may be impeded by the lack of connectivity among suitable habitat fragments located between the secure populations to the south and the potential range in Canada. A better understanding of the habitat requirements of this mouse, as well as its ability to disperse through the existing fragmented landscape of southern BC and Alberta, is required before the potential for a rescue effect should be interpreted as reducing the risk of extirpation in Canada. If the Suffield National Wildlife Area provides the only remaining habitat for harvest mice in Alberta, then a rescue effect is unlikely due to the hundreds of kilometres that separate Montana's harvest mouse populations from this protected area.

LIMITING FACTORS AND THREATS

Harvest mice are likely susceptible to the direct effects of fire (i.e., mortality; Kaufman *et al.* 1988) as well as indirect effects that fire has on habitat (i.e., removal of cover and food). Kaufman *et al.* (1988) and McMillan *et al.* (1995) noted population declines following fire in ungrazed tall prairie in Kansas. In BC, a 1993 fire which burned the entire Hayne's Lease Ecological Reserve near Osoyoos Lake and a 2003 fire that burned most of Okanagan Mountain Park likely reduced harvest mouse populations in these areas. However, densities of up to 13 western harvest mice/ha were recorded 3 years following a fire in the southern Okanagan (W. Klenner, pers.

comm.), suggesting that the impacts of fire may be short-lived. In addition, Masters *et al.* (1998) found that prescribed burning of dense pine stands in Oklahoma resulted in an increase in herbaceous-forage production and an increase in densities of fulvous harvest mouse (*Reithrodontomys fulvescens*), a species with similar habitat requirements.

The use of rodenticides to control vole (*Microtus* spp.) and northern pocket gopher (*Thomomys talpoides*) populations in old-field and orchard habitats in BC may have significant impacts on local populations of western harvest mice. However, orchards are not the preferred habitat for the western harvest mouse; thus, mortality from poisoning is assumed to be low (Sullivan and Sullivan 2005).

Cattle and horse grazing, agriculture, and urbanization are likely the greatest threats to the habitat of western harvest mice. The only recent records of harvest mice within Alberta all come from the Suffield National Wildlife Area (Reynolds *et al.* 1999), an area with relatively little livestock or other agricultural activities, suggesting that in Alberta, the harvest mouse may be particularly sensitive to agricultural disturbance. In BC, conversion of grasslands to orchards, cultivated fields, and more recently, urban development and vineyards has eliminated large areas of shrub-steppe habitats important to this mouse (British Columbia Ministry of Environment, Lands and Parks 1998, Wood 2003). The use of linear edge habitats may be particularly important for the dispersal of this species among suitable habitat fragments. Because western harvest mice have been caught in roadside habitats (Whitaker and Mumford 1972, Ford 1977) and along cultivated fields (Nagorsen 1995), mowing these habitats also poses a significant threat. The creation of new roads may result in a significant barrier to dispersal and movement by harvest mice. Kozel and Fleharty (1979) found that no western harvest mice returned after having been transported to the other side of a road on the edge of their home range.

SPECIAL SIGNIFICANCE OF THE SPECIES

In Canada, the western harvest mouse occurs only in restricted habitats of the intermontane grasslands of BC and the mixed grass prairie of southern Alberta. These two distinct populations are both at the northernmost limits of their North American range. Because of the selective pressures on individuals within populations at the periphery of a species distribution, marginal populations may be instrumental for maintaining the genetic diversity of a species (Scudder 1993). However, there are many instances where the opposite is true and swamping from core populations disallows local adaptation or clear differentiation.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The extensive distribution of western harvest mice (*R. megalotis*) throughout most of the US and Mexico results in this species receiving a global rank of G5 and a national

(US) rank of N5, which implies that this mouse is demonstrably widespread, abundant, and secure throughout most of North America, including Mexico (NatureServe 2005). The limited distribution within Canada results in a Canadian national rank of N2N3 (imperiled to uncommon, generally consisting of six to 100 extant occurrences; NatureServe 2005). As a result it was previously assessed by COSEWIC in April 1994 as Special Concern in BC and Data Deficient in Alberta .

British Columbia

The widespread distribution of the BC subspecies of western harvest mice (*R. m. megalotis*) throughout the western US and Mexico results in this infraspecific taxon receiving a global rank of T5 (very common), and a sub-national rank of S4S5 (frequent to very common) within Washington, the only state adjacent to its range within BC (NatureServe 2005). In BC, because of the limited distribution and apparent rarity, this mouse is ranked as S2S3 (imperiled to uncommon, generally consisting of six to 100 extant occurrences; British Columbia Conservation Data Centre 2005). The widespread use of road edge and disturbed habitats kept the subspecies from being uplisted further (L.R. Ramsay; pers. comm.). The western harvest mouse is on the provincial *Blue List* and is therefore considered *Vulnerable* (Cannings *et al.* 1999, British Columbia Conservation Data Centre 2005). This species is also protected by the provincial Wildlife Act; collecting or live-trapping requires permits.

Alberta

Although the distribution of the Alberta subspecies of western harvest mice (*R. m. dychei*) is widespread throughout the central US, this infraspecific taxon receives a global rank of TNR (rank not yet assessed), likely due to a lack of data at the subspecies level (NatureServe 2005). Within Montana, the only state adjacent to its range within Alberta, this subspecies receives a sub-national rank of S4 (apparently secure but may have restricted distribution; NatureServe 2005). In Alberta, because of the limited distribution and apparent rarity, this mouse is ranked as S1 (critically imperiled and known from five or fewer extant occurrences; NatureServe 2005). A lack of data has resulted in this subspecies being classified by the provincial government as *Status Undetermined* (Province of Alberta 2000). In Alberta, the mouse is protected by the provincial Wildlife Act as a non-game species.

TECHNICAL SUMMARY

Reithrodontomys megalotis megalotis

Western harvest mouse *megalotis* subspecies

Souris des moissons de la sous-espèce *megalotis*

Range of Occurrence in Canada: British Columbia

Extent and Area Information^a	
• <i>Extent of occurrence (EO)(km²)</i>	2,850 km ²
• <i>Specify trend in EO</i>	Stable
• <i>Are there extreme fluctuations in EO?</i>	No
• <i>Area of occupancy (AO) (km²)</i>	108 km ²
• <i>Specify trend in AO</i>	Stable
• <i>Are there extreme fluctuations in AO?</i>	No
• <i>Number of known or inferred current locations</i>	18
• <i>Specify trend in #</i>	Increasing
• <i>Are there extreme fluctuations in number of locations?</i>	No
• <i>Specify trend in area, extent or quality of habitat</i>	Decreasing

^a Area information was estimated based on present (i.e., post-1970) locations (see Fig. 2). AO was estimated following IUCN guidelines and used a 2 x 2 km (4 km²) grid.

Population Information	
• <i>Generation time (average age of parents in the population)</i>	6 months
• <i>Number of mature individuals</i>	Unknown
• <i>Total population trend:</i>	Unknown
• <i>% decline over the last/next 10 years or 3 generations.</i>	Unknown
• <i>Are there extreme fluctuations in number of mature individuals?</i>	Yes
• <i>Is the total population severely fragmented?</i>	Yes
• <i>Specify trend in number of populations</i>	Increasing
• <i>Are there extreme fluctuations in number of populations?</i>	No
• <i>List populations with number of mature individuals in each:</i>	
Threats (actual or imminent threats to populations or habitats)	
-urban development, cultivation and agricultural activity, domestic livestock grazing, fire	
Rescue Effect (immigration from an outside source)	
• <i>Status of outside population(s)?</i> USA: T5 (very common) Washington: S4S5 (frequent to very common)	
• <i>Is immigration known or possible?</i>	not known, but possible
• <i>Would immigrants be adapted to survive in Canada?</i>	Yes
• <i>Is there sufficient habitat for immigrants in Canada?</i>	Unknown
• <i>Is rescue from outside populations likely?</i>	No
Quantitative Analysis	
n/a	
Current Status	
COSEWIC: Special Concern (1994, 2007) Provincial status: Vulnerable (Blue Listed)	

Status and Reasons for Designation

Status: Special concern	Alpha-numeric code: not applicable
<p>Reasons for Designation:</p> <p>This subspecies has a limited range, and a small extent of occurrence and area of occupancy. However, the extent of occurrence and area of occupancy appear to be constant. Its principal native habitat in the Okanagan as well as old fields is declining. Furthermore, old apple orchards where the mouse has been caught are being converted to vineyards. Dispersal distance is limited and the likelihood of rescue effect is small. Extensive sampling has revealed the occurrence of the mouse at more localities. 63,000 hectares of suitable habitat is protected.</p>	
<p>Applicability of Criteria</p>	
<p>Criterion A: (Declining Total Population): There is no direct evidence of a declining population trend and there are no good data on population size. It appears to be naturally rare and occurs at low densities.</p> <p>Criterion B: (Small Distribution, and Decline or Fluctuation): EO < 3,000 km²; AO < 110 km². Close to meeting threatened B2ab but the population is not fragmented and there are greater than 10 localities.</p> <p>Criterion C: (Small Total Population Size and Decline): Total population size is unknown and there may be limited habitat available.</p> <p>Criterion D: (Very Small Population or Restricted Distribution): There is likely limited availability and high demand for exploitation of the remaining habitat, and the remaining populations appear to be fragmented.</p> <p>Criterion E: (Quantitative Analysis): Not applicable.</p>	

TECHNICAL SUMMARY

Reithrodontomys megalotis dychei

Western harvest mouse *dychei* subspecies
Range of Occurrence in Canada: Alberta

Souris des moissons de la sous-espèce *dychei*

Extent and Area Information^a	
• <i>Extent of occurrence (EO)(km²) based on locations</i>	459 km ²
• <i>Specify trend in EO</i>	Decreasing
• <i>Are there extreme fluctuations in EO?</i>	Unknown
• <i>Area of occupancy (AO) (km²) based on locations</i>	156 km ²
• <i>Specify trend in AO</i>	Decreasing
• <i>Are there extreme fluctuations in AO?</i>	Unknown
• <i>Number of known or inferred current locations^b</i>	1
• <i>Specify trend in #</i>	Decreasing
• <i>Are there extreme fluctuations in number of locations?</i>	No
• <i>Specify trend in area, extent or quality of habitat</i>	Decreasing

^a Area information was estimated based on present (i.e., post-1970) locations (see Fig. 2). AO was estimated following IUCN guidelines and used a 2 x 2 km (4 km²) grid.

^b All present records are from within a single large locality, the Suffield National Wildlife Area (459 km²).

Population Information	
• <i>Generation time (average age of parents in the population)</i>	6 months
• <i>Number of mature individuals</i>	Unknown
• <i>Total population trend:</i>	Unknown
• <i>% decline over the last/next 10 years or 3 generations.</i>	Unknown
• <i>Are there extreme fluctuations in number of mature individuals?</i>	Yes
• <i>Is the total population severely fragmented?</i>	Yes
• <i>Specify trend in number of populations</i>	Decreasing
• <i>Are there extreme fluctuations in number of populations?</i>	No
• <i>List populations with number of mature individuals in each:</i>	
Threats (actual or imminent threats to populations or habitats)	
-urban development, cultivation and agricultural activity, domestic livestock grazing, fire	
Rescue Effect (immigration from an outside source)	
• <i>Status of outside population(s)?</i> USA: T5 (very common) Montana: S4 (secure with restricted range)	
• <i>Is immigration known or possible?</i>	not known, but possible
• <i>Would immigrants be adapted to survive in Canada?</i>	Yes
• <i>Is there sufficient habitat for immigrants in Canada?</i>	Unknown
• <i>Is rescue from outside populations likely?</i>	No
Quantitative Analysis	
n/a	
Current Status	
COSEWIC: Data Deficient, April 1994 <i>Dychei</i> subspecies: Endangered (2007) Provincial status: Undetermined	

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: B1ab(iii)+2ab(iii)c(iv)
<p>Reasons for Designation:</p> <p>This subspecies has a limited range and has been found at only one location in the past 40 years; this location is isolated from others. Dispersal distance is limited and the population fluctuates. This species is commonly found in owl pellets in the USA, but none have been reported in owl pellets (including burrowing owls) in Suffield or other areas in southeast Alberta, despite substantial sampling. Owl pellet analysis is an excellent means of sampling for these mice.</p>	
<p>Applicability of Criteria</p>	
<p>Criterion A: (Declining Total Population): There is no direct evidence of a declining population, but there are no good data on population size. There appears to be only one isolated population.</p> <p>Criterion B: (Small Distribution, and Decline or Fluctuation): Endangered under B1ab(iii)+2ab(iii)c(iv): Small extent of occurrence and area of occupancy. Fewer than 5 locations and decreasing EO, AO and number of populations. Fluctuation in number of individuals.</p> <p>Criterion C: (Small Total Population Size and Decline): Would fit Threatened under C2ii if there were fewer than 10,000 adults during population 'lows' and there was only the single population.</p> <p>Criterion D: (Very Small Population or Restricted Distribution): Appears to be only one isolated population.</p> <p>Criterion E: (Quantitative Analysis): Not applicable.</p>	

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INFORMATION SOURCES

- Bancroft, W.L. 1967. Record fecundity for *Reithrodontomys megalotis*. *Journal of Mammalogy* 48:307-308.
- Banfield, A.W.F. 1974. *The mammals of Canada*. Univ. Toronto Press. xxv + 438 pp.
- Birkinholz, D.E. 1967. The harvest mouse (*Reithrodontomys megalotis*) in central Illinois. *Transactions of the Illinois State Academy of Science* 60:49-53.
- Brant, D.H. 1962. Measures of movements and population densities of small rodents. *University of California Publications in Zoology* 62:105-184.
- Brillhart, D.E. and D.W. Kaufman. 1994. Temporal variation in Coyote prey in tallgrass prairie of eastern Kansas. *Prairie Naturalist* 26:93-105.
- British Columbia Conservation Data Centre. 2005. Conservation Data Centre, Biodiversity Branch, Ministry of Environment, Victoria, BC.
- British Columbia Ministry of Environment. 2005a. Western harvest mouse, in *Accounts and measures for managing identified wildlife*. Identified Wildlife Management Strategy, Ministries of Environment and Forests, Victoria, BC. (In press).
- British Columbia Ministry of Environment. 2005b. Campbell Brown (Kalamalka Lake) Ecological Reserve, purpose statement. Ministry of Environment, Environmental Stewardship Division, Victoria, BC. 3 pp.

- British Columbia Ministry of Environment, Lands and Parks. 1998. Habitat atlas for wildlife at risk: South Okanagan & Lower Similkameen.
- British Columbia Ministry of Water, Land and Air Protection. 2003a. Management direction statement for Chopaka East Site, South Okanagan Grasslands Protected Area. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, BC. 19 pp.
- British Columbia Ministry of Water, Land and Air Protection. 2003b. Management direction statement for Chopaka West Site, South Okanagan Grasslands Protected Area. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, BC. 20 pp.
- British Columbia Ministry of Water, Land and Air Protection. 2003c. Management direction statement for Kilpoola Site, South Okanagan Grasslands Protected Area. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, BC. 22 pp.
- British Columbia Ministry of Water, Land and Air Protection. 2003d. Management direction statement for Mount Kobau Site, South Okanagan Grasslands Protected Area. Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Victoria, BC. 25 pp.
- Burt, W.H. and R.P. Grossenheider. 1976. A field guide to the mammals of America north of Mexico. Petersen Field Guide Ser. #5, Houghton Mifflin Company, Boston, Mass.
- Cahalane, V.H. 1961. Mammals of North America. The MacMillan Company, New York.
- Cannings, R.J. 1987. The breeding biology of Northern Saw-Whet Owls in southern British Columbia. Pp. 193-198, in Biology and conservation of northern forest owls. USDA, Forest Serv. Tech. Rep. RM-142.
- Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. Birds of the Okanagan Valley, British Columbia. Royal British Columbia Museum, Victoria. 420 pp.
- Cannings, S.G., L.R. Ramsay, D.F. Fraser and M.A. Fraker. 1999. Rare amphibians, reptiles, and mammals of British Columbia. Min. Environ., Lands and Parks, Wildl. Br. and Resour. Inv. Br., Victoria, BC.
- Clark, B.K., D.W. Kaufman, G.A. Kaufman, E.J. Finck and S.S. Hand. 1988. Long-distance movements by *Reithrodontomys megalotis* in tallgrass prairie. American Midland Naturalist 120:276-281.
- Davis, S.S., R.B. Mitchell and S. Demarais. 2000. Trap-revealed microhabitat use by small mammals in monoculture grasslands. Texas Journal of Science 52:195-200.
- Duncan, D., pers. comm. 2005. E-mail correspondence. August 2005. Canadian Wildlife Service, Prairie and Northern Region, Edmonton.
- Engley, L. and M. Norton. 2001. Distribution of selected small mammals in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Service, Alberta Species at Risk Report No. 12. Edmonton, AB. 75 pp.
- Engstrom, M.D., R.C. Dowler, D.S. Rogers, D.J. Schmidly, and J.W. Bickham. 1981. Chromosomal variation within four species of harvest mice (*Reithrodontomys*). Journal of Mammalogy 62:159-164.
- Fa, J.E., V. Sanchez-Cordero and A. Mendez. 1996. Interspecific agonistic behaviour in small mammals in a Mexican high-elevation grassland. Journal of Zoology, London 239:396-401.

- Fisler, G.F. 1966. Homing in the Western Harvest Mouse, *Reithrodontomys megalotis*. Journal of Mammalogy 47:53-58.
- Ford, S.D. 1977. Range, distribution and habitat of the Western Harvest Mouse, *Reithrodontomys megalotis*, in Indiana. American Midland Naturalist 98:422-432.
- Forsyth, A. 1999. Mammals of North America: temperate and Arctic regions. Firefly Books, Ontario. 350 pp.
- Gummer, D., pers. comm. 2005. E-mail correspondence. August 2005. Curator of Mammalogy, Royal Alberta Museum, Edmonton.
- Hall, E.R. 1946. Mammals of Nevada. University of California Press, Berkeley and Los Angeles, 710 pp.
- Hall, E.R. 1981. The mammals of North America: Volume 2. 2nd Edition. John Wiley, Toronto. 1181 pp.
- Hayssen, V., A. van Tienhoven and A. van Tienhoven. 1993. Asdell's patterns of mammalian reproduction: a compendium of species-specific data. Cornell Univ. Press, London.
- Heske, E.J., R.S. Ostfeld and W.Z. Lidicker, Jr. 1984. Competitive interactions between *Microtus californicus* and *Reithrodontomys megalotis* during two peaks of *Microtus* abundance. Journal of Mammalogy 65:271-280.
- Heske, E.J., J.H. Brown and S. Mistry. 1994. Long-term experimental study of a Chihuahuan Desert rodent community: 13 years of competition. Ecology 75:438-445.
- Jackson, H.H.T. 1961. Mammals of Wisconsin. University of Wisconsin Press, Madison, xii + 504 pp.
- Jekanoski, R.D. and D.W. Kaufman. 1995. Use of simulated herbaceous canopy by foraging rodents. American Midland Naturalist 133:304-311.
- Johnson, M.L. and M.S. Gaines. 1988. Demography of the Western Harvest Mouse, *Reithrodontomys megalotis*, in eastern Kansas. Oecologia 75:405-411.
- Kaufman, D.W. and E.D. Fleharty. 1974. Habitat selection by nine species of rodents in north-central Kansas. Southwestern Naturalist 18:443-452.
- Kaufman, G.A., D.W. Kaufman and E.J. Finck. 1988. Influence of fire and topography on habitat selection by *Peromyscus maniculatus* and *Reithrodontomys megalotis* in ungrazed tallgrass prairie. Journal of Mammalogy 69:342-352.
- Kaufman, G.A., D.E. Brillhart and D.W. Kaufman. 1993. Are deer mice a common prey of coyotes? Prairie Naturalist 25:295-304.
- Klenner, W., pers. comm. 2005. Telephone and e-mail correspondence. August 2005. Habitat Biologist, British Columbia Ministry of Forests, Kamloops.
- Kozel, R.M. and E.D. Fleharty. 1979. Movements of rodents across roads. Southwestern Naturalist 24:239-248.
- Marti, C.D. 1974. Feeding ecology of four sympatric owls. Condor 74:45-61.
- Masters, R.E., R.L. Lochmiller, S.T. McMurry and G.A. Bukenhofer. 1998. Small mammal response to pine-grassland restoration for Red-cockaded Woodpeckers. Wildlife Society Bulletin 26:148-158.
- McMillan, B.R., D.E. Brillhart, G.A. Kaufman, and D.W. Kaufman. 1995. Short-term responses of small mammals to autumn fire in tallgrass prairie. Prairie Naturalist 27:158-166.

- McNaughton, C., pers. comm. 2005. Telephone correspondence. August 2005. South Okanagan Conservation Land Manager, Nature Trust, Oliver.
- Meidinger, D. and Pojar, J. 1991. Ecosystems of British Columbia. Research Branch, Ministry of Forests, Victoria, B.C. Special Report Series No. 6. 330 pp.
- Meserve, P.L. 1976. Food relationships of a rodent fauna in a California coastal sage scrub community. *Journal of Mammalogy* 57:300-319.
- Meserve, P.L. 1977. Three-dimensional home ranges of cricetid rodents. *Journal of Mammalogy* 58:549-558.
- Moore, J.E. 1952. Notes on three additions to the fauna of Alberta. *Canadian Field Naturalist* 66:142-143.
- Moulton, M.P., J.R. Choate, S.J. Bissell and R.A. Nicholson. 1981. Associations of small mammals on the Central High Plains of eastern Colorado. *Southwestern Naturalist* 26:53-57.
- Nagorsen, D. 1990. The mammals of British Columbia: a taxonomic catalogue. Royal B.C. Museum, Memoir No. 4.
- Nagorsen, D. 1994. COSEWIC status report on the western harvest mouse, *Reithrodontomys megalotis megalotis* and *Reithrodontomys megalotis dychei*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 24 pp.
- Nagorsen, D. 1995. Status of the western harvest mouse in British Columbia. Min. Environ., Lands and Parks, Wildl. Br., Victoria, B.C. Wildl. Working Rep. No. WR-71.
- Nagorsen, D. 2005. Rodents and lagomorphs of British Columbia. The mammals of British Columbia, Volume 4. Royal BC Museum, Victoria. 410 pp.
- NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.5. NatureServe, Arlington, Virginia. Web site: <http://www.natureserve.org/explorer>. (Accessed: August 22, 2005).
- Nordstrom, W., pers. comm. 2005. E-mail correspondence. August 2005. Senior Zoologist, Alberta Natural Heritage Information Centre, Edmonton.
- Nowak, R.M. 1999. Walker's Mammals of the World, Sixth Edition. Volume II. The Johns Hopkins Univ. Press, Baltimore, Md. 1936 pp.
- O'Farrell, M.J. 1974. Seasonal activity patterns of rodents in a sagebrush community. *Journal of Mammalogy* 55:809-823.
- O'Farrell, M.J. 1978. Home range dynamics of rodents in a sagebrush community. *Journal of Mammalogy* 59:657-668.
- Pearson, O.P. 1959. A traffic survey of *Microtus-Reithrodontomys* runways. *Journal of Mammalogy* 40:169-180.
- Poulin, R., pers. comm. 2005. E-mail correspondence. August 2005. Postdoctoral Fellow, University of Alberta, Department of Biological Sciences, Edmonton.
- Province of Alberta. 2000. The general status of Alberta wild species 2000. Alberta Sustainable Resource Development, Alberta species at risk program, Edmonton, AB. 56 pp.
- Reynolds, H.W., S.J. Barry, and H.P.L. Kiliaan. 1999. Small mammal component report Canadian Forces Base Suffield National Wildlife Area wildlife inventory. Canadian Wildlife Service. Unpublished Report, Edmonton. 140 pp.

- Schmelzeisen, R., pers. comm. 2005. E-mail correspondence. August 2005. Alberta Conservation Association, Edmonton.
- Schwalter, T. 2004. Small mammal data from owl pellet analysis in western Canada. Committee on the Status of Endangered Species in Canada. Ottawa. 54 pp.
- Scudder, G. 1993. Biodiversity over time. In, Fenger, M.A., E.H. Miller, J.F. Johnson, and E.R.J.R. Williams (Eds.) Our living legacy: Proceedings of symposium on biological diversity. Royal British Columbia Museum, Victoria, BC. 392 pp.
- Skupski, M.P. 1995. Population ecology of the Western Harvest Mouse, *Reithrodontomys megalotis*: a long-term perspective. *Journal of Mammalogy* 76:358-367.
- Smith, H.C. 1993. Alberta mammals: an atlas and guide. The Provincial Museum of Alberta, Edmonton, AB. 238 pp.
- South Okanagan Regional Growth Strategy. 2006. Regional growth strategy – Draft, April 1, 2006.
- Stapp, P. 1997. Community structure of shortgrass-prairie rodents: competition or risk of intraguild predation. *Ecology* 78:1519-1530.
- Statistics Canada. 2003. Human activity and the environment: annual statistics 2003. Statistics Canada, Environment Accounts and Statistics Division, System of National Accounts. Catalogue no. 16-201-XIE. Ottawa, ON, 94 pp.
- Sullivan, T.P. 2004. Biodiversity and farmland. Diversity and conservation of plants and mammals in natural and orchard habitats. Extension Brochure. Faculty of Agricultural Sciences, University of B.C., Vancouver B.C.
- Sullivan, T.P. and D.S. Sullivan. 2004. Influence of a granivorous diversionary food on population dynamics of montane voles (*Microtus montanus*), deer mice (*Peromyscus maniculatus*), and western harvest mice (*Reithrodontomys megalotis*). *Crop Protection* 23:191-200.
- Sullivan, T.P. and D.S. Sullivan. 2005. Population dynamics and habitat enhancement for two vulnerable small mammals in the Okanagan Valley: Great Basin pocket mouse and western harvest mouse. In: T.D. Hooper, editor. Proceedings of the Species at Risk 2004 Pathways to Recovery Conference, March 2–6, 2004, Victoria, B.C. Species at Risk 2004 Pathways to Recovery Conference Organizing Committee, Victoria, B.C.
- Sullivan, T.P. and D.S. Sullivan. 2006a. Plant and small mammal diversity in orchard vs. non-crop habitats. *Agriculture, Ecosystems & Environment* (In Press).
- Sullivan, T.P. and D.S. Sullivan. 2006b. Population dynamics of two vulnerable small mammals in the Okanagan Valley: Great Basin pocket mouse and western harvest mouse. (In preparation).
- Thompson, D.C. 1985. Subspecies differences in metabolism, thermoregulation, and torpor in the Western Harvest Mouse *Reithrodontomys megalotis*. *Physiological Zoology* 58:430-444.
- Webster, W.D. and J.K. Jones, Jr. 1982. *Reithrodontomys megalotis*. *Mammalian Species* 167:1-5.
- Whitaker, J.O. and R.E. Mumford. 1972. Ecological studies on *Reithrodontomys megalotis* in Indiana. *Journal of Mammalogy* 53:850-860.
- Whitford, W.G. 1976. Temporal fluctuations in density and diversity of desert rodent populations. *Journal of Mammalogy* 57:351-369.

- Wikeem, B. and S. Wikeem. 2004. The grasslands of British Columbia. Grasslands Conservation Council of British Columbia. xvii + 479 pp.
- Wilson, D.E. and S. Ruff. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington. In association with the American Society of Mammalogists. 750 pp.
- Wood, C. 2003. GIS Mapping of Antelope Brush in the South Okanagan Similkameen, December 12, 2003, Penticton, BC.

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COLLECTIONS EXAMINED

None