

**Wildlife  
Management  
Division**

**STATUS AND  
SURVEYS BRANCH**

**Status of the  
Canadian Toad  
(Bufo hemiophrys)  
in Alberta**

**Ian M. Hamilton  
Joann L. Skilnick  
Howard Troughton  
Anthony P. Russell  
G. Lawrence Powell**



**Alberta Wildlife Status Report No. 12**



**Alberta**  
ENVIRONMENTAL PROTECTION



**Alberta Conservation  
Association**

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## PREFACE

Every five years, the Wildlife Management Division of Alberta Natural Resources Service reviews the status of wildlife species in Alberta. These overviews, which have been conducted in 1991 and 1996, assign individual species to “colour” lists that reflect the perceived level of risk to populations that occur in the province. Such designations are determined from extensive consultations with professional and amateur biologists, and from a variety of readily available sources of population data. A primary objective of these reviews is to identify species that may be considered for more detailed status determinations.

The Alberta Wildlife Status Report Series is an extension of the 1996 *Status of Alberta Wildlife* review process, and provides comprehensive current summaries of the biological status of selected wildlife species in Alberta. Priority is given to species that are potentially at risk in the province (Red or Blue listed), that are of uncertain status (Status Undetermined), or which are considered to be at risk at a national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Reports in this series are published and distributed by the Alberta Conservation Association and the Wildlife Management Division of Alberta Environmental Protection, and are intended to provide detailed and up-to-date information which will be useful to resource professionals for managing populations of species and their habitats in the province. The reports are also designed to provide current information which will assist the Alberta Endangered Species Conservation Committee to identify species that may be formally designated as endangered or threatened under the Alberta Wildlife Act. To achieve these goals, the reports have been authored and/or reviewed by individuals with unique local expertise in the biology and management of each species.

## EXECUTIVE SUMMARY

The Canadian Toad (Bufo hemiophrys) occurs from the southern Northwest Territories to northern Montana, and east to Manitoba and Minnesota. A relict population (B. h. baxteri) also occurs in the Laramie Basin of Wyoming. The species historically occupied the eastern half of Alberta, from the Milk River region to the Northwest Territories border. As recently as the 1980s, populations of this species were believed to be stable in the province. However, recent anecdotal reports have suggested that the species is declining in numbers in some parts of its provincial range, as well as in several other areas of North America. These trends led to the inclusion of the Canadian Toad on the "Red List" of species believed to be at risk of declining to nonviable levels in the province. This report summarizes current information on the Canadian Toad in Alberta, as a step in updating the status of the species in this province.

The Canadian Toad has not been well studied in Alberta. However, it appears that the species is among the most aquatic toads in this province, and seems to prefer permanent wetlands for breeding. Even so, much of the year is spent in adjacent uplands. Such areas are especially important as winter hibernation sites, when individuals burrow below the frost line in areas of sandy soil. Hibernacula may contain up to several hundred individuals.

The range of the Canadian Toad does not appear to have changed during this century, although the species may no longer occur in areas of the province south of Medicine Hat. There is some evidence for the decline of populations in the northern parts of the prairies and in the aspen parkland, where most recent and historical records for this species have occurred. However, historical information on population size is scant, and until recently, there have been no wide-scale programs in place to survey amphibian populations. Thus, rates of population change are difficult to quantify. However, there are a number of threats to Canadian Toad populations that may be cause for concern, including disturbance to hibernacula, forest harvest, wetland loss and alteration, and global factors (e.g., disease, climate change) which may be responsible for broad-scale decline in amphibian populations during the past few decades.

Additional studies are needed to document population and range changes in the Canadian Toad in Alberta, to determine the potential impacts of limiting factors on toad populations, and to gain a more complete understanding of the life history of this species.

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## INTRODUCTION

The Canadian Toad (*Bufo hemiophrys*), sometimes considered a subspecies of the American Toad (*B. americanus*; Cook 1983), is one of three species of the genus *Bufo* found in Alberta, along with the Western Toad (*B. boreas*) and the Great Plains Toad (*B. cognatus*). The primary distinguishing feature of the Canadian Toad is the presence of cranial crests which are parallel, or which diverge anteriorly. These crests diverge posteriorly in the Great Plains Toad, and are generally absent in the Western Toad (Cook 1984, Stebbins 1985).

The Canadian Toad was once a common inhabitant of the northern Interior Plains, and was not considered to be declining in Canada as recently as the mid-1980s (Butler and Roberts 1987, Preston 1987, Secoy 1987). In the past 10 years, however, Canadian Toads have declined sharply in numbers or disappeared in some areas of central Alberta (Roberts 1992) and populations in other areas of the range (e.g., Manitoba and Wyoming) may be declining as well (Lewis et al. 1985, Weller et al. 1994). In Alberta, the Canadian Toad is included on the "Red List\*" of species that current information suggests are at risk of declining to non-viable population levels in the province (Alberta Wildlife Management Division 1996).

This report summarizes current and historical information on the Canadian Toad in Alberta, as a step in reviewing the status of this species in the province.

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\* See Appendix 1 for definitions of selected status designations

## HABITAT

Relatively little is known about the habitat requirements of Canadian Toads. The species has historically been found in grassland, aspen parkland, and boreal forest regions across its range (Preston 1982, Russell and Bauer 1993, Strong 1992). The Canadian Toad is thought to be more aquatic than other bufonids (Henrich 1968, Underhill 1961). For example, Canadian Toads are found frequently in meadows and willow bogs near water in northeastern Alberta (Roberts and Lewin 1979), and are the only toad species occupying a habitat of plentiful wetlands amid tall grass prairie, aspen and willow in northwestern Minnesota (Breckenridge and Tester 1961). Roberts and Lewin (1979) reported that Canadian Toads decrease gradually in abundance at distances >40 m from water, and Breckenridge and Tester (1961) found that over 80% of toads were trapped within 8 m of wetland edges.

Roberts and Lewin (1979), in a study of amphibian populations in northeastern Alberta, found that Canadian Toads used a wider variety of spawning habitats (including natural ponds, borrow pits, streams, and lake margins) than did other amphibians in the same area, but were most often found near rivers and lakes than near small temporary or permanent ponds. Wetlands occupied by Canadian Toads sometimes contained little or no vegetation, and had currents and high wave action. In some of these habitats, Canadian Toads were the only species of amphibian present. Breckenridge and Tester (1961) caught more toads near ponds with stable water levels and gradually emerging shores with mud



flats surrounded by cattail and bulrush. The species was found less frequently in ponds lacking mud flats, and with shallow marginal zones and surrounding thick sedges (Breckenridge and Tester 1961).

Although the Canadian Toad appears to be more aquatic than other toads in Alberta, the species spends only about two months of the year (breeding season) in the water or in adjacent riparian habitats. After the breeding season, individuals tend to move to the upslope areas, where they remain until the following breeding season (P. Garcia, pers. comm.).

Unlike some other anurans found at northern latitudes, the American Toad is not freeze-resistant (Storey and Storey 1986), and it is reasonable to assume that neither is the closely related Canadian Toad. The persistence of local populations may therefore be closely tied to the availability of suitable hibernation sites, which allow toads to burrow below the frost line as refuge from freezing temperatures. As Canadian Toads are relatively poor burrowers (K. Larsen, pers. comm.), hibernation sites are usually located in areas of sandy soils in upland areas, rather than in wet, muddy substrates (Breckenridge and Tester 1961, Tester and Breckenridge 1964). Kuyt (1991) reported that hibernacula were several hundred meters away from permanent wetlands.

Populations of the Canadian Toad in Minnesota are known to hibernate almost entirely in "Mima-type" mounds (Tester and Breckenridge 1964). Such mounds are typically three to 15 m in diameter, up to 0.6 m high, and believed

to be partly the result of pocket gopher activity (Breckenridge and Tester 1961). Like hibernacula in the north, these mounds are characterized by a loose soil structure thought to facilitate burrowing. Wyoming Toads (*B. h. baxteri*), an isolated subspecies of the Canadian Toad which occurs in Wyoming (see "Distribution" section), may use similar mounds, and it has been speculated that Mima-mound topography may play an important role in maintaining this relict population (Baxter and Stone 1985). The tendency of Canadian Toads to hibernate communally may reflect a shortage of suitable substrates for hibernation in some areas.

## CONSERVATION BIOLOGY

*1. Overwintering.* - Canadian Toads move to the hibernation site by early to mid-September in Alberta and the Northwest Territories (Kuyt 1991, Roberts and Lewin 1979, Timoney 1996), but such movements may begin as early as late August in Minnesota (Breckenridge and Tester 1961). Adults tend to begin hibernating earlier than juveniles (Breckenridge and Tester 1961). Both age classes show strong homing abilities to specific wintering sites (>92% of 1,950 individuals over six years; Kelleher and Tester 1969). In northern regions, hibernacula often contain many individuals. For instance, aggregations of several hundred individuals have been observed near the Alberta/Northwest Territories border (Kuyt 1991, Timoney 1996), and in Minnesota (Breckenridge and Tester 1961). Individuals occupy separate burrows within wintering sites, and may change depth in response to soil temperatures (Breckenridge and Tester

1961). Individual burrows as deep as 117 cm have been reported (Breckenridge and Tester 1961).

In Minnesota, Tester and Breckenridge (1964) found that first emergence from hibernation, and peaks in emergence, are dependent on rising temperatures and/or precipitation. Emergence, which occurs over a five to six week period, begins in late April and peaks in mid-May. Adults tend to emerge earlier in the spring than juveniles, and males tend to emerge slightly earlier than females (Kelleher and Tester 1969, Tester and Breckenridge 1964).

**2. Reproduction.** - After emergence, males form breeding choruses at pond edges (Tester and Breckenridge 1964). Calling begins between mid-May and early June in the boreal forest; at this time, toads may be vulnerable to late frosts. Males continue to call for two months (Breckenridge and Tester 1961). Females arrive singly and only stay at breeding ponds long enough to mate and lay eggs (Tester and Breckenridge 1964).

Eggs are laid in long strings, as opposed to the more spherical egg masses that are typical of frogs (Preston 1982). Canadian Toads have a higher fecundity than amphibians such as Wood (*Rana sylvatica*) and Boreal Chorus (*Pseudacris triseriata*) Frogs that share the same habitats. This greater reproductive potential may compensate for higher mortality as a result of using more variable spawning habitats (Roberts and Lewin 1979).

Eggs may or may not be laid in association with aquatic vegetation. In the absence of vegetation, eggs and

larvae may be exposed to high risks of predation and displacement by currents (Roberts and Lewin 1979). However, Canadian Toads are also reported to breed in temporary waterbodies (Russell and Bauer 1993). Other bufonids also lay eggs in ephemeral pools, although with low success (e.g., *Bufo cognatus*; Krupa 1994). Selection of egg laying sites may therefore reflect a trade-off between the risk of desiccation prior to metamorphosis in ephemeral ponds, and the predation and competition pressures inherent in more permanent water bodies.

**3. Growth and Survival.** - Little is known about the development of juvenile Canadian Toads. Tamsitt (1962) saw large numbers of tadpoles in shallow areas by early June in the Delta Marsh region of Lake Manitoba. By mid-June, juveniles had developed posterior limbs, and ranged in size from 22 to 27 mm (Tamsitt 1962). In the boreal forest, juvenile toads appear from late June (Breckenridge and Tester 1961, Roberts and Lewin 1979, Tamsitt 1962) to mid-August (K. Larsen, pers. comm.). Young-of-the-year can be found along the margins of spawning sites after metamorphosis (Roberts and Lewin 1979). Breckenridge and Tester (1961) noted that the most rapid growth occurred in the first and second seasons after hatching, and that adult size was attained in about 23 months. Males and females did not show differences in growth rates (Breckenridge and Tester 1961).

Studies in Minnesota showed that annual survival of toads varied between 24 and 44% (Kelleher and Tester 1969). Juveniles had higher mortality rates than

adults (Kelleher and Tester 1969).

## DISTRIBUTION

*1. Alberta.* - Declines in population size and range of many amphibian species in North America were noted in the 1970s (Blaustein and Wake 1990, Wyman 1990). Therefore, in order to examine for changes in the distribution of Canadian Toads in Alberta over time, we assembled observational or collection information for this species in two time periods: pre-1970 ("historical"), and 1970 or later ("recent").

In Alberta, the historical distribution of Canadian Toads encompasses much of the eastern half of the province, with records as far north as the confluence of the Peace and Mikkwa rivers and Fort McMurray, and as far west as Slave Lake, the Rocky Mountain House area, and Calgary (Figure 1, Appendix 2). Most records occurred in the northern prairie region and in the aspen parkland, which no doubt partly reflects the greater number of observers in these areas. The most southerly records occurred near Brooks, with the exception of a single record at Milk River in the 1890s.

It must be cautioned that comparison of historical and recent ranges must take into account that survey effort in different areas is not consistent, and that an absence of records in particular areas does not necessarily reflect an absence of Canadian Toads. Nevertheless, it appears that the overall distribution of Canadian Toads in the province is relatively unchanged from that which occurred prior to 1970 (Figure 1). Recent observations have extended the species' known range into the foothills region

(northwest of Nordegg and southwest of Edson), although the species is apparently rare in this natural region (Hamilton et al. 1996). Russell and Bauer (1993) believed that some reports of this species in that area should be considered "doubtful". Recent surveys have also extended the species' range onto the Canadian Shield (south shore of Lake Athabasca), and into the Fort Smith area, several kilometers north of Alberta's border with the Northwest Territories (Kuyt 1991, Timoney 1996). This suggests that the entire northeastern corner of Alberta lies within the range of the Canadian Toad. No recent records occurred as far south as Milk River. However, only a single historical record occurred in this area, suggesting that populations may always have been low in this region.

Our definition of "recent" records encompasses over 25 years of observations and collections. More recent range changes, if they have occurred, would therefore be difficult to detect. However, there have been numerous amphibian surveys in the province over the past few years, and records from these investigations suggest that the Canadian Toad still occurs within much of its "recent" range. In 1996, Canadian Toads were found west of Edmonton at Onoway (H. Troughton, pers. obs.), east to the Alberta/Saskatchewan border at Burstall (H. Troughton, pers. obs.), and as far north as the Alberta/Northwest Territories border in Wood Buffalo National Park (Timoney 1996). Canadian Toads were also reported in 1996 in several areas in east-central Alberta (R. Lauzon, pers. comm.), in northeastern Alberta near Lac La Biche

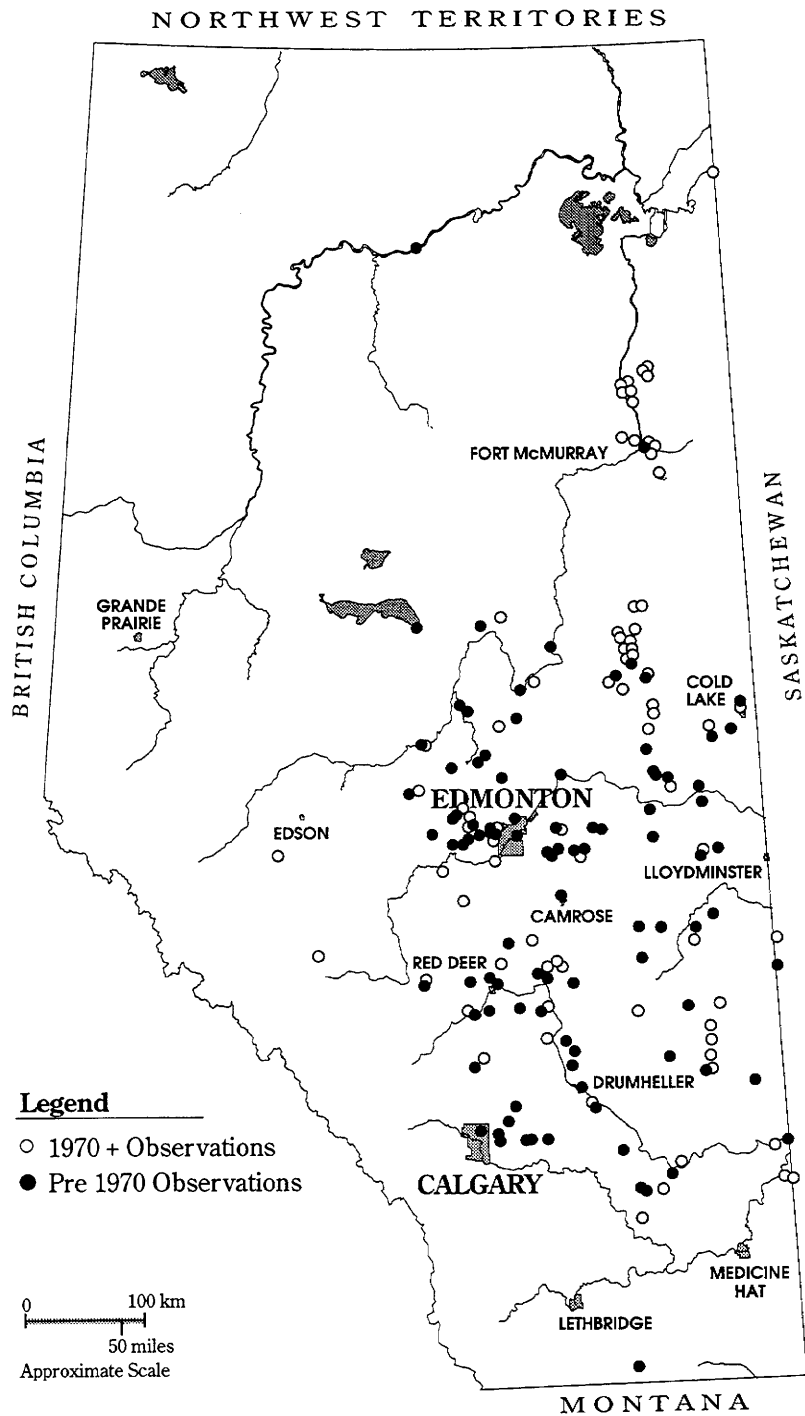


Figure 1. Known site records for Canadian Toads in Alberta since 1895. Detailed descriptions of observations are given in Appendix 2.

(J. Constible, pers. comm., B. Eaton, pers. comm.; P. Garcia, pers. comm.), and at 32% of surveyed sites near Kearn Lake, north of Fort McMurray (Collister and Kansas 1997). However, Canadian Toads were not detected in several other surveys within the known range, including the Mariana Lake region south of Fort McMurray in 1997 (J. Constible, pers. comm.), and near the Suncor oil sands development north of Fort McMurray in 1995 (Westworth, Brusnyk and Associates 1996). It is notable that no Canadian Toads were found during a three-year volunteer monitoring program (1992-1994) that concentrated its search effort in regions where most historical and recent records have occurred (aspen parkland and prairie; Powell et al. 1996). Although this suggests that the distribution within the core of the species' range may have become more sparse in recent years, reports to the Alberta Amphibian Monitoring Program in the mid-1990s suggest that the species still occurs with regularity in this area.

The distribution of Canadian Toads in Alberta appears to be confined to regions below 1000 m in elevation. However, the reason for this pattern is unclear, as numerous environmental variables correlate with elevation. A large proportion of sites where Canadian Toads have been observed are in regions of high groundwater probability (the expected yield of wells drilled or dug at that site). However, without a comparable random sample of sites where toads are not found, it is not possible to ascertain whether toads are disproportionately selecting areas with high groundwater, or whether the apparent preference simply results from there being a large number of relatively

wet sites available to Canadian Toads in these areas.

There is a zone of overlap between Canadian and Western Toads in the Edmonton and Lac La Biche regions (F. Cook, pers. comm., B. Eaton, pers. comm.). Hybrids between these species are also known (Cook 1983), and a Canadian Toad was observed mating with a Western Toad near Lac La Biche in 1996 (B. Eaton, pers. comm.). However, hybrids between these species are uncommon and usually infertile (Cook 1983, F. Cook, pers. comm.).

**2. Other Areas.** - Historically, Canadian Toads have been found in grassland, parkland and boreal forest regions of the Interior Plains, extending from immediately north of the Alberta/Northwest Territories border near Fort Smith, south to Montana, the Dakotas, and Minnesota (Figure 2), with a disjunct population near Laramie, Wyoming (see below). The species has been reported to occur throughout Saskatchewan, except for the northeastern corner (Didiuk 1997, Russell and Bauer 1993). A survey of the southwestern corner of the province, in Grasslands National Park, concluded that this area is also not part of the toad's current range (Powell et al. 1997). Seburn (1992) reported that Canadian Toads are widespread and locally abundant in the aspen parkland of Saskatchewan.

In Manitoba, the Canadian Toad's distribution encompasses an area west of Lake Winnipeg and Sandilands Provincial Forest and south of 55°N (Preston 1982, Logier and Toner 1955). The distribution of the Canadian Toad

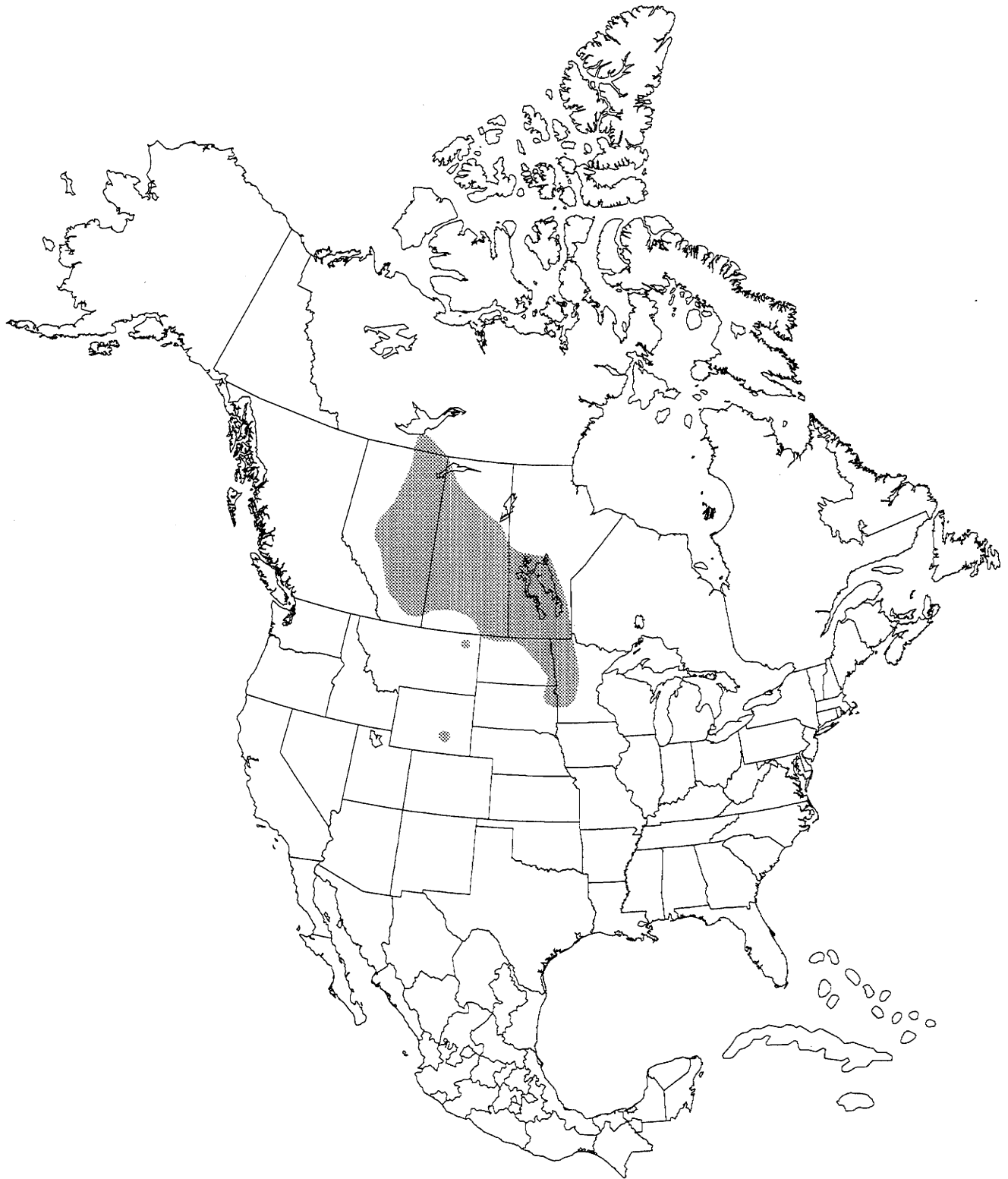


Figure 2. Current range of the Canadian Toad in North America (modified from Cook 1984).

overlaps with that of the American Toad in southeastern Manitoba, where fertile hybrids are found. Because of this zone of interbreeding, some authors consider Canadian Toads to be a subspecies of the American Toad (Cook 1983).

In the Northwest Territories, Bufo hemiophrys occurs within Wood Buffalo National Park near Fort Smith (Kuyt 1991). This represents the toad's northern distribution limit. Three new populations were recently found as far as 45 km northwest of the previous known distribution: at Klewi Lake in Wood Buffalo National Park (60°07'N; 113°42'W), along Preble Creek (60°05'01"N; 113°11'13"W) and in a marl pond between the Klewi and Sass Rivers (60°05'38"N; 113°24'03"W; Timoney 1996). Based on these findings it is predicted that more Canadian Toads may soon be found in Wood Buffalo National Park (Timoney 1996).

Older range maps that show the Canadian Toad occurring across northern Montana were apparently extrapolated from the species' known range in Alberta and Saskatchewan (D. Flath, pers comm.). However, there has only been one record of the Canadian Toad recorded in that state – from Daniels County, 20 km south of the Saskatchewan border and 12 km west of 105°W longitude (Black and Bragg 1968). The species has not been confirmed to occur in Montana since that time (D. Flath, pers. comm.).

The Canadian Toad's reported range in North Dakota is east of the Missouri River (Hoberg and Gause 1992). Johnson and Batie (1995) surveyed calling amphibians and showed that the

species' range was reduced to the northeastern portion of their published distribution in that state. In South Dakota, Canadian Toads occur in the northeastern corner of the state. A recent survey found the toads in new areas, possibly extending their range (D. Backlund, pers. comm.).

The Wyoming Toad is a relict population found only in the Laramie Basin, isolated by about 800 km from B. h. hemiophrys in the Dakotas, Minnesota and Central Canada (Porter 1968). State game authorities treat the Wyoming Toad as a subspecies of the Canadian Toad, but believe that this population may represent a distinct species (T. Thorne, pers. comm.).

## POPULATION SIZE AND TRENDS

*1. Alberta.* - The Canadian Toad apparently continues to be widely distributed throughout Alberta, and provincial populations were believed to be relatively stable as recently as the mid-1980s (Cottonwood Consultants Ltd. 1986). However, more recent information indicates that numbers may be declining in parts of their provincial range (Roberts 1992). In 1963, the species was described as being common in many areas in Alberta, particularly in the irrigated areas near Brooks, and in the Edmonton region (F. Cook, pers. comm.). Although the species still occurs in the Edmonton area (H. Troughton, pers. comm., Roberts 1992), it is now apparently rare around Brooks (D. Scobie, pers. comm.). Populations in central and south-central Alberta may be of particular concern. At Ghostpine Springs (southeast of Red Deer), and west of Innisfail, Canadian Toads have

been monitored since the early 1980s. At that time, the species was abundant at these sites (Roberts 1992). By 1991, however, there were no breeding adults found at the Ghostpine Springs site, and only a single adult was observed at the Innisfail site between 1987 and 1991 (Roberts 1992). The Alberta amphibian volunteer monitoring survey (1992-1994) did not find any evidence of Canadian Toads in the aspen parkland and parts of the grasslands (Powell et al. 1996), although numerous records have been gathered in these areas since that time by participants in the Alberta Amphibian Monitoring Program (Appendix 2). The species is reported to still occur in some of the major river valleys in central Alberta, such as the Red Deer River (W. Smith, pers. comm.). In east-central Alberta, Canadian Toads were found breeding in many waterbodies between Hardisty and Youngstown in 1996, although no pond contained large numbers of individuals (R. Lauzon, pers. comm.).

Canadian Toads are found in some areas of the northeastern boreal forest such as in Wood Buffalo National Park (Timoney 1996) and near Lac La Biche (P. Garcia, pers. comm.), but are absent in others (e.g., Calling Lake; E. Wind, pers. comm.). It is unknown whether these gaps represent population declines, as historical information for most areas in this region is lacking. Comparative data are available only for the Fort McMurray area, where the species was found at nine of 24 surveyed sites in the late 1970s (Roberts and Lewin 1979). In 1997, the Alberta Amphibian Monitoring Program reported three confirmed sightings of *B. hemiophys* near Fort McMurray, (Appendix 2),

confirming that populations persist in that area. In addition, Collister and Kansas (1997) found Canadian Toads at over one-third of sites surveyed near Kearl Lake, about 65 km north of Fort McMurray. The species is at least locally common around Fort Smith, near the Northwest Territories/Alberta border. One hibernaculum in that area is estimated to house several hundred individuals each winter (Kuyt 1991, Timoney 1996).

It should be noted that, due to the cryptic nature of toads outside of the breeding season and the variability of calling intensity during the breeding season, failure to observe toads does not necessarily mean they are not present (F. Cook, pers. comm.). Thus, more intensive surveys than have been conducted to date may be necessary to adequately detect trends in Canadian Toad populations. Limited and largely anecdotal evidence currently points to declining Canadian Toad populations in some regions of central Alberta. However, with little information on prior population sizes and natural fluctuations, it is difficult to evaluate the extent and severity of these declines.

**2. Other Areas.** - As is true for Alberta, there is little known about the historical population size of Canadian Toads in other provinces and states that can provide conclusive evidence of population changes over time. Weller et al. (1994) reported declining toad populations in Manitoba, particularly during drought conditions in the 1980s. However, populations appear to have recovered in the 1990s and are currently stable (R. Larche, pers. comm.). Similarly, in Saskatchewan, populations



were abundant at the Wascana Marsh, Regina and in the Spruce Woods Forest Reserve in the early 1960s (F. Cook, pers. comm.). These populations are believed to be stable, although there are no data available to evaluate population trends (Didiuk 1997). Recent estimates suggest that populations in North Dakota are smaller than previously thought, again likely the result of drought conditions experienced for a number of years, ending in 1993, and from which populations still have not recovered (Johnson and Batie 1995). A recent survey concluded that Canadian Toad populations are not declining in South Dakota (D. Backlund, pers. comm.).

The Wyoming Toad has shown the most dramatic population decline. This subspecies was abundant in the 1950s and 1960s, but numbers declined dramatically in the mid 1970s (Lewis et al. 1985). Intensive searches from 1976 to 1986 found only small numbers of toads in some years and none at all in others (Stebbins and Cohen 1995). In 1987, a healthy population was found in the Mortenson Lake area (Stebbins and Cohen 1995). Over the next five years, population size gradually decreased and proportions of juveniles to adults increased. By the early 1990s, fewer than one hundred breeding individuals were known in Wyoming, all occurring in a single pond (Vial and Saylor 1993).

The Wyoming Toad population is currently at a critical size, and its persistence is dependent on human intervention (T. Thorne, pers. comm.). A captive breeding program has now been established to reverse population declines in this subspecies. There are approximately 400 captive toads, and

every summer since the early 1990s, young have been released to the Mortensen Lake National Wildlife Refuge (NWR), as well as the Hutton NWR. Some of these toads are known to have overwintered one year, and some have survived to their second year. Although males have been heard calling, there has so far been no reproduction reported at these sites. Authorities hope to establish populations at four additional sites in the near future (T. Thorne, pers. comm.).

### LIMITING FACTORS

Conditions that lower habitat quality or decrease survival and reproduction are considered to be limiting factors. Various factors that may affect Canadian Toad populations have been proposed, but few studies have directly investigated their impact. Population size of Canadian Toads is most likely limited by availability of breeding and hibernation habitat. This section discusses factors that are likely to affect breeding and hibernation, and emphasizes impacts resulting from human activities.

*1. Disturbance of Hibernacula.* - The probable inability of individuals of this species to tolerate freezing, along with their poor burrowing ability, restricts areas where Canadian Toads can overwinter. Toads may therefore be vulnerable to disturbance of hibernation sites by human activity. Because relatively high concentrations of toads occur at some hibernation sites, there is potential for large numbers of individuals (perhaps entire populations) to be adversely affected by such disturbance.

The large hibernaculum on the Alberta/Northwest Territories border is subject to disturbance by vehicles during the winter. Nevertheless, this hibernaculum remains active, indicating that the level of disturbance is not high enough to prevent toad use (Timoney 1996). However, areas of the site which may be otherwise suitable for toads are not used, possibly due to disturbance by snow plows (Timoney 1996), and mortality of toads on the adjacent road has been reported during the period of spring emergence (Kuyt 1991). Specific threats to hibernacula in Alberta have not been documented, probably because few of these sites have been discovered.

Recent threats to hibernacula may not be restricted to human activity. Western Canada has experienced declining snow cover in recent years (Moore 1991) which may allow deeper frost penetration (W. Roberts, pers. comm., in Timoney 1996). Such conditions may increase mortality of hibernating Canadian Toads.

**2. Forestry.** - Canadian Toad populations in the boreal forest may be vulnerable to disturbance resulting from logging, which has only recently begun on a large scale in this area. The impact of widespread logging in the boreal forest on the abundance and distribution on Canadian Toads remains unknown, but several ongoing studies in this region are attempting to investigate the potential impact of such activities (P. Garcia, pers. comm.).

The aquatic nature of adult Canadian Toads suggests that they may be relatively unaffected by forest harvesting so long as buffer strips are retained

around waterbodies. The extent of movement away from waterbodies, both during the summer, and during migration from breeding sites to hibernacula is largely unknown in this area. However, hibernacula may be several hundred meters from water (Kuyt 1991), and recent information suggests that the species may make extensive use of upslope habitat for post-breeding activities (P. Garcia, pers. comm.). Canadian Toads may therefore be most vulnerable to forest harvest during the nonbreeding season.

**3. Wetland Loss and Alteration.** - Canadian Toads may be relatively restricted to more permanent waterbodies during adult and juvenile life history stages. Any loss or alteration of these water bodies may therefore adversely affect Canadian Toad populations. One such impact is drought, such as occurred in Alberta during the 1980s. However, the effects of drought are relatively short term, and should not have long-lasting effects on total populations. Wetland loss to drainage, and modification of wetland basins from agricultural activity are much more likely to have severe and permanent impacts on Canadian Toad populations.

In the last 50 years, the impacts on wetlands in the southern half of Alberta have been dramatic. For example, it is estimated that about 60% of wetlands in the aspen parkland have been drained during this period (Alberta Water Resources Commission 1990), and over 90% of wetlands in the prairie and parkland have now been modified by agricultural activities (Turner et al. 1987). Although the specific impact of

wetland alteration and loss on the Canadian Toad population in Alberta is unknown, it is notable that most changes to wetlands have occurred in areas of the province (grassland and aspen parkland) where declines in Canadian Toad populations have been reported.

**4. Global Changes.** - On a global scale, the widespread simultaneous decline of numerous amphibian populations has been linked to a number of factors, including increases in ultraviolet radiation reaching the earth's surface, the spread of pathogens, habitat destruction, acidification of water bodies, and climate change (Vial and Saylor 1993). It is possible that one or more of these factors are important influences on populations of Canadian Toads in Alberta. For example, global increases in ultraviolet light resulting from thinning of the ozone layer have been reported, particularly at high latitudes. Eggs of the Western Toad are known to be vulnerable to damage by UV-B radiation (Blaustein et al. 1994a), and B. hemiophrys may be similarly susceptible. Pathogens have been linked to declines in Western Toads in Colorado (Blaustein et al. 1994b), and "red leg disease" has been reported in declining populations of both the Western and Canadian Toads in Wyoming, and in Northern Leopard Frogs (Rana pipiens) in Alberta (Roberts 1987, Vial and Saylor 1993). However, it is not clear whether these, or other, factors have been responsible for apparent population declines of the Canadian Toad in Alberta.

## STATUS DESIGNATIONS

**1. Alberta.** - In 1991, a review of the

status of wildlife species in Alberta resulted in the inclusion of the Canadian Toad on the "Yellow List" of species which were potentially vulnerable, but not currently at risk, in the province (Alberta Fish and Wildlife 1991). This review noted that the species was common in boreal and parkland habitats, but may be experiencing declines in parkland areas. A second review five years later (Alberta Wildlife Management Division 1996) placed the Canadian Toad on the "Red List" of species that were believed to be at risk of declining to nonviable population levels. This designation was made on the basis of the "dramatic decline in parkland distribution", and the need for population monitoring.

Under the Alberta Wildlife Act, Bufo hemiophrys is legally designated as a "non-game animal" (B. Treichel, pers. comm.), which dictates that individuals may not be killed, possessed or sold without a permit.

**2. Other Areas.** - The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has not assigned a status to the Canadian Toad (COSEWIC 1996). The Nature Conservancy ranks Canadian Toads as "G4" which denotes species that are apparently secure in their global range, but for which there is long-term concern about their status (The Nature Conservancy 1997). Conservation Data Centers in Saskatchewan and Manitoba, which use the Nature Conservancy ranking system, have assigned the species an "S4" rating at a provincial scale, which is analagous to the global ranking (J. Keith, pers. comm., Duncan 1996). There is currently no legal protection for any toad or frog species in

Saskatchewan, although the provincial status of amphibians will be reviewed by an endangered species advisory committee to be established in the near future (E. Wiltse, pers. comm.). In Manitoba, the Wildlife Act was amended to include protection for Bufo hemiophrys as of January 15, 1996 (J. Duncan, pers. comm.). The Canadian Toad is considered to be uncommon, and has a restricted distribution in the Northwest Territories. It has no protected status under territorial legislation (Fournier 1997).

In Montana, there is only one locality record for the Canadian Toad (Black and Bragg 1968), and the species has been assigned an "S1", or "critically imperiled" status (P. Hendricks, pers. comm.), meaning it is very rare throughout its range in the state, and may be especially vulnerable to extirpation. There has not been any monitoring of the toad in its presumed range since the original sighting. The Montana National Heritage Program has received funding to conduct surveys in 1998 that will cover the area where the sighting occurred (P. Hendricks, pers. comm.).

Minnesota does not list the Canadian Toad as a protected species (R. Statz, pers. comm.) and has assigned the species an "S5" or "secure" status (C. Hall, pers. comm.). Populations are not currently being monitored in that state. Original records of the toad in South Dakota came from sightings recorded between the 1950s and the 1970s (D. Backlund, pers. comm.). The species is not currently being monitored in South Dakota, nor has it been assigned a legal designation. In North Dakota, B. hemiophrys is considered to be common.

The species has no legal status in that state, nor is it the subject of monitoring programs (K. Duttonhefner, pers. comm.).

In 1983, the Wyoming Toad population became listed as an "endangered" population under the Federal Endangered Species Act of 1973 (Lewis et al. 1985), and remains on that list today (Vial and Saylor 1993).

### RECENT MANAGEMENT IN ALBERTA

There are no current research or management projects on Canadian Toads underway in southern or central Alberta. In northeastern Alberta, however, there are several research projects that may lead to management of Canadian Toads and other amphibians. Patrick Garcia, an M.Sc. student at the University of Victoria, is currently examining habitat requirements of Canadian Toads in the boreal mixedwood forest near Lac La Biche, in partnership with Alberta-Pacific Forest Industries. Juanita Constible, an M.Sc. student at the University of Victoria, is studying landscape distribution and biomonitoring of anurans in the same area. Brian Eaton, a Ph.D. student at the University of Alberta, is conducting an ongoing study of Wood Frogs in the boreal mixedwood forest north of Lac La Biche, but also monitors other amphibian populations in the area. A similar study was conducted near Calling Lake by Elke Wind; however, she did not find B. hemiophrys in this region. All of the projects in northeastern Alberta are examining toad populations in both cutblocks and uncut areas of the boreal mixedwood forest.

## SYNTHESIS

Our knowledge of the Canadian Toad in Alberta is limited, and there is little specific information on the natural history, limiting factors and population trends in this province to determine whether provincial populations are at risk. Although there appears to be no substantial change in the species' distribution in the province during this century, there is a widespread perception that the Canadian Toad is declining in numbers and has become uncommon in some parts of the province (Powell et al. 1996, Roberts 1992).

Additional studies are clearly needed to determine the extent of population declines of the Canadian Toad in

Alberta, and to document potential threats to existing populations. We therefore recommend that known historical and potential population localities be visited and the presence and abundance of toads assessed on a regular basis. Until population distribution and trends are better documented, it may also be prudent to protect key breeding and wintering habitats from disturbance. These sites would be appropriate areas for initiating studies to increase our knowledge of the life history of Canadian Toads in Alberta. Such investigations could identify techniques which might be used to protect and manage this species, if perceived population declines in the province are real.

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APPENDIX 1. Definitions of selected legal and protective designations.

**A. Status of Alberta Wildlife colour lists (after Alberta Wildlife Management Division 1996)**

Red	Current knowledge suggests that these species <u>are</u> at risk. These species have declined, or are in immediate danger of declining, to nonviable population size
Blue	Current knowledge suggests that these species <u>may be</u> at risk. These species have undergone non-cyclical declines in population or habitat, or reductions in provincial distribution
Yellow	Species that are not currently at risk, but may require special management to address concerns related to naturally low populations, limited provincial distributions, or demographic/life history features that make them vulnerable to <u>human-related</u> changes in the environment
Green	Species not considered to be at risk. Populations are stable and key habitats are generally secure
Undetermined	Species not known to be at risk, but insufficient information is available to determine status

**B. Alberta Wildlife Act**

Species designated as “endangered” under the Alberta Wildlife Act include those defined as “endangered” or “threatened” by *A Policy for the Management of Threatened Wildlife in Alberta* (Alberta Fish and Wildlife 1985):

Endangered	A species whose present existence in Alberta is in danger of extinction within the next decade
Threatened	A species that is likely to become endangered if the factors causing its vulnerability are not reversed

**C. Committee on the Status of Endangered Wildlife in Canada (after COSEWIC 1996)**

Extirpated	A species no longer existing in the wild in Canada, but occurring elsewhere
Endangered	A species facing imminent extirpation or extinction
Threatened	A species likely to become endangered if limiting factors are not reversed
Vulnerable	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events
Not at Risk	A species that has been evaluated and found to be not at risk
Indeterminate	A species for which there is insufficient scientific information to support status designation

**D. United States Endangered Species Act (after National Research Council 1995)**

Endangered	Any species which is in danger of extinction throughout all or a significant portion of its range
Threatened	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range

APPENDIX 2. Locations where Canadian Toads have been reported in Alberta. Records correspond to sites plotted in Figure 1.

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
Red Deer River*				AMNH 3003-3004
Crane Lake*				NMC 37
Brooks*		72L	12U 043 560(NAD83)	AMNH 60722-60725
Dinosaur Provincial Park*		72L	12U 047 562(NAD83)	AMNH 86552
Veteran*		73D	12U 049 576(NAD83)	ROMZ 2-102 & 2-103
Lac La Biche		73L	12U 0437 6070(NAD27)	AMNH 62088
≈2 miles E of Bassano*		82I	12U 040 563(NAD83)	AMNH 76214
Milk River	1895	82H	12U 0421 5445(NAD83)	NMC 46
Beaver Lake, ≈50 miles E of Edmonton*	1907			NMC 119
Hastings Lake	1907	83H	12U 0373 5920(NAD27)	NMC 123
Edmonton	1914	83H	12U 0335 5935(NAD27)	NMC 590-591
Little Sandhill Creek, near Steeveville	1919	72L	12U 046 562(NAD83)	NMC 844
Morrin	1924	82P	12U 0378 5725(NAD83)	NMC 1109
Rumsey	1925	82P	12U 0372 5745(NAD83)	NMC 1292-1293
Beaverhill Lake	1925	83H	12U 0395 5925(NAD27)	NMC 1193
Ponoka	1928	83A	12U 033 584(NAD83)	NMC 1498
Fawcett	1934	83J	11U 0688 6047(NAD27)	UAMZ 119
Wabamun Lake	1939	83G	11U 066 594(NAD83)	UAMZ 118
Alix	1947	83A	12U 035 581(NAD83)	NMC 2146
Square Lake	1949	73L	12U 04465 60855	UAMZ 1133-1143
Goose Quill Lake, near Lousana	1949	83A	12U 03520 57700	UAMZ 120
Lesser Slave River*	1950			UAMZ 224
Brooks	1950	72L	12U 043 560(NAD83)	UAMZ 263, 328
Beynon	1950	82P	12U 0376 5688(NAD83)	UAMZ 143
Drumheller	1950	82P	12U 038 570(NAD83)	UAMZ 124, 137-140, 144
Wabamun Lake	1950	83G	11U 066 594(NAD83)	UAMZ 187

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
Mayatan Lake	1950	83G	11U 06785 59300	UAMZ 176-181
Jackfish Lake	1950	83G	11U 06830 59290	UAMZ 175
Cottage Lake	1950	83G	11U 0687 5933(NAD83)	UAMZ 147-152
Beach Corner	1950	83G	11U 0691 5936(NAD83)	UAMZ 146
Big Lake	1950	83H	12U 0320 5941(NAD27)	UAMZ 123
Edmonton	1950	83H	12U 0335 5935(NAD27)	UAMZ 121, 232, 304
Namao	1950	83H	12U 0335 5955(NAD27)	UAMZ 122
South Cooking Lake	1950	83H	12U 0365 5920(NAD27)	UAMZ 145
Trapper's Lake (Elk Island Nat. Park)	1950	83H	12U 0370 5942(NAD27)	UAMZ 243
Waskatenau	1950	83I	12U 038 599(NAD83)	UAMZ 1165
Fort Assiniboine	1950	83J	11U 0645 6023(NAD27)	UAMZ 201
Empress	1951	72L	12U 0569 5645(NAD83)	UAMZ 351-352, 433
Youngstown	1951	72M	12U 0486 5708(NAD27)	UAMZ 750, 1164
Coronation	1951	73D	12U 047 577(NAD83)	UAMZ 347
Didsbury	1951	82O	11U 0698 5728(NAD83)	UAMZ 495-496, 749
Irricana	1951	82P	12U 0318 5689(NAD83)	UAMZ 345-346
Pine Lake	1951	83A	12U 0332 5775(NAD83)	UAMZ 417
Fawcett Lake	1951	83P	12U 0315 6132(NAD27)	UAMZ 418
Hanna	1952	72M	12U 0436 5722(NAD27)	UAMZ 562, 573
Chinook	1952	72M	12U 0505 5700(NAD27)	UAMZ 570
Square Lake	1952	73L	12U 04465 60855	UAMZ 605-607
Hardisty	1953	73D	12U 048 584(NAD83)	UAMZ 658
Wainwright	1953	73D	12U 051 585(NAD83)	UAMZ 652-653
Vermilion	1953	73E	12U 0510 5911(NAD27)	UAMZ 664-665
Gem	1953	82I	12U 0417 5645(NAD83)	UAMZ 649-650
Blindman River, N of Red Deer	1953	83A	12U 0310 5804(NAD83)	UAMZ 662
Ponoka	1953	83A	12U 033 584(NAD83)	UAMZ 659
Stettler	1953	83A	12U 038 580(NAD83)	UAMZ 655
Sylvan Lake	1953	83B	11U 0695 5806(NAD83)	UAMZ 660

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
Camrose	1953	83H	12U 0378 5877(NAD27)	UAMZ 654
Beaverhill Lake	1953	83H	12U 0395 5925(NAD27)	UAMZ 656
Lac La Biche	1954	73L	12U 0437 6070(NAD27)	UAMZ 686, 1152-1163
Cold Lake	1954	73L	12U 0560 6045(NAD27)	UAMZ 681-683
Gem	1954	82I	12U 0417 5645(NAD83)	UAMZ 685
Slave Lake	1954	83O	11U 0640 6130(NAD27)	UAMZ 679-680
Fort McMurray	1955	74D	12V 048 628(NAD83)	UAMZ 1144-1151
Edmonton	1957	83H	12U 0335 5935(NAD27)	UAMZ 1381
Pembina River, 5 miles NW of Fawcett	1957	83J	11U 068 6055(NAD27)	UAMZ 787-798
Big Island in Lac La Biche	1961	73L	12U 04375 60765	UAMZ 1119-1125, 1129-1132
2.6 miles NE of the Keoma turnout on Highway 9	1961	82P	12U 03146 56800	NMC 5283
1.9 miles S of Rowley on Highway 56	1961	82P	12U 0381 5733(NAD83)	NMC 5289
5 miles W of Edmonton	1961	83H	12U 032 594(NAD27)	UAMZ 1116
7 miles W and 2 miles S of Edmonton	1961	83H	12U 032 594(NAD27)	UAMZ 1126-1128
2.8 miles NW of Brooks turnout on Highway 1	1962	72L	12U 0333 5608(NAD83)	NMC 6020
3.5 km NW of Brooks on Hwy 1	1962	72L	12U 04330 56075	NMC 6021
1.3 km NW of Brooks on Hwy 1	1962	72L	12U 04355 56052	NMC 6022
0.8 km NW of Brooks on Hwy 1	1962	72L	12U 04360 56060	NMC 6023
5.3 miles S of Killam on Highway 36	1962	73D	12U 0442 5842(NAD83)	NMC 6160
4.1 miles S of Galahad on Highway 36	1962	73D	12U 04434 58113	NMC 6162
0.9 miles SE of Loughheed on Highway 13	1962	73D	12U 04644 58434	NMC 6159
1.7 miles E of Hayter turnout on Highway 13	1962	73D	12U 05633 58014	NMC 6009
Lavoy	1962	73E	12U 0442 5923(NAD27)	NMC 6173
4.6 miles W of Mannville	1962	73E	12U 04805 59077	NMC 6177
Highway 41 at the North Saskatchewan River	1962	73E	12U 05068 59680	NMC 6181
8.5 miles S of N. Saskatchewan River on Highway 41 (Elk Point)	1962	73E	12U 0507 5954(NAD27)	NMC 6184
1 mile NE of Bonnyville on Highway 28	1962	73L	12U 05195 60148	NMC 6219
0.5 miles NE of Ardmore on Highway 28	1962	73L	12U 0535 6021(NAD27)	NMC 6220
Junction of Highway 12 and Highway 21	1962	83A	12U 03587 58037	NMC 6169

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
4 miles W of Nevis on Highway 12	1962	83A	12U 03594 58035	NMC 6165
Cottage Lake	1962	83G	11U 0687 5933(NAD83)	UAMZ 1378
NE edge of Ministik Lake	1962	83H	12U 0368 5914(NAD27)	UAMZ 1379
Elk Island National Park	1962	83H	12U 0375 5940(NAD27)	NMC 6510
1 mile W of the junction of Highways 15 and 16	1962	83H	12U 04100 59364	NMC 6171
Athabasca River at Calling River	1962	83P	12U 03799 61062	UAMZ 1380
Strathmore	1963	82P	12U 033 566(NAD83)	NMC 7117
3.2 km E of Strathmore on Hwy 1	1963	82P	12U 03373 56564	NMC 7115
4.7 km E of Strathmore on Hwy 1	1963	82P	12U 03387 56564	NMC 7116
5 miles N of Innisfail on Highway 2	1963	83A	12U 0304 5773(NAD83)	NMC 7170
N side of Red Deer	1963	83A	12U 031 580(NAD83)	NMC 7165, 7167
Mirror, on Buffalo Lake	1963	83A	12U 0359 5814(NAD83)	UAMZ 1466-1467, 1565-1574, 1576-1578
11.3 miles E of Rocky Mountain House on Highway 11	1963	83B	11U 06564 57988	NMC 7158
Sturgeon River, Highway 43	1963	83G	11U 06793 59553	NMC 7258, 7316
W side of Edmonton	1963	83H	12U 0325 5935(NAD27)	NMC 7319
1.4 miles S of Vimy turnoff on Highway 2	1963	83I	12U 03253 59916	NMC 7321
Vimy turnoff on Highway 2	1963	83I	12U 03253 59938	NMC 7322
13.5 miles W of Westlock	1963	83J	11U 029 600 (NAD83)	NMC 7326
Paddle River at Barrhead	1963	83J	11U 06699 59990	NMC 7324
Hubbles Lake	1964	83G	11U 0693 5939(NAD83)	UAMZ 2954-2957
S end of Beaverhill Lake	1964	83H	12U 0399 5915(NAD27)	UAMZ 1391-1405
Bearer Lake*	1965			UAMZ 1508, 1575
Owl River*	1965			UAMZ 1565
2 miles E of Two Hill on Highway 36	1965	73E	12U 04550 59519	NMC 8699
8.4 miles W of St. Paul on Highway 28	1965	73E	12U 04660 59825	NMC 8542, 8545
3.3 miles SW of St. Paul	1965	73E	12U 0475 5983(NAD27)	NMC 8547
10.5 miles N and W of St. Paul on Highway 28	1965	73L	12U 0465 5984(NAD27)	NMC 8543
2.1 miles W of Wabamun turnoff on Highway 16	1965	83G	11U 0664 5939(NAD83)	NMC 8512
0.5 miles E of Stony Plain	1965	83H	12U 03022 59364	NMC 8502, 8504-8505

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
0.7 miles E of Winterburn on Highway 16	1965	83H	12U 0323 5935(NAD27)	NMC 8643
2 miles W of Mundare on Highway 16	1965	83H	12U 04083 59365	NMC 8695
3 miles W of Westlock on Highway 18	1965	83I	12U 03077 60043	NMC 8514
2.4 miles N of Westlock on Highway 44	1965	83I	12U 03139 60097	NMC 8521, 8523
0.4 miles N of Westlock	1965	83I	12U 0315 6006(NAD83)	NMC 8520
0.6 miles SW of Perryvale on Highway 2	1965	83I	12U 034 604(NAD83)	NMC 8527
2 miles W of Athabasca on Highway 2	1965	83I	12U 035 607(NAD83)	NMC 8531
3 miles W of Freedom turnoff on Highway 18	1965	83J	11U 06758 60036	NMC 8515-8516
5.2 km N and 2.6 km E of 4th St. & Northmount Dr. NW, Calgary	1966	82O	11U 0707 5671(NAD83)	NMC 10325, 10332-10333
E end of Chestermere Lake	1966	82P	12U 0303 5658(NAD83)	NMC 10738
N end of Chestermere Lake	1966	82P	12U 0303 5660(NAD83)	NMC 10753
2 miles N of N end of Chestermere Lake	1966	82P	12U 0303 5664(NAD83)	NMC 10626
Lac Ste. Anne	1966	83G	11U 067 595(NAD83)	UAMZ 1559
5.2 km N and 2.6 km E of 4th St. & Northmount Dr. NW, Calgary	1967	82O	11U 0707 5671(NAD83)	NMC 10755
2.8 miles E of Strathmore on Highway 1	1967	82P	12U 0336 5657(NAD83)	NMC 10744
11.5 miles E of Strathmore on Highway 1	1967	82P	12U 0350 5656(NAD83)	NMC 10742
Square Lake	1968	73L	12U 04465 60855	UAMZ 1791-1793
Floatingstone Lake	1968	73L	12U 0460 6008(NAD27)	UAMZ 2966
Pembina River at Sangudo	1968	83G	11U 06380 59735	UAMZ 1719-1721
7 miles W of Edmonton	1968	83H	12U 032 594(NAD27)	UAMZ 1836
Mikkwa River, 58°25'N 114°46'W	1968	84J	11V 0630 6476(NAD27)	NMC 14045
Elk Island National Park	1969	83H	12U 0375 5940(NAD27)	Burns, undated ms
Beaver Lake, near Lac La Biche	1970	73L	12U 0445 6063(NAD27)	UAMZ 1970-1971
near Dillberry Lake	1971	73D	12U 056 583(NAD83)	UAMZ 2002-2004
Lillabo Lake, 6 miles S of Lake Athabasca	1971	74L	12V 0557 6527(NAD27)	UAMZ 1972
Elk Island National Park	1971	83H	12U 0375 5940(NAD27)	Burns, undated ms
Lake Newell	1972	72L	12U 043 559(NAD83)	UAMZ 2027
Buffalo Lake	1972	83A	12U 037 582(NAD83)	UAMZ 2079-2080, 2103-2115



Description (1)	Year	Sheet (2)	Location(3)	Source (4)
E end of Buffalo Lake	1972	83A	12U 038 582(NAD83)	UAMZ 2026
1 mile NW of Acheson	1972	83H	12U 031 594(NAD27)	UAMZ 2130
Elk Island National Park	1972	83H	12U 0375 5940(NAD27)	Burns, undated ms
Mouth of Medicine River	1975	83B	11U 06986 57716	UAMZ 2256, 2552
Elk Island National Park	1975	83H	12U 0375 5940(NAD27)	Burns, undated ms
Jade Lake*	1976			UAMZ 2437
12 miles N of Bonnyville	1976	73L	12U 052 603(NAD27)	UAMZ 2469
2.5 miles N, 11.5 miles W of Fort McMurray	1976	74D	12V 04523 62941	UAMZ 2803-2805, 2816, 2826, 2841-2843, 2854-2855
1.5 miles N, 0.5 miles W of Fort McMurray	1976	74D	12V 04753 62892	UAMZ 2795-2799, 2844
Island in Clearwater River	1976	74D	12V 04765 62880	UAMZ 2809-2811, 2817, 2822-2825, 2835-2840
0.25 miles E, 1.25 miles S of Fort McMurray	1976	74D	12V 048 628(NAD83)	UAMZ 2794
21 miles S, 10.5 miles E of Fort McMurray	1976	74D	12V 04936 62543	UAMZ 2793, 2806
Mouth of the Gregoire River	1976	74D	12V 04948 62549	UAMZ 2791-2792, 2807-2808, 2815, 2821, 2832, 2846-2848
Gregoire Lake shoreline	1976	74D	12V 04964 62558	UAMZ 2834
10.5 miles W, 26.5 miles N of Fort McMurray	1976	74E	12V 046 633(NAD83)	UAMZ 2853
36.5 miles N, 10.5 miles W of Fort McMurray	1976	74E	12V 04602 63445	UAMZ 2801-2802
E of McDermott Island, Athabasca River	1976	74E	12V 04602 63560	UAMZ 2426
30.5 miles N, 9 miles W of Fort McMurray	1976	74E	12V 04613 63361	UAMZ 2800, 2814, 2819-2820, 2831, 2851-2852
Mildred Lake	1976	74E	12V 04643 63230	UAMZ 2812-2813, 2818, 2827-2830, 2845, 2849-2850
25 miles N of Fort McMurray	1976	74E	12V 047 632(NAD83)	UAMZ 2508-2510
2 miles W, 37 miles N of Fort McMurray	1976	74E	12V 047 634(NAD83)	UAMZ 2833
15 miles N of Embarass, on the Embarass River	1976	83F	11U 0520 5915 (NAD27)	UAMZ 2427-28, 2430, 2436
0.5 miles E of Heatherdown	1976	83G	11U 0690 5948(NAD83)	UAMZ 2292-2294
Pigeon Lake	1976	83G	11U 070 588(NAD83)	UAMZ 2282, 2288-2289
North Saskatchewan River near Devon	1976	83H	12U 0319 5917(NAD27)	UAMZ 2451
7 miles S of Winterburn	1976	83H	12U 0321 5924(NAD27)	UAMZ 2518
2.5 miles N, 11.5 miles W of Fort McMurray	1977	74D	12V 04523 62941	Roberts and Lewin 1979
1.5 miles N, 0.5 miles W of Fort McMurray	1977	74D	12V 04753 62892	Roberts and Lewin 1979
Island in Clearwater River	1977	74D	12V 04765 62880	Roberts and Lewin 1979

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
21 miles S, 10.5 miles E of Fort McMurray	1977	74D	12V 04936 62543	Roberts and Lewin 1979
Mouth of the Gregoire River	1977	74D	12V 04948 62549	Roberts and Lewin 1979
Gregoire Lake shoreline	1977	74D	12V 04964 62558	Roberts and Lewin 1979
36.5 miles N, 10.5 miles W of Fort McMurray	1977	74E	12V 04602 63445	Roberts and Lewin 1979
30.5 miles N, 9 miles W of Fort McMurray	1977	74E	12V 04613 63361	Roberts and Lewin 1979
Mildred Lake	1977	74E	12V 04643 63230	Roberts and Lewin 1979
Red Deer River at 5th meridian	1977	83A	12U 02945 57720	UAMZ 2498
6 miles S of Bashaw on Buffalo Lake	1977	83A	12U 0368 5818(NAD83)	UAMZ 2485, 2517
5 miles SE of Bashaw (Buffalo Lake)	1977	83A	12U 037 582(NAD83)	UAMZ 2513
Sturgeon River, 3 miles NE of Onoway	1977	83G	11U 069 596(NAD83)	UAMZ 2515-2516
Pigeon Lake	1977	83G	11U 070 588(NAD83)	UAMZ 2486-2490
11 miles E of Brooks	1979	72L	12U 045 560(NAD83)	UAMZ 2559-2561, 2890
English Bay, Cold Lake	1979	73L	12U 0549 6045(NAD27)	UAMZ 2626
5 miles SE of Bashaw (Buffalo Lake)	1979	83A	12U 037 582(NAD83)	UAMZ 2655
5 miles NW of Devon	1979	83H	12U 031 592(NAD27)	UAMZ 2628
North Saskatchewan River, 10 miles S of Winterburn	1979	83H	12U 0321 5918(NAD27)	UAMZ 2627
Elk Island National Park	1985	83H	12U 0375 5940(NAD27)	Burns, undated ms
Elk Island National Park	1986	83H	12U 0375 5940(NAD27)	Burns, undated ms
Red Deer River, W of Big Valley	1987	83A	12U 036 577(NAD83)	UAMZ 2922
Fort Assiniboine	1988	83J	11U 0645 6023(NAD27)	UAMZ 2933, 2958
Fort Assiniboine	1992	83J	11U 0645 6023(NAD27)	UAMZ 3036
Goodwin Lake	1995	73M	12U 0458 6142(NAD83)	UAMZ 3037
near Sturrock Creek	1995	83C	52.518°N; 116.38°W	Alberta Amphibian Monitoring Program
Moose Lake	1995-97		55°08'30"N; 111°45'45"W	B. Eaton, pers comm.
Unnamed Lake	1995-97		55°08'00"N; 111°39'40"W	B. Eaton, pers comm.
Unnamed Lake	1995-97		55°10'00"N; 111°54'30"W	B. Eaton, pers comm.
Drowned Lake	1995-97		55°12'00"N; 111°38'30"W	B. Eaton, pers comm.
along the Red Deer River, N of Bindloss	1996	72L	12U 0551 5639(NAD83)	W. Smith, pers comm.
S of McNeill Gas Plant, near Burstall, SK	1996	72L	12U 05684 56122	H. Troughton, pers comm.

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
S of McNeill Gas Plant, near Burstall, SK	1996	72L	12U 05687 56123	H. Troughton, pers. comm.
Two ponds, E of Kirkpatrick Lake	1996	72M	12U 04875 57470	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
NE of Kirkpatrick Lake	1996	72M	12U 04875 57493	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04878 57248	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
SE of Kirkpatrick Lake	1996	72M	12U 04879 57396	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
NE of Kirkpatrick Lake	1996	72M	12U 04879 57526	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
Two ponds, SE of Kirkpatrick Lake	1996	72M	12U 04880 57414	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Kirkpatrick Lake	1996	72M	12U 04880 57470	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04881 57204	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04881 57230	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Kirkpatrick Lake	1996	72M	12U 04882 57453	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04884 57244	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
SE of Antelope Lake	1996	72M	12U 04885 57192	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04885 57275	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
NE of Youngstown	1996	72M	12U 04886 57101	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
Along Sounding Creek, N of Youngstown	1996	72M	12U 04886 57161	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Kirkpatrick Lake	1996	72M	12U 04886 57447	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Kirkpatrick Lake	1996	72M	12U 04886 57485	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
E of Antelope Lake	1996	72M	12U 04887 57210	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
SE of Antelope Lake	1996	72M	12U 04888 57189	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
NE of Youngstown	1996	72M	12U 04889 57118	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
Near Rosyth	1996	73D	12U 04819 58307	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
Near Rosyth	1996	73D	12U 04823 58287	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
Imperial Mills area (T69 R12 W4)	1996	73L	12U 045 609(NAD27)	UAMZ 3041
Unnamed Lake	1996		55°21'30"N; 113°43'30"W	B. Eaton, pers comm.
Owl River floodplain, N of Lac La Biche	1996	73M	12U 04504 61024	B. Eaton, pers. comm.
E of the Owl River, N of Lac La Biche	1996	73M	12U 04590 61085	B. Eaton, pers. comm.
near Onoway	1996	83G	11U 0687 5971(NAD83)	H. Troughton, unpubl. data
Goodwin Lake	1996	73M	12U 04585 61415	P. Garcia, pers. comm.

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
North of Lac La Biche, in the AIPac FMA	1996	73L	12U 04445 60905	P. Garcia, pers. comm.
near Athabasca River, NW of Jackfish Lake	1996	83I	54.84°N; 113.23°W	Alberta Amphibian Monitoring Program
near Red Deer River, NW of East Coulee	1996	82P	51.37°N; 112.65°W	Alberta Amphibian Monitoring Program
near Red Deer River, NW of East Coulee	1996	82P	51.36°N; 112.62°W	Alberta Amphibian Monitoring Program
near Red Deer River, NW of East Coulee	1996	82P	51.36°N; 112.62°W	Alberta Amphibian Monitoring Program
near Athabasca River, NW of Jackfish Lake	1996	83I	54.84°N; 113.23°W	Alberta Amphibian Monitoring Program
Samson Lake	1996	83A	52.72°N; 113.29°W	Alberta Amphibian Monitoring Program
Sullivan Lake	1996	73D	52.12°N; 111.95°W	Alberta Amphibian Monitoring Program
near Red Deer River, NW of East Coulee	1996	82P	51.37°N; 112.65°W	Alberta Amphibian Monitoring Program
near Red Deer River, NW of East Coulee	1996	82P	51.35°N; 112.63°W	Alberta Amphibian Monitoring Program
Vermilion River, NE of Claymore, NW of Vermilion	1996	73E	53.38°N; 110.90°W	Alberta Amphibian Monitoring Program
Red Deer River, Dinosaur Provincial Park	1996	72L	50.74°N; 111.45°W	Alberta Amphibian Monitoring Program
W of Gooseberry Lake	1996	73D	52.10°N; 110.80°W	Alberta Amphibian Monitoring Program
W of Gooseberry Lake	1996	73D	52.10°N; 110.78°W	Alberta Amphibian Monitoring Program
Ironwood Lake	1996	73L	54.60°N; 111.53°W	Alberta Amphibian Monitoring Program
S of Fork Lake, W of St. Lina Creek	1996	73L	54.38°N; 111.52°W	Alberta Amphibian Monitoring Program
W of Frenchman Lake	1996	73L	54.53°N; 111.49°W	Alberta Amphibian Monitoring Program
Vermilion River, NE of Claymore, NW of Vermilion	1996	73E	53.39°N; 110.90°W	Alberta Amphibian Monitoring Program
Red Deer River, W of Rumsey	1996	82P	51.82°N; 113.02°W	Alberta Amphibian Monitoring Program
near Athabasca River, NW of Jackfish Lake	1996	83I	54.84°N; 113.23°W	Alberta Amphibian Monitoring Program
Lower Therien Lake, E of Lac Canard	1996	73E	53.89°N; 111.33°W	Alberta Amphibian Monitoring Program
N of Jackson Lake	1996	73L	54.83°N; 111.56°W	Alberta Amphibian Monitoring Program
S of North Saskatchewan River, N of Alsike	1996	83G	53.27°N; 114.52°W	Alberta Amphibian Monitoring Program
S of North Saskatchewan River, N of Alsike	1996	83G	53.27°N; 114.52°W	Alberta Amphibian Monitoring Program
	1996	83H	53.40°N; 112.57°W	Alberta Amphibian Monitoring Program
S of North Saskatchewan River, N of Alsike	1996	83G	53.27°N; 114.52°W	Alberta Amphibian Monitoring Program
S of McNeil, E of Hwy 41 and S of Hwy 545, T19 R1	1997		12U 568100 5610650(NAD 27)	Axys Environmental Consulting Ltd. for Express Pipeline Ltd.
S of North Saskatchewan River, N of Alsike	1997	83G	53.27°N; 114.53°W	Alberta Amphibian Monitoring Program

Description (1)	Year	Sheet (2)	Location(3)	Source (4)
Paddle River	1997	83G	53.93°N; 114.89°W	Alberta Amphibian Monitoring Program
Athabasca River	1997	83I	54.84°N; 113.23°W	Alberta Amphibian Monitoring Program
S of North Saskatchewan River, NW of Alsike	1997	83G	53.27°N; 114.55°W	Alberta Amphibian Monitoring Program
Fort McMurray	1997	74D	56.69°N; 111.29°W	Alberta Amphibian Monitoring Program
E of Rocky Mountain House	1997	83B	52.27°N; 114.64°W	Alberta Amphibian Monitoring Program
N of Lacombe	1997	83A	52.48°N; 113.74°W	Alberta Amphibian Monitoring Program
Fort McMurray	1997	74D	56.69°N; 111.32°W	Alberta Amphibian Monitoring Program
near Devon, W of Edmonton	1997	83H	53.40°N; 113.75°W	Alberta Amphibian Monitoring Program
Fort McMurray	1997	74D	56.68°N; 111.31°W	Alberta Amphibian Monitoring Program
Lac La Biche	1997	73I	54.82°N; 112.10°W	Alberta Amphibian Monitoring Program
S of North Saskatchewan River, NW of Alsike	1997	83G	53.27°N; 114.55°W	Alberta Amphibian Monitoring Program
Long Island Lake	1997	83I	54.44°N; 113.78°W	Alberta Amphibian Monitoring Program
near Lonepine Creek	1997	82P	51.74°N; 113.98°W	Alberta Amphibian Monitoring Program
~6km NE of Kearn Lake	1997	74E	UTM 490925 6355790 (NAD27)	URSUS Ecosystem Management Ltd.
~6km NE of Kearn Lake	1997	74E	UTM 490368 6355742 (NAD27)	URSUS Ecosystem Management Ltd.
~3km N of Kearn Lake	1997	74E	UTM 488521 6354932(NAD27)	URSUS Ecosystem Management Ltd.
~3km N of Kearn Lake	1997	74E	UTM 487722 6354300 (NAD27)	URSUS Ecosystem Management Ltd.
~3km N of Kearn Lake	1997	74E	UTM 486794 6353859 (NAD27)	URSUS Ecosystem Management Ltd.
<1km W of Kearn Lake	1997	74E	UTM 484346 6350228 (NAD27)	URSUS Ecosystem Management Ltd.
~1km W of Kearn Lake	1997	74E	UTM 483655 6349967 (NAD27)	URSUS Ecosystem Management Ltd.

(1) Locations denoted by an asterisk (\*) are not mapped because specific location or date is unknown

(2) 1:250,000 map sheet for the record location

(3) Given as latitude/longitude or UTM. Format for UTM is Grid Zone Designation (e.g. 11U), Easting then Northing. The UTM coordinates are for the location as shown on the record. This may not correspond to the actual location where the toad was found but should be within 20km (=2cm at the 1:1,000,000 scale).  
NAD=North American Datum on which UTM measurements are based

(4) UAMZ=Univ. Alberta Museum; NMC=National Museum of Canada; AMNH=American Museum of Natural History; ROMZ=Royal Ontario Museum

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- No. 14 Status of the Great Plains Toad (Bufo cognatus) in Alberta, by Janice D. James. 26 pp.