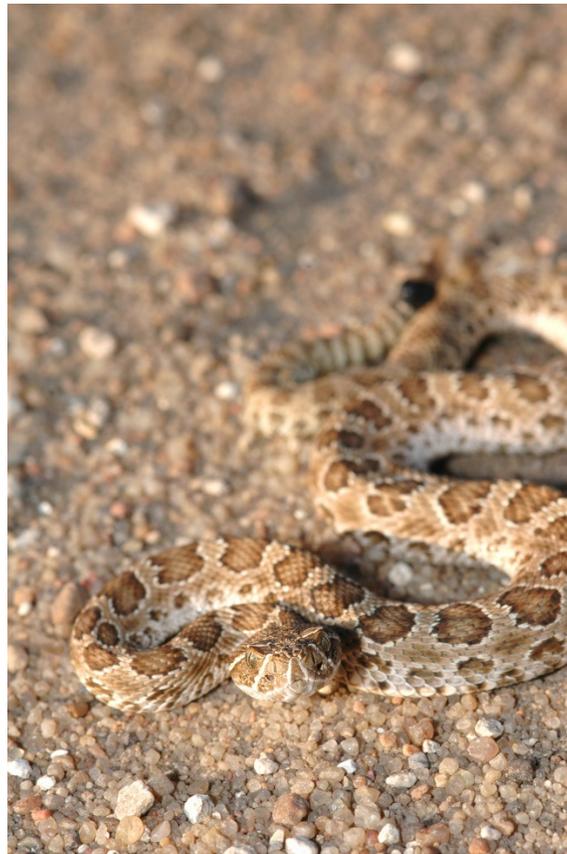


Prairie Rattlesnake Conservation Management Plan

2016-2021



Alberta Species at Risk Conservation Management Plan No. 12

Prairie Rattlesnake
Conservation Management Plan
2016-2021

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PREFACE

Albertans are fortunate to share their province with a diversity of wild species. A small number of these species are classified as *Species of Special Concern* because they have characteristics that make them particularly sensitive to human activities or natural events. Special conservation measures are necessary to ensure that these species do not become Endangered or Threatened. Conservation management plans are developed for *Species of Special Concern* to provide guidance for land and resource management decisions that affect the species and their habitat.

These plans are intended to be a resource tool for provincial and regional fish and wildlife, land and resource management staff in Alberta Environment and Parks and other government departments.

Conservation management plans provide background information including species biology, threats to species and habitat, and inventory/monitoring history. Plans also provide a goal, objectives, and actions (management recommendations). Management recommendations are typically categorised into inventory and monitoring needs; habitat management and conservation; education and communication; and additional management considerations as required.

Conservation management plans are generally prepared by an Alberta Environment and Parks fish and wildlife biologist who has been designated as the provincial species lead. Writers from outside the department are occasionally sought to prepare plans for species for which there is little in-house expertise. In order to ensure accuracy and utility, each plan is reviewed by a species expert and a designated provincial representative from forestry or land management programs. In some cases there may be additional reviewers from staff, industry, and other agencies.

Conservation management plans are internal guidance documents. They are implemented under the guidance of the species lead and are “living” documents that can be revised at any time as required. Conservation management plans are more succinct than the recovery plans that are prepared for Endangered and Threatened species and do not involve participation of a multi-stakeholder team.

Conservation management plans are approved by the Executive Director of Fish and Wildlife Policy. Plans will be reviewed annually by the species lead and updated if necessary, and a more in-depth review will occur five years after a plan’s approval.

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EXECUTIVE SUMMARY

Prairie rattlesnakes are a *Species of Special Concern* in Alberta. Their reduced reproductive potential as a result of late maturity, relatively small litters, and biennial or triennial reproductive cycles, means that the species has a reduced capacity to respond to stochastic population declines. Some prairie rattlesnakes travel long distances during the active season which results in an increased risk of mortality. Major threats to the species include road mortality, cultivation, energy development, urban development and intentional persecution by humans. Ensuring the viability of existing populations in the province will require focus on inventory and monitoring, communication and outreach, and habitat management and protection. With the diversity of land ownership and management that exists within the prairie rattlesnakes range in Alberta, a variety of tools need to be considered and applied, with a specific emphasis on educating government, industry, and landowners about the species.

1.0 INTRODUCTION

The prairie rattlesnake (*Crotalus viridis*) is a *Species of Special Concern* in Alberta. This listing occurred because the population is likely to continue to decline if current activities and trends persist, and the population size and area of occupancy are small. The provincial range of the species is known to have contracted from its historical extent. The prairie rattlesnake is protected as a *Non-Game Animal* under the *Wildlife Act*.

The Alberta Endangered Species Conservation Committee (AESCC) Initial Conservation Action Statement for prairie rattlesnake (AESCC 2013) recommends the following:

1. Identifying the species as a *Species of Special Concern* in Alberta,
2. Providing year-round habitat protection for birthing dens (hereafter referred to as rookeries),
3. Alberta Environment and Sustainable Resource Development (AESRD) developing and implementing a conservation and management strategy for the species, and
4. AESRD securing new resources to collect information on population sizes and trends and reassessing the status of the species within five years.

1.1 Distribution, Habitat Requirements, and Breeding Biology

The global range of the prairie rattlesnake extends from southern Canada, through the central USA and into the northern portion of Mexico (NatureServe 2013). In Alberta, the distribution of prairie rattlesnakes is limited to the southeast corner of the province (Figure 1). For a detailed review of the distribution of the species within Alberta, see the AESRD and Alberta Conservation Association (ACA) provincial status report update (AESRD and ACA 2012).

Essential habitat requirements for prairie rattlesnakes include hibernacula, rookeries (i.e., gestation sites or birthing dens), foraging areas and movement corridors that connect these habitat features. The majority of hibernacula in Alberta are closely associated with major rivers and coulees (Gannon 1978 as cited by Nicholson and Rose 2001; Martinson and Wielki 2012) and within transition zones between riparian and upland habitats (Andrus 2010; Gannon 1978 as cited by AESRD and ACA 2012). Hibernacula typically have a south, southeast or east facing aspect, however this can be influenced by microsite characteristics. They can consist of holes or cracks in the earth caused by, or associated with, a variety of biological and physical phenomena including slumping topography, erosion, remnant water channels, loose soil, sinkholes, rocky outcrops, fissures and mammal burrows. Prairie rattlesnakes den communally in Canada, often in large numbers, and site fidelity of up to 95% has been documented (Jørgensen 2009; Shipley et al. 2013). Individuals typically leave their hibernaculum by mid-May, and return by the end of October, although these dates can vary annually due to weather conditions (Martinson per obs). Migration distances for males and non-gravid females vary by individual. The maximum straight-line migration distance from dens generally ranges from 2 to 20km (Didiuk 2003; Gardiner 2012; Jørgensen 2009; Powell et al. 1998) however; the maximum distance observed in Alberta was 25km on Canadian Forces Base Suffield (Didiuk 1999 as cited in Didiuk 2003).

Mating usually occurs in mid-to late summer, though mating has also been observed in spring and fall, with females giving birth the following year (Aldridge 1993; Russell and Bauer 1993). For gravid females, rookeries provide optimum thermoregulatory conditions for embryonic development and cover from predation. Rookeries may occur at hibernacula or be separate sites, typically within 1 km of the gravid female's hibernaculum (AESRD and ACA 2012; Andrus 2010; Jørgensen and Nicholson 2007; Martinson 2009a). Prairie rattlesnakes in Alberta have low reproductive capacity and recruitment because of late reproductive maturity, relatively small litters, and biennial or triennial reproductive cycles (Jørgensen and Nicholson 2007, Macartney and Weichel 1993, Russell and Bauer 1993). This reduced reproductive capacity results in populations being sensitive to the removal of sexually mature individuals with a limited ability to rapidly recover from population declines.

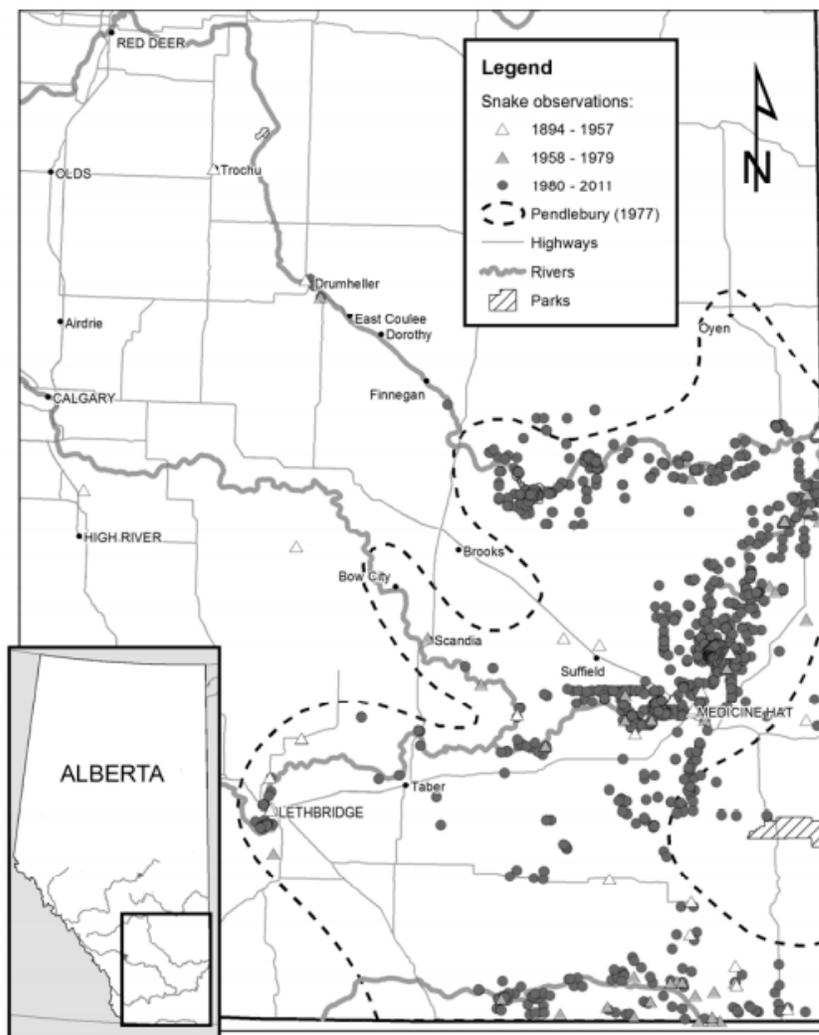


Figure 1. From AESRD and ACA 2012. Recent (1980 to 2011) and historical (1894 to 1979) records of prairie rattlesnakes in Alberta. Dashed line indicates the species' estimated range as of 1977 (Pendlebury 1977).

1.2 Threats to Population

The main threats to prairie rattlesnakes in Alberta affect the species through both direct mortality and habitat degradation. Hibernacula are particularly important habitat components because of their limited occurrence on the landscape, the high densities of prairie rattlesnakes present at sites during certain times of the year, high fidelity to these sites, and the absolute need for these sites in order to survive extreme winter temperatures.

1.2.1 Road Mortality

Road mortality is a major threat to prairie rattlesnakes and can play a role in other threats that affect the species (e.g., roads associated with oil and gas production). More than 95,000 km of roads cover the Grasslands Natural Region in Alberta, which includes the range of prairie rattlesnakes (Alberta Environmental Protection 1997, as cited by AESRD and ACA 2012). Roads pose a threat to prairie rattlesnakes predominantly through direct mortality, which has been documented empirically (Martinson 2009b; Weyer et al. 2014) and anecdotally (Gushulak pers. comm. 2013). Drivers have also been documented intentionally running over prairie rattlesnakes in Alberta (Jørgensen pers. comm. 2013; Martinson unpub. data). Prairie rattlesnakes were significantly more likely to be killed on roads relative to three other snake species (bullsnake [*Pituophis catenifer sayi*], wandering gartersnake [*Thamnopsis elegans*] and plains gartersnake [*Thamnopsis radix*]), near Dinosaur Provincial Park, Alberta (Martinson 2009b). Prairie rattlesnakes are particularly susceptible to road mortality because:

1. Long migration distances increase the likelihood of road crossings and encounters with vehicles,
2. High migration route fidelity means individual snakes may cross the same road(s) twice per season,
3. High density of roads within the Grasslands Natural Area increases the likelihood of individuals encountering roads,
4. Large size makes rattlesnakes more likely to be accidentally hit on roads and easy targets for drivers intent on hitting them (Martinson 2009b),
5. Colouration makes rattlesnakes hard to see and avoid on gravel or dirt roads (Martinson pers. obs.),
6. Rattlesnakes move relatively slowly when crossing roads (Martinson 2009b; Weyer et al. 2014),
7. Rattlesnakes may thermoregulate on road surfaces (Gardiner et al. 2013; Martinson 2009b), and
8. Rattlesnakes' defensive behaviour (i.e. coiling rather than fleeing when threatened) results in longer periods of exposure to risk on roads (Andrews et al. 2005).

1.2.2 Agricultural Development

Agricultural activity is pervasive within the range of the prairie rattlesnake in Alberta. Although habitat loss due to cultivation has slowed dramatically, direct mortality and associated population isolation are ongoing threats across the cultivated landscape. Conversion of native prairie to intensive cropland reduces the quantity and quality of available foraging habitat and is presumed to have contributed to the historical range

reduction of the prairie rattlesnake in Alberta (Pendlebury 1977; Rose 2001). In addition, cultivation in riparian areas may also result in the destruction of hibernacula (Jørgensen 2009; Rose 2001).

1.2.3 Oil and Gas Development

Industrial development in the energy sector is a threat to the prairie rattlesnake due to habitat loss and degradation, and direct mortality. Rattlesnakes can be susceptible to being trapped in excavations such as pipeline trenches or caissons (Didiuk 1999, as cited by AESRD and ACA 2012), or having their hibernacula destroyed if not identified during a pre-construction wildlife survey (Nicholson and Rose 2001). There is some evidence suggesting a link between prairie rattlesnake population declines and increased intensity of traffic associated with energy development in areas surrounding hibernacula (Proctor *et al.* 2009).

1.2.4 Urban Development

Urbanization within the range of the prairie rattlesnake results in direct habitat loss, mortality of snakes, reduction of connectivity, and isolation of populations. These threats are predominantly associated with the presence and expansion of two urban centres in Alberta: Medicine Hat (population: 60,005) and Lethbridge (population: 83,517; Statistics Canada 2012). In addition to direct habitat loss, where urban or near-urban habitat is protected, or not yet developed, remaining rattlesnakes are subject to increased levels of mortality through direct persecution and being struck by vehicles on roads. In addition, rattlesnakes are periodically relocated when they are found in urban areas. The results of relocation of snakes is not well understood, but it is likely that there are negative impacts related to successful navigation back to hibernacula.

1.2.5 Intentional Persecution

Intentional persecution en masse and destruction of hibernacula are thought to have played a role in the historical decline of prairie rattlesnake in Alberta (AESRD and ACA 2012). Rattlesnakes are most susceptible to catastrophic events such as large-scale illegal harvesting and alterations to hibernacula since these activities may rapidly and drastically reduce the size and alter the composition of snake populations (Gardiner and Sonmor 2011). There is some evidence to suggest that public education campaigns may reduce the incidence of intentional persecution to prairie rattlesnakes, at least at the local scale, however there are still reports of prairie rattlesnakes being targeted and killed illegally (J. Nicolson pers. comm. 2015).

1.3 Provincial Monitoring History

The first assessment of the provincial prairie rattlesnake range was completed in 1960's (Stebbins 1966) and was later refined in 1977 through a mail out questionnaire (Pendlebury 1977). Since 1996, the Alberta Conservation Association, first through the Alberta Snake Hibernacula Inventory and then through the Alberta Volunteer Amphibian Monitoring Program, has encouraged submissions of incidental observations of reptiles and their hibernacula (AESRD and ACA 2012). AESRD and ACA (2012) reported an increase in survey effort for the species between 2003 and 2012 due to various research initiatives. Targeted search effort in Alberta has been concentrated in areas including easy-to-access sites (e.g., along roads), along the Milk River system (MULTISAR program: AESRD and ACA 2012), the Red Deer River system (from Brooks, Alberta to

Saskatchewan border: Martinson 2009; Rose 2001), the Oldman River in Lethbridge (Andrus 2010), and the South Saskatchewan River in the Medicine Hat area (numerous studies described in AESRD and ACA 2012). Since 2008 there has been an ongoing mark-recapture study at Dinosaur Provincial Park that has marked 334 individual prairie rattlesnakes as of November 2014, with the intent of producing a population estimate for the park in the next several years (Martinson, unpublished data).

2.0 GOALS AND OBJECTIVES

2.1 Goal

Maintain the current distribution and breeding populations of prairie rattlesnakes and, where possible, restore populations that have experienced declines.

2.2 Objectives

1. Inventory and Monitoring: Implement long-term mark and recapture surveys at known hibernacula sites to establish population trends. Additional inventories should be conducted in suitable habitat to identify undocumented hibernacula.
2. Education and Communication: Enhance education and communication regarding the importance of prairie rattlesnakes and their habitats with government, industry, public and landowners. Reducing fear of the species is important to successful conservation.
3. Habitat Protection: Develop and implement habitat protection for hibernacula and rookeries on public, private, and municipal land.

3.0 MANAGEMENT ACTIONS

3.1 Inventory and Monitoring

Although there has been increased survey effort for prairie rattlesnakes in Alberta since 2003, still relatively little is known about the population size and trends in the province. It is essential to increase inventory and monitoring efforts so conservation targets can be set and progress can be measured.

Mark and Recapture

Through long-term mark and recapture studies at known hibernacula, population trends can be estimated across the province. Potential areas with known hibernacula that could be monitored include Dinosaur Provincial Park, Bindloss, Lethbridge, Medicine Hat, and Writing-on-Stone Provincial Park. This monitoring should be conducted on a biannual basis over the course of numerous days in the spring and fall when the likelihood of encountering snakes at hibernacula is highest. Two methods that could be employed for capturing prairie rattlesnakes include (1) installing drift fences with funnel traps around entrances to hibernacula (Martinson 2009a), or (2) opportunistic captures from repeated surveys of the sites. Each captured rattlesnake should be implanted with a passive

integrated transponder (PIT) tag for future identification and to enable robust capture-recapture analysis. An added benefit of PIT tagging individuals is the future potential to use remote solar-powered scanning equipment and data loggers for non-invasive monitoring of hibernacula use. Similar work has been ongoing at Dinosaur Provincial Park since 2008 (Martinson unpub. data).

Identification of Hibernacula and Rookeries

The difficulty in identifying hibernacula and rookery sites in the field means many of these locations go undocumented and unprotected. Focused searches should be conducted within high quality habitat as identified in previous habitat modelling efforts (Martinson and Wielki 2012, Fast 2003). These searches should be conducted in spring and fall during optimal conditions for observing snakes basking near hibernacula. Searches should be conducted on foot or by mountain bike to increase search efficiency and likelihood of detection. Numerous searches of the same area over multiple seasons may be required to either confirm that a site is being used as a hibernaculum, or to infer that no sites have been missed. The inconspicuous nature of hibernacula and rookeries can make their identification in the field both time consuming and challenging.

In addition to a large-scale survey program, industry should be conducting appropriate pre-development hibernacula and rookery surveys to identify undocumented sites when working in snake habitat. The results of these surveys should be reported into the Fish and Wildlife Management Information System (FWMIS).

3.2 Education and Communication

Snakes, rattlesnakes in particular, are commonly perceived negatively by the public. It is likely that there will be little support for conservation measures if people continue to view prairie rattlesnakes as pests or a significant safety risk. Educating all Albertans, including governments, industry and landowners, about the benefits of having prairie rattlesnakes on the landscape (e.g., rodent control), and how to safely coexists with them will not only reduce rattlesnake mortality, but also increase the likelihood of habitat management measures being adopted where they cannot be legislated (e.g., private land).

Fish and Wildlife (FW - Operations and Policy and Planning divisions) at AEP should provide information to, and collaborate with Alberta Parks, other government agencies and non-government organizations interested in participating in outreach activities. The focus should be on the value of native prairie habitats, complex riparian ecosystems, and how prairie rattlesnakes are an important component of these systems. Outreach methods that could be used include school talks, interpretive activities (e.g., presentations and field trips) at parks, displays at community events, social media, and printed material directed toward the general public. The inventory and monitoring programs discussed above could be highlighted during outreach activities and an example of this is currently ongoing at Dinosaur Provincial Park.

Wildlife and habitat managers should work with industry and private landowners to raise awareness of the importance of prairie rattlesnakes and provide information on how to live and work safely in prairie rattlesnake habitat. An example of raising awareness with industry was the development of a safety and awareness video that is required training for

all employees and contractors of an oil and gas company conducting work in prairie rattlesnake habitat (<http://vimeo.com/28910852>).

3.3 Habitat Protection

Prairie rattlesnakes in Alberta are found on private, municipal, provincial, and federal land. With such a diverse range of landowners and managers, the habitat management methods also need to be diverse. Because the species disperses over such large areas in low densities during the active season, habitat protection measures should be focused on hibernacula, rookeries and the foraging areas in close proximity to these sites. Both hibernacula and rookeries are protected year-round from disturbance under the *Wildlife Act*; however it is unlikely that this protection alone will be enough to ensure the populations in Alberta are maintained in their current state. Therefore, it is also important to reduce fragmentation of habitat to maintain population connectivity.

On public lands, legislated guidelines and restrictions are the tools utilised for habitat protection. The current setback from hibernacula is 500m, however, rookeries are known to be located within 1000m of hibernacula (AESRD and ACA 2012; Andrus 2010; Jørgensen and Nicholson 2007; Martinson 2009a). A 1000m setback distance is needed for more effective protection. This setback would help to reduce the anthropogenic mortality risk for the most sensitive individuals, gravid females, when travelling between their hibernaculum and rookery (Jørgensen and Nicholson 2007). Moreover, undocumented rookeries would likely be protected. Protective Notations (PNTs), stipulating setback distance, should be applied.

Careful consideration should be made for roads proposed in sensitive snake range. New road development within 10km of hibernacula should be discouraged, and only considered with strict mitigation, such as seasonal closures (i.e. spring and fall) or the installation of underpasses. The installation of underpasses should also be considered for existing roads at known high road-kill areas or migration routes.

Protection measures on private land are more difficult to enforce and warrant a different approach than on public land, because there are fewer regulatory tools on private lands. Education and outreach with land managers will be critical for successful implementation of conservation measures. Preferably, the guidelines and standards on public land should be adhered to on private land. Alternatively, best management practices (BMPs) should be developed to guide development decisions. BMPs should be provided to regulators for consideration during the review of developments on private land, and municipal governments for their consideration during the planning of new urban developments.

Spatial data and management guidelines need to be integrated into current policies and processes so that they are readily available to these stakeholders.

Other protection measures such as conservation easements and stewardship programs should also be pursued on private land. An additional tool that should be implemented is a recognition program for landowners who protect prairie rattlesnake hibernacula. This could be implemented in conjunction with existing programs (e.g., MULTISAR) that are already successfully engaging and recognizing landowners in southeastern Alberta.

4.0 SUMMARY

Prairie rattlesnakes are a *Species of Special Concern* in Alberta. Their reduced reproductive potential as a result of late maturity, relatively small litters, and biennial or triennial reproductive cycles, means that the species has a reduced capacity to respond to stochastic population declines. Some prairie rattlesnakes travel long distances during the active season which results in an increased risk of mortality. Major threats to the species include road mortality, cultivation, energy development, urban development and intentional persecution by humans. Ensuring the viability of existing populations in the province will require focus on inventory and monitoring, communication and outreach, and habitat management and protection. With the diversity of land ownership and management that exists within the prairie rattlesnakes range in Alberta, a variety of tools need to be considered and applied, with a specific emphasis on educating government, industry, and landowners about the species.

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