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# REPTILES

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## MAJOR SLUMP EVENT AT GRASSLANDS NATIONAL PARK SNAKE PIT IN SOUTHWESTERN SASKATCHEWAN

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### Introduction

The availability of suitable winter hibernacula for snakes is critical to their persistence at higher latitudes.<sup>1-4</sup> Southwestern Saskatchewan is home to multiple snake species living at the northern extent of their geographic range in North America. These snakes rely on unstable slump zones, mammal burrows, rock crevices, and abandoned cisterns to provide suitable over-wintering sites that enable them to survive the harsh winter.<sup>5,6</sup> It is common to find more than one species hibernating together at communal hibernation sites, which may be a response to limited availability of suitable locations for over-wintering. Communal hibernation places large numbers of snakes of multiple species together at single locations for prolonged periods when they are immobile, and therefore highly vulnerable. Disturbance or destruction of over-wintering sites by natural or anthropogenic factors may cause significant reductions in population size, especially for species that are already rare, such as the eastern yellow-bellied racer (*Coluber constrictor flaviventris*).<sup>7</sup> Here we describe occlusion

of hibernaculum openings due to natural erosion, and potential loss of 'Snake Pit', one of the largest and most important over-wintering sites for snakes in Grasslands National Park, Saskatchewan.

### Study Site

The Frenchman River Valley in southwest Saskatchewan was formed by glacial melt-water.<sup>8</sup> Landslides, or 'slumps', are the dominant process of valley widening, and are common along melt-water valleys and tributaries.<sup>9</sup> The Frenchman River Valley is 80 m shallower and almost three times as wide as the original melt-water channel due to the accumulation of landslide debris.<sup>8</sup> Slumping along unstable slopes creates terraces containing slight depressions or sinkholes, fissures or small faults, and loosely packed soil that attracts burrowing mammals.<sup>4</sup> These factors provide plentiful opportunities for snakes to find refuge below the frost line, making unstable slump zones a common location for winter hibernation sites in the area.

'Snake Pit' is a well-known hibernaculum located in the Frenchman



*Figure 1. Snake Pit hibernaculum in Grasslands National Park, SK, (A) before (May 2010) and (B) after (May 2011) the slump event along the back slope. The resulting debris occluded den entrances prior to typical spring emergence, trapping snakes in the hibernaculum. Photos by Laura Gardiner (A) and Danae Frier (B)*

River Valley in Grasslands National Park, Saskatchewan. It is an established slump-based hibernaculum inhabited by prairie rattlesnakes (*Crotalus viridis*), plains garter snakes (*Thamnophis radix*), eastern yellow-bellied racers, and bullsnakes (*Pituophis catenifer sayi*). Historically, the site has been subjected to instability due to both natural and anthropogenic disturbances. This site is the largest active snake den in the Val Marie area, known to contain large numbers of rattlesnakes since the establishment of the local community (K. Grant, Parks Canada, pers. comm.). It has also been recognized in several major reptile surveys in the area dating back to the late 1980's.<sup>10,11</sup> In the past, humans have attempted to eliminate snakes at Snake Pit using a variety of methods. These include use of dynamite to destroy dens, vandalism by shotgun, and physical mutilation resulting in observations of headless and rattle-less snakes.<sup>10,12</sup> The snakes at this location were formally protected under federal law within Grasslands National Park in 2001.

### **Erosion Event at Snake Pit in 2011**

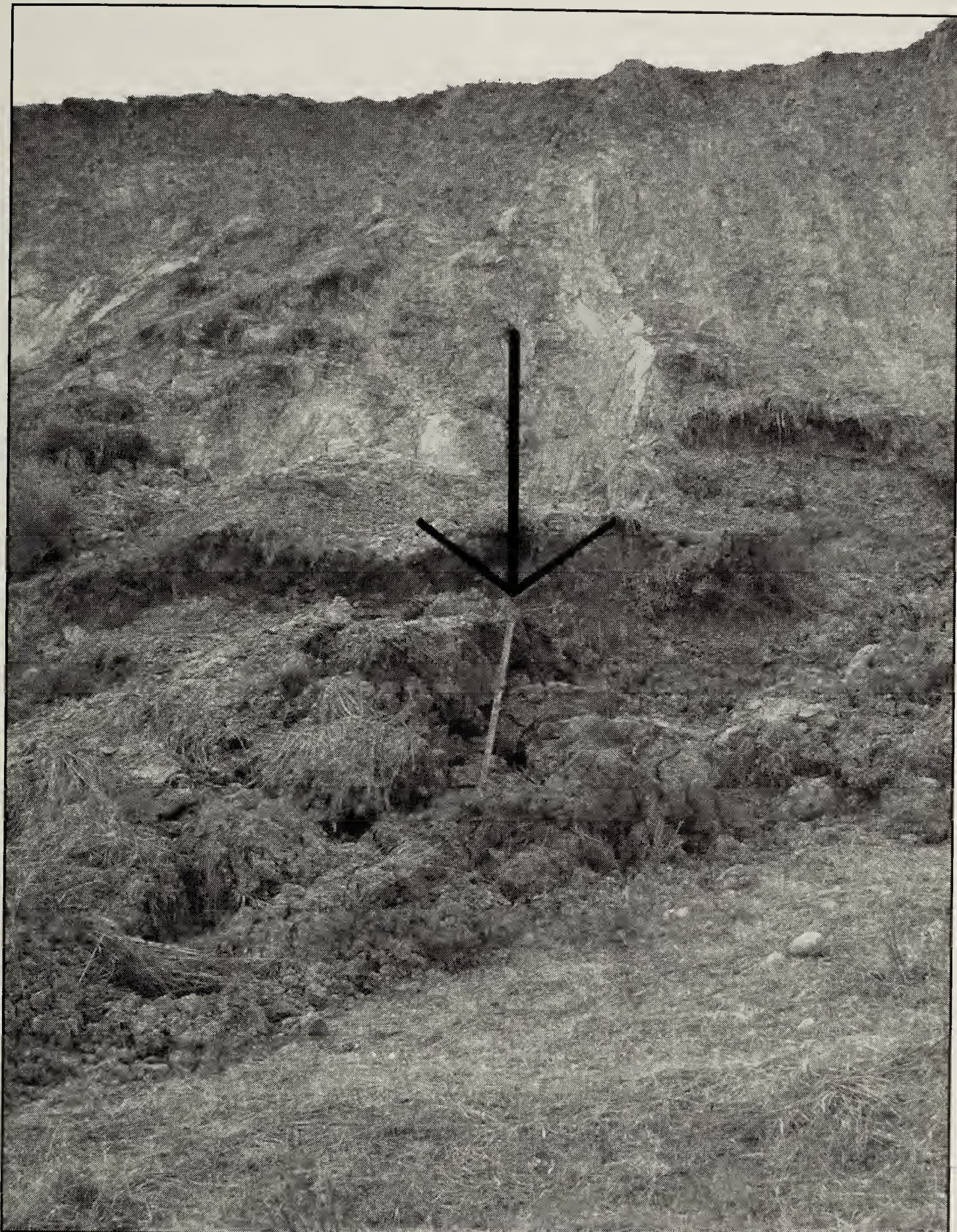
In the spring of 2011, Snake Pit was seriously damaged by a large slump event that was triggered by soil saturation (Fig. 1b). Excessive water in the soil caused a large amount of sediment to slide down the back slope of the den coulee, covering previously existing entrances to hibernation sites. There were previously at least 10 active entrance holes at this site.<sup>10</sup> Along the back slope where the slump occurred, at least six holes were observed in 2010. After the slump event, only one hole was observed on the slope. The slump extended from the top of the slope to the bottom and was estimated to be 120 m across; there was approximately 2 m of debris deposited at the bottom of the slope (Fig. 2). The slumping occurred in early April, about a

month before typical spring emergence, and likely trapped snakes inside of the hibernaculum.

In early May 2011, fewer snakes than usual were observed during research activities at Snake Pit, and many of the snakes that were observed were covered in mud. A remote motion-detecting camera was set up on the single remaining hole from 3 to 16 May. Review of the images revealed at least one rattlesnake using this hole. During the spring den survey following the slump in 2011, a maximum of 4 racers were caught per day, while surveys in 2010 had resulted in up to 16 racers per day at Snake Pit. Slumping also occurred to various extents at or near four of seven other known hibernacula within Grasslands National Park, although no other site experienced slumping to the same scale or level of destruction as was observed at Snake Pit.

### **Discussion**

The eastern yellow-bellied racer, an inhabitant of the Snake Pit hibernaculum, is a COSEWIC-designated Threatened species in Canada, with a known range confined to the Frenchman River Valley and Big Muddy Valley in southern Saskatchewan, and the Milk River Valley in southeastern Alberta.<sup>5,6,13</sup> As of 2011, Snake Pit contained the largest known population of racers in Canada, and was therefore a very important site for this species.<sup>5,13</sup> Mark-recapture estimates using the Lincoln-Peterson formula (four recaptures of 40 previously marked snakes in a sample of 17 snakes caught in 2011) suggest a 50% decrease in the racer population at Snake Pit from 2010 to 2011 (J. Martino, L. Gardiner, unpublished data).<sup>13</sup> The slump event may represent an important loss of individuals from the largest known population of eastern yellow-bellied racers in Canada. The event may have similarly affected other species using this den, although we have



*Figure 2. Metre stick (arrow) showing the amount of debris that slumped at Snake Pit. The slump was estimated at 120 m across resulting in 2 m of debris deposited at the bottom of the slope.*

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minimal data on the magnitude of this effect.

Large mortality events in small peripheral populations, such as those of snakes in southern Saskatchewan, have the potential to cause extirpation and genetic isolation, making them more susceptible to environmental perturbations.<sup>6</sup> As such, the potential decimation of the largest known population of racers in Canada may have negative consequences for the management of this Threatened species. At this time, additional search effort is needed to locate more racer dens in Canada in order to fully understand the conservation significance of this event to the species. The implications of this event to the other species concentrated at this site are currently unknown and warrant additional research.

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*Man's heart away from nature becomes hard.*

*- Standing Bear*