

## THE DISTRIBUTION OF THE SHORT-HORNED LIZARD *PHRYNOSOMA HERNANDEZI* IN SASKATCHEWAN, CANADA

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**ABSTRACT**—We examined the distribution and abundance of the short-horned lizard *Phrynosoma hernandesi* in Grasslands National Park, Saskatchewan, Canada. Historical records and anecdotal observations were compiled, and new surveys were conducted in 1995 and 1996. A total of 41 individuals, mostly young-of-the-year, were captured in the West Block of the Park in these years. The habitat used by lizards here was juniper dune terrain similar to that inhabited by the species in Alberta. Distribution in the West Block appeared to be restricted to the Frenchman River Valley. Twelve adult and subadult lizards were captured in the East Block of the Park in 1995 and 1996, mostly on gentle slopes in the lower reaches of Rock Creek Coulee within 4 km of the 49<sup>th</sup> parallel. The habitat in the East Block is mixed-grass prairie. Voucher specimens in collections, literature records and anecdotal accounts of this species in Saskatchewan almost all originate within the areas examined in this study, indicative of a restricted range in Saskatchewan.

**Key words:** short-horned lizards, Saskatchewan, *Phrynosoma hernandesi*, habitat, range-limit populations, distribution, Grasslands National Park

The short-horned lizard *Phrynosoma hernandesi* (previously *P. douglassii*, Zamudio and others 1997), though widespread throughout western North America (Smith 1946; Reeve 1952; Sherbrooke 1981; Zamudio and others 1997), has a limited distribution in Canada (Smith 1946; Logier and Toner 1961; Behler and King 1979; Cook 1984; Stebbins 1985). The species has range-marginal distributions in Alberta and Saskatchewan, where it is largely associated with the Missouri drainage basin. Alberta locality records are clustered loosely within coulees and river valleys but are seldom closely associated with one another (Powell and Russell 1992a, 1993a). The ecology of the short-horned lizard is fairly well-known in Alberta (Powell 1982; Powell and Russell 1984, 1985a, 1985b, 1991a, 1991b, 1992a, 1992b, 1993a, 1993b, 1994).

We present a review of the known localities and habitat use by *P. hernandesi* in southwestern Saskatchewan, and results of 2 field surveys within the West and East Blocks of the newly-created Grasslands National Park (Figs. 1, 2).

Given its apparently restricted range in the province (Logier and Toner 1961; McCorquedale 1965; Cook 1966; Secoy 1976; Powell and Russell 1992a, 1993a), and its COSEWIC (Committee on the Status of Endangered Wildlife in Canada) status of vulnerable (Powell and Russell 1992a; Anonymous 1995), knowledge of habitat and abundance in Saskatchewan is of value in planning management strategies and for long-term monitoring.

### METHODS

#### *Historical Records and Anecdotal Observations*

Voucher specimens from Saskatchewan were located from the specimen catalogue of the Canadian National Museum of Nature herpetology collection, which also contained references to anecdotal reports unaccompanied by a voucher specimen. Additional historical records were sought in the literature. We interviewed Grasslands National Park personnel and local inhabitants who worked outdoors in the study area for anecdotal information on localities and natural history of *P. hernandesi*.

*Field Surveys in Grasslands National Park*

The choice of areas for field study was initially dictated by the findings of the search for historical records and anecdotal observations. Our 1995 field work in the West Block of Grasslands National Park was conducted 9 to 14 August and 26 August to 4 September. Most field searches were carried out by a single observer. Field searches consisted of walking the area slowly under clement weather conditions, in daylight hours, scanning the ground within approximately 1 m to either side of the route. *Phrynosoma hernandesi* within about 1 m of a walker tended to flush, and were easily picked up once seen. An observer using this method misses altogether lizards which do not flush, unless they are sitting on a contrasting background, and tends to miss lizards which do not flush until the observer is almost past. Thus, additional observers were recruited, as they became available, to increase the total amount of disturbance and spot late-moving lizards. Because the area to be covered was so large, no effort was made to cover any given area systematically. Back-tracking, however, was avoided. Weights, snout-vent lengths (SVL), and sex were recorded for each capture, and any distinguishing marks were noted, as were location and habitat features. All lizards were released at the point of capture immediately after data were recorded. Our efforts were concentrated in the northern part of the West Block, partly due to the ease of access and extensive contiguous area of Park property, and partly due to the number of reported sightings of *P. hernandesi* in this part of the Park. Appropriate habitat (juniper dune areas, see below) on the northern side of the Frenchman River Valley was inspected from 70-Mile Butte east to Police Coulee (Fig. 1); isolated thinly-vegetated areas on the valley floor and juniper dune terrain on the valley's south side in this area were also walked. The only disjunct portion of the West Block which we visited was the Lower Gillespie area, which is bordered by the 49<sup>th</sup> parallel (Fig. 1).

We surveyed the East Block on 15 to 25 August 1995. The vicinity of the Killdeer Badlands and associated eroded areas to their north were walked, as were areas of the lower Hellfire Creek, Rock Creek, Butte Creek and Spring Creek Coulees (Fig. 2).

Because only 4 captures of *P. hernandesi* were made in the East Block in 1995 (during only 1 of 7 field days), a more intensive search of the known habitat was made in the summer of 1996 to further investigate their abundance. From 10 to 13 observers conducted surveys daily, 13 to 16 July 1996 on the north side of lower Rock Creek Coulee (Fig. 2). The number of captures made in 1996 should have scaled up as a function of the additional observer hours from the number of captures in 1995, assuming a constant rate of encounter. Conditions were hot and sunny throughout the field period. The observers were

paired up, with one trailing the other by  $\geq 1$  m in order to spot lizards flushed by the first.

## RESULTS

*Historical Records*

McCorquedale (1965) and Secoy (1976) state that *P. hernandesi* in Saskatchewan is restricted to the Frenchman River valley south of the town of Val Marie (Fig. 1). Saskatchewan localities based upon catalogue entries accompanying voucher specimens in the Canadian Museum of Nature (NMC) are given in Table 1. Saskatchewan localities based upon anecdotal reports or those derived from the literature, not established by voucher specimens, are listed in Table 2. All of these originate from a small area within the southwest corner of Saskatchewan (Figs. 1 and 2), representing localities apparently disjunct from those in Alberta (McCorquedale 1965; Secoy 1976; Powell and Russell 1992a, 1993a).

The distribution of *P. hernandesi* is poorly known in Montana, the only state contiguous with the areas of Saskatchewan within which they are found (Powell and Russell 1993a). Reeve (1952) did not list any Montana localities in the north of the state, but shows the species' range running along much of the border with Saskatchewan. Reichel and Flath (1995) do not record *P. hernandesi* occurring north of the Milk River in north-central Montana, although the species is recorded from the area immediately below the 49<sup>th</sup> parallel in the vicinity of the Frenchman River by Thompson (1982).

*Field Surveys*

*West Block.*—We captured 41 *P. hernandesi* in the West Block of Grasslands National Park in 1995. Thirty-nine of these were young-of-the-year (YOY;  $\leq 30$  mm SVL; Powell and Russell 1985a, 1991b). A high proportion of YOY captures were expected, because field work began immediately after parturition at this latitude (Powell and Russell 1991a, 1991b, 1992a, 1993a). The first 2 YOY captured in 1995 (10 August) on 70-Mile Butte still had sediment stuck to their umbilici, suggesting that they were born within a few days of their capture. The adult female caught close by the same day was not gravid, and no gravid females were captured subsequently. Captures were most abundant ( $n = 33$ ) in the northwest end of the Park (70-Mile Butte; Fig. 1), no doubt due to the

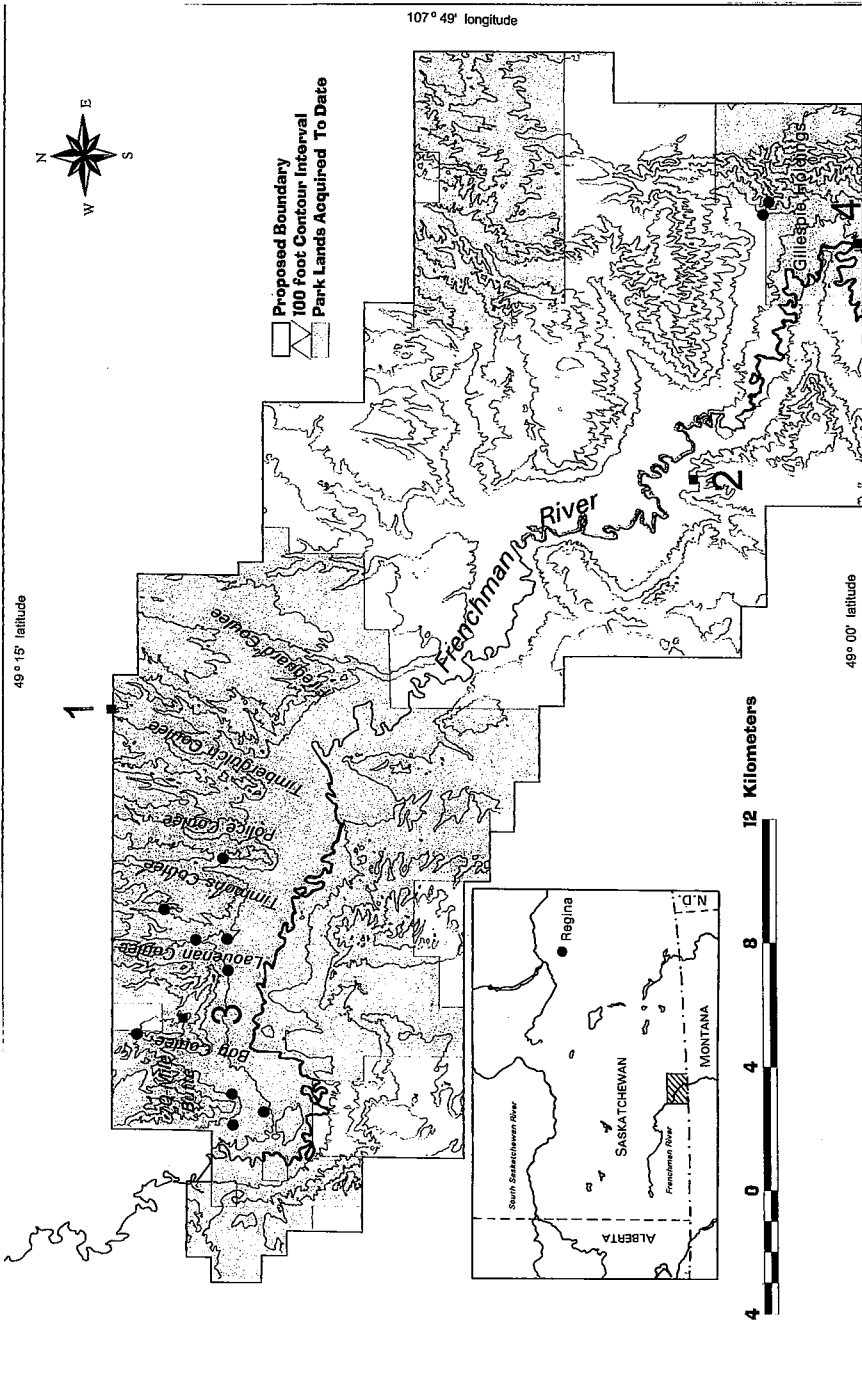


FIGURE 1. Map of West Block, Grasslands National Park, Saskatchewan, showing previously-recorded localities for *Phrynosoma hernandesi* (numbered squares correspond to localities in Tables 1 and 2) and locations of captures made during the course of this study (1995)—solid circles; a large number of captures are subsumed under one symbol south of 70-Mile Butte, due to scale). Inset shows the position of the bordered area within southern Saskatchewan (hatched area). Grasslands National Park is not yet fully incorporated; the areas blocked in grey represent the current Park holdings, while the area contained within the black border represents the proposed final configuration of the West Block.

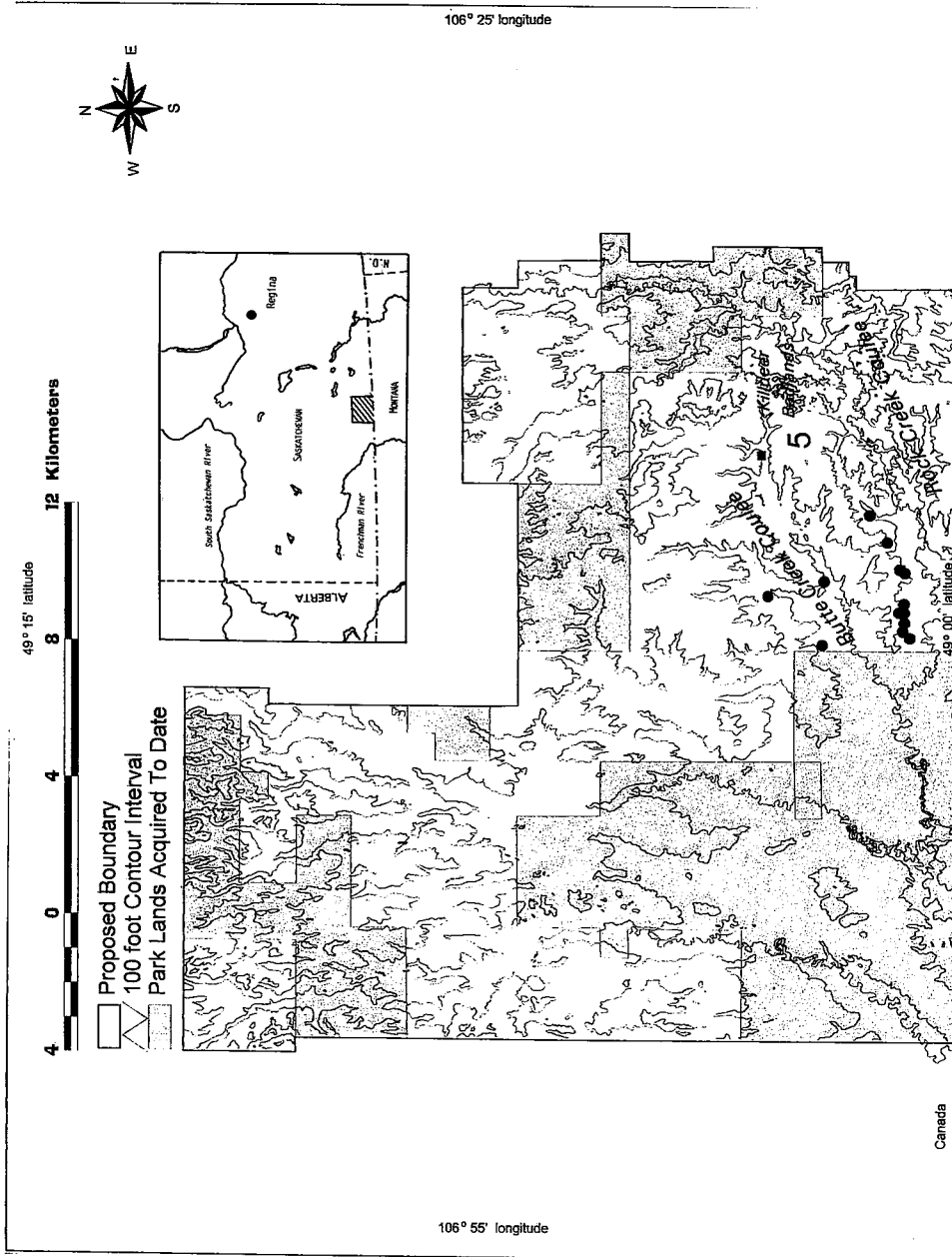


FIGURE 2. Map of East Block, Grasslands National Park, Saskatchewan, showing previously-recorded locality for *Phrynosoma hernandesi* (numbered square—Table 1), and locations of captures and reports made during the course of this study (1995 to 1996—solid circles). Inset shows the position of the bordered area within southern Saskatchewan (hatched area). Grasslands National Park is not yet fully incorporated; the areas blocked in grey represent the current Park holdings, while the area contained within the black border represents the proposed final configuration of the East Block.

TABLE 1. Voucher specimen records of the short-horned lizard, *Phrynosoma hernandesi*, from Saskatchewan. NMC—herpetology collection of the Canadian National Museum of Nature, Ottawa.

Locality	Voucher specimen	References
Gergovia, West Block, Grasslands National Park (Fig. 1, 1)	NMC 1634	Nero 1957; Logier and Toner 1961; Powell and Russell 1992a, 1993a
Rosefield (Fig. 1, 2)	NMC 5680	Nero 1957; Logier and Toner 1961; Powell and Russell 1992a, 1993a
Butte Creek Coulee (Fig. 2, 5)	NMC 15499	Powell and Russell 1992a, 1993a

amount of effort expended there (approximately 40 hr). Captures elsewhere in the northern part of the West Block were more widely scattered, from 70-Mile Butte east along the north side of the Frenchman River Valley, but not on the main valley floor or on the juniper dune terraces on the south side of the valley (Fig. 1). We have anecdotal accounts of encounters with lizards on the alluvial flats (Shelly Duquette-Larson, Grasslands National Park, pers. comm.; Mme. Lise Perrault, Val Marie, pers. comm.). The lack of captures from the south side of the Frenchman River Valley within the West Block is likely due to our cursory examination of that area, as the Rosefield specimen (Table 1) is from the south side of the river (Fig. 1).

Only 2 captures (YOY) were made farther south in the Frenchman River valley, on the lower expanses of the steep, extensively dissected Bearpaw slopes of the east side, immediately above the 49<sup>th</sup> parallel (Fig. 1). There is a 1931 report (without a voucher) from this area in the NMC catalogue (Table 2), and juniper dune habitat is extensive there.

The habitat used by short-horned lizards in the West Block is very similar to that east of Manyberries in Alberta, characterized by extensive juniper dune badlands resulting from the dissection of low-aspect slopes cut in dark fissile Bearpaw shale and their colonization by creeping juniper (*Juniperus horizontalis*) (Powell, 1982; Powell and Russell 1991a, 1992a, 1992b, 1993a, 1993b, 1994). All West Block captures were made in juniper dune terrain, from the tops of the valley sides down to the valley floor flats (Fig. 1), although we spent some time searching ecotones.

*East Block.*—Four lizards, all females, were caught in the East Block in 1995. Three were subadult (30 mm < SVL ≤ 60 mm; Powell and Russell 1985a) and one was an adult (>60 mm SVL; Powell and Russell 1985a). An adult female was captured later in 1995 in the same general area, although on the raised area between Rock Creek Coulee and Butte Creek Coulee (Table 2; Fig. 2). No YOY were captured in the East Block in 1995.

During 1996 surveys (approximately 200

TABLE 2. Literature and anecdotal records from Saskatchewan of short-horned lizards (*Phrynosoma hernandesi*) for which no voucher specimen exists.

Locality	Comments	Reference
70-Mile Butte (Fig. 1)	Found in juniper dune badlands, on or about butte	Canadian National Museum of Nature Catalogue; Wayne Harris (Saskatchewan Parks and Renewable Resources), pers. comm.
11 km SE of town of Val Marie, Saskatchewan; vicinity of 70-Mile Butte (Fig. 1, 3)	Found in juniper dune badlands on valley floor	Chandler 1965; Powell and Russell 1992a, 1993a
Frenchman River valley in immediate vicinity of 49 <sup>th</sup> parallel (Fig. 1, 4)	Said to be plentiful	Canadian National Museum of Nature Catalogue; Powell and Russell 1992a, 1993a
Between Rock Creek and Butte Creek Coulees, East Block (Fig. 2)	Adult female; on high terrain; 1995	Keith Foster (Grasslands National Park), pers. comm.
Coal Creek (106°12'30"W, 49°04'00"N), southeast of Killdeer		Canadian National Museum of Nature Catalogue

person-hr), 8 lizards were captured. All but 1 capture were made by naive observers, suggesting that experience was not a factor in capture success. For comparison, approximately 50 hr were spent searching for lizards in the East Block by a single experienced observer in 1995, resulting in 4 captures.

In 1996, 2 of 8 captures were males: 1 adult (>40 mm SVL; Powell and Russell 1985a), and the other was too small to be assigned to the preceding year's cohort, but too early in the year to be a neonate (Powell and Russell, 1985a). The relatively low number of captures of males is normal for this species in Canada (Powell and Russell 1985a). Of the 6 captures of females in 1996, only 2 were within the subadult SVL range (born in 1995), the rest being adult-sized (large enough to be  $\geq 2$  yr old; Powell and Russell 1985a). The weights of the females captured in 1996 suggested that they were gravid, and all appeared to be in good condition.

Most of our captures in the East Block were made along a 4-km stretch of the north side of the lower Rock Creek Coulee (Fig. 2). Almost all were found on relatively bare portions of the lower coulee slopes. While vegetation there was thick where it occurred, a significant portion of the area was unvegetated, consisting either of compacted depositional flats or eroded, crusty soil. Much of this material was apparently derived from Bearpaw shale. The relationship between lizard occurrence and Bearpaw exposure suggests that this substrate may be a limiting factor in Saskatchewan, although the two do not inevitably occur together in Alberta (Powell and Russell 1991a, 1992a, 1992b, 1993a). Unvegetated areas on the lower slopes upon which lizards were found were separated from one another by areas thickly-covered by grasses.

Anecdotal reports indicate that short-horned lizards are distributed as far as 3 to 4 km north of the area in which we were working, through the coulee system on the east side of the East Block (Fig. 2; Clive Elliot, pers. comm.; Miles Anderson, pers. comm.). The 1995 anecdotal locality (Table 2; Fig. 2), on top of the small highland between Butte Creek and Rock Creek, shows that *P. hernandezi* is not restricted to coulee slopes in the East Block, and also suggests that individuals may move freely across the

higher areas between the small drainage systems in this part of the Park.

#### DISCUSSION

Existing records of *P. hernandezi* from Saskatchewan lie within a region drained by tributaries of the Milk River, and bounded to the west by the Boundary Hills, to the northwest by the Cypress Hills, and to the northeast and east by Wood Mountain and Pinto Butte (Powell and Russell 1992a, 1993a). It seems likely, given the relationship between the distribution of *P. hernandezi* and elevation evident in Alberta (Powell and Russell 1991a, 1992a, 1993a), that locality records from Saskatchewan would occur only within this area. The climate is dry steppe (Longley 1977), with an average frost-free period of 80 to 100 days (early June to early September) and 30 to 35 cm of precipitation yearly (Richards and Fung 1969). The primary native vegetation community is the *Bouteloua-Stipa* assemblage (Coupland 1950), and the area falls within the mixed grassland ecoregion. The principal soil type over the area is brown loamy chernozem in the East Block (Clayton and others 1977; Anonymous 1992), with the uplands around the Frenchman River valley covered with soils ranging from clay to clay loam brown chernozems (Anonymous 1992).

The populations of *P. hernandezi* in the lower Frenchman River valley appear to comprise a small northern extension of the geographic range stretching into this part of southwest Saskatchewan, apparently contiguous with the species' known range in Montana (Thompson 1982). *Phrynosoma hernandezi* is moderately abundant in suitable terrain throughout the Frenchman River valley over the 30-km between the 49<sup>th</sup> parallel and the 70-Mile Butte area (Fig. 1). The apparently restricted range of *P. hernandezi* in this area (there are no reliable reports from the Frenchman River Valley outside of the area encompassed by the West Block of the Park) suggests that these populations are at the species' geographical range limit. Our understanding of what defines these limits in Alberta, where the ecology of *P. hernandezi* is much better known, remains poor (Powell and Russell 1991a, 1991b, 1992a, 1993a, 1993b, 1994, 1996). However, the distribution of the prairie rattlesnake (*Crotalus viridis*), which extends well to the north of the distribution of *P.*

*hernandezii* in Alberta (Russell and Bauer 1993), closely corresponds to the lizard's range in this part of southern Saskatchewan (MacArtney and Weichel 1993). This leads us to posit that climate, in combination with the rising relief of the land to the north of Val Marie, confines both species to the lower reaches of the Frenchman River Valley.

The population of *P. hernandezii* found in the East Block of Grasslands National Park is evidently a range-marginal one. This conclusion is supported by anecdotal reports that lizards occur no farther than 6 km north of the 49<sup>th</sup> parallel. The rapid increase in elevation to the north of this area (Fig. 2) probably confines lizard distribution to the south end of the East Block. We found no evidence of lizards around the Killdeer badlands or in the extensive Ravenscrag Formation badlands along the east side of Rock Creek Coulee. These areas resemble the badlands around which *P. hernandezii* tends to be found in southeastern Alberta (Powell and Russell 1991a, 1992a, 1992b, 1993a).

There are few data on habitat use by *P. hernandezii* in Saskatchewan. Nero (1957) recorded that they were common in "blue shale" badlands in the Frenchman River valley. The habitat in this area has also been termed Bearpaw shale badlands (Richards and Fung 1969) and juniper dunes (Powell and Russell 1991a, 1992a, 1993a). McCorquedale (1965) also noted this association south of the Cypress Hills. Patterns of habitat use similar to those described here were observed in juniper dune habitat in Alberta (Powell and Russell 1992a, 1992b) and radiotelemetry indicated that this reflects limited use of thickly-vegetated areas (Powell and Russell 1993b, 1994, 1996). The number of lizards found in the examined area of the West Block is smaller than what we would expect in a similar-sized area of the Alberta juniper dune habitat over the same period of time and at the same time of year (Powell 1982).

We have reports of 2 clutches of 9 neonates from the West Block (Leon Perrault, Mme. Lise Perrault, Val Marie, pers. comm.). This is within the clutch size range (5 to 11 young) for *P. hernandezii* in Alberta (Powell and Russell 1991b). Very likely the neonates captured in this study on 10 August 1995 were among the last born that year; parturition of *P. hernandezii* in Alberta is generally closely synchronized and takes

place in late July and early August (Powell 1982; Powell and Russell 1985a, 1991b).

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