Research in Foraging Habitats, pp. 12–18. Research and Management Techniques for the Conservation of Sea Turtles. IUCN/SSC Marine Turtle Specialist Group Publication No. 4). It is desirable to continue monitoring the different foraging areas in the Ojo de Liebre Lagoon throughout the year to identify any seasonal variation in the diet of sea turtles in relation to their age classes and the presence of these algae and others nutrients.

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***CHELYDRA SERPENTINA* (Snapping Turtle). MOVEMENT AND FLOOD RESPONSE.** Snapping Turtles are ranked as S3 in Manitoba due to the relatively few known populations, and are listed as Special Concern nationally (COSEWIC 2008. vii + 47pp.). There is little known about population sizes, survivorship, clutch sizes, habitat use, movement, and nest predation in Manitoba (Norris-Elye 1949. Can. Field Nat. 63:145–147). Here we report on habitat use and movement of *Chelydra serpentina* in southwestern Manitoba during non-flood (2010 and 2012) and flood (2011) years. The 2011 flood in the Assiniboine River watershed remained in flood stage for 100 days beginning in early May and remained high through early August (www.gov.mb.ca/flooding/2011/index.html; 1 October 2013). To date, there have been few studies on the impacts of changes in flood plains on animal spatial ecology (Hanke et al. 2015. Wetl. Ecol. Manag. 23:215–226; Zeng et al. 2015. PLoS ONE 10:e0127387), and even fewer that have investigated the impacts of flooding on reptiles (Bateman et al. 2008. J. Arid Environ. 72:1613–1619; Yagi and Litzgus 2012. Copeia 2012:179–190).

This study took place in the lower Little Saskatchewan River, in southwestern Manitoba, Canada (49.8872°N, 100.1211°W; WGS 84). The headwaters of the Little Saskatchewan are in Riding Mountain National Park and the river meanders southward for approximately 150 km where it flows into the Assiniboine River, approximately 15 km W of Brandon. The main study area was located between Glenorky (north) and Kirkham's (south) bridges. The straight-line distance between the most northern and southern locations of the study area was 10 km; the distance along the Little Saskatchewan River between these same two points was 12.5 km. The surrounding area is primarily agricultural and pastoral land. The vegetation community beyond the riparian habitat is comprised of shrubs, such as Silver Sage (*Elaeagnus commutate*), and trees including Aspen (*Populus tremuloides*) and Burr Oak (*Quercus macrocarpa*) with occasional gaps in which the grazed land reaches the riparian habitat of the river.

Nine Snapping Turtles were located and captured by hand or net from14 May to 15 June 2010; one additional turtle was captured on 9 June 2011. Nine out of ten of the turtles were captured in May 2010 or June 2011 in the same marsh (approximately 7.5 ha in size), located on the west side of the Little Saskatchewan River and approximately 1.5 km S of the Glenorky Bridge (Fig. 1). One turtle was captured in a nearby rivulet in June 2010. We recorded weight (kg), carapace width and length (cm), plastron length (cm), pre-cloacal tail length (cm), post-cloacal tail length (cm), water temperature (°C), and air temperature (°C) for each turtle (Table 1). We determined sex by either the presence of eggs and/or the ratio of the ratio of posterior plastron lobe to pre-cloacal tail length (Mosimann and Bider 1960. Can. J. Zool. 38:19–38). All individuals were adults, and there were six males, two females, and two of unknown sex. Each turtle was also given a unique notch combination on the marginal scutes of the carapace with a triangle file.

All turtles were restrained by placing their heads into a bucket, as described by (Galbraith and Brooks 1983. Herpetol. Rev. 14:115). A VHF radio transmitter (Advanced Telemetry Systems, transmitter model R1930, 24 g, ATS, Isanti, Minnesota, USA) was attached to the lower right side of the carapace. The area was first sanded and cleaned, and the radio transmitter was adhered to the shell with waterproof epoxy gel and Mighty Putty™ (Brown et al. 1990. Can. J. Zool. 68:1659–1663). The transmitters have a battery life of approximately three years. We tracked animals by foot and canoe once a week using an ATS R410 VHF receiver (ATS, Isanti, Minnesota, USA) during the summers of 2010 (14 May–21 October), 2011 (19 April–September 11), and 2012 (22 March–6 August).

We calculated home range sizes (ha) using the minimum convex polygon (MCP for 95% of points) in R v3.2.1 (adehabitatHR, MCP; Table 2). We assumed that the transmitter had been shed when we recorded 30 consecutive locations in the same spot for an individual, and excluded these locations from the home range calculations. Home range sizes were larger in the flood year (2011) compared to non-flood years (2010 and 2012; Table 2), although we were unable to complete statistical analyses because of our small samples sizes.

When turtles were located we recorded the date, time, location (UTM within 5 m), habitat, and behavior of each located turtle (when observed). We categorized turtle locations into 6 types: river (main channel of the Little Saskatchewan River or Assiniboine River), riverbank, splay channel (small flow of water that was separate from the main river channel, but joined to the main river channel at both ends), marsh (marshy areas typically within 25–100 m of the river), field (flooded area that had been cultivated), and rock (exposed rock in the river). We also categorized the behavior of individuals (where we had a visual record) into 3 categories: basking in the open, moving through the water, or resting on the bottom. We were unable to evaluate difference between the sexes because we only tracked two females.

The majority of our locations during tracking were in the river (75%, N = 202), a smaller percentage were found in the marsh (22%, N = 60), a handful of locations were in splay channels (3%, N = 7), and a single location was in a field (0.3%, N = 1). They

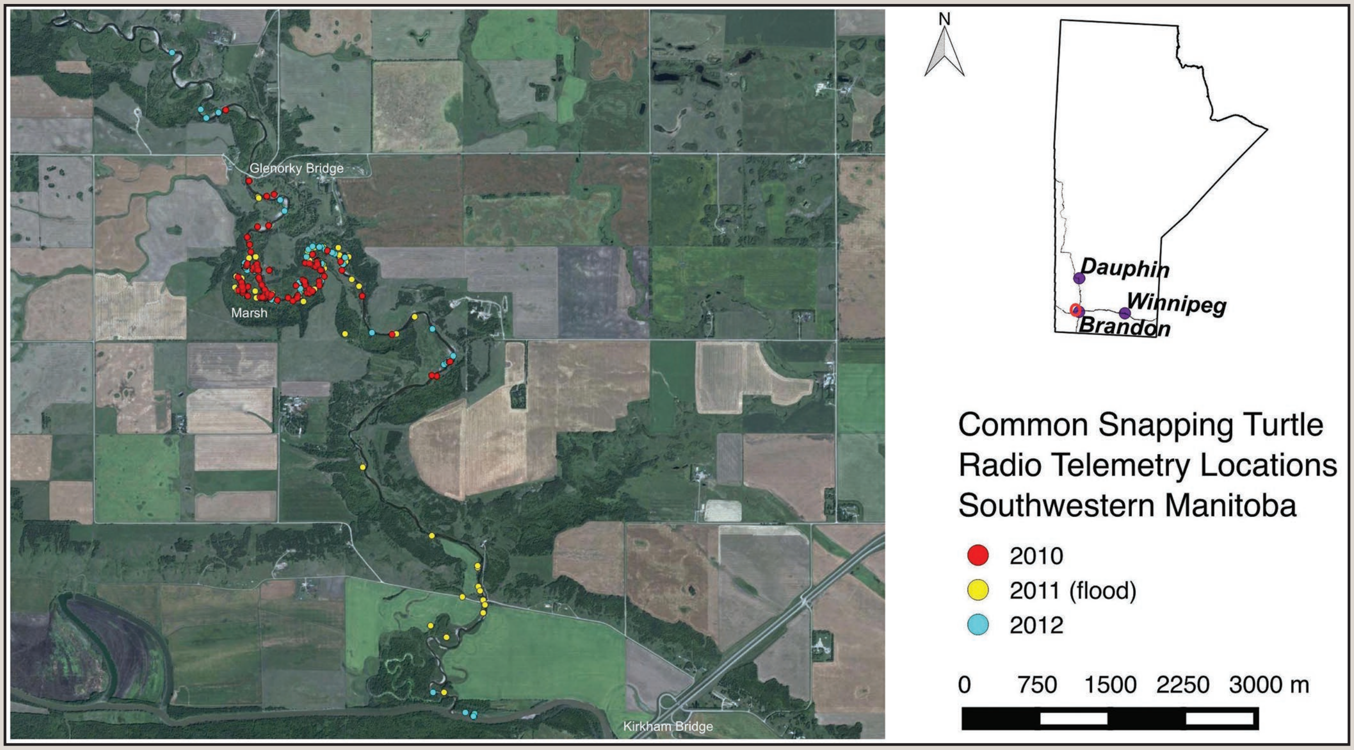

Fig. 1. Radio telemetry locations for 10 *Chelydra serpentina* tracked in southwestern Manitoba in 2010–2012. The area flooded in 2011, but returned to non-flood conditions in 2012.

Table 1. Morphology, water temperature, and air temperature capture data for female (N = 2) and male (N = 6) Common Snapping Turtles captured in the Little Saskatchewan River in southwestern Manitoba in 2010–2011. Morphological measures included: mass, carapace length (CL), carapace width (CW), and plastron length (PL).

	Female		Male	
	Mean ± SE	Range	Mean ± SE	Range
Mass (kg)	7.2 ± 0.35	6.8 – 7.5	10.9 ± 1.49	7.2 – 17.3
CL (cm)	29.2 ± 0.40	28.8 – 29.6	35.1 ± 1.65	30.0 – 41.9
CW (cm)	26.4 ± 1.50	24.9 – 27.9	31.5 ± 1.73	27.3 – 38.9
PL (cm)	22.5 ± 0.35	22.5 – 23.2	25.8 ± 0.92	23.1 – 28.1
Water Temp. (°C)	17.0 ± 1.50	15.5 – 18.5	21.2 ± 1.89	16.0 – 25.5
Air Temp. (°C)	20.8 ± 4.75	16.0 – 25.5	22.6 ± 2.21	16.0 – 29.0

also were more often found in the river during the summer (July 1st onwards; 86%, N = 140 out of 162 summer locations), than in the spring (May and June; 57%, N = 62 out of 108 spring locations). In the spring, there were more locations in the marsh (47%, N = 41 out of 108) compared to the summer (12%, N = 19 out of 162 summer locations). During tracking, animals were not typically visible (20%, N = 56), and were less often visible during the flood year (2011; 7%, N = 7) compared to the non-flood years (2010: 29%, N = 30; 2012: 24%, N = 19). Visible animals were most commonly found in the marsh (66%, N = 37) or on the riverbank (18%, N = 10); they were less frequently found in the river (11%, N = 6), in the splay channel (4%, N = 2) or on rocks in the river (2%, N = 1). The Little Saskatchewan River is very turbid (especially in the spring) so visibility in the river is limited to the near-shore, shallow areas.

Water in the marsh, or splay channels was clear, and therefore animals located in these areas were easy to see. Animals basking on the edge of the marsh, riverbank, or on rocks in the river were also easy to see. Because of this visibility bias, we only compared the locations of visible animals for the marsh. More of the visible animals in the marsh were seen in the water column (47%, N = 17), with fewer animals resting on the bottom (36%, N = 13) or basking on the edge (17%, N = 6). Atmospheric basking behavior (animal is out of the water) was highest in the marsh (10%, N = 6), compared to the river (5%, N = 11), or splay channels (0%).

Snapping Turtles observed in our study in southwestern Manitoba appeared to have larger home ranges during the flood year (2011) than in non-flood years (2010 and 2012). This increase in home range size during flood events has been shown in other turtle species. For example, flooded peatlands due to beaver dams created new aquatic habitat (of high thermal quality) resulting in larger home range sizes in Spotted Turtles (*Clemmys guttata*) (Yagi and Litzgus 2012. Copeia 2012:179–190). The 2011 flood on the Little Saskatchewan River did not appear to

TABLE 2. Home range sizes (ha) calculated for minimum convex polygons (MCP for 95% of points) for 10 turtles tracked in the Little Saskatchewan River in southwestern Manitoba from May 2010 to August 2012. For each individual, the number of times the turtle was located is indicated in brackets. For mean values the numbers of individuals is indicated in brackets.

Tag	Sex	2010 MCP	2011 MCP	2012 MCP
144	M	3.98 (13)	40.10 (11)	NA
160	M	NA	16.88 (10)	48.09 (7)
182	M	14.12 (14)	125.27 (11)	NA
223	M	68.00 (11)	160.64 (8)	67.15 (12)
286	M	11.68 (11)	4.36 (11)	19.45 (15)
307	M	3.95 (16)	NA	NA
240	F	11.25 (13)	320.85 (13)	NA
323	F	66.43 (10)	162.27 (11)	112.73 (13)
203	NA	10.07 (11)	NA	NA
261	NA	NA	NA	21.93 (9)
Mn ± SE		23.69 ± 9.59 (8)	118.62 ± 42.03 (7)	53.87 ± 17.15 (5)
Range		3.95 – 68.0	4.36 – 320.85	19.45 – 112.73
Mn ± SE (F)		38.84 ± 27.59 (2)	241.56 ± 79.29 (2)	NA
Mn ± SE (M)		20.35 ± 12.09 (5)	69.45 ± 31.06 (5)	44.90 ± 13.86 (3)

permanently create more aquatic habitat, because in 2012 they had home range sizes comparable to pre-flood levels in 2010. That said, there were differences in where they were spending their time in the non-flood years. In 2010, they were all found in the northern section of the river (Fig. 1), whereas in 2011 and 2012 some animals occupied the southern portions of the river, where it intersected with the Assiniboine River.

Possibly, individuals were swept downstream in 2011, resulting in larger home ranges. There were more turtles located downstream during 2011 compared to 2010 (Fig. 1). Currents were not measured along this stretch of the river during the flood event, but were significantly higher along the nearby Assiniboine River during the same time frame. On May 9, 2011, the Assiniboine River in Brandon recorded a peak flow of 1280 m^3/s, and a crest at 364 m above sea level (www.gov.mb.ca/flooding/2011/index.html; 1 October 2013). The southern edge of our study site includes the junction of the Little Saskatchewan and Assiniboine Rivers (Fig. 1) so high water levels on the Assiniboine River were directly affecting the Little Saskatchewan River, in addition to the high water volume on the Little Saskatchewan River itself. Water levels remained high on both the Little Saskatchewan and Assiniboine Rivers until August of 2011. Individuals may have been swept downstream, and then chose to hibernate in these locations and remained there during 2012. None of our tracked turtles were in the southern portion of the Little Saskatchewan River in 2010, but some were there in 2012 after the flood (Fig. 1).

It is also possible that females were moving downstream to seek out nesting habitat. In this system, we typically found nests and nesting females on sandy shorelines. During a flood event there will likely be less nesting habitat available, because the sandy shorelines were flooded and no longer be available. This may have caused the increase in female home range sizes. The two females that we tracked both increased their home range sizes, although our small samples sizes do not allow us to statistically test for differences between males and females. Given that both males and females increased their home range size, it is likely that the differences we saw during flooding were a combination of high flow rates and lack of nesting habitat. Given that climate change is likely to increase the frequency and severity of flood events, it is imperative that we further study these events so that we can have a better understanding of how these events impact animals both in the short- and long-term.

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***EMYS ORBICULARIS* (European Pond Turtle). NEONATE DIET.** Detailed information on the ecology of neonatal emydine turtles is scarce (Costanzo et al. 2008. J. Exp. Zool. 309A:297–379). Indeed, because of their small body size, and their high susceptibility to predation, field studies on neonatal emydids are logistically complex. Accordingly, the foraging ecology, and thus the precise composition of the diet of emerging young emydids is virtually unknown. Despite this lack of detailed information, it is usually assumed that neonatal emydine turtles rely on residual yolk until nest emergence and that; after emergence their diet is composed of gastropods and insects based on information gathered on larger juvenile individuals (Ottonello et al. 2005. Amphibia-Reptilia 26:562–565).

We studied *Emys orbicularis*, a typical emydine turtle species, in "Brenne" one of the largest wetlands of central France. These field studies include protection of nests, and subsequent monitoring of the emergence of neonates. At the end of the emergence