

## Exotic Red-eared Slider (*Trachemys scripta elegans*) observations and removal from New Brunswick, Canada

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### Abstract

Observations of exotic Red-eared Slider (*Trachemys scripta elegans*) turtles are rare in New Brunswick (NB), Canada, but we found multiple individuals residing in the recreational area of Rockwood Park, Saint John. We present evidence that suggests that Red-eared Sliders are able to overwinter in at least one water body in Rockwood Park. Seven Red-eared Sliders were removed from water bodies in NB from 2014 to 2016 and one in 2022. Currently, there are no known locations with Red-eared Sliders persisting in NB.

Key words: Invasive species; New Brunswick; overwintering; Painted Turtle; Snapping Turtle; Wood Turtle; Red-eared Slider; threats; *Trachemys scripta*; urban

### Résumé

Les observations de Tortues à Oreilles Rouges (*Trachemys scripta elegans*) exotiques sont rares au Nouveau-Brunswick (NB), Canada, mais nous avons trouvé plusieurs individus résidant dans la zone récréative de Rockwood Park, Saint John. Nous présentons des preuves qui suggèrent que les Tortues à Oreilles Rouges sont capables d'hiverner dans au moins un plan d'eau du parc Rockwood. Sept Tortues à Oreilles Rouges ont été retirées de plans d'eau au NB de 2014 à 2016 et une en 2022. À l'heure actuelle, il n'y a aucun endroit connu où des Tortues à Oreilles Rouges persistent au NB.

Mots clés : Les espèces envahissantes; Nouveau-Brunswick; hiverner; Tortue Peinte; Tortue Serpentine; Tortue des Bois; Tortue à Oreilles Rouges; des menaces; *Trachemys scripta*; urbain

### Introduction

Red-eared Slider (*Trachemys scripta elegans*) is native to south-central United States and northeastern Mexico, but introduced populations (originating from the release of unwanted pets) are now established in more than 70 countries as well as multiple states in the United States where they historically did not occur (Turtle Taxonomy Working Group 2021). The Invasive Species Specialist Group of the International Union for the Conservation of Nature's Species Survival Commission has ranked Red-eared Slider one of the top 100 worst invasive alien species worldwide (Invasive Species Specialist Group 2023). Red-eared Sliders are a threat to the ecosystem because, as with any non-native or captive animal, they could be carriers of disease or parasites (Brenes *et al.* 2014; Invasive Species Specialist Group 2019). In addition, they could compete with native turtles for food or basking sites (Invasive Species Specialist Group 2019).

In Canada, Red-eared Sliders have been confirmed to overwinter and breed successfully in southwestern

Ontario, and records exist for 130 spatially distinct sites in Ontario (Gillingwater 2013; Seburn 2015; Dupuis-Desormeaux *et al.* 2022b). Kikillus (2010) calculated that Red-eared Sliders need 502 degree-days above 20.2°C for their eggs to incubate successfully. Thus, modelling suggests that Canada is too cool for successful incubation because the warmest areas are below this value (e.g., 459.9 degree-days above 18°C in Windsor, Ontario; ECCC 2022); however, degree-days vary at microsites across the landscape and can allow survival and successful reproduction in cooler regions (Kikillus 2010). In Maritime Canada, numerous slider observations exist in Halifax-Dartmouth, Nova Scotia, with at least one record for every large pond, lake, and stream in the area (J. Gilhen unpubl. data). However, such observations are rare in New Brunswick (NB; D. McAlpine unpubl. data). As of 3 February 2023, iNaturalist included only two Red-eared Slider observations in NB (Wilson 2020; Rogers 2021), while 56 occurred in Nova Scotia. Our goals were to document the presence of

feral Red-eared Sliders in NB, examine evidence for overwintering, and implement a removal program.

## Methods

### Study area

Rockwood Park in Saint John, NB (45.2941°N, 66.0591°W) is one of the oldest (established in 1896) and largest (~695 ha) city parks in Canada. It includes 10 large lakes (1.4–10.3 ha) and several ponds (up to 0.8 ha). Two of the lakes, Lily Lake and Fisher Lakes (a single lake composed of multiple water bodies connected by narrow channels), are located within the park's designated recreation zone. Both the lakes and their surrounding riparian areas receive heavy public use (e.g., hiking, cycling, swimming, angling, non-motorized boating, horseback riding, and dog exercise). Native turtle species found in Rockwood Park include Eastern Painted Turtle (*Chrysemys picta picta*) and Snapping Turtle (*Chelydra serpentina*). Wood Turtle (*Glyptemys insculpta*) is occasionally observed, but these individuals are suspected to have been translocated by people.

### Survey methods

In June 2014, we initiated a citizen science project, asking the public to submit records of turtles observed in NB. Records were listed as confirmed if they were accompanied by a clear photograph or submitted by a qualified herpetologist or naturalist; all others were listed as unconfirmed. Red-eared Sliders were identified to subspecies by their shell and head shape, colours, and striping patterns, which included the diagnostic red head stripes in the individuals that we captured. We engaged the public by posting signs in Rockwood Park, a data request on the Rockwood Park website, and using social media posts (Facebook). We visited sites in Rockwood Park and elsewhere in the Saint John area where citizens observed turtles to try to confirm species and whether individuals were still present.

We used baited hoop traps to sample for turtles at 14 sites in Rockwood Park and four sites in the Saint John area. Hoop traps were 84 cm long, had three oval hoops 45–48 cm in diameter, 2.5 cm mesh, and were baited with chopped fish. The hoop traps were deployed for a total of 2669 trap-days during the active season (May–September) in 2014–2016. Our hoop trap sampling covered all waterbodies in Rockwood Park, except for Lily Lake. Lily Lake is frequently visited by park staff and visitors; thus, we are fairly confident that any turtles present would be detected. Only Red-eared Sliders were observed in the Lily Lake area, so we only deployed a basking trap at this site and reserved our hoop traps for sites where multiple turtle species might be found.

### Additional data sources

The New Brunswick Museum and the Province of New Brunswick both compile turtle observations recorded in NB. Staff members from the Department of Energy and Resource Development (conservation officers and rangers) record turtle observations opportunistically while working in the field. Both organizations also compile observations voluntarily submitted by citizens.

### Red-eared Slider removal

At locations where Red-eared Sliders were confirmed present, we used baited hoop traps, a basking trap, and hand captures to capture sliders. Six baited hoop traps were deployed at the First Arch section of Fisher Lakes on 16–18 July, 20–25 July, and 5–8 August 2014. Basking traps are an effective method for catching turtle species that are prolific baskers (Browne and Hecnar 2005). We deployed a basking trap at the First Arch section of Fisher Lakes from 24 June to 21 July 2016 and at Lily Lake from 21 July to 9 September 2016. The basking trap was 61 × 122 cm in size and followed the design described in Browne and Hecnar (2005). We checked all traps daily. Adult sliders were sexed by the presence or absence of secondary sex characteristics (elongate foreclaws, enlarged tail base, and more posterior positioning of the vent in males; Ernst *et al.* 1994). Healthy Red-eared Sliders that we captured were rehomed with responsible pet owners.

To prevent the release of additional pet turtles, we developed a program to teach the public about the threat of exotic species and why pet turtles should not be released into the wild. We engaged the public using four tactics: an educational display featuring two of the wild-caught Red-eared Sliders at the Rockwood Park Interpretation Centre, talks and guided hikes by park interpretive staff, a volunteer program for park visitors to check the basking trap while canoeing/kayaking, and social media posts (Facebook) and online classified advertising (Kijiji).

## Results

### Observations

As of 7 March 2022, we collected 275 observations of turtles in NB from citizens. Of these, 72 observations were from Rockwood Park (our target area). These included 30 unconfirmed Red-eared Slider observations, all from within Rockwood Park from the 1990s to 2016. Red-eared Sliders were observed at Lily Lake and Fisher Lakes (including the First Arch, A-frame, A-frame picnic site pond, and main sections of Fisher Lakes), and possibly Long Lake in Rockwood Park. Three turtle shells, identified as adult sliders by a knowledgeable amateur herpetologist, were

observed at Little Harrigan Lake. Park staff found and submitted a dead Red-eared Slider from the main section of Fisher Lakes on 21 May 2015.

The New Brunswick Museum and provincial databases each contained one slider observation. One carcass was collected from York County, NB, on 30 May 2010 (D. McAlpine unpubl. data). One slider was observed walking along a driveway in a residential area in Fredericton, NB, in October 2015 (M. Toner unpubl. data).

### Captures

Between 2014 and 2016, we caught and removed seven Red-eared Sliders. Four were removed from the First Arch section of Fisher Lakes: two females were caught in hoop traps on 17 and 22 July 2014, one female was caught by hand on 6 May 2015, and one female was caught by basking trap on 2 July 2016. No individuals have been observed in First Arch since this date. We estimate that approximately five to nine individuals were present at First Arch when we began our study. Five Red-eared Sliders were caught by anglers in First Arch and released with swallowed hooks in 2014, some or all may have been killed by the hooks because we were not able to catch five individuals from First Arch following this event (C.L.B. and S.A.S. unpubl. data). On 12 March 2019, the two females caught in First Arch in 2014 were screened by radiograph for hooks, but none were found.

We removed two sliders from Lily Lake: a female captured by hand on 2 August 2015 and a male captured by basking trap on 2 August 2016. No turtles were observed in Lily Lake from this date until June 2022 when an additional female Red-eared Slider was observed, captured, and rehomed to the Rockwood Park Interpretation Centre indoor turtle display.

Outside our study area, one male was captured opportunistically by hand at a wetland just outside Saint John (45.3700°N, 65.9611°W) on 21 August

2015. Three Red-eared Sliders (species confirmed by photograph) have been observed in recent years; one on the Miramichi River (46.9548°N, 65.5836°W) on 20 August 2019 (A. Chester pers. comm. 20 August 2019), one in Rothesay (45.3805°N, 65.9264°W) on 28 July 2020 (Wilson 2020), and one in Dieppe (46.0664°N, 64.7036°W) on 6 August 2021 (Rogers 2021). Red-eared Sliders have not been resighted in these areas since the original sightings.

### Evidence of overwintering

Red-eared Sliders were observed in sequential years at only two locations in NB: Lily Lake (Table 1) and the First Arch section of Fisher Lakes (Table 2) in Rockwood Park. Staff at Maritime Daytripping observed Red-eared Sliders in Lily Lake in 2014 and 2015 and we removed individuals in 2015 and 2016 (Table 1). Red-eared Sliders were observed in First Arch each year from 2012 to 2016 (Table 2). Early and late year observations were recorded at First Arch (Table 2) and the slider observation on 5 May 2015 is noteworthy because the winter ice and snow did not clear from this area until late April in 2015. Two sliders were observed on 6 May 2015, and we were able to catch one. The captured turtle was shedding her scutes, and the older scutes had mineral staining (Figure 1), suggesting that she had spent significant time in bottom sediments.

### Discussion

Slider observations are less frequent in NB than in many other regions where they have been introduced (e.g., Florida, USA, Emer 2004; Ontario, Seburn 2015; California, USA, Lambert *et al.* 2019). This could be because the human population size (and presumably also the number of unwanted pet turtles) is relatively low in NB (Table 3). But a better explanation may be because the climate is colder than in other Canadian locations where overwintering has been documented (Table 3). It is unknown whether sliders

**TABLE 1.** Red-eared Slider (*Trachemys scripta elegans*) observations and three captures from Lily Lake in Rockwood Park, Saint John, New Brunswick.

Date	No.	Comments	Confirmed	Removed
2014	4	Sticking their heads out of the water in Lily Lake.	No	No
2014	1	Found by road at Lily Lake; moved to First Arch Lake.	No	Yes
Summer 2014	1	Swimming in Lily Lake.	No	No
July or Aug. 2014	1	On rock in Lily Lake.	No	No
20 Aug. 2014	1	Basking on a branch in Lily Lake.	No	No
30 July 2015	1	Swimming in Lily Lake.	Yes	No
2 Aug. 2015	1	Female caught by park staff by hand on grass next to Lily Lake.	Yes	Yes
15 Sept. 2015	1	Filmed by tourist; looks like a slider but video is not clear enough to confirm.	No	No
2 Aug. 2016	1	Male caught in basking trap in Lily Lake.	Yes	Yes
June 2022	1	Female caught by hand.	Yes	Yes

**TABLE 2.** Red-eared Slider (*Trachemys scripta elegans*) observations and four captures from First Arch Lake in Rockwood Park, Saint John, New Brunswick.

Date	No.	Comments	Confirmed	Removed
~1998	3	Small (~8 cm diameter) green turtles.	No	No
~2008	>1	On the rocks in First Arch.	No	No
2012	1		No	No
2012 or 2013	1		No	No
2012 or 2013	1		No	No
July 2013	3	On rocks on a hot sunny day.	No	No
4 Oct. 2013	3	Photo of two on the rock; appear to be sliders but cannot confirm.	No	No
Early spring 2014	1	Basking on largest rock in First Arch.	No	No
2014	5	Caught in one evening accidentally while fishing using worms for bait on small barbless J-hooks. Each turtle swallowed the hook, lines were cut and turtles released. All were slightly different sizes (~15–23 cm). Photographs confirm species.	Yes	No
2014	1	Found by road at Lily Lake; moved to First Arch Lake.	No	No
17 June 2014	2	One large turtle and one smaller turtle basking on rocks around noon.	No	No
29 June 2014	1	Small turtle basking around noon.	No	No
4 July 2014	2	Basking at 1530.	No	No
14 July 2014	3	Basking; photo appears to show sliders but cannot confirm.	No	No
17 July 2014	1	Female caught in hoop trap.	Yes	Yes
18 July 2014	2	Basking; photo of one looks like slider but cannot confirm.	No	No
22 July 2014	1	Female caught in hoop trap.	Yes	Yes
21 Aug. 2014	1	Basking; looked like slider but too distant to confirm.	No	No
27 Aug. 2014	1	Red-eared Slider swimming in the water.	Yes	No
5 May 2015	1	Basking on rocks; looked like slider but too distant to confirm.	No	No
6 May 2015	1	Female caught by hand at edge of water.	Yes	Yes
7 May 2015	1	Basking on rock; red stripes on sides of head.	Yes	No
2015	>1	Small turtles in water.	No	No
15 May 2015	2	Basking on rocks.	Yes	No
2016	1	Small turtle.	No	No
2016	1	Turtle head in the water.	No	No
2 July 2016	1	Female caught in basking trap.	Yes	Yes

can overwinter in most of NB; two slider carcasses found in May (York County in 2010 and the main section of Fisher Lakes in 2015) may have been the result of overwinter mortality. However, Red-eared Sliders have been recorded to successfully overwinter as far north as Nitaure, Latvia, at more than 57°N (Nekrasova *et al.* 2022), much farther north than NB's most northern points (<49°N). Failed overwintering attempts have been documented for both native and exotic adult turtles in Ontario and could be the result of water-level fluctuations, poor overwintering site selection, or seeking mid-winter basking opportunities (Dupuis-Desormeaux *et al.* 2022a).

Evidence of successful overwintering in NB does not exist except for our data from the First Arch in Rockwood Park. Although it is possible that the sliders residing in First Arch were the result of multiple releases each year and not a small number of

individuals that survived and overwintered, the latter situation is far more likely. Evidence to support this includes: observations of multiple individuals in sequential years; an individual captured on 6 May 2015, shortly after ice-out, with mineral staining from the bottom sediments; multiple individuals present at this site, but observations rare from other water bodies; and no reestablishment of sliders following our removal program.

The prolific basking habits of Red-eared Sliders generated numerous turtle observations submitted by citizens and originally gave an impression of abundance. However, the Red-eared Slider population at Rockwood Park in the Lily and Fisher Lakes area was probably only 11 or 12 individuals in total over the span of our study (six removed alive, five caught by anglers and released with ingested hooks on one night at First Arch, and one dead slider from the main



**FIGURE 1.** Mineral staining on three plastral scutes (one gular and two anal scutes) from a Red-eared Slider (*Trachemys scripta elegans*) that was caught at First Arch in Fisher Lakes on 6 May 2015. Photo: Andrew Sullivan.

section of Fisher Lakes). We eradicated the exotic Red-eared Slider population in Rockwood Park with relatively little effort using baited hoop traps, hand captures, and a basking trap combined with a public education program.

### Author Contributions

Conceptualization: C.L.B.; Investigation: C.L.B. and S.A.S.; Data Curation: C.L.B. and S.A.S.; Project Administration: C.L.B.; Writing – Original Draft: C.L.B.; Writing – Review & Editing: C.L.B. and S.A.S.; Visualization: C.L.B.; Funding Acquisition: C.L.B.

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**TABLE 3.** Provincial population size and climate comparisons from three representative sites in New Brunswick (NB), Nova Scotia (NS), and Ontario (ON).

Province	Human population size*	Location	Average daily temperature, °C (SD)†		Average annual degree-days‡	
			January	July	Above 10°C	Above 18°C
NB	0.8 × 10 <sup>6</sup>	Saint John	-7.9 (2.3)	17.1 (0.7)	708.3	36.4
NS	1.0 × 10 <sup>6</sup>	Halifax	-4.1 (1.9)	18.8 (1.0)	921.9	114.3
ON	15.1 × 10 <sup>6</sup>	London	-5.6 (2.8)	20.8 (1.3)	1256.3	255.5

\*Statistics Canada 2022.

†From 1981 to 2010 (ECCC 2022).

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