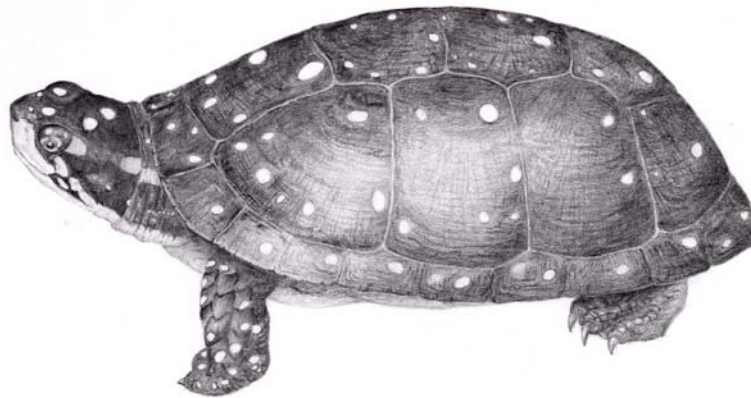


COSEWIC
Assessment and Update Status Report

on the

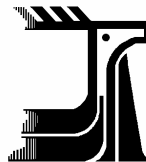
Spotted Turtle
Clemmys guttata

in Canada



ENDANGERED
2004

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA



COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC 2004. COSEWIC assessment and update status report on the spotted turtle *Clemmys guttata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Previous report:

Oldham, M.J. 1991. COSEWIC status report on the spotted turtle *Clemmys guttata* in Canada. Committee on the Status of Endangered Wildlife in Canada. 93 pp. (Unpublished report)

Production note: COSEWIC acknowledges Jacqueline D. Litzgus for writing the update status report on the spotted turtle *Clemmys guttata* in Canada. The report was overseen and edited by Ron Brooks, Co-chair (Reptiles), COSEWIC Amphibians and Reptiles Species Specialist Subcommittee.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur la tortue ponctuée (*Clemmys guttata*) au Canada – Mise à jour.

Cover illustration:

Spotted turtle — Kevin Kerr, Guelph Ontario.

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Catalogue No. CW69-14/382-2004E-PDF

ISBN 0-662-37307-3

HTML: CW69-14/382-2004E-HTML

0-662-37308-1



Recycled paper



COSEWIC Assessment Summary

Assessment Summary – May 2004

Common name

Spotted Turtle

Scientific name

Clemmys guttata

Status

Endangered

Reason for designation

This species occurs at low density, has an unusually low reproductive potential, combined with a long-lived life history, and occurs in small numbers in bogs and marshes that are fragmented and disappearing. Although some populations are in protected areas, they may have a low probability of persistence, especially because small numbers and isolation reduce population viability. The low frequency of juveniles in most studied populations suggests these populations are composed largely of remnant, aged cohorts with low reproductive success. Another clear threat is from collection for the pet trade. There is no rescue effect.

Occurrence

Ontario, Quebec

Status history

Designated Special Concern in April 1991. Status re-examined and designated as Endangered in May 2004. Last assessment based on an update status report.



COSEWIC
Executive Summary

Spotted Turtle
Clemmys guttata

Species information

The Spotted Turtle (*Clemmys guttata*) is a relatively small freshwater turtle, with adult shell length typically less than 13cm. The species is recognized by its black shell overlaid with an irregular pattern of yellow-orange spots.

Distribution

The Spotted Turtle is restricted to eastern North America in disjunct populations from southern Ontario, southern Quebec, and Maine southward along the Atlantic Coastal Plain to central Florida, and westward along the south shores of the Great Lakes to northeastern Illinois.

Habitat

Spotted Turtles prefer the unpolluted, slow-moving, shallow waters of ponds, bogs, fens, marshes, vernal pools and sedge meadows. Soft substrate, sphagnum moss, sedge tussocks, cattails, water lilies, and hydrophilic shrubs are important components of aquatic habitats used by Spotted Turtles.

Biology

Emergence from hibernation occurs from early to late April. Spotted Turtles aggregate in aquatic habitats in spring (May) to mate, and show fidelity to breeding sites. Nesting occurs from mid- to late June. Clutch sizes range from 3-7 eggs, with a mean of 5 eggs. Most females do not produce eggs every year. Summer dormancy, primarily in terrestrial sites, occasionally takes place from July through August and into September, after which turtles enter hibernation. Spotted Turtles often hibernate communally and show fidelity to hibernacula. Sexual maturity is attained when turtles are 11-15 years old. Some individuals in Pennsylvania and Ontario populations are at least 30 years old, and maximum longevity in a Georgian Bay population was estimated to be 110 years based on 24 years of recapture data.

Population sizes and trends

The Natural Heritage Information Centre (NHIC) recognizes 104 Element Occurrences of Spotted Turtles in Ontario. Of the 104 locations, 35% (36) are considered historic or extirpated, and 50% are ranked as of poor viability (low or 'D' quality with only 1 or 2 sightings at a location; see Population Sizes and Trends section). Furthermore, populations have disappeared from protected areas (e.g., Pt. Pelee National Park). Given that most NHIC data are from the past 30-40 years and that generation time of Spotted Turtles is >25 years, it is likely that the percent decline over the past three generations (75 years) exceeds the 35% suggested by the number of historic/extirpated sites cited above. Whether the Spotted Turtle currently occurs in Quebec is uncertain, and recent surveys have not yielded any sightings.

Limiting factors and threats

Spotted Turtle numbers are declining due to collection for the pet trade, habitat destruction and fragmentation, road mortality, agriculture, and pollution. The Spotted Turtle is particularly susceptible to habitat destruction and to exploitation by pet trade collectors in spring when turtles aggregate for breeding, and in fall when turtles gather at communal hibernation sites.

Special significance of the species

Turtles of the genus *Clemmys* (but see recent proposed changes in nomenclature for this genus, Feldman and Parham 2002) are among the most popular species exported from the USA. The Humane Society of the United States reported that 4692 specimens of the genus *Clemmys* were shipped overseas between 1989-1994 at a value of \$102,658 US. In December 2002, a website advertized Spotted Turtles for sale at \$175 US each for adults (presumably wild-caught), and \$150 US each for captive-bred individuals.

Existing protection or other status designations

In Canada, Nature Serve lists the Spotted Turtle as S3 in Ontario, S1 in Quebec, N3 in Canada, and G5 globally (where S = sub-national, N = national, G = global, 1 = critically imperiled, 3 = vulnerable, 5 = demonstrably widespread, abundant and secure; Alvo and Oldham 2000). In the United States, the Spotted Turtle is not currently listed in the US Federal Endangered Species Act; however, it is listed in at least 22 of the states in which it occurs. The species is not currently listed by CITES. The IUCN Red Book lists the Spotted Turtle as vulnerable to extinction in the wild in the medium-term future.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species and include the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal organizations (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership, chaired by the Canadian Museum of Nature), three nonjurisdictional members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The committee meets to consider status reports on candidate species.

DEFINITIONS (AFTER MAY 2004)

Species	Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.

** Formerly described as “Not In Any Category”, or “No Designation Required.”

*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

**Update
COSEWIC Status Report**

on the

Spotted Turtle
Clemmys guttata

in Canada

2004

TABLE OF CONTENTS

SPECIES INFORMATION.....	3
Name and classification.....	3
Description.....	3
DISTRIBUTION.....	4
Global range.....	4
Canadian range.....	5
HABITAT.....	7
Habitat requirements.....	7
Trends.....	8
Protection/ownership.....	8
BIOLOGY.....	8
General.....	8
Reproduction.....	9
Survival.....	10
Physiology.....	11
Movements/dispersal.....	12
Nutrition.....	12
Behaviour/adaptability.....	12
POPULATION SIZES AND TRENDS.....	13
LIMITING FACTORS AND THREATS.....	17
SPECIAL SIGNIFICANCE OF THE SPECIES.....	18
EXISTING PROTECTION OR OTHER STATUS.....	18
TECHNICAL SUMMARY.....	20
ACKNOWLEDGEMENTS.....	22
LITERATURE CITED.....	22
BIOGRAPHICAL SUMMARY OF THE REPORT WRITER.....	26
AUTHORITIES CONTACTED.....	26
COLLECTIONS EXAMINED.....	27

List of figures

Figure 1. Spotted Turtle (<i>Clemmys guttata</i>).....	3
Figure 2. North American distribution of the Spotted Turtle (<i>Clemmys guttata</i>).	4
Figure 3. Canadian distribution of the Spotted Turtle (<i>Clemmys guttata</i>).	6

SPECIES INFORMATION

Name and classification

Clemmys guttata (Schneider, 1792). Spotted Turtle. Tortue ponctuée. No subspecies or varieties are recognized.

Description

The Spotted Turtle is a relatively small freshwater turtle species, with adult carapace (upper shell) length typically less than 13cm. The species is recognized by its black keelless, unserrated carapace overlaid with an irregular pattern of yellow-orange spots (Figure 1). Hatchlings usually have one spot per carapacial scute. The plastron (lower shell) is black and orange and tends to become more melanistic with age. The black head and limbs also have yellow spots, and the tail may have yellow stripes. Large orange “ear” patches adorn each side of the head.



Figure 1. Spotted Turtle (*Clemmys guttata*). Line drawing by David M. Carroll, September 1990. Printed with permission of the artist.

Spotted Turtles are sexually dimorphic. Females have orange mandibles and irises, a flat plastron, and relatively small, thin tails with cloaca at the margin of the carapace. In contrast, males have brown-buff mandibles and irises, a concave plastron, and larger, thicker tails with cloaca distal to the margin of the carapace.

The Spotted Turtle may be confused with the Blanding's Turtle (*Emydoidea blandingii*) because both species have yellow markings. The two species can be distinguished based on shell shape; the Blanding's Turtle has a high domed carapace and a hinged plastron, whereas the Spotted Turtle has a lower profile carapace and a hingeless plastron. In addition, the Blanding's Turtle is much larger and has a bright yellow chin and throat.

DISTRIBUTION

Global range

The Spotted Turtle's distribution is restricted to eastern North America (Figure 2). The species ranges in disjunct populations from southern Ontario, southern Quebec (but see below), and Maine southward along the Atlantic Coastal Plain to central Florida, and westward through Pennsylvania, Ohio, Indiana, northeastern Illinois, and across the lower peninsula of Michigan (Ernst et al. 1994; Barnwell et al. 1997).



Figure 2. North American distribution of the Spotted Turtle (*Clemmys guttata*).

Canadian range

In Canada, Spotted Turtles have been reported from southern Ontario and southern Quebec (Figure 3). Populations are not contiguous. Seburn and Seburn (2000) suggest that Canadian populations of the Spotted Turtle are limited to Ontario, where the species is believed to be declining from habitat loss, degradation, and fragmentation, and from collection for the pet trade. Canadian records of the Spotted Turtle were first mapped by Logier and Toner (1955, 1961), and these included only 9 Ontario records and 2 Quebec records.

Current Ontario populations are concentrated around Georgian Bay and the north shore of Lake Erie with small, mostly isolated populations scattered in southeastern Ontario. The Ontario Ministry of Natural Resources' Natural Heritage Information Centre recognizes 104 Element Occurrences of Spotted Turtles in Ontario (M.J. Oldham, pers. comm. 2003). Of these 104 locations, 35% (36) are considered historic or extirpated, and 50% (50) are ranked as low quality (see Population Sizes and Trends section). Oldham (1982) reported Spotted Turtles in 65 localities from 25 counties or municipalities in Ontario; at least 18 of these localities were in areas affording some degree of protection (i.e., wildlife areas or parks). See Oldham (1982, 1991) and Oldham and Austen (1998) for detailed historical accounts of records for Ontario.

In Quebec, only two reliable records exist for the Spotted Turtle (J-F. Desroches, D. Rodrigue, pers. comm. 2002). Provancher (Canadian Museum of Nature) observed a specimen from Nicolet near Lake Ste. Pierre in 1874, and Ernst reported a road-killed specimen 8km south of Sherbrooke in 1967 (Ernst et al. 1994). Four additional records of Spotted Turtles in Quebec are invalid or questionable. An erroneous record from Quebec City resulted from a mistranslation of Provancher's 1874 French account (Oldham 1982). A record from Ste. Bruno de Kamouraska has recently been ruled out as a misidentification based on a reported shell length of 28cm, which is too large for a Spotted Turtle (D. Rodrigue, pers. comm. 2002). A record in 1973 from Granby is considered questionable (D. Rodrigue, pers. comm. 2002). A record from Ile de Laval is considered possibly valid based on the expertise of the observer (D. Rodrigue, pers. comm. 2002).

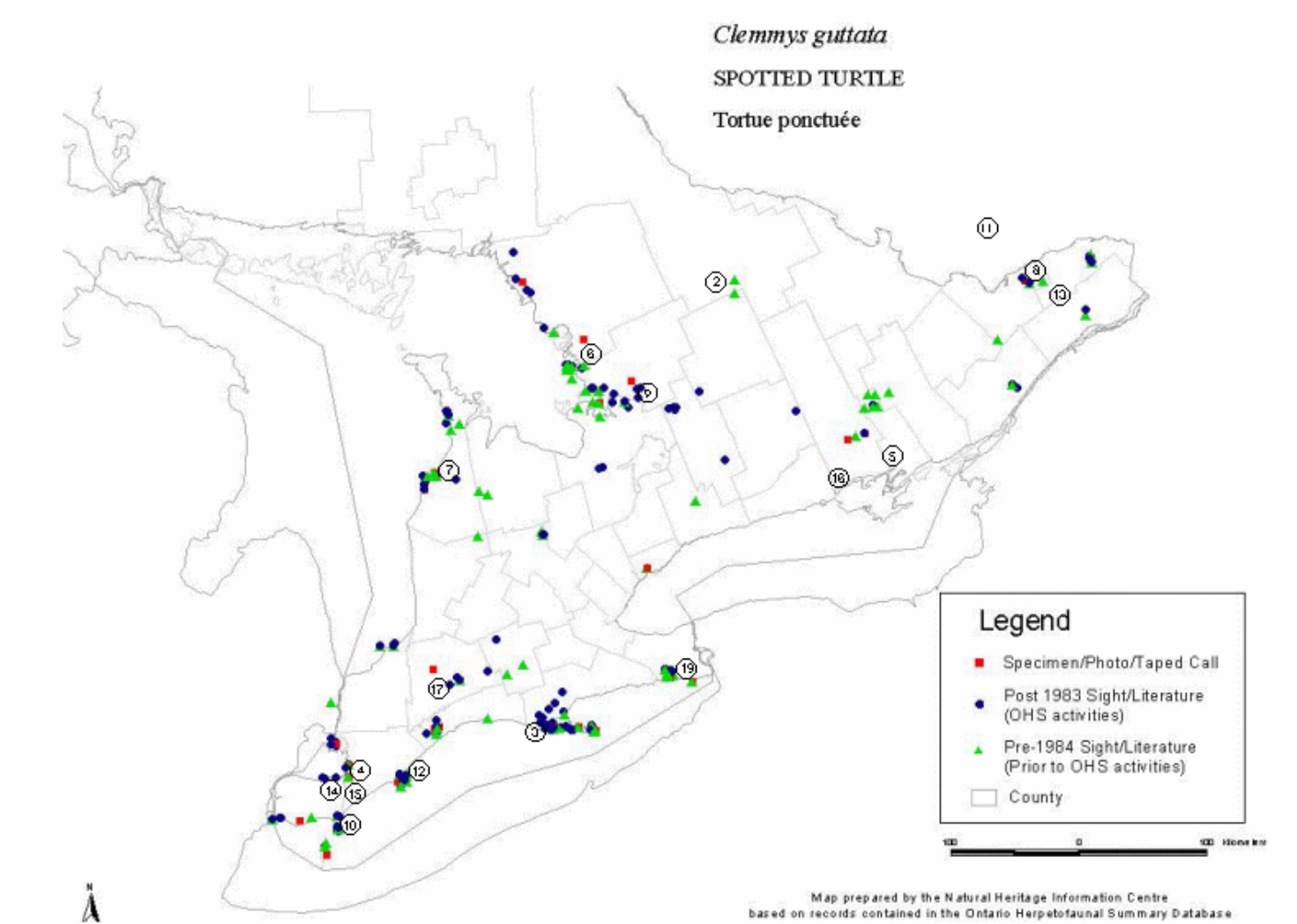


Figure 3. Canadian distribution of the Spotted Turtle (*Clemmys guttata*).

The Extent of Occurrence of the Spotted Turtle in Canada estimated from the distribution presented by Ernst et al. (1994) is approximately 57,500 km². Based on the data presented in this report, the Extent of Occurrence is declining. The Area of Occupancy in Canada is difficult to estimate. Given the limited extent of available habitat it is likely that the Area of Occupancy is less than 2,000 km². The Area of Occupancy is certainly declining, based on the data presented in this report, and on data in the Element Occurrence report by Oldham and Austen (1998). Perhaps an important point about Extent of Occurrence and Area of Occupancy in this species is that most or all extant populations of Spotted Turtles are completely isolated from one another because of the fragmented landscape. This species is small, not very mobile and associated with localized habitats so that local extirpations are probably permanent.

HABITAT

Habitat requirements

Spotted Turtles occur in high organic content wetlands including acidic bogs and alkaline fens in the Eastern Deciduous/Great Lakes forest and Atlantic Coastal Plain regions of North America. The species prefers unpolluted shallow waters of ponds, bogs, fens, marshes, ditches, vernal pools, woodland streams, sedge meadows and the sheltered edges of shallow bays (Ernst et al. 1994; Haxton and Berrill 1999; Litzgus and Brooks 2000). In the southern part of its range, the species also occupies cypress swamps, Carolina bays, and may also occur in the brackish water of tidal streams (Ernst et al. 1994). Sphagnum moss, sedge tussocks, cattails, water lilies, and hydrophilic shrubs appear to be important components of aquatic habitats in northern populations (Joyal 1996; Barlow 1996; Litzgus and Brooks 2000). Habitat requirements also include soft substrate in addition to some aquatic vegetation (Ernst et al. 1994).

Spotted Turtles use a mosaic of habitat types, display distinct seasonal shifts in habitat use (Haxton and Berrill 1999; Litzgus and Brooks 2000), and require terrestrial habitats during certain times of their seasonal activity cycle. Nesting occurs in terrestrial sites, including soil-filled crevices in Canadian Shield rock outcrops (Haxton 1998; Litzgus and Brooks 1998a, 2000), in areas exposed to full sunlight. Spotted Turtles also nest along man-made dykes, atop muskrat lodges and at the base of grass tussocks in southwestern Ontario (S. Gillingwater, pers. comm. 2003). In some populations, excursions are made to terrestrial habitats for summer dormancy (Graham 1995; Perillo 1997; Litzgus and Brooks 2000).

Spotted Turtles show fidelity to hibernacula and sites of spring aggregation (Haxton and Berrill 1999; Litzgus et al. 1999; Litzgus and Brooks 2000; Seburn 2001a; A. Yagi, pers. comm. 2003). A radio telemetry study in Georgian Bay, Ontario identified 18 hibernacula in sphagnum swamps; 15 hibernacula were under moss and tree root hummocks, and 3 were in rock caverns where Canadian Shield outcrop jutted into the swamp (Litzgus et al. 1999). Seven of the hibernacula were communal with up to nine Spotted Turtles occupying a single rock cavern (Litzgus et al. 1999). Communal use of

hibernacula by Spotted Turtles has been observed in other populations (Behler 1996; Lewis and Ritzenthaler 1997; Perillo 1997; Haxton and Berrill 1999). In the Georgian Bay population, the same 10-15 adults have returned in May to a single beaver pond for more than 20 years, presumably to mate (G. Bird, M.J. Oldham, J.D. Litzgus, unpubl. data). Spring mating aggregations in aquatic sites have also been observed elsewhere (Ernst 1967; S. Gillingwater, pers. comm. 2003; Perillo 1997; A. Yagi, pers. comm. 2003). The use of communal hibernation and mating aggregation sites makes Spotted Turtles susceptible to extirpation from habitat destruction and exploitation by pet trade collectors.

Trends

Habitat loss, destruction, and fragmentation have been implicated in the decline of Spotted Turtle populations throughout their range (Lovich 1989; Burke et al. 2000). Human-altered landscapes have reduced the quantity and quality of Spotted Turtle habitats.

Protection/ownership

Approximately 28 extant Element Occurrences in Ontario (out of 104 total) have some degree of public protection. These sites are owned at least in part by local conservation authorities, provincial and national parks, and national wildlife areas. Some sites are provincial nature reserves, provincial wildlife management areas, other provincial lands or lands with joint ownership/management, National Capital Commission lands, or Crown Lands (Oldham and Austen 1998).

The eastern Georgian Bay, Ontario population that has been the focus of the longest Spotted Turtle mark-recapture study to date occurs on Crown Land (Litzgus and Brooks 1998b). ***BLOCKED TEXT*** has the largest number of Spotted Turtle sightings in Ontario, and much of the Spotted Turtle habitat is within the ***BLOCKED TEXT*** (Oldham and Austen 1998, P. Ashby pers. comm. April 2004). Georgian Bay Islands National Park was able to justify the purchase of additional parkland ***BLOCKED TEXT*** because the area was used for breeding by Spotted Turtles (M. Villeneuve, pers. comm. 2002)

BIOLOGY

General

Emergence from hibernation in Canadian populations occurs in late March and throughout April (Haxton and Berrill 1999; Litzgus and Brooks 2000; S. Gillingwater, pers. comm. 2003; D. Seburn, pers. comm. 2003). Spotted Turtles spend much time basking on logs and vegetation in early spring. Breeding peaks in late May to early June. Nesting, which is primarily nocturnal, occurs from mid- to late June (Litzgus and Brooks 1998a, 2000; Haxton 1998). Summer dormancy, primarily in terrestrial sites,

occasionally takes place from July through August and into September, after which turtles enter hibernation.

Reproduction

Spotted Turtles aggregate in aquatic habitats in spring to mate (Ernst 1967; Perillo 1997; Litzgus and Brooks 1998a; S. Gillingwater, pers. comm. 2003; A. Yagi, pers. comm. 2003), and tend to show fidelity to breeding sites (J.D. Litzgus, unpubl. data). In the Georgian Bay area, nesting occurs nocturnally on Canadian Shield rock outcrops in shallow soil under lichen, moss and leaf litter (Haxton 1998; Litzgus and Brooks 1998a). Elsewhere in Ontario, a female was observed nesting at ~1800 hrs, 22 June, 1920, on the edge of the east side of the marsh at Point Pelee (Logier 1939). Rhodes (pers. comm. to M.J. Oldham 1981) observed a female nesting at ~2100 hrs, 16 June, at Long Point Provincial Park. Chippindale (1989) observed egg-laying at 1714 hrs, 29 June, at Mer Bleue Bog. Egg incubation is at least 80 days in the wild (Oldham 1991; J.D. Litzgus, unpubl. data).

Population sex ratios are typically equal. The sex of developing embryos is dependent upon temperature during incubation (temperature-dependent sex determination). Females are produced at temperatures of 30°C, whereas males are produced at temperatures below 27°C (Ewert and Nelson 1991). In Ontario, sexual maturity is delayed until turtles are 11 to 15 years old (Litzgus and Brooks 1998b). In Pennsylvania, maturity is reached at relatively younger ages (7-10 years; Ernst and Zug 1994). The longevity of wild Spotted Turtles is unknown but a captive lived for 42 years (Ernst et al. 1994). Some turtles in a Pennsylvania population (Ernst et al. 1994) and in a Georgian Bay population (J.D. Litzgus, unpubl. data) were at least 30 years old. Maximum longevity in a Georgian Bay population was estimated from the logarithmic decay equation: $S = 100 \times \text{EXP} [(1/\ln N_e/N_o)/t]$ to be 110 years based on a minimum adult female survivorship of 96.5% calculated from 24 years of mark-recapture data (J.D. Litzgus, unpubl. data).

This species nests as early as June 7 and as late as June 22 at ***BLOCKED TEXT***. The majority of females found (approx. 12-14 females from 1996 – 1999 and again in 2003) nested along a section of ATV trail with rich, dark loamy soil. The turtles used the centre area of the trail and nested amongst the sparse vegetation. The 2003 nest from this site contained 2 eggs and was protected with a wire mesh cage and the female was found nesting on June 22 at 1930hrs. One hatchling emerged in 72 days, the other on day 73. The dark soil was warm and humid throughout the incubation period. Two additional females have been found nesting at the base of grass tussocks (beneath a thin covering of moss and rotting vegetation) approx. 10 m. from shore in a shallow wetland). Nests contained 3 and 5 eggs. A Spotted Turtle was found nesting atop a muskrat lodge, and a second nest was also found atop a nearby muskrat lodge. The eggs of both nests on muskrat lodges were buried beneath approx. 7.5cm of rotting vegetation and mud (nests contained 4 eggs each). All females in the above information were observed nesting, except one, between 1900 hrs and 2230 hrs. The exception was in 1996, a female was observed nesting along the ***BLOCKED

TEXT***, ATV trail at 1500 hours on a very overcast day with light rain (information in this paragraph from S. Gillingwater, Dec 9, 2003).

Spotted Turtles have a relatively low reproductive output. Clutch sizes in Georgian Bay range from 3-7 eggs, with a mean of 5 eggs. Most females do not oviposit every year, and some do not produce eggs in up to at least three consecutive years (Litzgus and Brooks 1998a). An average of 58% of adult female Spotted Turtles were judged to be gravid in June of each year of the 4-year study in Georgian Bay (Litzgus and Brooks 1998a). In comparison elsewhere in Ontario, over 80% of female Snapping Turtles (*Chelydra serpentina*), 68% of Painted Turtles (*Chrysemys picta*), and 75% of Wood Turtles (*Glyptemys [Clemmys] insculpta*) nest annually (R.J. Brooks, pers. comm. 2002).

Survival

Spotted Turtles, like other turtle species, have been called “bet-hedgers”. The life-history strategy involves high egg and juvenile mortality, iteroparity (repeated reproductive events), low adult mortality, and a long life. Turtle populations can sustain years of low recruitment as long as reproducing adults are not lost to death or over-harvesting. Sensitivity analysis of life table parameters indicated that Spotted Turtle population viability is highly dependent upon adult survivorship (J.D. Litzgus, unpubl. data). These life history attributes make turtle populations susceptible to decline and extirpation when reproducing adults are lost from populations (Congdon et al. 1993).

Potential predators on adult and juvenile Spotted Turtles include raccoons (*Procyon*), skunks (*Mephitis*), otters (*Lontra*), muskrats (*Ondatra*), mink (*Mustela*), black bears (*Ursus*), and bald eagles (*Haliaeetus*) (Ernst et al. 1994; Litzgus 1996). Predators of Spotted Turtle eggs include raccoons (*Procyon*), red fox (*Vulpes*), skunks (*Mephitis*), and ants (*Formica*) (Litzgus 1996). It is not unusual to find a relatively large proportion of the adults in Spotted Turtle populations with injuries in the form of missing limbs, stubbed tails, and deep scratches in the shell. In a Georgian Bay population, 48% of the turtles were injured (Litzgus 1996). In a population in ***BLOCKED TEXT***, 7% had shell injuries and 11% had body injuries (Gillingwater and Brooks, 2002). In a Pennsylvania population, 18% of adults showed signs of predation injuries (Ernst et al. 1994), and in an Ohio population, 31% of the turtles showed signs of predator-related injuries (Lovich 1989).

Northern Spotted Turtles are particularly susceptible to predation after the long (6-8 months) hibernation. Limited oxygen uptake from the water column across restricted areas of the body results in an oxygen deficit, which in turn causes lactic acid to build up in tissues. The acid imbalance and cold temperatures cause turtles to be extremely lethargic and less capable of defense from predators. In the eastern Georgian Bay population, recently injured and dead turtles were most often found in late fall and early spring, near hibernacula (Litzgus, unpubl. data). At ***BLOCKED TEXT*** a male Spotted Turtle killed by a raccoon was the only observed predation over a two-year. (S. Gillingwater, pers. com. 2003).

Physiology

Spotted Turtles appear to prefer cooler environmental temperatures than other freshwater turtles (Ernst 1982), despite a relatively high critical thermal maximum of approximately 42°C (Hutchison et al. 1966). The normal activity range is 3 to 32°C, and activity can occur at water temperatures as low as 1 to 5°C (Ernst 1982; Litzgus et al. 1999). Spotted Turtles are often the first among syntopic turtles to emerge from hibernation, usually emerging as soon as snow cover melts (Ernst 1982), and are most active in the cool, early spring (Ward et al. 1976; Lovich 1988; Litzgus and Brooks 2000). Using temperature-sensitive radio transmitters, average body temperatures during certain activities were determined for Spotted Turtles in a Georgian Bay population (Litzgus and Brooks 2000). Average body temperature while turtles were basking was 25.3°C, while courting/mating was 15.1°C, nesting 19.8°C, foraging/feeding 16.7°C, summer dormancy 21.8°C, and at entrance into hibernation mean body temperature was 9.5°C (Litzgus and Brooks 2000). Spotted Turtles elevate their body temperature above ambient by basking (Ernst 1982; Haxton 1998; Litzgus and Brooks 2000). In Pennsylvania, the mean cloacal temperature during activity was about 20°C (Ernst 1982). The coolest cloacal temperatures recorded during the active season were for turtles dormant in water (10°C), whereas the warmest cloacal temperatures recorded were for nesting females (24°C) (Ernst 1982).

Spotted Turtles survive the extreme environmental conditions of the northern winter by hibernating in sites that do not freeze. Hibernation in Central Ontario lasts 6-7 months (Litzgus et al. 1999; Haxton and Berrill 2001). Turtles entered hibernacula in mid-September/October when body temperatures were between 12 to 16°C, and exited hibernacula in mid-late April when ambient temperatures ranged between 1 to 5°C (Litzgus et al. 1999). Despite fluctuations of 37°C over a 5-day period during the coldest part of the winter, a Spotted Turtle outfitted with a datalogger in an hibernaculum maintained a remarkably stable body temperature between 1 to 2°C (Litzgus et al. 1999). Spotted Turtles appear to be tolerant of low oxygen levels in water during hibernation. Dissolved oxygen concentrations of water in hibernacula in the fall were 1.0 to 2.2 ppm, and in the spring were 3.3 to 4.7 ppm (Litzgus et al. 1999).

Some individuals in some populations avoid the hot, dry, and desiccating conditions of summer by aestivating. In Pennsylvania, Spotted Turtles became inactive when water temperatures reached 30°C, and retreated to muskrat burrows in the banks of streams (Ernst 1982). Summer dormancy may be a more appropriate term than aestivation for the behaviour in Central Ontario where not all turtles became inactive in late summer. Those that did become inactive, mostly chose terrestrial sites that were not cooler than ambient temperatures (Litzgus and Brooks 2000; Haxton and Berrill 2001), and it is unknown whether metabolic depression (a characteristic of true aestivation) accompanied the inactivity.

Movements/dispersal

In Georgian Bay, home range size did not differ between sexes and was estimated between 2.1-3.6 ha (Litzgus 1996). In Victoria County, females (average range 2.6-4.7 ha) had significantly larger home ranges than males (average range 1.0-2.0 ha; Haxton 1998). Home range sizes did not differ between these two Central Ontario populations (Haxton and Berrill 1999). In Pennsylvania, home range size was smaller (0.5 ha) than in the Ontario populations, and did not differ between the sexes (Ernst 1970). Interestingly, Spotted Turtles have the ability to home when displaced up to approximately 500 m from the point of capture (Ernst et al. 1994; G. Bird, unpubl. data).

Average daily movements are typically between 20-30 m (Ernst 1976; Litzgus 1996; Haxton 1998); however, males searching for mates (Lovich 1990), and gravid females searching for nest sites (Litzgus 1996; Haxton and Berrill 1999) may move considerably further distances. Females may disperse outside of their regular home range to oviposit (Ernst 1970; Wilson 1994). Spotted Turtles migrate up to hundreds of meters among aquatic sites, and between aquatic and terrestrial sites (Ernst et al. 1994; Litzgus 1996). In Victoria County, average daily movements were greatest early in the season and generally declined as the year progressed (Haxton and Berrill 2001).

Nutrition

Spotted Turtles are omnivorous scavengers and generally feed in water when temperatures exceed 15°C (Ernst 1982; Ernst et al. 1994; Litzgus and Brooks 2000). Aquatic plants consumed include grasses, filamentous green algae, and cranberries (Ernst et al. 1994). Animal food items, eaten both live and as carrion, include earthworms, aquatic insect larvae, small crustaceans, snails, tadpoles, salamanders, fish, and birds (Ernst et al. 1994). ***BLOCKED TEXT***, Spotted Turtles were observed consuming snails, often oblivious to the presence of researchers. Occasionally Spotted Turtles were also observed eating algae, and on one occasion the leaf of a cattail (*Typha latifolia*) (S. Gillingwater, pers. comm. 2003). Surface (1908) examined the stomach contents of 27 Spotted Turtles; 3 contained plant material, and all 27 contained both aquatic and terrestrial invertebrate animal material.

Behaviour/adaptability

For species whose sex is determined by temperature during embryonic development, including the Spotted Turtle, some researchers have claimed that global warming may deleteriously impact population sex ratios (Janzen 1994). The Spotted Turtle is very sensitive to pollution and toxicants and disappears rapidly with declining water quality (New York State Department of Environmental Conservation (NYSDEC) Spotted Turtle Fact Sheet - 1998). Spotted Turtles become inactive when environmental conditions become unfavourable, such as during the freezing temperatures of winter and the extreme heat of summer. The species also appears to be relatively tolerant of drought conditions. In a South Carolina population, a severe drought in 2001-2002 left the swamp in the study site dry such that several turtles

outfitted with radio transmitters survived a brief hibernation and ice storm in terrestrial sites (J.D. Litzgus, unpubl. data).

POPULATION SIZES AND TRENDS

Spotted Turtle population densities in North America range from 0.05 turtles/ha (Ontario) to almost 80 turtles/ha (Pennsylvania) (Litzgus 1996). The lowest reported densities in North America occur in Ontario (Georgian Bay: 0.62 turtles/ha (Litzgus 1996); ***BLOCKED TEXT***: 0.05 turtles/ha (Chippindale 1984)), although a relatively high density was calculated for a portion (1.7ha) of a 31-ha managed impoundment within the ***BLOCKED TEXT*** (26.5 turtles/ha; Saumure 1995). For the entire 31 ha, the density would be closer to 1.5 turtles /ha. Spotted Turtle densities are low compared to those calculated for other North American freshwater turtle species. For example, Painted Turtle (*Chrysemys picta*) densities range from 25-838 turtles/ha, and Slider Turtle (*Trachemys scripta*) densities range from 88-353 turtles/ha (Ernst et al. 1994).

The Natural Heritage Information Centre (NHIC) ranks Element Occurrences (EOs) based on predicted long-term population viability as a way of prioritizing species for conservation (M.J. Oldham, pers. comm. 2003). An historic rank indicates that there are no records from the site in at least 20 years. Extirpated indicates that the species no longer occurs at a site, often because the site locality has been destroyed. An extant ranking is further broken down into 4 categories ranging from high quality with excellent predicted long-term viability (A quality) to low quality with poor predicted long-term viability (D quality). The NHIC recognizes 104 EOs of Spotted Turtles in Ontario (M.J. Oldham, pers. comm. 2003). Most of these populations are essentially unknown with respect to numbers of turtles. Of the 104 locations, 35% (36) are considered historic or extirpated and 50% are ranked as D quality (formerly referred to as “non-viable”) (usually only 1 or 2 sightings at a location). Of the handful of “known” populations, only a few have numbers that suggest long-term viability ***BLOCKED TEXT***. Furthermore, most known populations are isolated and small (i.e., no population is known to have more than 200 individuals). The NHIC reports Element Occurrences from 29 counties in southern Ontario; 16 of these counties include only 1 or 2 records.

In Southwestern Ontario in the late 1800s and early 1900s, the Spotted Turtle was considered common (Garnier 1881; Nash 1906; Logier 1939; Mills 1948). Field surveys at Point Pelee National Park in 1913 indicated that the Spotted Turtle was as common as the Painted Turtle (*Chrysemys picta*) (Patch 1919). By the 1960s and 1970s, Spotted Turtles were included in accounts of rare or endangered Ontario reptiles (Oldham 1982, 1991). There are no recent records of the species from the Lake Ontario area (Oldham 1982, 1991). The total population trend for Canada is declining; NHIC records indicate a 35% decline (see Technical Summary). This value is likely an underestimate given that most of the NHIC data were collected in the past 30-40 years, and that the average age of breeders is over 25 years, and thus 3 generations requires more than 75 years. This extended generation time exacerbates declines resulting from

collection of adults for the pet trade. The species appears to remain abundant in only a few localized pockets in Ontario, but with the increasing disappearance of wetlands in southern Ontario, further decline in Spotted Turtle populations is inevitable, and populations in the lower Great Lakes region are most acutely threatened (Oldham 1991).

Surveys in spring 2001 of 7 historical sites in Southeastern Ontario revealed only one adult male Spotted Turtle from only one site (Hastings County; Seburn 2001a). At ***BLOCKED TEXT***, a total of 9 Spotted Turtles was captured in 7 days of surveying; 5 adults, 2 juveniles, and 2 yearlings (Seburn and Snyder 2002). At the ***BLOCKED TEXT***, study from 1983-86 resulted in the capture of 49 Spotted Turtles (Chippindale 1989). Recent re-surveys of the ***BLOCKED TEXT*** (1999, 2001, 2003) yielded a total of 32 Spotted Turtles; 64% were recaptures from the earlier study (Seburn 2001b). Total (all ages classes) population size in ***BLOCKED TEXT*** was estimated at 44 in 1983 and at 42 (95% confidence limits 26-100) in 2001 (Seburn 2001a). In 2003, sampling in a different part of the bog yielded a few more individuals for a total of 40 (14 males, 19 females, 7 juveniles) caught from 1999-2003. A capture-mark-recaptured estimate for the total population was 63 (95% confidence interval 38-147) including juveniles (Seburn and Snyder 2003; D. Seburn, pers. comm. 2003), indicating a relatively stable population size. In 2003, several people searched ***BLOCKED TEXT*** northwest of Kingston over 5 days and found 5 Spotted Turtles, and another 2 Spotted Turtles were found in ***BLOCKED TEXT*** (C. Brdar, D. Seburn, pers. comm. 2003). Therefore, small numbers of Spotted Turtles persist in these small wetlands. In the St. Lawrence Islands National Park, there are historical sightings from 20-30 years ago; however, no Spotted Turtles have been seen recently inside or around the park despite active monitoring since 1994 (R. Alvo, pers. comm. 2002).

In Southwestern Ontario, one population at Cedar Creek has likely been extirpated (Oldham 1991). Similarly, Spotted Turtles have not been seen on Pelee Island since 1991 (B. Porchuk, pers. comm. 2003), and another population at Point Abino near Fort Erie has been extirpated in recent years (A. Yagi pers comm. 2003). In Point Pelee National Park (Essex County), the Spotted Turtle has declined from its once common status such that its continued presence in the park was in question (R. Alvo, pers. comm. 2002). A thorough two-year capture-mark-recapture survey of turtles at Point Pelee National Park in 2001-2002 failed to find any Spotted Turtles, and this species probably is extirpated from the Park (Browne and Hecnar 2002; C. Browne, pers. comm. 2002; V. McKay, pers. comm. 2003).

In 2002, seven historic Spotted Turtle sites and two potential new areas were surveyed (19 field days, 132 person hours) on the Upper Thames Watershed and no Spotted Turtles were found at any of the nine sites. Four of the sites have been substantially altered over the past 15-20 years, six of the nine sites are small and surrounded by agricultural land. Of the three larger sites, two have good habitat but they are the two for which Spotted Turtles have never been reported (S. Gillingwater, pers. comm. 2003). In West Lorne, a small population has been reported, but the last sighting was a road-killed Spotted Turtle in the early 1990s (S. Gillingwater, pers. comm. 2003).

In 2003, a single Spotted Turtle was found in the ***BLOCKED TEXT*** (K. Fernie, pers. comm. 2003). Spotted Turtles have been sighted occasionally in small numbers over the past 5 years in the ***BLOCKED TEXT***; however, in a localized area where an invasive variety of *Phragmites* has taken over, Spotted Turtles are observed less frequently than before the plant invaded (J. Haggeman, pers. comm. 2002). Spotted Turtles have been occasionally observed in small numbers in the ***BLOCKED TEXT***, but no individuals were captured by CWS researchers in 66 trap nights (i.e., 1 trap over 24 hours is 1 “trap night”) from May 25-June 2, 2001, although one Spotted Turtle was observed in late May in a drainage ditch (K. Fernie, pers. comm. 2003). At ***BLOCKED TEXT***, a few Spotted Turtles are observed every year, and during breeding bird surveys in the mid- 1990s, up to 3 Spotted Turtles were observed per day (T. Hamilton, pers. comm. to J. Haggeman 2002). Oldham (1982) considered the ***BLOCKED TEXT*** to be one of the last remaining strongholds for the Spotted Turtle in Ontario. Surveys of a 31-ha impoundment of the ***BLOCKED TEXT*** in 1995-96 yielded 47 Spotted Turtles, 34 of which were recaptures from earlier surveys conducted in 1992-94 (Saumure 1997). A more recent and thorough survey of ***BLOCKED TEXT*** yielded 146 individuals, of which 10 were recaptures from surveys conducted in 1992-1996 (S. Gillingwater, pers. comm. 2003). This large wetland probably harbours the most viable population left in southwestern Ontario, especially as there is a possibility for some movement and exchange with a smaller number of Spotted Turtles on ***BLOCKED TEXT***, where regular sampling yielded 6-12 individuals annually (1996-2003), although the total number is undoubtedly higher because Spotted Turtles occur all along the peninsula, albeit at low densities (S. Gillingwater, pers. comm. 2003). However, this area is well known to reptile hobbyists and poaching attempts have been observed. Also, there is a causeway running along the ***BLOCKED TEXT*** on which there were 3 observed, and certainly more that were not observed, roadkills of Spotted Turtles in 2003 (S. Gillingwater, pers. comm. 2003). At ***BLOCKED TEXT***, 113 turtles have been marked; 44 females, 44 males, 15 juveniles, and 10 hatchlings (A. Yagi, pers. comm. 2003). There is evidence that turtles from some parts of ***BLOCKED TEXT*** have been collected by poachers and habitat is disappearing as open water fills in with organic matter (A. Yagi, pers. comm. 2003).

A two-year survey of the herpetofauna in ***BLOCKED TEXT*** in 2000-2001, where the Spotted Turtle was thought to be very rare or even extirpated, found 158 specimens, 76 males and 80 females, but only 2 juveniles (Gillingwater and Brooks 2002). Only one nest was found and all the turtles were confined to ***BLOCKED TEXT***. Previous searches had not included this area because it is difficult to move about in the marshy terrain. No Spotted Turtles were found in extensive searches of other parts of ***BLOCKED TEXT***. Nevertheless, this population ranks with the one at ***BLOCKED TEXT*** as the largest remaining in Southern Ontario. Both populations are likely completely isolated from each other and probably from any others. However, this population is also highly exposed to poachers because turtles are confined to a small area which is easily accessed from ***BLOCKED TEXT***, out of sight of Park patrols. A more serious threat is that the marsh is filling in because of lower lake levels and the habitat used by Spotted Turtles could disappear quickly if current trends persist (S. Gillingwater pers. comm. 2003).

In Central Ontario, 3 mark-recapture and radio telemetry studies have been conducted: Muskoka District (Georgian Bay Islands National Park staff), Victoria County (Haxton 1998), and on the east shore of Georgian Bay in Parry Sound District (Litzgus 1996). Breeding has been observed at all 3 sites. At the Muskoka District site, a total of 11 Spotted Turtles (7 females, 2 males, 2 juveniles) were captured from 1993-95 (Georgian Bay Islands National Park 1995). In Victoria County (now, at least for the moment, called ***BLOCKED TEXT***), 35 turtles (9 males, 17 females, 9 juveniles) were marked over a 2-year period (Haxton 1998). In eastern Georgian Bay, a mark-recapture study has been ongoing since 1977, and more than 180 turtles have been marked (Litzgus, unpubl. data). Although evidence for recruitment is minimal (only 10 juveniles and 1 hatchling have been captured since 1977), and population density is low, the populations at the eastern Georgian Bay site appear to be stable, likely as a result of the remoteness of the location. The future of these populations, however, may be jeopardized by the recent widening of the nearby highway, and the development of a large factory at the closest marina. Only two Spotted Turtles have been observed in Algonquin Park, both over 33 years ago so the species is likely extirpated there (Brooks et al. 2003).

Intensive searches in ***BLOCKED TEXT*** on Lake Huron over the past 5 years (est. 2800 person hours per year!) have located four (4) Spotted Turtles, but in 2003, 24 Spotted Turtles were found on a beach habitat south of the ***BLOCKED TEXT*** and there may be a thriving population there (S. Marks, pers. comm. 2003).

Whether the Spotted Turtle currently occurs in Quebec is uncertain, and recent surveys have not yielded any sightings. The Spotted Turtle has not been reported from Nicolet since the 1874 record (Provancher), although recent surveys indicated that good bog habitat appears to be available. Further surveys are planned for the Nicolet area (J-F. Desroches, pers. comm. 2002). The 1967 sighting near Sherbrooke (Ernst et al. 1994) was in the Appalachian Mountains, and Spotted Turtles do not typically occur in such habitats. A poster program was initiated and surveys of this locality were conducted in 1998-99, and no Spotted Turtles were reported or found (J-F. Desroches, D. Rodrigue, pers. comm. 2002). J-F. Desroches (pers. comm. 2002) suspects that the 1967 record may have been a released pet.

If indeed the Spotted Turtle previously occurred naturally in Quebec, the failure of recent surveys of historical sites to find turtles suggests that the species may now be extirpated from the province. The Spotted Turtle is found in Ontario in localities that are only 15km from the Quebec border, and therefore it is possible that remnant populations still exist in Quebec, especially along the Ottawa River between Ile Perrot and Hull (D. Rodrigue, pers. comm. 2002). Rigorous field surveys during the active season (May-June) are necessary to confirm the presence of the species in Quebec, and such surveys should be considered of high priority.

A total population estimate for Canada is obviously difficult. Summing up all known populations gives a number between 1000-2000. However, there could be other unknown "populations" particularly in the Georgian Bay region. Given the significant

expansion of highways in that region (most importantly a new 4-lane road opened in 2003) these potential populations will be exposed to significant increases in road mortality and collection particularly if we view this new mortality over 1-3 average generation lengths (25-75+ years). Regardless, it seems unlikely that 1000s more Spotted Turtles exist in undiscovered bogs in southern Ontario and that 2000 represents a reasonable estimate of the total adult population of Spotted Turtles in Canada.

LIMITING FACTORS AND THREATS

Declines in Spotted Turtle numbers have been reported in the USA and Canada (Burke et al. 2000; Ernst et al. 1994; Turtle Conservation Fund 2002). The Spotted Turtle is not currently protected by CITES; however, international trade of the congeneric Bog Turtle (*C. muhlenbergii*, Appendix I) and Wood Turtle (*C. insculpta*, Appendix II) are restricted by CITES. Habitat destruction and overcollection have seriously impacted all four species in the former *Clemmys* group (*C. guttata*, *C. muhlenbergii*, *C. insculpta*, *C. marmorata*; Burke et al. 2000; Turtle Conservation Fund 2002). *C. marmorata* is extirpated from Canada (COSEWIC website, December 2002). (Note: Results of recent analyses have caused some to suggest that the taxonomy of these four species be changed (Holman and Fritz 2001; Feldman and Parham 2002)). Turtles in the *Clemmys* group may be more susceptible than other turtle species to the current level of habitat modification occurring throughout eastern North America (Oldham 1991). Reasons for decline in Spotted Turtles include overcollection for the pet trade, habitat destruction and fragmentation, road mortality, predation by subsidized predators (native species, particularly raccoons that survive in part due to resources provided by humans), overgrazing by livestock, agriculture, and pollution (Lovich 1989; Oldham 1991; Ernst et al. 1994; Burke et al. 2000). Population declines have been observed even in protected nature preserves in both the USA (Lovich 1989) and Canada (current report). The Spotted Turtle is particularly susceptible to habitat destruction and exploitation by pet trade collectors in spring when turtles aggregate for breeding, and in fall when turtles gather at communal hibernation sites.

The Humane Society of the United States reported the export of at least 25 million turtles through USA ports between 1989-1994. These turtles were mostly Common Sliders (*Trachemys scripta*), and were valued at over US \$17 million. Turtles of the genus *Clemmys* have long been popular with reptile hobbyists because they are hardy, intelligent, and attractive. Indeed, *Clemmys* are among most popular species of turtles exported from the USA; 4692 (recorded) specimens were shipped overseas between 1989-1994 at a value of US \$102,658. In December 2002, a website specializing in the sale of reptiles (www.gherp.com) advertised Spotted Turtles at \$175 each for adults (presumably wild-caught), and US \$150 each for captive-bred individuals. Spotted turtles have also been offered for sale on www.Kingsnake.com in the U.S. and on at least two occasions, filed notches in the turtle's shell were visible in photographs on the website. Because of the visible notches, these animals may have been taken from a

research population in the U.S. or Ontario. A small number of spotted turtles were offered for sale at the Toronto Reptile show in 1998 at a cost of \$110 each. Other species of the *Clemmys* group were also available on the same table *C. marmorata* (cost unknown), *Clemmys insculpta* (\$75.00 each) and *Clemmys muhlenbergii* (\$275.00) (S. Gillingwater, pers. comm. 2003).

Spotted Turtles have been considered especially vulnerable to increased adult mortality and overcollection because of slow growth rates, delayed maturity, and low egg and juvenile survivorship (Oldham 1991; Wilson et al. 1999). Natural succession of the habitats occupied (Ernst 1976) and relatively small average clutch sizes (low reproductive potential) further exacerbate susceptibility to local extinction (Oldham 1991; J. Harding 1999, pers. comm. to USFWS). Once a habitat becomes overgrown with later successional species of plants, it may be unsuitable for Spotted Turtles (Burke et al. 2000). In southwestern Ontario, particularly around Lake St. Clair, invasive *Phragmites* is destroying Spotted Turtle habitat and is a major threat (see earlier remarks in Population Sizes and Trends).

SPECIAL SIGNIFICANCE OF THE SPECIES

Turtles, in general, are important totem animals in many Aboriginal tribes. All Iroquois tribes and several Algonkin tribes recognize one or more turtles as totems (website: www.inquiry.net/outdoor/native/totem/authentic.htm). Turtle is a primary character in many Aboriginal creation stories, and turtle shells were often used as rattles in ceremony (H. Lickers, Turtle Clan, Haudenosaunee, pers. comm. 2003).

EXISTING PROTECTION OR OTHER STATUS

In Canada, the Spotted Turtle was designated as Vulnerable (i.e., a Species of Special Concern) by COSEWIC in 1991 (Oldham 1991). The Nature Conservancy lists the species as S3 in Ontario, S1 in Quebec, N3 in Canada, and G5 globally (where S = sub-national, N = national, G = global, 1 = critically imperiled, 3 = vulnerable, 5 = demonstrably widespread, abundant and secure; Alvo and Oldham 2000). The Ontario Ministry of Natural Resources lists the species as Vulnerable (1996), and the Ontario General Status is Sensitive (1999). The Spotted Turtle is listed as a Specially Protected Reptile (Schedule 9) in the Fish and Wildlife Conservation Act (1997; Bill 139, Chapter 41, Statutes of Ontario).

In the United States, the Spotted Turtle is not currently listed in the US Federal Endangered Species Act; however, it is listed in several of the states in which it occurs. Nature Serve's Conservation Status ranks classify the status of the species as follows: S5 in Maryland, New Jersey, Rhode Island, South Carolina; S4 in Connecticut, Pennsylvania, Virginia; S3 in Delaware, Florida, Georgia, Maine, Massachusetts, New Hampshire, New York, North Carolina, Ohio; S2 in Indiana, Michigan; and S1 in DC, Illinois, Vermont, West Virginia, as of November 2003 (www.natureserve.org).

The Spotted Turtle is not currently listed by CITES. At the April 2000 meeting of CITES in Nairobi (Kenya), the United States proposed that the Spotted Turtle be given Appendix II listing; however, the proposal was not accepted. The congeneric Bog Turtle (*C. muhlenbergii*, Appendix I) and Wood Turtle (*C. insculpta*, Appendix II) are protected by CITES.

As of November 2003, the IUCN Red Book lists the Spotted Turtle as VU A1cd+2cd: vulnerable to extinction in the wild in the medium-term future due to population reductions from a decline in area of occupancy and/or habitat quality, and from exploitation for the pet trade. The IUCN notes that the Spotted Turtle is globally conservation-dependent, indicating that cessation of conservation programs designed to preserve the species and its habitats would result in the uplisting of the Spotted Turtle within 5 years (<http://www.redlist.org/>).

TECHNICAL SUMMARY

Clemmys guttata

Spotted Turtle

Tortue ponctuée

Range of Occurrence in Canada: Southern Ontario, possibly Southern Quebec

Extent and Area Information	
• <i>Extent of occurrence (EO)(km²)</i>	~ 57,500 km ²
• <i>Specify trend in EO</i>	Declining
• <i>Are there extreme fluctuations in EO?</i>	No
• <i>Area of occupancy (AO) (km²)</i> Estimated from mapped areas.	<< 500 km ² (hibernacula) <2,000 km ² wetlands occupied through all seasons.
• <i>Specify trend in AO</i>	Declining
• <i>Are there extreme fluctuations in AO?</i>	No
• <i>Number of known or inferred current locations (NHIC Database)</i>	70 (50 ranked "poor viability", i.e. have only 1 or 2 sightings)
• <i>Specify trend in #</i>	Declining
• <i>Are there extreme fluctuations in number of locations?</i>	No
• <i>Specify trend in area, extent or quality of habitat</i>	Declining in area, extent and quality
Population Information	
• <i>Generation time (average age of parents in the population)</i>	>25 years
• <i>Number of mature individuals</i>	1,000 – 2,000 (a rough estimate at best)
• <i>Total population trend:</i>	Declining
• <i>% decline over the last/next 10 years or 3 generations.</i>	35% (NHIC records) Certainly should be higher because almost all NHIC records are more recent than the >75 years needed for 3 generations (i.e. later than 1983, and therefore cover less than one generation).
• <i>Are there extreme fluctuations in number of mature individuals?</i>	No
• <i>Is the total population severely fragmented?</i>	Yes
• <i>Specify trend in number of populations</i>	Declining
• <i>Are there extreme fluctuations in number of populations?</i>	No
• <i>List populations with number of mature individuals in each:</i> * Refers to numbers captured (if 0, then likely extirpated) ** Refers to population estimate – see text Numbers 1 to 20 refer to locations – see Figure 1	1. 9 2. 0 3. ~200 4. few 5. >24 6. 175+ and another ~100? (no complete survey) 7. 4 8. 63 9. 7 10. 0 11. 0 12. 160-200 13. 1 14. few 15. few 16. 5 17. 0 18. 35 19. 113 20. 0

Threats (actual or imminent threats to populations or habitats)	
<ul style="list-style-type: none"> Habitat loss, and a high degree of isolation of populations in fragmented wetlands. Unusually low reproductive potential, small low density populations, long-lived life history. Collection for the pet trade Road mortality Predation by “subsidized” predators (raccoons, coyotes, opossums) of nests and all life history stages, including mature turtles. 	
Rescue Effect (immigration from an outside source)	
<ul style="list-style-type: none"> Status of outside population(s)? USA: [other jurisdictions or agencies] 	Declining or extirpated (E. USA)
<ul style="list-style-type: none"> Is immigration known or possible? 	Very unlikely
<ul style="list-style-type: none"> Would immigrants be adapted to survive in Canada? 	Unknown
<ul style="list-style-type: none"> Is there sufficient habitat for immigrants in Canada? 	Perhaps in isolated areas
<ul style="list-style-type: none"> Is rescue from outside populations likely? 	No
Quantitative Analysis [provide details on calculation, source(s) of data, models, etc]	Not applicable
Other Status COSEWIC: Special Concern 1991 Ontario: S3; Quebec: S1	

Status and Reasons for Designation

Status: Endangered	Alpha-numeric code: [B2ab(i,ii,iii,iv,v); C1+2a(i)]
<p>Reasons for Designation: This species occurs at low density, has an unusually low reproductive potential, combined with a long-lived life history, and occurs in small numbers in bogs and marshes that are fragmented and disappearing. Although some populations are in protected areas, they may have a low probability of persistence, especially because small numbers and isolation reduce population viability. The low frequency of juveniles in most studied populations suggests these populations are composed largely of remnant, aged cohorts with low reproductive success. Another clear threat is from collection for the pet trade. There is no rescue effect.</p>	
Applicability of Criteria	
<p>Criterion A (Declining Total Population): The SSC (November 8, 2003) felt that Spotted Turtles qualified for a decline >50% over 3 generations even though NHIC records indicate 35% decline. Most NHIC records are from the past 20 years which is less than a generation and over 75 years habitat loss alone would easily account for more than a 50% decline (i.e. >15% for 55 years preceding most NHIC records) in Spotted Turtles. If this speculative approach is accepted, the species would qualify as Endangered under A2abc.</p>	
<p>Criterion B (Small Distribution, and Decline or Fluctuation): Qualifies as Endangered B2 (<500 km² if using hibernacula as Area of Occupancy), a (severely fragmented over much of its range), b (i, ii, iii, iv, v) or Threatened B2, a, b i-v, if using area of wetland occupied for all stages of life history.</p>	
<p>Criterion C (Small Total Population Size and Decline): Endangered (< 2500) 1 (likely to decline 20% in next 50 years), 2, a, i.</p>	
<p>Criterion D (Very Small Population or Restricted Distribution): Total population is likely greater than 1000 mature individuals, so D is not applicable.</p>	
<p>Criterion E (Quantitative Analysis): Not applicable at present.</p>	

ACKNOWLEDGEMENTS

This report was written while J. Litzgus was a PhD Candidate in the laboratory of Timothy A. Mousseau in the Department of Biological Sciences, University of South Carolina, Columbia, SC, USA. Funding for the preparation of this status report was provided by the Canadian Wildlife Service, Environment Canada.

I am indebted to David M. Carroll for providing one of his drawings for the report. I am grateful to the following people for their quick and informative replies to my inquiries about Spotted Turtle populations within their jurisdictions, and for providing published and unpublished data about the species: Robert Alvo (Parks Canada, Ontario), Paul Ashley (Canadian Wildlife Service, Ontario), Irene Bowman (OMNR), Dr. Joe Cebek (Trent University, Ontario), Dave Collins (Tennessee Aquarium), Jean-Francois Desroches (Biologist, Quebec), Gloria Goulet (Environment Canada, Traditional Knowledge), Tim Haxton (OMNR), John Haggeman (Environment Canada, southwestern Ontario), Jacques Jutras (Société de la Faune et des Parcs du Québec), Pierre Laporte (Environment Canada, Quebec), Michel Lepage (Société de la Faune et des Parcs du Québec), Henry Lickers (Mohawk Council of Akwesasne, Department of the Environment), Mike Oldham (Natural Heritage Information Centre, OMNR), David Seburn (Seburn Ecological Services, Ontario), Michele Steigerwald (Canadian Museum of Nature), David Rodrigue (Atlas of Amphibians and Reptiles of Quebec), Darlene Upton (Parks Canada, Ontario), Michel Villeneuve (Parks Canada, Ontario), Anne Yagi (OMNR).

In addition, the following made comments or added information to various later drafts of the report and we (J. Litzgus, R. Brooks (editor)) are grateful to them. Members of the Amphibian and Reptile Subcommittee of COSEWIC (particularly Mike Oldham), plus David Seburn, Vickie McKay, Joe Cebek, Anne Yagi, Leora Berman, Elsa Gagnon, Paul Ashley, Steve Marks, Kim Fernie, Ben Porchuk, Corina Brdar and especially Scott Gillingwater.

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BIOGRAPHICAL SUMMARY OF THE REPORT WRITER

Jacqueline Litzgus has been conducting research on Spotted Turtles since 1991. Her MSc research (University of Guelph, 1996) included a radio telemetry study of a population of Spotted Turtles near the northern extreme of the species' distribution, on the east shore of Georgian Bay, Ontario. Her current PhD research (University of South Carolina) includes an examination of the life history, behaviour, and seasonal activity of a southern population of Spotted Turtles. This research has so far resulted in six peer-reviewed scientific articles, several technical and popular reports, and over 20 presentations to both scientific and general audiences. Funding for Litzgus' (and collaborators) Spotted Turtle research has come from World Wildlife Fund Canada, NSERC, National Geographic Society, Sigma Xi, Santee Cooper Power Company SC, and Chelonian Research Foundation. Dr. Litzgus has also participated in surveys for Spotted Turtles in Ohio and West Virginia. In 1996, she was senior author on the COSEWIC status report on the Wood Turtle (*Clemmys insculpta*), a closely related species to the Spotted Turtle. Dr. Litzgus has also participated in surveys for Wood Turtles in Ontario and Virginia. She received her PhD on November 14, 2003 from USC.

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COLLECTIONS EXAMINED

The Canadian Museum of Nature has 34 Canadian records for the Spotted Turtle. Photocopies of the specimen record cards were provided by the Museum and examined by the contractor.