COSEWIC
Assessment and Status Report

on the

Western Painted Turtle
Chrysemys picta bellii

Pacific Coast population
Intermountain – Rocky Mountain population
Prairie/Western Boreal – Canadian Shield population

in Canada

PACIFIC COAST POPULATION – ENDANGERED
INTERMOUNTAIN - ROCKY MOUNTAIN POPULATION – SPECIAL CONCERN
PRAIRIE/WESTERN BOREAL – CANADIAN SHIELD POPULATION – NOT AT RISK
2006

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:

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Western Painted Turtle — Photo by Bill Leonard.

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COSEWIC
Assessment Summary

Assessment Summary – April 2006

Common name
Western Painted Turtle – Pacific Coast population

Scientific name
Chrysemys picta bellii

Status
Endangered

Reason for Designation
There are few records from Vancouver Island and the mainland south coast / Fraser River valley, and both regions are undergoing major loss of wetlands and a rapid increase in roads, development, and people. Recent searches of the lower Fraser River valley and of eastern Vancouver Island indicate the subspecies has declined in some of the handful of areas where it was previously observed.

Occurrence
British Columbia

Status history
Designated Endangered in April 2006. Assessment based on a new status report.

Assessment Summary – April 2006

Common name
Western Painted Turtle – Intermountain-Rocky Mountain population

Scientific name
Chrysemys picta bellii

Status
Special Concern

Reason for Designation
The number of turtles is likely small and declining because of extensive loss of wetland habitats and proliferation of roads.

Occurrence
British Columbia

Status history
Designated Special Concern in April 2006. Assessment based on a new status report.

Assessment Summary – April 2006

Common name
Western Painted Turtle – Prairie/Western Boreal – Canadian Shield population

Scientific name
Chrysemys picta bellii

Status
Not at Risk

Reason for Designation
Populations are numerous and widespread and there is an abundance of good habitat, especially in the eastern part of the range (Ontario).

Occurrence
Alberta, Saskatchewan, Manitoba, Ontario

Status history
Designated Not at Risk in April 2006. Assessment based on a new status report.

COSEWIC
Executive Summary

Western Painted Turtle
Chrysemys picta bellii

Pacific Coast population
Intermountain – Rocky Mountain population
Prairie/Western Boreal – Canadian Shield population

Species information

The Painted Turtle, *Chrysemys picta*, is a small freshwater turtle with a smooth, dark carapace (upper shell) and outstanding red and yellow patterns on its limbs and plastron (ventral shell). There are three subspecies in Canada. The Western Painted Turtle, *C. p. bellii,* is distinct from the other subspecies in being the largest, and in possessing a large central mark that extends along the plastral seams and covers much of the red/orange plastron.

Distribution

Chrysemys picta bellii occurs in wetlands in low elevation forests and grasslands of western and central North America. In Canada, its range extends from southwest of Lake Nipigon, Ontario, across the southern portion of the prairies, to the low-lying valleys of southern Interior and southwest British Columbia and Vancouver Island.. Range expansion appears to be limited by the length of the turtle's active season, mean ambient temperature during egg incubation, and, perhaps, mean winter temperature.

Habitat

This aquatic species is found in the shallow waters of ponds, lakes, sloughs, and slow-moving stream reaches. Suitable wetlands have muddy substrates, an abundance of emergent vegetation, and numerous basking sites. *Chrysemys p. bellii* habitat also includes riparian zones bordering wetlands; females nest up to 150 m away from water, in loose, warm, well-drained soils.

Biology

Western Painted Turtles mate in shallow water, probably throughout the active season. Females may mate with a single male prior to egg-laying, but there is evidence

of multiple paternity in some clutches. Nesting usually takes place at dawn or dusk during June. Once a female has traveled to her chosen nest site, she digs a 10-cm hole, deposits up to 23 eggs, and covers them. Incubation lasts roughly 76 days, and the temperature regime in the nest will determine the sex of the offspring. Constant temperatures above 29°C produce all females and those below 27°C produce males; at the pivotal temperature of 28°C, both sexes are produced. Hatchlings usually overwinter in the nest and emerge the following spring. They resist winter freezing by supercooling, or they survive by tolerating freezing. Mortality is high when nest temperatures are lower than about -4C.

There is no post-hatching parental care in this species, and few hatchlings survive to adulthood. The survival rate of juveniles and adults is relatively high and constant. Sexual maturity is attained in 8-10 years in males and 12-15 years in females. Adult lifespan is likely over 50 years and possibly much longer. Aside from hatchlings, all life stages lie dormant on the muddy substrate of ponds during winter. They become active as soon as ice cover melts and the surface of the water body has some open water. During the growing season, turtles bask to raise their temperature to facilitate foraging and mating. They may bask several times a day, and the basking period will vary with temperature, age (size), and activity (females may bask longer prior to the nesting season).

Population sizes and trends

Globally, the Western Painted Turtle is secure, with more than 300 locations with a dozen to several hundred individuals per hectare. In Canada, *Chrysemys p. bellii* is apparently secure in Ontario (> 100 locations) and Manitoba (> 100 locations); wetlands are abundant and interconnected in these provinces. The species is also considered secure in Saskatchewan (21-100 locations). *Chrysemys p. bellii* has a tenuous hold in Alberta (S1), with small numbers in a handful of isolated locations near the U.S. border. In British Columbia, the species has been reported from over 30 locations, most in the Okanagan Valley. The species is ranked as S3S4 (of concern). Some populations appear stable; but most are vulnerable because roads intercept nesting areas, and because wetland degradation/loss through urbanization and filling in for vineyards is on the rise in large parts of the species' range in British Columbia (Okanagan, lower mainland, Fraser River Valley, Vancouver Island).

Limiting factors and threats

Given this species' low adult recruitment, delayed maturity, and high adult survival, chronic added mortality of juveniles and adults could eliminate local populations. Factors contributing to this cumulative diminishment of older turtles include road kills of turtles, particularly gravid females during the nesting season, increased predation on dispersing turtles during drought years (or in reservoirs with low water levels), and increasing depredation of nests. Habitat loss is also a threat to turtles, and may rise significantly with climate change, particularly in the drier prairies. Wetland and riparian degradation is prevalent in landscapes where human activity is extensive, intensive or

frequent. Habitat threats include water pollution, habitat fragmentation, drainage of wetlands, increased predation of eggs and juveniles particularly by higher populations of raccoons, and introduction of exotic turtle species and their associated diseases and parasites.

Special significance of the species

Chrysemys p. bellii is one of only two extant, native freshwater turtle species west of Ontario, which makes it a significant element in the overall biodiversity of the western provinces. Western Painted Turtles undoubtedly play an important role in the ecology of some wetlands. Populations at range limits are critical sources of genetic variation for potential, future adaptation to changing environmental conditions.

Existing protection

Provincial wildlife acts protect turtles from killing and/or collection. A number of protected areas occur within the species' range though few are in the dry prairie belt, especially Alberta. In many protected areas, individuals are still vulnerable to collection, nest disturbance and road mortality. Federal fish regulations, provincial management initiatives and municipal by-laws can also protect turtles.

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. Species designated at meetings of the full committee are added to the list. On June 5th 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 for 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 entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2006)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife 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 wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* 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. Definition of the (DD) category revised in 2006.

Environment Canada / Environnement Canada
Canadian Wildlife Service / Service canadien de la faune
Canada

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

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Chrysemys picta bellii

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SPECIES INFORMATION

Name and classification

The Painted Turtle belongs to the genus *Chrysemys*. Although *Chrysemys* is among the most common and familiar genera of turtles, it contains only one species, *Chrysemys picta* (Scheider, 1783). *Chrysemys picta* was described from eastern North America, and the Western Painted Turtle (*Chrysemys picta bellii*; Gray, 1831) was recognized as a subspecies distinct from the Eastern Painted Turtle (*C. p. picta*) nearly 50 years later. In 1857, Agassiz recognized two additional subspecies: the Southern Painted Turtle (*C. p. dorsalis*) and Midland Painted Turtle (*C. p. marginata*) (Collins, 1997). All subspecies except *C. p. dorsalis* are found in Canada. Subspecies differ in the: (1) juxtaposition of vertebral and pleural seams; (2) lightness or darkness of these carapacial seams; (3) size of the central dorsal stripe; (4) carapace colouring; (5) plastron colouring; (6) extent of the plastral central marking and body size, with *C. p. bellii* being distinctly larger than the other three subspecies in both these respects (Ernst *et al*. 1994). *Chrysemys p. bellii* has a carapace with alternating vertebral and pleural seams, a poorly developed or absent mid-dorsal stripe, and a reticulate pattern of light lines. Its plastron is bright orange/red, with a central marking that extends along the seams to occupy most of the underside (Ernst *et al*.1994).

Patterns of morphological (Ultsch *et al*. 2001) and mt-DNA variation (Starkey *et al*. 2003) cast some doubt on the validity of current subspecific designations. The subspecies intergrade and a “pure” *picta* may not exist according to Ultsch *et al*. (2001): (1) there is *marginata* influence throughout *picta*’s range; (2) similarities exist between *picta* and *dorsalis*; and (3) there is a north-south cline that blends the characteristics of *bellii* with those of *marginata*. Starkey *et al*. (2003) suggest that the Southern Painted Turtle could be considered a distinct evolutionary species (*C. dorsalis*), and that *C. dorsalis* and *C. picta* may be best treated as monotypic. These authors are now investigating nuclear genes of the *Chrysemys picta* complex to refine species and subspecies boundaries. At present, *C. p. belliis* regarded as a distinct and valid subspecies (Crother *et al*. 2000).

Morphological description

Painted Turtles have low, smooth, oval, unkeeled carapaces (Figure 1), although the carapace of hatchlings tends to be rounder and slightly keeled along its length (Gregory and Campbell 1987). The Western Painted Turtle (*C. p. bellii*) is the largest subspecies, attaining a carapace length of 251 mm; females tend to be larger than males (Cook 1984). The *C. p. bellii* carapace is flatter than that of the other sub-species, with slightly different markings (Cook 1984). Carapace colour is brown, black, or olive green, and a central light yellow reticulated pattern or faint line may be present along the vertebral scutes (Gregory and Campbell 1987). The carapace of males is often marked with black reticulations (Cook 1984). The seams of the pleural and vertebral scutes are not aligned, similar to *C. p. marginata*, but contrasting with *C. p. picta* in which the seams are aligned (Cook 1984, Ernst *et al*. 1994). The plastron

Figure 1. Photo of a Western Painted Turtle (*Chrysemys picta bellii*) photo by Bill Leonard.

is orange-red (Stebbins 1966) and in all life stages, a dark pattern is located at the centre of the plastron, which branches out into the furrows between the scute margins (Figure 3). At hatching, plastron length is roughly 25 mm (Macartney and Gregory 1986). There are reddish markings on the bridge between the plastron and carapace. The head, tail and limbs of Western Painted Turtles are olive or blackish; there are yellow lines on the head and tail, and yellow dots on the limbs. The digits on the hind feet are deeply webbed. Males have much longer claws on the forefeet and their tails are longer and wider compared to females (Stebbins 1966; Gregory and Campbell 1987).

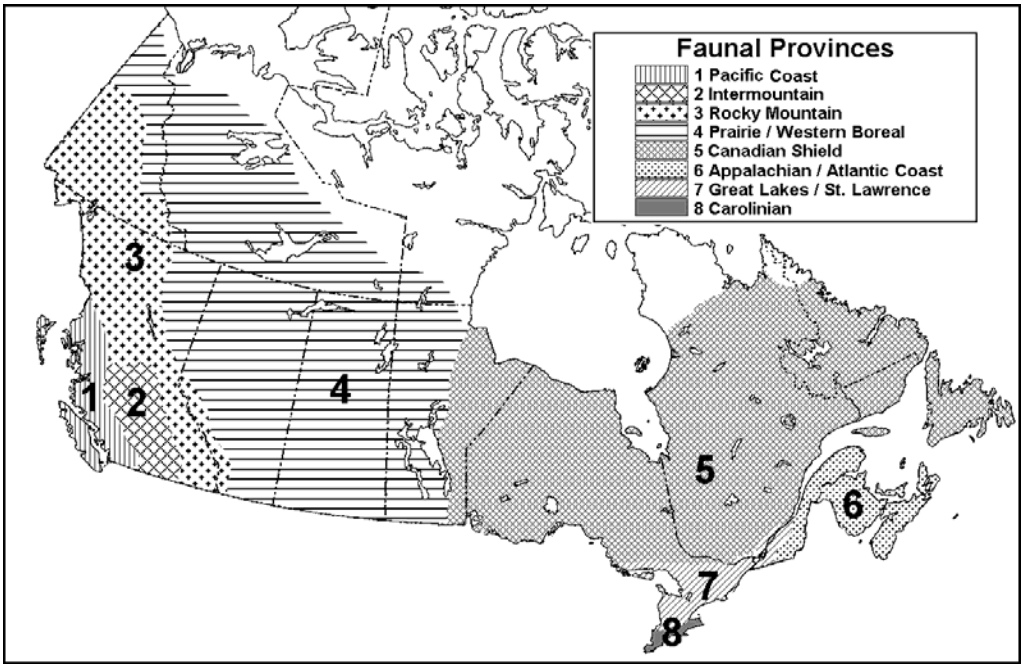

Figure 2. Faunal provinces of terrestrial amphibians, reptiles, and molluscs in Canada (map prepared by David M. Green, 2003).

Figure 3. Ventral view of a Western Painted Turtle, showing plastron colour and patterning; photo by Bill Leonard.

Designatable units

COSEWIC recognizes eight faunal provinces for the terrestrial amphibians and reptiles in Canada (Figure 2). The Western Painted Turtle occupies four of these. It is evident from comments from experienced observers, and from the number of occurrences, that this subspecies is faring quite differently across its Canadian range. In faunal provinces 4 (Prairie/Western Boreal) and 5 (Canadian Shield) (Ontario, Manitoba, Saskatchewan, and Alberta), the subspecies appears numerous and secure. The exception is Alberta where the subspecies is rare, and may have been introduced in some areas. In faunal provinces 2 (Intermountain) and 3 (Rocky Mountain) (British Columbia Southern Interior), the Western Painted Turtle is uncommon, and appears to be declining and threatened by loss of habitat, and increased mortality and population isolation and fragmentation from the expanding road network (J. Brown, pers. comm. 2005; P. Gregory, pers. comm. 2005; M. Sarell, pers. comm. 2005). The turtles in these regions are also isolated from other Canadian populations. Finally, the Western Painted Turtle also occupies faunal province 1 (Pacific Coast), which includes the southern Pacific Coast mainland and Vancouver Island. Again, these turtles are isolated from other Canadian populations. Furthermore, they exist in very small numbers with only a handful of records from this region. There is still some question whether the Painted Turtle is native or introduced to this area. However, records go back to the 1920s and with earlier anecdotal reports from Vancouver Island (F. Cook pers. comm. 2005). The current consensus seems to be that the main argument that they are not native is that they have always been rare (L. Friis, pers. comm. 2005, P Gregory, pers. comm. 2005). The Red-eared Slider (*Trachemys scripta*) is an introduced turtle that has rapidly increased in numbers and may be a threat to the Western Painted Turtle (F. Cook, pers. comm. 2005; P. Gregory, pers. comm. 2005; Bunnell 2005).

Therefore, given the disjunct populations found across the southern regions of British Columbia, and given the obviously different status of these populations: very uncommon in the coastal regions and declining in the southern interior, it is reasonable to treat these populations as three separate designatable units.

DISTRIBUTION

Global range

Chrysemys picta bellii occurs in central North America, from the southern portion of central and western Canada, southward to Missouri, northeastern Colorado, and Kansas (Figure 4). It extends as far east as Illinois, Wisconsin and the upper peninsula of Michigan, and westward around the Great Basin, to east and north Wyoming, northern Idaho, and Washington (Figure 4). There are isolated populations in the southwest United States, namely in Texas, New Mexico, Arizona, Utah, and southwest Colorado. There is also an isolated population in Chihuahua, Mexico (NatureServe 2004). The global range of *C. p. bellii* overlaps with the coniferous forest and tall and short grass prairies of central North America, contouring around the Great Basin, high plateaus (Columbia and Colorado), and mountain ranges (e.g., Coast Ranges, Cascades, Rocky Mountains).

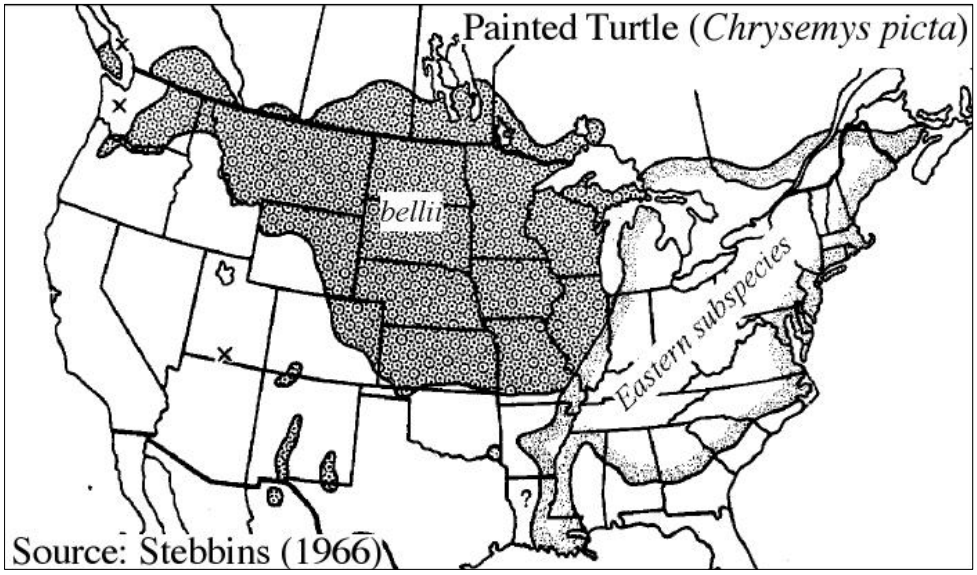

Figure 4. Western Painted Turtle (*Chrysemys picta bellii*) range in North America.

Canadian range

After the Wisconsin glaciation, the Painted Turtle was one of only three species of turtle to move northward into central and western Canada (Cook, 1984). *Chrysemys p. bellii* occurs from the southwest corner of northwestern Ontario, through southern Manitoba and Saskatchewan and extreme southern Alberta, to the low-lying

valleys of British Columbia's southern interior and south coast (Figure 5). Progressive continental cooling over the past 3,000 to 4,000 years appears to have prevented the Painted Turtle from expanding its range north of the 51st parallel (Bleakney 2004). Its range roughly coincides with areas of western and central Canada that have: (1) frost-free days until early November; (2) mean daily July temperatures of at least 17.5°C; (3) mean annual January temperatures above -20°C in Ontario and Manitoba, where there is significant snow cover, and above -12°C in the drier prairies, where mean annual snowfall is less than 100 cm (Hare and Morley 1974). These conditions offer a long growing season, with adequate warmth during the egg incubation period, and tolerable subterranean freezing levels for the overwintering hatchlings.

Province by province range descriptions for the Western Painted Turtle are as follows. The species has a continuous distribution in the southwest corner of central Ontario. It is found from the wetlands and streams of the Thunder Bay District that drain into Lake Superior, north to the Vermillion Lakes of Rainy River District, and west to the Lake of the Woods area of the Kenora District. In Manitoba, the Western Painted Turtle occurs along the margins of the large Lake Winnipegosis and Lake Winnipeg, and in their vast associated networks of inlets and wetlands. There are records as far north as Riding Mountain National Park, in western Manitoba, from lakes connected to the Assiniboine River watershed (W. Vandershuit pers. comm. 2005). In Saskatchewan, there are records for this species in the most southern headwaters of the Saskatchewan River (e.g., Swift Current Creek) and in the Qu'Appelle and Souris headwaters of the Assiniboine River, all of which drain into Lake Winnipeg, Manitoba. There are also Painted Turtle records in the Frenchman River drainage of Saskatchewan, which merges with Milk River in Montana (Missouri River headwater). Critical habitats in Saskatchewan appear to be in the lower reaches of the Souris River, and around this river's confluence with Roughbark Creek. In Alberta, the species is restricted to the Milk River, Cypress Hills, and upper Oldman River. Very recently, Western Painted Turtles have been found in Waterton Lakes National Park (P. Achuff pers. comm. 2005), and as far northwest as the Crowsnest Pass Municipality of Alberta, where the montane Douglas fir/limber pine landscape meets the fescue grassland foothills (R. Quinlan pers. comm. 2004). Turtles further north are thought to be released pets (R. Quinlan pers. comm. 2004). Although these records in the Oldman River headwaters are only within a few kilometres of the nearest B.C. watershed (Elk River), the mountains between the provinces represent a formidable barrier to movement. The nearest turtle locations in B.C. are confined to the low-lying Rocky Mountain Trench, and have undoubtedly originated from Montana. In British Columbia, *C. p. bellii* is present in other lowlands of the Southern Interior as well, including the valleys of Kootenay, Arrow and Okanagan Lakes, and of the Thompson River. On the South Coast of B.C., the Western Painted Turtle occurs in the Georgia Lowlands (Fraser River valley from Hope to Vancouver; Sunshine Coast up to Powell River), the Nanaimo Lowlands of southeast Vancouver Island, and some of the Gulf Islands. South Coast and Southern Interior locations are isolated from one another by the Cascade Mountains.

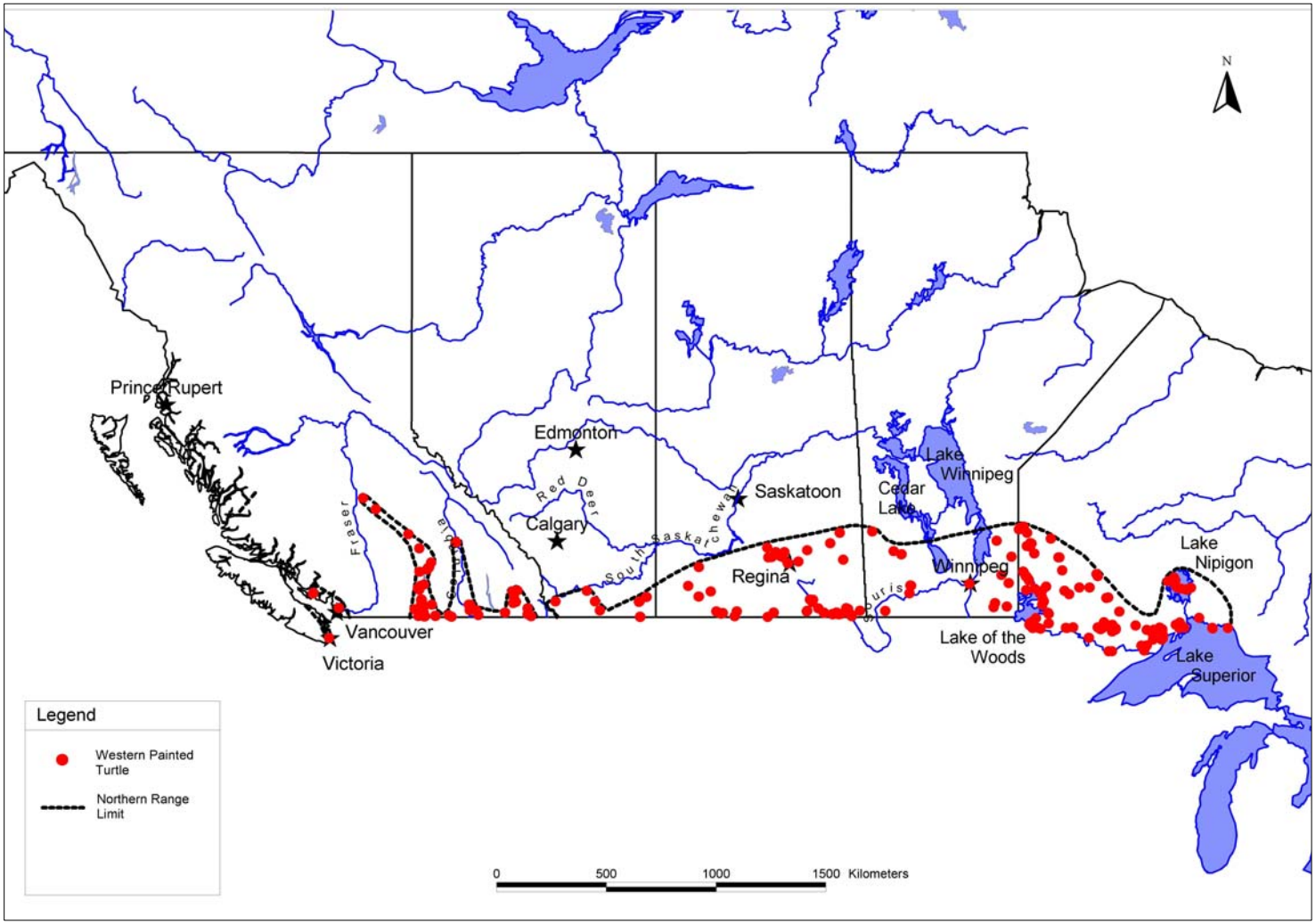

Figure 5. Western Painted Turtle (*Chrysemys picta bellii*) range in Canada.

HABITAT

Habitat requirements

Much of what we know of Western Painted Turtle habitat associations has been derived from the study of other subspecies, particularly in the northeastern United States. Painted Turtles are highly aquatic being found in shallow waters of ponds, lakes, oxbows and marshes, in slow-moving stream reaches, or the quiet backwater sloughs of rivers. Ideal Painted Turtle habitat contains muddy substrates, ample emergent aquatic vegetation, exposed cattail mats, logs, and open banks (St. John 2002). Orchard (1986) suggests that an optimum lake or pond has: (1) 80% of its water depth ≤ 3 m; (2) a mud or sand substrate in 80% of the shallow zone (≤ 3 m); (3) aquatic plants (emergents) in at least 80% of the littoral zone; and (4) at least one emergent basking site at a depth of ≤ 1 m/30 m of shoreline.

Although Painted Turtles forage, mate and hibernate in water, movements several hundred metres overland are not uncommon (Gregory and Campbell 1987). These long-distance movements typically represent spring and fall migrations of individuals that breed and hibernate in different ponds. Females, in particular, make extensive use of the terrestrial environment, laying their eggs up to 150 m, or more (R. Brooks pers. comm.), away from the water's edge. They select an exposed patch of soil or sand either in a field or pasture, or on a beach or roadside, where digging is possible. Gentle slopes (< 45°; Orchard 1986) with southern exposure and good drainage are often chosen: high temperatures increase growth and development rates whereas good drainage decreases soil saturation and thus the probability of ice crystals penetrating the bodies of overwintering hatchlings (Storey *et al*. 1989, 1998, Costanzo *et al*. 1995, 1998, 2004).

In a literature review of the biologically relevant size of core habitats surrounding wetlands for amphibians and reptiles, Semlitsch and Bodie (2003) emphasize that terrestrial habitats are critical to all semi-aquatic species and that acknowledging the biological interdependence between aquatic and terrestrial habitats is key for the persistence of populations. A landscape approach to the conservation of Spotted Turtles (*Clemmys guttata*) and Blanding's Turtles (*Emydoidea blandingii*), for example, involves the protection of small wetlands, maintenance of generous terrestrial buffers around individual wetlands, and conservation of wetlands in groups (Joyal *et al*. 2001). Gibbons (2003) proposes that for the Painted Turtle there are two terrestrial habitats of importance, the riparian periphery and the terrestrial corridors that connect isolated wetlands. In light of these arguments, Painted Turtle habitat ideally consists of a cluster of breeding and overwintering ponds, their riparian zones, and the matrix habitat connecting them. A riparian width of 150 m was deemed necessary by Bodie (2001), based on migration data from 10 species of freshwater turtles in the U.S.

Habitat trends

Small wetlands are often converted to more "usable" land for human activities including agriculture, raising of livestock, hydroelectric dams, urban development, and

industry. Wetland loss is especially significant near large urban centres. Vancouver, Victoria, Regina, Winnipeg and Thunder Bay occur within the range of the Western Painted Turtle in Canada. Wetland loss has been considerable in British Columbia. At least 75% of the wetlands in the Fraser River Valley of the South Coast - where Vancouver is situated - are gone (Nowlan and Jeffries 1996), and losses continue. Scientists estimate that 75% of the wetlands present in the vicinity of Victoria (i.e., along southeast coast of Vancouver Island) at the time of European settlement have disappeared (Capital Regional District 2005). Although there is no metropolis in the south-central part of British Columbia, human population has been rising steadily in the area; there was a tripling of people in the Okanagan from 1947 and 1987 (Cannings *et al*. 1998). Only 15% of wetland and riparian habitats remain in the South Okanagan-Similkameen River Valleys of south-central B.C. (Schebel 2005).

Many remaining wetlands are degraded by human activities; forms of habitat deterioration include water pollution, bank erosion, riparian vegetation loss, habitat fragmentation, infilling, water extraction and altered wetland hydrology. Habitat deterioration can be particularly pervasive in the vicinity of urban centres and in high recreation use areas. Based on a three-year water-quality monitoring program in the Lower Mainland between 1992 and 1997, 21% of 24 monitored wetlands had poor water quality most of the time, and 67% of the wetlands were subject to occasional contamination (Nichol *et al*. 2001).

Roads are a major source of habitat loss and degradation and direct mortality of turtles. For example, along a two-way highway intersecting prairie pothole habitat in western Montana, there is a mean of 346 road kills per year (K. Griffin pers. comm. 2005). The 6.2 million-kilometre network of public roads in the United States, which is used by 200 million vehicles per year, permeates and links essentially every local area (Forman 2000). Forman (2000) estimated that one fifth of the U.S. land area is directly affected ecologically by the public road system. Effects range from road mortality, toxic run-off, sedimentation, increased predation, altered drainage patterns, and increased habitat invasion by exotic species, to distant impacts such as noise pollution and loss of "interior" habitat conditions (Forman and Deblinger 2000). Road networks are less complex and dense in Canada, but they are nevertheless extensive in most of the Western Painted Turtle's range in Canada, particularly in British Columbia where human and turtle activities are largely confined to river valleys between steep mountain ranges. The severity of this problem is increasing in the southern interior of B.C. as rapid growth is creating more roads and increasing traffic density, causing more road mortality (M. Sarell pers. comm. 2005).

Wetland loss and deterioration, habitat fragmentation and roads will rise with increasing human population and activity. This is not yet a major concern in extreme western Ontario and in southern Manitoba, where a myriad of streams, rivers, lakes and smaller water bodies provide extensive connected habitat, most of which is not affected by humans (A. Didiuk pers. comm. 2005). In Saskatchewan and Alberta, wetlands are primarily subject to rangeland activities, with limited shoreline impacts from human activities. It should be cautioned, however, that dams contribute to habitat loss in large

river systems (e.g., Netley and Delta Marshes in Manitoba, Qu'Appelle and Souris Rivers in Saskatchewan, Oldman River in Alberta); an increase in the number of dams could pose a threat in the future. In southern British Columbia, human population has risen steadily since the mid-1900s (Cannings *et al*. 1997; Nichol *et al*. 2001), and is expected to double within 15 years (Nichol *et al*. 2001).

Habitat protection/ownership

The regions of Ontario that are occupied by the Western Painted Turtle tend to have low population densities of people. The Painted Turtle is protected in Pukaskwa National Park, in 12 provincial parks: Sibley, Waterway, Quetico, Sandbar Lake, Nipigon Lake, Rushing River, Woodland Caribou, Lake of the Woods, Kakabeka Falls, Caliper Lake, Sleeping Giant, and Arrow Lake, and in the Cedar Falls Conservation Area (based on known turtle records). Aside from the Thunder Bay District and communities along the Trans-Canada Highway, the southwestern portion of northwestern Ontario is dominated by forests and wetlands (and small cottage communities).

Apart from Winnipeg and its satellite towns, Manitoba has a moderate to low human population density (only 10 to 25 families per km^2; Hammond Atlas of Canada and the World) because the area is dominated by farmlands. Lake, river and wetland networks are extensive in most of the province and the Western Painted Turtle is protected in three extensive parks (Riding Mountain National Park, Nopiming and Whiteshell Provincial Parks) and several smaller ones including Assessippi, Grindstone, Hecla, Spruce Woods, Birds Hill, and Turtle Mountain provincial parks.

Southern Saskatchewan has a dry climate and Western Painted Turtles in this province are limited to four main river watersheds near the border (Qu'Appelle, Souris, Swift Current, and Frenchman Rivers). There is a moderately low human population density beyond the city limits of Regina because of the agricultural nature of the province. The large Grassland National Park protects *C. p. bellii* in the Frenchman River drainage near the U.S. border. At least three small parks (Buffalo Pound, Moose Mountain, and Roche Percée) offer some protection elsewhere in the province (based on known records).

In southern Alberta, the Western Painted Turtle is protected within Waterton Lakes National Park and the very small Milk River Natural Area. There are two small provincial parks within the species' range in Alberta (Beauvais Lake and Writing-on-Stone) though turtles have not been reported in either one of them. Although there is little habitat protection in Alberta, this province's human population density is low (< 3 families per km^2; Hammond Atlas of Canada 2000).

Based on known records, a number of small parks afford turtles some protection in British Columbia, including several provincial parks (e.g., Haynes Point, Kikomun Creek, Champion Lakes, Shuswap Lake, Grohman Narrows, and Okanagan Mountain), the Vaseaux Bighorn National Wildlife Area, and the Creston Valley Wildlife Management Area. In the Rocky Mountain Trench of southeastern B.C. the species appears to be

secure as roughly 60% of wetlands in the Columbia River basin are protected by conservation efforts (J. Krebs pers. comm. 2005), and there is a very large wildlife management area in Creston. The Southern Interior is largely agricultural (vineyards, orchards, rangelands), though urban centres are dominant and growing along certain lakes and river sections. On the south coast (including the mainland south of Fraser River and Vancouver Island), much of the land is intensively developed; some potentially beneficial parks include Rolley Lake, Cultus Lake, and Chilliwack Lake Provincial Parks.

Western Painted Turtle habitat in Canada can also be protected via: (1) fisheries regulations along commercial fish-containing wetlands and watercourses; (2) municipal parks; (3) local wildlife management initiatives; and (4) environmental by-laws (e.g., zoning by-laws that work around environmentally sensitive areas).

BIOLOGY

Life cycle and reproduction

Courtship and mating in Painted Turtles begins almost as soon as the turtles become active in spring and continues throughout the active season (Ernst *et al.* 1994). There is a peak in successful copulation in the late summer and early fall (Gist *et al.* 1990). Male painted turtles actively court females; a male will follow a female and when facing, vibrate his elongated foreclaws on either side of the female's face. He may repeat this courtship behaviour numerous times, often swimming away between bouts, enticing the female to follow. Responsive females may reciprocate by vibrating their claws near the forelimbs of the males. Courtship lasts up to 15 minutes, after which the female sinks to the bottom of the pond followed by the male. Once submerged, the male mounts the female from behind and moves his tail under her to copulate (Gregory and Campbell 1987). Male and female *C. picta* generally avoid each other except when courting and mating (Munoz 2004).

The Painted Turtle mating system is promiscuous and, as such, a small proportion of clutches have multiple paternity (13% in Illinois; Pearce and Avise 2001). Females also have the ability to store viable sperm for two to three consecutive years; however, the majority of *C. p. bellii* females mate prior to each nesting period (Pearce and Avise 2001). There is a small, but statistically significant, higher rate of hatching success in clutches with multiple paternity (Pearce and Avise 2001).

In Canada, Painted Turtles begin nesting in June (late May where the climate is mildest) (Ernst *et al.* 1994; Schwarzkopf and Brooks 1987). Females usually dig their flask-shaped nests within 200 m of water in open soil (Ernst *et al.* 1994) but may respond to absence of predators and travel further from water if risk of depredation (both nest and adult) is low (Spencer 2002; Spencer and Thompson 2003). At the microhabitat scale, females select nest sites that optimize incubation conditions and suitability of habitat for neonates (Schwarzkopf and Brooks 1997; Kolbe and Janzen

2001). For example, in New Mexico where risk of dessication and overheating is high, Painted Turtles nest under canopy cover and near standing water (Morjan 2003a) while in northern populations, where length of growing season may be a limiting factor, Painted Turtles usually nest on open south-facing slopes (Schwarzkopf and Brooks 1997; Weisrock and Janzen 1999).

Oviposition in northern populations of *C. picta* generally occurs in late afternoon and evening, when temperatures are warmest. Females void cloacal water on their chosen nest sites and excavate the 10-cm deep, flask-shaped nest using only their hind feet. Following oviposition, the female fills in the nest cavity with the excavated soil and packs it down with intricate dance steps of the hind limbs (R. Brooks pers. comm. 2005). The entire nesting process generally takes one hour. Females do not always complete nesting in the first chosen location (20% of attempts completed at Revelstoke Airport, B.C.; Maltby 2000). This low success rate is due to poor substrate conditions and interference by predators or other disturbances. Painted Turtles commonly lay a single clutch of eggs within a single active season in Canada, but a significant proportion also lay a second clutch 1-2 weeks after the first (Gregory and Campbell 1987; St. Clair *et al.* 1994; Samson 2003). Clutch frequency is inversely related to latitude, with two or more clutches laid in a season in warmer parts of the species' range (Iverson and Smith 1993; St. Clair *et al.* 1994). *C. picta* clutch size ranges from one to 23 eggs; the *C. p. bellii* subspecies lays the largest clutches (Ernst *et al.* 1994). Individual eggs are up to 35 x 22 mm in size and weigh up to 9 g when laid; they are elliptical, with a white, slightly pitted shell that calcifies during incubation (Ernst *et al.* 1994). Painted Turtles trade off reproductive potential of the female against growth potential of offspring because of the constraint imposed by the fixed size of the pelvic aperture in female turtles (Rowe 1994). Clutch size and reproductive frequency do not increase with age, but egg size and hatchling size do, concomitant with an increase in the size of the pelvic aperture (Lindeman 1991; Rowe 1994; Congdon *et al.* 2003; Samson 2003). Female Painted Turtles supplement their eggs with 50-60% more lipid than is required for hatching and emergence to enhance the potential survival of their offspring (Zug 1993). This excess helps to meet energetic needs prior to the hatchling encountering favourable feeding conditions (Zug 1993). The size of the energy reserve available to hatchlings is related to the thermal regime of the previous winter (Costanzo *et al.* 2004).

Incubation averages 76 days in natural and artificial nests (72-104 days in the Pacific Northwest; Nussbaum *et al.* 1983). Offspring sex is determined by temperatures experienced by the embryo during a critical period of incubation (temperature-dependent sex determination, TSD) (Ewert *et al*. 1994). Eggs incubated at higher temperatures (constant temperatures ≥29˚C) produce female hatchlings, whereas lower incubation temperatures (≤26˚C) produce male hatchlings (Schwarzkopf and Brooks 1985). At a pivotal temperature of 28˚C, an approximately equal number of males and females are produced, and between 26-28˚C both males and females are produced in varying ratios. Bobyn and Brooks (1994) reported that incubation temperatures below 25˚C reduce hatching success, post-hatching survival and hatchling growth rates in the Snapping Turtle (*Chelydra serpentina*), and that temperatures around 25-27˚C enhance

hatchling performance. Temperatures above these values tended to correlate with increasingly reduced hatchling performance and survival as the temperature increased. In Painted Turtles, which have only one pivotal temperature, compared to two in the Snapping Turtle, it appears that the optimal temperatures for growth and survival of embryos and hatchlings are around 28-30˚C, which corresponds to temperatures which produce the larger sex, which is the female in this species.(Schwarzkopf and Brooks 1985, 1987). Freedberg *et al.* (2004) found that higher incubation temperatures were positively correlated to enhanced righting ability in two species of TSD turtle, including *C. picta*.

Survival of Hatchling Painted Turtles is related to winter nest temperatures (Packard *et al.* 1997). Following hatching in late summer and early fall, hatchling Painted Turtles usually remain within the shallow subterranean nest until the following spring (Gregory and Campbell 1987; St. John 2002). Thus, hatchlings must often cope with subzero temperatures during winter months (Packard and Packard 2003).

Growth and survivorship

Adult painted turtles hibernate aquatically in ponds or streams, whereas hatchlings usually overwinter terrestrially within the natal nest chamber, approximately 10 cm or less below the ground surface (Ultsch 1989). The eggs hatch in the fall, but the hatchlings do not emerge from the nest chamber until the following spring, and so they may be exposed to temperatures as low as -10˚C during hibernation. In northern regions with sparse or transient snow cover, hibernating hatchlings may be exposed to temperatures below the freezing equilibrium temperature of their body fluids (-0.6˚C) for extended periods of time during hibernation (Costanzo *et al*. 2000). For example, Nagle *et al*. (2000) recorded a *C. picta* hatchling mortality rate of 45% during a cold, snowless winter in Michigan with soil temperatures of –7 to –9˚C, and a mortality rate of less than 3% in three consecutive mild winters with snow-insulated soils that remained above –2˚C.

The winter survival of hatchling Painted Turtles exposed to subzero temperatures may be promoted by both freeze-tolerance and supercooling. Because hatchlings apparently tolerate freezing only if body temperature remains above -4˚C (Storey et al. 1988; Churchill and Storey 1992; Costanzo *et al*. 1995), survival at temperatures lower than this is only possible if hatchlings remain supercooled (Packard et al. 1997). Although hatchling Painted Turtles can supercool extensively in the lab (to -15˚C; Costanzo *et al*. 1998; 2000), in nature supercooling may be constrained by environmental ice nuclei that seed the freezing of their body fluids. Freezing is inevitable in sandy soils (which have high water potential) with high water content, whereas supercooling is promoted in dry, organic soils (Costanzo *et al*. 1998). Interaction with ice nuclei in the winter microenvironment of the nest chamber (e.g., ice, sand crystals, bacteria) determines whether hatchlings remain supercooled or freeze (Costanzo *et al*. 1998). These interactions may ultimately account for variation in winter survival rates among populations.

There is no documented post-hatching care in this species (Zug 1993). Frazer *et al*. (1991) reported age specific juvenile annual survival rates of 0.21 to 0.51 in Michigan, with survival to adulthood being estimated at 0.9%. St. Clair (1989) suggested that the mortality rate is constant for all age groups (aside from hatchlings). However, recent long-term studies of *C. p. marginata* in central Ontario show that annual survival of juveniles gradually rises from about 0.7 at age 1 to adult rates of about 0.98 by age 4 (Samson 2003). Summer growth of young turtles is rapid, and they can attain a plastron length of 83 mm in three to five years depending mainly on food supply (Nussbaum *et al*. 1983). Growth rate begins to decrease as sexual maturity is approached, and adults have slow, indeterminate growth rates (Samson 2003).

In the more central parts of the range of *Chrysemys picta bellii* within the U.S.A., males usually take four years to mature whereas females normally take five years at southern latitudes and seven or eight years in colder climates (St. Clair *et al*. 1994; Cooley *et al*. 2003). In central Ontario, *C. p*. *marginata* males matured at 8-10 years and females at 12-15 years (Samson 2003). It is likely that these values are similar to those of Western Painted Turtles in much of the central and eastern parts of their range in Canada. However, both sexes can attain maturity within two years when environmental conditions are highly favourable for growth and development (Frazer *et al*. 1993; Lindeman 1996), usually in the warmer (southern or coastal) parts of their range (Gregory and Campbell 1987).

Frazer *et al*. (1991) recorded a maximum age of 34 years in a Michigan study, with annual male survivorship of 0.64 to 0.83 and annual female survivorship of 0.29 to 0.50. However, these studies likely underestimated survival because of low recapture frequencies. Long-term research in southeast Michigan (Congdon *et al*. 2003) and central Ontario (Samson 2003) on *C. p. marginata* indicate that adults have very high annual survivorship (>0.98), and that ages in excess of 50 years are often achieved.

Seasonal activity patterns

As ectotherms, turtles need to bask to raise their body temperature to a level suitable for activity (the sun's ultraviolet rays also help to eliminate skin parasites, and are essential for the synthesis of vitamin D3). Consequently, Western Painted Turtles spend their nights sleeping on the pond bottom or on partially submerged objects and become active during daylight hours. They bask for several hours at sunrise before feeding and may bask and forage again in the afternoon and evening. Basking time decreases with increasing ambient temperature (Lefevre and Brooks 1995). Females may bask more during the nesting season (Krawchuck and Brooks 1998). Juveniles appear to bask for shorter periods of time, possibly because their smaller body size allows them to heat faster and because they display greater predator avoidance behaviour (Lefevre and Brooks 1995). Basking substrates include mudbanks, rocks, logs, or other floating objects. There is no aggression shown during basking; individuals will even pile into stacks of several layers. It is unknown if there is social hierarchy in the wild, but a dominance hierarchy is quickly established in captivity: large turtles feed first and the least aggressive feed last (Ernst *et al*. 1994). Younger turtles primarily

occupy the shallow portions of a pond and move to increased water depth with increasing size and age through to sexual maturity (Congdon *et al*. 1992). Shallow waters are generally warmer and more productive and can thus enhance foraging and growth rates.

During winter, juvenile and adult painted turtles become dormant on the muddy substrate of ponds or seek muskrat burrows or other suitable shelter (Cohen 1992). Western Painted Turtles hibernate in shallow water below the freezing limit, remaining in one location or small area throughout the winter (St. Clair and Gregory 1990). The length of hibernation and the onset of breeding are governed by water temperature. While dormant, their need for oxygen is greatly decreased (Ultsch *et al*. 2001), and they may absorb oxygen from the water through their skin, throat linings and thin-walled sacs in the cloaca). It appears, however, that Painted Turtles are unable to maintain aerobic metabolism throughout an extended hibernation. Instead, they survive on anaerobic respiration, by using calcium and magnesium carbonates taken from their shell to buffer lactate accumulation in their tissues (Dinkelacker *et al*. 2005). Painted Turtles are the most tolerant turtle species to anoxia in Canada (Reese *et al*. 2004), and the Western Painted Turtle has a greater ability to tolerate and survive prolonged anoxia than does any other subspecies of this species (Ultsch *et al*. 1985), perhaps as an adaptation to its northern distribution and longer winters. Although a progressive lactate acidosis occurs through winter, levels are well below the maximum tolerable level for this species, even at northern latitudes (St. Clair and Gregory 1990).

Dispersal/migration

Based on a study of Midland Painted Turtles in a small marsh system in southern Michigan, males and females occupy similar-sized home ranges and individuals usually favour one or two core areas (Rowe 2003). Rowe (2003) documented an average home range size of 1.8 ha in 1999 and 0.7 ha in 2000 in his study, and average daily travel distances of 39 m/day in 2000 and 102 m/day in 1999. Low annual precipitation in 2000 caused the marsh to be reduced in size and this decrease may account for the differences in distances moved. During summer, movement was not related to sex, daily water temperature, or weather conditions.

Female turtles use upland habitats during nesting. They have been known to move up to 150 m from the water (Gregory and Campbell 1987; St. John 2002). A recent movement study demonstrated that distance traveled is inversely proportional to availability of good nesting habitat near a pond (Baldwin *et al.* 2004). In an Algonquin Park population, almost all nests (>99%) were within 3 m of water, largely because that is the only area where suitable nesting sites occurred (Schwarzkopf and Brooks 1985; Samson 2003). However, even when other suitable nesting habitat is available further from water, most females prefer nesting close to water, perhaps because of the risks associated with nesting further from the water's edge (R. Brooks pers. comm. 2005). Male turtles are more active in spring when they search for mates (Gibbons 1968).

Some turtles use different wintering and breeding ponds, and must travel between the two in spring and fall. In Nebraska, *C. p. bellii* often migrates several kilometres from shallow or dry marshes and basins to permanent water bodies during dry summer months (Ernst *et al*. 1994). Long-distance migrations are equally possible in the drier parts of this species' range in Canada. Movements may be overland from one water body to another or linearly along streams (MacCulloch and Secoy 1983). Long-distance homing ability seems to be well developed in the Western Painted Turtle, with successful homing distances of up to 3km having been recorded (Gregory and Campbell 1987).

Diet

Small juvenile Painted Turtles feed primarily on tadpoles and invertebrates such as aquatic insects, crayfish and snails. When they grow larger they switch to bigger prey such as frogs and fish and they also scavenge (Gregory and Campbell 1987). As turtles mature and their growth rate declines, individuals become increasingly omnivorous, feeding on live animals and carrion as well as the abundant wetland plant life (Gregory and Campbell 1987). Cooley *et al*. (2003) suggested that northerly populations exhibit a greater degree of carnivory than southerly ones. Like most aquatic turtles, *C. picta* swallows its food with more ease when submerged because of its fixed tongue (Gregory and Campbell 1987). Feeding begins when water temperatures reach 15 to 18°C in April or May and ceases when temperatures drop below this threshold in September; feeding may also stop when water temperatures exceed 30°C (Ernst *et al*. 1994).

Predation

The egg stage is the most vulnerable phase of the turtle's life cycle because: (1) predators can easily dig up the eggs; (2) nests are, generally, predictably situated close to the water's edge or along roadsides; and (3) many wildlife species, including predators of turtle nests, travel along linear landscape features such as roads or shorelines (Spackman and Hughes 1995). Predation on Western Painted Turtle eggs is commonly high; up to 90%. For example, a family of skunks preyed on 80 to 100% of the Western Painted Turtle eggs along Elizabeth Lake in Interior B.C. during at least three consecutive years (Clark and Grueing 2002; Clarke pers. comm. 2004). Macartney and Gregory (1986) encountered 28 predator-destroyed nests in Kikomun Creek Provincial Park during a 3-month study. Predation rate on nests decreases with increasing distance from the edge of ponds (Kolbe and Janzen 2002b; Marchand *et al*. 2002) and is greatest on nests within 50 m of the water (Kolbe and Janzen 2002b; Marchand *et al*. 2002; Marchand and Litvaitis 2004). Nest distribution seems to affect predation, with clumped nests being preyed upon at a higher rate than scattered ones (Marchand and Litvaitis 2004). Aside from the pond edge effect, landscape composition (500-2,000 m from ponds) and the type of habitats surrounding ponds (up to 250 m from water) apparently have little influence on predation rates (Marchand and Litvaitis 2004).

Predators of painted turtle eggs include raccoons (*Procyon lotor*), coyotes (*Canis latrans*), mustelids (fishers, *Martes pennanti*; badgers, *Taxidea taxus*; otters, *Lutra Canadensis*; mink, *Mustela vison*; and weasels), skunks, black bears (*Ursus americanus*), squirrels, ground squirrels, chipmunks, corvids (ravens, *Corvus corax,* and crows, *Corvus brachyrhynchos*), and domestic cats and dogs (see Marchand and Litvaitis 2004; Clarke and Gruenig 2002; Maltby 2000). These species can also prey on hatchlings and small juveniles at the water's edge. Predators of small turtles within the water include the semi-aquatic mustelids, raccoons, bullfrogs (*Rana catesbeiana*), great-blue herons (*Ardea herodias*), gulls and large fish. Mammalian predators (coyotes, raccoons and some mustelids) also feed on larger juveniles and adults, primarily when they are on shore. Otters kill hibernating turtles and can devastate local populations when the turtles overwinter in groups in exposed areas (Brooks *et al*. 1991).

Parasitism

Rates of parasitism may be high in shallow, warm water bodies. For example, 10 to 40% of adult Western Painted Turtles can be infested with leeches (*Placobdell spp*.) at any given location (MacCulloch 1981). Nine different species of Monogenea (*Polystomoides pauli* and *Neopolustoma* species), four species of Digenea (*Eustomus chelydra, Spirochis kirki* and *S. parvus, Allassostomoides chelydrae*), and three nematodes (*Spiroxys contorta*, *Serpinema trispinosus* and *Amphibiocapillaria serpential*) are known to parasitize Painted Turtles (Platt 2000). Leeches can transfer protozoan parasites to other individuals of the same or different species of turtles (Siddall and Desser 2001).

Adaptability

High elasticity of adult survival and low elasticity of fecundity in turtles implies that conservation efforts that reduce mortality of adults are likely the most effective way to stabilize declining populations (Heppell 1998). A barrier/wall-culvert system was introduced by the Florida Department of Transportation because of high numbers of roadkills (Dodd *et al*. 2004). This barrier system reduced mortality of adult turtles by 65%. B.C. Hydro's Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) has also been successful at protecting Western Painted Turtle females through various forms of fencing, crossing or interpretive signage and/or working with government to protect known nesting areas (R. Clark pers. comm. 2004). If an abundance of nesting habitat is available, especially beyond 50 m of the water line (where predation rates drop), this type of conservation strategy could be very effective at protecting local populations.

POPULATION SIZES AND TRENDS

Search effort

There are 496 known Western Painted Turtle records in Canada: 219 in Ontario, 129 in B.C., 101 in Saskatchewan, 25 in Manitoba, and 22 in Alberta. These records, which date from 1920 to 2005, represent about 320 locations (some locations have several records). High numbers of records in Ontario and B.C. may simply reflect higher human population densities and the correspondingly greater number of citizens detecting or looking for turtles. Ontario has a relatively thorough coverage of turtles in the province because the Ontario Herpetofaunal Summary Atlas (OHS) has been in existence since 1984 (Ontario MNR 2005). Given that there are few potentially turtle-bearing wetlands in Alberta, this province's small collection of records is probably relatively complete as well.

Most of the Western Painted Turtle records that have been used in delineating range limits and understanding distribution patterns in Canada are the result of nonsystematic searches and reports. Exceptions to this sporadic collection/ observation method are as follows: (1) 16% of Ontario records were the results of a more thorough wetland inventory of Ontario; (2) there has been a fairly systematic reconnaissance of the South Okanagan wetlands over the course of several years (43% of B.C. records by local herpetologist Mike Sarrell); (3) the Saskatchewan Wetland Conservation Corporation funded turtle surveys in 2002 and 2003 (26% of SK records); (4) a recent systematic survey of critical wetland habitats was conducted along the Souris River, as part of an environmental impact assessment for the Saskatchewan Watershed Authority (39% of SK records).

In summary, the records probably give a reasonable index of range, distribution, and abundance within each province except in Manitoba (the scant number of records do not reflect this province's profusion of interconnected wetlands).

Abundance

Painted Turtles are generally the most abundant turtle species wherever they occur in Canada (Cook 1984; Ernst *et al*. 1994) but their densities can be quite variable, ranging from a few to several hundred individuals/ha. The overall abundance of Western Painted Turtles in Canada is unknown. NatureServe (2004) considers this species secure in Canada and the U.S. (N5) because it can be abundant in suitable habitats, there are many large sub-populations throughout its range, its numbers appear to be relatively stable, and threats (habitat degradation, mortality on roads, human-induced rise in predation) are moderate and often localized. However, given the increase in road density, intensive drainage of wetlands, the propensity of nesting females to use roads and the species' long-lived life history, it may be that these threats are having a greater effect than has been supposed. As pointed out by Congdon (J. Congdon pers. comm. 2005), just because this species has a wide range does not mean it does not respond to these threats in the same manner as other long-lived vertebrates.

In light of the wide variation in local abundance, it may be more useful to examine the number of Western Painted Turtle 'occurrences'. An occurrence (location as defined by COSEWIC) is a sub-population that is separated from all others by barriers such as (1) busy highways; (2) highways with obstructions to crossings (e.g., concrete dividers); (3) untraversable topography (e.g., cliffs); or (4) extensive urban or dry areas lacking wetted habitats (NatureServe 2004). In the absence of such barriers, a sub-population can be viewed as separate if species records are: (1) 10 km apart in more or less continuously joined suitable habitat; (2) three km apart across upland habitat (so that females on nesting migrations from separate ponds do not overlap); or (3) five km apart in intermediate situations (NatureServe 2004).

Chrysemys picta bellii is assessed as secure (S4) in northwestern Ontario and Manitoba because human impacts are not severe in these areas (compared to southern Ontario), wetlands abound, and there are more than 100 occurrences in each province (M. Oldham pers. comm. 2004; J. Duncan pers. comm. 2004).

In Saskatchewan, *C. p. bellii* is also secure (S4; J. Pepper pers. comm. 2004) because it is found in four large watersheds; there are 101 records from about 40 different places, which implies that there are at least 40 known occurrences in the province. Threats to the species in Saskatchewan include habitat loss and alteration (J. epper pers. comm. 2004).

Chrysemys p. bellii has a tenuous hold in Alberta with probably fewer than 100 individuals belonging to few, if any, viable occurrences in the Cypress Hills, lower Milk River, and Oldman River basins (Alberta Conservation Data Centre 2004). It is thought that more northern Western Painted Turtle records (e.g., Lethbridge, Edmonton) represent individuals released from the pet trade (R. Quinlan pers. comm. 2004).

In British Columbia, *C. p. bellii* is considered vulnerable (S3S4). There appear to be on the order of 100 occurrences. However, roads often bisect nesting areas in British Columbia, because suitable wetlands, turtles, and roads all tend to be confined to valleys between mountain ranges. Although the species appears to be widespread and secure in eastern B.C., with up to 60% of the wetlands in the Columbia River basin protected through conservation initiatives (Krebs pers. comm. 2005), wetland habitat loss, degradation and fragmentation, and road construction and use continue to increase in the Southern Interior and on the South Coast (Lower Mainland; Vancouver Island). In these latter areas, numbers of turtles are small and appear to be declining (M. Sarell pers. comm. 2005; P. Gregory pers. comm. 2005, Bunnell 2005).

In the Okanagan, Sarell (M. Sarell pers. comm. 2005) and Brown (J. Brown pers. comm. 2005) stated that "natural" habitat loss (loss of numerous small lakes and ponds from recent extended droughts) has probably destroyed not only those turtle populations but connectivity between populations that remain. In addition, there is a significant loss of wetlands due to filling and draining to increase land for cultivation and development. Sarell also observed many Western Painted Turtles killed on roads and dead from injuries from being hooked by fishermen. Recent expansion of the raccoon

(*Procyon lotor*) has likely reduced nesting success and led to increased mortality of hatchlings and nesting females.

On Vancouver Island and the lower mainland, Painted Turtles have always been very uncommon (P. Gregory pers. comm. 2005, L. Friis pers. comm. 2005), and Gregory stated that he had not seen one in years. There has been some question whether the Painted Turtle is native or introduced to Vancouver Island, but this debate seems based mainly on the fact that the turtles have always been rare. However, records do go back to at least the early 1900s, and likely the Western Painted Turtle should be considered a native subspecies (F. Cook pers. comm.)

Population trends

There are no data on population trends for the Western Painted Turtle. Although the species appears to be stable overall (K. Griffin pers. comm. 2005; J. Krebs pers. comm. 2005), it seems to be experiencing significant declines in certain areas in the far west. Based on habitat trends (e.g., Nichol *et al*. 2001), the Western Painted Turtle has likely suffered significant declines in: (1) the lower Fraser Valley (Vancouver Region); (2) the southeast coast of Vancouver Island (Victoria Region); and (3) the Okanagan and Similkameen River Valleys. A recent survey of 29 wetlands for turtles in lower Fraser River valley found Western Painted Turtles at only one site (Burnaby Lake) even though the species had previously been reported form six of the 29 surveyed sites (Bunnell 2005). The species also seems to be declining locally in other parts of its Canadian range (e.g., Clark and Grueing 2002), where roads or human activities significantly impact certain wetlands or turtle nesting grounds.

Rescue effect

Dispersal among populations of Western Painted Turtles is likely high in Ontario, Manitoba, and eastern Saskatchewan, where the extensive, interconnected complex of lakes and wetlands undoubtedly facilitates metapopulation dynamics (e.g., Lake of the Woods in Ontario drains into Lake Winnipeg via Winnipeg River; a significant proportion of the turtle-bearing watercourses of Saskatchewan are connected to Lake Winnipeg by the Assiniboine River).

Although southwest Saskatchewan and southeastern Alberta have fewer lakes and wetlands, sub-populations appear to be linked through watersheds to source populations in the U.S. (e.g., the Frenchman River of Saskatchewan merges with the Milk River headwater of Missouri River in Montana and the Milk River extends into Alberta). The Western Painted Turtle is not at risk in the neighbouring, agricultural states of North Dakota, Montana and Minnesota (NatureServe 2004). Presumably, landscape fragmentation and wetland degradation is moderately low in this part of the U.S. because human population densities are low to moderate (10 families/km or less based on the Hammond Atlas of Canada and the World year).

Southeast British Columbia is not heavily populated and the landscape between this region and the moderately populated, agricultural land of northern Idaho is fairly continuous; *C. picta* is apparently secure in Idaho (NatureServe 2004). Conversely, human activity levels are high on southern Vancouver Island, the Lower Mainland region (Vancouver and vicinity), and the Okanagan Valley and there are matching human densities across the border with the U.S.A. (Spokane, Seattle and suburbs), at least for the coastal mainland. The ensuing level of habitat loss, degradation, and fragmentation across the border implies that there is a low potential for natural turtle dispersal/recolonization across the border. Wetlands in less populated areas of the Southern Interior ecoprovince could perhaps serve as source populations for the Okanagan Valley, but coastal sub-populations have few sources of colonists.

LIMITING FACTORS AND THREATS

Habitat loss, both of productive pond habitat and natural nesting habitat, is a primary threat to the Western Painted Turtle, at least in the British Columbia part of its range. Habitats that are not lost are often altered by habitat fragmentation, shoreline degradation, changes in hydrology, or water contamination, all of which will be discussed below. Habitat loss and degradation will rise in frequency and intensity as human populations continue to grow, and the link between habitat integrity and species' persistence has been well documented (Gibbons *et al*. 2000).

Road mortality is suspected of contributing to widespread declines in turtles (10% annual mortality in adult turtles in eastern U.S.; Gibbs and Shriver 2002), particularly where roads are next to open water areas (Ashley and Robinson 1996). Gibbs and Shriver (2002) integrated road maps and traffic-volume data with simulated movements of small and large-bodied pond turtles and terrestrial turtles to model effects of roads on populations of pond turtles. Road density was strongly, linearly, positively correlated with road-crossing frequencies for all turtles. Roads bisecting movement routes to nesting sites threaten primarily females on nesting migrations and dispersing juveniles. In support of this, Steen and Gibbs (2004) observed male-biased sex ratios in wetlands associated with areas of high road density. In a radio-telemetry study by Baldwin *et al*. (2004), eight females made five road crossings in a single active season; two of these turtles (25%) were killed by vehicles. Road mortality has the potential to alter the structure of turtle populations because turtle life histories are characterized by low annual recruitment rates, high adult survival rates, and delayed sexual maturity (Steen and Gibbs 2004). Together, these features severely constrain the ability of turtle populations to cope with added adult mortality (e.g., Brooks *et al*. 1991; Congdon *et al*. 1993). Furthermore, roads have a negative impact on wetland quality and their influence can extend more than 100 m away (Forman and Deblinger 2000). Road construction can kill eggs and juveniles directly (Maltby 2000). Moreover, linear elements such as roads have a positive influence on the dispersal of many species, including mammalian predators of turtles and their nests, such as raccoons, skunks, coyotes and foxes, through the landscape (e.g., Merriam and Lanoue 1990; Spackman and Hughes 1995; Rosenberg 1998; Berggren *et al*. 2002). Roads surrounding

wetlands may thus increase predation rates significantly, particularly for small slow-moving turtles and their relatively accessible eggs.

In the Canadian part of the Western Painted Turtle's range, road density varies tremendously. Thus, roads are relatively sparse in northwestern Ontario and in parts of the species' range in Saskatchewan and Manitoba. However in British Columbia, road densities can be quite high in the southern interior and the southwest mainland, where the best wetland habitats of this species occur.

In the absence of good nesting habitat connected to wetlands near human centres, grassy and sandy sites near buildings and fences can attract nesting turtles. Yet the nesting density and success at these disturbed sites can provide inferior growing conditions and even alter the sex ratio of populations (Kolbe and Janzen 2002a). Sandy and grassy patches in residential, commercial and industrial areas encourage this opportunistic nesting behaviour but can be population sinks (Kolbe and Janzen 2001). Roads also impinge on nesting habitat. Soils along their shoulders can be too compacted to allow nests to be successfully dug (Maltby 2000) and/or they can be overgrown with invasive plants possessing aggressive root systems that pierce the eggs and the bodies of hatchlings or physically impede their emergence in the spring (Maltby 2000; R. Clark pers. comm. 2004).

Disturbance of shallow wetlands by motorized vehicles and cattle can cause significant degradation of shoreline and riparian zones in open landscapes of the prairie, foothill and semi-desert rangelands. The removal of native plant cover, erosion of banks, soil compaction and water pollution (or eutrophication, if a wetland is overburdened with nitrogenous waste) that follow can all affect turtles, particularly hatchlings, juveniles and nesting females.

Habitat fragmentation by humans can cause rates of predation to rise (Marchand and Litvaitis 2004). Populations of some predators such as raccoons, coyotes, and foxes for example, increase as farms and suburbs replace forests (Oehler and Litvaitis 1996). Nests become more accessible along edges (Kolbe and Janzen 2002b).

PCBs, organochlorine pesticides, dioxins and furans can collect in the tissues of aquatic organisms like turtles. In the industrial region of southern Ontario, toxic residues in the liver and adipose tissue of snapping turtles (*Chyledra serpentina*) are commonly above human consumption guidelines (de Solla and Fernie 2004). These high levels bioaccumulate because snapping turtles live several decades, although there is some evidence that levels approach an asymptote when rate of accumulation equals rate of elimination (S. deSolla pers. comm. 2006). Given that Painted Turtles live at least as long as snapping turtles (Congdon *et al*. 2003; Samson 2003), we could expect adult Painted Turtles to also carry high levels of such residues where these chemicals are at high concentrations in the aquatic environment. High toxicity has the potential to influence individual as well as population fitness. In a study of Eastern Spiny Softshells (*Apalone spinifera*) in southern Ontario for example, de Solla *et al.* (2003) found that PCB and pesticide contaminant concentrations were positively

correlated with egg viability, although there was no evidence for any negative effect of PCBs or pesticides upon hatching success. Crews *et al*. (1995) noted that PCBs can alter Painted Turtle population structure by reversing gonadal sex at otherwise male-producing temperatures. Although central and western Canada are not generally exposed to the same intensity of industrialization, pesticides, herbicides and chemical fertilizers are used throughout rangelands, large-scale farms, vineyards and orchards. Some wetlands may be more affected than others by toxic infusions depending on bathymetry, hydrology, and exposure to the chemicals (proximity and concentrations).

Humans can also affect Western Painted Turtles directly by harassing them at their basking or nesting sites, which is a common occurrence in popular recreation sites (Maltby 2000; R. Clark pers. comm. 2004), or by capturing turtles for pets (Orchard 1986; M. Machmer pers. comm. 2004). Sustainable use of long-lived turtles as pets can be problematic because their longevity is associated with low fecundity, delayed sexual maturity, and high adult survivorship: populations cannot remain stable (or grow) when adults and older juveniles are harvested at high rates (Congdon *et al*. 1993). The Eastern Box Turtle (*Terrapene carolina*) and Bog Turtle (*Glyptemys muhlenbergii*) for example, have declined significantly as a result of collection (Gibbons *et al*. 2000). Releasing pet turtles is equally harmful whether they are native species from a nearby pond or another location, or exotic species. Some introduced species, which can be common in urban areas, compete for food and space and are potential vectors for disease and parasites. Disease can also be a secondary expression of other environmental stressors associated with habitat degradation (Gibbons *et al*. 2000). Angling also contributes to turtle mortality; turtles have been found dead as a result of having the bottom of their jaws torn open by hooks, preventing them from feeding. (M. Sarell pers. comm. 2005).

Droughts and human-induced water-level fluctuations (reservoirs and dams) appear to cause high rates of mortality in turtles. In particular, shrinking wetlands have a reduced carrying capacity, and individuals seeking other wetlands are highly vulnerable to predation. For example, 18 dead Western Painted Turtles and 28 predator-destroyed nests were reported in a naturally dry channel bed of Kikomun Creek during a three-month study in 1986 (Macartney and Gregory 1986). Ray Buchner (pers. comm. 2004) found 50 to 60 Western Painted Turtle shells in Okanagan Mountain Park in 1985. Mike Sarrell (pers. comm. 2004) similarly found “lots of carcasses” at Post, Pillar and Island Lakes in the Okanagan in 1988, as well as some carcasses on Crooked Lake in 1987. Lindeman and Rabe (1990) reported a 70% decline in a *C. p. bellii* sub-population in Washington, at a small lake that dried up for two years from drought. There was evidence of emigration and mortality from increased overland migratory activity. The growth of individual turtles was markedly suppressed during the second year of drought. Although drought is an ephemeral phenomenon to an animal with a long lifespan, extended droughts can have significant impacts.

SPECIAL SIGNIFICANCE OF THE SPECIES

Populations at the extremes of a species' range represent reservoirs of genetic variation for potential future adaptation to changing environmental conditions. Janzen (1994 b) noted that annual variation in offspring sex ratios of Western Painted Turtles were highly correlated with variation in mean July air temperature. This relationship implies that even modest increases in mean temperature (< 2 °C) in the more southern parts of this species' range could drastically skew sex ratios and an increase of 4°C could eliminate the production of male offspring. Species with TDSD may not be able to evolve rapidly enough to counteract this negative trend (e.g., Willette *et al*. 2005, Morjan 2003 b), in which case Canadian Western Painted Turtle populations may play a critical role in this species' long-term survival assuming that higher winter temperatures enable it to expand its range northward.

The Western Painted Turtle is one of only two extant indigenous species of turtle west of Ontario. Although it is not of direct economic value in Canada, it likely plays an important role in the food web of lakes, ponds and their riparian zones.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

As the Western Painted Turtle is not considered at risk in Manitoba (S4) and Saskatchewan (S4), it receives no protection aside from that afforded in parks and natural area reserves. It is S4 in Ontario too, but it is listed as a specially protected reptile under the Ontario Fish and Wildlife Conservation Act. In Alberta, the species is ranked critically imperiled (S1) by NatureServe (NatureServe 2004) and Sensitive by the province (Alberta SRD 2000) and despite the fact that there are few protected areas within its range, there are no management or conservation initiatives to protect it further. Nor are there provincial measures to protect turtles and their habitats in British Columbia, except in the Columbia River Basin, where Hydro's CBFWCP is protecting wetlands, and attempting to reduce road mortality at some lakes in the Columbia Basin through fencing, establishing artificial nest sites, and/or educating the public with viewing platforms and signage (e.g., Gillies and St. Clair 1997; Maltby 2000; Clark and Grueing 2002).

Even when jurisdictional wetlands are protected by municipalities, provincial conservation initiatives, riparian provisions, or federal (Department of Fisheries and Oceans) regulations, nesting habitats away from water generally are not although Ontario does have a 120-m provision for adjacent lands. This would cover some but not all nesting areas.

TECHNICAL SUMMARY

Western Painted Turtle — Tortue peinte de l'Ouest
Pacific Coast population
Range of Occurrence in Canada: BC (Vancouver Island, lower Fraser River valley southwest mainland)

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **GIS query of range based on records with geographic coordinates**	4,000 km²
• *Specify trend in EO*	Declining
• *Are there extreme fluctuations in EO?*	
• *Area of occupancy (AO) (km²) estimated from area of potential nesting sites* **[explain source of information and calculation]**	<10 km²
• *Specify trend in AO*	Unknown; suspect decline in most of range
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	6 localities
• *Specify trend in #*	Decline
• *Are there extreme fluctuations in number of locations?*	Unknown
• *Specify trend in area, extent or quality of habitat*	Declining habitat

Population Information	
• *Generation time (average age of parents in the population)*	35 years
• *Number of mature individuals*	Probably fewer than 250
• *Total population trend:*	Decline
• *% decline over the last/next 10 years or 3 generations.*	Unknown
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	Probably is fragmented
• *Specify trend in number of populations*	Unknown
• *Are there extreme fluctuations in number of populations?*	No
• *List populations with number of mature individuals in each:*	Unknown
Threats (actual or imminent threats to populations or habitats)	
1. Vehicles kill females in search of nesting grounds; and this chronic increase in mortality will reduce populations of this long-lived species particularly since hatchling mortality is also high and few hatchlings survive to maturity. 2. Human population growth has led to rising pressures from development in or around wetlands. 3. Introduced Red-eared Slider turtles may be a threat.	
Rescue Effect (immigration from an outside source)	
USA: N5T5; common in adjacent states, rare in some extreme southwest U.S. pockets (WA-S5, ID-S4, MT-S5, ND-SNR, MN-SNR, WI-S5, MI(UP)-S5, IL-S5, IW-S5, SD-S5, NB-S5, WY-S4, CO-S5, AZ-S1, TX-S1, KA-S5, OK-S2)	
• *Is immigration known or possible?*	No
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	No
Quantitative Analysis	None
Current Status COSEWIC: New assessment / Endangered, April 2006 (S1 in Alberta, S3S4 in B.C., S4 in Saskatchewan, Manitoba, Ontario)	

Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code**: B1ab(i,ii,iii)+2ab(i,ii,iii); C2a(i); D1

Reasons for Designation:

There are few records from Vancouver Island and the mainland south coast/ Fraser River valley, and both regions are undergoing major loss of wetlands and a rapid increase in roads, development, and people. Recent searches of the lower Fraser River valley and of eastern Vancouver Island indicate the subspecies has declined in some of the handful of areas where it was previously observed.

Applicability of Criteria

Criterion A: (Declining Total Population): Not applicable.

Criterion B: (Small Distribution, and Decline or Fluctuation): The AO is less than 500km^2. It is known from only a few locations, and continuing decline can be inferred in habitat area and quality and number of individuals and both EO and AO.

Criterion C: (Small Total Population Size and Decline): There are certainly fewer than 2500 adults and continuing decline can be inferred because of increasing loss of habitat and increase in road traffic. No population contains more than 250 adult turtles.

Criterion D: (Very Small Population or Restricted Distribution): There are likely fewer than 250 adults.

Criterion E: (Quantitative Analysis): Not available.

TECHNICAL SUMMARY

Chrysemys picta bellii
Western Painted Turtle — Tortue peinte de l'Ouest
Intermountain - Rocky Mountain population
Range of Occurrence in Canada: BC (Okanagan Valley, Kootenays)

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **GIS query of range based on records with geographic coordinates**	32,000 km²
• *Specify trend in EO*	Declining
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²) based on the area of wetland available to turtles* **[explain source of information and calculation]**	<100 km²
• *Specify trend in AO*	Declining
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	Unknown
• *Specify trend in #*	Probably declining
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Declining
Population Information	
• *Generation time (average age of parents in the population)*	35 years
• *Number of mature individuals*	Unknown
• *Total population trend:*	Declining
• *% decline over the last/next 10 years or 3 generations.*	Unknown
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	Possibly. Certainly, fragmentation is increasing.
• *Specify trend in number of populations*	Declining
• *Are there extreme fluctuations in number of populations?*	No
• *List populations with number of mature individuals in each:*	Unknown
Threats (actual or imminent threats to populations or habitats)	
1. Loss of wetlands to development, drainage for agriculture and increasing natural drought. 2. Increase in road networks and road traffic 3. Increase in abundance of predators (raccoons) of eggs and all age classes	
Rescue Effect (immigration from an outside source)	
USA: N5T5; common in adjacent states, rare in some extreme southwest U.S. pockets (WA-S5, ID-S4, MT-S5, ND-SNR, MN-SNR, WI-S5, MI(UP)-S5, IL-S5, IW-S5, SD-S5, NB-S5, WY-S4, CO-S5, AZ-S1, TX-S1, KA-S5, OK-S2)	
• *Is immigration known or possible?*	Possible
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Possibly
• *Is rescue from outside populations likely?*	Unknown
Quantitative Analysis	None
Current Status COSEWIC: New assessment / Special Concern, April 2006. (S1 in Alberta, S3S4 in B.C., S4 in Saskatchewan, Manitoba, Ontario)	

Status and Reasons for Designation

Status: Special Concern	**Alpha-numeric code**: NA
Reasons for Designation: The number of turtles is likely small and declining because of extensive loss of wetland habitats and proliferation of roads.	
Applicability of Criteria **Criterion A**: (Declining Total Population): Not applicable. **Criterion B**: (Small Distribution, and Decline or Fluctuation): Not applicable unless severely fragmented. Degree of fragmentation is unknown. **Criterion C**: (Small Total Population Size and Decline): Not applicable because there are no estimates of abundance. **Criterion D**: (Very Small Population or Restricted Distribution): Not applicable. **Criterion E**: (Quantitative Analysis): Not available.	

Chrysemys picta bellii
Western Painted Turtle — Tortue peinte de l'Ouest
Prairie/Western Boreal - Canadian Shield population
Range of Occurrence in Canada: southern AB, SK, MB, western ON

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* **GIS query of range based on records with geographic coordinates**	390,000 km²
• *Specify trend in EO*	Likely stable and large.
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)* **[explain source of information and calculation]**	Unknown, but likely substantial
• *Specify trend in AO*	Stable
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	Unknown
• *Specify trend in #*	Unknown
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Decline
Population Information	
• *Generation time (average age of parents in the population)*	35 years
• *Number of mature individuals*	Unknown
• *Total population trend:*	Unknown-Stable
• *% decline over the last/next 10 years or 3 generations.*	Unknown
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	No
• *Specify trend in number of populations*	Likely stable
• *Are there extreme fluctuations in number of populations?*	No
• *List populations with number of mature individuals in each:*	Unknown
Threats (actual or imminent threats to populations or habitats)	
There may be loss of habitat in Saskatchewan and Alberta, especially if drought becomes a severe problem.	
Rescue Effect (immigration from an outside source)	
USA: N5T5; common in adjacent states, rare in some extreme southwest U.S. pockets (WA-S5, ID-S4, MT-S5, ND-SNR, MN-SNR, WI-S5, MI(UP)-S5, IL-S5, IW-S5, SD-S5, NB-S5, WY-S4, CO-S5, AZ-S1, TX-S1, KA-S5, OK-S2)	
• *Is immigration known or possible?*	Possibly
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	Yes
Quantitative Analysis	None
Current Status COSEWIC: New assessment / Not at Risk, April 2006. (S1 in Alberta, S3S4 in B.C., S4 in Saskatchewan, Manitoba, Ontario)	

Status and Reasons for Designation

Status: Not At Risk	**Alpha-numeric code**: NA
Reasons for Designation: Populations are numerous and widespread and there is an abundance of good habitat, especially in the eastern part of the range (Ontario).	
Applicability of Criteria **Criterion A**: (Declining Total Population): Not applicable. **Criterion B**: (Small Distribution, and Decline or Fluctuation): Not applicable. **Criterion C**: (Small Total Population Size and Decline): Not applicable. **Criterion D**: (Very Small Population or Restricted Distribution): Not applicable. **Criterion E**: (Quantitative Analysis): Not available.	

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COLLECTIONS EXAMINED

All Ontario records came from the Ontario Herpetological Atlas (OHA), an extensive database that encompasses records from the Royal Ontario Museum, naturalist groups, individuals and various government agencies; records date back to the 1920s. For the remainder of Canada, Western Painted Turtle information was acquired from the National Museum of Natural History, Royal B.C. Museum, Alberta Museum, Royal Saskatchewan Museum, and Manitoba Museum. Records also came from Parks Canada, the UBC Zoology Museum, the Saskatchewan Watershed Authority, the Conservation Data Centres of Alberta, Saskatchewan and British Columbia, and individual researchers and consultants.