"Great Basin" Gopher Snake

Pituophis catenifer deserticola

Original[1] prepared by Nadine Bertram

Species Information

Taxonomy

The Gopher Snake *(Pituophis catenifer)* is a member of the family Colubridae that includes the majority of the world's non-venomous snake species. Six subspecies of *P. catenifer* are currently recognized, two of which have been documented in British Columbia: *P. catenifer catenifer* and *P. catenifer deserticola* (Gregory and Gregory 1999). *P. catenifer deserticola*, hereafter referred to as the Great Basin Gopher Snake, is confined to the Southern Interior of British Columbia, while *P. catenifer catenifer* is suspected to be extirpated from British Columbia (Cannings et al. 1999).

Description

Adults are generally between 70 and 200 cm, but may exceed 240 cm (Gregory and Campbell 1984; Shewchuk 1996). They are usually very light brown or yellowish-brown with superimposed dark brown-black squares running from the head to the tail; on the tail the squares become more like stripes or cross-bands (Gregory and Campbell 1984). Smaller, more irregularly shaped dark brown-black markings occur along the sides of the body and the ventral surface is a creamy yellowish colour (Gregory and Campbell 1984). Scutes on the snakes back are lightly keeled, while all other body scutes are smooth; two rows of subcaudal scutes are present (Gregory and Campbell 1984).

The head is slightly wider than the neck; the eyes are relatively large with a round pupil (Gregory and Campbell 1984). Three distinctive markings (dark brown-black) occur on the head, including a horizontal band between the eyes, a vertical line running from below the eye to the upper jaw, and an angled stripe running from the eye to the angle of the jaw (Gregory and Campbell 1984).

Distribution

Global

The Great Basin Gopher Snake occurs in southern British Columbia and the western United States including Washington, Oregon, Colorado, Nevada, Wyoming, Arizona, and New Mexico.

British Columbia

The Great Basin Gopher Snake has a patchy distribution throughout the warm, dry grassland valleys of the interior with the highest population densities occurring in low elevation areas of the Thompson and Okanagan valleys. Gopher snakes also occur in the Fraser Valley (from at least as far south as Lytton north to Churn Creek) and the Nicola and Similkameen valleys (Hobbs and Sarrel 2000), and have also been found in the Kettle Valley, from Rock Creek east to Christina Lake (Hobbs and Sarell 2000).

Forest region and districts

Southern Interior: 100 Mile House, Arrow Boundary, Cascades, Central Cariboo, Kamloops, Okanagan Shuswap (Salmon Arm)

Ecoprovinces and ecosections

CEI: FRB

SOI: NOB, NOH, OKR, PAR, SHB, SOB, SOH, STU, THB, TRU

Biogeoclimatic units

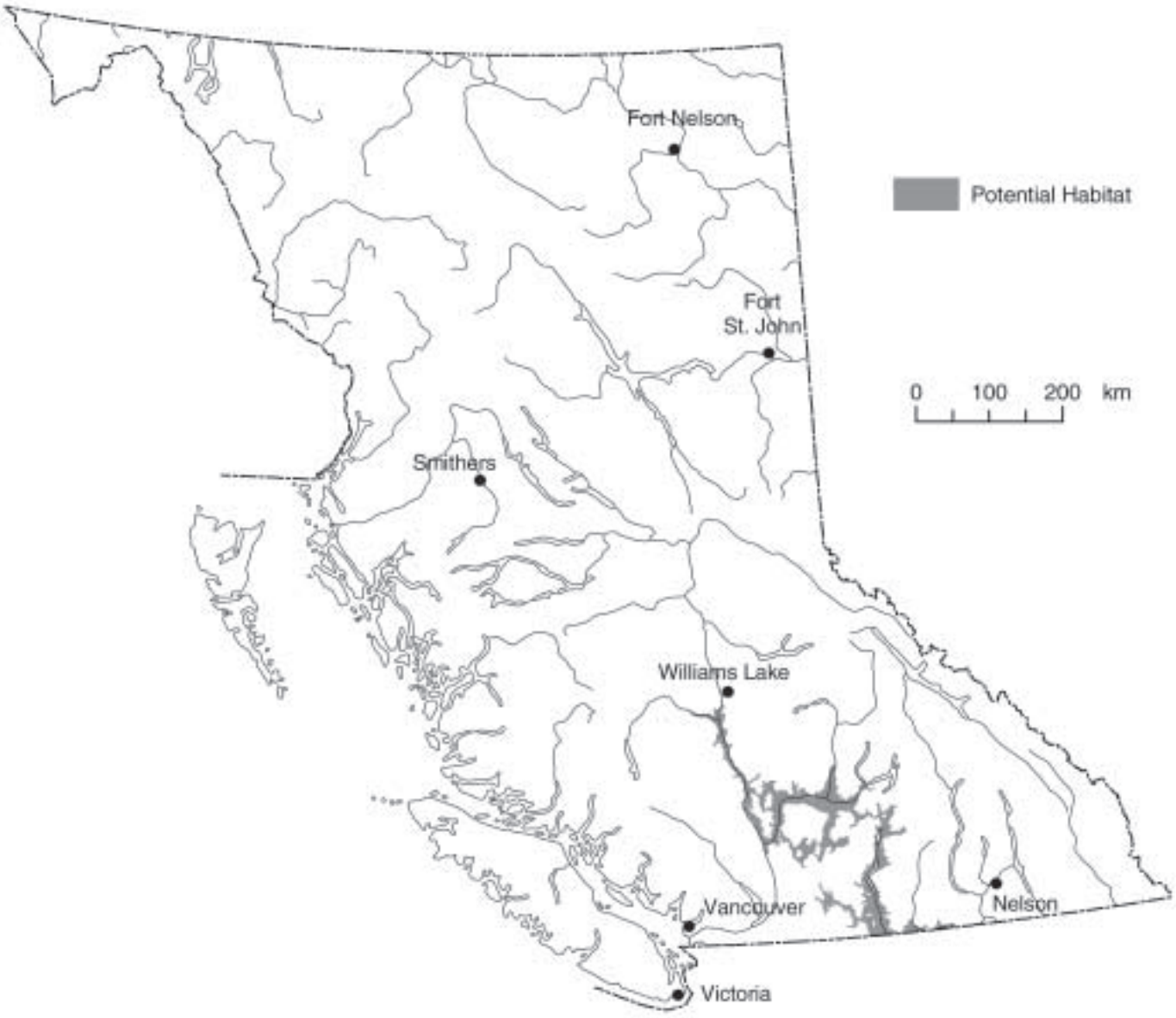
BG: xh, xw

IDF: xh (including a and b phases), xm, xw

PP: dh1, dh2, xh1

1 Volume 1 account prepared by C. Shewchuk.

Gopher Snake - subspecies *deserticola*
(Pituophis catenifer deserticola)



Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated.

Broad ecosystem units

AB, BS, CR, DP, OV, PP, SS, UR

Elevation

250–1100 m

Life History

Diet and foraging behaviour

The Great Basin Gopher Snake uses constriction to kill its prey before ingesting it. Shewchuk (1996) found that in the south Okanagan, small rodents, such as voles, pocket mice, and deer mice, comprised 91% of the gopher snakes diet and juvenile birds accounted for the remaining 9%. Shewchuk (1996) found a high abundance of neonate rodents and juvenile swallows (*Hirundo* spp.) in the diet, indicating that gopher snakes actively forage by searching rodent burrows and by climbing to reach bird nests. Seigel and Collins (1993) found that as air and ground temperatures increase from 18 to 27^{i}C, the activity, movements, and prey capture success of the gopher snake also increased.

Reproduction

Mating occurs in May. Typically ovulation follows in early June and the eggs are deposited between late June and early July (Parker and Brown 1980; Shewchuk 1996). In the south Okanagan, Shewchuk (1996) reported that gravid females (n = 19) deposited between two and eight eggs each (mean, 4.6) and clutch size was significantly correlated to female snout-vent-length. Egg-laying sites are known to occur in abandoned rodent burrows in sandy substrates, commonly in flat areas or on south-facing slopes; talus slopes in rocky habitats also may be used (Parker and Brown 1980; Shewchuk 1996). Nest sites often are communal, containing the eggs of several females, and often include the eggs of other species such as the Racer *(Coluber constrictor mormon)* (Parker and Brown 1980; Shewchuk 1996). Incubation occurred for ~60–80 days and hatchlings emerged in late August or early September (Shewchuk 1996).

Site fidelity

Successive use and fidelity to hibernacula, egg-laying sites, and foraging areas has been documented in Utah and the south Okanagan (Parker and Brown 1980; Shewchuk 1996). In addition, Shewchuk (1996) observed the repeated use of "retreat sites" (locations that provide shelter and thermal protection) in the south Okanagan. Retreat sites were used repeatedly by individuals to provide cover when the snakes were not actively foraging. Several gopher snakes were observed returning to these areas within and across active seasons.

Home range

Gopher snakes studied in the south Okanagan were found to have relatively large mean home ranges (13.9 ha females, 5.3 ha males) compared with those studied in Utah (1–3 ha), possibly due to a different distribution of food resources and critical habitats (Shewchuk 1996). In the Thompson, the approximate summer home range sizes of two male gopher snakes were 5 ha and 18 ha, respectively, and one gravid female used a home range of ~25 ha (Bertram and Larsen 2001). One possible explanation for the large size of female home ranges in the south Okanagan (and Thompson) may be large movements to suitable egg-laying sites that may be located some distance from the snakes primary foraging habitat (Shewchuk 1996).

Movements and dispersal

In British Columbia, this species hibernates in dens for a large part of the year (November to March). The over wintering sites are often communal, and typically shelter more than one snake species (i.e., *Crotalus oreganus, Coluber constrictor, Hypsiglena torquata, Thamnophis elegans*). Depending on weather, the snakes emerge from hibernation in late March or early April. Shortly after emergence from hibernation the snakes disperse to summer foraging and egg-laying habitats. In the south Okanangan, Shewchuk (1996) found a mean dispersal/return distance of 934 m. A study in the Kamloops area found return distances of between 275 and 520 m (Bertram and Larsen 2001).

The majority of movements during the summer feeding period are usually <200 m; between feedings or during ecdysis (shedding), the Great Basin Gopher Snake may be inactive for 10–15 days (Parker and Brown 1980; Shewchuk 1996; Bertram and Larsen 2001). Gravid females may travel substantial distances to locate suitable egg-laying sites. Migrations of 440 m and 2188 m have been observed (Shewchuk 1996; Bertram and Larsen 2001). Movements during the spring and fall usually are diurnal while during the summer the snakes may become nocturnal to avoid the heat (Greene 1997).

Habitat

Structural stage

1: non-vegetated/sparse
2: herb
3: shrub/herb

Important habitats and habitat features

Denning

Most known den sites are located within rock outcrops or talus habitat. These sites provide specific thermal and moisture regimes that protect snakes from freezing and dehydration. Most den sites are located on south-facing slopes in the Ponderosa Pine or Bunchgrass biogeoclimatic zones (Hobbs and Sarell 2000; Bertram and Larsen 2001). Hibernacula have been found in various areas, for example within a talus slope below a cliff, and in horizontal rock cracks at the base of cliffs (Shewchuk 1996). In general, dens have been located at elevations of ~450 m (Shewchuk 1996; Bertram and Larsen 2001). In some cases gopher snakes may hibernate alone or with a relatively small number of snakes in rodent burrows or other inconspicuous openings. Two gopher snakes in the Thompson area were observed overwintering in areas such as these. One is a rodent hole complex on the southeast facing slope of a small gully in open grassland habitat (elevation 400 m); the second is an opening produced by a dead and decaying sagebrush in the coarse gravel of a railway bed (elevation 350 m) (Bertram and Larsen 2001).

Breeding

Egg-laying sites also tend to be on south-facing slopes, but are more likely to be found in abandoned rodent burrows than in talus or rock outcrops. Several egg-laying sites in the south Okanagan and one in the Thompson have been found near the crest of large sand banks (Shewchuk 1996; Bertram and Larsen 2001). These sites contained minimal vegetation with loose, sandy soils, probably enabling partial excavation by the snakes. The sites also appeared to be well drained and were south to southeast facing. Studies indicate that egg-laying sites may be selected based on specific thermoregulatory criteria to ensure optimum conditions for development of the embryos (Shewchuk 1996).

Foraging

Gopher snakes tend to forage in open grassland habitats but riparian areas within the grassland habitat may also be important. Shewchuk (1996) found that after dispersal, individual gopher snakes spent most of their time moving in the riparian habitats of the south Okanagan study area; two of three gopher snakes followed in the Thompson had a riparian component within their home range (Bertram and Larsen 2001). The third gopher snake foraged in an open grassland habitat that included two dry gullies but no riparian areas, several other gopher snakes were observed in this area throughout the summer (Bertram and Larsen 2001). In the Kamloops area, rodent holes and to a lesser extent, rock outcroppings and wildlife trees (class 8 and 9 [dead fallen]) were observed to be important sources of cover for the snakes (Bertram and Larsen 2001). These sites offer physical cover and thermal protection for the snakes between foraging movements (Shewchuk 1996).

Conservation and Management

Status

The Great Basin Gopher Snake is on the provincial *Blue List* in British Columbia. Its status in Canada has not been determined (COSEWIC 2002).

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

AB	BC	ID	MT	OR	WA	Canada	Global
S3*[a]	S3	S5*	S5*	S5*	S5*	N3	G5T5

a NatureServe has not yet assessed the status of this subspecies; thus, these ranks reflect the status at the species level and are not specific to the *deserticola* subspecies.

Trends

Population trends

Estimates of abundance in British Columbia are not available. This snake is known to occur at many locations within the Thompson, Okanagan, Similkameen, and Fraser valleys, but critical habitats such as communal hibernacula have not been identified in most cases; therefore population monitoring is very difficult. Although population data are not available, significant development has occurred and continues to occur in areas known to support gopher snakes (see below); population declines due to habitat loss in the past, present, and future are therefore highly probable.

Habitat trends

Since settlement of the southern interior began, significant alteration of snake habitat has occurred. Most human developments, such as residential, industrial, and agricultural, occur within the valley bottoms. As human populations increase, development also is accelerating; this trend is evident throughout the range of the Great Basin Gopher Snake, particularly in the south Okanagan and Similkameen (SOS 2000).

Threats

Population threats

The Great Basin Gopher Snake has a restricted range in the province. Its populations are also seasonally concentrated at den sites, causing this species to be susceptible to disturbance and local extirpation. Specific microclimatic conditions make these sites unique and they are limited within the habitat (Shewchuk 1996). Entire snake populations may be destroyed if these sites are lost or altered as a result of human activities or natural occurrences.

Roads and railways that bisect the summer range of this snake represent a significant source of mortality, as gopher snakes often are killed or injured while migrating across or basking in these locations (Shewchuk 1996; Bertram and Larsen 2001). Mortality caused by agricultural activities such as cattle grazing and crop harvesting also is evident in the south Okanagan and Thompson areas (Shewchuk 1996; Bertram and Larsen 2001). In addition, the superficial resemblance of this non-venomous snake to the venomous Western Rattlesnake *(Crotalus oreganus)* results in unfounded persecution (Bertram and Larsen 2001).

Habitat threats

In British Columbia, the main threat to this species is habitat loss and alteration due to urban and agricultural development and livestock grazing. Grazing is likely to increase exposure to predators by causing a reduction of available ground cover within critical summer habitats (Hobbs and Sarell 2000; G. Schuett, pers. comm.). Human developments in the grassland/shrub-steppe habitat are expanding, resulting in population declines and loss of species, particularly vertebrates (SOS 2000).

Road development also contributes to habitat fragmentation and loss (Shewchuk 1996; Bertram and Larsen 2001). Recreational activities such as all-terrain vehicle use currently pose a minor threat to habitat through compaction and degradation of soils and vegetation.

Legal Protection and Habitat Conservation

The Great Basin Gopher Snake is protected in that it cannot be killed, collected, or held in captivity without special permits, under the provincial *Wildlife Act*.

Several ecological reserves (i.e., Tranquille, Haynes Basin) and provincial parks (i.e., Lac du Bois, Kalamalka Lake) contain suitable gopher snake habitat. At least seven known hibernacula are within protected areas including Okanagan Mountain and Kalamalka provincial parks; Trout Creek and Thorne ecological reserves; and White Lake, Churn Creek, and South Okanagan Grasslands protected areas.

Under the results based code, range use plans that consider the requirements of this species may be sufficient to meet the needs of the species. However, for a species to be specifically addressed within these plans, they must be designated as Identified Wildlife. Wildlife habitat features may be used to protect den sites.

Identified Wildlife Provisions

Sustainable resource management and planning recommendations

❖ Maintain and maximize connectivity between hibernacula and foraging habitats.

Wildlife habitat area

Goal

Maintain and link denning and foraging habitat, travel corridors, and egg-laying sites within and between adjacent populations.

Feature

Establish WHAs at communal dens, especially for multi-species dens, and talus slopes, rock outcrops or cliff habitats identified to be important for the conservation of this species.

Size

Approximately 200–300 ha but will depend on site-specific factors such as area of suitable habitat, nearness to foraging areas, and egg-laying sites.

Design

The boundaries of the WHA should be designed to include and connect den sites, travel corridors, egg-laying sites, and important foraging areas.

General wildlife measures

Goals

1. Minimize disturbance and mortality, particularly road mortality.
2. Maintain critical structural elements such as rock outcrops, talus slopes, friable soils, coarse woody debris, friable soils, rodent burrows, concentrations of boulders, or other unconsolidated materials and vegetative cover.
3. Maintain microclimatic conditions of hibernacula.
4. Maintain moderate to dense cover to conceal snakes and maintain foraging opportunities.
5. Maintain WHA in a properly functioning condition.

Measures

Access

- Place roads as far as practicable from hibernacula and known snake travel corridors. Avoid construction between April and October when snakes are active. When recommended by MWLAP, rehabilitate temporary access roads immediately after use or gate less temporary roads to reduce traffic.
- Where determined to be necessary by MWLAP, use snake drift fences and drainage culverts at intersections of roads and known travel corridors. Drift fences should be ≥75 cm high. Length will vary by site depending on area used by snakes. Consult MWLAP for more information. Seasonal use restrictions may be appropriate for some roads. Do not remove or disturb rock or talus.

Harvesting and silviculture

- Do not harvest within 200 m of den sites. Retain coarse woody debris.

Pesticides

- Do not use pesticides.

Range

- Plan livestock grazing (e.g., timing, distribution, and level of use) to prevent trampling and maintain suitable vegetative cover (i.e., >15 cm height in upland areas; >10 cm height in riparian areas).
- Do not concentrate livestock within 200 m of den site during spring dispersal (March/April) and fall (September/October) aggregations.
- Do not place livestock attractants or corrals within 200 m of den site.
- Do not trail livestock within 200 m of den site during spring and fall aggregations.
- When hay cutting or prescribed burning is planned, consult with MWLAP for the preferable times (i.e., after snakes have returned to dens).

Recreation

- Do not establish recreation sites within WHA.

Additional Management Considerations

Where migration routes from denning locations to summer habitats have been transected by roads, use methods such as drift fences, culverts, or seasonal road restrictions to allow the safe passage of snakes.

Rock climbing should be considered a disturbance at sensitive sites.

Riparian areas adjacent to WHA should be managed or restored to ensure foraging habitat is maintained.

Avoid converting areas adjacent to WHA to an early seral grassland condition. Early seral stages may have less cover for concealing snakes from predators and they may experience greater threats from trampling due to higher livestock pressures.

Information Needs

1. Inventory of hibernacula, egg-laying sites, and foraging areas.
2. Monitoring of hibernacula to provide population data.
3. Increased knowledge of life history, specifically reproduction.

Cross References

Badger, Racer, Western Rattlesnake

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