Great Basin Spadefoot

Spea intermontana

Original prepared by Mike Sarell

Species Information

Taxonomy

The Great Basin Spadefoot, *Spea intermontana,* belongs to the family Pelobatidae (spadefoots) and is the only species in the *Spea* genera in British Columbia. Until recently, the Great Basin Spadefoot was placed in the genus *Scaphiopus*. Although there are no currently recognized subspecies (Green 1999), the variation between populations of *Spea intermontana* may represent separate species (Wiens and Titus 1991).

Description

The Great Basin Spadefoot is the only spadefoot toad in British Columbia. It is a small anuran (40–64 mm svl) that differs from true toads (genus *Bufo*) by having vertical pupils, no (or indistinct) parotid glands, and relatively smooth skin. It has well-developed, sharp-edged black tubercals or "spades" on the bottom of each hind foot, which are used for burrowing. The ventral surface is cream coloured or white whereas the dorsal surface may be olive or grey with spots or streaks. Tadpoles are heavy bodied, grey or tan with brass flecks. Other tadpole characteristics include prominent nostrils close to the eyes, and eyes that are close together and somewhat upturned (Corkran and Thoms 1996).

Distribution

Global

The Great Basin Spadefoot occurs from southern British Columbia, south through the Great Basin to California, Arizona, and east to Colorado and Wyoming (Green 1999). In Canada, it occurs only in British Columbia.

British Columbia

In British Columbia, it occurs in the Okanagan, Similkameen, Kettle, Nicola, and Thompson valleys north to 70 Mile House in the Cariboo, west to Princeton, and east to Grand Forks. In addition to climate, the range of this species is related to the distribution of deep friable soils and wetlands. Their range also may be correlated with the range of pocket gophers (*Thomomys* spp.) and other small mammals due to loosening of compact morainal soils.

Forest region and districts

Southern Interior: 100 Mile House, Arrow Boundary, Cascades, Central Cariboo, Kamloops, Okanagan Shuswap

Ecoprovinces and ecosections

CEI: CAB, CAP*[1], CHP*, FRB*

SIM: SFH*

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

Biogeoclimatic units

BG: xh1, xh2, xh3, xw, xw1, xw2

ESSF: dc*

ICH: dw*, mk*, xw

IDF: dm1, dk1, dk2, mw1*, mw2*, xh1, xh1a, xh2, xh2a, xw

MS: dm*

PP: dh1, xh1, xh2

Broad ecosystem units

Terrestrial: AB, BS, DF, DP, OV, PP, SS

Aquatic: GB, LS, SP

1 * Indicates that range extent has not been confirmed.

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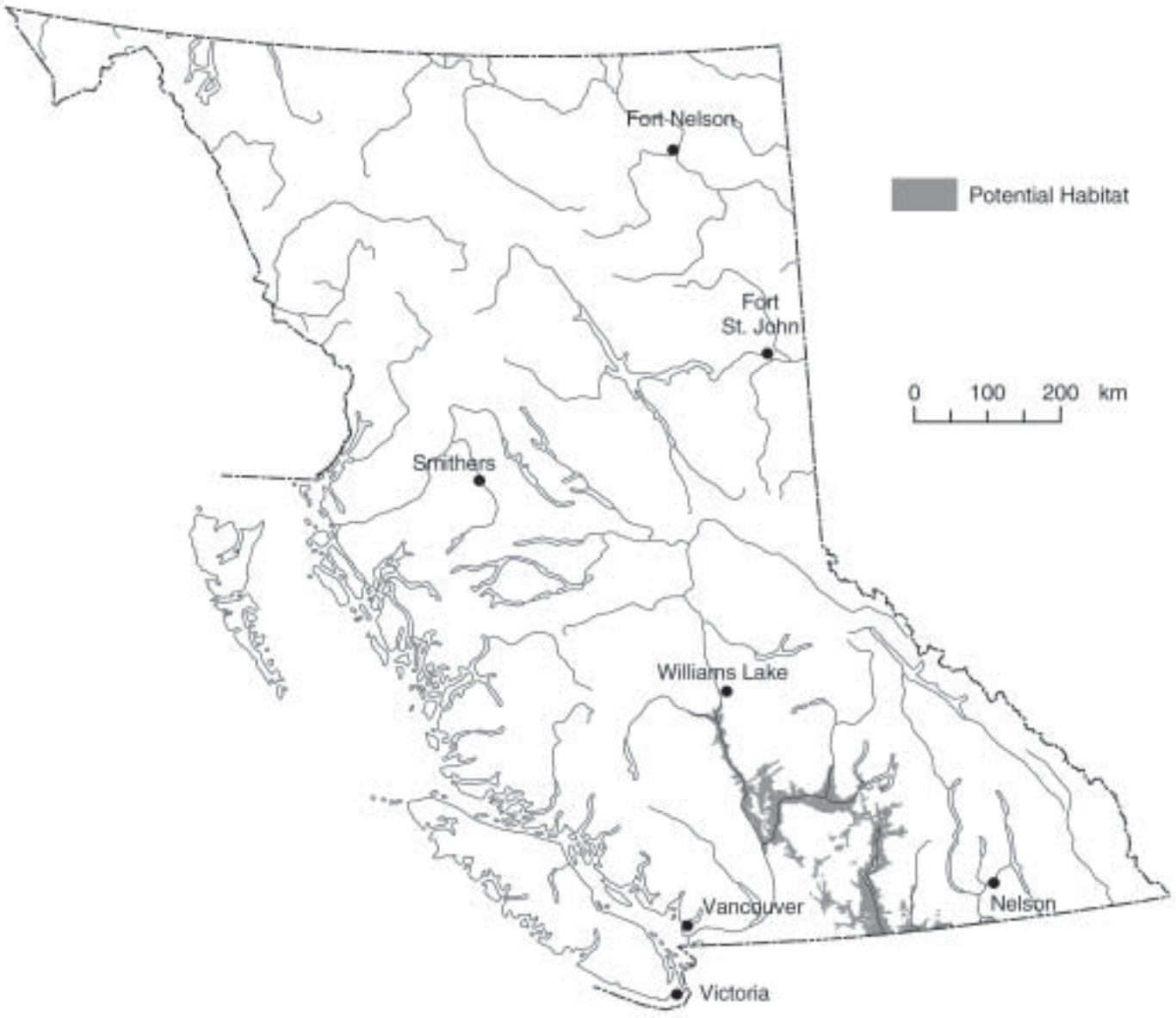

Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may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

Elevation

275–1800 m but generally found breeding below 600 m (St. John 1993; Cannings 1998)

Life History

Diet and foraging behaviour

Adult spadefoots are insectivorous and prey on a variety of invertebrates including earthworms, ants, beetles, crickets, and flies (Nussbaum et al. 1983). Aquatic larvae feed on algae, aquatic plants, or detritus (Green and Campbell 1984). Adult Great Basin Spadefoots forage at night, particularly under warm (>12°C), wet conditions. The remainder of the time is spent inactive, in underground retreats.

Reproduction

The Great Basin Spadefoot reaches sexual maturity at 2–3 years of age. Adults emerge from overwintering sites in mid-April and migrate to aquatic breeding sites. Females deposit eggs from April to early June. Between 300 and 800 eggs are deposited, in clusters of 20–40 eggs, which are fertilized externally. Eggs are normally deposited under the water surface on submerged vegetation or the bottom of pools. Eggs and tadpoles develop relatively rapidly which enables the Great Basin Spadefoot to successfully breed in aquatic habitats that are only available seasonally for short periods before drying up. Tadpoles also exhibit a tolerance to very warm water temperatures (Low 1976). Eggs generally hatch within a week, depending on water temperature, and tadpoles transform in 6–8 weeks. Metamorphosed spadefoots often still have a substantial tail when they leave the water (Nussbaum et al. 1983). The length of the breeding season varies considerably between sites (St. John 1993), but most metamorphosed toadlets appear in July (Cannings 1998).

Site fidelity

Site fidelity to breeding ponds has not been documented. It is assumed that spadefoots will use the nearest available water source, as many breeding sites are ephemeral and not always suitable. It is not known how far spadefoots can successfully travel to a breeding site.

Home range

The distance adult spadefoots will travel from breeding sites has not been documented, and is difficult to determine as some breeding sites are inconspicuous, particularly if they are suitable for breeding only in some years. The nocturnal habits and burrowing nature of the adults also makes it difficult to locate them in foraging areas.

Movements and dispersal

The Great Basin Spadefoot generally migrates to aquatic breeding habitats after the first warm rainfall in the spring. Although information on dispersal distances is lacking, spadefoots may migrate several hundred metres between aquatic breeding sites and terrestrial non-breeding habitats, and some may travel much farther. There are two emigration movements: after adults breed and after young metamorphose.

Habitat

Structural stage

Although most closely associated with herb (2) and shrub (3) structural stages for foraging, they will occur in open forest (4–7). Soil texture and depth, and an open habitat structure are more critical factors in determining foraging suitability.

Important habitats and habitat features

Aquatic

The Great Basin Spadefoot breeds in permanent or temporary aquatic habitats such as lakes, seasonal wetlands, rain pools, flooded areas along streams, and pools in intermittent streams. Shallow water is an important feature of suitable breeding sites, including the edges of deeper water features. Emergent vegetation aids in breeding as a substrate for egg deposition but is not essential. The absence of predatory fish dramatically increases the survival of eggs and tadpoles. Breeding habitat is used between April and July.

Terrestrial

Spadefoots occur in semi-arid habitats such as bunchgrass grasslands, sagebrush steppe, and open ponderosa pine (*Pinus ponderosa*) forests. They escape dry conditions by retreating into underground refuges such as small mammal burrows or by burrowing into the soil. Loose and deep soils provide suitable burrowing habitat. They may also retreat under coarse woody materials. It is unknown how deep the burrows must be to avoid lethal temperatures during winter hibernation, but may be up to 1 m or more. Terrestrial habitats are used throughout the year.

Conservation and Management

Status

The Great Basin Spadefoot is on the provincial *Blue List* in British Columbia. It is considered *Threatened* in Canada (COSEWIC 2002).

Summary of status in British Columbia and adjacent jurisdictions (NatureServe Explorer 2002)

BC	CA	CO	ID	MT	WA	Canada	Global
S3	S5	S3	S4	SR	S5	N3	G5

Trends

Population trends

Only three detailed population surveys have been conducted in British Columbia (St. John 1993; Leupin et al. 1994; Weber 1996), all in the south Okanagan or Thompson and Nicola valleys. The population is estimated to be approximately 10 000 (Cannings 1998); however, trends are not known (Cannings et al. 1999). The population in British Columbia has been described as "clumped" because over half of the calling males are reported from only three sites (Cannings 1998). The largest populations in the Okanagan are at Osoyoos Oxbows and Osoyoos Effluent Lagoon (St. John 1993).

Habitat trends

Most of the spadefoot population occurs in the arid grasslands in the valley bottoms of the Okanagan, Similkameen, Kettle, Nicola, and Thompson watersheds. These habitats, especially the Okanagan, are under intense development pressure. It was estimated that <9% of the south Okanagan remains in a relatively natural state (Redpath 1990). Agricultural and residential developments have already altered much of their former habitat. Most of the remaining habitats throughout their range are roaded or used for grazing, and much is weeded.

The largest known population of Great Basin Spadefoot occurs at the Osoyoos sewage lagoon (St. John 1993), where much of the surrounding antelope-brush and sagebrush grasslands have been recently lost to housing and golf course expansion.

Threats

Population threats

The range of the Great Basin Spadefoot in British Columbia tends to be concentrated in the valley bottoms, where the demand for agricultural and residential land is high. Because the distribution appears to be clumped, populations may be more susceptible to local extirpation if these areas are disturbed.

There are no known disease or infection threats, although at least one die-off of Tiger Salamanders (*Ambystoma tigrinum*) has occurred in the south Okanagan, for unknown reasons. These species are sympatric in breeding habitats within the salamander's range.

The water table at many sites within the range of the Great Basin Spadefoot has dropped significantly in the past decades, due to reduced precipitation and possibly increased human consumption (Cannings 1998). Although spadefoot eggs and tadpoles develop quickly, shorter breeding periods due to drying ponds likely reduce breeding success, and may prevent it altogether in dry years. If permanent or ephemeral breeding sites were to dry up, spadefoots would become increasingly dependent on fish-bearing and artificial or managed water bodies.

In permanent water bodies, non-native species, especially various species of non-native predatory fish, are a threat. Bullfrogs (*Rana catesbeiana*) have not successfully colonized spadefoot breeding habitat yet but have been the cause of significant declines elsewhere. In terrestrial habitats, the invasion of non-native plants may affect the available invertebrate composition and may hinder burrowing due to continuous root mats.

Although nothing is known about the specific effect on Great Basin Spadefoots, amphibians are known to be highly susceptible to environmental contaminants and changes (Seburn and Seburn 2000). Water quality of breeding sites may be affected by pollution from pesticides, dumping refuse to fill wetlands, and runoff from accumulated livestock faeces.

High mortality from road kill occurs at some migration areas. Traffic statistics in the south Okanagan range from an average of 2–14 cars per minute at various locations on Highway 97 during the summer (MOTH 1999).

Habitat threats

The primary threat to the Great Basin Spadefoot in British Columbia is likely habitat loss and fragmentation due to urban and agricultural development, for both breeding sites and foraging areas.

Livestock grazing can negatively impact Great Basin Spadefoot habitats due to soil and burrow compaction, trampling, loss of cover (riparian and grassland vegetation), and reduced water quality (Leupin et al. 1994; Cannings 1998; M. Sarell, pers. obs.). Leupin et al. (1994) found that nearly of all the surveyed ponds with spadefoot toads showed signs of livestock impact at the pond edge. Livestock may also create small depressions (hoof prints) that may trap developing eggs or larvae and which readily dry out, stranding the eggs or larvae.

Stocking lakes with sport fish may increase predation on spadefoot eggs and tadpoles. Loss of grasslands to recreational facilities such as golf courses reduces available foraging habitat. Off-road vehicles can cause disturbance to both grasslands and wetland edges. In grasslands, motor vehicles may cause soil compaction or erosion. At wetlands, vegetation and soil disturbance is largest when water levels are low and much of the foreshore is exposed, allowing access to a large area of mudflats. The resulting deep ruts may trap eggs or tadpoles as the pond dries.

Water management may benefit spadefoots by creating reservoirs, providing dependable breeding habitats in otherwise dry areas (Nussbaum 1983). Alternately, irrigation projects may decrease the availability of foraging areas through conversion to agricultural crops (Cannings 1998) and reduce the depth and duration of standing water. Further, irrigation may attract spadefoots to areas that are unsuitable for breeding, thus losing breeding opportunities for the season, due to the false appearance of available water.

Legal Protection and Habitat Conservation

The Great Basin Spadefoot is protected in that it cannot be killed, collected, or held in captivity without special permits, under the provincial *Wildlife Act*. The species is listed as Threatened under COSEWIC, and may be afforded some level of federal protection pending proposed legislation.

Two of the three largest populations are protected or partially protected by the Haynes Lease Ecological Reserve (100 ha), South Okanagan Wildlife Management Area, and Lac du Bois Provincial Park. The Nature Trust of BC owns lands that support smaller breeding populations of spadefoots. Other areas where they occur have recently been protected by the creation of White Lake Grasslands and South Okanagan Grasslands provincial parks.

Until the recent designation of the two grassland parks, only 6% (4600 ha) of suitable Great Basin Spadefoot habitat in the south Okanagan was designated as conservation lands, and 26% (~15 000 ha) was found on Crown land. Approximately 68% (about 40 000 ha) of suitable habitat is on Indian Reserves or private land (MELP 1998).

Identified Wildlife Provisions

Sustainable resource management and planning recommendations

Protect, and maximize connectivity between, known or suitable aquatic breeding sites and terrestrial non-breeding habitats (i.e., foraging and overwintering habitats). Identify potential and known ephemeral and cyclical aquatic breeding habitat.

Wildlife habitat area

Goal

Maintain suitable aquatic breeding habitats and integrity of adjacent terrestrial non-breeding habitat.

Feature

Establish WHAs at known breeding areas.

Size

Approximately 10 ha but will depend on site-specific factors such as size of water feature and extent of surrounding suitable habitat.

Design

The WHA should include a core area and may include a management zone. The core area should include the aquatic breeding site(s) and suitable uplands within ~250 m to protect most of the aestivation habitat. A management zone may be included to capture high quality habitat or to provide connectivity between populations.

General wildlife measures

Goals

1. Minimize disturbance during the breeding season.
2. Minimize road mortality.
3. Maintain water quality.
4. Maintain water levels.
5. Minimize soil disturbance and trampling of burrows.
6. Maintain important habitat features (i.e., small mammal burrows, riparian and emergent vegetation, and non-compacted soils).
7. Maintain or remediate riparian and aquatic habitats to a properly functioning condition.

Measures

Access

- As recommended by MWLAP, do not construct roads, deactivate temporary road structures, and close roads during critical times. Drift fences and culverts may be recommended by the statutory decision maker for locations where road mortality is extensive.
- Do not construct roads, although skidder trails may be acceptable on drier sites or in the winter.
- Do not place landings within core or management zone.

Harvesting and silviculture

- Do not harvest within core area.
- Minimize ground disturbances and do not scarify harvested areas.
- Stock only to natural densities, maintaining open forest characteristics with clearings, as per an NTD4 fire maintained ecosystem.

Pesticides

- Do not use pesticides.

Range

- Plan livestock use in the core area to meet objectives described above (GWM goals). Exclusion fencing may be required by the statutory decision maker to meet objectives.
- Do not place livestock attractants within WHA.

Additional Management Considerations

Maintain water levels and avoid draining wetland habitats.

Maintain ephemeral water features.

Prevent fish introductions in permanent water bodies.

Prevent incompatible recreation activities and prevent off-road vehicle access.

Encourage private land stewardship where important habitat extends beyond Crown land.

Information Needs

1. Distribution, both inside and outside of known range.
2. Limiting habitat (aquatic and terrestrial) and factors.
3. Movement and dispersal patterns.

Cross References

Badger, Burrowing Owl, Fringed Myotis, Grasshopper Sparrow, "Great Basin" Gopher Snake, Racer, "Sagebrush" Brewer's Sparrow, Sage Thrasher, Tiger Salamander, Western Rattlesnake

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