

SPECIES ACCOUNT

Species Data

Common Name: **Bighorn Sheep – ‘California’ form**
 Scientific Name: *Ovis canadensis* (previously ssp. *californiana*)
 Species Code: M-OVCA
 BC Status: Blue-listed.
 Identified Wildlife Status: Version I
 COSEWIC Status:

Project Data

Project Name: Central Okanagan Terrestrial Ecosystem & Wildlife Habitat Mapping Project
 Project Type: Terrestrial Ecosystem Mapping
 Area: Central Okanagan
 Ecoprovince: Southern Interior
 Ecoregions: Thompson-Okanagan Plateau
 Ecoregions: Northern Okanagan Basin (NOB)
 BGC Units: IDFxh1, PPxh1
 Map Scale: 1:20 000

Distribution

Provincial Range

California bighorn sheep are scattered in small herds on the mountains and grasslands of the Ashnola River system, the east side of the South Okanagan valley in the vicinity of Vaseux Creek, Shorts Creek west of Okanagan Lake, the Fraser River basin from Lillooet north to Williams Lake, the Chilcotin River, and the upper Taseko and Chilko Rivers, and an isolated herd on Far Mountain, north of Anaheim Lake. Two herds have been established near Kamloops Lake and Grand Forks following transplants (Demarchi et al. 2000).

Elevation Range

California Bighorn Sheep use elevations ranging from 360 to 1500m in the Vaseux Lake area (Takoff 1988). Winter range is often below 600m but can extend up to 1800m (BC Environment 1996). During summer, sheep use elevations ranging from 1800 to 2600m (Zemlack 1989).

Distribution in the Project Area

Currently only a few Bighorn Sheep occur in Shorts Creek west of Okanagan Lake (Gyug 2000). Only three sheep have been seen on recent herd surveys, and these are believed to be the only remaining members of the Shorts Creek herd (Tom Ethier, pers. comm). In the 1980s there were approximately 50 sheep in the Shorts Creek herd, but in the early 1990's the numbers declined catastrophically for unknown reasons.

Historically, they were observed at Fintry at the mouth of Shorts Creek, in a few areas just to the north of Shorts Creek, and south along the west side of Okanagan Lake to Peachland (Stelfox 1993). Any herds in the area of Peachland and Westbank appear to have declined before any accurate records would have been kept and herd numbers are unknown, although there do not appear to have been large herds there. However, sheep did occur on Drought Mt., and Mt. Law in Peachland, Carrot Mt, Mt. Swite, McDougall Rim, and Mt. Boucherie (Stelfox 1993). What was once a larger herd on Blue Grouse Mt., just north of Bear Creek, disappeared after the 1970's for unknown reasons (Stelfox 1993, Gyug 1994). There is lambing range in this area, so at least part of the herd occupied the Blue Grouse Mt. area year round, but no sheep have been reported there for many years now (Gyug 1994, Gyug 2000). All or part of the sheep herd that summered in Shorts Creek and on Terrace Mt., spent the winters in Shorts Creek, Fintry or on the west side of Okanagan Lake near Westside Road--particularly in the area of Nahun (Stelfox 1993, Gyug 1994).

On the east side of Okanagan Lake, Bighorn Sheep occasionally occur just to the south of the project area in Okanagan Mountain Park, although there does not appear to be an established herd that far north of the main herds in the Skaha Lake-Vaseux Lake areas. With continued expansion of this herd, it would be possible that areas on the east side of Okanagan Lake might be used by Bighorn Sheep, although there do not currently appear to be any sheep there.

Ecology and Habitat Requirements

Breeding occurs in November and usually takes place on grassy slopes of the winter range. Ewes give birth to lambs from April-May on rough, rocky escape terrain adjoining the winter range grasslands. Some bighorns are migratory. Ewes and lambs remain on the winter range until late spring and early summer, when the lambs are strong enough to move with the ewes to higher summer ranges; adult rams usually leave the winter ranges before the ewes and younger sheep. Summer range may overlap winter range but may also include more treed, cool aspect areas. Typically summer range extends into higher elevations than winter range, however in the study area the highest elevation is approximately 1000 m and summer and winter range will overlap. Bighorns are gregarious: ewes, lambs, yearlings and two-year-old rams stay together for much of the year in groups which may reach 100 animals; rams of about three years and older form loose aggregations and, except for the rut, remain apart from the females and younger animals (BC Environment 1997).

California Bighorn Sheep are not territorial in that they do not exclude other bighorn sheep from home ranges. However, they are very traditional and once the range use patterns of an individual are established, they tend to keep these same range use and seasonal movements throughout their lives. Home range size varies with the distance between summer and winter ranges, which may be as much as 60 km apart (BC Environment 1997). Bighorn sheep in the project area used summer ranges at slightly higher elevations such as at Terrace Mt., and lower elevations in winter along Okanagan Lake (Gyug 1994, Gyug 2000).

Wild sheep are predominately grazers, relying on grassland habitats, and tend to forage in grasslands, shrublands or mixes of these (Van Dyke *et al.* 1983). Grasses, sedges, and forbs comprise the majority of bighorn food but up to 25% of the diet may be shrubs such as big sagebrush, saskatoon, kinnikinnick, juniper and willows. (BC Environment 1997). The Vaseux Lake band of Bighorn Sheep feed on grasses, forbs, and shrubs. Grasses and sedges comprise approximately 60% and forbs 15% of the annual diet (Takoff 1988). Chapman (1999) found 62% of foraging was on bunchgrasses, 9% on cultivated grasses, and 10% on mock-orange.

In the Ashnola herd, the diet of sheep was determined to be opportunistic. Grasses comprised 66.6% of the diet, forbs 19%, and browse 14.6%, which are similar proportions to the average frequency of the forage species found on the site. Bluebunch wheatgrass was the most common component of the diet (20.5%), followed by junegrass (13.9%), needle-and-thread grass (10.6%), rough fescue (8%), cheatgrass (4.6%), and arrowleaf balsamroot (4%) (Wikeem and Pitt 1992).

Bighorn Sheep select ranges where visibility (sight lines) is unrestricted by standing timber, high shrubs, brush, or other obstructions (Risenhoover and Bailey 1985; BC Environment 1997). In South-eastern Oregon, suitable forage sites usually have less than 25% tree or shrub canopy cover with shrubs less than 0.6 metres high (Van Dyke *et al.* 1983). They avoid areas with greater than 25% shrub (60 cm high) or canopy cover on mild slopes but may bed in dense brush on steeper slopes (Van Dyke *et al.* 1983). In the Vaseux Lake area sheep locations varied from 43% of observations in open grassland slopes to 31.5% in open canopy habitats to 19% on rock bluffs during the months from February to August. Deciduous and closed canopy habitats are used to a lesser extent (Takoff 1988).

The closing-in of migration routes between traditional bighorn sheep ranges by forest ingrowth or shrub or tree encroachment can lead to abandonment of entire ranges as the sheep refuse to continue to migrate where they are subject to predation, particularly from cougars (USDA Forest Service 1999). This is probably the principal limiting factor to the Shorts Creek sheep population. Traditional migration routes from the main lambing range at Shorts Creek to mid- or late-winter ranges on Westside Road and at Fintry are very unsuitable for sheep use at present.

Bighorn sheep are also vulnerable to harassment, and rams will abandon ranges where they are hunted.

General Living during Growing Season

Food

In the Vaseux Lake area, spring forage sites are generally found on south or southwest aspects (Takoff 1988). Ewes with lambs tend to forage on bluff tops and talus slopes during late spring. In later spring they tend to use grassland slopes and rock outcrops. Important grass species, from most to least, are: bluebunch wheatgrass, sand dropseed, needle-and-thread grass, cheatgrass, and three-awn (Sarell and Haney 1995). Fescues are likely highly important where they occur.

Browse species such as pasture sage, kinnikinnick, Douglas-fir, juniper and wild rose comprise 20% of the diet. Moses, lichens, and horsetails comprise 5% of the diet (Banfield 1987). Bighorn Sheep will also browse on saskatoon, mock orange, elderberry, sumac, antelope brush, and big sagebrush (T. Chapman pers. comm.).

Plant species found on summer range foraging areas generally include fescues and sedges. Associated shrubs include saskatoon, kinnikinnick, mallow ninebark, squaw current, soopolallie, Oregon grape (Spalding and Bone 1969), elderberry, mock orange, antelope brush, big sagebrush,

pasture sage and common rabbit-brush (T. Chapman pers. comm.). Many of these plant species comprise a portion of the diet of Bighorn Sheep.

In Washington, Morgan (1995) found that browse is consumed during the fall and winter when decadent grasses and forbs are less available. However, in more timbered habitats (such as would occur on cool aspects and level areas in the Central Okanagan) browse may be consumed at a high rate regardless of the season (Morgan 1995).

Security/Thermal Habitat

High quality security habitat consists of steep rock bluffs and canyons with narrow ledges, rugged rocky slopes, and talus (BC Environment 1997). Preferred security habitat consisted of cliffs (of at least 8-m height and 200-m length) with at least 100% slope interspersed throughout rugged, broken terrain with an average slope of 75% (Van Dyke et al. 1983). Tilton and Willard (1982) observed that Bighorn Sheep prefer slopes greater than 80%.

Bighorn sheep also require freedom from disturbance. If hunted, rams will abandon ranges, temporarily or permanently (Geist 1971). Close to suburban or rural housing, free-roaming dogs will tend to limit use of areas by Bighorn Sheep.

General Living during Winter

Food

The majority of winter habitat is provided by grasslands within or near ponderosa pine or Douglas-fir forests, but timbered, rocky bluffs and openings with early seral stages following fire or logging are also used (BC Environment 1997).

The predominant overstory of winter habitat consists of scattered ponderosa pine with mixed Douglas-fir at higher elevations. Very open grasslands are also used where available. Associated shrubs include saskatoon, sagebrush, common rabbit-brush, antelope brush, squaw current, Oregon grape, sumac, wild rose (Spalding and Bone 1969), mock orange (T. Chapman pers. comm.), and pasture sage (Sarell and Haney 1995). Many of these species are browsed by Bighorn Sheep.

Security/Thermal Habitat

Two kinds of security habitat are required during winter: (1) the typical security habitat consisting of steep rocky slopes and cliffs, and (2) features which reduce snow pack and permit movement over the landscape. Features that reduce snowpack include large-canopied trees, dense stands of trees, windswept ridges, and warm aspect slopes. These features are especially important during winters of high snowfall (BC Environment 1997). Winter snow accumulations of more than 30 cm are completely limiting to sheep, and they seek areas of lower snow accumulation, preferring areas with less than 15 cm accumulation (Hebert 1973). In the Central Okanagan, snowfall will be a factor limiting sheep to lower elevations such as the IDF and PP zones in the winter, and in more severe winters will limit use of areas normally used in the winter such as Shorts Creek.

Bighorn sheep will abandon areas if harassed (Geist 1971). Close to suburban or rural housing, free roaming dogs will tend to limit use of areas by Bighorn Sheep. This will be particularly critical in winter when sheep need the lower elevation areas in the IDFxh and PPxh that are near to housing and other development.

Reproducing (birthing)

Security/Thermal Habitat

Security habitat for lambing consists of steep rock bluffs with south aspects where shrubs, trees and overhangs provide security cover during lambing (Blood 1963; Takoff 1988). Lambing usually occurs on steep terrain adjoining the winter range grasslands (Takoff 1988; BC Environment 1997) but can occur on winter, summer or spring-fall ranges (Van Dyke *et al.* 1983).

The only known lambing area in the Central Okanagan is the area of steep south-facing cliffs at the center of the Shorts Creek canyon near Hamilton and Emily Creeks (Gyug 2000). There must have been another lambing area at Blue Grouse Mt. used prior to the 1980's, but exactly which of the cliffs on Blue Grouse Mt were used is not known.

Ratings

This model employs a 6-class rating scheme because there is sufficient knowledge of habitat requirements. This complies with the recommended rating scheme in the RIC standards manual (1999).

Provincial Benchmark

Provincial Benchmarks and example ratings for California Bighorn Sheep (taken from Provincial Generic Species Account for Bighorn Sheep) - Benchmarks (B) are shaded

Ecoprovince	Ecosection	Rating	BGC Subzone	Broad Ecosystem Unit	Rating
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Winter

Central Interior	FRB	B	BGxh	SS - Big Sagebrush Shrub/Grassland/Steep	1
	WCU	4	AT	AT - Alpine Tundra	4
Southern Interior	OKR	2	IDFdk	BS - Bunchgrass Grassland/Steep	1
	PAR ¹	1	PPxh	SS - Big Sagebrush Shrub/Grassland/Steep	1
	SOB	1	PPxh	SS - Big Sagebrush Shrub/Grassland/Steep	1
	THB ¹	2	PPxh	BS - Bunchgrass Grassland/Steep	1

Growing Season

Central Interior	CCR	4	AT	AM - Alpine Meadow	1
	FRB	B	BGxw	BS - Bunchgrass Grassland	1
	WCU	4	AT	AM - Alpine Meadow	1
Southern Interior	OKR	2	ESSFxc	AM - Alpine Meadow	1
	PAR ¹	1	ESSFxc	SM - Subalpine Meadow	1
	THB ¹	2	IDFxh	DF/1 - Interior Douglas-fir Forest	3

Map Themes

Life Requisite	Habitat Use	Season	Rating Code	Ecosystem Attributes
Reproducing	Security/ Thermal	Spring	STRB	<ul style="list-style-type: none"> Large (80-m high and 260-m length) areas of very steep (> 100%) rock outcrops or cliffs
Living	Security/ Thermal	Winter	STLIW	<ul style="list-style-type: none"> Snow accumulations of < 30cm, and preferably <15cm. Steep slopes >100% at least 8m high and 200m length. South aspect preferred. In severe winters, large open (canopy cover <25%) ponderosa pine and Douglas-fir for snow interception. Lack of shrub or small tree layer >0.6m for sight lines
Living	Food	Winter	FDLIW	<ul style="list-style-type: none"> Low elevation grasslands <500m from escape terrain
Living	Security/ Thermal	Growing season	STLIG	<ul style="list-style-type: none"> Large open-grown (canopy cover <25%) ponderosa pine and Douglas-fir trees for shade Water available if shade not available Lack of shrub or small tree layer >0.6m for sight lines
Living	Food	Growing season	FDLIG	<ul style="list-style-type: none"> Grassland or mixed grassland-shrubland <500m from escape terrain

Ratings Assumptions

Reproducing – Security/Thermal	
Site Series	<ul style="list-style-type: none"> Cliff with access to spring foraging area rated up to class 1.
Aspect	<ul style="list-style-type: none"> Cool rated up to Class 4.
Slope	<ul style="list-style-type: none"> Very steep (>100%) up to class 1, steep (>45%) up to class 3.
General Living, Winter – Food	
Site Series	<ul style="list-style-type: none"> Productive grassland units (BN, FW, WA, WB, FB, GW) rated up to class 1. Other grassland units are lower, followed by shrublands/open forests, moderately closed forests, and closed forests and riparian lowest. Other site series with major grass component in early seral stages may be rated up to class 2.
Structural Stage	<ul style="list-style-type: none"> 2, 3a rated up to class 1; 4-7 usually rated to class 5 unless canopy <25%.
Aspect	<ul style="list-style-type: none"> 315 to 045 rated down to class 5, warm aspect up to class 1.
Slope	<ul style="list-style-type: none"> Steep rated up to class 1, others down-rated.
Soil Depth	<ul style="list-style-type: none"> Very shallow rated down.
General Living, Winter – Security	
Site Series	<ul style="list-style-type: none"> Rock outcrop and cliff rated up to class 1. Other map units that are steep may be rated up to class 2, e.g. SB or possibly SA, SS, PB, FO, WB, or CW.
Structural Stage	<ul style="list-style-type: none"> 2,3a rated up to class 1. 6-7 rated up to class 2 if canopy <25%.
Canopy Closure	<ul style="list-style-type: none"> <25% rated up to class 1.
Aspect	<ul style="list-style-type: none"> Warm aspects rated up to class 1, cool aspects rated up to class 4.
Slope	<ul style="list-style-type: none"> >100% for small areas, or >75% for larger areas of broken terrain.

General Living, Growing season – Food	
Site Series	<ul style="list-style-type: none"> • Productive grassland units (BN, FW, WA, WB, FB, GW) rated up to class 1. • Other grassland map units lower, followed by shrublands/open forests, moderately closed forests, and closed forests and riparian lowest. • Other site series with major grass component in early seral stages rated up to class 2.
Structural Stage	• 2, 3a rated up to class 1; 4-7 usually rated up to class 5 unless canopy <25%.
Aspect	• No effect.
Slope	• Steep rated up to class 1, others down-rated.
Soil Depth	• Very shallow rated down.
General Living, Growing season – Security	
Site Series	<ul style="list-style-type: none"> • Rock outcrop, cliff rated up to class 1. • Other Site Series that are steep rated up to class 2.
Structural Stage	• 2,3a rated up to class 1.
Canopy Closure	• <25%.
Aspect	• No effect.
Slope	• >100% for small areas, or >75% for larger areas of broken terrain.
Soil Depth	• Usually surface expression of very thin, or includes exposed bedrock.

Map Presentation and Interpretation

A 500m buffer around all polygons with security habitat ratings of moderate or better (Class 1, 2 or 3) will be used to select foraging habitats that are proximal to escape terrain. Highest-value method will be used to portray ratings for security habitats, and average values will be portrayed for foraging.

Breeding (lambing) is the top layer of the Bighorn Sheep habitat suitability map, followed by winter security habitat, growing season security habitat, winter food, and growing season food. Only high and moderate ratings are portrayed for security habitats, preventing low values from masking potentially high-value foraging areas. Moderate (Class 3) and moderately high (Class 2) security habitats may, however, cover higher foraging values. Winter security habitat and food will be crosshatched, portraying potential winter range, while allowing summer habitats to be visible beneath.

Minimum area requirements cannot be incorporated into the mapping, so interpretation of the mapping will be required. Small lambing areas (less than 80m high by 260m long) are less likely to be useful, particularly if isolated from other escape terrain.

Management Considerations

California Bighorn Sheep require rugged hillsides for lambing and escape terrain, and adjacent grasslands for foraging. Management of habitats should include a no disturbance area on the rugged slopes, and maintenance of grasslands within a 500m buffer. Some activities may be suitable within foraging habitats, but no activities should occur within the escape terrain, particularly in or near lambing areas. Sheep are traditional in their habitat use; local sheep

biologists and recovery strategies should be consulted to determine whether sheep are a significant concern in specific areas.

Although historic sheep populations in the Central Okanagan have declined and/or disappeared, critical habitats should be maintained for the possibility of transplants or re-colonization. Forest ingress into open habitats is likely a large factor in the decline of Bighorn Sheep in the Okanagan. The Garnet fire improved sheep habitat in the Penticton area by killing many trees and creating greater connectivity between Skaha/Vaseux herds and the eastside of the Central Okanagan. Preservation and restoration of critical habitat and corridors may allow Bighorn Sheep to re-occupy the Central Okanagan. Forests that currently inhibit the movement of sheep would need to be thinned and burned to make these habitats suitable again.

Gyug (2000) made recommendations on several options available for maintaining a viable herd of Bighorn Sheep on the Westside of Okanagan Lake. Range maintenance, primarily by prescribed burning, will be necessary to maintain grasslands that are currently proceeding along successional paths to tall shrublands and forests in the absence of naturally occurring fires. Transplanting of Bighorn Sheep into the area would be required since the herd has presently collapsed and is no longer viable. For long-term viability the Westside herd would probably require two separate winter ranges at Shorts Creek/Fintry, and at Blue Grouse Mt./Westside Road/Nahun with migration corridors between them that are suitable for use by sheep, i.e. in a grassland or short shrubland phase.

The Okanagan-Shuswap LRMP also recognized Bighorn Sheep and established Resource Management Zones (RMZ) where there was Bighorn Sheep habitat. Bighorn Sheep issues will be addressed before any developments on Crown Land. Issues to be addressed include keeping lambing, winter and spring ranges free from disruptive disturbances of unfettered human access, providing sufficient forage on these ranges, maintaining forest cover for snow interception, and providing movement corridors suitable for sheep between seasonal ranges. The Bighorn Sheep RMZ overlaps with the area of this mapping project in the Central Okanagan.

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California Bighorn Sheep Suitability Map

