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Vaseux–Bighorn National Wildlife Area Management Plan



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Copies of this plan are available from Environment Canada's Canadian Wildlife Service, Pacific and Yukon Region.

Website for Environment Canada Protected Areas: www.cws-scf.ec.gc.ca/habitat

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About Environment Canada Protected Areas and Management Plans

What are Environment Canada Protected Areas?

Environment Canada establishes National Wildlife Areas (NWAs) and Migratory Bird Sanctuaries (MBSs) for the purposes of conservation, research and interpretation. These areas are established to protect migratory birds, species at risk, and other wildlife and their habitat. NWAs are established under the authority of the *Canada Wildlife Act* and are, first and foremost, places for wildlife.

What is the size of the Environment Canada Protected Areas Network?

The current Protected Areas Network consists of 54 NWAs and 92 MBSs comprising almost twelve million hectares across Canada.

What is a Management Plan?

Management plans provide the framework within which management decisions are made. They are intended for use by Environment Canada staff to guide decision making, especially with respect to permitting. Management is undertaken in order to maintain the ecological integrity of the protected area and the attributes for which the protected area was designated. The Canadian Wildlife Service prepares a management plan for each protected area in consultation with the public and other stakeholders.

The management plan specifies activities that are allowed and identifies other activities that may be undertaken under the authority of a permit. Management plans may also specify how and where to make habitat improvements. As well, they must respect Aboriginal rights and allowable practices specified under land claims agreements. Furthermore, measures carried out for the conservation of wildlife must not be inconsistent with any law respecting wildlife in the province in which the lands are situated.

What is Protected Areas Management?

Management includes monitoring of wildlife, maintaining and improving wildlife habitat, periodic inspections of facilities, enforcement of regulations, and the maintenance of signs and other infrastructure. Research is also an important function of protected areas; Environment Canada staff carry out or coordinate research at some sites.

Each protected area is managed in accordance with the specific characteristics of the site and local area, but the same overall management strategy is applied in each protected area, i.e., protect and maintain habitat vital for wildlife and improve habitat when necessary for wildlife use.

Reviews of Management Plans

All NWAs administered by Environment Canada have a management plan. These plans are reviewed 5 years after approval of the first plan, and every 10 years thereafter.

Further Information

To learn more about Environment Canada's protected areas, please visit our website at www.cws-scf.ec.gc.ca/habitat or contact the Canadian Wildlife Service in Ottawa.

Vaseux–Bighorn National Wildlife Area

The spectacular Vaseux–Bighorn National Wildlife Area (NWA) in British Columbia is home to 30 species listed as at risk in Canada. This NWA's native grasslands support some exceptional and enigmatic species, and it is located within one of Canada's most biologically diverse regions. The habitats are unique because the valley is the northern extension of the Great Basin Desert, the only true desert in Canada.

Vaseux–Bighorn NWA surrounds Vaseux Lake Migratory Bird Sanctuary (MBS), a federal migratory bird sanctuary established in 1923. The NWA is part of a network of federal, provincial and private protected areas in the Okanagan Valley of B.C. that together help to protect a substantial amount of nationally important wildlife habitat.

This NWA was established in 1979 to protect prime winter range for a remnant herd of California Bighorn Sheep that was on the verge of disappearing from the valley. Since that time, sheep populations have rebounded as a result of conservation efforts. Concurrently, as a result of continental changes to populations and habitat, many of the other species found in Vaseux–Bighorn NWA have since been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as species at risk, and subsequently have been listed under the federal *Species at Risk Act*.

The South Okanagan and Similkameen River valleys are part of a contiguous grassland ecosystem that extends northward from the Great Basin Desert of the western United States. The low-elevation valley bottoms form an important migration corridor that extends up into the northern interior Chilcotin Plateau grasslands and beyond. The NWA is important habitat for local wildlife and is part of a continuous habitat corridor for migratory species.

The NWA includes habitats that extend from wetlands and riparian thickets around Vaseux Lake, rising up to arid terraces dominated by Antelope Brush, and finally to rugged cliffs and hillsides dominated by exposed rock, talus slopes and Ponderosa Pine. Old Ponderosa Pine and Douglas Fir parklands in the area create habitat for cavity-nesting birds, including Lewis's and White-headed Woodpeckers. Grasslands dominated by Antelope Brush, Sagebrush and Bluebunch Wheatgrass provide suitable habitat for species such as Behr's Hairstreak and several bird species including the Long-billed Curlew. Extensive wetlands surrounding the Okanagan River's channel and dyke system at the north end of Vaseux Lake provide excellent migratory bird habitat.

The soils and climate of the Okanagan are conducive to agricultural production in the landscape surrounding the NWA. Habitat loss to agriculture, residential development and recreation are the main landscape-level threats to the integrity of the surrounding ecosystem. This makes the protection, management and connectivity of the remaining habitat in the valley, including within the NWA, critically

important. Habitat change resulting from the invasion of exotic and alien plant species is the main site-specific threat to habitat and species within the NWA.

Environment Canada's Canadian Wildlife Service is continually working to conserve the important and special elements of Vaseux-Bighorn NWA by actively managing habitat for species at risk and other wildlife. To protect the NWA, all activities within the NWA are restricted unless otherwise posted or permitted.

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1 Site Description

Vaseux–Bighorn National Wildlife Area (NWA) is located in the South Okanagan–Similkameen region of British Columbia. The Canadian Wildlife Service (CWS) of Environment Canada manages several separate units of land that together comprise this NWA. The NWA is adjacent to Vaseux Lake (a federal Migratory Bird Sanctuary [MBS] established in 1923), large areas protected by the province, extensive Nature Trust of B.C. land holdings, and properties managed by the Land Conservancy of B.C. and Nature Conservancy of Canada (Figure 1).

Vaseux–Bighorn NWA was established in 1979 to protect habitat for species deemed to be special and important, including the California Bighorn Sheep, which was at risk of disappearing from the valley at that time. As a result of continental-scale changes in population sizes and habitat quality and availability, many of the species found in Vaseux–Bighorn NWA have since been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); most of those species are now also listed under the federal *Species at Risk Act* (SARA).

In addition to providing significant habitat for species at risk, this NWA supports many other species of migratory birds, mammals, reptiles, insects and plants (Table 1). It is a dynamic natural system, and is influenced by erosion, flooding, fire, grazing and other natural processes.

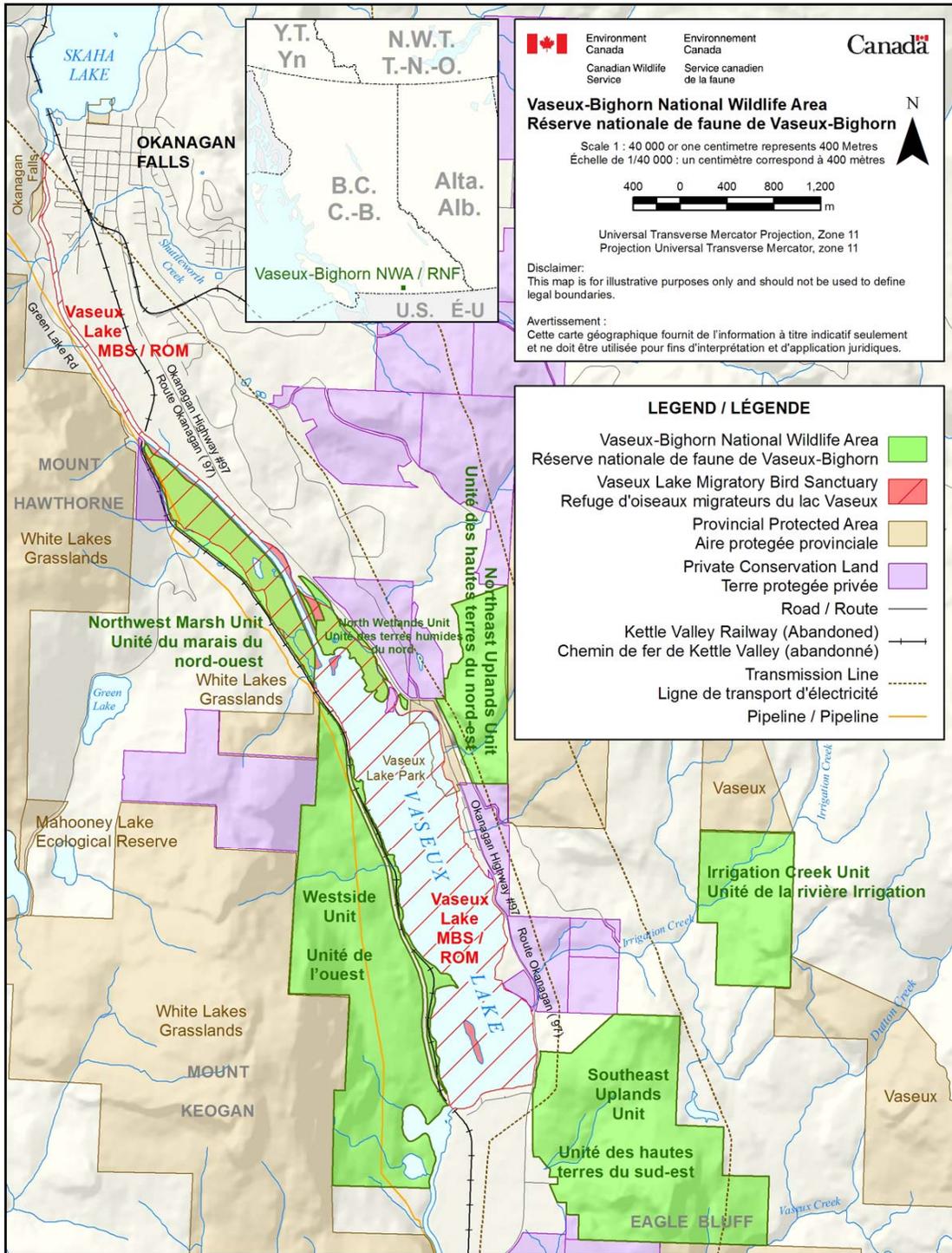


Figure 1 Vaseux-Bighorn National Wildlife Area

Table 1
Protected area summary

Protected Area designation	National Wildlife Area
Province/territory	British Columbia
Latitude/longitude	49°17' N 119°33' W
Size (ha)	812 ha, comprising several disjunct parcels
Protected Area designation criteria	Historic: protection of critical winter range for California Bighorn Sheep. Current: 2(a) “the area supports an appreciable assemblage of rare, vulnerable, threatened or endangered species.”
Protected Area Classification System	A (high) species or critical habitat conservation
International Union for Conservation of Nature Classification	Category IV – Habitat Management Area
Order in Council Number	PC 1979 – 648
Directory of Federal Real Property number	70878
Gazetted	1979
Additional designations	None
Faunistic and floristic importance	Rare plant communities (identified by the B.C. Conservation Data Centre as red- or blue-listed): Antelope Brush, Needle-and-Thread Grass, Water Birch, Red Osier Dogwood, Bluebunch Wheatgrass, Arrow-Leaved Balsamroot, and Ponderosa Pine–Bluebunch Wheatgrass communities
Invasive species	Riparian (e.g., Purple Loosestrife), aquatic (e.g., Eurasian Milfoil), upland (e.g., Sulphur Cinquefoil, Reed Canary Grass, Cheatgrass, Smooth Brome, Bull Thistle, Diffuse Knapweed, Hound’s Tongue, St. John’s Wort)
Species at risk	30 listed on Schedule I of the <i>Species at Risk Act</i>
Land/aquatic use	Public wildlife viewing platform in the North Wetlands Unit
Management agency	Canadian Wildlife Service
Public access/use	Public access allowed only on designated trail, wildlife viewing tower and boardwalk

1.1 REGIONAL CONTEXT

Vaseux–Bighorn NWA occupies 812 hectares (ha) of mainly low-elevation habitats in the Vaseux Lake basin. A dry climate and desert-like habitats characterize the basin, which forms the northern tip of the Great Basin Desert and contains one of the highest concentrations of species at risk and highest species diversity in Canada. At Vaseux Lake, the South Okanagan River valley narrows significantly and rises steeply from small wetlands, marshes and ravines to shrub-grasslands, forested benches, and parkland habitats, then to rocky outcrops, talus slopes, and finally to the higher-elevation cliffs above. Ponderosa Pine and mixed Ponderosa Pine–Douglas Fir parklands are the predominant forest types throughout the NWA. The NWA provides habitat connectivity between protected areas and grazing lands on either side of the South Okanagan Valley.

Situated 25 kilometres (km) south of Penticton, B.C., between Oliver and Okanagan Falls, Vaseux–Bighorn NWA includes the following six distinct management units:

1. **Irrigation Creek Unit:** This unit spans Irrigation Creek in the hillsides east of Vaseux Lake. The western portion of the unit is relatively flat, consisting mostly of immature mixed Ponderosa Pine and Douglas Fir forests, interspersed with wet meadows and paper birch in the gullies. The eastern portion of the unit contains pockets of steeply sloped grassland that give way to more rugged terrain, chiefly rocky terraces and steep cliff faces (Chapman et al. 1997d).

2. **Southeast Uplands Unit:** This unit extends from the southeastern shores of Vaseux Lake. It is characterized by rugged terrain, consisting of grasslands, steep cliffs, rocky outcrops, dense forest, and parkland forest. Grasslands dominated by Antelope Brush, Sagebrush and Bluebunch Wheatgrass are all found within this unit (Chapman et al. 1997e).

3. **Northeast Uplands Unit:** This unit extends above the western shores of Vaseux Lake. Shoreline riparian areas give way to upland slopes and benches consisting primarily of open Ponderosa Pine forest. Moving further upslope, these benches, in turn, become rocky cliffs and outcroppings, talus slopes, higher-elevation grasslands, and Ponderosa Pine parklands (Chapman et al. 1997c). Adjacent lands include a vineyard, which runs along the northwest side of the unit and extends down to the Northwest Marsh Unit.

4. **Westside Unit:** This unit extends above the western shores of Vaseux Lake. Similar to the Southeast Unit, the Westside Unit includes wetlands, forested benchlands, grassy parklands, rocky talus slopes, and higher-elevation ridges (Chapman et al. 1997b).

5. **North Wetlands Unit:** This unit encompasses the extensive wetlands surrounding the Okanagan River channel and dyke system at the north end of Vaseux Lake (Barnett 2000). This wetlands complex is one of the largest remaining in the Okanagan Valley. Associated riparian vegetation provides

important breeding habitat for migratory birds. These wetlands form part of Vaseux Lake MBS (Bryan et al. 1997).

6. **Northwest Marsh Unit:** This unit extends up the channel from Vaseux Lake and includes over 2 km of shoreline. The riparian habitat consists of marshes and oxbows (old river-channel ponds and ditches separated from the river by channelization of the Okanagan River), riparian woodlands, moist pastures, and hayfields (Bryan et al. 1997).

The NWA partially overlaps the Vaseux Lake MBS designated in 1923. This sanctuary was designated under the *Migratory Birds Convention Act* to protect a wintering flock of Trumpeter Swans considered endangered at the time (Alvo 1996). The lake and associated marsh wetlands remain an important breeding and stopover site for waterfowl and many other species of migratory birds. The Vaseux Lake Important Bird Area includes part of Vaseux Lake MBS.

The old Kettle Valley Railway right-of-way runs through the Westside Unit, but is not part of the NWA.

1.2 HISTORICAL BACKGROUND

The South Okanagan–Similkameen Region was first occupied by the Okanagan (Syilx) First Nations people, and is considered by them to be part of the traditional territory of the members of the Okanagan Nation (Okanagan Nation Alliance 2004). The area that today comprises Vaseux–Bighorn NWA supported significant historical occupation and use by First Nations people, who used and managed the resources of the valley.

The Vaseux area has some of the most diverse, abundant and intact archaeological sites in the Okanagan Valley. Concentrations of archaeological sites are found at several locations near Vaseux Lake, some of which include pictographs drawn by the Okanagan Aboriginal peoples. Cultural sites of note within the Vaseux area include habitation features, rock shelters, shell middens, cache pits, drying rocks, fish weirs, quarry sites, lithic debris accumulations, burial sites and trails. Little physical evidence exists of traditional hunting and gathering areas in the NWA, but it was undoubtedly extensively used (and still is used) by First Nations people. In addition to the assertions of the Okanagan people themselves, several key factors have contributed to the prolific evidence of traditional Aboriginal use of the area. They include the close proximity of considerable resources (e.g., freshwater, firewood, rock shelters), and abundant faunal resources such as ungulates, waterfowl, upland game birds, fish and freshwater mussels (Chapman et al. 1997a).

Diverse and abundant plants were also used by Aboriginal peoples, including for food, tools and medicines (e.g., Arrow-Leaved Balsamroot, Saskatoon Berry, Chokecherry, Mariposa Lily, rabbitbrush, elderberry, tule, etc.).

In the early 1800s, Europeans began to explore and colonize the region, driven first by the fur trade and subsequently by the supply demands of the Cariboo gold rush. In the 1880s the area experienced its own small gold rush, but it was not until 1918, when the Southern Okanagan Lands Project was established, that major irrigation works were undertaken as part of a larger veteran settlement scheme. The town of Oliver, B.C., was laid out in the 1920s and water irrigation was used to intensify agricultural production (Brotherton 2004). With its rich soils and grassland benches, the South Okanagan–Similkameen Valley quickly became one of the most productive agricultural areas in Canada. Orchards and vineyards in the region today produce fruits and vine products of high quality. The channelization and damming of the Okanagan River for flood control purposes in the 1950s significantly altered the landscape of the South Okanagan, including a portion of Vaseux Lake MBS.

An NWA for the Vaseux Lake basin was first proposed in 1970. A feasibility study and assessment of the plant and wildlife species inhabiting the area was completed (Keller 1977, 1978, 1979) and lands were subsequently purchased with the assistance of the Okanagan–Similkameen Parks Society. The wildlife area officially became a federal property in 1979. Vaseux–Bighorn NWA took its name from Vaseux Lake and the area’s flagship wildlife species, the California Bighorn Sheep.

1.3 LAND OWNERSHIP

The surface title of Vaseux-Bighorn NWA is in the name of the federal government, while the subsurface mineral rights are held by the provincial Crown. Adjoining lands are owned by the province and private interests, including conservation organizations such as The Nature Trust of B.C., the Land Conservancy of B.C. and the Nature Conservancy of Canada.

There are three rights of way on title:

1. one running along the Westside Unit of the NWA to facilitate operation of a pipeline; and
2. two crossing the Southeast Upland Unit of the NWA to facilitate operation of transmission lines.

Access to and use of any of these are subject to agreements between the companies and Environment Canada, and require permits for maintenance or other works.

1.4 FACILITIES AND INFRASTRUCTURE

The only facilities and infrastructure in the NWA consist of a boardwalk, a portion of a parking lot, a gate, and a wildlife viewing tower. The boardwalk is jointly maintained with the Nature Trust of B.C. Those assets that require funds to upgrade or manage, and are the responsibility of Environment Canada–CWS, are listed in Table 2.

**Table 2
Facilities and infrastructure**

Type of Asset¹	Approximate Size	Responsibility
Parking lot	1408 m ²	CWS and Province of B.C.
Gate	N/A	CWS and Province of B.C.
Boardwalk	375 m ²	CWS and The Nature Trust of B.C.
Viewing tower	10 m ²	CWS

¹ Building, fence, trail, garage, barn, etc.

2 Ecological Resources

2.1 TERRESTRIAL AND AQUATIC HABITATS

The wetlands of the valley bottom are embedded in a matrix of riparian woodland and shrub grassland. The grassland of the lower elevations gives way to open forests of Douglas Fir and Ponderosa Pine in rocky areas, on steep slopes, and on cliffs at higher elevations. The lake and associated marshes are important breeding and stopover sites for waterfowl and many other species of migratory birds. The unusual and rare habitats that make this area special include shrub grassland parkland (mainly open grass with sparse shrubs and trees scattered throughout) containing old growth Ponderosa Pine, wide unfragmented riparian birch thickets, undisturbed cliffs including talus and rock outcroppings, and shallow wetlands. These special habitats support a number of rare species, with the transitional zones between them being biodiversity hotspots (Chapman et al. 1997b).

Grasslands of the NWA are characterized by Bluebunch Wheatgrass and Needle-and-Thread Grass (Grasslands Conservation Council of B.C. 2003). Antelope Brush, Sagebrush and rabbitbrush dominate shrub habitats. These habitat types are relatively rare and sensitive to disturbance, and the grasslands are threatened by the ongoing invasion of exotic and alien plant species.

At higher elevations, grasslands grade into parklands with denser tree cover, where pine gives way to Douglas Fir with an understorey of Slender Fescue, Oregon Grape, Sumac and Poison Ivy. Rock Rose (bitterroot), Arrow-Leaved Balsamroot, Sagebrush and Mariposa Lily are among the floral highlights of the higher-elevation forested parklands (Dawe et al. 2004). Widely-spaced stands of Ponderosa Pine with a minor component of Douglas Fir (Nicholson et al. 1991) are found in some areas. Bluebunch Wheatgrass and fescues dominate the herb layer and, on drier sites, Antelope Brush and rabbitbrush commonly occur. In wetter areas, Trembling Aspen, Saskatoon Bush, Water Birch and a variety of willow species predominate. The vegetation that defines the northern wetlands and lake shoreline riparian areas is typically dominated by sedges and cattails. Other common marsh plants are Bulrush, Common Silverweed and Yellow Pond Lily. At the edges of watercourses, Slender Willow, Water Birch, Red Osier Dogwood and Mountain Alder are present (Bryan et al. 1997).

2.2 WILDLIFE

The NWA provides seasonal and year-round habitat for many small and large wildlife species, such as songbirds, raptors, ungulates, waterfowl, bats, carnivores, fur-bearers, amphibians, reptiles and a large diversity of plants and invertebrates. A time-limited and partial inventory conducted within the

NWA identified 30 invertebrate species, 5 fish species, 2 amphibian species, 8 reptile species, 132 bird species, and 17 mammal species between May and August 2003 (Dawe et al. 2004).

2.3 SPECIES AT RISK

Thirty species included on Schedule 1 of SARA are currently known to occur in the NWA. An additional 19 species tracked by the B.C. Conservation Data Centre as either red- or blue-listed, as well as three red-listed communities and one blue-listed plant community, also occur within the NWA's boundaries (B.C. Conservation Data Centre 2010) (Table 3).

Table 3
Species at risk confirmed or likely to occur in Vaseux–Bighorn NWA

Common Name	Latin Name	SARA Status ²	Provincial Status ³
<i>Birds</i>			
American Bittern	<i>Botaurus lentiginosus</i>	NS	Blue
American White Pelican	<i>Pelecanus erythrorhynchos</i>	NS	Red
Canyon Wren	<i>Catherpes mexicanus</i>	NS	Blue
Caspian Tern	<i>Sterna caspia</i>	NS	Blue
Common Nighthawk	<i>Chordeiles minor</i>	TH	Yellow
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	NS	Blue
Flammulated Owl	<i>Otus flammeolus</i>	SC	Blue
Great Blue Heron	<i>Ardea herodias</i>	NS	Blue
Lewis's Woodpecker	<i>Melanerpes lewis</i>	SC ⁴	Red
Long-billed Curlew	<i>Numenius americanus</i>	SC	Blue
Peregrine Falcon	<i>Falco peregrinus</i>	TH ⁵	Red
Rusty Blackbird	<i>Euphagus carolinus</i>	SC	Blue
Sage Thrasher	<i>Oreoscoptes montanus</i>	EN	Red
Sandhill Crane	<i>Grus canadensis</i>	NS	Yellow
Western Screech-Owl ⁶	<i>Megascops kennicottii</i>	EN	Red

² SARA status (EN–Endangered; TH–Threatened; SC–Special Concern; NS–No Schedule).

³ B.C. Conservation Data Centre. 2010. BC Species and Ecosystems Explorer. B.C. Ministry of Environment. Victoria, B.C. Available at: <http://a100.gov.bc.ca/pub/eswp> (accessed May 5, 2010).

⁴ Reassessed by COSEWIC as TH in 2010, currently under consideration for SARA uplisting.

⁵ TH designation is for the *anatum* subspecies. The *anatum* / *tundrius* subspecies were combined by COSEWIC in 2007 (COSEWIC 2007b) and reassessed as SC, currently under consideration for SARA downlisting.

⁶ *auricollis* subspecies (B.C. population)

Common Name	Latin Name	SARA Status ²	Provincial Status ³
White-headed Woodpecker	<i>Picoides albolarvatus</i>	EN	Red
White-throated Swift	<i>Aeronautes saxatalis</i>	NS	Yellow
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>	EN	Red ⁷
Yellow-breasted Chat ⁸	<i>Icteria virens auricollis</i>	EN	Red
<i>Mammals</i>			
American Badger	<i>Taxidea taxus</i>	EN	Red
California Bighorn Sheep	<i>Ovis canadensis</i>	NS	Blue
Nuttall's Cottontail ⁹	<i>Sylvilagus nuttallii</i>	SC	Blue
Pallid Bat	<i>Antrozoux pallidus</i>	TH	Red
Spotted Bat	<i>Euderma maculatum</i>	SC	Blue
Western Harvest Mouse ¹⁰	<i>Reithrodontomys megalotis megalotis</i>	SC	Blue
<i>Amphibians and Reptiles</i>			
Desert Nightsnake	<i>Hypsiglena chlorophaea</i>	EN	Red
Great Basin Gopher Snake	<i>Pituophis catenifer deserticola</i>	TH	Blue
Great Basin Spadefoot	<i>Spea intermontana</i>	TH	Blue
Rubber Boa	<i>Charina bottae</i>	SC	Yellow
Tiger Salamander	<i>Ambystoma tigrinum</i>	EN	Red
Western Painted Turtle ¹¹	<i>Chrysemys picta bellii</i>	SC	Blue
Western Rattlesnake	<i>Crotalus oreganus</i>	TH	Blue
Western Skink	<i>Plestiodon skiltonianus</i>	SC	Blue
Western Toad	<i>Bufo boreas</i>	SC	Yellow
Western Yellow-bellied Racer	<i>Coluber constrictor mormon</i>	SC	Blue
<i>Arthropods</i>			
Behr's (Columbia) Hairstreak	<i>Satyrium behrii columbia</i>	TH	Red
California Hairstreak	<i>Satyrium californica</i>	NS	Blue
Monarch	<i>Danaus plexippus</i>	SC	Blue

⁷ Status for *nataliae* and *thyroideus* subspecies

⁸ *macfarlanei* subspecies

⁹ *nuttalli* subspecies

¹⁰ *megalotis* subspecies

¹¹ Intermountain–Rocky Mountain population

Common Name	Latin Name	SARA Status ²	Provincial Status ³
Mormon Metalmark ¹²	<i>Apodemia mormo</i>	EN	Red
<i>Plants</i>			
Bearded Sedge	<i>Carex comosa</i>	NS	Red
Big-leaf Sedge	<i>Carex amplifolia</i>	NS	Yellow
Blue Vervain	<i>Verbena hastata var. scabra</i>	NS	Red
Columbia Goldenweed	<i>Pyrocoma carthamoides var. carthamoides</i>	NS	Yellow
Fox Sedge	<i>Carex vulpinoidea</i>	NS	Blue
Giant Helleborine	<i>Epipactis gigantea</i>	NS ¹³	Blue
Porcupine Sedge	<i>Carex hystricina</i>	NS	Blue
Richardson's Penstemon	<i>Penstemon richardsonii var. richardsonii</i>	NS	Yellow
Short-rayed Alkali Aster	<i>Symphotrichum frondosum</i>	EN	Red
Thick-leaved Thelypody	<i>Thelypodium laciniatum var. laciniatum</i>	NS	Blue

2.4 VISION

Vaseux–Bighorn NWA was established for conservation purposes. The long-term vision for the NWA is to maintain and enhance habitat for all native wildlife, with priority being given to species at risk and their associated habitats.

2.5 GOALS AND OBJECTIVES

Vaseux–Bighorn NWA was originally selected as a protected area to protect habitat for a remnant population of California Bighorn Sheep and to protect a collection of rare and unique habitats. Conservation priorities have shifted over time, but the maintenance of habitat for rare and unique species continues to be the first priority, including the maintenance of habitat for Bighorn Sheep. The NWA is classified under the International Union for Conservation of Nature criteria for protected areas as a Category IV protected area, which indicates that the NWA is to be managed “mainly for conservation of habitat and species through management intervention.”¹⁴

¹² Southern Mountain population

¹³ Giant Helleborine has been assessed by COSEWIC as Special Concern, and is currently on SARA Schedule 3.

¹⁴ International Union for Conservation of Nature. 2005. Consultation on classification was undertaken with the Canadian Council on Ecological Areas and the Conservation Areas Reporting and Tracking System.

The goals and objectives seek to create conditions that mimic those that would occur under natural ecological processes. These are goals to which Environment Canada aspires and, if achieved, would produce tangible benefits for habitat and wildlife, particularly migratory birds and species at risk, over the long term. To achieve the overall conservation goal, the ecological goals and objectives for Vaseux–Bighorn NWA are as follows:

1. Goal 1: Restoration and management of important habitats and ecosystems, particularly for species at risk, migratory birds and other priority species

- 1.1. Sub-Goal: Forest habitats will be maintained to mimic an ecosystem driven by periodic low-intensity fires so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
 - (a) Objective: 50% of conifer forest will contain less than 25% canopy closure over the long term (by 2025).
 - (b) Objective: 50% of conifer forest will have less than 5% downed woody material over the long term (by 2025).
- 1.2. Sub-Goal: Riparian habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
 - (a) Objective: Riparian areas and cottonwood forests do not decrease in extent.
 - (b) Objective: The spatial extent of riparian woodlands in the Northwest Marsh Unit will be increased from 4 to 16 ha in the medium term (by 2020).
- 1.3. Sub-Goal: Wetland and meadow habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
 - (a) Objective: Half of historic side channels will contain permanent water over the long term (by 2025).
 - (b) Objective: Restored riparian and wetland pond habitat will be increased to 16 ha by 2020.
 - (c) Objective: Cattail wetlands will be managed so that closure does not exceed 50% and is patchy when assessed in a grid of 25 x 25 metres (m) by 2020.
- 1.4. Sub-Goal: Rocky cliffs and talus slope habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.
 - (a) Objective: Stop illegal access that damages these habitats.

1.5. Sub-Goal: Grassland and Antelope Brush habitats will be maintained so that populations of species at risk, migratory birds and other priority species are sustained and/or residences and habitats are created, restored or maintained through active management.

(a) Objective: Antelope Brush habitat does not decrease in spatial extent.

(b) Objective: The spatial extent of Antelope Brush habitat is within 20% of its historical maximum by 2025.

2. Goal 2: Control of invasive species

2.1. Sub-Goal: Habitat and vegetation will be actively managed to eliminate (where possible) or reduce the extent and density of alien and exotic species of plants.

(a) Objective: The size and number of habitat patches known to be dominated by alien and invasive species (more than 25% of cover) will have decreased over time.

3. Goal 3: Control of unauthorized activities in the NWA

3.1. Sub-Goal: Eliminate off-trail recreational activities in the NWA.

(a) Objective: On an ongoing basis, the number and nature of incidents where evidence of illegal activities occur in Vaseux–Bighorn NWA is documented and reported to Environment Canada’s Wildlife Enforcement Division.

4. Goal 4: Reduce risk of catastrophic fire in the NWA

4.1. Achieve sub-goal 1.1 so that fuel load is reduced through the removal of young trees and downed woody material.

(a) Objective: 50% of conifer forest will contain less than 25% canopy closure over the long term (by 2025).

(b) Objective: 50% of conifer forest will have less than 5% downed woody material over the long term (by 2025).

5. Goal 5: Limit anthropogenic impacts on water quality in the NWA

5.1. Sub-Goal: The quality of surface water in Vaseux–Bighorn NWA will be sustained or improved to a level necessary to meet native aquatic species’ life history requirements.

(a) Objective: Detectable concentration levels of pesticides, herbicides and other toxic chemicals in surface water must meet Canadian Council of Ministers of the Environment (CCME) guidelines.

(b) Objective: Sources of water contamination are identified and a compliance promotion plan is produced (by 2025) to reduce the prevalence of these sources over the long term.

2.6 EVALUATION

Annual monitoring will be performed within the limits imposed by financial and human resources. The management plan will be reviewed in five years and every ten years thereafter. Evaluation will take the form of an annual review of monitoring data obtained from the monitoring and research projects outlined in sections 4.5 and 4.6. These data and the annual review will be used to inform future management and to evaluate federal contributions to the recovery of the numerous species at risk in the region.

3 Management Challenges and Threats

The management challenges and threats faced by Vaseux–Bighorn NWA are managed in the context of the broader landscape of the Okanagan–Similkameen region. Since the first management plan was adopted for Vaseux–Bighorn NWA in 1986 (Environment Canada 1986), this region has undergone tremendous development pressure. B.C. Stats predicts that between 1986 and 2036 the population of the Okanagan–Similkameen Regional District will experience a 51.4% increase, with predicted growth rates ranging between 3 and 5% annually. The burgeoning wine industry, ranchland tenures, forestry, transportation, tourism and, in particular, high-value vineyard and tree fruit crops continue to drive the local economy. The expansion of the vineyard industry, however, contributes to habitat loss and fragmentation, particularly for Antelope Brush, a rare habitat type in British Columbia and Canada. According to the 2006 Census of Agriculture, in 1989 there were 1100 acres of wine grapes in the Okanagan Basin, while in 2004 there were almost 6000. Further growth in the industry has occurred since 2004, and more growth is expected. Other challenges are summarized in Table 4.

In this context, habitat conservation (particularly for species at risk) and maintenance of connectivity between the remaining habitats in the valley become increasingly important functions within and around the NWA.

The channelization of the Okanagan River to control flooding has disrupted the natural flooding cycle in riparian areas surrounding Vaseux Lake (Chapman 1997b). The stages of Vaseux Lake are controlled by McIntyre Dam, which is located below the lake outlet to address seasonal flooding on the Okanagan River. In addition to flood protection objectives, the channel facilitates drainage of adjacent agricultural lands. Any overflow from this dam is diverted into an irrigation channel to provide water to the surrounding agricultural areas (Allen and Toews 2009). Areas that are particularly affected by such changes in hydrology are the riparian habitats along the lake, which require sufficient flooding to maintain biological processes. Since the 1980s, Ducks Unlimited Canada has operated a dam at the north end of Vaseux Lake to maintain water levels within the marsh area of the Northwest Marsh Unit.

There are site-specific contamination risks in the Irrigation Creek (Old Mill), and the Southeast and Westside units (adjacent to the Kettle Valley Railway). A series of investigations has been undertaken to determine the level of potential contamination. A detailed Phase I Environmental Assessment was completed at Vaseux–Bighorn NWA in 2003 by SEACOR Environmental Inc. (SEACOR 2003). A site assessment (Phase III) was done for the NWA by SLR Environmental

Consulting in 2009, to delineate soil contamination in the Irrigation Creek Unit (Old Mill), the Southeast and Northwest Upland Units, and the Westside Unit (Kettle Valley Railway). The results of the investigations from 2005 and 2009 showed that for the Irrigation Creek Unit (Old Mill site), one soil sample exceeded the CCME guidelines for naphthalene (a polycyclic aromatic hydrocarbon [PAH]). It is therefore recommended that further soil sampling take place to delineate the extent of PAH contamination. Once delineation of the contaminant has been achieved, a risk assessment will be conducted to determine the level of risk present at the Old Mill site (SLR Environmental Consulting 2009). Overall, however, the risk of contamination in the NWA is low.

Although agricultural areas are outside of the NWA, some are adjacent to the wildlife units and are therefore still able to cause potential contamination within the NWA. Adjacent vineyards and ranches can potentially contribute to the input of nutrients, salts, sediment, agricultural chemicals, litter and microbes into the wildlife area due to the migration of contaminants via surface runoff or movement through soils. In addition to agricultural sources of contamination, there is also an effluent plume on the east and south sides of Vaseux Lake, due to the lack of appropriate sewage facilities for residential properties located there. This could potentially affect the riparian communities along the NWA units that are adjacent to Vaseux Lake. There are currently no water quality monitoring sites in place on Vaseux Lake.

Other challenges include: the restoration and management of important habitats and ecosystems, particularly for species at risk; the control of invasive species, including the control of extensive patches of Knapweed, Sulphur Cinquefoil, and Purple Loosestrife; control of unauthorized access to the NWA that results in wildlife and habitat disturbance and spread of invasive species; reducing fire risk by managing forest encroachment into grassland and urban areas and reducing fuel loads; and improving water quality in the NWA.

Overall, the NWA is in poorer condition than it was at the time of establishment, owing to alien and invasive plants, fire suppression and unauthorized recreational access. In a 2007 report on the state of federal protected areas, Environment Canada rated the ecological integrity of the NWA as fair, and noted that the NWA is currently under moderate threat. It is anticipated to be under a higher level of threat in the future due to population growth, recreation pressure, and alien and invasive plant species.

Table 4
Summary of threats, goals and management approaches

Threats and Challenges	Goals and Objectives	Management Approaches
Regional population growth and subsequent agricultural, industrial and urban expansion resulting in habitat loss in the surrounding habitat.	Maintain habitats in the NWA and habitat connectivity between the NWA and the surrounding landscape as a critical contribution to the recovery of species at risk in the region.	Departmental support for sustainable development strategies, participation in the South Okanagan–Similkameen Conservation Program, regional land use planning initiatives, and outreach and compliance promotion targeted at potential users. Participate in integrated landscape planning with the goal of managing the landscape to increase the number of conservation lands around the NWA. Application of Environment Canada and other funding programs in surrounding area.
Habitat fragmentation as a result of agricultural development, urban expansion, road development and other infrastructure and construction.	Maintain habitats in the NWA, and habitat connectivity between the NWA and the surrounding landscape, as a critical contribution to the recovery of species at risk in the region.	Departmental support for local land trust conservation initiatives through the Habitat Stewardship Program, Ecological Gifts Program and Natural Areas Conservation Program. Increase wildlife signage on Highway 97 and participate in any discussions regarding the construction of a wildlife overpass along Highway 97.
Habitat loss due to forest encroachment into grassland areas.	Objectives 1.1(a) and 1.1(b) reduce extent and density of conifer forests; 1.5(a) and 1.5(b) maintain and expand the extent of Antelope Brush habitat.	Controlled burns and cutting (selective logging) where deemed appropriate.
Risk of catastrophic fire from the buildup of forest fuels as a result of long-term fire suppression in the area.	Objectives 1.1(a) reduce canopy closure of existing pine forests; 1.1(b) reduce forest litter and debris	Controlled burns and cutting (selective logging), and grazing where deemed appropriate.
Habitat loss due to development and river channelization.	Objectives 1.2(a) no decrease in spatial extent of riparian woodlands; 1.2(b) increase riparian	Partnership agreements with regional and provincial water management authorities;

Threats and Challenges	Goals and Objectives	Management Approaches
Alien and invasive species reducing habitat quality and displacing local flora and fauna.	woodlands in north meadow; 1.3(b) restored riparian and wetland pond habitat will be increased to 16 ha by 2020; 1.3(d) retain patchy nature of cattail wetlands. Objective 2(a) reduce and eliminate the extent and density of alien and invasive plants.	development of on-site water management projects (wells, dams, irrigation) in cooperation with partners. Continued support for Ducks Unlimited Canada wetland project. Explore reversal of channelization. Ongoing participation in the South Okanagan–Similkameen Invasive Plant Society; chemical treatment, hand-pulling, and biological control (chemicals are not a first choice and will not be used near water).
Reduction in the frequency of flooding in the valley.	Objectives 1.2(a) no decrease in spatial extent of riparian woodlands; 1.2(b) increase riparian woodlands in north meadow; 1.3(a) half of historic side-channels will contain water; 1.3(b) restored riparian and wetland pond habitat will be increased to 16 ha by 2020.	Partnership agreements with regional and provincial water management authorities; development of on-site water management projects (wells, dams, irrigation) in cooperation with partners. Continued support for Ducks Unlimited Canada’s water and vegetation management project. Explore reversal of channelization and dam removal.
Disturbance of residences and habitat as a result of non-permitted recreational access.	Objectives 1.4(a) and 3.1(a) eliminate incidents of non-permitted recreational access.	Increase in signage, monitoring and enforcement actions. Compliance promotion in local communities and with relevant user groups.
Regional agricultural and drainage practices, wastewater (from sewage treatment plants and septic systems) and storm water inputs, and the subsequent reduction in water quality.	Objectives 5.1(a) and 5.1(b) limit anthropogenic sources of water contamination.	Monitor water quality as resources allow. Consider outreach to surrounding agricultural producers to raise awareness of water quality issues. Riparian planting along Highway 97 to reduce concentrations of contaminants in road runoff.

Threats and Challenges	Goals and Objectives	Management Approaches
Loss of natural processes (fire, flooding, grazing) resulting in long-term loss of habitat quality and spatial heterogeneity.	Objectives 1.1 forest habitats maintain patchy character; 1.3(c) retain patchy nature of cattail wetlands; 4.1 reduce risk of catastrophic fire.	Consider controlled burns or mechanical thinning of encroaching forests Mechanical removal of cattails.
Habitat loss of Antelope Brush in the South Okanagan region due to urban and agricultural development and wildfires.	Objectives 1.5(a) and (b) stop the loss of Antelope Brush and restore spatial extent of Antelope Brush habitat.	Replanting of Antelope Brush and fire suppression in Antelope Brush–Sagebrush habitat.

4 Management Approaches

This section describes the approaches that will be used in the management of the NWA. However, specific management actions will be determined during the annual work-planning process and will be implemented as human and financial resources allow.

4.1 HABITAT MANAGEMENT

4.1.1 Forests

Forests will be managed to reduce the growth of young trees in order to maintain an open-canopy forest with less than 25% canopy closure, composed primarily of older trees. Forest expansion will be limited by controlled burns and cutting where deemed necessary and practicable.

4.1.2 Riparian and Cottonwood Habitats

Where control and facilitation of flooding is possible, riparian and cottonwood forests will be maintained, and their growth encouraged. Partnership agreements with local and regional water management authorities will be explored to manage water for flooding of key habitats. Local water management will be managed through the construction of local wells, small-scale irrigation and dam projects. The development of these on-site projects will be discussed with partners such as Ducks Unlimited Canada.

4.1.3 Wetlands and Meadows

Management of wetlands and meadows will be directed at (a) restoring, to the extent practical, the historic hydrological regime, and (b) reducing or eliminating alien invasive species. Past management of the wetlands included digging a series of test holes as part of a study to bring water to the surface in order to return the meadow at the north part of Vaseux Lake nearer to its original hydrology, while adding habitat diversity and creating habitat for the endangered Yellow-breasted Chat (Glenfir Resources 2003). The study indicated that increased moisture retention could also help to temporarily suppress the in-growth of currently dominant species (e.g., Reed Canary Grass and Lousel's Tumble Mustard). Therefore, soil and moisture regimes and flood levels will be managed to mimic historical hydrological systems to the extent practical, in order to support native plants and animals and reduce the occurrence of invasive species (J. Emery, pers. comm. 2010).

Hydrological management must include close cooperation with Ducks Unlimited Canada and monitoring of their Vegetation Management Project in the Northwest Marsh Unit. Removal of some of the dykes along the river would allow the wetlands to be self-sustaining and fully functioning but may require purchase of one or more riverside parcels (Glenfir Resources 2003).

4.1.4 Talus Slopes and Cliffs

Talus slopes and cliffs will not be actively managed, but human disturbance of these habitats will be minimized through monitoring, signage, education, other compliance promotion efforts, and enforcement of prohibitions.

4.1.5 Grasslands and Shrub Lands

Grasslands and shrub lands will be managed to preserve the existing extent of Antelope Brush and increase its extent through restoration where possible. Alien and invasive plant species will be controlled with the aim of eventual elimination.

4.2 WATER QUALITY

Drainage waters from Highway 97 are a probable source of pollution into the adjacent wetland areas of the NWA (North Wetlands Unit). The principal pollutants are sediments, heavy metals, and hydrocarbons, which are all persistent pollutants. These are especially damaging to the wetland areas when short, heavy rainstorms follow long dry periods, since this flushes a large amount of drainage into the ecosystem.

Agricultural water and wastewater may also contribute to water quality issues in the Okanagan River and Vaseux Lake adjacent to the NWA.

Water quality will be improved wherever possible through riparian plantings, because an increase in riparian plants between the highway and lake will mitigate pollution to some degree, and also through compliance promotion if considered necessary. Other methods may also be explored.

4.3 ALIEN AND INVASIVE PLANTS

The South Okanagan–Similkameen Invasive Plant Society provides strategic management planning for invasive species in the South Okanagan, including the NWA. The overall goal of the weed management plan in the Okanagan–Similkameen region is to “...cooperatively control, contain, and reduce weeds in the region, and to encourage knowledge and partnership for an integrated, effective weed control program” (South Okanagan–Similkameen Invasive Plant Society, undated).

Where invasive species (especially non-native plants, i.e., weeds) might disrupt native plant communities or associated native flora/fauna, attempts will be made to control or eradicate these

invasives. Sulphur Cinquefoil is the highest-priority plant for control because of its known ecological impacts and widespread occurrence within the NWA (Perry 2004). Other predominant invasive plants present in the NWA include Dalmatian Toadflax, Diffuse Knapweed, Hound's Tongue and Bull Thistle.

An Integrated Pest Management approach using a combination of chemical treatment, hand-pulling and biological controls is being used to help manage these species. Continued treatments will be necessary to control these species or eradicate them from the NWA. Using alternate control treatments (as opposed to chemical treatments) will be encouraged wherever feasible. To help protect aquatic habitats and associated wildlife, use of chemicals will not be permitted near water.

4.4 WILDLIFE MANAGEMENT

The management of wildlife within the NWA, particularly for those species that range off the federal lands and that are ordinarily managed provincially, will be carried out in close collaboration with the Province of British Columbia. Where there may be broader implications, the CWS will consult with adjacent landowners and other key stakeholders.

The management units of the NWA are, in many places, contiguous with the Nature Trust of B.C. and provincial Parks and Protected Areas. Major movement restrictions between the NWA and surrounding lands are mostly due to Highway 97, which runs along the east side of Vaseux Lake adjacent to the Northeast Upland Unit and parallel to the Okanagan River east of the North Wetland Unit. This creates situations in which wildlife movements are potentially restricted. Another concern is the encroachment of the surrounding agricultural and urban development areas onto potential movement corridors leading in and out of the wildlife area.

Managing the movement of wildlife includes addressing the issue of roadkill, adjacent land encroachment, and the linear corridors created by the old railway bed and the gas line right-of-way. In addition to existing deer fencing to reduce roadkill, management measures could include building a wildlife overpass over Highway 97 to allow unrestricted movement of wildlife, particularly large mammals. Other options include erecting signage, or traffic devices to reduce vehicle speed through areas that are known to have high wildlife crossover rates.

4.4.1 Waterfowl

Management strategies will maintain existing natural features in wetland and upland habitats that meet the requirements of all breeding and migrating waterfowl. Since the channelization of the Okanagan River between Skaha Lake and Osoyoos Lake, hydrological values have been altered, which also affected breeding and stopover sites for waterfowl and other migratory birds. One generalized habitat enhancement program in the NWA that has been ongoing for more than two decades is the restoration of the Vaseux Lake marsh (the southern half of the Northwest Marsh Unit) by Ducks

Unlimited Canada (30-year agreement since 1984, with the CWS). Ducks Unlimited Canada manages for waterfowl and periodically updates their management initiative (every 5–7 years) to adjust to changing management issues (K. Johnson, pers. comm. 2009). Their current management activities in this unit mostly include reducing the density of cattails in order to create appropriate open-water areas for waterfowl (K. Johnson, pers. comm. 2009).

Wetlands within the NWA will be managed to maintain diverse habitats. Manipulation of habitats will only occur in areas that show disturbances. Management will include restriction of livestock access, maintenance of water levels, and restricted activities in buffer zones (300 m) around wetland areas (Chapman et al. 2004).

4.4.2 Mammals

Within the NWA, 17 species of mammals have been recorded. Of these, one is listed under the *Species at Risk Act* as endangered (American Badger), one is listed as threatened (Pallid Bat), and three are listed as special concern (Western Harvest Mouse, Spotted Bat and Nuttall's Cottontail). In addition, California Bighorn Sheep, a local flagship species, is provincially blue-listed (B.C. Conservation Data Centre 2010).

Except for an inventory conducted within the NWA in 2003 (Dawe et al. 2004), populations of mammals within the NWA are not well studied. As such, the actual number of mammalian species using the site is undoubtedly greater than currently enumerated. Management for large mammals will include control of invasive plants to improve foraging habitat, and exclusion of domestic animals. Major habitat alterations will not likely occur, unless circumstances deem such major alterations (thinning, logging, burning) appropriate.

California Bighorn Sheep inhabit rugged and rocky terrain as well as the adjacent grassland and open-forest foraging areas, and are found primarily on the east side of Vaseux Lake. This subpopulation is the largest in the South Okanagan meta-population. It inhabits the south- and west-facing bluffs between Shuttleworth and Vaseux creeks east of Highway 97 and Vaseux Lake and the Gallagher Range to the west. In 1965, 173 Bighorn Sheep were counted in this subpopulation (Spalding and Bone 1969). Counts through the 1980s and 1990s revealed similar numbers, but a severe disease-related die-off occurred in the late 1990s. The highest count subsequent to the die-off was 44 animals in February 2000, and numbers near Vaseux Lake continued to decline through to December 2000 (Harper et al. 2002).

Winter ranges for the Vaseux Lake sheep subpopulation are generally in poor condition, and have been so since at least the 1960s. Spalding and Bone (1969) noted major infestations of Diffuse Knapweed in a number of areas, particularly those areas in the vicinity of power transmission lines, which has reduced natural forage.

Populations now seem to be rebounding. In 2003, ewes and lambs were often seen on the lambing cliffs of the Northeast Uplands Unit, as well as on the Nature Trust's Emery property where flocks of sheep were observed frequently in the spring and summer (Dawe et al. 2004). A provincial recovery plan is in place (Harper et al. 2002), and substantial opportunities to conserve habitat exist in the NWA, mainly through control of invasive plants to improve foraging habitat and exclusion of domestic animals. The South Okanagan meta-population has rebounded since 2002, with a count of 205 recorded by aerial survey in March of 2009 (Gyug 2009).

4.4.3 Species at Risk

Vaseux–Bighorn NWA provides year-round and seasonal habitat for 30 species listed under Schedule 1 of the *Species at Risk Act*. Species-specific recovery strategies and action plans are, and will continue to be, key drivers of management activities in the NWA. Management will be adapted as more recovery strategies and action plans are completed and posted on the *Species at Risk Act* Public Registry.

Multi-species approaches to recovery are being developed by the CWS, the South Okanagan–Similkameen Conservation Program and other similar organizations. These strategies will also help to guide recovery efforts for species at risk in the Conservation Program area for many years into the future.

Appendix I outlines species at risk for which active habitat management would likely produce tangible benefits. Species at risk will be managed in an integrated fashion with other species at risk and other wildlife. Overlapping and conflicting habitat needs will be evaluated, and habitat management will be based on providing the greatest amount of benefit to the greatest number of species at risk, while considering high-priority species (those at greatest risk).

4.5 MONITORING

Effective and efficient monitoring requires careful planning and a coordinated approach, and will be carried out in a manner that contributes to meeting recovery strategy and action plan objectives. A separate document that outlines the ecological and site monitoring approach for the NWA will be produced at a later date; it will be driven by recovery strategies and action plans for multiple species.

Ongoing monitoring needs are as follows:

1. Monitor distribution and abundance of species at risk such as Yellow-breasted Chat, Behr's Hairstreak and Sage Thrasher
2. Monitor the extent and distribution of Snow Buckwheat, Big Sagebrush, riparian and cottonwood forests, and permanent and ephemeral wetlands
3. Monitor snake populations and track population size by species over time
4. Monitor, at select locations, the volume of un-permitted access for off-trail recreational use
5. Monitor the distribution and density of alien invasive plant species within the NWA

6. Monitor surface water for concentration of pesticides, herbicides, nitrogen, phosphorus, and sediment

4.6 RESEARCH

Research activities will be considered for permitting only when the results from the research have the potential for the following:

1. Protecting, maintaining, restoring or enhancing naturally occurring habitats
2. Recovering species at risk or conserving migratory birds
3. Reducing the encroachment of invasive species in the NWA
4. Assessing the trends in species populations (especially species at risk) and habitats of concern
5. Maintaining wetlands in a state most beneficial to wetland-dependent wildlife
6. Reducing illegal public trespassing onto NWA lands.

4.7 PUBLIC INFORMATION AND OUTREACH

Public access for recreational purposes to the majority of Vaseux–Bighorn NWA is subject to the federal *Wildlife Area Regulations* and is generally not permitted. In cooperation with the Province of British Columbia and the Nature Trust of B.C., Environment Canada established a bird viewing tower and parking lot on the northeast end of Vaseux Lake. There is an information kiosk belonging to B.C. Parks and a boardwalk leading from the parking lot to the bird viewing tower. The boardwalk trail meanders in and out of the NWA. The parking lot lies across the boundary between the NWA and kiosk.

5 Prohibited Activities and Entry

Human activities are minimized and controlled in NWAs through the implementation of the *Wildlife Area Regulations*. These regulations set out activities that are prohibited (subsection 3(1)), and provide mechanisms for the federal Minister of the Environment to allow for certain activities to take place in NWAs that are otherwise considered prohibited. They also provide the authority to the Minister to prohibit entry into NWAs.

Access to, and use of, the NWA is authorized only as and where notices have been posted or published. Unless posted or published, all activities listed in section 3 of the *Wildlife Area Regulations* are prohibited. A permit may be obtained from the Minister of the Environment authorizing certain activities to take place.

5.1 AUTHORIZATIONS

Under the *Wildlife Area Regulations* the Minister of the Environment may authorize an activity that is prohibited, through the issuance of permits and notices published in local newspapers or posted at the entrance of any wildlife area or on the boundary of any part thereof.

Authorizations may be issued only if the Minister is of the opinion that the activity is scientific research relating to wildlife or habitat conservation, benefits the wildlife and their habitats, will contribute to wildlife conservation, or is otherwise consistent with the criteria and purpose for which the NWA was established as stated in the management plan. These conditions **must** be met before the Minister will consider authorizing a prohibited activity.

Terms and conditions that the Minister considers necessary for protecting and minimizing the impact of an authorized activity on wildlife and their habitat may be added to authorizations.

All permit requests must be made (in writing) to:

Canadian Wildlife Service

Environment Canada

Pacific and Yukon Region

5421 Robertson Road, RR #1

Delta B.C. V4K 3Y3

Given the number and extent of species at risk in this NWA, it is probable that all or most of the NWA will be identified as critical habitat for one or more species at risk during the duration of this management plan. *Species at Risk Act* permits for activities affecting the individuals, residences or critical habitat of these species will, therefore, also likely be required.

5.2 AUTHORIZED ACTIVITIES

Except for use of the above-noted parking lot, boardwalk and viewing tower, all activities within Vaseux–Bighorn NWA require a permit.

Permits may be issued for activities that are required to implement this management plan and for research and monitoring as described in sections 5.5 and 5.6. Permits may also be issued for activities not required for implementation of the plan but that are otherwise consistent with its goals and objectives, such as allowing access for maintenance of utility rights-of-way.

Permits will be issued with terms and conditions to ensure that any potential damage to the NWA by permitted activities is avoided or mitigated to the extent possible.

5.3 EXCEPTIONS

The *Wildlife Area Regulations* allow for exceptions to the prohibited activities under the following circumstances:

- Activities related to public safety, health or national security, that are authorized by or under another Act of Parliament, or activities under the Health of Animals Act and the Plant Protection Act for the health of animals and plants
- Activities related to routine maintenance of NWAs, implementation of management plans, and enforcement activities conducted by an officer or employee of Environment Canada

5.4 OTHER FEDERAL AND PROVINCIAL AUTHORIZATIONS

Depending on the type of activity, other federal or provincial permits may be required to undertake an activity in Vaseux–Bighorn NWA.

5.5 HUNTING

There is no hunting permitted within the NWA. First Nations traditional hunting and gathering may be occurring, however, but are not well documented for the NWA.

5.6 WILDLIFE VIEWING

Although the bulk of the NWA is closed to public access, a permit is not required for walking and non-motorized boat access to the adjacent Vaseux Lake MBS. However, the public is asked to

remain on designated paths. A wildlife viewing platform is located within the North Wetlands Unit and the MBS's North Wetlands Unit.

5.7 FORESTRY

Forestry operations within the NWA will only be permitted where they are deemed to be a benefit to wildlife and their associated habitats (i.e., as part of a habitat management or restoration project). Activities that enhance habitat within the NWA, such as prescribed burning, thinning of vegetation and general restoration, are also permissible through the issuance of permits.

5.8 AGRICULTURE

Agricultural activities within the NWA will only be permitted where they are deemed to be a benefit to wildlife and their associated habitats.

5.9 RECREATION

Except for use of the above-noted parking lot, boardwalk and viewing tower, all recreational activities within Vaseux–Bighorn NWA require a permit.

6 Security, Health and Safety

Responses to environmental and other emergencies will follow the established course of action for the Vaseux area: the RCMP will be the main contact for most emergencies, and in the case of environmental emergencies, contact will be made with the **Canadian Wildlife Notification System, at 1-800-663-3456**.

Management activities to improve the protection of public health and safety and reduce the risk of hazardous occurrence will include constructing and repairing fencing along the perimeter of the NWA, and erecting appropriate signage.

All reasonable efforts will continue to be made to protect the health and safety of the public, including adequately informing visitors of any known or anticipated hazards or risks. Furthermore, Environment Canada staff will take all reasonable and necessary precautions to ensure their own health and safety and that of their co-workers. However, visitors (including researchers and contractors) must make all reasonable efforts to inform themselves of risks and hazards and must be prepared and self-sufficient. Natural areas have inherent dangers, and proper precautions must be taken by visitors, recognizing that Environment Canada staff do not regularly patrol, or offer services for visitor safety in, NWAs.

7 Enforcement

Active on-the-ground management and/or periodic enforcement are required to prevent potentially deleterious factors from gaining influence over secured conservation lands. The *Migratory Birds Convention Act*, *Species at Risk Act* and *Canada Wildlife Act* prohibit several activities on all CWS conservation holdings. Wildlife enforcement officers typically visit the Vaseux–Bighorn NWA on a routine basis, and can increase the frequency of visits as needed.

Officers monitor compliance with the *Canada Wildlife Act* on an ongoing basis and will initiate investigations as required. The *Wildlife Area Regulations* list prohibited activities in section 3, and include:

- destroying or disturbing any wildlife, their habitats or eggs;
- possession of any wildlife or carcass, nest, egg or parts thereof;
- cutting, picking, removing or wilfully damaging any vegetation;
- disturbing or removing soils, sand, gravel, rock or related material;
- removing, defacing, damaging or destroying any artefact, building, fence poster, sign or other structure;
- entry into any NWA property where notice prohibiting such entry has been given;
- camping or campfires;
- firewood cutting;
- vehicle use on the land base;
- dumping or depositing waste or other refuse materials or substances that would degrade or alter the quality of the environment;
- horseback riding;
- bicycling;
- rock climbing;
- hang gliding.

As the NWA is federal land, the general prohibitions of the *Species at Risk Act* (sections 32 and 33) apply to all species listed on Schedule 1 as extirpated, endangered or threatened. Individuals of such listed species shall not be killed, harmed, harassed, captured or taken, and residences shall not be damaged or destroyed. If critical habitat of a listed species is identified within the NWA, a description of

that habitat must be published in the *Canada Gazette*. Section 58 of the *Species at Risk Act* prohibits the destruction of critical habitat within the NWA.

Public education and awareness is fundamental to promoting compliance. Preventative measures such as strategic use of signage as well as public outreach activities and events, combined with an on-the-ground presence, are more likely to result in effective compliance. In this regard, several primitive roads exist in lower portions of the Irrigation Creek Unit and significant sections of the Northeast Uplands Unit, and of particular concern here is the use of dirt bikes and ATVs along these routes: such vehicles can more easily access more restricted and sensitive habitats, and consequently can cause significant damage.

8 Plan Implementation

Details of the management plan implementation will be developed through Environment Canada's annual work planning process, and will be implemented as human and financial resources allow.

The following actions, among others, will be necessary for the successful implementation of this plan:

- Restoration and management of key habitats in accordance with the goals outlined above
- Completion of a boundary legal survey
- Construction of a perimeter fence independently or in cooperation with adjacent landowners, or the development of a conservation fencing program in cooperation with adjacent conservation landowners
- Erection of boundary signs
- Erection of notifications at designated access points
- Erection of highway signs (if deemed necessary) to advise the motoring public of wildlife and to reduce speed for the benefit of badgers, Bighorn Sheep and other wildlife
- Manage water flowing off of Highway 97, to control pollution and water contamination
- Protection of rocks, cliffs, cracks and fissures on steep slopes, for the benefit of populations of snakes and bats
- Completion of contaminated site remediations

9 Collaborators

Many of the programs and projects described within the NWA have involved collaborative arrangements between the CWS and Vaseux basin stakeholders. These arrangements include formal and informal agreements that have enabled many programs in the NWA. Ongoing and continued collaboration with the South Okanagan–Similkameen Conservation Program and its members represents the bulk of collaborative arrangements in which the CWS is presently engaged in the Vaseux area.

Several member organizations of the South Okanagan–Similkameen Conservation Program have expressed interest in continuing cooperation with the CWS on this NWA, including the Government of British Columbia, B.C. Wildlife Federation, Federation of B.C. Naturalists, South Okanagan Naturalist Club, Habitat Conservation Trust Fund, Okanagan Similkameen Conservation Alliance, Land Conservancy of B.C., and Nature Trust of B.C. In addition to providing significant funding for CWS projects such as the Vaseux Conservation Strategy, the Nature Trust of B.C. contributes to land management activities in the NWA. Cooperative arrangements with the Nature Trust have involved extensive coordination and management of in-the-field volunteer time, including post-2003 fire restoration projects and capital expenditures (e.g., fence postings). The Land Conservancy of B.C. has created many of their outreach and public education materials in collaboration with the CWS, has expressed a continued interest in supporting CWS-relevant outreach, and recognizes the possibility of expanding new stewardship activities in the South Okanagan, such as through their South Okanagan–Similkameen Stewardship Program (which involves contact with landowners).

At the north end of Vaseux Lake, situated in lowland riparian habitat, is the Vaseux Lake Bird Observatory, which was established by the CWS in 1994 as one of the 23 stations across Canada that form the Canadian Migration Monitoring Network. This station is operated by the Okanagan Similkameen Conservation Alliance, which monitors land bird migrations through the South Okanagan valley. Each summer, thousands of migratory birds, mainly songbirds, are captured and banded at this station. The station provides a long-term index of species diversity and abundances for birds using the Vaseux Lake area during migration. This station monitors western migrant species, including the Orange-crowned Warbler, Gray Catbird, Song Sparrow, Willow Flycatcher, Audubon's Warbler, and Common Yellowthroat.

In 1984, Ducks Unlimited Canada entered into a 30-year agreement with the CWS to undertake a water and vegetation management project within Vaseux's Northwest Marsh Unit. With a long-term

goal to restore oxbows and enhance waterfowl values, the project focused on infrastructure improvements. The agreement includes the completion of upgrades to the dyke system along 150 m of the water channel, and installation of a main pump station, intake line, and well, all near the south end of the marsh (Barnett 1993).

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Appendix I

Species at Risk Act (SARA)-LISTED SPECIES AT RISK CONFIRMED OR LIKELY TO OCCUR IN VASEUX–BIGHORN NWA

Common Nighthawk (threatened, SARA Schedule 1)

Common Nighthawk occurs in all Canadian provinces and territories. It was designated as threatened due to significant population declines (49.5% decline over 10 years). This species hunts for flying insects at dusk and dawn, and nests in a range of open, vegetation-free habitats. Declines in insect populations due to insecticide use and habitat loss and alteration are likely contributing factors to the decline of the species (COSEWIC 2007a).

The species was listed on Schedule 1 in 2010, and a recovery strategy has not yet been completed. The NWA likely provides an abundant source of insect prey for Common Nighthawks as well as potential nesting sites. This species is frequently seen feeding in the area of the NWA.

Flammulated Owl (special concern, Schedule 1)

In Canada, the Flammulated Owl only occurs in British Columbia's southern interior, with a substantial amount of habitat appropriate for the species occurring in this NWA. Older forests of mixed Douglas Fir and Ponderosa Pine constitute its preferred habitat. Foraging habitat includes large trees and is more open; security habitat includes younger, more dense trees, and large-diameter snags with pre-existing nest cavities are required for suitable nesting habitat. Nest boxes will also be readily used when available. Fire suppression, selective logging and insect outbreaks (e.g., pine beetle) have negatively affected this owl's preferred habitat (COSEWIC 2010a).

A provincial management plan is in the early stages of development for this species.

Lewis's Woodpecker (special concern, Schedule I – has been reassessed by COSEWIC as threatened, and is currently being considered for up-listing under SARA)

The Lewis's Woodpecker breeds in the southern interior of British Columbia from the Similkameen Valley east to the East Kootenay Trench. The core breeding range in the province is in the Okanagan Valley and Thompson Basin (Cooper et al. 1998). Preferred habitats include low-elevation old riparian cottonwood stands along river valleys; low-elevation grasslands with scattered mature and old Ponderosa Pine and Douglas Fir; open Ponderosa Pine forests with fire-maintained features such as

low-stem densities, abundant wildlife trees, and rich herb and shrub layers; and open areas with very old veteran Ponderosa Pines (Cooper et al. 2004).

Lewis's Woodpeckers occur regularly in the NWA (Cooper et al. 1998, 2004; Dawe et al. 2004). Substantial amounts of suitable habitat occur, and the NWA should be considered a core conservation area for this woodpecker. Although there is high potential for enhancing suboptimal habitat using prescribed burning, girdling of trees, riparian plantings and shrubland enhancement, multi-species habitat needs should be considered before embarking on actions (Cooper and Gillies 2000). A draft management plan for the Lewis's Woodpecker is in the final stages of approval (Environment Canada, unpublished).

Long-billed Curlew (special concern, Schedule 1)

In Canada, long-billed Curlews breed in British Columbia, Alberta and Saskatchewan. Preferred nesting areas include large, relatively flat areas of short (less than 30-centimetres tall) grassland. In British Columbia, cultivated fields are sometimes also used (COSEWIC 2002).

Peregrine Falcon (threatened, Schedule I)

The *anatum* subspecies of Peregrine Falcon is currently listed as threatened on SARA Schedule 1. However, the *anatum* and *tundrius* subspecies were reassessed in 2007 by COSEWIC and combined into one unit (*anatum/tundrius*) on the basis of genetic analysis, and collectively designated as special concern. The change to Schedule 1 is currently under consideration.

Peregrine Falcons occur across Canada. In British Columbia, they breed along the coast and portions of the southern interior. Nest sites (typically cliff ledges or crevices near a prey source) appear to be a factor affecting the distribution of the species. The species historically occurred throughout the Okanagan Valley, including a known nest site at McIntyre Bluff near the NWA. The species had been considered extirpated from the valley for most of the 20th century, but reintroduction programs appear to have had some success (Cooper and Beauchesne 2004). A federal recovery strategy had been drafted but is likely being modified as a management plan to reflect the new status designation.

Rusty Blackbird (special concern, Schedule 1)

Rusty Blackbird is found in all Canadian provinces and territories; virtually the entire breeding range of the species is within Canada. Primarily a boreal forest species, it occurs within north and central British Columbia and the southern interior, not along the coast or southeastern region (COSEWIC 2006a). They are uncommon in the Okanagan Valley, and are seen occasionally in the Vaseux area.

The species was listed as special concern due to significant population declines, likely as a result of habitat loss on the wintering grounds and, to a lesser extent, the breeding grounds. As this

species is a riparian specialist, the loss of wetlands in southern Canada is a likely factor in its decline (COSEWIC 2006a). A federal management plan has not yet been developed for this species.

Sage Thrasher (endangered, Schedule I)

In Canada, the Sage Thrasher occurs regularly only in the southern Similkameen and Okanagan valleys of British Columbia, and southwestern Saskatchewan and southeastern Alberta (Cannings 2000b). Since approximately 1980, only 5–10 pairs have been present in British Columbia (Campbell et al. 1997).

The Sage Thrasher is limited in distribution to regions of Big Sage and shrub-steppe habitats. It nests primarily in large sage bushes, a habitat that is potentially at risk due to urban, recreational and vineyard development. Cattle ranching can be compatible with successful breeding of Sage Thrashers, given moderate levels of grazing and carefully monitored management.

A draft recovery strategy is in the final stages of approval. Considerable amounts of suitable or potential Sagebrush habitat occur near the NWA, especially at White Lake. Dry sites within the NWA offer potential to manage for Big Sagebrush, which could contribute to the regional habitat requirement for Sage Thrashers.

Western Screech-Owl (endangered, Schedule I)

The Western Screech-Owl *macfarlanei* subspecies in Canada is restricted to south-central British Columbia, including the Okanagan Valley. It is listed as endangered because of its extremely small population size and past and imminent future loss of its native riparian woodland breeding habitat in the lowland valleys of the southern interior of British Columbia, particularly in the Okanagan and lower Similkameen watersheds (Chaundy-Smart 2002).

This cavity-nesting species requires high-quality riparian habitat with mature large-diameter trees for roosting and nesting, as well as suitable adjacent woodlands and edges of open habitats.

A provincial recovery strategy is available (Western Screech-Owl, *macfarlanei* subspecies Recovery Team 2008). Mature riparian forest is in very limited supply in the NWA, but opportunities to enhance and conserve habitat along Vaseux Lake and the Okanagan River are available.

White-headed Woodpecker (endangered, Schedule I)

In Canada, the White-headed Woodpecker is found only in British Columbia, where it is a rare resident in the Okanagan Valley from Naramata south, and a casual resident in the Similkameen Valley, Grand Forks area, and Kootenays (Campbell et al. 1990). White-headed Woodpecker sightings have occurred several times near Vaseux Lake, on provincial and federal conservation lands including the NWA (Vaseux Protected Area, Vaseux–Bighorn NWA, White Lake Protected Area, and Nature Trust lands) (Environment Canada, unpublished data).

The White-headed Woodpecker needs mature Ponderosa Pine that produces significant amounts of seed. Current habitat has been degraded through harvesting of larger-diameter pines and fire suppression (the density of younger trees has increased in some areas) (Cannings 2000a). Most of the old-growth Ponderosa Pine forests of British Columbia were logged in the 1930s and 1940s (Cannings et al. 1998), but scattered remnants occur in some areas.

A draft recovery strategy for White-headed Woodpeckers is in the final stages of approval (Environment Canada, unpublished). Considerable amounts of suitable or potential Ponderosa Pine habitat occur in the NWA, and these areas could be a focal point for habitat management/enhancement for the White-headed Woodpecker.

Williamson's Sapsucker (endangered, Schedule I)

The Williamson's Sapsucker inhabits higher-elevation mature, mixed coniferous and deciduous forests dominated by Western Larch. In the southern interior of British Columbia, breeding primarily occurs in montane forests (Campbell et al. 1990). In the Okanagan region it is restricted to the southern Okanagan highlands, where populations are thought to be sizable and stable (Cannings et al. 1987; Cooper 1995). Habitat loss is the primary threat to the Williamson's Sapsucker, and this is primarily through logging activities and fire, reducing the amount of mature coniferous forest. Williamson's Sapsuckers may benefit from management practices aimed at protecting and maintaining the NWA's and surrounding lands' open-canopy Ponderosa Pine forest with grassy understorey. A draft recovery strategy for the Williamson's Sapsucker is in the final stages of approval (Environment Canada, unpublished).

Yellow-breasted Chat (endangered, Schedule I)

The Yellow-breasted Chat *auricollis* subspecies, British Columbia population, occurs in Canada almost exclusively in the south Okanagan and Similkameen valleys. As of 2010, it was estimated that there were approximately 153 breeding pairs of Yellow-breasted Chats in the province (Environment Canada, unpublished data). The primary threat to the species is the loss, degradation and fragmentation of its habitat through development, roadside vegetation removal, and livestock grazing (Cannings 2000c).

A draft recovery strategy is nearing completion. The NWA has some suitable chat habitat and some potential for enhancement. Restoration efforts have already occurred within the NWA, as species recovery efforts have been ongoing for several years. However, it is important to ensure that recovery efforts are compatible with other species in need of conservation.

American Badger (endangered, Schedule I)

Badgers occur in British Columbia in the Okanagan and Thompson valleys, East Kootenay Trench and the Cariboo. Populations are very low, probably less than 350 individuals. Formerly occurring

regularly in the NWA, sightings in recent decades have dwindled. Threats to badgers include continued loss of habitat to development, mortality from road kill, and the relatively low and dispersed populations. Subdivision and development of private land, and current and future sales of existing crown lands, are also a significant threat. Fire suppression has also resulted in extensive ongoing forest in-growth.

Management practices such as forest thinning and burning in areas that were historically open habitats will contribute to badger recovery. Human-caused mortality from road kill must be addressed, including provision of safe crossing structures and openings in concrete barriers (BC Conservation Data Centre 2010).

A provincial recovery strategy is available (*Jeffersonii* Badger Recovery Team 2008). Substantial amounts of suitable habitat exist in the NWA, but threats from road-kill mortality need to be addressed before it is likely that badgers can recover in the Okanagan Valley.

Nuttall's Cottontail (special concern, Schedule 1)

Although a common species in the United States, within Canada the *nuttalli* subspecies of Nuttall's Cottontail only occurs in the Okanagan and Similkameen valleys (COSEWIC 2006b), in shrub-steppe habitat, with Sagebrush and rocky outcrops being important habitat features. Suitable habitat is present in the NWA. A provincial management plan has not yet been drafted for this species.

Pallid Bat (threatened, Schedule I)

The Pallid Bat occurs in Canada only in extreme southern British Columbia in the southern Okanagan Valley, in a localized area between the Oliver, Osoyoos and Okanagan falls. It appears to be most abundant on the Osoyoos Indian Reserve. Pallid Bats have also been captured at Vaseux Canyon and Gallagher Bluff. The Pallid Bat is found in arid desert-like habitat in British Columbia, often near rocky outcrops and water. It is restricted to low elevations (300–500 m) in Sagebrush areas and Ponderosa Pine forests in the vicinity of cliff faces and water. Preferring to forage in open areas, the Pallid Bat can be found over lengthy tracks of sandy, sparsely vegetated Sagebrush and grassland. Gravel roads and canyon mouths are preferred feeding areas. Ponderosa Pines are preferred as night roosts, and cliffs are used for day roosts.

The main limiting factors for Pallid Bats in Canada seem to be climate and naturally low availability of adequate habitat. The bats are threatened by continuing habitat loss from a rapidly increasing human population, urban expansion, recreational use and agriculture.

A provincial recovery strategy is available for Pallid Bats (Pallid Bat Recovery Team 2008). Substantial amounts of suitable habitat occur in the NWA, and the NWA could be part of the core protected area for this bat.

Spotted Bat (special concern, Schedule I)

The Spotted Bat is patchily distributed from central Mexico through the western United States. In Canada, it is restricted to lower elevations (below 900 m) in the southern interior of British Columbia. Most occurrences are in the bunchgrass, Ponderosa Pine, or interior Douglas Fir biogeoclimatic zones. Day roosts consist of crevices or cracks in high cliff faces. Winter roosting habitat is unknown. Foraging sites are close to water and within 6 km of day roosts. Foraging activity in the Okanagan has been observed in old fields adjacent to Ponderosa Pine forest (COSEWIC 2004a).

A provincial management plan has not yet been initiated for this species. Suitable foraging (and likely roosting) habitat occurs in the NWA.

Western Harvest Mouse (special concern, Schedule 1)

Like the Nuttall's Cottontail, the Western Harvest Mouse is at the northern limit of its range in Canada. The *megalotis* subspecies occurs throughout the south and central Okanagan in valley bottoms or south-facing slopes up to 780 m elevation. Suitable habitats are shrub-steppe grasslands with a well-developed, abundant herb layer. Old agricultural fields and orchards may also be used (COSEWIC 2007b). Suitable habitat is present in the NWA. A provincial management plan has not yet been drafted for this species.

Desert Nightsnake (endangered, Schedule I)

Nightsnakes occur in Canada only in the South Okanagan, including in the NWA. Less than 25 sites are known, and the Desert Nightsnake is considered highly endangered (Gregory 2001). The most essential habitat for Nightsnakes is over-wintering hibernacula. These occur on rugged hillsides, usually on warm aspects, dominated with rock outcroppings and talus. Entrances are usually fractures in bedrock or gaps between rocks that extend below the frost line. The internal structure of the over-wintering sites is unknown, but it must be sufficiently deep to avoid freezing, and high humidity is likely important to avoid desiccation. Other important habitats include summer shelter (large flat rocks, burrows, crevices) and nests (currently unknown) (Sarell 2004).

Nightsnakes are a priority species for the Southern Interior Reptile and Amphibian Recovery Team (Sarell 2004) and a provincial recovery strategy has been prepared (Southern Interior Reptile and Amphibian Recovery Team 2008c). There are likely opportunities to enhance/conservate habitat in the NWA, as Nightsnakes are known to occur there in Big Sage / rock outcrop habitats (Dawe et al. 2004).

Great Basin Gophersnake (threatened, Schedule I)

Great Basin Gophersnakes occur in the NWA and at low and mid-elevations within dry areas of the southern interior of British Columbia. Open areas in bunchgrass, Sagebrush, shrub-steppe and open

Ponderosa Pine forest habitats are preferred. Over-wintering dens are usually located on south-facing slopes in the Ponderosa Pine and bunchgrass biogeoclimatic zones. They are mainly found above the valley bottom, usually located at the base of cliffs, talus slopes, rock piles, or fissures in rock outcrops. Horizontal fissures or talus at the base of cliffs are particularly suitable. Individual gophersnakes occasionally use abandoned rodent burrows and human-modified habitats, such as the gravel bed of a railway. Dens are often communal and, in addition to Great Basin Gophersnakes, may be occupied by other snake species, including the Western Rattlesnake, Western Yellow-bellied Racer, Desert Nightsnake, and garter snakes (Waye and Shewchuk 2002). Gophersnakes disperse quickly from over-wintering sites in the spring and may move 1 km or more to summer foraging areas, where they make regular use of shelter sites. Shelter sites are usually located in abandoned rodent burrows on south-facing slopes. Nests are usually located in abandoned rodent burrows on sparsely-vegetated, south-facing slopes with loose, sandy soils (Shewchuk 1996).

Conservation is being addressed mainly by the Southern Interior Reptile and Amphibian Recovery Team, and a recovery strategy has been prepared (Southern Interior Reptile and Amphibian Recovery Team 2008d). Because there are substantial amounts of suitable habitat, there are likely multiple opportunities to conserve and/or enhance habitat in the NWA.

Great Basin Spadefoot (threatened, Schedule I)

The Great Basin Spadefoot reaches the northern limit of its distribution in the dry valleys of the southern interior of British Columbia. It is a poorly known species, mainly because of its habit of living underground most of the time. Spadefoots are often opportunistic breeders, as they use ephemeral water bodies that may not be available each year. They may also use more permanent water bodies with distinct basins that predictably contain water until at least late summer. Such sites can be very important in supporting the population during drought years, when ephemeral egg-laying sites are either not available or dry up before tadpoles are able to complete their development (COSEWIC 2007c; Sarell 2004).

The Great Basin Spadefoot is known to occur in the NWA (Dawe et al. 2004), but the extent of its distribution and abundance is uncertain. Ephemeral ponds are rare in the NWA, but there may be opportunities to enhance more permanent water bodies as habitat for Great Basin Spadefoot toads. A provincial recovery strategy is available (Southern Interior Reptile and Amphibian Recovery Team 2008e).

Rubber Boa (special concern, Schedule I)

In Canada, Rubber Boas are patchily distributed throughout southern British Columbia. A wide variety of habitat types are used, with the presence of abundant, coarse, woody debris appearing to be an important feature component. Rock crevices and abandoned rodent burrows are used extensively for thermoregulation; individuals spend the majority of time underground (Cameron et al. 2003). The stated

management objective to reduce coarse, woody debris in the NWA may limit suitable habitat for this species. A provincial management plan has not yet been drafted.

Tiger Salamander (endangered, Schedule I)

The endangered Southern Mountain population of Tiger Salamander is restricted in Canada to a small area of arid habitats in the South Okanagan, Lower Similkameen, and Kettle River Valley watersheds (COSEWIC 2001; Southern Interior Reptile and Amphibian Recovery Team 2008g). Important habitats include egg-laying sites (aquatic) and terrestrial shelters. Tiger Salamanders breed in both permanent and ephemeral water bodies in valley bottoms up to 1250-m elevation. The water bodies in which egg-laying sites occur are often alkaline and soft bottomed, but can be of various sizes and depths and are often surrounded by grassland. Egg-laying sites are usually in warm, shallow (less than 1-m deep) water. Shelters are burrows or underground crevices (Richardson et al. 2000).

Tiger Salamanders likely occur in various parts of the NWA. Conservation is being addressed mainly by the Southern Interior Reptile and Amphibian Recovery Team and a provincial recovery strategy has been prepared (Southern Interior Reptile and Amphibian Recovery Team 2008g). Maintaining the structural integrity and water quality of wetlands and their shorelines in the NWA may be the best method of conserving habitat.

Western Painted Turtle (special concern, Schedule I)

Western Painted Turtles are distributed across the central United States, with disjunct populations in the southwest and Mexico. In southern Canada, the species occurs from Ontario to British Columbia. The Intermountain–Rocky Mountain population, which is designated as special concern and which occurs in the NWA, is geographically isolated from the endangered Pacific Coast population. Preferred habitat consists of a cluster of breeding and over-wintering ponds, their associated riparian areas, and upland habitat connecting the areas (COSEWIC 2006c).

The species is known to occur in the NWA (COSEWIC 2006c). A provincial management plan has not yet been prepared for the Intermountain–Rocky Mountain population.

Western Rattlesnake (threatened, Schedule I)

In Canada, this species, also known as Northern Pacific Rattlesnake, occurs mainly in arid regions of the Okanagan and Thompson valleys. It is considered threatened in Canada as a result of habitat loss from agricultural and residential development as well as persecution by humans. Western Rattlesnakes are known to have three important habitats: over-wintering dens (hibernacula), maternal rookeries and shelter sites. Western Rattlesnake over-wintering hibernacula occur on steep and rugged hillsides, usually on warm aspects, dominated with rock outcroppings and talus. The entrance may be a

fracture in bedrock or gaps between rocks. Over-wintering sites usually have flat, exposed areas around the entrance of the den where rattlesnakes spend several weeks laying out just after emergence in the spring, and just before re-entering in the fall. Maternal rookeries are usually composed of rock with recesses and fissures. The complex structure and temperature gradients of the rocks and fissures that make up the sites are essential for proper development of embryos, and also provide protection from predators. Rookeries are usually located within 50 m of the winter hibernacula. Shelter sites occur in rock outcroppings, rubble, vegetation or man-made structures (e.g., concrete berms, construction materials).

The Western Rattlesnake requires several interconnected habitats to perform its life-history functions. Extensive seasonal movement between habitats makes the Western Rattlesnake particularly vulnerable to disturbance. Conservation is being addressed mainly by the Southern Interior Reptile and Amphibian Recovery Team, and a provincial recovery strategy is in place (Southern Interior Reptile and Amphibian Recovery Team 2008f). The Western Rattlesnake is relatively common in the NWA and several hibernacula sites are known (Dawe et al. 2004). As habitat and numbers are relatively abundant, there seems to be a great opportunity to conserve habitat and populations in the NWA.

Western Skink (special concern, Schedule I)

In Canada, Western Skinks are limited in distribution to the south Okanagan and Similkameen valleys and the Kootenay region, with most records coming from the hotter, drier locations. Diverse habitats, including forest and grassland, are used. Abundant herbaceous cover, and cover objects such as coarse, woody debris or talus, are important habitat features, as is a south-facing aspect (Ovaska et al. 2002).

Suitable habitat is present in the NWA. A provincial management plan has yet to be prepared for this species.

Western Toad (special concern, Schedule 1)

The *halophilus* subspecies of the Western Toad ranges from western British Columbia to southern Alaska. Preferred habitat types are desert streams and springs, grasslands, aspen groves and mountain meadows; they are less common in heavily wooded regions. Western Toads are terrestrial amphibians, and outside of the breeding season they spend their daylight hours on the forest floor or under rocks or shrubs. There are two records of individual adult Western Toads observed around the Vaseux basin / NWA–constructed wetlands in 2005 and 2006.

Suitable habitat is present within the NWA. A draft provincial management plan is available for Western Toads in British Columbia (Provincial Western Toad Working Group, unpublished), and a national management plan is also nearing the final stages of completion (Environment Canada, unpublished).

Western Yellow-bellied Racer (special concern, Schedule I)

Yellow-bellied Racers occur across North and Central America. In Canada they occur only in the south and central interior of British Columbia, with the Okanagan and Similkameen valleys comprising the core of the species' range. Favoured habitats are characterized as open and sparsely treed. Nesting sites are usually south-facing, and can be abandoned rodent burrows or stable talus slopes. Nest sites are sometimes shared with other species, such as gophersnakes. Hibernacula are also on south-facing slopes (steep), and shared with other snakes. Dens may be on rocky outcrops, talus slopes and small rock piles with sufficient humidity to prevent dessication (COSEWIC 2004b).

Suitable habitat is present in the NWA. A provincial management plan has yet to be prepared for this species.

Behr's Hairstreak (threatened, Schedule I)

In Canada, the Behr's Hairstreak is known to occur only in the South Okanagan, from Penticton south to the U.S. border (Shepard 2000). It uses Antelope Brush, almost exclusively, as a host plant. Hairstreaks generally lay their eggs singly on woody twigs of Antelope Brush plants and at the base of the buds of the next year's leaves. The Behr's Hairstreak appears to select large, mature Antelope Brush (> 2 m in height) as host plants. Yarrow, Smooth Sumac, Baby's Breath and other flowering plants are also used for nectaring.

Surveys for Behr's Hairstreaks in 2003 in the NWA found most individuals in the Northeast Upland Unit (Dawe et al. 2004). A provincial recovery strategy has been completed (Southern Interior Invertebrates Recovery Team 2008a), and as Antelope Brush occurs commonly in the NWA, there are likely substantial opportunities to enhance and conserve habitat. Although the NWA provides protection from development and destruction of Antelope Brush habitat, additional management practices to increase the quality of this habitat are required. These practices include reducing recreational activity in the protected area, eliminating exotic species, and identifying areas of burned Antelope Brush with previous Behr's Hairstreak records in the NWA along with developing a plan to replant these communities in accordance with recovery strategy goals.

Monarch (special concern, Schedule I)

In Canada, the distribution of the Monarch is correlated with the northern range limit of milkweeds, which is generally southern Canada, with highest abundances in southern Ontario and Quebec (COSEWIC 2010b). Southern British Columbia represents the only area where the western population occurs. Showy Milkweed is the only native milkweed in British Columbia, and along with cultivated milkweeds, provides the Monarch's larval caterpillar with its sole food source. Primary threats

to the species are at over-wintering sites in Mexico, although the use of herbicides and pesticides near breeding areas is also a concern (COSEWIC 2010b).

Suitable habitat is present in the NWA. A national management plan for the Monarch is in the draft stages.

Mormon Metalmark (endangered, Schedule I)

The Mormon Metalmark is a butterfly of arid regions, and occurs in British Columbia only in the South Okanagan. The Mormon Metalmark uses Snow Buckwheat as both larval food plant and adult nectar source. Common rabbitbrush is an important secondary nectar source. It is mainly associated with hillsides, dunes and embankments on barren, sandy or gravelly soils where the buckwheat larval host plants grow (St. John 2002). A provincial recovery strategy has been prepared (Southern Interior Invertebrates Recovery Team 2008b).

Where possible, early successional habitats that promote the growth of Snow Buckwheat will be maintained. Maintenance activities that could damage areas that contain, or could contain, Snow Buckwheat will not be carried out.

Short-rayed Alkali Aster (endangered, Schedule I)

In Canada, the Short-rayed Alkali Aster is found only in British Columbia's southern interior, including along the shores of Vaseux Lake. The aster seems to depend on late-summer draw-downs of ponds and rivers and is found on gentle, moist slopes. The aster flowers from July to October, and dispersal is facilitated by wind, water and animals. The plant has a very limited distribution in Canada, and the main threats are beach management activities and invasive plants.

www.ec.gc.ca

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